

Microwave Terrestrial Link
Rain Attenuation Prediction Parameter Analysis

E. J. Dutton*

Because rain attenuation continues to be a problem for the operation of microwave links worldwide, this report examines the behavior and the prediction of rain rate and rain attenuation distributions on a worldwide basis. Particular emphasis is placed on seven areas of the world of special interest to the U. S. Army Communications Electronics and Engineering-Installation Agency (USACEEIA).

The first part of the report discusses the need for, and provides, an alternative thunderstorm ratio in the Rice-Holmberg rain rate distribution prediction model. This new thunderstorm ratio is more readily obtained in regions of the world with sparse, and less historical, meteorological data. Comparisons of rain rate distributions predicted from the Rice-Holmberg model with observed distributions are then presented.

The second part of the report discusses rain attenuation prediction on terrestrial microwave links. Ten models, including a newly-derived model for this report, are presented for this purpose. Of these 10 models, however, only 3 contain a year-to-year variability prediction feature--a feature usually necessary to the annual distribution prediction process. An "ad hoc" annual variability is attached to the remaining 7 models. All 10 models are then intercompared with observed rain attenuation distribution data.

The third, and largest, part of the report presents contour maps of the parameters necessary for annual rain rate distribution predictions. Also presented are contour maps of rain rate distribution prediction results at the 1, 0.1, and 0.01 percentile exceedance levels, for use to the reader in predicting annual rain attenuation distributions at those levels. Seven specific regions of the world have been contoured in this report:

1. the Federal Republic of Germany and vicinity,
2. Okinawa,
3. the Republic of Korea and vicinity,
4. Southwest Asia,
5. Central America,
6. the United States of America,
7. Southeast Asia.

Key Words: attenuation distributions; contour maps; microwave links; model-data comparisons; rain attenuation

*The author is with the Institute for Telecommunication Sciences, National Telecommunications and Information Administration, U. S. Department of Commerce, Boulder, Colorado 80303.