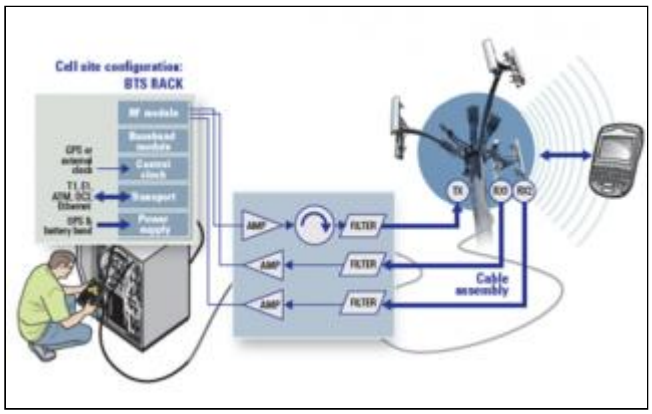
Hands-On

# RF Interference

## Course Description




This extensive course is geared to resolve problems and is a must for Radio Frequency Engineers and Field Support Technicians. First it is necessary to fully understand the radio technology in use and how signals are encoded, decoded and engineered in fully working systems. Coverage will be affected by antennas and the coverage expected for different types of antenna systems must be understood. With this knowledge and good spectrum analyzers it is possible to examine radio signals in locations where interference is expected and identify the type of interference. Different types of interference exhibit different signal patters and from this experienced technicians can start to locate suspected interference sources.

This course provides an understanding of radio systems in the 60, 850, 900, 1800 (PCS), 2100 and 2400 MHz bands used for cellular phone, two-way radio, Wi-Fi and wireless data networks.

Students will use simple laptop computers, regular cell phones and Spectrum Analyzers to understand RF interference, expected antenna propagation and the patterns generated by interference sources on tester displays. They will use directional antennas to track interference and learn how to locate individual interference sources.

## Students Will Learn

- **How to Describe the Radio Principles used in Modern RF Systems**
- **To Calculate Path Loss, Evaluate Fading Effects on Signals and Interference Sources**
- **How to Assess Power Quality**
- **60Hz Power Interference and Harmonics Grounding Faults**
- **Radio Systems in the 60, 850, 900, 1800 (PCS), 2100 and 2400 MHz Bands Used for Cellular Phone, Two-Way Radio, Wi-Fi and Wireless Data Networks.**
- **Analyze Antenna Types and Identify their likely Coverage**
- **Identify Interference Sources and Calculate the Effects caused by Obstructions**
- **Recognize the Effects of Different Types of Interference**
- **Use Test Equipment to Identify and Locate Interference Sources**
- **And More**

## Target Audience

This course is geared to field technicians who must learn how to detect, measure, and locate interference sources on cellular phone, two-way radio, Wi-Fi and wireless data networks.

## Prerequisites

A basic understanding of Telecommunications.

## Course Outline

**Module I: Radio Principles**

Radio Transmission Principles

Radio Propagation

Frequency, Wave Length, Phase and polarization

Signal Power and Free Space Loss

Effective Radiated Power (ERP)

Polarization, Absorption, Diffraction and Reflection effects

Signal to Noise Ratio

Interference effects and Fading

Channel Allocation

Modulation: Amplitude, Frequency and Phase Modulation

QAM

Multi-Access Systems: FDM, TDM, TDMA, FHSS, DSSS, OFDM, CDMA

PCS and GSM system timing needs

Frequency use

Overlapping channels

Coverage and what affects it

Causes of drop-outs of calls

**Module II: Antenna Systems**

Classes of Antennas

Antenna types used

Antenna Loss and Gain

Point-to-point services

Area Coverage

Cellular coverage

Towers and Mountings

Antenna Tower Engineering

Hidden Antennas

**Module III: Noise and Interference**

Noise and signal strength

Noise: sources and temperature

Co-channel Interference

Noise Types: Narrow band, Wide band, Impulse noise

Effects of reflection

Locating noise sources ?

60Hz Power Interference and Harmonics Grounding Faults

**Module VI: Interference Testing**

Types of test equipment and the tests that it can perform

Using Spectrum Analyzers to test and analyze normal signals

Recognizing different kinds of interference

Assessing Power Quality ?

Using directional antennas to locate interference sources

Handing off descriptions of interference faults found

**Module V: Evaluation and Review**

## Delivery Method

Instructor-Led with numerous Hands-On Labs and 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

3 Days