

CONTENTS

<i>Preface</i>	xi
<i>About the Author</i>	xiii
1 Controlled Thermonuclear Fusion	1
1.1 Introduction	1
1.2 Ignition Conditions	3
1.3 Tokamaks	5
1.4 Tokamak Operating Limits	10
Bibliography	15
2 Electron Waves	17
2.1 Maxwell Equations	17
2.2 Homogeneous Plasmas	18
2.3 Plane Waves in Cold Homogeneous Plasmas	22
2.4 Wave Polarization	26
2.5 Wave Packets in Homogeneous Plasmas	31
References	33
3 Inhomogeneous Plasmas	35
3.1 Wave Packets in Weakly Inhomogeneous Plasmas	35
3.2 Ray Equations in Absorbing Plasmas	39
3.3 Ray Tracing	40
3.4 The Complex Eikonal Approximation	42
3.5 Propagation of a Gaussian Beam	45
Bibliography	49

4	Refractive Index Measurements	51	8	Electron Cyclotron Waves in Hot Plasmas	163
4.1	Interferometry	51	8.1	Relativistic Theory of Electron Cyclotron Waves	163
4.2	Polarization of Waves	60	8.2	Dispersion Relation	170
4.3	Polarization Evolution Equation	66	8.3	Wave Cutoff in Hot Plasmas	174
4.4	Plasma Polarimetry	69		Bibliography	176
4.5	Conclusion	73	9	Electron Cyclotron Emission	179
	Bibliography	74	9.1	Radiation Transport	179
5	Wave Propagation in Turbulent Plasmas	75	9.2	Solution of Radiative Transfer Equation	182
5.1	Scattering of Waves by Plasma Fluctuations	76	9.3	Plasma Emission	185
5.2	Intensity of Scattered Waves	79	9.4	Temperature Measurements	190
5.3	Turbulence Measurements	82	9.5	Temperature Fluctuations Measurements	192
5.4	Short-Scale Anisotropic Turbulence	87		Bibliography	198
5.5	CO ₂ Laser Scattering	91	Index		201
5.6	Wave Number Resolution	95			
	Bibliography	98			
6	Non-collective Scattering	101			
6.1	Radiation by a Moving Electron	102			
6.2	Scattered Power	105			
6.3	Spectral Density to Second Order in β	108			
6.4	Non-Collective Scattering in Magnetized Plasmas	112			
6.5	Scattering Measurements	117			
	Bibliography	120			
7	Plasma Reflectometry	123			
7.1	Introduction	124			
7.2	Density Measurements	128			
7.3	WKB Approximation	132			
7.4	Calculation of Electron Density	134			
7.5	Fluctuations Measurements	138			
7.6	Multidimensional Turbulent Fluctuations	143			
7.7	Numerical Simulation	150			
	Bibliography	160			