Modeling Aggregate Interference From LTE Systems

Joel Dumke*, Nicholas Kent, and Dylan Hicks
Institute for Telecommunication Sciences, Boulder, CO,
http://www.its.bldrdoc.gov/

The demand for mobile bandwidth has steadily grown in recent years and this has led to a great deal of interest in the idea of spectrum sharing. One example of this is the desire to operate Long-Term Evolution (LTE) cellular networks on frequencies that have previously been allocated for various government communications. In order to determine whether this is feasible and establish proper restrictions and exclusion zones, we must have a method of accurately predicting the interference an LTE network will produce against an incumbent system. The exact amount of interference is affected by the location of user equipment (UE) and various radio propagation parameters.

We have approached this issue by developing software to run a monte carlo simulation that on each iteration randomly assigns UE locations, determines each UE transmission power, calculates a path loss from each UE to the victim receiver using the Irregular Terrain Model (ITM), and aggregates the signals from each UE to produce a total interference power. The transmission powers of the UEs are limited by self-interference, requiring us to simultaneously solve many power levels based on the exact locations of UEs and base stations. This represents a significant improvement over previous aggregate interference models which had drawn UE power levels from a fixed distribution. The monte carlo iterations are then used to estimate a CDF of the aggregate interference at the victim.

This software has been used to simulate a network in Suitland, MD based on randomized-real base station locations. This location is of particular interest because of a nearby weather satellite earth station. Results from this simulation will be presented.