A Comparison of Radio Propagation Predictions and Measurements at VHF and UHF Using Univariate and Multivariate Normal Statistics

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Abstract:

Radio propagation models' predictions are notorious for the statistical concepts that are used to modify them, as in the statement: *"In q_s of like situations there will be at least q_l of locations where the attenuation does not exceed A for at least q_t of the time."* [1], where q_s, q_l and q_t are fractions and are usually given as percentages. On the macroscopic level, at least, one must resort to these sorts of probabalistic caveats because the models cannot account for all of the factors that Maxwell's Equations imply affect radio propagation, and because, even for those factors for which the models do attempt to account, analytical tractability often requires rather gross approximations of physical reality. The statements of probability then imply that the fluctuations of the models' unaccounted-for factors (and, indeed, the qualities of the approximations in those that are accounted-for) are independent, identically distributed, random variables with measurable statistics, in the strata of situations, locations and times. This presentation provides a report on the early stages of an attempt to revisit these longstanding truisms. We report on comparisons of nearly 40,000 measurements and predictions, covering a wide variety of frequencies, terminal heights and terrain types within the lower 48 states. These are examined using both univariate and multivariate statistical techniques.

[1]Hufford, G. A., A. G. Longley and W. A. Kissick, "A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode," NTIA Report 82-100, 1982.