



Telecom Training Center

www.pathlosstraining.com

Pathloss 5.0 Training Course Outline

Welcome to the Pathloss and microwave radio network design training course featured by Telecom Training Center. This course provides classroom and computer hands-on training in microwave transmission design using Pathloss 5 program with support of real microwave link application cases.

Course Objectives

After completing this course, you will be able to perform the following tasks:

- Understand the microwave transmission propagation theory
- Explain the basic features of the microwave radio system
- Operate Pathloss 5 program
- Design microwave links and networks using Pathloss 5 program, including:
 - Calculate path availability
 - Define equipment requirement
 - Calculate antenna heights
 - Analyze path diffractions
 - Analyze multipath and reflections
 - Define space diversity antenna size and height
 - Assign frequency channels
 - Analyze interferences
 - Automatic design of large scale of MW network
 - Create network in 3D, export network format of MapInfo.
 - Reporting

Prerequisites

- General Knowledge of Microwave Radio Communications Engineering Concepts.

Course Structure

Microwave Link planning and Design Concepts

Microwave transmission propagation theory

- Microwave Network and System Specification
- Map study and preparation of path profiles
- Field survey and site determination
- Determination of Antenna Heights
- Path Calculations
- Performance and availability
- Frequency Spectrum Allocation

PO Box 314, Cornwall, On, Canada K6H 5T1 Tel: 1 514 696 4802 Fax: 1 613 931 9387

Email: info@pathlosstraining.com



Telecom Training Center

www.pathlosstraining.com

- Equipment Specifications & Selection
 - MW Radio
 - Digital Modulation
 - Receiver Sensitivity
 - Signal Equalizers
 - Forward Error Correction (FEC)
 - Scrambling and Interleaving
 - Network Management
 - Types of Antenna
 - Antenna Gain
 - VSWR, Cross-polarization Discrimination
 - Radiation Pattern
 - Typical Antenna Characteristics
 - Near Field versus Far Field
 - Antenna Misalignment
 - Transmission Lines (Feeders)
 - Power Supply
 - Towers and Masts
 - Shelters and Containers
 - Auxiliary Equipment
 - Economical Considerations

Microwave Link Budgets Concepts - System Gain

- Transmitter Output
- Connector & Feeder Losses
- Free Space Loss
- Receiver threshold and fade margin

Propagation, Fading, and Interference

- Propagation Basics
- Line of sight, earth bulge, required clearance
- Fading, flat, dispersive fading
- Rain impacts
- Interference sources
- Availability Basics
- Free Space Propagation
- Atmospheric Absorption
- Rain Attenuation
- Atmospheric Refraction
- Refractive Ray Bending
- Radio and Optical Refractivity
- Gradient of Refractive Index

PO Box 314, Cornwall, On, Canada K6H 5T1 Tel: 1 514 696 4802 Fax: 1 613 931 9387

Email: info@pathlosstraining.com



Telecom Training Center

www.pathlosstraining.com

- Anomalous Propagation
- Substandard Refraction
- Ducting and Blackout Fade phenomenon.

Microwave parameters configuration and Introduction of Pathloss 5.0 Link and PL5 main program

- Configure Reliability options
- Concept of Geo-climatic factor
- Concept of rain attenuation
- Configure the branching losses
- Choosing the frequency channels
- Comparison of PL4 and PL5
- Pathloss 5 installation, initialization, general description
- Pathloss 5 ---GIS setup, terrain data selection criteria.
- Pathloss 5 --- Procedure to Create a Terrain profile
- Reports

Clearance Criteria and fading models in Pathloss 5.0 Link

- Fresnel Zones Concept
 - Clearance Criteria
- Terrain Related Effects
 - Reflections
 - Diffraction
- Multipath Fading Mechanism-Flat Fading
 - Vigants
 - Barnet Model
 - ITU-R Rec. P.530
 - Frequency Selective Fading
 - Applicable Fade Margins
 - Radio Signature Curves

Reflection and Dispersion Analysis in Pathloss 5.0 Link

- Concept of Reflective Plan
- Configure Dispersion Analysis
- Configure Diversity antenna spacing calculations
- Configure Fresnel Zone
- Reports



Telecom Training Center

www.pathlosstraining.com

Diffraction Module configuration in Pathloss 5.0 Link

- Overview
- Total Loss Concept
- General Operation of the Diffraction Module

Multipath Operation in Pathloss 5.0 Link

- Concept of Multipath
- Variable gradient
- Constant Gradient

Countermeasures and Availability Objectives

- Basic Definitions of Reliability, Performance and Availability
- Selected NA (Bellcore) Definitions
- ITU-R Related Definitions
 - Worst Month and Annual Parameters
- Availability and Performance Recommendations
 - ITU-T G.821
 - Availability Recommendation ITU-R F.557
 - ITU-T G.826/828
- Comparing NA and ITU-R
- Antenna considerations, F/B ratio, discrimination, XPD impact
- Radio Adaptive Technologies
 - ATDE and Slope Equalizers
 - ATPC Transmitter power control
 - Space and Frequency Diversity
 - IF Combining vs. BB switching

PL5 main program

- GIS configuration
- Network display
- Site List Data Imports
- Use of group
- Link List
- Network Operations
- Automatic network/link design

Repeaters in Pathloss 5.0

PO Box 314, Cornwall, On, Canada K6H 5T1 Tel: 1 514 696 4802 Fax: 1 613 931 9387

Email: info@pathlosstraining.com



Telecom Training Center

www.pathlosstraining.com

- Difference between Passive and Active Repeaters.
- Creating a Passive Repeater
- Propagation reliability Calculations on Passive Repeater

Frequency Planning and Interference Analysis

- Setting Up the Frequency Plan
- North America and International Frequency Plans
- Frequency Planning Rules
 - Two-Frequency Plan
 - Four-Frequency Plan
 - Meshed Networks
- Interference in Digital Networks
 - Co-channel Interference
 - Adjacent Channel Interference
 - Receiver Threshold Degradation
 - Interference Mitigation
 - Planning Considerations



Telecom Training Center

www.pathlosstraining.com

Price: \$3,480 CAD per person per session, tax included

Included:

- 3 day Microwave transmission network design and PathLoss training course, text books and Certificate;
- 3 day and night accommodation, single occupancy in Nav Canada Training and Conference Center for each session;
- Daily breakfast, lunch and dinner on site;
- Continuous refreshment, coffee, tea, soft drink and snack service on site;
- Fully equipped classroom and facilities on site;
- Free WiFi internet access;
- Indoor swimming pool and fitness room on site.

Location: NAV CANADA Training and Conference Centre, 1950 Montreal Road, Cornwall (Ontario) K6H 6L2, Canada. <http://conference.navcanada.ca/>