

1. Record Nr.	UNINA9910829907903321
Autore	Duan Baoyan
Titolo	Electromechanical coupling theory, methodology and applications for high-performance microwave equipment // Baoyan Duan and Shuxin Zhang
Pubbl/distr/stampa	Hoboken, New Jersey : , : John Wiley & Sons, , [2023] ©2023
ISBN	1-119-90442-0 1-119-90440-4
Descrizione fisica	1 online resource (339 pages)
Disciplina	621.381/32
Soggetti	Microwave circuits Microwave devices Couplings
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover -- Title Page -- Copyright -- Contents -- About the Authors -- Preface -- Chapter 1 Background of Electromechanical Coupling of Electronic Equipment -- 1.1 Introduction -- 1.2 Characteristics of Electronic Equipment -- 1.3 Components of Electronic Equipment -- 1.3.1 Mechanical and Structural Part of Electronic Equipment -- 1.3.2 Electrical Part of Electronic Equipment -- 1.4 On research of Electromechanical Coupling (EMC) of Electronic Equipment -- 1.4.1 Current Status of Research on Electromechanical Coupling of Electronic Equipment -- 1.4.2 The Development Trends of Electronic Equipment -- 1.4.2.1 High Frequency and High Gain -- 1.4.2.2 Broad Bandwidth, Multiband, and High Power -- 1.4.2.3 High Density and Miniaturization -- 1.4.2.4 Fast Response and High Pointing Accuracy -- 1.4.2.5 Good Environmental Adaptability -- 1.4.2.6 Integration -- 1.4.2.7 Intelligence -- 1.5 Problem of the Traditional Design Method of Electronic Equipment -- 1.5.1 Traditional Design Method and Problems with Electronic Equipment -- 1.5.2 The Electromechanical Coupling Problem of Electronic Equipment and Its Solution -- 1.6 Main Science and Technology Respects of Design for Electronic Equipment -- 1.6.1

Holism of Electronic Equipment System Design -- 1.6.2
Electromechanical Coupling Theory of Electronic Equipment -- 1.6.3
Test and Evaluation Methods of Electronic Equipment -- 1.6.4
Environmental Adaptability (Thermal, Vibration, and EMC) and
Reliability of Electronic Equipment -- 1.6.5 Special Electronic
Equipment -- 1.6.6 Electromechanical Coupling Design of Electronic
Equipment -- 1.6.6.1 Electromechanical Coupling Design of Antennas
-- 1.6.6.2 Integrated Design of Radar Antenna Servo System -- 1.6.6.3
Coupling Design of HighDensity Chassis -- 1.7 Mechatronics Marching
Toward Coupling Between Mechanical and Electronic Technologies --
References.

Chapter 2 Fundamental of Establishing Multifield Coupling Theoretical
Model of Electronic Equipment -- 2.1 Introduction -- 2.2 Mathematical
Description of Electromagnetic (EM), Structural Deformation (S), and
Temperature (T) Fields -- 2.2.1 Electromagnetic Field -- 2.2.2
Structural Displacement Field -- 2.2.3 Temperature Field -- 2.3
Consideration of Establishing Multifield Coupling Model -- References
-- Chapter 3 Multifield Coupling Models of Four Kinds of Typical
Electronic Equipment -- 3.1 Introduction -- 3.2 Reflector Antennas --
3.2.1 Influence of Main Reflector Deformation -- 3.2.2 Influence of the
Feed Position Error -- 3.2.3 Effect of Feed Pointing Error -- 3.2.4
Electromechanical Twofield Coupling Model -- 3.2.5 Dual Reflector
Antenna -- 3.2.6 Experiment -- 3.2.6.1 Basic Parameters -- 3.2.6.2
The Basic Idea of the Experiment -- 3.2.6.3 Working Conditions and
Deformation -- 3.2.6.4 Measurement and Environment -- 3.2.6.5
Calculated and Measured Results -- 3.3 Planar Slotted Waveguide Array
Antennas -- 3.3.1 Effect of Position Error of the Radiation Slot -- 3.3.2
Effect of Radiation Slot Pointing Deflection -- 3.3.3 Effect of Seam
Cavity Deformation on Radiation Seam Voltage -- 3.3.4 Twofield
Electromechanical Coupling Model -- 3.3.5 Experiment -- 3.3.5.1 Basic
Parameters -- 3.3.5.2 Basic Idea -- 3.3.5.3 Working Condition and
Deformation -- 3.3.5.4 Testing and Environment -- 3.3.5.5 Calculated
and Measured Results -- 3.4 Active Phased Array Antennas -- 3.4.1
Effect of Change of Position and Attitude of the Radiation Unit -- 3.4.2
Effect of Array Surface Manufacturing and Assembly Errors -- 3.4.3
Effect of Radiation Array Element Manufacturing and Assembly Errors
-- 3.4.3.1 Waveguide Flange Connection Discontinuity -- 3.4.3.2
Influence of Waveguide Inner Wall Roughness -- 3.4.3.3 Effect of
Temperature Drift of T/R Components.
3.4.4 Effect of Mutual Coupling of Radiation Elements on the Radiation
Performance of Antennas -- 3.4.5 Theoretical Model of
Electromagnetic-Displacement-Temperature Fields Coupling -- 3.4.6
Experiment -- 3.4.6.1 Basic Parameters -- 3.4.6.2 Basic Ideas --
3.4.6.3 Working Conditions and Array Surface Errors -- 3.4.6.4
Measurement and Environment -- 3.4.6.5 Calculated and Measured
Results -- 3.5 Highdensity Cabinets -- 3.5.1 Effect of Contact Gaps --
3.5.2 Effect of Heat Sink Holes and Structural Deformation -- 3.5.3
Theoretical Model of Electromagnetic-Displacement-Temperature
Fields Coupling -- 3.5.4 Experiment -- 3.5.4.1 Basic Parameters --
3.5.4.2 Measurement and Environment -- 3.5.4.3 Calculated and
Measured Results -- References -- Chapter 4 Solving Strategy and
Method of the Multifield Coupling Problem of Electronic Equipment --
4.1 Introduction -- 4.2 Solving Strategy of the Multifield Coupling
Problem -- 4.3 Solving Method of the Multifield Coupling Problem --
4.3.1 Solution Method of Direct Coupling Analysis -- 4.3.2 Solution
Method of Sequential Coupling Analysis -- 4.3.3 Solution Method for
Mathematical Decoupling Analysis -- 4.3.4 Solution Method of
Integrated Optimization Analysis -- 4.4 General Approach Method of

the Multifield Coupling Problem -- 4.4.1 Neighborhood Interpolation Method -- 4.4.2 Mapping Method -- 4.4.3 Spline Function Interpolation Method -- 4.4.4 Continuation Method -- 4.5 The Mesh Matching Among Different Fields -- 4.5.1 Generated Directly in the Structural Finite Element Mesh -- 4.5.2 Mesh Mapping from Structure to EM -- 4.6 Mesh Transformation and Information Transfer -- 4.6.1 Transmission of Deformation Information -- 4.6.2 Extraction of Deformed Meshes -- References -- Chapter 5 Influence Mechanism (IM) of Nonlinear Factors of AntennaServoFeeder Systems on Performance -- 5.1 Introduction.

5.2 Data Mining of ISFP -- 5.2.1 Data Modeling Method -- 5.2.2 Acquisition of Data Samples -- 5.2.2.1 Building the Initial Data Warehouse -- 5.2.2.2 Obtaining the Data Samples Needed for Modeling -- 5.2.2.3 Data Conversion and Normalized Processing -- 5.2.3 Multicore Regression Method for Data Mining -- 5.2.4 Application of Data Mining -- 5.3 ISFP of Reflector Antennas -- 5.3.1 Data Collection and Mining -- 5.3.2 The Establishment of an Analysis Model of the Influence Mechanism -- 5.3.3 Experiment -- 5.4 ISFP of Planar Slotted Waveguide Array Antennas -- 5.4.1 Hierarchical Relationship Model of Structural Factors and Electrical Properties -- 5.4.2 Influence of Structural Factors on the Amplitude Phase of a Unit in a Radiated Functional Component -- 5.4.2.1 Influence of Slot Deviation on Conductance and Resonance Length -- 5.4.2.2 The Relationship Between Frequency and Admittance, Amplitude Phase -- 5.4.2.3 Influence of Waveguide Wall Thickness on Admittance, Amplitude Phase -- 5.4.2.4 Influence of Slot Width on Admittance, Amplitude Phase -- 5.4.2.5 Influence of Slot Length on Amplitude and Phase -- 5.4.3 Influence of Structural Factors on the Amplitude Phase of a Unit in a Coupling Functional Component -- 5.4.3.1 Influence of the Inclination Angle of the Slot on the Resonance Length and Resonance Resistance -- 5.4.3.2 Influence of Inclination Angle and Slot Length on Amplitude and Phase -- 5.4.3.3 Influence of Waveguide Wall Thickness on Impedance, Amplitude Phase -- 5.4.3.4 Influence of Slot Width on Impedance, Amplitude Phase -- 5.4.4 Influence of Structural Factors on Voltage Standing Wave Ratio in the Excitation Functional Components -- 5.4.4.1 Weighting Analysis of the Influence of the structural Factors on the Amplitude and Phase in the Incentive Function Component -- 5.4.4.2 Results and Discussion -- 5.4.5 Prototype Design and Experiment.

5.5 ISFP of Microwave Feeder and Filters -- 5.5.1 Hierarchical Relationship Model of the Influence of Structural Factors on the Resonant Cavity Filters -- 5.5.2 Influence of Structural Factors on the Noload Q Value of the Resonant Cavity -- 5.5.2.1 Influence of Geometric Shape, Size, and Position Deviation on the Noload Q Value -- 5.5.2.2 Relationship Between Surface Roughness and Equivalent Conductivity -- 5.5.2.3 Relationship Between Coating Quality and Equivalent Conductivity -- 5.5.2.4 Influence of Coaxial Cavity Assembly Connection Quality on Noload Q Value -- 5.5.3 Influence of Structural Factors on the Coupling Coefficient -- 5.5.3.1 Influence of Coupling Hole Structure Factors on the Coupling Coefficient -- 5.5.3.2 Analysis of the Influence of the Position and Size of the Coupling Diaphragm and the Length of the Resonant Rod on the Coupling Coefficient -- 5.5.4 Influence of Tuning Screw on Resonance Frequency and Coupling Coefficient -- 5.5.4.1 Effect of Screw Depth on Resonant Frequency -- 5.5.4.2 Relationship of the Influence of the Tuning Screw on the Coupling Coefficient -- 5.5.5 Influence of Structural Factors on the Power Capacity of Microwave Filters -- 5.5.6 Prototype Production and Experiment -- 5.6 ISFP of RadarServo Mechanism -- 5.6.1 Influence of

Clearance on the Performance of the Servo System -- 5.6.1.1 Influence
of Gear Meshing Clearance -- 5.6.1.2 Influence of Bearing Clearance --
5.6.2 Influence of Friction on the Performance of the Servo System --
5.6.2.1 Influence of Gear Meshing Friction -- 5.6.2.2 Influence of
Bearing Friction -- 5.6.3 Construction of Servo System Prototype and
Experiment -- 5.6.3.1 Servo System Prototype -- 5.6.3.2 Experiment
-- 5.7 ISFP of Active Phased Array Antennas with Radiating Arrays --
5.7.1 Decomposition and Accuracy Transfer of Multilayer Conformal
Surfaces.
5.7.1.1 Decomposition of Multilayer Conformal Surfaces.
