



Point-to-Point Radio Link Engineering through Herald SW

Brief Description

- Radio Propagation and Planning is a course for service. The topics are among others Overview of MW Radio Systems, Radio Link Equation (Friis Formula), Path Propagation Evaluation, Rain Attenuation and Non-availability Calculation, Outage Time Calculation, Diversity Configurations and Performance Objectives. After completing this course, the participant is able to support the network element in the field and to analyze the microwave network's performance objectives.

Target Group

- Planning - Engineering

Learning Target

- The main objective of this course is to enable the participant to design a microwave radio link system with the support of “Herald” software

Prerequisite

- Participants must have some technical knowledge in telecommunications. Some basic knowledge in PDH & SDH is required.

Contents

Introduction to Herald Professional: General presentation, Program purpose, goals and limitations. Sw requirements. Installation of Herald Educational on participants' pc.

General structure of Radio links and networks: Long-haul, short-haul, radial, and meshed networks. General criteria for path and site selection. Multi-hop radio links, radio sections, use of frequencies in radio networks. Paths with passive repeaters.

Hop Configuration: Radio Site positioning. Antenna, Radio equipment, Feeder, and Ancillary equipment. Diversity configurations. Working frequency and RF channel arrangements. Additional path losses.

Hop Configuration: Examples and design exercises.

Basics on Radio propagation: Free Space Propagation, basic radio link equation, free space loss. Terrestrial radio links and networks, propagation in the atmosphere, overview of main impairing factors.

Link Budget: Link Budget computation. Fade margin. General concepts in outage time prediction. Link budget with passive repeaters.

Link Budget: Examples and design exercises.

Path Profile, Clearance, Obstruction Loss: Digital mapping, required resolution. Effect of atmospheric refraction,

For additional information:

Website www.radioengineering.it

Email sidicomcr@gmail.com



estimate of obstruction loss (obstacle type; single and multiple obstacles).

Path Profile, Ground Reflections: Path geometry, main parameters. Reflected ray loss and phase shift, major factors. Reflection coefficient vs. surface type, frequency and polarization. Rx power vs. antenna height and k-factor. Use of Rx diversity configuration.

Multipath Propagation: Atmospheric refraction, refractivity gradient, multiple ray trajectories. Statistical description, Rayleigh fading, multipath activity factor. Frequency selective fading, signal distortion. Countermeasures (equalization, antenna and frequency diversity).

Modelling Multipath channel: ITU and Bell Labs channel models. Signature measurements. Narrowband/Wideband prediction models. Estimate of multipath outage.

Estimate of Multipath Outage: Examples and design exercises.

Rain Attenuation: EM wave interaction with atmosphere (water vapour, oxygen, raindrops). Rain attenuation vs. rain-rate, frequency, and polarization. ITU-R rain rate statistics. Rain depolarization, other related phenomena.

Rain Unavailability: ITU rain intensity prediction model; frequency / polarization scaling. Application to Unavailability prediction.

Estimate of Rain Unavailability: Examples and design exercises.

Use of RF bands, Interference: RF bands for fixed radio service, Radio Regulations. RF channel arrangements (co-channel, interleaved, patterns), use of orthogonal polarizations. ITU-R Recs. RF protection systems (1+1, N+1).

Interference classification, Effects of Interference: Analysis and classification of interference sources in linear, radial and meshed networks. Estimate of interference power. Same-hop and other-hop interference. Effect of propagation impairments (multipath, rain).

Interference analysis: Examples and design exercises.

Performance Objectives: Introduction to ITU-T and ITU-R Recs. on link availability and transmission quality. Basic Definitions. Relationship between performance objectives and main propagation impairments.

Passive Repeaters: Use of passive repeaters: one or two reflectors, back-to-back antenna system. Hop design with passive repeaters.

Checking ITU Objectives: Examples and design exercises.

**** Second Week - Wednesday, Thursday, Friday**

Additional insight in Herald Sw: Managing projects, equipment libraries, and terrain maps (SRTM and Aster data). Import of Antenna diagrams from files in NSMA format. Interface with Google Earth: importing site data, exporting network maps with hop data.

Concluding exercises: In-depth training on Herald use.

(*) IMPORTANT NOTE: Design examples and exercises are developed using the HERALD Sw tool. The HERALD Educational release will be offered to course participants. They are invited to install HERALD Educational to their notebook or portable PC, in order to directly execute each exercise.

Duration

For additional information:

Website www.radioengineering.it

Email sidicomcr@gmail.com

Training Courses Portfolio

Radio Engineering Services



Course Instructor : Claudio Crini, Dr. Eng. (certified Guest Instructor at I&C Training Institute, Siemens Group)

10 days

Maximum number of participants (suggested)

10

Course Type

Theoretical course (expert) with practical exercises

For additional information:

Website www.radioengineering.it

Email sidicomcr@gmail.com