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FORM OT-29
(3-73)

U.S. DEPARTMENT OF COMMERCE
OFFICE OF TELECOMMUNICATIONS

BIBLIOGRAPHIC DATA SHEET

	1. PUBLICATION OR REPORT NO.	2. Gov't Accession No.	3. Recipient's Accession No.
	OTR 76-86		

4. TITLE AND SUBTITLE	5. Publication Date
Statistical-Physical Models of Man-Made and Natural Radio Noise Part II: First Order Probability Models of the Envelope and Phase	April 1976
	6. Performing Organization Code
7. AUTHOR(S) Dr. David Middleton	9. Project/Task/Work Unit No.
8. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Department of Commerce Office of Telecommunications, ITS Boulder Laboratories Boulder, Colorado 80302	10. Contract/Grant No. OT-0124
11. Sponsoring Organization Name and Address U.S. Department of Commerce Office of Telecommunications Washington, D.C. 20005	12. Type of Report and Period Covered
	13.

14. SUPPLEMENTARY NOTES
Prepared under contract by D. Middleton, 127 E. 91st St., New York, N.Y. 10028

15. ABSTRACT *(A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)*

Most man-made and natural electromagnetic interferences are highly non-gaussian random processes, whose degrading effects on system performance can be severe, particularly on most conventional systems, which are designed for optimal or near optimal performance against normal noise. In addition, the nature, origins, measurement and prediction of the general EM interference environment are a major concern of an adequate spectral management program. Accordingly, this second study in a continuing series [cf., Middleton, 1974] is devoted to the development of analytically tractable, experimentally verifiable, statistical-physical models of such electromagnetic interference.

Here, classification into three major types of noise is made: Class A (narrowband vis-à-vis the receiver), Class B (broadband vis-à-vis the receiver), and Class C (=Class A + Class B). First-order statistical models are constructed for the Class A and Class B cases. In particular, the APD (a posteriori probability distribution) or exceedance probability, PD, viz. $P_1(\mathcal{E} > \mathcal{E}_0)_{A,B}$, and the

16. Key words *(Alphabetical order, separated by semicolons)*

Man-made radio noise, Radio noise models, Statistical communication theory

17. AVAILABILITY STATEMENT	18. Security Class *(This report)*	20. Number of pages
[XX] UNLIMITED.	Unclassified	142
[ ] FOR OFFICIAL DISTRIBUTION.	19. Security Class *(This page)* Unclassified	21. Price:

USCOMM-DC 29716-P73

associated probability densities, pdf's, $w_1(\mathcal{E})_{A,B}$, of the envelope are obtained; [the phase is shown to be uniformly distributed $(0,2\pi)$]. These results are canonical, i.e., their analytic forms are invariant of the particular noise source and its quantifying parameter values, levels, etc. Class A interference is described by a 3-parameter model, Class B noise by a 6-parameter model. All parameters are deducible from measurement, and like the APD's and pdf's, are also canonical in form: their structure is based on the general physics underlying the propagation and reception processes involved, and they, too, are invariant with respect to form and occurrence of particular interference sources.

Excellent agreement between theory and experiment is demonstrated, for many types of EM noise, man-made and natural, as shown by a broad spectrum of examples. Results for the moments of these distribution are included, and more precise analytical conditions for distinguishing between Class A,B, and C interference are also given. Methods for estimating the canonical model parameters from experimental data (essentially embodied in the APD) are outlined in some detail, and a program of possible next steps in developing the theory of these highly nongaussian random processes for application to general problems of spectrum management is presented.

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