

Beam Scanning Enabled Massive MIMO for the Realization of Futuristic 5G Technologies

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A new set of mobile network standards are introduced every ten years or so, with the latest being the 4G, released in 2010. Several technologies are being developed to meet the 4G standards with LTE-Advanced being the most prominent and widely accepted one. The mobile network traffic worldwide is increasing exponentially each year and the trend will likely continue for the foreseeable future. The next generation of standards are expected to be released by 2020 addressing the demands and needs of this exponential growth but none of the existing technologies would be able to address these demands. This paper presents a futuristic conceptual technology that uses beam scanning enabled massive MIMO, which might be able to meet the demands of 5G.

Any technology aiming to serve 5G should be looking at an ambitious data rate of 10 Gb/s for static users and 1 Gb/s for mobile users and no less than 100 Mb/s in urban areas. It should also focus on lower power consumption for a greener technology. More importantly the technology should be cost effective to make the mass deployment of 5G networks a reality.

The existing technologies like LTE and LTE-Advanced already use MIMO, where the base station and the user device have more than one antenna. But, massive MIMO employs much higher number of antennas that create localized beams towards each device as shown in Fig. 1. These localized beams establish multiple spatial paths between the base station and the user equipment such that multiple channels of data can be transmitted simultaneously. The directed beams will also avoid the wastage of power by transmitting the signal only in the intended direction – a step towards greener technology. Detailed analysis of antenna designs, both at the base station and at the mobile device to meet 5G requirements using the massive MIMO technology and the achievable data rates will be presented at the conference.

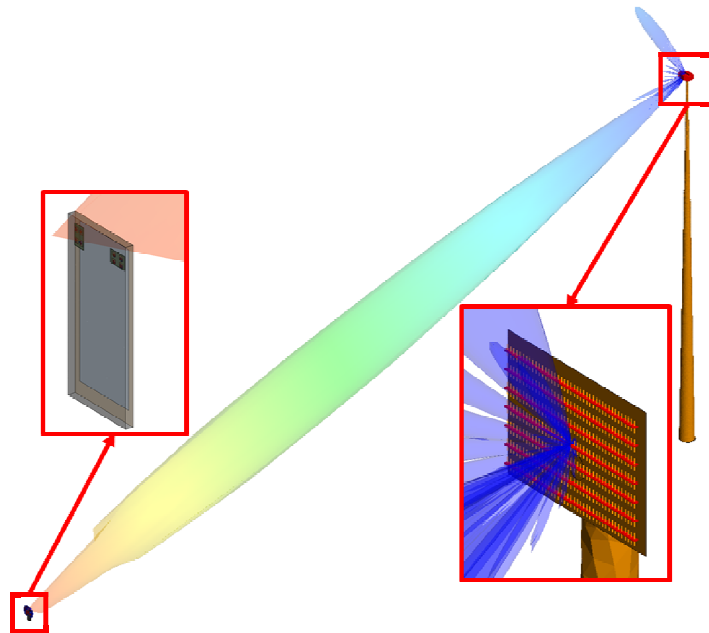


Figure 1. A base station antenna array directing its beam towards the mobile handset.