- Foreword to the Revised Edition p. ix
- Preface to the Revised Edition p. xi
- Preface p. xix
- I Source-Field Relations Single Antenna Elements p. 1
- 1 The Far-Field Integrals, Reciprocity, Directivity p. 3
- 1.1 Introduction p. 3
- 1.2 Electrostatics and Magnetostatics in Free Space p. 4
- 1.3 The Introduction of Dielectric, Magnetic, and Conductive Materials p. 7
- 1.4 Time-Varying Fields p. 10
- 1.5 The Retarded Potential Functions p. 11
- 1.6 Poynting's Theorem p. 13
- 1.7 The Stratton-Chu Solution p. 17
- 1.8 Conditions at Infinity p. 21
- 1.9 Field Values in the Excluded Regions p. 25
- 1.10 The Retarded Potential Functions: Reprise p. 26
- 1.11 The Far Field: Type I Antennas p. 27
- 1.12 The Schelkunoff Equivalence Principle p. 31
- 1.13 The Far Field: Type IL Antennas p. 36
- 1.14 The Reciprocity Theorem p. 39
- 1.15 Equivalence of the Transmitting and Receiving Patterns of an Antenna p. 41
- 1.16 Directivity and Gain p. 46
- 1.17 Receiving Cross Section p. 48
- 1.18 Polarization of the Electric Field p. 53
- 2 Radiation Patterns of Dipoles, Loops, and Helices p. 58
- 2.1 Introduction p. 58
- 2.2 The Center-Fed Dipole p. 58
- 2.3 Images in a Ground Plane p. 65
- 2.4 A Monopole Above a Ground Plane p. 67
- 2.5 A Dipole in Front of a Ground Plane p. 68
- 2.6 The Small Current Loop p. 69
- 2.7 Traveling Wave Current on a Loop p. 71
- 2.8 The End-Fire Helix p. 73
- 3 Radiation Patterns of Horns, Slots and Patch Antennas p. 79
- 3.1 Introduction p. 79
- 3.2 The Open-Ended Waveguide p. 79
- 3.3 Radiation from Horns p. 83
- 3.4 Center-Fed Slot in Large Ground Plane p. 86
- 3.5 Waveguide-Fed Slots p. 88
- 3.6 Theory of Waveguide-Fed Slot Radiators p. 91
- 3.7 Patch Antennas p. 99
- II Array Analysis and Synthesis p. 111
- 4 Linear Arrays: Analysis p. 113
- 4.1 Introduction p. 113
- 4.2 Pattern Formulas for Arrays with Arbitrary Element Positions p. 114

- 4.3 Linear Arrays: Preliminaries p. 117
- 4.4 Schelkunoff's Unit Circle Representation p. 128
- 5 Linear Arrays: Synthesis p. 141
- 5.1 Introduction p. 141
- 5.2 Sum and Difference Patterns p. 142
- 5.3 Dolph-Chebyshev Synthesis of Sum Patterns p. 143
- 5.4 Sum Pattern Beamwidth of Linear Arrays p. 148
- 5.5 Peak Directivity of the Sum Pattern of a Linear Array p. 153
- 5.6 A Relation Between Beamwidth and Peak Directivity for Linear Arrays p. 157
- 5.7 Taylor Synthesis of Sum Patterns p. 157
- 5.8 Modified Taylor Patterns p. 162
- 5.9 Sum Patterns with Arbitrary Side Lobe Topography p. 165
- 5.10 Discretization of a Continuous Line Source Distribution p. 172
- 5.11 Bayliss Synthesis of Difference Patterns p. 181
- 5.12 Difference Patterns with Arbitrary Side Lobe Topography p. 185
- 5.13 Discretization Applied to Difference Patterns p. 187
- 5.14 Design of Linear Arrays to Produce Null-Free Patterns p. 190
- 6 Planar Arrays: Analysis and Synthesis p. 196
- 6.1 Introduction p. 196
- 6.2 Rectangular Grid Arrays: Rectangular Boundary and Separable Distribution p. 197
- 6.3 Circular Taylor Patterns p. 213
- 6.4 Modified Circular Taylor Patterns: Ring Side Lobes of Individually Arbitrary Heights p. 218
- 6.5 Modified Circular Taylor Patterns: Undulating Ring Side Lobes p. 221
- 6.6 Sampling Generalized Taylor Distributions: Rectangular Grid Arrays p. 225
- 6.7 Sampling Generalized Taylor Distributions: Circular Grid Arrays p. 230
- 6.8 An Improved Discretizing Technique for Circular Grid Arrays p. 233
- 6.9 Rectangular Grid Arrays with Rectangular Boundaries: Nonseparable Tseng-Cheng Distributions p. 237
- 6.10 A Discretizing Technique for Rectangular Grid Arrays p. 243
- 6.11 Circular Bayliss Patterns p. 250
- 6.12 Modified Circular Bayliss Patterns p. 256
- 6.13 The Discretizing Technique Applied to Planar Arrays Excited to Give a Difference Pattern p. 256
- 6.14 Comparative Performance of Separable and Nonseparable Excitations for Planar Apertures p. 261
- 6.15 Fourier Integral Representation of the Far Field p. 265
- III Self-Impedance and Mutual Impedance, Feeding Structures p. 275
- 7 Self-Impedance and Mutual Impedance of Antenna Elements p. 277
- 7.1 Introduction p. 277
- 7.2 The Current Distribution on an Antenna: General Formulation p. 278
- 7.3 The Cylindrical Dipole: Arbitrary Cross Section p. 281
- 7.4 The Cylindrical Dipole: Circular Cross Section, Hallen's Formulation p. 284
- 7.5 The Method of Moments p. 286

- 7.6 Solution of Hallen's Integral Equation: Pulse Functions p. 287
- 7.7 Solution of Hallen's Integral Equation: Sinusoidal Basis Functions p. 294
- 7.8 Self-Impedance of Center-Fed Cylindrical Dipoles: Induced EMF Method p. 297
- 7.9 Self-Impedance of Center-Fed Cylindrical Dipoles: Storer's Variational Solution p. 305
- 7.10 Self-Impedance of Center-Fed Cylindrical Dipoles: Zeroth and First Order Solutions to Hallen's Integral Equation p. 308

• 7.11 Self-Impedance of Center-Fed Cylindrical Dipoles: King-Middleton Second-Order Solution p. 314

- 7.12 Self-Impedance of Center-Fed Strip Dipoles p. 321
- 7.13 The Derivation of a Formula for the Mutual Impedance Between Slender Dipoles p. 325
- 7.14 The Exact Field of a Dipole: Sinusoidal Current Distribution p. 329
- 7.15 Computation of the Mutual Impedance Between Slender Dipoles p. 332

• 7.16 The Self-Admittance of Center-Fed Slots in a Large Ground Plane: Booker's Relation p. 336

• 7.17 Arrays of Center-Fed Slots in a Large Ground Plane: Self-Admittance and Mutual Admittance p. 342

- 7.18 The Self-Impedance of a Patch Antenna p. 344
- 8 The Design of Feeding Structures for Antenna Elements and Arrays p. 351
- 8.1 Introduction p. 351
- 8.2 Design of a Coaxially Fed Monopole with Large Ground Plane p. 352
- 8.3 Design of a Balun-Fed Dipole Above a Large Ground Plane p. 355
- 8.4 Two-Wire-Fed Slots: Open and Cavity-Backed p. 359
- 8.5 Coaxially Fed Helix Plus Ground Plane p. 361
- 8.6 The Design of an Endfire Dipole Array p. 363
- 8.7 Yagi-Uda Type Dipole Arrays: Two Elements p. 368
- 8.8 Yagi-Uda Type Dipole Arrays: Three or More Elements p. 373
- 8.9 Frequency-Independent Antennas: Log-Periodic Arrays p. 375
- 8.10 Ground Plane Backed Linear Dipole Arrays p. 386
- 8.11 Ground Plane Backed Planar Dipole Arrays p. 390
- 8.12 The Design of a Scanning Array p. 393

• 8.13 The Design of Waveguide-Fed Slot Arrays: The Concept of Active Slot Admittance (Impedance) p. 397

• 8.14 Arrays of Longitudinal Shunt Slots in a Broad Wall of Rectangular Waveguides: The Basic Design Equations p. 402

- 8.15 The Design of Linear Waveguide-Fed Slot Arrays p. 407
- 8.16 The Design of Planar Waveguide-Fed Slot Arrays p. 414
- 8.17 Sum and Difference Patterns for Waveguide-Fed Slot Arrays; Mutual Coupling Included p. 418
- IV Continuous Aperture Antennas p. 427
- 9 Traveling Wave Antennas p. 429
- 9.1 Introduction p. 429
- 9.2 The Long Wire Antenna p. 430
- 9.3 Rhombic and Vee-Antennas p. 432
- 9.4 Dielectric-Clad Planar Conductors p. 437

- 9.5 Corrugated Planar Conductors p. 440
- 9.6 Surface Wave Excitation p. 442
- 9.7 Surface Wave Antennas p. 446
- 9.8 Fast Wave Antennas p. 453
- 9.9 Trough Waveguide Antennas p. 464
- 9.10 Traveling Wave Arrays of Quasi-Resonant Discretely Spaced Slots [Main Beam at [theta subscript 0] = arccos([beta]/[kappa])] p. 467
- 9.11 Traveling Wave Arrays of Quasi-Resonant Discretely Spaced Slots (Main Beam Near Broadside) p. 474
- 9.12 Frequency Scanned Arrays p. 476
- 10 Reflectors and Lenses p. 482
- 10.1 Introduction p. 482
- 10.2 Geometrical Optics: The Eikonal Equation p. 483
- 10.3 Simple Reflectors p. 490
- 10.4 Aperture Blockage p. 495
- 10.5 The Design of a Shaped Cylindrical Reflector p. 498
- 10.6 The Design of a Doubly Curved Reflector p. 504
- 10.7 Radiation Patterns of Reflector Antennas: The Aperture Field Method p. 508
- 10.8 Radiation Patterns of Reflector Antennas: The Current Distribution Method p. 518
- 10.9 Dual Shaped Reflector Systems p. 521
- 10.10 Single Surface Dielectric Lenses p. 525
- 10.11 Stepped Lenses p. 529
- 10.12 Surface Mismatch, Frequency Sensitivity, and Dielectric Loss for Lens Antennas p. 532
- 10.13 The Far Field of a Dielectric Lens Antenna p. 534
- 10.14 The Design of a Shaped Cylindrical Lens p. 536
- 10.15 Artificial Dielectrics: Discs and Strips p. 538
- 10.16 Artificial Dielectrics: Metal Plate (Constrained) Lenses p. 542
- 10.17 The Luneburg Lens p. 545
- Appendices p. 557
- A. Reduction of the Vector Green's Formula for E p. 559
- B. The Wave Equations for A and D p. 562
- C. Derivation of the Chebyshev Polynomials p. 564
- D. A General Expansion of cos[superscript m] v p. 567
- E. Approximation to the Magnetic Vector Potential Function for Slender Dipoles p. 569
- F. Diffraction by Plane Conducting Screens: Babinet's Principle p. 573
- G. The Far-Field in Cylindrical Coordinates p. 581
- H. The Utility of a Csc[subscript 2] [theta] Pattern p. 585
- Index p. 587