

# CONTENTS

|                  |           |
|------------------|-----------|
| PREFACE. . . . . | PAGE<br>V |
|------------------|-----------|

## CHAPTER I

|  |   |
|--|---|
| FUNDAMENTAL RELATIONS AND FEATURES IN FREQUENCY-MODULATED, PHASE-MODULATED, AND AMPLITUDE-MODULATED SYSTEMS. . . . . | 1 |
|--|---|

1. Fundamental Relations.—2. Basic Relations and Features for Amplitude Modulation.—3. Fundamental Relations and Features for Phase Modulation.—4. Relations and Features for Frequency Modulation.—5. Side-current Distribution in Frequency Modulation and Phase Modulation.—6. Application of Bessel Tables and Bessel Curves.—7. Numerical Speculations on Frequency Swing, Equivalent Phase Swing, and Band Width.—8. Useful Formulas for Small Modulation Index.—9. Three Types of Modulation.—10. Addition of Modulation Products.—11. Effects When Two Types of Modulations Are Present.—12. Effects When Frequency Modulation and Amplitude Modulation Are Present.—13. Actions in Threefold Modulation (FM + PM + AM).—14. Translation of Signal Currents into Corresponding Frequency and Phase Variations.—15. Translation of Frequency Modulation and Phase Modulation into Amplitude Modulation.—16. Determination of Maximum Frequency and Maximum Phase Deviations and of the Mean Carrier Frequency.—17. Effect of Band Restriction Filters on Currents Modulated in Frequency.—18. Interference and Its Partial Elimination in FM Systems.—19. Phase Modulation, Equivalent Frequency Modulation, and Amplitude Effect of Two Received Carrier Currents.—20. Superposition of Currents in Transfer Networks.—21. Different Kinds of Interference Impulses.—22. Frequency Multiplication in FM Systems.—23. Frequency Division in FM Systems.—24. Heterodyning in FM Systems.—25. Wave Propagation in the Present-day FM Band.

## CHAPTER II

|  |     |
|--|-----|
| AUXILIARY APPARATUS EMPLOYED IN FM SYSTEMS . . . . . | 150 |
|--|-----|

26. Balanced Modulators.—27. Ring Modulators.—28. Frequency Division by Regenerative Modulation.—29. Reactance Tubes.—30. Design Formulas and Useful Quadrature Tube Modulators.—31. Frequency Modulators.—32. Balancing of a Two-tube Frequency Modulator.—33. Phase Modulators.—34. Commercial Demodulators.—35. Actions in Frequency Discriminators.—36. Band-width Design of Discriminators.—37. Useful Discriminator Networks.—38. Tests on Discriminators.—39. Useful Amplitude Limiters.—40. Time Constants in FM-Networks.—41. Networks for Audio-frequency Accentuation and Deaccentuation.—42. Networks for Producing Inverse Frequency Effects.

## CHAPTER III

|  |     |
|--|-----|
| TRANSMITTERS FOR FREQUENCY MODULATION. . . . . | 226 |
|--|-----|

43. FM Transmitters.—44. The Armstrong Indirect FM Transmitter.—45. The FM Transmitter of the General Electric Company.—46. The

FM Transmitter of the Radio Corporation of America.—47. The FM Transmitter of the Western Electric Company.—48. Notes on FM Signal Generators.

CHAPTER IV

RECEIVERS FOR FREQUENCY-MODULATED CURRENTS . . . . . 249

49. FM Receivers.—50. Typical Sections in an FM Receiver.—51. Characteristic Curves in FM Receivers.—52. Image Response in FM Systems in Comparison with Such Responses in AM Systems.—53. All Networks in an FM Receiver.—54. Alignment of FM Receivers.

CHAPTER V

TRANSMITTER AND RECEIVER AERIALS. . . . . 278

55. Radiation of Waves in the Carrier Frequency Spectrum of FM Waves.—56. Input Impedance and Mutual Impedance of Dipoles.—57. FM Voltage Effective at the Input Terminals of an FM Receiver in Terms of the Electric Field Intensity.—58. Effect of the Q Value of Linear Conductors on the Self-impedance.—59. Dipoles for FM Reception.—60. Dipoles with a Reflector.—61. Feeders Used in FM Systems.—62. Formulas and Computations for Feeders and Matching Sections.—63. Feeder Tests.—64. Linear Conductors Used as Radiators.—65. Excitation of Dipoles.—66. Transmitter Antennas.—67. Quarter-wave-length Feeder Sections.

APPENDIX . . . . . 347

68. Theory of the Spectrum Solution.—69. Effective Input Impedance and Q Value of Feeders.—70. Magnitudes of Important Factors. References.

INDEX. . . . . 367