SIMULATION OF PCS TRAFFIC LOADING AND INTERFERENCE DUE TO CELL DAMAGE OR FAILURE

Riley, T.J., Rusyn, T. L.
US Department of Commerce, National Telecommunications and Information Administration, Institute for Telecommunication Sciences

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: riley19247

Date Received: September 30, 2004

While cellular systems offer an attractive and necessary form of data and voice communications following a natural or man-made disaster, the system itself is not immune to damage. As base stations are removed from service, the traffic load patterns are altered and the resultant system performance and availability is negatively affected. In addition to the loss of base stations, as the availability of the existing land-line infrastructure declines, more users migrate to wireless communications. As is the nature of any emergency, the need for communication increases beyond levels experienced during non-emergency periods. Using a self-interference model developed at the Institute for Telecommunication Sciences (ITS), the effects of system damage, load shifting, and increased traffic, can be studied, allowing emergency service providers to anticipate system availability and the need for supplemental emergency communications equipment.

The model consists of an hexagonal array of circular cells with a base station positioned in the center of each cell and a random number of mobile stations randomly positioned throughout each cell. As base stations are removed from operation, the mobile stations are picked up by the remaining base stations. Additional mobile users may be added and their locations can be changed to reflect the nature of the emergency. The change in the aggregate air-interface spectrum is monitored and the resultant signal to interference (C/I) values are used to determine the change in service quality and the probability of service availability. Any number of scenarios can be developed, depending on the configuration of the system under study and the level of detail desired.

Since the model produces a cumulative baseband signal for both the forward and reverse directions, it can be used in both hardware and software simulations. Predicted C/I values can be used in software-based network models to anticipate system limitations, traffic bottlenecks, and the probability of overall system failure. The baseband signal produced can be used to generate a simulated traffic signal for the testing and evaluation of commercial equipment.

1. (a)
Tim Riley
US Department of Commerce
NTIA/ITS.E
325 Broadway
Boulder, CO
80305 USA
triley@its.bldrdoc.gov

(b) 303-497-5735

(c) 303-497-6982

2. C - Signals and Systems

3. (a)

4. C - Contributed Paper

5. No special instructions