

1: MICROWAVE RADIO TRANSMISSION DESIGN GUIDE TREVOR MANNING EPUB

This newly revised second edition provides a current, comprehensive treatment of the subject with a focus on applying practical knowledge to real-world networks. It includes a wealth of important updates, including discussions on backhaul capacity limitations, ethernet over radio, details on the latest cellular radio standards (G, 3G, and 4G).

A history of point to point digital microwave radio systems Professor Andy Sutton University of Salford This article first appeared in the Telecommunications Heritage Journal, Issue Number 83, Summer and is reproduced with the permission of the Telecommunications Heritage Group. This article presents my perspective on the evolution of point to point digital microwave radio systems over the last quarter of a century. I started working with these systems, which for the sake of brevity I will call microwave radios, during the mid s. Digital microwave radios were very new at the time, most microwave radio systems in use were analogue. As a result of this particular configuration, the microwave radios tended to be lower in frequency a relative term of course in microwave engineering , typically below 12GHz and often 6 or 4GHz. Examples of such deployments include the original UK trunk network deployed by BT and, some years later, the Mercury Communication national figure of eight network 11GHz. These networks are no longer in service as long distance transmission is now carried on optical fibre systems, this shift to fibre for trunk networks has recently been highlighted by the removal of the large microwave horn antennas from the BT tower in London. Despite this, the market for microwave radio is larger than ever as systems have shifted focus to access rather than trunk applications, of which I will say more further in to this article. With such a wide range of frequencies included in the microwave spectrum, we find there is a corresponding wide range of propagation characteristics. Destructive interference from multi-path propagation caused by phenomena such as atmospheric ducting influences lower bands, while the dominant fading mechanism for frequencies above approx. To allow for these fading mechanisms we must include a safety factor or fade margin when calculating the power budget to ensure microwave radio links meet their target availability, typically expressed as uptime of The higher this figure the greater the required fade margin for a given link configuration, this has a knock on effect on the practical link design parameters such as frequency band, transmit power, modulation scheme, transmit channel bandwidth, and antenna size. It should also be noted that free space path loss, the attenuation a signal suffers as it passes through the air, increases with frequency, so a longer link length can be achieved in a lower frequency band for a given configuration. Now onto digital microwave heritage. For example, a metre of 7. The interconnection between this indoor unit and outdoor unit uses an intermediate frequency signal, typically 10s to s of MHz that can be carried over coaxial cable which is much cheaper to purchase and install than waveguide and which has no impact on link power budget. Such split mount systems offer greater flexibility as the outdoor unit can be mounted at the base of the tower with a shorter length of waveguide to the antenna compared with waveguide run back in to the equipment shelter , it could be mounted on the tower behind the antenna or, as is increasingly common, directly mounted to the back of the antenna as an integrated system. Antennas themselves have evolved too, from horns to parabolic dishes with ever increasing amounts of sophistication and performance. These data rates aligned with typical telecommunications transmission networks. We can carry 30 traditional 64kbps voice calls over a 2Mbps circuit. An 8Mbps circuit could carry 4 x 2Mbps signals, hence voice channels and 34Mbps could carry up to voice calls. To access the radio system a single interface would be provided at the PDH line rate, so circuits had to be aggregated up to that rate via a PDH mux multiplexer. At this time most circuits were connected to end systems such as System X telephone exchanges or remote concentrators at the 2Mbps level. PDH Multiplexing Starting on the left of figure 4, we have several options for connectivity to the E1 ports of the second order mux. These include the output of a primary mux containing up to 30 voice channels with channel associated signals or common channel signalling or a mix of voice and data, or a direct 2Mbps interface from a microwave radio or a digital switch port. Microwave radio tower with a class 1 parabolic antenna and a class

2 parabolic antenna With increasing deployment of access microwave radio systems, the concept of the skip-mux evolved. The adoption of this solution, effectively incorporating the mux functionality within the radio IDU, has reduced the cost and greatly increased the flexibility of deploying point to point digital microwave radio systems. Microwave radio tower with cellular antennas and a large quantity of class 3 antennas The deployment of cellular networks, from analogue systems through 2G GSM and more recently 3G UMTS, has driven significant deployment of access microwave radio. Mobile operators looking for cost optimised backhaul between their cellular base stations and core sites, deploy microwave radio systems as an alternative to leasing 2Mbps circuits from fixed network providers. There are now tens of thousands of microwave radio systems deployed in the UK. As telecoms transmission systems evolved to even higher capacity, the Synchronous Digital Hierarchy SDH was standardised by the European telecommunications regulator during the late s, with commercial equipment available from the early s. SDH introduced data rates from Mbps to 2. The evolution of microwave radio systems continues, with significant progress made over the last decade. Modern systems support parallel TDM and Ethernet transmission and more recently, all packet based systems have been introduced. Higher order modulation schemes and new frequency bands along with improvements in antenna technology ensure microwave radio systems are as relevant today as they were when I started working with this technology, a little over 25 years ago.

2: Microwave Radio Transmission Design Guide (ExLib) by Trevor Manning | eBay

Trevor Manning's Microwave Radio Transmission Design Guide is a comprehensive guide to the practical design and deployment of digital microwave links of small to medium capacity, of the kind now used so widely in mobile telephone and wireless systems.

Uses[edit] Microwaves are widely used for point-to-point communications because their small wavelength allows conveniently-sized antennas to direct them in narrow beams, which can be pointed directly at the receiving antenna. This allows nearby microwave equipment to use the same frequencies without interfering with each other, as lower frequency radio waves do. Another advantage is that the high frequency of microwaves gives the microwave band a very large information-carrying capacity; the microwave band has a bandwidth 30 times that of all the rest of the radio spectrum below it. A disadvantage is that microwaves are limited to line of sight propagation; they cannot pass around hills or mountains as lower frequency radio waves can. A parabolic satellite antenna for Erdfunkstelle Raisting, based in Raisting , Bavaria , Germany Microwave radio transmission is commonly used in point-to-point communication systems on the surface of the Earth, in satellite communications , and in deep space radio communications. Other parts of the microwave radio band are used for radars , radio navigation systems, sensor systems, and radio astronomy. Radio waves in this band are usually strongly attenuated by the Earthly atmosphere and particles contained in it, especially during wet weather. The electronic technologies needed in the millimeter wave band are also much more difficult to utilize than those of the microwave band. Wireless transmission of information One-way e. In microwave radio relay, microwaves are transmitted on a line of sight path between relay stations using directional antennas , forming a fixed radio connection between the two points. The requirement of a line of sight limits the separation between stations to the visual horizon, about 30 to 50 miles. Before the widespread use of communications satellites , chains of microwave relay stations were used to transmit telecommunication signals over transcontinental distances. Much of the transcontinental traffic is now carried by cheaper optical fibers and communication satellites , but microwave relay remains important for shorter distances. Antennas must be highly directional high gain ; these antennas are installed in elevated locations such as large radio towers in order to be able to transmit across long distances. Typical types of antenna used in radio relay link installations are parabolic antennas , dielectric lens, and horn-reflector antennas , which have a diameter of up to 4 meters. Highly directive antennas permit an economical use of the available frequency spectrum, despite long transmission distances. Danish military radio relay node Because of the high frequencies used, a line-of-sight path between the stations is required. Additionally, in order to avoid attenuation of the beam, an area around the beam called the first Fresnel zone must be free from obstacles. Obstacles in the signal field cause unwanted attenuation. High mountain peak or ridge positions are often ideal. Production truck used for remote broadcasts by television news has a microwave dish on a retractable telescoping mast to transmit live video back to the studio. Obstacles, the curvature of the Earth, the geography of the area and reception issues arising from the use of nearby land such as in manufacturing and forestry are important issues to consider when planning radio links. In the planning process, it is essential that "path profiles" are produced, which provide information about the terrain and Fresnel zones affecting the transmission path. The presence of a water surface, such as a lake or river, along the path also must be taken into consideration since it can reflect the beam, and the direct and reflected beam can interfere at the receiving antenna, causing multipath fading. Rare events of temperature, humidity and pressure profile versus height, may produce large deviations and distortion of the propagation and affect transmission quality. All previous factors, collectively known as path loss , make it necessary to compute suitable power margins, in order to maintain the link operative for a high percentage of time, like the standard Hop distance is the distance between two microwave stations [2] Previous considerations represent typical problems characterizing terrestrial radio links using microwaves for the so-called backbone networks: During s microwave radio links

begun widely to be used for urban links in cellular network. Furthermore, link planning deals more with intense rainfall and less with multipath, so diversity schemes became less used. Another big change that occurred during the last decade was an evolution toward packet radio transmission. Therefore, new countermeasures, such as adaptive modulation, have been adopted. The emitted power is regulated by norms EIRP both for cellular system and microwave. In the last decade the dedicated spectrum for each microwave band reaches an extreme overcrowding, forcing efforts towards techniques for increasing the transmission capacity frequency reuse, Polarization-division multiplexing, XPIC, MIMO. History[edit] Antennas of experimental 1. The receiving antenna background, right was located behind the transmitting antenna to avoid interference. US Army Signal Corps portable microwave relay station, Microwave relay systems were first developed in World War II for secure military communication. The first experiments with radio repeater stations to relay radio signals were done in by Emile Guarini-Foresio. In an Anglo-French consortium headed by Andre C. A military microwave link between airports at St. After the war telephone companies used this technology to build large microwave radio relay networks to carry long distance telephone calls. It was expected at that time that the annual operating costs for microwave radio would be greater than for cable. There were two main reasons that a large capacity had to be introduced suddenly: Pent up demand for long distance telephone service, because of the hiatus during the war years, and the new medium of television, which needed more bandwidth than radio. Military microwave relay systems continued to be used into the s, when many of these systems were supplanted with tropospheric scatter or communication satellite systems. When the NATO military arm was formed, much of this existing equipment was transferred to communications groups. The typical communications systems used by NATO during that time period consisted of the technologies which had been developed for use by the telephone carrier entities in host countries. The typical microwave relay installation or portable van had two radio systems plus backup connecting two line of sight sites. These radios would often carry 24 telephone channels frequency division multiplexed on the microwave carrier i. Any channel could be designated to carry up to 18 teletype communications instead. Similar systems from Germany and other member nations were also in use. Long-distance microwave relay networks were built in many countries until the s, when the technology lost its share of fixed operation to newer technologies such as fiber-optic cable and communication satellites, which offer a lower cost per bit. By positioning a geosynchronous satellite in the path of the beam, the microwave beam can be received. At the turn of the century, microwave radio relay systems are being used increasingly in portable radio applications. The technology is particularly suited to this application because of lower operating costs, a more efficient infrastructure, and provision of direct hardware access to the portable radio operator. Microwave link[edit] A microwave link is a communications system that uses a beam of radio waves in the microwave frequency range to transmit video, audio, or data between two locations, which can be from just a few feet or meters to several miles or kilometers apart. Microwave links are commonly used by television broadcasters to transmit programmes across a country, for instance, or from an outside broadcast back to a studio. Mobile units can be camera mounted, allowing cameras the freedom to move around without trailing cables. These are often seen on the touchlines of sports fields on Steadicam systems. Tropospheric scatter "troposcatter" or "scatter" was a technology developed in the s allow microwave communication links beyond the horizon, to a range of several hundred kilometers. The transmitter radiates a beam of microwaves into the sky, at a shallow angle above the horizon toward the receiver. As the beam passes through the troposphere a small fraction of the microwave energy is scattered back toward the ground by water vapor and dust in the air. A sensitive receiver beyond the horizon picks up this reflected signal. Signal clarity obtained by this method depends on the weather and other factors, and as a result a high level of technical difficulty is involved in the creation of a reliable over horizon radio relay link. Troposcatter links are therefore only used in special circumstances where satellites and other long distance communication channels cannot be relied on, such as in military communications.

3: Microwave Radio Transimission Design Guide by Trevor Manning

This handy reference provides you with expert advice and instruction for the planning and detailed design of microwave radio transmission systems. It is a valuable resource if you're designing and planning SDH/SONET broadband networks, backhaul for mobile radio networks such as GSM, transmission.

Wireless Communications Andrea Goldsmith. A combination of practical real-world design guidance as well as the theory, based on prior operator and manufacturer experience. This practical book offers proven advice that helps save engineers time and money when developing new networks, and reduces the risk of encountering problems during design and planning. Microwave radio transmission design guide trevor manning who viewed this item also viewed. Page 1 of 1 Start over Page 1 of 1. Snow over Surabaya Nigel Barley. Beyond Powerful Radio Valerie Geller. Shoppob Designer Fashion Brands. He holds a B. To learn more about Amazon Sponsored Products, click here. It includes a wealth of important updates, including discussions on backhaul capacity limitations, ethernet over radio, details on the latest A collection of birds to color from all over the world brings nature into your home, and nourishes your soul with beautiful and magical creatures. When you click on a Sponsored Microwave radio transmission design guide trevor manning ad, you will be taken to an Amazon detail page where you can learn more about the product and purchase it. Radio Production Robert McLeish. Microwave Radio Transmission Design Guide Written in an easy-to-understand style, the author provides practical guidelines based on hands-on experience. Tribology in Electrical Environments: Declutter your house without feeling shame or loss. AmazonGlobal Ship Microwave radio transmission design guide trevor manning Internationally. Ham Radio For Dummies H. Trevor has extensive practical knowledge and experience which I can personally verify as being solid and real-world. Related Video Shorts 0 Upload your video. The author provides practical guidelines based on hands-on experience. Would you like to tell us about a lower price? When was the last time you colored? Get fast, free shipping with Amazon Prime. Foundation Licence Now Alan Betts. In addition, the volume serves as a guide to frequency planning for radio networks and provides intelligence on digital radio equipment characteristics and fading in radio systems. Using practical desin studies, Microwave Radio Transmission Design Guide, Second Edition gives microwave radio transmission design guide trevor manning proven advice that helps you save time and money when developing new networks, and reduces your risk of encountering problems during design and planning. Microwave Radio Transmission Design Guide. Description This reference provides advice and instruction for the planning and detailed design of microwave radio transmission systems. Read more Read less. A Review of Trevor Manning, Microwave Radio Transmission Design Guide " Argos Press In each he trrevor demonstrated his very capable knowledge on the topic, and his strengths for conveying to students in an easily understood manner the rather technical topic of microwave propagation theory and planning. Amazon Drive Cloud storage from Amazon. People who viewed this also viewed. Since then, Trevor has taught 12 microwave planning short courses for the UW, the most recent in April It includes a wealth of important updates, including discussions on backhaul capacity limitations, ethernet over radio, details on the latest cellular radio standards 2. In fact, the programs in which he has taught in are some of the most highly-rated that I manage.

4: Microwave Radio Transmission Design Guide : Trevor Manning :

This reference provides advice and instruction for the planning and detailed design of microwave radio transmission systems. It should be useful for readers planning SDH/SONET broadband networks, backhaul for mobile radio networks such as GSM, transmission links for TETRA networks, TV and utility networks, and Wireless Local Loop networks.

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7: Microwave transmission - Wikipedia

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This newly revised edition of the classic Artech House book, Microwave Radio Transmission Design, provides a current, comprehensive treatment of the subject with a focus on applying practical knowledge to real-world networks. The second edition includes a wealth of important updates, including.

9: A history of point to point digital microwave radio systems

About the Author Trevor Manning is a director at TMC Global in Northampton, Northants, UK. He holds a www.enganchecubano.com in electronics engineering from Natal (Durban) University in South Africa.. Download Microwave Radio Transmission, Design Guide, Second Edition (Artech House Microwave Library) - Trevor Manning PDF free.

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