# PROPAGATION MODEL DEVELOPMENT CONSIDERATIONS FOR CLOSE-IN DISTANCES AND LOW-ANTENNA HEIGHT APPLICATIONS

Nicholas DeMinco
U.S. Department of Commerce, Institute for Telecommunication Sciences

An investigation of different propagation modeling methods to meet the special requirements of a short-range propagation model with low antenna heights was performed, and has resulted in the development of approaches to be taken to accurately model radio-wave propagation loss for these types of scenarios. The basic requirements for the Short-Range Mobile-to-Mobile (MTOM) Propagation Model include: separation distances between the transmitter and receiver from one meter to two kilometers, a frequency range of 150 MHz to 3000 MHz, and antenna heights of one to three meters for both transmitter and receiver sites. It is necessary to develop alternative methods for accurate predictions of propagation loss to provide a propagation model that will simultaneously meet all of these requirements. This will require special considerations that currently available models do not include in their methods of analysis. Several analytical approaches were investigated to develop propagation loss prediction methods that take all of these considerations into account. Analysis efforts have determined that the development of this model will require the use of mutual-coupling predictions and should also include the effects of the surface wave. Conventional far-field antenna patterns and gain of the antennas may also not be valid at close separation distances, since one antenna may not be in the far field of the other antenna. Analysis efforts have also determined that these issues and effects become more significant for the lower frequencies (900 MHz and below). For low antenna heights the effects of the close proximity between the Earth and the antenna produce a strong interaction between the antenna and the ground. The antenna pattern performance is vastly different than if the antenna were in free space. A hierarchy of approaches were investigated that could be used to develop the short-range MTOM model. These approaches would account for different levels of complexity from very simplistic models where not much information about the scenario was known, to increasingly more sophisticated models that include all of the previously mentioned effects for scenarios where more site-specific information would be available. This paper will describe the considerations that are involved in developing a propagation model that could meet the requirements stated above.