ABSTRACT

A system for angle-of-arrival (AOA) measurement at a UHF mobile radio base station is described. A seven-element "Y"-shaped array of monopoles above a ground plane is used to observe the signal from a hand-held radio transmitting at 460 MHz as the user moves through a variety of terrain conditions. A novel low-cost digitizing array receiver is used to capture the signal. Array calibration is achieved by fitting a physical model of the open-circuit impedance matrix to a small number of previous AOA measurements for known transmitter locations. The calibrated data is then analyzed using conventional AOA estimators assuming discrete AOAs. The quality of the estimate is assessed using a simple "residual power" metric which provides an indication of how well the estimate describes the data obtained from the array. The system was evaluated in both line-of-sight (LOS) and non-LOS cases. It is shown that transmitter localization to within a few degrees is usually possible. In certain cases, a higher-order estimate is used to identify significant multipaths. A few examples of complex terrain scattering are also observed, including evidence of multipath reflections from buildings. In general, this multipath is found to be weak relative to the primary path. The results also suggest that angle spread was less than 5° in Los cases, and less than 20V in non-LOS cases, which is consistent with the findings of other field studies.