



Course Synopsis

Course : Radio Site Engineering

Duration: 2 days

ETS Code : ETS431

Many people and many skills are involved in the process that ends with an operational cellular mobile phone site. Two groups with a large involvement are the radio planners and the radio site engineers.

This two day course provides the latter, the radio site engineers, with a basic understanding of both the radio planning process as well as essential radio aspects of their own task.

This course is intended for those involved in the acquisition, design and construction of 2G (GSM) and 3G (UMTS). It provides an overview of the principles involved in the siting of telecoms transceiver equipment.

Whilst some mechanical and civil engineering aspects will be mentioned in passing, these areas are not the prime focus of the course except where bad practice can affect site performance.

The course assumes that delegates do not have a technical telecommunications background.

Most course sections end with a brief refresher quiz to aid the learning process and encourage interaction.

Delegates will benefit by:

- Understanding the terms and basics of wireless communications
- Appreciating strategies for building cellular systems
- Be aware of the differences between 2G and 3G planning processes
- Gain an understanding of the impact that antennas can have, especially on 3G systems
- Understand the core network/radio access network division and the technologies they need to communicate
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Appreciate the fine tuning of sites possible with UMTS

Course Content

Basics of Wireless

The Mystery of Wireless propagation

Enemies of Wireless

RADAR (Reflection, Attenuation, Diffraction, Absorption and Refraction)

Multipath propagation

Terms used in Wireless

Hertz and Wavelength

The decibel

Differences between frequencies

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What we use different frequencies for
Transmission line theory
 Impedance
 Impedance matching
 Infinite length
 Termination

Locating the Place

Geographical positioning, grid references and bearings
GPS and other positioning systems

Cellular Communications Systems

Cellular coverage strategies
 Macro, Micro and Pico cells
 Overlaid Cells and Hot Spots
The problems of cities
The problems of indoor coverage

2G (GSM) Network Capacity and Coverage

Working out GSM Capacity
The Erlang and Traffic Engineering
It's not just traffic but Signalling as well
Shifting the Paradigm, Voice to Data
General Packet Radio System (GPRS)

3G (UMTS) Network Capacity and Coverage

Why CDMA (Code Division Multiple Access) is harder to roll out than GSM
An Interference-limited system
Power Control
Hard and Soft Capacity
Shrinking Cells
'Round the Corner' effect
Interference Reduction measures



Antennas

Principles of antennas

EIRP

Impedance and impedance matching

Gain

Lobes and directions of beams

Radiated power, gain and beamwidth

Antenna Diversity – transmit and receive

Mast Head Amplifiers

Tilting of Antennas, mechanical and electrical

Required isolation between co-sited systems, 2G and 3G

Isolation between operators - raster

Multi-site antenna configurations

Smart antennas

Connecting to the Core Network

2G and 3G Core Networks

Transmission lines for GSM

Higher Speeds for 3G

Optical Fibres

Microwave Links

Principles of Radio Planning

2G and 3G Differences

Coverage planning

The Nominal Plan

Link Budgets

Planning Tools

Differences in land usage

Effects of clutter – buildings, vehicles and trees, etc.

The Site Selection process

The Testmobile

Good and bad sites for 2G and 3G

The rollout process

Fine tuning 3G sites

Suggested antenna heights for different environments

Regulatory and Safety Aspects

Permitted development to persecuted profession in just a few years

Safety of Base Stations – 2G and 3G

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