RF subsystem power consumption and induced radiation emulation

The thesis introduces a novel approach towards the emulation of the RF subsystem power consumption when transmitting a LTE signal. The RF subsystem which is made up of analog components has not been covered by the status quo emulation methodologies which are compatible with digital circuits. Though the study of the RF subsystem architectures revealed numerous architectures with different impacts on power consumption, we have decided to consider the RF subsystem as a black box.

The RF subsystem power emulation has been studied for the telecommunication technology Long Term Evolution (LTE). Given the fact that major power consumptions of wireless devices are largely functions of sequences of protocol/ logical activities, it is this technology that provided the inputs to the RF subsystem as a black black box which are Tx power, carrier frequency and signal bandwidth. The physical environmental variable temperature has also proven to be very influential on power consumption. These inputs also do constitute to the input parameters of the emulation methodology.

The emulation methodology has been proven to be a mathematical mapping between the input parameters and a predefined mathematical model. For the mathematical model, multivariate modeling approaches were analyzed for an approach with the least modeling error and complexity. Herein, the homotopy continuation numerical approach proved to have the least modeling error of 3%. The RF subsystem power consumption has been emulated with accuracies of 84% ±2.25% and 94.3% ±2.25% on different devices.

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