Polarization Diversity Performance of Mobile Terminals in Multipath Environment Using MIMO Channel Characterization

G. A. Ioannopoulos[(1)], A. G. Koutinos[(1)], P. K. Gkonis[(2)], C. F. Kalialakis[(3)], D. E. Anagnostou[(1)], M. T. Chryssomallis*[(1)] and G. A. Kyriakou[(1)]
(1) Democritus University of Thrace, Department of Electrical & Computer Engineering, Microwaves Laboratory, Xanthi, Greece, mchrysso@ee.duth.gr
(2) National Technical University of Athens,
School of Electrical and Computer Engineering, Athens, Greece
(3) Aristotle University of Thessaloniki,
Radiocommunications Laboratory, Thessaloniki, Greece

Polarization diversity, a technique where different polarizations are used to provide diversity, has proved to be an efficient way of reducing the size and numbers of the antennas needed for a mobile terminal working in modern wireless networks. This method does not require any extra bandwidth or more space for physical separations between the antennas. It uses only one dual-polarized antenna and it takes advantage of the multipath propagation characteristics to receive separate uncorrelated signals and reduce fading. The applicability of polarization diversity for mobile terminals in a multipath environment can be evaluated using as figures of merit the signal cross correlation and cross polarization discrimination (XPD), while the effectiveness of the diversity system can be measured by diversity gain. Since the XPD may be crucial to polarization diversity, the antenna radiation patterns should always include co- and cross-polar field components. In a multipath rich environment, regardless of the original polarization of radiated waves, multiple reflections depolarize radio waves and couple some energy into the orthogonal polarized wave. As a result, both orthogonal wave components are received by the antenna of the mobile terminal.

The use of a dual-polarized antenna at one or both ends of a wireless link, is an application of MIMO technology, and allows an important increase in spectral efficiency through the technique of spatial multiplexing. Since the performance of applied polarization diversity depends strongly on the multipath scattering environment, the use of a MIMO channel characterization model is a first-class choice, which allows taking simulation results very close to real situations. Thus, in this work the performance of polarization diversity technique, as a means of creation multiple antennas, using a MIMO spatial channel model is investigated. As a system-level model it can simulate various environments using an almost infinite number of propagation paths, each one with its own spatial channel characteristics, such as angular spread, angles of departure and arrival and power spectrum. The results will be presented and discussed at the conference.