LTE RF Planning Training – LTE RF Planning, Design, Optimization Training

Why should you choose LTE RF Planning Training?

LTE RF Planning Training is focused on carrying out RF planning and Design and capacity planning for Long Term Evolution (LTE) based networks. It provides a solid understanding of how to plan, design and optimize and a high quality LTE network. Learn how to plan and design LTE networks, techniques to boost LTE capacity, and how to lower interference and increase quality in the LTE network.

LTE RF Planning Training Course will show the attendees how to plan, design and optimize LTE networks efficiently?

With the proliferation of smart devices, M2M, social networking and location-based services, operators are seeing LTE data usage expand rapidly to augment traditional GSM voice service revenues. With the increased data traffic delivered through LTE networks and increasing of more bandwidth-intensive applications, operators are experiencing capacity issues on their LTE networks. Unfortunately adding more spectrum is more costly and is not always an option.

LTE networks promise to be more spectral-efficient however LTE many operators are planning to target a series of non-traditional vertical markets and M2M (machine-to-machine) communications. So any additional LTE capacity could be quickly used up. The need for proactive RF planning, design and optimization, is the purpose of LTE RF Planning Training Course.

Learn the theory and practical aspects of LTE RF Planning including:

- High level overview of LTE
- LTE Air Interface Overview
- Basic Spectrum Planning
- Radio Network Planning Basics
- Initial LTE RF Link Budget
- Detailed LTE RF Propagation
- RF Link Budget Principals
- LTE Capacity Planning
- LTE RF Components, RF Propagation Theory and LTE Channels
- Basics of RF designs
- Planning a LTE Network
- Planning the parameters of Network
- Performance of Network (KPI Analysis*)*

- LTE Cell Planning
- Fine Tuning and Optimization
- Continuous Optimization
- RF Antenna Systems
- Inter System Interference
- Inter-Technology Antenna Sharing

Who Should Attend

RF Engineers, Radio Network Planning Engineers, project managers, operators, Regulators. or anyone else responsible for RF planning or design will benefit from LTE RF Planning Training Course: Radio Network Planning, Design and Optimization.

Objectives

Upon completing this course, the attendees are able to to:

- Understand LTE Air Interface and basic Spectrum Planning
- List main LTE radio interface parameters
- Describe LTE Air Interface applied to RF Planning, Design and Optimization
- Understand the LTE RF planning, design and optimization principals
- Understand basics of Frequency Reuse for LTE
- Describe the impact of MIMO on LTE and its planning
- Calculate Link Budgets for LTE using our tools
- List Timing and Synchronization for LTE
- List LTE RF planning and design tools
- Describe the impact of the LTE backhaul in the planning and design process

Outline

Introduction to the RF Planning, Design and Optimization Processes

- What is RF Planning?
- Planning for Capacity and/or Coverage
- Nominal Cell Size
- Radio Propagation 101
- Propagation Models
- Link Budgets 101
- The Power Law
- Using a Planning Tool
- Site Acquisition and Selection

- Mast Options
- Nominal Areas for Sites
- Feedback Loop
- Detailed Site Design
- Concrete Canyons
- High Sites
- Drive Testing
- Flat Earth Modeling
- RF Planning and Tools

LTE Air Interface Overview

- S-OFDMA (LTE downlink)
- SC-FDMA (LTE uplink)
- Number of Subcarriers
- Symbol Size
- Subcarrier Types
- Frames
- Resource Blocks (RB)
- UL Allocation
- Modulation Techniques
- Error Correction
- Basic Spectrum Planning in LTE
- Operating Bands
- Channel Bandwidths
- Channel Spacing
- Guard Band Considerations

LTE RF Link Budget

- Effective Radiated Power
- Thermal Noise
- Noise Figure
- Ambient Noise
- SNR
- Implementation Margin
- Fast Fading
- Receive Diversity Gain
- System Gain and Losses
- Typical Parameter Values

- Base Station Antenna Gain
- Uplink Budget
- Downlink Budget
- Data rate (Mbps)
- Receiver sensitivity (dBm)
- Interference Margin (dB)
- Control Channel Overhead (dB)
- Maximum path loss
- Propagation (Path Loss) Models
- Environment : urban, rural, dense urban, suburban, open, forest, water
- Estimated Number of Sites
- Neighbor Cell Lists for each site
- Detailed Coverage Predictions (e.g. Signal Strength (RSRP), Signal Quality (RSRQ) Best CINR, Best Server Areas, Uplink and Downlink Throughput)
- Sites Coverage by Signal Strength
- Fine Tuning and Optimization

RF Propagation Models

- Free Space
- HATA
- Okumura Model
- COST-HATA
- COST-231 Walfisch-Ikegami Model
- ERCEG-GREENSTEIN
- Stanford University Interim (SUI) model
- SEMI-DETERMINISTIC Models
- Ray Tracing Model
- Factors Impacting Propagation Models

Mapping of Path Losses to Cell Sizes

- Okumura–Hata parameter
- Urban Indoor
- Suburban Indoor
- Rural Indoor
- Rural outdoor fixed
- Base station antenna height (m)
- Mobile antenna height (m)
- Mobile antenna gain (dBi) 0

- Slow fading standard deviation (dB)
- Location probability (%)
- Correction factor (dB)
- Indoor loss (dB)
- Slow fading margin (dB)
- Cell Size in Km

LTE Capacity Planning

- Uplink Throughput
- Capacity and MPR Distributions
- CINR Distributions
- MAC Scheduler
- Antenna Schemas
- LTE System Spectral Efficiency
- TDD Capacity
- Workload Modeling
- LTE Traffic Planning and Calculations

Practical LTE Planning Considerations

- Coverage vs. Capacity Planning
- Coverage in Noise-Limited Cases
- Definition of average SINR
- Optimizing LTE system bandwidth for coverage
- LTE in Interference-Limited Cases
- Link budget with non-negligible interference: Interference Margin
- Trade-off between cell range, network load and cell edge throughput
- Cell range vs. network load, fixed cell edge throughput
- Network load vs. cell edge throughput, fixed cell range
- Antenna Systems MIMO Transmission Schemes in LTE
- Frequency Reuse
- Timing and Synchronization for LTE
- Carrier to Interference
- Noise ratio
- Inter System Interference
- Inter technology Antenna Sharing
- Cell range versus cell edge throughput, fixed network load
- Frequency-Aware UL/DL Scheduling
- Example of Measured MIMO Radio Channel

- Backhaul Capacity Planning

Case Studies, and Hands-on Workshops

- Creating a brand new LTE network in Johannesburg
- Planning a LTE network in Hawaii
- Designing a LTE network in Dubai
- Link-budget analysis of a LTE network in Frankfurt, Germany
- Optimization a LTE network in Tokyo