

Earth, our 'home', has limited resources which are constantly decreasing. With the improvements in technology, we are trying to use every resource we have efficiently for a sustainable world. There is no doubt that increasing the efficiency is very important for mobile communication systems. One of the most power consuming part in mobile communications is base stations. In his paper Yarleque, states that a European operator with a network of 20000 base stations creates an electricity bill of 46 million euros and a carbon footprint around 220 000 tons of CO₂ per year. Power amplifiers have the highest power consumption in a base station up to 40 percent of the overall power budget. This shows that increasing the efficiency of power amplifiers is vitally important for sustainable base stations.

But what are base stations? Base stations are the communication hubs for mobile devices that enables communication. Basically any mobile device that has communication capabilities, either for phone calls or for data services, needs base stations. It is a known fact that mobile devices are getting in to our lives more and more, which means the need of base stations are increasing every day. We as wireless engineers have a responsibility of creating sustainable technologies. In this project I have focused on increasing the efficiency of base stations by increasing the efficiency of power amplifiers used in base stations.

With the research I have done I found out that there are many different suggested methods for increasing the efficiency of a power amplifier. One of these methods is called digital predistortion. By using digital predistortion techniques efficiency of a power amplifier can be increased without violating any communication protocols.

When a literature study about digital predistortion methods is made, one can see that there are many different suggested techniques for implementing digital predistortion. One of these techniques is based on Volterra series. Volterra series is a mathematical series which is capable of modelling power amplifiers. However due to its complexity, Volterra series needs to be modified to be able to use it for power amplifier modelling. In this project 5 different modified versions of Volterra series is chosen and implemented. Each method is tested with different power amplifiers and the results are compared. These tests and comparisons are made for 4G standards, i.e. power amplifiers and digital predistortion algorithms are tested for 4G communication. Tests showed that these implemented algorithms can be used for 4G communication.