Popular science summary of Analysis of Channel Measurements Using a Very Large Antenna Array

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The effect of frequency band, antenna polarization, and antenna directivity on the behavior of propagation channels with very large antenna array is shown in this work.

By calculating physical processing effects that signal undergoes while traveling from the transmitter to the receiver, channel models help to analyze performance of wireless systems. State-of-the-art channel models such as WINNER and COST 2100 are able to model the characteristics of conventional MIMO (Multiple-Input Multiple-Output) systems (where a moderate number of antennas is used at the two sides of the link) with sufficient accuracy. However, model extensions are needed for the current models in order to be able to capture new propagation characteristics results from having massive number of antenna elements at one or both ends of the communication link.

Two measurement campaigns are performed in a semi-urban area (Faculty of Engineering campus, Lund University, Lund, Sweden) using very large antenna array (about 7.5m long) in order to study key propagation characteristics for massive MIMO. The channel measurements are performed using two frequency bands (2.6 GHz and 5.1 GHz), vertical and horizontal antenna polarizations, directional, and omni-directional antennas. Effect of aforementioned setup parameters on cluster delay spread, angle spread, power slope, shadowing, number of clusters, and their observation lengths are studied in this work. Also, the correlation among estimated cluster parameters is estimated. During the measurements, a virtual array at the base station contains 128 and 256 antenna elements for the 2.6 GHz band and 5.1 GHz band, respectively.

Modeling of cluster parameters and their correlations estimated in this work will enable channel models to reflect the characteristics demonstrated by real wireless communication channels under different wireless system configurations. The Results of this work are important while implementing extension for cluster-based COST 2100 channel model for the massive MIMO case.