

Hands-On

# Plant Wireless Core: Antennas, Masts and Feeds



## Course Description

This course teaches installation and troubleshooting technicians the key elements needed for installing, testing and maintaining antennas and masts.

The course introduces the elementary principles of radio used in all classes of service. It teaches what kinds of antenna systems exist and which offer advantages for particular applications. Siting masts is becoming more difficult and so it has become necessary to share masts where possible and also to share antennas. Methods for achieving this will be considered. However within built-up areas or areas of natural beauty new masts may need to be concealed or located in less than optimal locations. The course will address these issues and provide potential solutions.

## Students Will Learn

- **Recognize Different Classes Of Antenna Tower And Plant**
- **Recognize And Select Appropriate Cables And Antenna Connections**
- **Advise On Antenna Sharing And Location**
- **Appreciate Wind Loading And Mast Design Parameters**
- **Troubleshoot Link Problems**
- **And More...**

## Target Audience

This course is geared for installation and troubleshooting technicians.

## Prerequisites

This course assumes attendees already have basic knowledge of data communications, PCs and IP systems. No prior knowledge of radio or Wireless systems will be assumed.

## Course Outline

### Module I: Radio Principles

- Radio Transmission Principles
- Radio Propagation
- Signal Power and Free Space Loss
- Effective Radiated Power (ERP)
- Polarization
- Absorption
- Diffraction
- Reflection
- Signal to Noise Ratio
- Cell Based operation
- Carrier interference noise
- Interference effects and Fading
- MiMo and SiSo
  - Modulation
    - Amplitude, Frequency and Phase Modulation
    - QAM
  - Multi-Access Systems
    - FDM, TDM, TDMA, FHSS, DSSS, OFDM, CDMA
    - Frequency use
    - Overlapping channels
    - Noise and signal strength
- Operating Speed and multi-standard selection
- Configuring Access Points

### Module II: Antenna Systems

- Classes of Antennas

Antenna designs

Antenna Arrays: Adcock, collinear,

All Frequency Antennas: AWX

Omni-Directional Systems: Choke Ring, Mono-pole, Biconical, Disconcial, Folded unipole, Mast Radiator antenna

High-gain antenna (HGA) Concepts

Directional Systems: Cassegrain, BUD, Offset Dish, Catinna,

Beverage Antennas: Dipole, Log-Periodic, Yaggi, Helical

Loop Antennas

Engineering the Beam Shape: Fan-beam antenna

Increasing Antenna Gain: Quad antenna

Antenna Bandwidth

Antenna Polarization Characteristics

Wide Band Antennas: Fractal antenna, Tilted Terminated Folded Dipole

Mobile Network Antennas: Sector, Panel, Vivaldi, Whip, Smart, Blister, Patch

Leaky Coax Antenna Systems

Shortwave relay station

Selecting the appropriate types

Point-to-point services

Area Coverage

Cellular coverage

Indoor and mobile applications

Towers and Mountings

Static Mounts

Camouflaged Antennas: Artificial Trees, Roof-Top, Street Furniture

Loading and support

Raw Poles

Guyed Poles

Case Study Selecting Types of Antenna

### **Module III: Cable Plant**

- Digital Interfaces
- Cable transmission fundamentals
- Twisted pair Cables
- Coaxial Cables Characteristics
- Characteristic Impedance
- RF Cable Signal Loss and Noise
- Reflections and termination
- Cable loss and noise
- Splitters, Taps, Line Amplifiers, Attenuators and Connections
- Optical Cables
- Engineering Antenna Cable Feeds

  

- Case Study Engineering Cable Plant

### **Module IV: RF Link and System Considerations**

- Key Specification Parameters
- Frequency Selection
- Transmission Path Loss calculation
- Calculating the Antenna Height Required
- Allowing for obstructions
- Allowing for Interference
- Feeder Loss
- Allocating the Link Budget
- Matching the receiver sensitivity

### **Evaluation and Review**

## **Delivery Method**

Instructor-Led with numerous case-studies and Hands-On exercises.

## **Equipment Requirements**

**(This apply's to our hands-on courses only)**

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

## **Course Length**

2 Days