University of Southern Queensland

Faculty of Engineering and Surveying

A Comparison of the Limitations and Accuracy of both Obstructed Prism and Obstructed Non-Prism Measurements

A dissertation submitted by

Mitchell Dane Hooson

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ABSTRACT

Whether it be through the implementation of either prism based measurements, or non-prism based measurements, when an obstruction is introduced into the equation, and a clear unobstructed view between the instrument and target no longer exists, there is a strong possibility of a distortion of some magnitude being introduced into any recorded data.

The aim of this report is to compare and contrast both the limitations and accuracies of obstructed prism based (both ATR and manual pointing) and obstructed non-prism based field measurements and to derive the reliability as well as the repeatability of such measurements.

The instruments being tested in this project include the Topcon DS-203AC Total Station, the Leica TPS1103 Total Station and the Trimble SPS930 DR+ Total Station. A series of physical obstructions were placed at different distance intervals between these instruments and targets so that the view to the target from the instrument was obstructed. These distance intervals between the instrument/ target and the obstruction were altered in proximity to both the instrument and target in order to best simulate a variety of field conditions. The overall distance between the instrument and the target were also varied to simulate different situations.

Results obtained from this investigation indicated clear trends amongst the instruments through all of the obstructions. Whilst some obstructions had little impact on the accuracy of the instrument readings, other obstructions introduced some significant and intolerable errors. After all of the results had been analysed, a set of recommendations was compiled from the analysed data that indicate the accuracy and repeatability of each of the different methods of measurement through different obstructions and how the resulting errors can best be mitigated and minimised.

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Mitchell Dane Hooson

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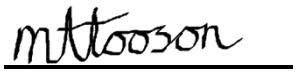

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GLOSSARY

ATR	Automatic Target Recognition
Beam Divergence	Beam divergence refers to the laser beam spreading out, or expanding its footprint as it gets further away from the Instrument
DR	Direct Reflex; Trimble's reflectorless/ non-prism mode of measurement
EDM	Electronic Distance Measurement
Phase Shift	Measurement method utilising a coaxial intensity modulated optical measuring beam
PPM	Parts Per Million; Scale error associated with the instrument
Prism Constant	Correction applied to a recorded measurement to obtain the centre of the prism
PVC	Polyvinyl chloride; synthetic plastic polymer commonly used as conduit
Reflective Target	A target designed to reflect a high percentage of light
Reflector Uncertainty	Occurs when the beam emitted from the instrument reflects off anything but the intended target
Reflectorless	A form of measurement not requiring a prism
Repeatability	The ability to obtain the same results time and time again
Time of Flight (TOF)	Measurement method utilising many short infrared or laser light pulses

CHAPTER 1

INTRODUCTION

1.1 Background

Prism based and non-prism based, represent the two forms of measurement found in most modern day total stations. Prism based measurement consists of the standard manual pointing mode where the surveyor is manually required to sight the target through the telescope, and Automatic Target Recognition (ATR) where the surveyor is not required to manually sight the target and the instrument is able to locate and find the centre of the target *(Leica Geosystems, 2007)*. The non-prism based form of measurement also requires the surveyor to manually sight the target through the instruments telescope, however the target is not required to be a prism and may include any surface that is reflective enough to return an emitted signal from the instrument.

All three of the aforementioned forms of measurement (Manual Prism, ATR, Non-Prism) are used on a daily basis by surveyors everywhere. The technology behind these three forms of measurement is at a standard where most surveyors will feel comfortable recording survey observations even if there exists the possibility that somewhere between the instrument and the intended target, an obstruction exists. Although the instrument will almost always return a value or reading through an obstruction, what is not known is the impact that this obstruction has on the recorded measurement. For some surveys such as detail surveys, the impact of the obstruction may not be critical, but for cadastral surveys where a tight distance and angular close is often required, the impact of the potential obstruction may have a detrimental impact on the recorded observation as well as the entire survey.

This project aims to test each of the three forms of measurement through several different obstructions that can be regularly encountered in the field and to examine the likely effect that each obstruction will have on any recorded observations over a series of varying distances. This will be measured in terms of the horizontal distance displacement as well as the vertical and horizontal angular displacement.

1.2 Project Justification

Throughout everyday field procedures, it was discovered that it is possible to record information or points through everyday obstructions in both manual prism, ATR and non-prism modes of EDM. What was not known was the accuracy of these obtained readings and whether or not the obstructions were degrading the EDM's signal to a point where inaccurate results were being unknowingly recorded and accepted.

There is very little literature available that shows the performance of EDM through everyday obstructions, let alone information that compares the accuracies and limitations of manual prism, ATR and non-prism based forms of measurement. A previous study has been done testing the ability of ATR alone through obstructions *(Weyman-Jones, A, 2010)* as well as studies testing different capabilities of reflectorless measurement *(Hosking, A, 2009)* and *(Coaker, L, 2009)*. However no literature was available that directly compared prism based measurement and non-prism based measurement.

With little comparative data available, undertaking a project that compares the performance of both prism based and non-prism based measurements through everyday obstructions was justified.

1.3 Project Objectives

The overall aim of this project was to test both prism based and non-prism based EDM through a range of real world obstructions. In order to validate this project, a series of specific objectives were formulated. These objective formed an outline of what was to be tested and analysed over the entirety of the project. The specific objectives formulated for this project were to:

1. Determine the impact each selected obstruction has on prism based and non-prism based measurement.
3. Determine the impact the target distance has on both prism based and non-prism based EDM.
4. Determine the repeatability and reliability of measurements through each obstruction.
5. Determine the impact the proximity of the obstruction to the instrument and target has on the measurements.
6. Obtain a consensus of data gathered from all three instruments and deduce a series of conclusions and recommendations based on the results.

1.4 Conclusions

This chapter has provided an insight into the problem of having little available literature that directly compares the performance of prism based and non-prism based measurements through obstructions and the need to have this comparable data. This chapter has also defined the project specific objectives that formed the outline for all field testing and analysis. The next chapter will discuss the relevant literature attaining to the necessary elements of prism based and non-prism based measurements required for the completion of this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Before any practical obstruction based field testing could be undertaken, an in-depth study first had to be performed in order to locate and comprehend as well as evaluate relevant literature relating to all aspects of the project. This literature review provided the relevant knowledge and understanding required to be able to develop a suitable methodology for all experimentation.

2.2 Electronic Distance Measurement

Electronic Distance Measurement (EDM) defines the technology that is incorporated into current survey instruments, in particular the Total Station. Before EDM, measurements were taken manually with equipment including tape measures, steel survey tapes and chains. With the current EDM technology that exists within survey instruments, distance measurements can be taken both quickly and accurately. The technologies used by the instruments to determine a value for the distance being measured are known as phase shift and time of flight.

Most total stations used in surveying today have the ability to measure distances in two different ways which are through the use of prism based EDM and non-prism base EDM, also known as reflectorless EDM. Prism based EDM is still the standard form of distance measurement being used in modern total stations. It works on the principle that the instrument emits a light source towards the prism which is then in turn reflected back to the point of emission where a distance can be calculated. *"An EDM uses electromagnetic (EM) energy to determine the length of a line. The energy originates at an instrument at one end of a line and is transmitted to a "reflector" at the other end from where it is returned to the originating instrument" (Mahun, J. 2013).*

Since the introduction of non-prism based EDM, the need for a prism is no longer required. Although non-prism is not generally the accepted method of distance measurement for survey procedures that require a high level of accuracy (traversing or setout works etc), it allows an observation to be recorded in scenarios where it would otherwise be unsafe or impossible for a surveyor to position a prism. As stated by Key and Lemmens, 2005, "*Reflectorless Electronic Distance Measurement (EDM) enables the measurement of distances of up to hundreds of metres without needing to access the target. Inaccessible objects and objects located at dangerous sites can thus be mapped easily."*

The technology inside these instruments is at the stage now where the manufacturers quoted accuracies for non-prism measurement are equal to the accuracies specified for prism based measurement. The Trimble SPS930 DR+ total station has a specified +/- 2mm+2ppm prism based accuracy and a +/- 2mm+2ppm non-prism accuracy *(Trimble Universal Total Station Data Sheet).* With the specifications between an instruments prism accuracy and non-prism accuracy being so similar, it will be interesting to note the difference in the tested accuracy of both forms when exposed to obstructions.

2.3 Automatic Target Recognition

Automatic target recognition (ATR) is a modern technology that exists in most modern day total stations. ATR allows the instrument to locate the centre of the prism without the surveyor having to manually point the instrument at the centre of the target. This allows the surveyor to be able to work away from the instrument. Different manufacturers give different names to the ATR technology inside their respective instruments, however the fundamental principles on which ATR functions and is able to calculate the centre of the prism are the same.

Leica Geosystems describes ATR as *"Automatic Target Recognition (ATR) is the sensor that identifies the prism and measures its position on an image sensor to determine its exact angular location".* Once the light signal is emitted from the instrument, reflected off the prism and returned to the instrument, it is converted into digital data onto a sensor (either CMOS of CCD). This function is used to determine the horizontal and vertical position of the target, relative to the instrument. Leica Geosystems also describes the benefits of the CMOS technology over the CCD technology in that the CMOS sensor can provide clearer higher quality images even with the existence of bright background lights. This technology also allows for superior measuring accuracy *(Leica Geosystems, 2007).*

2.4 Time of Flight Method

The time of flight method of EDM measures the timing information of the pulsed laser between being emitted and received by the instrument. This information is then used by the instruments internal computer to calculate a distance.

Essentially, *the EDM generates many short infrared or laser light pulses, which are transmitted through the telescope to a target. These pulses reflect off the target and return to the instrument, where electronics determine the round trip time for each light pulse. As the velocity of light through the medium can be accurately estimated, the travel time can be used to compute the distance between instrument and target (Hoglund R, 2005).* Figure 2.1 demonstrates the principle of Time of Flight.

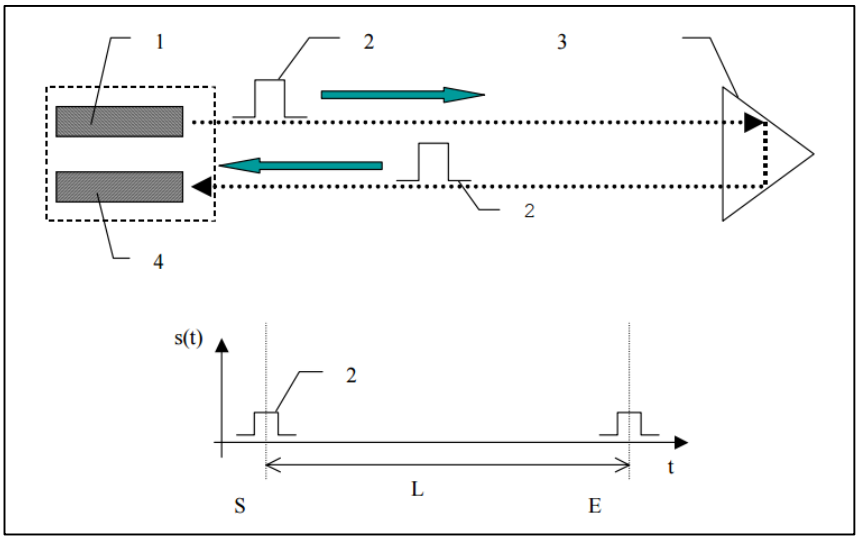


Figure 2.1: Principle of Time of Flight (Source: Leica's Pinpoint EDM Technology)

The above figure demonstrates the Time of Flight method of distance measurement. The sequence shown can be explained as *"A transmitter 1 emits a light pulse 2, which is detected after reflection by the target, e.g. a retro-reflector 3, by the receiver 4. In general, transmitter 1 and receiver 4 are arranged in one unit. The distance is determined from L as being the time difference between the start time S of the emission of a light pulse 2 and the time E of reception" (Bayoud, 2006).*

Due to the laser pulses emitted from the instrument using the TOF method being substantially more powerful than the modulated light of the phase shift method, the TOF method offers the ability to measure greater distances as well as the ability to be more tolerant of obstructions interfering with the instruments line of sight. Whilst the TOF method has been considered to be the least accurate form of measurement when compared with phases shift measurement, recent advances in the technology behind both forms of measurement have made these accuracy differences insignificant *(Hoglund R, 2005)*.

2.5 Phase Shift Method

The phase shift method of EDM works in a different way to the TOF method in that *"The EDM transmits a coaxial intensity modulated optical measuring beam that is reflected by a prism or scattered by a surface on which the beam is directed. The phase difference between the transmitted light and the reflected received light is detected and represents the distance" (Hoglund R, 2005).* Figure 2.2 demonstrates the principle of Phase Shift.

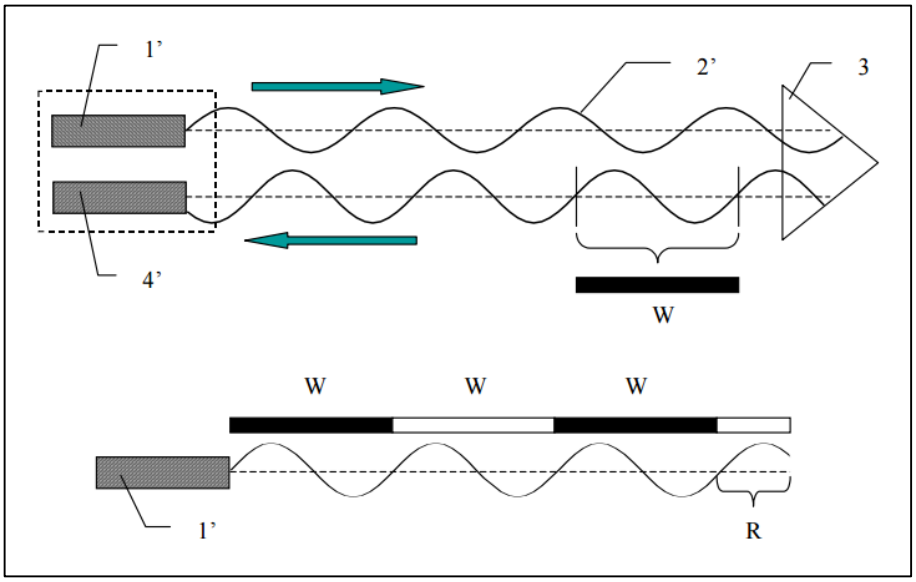


Figure 2.2: Principle of Phase Shift (Source: Leica's Pinpoint EDM Technology)

The above figure shows how the instrument determines the distance being measured using the phase shift method. This method can be explained as "*A transmitter 1' emits the modulated light signal as light wave 2' to a target which in turn may consist of a retro-reflector 3, and said light signal is reflected back from there to the receiver 4'. In contrast to the TOF method, no time difference between emission and reception of a signal pulse is registered in this case. The phase shift of the incoming and outgoing periodic signal is recorded. This shift is dependent on the distance between unit and target" (Bayoud, 2006).*

The phase shift EDM method is considered to be the more accurate of the two forms of EDM, partially due to its significantly narrower beam divergence, however it does not have the capability to measure through obstructions or to wet surfaces as efficiently as the TOF method and lacks the ability to read longer distances *(Bayoud, 2006).*

2.6 Beam Divergence

There are two main sources of error involved with reflectorless EDM. One of these forms of error is beam divergence. Beam divergence refers to the laser beam spreading out, or expanding its footprint as it gets further away from the Instrument. The laser beam emitted from the instrument is not defined by a precise point, rather by an extent, or shape usually in the form of an ellipse. *"The shape of the beam's footprints vary in relation to the instrument manufacturing and can be a circle, an ellipse, or a trapezium. (Kowalczyk and Rapinski, 2014)"*

The size of the footprint is therefore directly proportional to the distance the target is from the point of emission. As stated by Hoglund R, 2005 *"The physics of light determines that all light beams diverge (spread out) as a function of distance from the emitter. This is true for both TOF and phase shift EDM, although the size and shape of the beam divergence effect differs".*

Each manufacturer has their own specifications relating to the beam divergence of each of their instruments. The Trimble SPS930 DR+ total station has a quoted beam divergence of 40mm horizontal by 80mm vertical over a distance of 100m *(Trimble UTS Data Sheet)*. The Leica TPS1103 total station as specified in the instrument specifications datasheet has a beam divergence of 15mm horizontal by 30mm vertical over a distance of 100m *(Leica Geosystems)*. No information could be found for the Topcon DS 203AC where the beam divergence of the instrument was explicitly listed. The instrument specifications however quoted the instrument as having a *"smaller beam spot size" (Topcon Datasheet)*.

Beam divergence can introduce errors into non-prism point measuring especially when measuring a small target at a large distance. Doing this can result in the majority of the beam passing the intended target and reflecting off something behind the target. This error is also prevalent when measuring to corners. A larger beam divergence will allow a greater percentage of the measurement energy to be reflected by the walls either side of the corner being measured. A larger beam divergence may also be beneficial in some circumstances as it would allow more of the emitted energy to travel around and beyond an obstruction to the intended target.

2.7 Reflector Uncertainty

Reflector uncertainty occurs in reflectorless EDM when the beam from the emitter is reflected off something other than the intended target or surface *(Coaker, 2009)*. If this occurs, false measurements will be recorded. By observing several measurements to a particular target, the likelihood of unknowingly accepting data affected by reflector uncertainty is reduced. Since reflector uncertainty is likely to affect the results of this project due to obstructions being intentionally placed in the instruments line of sight, multiple readings will be taken through the obstructions to determine the repeatability of each scenario and to what level they are affected by reflector uncertainty.

2.8 EDM Targets

"Any surface capable of reflecting the electro-optical signal will allow distance measurement. However, the more efficient the reflector, the stronger the returned signal and the longer distance which can be measured" (Mahun J. 2013). Two types of targets will be used over the duration of this project. A Topcon circular prism with a 0mm constant will be used for all prism based testing and a Leica 60mmx60mm reflective strip will be used for the non-prism testing.

The most commonly used prism, when high accuracy measurements are required is the circular prism *(figure 2.3).* A circular prism consists of taking a *triple prism glass assembly and grinding down the three corners to fit correctly within the circular housing (Leica Geosystems, 2010).*

Figure 2.3: Circular Prism

The circular prism works by reflecting the signal leaving the prism parallel to its incoming path even if the prism is not perpendicular to the signal path (Mahun J, 2013). Figure 2.4 demonstrates this principle.

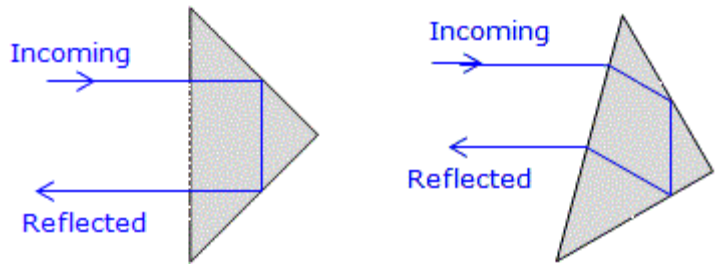


Figure 2.4: Principle of a Circular Prism

Although it does not represent the most common target used for non-prism based EDM, the reflective target represents, much like a circular prism for prism based measurements, the optimal target to read to. In all manufactures specifications for the instruments used, the reflective target was the target that allowed for the longest non-prism distances to be read *(figure 2.4).*

Figure 2.5: Reflective Target

As per the manufactures specifications, the Topcon, Trimble and Leica instruments being used for this project have maximum prism ranges of 6000m, 2500m and 3000m respectively and non-prism ranges of 1000m, 1300m and 250m respectively. Whilst these numbers may not represent the actual capabilities of the instruments and are not necessarily comparable as the targets used by each manufacturer to determine these ranges are not the same, what can be determined is that the prism based measurement is capable of much greater distances than the non-prism based measurements. This is partially due to a higher degradation of the emitted and received light source during non-prism based measurement over long ranges.

2.9 Conclusions

The above literature review has outlined the principles and elements of EDM that will affect the results and outcomes of this project. It has outlined a comparison of the two forms of EDM (Phase Shift and Time of Flight) as well as their strengths and weaknesses. The main sources of error in non-prism measurement have been discussed in relation to how they will impact on this project also.

Although it has been noted that there is no readily available literature comparing both prism based and non-prism based measurements through obstructions, sufficient literature was found demonstrating how the different instruments can be expected to perform in ideal conditions (with no obstructions) as well as literature stating how the different forms of measurement (Phase Shift and Time of Flight) should theoretically perform through obstructions.

These gaps in available literature provide the justification required to make this project a valid and beneficial exercise, as by the completion of this project, the research undertaken will have the potential to fill some of these gaps in literature.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The previous chapter discussed the relevant literature and critical background knowledge required before the commencement of any field procedures could be attempted. Now that a solid and comprehensive understanding of the principles of both prism based and non-prism based EDM has been attained, the field based obstruction testing can now be undertaken. In this chapter, the methodology employed in order to carry out the obstruction testing will be explained. Figure 3.1 outlines the methodology used for the field testing and data analysis.

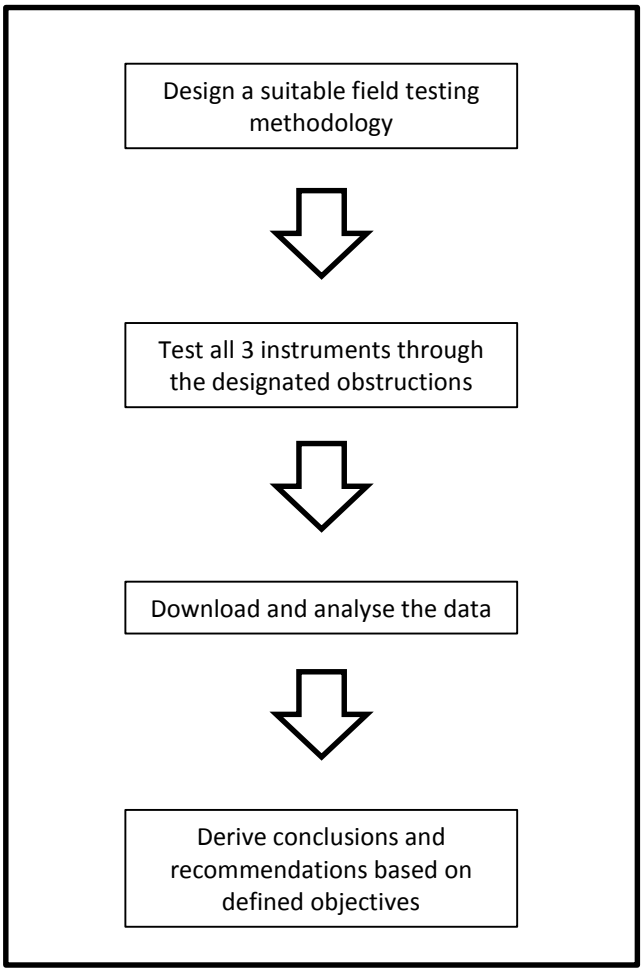


Figure 3.1: Methodology Flowchart

3.2 Field Location and Conditions

The location for all of the field testing was a vacant area of land and future stage in a multi stage subdivision in Highfields, north of Toowoomba *(see figure 3.2)*. The area chosen for the field test was relatively flat and free from any sudden height deviations and was thusly suitable as the experimentation required the instruments to sight through an obstruction to a set target. The testing was carried out over a period of 3 weekends and was done so during the month of August, 2015 where the temperature as well climatic conditions were reasonable unchanging so as to provide a fair and identical series of circumstances for all three instruments to operate under. On all days of testing, the temperature was noted between 12°C and 18°C and the weather was sunny with some cloud coverage.

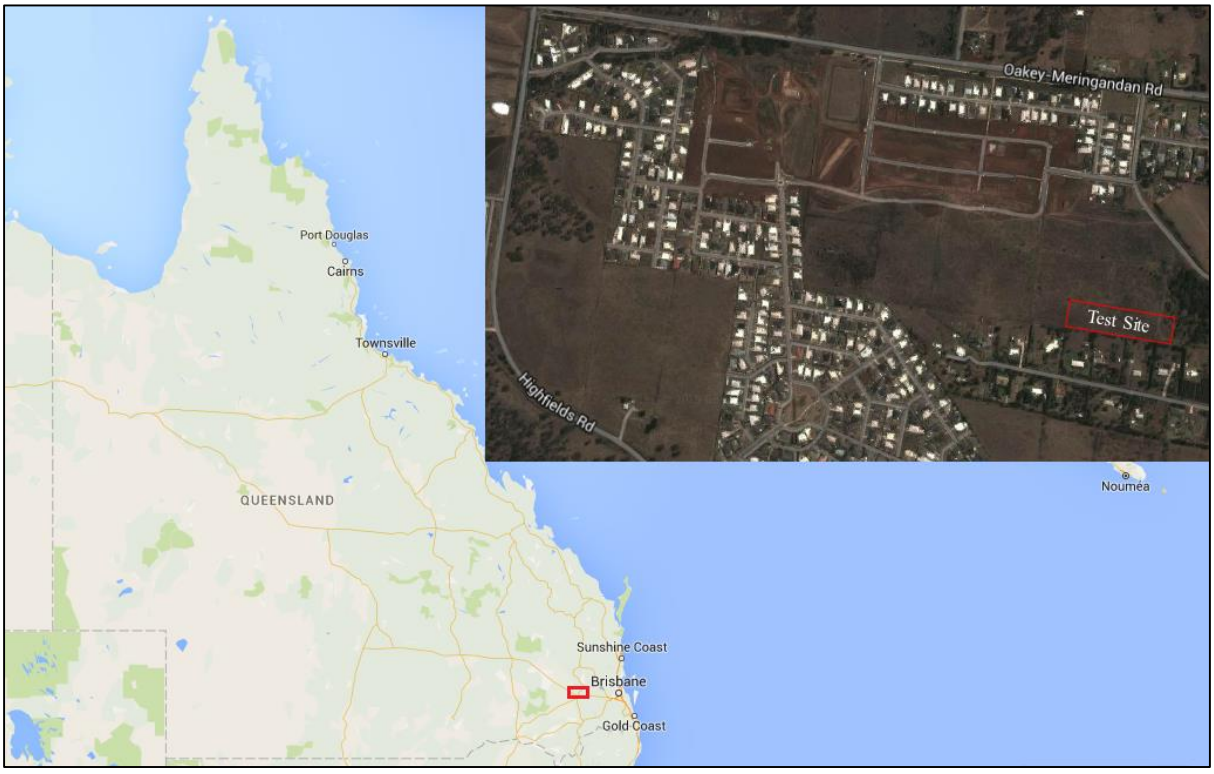


Figure 3.2: Site Location

3.3 Tested Instruments

The three instruments selected for use over the entirety of the obstruction based testing were chosen from three of the big manufactures, to avoid any potential bias in the analysis of the results as well as to achieve a consensus in all obtained results and conclusions. These three instruments included the Topcon DS-203AC Total Station, the Leica TPS1103 Total Station and the Trimble SPS930 DR+ Total Station *(see figure 3.3)*.

a) *Topcon DS-203AC* *b) Leica TPS1103* *c) Trimble SPS930 DR+*

Figure 3.3: Field Tested Instruments

The accuracies of each instrument as quoted by their respective manufacturer's instrument specification sheets can be seen in *table 3.1*.

Instrument	Angular Accuracy	Prism Accuracy	Non-Prism Accuracy
Topcon DS-203AC	3"	1.5mm+2ppm	2mm+2ppm
Leica TPS1103	3"	2mm+2ppm	3mm+2ppm
Trimble SPS930 DR+	1"	2mm+2ppm	2mm+2ppm

Table 3.1: Instrument Accuracies

3.4 Field Testing and Setup Components

Before any physical field testing could be undertaken, a control range, consisting of stations to cater for both the instruments, obstructions and targets had to be established. Iron pins were used for all of the control points as they were stable and did not move horizontally or vertically for the duration of the project. All of the control stations were set out using the Topcon DS-203AC Total Station, which is a new instrument that had been recently calibrated. All of the control pins that were placed to be utilised by either the instrument itself or the target, were checked with both the Leica TPS1103 and the Trimble SPS930 DR+ to ensure that all three instruments were recording the same distances between control points.

The target distances read to during the field testing were specifically chosen as they best represented the range of shots usually observed in the field. The 10m target distance represents a shot taken in close proximity, usually occurring during setout works on a busy construction site, while the 160m target distance is characteristic of a long backsight or foresight associated with cadastral surveying. The target distances were divided into two groups; short range and long range. The short range target distances were 10m, 20m, and 40m and had the obstructions positioned 2.5m from the instrument, halfway between the instrument and target and 2.5m from the target. The long range distances were 40m, 80m and 160m and had the obstructions positioned 10m from the instrument, halfway between the instrument and target and 10m from the target *(see table 3.2)*.

Instrument Chainage	Obstruction Chainage			Target Chainage
0m (0%)	2.5m (25%)	5m (50%)	7.5m (75%)	10m (100%)
0m (0%)	2.5m (12.5%)	10m (50%)	17.5m (87.5%)	20m (100%)
0m (0%)	2.5m (6.25%)	20m (50%)	37.5m (93.75%)	40m (100%)
0m (0%)	10m (25%)	20m (50%)	30m (75%)	40m (100%)
0m (0%)	10m (12.5%)	40m (50%)	70m (87.5%)	80m (100%)
0m (0%)	10m (6.25%)	80m (50%)	150m (93.75%)	160m (100%)

Table 3.2: Obstruction and Target Chainages

Two targets were used for the field testing. A Topcon prism with a 0mm constant (+34.4mm constant for the Leica TPS1103 instrument) was used for both ATR and manual pointing based obstruction testing and a Leica 60mmx60mm reflective target was used for the non-prism based obstruction testing *(see figure 3.4)*. Both of these targets were chosen because they represent the optimal target for each form of distance measurement, which allowed for a closer comparison of the obtained data. For ease of use, the reflective target was stuck to the reverse of the prism housing so that the target could be rotated 180° when either prism or non-prism measurements were required. Due to the positioning of the reflective target on the prism housing, the reflective target was a constant 22mm lower than the centre of the prism and had to have a -14mm constant applied to it to adjust for the distance from the face of the target to the centre of the prism.

a) Topcon 0mm Prism

b) Leica 60mmx60mm Reflective Target

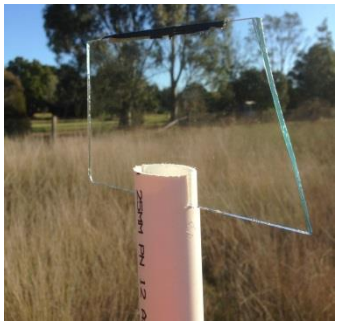
Figure 3.4: Targets used in testing

All of the tested obstruction targets were constructed using a piece of 25mm PVC tubing as the base as this could be easily and firmly mounted on a bipod equipped range pole. Both of the mesh type obstructions were fastened to a frame in order to achieve the desired tension to simulate field conditions. The remaining glass and vegetation targets had enough strength and stability as not to require a frame and were simply attached to the PVC tubing.

The obstructions used as part of the testing included:

- Obstruction 1: 5mm Thick Tinted Glass (UV Protected)
- Obstruction 2: 5mm Thick Glass (Clear)
- Obstruction 3: Light Gauge Screen (Fly Screen)
- Obstruction 4: Light Vegetation (Dried Grass)
- Obstruction 5: Dense Vegetation (Leaves)
- Obstruction 6: Heavy Gauge Screen (Builders Shade Cloth)

a) 5mm Tinted Glass



b) 5mm Glass

c) Light Gauge Screen

d) Light Vegetation

e) Dense Vegetation

f) Heavy Gauge Screen

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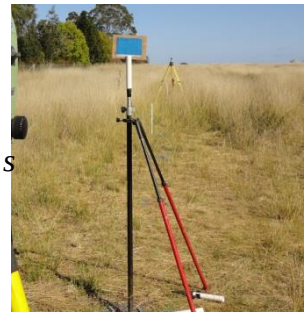

g) Mounted Obstruction

Figure 3.5: Obstruction Apparatuses

3.5 Field Testing Procedure

The procedure designed for implementation over the duration of the field testing for all three instruments was done so that the number of times both the target and obstruction had to be setup were minimised, reducing the potential of introducing errors other than the intended obstruction based errors into the testing. The following, is a point by point description of how the field testing was undertaken.

1) The instrument being tested was setup at chainage 0m;

2) The instrument was pointed to the centre of the target (located at either 10m, 20m, 40m, 80m or 160m);

3) A zero azimuth was set and three measurements were recorded to the unobstructed target as the control values for the setup;

4) The first obstruction was placed at the closest obstruction chainage (either 2.5m or 10m from the instrument) and three measurements were recorded to the target in manual pointing mode;

5) The instrument was turned off the prism and then forced to find the prism through the obstruction. Once the instrument had locked onto the prism, 3 observations were recorded;

6) Steps 4) and 5) were repeated with the remaining five obstructions at the closest obstruction chainage and were then repeated at the obstruction chainage halfway between the instrument and the target and the chainage closest to the target (either 2.5m or 10m from the target);

7) The prism was rotated 180° so that the reflective target was facing the instrument;

8) The instrument was pointed at the centre of the target and three measurements were recorded in non-prism mode through each of the six obstructions at each of the obstruction chainages.

This process was performed until each of the three instruments had measured through each obstruction at each obstruction chainage and each target distance in both manual pointing mode, ATR mode and non-prism mode *(see figure 3.6 for typical field setup configurations)*.

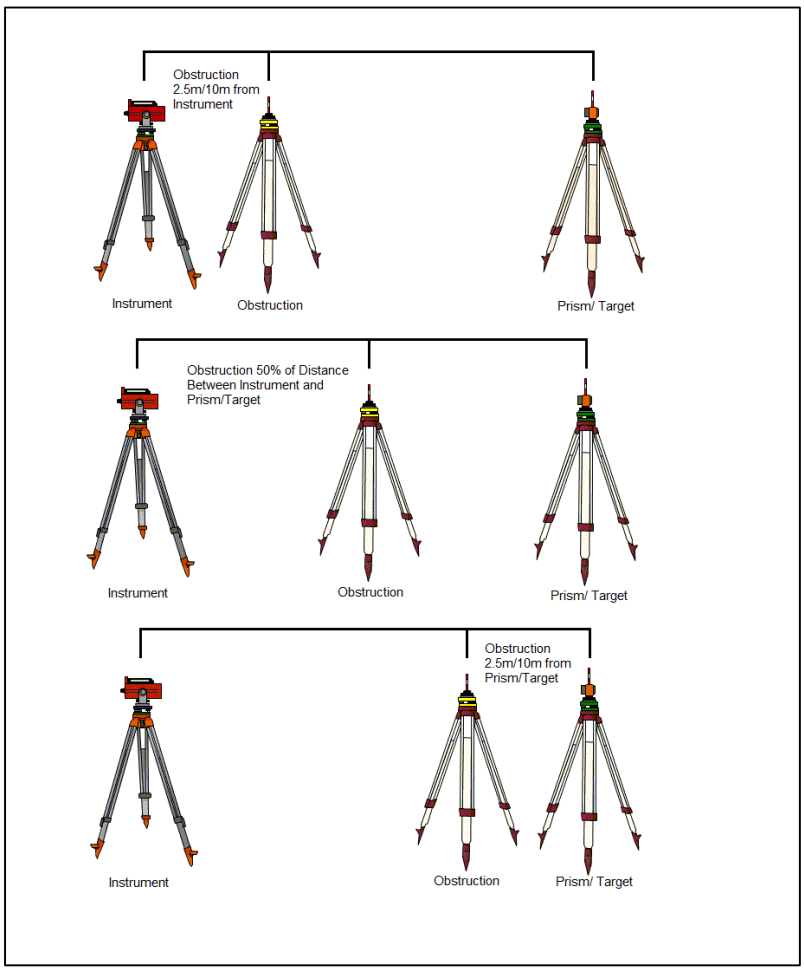

Figure 3.6: Typical Field Setup Configurations

3.6 Recording of Data

All of the data obtained during the field tests, was recorded onto the data recorder corresponding to each instrument. The data was downloaded into Microsoft Excel and any miscoded/ unintentionally stored points were either removed or recoded. The data was downloaded as a series of coded points with unique point identifiers as well as easting, northing and RL values.

3.7 Conclusions

All three of the instruments have been tested in compliance with the conditions and procedures outlined in this past chapter. The next chapter will investigate all of the results and findings derived from the data obtained in the testing.

CHAPTER 4

RESULTS

4.1 Introduction

In the previous chapter, the methodology used for the field experimentation part of the investigation was discussed in detail. In this chapter, the results of the field testing will be presented. The results have been divided into two main parts for analysis and discussion. The first section of the results focusses on the horizontal distance displacement part of the investigation and the second part focusses on the vertical and horizontal angular displacement of the ATR results.

4.1 Reduction of Data

Once all of the data had been collected in the field, it was reduced through Microsoft Excel. The raw easting, northing and RL values for each point were used to calculate displacements in the horizontal distance, vertical angle and horizontal angle. Once these displacements had been calculated, further calculations were made within the data in order to determine statistical information including the range, mean, percentage of shots able to be obtained and percentage of these shots that fell within the respective manufacturers horizontal distance tolerances.

4.3 Horizontal Distance Displacement

For the horizontal distance displacement section of the results, three graphs were produced for each obstruction (one for each of the three instruments). Each of these graphs displayed all of the short range (10m,20m,40m) obstruction data as well as the long range (40m,80m,160m) data recorded in all three measurement modes (Manual Prism, ATR, Manual Non-Prism) through the respective obstruction. Each graph was presented with both short range and long range statistical information. The following figures *(figure 4.1 – figure 4.18)* show the results for the horizontal distance displacement. In all of the following graphs, the colour red represents a point where the instrument was either unable to obtain a reading, obtained a reading to the obstruction rather than the target, or obtained a gross error reading returning a distance somewhere between the obstruction and the intended target.

4.3.1 5mm Tinted Glass Obstruction

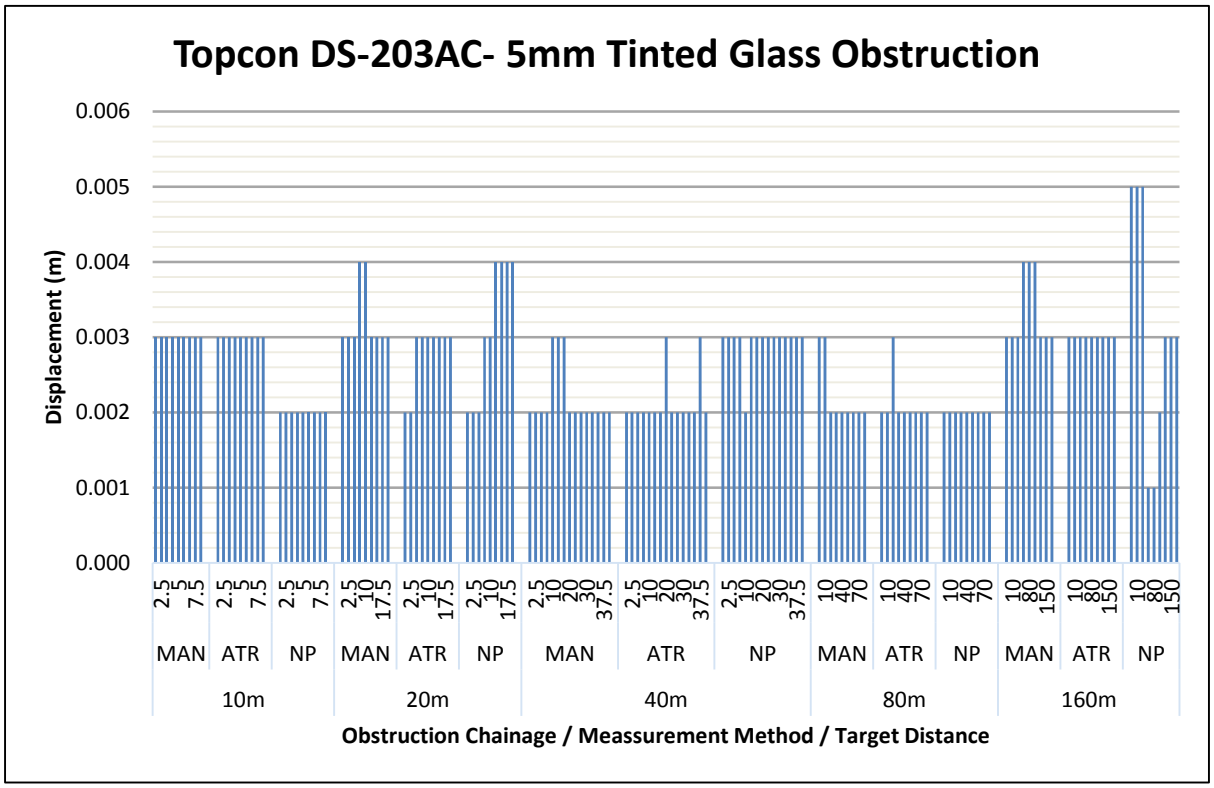

Figure 4.1: Topcon DS-203AC – 5mm Tinted Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 4mm	LR = 4mm
Displacement Range	SR = 2mm (2mm-4mm)	LR = 2mm (2mm-4mm)
Mean Error	SR = 2.8mm	LR = 2.6mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 0/27 (0%)	LR = 0/27 (0%)

ATR

Max Displacement	SR = 3mm	LR = 3mm
Displacement Range	SR = 1mm (2mm-3mm)	LR = 1mm (2mm-3mm)
Mean Error	SR = 2.7mm	LR = 2.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 0/27 (0%)	LR = 0/27 (0%)

Manual Non-Prism

Max Displacement	SR = 4mm	LR = 5mm
Displacement Range	SR = 2mm (2mm-4mm)	LR = 4mm (1mm-5mm)
Mean Error	SR = 2.7mm	LR = 2.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 12/27 (44%)	LR = 13/27 (48%)

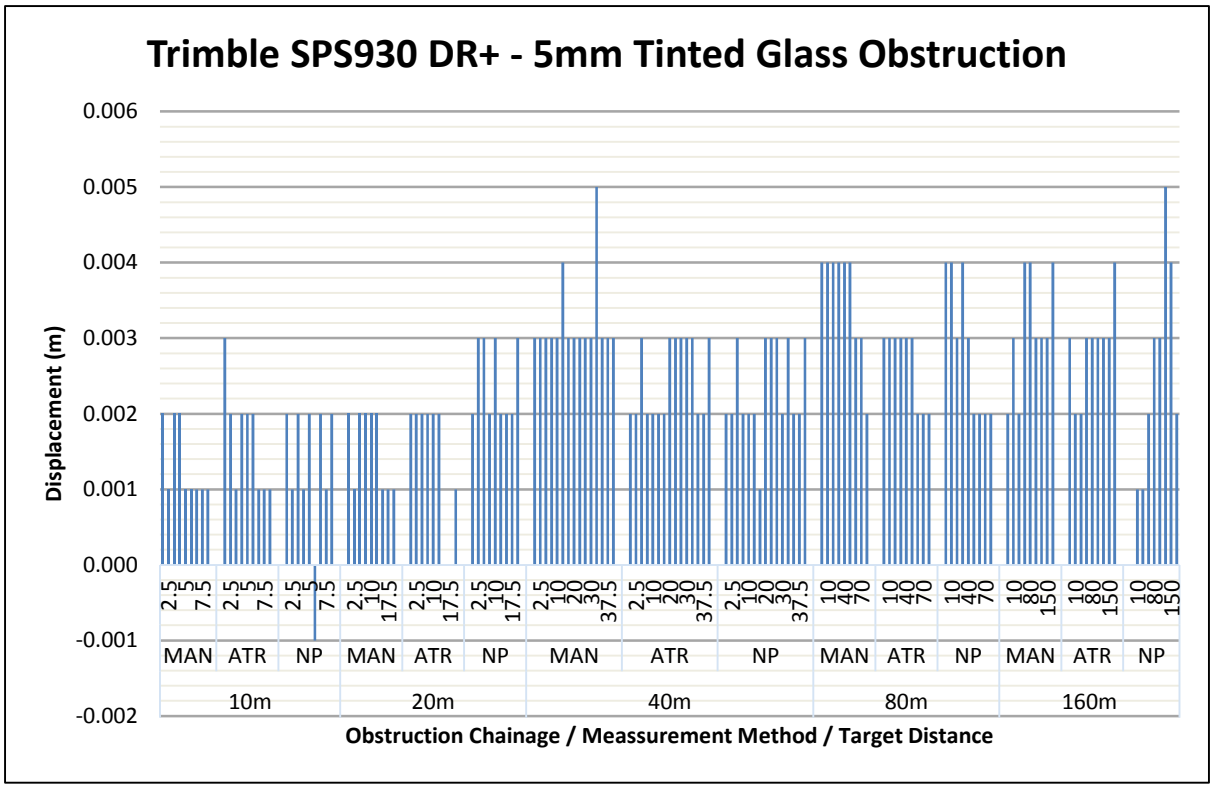

Figure 4.2: Trimble SPS930 DR+ - 5mm Tinted Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 3mm	LR = 5mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 3mm (2mm-5mm)
Mean Error	SR = 2.0mm	LR = 3.3mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 18/27 (67%)	LR = 3/27 (11%)

ATR

Max Displacement	SR = 3mm	LR = 4mm
Displacement Range	SR = 3mm (0mm-3mm)	LR = 2mm (2mm-4mm)
Mean Error	SR = 1.9mm	LR = 2.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 22/27 (81%)	LR = 9/27 (33%)

Manual Non-Prism

Max Displacement	SR = 3mm	LR = 5mm
Displacement Range	SR = 4mm (-1mm-3mm)	LR = 5mm (0mm-5mm)
Mean Error	SR = 2.1mm	LR = 2.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 19/27 (70%)	LR = 13/27 (48%)

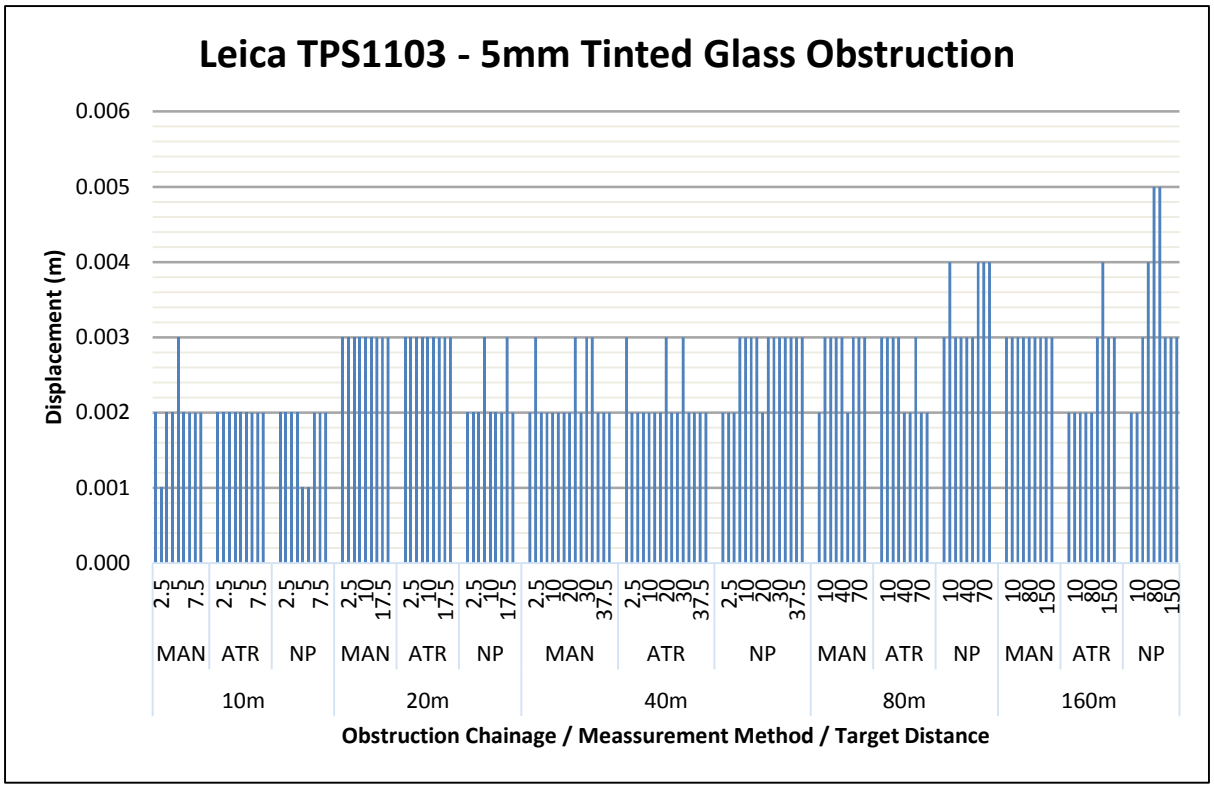

Figure 4.3: Leica TPS1103 - 5mm Tinted Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 3mm	LR = 3mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 1mm (2mm-3mm)
Mean Error	SR = 2.4mm	LR = 2.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 12/27 (44%)	LR = 16/27 (59%)

ATR

Max Displacement	SR = 3mm	LR = 4mm
Displacement Range	SR = 1mm (2mm-3mm)	LR = 2mm (2mm-4mm)
Mean Error	SR = 2.4mm	LR = 2.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 16/27 (59%)	LR = 16/27 (59%)

Manual Non-Prism

Max Displacement	SR = 3mm	LR = 5mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 3mm (2mm-5mm)
Mean Error	SR = 2.2mm	LR = 3.2mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-3mm	SR = 27/27 (100%)	LR = 20/27 (74%)

4.3.2 5mm Glass Obstruction

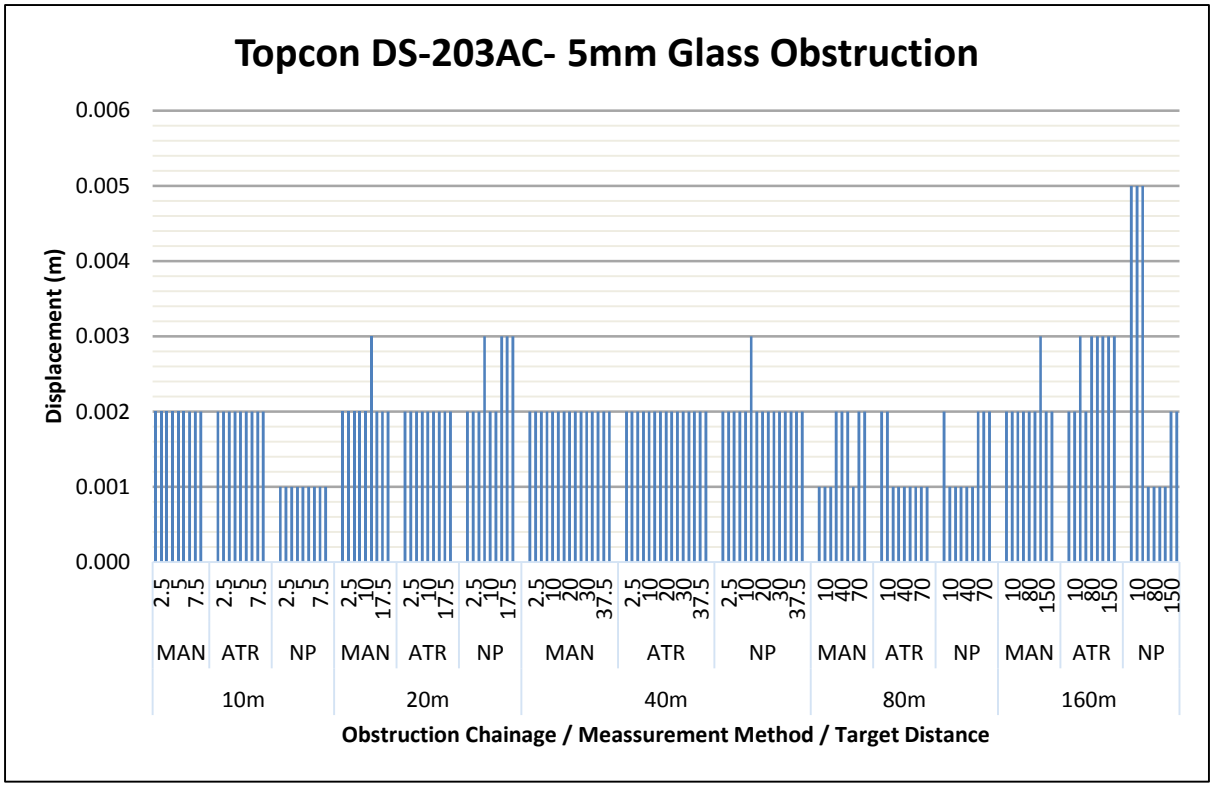

Figure 4.4: Topcon DS-203AC – 5mm Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 3mm	LR = 3mm
Displacement Range	SR = 1mm (2mm-3mm)	LR = 2mm (1mm-3mm)
Mean Error	SR = 2.0mm	LR = 1.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 0/27 (0%)	LR = 4/27 (15%)

ATR

Max Displacement	SR = 2mm	LR = 3mm
Displacement Range	SR = 0mm (2mm-2mm)	LR = 2mm (1mm-3mm)
Mean Error	SR = 2.0mm	LR = 2.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 0/27 (0%)	LR = 7/27 (26%)

Manual Non-Prism

Max Displacement	SR = 3mm	LR = 5mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 4mm (1mm-5mm)
Mean Error	SR = 1.8mm	LR = 2.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 23/27 (86%)	LR = 23/27 (86%)

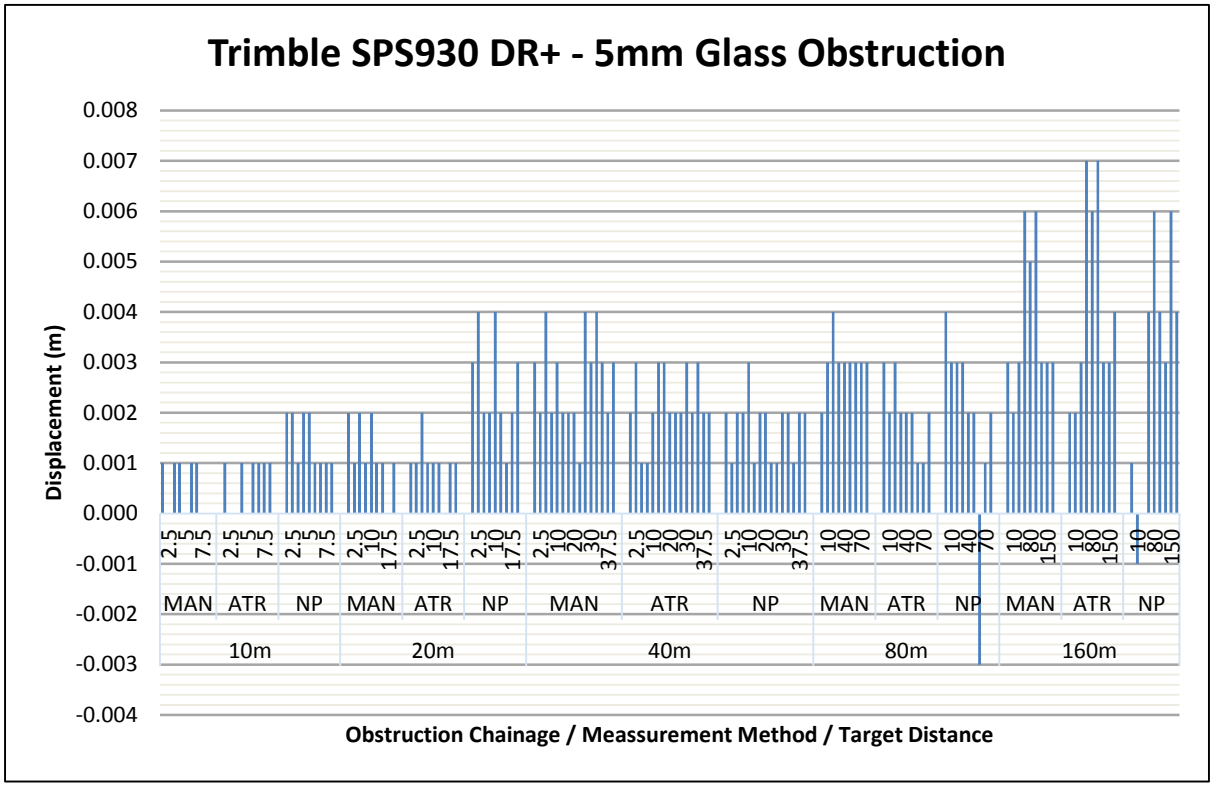

Figure 4.5: Trimble SPS930 DR+ - 5mm Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 4mm	LR = 6mm
Displacement Range	SR = 4mm (0mm-4mm)	LR = 5mm (1mm-6mm)
Mean Error	SR = 1.4mm	LR = 3.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 24/27 (89%)	LR = 6/27 (22%)

ATR

Max Displacement	SR = 3mm	LR = 7mm
Displacement Range	SR = 3mm (0mm-3mm)	LR = 6mm (1mm-7mm)
Mean Error	SR = 1.3mm	LR = 2.8mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 24/27 (89%)	LR = 15/27 (56%)

Manual Non-Prism

Max Displacement	SR = 4mm	LR = 6mm
Displacement Range	SR = 3mm (1mm-4mm)	LR = 9mm (-3mm-6mm)
Mean Error	SR = 1.9mm	LR = 2.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 22/27 (81%)	LR = 15/27 (56%)

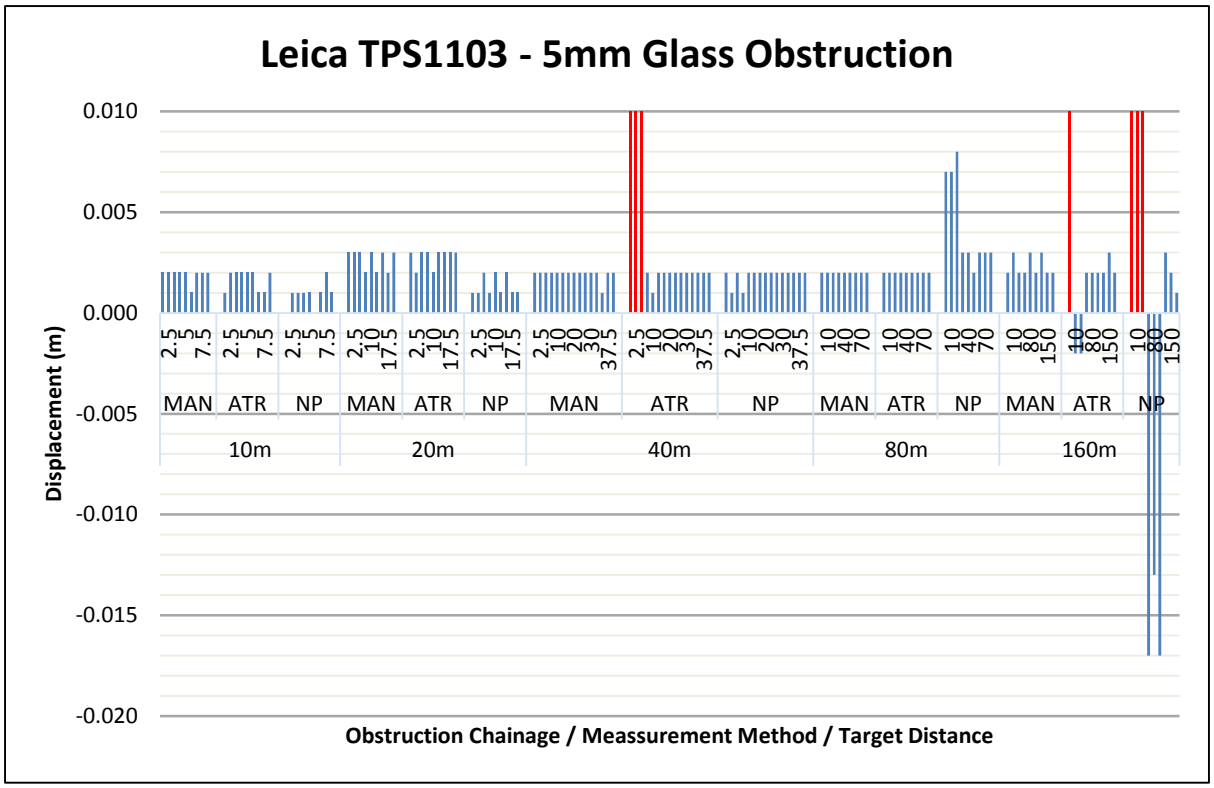

Figure 4.6: Leica TPS1103 – 5mm Glass Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 3mm	LR = 3mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 1mm (2mm-3mm)
Mean Error	SR = 2.1mm	LR = 2.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 21/27m (78%)	LR = 24/27 (89%)

ATR

Max Displacement	SR = 3mm	LR = 3mm
Displacement Range	SR = 2mm (1mm-3mm)	LR = 5mm (-2mm-3mm)
Mean Error	SR = 2.2mm	LR = 2.0mm
% Obtainable Points	SR = 24/27 (89%)	LR = 26/27 (96%)
% within +/-2mm	SR = 17/24 (71%)	LR = 25/26 (96%)

Manual Non-Prism

Max Displacement	SR = 2mm	LR = -17mm
Displacement Range	SR = 2mm (0mm-2mm)	LR = 24mm (-17mm-8mm)
Mean Error	SR = 1.4mm	LR = 4.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 24/27 (89%)
% within +/3mm	SR = 27/27 (100%)	LR = 17/24 (71%)

4.3.3 Light Gauge Screen Obstruction

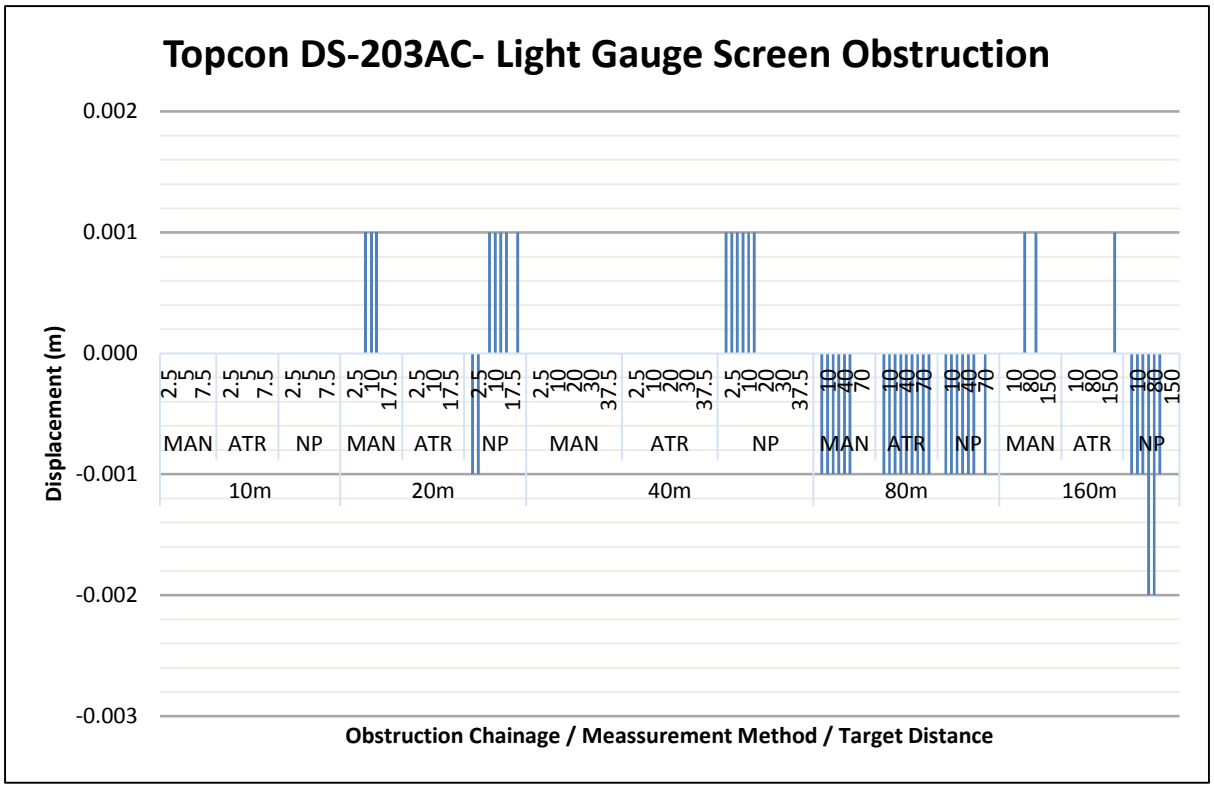

Figure 4.7: Topcon DS-203AC – Light Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 1mm (0mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.1mm	LR = 0.3mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = 0mm	LR = 1mm
Displacement Range	SR = 0mm (0mm-0mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.0mm	LR = 0.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = 1mm	LR = -2mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 3mm (-2mm-1mm)
Mean Error	SR = 0.4mm	LR = 0.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

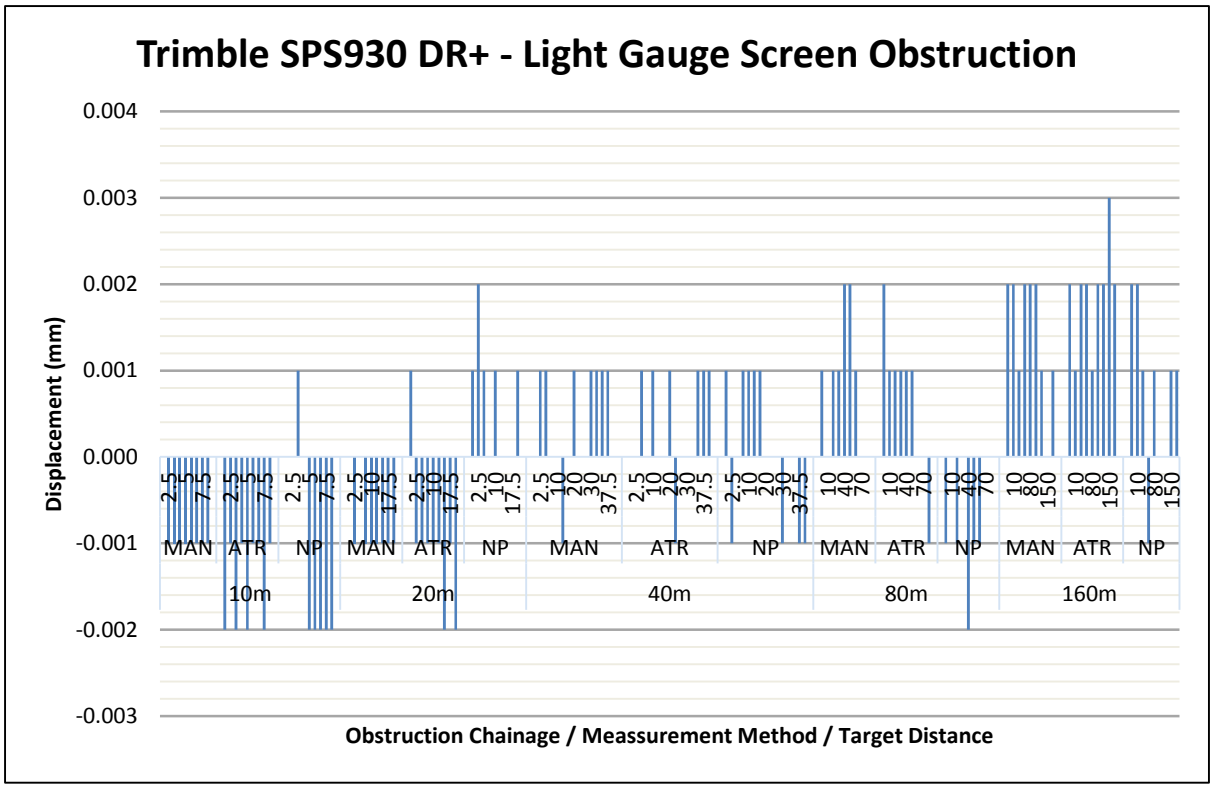

Figure 4.8: Trimble SPS930 DR+ - Light Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = -2mm	LR = 2mm
Displacement Range	SR = 3mm (-2mm-1mm)	LR = 3mm (-1mm-2mm)
Mean Error	SR = 0.8mm	LR = 0.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = -2mm	LR = 3mm
Displacement Range	SR = 3mm (-2mm-1mm)	LR = 4mm (-1mm-3mm)
Mean Error	SR = 1.1mm	LR = 1.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 26/27 (96%)

Manual Non-Prism

Max Displacement	SR = 2mm	LR = 2mm
Displacement Range	SR = 4mm (-2mm-2mm)	LR = 4mm (-2mm-2mm)
Mean Error	SR = 0.8mm	LR = 0.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

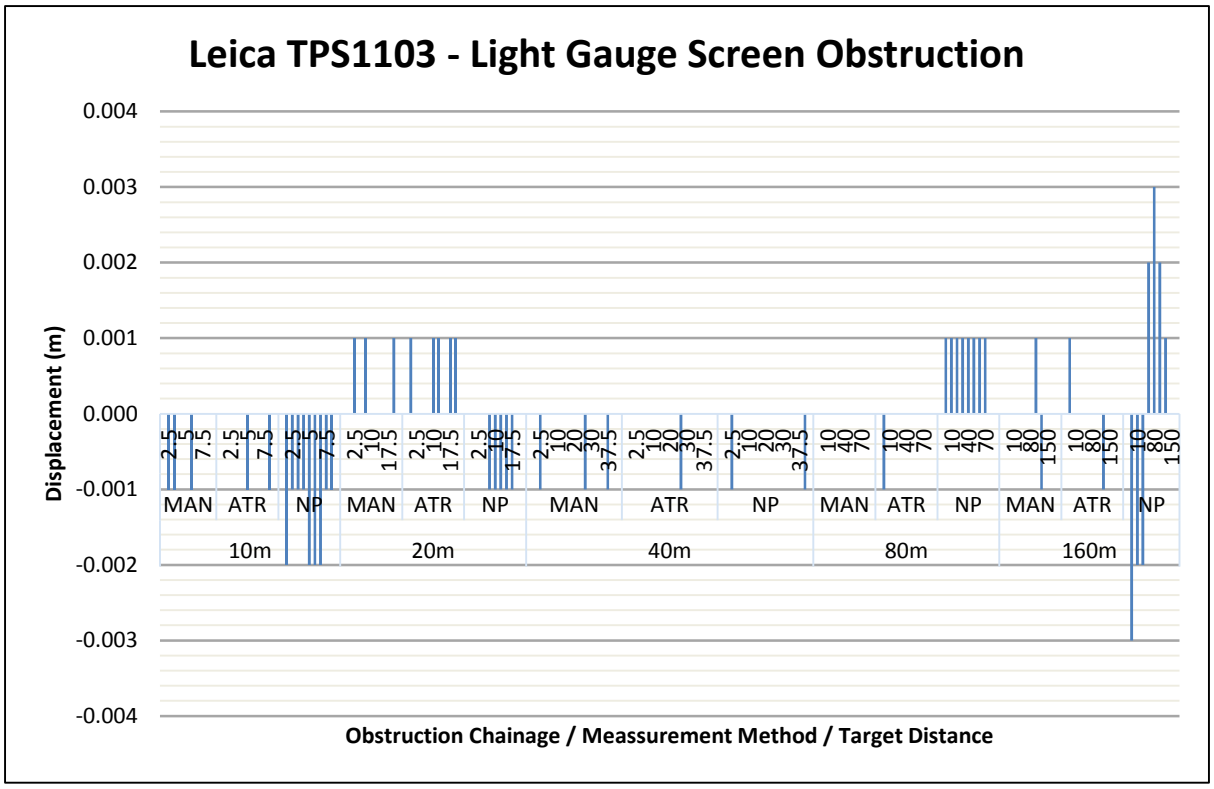

Figure 4.9: Leica TPS1103 – Light Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.3mm	LR = 0.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.3mm	LR = 0.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = -2mm	LR = 3mm
Displacement Range	SR = 2mm (-2mm-0mm)	LR = 6mm (-3mm-3mm)
Mean Error	SR = 0.7mm	LR = 0.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-3mm	SR = 27/27 (100%)	LR = 27/27 (100%)

4.3.4 Light Vegetation Obstruction

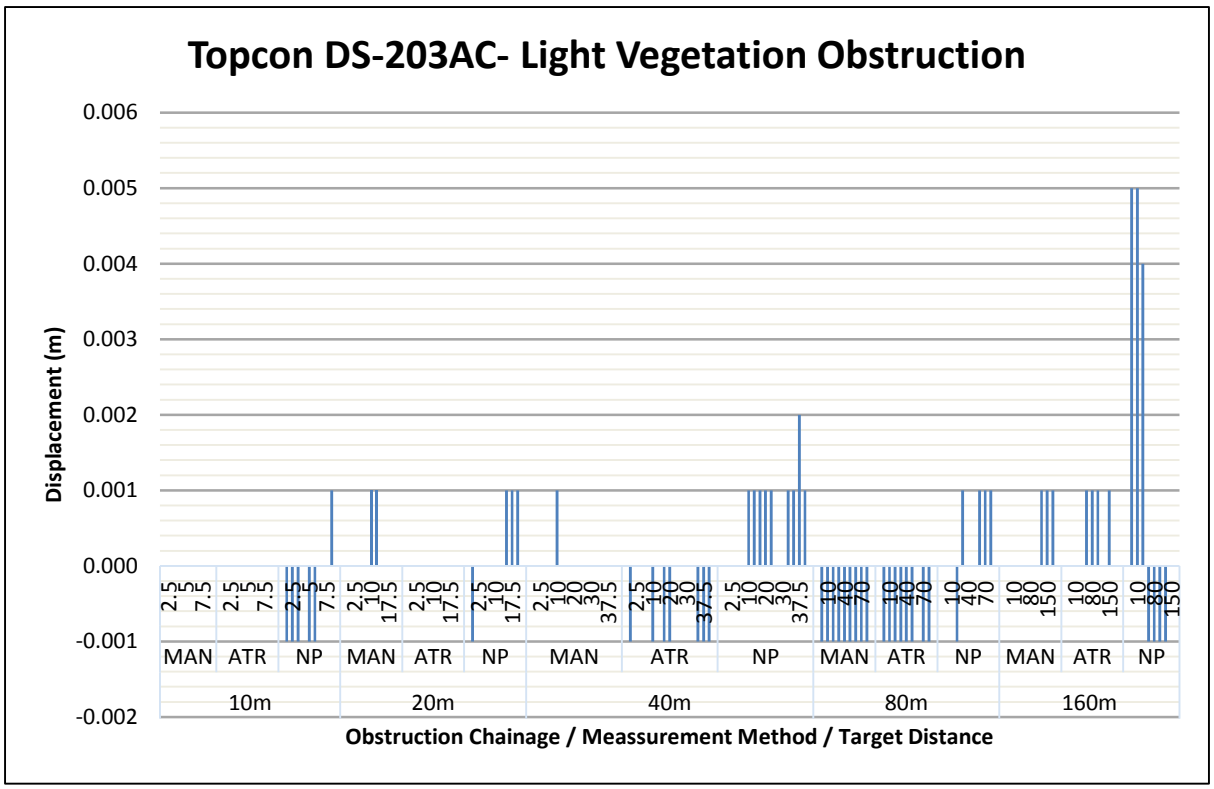

Figure 4.10: Topcon DS-203AC – Light Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 1mm (0mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.1mm	LR = 0.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = -1mm	LR = 1mm
Displacement Range	SR = 1mm (-1mm-0mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.2mm	LR = 0.6mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = 2mm	LR = 5mm
Displacement Range	SR = 3mm (-1mm-2mm)	LR = 6mm (-1mm-5mm)
Mean Error	SR = 0.6mm	LR = 1.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 24/27 (89%)

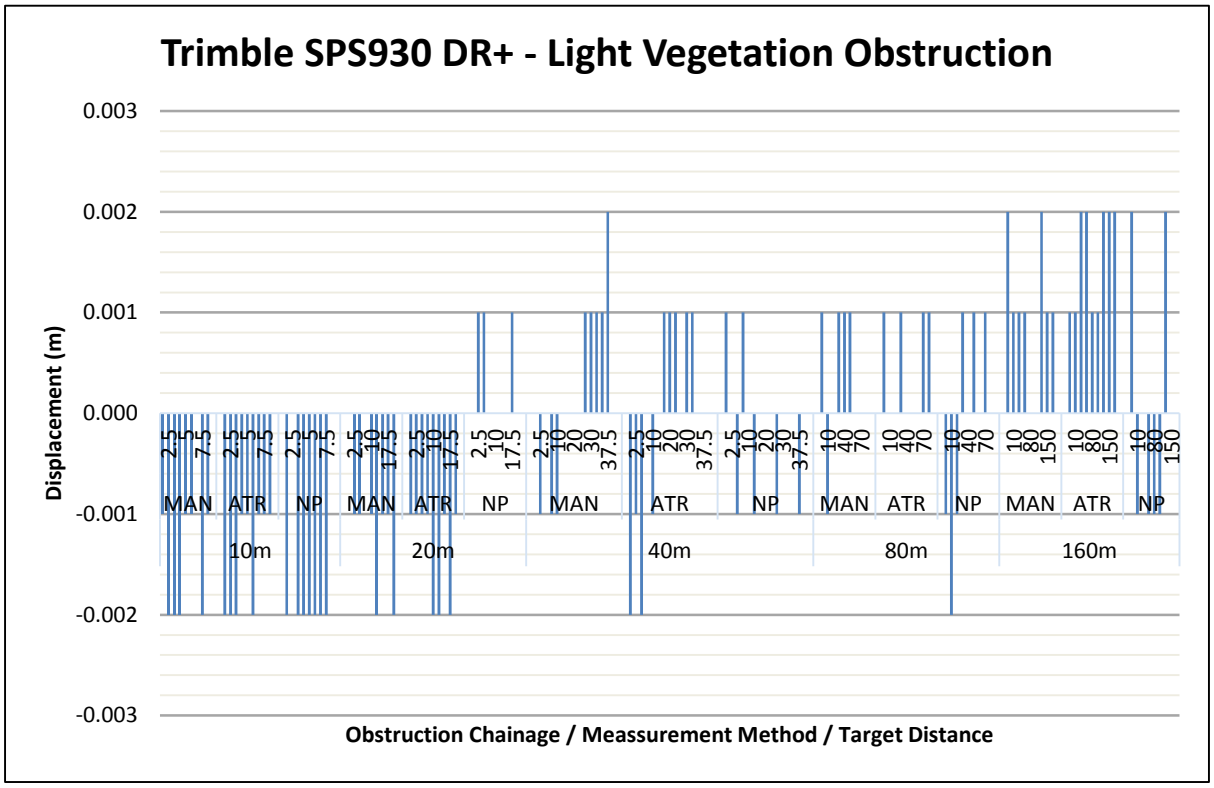

Figure 4.11: Trimble SPS930 DR+ - Light Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 2mm	LR = 2mm
Displacement Range	SR = 4mm (-2mm-2mm)	LR = 3mm (-1mm-2mm)
Mean Error	SR = 0.9mm	LR = 0.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = -2mm	LR = 2mm
Displacement Range	SR = 3mm (-2mm-1mm)	LR = 3mm (-1mm-2mm)
Mean Error	SR = 1.2mm	LR = 0.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = -2mm	LR = 2mm
Displacement Range	SR = 3mm (-2mm-1mm)	LR = 4mm (-2mm-2mm)
Mean Error	SR = 0.7mm	LR = 0.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

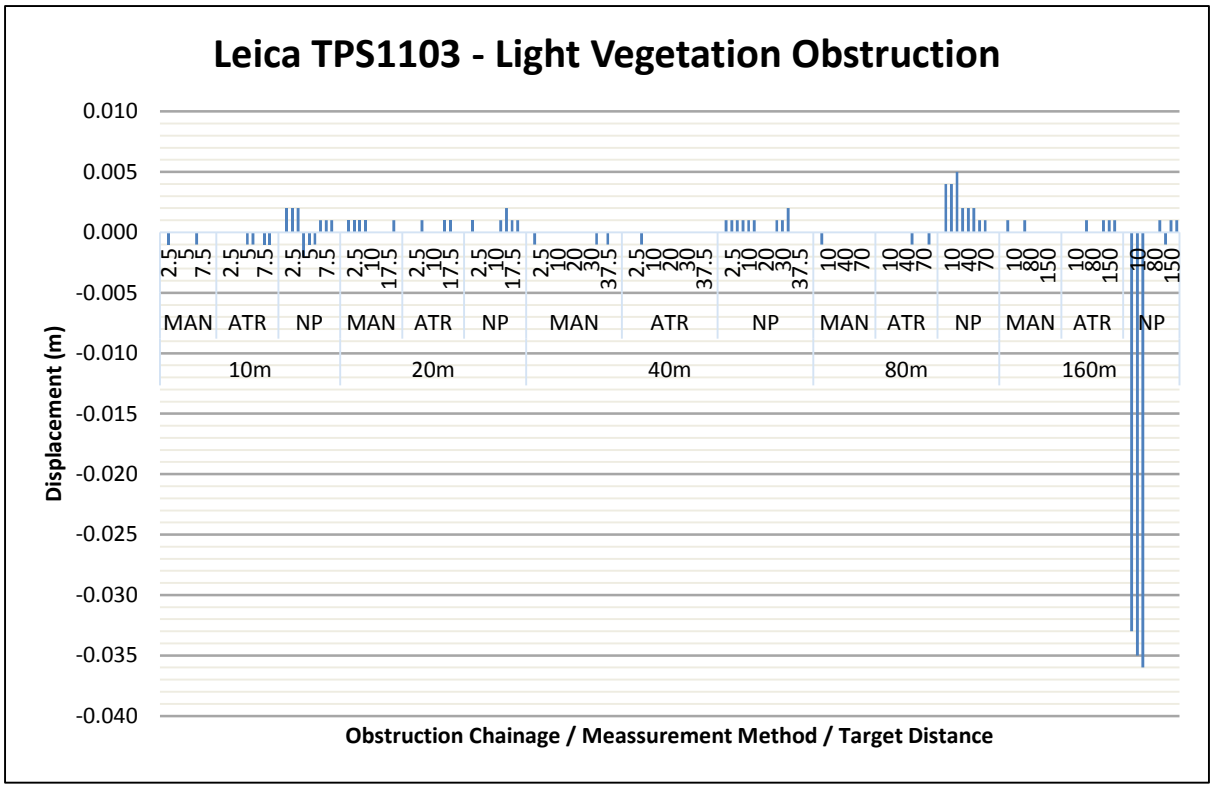

Figure 4.12: Leica TPS1103 – Light Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.3mm	LR = 0.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

ATR

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.3mm	LR = 0.2mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = 2mm	LR = -36mm
Displacement Range	SR = 3mm (-1mm-2mm)	LR = 41mm (-36mm-5mm)
Mean Error	SR = 0.8mm	LR = 5.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-3mm	SR = 27/27 (100%)	LR = 21/27 (78%)

4.3.5 Dense Vegetation Obstruction

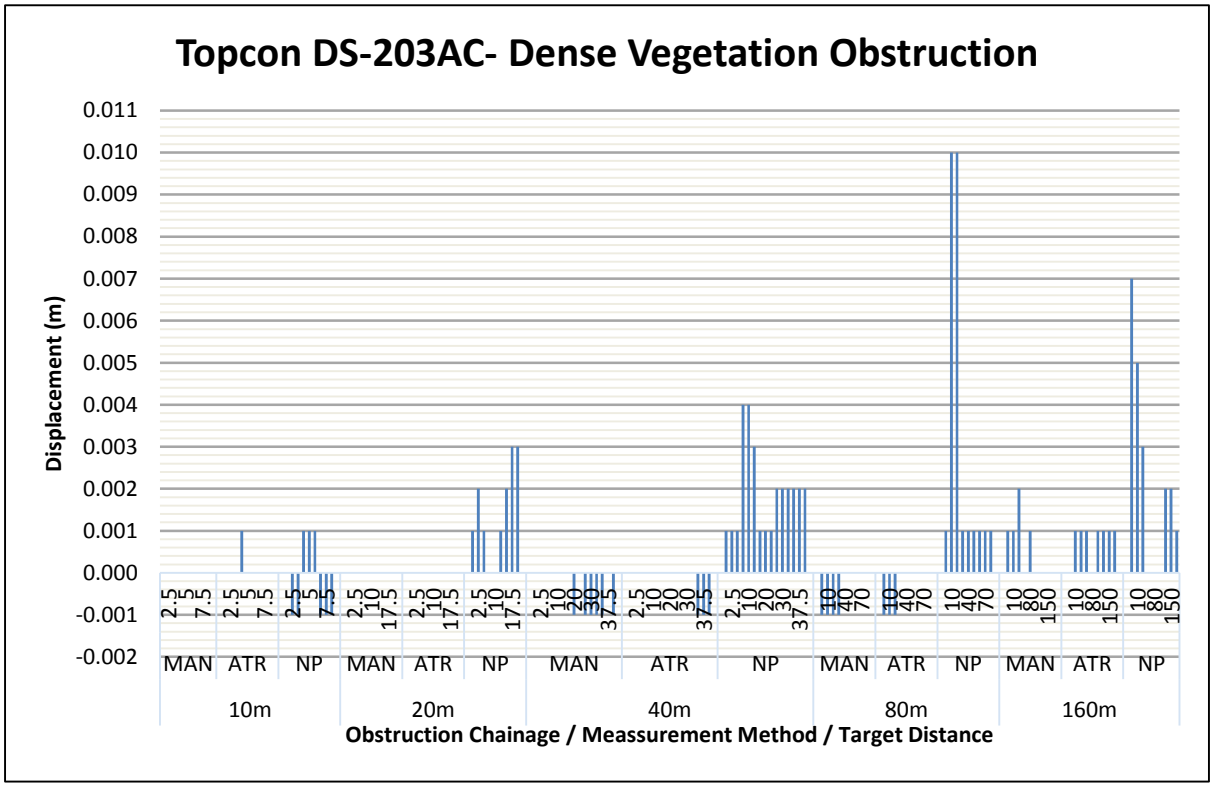

Figure 4.13: Topcon DS-203AC – Dense Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = -1mm	LR = 2mm
Displacement Range	SR = 1mm (-1mm-0mm)	LR = 3mm (-1mm-2mm)
Mean Error	SR = 0.1mm	LR = 0.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 26/27 (96%)

ATR

Max Displacement	SR = 1mm	LR = 1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.2mm	LR = 0.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-1.5mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = 3mm	LR = 10mm
Displacement Range	SR = 4mm (-1mm-3mm)	LR = 10mm (0mm-10mm)
Mean Error	SR = 1.2mm	LR = 2.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 25/27 (93%)	LR = 19/27 (70%)

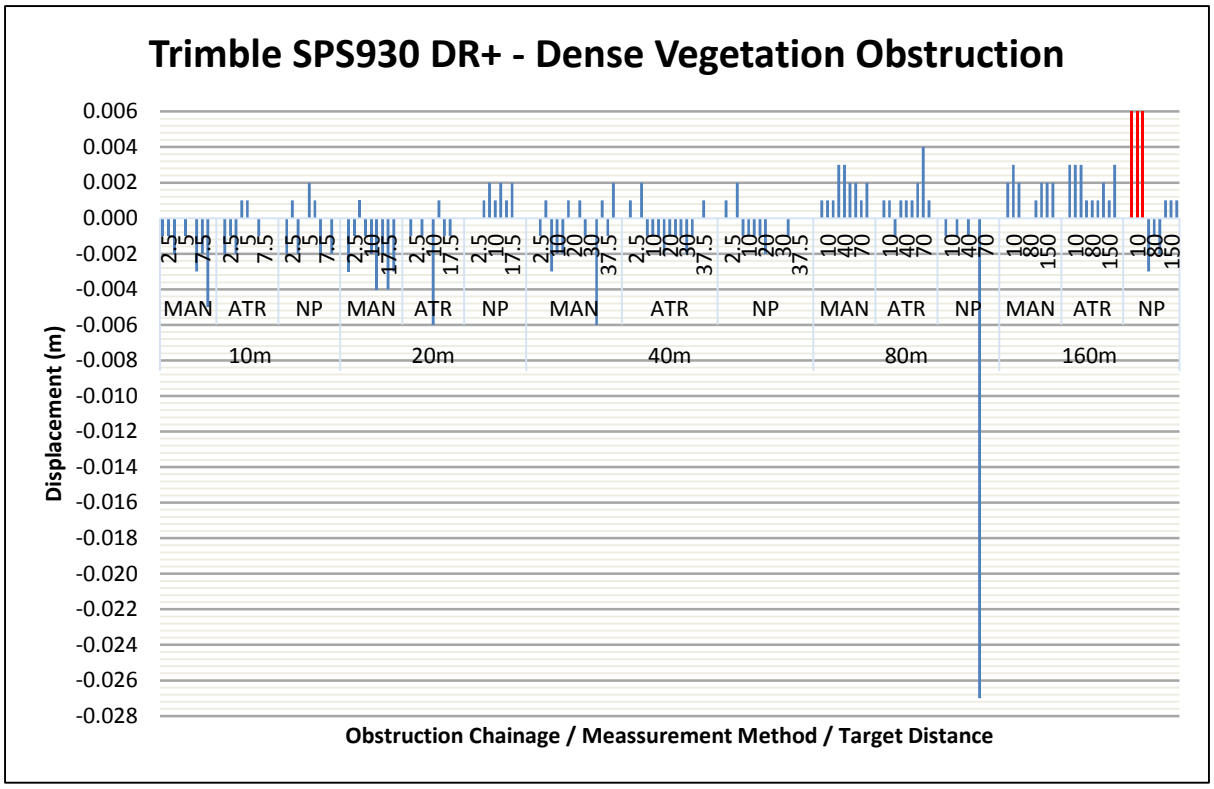

Figure 4.14: Trimble SPS930 DR+ - Dense Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = -5mm	LR = -6mm
Displacement Range	SR = 7mm (-5mm-2mm)	LR = 9mm (-6mm-3mm)
Mean Error	SR = 1.6mm	LR = 1.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 26/27 (96%)	LR = 22/27 (81%)

ATR

Max Displacement	SR = -6m	LR = 4mm
Displacement Range	SR = 8mm (-6mm-2mm)	LR = 6mm (-2mm-4mm)
Mean Error	SR = 1.0mm	LR = 1.6mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 26/27 (96%)	LR = 22/27 (81%)

Manual Non-Prism

Max Displacement	SR = 2mm	LR = -27mm
Displacement Range	SR = 4mm (-2mm-2mm)	LR = 28mm (-27mm-1mm)
Mean Error	SR = 1.0mm	LR = 1.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 24/27 (89%)
% within +/-2mm	SR = 27/27 (100%)	LR = 22/24 (92%)

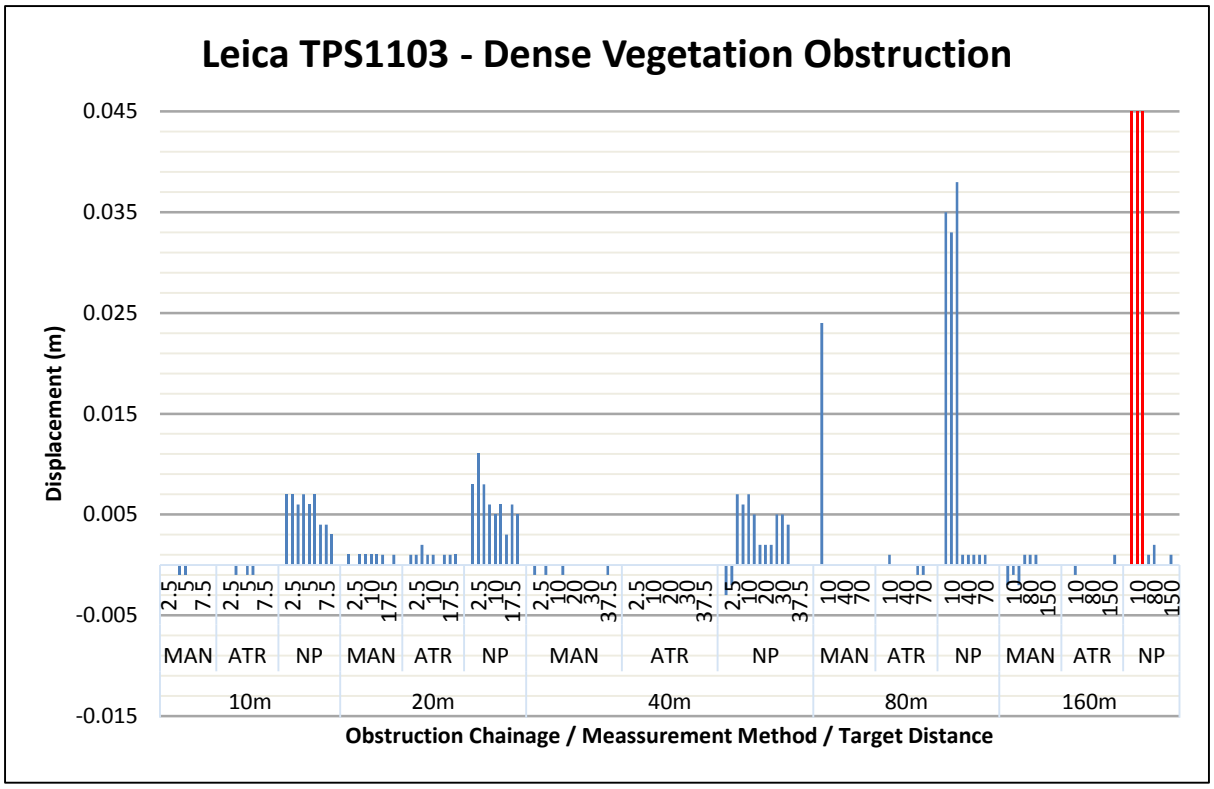

Figure 4.15: Leica TPS1103 – Dense Vegetation Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 1mm	LR = 24mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 26mm (-2mm-24mm)
Mean Error	SR = 0.4mm	LR = 1.2mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 26/27 (96%)

ATR

Max Displacement	SR = 2mm	LR = 1mm
Displacement Range	SR = 3mm (-1mm-2mm)	LR = 2mm (-1mm-1mm)
Mean Error	SR = 0.5mm	LR = 0.2mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)
% within +/-2mm	SR = 27/27 (100%)	LR = 27/27 (100%)

Manual Non-Prism

Max Displacement	SR = 11mm	LR = 38mm
Displacement Range	SR = 14mm (-3mm-11mm)	LR = 38mm (0mm-38mm)
Mean Error	SR = 4.7mm	LR = 6.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 24/27 (89%)
% within +/-3mm	SR = 10/27 (37%)	LR = 17/24 (71%)

4.3.6 Heavy Gauge Screen Obstruction

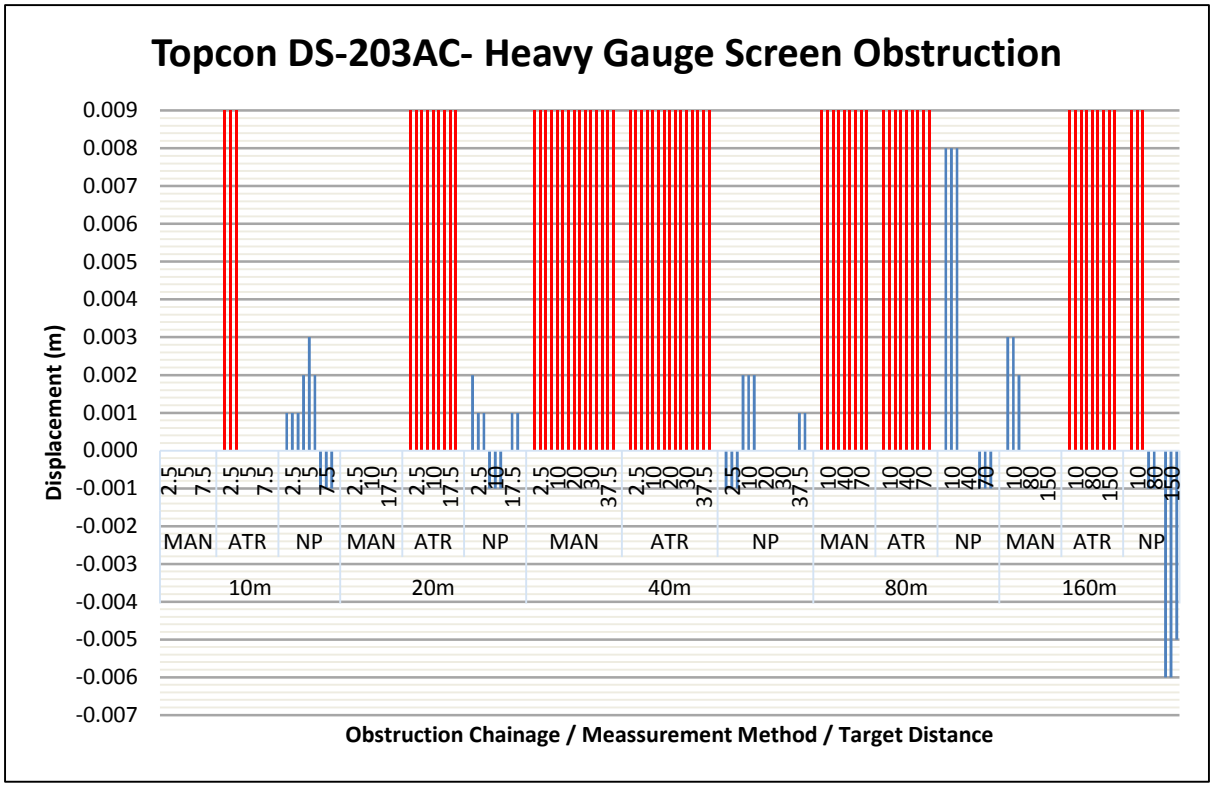

Figure 4.16: Topcon DS-203AC – Heavy Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = 0mm	LR = 3mm
Displacement Range	SR = 0mm (0mm-0mm)	LR = 3mm (0mm-3mm)
Mean Error	SR = 0.0mm	LR = 0.9mm
% Obtainable Points	SR = 18/27 (67%)	LR = 9/27 (33%)
% within +/-1.5mm	SR = 18/18 (100%)	LR = 6/9 (67%)

ATR

Max Displacement	SR = 0mm	LR = N/A
Displacement Range	SR = 0mm (0mm-0mm)	LR = N/A
Mean Error	SR = 0.0mm	LR = N/A
% Obtainable Points	SR = 6/27 (22%)	LR = 0/27 (0%)
% within +/-1.5mm	SR = 6/6 (100%)	LR = 0/0 (0%)

Manual Non-Prism

Max Displacement	SR = 3mm	LR = 8mm
Displacement Range	SR = 4mm (-1mm-3mm)	LR = 14mm (-6mm-8mm)
Mean Error	SR = 1.0mm	LR = 1.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 24/27 (89%)
% within +/-2mm	SR = 25/27 (93%)	LR = 18/24 (75%)

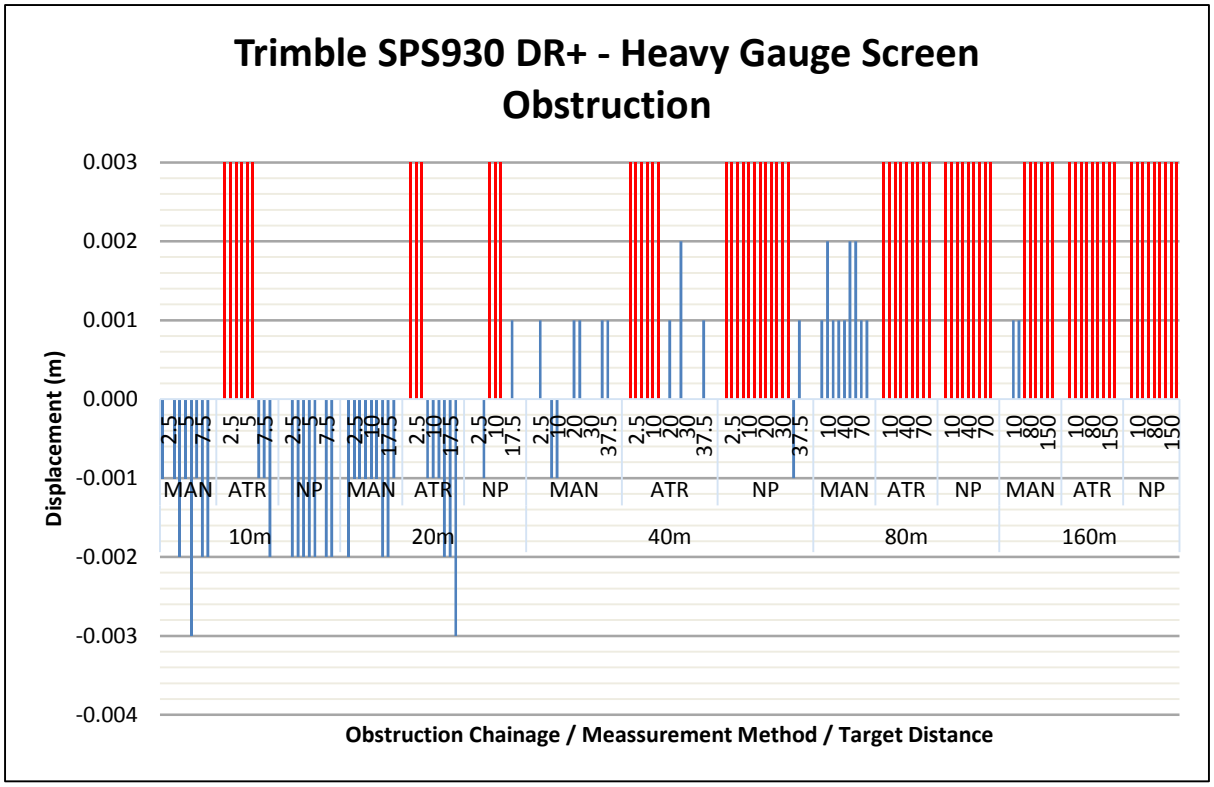

Figure 4.17: Trimble SPS930 DR+ - Heavy Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = -3mm	LR = 2mm
Displacement Range	SR = 4mm (-3mm-1mm)	LR = 3mm (-1mm-2mm)
Mean Error	SR = 1.1mm	LR = 0.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 23/27 (85%)
% within +/-2mm	SR = 26/27 (96%)	LR = 23/23 (100%)

ATR

Max Displacement	SR = -3mm	LR = 2mm
Displacement Range	SR = 4mm (-3mm-1mm)	LR = 2mm (0mm-2mm)
Mean Error	SR = 1.1mm	LR = 0.5mm
% Obtainable Points	SR = 15/27 (56%)	LR = 6/27 (22%)
% within +/-2mm	SR = 14/15 (93%)	LR = 6/6 (100%)

Manual Non-Prism

Max Displacement	SR = -2mm	LR = N/A
Displacement Range	SR = 3mm (-2mm-1mm)	LR = N/A
Mean Error	SR = 0.9mm	LR = N/A
% Obtainable Points	SR = 18/27 (66%)	LR = 0/27 (0%)
% within +/-2mm	SR = 18/18 (100%)	LR = 0/0 (0%)

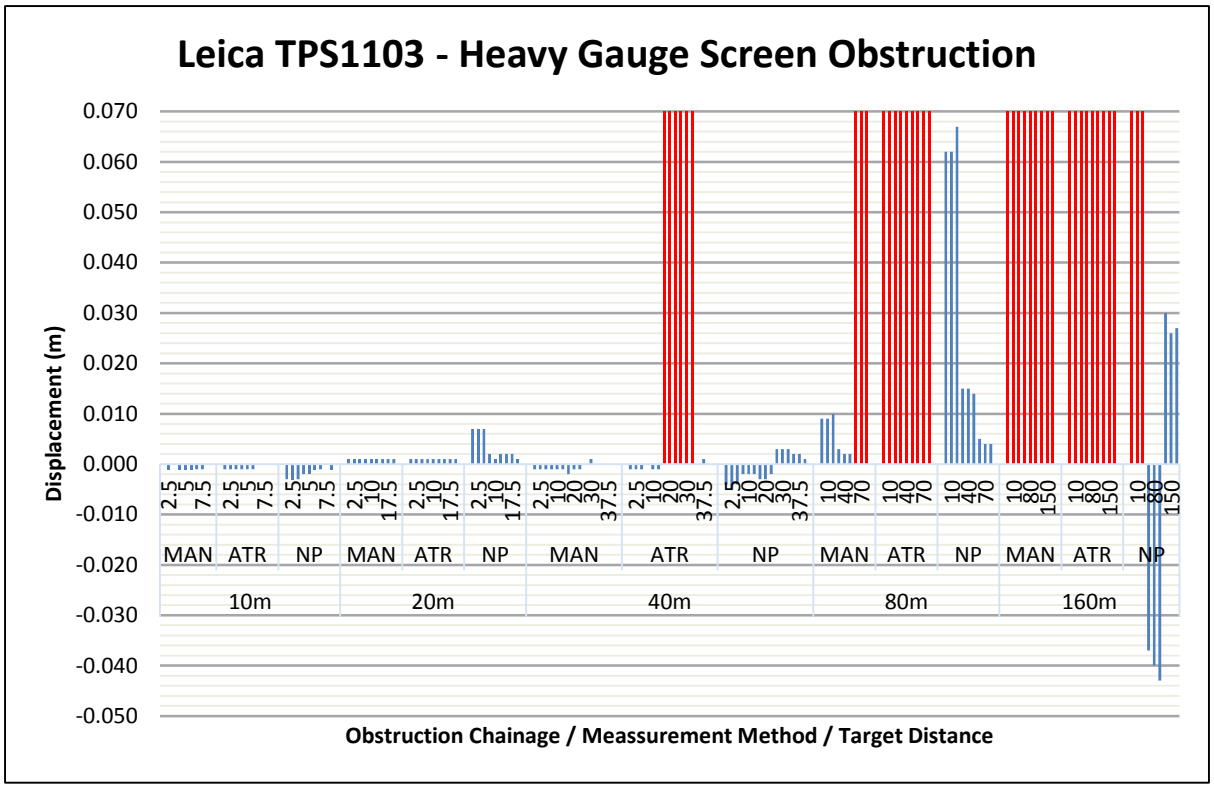

Figure 4.18: Leica TPS1103 – Heavy Gauge Screen Horizontal Distance Displacement Results

Manual Prism

Max Displacement	SR = -2mm	LR = 10mm
Displacement Range	SR = 3mm (-2mm-1mm)	LR = 12mm (-2mm-10mm)
Mean Error	SR = 0.8mm	LR = 2.9mm
% Obtainable Points	SR = 27/27 (100%)	LR = 15/27 (56%)
% within +/-2mm	SR = 27/27 (100%)	LR = 11/15 (73%)

ATR

Max Displacement	SR = 1mm	LR = -1mm
Displacement Range	SR = 2mm (-1mm-1mm)	LR = 1mm (-1mm-0mm)
Mean Error	SR = 0.8mm	LR = 0.7mm
% Obtainable Points	SR = 24/27 (89%)	LR = 3/27 (11%)
% within +/-2mm	SR = 24/24 (100%)	LR = 3/3 (100%)

Manual Non-Prism

Max Displacement	SR = 7mm	LR = 67mm
Displacement Range	SR = 12mm (-5mm-7mm)	LR = 110mm (-43mm-67mm)
Mean Error	SR = 2.7mm	LR = 16.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 24/27 (89%)
% within +/-3mm	SR = 21/27 (78%)	LR = 9/24 (36%)

4.4 Vertical and Horizontal Angular Displacement (ATR)

For the vertical and horizontal angular displacement section of the results, three graphs were produced for each obstruction (one for each of the three instruments). Each of these graphs displayed all of the short range (10m,20m,40m) obstruction data as well as the long range (40m,80m,160m) data recorded in ATR mode through the respective obstruction. Graphs were not produced for the angular displacement of data acquired through manual prism and manual non-prism based measurement as these displacements relied on the surveyor's ability to point the instrument accurately at the target rather than the instruments ability to find the centre of target as best it could through the obstruction. Each graph was presented with both short range and long range statistical information.

The following figures *(figure 4.19 – figure 4.36)* show the results for the vertical and horizontal angular displacement. In all of the following graphs, the colour red represents a point where the instrument was either unable to obtain a reading, obtained a reading to the obstruction rather than the target, or obtained a gross error reading returning a distance somewhere between the obstruction and the intended target.

4.4.1 5mm Tinted Glass Obstruction

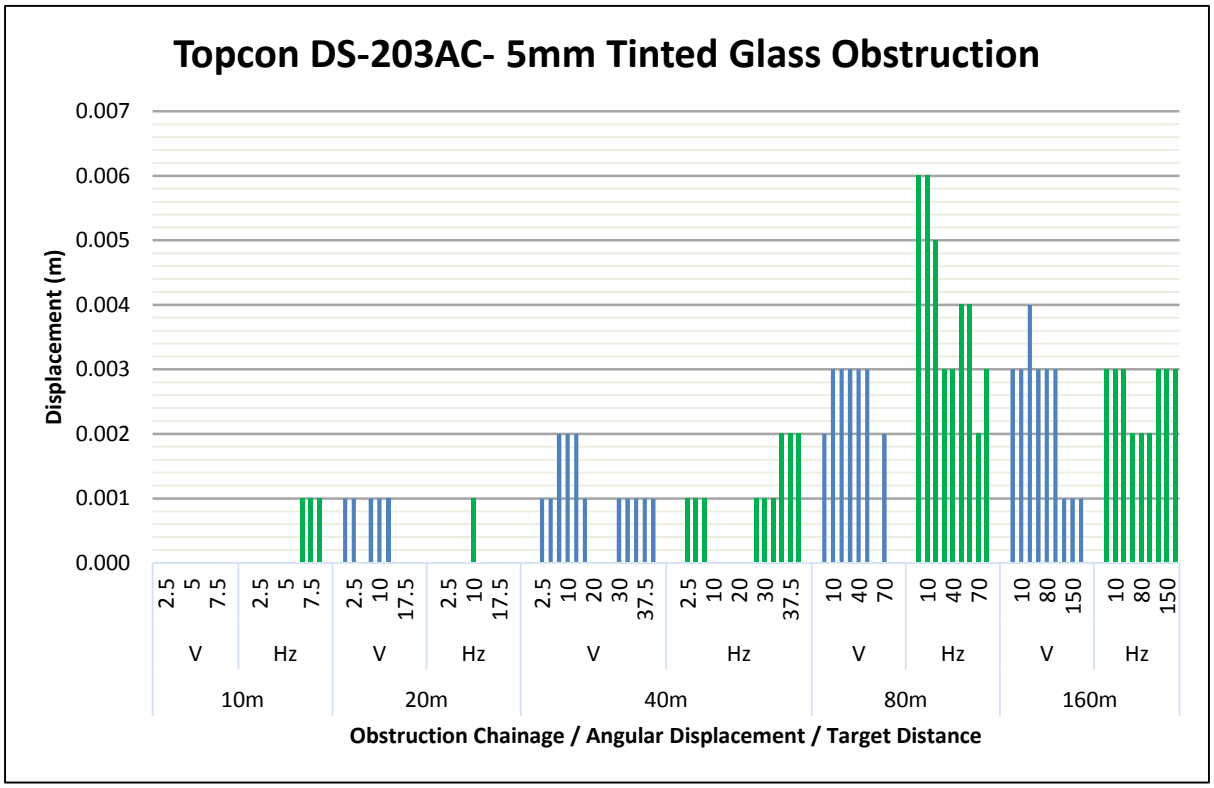

Figure 4.19: Topcon DS-203AC – 5mm Tinted Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 1mm	LR = 4mm
Mean V Error	SR = 0.4mm	LR = 1.9mm
Max Hz Displacement	SR = 2mm	LR = 6mm
Mean Hz Error	SR = 0.4mm	LR = 2.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

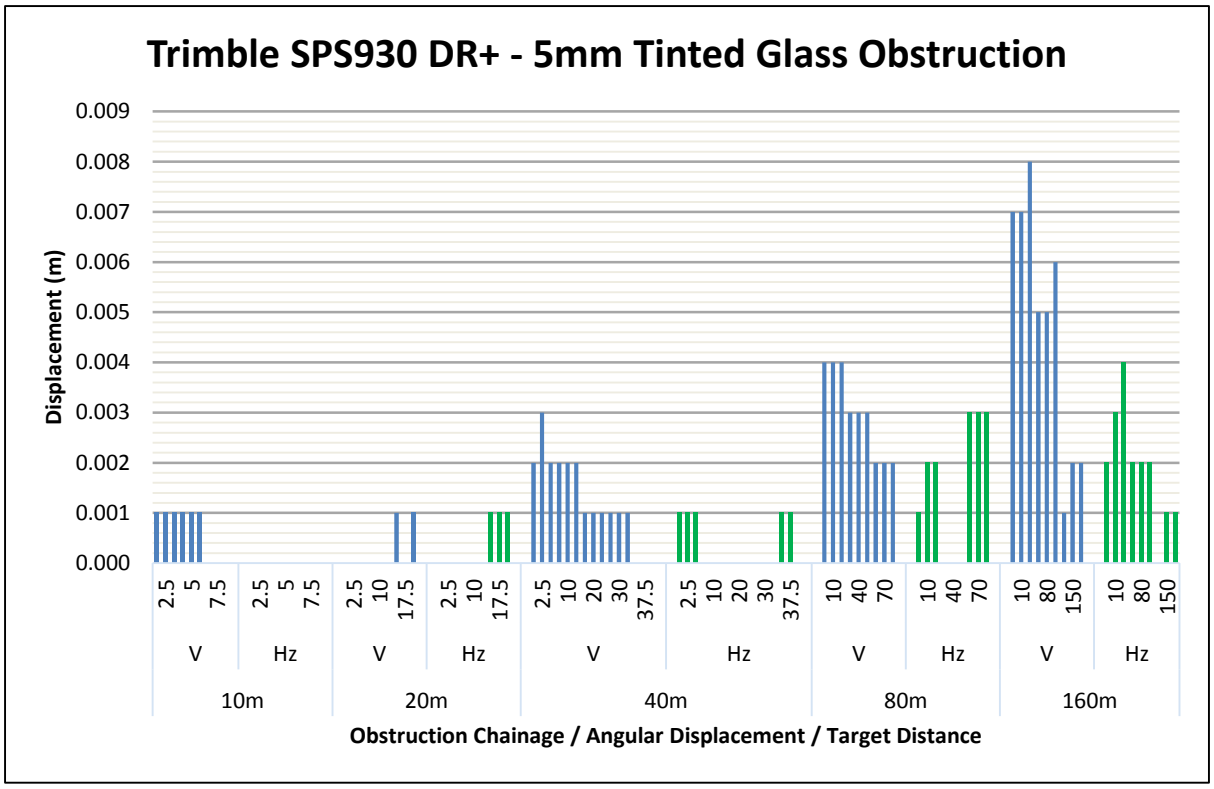

Figure 4.20: Trimble SPS930 DR+ - 5mm Tinted Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 3mm	LR = 8mm
Mean V Error	SR = 0.7mm	LR = 3.0mm
Max Hz Displacement	SR = 1mm	LR = 4mm
Mean Hz Error	SR = 0.3mm	LR = 1.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

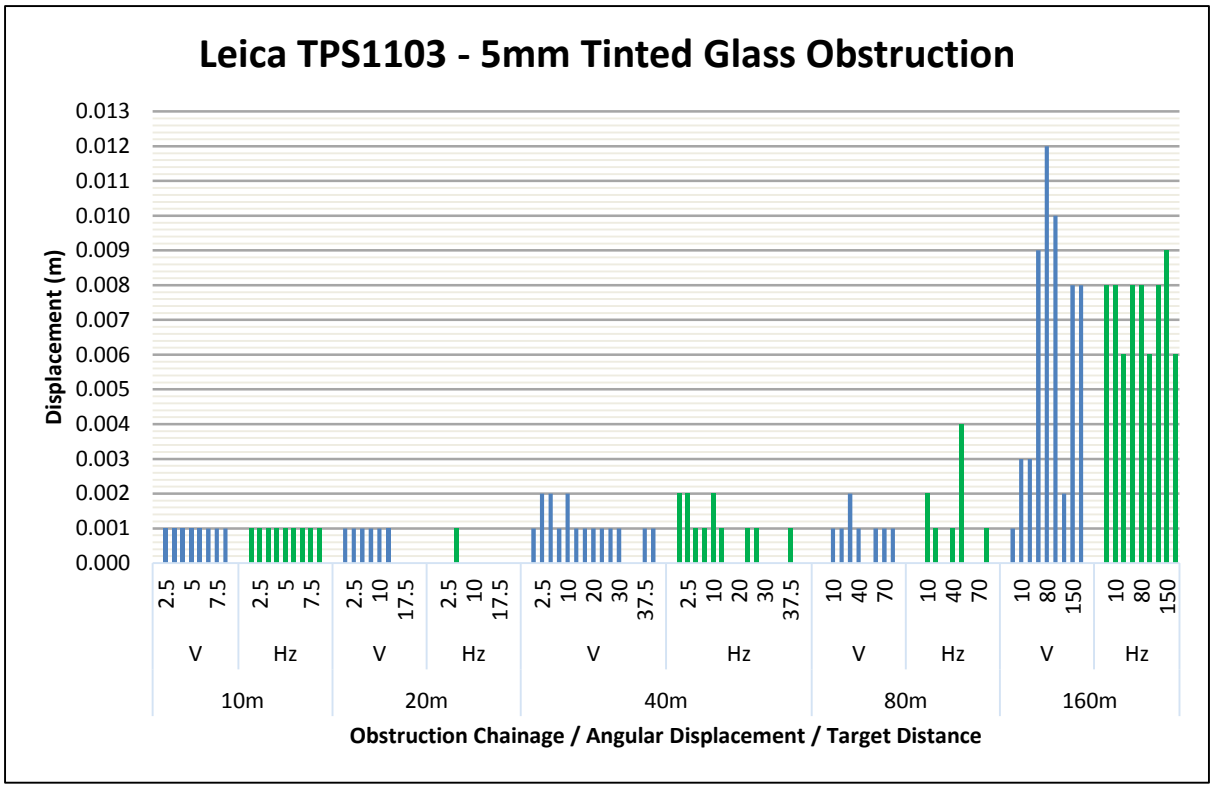

Figure 4.21: Leica TSP1103 – 5mm Tinted Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 2mm	LR = 12mm
Mean V Error	SR = 0.9mm	LR = 2.7mm
Max Hz Displacement	SR = 2mm	LR = 9mm
Mean Hz Error	SR = 0.6mm	LR = 3.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

4.4.2 5mm Glass Obstruction

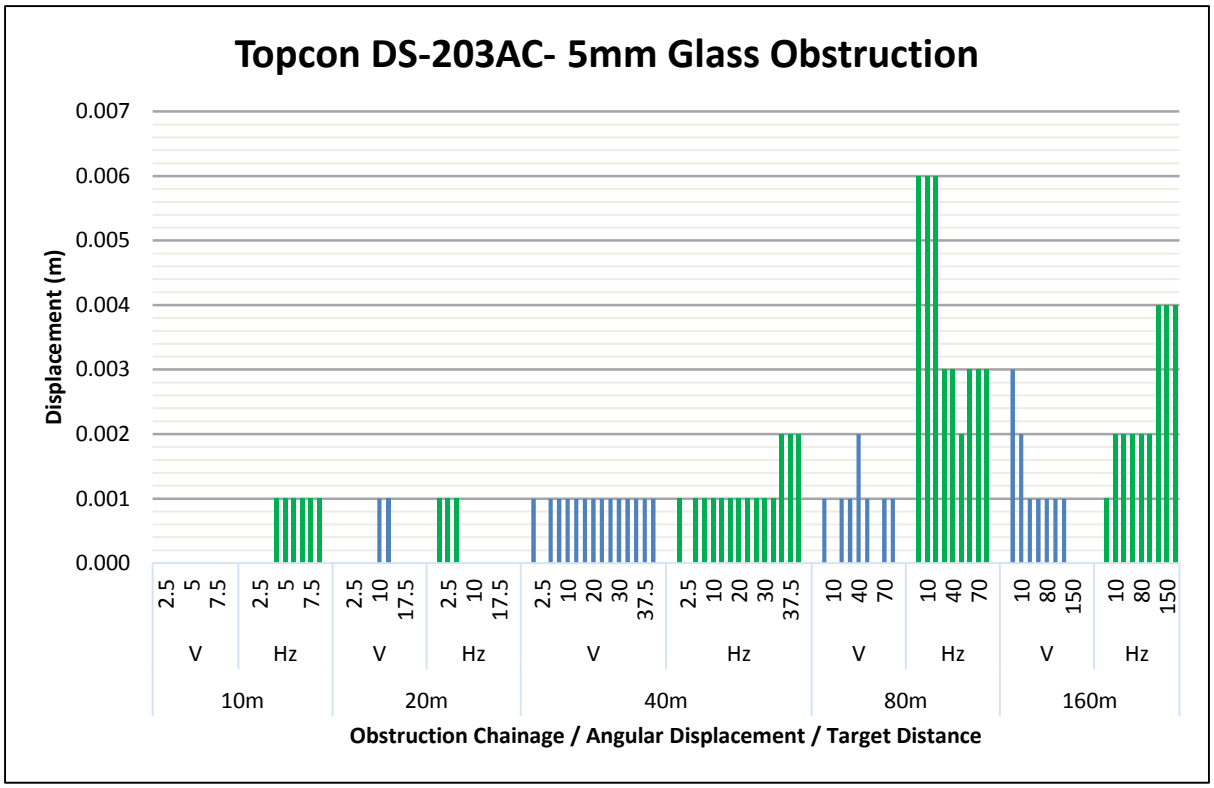

Figure 4.22: Topcon DS-203AC - 5mm Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 1mm	LR = 3mm
Mean V Error	SR = 0.4mm	LR = 1.0mm
Max Hz Displacement	SR = 2mm	LR = 6mm
Mean Hz Error	SR = 0.7mm	LR = 2.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

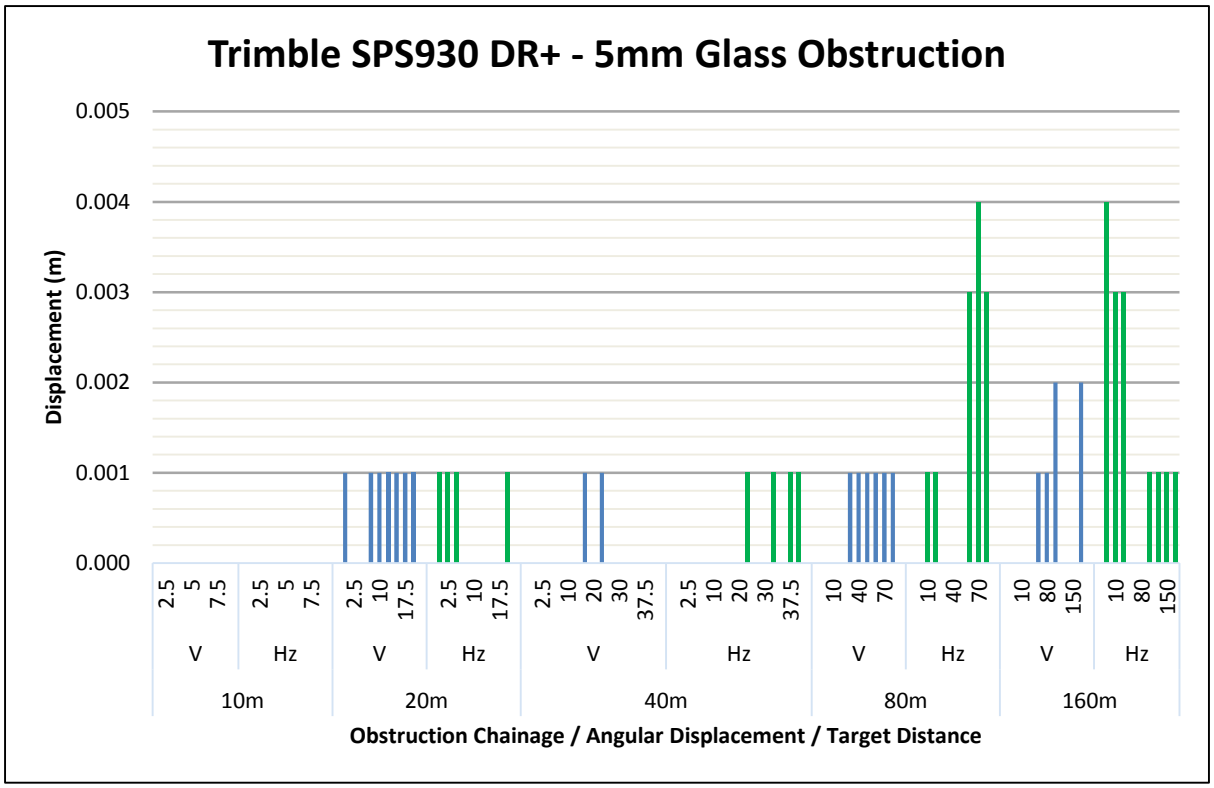

Figure 4.23: Trimble SPS930 DR+ - 5mm Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 1mm	LR = 2mm
Mean V Error	SR = 0.3mm	LR = 0.5mm
Max Hz Displacement	SR = 1mm	LR = 4mm
Mean Hz Error	SR = 0.3mm	LR = 1.0mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

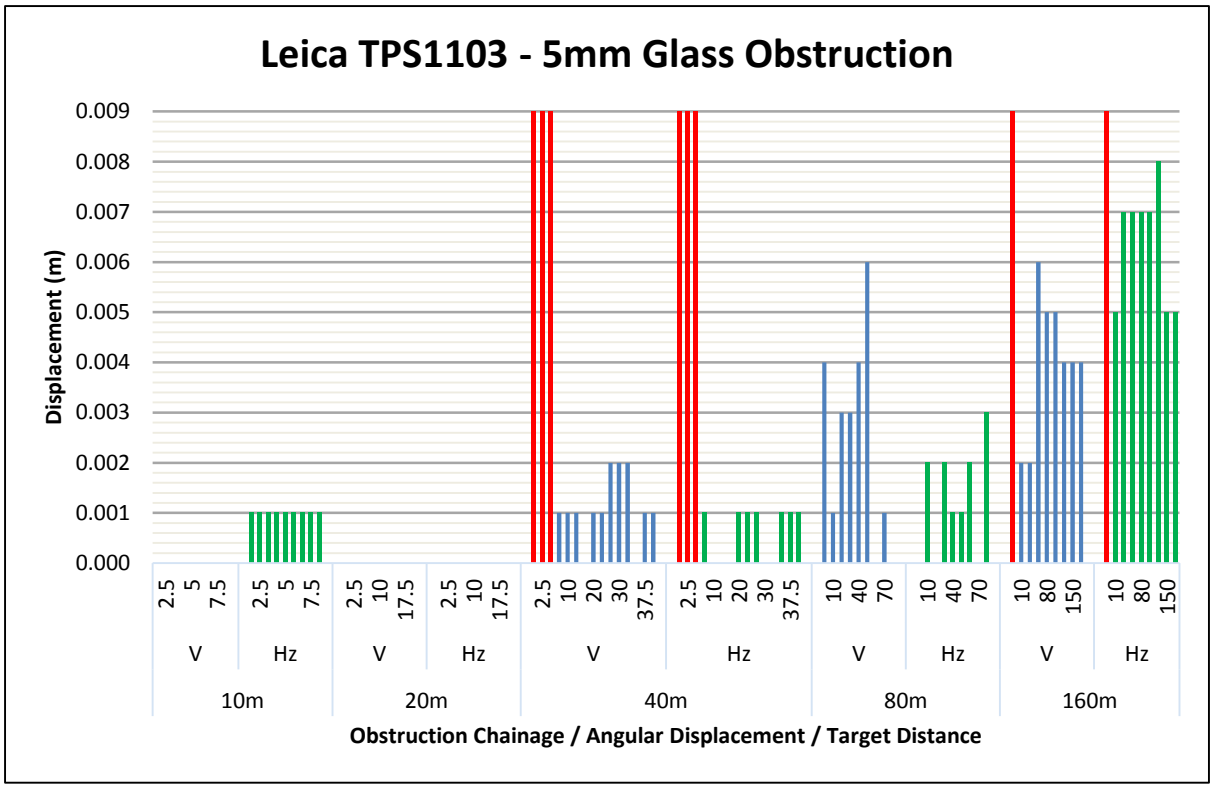

Figure 4.24: Leica TSP1103 – 5mm Glass Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 1mm	LR = 8mm
Mean V Error	SR = 0.2mm	LR = 2.5mm
Max Hz Displacement	SR = 1mm	LR = 6mm
Mean Hz Error	SR = 0.6mm	LR = 2.5mm
% Obtainable Points	SR = 24/27 (89%)	LR = 26/27 (96%)

4.4.3 Light Gauge Screen Obstruction

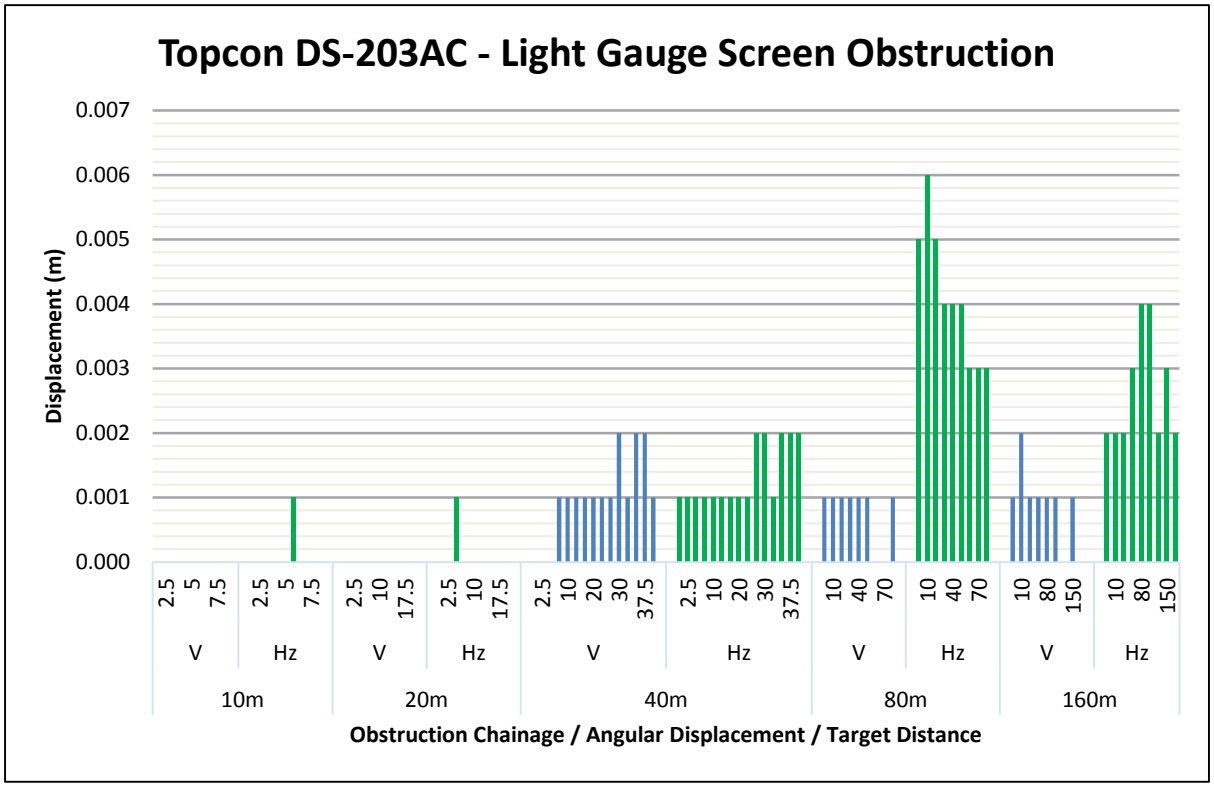

Figure 4.25: Topcon DS-203AC – Light Gauge Screen Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 2mm	LR = 2mm
Mean V Error	SR = 0.3mm	LR = 0.9mm
Max Hz Displacement	SR = 2mm	LR = 6mm
Mean Hz Error	SR = 0.5mm	LR = 2.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

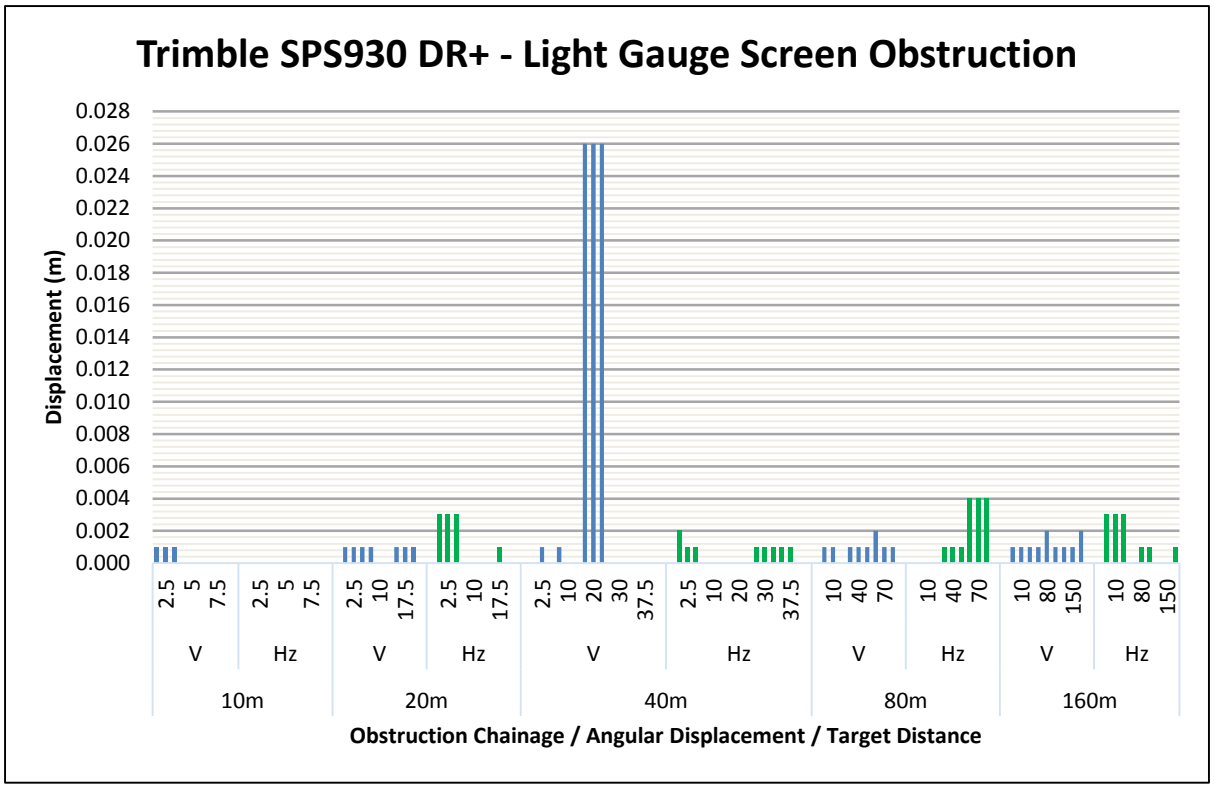

Figure 4.26: Trimble SPS930 DR+ - Light Gauge Screen Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 26mm	LR = 26mm
Mean V Error	SR = 3.3mm	LR = 3.7mm
Max Hz Displacement	SR = 3mm	LR = 4mm
Mean Hz Error	SR = 0.6mm	LR = 1.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

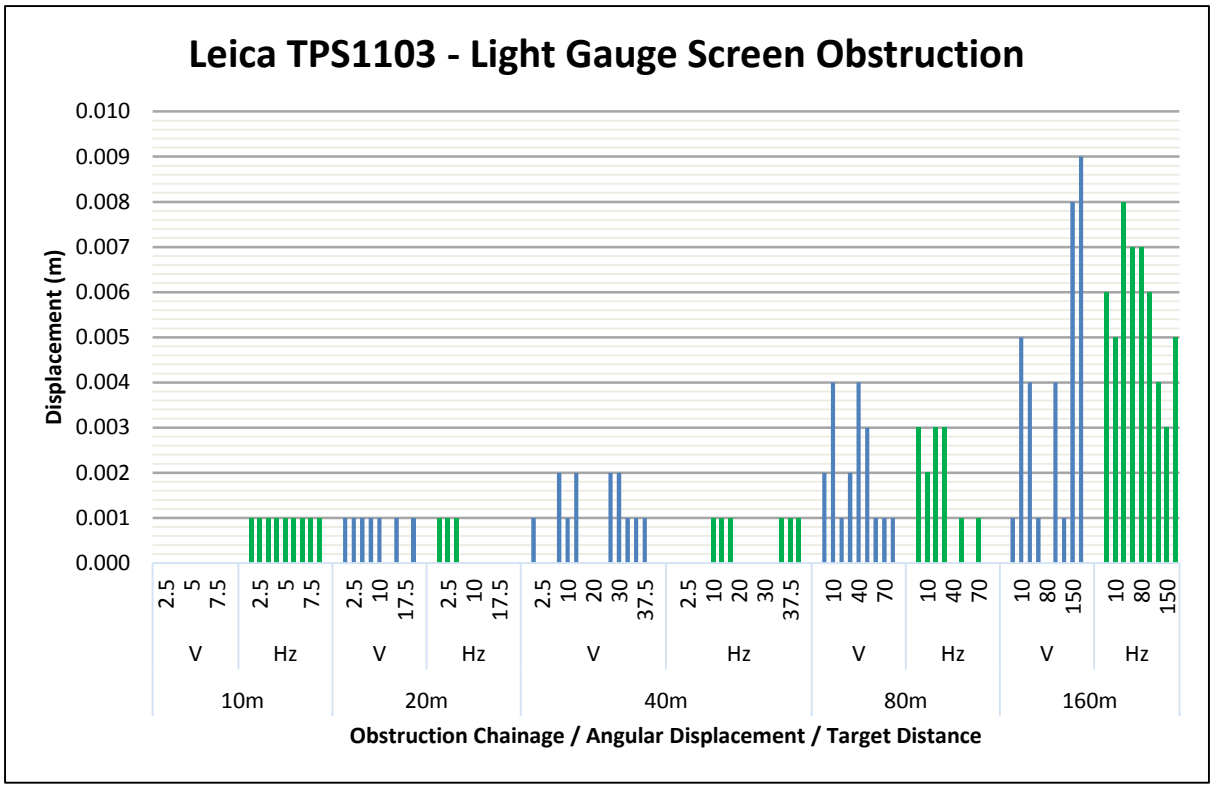

Figure 4.27: Leica TPS1103 – Light Gauge Screen Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 1mm	LR = 9mm
Mean V Error	SR = 0.4mm	LR = 2.3mm
Max Hz Displacement	SR = 1mm	LR = 8mm
Mean Hz Error	SR = 0.6mm	LR = 2.5mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

4.4.4 Light Vegetation Obstruction

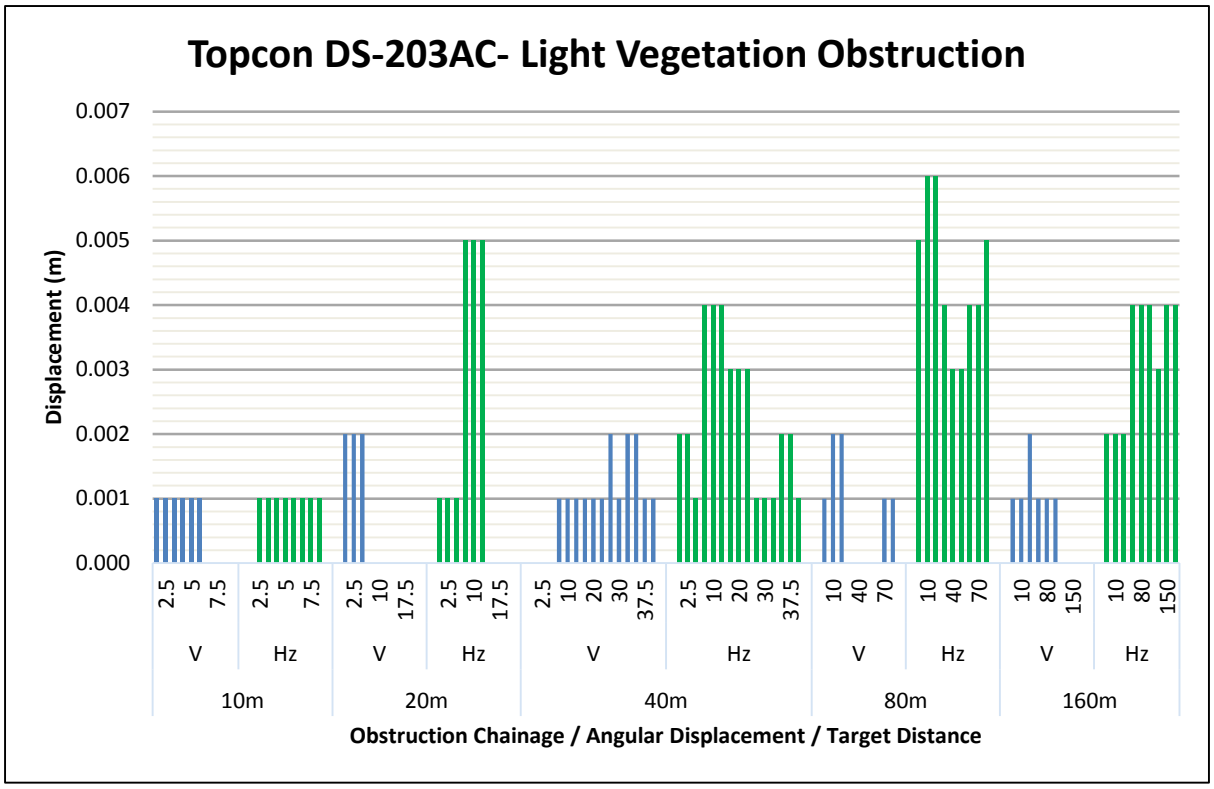

Figure 4.28: Topcon DS-203AC – Light Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 2mm	LR = 2mm
Mean V Error	SR = 0.7mm	LR = 0.9mm
Max Hz Displacement	SR = 5mm	LR = 6mm
Mean Hz Error	SR = 1.7mm	LR = 3.4mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

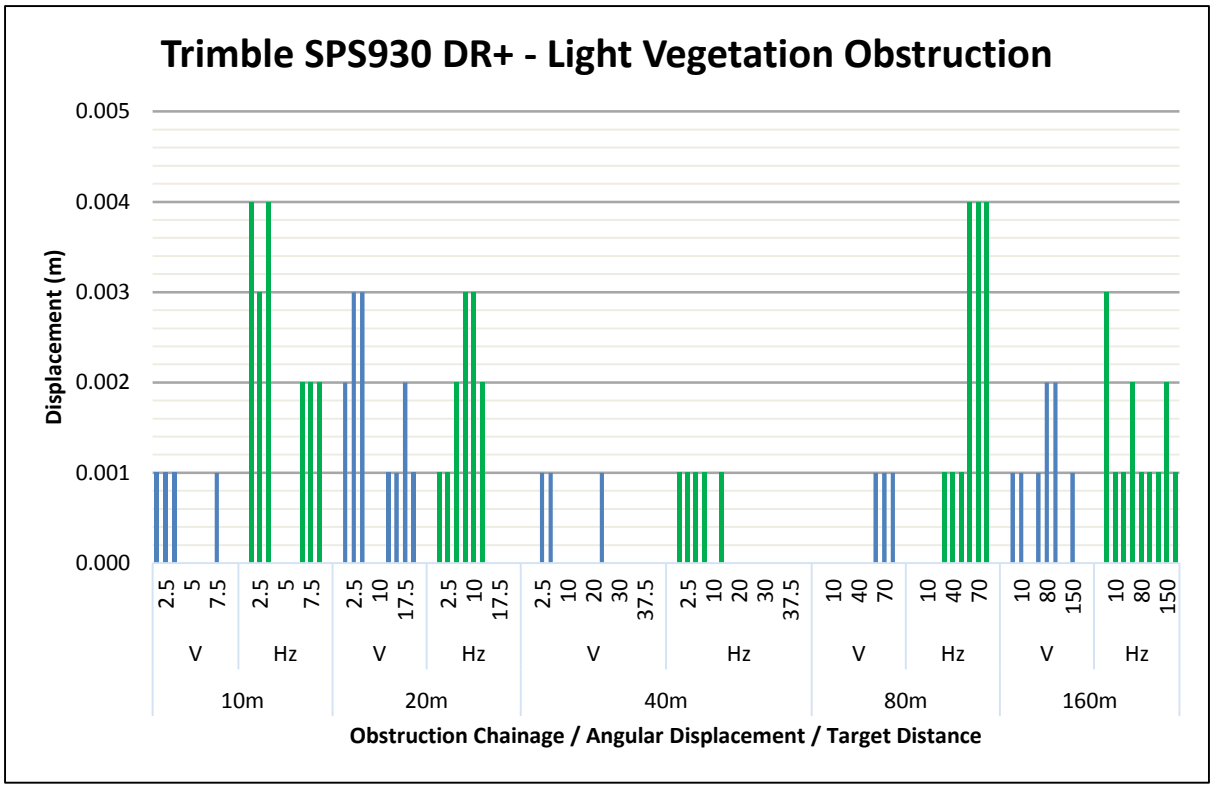

Figure 4.29: Trimble SPS930 DR+ - Light Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 3mm	LR = 2mm
Mean V Error	SR = 0.7mm	LR = 0.4mm
Max Hz Displacement	SR = 4mm	LR = 4mm
Mean Hz Error	SR = 1.2mm	LR = 1.1mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

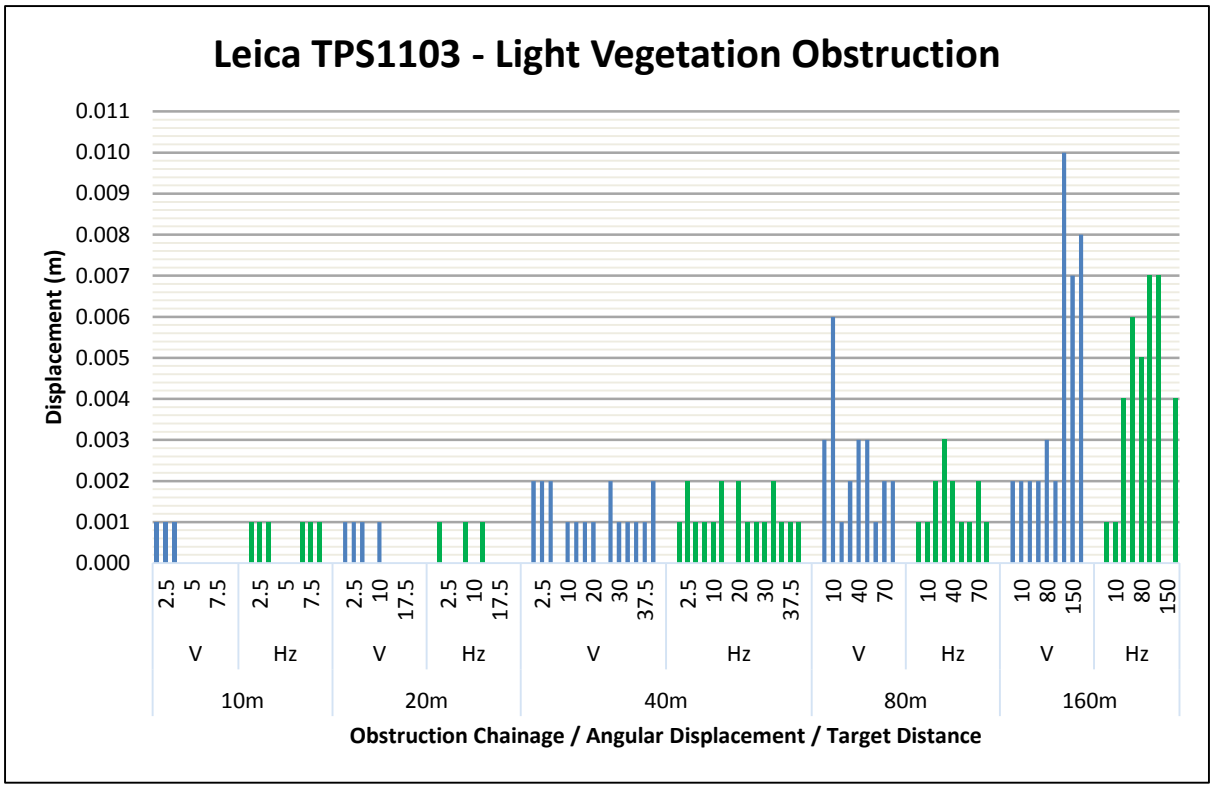

Figure 4.30: Leica TPS1103 – Light Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 2mm	LR = 10mm
Mean V Error	SR = 0.7mm	LR = 2.6mm
Max Hz Displacement	SR = 2mm	LR = 7mm
Mean Hz Error	SR = 0.7mm	LR = 2.2mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

4.4.5 Dense Vegetation Obstruction

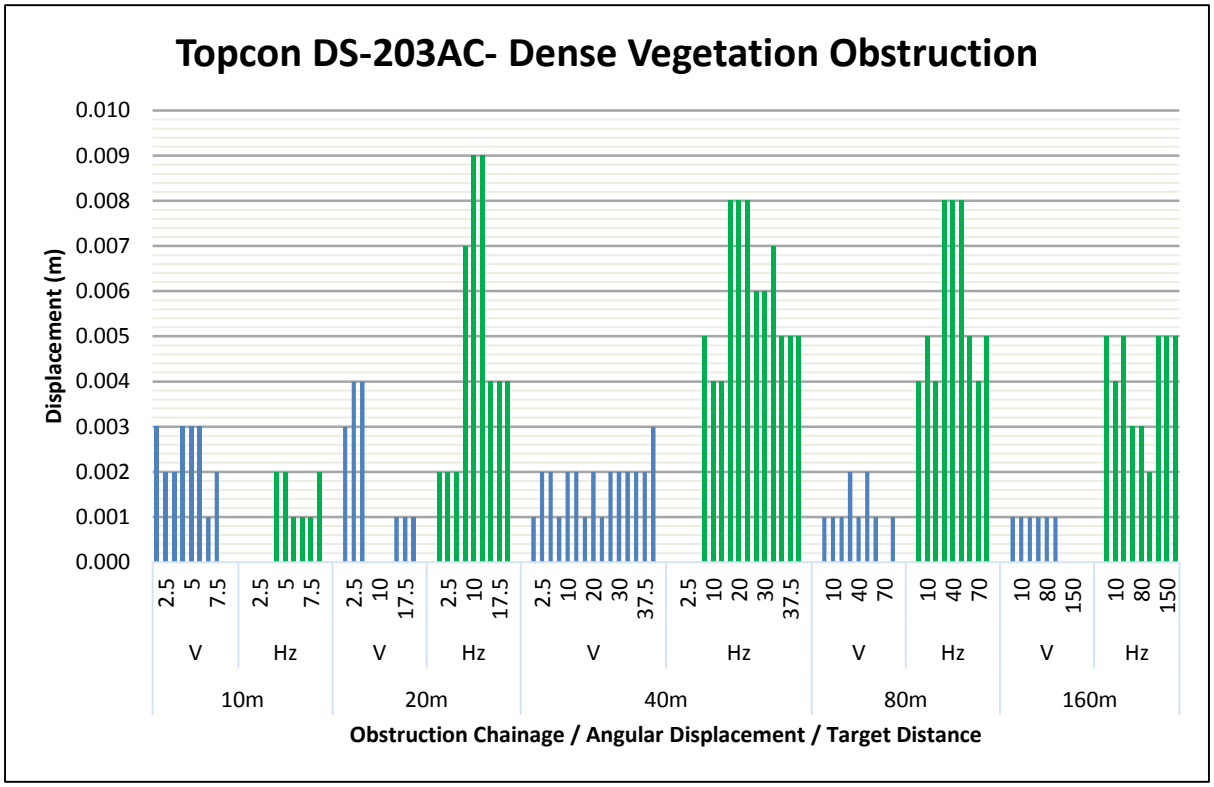

Figure 4.31: Topcon DS-203AC – Dense Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 4mm	LR = 2mm
Mean V Error	SR = 1.8mm	LR = 1.1mm
Max Hz Displacement	SR = 9mm	LR = 8mm
Mean Hz Error	SR = 3.4mm	LR = 5.3mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

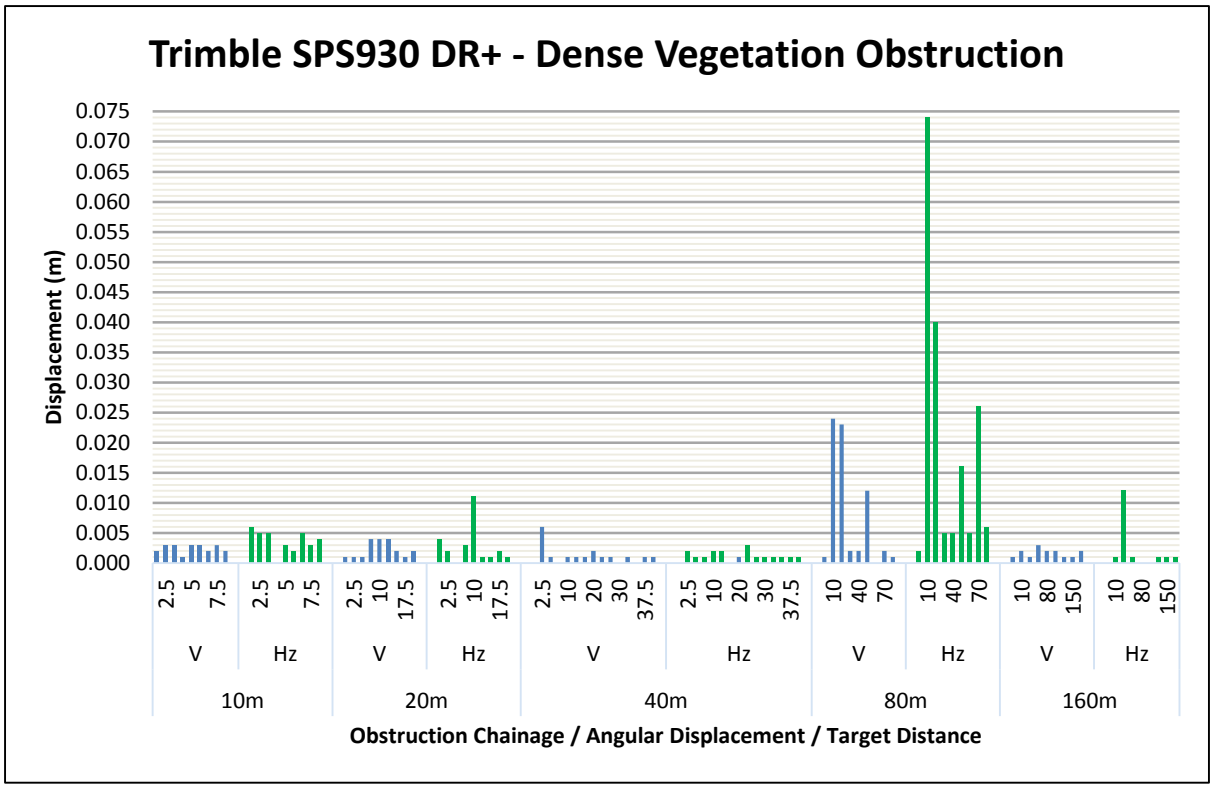

Figure 4.32: Trimble SPS930 DR+ - Dense Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 6mm	LR = 24mm
Mean V Error	SR = 2.0mm	LR = 3.3mm
Max Hz Displacement	SR = 11mm	LR = 74mm
Mean Hz Error	SR = 2.5mm	LR = 7.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

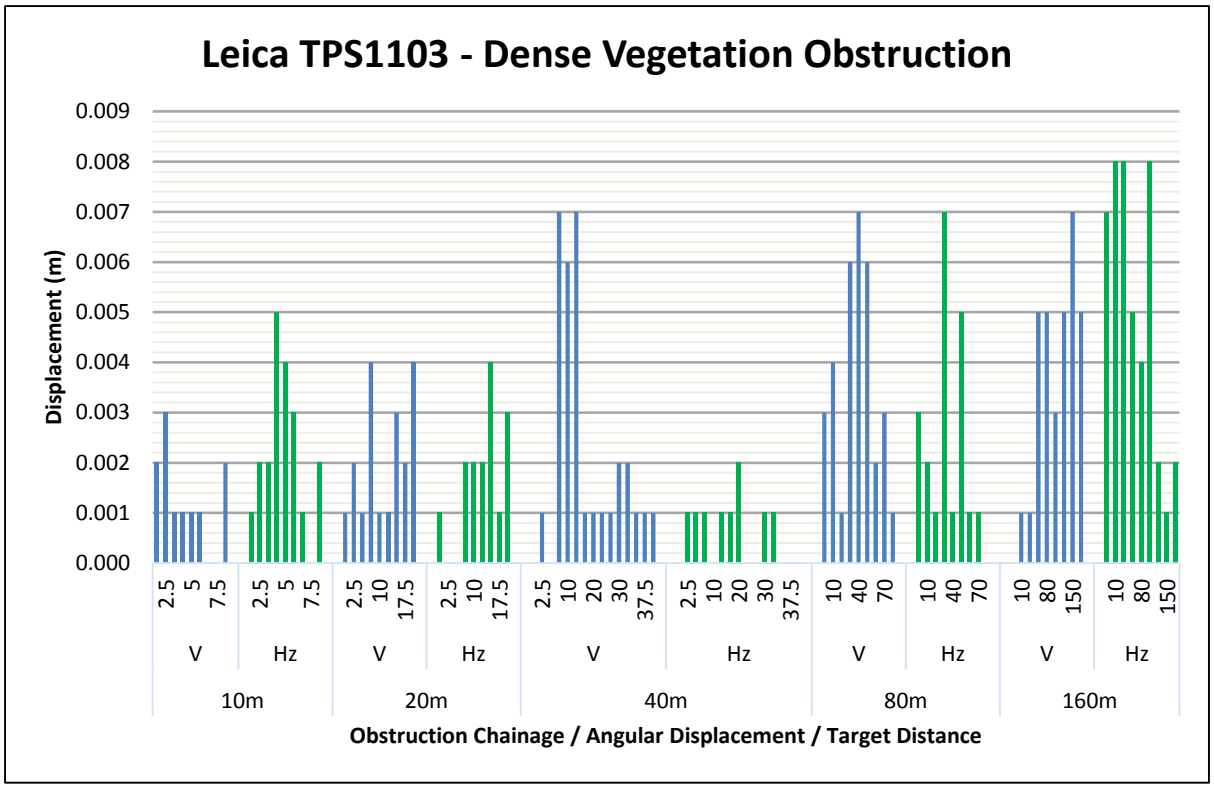

Figure 4.33: Leica TPS1103 – Dense Vegetation Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 4mm	LR = 7mm
Mean V Error	SR = 1.4mm	LR = 3.4mm
Max Hz Displacement	SR = 5mm	LR = 8mm
Mean Hz Error	SR = 1.5mm	LR = 2.7mm
% Obtainable Points	SR = 27/27 (100%)	LR = 27/27 (100%)

4.4.6 Heavy Gauge Screen Obstruction

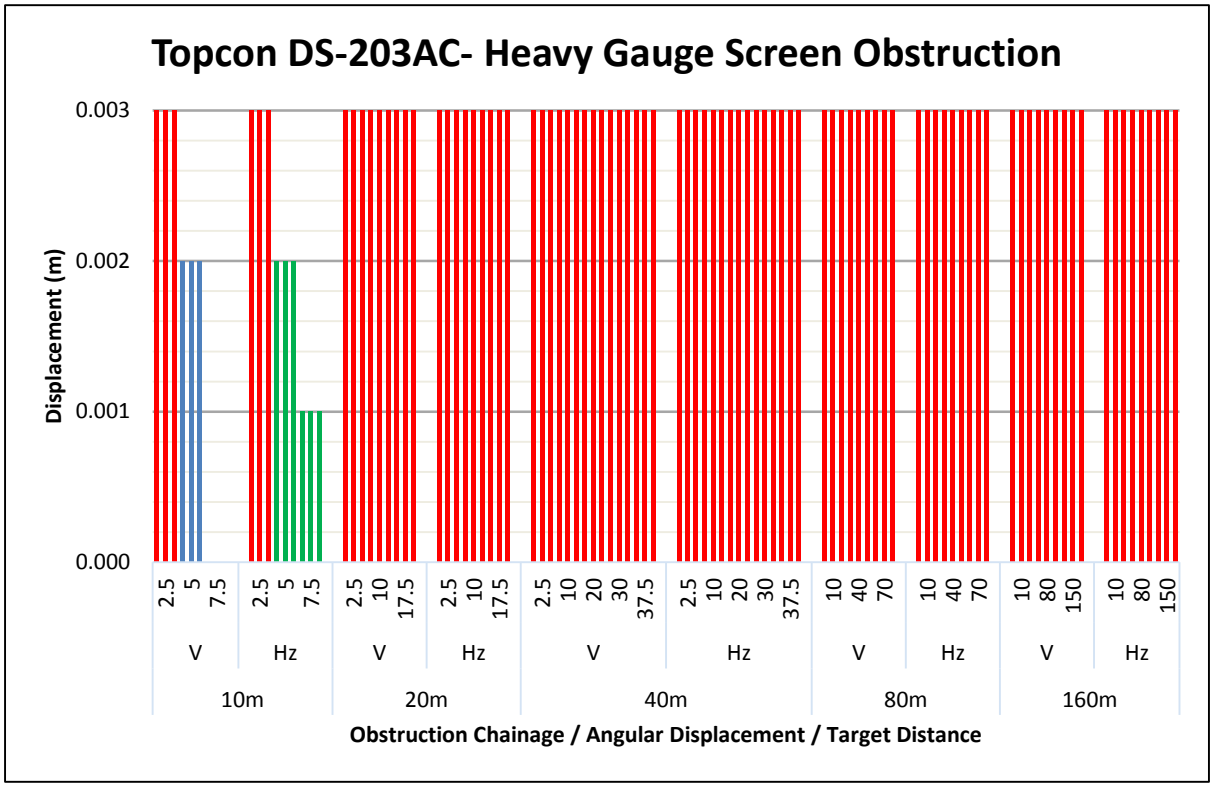

Figure 4.34: Topcon DS-203AC – Heavy Gauge Screen Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 2mm	LR = N/A
Mean V Error	SR = 1.0mm	LR = N/A
Max Hz Displacement	SR = 2mm	LR = N/A
Mean Hz Error	SR = 1.5mm	LR = N/A
% Obtainable Points	SR = 6/27 (22%)	LR = 0/27 (0%)

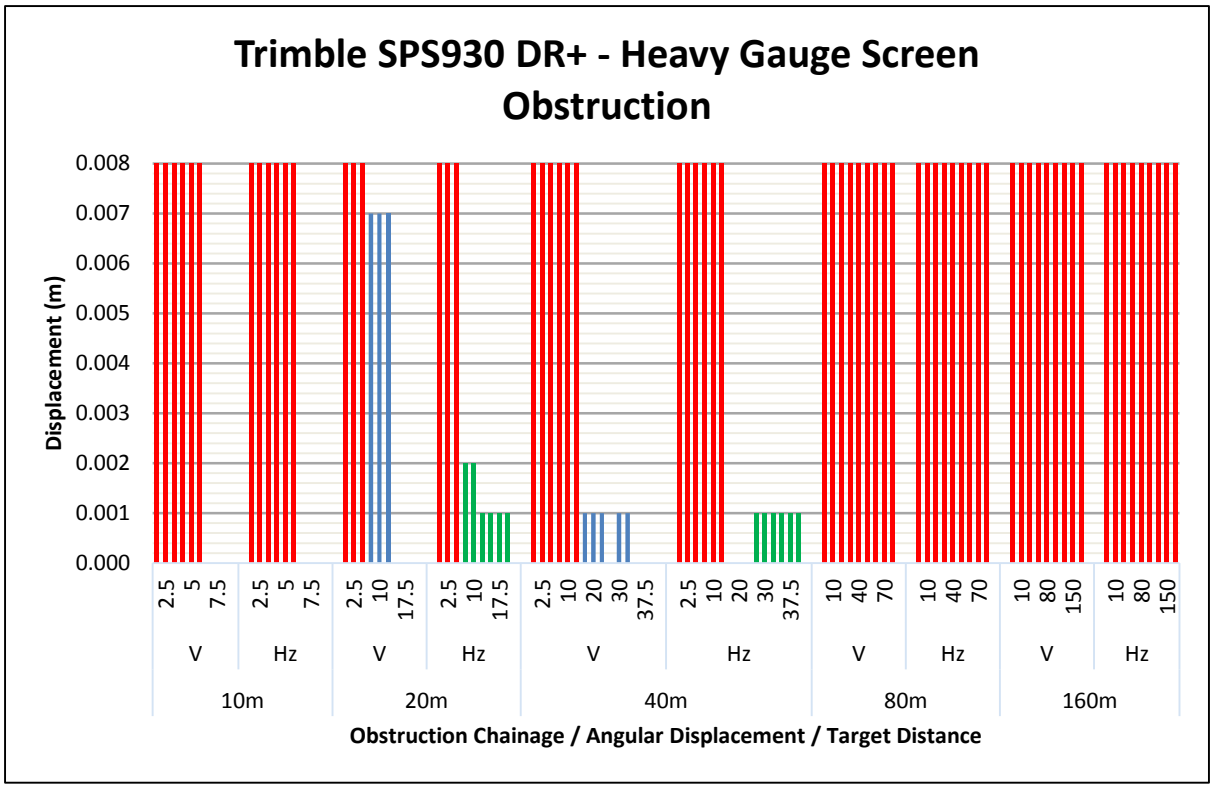

Figure 4.35: Trimble SPS930 DR+ - Heavy Gauge Screen Vertical and Horizontal Angle Error Results

Max V Displacement	SR = 7mm	LR = 1mm
Mean V Error	SR = 1.6mm	LR = 0.8mm
Max Hz Displacement	SR = 2mm	LR = 1mm
Mean Hz Error	SR = 0.7mm	LR = 0.5mm
% Obtainable Points	SR = 15/27 (56%)	LR = 6/27 (22%)

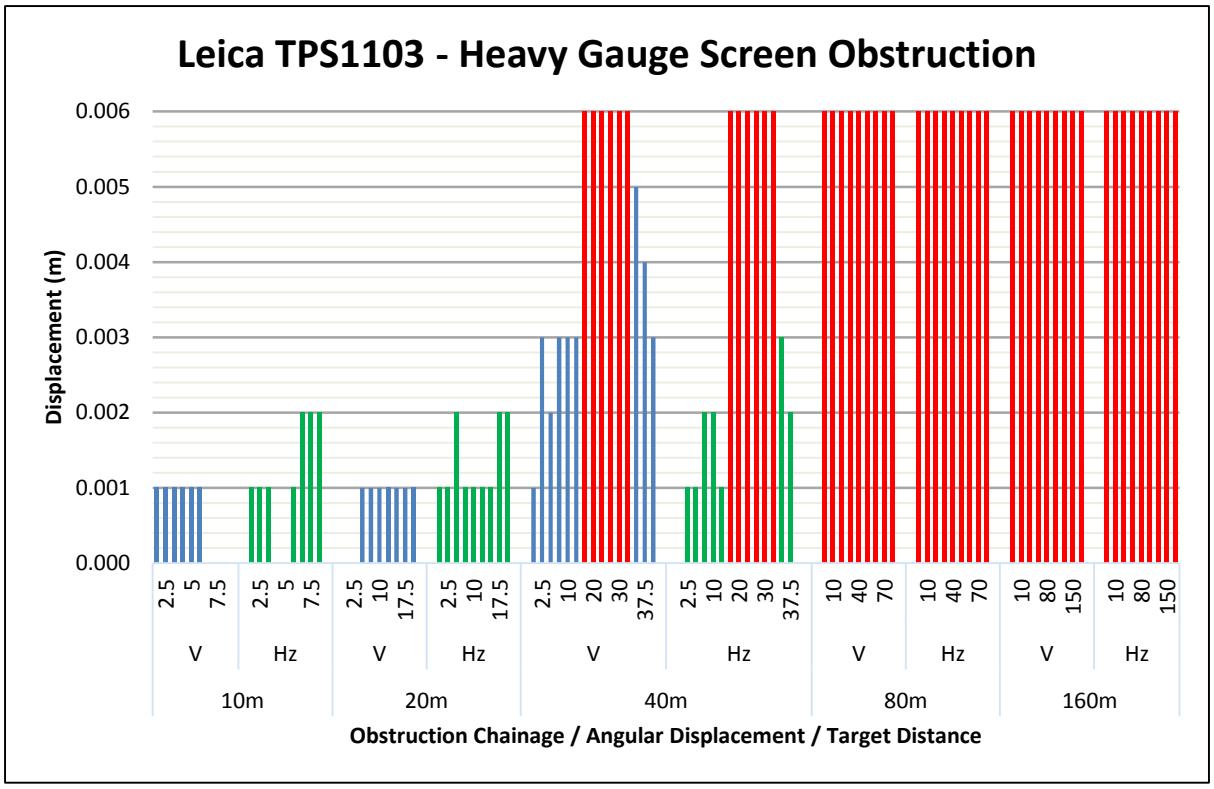

Figure 4.36: Leica TPS1103 – Heavy Gauge Screen Vertical and Horizontal Angle Results

Max V Displacement	SR = 5mm	LR = 3mm
Mean V Error	SR = 1.3mm	LR = 3.0mm
Max Hz Displacement	SR = 3mm	LR = 2mm
Mean Hz Error	SR = 1.2mm	LR = 1.7mm
% Obtainable Points	SR = 24/27 (89%)	LR = 3/27 (11%)

4.5 Conclusions

In this chapter, all of the results for the obstruction experimentation have been presented along with key statistical information. This information was displayed in terms including the short and long range mean, range and maximum displacement for each measurement method relating to horizontal distance displacement as well as the mean and maximum displacements relating to both vertical and horizontal angle error. The next chapter will discuss and analyse these results in greater detail.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

In the previous chapter, the complete set of the obstruction based testing data was graphed and displayed with statistical information that indicated the quality of the results obtained. In this chapter these graphs and statistics will be discussed in conjunction with the effect each obstruction had on the measurements, the reliability and repeatability of the data obtained, the effect the total target distance had on the results and the effect the proximity of the obstruction to the instrument had on the results. Data compared to manufacturers horizontal distance specifications in this chapter ignores the +2ppm associated with each instrument due to the fact that the longest distance measured is 160m and that over this distance, 2ppm is equivalent to 0.32mm.

5.2 5mm Tinted Glass Obstruction

All of the required testing through the 5mm tinted glass obstruction was able to be successfully completed with all three instruments using the three forms of measurement. The 5mm tinted glass obstruction was chosen as an obstruction for this project as it represented an obstruction encountered in the field, albeit rarely, occurring in the form of a window from plant such as an excavator cab window. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

5mm Tinted Glass Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	2mm-4mm	2.8mm	100%	0%	2mm-4mm	2.6mm	100%	0%
DS-203AC	ATR	2mm-3mm	2.7mm	100%	0%	2mm-3mm	2.4mm	100%	0%
	NP	2mm-4mm	2.7mm	100%	44%	1mm-5mm	2.7mm	100%	48%
Trimble	Man	1mm-3mm	2.0mm	100%	67%	2mm-5mm	3.3mm	100%	33%
SPS930 DR+	ATR	0mm-3mm	1.9mm	100%	81%	2mm-4mm	2.7mm	100%	33%
	NP	-1mm-3mm	2.1mm	100%	70%	0mm-5mm	2.5mm	100%	48%
Leica	Man	1mm-3mm	2.4mm	100%	44%	2mm-3mm	2.7mm	100%	59%
TPS1103	ATR	2mm-3mm	2.4mm	100%	59%	2mm-4mm	2.4mm	100%	59%
	NP	1mm-3mm	2.2mm	100%	100%	2mm-5mm	3.2mm	100%	74%
	Man	1mm-4mm	2.4mm			2mm-5mm	2.8mm		
Total	ATR	0mm-3mm	2.3mm			2mm-4mm	2.5mm		
	NP	-1mm-4mm	2.3mm			0mm-5mm	2.8mm		

Table 5.1: 5mm Tinted Glass Obstruction Horizontal Distance Displacement Statistical Analysis

The above table *(Table 5.1)* shows the key horizontal distance displacement statistical information for all three instruments through 5mm tinted glass. What the above table shows is that the displacement errors measured were all very consistent, regardless of the instrument being used or the type of measurement (Manual Prism, ATR, Manual Non-Prism). The ranges and means displayed in the table are all very similar, indicating that the total distance being measured and the proximity of the obstruction to the instrument had very minimal effect on the recorded distance.

The mean value of all of the mean values mentioned in the above table is 2.5mm. What this figure shows is that the light signal emitted from the instrument is disrupted through the obstruction on its way to the target and then again through the obstruction on its return to the instrument. Since light travels slower through a medium such as glass, the signal emitted from the instrument will take longer to return to the instrument thus giving the instrument the false impression that the target is further away than it actually is.

Since all three instruments had a 100% success rate with all forms of measurement reading through this medium, and the ranges and means were all similar, there is a very precise level of repeatability through 5mm tinted glass. Due to the properties of the glass that forces the instrument to miscalculate the distance being measured, the percentage of recorded shots that fell within the manufactures specifications for distance measurement was approximately 45% (average of all percentages within tolerance). Since the above information has confirmed that the 5mm tinted glass consistently results in a 2.5mm (approx.) error in horizontal displacement, every time a measurement is recorded through this medium, a 2.5mm offset should be applied to correct for the over calculation of the distance being observed. If this offset is applied, the percentage of recorded shots that fall within the manufactures specifications for distance measurement will be significantly improved to a level of just under 100%.

Table 5.2 shows the key statistical information for the vertical and horizontal angular displacement through 5mm tinted glass.

5mm Tinted Glass Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon DS-203AC	Vertical	1mm	0.4mm	4mm	1.9mm
	Horizontal	2mm	0.4mm	6mm	2.4mm
Trimble SPS930 DR+	Vertical	3mm	0.7mm	8mm	3.0mm
	Horizontal	1mm	0.3mm	4mm	1.1mm
Leica TPS1103	Vertical	2mm	0.9mm	12mm	2.7mm
	Horizontal	2mm	0.6mm	9mm	3.0mm
Total	Vertical	3mm	0.7mm	12mm	2.5mm
	Horizontal	2mm	0.4mm	9mm	2.2mm

Table 5.2: 5mm Tinted Glass Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

The information in the table above shows that reading through 5mm tinted glass over short distances has no real impact on either the vertical or horizontal angular accuracy as the largest errors recorded were a 3mm vertical displacement and a 2mm horizontal displacement. However, when the 5mm glass is being read through over longer target distances, greater error is introduced. The largest deflections over the long range distances were a vertical displacement of 12mm and a horizontal displacement of 9mm. Figures 4.19-4.21 concur with this assessment and indicate that the largest angular errors occur over target distances of 80m and 160m and in particular when the obstruction is closest to the instrument.

5.3 5mm Glass Obstruction

All of the required obstruction based testing was completed through the 5mm glass obstruction with all three instruments using all three measurement forms. The 5mm glass obstruction was chosen for this project as it represented an obstruction such as a building window that may be occasionally encountered in the field. This obstruction also allowed for a comparison between regular and tinted glass. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

5mm Glass Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	2mm-3mm	2.0mm	100%	0%	1mm-3mm	1.9mm	100%	15%
DS-203AC	ATR	2mm-2mm	2.0mm	100%	0%	1mm-3mm	2.0mm	100%	26%
	NP	1mm-3mm	1.8mm	100%	86%	1mm-5mm	2.0mm	100%	86%
Trimble	Man	0mm-4mm	1.4mm	100%	89%	1mm-6mm	3.1mm	100%	22%
SPS930 DR+	ATR	0mm-3mm	1.3mm	100%	89%	1mm-7mm	2.8mm	100%	56%
	NP	1mm-4mm	1.9mm	100%	81%	-3mm-6mm	2.5mm	100%	56%
Leica	Man	1mm-3mm	2.1mm	100%	78%	2mm-3mm	2.1mm	100%	89%
TPS1103	ATR	1mm-3mm	2.2mm	89%	71%	-2mm-3mm	2.0mm	96%	96%
	NP	0mm-2mm	1.4mm	100%	100%	-17mm-8mm	4.5mm	89%	71%
	Man	0mm-4mm	1.8mm			1mm-6mm	2.4mm		
Total	ATR	0mm-3mm	1.8mm			-2mm-7mm	2.3mm		
	NP	0mm-4mm	1.7mm			-17mm-8mm	3mm		

Table 5.3: 5mm Glass Obstruction Horizontal Distance Displacement Statistical Analysis

What the above table shows is that like the results for the 5mm tinted glass obstruction, the displacement errors measured were all very consistent, regardless of the instrument being used or the type of measurement (Manual Prism, ATR, Manual Non-Prism). Over the short range distances, both the ranges and means are all very consistent with each other. This applies also to the long range set of data however the long range set of data had some horizontal distance displacements that measured well outside the mean. The Leica TPS1103 recorded three measurements where the displacement was greater than 10mm and in two of those cases the displacement reach 17mm. The Leica instrument also recorded four distances to the glass obstruction instead of the target in ATR mode. This occurred in three out of three measurements at 40m with the obstruction 2.5m from the instrument and at 160m with the obstruction at 10m from the instrument. This is most likely due to the higher reflectivity of the clear glass in conjunction with excessive sunlight, which caused the instrument to lock on to and measure to the obstruction rather than the prism.

The Leica TPS1103 instrument also failed to record an acceptable non-prism measurement on three out of three attempts with a target distance of 160m and an obstruction distance of 10m from the instrument. The instrument recorded a distance of approximately 66m on all three shots, which is 56m behind the obstruction and 94m in front of the target. It can be noted that all of the failed measurements through 5mm glass occurred when the obstruction was closest to the instrument.

The mean value of the mean values in the above table is 2.2mm. This number indicates that the light beam from the instrument is generally delayed less through the clear glass than the tinted glass (2.5mm). Since all three instruments had a near 100% success rate with all forms of measurement reading through this medium, and the ranges and means were all similar, with the exception of a few measurements, there is a very precise level of repeatability through 5mm tinted glass. However, although the instrument signal is delayed less through the clear glass, there exists a higher possibility of large errors being recorded than those of the 5mm tinted glass obstruction due to the higher reflectivity of the clear glass.

Due to the properties of the glass that forces the instrument to miscalculate the distance being measured, the percentage of recorded shots that fell within the manufactures specifications for distance measurement was approximately 62% (average of all percentages within tolerance). Since the above information has confirmed that the 5mm tinted glass consistently results in a 2.2mm (approx.) error in horizontal displacement, every time a measurement is recorded through this medium, a 2.2mm offset should be applied to correct for the over calculation of the distance being observed. If this offset is applied, the percentage of recorded shots that fall within the manufactures specifications for distance measurement will be significantly improved to a level of just under 100%. The results from the 5mm glass obstruction testing also indicate that generally, the total distance being read as well as the proximity of the obstruction to the instrument has little effect on the results, although extreme conditions such as sun glare on the glass may cause false measurements in particular when the obstruction is closest to the instrument.

Table 5.4 shows the key statistical information for the vertical and horizontal angular displacement through 5mm glass.

5mm Glass Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon	Vertical	1mm	0.4mm	3mm	1.0mm
DS-203AC	Horizontal	2mm	0.7mm	6mm	2.5mm
Trimble	Vertical	1mm	0.3mm	2mm	0.5mm
SPS930 DR+	Horizontal	1mm	0.3mm	4mm	1.0mm
Leica	Vertical	1mm	0.2mm	8mm	2.5mm
TPS1103	Horizontal	1mm	0.6mm	6mm	2.5mm
Total	Vertical	1mm	0.3mm	8mm	1.3mm
	Horizontal	2mm	0.5mm	6mm	2.0mm

Table 5.4: 5mm Glass Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

The information in the table above shows that reading through 5mm glass over short distances has no real impact on either the vertical or horizontal angular accuracy as the largest errors recorded were a 1mm vertical displacement and a 2mm horizontal displacement. However, when the 5mm glass is being read through over longer target distances, greater error is introduced. The largest deflections over the long range distances were a vertical displacement of 8mm and a horizontal displacement of 6mm. Figures 4.22-4.24 concur with this assessment and indicate that the larges angular errors occur over target distances of 80m and 160m and in particular when the obstruction is closest to the instrument.

5.4 Light Gauge Screen Obstruction

All of the required testing was successfully completed through the light gauge screen obstruction with all three instruments using all three measurement methods. This obstruction template was chosen for testing as although it was a piece of fly screen, it also represented a very light builder's fence, which is an obstruction that can be regularly encountered on a construction site. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

Light Gauge Screen Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	0mm-1mm	0.1mm	100%	100%	-1mm-1mm	0.3mm	100%	100%
DS-203AC	ATR	0mm-0mm	0.0mm	100%	100%	-1mm-1mm	0.4mm	100%	100%
	NP	-1mm-1mm	0.4mm	100%	100%	-2mm-1mm	0.7mm	100%	100%
Trimble	Man	-2mm-1mm	0.8mm	100%	100%	-1mm-2mm	0.9mm	100%	100%
SPS930 DR+	ATR	-2mm-1mm	1.1mm	100%	100%	-1mm-3mm	1.0mm	100%	96%
	NP	-2mm-2mm	0.8mm	100%	100%	-2mm-2mm	0.7mm	100%	100%
Leica	Man	-1mm-1mm	0.3mm	100%	100%	-1mm-1mm	0.1mm	100%	100%
TPS1103	ATR	-1mm-1mm	0.3mm	100%	100%	-1mm-1mm	0.1mm	100%	100%
	NP	-2mm-0mm	0.7mm	100%	100%	-3mm-3mm	0.9mm	100%	100%
	Man	-2mm-1mm	0.4mm			-1mm-2mm	0.4mm		
Total	ATR	-2mm-1mm	0.5mm			-1mm-3mm	0.5mm		
	NP	-2mm-2mm	0.6mm			-3mm-3mm	0.8mm		

Table 5.5: Light Gauge Screen Obstruction Horizontal Distance Displacement Statistical Analysis

From the information presented in the above table, it is clear that the light gauge screen obstruction had very little effect on the horizontal distances measured. The error range from all three instruments using all three measurement methods was 6mm (-3mm-3mm). This range, the fact that the means ranged from 0mm to 1.1mm and that 100% of attempted shots were recorded successfully and almost 100% of those were within the manufactures specifications for horizontal distance measurement indicates that this obstruction had almost no effect on the ability to repeatedly record reliable horizontal distances. Hence the length of the total distance being measured and the proximity of the obstruction to the instrument also have no effect on recorded distances.

Table 5.6 shows the key statistical information for the vertical and horizontal angular displacement through light gauge screen.

Light Gauge Screen Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon	Vertical	2mm	0.3mm	2mm	0.9mm
DS-203AC	Horizontal	2mm	0.5mm	6mm	2.7mm
Trimble	Vertical	26mm	3.3mm	26mm	3.7mm
SPS930 DR+	Horizontal	3mm	0.6mm	4mm	1.1mm
Leica	Vertical	1mm	0.4mm	9mm	2.3mm
TPS1103	Horizontal	1mm	0.6mm	8mm	2.5mm
Total	Vertical	26mm	1.4mm	26mm	2.3mm
	Horizontal	3mm	0.6mm	8mm	2.1mm

Table 5.6: Light Gauge Screen Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

The information in table 5.6 shows that reading through light gauge screen over short distances has no real impact on either the vertical or horizontal angular accuracy as the largest errors recorded were a 2mm vertical displacement and a 3mm horizontal displacement. The one exception to this is the measurements recorded with the Trimble SPS930 DR+ over a target distance of 40m with an obstruction distance of 20m. During these three shots, the instrument recorded a vertical displacement of 26mm and a horizontal displacement of 0mm. This reading was considered a random error as it in no way represents the trends that occurred with all three instruments.

When the instruments read through the obstruction over longer distances, particularly over target distances of 80m and 160m, the error in both the horizontal and vertical displacements became larger. The largest deflections over the long range distances were a vertical displacement of 9mm (ignoring the 26mm displacement recorded by the Trimble SPS930 DR+) and a horizontal displacement of 8mm. Figures 4.25-4.27 concur with this assessment that although the light vegetation obstruction had little impact over the short range target distances, when the target distance was increased, the error was also increased.

5.5 Light Vegetation Obstruction

The required obstruction testing was completed successfully through the light vegetation obstruction with all three instruments using the three measurement methods. This obstruction was chosen as it represents one of the most common obstructions regularly encountered in the field. The light vegetation obstruction represents tall dead grass that will often be encountered when surveying a rural block. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

Light Vegetation Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	0mm-1mm	0.1mm	100%	100%	-1mm-1mm	0.5mm	100%	100%
DS-203AC	ATR	-1mm-0mm	0.2mm	100%	100%	-1mm-1mm	0.6mm	100%	100%
	NP	-1mm-2mm	0.6mm	100%	100%	-1mm-5mm	1.1mm	100%	89%
Trimble	Man	-2mm-2mm	0.9mm	100%	100%	-1mm-2m	0.7mm	100%	100%
SPS930 DR+	ATR	-2mm-1mm	1.2mm	100%	100%	-1mm-2mm	0.9mm	100%	100%
	NP	-2mm-1mm	0.7mm	100%	100%	-2mm-2mm	0.7mm	100%	100%
Leica	Man	-1mm-1mm	0.3mm	100%	100%	-1mm-1mm	0.1mm	100%	100%
TPS1103	ATR	-1mm-1mm	0.3mm	100%	100%	-1mm-1mm	0.2mm	100%	100%
	NP	-1mm-2mm	0.8mm	100%	100%	-36mm-5mm	5.0mm	100%	78%
	Man	-2mm-2mm	0.4mm			-1mm-2mm	0.4mm		
Total	ATR	-2mm-1mm	0.6mm			-1mm-2mm	0.6mm		
	NP	-2mm-2mm	0.7mm			-36mm-5mm	2.3mm		

Table 5.7: Light Vegetation Obstruction Horizontal Distance Displacement Statistical Analysis

Both vegetation obstructions were more difficult to determine patterns or trends from the data due to the fact that they were not a constant medium to read through like the glass and screen based obstructions. Although every effort was taken to ensure each instrument read through the same part of the vegetation obstruction, the trends that occurred in the data were somewhat random rather than an easily identifiable pattern.

From the results of the above table, it can be deduced that over a short range, the light vegetation has minimal effect on the horizontal distance displacement. This is evident due to the range of errors being limited to 4mm (-2mm-2mm) and the fact that 100% of short range observations were obtained and 100% of the observations were within the manufacturers horizontal distance specifications. From this information it can be concluded that over a short range, the total distance being measured as well as the proximity of the light vegetation obstruction to the instrument has little effect on the recorded measurement.

The light vegetation also had a very limited effect on the series of long observations. The greatest source of error in these reading was again when the obstruction was closest to the instrument. 100% of the observations attempted were achieved and of this, almost 100% were within tolerance. The main exception to this was the Leica TPS1103 total station reading at a target distance of 160m in non-prism mode with an obstruction distance of 10m. During this setup, the instrument read three readings containing errors of 33mm, 35mm and 36mm respectively. Although the light vegetation had very limited effect on the long range results recorded, some of the results obtained were outside the instruments manufacturer's specifications for horizontal distance measurement and some of the results contained large horizontal distance errors.

Table 5.8 shows the key statistical information for the vertical and horizontal angular displacement through light vegetation.

Light Vegetation Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon DS-203AC	Vertical	2mm	0.7mm	2mm	0.9mm
	Horizontal	5mm	1.7mm	6mm	3.4mm
Trimble SPS930 DR+	Vertical	3mm	0.7mm	2mm	0.4mm
	Horizontal	4mm	1.2mm	4mm	1.1mm
Leica TPS1103	Vertical	2mm	0.7mm	10mm	2.6mm
	Horizontal	2mm	0.7mm	7mm	2.2mm
Total	Vertical	3mm	0.7mm	10mm	3.9mm
	Horizontal	5mm	1.2mm	7mm	2.2mm

Table 5.8: Light Vegetation Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

From the data presented in table 5.8, it can be deduced that all three instruments had some difficulties reading through the light vegetation obstruction. The fact that the horizontal angle displacement is generally greater than the vertical angle displacement illustrates that the instruments had trouble reading directly through the obstruction and opted to try and read either side of the obstruction. The lower vertical residuals (with the exception of the Leica TPS1103 residual of 10mm) indicates that vertical angles recorded by the instruments were not generally affected by the light vegetation obstruction. Figures 4.28-4.30 also indicate that there was no real pattern to the vertical and horizontal errors recorded and that the target distance as well as the proximity of the obstruction had no real impact on the magnitude of the errors, and that the errors themselves seemed to appear randomly due to the nature of the obstruction.

5.6 Dense Vegetation Obstruction

The dense vegetation obstruction was chosen as an obstruction for the testing as it represents a higher degree of difficulty to read through than that of light vegetation. This obstruction was read through with all three instruments using all three measurement methods and it is representative of a small branch of leaves which can usually be encountered whilst undertaking residential surveys. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

Dense Vegetation Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	-1mm-0mm	0.1mm	100%	100%	-1mm-2mm	0.5mm	100%	96%
DS-203AC	ATR	-1mm-1mm	0.2mm	100%	100%	-1mm-1mm	0.4mm	100%	100%
	NP	-1mm-3mm	1.2mm	100%	93%	0mm-10mm	2.5mm	100%	70%
Trimble	Man	-5mm-2mm	1.6mm	100%	96%	-2mm-4mm	1.6mm	100%	81%
SPS930 DR+	ATR	-6mm-2mm	1.0mm	100%	96%	-2mm-4mm	1.6mm	100%	81%
	NP	-2mm-2mm	1.0mm	100%	100%	-27mm-1mm	1.9mm	89%	92%
Leica	Man	-1mm-1mm	0.4mm	100%	100%	-2mm-24mm	1.2mm	100%	96%
TPS1103	ATR	-1mm-2mm	0.5mm	100%	100%	-1mm-1mm	0.2mm	100%	100%
	NP	-3mm-11mm	4.7mm	100%	37%	0mm-38mm	6.4mm	89%	71%
	Man	-5mm-2mm	0.7mm			-2mm-24mm	1.3mm		
Total	ATR	-6mm-2mm	0.6mm			-2mm-4mm	0.7mm		
	NP	-3mm-11mm	2.3mm			-27mm-38mm	3.6mm		

Table 5.9: Dense Vegetation Obstruction Horizontal Distance Displacement Statistical Analysis

The data shown in table 5.9 indicates that unlike the light vegetation obstruction, the measurements taken through the dense vegetation obstruction were riddled with horizontal distance displacement errors well outside of manufactures specifications. In all three forms of measurement over the short range target distances, there was a substantial range of error when compared with all other obstructions previously discussed. Although 100% of all short range shots that were attempted were recorded and 91% of these fell within the instruments respective horizontal distance specifications, there were numerous large errors recorded that ranged from -6mm to 11mm.

In the long range dataset, the errors noted were greatly exacerbated due to the increased target distance, when compared with the short range errors recorded. Over the longer distance, all three instruments were noticeable less efficient at recording accurate measurement. Although 98% of attempted measurements were recorded, only 87% were recorded within tolerance. Again the non-prism mode of measurement was the one that was impacted the most by this obstruction. Despite 87% of the measurements being recorded within the instruments respective manufacturer specifications for horizontal distance measurement, the range of the error that existed outside of these tolerances was substantial. The range of horizontal distance displacement error over the long range target distances was -27mm to 38mm. The errors at the extremes of this range are well beyond what would generally be acceptable for a survey.

Although the errors generally became worse as the target distance increased, the most affected measurement method was the non-prism measurement method which recorded large spikes in error as the target distance increased. Both forms of prism based measurement avoided this trend an instead contained only a few random spikes in error over both short range and long range target distances.

Table 5.10 shows the key statistical information for the vertical and horizontal angular displacement through light vegetation.

Dense Vegetation Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon DS-203AC	Vertical	4mm	1.8mm	2mm	1.1mm
	Horizontal	9mm	3.4mm	8mm	5.3mm
Trimble SPS930 DR+	Vertical	6mm	2.0mm	24mm	3.3mm
	Horizontal	11mm	2.5mm	74mm	7.7mm
Leica TPS1103	Vertical	4mm	1.4mm	7mm	3.4mm
	Horizontal	5mm	1.5mm	8mm	2.7mm
Total	Vertical	6mm	1.7mm	24mm	2.6mm
	Horizontal	11mm	2.5mm	74mm	5.2mm

Table 5.10: Dense Vegetation Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

The data in table 5.10 shows that in comparison to the light vegetation obstruction, the dense vegetation obstruction had a significantly greater effect on the vertical and horizontal angle displacements of the ATR measurements. In the short range data set, both the horizontal and vertical displacement errors were considerably larger than those of the light vegetation as the size and density of the dense vegetation forced the instruments to read around the obstruction rather than through it.

The results of the long range data set further indicate that the dense vegetation had a significant impact on the horizontal and vertical angle errors introduced into the recorded observations. The means relating to the long range data are substantially larger than those of the short range data. The maximum displacements recorded for the vertical angle error and the horizontal angle error are 24mm and 74mm respectively. These displacements occurred over a target distance of 80m with the obstruction placed at the closest chainage to the instrument. Although these maximum displacements are exaggerated compared to the mean displacements, they represent the potential of recording observations with significant error through dense vegetation.

5.7 Heavy Gauge Screen Obstruction

The obstruction testing was completed successfully through the heavy gauge screen with all three instruments using all three measurement methods. This obstruction was selected as it is representative of a heavy builders screen usually encountered on construction sites. This obstruction was also able to be compared to the light gauge screen, however this obstruction was a significantly harder medium to read through. This section, will discuss the results obtained in the areas of horizontal distance displacement and then vertical and horizontal angular displacement (ATR).

Heavy Gauge Screen Obstruction

		Short Range				Long Range			
		Range	Mean	% Obt	% Tol	Range	Mean	% Obt	% Tol
Topcon	Man	0mm-0mm	0.0mm	67%	100%	0mm-3mm	0.9mm	33%	67%
DS-203AC	ATR	0mm-0mm	0.0mm	22%	100%	N/A	N/A	0%	0%
	NP	-1mm-3mm	1.0mm	100%	93%	-6mm-8mm	1.9mm	89%	75%
Trimble	Man	-3mm-1mm	1.1mm	100%	96%	-1mm-2mm	0.9mm	85%	100%
SPS930 DR+	ATR	-3mm-1mm	1.1mm	56%	93%	0mm-2mm	0.5mm	22%	100%
	NP	-2mm-1mm	0.9mm	66%	100%	N/A	N/A	0%	0%
Leica	Man	-2mm-1mm	0.8mm	100%	100%	-2mm-10mm	2.9mm	56%	73%
TPS1103	ATR	-1mm-1mm	0.8mm	89%	100%	-1mm-0mm	0.7mm	11%	100%
	NP	-5mm-7mm	2.7mm	100%	37%	-43mm-67mm	16.4mm	89%	36%
	Man	-3mm-1mm	0.6mm			-2mm-10mm	1.6mm		
Total	ATR	-3mm-1mm	0.6mm			-1mm-2mm	0.6mm		
	NP	-5mm-7mm	1.5mm			-43mm-67mm	9.1mm		

Table 5.11: Heavy Gauge Screen Obstruction Horizontal Distance Displacement Statistical Analysis

The heavy gauge screen proved to be the most difficult obstruction medium to read through due to the dense nature of the material and the limited size of the holes in the screen. Table 5.11 indicates that all three instruments had difficulties recording observations. In the short data, 78% of shots were able to be recorded and of this 78%, 91% fell within the manufacturers horizontal distance specifications. Although the ability to record observations through the heavy gauge screen was limited, the accuracy of the recorded shots was generally not effected by the screen.

Table 5.11 indicates that as the target distance increase, the light sources from each instrument struggled to penetrate the density of the heavy gauge cloth. This indication is reinforced by the fact that only 43% of all possible shots were able to be obtained and of these 43%, only 61% were within the specified tolerances. In ATR mode, all three instruments struggled to locate the prism to the point where over longer distances, if the instrument was turned completely away from the prism and then forced to locate the prism it would be unable to do so. This was due to the instrument rotating at full speed and being unable to send and receive a signal through the obstruction to determine the prism.

The variation in the errors recorded ranged from -43mm to 67mm which are well out of tolerance for most survey requirements. This error range indicates the instruments inability to read consistently and reliably through this obstruction.

Table 5.10 shows the key statistical information for the vertical and horizontal angular displacement through light vegetation.

Heavy Gauge Screen Obstruction

		Short Range		Long Range	
		Max Displ	Mean	Max Displ	Mean
Topcon	Vertical	2mm	1.0mm	N/A	N/A
DS-203AC	Horizontal	2mm	1.5mm	N/A	N/A
Trimble	Vertical	7mm	1.6mm	1mm	0.8mm
SPS930 DR+	Horizontal	2mm	0.7mm	1mm	0.5mm
Leica	Vertical	5mm	1.3mm	3mm	3.0mm
TPS1103	Horizontal	3mm	1.2mm	2mm	1.7mm
Total	Vertical	7mm	1.3mm	3mm	1.9mm
	Horizontal	3mm	1.1mm	2mm	1.1mm

Table 5.12: Heavy Gauge Screen Obstruction Vertical and Horizontal Angle Displacement Statistical Analysis

The above table displaying the vertical and horizontal angle displacements indicates that both the vertical and horizontal angles were not greatly affected by the heavy gauge screen obstruction. These results however are only based on the limited percentage of observations that were able to be recorded. This obstruction displays similar results to the light gauge screen obstruction in that the obstruction itself has no real effect on the angles recorded.

5.8 Conclusions

This chapter has discussed the effects that each of the six obstructions had on the three different forms of measurement (Manual Prism, ATR and Non-Prism) in terms of target distance, obstruction proximity, reliability and repeatability. The next chapter will highlight the key findings and conclusions from this project as well as the limitations behind measuring through obstructions in the field. The next chapter will also provide a series of recommendations on how to best minimise any errors associated with observing data through obstructions.

CHAPTER 6
CONCLUSIONS AND RECOMENDATIONS

From the completion of the in depth analysis of the data retaining to the field based obstruction testing, a series of both conclusions and recommendations were able to be provided. The following recommendations and conclusions are based directly on the key objectives initially outlined at the beginning of this dissertation. All of these objectives were met during the completion of this project. The recommendations and conclusions provided are based entirely on the data obtained during the testing.

6.1 Glass Obstructions

When reading through glass, using either prism based or non-prism based measurement, the delay of the light signal traveling through the glass medium will generally add a constant error to the horizontal distance recorded. For tinted 5mm glass a 2.5mm correction should be applied and for 5mm glass a 2.2mm correction should be applied. This correction is directly proportional to the thickness of the glass (ie: 5mm correction would be applied to 10mm thick tinted glass). The non-tinted glass also interfered with the ATR more than the tinted glass due to the increased amount of natural light reflecting off the obstruction. A surveyor intending to record an observation through glass should consider the density of the glass as well as the reflectivity of the glass before storing an observation.

6.2 Screen Obstructions

Reading through screen can have little to no effect on any recorded observations or it can have a major impact on recorded observations. The factor that determines the impact on the measurement is the gauge of the screen. Light gauge screen will not disrupt the emitted light from the instrument significantly enough to introduce major errors, however heavy gauge screen will have a significant impact on recorded observations to the point where observations are no longer able to physically be recorded through the obstruction medium. The heavy gauge screen introduced some of the largest errors in the obstruction testing. Both forms of screen generally didn't affect the horizontal and vertical angle error but did still cause some unacceptable errors. Therefore, the thickness of the screen obstruction should be carefully considered by the surveyor before they record an observation through this style of obstruction.

6.3 Vegetation Obstructions

Reading through vegetation can have unpredictable effects on any recorded observations. Whilst light vegetation does not impact too influentially on recorded observations, the heavier the vegetation, the greater the impact will generally be. The types of vegetation tested were cable of introducing large errors in both angle and distance into all three forms of measurement used. Before a surveyor records an observation through this obstruction, the density of the vegetation should be considered.

6.4 Target Distance

The target distance did have an effect on the recorded observations made by all three instruments via the three different measurement methods. The trends in the data collected indicate that the longer the target distance, the greater the likelihood of introducing large errors into a recorded observation. This applied to both horizontal distance error and vertical and horizontal angle error. Any surveyor intending to observe a measurement through an obstruction should consider the target distance prior to doing so.

6.5 Obstruction Proximity

The proximity of the obstruction also had an effect on the recorded observations made by all three instruments via the three different measurement methods. As the trends in the data suggest, the closer the obstruction is to the instrument, the greater the probability is of introducing larger errors into recorded data. This is more prominent with obstructions such as vegetation that cannot be easily penetrated with light. Therefore when the obstruction is close to the instrument and hence blocking a larger portion of the target, large angular errors can be introduced. Any surveyor intending to observe a measurement through an obstruction should consider the proximity of the obstruction to the instrument before doing so.

6.6 Repeatability and Reliability

All of the obstructions tested had different effects on repeatability and reliability. Obstructions such as glass often recorded very repeatable results however, without adding a distance correction for the thickness of the glass the results were not reliable. The vegetation obstructions showed that although their errors were generally insignificant, observing a measurement through this medium will not provide consistently repeatable or reliable results. The screen obstructions showed that as the gauge of the screen becomes thicker, the repeatability and reliability of results is diminished. Although it can be argued that for the most part, the results for most obstructions were generally reliable and repeatable, the best way to consistently achieve reliable and repeatable observations in the field is to avoid obstructions completely.

6.7 Non-Prism Target Reflectivity

The non-prism target used in all of the obstruction testing represented an ideal target rather than a target that is more likely to be found in the field. The reflectivity of the target more than likely did impact the results to some extent. Further study could be done in the future to determine how non-prism EDM functions through obstructions with targes of varying levels of reflectivity.

6.8 Recommendations

The following list of recommendations is designed to provide surveyors with some guidelines when reading obstructed prism based or non-prism based measurements in the field:

- Non-Prism based measurements through obstructions generally result in larger horizontal displacement errors than those of prism based observations.
- 5mm tinted glass ads on average 2.5mm to a recorded observation and 5mm clear glass adds on average 2.2mm.
- The horizontal distance error is proportional to the thickness of the glass.
- Light and dense vegetation are more likely to incur larger errors in both distance and angle randomly due to them being an inconsistent medium to read through.
- Heavy gauge screen can be read through accurately over short distances in both prism and non-prism modes provided that the non-prism target is reflective enough.
- All obstructions at one point or another will introduce an unacceptable level of error into the recorded observations.
- The greater the target distance, the greater the likelihood of error.
- The closer the obstruction is to the instrument, the greater the chance of error is.
- Manually sighting a prism through an obstruction will negate angular error that would be present in ATR but may still result in horizontal displacement error.

6.9 Concluding Remarks

At this point, the effects of each obstruction as well as target distance and obstruction proximity have all been analysed to the stage where a surveyor should know what to expect when reading through varying obstructions over a wide range of conditions and scenarios. Whilst this report has determined that it is possible to obtain accurate results when measuring through obstructions, it does not support the act of doing so. All attempts should be made to avoid recording an observation through an obstruction, however if it cannot be avoided, the recommendations discussed in this chapter as well as previous chapters should provide an insight into the ways in which errors can be mitigated in the field.

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APPENDICIES

APPENDIX A PROJECT SPECIFICATION

University of Southern Queensland

FACULTY OF ENGINEERING AND SURVEYING

ENG4111 Research Project

PROJECT SPECIFICATION

FOR:	**MITCHELL HOOSON**
TOPIC:	A COMPARRISON OF THE LIMITATIONS AND ACCURACY OF BOTH OBSTRUCTED PRISM AND OBSTRUCTED NON-PRISM MEASUREMENTS
SUPERVISOR:	DEV RAJ PAUDYAL
ENROLMENT:	ENG4111 – S1, 2015 ENG4112 – S2, 2015
PROJECT AIM:	This project aims to compare the accuracy of both prism based and reflectorless measurements between a range of total stations as well as a series of different obstructions often encountered in the field. The results will then be analysed to determine the limitations of both forms of measurement and the implications that measuring through obstructions with both forms will have on any given field data.
PROGRAMME:	**Issue A, 18th March 2015**

1) Research the specifications and theoretical accuracy and limitations of each of the three total stations to be tested.

2) Design a series of practical tests to test each of the three total stations against the series of obstructions (at varying distances) including both weather and object related obstructions which are: glass obstruction, vegetation obstruction, shade cloth obstruction, fence obstruction as well as rain obstruction, dust obstruction, fog obstruction and heat shimmer obstruction.

3) Test each of the three total stations (Topcon DS, Trimble S6, Leica 1100) ensuring that the only variable in each test is the instrument used.

4) Analyse the data obtained from all practical tests and produce statistical graphs and diagrams that show the data.

5) Reach a series of conclusions about the data obtained and ensure that the data enables the accuracy and limitations of each instrument to be intellectually discussed.

6) Produce and submit an academic dissertation on the research conducted and its conclusions.

As Time Permits:

7) Test each instrument against additional obstructions that are commonly encountered in the field if more are thought up.

8) Test more instruments against the obstructions previously tested.

9) Test the instruments ability to read through some of the obstructions such as glass through varying angles as opposed to being square to the obstruction.

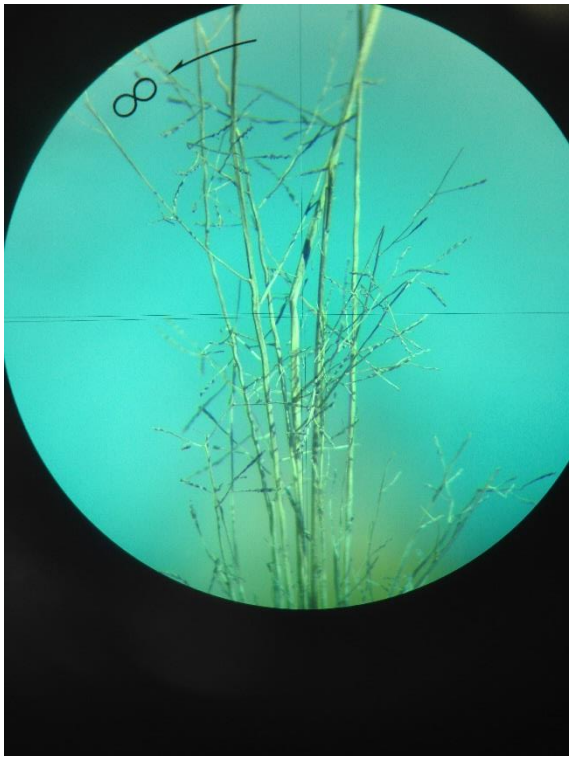
AGREED

Mitchell Hooson (student), Dev Raj Paudyal (supervisor)

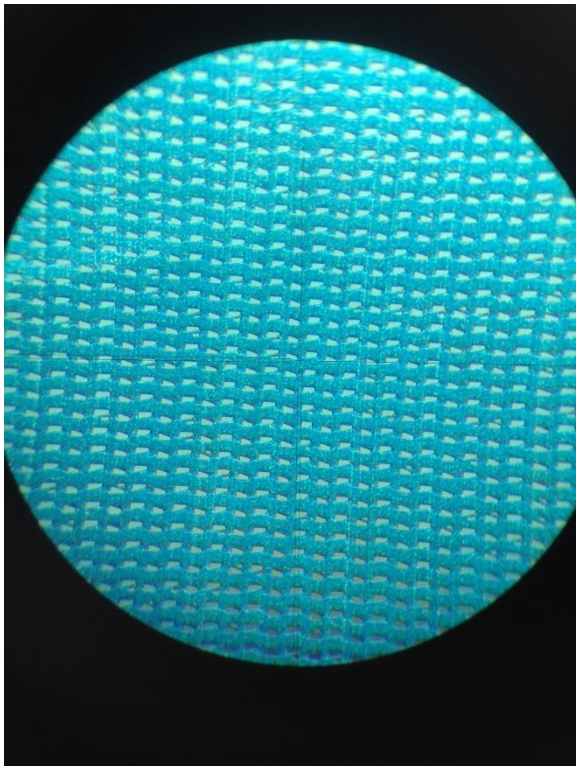
 (18/03/15) _____ (/03/15)

APPENDIX B SITE PHOTOS

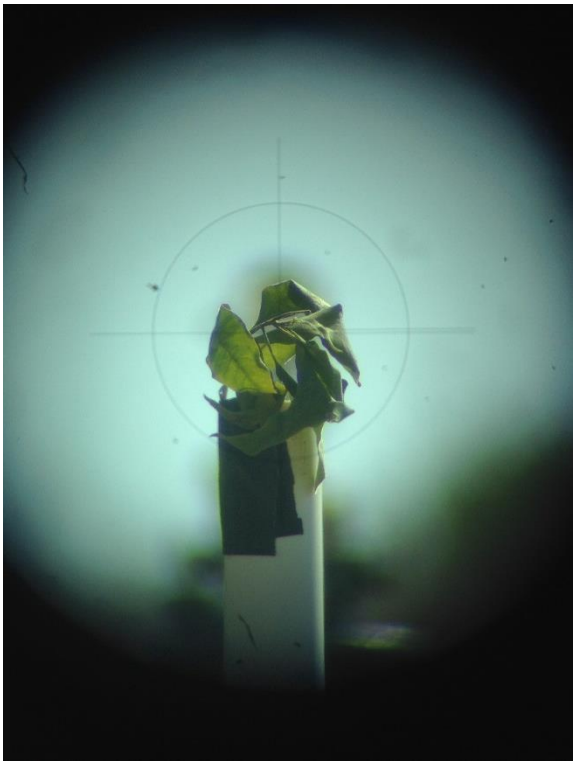
Reflectorless Laser Beam on Light Vegetation



Light Vegetation through Instrument Telescope



Heavy Gauge Screen through Instrument Telescope



Dense Vegetation through Instrument Telescope

Topcon DS-203AC Instrument Setup

Trimble SPS930 DR+ Instrument Setup

Leica TPS1103 Instrument Setup

APPENDIX C TOPCON DS-203AC DATASHEET

DS Series Compact Auto-Tracking Total Station

TOPCON

SPECIFICATIONS

Telescope	
Resolving power	2.5"
Magnification	30x
Angle Measurement	
	Min. Resolution/Accuracy
DS-201	1"
DS-203	3"
DS-205	5"
Tilt Angle Compensation	
Compensation	Dual-axis compensator
Range	±6'
Distance Measurement	
Prism EDM Range	6,000m
Prism EDM Accuracy	1.5mm+2ppm
Non-Prism Range	1,000m
Non-Prism Accuracy	2mm+2ppm (0.3 to 200m)
Measuring Time	Fine: 0.9 sec
	Rapid: 0.6 sec
	Tracking: 0.4 sec
Optional Auto-Tracking	
360° Prism Range	2 to 600m (6.6 to 1,960 ft.)
Single Prism Range	1.3 to 1,000m (4.3 to 3,280 ft.)
Communications	
LongLink™ rover communications*	
USB 2.0 Slot (Host + Slave)	
RS-232C Serial	
General	
Display	Color Touch TFT 240 x 320 QVGA Display (Dual Display)
Keyboard	25 keys with illuminator (Single Keyboard)
Battery Operation	Up to 5 hours
Dust/Water Protection	IP65
Wireless Connection	*Bluetooth*® Class 1
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Upgrade Options	
Hybrid Positioning	
RC-5 LongLink/Quick lock	

** The communication range may vary due to the condition of the area*

For more specification information:
www.topconpositioning.com/ds-series

SOFTWARE

MAGNET™

A family of software solutions that streamlines the workflow for surveyors, contractors, engineers and mapping professionals.

Field

Modern User Interface

MAGNET Field provides a bright, graphical user interface with large touch icons, and bright readable text. The screens not only look good, but provide fast workflows.

Easy to Use

The icon and text field interface has been optimized to provide both text and images to indicate what data is needed on each screen.

Advanced Calculations

MAGNET Field on-board not only controls the measurements of the DS, but also provides many COGO and adjustment calculations right on the instrument.

Office Tools

MAGNET Office Tools

Directly integrates into Autodesk products utilizing their CAD engine, or as a standalone installation with Topcon's MAGNET Office Site and MAGNET Office Topo.

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APPENDIX D TRIMBLE SPS930 DR+ DATASHEET

TRIMBLE UNIVERSAL TOTAL STATION

ANGLE MEASUREMENT
Horizontal Accuracy SPS630, SPS730, SPS930
Standard deviation based on DIN 18723 .....5", 3", 1" (1.5, 1.0, 0.3 mgon)
Vertical Accuracy SPS630, SPS730, SPS930
Standard deviation based on DIN 18723 .....5", 2", 1" (1.5, 0.6, 0.3 mgon)
Angle Reading (least count)
Standard mode .....1" (0.3 mgon)
Tracking mode.....2" (0.6 mgon)
Dual-axis compensator ..... ±6' (±100 mgon)

DISTANCE MEASUREMENT ACCURACY
Prism Mode
Standard mode .....±(2 mm + 2 ppm) ±(0.0065 ft + 2 ppm)
Tracking mode[1] .....±(4 mm + 2 ppm) ±(0.013 ft + 2 ppm)
Synchronized angle and distance measurements..... Yes
Position update rate .....Up to 20Hz
DR Reflectorless Mode
Standard mode .....±(2 mm + 2 ppm) ±(0.0065 ft + 2 ppm)
Scanning mode .....±(4 mm + 2 ppm) ±(0.013 ft + 2 ppm)

MEASUREMENT RANGE
Prism Mode (under clear conditions[2,3])
1 prism ..... 2,500 m (8,202 ft)
1 prism (long range mode) ..... 5,500 m (18,044 ft)
DR Reflectorless Mode[4]
Kodak Gray Card (18% reflective) ..... >600 m (1969 ft)
Kodak Gray Card (90% reflective) ..... >1300 m (4265 ft)
Servo system ..... MagDrive servo technology, integrated servo/angle sensor, electromagnetic direct drive
Rotation speed.....115 degrees/sec (128 gon/sec)
Clamps and slow motions.....Servo-driven, endless fine adjustment
Positioning speed 180 degrees (200 gon) ..... 3.2 sec

TELESCOPE
Magnification 30x
Field of view .....2.6 m at 100 m (8.5 ft at 328 ft)
Shortest focusing distance ..... 1.5 m (4.92 ft) – infinity
Illuminated crosshair .....Variable (10 steps)

POWER SUPPLY
Internal battery.....Rechargeable Li-Ion battery 11.1 V, 4.4 Ah
Operating time[5] ..... Approximately 6 hours on one internal battery

WEIGHT
Instrument with internal battery.....5.25 kg (11.57 lb)

ROBOTIC SPECIFICATIONS
Range[6] .....700 m (2,297 ft)
Shortest search distance .....0.2 m (0.65 ft)

ATS MODE FOR GRADE CONTROL
Range to target (MT900)[1,2,3].....700 m (2,297 ft)
Search time (typical)[6].....2-10 s
Search area ..... 360 degrees (400 gon)
or defined horizontal and vertical search window
Maximum velocity of target
Radial speed.....114°/s
Axial speed..... 6 m/s
Data output
Rate.....20 Hz
Timing..... ± 1 ms
Latency over radio .....40 ms
Synchronized measurement data.....<1 ms
Number of Target ID channels.....16

Specifications subject to change without notice.

1 The accuracy statement is valid for a static target or a target moving at constant speed. During acceleration or deceleration, or a target moving with high speed >15 kph (9.3 mph) the accuracy will decrease.
2 Standard clear: No haze. Overcast or moderate sunlight with very light heat shimmer.
3 Range and accuracy depend on atmospheric conditions, size of prisms and background radiation.
4 Kodak Gray Card, number E1527795
5 The capacity at -20 °C (-5 °F) is 75% of the capacity at +20 °C (68 °F).
6 Dependent on selected size of search window.

Bluetooth® CE

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NORTH AMERICA
Trimble Heavy & Highway Division
10355 Westmoor Drive, Suite #100
Westminster, Colorado 80021
USA
800-361-1249 (Toll Free)
+1-937-245-5154 Phone
+1-720-587-4685 Fax
www.trimble.com

EUROPE
Trimble Germany GmbH
Am Prime Parc 11
65479 Raunheim
GERMANY
+49-6142-2100-0 Phone
+49-6142-2100-550 Fax

ASIA-PACIFIC
Trimble Navigation
Singapore PTE Ltd.
80 Marine Parade Road
#22-06, Parkway Parade
Singapore, 449269
SINGAPORE
+65 6348 2212 Phone
+65 6348 2232 Fax

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APPENDIX E LEICA TPS1103 DATASHEET

TPS1100 Professional Series – Technical data

Define your requirements

Overview of the models and options	TC	TCR	TCRM+	TCA+	TCRA+	TCRA+ Power Search
Angle measurement	•	•	•	•	•	•
Distance measurement (IR)	•	•	•	•	•	•
Reflectorless and Long Range distance measurement (RL)	~	•	•	~	•	•
Motorized			•	•	•	•
Automatic Target Recognition (ATR)			~	•	•	•
PowerSearch (PS)				~	~	•
Electronic Guide Light (EGL)	○	○	○	•	•	•
Remote Control RCS1100	○	○	○	○	○	○

• Standard ○ Optional ~ Retrofit possible – Option: standard range + plus

Angle measurement

Accuracy	Type 1101	Type 1102	Type 1103	Type 1105
Hz, V (ISO 17123-3):	1.5" (0.5 mgon)	2" (0.6 mgon)	3" (1 mgon)	5" (1.5 mgon)
Display resolution:	1" (0.1 mgon)	1" (0.1 mgon)	1" (0.5 mgon)	1" (0.5 mgon)
Method	absolute, continuous, diametric			

Distance measurement (IR)

Range (average atmospheric conditions)	
Round prism (GPR1):	3000m / 9,800 ft
360° reflector (GRZ4):	1500m / 4,900 ft
Mini prism:	1200m / 3,900 ft
Reflective tape (60 mm x 60 mm):	250 m / 820 ft
Shortest measurable distance:	0.2 m to round prism (GPR1) / 1.5 m to a 360° reflector
Accuracy (ISO 17123-4) / Measuring time	
Standard mode:	2 mm + 2 ppm / 1.0 sec
Fast mode:	5 mm + 2 ppm / 0.5 sec
Tracking mode:	5 mm + 2 ppm / 0.3 sec
Fast mode tracking:	10 mm + 2 ppm / < 0.15 sec
Display resolution:	1 mm
Method	Principle of phase measurement (coaxial, invisible infrared laser)

Reflectorless and Long Range distance measurement (RL)

Range (average atmospheric conditions)	
Reflectorless (extended range):	170 m / 550 ft (Kodak Gray Card, white side)
Reflectorless (standard range):	80 m / 260 ft (Codak Gray Card, white side)
Shortest measurable distance:	1.5 m
Long Range on to round prism (GPR1):	1000 m – 5000 m
Accuracy (ISO 17123-4) / Measuring Time	
Reflectorless (standard mode):	3 mm + 2 ppm / typ. 3–6 sec, max. 12 sec
Reflectorless (tracking mode):	10 mm + 2 ppm / typ. 3–6 sec, max. 12 sec
Laser dot size:	5 mm + 2 ppm / typ. 2.5 sec, max. 8 sec
Laser dot size	
At 50 m:	approx. 10 mm x 20 mm
At 100 m:	approx. 15 mm x 30 mm
At 200 m:	approx. 30 mm x 60 mm
Method	Principle of phase measurement (coaxial, visible red laser)

Motorized (M)

Maximum speed	
Rotating speed:	50 gon / sec (45 deg / sec)

Automatic Target Recognition (ATR)

Range ATR mode / LOCK mode (average atmospheric conditions)	
Round prism (GPR1):	1000 m / 800 m (3300 ft / 2600 ft)
360° reflector (GRZ4):	600 m / 500 m (1900 ft / 1600 ft)
Mini prism:	500 m / 400 m (1600 ft / 1300 ft)
Reflective tape (60 mm x 60 mm):	65 m / -- (200 ft / --)
Shortest measurable distance:	1.5 m to 360° reflector (GRZ4)
Accuracy / Measuring Time	
Distances < 300 m:	3 mm / 3 sec
Distances > 300 m:	1.5", 2", 3", 5" (equivalent type) / 3–4 sec
Maximum speed (LOCK mode)	
Tangential (standard mode):	25 m / sec at 100 m
Tangential (tracking mode):	18 m / sec at 100 m
Radial (tracking mode):	4 m / sec
Method	Digital image processing (laser beam)

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APPENDIX F TOPCON DS-203AC REDUCED FIELD DATA

Topcon DS-203AC - 10m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH10	5000.000	2009.997	100.147	STN					
1000	5000.000	2010.000	100.147	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
1001	5000.000	2010.000	100.147	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
1002	5000.000	2010.000	100.147	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
1003	4999.991	2009.999	100.147	2.5MMAN2	0.000	-0.009	0.002	0.009	0.009
1004	4999.991	2009.999	100.147	2.5MMAN2	0.000	-0.009	0.002	0.009	0.009
1005	4999.991	2009.999	100.147	2.5MMAN2	0.000	-0.009	0.002	0.009	0.009
1006	5000.000	2009.997	100.147	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
1007	5000.000	2009.997	100.147	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
1008	5000.000	2009.997	100.147	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
1009	4999.999	2009.997	100.147	2.5MMAN4	0.000	-0.001	0.000	0.001	0.001
1010	4999.999	2009.997	100.147	2.5MMAN4	0.000	-0.001	0.000	0.001	0.001
1011	4999.999	2009.997	100.147	2.5MMAN4	0.000	-0.001	0.000	0.001	0.001
1012	5000.000	2009.997	100.146	2.5MMAN5	-0.001	0.000	0.000	0.000	0.001
1013	5000.000	2009.997	100.146	2.5MMAN5	-0.001	0.000	0.000	0.000	0.001
1014	5000.000	2009.997	100.146	2.5MMAN5	-0.001	0.000	0.000	0.000	0.001
1015	5000.000	2009.997	100.147	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
1016	5000.000	2009.997	100.147	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
1017	5000.000	2009.997	100.147	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
1018	5000.000	2010.000	100.147	5MMAN1	0.000	0.000	0.003	0.003	0.003
1019	5000.000	2010.000	100.147	5MMAN1	0.000	0.000	0.003	0.003	0.003
1020	5000.000	2010.000	100.147	5MMAN1	0.000	0.000	0.003	0.003	0.003
1021	4999.999	2009.999	100.147	5MMAN2	0.000	-0.001	0.002	0.002	0.002
1022	4999.999	2009.999	100.147	5MMAN2	0.000	-0.001	0.002	0.002	0.002
1023	4999.999	2009.999	100.147	5MMAN2	0.000	-0.001	0.002	0.002	0.002
1024	5000.000	2009.997	100.147	5MMAN3	0.000	0.000	0.000	0.000	0.000
1025	5000.000	2009.997	100.147	5MMAN3	0.000	0.000	0.000	0.000	0.000
1026	5000.000	2009.997	100.147	5MMAN3	0.000	0.000	0.000	0.000	0.000
1027	5000.000	2009.997	100.147	5MMAN4	0.000	0.000	0.000	0.000	0.000
1028	5000.000	2009.997	100.146	5MMAN4	-0.001	0.000	0.000	0.000	0.001
1029	5000.000	2009.997	100.146	5MMAN4	-0.001	0.000	0.000	0.000	0.001
1030	5000.000	2009.997	100.146	5MMAN5	-0.001	0.000	0.000	0.000	0.001
1031	5000.000	2009.997	100.146	5MMAN5	-0.001	0.000	0.000	0.000	0.001
1032	5000.000	2009.997	100.146	5MMAN5	-0.001	0.000	0.000	0.000	0.001
1033	5000.000	2009.997	100.147	5MMAN6	0.000	0.000	0.000	0.000	0.000
1034	5000.000	2009.997	100.147	5MMAN6	0.000	0.000	0.000	0.000	0.000
1035	5000.000	2009.997	100.147	5MMAN6	0.000	0.000	0.000	0.000	0.000
1036	4999.999	2010.000	100.147	7.5MMAN1	0.000	-0.001	0.003	0.003	0.003
1037	4999.999	2010.000	100.147	7.5MMAN1	0.000	-0.001	0.003	0.003	0.003
1038	4999.999	2010.000	100.147	7.5MMAN1	0.000	-0.001	0.003	0.003	0.003
1039	5000.000	2009.999	100.147	7.5MMAN2	0.000	0.000	0.002	0.002	0.002
1040	5000.000	2009.999	100.147	7.5MMAN2	0.000	0.000	0.002	0.002	0.002
1041	5000.000	2009.999	100.147	7.5MMAN2	0.000	0.000	0.002	0.002	0.002
1042	4999.999	2009.997	100.147	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1043	4999.999	2009.997	100.147	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1044	4999.999	2009.997	100.147	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1045	5000.000	2009.997	100.147	7.5MMAN4	0.000	0.000	0.000	0.000	0.000
1046	5000.000	2009.997	100.147	7.5MMAN4	0.000	0.000	0.000	0.000	0.000
1047	5000.000	2009.997	100.147	7.5MMAN4	0.000	0.000	0.000	0.000	0.000
1048	5000.000	2009.997	100.147	7.5MMAN5	0.000	0.000	0.000	0.000	0.000
1049	5000.000	2009.997	100.147	7.5MMAN5	0.000	0.000	0.000	0.000	0.000
1050	5000.000	2009.997	100.147	7.5MMAN5	0.000	0.000	0.000	0.000	0.000
1051	5000.000	2009.997	100.147	7.5MMAN6	0.000	0.000	0.000	0.000	0.000
1052	5000.000	2009.997	100.147	7.5MMAN6	0.000	0.000	0.000	0.000	0.000
1053	5000.000	2009.997	100.147	7.5MMAN6	0.000	0.000	0.000	0.000	0.000

Topcon DS-203AC - 10m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
1054	5000.000	2010.000	100.147	2.5MATR1	0.000	0.000	0.003	0.003	0.003
1055	5000.000	2010.000	100.147	2.5MATR1	0.000	0.000	0.003	0.003	0.003
1056	5000.000	2010.000	100.147	2.5MATR1	0.000	0.000	0.003	0.003	0.003
1057	5000.000	2009.999	100.147	2.5MATR2	0.000	0.000	0.002	0.002	0.002
1058	5000.000	2009.999	100.147	2.5MATR2	0.000	0.000	0.002	0.002	0.002
1059	5000.000	2009.999	100.147	2.5MATR2	0.000	0.000	0.002	0.002	0.002
1060	5000.000	2009.997	100.147	2.5MATR3	0.000	0.000	0.000	0.000	0.000
1061	5000.000	2009.997	100.147	2.5MATR3	0.000	0.000	0.000	0.000	0.000
1062	5000.000	2009.997	100.147	2.5MATR3	0.000	0.000	0.000	0.000	0.000
1063	5000.000	2009.997	100.146	2.5MATR4	-0.001	0.000	0.000	0.000	0.001
1064	4999.999	2009.997	100.146	2.5MATR4	-0.001	-0.001	0.000	0.001	0.001
1065	4999.999	2009.997	100.146	2.5MATR4	-0.001	-0.001	0.000	0.001	0.001
1066	5000.000	2009.997	100.144	2.5MATR5	-0.003	0.000	0.000	0.000	0.003
1067	5000.000	2009.997	100.145	2.5MATR5	-0.002	0.000	0.000	0.000	0.002
1068	5000.000	2009.997	100.145	2.5MATR5	-0.002	0.000	0.000	0.000	0.002
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
1069	5000.000	2010.000	100.147	5MATR1	0.000	0.000	0.003	0.003	0.003
1070	5000.000	2010.000	100.147	5MATR1	0.000	0.000	0.003	0.003	0.003
1071	5000.000	2010.000	100.147	5MATR1	0.000	0.000	0.003	0.003	0.003
1072	4999.999	2009.999	100.147	5MATR2	0.000	-0.001	0.002	0.002	0.002
1073	4999.999	2009.999	100.147	5MATR2	0.000	-0.001	0.002	0.002	0.002
1074	4999.999	2009.999	100.147	5MATR2	0.000	-0.001	0.002	0.002	0.002
1075	5000.000	2009.997	100.147	5MATR3	0.000	0.000	0.000	0.000	0.000
1076	5000.000	2009.997	100.147	5MATR3	0.000	0.000	0.000	0.000	0.000
1077	4999.999	2009.997	100.147	5MATR3	0.000	-0.001	0.000	0.001	0.001
1078	5000.001	2009.997	100.146	5MATR4	-0.001	0.001	0.000	0.001	0.001
1079	5000.001	2009.997	100.146	5MATR4	-0.001	0.001	0.000	0.001	0.001
1080	5000.001	2009.997	100.146	5MATR4	-0.001	0.001	0.000	0.001	0.001
1081	5000.002	2009.998	100.144	5MATR5	-0.003	0.002	0.001	0.002	0.004
1082	5000.002	2009.997	100.144	5MATR5	-0.003	0.002	0.000	0.002	0.004
1083	5000.001	2009.997	100.144	5MATR5	-0.003	0.001	0.000	0.001	0.003
1084	4999.998	2009.997	100.145	5MATR6	-0.002	-0.002	0.000	0.002	0.003
1085	4999.998	2009.997	100.145	5MATR6	-0.002	-0.002	0.000	0.002	0.003
1086	4999.998	2009.997	100.145	5MATR6	-0.002	-0.002	0.000	0.002	0.003
1087	4999.999	2010.000	100.147	7.5MATR1	0.000	-0.001	0.003	0.003	0.003
1088	4999.999	2010.000	100.147	7.5MATR1	0.000	-0.001	0.003	0.003	0.003
1089	4999.999	2010.000	100.147	7.5MATR1	0.000	-0.001	0.003	0.003	0.003
1090	4999.999	2009.999	100.147	7.5MATR2	0.000	-0.001	0.002	0.002	0.002
1091	4999.999	2009.999	100.147	7.5MATR2	0.000	-0.001	0.002	0.002	0.002
1092	4999.999	2009.999	100.147	7.5MATR2	0.000	-0.001	0.002	0.002	0.002
1093	5000.000	2009.997	100.147	7.5MATR3	0.000	0.000	0.000	0.000	0.000
1094	5000.000	2009.997	100.147	7.5MATR3	0.000	0.000	0.000	0.000	0.000
1095	5000.000	2009.997	100.147	7.5MATR3	0.000	0.000	0.000	0.000	0.000
1096	4999.999	2009.997	100.147	7.5MATR4	0.000	-0.001	0.000	0.001	0.001
1097	4999.999	2009.997	100.147	7.5MATR4	0.000	-0.001	0.000	0.001	0.001
1098	4999.999	2009.997	100.147	7.5MATR4	0.000	-0.001	0.000	0.001	0.001
1099	5000.001	2009.997	100.146	7.5MATR5	-0.001	0.001	0.000	0.001	0.001
1100	4999.999	2009.997	100.149	7.5MATR5	0.002	-0.001	0.000	0.001	0.002
1101	4999.998	2009.997	100.147	7.5MATR5	0.000	-0.002	0.000	0.002	0.002
1102	4999.999	2009.997	100.147	7.5MATR6	0.000	-0.001	0.000	0.001	0.001
1103	4999.999	2009.997	100.147	7.5MATR6	0.000	-0.001	0.000	0.001	0.001
1104	4999.999	2009.997	100.147	7.5MATR6	0.000	-0.001	0.000	0.001	0.001

Topcon DS-203AC - 10m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH10NP	5000.000	2009.996	100.148	STN					
1105	4999.999	2009.998	100.148	2.5MNP1	0.000	-0.001	0.002	0.002	0.002
1106	4999.999	2009.998	100.148	2.5MNP1	0.000	-0.001	0.002	0.002	0.002
1107	4999.999	2009.998	100.148	2.5MNP1	0.000	-0.001	0.002	0.002	0.002
1108	4999.999	2009.997	100.147	2.5MNP2	-0.001	-0.001	0.001	0.001	0.002
1109	4999.999	2009.997	100.147	2.5MNP2	-0.001	-0.001	0.001	0.001	0.002
1110	4999.999	2009.997	100.147	2.5MNP2	-0.001	-0.001	0.001	0.001	0.002
1111	5000.000	2009.996	100.148	2.5MNP3	0.000	0.000	0.000	0.000	0.000
1112	5000.000	2009.996	100.148	2.5MNP3	0.000	0.000	0.000	0.000	0.000
1113	5000.000	2009.996	100.148	2.5MNP3	0.000	0.000	0.000	0.000	0.000
1114	5000.000	2009.995	100.148	2.5MNP4	0.000	0.000	-0.001	0.001	0.001
1115	5000.000	2009.995	100.148	2.5MNP4	0.000	0.000	-0.001	0.001	0.001
1116	5000.000	2009.995	100.148	2.5MNP4	0.000	0.000	-0.001	0.001	0.001
1117	4999.999	2009.996	100.147	2.5MNP5	-0.001	-0.001	0.000	0.001	0.001
1118	4999.999	2009.995	100.147	2.5MNP5	-0.001	-0.001	-0.001	0.001	0.002
1119	4999.999	2009.995	100.147	2.5MNP5	-0.001	-0.001	-0.001	0.001	0.002
1120	5000.000	2009.997	100.146	2.5MNP6	-0.002	0.000	0.001	0.001	0.002
1121	5000.000	2009.997	100.146	2.5MNP6	-0.002	0.000	0.001	0.001	0.002
1122	5000.000	2009.997	100.146	2.5MNP6	-0.002	0.000	0.001	0.001	0.002
1123	5000.000	2009.998	100.148	5MNP1	0.000	0.000	0.002	0.002	0.002
1124	5000.000	2009.998	100.148	5MNP1	0.000	0.000	0.002	0.002	0.002
1125	5000.000	2009.998	100.148	5MNP1	0.000	0.000	0.002	0.002	0.002
1126	5000.000	2009.997	100.148	5MNP2	0.000	0.000	0.001	0.001	0.001
1127	5000.000	2009.997	100.148	5MNP2	0.000	0.000	0.001	0.001	0.001
1128	5000.000	2009.997	100.148	5MNP2	0.000	0.000	0.001	0.001	0.001
1129	5000.000	2009.996	100.147	5MNP3	-0.001	0.000	0.000	0.000	0.001
1130	5000.000	2009.996	100.147	5MNP3	-0.001	0.000	0.000	0.000	0.001
1131	5000.000	2009.996	100.147	5MNP3	-0.001	0.000	0.000	0.000	0.001
1132	5000.000	2009.996	100.148	5MNP4	0.000	0.000	0.000	0.000	0.000
1133	5000.000	2009.995	100.148	5MNP4	0.000	0.000	-0.001	0.001	0.001
1134	5000.000	2009.995	100.148	5MNP4	0.000	0.000	-0.001	0.001	0.001
1135	5000.000	2009.997	100.147	5MNP5	-0.001	0.000	0.001	0.001	0.001
1136	5000.000	2009.997	100.148	5MNP5	0.000	0.000	0.001	0.001	0.001
1137	5000.000	2009.997	100.148	5MNP5	0.000	0.000	0.001	0.001	0.001
1138	5000.000	2009.998	100.148	5MNP6	0.000	0.000	0.002	0.002	0.002
1139	5000.000	2009.999	100.148	5MNP6	0.000	0.000	0.003	0.003	0.003
1140	5000.000	2009.998	100.148	5MNP6	0.000	0.000	0.002	0.002	0.002
1141	5000.000	2009.998	100.148	7.5MNP1	0.000	0.000	0.002	0.002	0.002
1142	5000.000	2009.998	100.148	7.5MNP1	0.000	0.000	0.002	0.002	0.002
1143	5000.000	2009.998	100.148	7.5MNP1	0.000	0.000	0.002	0.002	0.002
1144	5000.000	2009.997	100.148	7.5MNP2	0.000	0.000	0.001	0.001	0.001
1145	5000.000	2009.997	100.148	7.5MNP2	0.000	0.000	0.001	0.001	0.001
1146	5000.000	2009.997	100.148	7.5MNP2	0.000	0.000	0.001	0.001	0.001
1147	4999.999	2009.996	100.147	7.5MNP3	-0.001	-0.001	0.000	0.001	0.001
1148	4999.999	2009.996	100.147	7.5MNP3	-0.001	-0.001	0.000	0.001	0.001
1149	4999.999	2009.996	100.147	7.5MNP3	-0.001	-0.001	0.000	0.001	0.001
1150	4999.999	2009.996	100.147	7.5MNP4	-0.001	-0.001	0.000	0.001	0.001
1151	5000.000	2009.996	100.147	7.5MNP4	-0.001	0.000	0.000	0.000	0.001
1152	5000.000	2009.997	100.147	7.5MNP4	-0.001	0.000	0.001	0.001	0.001
1153	5000.000	2009.995	100.147	7.5MNP5	-0.001	0.000	-0.001	0.001	0.001
1154	5000.000	2009.995	100.147	7.5MNP5	-0.001	0.000	-0.001	0.001	0.001
1155	5000.000	2009.995	100.147	7.5MNP5	-0.001	0.000	-0.001	0.001	0.001
1156	5000.000	2009.995	100.148	7.5MNP6	0.000	0.000	-0.001	0.001	0.001
1157	5000.000	2009.995	100.148	7.5MNP6	0.000	0.000	-0.001	0.001	0.001
1158	5000.000	2009.995	100.148	7.5MNP6	0.000	0.000	-0.001	0.001	0.001

Topcon DS-203AC - 20m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH20	5000.000	2020.000	100.315	STN					
2000	4999.999	2020.003	100.316	2.5MMAN1	0.001	-0.001	0.003	0.003	0.003
2001	4999.999	2020.003	100.316	2.5MMAN1	0.001	-0.001	0.003	0.003	0.003
2002	4999.999	2020.003	100.316	2.5MMAN1	0.001	-0.001	0.003	0.003	0.003
2003	4999.999	2020.002	100.316	2.5MMAN2	0.001	-0.001	0.002	0.002	0.002
2004	4999.999	2020.002	100.316	2.5MMAN2	0.001	-0.001	0.002	0.002	0.002
2005	4999.999	2020.002	100.316	2.5MMAN2	0.001	-0.001	0.002	0.002	0.002
2006	4999.999	2020.000	100.316	2.5MMAN3	0.001	-0.001	0.000	0.001	0.001
2007	4999.999	2020.000	100.316	2.5MMAN3	0.001	-0.001	0.000	0.001	0.001
2008	4999.999	2020.000	100.316	2.5MMAN3	0.001	-0.001	0.000	0.001	0.001
2009	4999.999	2020.000	100.316	2.5MMAN4	0.001	-0.001	0.000	0.001	0.001
2010	4999.999	2020.000	100.316	2.5MMAN4	0.001	-0.001	0.000	0.001	0.001
2011	4999.999	2020.000	100.316	2.5MMAN4	0.001	-0.001	0.000	0.001	0.001
2012	4999.999	2020.000	100.316	2.5MMAN5	0.001	-0.001	0.000	0.001	0.001
2013	4999.999	2020.000	100.316	2.5MMAN5	0.001	-0.001	0.000	0.001	0.001
2014	4999.999	2020.000	100.316	2.5MMAN5	0.001	-0.001	0.000	0.001	0.001
2015	4999.999	2020.000	100.316	2.5MMAN6	0.001	-0.001	0.000	0.001	0.001
2016	4999.999	2020.000	100.316	2.5MMAN6	0.001	-0.001	0.000	0.001	0.001
2017	4999.999	2020.000	100.316	2.5MMAN6	0.001	-0.001	0.000	0.001	0.001
2018	5000.000	2020.004	100.316	10MMAN1	0.001	0.000	0.004	0.004	0.004
2019	5000.000	2020.004	100.316	10MMAN1	0.001	0.000	0.004	0.004	0.004
2020	5000.000	2020.003	100.316	10MMAN1	0.001	0.000	0.003	0.003	0.003
2021	5000.000	2020.002	100.316	10MMAN2	0.001	0.000	0.002	0.002	0.002
2022	5000.000	2020.002	100.316	10MMAN2	0.001	0.000	0.002	0.002	0.002
2023	5000.000	2020.003	100.316	10MMAN2	0.001	0.000	0.003	0.003	0.003
2024	5000.000	2020.001	100.316	10MMAN3	0.001	0.000	0.001	0.001	0.001
2025	5000.000	2020.001	100.316	10MMAN3	0.001	0.000	0.001	0.001	0.001
2026	5000.000	2020.001	100.316	10MMAN3	0.001	0.000	0.001	0.001	0.001
2027	5000.000	2020.000	100.316	10MMAN4	0.001	0.000	0.000	0.000	0.001
2028	5000.000	2020.001	100.316	10MMAN4	0.001	0.000	0.001	0.001	0.001
2029	5000.000	2020.001	100.316	10MMAN4	0.001	0.000	0.001	0.001	0.001
2030	5000.001	2020.000	100.316	10MMAN5	0.001	0.001	0.000	0.001	0.001
2031	5000.001	2020.000	100.316	10MMAN5	0.001	0.001	0.000	0.001	0.001
2032	5000.001	2020.000	100.316	10MMAN5	0.001	0.001	0.000	0.001	0.001
2033	5000.000	2020.000	100.316	10MMAN6	0.001	0.000	0.000	0.000	0.001
2034	5000.000	2020.000	100.316	10MMAN6	0.001	0.000	0.000	0.000	0.001
2035	5000.000	2020.000	100.316	10MMAN6	0.001	0.000	0.000	0.000	0.001
2036	5000.000	2020.003	100.314	17.5MMAN1	-0.001	0.000	0.003	0.003	0.003
2037	5000.000	2020.003	100.314	17.5MMAN1	-0.001	0.000	0.003	0.003	0.003
2038	5000.000	2020.003	100.314	17.5MMAN1	-0.001	0.000	0.003	0.003	0.003
2039	5000.000	2020.002	100.314	17.5MMAN2	-0.001	0.000	0.002	0.002	0.002
2040	5000.000	2020.002	100.314	17.5MMAN2	-0.001	0.000	0.002	0.002	0.002
2041	5000.000	2020.002	100.314	17.5MMAN2	-0.001	0.000	0.002	0.002	0.002
2042	5000.000	2020.000	100.314	17.5MMAN3	-0.001	0.000	0.000	0.000	0.001
2043	5000.000	2020.000	100.314	17.5MMAN3	-0.001	0.000	0.000	0.000	0.001
2044	5000.000	2020.000	100.314	17.5MMAN3	-0.001	0.000	0.000	0.000	0.001
2045	5000.000	2020.000	100.314	17.5MMAN4	-0.001	0.000	0.000	0.000	0.001
2046	5000.000	2020.000	100.314	17.5MMAN4	-0.001	0.000	0.000	0.000	0.001
2047	5000.000	2020.000	100.314	17.5MMAN4	-0.001	0.000	0.000	0.000	0.001
2048	5000.000	2020.000	100.314	17.5MMAN5	-0.001	0.000	0.000	0.000	0.001
2049	5000.000	2020.000	100.314	17.5MMAN5	-0.001	0.000	0.000	0.000	0.001
2050	5000.000	2020.000	100.314	17.5MMAN5	-0.001	0.000	0.000	0.000	0.001
2051	5000.000	2020.000	100.314	17.5MMAN6	-0.001	0.000	0.000	0.000	0.001
2052	5000.000	2020.000	100.314	17.5MMAN6	-0.001	0.000	0.000	0.000	0.001
2053	5000.000	2020.000	100.314	17.5MMAN6	-0.001	0.000	0.000	0.000	0.001

Topcon DS-203AC - 20m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
2054	5000.000	2020.002	100.316	2.5MATR1	0.001	0.000	0.002	0.002	0.002
2055	5000.000	2020.002	100.316	2.5MATR1	0.001	0.000	0.002	0.002	0.002
2056	5000.000	2020.003	100.315	2.5MATR1	0.000	0.000	0.003	0.003	0.003
2057	4999.999	2020.002	100.315	2.5MATR2	0.000	-0.001	0.002	0.002	0.002
2058	4999.999	2020.002	100.315	2.5MATR2	0.000	-0.001	0.002	0.002	0.002
2059	4999.999	2020.002	100.315	2.5MATR2	0.000	-0.001	0.002	0.002	0.002
2060	5000.000	2020.000	100.315	2.5MATR3	0.000	0.000	0.000	0.000	0.000
2061	5000.000	2020.000	100.315	2.5MATR3	0.000	0.000	0.000	0.000	0.000
2062	4999.999	2020.000	100.315	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
2063	5000.001	2020.000	100.313	2.5MATR4	-0.002	0.001	0.000	0.001	0.002
2064	5000.001	2020.000	100.313	2.5MATR4	-0.002	0.001	0.000	0.001	0.002
2065	5000.001	2020.000	100.313	2.5MATR4	-0.002	0.001	0.000	0.001	0.002
2066	5000.002	2020.000	100.312	2.5MATR5	-0.003	0.002	0.000	0.002	0.004
2067	5000.002	2020.000	100.311	2.5MATR5	-0.004	0.002	0.000	0.002	0.004
2068	5000.002	2020.000	100.311	2.5MATR5	-0.004	0.002	0.000	0.002	0.004
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
2069	5000.000	2020.003	100.316	10MATR1	0.001	0.000	0.003	0.003	0.003
2070	4999.999	2020.003	100.316	10MATR1	0.001	-0.001	0.003	0.003	0.003
2071	5000.000	2020.003	100.316	10MATR1	0.001	0.000	0.003	0.003	0.003
2072	5000.000	2020.002	100.315	10MATR2	0.000	0.000	0.002	0.002	0.002
2073	5000.000	2020.002	100.316	10MATR2	0.001	0.000	0.002	0.002	0.002
2074	5000.000	2020.002	100.316	10MATR2	0.001	0.000	0.002	0.002	0.002
2075	5000.000	2020.000	100.315	10MATR3	0.000	0.000	0.000	0.000	0.000
2076	5000.000	2020.000	100.315	10MATR3	0.000	0.000	0.000	0.000	0.000
2077	5000.000	2020.000	100.315	10MATR3	0.000	0.000	0.000	0.000	0.000
2078	5000.005	2020.000	100.315	10MATR4	0.000	0.005	0.000	0.005	0.005
2079	5000.005	2020.000	100.315	10MATR4	0.000	0.005	0.000	0.005	0.005
2080	5000.005	2020.000	100.315	10MATR4	0.000	0.005	0.000	0.005	0.005
2081	5000.007	2020.000	100.315	10MATR5	0.000	0.007	0.000	0.007	0.007
2082	5000.009	2020.000	100.315	10MATR5	0.000	0.009	0.000	0.009	0.009
2083	5000.009	2020.000	100.315	10MATR5	0.000	0.009	0.000	0.009	0.009
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
2084	5000.000	2020.003	100.315	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2085	5000.000	2020.003	100.315	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2086	5000.000	2020.003	100.315	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2087	5000.000	2020.002	100.315	17.5MATR2	0.000	0.000	0.002	0.002	0.002
2088	5000.000	2020.002	100.315	17.5MATR2	0.000	0.000	0.002	0.002	0.002
2089	5000.000	2020.002	100.315	17.5MATR2	0.000	0.000	0.002	0.002	0.002
2090	5000.000	2020.000	100.315	17.5MATR3	0.000	0.000	0.000	0.000	0.000
2091	5000.000	2020.000	100.315	17.5MATR3	0.000	0.000	0.000	0.000	0.000
2092	5000.000	2020.000	100.315	17.5MATR3	0.000	0.000	0.000	0.000	0.000
2093	5000.000	2020.000	100.315	17.5MATR4	0.000	0.000	0.000	0.000	0.000
2094	5000.000	2020.000	100.315	17.5MATR4	0.000	0.000	0.000	0.000	0.000
2095	5000.000	2020.000	100.315	17.5MATR4	0.000	0.000	0.000	0.000	0.000
2096	4999.996	2020.000	100.314	17.5MATR5	-0.001	-0.004	0.000	0.004	0.004
2097	4999.996	2020.000	100.314	17.5MATR5	-0.001	-0.004	0.000	0.004	0.004
2098	4999.996	2020.000	100.314	17.5MATR5	-0.001	-0.004	0.000	0.004	0.004
-	-	-	-	17.5MATR6					
-	-	-	-	17.5MATR6					
-	-	-	-	17.5MATR6					

Topcon DS-203AC - 20m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH20NP	5000.000	2019.999	100.316	STN					
2099	5000.000	2020.001	100.317	2.5MNP1	0.001	0.000	0.002	0.002	0.002
2100	5000.000	2020.001	100.317	2.5MNP1	0.001	0.000	0.002	0.002	0.002
2101	5000.000	2020.001	100.317	2.5MNP1	0.001	0.000	0.002	0.002	0.002
2102	5000.000	2020.001	100.317	2.5MNP2	0.001	0.000	0.002	0.002	0.002
2103	5000.000	2020.001	100.317	2.5MNP2	0.001	0.000	0.002	0.002	0.002
2104	5000.000	2020.001	100.317	2.5MNP2	0.001	0.000	0.002	0.002	0.002
2105	5000.000	2019.998	100.317	2.5MNP3	0.001	0.000	-0.001	0.001	0.001
2106	5000.000	2019.998	100.317	2.5MNP3	0.001	0.000	-0.001	0.001	0.001
2107	5000.000	2019.999	100.317	2.5MNP3	0.001	0.000	0.000	0.000	0.001
2108	5000.000	2019.998	100.317	2.5MNP4	0.001	0.000	-0.001	0.001	0.001
2109	5000.000	2019.999	100.317	2.5MNP4	0.001	0.000	0.000	0.000	0.001
2110	5000.000	2019.999	100.317	2.5MNP4	0.001	0.000	0.000	0.000	0.001
2111	5000.000	2020.000	100.317	2.5MNP5	0.001	0.000	0.001	0.001	0.001
2112	5000.000	2020.001	100.317	2.5MNP5	0.001	0.000	0.002	0.002	0.002
2113	5000.000	2020.000	100.317	2.5MNP5	0.001	0.000	0.001	0.001	0.001
2114	5000.000	2020.001	100.317	2.5MNP6	0.001	0.000	0.002	0.002	0.002
2115	5000.000	2020.000	100.317	2.5MNP6	0.001	0.000	0.001	0.001	0.001
2116	5000.000	2020.000	100.317	2.5MNP6	0.001	0.000	0.001	0.001	0.001
2117	5000.001	2020.002	100.316	10MNP1	0.000	0.001	0.003	0.003	0.003
2118	5000.001	2020.002	100.316	10MNP1	0.000	0.001	0.003	0.003	0.003
2119	5000.001	2020.003	100.316	10MNP1	0.000	0.001	0.004	0.004	0.004
2120	5000.001	2020.002	100.316	10MNP2	0.000	0.001	0.003	0.003	0.003
2121	5000.001	2020.001	100.316	10MNP2	0.000	0.001	0.002	0.002	0.002
2122	5000.001	2020.001	100.316	10MNP2	0.000	0.001	0.002	0.002	0.002
2123	5000.001	2020.000	100.316	10MNP3	0.000	0.001	0.001	0.001	0.001
2124	5000.001	2020.000	100.316	10MNP3	0.000	0.001	0.001	0.001	0.001
2125	5000.001	2020.000	100.316	10MNP3	0.000	0.001	0.001	0.001	0.001
2126	5000.001	2019.999	100.316	10MNP4	0.000	0.001	0.000	0.001	0.001
2127	5000.001	2019.999	100.316	10MNP4	0.000	0.001	0.000	0.001	0.001
2128	5000.001	2019.999	100.316	10MNP4	0.000	0.001	0.000	0.001	0.001
2129	5000.001	2019.999	100.316	10MNP5	0.000	0.001	0.000	0.001	0.001
2130	5000.001	2019.999	100.316	10MNP5	0.000	0.001	0.000	0.001	0.001
2131	5000.001	2020.000	100.316	10MNP5	0.000	0.001	0.001	0.001	0.001
2132	5000.001	2019.998	100.317	10MNP6	0.001	0.001	-0.001	0.001	0.002
2133	5000.001	2019.998	100.317	10MNP6	0.001	0.001	-0.001	0.001	0.002
2134	5000.001	2019.998	100.317	10MNP6	0.001	0.001	-0.001	0.001	0.002
2135	5000.001	2020.003	100.317	17.5MNP1	0.001	0.001	0.004	0.004	0.004
2136	5000.001	2020.003	100.317	17.5MNP1	0.001	0.001	0.004	0.004	0.004
2137	5000.001	2020.003	100.317	17.5MNP1	0.001	0.001	0.004	0.004	0.004
2138	5000.001	2020.002	100.317	17.5MNP2	0.001	0.001	0.003	0.003	0.003
2139	5000.001	2020.002	100.317	17.5MNP2	0.001	0.001	0.003	0.003	0.003
2140	5000.001	2020.002	100.317	17.5MNP2	0.001	0.001	0.003	0.003	0.003
2141	5000.001	2020.000	100.317	17.5MNP3	0.001	0.001	0.001	0.001	0.002
2142	5000.001	2019.999	100.317	17.5MNP3	0.001	0.001	0.000	0.001	0.001
2143	5000.001	2020.000	100.317	17.5MNP3	0.001	0.001	0.001	0.001	0.002
2144	5000.001	2020.000	100.317	17.5MNP4	0.001	0.001	0.001	0.001	0.002
2145	5000.001	2020.000	100.317	17.5MNP4	0.001	0.001	0.001	0.001	0.002
2146	5000.001	2020.000	100.317	17.5MNP4	0.001	0.001	0.001	0.001	0.002
2147	5000.001	2020.001	100.316	17.5MNP5	0.000	0.001	0.002	0.002	0.002
2148	5000.001	2020.002	100.316	17.5MNP5	0.000	0.001	0.003	0.003	0.003
2149	5000.001	2020.002	100.316	17.5MNP5	0.000	0.001	0.003	0.003	0.003
2150	5000.001	2019.999	100.316	17.5MNP6	0.000	0.001	0.000	0.001	0.001
2151	5000.001	2020.000	100.316	17.5MNP6	0.000	0.001	0.001	0.001	0.001
2152	5000.001	2020.000	100.316	17.5MNP6	0.000	0.001	0.001	0.001	0.001

Topcon DS-203AC - 40m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Hz Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH40	5000.000	2040.002	100.497	STN					
3000	5000.000	2040.004	100.498	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
3001	5000.000	2040.004	100.498	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
3002	5000.000	2040.004	100.498	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
3003	5000.000	2040.004	100.498	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
3004	5000.000	2040.004	100.498	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
3005	5000.000	2040.004	100.498	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
3006	5000.000	2040.002	100.498	2.5MMAN3	0.001	0.000	0.000	0.000	0.001
3007	5000.000	2040.002	100.498	2.5MMAN3	0.001	0.000	0.000	0.000	0.001
3008	5000.000	2040.002	100.498	2.5MMAN3	0.001	0.000	0.000	0.000	0.001
3009	5000.000	2040.002	100.498	2.5MMAN4	0.001	0.000	0.000	0.000	0.001
3010	5000.000	2040.002	100.498	2.5MMAN4	0.001	0.000	0.000	0.000	0.001
3011	5000.000	2040.002	100.498	2.5MMAN4	0.001	0.000	0.000	0.000	0.001
3012	5000.000	2040.002	100.498	2.5MMAN5	0.001	0.000	0.000	0.000	0.001
3013	5000.000	2040.002	100.497	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
3014	5000.000	2040.002	100.497	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
-	-	-	-	2.5MMAN6					
-	-	-	-	2.5MMAN6					
-	-	-	-	2.5MMAN6					
3015	5000.000	2040.004	100.497	10MMAN1	0.000	0.000	0.002	0.002	0.002
3016	5000.000	2040.005	100.497	10MMAN1	0.000	0.000	0.003	0.003	0.003
3017	5000.000	2040.005	100.497	10MMAN1	0.000	0.000	0.003	0.003	0.003
3018	5000.001	2040.004	100.497	10MMAN2	0.000	0.001	0.002	0.002	0.002
3019	5000.001	2040.004	100.497	10MMAN2	0.000	0.001	0.002	0.002	0.002
3020	5000.001	2040.004	100.497	10MMAN2	0.000	0.001	0.002	0.002	0.002
3021	5000.001	2040.002	100.497	10MMAN3	0.000	0.001	0.000	0.001	0.001
3022	5000.001	2040.002	100.497	10MMAN3	0.000	0.001	0.000	0.001	0.001
3023	5000.001	2040.002	100.497	10MMAN3	0.000	0.001	0.000	0.001	0.001
3024	5000.001	2040.002	100.498	10MMAN4	0.001	0.001	0.000	0.001	0.001
3025	5000.001	2040.003	100.498	10MMAN4	0.001	0.001	0.001	0.001	0.002
3026	5000.001	2040.002	100.498	10MMAN4	0.001	0.001	0.000	0.001	0.001
3027	5000.001	2040.002	100.498	10MMAN5	0.001	0.001	0.000	0.001	0.001
3028	5000.001	2040.002	100.498	10MMAN5	0.001	0.001	0.000	0.001	0.001
3029	5000.001	2040.002	100.498	10MMAN5	0.001	0.001	0.000	0.001	0.001
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
3030	5000.000	2040.005	100.498	20MMAN1	0.001	0.000	0.003	0.003	0.003
3031	5000.000	2040.004	100.498	20MMAN1	0.001	0.000	0.002	0.002	0.002
3032	5000.000	2040.004	100.498	20MMAN1	0.001	0.000	0.002	0.002	0.002
3033	5000.001	2040.004	100.498	20MMAN2	0.001	0.001	0.002	0.002	0.002
3034	5000.001	2040.004	100.498	20MMAN2	0.001	0.001	0.002	0.002	0.002
3035	5000.001	2040.004	100.498	20MMAN2	0.001	0.001	0.002	0.002	0.002
3036	5000.001	2040.002	100.496	20MMAN3	-0.001	0.001	0.000	0.001	0.001
3037	5000.001	2040.002	100.496	20MMAN3	-0.001	0.001	0.000	0.001	0.001
3038	5000.001	2040.002	100.497	20MMAN3	0.000	0.001	0.000	0.001	0.001
3039	5000.003	2040.002	100.497	20MMAN4	0.000	0.003	0.000	0.003	0.003
3040	5000.003	2040.002	100.497	20MMAN4	0.000	0.003	0.000	0.003	0.003
3041	5000.003	2040.002	100.497	20MMAN4	0.000	0.003	0.000	0.003	0.003
3042	5000.000	2040.002	100.497	20MMAN5	0.000	0.000	0.000	0.000	0.000
3043	5000.000	2040.001	100.497	20MMAN5	0.000	0.000	-0.001	0.001	0.001
3044	5000.000	2040.002	100.497	20MMAN5	0.000	0.000	0.000	0.000	0.000
-	-	-	-	20MMAN6					
-	-	-	-	20MMAN6					
-	-	-	-	20MMAN6					

3045	5000.001	2040.004	100.497	30MMAN1	0.000	0.001	0.002	0.002	0.002
3046	5000.001	2040.004	100.497	30MMAN1	0.000	0.001	0.002	0.002	0.002
3047	5000.001	2040.004	100.497	30MMAN1	0.000	0.001	0.002	0.002	0.002
3048	5000.001	2040.004	100.497	30MMAN2	0.000	0.001	0.002	0.002	0.002
3049	5000.001	2040.004	100.497	30MMAN2	0.000	0.001	0.002	0.002	0.002
3050	5000.001	2040.004	100.496	30MMAN2	-0.001	0.001	0.002	0.002	0.002
3051	5000.001	2040.002	100.496	30MMAN3	-0.001	0.001	0.000	0.001	0.001
3052	5000.001	2040.002	100.496	30MMAN3	-0.001	0.001	0.000	0.001	0.001
3053	5000.001	2040.002	100.496	30MMAN3	-0.001	0.001	0.000	0.001	0.001
3054	5000.001	2040.002	100.496	30MMAN4	-0.001	0.001	0.000	0.001	0.001
3055	5000.001	2040.002	100.496	30MMAN4	-0.001	0.001	0.000	0.001	0.001
3056	5000.001	2040.002	100.496	30MMAN4	-0.001	0.001	0.000	0.001	0.001
3057	5000.001	2040.001	100.496	30MMAN5	-0.001	0.001	-0.001	0.001	0.002
3058	5000.001	2040.001	100.496	30MMAN5	-0.001	0.001	-0.001	0.001	0.002
3059	5000.001	2040.001	100.496	30MMAN5	-0.001	0.001	-0.001	0.001	0.002
-	-	-	-	30MMAN6					
-	-	-	-	30MMAN6					
-	-	-	-	30MMAN6					
3060	5000.001	2040.004	100.496	37.5MMAN1	-0.001	0.001	0.002	0.002	0.002
3061	5000.001	2040.004	100.496	37.5MMAN1	-0.001	0.001	0.002	0.002	0.002
3062	5000.001	2040.004	100.496	37.5MMAN1	-0.001	0.001	0.002	0.002	0.002
3063	5000.001	2040.004	100.496	37.5MMAN2	-0.001	0.001	0.002	0.002	0.002
3064	5000.001	2040.004	100.496	37.5MMAN2	-0.001	0.001	0.002	0.002	0.002
3065	5000.001	2040.004	100.496	37.5MMAN2	-0.001	0.001	0.002	0.002	0.002
3066	5000.001	2040.002	100.496	37.5MMAN3	-0.001	0.001	0.000	0.001	0.001
3067	5000.001	2040.002	100.496	37.5MMAN3	-0.001	0.001	0.000	0.001	0.001
3068	5000.001	2040.002	100.496	37.5MMAN3	-0.001	0.001	0.000	0.001	0.001
3069	5000.001	2040.002	100.495	37.5MMAN4	-0.002	0.001	0.000	0.001	0.002
3070	5000.001	2040.002	100.495	37.5MMAN4	-0.002	0.001	0.000	0.001	0.002
3071	5000.001	2040.002	100.495	37.5MMAN4	-0.002	0.001	0.000	0.001	0.002
3072	5000.001	2040.001	100.495	37.5MMAN5	-0.002	0.001	-0.001	0.001	0.002
3073	5000.001	2040.002	100.495	37.5MMAN5	-0.002	0.001	0.000	0.001	0.002
3074	5000.001	2040.001	100.495	37.5MMAN5	-0.002	0.001	-0.001	0.001	0.002
-	-	-	-	37.5MMAN6					
-	-	-	-	37.5MMAN6					
-	-	-	-	37.5MMAN6					

Topcon DS-203AC - 40m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Hz Displ (mm)
3075	5000.000	2040.004	100.497	2.5MATR1	0.000	0.000	0.002	0.002	0.002
3076	5000.001	2040.004	100.496	2.5MATR1	-0.001	0.001	0.002	0.002	0.002
3077	5000.001	2040.004	100.496	2.5MATR1	-0.001	0.001	0.002	0.002	0.002
3078	4999.999	2040.004	100.496	2.5MATR2	-0.001	-0.001	0.002	0.002	0.002
3079	5000.000	2040.004	100.497	2.5MATR2	0.000	0.000	0.002	0.002	0.002
3080	4999.999	2040.004	100.496	2.5MATR2	-0.001	-0.001	0.002	0.002	0.002
3081	4999.999	2040.002	100.497	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
3082	4999.999	2040.002	100.497	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
3083	4999.999	2040.002	100.497	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
3084	4999.998	2040.001	100.497	2.5MATR4	0.000	-0.002	-0.001	0.002	0.002
3085	4999.998	2040.002	100.497	2.5MATR4	0.000	-0.002	0.000	0.002	0.002
3086	4999.999	2040.002	100.497	2.5MATR4	0.000	-0.001	0.000	0.001	0.001
3087	5000.000	2040.002	100.496	2.5MATR5	-0.001	0.000	0.000	0.000	0.001
3088	5000.000	2040.002	100.495	2.5MATR5	-0.002	0.000	0.000	0.000	0.002
3089	5000.000	2040.002	100.495	2.5MATR5	-0.002	0.000	0.000	0.000	0.002
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
3090	4999.999	2040.004	100.499	10MATR1	0.002	-0.001	0.002	0.002	0.003
3091	5000.000	2040.004	100.499	10MATR1	0.002	0.000	0.002	0.002	0.003
3092	5000.000	2040.004	100.499	10MATR1	0.002	0.000	0.002	0.002	0.003
3093	5000.001	2040.004	100.496	10MATR2	-0.001	0.001	0.002	0.002	0.002
3094	5000.001	2040.004	100.496	10MATR2	-0.001	0.001	0.002	0.002	0.002
3095	5000.001	2040.004	100.496	10MATR2	-0.001	0.001	0.002	0.002	0.002
3096	5000.001	2040.002	100.496	10MATR3	-0.001	0.001	0.000	0.001	0.001
3097	5000.001	2040.002	100.496	10MATR3	-0.001	0.001	0.000	0.001	0.001
3098	5000.001	2040.002	100.496	10MATR3	-0.001	0.001	0.000	0.001	0.001
3099	5000.001	2040.002	100.496	10MATR3	-0.001	0.001	0.000	0.001	0.001
3100	5000.004	2040.002	100.496	10MATR4	-0.001	0.004	0.000	0.004	0.004
3101	5000.004	2040.001	100.496	10MATR4	-0.001	0.004	-0.001	0.004	0.004
3102	5000.004	2040.002	100.496	10MATR4	-0.001	0.004	0.000	0.004	0.004
3103	5000.005	2040.002	100.496	10MATR5	-0.001	0.005	0.000	0.005	0.005
3104	5000.004	2040.002	100.495	10MATR5	-0.002	0.004	0.000	0.004	0.004
3105	5000.004	2040.002	100.495	10MATR5	-0.002	0.004	0.000	0.004	0.004
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
3106	5000.000	2040.004	100.496	20MATR1	-0.001	0.000	0.002	0.002	0.002
3107	5000.000	2040.005	100.497	20MATR1	0.000	0.000	0.003	0.003	0.003
3108	5000.000	2040.004	100.497	20MATR1	0.000	0.000	0.002	0.002	0.002
3109	5000.001	2040.004	100.496	20MATR2	-0.001	0.001	0.002	0.002	0.002
3110	5000.001	2040.004	100.496	20MATR2	-0.001	0.001	0.002	0.002	0.002
3111	5000.001	2040.004	100.496	20MATR2	-0.001	0.001	0.002	0.002	0.002
3112	5000.001	2040.002	100.496	20MATR3	-0.001	0.001	0.000	0.001	0.001
3113	5000.001	2040.002	100.496	20MATR3	-0.001	0.001	0.000	0.001	0.001
3114	5000.001	2040.002	100.496	20MATR3	-0.001	0.001	0.000	0.001	0.001
3115	4999.997	2040.001	100.496	20MATR4	-0.001	-0.003	-0.001	0.003	0.003
3116	4999.997	2040.001	100.496	20MATR4	-0.001	-0.003	-0.001	0.003	0.003
3117	4999.997	2040.002	100.496	20MATR4	-0.001	-0.003	0.000	0.003	0.003
3118	5000.008	2040.002	100.496	20MATR5	-0.001	0.008	0.000	0.008	0.008
3119	5000.008	2040.002	100.495	20MATR5	-0.002	0.008	0.000	0.008	0.008
3120	5000.008	2040.002	100.496	20MATR5	-0.001	0.008	0.000	0.008	0.008
-	-	-	-	20MATR6					
-	-	-	-	20MATR6					
-	-	-	-	20MATR6					

3121	5000.001	2040.004	100.497	30MATR1	0.000	0.001	0.002	0.002	0.002
3122	5000.001	2040.004	100.496	30MATR1	-0.001	0.001	0.002	0.002	0.002
3123	5000.001	2040.004	100.496	30MATR1	-0.001	0.001	0.002	0.002	0.002
3124	5000.001	2040.004	100.496	30MATR2	-0.001	0.001	0.002	0.002	0.002
3125	5000.001	2040.004	100.496	30MATR2	-0.001	0.001	0.002	0.002	0.002
3126	5000.001	2040.004	100.496	30MATR2	-0.001	0.001	0.002	0.002	0.002
3127	5000.002	2040.002	100.496	30MATR3	-0.001	0.002	0.000	0.002	0.002
3128	5000.002	2040.002	100.495	30MATR3	-0.002	0.002	0.000	0.002	0.003
3129	5000.001	2040.002	100.496	30MATR3	-0.001	0.001	0.000	0.001	0.001
3130	5000.001	2040.002	100.495	30MATR4	-0.002	0.001	0.000	0.001	0.002
3131	5000.001	2040.002	100.496	30MATR4	-0.001	0.001	0.000	0.001	0.001
3132	5000.001	2040.002	100.495	30MATR4	-0.002	0.001	0.000	0.001	0.002
3133	5000.006	2040.002	100.495	30MATR5	-0.002	0.006	0.000	0.006	0.006
3134	5000.006	2040.002	100.495	30MATR5	-0.002	0.006	0.000	0.006	0.006
3135	5000.007	2040.002	100.495	30MATR5	-0.002	0.007	0.000	0.007	0.007
-	-	-	-	30MATR6					
-	-	-	-	30MATR6					
-	-	-	-	30MATR6					
3136	5000.002	2040.004	100.496	37.5MATR1	-0.001	0.002	0.002	0.003	0.003
3137	5000.002	2040.005	100.496	37.5MATR1	-0.001	0.002	0.003	0.004	0.004
3138	5000.002	2040.004	100.496	37.5MATR1	-0.001	0.002	0.002	0.003	0.003
3139	5000.002	2040.004	100.496	37.5MATR2	-0.001	0.002	0.002	0.003	0.003
3140	5000.002	2040.004	100.496	37.5MATR2	-0.001	0.002	0.002	0.003	0.003
3141	5000.002	2040.004	100.496	37.5MATR2	-0.001	0.002	0.002	0.003	0.003
3142	5000.002	2040.002	100.495	37.5MATR3	-0.002	0.002	0.000	0.002	0.003
3143	5000.002	2040.002	100.495	37.5MATR3	-0.002	0.002	0.000	0.002	0.003
3144	5000.002	2040.002	100.496	37.5MATR3	-0.001	0.002	0.000	0.002	0.002
3145	5000.002	2040.001	100.495	37.5MATR4	-0.002	0.002	-0.001	0.002	0.003
3146	5000.002	2040.001	100.496	37.5MATR4	-0.001	0.002	-0.001	0.002	0.002
3147	5000.001	2040.001	100.496	37.5MATR4	-0.001	0.001	-0.001	0.001	0.002
3148	5000.005	2040.001	100.495	37.5MATR5	-0.002	0.005	-0.001	0.005	0.005
3149	5000.005	2040.001	100.495	37.5MATR5	-0.002	0.005	-0.001	0.005	0.005
3150	5000.005	2040.001	100.494	37.5MATR5	-0.003	0.005	-0.001	0.005	0.006
-	-	-	-	37.5MATR6					
-	-	-	-	37.5MATR6					
-	-	-	-	37.5MATR6					

Topcon DS-203AC - 40m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Hz Displ (mm)
CH20NP	5000.000	2040.001	100.497	STN					
3151	5000.000	2040.004	100.497	2.5MNP1	0.000	0.000	0.003	0.003	0.003
3152	5000.000	2040.004	100.497	2.5MNP1	0.000	0.000	0.003	0.003	0.003
3153	5000.000	2040.004	100.497	2.5MNP1	0.000	0.000	0.003	0.003	0.003
3154	5000.000	2040.003	100.497	2.5MNP2	0.000	0.000	0.002	0.002	0.002
3155	5000.000	2040.003	100.497	2.5MNP2	0.000	0.000	0.002	0.002	0.002
3156	5000.000	2040.003	100.497	2.5MNP2	0.000	0.000	0.002	0.002	0.002
3157	5000.000	2040.002	100.497	2.5MNP3	0.000	0.000	0.001	0.001	0.001
3158	5000.000	2040.002	100.497	2.5MNP3	0.000	0.000	0.001	0.001	0.001
3159	5000.000	2040.002	100.497	2.5MNP3	0.000	0.000	0.001	0.001	0.001
3160	5000.000	2040.001	100.497	2.5MNP4	0.000	0.000	0.000	0.000	0.000
3161	5000.000	2040.001	100.497	2.5MNP4	0.000	0.000	0.000	0.000	0.000
3162	5000.000	2040.001	100.497	2.5MNP4	0.000	0.000	0.000	0.000	0.000
3163	5000.000	2040.002	100.497	2.5MNP5	0.000	0.000	0.001	0.001	0.001
3164	5000.000	2040.002	100.497	2.5MNP5	0.000	0.000	0.001	0.001	0.001
3165	5000.000	2040.002	100.497	2.5MNP5	0.000	0.000	0.001	0.001	0.001
3166	5000.000	2040.000	100.498	2.5MNP6	0.001	0.000	-0.001	0.001	0.001
3167	5000.000	2040.000	100.498	2.5MNP6	0.001	0.000	-0.001	0.001	0.001
3168	5000.000	2040.000	100.498	2.5MNP6	0.001	0.000	-0.001	0.001	0.001
3169	5000.000	2040.004	100.498	10MNP1	0.001	0.000	0.003	0.003	0.003
3170	5000.000	2040.003	100.499	10MNP1	0.002	0.000	0.002	0.002	0.003
3171	5000.000	2040.004	100.499	10MNP1	0.002	0.000	0.003	0.003	0.004
3172	5000.000	2040.003	100.498	10MNP2	0.001	0.000	0.002	0.002	0.002
3173	5000.000	2040.003	100.498	10MNP2	0.001	0.000	0.002	0.002	0.002
3174	5000.000	2040.004	100.498	10MNP2	0.001	0.000	0.003	0.003	0.003
3175	5000.000	2040.002	100.497	10MNP3	0.000	0.000	0.001	0.001	0.001
3176	5000.000	2040.002	100.497	10MNP3	0.000	0.000	0.001	0.001	0.001
3177	5000.000	2040.002	100.497	10MNP3	0.000	0.000	0.001	0.001	0.001
3178	5000.000	2040.001	100.497	10MNP4	0.000	0.000	0.000	0.000	0.000
3179	5000.000	2040.002	100.497	10MNP4	0.000	0.000	0.001	0.001	0.001
3180	5000.000	2040.002	100.497	10MNP4	0.000	0.000	0.001	0.001	0.001
3181	5000.001	2040.005	100.497	10MNP5	0.000	0.001	0.004	0.004	0.004
3182	5000.001	2040.005	100.497	10MNP5	0.000	0.001	0.004	0.004	0.004
3183	5000.001	2040.004	100.497	10MNP5	0.000	0.001	0.003	0.003	0.003
3184	5000.001	2040.003	100.497	10MNP6	0.000	0.001	0.002	0.002	0.002
3185	5000.001	2040.003	100.497	10MNP6	0.000	0.001	0.002	0.002	0.002
3186	5000.001	2040.003	100.497	10MNP6	0.000	0.001	0.002	0.002	0.002
3187	5000.000	2040.004	100.499	20MNP1	0.002	0.000	0.003	0.003	0.004
3188	5000.000	2040.004	100.499	20MNP1	0.002	0.000	0.003	0.003	0.004
3189	5000.000	2040.004	100.499	20MNP1	0.002	0.000	0.003	0.003	0.004
3190	5000.000	2040.003	100.499	20MNP2	0.002	0.000	0.002	0.002	0.003
3191	5000.000	2040.003	100.499	20MNP2	0.002	0.000	0.002	0.002	0.003
3192	5000.000	2040.003	100.499	20MNP2	0.002	0.000	0.002	0.002	0.003
3193	5000.000	2040.001	100.497	20MNP3	0.000	0.000	0.000	0.000	0.000
3194	5000.000	2040.001	100.497	20MNP3	0.000	0.000	0.000	0.000	0.000
3195	5000.000	2040.001	100.497	20MNP3	0.000	0.000	0.000	0.000	0.000
3196	5000.001	2040.002	100.497	20MNP4	0.000	0.001	0.001	0.001	0.001
3197	5000.001	2040.002	100.497	20MNP4	0.000	0.001	0.001	0.001	0.001
3198	5000.001	2040.002	100.497	20MNP4	0.000	0.001	0.001	0.001	0.001
3199	5000.001	2040.002	100.497	20MNP5	0.000	0.001	0.001	0.001	0.001
3200	5000.001	2040.002	100.497	20MNP5	0.000	0.001	0.001	0.001	0.001
3201	5000.001	2040.002	100.497	20MNP5	0.000	0.001	0.001	0.001	0.001
3202	5000.001	2040.001	100.496	20MNP6	-0.001	0.001	0.000	0.001	0.001
3203	5000.001	2040.001	100.496	20MNP6	-0.001	0.001	0.000	0.001	0.001
3204	5000.001	2040.001	100.496	20MNP6	-0.001	0.001	0.000	0.001	0.001

3205	5000.001	2040.004	100.499	30MNP1	0.002	0.001	0.003	0.003	0.004
3206	5000.001	2040.004	100.499	30MNP1	0.002	0.001	0.003	0.003	0.004
3207	5000.001	2040.004	100.499	30MNP1	0.002	0.001	0.003	0.003	0.004
3208	5000.001	2040.003	100.500	30MNP1	0.003	0.001	0.002	0.002	0.004
3209	5000.001	2040.003	100.499	30MNP2	0.002	0.001	0.002	0.002	0.003
3210	5000.001	2040.003	100.499	30MNP2	0.002	0.001	0.002	0.002	0.003
3211	5000.001	2040.003	100.499	30MNP2	0.002	0.001	0.002	0.002	0.003
3212	5000.001	2040.001	100.499	30MNP3	0.002	0.001	0.000	0.001	0.002
3213	5000.001	2040.001	100.499	30MNP3	0.002	0.001	0.000	0.001	0.002
3214	5000.001	2040.001	100.499	30MNP3	0.002	0.001	0.000	0.001	0.002
3215	5000.001	2040.001	100.500	30MNP4	0.003	0.001	0.000	0.001	0.003
3216	5000.001	2040.001	100.499	30MNP4	0.002	0.001	0.000	0.001	0.002
3217	5000.001	2040.002	100.499	30MNP4	0.002	0.001	0.001	0.001	0.002
3218	5000.001	2040.003	100.500	30MNP5	0.003	0.001	0.002	0.002	0.004
3219	5000.001	2040.003	100.500	30MNP5	0.003	0.001	0.002	0.002	0.004
3220	5000.001	2040.003	100.500	30MNP5	0.003	0.001	0.002	0.002	0.004
3221	5000.001	2040.001	100.499	30MNP6	0.002	0.001	0.000	0.001	0.002
3222	5000.001	2040.001	100.499	30MNP6	0.002	0.001	0.000	0.001	0.002
3223	5000.001	2040.001	100.499	30MNP6	0.002	0.001	0.000	0.001	0.002
3224	5000.001	2040.004	100.497	37.5MNP1	0.000	0.001	0.003	0.003	0.003
3225	5000.001	2040.004	100.497	37.5MNP1	0.000	0.001	0.003	0.003	0.003
3226	5000.001	2040.004	100.497	37.5MNP1	0.000	0.001	0.003	0.003	0.003
3227	5000.001	2040.003	100.497	37.5MNP2	0.000	0.001	0.002	0.002	0.002
3228	5000.001	2040.003	100.497	37.5MNP2	0.000	0.001	0.002	0.002	0.002
3229	5000.001	2040.003	100.497	37.5MNP2	0.000	0.001	0.002	0.002	0.002
3230	5000.001	2040.001	100.497	37.5MNP3	0.000	0.001	0.000	0.001	0.001
3231	5000.001	2040.001	100.497	37.5MNP3	0.000	0.001	0.000	0.001	0.001
3232	5000.001	2040.001	100.497	37.5MNP3	0.000	0.001	0.000	0.001	0.001
3233	5000.001	2040.002	100.497	37.5MNP4	0.000	0.001	0.001	0.001	0.001
3234	5000.001	2040.003	100.497	37.5MNP4	0.000	0.001	0.002	0.002	0.002
3235	5000.001	2040.002	100.497	37.5MNP4	0.000	0.001	0.001	0.001	0.001
3236	5000.001	2040.003	100.497	37.5MNP5	0.000	0.001	0.002	0.002	0.002
3237	5000.001	2040.003	100.497	37.5MNP5	0.000	0.001	0.002	0.002	0.002
3238	5000.001	2040.003	100.497	37.5MNP5	0.000	0.001	0.002	0.002	0.002
3239	5000.003	2040.001	100.497	37.5MNP6	0.000	0.003	0.000	0.003	0.003
3240	5000.003	2040.002	100.497	37.5MNP6	0.000	0.003	0.001	0.003	0.003
3241	5000.003	2040.002	100.497	37.5MNP6	0.000	0.003	0.001	0.003	0.003

Topcon DS-203-AC 80m (Manual Prism)									
Pt IDr	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH80	5000.000	2079.999	100.884	STN					
4000	5000.003	2080.002	100.889	10MMAN1	0.004	0.003	0.003	0.004	0.006
4001	5000.003	2080.002	100.889	10MMAN1	0.004	0.003	0.003	0.004	0.006
4002	5000.003	2080.001	100.889	10MMAN1	0.004	0.003	0.002	0.004	0.005
4003	5000.004	2080.000	100.889	10MMAN2	0.004	0.004	0.001	0.004	0.006
4004	5000.004	2080.000	100.888	10MMAN2	0.003	0.004	0.001	0.004	0.005
4005	5000.004	2080.000	100.888	10MMAN2	0.003	0.004	0.001	0.004	0.005
4006	5000.003	2079.998	100.889	10MMAN3	0.004	0.003	-0.001	0.003	0.005
4007	5000.003	2079.998	100.888	10MMAN3	0.003	0.003	-0.001	0.003	0.004
4008	5000.003	2079.998	100.888	10MMAN3	0.003	0.003	-0.001	0.003	0.004
4009	5000.001	2079.998	100.887	10MMAN4	0.002	0.001	-0.001	0.001	0.002
4010	5000.001	2079.998	100.888	10MMAN4	0.003	0.001	-0.001	0.001	0.003
4011	5000.001	2079.998	100.888	10MMAN4	0.003	0.001	-0.001	0.001	0.003
4012	5000.002	2079.998	100.886	10MMAN5	0.001	0.002	-0.001	0.002	0.002
4013	5000.002	2079.998	100.886	10MMAN5	0.001	0.002	-0.001	0.002	0.002
4014	5000.002	2079.998	100.886	10MMAN5	0.001	0.002	-0.001	0.002	0.002
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
4015	5000.005	2080.001	100.886	40MMAN1	0.001	0.005	0.002	0.005	0.005
4016	5000.005	2080.001	100.886	40MMAN1	0.001	0.005	0.002	0.005	0.005
4017	5000.005	2080.001	100.886	40MMAN1	0.001	0.005	0.002	0.005	0.005
4018	5000.007	2080.001	100.886	40MMAN2	0.001	0.007	0.002	0.007	0.007
4019	5000.006	2080.001	100.886	40MMAN2	0.001	0.006	0.002	0.006	0.006
4020	5000.007	2080.001	100.886	40MMAN2	0.001	0.007	0.002	0.007	0.007
4021	5000.004	2079.998	100.887	40MMAN3	0.002	0.004	-0.001	0.004	0.005
4022	5000.004	2079.998	100.887	40MMAN3	0.002	0.004	-0.001	0.004	0.005
4023	5000.004	2079.998	100.887	40MMAN3	0.002	0.004	-0.001	0.004	0.005
4024	5000.004	2079.998	100.886	40MMAN4	0.001	0.004	-0.001	0.004	0.004
4025	5000.004	2079.998	100.887	40MMAN4	0.002	0.004	-0.001	0.004	0.005
4026	5000.004	2079.998	100.887	40MMAN4	0.002	0.004	-0.001	0.004	0.005
4027	5000.002	2079.998	100.887	40MMAN5	0.002	0.002	-0.001	0.002	0.003
4028	5000.002	2079.999	100.887	40MMAN5	0.002	0.002	0.000	0.002	0.003
4029	5000.002	2079.999	100.887	40MMAN5	0.002	0.002	0.000	0.002	0.003
-	-	-	-	40MMAN6					
-	-	-	-	40MMAN6					
-	-	-	-	40MMAN6					
4030	5000.001	2080.001	100.886	70MMAN1	0.001	0.001	0.002	0.002	0.002
4031	5000.001	2080.001	100.886	70MMAN1	0.001	0.001	0.002	0.002	0.002
4032	5000.001	2080.001	100.886	70MMAN1	0.001	0.001	0.002	0.002	0.002
4033	5000.001	2080.000	100.886	70MMAN2	0.001	0.001	0.001	0.001	0.002
4034	5000.001	2080.001	100.885	70MMAN2	0.000	0.001	0.002	0.002	0.002
4035	5000.001	2080.001	100.886	70MMAN2	0.001	0.001	0.002	0.002	0.002
4036	5000.001	2079.999	100.885	70MMAN3	0.000	0.001	0.000	0.001	0.001
4037	5000.001	2079.999	100.885	70MMAN3	0.000	0.001	0.000	0.001	0.001
4038	5000.001	2079.999	100.885	70MMAN3	0.000	0.001	0.000	0.001	0.001
4039	5000.004	2079.998	100.885	70MMAN4	0.000	0.004	-0.001	0.004	0.004
4040	5000.004	2079.998	100.885	70MMAN4	0.000	0.004	-0.001	0.004	0.004
4041	5000.004	2079.998	100.885	70MMAN4	0.000	0.004	-0.001	0.004	0.004
4042	5000.003	2079.999	100.886	70MMAN5	0.001	0.003	0.000	0.003	0.003
4043	5000.003	2079.999	100.886	70MMAN5	0.001	0.003	0.000	0.003	0.003
4044	5000.003	2079.999	100.886	70MMAN5	0.001	0.003	0.000	0.003	0.003
-	-	-	-	70MMAN6					
-	-	-	-	70MMAN6					
-	-	-	-	70MMAN6					

Topcon DS-203-AC 80m (ATR)									
Pt IDr	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
4045	5000.006	2080.001	100.887	10MATR1	0.002	0.006	0.002	0.006	0.007
4046	5000.006	2080.001	100.888	10MATR1	0.003	0.006	0.002	0.006	0.007
4047	5000.005	2080.002	100.888	10MATR1	0.003	0.005	0.003	0.006	0.007
4048	5000.006	2080.001	100.884	10MATR2	-0.001	0.006	0.002	0.006	0.006
4049	5000.006	2080.001	100.885	10MATR2	0.000	0.006	0.002	0.006	0.006
4050	5000.006	2080.000	100.884	10MATR2	-0.001	0.006	0.001	0.006	0.006
4051	5000.005	2079.998	100.884	10MATR3	-0.001	0.005	-0.001	0.005	0.005
4052	5000.006	2079.998	100.884	10MATR3	-0.001	0.006	-0.001	0.006	0.006
4053	5000.005	2079.998	100.884	10MATR3	-0.001	0.005	-0.001	0.005	0.005
4054	5000.005	2079.998	100.884	10MATR4	-0.001	0.005	-0.001	0.005	0.005
4055	5000.006	2079.998	100.883	10MATR4	-0.002	0.006	-0.001	0.006	0.006
4056	5000.006	2079.998	100.883	10MATR4	-0.002	0.006	-0.001	0.006	0.006
4057	5000.004	2079.998	100.884	10MATR5	-0.001	0.004	-0.001	0.004	0.004
4058	5000.005	2079.998	100.884	10MATR5	-0.001	0.005	-0.001	0.005	0.005
4059	5000.004	2079.998	100.884	10MATR5	-0.001	0.004	-0.001	0.004	0.004
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
4060	5000.003	2080.001	100.888	40MATR1	0.003	0.003	0.002	0.004	0.005
4061	5000.003	2080.001	100.888	40MATR1	0.003	0.003	0.002	0.004	0.005
4062	5000.004	2080.001	100.888	40MATR1	0.003	0.004	0.002	0.004	0.005
4063	5000.003	2080.000	100.886	40MATR2	0.001	0.003	0.001	0.003	0.003
4064	5000.003	2080.000	100.887	40MATR2	0.002	0.003	0.001	0.003	0.004
4065	5000.002	2080.000	100.886	40MATR2	0.001	0.002	0.001	0.002	0.002
4066	5000.004	2079.998	100.886	40MATR3	0.001	0.004	-0.001	0.004	0.004
4067	5000.004	2079.998	100.886	40MATR3	0.001	0.004	-0.001	0.004	0.004
4068	5000.004	2079.998	100.886	40MATR3	0.001	0.004	-0.001	0.004	0.004
4069	5000.004	2079.998	100.885	40MATR4	0.000	0.004	-0.001	0.004	0.004
4070	5000.003	2079.998	100.885	40MATR4	0.000	0.003	-0.001	0.003	0.003
4071	5000.003	2079.998	100.885	40MATR4	0.000	0.003	-0.001	0.003	0.003
4072	5000.008	2079.999	100.883	40MATR5	-0.002	0.008	0.000	0.008	0.008
4073	5000.008	2079.999	100.884	40MATR5	-0.001	0.008	0.000	0.008	0.008
4074	5000.008	2079.999	100.883	40MATR5	-0.002	0.008	0.000	0.008	0.008
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
4075	5000.004	2080.001	100.885	70MATR1	0.000	0.004	0.002	0.004	0.004
4076	5000.002	2080.001	100.887	70MATR1	0.002	0.002	0.002	0.003	0.003
4077	5000.003	2080.001	100.885	70MATR1	0.000	0.003	0.002	0.004	0.004
4078	5000.003	2080.000	100.885	70MATR2	0.000	0.003	0.001	0.003	0.003
4079	5000.003	2080.000	100.886	70MATR2	0.001	0.003	0.001	0.003	0.003
4080	5000.003	2080.000	100.886	70MATR2	0.001	0.003	0.001	0.003	0.003
4081	5000.003	2079.998	100.885	70MATR3	0.000	0.003	-0.001	0.003	0.003
4082	5000.003	2079.998	100.885	70MATR3	0.000	0.003	-0.001	0.003	0.003
4083	5000.003	2079.998	100.884	70MATR3	-0.001	0.003	-0.001	0.003	0.003
4084	5000.004	2079.999	100.885	70MATR4	0.000	0.004	0.000	0.004	0.004
4085	5000.004	2079.998	100.884	70MATR4	-0.001	0.004	-0.001	0.004	0.004
4086	5000.005	2079.998	100.884	70MATR4	-0.001	0.005	-0.001	0.005	0.005
4087	5000.005	2079.999	100.884	70MATR5	-0.001	0.005	0.000	0.005	0.005
4088	5000.004	2079.999	100.885	70MATR5	0.000	0.004	0.000	0.004	0.004
4089	5000.005	2079.999	100.884	70MATR5	-0.001	0.005	0.000	0.005	0.005
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					

Topcon DS-203-AC 80m (Manual Non-Prism)									
Pt IDr	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH80NP	5000.005	2079.998	100.887	CTLMNP					
4090	5000.002	2080.000	100.892	10MNP1	0.005	-0.003	0.002	0.004	0.006
4091	5000.002	2080.000	100.892	10MNP1	0.005	-0.003	0.002	0.004	0.006
4092	5000.002	2080.000	100.892	10MNP1	0.005	-0.003	0.002	0.004	0.006
4093	5000.003	2080.000	100.885	10MNP2	-0.002	-0.002	0.002	0.003	0.003
4094	5000.003	2079.999	100.886	10MNP2	-0.001	-0.002	0.001	0.002	0.002
4095	5000.003	2079.999	100.886	10MNP2	-0.001	-0.002	0.001	0.002	0.002
4096	5000.003	2079.997	100.886	10MNP3	-0.001	-0.002	-0.001	0.002	0.002
4097	5000.003	2079.997	100.886	10MNP3	-0.001	-0.002	-0.001	0.002	0.002
4098	5000.003	2079.997	100.886	10MNP3	-0.001	-0.002	-0.001	0.002	0.002
4099	5000.003	2079.998	100.886	10MNP4	-0.001	-0.002	0.000	0.002	0.002
4100	5000.003	2079.998	100.887	10MNP4	0.000	-0.002	0.000	0.002	0.002
4101	5000.003	2079.997	100.887	10MNP4	0.000	-0.002	-0.001	0.002	0.002
4102	5000.003	2079.999	100.886	10MNP5	-0.001	-0.002	0.001	0.002	0.002
4103	5000.003	2080.008	100.886	10MNP5	-0.001	-0.002	0.010	0.010	0.010
4104	5000.003	2080.008	100.886	10MNP5	-0.001	-0.002	0.010	0.010	0.010
4105	5000.003	2080.006	100.885	10MNP6	-0.002	-0.002	0.008	0.008	0.008
4106	5000.003	2080.006	100.885	10MNP6	-0.002	-0.002	0.008	0.008	0.008
4107	5000.003	2080.006	100.885	10MNP6	-0.002	-0.002	0.008	0.008	0.008
4108	5000.004	2080.000	100.887	40MNP1	0.000	-0.001	0.002	0.002	0.002
4109	5000.004	2080.000	100.887	40MNP1	0.000	-0.001	0.002	0.002	0.002
4110	5000.004	2080.000	100.887	40MNP1	0.000	-0.001	0.002	0.002	0.002
4111	5000.004	2079.999	100.887	40MNP2	0.000	-0.001	0.001	0.001	0.001
4112	5000.004	2079.999	100.887	40MNP2	0.000	-0.001	0.001	0.001	0.001
4113	5000.004	2079.999	100.887	40MNP2	0.000	-0.001	0.001	0.001	0.001
4114	5000.006	2079.997	100.887	40MNP3	0.000	0.001	-0.001	0.001	0.001
4115	5000.006	2079.997	100.887	40MNP3	0.000	0.001	-0.001	0.001	0.001
4116	5000.006	2079.997	100.887	40MNP3	0.000	0.001	-0.001	0.001	0.001
4117	5000.006	2079.999	100.887	40MNP4	0.000	0.001	0.001	0.001	0.001
4118	5000.006	2079.998	100.887	40MNP4	0.000	0.001	0.000	0.001	0.001
4119	5000.006	2079.998	100.887	40MNP4	0.000	0.001	0.000	0.001	0.001
4120	5000.006	2079.999	100.887	40MNP5	0.000	0.001	0.001	0.001	0.001
4121	5000.006	2079.999	100.887	40MNP5	0.000	0.001	0.001	0.001	0.001
4122	5000.006	2079.999	100.887	40MNP5	0.000	0.001	0.001	0.001	0.001
4123	5000.006	2079.998	100.887	40MNP6	0.000	0.001	0.000	0.001	0.001
4124	5000.006	2079.998	100.887	40MNP6	0.000	0.001	0.000	0.001	0.001
4125	5000.006	2079.998	100.887	40MNP6	0.000	0.001	0.000	0.001	0.001
4126	5000.005	2080.000	100.886	70MNP1	-0.001	0.000	0.002	0.002	0.002
4127	5000.005	2080.000	100.886	70MNP1	-0.001	0.000	0.002	0.002	0.002
4128	5000.005	2080.000	100.886	70MNP1	-0.001	0.000	0.002	0.002	0.002
4129	5000.004	2080.000	100.887	70MNP2	0.000	-0.001	0.002	0.002	0.002
4130	5000.004	2080.000	100.887	70MNP2	0.000	-0.001	0.002	0.002	0.002
4131	5000.004	2080.000	100.887	70MNP2	0.000	-0.001	0.002	0.002	0.002
4132	5000.004	2079.998	100.887	70MNP3	0.000	-0.001	0.000	0.001	0.001
4133	5000.004	2079.997	100.887	70MNP3	0.000	-0.001	-0.001	0.001	0.001
4134	5000.004	2079.998	100.887	70MNP3	0.000	-0.001	0.000	0.001	0.001
4135	5000.004	2079.999	100.887	70MNP4	0.000	-0.001	0.001	0.001	0.001
4136	5000.004	2079.999	100.887	70MNP4	0.000	-0.001	0.001	0.001	0.001
4137	5000.004	2079.999	100.886	70MNP4	-0.001	-0.001	0.001	0.001	0.002
4138	5000.004	2079.999	100.887	70MNP5	0.000	-0.001	0.001	0.001	0.001
4139	5000.004	2079.999	100.887	70MNP5	0.000	-0.001	0.001	0.001	0.001
4140	5000.004	2079.999	100.887	70MNP5	0.000	-0.001	0.001	0.001	0.001
4141	5000.004	2079.997	100.887	70MNP6	0.000	-0.001	-0.001	0.001	0.001
4142	5000.004	2079.997	100.887	70MNP6	0.000	-0.001	-0.001	0.001	0.001
4143	5000.004	2079.997	100.887	70MNP6	0.000	-0.001	-0.001	0.001	0.001

Topcon DS-203AC - 160m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH160	5000.000	2159.997	101.488	STN					
5000	4999.999	2160.000	101.496	10MMAN1	0.008	-0.001	0.003	0.003	0.009
5001	4999.999	2160.000	101.496	10MMAN1	0.008	-0.001	0.003	0.003	0.009
5002	4999.999	2160.000	101.496	10MMAN1	0.008	-0.001	0.003	0.003	0.009
5003	4999.999	2159.999	101.486	10MMAN2	-0.002	-0.001	0.002	0.002	0.003
5004	4999.999	2159.999	101.485	10MMAN2	-0.003	-0.001	0.002	0.002	0.004
5005	4999.999	2159.999	101.486	10MMAN2	-0.002	-0.001	0.002	0.002	0.003
5006	4999.999	2159.997	101.485	10MMAN3	-0.003	-0.001	0.000	0.001	0.003
5007	4999.999	2159.997	101.485	10MMAN3	-0.003	-0.001	0.000	0.001	0.003
5008	4999.999	2159.997	101.485	10MMAN3	-0.003	-0.001	0.000	0.001	0.003
5009	5000.001	2159.997	101.485	10MMAN4	-0.003	0.001	0.000	0.001	0.003
5010	5000.000	2159.997	101.485	10MMAN4	-0.003	0.000	0.000	0.000	0.003
5011	5000.000	2159.997	101.485	10MMAN4	-0.003	0.000	0.000	0.000	0.003
5012	5000.001	2159.998	101.485	10MMAN5	-0.003	0.001	0.001	0.001	0.003
5013	5000.001	2159.998	101.485	10MMAN5	-0.003	0.001	0.001	0.001	0.003
5014	5000.001	2159.999	101.485	10MMAN5	-0.003	0.001	0.002	0.002	0.004
5015	5000.000	2160.000	101.484	10MMAN6	-0.004	0.000	0.003	0.003	0.005
5016	5000.000	2160.000	101.484	10MMAN6	-0.004	0.000	0.003	0.003	0.005
5017	5000.000	2159.999	101.484	10MMAN6	-0.004	0.000	0.002	0.002	0.004
5018	5000.002	2160.001	101.487	80MMAN1	-0.001	0.002	0.004	0.004	0.005
5019	5000.002	2160.001	101.487	80MMAN1	-0.001	0.002	0.004	0.004	0.005
5020	5000.002	2160.001	101.487	80MMAN1	-0.001	0.002	0.004	0.004	0.005
5021	5000.002	2159.999	101.487	80MMAN2	-0.001	0.002	0.002	0.003	0.003
5022	5000.002	2159.999	101.487	80MMAN2	-0.001	0.002	0.002	0.003	0.003
5023	5000.002	2159.999	101.487	80MMAN2	-0.001	0.002	0.002	0.003	0.003
5024	5000.003	2159.998	101.487	80MMAN3	-0.001	0.003	0.001	0.003	0.003
5025	5000.003	2159.997	101.487	80MMAN3	-0.001	0.003	0.000	0.003	0.003
5026	5000.003	2159.998	101.487	80MMAN3	-0.001	0.003	0.001	0.003	0.003
5027	5000.003	2159.997	101.487	80MMAN4	-0.001	0.003	0.000	0.003	0.003
5028	5000.003	2159.997	101.487	80MMAN4	-0.001	0.003	0.000	0.003	0.003
5029	5000.003	2159.997	101.487	80MMAN4	-0.001	0.003	0.000	0.003	0.003
5030	5000.002	2159.997	101.487	80MMAN5	-0.001	0.002	0.000	0.002	0.002
5031	5000.002	2159.998	101.487	80MMAN5	-0.001	0.002	0.001	0.002	0.002
5032	5000.002	2159.997	101.487	80MMAN5	-0.001	0.002	0.000	0.002	0.002
5033	5000.002	2159.997	101.487	80MMAN6	-0.001	0.002	0.000	0.002	0.002
5034	5000.002	2159.997	101.487	80MMAN6	-0.001	0.002	0.000	0.002	0.002
5035	5000.002	2159.997	101.487	80MMAN6	-0.001	0.002	0.000	0.002	0.002
5036	5000.003	2160.000	101.487	150MMAN1	-0.001	0.003	0.003	0.004	0.004
5037	5000.003	2160.000	101.487	150MMAN1	-0.001	0.003	0.003	0.004	0.004
5038	5000.003	2160.000	101.487	150MMAN1	-0.001	0.003	0.003	0.004	0.004
5039	5000.003	2160.000	101.487	150MMAN2	-0.001	0.003	0.003	0.004	0.004
5040	5000.003	2159.999	101.487	150MMAN2	-0.001	0.003	0.002	0.004	0.004
5041	5000.003	2159.999	101.487	150MMAN2	-0.001	0.003	0.002	0.004	0.004
5042	5000.003	2159.997	101.487	150MMAN3	-0.001	0.003	0.000	0.003	0.003
5043	5000.003	2159.997	101.487	150MMAN3	-0.001	0.003	0.000	0.003	0.003
5044	5000.003	2159.997	101.487	150MMAN3	-0.001	0.003	0.000	0.003	0.003
5045	5000.003	2159.998	101.487	150MMAN4	-0.001	0.003	0.001	0.003	0.003
5046	5000.003	2159.998	101.487	150MMAN4	-0.001	0.003	0.001	0.003	0.003
5047	5000.003	2159.998	101.487	150MMAN4	-0.001	0.003	0.001	0.003	0.003
5048	5000.003	2159.997	101.487	150MMAN5	-0.001	0.003	0.000	0.003	0.003
5049	5000.003	2159.997	101.487	150MMAN5	-0.001	0.003	0.000	0.003	0.003
5050	5000.003	2159.997	101.487	150MMAN5	-0.001	0.003	0.000	0.003	0.003
5051	5000.003	2159.997	101.486	150MMAN6	-0.002	0.003	0.000	0.003	0.004
5052	5000.003	2159.997	101.486	150MMAN6	-0.002	0.003	0.000	0.003	0.004
5053	5000.003	2159.997	101.486	150MMAN6	-0.002	0.003	0.000	0.003	0.004

Topcon DS-203AC - 160m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
5054	5000.003	2160.000	101.491	10MATR1	0.003	0.003	0.003	0.004	0.005
5055	5000.003	2160.000	101.491	10MATR1	0.003	0.003	0.003	0.004	0.005
5056	5000.003	2160.000	101.492	10MATR1	0.004	0.003	0.003	0.004	0.006
5057	4999.999	2159.999	101.485	10MATR2	-0.003	-0.001	0.002	0.002	0.004
5058	5000.002	2159.999	101.486	10MATR2	-0.002	0.002	0.002	0.003	0.003
5059	5000.002	2160.000	101.487	10MATR2	-0.001	0.002	0.003	0.004	0.004
5060	5000.002	2159.997	101.487	10MATR3	-0.001	0.002	0.000	0.002	0.002
5061	5000.002	2159.997	101.486	10MATR3	-0.002	0.002	0.000	0.002	0.003
5062	5000.002	2159.997	101.487	10MATR3	-0.001	0.002	0.000	0.002	0.002
5063	5000.002	2159.997	101.487	10MATR4	-0.001	0.002	0.000	0.002	0.002
5064	5000.002	2159.997	101.487	10MATR4	-0.001	0.002	0.000	0.002	0.002
5065	5000.002	2159.997	101.486	10MATR4	-0.002	0.002	0.000	0.002	0.003
5066	5000.005	2159.997	101.487	10MATR5	-0.001	0.005	0.000	0.005	0.005
5067	5000.004	2159.998	101.487	10MATR5	-0.001	0.004	0.001	0.004	0.004
5068	5000.005	2159.998	101.487	10MATR5	-0.001	0.005	0.001	0.005	0.005
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
5069	5000.002	2160.000	101.491	80MATR1	0.003	0.002	0.003	0.004	0.005
5070	5000.002	2160.000	101.491	80MATR1	0.003	0.002	0.003	0.004	0.005
5071	5000.002	2160.000	101.491	80MATR1	0.003	0.002	0.003	0.004	0.005
5072	5000.002	2159.999	101.487	80MATR2	-0.001	0.002	0.002	0.003	0.003
5073	5000.002	2160.000	101.487	80MATR2	-0.001	0.002	0.003	0.004	0.004
5074	5000.002	2160.000	101.487	80MATR2	-0.001	0.002	0.003	0.004	0.004
5075	5000.003	2159.997	101.489	80MATR3	0.001	0.003	0.000	0.003	0.003
5076	5000.004	2159.997	101.489	80MATR3	0.001	0.004	0.000	0.004	0.004
5077	5000.004	2159.997	101.489	80MATR3	0.001	0.004	0.000	0.004	0.004
5078	5000.004	2159.998	101.489	80MATR4	0.001	0.004	0.001	0.004	0.004
5079	5000.004	2159.998	101.489	80MATR4	0.001	0.004	0.001	0.004	0.004
5080	5000.004	2159.998	101.489	80MATR4	0.001	0.004	0.001	0.004	0.004
5081	5000.003	2159.998	101.487	80MATR5	-0.001	0.003	0.001	0.003	0.003
5082	5000.003	2159.997	101.487	80MATR5	-0.001	0.003	0.000	0.003	0.003
5083	5000.002	2159.998	101.487	80MATR5	-0.001	0.002	0.001	0.002	0.002
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
5084	5000.003	2160.000	101.489	150MATR1	0.001	0.003	0.003	0.004	0.004
5085	5000.003	2160.000	101.489	150MATR1	0.001	0.003	0.003	0.004	0.004
5086	5000.003	2160.000	101.489	150MATR1	0.001	0.003	0.003	0.004	0.004
5087	5000.004	2160.000	101.487	150MATR2	-0.001	0.004	0.003	0.005	0.005
5088	5000.004	2160.000	101.488	150MATR2	0.000	0.004	0.003	0.005	0.005
5089	5000.004	2160.000	101.488	150MATR2	0.000	0.004	0.003	0.005	0.005
5090	5000.002	2159.997	101.488	150MATR3	0.000	0.002	0.000	0.002	0.002
5091	5000.003	2159.997	101.489	150MATR3	0.001	0.003	0.000	0.003	0.003
5092	5000.002	2159.998	101.488	150MATR3	0.000	0.002	0.001	0.002	0.002
5093	5000.003	2159.997	101.488	150MATR4	0.000	0.003	0.000	0.003	0.003
5094	5000.004	2159.998	101.488	150MATR4	0.000	0.004	0.001	0.004	0.004
5095	5000.004	2159.997	101.488	150MATR4	0.000	0.004	0.000	0.004	0.004
5096	5000.005	2159.998	101.488	150MATR5	0.000	0.005	0.001	0.005	0.005
5097	5000.005	2159.998	101.488	150MATR5	0.000	0.005	0.001	0.005	0.005
5098	5000.005	2159.998	101.488	150MATR5	0.000	0.005	0.001	0.005	0.005
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					

Topcon DS-203AC - 160m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH160NP	5000.003	2160.000	101.493	STN					
5099	5000.004	2160.005	101.491	10MNP1	-0.002	0.001	0.005	0.005	0.005
5100	5000.004	2160.005	101.491	10MNP1	-0.002	0.001	0.005	0.005	0.005
5101	5000.004	2160.005	101.491	10MNP1	-0.002	0.001	0.005	0.005	0.005
5102	5000.005	2160.005	101.491	10MNP2	-0.002	0.002	0.005	0.005	0.006
5103	5000.005	2160.005	101.491	10MNP2	-0.002	0.002	0.005	0.005	0.006
5104	5000.005	2160.005	101.491	10MNP2	-0.002	0.002	0.005	0.005	0.006
5105	5000.002	2159.999	101.491	10MNP3	-0.002	-0.001	-0.001	0.001	0.002
5106	5000.003	2159.999	101.491	10MNP3	-0.002	0.000	-0.001	0.001	0.002
5107	5000.003	2159.999	101.491	10MNP3	-0.002	0.000	-0.001	0.001	0.002
5108	5000.005	2160.005	101.496	10MNP4	0.003	0.002	0.005	0.005	0.006
5109	5000.005	2160.005	101.496	10MNP4	0.003	0.002	0.005	0.005	0.006
5110	5000.005	2160.004	101.496	10MNP4	0.003	0.002	0.004	0.004	0.005
5111	5000.004	2160.007	101.496	10MNP5	0.003	0.001	0.007	0.007	0.008
5112	5000.004	2160.005	101.496	10MNP5	0.003	0.001	0.005	0.005	0.006
5113	5000.004	2160.003	101.496	10MNP5	0.003	0.001	0.003	0.003	0.004
5114	5000.000	2009.978	100.119	10MNP6	-1.374	-0.003	-150.022	150.022	150.028
5115	5000.000	2009.977	100.119	10MNP6	-1.374	-0.003	-150.023	150.023	150.029
5116	5000.000	2009.977	100.119	10MNP6	-1.374	-0.003	-150.023	150.023	150.029
5117	5000.001	2160.001	101.496	80MNP1	0.003	-0.002	0.001	0.002	0.004
5118	5000.001	2160.001	101.496	80MNP1	0.003	-0.002	0.001	0.002	0.004
5119	5000.001	2160.002	101.496	80MNP1	0.003	-0.002	0.002	0.003	0.004
5120	5000.000	2160.001	101.496	80MNP2	0.003	-0.003	0.001	0.003	0.004
5121	5000.000	2160.001	101.496	80MNP2	0.003	-0.003	0.001	0.003	0.004
5122	5000.000	2160.001	101.496	80MNP2	0.003	-0.003	0.001	0.003	0.004
5123	5000.003	2159.998	101.496	80MNP3	0.003	0.000	-0.002	0.002	0.004
5124	5000.003	2159.998	101.496	80MNP3	0.003	0.000	-0.002	0.002	0.004
5125	5000.003	2159.999	101.496	80MNP3	0.003	0.000	-0.001	0.001	0.003
5126	5000.004	2159.999	101.495	80MNP4	0.002	0.001	-0.001	0.001	0.002
5127	5000.004	2159.999	101.496	80MNP4	0.003	0.001	-0.001	0.001	0.003
5128	5000.004	2159.999	101.496	80MNP4	0.003	0.001	-0.001	0.001	0.003
5129	5000.004	2160.000	101.496	80MNP5	0.003	0.001	0.000	0.001	0.003
5130	5000.004	2160.000	101.496	80MNP5	0.003	0.001	0.000	0.001	0.003
5131	5000.004	2160.000	101.496	80MNP5	0.003	0.001	0.000	0.001	0.003
5132	5000.003	2159.999	101.496	80MNP6	0.003	0.000	-0.001	0.001	0.003
5133	5000.003	2159.999	101.496	80MNP6	0.003	0.000	-0.001	0.001	0.003
5134	5000.003	2160.000	101.496	80MNP6	0.003	0.000	0.000	0.000	0.003
5135	5000.003	2160.003	101.492	150MNP1	-0.001	0.000	0.003	0.003	0.003
5136	5000.003	2160.003	101.493	150MNP1	0.000	0.000	0.003	0.003	0.003
5137	5000.003	2160.003	101.492	150MNP1	-0.001	0.000	0.003	0.003	0.003
5138	5000.003	2160.001	101.493	150MNP2	0.000	0.000	0.001	0.001	0.001
5139	5000.003	2160.002	101.493	150MNP2	0.000	0.000	0.002	0.002	0.002
5140	5000.003	2160.002	101.493	150MNP2	0.000	0.000	0.002	0.002	0.002
5141	5000.003	2160.000	101.492	150MNP3	-0.001	0.000	0.000	0.000	0.001
5142	5000.003	2160.000	101.493	150MNP3	0.000	0.000	0.000	0.000	0.000
5143	5000.003	2160.000	101.493	150MNP3	0.000	0.000	0.000	0.000	0.000
5144	5000.003	2159.999	101.492	150MNP4	-0.001	0.000	-0.001	0.001	0.001
5145	5000.003	2160.000	101.492	150MNP4	-0.001	0.000	0.000	0.000	0.001
5146	5000.003	2160.000	101.493	150MNP4	0.000	0.000	0.000	0.000	0.000
5147	5000.004	2160.002	101.492	150MNP5	-0.001	0.001	0.002	0.002	0.002
5148	5000.004	2160.002	101.492	150MNP5	-0.001	0.001	0.002	0.002	0.002
5149	5000.004	2160.001	101.493	150MNP5	0.000	0.001	0.001	0.001	0.001
5150	5000.004	2159.994	101.493	150MNP6	0.000	0.001	-0.006	0.006	0.006
5151	5000.004	2159.994	101.493	150MNP6	0.000	0.001	-0.006	0.006	0.006
5152	5000.004	2159.995	101.493	150MNP6	0.000	0.001	-0.005	0.005	0.005

APPENDIX G TRIMBLE SPS930 DR + REDUCED FIELD DATA

Trimble SPS930 DR+ - 10m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH10	5000.000	2009.996	100.149	STN					
1000	5000.000	2009.998	100.150	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
1001	5000.000	2009.997	100.150	2.5MMAN1	0.001	0.000	0.001	0.001	0.001
1002	5000.000	2009.998	100.150	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
1003	5000.000	2009.997	100.149	2.5MMAN2	0.000	0.000	0.001	0.001	0.001
1004	5000.000	2009.996	100.149	2.5MMAN2	0.000	0.000	0.000	0.000	0.000
1005	5000.000	2009.997	100.149	2.5MMAN2	0.000	0.000	0.001	0.001	0.001
1006	5000.001	2009.996	100.149	2.5MMAN3	0.000	0.001	0.000	0.001	0.001
1007	5000.001	2009.995	100.149	2.5MMAN3	0.000	0.001	-0.001	0.001	0.001
1008	5000.001	2009.995	100.149	2.5MMAN3	0.000	0.001	-0.001	0.001	0.001
1009	5000.000	2009.995	100.148	2.5MMAN4	-0.001	0.000	-0.001	0.001	0.001
1010	5000.000	2009.994	100.148	2.5MMAN4	-0.001	0.000	-0.002	0.002	0.002
1011	5000.000	2009.994	100.148	2.5MMAN4	-0.001	0.000	-0.002	0.002	0.002
1012	5000.000	2009.995	100.149	2.5MMAN5	0.000	0.000	-0.001	0.001	0.001
1013	5000.000	2009.995	100.149	2.5MMAN5	0.000	0.000	-0.001	0.001	0.001
1014	5000.000	2009.994	100.149	2.5MMAN5	0.000	0.000	-0.002	0.002	0.002
1015	5000.001	2009.995	100.149	2.5MMAN6	0.000	0.001	-0.001	0.001	0.001
1016	5000.001	2009.996	100.149	2.5MMAN6	0.000	0.001	0.000	0.001	0.001
1017	5000.001	2009.995	100.149	2.5MMAN6	0.000	0.001	-0.001	0.001	0.001
1018	5000.001	2009.998	100.149	5MMAN1	0.000	0.001	0.002	0.002	0.002
1019	5000.001	2009.997	100.149	5MMAN1	0.000	0.001	0.001	0.001	0.001
1020	5000.001	2009.997	100.149	5MMAN1	0.000	0.001	0.001	0.001	0.001
1021	5000.000	2009.997	100.148	5MMAN2	-0.001	0.000	0.001	0.001	0.001
1022	5000.000	2009.996	100.148	5MMAN2	-0.001	0.000	0.000	0.000	0.001
1023	5000.000	2009.997	100.148	5MMAN2	-0.001	0.000	0.001	0.001	0.001
1024	5000.000	2009.995	100.148	5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1025	5000.000	2009.995	100.148	5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1026	5000.000	2009.995	100.148	5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1027	5000.000	2009.994	100.149	5MMAN4	0.000	0.000	-0.002	0.002	0.002
1028	5000.000	2009.995	100.149	5MMAN4	0.000	0.000	-0.001	0.001	0.001
1029	5000.000	2009.995	100.149	5MMAN4	0.000	0.000	-0.001	0.001	0.001
1030	5000.000	2009.996	100.149	5MMAN5	0.000	0.000	0.000	0.000	0.000
1031	5000.000	2009.995	100.149	5MMAN5	0.000	0.000	-0.001	0.001	0.001
1032	5000.000	2009.996	100.149	5MMAN5	0.000	0.000	0.000	0.000	0.000
1033	5000.000	2009.994	100.148	5MMAN6	-0.001	0.000	-0.002	0.002	0.002
1034	5000.000	2009.995	100.148	5MMAN6	-0.001	0.000	-0.001	0.001	0.001
1035	5000.000	2009.993	100.148	5MMAN6	-0.001	0.000	-0.003	0.003	0.003
1036	5000.000	2009.997	100.149	7.5MMAN1	0.000	0.000	0.001	0.001	0.001
1037	5000.000	2009.997	100.149	7.5MMAN1	0.000	0.000	0.001	0.001	0.001
1038	5000.000	2009.997	100.149	7.5MMAN1	0.000	0.000	0.001	0.001	0.001
1039	5000.000	2009.997	100.148	7.5MMAN2	-0.001	0.000	0.001	0.001	0.001
1040	5000.000	2009.996	100.148	7.5MMAN2	-0.001	0.000	0.000	0.000	0.001
1041	5000.000	2009.996	100.148	7.5MMAN2	-0.001	0.000	0.000	0.000	0.001
1042	5000.000	2009.995	100.148	7.5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1043	5000.000	2009.995	100.148	7.5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1044	5000.000	2009.995	100.148	7.5MMAN3	-0.001	0.000	-0.001	0.001	0.001
1045	5000.000	2009.996	100.149	7.5MMAN4	0.000	0.000	0.000	0.000	0.000
1046	5000.000	2009.994	100.148	7.5MMAN4	-0.001	0.000	-0.002	0.002	0.002
1047	5000.000	2009.995	100.148	7.5MMAN4	-0.001	0.000	-0.001	0.001	0.001
1048	5000.000	2009.993	100.147	7.5MMAN5	-0.002	0.000	-0.003	0.003	0.004
1049	5000.000	2009.994	100.147	7.5MMAN5	-0.002	0.000	-0.002	0.002	0.003
1050	5000.000	2009.991	100.147	7.5MMAN5	-0.002	0.000	-0.005	0.005	0.005
1051	5000.000	2009.995	100.149	7.5MMAN6	0.000	0.000	-0.001	0.001	0.001
1052	5000.000	2009.994	100.149	7.5MMAN6	0.000	0.000	-0.002	0.002	0.002
1053	5000.000	2009.994	100.149	7.5MMAN6	0.000	0.000	-0.002	0.002	0.002

Trimble SPS930 DR+ - 10m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
1054	5000.000	2009.999	100.150	2.5MATR1	0.001	0.000	0.003	0.003	0.003
1055	5000.000	2009.998	100.150	2.5MATR1	0.001	0.000	0.002	0.002	0.002
1056	5000.000	2009.997	100.150	2.5MATR1	0.001	0.000	0.001	0.001	0.001
1057	5000.000	2009.997	100.149	2.5MATR2	0.000	0.000	0.001	0.001	0.001
1058	5000.000	2009.996	100.149	2.5MATR2	0.000	0.000	0.000	0.000	0.000
1059	5000.000	2009.996	100.149	2.5MATR2	0.000	0.000	0.000	0.000	0.000
1060	5000.000	2009.994	100.150	2.5MATR3	0.001	0.000	-0.002	0.002	0.002
1061	5000.000	2009.995	100.150	2.5MATR3	0.001	0.000	-0.001	0.001	0.001
1062	5000.000	2009.994	100.150	2.5MATR3	0.001	0.000	-0.002	0.002	0.002
1063	5000.004	2009.994	100.148	2.5MATR4	-0.001	0.004	-0.002	0.004	0.005
1064	5000.003	2009.994	100.148	2.5MATR4	-0.001	0.003	-0.002	0.004	0.004
1065	5000.004	2009.994	100.148	2.5MATR4	-0.001	0.004	-0.002	0.004	0.005
1066	5000.006	2009.994	100.151	2.5MATR5	0.002	0.006	-0.002	0.006	0.007
1067	5000.005	2009.995	100.152	2.5MATR5	0.003	0.005	-0.001	0.005	0.006
1068	5000.005	2009.994	100.152	2.5MATR5	0.003	0.005	-0.002	0.005	0.006
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
1069	5000.000	2009.998	100.150	5MATR1	0.001	0.000	0.002	0.002	0.002
1070	5000.000	2009.998	100.150	5MATR1	0.001	0.000	0.002	0.002	0.002
1071	5000.000	2009.998	100.150	5MATR1	0.001	0.000	0.002	0.002	0.002
1072	5000.000	2009.997	100.149	5MATR2	0.000	0.000	0.001	0.001	0.001
1073	5000.000	2009.996	100.149	5MATR2	0.000	0.000	0.000	0.000	0.000
1074	5000.000	2009.997	100.149	5MATR2	0.000	0.000	0.001	0.001	0.001
1075	5000.000	2009.995	100.149	5MATR3	0.000	0.000	-0.001	0.001	0.001
1076	5000.000	2009.994	100.149	5MATR3	0.000	0.000	-0.002	0.002	0.002
1077	5000.000	2009.995	100.149	5MATR3	0.000	0.000	-0.001	0.001	0.001
1078	5000.000	2009.995	100.149	5MATR4	0.000	0.000	-0.001	0.001	0.001
1079	5000.000	2009.995	100.149	5MATR4	0.000	0.000	-0.001	0.001	0.001
1080	5000.000	2009.994	100.149	5MATR4	0.000	0.000	-0.002	0.002	0.002
1081	5000.000	2009.997	100.150	5MATR5	0.001	0.000	0.001	0.001	0.001
1082	4999.997	2009.997	100.146	5MATR5	-0.003	-0.003	0.001	0.003	0.004
1083	5000.002	2009.996	100.152	5MATR5	0.003	0.002	0.000	0.002	0.004
-	-	-	-	5MATR6					
-	-	-	-	5MATR6					
-	-	-	-	5MATR6					
1084	5000.000	2009.997	100.149	7.5MATR1	0.000	0.000	0.001	0.001	0.001
1085	5000.000	2009.997	100.149	7.5MATR1	0.000	0.000	0.001	0.001	0.001
1086	5000.000	2009.997	100.149	7.5MATR1	0.000	0.000	0.001	0.001	0.001
1087	5000.000	2009.997	100.149	7.5MATR2	0.000	0.000	0.001	0.001	0.001
1088	5000.000	2009.997	100.149	7.5MATR2	0.000	0.000	0.001	0.001	0.001
1089	5000.000	2009.997	100.149	7.5MATR2	0.000	0.000	0.001	0.001	0.001
1090	5000.000	2009.995	100.149	7.5MATR3	0.000	0.000	-0.001	0.001	0.001
1091	5000.000	2009.994	100.149	7.5MATR3	0.000	0.000	-0.002	0.002	0.002
1092	5000.000	2009.995	100.149	7.5MATR3	0.000	0.000	-0.001	0.001	0.001
1093	5000.002	2009.995	100.149	7.5MATR4	0.000	0.002	-0.001	0.002	0.002
1094	5000.002	2009.995	100.148	7.5MATR4	-0.001	0.002	-0.001	0.002	0.002
1095	5000.002	2009.995	100.149	7.5MATR4	0.000	0.002	-0.001	0.002	0.002
1096	5000.005	2009.995	100.147	7.5MATR5	-0.002	0.005	-0.001	0.005	0.005
1097	5000.003	2009.996	100.146	7.5MATR5	-0.003	0.003	0.000	0.003	0.004
1098	5000.004	2009.996	100.147	7.5MATR5	-0.002	0.004	0.000	0.004	0.004
1099	5000.000	2009.995	100.149	7.5MATR6	0.000	0.000	-0.001	0.001	0.001
1100	5000.000	2009.995	100.149	7.5MATR6	0.000	0.000	-0.001	0.001	0.001
1101	5000.000	2009.994	100.149	7.5MATR6	0.000	0.000	-0.002	0.002	0.002

Trimble SPS930 DR+ - 10m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH10NP	5000.000	2009.996	100.149	CLRNP					
1102	5000.000	2009.998	100.150	2.5MNP1	0.001	0.000	0.002	0.002	0.002
1103	5000.000	2009.997	100.150	2.5MNP1	0.001	0.000	0.001	0.001	0.001
1104	5000.000	2009.998	100.150	2.5MNP1	0.001	0.000	0.002	0.002	0.002
1105	5000.000	2009.998	100.150	2.5MNP2	0.001	0.000	0.002	0.002	0.002
1106	5000.000	2009.998	100.150	2.5MNP2	0.001	0.000	0.002	0.002	0.002
1107	5000.000	2009.997	100.150	2.5MNP2	0.001	0.000	0.001	0.001	0.001
1108	5000.001	2009.996	100.149	2.5MNP3	0.000	0.001	0.000	0.001	0.001
1109	5000.001	2009.996	100.149	2.5MNP3	0.000	0.001	0.000	0.001	0.001
1110	5000.001	2009.997	100.149	2.5MNP3	0.000	0.001	0.001	0.001	0.001
1111	5000.001	2009.994	100.149	2.5MNP4	0.000	0.001	-0.002	0.002	0.002
1112	5000.001	2009.996	100.149	2.5MNP4	0.000	0.001	0.000	0.001	0.001
1113	5000.001	2009.994	100.149	2.5MNP4	0.000	0.001	-0.002	0.002	0.002
1114	5000.000	2009.994	100.149	2.5MNP5	0.000	0.000	-0.002	0.002	0.002
1115	5000.000	2009.997	100.149	2.5MNP5	0.000	0.000	0.001	0.001	0.001
1116	5000.000	2009.994	100.149	2.5MNP5	0.000	0.000	-0.002	0.002	0.002
1117	5000.000	2009.996	100.149	2.5MNP6	0.000	0.000	0.000	0.000	0.000
1118	5000.000	2009.994	100.149	2.5MNP6	0.000	0.000	-0.002	0.002	0.002
1119	5000.000	2009.994	100.149	2.5MNP6	0.000	0.000	-0.002	0.002	0.002
1120	5000.000	2009.997	100.150	5MNP1	0.001	0.000	0.001	0.001	0.001
1121	5000.000	2009.998	100.150	5MNP1	0.001	0.000	0.002	0.002	0.002
1122	5000.000	2009.995	100.150	5MNP1	0.001	0.000	-0.001	0.001	0.001
1123	5000.000	2009.998	100.150	5MNP2	0.001	0.000	0.002	0.002	0.002
1124	5000.000	2009.998	100.150	5MNP2	0.001	0.000	0.002	0.002	0.002
1125	5000.000	2009.997	100.150	5MNP2	0.001	0.000	0.001	0.001	0.001
1126	5000.000	2009.996	100.149	5MNP3	0.000	0.000	0.000	0.000	0.000
1127	5000.000	2009.994	100.149	5MNP3	0.000	0.000	-0.002	0.002	0.002
1128	5000.000	2009.994	100.149	5MNP3	0.000	0.000	-0.002	0.002	0.002
1129	5000.000	2009.994	100.149	5MNP4	0.000	0.000	-0.002	0.002	0.002
1130	5000.000	2009.994	100.149	5MNP4	0.000	0.000	-0.002	0.002	0.002
1131	5000.000	2009.994	100.149	5MNP4	0.000	0.000	-0.002	0.002	0.002
1132	5000.001	2009.996	100.149	5MNP5	0.000	0.001	0.000	0.001	0.001
1133	5000.001	2009.998	100.149	5MNP5	0.000	0.001	0.002	0.002	0.002
1134	5000.001	2009.997	100.149	5MNP5	0.000	0.001	0.001	0.001	0.001
1135	5000.001	2009.994	100.149	5MNP6	0.000	0.001	-0.002	0.002	0.002
1136	5000.001	2009.994	100.149	5MNP6	0.000	0.001	-0.002	0.002	0.002
1137	5000.001	2009.994	100.149	5MNP6	0.000	0.001	-0.002	0.002	0.002
1138	5000.001	2009.998	100.149	7.5MNP1	0.000	0.001	0.002	0.002	0.002
1139	5000.001	2009.997	100.149	7.5MNP1	0.000	0.001	0.001	0.001	0.001
1140	5000.001	2009.998	100.149	7.5MNP1	0.000	0.001	0.002	0.002	0.002
1141	5000.001	2009.997	100.149	7.5MNP2	0.000	0.001	0.001	0.001	0.001
1142	5000.001	2009.997	100.149	7.5MNP2	0.000	0.001	0.001	0.001	0.001
1143	5000.001	2009.997	100.149	7.5MNP2	0.000	0.001	0.001	0.001	0.001
1144	5000.000	2009.994	100.149	7.5MNP3	0.000	0.000	-0.002	0.002	0.002
1145	5000.000	2009.994	100.149	7.5MNP3	0.000	0.000	-0.002	0.002	0.002
1146	5000.000	2009.994	100.149	7.5MNP3	0.000	0.000	-0.002	0.002	0.002
1147	5000.000	2009.994	100.149	7.5MNP4	0.000	0.000	-0.002	0.002	0.002
1148	5000.000	2009.994	100.149	7.5MNP4	0.000	0.000	-0.002	0.002	0.002
1149	5000.000	2009.996	100.149	7.5MNP4	0.000	0.000	0.000	0.000	0.000
1150	5000.000	2009.994	100.148	7.5MNP5	-0.001	0.000	-0.002	0.002	0.002
1151	5000.000	2009.996	100.148	7.5MNP5	-0.001	0.000	0.000	0.000	0.001
1152	5000.000	2009.994	100.148	7.5MNP5	-0.001	0.000	-0.002	0.002	0.002
1153	5000.000	2009.996	100.148	7.5MNP6	-0.001	0.000	0.000	0.000	0.001
1154	5000.000	2009.994	100.148	7.5MNP6	-0.001	0.000	-0.002	0.002	0.002
1155	5000.000	2009.994	100.148	7.5MNP6	-0.001	0.000	-0.002	0.002	0.002

Trimble SPS930 DR+ - 20m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH20	5000.000	2020.000	100.318	STN					
2000	5000.000	2020.002	100.318	2.5MMAN1	0.000	0.000	0.002	0.002	0.002
2001	5000.000	2020.001	100.318	2.5MMAN1	0.000	0.000	0.001	0.001	0.001
2002	5000.000	2020.002	100.318	2.5MMAN1	0.000	0.000	0.002	0.002	0.002
2003	5000.001	2020.002	100.317	2.5MMAN2	-0.001	0.001	0.002	0.002	0.002
2004	5000.001	2020.001	100.317	2.5MMAN2	-0.001	0.001	0.001	0.001	0.002
2005	5000.001	2020.002	100.317	2.5MMAN2	-0.001	0.001	0.002	0.002	0.002
2006	5000.000	2020.000	100.317	2.5MMAN3	-0.001	0.000	0.000	0.000	0.001
2007	5000.000	2019.999	100.317	2.5MMAN3	-0.001	0.000	-0.001	0.001	0.001
2008	5000.000	2020.000	100.317	2.5MMAN3	-0.001	0.000	0.000	0.000	0.001
2009	5000.000	2020.000	100.316	2.5MMAN4	-0.002	0.000	0.000	0.000	0.002
2010	5000.000	2019.999	100.316	2.5MMAN4	-0.002	0.000	-0.001	0.001	0.002
2011	5000.000	2019.999	100.316	2.5MMAN4	-0.002	0.000	-0.001	0.001	0.002
2012	5000.001	2019.997	100.317	2.5MMAN5	-0.001	0.001	-0.003	0.003	0.003
2013	5000.001	2019.999	100.317	2.5MMAN5	-0.001	0.001	-0.001	0.001	0.002
2014	5000.001	2020.001	100.317	2.5MMAN5	-0.001	0.001	0.001	0.001	0.002
2015	5000.000	2019.998	100.317	2.5MMAN6	-0.001	0.000	-0.002	0.002	0.002
2016	5000.000	2019.999	100.317	2.5MMAN6	-0.001	0.000	-0.001	0.001	0.001
2017	5000.000	2019.999	100.317	2.5MMAN6	-0.001	0.000	-0.001	0.001	0.001
2018	5000.001	2020.002	100.317	10MMAN1	-0.001	0.001	0.002	0.002	0.002
2019	5000.001	2020.002	100.317	10MMAN1	-0.001	0.001	0.002	0.002	0.002
2020	5000.001	2020.002	100.317	10MMAN1	-0.001	0.001	0.002	0.002	0.002
2021	5000.000	2020.001	100.317	10MMAN2	-0.001	0.000	0.001	0.001	0.001
2022	5000.000	2020.002	100.317	10MMAN2	-0.001	0.000	0.002	0.002	0.002
2023	5000.000	2020.001	100.317	10MMAN2	-0.001	0.000	0.001	0.001	0.001
2024	5000.000	2019.999	100.317	10MMAN3	-0.001	0.000	-0.001	0.001	0.001
2025	5000.000	2019.999	100.317	10MMAN3	-0.001	0.000	-0.001	0.001	0.001
2026	5000.000	2019.999	100.317	10MMAN3	-0.001	0.000	-0.001	0.001	0.001
2027	5000.000	2020.000	100.318	10MMAN4	0.000	0.000	0.000	0.000	0.000
2028	5000.000	2019.999	100.318	10MMAN4	0.000	0.000	-0.001	0.001	0.001
2029	5000.000	2019.998	100.318	10MMAN4	0.000	0.000	-0.002	0.002	0.002
2030	5000.001	2019.999	100.318	10MMAN5	0.000	0.001	-0.001	0.001	0.001
2031	5000.001	2019.998	100.318	10MMAN5	0.000	0.001	-0.002	0.002	0.002
2032	5000.001	2019.996	100.318	10MMAN5	0.000	0.001	-0.004	0.004	0.004
2033	5000.000	2019.999	100.311	10MMAN6	-0.007	0.000	-0.001	0.001	0.007
2034	5000.000	2019.999	100.311	10MMAN6	-0.007	0.000	-0.001	0.001	0.007
2035	5000.000	2019.999	100.311	10MMAN6	-0.007	0.000	-0.001	0.001	0.007
2036	5000.001	2020.001	100.317	17.5MMAN1	-0.001	0.001	0.001	0.001	0.002
2037	5000.001	2020.001	100.317	17.5MMAN1	-0.001	0.001	0.001	0.001	0.002
2038	5000.001	2020.001	100.317	17.5MMAN1	-0.001	0.001	0.001	0.001	0.002
2039	5000.001	2020.001	100.317	17.5MMAN2	-0.001	0.001	0.001	0.001	0.002
2040	5000.001	2020.000	100.317	17.5MMAN2	-0.001	0.001	0.000	0.001	0.001
2041	5000.001	2020.001	100.317	17.5MMAN2	-0.001	0.001	0.001	0.001	0.002
2042	5000.001	2019.999	100.317	17.5MMAN3	-0.001	0.001	-0.001	0.001	0.002
2043	5000.001	2019.999	100.317	17.5MMAN3	-0.001	0.001	-0.001	0.001	0.002
2044	5000.001	2019.999	100.317	17.5MMAN3	-0.001	0.001	-0.001	0.001	0.002
2045	5000.000	2019.999	100.317	17.5MMAN4	-0.001	0.000	-0.001	0.001	0.001
2046	5000.000	2019.999	100.317	17.5MMAN4	-0.001	0.000	-0.001	0.001	0.001
2047	5000.000	2019.998	100.317	17.5MMAN4	-0.001	0.000	-0.002	0.002	0.002
2048	5000.000	2019.998	100.317	17.5MMAN5	-0.001	0.000	-0.002	0.002	0.002
2049	5000.000	2019.996	100.317	17.5MMAN5	-0.001	0.000	-0.004	0.004	0.004
2050	5000.000	2019.997	100.317	17.5MMAN5	-0.001	0.000	-0.003	0.003	0.003
2051	5000.001	2019.998	100.318	17.5MMAN6	0.000	0.001	-0.002	0.002	0.002
2052	5000.001	2019.998	100.318	17.5MMAN6	0.000	0.001	-0.002	0.002	0.002
2053	5000.001	2019.999	100.318	17.5MMAN6	0.000	0.001	-0.001	0.001	0.001

Trimble SPS930 DR+ - 20m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
2054	5000.000	2020.002	100.318	2.5MATR1	0.000	0.000	0.002	0.002	0.002
2055	5000.000	2020.002	100.318	2.5MATR1	0.000	0.000	0.002	0.002	0.002
2056	5000.000	2020.002	100.318	2.5MATR1	0.000	0.000	0.002	0.002	0.002
2057	5000.001	2020.001	100.317	2.5MATR2	-0.001	0.001	0.001	0.001	0.002
2058	5000.001	2020.001	100.318	2.5MATR2	0.000	0.001	0.001	0.001	0.001
2059	5000.001	2020.002	100.318	2.5MATR2	0.000	0.001	0.002	0.002	0.002
2060	5000.003	2020.001	100.317	2.5MATR3	-0.001	0.003	0.001	0.003	0.003
2061	5000.003	2019.999	100.317	2.5MATR3	-0.001	0.003	-0.001	0.003	0.003
2062	5000.003	2019.999	100.317	2.5MATR3	-0.001	0.003	-0.001	0.003	0.003
2063	5000.001	2019.999	100.316	2.5MATR4	-0.002	0.001	-0.001	0.001	0.002
2064	5000.001	2019.999	100.315	2.5MATR4	-0.003	0.001	-0.001	0.001	0.003
2065	5000.002	2019.999	100.315	2.5MATR4	-0.003	0.002	-0.001	0.002	0.004
2066	5000.004	2019.999	100.317	2.5MATR5	-0.001	0.004	-0.001	0.004	0.004
2067	5000.002	2020.000	100.319	2.5MATR5	0.001	0.002	0.000	0.002	0.002
2068	5000.000	2019.999	100.319	2.5MATR5	0.001	0.000	-0.001	0.001	0.001
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
2069	5000.000	2020.002	100.318	10MATR1	0.000	0.000	0.002	0.002	0.002
2070	5000.000	2020.002	100.318	10MATR1	0.000	0.000	0.002	0.002	0.002
2071	5000.000	2020.002	100.318	10MATR1	0.000	0.000	0.002	0.002	0.002
2072	5000.000	2020.001	100.319	10MATR2	0.001	0.000	0.001	0.001	0.001
2073	5000.000	2020.001	100.319	10MATR2	0.001	0.000	0.001	0.001	0.001
2074	5000.000	2020.001	100.319	10MATR2	0.001	0.000	0.001	0.001	0.001
2075	5000.000	2019.999	100.317	10MATR3	-0.001	0.000	-0.001	0.001	0.001
2076	5000.000	2019.999	100.318	10MATR3	0.000	0.000	-0.001	0.001	0.001
2077	5000.000	2019.999	100.318	10MATR3	0.000	0.000	-0.001	0.001	0.001
2078	5000.003	2019.999	100.318	10MATR4	0.000	0.003	-0.001	0.003	0.003
2079	5000.003	2019.998	100.318	10MATR4	0.000	0.003	-0.002	0.004	0.004
2080	5000.002	2019.998	100.317	10MATR4	-0.001	0.002	-0.002	0.003	0.003
2081	4999.997	2020.000	100.314	10MATR5	-0.004	-0.003	0.000	0.003	0.005
2082	5000.011	2019.994	100.322	10MATR5	0.004	0.011	-0.006	0.013	0.013
2083	4999.999	2020.001	100.314	10MATR5	-0.004	-0.001	0.001	0.001	0.004
2084	4999.998	2019.999	100.311	10MATR6	-0.007	-0.002	-0.001	0.002	0.007
2085	4999.998	2019.999	100.311	10MATR6	-0.007	-0.002	-0.001	0.002	0.007
2086	4999.999	2019.999	100.311	10MATR6	-0.007	-0.001	-0.001	0.001	0.007
2087	5000.001	2020.000	100.317	17.5MATR1	-0.001	0.001	0.000	0.001	0.001
2088	5000.001	2020.000	100.318	17.5MATR1	0.000	0.001	0.000	0.001	0.001
2089	5000.001	2020.001	100.317	17.5MATR1	-0.001	0.001	0.001	0.001	0.002
2090	5000.000	2020.000	100.317	17.5MATR2	-0.001	0.000	0.000	0.000	0.001
2091	5000.000	2020.001	100.317	17.5MATR2	-0.001	0.000	0.001	0.001	0.001
2092	5000.001	2020.001	100.317	17.5MATR2	-0.001	0.001	0.001	0.001	0.002
2093	5000.000	2019.998	100.317	17.5MATR3	-0.001	0.000	-0.002	0.002	0.002
2094	5000.001	2019.999	100.317	17.5MATR3	-0.001	0.001	-0.001	0.001	0.002
2095	5000.000	2019.998	100.317	17.5MATR3	-0.001	0.000	-0.002	0.002	0.002
2096	5000.000	2019.999	100.317	17.5MATR4	-0.001	0.000	-0.001	0.001	0.001
2097	5000.000	2019.998	100.316	17.5MATR4	-0.002	0.000	-0.002	0.002	0.003
2098	5000.000	2019.999	100.317	17.5MATR4	-0.001	0.000	-0.001	0.001	0.001
2099	5000.001	2019.999	100.316	17.5MATR5	-0.002	0.001	-0.001	0.001	0.002
2100	5000.002	2019.999	100.317	17.5MATR5	-0.001	0.002	-0.001	0.002	0.002
2101	5000.001	2020.000	100.316	17.5MATR5	-0.002	0.001	0.000	0.001	0.002
2102	5000.001	2019.998	100.318	17.5MATR6	0.000	0.001	-0.002	0.002	0.002
2103	5000.001	2019.998	100.318	17.5MATR6	0.000	0.001	-0.002	0.002	0.002
2104	5000.001	2019.997	100.318	17.5MATR6	0.000	0.001	-0.003	0.003	0.003

Trimble SPS930 DR+ - 20m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH20NP	5000.001	2019.999	100.317	STN					
2105	5000.000	2020.001	100.319	2.5MNP1	0.002	-0.001	0.002	0.002	0.003
2106	5000.000	2020.002	100.319	2.5MNP1	0.002	-0.001	0.003	0.003	0.004
2107	5000.000	2020.002	100.319	2.5MNP1	0.002	-0.001	0.003	0.003	0.004
2108	5000.000	2020.002	100.319	2.5MNP2	0.002	-0.001	0.003	0.003	0.004
2109	5000.000	2020.003	100.319	2.5MNP2	0.002	-0.001	0.004	0.004	0.005
2110	5000.000	2020.001	100.319	2.5MNP2	0.002	-0.001	0.002	0.002	0.003
2111	5000.001	2020.000	100.318	2.5MNP3	0.001	0.000	0.001	0.001	0.001
2112	5000.001	2020.001	100.318	2.5MNP3	0.001	0.000	0.002	0.002	0.002
2113	5000.001	2020.000	100.318	2.5MNP3	0.001	0.000	0.001	0.001	0.001
2114	5000.000	2019.999	100.316	2.5MNP4	-0.001	-0.001	0.000	0.001	0.001
2115	5000.000	2020.000	100.316	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
2116	5000.000	2020.000	100.316	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
2117	5000.001	2019.999	100.316	2.5MNP5	-0.001	0.000	0.000	0.000	0.001
2118	5000.001	2019.999	100.316	2.5MNP5	-0.001	0.000	0.000	0.000	0.001
2119	5000.001	2020.000	100.316	2.5MNP5	-0.001	0.000	0.001	0.001	0.001
2120	5000.001	2019.999	100.316	2.5MNP6	-0.001	0.000	0.000	0.000	0.001
2121	5000.001	2019.999	100.316	2.5MNP6	-0.001	0.000	0.000	0.000	0.001
2122	5000.001	2019.998	100.316	2.5MNP6	-0.001	0.000	-0.001	0.001	0.001
2123	5000.000	2020.001	100.319	10MNP1	0.002	-0.001	0.002	0.002	0.003
2124	5000.000	2020.002	100.319	10MNP1	0.002	-0.001	0.003	0.003	0.004
2125	5000.000	2020.001	100.319	10MNP1	0.002	-0.001	0.002	0.002	0.003
2126	5000.000	2020.001	100.319	10MNP2	0.002	-0.001	0.002	0.002	0.003
2127	5000.000	2020.003	100.319	10MNP2	0.002	-0.001	0.004	0.004	0.005
2128	5000.000	2020.001	100.319	10MNP2	0.002	-0.001	0.002	0.002	0.003
2129	5000.000	2019.999	100.317	10MNP3	0.000	-0.001	0.000	0.001	0.001
2130	5000.000	2020.000	100.317	10MNP3	0.000	-0.001	0.001	0.001	0.001
2131	5000.000	2019.999	100.317	10MNP3	0.000	-0.001	0.000	0.001	0.001
2132	5000.000	2019.999	100.317	10MNP4	0.000	-0.001	0.000	0.001	0.001
2133	5000.000	2019.999	100.317	10MNP4	0.000	-0.001	0.000	0.001	0.001
2134	5000.000	2019.999	100.317	10MNP4	0.000	-0.001	0.000	0.001	0.001
2135	5000.001	2020.001	100.318	10MNP5	0.001	0.000	0.002	0.002	0.002
2136	5000.001	2020.000	100.318	10MNP5	0.001	0.000	0.001	0.001	0.001
2137	5000.001	2020.001	100.318	10MNP5	0.001	0.000	0.002	0.002	0.002
2138	5000.000	2009.988	100.316	10MNP6	-0.001	-0.001	-10.011	10.011	10.011
2139	5000.000	2009.989	100.316	10MNP6	-0.001	-0.001	-10.010	10.010	10.010
2140	5000.000	2009.992	100.316	10MNP6	-0.001	-0.001	-10.007	10.007	10.007
2141	5000.001	2020.001	100.318	17.5MNP1	0.001	0.000	0.002	0.002	0.002
2142	5000.001	2020.001	100.318	17.5MNP1	0.001	0.000	0.002	0.002	0.002
2143	5000.001	2020.002	100.318	17.5MNP1	0.001	0.000	0.003	0.003	0.003
2144	5000.001	2020.000	100.318	17.5MNP2	0.001	0.000	0.001	0.001	0.001
2145	5000.001	2020.001	100.318	17.5MNP2	0.001	0.000	0.002	0.002	0.002
2146	5000.001	2020.002	100.318	17.5MNP2	0.001	0.000	0.003	0.003	0.003
2147	5000.001	2019.999	100.317	17.5MNP3	0.000	0.000	0.000	0.000	0.000
2148	5000.001	2019.999	100.317	17.5MNP3	0.000	0.000	0.000	0.000	0.000
2149	5000.001	2020.000	100.318	17.5MNP3	0.001	0.000	0.001	0.001	0.001
2150	5000.001	2019.999	100.317	17.5MNP4	0.000	0.000	0.000	0.000	0.000
2151	5000.001	2020.000	100.318	17.5MNP4	0.001	0.000	0.001	0.001	0.001
2152	5000.001	2019.999	100.317	17.5MNP4	0.000	0.000	0.000	0.000	0.000
2153	5000.001	2020.000	100.318	17.5MNP5	0.001	0.000	0.001	0.001	0.001
2154	5000.001	2020.001	100.318	17.5MNP5	0.001	0.000	0.002	0.002	0.002
2155	5000.001	2019.999	100.318	17.5MNP5	0.001	0.000	0.000	0.000	0.001
2156	5000.001	2019.999	100.318	17.5MNP6	0.001	0.000	0.000	0.000	0.001
2157	5000.001	2020.000	100.318	17.5MNP6	0.001	0.000	0.001	0.001	0.001
2158	5000.001	2019.999	100.318	17.5MNP6	0.001	0.000	0.000	0.000	0.001

Trimble SPS930 DR+ - 40m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH40	5000.000	2039.998	100.498	STN					
3000	4999.999	2040.001	100.501	2.5MMAN1	0.003	-0.001	0.003	0.003	0.004
3001	4999.999	2040.001	100.501	2.5MMAN1	0.003	-0.001	0.003	0.003	0.004
3002	4999.999	2040.001	100.501	2.5MMAN1	0.003	-0.001	0.003	0.003	0.004
3003	5000.000	2040.001	100.498	2.5MMAN2	0.000	0.000	0.003	0.003	0.003
3004	5000.000	2040.000	100.498	2.5MMAN2	0.000	0.000	0.002	0.002	0.002
3005	5000.000	2040.002	100.498	2.5MMAN2	0.000	0.000	0.004	0.004	0.004
3006	5000.000	2039.998	100.498	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
3007	5000.000	2039.999	100.498	2.5MMAN3	0.000	0.000	0.001	0.001	0.001
3008	5000.000	2039.999	100.498	2.5MMAN3	0.000	0.000	0.001	0.001	0.001
3009	5000.000	2039.998	100.497	2.5MMAN4	-0.001	0.000	0.000	0.000	0.001
3010	5000.000	2039.997	100.497	2.5MMAN4	-0.001	0.000	-0.001	0.001	0.001
3011	5000.000	2039.998	100.497	2.5MMAN4	-0.001	0.000	0.000	0.000	0.001
3012	4999.999	2039.998	100.497	2.5MMAN5	-0.001	-0.001	0.000	0.001	0.001
3013	4999.999	2039.997	100.497	2.5MMAN5	-0.001	-0.001	-0.001	0.001	0.002
3014	4999.999	2039.999	100.497	2.5MMAN5	-0.001	-0.001	0.001	0.001	0.002
3015	5000.000	2039.998	100.498	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
3016	5000.000	2039.999	100.498	2.5MMAN6	0.000	0.000	0.001	0.001	0.001
3017	5000.000	2039.998	100.498	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
3018	5000.000	2040.001	100.500	10MMAN1	0.002	0.000	0.003	0.003	0.004
3019	5000.000	2040.001	100.500	10MMAN1	0.002	0.000	0.003	0.003	0.004
3020	5000.000	2040.002	100.500	10MMAN1	0.002	0.000	0.004	0.004	0.004
3021	5000.002	2040.000	100.498	10MMAN2	0.000	0.002	0.002	0.003	0.003
3022	5000.002	2040.001	100.498	10MMAN2	0.000	0.002	0.003	0.004	0.004
3023	5000.002	2040.000	100.498	10MMAN2	0.000	0.002	0.002	0.003	0.003
3024	5000.001	2039.998	100.497	10MMAN3	-0.001	0.001	0.000	0.001	0.001
3025	5000.001	2039.998	100.497	10MMAN3	-0.001	0.001	0.000	0.001	0.001
3026	5000.001	2039.997	100.497	10MMAN3	-0.001	0.001	-0.001	0.001	0.002
3027	5000.001	2039.997	100.497	10MMAN4	-0.001	0.001	-0.001	0.001	0.002
3028	5000.001	2039.997	100.497	10MMAN4	-0.001	0.001	-0.001	0.001	0.002
3029	5000.001	2039.998	100.497	10MMAN4	-0.001	0.001	0.000	0.001	0.001
3030	5000.001	2039.995	100.497	10MMAN5	-0.001	0.001	-0.003	0.003	0.003
3031	5000.001	2039.996	100.497	10MMAN5	-0.001	0.001	-0.002	0.002	0.002
3032	5000.001	2039.996	100.497	10MMAN5	-0.001	0.001	-0.002	0.002	0.002
3033	5000.000	2039.997	100.498	10MMAN6	0.000	0.000	-0.001	0.001	0.001
3034	5000.000	2039.997	100.498	10MMAN6	0.000	0.000	-0.001	0.001	0.001
3035	5000.000	2039.998	100.498	10MMAN6	0.000	0.000	0.000	0.000	0.000
3036	5000.000	2040.001	100.498	20MMAN1	0.000	0.000	0.003	0.003	0.003
3037	5000.000	2040.001	100.498	20MMAN1	0.000	0.000	0.003	0.003	0.003
3038	5000.000	2040.001	100.498	20MMAN1	0.000	0.000	0.003	0.003	0.003
3039	5000.000	2040.000	100.498	20MMAN2	0.000	0.000	0.002	0.002	0.002
3040	5000.000	2040.000	100.498	20MMAN2	0.000	0.000	0.002	0.002	0.002
3041	5000.000	2039.999	100.498	20MMAN2	0.000	0.000	0.001	0.001	0.001
3042	5000.001	2039.998	100.497	20MMAN3	-0.001	0.001	0.000	0.001	0.001
3043	5000.001	2039.999	100.497	20MMAN3	-0.001	0.001	0.001	0.001	0.002
3044	5000.001	2039.998	100.497	20MMAN3	-0.001	0.001	0.000	0.001	0.001
3045	5000.001	2039.998	100.497	20MMAN4	-0.001	0.001	0.000	0.001	0.001
3046	5000.001	2039.998	100.497	20MMAN4	-0.001	0.001	0.000	0.001	0.001
3047	5000.001	2039.998	100.497	20MMAN4	-0.001	0.001	0.000	0.001	0.001
3048	5000.001	2039.999	100.498	20MMAN5	0.000	0.001	0.001	0.001	0.001
3049	5000.001	2039.998	100.498	20MMAN5	0.000	0.001	0.000	0.001	0.001
3050	5000.001	2039.999	100.498	20MMAN5	0.000	0.001	0.001	0.001	0.001
3051	5000.001	2039.998	100.498	20MMAN6	0.000	0.001	0.000	0.001	0.001
3052	5000.001	2039.999	100.498	20MMAN6	0.000	0.001	0.001	0.001	0.001
3053	5000.001	2039.999	100.498	20MMAN6	0.000	0.001	0.001	0.001	0.001

3054	5000.001	2040.001	100.498	30MMAN1	0.000	0.001	0.003	0.003	0.003
3055	5000.001	2040.001	100.498	30MMAN1	0.000	0.001	0.003	0.003	0.003
3056	5000.001	2040.003	100.498	30MMAN1	0.000	0.001	0.005	0.005	0.005
3057	5000.001	2040.002	100.498	30MMAN2	0.000	0.001	0.004	0.004	0.004
3058	5000.001	2040.001	100.498	30MMAN2	0.000	0.001	0.003	0.003	0.003
3059	5000.001	2040.002	100.498	30MMAN2	0.000	0.001	0.004	0.004	0.004
3060	5000.001	2039.998	100.498	30MMAN3	0.000	0.001	0.000	0.001	0.001
3061	5000.001	2039.999	100.498	30MMAN3	0.000	0.001	0.001	0.001	0.001
3062	5000.001	2039.999	100.498	30MMAN3	0.000	0.001	0.001	0.001	0.001
3063	5000.001	2039.999	100.498	30MMAN4	0.000	0.001	0.001	0.001	0.001
3064	5000.001	2039.999	100.498	30MMAN4	0.000	0.001	0.001	0.001	0.001
3065	5000.001	2039.999	100.498	30MMAN4	0.000	0.001	0.001	0.001	0.001
3066	4999.999	2039.997	100.500	30MMAN5	0.002	-0.001	-0.001	0.001	0.002
3067	4999.999	2039.998	100.500	30MMAN5	0.002	-0.001	0.000	0.001	0.002
3068	4999.999	2039.992	100.500	30MMAN5	0.002	-0.001	-0.006	0.006	0.006
3069	5000.001	2039.998	100.498	30MMAN6	0.000	0.001	0.000	0.001	0.001
3070	5000.001	2039.998	100.498	30MMAN6	0.000	0.001	0.000	0.001	0.001
3071	5000.001	2039.998	100.498	30MMAN6	0.000	0.001	0.000	0.001	0.001
3072	5000.002	2040.001	100.498	37.5MMAN1	0.000	0.002	0.003	0.004	0.004
3073	5000.002	2040.001	100.498	37.5MMAN1	0.000	0.002	0.003	0.004	0.004
3074	5000.002	2040.001	100.498	37.5MMAN1	0.000	0.002	0.003	0.004	0.004
3075	5000.002	2040.001	100.498	37.5MMAN2	0.000	0.002	0.003	0.004	0.004
3076	5000.002	2040.000	100.498	37.5MMAN2	0.000	0.002	0.002	0.003	0.003
3077	5000.002	2040.001	100.498	37.5MMAN2	0.000	0.002	0.003	0.004	0.004
3078	5000.002	2039.999	100.498	37.5MMAN3	0.000	0.002	0.001	0.002	0.002
3079	5000.002	2039.999	100.498	37.5MMAN3	0.000	0.002	0.001	0.002	0.002
3080	5000.002	2039.998	100.498	37.5MMAN3	0.000	0.002	0.000	0.002	0.002
3081	5000.001	2039.999	100.498	37.5MMAN4	0.000	0.001	0.001	0.001	0.001
3082	5000.001	2040.000	100.498	37.5MMAN4	0.000	0.001	0.002	0.002	0.002
3083	5000.001	2039.998	100.498	37.5MMAN4	0.000	0.001	0.000	0.001	0.001
3084	5000.000	2039.999	100.498	37.5MMAN5	0.000	0.000	0.001	0.001	0.001
3085	5000.000	2039.997	100.497	37.5MMAN5	-0.001	0.000	-0.001	0.001	0.001
3086	5000.000	2040.000	100.497	37.5MMAN5	-0.001	0.000	0.002	0.002	0.002
3087	5000.002	2039.999	100.498	37.5MMAN6	0.000	0.002	0.001	0.002	0.002
3088	5000.002	2039.999	100.498	37.5MMAN6	0.000	0.002	0.001	0.002	0.002
3089	5000.002	2039.998	100.498	37.5MMAN6	0.000	0.002	0.000	0.002	0.002

Trimble SPS930 DR+ - 40m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
3090	4999.999	2040.000	100.500	2.5MATR1	0.002	-0.001	0.002	0.002	0.003
3091	4999.999	2040.000	100.501	2.5MATR1	0.003	-0.001	0.002	0.002	0.004
3092	4999.999	2040.001	100.500	2.5MATR1	0.002	-0.001	0.003	0.003	0.004
3093	5000.000	2040.000	100.498	2.5MATR2	0.000	0.000	0.002	0.002	0.002
3094	5000.000	2040.001	100.498	2.5MATR2	0.000	0.000	0.003	0.003	0.003
3095	5000.000	2039.999	100.498	2.5MATR2	0.000	0.000	0.001	0.001	0.001
3096	4999.998	2039.998	100.498	2.5MATR3	0.000	-0.002	0.000	0.002	0.002
3097	4999.999	2039.998	100.497	2.5MATR3	-0.001	-0.001	0.000	0.001	0.001
3098	4999.999	2039.999	100.498	2.5MATR3	0.000	-0.001	0.001	0.001	0.001
3099	5000.001	2039.996	100.498	2.5MATR4	0.000	0.001	-0.002	0.002	0.002
3100	5000.001	2039.997	100.497	2.5MATR4	-0.001	0.001	-0.001	0.001	0.002
3101	5000.001	2039.996	100.497	2.5MATR4	-0.001	0.001	-0.002	0.002	0.002
3102	5000.000	2039.999	100.498	2.5MATR5	0.000	0.000	0.001	0.001	0.001
3103	5000.002	2039.998	100.504	2.5MATR5	0.006	0.002	0.000	0.002	0.006
3104	5000.001	2040.000	100.497	2.5MATR5	-0.001	0.001	0.002	0.002	0.002
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
-	-	-	-	2.5MATR6					
3105	5000.000	2040.000	100.500	10MATR1	0.002	0.000	0.002	0.002	0.003
3106	5000.000	2040.000	100.500	10MATR1	0.002	0.000	0.002	0.002	0.003
3107	5000.000	2040.000	100.500	10MATR1	0.002	0.000	0.002	0.002	0.003
3108	5000.000	2039.999	100.498	10MATR2	0.000	0.000	0.001	0.001	0.001
3109	5000.000	2040.000	100.498	10MATR2	0.000	0.000	0.002	0.002	0.002
3110	5000.000	2040.001	100.498	10MATR2	0.000	0.000	0.003	0.003	0.003
3111	5000.000	2039.998	100.499	10MATR3	0.001	0.000	0.000	0.000	0.001
3112	5000.000	2039.999	100.498	10MATR3	0.000	0.000	0.001	0.001	0.001
3113	5000.000	2039.998	100.498	10MATR3	0.000	0.000	0.000	0.000	0.000
3114	5000.001	2039.998	100.498	10MATR4	0.000	0.001	0.000	0.001	0.001
3115	5000.000	2039.997	100.498	10MATR4	0.000	0.000	-0.001	0.001	0.001
3116	5000.001	2039.998	100.498	10MATR4	0.000	0.001	0.000	0.001	0.001
3117	5000.001	2039.997	100.498	10MATR5	0.000	0.001	-0.001	0.001	0.001
3118	5000.002	2039.997	100.497	10MATR5	-0.001	0.002	-0.001	0.002	0.002
3119	5000.002	2039.997	100.497	10MATR5	-0.001	0.002	-0.001	0.002	0.002
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
3120	5000.000	2040.000	100.499	20MATR1	0.001	0.000	0.002	0.002	0.002
3121	5000.000	2040.001	100.499	20MATR1	0.001	0.000	0.003	0.003	0.003
3122	5000.000	2040.001	100.499	20MATR1	0.001	0.000	0.003	0.003	0.003
3123	5000.000	2040.001	100.499	20MATR2	0.001	0.000	0.003	0.003	0.003
3124	5000.000	2040.000	100.498	20MATR2	0.000	0.000	0.002	0.002	0.002
3125	4999.999	2040.000	100.499	20MATR2	0.001	-0.001	0.002	0.002	0.002
3126	5000.000	2039.998	100.524	20MATR3	0.026	0.000	0.000	0.000	0.026
3127	5000.000	2039.999	100.524	20MATR3	0.026	0.000	0.001	0.001	0.026
3128	5000.000	2039.997	100.524	20MATR3	0.026	0.000	-0.001	0.001	0.026
3129	5000.000	2039.999	100.498	20MATR4	0.000	0.000	0.001	0.001	0.001
3130	5000.000	2039.999	100.498	20MATR4	0.000	0.000	0.001	0.001	0.001
3131	5000.000	2039.999	100.499	20MATR4	0.001	0.000	0.001	0.001	0.001
3132	5000.000	2039.996	100.497	20MATR5	-0.001	0.000	-0.002	0.002	0.002
3133	4999.999	2039.997	100.500	20MATR5	0.002	-0.001	-0.001	0.001	0.002
3134	4999.997	2039.997	100.499	20MATR5	0.001	-0.003	-0.001	0.003	0.003
3135	5000.000	2039.998	100.499	20MATR6	0.001	0.000	0.000	0.000	0.001
3136	5000.000	2039.999	100.499	20MATR6	0.001	0.000	0.001	0.001	0.001
3137	5000.000	2039.998	100.499	20MATR6	0.001	0.000	0.000	0.000	0.001

3138	5000.000	2040.001	100.499	30MATR1	0.001	0.000	0.003	0.003	0.003
3139	5000.000	2040.001	100.499	30MATR1	0.001	0.000	0.003	0.003	0.003
3140	5000.000	2040.001	100.499	30MATR1	0.001	0.000	0.003	0.003	0.003
3141	5000.000	2040.000	100.498	30MATR2	0.000	0.000	0.002	0.002	0.002
3142	5000.000	2040.001	100.498	30MATR2	0.000	0.000	0.003	0.003	0.003
3143	5000.001	2040.000	100.498	30MATR2	0.000	0.001	0.002	0.002	0.002
3144	5000.001	2039.998	100.498	30MATR3	0.000	0.001	0.000	0.001	0.001
3145	5000.001	2039.998	100.498	30MATR3	0.000	0.001	0.000	0.001	0.001
3146	5000.001	2039.998	100.498	30MATR3	0.000	0.001	0.000	0.001	0.001
3147	5000.000	2039.998	100.498	30MATR4	0.000	0.000	0.000	0.000	0.000
3148	5000.000	2039.999	100.498	30MATR4	0.000	0.000	0.001	0.001	0.001
3149	5000.000	2039.999	100.498	30MATR4	0.000	0.000	0.001	0.001	0.001
3150	5000.001	2039.997	100.499	30MATR5	0.001	0.001	-0.001	0.001	0.002
3151	5000.001	2039.996	100.498	30MATR5	0.000	0.001	-0.002	0.002	0.002
3152	5000.001	2039.997	100.499	30MATR5	0.001	0.001	-0.001	0.001	0.002
3153	5000.001	2040.000	100.498	30MATR6	0.000	0.001	0.002	0.002	0.002
3154	5000.001	2039.998	100.499	30MATR6	0.001	0.001	0.000	0.001	0.001
3155	5000.001	2039.998	100.499	30MATR6	0.001	0.001	0.000	0.001	0.001
3156	5000.001	2040.000	100.498	37.5MATR1	0.000	0.001	0.002	0.002	0.002
3157	5000.001	2040.000	100.498	37.5MATR1	0.000	0.001	0.002	0.002	0.002
3158	5000.000	2040.001	100.498	37.5MATR1	0.000	0.000	0.003	0.003	0.003
3159	5000.000	2040.001	100.498	37.5MATR2	0.000	0.000	0.003	0.003	0.003
3160	5000.001	2040.000	100.498	37.5MATR2	0.000	0.001	0.002	0.002	0.002
3161	5000.001	2040.000	100.498	37.5MATR2	0.000	0.001	0.002	0.002	0.002
3162	5000.001	2039.999	100.498	37.5MATR3	0.000	0.001	0.001	0.001	0.001
3163	5000.001	2039.999	100.498	37.5MATR3	0.000	0.001	0.001	0.001	0.001
3164	5000.000	2039.999	100.498	37.5MATR3	0.000	0.000	0.001	0.001	0.001
3165	5000.000	2039.998	100.498	37.5MATR4	0.000	0.000	0.000	0.000	0.000
3166	5000.000	2039.998	100.498	37.5MATR4	0.000	0.000	0.000	0.000	0.000
3167	5000.000	2039.998	100.498	37.5MATR4	0.000	0.000	0.000	0.000	0.000
3168	5000.001	2039.998	100.498	37.5MATR5	0.000	0.001	0.000	0.001	0.001
3169	5000.001	2039.999	100.497	37.5MATR5	-0.001	0.001	0.001	0.001	0.002
3170	5000.001	2039.998	100.497	37.5MATR5	-0.001	0.001	0.000	0.001	0.001
3171	5000.001	2039.998	100.498	37.5MATR6	0.000	0.001	0.000	0.001	0.001
3172	5000.001	2039.999	100.498	37.5MATR6	0.000	0.001	0.001	0.001	0.001
3173	5000.001	2039.998	100.498	37.5MATR6	0.000	0.001	0.000	0.001	0.001

Trimble SPS930 DR+ - 40m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH40NP	5000.000	2039.999	100.502	STN					
3174	5000.000	2040.001	100.504	2.5MNP1	0.002	0.000	0.002	0.002	0.003
3175	5000.000	2040.001	100.504	2.5MNP1	0.002	0.000	0.002	0.002	0.003
3176	5000.000	2040.002	100.505	2.5MNP1	0.003	0.000	0.003	0.003	0.004
3177	5000.000	2040.001	100.504	2.5MNP2	0.002	0.000	0.002	0.002	0.003
3178	5000.000	2040.000	100.504	2.5MNP2	0.002	0.000	0.001	0.001	0.002
3179	5000.000	2040.001	100.504	2.5MNP2	0.002	0.000	0.002	0.002	0.003
3180	5000.000	2040.000	100.502	2.5MNP3	0.000	0.000	0.001	0.001	0.001
3181	5000.000	2039.998	100.502	2.5MNP3	0.000	0.000	-0.001	0.001	0.001
3182	5000.000	2039.999	100.502	2.5MNP3	0.000	0.000	0.000	0.000	0.000
3183	5000.000	2040.000	100.502	2.5MNP4	0.000	0.000	0.001	0.001	0.001
3184	5000.000	2039.999	100.502	2.5MNP4	0.000	0.000	0.000	0.000	0.000
3185	5000.000	2039.998	100.502	2.5MNP4	0.000	0.000	-0.001	0.001	0.001
3186	4999.999	2040.000	100.501	2.5MNP5	-0.001	-0.001	0.001	0.001	0.002
3187	4999.999	2039.999	100.501	2.5MNP5	-0.001	-0.001	0.000	0.001	0.001
3188	4999.999	2040.001	100.501	2.5MNP5	-0.001	-0.001	0.002	0.002	0.002
3189	5000.000	2002.495	100.081	2.5MNP6	-0.421	0.000	-37.504	37.504	37.506
3190	5000.000	2002.496	100.081	2.5MNP6	-0.421	0.000	-37.503	37.503	37.505
3191	5000.000	2002.494	100.081	2.5MNP6	-0.421	0.000	-37.505	37.505	37.507
3192	5000.000	2040.001	100.503	10MNP1	0.001	0.000	0.002	0.002	0.002
3193	5000.000	2040.001	100.503	10MNP1	0.001	0.000	0.002	0.002	0.002
3194	5000.000	2040.001	100.503	10MNP1	0.001	0.000	0.002	0.002	0.002
3195	5000.000	2040.001	100.503	10MNP2	0.001	0.000	0.002	0.002	0.002
3196	5000.000	2040.002	100.503	10MNP2	0.001	0.000	0.003	0.003	0.003
3197	5000.000	2040.000	100.503	10MNP2	0.001	0.000	0.001	0.001	0.001
3198	5000.000	2040.000	100.503	10MNP3	0.001	0.000	0.001	0.001	0.001
3199	5000.000	2040.000	100.503	10MNP3	0.001	0.000	0.001	0.001	0.001
3200	5000.000	2040.000	100.503	10MNP3	0.001	0.000	0.001	0.001	0.001
3201	5000.000	2040.000	100.503	10MNP4	0.001	0.000	0.001	0.001	0.001
3202	5000.000	2039.999	100.503	10MNP4	0.001	0.000	0.000	0.000	0.001
3203	5000.000	2039.998	100.503	10MNP4	0.001	0.000	-0.001	0.001	0.001
3204	5000.001	2039.998	100.503	10MNP5	0.001	0.001	-0.001	0.001	0.002
3205	5000.001	2039.998	100.503	10MNP5	0.001	0.001	-0.001	0.001	0.002
3206	5000.001	2039.998	100.503	10MNP5	0.001	0.001	-0.001	0.001	0.002
3207	5000.000	2009.987	100.165	10MNP6	-0.337	0.000	-30.012	30.012	30.014
3208	5000.000	2009.988	100.165	10MNP6	-0.337	0.000	-30.011	30.011	30.013
3209	5000.000	2009.987	100.165	10MNP6	-0.337	0.000	-30.012	30.012	30.014
3210	5000.000	2040.000	100.503	20MNP1	0.001	0.000	0.001	0.001	0.001
3211	5000.000	2040.002	100.503	20MNP1	0.001	0.000	0.003	0.003	0.003
3212	5000.000	2040.002	100.503	20MNP1	0.001	0.000	0.003	0.003	0.003
3213	5000.000	2040.001	100.503	20MNP2	0.001	0.000	0.002	0.002	0.002
3214	5000.000	2040.001	100.503	20MNP2	0.001	0.000	0.002	0.002	0.002
3215	5000.000	2040.000	100.503	20MNP2	0.001	0.000	0.001	0.001	0.001
3216	5000.000	2040.000	100.503	20MNP3	0.001	0.000	0.001	0.001	0.001
3217	5000.000	2039.999	100.503	20MNP3	0.001	0.000	0.000	0.000	0.001
3218	5000.000	2039.999	100.503	20MNP3	0.001	0.000	0.000	0.000	0.001
3219	5000.000	2039.999	100.503	20MNP4	0.001	0.000	0.000	0.000	0.001
3220	5000.000	2039.999	100.503	20MNP4	0.001	0.000	0.000	0.000	0.001
3221	5000.000	2039.999	100.503	20MNP4	0.001	0.000	0.000	0.000	0.001
3222	5000.000	2039.998	100.503	20MNP5	0.001	0.000	-0.001	0.001	0.001
3223	5000.000	2039.997	100.503	20MNP5	0.001	0.000	-0.002	0.002	0.002
3224	5000.000	2039.999	100.503	20MNP5	0.001	0.000	0.000	0.000	0.001
3225	5000.000	2019.989	100.278	20MNP6	-0.224	0.000	-20.010	20.010	20.011
3226	5000.000	2019.991	100.278	20MNP6	-0.224	0.000	-20.008	20.008	20.009
3227	5000.000	2019.991	100.278	20MNP6	-0.224	0.000	-20.008	20.008	20.009

3228	5000.000	2040.002	100.503	30MNP1	0.001	0.000	0.003	0.003	0.003
3229	5000.000	2040.001	100.503	30MNP1	0.001	0.000	0.002	0.002	0.002
3230	5000.000	2040.002	100.503	30MNP1	0.001	0.000	0.003	0.003	0.003
3231	5000.000	2040.000	100.503	30MNP2	0.001	0.000	0.001	0.001	0.001
3232	5000.000	2040.001	100.503	30MNP2	0.001	0.000	0.002	0.002	0.002
3233	5000.000	2040.001	100.503	30MNP2	0.001	0.000	0.002	0.002	0.002
3234	5000.000	2039.999	100.503	30MNP3	0.001	0.000	0.000	0.000	0.001
3235	5000.000	2039.998	100.503	30MNP3	0.001	0.000	-0.001	0.001	0.001
3236	5000.000	2039.999	100.503	30MNP3	0.001	0.000	0.000	0.000	0.001
3237	5000.000	2039.998	100.503	30MNP4	0.001	0.000	-0.001	0.001	0.001
3238	5000.000	2039.999	100.503	30MNP4	0.001	0.000	0.000	0.000	0.001
3239	5000.000	2039.999	100.503	30MNP4	0.001	0.000	0.000	0.000	0.001
3240	5000.000	2039.999	100.501	30MNP5	-0.001	0.000	0.000	0.000	0.001
3241	5000.000	2039.999	100.501	30MNP5	-0.001	0.000	0.000	0.000	0.001
3242	5000.000	2039.998	100.501	30MNP5	-0.001	0.000	-0.001	0.001	0.001
3243	5000.000	2029.990	100.389	30MNP6	-0.113	0.000	-10.009	10.009	10.010
3244	5000.000	2029.989	100.389	30MNP6	-0.113	0.000	-10.010	10.010	10.011
3245	5000.000	2029.992	100.389	30MNP6	-0.113	0.000	-10.007	10.007	10.008
3246	5000.001	2040.001	100.501	37.5MNP1	-0.001	0.001	0.002	0.002	0.002
3247	5000.001	2040.001	100.501	37.5MNP1	-0.001	0.001	0.002	0.002	0.002
3248	5000.001	2040.002	100.501	37.5MNP1	-0.001	0.001	0.003	0.003	0.003
3249	5000.001	2040.000	100.501	37.5MNP2	-0.001	0.001	0.001	0.001	0.002
3250	5000.001	2040.001	100.501	37.5MNP2	-0.001	0.001	0.002	0.002	0.002
3251	5000.001	2040.001	100.501	37.5MNP2	-0.001	0.001	0.002	0.002	0.002
3252	5000.001	2039.999	100.501	37.5MNP3	-0.001	0.001	0.000	0.001	0.001
3253	5000.001	2039.998	100.501	37.5MNP3	-0.001	0.001	-0.001	0.001	0.002
3254	5000.001	2039.999	100.501	37.5MNP3	-0.001	0.001	0.000	0.001	0.001
3255	5000.001	2039.998	100.501	37.5MNP3	-0.001	0.001	-0.001	0.001	0.002
3256	5000.001	2039.998	100.501	37.5MNP3	-0.001	0.001	-0.001	0.001	0.002
3257	5000.001	2039.999	100.501	37.5MNP4	-0.001	0.001	0.000	0.001	0.001
3258	5000.001	2039.998	100.501	37.5MNP4	-0.001	0.001	-0.001	0.001	0.002
3259	5000.001	2039.999	100.501	37.5MNP4	-0.001	0.001	0.000	0.001	0.001
3260	5000.001	2039.999	100.501	37.5MNP5	-0.001	0.001	0.000	0.001	0.001
3261	5000.001	2039.999	100.501	37.5MNP5	-0.001	0.001	0.000	0.001	0.001
3262	5000.001	2039.999	100.501	37.5MNP5	-0.001	0.001	0.000	0.001	0.001
3263	5000.001	2039.998	100.501	37.5MNP6	-0.001	0.001	-0.001	0.001	0.002
3264	5000.001	2040.000	100.501	37.5MNP6	-0.001	0.001	0.001	0.001	0.002
3265	5000.001	2039.999	100.501	37.5MNP6	-0.001	0.001	0.000	0.001	0.001

Trimble SPS930 DR+ - 80m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH80	5000.000	2079.994	100.890	STN					
4000	4999.999	2079.998	100.894	10MMAN1	0.004	-0.001	0.004	0.004	0.006
4001	4999.999	2079.998	100.894	10MMAN1	0.004	-0.001	0.004	0.004	0.006
4002	4999.999	2079.998	100.894	10MMAN1	0.004	-0.001	0.004	0.004	0.006
4003	4999.999	2079.996	100.894	10MMAN2	0.004	-0.001	0.002	0.002	0.005
4004	4999.999	2079.997	100.894	10MMAN2	0.004	-0.001	0.003	0.003	0.005
4005	4999.999	2079.998	100.894	10MMAN2	0.004	-0.001	0.004	0.004	0.006
4006	4999.999	2079.995	100.894	10MMAN3	0.004	-0.001	0.001	0.001	0.004
4007	4999.999	2079.994	100.894	10MMAN3	0.004	-0.001	0.000	0.001	0.004
4008	4999.999	2079.995	100.894	10MMAN3	0.004	-0.001	0.001	0.001	0.004
4009	4999.999	2079.995	100.894	10MMAN4	0.004	-0.001	0.001	0.001	0.004
4010	4999.999	2079.993	100.894	10MMAN4	0.004	-0.001	-0.001	0.001	0.004
4011	4999.999	2079.994	100.894	10MMAN4	0.004	-0.001	0.000	0.001	0.004
4012	5000.002	2079.995	100.888	10MMAN5	-0.002	0.002	0.001	0.002	0.003
4013	5000.002	2079.995	100.888	10MMAN5	-0.002	0.002	0.001	0.002	0.003
4014	5000.002	2079.995	100.888	10MMAN5	-0.002	0.002	0.001	0.002	0.003
4015	4999.999	2079.995	100.894	10MMAN6	0.004	-0.001	0.001	0.001	0.004
4016	4999.999	2079.996	100.894	10MMAN6	0.004	-0.001	0.002	0.002	0.005
4017	4999.999	2079.995	100.894	10MMAN6	0.004	-0.001	0.001	0.001	0.004
4018	5000.002	2079.998	100.892	40MMAN1	0.002	0.002	0.004	0.004	0.005
4019	5000.002	2079.998	100.892	40MMAN1	0.002	0.002	0.004	0.004	0.005
4020	5000.002	2079.998	100.892	40MMAN1	0.002	0.002	0.004	0.004	0.005
4021	5000.002	2079.997	100.892	40MMAN2	0.002	0.002	0.003	0.004	0.004
4022	5000.002	2079.997	100.892	40MMAN2	0.002	0.002	0.003	0.004	0.004
4023	5000.002	2079.997	100.892	40MMAN2	0.002	0.002	0.003	0.004	0.004
4024	5000.002	2079.995	100.892	40MMAN3	0.002	0.002	0.001	0.002	0.003
4025	5000.002	2079.996	100.892	40MMAN3	0.002	0.002	0.002	0.003	0.003
4026	5000.002	2079.996	100.892	40MMAN3	0.002	0.002	0.002	0.003	0.003
4027	5000.002	2079.995	100.890	40MMAN4	0.000	0.002	0.001	0.002	0.002
4028	5000.002	2079.995	100.890	40MMAN4	0.000	0.002	0.001	0.002	0.002
4029	5000.002	2079.995	100.890	40MMAN4	0.000	0.002	0.001	0.002	0.002
4030	5000.002	2079.997	100.890	40MMAN5	0.000	0.002	0.003	0.004	0.004
4031	5000.002	2079.997	100.890	40MMAN5	0.000	0.002	0.003	0.004	0.004
4032	5000.002	2079.996	100.890	40MMAN5	0.000	0.002	0.002	0.003	0.003
4033	5000.002	2079.995	100.892	40MMAN6	0.002	0.002	0.001	0.002	0.003
4034	5000.002	2079.995	100.892	40MMAN6	0.002	0.002	0.001	0.002	0.003
4035	5000.002	2079.996	100.892	40MMAN6	0.002	0.002	0.002	0.003	0.003
4036	5000.002	2079.997	100.890	70MMAN1	0.000	0.002	0.003	0.004	0.004
4037	5000.002	2079.997	100.890	70MMAN1	0.000	0.002	0.003	0.004	0.004
4038	5000.002	2079.996	100.890	70MMAN1	0.000	0.002	0.002	0.003	0.003
4039	5000.002	2079.997	100.890	70MMAN2	0.000	0.002	0.003	0.004	0.004
4040	5000.002	2079.997	100.890	70MMAN2	0.000	0.002	0.003	0.004	0.004
4041	5000.002	2079.997	100.890	70MMAN2	0.000	0.002	0.003	0.004	0.004
4042	5000.002	2079.995	100.890	70MMAN3	0.000	0.002	0.001	0.002	0.002
4043	5000.002	2079.994	100.890	70MMAN3	0.000	0.002	0.000	0.002	0.002
4044	5000.002	2079.994	100.890	70MMAN3	0.000	0.002	0.000	0.002	0.002
4045	5000.002	2079.994	100.890	70MMAN4	0.000	0.002	0.000	0.002	0.002
4046	5000.002	2079.994	100.890	70MMAN4	0.000	0.002	0.000	0.002	0.002
4047	5000.002	2079.994	100.890	70MMAN4	0.000	0.002	0.000	0.002	0.002
4048	5000.002	2079.996	100.890	70MMAN5	0.000	0.002	0.002	0.003	0.003
4049	5000.002	2079.995	100.890	70MMAN5	0.000	0.002	0.001	0.002	0.002
4050	5000.002	2079.996	100.890	70MMAN5	0.000	0.002	0.002	0.003	0.003
4051	5000.002	2079.996	100.890	70MMAN6	0.000	0.002	0.002	0.003	0.003
4052	5000.002	2079.995	100.890	70MMAN6	0.000	0.002	0.001	0.002	0.002
4053	5000.002	2079.995	100.890	70MMAN6	0.000	0.002	0.001	0.002	0.002

Trimble SPS930 DR+ - 80m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
4054	4999.999	2079.997	100.894	10MATR1	0.004	-0.001	0.003	0.003	0.005
4055	4999.998	2079.997	100.894	10MATR1	0.004	-0.002	0.003	0.004	0.005
4056	4999.998	2079.997	100.894	10MATR1	0.004	-0.002	0.003	0.004	0.005
4057	5000.000	2079.997	100.890	10MATR2	0.000	0.000	0.003	0.003	0.003
4058	4999.999	2079.996	100.890	10MATR2	0.000	-0.001	0.002	0.002	0.002
4059	4999.999	2079.997	100.890	10MATR2	0.000	-0.001	0.003	0.003	0.003
4060	5000.000	2079.996	100.891	10MATR3	0.001	0.000	0.002	0.002	0.002
4061	5000.000	2079.995	100.891	10MATR3	0.001	0.000	0.001	0.001	0.001
4062	5000.000	2079.995	100.890	10MATR3	0.000	0.000	0.001	0.001	0.001
4063	5000.000	2079.995	100.890	10MATR4	0.000	0.000	0.001	0.001	0.001
4064	5000.000	2079.994	100.890	10MATR4	0.000	0.000	0.000	0.000	0.000
4065	5000.000	2079.994	100.890	10MATR4	0.000	0.000	0.000	0.000	0.000
4066	5000.002	2079.995	100.889	10MATR5	-0.001	0.002	0.001	0.002	0.002
4067	5000.074	2079.995	100.866	10MATR5	-0.024	0.074	0.001	0.074	0.078
4068	4999.994	2079.993	100.889	10MATR5	-0.001	-0.006	-0.001	0.006	0.006
4069	5000.040	2079.993	100.867	10MATR5	-0.023	0.040	-0.001	0.040	0.046
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
4070	5000.000	2079.997	100.893	40MATR1	0.003	0.000	0.003	0.003	0.004
4071	5000.000	2079.997	100.893	40MATR1	0.003	0.000	0.003	0.003	0.004
4072	5000.000	2079.997	100.893	40MATR1	0.003	0.000	0.003	0.003	0.004
4073	5000.000	2079.996	100.891	40MATR2	0.001	0.000	0.002	0.002	0.002
4074	5000.000	2079.996	100.891	40MATR2	0.001	0.000	0.002	0.002	0.002
4075	5000.000	2079.996	100.891	40MATR2	0.001	0.000	0.002	0.002	0.002
4076	5000.001	2079.995	100.891	40MATR3	0.001	0.001	0.001	0.001	0.002
4077	5000.001	2079.995	100.891	40MATR3	0.001	0.001	0.001	0.001	0.002
4078	5000.001	2079.995	100.891	40MATR3	0.001	0.001	0.001	0.001	0.002
4079	5000.001	2079.995	100.890	40MATR4	0.000	0.001	0.001	0.001	0.001
4080	5000.001	2079.994	100.890	40MATR4	0.000	0.001	0.000	0.001	0.001
4081	5000.001	2079.994	100.890	40MATR4	0.000	0.001	0.000	0.001	0.001
4082	5000.005	2079.995	100.892	40MATR5	0.002	0.005	0.001	0.005	0.005
4083	5000.005	2079.995	100.892	40MATR5	0.002	0.005	0.001	0.005	0.005
4084	4999.984	2079.995	100.878	40MATR5	-0.012	-0.016	0.001	0.016	0.020
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
4085	5000.003	2079.996	100.892	70MATR1	0.002	0.003	0.002	0.004	0.004
4086	5000.003	2079.996	100.892	70MATR1	0.002	0.003	0.002	0.004	0.004
4087	5000.003	2079.996	100.892	70MATR1	0.002	0.003	0.002	0.004	0.004
4088	5000.003	2079.995	100.891	70MATR2	0.001	0.003	0.001	0.003	0.003
4089	5000.004	2079.995	100.891	70MATR2	0.001	0.004	0.001	0.004	0.004
4090	5000.003	2079.996	100.891	70MATR2	0.001	0.003	0.002	0.004	0.004
4091	5000.004	2079.994	100.892	70MATR3	0.002	0.004	0.000	0.004	0.004
4092	5000.004	2079.994	100.891	70MATR3	0.001	0.004	0.000	0.004	0.004
4093	5000.004	2079.993	100.891	70MATR3	0.001	0.004	-0.001	0.004	0.004
4094	5000.004	2079.994	100.891	70MATR4	0.001	0.004	0.000	0.004	0.004
4095	5000.004	2079.995	100.891	70MATR4	0.001	0.004	0.001	0.004	0.004
4096	5000.004	2079.995	100.891	70MATR4	0.001	0.004	0.001	0.004	0.004
4097	5000.005	2079.996	100.890	70MATR5	0.000	0.005	0.002	0.005	0.005
4098	4999.974	2079.998	100.892	70MATR5	0.002	-0.026	0.004	0.026	0.026
4099	5000.006	2079.995	100.891	70MATR5	0.001	0.006	0.001	0.006	0.006
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					

Trimble SPS930 DR+ - 80m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH80NP	5000.001	2079.995	100.898	STN					
4100	5000.001	2079.999	100.898	10MNP1	0.000	0.000	0.004	0.004	0.004
4101	5000.001	2079.999	100.898	10MNP1	0.000	0.000	0.004	0.004	0.004
4102	5000.001	2079.998	100.898	10MNP1	0.000	0.000	0.003	0.003	0.003
4103	5000.001	2079.999	100.898	10MNP2	0.000	0.000	0.004	0.004	0.004
4104	5000.001	2079.998	100.898	10MNP2	0.000	0.000	0.003	0.003	0.003
4105	5000.001	2079.998	100.898	10MNP2	0.000	0.000	0.003	0.003	0.003
4106	5000.001	2079.994	100.898	10MNP3	0.000	0.000	-0.001	0.001	0.001
4107	5000.001	2079.995	100.898	10MNP3	0.000	0.000	0.000	0.000	0.000
4108	5000.001	2079.994	100.898	10MNP3	0.000	0.000	-0.001	0.001	0.001
4109	5000.001	2079.994	100.898	10MNP4	0.000	0.000	-0.001	0.001	0.001
4110	5000.001	2079.993	100.898	10MNP4	0.000	0.000	-0.002	0.002	0.002
4111	5000.001	2079.994	100.898	10MNP4	0.000	0.000	-0.001	0.001	0.001
4112	5000.001	2079.994	100.898	10MNP5	0.000	0.000	-0.001	0.001	0.001
4113	5000.001	2079.995	100.898	10MNP5	0.000	0.000	0.000	0.000	0.000
4114	5000.001	2079.994	100.898	10MNP5	0.000	0.000	-0.001	0.001	0.001
4115	5000.000	2009.989	100.142	10MNP6	-0.756	-0.001	-70.006	70.006	70.010
4116	5000.000	2009.989	100.142	10MNP6	-0.756	-0.001	-70.006	70.006	70.010
4117	5000.000	2009.989	100.142	10MNP6	-0.756	-0.001	-70.006	70.006	70.010
4118	5000.001	2079.999	100.898	40MNP1	0.000	0.000	0.004	0.004	0.004
4119	5000.001	2079.998	100.898	40MNP1	0.000	0.000	0.003	0.003	0.003
4120	5000.001	2079.997	100.898	40MNP1	0.000	0.000	0.002	0.002	0.002
4121	5000.001	2079.998	100.898	40MNP2	0.000	0.000	0.003	0.003	0.003
4122	5000.001	2079.997	100.898	40MNP2	0.000	0.000	0.002	0.002	0.002
4123	5000.001	2079.997	100.898	40MNP2	0.000	0.000	0.002	0.002	0.002
4124	5000.001	2079.995	100.898	40MNP3	0.000	0.000	0.000	0.000	0.000
4125	5000.001	2079.993	100.898	40MNP3	0.000	0.000	-0.002	0.002	0.002
4126	5000.001	2079.994	100.898	40MNP3	0.000	0.000	-0.001	0.001	0.001
4127	5000.001	2079.996	100.898	40MNP4	0.000	0.000	0.001	0.001	0.001
4128	5000.001	2079.995	100.898	40MNP4	0.000	0.000	0.000	0.000	0.000
4129	5000.001	2079.996	100.898	40MNP4	0.000	0.000	0.001	0.001	0.001
4130	5000.001	2079.995	100.898	40MNP5	0.000	0.000	0.000	0.000	0.000
4131	5000.001	2079.994	100.898	40MNP5	0.000	0.000	-0.001	0.001	0.001
4132	5000.001	2079.995	100.898	40MNP5	0.000	0.000	0.000	0.000	0.000
4133	5000.001	2039.989	100.466	40MNP6	-0.432	0.000	-40.006	40.006	40.008
4134	5000.001	2039.990	100.466	40MNP6	-0.432	0.000	-40.005	40.005	40.007
4135	5000.001	2039.988	100.466	40MNP6	-0.432	0.000	-40.007	40.007	40.009
4136	5000.006	2079.997	100.897	70MNP1	-0.001	0.005	0.002	0.005	0.005
4137	5000.006	2079.997	100.897	70MNP1	-0.001	0.005	0.002	0.005	0.005
4138	5000.006	2079.997	100.897	70MNP1	-0.001	0.005	0.002	0.005	0.005
4139	5000.006	2079.992	100.897	70MNP2	-0.001	0.005	-0.003	0.006	0.006
4140	5000.006	2079.996	100.897	70MNP2	-0.001	0.005	0.001	0.005	0.005
4141	5000.006	2079.997	100.897	70MNP2	-0.001	0.005	0.002	0.005	0.005
4142	5000.006	2079.994	100.897	70MNP3	-0.001	0.005	-0.001	0.005	0.005
4143	5000.006	2079.995	100.897	70MNP3	-0.001	0.005	0.000	0.005	0.005
4144	5000.006	2079.995	100.897	70MNP3	-0.001	0.005	0.000	0.005	0.005
4145	5000.006	2079.995	100.897	70MNP4	-0.001	0.005	0.000	0.005	0.005
4146	5000.006	2079.996	100.897	70MNP4	-0.001	0.005	0.001	0.005	0.005
4147	5000.006	2079.995	100.897	70MNP4	-0.001	0.005	0.000	0.005	0.005
4148	5000.006	2079.968	100.897	70MNP5	-0.001	0.005	-0.027	0.027	0.027
4149	5000.006	2079.995	100.897	70MNP5	-0.001	0.005	0.000	0.005	0.005
4150	5000.006	2079.995	100.897	70MNP5	-0.001	0.005	0.000	0.005	0.005
4151	5000.005	2069.996	100.789	70MNP6	-0.109	0.004	-9.999	9.999	10.000
4152	5000.005	2069.999	100.789	70MNP6	-0.109	0.004	-9.996	9.996	9.997
4153	5000.005	2070.000	100.789	70MNP6	-0.109	0.004	-9.995	9.995	9.996

Trimble SPS930 DR+ - 160m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH160	5000.000	2159.999	101.498	STN					
5000	5000.003	2160.001	101.500	10MMAN1	0.002	0.003	0.002	0.004	0.004
5001	5000.003	2160.002	101.500	10MMAN1	0.002	0.003	0.003	0.004	0.005
5002	5000.003	2160.001	101.500	10MMAN1	0.002	0.003	0.002	0.004	0.004
5003	5000.007	2160.002	101.500	10MMAN2	0.002	0.007	0.003	0.008	0.008
5004	5000.007	2160.001	101.500	10MMAN2	0.002	0.007	0.002	0.007	0.008
5005	5000.007	2160.002	101.500	10MMAN2	0.002	0.007	0.003	0.008	0.008
5006	5000.006	2160.001	101.496	10MMAN3	-0.002	0.006	0.002	0.006	0.007
5007	5000.006	2160.001	101.496	10MMAN3	-0.002	0.006	0.002	0.006	0.007
5008	5000.006	2160.000	101.496	10MMAN3	-0.002	0.006	0.001	0.006	0.006
5009	5000.002	2160.001	101.503	10MMAN4	0.005	0.002	0.002	0.003	0.006
5010	5000.002	2160.000	101.503	10MMAN4	0.005	0.002	0.001	0.002	0.005
5011	5000.002	2160.000	101.503	10MMAN4	0.005	0.002	0.001	0.002	0.005
5012	5000.002	2160.001	101.504	10MMAN5	0.006	0.002	0.002	0.003	0.007
5013	5000.002	2160.002	101.504	10MMAN5	0.006	0.002	0.003	0.004	0.007
5014	5000.002	2160.001	101.504	10MMAN5	0.006	0.002	0.002	0.003	0.007
5015	5000.005	2159.999	101.498	10MMAN6	0.000	0.005	0.000	0.005	0.005
5016	5000.005	2160.000	101.498	10MMAN6	0.000	0.005	0.001	0.005	0.005
5017	5000.005	2160.000	101.498	10MMAN6	0.000	0.005	0.001	0.005	0.005
5018	5000.005	2160.003	101.506	80MMAN1	0.008	0.005	0.004	0.006	0.010
5019	5000.005	2160.003	101.506	80MMAN1	0.008	0.005	0.004	0.006	0.010
5020	5000.005	2160.002	101.506	80MMAN1	0.008	0.005	0.003	0.006	0.010
5021	5000.004	2160.005	101.500	80MMAN2	0.002	0.004	0.006	0.007	0.007
5022	5000.004	2160.004	101.500	80MMAN2	0.002	0.004	0.005	0.006	0.007
5023	5000.004	2160.005	101.500	80MMAN2	0.002	0.004	0.006	0.007	0.007
5024	5000.004	2160.001	101.500	80MMAN3	0.002	0.004	0.002	0.004	0.005
5025	5000.004	2160.001	101.500	80MMAN3	0.002	0.004	0.002	0.004	0.005
5026	5000.004	2160.001	101.500	80MMAN3	0.002	0.004	0.002	0.004	0.005
5027	5000.005	2160.000	101.502	80MMAN4	0.004	0.005	0.001	0.005	0.006
5028	5000.005	2159.999	101.502	80MMAN4	0.004	0.005	0.000	0.005	0.006
5029	5000.005	2159.999	101.502	80MMAN4	0.004	0.005	0.000	0.005	0.006
5030	5000.005	2159.999	101.502	80MMAN5	0.004	0.005	0.000	0.005	0.006
5031	5000.005	2159.999	101.502	80MMAN5	0.004	0.005	0.000	0.005	0.006
5032	5000.005	2160.000	101.502	80MMAN5	0.004	0.005	0.001	0.005	0.006
-	-	-	-	80MMAN6					
-	-	-	-	80MMAN6					
-	-	-	-	80MMAN6					
5033	5000.004	2160.002	101.502	150MMAN1	0.004	0.004	0.003	0.005	0.006
5034	5000.004	2160.002	101.502	150MMAN1	0.004	0.004	0.003	0.005	0.006
5035	5000.004	2160.003	101.502	150MMAN1	0.004	0.004	0.004	0.006	0.007
5036	5000.005	2160.002	101.498	150MMAN2	0.000	0.005	0.003	0.006	0.006
5037	5000.005	2160.002	101.498	150MMAN2	0.000	0.005	0.003	0.006	0.006
5038	5000.005	2160.002	101.498	150MMAN2	0.000	0.005	0.003	0.006	0.006
5039	5000.005	2160.000	101.498	150MMAN3	0.000	0.005	0.001	0.005	0.005
5040	5000.005	2159.999	101.498	150MMAN3	0.000	0.005	0.000	0.005	0.005
5041	5000.005	2160.000	101.498	150MMAN3	0.000	0.005	0.001	0.005	0.005
5042	5000.007	2160.001	101.498	150MMAN4	0.000	0.007	0.002	0.007	0.007
5043	5000.007	2160.000	101.498	150MMAN4	0.000	0.007	0.001	0.007	0.007
5044	5000.007	2160.000	101.498	150MMAN4	0.000	0.007	0.001	0.007	0.007
5045	5000.007	2160.001	101.498	150MMAN5	0.000	0.007	0.002	0.007	0.007
5046	5000.007	2160.001	101.498	150MMAN5	0.000	0.007	0.002	0.007	0.007
5047	5000.007	2160.001	101.498	150MMAN5	0.000	0.007	0.002	0.007	0.007
-	-	-	-	150MMAN6					
-	-	-	-	150MMAN6					
-	-	-	-	150MMAN6					

Trimble SPS930 DR+ - 160m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
5048	4999.998	2160.002	101.505	10MATR1	0.007	-0.002	0.003	0.004	0.008
5049	4999.997	2160.001	101.505	10MATR1	0.007	-0.003	0.002	0.004	0.008
5050	4999.996	2160.001	101.506	10MATR1	0.008	-0.004	0.002	0.004	0.009
5051	5000.004	2160.001	101.498	10MATR2	0.000	0.004	0.002	0.004	0.004
5052	5000.003	2160.001	101.498	10MATR2	0.000	0.003	0.002	0.004	0.004
5053	5000.003	2160.002	101.498	10MATR2	0.000	0.003	0.003	0.004	0.004
5054	5000.003	2160.001	101.499	10MATR3	0.001	0.003	0.002	0.004	0.004
5055	5000.003	2160.000	101.499	10MATR3	0.001	0.003	0.001	0.003	0.003
5056	5000.003	2160.001	101.499	10MATR3	0.001	0.003	0.002	0.004	0.004
5057	4999.997	2160.000	101.499	10MATR4	0.001	-0.003	0.001	0.003	0.003
5058	4999.999	2160.000	101.499	10MATR4	0.001	-0.001	0.001	0.001	0.002
5059	4999.999	2160.001	101.498	10MATR4	0.000	-0.001	0.002	0.002	0.002
5060	5000.000	2160.002	101.497	10MATR5	-0.001	0.000	0.003	0.003	0.003
5061	4999.999	2160.002	101.496	10MATR5	-0.002	-0.001	0.003	0.003	0.004
5062	4999.988	2160.002	101.497	10MATR5	-0.001	-0.012	0.003	0.012	0.012
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
5063	5000.002	2160.002	101.503	80MATR1	0.005	0.002	0.003	0.004	0.006
5064	5000.002	2160.002	101.503	80MATR1	0.005	0.002	0.003	0.004	0.006
5065	5000.002	2160.002	101.504	80MATR1	0.006	0.002	0.003	0.004	0.007
5066	5000.000	2160.006	101.499	80MATR2	0.001	0.000	0.007	0.007	0.007
5067	5000.000	2160.005	101.499	80MATR2	0.001	0.000	0.006	0.006	0.006
5068	5000.001	2160.006	101.500	80MATR2	0.002	0.001	0.007	0.007	0.007
5069	5000.000	2160.001	101.499	80MATR3	0.001	0.000	0.002	0.002	0.002
5070	5000.001	2160.000	101.500	80MATR3	0.002	0.001	0.001	0.001	0.002
5071	5000.001	2160.001	101.499	80MATR3	0.001	0.001	0.002	0.002	0.002
5072	5000.002	2160.001	101.499	80MATR4	0.001	0.002	0.002	0.003	0.003
5073	5000.001	2160.000	101.500	80MATR4	0.002	0.001	0.001	0.001	0.002
5074	5000.001	2160.000	101.500	80MATR4	0.002	0.001	0.001	0.001	0.002
5075	4999.999	2160.000	101.501	80MATR5	0.003	-0.001	0.001	0.001	0.003
5076	5000.000	2160.000	101.500	80MATR5	0.002	0.000	0.001	0.001	0.002
5077	5000.000	2160.000	101.500	80MATR5	0.002	0.000	0.001	0.001	0.002
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
5077	5000.000	2160.002	101.499	150MATR1	0.001	0.000	0.003	0.003	0.003
5078	5000.001	2160.002	101.500	150MATR1	0.002	0.001	0.003	0.003	0.004
5079	4999.999	2160.003	101.500	150MATR1	0.002	-0.001	0.004	0.004	0.005
5080	5000.001	2160.002	101.498	150MATR2	0.000	0.001	0.003	0.003	0.003
5081	5000.001	2160.002	101.498	150MATR2	0.000	0.001	0.003	0.003	0.003
5082	4999.999	2160.003	101.500	150MATR2	0.002	-0.001	0.004	0.004	0.005
5083	5000.000	2160.001	101.499	150MATR3	0.001	0.000	0.002	0.002	0.002
5084	5000.000	2160.002	101.499	150MATR3	0.001	0.000	0.003	0.003	0.003
5085	4999.999	2160.001	101.500	150MATR3	0.002	-0.001	0.002	0.002	0.003
5086	5000.001	2160.001	101.498	150MATR4	0.000	0.001	0.002	0.002	0.002
5087	5000.002	2160.001	101.499	150MATR4	0.001	0.002	0.002	0.003	0.003
5088	5000.001	2160.001	101.498	150MATR4	0.000	0.001	0.002	0.002	0.002
5089	5000.001	2160.001	101.499	150MATR5	0.001	0.001	0.002	0.002	0.002
5090	5000.001	2160.000	101.499	150MATR5	0.001	0.001	0.001	0.001	0.002
5091	5000.001	2160.002	101.500	150MATR5	0.002	0.001	0.003	0.003	0.004
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					

Trimble SPS930 DR+ - 160m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH160NP	5000.003	2160.000	101.501	STN					
5092	5000.002	2160.000	101.493	10MNP1	-0.008	-0.001	0.000	0.001	0.008
5093	5000.002	2160.001	101.493	10MNP1	-0.008	-0.001	0.001	0.001	0.008
5094	5000.002	2160.001	101.493	10MNP1	-0.008	-0.001	0.001	0.001	0.008
5095	5000.005	2160.001	101.498	10MNP2	-0.003	0.002	0.001	0.002	0.004
5096	5000.005	2159.999	101.498	10MNP2	-0.003	0.002	-0.001	0.002	0.004
5097	5000.005	2160.000	101.498	10MNP2	-0.003	0.002	0.000	0.002	0.004
5098	5000.006	2160.002	101.498	10MNP3	-0.003	0.003	0.002	0.004	0.005
5099	5000.006	2160.002	101.498	10MNP3	-0.003	0.003	0.002	0.004	0.005
5100	5000.006	2160.001	101.498	10MNP3	-0.003	0.003	0.001	0.003	0.004
5101	5000.001	2160.002	101.500	10MNP4	-0.001	-0.002	0.002	0.003	0.003
5102	5000.001	2159.999	101.500	10MNP4	-0.001	-0.002	-0.001	0.002	0.002
5103	5000.001	2160.000	101.500	10MNP4	-0.001	-0.002	0.000	0.002	0.002
5104	5000.000	2009.997	100.048	10MNP5	-1.453	-0.003	-150.003	150.003	150.010
5105	5000.000	2009.995	100.048	10MNP5	-1.453	-0.003	-150.005	150.005	150.012
5106	5000.000	2009.998	100.048	10MNP5	-1.453	-0.003	-150.002	150.002	150.009
5107	5000.000	2009.988	100.048	10MNP6	-1.453	-0.003	-150.012	150.012	150.019
5108	5000.000	2009.988	100.048	10MNP6	-1.453	-0.003	-150.012	150.012	150.019
5109	5000.000	2009.989	100.048	10MNP6	-1.453	-0.003	-150.011	150.011	150.018
5110	5000.006	2160.002	101.505	80MNP1	0.004	0.003	0.002	0.004	0.005
5111	5000.006	2160.003	101.505	80MNP1	0.004	0.003	0.003	0.004	0.006
5112	5000.006	2160.003	101.505	80MNP1	0.004	0.003	0.003	0.004	0.006
5113	5000.006	2160.004	101.505	80MNP2	0.004	0.003	0.004	0.005	0.006
5114	5000.006	2160.006	101.505	80MNP2	0.004	0.003	0.006	0.007	0.008
5115	5000.006	2160.004	101.505	80MNP2	0.004	0.003	0.004	0.005	0.006
5116	5000.005	2159.999	101.501	80MNP3	0.000	0.002	-0.001	0.002	0.002
5117	5000.005	2160.001	101.501	80MNP3	0.000	0.002	0.001	0.002	0.002
5118	5000.005	2160.000	101.501	80MNP3	0.000	0.002	0.000	0.002	0.002
5119	5000.005	2159.999	101.501	80MNP4	0.000	0.002	-0.001	0.002	0.002
5120	5000.005	2159.999	101.501	80MNP4	0.000	0.002	-0.001	0.002	0.002
5121	5000.005	2159.999	101.501	80MNP4	0.000	0.002	-0.001	0.002	0.002
5122	5000.003	2159.997	101.507	80MNP5	0.006	0.000	-0.003	0.003	0.007
5123	5000.003	2159.999	101.507	80MNP5	0.006	0.000	-0.001	0.001	0.006
5124	5000.003	2159.998	101.507	80MNP5	0.006	0.000	-0.002	0.002	0.006
5125	5000.003	2079.988	100.726	80MNP6	-0.775	0.000	-80.012	80.012	80.016
5126	5000.003	2079.989	100.726	80MNP6	-0.775	0.000	-80.011	80.011	80.015
5127	5000.003	2079.987	100.726	80MNP6	-0.775	0.000	-80.013	80.013	80.017
5128	5000.004	2160.005	101.502	150MNP1	0.001	0.001	0.005	0.005	0.005
5129	5000.004	2160.004	101.502	150MNP1	0.001	0.001	0.004	0.004	0.004
5130	5000.004	2160.002	101.502	150MNP1	0.001	0.001	0.002	0.002	0.002
5131	5000.004	2160.003	101.502	150MNP2	0.001	0.001	0.003	0.003	0.003
5132	5000.004	2160.006	101.502	150MNP2	0.001	0.001	0.006	0.006	0.006
5133	5000.004	2160.004	101.502	150MNP2	0.001	0.001	0.004	0.004	0.004
5134	5000.002	2160.000	101.501	150MNP3	0.000	-0.001	0.000	0.001	0.001
5135	5000.002	2160.001	101.501	150MNP3	0.000	-0.001	0.001	0.001	0.001
5136	5000.002	2160.001	101.501	150MNP3	0.000	-0.001	0.001	0.001	0.001
5137	5000.005	2160.002	101.501	150MNP4	0.000	0.002	0.002	0.003	0.003
5138	5000.005	2160.000	101.501	150MNP4	0.000	0.002	0.000	0.002	0.002
5139	5000.005	2160.000	101.501	150MNP4	0.000	0.002	0.000	0.002	0.002
5140	5000.003	2160.001	101.504	150MNP5	0.003	0.000	0.001	0.001	0.003
5141	5000.003	2160.001	101.504	150MNP5	0.003	0.000	0.001	0.001	0.003
5142	5000.003	2160.001	101.504	150MNP5	0.003	0.000	0.001	0.001	0.003
5143	5000.003	2149.991	101.407	150MNP6	-0.094	0.000	-10.009	10.009	10.009
5144	5000.003	2149.994	101.407	150MNP6	-0.094	0.000	-10.006	10.006	10.006
5145	5000.003	2149.996	101.407	150MNP6	-0.094	0.000	-10.004	10.004	10.004

APPENDIX H LEICA TPS1103 REDUCED FIELD DATA

Leica TPS1103 - 10m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH10	5000.000	2009.999	100.148	STN					
1000	5000.000	2010.001	100.149	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
1001	5000.000	2010.000	100.149	2.5MMAN1	0.001	0.000	0.001	0.001	0.001
1002	5000.000	2010.001	100.149	2.5MMAN1	0.001	0.000	0.002	0.002	0.002
1003	5000.000	2010.001	100.149	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
1004	5000.000	2010.001	100.149	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
1005	5000.000	2010.001	100.149	2.5MMAN2	0.001	0.000	0.002	0.002	0.002
1006	5000.000	2009.999	100.148	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
1007	5000.000	2009.998	100.148	2.5MMAN3	0.000	0.000	-0.001	0.001	0.001
1008	5000.000	2009.998	100.148	2.5MMAN3	0.000	0.000	-0.001	0.001	0.001
1009	5000.000	2009.999	100.148	2.5MMAN4	0.000	0.000	0.000	0.000	0.000
1010	5000.000	2009.998	100.148	2.5MMAN4	0.000	0.000	-0.001	0.001	0.001
1011	5000.000	2009.999	100.148	2.5MMAN4	0.000	0.000	0.000	0.000	0.000
1012	5000.000	2009.999	100.148	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
1013	5000.000	2009.999	100.148	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
1014	5000.000	2009.999	100.148	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
1015	5000.000	2009.999	100.148	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
1016	5000.000	2009.998	100.148	2.5MMAN6	0.000	0.000	-0.001	0.001	0.001
1017	5000.000	2009.999	100.148	2.5MMAN6	0.000	0.000	0.000	0.000	0.000
1018	4999.999	2010.001	100.148	5MMAN1	0.000	-0.001	0.002	0.002	0.002
1019	4999.999	2010.002	100.148	5MMAN1	0.000	-0.001	0.003	0.003	0.003
1020	4999.999	2010.001	100.148	5MMAN1	0.000	-0.001	0.002	0.002	0.002
1021	4999.999	2010.001	100.148	5MMAN2	0.000	-0.001	0.002	0.002	0.002
1022	4999.999	2010.001	100.148	5MMAN2	0.000	-0.001	0.002	0.002	0.002
1023	4999.999	2010.000	100.148	5MMAN2	0.000	-0.001	0.001	0.001	0.001
1024	4999.999	2009.999	100.148	5MMAN3	0.000	-0.001	0.000	0.001	0.001
1025	4999.999	2009.999	100.148	5MMAN3	0.000	-0.001	0.000	0.001	0.001
1026	4999.999	2009.998	100.148	5MMAN3	0.000	-0.001	-0.001	0.001	0.001
1027	4999.999	2009.999	100.148	5MMAN4	0.000	-0.001	0.000	0.001	0.001
1028	4999.999	2009.999	100.148	5MMAN4	0.000	-0.001	0.000	0.001	0.001
1029	4999.999	2009.999	100.148	5MMAN4	0.000	-0.001	0.000	0.001	0.001
1030	4999.999	2009.998	100.148	5MMAN5	0.000	-0.001	-0.001	0.001	0.001
1031	4999.999	2009.998	100.148	5MMAN5	0.000	-0.001	-0.001	0.001	0.001
1032	4999.999	2009.999	100.148	5MMAN5	0.000	-0.001	0.000	0.001	0.001
1033	4999.999	2009.998	100.148	5MMAN6	0.000	-0.001	-0.001	0.001	0.001
1034	4999.999	2009.998	100.148	5MMAN6	0.000	-0.001	-0.001	0.001	0.001
1035	4999.999	2009.998	100.148	5MMAN6	0.000	-0.001	-0.001	0.001	0.001
1036	4999.999	2010.001	100.148	7.5MMAN1	0.000	-0.001	0.002	0.002	0.002
1037	4999.999	2010.001	100.148	7.5MMAN1	0.000	-0.001	0.002	0.002	0.002
1038	4999.999	2010.001	100.148	7.5MMAN1	0.000	-0.001	0.002	0.002	0.002
1039	4999.999	2010.001	100.148	7.5MMAN2	0.000	-0.001	0.002	0.002	0.002
1040	4999.999	2010.001	100.148	7.5MMAN2	0.000	-0.001	0.002	0.002	0.002
1041	4999.999	2010.001	100.148	7.5MMAN2	0.000	-0.001	0.002	0.002	0.002
1042	4999.999	2009.999	100.148	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1043	4999.999	2009.999	100.148	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1044	4999.999	2009.999	100.148	7.5MMAN3	0.000	-0.001	0.000	0.001	0.001
1045	4999.999	2009.998	100.148	7.5MMAN4	0.000	-0.001	-0.001	0.001	0.001
1046	4999.999	2009.999	100.148	7.5MMAN4	0.000	-0.001	0.000	0.001	0.001
1047	4999.999	2009.999	100.148	7.5MMAN4	0.000	-0.001	0.000	0.001	0.001
1048	4999.999	2009.999	100.148	7.5MMAN5	0.000	-0.001	0.000	0.001	0.001
1049	4999.999	2009.999	100.148	7.5MMAN5	0.000	-0.001	0.000	0.001	0.001
1050	4999.999	2009.999	100.148	7.5MMAN5	0.000	-0.001	0.000	0.001	0.001
1051	4999.999	2009.998	100.148	7.5MMAN6	0.000	-0.001	-0.001	0.001	0.001
1052	4999.999	2009.998	100.148	7.5MMAN6	0.000	-0.001	-0.001	0.001	0.001
1053	4999.999	2009.999	100.148	7.5MMAN6	0.000	-0.001	0.000	0.001	0.001

Leica TPS1103 - 10m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
1054	4999.999	2010.001	100.148	2.5MATR1	0.000	-0.001	0.002	0.002	0.002
1055	4999.999	2010.001	100.149	2.5MATR1	0.001	-0.001	0.002	0.002	0.002
1056	4999.999	2010.001	100.149	2.5MATR1	0.001	-0.001	0.002	0.002	0.002
1057	4999.999	2010.000	100.148	2.5MATR2	0.000	-0.001	0.001	0.001	0.001
1058	4999.999	2010.001	100.148	2.5MATR2	0.000	-0.001	0.002	0.002	0.002
1059	4999.999	2010.001	100.148	2.5MATR2	0.000	-0.001	0.002	0.002	0.002
1060	4999.999	2009.999	100.148	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
1061	4999.999	2009.999	100.148	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
1062	4999.999	2009.999	100.148	2.5MATR3	0.000	-0.001	0.000	0.001	0.001
1063	4999.999	2009.999	100.147	2.5MATR4	-0.001	-0.001	0.000	0.001	0.001
1064	4999.999	2009.999	100.147	2.5MATR4	-0.001	-0.001	0.000	0.001	0.001
1065	4999.999	2009.999	100.147	2.5MATR4	-0.001	-0.001	0.000	0.001	0.001
1066	5000.001	2009.999	100.150	2.5MATR5	0.002	0.001	0.000	0.001	0.002
1067	5000.002	2009.999	100.151	2.5MATR5	0.003	0.002	0.000	0.002	0.004
1068	5000.002	2009.998	100.149	2.5MATR5	0.001	0.002	-0.001	0.002	0.002
1069	4999.999	2009.998	100.147	2.5MATR6	-0.001	-0.001	-0.001	0.001	0.002
1070	4999.999	2009.998	100.147	2.5MATR6	-0.001	-0.001	-0.001	0.001	0.002
1071	4999.999	2009.998	100.147	2.5MATR6	-0.001	-0.001	-0.001	0.001	0.002
1072	4999.999	2010.001	100.149	5MATR1	0.001	-0.001	0.002	0.002	0.002
1073	4999.999	2010.001	100.149	5MATR1	0.001	-0.001	0.002	0.002	0.002
1074	4999.999	2010.001	100.149	5MATR1	0.001	-0.001	0.002	0.002	0.002
1075	4999.999	2010.001	100.148	5MATR2	0.000	-0.001	0.002	0.002	0.002
1076	4999.999	2010.001	100.148	5MATR2	0.000	-0.001	0.002	0.002	0.002
1077	4999.999	2010.001	100.148	5MATR2	0.000	-0.001	0.002	0.002	0.002
1078	4999.999	2009.999	100.148	5MATR3	0.000	-0.001	0.000	0.001	0.001
1079	4999.999	2009.998	100.148	5MATR3	0.000	-0.001	-0.001	0.001	0.001
1080	4999.999	2009.999	100.148	5MATR3	0.000	-0.001	0.000	0.001	0.001
1081	5000.000	2009.999	100.148	5MATR4	0.000	0.000	0.000	0.000	0.000
1082	5000.000	2009.998	100.148	5MATR4	0.000	0.000	-0.001	0.001	0.001
1083	5000.000	2009.998	100.148	5MATR4	0.000	0.000	-0.001	0.001	0.001
1084	4999.995	2009.999	100.147	5MATR5	-0.001	-0.005	0.000	0.005	0.005
1085	4999.996	2009.998	100.147	5MATR5	-0.001	-0.004	-0.001	0.004	0.004
1086	4999.997	2009.998	100.147	5MATR5	-0.001	-0.003	-0.001	0.003	0.003
1087	5000.000	2009.998	100.147	5MATR6	-0.001	0.000	-0.001	0.001	0.001
1088	5000.000	2009.998	100.147	5MATR6	-0.001	0.000	-0.001	0.001	0.001
1089	4999.999	2009.998	100.147	5MATR6	-0.001	-0.001	-0.001	0.001	0.002
1090	4999.999	2010.001	100.149	7.5MATR1	0.001	-0.001	0.002	0.002	0.002
1091	4999.999	2010.001	100.149	7.5MATR1	0.001	-0.001	0.002	0.002	0.002
1092	4999.999	2010.001	100.149	7.5MATR1	0.001	-0.001	0.002	0.002	0.002
1093	4999.999	2010.000	100.148	7.5MATR2	0.000	-0.001	0.001	0.001	0.001
1094	4999.999	2010.000	100.148	7.5MATR2	0.000	-0.001	0.001	0.001	0.001
1095	4999.999	2010.001	100.148	7.5MATR2	0.000	-0.001	0.002	0.002	0.002
1096	4999.999	2009.999	100.148	7.5MATR3	0.000	-0.001	0.000	0.001	0.001
1097	4999.999	2009.999	100.148	7.5MATR3	0.000	-0.001	0.000	0.001	0.001
1098	4999.999	2009.998	100.148	7.5MATR3	0.000	-0.001	-0.001	0.001	0.001
1099	4999.999	2009.999	100.148	7.5MATR4	0.000	-0.001	0.000	0.001	0.001
1100	4999.999	2009.998	100.148	7.5MATR4	0.000	-0.001	-0.001	0.001	0.001
1101	4999.999	2009.998	100.148	7.5MATR4	0.000	-0.001	-0.001	0.001	0.001
1102	4999.999	2009.999	100.148	7.5MATR5	0.000	-0.001	0.000	0.001	0.001
1103	5000.000	2009.999	100.148	7.5MATR5	0.000	0.000	0.000	0.000	0.000
1104	5000.002	2009.999	100.150	7.5MATR5	0.002	0.002	0.000	0.002	0.003
1105	4999.998	2009.999	100.148	7.5MATR6	0.000	-0.002	0.000	0.002	0.002
1106	4999.998	2009.999	100.148	7.5MATR6	0.000	-0.002	0.000	0.002	0.002
1107	4999.998	2009.999	100.148	7.5MATR6	0.000	-0.002	0.000	0.002	0.002

Leica TPS1103 - 10m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH10NP	5000.000	2009.999	100.149	STN					
1108	5000.000	2010.001	100.150	2.5MNP1	0.001	0.000	0.002	0.002	0.002
1109	5000.000	2010.001	100.150	2.5MNP1	0.001	0.000	0.002	0.002	0.002
1110	5000.000	2010.001	100.150	2.5MNP1	0.001	0.000	0.002	0.002	0.002
1111	5000.000	2009.999	100.150	2.5MNP2	0.001	0.000	0.000	0.000	0.001
1112	5000.000	2010.000	100.150	2.5MNP2	0.001	0.000	0.001	0.001	0.001
1113	5000.000	2010.000	100.150	2.5MNP2	0.001	0.000	0.001	0.001	0.001
1114	5000.000	2009.997	100.150	2.5MNP3	0.001	0.000	-0.002	0.002	0.002
1115	5000.000	2009.998	100.150	2.5MNP3	0.001	0.000	-0.001	0.001	0.001
1116	5000.000	2009.998	100.150	2.5MNP3	0.001	0.000	-0.001	0.001	0.001
1117	5000.000	2010.001	100.150	2.5MNP4	0.001	0.000	0.002	0.002	0.002
1118	5000.000	2010.001	100.150	2.5MNP4	0.001	0.000	0.002	0.002	0.002
1119	5000.000	2010.001	100.150	2.5MNP4	0.001	0.000	0.002	0.002	0.002
1120	5000.000	2010.006	100.150	2.5MNP5	0.001	0.000	0.007	0.007	0.007
1121	5000.000	2010.006	100.150	2.5MNP5	0.001	0.000	0.007	0.007	0.007
1122	5000.000	2010.005	100.150	2.5MNP5	0.001	0.000	0.006	0.006	0.006
1123	5000.000	2009.996	100.149	2.5MNP6	0.000	0.000	-0.003	0.003	0.003
1124	5000.000	2009.996	100.149	2.5MNP6	0.000	0.000	-0.003	0.003	0.003
1125	5000.000	2009.996	100.149	2.5MNP6	0.000	0.000	-0.003	0.003	0.003
1126	5000.000	2010.001	100.150	5MNP1	0.001	0.000	0.002	0.002	0.002
1127	5000.000	2010.000	100.150	5MNP1	0.001	0.000	0.001	0.001	0.001
1128	5000.000	2010.000	100.150	5MNP1	0.001	0.000	0.001	0.001	0.001
1129	5000.000	2010.000	100.149	5MNP2	0.000	0.000	0.001	0.001	0.001
1130	5000.000	2010.000	100.149	5MNP2	0.000	0.000	0.001	0.001	0.001
1131	5000.000	2009.999	100.149	5MNP2	0.000	0.000	0.000	0.000	0.000
1132	5000.000	2009.998	100.149	5MNP3	0.000	0.000	-0.001	0.001	0.001
1133	5000.000	2009.997	100.149	5MNP3	0.000	0.000	-0.002	0.002	0.002
1134	5000.000	2009.997	100.149	5MNP3	0.000	0.000	-0.002	0.002	0.002
1135	5000.000	2009.997	100.149	5MNP4	0.000	0.000	-0.002	0.002	0.002
1136	5000.000	2009.998	100.149	5MNP4	0.000	0.000	-0.001	0.001	0.001
1137	5000.000	2009.998	100.149	5MNP4	0.000	0.000	-0.001	0.001	0.001
1138	5000.000	2010.006	100.149	5MNP5	0.000	0.000	0.007	0.007	0.007
1139	5000.000	2010.005	100.149	5MNP5	0.000	0.000	0.006	0.006	0.006
1140	5000.000	2010.006	100.149	5MNP5	0.000	0.000	0.007	0.007	0.007
1141	5000.000	2009.997	100.149	5MNP6	0.000	0.000	-0.002	0.002	0.002
1142	5000.000	2009.997	100.149	5MNP6	0.000	0.000	-0.002	0.002	0.002
1143	5000.000	2009.998	100.149	5MNP6	0.000	0.000	-0.001	0.001	0.001
1144	4999.999	2010.001	100.149	7.5MNP1	0.000	-0.001	0.002	0.002	0.002
1145	4999.999	2010.001	100.149	7.5MNP1	0.000	-0.001	0.002	0.002	0.002
1146	4999.999	2010.001	100.149	7.5MNP1	0.000	-0.001	0.002	0.002	0.002
1147	4999.999	2010.000	100.149	7.5MNP2	0.000	-0.001	0.001	0.001	0.001
1148	4999.999	2010.001	100.149	7.5MNP2	0.000	-0.001	0.002	0.002	0.002
1149	4999.999	2010.000	100.149	7.5MNP2	0.000	-0.001	0.001	0.001	0.001
1150	5000.000	2009.997	100.149	7.5MNP3	0.000	0.000	-0.002	0.002	0.002
1151	5000.000	2009.998	100.149	7.5MNP3	0.000	0.000	-0.001	0.001	0.001
1152	5000.000	2009.998	100.149	7.5MNP3	0.000	0.000	-0.001	0.001	0.001
1153	5000.000	2010.000	100.149	7.5MNP4	0.000	0.000	0.001	0.001	0.001
1154	5000.000	2010.000	100.149	7.5MNP4	0.000	0.000	0.001	0.001	0.001
1155	5000.000	2010.000	100.149	7.5MNP4	0.000	0.000	0.001	0.001	0.001
1156	5000.000	2010.003	100.149	7.5MNP5	0.000	0.000	0.004	0.004	0.004
1157	5000.000	2010.003	100.149	7.5MNP5	0.000	0.000	0.004	0.004	0.004
1158	4999.999	2010.002	100.149	7.5MNP5	0.000	-0.001	0.003	0.003	0.003
1159	5000.000	2009.998	100.149	7.5MNP6	0.000	0.000	-0.001	0.001	0.001
1160	5000.000	2009.999	100.149	7.5MNP6	0.000	0.000	0.000	0.000	0.000
1161	5000.000	2009.998	100.149	7.5MNP6	0.000	0.000	-0.001	0.001	0.001

Leica TPS1103 - 20m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH20	5000.000	2020.000	100.318	STN					
2000	5000.000	2020.003	100.318	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
2001	5000.000	2020.003	100.318	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
2002	5000.000	2020.003	100.318	2.5MMAN1	0.000	0.000	0.003	0.003	0.003
2003	5000.000	2020.003	100.318	2.5MMAN2	0.000	0.000	0.003	0.003	0.003
2004	5000.000	2020.003	100.318	2.5MMAN2	0.000	0.000	0.003	0.003	0.003
2005	5000.000	2020.003	100.318	2.5MMAN2	0.000	0.000	0.003	0.003	0.003
2006	5000.000	2020.000	100.318	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
2007	5000.000	2020.001	100.318	2.5MMAN3	0.000	0.000	0.001	0.001	0.001
2008	5000.000	2020.000	100.318	2.5MMAN3	0.000	0.000	0.000	0.000	0.000
2009	4999.999	2020.001	100.318	2.5MMAN4	0.000	-0.001	0.001	0.001	0.001
2010	4999.999	2020.001	100.318	2.5MMAN4	0.000	-0.001	0.001	0.001	0.001
2011	4999.999	2020.001	100.318	2.5MMAN4	0.000	-0.001	0.001	0.001	0.001
2012	5000.000	2020.001	100.318	2.5MMAN5	0.000	0.000	0.001	0.001	0.001
2013	5000.000	2020.000	100.318	2.5MMAN5	0.000	0.000	0.000	0.000	0.000
2014	5000.000	2020.001	100.318	2.5MMAN5	0.000	0.000	0.001	0.001	0.001
2015	5000.000	2020.001	100.318	2.5MMAN6	0.000	0.000	0.001	0.001	0.001
2016	5000.000	2020.001	100.318	2.5MMAN6	0.000	0.000	0.001	0.001	0.001
2017	5000.000	2020.001	100.318	2.5MMAN6	0.000	0.000	0.001	0.001	0.001
2018	4999.999	2020.003	100.318	10MMAN1	0.000	-0.001	0.003	0.003	0.003
2019	5000.000	2020.003	100.318	10MMAN1	0.000	0.000	0.003	0.003	0.003
2020	5000.000	2020.003	100.318	10MMAN1	0.000	0.000	0.003	0.003	0.003
2021	5000.000	2020.002	100.318	10MMAN2	0.000	0.000	0.002	0.002	0.002
2022	5000.000	2020.003	100.318	10MMAN2	0.000	0.000	0.003	0.003	0.003
2023	5000.000	2020.002	100.318	10MMAN2	0.000	0.000	0.002	0.002	0.002
2024	5000.000	2020.001	100.318	10MMAN3	0.000	0.000	0.001	0.001	0.001
2025	5000.000	2020.000	100.318	10MMAN3	0.000	0.000	0.000	0.000	0.000
2026	5000.000	2020.000	100.318	10MMAN3	0.000	0.000	0.000	0.000	0.000
2027	5000.000	2020.001	100.318	10MMAN4	0.000	0.000	0.001	0.001	0.001
2028	5000.000	2020.000	100.318	10MMAN4	0.000	0.000	0.000	0.000	0.000
2029	5000.000	2020.000	100.318	10MMAN4	0.000	0.000	0.000	0.000	0.000
2030	5000.000	2020.001	100.318	10MMAN5	0.000	0.000	0.001	0.001	0.001
2031	5000.000	2020.001	100.318	10MMAN5	0.000	0.000	0.001	0.001	0.001
2032	5000.000	2020.001	100.318	10MMAN5	0.000	0.000	0.001	0.001	0.001
2033	5000.000	2020.001	100.318	10MMAN6	0.000	0.000	0.001	0.001	0.001
2034	5000.000	2020.001	100.318	10MMAN6	0.000	0.000	0.001	0.001	0.001
2035	5000.000	2020.001	100.318	10MMAN6	0.000	0.000	0.001	0.001	0.001
2036	5000.000	2020.003	100.319	17.5MMAN1	0.001	0.000	0.003	0.003	0.003
2037	5000.000	2020.003	100.318	17.5MMAN1	0.000	0.000	0.003	0.003	0.003
2038	5000.000	2020.003	100.318	17.5MMAN1	0.000	0.000	0.003	0.003	0.003
2039	5000.000	2020.003	100.318	17.5MMAN2	0.000	0.000	0.003	0.003	0.003
2040	5000.000	2020.002	100.318	17.5MMAN2	0.000	0.000	0.002	0.002	0.002
2041	5000.000	2020.003	100.318	17.5MMAN2	0.000	0.000	0.003	0.003	0.003
2042	5000.000	2020.000	100.318	17.5MMAN3	0.000	0.000	0.000	0.000	0.000
2043	4999.999	2020.000	100.318	17.5MMAN3	0.000	-0.001	0.000	0.001	0.001
2044	5000.000	2020.001	100.318	17.5MMAN3	0.000	0.000	0.001	0.001	0.001
2045	5000.000	2020.000	100.318	17.5MMAN4	0.000	0.000	0.000	0.000	0.000
2046	5000.000	2020.000	100.318	17.5MMAN4	0.000	0.000	0.000	0.000	0.000
2047	5000.000	2020.001	100.318	17.5MMAN4	0.000	0.000	0.001	0.001	0.001
2048	4999.999	2020.001	100.317	17.5MMAN5	-0.001	-0.001	0.001	0.001	0.002
2049	4999.993	2020.000	100.314	17.5MMAN5	-0.004	-0.007	0.000	0.007	0.008
2050	4999.998	2020.001	100.315	17.5MMAN5	-0.003	-0.002	0.001	0.002	0.004
2051	5000.001	2020.001	100.317	17.5MMAN6	-0.001	0.001	0.001	0.001	0.002
2052	5000.001	2020.001	100.317	17.5MMAN6	-0.001	0.001	0.001	0.001	0.002
2053	5000.001	2020.001	100.317	17.5MMAN6	-0.001	0.001	0.001	0.001	0.002

Leica TPS1103 - 20m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
2054	5000.000	2020.003	100.319	2.5MATR1	0.001	0.000	0.003	0.003	0.003
2055	5000.000	2020.003	100.319	2.5MATR1	0.001	0.000	0.003	0.003	0.003
2056	4999.999	2020.003	100.319	2.5MATR1	0.001	-0.001	0.003	0.003	0.003
2057	5000.000	2020.003	100.318	2.5MATR2	0.000	0.000	0.003	0.003	0.003
2058	5000.000	2020.002	100.318	2.5MATR2	0.000	0.000	0.002	0.002	0.002
2059	5000.000	2020.003	100.318	2.5MATR2	0.000	0.000	0.003	0.003	0.003
2060	4999.999	2020.001	100.317	2.5MATR3	-0.001	-0.001	0.001	0.001	0.002
2061	4999.999	2020.000	100.317	2.5MATR3	-0.001	-0.001	0.000	0.001	0.001
2062	4999.999	2020.000	100.317	2.5MATR3	-0.001	-0.001	0.000	0.001	0.001
2063	5000.001	2020.000	100.317	2.5MATR4	-0.001	0.001	0.000	0.001	0.001
2064	5000.000	2020.000	100.317	2.5MATR4	-0.001	0.000	0.000	0.000	0.001
2065	5000.000	2020.001	100.317	2.5MATR4	-0.001	0.000	0.001	0.001	0.001
2066	4999.999	2020.001	100.319	2.5MATR5	0.001	-0.001	0.001	0.001	0.002
2067	5000.000	2020.001	100.320	2.5MATR5	0.002	0.000	0.001	0.001	0.002
2068	5000.000	2020.002	100.319	2.5MATR5	0.001	0.000	0.002	0.002	0.002
2069	4999.999	2020.001	100.318	2.5MATR6	0.000	-0.001	0.001	0.001	0.001
2070	4999.999	2020.001	100.318	2.5MATR6	0.000	-0.001	0.001	0.001	0.001
2071	4999.998	2020.001	100.319	2.5MATR6	0.001	-0.002	0.001	0.002	0.002
2072	5000.000	2020.003	100.319	10MATR1	0.001	0.000	0.003	0.003	0.003
2073	5000.000	2020.003	100.319	10MATR1	0.001	0.000	0.003	0.003	0.003
2074	5000.000	2020.003	100.319	10MATR1	0.001	0.000	0.003	0.003	0.003
2075	5000.000	2020.003	100.318	10MATR2	0.000	0.000	0.003	0.003	0.003
2076	5000.000	2020.002	100.318	10MATR2	0.000	0.000	0.002	0.002	0.002
2077	5000.000	2020.003	100.318	10MATR2	0.000	0.000	0.003	0.003	0.003
2078	5000.000	2020.000	100.317	10MATR3	-0.001	0.000	0.000	0.000	0.001
2079	5000.000	2020.001	100.317	10MATR3	-0.001	0.000	0.001	0.001	0.001
2080	5000.000	2020.001	100.318	10MATR3	0.000	0.000	0.001	0.001	0.001
2081	4999.999	2020.000	100.318	10MATR4	0.000	-0.001	0.000	0.001	0.001
2082	5000.000	2020.000	100.319	10MATR4	0.001	0.000	0.000	0.000	0.001
2083	4999.999	2020.000	100.318	10MATR4	0.000	-0.001	0.000	0.001	0.001
2084	5000.002	2020.001	100.322	10MATR5	0.004	0.002	0.001	0.002	0.005
2085	4999.998	2020.001	100.319	10MATR5	0.001	-0.002	0.001	0.002	0.002
2086	4999.998	2020.000	100.319	10MATR5	0.001	-0.002	0.000	0.002	0.002
2087	4999.999	2020.001	100.317	10MATR6	-0.001	-0.001	0.001	0.001	0.002
2088	4999.999	2020.001	100.317	10MATR6	-0.001	-0.001	0.001	0.001	0.002
2089	4999.999	2020.001	100.317	10MATR6	-0.001	-0.001	0.001	0.001	0.002
2090	5000.000	2020.003	100.318	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2091	5000.000	2020.003	100.318	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2092	5000.000	2020.003	100.318	17.5MATR1	0.000	0.000	0.003	0.003	0.003
2093	5000.000	2020.003	100.318	17.5MATR2	0.000	0.000	0.003	0.003	0.003
2094	5000.000	2020.003	100.318	17.5MATR2	0.000	0.000	0.003	0.003	0.003
2095	5000.000	2020.003	100.318	17.5MATR2	0.000	0.000	0.003	0.003	0.003
2096	5000.000	2020.000	100.317	17.5MATR3	-0.001	0.000	0.000	0.000	0.001
2097	5000.000	2020.001	100.318	17.5MATR3	0.000	0.000	0.001	0.001	0.001
2098	5000.000	2020.001	100.317	17.5MATR3	-0.001	0.000	0.001	0.001	0.001
2099	5000.000	2020.001	100.318	17.5MATR4	0.000	0.000	0.001	0.001	0.001
2100	5000.000	2020.001	100.318	17.5MATR4	0.000	0.000	0.001	0.001	0.001
2101	5000.000	2020.000	100.318	17.5MATR4	0.000	0.000	0.000	0.000	0.000
2102	4999.996	2020.001	100.315	17.5MATR5	-0.003	-0.004	0.001	0.004	0.005
2103	4999.999	2020.001	100.316	17.5MATR5	-0.002	-0.001	0.001	0.001	0.002
2104	4999.997	2020.001	100.314	17.5MATR5	-0.004	-0.003	0.001	0.003	0.005
2105	4999.999	2020.001	100.317	17.5MATR6	-0.001	-0.001	0.001	0.001	0.002
2106	4999.998	2020.001	100.317	17.5MATR6	-0.001	-0.002	0.001	0.002	0.002
2107	4999.998	2020.001	100.317	17.5MATR6	-0.001	-0.002	0.001	0.002	0.002

Leica TPS1103 - 20m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH20NP	5000.000	2020.000	100.319	STN					
2108	5000.000	2020.002	100.320	2.5MNP1	0.001	0.000	0.002	0.002	0.002
2109	4999.999	2020.002	100.321	2.5MNP1	0.002	-0.001	0.002	0.002	0.003
2110	4999.999	2020.002	100.321	2.5MNP1	0.002	-0.001	0.002	0.002	0.003
2111	4999.999	2020.001	100.319	2.5MNP2	0.000	-0.001	0.001	0.001	0.001
2112	5000.000	2020.001	100.319	2.5MNP2	0.000	0.000	0.001	0.001	0.001
2113	4999.999	2020.002	100.319	2.5MNP2	0.000	-0.001	0.002	0.002	0.002
2114	4999.999	2020.000	100.318	2.5MNP3	-0.001	-0.001	0.000	0.001	0.001
2115	4999.999	2020.000	100.318	2.5MNP3	-0.001	-0.001	0.000	0.001	0.001
2116	4999.999	2020.000	100.318	2.5MNP3	-0.001	-0.001	0.000	0.001	0.001
2117	4999.999	2020.001	100.318	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
2118	4999.999	2020.000	100.318	2.5MNP4	-0.001	-0.001	0.000	0.001	0.001
2119	4999.999	2020.000	100.318	2.5MNP4	-0.001	-0.001	0.000	0.001	0.001
2120	4999.999	2020.008	100.319	2.5MNP5	0.000	-0.001	0.008	0.008	0.008
2121	4999.999	2020.011	100.319	2.5MNP5	0.000	-0.001	0.011	0.011	0.011
2122	4999.999	2020.008	100.319	2.5MNP5	0.000	-0.001	0.008	0.008	0.008
2123	4999.999	2020.007	100.319	2.5MNP6	0.000	-0.001	0.007	0.007	0.007
2124	4999.999	2020.007	100.319	2.5MNP6	0.000	-0.001	0.007	0.007	0.007
2125	4999.999	2020.007	100.319	2.5MNP6	0.000	-0.001	0.007	0.007	0.007
2126	5000.000	2020.003	100.319	10MNP1	0.000	0.000	0.003	0.003	0.003
2127	5000.000	2020.002	100.319	10MNP1	0.000	0.000	0.002	0.002	0.002
2128	5000.000	2020.002	100.319	10MNP1	0.000	0.000	0.002	0.002	0.002
2129	5000.000	2020.001	100.319	10MNP2	0.000	0.000	0.001	0.001	0.001
2130	5000.000	2020.002	100.319	10MNP2	0.000	0.000	0.002	0.002	0.002
2131	5000.000	2020.001	100.319	10MNP2	0.000	0.000	0.001	0.001	0.001
2132	5000.000	2019.999	100.318	10MNP3	-0.001	0.000	-0.001	0.001	0.001
2133	5000.000	2019.999	100.318	10MNP3	-0.001	0.000	-0.001	0.001	0.001
2134	5000.000	2019.999	100.318	10MNP3	-0.001	0.000	-0.001	0.001	0.001
2135	5000.000	2020.000	100.318	10MNP4	-0.001	0.000	0.000	0.000	0.001
2136	5000.000	2020.000	100.318	10MNP4	-0.001	0.000	0.000	0.000	0.001
2137	5000.000	2020.001	100.318	10MNP4	-0.001	0.000	0.001	0.001	0.001
2138	5000.000	2020.006	100.319	10MNP5	0.000	0.000	0.006	0.006	0.006
2139	5000.000	2020.005	100.319	10MNP5	0.000	0.000	0.005	0.005	0.005
2140	5000.000	2020.006	100.319	10MNP5	0.000	0.000	0.006	0.006	0.006
2141	5000.000	2020.002	100.319	10MNP6	0.000	0.000	0.002	0.002	0.002
2142	5000.000	2020.001	100.319	10MNP6	0.000	0.000	0.001	0.001	0.001
2143	5000.000	2020.002	100.319	10MNP6	0.000	0.000	0.002	0.002	0.002
2144	5000.000	2020.002	100.319	17.5MNP1	0.000	0.000	0.002	0.002	0.002
2145	5000.000	2020.003	100.319	17.5MNP1	0.000	0.000	0.003	0.003	0.003
2146	5000.000	2020.002	100.319	17.5MNP1	0.000	0.000	0.002	0.002	0.002
2147	5000.000	2020.002	100.319	17.5MNP2	0.000	0.000	0.002	0.002	0.002
2148	5000.000	2020.001	100.319	17.5MNP2	0.000	0.000	0.001	0.001	0.001
2149	5000.000	2020.001	100.319	17.5MNP2	0.000	0.000	0.001	0.001	0.001
2150	5000.000	2019.999	100.319	17.5MNP3	0.000	0.000	-0.001	0.001	0.001
2151	5000.000	2019.999	100.319	17.5MNP3	0.000	0.000	-0.001	0.001	0.001
2152	5000.000	2020.000	100.319	17.5MNP3	0.000	0.000	0.000	0.000	0.000
2153	5000.000	2020.002	100.319	17.5MNP4	0.000	0.000	0.002	0.002	0.002
2154	5000.000	2020.001	100.319	17.5MNP4	0.000	0.000	0.001	0.001	0.001
2155	5000.000	2020.001	100.319	17.5MNP4	0.000	0.000	0.001	0.001	0.001
2156	5000.000	2020.003	100.319	17.5MNP5	0.000	0.000	0.003	0.003	0.003
2157	5000.000	2020.006	100.319	17.5MNP5	0.000	0.000	0.006	0.006	0.006
2158	5000.000	2020.005	100.319	17.5MNP5	0.000	0.000	0.005	0.005	0.005
2159	5000.000	2020.002	100.319	17.5MNP6	0.000	0.000	0.002	0.002	0.002
2160	5000.000	2020.002	100.319	17.5MNP6	0.000	0.000	0.002	0.002	0.002
2161	5000.000	2020.001	100.319	17.5MNP6	0.000	0.000	0.001	0.001	0.001

Leica TPS1103 - 40m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH40	4999.999	2040.000	100.500	STN					
3000	4999.998	2040.002	100.500	2.5MMAN1	0.000	-0.001	0.002	0.002	0.002
3001	4999.998	2040.003	100.501	2.5MMAN1	0.001	-0.001	0.003	0.003	0.003
3002	4999.998	2040.002	100.501	2.5MMAN1	0.001	-0.001	0.002	0.002	0.002
3003	4999.998	2040.002	100.501	2.5MMAN2	0.001	-0.001	0.002	0.002	0.002
3004	4999.998	2040.002	100.500	2.5MMAN2	0.000	-0.001	0.002	0.002	0.002
3005	4999.998	2040.002	100.501	2.5MMAN2	0.001	-0.001	0.002	0.002	0.002
3006	4999.998	2040.000	100.500	2.5MMAN3	0.000	-0.001	0.000	0.001	0.001
3007	4999.998	2039.999	100.500	2.5MMAN3	0.000	-0.001	-0.001	0.001	0.001
3008	4999.998	2040.000	100.500	2.5MMAN3	0.000	-0.001	0.000	0.001	0.001
3009	4999.998	2039.999	100.500	2.5MMAN4	0.000	-0.001	-0.001	0.001	0.001
3010	4999.998	2040.000	100.500	2.5MMAN4	0.000	-0.001	0.000	0.001	0.001
3011	4999.998	2040.000	100.500	2.5MMAN4	0.000	-0.001	0.000	0.001	0.001
3012	4999.998	2039.999	100.500	2.5MMAN5	0.000	-0.001	-0.001	0.001	0.001
3013	4999.998	2040.000	100.500	2.5MMAN5	0.000	-0.001	0.000	0.001	0.001
3014	4999.998	2039.999	100.499	2.5MMAN5	-0.001	-0.001	-0.001	0.001	0.002
3015	4999.998	2039.999	100.500	2.5MMAN6	0.000	-0.001	-0.001	0.001	0.001
3016	4999.998	2039.999	100.500	2.5MMAN6	0.000	-0.001	-0.001	0.001	0.001
3017	4999.998	2039.999	100.500	2.5MMAN6	0.000	-0.001	-0.001	0.001	0.001
3018	4999.998	2040.002	100.500	10MMAN1	0.000	-0.001	0.002	0.002	0.002
3019	4999.998	2040.002	100.500	10MMAN1	0.000	-0.001	0.002	0.002	0.002
3020	4999.998	2040.002	100.500	10MMAN1	0.000	-0.001	0.002	0.002	0.002
3021	4999.998	2040.002	100.500	10MMAN2	0.000	-0.001	0.002	0.002	0.002
3022	4999.998	2040.002	100.500	10MMAN2	0.000	-0.001	0.002	0.002	0.002
3023	4999.998	2040.002	100.500	10MMAN2	0.000	-0.001	0.002	0.002	0.002
3024	4999.998	2040.000	100.499	10MMAN3	-0.001	-0.001	0.000	0.001	0.001
3025	4999.998	2040.000	100.499	10MMAN3	-0.001	-0.001	0.000	0.001	0.001
3026	4999.998	2040.000	100.499	10MMAN3	-0.001	-0.001	0.000	0.001	0.001
3027	4999.998	2040.000	100.499	10MMAN4	-0.001	-0.001	0.000	0.001	0.001
3028	4999.998	2040.000	100.499	10MMAN4	-0.001	-0.001	0.000	0.001	0.001
3029	4999.998	2040.000	100.499	10MMAN4	-0.001	-0.001	0.000	0.001	0.001
3030	4999.998	2040.000	100.499	10MMAN5	-0.001	-0.001	0.000	0.001	0.001
3031	4999.998	2040.000	100.499	10MMAN5	-0.001	-0.001	0.000	0.001	0.001
3032	4999.998	2039.999	100.499	10MMAN5	-0.001	-0.001	-0.001	0.001	0.002
3033	4999.998	2039.999	100.499	10MMAN6	-0.001	-0.001	-0.001	0.001	0.002
3034	4999.998	2039.999	100.500	10MMAN6	0.000	-0.001	-0.001	0.001	0.001
3035	4999.998	2039.999	100.500	10MMAN6	0.000	-0.001	-0.001	0.001	0.001
3036	4999.998	2040.002	100.499	20MMAN1	-0.001	-0.001	0.002	0.002	0.002
3037	4999.998	2040.002	100.499	20MMAN1	-0.001	-0.001	0.002	0.002	0.002
3038	4999.998	2040.003	100.499	20MMAN1	-0.001	-0.001	0.003	0.003	0.003
3039	4999.999	2040.002	100.500	20MMAN2	0.000	0.000	0.002	0.002	0.002
3040	4999.999	2040.002	100.500	20MMAN2	0.000	0.000	0.002	0.002	0.002
3041	5000.000	2040.002	100.500	20MMAN2	0.000	0.001	0.002	0.002	0.002
3042	4999.999	2040.000	100.500	20MMAN3	0.000	0.000	0.000	0.000	0.000
3043	4999.999	2040.000	100.500	20MMAN3	0.000	0.000	0.000	0.000	0.000
3044	4999.999	2040.000	100.500	20MMAN3	0.000	0.000	0.000	0.000	0.000
3045	4999.999	2040.000	100.500	20MMAN4	0.000	0.000	0.000	0.000	0.000
3046	4999.999	2040.000	100.500	20MMAN4	0.000	0.000	0.000	0.000	0.000
3047	4999.999	2040.000	100.500	20MMAN4	0.000	0.000	0.000	0.000	0.000
3048	4999.999	2040.000	100.500	20MMAN5	0.000	0.000	0.000	0.000	0.000
3049	4999.999	2040.000	100.500	20MMAN5	0.000	0.000	0.000	0.000	0.000
3050	4999.999	2040.000	100.500	20MMAN5	0.000	0.000	0.000	0.000	0.000
3051	4999.999	2039.998	100.499	20MMAN6	-0.001	0.000	-0.002	0.002	0.002
3052	5000.000	2039.999	100.500	20MMAN6	0.000	0.001	-0.001	0.001	0.001
3053	4999.999	2039.999	100.499	20MMAN6	-0.001	0.000	-0.001	0.001	0.001

3054	4999.999	2040.002	100.500	30MMAN1	0.000	0.000	0.002	0.002	0.002
3055	4999.998	2040.003	100.501	30MMAN1	0.001	-0.001	0.003	0.003	0.003
3056	4999.998	2040.003	100.501	30MMAN1	0.001	-0.001	0.003	0.003	0.003
3057	4999.998	2040.002	100.501	30MMAN2	0.001	-0.001	0.002	0.002	0.002
3058	4999.998	2040.002	100.501	30MMAN2	0.001	-0.001	0.002	0.002	0.002
3059	4999.998	2040.002	100.501	30MMAN2	0.001	-0.001	0.002	0.002	0.002
3060	4999.998	2039.999	100.501	30MMAN3	0.001	-0.001	-0.001	0.001	0.002
3061	4999.998	2040.000	100.501	30MMAN3	0.001	-0.001	0.000	0.001	0.001
3062	4999.998	2040.000	100.501	30MMAN3	0.001	-0.001	0.000	0.001	0.001
3063	4999.998	2040.000	100.501	30MMAN4	0.001	-0.001	0.000	0.001	0.001
3064	4999.998	2040.000	100.501	30MMAN4	0.001	-0.001	0.000	0.001	0.001
3065	4999.998	2039.999	100.501	30MMAN4	0.001	-0.001	-0.001	0.001	0.002
3066	4999.999	2040.000	100.501	30MMAN5	0.001	0.000	0.000	0.000	0.001
3067	4999.999	2040.000	100.501	30MMAN5	0.001	0.000	0.000	0.000	0.001
3068	4999.998	2040.000	100.501	30MMAN5	0.001	-0.001	0.000	0.001	0.001
3069	4999.998	2040.000	100.501	30MMAN6	0.001	-0.001	0.000	0.001	0.001
3070	4999.998	2040.001	100.501	30MMAN6	0.001	-0.001	0.001	0.001	0.002
3071	4999.998	2040.000	100.501	30MMAN6	0.001	-0.001	0.000	0.001	0.001
3072	4999.998	2040.002	100.501	37.5MMAN1	0.001	-0.001	0.002	0.002	0.002
3073	4999.998	2040.002	100.501	37.5MMAN1	0.001	-0.001	0.002	0.002	0.002
3074	4999.998	2040.002	100.501	37.5MMAN1	0.001	-0.001	0.002	0.002	0.002
3075	4999.999	2040.001	100.501	37.5MMAN2	0.001	0.000	0.001	0.001	0.001
3076	4999.999	2040.002	100.501	37.5MMAN2	0.001	0.000	0.002	0.002	0.002
3077	4999.999	2040.002	100.501	37.5MMAN2	0.001	0.000	0.002	0.002	0.002
3078	4999.999	2040.000	100.501	37.5MMAN3	0.001	0.000	0.000	0.000	0.001
3079	4999.999	2039.999	100.501	37.5MMAN3	0.001	0.000	-0.001	0.001	0.001
3080	4999.999	2040.000	100.501	37.5MMAN3	0.001	0.000	0.000	0.000	0.001
3081	4999.999	2040.000	100.501	37.5MMAN4	0.001	0.000	0.000	0.000	0.001
3082	4999.999	2039.999	100.501	37.5MMAN4	0.001	0.000	-0.001	0.001	0.001
3083	4999.999	2040.000	100.501	37.5MMAN4	0.001	0.000	0.000	0.000	0.001
3084	4999.999	2040.000	100.502	37.5MMAN5	0.002	0.000	0.000	0.000	0.002
3085	4999.999	2039.999	100.502	37.5MMAN5	0.002	0.000	-0.001	0.001	0.002
3086	4999.999	2040.000	100.502	37.5MMAN5	0.002	0.000	0.000	0.000	0.002
3087	4999.999	2040.000	100.502	37.5MMAN6	0.002	0.000	0.000	0.000	0.002
3088	4999.999	2040.000	100.502	37.5MMAN6	0.002	0.000	0.000	0.000	0.002
3089	4999.999	2040.000	100.502	37.5MMAN6	0.002	0.000	0.000	0.000	0.002

Leica TPS1103 - 40m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
3090	4999.997	2040.003	100.499	2.5MATR1	-0.001	-0.002	0.003	0.004	0.004
3091	4999.997	2040.002	100.502	2.5MATR1	0.002	-0.002	0.002	0.003	0.003
3092	4999.998	2040.002	100.502	2.5MATR1	0.002	-0.001	0.002	0.002	0.003
3093	5000.031	2002.495	100.052	2.5MATR2	-0.448	0.032	-37.505	37.505	37.508
3094	5000.031	2002.496	100.052	2.5MATR2	-0.448	0.032	-37.504	37.504	37.507
3095	5000.031	2002.497	100.052	2.5MATR2	-0.448	0.032	-37.503	37.503	37.506
3096	4999.999	2040.000	100.501	2.5MATR3	0.001	0.000	0.000	0.000	0.001
3097	4999.999	2040.000	100.500	2.5MATR3	0.000	0.000	0.000	0.000	0.000
3098	4999.999	2040.000	100.500	2.5MATR3	0.000	0.000	0.000	0.000	0.000
3099	5000.000	2040.000	100.498	2.5MATR4	-0.002	0.001	0.000	0.001	0.002
3100	5000.001	2040.000	100.498	2.5MATR4	-0.002	0.002	0.000	0.002	0.003
3101	5000.000	2040.000	100.498	2.5MATR4	-0.002	0.001	0.000	0.001	0.002
3102	5000.000	2039.999	100.498	2.5MATR4	-0.002	0.001	-0.001	0.001	0.002
3103	4999.999	2040.000	100.500	2.5MATR5	0.000	0.000	0.000	0.000	0.000
3104	4999.998	2040.000	100.499	2.5MATR5	-0.001	-0.001	0.000	0.001	0.001
3105	4999.998	2040.000	100.500	2.5MATR5	0.000	-0.001	0.000	0.001	0.001
3106	4999.999	2039.999	100.499	2.5MATR6	-0.001	0.000	-0.001	0.001	0.001
3107	5000.000	2039.999	100.497	2.5MATR6	-0.003	0.001	-0.001	0.001	0.003
3108	5000.000	2039.999	100.498	2.5MATR6	-0.002	0.001	-0.001	0.001	0.002
3109	4999.998	2040.002	100.501	10MATR1	0.001	-0.001	0.002	0.002	0.002
3110	4999.997	2040.002	100.502	10MATR1	0.002	-0.002	0.002	0.003	0.003
3111	4999.998	2040.002	100.501	10MATR1	0.001	-0.001	0.002	0.002	0.002
3112	4999.998	2040.002	100.499	10MATR2	-0.001	-0.001	0.002	0.002	0.002
3113	4999.999	2040.001	100.499	10MATR2	-0.001	0.000	0.001	0.001	0.001
3114	4999.999	2040.002	100.499	10MATR2	-0.001	0.000	0.002	0.002	0.002
3115	4999.999	2040.000	100.498	10MATR3	-0.002	0.000	0.000	0.000	0.002
3116	5000.000	2040.000	100.499	10MATR3	-0.001	0.001	0.000	0.001	0.001
3117	4999.998	2040.000	100.498	10MATR3	-0.002	-0.001	0.000	0.001	0.002
3118	5000.000	2040.000	100.500	10MATR4	0.000	0.001	0.000	0.001	0.001
3119	5000.000	2040.000	100.499	10MATR4	-0.001	0.001	0.000	0.001	0.001
3120	5000.001	2040.000	100.499	10MATR4	-0.001	0.002	0.000	0.002	0.002
3121	4999.998	2040.000	100.493	10MATR5	-0.007	-0.001	0.000	0.001	0.007
3122	4999.999	2040.000	100.494	10MATR5	-0.006	0.000	0.000	0.000	0.006
3123	4999.998	2040.000	100.493	10MATR5	-0.007	-0.001	0.000	0.001	0.007
3124	4999.997	2040.000	100.497	10MATR6	-0.003	-0.002	0.000	0.002	0.004
3125	4999.997	2039.999	100.497	10MATR6	-0.003	-0.002	-0.001	0.002	0.004
3126	4999.998	2039.999	100.497	10MATR6	-0.003	-0.001	-0.001	0.001	0.003
3127	4999.999	2040.002	100.501	20MATR1	0.001	0.000	0.002	0.002	0.002
3128	4999.999	2040.003	100.501	20MATR1	0.001	0.000	0.003	0.003	0.003
3129	5000.000	2040.002	100.501	20MATR1	0.001	0.001	0.002	0.002	0.002
3130	4999.999	2040.002	100.500	20MATR2	0.000	0.000	0.002	0.002	0.002
3131	5000.000	2040.002	100.501	20MATR2	0.001	0.001	0.002	0.002	0.002
3132	5000.000	2040.002	100.501	20MATR2	0.001	0.001	0.002	0.002	0.002
3133	5000.000	2040.000	100.500	20MATR3	0.000	0.001	0.000	0.001	0.001
3134	4999.999	2040.000	100.500	20MATR3	0.000	0.000	0.000	0.000	0.000
3135	4999.999	2040.000	100.500	20MATR3	0.000	0.000	0.000	0.000	0.000
3136	4999.999	2040.000	100.500	20MATR3	0.000	0.000	0.000	0.000	0.000
3137	4999.999	2040.000	100.499	20MATR4	-0.001	0.000	0.000	0.000	0.001
3138	5000.001	2040.000	100.499	20MATR4	-0.001	0.002	0.000	0.002	0.002
3139	5000.000	2040.000	100.500	20MATR4	0.000	0.001	0.000	0.001	0.001
3140	4999.998	2040.000	100.499	20MATR5	-0.001	-0.001	0.000	0.001	0.001
3141	4999.997	2040.000	100.499	20MATR5	-0.001	-0.002	0.000	0.002	0.002
3142	4999.999	2040.000	100.499	20MATR5	-0.001	0.000	0.000	0.000	0.001
-	-	-	-	20MATR6					
-	-	-	-	20MATR6					
-	-	-	-	20MATR6					

3143	5000.000	2040.002	100.499	30MATR1	-0.001	0.001	0.002	0.002	0.002
3144	4999.999	2040.003	100.499	30MATR1	-0.001	0.000	0.003	0.003	0.003
3145	4999.999	2040.002	100.500	30MATR1	0.000	0.000	0.002	0.002	0.002
3146	5000.000	2040.002	100.498	30MATR2	-0.002	0.001	0.002	0.002	0.003
3147	4999.999	2040.002	100.498	30MATR2	-0.002	0.000	0.002	0.002	0.003
3148	4999.999	2040.002	100.498	30MATR2	-0.002	0.000	0.002	0.002	0.003
3149	4999.999	2039.999	100.498	30MATR3	-0.002	0.000	-0.001	0.001	0.002
3150	4999.999	2040.000	100.498	30MATR3	-0.002	0.000	0.000	0.000	0.002
3151	4999.999	2040.000	100.499	30MATR3	-0.001	0.000	0.000	0.000	0.001
3152	4999.998	2040.000	100.498	30MATR4	-0.002	-0.001	0.000	0.001	0.002
3153	4999.998	2040.000	100.499	30MATR4	-0.001	-0.001	0.000	0.001	0.001
3154	4999.997	2040.000	100.499	30MATR4	-0.001	-0.002	0.000	0.002	0.002
3155	4999.999	2040.000	100.499	30MATR5	-0.001	0.000	0.000	0.000	0.001
3156	5000.000	2040.000	100.498	30MATR5	-0.002	0.001	0.000	0.001	0.002
3157	5000.000	2040.000	100.498	30MATR5	-0.002	0.001	0.000	0.001	0.002
-	-	-	-	30MATR6					
-	-	-	-	30MATR6					
-	-	-	-	30MATR6					
3158	4999.999	2040.002	100.500	37.5MATR1	0.000	0.000	0.002	0.002	0.002
3159	5000.000	2040.002	100.499	37.5MATR1	-0.001	0.001	0.002	0.002	0.002
3160	4999.999	2040.002	100.499	37.5MATR1	-0.001	0.000	0.002	0.002	0.002
3161	4999.998	2040.002	100.500	37.5MATR2	0.000	-0.001	0.002	0.002	0.002
3162	4999.998	2040.002	100.499	37.5MATR2	-0.001	-0.001	0.002	0.002	0.002
3163	4999.998	2040.002	100.499	37.5MATR2	-0.001	-0.001	0.002	0.002	0.002
3164	4999.998	2040.000	100.499	37.5MATR3	-0.001	-0.001	0.000	0.001	0.001
3165	5000.000	2040.000	100.499	37.5MATR3	-0.001	0.001	0.000	0.001	0.001
3166	4999.998	2040.000	100.500	37.5MATR3	0.000	-0.001	0.000	0.001	0.001
3167	4999.998	2040.000	100.499	37.5MATR4	-0.001	-0.001	0.000	0.001	0.001
3168	4999.998	2040.000	100.499	37.5MATR4	-0.001	-0.001	0.000	0.001	0.001
3169	4999.998	2040.000	100.498	37.5MATR4	-0.002	-0.001	0.000	0.001	0.002
3170	4999.999	2040.000	100.499	37.5MATR5	-0.001	0.000	0.000	0.000	0.001
3171	4999.999	2040.000	100.499	37.5MATR5	-0.001	0.000	0.000	0.000	0.001
3172	4999.999	2040.000	100.499	37.5MATR5	-0.001	0.000	0.000	0.000	0.001
3173	4999.996	2040.000	100.495	37.5MATR6	-0.005	-0.003	0.000	0.003	0.006
3174	4999.997	2040.001	100.496	37.5MATR6	-0.004	-0.002	0.001	0.002	0.005
3175	4999.999	2040.000	100.497	37.5MATR6	-0.003	0.000	0.000	0.000	0.003

Leica TPS1103 - 40m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH40NP	4999.999	2039.999	100.502	STN					
3176	4999.999	2040.001	100.504	2.5MNP1	0.002	0.000	0.002	0.002	0.003
3177	4999.998	2040.001	100.504	2.5MNP1	0.002	-0.001	0.002	0.002	0.003
3178	4999.998	2040.001	100.504	2.5MNP1	0.002	-0.001	0.002	0.002	0.003
3179	4999.998	2040.001	100.504	2.5MNP2	0.002	-0.001	0.002	0.002	0.003
3180	4999.998	2040.000	100.504	2.5MNP2	0.002	-0.001	0.001	0.001	0.002
3181	4999.998	2040.001	100.504	2.5MNP2	0.002	-0.001	0.002	0.002	0.003
3182	4999.998	2039.999	100.501	2.5MNP3	-0.001	-0.001	0.000	0.001	0.001
3183	4999.998	2039.998	100.501	2.5MNP3	-0.001	-0.001	-0.001	0.001	0.002
3184	4999.999	2039.999	100.501	2.5MNP3	-0.001	0.000	0.000	0.000	0.001
3185	4999.998	2040.000	100.501	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
3186	4999.998	2040.000	100.501	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
3187	4999.998	2040.000	100.501	2.5MNP4	-0.001	-0.001	0.001	0.001	0.002
3188	4999.998	2039.996	100.501	2.5MNP5	-0.001	-0.001	-0.003	0.003	0.003
3189	4999.998	2039.997	100.501	2.5MNP5	-0.001	-0.001	-0.002	0.002	0.002
3190	4999.998	2040.006	100.501	2.5MNP5	-0.001	-0.001	0.007	0.007	0.007
3191	4999.998	2039.995	100.501	2.5MNP6	-0.001	-0.001	-0.004	0.004	0.004
3192	4999.998	2039.994	100.501	2.5MNP6	-0.001	-0.001	-0.005	0.005	0.005
3193	4999.998	2039.995	100.501	2.5MNP6	-0.001	-0.001	-0.004	0.004	0.004
3194	4999.998	2040.002	100.503	10MNP1	0.001	-0.001	0.003	0.003	0.003
3195	4999.998	2040.002	100.503	10MNP1	0.001	-0.001	0.003	0.003	0.003
3196	4999.998	2040.002	100.503	10MNP1	0.001	-0.001	0.003	0.003	0.003
3197	4999.997	2040.000	100.502	10MNP2	0.000	-0.002	0.001	0.002	0.002
3198	4999.998	2040.001	100.502	10MNP2	0.000	-0.001	0.002	0.002	0.002
3199	4999.998	2040.001	100.503	10MNP2	0.001	-0.001	0.002	0.002	0.002
3200	4999.998	2039.999	100.502	10MNP3	0.000	-0.001	0.000	0.001	0.001
3201	4999.998	2039.999	100.502	10MNP3	0.000	-0.001	0.000	0.001	0.001
3202	4999.998	2039.999	100.502	10MNP3	0.000	-0.001	0.000	0.001	0.001
3203	4999.998	2040.000	100.500	10MNP4	-0.002	-0.001	0.001	0.001	0.002
3204	4999.998	2040.000	100.500	10MNP4	-0.002	-0.001	0.001	0.001	0.002
3205	4999.998	2040.000	100.500	10MNP4	-0.002	-0.001	0.001	0.001	0.002
3206	4999.998	2040.005	100.500	10MNP5	-0.002	-0.001	0.006	0.006	0.006
3207	4999.998	2040.006	100.500	10MNP5	-0.002	-0.001	0.007	0.007	0.007
3208	4999.998	2040.004	100.500	10MNP5	-0.002	-0.001	0.005	0.005	0.005
3209	4999.998	2039.997	100.500	10MNP6	-0.002	-0.001	-0.002	0.002	0.003
3210	4999.998	2039.997	100.500	10MNP6	-0.002	-0.001	-0.002	0.002	0.003
3211	4999.998	2039.997	100.500	10MNP6	-0.002	-0.001	-0.002	0.002	0.003
3212	5000.000	2040.002	100.501	20MNP1	-0.001	0.001	0.003	0.003	0.003
3213	4999.999	2040.001	100.501	20MNP1	-0.001	0.000	0.002	0.002	0.002
3214	4999.999	2040.002	100.501	20MNP1	-0.001	0.000	0.003	0.003	0.003
3215	4999.999	2040.001	100.501	20MNP2	-0.001	0.000	0.002	0.002	0.002
3216	4999.999	2040.001	100.501	20MNP2	-0.001	0.000	0.002	0.002	0.002
3217	4999.999	2040.001	100.501	20MNP2	-0.001	0.000	0.002	0.002	0.002
3218	4999.999	2039.999	100.501	20MNP3	-0.001	0.000	0.000	0.000	0.001
3219	4999.999	2039.999	100.501	20MNP3	-0.001	0.000	0.000	0.000	0.001
3220	4999.999	2039.999	100.501	20MNP3	-0.001	0.000	0.000	0.000	0.001
3221	4999.999	2039.999	100.501	20MNP4	-0.001	0.000	0.000	0.000	0.001
3222	4999.999	2039.999	100.501	20MNP4	-0.001	0.000	0.000	0.000	0.001
3223	4999.999	2039.999	100.501	20MNP4	-0.001	0.000	0.000	0.000	0.001
3224	4999.999	2040.001	100.500	20MNP5	-0.002	0.000	0.002	0.002	0.003
3225	4999.999	2040.001	100.501	20MNP5	-0.001	0.000	0.002	0.002	0.002
3226	4999.999	2040.001	100.501	20MNP5	-0.001	0.000	0.002	0.002	0.002
3227	4999.999	2039.996	100.501	20MNP6	-0.001	0.000	-0.003	0.003	0.003
3228	4999.999	2039.996	100.501	20MNP6	-0.001	0.000	-0.003	0.003	0.003
3229	4999.999	2039.997	100.501	20MNP6	-0.001	0.000	-0.002	0.002	0.002

3230	4999.999	2040.002	100.501	30MNP1	-0.001	0.000	0.003	0.003	0.003
3231	4999.999	2040.002	100.501	30MNP1	-0.001	0.000	0.003	0.003	0.003
3232	4999.999	2040.002	100.501	30MNP1	-0.001	0.000	0.003	0.003	0.003
3233	4999.999	2040.001	100.501	30MNP2	-0.001	0.000	0.002	0.002	0.002
3234	4999.999	2040.001	100.501	30MNP2	-0.001	0.000	0.002	0.002	0.002
3235	4999.999	2040.001	100.501	30MNP2	-0.001	0.000	0.002	0.002	0.002
3236	4999.999	2039.999	100.501	30MNP3	-0.001	0.000	0.000	0.000	0.001
3237	4999.999	2039.999	100.501	30MNP3	-0.001	0.000	0.000	0.000	0.001
3238	4999.999	2039.999	100.501	30MNP3	-0.001	0.000	0.000	0.000	0.001
3239	4999.999	2040.000	100.501	30MNP4	-0.001	0.000	0.001	0.001	0.001
3240	4999.999	2040.000	100.501	30MNP4	-0.001	0.000	0.001	0.001	0.001
3241	4999.999	2040.001	100.501	30MNP4	-0.001	0.000	0.002	0.002	0.002
3242	4999.999	2040.004	100.501	30MNP5	-0.001	0.000	0.005	0.005	0.005
3243	4999.999	2040.004	100.501	30MNP5	-0.001	0.000	0.005	0.005	0.005
3244	4999.999	2040.003	100.501	30MNP5	-0.001	0.000	0.004	0.004	0.004
3245	4999.999	2040.002	100.501	30MNP6	-0.001	0.000	0.003	0.003	0.003
3246	4999.999	2040.002	100.501	30MNP6	-0.001	0.000	0.003	0.003	0.003
3247	4999.999	2040.002	100.501	30MNP6	-0.001	0.000	0.003	0.003	0.003
3248	4999.999	2040.002	100.501	37.5MNP1	-0.001	0.000	0.003	0.003	0.003
3249	4999.998	2040.002	100.501	37.5MNP1	-0.001	-0.001	0.003	0.003	0.003
3250	4999.999	2040.002	100.501	37.5MNP1	-0.001	0.000	0.003	0.003	0.003
3251	4999.999	2040.001	100.501	37.5MNP2	-0.001	0.000	0.002	0.002	0.002
3252	4999.999	2040.001	100.501	37.5MNP2	-0.001	0.000	0.002	0.002	0.002
3253	4999.999	2040.001	100.501	37.5MNP2	-0.001	0.000	0.002	0.002	0.002
3254	4999.999	2039.999	100.501	37.5MNP3	-0.001	0.000	0.000	0.000	0.001
3255	4999.998	2039.999	100.501	37.5MNP3	-0.001	-0.001	0.000	0.001	0.001
3256	4999.998	2039.998	100.501	37.5MNP3	-0.001	-0.001	-0.001	0.001	0.002
3257	4999.998	2039.999	100.501	37.5MNP4	-0.001	-0.001	0.000	0.001	0.001
3258	4999.998	2039.999	100.501	37.5MNP4	-0.001	-0.001	0.000	0.001	0.001
3259	4999.998	2039.999	100.501	37.5MNP4	-0.001	-0.001	0.000	0.001	0.001
3260	4999.999	2039.999	100.501	37.5MNP5	-0.001	0.000	0.000	0.000	0.001
3261	4999.998	2039.999	100.501	37.5MNP5	-0.001	-0.001	0.000	0.001	0.001
3262	4999.998	2039.999	100.501	37.5MNP5	-0.001	-0.001	0.000	0.001	0.001
3263	4999.998	2040.001	100.501	37.5MNP6	-0.001	-0.001	0.002	0.002	0.002
3264	4999.998	2040.001	100.501	37.5MNP6	-0.001	-0.001	0.002	0.002	0.002
3265	4999.998	2040.000	100.501	37.5MNP6	-0.001	-0.001	0.001	0.001	0.002

Leica TPS1103 - 80m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH80	4999.999	2079.998	100.891	STN					
4000	5000.003	2080.000	100.893	10MMAN1	0.002	0.004	0.002	0.004	0.005
4001	5000.002	2080.001	100.893	10MMAN1	0.002	0.003	0.003	0.004	0.005
4002	5000.002	2080.001	100.893	10MMAN1	0.002	0.003	0.003	0.004	0.005
4003	5000.002	2080.000	100.890	10MMAN2	-0.001	0.003	0.002	0.004	0.004
4004	5000.002	2080.000	100.890	10MMAN2	-0.001	0.003	0.002	0.004	0.004
4005	5000.002	2080.000	100.890	10MMAN2	-0.001	0.003	0.002	0.004	0.004
4006	5000.001	2079.998	100.888	10MMAN3	-0.003	0.002	0.000	0.002	0.004
4007	5000.001	2079.998	100.888	10MMAN3	-0.003	0.002	0.000	0.002	0.004
4008	5000.001	2079.998	100.888	10MMAN3	-0.003	0.002	0.000	0.002	0.004
4009	5000.001	2079.997	100.888	10MMAN4	-0.003	0.002	-0.001	0.002	0.004
4010	5000.001	2079.998	100.888	10MMAN4	-0.003	0.002	0.000	0.002	0.004
4011	5000.001	2079.998	100.888	10MMAN4	-0.003	0.002	0.000	0.002	0.004
4012	4999.999	2080.022	100.889	10MMAN5	-0.002	0.000	0.024	0.024	0.024
4013	4999.999	2079.998	100.888	10MMAN5	-0.003	0.000	0.000	0.000	0.003
4014	4999.999	2079.998	100.888	10MMAN5	-0.003	0.000	0.000	0.000	0.003
4015	4999.999	2080.007	100.888	10MMAN6	-0.003	0.000	0.009	0.009	0.009
4016	4999.999	2080.007	100.888	10MMAN6	-0.003	0.000	0.009	0.009	0.009
4017	4999.999	2080.008	100.888	10MMAN6	-0.003	0.000	0.010	0.010	0.010
4018	4999.999	2080.001	100.886	40MMAN1	-0.005	0.000	0.003	0.003	0.006
4019	4999.999	2080.001	100.887	40MMAN1	-0.004	0.000	0.003	0.003	0.005
4020	4999.999	2080.000	100.887	40MMAN1	-0.004	0.000	0.002	0.002	0.004
4021	4999.999	2080.000	100.887	40MMAN2	-0.004	0.000	0.002	0.002	0.004
4022	4999.998	2080.000	100.886	40MMAN2	-0.005	-0.001	0.002	0.002	0.005
4023	4999.998	2080.000	100.886	40MMAN2	-0.005	-0.001	0.002	0.002	0.005
4024	4999.998	2079.998	100.887	40MMAN3	-0.004	-0.001	0.000	0.001	0.004
4025	4999.998	2079.998	100.887	40MMAN3	-0.004	-0.001	0.000	0.001	0.004
4026	4999.998	2079.998	100.887	40MMAN3	-0.004	-0.001	0.000	0.001	0.004
4027	4999.998	2079.998	100.887	40MMAN4	-0.004	-0.001	0.000	0.001	0.004
4028	4999.998	2079.998	100.888	40MMAN4	-0.003	-0.001	0.000	0.001	0.003
4029	5000.000	2079.998	100.887	40MMAN4	-0.004	0.001	0.000	0.001	0.004
4030	4999.998	2079.998	100.887	40MMAN5	-0.004	-0.001	0.000	0.001	0.004
4031	4999.998	2079.998	100.888	40MMAN5	-0.003	-0.001	0.000	0.001	0.003
4032	4999.998	2079.998	100.888	40MMAN5	-0.003	-0.001	0.000	0.001	0.003
4033	4999.998	2080.001	100.888	40MMAN6	-0.003	-0.001	0.003	0.003	0.004
4034	4999.998	2080.000	100.888	40MMAN6	-0.003	-0.001	0.002	0.002	0.004
4035	4999.998	2080.000	100.888	40MMAN6	-0.003	-0.001	0.002	0.002	0.004
4036	4999.998	2080.001	100.889	70MMAN1	-0.002	-0.001	0.003	0.003	0.004
4037	4999.999	2080.001	100.889	70MMAN1	-0.002	0.000	0.003	0.003	0.004
4038	4999.999	2080.001	100.889	70MMAN1	-0.002	0.000	0.003	0.003	0.004
4039	4999.999	2080.000	100.889	70MMAN2	-0.002	0.000	0.002	0.002	0.003
4040	4999.999	2080.000	100.889	70MMAN2	-0.002	0.000	0.002	0.002	0.003
4041	4999.999	2080.000	100.889	70MMAN2	-0.002	0.000	0.002	0.002	0.003
4042	4999.998	2079.998	100.889	70MMAN3	-0.002	-0.001	0.000	0.001	0.002
4043	4999.998	2079.998	100.889	70MMAN3	-0.002	-0.001	0.000	0.001	0.002
4044	4999.999	2079.998	100.889	70MMAN3	-0.002	0.000	0.000	0.000	0.002
4045	4999.999	2079.998	100.889	70MMAN4	-0.002	0.000	0.000	0.000	0.002
4046	4999.999	2079.998	100.889	70MMAN4	-0.002	0.000	0.000	0.000	0.002
4047	4999.999	2079.998	100.889	70MMAN4	-0.002	0.000	0.000	0.000	0.002
4048	4999.999	2079.998	100.889	70MMAN5	-0.002	0.000	0.000	0.000	0.002
4049	4999.999	2079.998	100.889	70MMAN5	-0.002	0.000	0.000	0.000	0.002
4050	4999.999	2079.998	100.889	70MMAN5	-0.002	0.000	0.000	0.000	0.002
-	-	-	-	70MMAN6					
-	-	-	-	70MMAN6					
-	-	-	-	70MMAN6					

Leica TPS1103 - 80m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
4051	4999.999	2080.001	100.891	10MATR1	0.000	0.000	0.003	0.003	0.003
4052	4999.997	2080.001	100.892	10MATR1	0.001	-0.002	0.003	0.004	0.004
4053	4999.998	2080.001	100.890	10MATR1	-0.001	-0.001	0.003	0.003	0.003
4054	4999.999	2080.000	100.887	10MATR2	-0.004	0.000	0.002	0.002	0.004
4055	4999.997	2080.000	100.890	10MATR2	-0.001	-0.002	0.002	0.003	0.003
4056	4999.999	2080.000	100.888	10MATR2	-0.003	0.000	0.002	0.002	0.004
4057	4999.996	2079.997	100.889	10MATR3	-0.002	-0.003	-0.001	0.003	0.004
4058	4999.997	2079.998	100.887	10MATR3	-0.004	-0.002	0.000	0.002	0.004
4059	4999.996	2079.998	100.892	10MATR3	0.001	-0.003	0.000	0.003	0.003
4060	4999.998	2079.998	100.888	10MATR4	-0.003	-0.001	0.000	0.001	0.003
4061	5000.000	2079.998	100.885	10MATR4	-0.006	0.001	0.000	0.001	0.006
4062	4999.997	2079.998	100.890	10MATR4	-0.001	-0.002	0.000	0.002	0.002
4063	4999.996	2079.998	100.888	10MATR5	-0.003	-0.003	0.000	0.003	0.004
4064	4999.997	2079.999	100.887	10MATR5	-0.004	-0.002	0.001	0.002	0.005
4065	4999.998	2079.998	100.890	10MATR5	-0.001	-0.001	0.000	0.001	0.001
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
4065	4999.999	2080.001	100.889	40MATR1	-0.002	0.000	0.003	0.003	0.004
4066	5000.000	2080.000	100.890	40MATR1	-0.001	0.001	0.002	0.002	0.002
4067	4999.995	2080.000	100.891	40MATR1	0.000	-0.004	0.002	0.004	0.004
4068	5000.001	2080.000	100.888	40MATR2	-0.003	0.002	0.002	0.003	0.004
4069	5000.000	2080.000	100.887	40MATR2	-0.004	0.001	0.002	0.002	0.005
4070	5000.000	2080.000	100.885	40MATR2	-0.006	0.001	0.002	0.002	0.006
4071	4999.996	2079.998	100.889	40MATR3	-0.002	-0.003	0.000	0.003	0.004
4072	4999.999	2079.998	100.887	40MATR3	-0.004	0.000	0.000	0.000	0.004
4073	5000.000	2079.998	100.888	40MATR3	-0.003	0.001	0.000	0.001	0.003
4074	5000.002	2079.998	100.889	40MATR4	-0.002	0.003	0.000	0.003	0.004
4075	5000.001	2079.998	100.888	40MATR4	-0.003	0.002	0.000	0.002	0.004
4076	5000.000	2079.997	100.888	40MATR4	-0.003	0.001	-0.001	0.001	0.003
4077	4999.992	2079.998	100.885	40MATR5	-0.006	-0.007	0.000	0.007	0.009
4078	4999.998	2079.998	100.884	40MATR5	-0.007	-0.001	0.000	0.001	0.007
4079	4999.994	2079.998	100.885	40MATR5	-0.006	-0.005	0.000	0.005	0.008
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
-	-	-	-	40MATR6					
4080	4999.999	2080.001	100.892	70MATR1	0.001	0.000	0.003	0.003	0.003
4081	4999.999	2080.000	100.892	70MATR1	0.001	0.000	0.002	0.002	0.002
4082	4999.998	2080.000	100.892	70MATR1	0.001	-0.001	0.002	0.002	0.002
4083	4999.997	2080.000	100.891	70MATR2	0.000	-0.002	0.002	0.003	0.003
4084	4999.999	2080.000	100.890	70MATR2	-0.001	0.000	0.002	0.002	0.002
4085	4999.996	2080.000	100.891	70MATR2	0.000	-0.003	0.002	0.004	0.004
4086	4999.999	2079.998	100.890	70MATR3	-0.001	0.000	0.000	0.000	0.001
4087	5000.000	2079.998	100.890	70MATR3	-0.001	0.001	0.000	0.001	0.001
4088	4999.999	2079.998	100.892	70MATR3	0.001	0.000	0.000	0.000	0.001
4089	4999.998	2079.998	100.892	70MATR4	0.001	-0.001	0.000	0.001	0.001
4090	5000.001	2079.998	100.889	70MATR4	-0.002	0.002	0.000	0.002	0.003
4091	5000.000	2079.997	100.889	70MATR4	-0.002	0.001	-0.001	0.001	0.002
4092	4999.998	2079.997	100.889	70MATR5	-0.002	-0.001	-0.001	0.001	0.002
4093	4999.998	2079.997	100.888	70MATR5	-0.003	-0.001	-0.001	0.001	0.003
4094	4999.999	2079.998	100.892	70MATR5	0.001	0.000	0.000	0.000	0.001
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					
-	-	-	-	70MATR6					

Leica TPS1103 - 80m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH80NP	5000.000	2079.995	100.892	STN					
4095	4999.998	2079.998	100.896	10MNP1	0.004	-0.002	0.003	0.004	0.005
4096	4999.998	2079.999	100.896	10MNP1	0.004	-0.002	0.004	0.004	0.006
4097	4999.998	2079.998	100.896	10MNP1	0.004	-0.002	0.003	0.004	0.005
4098	4999.998	2080.002	100.893	10MNP2	0.001	-0.002	0.007	0.007	0.007
4099	4999.998	2080.002	100.893	10MNP2	0.001	-0.002	0.007	0.007	0.007
4100	4999.998	2080.003	100.892	10MNP2	0.000	-0.002	0.008	0.008	0.008
4101	4999.998	2079.996	100.893	10MNP3	0.001	-0.002	0.001	0.002	0.002
4102	4999.997	2079.996	100.893	10MNP3	0.001	-0.003	0.001	0.003	0.003
4103	4999.998	2079.996	100.893	10MNP3	0.001	-0.002	0.001	0.002	0.002
4104	4999.997	2079.999	100.893	10MNP4	0.001	-0.003	0.004	0.005	0.005
4105	4999.997	2079.999	100.893	10MNP4	0.001	-0.003	0.004	0.005	0.005
4106	4999.997	2080.000	100.893	10MNP4	0.001	-0.003	0.005	0.006	0.006
4107	4999.997	2080.030	100.893	10MNP5	0.001	-0.003	0.035	0.035	0.035
4108	4999.997	2080.028	100.893	10MNP5	0.001	-0.003	0.033	0.033	0.033
4109	4999.997	2080.033	100.894	10MNP5	0.002	-0.003	0.038	0.038	0.038
4110	4999.998	2080.057	100.890	10MNP6	-0.002	-0.002	0.062	0.062	0.062
4111	4999.998	2080.057	100.890	10MNP6	-0.002	-0.002	0.062	0.062	0.062
4112	4999.998	2080.062	100.890	10MNP6	-0.002	-0.002	0.067	0.067	0.067
4113	5000.000	2079.998	100.893	40MNP1	0.001	0.000	0.003	0.003	0.003
4114	5000.000	2079.998	100.893	40MNP1	0.001	0.000	0.003	0.003	0.003
4115	5000.000	2079.998	100.893	40MNP1	0.001	0.000	0.003	0.003	0.003
4116	4999.999	2079.998	100.891	40MNP2	-0.001	-0.001	0.003	0.003	0.003
4117	4999.999	2079.998	100.891	40MNP2	-0.001	-0.001	0.003	0.003	0.003
4118	5000.000	2079.997	100.890	40MNP2	-0.002	0.000	0.002	0.002	0.003
4119	4999.999	2079.996	100.890	40MNP3	-0.002	-0.001	0.001	0.001	0.002
4120	4999.999	2079.996	100.890	40MNP3	-0.002	-0.001	0.001	0.001	0.002
4121	4999.999	2079.996	100.891	40MNP3	-0.001	-0.001	0.001	0.001	0.002
4122	4999.999	2079.997	100.890	40MNP4	-0.002	-0.001	0.002	0.002	0.003
4123	4999.999	2079.997	100.890	40MNP4	-0.002	-0.001	0.002	0.002	0.003
4124	4999.999	2079.997	100.890	40MNP4	-0.002	-0.001	0.002	0.002	0.003
4125	4999.999	2079.996	100.891	40MNP5	-0.001	-0.001	0.001	0.001	0.002
4126	4999.999	2079.996	100.891	40MNP5	-0.001	-0.001	0.001	0.001	0.002
4127	5000.000	2079.996	100.891	40MNP5	-0.001	0.000	0.001	0.001	0.001
4128	5000.000	2080.010	100.891	40MNP6	-0.001	0.000	0.015	0.015	0.015
4129	4999.999	2080.010	100.890	40MNP6	-0.002	-0.001	0.015	0.015	0.015
4130	4999.999	2080.009	100.890	40MNP6	-0.002	-0.001	0.014	0.014	0.014
4131	4999.999	2079.999	100.893	70MNP1	0.001	-0.001	0.004	0.004	0.004
4132	4999.999	2079.999	100.893	70MNP1	0.001	-0.001	0.004	0.004	0.004
4133	4999.999	2079.999	100.893	70MNP1	0.001	-0.001	0.004	0.004	0.004
4134	4999.998	2079.998	100.893	70MNP2	0.001	-0.002	0.003	0.004	0.004
4135	4999.999	2079.998	100.893	70MNP2	0.001	-0.001	0.003	0.003	0.003
4136	4999.998	2079.998	100.893	70MNP2	0.001	-0.002	0.003	0.004	0.004
4137	4999.998	2079.996	100.893	70MNP3	0.001	-0.002	0.001	0.002	0.002
4138	4999.999	2079.996	100.893	70MNP3	0.001	-0.001	0.001	0.001	0.002
4139	4999.998	2079.995	100.893	70MNP3	0.001	-0.002	0.000	0.002	0.002
4140	4999.999	2079.996	100.893	70MNP4	0.001	-0.001	0.001	0.001	0.002
4141	4999.998	2079.996	100.893	70MNP4	0.001	-0.002	0.001	0.002	0.002
4142	4999.998	2079.995	100.893	70MNP4	0.001	-0.002	0.000	0.002	0.002
4143	4999.998	2079.996	100.892	70MNP5	0.000	-0.002	0.001	0.002	0.002
4144	4999.999	2079.996	100.892	70MNP5	0.000	-0.001	0.001	0.001	0.001
4145	4999.998	2079.995	100.892	70MNP5	0.000	-0.002	0.000	0.002	0.002
4146	4999.998	2080.000	100.893	70MNP6	0.001	-0.002	0.005	0.005	0.005
4147	4999.998	2079.999	100.893	70MNP6	0.001	-0.002	0.004	0.004	0.005
4148	4999.998	2079.999	100.893	70MNP6	0.001	-0.002	0.004	0.004	0.005

Leica TPS1103 - 160m (Manual Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH0	5000.000	2000.000	100.000	STN					
CH160	4999.999	2159.997	101.492	STN					
5000	5000.000	2160.000	101.497	10MMAN1	0.005	0.001	0.003	0.003	0.006
5001	5000.000	2160.000	101.497	10MMAN1	0.005	0.001	0.003	0.003	0.006
5002	5000.000	2160.000	101.498	10MMAN1	0.006	0.001	0.003	0.003	0.007
5003	4999.999	2159.999	101.497	10MMAN2	0.005	0.000	0.002	0.002	0.005
5004	4999.999	2160.000	101.496	10MMAN2	0.004	0.000	0.003	0.003	0.005
5005	4999.999	2159.999	101.496	10MMAN2	0.004	0.000	0.002	0.002	0.004
5006	5000.001	2159.997	101.496	10MMAN3	0.004	0.002	0.000	0.002	0.004
5007	5000.001	2159.997	101.497	10MMAN3	0.005	0.002	0.000	0.002	0.005
5008	5000.001	2159.997	101.496	10MMAN3	0.004	0.002	0.000	0.002	0.004
5009	5000.002	2159.998	101.492	10MMAN4	0.000	0.003	0.001	0.003	0.003
5010	5000.001	2159.997	101.492	10MMAN4	0.000	0.002	0.000	0.002	0.002
5011	5000.002	2159.997	101.492	10MMAN4	0.000	0.003	0.000	0.003	0.003
5012	5000.000	2159.995	101.490	10MMAN5	-0.002	0.001	-0.002	0.002	0.003
5013	5000.000	2159.996	101.490	10MMAN5	-0.002	0.001	-0.001	0.001	0.002
5014	5000.000	2159.995	101.491	10MMAN5	-0.001	0.001	-0.002	0.002	0.002
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
-	-	-	-	10MMAN6					
5015	4999.990	2160.000	101.499	80MMAN1	0.007	-0.009	0.003	0.009	0.012
5016	4999.993	2160.000	101.500	80MMAN1	0.008	-0.006	0.003	0.007	0.010
5017	4999.993	2160.000	101.499	80MMAN1	0.007	-0.006	0.003	0.007	0.010
5018	4999.993	2159.999	101.500	80MMAN2	0.008	-0.006	0.002	0.006	0.010
5019	4999.993	2160.000	101.499	80MMAN2	0.007	-0.006	0.003	0.007	0.010
5020	4999.993	2159.999	101.499	80MMAN2	0.007	-0.006	0.002	0.006	0.009
5021	4999.993	2159.997	101.499	80MMAN3	0.007	-0.006	0.000	0.006	0.009
5022	4999.993	2159.997	101.499	80MMAN3	0.007	-0.006	0.000	0.006	0.009
5023	4999.993	2159.998	101.499	80MMAN3	0.007	-0.006	0.001	0.006	0.009
5024	4999.993	2159.998	101.499	80MMAN4	0.007	-0.006	0.001	0.006	0.009
5025	4999.992	2159.997	101.498	80MMAN4	0.006	-0.007	0.000	0.007	0.009
5026	4999.994	2159.997	101.497	80MMAN4	0.005	-0.005	0.000	0.005	0.007
5027	4999.994	2159.998	101.497	80MMAN5	0.005	-0.005	0.001	0.005	0.007
5028	4999.994	2159.998	101.497	80MMAN5	0.005	-0.005	0.001	0.005	0.007
5029	4999.994	2159.998	101.497	80MMAN5	0.005	-0.005	0.001	0.005	0.007
-	-	-	-	80MMAN6					
-	-	-	-	80MMAN6					
-	-	-	-	80MMAN6					
5030	4999.995	2160.000	101.493	150MMAN1	0.001	-0.004	0.003	0.005	0.005
5031	4999.995	2160.000	101.492	150MMAN1	0.000	-0.004	0.003	0.005	0.005
5032	4999.995	2160.000	101.492	150MMAN1	0.000	-0.004	0.003	0.005	0.005
5033	4999.996	2160.000	101.492	150MMAN2	0.000	-0.003	0.003	0.004	0.004
5034	4999.996	2159.999	101.491	150MMAN2	-0.001	-0.003	0.002	0.004	0.004
5035	4999.996	2159.999	101.491	150MMAN2	-0.001	-0.003	0.002	0.004	0.004
5036	4999.996	2159.996	101.491	150MMAN3	-0.001	-0.003	-0.001	0.003	0.003
5037	4999.996	2159.997	101.491	150MMAN3	-0.001	-0.003	0.000	0.003	0.003
5038	4999.996	2159.997	101.491	150MMAN3	-0.001	-0.003	0.000	0.003	0.003
5039	4999.996	2159.997	101.497	150MMAN4	0.005	-0.003	0.000	0.003	0.006
5040	4999.999	2159.997	101.498	150MMAN4	0.006	0.000	0.000	0.000	0.006
5041	4999.999	2159.997	101.495	150MMAN4	0.003	0.000	0.000	0.000	0.003
5042	4999.997	2159.997	101.496	150MMAN5	0.004	-0.002	0.000	0.002	0.004
5043	4999.998	2159.997	101.496	150MMAN5	0.004	-0.001	0.000	0.001	0.004
5044	4999.997	2159.997	101.496	150MMAN5	0.004	-0.002	0.000	0.002	0.004
-	-	-	-	150MMAN6					
-	-	-	-	150MMAN6					
-	-	-	-	150MMAN6					

Leica TPS1103 - 160m (ATR)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
5045	4999.991	2159.999	101.493	10MATR1	0.001	-0.008	0.002	0.008	0.008
5046	4999.991	2159.999	101.495	10MATR1	0.003	-0.008	0.002	0.008	0.009
5047	4999.993	2159.999	101.495	10MATR1	0.003	-0.006	0.002	0.006	0.007
5048	4999.979	2009.994	100.055	10MATR2	-1.437	-0.020	-150.003	150.003	150.010
5049	4999.994	2159.995	101.494	10MATR2	0.002	-0.005	-0.002	0.005	0.006
5050	4999.992	2159.995	101.494	10MATR2	0.002	-0.007	-0.002	0.007	0.008
5051	4999.993	2159.998	101.491	10MATR3	-0.001	-0.006	0.001	0.006	0.006
5052	4999.994	2159.997	101.497	10MATR3	0.005	-0.005	0.000	0.005	0.007
5053	4999.993	2159.997	101.496	10MATR3	0.004	-0.006	0.000	0.006	0.007
5054	4999.991	2159.997	101.496	10MATR3	0.004	-0.008	0.000	0.008	0.009
5055	4999.998	2159.997	101.494	10MATR4	0.002	-0.001	0.000	0.001	0.002
5056	4999.998	2159.997	101.494	10MATR4	0.002	-0.001	0.000	0.001	0.002
5057	4999.995	2159.997	101.494	10MATR4	0.002	-0.004	0.000	0.004	0.004
5058	4999.992	2159.997	101.492	10MATR5	0.000	-0.007	0.000	0.007	0.007
5059	4999.991	2159.996	101.493	10MATR5	0.001	-0.008	-0.001	0.008	0.008
5060	4999.991	2159.997	101.493	10MATR5	0.001	-0.008	0.000	0.008	0.008
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
-	-	-	-	10MATR6					
5061	4999.991	2159.999	101.501	80MATR1	0.009	-0.008	0.002	0.008	0.012
5062	4999.991	2159.999	101.504	80MATR1	0.012	-0.008	0.002	0.008	0.015
5063	4999.993	2160.000	101.502	80MATR1	0.010	-0.006	0.003	0.007	0.012
5064	4999.992	2159.999	101.498	80MATR2	0.006	-0.007	0.002	0.007	0.009
5065	4999.992	2159.999	101.497	80MATR2	0.005	-0.007	0.002	0.007	0.009
5066	4999.992	2159.999	101.497	80MATR2	0.005	-0.007	0.002	0.007	0.009
5067	4999.992	2159.997	101.493	80MATR3	0.001	-0.007	0.000	0.007	0.007
5068	4999.992	2159.997	101.492	80MATR3	0.000	-0.007	0.000	0.007	0.007
5069	4999.993	2159.997	101.496	80MATR3	0.004	-0.006	0.000	0.006	0.007
5070	4999.993	2159.998	101.494	80MATR4	0.002	-0.006	0.001	0.006	0.006
5071	4999.994	2159.997	101.495	80MATR4	0.003	-0.005	0.000	0.005	0.006
5072	4999.992	2159.997	101.494	80MATR4	0.002	-0.007	0.000	0.007	0.007
5073	4999.994	2159.997	101.487	80MATR5	-0.005	-0.005	0.000	0.005	0.007
5074	4999.995	2159.997	101.487	80MATR5	-0.005	-0.004	0.000	0.004	0.006
5075	4999.991	2159.997	101.489	80MATR5	-0.003	-0.008	0.000	0.008	0.009
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
-	-	-	-	80MATR6					
5076	4999.991	2160.001	101.494	150MATR1	0.002	-0.008	0.004	0.009	0.009
5077	4999.990	2160.000	101.500	150MATR1	0.008	-0.009	0.003	0.009	0.012
5078	4999.993	2160.000	101.500	150MATR1	0.008	-0.006	0.003	0.007	0.010
5079	4999.991	2159.999	101.496	150MATR2	0.004	-0.008	0.002	0.008	0.009
5080	4999.209	2159.963	103.682	150MATR2	2.190	-0.790	-0.034	0.791	2.328
5081	4999.994	2160.000	101.496	150MATR2	0.004	-0.005	0.003	0.006	0.007
5082	4999.994	2159.999	101.496	150MATR2	0.004	-0.005	0.002	0.005	0.007
5083	4999.995	2159.996	101.491	150MATR3	-0.001	-0.004	-0.001	0.004	0.004
5084	4999.996	2159.997	101.500	150MATR3	0.008	-0.003	0.000	0.003	0.009
5085	4999.994	2159.997	101.501	150MATR3	0.009	-0.005	0.000	0.005	0.010
5086	4999.992	2159.998	101.502	150MATR4	0.010	-0.007	0.001	0.007	0.012
5087	4999.999	2159.998	101.499	150MATR4	0.007	0.000	0.001	0.001	0.007
5088	4999.995	2159.998	101.500	150MATR4	0.008	-0.004	0.001	0.004	0.009
5089	4999.997	2159.997	101.497	150MATR5	0.005	-0.002	0.000	0.002	0.005
5090	4999.998	2159.997	101.499	150MATR5	0.007	-0.001	0.000	0.001	0.007
5091	4999.997	2159.998	101.497	150MATR5	0.005	-0.002	0.001	0.002	0.005
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					
-	-	-	-	150MATR6					

Leica TPS1103 - 160m (Manual Non-Prism)									
Pt ID	Easting	Northing	RL	Code	Vertical Displ (mm)	Easting Displ (mm)	Northing Displ (mm)	Total Hz Displ (mm)	Total Displ (mm)
CH160NP	4999.997	2159.991	101.512	STN					
5092	5000.000	2159.993	101.511	10MNP1	-0.001	0.003	0.002	0.004	0.004
5093	5000.000	2159.993	101.511	10MNP1	-0.001	0.003	0.002	0.004	0.004
5094	5000.000	2159.994	101.511	10MNP1	-0.001	0.003	0.003	0.004	0.004
5095	5000.000	2093.980	100.897	10MNP2	-0.615	0.003	-66.011	66.011	66.014
5096	5000.000	2093.981	100.898	10MNP2	-0.614	0.003	-66.010	66.010	66.013
5097	5000.001	2093.985	100.898	10MNP2	-0.614	0.004	-66.006	66.006	66.009
5098	5000.000	2159.988	101.512	10MNP3	0.000	0.003	-0.003	0.004	0.004
5099	5000.000	2159.989	101.513	10MNP3	0.001	0.003	-0.002	0.004	0.004
5100	5000.000	2159.989	101.512	10MNP3	0.000	0.003	-0.002	0.004	0.004
5101	5000.000	2159.958	101.512	10MNP4	0.000	0.003	-0.033	0.033	0.033
5102	5000.001	2159.956	101.511	10MNP4	-0.001	0.004	-0.035	0.035	0.035
5103	5000.000	2159.955	101.512	10MNP4	0.000	0.003	-0.036	0.036	0.036
5104	5000.000	2064.046	100.621	10MNP5	-0.891	0.003	-95.945	95.945	95.949
5105	5000.001	2064.045	100.621	10MNP5	-0.891	0.004	-95.946	95.946	95.950
5106	5000.000	2064.044	100.621	10MNP5	-0.891	0.003	-95.947	95.947	95.951
5107	5000.000	2010.019	100.119	10MNP6	-1.393	0.003	-149.972	149.972	149.978
5108	5000.000	2010.018	100.119	10MNP6	-1.393	0.003	-149.973	149.973	149.979
5109	5000.000	2010.020	100.119	10MNP6	-1.393	0.003	-149.971	149.971	149.977
5110	5000.001	2159.995	101.510	80MNP1	-0.002	0.004	0.004	0.006	0.006
5111	5000.001	2159.996	101.511	80MNP1	-0.001	0.004	0.005	0.006	0.006
5112	5000.001	2159.996	101.511	80MNP1	-0.001	0.004	0.005	0.006	0.006
5113	5000.000	2159.974	101.511	80MNP2	-0.001	0.003	-0.017	0.017	0.017
5114	5000.001	2159.978	101.511	80MNP2	-0.001	0.004	-0.013	0.014	0.014
5115	4999.999	2159.974	101.511	80MNP2	-0.001	0.002	-0.017	0.017	0.017
5116	4999.999	2159.993	101.510	80MNP3	-0.002	0.002	0.002	0.003	0.003
5117	4999.999	2159.994	101.510	80MNP3	-0.002	0.002	0.003	0.004	0.004
5118	4999.999	2159.993	101.510	80MNP3	-0.002	0.002	0.002	0.003	0.003
5119	5000.000	2159.991	101.510	80MNP4	-0.002	0.003	0.000	0.003	0.004
5120	5000.000	2159.991	101.509	80MNP4	-0.003	0.003	0.000	0.003	0.004
5121	5000.000	2159.992	101.509	80MNP4	-0.003	0.003	0.001	0.003	0.004
5122	5000.000	2159.992	101.510	80MNP5	-0.002	0.003	0.001	0.003	0.004
5123	5000.000	2159.993	101.510	80MNP5	-0.002	0.003	0.002	0.004	0.004
5124	4999.999	2159.991	101.509	80MNP5	-0.003	0.002	0.000	0.002	0.004
5125	4999.999	2159.954	101.509	80MNP6	-0.003	0.002	-0.037	0.037	0.037
5126	4999.999	2159.951	101.509	80MNP6	-0.003	0.002	-0.040	0.040	0.040
5127	4999.999	2159.948	101.509	80MNP6	-0.003	0.002	-0.043	0.043	0.043
5128	4999.995	2159.994	101.509	150MNP1	-0.003	-0.002	0.003	0.004	0.005
5129	4999.996	2159.994	101.509	150MNP1	-0.003	-0.001	0.003	0.003	0.004
5130	4999.996	2159.994	101.509	150MNP1	-0.003	-0.001	0.003	0.003	0.004
5131	4999.996	2159.994	101.509	150MNP2	-0.003	-0.001	0.003	0.003	0.004
5132	4999.996	2159.993	101.509	150MNP2	-0.003	-0.001	0.002	0.002	0.004
5133	4999.995	2159.992	101.509	150MNP2	-0.003	-0.002	0.001	0.002	0.004
5134	4999.995	2159.992	101.509	150MNP3	-0.003	-0.002	0.001	0.002	0.004
5135	4999.996	2159.991	101.509	150MNP3	-0.003	-0.001	0.000	0.001	0.003
5136	4999.997	2159.991	101.509	150MNP3	-0.003	0.000	0.000	0.000	0.003
5137	4999.996	2159.990	101.508	150MNP4	-0.004	-0.001	-0.001	0.001	0.004
5138	4999.996	2159.992	101.509	150MNP4	-0.003	-0.001	0.001	0.001	0.003
5139	4999.996	2159.992	101.509	150MNP4	-0.003	-0.001	0.001	0.001	0.003
5140	4999.996	2159.991	101.509	150MNP5	-0.003	-0.001	0.000	0.001	0.003
5141	4999.996	2159.992	101.508	150MNP5	-0.004	-0.001	0.001	0.001	0.004
5142	4999.996	2159.991	101.509	150MNP5	-0.003	-0.001	0.000	0.001	0.003
5143	4999.996	2160.021	101.509	150MNP6	-0.003	-0.001	0.030	0.030	0.030
5144	4999.996	2160.017	101.509	150MNP6	-0.003	-0.001	0.026	0.026	0.026
5145	4999.997	2160.018	101.509	150MNP6	-0.003	0.000	0.027	0.027	0.027