DOWNLOAD PDF MICROWAVE AND RADAR NOTES

Chapter 1 : Engineering Notes Handwritten class Notes Old Year Exam Question

A circuit which cutoff voltage above or below are both specified level is called clipper. A clipper which removes a portion of positive.

First experiments[edit] As early as , German physicist Heinrich Hertz showed that radio waves could be reflected from solid objects. In , Alexander Popov , a physics instructor at the Imperial Russian Navy school in Kronstadt , developed an apparatus using a coherer tube for detecting distant lightning strikes. The next year, he added a spark-gap transmitter. In , while testing this equipment for communicating between two ships in the Baltic Sea , he took note of an interference beat caused by the passage of a third vessel. In his report, Popov wrote that this phenomenon might be used for detecting objects, but he did nothing more with this observation. In , he demonstrated the feasibility of detecting a ship in dense fog, but not its distance from the transmitter. He also got a British patent on September 23, [10] for a full radar system, that he called a telemobiloscope. His system already used the classic antenna setup of horn antenna with parabolic reflector and was presented to German military officials in practical tests in Cologne and Rotterdam harbour but was rejected. Through his lightning experiments, Watson-Watt became an expert on the use of radio direction finding before turning his inquiry to shortwave transmission. Requiring a suitable receiver for such studies, he told the "new boy" Arnold Frederic Wilkins to conduct an extensive review of available shortwave units. Across the Atlantic in , after placing a transmitter and receiver on opposite sides of the Potomac River , U. Hoyt Taylor and Leo C. Young discovered that ships passing through the beam path caused the received signal to fade in and out. Taylor submitted a report, suggesting that this phenomenon might be used to detect the presence of ships in low visibility, but the Navy did not immediately continue the work. Eight years later, Lawrence A. Hyland at the Naval Research Laboratory NRL observed similar fading effects from passing aircraft; this revelation led to a patent application [13] as well as a proposal for further intensive research on radio-echo signals from moving targets to take place at NRL, where Taylor and Young were based at the time. Hugon, began developing an obstacle-locating radio apparatus, aspects of which were installed on the ocean liner Normandie in In total, only Redut stations were produced during the war. The first Russian airborne radar, Gneiss-2 , entered into service in June on Pe-2 fighters. More than Gneiss-2 stations were produced by the end of Full radar evolved as a pulsed system, and the first such elementary apparatus was demonstrated in December by the American Robert M. Page , working at the Naval Research Laboratory. Watson-Watt in Great Britain. Wilkins returned a set of calculations demonstrating the system was basically impossible. When Watson-Watt then asked what such a system might do, Wilkins recalled the earlier report about aircraft causing radio interference. This revelation led to the Daventry Experiment of 26 February , using a powerful BBC shortwave transmitter as the source and their GPO receiver setup in a field while a bomber flew around the site. Work there resulted in the design and installation of aircraft detection and tracking stations called " Chain Home " along the East and South coasts of England in time for the outbreak of World War II in This system provided the vital advance information that helped the Royal Air Force win the Battle of Britain ; without it, significant numbers of fighter aircraft would always need to be in the air to respond quickly enough if enemy aircraft detection relied solely on the observations of ground-based individuals. Also vital was the " Dowding system " of reporting and coordination to make best use of the radar information during tests of early deployment of radar in and Given all required funding and development support, the team produced working radar systems in and began deployment. This fact meant CH transmitters had to be much more powerful and have better antennas than competing systems but allowed its rapid introduction using existing technologies. Radar in World War II A key development was the cavity magnetron in the UK, which allowed the creation of relatively small systems with sub-meter resolution. Britain shared the technology with the U. Later, in , Page greatly improved radar with the monopulse technique that was used for many years in most radar applications. Applications[edit] Commercial marine radar antenna. The rotating antenna radiates a vertical fan-shaped beam. The information provided by radar includes the bearing and range and therefore position of the object from the radar scanner. It is thus used in many different fields where the need for such positioning is crucial.

The first use of radar was for military purposes: This evolved in the civilian field into applications for aircraft, ships, and roads. The first commercial device fitted to aircraft was a Bell Lab unit on some United Air Lines aircraft. Military fighter aircraft are usually fitted with air-to-air targeting radars, to detect and target enemy aircraft. In addition, larger specialized military aircraft carry powerful airborne radars to observe air traffic over a wide region and direct fighter aircraft towards targets. In port or in harbour, vessel traffic service radar systems are used to monitor and regulate ship movements in busy waters. It has become the primary tool for short-term weather forecasting and watching for severe weather such as thunderstorms , tornadoes , winter storms , precipitation types, etc. Police forces use radar guns to monitor vehicle speeds on the roads. Smaller radar systems are used to detect human movement. Examples are breathing pattern detection for sleep monitoring [32] and hand and finger gesture detection for computer interaction.

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Chapter 2 : SUCCESS POINT: LECTURER NOTES

VTU University Microwave And Radar 10ec54 lecturer Notes. Microwave And Radar 10ec54 Notes.

These questions will help you prepare better for your semester exams. Very Short Answer type questions. What is frequency range of X band? Draw shape of circular wave guide. What is use of Isolator? Draw structure of Horn antenna. Name any most common type of radar display. What are applications of microwave frequencies? Why wave guides are used for higher frequencies? Write expression for propagation constant of a rectangular wave guide. Write a short note on "slotted section". What are different types of Tees? What is the use of Twists in microwave components? Explain the basic concepts of thermionic emission and vacuum tube. Explain the effect of transit time on high frequency performance of conventional vacuum tube. What are applications of reflex Klystron? Write a short note on "Gunn diode". What are different applications of Horn antennas? Explain troposphere and its properties. Explain the radar range equation. Write a short note on "PPI". What are different multiple access techniques? Long answer type questions What is microwave? Classify microwave on the basis of its frequency bands. Explain Microwave circulator with the help of suitable diagram. Also write applications of microwave circulator. Explain characteristics and working of Multi-cavity magnetron. Draw and explain the block diagram of microwave communication link. Draw and explain block diagram of MTI radar system.

Chapter 3 : Microwave engineering - Wikipedia

ece v microwaves and radar notes part a pdf. ece v microwaves and radar notes part b pdf.

February 8, The CMB is a snapshot of the oldest light in our Universe, imprinted on the sky when the Universe was just years old. It shows tiny temperature fluctuations that correspond to regions of slightly different densities, representing the seeds of all future structure: ESA and the Planck Collaboration Microwaves are a type of electromagnetic radiation, as are radio waves, ultraviolet radiation, X-rays and gamma-rays. Microwaves have a range of applications, including communications, radar and, perhaps best known by most people, cooking. Electromagnetic radiation is transmitted in waves or particles at different wavelengths and frequencies. This broad range of wavelengths is known as the electromagnetic spectrum EM spectrum. The spectrum is generally divided into seven regions in order of decreasing wavelength and increasing energy and frequency. The common designations are radio waves, microwaves, infrared IR , visible light, ultraviolet UV , X-rays and gamma-rays. Microwaves fall in the range of the EM spectrum between radio and infrared light. Microwaves have frequencies ranging from about 1 billion cycles per second, or 1 gigahertz GHz , up to about gigahertz and wavelengths of about 30 centimeters 12 inches to 1 millimeter 0. The scale at the bottom indicates representative objects that are equivalent to the wavelength scale. They are also used for supervisory control and data acquisition SCADA for remote machinery, switches, valves and signals. Another important application of microwaves is radar. Prior to World War II, British radio engineers found that short-wavelength radio waves could be bounced off distant objects like ships and aircraft, and the returning signal could be detected with highly sensitive directional antennas so the presence and locations of those objects could be determined. Usage of the term "radar" has become so common that it is now a word in and of itself, and can refer to systems that use microwaves or radio waves. However, because the system had been in operation for only two weeks, it was considered unreliable, and the warning was ignored. Over the course of the war, radar was improved and refined, and it has since become an essential element of national defense and civilian air-traffic control. Radar has found many other uses, some of which exploit the Doppler effect. An example of the Doppler effect can be demonstrated by an approaching ambulance: As it nears, the sound of the siren seems to rise in pitch, until it wails by. Then, as it recedes into the distance, the siren seems to lower in pitch. Robert Mayanovic, a professor of physics at Missouri State University, said that Doppler radar, which often employs microwaves, is used for air-traffic control and vehicular speed-limit enforcement. When an object is approaching the antenna, the returning microwaves are compressed and thus have a shorter wavelength and higher frequency. Conversely, return waves from objects moving away are elongated and have a longer wavelength and lower frequency. By measuring this frequency shift, the speed of an object toward or away from the antenna can be determined. Common applications of this principle include simple motion detectors, radar guns for speed-limit enforcement, radar altimeters and weather radar that can track the 3D motion of water droplets in the atmosphere. These applications are called active sensing, because microwaves are transmitted, and the reflected signals are received and analyzed. In passive sensing, natural sources of microwaves are observed and analyzed. Many of these observations are conducted by satellites looking either back at the Earth or out into space. Microwave heat sources One of the most common uses of microwaves is to heat food quickly. Microwave ovens are possible because microwaves can be used to transmit thermal energy. The discovery of this phenomenon was purely accidental. In his book, " They All Laughed From the Light Bulbs to Lasers: Spencer, an electronics genius and war hero, was touring one of his laboratories at the Raytheon Company. Spencer stopped in front of a magnetron , the power tube that drives a radar set. Suddenly he noticed that a candy bar in his pocket had begun to melt. The first microwave ovens were quite large and expensive, but they have since become so affordable that they are common in homes worldwide. Microwave heating systems are also used in a number of industrial applications, including food, chemical and materials processing in both batch and continuous operations. Tafreshi Natural microwave sources Radio astronomers conduct observations in the microwave region, but due to attenuation by the atmosphere, most of these studies are done using high-altitude balloons or satellites. However, perhaps the

most famous observation of extraterrestrial microwaves was conducted by two Bell Labs scientists working on a telecommunications system using a large ground-based horn antenna. They detected background noise using a special low-noise antenna. The strange thing about the noise was that it was coming from every direction and did not seem to vary in intensity much at all. If this static were from something on our planet, such as radio transmissions from a nearby airport control tower, it would come only from one direction, not everywhere. The Bell Lab scientists soon realized that they had serendipitously discovered the cosmic microwave background radiation. This radiation, which fills the entire universe, is a clue to its beginning, known as the Big Bang. The cosmic microwave background radiation has since been mapped with great accuracy by satellites. These observations have revealed the minute temperature variations that eventually evolved into the galactic clusters we see today. Analysis of this background radiation has also given astronomers clues as to the composition of the universe, and scientists now think about 95 percent of the cosmos is made up of matter and energy that cannot be "sensed" with conventional instruments, leading to the names dark matter and dark energy. Future analysis of this background radiation might shed further light on what happened shortly after the birth of the universe â€” and, potentially, even before this universe existed, according to some cosmic models. Additional reporting by Charles Q. Choi, Live Science contributor.

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Chapter 4 : Microwave and Radar Engineering [Book]

2/26 - 1 - Lecture Microwave Communications and Radar A. Overview Microwave communications and radar systems have similar architectures.

Short wavelength energy offers distinct advantages in many applications. For instance, sufficient directivity can be obtained using relatively small antennas and low-power transmitters. These characteristics are ideal for use in both military and civilian radar and communication applications. Small antennas and other small components are made possible by microwave frequency applications. The size advantage can be considered as part of a solution to problems of space, or weight, or both. Microwave frequency usage is significant for the design of shipboard radar because it makes possible the detection of smaller targets. Microwave frequencies present special problems in transmission, generation, and circuit design that are not encountered at lower frequencies. Conventional circuit theory is based on voltages and currents while microwave theory is based on electromagnetic fields. As a consequence, practical microwave technique tends to move away from the discrete resistors , capacitors , and inductors used with lower frequency radio waves. Instead, distributed circuit elements and transmission-line theory are more useful methods for design and analysis. Open-wire and coaxial transmission lines give way to waveguides and stripline , and lumped-element tuned circuits are replaced by cavity resonators or resonant lines. Effects of reflection , polarization , scattering , diffraction and atmospheric absorption usually associated with visible light are of practical significance in the study of microwave propagation. The same equations of electromagnetic theory apply at all frequencies. Inexpensive components and digital communications in the microwave domain have opened up areas pertinent to this discipline. Some of these areas are radar, satellite , wireless radio , optical communication , faster computer circuits, and collision avoidance radar. The University of Massachusetts Amherst provides research and educational programs in microwave remote sensing, antenna design and communications systems. Courses and project work are offered leading toward graduate degrees. Specialties include microwave and RF integrated circuit design, antenna engineering, computational electromagnetics, radiowave propagation, radar and remote sensing systems, image processing, and THz imaging. Wireless Engineering Research and Education Center is one of three research centers. It has an Advanced Microwave Laboratory, a Wireless Communication Laboratory and other facilities related to research. The society also publishes peer reviewed journals, and one magazine.

Chapter 5 : Microwave engineering ebook pdf Free Download

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Chapter 6 : NPTEL Phase II :: Electronics & Communication Engineering - Microwave Theory and Techniq

Below you can find some important questions for the subject Microwave and Radar Engg.. Explain the radar range equation. Write a short note on "PPI".

Chapter 7 : MRW â€“ Welcome | Microwave and Radar Week PoznaÅ„

Devil in the Grove: Thurgood Marshall, the Groveland Boys, and the Dawn of a New America.

Chapter 8 : Microwave and Radar Engineering - M. Kulkarni - Google Books

Microwaves are also employed in microwave ovens and in radar technology. Beginning at about 40 GHz, the atmosphere becomes less transparent to microwaves, due at lower frequencies to absorption from water vapor and at

higher frequencies from oxygen.

Chapter 9 : Radar - Wikipedia

The ward radar means radio direction and ranging. Radar is a system which is used to find out the direction of the target. It is also used to find out the range of that target from the reference place where radar is installed.