Spread spectrum modulation in digital communication pdf

Spread the frequency domain of passband tuning analog adjustment AM FM PM QAM SM SSB Digital Adjustable ASK APSK CPM FSK MFSK MSK PPM PSK PSK QAM SC-FDE TCM WDM Hierarchy Adjustment QAM WDM Spectrum Distribution CSS DS In addition SSS FHSS THSM Also see capacity code near demo end of modem line An PoM PCM PCM PWM PWM ΣM AM FDM also sees capacity code near the modem encoding level, An PoM PCM PCM PWM PWM ΣM ΣM AM FDM also sees the capacity code near the modem encoding downgrade of the An PomPE PCM PCM MODEM PWM PWM ΣM ΣM. Multiplex vte Analog Adjustable AM FM PM QAM SM SSB Circuit Mode (Fixed Bandwidth) TDM FDM / WDM SDMA Spatial Polarization OAM Multiplex Statistics (Variable Bandwidth) Dynamic Switch Packet TDMA FHSS DSS OFDMA SC-FDM MC-SS Related Topics How to Access Channels How To Control Medium Access Vte Part of The Series OnAntennas General Type Dipole Fractal Loop Monopol Satellite Dish Television Whip Components Balun Block Upverter Counter Cable Coaxial Cable (Ground System) Feed Cable Feed Low Noise Downconverter Passive Radiator Receiver Rotator Stub Transmitter Tuner Dual Antenna System Led Farm Network Amateur Telephone Hotspot Wireless Network Municipal Radio Mast and Building Wi-Fi Wireless Security and Radiation Regulation Mobile Phone And Health Wireless Electronics And Health International Telecommunications Union (Radio Regulation) World Radio Meeting Radiation Source / Region Boresight Focal Ground Cloud Airplane Near And Far Field Side SideAlle Side Vertical Aircraft Characteristics Array Distance Receiving Direct Performance Electrolysesoral Equivalent Range Factors Friis conveys high-radiation exposure equations, radiation resistance patterns, radio waves, frequency signals to sound. The emissiontechnic ratio is decisive, beam beam beam tilt beam Beamforming Laboratory, small cell bell LayeredSpace-Time (BLAST), large multi-input multi-input multi-output (MIMO), wideband space divisionmultiple access spectrum spread (WSDMA) vte in telecommunications and radio spectrum diffusion techniques is how signals (such as electromagnets or acoustic signals) created with specific bandwidth are deliberately spread in frequency domains. As a result, the signal has wider bandwidth. These techniques are used for a number of reasons, including the establishment of secure communications, increasing resistance to natural interference, noise and jamming to prevent detection, to limit the density of energy flux (e.g. in linking satellites down), and to enable multi-access communication. It originally had two motives: to resist enemy efforts to disrupt communication (anti-jam or AJ) or to hide the truth. Communication occurs sometimes called low probability of interception (LPI), frequency-jumping spectrum (FHSS), direct sequence spread spectrum (DSSS), time jump spread spectrum (THSS), chirp spread spectrum (CSS) and a combination of these techniques as a form of spread spectrum. These first two techniques use pseudorandom number sequences created using the pseudorandom number generator to determine and control signal spread patterns through allocated bandwidth. The IEEE 802.11 wireless standard uses FHSS or DSSS in the radio interface. The technique has been known since the 1940s and has been used in military communication systems since the 1950s. The main principle of the spread spectrum is the use of signal-like, sound-like carriers, and by name refers to the wider bandwidth required for simple point-to-point communication at the same data rate. Resistance to direct sequence (noise) (DS) is good for continuous narrow ingress resistance, while frequency jumping (FH) is better in resisting pulse jams. In the DS system, narrow jamming affects the detection efficiency, as if the amount of jammed power is spread across the entire signal bandwidth, which is often much stronger than background noise. On the other hand, in a narrow system where low signal bandwidth receives signal quality is severely reduced, if the jammed power occurs, it focuses on signal bandwidth, eavesdropping resistance, spread sequences (in DS systems) or frequency jump patterns (in FH systems), often unknown by anyone whose signals are unintentional, in which case it obscures the signal and reduces the likelihood of an adversary making sense of it. What's more, for a given energy spectrum density (PSD), the spread spectrum system requires the same amount of energy per bit before spreading into a narrow system, and therefore the energy in the same amount if the bitrate before the spread is the same. But because the signal power spreads through large bandwidth, psd signals are significantly lower than PSD sounds - so that the adversary may not be able to determine whether all signals are lower than noise. However, for mission-critical applications, especially those that use commercially available radios, the spread spectrum radio does not provide adequate security, unless a long non-linear spread sequence is used and the text is encoded. High bandwidth occupied by spread spectrum signals offers a variety of frequencies. That is to say, it is unlikely that the signal will face several severe paths, fading across the bandwidth. In the direct sequence system, the signal can be detected using a rake receiver. Access capabilities known as multi-code access (CDMA) or multiplex code breaks (CDM) multiple users can simultaneously send in the same frequency band as long as they use different spread sequences. Inventing more jumping frequencies: the jump frequency spreads the thought spectrum of trying to protect and avoid interference in the radio transmission retrospectively to the beginning of radio transmission. In 1899, Guglielmo Marconi experimented with receiving selected frequencies in an effort to reduce interference. The concept of frequency jumping was adopted by German radio company Telefunken and is also described in part by a US patent in 1903 by Nikola Tesla[3] radio pioneer Jonathan Zenneck of the 1908 German book Wireless Telegraphy explaining the process and note that Telefunken used it earlier. It saw limited use by the German army in World War I,[5] being put forward by Polish engineer Leonard Danilewicz in 1929,[6] displayed in a patent in the 1930s by Willem Broertjes (U.S. Patent 1869,659 released Aug 2. And in the U.S. Army's secretive U.S. Army Communications System, a World War II communications system named SIGSALY during World War II, the golden age of Hollywood actor Hedy Lamarr and avant-garde composer George Antheil developed a radio-resistant guidance system that was resistant to jamming for use in allied torpedoes, patented devices under the U.S. patent of 2,292,387 Secret Communications Systems. [7] This section requires additional reference for inspection. Please help improve this article by adding references to trusted sources. Unpurchased materials may be challenged and removed (January 2020) (learn how and when to remove this template text). Spread the spectrum of modern switching power supply (heating up time), including waterfall diagrams in minutes. Recorded with the NF-5030 EMC-Analyzer, the creation of a spectrum spread clock (SSCG) is used in some synchronous digital systems, especially those with microprocessors to reduce the spectrum density of electromagnetic interference. These systems are created. Synchronous digital is clock-driven, and because of its timing, there is an inevitable narrow frequency spectrum. In fact, the perfect clock will have all the energy concentrated at a single frequency (the desired clock frequency) and its harmonics. A practical synchronous digital system radiates electromagnetic energy on a narrow strip. A lot of its spread on the clock frequency and harmonics results in a frequency spectrum where certain frequencies can exceed the limit. Limited regulations for electromagnetic interference (e.g. the FCC in the United States Spread spectrum clocking avoids this problem by using one of the methods described earlier to reduce maximum radiation energy, and therefore electromagnetic emissions, and to comply with electromagnetic compatibility (EMC) regulations, it has become a popular technique to get regulatory approval, because it requires only simple equipment modifications. It is increasingly popular in portable electronic devices due to faster clock speeds and increased integration of high-resolution LCD displays with ever smaller devices. Active EMI reduction techniques such as spread spectrum clocks are required in these cases. However, clocking the spread spectrum, such as other types of dynamic frequency changes, can also create challenges for designers. The main among them is the clock/data orientation or tilt of the clock, so the ability to disable spread spectrum clocks in computer systems is useful. Please note that this method does not reduce all radiating energy, so the system does not necessarily have the less chance of causing interference. The general measurement receiver used by the EMC test laboratory divides the electromagnetic spectrum into a wide spectrum of about 120 kHz. Distributing this same power into a bigger bandwidth prevents the system from bringing enough power into any narrow bar to exceed the legal limit. The benefits of this method as a way to reduce real-life disturbances are often debated, as it is perceived that the spectrum clock spreads in hiding rather than addressing the higher radiated energy problems by exploiting vulnerabilities in EMC law or certification procedures. This situation results in electronics susceptible to narrow bandwidth, experiencing much less interference, while those with broadband sensitivity or even other higher-frequency operations (such as radio receivers adapted to other stations) will experience more interference. FCC certification tests are usually completed with a spread spectrum function enabled to reduce emissions measured within the limits. acceptable laws. However, spread spectrum functions may be disabled by users in some cases, for example, in the personal computer area, some BIOS writers, as well as the ability to disable the creation of a spread spectrum clock as a user preference, thus overcoming the object of EMI regulation, this may be considered a vulnerability. But in general, As long as the spread spectrum is enabled by default. See also Direct Spread Spectrum Electromagnetic Compatibility Spectrum (EMC) Electromagnetic Interference (EMI) Frequency Allocation Frequency Jump Spectrum George Antheil Has Military Frequency Rapid Jump Communication System UHF Radio Hedy Lamarr Open Spectrum Factor SpreadOr close-angle (OVSF) spectrum spread domain time reflection time Principles of spectrum spread communication system, 4th ed. How I discovered the greatest spies of World War II and other stories of intelligence and code, CRC Press - 2014, page 157-158 ^ Tony Rothman, random path to frequency jump, American scientist, January-February 2019 Volume 107, number 1, page 46 americanscientist.org ^ Jonathan Wilhelm Zenneck, Telegraph Wireless, McGraw-Hill Book Company, total, 191 Page 331 ^ Denis Winter, Haig's statement - reassessment ^ Danilewicz remembered later: In 1929 we proposed to the general staff my design equipment for the secret radio telegram, which fortunately did not win recognition, since it was a truly barbaric idea, which consisted of constantly changing the frequency of the transmitter. However, the commission has deemed it appropriate to give me 5,000 zotych for modeling operations and was encouraged to continue working. Quote in Wadysaw Kozaczuk, Enigma: How the German Cipher machine was destroyed and how it was read by allies in World War II, 1984, p. 27. Historical Encyclopedia of Natural Science and Mathematics Vol. 1 Springer Science & Business Media - 2009, page 4527-4530 ^ American National Standard for Electromagnetic Noise and Field Strength Measurement Tools, 10 Hz Article 8.2 Overall Bandwidth Source This article contains public domain content from the General Service Administration Document: Federal Standard 1037C (in support of MIL-STD-188), NTIA's guide of rules and procedures for managing the federal radio frequency information system, the National Metacognitive History of Spectrum Metacognitive, As defined in the Smart Mob, the next social revolution, Howard Rheingold, ISBN 0-7382-0608-3 Wadysaw Kozaczuk, Enigma: How german machine encryption was destroyed and it was read by allies in World War II edited and translated by Christopher Kasparek, Frederick, MD, University publication of America, 1984, ISBN 0-8909 Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, No. 5. External links, a résumé of cdma spectrum spread and spectrum spread, newsletter-scene newsletters drawn from