

TABLE OF CONTENTS

Personnel	v
Publications and Reports	xiv
Introduction	xviii

GENERAL PHYSICS

I.	Microwave Spectroscopy	1
	Propagating Waves in High Dielectric Waveguide of Square Cross Section	1
II.	Radio Astronomy	9
	Anomalous Oxygen Absorption Inferred from Nimbus-5 Microwave Experiment	9
	Stellar Interferometer: Digital Filters	15
III.	Electrodynamics of Media	21
	Subsurface Probing and Communication with a Magnetic Dipole	21

PLASMA DYNAMICS

IV.	Plasmas and Controlled Nuclear Fusion	27
	Waves and Radiation	27
	Comparison of Stark-Broadened Optical Line Shapes Caused by Holtmark and Gaussian Microfields	27
	Pulse Evolution of Second-Order Wave-Wave Interactions	31
	Diffusion and Turbulence	38
	Some Fast Inexpensive Line Pulsers Now in Use	38
	Linear Analysis of the "One-Half Cyclotron Frequency" Instability	41
	Fusion-Related Studies	47
	Experimental Determination of the Expected Lifetime of a Theta-Pinch First Wall	47
	High-Temperature Plasma Physics	57
	Current-Driven Instabilities in a Plasma	57
V.	Gaseous Electronics	65
	High-Pressure TEA CO ₂ Laser	65
	Evolution of Field in Bound-Free Laser Systems	67

CONTENTS

VI.	Applied Plasma Research	71
	Active Plasma Systems	71
	Use of MACSYMA in the Symbolic Derivations of Nonlinear Coupling Coefficients	71
	Third-Order Nonlinear Theory of Wave-Wave Interactions	84
	Laser-Plasma Interactions	99
	CO ₂ Short-Pulse Amplification Studies	99
	Amplification of Two High-Intensity Nanosecond TEA CO ₂ Laser Pulses (AHN)	109

COMMUNICATION SCIENCES AND ENGINEERING

VII.	Processing and Transmission of Information	115
	An Optimum Receiver for the Binary Coherent State Quantum Channel	115
VIII.	Linguistics	121
	Some Effects of Adaptation on Speech Perception	121
IX.	Cognitive Information Processing	131
	Localization of Cellular Structures	131
X.	Neurophysiology	141
	Autoradiographic Study of Changes in the Frog Tectum after Cutting the Optic Nerve	141
	Presence of Monoamines in the Salamander Tectum and Their Relation to the Spinal Lemniscus	147
XI.	Signal Processing	155
	Simulator of Auditory Localization Cues	155
XII.	Digital Signal Processing	157
	Pole-Zero Modeling Using Cepstral Prediction	157
	Author Index	161
	Research Support Index	162