

# Characterization of Green Wireless Access Networks

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**Abstract**—The power consumption of wireless access networks will become an important issue in the coming years. In this paper, the power consumption of a base station in wireless access networks is modeled for green network design.

## I. INTRODUCTION

Today, ICT is responsible for 4% of the annual energy consumption and it is expected to double in the next years. A large contributor to the ICT CO<sub>2</sub> emissions are the radio access networks. The purpose of this research is to characterize the power consumption of base stations for various wireless technologies in order to model, design and optimize green energy-efficient wireless access networks.

## II. METHOD

A model is designed for determining the base station's power consumption [1]. Therefore, the power consuming parts of a base station were identified, which are shown in Fig. 1. Based on the components' power consumptions, the base station's power consumption is determined and related to its range. Furthermore, a metric for energy efficiency is proposed.

## III. RESULTS

The energy efficiency of mobile WiMAX (Worldwide Interoperability for Microwave Access), HSPA (High Speed Packett Access) and LTE (Long Term Evolution), is compared

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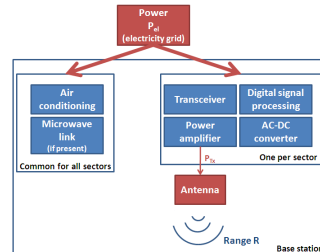


Figure 1. Base station equipment.

for different bit rates. The lower the bit rate, the more energy-efficient each technology is. Based on our assumptions, HSPA is the most energy-efficient until a bit rate of 2.8 Mbps, LTE for bit rates between 2.8 Mbps and 9 Mbps, and mobile WiMAX for bit rates higher than 9 Mbps. The introduction of MIMO (Multiple Input Multiple Output), where multiple transmitting and receiving antennas are used, leads to a higher energy efficiency, making it a valuable energy-saving solution for future green radio access networks.

## IV. CONCLUSION

In this research, a power consumption model for base stations in wireless access networks is proposed. The energy efficiency of wireless access networks depends on the used bit rate and the used technology.

## REFERENCES

- [1] M. Deruyck, E. Tanghe, W. Joseph, W. Vereecken, M. Pickavet, B. Dhoedt and L. Martens *Towards a deployment tool for wireless access networks with minimal power consumption*, IEEE PIMRC conference, 2010.