

RFMTC09

Measurement of Throughput using the Multipath Simulator

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The figures of merits used to estimate the performance of a radio systems have traditionally been assessed by measuring the basic components – the antenna and the radio. Antennas are described using efficiency; antenna diagram etc. and the radio shall have e.g. sufficient sensitivity and output power. Maintaining the link is the goal.

In a modern system like HSPA or LTE new antenna and radio parameters are added but more important is the software handling coding, equalisation, MIMO-algorithms etc. This allows a link with data rates far above what is required for speech coding.

The key performance is not any more sensitivity and power but the actual bit rate or throughput achieved in various situations. The link is adapted to the actual situation by selection of modulation, code rate and MIMO mode is optimized. The achieved throughput is heavily depending not only on signal and noise levels but also on fading, delay spread and multipath conditions.

This means that throughput must be measured in a situation where the propagation conditions are similar to the real world and at the same time reproducible and repeatable. The multipath simulator is one possible tool creating this environment. The signal from a base station is divided into e.g. 16 channels, each connected to an antenna that is placed in a circular array around the terminal. Each channel can be given an independent Doppler shift, delay, amplitude and polarization. The array emulates a multipath environment with 16 separate rays. The MPS can not only create an environment with Rayleigh or Rice statistical distribution but also realistic signals in the time and frequency domain including Doppler shift and delay spread.

A test method for performance measurements of cellular terminals with high data rate is currently under development. An experimental MPS has been built and it has shown to generate the expected propagation conditions. It is now being evaluated for the intended throughput measurements.

The presentation will describe the problem, the Multipath Simulator construction and some recent measurements.