A MODEL OF PACKET LOSS CAUSED BY INTERFERENCE BETWEEN THE BLUETOOTH LOW ENERGY COMPONENT OF AN IOS WEARABLE BODY AREA NETWORK AND RESIDENTIAL MICROWAVE OVENS

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ABSTRACT

Cardiovascular diseases are the leading cause of death in the United States. Advances in wireless technology have made possible the remote monitoring of a patient's heart sensors as part of a body area network. Previous studies have suggested that stray wireless transmissions in the industrial, scientific, and medical (ISM) band cause interference resulting in packet loss in Bluetooth piconets. This study investigates the impact that wireless transmissions from residential microwave ovens have on the Bluetooth Low Energy (BLE) component of the body area network.

Using a systematic data collection approach, two variables were manipulated. The distance between the microwave oven and the BLE piconet was varied from 0.5 meter to 5.0 meters at one-half meter increments. At each distance, the power level of the microwave oven was varied from the lowest power setting to the highest power setting. The two variables that were collected were the microwave interference generated by channel and the packet loss by channel. The results suggest more packet loss is due to the microwave oven's power level than by the distance, the interference caused by the microwave oven affects all BLE channels equally, and the packet loss by channel is a good predictor of microwave oven interference.

The significance of this study lies in providing beneficial information to the medical and digital communication industries concerning the causes and solutions to disruptions in the Bluetooth-enabled body area network devices in a very common situation. The results of this study may lend support for improvements and widespread use of body area network medical

systems, which may have the benefit of better monitoring, more data, and reduced fatalities due to misdiagnosed heart conditions.

PREFACE

The research described in this dissertation was conducted between September 2009 and January 2015. Data collection for the pilot study occurred between November 2012 and February 2013. Data collection for the expanded study occurred between October 2013 and July 2014.

Two sources inspired this study. The first source was Nada Golmie's presentation "Prevailing over Wires in Healthcare Environments: Benefits and Challenges" where she suggested Zigbee, Bluetooth, WiBree, and WiFi as potential wireless medical body area network technologies. Two questions she asked concerned the impact of interference on performance and improvements needed in the protocol to provide better performance. The second source was Thomas Rondeau's paper "Residential Microwave Oven Interference on Bluetooth Data Performance" where he looked at the effects of microwave oven interference on classic Bluetooth networks.

This dissertation is original except where acknowledgments and references are made to previous work. While the dissertation has not been submitted for any other degree at any other university, parts of the work have been presented in the following publications:

Barge, W.C., Chou, T., Lin, Y., Ozan, E. (2014). "A Model of Packet Loss in the Bluetooth Low Energy Component of a Wearable Body Area Network Caused by Interference from a Residential Microwave Oven," Proceedings of the IEEE Healthcare Innovation/Point-of-Care Technologies Conference (HIC-POCT'14), pages 87-90.

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CHAPTER 1

INTRODUCTION

Cardiovascular diseases are the leading cause of death for both men and women in the United States, and the cause for 30 percent of all deaths worldwide (Centers for Disease Control and Prevention, 2012, 2014; Lin et al., 2010). In addition to the fatal cases, at least 20 million people experience nonfatal heart attacks each year (Lin et al., 2010). Worldwide global deaths due to heart attacks and strokes are expected to increase by 15 percent in the next five years (Latre, Braem, Moerman, Blondia, & Demeester, 2011). Characterized by arrhythmia, most ischemic episodes take place during daily activities. Because survival is dependent on timely access to emergency care, early detection of this type of abnormal heartbeat is very important (Belgacem & Boumerdassi, 2009).

In order to allow greater physical mobility, sensors can be placed on clothing, on the body, or even under the skin. These sensors provide real-time continuous health monitoring. The combination of these sensors with a personal device to gather sensor data and forward information via an external gateway can be used to measure heartbeat, measure body temperature, record electrocardiogram (ECG), or even provide intervention via actuator equipped pumps or cardiac pacemakers (Chen, Gonzalez, Vasilakos, Cao, & Leung, 2011; Latre et al., 2011; M. Zhang, Raghunathan, & Jha, 2013).

The use of body area networks (BANs) to monitor a patient's heart rate remotely is being explored as a tool to save lives and reduce medical related in-hospital monitoring. With this patient-centric paradigm, the focus changes to just-in-time intervention. Wearable heart sensors play a key role in continuous monitoring. With a medical sensor relaying heart data via Bluetooth to a smart phone, it is possible to track a patient anywhere a cellular signal is available (Altini et al., 2011; Proulx, Clifford, Sorensen, Lee, & Archibald, 2006). The Bluetooth module is configured as a slave and the smart phone is considered to be functioning as a master. The signal acquisition unit sends data to the Bluetooth module, which transmits data continuously (Belgacem & Boumerdassi, 2009). The study of packet loss due to interference is important because it affects our knowledge of the throughput of the Bluetooth network, called a piconet, and, consequently, the effectiveness of the BAN system (Naik, Wei, Su, & Shiratori, 2005).

Bluetooth is said to be resilient to interference with moderate bandwidth. However, because the users of BANs are mobile, maintaining connectivity among Bluetooth devices in a piconet may pose some challenges (Chang, 2008). Due to the absence of coordination between independent masters while accessing the wireless medium, devices will encounter high packet interference if several piconets are simultaneously operating in the same area. All versions of Bluetooth operate in the unlicensed 2.4 GHz Industrial Scientific Medical (ISM) band which is also occupied by non-communications devices such as microwave ovens and radio frequency-excited lighting. Stray wireless signals from these non-communication devices can interfere with the data transmission on a wanted Bluetooth piconet. Consequently, the requirement to retransmit packets will increase, reducing the overall data throughput. Packet collisions take place when two or more wireless signals simultaneously transmit over the same frequency slot (Mazzenga, Cassioli, Loreti, & Vatalaro, 2002). The frequency of collisions depends on the proximity of piconets within the environment and the transmission power levels (Arumugam, Nix, Fletcher, Armour, & Lee, 2002). For real-time applications or very sensitive data transfers, packet loss may have dramatic consequences (Cypher, Chevrollier, Montavont, & Golmie, 2006). As the amount of interference increases, the probability of packet loss increases, and the overall throughput of each piconet decreases (Mazzenga et al., 2002).

Previous studies have investigated the interference in classical Bluetooth piconets caused by the stray wireless signals generated from microwave ovens. The results of these studies, which will be discussed later, suggest that the distance between the piconet members and the distance to the microwave determines the extent to which the microwave oven affects the Bluetooth networks. In general, the interference did not significantly degrade the performance until the piconet was within about 5m of the microwave oven (Rondeau, D'Souza, & Sweeney, 2004).

The latest Bluetooth protocol, Bluetooth 4.0, also known as Bluetooth Low Energy (BLE), builds off the previous releases and operates at a lower power to conserve the device's battery. To add resiliency, the BLE protocol uses a 24-bit cyclic redundancy check (Bluetooth SIG Inc., 2010). Overcoming the effects of the interference in the BLE module is an area that needs to be addressed (Garroppo, Gazzarrini, Giordano, & Tavanti, 2011; Kumar, Kambhatla, Hu, Lifson, & Xiao, 2008; Nassar, Lin, & Evans, 2011; Rondeau et al., 2004).

Statement of the Problem

Previous studies using classic Bluetooth have concluded that the interference from residential microwave ovens significantly degrades the performance of the Bluetooth piconet at distances less than 5m. Recent innovations in medical BANs use the latest Bluetooth protocol which is said to be resilient to interference. While there have been studies using BLE, there have been virtually no studies of the effects of interference on medical BAN when the source of interference is in close proximity to the BAN. Given the mobility and immediate response provided by the BLE-enabled BAN systems and the universal acceptance and use of residential microwave ovens, there needs to be a study that investigates the impact stray signals from microwave ovens have on the BLE component of the medical BAN systems.

Therefore, the problem of this study is to investigate the effect of the interference generated by a residential microwave oven on the BLE component of a medical BAN when the source of the interference and the BAN are less than 5 meters apart. This study records packet loss at discrete distances between the microwave oven and the BAN, at discrete power settings of the microwave oven, and at different channel positions inside the ISM band. A statistical analysis of the data collected creates models to predict the packet loss caused by proximity and power strength of the microwave oven. From this data, a new protocol may be able to be created to allow acceptable quality of service in the medical BAN while it is in close proximity to a source of interference.

Research Objectives

The objectives of the study are to use the findings to:

- Identify the impact of the coexistence of multiple signals in the ISM band on the emerging BLE technology's ability to transmit medical data.
- Identify the impact of stray interference on the data transmissions on each BLE channel.
- Identify the relationship between packet loss and the distance that separates the BLE piconet from the microwave oven.
- Develop a model that may be used to predict packet loss when the piconet is subjected to various forms of interference.

Research Questions and Hypotheses

The two primary purposes of the study are to propose a simple model that can be used to predict packet loss based on the distance that the piconet is from the microwave oven and the power output from the microwave oven and to propose a method to be employed in the BLE-enabled BAN that will avoid the packet loss and decreased throughput in the piconet. The substantive research questions and hypotheses are as follows:

RQ 1: Will the interference caused by the residential microwave oven result in more packet loss as the microwave oven's transmission signal increases due to either a decrease in the distance between the microwave oven and the BLE piconet or due to an increase in the microwave oven power level?

H 1-1: A decrease in the distance between the microwave oven and the BAN system components increases packet loss.

H 1-2: An increase in the microwave oven's power level will contribute to packet loss.

RQ 2: Will the interference caused by the residential microwave oven be clustered and primarily affect only a portion of the channels available to the BLE piconet?

H 2-1: All channels are equally affected by interference from the microwave oven regardless of strength of interference.

H 2-2: Clusters of channels at the top of the ISM band are affected the most by microwave oven interference.

RQ 3: Will the packet loss by channel be a predictor of microwave oven interference that can be used to avoid decreased throughput in the piconet?

H 3-1: The packet loss by channel significantly predicts the interference from the microwave oven.

H 3-2: The packet loss by channel significantly predicts the distance between the piconet and microwave oven.

H 3-3: The packet loss significantly predicts the channel used by the piconet.

Significance of the Study

The significance of this study lies in that it may provide beneficial information to the medical and digital communication industries concerning the causes and solutions to disruptions in the wearable BLE-enabled BAN devices in a very common situation. The results of this study may lead to improvements and widespread use of wearable medical BAN systems, which may have the benefit of better monitoring, more data, and fewer fatalities due to misdiagnosed heart conditions.

Methodology

A BLE-enabled heart rate sensor was paired with a smartphone to create the medical BAN. Data packets sent by the heart sensor to the smartphone were captured using the ComProbe BPA LE (ComProbe BLE) Bluetooth protocol analyzer and software running on a Windows 7 laptop computer.

Five residential microwave ovens were used to create interference in the ISM frequency band. Each of these microwave ovens was rated at 1100 watts power consumption. The signal strength of the interference that each microwave oven creates in the ISM band was measured by using the Ubertooth One device and related spectrum analysis software running on a Back Track 5 Linux laptop computer.

Using a systematic data collection approach, two variables were manipulated. The first variable was the distance between the microwave oven and the BLE piconet. The distance from each of the five microwave ovens to the BLE piconet was varied from 0.5 meter to 5.0 meters at one-half meter increments. The second variable was the power level of the microwave oven. At each distance, the power level of the microwave ovens was varied from the lowest power setting to the highest power setting. The distance between the bio sensor and the smart phone in the BLE piconet was fixed at 0.5 meter. The two variables that were collected were the microwave interference generated by channel and the packet loss by channel.

The data collected was analyzed using several common statistical techniques. The correlation coefficient was used to determine the impact of the decrease in the distance between the BAN and the microwave oven had on packet error. It was found there was statistical evidence to support the conclusion that a decrease in distance between the microwave oven and the BAN increases packet loss when the microwave oven is operating at the highest power level.

The Analysis of Variance (ANOVA) statistical test was used to determine the strength of the microwave oven's interference on the individual BLE channels. It was found that the microwave oven interference is not clustered and equally affects all of the BLE channels.

Multiple linear regression analysis was used to create models that may be used to predict packet loss. While the distance and average strength of the interference in the channel is statistically a good predictor of packet loss, the model only explains about one-third of the variation in the data points. Similarly, multiple linear regression models were created to predict the distance the microwave oven was from the BAN when the packet error rate and channel were know and to predict the BLE channel when the packet error rate was known. While statistically good predictors, neither of these two models explained more than one percent of the variation in the data points.

Definition of Terms

- Adaptive Frequency Hopping (AFH) – Allows Bluetooth to adapt to the environment by identifying fixed sources of interference and excluding them from the list of available channels, reducing the number of channels used by Bluetooth.
- Bluetooth Low Energy (BLE) – The fourth generation Bluetooth protocol that operates at a low power to conserve the device's battery.
- Body Area Network (BAN) – The class of network employing biosensors to continuously monitor physiological activities and actions, usually as part of a healthcare monitoring application.
- Electrocardiogram (EKG) - The graphic record produced by an electrocardiograph.
- Electrocardiograph (ECG) - A galvanometric device that detects and records the minute differences in electric potential caused by heart action and occurring between different parts of the body used in the diagnosis of heart disease.
- Forward Error Correction (FEC) – A system of error control for data transmissions where the sender adds redundant data to its message to allow the receiver to detect and correct errors without the need to ask the sender for additional data.
- Frequency Hopping (FH) – A method of transmitting radio signals by changing carrier frequencies.
- Frequency Hopping Spread Spectrum (FHSS) – A method of transmitting radio signals by rapidly switching a carrier among many frequency channels using a pseudorandom sequence known to both the transmitter and receiver.

- Implantable Body Area Network (Implantable BAN) - A BAN that uses light-weight, small-size, ultra-low-power, intelligent sensors that are strategically implanted into the human body.
- Industrial Scientific Medical (ISM) band – Radio bands originally reserved for the use of radio frequency electromagnetic fields for industrial, scientific, and medical purposes. Communication devices operating in this unlicensed band must tolerate any interference from ISM equipment.
- Personal Area Network (PAN) – A computer network used for communication among devices close to one's person.
- Received Signal Strength Indication (RSSI) – A measurement of the power present in a received radio signal.
- Wearable Body Area Network (Wearable BAN) – A BAN that uses light-weight, small-size, ultra-low-power, intelligent wearable sensors that are strategically placed on the human body or incorporated into clothing.

CHAPTER 2

LITERATURE REVIEW

Body Area Network

Cardiovascular disease is the single leading cause of death in the world representing 30 percent of all global deaths (Latre et al., 2011). According to the American Heart Association, approximately 300,000 incidents of out-of-hospital cardiac arrests (OHCA) occur annually, and 92 percent of persons that experience OHCA die (McNally et al., 2011). Studies have found that early detection and defibrillation is critical for survival. Treating a patient who is experiencing ventricular fibrillation during the first 12 minutes of cardiac arrest achieves survival rates of up to 75 percent. Survival with treatment after 12 minutes drops to four percent (Shih, Bychkovsky, Curtis, & Guttag, 2004). These deaths can often be prevented with proper healthcare (Latre et al., 2011).

Cardiovascular disease is usually characterized by arrhythmia, making it important to detect this kind of abnormal heartbeat (Belgacem & Boumerdassi, 2009). In addition, most ischemic[1] episodes leading to a heart attack take place during daily activities rather than in the hospital and may lead to a heart attack. The ability to implement real-time remote monitoring of a cardiologic patient's heart during daily activity can reduce the delay in administering

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[1] A decrease in the blood supply to a bodily organ, tissue, or part caused by constriction or obstruction of the blood vessels.

emergency care and increase the chances of patient survival (Gonçalves, Filho, Andreão, & Guizzardi, 2008).

Cardiovascular disease is now becoming more common in younger people with most of the people affected now aged between 34 and 66 years. At least 20 million people worldwide experience nonfatal heart attacks and strokes every year. Many of these survivors require continuing medical care (Lin et al., 2010). One method of continuing monitoring is through wireless technology. New technologies allow wearable biomedical sensors that give patients the freedom to be mobile while still under continuous monitoring (Kumar et al., 2008).

With the increased use of wireless networks and rapid advancements in applications that run on smart phones and other mobile devices, there has been increasing interest in a new type of network architecture known as body area networks (BANs) which are made feasible by advances in small, lightweight, ultra-low-power, wearable monitoring sensors that continuously monitor human physiological activities (Chen et al., 2011; Latre et al., 2011; M. Zhang et al., 2013). Two types of devices in a BAN are sensors and actuators. The sensors are placed in clothing or directly on the body. These sensors can be used to measure temperature, blood pressure, heart rate, electrocardiograph (ECG), or other physiological parameters. The actuator takes some specific action based on the data received from the sensor. Interaction with the user of other persons is usually via a personal device, such as a smart phone. (Latre et al., 2011). Smart phones are "more powerful than the computers that took Apollo 11 to the moon" and have the ability to send and receive data from nearly anywhere with 3G or 4G data transmission rates (Zakas, 2013).

The initial target applications for BANs are for wearable health care systems capable of establishing a wireless communication link to provide continuous in-home health monitoring and diagnosis as well as real-time feedback to the user of medical personnel (Gollakota, Hassanieh, Ransford, Katabi, & Fu, 2011; Latre et al., 2011; Yoo, 2013; M. Zhang et al., 2013). "The smart phone and tablet PC are about to realize the dream of the wearable computer, and the remaining issues concern the required technology for the ultimate seamless interface with the human body" (Yoo, 2013).

Remote monitoring systems can consist of two components: a data analysis system and a client program connecting the mobile device to a remote database (Hu, Stoelting, Wang, Zou, & Sarrafzadeh, 2010). Communication can be via Bluetooth, WiFi, 3G, or 4G networks. The ability to monitor a patient's heart remotely is being explored as a tool to save lives and reduce medical costs related to in-hospital monitoring. Although these remote monitoring systems can take many forms, they all are functionally divided into four subsystems: medical sensors, data sampling, wireless transmission, and host interface (Park, Chou, Bai, Matthews, & Hibbs, n.d.; M. Zhang et al., 2013).

In a common setup, the patient wears a wireless sensor which transmits the heart's data signals to a smart phone (Kumar et al., 2008; Latre et al., 2011). The sensors are worn on the body and transmit the continuous electrical signals from the heart. These signals must be periodically sampled in order to be digitized. The sampling frequency and digitization method play a critical role in determining the characteristics of the digital signal (Cypher et al., 2006; Shih et al., 2004). In the conversion process, the analog heart beat is sampled at discrete intervals. The sampling interval is obtained from standard databases or developed by the sensor manufacturer and is beyond the scope of this study. The digital signal is then packetized into a frame to be transmitted wirelessly to the host. To provide portability to the patient, this wireless transmission is often accomplished via a cellular connection between the patient and the medical provider. Because it is unrealistic to establish a full-time cellular connection, an additional component is often included to buffer the data.

One of the main challenges in patient monitoring is early diagnosis in the area of emergency e-Health where real-time ECG transmission is desirable (Alesanco & Garc´ıa, 2010). The main objective of the IEEE 1073 Medical Device Communications standards organization is to develop universal and interoperable medical equipment interfaces that are easy to use and quickly reconfigured (Cypher et al., 2006; Kennelly, 1998; Yao, Schmitz, & Warren, 2005). While radio frequency (RF), WiFi, and Zigbee are mentioned in the literature, Bluetooth offers the additional benefits of an embedded base, reliable data transfer, and device compatibility between different vendors. Using commonly available non-proprietary off-the-shelf sensors to infer people's health is preferred to closed vertically-integrated designs that impede compatibility (Lim et al., 2012).

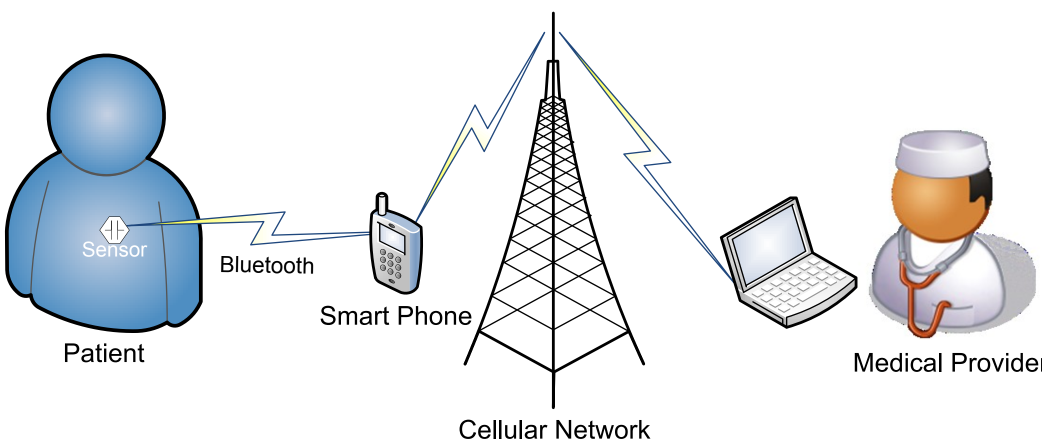

Figure 1. Medical BAN system using Bluetooth and smart phone technology

As diagramed in Figure 1, the Bluetooth component sits between the data sampling and wireless transmission subsystems. The heart sensor includes a Bluetooth module that is configured as a slave. The smart phone functions as the master. The sensors' Bluetooth module transmits data continually. Mobile application software is run on the smart phone. The phone's

Bluetooth module stores the transmitted data in the buffer. The mobile application reads data from the buffer and has the ability to transmit this data to a remote medical facility via the cellular connection. The software can transmit data at set intervals or when the saved data measurements are beyond a preset value. The transferred data is sent to a medical provider who can examine and manage the patient's status. If the patient's measurements are out of the predefined range, emergency care can be dispatched to the patient's location or actuators can be used to administer emergency intervention (Belgacem & Boumerdassi, 2009; Yao et al., 2005; M. Zhang et al., 2013).

The use of a Bluetooth-enabled remote monitoring system has to guarantee the integrity of the medical signal during the transmission process in order to provide an accurate diagnosis. It is known that the transmission of the medical signals may be affected by interference that distorts the reconstruction of the medical signals in reception. In previous studies using the TCP/IP protocol stack to transmit the medical signals, data packets containing errors due to erroneous bits distorting the reconstructed medical signal were not retransmitted, but shown in the monitoring process (Alesanco & Garc´ıa, 2010). Current protocols are not always well suited to support a BAN (Latre et al., 2011).

Bluetooth Technology

Bluetooth was one of the first IEEE 802.15 protocols. It is a single-hop, point-to-multipoint technology designed for ad-hoc, short-range wireless applications (Dideles, 2003). Bluetooth is a low cost and low power wireless interface for ubiquitous connectivity in the area of Personal Area Networks (PAN) covering distances of 10 meters or less. The technology operates in the unlicensed 2.402 GHz to 2.480 GHz Industrial Scientific Medical (ISM) band. The Bluetooth standard is maintained by the Bluetooth Special Interest Group (SIG) and operates under Title 47 of the Federal Communication Commission's Code of Federal Regulation: Part 15 – Radio Frequency Devices which stipulates that the wireless devices must not give interference and must take any interference received (Rondeau et al., 2004).

Bluetooth is one of the low-cost, low-power consumption standards that are feasible for ISM applications (Yaqub, Gondal, & Kamruzzaman, 2010). Over 40 million Bluetooth enabled health and medical devices are already available on the market. "Some of the many Bluetooth enabled health and wellness devices already on the market include wireless blood glucose monitors, heart rate monitors, weight scales and stethoscopes. These devices are making it easier than ever to collect vital health information about people with a wide variety of medical conditions – even allowing healthcare providers to monitor patients while they're at home or on the go (Bluetooth SIG Inc., 2012)." As a complement to these Bluetooth enabled devices, work is also being done on iOS applications for remote monitoring (Rodriguez-Sanchez, Torrado-Carvajal, Borromeo, Hernandez-Tamames, & Luaces, 2012).

Bluetooth is a transmission standard designed to support ad-hoc connectivity in a local area. When Bluetooth devices are within range, they can cluster into ad-hoc networks called piconets and temporarily designate one device to act as the master unit to coordinate transmissions with up to seven slave units. The slaves in a piconet can only have links to the master. Slaves cannot directly transmit data to one another. All packets have to be passed to the master when inter-slave communication is necessary. In effect, the master acts as a switch for the piconet and all traffic must pass through the master. Any device can be either a master or a slave within a piconet, and the device can change roles at any point in a connection when a slave wants to take over a master's role. At any given moment, there can be up to 7 active slaves in a piconet but only one master. (Chang, 2008; Dideles, 2003).

When two or more independent, non-synchronized Bluetooth piconets overlap, a scatternet is formed in a seamless, ad-hoc fashion allowing inter-piconet communication. While the Bluetooth specification stipulates the use of time-division multiplexing (TDM) for enabling concurrent participation by a device in multiple piconets, it leaves the choice of actual mechanisms and algorithms for achieving this functionality open to developers ("Scatternet - Part 1: Baseband vs. Host Stack Implementation," 2004)

Bluetooth is based on packet transmission and frequency hopping (FH) technologies to provide channelization among different piconets within the same area. Terminals belonging to the same piconet communicate over the channel identified by a frequency hopping code. Based on different FH code patterns, several piconets can coexist in the same area, regardless of whether or not they link to form a scatternet. Within scatternets, packet collisions can occur with significant probability and this kind of interference degrades link performance (Mazzenga et al., 2002).

In a Bluetooth piconet, the master controls the channel. Due to an absence of coordination between the independent masters while accessing a wireless medium, devices may encounter high packet interferences if several piconets are simultaneously operating in the same area. A pair of packets transmitted in two piconets are said to interfere with each other if the packets are transmitted on the same frequency and the two packets overlap. Because of the popularity of Bluetooth devices, it may not be unusual to find tens of independent piconets in a crowded place (Naik et al., 2005).

Figure 2 diagrams three different Bluetooth configurations. The first piconet, labeled P_1, has one master, A, and three slaves, B, C, and D. The second piconet, P_2, is a peer-to-peer network with C acting as the master and H as the slave. The third piconet, P_3, has E as the master and D, and F as slaves. Together these three piconets form a scatternet. The two connections in the scatternet are C and D. Node C acts as a slave in P_1 but as the master in P_2. Node D acts a slave in both P_1 and P_3.

Using the example scatternet in Figure 2, assume piconet P_2 represents a BAN with the heart sensors being represented by node H and the smart phone represented by node C. Next assume piconet P_1 represents a network where node A is a Bluetooth-enabled PC and nodes B and D are other Bluetooth-enabled devices.

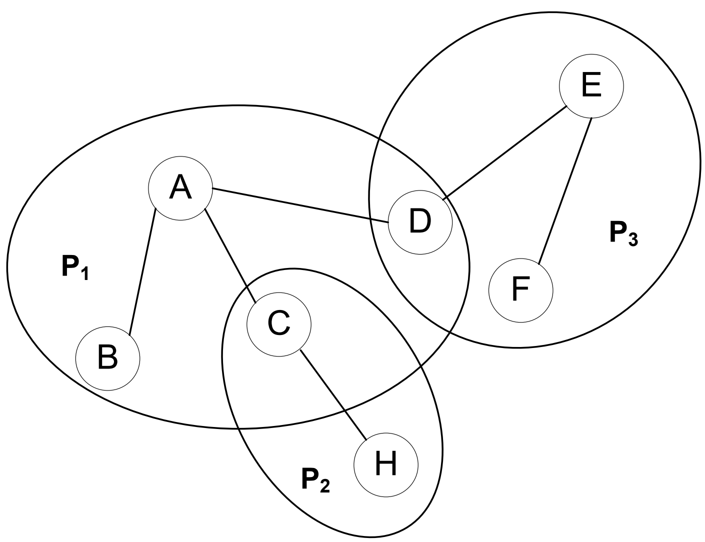

Figure 2. Example Bluetooth topology[2]

In this example, the smart phone, node C, belongs to two piconets. Node C acts as the master when communicating with node H. There may be a reason to transfer the heart data to a

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[2] From Scatternet - Part 1: Baseband vs. Host Stack Implementation. (2004). Retrieved October 31, 2009, from http://www.bluetooth.com/NR/rdonlyres/090D96C0-5396-45F7-BDFD-2B7C70AF5E59/0/Scatternet_Part_1_Baseband_vs_Host_Stack_Implementation.pdf, p. 4.

PC, such as when the patient visits the physician. At these times, the smart phone may act as a slave in the other piconet. However, node C cannot simultaneously act as a master and a slave, rather it must oscillate between these two functions. When polled by node A, it acts as a slave; otherwise it acts as the master for node H. In this way, data from node H may be transferred to node A via node C.

Messages sent through the scatternet "meander" from device to device until they arrive at the destination (Wang, 2008). When a device is not active in a piconet, the messages may be rerouted to an alternate path, if one is available. Sometimes wireless devices drop packets that should have been forwarded to other devices in order to save their own resources (Li, 2006).

The fact that all communication in a Bluetooth piconet is through the master node makes the Bluetooth piconet very suitable for a medical sensor network where there should be no communication between the sensor nodes. The master periodically sends out inquiry packets to see if any sensors want to join the piconet. The sensor node will send back a frequency hopping serial (FHS) packet containing the device address and timing information. The master then sends a paging packet with the sensor node's data access code (DAC). After receiving the paging packet, the sensor node sends an acknowledgement packet. The master sends another FHS containing the master's device address and timing information. Finally, the sensor node sends a final acknowledgement, and the connection is established (Zein, Genidy, & Ismail, 2009).

The most important aspects of a Bluetooth device for an interference study are its frequency and power output. The Frequency Hopping Spread Spectrum (FHSS) technique employed by Bluetooth implements stop-and-wait Automatic Repeat request (ARQ), Cyclic Redundancy Check (CRC), and Forward Error Correction (FEC) functions to ensure that the wireless links are reliable. As a result, the FHSS is said to alleviate interference caused by other radio technologies in the ISM band (Hung & Chen, 2008).

The FHSS system reduces Bluetooth's ability to produce interference to other ISM band devices by spreading the power throughout the spectrum. In addition, FHSS provides the ability to reduce the effects of interference from other sources. If another device is using a portion of the ISM band and packets are lost, the Bluetooth device will retransmit packets on a different channel than they were originally sent. However, the FHSS is pseudorandom. There is no intelligence in the FHSS to avoid hopping onto certain channels. Even with the pseudorandom FHSS sequence, interference from other devices may still produce significant packet errors and reduce throughput (Rondeau et al., 2004).

The Bluetooth communication structure is based on an ad-hoc network. All Bluetooth units within a piconet share the same channel and hop using the same hop pattern defined by the Bluetooth device address (BD-ADDR) and current value of the system clock (CLK) of the master. Because each piconet contains a master with unique BD-ADDR and a different CLK, the hop pattern varies from one piconet to another (Arumugam et al., 2002).

The Adaptive Frequency Hopping (AFH) scheme was implemented in the Bluetooth Spec v1.2. In the AFH scheme, the slave devices measure the quality of the Bluetooth channels in the Channel Classification phase. The slave devices then send their measurement results to the master device so that its AFH hopping kernel can determine the appropriate hopping sequence. More precisely, the AFH scheme classifies the Bluetooth channels into two groups: unused and used. The former should not be used because they may have heavy interference, but the latter are suitable for transmission. As a result, the scheme can avoid the channels affected by heavy interference, and thereby improve data throughput (Hung & Chen, 2008).

In a study of interference in Bluetooth networks, Hung and Chen (2008) proposed that the expected number of used channels can be derived by $N_{good} = \sum_{i=1}^{N} P_g^{(i)}$, where $P_g^{(i)}$ is the probability that the i^{th} channel will be marked as used. The IEEE 802.15.2 standard specifies two operating modes: $N_{good} \geq N_{\min}$ (i.e., Mode L) and $N_{good} < N_{\min}$ (i.e., Mode H). Suppose $\delta(i)$ is a function that indicates whether the i^{th} channel is used or unused. The two operating modes can be described by the step function

$$\delta(i) = \begin{cases} 0 & \text{if the } i^{th} \text{ channel is unused} \\ 1 & \text{if the } i^{th} \text{ channel is used} \end{cases} \tag{1}$$

Mode L is used when N_{good} is equal to or larger than $N_{\min}$. A mapping function is then employed by AFH to uniformly map unused channels to the used channels. Therefore, the classified N_{good} channels will be the reduced hopping set. The probability that the channels will be in the good state is derived by

$$P_g' = \frac{1}{N_{good}} \sum_{i=1}^{N} P_g^{(i)} \times \delta(i) \tag{2}$$

Mode H is used when N_{good} is less than $N_{\min}$. The hopping sequence is divided into R_g consecutive good slots and R_b consecutive bad slots alternately. Although the values of R_g and R_b are determined by the traffic type required by the application, to preserve the frequency diversity, $R_g + R_b$ must not be less than $N_{\min}$. All used channels are uniformly mapped into the good slots and unused channels are uniformly mapped into the bad slots. Therefore under the AFH mechanism, P_g' can be obtained by

$$P_g' = \frac{R_g}{R_g + R_b} \times \frac{\sum_{i=1}^{N} P_g^{(i)} \delta(i)}{N_{good}} + \frac{R_b}{R_g + R_b} \times \frac{\sum_{i=1}^{N} P_g^{(i)} \left(1 - \delta(i)\right)}{N - N_{good}} \tag{3}$$

For full duplex transmission, a Time Division Duplex (TDD) scheme is used. Each single time slot packet is transmitted on a different hop frequency as opposed to a single hop frequency is used for the entire span of a multi time slot packet. The hop frequency in the first time slot after a multi time slot packet uses the frequency determined by the current Bluetooth clock value (Arumugam et al., 2002).

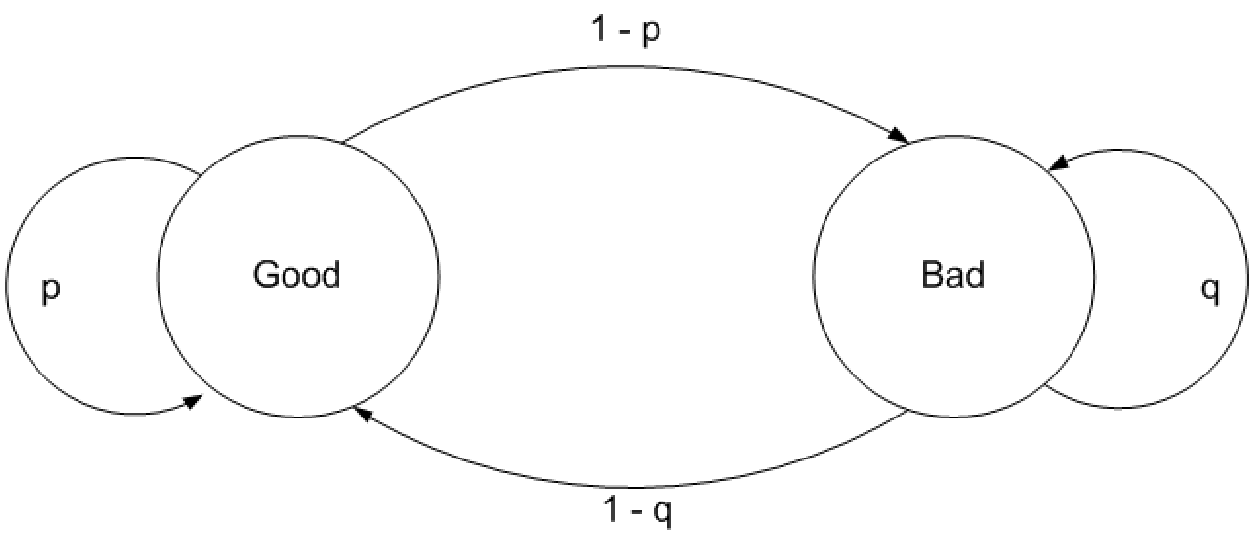

Figure 3. Two-State Markov model for wireless channel simulation[3]

A two-state Markov model can be used to simulate a wireless channel. Using a model to simulate the bit-to-bit transmission, Figure 3 shows the states and probabilities of success and failure of the transmission. Using the transition probability matrix of the two-state Markov model shown in the below matrix

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[3] From Alesanco, A. l., & Garc´ıa, J. (2010). Clinical Assessment of Wireless ECG Transmission in Real-Time Cardiac Telemonitoring. IEEE Transactions on Information Technology in Biomedicine, 14(5), 9.

$$M_c = \begin{bmatrix} p & 1-p \\ 1-q & q \end{bmatrix} \tag{4}$$

where p and $1-q$ are the probabilities of a successful transmission of bit n taking into account that the transmission of bit $n-1$ was successful and unsuccessful, respectively. Given matrix M_c, the bit error rate (BER) is given by

$$BER = \frac{1-p}{2-p-q} \tag{5}$$

In the hopping behavior of Bluetooth, it is assumed the channels are identical and independently distributed. For each channel, a two-state Gilbert-Elliot model is used to capture the behavior of the wireless channel errors. Suppose $P_{gg}^{(i)}, P_{gb}^{(i)}$, $P_{bg}^{(i)}$, and $P_{bb}^{(i)}$ are the state transition probabilities of the i^{th} channel. Moreover, the Markov chain is ergodic[4] with stationary probabilities $P_g^{(i)} = \frac{1-P_{bb}^{i}}{1-P_{bb}^{(i)}+P_{gb}^{(i)}}$ for the good state and $P_b^{(i)} = \frac{1-P_{gb}^{i}}{1-P_{bb}^{(i)}+P_{gb}^{(i)}}$ for the bad state, where $P_b^{(i)}$ denotes the average packet error rate (Hung & Chen, 2008; Laourine & Tong, 2009).

Because the hopping kernel must hop through all the channels equally, the distribution of the hopping sequence is uniform. In other words, the probability that the kernel will hop to each channel in the next time slot is $\frac{1}{N}$, where N is the number of channels. Moreover, in the next time slot, the probability of hopping to channel i in a good state and a bad state is $\frac{P_g^{(i)}}{N}$ and $\frac{P_b^{(i)}}{N}$, respectively. The hierarchical structure is reducible because the next state is not determined by the hopping behavior, but by the state of the channel to be hopped. Therefore, the states can be

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[4] of or relating to a process in which every sequence or sizable sample is equally representative of the whole

combined according to the derived $P_g^{(i)}$ and $P_b^{(i)}$ values. The probability of the hopped channels in the good state $P_g' = \frac{1}{N}\sum_{i=1}^{N} P_g^{(i)}$.

Additionally, because the Bluetooth channels are independent, the state of the current channel is not connected to the state of the channel in the next time slot. Therefore, if P_{gg}', P_{gb}', P_{bg}', and P_{bb}' are the transition probabilities of the Bluetooth link between two consecutive time slots, we can apply Bayes' Theorem of conditional probabilities and obtain $P_{gg}' = P_{bg}' = P_g'$ and $P_{gb}' = P_{bb}' = P_b'$. Figure 4 shows the reduced model (Hung & Chen, 2008).

In Bluetooth, the master transmits the data only if it finds a “good” frequency; otherwise it waits, which can cause delays. AFH does not differentiate between static and self-interferers and does not contain any method to avoid self-interferences (Yaqub et al., 2010).

Packet collisions take place when two or more piconets simultaneously transmit over the same frequency slot. The distance between piconets influences the interference effects due to packet collision (Rondeau et al., 2004). Frequency-hopping (FH) patterns of different piconets can be represented through statistically independent time-discrete random processes. A study found that packet loss probability increased proportionally to the number of piconets in the area (Mazzenga et al., 2002).

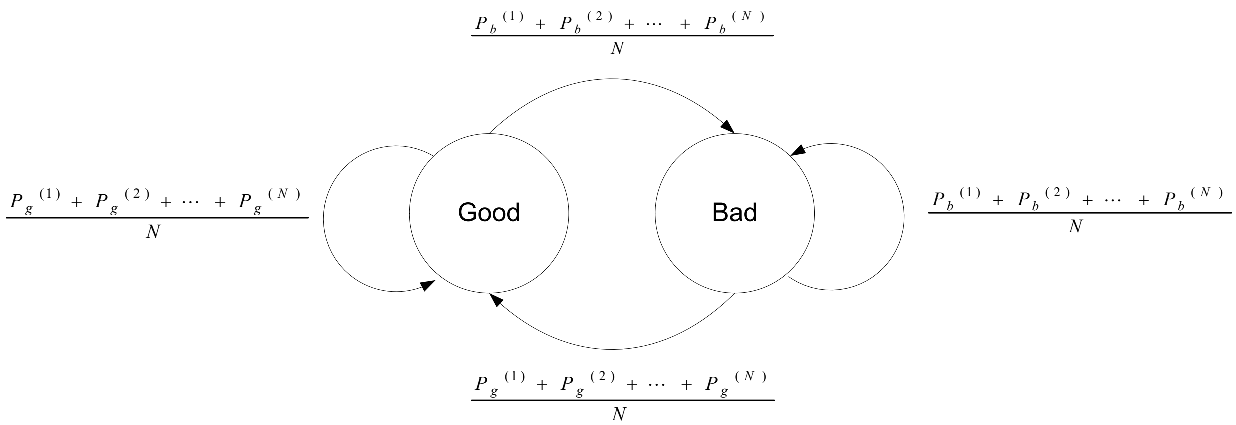

Figure 4. The modeling of a Bluetooth link[5]

Inherent to the wireless technology characteristics, a device can appear anytime, anywhere. These unpredictable appearances present a challenge when compared to a preplanned wireless network configuration. One growing area of study is determining how well Bluetooth devices are able to operate in close proximity to each other. With Bluetooth's frequency-hopping technique, overlapping between Bluetooth channels on different wireless networks is inevitable (Cypher et al., 2006).

Bluetooth protocol standards through Bluetooth 3.0 are classified as classic Bluetooth. Classic Bluetooth utilizes frequency hopping with terminals cycling through 79 channels at 1600 hops per second or 800 hops per second with Adaptive Frequency Hopping enabled (Arumugam et al., 2002; Rondeau et al., 2004; Y. Zhang & Xiao, 2011). In classic Bluetooth, a slave can transmit only if the master has addressed it in the previous slot. The master transmits in the even-numbered slots and a slave transmits in the odd-numbered slots. Packets must occupy an

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[5] From Hung, H.-H., & Chen, L.-J. (2008). An Analytical Study of Wireless Error Models for Bluetooth Networks. Advanced Information Networking and Applications - Workshops, 2008. AINAW 2008. 22nd International Conference on, 6, p. 1319.

odd number of slots. Each packet spans one, three, or five slots and is transmitted on a single channel in a single frequency band. After each packet is transmitted, the devices retune their radios to the next frequency in the sequence. The sequence involves all 79 channels (Sarkar, Anjum, & Guha, 2005)

Bluetooth 4.0, also known as Bluetooth Low Energy (BLE) and Bluetooth Smart, is the latest version of the Bluetooth standard. The BLE standard builds off the previous releases and supports 800 hops per second at 200 kbps with AFH enabled. The BLE technology is expected to eventually provide data rates up to 1 Mbps. However, BLE was designed as a low energy technology. The smaller packets can be sent in one-tenth the time of classic Bluetooth. Subsequently, the BLE sensor does not need to send as much data. These changes were made to conserve energy which makes BLE a good choice for health-monitoring applications (Bluetooth SIG Inc., 2010; Chen et al., 2011).

The BLE standard does include a few additional differences from classic Bluetooth. It does not support voice communication, a BLE slave device is permitted to belong to only one piconet at a time, and, unlike in earlier releases, each BLE slave communicates on a separate physical channel in its communication with the master. Additionally, the BLE standard uses 40 equal size channels, each of which is 2 MHz-wide. Three of these channels are designated advertising channels which are dedicated to allow the discovery of available devices in the vicinity. With the BLE advertising functionality, an advertiser periodically sends messages announcing it has something to transmit. These advertiser devices will become slaves in the future piconet (Yu & Xu, 2012). The advertising channels are not contiguous and are not included in the frequency hopping scheme. The other 37 channels use AFH. Adding to the resiliency of the Bluetooth communication, the BLE standard uses a 24-bit cyclic redundancy error check. If the verification of the packet fails, the receiver does not send an acknowledgement, and the sender will retransmit the packet (Bluetooth SIG Inc., 2010).

Compared to its competitor Zigbee, BLE has less communication overhead because it was designed for inter-BAN communication by supporting single hop topology, short range coverage, and compatibility with widely used Bluetooth devices. Although BLE is expected to become the dominant player in the ultra-low-power application market, “a strong need exists for further research and development” (Chen et al., 2011).

Microwave Ovens

In the United States, approximately 90 percent of households have residential microwave ovens (Ganapati, 2010; "Home Appliances Characteristics by Type of Housing Unit," 2005). These microwave ovens operate in the unlicensed 2.4 GHz ISM band. The relatively large power leakage from microwave ovens is a potential source of unintentional interference to unlicensed Federal Communications Commission (FCC) Part 15 communication devices. Because of the disproportionately large power output of microwave ovens compared to the low powered Bluetooth devices, studies have suggested that microwave oven interference can greatly reduce the data throughput of sensor networks, which can severely impair operation and usability (Iturri et al., 2012; Rondeau et al., 2004; Taher, Misurac, LoCicero, & Ucci, 2008).

Residential microwave ovens have one magnetron tube used to generate microwave energy in a continuous wave centered at 2.45 GHz which is in the middle of the ISM band. At full-power operation, a microwave oven usually has an output spectrum about 2 MHz wide, but during the start-up and shutdown cycles; the spectrum can be as wide as 20 MHz. The residential microwave oven periodically turns ON and OFF in synchronization with the 60 Hz frequency of the AC supply line powering the microwave oven. While in the ON mode, the residential microwave oven signal emits stray signals caused by energy leaking from the microwave oven's cavity. The signals' power can vary significantly during the ON cycle. The amplitude of the microwave oven's signal can be approximated by a sinusoidal waveform when the microwave oven is on (Coplu & Oktug, 2011; Huo, Xu, Gidlund, & Zhang, 2010; Taher et al., 2008).

Packet Loss and Collisions

Several studies have investigated different aspects of classic Bluetooth packet loss. The results of each of these studies help identify characteristics of classic Bluetooth piconets. These studies looked at distance between piconets, the distance from a source of interference, the size of sent files, and location of the slaves in the piconet.

One study looked at packet loss at the MAC sublayer and monitored performance (Cypher et al., 2006). The study suggested that as distance between Bluetooth piconets decreased, the packet loss increased. At a very close range of 0.5 meter, packet loss was up to 60 percent. As the distance between piconets was increased to 2 meters, packet loss decreased to 18 percent. The unexpected appearances of wireless devices can severely impact the existing surrounding wireless environment (Cypher et al., 2006)

A second study looked at the distance between piconets members and the distance to an external source of interference. The closer the Bluetooth piconet member was to the source of interference, the greater the effect of the interference. However, in this study, the Bluetooth devices maintained connection and usable throughput even in extreme situations (Rondeau et al., 2004).

A third study calculated the number of frequency collisions that occurred in the downlink direction between a single wanted piconet and up to four unwanted piconet/interferers when they are transmitting. The study found degradation is more significant for multi-slot packet transmission in Bluetooth. As a result, the data throughput of the system is reduced, especially when a large number of interferers are present (Arumugam et al., 2002).

A fourth study concluded that the delay-throughput characteristic of a Bluetooth-based personal area network (PAN) is exponential regardless of types and size of files within its transmission range. The delay also increases with increase in file sizes for a non-line-of-sight propagation. This exponential characteristic is also evident in the communication using different types of Bluetooth devices (Rashid & Yusoff, 2006).

A fifth study confirmed that within a piconet, different slaves may experience different bit success rates, even though the same frequency is used for all slaves. Interference can be location-dependent where errors in wireless networks are caused because one slave may be near an external wireless device while the master and other slaves may be away from the source of interference (Sarkar et al., 2005).

The fundamental issue with separate Bluetooth piconets operating within the same environment is that they are not time synchronized to each other, causing collisions to occur in both time and frequency. As a result, unwanted data signals can interfere with the data transmissions on a wanted piconet. Consequently, the requirement to retransmit packets will increase, reducing the overall data throughput. The frequency of collisions was found to depend on the proximity of piconets within the environment (Arumugam et al., 2002).

The effects of frequency collisions depend largely on the proximity of piconets within the environment. The location of piconets within the environment is a crucial factor because interferers lying in line-of-sight to the wanted piconets will have greater impact than those lying in non-line-of-sight positions (Arumugam et al., 2002).

The FH patterns assigned to the different piconets can be modeled as statistically independent time-discrete random sequences assuming values in the set $\{f_0, f_1, \ldots, f_{N_f - 1}\}$. The N_f frequencies f_i are the carrier frequencies used for hopping. Assuming each Bluetooth unit transmits with the same power level W_T (i.e., absence of power control) and that each interference power, I_M, due to M active piconets is

$$I_M = \sum_{m=1}^{M} \chi_m Y_m \tag{6}$$

where $\chi_m, m = 1, \ldots, M$, are independent, identically distributed binary random variables accounting for the occurrence of the frequency-collision events, and Y_m is the power received due to a transmitter belonging to the mth piconet (Mazzenga et al., 2004).

Mazzenga continues by developing a function to estimate the packet loss probability due to M, the number of active piconets in the area. The packet loss probability can be expressed as

$$P_{LP}(M) = \sum_{m=1}^{M} \binom{M}{m} q^{M-m} p^m \beta_m \tag{7}$$

where p is given by

$$p = \begin{cases} \dfrac{1}{N_f} & \textit{synchronized piconets} \\ 1 - (1 - N_f)^2 & \textit{unsyncronized piconets} \end{cases} \tag{8}$$

and $q = 1 - p$. The N_f frequencies f_i are the carrier frequencies used for hopping. The coefficients β_m are

$$\beta_m = \int_{-\infty}^{0} g_m(x) \otimes f_c(x) dx \tag{9}$$

where $g_m(x) = \rho_o^{-m} f_{Y_1}(-x/\rho_0) \otimes \cdots \otimes f_{Y_m}(-x/\rho_0)$ for $m = 1,2,\ldots,M$ and $g_0(x) = \delta(x)$.

The author does make a few assumptions, primarily that $f_Y(x)$ and $f_c(x)$ are known, $\otimes$ denotes convolution, $f_Y(x)$ is the probability density function of *Y*, and $f_c(x)$ is the probability density function of *C*, the received power.

As validation for the packet loss probability function, Mazzenga performed a Monte Carlo simulation with *M* masters uniformly located in a circular area 20 meters in diameter. Each master formed a piconet with N_s active slaves where N_s was a random number, uniformly distributed between 1 to 7. Both *C* and *Y* were assumed to be discrete probability density functions. The study concluded that the packet loss probability changes with changes in the receiver's position.

Interference can be introduced by any of the electronics that surround everyone every day. One way to simulate high latency, variable latency, limited packet rate, and packet loss is to use a residential microwave oven (Hughes-Croucher, 2009; Zakas, 2013). For this reason, the common residential microwave oven is the most critical application to investigate with the goal of interference mitigation (Taher et al., 2008).

IEEE 802.15 and Microwave Ovens

Several studies have used residential microwave ovens to generate interference in classic Bluetooth piconets. The goal of these studies is to improve the availability of the network. A requirement of the BAN is that the BAN should be available even during jamming and denial-of-service attacks. The critical nature of their functionality and the fact that they are in close contact with human organs leaves little tolerance for even temporary failure of the sensors and actuators in the BAN (M. Zhang et al., 2013). The following studies by Rondeau, Sikora, Chowdhury, Huo, and Coplu all contribute to increasing the knowledge of microwave oven interference on 802.15 networks.

In the 2004 study, Rondeau analyzed the interference effects of microwave ovens on classic Bluetooth networks. A Bluetooth protocol analyzer was used to capture all of the data packets during a transmission. Each of the five tests used a USB Bluetooth module connected to a notebook computer. This USB module acted as the master in the piconet. The distance between the Bluetooth slave device and the master was varied, as was the distance between the microwave oven, the master, and the slave device.

Each test consisted of a 30 second transmission where a total of 24,000 packets were transmitted by both the master and the slave. All tests followed the same procedure. To start each test, the microwave oven was warmed up for 30 seconds, and then the computer controlled spectrum analyzer captured the microwave oven spectrum for 30 seconds. After the spectrum capture was completed, the classic Bluetooth devices were connected and the protocol analyzer began to capture all traffic for 30 seconds.

Three different environments were used for the tests. The first environment was a modular building identified in Figure 5 as Bluetooth Lab. The second environment was an office setting. The third environment was outdoors using a line-of-sight path.

Figure 5 and Table 1 illustrate the five experimental setups used by Rondeau. Note that setup (e) actually identifies two scenarios. First the piconet members were 30 meters apart. Then the experiment was repeated with the piconet members 72 meters apart.

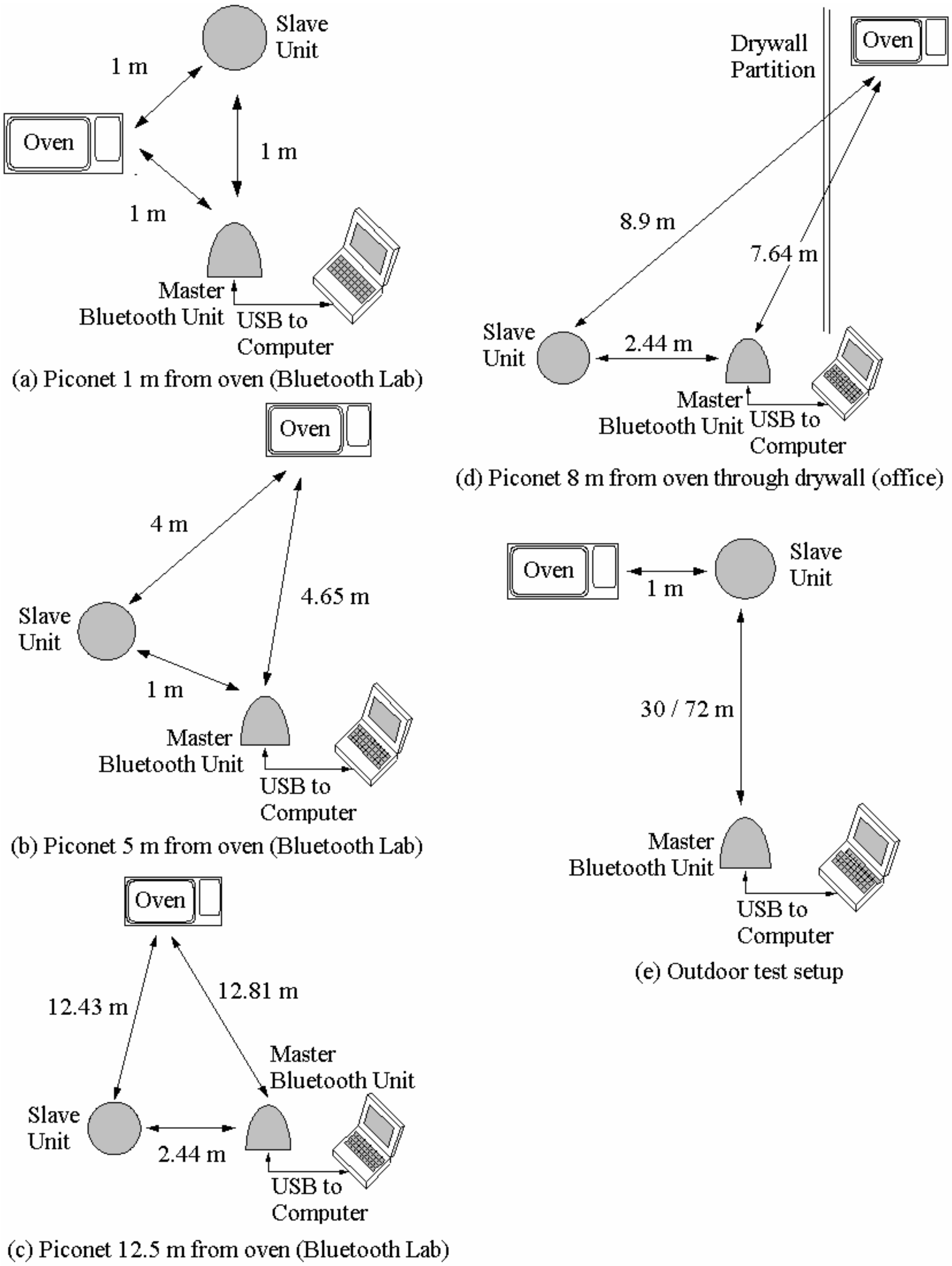


Figure 5. Experimental test setups[6]

[6] From Rondeau, T. W., D'Souza, M. F., & Sweeney, D. G. (2004). Residential Microwave Oven Interference on Bluetooth Data Performance. Consumer Electronics, IEEE Transactions on, 50(3), 8, p. 859

Table 1 Bluetooth data rates in interference environment

Experimental Scenarios	DM1 packet transmission (kbps)	Percent of Max	DH1 packet transmission (kbps)	Percent of Max
Maximum Data Rate	108.8	100.0	172.8	100.0
a. Piconet 1 meter from oven – Without oven on	108.4	99.6	166.3	96.2
a. Piconet 1 meter from oven - With oven on	75.3	69.2	99.9	57.8
b. Piconet 5 meters from oven	85.2	78.3	149.6	86.6
c. Piconet 12.5 meters from oven	105.4	96.9	163.7	94.7
d. Piconet 8 meters from oven through drywall	103.9	95.5	160.7	93.0
e. Outside – 30 meter master/slave separation	25.1	23.1	68.4	39.6
e. Outside – 72 meters master/slave separation	38.5	35.4	38.4	22.2

In setup (a), all packets transmitted at the 2.440 GHz frequency were lost due to the extremely high interference. Packets were also lost in adjacent channels on frequencies 2.439

and 2.441 GHz. As the microwave oven was moved further from the piconet, fewer packets were lost. Table 1 lists the packet transmission rates and percentage of the maximum transmission data rates for each of the five experimental scenerios. As can be seen in the data, the distance between the piconet members and the distance to the microwave oven determines the extent to which the microwave oven affects the classic Bluetooth network. The closer the microwave oven was to the piconet, the greater the effect of the interference.

Sikora's 2005 study put the classic Bluetooth system on top of the residential microwave oven. It was found that Received Signal Strength Indication (RSSI) was reduced by 5 dBm and between 5 and 20 data packets out of 1000 were completely destroyed. The conclusion for this study is that a coexistence issue exists in the ISM band, the impact of a high duty cycle device increases packet error. It is claimed that a packet error rate lower than 10 percent is not critical (Sikora & Groza, 2005).

Chowdhury's 2009 experiment looked at the impact of a commercial microwave oven on a Zigbee network. Even though this study does not use a residential microwave oven or Bluetooth, the results still are interesting. In this experiment, the Zigbee devices were 0.5 meter apart and 1 meter from the microwave oven. There was measurable packet loss, but not in contiguous channels. It was found that only five channels were detrimentally affected, and this set of five channels did not change with time. A noise floor of -92 dBm was set. The microwave oven's duty cycle was predictable. In the end, Chowdhury proposed a scheme to classify an unknown source of interference based on observed channel power measurements and to choose the transmission channel by aligning the sensor's with the duty cycle of the microwave oven (Chowdhury & Akyildiz, 2009).

Huo’s 2009 experiments used Zigbee with a residential microwave oven. In these experiments, the distance between the Zigbee transmitter and receiver was fixed at 10 meters and the distance from the received to the microwave oven was set at two different distances: 0.5 meter and 1.5 meters. The experiment was conducted in the Huo’s kitchen. Each trial was 150 seconds long with 50 trials at each distance being recorded. The conclusion was that the interference generated by the microwave oven cannot be significantly reduced by Zigbee channel selection, but is tolerable if the packet error rate is less than 8 percent and the distance from the microwave oven to the sensor is 1.5 meters (Huo, Xu, Bilen, & Zhang, 2009; Huo et al., 2010).

Coplu’s 2011 experiment again used Zigbee with a microwave oven. The purpose of this experiment was to predict the near future channel quality using the statistical channel noise history. Coplu built on Sikara’s 2005 study and used his own home’s kitchen. In this study, a noise floor of -80 dBm was set as a “convenient value.” The RSSI was measured every 10 milliseconds during a four minute capture. Three different Time Domain Hurst estimators were used to calculate the Hurst parameter index of dependency over the obtained RSSI values. The Hurst parameters indicated similarity between the RSSI values. The RSSI data was used to predict when the next noise would occur. Results of the study are that noise ratio and packet loss are directly proportional. The authors claim that a 60 percent to 90 percent reduction in packet loss rates can be realized using the sensing algorithm. The authors also claim their study “provides the first step analysis to employ prediction for transmission scheduling under heavy interference” (Coplu & Oktug, 2011).

Limitations

There are certain limitations that affect this research study. This study was not design to test the complete medical BAN system or all aspects of the interaction between Bluetooth piconets and microwave ovens, but limited to identifying the packet loss in a BAN system during the time period when a patient is in close proximity to the operating residential microwave oven. Because of the purpose of the study, the following were the limitations identified:

- Only four variables were used in the study. These variables were:
    - the distance between the piconet and the residential microwave oven
    - the power level of the microwave oven
    - the number of lost packets per channel in the Bluetooth piconet
    - the amount of interference by channel number.
- The exact power output of the residential microwave ovens was not be measured. The power output of each 1100 watt residential microwave oven was between 110 and 990 watts, but the each oven was only run at the lowest and highest power levels.
- The hardware and network analysis software used in the study were selected based on cost and availability. This study was not intended to identify the best hardware/software configuration but rather to use an available combination of off-the-shelf components as a measuring tool to identify packet loss.
- The medical BAN system used is this study was selected based on availability. This system uses a BLE component. Only the BLE component of this system was being studied. No part of the study looks at the ability of the system to accurately detect, transmit, or interpret signals from the patient’s heart, nor does the study investigate the cellular component of the system.
- Security was not addressed. The BLE signal between the sensor and master device was neither secured nor probed for security issues.

Summary

The use of medical BAN systems can save lives. The ability to implement real-time remote monitoring of a cardiologic patient’s heart during daily activity may reduce the delay in administering emergency care and increase the chances of patient survival (Gonçalves et al., 2008). Smart phone technology has made wearable computers a reality, but the use of the technology to create the BAN is still an issue (Yoo, 2013). Bluetooth Low Energy is a good choice for health-monitoring applications, but a strong need exists for further research and development of BLE (Chen et al., 2011). Interference in the BLE transmission may render the BAN inoperable. While many sources of interference exists, the common residential microwave oven has been identified as the most critical application to investigate with the goal of interference mitigation (Taher et al., 2008). The literature identifies the need for research in interference affecting BLE-enabled medical body area network systems.

CHAPTER 3

METHODOLOGY

Body Area Networks (BANs) may provide real-time senor readings to a medical professional. However, these systems are only as effective as the data they provide. The number of devices operating in the ISM band continues to increase requiring spectrum sharing management issues (Coplu & Oktug, 2011). There were many previous studies on interference using classic Bluetooth and Zigbee, but there are few other studies using Bluetooth Low Energy (BLE). Although many protocols and algorithms have been proposed for classic Bluetooth and Zigbee networks, they were not well suited to the unique features and application requirements of BANs (Chen et al., 2011). There was an identified need for research into the mobility issues related to the cost-effective non-proprietary devices that could be used to provide reliable medical BAN systems (Latre et al., 2011; M. Zhang et al., 2013).

Previous studies have looked at packet loss in classic Bluetooth piconets due to interference from residential microwave ovens. Based on the results of these previous studies, similar results were expected with BLE, including:

- Significant packet loss in the 2430 to 2450 MHz frequency range (BLE channels 12 to 22)
- Correlation between distance from the microwave oven and packet loss

- No correlation between the microwave oven's power and the packet loss because it was expected that all microwave ovens and power levels create very similar packet loss
- Unequal channel interference by power and distance in the 2462 through 2472 MHz frequency range which is BLE channels 28 to 32

In order to evaluate the packet loss caused by interference between the BLE components of the BAN and residential microwave oven, several test scenerios were created. Using properties from previous studies, this study:

- Set the distance between the BLE components of the BAN at 0.5 meter vertically to simulate the distance and position of the components on a human patient
- Varied the distance between the patient and the front panel of the microwave oven from 0.5 meter to 5.0 meters in 0.5 meter increments
- Varied the power setting of each of the five 1100 watt residential microwave oven using only the lowest and highest power settings, which are 110 and 990 watts respectively
- Captured the BLE data for 180 seconds using both the Ubertooth One spectrum analyzer and the Frontline ComProbe BLE protocol analyzer
- Identified the effect of interference on each BLE channel in the transmission
- At each configuration, thirty trials were run

This study provides a statistical analysis on how various configurations affect the number of lost packets. An analysis of the data by various factors was conducted. The result of the research may lead to a better understanding of the causes and impact of data packet loss in BLE wireless personal area networks (WPANs) in a BAN. This data can be extrapolated to construct a set of guidelines that can be used when creating components for BLE-enabled BANs. This study was designed to predict the percentage of packet loss caused by interference from a residential microwave oven based on the channel location, microwave oven power level, and distance from the microwave oven.

Data Collection

The following tools and applications were necessary elements of the data collection process:

- Heart monitor. A heart monitor that implements BLE for wireless transmission was required. In this study the Polar H7 Bluetooth Smart Heart Rate Sensor was used.
- Smart phone device. For this study, an iPhone 5 running iOS 7 with the appropriate Polar heart monitor software app was used.
- Personal computer running the Back Track 5 Linux operating system with the Ubertooth One device and associated spectrum analyzer software to perform real-time packet capturing. The spectrum analyzer was used to identify the pattern of interference generated by the microwave oven.
- Personal computer running Windows 7 and the Frontline ComProbe BLE Bluetooth protocol analyzer and matching software. The ComProbe BLE protocol analyzer was used to capture the channels and packet loss occurring in the Bluetooth piconet.
- Five microwave ovens rated at 1100 watts.

Data was collected using a systematic approach. The two variables were the distance between the microwave oven and the Bluetooth component of the medical BAN system and the power level of the microwave oven. The setup of the room, the position of the BAN system, the measuring procedures, and the coding scheme are described below.

The test room was a simulation of 3.6 meters by 6.1 meters residential kitchen with 2.4 meters of cabinets, countertop, and backsplash along one of the 3.6 meter long walls. The ceiling was 2.7 meters high. By the exterior metal construction of the building containing the room creating an EMI chamber, this room was free from outside electromagnetic signals. The interior of the room is painted wall board with a painted cement floor. The 1100 watt residential microwave ovens were placed in the center of the countertop with the front of the microwave oven facing into the room. On the floor were tape marks every one-half meter from a distance of 0.5 meter in front of the microwave oven to a distance of 5.0 meters for a total of ten tape marks.

The heart monitor and smart phone of the BAN system were positioned approximately 0.5 meter apart with the smart phone positioned approximately one meter directly above the tape mark.

The data collection measuring procedure included the following steps:

1. The power setting for the microwave oven was set at the lowest power level.
2. Warm-up period during which the microwave oven was run at the desired power level for thirty-seconds. There was one cup of water inside the microwave oven to avoid damage.
3. The BLE connection between the heart monitor and the smart phone was established.
4. The BAN system was positioned on the furthest tape mark.
5. The microwave oven was run for 30 trials of 180 seconds each with a 60 second off period in between. The data collected was saved using the coding scheme shown below. The length of the trials was set at 180 seconds to take into account the cycling of the microwave oven especially at the lowest power setting.

6. The BAN system was positioned at the next tape mark 0.5 meter closer to the microwave oven.
7. Step 5 and step 6 were repeated until the BAN system is at the 0.5 meter tape mark.
8. The power setting for the microwave oven was changed to the highest power level.
9. Step 2 through step 7 were repeated for highest power setting.
10. Step 3 through step 7 were repeated with the microwave oven not running as a control.
11. The microwave oven was changed.
12. Steps 1 through 9 were repeated for each of the five microwave ovens.

The data collected was coded using the variables M, P, D, and T to represent the microwave oven, power level, distance in meters, and trial respectively. Each microwave oven was coded as $i = 1, 2, 3, 4, 5$. Each power level was coded as $j = 0, 1, 2$ with 0 representing the microwave oven in the off state, 1 representing the lowest power level, and 2 representing the highest power level. The distance was coded as $k = 05, 10, 15, 20, 25, 30, 35, 40, 45, 50$ where 05 represents the tape mark at the 0.5 meter, 10 representing the 1.0 meter tape mark, through 50 representing the 5.0 meter tape mark. Each of the 30 trials for each microwave oven at each power setting at each distance was coded using h. Each trial was coded as MiPjDkTh.

The data was simultaneously collected on two computers. The microwave interference signal strength per channel was collected using the Ubertooth One's spectrum analyzer. The BLE transmission and errors were collected using the ComProbe BLE.

Data Analysis

In order to test the null hypotheses associated with the research questions, the Pearson Product Movement Correlation Coefficient and Analysis of Variance (ANOVA) statistical techniques were used. Microsoft Excel 2010's Data Analysis Toolkit was used for the analysis of these research questions. The data analysis was divided into two major parts. The first part was to identify if a linear or non-linear correlation exists between the distance from the microwave oven, the power level setting of the microwave oven, and packet loss in the BLE piconet. The Pearson Product Movement Correlation Coefficient was used to test for correlation between two variables. The calculated coefficient of correlation, r, is an estimator of the relationship between the two variables x and y. When r is positive, x increases when y increases and vice versa. When r is negative, x decreases when y increases, or when x increases, y decreases. When r takes on the value 1, or -1, all the points lie exactly on a straight line. If r = 0, then there is no apparent linear relationship between the two variables. The closer the value of r is to 1 or -1, the stronger the linear relationship between the two variables. Table 2 lists the "informal rule of thumb" for characterizing the value of r. If r is further from 0 than 0.8 units, there is said to be strong correlation between the variables. If r is closer to 0 than 0.5, there is said to be weak correlation between the variables (Devore, 2012).

Table 2 Characterizing the value of r

Weak	**Moderate**	**Strong**
$-0.5 \leq r \leq 0.5$	$-0.8 < r < -0.5$ or $0.5 < r < 0.8$	$r \geq 0.8$ or $r \leq -0.8$

The second part was to test all channels are equally affected by the interference, an Analysis of Variance (ANOVA) single factor technique was used. The assumptions for ANOVA tests are:

- The observations within each population are normally distributed with a common variance σ^2 and
- The samples have been randomly and independently selected from their respective populations.

In each statistical test, the observed level of significance, commonly referred to as the p-value, will be used to interpret the evidence against the null hypothesis, H_0. As seen in Table 3, if the calculated p-value is less than 0.10, the null hypothesis will be rejected (Simon & Goes, 2010).

Table 3 Interpreting results of hypothesis

p-value	**Interpretation**
$p < 0.01$	Very strong evidence against H_0
$p < 0.05$	Moderate evidence against H_0
$p < 0.10$	Suggestive evidence against H_0
$p > 0.10$	Little or no evidence against H_0

Having finished the initial analysis of correlation, the predictive models were generated by using multiple linear regression analysis. The general linear model was denoted by

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon \qquad (11)$$

The assumptions of this test were:

- y is the response variable that is being predicted
- $\beta_0, \beta_1, \beta_2, \ldots, \beta_k$ are unknown constants
- $x_1, x_2, \ldots, x_k$ are independent predictor variables that are measured without error
- ε is a random error that for any given set of values for $x_1, x_2, \ldots, x_k$ is normally distributed with mean zero and variance equal to σ^2
- The random errors, say ε_i and ε_j, associated with any pair of y values are independent

With these assumptions, it follows that the mean value of y for any given set of values $x_1, x_2, \ldots, x_k$ is equal to

$$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k \qquad (12)$$

This model may be able to be combined with AFH to create a modified protocol by the medical BAN system's Bluetooth component to avoid packet loss. In essence, as packet loss increases, the Bluetooth component will avoid the channels most affected by the model.

Feasibility of the Study

The full study required a large amount of data to be collected. Five residential microwave ovens were used. For each microwave oven, data were collected at three power levels. At each power level, data were collected at ten distances. At each distance, 30 trials were run. The effects of interference in each trial were captured on two computers; one capturing microwave interference signal levels and the other capturing packet loss. With the prospect of 9000 data files being collected, the completion of a smaller study seemed to be wise to identify problems with the design of the study.

To test the feasibility of the study, a pilot study using only one residential microwave oven and only five trials at each of the ten distances was run. The number of data files that needed to be collected was reduced to 220. With the smaller amount of data, the process was tested and redesigned. Several changes from the original design were made.

It was found that each trial needed to be increased from 30 seconds to 180 seconds to allow for the microwave oven to cycle on and off several times during the trial, especially at the lowest power setting. With the increased time of each trial, the number of records collected by the Ubertooth One's spectrum analyzer increased six fold. A Java program was written to sort and summarize each of the spectrum analyzer's data files by channel before importing the data to Microsoft Excel running on the Windows 7 laptop computer.

There were several problems with the Ubertooth One device. First, the device did not consistently communicate with Kismet which was necessary to analyze the packet data in Wireshark. No packet data was able to be collected using this device. Second, it was found that the device could not simultaneously capture data in both the spectrum analyzer and Kismet. It was determined to use the Frontline ComProbe BLE device on a Windows computer to capture the packet data while simultaneously capturing the strength of the microwave oven's interference using the Ubertooth One's spectrum analyzer. With the data capture problems resolved, the pilot study statistical analysis gave significant, yet surprising results.

The pilot study used the author's 1200 watt Sharp R-520LKT 2.0 cu. ft. residential microwave oven. For the full study, the power of the microwave ovens was reduced to 1100 watts because an adequate supply of 1200 watt microwave ovens could not be found. The 1100 watt microwave oven, being a more common size, was readily available and thus better represented the population of microwave ovens that may be encountered by medical BAN system users.

The room design was also modified between the pilot study and the full study. The pilot study was conducted in an optics lab at Trine University in Angola, Indiana. The room was approximately 7.3 meters wide and 15.2 meters long. The microwave oven was placed on the lab table on the narrow wall. The tape marks ran in the aisle between the lab tables running the length of the room. The full study used an isolated room that better matched the size and construction of a residential kitchen. The dimensions of the full study room were 3.6 meters wide by 6.1 meters long by 2.7 meters tall.

In the months between the pilot study and the full study, Apple released iOS 7. The iPhone 5 used in the study was upgraded to iOS 7 as was the Polar application. These updates did not seem to affect the results of the full study.

The results of the pilot study effected changes in the design of the full study. The size of the room and the power rating of the microwave ovens were changed to better match those found in the typical residential kitchen. The Java program and Microsoft Excel worksheets and workbooks used for data analysis were revised to allow for the additional data that was created by the extended study’s additional trials and microwave ovens.

CHAPTER 4

FEASIBILITY OF THE EXPERIMENTAL DESIGN

The feasibility of the experimental design methodology had to be verified. The experimental portion of the study needed to collect data on packet loss caused by the interference generated by a residential microwave oven. A device was needed to read and record the strength of the interference on each BLE channel. A device was needed to read and record packet loss by BLE channel. Software was needed to process the data and perform data analysis.

Methodology

In the pilot study described in section 3.3, five samples, each 180 seconds in length, were collected at distance between 0.5 meter to 5.0 meters with 0.5 meter increments from a single microwave oven with the microwave oven's power level at low and high. One sample was collected with the microwave oven off. The collection time of each sample was increased after it was noted that the microwave oven went through several on-off cycles during the sample collection. Two computers captured the data. A Linux computer using the Ubertooth One device captured the signal strength of the microwave oven's interference by channel via the Specan spectrum analysis software. A Windows computer using the ComProbe BLE protocol analyzer and software captured packet loss by channel. The captured spectrum analyzer files were processed by a Java program that added a field identifying the channel based on the frequency and converted the captured RSSI values to a positive value from 0 to 100.

Interference and packet loss data files were processed by Microsoft Excel's built-in data analysis tools.

Ubertooth One

The Ubertooth One device was a USB Bluetooth device that was expected to capture both the microwave oven's generated interference signal strength and the packet loss by channel by using Kismet. The Kismet files were then going to be processed by Wireshark. The spectrum analyzer application looped through all of the frequencies from 2400 MHz to 2483 MHz and captured approximately 2400 samples per second. This passive scan identified a signal on a specific frequency at some discrete point in time, but it did not attempt to follow a frequency hopping Bluetooth transmission.

The spectrum analyzer application data wrote the captured data to a text file with three fields per record: timestamp, frequency, and RSSI. For graphing purposes, the spectrum analyzer's RSSI value was converted via a custom Java program to give the Cisco RSSI values between 0 and 100.

The Ubertooth One device was not able to simultaneously capture packet data in Kismet. Dominic Spill, lead developer on the Ubertooth project, confirmed the Ubertooth One device could not follow an AFH sequence (Spill, 2013). In its place, the ComProbe BLE was used to capture the actual BLE packet data. The file sizes for each trial averaged 12,500 packets.

The screen shots in Figures 6 through 8 are from the Specan UI graphical interface. The data was collected by the Ubertooth One device. In these figures, the x-axis is frequency. The y-axis is the received signal strength indicator (RSSI) which is a relative measure of power present in the radio signal. A larger RSSI value indicates stronger signal strength.

The white lines were the signal strength at that frequency. In the running spectrum analyzer application, the white lines were displayed for approximately one second. The green lines were the maximum signal strength at the frequency over the previous five seconds.

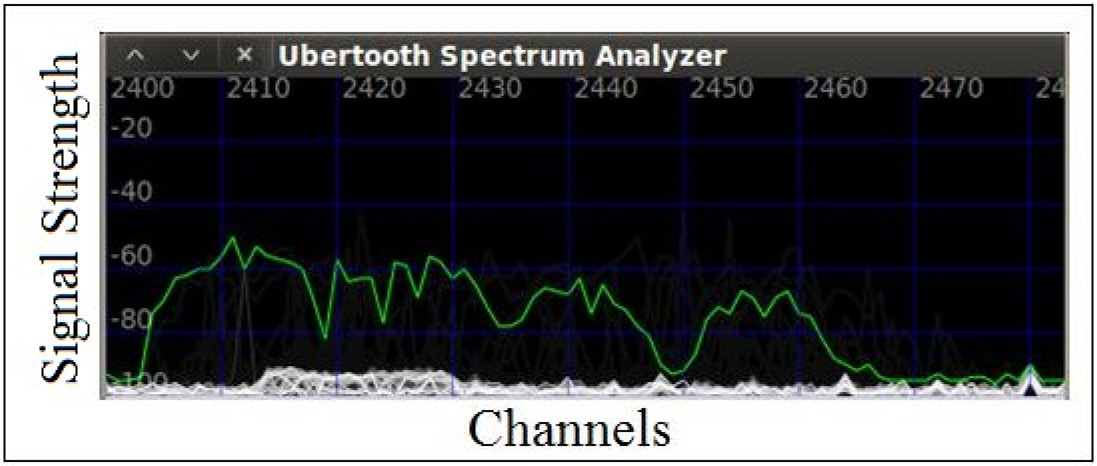


Figure 6. Signal strength with microwave oven off

As can be seen in Figure 6, the heart monitor signal has peak RSSI values of near -50. The heart monitor signals were spaced far enough apart that the spectrum analyzer screenshot only showed the peak values and low power noise. It was believed this low power noise may have been generated by the computers capturing the data.

In Figure 7, the heart monitor's piconet was located 0.5 meter in front of the microwave oven running at the highest power level which was approximately 1080 watts. Peak values were only slightly higher than those generated by the heart monitor alone, but the interference noise was more continuous, as indicated by the white lines.

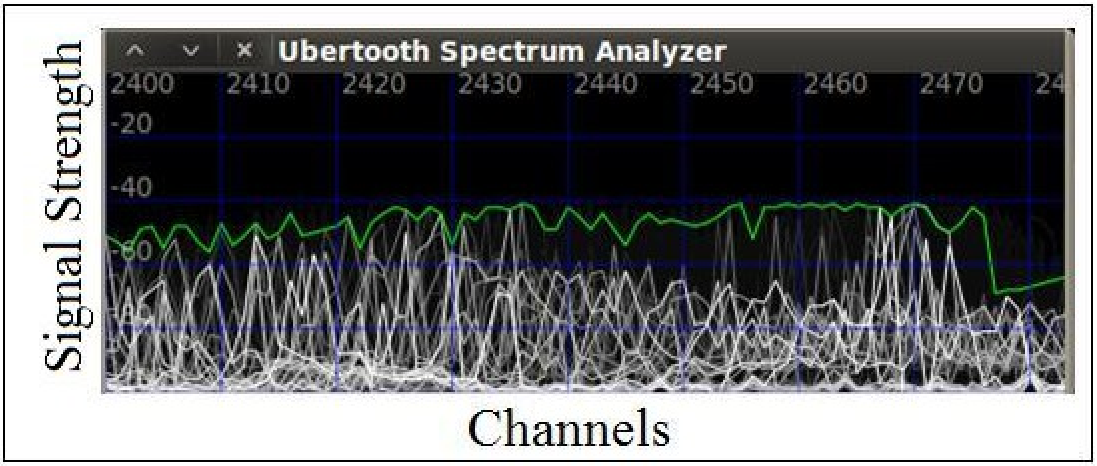


Figure 7. Signal strength; High power @ 0.5 meter

Similarly, as seen in Figure 8, when the heart monitor's piconet was located 5.0 meters from the microwave oven running at the highest power level, the peak of the interference generated was consistent with what had been seen at the 0.5 meter distance. However, the strength of the interference is slightly less at the greater distance. Regardless of the distance, the microwave oven operating at the highest power setting does generate a stronger signal, which translates to greater interference than was seen when the microwave oven was off.

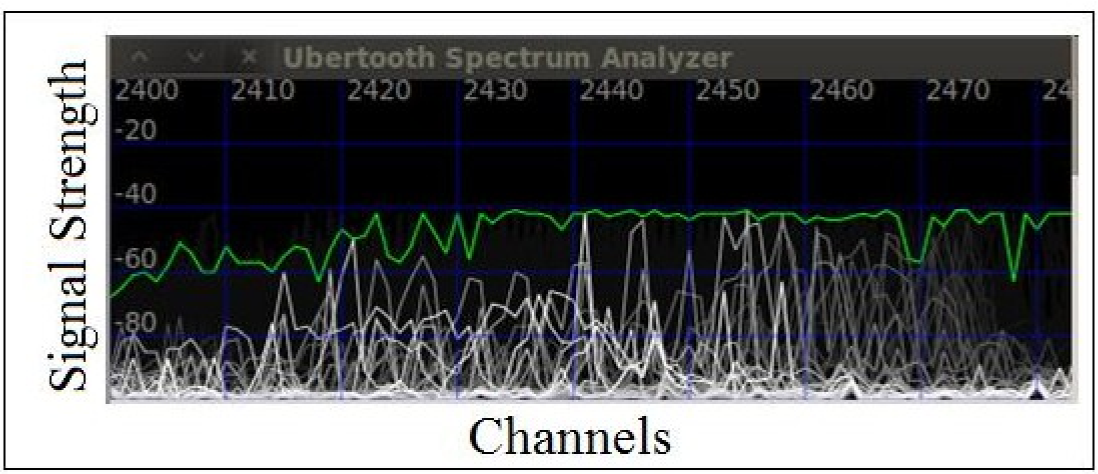


Figure 8. Signal strength; High power @ 5.0 meters

The spectrum analyzer application data was captured to a text file. This text file consisted of three fields per record: timestamp, frequency, and RSSI. Figures 9 through 11 are graphical representations of the mean signal strength per channel for the three scenerios shown in Figures 6 through 8. The arithmetic mean of the adjusted RSSI values captured for each channel was calculated. The sum of the adjusted RSSI values was divided by the number of filtered observations for that channel. The detected signal strength increased when the piconet was in close proximity to the microwave oven running at the highest power level.

In Figure 9, the mean signal strength appeared to be equal by channel with the microwave oven off. The snapshot in time illustrated in Figure 6 shows that the signal strength of the interference does vary by channel. Over the course of 180 seconds, though, each channel is exposed to a similar amount of interference. By contrast to Figure 9, Figure 10 indicates an increase in the mean signal strength of interference per channel at a distance of 0.5 meter with the microwave oven operating at the highest power setting. The snapshot illustrated in Figure 7 shows widely varied and stronger signal strengths across the channels. As expected from the observation of Figure 8, Figure 11 showed a decrease in the mean signal strength of interference per channel at a distance of 5.0 meters with the microwave oven still operating at the highest power setting. From the observations, it appears the mean signal strength of the interference noticeably increased with the microwave oven operating in the ON state and decreased as the distance between the microwave oven and the BLE-enabled medical BAN increased.

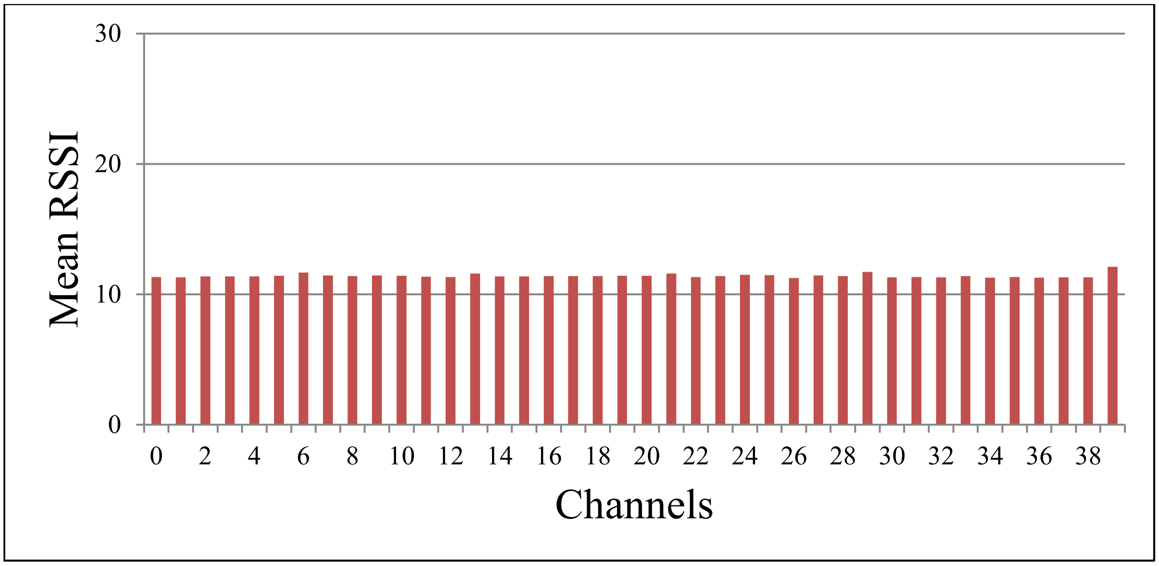


Figure 9. Pilot study mean signal strength per channel with microwave oven off

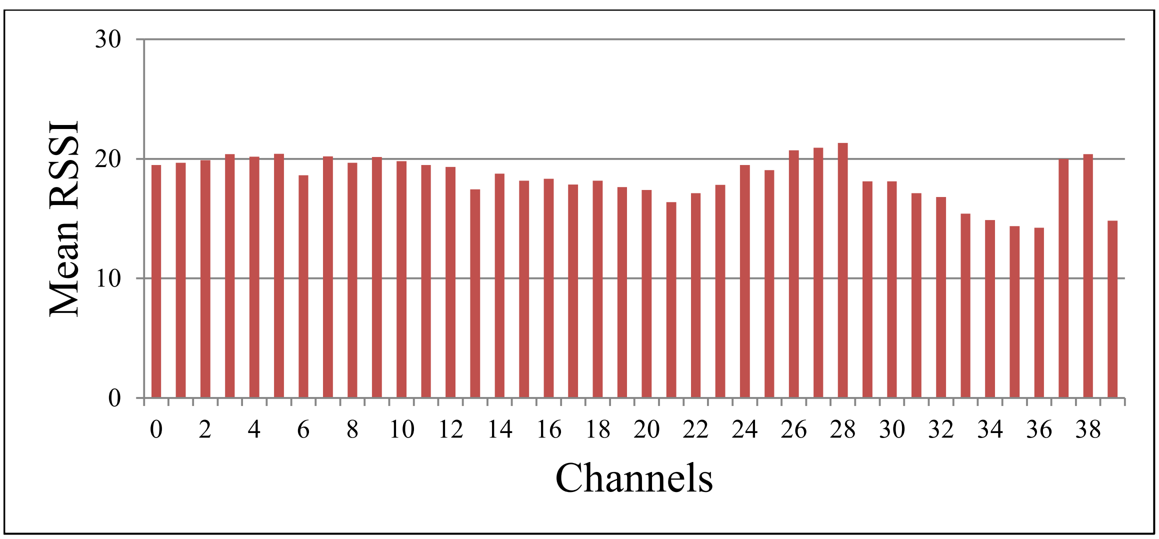


Figure 10. Pilot study mean signal strength; High power @ 0.5 meter

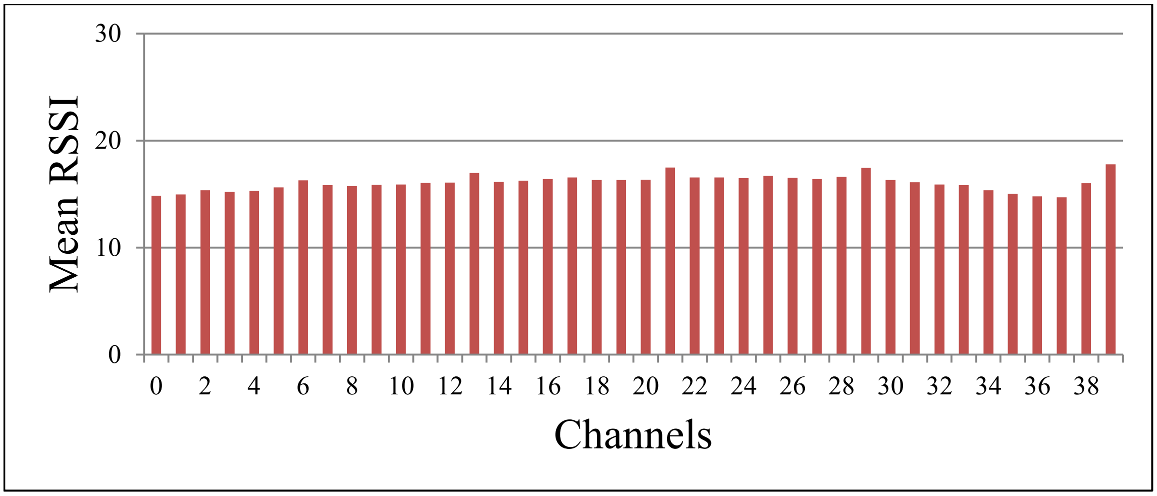


Figure 11. Pilot study mean signal strength; High power @ 5.0 meters

Frontline ComProbe BLE

The Frontline ComProbe BLE protocol analyzer device was used to capture the BLE packets sent between the heart monitor and the iOS device. The ComProbe BLE device interacted with the proprietary Frontline software to create tables of data. Several of these tables have content that was saved as comma separated files that were read into Microsoft Excel. Microsoft Excel was used to calculate the usage by channel. Figure 12 represents the channel usage for the heart monitor when the microwave oven was off. The advertising channels had the most usage. All of the data channels appear to be used equally. Similar channel utilization can be seen in Figures 13 and 14. Figure 13 represents the channel usage for the BLE data capture with the piconet 0.5 meter from the microwave oven running at the highest power level. Figure 14 represents the channel usage for the BLE data capture with the piconet 5.0 meters from the microwave oven running at the highest power level. Based on the graphs in Figures 12 through 14, the BLE usage per channel seemed to be consistent regardless of the distance the BAN was from the microwave oven and the power setting of the microwave oven.

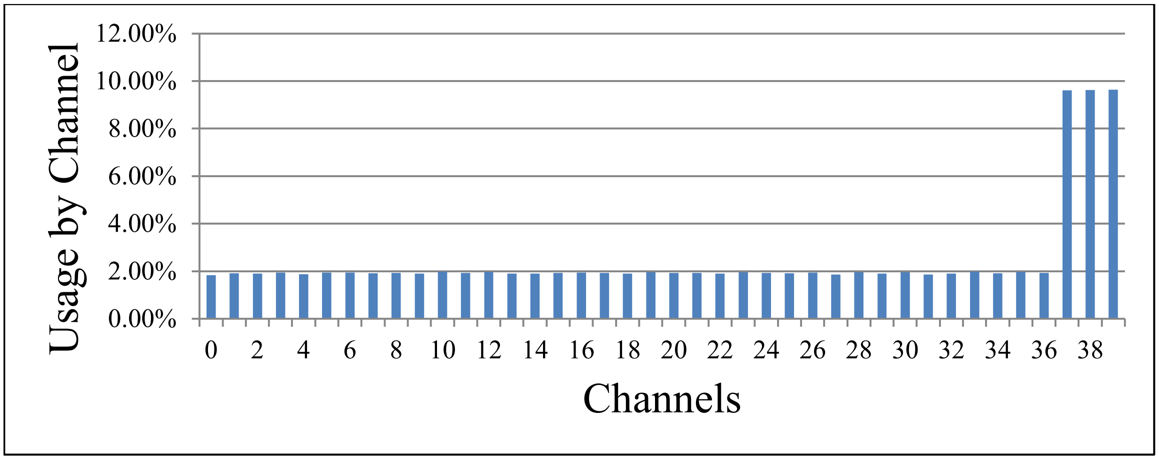


Figure 12. Pilot study BLE usage per channel; Microwave oven off

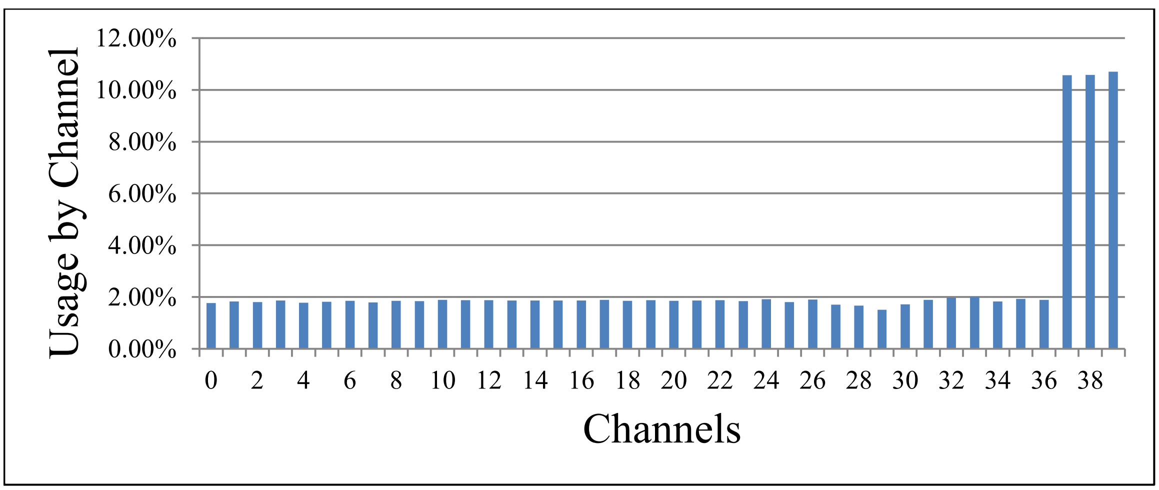


Figure 13. Pilot study BLE usage per channel; High power @ 0.5 meter

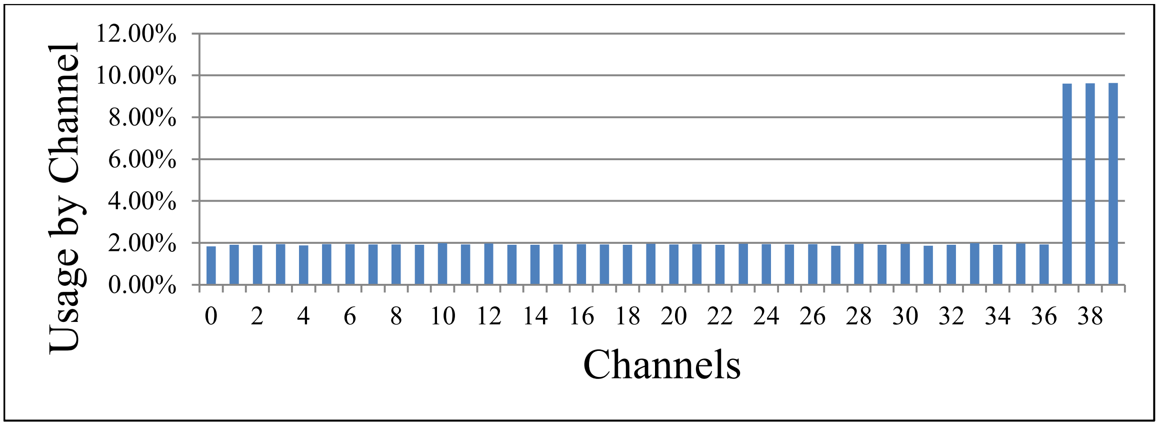


Figure 14. Pilot study BLE usage per channel; High power @ 5.0 meters

The ComProbe BLE protocol analyzer also collected the packet loss per channel. It was discovered that BLE was very resilient to interference. The percentage of packet loss per channel was much lower than was expected. However, the ComProbe BLE software reported that channels 23, 29, 30, and 33 (frequencies 2452 MHz, 2464 MHz, 2466 MHz, and 2472 MHz respectively) were not available for most of the trials. It is unknown why these channels would become unavailable, but it is assumed that AFH avoided the channels.

Figures 15 to 17 show the percentage of packet loss by channel. Figure 15 represents the percentage of packet loss by channel when the microwave oven was off. Only 16 of the 37 data channels, and only one advertising channel, had any packet loss. In the channels with packet loss, the percentage of packets lost was very small at just a fraction of one percent. With the microwave oven off, this low percentage of packet loss was expected.

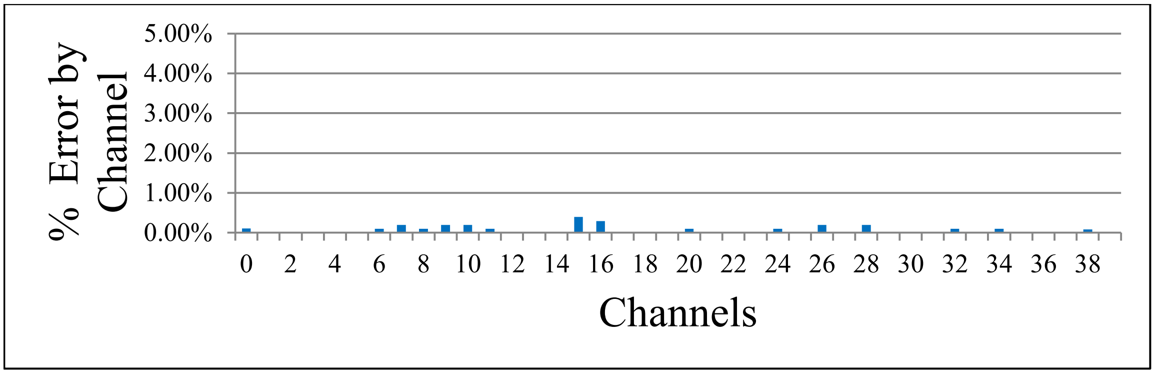


Figure 15. Pilot study percent packet loss by channel; Microwave oven off

By contrast, Figure 16 shows the packet loss per channel with the microwave oven operating at the highest power level when the microwave oven was only 0.5 meter from the piconet. Thirty-one of the 37 data channels, and two of the advertising channels, experienced packet loss. At distances 2.0 meters and closer, the heart rate displayed in the iOS device application would jump erratically from single digits to over 200. It was assumed this erratic behavior was caused by the packet loss.

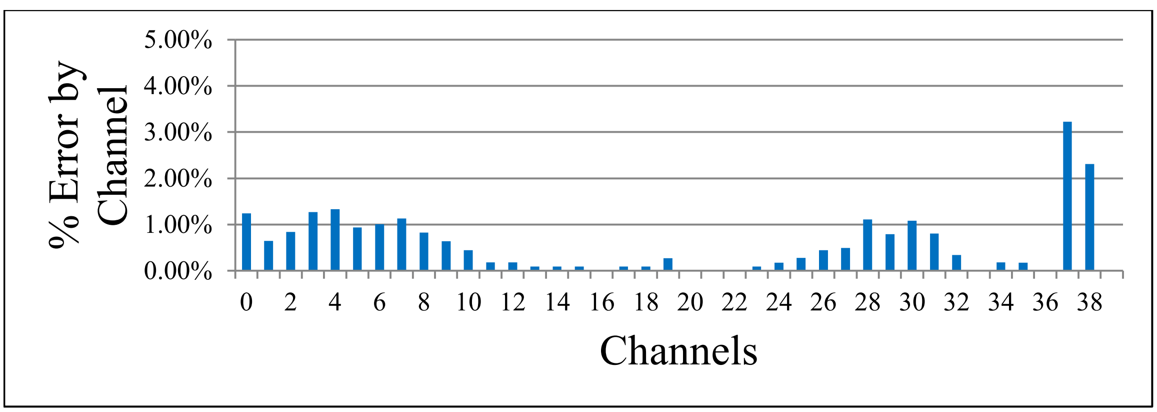


Figure 16. Pilot study percent packet loss by channel; High power @ 0.5 meter

Figure 17 shows the packet loss per channel with the microwave oven operating at the highest power level when the microwave oven was 5.0 meters from the piconet. While the percentage of packet loss per channel was less at this increased distance, every data and advertising channel experienced some packet loss.

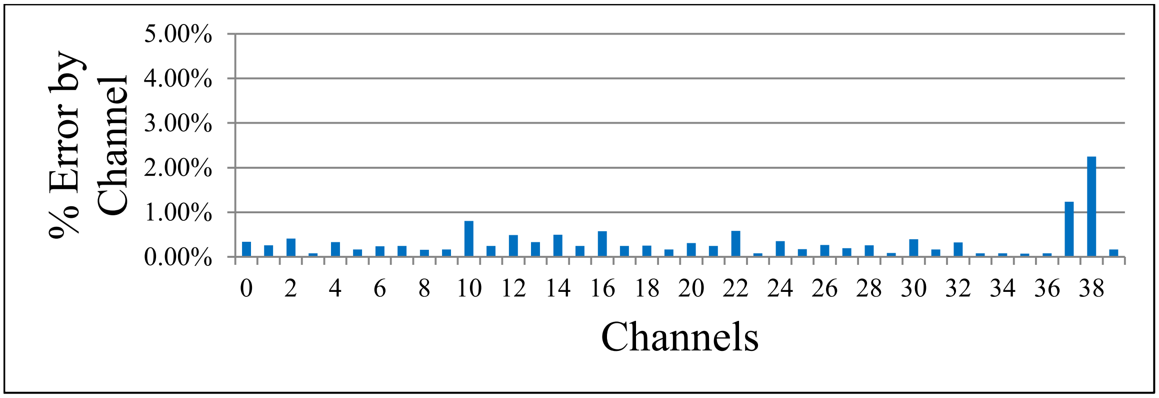


Figure 17. Pilot study percent packet loss by channel; High power @ 5.0 meters

Correlation Coefficient

While the graphical representations of the interference and packet loss are interesting, a statistical analysis of the data was needed to determine if the hypotheses should be rejected. The data captured by the spectrum analyzer and the ComProbe BLE device was processed by several of Microsoft Excel's data analysis tools.

The Pearson correlation coefficient and associated *r* value were used to test the correlation between the distance and packet error. As can be seen in Table 4, the correlation coefficient is -0.054. The correlation coefficient of -0.0536 is very close to zero indicating that there is very weak indirect correlation between the two variables.

Table 4 Pilot study correlation coefficient; Distance and % Pkt Error; All

	Distance	% Pkt Error
Distance	1	
% Pkt Error	-0.05358147	1

Table 5 includes the correlation coefficient for only low power records. The correlation coefficient of -0.3237 confirmed that as there was weak indirect correlation which suggested a decrease in the distance between the microwave oven and the BAN system components increased packet loss when the microwave oven was operating at the lowest power level.

Table 5 Pilot study correlation coefficient; Distance and % Pkt Error; Low power

	Distance	% Pkt Error
Distance	1	
% Pkt Error	-0.3237316	1

Table 6 included the correlation coefficient for only high power records. The correlation coefficient was -0.088. This very weak indirect correlation coefficient suggests there was not enough statistical evidence to support the statement that a decrease in the distance between the microwave oven and the BAN system components increased packet loss when the microwave oven was operating at the highest power level.

Table 6 Pilot study correlation coefficient; Distance and % Pkt Error; High power

	Distance	% Pkt Error
Distance	1	
% Pkt Error	-0.08772258	1

The packet loss was measured as the power level was alternated between the lowest and the highest power settings. The Pearson correlation coefficient was again used to test the correlation between the variables. In Table 7, the correlation coefficient was 0.339 which suggested there was weak direct correlation between the variables which suggested that an increase in the microwave oven's power level will contribute to packet loss.

Table 7 Pilot study correlation coefficient; % Pkt Error and Power; All distances

	% Pkt Error	Power
% Pkt Error	1	
Power	0.33900412	1

Analysis of Variance

The spectrum analyzer was used to measure the amount of interference on each channel at each distance and each power setting. Microsoft Excel's Analysis of Variance (ANOVA) test was used to test the interference produced by the microwave oven by BLE channel in the medical BAN. An ANOVA test compares the means of more than two groups of data. The null hypothesis is that all of the group means are equal. A small p-value suggests at least one group is assumed to have a mean that is statistically different than the other group means. A p-value larger than 0.01 suggests the group means are equal. An explanation of the ANOVA test and the associated results table is included in Appendix A.

In this study, the data observations are grouped by channel. The p-value of 0.343 in Table 8 suggests that there was not sufficient evidence to reject the null hypothesis that all channels were equally affected by interference.

Table 8 Pilot study ANOVA for channel interference

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	199.6521	39	5.1193	1.0796	0.3432	1.4146
Within Groups	3793.3574	800	4.7417			
Total	3993.0095	839				

t-Test

The spectrum analyzer was used to measure the amount of interference on each channel at each distance and each power setting. A Microsoft Excel two-sample t-Test assuming unequal variances was used to compare the upper and lower channels based on frequency. In the t-test, the null hypothesis is that the two group means are equal. A small p-value suggests that the two groups have different means. In Table 9, the one-tail and two-tail p-values, 0.4879 and 0.9758 respectively, were large which suggests that there is not sufficient evidence to reject the null hypothesis that all channels are affected equally.

Table 9 Pilot study two-sample t-test: Upper vs. Lower Channels

	Lower Channels	Upper Channels
Mean	14.62169122	14.62626181
Variance	4.804713942	4.725131281
Observations	420	420
Hypothesized Mean Difference	0	
Df	838	
t Stat	-0.030342709	
P(T<=t) one-tail	0.48790048	
t Critical one-tail	1.646673991	
P(T<=t) two-tail	0.97580096	
t Critical two-tail	1.962798881	

If the ten channels with the lowest frequencies were compared to the ten channels with the highest frequencies, the results were similar. In Table 10, the one-tail and two-tail p-values, 0.4164 and 0.8328 respectively, were above 0.10 which indicated that the null hypothesis should not be rejected.

Table 10 Pilot study two-sample t-test: Bottom 10 channels vs. top 10 channels

	Bottom 10	Top 10
Mean	14.49985186	14.4559433
Variance	4.994138637	4.076618611
Observations	210	210
Hypothesized Mean Difference	0	
Df	414	
t Stat	0.211269623	
P(T<=t) one-tail	0.416390421	
t Critical one-tail	1.648542529	
P(T<=t) two-tail	0.832780842	
t Critical two-tail	1.965710612	

As seen in Table 11, if the data channels with the highest and lowest frequencies were compared, there was evidence that interference affected channels with lower frequencies more than channels with higher frequencies. Using a one-tail test with p-value 0.0404, there is moderate evidence to suggest the null hypothesis that channels are equally affected by the interference is rejected. However, if a two-tail test with p-value 0.0802 were used, there was only suggestive evidence that null hypothesis should be rejected.

Table 11 Pilot study two-sample t-test: Data Channel 0 vs. Channel 36

	Channel 0	Channel 36
Mean	14.237744	13.257855
Variance	4.6209858	1.5551021
Observations	21	21
Hypothesized Mean Difference	0	
Df	32	
t Stat	1.8068814	
P(T<=t) one-tail	0.0400961	
t Critical one-tail	1.6938887	
P(T<=t) two-tail	0.0801922	
t Critical two-tail	2.0369333	

Finally, if the two channels with the lowest and highest frequencies were compared, the results were surprising. Two of the advertising channels were actually at the lower and upper end of the frequency band. Channel 37 operated at 2402 MHz. Channel 39 is at 2480 MHz. As seen in Table 12, the one-tail p-value of 0.0064 suggested there was strong evidence to reject the null hypothesis and conclude that the interference has more of an effect on the channel at the upper end of the frequency band. Even using a two-tail p-value of 0.0129, there was moderate evidence to reject the null hypothesis. Using the intent of this hypothesis, the data collected in this pilot study suggested that interference affected all channels equally.

Table 12 Pilot study two-sample t-test: Advertising Channel 37 vs. Channel 39

	Channel 37	Channel 39
Mean	14.1413217	15.68391
Variance	4.73663973	2.577546
Observations	21	21
Hypothesized Mean Difference	0	
Df	37	
t Stat	-2.6138254	
P(T<=t) one-tail	0.00643595	
t Critical one-tail	1.68709362	
P(T<=t) two-tail	0.01287189	
t Critical two-tail	2.02619246	

Regression Models

A Microsoft Excel multiple linear regression analysis was performed using the level of interference created by the microwave oven as the dependent variable and the packet loss, distance, and channel as the independent variables. The regression model is

$$\begin{aligned} \mathit{Avg\ RSSI} &= 10.262 + 0.604(\mathit{Distance}) + 2.671(\mathit{Power}) \\ &+ 111.188(\%\ \mathit{Pkt\ Error}) - 0.003(\mathit{Channel}) \end{aligned} \tag{13}$$

The column Significance *F* is the statistical significance of the observed variable F. In Microsoft Excel regression analysis tables, the Significance *F* was the p-value of the model. In Table 13, the p-value of 5.7779×10^{-101} was very small and suggested the regression model was statistically significant. The R Square value is the coefficient of determination which is a statistical measure of how well the regression model explains the variation in the data points. In Table 13, the R Square suggested the model explained 73.494 percent of the variation in the data points. However, the p-value of 0.5888 for the independent variable Channel suggested this variable does not contribute to the accuracy of the model. As seen in Table 14, when the variable Channel is removed, the new model

$$Avg\ RSSI = 10.193 + 0.604(Distance) + 2.673(Power) + 110.578(\%\ Pkt\ Error) \quad (14)$$

is statistically a good predictor of Avg RSSI with p-value 3.392 x 10^{-102} and the R Square suggests the model explains 73.472 percent of the variation in the data points.

Table 13 Pilot study multiple linear regression analysis; Predict Avg RSSI

Regression Statistics	
Multiple R	0.8573
R Square	0.7349
Adjusted R Square	0.7320
Standard Error	1.4371
Observations	360

ANOVA

	Df	SS	MS	F	Significance F
Regression	4	2032.9008	508.2252	246.0824	5.7779E-101
Residual	355	733.1687	2.0653		
Total	359	2766.0696			

	Coefficients	Standard Error	t Stat	P-value
Intercept	10.2616	0.2193	46.7954	6.617E-154
Distance	0.6041	0.0454	13.3143	4.3641E-33
Power	2.6713	0.1245	21.4567	4.4463E-66
% Pkt Error	111.1884	22.1415	5.0217	8.1243E-07
Channel	-0.0036	0.0066	-0.5410	0.58883951

Table 14 Pilot study modified multiple linear regression analysis; Predict Avg RSSI

Regression Statistics	
Multiple R	0.8572
R Square	0.7347
Adjusted R Square	0.7325
Standard Error	1.4357
Observations	360

ANOVA

	df	SS	MS	F	Significance F
Regression	3	2032.2963	677.4321	328.6653	3.392E-102
Residual	356	733.7732	2.0612		
Total	359	2766.0696			

	Coefficients	Standard Error	t Stat	P-value
Intercept	10.1926	0.1782	57.2105	1.457E-181
Distance	0.6040	0.0453	13.3241	3.8545E-33
Power	2.6725	0.1244	21.4915	2.8044E-66
% Pkt Error	110.5778	22.0907	5.0056	8.7741E-07

A multiple linear regression analysis was performed using the captured packet loss data as the dependent variable and level of interference created by the microwave oven, distance, and channel as the independent variables. Table 15 was the result of the regression analysis. While statistically a good predictor, as indicated by the low p-value of 1.6327×10^{-15}, the model

$$\%\ Pkt\ Loss = -0.0060 - 0.0006(Distance) + 0.0006(AvgRSSI) + 0.0000(Channel) + 0.0003(Power) \quad (15)$$

only explains 19.090 percent of the variation in the data points as indicated by the R Square value. The high p-values of 0.2860 and 0.5044 for the independent variables Channel and Power respectively indicated these variables do not contribute to the accuracy of the model.

Table 15 Pilot study multiple linear regression analysis; Predict % Pkt Loss

Regression Statistics	
Multiple R	0.4369
R Square	0.1909
Adjusted R Square	0.1818
Standard Error	0.0033
Observations	360

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.0009	0.0002	20.9400	1.6327E-15
Residual	355	0.0039	1.12E-05		
Total	359	0.0049			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0.0060	0.0013	-4.5166	8.56E-06
Distance	-0.0006	0.0001	-4.9828	9.81E-07
Avg RSSI	0.0006	0.0001	5.0217	8.12E-07
Channel	1.6243E-05	1.52E-05	1.0687	0.285951
Power	0.0003	0.0004	0.6682	0.504435

These two variables were removed, and the regression was run again. As can be seen in Table 16, the new model

$$\%\ Pkt\ Loss = -0.0062 - 0.0006(Distance) + 0.0007(Avg\ RSSI) \quad (16)$$

was statistically a good predictor with a p-value of 8.4723×10^{-17} but only explained 18.724 percent of the variation in the data points.

Table 16 Pilot study modified multiple linear regression analysis; Predict % Pkt Loss

Regression Statistics	
Multiple R	0.4327
R Square	0.1872
Adjusted R Square	0.1827
Standard Error	0.0033
Observations	360

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.0009	0.0005	41.1228	8.4723E-17
Residual	357	0.0040	1.12E-05		
Total	359	0.0049			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0.0062	0.0010	-5.9613	6.012E-09
Distance	-0.0006	0.0001	-5.4912	7.594E-08
Avg RSSI	0.0007	7.32E-05	8.9991	1.373E-17

A linear regression analysis was performed with the channel as the dependent variable and the packet loss as the independent variable. As seen in Table 17, the p-value was 0.3687. This high p-value indicates that the model was not a good predictor of the channel used.

Table 17 Pilot study simple linear regression analysis: Predict Channel

Regression Statistics	
Multiple R	0.0475
R Square	0.0023
Adjusted R Square	-0.0005
Standard Error	11.5625
Observations	360

ANOVA

	df	SS	MS	F	Significance F
Regression	1	108.2992	108.2992	0.8101	0.3687
Residual	358	47861.7008	133.6919		
Total	359	47970			

	Coefficients	Std. Error	t Stat	P-value
Intercept	19.1111	0.7470	25.5829	7.93E-83
% Pkt Error	149.2570	165.8343	0.9000	0.3687

Table 18 Pilot study multiple linear regression analysis; Predict Channel

Regression Statistics	
Multiple R	0.0540
R Square	0.0029
Adjusted R Square	-0.0027
Standard Error	11.5749
Observations	360

ANOVA

	df	SS	MS	F	Significance F
Regression	2	140.0707	70.0354	0.5227	0.5933
Residual	357	47829.9293	133.9774		
Total	359	47970			

	Coefficients	Std Error	t Stat	P-value
Intercept	20.7711	3.4899	5.9518	6.34E-09
% Pkt Error	178.9113	176.8276	1.0118	0.3123
Avg RSSI	-0.1142	0.2344	-0.4870	0.6266

The regression was run a second time adding the independent variable Avg RSSI. As seen in Table 18, the p-value 0.5933 indicated the model also was not a good predictor of the channel used.

Summary

After making modifications to the process, the pilot study confirmed the assumptions that residential microwave interference could be captured using the Ubertooth One device with the related spectrum analysis software on a Linux computer, BLE packet loss could be captured using the ComProbe BLE on a Windows 7 computer, and Microsoft Excel could be used for data analysis. Each of the hypotheses was tested. The small amount of data collected in the pilot study sufficiently tested the process and supports the feasibility of completing the full study.

CHAPTER 5

RESULTS OF THE FULL STUDY

The full study was conducted using five 1100 watt residential microwave ovens, the Polar BLE heart monitor sensor, an iPhone 5 running iOS 7.0.4, the iOS Polar app, the ComProbe BLE device, and the Ubertooth One's spectrum analyzer. As was done in the pilot study, the heart monitor and smart phone were placed 0.5 meter apart. The distance between the medical BAN system and the microwave oven was varied from 0.5 meter to 5.0 meters at 0.5 meter increments for each of the residential microwave ovens with the power set to the lowest setting, the highest setting, and the OFF setting. Thirty trials of 180 seconds each were collected for each distance, microwave oven, and power setting. The data was simultaneously collected on two computers. The microwave interference was collected using the Ubertooth One's spectrum analyzer. The BLE transmission and errors was collected using the ComProbe BLE protocol analyzer.

Microwave Ovens

The five microwave ovens used in this study were all purchased in 2013 at Walmart, Meijer, or Menards in Angola, Indiana. As seen in Table 18, the five ovens varied in capacity but all had a power rating of 1100 watts. The capacity was the manufactures' stated volume of the internal cooking cavity. The important measurement for this study was the microwave ovens' stated power rating. The manufacturer, model, capacity, and power rating in Table 19 were found on the identification tag affixed to the back or bottom of the microwave oven.

Table 19 Microwave ovens used in experiment

Number	Manufacturer	Model	Capacity	Power Rating
1	Magic Chef	MCD1611ST	1.6 cu. ft.	1100 watts
2	GE	WES1450DS1BB	1.4 cu. ft.	1100 watts
3	Magic Chef	MCD1611B	1.6 cu. ft.	1100 watts
4	Galanz	P110N30AP	1.1 cu. ft.	1100 watts
5	Sharp	R559YW	1.8 cu. ft.	1100 watts

Table 20 Microwave oven power consumption

Microwave Oven Number	Power at Off in Watts	High Setting In Watts		Low Setting In Watts		Cycle High in Seconds		Cycle Low In Seconds		Mean Watts At High	Mean Watts At Low
		High	Low	High	Low	On	Off	On	Off		
1	1.6	1388	41.8	42.0	41.3	18	9	5	25	939.3	41.4
2	1.5	1221	43.4	153	43.9	25	3	4	25	1094.8	58.9
3	1.6	1391	40.4	42.9	40.6	18	9	5	25	940.8	41.0
4	1.8	1175	40.2	578	31.0	12	2	3	18	1012.9	109.1
5	1.6	1089	41.6	1089	42.1	24	6	2	28	972.6	111.9

Table 20 lists the power consumption for each of the microwave ovens. Power consumption was measured using the KILL A WATT model P4400.01 meter manufactured by P3 International Corporation. The Power at Off in Watts was the power consumption with the microwave oven plugged into the receptacle but not running. The 1.5 to 1.8 watts is assumed to be the power consumption of the clock and other internal components.

The High Setting in Watts was the power consumption with the microwave oven cooking at the highest power setting. The duty cycle of the microwave ovens is listed in the Cycle High in Seconds column. For example, microwave 1 consumed 1388 watts for 18 seconds while the microwave oven was ON and consumed 41.8 watts for the 9 seconds the microwave oven was OFF in the duty cycle. For the 27 second duty cycle of this microwave oven, the mean power consumption at the highest setting was 939.3 watts.

Similarly, at the lowest power setting, microwave 1 consumed 42.0 watts for the 5 seconds the microwave oven was ON and consumed 41.3 watts for the 25 seconds the microwave oven was OFF in the duty cycle. For the 30 second duty cycle of this microwave oven, the mean power consumption at the lowest setting was 41.4 watts.

Note that the KILL A WATT device does not save or record the high and low readings. The number of watts consumed fluctuated even while the microwave oven is wan the ON and OFF portions of the duty cycle. The values presented in Table 20 were the best estimate of the average power consumption based on the number of watts presented on, and manually recorded from, the KILL A WATT device's display.

The results of this study are organized by research question. The three research questions are:

- Will the interference caused by the residential microwave oven result in more packet loss as the microwave oven's transmission signal increases due to either a decrease in the distance between the microwave oven and the BLE piconet or due to an increase in the microwave oven's power level?

- Will the interference caused by the residential microwave oven be clustered and primarily affect only a portion of the channels available to the BLE piconet?
- Will the packet loss by channel be a predictor of microwave oven interference that can be used to avoid decreased throughput in the piconet?

To answer these research questions, this study used the Ubertooth One device to record the interference generated by the microwave oven in the ISM band, the ComProbe BLE protocol analyzer to record BLE packet loss, and the Microsoft Excel data analysis tools to analyze the data.

Packet Loss by Distance and Power

In this study, thirty 180 second samples were collected at each distance 0.5 meter to 5.0 meters at 0.5 meter increments from each of the five microwave ovens with the microwave oven's power level at off, low, and high. For each distance and power level, mean signal strength of interference per channel was calculated. Figure 18 displays the mean signal strength per channel with the microwave ovens operating at the lowest power setting at a distance of 0.5 meter from the BLE piconet. For comparison, Figure 19 displays the mean signal strength with the microwave ovens operating at the highest power setting at a distance of 0.5 meter from the BLE piconet. The mean signal strength is much greater at the higher power level. A summary of the data collected by the spectrum analyzer is presented in Appendix B.

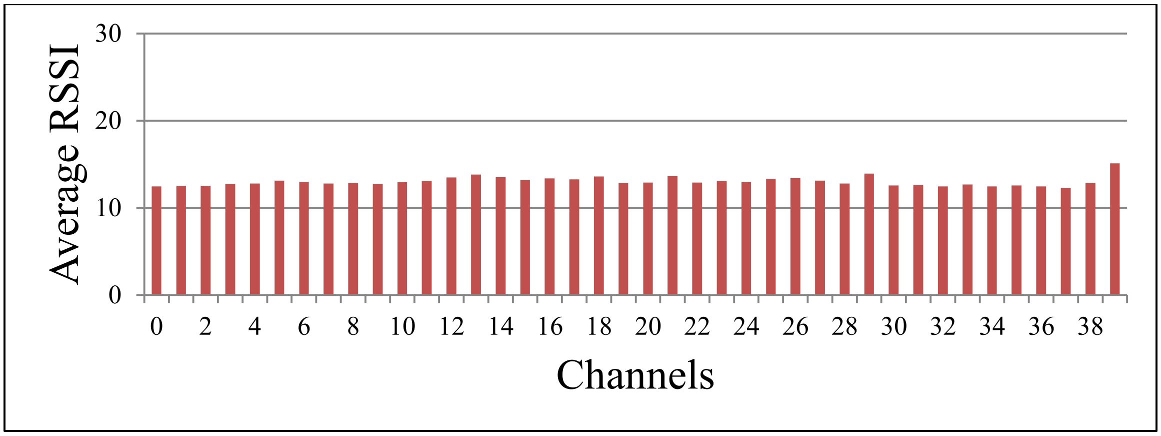


Figure 18. Mean signal strength; Low power at 0.5 meter

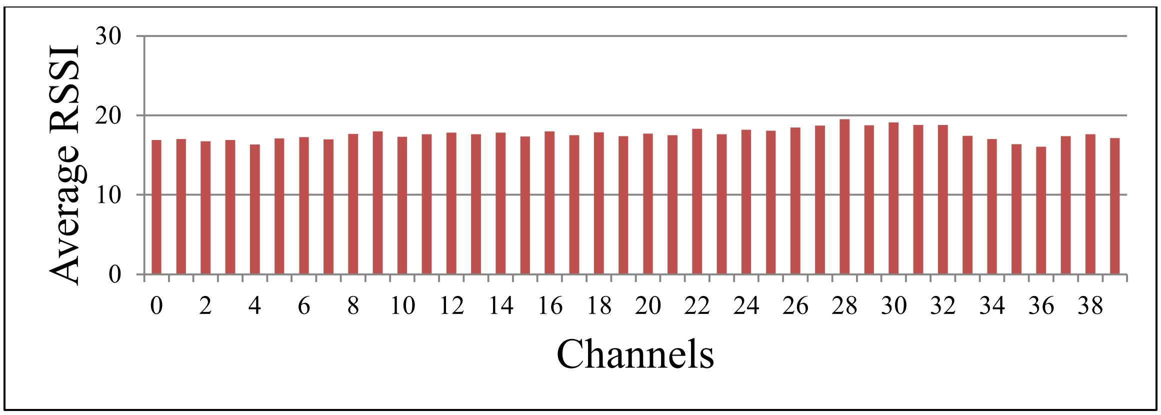


Figure 19. Mean signal strength; High power at 0.5 meter

Similarly, Figure 20 displays the mean signal strength per channel with the microwave ovens operating at the lowest power setting at a distance of 5.0 meters from the BLE piconet. For comparison, Figure 21 displays the mean signal strength with the microwave ovens operating at the highest power setting at a distance of 5.0 meters from the BLE piconet. As can be seen in Figures 18 through 21, the mean signal strength of interference appeared to be greater at the higher power setting.

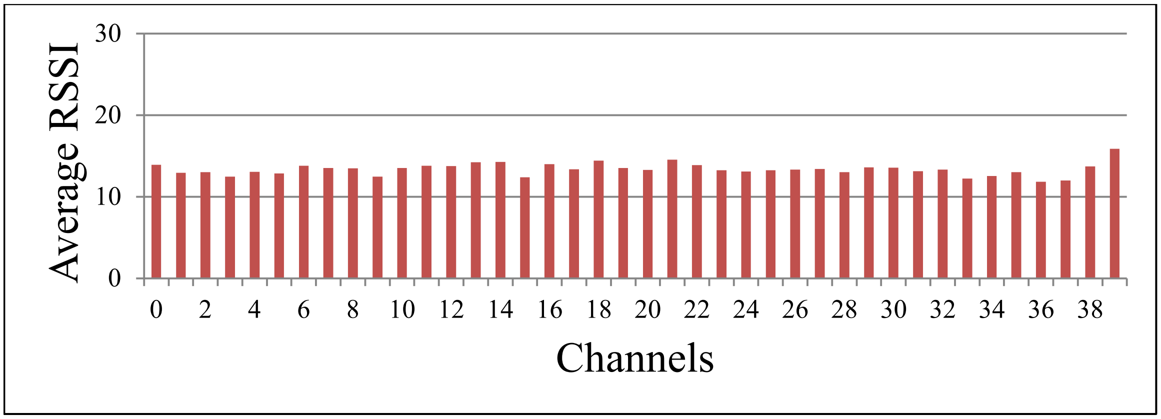


Figure 20. Mean signal strength; Low power @ 5.0 meters

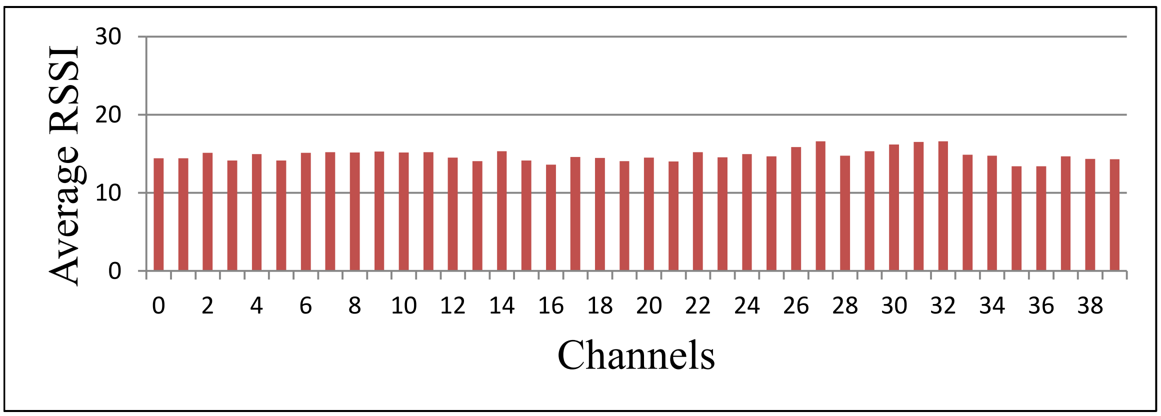


Figure 21 Mean signal strength; High power @ 5.0 meters

The Frontline ComProbe BLE device was used to capture the BLE packets sent between the heart monitor and the iOS device. The ComProbe BLE protocol analyzer interacts with the proprietary Frontline software creating many of its own charts and tables. Figure 22 shows the channel usage for the heart monitor when the microwave oven was off. The data channels appear to be used equally. By contrast, there is unequal channel utilization with the microwave oven running at the highest power level as seen in Figures 23 and 24. A summary of the data collected by the ComProbe BLE protocol analyzer is presented in Appendix C.

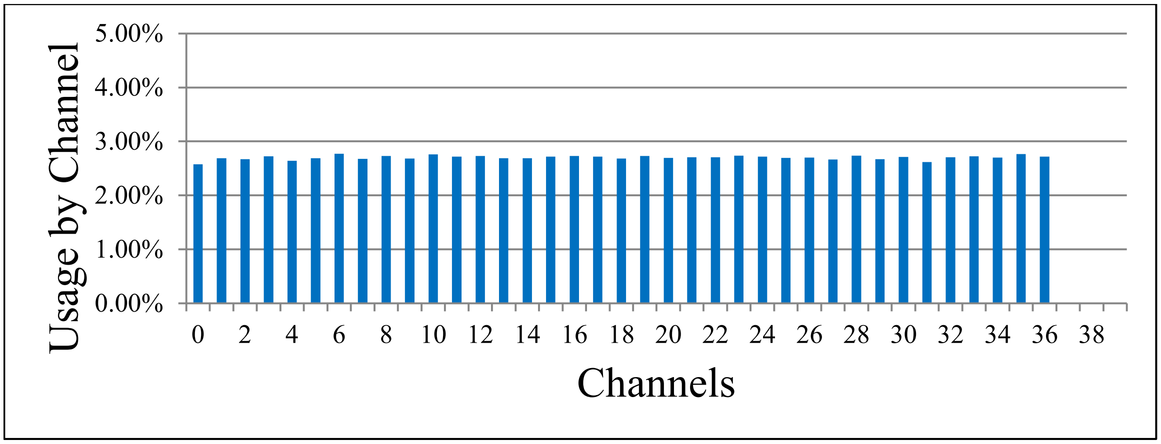


Figure 22. Bluetooth LE usage per channel; Microwave oven off

Figure 23 is the channel usage for the BLE data capture with the piconet 0.5 meter away from the microwave oven running at the highest power level. At this close distance, it can be seen that the middle channels have less usage than the lower frequency channels indicating the interference may affect the lower frequency channels less. Figure 24 is the channel usage for the BLE data capture with the piconet 5.0 meters from the microwave oven running at the highest power level. Strangely, there is no simple pattern with channel usage alternating throughout the frequency band.

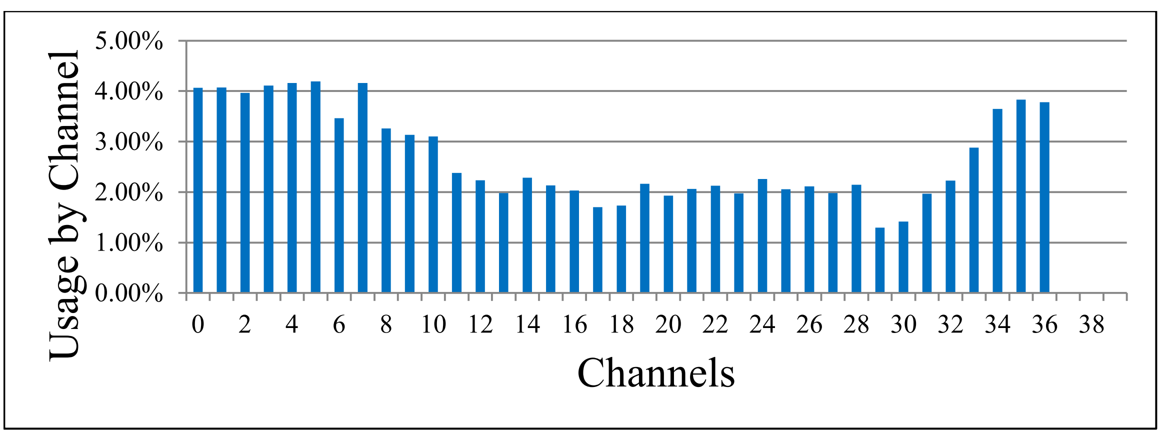


Figure 23. BLE usage per channel; High power @ 0.5 meter

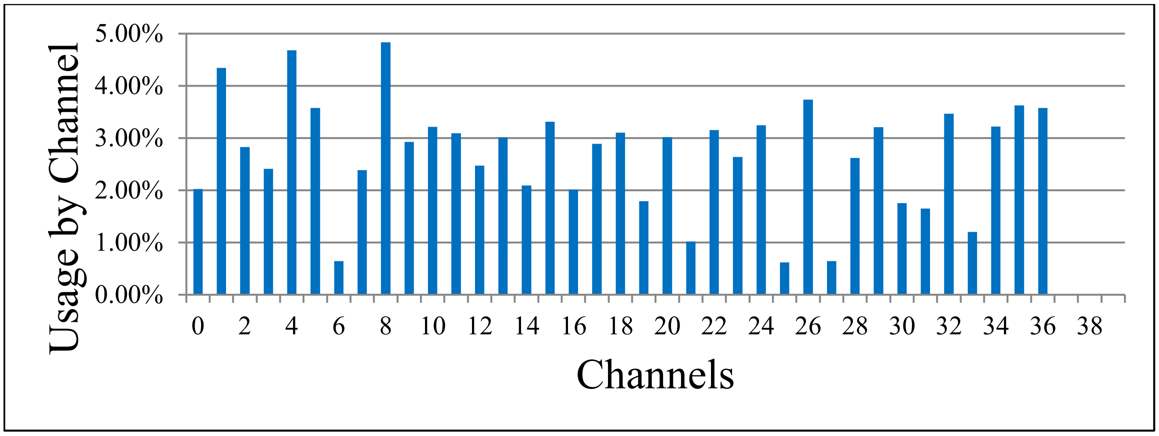


Figure 24. BLE usage per channel; High power @ 5.0 meters

Figures 22 through 24 seem to illustrate that the microwave oven's interference did affect the usage by channel indicating a shift in channel selection compared to the pattern observed when the microwave oven was off. In Figure 23, when the BLE piconet was closer to the microwave oven operating on the highest power setting, usage is seen shifted to the lower frequency channels. When the BLE piconet was moved further away from the microwave oven, as seen in Figure 24, usage is more equally divided among the channels.

The ComProbe BLE protocol analyzer also collected the packet loss per channel. It was discovered that BLE is very resilient to interference. Figures 25 to 27 show the percentage of packet loss by channel. Figure 25 shows the percentage of packet loss by channel when the microwave oven was off. While there were packet errors, the highest percentage of packet errors occurred on channel 15 with eight errors in 5203 packets for a 0.1538 percent error rate. Channel 15 is centered at 2437 GHz.

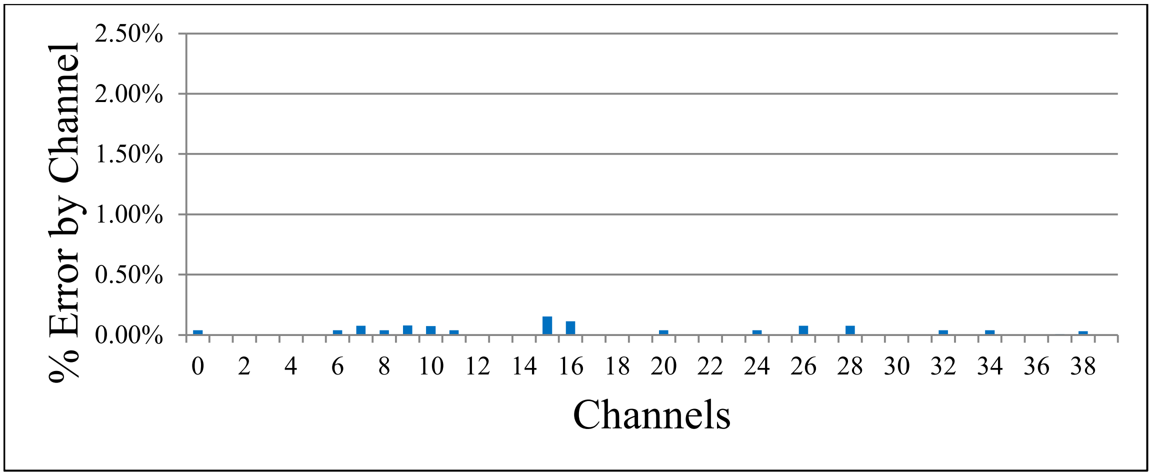


Figure 25. Percent packet loss by channel; Microwave oven off

Figure 26 shows the packet loss per channel with the microwave oven operating at the highest power level when the microwave oven was 0.5 meter from the piconet. Almost every channel experienced packet loss.

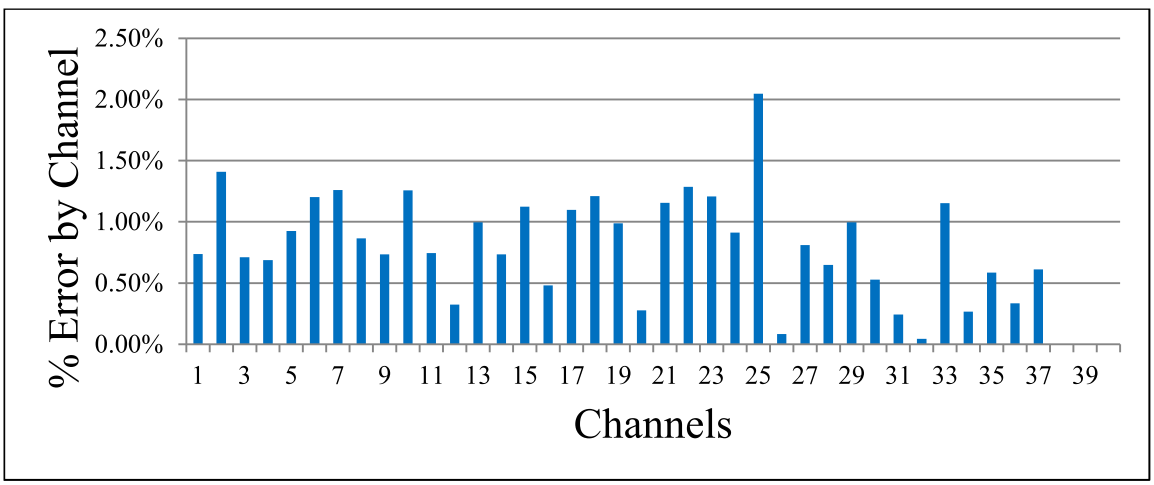


Figure 26. Percent packet loss by channel; High power @ 0.5 meter

Figure 27 shows the packet loss per channel with the microwave oven operating at the highest power level when the microwave oven was 5.0 meters percentage of from the piconet. While the percentage of packet loss per channel was less at this increased distance, some channels experienced a relatively high percentage of packet loss. Centered at 2463 GHz, channel 28 experienced a 1.7621 percent error rate.

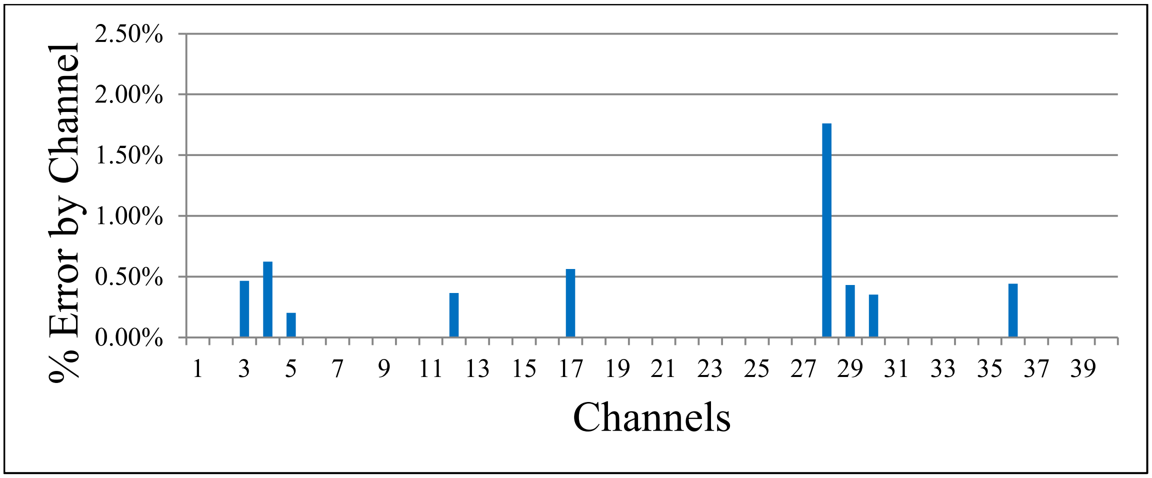


Figure 27. Percent packet loss by channel; High power @ 5.0 meters

While the graphical representations of the interference and packet loss are interesting, a statistical analysis of the data is needed to determine if the hypotheses are rejected.

Distance

The packet loss was measured as the distance between the piconet and microwave oven was systematically decreased from 5.0 meters to 0.5 meter using 0.5 meter increments. The Pearson correlation coefficient and associated *r* value were used to test hypothesis 1-1. The coefficient correlation in Table 21 looked for correlation between the distance and percentage of packet errors per channel when the microwave oven was operating at the lowest power level. The correlation coefficient of -0.4519 suggests there was weak correlation between these variables. Similarly, Table 22 looked for correlation between the distance and number of packet errors. The correlation coefficient -0.4713 suggests there was weak correlation between the variables. These correlation coefficients suggest there was weak statistical evidence to suggest that a decrease in the distance between the microwave oven and the BAN system components increases packet loss when the microwave oven was operating at the lowest power level.

Table 21 Correlation coefficient; Distance & Percent Error; Low power

	Distance	% Pkt Error
Distance	1	
% Pkt Error	-0.4519	1

Table 22 Correlation coefficient; Distance; Distance & Error Count; Low power

	Distance	Pkt Error Count
Distance	1	
Pkt Error Count	-0.4713	1

Table 23 Correlation coefficient; Distance & Percent Error; High power

	Distance	% Pkt Error
Distance	1	
% Pkt Error	-0.4355	1

Table 24 Correlation coefficient; Distance & Error Count; High power

	Distance	Pkt Error Count
Distance	1	
Pkt Error Count	-0.5245	1

Tables 23 and 24 include the correlation coefficient for only high power records. Table 23 looked for correlation between the distance and the percentage of packet errors per channel when the microwave oven was operating at the highest power level. The correlation coefficient of -0.436 suggested a weak correlation between the variables. Table 24 looked for correlation between the distance and the number of packet errors per channel when the microwave oven was operating at the highest power setting. With the correlation coefficient of -0.525, there was a moderate correlation between the variables. This weak to moderate correlation coefficients suggests there was enough statistical evidence to support the statement that a decrease in the distance between the microwave oven and the BAN system components increases packet loss when the microwave oven is operating at the highest power level.

Power Level

The packet loss was measured as the power level of the microwave oven was alternated between the lowest and the highest power settings. The Pearson correlation coefficient and associated rho value were used to test hypothesis 1-2. Table 25 looked for the correlation between the microwave oven's power level and the percentage of packet errors per channel. The correlation coefficient of 0.4224 suggests weak correlation between the variables. Table 26 looked for correlation between the microwave oven's power level and the packet error count by channel. The correlation coefficient of 0.4514 also suggests a weak correlation between the variables. The correlation coefficients suggest a weak evidence to suggest that an increase in the microwave oven's power level will contribute to packet loss.

Table 25 Correlation coefficient: Power & Percent Error

	% Pkt Error	Power
% Pkt Error	1	
Power	0.4224	1

Table 26 Correlation Coefficient: Power & Error Count

	% Pkt Error	Power
Pkt Error Count	1	
Power	0.4514	1

Conclusion 1: The interference caused by the residential microwave oven results in more packet loss due to an increase in the microwave oven power level and an increase in packet loss due to an decrease in the distance between the microwave oven and the BLE piconet.

Interference

In this study, the Ubertooth One device was used to collect the signal strength of the microwave oven's interference by BLE channel while simultaneously the ComProbe BLE protocol analyzer was used to collect packet data by channel.

Microwave Interference by Channel

The spectrum analyzer was used to measure the amount of interference on each channel at each distance and each power setting. An ANOVA test was used to test hypothesis 2-1. The p-value of 0.211 in Table 27 suggests that there was not sufficient evidence to reject the null hypothesis that all channels were equally affected by interference. In other words, the results of the ANOVA test suggested all channels were equally affected by interference.

Table 27 ANOVA for channel interference

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	151.11	39	3.87	1.18	0.211	1.41
Within Groups	3814.26	1160	3.29			
Total	3965.37	1199				

Interference at Ends of ISM Band

The spectrum analyzer was used to measure the amount of interference on each channel at each distance and each power setting. A two-sample t-Test assuming unequal variances was used to compare the upper and lower channels based on frequency to test hypothesis 2-2. As seen in Table 28, both the one-tail and two-tail p-values, 0.154 and 0.309 respectively, suggest that there was not sufficient evidence to reject the null hypothesis that all channels were affected equally. In other words, the results of this ANOVA test suggested the channels at the bottom of the BLE frequency range, e.g. 2402 MHz to 2442 MHz, and the channels at the top of the BLE frequency range, e.g. 2442 MHz to 2480 MHz, were equally affected by interference from the microwave oven.

If the ten channels with the lowest frequencies were compared to the ten channels with the highest frequencies, the results are similar. As can be seen in Table 29, the one-tail test p-value was 0.074. This p-value indicated suggestive evidence against the null hypothesis that all channels are equally affected by microwave oven interference. The two-tail p-value, 0.149, indicated little to no evidence against the null hypothesis. The results of this t-test suggested that the null hypothesis should not be rejected. In other words, the ten channels with the lowest frequencies and the ten channels with the highest frequencies were equally affected by microwave oven interference.

Table 28 Two-sample t-test: Upper vs. Lower Channels

	Lower Channels	Upper Channels
Mean	13.415	13.522
Variance	2.845	3.769
Observations	600	600
Hypothesized Mean Difference	0	
Df	1175	
t Stat	-1.109	
P(T<=t) one-tail	0.154	
t Critical one-tail	1.646	
P(T<=t) two-tail	0.309	
t Critical two-tail	1.962	

Table 29 Two-sample t-test: Bottom 10 channels vs. top 10 channels

	Bottom 10	Top 10
Mean	13.305	13.526
Variance	2.867	4.070
Observations	299	299
Hypothesized Mean Difference	0	
Df	579	
t Stat	-1.446	
P(T<=t) one-tail	0.074	
t Critical one-tail	1.647	
P(T<=t) two-tail	0.149	
t Critical two-tail	1.964	

As seen in Table 30, if the data channels with the highest and lowest frequencies were compared, there was no evidence that interference affects channels with lower frequencies more than channels with higher frequencies. Data channel 0 was centered at 2405 MHz. Data channel 36 was centered at 2479 MHz. The one-tail and two-tail p-values, 0.114 and 0.229 respectively, suggest there was little to no evidence against the null hypothesis that both channels were equally affected by microwave oven interference.

Table 30 Two-sample t-test: Channel 0 vs. Channel 36

	Channel 0	Channel 36
Mean	13.114	12.648
Variance	2.641	1.745
Observations	30	30
Hypothesized Mean Difference	0	
Df	56	
t Stat	1.217	
P(T<=t) one-tail	0.114	
t Critical one-tail	1.673	
P(T<=t) two-tail	0.229	
t Critical two-tail	2.003	

Finally, if the two advertising channels with the lowest and highest frequencies are compared, the data suggests there was a difference in the interference per channel. Two of the advertising channels are actually at the lower and upper end of the frequency band. Channel 37 is centered at 2403 MHz. Channel 39 is centered at 2481 MHz. As seen in Table 31, both the one-tail and two-tail p-values, 0.001 and 0.002 respectively, suggest that there was strong evidence against the null hypothesis that both channels were equally affected by microwave oven interference.

Table 31 Two-sample t-test: Channel 37 vs. Channel 39

	Channel 37	Channel 39
Mean	13.021	15.683
Variance	3.281	2.578
Observations	30	21
Hypothesized Mean Difference	0	
Df	58	
t Stat	-3.240	
P(T<=t) one-tail	0.001	
t Critical one-tail	1.672	
P(T<=t) two-tail	0.002	
t Critical two-tail	2.002	

Interference Conclusion

While channels 37 and 39 were unequally affected by the microwave oven interference, these two channels are advertising channels, not data channels. The results of the other ANOVA and t-tests indicated the interference caused by the residential microwave oven is not clustered and equally affected all channels available to the BLE piconet.

The Predictive Model

This study used multiple linear regressions to determine if a statistically significant linear predictor model can be created. This study modelled packet loss by channel as a predictor of interference from the microwave oven, packet loss by channel as a predictor of the distance between the medical BAN system and the microwave oven, and the packet loss as a predictor of the channel used by the BLE piconet.

Packet Loss by Channel Predicts Interference

A multiple linear regression analysis was performed using the signal strength of the interference created by the microwave oven as the dependent variable and the packet loss, distance, and channel as the independent variables. The regression model was

$$Avg\ RSSI = 11.804 - 0.124(Distance) + 1.732(Power) + 111.211(\%\ Pkt\ Error) - 0.006(Channel) \quad (18)$$

Table 32 Multiple linear regression analysis; Predict Avg RSSI

Regression Statistics	
Multiple R	0.8950
R Square	0.8003
Adjusted R Square	0.8000
Standard Error	0.8140
Observations	1200

ANOVA

	df	SS	MS	F	Significance F
Regression	4	3173.6287	793.4072	1197.2764	0
Residual	1195	791.8987	0.6627		
Total	1199	3965.5274			

	Coefficients	Standard Error	t Stat	P-value
Intercept	11.8039	0.0715	165.0122	0
Distance	-0.1243	0.0169	-7.3793	2.9704E-13
Power	1.7322	0.0317	54.8687	0
% Pkt Error	111.2112	7.9389	14.0084	2.1465E-41
Channel	0.0057	0.0020	2.8149	0.00496

The p-value in Table 32 is listed as the Significance *F* which is a measure of the significance level of the observed F test statistic. The p-value of 0 suggested the regression model was statistically significant and presented very strong evidence against the null hypothesis that the model was not a good predictor. The R Square statistic indicated the model predicted 80.00 percent of the variation in the data points. The model in equation 18 was significant and was a good predictor of the signal strength of the interference from the microwave oven.

Even though all of the independent variables in equation 18 contribute to the accuracy of the model, not all of these variables are necessary. A multiple linear regression analysis was performed using the signal strength of the interference created by the microwave oven as the dependent variable and only the packet loss and channel as the independent variables. The regression model was

$$Avg\ RSSI = 12.878 + 296.244(\%\ Pkt\ Error) + 0.009(Channel) \qquad (19)$$

The p-value in Table 33 is listed as the Significance *F* which is a measure of the significance level of the observed F test statistic. The p-value of 13.5551×10^{-92} is very small and essentially 0. The p-value suggested the regression model was statistically significant and presented very strong evidence against the null hypothesis that the model was not a good predictor. The R Square statistic indicated the model predicted 29.66 percent of the variation in the data points. Although not explaining as much of the variation in the data points as the model in equation 18, the model in equation 19 was significant and was a good predictor of the signal strength of the interference from the microwave oven while using fewer independent variables.

Table 33 Multiple linear regression analysis; Packet loss to predict Avg RSSI

Regression Statistics	
Multiple R	0.5446
R Square	0.2966
Adjusted R Square	0.2954
Standard Error	1.5265
Observations	1200

ANOVA

	df	SS	MS	F	Significance F
Regression	2	1176.1728	588.0864	252.3664	3.5551E-92
Residual	1197	2789.3545	2.3303		
Total	1199	3965.5274			

	Coefficients	Standard Error	t Stat	P-value
Intercept	12.8781	0.0895	143.8797	0
% Pkt Error	296.2441	13.1993	22.4439	2.1417E-93
Channel	0.0089	0.0038	2.3345	0.01973512

Distance and Interference Predicts Packet Loss

A multiple linear regression analysis was performed using the captured packet loss data as the dependent variable and level of interference created by the microwave oven, distance, and channel as the independent variables. Table 34 is the result of the regression analysis. While statistically a good predictor, as indicated by the low p-value of 2.9446×10^{-101}, the model in equation 20 only explained 32.72 percent of the variation in the data points.

$$\%\ Pkt\ Loss = -0.0137 - 0.0003(Distance) - 0.0008(Power) + 0.0013(AvgRSSI) - 0.0000(Channel) \quad (20)$$

Table 34 Multiple linear regression analysis; Predict % Pkt Loss

Regression Statistics	
Multiple R	0.5720
R Square	0.3272
Adjusted R Square	0.3249
Standard Error	0.0027
Observations	1200

ANOVA

	df	SS	MS	F	Significance F
Regression	4	0.0044	0.0011	145.2662	2.9446E-101
Residual	1195	0.0090	7.6E-06		
Total	1199	0.0134			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0.1371	0.0011	-12.3583	4.202E-33
Distance	-0.0003	5.8E-05	-4.8218	1.606E-06
Power	-0.0008	0.0003	-3.8721	0.0001137
Avg RSSI	0.0013	9.1E-05	14.0084	2.146E-41
Channel	-2.207E-05	6.9E-06	-3.2057	0.0013832

The very low coefficient value for Channel renders this variable unnecessary. This variable was removed, and the regression was run again. As can be seen in Table 35, the new model

$$\%\ Pkt\ Loss = -0.0140 - 0.0003(Distance) - 0.0007(Power) + 0.0013(Avg\ RSSI) \tag{21}$$

was statistically a good predictor with p-value of 3.227×10^{-100} but only explained 32.14 percent of the variation in the data points.

Table 35 Modified multiple linear regression analysis; Predict % Pkt Loss

Regression Statistics	
Multiple R	0.5669
R Square	0.3214
Adjusted R Square	0.3197
Standard Error	0.0028
Observations	1200

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.0043	0.0014	188.7985	3.2269E-100
Residual	1196	0.0091	7.6E-06		
Total	1199	0.0134			

	Coefficients	Standard Error	t Stat	P-value
Intercept	-0.0140	0.0011	-12.5711	3.944E-34
Distance	-0.0003	5.8E-05	-4.8494	1.402E-06
Power	-0.0007	0.0002	-3.7203	0.000208
Avg RSSI	0.0013	9.1E-05	13.8111	2.294E-40

5.4.3 Packet Loss Predicts Distance

Another regression analysis was run. This time Distance was the independent variable and % Pkt Loss and Channel were the independent variables. The results of this regression analysis are in Table 36.

Table 36 Multiple linear regression analysis; Predict distance

Regression Statistics	
Multiple R	0.2182
R Square	0.0476
Adjusted R Square	0.0460
Standard Error	1.4033
Observations	1200

ANOVA

	df	SS	MS	F	Significance F
Regression	2	117.7839	58.8920	29.9055	2.1194E-13
Residual	1197	2357.2161	1.9693		
Total	1199	2475			

	Coefficients	Std Error	t Stat	P-value
Intercept	2.9133	0.0823	35.4072	1.82E-188
% Pkt Error	-93.8405	12.1339	-7.7338	2.205E-14
Channel	-0.0016	0.0035	-0.4594	0.0646048

Although the regression equation only explained 4.76 percent of the variation in the data points,

$$Distance = 2.913 – 93.841(\%\ Pkt\ Error) – 0.002(Channel) \qquad (22)$$

the p-value of 2.1194×10^{-13} strongly suggests that the model in equation 22 was a good predictor of the Distance.

Packet Loss Predicts Channel

A linear regression analysis was performed with the channel as the dependent variable and the packet loss as the independent variable. As seen in Table 37, the p-value was 0.0397. This p-value indicates that the model in equation 23 was a good predictor of the channel used, but the model only described 0.35 percent of the variation in the data points.

Table 37 Simple linear regression analysis: Predict channel

Regression Statistics	
Multiple R	0.0594
R Square	0.0035
Adjusted R Square	0.0027
Standard Error	11.5326
Observations	1200

ANOVA

	Df	SS	MS	F	Significance F
Regression	1	564.1599	564.1599	4.2418	0.0397
Residual	1198	159335.8401	133.0015		
Total	1199	159900			

	Coefficients	Std. Error	t Stat	P-value
Intercept	19.7881	0.3611	54.7984	0.0000
% Pkt Error	-205.0128	99.5424	-2.0596	0.0397

$$Channel = 19.7881 - 205.0128(\%\ Pkt\ Error) \qquad (23)$$

Predictive Model Conclusion

Four statistically significant predictive models were found using multiple linear regressions. While the linear model in equation 18 explained 80.0 percent of the variation in the data points when predicting signal strength of the microwave oven's interference using the distance, power level setting, packet error rate, and the channel, the linear model in equation 20 was able to explain 32.72 percent of the variation in the data points when predicting signal strength of the interference using only the packet error rate and channel. The linear model in equation 21 explained 32.14 percent of the variation in the data points when predicting the packet loss rate using the distance and signal strength. The linear model in equation 22 explained only 4.76 percent of the variation in the data points when predicting the distance using the packet error rate and the channel. Finally, the linear model in equation 23, while statistically significant, explained only 0.35 percent of the variation in the data points when predicting the channel based on the packet error rate. These linear models used together may be the basis for a protocol which will be able to decrease disruptions in the wearable BLE-enabled medical BAN devices.

CHAPTER 6

CONCLUSIONS, RECOMMENDATIONS, AND FUTURE WORK

Conclusions

In coming to this conclusion, three questions were answered. The first question was, "Will the interference caused by the residential microwave oven result in more packet loss as the microwave oven's transmission signal increases due to either a decrease in the distance between the microwave oven and the BLE piconet or due to an increase in the microwave oven power level?" One hypothesis was that a decrease in distance between the microwave oven and the BLE-enabled medical BAN system components would increase packet loss. It was found there was weak to moderate coefficient correlation statistical evidence suggesting a decrease in the distance between microwave oven and the BLE-enabled medical BAN system components increases packet loss regardless of the power level of the microwave oven. A second hypothesis was that an increase in the microwave oven's power level would contribute to packet loss. It was found there was weak to moderate coefficient correlation suggesting an increase in the microwave oven's power level contributes to packet loss. The study found that the interference caused by the residential microwave oven result in more packet loss due to an increase in the microwave oven power level than due to the decreased distance between the microwave oven and the BLE piconet.

The second question was, "Will the interference caused by the residential microwave oven be clustered and primarily affect only a portion of the channels available to the BLE piconet?" The first hypothesis was that all channels would be equally affected by the microwave oven regardless of the strength of the interference. There was not sufficient evidence to reject the hypothesis suggesting all channels are equally affected by the interference. A second hypothesis was that a cluster of channels at the top of the ISM band would be more affected by the microwave oven's interference. Again, there was not sufficient evidence to suggest that the higher frequency channels were more affected. The study found that the interference caused by the residential microwave oven was not clustered and equally affected all channels available to the BLE piconet.

The third question was, "Will the packet loss by channel be a good predictor of microwave oven interference that can be used to avoid decreased throughput of the piconet?" Five statistically significant models were found while answering this question. The first hypothesis was that the packet loss by channel significantly predicts the interference from the microwave oven. A linear model (Equation 18) was created to predict the average interference based on the distance, microwave oven power level, percentage of packets that erred, and the BLE channel. This model explained 80.0 percent of the variation in the data points.

A modification to the linear model (Equation 19) used only the percentage of packets that erred and the BLE channel to predict the average interference. This model explained 29.7 percent of the variation in the data points. The advantage of this model, however, is that the percentage of packets that erred and the BLE channel are known by the medical BAN device.

A second hypothesis was that the packet loss by channel would significantly predict the distance between the piconet and microwave oven. A multiple linear regression model (Equation 21) predicted the percentage of erred packets using the distance and the average interference. This model explained 32.7 percent of the variation in the data points. Another linear regression model (Equation 22) predicted the distance using the percent erred packets and the channel. This model explained 4.76 percent of the variation in the data points.

The final hypothesis was that the packet loss would significantly predict the channel used by the piconet. Another multiple linear regression model (Equation 23) predicted the channel using the percentage of erred packets. This model only explained 0.35 percent of the variation in the data points.

With five statistically significant models, the study found that the packet loss by channel was a good predictor of microwave oven interference.

The AFH mapping function does not look ahead at what channels will be affected by interference. Instead, AFH simply keeps track of the channels that are in a used state and the channels in an unused state. Channels with microwave oven interference will be seen as used. Being able to predict the channels that will be affected before packets are lost would allow the piconet to avoid blocks of channels and decrease packet errors which will increase throughput.

Recommendations

The following four recommendations are offered as possible ways to improve this study. First, a better method of capturing the signal strength of the interference generated by the residential microwave oven should be used. The Ubertooth One device could be used as an ISM-band spectrum analyzer and provided the ability to save the captured relative signal strength in a data file. The spectrum analysis did not follow the Bluetooth hopping sequence but rather provided a sweep of the ISM-band at 2400 samples per second. A better solution would allow the researcher to follow the BLE hopping scheme to simultaneously measure the strength of the interference and packet loss at each time slot. The ability to link the data may produce more significant results to more accurately answer the three research questions.

Second, a different selection of microwave ovens may give more significant results. Five different 1100 watt microwave oven models by four different manufacturers were used in this study. The power consumption of these microwave ovens varied more than expected. A repeat of this study using five microwave ovens of the same make, model, and age may remove variability introduced by the different duty cycle methodologies used by the different manufacturers.

Third, the selection of data analysis software used may improve the interpretation of the data. The data analysis tools of Microsoft Excel 2010 were used to generate the tables used in interpreting the data. Using Microsoft Excel for data analysis is similar to using an adjustable wrench; it can do the job but it is not the best tool available. The statistical software package SPSS is designed to handle large amounts of data, perform data analysis, and create tables and graphs. The capabilities of the SPSS statistical software package may provide additional clues as to the true relationship between the interference generated by residential microwave ovens and the packet loss by channel in the BLE-enabled medical BAN system.

Fourth, there needs to be an investigation into the cause of the ComProbe BLE indicating channels as unavailable while there is data usage on the channel. It was assumed the channel was available for a portion of the 180 second trial, but the channel was coded as unavailable for this study because it was not possible to determine the percentage of the trial the channel was available. In some cases, channels with data and no errors were also marked as unavailable. The ability to better determine the causes of channels becoming unavailable may lead to more accurate results in analyzing and predicting interference-related errors in the BLE portion of the medical BAN.

Limitations of this Research

This study was not designed to test the complete medical BAN system or all aspects of the interaction between Bluetooth piconets and microwave ovens, but rather was limited to identifying the packet loss in a medical BAN system during the time period when a patient is in close proximity to the operating residential microwave oven. Limitations that have been identified include the small number of variables, the unknown power output of the residential microwave oven, and the selection of hardware and software used in the study.

Only four variables were used in this study. These variables were the distance between the medical BAN piconet and front of the residential microwave oven, the relative power output of the microwave oven, the number of packets lost per channel in the Bluetooth piconet, and the amount of interference by channel. There may be additional variables that would contribute to the understanding of the effects of microwave oven interference on a BLE-component of a medical BAN.

All of the residential microwave ovens used in this study were rated by the manufacturer at 1100 watts. As was seen in the table of microwave oven power consumption (Table 20), different makes and models of microwave ovens consume different a different number of watts to achieve their highest and lowest power settings. The actual power output of the magnetron tube could not be measured. Additionally, this study only used the common 1100 watt residential microwave ovens. Ovens rated at more watts and fewer watts may produce different results.

The hardware and software used in this study may not represent the best equipment available. The Frontline ComProbe BPA LE Bluetooth protocol analyzer and related software was an industry recognized professional tool used by major corporations to design and test BLE devices. However, the Ubertooth One device was selected based on the claims of the designers. It did not perform as advertised but did include spectrum analysis software that was used to measure and capture the relative signal strength of the microwave oven's interference in the ISM band. It is still unknown of the signal strength specified in the capture file is accurate. Similarly, while using the Microsoft Excel 2010 data analysis tools allowed for the statistical analysis of the data, a professional statistical package, such as SPSS, may have allowed for a more complete analysis.

The medical BAN system used in the study represents one possible heart monitoring scenario. It was not designed to represent the most popular or the best BLE-enabled medical BAN system but rather was selected due to the availability of the components. No part of the study looked at the ability of the medical BAN system to accurately detect, transmit, or interpret signals from the patient's heart nor does it investigate the cellular component of some medical BAN systems.

Even with the limitations identified above, this study did increase knowledge of the effects of residential microwave oven interference on a BLE-enabled medical BAN system. The results of this study can be used as a starting point for additional studies which may clarify and expand on the knowledge gain via this study.

Future Work

The results of this study open the door to other studies on different areas of medical BANs in common situations. Interference from a residential microwave oven was selected because this type of interference has been identified as causing packet loss in other networks. Future experiments may study the effects of interference generated by industrial equipment that are common in some work environments. None of the advances in medical BAN systems are feasible if common workplace interference can cause the medical BAN system to administer an incorrect treatment that may be more dangerous than the illness.

It was discovered during this study that microwave ovens produced by different manufactures had different duty cycles with different power draws at the lowest power setting. Because this difference in the duty cycle did not affect the main objective of this study, an investigation of residential microwave oven duty cycles was left for future research.

REFERENCES

Alesanco, A. l., & Garc´ıa, J. (2010). Clinical Assessment of Wireless ECG Transmission in Real-Time Cardiac Telemonitoring. *IEEE Transactions on Information Technology in Biomedicine, 14*(5), 9.

Altini, M., Polito, S., Penders, J., Kim, H., VanHelleputte, N., Kim, S., et al. (2011, October 10-13). *An ECG Patch Combining a Customized Ultra-Low-Power ECG SoC with Bluetooth Low Energy for Long Term Ambulatory Monitoring.* Paper presented at the WH '11 Proceedings of the 2nd Conference on Wireless Health, San Diego, CA.

Arumugam, A. K., Nix, A. R., Fletcher, P. N., Armour, S. M. D., & Lee, B. S. (2002). Scenario Driven Evaluation and Interference Mitigation Proposals for Bluetooth and High Data Rate Bluetooth Enabled Consumer Electronic Devices. *Consumer Electronics, IEEE Transactions on, 48*(3), 11.

Belgacem, N., & Boumerdassi, S. (2009). Mobile Personal Electrocardiogram Monitoring System with Patient Location *Proceedings of the 1st ACM International Workshop on Medical-Grade Wireless Networks*, 3.

Bluetooth SIG Inc. (2010). Bluetooth Specification Version 4.0 [Electronic Version], *1*. Retrieved March 1, 2013.

Bluetooth SIG Inc. (2012). Bluetooth Technology Creating Huge Opportunities in Health & Wellness.   Retrieved July 30, 2012, from http://www.bluetooth.com/Pages/Health-Wellness-Market.aspx

Centers for Disease Control and Prevention. (2012). Heart Disease Facts. Retrieved July 30, 2012, from http://www.cdc.gov/heartdisease/facts.htm

Centers for Disease Control and Prevention. (2014). Heart Disease Facts. Retrieved May 8, 2014, from http://www.cdc.gov/heartdisease/facts.htm

Chang, A. C. (2008). *Connectivity, Mobility, and Security Supports for Wireless Personal Area Networks and HealthNet.* University of California, Los Angeles.

Chen, M., Gonzalez, S., Vasilakos, A., Cao, H., & Leung, V. C. M. (2011). Body Area Networks: A Survey. *Mobile Networks and Applications, 16*(2), 23.

Chowdhury, K. R., & Akyildiz, I. F. (2009, June 14-18). *Interferer Classification, Channel Selection and Transmission Adaptation for Wireless Sensor Networks.* Paper presented at the Communications, 2009. ICC '09. IEEE International Conference on, Dresden.

Coplu, T., & Oktug, S. F. (2011, January 9-12). *Predictive Channel Access Scheme for Wireless Sensor Networks using Received Signal Strength Statistics.* Paper presented at the Consumer Communications and Networking Conference (CCNC), 2011 IEEE, Las Vegas, NV.

Cypher, D., Chevrollier, N., Montavont, N., & Golmie, N. (2006). Prevailing Over Wires in Healthcare Environments: Benefits and Challenges. *Communications Magazine, IEEE, 44*(4), 8.

Devore, J. L. (2012). *Probability & Statistics for Engineering and the Sciences*. Boston: Brooks/Cole.

Dideles, M. (2003). Bluetooth: A Technical Overview. *ACM: Crossroads, 9*(4).

Ganapati, P. (2010). Oct 25, 1955: Time to Nuke Dinner. Retrieved August 15, 2014, from http://www.wired.com/2010/10/1025home-microwave-ovens/

Garroppo, R. G., Gazzarrini, L., Giordano, S., & Tavanti, L. (2011). *Experimental Assessment of the Coexistence of Wi-Fi, ZigBee, and Bluetooth Devices*. Paper presented at the 2011 IEEE International Symposium on a.

Gollakota, S., Hassanieh, H., Ransford, B., Katabi, D., & Fu, K. (2011, August 15-19). *They Can Hear Your Heartbeats: Non-Invasive Security for Implantable Medical Devices.* Paper presented at the SIGCOMM '11: Proceedings of the ACM SIGCOMM 2011 Conference, Toronto.

Gonçalves, B., Filho, J. G. P., Andreão, R. V., & Guizzardi, G. (2008). ECG Data Provisioning for Telehomecare Monitoring

Proceedings of the 2008 ACM Symposium on Applied Computing, 6.

Home Appliances Characteristics by Type of Housing Unit. (2005). Retrieved February 28, 2010, from http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc9homeappliance/pdf/tablehc2.9.pdf

Hu, Y., Stoelting, A., Wang, Y.-T., Zou, Y., & Sarrafzadeh, M. (2010). Providing a Cushion for Wireless Healthcare Application Development. *Potentials, IEEE 29*(1), 5.

Hughes-Croucher, T. (2009). An Engineer's Guide to Bandwidth. Retrieved July 20, 2013, from http://developer.yahoo.com/blogs/ydn/posts/2009/10/a_engineers_gui/

Hung, H.-H., & Chen, L.-J. (2008). An Analytical Study of Wireless Error Models for Bluetooth Networks. *Advanced Information Networking and Applications - Workshops, 2008. AINAW 2008. 22nd International Conference on*, 6.

Huo, H., Xu, Y., Bilen, C. C., & Zhang, H. (2009, June 18-23). *Coexistence Issues of 2.4GHz Sensor Networks with Other RF Devices at Home.* Paper presented at the Sensor

Technologies and Applications, 2009. SENSORCOMM '09. Third International Conference on, Athens.

Huo, H., Xu, Y., Gidlund, M., & Zhang, H. (2010). Coexistence of 2.4 GHz Sensor Networks in Home Environment. *The Journal of China Universities of Posts and Telecommunications, 17*(1), 10.

Iturri, P. L., Nazabal, J. A., Azpilicueta, L., Rodriguez, P., Beruete, M., Fernandez-Valdivielso, C., et al. (2012). Impact of High Power Interference Sources in Planning and Deployment of Wireless Sensor Networks and Devices in the 2.4 GHz Frequency Band in Heterogeneous Environments. *Sensors, 12*(11), 20.

Kennelly, R. J. (1998). The IEEE 1073 Standard for Medical Device Communications. *AUTOTESTCON '98. IEEE Systems Readiness Technology Conference., 1998 IEEE*, 2.

Kumar, S., Kambhatla, K., Hu, F., Lifson, M., & Xiao, Y. (2008). Ubiquitous computing for remote cardiac patient monitoring: a survey. *International Journal of Telemedicine and Applications, 2008*, 19.

Laourine, A., & Tong, L. (2009). Betting on Gilbert-Elliot Channels [Electronic Version], 34. Retrieved July 30, 2012 from http://acsp.ece.cornell.edu/papers/ACSP-TR-01-09-14.pdf.

Latre, B., Braem, B., Moerman, I., Blondia, C., & Demeester, P. (2011). A Survey on Wireless Body Area Networks. *Wireless Networks, 17*(1), 18.

Lim, J. H., Zhan, A., Goldschmidt, E., Ko, J., Chang, M., & Terzis, A. (2012, November 6-9). *HealthOS: A Platform for Pervasive Health Applications.* Paper presented at the mHealthSys '12: Proceedings of the Second ACM Workshop on Mobile Systems, Applications, and Services for HealthCare, Toronto.

Lin, C.-T., Chang, K.-C., Lin, C.-L., Chiang, C.-C., Lu, S.-W., Chang, S.-S., et al. (2010). An intelligent telecardiology system using a wearable and wireless ECG to detect atrial fibrillation. *IEEE Transactions on Information Technology in Biomedicine - Special section on new and emerging technologies in bioinformatics and bioengineering, 14*(3), 8.

Mazzenga, F., Cassioli, D., Detti, A., Habib, I., Loreti, P., & Vatalaro, F. (2004). Performance Evaluation in Bluetooth Dense Piconet Areas. *Wireless Communications, IEEE Transactions on, 3*(6), 12.

Mazzenga, F., Cassioli, D., Loreti, P., & Vatalaro, F. (2002). Evaluation of Packet Loss Probability in Bluetooth Networks. *Communications, 2002. ICC 2002. IEEE International Conference on, 1*, 5.

McNally, B., Robb, R., Mehta, M., Vellano, K., Valderrama, A. L., Yoon, P. W., et al. (2011). Out-of-Hospital Cardiac Arrest Surveillance --- Cardiac Arrest Registry to Enhance Survival (CARES), United States, October 1, 2005--December 31, 2010. Retrieved July 30, 2012, from http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6008a1.htm

Naik, K., Wei, D. S. L., Su, Y. T., & Shiratori, N. (2005). Analysis of Packet Interference and Aggregated Throughput in a Cluster of Bluetooth Piconets Under Different Traffic Conditions. *Selected Areas in Communications, IEEE Journal on, 23*(6), 14.

Nassar, M., Lin, X. E., & Evans, B. L. (2011, 2011). *Stochastic Modeling of Microwave Oven Interference in WLANs.* Paper presented at the Communications (ICC), 2011 IEEE International Conference on

Park, C., Chou, P. H., Bai, Y., Matthews, R., & Hibbs, A. (n.d.). An Ultra-Wearable, Wireless, Low Power ECG Monitoring System. Retrieved October 5, 2009, from http://www.ece.uci.edu/~chou/biocas06-ECG.pdf

Proulx, J., Clifford, R., Sorensen, S., Lee, D.-J., & Archibald, J. (2006). Development and Evaluation of a Bluetooth EKG Monitoring Sensor. *Computer-Based Medical Systems, 2006. CBMS 2006. 19th IEEE International Symposium on*, 5.

Rashid, R. A., & Yusoff, R. (2006). Bluetooth Performance Analysis in Personal Area Network (PAN). *RF and Microwave Conference, 2006. RFM 2006. International*, 5.

Rodriguez-Sanchez, M. C., Torrado-Carvajal, A., Borromeo, S., Hernandez-Tamames, J. A., & Luaces, M. (2012). ECG Remote-Monitoring System for iOS Device. *IEEE Pervasive Computing Mobile and Ubiquitous Systems, 11*(1), 2.

Rondeau, T. W., D’Souza, M. F., & Sweeney, D. G. (2004). Residential Microwave Oven Interference on Bluetooth Data Performance. *Consumer Electronics, IEEE Transactions on, 50*(3), 8.

Sarkar, S., Anjum, F., & Guha, R. (2005). Optimal Communication in Bluetooth Piconets. *Vehicular Technology, IEEE Transactions on, 54*(2), 13.

Scatternet - Part 1: Baseband vs. Host Stack Implementation. (2004). Retrieved October 31, 2009, from http://www.bluetooth.com/NR/rdonlyres/090D96C0-5396-45F7-BDFD-2B7C70AF5E59/0/Scatternet_Part_1_Baseband_vs_Host_Stack_Implementation.pdf

Shih, E., Bychkovsky, V., Curtis, D., & Guttag, J. (2004). Continuous Medical Monitoring Using Wireless Microsensors. *Proceedings of the 2nd International Conference on Embedded Networked Sensor Systems (ACM)*, 1.

Sikora, A., & Groza, V. F. (2005). *Coexistence of IEEE 802.15.4 with other Systems in the 2.4 GHz-ISM-Band.* Paper presented at the IMTC 2005 - Instrumentation and Measurement Technology Conference, Ottawa, Canada.

Simon, M. K., & Goes, J. (2010). *Dissertation and Scholarly Research: Recipes for Success* (Second ed.). Dubuque, IA: Kendall Hunt.

Spill, D. (2013). Trouble Following Piconet (Ubertooth-general Digest, Vol 26, Issue 2 ed.).

Taher, T. M., Misurac, M. J., LoCicero, J. L., & Ucci, D. R. (2008, March 31-April 3). *Microwave Oven Signal Modeling.* Paper presented at the WCNC 2008 IEEE Wireless Communications and Networking Conference, Las Vegas, NV.

Yao, J., Schmitz, R., & Warren, S. (2005). A Wearable Point-of-Care System for Home Use that Incorporates Plug-and-Play and Wireless Standards. *Information Technology in Biomedicine, IEEE Transactions on, 9*(3), 9.

Yaqub, M. F., Gondal, I., & Kamruzzaman, J. (2010). Coexistence Mechanism for Industrial Automation Network. *12th IEEE International Conference on High Performance Computing and Communication*, 376-382.

Yoo, H.-J. (2013). Your Heart on Your Sleeve: Advances in Textile-Based Electronics are Weaving Computers Right into the Clothes We Wear. *IEEE Solid-State Circuits Magazine, 5*(1), 12.

Yu, B., & Xu, L. (2012, June 2012). *Bluetooth Low Energy (BLE) Based Mobile Electrocardiogram Monitoring System.* Paper presented at the IEEE International Conference on Information and Automation, Shenyang, China.

Zakas, N. C. (2013). The Evolution of Web Development for Mobile Devices. *Communications of the ACM, 56*(4), 7.

Zhang, M., Raghunathan, A., & Jha, N. K. (2013, May 29-June 7, 2013). *Towards Trustworthy Medical Devices and Body Area Networks.* Paper presented at the DAC '13: Proceedings of the 50th Annual Design Automation Conference, Austin, TX.

Zhang, Y., & Xiao, H. (2011). Bluetooth-Based Sensor Networks for Remotely Monitoring the Physiological Signals of a Patient. *IEEE Transactions on Information Technology in Biomedicine, 13*(6), 9.

APPENDIX A: EXPLANATION OF ANOVA TEST

The Analysis of Variance (ANOVA) statistical test analyzes the relationship between the sample means and their associated variances. This analysis is done by comparing the variance of all of the data observations to the variance between the groups. In this study, the groups are the BLE channels. The two sources of variation are “Between Groups” and “Within Groups.” The “Between Groups” row uses all of the observations as one sample. The “Within Groups” row considers each group as a different sample. The “Total” row is the sum of the previous two rows.

The columns “SS”, “df”, and “MS” are intermediate steps in calculating the variance. The “SS” column is the sum of the squares of the differences between the observation and the sample mean. The “df” column is the degrees of freedom. The degrees of freedom is a measure of independence of the parameters. In an ANOVA statistical test, the degrees of freedom are set as the number of observations less the number of samples.

The “F” column is the calculated *F*-test statistic value using the F-distribution. This calculated *F*-value is the ratio of the two “MS” values. The “P-value” is the observed level of significance. The “F crit” is the critical value calculated by the *F*-test statistic for a set level of significance. In this study, the level of significance was set at 0.05.

The null hypothesis of an ANOVA statistical test is that all of the group means are equal. The alternate hypothesis is that not all of the group means are equal, or at least one group mean is different than the other group means. The observed level of significance, or p-value, is used to determine whether the null hypothesis is rejected. The p-value is compared to the level of significance, or α. If the p-value is less than α, the null hypothesis is rejected and the ANOVA test suggests at least one group mean is different from the others. If the p-value is not less than α, the ANOVA test fails to reject the null hypothesis, and it suggests the group means are all equal.

The Calculations Behind ANOVA

Table A-1 Packet success at three power levels

An example of the ANOVA test follows. In this example, 21 observations of percentage of packet success were collected for three different interference power levels. This fabricated data is presented in Table A-1.

% Packet Success

Power 0	Power 1	Power 2
97	88	76
100	89	69
91	87	77
92	78	70
95	91	73
99	88	71
91	81	75

Step 1: Calculate the arithmetic mean for each column

The arithmetic mean for each power level is calculated as

$$\bar{x} = \frac{\sum_{i=0}^{n} x_i}{n} \tag{24}$$

The arithmetic mean for Power 0 is 96.0, for Power 1 is 86.0, and for Power 2 is 73.0.

$$\bar{x}_0 = \frac{\sum_{i=0}^{n} x_i}{n} = \frac{97+100+93+94+96+99+93}{7} = \frac{672}{7} = 96.0 \tag{25}$$

$$\bar{x}_1 = \frac{\sum_{i=0}^{n} x_i}{n} = \frac{88+89+87+78+91+88+81}{7} = \frac{602}{7} = 86.0 \tag{26}$$

$$\bar{x}_3 = \frac{\sum_{i=0}^{n} x_i}{n} = \frac{77+68+75+70+73+72+76}{7} = \frac{511}{7} = 73.0 \tag{27}$$

Step 2: Calculate the overall arithmetic mean for all of the observations ($\bar{\bar{x}}$)

The mean is the calculated as

$$\bar{\bar{x}} = \frac{\sum_{j=0}^{k} \sum_{i=0}^{n} x_{ij}}{nk} = \frac{sum\ of\ all\ observations}{total\ number\ of\ observations} = \frac{1785}{21} = 85.0 \tag{28}$$

Step 3: Calculate the correction for the mean (CM)

The correction for the mean (CM) is the mean square of the observations. It is calculated as

$$CM = \frac{\left(\sum_{j=0}^{k} \sum_{i=0}^{n} x_{ij}\right)^2}{nk} = \frac{(sum\ of\ all\ observations)^2}{total\ number\ of\ observations} = \frac{(1785)^2}{21} = 151725 \tag{29}$$

Step 4: Calculate the treatment sum of squares (SST)

The treatment sum of squares (SST) is the sum of the squares between groups. The first step is to find the sum of each group.

$$T_1 = 97 + 100 + 93 + 94 + 96 + 99 + 93 = 672 \tag{30}$$

$$T_2 = 88 + 89 + 87 + 78 + 91 + 88 + 81 = 602 \tag{31}$$

$$T_3 = 77 + 68 + 75 + 70 + 73 + 72 + 76 = 511 \tag{32}$$

Then, compute SST as the sum of the means of each group minus CM, as shown in equation 33.

$$SST = \sum_{j=0}^{k} \frac{T_j^2}{n_j} - CM = \frac{(672)^2}{7} + \frac{(602)^2}{7} + \frac{(511)^2}{7} - 151725 = 153587 - 151725 = 1862 \tag{33}$$

Step 5: Calculate the errors sum of squares (SSE)

The error sum of squares (SSE) assumes each column is its own sample. The general equation is

$$SSE = \sum_{j=0}^{k} \left(\sum_{i=0}^{n} (x_{ij} - \bar{x})^2 \right) = 48 + 132 + 64 = 244 \tag{34}$$

Calculating SSE using a table helps keep track of the calculations. As seen in Table A-2, the SSE for this example is 244.

Table A-2: Calculating SSE

j	i	x_{ji}	$\bar{x}_j$	$x_{ji} - \bar{x}_j$	$(x_{ji} - \bar{x}_j)^2$	$\sum_{i=0}^{n}(x_{ji} - \bar{x}_j)^2$
1	1	97	96	1	1	
1	2	100	96	4	16	
1	3	93	96	-3	9	
1	4	94	96	-2	4	
1	5	96	96	0	0	
1	6	99	96	3	9	
1	7	93	96	-3	9	48
2	1	88	86	2	4	
2	2	89	86	3	9	
2	3	87	86	1	1	
2	4	78	86	-8	64	
2	5	91	86	5	25	
2	6	88	86	2	4	
2	7	81	86	-5	25	132
3	1	77	73	4	16	
3	2	68	73	-5	25	
3	3	75	73	2	4	
3	4	70	73	-3	9	
3	5	73	73	0	0	
3	6	72	73	-1	1	
3	7	76	73	3	9	64
				Total	244	244

Step 6: Calculate the Total SS

The total sum of the squares (Total SS) is the sum of the squares of the deviations between the observation and the overall arithmetic mean.

$$Total\ SS = \sum_{j=0}^{k} \sum_{i=0}^{n} \left(x_{ij} - \bar{x}\right)^2 = \frac{1785}{21} = 85.0 \tag{35}$$

Table A-2 shows all of the steps needed to calculate Total SS for this example. The observations are listed in the first column. The overall arithmetic mean for all of the observations is in the second column. The third column is the difference between the observation and the mean. The last column is the square of the difference. The squares of the differences are summed to give Total SS.

Table A-3: Calculating Total SS

x_i	$\bar{x}$	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
97	85	12	144
100	85	15	225
93	85	8	64
94	85	9	81
96	85	11	121
99	85	14	196
93	85	8	64
88	85	3	9
89	85	4	16
87	85	2	4
78	85	-7	49
91	85	6	36
88	85	3	9
81	85	-4	16
77	85	-8	64
68	85	-17	289
75	85	-10	100
70	85	-15	225
73	85	-12	144
72	85	-13	169
76	85	-9	81
		Total	2106

Step 7: Verify SST, SSE, and Total SS

The calculated values of SST, SSE, and Total SS can be verified. The sum of SST and SSE should equal Total SS as seen in Equation 34.

$$SST + SSE = 1862 + 244 = 2106 = Total\ SS \tag{36}$$

Step 8: Calculate the degrees of freedom for the treatments and the errors

The calculation of the degrees of freedom for the treatments is the number of groups minus one. As seen in Equation 35, the calculated degrees of freedom for the treatments is 2.

$$df_{Treatments} = number\ of\ groups - 1 = 3 - 1 = 2 \tag{37}$$

The calculation for the degrees of freedom for the errors is the total number of observations minus the number of groups. As seen in Equation 36, the calculated degrees of freedom for the errors is 18.

$$df_{Errors} = total\ number\ of\ observations - num.\ of\ groups = 21 - 3 = 18 \tag{38}$$

Step 9: Calculate MST and MSE

The mean square of the treatments (MST) and mean square of the errors (MSE) are the sum of the squares divided by their related degrees of freedom. The mean squares are a calculation of variance.

$$MST = \frac{SST}{df_{Treatments}} = \frac{1862}{2} = 931 \tag{39}$$

$$MSE = \frac{SSE}{df_{Errors}} = \frac{244}{18} = 13.5556 \tag{40}$$

Step 10: Calculate the F-test statistic

The *F*-test statistic is the ratio between the MST and the MSE. The F-statistic is a measure of the two different methods of calculating the variability of the data. If the two methods produce similar values for the variability, the *F*-test statistic will be close to 1. In this example, the *F*-test statistic is 68.6803.

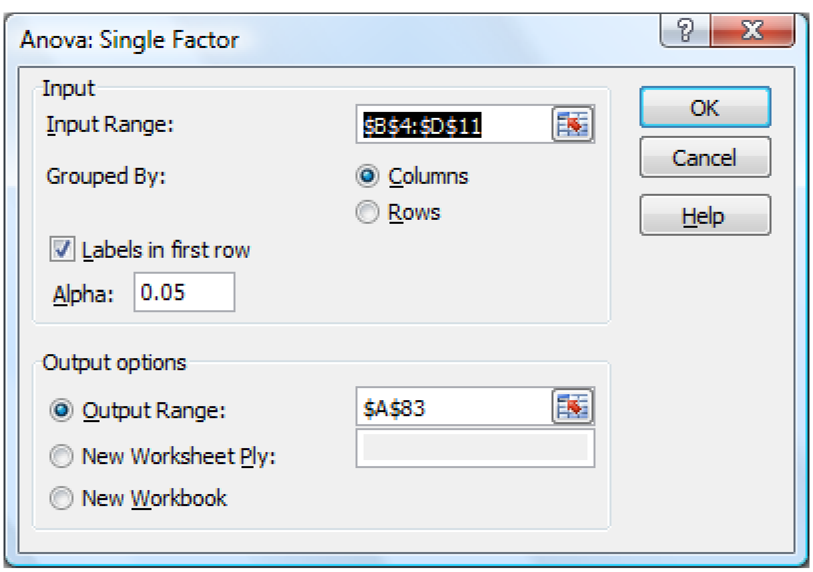
Step 11: Obtaining the p-value and critical F-value

The critical *F*-value can be obtained from a computer, calculator, or *F*-distribution table. The critical value is based on the level of significance and two degrees of freedom values. Similarly, the p-value is the observed level of significance for the calculated *F*-test statistic.

Calculating ANOVA in Microsoft Excel

The tool to calculate ANOVA in Microsoft Excel is included in the data analysis tools. The input is the input range of contiguous cells containing the groups of data, a level of significance value also known as Alpha, and an output location. As seen in Figure A-1, in this example, the data groups were located in cells B4:D11, a 5 percent level of significance was desired, and the upper left corner of the output table was cell A83. The level of significance is used by Excel in determining the critical *F*-value.

Figure A-1. ANOVA in Microsoft Excel



The output table includes the results of all of the above calculations. In the output table, as seen in Table A-4, the treatments are in the Between Groups row and the errors are in the Within Groups row.

Table A-4: Microsoft Excel's ANOVA output table

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Power 0	7	672	96	8
Power 1	7	602	86	22
Power 2	7	511	73	10.6667

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1862	2	931	68.6803	3.76169E-09	3.55456
Within Groups	244	18	13.55556			
Total	2106	20				

In this example, the there is sufficient evidence to reject the null hypothesis that all of the group means are equal. The evidence is in the comparison between the *F*-test statistic and the critical *F*-value and in the comparison of the observed level of significance and the level of significance. Alpha, or α, was set at 0.05 or 5 percent. The calculated *F*-test statistic (F) is greater than the critical *F*-value (F crit). The F crit represents the point at the 5 percent level of significance. The p-value is the observed level of significance of the *F*-test statistic. The p-value is less than α. In this example, the p-value is very small and the calculated *F*-test statistic is much greater than the critical *F*-value indicating there is strong evidence that the group means are not equal.

APPENDIX B: INTERFERENCE SIGNAL STRENGTH DATA

The spectrum analyzer data captured by the Ubertooth One device was written to data files for each trial. The data captured was the signal strength at each of the ISM band's frequencies. Each of these data files captured approximately 432,000 records in the 180 second trial. There were 30 trials at each distance and power setting.

The captured data was processed to put it in a form usable by this study. First, the spectrum analyzer coded the signal strength as an integer between 200 and 300. For graphing and ease of understanding purposes, the RSSI values were adjusted by subtracting 200 leaving integer values between 0 and 100. The ISM frequencies were then grouped to match the BLE channels.

The following 30 tables are the mean values of the signal strength of the interference from the microwave ovens for each of the 30 trials at each distance and power level. There are 10 tables for each power level with one table for each distance the BLE piconet was from the microwave oven.

Table B-1 Mean interference signal strength; Power Off; Distance 0.5 meter

P0	Ovens				
D05	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.51610170	11.50560269	11.48311577	11.47872889	11.47300354
1	11.50491170	11.46487012	11.41052141	11.49805918	11.56295185
2	11.62130856	11.61657209	11.59276444	11.55337519	11.53082042
3	11.68827493	11.63844879	11.56350501	11.58512507	11.66090229
4	11.66308895	11.67581462	11.71980841	11.80214965	11.70323445
5	11.80141727	11.74655420	11.87317427	11.91700601	11.87960244
6	12.23920549	12.22841329	12.24113957	12.34125367	12.39839180
7	12.14243161	12.08327369	12.12862029	12.20214949	12.20813937
8	11.72800350	11.82298381	11.84808881	11.73098946	11.69087611
9	11.75448093	11.80907354	11.75768399	11.81069131	11.83643120
10	11.71513301	11.71370507	11.75510208	11.72586405	11.74483131
11	11.64653598	11.63397712	11.67182349	11.65804560	11.75616729
12	11.63891123	11.71891446	11.79250123	11.83094183	11.86608082
13	11.90437086	11.96524905	11.99863243	11.98128751	12.00607004
14	11.74588536	11.83331799	11.82335262	11.78555303	11.79765352
15	11.89399520	11.96767497	11.99969217	11.98137943	11.90743310
16	11.67949754	11.66604248	11.63891069	11.62349535	11.65591981
17	11.77623260	11.81013032	11.81228027	11.79423799	11.91593686
18	11.70297944	11.72139190	11.69283465	11.76136594	11.73494153
19	11.84631313	11.88448854	11.82941408	11.82766896	11.80279131
20	11.95550486	11.93758057	11.91198360	11.89367702	11.97115699
21	11.87764814	11.86558648	11.81647335	11.92788770	11.93525942
22	11.83795554	11.87078013	11.85273839	11.89938438	11.82783778
23	11.60485910	11.65862943	11.63993190	11.60681872	11.62723529
24	11.68471805	11.72730352	11.70842708	11.72317242	11.71796841
25	11.71380319	11.70998737	11.73032409	11.65298751	11.69998397
26	11.69057111	11.69612354	11.54888536	11.59239754	11.64331778
27	11.62784656	11.72456369	11.73398095	11.80895913	11.80148158
28	11.49728860	11.46754949	11.43193061	11.45036117	11.39325073
29	11.68609896	11.75926971	11.71489625	11.69430403	11.67922139
30	11.42683702	11.42649910	11.32200262	11.32629013	11.36384843
31	11.68238833	11.64297100	11.58914545	11.46774739	11.47054849
32	11.40303441	11.33305298	11.26739139	11.25139231	11.27926112
33	11.46771474	11.45148905	11.51187240	11.49886529	11.41635598
34	11.55858743	11.52968656	11.60528421	11.58812334	11.59145085
35	11.38001647	11.40265622	11.33260850	11.27911561	11.28456734
36	11.36375065	11.39899808	11.43420411	11.34951179	11.32758382
37	11.41525219	11.35693959	11.27341578	11.30309997	11.33932559
38	11.44301814	11.49749091	11.51129150	11.53893018	11.56528061
39	12.11009338	12.08701165	12.09815875	12.07960268	12.11023576

Table B-2 Mean interference signal strength; Power Off; Distance 1.0 meter

P0	Ovens				
D10	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.47671465	11.42508232	11.40032154	11.38592730	11.38327393
1	11.53083469	11.53917914	11.55282521	11.59396960	11.60931793
2	11.50711224	11.54384495	11.50114349	11.51978091	11.52716351
3	11.51379252	11.52750702	11.55891870	11.59604015	11.58372752
4	11.70962507	11.72891354	11.69887815	11.68807332	11.68223531
5	11.83214679	11.79341639	11.84755301	11.91398056	11.90123649
6	12.14223008	12.12064906	12.16850226	12.24289778	12.21119798
7	12.05353725	12.08177885	12.16545112	12.18734879	12.16876667
8	11.71914407	11.73163429	11.64086808	11.70266393	11.74561398
9	11.69860919	11.72675105	11.73087245	11.72995181	11.71525385
10	11.81618496	11.91484682	11.89992569	11.88078819	11.87970130
11	11.56547179	11.53668158	11.55088884	11.51401756	11.52648186
12	11.75940485	11.86230173	11.92440291	11.92015015	11.94270193
13	11.83412185	11.82948840	11.85141713	11.87122595	11.76761215
14	11.81548808	11.74265058	11.80272141	11.78390811	11.71138556
15	11.71049238	11.66218547	11.61325847	11.58968479	11.57493495
16	11.82493363	11.93546237	11.88908646	11.98206934	11.92753990
17	11.84637266	11.82107445	11.76904237	11.72810113	11.74817705
18	11.62331898	11.69956913	11.70478504	11.76787491	11.74196555
19	11.74786725	11.82672118	11.81713771	11.80696421	11.83140179
20	11.85362209	11.85449988	11.84192618	11.78940896	11.74319409
21	11.80897759	11.87756827	11.93064577	11.84759278	11.82045241
22	11.76438667	11.85412464	11.88039744	11.92993939	11.90025046
23	11.77090666	11.74728591	11.66823102	11.65986068	11.69252720
24	11.91661475	12.03624779	12.07134858	12.12743765	12.12151722
25	11.72624672	11.71540156	11.63444168	11.62291754	11.64531625
26	11.61227620	11.61952551	11.61747608	11.67051286	11.71043575
27	11.56929463	11.62441396	11.56163591	11.57262409	11.55400520
28	11.51114517	11.53639449	11.44550255	11.53548085	11.55078904
29	11.76209394	11.72495329	11.82811729	11.87786237	11.86257666
30	11.37904565	11.26885811	11.29021822	11.27461055	11.29757894
31	11.44320062	11.39825432	11.48207602	11.51619089	11.52448287
32	11.35810889	11.31811874	11.38681982	11.31245676	11.33876779
33	11.48645871	11.55957662	11.62142528	11.66165572	11.58407396
34	11.34523382	11.32201057	11.33729585	11.30149601	11.35822984
35	11.47775804	11.53606539	11.48967813	11.49170165	11.47356287
36	11.28206725	11.20723227	11.15274783	11.13652930	11.14132501
37	11.31896935	11.28302936	11.22042331	11.30990128	11.30739853
38	11.59931994	11.58051308	11.59415544	11.57039749	11.55587314
39	12.10804077	12.12799827	12.16719779	12.16359502	12.09026575

Table B-3 Mean interference signal strength; Power Off; Distance 1.5 meters

P0	Ovens				
D15	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.66801381	11.67590042	11.73946425	11.72543057	11.69418071
1	11.70325976	11.70592497	11.67254102	11.69483924	11.66601376
2	11.84078709	11.92732044	11.93832134	11.91252930	11.94268650
3	11.63287866	11.64956105	11.54192551	11.51858164	11.51234824
4	11.81675827	11.89147445	11.90904765	11.93915807	11.93759117
5	11.74207058	11.73534116	11.66450520	11.58582213	11.51931391
6	12.16363498	12.15353038	12.23260152	12.24941740	12.20759836
7	11.67380105	11.73710123	11.72130116	11.71932989	11.66014839
8	11.81365049	11.73861674	11.74201552	11.76262537	11.78557640
9	11.75244815	11.71892059	11.63124556	11.72336052	11.76961708
10	11.82907791	11.77190026	11.85533280	11.78544674	11.81198309
11	11.80529036	11.78823641	11.81339618	11.84747533	11.84043535
12	11.61368422	11.57489844	11.69428729	11.67465677	11.74787231
13	12.26978761	12.25558446	12.21731261	12.27422522	12.30349450
14	11.74823076	11.69154283	11.64980661	11.69517300	11.74135395
15	11.79014929	11.76656331	11.74923740	11.66162556	11.63417989
16	11.61833417	11.58289728	11.67835550	11.78472229	11.83514281
17	11.93082485	11.87843822	11.94537810	11.92317384	11.92888630
18	11.69764527	11.72997532	11.74323109	11.69142707	11.79948858
19	11.79727259	11.81620171	11.88148320	11.83219983	11.87411340
20	11.56200637	11.65066606	11.56354412	11.62085902	11.57508618
21	12.25795359	12.35994272	12.29017324	12.26378314	12.32895445
22	11.56479751	11.48362874	11.43443843	11.51907672	11.51633439
23	11.91209687	11.95793568	11.92984182	12.00830760	11.90982916
24	11.57698476	11.52879107	11.54361359	11.59874037	11.59291428
25	11.94344295	11.87503367	11.97332355	11.93355092	11.84481979
26	11.59348544	11.54384304	11.52761150	11.52611100	11.58540606
27	11.66764655	11.68982001	11.64362604	11.69420355	11.69973635
28	11.70342823	11.73875924	11.80659964	11.88000748	11.86291605
29	12.43628535	12.44422234	12.51075395	12.48232380	12.53550206
30	11.63959475	11.72385462	11.79221547	11.73616286	11.75209646
31	11.71101920	11.72017926	11.79871648	11.77069268	11.69840892
32	11.63731430	11.69428140	11.71762395	11.74908417	11.76152777
33	11.79673065	11.73465324	11.74484842	11.74213195	11.70651721
34	11.51036389	11.43869752	11.36067931	11.30287980	11.32719326
35	11.58830428	11.62232886	11.66341630	11.66589215	11.73701889
36	11.64913493	11.70800532	11.70395390	11.74037142	11.66070384
37	11.68955860	11.77621312	11.67823074	11.67061789	11.69704972
38	11.69743419	11.75778763	11.83894741	11.83834393	11.89277861
39	12.18685358	12.24510877	12.24990235	12.24577321	12.29225803

Table B-4 Mean interference signal strength; Power Off; Distance 2.0 meters

P0	Ovens				
D20	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.90767258	11.87989190	11.92771291	12.02005727	11.97954008
1	11.85695757	11.87169955	11.80021768	11.75653272	11.81788443
2	12.28860716	12.32584290	12.38523564	12.45017654	12.51575826
3	12.00395003	12.11964182	12.20844232	12.18967915	12.12294893
4	11.91545372	11.95956430	11.98194389	11.94175644	11.98725526
5	11.89825305	11.89681483	11.97051648	12.06186330	12.00934155
6	12.62615552	12.64845245	12.71766335	12.75267512	12.84026094
7	11.96363633	11.91097504	11.89216477	11.82358740	11.72540810
8	12.04891517	12.05887425	12.08299735	12.11435423	12.10009712
9	12.06580379	12.09456973	12.12124770	12.11872445	12.06069508
10	12.43059199	12.45234708	12.48516220	12.50927535	12.46632883
11	11.98719505	11.97675543	11.98877257	12.04680479	12.00405141
12	11.93858905	11.96198090	11.95348968	11.91885286	11.90798153
13	13.48377220	13.49907469	13.49235968	13.51265142	13.50991545
14	12.00165795	11.96067379	11.89891999	11.94550091	12.07595374
15	12.23505550	12.33959215	12.24381047	12.21974071	12.20370773
16	12.06502014	12.00857635	12.00505625	11.96803347	11.98253534
17	12.48880103	12.50253794	12.50870990	12.54349645	12.53667637
18	11.99218786	12.01520265	11.95012920	12.04147076	11.98429338
19	12.13924314	12.13798775	12.10438192	12.03985394	12.07637641
20	12.09680095	12.19433608	12.23201732	12.17849744	12.20910117
21	13.53349542	13.51176487	13.53323288	13.44812738	13.44161260
22	11.94218475	11.88023801	11.95292194	11.92762280	11.88795615
23	12.07529440	12.04028755	12.07714092	12.12761093	12.08513789
24	11.94206806	11.95685417	11.88548994	11.96603665	11.92964181
25	12.75460187	12.70578876	12.71471873	12.76750992	12.80478796
26	12.02958234	11.97000011	11.94097443	11.97883528	11.99334141
27	12.09844550	12.08137308	12.09831622	12.18733826	12.18869980
28	11.92100011	11.93294820	11.98530631	11.91868108	11.87996684
29	13.81018738	13.84222242	13.92253484	13.87861905	13.87502557
30	11.78898319	11.80730453	11.89853275	11.84277664	11.77537555
31	12.02858393	11.95717338	11.99376361	11.95922214	11.89687454
32	11.73677913	11.78311162	11.78927024	11.84191645	11.92714250
33	12.38968482	12.48898720	12.50806257	12.43528141	12.41059378
34	11.86340352	11.82903387	11.85748960	11.77700698	11.84421552
35	11.99447614	11.97357837	11.97695701	12.06839919	12.17214217
36	11.78272336	11.80587173	11.84521022	11.87138062	11.87188238
37	11.84503189	11.81899962	11.83273499	11.79977414	11.80070508
38	11.96403047	11.92184623	11.90042614	11.84363421	11.81282032
39	12.21634192	12.23698385	12.29452859	12.23102359	12.27256779

Table B-5 Mean interference signal strength; Power Off; Distance 2.5 meters

P0	Ovens				
D25	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.73741449	11.70249601	11.67752224	11.71297378	11.71922900
1	11.57191558	11.63549924	11.56806784	11.52090576	11.48388982
2	11.82964915	11.82678818	11.89030378	11.91816997	11.97888492
3	11.69413127	11.59136904	11.55071395	11.56057764	11.58347473
4	11.84507842	11.85660128	11.78542316	11.84127079	11.78480445
5	11.77988758	11.73358463	11.73370808	11.70199501	11.68987692
6	12.31064458	12.35059844	12.36640467	12.32288671	12.30722693
7	12.15211090	12.16325254	12.21320935	12.19195765	12.24098612
8	11.74424366	11.71852234	11.82381564	11.82498915	11.89109004
9	11.86737513	11.86479010	11.97611053	11.99561475	11.90386543
10	12.00931408	12.09091361	12.08042515	12.09745152	12.12216267
11	11.77786960	11.70880883	11.66231135	11.69558232	11.74593127
12	11.75284775	11.70423325	11.68512727	11.63842521	11.57946194
13	12.52405091	12.57663588	12.63903455	12.71888308	12.77311595
14	11.80487490	11.79350299	11.83628977	11.79131364	11.86803636
15	12.08160224	12.01562238	11.99710117	11.92075661	11.92236985
16	11.87330670	11.94725361	11.88224757	11.85992544	11.80887951
17	11.98181476	11.97854144	11.92813510	11.90625388	11.85310296
18	11.82603085	11.80968178	11.82187268	11.83892719	11.78248358
19	11.86712683	11.92844114	11.98492591	12.00040030	12.07118201
20	11.82831658	11.83050301	11.81445375	11.84247027	11.87971626
21	12.40292446	12.43826783	12.40075968	12.46541804	12.48563684
22	11.67046650	11.76456207	11.77056060	11.70154937	11.73391386
23	11.74535493	11.69528160	11.70293292	11.75510372	11.78849933
24	11.88619002	11.83711335	11.94001070	11.99322193	11.98527995
25	11.96520008	11.89769650	11.85916833	11.88682084	11.97862702
26	11.76121785	11.75421554	11.81705144	11.79563844	11.77046031
27	11.83493460	11.85327609	11.77986328	11.75308847	11.74808404
28	11.81868264	11.78787539	11.79845082	11.80903084	11.70758713
29	12.60450634	12.66741752	12.73201952	12.74380206	12.68362396
30	11.52421406	11.55631597	11.53339163	11.47022591	11.44706580
31	11.62870807	11.55706261	11.56167869	11.57163471	11.52273456
32	11.63826524	11.66858251	11.72528449	11.65842720	11.58478441
33	11.83257699	11.84527364	11.85813186	11.95186212	11.93871543
34	11.45768729	11.51997941	11.55350209	11.55504453	11.55733353
35	11.51531916	11.48619067	11.42317091	11.42133658	11.41503419
36	11.62970424	11.63341507	11.58447111	11.66119220	11.62159582
37	11.44845442	11.47919677	11.52148916	11.54950810	11.49164209
38	11.61712574	11.56356658	11.55540130	11.52887931	11.52142852
39	12.16124771	12.13782593	12.12391538	12.07003052	12.00614649

Table B-6 Mean interference signal strength; Power Off; Distance 3.0 meters

P0	Ovens				
D30	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.60831763	11.55099489	11.52400734	11.53203693	11.54219244
1	11.64590350	11.60621742	11.57285266	11.57287245	11.61016337
2	11.76251036	11.72450085	11.67516397	11.62860480	11.60810336
3	11.80549644	11.87489145	11.86486284	11.82716894	11.77775441
4	11.84323008	11.79485780	11.85195374	11.83398980	11.69606143
5	11.91834310	11.93811174	11.87225702	11.92095950	11.96820139
6	12.32494737	12.31254059	12.35860154	12.34271094	12.32285209
7	11.93653733	11.88168693	11.89724115	11.93032823	11.96765264
8	11.69820103	11.69575736	11.69462168	11.78321675	11.76979941
9	11.90177019	11.81492745	11.77573837	11.80776027	11.91600604
10	12.02531062	12.00590037	12.03817459	11.98211225	11.95239511
11	11.92736371	11.84743910	11.87863250	11.90724098	11.88478565
12	11.70828258	11.70615070	11.73663003	11.81037632	11.85940289
13	12.55535338	12.55640853	12.56209698	12.59180785	12.53650321
14	11.99231870	12.00216196	11.90046714	11.92830401	11.96168570
15	11.95855845	11.95332854	12.02527500	12.01579451	12.00181769
16	11.87975978	11.84781601	11.81616765	11.74291574	11.71712197
17	12.14114137	12.15486795	12.21321561	12.21099780	12.24005574
18	11.90514056	11.87560926	11.98161537	12.00821362	12.05077499
19	11.87737428	11.85987036	11.87878660	11.87956794	12.01781023
20	11.88138405	11.93947092	11.88171281	11.86528263	11.85018870
21	12.60195700	12.57573105	12.61540922	12.64478187	12.65193766
22	11.80265030	11.87208236	11.90572270	11.83382939	11.74921700
23	11.94335693	11.91661033	11.90730616	11.92551367	11.89106244
24	11.70712393	11.67031624	11.75424412	11.76024759	11.70526767
25	12.10979922	12.08112587	12.06366991	12.10715560	12.09619989
26	11.68239532	11.68826844	11.74296148	11.70303595	11.71411897
27	11.78440855	11.77799044	11.75338021	11.68737966	11.62179955
28	11.70616848	11.72053964	11.75406623	11.76421374	11.72761172
29	12.69496500	12.70864894	12.80099129	12.85450302	12.87163264
30	11.58930081	11.57532403	11.60132390	11.57460713	11.62645857
31	11.68802701	11.72233252	11.73158010	11.76034353	11.68444705
32	11.55827644	11.59656071	11.67371916	11.67201724	11.64520602
33	11.71035197	11.70719463	11.71322343	11.66308401	11.70052321
34	11.51876571	11.48535407	11.43334358	11.47371350	11.49286829
35	11.73235848	11.77163653	11.82080666	11.84360139	11.83748287
36	11.43186130	11.41044171	11.44573071	11.47996189	11.49704805
37	11.58184039	11.62809820	11.51491496	11.46350470	11.40456135
38	11.65886050	11.69595178	11.65839473	11.72854258	11.72803783
39	12.13874846	12.09727995	11.97169209	11.96608608	11.94800331

Table B-7 Mean interference signal strength; Power Off; Distance 3.5 meters

P0	Ovens				
D35	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.80985260	11.79821703	11.74673433	11.60979339	11.55661723
1	11.71632386	11.62564807	11.58232187	11.47567362	11.41416268
2	11.77300722	11.78858424	11.80703718	11.85035235	11.93821773
3	11.88924012	11.98558762	12.07679178	11.98723417	11.89597405
4	11.78720165	11.84563282	11.84335196	11.80793529	11.84815066
5	11.78125311	11.84358952	11.88901971	11.94660951	11.92404495
6	12.33897194	12.35508740	12.31219282	12.26800259	12.29968902
7	11.92340862	11.90420646	11.86761055	11.86331575	11.89231574
8	11.90980978	11.91522281	11.96496804	11.85688594	11.83950931
9	12.02070577	11.99639560	11.97191424	11.91687253	11.95199655
10	12.02849852	12.00830188	12.01792011	12.01558341	11.97605631
11	11.91425899	12.02370876	12.04220712	11.98606078	12.00371680
12	11.86405115	11.78607515	11.71288942	11.69366723	11.70428307
13	12.63583233	12.66053577	12.66840863	12.65842348	12.61079454
14	11.97471271	11.92809652	11.90206909	11.90232666	11.86016356
15	11.88190139	11.88344198	11.85522369	11.87993663	11.85594840
16	11.85272511	11.83378390	11.76039274	11.72340891	11.80970165
17	12.22028295	12.23376820	12.24366906	12.24438954	12.21180106
18	11.84129435	11.86254724	11.80105180	11.68783051	11.71128983
19	11.93495781	11.86053666	11.87535508	11.93799181	11.98786471
20	12.00072676	12.03730405	12.10456516	12.19912030	12.14845026
21	12.87977157	12.86576419	12.77998951	12.75022466	12.74721344
22	11.77678541	11.79758879	11.82038215	11.78972229	11.69854397
23	11.89855054	11.90630189	11.88713708	11.81025614	11.86647049
24	11.85441569	11.82243441	11.75659531	11.72583053	11.79063884
25	12.25117997	12.22021752	12.18313452	12.14560761	12.19903556
26	11.70376848	11.71983168	11.71485859	11.76969310	11.75036050
27	11.90897557	11.99545769	11.98613921	12.05398805	12.09343767
28	11.78057476	11.72314206	11.71714701	11.74181551	11.72765168
29	12.93075380	12.94105394	12.92614612	12.90111891	12.85273175
30	11.74928709	11.72603278	11.79731877	11.72548871	11.73033833
31	11.69276575	11.71894441	11.76070761	11.75727852	11.82089442
32	11.59561456	11.56160161	11.49229368	11.57244894	11.63199312
33	12.01703734	11.95549051	11.88644592	11.93470150	11.91677050
34	11.71391602	11.77273501	11.76284797	11.73541613	11.72062753
35	11.82052919	11.87631217	11.90123972	11.82818507	11.86012679
36	11.71473928	11.65624632	11.67371048	11.67941376	11.62093783
37	11.62696960	11.68387145	11.70690660	11.72891133	11.70815258
38	11.55699773	11.53076885	11.55037472	11.56658841	11.53570206
39	12.12449418	12.17033150	12.06566460	12.08171673	12.09770905

Table B-8 Mean interference signal strength; Power Off; Distance 4.0 meters

P0	Ovens				
D40	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.74124956	11.66189418	11.71555469	11.73989748	11.67719894
1	11.55446118	11.56675441	11.56314326	11.61359877	11.65908326
2	12.06700731	12.09190631	12.10823404	12.14482100	12.20894409
3	11.82660787	11.89115346	11.90648990	11.98275103	11.97515558
4	11.79773610	11.85850235	11.82037428	11.90001548	11.94705156
5	11.71294663	11.60204853	11.57500166	11.59282493	11.66994648
6	12.30553358	12.36093187	12.36088631	12.36921114	12.26665542
7	12.00992360	11.94472276	11.96566581	11.96638234	11.94566107
8	11.88669806	11.93248164	11.89852010	11.90010900	11.97380103
9	12.03712814	12.03430200	12.10950756	12.06021912	11.98543620
10	12.23802187	12.26992508	12.31867716	12.35166559	12.36019299
11	12.02430438	12.06614336	12.03916568	12.01413821	11.98321560
12	11.80329346	11.79093112	11.83028067	11.81780924	11.81596562
13	12.80174117	12.70727007	12.67586928	12.60016150	12.59379886
14	11.95090016	11.87816061	11.84246575	11.83818092	11.87057571
15	11.94617003	11.91093384	11.95134860	11.90644467	11.83412865
16	11.93585473	11.91627218	11.86875554	11.86239647	11.87105156
17	12.41428693	12.41456792	12.42713228	12.40380122	12.49766949
18	11.91761788	11.90919972	11.89330657	11.81323591	11.77350893
19	11.85254909	11.87813159	11.89496409	11.88938694	11.95394877
20	11.87034056	11.92665484	11.86492135	11.80516057	11.78776424
21	12.92408782	13.01911811	13.01386806	13.13596311	13.19169739
22	11.79769907	11.77027027	11.82011367	11.82841049	11.75021126
23	11.97845166	12.01664295	12.00009807	11.98746897	11.96653200
24	11.90786911	11.92414852	11.84845533	11.83309569	11.84791184
25	12.26187513	12.21360967	12.19136122	12.17118295	12.18726321
26	11.72694604	11.60534949	11.64577698	11.60691282	11.52004961
27	11.88557721	11.89153444	11.84167507	11.77032882	11.80406972
28	11.81909494	11.79339037	11.86360652	11.85476973	11.88006618
29	12.98388863	12.99138305	12.96347207	12.92496844	12.90094207
30	11.87332055	11.91935104	11.95083027	11.91649659	11.86967879
31	11.77821922	11.74273310	11.60431307	11.58790715	11.48030501
32	11.74702261	11.74233093	11.78643716	11.88477201	11.95990015
33	11.87157900	11.79846635	11.71234968	11.70345504	11.77233460
34	11.68929517	11.78573197	11.81074476	11.76953724	11.76408376
35	11.62210823	11.67240891	11.68860854	11.73399807	11.75319927
36	11.54694060	11.54698415	11.52792133	11.47214416	11.49030927
37	11.54377290	11.50204434	11.45123656	11.53464111	11.55298569
38	11.79679452	11.80963483	11.83097890	11.80099525	11.78288858
39	12.08331156	12.11259161	12.08643003	12.12625432	12.15086212

Table B-9 Mean interference signal strength; Power Off; Distance 4.5 meters

P0	Ovens				
D45	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.83955434	11.85347275	11.87565898	11.91342102	11.89385228
1	11.70855789	11.80969520	11.86333692	11.87903389	11.88817818
2	11.96837992	11.88305700	11.87924344	11.98476862	12.04237760
3	11.86762029	11.88918115	11.95194587	11.98250479	11.94276884
4	11.80932971	11.87904556	11.93695950	11.93978735	11.98295030
5	11.62651273	11.63163303	11.62062007	11.72858175	11.79111541
6	12.25465548	12.25964113	12.29093669	12.32181284	12.30873064
7	11.87278921	11.85182285	11.85017503	11.89213107	11.90996934
8	11.69820929	11.65228817	11.60120051	11.53946946	11.51059001
9	11.98405375	12.01178989	11.92476742	11.91257838	11.91370864
10	12.22967993	12.27567447	12.22313583	12.25088249	12.18273676
11	11.98906669	11.96259470	11.95143844	11.97393340	11.87031323
12	11.83881848	11.78281156	11.80174414	11.74954655	11.73583359
13	12.57528218	12.57023224	12.50777885	12.54076529	12.61503082
14	11.84457012	11.79265476	11.79250287	11.76696640	11.84747233
15	11.95933509	11.87076874	11.87180371	11.87208696	11.80233637
16	11.71832218	11.74373651	11.71885890	11.73352871	11.77409006
17	12.10701712	12.04338725	12.10328704	12.11127987	12.18900245
18	11.83409011	11.85823238	11.85759125	11.89701863	11.86919129
19	11.82441549	11.77536439	11.82195922	11.93254088	11.91437160
20	11.81777241	11.84403214	11.84198578	11.94370034	11.95072974
21	12.74856001	12.63852583	12.60809725	12.68101469	12.70893298
22	11.87173278	11.97968651	12.01368294	11.96225150	11.89731296
23	11.88094730	11.90590180	11.88332979	11.83829201	11.79621274
24	11.72774971	11.77699657	11.82294026	11.79265073	11.78110622
25	12.26386948	12.35533774	12.38385911	12.41105720	12.39922095
26	11.74834210	11.74842565	11.70980093	11.72952407	11.66644175
27	11.72767955	11.64727269	11.59328193	11.57890736	11.57053614
28	11.69140025	11.65102849	11.56918866	11.55575396	11.54639943
29	12.76944643	12.79540605	12.80654068	12.77829487	12.70437361
30	11.72332522	11.65317594	11.66773286	11.62507755	11.61254749
31	11.66971234	11.68365721	11.74745149	11.71292208	11.80043334
32	11.65959036	11.66538091	11.65044919	11.70267410	11.74389110
33	11.79987307	11.82020200	11.80869520	11.95142852	11.99815140
34	11.55003826	11.59483360	11.52269166	11.50986839	11.40883353
35	11.55470041	11.59553746	11.58205827	11.54293703	11.59898468
36	11.56404684	11.65738466	11.74971157	11.78408640	11.71918496
37	11.69142765	11.73621937	11.72008060	11.71833919	11.75991397
38	11.52280595	11.54798926	11.57754325	11.57740026	11.61222113
39	12.07950322	12.00843216	12.04347901	12.07745966	12.10234217

Table B-10 Mean interference signal strength; Power Off; Distance 5.0 meters

P0	Ovens				
D50	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.24651988	11.36017273	11.38899866	11.40273063	11.46963024
1	11.29227881	11.26227757	11.24413341	11.24817859	11.24797409
2	11.46050089	11.47689958	11.44779461	11.35223423	11.36097135
3	11.44584231	11.51319911	11.48046151	11.48838968	11.48502467
4	11.36232450	11.41237082	11.49582311	11.52894204	11.59388487
5	11.45808267	11.58448895	11.59799564	11.62636585	11.57401895
6	11.77397519	11.71343205	11.69003454	11.60963961	11.55794116
7	11.55848251	11.56339014	11.48698389	11.47894637	11.50381229
8	11.39067324	11.34483041	11.35269842	11.37055341	11.34958915
9	11.51050703	11.44846364	11.43928839	11.47111263	11.50723390
10	11.49010612	11.57011215	11.56847907	11.61183577	11.62052206
11	11.24289957	11.20643614	11.13002531	11.20527341	11.28901370
12	11.34880364	11.34609355	11.35667289	11.34825497	11.35000820
13	11.49022780	11.51471364	11.51934867	11.42447964	11.43689288
14	11.34246401	11.28605841	11.33276980	11.34884417	11.28739264
15	11.46446606	11.49793994	11.47789175	11.40274996	11.38592622
16	11.39035098	11.38345304	11.40352368	11.44222908	11.44050547
17	11.44125122	11.34204794	11.29819768	11.31013975	11.26009613
18	11.37988365	11.40753594	11.37146515	11.35452701	11.44701035
19	11.43282355	11.42029802	11.42754417	11.38050738	11.34231511
20	11.38311610	11.44842532	11.43879623	11.43548800	11.47219952
21	11.57199084	11.56529312	11.61831690	11.51666476	11.53866036
22	11.43807588	11.44466377	11.56852327	11.57324435	11.66438796
23	11.43744256	11.54106640	11.54236278	11.54733531	11.65264602
24	11.52544393	11.51128964	11.55681926	11.53555909	11.61439505
25	11.49067860	11.50341691	11.44537975	11.50898542	11.43488041
26	11.20718262	11.16375757	11.11520523	11.12960462	11.12139473
27	11.46755380	11.46990354	11.42209415	11.39732021	11.37884223
28	11.48158516	11.51559838	11.48591101	11.51195838	11.50308922
29	11.71233967	11.77228986	11.68082991	11.66002039	11.66836090
30	11.19509114	11.13025538	11.11878442	11.09257099	11.09009108
31	11.32779179	11.36985433	11.30700772	11.33196376	11.38487527
32	11.25880802	11.32734161	11.34857941	11.35950687	11.37284031
33	11.37134867	11.48226053	11.50639028	11.46819279	11.45745705
34	11.26677585	11.24894306	11.23926592	11.29076372	11.32180377
35	11.26998155	11.30780468	11.33049456	11.30081542	11.25749643
36	11.25031760	11.17801088	11.22436138	11.21524102	11.17195316
37	11.28370627	11.34288464	11.31609245	11.36782468	11.40075257
38	11.35901391	11.32030724	11.30932210	11.38050449	11.47386429
39	12.09675604	12.13452642	12.13201922	12.10331909	12.10439962

Table B-11 Mean interference signal strength; Low power; Distance 0.5 meter

P1	Ovens				
D05	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.79041881	13.93827754	12.15365480	12.29879389	12.11753763
1	11.75840525	14.01552107	12.27920860	12.82420418	11.80326833
2	11.98462492	13.62123234	12.33567051	13.10272419	11.66718886
3	11.84961850	13.58409353	12.92303266	13.22617737	12.28775959
4	11.85638348	14.82501710	13.21784509	12.78803156	11.36396714
5	11.85377168	15.49294946	13.00130043	12.73965716	12.56400451
6	12.48761792	14.09090168	12.70612748	13.15929226	12.50199244
7	11.90448143	13.96275596	13.17857323	13.07608276	11.87682080
8	11.94086393	14.70625917	13.27467632	12.81165341	11.66357285
9	11.92930422	13.51773444	13.50099636	13.39065696	11.48620487
10	12.22192975	13.78316557	12.75923119	13.46147771	12.39273893
11	12.26211663	14.02294145	13.55426787	13.30555626	12.21925246
12	12.54721894	14.70871862	13.55553097	13.52265033	13.07516913
13	14.01042096	13.41301092	13.18773300	14.02763292	14.54260412
14	13.26200319	14.46465558	13.73258435	13.10185238	13.10755127
15	13.27326025	13.75703452	13.39149252	12.95722456	12.65483942
16	13.45509216	13.83395993	13.71378136	13.31662103	12.65262798
17	13.38949036	13.53426383	12.80607359	13.36121842	13.18400217
18	12.82659506	14.99038115	13.12823266	13.25389275	13.80000023
19	12.58471996	13.15842705	12.58365851	13.30227559	12.71905699
20	12.05908979	14.31078209	13.21871061	13.02731590	11.85201106
21	13.45396201	13.45462782	13.15769240	14.93669323	13.11540125
22	11.93944920	14.23902000	13.27868066	13.49247231	11.62299866
23	12.13975139	13.68311511	13.19209798	14.10351958	12.24811028
24	11.88303363	13.90482561	13.65546783	13.56191178	11.83359557
25	12.55751992	13.39895198	12.64467694	14.42552915	13.75897389
26	11.81539252	15.18263088	13.52144503	13.74741851	12.87597205
27	12.02933401	14.73045303	12.85318274	13.72173348	12.35413973
28	11.79906291	14.92019439	13.12042189	12.82547096	11.35799115
29	13.79103944	13.30026685	13.56621039	14.74404866	14.32011172
30	11.76540822	14.08146762	12.49486467	12.67337724	11.92506226
31	11.92767235	13.21700370	12.51709512	13.03558746	12.45685816
32	11.76815156	13.93373198	12.29613227	13.28806293	10.99277296
33	12.33310895	13.14590687	12.26228050	13.47647818	12.11957482
34	11.77441410	13.44847065	12.33792789	12.94963130	11.79392107
35	11.89159838	12.68750916	12.67267969	12.86269406	12.80518395
36	11.76693495	12.61833419	12.10531301	13.08754031	12.77232101
37	11.75534877	13.96882826	12.01286911	12.14823131	11.45643868
38	11.92230020	14.10301213	13.39503596	13.16365751	11.68005256
39	16.10217425	12.45712816	13.96838752	17.61884688	15.46573976

Table B-12 Mean interference signal strength; Low power; Distance 1.0 meter

P1	Ovens				
D10	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	12.15521642	13.16888924	12.92354574	12.23321076	12.22485690
1	12.47513599	12.93517095	12.73338292	12.98719688	10.72122420
2	11.84091456	13.59313901	13.05858836	13.10998560	11.57793182
3	11.53097022	12.99633132	12.76662664	12.91931373	12.83621960
4	12.47126185	13.31400464	12.69540685	12.63990479	12.75388276
5	12.39511760	13.47671547	13.48201148	12.84967338	12.92983494
6	13.17301923	13.98506967	14.60177738	15.18281348	12.84557991
7	12.85697583	14.80092566	12.78793634	13.11680898	13.32185159
8	12.44523956	14.03694147	12.69271612	13.30957545	11.68841546
9	12.45815563	13.79691094	12.40939112	12.75988303	11.76321690
10	12.88841989	14.16079336	12.45162694	13.55770239	13.15785839
11	12.70848665	14.15475818	13.02897196	12.54773434	12.91605536
12	12.87465797	13.76364337	12.67014710	12.86454687	12.63503414
13	14.13116739	13.25741945	14.77717832	15.36658397	12.76979453
14	12.36669139	13.99511523	12.10159460	12.63702730	13.70123667
15	12.80485331	13.81772045	12.48515701	13.28991701	12.09922616
16	12.63090301	13.34512258	12.58648163	12.79432706	12.49010955
17	12.74863508	13.78785122	13.15039624	12.96005260	12.95461502
18	12.77567559	13.88141792	12.27028553	12.41478051	11.89523197
19	12.26870911	14.44357205	12.99476087	12.92308095	12.70991401
20	12.37503332	14.18283231	12.54308454	12.76256330	13.93378291
21	13.75337536	13.97483936	15.42384600	15.72711346	12.81874679
22	12.43876722	14.06278714	12.74471878	13.22378455	12.64575711
23	13.29311133	14.36088422	12.85501379	13.04296891	11.75626566
24	12.93953001	13.83038680	12.84543242	12.38200669	11.96209459
25	13.33832813	14.12297716	13.32308502	14.59336080	13.22410099
26	12.35906834	14.45744953	12.55831499	12.93322705	12.71464095
27	12.54472090	13.38000060	12.70762547	13.40369098	12.38806557
28	12.42399021	14.38521702	12.19492694	13.29224736	13.00906927
29	14.22906523	13.75400758	15.89343451	17.73286325	12.30215855
30	12.84002005	13.80662099	12.86277788	12.63424339	12.02749884
31	12.51289156	13.22692810	12.35387553	13.22950949	12.88532157
32	11.81671510	12.71939960	11.86713797	12.97409977	10.99034556
33	12.07647908	13.30177616	13.23018585	13.96838170	12.89598572
34	11.75060181	12.63210480	11.92865071	13.18406748	11.42757917
35	12.25338391	12.47170479	12.09326540	13.55654679	12.14568647
36	11.93650088	12.88920503	11.62915720	12.96831134	12.62939855
37	11.48908965	14.01140382	11.92087443	12.24189760	11.40797733
38	12.09380361	14.34427419	12.67688767	12.45673425	12.24741750
39	16.10604472	13.66609200	18.09613745	19.30065800	13.06495816

Table B-13 Mean interference signal strength; Low power; Distance 1.5 meters

P1	Ovens				
D15	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.70058545	12.50903962	12.24098932	12.72852216	13.29403089
1	12.31545596	12.98401563	11.59619393	13.43200031	11.74654547
2	13.10441799	11.93215754	12.40128450	13.69955048	11.70560392
3	11.95148825	12.50064518	12.11176111	12.54591805	12.92130730
4	11.69236941	12.54309966	12.38177961	12.93875537	11.57767598
5	12.19715732	13.10246964	12.12589505	13.19183917	11.59015912
6	14.62289700	13.67438200	13.38357385	15.77497540	15.95873108
7	12.69960780	12.47972171	11.89617578	12.99018438	12.09846705
8	12.42425584	13.01267929	12.21358440	13.00220985	13.05059350
9	12.72625250	12.53973700	12.60885250	12.62344965	11.42857343
10	13.05256507	12.76589187	12.24165414	13.52958047	13.22999281
11	12.76816279	12.76350803	12.98672252	13.58685467	12.37695220
12	12.66787656	13.44359912	12.84750450	13.28523688	12.68718900
13	16.15793604	13.13505151	13.91130212	15.90452101	15.70297529
14	11.70317932	12.86317123	12.97144566	13.26185209	12.15137661
15	12.59721680	13.09338310	12.66237054	13.40898742	13.38985340
16	12.27572840	12.62246907	13.19426094	13.23262375	12.09249666
17	13.45321786	13.17799952	13.05556276	13.99215788	12.75508098
18	12.41170687	12.80195042	12.60638815	12.68607903	12.31002475
19	12.38444870	12.94594341	12.54482861	12.44244629	12.59362814
20	11.83803880	13.09398126	13.01954794	13.21076976	11.23786749
21	15.70287977	13.48538177	13.33273897	16.63723016	16.03700638
22	12.88369062	14.70874324	13.16499616	13.22844012	12.65231184
23	13.20799741	13.19716552	12.42826686	13.23106355	13.23163338
24	12.34920242	13.21646873	13.28402553	13.39400449	13.47177775
25	13.59235055	13.65836711	12.81187785	14.58151048	13.53904445
26	12.60706553	13.35581643	12.52560314	13.45651681	12.72502019
27	12.17899240	13.06279574	12.66020181	13.10714336	12.88240040
28	12.30248823	13.19781769	12.08223158	13.22081565	12.41184997
29	16.75876342	12.65786149	13.85906191	17.23563464	16.89292899
30	12.68084717	13.01914587	11.15283354	13.11982192	12.45272454
31	11.77639731	12.75988462	11.88208479	12.93254776	11.84077547
32	11.91376766	13.50351956	11.34847598	12.34460263	12.00520638
33	13.23185636	12.27468213	12.15828497	13.85781485	13.43843437
34	12.08411429	13.37582361	11.80279634	13.80482758	11.14364252
35	11.98666060	11.15106389	11.34206665	12.90261498	11.49188228
36	12.49247242	12.29604409	11.58254822	13.36842486	13.14108107
37	12.06526405	12.67596488	11.73111399	13.03652717	12.17199840
38	12.22923257	12.65096101	12.82104212	13.48779606	12.65486114
39	20.23425695	14.10261036	15.65904572	19.98383692	19.76267016

Table B-14 Mean interference signal strength; Low power; Distance 2.0 meters

P1	Ovens				
D20	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.81999749	12.48517351	11.93765243	12.33668147	11.45872950
1	11.75498868	12.60822218	12.62815989	11.79634401	12.83191675
2	11.96082150	12.34091968	12.07943089	12.04405233	13.02606419
3	12.34667659	12.25699914	12.16326178	12.90582970	12.79119954
4	12.51210762	12.52520305	12.13100525	12.89469948	11.47407894
5	12.76839465	12.84339685	12.60440945	12.86869303	12.22743688
6	12.91676727	12.61149129	12.63716517	13.84359954	13.31402097
7	12.71904618	11.82592532	12.52307565	12.99986561	13.19249440
8	12.94719153	12.87872622	12.64616325	12.35979572	12.94779562
9	12.75003113	12.31022050	12.45750844	12.74041079	11.93201979
10	13.30568291	12.68594493	12.42332380	12.93017479	12.80686903
11	12.64005306	12.14712972	12.49932350	12.69988676	11.61327668
12	12.76097723	13.33878086	12.43963949	12.61452952	12.33078037
13	13.33012081	13.88175264	13.02776961	14.81227152	12.54957541
14	12.55778148	12.31494517	12.73071186	12.37258953	12.89773344
15	12.73837951	12.94249027	12.49057683	13.18048625	11.60502222
16	12.48317477	12.99667977	12.69295774	12.14239808	12.59654294
17	12.35376069	13.48535948	12.60673942	13.37624905	12.63099926
18	12.84066583	13.26184303	12.23010713	12.60850900	12.58987870
19	12.46563296	12.55273147	12.71769626	12.89167177	12.48881397
20	12.76458448	12.35502928	12.59699876	12.91397400	11.64825290
21	13.54187930	13.73275730	12.94192483	15.17196409	14.10037995
22	12.81801723	12.91626932	12.13566826	12.81596487	11.56591086
23	12.63813935	13.03806796	11.85095444	13.95948477	12.76101200
24	12.81964084	12.69431830	12.15774743	12.70381292	11.74338264
25	13.05664920	13.19017279	12.25595546	13.97867753	12.94937578
26	12.50325280	13.23830193	12.61880358	12.86478447	13.49231079
27	12.98504747	12.86524658	12.96858350	12.90518021	11.47487124
28	11.85667069	12.39753719	12.26637746	12.57634459	12.84801392
29	13.42771022	14.20082069	13.61209306	16.12862354	12.49707030
30	11.93832885	12.57005747	11.72206549	13.01357804	12.37602452
31	12.50854365	12.80116886	12.00089875	13.40342339	11.01496370
32	11.57524049	12.33104059	11.53316819	12.53514544	11.87718895
33	12.17397987	13.72289375	12.16892927	13.07096861	12.22514535
34	11.79567479	12.74734083	11.47683253	12.49861267	12.20623351
35	12.02623965	12.45031372	12.12739491	12.78435961	12.17205067
36	11.78306651	13.21247919	11.57057087	12.11474682	11.86059448
37	11.80861631	12.18535112	11.87189064	12.22665993	11.00770786
38	12.61424096	12.33228545	12.36592025	12.40597209	12.36727158
39	14.72955883	16.42574056	14.79626435	19.16324337	15.17687881

Table B-15 Mean interference signal strength; Low power; Distance 2.5 meters

P1	Ovens				
D25	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	12.38874755	12.19914855	13.70079807	12.27283856	11.67426847
1	11.90064988	12.44511130	14.24097291	11.87016660	12.62558774
2	12.59737493	12.81984225	13.88117169	11.83066518	12.78576396
3	12.15952874	12.67713602	13.97711762	12.18221696	12.65878605
4	12.59727573	12.07772920	13.89889976	12.19433762	13.24009269
5	12.25643155	12.73542654	14.39968475	12.28234365	12.31586458
6	14.53397855	14.16621485	14.11675060	13.48071143	13.91227765
7	13.13582378	12.20850529	13.81977583	11.71502925	12.80146842
8	12.66406919	12.11769607	13.05817416	12.04278623	12.22044382
9	12.68243834	12.53222501	12.28480856	12.48470205	13.05290304
10	12.28557980	13.02488459	12.38313625	12.11574274	12.62686877
11	13.47679449	12.57116575	11.94133218	12.59311377	12.49680785
12	11.92507666	12.58455118	12.40417586	12.73929805	13.48652868
13	14.46137620	14.39154470	12.10532440	14.93300848	14.36050723
14	11.91575599	12.24233813	11.94551274	11.86858742	11.94052643
15	12.55844628	12.71755506	12.09148166	12.59345200	12.18010872
16	13.27460017	12.75502768	12.42221937	12.14496838	12.70050523
17	12.70102707	12.63966391	12.00456481	13.46604428	13.13783551
18	13.05078895	12.08132280	11.94848565	12.63888767	12.91923789
19	13.06004098	12.47592498	12.19524871	13.00216743	12.70281451
20	12.51936392	12.49911373	11.93331501	11.81594984	12.12218160
21	14.27835511	14.32636029	13.03033170	15.10618182	14.21857620
22	12.81183045	12.42171342	12.30813345	12.29162142	12.42283890
23	12.83035971	13.12674067	12.01354828	12.42666182	13.22573388
24	12.77988865	12.53751547	12.26250223	12.11972250	12.53162676
25	14.09934494	13.25064149	12.74004504	13.51444064	13.86069958
26	13.00515801	12.67519760	11.83848969	12.24549312	12.56807237
27	12.40014656	11.98346740	12.58170254	12.02882276	12.13102923
28	12.08566655	13.41307680	12.50201199	12.15968706	11.51795300
29	14.49003096	15.36330218	13.13500215	15.51693588	14.57358031
30	11.38170129	13.33403672	12.20042492	12.21750121	12.09282196
31	12.58589045	12.79657933	11.97930046	12.98066194	11.84787196
32	12.20246747	11.57812274	11.85363493	11.26104337	11.14896153
33	13.23741072	13.90564942	11.72915570	12.62814765	12.94062469
34	11.72008101	12.65220602	11.91255896	11.80822809	11.46823943
35	12.90091916	12.50914855	11.73384945	13.10498184	12.92592890
36	12.08453792	11.99893820	11.66798136	11.99180101	12.04341023
37	12.13859162	12.25312022	11.90446786	12.07633190	11.86977521
38	12.10298670	12.51724830	12.50268857	12.41134970	12.78173285
39	16.94131108	17.62535722	14.66825496	19.55224952	17.58822810

Table B-16 Mean interference signal strength; Low power; Distance 3.0 meters

P1	Ovens				
D30	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	12.52236759	11.77240170	11.70889232	12.56806904	12.25792464
1	11.29467261	11.89533057	11.38177100	12.17049585	11.62460184
2	12.04171008	12.16825605	11.86625557	12.48401506	12.66965016
3	11.73854981	12.52932473	12.29798821	13.13322031	12.17820441
4	11.86539573	13.07602077	12.33175400	12.85263882	13.33277905
5	12.70845036	12.71075278	12.25470660	12.01179463	12.33523958
6	13.91216265	13.92506156	12.52186771	14.40212810	13.95678032
7	13.07633676	12.88056833	12.15086378	12.34774720	13.03762767
8	12.31295427	12.63151205	11.86474452	12.92355093	12.40686299
9	12.24422076	13.17997287	12.31294995	12.69325838	12.11050390
10	13.05776754	13.40222619	12.12589880	12.89990928	12.30963376
11	12.27122196	12.44764454	12.34048094	12.62820192	12.58017074
12	11.84896966	12.77295088	12.55295456	13.65043144	12.60188256
13	14.68915816	13.96916558	12.45831905	16.59485594	14.60874706
14	12.82770293	12.97641875	12.99723915	12.91932257	11.33559703
15	13.16332966	13.47542152	12.45228712	13.80726890	13.35489921
16	12.08147030	13.34322655	12.29527455	12.82613270	12.42046827
17	13.49025228	13.40941374	12.89040009	12.73727563	12.45124580
18	12.82296108	12.62501375	12.60735580	13.28654030	12.12048970
19	12.87550315	12.67388899	12.36100889	13.46023560	13.70914885
20	11.65220934	12.77979537	12.61505043	13.04614311	11.32351412
21	14.22130961	13.19063234	12.81323250	15.50183720	13.79894553
22	12.41902770	12.70281588	12.59629002	12.64674335	11.95624469
23	13.10367519	12.89617003	12.17009162	13.53373521	12.36339325
24	12.43392770	12.56960367	11.77747975	12.72243209	12.48275004
25	13.24142275	14.08807453	12.04696716	13.62091839	12.62263511
26	12.18388495	12.58482161	12.10741554	12.36942594	12.53220960
27	12.17497534	13.56033451	12.29117013	12.92335741	11.94728886
28	11.79164042	14.28799866	11.95769250	12.46759479	12.62944607
29	14.81927773	14.28317099	12.14915594	15.26663576	15.43255341
30	13.09862472	12.97906352	11.51243350	12.98667685	12.43066831
31	12.96189093	12.04091695	11.89541047	13.21927535	12.30296776
32	11.84480008	12.44139379	11.76427748	12.85597935	11.84840728
33	12.40191290	13.28724379	11.26839836	13.05875712	13.37934299
34	11.19751007	12.09876182	11.81979931	13.65891825	11.91152980
35	12.09552062	11.73340180	11.53519260	12.78250927	12.61672833
36	12.18825095	12.17394395	11.55666297	12.82795114	11.55555594
37	11.89705466	12.46404356	11.65589433	12.30927141	12.62988435
38	12.57710752	12.61976179	12.26097997	13.70780861	12.19323121
39	18.60441246	13.87229779	12.75504058	19.20952558	18.48508149

Table B-17 Mean interference signal strength; Low power; Distance 3.5 meters

P1	Ovens				
D35	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	11.92624133	12.19406638	12.09393865	11.73864591	12.64779288
1	11.56006503	12.59738032	11.95759732	12.78489150	13.62921420
2	12.22158098	13.03546214	13.07286346	13.37038029	12.46208618
3	11.62496915	12.55379884	11.96461294	13.32299752	11.38979109
4	11.97074012	13.17322395	12.06731390	12.48756949	12.89377911
5	12.52216541	12.67539869	13.24432896	13.01006130	12.78767797
6	13.29267651	12.77707990	13.21380093	14.70961061	12.51235568
7	12.96208278	13.49788402	12.05202593	14.04061686	12.73173649
8	11.89403132	13.62937302	11.96786193	12.57112616	13.01467600
9	11.57216566	13.16708209	11.67477402	13.05089516	11.89064395
10	12.21547561	12.21484098	11.97521504	12.08856268	12.38958899
11	12.50791472	12.58141977	12.47765445	13.74403831	13.07950007
12	12.78823742	12.51877124	13.42654664	12.73992908	11.65801558
13	14.76075440	13.24381884	12.97350707	15.30099452	15.34243778
14	12.96879320	13.56514441	13.47647577	12.88874865	12.76768871
15	12.24653702	13.65094071	12.78278296	13.21502969	11.95406926
16	12.72886312	12.90300947	12.16895612	12.96583980	11.30147266
17	11.81747463	12.62003301	12.00000749	13.35230931	13.11536497
18	12.83151318	12.35722920	12.87334268	13.29787188	13.39413845
19	13.58196192	12.74003278	12.01491408	12.79666351	13.02984748
20	13.21582485	13.24886743	12.78783536	12.92604895	12.66163023
21	15.90300204	13.18734980	12.54431866	15.99339390	15.26182299
22	11.50156666	13.02549959	12.53078498	13.65177657	11.90109038
23	13.47533737	12.69032236	11.71484844	13.15346867	12.27819604
24	12.76170683	13.86306632	12.41062474	13.41818991	12.77521993
25	13.75605108	13.65368778	12.69434153	13.64027190	13.84624593
26	12.21503341	13.30111675	11.69172047	12.15798124	12.41520665
27	11.28969078	12.38236200	11.82731738	12.20430752	11.90784486
28	12.56454544	13.89908012	11.85467648	12.87338051	12.16162301
29	14.24575038	13.90235168	12.57392416	15.91029964	15.03818464
30	12.24466006	12.64266004	11.47824923	12.35442597	12.66717354
31	12.39308157	12.50563751	12.68344628	13.21474986	12.82442803
32	12.17424937	12.20838752	11.21340749	12.25193070	12.38595075
33	11.98934301	12.16499422	11.25144569	14.13453155	11.98982935
34	11.24875920	12.00771424	12.31486551	12.49494844	12.17451346
35	12.10542797	11.98671471	11.72329351	13.10751452	11.86220938
36	12.03369445	11.78774051	11.60307744	13.12655948	12.55822051
37	12.18026837	12.43938115	11.86866647	12.20812944	11.46985329
38	12.96685972	12.82932740	13.03099387	12.09915001	12.16509760
39	18.55001372	13.92559912	11.87944790	19.63686715	16.65440939

Table B-18 Mean interference signal strength; Low power; Distance 4.0 meters

P1	Ovens				
D40	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	12.65562918	12.64324791	12.95325507	11.38626689	11.55615199
1	12.18354908	12.81171540	11.89034599	12.05404536	11.83190820
2	12.27631299	12.21427501	12.85151625	12.03543724	11.92038194
3	12.07111081	12.27321608	11.79668418	12.85491351	13.01917016
4	13.08924981	13.61007680	11.90758060	11.30109561	12.32376091
5	12.49750587	12.83699279	13.51066207	14.13957346	12.42620880
6	13.04458572	13.19907009	12.64593001	14.32019936	13.56260165
7	12.30480289	12.12436716	11.35358297	12.97958475	12.60194484
8	12.63142546	12.57004007	12.36984510	12.07397903	12.42986481
9	11.89934972	12.74677864	11.81743949	13.65895463	12.18836986
10	12.61952365	12.79560662	12.87002072	12.73966129	12.10294043
11	12.71612388	11.89392803	13.15082241	12.82910000	12.44930963
12	12.88760832	12.52212337	13.96707999	12.50249327	12.80308567
13	14.50720212	14.36393601	13.41442419	15.92779371	14.34475360
14	12.82515177	12.27219279	13.75454079	12.17084892	13.20297369
15	12.64182680	12.72652201	12.67995716	12.87524887	11.32863171
16	12.77113490	12.71087699	12.44877974	13.08896103	12.48013255
17	12.01468800	11.91153074	12.91339856	14.21096928	12.52648457
18	14.05108890	12.86033973	13.22273397	13.46157242	13.18865261
19	14.06807946	12.40858302	12.29323883	12.82266630	13.59832903
20	12.25010490	12.83615999	12.87197192	12.76816507	12.71485542
21	15.89692429	13.95617620	13.13663398	15.39962253	15.27965051
22	12.35701263	13.17081231	13.10260912	12.35939160	12.44905309
23	12.49383576	12.93250122	12.00855495	11.91032938	13.05136044
24	12.21984800	12.91346172	12.35915054	12.45352670	12.70713366
25	13.30986848	13.16039083	12.49072135	14.37692742	13.65561692
26	12.05101793	12.28419012	12.57519513	11.77837832	11.46439083
27	12.14632309	11.85012867	13.06229561	12.41989617	11.97550342
28	12.23669596	12.01126849	11.21679637	12.73599601	12.17048943
29	14.74745551	14.14016497	12.81735317	14.85519255	14.84456890
30	12.23758884	12.76194531	11.90547355	12.25935405	12.38345329
31	13.10544472	13.10241213	12.40143874	12.66741665	13.00263583
32	12.78771992	13.12015818	10.95683426	11.50816343	11.51874997
33	11.45019315	12.53416507	11.00303884	13.45716990	10.90623719
34	11.63577390	13.20048754	11.32215773	13.09525425	11.96669987
35	12.18388755	12.06887161	10.97418356	12.79267891	11.89364817
36	11.53930511	12.43257885	11.84618331	12.39546051	13.03826474
37	11.83345485	12.15472613	12.79496393	12.26562035	12.22097269
38	12.80768727	13.30427677	12.87067597	12.64874442	12.85444304
39	20.04665178	17.01978658	13.04097689	19.69379319	18.47903959

Table B-19 Mean interference signal strength; Low power; Distance 4.5 meters

P1	Ovens				
D45	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	12.88291338	12.58298746	12.11089882	11.18251481	12.06975042
1	11.79793132	11.87972836	12.17342471	11.39243083	11.57804964
2	12.19077457	12.44882191	13.89266148	11.22649300	14.09416224
3	12.06365150	12.00746925	11.87270100	11.94194281	12.13398743
4	12.79081907	12.58682764	11.51563251	11.36246377	12.66318720
5	12.16644795	13.17486559	13.39053010	13.43310053	12.80032555
6	12.53246627	12.60060095	12.82835849	14.20587012	12.09171169
7	12.45772978	12.13016924	12.15377032	12.93955398	12.31780063
8	13.05873050	12.61193264	12.33317610	11.48206769	12.94413871
9	11.63425403	13.11664185	12.12165562	12.74038926	11.32929869
10	12.72533907	13.03007554	13.09862092	13.08340050	12.95244423
11	12.87896822	13.24241279	12.71456077	12.88437198	12.05355927
12	12.48167175	12.40967661	14.00233499	12.38277237	12.49098568
13	14.35864364	14.84813652	12.80731803	16.27094079	13.92578371
14	12.61562612	12.55552284	14.58012363	12.09282858	12.25077717
15	12.06423320	12.65170732	12.66745007	12.07577925	12.70114423
16	13.38599774	12.56107360	13.96799180	12.44679148	13.87880554
17	11.57486657	12.31833233	12.22875564	13.35721564	12.64712433
18	14.38892351	12.99092973	13.26837159	13.43955190	14.31244567
19	13.53093660	12.38995327	12.36415874	12.71131595	14.40065443
20	12.60504240	12.57288473	13.41656469	12.89266643	12.90209732
21	14.81108386	13.21746341	13.22831917	15.39330300	15.86970457
22	12.01523845	13.13469062	13.38622674	12.30316280	10.94243771
23	12.95554103	12.16802217	12.03409184	12.38057696	12.74373406
24	11.32502968	12.63674138	13.14812369	12.32906288	12.65804997
25	13.11173062	12.23483287	12.14848236	15.50104432	13.75393783
26	11.08134765	12.13057084	12.13649290	12.82566846	10.95951630
27	12.35557815	12.65337869	13.78432686	11.75385386	12.03400008
28	12.60447824	12.47239740	11.01645041	12.42424605	11.72284466
29	14.34482634	13.59493436	13.06880637	15.28942927	14.20792317
30	12.52860057	12.17512654	12.15104753	11.59032494	11.78956320
31	11.94580383	12.02367816	13.18821331	11.68172581	13.05003113
32	12.36800244	13.01671093	11.67768750	11.66713269	11.62011435
33	10.95530130	12.38830636	10.20196023	13.74909201	10.79021859
34	11.47825465	11.85731072	10.66489582	13.53666835	10.89573475
35	12.89556629	12.44788620	12.22393714	12.06360226	12.55572056
36	11.90391014	12.38652981	11.61376305	11.94948226	12.19132063
37	11.67413512	12.19266299	11.92976395	12.13617993	12.25697022
38	12.65014101	12.94783833	13.07380124	12.53054639	12.09025056
39	18.88962792	15.82062009	13.08418801	18.92478847	17.48619532

Table B-20 Mean interference signal strength; Low power; Distance 5.0 meters

P1	Ovens				
D50	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	13.67082473	15.02627797	13.35276074	12.11652114	13.64971951
1	11.92322782	14.86884564	12.06646915	11.07711048	13.67041118
2	12.27224748	16.23212053	13.52341287	12.05923768	11.92363219
3	11.58485535	14.42307157	11.27943650	11.33788666	12.98979805
4	13.21844342	15.16217755	11.81088968	11.16672516	13.69313298
5	11.96022310	15.26111756	12.76405739	12.95360859	13.04076931
6	12.91413300	17.01179406	12.99271058	13.33332195	13.02997361
7	13.18177225	16.35564366	12.18014470	12.50307490	12.57954566
8	12.41808032	16.34770777	13.70139824	11.12461931	12.46530992
9	11.66181730	15.73235974	12.07277527	12.48214944	11.77860789
10	12.53526411	15.86648504	13.80015044	12.57781776	12.86871622
11	13.30271093	16.74326409	13.50409556	12.86176695	12.90327356
12	13.18714421	15.54154972	14.58647486	12.39277412	12.64648235
13	14.40039818	16.47832845	13.59845904	17.13192840	14.14916152
14	12.31333383	16.27109590	13.80420784	10.78474029	11.73894732
15	12.09900326	14.87741106	12.36504146	12.54832434	11.67535767
16	13.65838861	16.04135983	13.12831017	12.74899726	14.61004667
17	12.15559854	16.57717389	12.85231555	13.47481738	12.43162071
18	13.64091295	15.79712909	14.27267113	12.76956200	14.79546488
19	13.59520462	15.81916801	11.99889502	11.31302101	13.40742802
20	13.01870677	16.05402385	12.85191848	12.44095693	13.22977795
21	15.58532916	17.26912266	12.55192761	15.87765406	14.82250731
22	11.79502365	17.02296613	13.62880698	12.21405068	11.08667717
23	13.21073115	16.40066995	11.50775026	12.92852020	12.90382982
24	11.12621341	16.35971619	13.38448026	11.96717755	11.52020013
25	13.10495546	16.70557553	11.67722949	14.17988505	12.68586344
26	11.44930027	16.37213212	11.91349669	12.94136626	12.62329574
27	12.33675703	15.86039413	13.54835566	11.83897824	12.30081965
28	12.98371901	16.43951762	10.94549520	11.05934309	12.82024106
29	13.23397717	16.61207364	13.00914773	15.10314219	14.05303494
30	12.37964783	16.48429091	11.54645437	11.31567499	12.21786014
31	12.55897855	15.71941865	12.40698759	11.89662894	13.56268287
32	13.87039387	15.88850354	11.59032469	12.28320155	13.34456569
33	11.60618877	15.81625246	10.22398706	13.94280996	11.19807259
34	10.91550353	15.45929550	11.00089178	13.12348285	11.28058152
35	11.63228099	16.14120142	11.81355524	11.26101998	12.28809537
36	12.05750214	14.46723852	10.59186527	10.76893351	10.75381235
37	11.57987715	14.72837062	11.50627212	11.51985993	11.24744816
38	12.79377405	15.86619043	14.58868278	12.53547861	13.85879158
39	18.89673510	18.00405509	12.93722750	18.00625423	16.90734186

Table B-21 Mean interference signal strength; High power; Distance 0.5 meter

P2	Ovens				
D05	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.49822375	16.33124478	16.69588356	17.36943035	15.29305922
1	15.48451043	16.88210726	16.82315477	17.65578310	16.10843143
2	15.30056402	16.33872372	16.54586068	16.00464132	16.67280611
3	15.55982565	16.33463815	16.84371867	17.66845794	15.00081836
4	15.86897140	15.34825116	16.93993982	15.60871084	15.08779148
5	16.05542294	15.95717033	18.03487247	16.39943857	15.51490209
6	16.13012782	16.78331077	17.58039883	16.94362691	16.62299463
7	16.17647532	16.19491207	16.84517120	17.11058386	15.27924028
8	16.20089251	17.24470723	17.61711157	18.60020826	15.88920620
9	16.32613399	16.64977249	18.99860235	17.00161146	16.29793352
10	16.13682678	16.54865546	18.10363729	16.81052077	16.28679016
11	16.67860683	16.76608812	17.82546151	17.40380810	16.12836814
12	16.93969741	17.30425886	18.00084842	17.70743404	16.90108367
13	17.64118794	17.49996092	17.26643747	17.29001586	17.70990599
14	17.50641387	17.34568705	17.35368037	17.39697272	17.29440138
15	17.10412580	16.62789890	17.34257313	17.16990852	16.08588928
16	17.56089364	17.58982180	17.94660526	17.42897009	17.75067352
17	17.23001002	16.94780588	17.21119109	16.52026489	17.37534686
18	17.41280872	17.21180043	17.09887938	17.00677772	17.41682313
19	16.99188574	17.00772811	17.10305474	16.83891778	17.17653845
20	17.12723594	17.38626307	16.97083461	16.33723554	18.43529060
21	17.52473010	16.69630366	17.03364601	16.86067656	16.53193077
22	17.28567215	18.34997469	17.86162181	18.40416778	18.29578159
23	17.19736884	16.78070964	17.88253058	17.64596513	15.91545415
24	17.63681010	16.74280156	18.91317226	16.86845101	16.61715212
25	17.58033298	16.91512682	19.18205337	17.18739040	16.64286323
26	17.85341188	17.24765369	19.23846965	18.61760362	15.87770376
27	17.56328954	17.67365728	19.78217929	18.23429848	17.11301608
28	17.90975271	18.67720600	20.23664652	18.84509990	18.50931209
29	18.50082384	18.19065305	19.51940362	18.52974908	17.85155701
30	17.94933118	19.08813575	19.70124344	20.33445603	17.84181546
31	17.40488125	19.88785352	17.97293363	21.72667582	18.04903123
32	17.31890977	19.70713986	18.21274246	21.99468726	17.41959246
33	16.66963485	18.10243989	17.20812657	19.16664881	17.03823098
34	16.64584324	17.09431885	17.35993800	17.96447366	16.22416404
35	16.18438152	16.29603561	16.63578000	16.24311933	16.34895189
36	16.09577949	16.23440962	16.65652232	16.09392602	16.37489322
37	15.73570974	16.84596955	17.87060488	17.06047401	16.63146509
38	16.31887723	17.08351174	17.74036162	18.00862738	16.15839609
39	18.15195215	17.44812079	16.19883612	16.25161414	18.64462743

Table B-22 Mean interference signal strength; High power; Distance 1.0 meter

P2	Ovens				
D10	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	16.52840570	17.05754250	14.49300613	18.14016173	15.97492327
1	15.92823053	17.71796608	15.54307535	19.08592940	16.35000276
2	16.07834574	16.38328253	16.13510899	16.37070551	16.39585955
3	17.70949097	17.55512395	15.84580534	17.40148740	17.70876049
4	17.36644833	16.79791644	15.29335923	17.01205495	16.58377793
5	18.01441140	16.72254025	15.36519206	17.01895071	16.42612979
6	15.68477923	16.64299864	15.95477791	18.56012958	14.72586769
7	17.82519655	17.42524643	15.37480659	17.81713486	17.03335800
8	17.36242389	17.62252609	15.82141996	17.40406877	17.84098340
9	16.94496669	17.80305635	15.90751395	18.02789769	17.57821500
10	16.91342165	17.79713523	16.20480263	18.12236717	17.47190329
11	16.32399987	17.14621368	15.43242103	17.33044312	16.96198424
12	15.83803380	16.64208183	15.83076455	17.58652882	15.69763484
13	15.19565621	16.80401444	16.06725343	19.01354264	14.59448623
14	16.58735954	16.90439016	16.08307536	17.31816342	16.49061689
15	16.29969450	17.28627701	15.07495141	18.24381419	16.32873983
16	16.25827590	17.10729536	15.87650078	18.71066656	15.50392416
17	15.50882245	15.73357272	16.20704050	16.46097939	15.00616605
18	15.89496225	16.15265521	15.81219798	17.38407453	14.92123590
19	16.57621335	16.66044745	15.78281232	17.00264338	16.31825152
20	16.57623654	17.12084027	15.77599291	16.95280709	17.28887345
21	14.64825992	16.78193829	16.18483675	17.82892148	15.73495511
22	16.57615088	16.93386377	16.71705403	17.40398986	16.46373768
23	16.81672553	17.19987574	16.77048004	17.37247433	17.02727716
24	16.53401187	16.44449921	17.75488566	17.22955922	15.65943920
25	16.38833489	16.82261413	17.93017012	17.64610366	15.99912460
26	16.91671069	18.09004617	18.33060923	18.59922423	17.58086811
27	17.20919017	17.98120041	17.44514760	18.01846421	17.94393661
28	17.04056298	17.75190552	18.50001907	18.29103134	17.21277971
29	15.84759647	17.93599479	17.62226450	20.30126239	15.57072720
30	16.41845794	17.97964432	18.53564660	18.90078007	17.05850857
31	15.63527279	17.16531416	17.80247008	19.29197758	15.03865073
32	14.83873756	18.49314085	18.23901310	21.49336322	15.49291848
33	14.84799694	17.95202102	17.78057345	20.64375586	15.26028617
34	14.67556091	17.68871448	18.36374677	20.75545494	14.62197401
35	14.08911907	15.99440187	17.12888959	18.36057894	13.62822479
36	14.19968533	15.69101434	16.71402447	16.35543392	15.02659477
37	16.66241899	17.06299225	16.27975904	17.35349261	16.77249190
38	16.76878060	17.89122987	16.05722278	18.30075825	17.48170148
39	14.59211588	18.30247037	17.15745396	22.17365718	14.43128356

Table B-23 Mean interference signal strength; High power; Distance 1.5 meters

P2	Ovens				
D15	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	14.42548588	15.44721118	14.32069265	16.87245792	14.02196444
1	14.12592024	17.04258625	14.68268485	19.11918529	14.96598721
2	14.44724262	15.77312071	14.38538888	17.55588276	13.99035866
3	14.33876347	16.26187266	14.46494152	17.02931349	15.49443183
4	14.59726865	15.55731880	14.90776720	16.26400458	14.85063302
5	14.82472106	16.52983334	15.38155889	17.30229366	15.75737303
6	14.50328085	15.83440674	15.60539237	17.09303990	14.57577357
7	14.91592936	16.59714817	15.40672392	18.11298338	15.08131297
8	14.87249215	15.74811523	14.95373714	17.27809266	14.21813779
9	14.59203411	16.91384677	14.65214154	18.09054476	15.73714879
10	14.59292984	16.67233553	14.65040985	17.59928279	15.74538828
11	14.99688316	16.10783423	14.78953090	16.86329765	15.35237081
12	15.11202071	16.26518527	14.59849916	17.39680424	15.13356630
13	16.26372618	17.99577078	14.60440522	18.89754348	17.09399808
14	14.61317146	16.11793563	15.29653863	17.80000932	14.43586194
15	14.47312637	15.94435316	14.62296838	17.07327684	14.81542947
16	14.55762078	16.30270104	14.51433404	17.07332885	15.53207323
17	14.59488014	15.81923840	14.81371037	16.39175235	15.24672445
18	13.95575872	15.42399738	15.20306146	16.17330002	14.67469474
19	15.25183710	15.67859106	15.19315038	16.44459582	14.91258631
20	15.27769675	16.70233751	15.39061009	17.60229303	15.80238199
21	16.20643554	17.44393846	15.85531846	17.96336405	16.92451286
22	15.89889287	16.35416666	15.23655351	17.53012495	15.17820837
23	15.74330579	16.76217074	15.06942760	18.08686042	15.43748107
24	16.05500651	16.76843782	15.59147062	17.46416180	16.07271384
25	16.53350458	17.14369829	15.39456217	18.27787113	16.00952544
26	16.12950848	17.03735339	16.28261644	17.74346846	16.33123832
27	16.46092615	17.02297395	15.82307570	18.11143355	15.93451436
28	15.80030760	16.11661128	16.30438596	17.65724802	14.57597454
29	17.84190406	18.47525147	15.73448808	20.31329279	16.63721015
30	15.69989459	16.54565277	15.43038367	17.97796720	15.11333835
31	15.85456808	17.93033385	15.18950609	19.70009712	16.16057058
32	15.30726580	17.66246018	14.54706298	20.38929988	14.93562048
33	14.33154325	17.44618761	13.48679130	19.95957004	14.93280518
34	14.54276560	17.29352277	13.36306486	19.76237632	14.82466921
35	14.49323808	15.41811864	13.08553989	17.94881609	12.88742120
36	13.55207704	15.42580895	13.19006704	16.98761623	13.86400166
37	14.29718946	16.11171405	14.46292866	17.65441913	14.56900897
38	14.73249156	16.27264342	14.53226982	17.81945259	14.72583424
39	17.78919859	19.09050401	15.44931473	19.83020105	18.35080698

Table B-24 Mean interference signal strength; High power; Distance 2.0 meters

P2	Ovens				
D20	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.50659031	15.94645871	13.80456836	16.57491236	15.31800506
1	14.62599423	15.60836150	14.84764816	16.64881493	14.56790807
2	14.62448882	15.72185314	14.29484323	16.20756558	15.23614071
3	15.75073616	14.67560587	14.67219369	14.69167107	14.65954067
4	15.84034105	15.15600675	14.52866498	14.95181857	15.36019492
5	16.31184970	15.29297734	14.55167320	14.29809633	16.28785835
6	15.59288034	14.26801062	14.98533017	14.83222995	13.70379128
7	15.79089518	15.95627841	14.48297617	15.71283308	16.19972373
8	15.56004552	15.98689249	14.53972411	16.42440809	15.54937688
9	15.68928784	16.14617231	14.36047132	16.24924684	16.04309779
10	14.87530802	15.13191357	14.77337702	15.89874040	14.36508674
11	15.06067070	15.66616278	14.21773005	16.14608479	15.18624077
12	14.64816248	15.06224804	14.40223797	15.56812164	14.55637444
13	13.49961820	15.34066197	14.78663731	17.38858713	13.29273681
14	15.29465562	15.49515035	14.58894390	15.77511563	15.21518508
15	15.10283904	15.55877545	13.88161400	15.60807097	15.50947992
16	15.91987434	15.06465223	14.07701176	15.68504524	14.44425922
17	14.00595073	15.56275524	14.26154758	16.57176227	14.55374821
18	14.44699329	15.20213415	14.18358055	15.90019648	14.50407182
19	14.48405092	14.74466231	15.09127778	15.55705748	13.93226713
20	14.21986438	14.88284067	14.56109117	15.70974286	14.05593847
21	13.77250905	16.14454771	15.16575113	17.95677080	14.33232462
22	14.57759131	15.42773202	14.15254780	16.53827482	14.31718923
23	14.13509363	15.56009619	14.08365476	16.80345443	14.31673796
24	14.94069738	15.53999036	14.73620402	15.44261780	15.63736291
25	14.96358166	15.62078402	15.19779189	17.38424216	13.85732589
26	15.61976614	17.03498833	15.29210578	16.99036257	17.07961410
27	16.59025248	16.91918327	15.36966174	17.21483603	16.62353050
28	18.06453540	17.14751258	15.19481551	16.86476435	17.43026080
29	15.37691651	17.34465631	17.02962400	19.87515932	14.81415330
30	16.56684520	16.52156265	14.73602492	17.21747764	15.82564765
31	15.07781086	16.64648757	14.43795452	17.62884374	15.66413139
32	16.06983540	17.60351412	14.07294768	19.64669096	15.56033728
33	13.85993615	16.74668099	13.73615181	18.77846968	14.71489230
34	13.47086316	15.15646754	13.42678145	17.86002160	12.45291348
35	13.26750540	14.91634133	12.52106842	16.68362533	13.14905733
36	12.09671132	14.23906157	12.83277262	15.93130885	12.54681429
37	15.61577793	15.63009240	13.23604710	15.62833027	15.63185454
38	15.38298401	15.24248948	14.16640262	16.11953350	14.36544546
39	13.45613208	16.48223410	16.68756117	20.42096867	12.54349953

Table B-25 Mean interference signal strength; High power; Distance 2.5 meters

P2	Ovens				
D25	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	13.62766162	15.27029480	14.48875013	16.42790462	14.11268498
1	14.10464438	15.04323366	14.87709440	17.12454909	12.96191823
2	13.86653304	14.80505686	14.61191417	15.99645406	13.61365966
3	13.96623798	15.19092315	14.42166769	16.65205108	13.72979521
4	14.74624213	14.89766986	15.09430923	16.15487256	13.64046716
5	14.20344279	14.40730570	14.97465852	15.14407465	13.67053675
6	14.17052274	15.24602333	14.58442729	17.00404467	13.48800199
7	14.45778688	14.92389367	14.27630980	16.07339050	13.77439683
8	14.50784813	15.53474900	15.21009967	17.18891010	13.88058791
9	14.29832199	15.94445960	14.73272138	16.76534494	15.12357426
10	14.04756486	15.08383041	15.23254663	15.99453063	14.17313019
11	13.75076677	14.48691601	15.45250548	15.97322775	13.00060428
12	14.02907001	13.87167273	14.70673444	14.64103046	13.10231500
13	14.93956353	16.80407343	14.94999127	17.99023469	15.61791217
14	14.12774495	15.68446372	14.50286328	15.58537491	15.78355253
15	15.18230669	16.04297627	14.34423225	16.60218246	15.48377007
16	14.33766561	15.86014292	14.75302964	16.71249925	15.00778659
17	14.48041851	14.71315457	14.32910733	15.83731422	13.58899492
18	14.63406792	14.67567853	15.07624373	15.11151432	14.23984274
19	13.69246171	15.36988378	15.18274104	16.19998425	14.53978331
20	13.57307119	14.34104022	14.99859092	15.71232729	12.96975314
21	14.61133513	15.99802482	14.95003559	17.53397802	14.46207161
22	13.66302308	15.14609068	15.49212761	16.30043883	13.99174254
23	14.84604143	14.39089384	15.52864244	15.38564125	13.39614642
24	14.77641774	14.83593887	16.29323555	15.89583058	13.77604715
25	14.25204234	15.73579535	16.60505666	16.98349060	14.48810011
26	14.29842839	16.30488517	16.12732245	17.87428495	14.73548539
27	15.65178600	15.88791338	16.25412130	17.20226049	14.57356627
28	15.74229561	16.11246674	16.70231500	16.47491082	15.75002266
29	16.04246575	17.67240602	16.00840512	19.14921743	16.19559462
30	15.66672303	15.57044269	15.53528069	16.55984996	14.58103543
31	14.71404757	17.07703357	15.19686534	18.36601864	15.78804850
32	16.21060364	17.75287302	15.51402447	18.70679108	16.79895496
33	15.20248020	17.07994693	14.36850530	18.43116692	15.72872694
34	15.14474517	16.53208931	14.24637361	18.25397348	14.81020514
35	14.25208845	15.29886864	13.48285952	16.47178132	14.12595596
36	13.78655766	14.66019600	13.35936002	15.39083603	13.92955597
37	13.56703396	14.65636606	14.87454189	15.79737868	13.51535345
38	13.33719873	15.64069243	14.90958704	16.82141830	14.45996656
39	15.28497894	17.78050128	13.58313301	20.26522740	15.29577517

Table B-26 Mean interference signal strength; High power; Distance 3.0 meters

P2	Ovens				
D30	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	14.51681996	14.62828128	15.24618452	15.11057774	14.14598482
1	14.65898692	14.72045558	14.58736072	14.95577411	14.48513705
2	14.72418310	14.97230211	14.55966715	15.07493587	14.86966834
3	14.41667632	15.04652451	14.09158583	15.57643374	14.51661527
4	14.05465789	15.34445313	14.70551747	15.02327855	15.66562771
5	14.16985696	15.23118267	14.01812466	15.26757531	15.19479004
6	14.35709471	14.78746048	14.83995581	15.78034509	13.79457587
7	15.05027808	15.98292766	14.10645459	15.91030855	16.05554677
8	14.66161285	15.88427725	14.09057003	17.33145112	14.43710339
9	14.43378285	16.00790636	14.46130467	16.71531648	15.30049624
10	15.53238184	15.40593835	14.74025050	16.28448982	14.52738688
11	14.00861409	15.89130371	14.73986485	17.97846896	13.80413846
12	14.05336563	14.96743193	14.59631005	16.14412421	13.79073966
13	14.00369671	15.70960364	14.59346137	17.22575934	14.19344795
14	13.81229390	15.36642979	14.39328449	16.56985865	14.16300094
15	13.67136309	15.27521224	14.54021770	15.77169141	14.77873308
16	13.73112502	15.22191890	14.35294036	16.67791405	13.76592374
17	13.78499904	14.40014672	13.97077389	15.52436999	13.27592346
18	14.26095265	14.59285144	14.57725138	15.11800401	14.06769886
19	13.76759211	14.85609477	14.33805258	16.37521005	13.33697949
20	14.01534159	14.87088747	14.58275524	15.58718765	14.15458729
21	13.35872677	15.27203246	13.76346107	17.19397957	13.35008535
22	14.18837944	14.92499612	14.92949327	16.09704171	13.75295053
23	13.66046844	14.85109288	14.27095117	16.43603968	13.26614607
24	14.03657079	15.24721520	14.82674782	16.83132834	13.66310205
25	14.56051813	15.74604511	15.49139917	16.58291792	14.90917231
26	14.92034998	15.63122522	15.90926970	17.03787381	14.22457663
27	14.45236975	16.18302124	15.85689424	16.10897467	16.25706781
28	15.30323343	16.84008171	15.40663679	17.71058563	15.96957779
29	15.51595417	17.21960274	14.69422475	18.45393749	15.98526799
30	15.37458121	16.00233476	14.87293289	17.21528322	14.78938630
31	15.25329913	16.37073349	14.55202312	18.37229195	14.36917503
32	15.60502024	17.72553621	14.62323419	20.15616610	15.29490632
33	14.27424154	16.14911572	13.91591315	18.52657562	13.77165582
34	13.91923117	15.85971433	14.32759689	17.06113556	14.65829309
35	13.61035613	14.14486828	13.02034724	14.68589138	13.60384519
36	12.61398156	13.44483982	13.03344248	14.70530117	12.18437848
37	14.60952261	14.29577362	14.07400901	14.88821498	13.70333227
38	14.20764185	15.36626981	14.96874799	15.59009502	15.14244461
39	15.71598481	17.05847395	13.03492350	18.20942811	15.90751979

Table B-27 Mean interference signal strength; High power; Distance 3.5 meters

P2	Ovens				
D35	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.36508525	14.44978031	14.05832886	13.83718443	15.06237619
1	14.76722078	14.70678795	15.18048721	14.83325838	14.58031751
2	14.92802190	15.00247321	14.55259676	15.58930291	14.41564352
3	15.02552235	14.63430000	12.94556385	15.28482555	13.98377445
4	14.53742374	15.30906462	14.99541845	15.32206298	15.29606626
5	14.42338795	15.55141442	14.30274073	15.92736656	15.17546227
6	14.33137073	15.90597083	13.60208883	17.19353150	14.61841017
7	14.83526966	15.52528156	15.17621401	16.36164697	14.68891614
8	14.13142312	15.20198283	15.54962424	15.83588171	14.56808395
9	14.54648533	16.02932288	14.38234242	17.28588639	14.77275937
10	14.85446329	16.34941115	14.75844312	16.48564208	16.21318021
11	14.43572785	15.07814455	15.30671937	15.54665954	14.60962957
12	13.86491805	14.63845050	14.41061564	15.37596848	13.90093252
13	14.04712046	15.22479943	13.56264090	17.12287134	13.32672752
14	14.32154356	15.29128696	14.91150266	15.77643942	14.80613450
15	13.33489090	14.75275269	14.71501270	15.89002940	13.61547599
16	13.22777504	14.71235637	14.33684313	16.70533612	12.71937662
17	13.75222396	15.13097834	15.00938744	16.41719074	13.84476594
18	13.78671517	15.03653234	13.64546796	15.54770393	14.52536074
19	13.55504420	14.90457298	14.62831660	16.42384331	13.38530265
20	13.51155315	15.86612074	13.96512202	17.05135072	14.68089077
21	13.44645257	15.92542920	13.72927108	17.47020263	14.38065578
22	14.54872088	15.04647799	14.04942009	15.91453472	14.17842126
23	14.34999863	15.32057082	14.78128364	16.70532587	13.93581577
24	14.18657440	15.65533352	14.22298071	17.16454857	14.14611846
25	13.69934464	14.09205233	15.40850447	15.22784458	12.95626007
26	15.16289944	15.98179191	16.14756843	17.10816316	14.85542066
27	15.39372913	16.28295876	16.50578135	15.72802910	16.83788843
28	14.43097721	16.33449970	16.53071633	16.97328971	15.69570968
29	15.70074397	17.41771729	14.33596551	18.26624451	16.56919008
30	15.22009168	16.71590301	15.58763973	18.40701487	15.02479115
31	15.33582049	16.69221969	14.09998317	18.68038364	14.70405574
32	15.38525680	17.25953758	13.93781274	20.19189661	14.32717855
33	13.95099543	16.53142873	13.55813676	18.60932247	14.45353499
34	13.84629504	15.49825702	13.71671987	16.97353545	14.02297860
35	13.42874416	13.65536854	12.39550586	13.81524873	13.49548835
36	12.50214349	13.74063282	13.02526254	15.53785272	11.94341292
37	14.22425553	14.33878105	14.78494499	13.98353753	14.69402457
38	14.22052646	15.52013766	15.31519234	15.69999390	15.34028142
39	14.93203981	15.86861171	13.19371607	17.14846162	14.58876180

Table B-28 Mean interference signal strength; High power; Distance 4.0 meters

P2	Ovens				
D40	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.27802110	15.11142280	14.14281837	15.15268583	15.07015977
1	14.62551245	14.73692520	15.65685334	15.78625207	13.68759834
2	14.70174349	15.81102252	14.91587298	15.96334070	15.65870433
3	14.73900065	14.60855859	13.42214444	14.84051466	14.37660251
4	15.06043715	15.10551071	15.31739199	14.48590227	15.72511915
5	14.48319203	15.29233243	14.55965718	15.67608000	14.90858487
6	14.13887251	15.21324235	13.63824781	16.37578702	14.05069768
7	14.70264486	15.39306285	15.37373763	14.99109295	15.79503275
8	14.10953016	15.91268493	14.82233463	17.27665587	14.54871399
9	14.66437384	15.67699912	13.64201705	16.84515459	14.50884365
10	15.49703114	15.70219059	14.62679004	16.55330731	14.85107387
11	14.13928887	15.09615039	16.14663830	15.33770558	14.85459520
12	13.96378810	15.73235193	14.14528319	17.31346842	14.15123544
13	13.58777820	15.91067265	12.04100248	17.48548253	14.33586278
14	14.57057896	15.59006476	15.67898942	15.91711117	15.26301836
15	13.69361264	14.20358433	14.25816758	15.08393546	13.32323320
16	14.02772376	15.05231644	13.77793979	15.90513383	14.19949905
17	13.17918755	14.99217405	13.65333404	16.95457379	13.02977430
18	14.23913503	14.76874224	14.75740291	14.95823177	14.57925271
19	13.85333927	14.42236240	13.72967779	15.26251527	13.58220954
20	13.37742288	14.55378785	14.77684941	16.14385589	12.96371981
21	13.54001607	15.18750738	12.86824134	17.20274537	13.17226939
22	14.85140350	15.40682396	14.29959955	15.84061806	14.97302986
23	14.48459302	14.80065321	14.76196356	15.91872592	13.68258051
24	14.43108952	15.79787348	16.19338371	16.06315757	15.53258939
25	14.23539464	15.51659514	14.85653614	15.84882422	15.18436606
26	15.92505339	17.08329316	16.00826101	18.85597192	15.31061440
27	14.48614813	15.04832074	16.46391962	14.53464270	15.56199879
28	14.14525529	16.35456603	16.06003907	16.94311835	15.76601372
29	15.30843768	17.49422790	13.95176805	19.18596269	15.80249311
30	15.46095510	17.03268094	15.95332329	18.36681026	15.69855163
31	15.08286060	16.84228397	14.73302072	17.81762970	15.86693824
32	16.06513482	17.98050778	15.00065403	19.58053737	16.38047818
33	14.37141576	16.83572787	12.90426015	18.63197432	15.03948142
34	14.51778459	15.29659215	12.68934926	16.63981859	13.95336571
35	13.25280110	13.69025322	13.33901283	13.88764940	13.49285704
36	12.72066896	14.45935917	13.95814988	15.69911932	13.21959902
37	14.52231106	14.90918811	15.95330099	15.16039094	14.65798528
38	14.60384548	14.45218709	16.01009122	14.56153844	14.34283574
39	15.55757300	16.03370502	13.59667640	17.15875691	14.90865312

Table B-29 Mean interference signal strength; High power; Distance 4.5 meters

P2	Ovens				
D45	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.33151145	14.83317022	14.89940564	14.46958253	15.19675792
1	14.24632732	15.30676450	14.73091586	16.03479155	14.57873745
2	14.89498414	15.40596464	14.14194223	14.94519073	15.86673855
3	14.13938166	14.36008574	12.16945064	14.16172060	14.55845088
4	15.25002232	14.88925009	15.18308666	15.40995480	14.36854537
5	14.14704352	14.92917287	14.81409300	15.60340916	14.25493659
6	13.92541697	15.06884704	13.89709816	17.11313599	13.02455810
7	14.85646124	14.16483863	15.69499284	14.67820569	13.65147156
8	14.60882150	15.71507418	15.07392052	17.56335625	13.86679211
9	14.82252612	16.23895768	12.70315476	18.06071464	14.41720072
10	15.56327532	15.98990266	14.54583529	16.85529112	15.12451421
11	13.78244054	15.00835008	15.38707091	15.80197484	14.21472533
12	14.03737763	15.14721663	14.44839963	16.55634890	13.73808435
13	13.80427059	15.83484435	13.43920359	18.77600530	12.89368339
14	14.09373066	14.25142533	16.56522094	15.34112304	13.16172761
15	13.79303435	13.55608401	13.94980804	13.77836041	13.33380762
16	13.41953695	15.56282434	13.62103460	15.91112237	15.21452630
17	13.61428726	15.00121356	13.81532783	15.53533162	14.46709549
18	14.07821148	13.94940937	14.34460345	14.74418856	13.15463018
19	14.00998410	13.88274235	13.47552537	14.03734975	13.72813494
20	13.30731246	14.83314593	14.78258119	16.35709000	13.30920186
21	13.55880141	14.49586807	12.71772075	16.24495752	12.74677862
22	15.20257216	15.80772811	15.23164578	16.10185765	15.51359857
23	14.17318163	14.55147779	15.07328069	15.20395226	13.89900332
24	14.80386732	15.01751637	14.65558023	15.30381020	14.73122255
25	13.90485206	15.35870359	15.90558691	16.41816529	14.29924190
26	16.15112335	17.59567851	16.58710692	18.52143217	16.66992484
27	14.55794229	14.97934499	16.59241277	14.94094807	15.01774192
28	13.71134890	15.58683913	15.94690320	16.10781828	15.06585998
29	15.69345893	17.14281205	14.24179292	19.10041695	15.18520716
30	15.69179587	17.01444270	16.07922335	18.82464424	15.20424115
31	15.25732928	16.18722882	15.16372997	16.75877979	15.61567785
32	15.75307960	18.57211249	15.03500436	20.84733332	16.29689166
33	14.07920795	16.73389071	12.15984136	19.46731660	14.00046481
34	14.66754580	14.95592962	13.26710489	15.74181227	14.17004697
35	13.88114605	14.02387422	12.38292644	15.26377627	12.78397217
36	12.97144495	14.25558224	14.37181256	15.09663237	13.41453210
37	14.51064229	14.63333537	16.24499718	15.34131101	13.92535973
38	14.47829371	13.86147137	14.90285526	13.51777001	14.20517274
39	14.72322315	16.16290364	12.31477394	17.16357665	15.16223063

Table B-30 Mean interference signal strength; High power; Distance 5.0 meters

P2	Ovens				
D50	Microwave 1	Microwave 2	Microwave 3	Microwave 4	Microwave 5
Channel	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI	Mean RSSI
0	15.27394162	14.93094239	15.04613274	15.21944665	14.64243813
1	14.54837814	15.52731042	13.85976865	16.61969114	14.43492970
2	14.90508175	15.63378471	14.47714718	15.54433065	15.72323877
3	14.66410417	14.31593089	12.41675001	14.73932949	13.89253229
4	15.01661630	14.80297895	15.82339148	14.40656497	15.19939293
5	14.06511579	14.66462631	14.27681364	15.74665419	13.58259843
6	14.30408070	16.23755969	14.79713489	17.39164875	15.08347063
7	15.11216833	14.27951509	15.37393041	15.13671885	13.42231133
8	14.51995578	16.45197078	15.30867876	17.26589894	15.63804262
9	15.32626796	16.50120104	14.36211936	17.58050092	15.42190115
10	15.12028904	16.02588667	13.71058084	17.13446619	14.91730715
11	13.75011144	15.30584771	15.68295210	15.58174070	15.02995472
12	13.93101820	14.92693236	14.44703044	16.02097958	13.83288514
13	13.94870063	15.90521997	12.79276022	18.09129404	13.71914590
14	14.00842959	13.95785489	16.89777707	15.00992457	12.90578521
15	13.96271525	13.00266212	13.73098431	13.02633983	12.97898441
16	13.48844756	14.67490119	13.23256845	15.66074644	13.68905594
17	14.14395351	15.39992370	14.14643888	16.00422674	14.79562065
18	13.69044903	14.49495042	13.97170609	15.47544725	13.51445358
19	13.47176186	13.56426903	13.51624744	14.40954304	12.71899502
20	13.27245007	14.99926090	15.87330655	16.03912449	13.95939731
21	13.37722867	15.66760874	12.41189011	17.20004526	14.13517222
22	14.90896058	15.55798533	13.78774331	15.92009184	15.19587881
23	13.66001231	14.72218207	15.15012486	15.71477073	13.72959341
24	14.30231061	14.91560520	15.83074039	15.60662452	14.22458588
25	14.21252063	15.25473931	14.78283435	16.93798998	13.57148863
26	14.71084226	17.09286568	16.73181545	19.46754479	14.71818656
27	14.83801196	14.81325328	16.85417961	14.54200292	15.08450364
28	13.59866554	15.23779621	14.68054265	16.79097358	13.68461884
29	14.87506904	16.98264183	14.71250027	18.59090895	15.37437470
30	15.43093762	17.84234498	16.28888278	20.91136500	14.77332495
31	15.11389359	17.07042325	14.49952794	17.52898972	16.61185678
32	15.73251661	17.66292187	16.57736260	18.88233120	16.44351253
33	14.46534310	16.91570736	12.15743432	19.35392593	14.47748879
34	14.75413338	15.73412741	12.64254332	17.35462408	14.11363075
35	13.13500118	14.15105698	11.16349591	15.01984140	13.28227256
36	13.04599484	14.09227938	14.96036396	15.73939435	12.44516441
37	14.07411719	14.50022645	15.45632673	14.16250652	14.83794639
38	13.74191657	14.05092416	15.69981451	14.46430451	13.63754381
39	15.03556033	15.69864437	13.23828008	16.12704449	15.27024425

APPENDIX C: PACKET LOSS DATA

The Frontline ComProbe BPA LE protocol analyzer device and software was used to monitor the BLE piconet. The software reported the number of packets sent and the number of packets that erred per channel for each trial. The software also reported channels that were not available at any time during the capture. The following tables are the sum of the number of packets sent and erred per channel for all 30 trials for each distance and power setting per microwave oven. The percent available is percentage of trials that the channel was available for the full 180 second trial.

Table C-1 Packet loss; Power Off; Distance 0.5 meter

Power Level: Off
Distance 0.5m

	Ovens																			
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5855	5853	2	0.0342%	99.33%	1148	0	100.00%	1130	0	100.00%	1170	0	100.00%	1240	0	96.67%	1165	2	100.00%
1	6109	6109	0	0.0000%	97.33%	1199	0	100.00%	1195	0	96.67%	1210	0	100.00%	1280	0	90.00%	1225	0	100.00%
2	6081	6081	0	0.0000%	98.00%	1196	0	100.00%	1190	0	93.33%	1210	0	96.67%	1250	0	100.00%	1235	0	100.00%
3	6223	6223	0	0.0000%	97.33%	1223	0	100.00%	1200	0	93.33%	1245	0	100.00%	1310	0	93.33%	1245	0	100.00%
4	6003	6003	0	0.0000%	100.00%	1178	0	100.00%	1140	0	100.00%	1235	0	100.00%	1260	0	100.00%	1190	0	100.00%
5	6215	6215	0	0.0000%	100.00%	1220	0	100.00%	1195	0	100.00%	1260	0	100.00%	1305	0	100.00%	1235	0	100.00%
6	6224	6222	2	0.0321%	98.67%	1222	0	93.33%	1195	0	100.00%	1245	0	100.00%	1305	2	100.00%	1255	0	100.00%
7	6126	6122	4	0.0653%	98.00%	1202	0	96.67%	1175	0	93.33%	1235	0	100.00%	1285	0	100.00%	1225	4	100.00%
8	6174	6172	2	0.0324%	99.33%	1212	0	100.00%	1215	0	100.00%	1250	0	100.00%	1260	0	96.67%	1235	2	100.00%
9	6082	6078	4	0.0658%	100.00%	1193	0	100.00%	1185	0	100.00%	1215	0	100.00%	1260	2	100.00%	1225	2	100.00%
10	6332	6328	4	0.0632%	99.33%	1243	0	100.00%	1235	2	100.00%	1255	0	96.67%	1305	2	100.00%	1290	0	100.00%
11	6167	6165	2	0.0324%	97.33%	1210	0	100.00%	1175	2	90.00%	1240	0	100.00%	1305	0	96.67%	1235	0	100.00%
12	6303	6303	0	0.0000%	100.00%	1238	0	100.00%	1220	0	100.00%	1240	0	100.00%	1330	0	100.00%	1275	0	100.00%
13	6091	6091	0	0.0000%	100.00%	1196	0	100.00%	1190	0	100.00%	1220	0	100.00%	1265	0	100.00%	1220	0	100.00%
14	6111	6111	0	0.0000%	100.00%	1201	0	100.00%	1175	0	100.00%	1225	0	100.00%	1280	0	100.00%	1230	0	100.00%
15	6150	6142	8	0.1301%	98.00%	1207	0	90.00%	1210	2	100.00%	1230	0	100.00%	1245	6	100.00%	1250	0	100.00%
16	6190	6184	6	0.0969%	100.00%	1214	0	100.00%	1200	0	100.00%	1225	0	100.00%	1295	6	100.00%	1250	0	100.00%
17	6147	6147	0	0.0000%	98.00%	1207	0	100.00%	1175	0	93.33%	1235	0	100.00%	1310	0	100.00%	1220	0	96.67%
18	6084	6084	0	0.0000%	97.33%	1194	0	100.00%	1165	0	93.33%	1245	0	100.00%	1270	0	96.67%	1210	0	96.67%
19	6247	6247	0	0.0000%	100.00%	1227	0	100.00%	1205	0	100.00%	1240	0	100.00%	1300	0	100.00%	1275	0	100.00%
20	6142	6140	2	0.0326%	99.33%	1205	0	96.67%	1200	0	100.00%	1220	0	100.00%	1275	0	100.00%	1240	2	100.00%
21	6184	6184	0	0.0000%	97.33%	1214	0	100.00%	1185	0	96.67%	1245	0	96.67%	1300	0	93.33%	1240	0	100.00%
22	6097	6097	0	0.0000%	95.33%	1197	0	93.33%	1180	0	100.00%	1235	0	93.33%	1275	0	90.00%	1210	0	100.00%
23	6247	6247	0	0.0000%	96.67%	1227	0	100.00%	1215	0	93.33%	1250	0	100.00%	1300	0	90.00%	1255	0	100.00%
24	6180	6178	2	0.0324%	100.00%	1213	0	100.00%	1210	0	100.00%	1225	0	100.00%	1295	2	100.00%	1235	0	100.00%
25	6140	6140	0	0.0000%	99.33%	1205	0	100.00%	1185	0	100.00%	1240	0	100.00%	1255	0	100.00%	1255	0	96.67%
26	6182	6178	4	0.0647%	99.33%	1213	0	100.00%	1185	0	100.00%	1245	0	96.67%	1285	2	100.00%	1250	2	100.00%
27	5961	5961	0	0.0000%	98.67%	1171	0	93.33%	1150	0	100.00%	1185	0	100.00%	1275	0	100.00%	1180	0	100.00%
28	6217	6213	4	0.0643%	97.33%	1218	0	100.00%	1195	0	93.33%	1230	0	100.00%	1325	2	100.00%	1245	2	93.33%
29	6097	6097	0	0.0000%	96.67%	1197	0	93.33%	1190	0	93.33%	1215	0	100.00%	1270	0	96.67%	1225	0	100.00%
30	6234	6234	0	0.0000%	98.67%	1224	0	93.33%	1210	0	100.00%	1240	0	100.00%	1295	0	100.00%	1265	0	100.00%
31	5965	5965	0	0.0000%	99.33%	1170	0	100.00%	1160	0	100.00%	1220	0	100.00%	1240	0	100.00%	1175	0	96.67%
32	6092	6090	2	0.0328%	98.00%	1195	0	96.67%	1170	2	100.00%	1240	0	100.00%	1265	0	93.33%	1220	0	100.00%
33	6334	6334	0	0.0000%	98.00%	1244	0	100.00%	1210	0	100.00%	1275	0	96.67%	1325	0	93.33%	1280	0	100.00%
34	6117	6115	2	0.0327%	98.67%	1200	0	93.33%	1190	0	100.00%	1225	0	100.00%	1255	2	100.00%	1245	0	100.00%
35	6290	6290	0	0.0000%	97.33%	1235	0	100.00%	1225	0	96.67%	1250	0	100.00%	1315	0	100.00%	1265	0	90.00%
36	6159	6159	0	0.0000%	97.33%	1209	0	100.00%	1180	0	100.00%	1260	0	100.00%	1285	0	93.33%	1225	0	93.33%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-2 Packet loss; Power Off; Distance 1.0 meter

Power Level: Off
Distance 1.0m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5619	5610	9	0.1602%	100.00%	950	2	100.00%	930	2	100.00%	1275	2	100.00%	1190	0	100.00%	1265	3	100.00%
1	5918	5915	3	0.0507%	97.33%	1015	0	86.67%	1015	0	100.00%	1320	1	100.00%	1230	2	100.00%	1335	0	100.00%
2	5827	5825	2	0.0343%	100.00%	1010	0	100.00%	990	0	100.00%	1335	2	100.00%	1195	0	100.00%	1295	0	100.00%
3	5923	5920	3	0.0507%	100.00%	1020	1	100.00%	1000	0	100.00%	1320	1	100.00%	1255	1	100.00%	1325	0	100.00%
4	5784	5780	4	0.0692%	98.00%	1010	1	100.00%	965	0	100.00%	1330	0	100.00%	1215	1	90.00%	1260	2	100.00%
5	5732	5725	7	0.1221%	100.00%	1020	2	100.00%	995	1	100.00%	1315	0	100.00%	1215	3	100.00%	1180	1	100.00%
6	6230	6225	5	0.0803%	97.33%	1045	1	100.00%	1010	1	100.00%	1355	2	100.00%	1290	1	86.67%	1525	0	100.00%
7	5874	5870	4	0.0681%	100.00%	990	0	100.00%	960	2	100.00%	1340	2	100.00%	1245	0	100.00%	1335	0	100.00%
8	5996	5995	1	0.0167%	100.00%	1040	1	100.00%	1000	0	100.00%	1335	0	100.00%	1275	0	100.00%	1345	0	100.00%
9	5882	5880	2	0.0340%	100.00%	990	1	100.00%	990	0	100.00%	1335	1	100.00%	1255	0	100.00%	1310	0	100.00%
10	6017	6015	2	0.0332%	98.67%	1035	0	100.00%	1025	0	100.00%	1345	1	100.00%	1275	0	93.33%	1335	1	100.00%
11	5972	5970	2	0.0335%	95.33%	1015	0	100.00%	1005	0	76.67%	1335	2	100.00%	1255	0	100.00%	1360	0	100.00%
12	5968	5965	3	0.0503%	96.67%	1015	2	100.00%	1005	1	83.33%	1345	0	100.00%	1260	0	100.00%	1340	0	100.00%
13	5797	5795	2	0.0345%	100.00%	995	1	100.00%	965	0	100.00%	1320	1	100.00%	1225	0	100.00%	1290	0	100.00%
14	5920	5915	5	0.0845%	98.00%	995	4	100.00%	1000	0	100.00%	1345	0	90.00%	1255	0	100.00%	1320	1	100.00%
15	5950	5950	0	0.0000%	92.67%	1040	0	100.00%	1005	0	63.33%	1355	0	100.00%	1230	0	100.00%	1320	0	100.00%
16	5986	5985	1	0.0167%	94.00%	1010	0	100.00%	1030	0	70.00%	1360	0	100.00%	1250	1	100.00%	1335	0	100.00%
17	5998	5995	3	0.0500%	98.67%	1030	2	100.00%	985	1	100.00%	1360	0	93.33%	1265	0	100.00%	1355	0	100.00%
18	5841	5840	1	0.0171%	98.67%	990	1	100.00%	965	0	93.33%	1330	0	100.00%	1230	0	100.00%	1325	0	100.00%
19	5996	5995	1	0.0167%	96.67%	1025	0	100.00%	1020	0	100.00%	1335	1	100.00%	1265	0	83.33%	1350	0	100.00%
20	5889	5885	4	0.0679%	91.33%	985	2	100.00%	1015	0	100.00%	1340	1	73.33%	1235	0	83.33%	1310	1	100.00%
21	5913	5910	3	0.0507%	99.33%	1030	1	100.00%	960	1	100.00%	1365	0	96.67%	1250	0	100.00%	1305	1	100.00%
22	5927	5925	2	0.0337%	100.00%	990	1	100.00%	980	1	100.00%	1345	0	100.00%	1265	0	100.00%	1345	0	100.00%
23	5943	5940	3	0.0505%	100.00%	1025	1	100.00%	995	0	100.00%	1320	1	100.00%	1260	0	100.00%	1340	1	100.00%
24	6006	6005	1	0.0167%	100.00%	1030	0	100.00%	1025	0	100.00%	1365	0	100.00%	1245	0	100.00%	1340	1	100.00%
25	5896	5895	1	0.0170%	96.67%	985	0	100.00%	1000	0	83.33%	1350	0	100.00%	1260	0	100.00%	1300	1	100.00%
26	5903	5900	3	0.0508%	98.00%	1005	2	100.00%	980	0	100.00%	1350	1	90.00%	1250	0	100.00%	1315	0	100.00%
27	5892	5890	2	0.0339%	92.67%	995	1	83.33%	970	0	96.67%	1335	0	96.67%	1255	1	90.00%	1335	0	96.67%
28	6017	6015	2	0.0332%	90.67%	1035	1	76.67%	1040	0	100.00%	1350	0	100.00%	1265	0	100.00%	1325	1	76.67%
29	5821	5815	6	0.1031%	96.67%	970	4	100.00%	980	1	100.00%	1340	1	100.00%	1200	0	83.33%	1325	0	100.00%
30	5806	5805	1	0.0172%	95.33%	1035	1	100.00%	1030	0	100.00%	1340	0	100.00%	1225	0	76.67%	1175	0	100.00%
31	5682	5675	7	0.1232%	84.67%	980	1	100.00%	940	0	100.00%	1290	4	93.33%	1175	1	30.00%	1290	1	100.00%
32	5989	5985	4	0.0668%	100.00%	1000	1	100.00%	980	1	100.00%	1305	0	100.00%	1225	1	100.00%	1475	1	100.00%
33	5706	5705	1	0.0175%	92.00%	1020	0	100.00%	1005	0	100.00%	1310	1	100.00%	1225	0	60.00%	1145	0	100.00%
34	6078	6075	3	0.0494%	100.00%	975	2	100.00%	965	1	100.00%	1355	0	100.00%	1255	0	100.00%	1525	0	100.00%
35	6043	6040	3	0.0496%	100.00%	1025	1	100.00%	1030	0	100.00%	1370	0	100.00%	1270	2	100.00%	1345	0	100.00%
36	5981	5980	1	0.0167%	100.00%	1030	0	100.00%	965	1	100.00%	1340	0	100.00%	1320	0	100.00%	1325	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-3 Packet loss; Power Off; Distance 1.5 meters

Power Level: Off
Distance 1.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5722	5721	1	0.0175%	98.67%	1047	0	100.00%	1028	0	100.00%	1220	0	100.00%	1213	0	100.00%	1213	1	93.33%
1	6002	6002	0	0.0000%	100.00%	1105	0	100.00%	1103	0	100.00%	1263	0	100.00%	1253	0	100.00%	1278	0	100.00%
2	5942	5942	0	0.0000%	99.33%	1101	0	96.67%	1088	0	100.00%	1270	0	100.00%	1220	0	100.00%	1263	0	100.00%
3	6060	6060	0	0.0000%	98.00%	1119	0	90.00%	1098	0	100.00%	1280	0	100.00%	1280	0	100.00%	1283	0	100.00%
4	5880	5880	0	0.0000%	100.00%	1092	0	100.00%	1050	0	100.00%	1280	0	100.00%	1235	0	100.00%	1223	0	100.00%
5	5959	5959	0	0.0000%	100.00%	1118	0	100.00%	1093	0	100.00%	1285	0	100.00%	1258	0	100.00%	1205	0	100.00%
6	6212	6212	0	0.0000%	96.67%	1131	0	90.00%	1100	0	100.00%	1298	0	100.00%	1295	0	93.33%	1388	0	100.00%
7	5986	5985	1	0.0167%	100.00%	1094	0	100.00%	1065	0	100.00%	1285	0	100.00%	1263	0	100.00%	1278	1	100.00%
8	6072	6072	0	0.0000%	100.00%	1124	0	100.00%	1105	0	100.00%	1290	0	100.00%	1265	0	100.00%	1288	0	100.00%
9	5967	5967	0	0.0000%	98.00%	1089	0	100.00%	1085	0	100.00%	1273	0	100.00%	1255	0	100.00%	1265	0	90.00%
10	6161	6161	0	0.0000%	94.00%	1137	0	90.00%	1128	0	100.00%	1298	0	90.00%	1288	0	96.67%	1310	0	93.33%
11	6056	6056	0	0.0000%	93.33%	1110	0	96.67%	1088	0	70.00%	1285	0	100.00%	1278	0	100.00%	1295	0	100.00%
12	6122	6122	0	0.0000%	99.33%	1124	0	100.00%	1110	0	100.00%	1290	0	100.00%	1293	0	100.00%	1305	0	96.67%
13	5932	5932	0	0.0000%	100.00%	1093	0	100.00%	1075	0	100.00%	1268	0	100.00%	1243	0	100.00%	1253	0	100.00%
14	6003	6002	1	0.0167%	96.67%	1096	1	93.33%	1085	0	90.00%	1283	0	100.00%	1265	0	100.00%	1273	0	100.00%
15	6035	6034	1	0.0166%	97.33%	1121	0	100.00%	1105	0	86.67%	1290	0	100.00%	1235	1	100.00%	1283	0	100.00%
16	6074	6073	1	0.0165%	100.00%	1110	0	100.00%	1113	0	100.00%	1290	0	100.00%	1270	1	100.00%	1290	0	100.00%
17	6059	6059	0	0.0000%	100.00%	1116	0	100.00%	1078	0	100.00%	1295	0	100.00%	1285	0	100.00%	1285	0	100.00%
18	5951	5951	0	0.0000%	90.67%	1090	0	100.00%	1063	0	53.33%	1285	0	100.00%	1248	0	100.00%	1265	0	100.00%
19	6109	6109	0	0.0000%	96.00%	1124	0	100.00%	1110	0	100.00%	1285	0	100.00%	1280	0	83.33%	1310	0	96.67%
20	6002	6002	0	0.0000%	100.00%	1093	0	100.00%	1105	0	100.00%	1278	0	100.00%	1253	0	100.00%	1273	0	100.00%
21	6036	6036	0	0.0000%	100.00%	1120	0	100.00%	1070	0	100.00%	1303	0	100.00%	1273	0	100.00%	1270	0	100.00%
22	6000	6000	0	0.0000%	98.00%	1091	0	96.67%	1078	0	100.00%	1288	0	100.00%	1268	0	93.33%	1275	0	100.00%
23	6083	6083	0	0.0000%	99.33%	1124	0	96.67%	1103	0	100.00%	1283	0	100.00%	1278	0	100.00%	1295	0	100.00%
24	6080	6080	0	0.0000%	100.00%	1119	0	100.00%	1115	0	100.00%	1293	0	100.00%	1268	0	100.00%	1285	0	100.00%
25	6006	6006	0	0.0000%	96.00%	1093	0	100.00%	1090	0	90.00%	1293	0	100.00%	1255	0	90.00%	1275	0	100.00%
26	6027	6027	0	0.0000%	100.00%	1107	0	100.00%	1080	0	100.00%	1295	0	100.00%	1265	0	100.00%	1280	0	100.00%
27	5915	5915	0	0.0000%	82.00%	1081	0	100.00%	1058	0	56.67%	1258	0	100.00%	1263	0	53.33%	1255	0	100.00%
28	6103	6103	0	0.0000%	92.67%	1124	0	100.00%	1115	0	100.00%	1288	0	100.00%	1293	0	63.33%	1283	0	100.00%
29	5946	5945	1	0.0168%	84.67%	1081	1	100.00%	1083	0	100.00%	1275	0	93.33%	1233	0	33.33%	1273	0	96.67%
30	6009	6009	0	0.0000%	84.67%	1127	0	90.00%	1118	0	100.00%	1288	0	100.00%	1258	0	33.33%	1218	0	100.00%
31	5810	5809	1	0.0172%	88.67%	1073	0	100.00%	1048	0	100.00%	1253	1	100.00%	1205	0	43.33%	1230	0	100.00%
32	6026	6026	0	0.0000%	99.33%	1095	0	100.00%	1073	0	100.00%	1270	0	100.00%	1243	0	100.00%	1345	0	96.67%
33	6008	6008	0	0.0000%	88.00%	1130	0	100.00%	1105	0	100.00%	1290	0	100.00%	1273	0	40.00%	1210	0	100.00%
34	6084	6084	0	0.0000%	99.33%	1085	0	100.00%	1075	0	100.00%	1288	0	100.00%	1253	0	96.67%	1383	0	100.00%
35	6154	6154	0	0.0000%	100.00%	1128	0	100.00%	1125	0	100.00%	1308	0	100.00%	1290	0	100.00%	1303	0	100.00%
36	6058	6058	0	0.0000%	98.00%	1117	0	100.00%	1070	0	100.00%	1298	0	100.00%	1300	0	90.00%	1273	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-4 Packet loss; Power Off; Distance 2.0 meters

Power Level: Off
Distance 2.0m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	6230	6230	0	0.0000%	100.00%	1310	0	100.00%	1270	0	100.00%	1240	0	100.00%	1235	0	100.00%	1175	0	100.00%
1	6482	6480	2	0.0309%	98.00%	1350	0	100.00%	1325	0	100.00%	1295	0	93.33%	1275	0	100.00%	1235	2	96.67%
2	6412	6410	2	0.0312%	98.67%	1355	2	100.00%	1305	0	100.00%	1280	0	100.00%	1250	0	100.00%	1220	0	93.33%
3	6519	6515	4	0.0614%	99.33%	1345	0	100.00%	1305	2	100.00%	1305	0	100.00%	1300	2	100.00%	1260	0	96.67%
4	6415	6415	0	0.0000%	100.00%	1310	0	100.00%	1315	0	100.00%	1260	0	100.00%	1295	0	100.00%	1235	0	100.00%
5	6412	6410	2	0.0312%	98.67%	1330	0	100.00%	1320	0	100.00%	1275	0	100.00%	1285	0	100.00%	1200	2	93.33%
6	6636	6630	6	0.0904%	96.00%	1365	2	100.00%	1345	0	100.00%	1330	2	96.67%	1315	0	83.33%	1275	2	100.00%
7	6468	6460	8	0.1237%	99.33%	1330	2	100.00%	1305	4	100.00%	1315	0	100.00%	1290	0	100.00%	1220	2	96.67%
8	6529	6525	4	0.0613%	98.67%	1350	0	100.00%	1325	2	100.00%	1310	0	93.33%	1285	0	100.00%	1255	2	100.00%
9	6466	6460	6	0.0928%	97.33%	1360	0	93.33%	1290	4	100.00%	1280	0	93.33%	1265	2	100.00%	1265	0	100.00%
10	6529	6525	4	0.0613%	99.33%	1370	2	100.00%	1300	2	100.00%	1285	0	96.67%	1300	0	100.00%	1270	0	100.00%
11	6546	6540	6	0.0917%	96.67%	1345	2	100.00%	1320	0	83.33%	1305	2	100.00%	1285	0	100.00%	1285	2	100.00%
12	6480	6480	0	0.0000%	92.67%	1345	0	100.00%	1305	0	63.33%	1310	0	100.00%	1265	0	100.00%	1255	0	100.00%
13	6469	6465	4	0.0618%	97.33%	1340	0	100.00%	1305	0	86.67%	1315	0	100.00%	1295	2	100.00%	1210	2	100.00%
14	6492	6490	2	0.0308%	92.00%	1340	2	96.67%	1310	0	63.33%	1280	0	100.00%	1320	0	100.00%	1240	0	100.00%
15	6484	6480	4	0.0617%	98.67%	1355	2	100.00%	1330	2	93.33%	1285	0	100.00%	1295	0	100.00%	1215	0	100.00%
16	6585	6585	0	0.0000%	100.00%	1360	0	100.00%	1345	0	100.00%	1315	0	100.00%	1315	0	100.00%	1250	0	100.00%
17	6552	6550	2	0.0305%	100.00%	1345	0	100.00%	1340	0	100.00%	1305	0	100.00%	1290	0	100.00%	1270	2	100.00%
18	6465	6465	0	0.0000%	89.33%	1330	0	100.00%	1315	0	46.67%	1300	0	100.00%	1295	0	100.00%	1225	0	100.00%
19	6506	6500	6	0.0922%	94.67%	1360	0	96.67%	1300	0	100.00%	1325	0	100.00%	1275	2	76.67%	1240	4	100.00%
20	6439	6435	4	0.0621%	98.67%	1340	4	100.00%	1295	0	100.00%	1285	0	93.33%	1270	0	100.00%	1245	0	100.00%
21	6457	6455	2	0.0310%	96.67%	1340	0	100.00%	1315	0	83.33%	1275	0	100.00%	1280	2	100.00%	1245	0	100.00%
22	6540	6540	0	0.0000%	98.00%	1340	0	90.00%	1305	0	100.00%	1310	0	100.00%	1320	0	100.00%	1265	0	100.00%
23	6546	6540	6	0.0917%	100.00%	1345	2	100.00%	1335	2	100.00%	1315	0	100.00%	1290	0	100.00%	1255	2	100.00%
24	6567	6565	2	0.0305%	97.33%	1355	0	100.00%	1325	0	100.00%	1300	2	100.00%	1305	0	93.33%	1280	0	93.33%
25	6479	6475	4	0.0617%	98.00%	1350	2	96.67%	1320	0	100.00%	1290	0	100.00%	1285	0	93.33%	1230	2	100.00%
26	6469	6465	4	0.0618%	98.67%	1355	2	100.00%	1330	0	100.00%	1290	0	100.00%	1270	2	100.00%	1220	0	93.33%
27	6474	6470	4	0.0618%	87.33%	1340	0	90.00%	1310	0	70.00%	1305	0	100.00%	1290	2	80.00%	1225	2	96.67%
28	6501	6495	6	0.0923%	98.00%	1330	2	100.00%	1315	0	100.00%	1310	0	96.67%	1285	2	96.67%	1255	2	96.67%
29	6379	6375	4	0.0627%	85.33%	1325	2	100.00%	1290	0	100.00%	1280	0	100.00%	1265	2	26.67%	1215	0	100.00%
30	6479	6475	4	0.0617%	95.33%	1340	0	100.00%	1320	2	100.00%	1290	0	100.00%	1270	0	83.33%	1255	2	93.33%
31	6345	6345	0	0.0000%	97.33%	1320	0	93.33%	1290	0	100.00%	1250	0	100.00%	1280	0	93.33%	1205	0	100.00%
32	6539	6535	4	0.0612%	98.67%	1355	0	100.00%	1335	0	100.00%	1300	0	100.00%	1295	0	100.00%	1250	4	93.33%
33	6620	6620	0	0.0000%	90.00%	1365	0	100.00%	1335	0	100.00%	1325	0	96.67%	1310	0	60.00%	1285	0	93.33%
34	6447	6445	2	0.0310%	97.33%	1345	0	96.67%	1315	0	100.00%	1290	0	100.00%	1265	2	100.00%	1230	0	90.00%
35	6559	6555	4	0.0610%	100.00%	1355	2	100.00%	1330	0	100.00%	1305	0	100.00%	1310	2	100.00%	1255	0	100.00%
36	6512	6510	2	0.0307%	100.00%	1340	0	100.00%	1320	0	100.00%	1285	0	100.00%	1295	0	100.00%	1270	2	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-5 Packet loss; Power Off; Distance 2.5 meters

Power Level: Off
Distance 2.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5774	5774	0	0.0000%	100.00%	1156	0	100.00%	1051	0	100.00%	1202	0	100.00%	1171	0	100.00%	1194	0	100.00%
1	6018	6017	1	0.0166%	94.00%	1197	0	86.67%	1114	1	100.00%	1241	0	100.00%	1221	0	100.00%	1244	0	83.33%
2	6000	6000	0	0.0000%	100.00%	1203	0	100.00%	1111	0	100.00%	1245	0	100.00%	1202	0	100.00%	1239	0	100.00%
3	6132	6131	1	0.0163%	99.33%	1229	0	100.00%	1131	0	96.67%	1272	1	100.00%	1240	0	100.00%	1259	0	100.00%
4	5909	5908	1	0.0169%	100.00%	1173	1	100.00%	1105	0	100.00%	1247	0	100.00%	1177	0	100.00%	1206	0	100.00%
5	6055	6055	0	0.0000%	100.00%	1221	0	100.00%	1124	0	100.00%	1252	0	100.00%	1221	0	100.00%	1237	0	100.00%
6	6210	6208	2	0.0322%	100.00%	1233	0	100.00%	1145	0	100.00%	1259	1	100.00%	1250	0	100.00%	1321	1	100.00%
7	5986	5983	3	0.0501%	100.00%	1192	3	100.00%	1102	0	100.00%	1237	0	100.00%	1206	0	100.00%	1246	0	100.00%
8	6139	6137	2	0.0326%	100.00%	1224	0	100.00%	1142	1	100.00%	1270	0	100.00%	1225	0	100.00%	1276	1	100.00%
9	6011	6011	0	0.0000%	100.00%	1184	0	100.00%	1117	0	100.00%	1256	0	100.00%	1207	0	100.00%	1247	0	100.00%
10	6229	6229	0	0.0000%	100.00%	1243	0	100.00%	1151	0	100.00%	1291	0	100.00%	1254	0	100.00%	1290	0	100.00%
11	6082	6077	5	0.0822%	92.67%	1205	2	100.00%	1131	1	100.00%	1255	1	63.33%	1236	0	100.00%	1250	1	100.00%
12	6135	6135	0	0.0000%	86.00%	1217	0	100.00%	1135	0	70.00%	1260	0	60.00%	1251	0	100.00%	1272	0	100.00%
13	6050	6050	0	0.0000%	85.33%	1209	0	100.00%	1115	0	70.00%	1256	0	56.67%	1219	0	100.00%	1251	0	100.00%
14	6015	6015	0	0.0000%	82.67%	1210	0	100.00%	1105	0	63.33%	1251	0	50.00%	1210	0	100.00%	1239	0	100.00%
15	6132	6131	1	0.0163%	97.33%	1233	0	100.00%	1135	1	100.00%	1275	0	86.67%	1222	0	100.00%	1266	0	100.00%
16	6114	6113	1	0.0164%	100.00%	1202	1	100.00%	1159	0	100.00%	1270	0	100.00%	1235	0	100.00%	1247	0	100.00%
17	6086	6084	2	0.0329%	100.00%	1218	0	100.00%	1121	1	100.00%	1255	0	100.00%	1235	0	100.00%	1255	1	100.00%
18	6016	6015	1	0.0166%	90.67%	1200	0	100.00%	1109	1	53.33%	1250	0	100.00%	1216	0	100.00%	1240	0	100.00%
19	6132	6129	3	0.0489%	95.33%	1217	2	100.00%	1125	1	100.00%	1265	0	100.00%	1235	0	76.67%	1287	0	100.00%
20	6059	6057	2	0.0330%	100.00%	1199	0	100.00%	1120	0	100.00%	1261	0	100.00%	1221	0	100.00%	1256	2	100.00%
21	6068	6066	2	0.0330%	96.00%	1217	1	100.00%	1107	1	80.00%	1266	0	100.00%	1226	0	100.00%	1250	0	100.00%
22	6061	6060	1	0.0165%	100.00%	1200	0	100.00%	1126	0	100.00%	1251	1	100.00%	1231	0	100.00%	1252	0	100.00%
23	6160	6157	3	0.0487%	100.00%	1217	0	100.00%	1141	2	100.00%	1276	1	100.00%	1256	0	100.00%	1267	0	100.00%
24	6080	6078	2	0.0329%	100.00%	1214	0	100.00%	1127	1	100.00%	1256	0	100.00%	1231	0	100.00%	1250	1	100.00%
25	6029	6029	0	0.0000%	97.33%	1204	0	100.00%	1107	0	86.67%	1261	0	100.00%	1217	0	100.00%	1240	0	100.00%
26	6044	6044	0	0.0000%	97.33%	1208	0	100.00%	1100	0	86.67%	1262	0	100.00%	1222	0	100.00%	1252	0	100.00%
27	5959	5958	1	0.0168%	93.33%	1180	0	90.00%	1111	0	76.67%	1249	1	100.00%	1206	0	100.00%	1212	0	100.00%
28	6150	6148	2	0.0325%	98.00%	1232	0	90.00%	1140	0	100.00%	1271	1	100.00%	1251	0	100.00%	1254	1	100.00%
29	5998	5998	0	0.0000%	96.67%	1205	0	100.00%	1104	0	100.00%	1237	0	100.00%	1206	0	83.33%	1246	0	100.00%
30	6113	6108	5	0.0818%	99.33%	1223	1	100.00%	1131	4	100.00%	1279	0	100.00%	1239	0	96.67%	1236	0	100.00%
31	5852	5850	2	0.0342%	94.67%	1159	0	100.00%	1066	2	100.00%	1231	0	100.00%	1177	0	73.33%	1217	0	100.00%
32	6069	6067	2	0.0330%	100.00%	1205	0	100.00%	1109	1	100.00%	1252	0	100.00%	1214	0	100.00%	1287	1	100.00%
33	6090	6090	0	0.0000%	100.00%	1215	0	100.00%	1135	0	100.00%	1267	0	100.00%	1241	0	100.00%	1232	0	100.00%
34	6031	6031	0	0.0000%	100.00%	1180	0	100.00%	1105	0	100.00%	1251	0	100.00%	1204	0	100.00%	1291	0	100.00%
35	6228	6226	2	0.0321%	100.00%	1241	0	100.00%	1155	1	100.00%	1274	1	100.00%	1267	0	100.00%	1289	0	100.00%
36	6113	6112	1	0.0164%	100.00%	1213	1	100.00%	1112	0	100.00%	1276	0	100.00%	1252	0	100.00%	1259	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-6 Packet loss; Power Off; Distance 3.0 meters

Power Level: Off
Distance 3.0m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5943	5943	0	0.0000%	99.33%	1243	0	100.00%	1132	0	100.00%	1209	0	96.67%	1178	0	100.00%	1181	0	100.00%
1	6177	6176	1	0.0162%	100.00%	1279	0	100.00%	1188	1	100.00%	1252	0	100.00%	1228	0	100.00%	1229	0	100.00%
2	6154	6154	0	0.0000%	100.00%	1287	0	100.00%	1183	0	100.00%	1248	0	100.00%	1212	0	100.00%	1224	0	100.00%
3	6282	6281	1	0.0159%	98.00%	1304	0	100.00%	1200	0	90.00%	1280	1	100.00%	1246	0	100.00%	1251	0	100.00%
4	6087	6086	1	0.0164%	100.00%	1246	1	100.00%	1193	0	100.00%	1240	0	100.00%	1197	0	100.00%	1210	0	100.00%
5	6205	6205	0	0.0000%	100.00%	1292	0	100.00%	1199	0	100.00%	1249	0	100.00%	1230	0	100.00%	1235	0	100.00%
6	6347	6345	2	0.0315%	100.00%	1311	0	100.00%	1226	0	100.00%	1269	1	100.00%	1256	0	100.00%	1283	1	100.00%
7	6145	6141	4	0.0651%	100.00%	1270	3	100.00%	1182	1	100.00%	1247	0	100.00%	1215	0	100.00%	1227	0	100.00%
8	6288	6286	2	0.0318%	100.00%	1299	0	100.00%	1215	1	100.00%	1276	0	100.00%	1231	0	100.00%	1265	1	100.00%
9	6175	6174	1	0.0162%	100.00%	1274	0	100.00%	1185	1	100.00%	1258	0	100.00%	1210	0	100.00%	1247	0	100.00%
10	6350	6350	0	0.0000%	96.67%	1321	0	100.00%	1208	0	100.00%	1287	0	83.33%	1258	0	100.00%	1276	0	100.00%
11	6241	6236	5	0.0801%	98.67%	1283	2	100.00%	1208	1	93.33%	1261	1	100.00%	1238	0	100.00%	1246	1	100.00%
12	6253	6253	0	0.0000%	92.00%	1290	0	100.00%	1200	0	60.00%	1266	0	100.00%	1242	0	100.00%	1255	0	100.00%
13	6227	6227	0	0.0000%	92.00%	1291	0	100.00%	1191	0	60.00%	1272	0	100.00%	1236	0	100.00%	1237	0	100.00%
14	6177	6177	0	0.0000%	91.33%	1291	0	100.00%	1180	0	56.67%	1250	0	100.00%	1228	0	100.00%	1228	0	100.00%
15	6280	6279	1	0.0159%	97.33%	1311	0	100.00%	1210	1	93.33%	1273	0	93.33%	1242	0	100.00%	1243	0	100.00%
16	6284	6283	1	0.0159%	100.00%	1285	1	100.00%	1236	0	100.00%	1278	0	100.00%	1250	0	100.00%	1234	0	100.00%
17	6248	6246	2	0.0320%	100.00%	1294	0	100.00%	1208	1	100.00%	1258	0	100.00%	1236	0	100.00%	1250	1	100.00%
18	6187	6186	1	0.0162%	86.00%	1280	0	100.00%	1193	1	30.00%	1255	0	100.00%	1232	0	100.00%	1226	0	100.00%
19	6262	6258	4	0.0639%	98.67%	1295	2	100.00%	1188	1	100.00%	1278	0	100.00%	1233	0	93.33%	1264	1	100.00%
20	6204	6201	3	0.0484%	100.00%	1281	1	100.00%	1183	0	100.00%	1263	0	100.00%	1227	0	100.00%	1247	2	100.00%
21	6207	6205	2	0.0322%	96.00%	1290	1	100.00%	1189	1	80.00%	1257	0	100.00%	1228	0	100.00%	1241	0	100.00%
22	6241	6240	1	0.0160%	100.00%	1283	0	100.00%	1202	0	100.00%	1258	1	100.00%	1248	0	100.00%	1249	0	100.00%
23	6312	6309	3	0.0475%	100.00%	1290	0	100.00%	1218	2	100.00%	1287	1	100.00%	1260	0	100.00%	1254	0	100.00%
24	6241	6239	2	0.0320%	100.00%	1293	0	100.00%	1197	1	100.00%	1258	0	100.00%	1243	0	100.00%	1248	1	100.00%
25	6185	6185	0	0.0000%	93.33%	1289	0	100.00%	1184	0	66.67%	1260	0	100.00%	1227	0	100.00%	1225	0	100.00%
26	6190	6190	0	0.0000%	92.00%	1291	0	100.00%	1183	0	60.00%	1260	0	100.00%	1224	0	100.00%	1232	0	100.00%
27	6143	6142	1	0.0163%	81.33%	1266	0	80.00%	1195	0	43.33%	1264	1	100.00%	1215	0	100.00%	1202	0	83.33%
28	6278	6276	2	0.0319%	94.00%	1300	0	83.33%	1206	0	100.00%	1278	1	100.00%	1248	0	100.00%	1244	1	86.67%
29	6142	6142	0	0.0000%	84.67%	1286	0	100.00%	1173	0	56.67%	1239	0	100.00%	1217	0	66.67%	1227	0	100.00%
30	6267	6262	5	0.0798%	100.00%	1294	1	100.00%	1198	4	100.00%	1279	0	100.00%	1243	0	100.00%	1248	0	100.00%
31	6031	6029	2	0.0332%	94.00%	1241	0	100.00%	1147	2	100.00%	1230	0	100.00%	1202	0	70.00%	1209	0	100.00%
32	6238	6235	3	0.0481%	100.00%	1291	0	100.00%	1196	1	100.00%	1262	0	100.00%	1231	0	100.00%	1255	2	100.00%
33	6293	6293	0	0.0000%	100.00%	1293	0	100.00%	1211	0	100.00%	1279	0	100.00%	1253	0	100.00%	1257	0	100.00%
34	6151	6151	0	0.0000%	99.33%	1266	0	100.00%	1185	0	96.67%	1252	0	100.00%	1208	0	100.00%	1240	0	100.00%
35	6362	6360	2	0.0314%	100.00%	1317	0	100.00%	1223	1	100.00%	1273	1	100.00%	1274	0	100.00%	1273	0	100.00%
36	6263	6262	1	0.0160%	100.00%	1287	1	100.00%	1195	0	100.00%	1272	0	100.00%	1250	0	100.00%	1258	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-7 Packet loss; Power Off; Distance 3.5 meters

Power Level: Off
Distance 3.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5791	5790	1	0.0173%	96.67%	1101	0	100.00%	1077	0	90.00%	1213	0	100.00%	1207	0	100.00%	1192	1	93.33%
1	6062	6062	0	0.0000%	99.33%	1154	0	96.67%	1147	0	100.00%	1259	0	100.00%	1247	0	100.00%	1255	0	100.00%
2	6000	6000	0	0.0000%	98.00%	1153	0	100.00%	1130	0	100.00%	1261	0	100.00%	1216	0	100.00%	1240	0	90.00%
3	6115	6115	0	0.0000%	89.33%	1164	0	100.00%	1138	0	46.67%	1275	0	100.00%	1273	0	100.00%	1265	0	100.00%
4	5955	5955	0	0.0000%	100.00%	1135	0	100.00%	1105	0	100.00%	1263	0	100.00%	1238	0	100.00%	1214	0	100.00%
5	6013	6013	0	0.0000%	98.00%	1159	0	100.00%	1138	0	96.67%	1271	0	100.00%	1253	0	100.00%	1192	0	93.33%
6	6259	6258	1	0.0160%	97.33%	1178	0	100.00%	1150	0	90.00%	1294	1	100.00%	1288	0	100.00%	1348	0	96.67%
7	6047	6045	2	0.0331%	100.00%	1141	0	100.00%	1113	1	100.00%	1281	0	100.00%	1258	0	100.00%	1252	1	100.00%
8	6127	6126	1	0.0163%	99.33%	1169	0	100.00%	1148	0	100.00%	1283	0	100.00%	1258	0	100.00%	1268	1	96.67%
9	6034	6032	2	0.0331%	100.00%	1145	0	100.00%	1125	1	100.00%	1263	0	100.00%	1246	1	100.00%	1253	0	100.00%
10	6193	6192	1	0.0161%	93.33%	1183	0	100.00%	1159	1	100.00%	1283	0	73.33%	1279	0	100.00%	1288	0	93.33%
11	6119	6118	1	0.0163%	90.67%	1157	0	100.00%	1134	0	66.67%	1278	1	100.00%	1268	0	86.67%	1281	0	100.00%
12	6153	6153	0	0.0000%	89.33%	1168	0	100.00%	1147	0	53.33%	1283	0	100.00%	1274	0	100.00%	1281	0	93.33%
13	6006	6006	0	0.0000%	91.33%	1143	0	100.00%	1121	0	56.67%	1268	0	100.00%	1244	0	100.00%	1230	0	100.00%
14	6066	6065	1	0.0165%	83.33%	1145	1	100.00%	1130	0	23.33%	1270	0	100.00%	1267	0	100.00%	1253	0	93.33%
15	6089	6087	2	0.0328%	94.67%	1168	0	100.00%	1150	1	83.33%	1277	0	96.67%	1238	1	100.00%	1254	0	93.33%
16	6145	6143	2	0.0325%	100.00%	1161	0	100.00%	1159	0	100.00%	1285	0	100.00%	1270	2	100.00%	1268	0	100.00%
17	6125	6125	0	0.0000%	100.00%	1162	0	100.00%	1132	0	100.00%	1286	0	100.00%	1275	0	100.00%	1270	0	100.00%
18	6020	6020	0	0.0000%	84.67%	1138	0	100.00%	1114	0	23.33%	1277	0	100.00%	1248	0	100.00%	1243	0	100.00%
19	6149	6148	1	0.0163%	100.00%	1171	0	100.00%	1146	0	100.00%	1283	0	100.00%	1267	0	100.00%	1281	1	100.00%
20	6052	6051	1	0.0165%	100.00%	1143	1	100.00%	1141	0	100.00%	1268	0	100.00%	1245	0	100.00%	1254	0	100.00%
21	6082	6082	0	0.0000%	95.33%	1163	0	100.00%	1120	0	76.67%	1284	0	100.00%	1263	0	100.00%	1252	0	100.00%
22	6077	6077	0	0.0000%	100.00%	1142	0	100.00%	1123	0	100.00%	1282	0	100.00%	1269	0	100.00%	1261	0	100.00%
23	6137	6137	0	0.0000%	100.00%	1167	0	100.00%	1149	0	100.00%	1279	0	100.00%	1269	0	100.00%	1273	0	100.00%
24	6142	6142	0	0.0000%	100.00%	1166	0	100.00%	1156	0	100.00%	1283	0	100.00%	1265	0	100.00%	1272	0	100.00%
25	6064	6064	0	0.0000%	86.67%	1145	0	100.00%	1136	0	36.67%	1280	0	100.00%	1251	0	100.00%	1252	0	96.67%
26	6080	6078	2	0.0329%	90.67%	1157	1	100.00%	1131	0	53.33%	1282	0	100.00%	1255	1	100.00%	1253	0	100.00%
27	5995	5995	0	0.0000%	88.67%	1134	0	93.33%	1109	0	50.00%	1258	0	100.00%	1258	0	100.00%	1236	0	100.00%
28	6144	6142	2	0.0326%	98.67%	1164	0	100.00%	1153	0	100.00%	1282	0	100.00%	1279	1	100.00%	1264	1	93.33%
29	5995	5994	1	0.0167%	74.00%	1130	1	100.00%	1123	0	46.67%	1265	0	100.00%	1229	0	33.33%	1247	0	90.00%
30	6067	6067	0	0.0000%	100.00%	1169	0	100.00%	1157	0	100.00%	1277	0	100.00%	1249	0	100.00%	1215	0	100.00%
31	5885	5884	1	0.0170%	91.33%	1123	0	100.00%	1097	0	100.00%	1240	1	100.00%	1212	0	56.67%	1212	0	100.00%
32	6096	6095	1	0.0164%	100.00%	1148	0	100.00%	1127	0	100.00%	1266	0	100.00%	1244	0	100.00%	1310	1	100.00%
33	6102	6102	0	0.0000%	95.33%	1177	0	100.00%	1151	0	100.00%	1287	0	100.00%	1270	0	76.67%	1217	0	100.00%
34	6116	6115	1	0.0164%	97.33%	1138	0	100.00%	1123	0	100.00%	1277	0	100.00%	1244	1	86.67%	1333	0	100.00%
35	6196	6195	1	0.0161%	98.67%	1173	0	100.00%	1165	0	100.00%	1295	0	100.00%	1283	1	100.00%	1279	0	93.33%
36	6112	6112	0	0.0000%	100.00%	1161	0	100.00%	1121	0	100.00%	1283	0	100.00%	1287	0	100.00%	1260	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-8 Packet loss; Power Off; Distance 4.0 meters

Power Level: Off
Distance 4.0m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5887	5887	0	0.0000%	100.00%	1210	0	100.00%	1116	0	100.00%	1204	0	100.00%	1179	0	100.00%	1178	0	100.00%
1	6127	6127	0	0.0000%	96.67%	1249	0	83.33%	1174	0	100.00%	1248	0	100.00%	1227	0	100.00%	1229	0	100.00%
2	6097	6097	0	0.0000%	98.67%	1255	0	100.00%	1167	0	100.00%	1245	0	96.67%	1208	0	96.67%	1222	0	100.00%
3	6222	6222	0	0.0000%	98.67%	1271	0	100.00%	1182	0	100.00%	1274	0	100.00%	1246	0	100.00%	1249	0	93.33%
4	6034	6034	0	0.0000%	98.00%	1218	0	100.00%	1170	0	90.00%	1240	0	100.00%	1200	0	100.00%	1206	0	100.00%
5	6140	6140	0	0.0000%	96.67%	1260	0	100.00%	1182	0	96.67%	1248	0	100.00%	1229	0	86.67%	1221	0	100.00%
6	6304	6302	2	0.0317%	94.00%	1279	0	100.00%	1206	0	100.00%	1269	1	90.00%	1257	0	80.00%	1291	1	100.00%
7	6099	6096	3	0.0492%	98.00%	1239	2	100.00%	1163	1	93.33%	1249	0	100.00%	1218	0	100.00%	1227	0	96.67%
8	6230	6228	2	0.0321%	100.00%	1268	0	100.00%	1197	1	100.00%	1272	0	100.00%	1231	0	100.00%	1260	1	100.00%
9	6121	6120	1	0.0163%	100.00%	1243	0	100.00%	1168	1	100.00%	1254	0	100.00%	1212	0	100.00%	1243	0	100.00%
10	6292	6292	0	0.0000%	97.33%	1288	0	100.00%	1193	0	100.00%	1281	0	86.67%	1257	0	100.00%	1273	0	100.00%
11	6191	6187	4	0.0646%	78.00%	1253	2	100.00%	1188	0	100.00%	1259	1	56.67%	1239	0	33.33%	1248	1	100.00%
12	6207	6207	0	0.0000%	100.00%	1261	0	100.00%	1184	0	100.00%	1264	0	100.00%	1243	0	100.00%	1255	0	100.00%
13	6156	6156	0	0.0000%	100.00%	1256	0	100.00%	1172	0	100.00%	1266	0	100.00%	1232	0	100.00%	1230	0	100.00%
14	6130	6130	0	0.0000%	99.33%	1257	0	100.00%	1165	0	100.00%	1249	0	100.00%	1231	0	100.00%	1228	0	96.67%
15	6216	6215	1	0.0161%	91.33%	1277	0	100.00%	1193	1	100.00%	1269	0	56.67%	1236	0	100.00%	1240	0	100.00%
16	6228	6228	0	0.0000%	97.33%	1255	0	100.00%	1215	0	93.33%	1274	0	100.00%	1249	0	100.00%	1235	0	93.33%
17	6197	6196	1	0.0161%	100.00%	1262	0	100.00%	1188	0	100.00%	1258	0	100.00%	1239	0	100.00%	1249	1	100.00%
18	6126	6126	0	0.0000%	99.33%	1246	0	100.00%	1172	0	96.67%	1254	0	100.00%	1230	0	100.00%	1224	0	100.00%
19	6212	6210	2	0.0322%	98.00%	1265	1	100.00%	1174	0	93.33%	1274	0	100.00%	1235	0	100.00%	1262	1	96.67%
20	6146	6144	2	0.0325%	100.00%	1248	1	100.00%	1169	0	100.00%	1259	0	100.00%	1225	0	100.00%	1243	1	100.00%
21	6155	6155	0	0.0000%	98.67%	1260	0	100.00%	1170	0	96.67%	1257	0	100.00%	1230	0	100.00%	1238	0	96.67%
22	6182	6182	0	0.0000%	99.33%	1250	0	100.00%	1181	0	96.67%	1258	0	100.00%	1247	0	100.00%	1246	0	100.00%
23	6250	6248	2	0.0320%	100.00%	1260	0	100.00%	1199	2	100.00%	1280	0	100.00%	1257	0	100.00%	1252	0	100.00%
24	6194	6194	0	0.0000%	100.00%	1262	0	100.00%	1184	0	100.00%	1258	0	100.00%	1242	0	100.00%	1248	0	100.00%
25	6135	6135	0	0.0000%	100.00%	1255	0	100.00%	1169	0	100.00%	1259	0	100.00%	1227	0	100.00%	1225	0	100.00%
26	6141	6141	0	0.0000%	100.00%	1259	0	100.00%	1167	0	100.00%	1259	0	100.00%	1225	0	100.00%	1231	0	100.00%
27	6088	6088	0	0.0000%	95.33%	1235	0	83.33%	1173	0	100.00%	1258	0	100.00%	1218	0	100.00%	1204	0	93.33%
28	6225	6224	1	0.0161%	98.00%	1268	0	90.00%	1190	0	100.00%	1274	0	100.00%	1249	0	100.00%	1243	1	100.00%
29	6087	6087	0	0.0000%	94.67%	1250	0	100.00%	1158	0	96.67%	1239	0	100.00%	1214	0	83.33%	1226	0	93.33%
30	6201	6198	3	0.0484%	99.33%	1264	0	100.00%	1185	3	100.00%	1274	0	100.00%	1239	0	100.00%	1236	0	96.67%
31	5975	5974	1	0.0167%	87.33%	1212	0	100.00%	1132	1	100.00%	1227	0	100.00%	1199	0	46.67%	1204	0	90.00%
32	6183	6181	2	0.0323%	98.67%	1257	0	100.00%	1177	0	93.33%	1258	0	100.00%	1228	0	100.00%	1261	2	100.00%
33	6229	6229	0	0.0000%	94.67%	1265	0	100.00%	1194	0	100.00%	1275	0	100.00%	1251	0	73.33%	1244	0	100.00%
34	6117	6117	0	0.0000%	100.00%	1235	0	100.00%	1167	0	100.00%	1252	0	100.00%	1210	0	100.00%	1253	0	100.00%
35	6300	6300	0	0.0000%	100.00%	1283	0	100.00%	1206	0	100.00%	1272	0	100.00%	1270	0	100.00%	1269	0	100.00%
36	6206	6206	0	0.0000%	100.00%	1257	0	100.00%	1175	0	100.00%	1269	0	100.00%	1252	0	100.00%	1253	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-9 Packet loss; Power Off; Distance 4.5 meters

Power Level: Off
Distance 4.5m

	Total # Packets					Ovens: Microwave 1			Ovens: Microwave 2			Ovens: Microwave 3			Ovens: Microwave 4			Ovens: Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	7870	7870	0	0.0000%	90.00%	1145	0	100.00%	1578	0	50.00%	1719	0	100.00%	1731	0	100.00%	1697	0	100.00%
1	8215	8215	0	0.0000%	99.33%	1190	0	100.00%	1671	0	100.00%	1780	0	100.00%	1794	0	96.67%	1780	0	100.00%
2	8164	8164	0	0.0000%	98.67%	1193	0	93.33%	1659	0	100.00%	1781	0	100.00%	1757	0	100.00%	1774	0	100.00%
3	8339	8339	0	0.0000%	90.67%	1210	0	100.00%	1677	0	60.00%	1819	0	100.00%	1830	0	100.00%	1803	0	93.33%
4	8076	8076	0	0.0000%	98.67%	1166	0	100.00%	1627	0	100.00%	1792	0	100.00%	1761	0	93.33%	1730	0	100.00%
5	8249	8249	0	0.0000%	93.33%	1202	0	100.00%	1673	0	73.33%	1810	0	100.00%	1809	0	93.33%	1755	0	100.00%
6	8444	8443	1	0.0118%	98.00%	1219	0	93.33%	1691	0	100.00%	1822	1	100.00%	1840	0	100.00%	1871	0	96.67%
7	8195	8193	2	0.0244%	94.67%	1180	1	100.00%	1642	1	86.67%	1799	0	93.33%	1794	0	93.33%	1778	0	100.00%
8	8331	8330	1	0.0120%	100.00%	1210	0	100.00%	1696	0	100.00%	1824	0	100.00%	1792	0	100.00%	1808	1	100.00%
9	8190	8190	0	0.0000%	100.00%	1182	0	100.00%	1657	0	100.00%	1790	0	100.00%	1776	0	100.00%	1785	0	100.00%
10	8457	8457	0	0.0000%	97.33%	1227	0	96.67%	1710	0	100.00%	1834	0	100.00%	1837	0	90.00%	1849	0	100.00%
11	8297	8295	2	0.0241%	96.00%	1195	1	90.00%	1667	0	96.67%	1809	1	100.00%	1822	0	100.00%	1802	0	93.33%
12	8378	8378	0	0.0000%	96.00%	1205	0	100.00%	1691	0	80.00%	1814	0	100.00%	1840	0	100.00%	1828	0	100.00%
13	8206	8206	0	0.0000%	87.33%	1192	0	100.00%	1658	0	50.00%	1798	0	96.67%	1788	0	93.33%	1770	0	96.67%
14	8217	8217	0	0.0000%	90.00%	1193	0	100.00%	1650	0	50.00%	1794	0	100.00%	1801	0	100.00%	1779	0	100.00%
15	8298	8297	1	0.0121%	95.33%	1215	0	100.00%	1691	1	83.33%	1812	0	96.67%	1779	0	100.00%	1800	0	96.67%
16	8335	8334	1	0.0120%	98.00%	1196	0	100.00%	1704	0	100.00%	1814	0	90.00%	1821	1	100.00%	1799	0	100.00%
17	8294	8294	0	0.0000%	98.67%	1203	0	100.00%	1663	0	100.00%	1809	0	100.00%	1826	0	100.00%	1793	0	93.33%
18	8189	8189	0	0.0000%	88.67%	1184	0	100.00%	1643	0	50.00%	1807	0	93.33%	1790	0	100.00%	1765	0	100.00%
19	8356	8355	1	0.0120%	100.00%	1208	1	100.00%	1678	0	100.00%	1818	0	100.00%	1817	0	100.00%	1834	0	100.00%
20	8241	8239	2	0.0243%	98.67%	1186	1	93.33%	1671	0	100.00%	1797	0	100.00%	1791	0	100.00%	1794	1	100.00%
21	8273	8273	0	0.0000%	96.67%	1203	0	100.00%	1653	0	90.00%	1815	0	100.00%	1812	0	96.67%	1790	0	96.67%
22	8247	8247	0	0.0000%	100.00%	1187	0	100.00%	1661	0	100.00%	1806	0	100.00%	1810	0	100.00%	1783	0	100.00%
23	8374	8373	1	0.0119%	98.67%	1205	0	100.00%	1697	1	100.00%	1826	0	100.00%	1831	0	100.00%	1814	0	93.33%
24	8311	8311	0	0.0000%	92.00%	1204	0	100.00%	1688	0	60.00%	1804	0	100.00%	1816	0	100.00%	1799	0	100.00%
25	8234	8234	0	0.0000%	91.33%	1191	0	100.00%	1659	0	56.67%	1811	0	100.00%	1784	0	100.00%	1789	0	100.00%
26	8259	8259	0	0.0000%	100.00%	1198	0	100.00%	1655	0	100.00%	1814	0	100.00%	1799	0	100.00%	1793	0	100.00%
27	8107	8107	0	0.0000%	91.33%	1173	0	96.67%	1635	0	60.00%	1774	0	100.00%	1790	0	100.00%	1735	0	100.00%
28	8353	8352	1	0.0120%	98.67%	1210	0	93.33%	1686	0	100.00%	1815	0	100.00%	1842	0	100.00%	1799	1	100.00%
29	8165	8165	0	0.0000%	89.33%	1183	0	100.00%	1651	0	50.00%	1781	0	100.00%	1774	0	96.67%	1776	0	100.00%
30	8311	8309	2	0.0241%	100.00%	1208	0	100.00%	1690	2	100.00%	1819	0	100.00%	1810	0	100.00%	1782	0	100.00%
31	7999	7998	1	0.0125%	100.00%	1155	0	100.00%	1609	1	100.00%	1767	0	100.00%	1742	0	100.00%	1725	0	100.00%
32	8255	8254	1	0.0121%	98.67%	1193	0	100.00%	1652	0	100.00%	1803	0	93.33%	1785	0	100.00%	1821	1	100.00%
33	8366	8366	0	0.0000%	98.67%	1209	0	100.00%	1692	0	100.00%	1837	0	96.67%	1837	0	100.00%	1791	0	96.67%
34	8240	8240	0	0.0000%	94.67%	1175	0	100.00%	1655	0	83.33%	1798	0	93.33%	1772	0	96.67%	1840	0	100.00%
35	8446	8446	0	0.0000%	96.00%	1221	0	90.00%	1713	0	100.00%	1829	0	100.00%	1851	0	96.67%	1832	0	93.33%
36	8305	8305	0	0.0000%	98.67%	1200	0	100.00%	1654	0	100.00%	1828	0	96.67%	1829	0	100.00%	1794	0	96.67%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-10 Packet loss; Power Off; Distance 5.0 meters

Power Level: Off
Distance 5.0m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	5830	5830	0	0.0000%	95.33%	1265	0	93.33%	1075	0	86.67%	1185	0	100.00%	1130	0	96.67%	1175	0	100.00%
1	6037	6035	2	0.0331%	98.67%	1290	0	100.00%	1125	2	100.00%	1220	0	100.00%	1190	0	93.33%	1210	0	100.00%
2	6060	6060	0	0.0000%	100.00%	1305	0	100.00%	1135	0	100.00%	1220	0	100.00%	1185	0	100.00%	1215	0	100.00%
3	6207	6205	2	0.0322%	97.33%	1340	0	100.00%	1165	0	96.67%	1265	2	100.00%	1200	0	90.00%	1235	0	100.00%
4	5942	5940	2	0.0337%	98.67%	1255	2	100.00%	1160	0	100.00%	1215	0	100.00%	1120	0	100.00%	1190	0	93.33%
5	6155	6155	0	0.0000%	95.33%	1325	0	100.00%	1155	0	83.33%	1220	0	100.00%	1185	0	93.33%	1270	0	100.00%
6	6209	6205	4	0.0644%	99.33%	1335	0	100.00%	1190	0	100.00%	1220	2	100.00%	1205	0	100.00%	1255	2	96.67%
7	5991	5985	6	0.1002%	90.00%	1290	6	100.00%	1140	0	83.33%	1190	0	76.67%	1150	0	93.33%	1215	0	96.67%
8	6209	6205	4	0.0644%	99.33%	1325	0	100.00%	1180	2	100.00%	1250	0	100.00%	1185	0	96.67%	1265	2	100.00%
9	6060	6060	0	0.0000%	100.00%	1280	0	100.00%	1150	0	100.00%	1240	0	100.00%	1160	0	100.00%	1230	0	100.00%
10	6300	6300	0	0.0000%	96.67%	1350	0	93.33%	1175	0	100.00%	1285	0	100.00%	1220	0	100.00%	1270	0	90.00%
11	6110	6100	10	0.1637%	99.33%	1300	4	96.67%	1175	2	100.00%	1225	2	100.00%	1195	0	100.00%	1205	2	100.00%
12	6150	6150	0	0.0000%	100.00%	1310	0	100.00%	1160	0	100.00%	1230	0	100.00%	1210	0	100.00%	1240	0	100.00%
13	6170	6170	0	0.0000%	94.00%	1325	0	100.00%	1155	0	83.33%	1245	0	100.00%	1195	0	90.00%	1250	0	96.67%
14	6030	6030	0	0.0000%	95.33%	1325	0	100.00%	1125	0	83.33%	1220	0	100.00%	1155	0	100.00%	1205	0	93.33%
15	6232	6230	2	0.0321%	96.67%	1345	0	90.00%	1165	2	100.00%	1260	0	100.00%	1210	0	100.00%	1250	0	93.33%
16	6157	6155	2	0.0325%	100.00%	1295	2	100.00%	1205	0	100.00%	1250	0	100.00%	1200	0	100.00%	1205	0	100.00%
17	6114	6110	4	0.0654%	100.00%	1320	0	100.00%	1165	2	100.00%	1215	0	100.00%	1185	0	100.00%	1225	2	100.00%
18	6082	6080	2	0.0329%	94.67%	1310	0	96.67%	1155	2	83.33%	1215	0	100.00%	1185	0	93.33%	1215	0	100.00%
19	6156	6150	6	0.0975%	100.00%	1310	4	100.00%	1140	2	100.00%	1245	0	100.00%	1190	0	100.00%	1265	0	100.00%
20	6119	6115	4	0.0654%	98.67%	1305	0	93.33%	1135	0	100.00%	1245	0	100.00%	1190	0	100.00%	1240	4	100.00%
21	6104	6100	4	0.0655%	98.00%	1315	2	100.00%	1145	2	90.00%	1230	0	100.00%	1180	0	100.00%	1230	0	100.00%
22	6127	6125	2	0.0326%	98.67%	1310	0	100.00%	1175	0	100.00%	1215	2	100.00%	1195	0	100.00%	1230	0	93.33%
23	6241	6235	6	0.0961%	98.00%	1310	0	90.00%	1180	4	100.00%	1270	2	100.00%	1235	0	100.00%	1240	0	100.00%
24	6084	6080	4	0.0657%	94.67%	1310	0	100.00%	1140	2	83.33%	1220	0	100.00%	1195	0	90.00%	1215	2	100.00%
25	6055	6055	0	0.0000%	97.33%	1315	0	100.00%	1125	0	100.00%	1230	0	100.00%	1180	0	96.67%	1205	0	90.00%
26	6065	6065	0	0.0000%	100.00%	1310	0	100.00%	1120	0	100.00%	1230	0	100.00%	1180	0	100.00%	1225	0	100.00%
27	6007	6005	2	0.0333%	96.67%	1280	0	100.00%	1165	0	83.33%	1240	2	100.00%	1150	0	100.00%	1170	0	100.00%
28	6199	6195	4	0.0645%	100.00%	1340	0	100.00%	1165	0	100.00%	1255	2	100.00%	1210	0	100.00%	1225	2	100.00%
29	6055	6055	0	0.0000%	96.00%	1330	0	100.00%	1125	0	83.33%	1200	0	100.00%	1180	0	100.00%	1220	0	96.67%
30	6220	6210	10	0.1608%	98.00%	1320	2	96.67%	1145	8	100.00%	1270	0	93.33%	1220	0	100.00%	1255	0	100.00%
31	5899	5895	4	0.0678%	100.00%	1245	0	100.00%	1085	4	100.00%	1210	0	100.00%	1150	0	100.00%	1205	0	100.00%
32	6114	6110	4	0.0654%	98.67%	1315	0	93.33%	1145	2	100.00%	1235	0	100.00%	1185	0	100.00%	1230	2	100.00%
33	6175	6175	0	0.0000%	100.00%	1300	0	100.00%	1165	0	100.00%	1245	0	100.00%	1210	0	100.00%	1255	0	100.00%
34	5980	5980	0	0.0000%	100.00%	1275	0	100.00%	1135	0	100.00%	1215	0	100.00%	1155	0	100.00%	1200	0	100.00%
35	6304	6300	4	0.0635%	98.67%	1355	0	100.00%	1185	2	100.00%	1240	2	100.00%	1245	0	100.00%	1275	0	93.33%
36	6172	6170	2	0.0324%	100.00%	1310	2	100.00%	1155	0	100.00%	1255	0	100.00%	1205	0	100.00%	1245	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-11 Packet loss; Low power; Distance 0.5 meter

Power Level: Low
Distance 0.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3437	3432	5	0.1455%	100.00%	758	0	100.00%	544	0	100.00%	547	2	100.00%	827	1	100.00%	756	2	100.00%
1	3551	3550	1	0.0282%	100.00%	763	0	100.00%	573	0	100.00%	568	0	100.00%	916	1	100.00%	730	0	100.00%
2	3320	3320	0	0.0000%	100.00%	660	0	100.00%	562	0	100.00%	553	0	100.00%	889	0	100.00%	656	0	100.00%
3	3054	3053	1	0.0327%	98.00%	641	0	100.00%	537	1	100.00%	554	0	100.00%	709	0	90.00%	612	0	100.00%
4	2962	2962	0	0.0000%	94.00%	630	0	96.67%	560	0	100.00%	547	0	100.00%	591	0	73.33%	634	0	100.00%
5	3189	3186	3	0.0941%	99.33%	632	2	100.00%	539	0	100.00%	539	0	100.00%	840	0	96.67%	636	1	100.00%
6	2919	2918	1	0.0343%	88.00%	583	0	76.67%	569	1	100.00%	575	0	100.00%	587	0	63.33%	604	0	100.00%
7	2900	2898	2	0.0690%	86.67%	554	0	70.00%	559	0	100.00%	566	1	100.00%	662	1	80.00%	557	0	83.33%
8	3266	3265	1	0.0306%	96.67%	686	0	86.67%	553	0	100.00%	536	0	100.00%	805	1	96.67%	685	0	100.00%
9	2853	2851	2	0.0701%	87.33%	510	1	70.00%	554	0	100.00%	559	0	100.00%	670	1	76.67%	558	0	90.00%
10	2697	2697	0	0.0000%	78.67%	509	0	70.00%	558	0	100.00%	545	0	83.33%	609	0	66.67%	476	0	73.33%
11	2279	2276	3	0.1316%	57.33%	288	0	30.00%	406	1	70.00%	459	0	50.00%	792	2	100.00%	331	0	36.67%
12	2430	2428	2	0.0823%	68.00%	357	0	46.67%	571	0	80.00%	493	1	70.00%	698	1	96.67%	309	0	46.67%
13	2325	2323	2	0.0860%	69.33%	271	0	23.33%	624	0	100.00%	590	0	93.33%	582	1	100.00%	256	1	30.00%
14	2339	2337	2	0.0855%	68.67%	266	0	30.00%	552	0	90.00%	646	0	96.67%	573	2	100.00%	300	0	26.67%
15	2224	2222	2	0.0899%	66.00%	294	0	33.33%	563	1	93.33%	492	0	70.00%	591	1	100.00%	282	0	33.33%
16	2183	2179	4	0.1832%	64.00%	309	2	26.67%	538	0	83.33%	482	1	70.00%	547	0	100.00%	303	1	40.00%
17	2387	2385	2	0.0838%	76.67%	367	0	40.00%	581	0	100.00%	598	0	100.00%	494	0	96.67%	345	2	46.67%
18	2646	2646	0	0.0000%	70.00%	496	0	60.00%	537	0	86.67%	474	0	60.00%	647	0	96.67%	492	0	46.67%
19	3003	2999	4	0.1332%	82.67%	661	0	73.33%	610	2	100.00%	631	0	96.67%	416	0	53.33%	681	2	90.00%
20	2901	2899	2	0.0689%	80.00%	591	1	63.33%	598	0	100.00%	559	0	100.00%	497	1	50.00%	654	0	86.67%
21	3270	3267	3	0.0917%	92.00%	701	0	76.67%	611	1	100.00%	640	0	93.33%	630	1	100.00%	685	1	90.00%
22	3355	3353	2	0.0596%	94.00%	791	0	76.67%	551	1	100.00%	574	0	100.00%	651	1	100.00%	786	0	93.33%
23	3479	3477	2	0.0575%	92.00%	758	0	80.00%	619	0	100.00%	618	1	100.00%	680	1	100.00%	802	0	80.00%
24	3519	3517	2	0.0568%	95.33%	843	0	93.33%	574	0	100.00%	572	1	100.00%	673	1	86.67%	855	0	96.67%
25	3039	3038	1	0.0329%	79.33%	842	0	90.00%	475	0	86.67%	429	1	56.67%	446	0	63.33%	846	0	100.00%
26	3270	3270	0	0.0000%	86.00%	817	0	93.33%	601	0	93.33%	641	0	83.33%	449	0	63.33%	762	0	96.67%
27	2961	2960	1	0.0338%	76.00%	768	0	86.67%	519	0	83.33%	552	0	63.33%	405	0	50.00%	716	1	96.67%
28	3314	3313	1	0.0302%	91.33%	873	0	96.67%	577	0	100.00%	581	0	100.00%	404	0	60.00%	878	1	100.00%
29	3116	3116	0	0.0000%	86.67%	868	0	100.00%	565	0	100.00%	562	0	100.00%	360	0	33.33%	761	0	100.00%
30	2920	2919	1	0.0342%	84.00%	756	1	93.33%	558	0	100.00%	554	0	100.00%	345	0	40.00%	706	0	86.67%
31	3008	3007	1	0.0332%	80.00%	829	0	100.00%	597	0	100.00%	599	0	100.00%	153	0	3.33%	829	1	96.67%
32	3339	3338	1	0.0299%	92.00%	796	0	100.00%	576	0	100.00%	581	0	100.00%	503	1	60.00%	882	0	100.00%
33	3073	3072	1	0.0325%	84.67%	780	0	100.00%	648	0	100.00%	652	0	96.67%	306	0	30.00%	686	1	96.67%
34	3218	3215	3	0.0932%	90.67%	770	0	100.00%	633	1	100.00%	605	0	100.00%	454	1	56.67%	753	1	96.67%
35	3251	3249	2	0.0615%	99.33%	765	0	100.00%	553	1	100.00%	540	0	100.00%	618	1	96.67%	773	0	100.00%
36	3119	3119	0	0.0000%	90.67%	739	0	96.67%	551	0	100.00%	559	0	100.00%	509	0	56.67%	761	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-12 Packet loss; Low power; Distance 1.0 meter

Power Level: Low
Distance 1.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3105	3102	3	0.0966%	100.00%	595	1	100.00%	539	0	100.00%	565	0	100.00%	807	2	100.00%	596	0	100.00%
1	3086	3085	1	0.0324%	89.33%	507	0	63.33%	576	1	100.00%	579	0	100.00%	925	0	100.00%	498	0	83.33%
2	3205	3204	1	0.0312%	93.33%	594	0	86.67%	560	0	100.00%	541	0	83.33%	883	0	100.00%	626	1	96.67%
3	2883	2879	4	0.1387%	96.00%	525	0	90.00%	556	1	100.00%	541	0	96.67%	756	2	93.33%	501	1	100.00%
4	2945	2944	1	0.0340%	91.33%	579	0	93.33%	544	1	100.00%	626	0	96.67%	646	0	66.67%	549	0	100.00%
5	3160	3159	1	0.0316%	100.00%	581	1	100.00%	544	0	100.00%	627	0	100.00%	839	0	100.00%	568	0	100.00%
6	2769	2767	2	0.0722%	91.33%	581	0	100.00%	572	1	100.00%	530	0	93.33%	514	1	63.33%	570	0	100.00%
7	2968	2967	1	0.0337%	96.67%	553	0	100.00%	566	0	100.00%	608	0	100.00%	701	0	83.33%	539	1	100.00%
8	2993	2993	0	0.0000%	100.00%	549	0	100.00%	539	0	100.00%	566	0	100.00%	806	0	100.00%	533	0	100.00%
9	2830	2829	1	0.0353%	97.33%	548	0	100.00%	557	0	100.00%	544	0	100.00%	653	1	86.67%	527	0	100.00%
10	2763	2762	1	0.0362%	92.67%	544	0	100.00%	550	1	93.33%	572	0	100.00%	561	0	70.00%	535	0	100.00%
11	2968	2965	3	0.1011%	90.00%	566	1	100.00%	440	0	53.33%	571	0	100.00%	830	0	96.67%	558	2	100.00%
12	2975	2973	2	0.0672%	92.00%	574	1	100.00%	548	0	60.00%	572	0	100.00%	721	0	100.00%	558	1	100.00%
13	2896	2894	2	0.0691%	98.67%	570	1	100.00%	602	0	93.33%	579	1	100.00%	589	0	100.00%	554	0	100.00%
14	2803	2803	0	0.0000%	91.33%	561	0	100.00%	646	0	90.00%	479	0	66.67%	564	0	100.00%	553	0	100.00%
15	2737	2734	3	0.1096%	85.33%	559	2	100.00%	431	0	40.00%	610	1	86.67%	595	0	100.00%	539	0	100.00%
16	2674	2673	1	0.0374%	89.33%	557	1	100.00%	470	0	46.67%	563	0	100.00%	547	0	100.00%	536	0	100.00%
17	2741	2741	0	0.0000%	94.00%	600	0	100.00%	586	0	100.00%	469	0	70.00%	502	0	100.00%	584	0	100.00%
18	2916	2913	3	0.1029%	92.67%	574	2	100.00%	496	1	70.00%	635	0	93.33%	645	0	100.00%	563	0	100.00%
19	2709	2708	1	0.0369%	91.33%	572	0	100.00%	626	0	96.67%	562	0	100.00%	386	0	60.00%	562	1	100.00%
20	2554	2551	3	0.1175%	81.33%	552	0	100.00%	577	2	96.67%	460	0	50.00%	420	0	60.00%	542	1	100.00%
21	2930	2929	1	0.0341%	94.00%	543	1	100.00%	631	0	96.67%	613	0	73.33%	613	0	100.00%	529	0	100.00%
22	2879	2877	2	0.0695%	95.33%	527	1	93.33%	568	0	100.00%	650	0	83.33%	623	0	100.00%	509	1	100.00%
23	2963	2960	3	0.1012%	98.67%	550	2	100.00%	602	0	96.67%	576	1	100.00%	699	0	96.67%	533	0	100.00%
24	2987	2983	4	0.1339%	96.67%	568	1	100.00%	573	2	100.00%	656	1	93.33%	633	0	90.00%	553	0	100.00%
25	2572	2570	2	0.0778%	89.33%	555	0	100.00%	499	0	60.00%	564	1	100.00%	432	0	86.67%	520	1	100.00%
26	2629	2627	2	0.0761%	86.00%	529	0	90.00%	595	1	76.67%	493	0	66.67%	484	1	100.00%	526	0	96.67%
27	2380	2380	0	0.0000%	69.33%	450	0	60.00%	528	0	73.33%	528	0	73.33%	414	0	66.67%	460	0	73.33%
28	2424	2424	0	0.0000%	76.67%	403	0	53.33%	580	0	100.00%	596	0	100.00%	441	0	76.67%	404	0	53.33%
29	2877	2877	0	0.0000%	88.00%	686	0	90.00%	560	0	100.00%	545	0	93.33%	378	0	60.00%	708	0	96.67%
30	3005	3005	0	0.0000%	88.00%	736	0	96.67%	547	0	100.00%	625	0	90.00%	358	0	53.33%	739	0	100.00%
31	2482	2482	0	0.0000%	75.33%	574	0	100.00%	606	0	100.00%	587	0	70.00%	154	0	6.67%	561	0	100.00%
32	2749	2749	0	0.0000%	94.67%	580	0	100.00%	569	0	100.00%	553	0	93.33%	475	0	80.00%	572	0	100.00%
33	2744	2744	0	0.0000%	84.67%	567	0	100.00%	672	0	93.33%	691	0	93.33%	258	0	36.67%	556	0	100.00%
34	2702	2702	0	0.0000%	96.00%	553	0	100.00%	603	0	100.00%	573	0	100.00%	435	0	80.00%	538	0	100.00%
35	2808	2807	1	0.0356%	100.00%	553	0	100.00%	539	0	100.00%	565	0	100.00%	620	1	100.00%	530	0	100.00%
36	2878	2878	0	0.0000%	96.00%	599	0	100.00%	562	0	100.00%	547	0	100.00%	591	0	80.00%	579	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-13 Packet loss; Low power; Distance 1.5 meters

Power Level: Low
Distance 1.5m

	Ovens																			
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3074	3073	1	0.0325%	98.00%	575	0	100.00%	519	0	100.00%	638	0	90.00%	782	1	100.00%	559	0	100.00%
1	3086	3085	1	0.0324%	98.67%	578	0	100.00%	547	0	100.00%	539	1	93.33%	855	0	100.00%	566	0	100.00%
2	3279	3279	0	0.0000%	97.33%	558	0	100.00%	556	0	100.00%	661	0	86.67%	954	0	100.00%	550	0	100.00%
3	3165	3165	0	0.0000%	98.67%	559	0	96.67%	530	0	100.00%	629	0	96.67%	888	0	100.00%	559	0	100.00%
4	3520	3519	1	0.0284%	97.33%	568	0	100.00%	561	0	100.00%	700	0	86.67%	1129	0	100.00%	561	1	100.00%
5	2989	2989	0	0.0000%	96.00%	570	0	100.00%	521	0	96.67%	573	0	83.33%	765	0	100.00%	560	0	100.00%
6	2886	2884	2	0.0693%	93.33%	557	1	100.00%	541	0	100.00%	678	1	96.67%	571	0	70.00%	537	0	100.00%
7	3031	3031	0	0.0000%	98.00%	563	0	100.00%	575	0	100.00%	695	0	96.67%	651	0	93.33%	547	0	100.00%
8	3054	3051	3	0.0982%	99.33%	552	1	100.00%	526	0	96.67%	607	0	100.00%	833	2	100.00%	533	0	100.00%
9	3159	3158	1	0.0317%	98.00%	600	0	100.00%	558	0	100.00%	608	0	90.00%	806	0	100.00%	586	1	100.00%
10	2662	2661	1	0.0376%	84.67%	600	0	100.00%	520	0	83.33%	501	0	66.67%	457	1	73.33%	583	0	100.00%
11	3016	3016	0	0.0000%	86.67%	600	0	100.00%	495	0	46.67%	645	0	86.67%	693	0	100.00%	583	0	100.00%
12	2920	2918	2	0.0685%	92.00%	576	1	100.00%	550	0	83.33%	501	0	76.67%	726	1	100.00%	565	0	100.00%
13	2956	2953	3	0.1015%	96.67%	576	1	100.00%	534	1	90.00%	701	1	93.33%	593	0	100.00%	549	0	100.00%
14	2756	2756	0	0.0000%	92.00%	563	0	100.00%	471	0	66.67%	617	0	93.33%	545	0	100.00%	560	0	100.00%
15	2680	2677	3	0.1119%	90.00%	551	2	100.00%	465	1	63.33%	524	0	86.67%	595	0	100.00%	542	0	100.00%
16	2745	2744	1	0.0364%	95.33%	559	0	100.00%	535	0	83.33%	550	0	93.33%	555	1	100.00%	545	0	100.00%
17	2694	2693	1	0.0371%	94.00%	563	1	100.00%	564	0	100.00%	493	0	76.67%	519	0	93.33%	554	0	100.00%
18	2581	2580	1	0.0387%	84.67%	576	0	100.00%	354	1	30.00%	529	0	93.33%	558	0	100.00%	563	0	100.00%
19	2705	2705	0	0.0000%	88.00%	565	0	100.00%	639	0	93.33%	517	0	86.67%	422	0	60.00%	562	0	100.00%
20	2845	2843	2	0.0703%	94.67%	549	2	100.00%	619	0	100.00%	523	0	86.67%	609	0	86.67%	543	0	100.00%
21	2803	2803	0	0.0000%	95.33%	567	0	100.00%	569	0	83.33%	524	0	93.33%	591	0	100.00%	552	0	100.00%
22	2681	2681	0	0.0000%	89.33%	600	0	100.00%	556	0	100.00%	501	0	76.67%	438	0	70.00%	586	0	100.00%
23	2979	2977	2	0.0671%	94.00%	600	0	100.00%	574	0	100.00%	532	0	86.67%	689	2	83.33%	582	0	100.00%
24	2734	2734	0	0.0000%	93.33%	576	0	100.00%	572	0	100.00%	514	0	80.00%	511	0	86.67%	561	0	100.00%
25	2540	2539	1	0.0394%	84.00%	555	0	100.00%	532	0	66.67%	546	0	86.67%	357	0	66.67%	549	1	100.00%
26	2862	2862	0	0.0000%	92.67%	580	0	100.00%	712	0	83.33%	533	0	80.00%	480	0	100.00%	557	0	100.00%
27	2357	2357	0	0.0000%	72.00%	549	0	100.00%	392	0	33.33%	550	0	96.67%	337	0	30.00%	529	0	100.00%
28	2556	2555	1	0.0391%	88.00%	570	0	100.00%	540	0	100.00%	560	0	100.00%	327	1	40.00%	558	0	100.00%
29	2375	2372	3	0.1263%	76.00%	567	2	100.00%	538	1	100.00%	478	0	70.00%	241	0	10.00%	548	0	100.00%
30	2400	2398	2	0.0833%	80.00%	549	1	100.00%	535	0	90.00%	561	0	100.00%	212	0	10.00%	541	1	100.00%
31	2433	2431	2	0.0822%	84.00%	550	2	100.00%	556	0	100.00%	545	0	100.00%	242	0	20.00%	538	0	100.00%
32	2653	2652	1	0.0377%	94.67%	560	1	100.00%	558	0	96.67%	562	0	100.00%	430	0	76.67%	542	0	100.00%
33	2507	2506	1	0.0399%	80.00%	568	0	100.00%	637	0	96.67%	540	0	86.67%	211	1	16.67%	550	0	100.00%
34	2755	2754	1	0.0363%	94.67%	589	0	100.00%	601	1	100.00%	539	0	100.00%	455	0	73.33%	570	0	100.00%
35	2934	2933	1	0.0341%	95.33%	600	0	100.00%	513	1	96.67%	638	0	86.67%	594	0	93.33%	588	0	100.00%
36	2642	2642	0	0.0000%	93.33%	579	0	100.00%	547	0	100.00%	575	0	100.00%	379	0	66.67%	562	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-14 Packet loss; Low power; Distance 2.0 meters

Power Level: Low
Distance 2.0m

	Ovens																			
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2870	2868	2	0.0697%	96.67%	563	0	100.00%	502	0	100.00%	530	0	83.33%	725	1	100.00%	548	1	100.00%
1	2911	2910	1	0.0344%	98.67%	553	0	100.00%	553	0	100.00%	552	0	100.00%	707	1	93.33%	545	0	100.00%
2	3011	3008	3	0.0996%	100.00%	562	1	100.00%	523	1	100.00%	576	0	100.00%	795	1	100.00%	552	0	100.00%
3	2937	2937	0	0.0000%	94.00%	568	0	100.00%	538	0	90.00%	581	0	100.00%	691	0	80.00%	559	0	100.00%
4	3057	3056	1	0.0327%	89.33%	564	1	100.00%	532	0	100.00%	503	0	70.00%	903	0	76.67%	554	0	100.00%
5	2933	2932	1	0.0341%	98.00%	609	0	100.00%	506	0	93.33%	595	0	100.00%	633	1	96.67%	589	0	100.00%
6	2609	2607	2	0.0767%	92.00%	569	0	100.00%	514	0	100.00%	562	0	100.00%	413	1	60.00%	549	1	100.00%
7	2822	2822	0	0.0000%	100.00%	577	0	100.00%	550	0	100.00%	551	0	100.00%	586	0	100.00%	558	0	100.00%
8	2871	2870	1	0.0348%	98.67%	564	0	100.00%	530	1	100.00%	544	0	100.00%	689	0	93.33%	543	0	100.00%
9	2987	2987	0	0.0000%	98.67%	557	0	100.00%	578	0	100.00%	559	0	100.00%	753	0	93.33%	540	0	100.00%
10	2730	2730	0	0.0000%	94.67%	544	0	100.00%	576	0	96.67%	522	0	83.33%	556	0	93.33%	532	0	100.00%
11	2721	2721	0	0.0000%	88.67%	537	0	100.00%	489	0	60.00%	562	0	100.00%	613	0	83.33%	520	0	100.00%
12	2706	2704	2	0.0739%	86.67%	543	1	100.00%	432	0	40.00%	563	0	100.00%	640	0	93.33%	526	1	100.00%
13	2706	2706	0	0.0000%	92.67%	554	0	100.00%	454	0	63.33%	584	0	100.00%	569	0	100.00%	545	0	100.00%
14	2588	2586	2	0.0773%	88.00%	556	0	100.00%	414	0	40.00%	549	1	100.00%	518	0	100.00%	549	1	100.00%
15	2815	2813	2	0.0710%	94.00%	579	1	100.00%	537	1	70.00%	565	0	100.00%	561	0	100.00%	571	0	100.00%
16	2849	2848	1	0.0351%	97.33%	550	1	100.00%	613	0	86.67%	576	0	100.00%	568	0	100.00%	541	0	100.00%
17	2873	2873	0	0.0000%	100.00%	583	0	100.00%	558	0	100.00%	559	0	100.00%	604	0	100.00%	569	0	100.00%
18	2646	2645	1	0.0378%	84.67%	579	0	100.00%	363	0	23.33%	565	0	100.00%	571	0	100.00%	567	1	100.00%
19	2727	2725	2	0.0733%	90.00%	572	0	100.00%	724	0	96.67%	540	1	100.00%	342	1	53.33%	547	0	100.00%
20	2938	2937	1	0.0340%	100.00%	574	0	100.00%	583	0	100.00%	560	0	100.00%	666	0	100.00%	554	1	100.00%
21	2662	2660	2	0.0751%	89.33%	521	1	86.67%	475	0	60.00%	573	1	100.00%	584	0	100.00%	507	0	100.00%
22	2776	2773	3	0.1081%	96.67%	585	0	96.67%	534	1	100.00%	554	0	100.00%	549	0	86.67%	551	2	100.00%
23	2832	2831	1	0.0353%	96.67%	537	1	100.00%	490	0	93.33%	560	0	100.00%	719	0	90.00%	525	0	100.00%
24	2622	2622	0	0.0000%	94.00%	544	0	100.00%	557	0	100.00%	545	0	100.00%	446	0	70.00%	530	0	100.00%
25	2571	2568	3	0.1167%	88.67%	561	1	100.00%	499	0	83.33%	561	0	90.00%	411	1	70.00%	536	1	100.00%
26	2933	2933	0	0.0000%	98.00%	560	0	100.00%	767	0	90.00%	560	0	100.00%	502	0	100.00%	544	0	100.00%
27	2420	2418	2	0.0826%	80.67%	541	1	100.00%	418	0	46.67%	544	0	100.00%	390	1	56.67%	525	0	100.00%
28	2640	2639	1	0.0379%	94.67%	564	0	100.00%	522	0	100.00%	560	0	100.00%	442	1	73.33%	551	0	100.00%
29	2457	2456	1	0.0407%	77.33%	576	0	100.00%	482	1	86.67%	568	0	96.67%	270	0	3.33%	560	0	100.00%
30	2613	2613	0	0.0000%	92.00%	572	0	100.00%	540	0	100.00%	564	0	100.00%	381	0	60.00%	556	0	100.00%
31	2635	2635	0	0.0000%	91.33%	551	0	100.00%	548	0	100.00%	542	0	86.67%	446	0	70.00%	548	0	100.00%
32	2769	2768	1	0.0361%	98.67%	611	0	96.67%	558	1	100.00%	538	0	100.00%	470	0	96.67%	591	0	100.00%
33	2608	2608	0	0.0000%	87.33%	581	0	100.00%	618	0	100.00%	555	0	100.00%	302	0	36.67%	552	0	100.00%
34	2827	2826	1	0.0354%	98.67%	541	1	100.00%	607	0	96.67%	547	0	100.00%	608	0	96.67%	523	0	100.00%
35	2598	2597	1	0.0385%	94.67%	535	1	100.00%	492	0	93.33%	563	0	100.00%	490	0	80.00%	517	0	100.00%
36	2823	2823	0	0.0000%	99.33%	552	0	100.00%	533	0	100.00%	591	0	96.67%	598	0	100.00%	549	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-15 Packet loss; Low power; Distance 2.5 meters

Power Level: Low
Distance 2.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2770	2770	0	0.0000%	96.00%	594	0	100.00%	467	0	86.67%	527	0	93.33%	595	0	100.00%	587	0	100.00%
1	2739	2739	0	0.0000%	84.67%	469	0	63.33%	529	0	100.00%	567	0	100.00%	747	0	100.00%	427	0	60.00%
2	3091	3090.5	0.5	0.0162%	96.00%	636.5	0.5	93.33%	504	0	93.33%	589	0	100.00%	728	0	93.33%	633	0	100.00%
3	2728	2728	0	0.0000%	93.33%	547	0	93.33%	499	0	73.33%	575	0	100.00%	580	0	100.00%	527	0	100.00%
4	2922	2921	1	0.0342%	99.33%	615	0	100.00%	508	1	100.00%	577	0	100.00%	623	0	96.67%	598	0	100.00%
5	2674	2674	0	0.0000%	96.00%	567	0	96.67%	492	0	93.33%	571	0	100.00%	489	0	90.00%	555	0	100.00%
6	2770	2770	0	0.0000%	96.67%	574	0	96.67%	490	0	100.00%	596	0	100.00%	559	0	86.67%	551	0	100.00%
7	2765	2765	0	0.0000%	99.33%	553	0	100.00%	521	0	96.67%	583	0	100.00%	566	0	100.00%	542	0	100.00%
8	2937	2936	1	0.0340%	100.00%	563	0	100.00%	514	1	100.00%	551	0	100.00%	749	0	100.00%	559	0	100.00%
9	2871	2871	0	0.0000%	97.33%	543	0	100.00%	562	0	100.00%	582	0	100.00%	645	0	86.67%	539	0	100.00%
10	2853	2852	1	0.0351%	98.67%	551	0	100.00%	574	0	93.33%	559	0	100.00%	629	1	100.00%	539	0	100.00%
11	2914.5	2914.5	0	0.0000%	82.00%	564.5	0	100.00%	627	0	80.00%	416	0	40.00%	755	0	90.00%	552	0	100.00%
12	2498	2498	0	0.0000%	74.67%	571	0	100.00%	425	0	46.67%	357	0	36.67%	588	0	90.00%	557	0	100.00%
13	2497.5	2497.5	0	0.0000%	76.00%	574.5	0	100.00%	425	0	46.67%	400	0	33.33%	535	0	100.00%	563	0	100.00%
14	2329	2329	0	0.0000%	73.33%	565	0	100.00%	396	0	40.00%	277	0	26.67%	531	0	100.00%	560	0	100.00%
15	2675	2674	1	0.0374%	84.67%	560	0	100.00%	629	0	83.33%	489	0	63.33%	460	1	76.67%	536	0	100.00%
16	3021.5	3021.5	0	0.0000%	98.67%	554.5	0	100.00%	570	0	100.00%	748	0	93.33%	613	0	100.00%	536	0	100.00%
17	2982	2982	0	0.0000%	99.33%	564	0	100.00%	548	0	100.00%	724	0	96.67%	600	0	100.00%	546	0	100.00%
18	2732	2731	1	0.0366%	84.00%	571	0	100.00%	340	1	30.00%	680	0	90.00%	583	0	100.00%	557	0	100.00%
19	3011	3011	0	0.0000%	88.67%	559	0	100.00%	789	0	100.00%	711	0	90.00%	396	0	53.33%	556	0	100.00%
20	3008	3007	1	0.0332%	99.33%	549	0	96.67%	589	1	100.00%	684	0	100.00%	640	0	100.00%	545	0	100.00%
21	2658.5	2658.5	0	0.0000%	90.67%	535.5	0	96.67%	439	0	56.67%	593	0	100.00%	569	0	100.00%	522	0	100.00%
22	2716.5	2716.5	0	0.0000%	100.00%	542.5	0	100.00%	531	0	100.00%	589	0	100.00%	525	0	100.00%	529	0	100.00%
23	2663	2661.5	1.5	0.0563%	100.00%	561.5	0.5	100.00%	507	0	100.00%	526	0	100.00%	516	0	100.00%	551	1	100.00%
24	2772	2770	2	0.0722%	96.67%	562	0	100.00%	537	1	100.00%	571	0	100.00%	545	0	83.33%	555	1	100.00%
25	2590	2589.5	0.5	0.0193%	92.00%	570.5	0.5	100.00%	458	0	63.33%	540	0	100.00%	464	0	96.67%	557	0	100.00%
26	2587	2587	0	0.0000%	92.67%	530	0	100.00%	495	0	63.33%	529	0	100.00%	517	0	100.00%	516	0	100.00%
27	2405.5	2405.5	0	0.0000%	76.00%	471.5	0	66.67%	452	0	53.33%	586	0	100.00%	458	0	80.00%	438	0	80.00%
28	2483	2482	1	0.0403%	87.33%	481	0	66.67%	532	0	100.00%	505	0	93.33%	508	0	100.00%	456	1	76.67%
29	2714	2714	0	0.0000%	82.67%	669	0	93.33%	453	0	76.67%	575	0	100.00%	362	0	60.00%	655	0	83.33%
30	2909	2908	1	0.0344%	92.67%	680	0	90.00%	518	1	100.00%	566	0	100.00%	445	0	73.33%	699	0	100.00%
31	2620	2619	1	0.0382%	89.33%	575	1	100.00%	545	0	100.00%	614	0	96.67%	330	0	50.00%	555	0	100.00%
32	2846	2846	0	0.0000%	100.00%	569	0	100.00%	557	0	100.00%	589	0	100.00%	581	0	100.00%	550	0	100.00%
33	2749	2749	0	0.0000%	93.33%	561	0	100.00%	594	0	90.00%	561	0	100.00%	470	0	76.67%	563	0	100.00%
34	2723	2722	1	0.0367%	97.33%	557	1	100.00%	535	0	93.33%	589	0	100.00%	505	0	93.33%	536	0	100.00%
35	2722.5	2722.5	0	0.0000%	98.00%	564.5	0	100.00%	470	0	93.33%	574	0	100.00%	564	0	96.67%	550	0	100.00%
36	2913	2913	0	0.0000%	100.00%	594	0	100.00%	518	0	100.00%	563	0	100.00%	661	0	100.00%	577	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-16 Packet loss; Low power; Distance 3.0 meters

Power Level: Low
Distance 3.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2746	2744	2	0.0728%	88.67%	574	2	100.00%	449	0	76.67%	487	0	73.33%	665	0	93.33%	569	0	100.00%
1	2985	2985	0	0.0000%	92.67%	544	0	76.67%	529	0	100.00%	639	0	100.00%	761	0	93.33%	512	0	93.33%
2	2734	2733	1	0.0366%	91.33%	590	1	93.33%	488	0	90.00%	517	0	86.67%	600	0	86.67%	538	0	100.00%
3	2785	2784	1	0.0359%	91.33%	540	1	93.33%	475	0	66.67%	550	0	100.00%	690	0	100.00%	529	0	96.67%
4	2997	2996	1	0.0334%	96.67%	614	1	93.33%	501	0	100.00%	564	0	100.00%	729	0	100.00%	588	0	90.00%
5	2646	2643	3	0.1134%	94.67%	584	3	100.00%	474	0	93.33%	594	0	100.00%	446	0	80.00%	545	0	100.00%
6	2667	2664	3	0.1125%	90.67%	539	3	93.33%	462	0	76.67%	527	0	90.00%	623	0	100.00%	513	0	93.33%
7	2838	2837	1	0.0352%	95.33%	574	1	100.00%	497	0	80.00%	582	0	96.67%	585	0	100.00%	599	0	100.00%
8	2853	2850	3	0.1052%	96.67%	571	2	100.00%	482	0	96.67%	568	0	100.00%	724	0	93.33%	505	1	93.33%
9	2821	2820	1	0.0354%	100.00%	537	1	100.00%	543	0	100.00%	572	0	100.00%	664	0	100.00%	504	0	100.00%
10	2702	2701	1	0.0370%	90.67%	537	1	93.33%	574	0	100.00%	471	0	60.00%	580	0	100.00%	539	0	100.00%
11	3085	3081	4	0.1297%	90.00%	552	3	100.00%	547	0	70.00%	632	1	96.67%	825	0	83.33%	525	0	100.00%
12	2650	2650	0	0.0000%	86.67%	563	0	100.00%	398	0	36.67%	546	0	100.00%	575	0	96.67%	568	0	100.00%
13	2495	2493	2	0.0802%	84.67%	532	2	90.00%	403	0	36.67%	543	0	100.00%	528	0	100.00%	487	0	96.67%
14	2604	2603	1	0.0384%	86.67%	580	1	100.00%	363	0	33.33%	561	0	100.00%	526	0	100.00%	573	0	100.00%
15	2626	2624	2	0.0762%	83.33%	587	1	100.00%	550	1	70.00%	508	0	70.00%	401	0	76.67%	578	0	100.00%
16	2986	2986	0	0.0000%	96.00%	577	0	100.00%	541	0	100.00%	666	0	86.67%	640	0	93.33%	562	0	100.00%
17	2914	2908	6	0.2059%	100.00%	600	6	100.00%	529	0	100.00%	553	0	100.00%	652	0	100.00%	574	0	100.00%
18	2508	2507	1	0.0399%	80.67%	573	1	96.67%	272	0	6.67%	550	0	100.00%	559	0	100.00%	553	0	100.00%
19	3104	3102	2	0.0644%	94.00%	580	2	100.00%	808	0	100.00%	609	0	100.00%	544	0	70.00%	561	0	100.00%
20	2795	2793	2	0.0716%	99.33%	520	2	96.67%	598	0	100.00%	550	0	100.00%	592	0	100.00%	533	0	100.00%
21	2575	2572	3	0.1165%	90.00%	521	2	96.67%	452	0	56.67%	550	1	100.00%	539	0	100.00%	510	0	96.67%
22	2584	2584	0	0.0000%	94.67%	550	0	100.00%	493	0	90.00%	544	0	100.00%	454	0	83.33%	543	0	100.00%
23	2668	2667	1	0.0375%	100.00%	555	1	100.00%	495	0	100.00%	564	0	100.00%	501	0	100.00%	552	0	100.00%
24	2769	2767	2	0.0722%	97.33%	579	2	100.00%	508	0	93.33%	578	0	100.00%	546	0	100.00%	556	0	93.33%
25	2644	2643	1	0.0378%	87.33%	626	1	100.00%	417	0	43.33%	588	0	100.00%	428	0	100.00%	584	0	93.33%
26	2549	2547	2	0.0785%	86.00%	546	2	93.33%	410	0	36.67%	534	0	100.00%	513	0	100.00%	544	0	100.00%
27	2316	2314	2	0.0864%	67.33%	446	2	56.67%	390	0	20.00%	528	0	100.00%	538	0	100.00%	412	0	60.00%
28	2467	2465	2	0.0811%	84.67%	460	2	60.00%	511	0	100.00%	577	0	100.00%	513	0	100.00%	404	0	63.33%
29	2606	2603	3	0.1151%	70.67%	662	1	86.67%	424	1	33.33%	573	1	100.00%	313	0	43.33%	631	0	90.00%
30	2987	2986	1	0.0335%	96.67%	724	1	96.67%	511	0	100.00%	546	0	100.00%	510	0	86.67%	695	0	100.00%
31	2520	2518	2	0.0794%	89.33%	572	1	100.00%	515	0	100.00%	542	0	100.00%	329	0	46.67%	560	1	100.00%
32	2820	2819	1	0.0355%	100.00%	570	1	100.00%	560	0	100.00%	551	0	100.00%	575	0	100.00%	563	0	100.00%
33	2863	2861	2	0.0699%	100.00%	568	2	100.00%	649	0	100.00%	563	0	100.00%	529	0	100.00%	552	0	100.00%
34	2773	2770	3	0.1082%	94.00%	557	2	100.00%	483	0	73.33%	570	0	100.00%	623	0	96.67%	537	1	100.00%
35	2696	2695	1	0.0371%	99.33%	557	1	100.00%	473	0	100.00%	566	0	100.00%	555	0	96.67%	544	0	100.00%
36	2796	2795	1	0.0358%	99.33%	593	1	100.00%	518	0	100.00%	580	0	100.00%	517	0	96.67%	587	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-17 Packet loss; Low power; Distance 3.5 meters

Power Level: Low
Distance 3.5m

	Total # Packets					Ovens: Microwave 1			Ovens: Microwave 2			Ovens: Microwave 3			Ovens: Microwave 4			Ovens: Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2828	2827	1	0.0354%	89.33%	591	1	100.00%	440	0	66.67%	517	0	80.00%	704	0	100.00%	575	0	100.00%
1	2812	2809	3	0.1067%	90.67%	525	3	73.33%	495	0	100.00%	603	0	100.00%	672	0	100.00%	514	0	80.00%
2	2915	2915	0	0.0000%	93.33%	678	0	93.33%	468	0	90.00%	522	0	86.67%	584	0	96.67%	663	0	100.00%
3	2618	2616	2	0.0764%	84.00%	522	1	96.67%	371	0	23.33%	542	0	100.00%	680	0	100.00%	501	1	100.00%
4	2890	2888	2	0.0692%	97.33%	562	2	86.67%	489	0	100.00%	567	0	100.00%	731	0	100.00%	539	0	100.00%
5	2589	2588	1	0.0386%	86.00%	547	1	86.67%	458	0	73.33%	591	0	100.00%	498	0	76.67%	494	0	93.33%
6	2598	2597	1	0.0385%	86.67%	542	1	93.33%	468	0	66.67%	537	0	96.67%	535	0	76.67%	515	0	100.00%
7	2880	2879	1	0.0347%	90.67%	536	1	90.00%	462	0	80.00%	601	0	90.00%	753	0	93.33%	527	0	100.00%
8	2917	2915	2	0.0686%	98.00%	559	1	96.67%	472	0	93.33%	576	0	100.00%	773	0	100.00%	535	1	100.00%
9	2723	2722	1	0.0367%	100.00%	541	1	100.00%	497	0	100.00%	573	0	100.00%	591	0	100.00%	520	0	100.00%
10	2625	2625	0	0.0000%	88.00%	536	0	96.67%	566	0	93.33%	413	0	50.00%	586	0	100.00%	524	0	100.00%
11	2838	2836	2	0.0705%	78.00%	545	2	100.00%	394	0	43.33%	638	0	83.33%	729	0	63.33%	530	0	100.00%
12	2624	2623	1	0.0381%	81.33%	577	1	100.00%	384	0	30.00%	544	0	96.67%	561	0	80.00%	557	0	100.00%
13	2495	2495	0	0.0000%	80.67%	566	0	93.33%	410	0	33.33%	536	0	100.00%	425	0	76.67%	558	0	100.00%
14	2636	2635	1	0.0379%	80.00%	583	0	100.00%	291	1	0.00%	568	0	100.00%	618	0	100.00%	575	0	100.00%
15	2866	2866	0	0.0000%	84.67%	582	0	100.00%	460	0	60.00%	541	0	73.33%	725	0	90.00%	558	0	100.00%
16	2914	2912	2	0.0686%	94.67%	554	2	100.00%	528	0	96.67%	676	0	90.00%	621	0	86.67%	533	0	100.00%
17	2826	2824	2	0.0708%	99.33%	588	2	100.00%	520	0	100.00%	550	0	100.00%	600	0	96.67%	566	0	100.00%
18	2497	2497	0	0.0000%	80.00%	578	0	100.00%	230	0	0.00%	549	0	100.00%	566	0	100.00%	574	0	100.00%
19	3046	3042	4	0.1313%	97.33%	563	3	100.00%	773	0	100.00%	584	0	100.00%	568	0	86.67%	554	1	100.00%
20	2734	2732	2	0.0732%	98.67%	534	2	93.33%	593	0	100.00%	541	0	100.00%	534	0	100.00%	530	0	100.00%
21	2537	2535	2	0.0788%	88.00%	535	1	93.33%	439	1	53.33%	537	0	100.00%	513	0	93.33%	511	0	100.00%
22	2583	2580	3	0.1161%	99.33%	533	3	100.00%	498	0	100.00%	538	0	100.00%	483	0	96.67%	528	0	100.00%
23	2601	2601	0	0.0000%	100.00%	548	0	100.00%	478	0	100.00%	584	0	100.00%	459	0	100.00%	532	0	100.00%
24	2660	2659	1	0.0376%	96.00%	568	1	100.00%	496	0	83.33%	560	0	100.00%	483	0	96.67%	552	0	100.00%
25	2420	2418	2	0.0826%	81.33%	560	2	93.33%	295	0	13.33%	612	0	100.00%	406	0	100.00%	545	0	100.00%
26	2456	2455	1	0.0407%	82.67%	540	1	90.00%	380	0	30.00%	531	0	100.00%	467	0	93.33%	537	0	100.00%
27	2374	2373	1	0.0421%	75.33%	499	1	70.00%	384	0	26.67%	523	0	100.00%	450	0	90.00%	517	0	90.00%
28	2557	2557	0	0.0000%	93.33%	527	0	83.33%	488	0	100.00%	555	0	100.00%	459	0	93.33%	528	0	90.00%
29	2718	2718	0	0.0000%	65.33%	754	0	96.67%	409	0	23.33%	564	0	96.67%	256	0	10.00%	735	0	100.00%
30	2940	2940	0	0.0000%	94.67%	703	0	90.00%	509	0	100.00%	558	0	100.00%	492	0	90.00%	678	0	93.33%
31	2466	2465	1	0.0406%	86.67%	574	1	100.00%	503	0	100.00%	539	0	100.00%	290	0	33.33%	559	0	100.00%
32	2720	2720	0	0.0000%	98.00%	575	0	100.00%	551	0	100.00%	548	0	100.00%	483	0	90.00%	563	0	100.00%
33	2657	2656	1	0.0376%	90.67%	560	1	100.00%	621	0	100.00%	563	0	100.00%	368	0	53.33%	544	0	100.00%
34	2619	2615	4	0.1527%	88.67%	548	3	100.00%	501	0	80.00%	564	0	100.00%	469	0	63.33%	533	1	100.00%
35	2565	2564	1	0.0390%	98.00%	563	1	100.00%	469	0	90.00%	554	0	100.00%	423	0	100.00%	555	0	100.00%
36	2832	2830	2	0.0706%	98.00%	583	2	100.00%	497	0	100.00%	571	0	100.00%	605	0	90.00%	574	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-18 Packet loss; Low power; Distance 4.0 meters

Power Level: Low
Distance 4.0m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2705	2703	2	0.0739%	81.33%	597	2	100.00%	412	0	10.00%	511	0	100.00%	615	0	96.67%	568	0	100.00%
1	2645	2643	2	0.0756%	84.67%	459	2	60.00%	475	0	96.67%	568	0	90.00%	705	0	100.00%	436	0	76.67%
2	2707	2707	0	0.0000%	85.33%	623	0	100.00%	480	0	83.33%	486	0	73.33%	514	0	73.33%	604	0	96.67%
3	2530	2527	3	0.1186%	77.33%	524	3	86.67%	348	0	3.33%	493	0	96.67%	663	0	100.00%	499	0	100.00%
4	2955	2954	1	0.0338%	100.00%	611	1	100.00%	489	0	100.00%	535	0	100.00%	717	0	100.00%	602	0	100.00%
5	2559	2558	1	0.0391%	87.33%	544	1	90.00%	451	0	86.67%	562	0	100.00%	458	0	63.33%	543	0	96.67%
6	2370	2368	2	0.0844%	74.00%	537	2	86.67%	438	0	63.33%	453	0	66.67%	407	0	56.67%	533	0	96.67%
7	2956	2956	0	0.0000%	92.00%	569	0	100.00%	439	0	63.33%	620	0	100.00%	805	0	96.67%	523	0	100.00%
8	2867	2865	2	0.0698%	94.67%	551	2	96.67%	455	0	76.67%	564	0	100.00%	765	0	100.00%	530	0	100.00%
9	2665	2662	3	0.1126%	99.33%	530	3	96.67%	495	0	100.00%	574	0	100.00%	552	0	100.00%	511	0	100.00%
10	2668	2668	0	0.0000%	90.00%	545	0	100.00%	549	0	100.00%	480	0	63.33%	566	0	86.67%	528	0	100.00%
11	1900	1899	1	0.0526%	52.00%	534	1	96.67%	312	0	20.00%	349	0	33.33%	179	0	10.00%	525	0	100.00%
12	2756	2755	1	0.0363%	88.00%	555	1	100.00%	382	0	40.00%	531	0	100.00%	746	0	100.00%	541	0	100.00%
13	2457	2455	2	0.0814%	80.67%	554	1	93.33%	364	1	10.00%	539	0	100.00%	469	0	100.00%	529	0	100.00%
14	2674	2674	0	0.0000%	80.00%	573	0	100.00%	317	0	0.00%	546	0	100.00%	684	0	100.00%	554	0	100.00%
15	2478	2477	1	0.0404%	70.67%	583	1	100.00%	359	0	36.67%	426	0	33.33%	548	0	83.33%	561	0	100.00%
16	3053	3052	1	0.0328%	94.00%	569	1	100.00%	535	0	100.00%	720	0	90.00%	673	0	80.00%	555	0	100.00%
17	2759	2758	1	0.0362%	96.67%	570	1	100.00%	472	0	83.33%	527	0	100.00%	637	0	100.00%	552	0	100.00%
18	2364	2363	1	0.0423%	80.00%	585	1	100.00%	149	0	0.00%	525	0	100.00%	536	0	100.00%	568	0	100.00%
19	2969	2969	0	0.0000%	98.00%	577	0	100.00%	751	0	100.00%	604	0	100.00%	479	0	90.00%	558	0	100.00%
20	2655	2653	2	0.0753%	92.67%	519	2	90.00%	575	0	100.00%	516	0	96.67%	527	0	90.00%	516	0	86.67%
21	2456	2455	1	0.0407%	83.33%	527	1	93.33%	363	0	36.67%	566	0	96.67%	459	0	90.00%	540	0	100.00%
22	2544	2543	1	0.0393%	94.67%	548	1	100.00%	488	0	100.00%	532	0	96.67%	428	0	76.67%	547	0	100.00%
23	2580	2580	0	0.0000%	98.00%	555	0	100.00%	455	0	96.67%	545	0	93.33%	481	0	100.00%	544	0	100.00%
24	2537	2535	2	0.0788%	86.67%	579	2	100.00%	452	0	53.33%	541	0	100.00%	407	0	80.00%	556	0	100.00%
25	2430	2429	1	0.0412%	84.00%	565	1	96.67%	322	0	23.33%	589	0	100.00%	391	0	100.00%	562	0	100.00%
26	2528	2528	0	0.0000%	86.00%	559	0	93.33%	463	0	56.67%	514	0	100.00%	427	0	80.00%	565	0	100.00%
27	2333	2331	2	0.0857%	64.00%	503	2	60.00%	367	0	6.67%	524	0	100.00%	424	0	80.00%	513	0	73.33%
28	2474	2470	4	0.1617%	88.67%	471	3	66.67%	480	1	100.00%	554	0	100.00%	499	0	100.00%	466	0	76.67%
29	2784	2784	0	0.0000%	74.67%	699	0	100.00%	406	0	13.33%	574	0	100.00%	351	0	60.00%	754	0	100.00%
30	2701	2701	0	0.0000%	94.67%	638	0	90.00%	476	0	93.33%	528	0	100.00%	481	0	100.00%	578	0	90.00%
31	2401	2401	0	0.0000%	84.00%	579	0	100.00%	482	0	100.00%	517	0	96.67%	255	0	23.33%	568	0	100.00%
32	2766	2764	2	0.0723%	100.00%	560	2	100.00%	539	0	100.00%	564	0	100.00%	555	0	100.00%	546	0	100.00%
33	2655	2655	0	0.0000%	89.33%	563	0	100.00%	623	0	96.67%	560	0	100.00%	355	0	50.00%	554	0	100.00%
34	2694	2694	0	0.0000%	88.67%	552	0	100.00%	445	0	56.67%	523	0	100.00%	642	0	86.67%	532	0	100.00%
35	2540	2539	1	0.0394%	96.67%	559	1	100.00%	466	0	83.33%	552	0	100.00%	414	0	100.00%	548	0	100.00%
36	2886	2884	2	0.0693%	100.00%	584	2	100.00%	498	0	100.00%	523	0	100.00%	716	0	100.00%	563	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-19 Packet loss; Low power; Distance 4.5 meters

Power Level: Low
Distance 4.5m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2743	2742	1	0.0365%	77.33%	586	1	100.00%	392	0	0.00%	524	0	86.67%	664	0	100.00%	576	0	100.00%
1	2800	2800	0	0.0000%	88.00%	570	0	83.33%	448	0	70.00%	569	0	100.00%	685	0	100.00%	528	0	86.67%
2	2787	2787	0	0.0000%	90.00%	639	0	96.67%	469	0	86.67%	468	0	70.00%	583	0	100.00%	628	0	96.67%
3	2596	2595	1	0.0385%	80.00%	543	1	93.33%	344	0	10.00%	549	0	96.67%	643	0	100.00%	516	0	100.00%
4	2837	2835	2	0.0705%	98.00%	584	2	96.67%	492	0	96.67%	509	0	96.67%	683	0	100.00%	567	0	100.00%
5	2395	2394	1	0.0418%	66.67%	560	1	90.00%	425	0	23.33%	560	0	90.00%	290	0	33.33%	559	0	96.67%
6	2340	2339	1	0.0427%	76.67%	561	1	90.00%	464	0	83.33%	464	0	76.67%	295	0	36.67%	555	0	96.67%
7	3100	3098	2	0.0645%	87.33%	573	2	100.00%	431	0	36.67%	611	0	100.00%	913	0	100.00%	570	0	100.00%
8	2788	2787	1	0.0359%	88.67%	536	0	90.00%	436	1	56.67%	584	0	100.00%	702	0	100.00%	529	0	96.67%
9	2676	2675	1	0.0374%	98.67%	547	1	100.00%	463	0	93.33%	574	0	100.00%	572	0	100.00%	519	0	100.00%
10	2632	2632	0	0.0000%	90.00%	546	0	100.00%	476	0	96.67%	581	0	60.00%	513	0	93.33%	516	0	100.00%
11	2570	2566	4	0.1556%	65.33%	545	4	100.00%	477	0	46.67%	809	0	73.33%	202	0	6.67%	533	0	100.00%
12	2839	2837	2	0.0704%	86.00%	578	2	100.00%	386	0	30.00%	541	0	100.00%	778	0	100.00%	554	0	100.00%
13	2331	2328	3	0.1287%	74.67%	537	3	90.00%	307	0	0.00%	540	0	100.00%	434	0	86.67%	510	0	96.67%
14	2611	2609	2	0.0766%	79.33%	566	2	96.67%	303	0	0.00%	508	0	100.00%	661	0	100.00%	571	0	100.00%
15	2820	2817	3	0.1064%	82.67%	561	3	93.33%	413	0	33.33%	660	0	100.00%	636	0	86.67%	547	0	100.00%
16	2919	2917	2	0.0685%	96.00%	569	2	100.00%	512	0	96.67%	682	0	100.00%	599	0	83.33%	555	0	100.00%
17	2663	2663	0	0.0000%	94.00%	564	0	100.00%	445	0	70.00%	493	0	100.00%	628	0	100.00%	533	0	100.00%
18	2327	2326	1	0.0430%	80.00%	571	1	100.00%	81	0	0.00%	553	0	100.00%	554	0	100.00%	567	0	100.00%
19	2815	2813	2	0.0710%	90.67%	560	2	100.00%	754	0	100.00%	575	0	100.00%	370	0	53.33%	554	0	100.00%
20	2549	2546	3	0.1177%	88.00%	546	3	90.00%	561	0	100.00%	509	0	100.00%	429	0	66.67%	501	0	83.33%
21	2421	2417	4	0.1652%	82.67%	542	4	96.67%	433	0	40.00%	469	0	80.00%	469	0	100.00%	504	0	96.67%
22	2540	2539	1	0.0394%	94.67%	551	1	100.00%	482	0	100.00%	510	0	100.00%	453	0	73.33%	543	0	100.00%
23	2447	2447	0	0.0000%	88.00%	556	0	100.00%	441	0	70.00%	466	0	70.00%	447	0	100.00%	537	0	100.00%
24	2381	2379	2	0.0840%	73.33%	557	2	96.67%	366	0	10.00%	535	0	100.00%	356	0	60.00%	565	0	100.00%
25	2307	2305	2	0.0867%	79.33%	579	1	96.67%	225	1	6.67%	576	0	100.00%	382	0	96.67%	543	0	96.67%
26	2562	2559	3	0.1171%	90.00%	553	3	93.33%	430	0	56.67%	516	0	100.00%	526	0	100.00%	534	0	100.00%
27	2245	2244	1	0.0445%	66.00%	517	1	63.33%	340	0	10.00%	505	0	100.00%	365	0	63.33%	517	0	93.33%
28	2633	2632	1	0.0380%	94.00%	537	1	80.00%	475	0	100.00%	592	0	100.00%	465	0	100.00%	563	0	90.00%
29	2623	2623	0	0.0000%	62.00%	673	0	96.67%	387	0	0.00%	567	0	100.00%	284	0	13.33%	712	0	100.00%
30	2703	2703	0	0.0000%	89.33%	658	0	96.67%	446	0	56.67%	508	0	96.67%	474	0	100.00%	617	0	96.67%
31	2359	2357	2	0.0848%	84.00%	573	2	100.00%	461	0	100.00%	483	0	100.00%	286	0	20.00%	554	0	100.00%
32	2623	2622	1	0.0381%	99.33%	562	1	100.00%	548	0	100.00%	493	0	96.67%	473	0	100.00%	546	0	100.00%
33	2660	2660	0	0.0000%	90.00%	554	0	100.00%	621	0	100.00%	536	0	100.00%	410	0	50.00%	539	0	100.00%
34	2754	2754	0	0.0000%	86.67%	546	0	100.00%	406	0	33.33%	535	0	100.00%	735	0	100.00%	532	0	100.00%
35	2483	2481	2	0.0805%	93.33%	554	2	100.00%	454	0	66.67%	524	0	100.00%	410	0	100.00%	539	0	100.00%
36	2935	2933	2	0.0681%	100.00%	585	2	100.00%	476	0	100.00%	548	0	100.00%	751	0	100.00%	573	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-20 Packet loss; Low power; Distance 5.0 meters

Power Level: Low
Distance 5.0m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2600	2598	2	0.0769%	74.67%	589	2	100.00%	361	0	3.33%	465	0	70.00%	606	0	100.00%	577	0	100.00%
1	2842	2839	3	0.1056%	75.33%	492	3	70.00%	428	0	33.33%	760	0	86.67%	644	0	100.00%	515	0	86.67%
2	2642	2642	0	0.0000%	83.33%	570	0	83.33%	425	0	40.00%	516	0	100.00%	576	0	100.00%	555	0	93.33%
3	2447	2445	2	0.0817%	73.33%	515	2	86.67%	296	0	13.33%	467	0	66.67%	645	0	100.00%	522	0	100.00%
4	2761	2757	4	0.1449%	95.33%	590	4	96.67%	452	0	80.00%	498	0	100.00%	666	0	100.00%	551	0	100.00%
5	2254	2253	1	0.0444%	52.00%	550	1	90.00%	409	0	0.00%	471	0	80.00%	257	0	0.00%	566	0	90.00%
6	2098	2095	3	0.1430%	59.33%	560	3	93.33%	439	0	50.00%	441	0	60.00%	103	0	0.00%	552	0	93.33%
7	2803	2800	3	0.1070%	64.00%	562	3	96.67%	405	0	0.00%	350	0	26.67%	941	0	100.00%	542	0	96.67%
8	2695	2693	2	0.0742%	82.67%	559	2	96.67%	411	0	16.67%	496	0	100.00%	668	0	100.00%	559	0	100.00%
9	2622	2618	4	0.1526%	91.33%	535	4	100.00%	445	0	56.67%	559	0	100.00%	564	0	100.00%	515	0	100.00%
10	2549	2549	0	0.0000%	80.67%	546	0	100.00%	440	0	46.67%	527	0	66.67%	498	0	90.00%	538	0	100.00%
11	2971	2969	2	0.0673%	78.67%	547	2	100.00%	755	0	93.33%	932	0	100.00%	202	0	0.00%	533	0	100.00%
12	2807	2806	1	0.0356%	87.33%	558	1	100.00%	394	0	36.67%	500	0	100.00%	811	0	100.00%	543	0	100.00%
13	2284	2281	3	0.1313%	70.00%	542	3	96.67%	305	0	0.00%	506	0	83.33%	372	0	70.00%	556	0	100.00%
14	2595	2592	3	0.1156%	80.00%	576	3	100.00%	304	0	0.00%	490	0	100.00%	654	0	100.00%	568	0	100.00%
15	2250	2250	0	0.0000%	63.33%	556	0	93.33%	361	0	20.00%	437	0	50.00%	349	0	53.33%	547	0	100.00%
16	2851	2847	4	0.1403%	100.00%	577	3	100.00%	517	1	100.00%	736	0	100.00%	464	0	100.00%	553	0	100.00%
17	2612	2609	3	0.1149%	90.67%	540	3	100.00%	434	0	53.33%	480	0	100.00%	638	0	100.00%	517	0	100.00%
18	2274	2273	1	0.0440%	80.00%	574	1	100.00%	60	0	0.00%	521	0	100.00%	557	0	100.00%	561	0	100.00%
19	2826	2825	1	0.0354%	86.67%	565	1	93.33%	736	0	100.00%	608	0	93.33%	352	0	46.67%	564	0	100.00%
20	2646	2645	1	0.0378%	89.33%	520	1	90.00%	537	0	100.00%	489	0	96.67%	586	0	63.33%	513	0	96.67%
21	2249	2246	3	0.1334%	80.67%	539	2	96.67%	232	1	6.67%	506	0	100.00%	465	0	100.00%	504	0	100.00%
22	2358	2357	1	0.0424%	85.33%	546	1	100.00%	475	0	96.67%	508	0	100.00%	305	0	30.00%	523	0	100.00%
23	2466	2466	0	0.0000%	86.00%	552	0	100.00%	429	0	33.33%	501	0	96.67%	447	0	100.00%	537	0	100.00%
24	2260	2257	3	0.1327%	70.00%	538	3	93.33%	345	0	0.00%	510	0	100.00%	341	0	56.67%	523	0	100.00%
25	2262	2261	1	0.0442%	75.33%	584	1	93.33%	267	0	20.00%	519	0	100.00%	355	0	63.33%	536	0	100.00%
26	2571	2568	3	0.1167%	86.67%	544	3	93.33%	419	0	43.33%	507	0	100.00%	564	0	100.00%	534	0	96.67%
27	2225	2222	3	0.1348%	76.00%	551	3	100.00%	283	0	0.00%	484	0	100.00%	397	0	86.67%	507	0	93.33%
28	2483	2480	3	0.1208%	98.00%	524	3	96.67%	458	0	100.00%	550	0	100.00%	447	0	100.00%	501	0	93.33%
29	2463	2463	0	0.0000%	60.67%	696	0	100.00%	367	0	0.00%	476	0	100.00%	238	0	6.67%	686	0	96.67%
30	2669	2669	0	0.0000%	77.33%	683	0	100.00%	435	0	50.00%	431	0	43.33%	454	0	93.33%	666	0	100.00%
31	2324	2324	0	0.0000%	81.33%	566	0	100.00%	452	0	83.33%	519	0	100.00%	228	0	23.33%	559	0	100.00%
32	2655	2653	2	0.0753%	100.00%	556	2	100.00%	527	0	100.00%	535	0	100.00%	487	0	100.00%	548	0	100.00%
33	2275	2274	1	0.0440%	78.67%	563	0	100.00%	584	1	96.67%	495	0	96.67%	86	0	0.00%	546	0	100.00%
34	2736	2731	5	0.1827%	85.33%	549	5	100.00%	370	0	26.67%	532	0	100.00%	742	0	100.00%	538	0	100.00%
35	2515	2514	1	0.0398%	87.33%	562	1	100.00%	422	0	36.67%	580	0	100.00%	404	0	100.00%	546	0	100.00%
36	2950	2947	3	0.1017%	99.33%	581	2	100.00%	458	1	96.67%	542	0	100.00%	795	0	100.00%	571	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-21 Packet loss; High power; Distance 0.5 meter

Power Level: High
Distance 0.5m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	4755	4720	35	0.7361%	90.00%	952	9	86.67%	1025	6	96.67%	1041	3	93.33%	627	10	80.00%	1075	7	93.33%
1	4757	4690	67	1.4085%	86.00%	963	14	86.67%	995	11	86.67%	853	10	80.00%	760	23	83.33%	1119	9	93.33%
2	4636	4603	33	0.7118%	86.67%	935	8	83.33%	857	10	90.00%	977	7	80.00%	912	2	90.00%	922	6	90.00%
3	4804	4771	33	0.6869%	91.33%	981	5	90.00%	893	7	93.33%	863	5	76.67%	987	9	100.00%	1047	7	96.67%
4	4865	4820	45	0.9250%	87.33%	1024	4	83.33%	1074	9	90.00%	990	10	83.33%	626	15	83.33%	1106	7	96.67%
5	4903	4844	59	1.2033%	93.33%	1163	12	93.33%	1106	12	96.67%	1093	12	96.67%	594	12	86.67%	888	11	93.33%
6	4048	3997	51	1.2599%	78.00%	882	13	73.33%	788	9	80.00%	751	17	70.00%	561	1	73.33%	1015	11	93.33%
7	4863	4821	42	0.8637%	91.33%	1065	4	83.33%	980	5	90.00%	1002	6	96.67%	875	20	96.67%	899	7	90.00%
8	3808	3780	28	0.7353%	76.00%	700	3	63.33%	603	5	66.67%	862	2	90.00%	873	12	83.33%	742	6	76.67%
9	3661	3615	46	1.2565%	75.33%	786	9	66.67%	802	9	90.00%	640	10	70.00%	730	12	73.33%	657	6	76.67%
10	3625	3598	27	0.7448%	74.67%	654	7	60.00%	764	1	76.67%	708	3	76.67%	654	13	83.33%	818	3	76.67%
11	2779	2770	9	0.3239%	62.00%	470	1	46.67%	524	1	60.00%	484	4	53.33%	759	3	93.33%	533	0	56.67%
12	2610	2584	26	0.9962%	62.67%	376	3	40.00%	409	5	53.33%	482	3	60.00%	757	10	90.00%	560	5	70.00%
13	2313	2296	17	0.7350%	56.67%	329	3	33.33%	355	3	50.00%	428	1	53.33%	819	7	93.33%	365	3	53.33%
14	2669	2639	30	1.1240%	65.33%	337	5	36.67%	422	10	66.67%	484	8	66.67%	950	1	100.00%	446	6	56.67%
15	2495	2483	12	0.4810%	62.00%	337	2	46.67%	357	2	40.00%	435	0	60.00%	926	8	96.67%	428	0	66.67%
16	2371	2345	26	1.0966%	56.00%	342	5	43.33%	353	7	40.00%	447	1	53.33%	783	8	86.67%	420	5	56.67%
17	1985	1961	24	1.2091%	53.33%	317	6	36.67%	343	7	43.33%	412	5	60.00%	589	1	93.33%	300	5	33.33%
18	2027	2007	20	0.9867%	46.00%	276	5	23.33%	286	4	36.67%	353	5	46.67%	722	2	90.00%	370	4	33.33%
19	2529	2522	7	0.2768%	60.00%	591	1	53.33%	555	3	73.33%	410	0	46.67%	446	0	63.33%	520	3	63.33%
20	2252	2226	26	1.1545%	54.67%	429	4	40.00%	467	6	63.33%	453	4	60.00%	454	6	60.00%	423	6	50.00%
21	2410	2379	31	1.2863%	58.67%	490	6	50.00%	540	4	56.67%	546	5	63.33%	356	13	56.67%	447	3	66.67%
22	2484	2454	30	1.2077%	58.00%	393	6	40.00%	431	7	56.67%	575	8	66.67%	605	0	66.67%	450	9	60.00%
23	2305	2284	21	0.9111%	56.00%	417	4	40.00%	499	1	73.33%	432	2	50.00%	463	8	60.00%	473	6	56.67%
24	2638	2584	54	2.0470%	62.00%	561	11	53.33%	632	12	83.33%	556	14	73.33%	230	7	23.33%	605	10	76.67%
25	2400	2398	2	0.0833%	57.33%	591	0	56.67%	539	0	83.33%	491	1	66.67%	193	1	6.67%	584	0	73.33%
26	2467	2447	20	0.8107%	60.67%	601	6	56.67%	521	3	70.00%	545	3	73.33%	223	2	23.33%	557	6	80.00%
27	2313	2298	15	0.6485%	57.33%	475	3	40.00%	529	4	70.00%	456	2	60.00%	388	0	53.33%	450	6	63.33%
28	2510	2485	25	0.9960%	64.67%	529	6	66.67%	572	6	76.67%	495	8	73.33%	378	0	43.33%	511	5	63.33%
29	1513	1505	8	0.5288%	34.67%	358	2	43.33%	347	0	40.00%	316	3	43.33%	153	0	10.00%	331	3	36.67%
30	1656	1652	4	0.2415%	36.00%	409	0	46.67%	366	0	40.00%	296	0	33.33%	200	4	10.00%	381	0	50.00%
31	2303	2302	1	0.0434%	55.33%	614	0	63.33%	502	0	70.00%	482	0	66.67%	253	1	20.00%	451	0	56.67%
32	2602	2572	30	1.1530%	64.00%	633	6	66.67%	611	6	83.33%	517	5	70.00%	276	6	26.67%	535	7	73.33%
33	3369	3360	9	0.2671%	69.33%	807	1	70.00%	779	3	86.67%	724	2	73.33%	309	0	26.67%	741	3	90.00%
34	4266	4241	25	0.5860%	82.00%	1037	6	70.00%	1021	2	96.67%	815	8	80.00%	498	0	73.33%	870	9	90.00%
35	4481	4466	15	0.3347%	83.33%	978	3	80.00%	916	3	86.67%	939	5	86.67%	598	0	70.00%	1035	4	93.33%
36	4422	4395	27	0.6106%	87.33%	1028	5	93.33%	822	5	90.00%	823	5	83.33%	615	8	73.33%	1107	4	96.67%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-22 Packet loss; High power; Distance 1.0 meter

Power Level: High
Distance 1.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3296	3249	47	1.4260%	82.67%	618	2	83.33%	561	16	70.00%	615	6	83.33%	788	9	96.67%	667	14	80.00%
1	4387	4317	70	1.5956%	90.00%	821	4	83.33%	781	17	86.67%	949	18	86.67%	900	10	100.00%	866	21	93.33%
2	4528	4511	17	0.3754%	93.33%	1031	1	93.33%	867	7	93.33%	883	2	93.33%	847	6	96.67%	883	1	90.00%
3	4242	4197	45	1.0608%	94.00%	835	2	93.33%	775	11	93.33%	883	11	93.33%	896	10	100.00%	808	11	90.00%
4	3719	3679	40	1.0756%	82.00%	664	2	73.33%	665	8	80.00%	715	18	70.00%	849	3	93.33%	786	9	93.33%
5	3248	3205	43	1.3239%	78.67%	501	2	63.33%	668	12	83.33%	721	14	76.67%	726	3	90.00%	589	12	80.00%
6	2991	2986	5	0.1672%	74.00%	462	0	60.00%	525	0	76.67%	638	1	80.00%	955	4	100.00%	406	0	53.33%
7	4529	4459	70	1.5456%	94.67%	927	4	96.67%	974	17	96.67%	915	16	83.33%	777	16	96.67%	866	17	100.00%
8	4680	4638	42	0.8974%	88.67%	990	3	90.00%	992	9	90.00%	935	13	76.67%	762	6	96.67%	959	11	90.00%
9	3899	3861	38	0.9746%	79.33%	805	3	76.67%	692	8	66.67%	767	10	80.00%	812	6	90.00%	785	11	83.33%
10	3333	3294	39	1.1701%	78.00%	596	3	80.00%	575	8	70.00%	690	16	63.33%	814	1	100.00%	619	11	76.67%
11	4132	4105	27	0.6534%	92.67%	750	1	83.33%	824	5	93.33%	960	6	93.33%	712	10	96.67%	859	5	96.67%
12	3546	3512	34	0.9588%	85.33%	639	1	76.67%	658	7	76.67%	716	12	90.00%	730	8	96.67%	769	6	86.67%
13	4365	4323	42	0.9622%	96.67%	878	2	100.00%	866	15	100.00%	894	14	93.33%	747	0	90.00%	938	11	100.00%
14	4453	4437	16	0.3593%	96.67%	929	0	96.67%	983	0	100.00%	936	0	96.67%	626	16	90.00%	963	0	100.00%
15	4385	4365	20	0.4561%	98.67%	848	1	100.00%	935	5	100.00%	893	10	96.67%	759	0	96.67%	930	4	100.00%
16	4156	4134	22	0.5294%	94.67%	867	1	96.67%	945	7	93.33%	826	7	90.00%	609	0	96.67%	887	7	96.67%
17	2934	2933	1	0.0341%	90.00%	584	0	90.00%	594	0	90.00%	602	1	90.00%	548	0	96.67%	605	0	83.33%
18	2662	2662	0	0.0000%	74.67%	500	0	63.33%	533	0	70.00%	513	0	66.67%	551	0	96.67%	565	0	76.67%
19	2724	2706	18	0.6608%	76.00%	570	0	80.00%	517	0	70.00%	562	2	70.00%	483	16	86.67%	574	0	73.33%
20	2154	2120	34	1.5785%	57.33%	358	1	50.00%	416	4	60.00%	484	8	53.33%	529	14	80.00%	333	7	43.33%
21	2008	1945	63	3.1375%	52.00%	328	3	40.00%	370	19	50.00%	356	20	36.67%	589	3	96.67%	302	18	36.67%
22	3039	3032	7	0.2303%	74.67%	683	0	83.33%	645	0	73.33%	685	1	70.00%	409	6	66.67%	610	0	80.00%
23	2409	2394	15	0.6227%	54.00%	473	1	53.33%	556	5	60.00%	423	4	46.67%	283	0	36.67%	659	5	73.33%
24	1302	1271	31	2.3810%	28.00%	258	1	23.33%	286	8	36.67%	177	3	10.00%	320	13	46.67%	230	6	23.33%
25	1328	1317	11	0.8283%	31.33%	217	0	23.33%	229	0	26.67%	261	2	30.00%	371	9	50.00%	239	0	26.67%
26	1357	1346	11	0.8106%	29.33%	322	1	43.33%	303	4	33.33%	217	4	13.33%	268	0	26.67%	236	2	30.00%
27	1408	1403	5	0.3551%	34.00%	328	0	40.00%	288	0	33.33%	282	0	40.00%	258	5	30.00%	247	0	26.67%
28	1570	1566	4	0.2548%	38.00%	293	0	30.00%	343	0	53.33%	327	0	40.00%	341	4	36.67%	262	0	30.00%
29	948	946	2	0.2110%	14.00%	201	0	23.33%	195	0	13.33%	200	1	10.00%	134	1	10.00%	216	0	13.33%
30	1182	1164	18	1.5228%	20.00%	210	1	13.33%	194	7	20.00%	219	4	20.00%	285	0	20.00%	256	6	26.67%
31	1378	1374	4	0.2903%	30.67%	247	0	26.67%	300	0	33.33%	272	0	26.67%	301	4	36.67%	254	0	30.00%
32	1354	1333	21	1.5510%	28.67%	235	1	23.33%	230	10	23.33%	379	1	50.00%	167	0	6.67%	322	9	40.00%
33	2229	2222	7	0.3140%	57.33%	487	0	53.33%	392	0	56.67%	400	0	50.00%	358	7	46.67%	585	0	80.00%
34	2538	2529	9	0.3546%	74.67%	453	0	70.00%	513	0	70.00%	572	2	80.00%	472	7	76.67%	519	0	76.67%
35	2755	2754	1	0.0363%	70.67%	708	0	86.67%	512	0	73.33%	632	1	80.00%	324	0	36.67%	578	0	76.67%
36	3321	3293	28	0.8431%	80.67%	695	1	83.33%	647	5	80.00%	681	6	76.67%	565	7	76.67%	705	9	86.67%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-23 Packet loss; High power; Distance 1.5 meters

Power Level: High
Distance 1.5m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	4082	4052	30	0.7349%	98.00%	820	3	100.00%	852	6	100.00%	804	11	96.67%	739	0	93.33%	837	10	100.00%
1	3869	3844	25	0.6462%	92.67%	856	1	100.00%	860	2	100.00%	845	5	96.67%	453	0	66.67%	830	17	100.00%
2	4137	4118	19	0.4593%	96.67%	889	1	100.00%	816	6	100.00%	857	4	100.00%	734	4	83.33%	822	4	100.00%
3	4466	4426	40	0.8957%	99.33%	905	3	100.00%	869	15	100.00%	823	11	96.67%	1007	6	100.00%	822	5	100.00%
4	3998	3964	34	0.8504%	88.00%	793	1	83.33%	833	3	93.33%	689	6	83.33%	885	7	96.67%	764	17	83.33%
5	3414	3390	24	0.7030%	88.67%	661	1	90.00%	670	4	90.00%	744	11	96.67%	679	0	76.67%	636	8	90.00%
6	4250	4230	20	0.4706%	94.00%	901	1	96.67%	952	8	100.00%	866	9	96.67%	638	2	76.67%	873	0	100.00%
7	3655	3619	36	0.9850%	86.00%	792	3	93.33%	744	9	96.67%	802	11	93.33%	400	0	46.67%	881	13	100.00%
8	3783	3751	32	0.8459%	90.67%	752	1	93.33%	802	6	96.67%	791	9	93.33%	649	0	90.00%	757	16	80.00%
9	4083	4056	27	0.6613%	78.67%	840	1	73.33%	777	6	73.33%	834	4	83.33%	797	0	83.33%	808	16	80.00%
10	4045	4032	13	0.3214%	98.67%	822	0	100.00%	823	0	100.00%	731	0	93.33%	819	0	100.00%	837	13	100.00%
11	3898	3863	35	0.8979%	98.00%	728	3	96.67%	739	10	100.00%	762	10	93.33%	913	8	100.00%	721	4	100.00%
12	3537	3521	16	0.4524%	94.67%	668	1	96.67%	748	3	96.67%	654	7	80.00%	730	1	100.00%	721	4	100.00%
13	3467	3450	17	0.4903%	90.00%	669	0	93.33%	632	0	86.67%	732	2	86.67%	699	0	90.00%	718	15	93.33%
14	3097	3068	29	0.9364%	94.67%	633	2	93.33%	657	15	93.33%	653	12	100.00%	478	0	86.67%	647	0	100.00%
15	3712	3704	8	0.2155%	97.33%	768	0	100.00%	748	0	100.00%	717	3	93.33%	694	0	96.67%	777	5	96.67%
16	3265	3250	15	0.4594%	100.00%	613	0	100.00%	654	0	100.00%	611	3	100.00%	760	4	100.00%	612	8	100.00%
17	2854	2853	1	0.0350%	98.67%	557	0	100.00%	549	0	100.00%	560	1	93.33%	627	0	100.00%	560	0	100.00%
18	2773	2769	4	0.1442%	97.33%	563	0	100.00%	571	0	100.00%	535	3	90.00%	544	1	96.67%	556	0	100.00%
19	2596	2572	24	0.9245%	90.00%	511	2	86.67%	477	13	86.67%	521	9	83.33%	559	0	100.00%	504	0	93.33%
20	2544	2515	29	1.1399%	80.67%	527	2	80.00%	505	13	80.00%	461	9	63.33%	455	0	96.67%	567	5	83.33%
21	2961	2926	35	1.1820%	98.00%	618	1	100.00%	609	9	100.00%	560	6	93.33%	548	0	96.67%	591	19	100.00%
22	2034	2026	8	0.3933%	58.00%	367	1	46.67%	380	2	50.00%	405	5	60.00%	438	0	66.67%	436	0	66.67%
23	1637	1627	10	0.6109%	43.33%	285	0	26.67%	291	0	40.00%	289	2	26.67%	511	0	96.67%	251	8	26.67%
24	1715	1688	27	1.5743%	40.00%	241	2	23.33%	325	8	40.00%	285	10	20.00%	499	1	70.00%	338	6	46.67%
25	1932	1903	29	1.5010%	52.67%	362	2	43.33%	413	15	63.33%	398	12	50.00%	346	0	46.67%	384	0	60.00%
26	1481	1469	12	0.8103%	36.00%	300	0	36.67%	246	0	26.67%	289	4	23.33%	317	1	46.67%	317	7	46.67%
27	1668	1649	19	1.1391%	41.33%	337	1	43.33%	345	3	50.00%	347	9	40.00%	304	6	36.67%	316	0	36.67%
28	1577	1564	13	0.8244%	37.33%	376	1	60.00%	312	4	33.33%	353	5	40.00%	137	3	0.00%	386	0	53.33%
29	907	901	6	0.6615%	13.33%	121	0	0.00%	168	0	10.00%	135	1	6.67%	360	5	43.33%	117	0	6.67%
30	1480	1471	9	0.6081%	24.67%	293	0	20.00%	279	0	20.00%	333	1	33.33%	300	0	40.00%	266	8	10.00%
31	1588	1576	12	0.7557%	37.33%	321	1	30.00%	255	5	30.00%	317	6	43.33%	332	0	43.33%	351	0	40.00%
32	1273	1268	5	0.3928%	26.67%	180	0	6.67%	207	0	23.33%	242	0	23.33%	449	0	66.67%	190	5	13.33%
33	2031	2008	23	1.1324%	52.67%	472	2	63.33%	419	10	56.67%	391	11	53.33%	311	0	30.00%	415	0	60.00%
34	2593	2581	12	0.4628%	72.67%	506	1	66.67%	517	7	73.33%	511	4	66.67%	553	0	83.33%	494	0	73.33%
35	2177	2165	12	0.5512%	54.67%	465	0	66.67%	294	0	33.33%	353	2	36.67%	631	10	86.67%	422	0	50.00%
36	3152	3136	16	0.5076%	82.67%	567	1	73.33%	640	6	86.67%	610	6	73.33%	640	0	96.67%	679	3	83.33%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-24 Packet loss; High power; Distance 2.0 meters

Power Level: High
Distance 2.0m

						Ovens														
	Total # Packets					Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3848	3845	3	0.0780%	93.33%	780	2	96.67%	703	0	86.67%	763	0	86.67%	773	1	96.67%	826	0	100.00%
1	1833	1829	4	0.2182%	46.00%	386	0	53.33%	309	0	43.33%	447	4	46.67%	357	0	36.67%	330	0	50.00%
2	3533	3502	31	0.8774%	76.00%	624	0	70.00%	596	8	70.00%	655	4	80.00%	929	6	86.67%	698	13	73.33%
3	4906	4877	29	0.5911%	99.33%	955	0	100.00%	1093	6	100.00%	947	10	100.00%	824	9	100.00%	1058	4	96.67%
4	4327	4302	25	0.5778%	98.67%	847	0	100.00%	893	6	100.00%	871	8	93.33%	819	5	100.00%	872	6	100.00%
5	2695	2693	2	0.0742%	68.00%	609	1	83.33%	525	0	53.33%	506	0	60.00%	506	1	70.00%	547	0	73.33%
6	2611	2608	3	0.1149%	68.67%	554	0	76.67%	446	0	56.67%	699	3	76.67%	396	0	63.33%	513	0	70.00%
7	2313	2312	1	0.0432%	78.00%	443	0	73.33%	479	0	86.67%	512	1	80.00%	486	0	83.33%	392	0	66.67%
8	2951	2949	2	0.0678%	74.67%	668	0	90.00%	630	0	76.67%	621	2	73.33%	406	0	63.33%	624	0	70.00%
9	4136	4132	4	0.0967%	81.33%	862	2	86.67%	661	0	80.00%	657	1	70.00%	1201	1	96.67%	751	0	73.33%
10	4285	4281	4	0.0933%	97.33%	878	4	96.67%	849	0	100.00%	801	0	93.33%	936	0	96.67%	817	0	100.00%
11	4577	4550	27	0.5899%	98.67%	897	3	100.00%	920	4	100.00%	867	7	96.67%	920	5	96.67%	946	8	100.00%
12	3544	3540	4	0.1129%	98.67%	718	0	100.00%	746	0	100.00%	785	4	100.00%	526	0	93.33%	765	0	100.00%
13	3125	3124	1	0.0320%	76.00%	556	0	63.33%	669	0	86.67%	716	1	80.00%	474	0	66.67%	709	0	83.33%
14	2429	2425	4	0.1647%	84.00%	501	0	86.67%	454	0	86.67%	547	4	90.00%	421	0	60.00%	502	0	96.67%
15	3288	3287	1	0.0304%	91.33%	697	1	100.00%	635	0	93.33%	782	0	100.00%	472	0	63.33%	701	0	100.00%
16	3850	3829	21	0.5455%	91.33%	841	1	96.67%	804	3	100.00%	804	5	93.33%	626	5	70.00%	754	7	96.67%
17	3083	3082	1	0.0324%	98.67%	617	1	100.00%	618	0	100.00%	631	0	100.00%	601	0	93.33%	615	0	100.00%
18	2788	2782	6	0.2152%	98.67%	545	2	100.00%	541	0	100.00%	546	4	96.67%	604	0	96.67%	546	0	100.00%
19	2826	2823	3	0.1062%	98.00%	556	1	100.00%	568	0	100.00%	548	1	96.67%	597	1	93.33%	554	0	100.00%
20	2377	2376	1	0.0421%	92.67%	472	0	93.33%	471	0	100.00%	465	1	86.67%	508	0	86.67%	460	0	96.67%
21	2741	2738	3	0.1094%	98.67%	560	1	100.00%	560	0	100.00%	523	1	96.67%	562	1	96.67%	533	0	100.00%
22	2472	2469	3	0.1214%	73.33%	474	0	70.00%	450	0	70.00%	434	2	63.33%	620	1	90.00%	491	0	73.33%
23	2558	2558	0	0.0000%	91.33%	530	0	100.00%	536	0	100.00%	510	0	93.33%	461	0	63.33%	521	0	100.00%
24	2351	2350	1	0.0425%	65.33%	396	0	56.67%	575	0	86.67%	408	1	53.33%	459	0	56.67%	512	0	73.33%
25	1905	1904	1	0.0525%	54.00%	348	1	56.67%	389	0	50.00%	378	0	50.00%	390	0	56.67%	399	0	56.67%
26	1970	1969	1	0.0508%	64.00%	440	0	70.00%	395	0	60.00%	393	1	46.67%	425	0	93.33%	316	0	50.00%
27	1702	1684	18	1.0576%	48.67%	292	1	40.00%	362	7	56.67%	337	5	46.67%	337	3	46.67%	356	2	53.33%
28	785	763	22	2.8025%	6.67%	150	0	0.00%	119	1	3.33%	169	6	6.67%	213	7	23.33%	112	8	0.00%
29	2006	1988	18	0.8973%	48.00%	452	0	50.00%	455	5	66.67%	463	4	46.67%	296	6	36.67%	322	3	40.00%
30	1956	1956	0	0.0000%	54.00%	380	0	46.67%	392	0	50.00%	322	0	40.00%	475	0	76.67%	387	0	56.67%
31	1580	1579	1	0.0633%	36.67%	320	1	36.67%	407	0	53.33%	404	0	53.33%	238	0	16.67%	210	0	23.33%
32	2103	2102	1	0.0476%	64.67%	490	1	70.00%	420	0	66.67%	383	0	56.67%	356	0	53.33%	453	0	76.67%
33	1579	1578	1	0.0633%	38.67%	308	1	36.67%	287	0	36.67%	340	0	40.00%	377	0	53.33%	266	0	26.67%
34	2858	2857	1	0.0350%	78.00%	570	0	76.67%	604	0	73.33%	541	1	70.00%	562	0	86.67%	580	0	83.33%
35	2824	2804	20	0.7082%	82.67%	560	0	86.67%	595	4	86.67%	572	6	80.00%	539	3	73.33%	538	7	86.67%
36	3444	3443	1	0.0290%	98.67%	718	1	100.00%	668	0	100.00%	684	0	96.67%	697	0	96.67%	676	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-25 Packet loss; High power; Distance 2.5 meters

Power Level: High
Distance 2.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	3450	3446	4	0.1159%	90.00%	800	2	93.33%	735	0	96.67%	665	0	90.00%	522	2	76.67%	724	0	93.33%
1	2365	2363	2	0.0846%	63.33%	443	0	70.00%	374	0	46.67%	446	2	56.67%	772	0	96.67%	328	0	46.67%
2	3646	3619	27	0.7405%	80.00%	643	0	73.33%	811	3	70.00%	833	10	76.67%	620	8	100.00%	712	6	80.00%
3	4074	4048	26	0.6382%	98.67%	1007	0	100.00%	829	4	100.00%	836	8	100.00%	469	2	93.33%	907	12	100.00%
4	4150	4125	25	0.6024%	98.00%	831	0	96.67%	720	9	96.67%	749	5	100.00%	1033	5	96.67%	792	6	100.00%
5	2992	2990	2	0.0668%	82.67%	586	0	76.67%	551	0	83.33%	552	0	83.33%	784	2	100.00%	517	0	70.00%
6	2257	2255	2	0.0886%	66.00%	512	0	73.33%	472	0	63.33%	475	1	66.67%	353	1	46.67%	443	0	80.00%
7	2654	2653	1	0.0377%	84.00%	438	0	80.00%	539	0	86.67%	553	1	86.67%	610	0	76.67%	513	0	90.00%
8	2690	2686	4	0.1487%	65.33%	594	0	73.33%	383	0	53.33%	392	2	56.67%	926	2	100.00%	391	0	43.33%
9	4827	4824	3	0.0622%	94.00%	890	2	90.00%	1157	0	96.67%	1157	1	96.67%	634	0	96.67%	986	0	90.00%
10	4227	4220	7	0.1656%	99.33%	883	5	100.00%	920	0	100.00%	904	1	100.00%	628	1	96.67%	885	0	100.00%
11	4219	4199	20	0.4740%	100.00%	883	4	100.00%	904	3	100.00%	871	6	100.00%	613	1	100.00%	928	6	100.00%
12	3022	3020	2	0.0662%	87.33%	717	1	100.00%	573	0	83.33%	556	1	83.33%	508	0	76.67%	666	0	93.33%
13	2882	2881	1	0.0347%	84.00%	635	1	80.00%	574	0	76.67%	500	0	76.67%	623	0	100.00%	549	0	86.67%
14	2467	2467	0	0.0000%	82.67%	502	0	90.00%	514	0	83.33%	488	0	83.33%	489	0	70.00%	474	0	86.67%
15	2620	2617	3	0.1145%	78.00%	684	2	100.00%	382	0	50.00%	430	1	63.33%	634	0	96.67%	487	0	80.00%
16	2789	2766	23	0.8247%	73.33%	803	0	100.00%	464	4	60.00%	475	6	66.67%	518	3	73.33%	506	10	66.67%
17	3031	3026	5	0.1650%	99.33%	601	1	100.00%	629	0	100.00%	631	4	100.00%	573	0	96.67%	592	0	100.00%
18	3050	3049	1	0.0328%	93.33%	545	0	100.00%	618	0	93.33%	628	1	90.00%	610	0	90.00%	648	0	93.33%
19	2747	2746	1	0.0364%	86.00%	552	1	100.00%	596	0	93.33%	582	0	90.00%	396	0	46.67%	620	0	100.00%
20	2603	2601	2	0.0768%	90.67%	463	0	90.00%	506	0	90.00%	502	2	83.33%	617	0	96.67%	513	0	93.33%
21	2629	2627	2	0.0761%	91.33%	552	0	100.00%	565	0	100.00%	575	2	100.00%	385	0	56.67%	550	0	100.00%
22	2573	2572	1	0.0389%	76.67%	450	1	70.00%	484	0	66.67%	553	0	76.67%	564	0	86.67%	521	0	83.33%
23	2362	2362	0	0.0000%	75.33%	514	0	100.00%	434	0	63.33%	486	0	60.00%	562	0	96.67%	366	0	56.67%
24	2314	2314	0	0.0000%	63.33%	323	0	46.67%	376	0	53.33%	458	0	56.67%	691	0	96.67%	466	0	63.33%
25	1538	1538	0	0.0000%	36.00%	368	0	53.33%	333	0	50.00%	326	0	40.00%	170	0	0.00%	341	0	36.67%
26	2349	2348	1	0.0426%	83.33%	374	1	53.33%	446	0	96.67%	403	0	73.33%	675	0	96.67%	450	0	96.67%
27	1514	1492	22	1.4531%	38.00%	277	1	30.00%	344	7	63.33%	348	7	43.33%	199	4	13.33%	324	3	40.00%
28	1242	1217	25	2.0129%	16.67%	143	0	0.00%	179	8	6.67%	257	7	20.00%	461	2	50.00%	177	8	6.67%
29	2065	2046	19	0.9201%	60.67%	418	0	70.00%	404	4	66.67%	426	4	56.67%	444	2	53.33%	354	9	56.67%
30	2262	2262	0	0.0000%	66.67%	400	0	60.00%	532	0	83.33%	517	0	70.00%	329	0	46.67%	484	0	73.33%
31	1773	1772	1	0.0564%	46.67%	383	0	56.67%	326	0	43.33%	355	1	40.00%	360	0	46.67%	348	0	46.67%
32	2260	2259	1	0.0442%	60.67%	387	1	63.33%	411	0	50.00%	418	0	56.67%	623	0	76.67%	420	0	56.67%
33	1957	1956	1	0.0511%	55.33%	328	1	43.33%	408	0	70.00%	407	0	40.00%	443	0	60.00%	370	0	63.33%
34	3148	3148	0	0.0000%	86.00%	549	0	80.00%	491	0	73.33%	636	0	90.00%	781	0	96.67%	691	0	90.00%
35	2828	2799	29	1.0255%	78.67%	563	0	80.00%	486	11	66.67%	556	5	83.33%	586	4	80.00%	608	9	83.33%
36	3547	3546	1	0.0282%	98.00%	693	1	100.00%	703	0	100.00%	658	0	93.33%	801	0	96.67%	691	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-26 Packet loss; High power; Distance 3.0 meters

Power Level: High
Distance 3.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2605	2603	2	0.0768%	70.67%	508	0	70.00%	464	0	60.00%	592	1	80.00%	417	1	63.33%	622	0	80.00%
1	4252	4252	0	0.0000%	98.00%	818	0	93.33%	845	0	100.00%	781	0	96.67%	971	0	100.00%	837	0	100.00%
2	3091	3077	14	0.4529%	96.00%	611	1	93.33%	603	6	100.00%	618	0	86.67%	640	4	100.00%	605	3	100.00%
3	2505	2485	20	0.7984%	92.67%	467	1	96.67%	443	4	90.00%	528	2	86.67%	578	5	100.00%	469	8	90.00%
4	4581	4567	14	0.3056%	96.67%	903	0	100.00%	974	6	100.00%	928	0	93.33%	828	5	90.00%	934	3	100.00%
5	3900	3898	2	0.0513%	99.33%	770	0	100.00%	767	0	100.00%	748	2	96.67%	846	0	100.00%	767	0	100.00%
6	1375	1372	3	0.2182%	31.33%	297	2	46.67%	320	0	43.33%	306	1	26.67%	200	0	3.33%	249	0	36.67%
7	2672	2670	2	0.0749%	72.67%	535	0	80.00%	518	0	70.00%	582	2	70.00%	534	0	70.00%	501	0	73.33%
8	4772	4772	0	0.0000%	98.00%	897	0	100.00%	1002	0	100.00%	889	0	90.00%	1008	0	100.00%	976	0	100.00%
9	3155	3154	1	0.0317%	94.67%	601	1	90.00%	592	0	96.67%	663	0	93.33%	710	0	96.67%	588	0	96.67%
10	3360	3358	2	0.0595%	92.67%	637	0	93.33%	618	0	93.33%	684	2	86.67%	801	0	96.67%	618	0	93.33%
11	3288	3261	27	0.8212%	99.33%	617	1	100.00%	656	4	100.00%	664	7	96.67%	710	4	100.00%	614	11	100.00%
12	2441	2440	1	0.0410%	71.33%	451	0	70.00%	484	0	70.00%	522	0	70.00%	532	1	73.33%	451	0	73.33%
13	3167	3165	2	0.0632%	96.67%	619	0	96.67%	628	0	100.00%	658	2	93.33%	659	0	93.33%	601	0	100.00%
14	2399	2399	0	0.0000%	70.00%	419	0	70.00%	483	0	73.33%	451	0	70.00%	521	0	60.00%	525	0	76.67%
15	3280	3278	2	0.0610%	98.67%	632	0	100.00%	618	0	100.00%	665	0	96.67%	697	2	96.67%	666	0	100.00%
16	2311	2291	20	0.8654%	71.33%	461	2	73.33%	383	5	53.33%	546	5	76.67%	534	5	90.00%	367	3	63.33%
17	2959	2957	2	0.0676%	98.00%	565	0	100.00%	584	0	100.00%	620	0	96.67%	622	2	93.33%	566	0	100.00%
18	3227	3226	1	0.0310%	97.33%	644	0	96.67%	610	0	96.67%	651	0	96.67%	691	1	96.67%	630	0	100.00%
19	2093	2090	3	0.1433%	55.33%	443	0	60.00%	390	0	43.33%	506	2	73.33%	360	1	46.67%	391	0	53.33%
20	3112	3109	3	0.0964%	96.67%	625	0	100.00%	628	0	100.00%	629	3	90.00%	600	0	93.33%	627	0	100.00%
21	1695	1695	0	0.0000%	44.00%	338	0	56.67%	385	0	53.33%	387	0	46.67%	231	0	10.00%	354	0	53.33%
22	3011	3009	2	0.0664%	87.33%	613	1	83.33%	545	0	86.67%	607	1	86.67%	630	0	93.33%	614	0	86.67%
23	2720	2720	0	0.0000%	95.33%	560	0	96.67%	557	0	100.00%	509	0	86.67%	534	0	93.33%	560	0	100.00%
24	3290	3289	1	0.0304%	96.67%	699	0	100.00%	685	0	100.00%	620	1	90.00%	623	0	93.33%	662	0	100.00%
25	810	810	0	0.0000%	2.00%	179	0	6.67%	168	0	0.00%	160	0	3.33%	141	0	0.00%	162	0	0.00%
26	3517	3517	0	0.0000%	96.67%	688	0	100.00%	749	0	100.00%	629	0	90.00%	739	0	93.33%	712	0	100.00%
27	920	911	9	0.9783%	8.67%	207	1	6.67%	206	1	13.33%	164	1	3.33%	117	1	0.00%	217	5	20.00%
28	2428	2412	16	0.6590%	61.33%	482	1	63.33%	506	4	66.67%	366	4	40.00%	539	0	70.00%	519	7	66.67%
29	2627	2616	11	0.4187%	71.33%	448	1	66.67%	472	1	56.67%	468	3	56.67%	593	1	93.33%	635	5	83.33%
30	1762	1761	1	0.0568%	44.00%	381	0	60.00%	344	0	33.33%	322	1	40.00%	409	0	60.00%	305	0	26.67%
31	1794	1792	2	0.1115%	47.33%	402	0	50.00%	434	0	70.00%	307	2	33.33%	282	0	30.00%	367	0	53.33%
32	3311	3310	1	0.0302%	81.33%	662	0	76.67%	674	0	76.67%	583	1	76.67%	815	0	93.33%	576	0	83.33%
33	2212	2209	3	0.1356%	51.33%	577	0	66.67%	550	0	73.33%	387	3	53.33%	235	0	6.67%	460	0	56.67%
34	3826	3826	0	0.0000%	96.67%	811	0	100.00%	715	0	100.00%	779	0	90.00%	693	0	93.33%	828	0	100.00%
35	3130	3119	11	0.3514%	78.67%	587	1	80.00%	618	1	73.33%	615	3	73.33%	718	1	93.33%	581	5	73.33%
36	3877	3877	0	0.0000%	98.00%	783	0	100.00%	825	0	100.00%	762	0	96.67%	719	0	93.33%	788	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-27 Packet loss; High power; Distance 3.5 meters

Power Level: High
Distance 3.5m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2030	2030	0	0.0000%	58.67%	444	0	60.00%	363	0	46.67%	379	0	60.00%	462	0	70.00%	382	0	56.67%
1	4672	4672	0	0.0000%	100.00%	935	0	100.00%	933	0	100.00%	934	0	100.00%	934	0	100.00%	936	0	100.00%
2	2993	2981	12	0.4009%	99.33%	594	1	96.67%	600	5	100.00%	591	1	100.00%	602	2	100.00%	594	3	100.00%
3	2588	2574	14	0.5410%	100.00%	508	2	100.00%	522	3	100.00%	522	2	100.00%	512	3	100.00%	510	4	100.00%
4	4548	4540	8	0.1759%	97.33%	900	0	100.00%	929	3	100.00%	799	1	86.67%	1013	2	100.00%	899	2	100.00%
5	3897	3897	0	0.0000%	100.00%	772	0	100.00%	784	0	100.00%	789	0	100.00%	786	0	100.00%	766	0	100.00%
6	712	712	0	0.0000%	0.00%	153	0	0.00%	145	0	0.00%	137	0	0.00%	138	0	0.00%	139	0	0.00%
7	2009	2009	0	0.0000%	54.67%	388	0	56.67%	376	0	53.33%	414	0	56.67%	460	0	60.00%	371	0	46.67%
8	5048	5048	0	0.0000%	100.00%	1052	0	100.00%	963	0	100.00%	993	0	100.00%	1013	0	100.00%	1027	0	100.00%
9	3321	3321	0	0.0000%	95.33%	702	0	93.33%	627	0	100.00%	654	0	93.33%	672	0	93.33%	666	0	96.67%
10	3402	3402	0	0.0000%	91.33%	603	0	80.00%	734	0	96.67%	704	0	93.33%	659	0	90.00%	702	0	96.67%
11	3284	3269	15	0.4568%	100.00%	655	1	100.00%	653	3	100.00%	648	5	100.00%	663	3	100.00%	650	3	100.00%
12	2773	2773	0	0.0000%	79.33%	533	0	83.33%	630	0	83.33%	507	0	80.00%	528	0	73.33%	575	0	76.67%
13	3229	3229	0	0.0000%	99.33%	644	0	96.67%	643	0	100.00%	649	0	100.00%	645	0	100.00%	648	0	100.00%
14	2070	2070	0	0.0000%	50.00%	462	0	60.00%	361	0	50.00%	316	0	30.00%	446	0	50.00%	485	0	60.00%
15	3521	3521	0	0.0000%	100.00%	707	0	100.00%	698	0	100.00%	706	0	100.00%	705	0	100.00%	705	0	100.00%
16	2341	2323	18	0.7689%	74.00%	489	3	73.33%	415	4	70.00%	538	3	90.00%	399	3	56.67%	482	5	80.00%
17	3139	3139	0	0.0000%	100.00%	615	0	100.00%	636	0	100.00%	633	0	100.00%	621	0	100.00%	634	0	100.00%
18	3409	3409	0	0.0000%	99.33%	707	0	96.67%	695	0	100.00%	659	0	100.00%	671	0	100.00%	677	0	100.00%
19	1827	1827	0	0.0000%	51.33%	362	0	56.67%	430	0	60.00%	361	0	46.67%	326	0	36.67%	348	0	56.67%
20	3230	3230	0	0.0000%	100.00%	646	0	100.00%	645	0	100.00%	647	0	100.00%	650	0	100.00%	642	0	100.00%
21	1261	1261	0	0.0000%	8.67%	254	0	10.00%	255	0	16.67%	247	0	3.33%	231	0	6.67%	274	0	6.67%
22	3363	3363	0	0.0000%	99.33%	673	0	96.67%	662	0	100.00%	666	0	100.00%	695	0	100.00%	667	0	100.00%
23	2807	2807	0	0.0000%	99.33%	565	0	96.67%	560	0	100.00%	555	0	100.00%	562	0	100.00%	565	0	100.00%
24	3334	3334	0	0.0000%	100.00%	693	0	100.00%	630	0	100.00%	665	0	100.00%	690	0	100.00%	656	0	100.00%
25	701	701	0	0.0000%	2.00%	152	0	10.00%	135	0	0.00%	139	0	0.00%	140	0	0.00%	135	0	0.00%
26	3854	3854	0	0.0000%	100.00%	753	0	100.00%	775	0	100.00%	779	0	100.00%	801	0	100.00%	746	0	100.00%
27	659	649	10	1.5175%	0.00%	122	2	0.00%	138	3	0.00%	126	2	0.00%	134	0	0.00%	129	3	0.00%
28	2947	2932	15	0.5090%	80.00%	555	2	80.00%	596	2	80.00%	668	3	86.67%	529	5	66.67%	584	3	86.67%
29	3361	3345	16	0.4760%	99.33%	676	2	96.67%	656	3	100.00%	647	3	100.00%	714	3	100.00%	652	5	100.00%
30	2151	2151	0	0.0000%	64.67%	423	0	63.33%	445	0	66.67%	431	0	66.67%	353	0	56.67%	499	0	70.00%
31	1928	1928	0	0.0000%	48.00%	334	0	36.67%	400	0	46.67%	381	0	50.00%	336	0	46.67%	477	0	60.00%
32	3792	3792	0	0.0000%	96.67%	821	0	96.67%	797	0	100.00%	748	0	100.00%	669	0	86.67%	757	0	100.00%
33	1224	1224	0	0.0000%	7.33%	234	0	6.67%	243	0	3.33%	236	0	3.33%	264	0	16.67%	247	0	6.67%
34	3650	3650	0	0.0000%	100.00%	741	0	100.00%	720	0	100.00%	730	0	100.00%	719	0	100.00%	740	0	100.00%
35	3946	3929	17	0.4308%	100.00%	785	1	100.00%	777	3	100.00%	777	6	100.00%	786	5	100.00%	804	2	100.00%
36	3772	3772	0	0.0000%	100.00%	746	0	100.00%	740	0	100.00%	744	0	100.00%	778	0	100.00%	764	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-28 Packet loss; High power; Distance 4.0 meters

Power Level: High
Distance 4.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2243	2243	0	0.0000%	64.41%	439	0	62.07%	469	0	56.67%	420	0	66.67%	477	0	73.33%	438	0	63.33%
1	4615	4615	0	0.0000%	100.00%	901	0	100.00%	925	0	100.00%	928	0	100.00%	932	0	100.00%	929	0	100.00%
2	2987	2975	12	0.4017%	99.31%	584	1	96.55%	598	0	100.00%	597	5	100.00%	596	4	100.00%	600	2	100.00%
3	2539	2526	13	0.5120%	100.00%	501	1	100.00%	493	3	100.00%	498	3	100.00%	524	3	100.00%	510	3	100.00%
4	5220	5208	12	0.2299%	97.31%	934	0	96.55%	1038	4	100.00%	1007	3	93.33%	1060	4	96.67%	1169	1	100.00%
5	3776	3776	0	0.0000%	100.00%	725	0	100.00%	757	0	100.00%	759	0	100.00%	760	0	100.00%	775	0	100.00%
6	663	663	0	0.0000%	0.00%	132	0	0.00%	128	0	0.00%	126	0	0.00%	133	0	0.00%	144	0	0.00%
7	2205	2205	0	0.0000%	56.34%	414	0	51.72%	418	0	60.00%	527	0	66.67%	427	0	56.67%	419	0	46.67%
8	5156	5156	0	0.0000%	100.00%	1006	0	100.00%	1035	0	100.00%	1051	0	100.00%	1038	0	100.00%	1026	0	100.00%
9	3087	3087	0	0.0000%	91.26%	614	0	89.66%	628	0	93.33%	649	0	86.67%	579	0	93.33%	617	0	93.33%
10	3288	3288	0	0.0000%	89.91%	617	0	86.21%	659	0	86.67%	721	0	96.67%	607	0	80.00%	684	0	100.00%
11	3298	3284	14	0.4245%	100.00%	640	1	100.00%	661	6	100.00%	661	3	100.00%	658	2	100.00%	664	2	100.00%
12	2605	2605	0	0.0000%	69.03%	408	0	55.17%	508	0	73.33%	618	0	76.67%	560	0	73.33%	511	0	66.67%
13	3209	3209	0	0.0000%	99.31%	626	0	96.55%	649	0	100.00%	644	0	100.00%	644	0	100.00%	646	0	100.00%
14	2265	2265	0	0.0000%	57.72%	411	0	58.62%	454	0	60.00%	430	0	50.00%	518	0	63.33%	452	0	56.67%
15	3488	3488	0	0.0000%	100.00%	679	0	100.00%	700	0	100.00%	700	0	100.00%	704	0	100.00%	705	0	100.00%
16	2192	2181	11	0.5018%	62.39%	404	2	58.62%	496	1	70.00%	452	4	66.67%	446	1	60.00%	383	3	56.67%
17	3057	3057	0	0.0000%	100.00%	589	0	100.00%	620	0	100.00%	613	0	100.00%	622	0	100.00%	613	0	100.00%
18	3303	3303	0	0.0000%	98.00%	657	0	100.00%	580	0	93.33%	647	0	96.67%	665	0	100.00%	754	0	100.00%
19	1762	1762	0	0.0000%	47.70%	352	0	55.17%	377	0	50.00%	345	0	43.33%	271	0	33.33%	417	0	56.67%
20	3208	3208	0	0.0000%	100.00%	624	0	100.00%	644	0	100.00%	649	0	100.00%	648	0	100.00%	643	0	100.00%
21	1141	1141	0	0.0000%	14.76%	213	0	13.79%	219	0	20.00%	230	0	10.00%	244	0	10.00%	235	0	20.00%
22	3321	3321	0	0.0000%	99.31%	660	0	96.55%	653	0	100.00%	673	0	100.00%	669	0	100.00%	666	0	100.00%
23	2757	2757	0	0.0000%	99.31%	532	0	96.55%	551	0	100.00%	560	0	100.00%	561	0	100.00%	553	0	100.00%
24	3441	3441	0	0.0000%	100.00%	667	0	100.00%	695	0	100.00%	703	0	100.00%	669	0	100.00%	707	0	100.00%
25	668	668	0	0.0000%	1.38%	133	0	6.90%	130	0	0.00%	131	0	0.00%	144	0	0.00%	130	0	0.00%
26	3872	3872	0	0.0000%	100.00%	760	0	100.00%	776	0	100.00%	771	0	100.00%	778	0	100.00%	787	0	100.00%
27	661	648	13	1.9667%	0.00%	127	1	0.00%	139	3	0.00%	113	2	0.00%	136	2	0.00%	133	5	0.00%
28	2675	2663	12	0.4486%	71.75%	462	1	62.07%	509	5	66.67%	581	0	76.67%	577	2	83.33%	534	4	70.00%
29	3386	3369	17	0.5021%	99.31%	646	1	96.55%	670	8	100.00%	690	1	100.00%	686	6	100.00%	677	1	100.00%
30	1905	1905	0	0.0000%	52.44%	406	0	65.52%	402	0	53.33%	349	0	43.33%	420	0	60.00%	328	0	40.00%
31	1837	1837	0	0.0000%	45.66%	378	0	48.28%	380	0	50.00%	351	0	43.33%	450	0	63.33%	278	0	23.33%
32	3920	3920	0	0.0000%	97.29%	749	0	93.10%	775	0	93.33%	801	0	100.00%	840	0	100.00%	755	0	100.00%
33	1273	1273	0	0.0000%	12.09%	248	0	13.79%	250	0	13.33%	278	0	16.67%	255	0	10.00%	242	0	6.67%
34	3509	3509	0	0.0000%	100.00%	680	0	100.00%	687	0	100.00%	721	0	100.00%	712	0	100.00%	709	0	100.00%
35	3812	3799	13	0.3410%	100.00%	758	1	100.00%	716	1	100.00%	778	5	100.00%	769	4	100.00%	778	2	100.00%
36	3835	3835	0	0.0000%	100.00%	741	0	100.00%	775	0	100.00%	746	0	100.00%	764	0	100.00%	809	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-29 Packet loss; High power; Distance 4.5 meters

Power Level: High
Distance 4.5m

	Total # Packets					Ovens														
						Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2120	2120	0	0.0000%	58.41%	425	0	62.07%	512	0	70.00%	391	0	56.67%	395	0	50.00%	397	0	53.33%
1	4604	4604	0	0.0000%	100.00%	899	0	100.00%	925	0	100.00%	922	0	100.00%	924	0	100.00%	934	0	100.00%
2	3005	2979	26	0.8652%	99.31%	578	1	96.55%	595	15	100.00%	602	3	100.00%	596	5	100.00%	608	2	100.00%
3	2569	2549	20	0.7785%	97.98%	492	1	96.55%	504	11	100.00%	526	5	96.67%	508	1	96.67%	519	2	100.00%
4	4960	4953	7	0.1411%	97.31%	932	0	96.55%	1145	0	100.00%	997	3	100.00%	1016	1	93.33%	863	3	96.67%
5	3777	3777	0	0.0000%	100.00%	757	0	100.00%	763	0	100.00%	749	0	100.00%	772	0	100.00%	736	0	100.00%
6	687	687	0	0.0000%	0.00%	128	0	0.00%	138	0	0.00%	137	0	0.00%	135	0	0.00%	149	0	0.00%
7	2405	2405	0	0.0000%	57.66%	465	0	48.28%	506	0	63.33%	395	0	50.00%	534	0	63.33%	505	0	63.33%
8	5121	5121	0	0.0000%	100.00%	1048	0	100.00%	1049	0	100.00%	1021	0	100.00%	1026	0	100.00%	977	0	100.00%
9	3147	3147	0	0.0000%	91.26%	560	0	89.66%	708	0	96.67%	653	0	93.33%	627	0	90.00%	599	0	86.67%
10	3353	3353	0	0.0000%	87.95%	772	0	93.10%	671	0	90.00%	627	0	83.33%	635	0	86.67%	648	0	86.67%
11	3291	3272	19	0.5773%	100.00%	642	1	100.00%	657	13	100.00%	657	1	100.00%	661	2	100.00%	655	2	100.00%
12	2630	2630	0	0.0000%	73.82%	469	0	72.41%	623	0	83.33%	531	0	76.67%	550	0	70.00%	457	0	66.67%
13	3207	3207	0	0.0000%	99.31%	625	0	96.55%	641	0	100.00%	642	0	100.00%	654	0	100.00%	645	0	100.00%
14	2555	2555	0	0.0000%	67.01%	397	0	51.72%	596	0	73.33%	522	0	73.33%	548	0	70.00%	492	0	66.67%
15	3499	3499	0	0.0000%	100.00%	683	0	100.00%	706	0	100.00%	705	0	100.00%	704	0	100.00%	701	0	100.00%
16	2295	2250	45	1.9608%	65.79%	455	2	68.97%	435	30	60.00%	471	4	70.00%	419	3	63.33%	470	6	66.67%
17	3060	3060	0	0.0000%	100.00%	593	0	100.00%	619	0	100.00%	609	0	100.00%	620	0	100.00%	619	0	100.00%
18	3162	3162	0	0.0000%	97.31%	639	0	96.55%	635	0	100.00%	638	0	96.67%	639	0	96.67%	611	0	96.67%
19	1937	1937	0	0.0000%	48.34%	418	0	51.72%	333	0	33.33%	383	0	50.00%	440	0	56.67%	363	0	50.00%
20	3195	3195	0	0.0000%	100.00%	622	0	100.00%	644	0	100.00%	640	0	100.00%	644	0	100.00%	645	0	100.00%
21	1077	1077	0	0.0000%	7.45%	237	0	17.24%	227	0	6.67%	183	0	3.33%	214	0	6.67%	216	0	3.33%
22	3331	3331	0	0.0000%	99.31%	654	0	96.55%	683	0	100.00%	651	0	100.00%	670	0	100.00%	673	0	100.00%
23	2747	2747	0	0.0000%	99.31%	542	0	96.55%	554	0	100.00%	554	0	100.00%	546	0	100.00%	551	0	100.00%
24	3404	3404	0	0.0000%	100.00%	643	0	100.00%	661	0	100.00%	706	0	100.00%	717	0	100.00%	677	0	100.00%
25	672	672	0	0.0000%	1.38%	142	0	6.90%	126	0	0.00%	138	0	0.00%	129	0	0.00%	137	0	0.00%
26	3911	3911	0	0.0000%	99.33%	750	0	100.00%	767	0	96.67%	781	0	100.00%	821	0	100.00%	792	0	100.00%
27	715	694	21	2.9371%	0.00%	134	1	0.00%	144	12	0.00%	131	2	0.00%	140	3	0.00%	145	3	0.00%
28	2785	2758	27	0.9695%	73.84%	595	1	75.86%	504	18	70.00%	575	1	70.00%	535	4	73.33%	549	3	80.00%
29	3357	3333	24	0.7149%	98.64%	670	1	96.55%	619	18	96.67%	685	2	100.00%	686	2	100.00%	673	1	100.00%
30	1957	1957	0	0.0000%	54.34%	346	0	51.72%	419	0	56.67%	367	0	50.00%	409	0	56.67%	416	0	56.67%
31	2001	2001	0	0.0000%	52.30%	365	0	44.83%	380	0	60.00%	402	0	50.00%	439	0	56.67%	415	0	50.00%
32	3874	3874	0	0.0000%	94.00%	788	0	100.00%	738	0	96.67%	761	0	93.33%	834	0	93.33%	753	0	86.67%
33	1251	1251	0	0.0000%	13.43%	233	0	13.79%	267	0	16.67%	240	0	6.67%	265	0	13.33%	246	0	16.67%
34	3466	3466	0	0.0000%	100.00%	662	0	100.00%	713	0	100.00%	692	0	100.00%	700	0	100.00%	699	0	100.00%
35	3812	3789	23	0.6034%	100.00%	749	1	100.00%	750	15	100.00%	766	1	100.00%	771	3	100.00%	753	3	100.00%
36	3828	3828	0	0.0000%	100.00%	748	0	100.00%	759	0	100.00%	776	0	100.00%	763	0	100.00%	782	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%

Table C-30 Packet loss; High power; Distance 5.0 meters

Power Level: High
Distance 5.0m

	Total # Packets					Ovens: Microwave 1			Microwave 2			Microwave 3			Microwave 4			Microwave 5		
Channel	Total	OK	Fail	% of Total	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail	# OK	# Error	% Avail
0	2151	2151	0	0.0000%	63.17%	472	0	75.86%	453	0	60.00%	430	0	63.33%	418	0	50.00%	378	0	66.67%
1	4614	4614	0	0.0000%	100.00%	894	0	100.00%	926	0	100.00%	930	0	100.00%	935	0	100.00%	929	0	100.00%
2	3002	2988	14	0.4664%	99.31%	578	1	96.55%	595	0	100.00%	606	3	100.00%	604	7	100.00%	605	3	100.00%
3	2564	2548	16	0.6240%	99.33%	489	1	100.00%	506	3	100.00%	510	4	100.00%	520	2	100.00%	523	6	96.67%
4	4976	4966	10	0.2010%	96.00%	1107	0	100.00%	887	0	96.67%	1042	3	100.00%	868	4	86.67%	1062	3	96.67%
5	3802	3802	0	0.0000%	100.00%	757	0	100.00%	783	0	100.00%	757	0	100.00%	764	0	100.00%	741	0	100.00%
6	682	682	0	0.0000%	0.00%	131	0	0.00%	135	0	0.00%	131	0	0.00%	145	0	0.00%	140	0	0.00%
7	2537	2537	0	0.0000%	65.01%	433	0	51.72%	499	0	70.00%	525	0	73.33%	571	0	70.00%	509	0	60.00%
8	5135	5135	0	0.0000%	100.00%	1002	0	100.00%	1033	0	100.00%	1044	0	100.00%	1021	0	100.00%	1035	0	100.00%
9	3110	3110	0	0.0000%	88.57%	627	0	86.21%	648	0	90.00%	614	0	90.00%	628	0	90.00%	593	0	86.67%
10	3417	3417	0	0.0000%	87.91%	660	0	86.21%	637	0	90.00%	668	0	83.33%	712	0	86.67%	740	0	93.33%
11	3282	3270	12	0.3656%	100.00%	636	1	100.00%	654	5	100.00%	660	1	100.00%	659	1	100.00%	661	4	100.00%
12	2627	2627	0	0.0000%	73.86%	588	0	79.31%	560	0	80.00%	472	0	73.33%	529	0	76.67%	478	0	60.00%
13	3197	3197	0	0.0000%	99.31%	622	0	96.55%	642	0	100.00%	643	0	100.00%	645	0	100.00%	645	0	100.00%
14	2221	2221	0	0.0000%	60.44%	443	0	65.52%	495	0	60.00%	448	0	63.33%	396	0	46.67%	439	0	66.67%
15	3520	3520	0	0.0000%	100.00%	686	0	100.00%	706	0	100.00%	709	0	100.00%	710	0	100.00%	709	0	100.00%
16	2135	2123	12	0.5621%	63.77%	396	2	65.52%	471	1	73.33%	399	4	53.33%	428	3	60.00%	429	2	66.67%
17	3072	3072	0	0.0000%	100.00%	601	0	100.00%	628	0	100.00%	613	0	100.00%	608	0	100.00%	622	0	100.00%
18	3300	3300	0	0.0000%	98.00%	614	0	100.00%	658	0	96.67%	710	0	100.00%	611	0	93.33%	707	0	100.00%
19	1900	1900	0	0.0000%	53.03%	387	0	55.17%	361	0	50.00%	391	0	53.33%	392	0	66.67%	369	0	40.00%
20	3209	3209	0	0.0000%	100.00%	623	0	100.00%	644	0	100.00%	644	0	100.00%	649	0	100.00%	649	0	100.00%
21	1083	1083	0	0.0000%	8.74%	210	0	10.34%	225	0	16.67%	225	0	10.00%	215	0	3.33%	208	0	3.33%
22	3351	3351	0	0.0000%	99.31%	654	0	96.55%	677	0	100.00%	677	0	100.00%	674	0	100.00%	669	0	100.00%
23	2804	2804	0	0.0000%	99.31%	552	0	96.55%	577	0	100.00%	550	0	100.00%	555	0	100.00%	570	0	100.00%
24	3448	3448	0	0.0000%	100.00%	681	0	100.00%	698	0	100.00%	653	0	100.00%	716	0	100.00%	700	0	100.00%
25	655	655	0	0.0000%	1.38%	124	0	6.90%	132	0	0.00%	131	0	0.00%	132	0	0.00%	136	0	0.00%
26	3968	3968	0	0.0000%	100.00%	768	0	100.00%	799	0	100.00%	786	0	100.00%	794	0	100.00%	821	0	100.00%
27	681	669	12	1.7621%	0.00%	132	1	0.00%	142	2	0.00%	135	3	0.00%	136	1	0.00%	124	5	0.00%
28	2785	2773	12	0.4309%	69.17%	591	1	75.86%	495	1	66.67%	579	4	53.33%	546	3	76.67%	562	3	73.33%
29	3407	3395	12	0.3522%	99.31%	621	1	96.55%	695	3	100.00%	704	3	100.00%	704	3	100.00%	671	2	100.00%
30	1867	1867	0	0.0000%	53.13%	401	0	68.97%	356	0	53.33%	448	0	70.00%	313	0	33.33%	349	0	40.00%
31	1751	1751	0	0.0000%	40.92%	343	0	37.93%	320	0	36.67%	332	0	36.67%	383	0	50.00%	373	0	43.33%
32	3682	3682	0	0.0000%	87.93%	772	0	89.66%	741	0	86.67%	760	0	90.00%	675	0	83.33%	734	0	90.00%
33	1276	1276	0	0.0000%	14.11%	266	0	17.24%	240	0	6.67%	244	0	10.00%	244	0	13.33%	282	0	23.33%
34	3421	3421	0	0.0000%	100.00%	665	0	100.00%	692	0	100.00%	711	0	100.00%	690	0	100.00%	663	0	100.00%
35	3849	3832	17	0.4417%	100.00%	771	1	100.00%	775	2	100.00%	741	6	100.00%	783	4	100.00%	762	4	100.00%
36	3803	3803	0	0.0000%	100.00%	742	0	100.00%	767	0	100.00%	764	0	100.00%	774	0	100.00%	756	0	100.00%
37	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
38	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%
39	0	0	0	0.0000%	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%	0	0	100.00%