4. SUMMARY AND CONCLUSIONS

A simple physical model of wideband HF noise/interference has been developed, based on analyses of measured data. Unlike previously developed models, which have generally consisted of descriptions of the statistical characteristics of the received noise/interference (for example, the amplitude probability distribution), the present model provides a description of the received noise/interference waveform, and therefore can be used to simulate the noise/interference process. The statistical characteristics of the process have been investigated to guide the model development and to check the validity of the proposed model. In particular, we have examined the raw data, pdf's of the raw data, pdf's of the voltage and power envelopes, pdf's of the phase, and level crossing distributions of the voltage envelope. In addition, we have examined characteristics of the noise/interference in the frequency domain, including power spectra, cdf's of the power envelope in the frequency domain, and pdf's of the phase in the frequency domain. <u>Every one of these quantities generated from the simulated data closely resembles the corresponding measured quantity for a variety of measured data.</u> However, the model developed thus far is incomplete for several reasons.

First, in its present form the model provides no way of specifying values of the model parameters. For the simulations discussed in this report, values of the parameters were determined by examining the results of analyses of measured data. However, it would be desirable to have the capability to specify values of the parameters which are appropriate for a given environment (location, time of day, etc.) in the absence of measured data. Empirical noise models have been developed, for example the model for atmospheric noise specified by the CCIR (1986) and discussed by Spaulding and Washburn (1985), which could be of use in determining parameter values. However, combining such models with the present model to provide this capability has yet to be accomplished.

Second, the higher-order statistics, which describe the relationships between the noise/interference process at different instants in time, need to be examined and modeled. For example, distributions of pulse width and pulse spacing (essential for modeling the arrival time distribution of noise impulses) and the nonstationarity of the noise/interference need to be investigated.

Finally, the measured data analyzed thus far comprise a limited data base obtained during March 1989 at Bedford, MA. More data with impulsive noise, and atmospheric noise in particular, need to be analyzed and modeled, as do data obtained at different receive sites, at different times of year, with different antennas, and with appropriate dynamic range (greater than eight bits). These investigations are currently under way and will be reported elsewhere.

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