

Antenna Theory Analysis And Design

2nd Edition

Helical antenna

Theory, Analysis and Design. John Wiley and Sons. Stutzman, Warren; Thiele, Gary (1998). Antenna Theory and Design (2nd ed.). John Wiley and Sons. "Helical

A helical antenna is an antenna consisting of one or more conducting wires wound in the form of a helix. A helical antenna made of one helical wire, the most common type, is called monofilar, while antennas with two or four wires in a helix are called bifilar, or quadrifilar, respectively.

In most cases, directional helical antennas are mounted over a ground plane, while omnidirectional designs may not be. The feed line is connected between the bottom of the helix and the ground plane. Helical antennas can operate in one of two principal modes: normal or axial.

In the normal mode or broadside helical antenna, the diameter and the pitch of the aerial are small compared with the wavelength. The antenna acts similarly to an electrically short dipole or monopole, equivalent to a $1/4$ wave vertical...

Computational electromagnetics

antenna modeling computer programs, which calculate the radiation pattern and electrical properties of radio antennas, and are widely used to design antennas

Computational electromagnetics (CEM), computational electrodynamics or electromagnetic modeling is the process of modeling the interaction of electromagnetic fields with physical objects and the environment using computers.

It typically involves using computer programs to compute approximate solutions to Maxwell's equations to calculate antenna performance, electromagnetic compatibility, radar cross section and electromagnetic wave propagation when not in free space. A large subfield is antenna modeling computer programs, which calculate the radiation pattern and electrical properties of radio antennas, and are widely used to design antennas for specific applications.

Radiation pattern

directivity. Antenna modeling E-plane and H-plane Constantine A. Balanis: "Antenna Theory, Analysis and Design";, John Wiley & Sons, Inc., 2nd ed. 1982 ISBN 0-471-59268-4

In the field of antenna design the term radiation pattern (or antenna pattern or far-field pattern) refers to the directional (angular) dependence of the strength of the radio waves from the antenna or other source.

Particularly in the fields of fiber optics, lasers, and integrated optics, the term radiation pattern may also be used as a synonym for the near-field pattern or Fresnel pattern. This refers to the positional dependence of the electromagnetic field in the near field, or Fresnel region of the source. The near-field pattern is most commonly defined over a plane placed in front of the source, or over a cylindrical or spherical surface enclosing it.

The far-field pattern of an antenna may be determined experimentally at an antenna range, or alternatively, the near-field pattern may...

Pyotr Ufimtsev

Fundamentals of the Physical Theory of Diffraction, Wiley & Sons, Inc., Hoboken, New Jersey, 1st edition 2007 and 2nd edition 2014. In these two books, Ufimtsev

Pyotr (Petr) Yakovlevich Ufimtsev (Russian: Пётр Яковлевич Уфимцев; born 8 July 1931) is a Soviet and Russian electrical engineer and mathematical physicist, best known for his pioneering work on the physical theory of diffraction (PTD), which laid the groundwork for modern stealth aircraft technology. His research on how electromagnetic waves reflect from surfaces like edges and vertices became critical in the development of aircraft with reduced radar signatures.

Mikhail Samoilovich Neiman

transmitting antennas";, which for a long time served as a guide for the design of these antennas and was used as the textbook. He created a general theory of frequency

Mikhail Samoilovich Neiman (March 7, 1905, in Sevastopol, Russian Empire – June 25, 1975, in Moscow, USSR) was a Soviet physicist, Doctor of Technical Sciences and professor. The main directions of his research were the study of the ultra-high frequency electromagnetic systems, theoretical and applied radio engineering, and automatic processes.

List of textbooks in electromagnetism

Electromagnetic Waves in Stratified Media, 2nd ed, IEEE-Oxford University, 1996.
Balanis CA, Antenna Theory: Analysis and Design, 4th ed, Wiley, 2016. Collin RE

The study of electromagnetism in higher education, as a fundamental part of both physics and electrical engineering, is typically accompanied by textbooks devoted to the subject. The American Physical Society and the American Association of Physics Teachers recommend a full year of graduate study in electromagnetism for all physics graduate students. A joint task force by those organizations in 2006 found that in 76 of the 80 US physics departments surveyed, a course using John Jackson's Classical Electrodynamics was required for all first year graduate students. For undergraduates, there are several widely used textbooks, including David Griffiths' Introduction to Electrodynamics and Electricity and Magnetism by Edward Purcell and David Morin. Also at an undergraduate level, Richard Feynman...

Radar cross section

Metasurfaces Based on Scattering Cancellation Using Array Theory," in IEEE Transactions on Antennas and Propagation, vol. 67, no. 1, pp. 298-308, Jan. 2019

Radar cross-section (RCS), denoted σ , also called radar signature, is a measure of how detectable an object is by radar. A larger RCS indicates that an object is more easily detected.

An object reflects a limited amount of radar energy back to the source. The factors that influence this include:

the material with which the target is made;

the size of the target relative to the wavelength of the illuminating radar signal;

the absolute size of the target;

the incident angle (angle at which the radar beam hits a particular portion of the target, which depends upon the shape of the target and its orientation to the radar source);

the reflected angle (angle at which the reflected beam leaves the part of the target hit; it depends upon incident angle);

the polarization of the radiation transmitted...

Mathematical optimization

space mapping design of microwave structures, handset antennas, electromagnetics-based design. Electromagnetically validated design optimization of

Mathematical optimization (alternatively spelled optimisation) or mathematical programming is the selection of a best element, with regard to some criteria, from some set of available alternatives. It is generally divided into two subfields: discrete optimization and continuous optimization. Optimization problems arise in all quantitative disciplines from computer science and engineering to operations research and economics, and the development of solution methods has been of interest in mathematics for centuries.

In the more general approach, an optimization problem consists of maximizing or minimizing a real function by systematically choosing input values from within an allowed set and computing the value of the function. The generalization of optimization theory and techniques to other...

Huygens-Fresnel principle

ISBN 978-0-470-58948-9. Balanis, Constantine A. (2005). Antenna Theory: Analysis and Design (3rd ed.). John Wiley and Sons. p. 333. ISBN 047166782X. Miller, David

The Huygens-Fresnel principle (named after Dutch physicist Christiaan Huygens and French physicist Augustin-Jean Fresnel) states that every point on a wavefront is itself the source of spherical wavelets, and the secondary wavelets emanating from different points mutually interfere. The sum of these spherical wavelets forms a new wavefront. As such, the Huygens-Fresnel principle is a method of analysis applied to problems of luminous wave propagation both in the far-field limit and in near-field diffraction as well as reflection.

Near and far field

(2005). Antenna Theory: Analysis and Design (3rd ed.). Chapter 2, page 34. Rappaport, Theodore S. (2010). Wireless Communications Principles and Practice

The near field and far field are regions of the electromagnetic (EM) field around an object, such as a transmitting antenna, or the result of radiation scattering off an object. Non-radiative near-field behaviors dominate close to the antenna or scatterer, while electromagnetic radiation far-field behaviors predominate at greater distances.

Far-field E (electric) and B (magnetic) radiation field strengths decrease as the distance from the source increases, resulting in an inverse-square law for the power intensity of electromagnetic radiation in the transmitted signal. By contrast, the near-field's E and B strengths decrease more rapidly with distance: The radiative field decreases by the inverse-distance squared, the reactive field by an inverse-cube law, resulting in a diminished power in...

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