1. Record Nr. UNINA9910815753903321

Autore Markin Evgeny

Titolo Principles of Modern Radar Missile Seekers

Pubbl/distr/stampa Norwood:,: Artech House,, 2022

©2022

ISBN 1-5231-4572-2

1-63081-778-3

Descrizione fisica 1 online resource (443 pages)

Disciplina 621.38485

Soggetti Radar - Military applications

Guided missiles - Tracking

Guided missiles - Guidance systems

Antiaircraft missiles

Lingua di pubblicazione Inglese

Formato Materiale a stampa

Livello bibliografico Monografia

Nota di contenuto Intro -- Principles of Modern Radar Missile Seekers -- Contents --

Preface -- Acknowledgments -- CHAPTER 1 Introduction -- 1.1
Threats -- 1.1.1 The First Threat -- 1.1.2 The Second Threat -- 1.1.3
The Third Threat -- 1.2 Goals and Objectives -- 1.3 Basic Concepts -References -- CHAPTER 2 Tactical and Technical Characteristics of an
Anti-Aircraft Missile System -- 2.1 The Defeat Zone -- 2.1.1 Choosing
the Anti-Aircraft Missile System Defeat Zone Boundaries -- 2.1.2
Providing a Given Defeat Zone with the Technical Characteristics of
Anti-Aircraft Missile System Combat Requirements -- 2.2 Missile
Launch Zone -- 2.3 A Target Detection Zone -- References -CHAPTER 3 Firing over the Horizon -- 3.1 Basic Principles -- 3.2

CHAPTER 3 Firing over the Horizon -- 3.1 Basic Principles -- 3.2 Estimate of Ballistic and Flight Characteristics of the Missile According to Data From Open Sources -- 3.3 Problems: Target Search and Auto-Tracking -- References -- CHAPTER 4 Radio Control of Atmospheric Anti-Aircraft Missile -- 4.1 Generalized Block Diagram of the Radio System -- 4.2 Radio Control System Classification -- 4.2.1 Launch Control -- 4.2.2 Anti-Aircraft Missile Flight Control -- 4.2.3 Missile Warhead Detonation Control -- 4.3 Flight Trajectories and Guidance

Methods -- 4.3.1 Two-Point Guidance Methods: Homing Methods --

4.3.2 Three-Point Guidance Methods: Teleguidance Methods -- References -- CHAPTER 5 Radar -- 5.1 Basic Principles -- 5.2 Radar Types -- 5.2.1 Search and Detect Radars -- 5.2.2 Tracking Radars -- 5.2.3 Image Radars -- 5.3 Tactical and Technical Characteristics of the Radar -- References -- CHAPTER 6 Monopulse Radars -- 6.1 Basic Principles -- 6.2 Tracking Radars -- 6.2.1 Amplitude Sum-and-Difference System of Automatic Target Tracking -- 6.2.2 Phase Sum-and-Difference System of Automatic Target Tracking -- 6.3 Monopulse Antenna -- 6.3.1 Lens Antennas -- 6.3.2 Reflector Antennas -- 6.3.3 Arrays Antennas.

6.4 Cross-Polarization Radiation -- 6.5 Radar Resolution on Angular Coordinates -- References -- CHAPTER 7 Some Interferences for Monopulse Radar -- 7.1 Camouflaging Interference -- 7.1.1 Active Camouflaging Interference -- 7.1.2 Passive Camouflaging Interference -- 7.2 Active Misinforming Interference -- 7.3 Interference due to High-Altitude Nuclear Explosions: Electromagnetic Weapons --References -- CHAPTER 8 Interference Immunity of Monopulse Radar -- 8.1 Interference Immunity Indicators -- 8.2 Criterion for Assessing the Stability of Automatic Target Tracking by Monopulse Radar in Real Time -- References -- CHAPTER 9 Modeling -- 9.1 Formation Procedure of the Direction-Finding Characteristic -- 9.2 The Initial Impacts Classification -- 9.3 Formation Method of Stochastic Orthogonal Processes -- References -- CHAPTER 10 Interference Detection Problem -- 10.1 Testing a Simple Hypothesis Against a Simple Alternative -- 10.2 Testing a Complex Hypothesis Against a Simple Alternative -- 10.3 Determination of Estimates of the Maximum Similarities -- 10.4 Interference Recognition Procedure -- 10.4.1 Estimation of the Required Range of a Hypersonic Target Detection by the Missile Homing Head when Firing over the Horizon -- 10.4.2 Recognition Procedure for Some Interference Types -- References --CHAPTER 11 Assessment of an Anti-Aircraft Missile System Operation in Interference Conditions -- 11.1 Assessment Probability of Target Defeat by One Missile -- 11.2 Radomes and Estimation of the Active Seeker Operating Wavelength -- 11.3 Operation of an Active Homing Head on a Group of Targets-Self-Cover Jammers -- 11.4 Probability a Target is Defeated by One Missile -- 11.5 Operating Principles of a Modern Anti-Aircraft Missile System on a Group Target -- 11.5.1 The Work of an Active Homing Head on a Group of Targets: Self-Cover Jammers.

11.6 Operation of the Active Homing Head When Auto-Tracking a Low-Attitude Clean Target and Using an Antipode Jammer -- 11.6.1 Signal Processing and Decision Rules -- 11.6.2 Operation of the Active Seeker on the Clean Target, Which Creates a Mirror Image from the Earth's (Water's) Surface -- 11.6.3 The Work of the Active Seeker on a Target, that Creates Interference such as Antipode -- References -- CHAPTER 12 Synthesis of Solutions on Improving Interference Immunity Against the Impact of Polarization Interference -- 12.1 Calculation of Direction-Finding Characteristics -- 12.2 Assessing Accuracy of an Angular Auto-Tracking System of the Target under Conditions of Polarization Interfe -- 12.3 Stability of Target Auto-Tracking in Conditions of Polarization Interference -- 12.4 The Decision Synthesis, Providing Auto-Tracking Stability of the Polarization Interference Source -- 12.5 Evaluation of the Stability of an Angular Auto-Tracking System of a Target Under Conditions of Polarization Interference -- 12.6 Proposals to Improve the Interference Immunity of a Monopulse Direction Finder to the Effects of Polarization Interference -- 12.6.1 Operation of Prototype Mode: 1A -- 12.6.2 Operation in Mode of the Proposed Decision: 1B --12.6.3 Operation of Prototype Mode: 2A -- 12.6.4 Operation in Mode

of the Proposed Decision: 2B -- 12.7 The Interference Immunity Indicator -- 12.8 Conclusion -- References -- CHAPTER 13 Solutions Synthesis to Increase the Noise Immunity of an Active Homing Head --13.1 Interference Immunity of a Missile Homing Head from Interference Along the Sidelobes of its Directional Pattern -- 13.2 Operation Assessment of the Air Defense Missile System for High-Speed and Low-Altitude Targets Without Interferen -- 13.2.1 Methods for Overcoming the Defeat Zone of an Anti-Aircraft Missile System. 13.3 Solution Synthesis to Increase the Interference Immunity of an Active Homing Head During its Operation at Low-Altitude Targets and by a Group of Jammers -- 13.3.1 Options Analysis for Increasing the Accuracy and Formulation of the Synthesis Problem -- 13.3.2 Solution Synthesis -- 13.3.3 Solution for the Emitted Signal, Taking into Account the Limitations due to the Hardware Implementation of the Anti-Aircraft Missile System -- 13.3.4 Proposals for the Hardware Implementation of a Synthesized Solution in a Real Anti-Aircraft Missile System -- References -- CHAPTER 14 Determining Performance Limitations of Existing Air Defense Systems for Intercepting Hypersonic Vehicles -- 14.1 Introduction -- 14.2 Field Scatter Pattern Calculation Mathematics -- 14.3 Evaluation of Interception Hypersonic Vehicles by Some Existing Air Defense Missile Systems -- 14.4 Calculation Results -- 14.5 Conclusion -- References -- Acronyms and Abbreviations --About the Author -- Index.

Sommario/riassunto

This book gives you an in-depth look into the critical function of interference shielding for onboard radar of anti-aircraft missile systems. Three problematic interferences are presented and discussed in detail: polarization interference; interference to the sidelobe of onboard antenna; and interference from two points in space, including interference reflected from the earth (water) surface. You will learn the basic principles of radiolocation, including monopulse radars, and get insight into the fundamental functional units of anti-aircraft missiles and surface-to-air missile systems. The book presents guidance methods, systems of direction finding, problems on firing over the horizon, and questions of accuracy and resolution - all important for better addressing solutions of interference shielding. This is a unique and valuable resource for engineers and technicians who are involved in the design and development of anti-aircraft guided missile systems, with special emphasis on interference immunity and protection. It can also be used as a textbook in advanced radar technology coursework and seminars.