Atmospheric Radio Noise: Worldwide Levels and Other Characteristics

A. D. Spaulding and J. S. Washburn

The determination of radio communication system performance is a matter of proper statistical treatment of both the desired signal and the real-world noise (or interference) processes. System performance is highly dependent on the detailed statistical characteristics of both the signal and the noise as well as the single parameter: signal-to-noise ratio (which is sometimes the only parameter considered). Generally, the computation of the desired signal characteristics over a given path can be made reasonably accurately. This is not the case when it comes to estimating the noise level and other required noise characteristics. Existing noise models consist primarily of the worldwide atmospheric noise maps contained in CCIR Report 322 and estimated man-made noise levels given in CCIR Report 258. In addition, there are numerous other special purpose models.

There is a need for an overall, comprehensive usable noise model for application to telecommunication problems. One needed task that has been accomplished toward the goal of obtaining such an overall model is the development of an improved atmospheric noise model. The existing worldwide atmospheric noise model (CCIR Report 322) was developed from approximately 4 years of measurements from a worldwide network of 16 measurement stations. This network made measurements for 5 years (longer in a few cases) past the completion of CCIR Report 322 in 1963. Also, additional data are now available from other locations, primarily many years of data from 10 Soviet measurement stations. All these additional data have been analyzed and an updated worldwide atmospheric noise model has been prepared in both graphical and numerical forms. Results of this analysis show substantial "corrections" (on the order of 20 dB for some locations) to the 1 MHz noise level values given by CCIR Report 322. It is the purpose of this report to present and discuss this new model for atmospheric noise levels and other characteristics.