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Knowledge That Powers Organizations!

Course ID	Course Title
LTEAI	**LTE Air Interface**
Course Duration	
4 days	

Related Courses

- LTE: Technology & Business (LTE-BIZ, 2 days)
- LTE Signaling (LTESIG, 3 days)
- LTE Network Planning (LTE-NPC, 5 days)
- HSDPA (HSDPA, 2 days)
- HSUPA (HSUPA, 2 days)

Aimed At

Technical audiences with a good understanding of WCDMA/UMTS and prior exposure to LTE who wish to study the LTE air interface in depth.

Group Size   5-25

Prerequisites

- LTE/SAE Technology (LTE-TECH, 3 days)
- UMTS (UMTS-FDD, 3 days)

The UMTS course, or equivalent knowledge/experience, is a required prerequisite for this course. The LTE Overview is a recommended prerequisite but not mandatory.

Course in a Nutshell

This course will undertake an in-depth study of the LTE air interface. The course will begin with a discussion of the radio channel environment and the related RF propagation issues to help you understand the problems that OFDM/MIMO solve. This is followed by a discussion of the modulation principles along with a detailed look at the LTE physical layer structure as it complements the modulation and MIMO channels. The transmitter and receiver parameters and techniques, based on the 3GPP specifications, are then presented. The course concludes with a discussion of the physical layer procedures with emphasis on the channel quality and random access techniques.

Customize It!

- If you lack the necessary WCDMA/LTE background, we can teach an extended five-day course that includes WCDMA principles, LTE overview, and LTE air interface techniques.
- Add a workshop day at the end of the course, for a total of five days, for a deeper dive into capacity planning and coverage calculations.

- LTE/SAE Introduction

  o Evolution of cellular networks
  o 3GPP Releases (Release 99 to Release 8)
  o EPS (E-UTRAN and EPC) logical architecture
  o EPS interfaces
  o EPC (Evolved Packet Core) architecture
  o SAE/LTE interfaces

- Radio Interface Physical Layer Principles

  o Propagation conditions
    - Channel models
    - Frequency selective channels
    - Time dependent radio channels
    - Multipath radio conditions: Delay, Doppler spectrum, multi-antenna channel model
    - Dispersive channels: Drawbacks and design considerations
    - Macrocell propagation model: Urban case
    - Macrocell propagation model: Rural case
    - Exercises
  o Modulation principles
    - BPSK, QPSK, 16QAM, 64QAM
    - OFDM: Principles of operation
    - MIMO system
    - Exercises
  o Coding and protection
    - Turbo codes
    - ARQ-HARQ principles
    - Interleaving
  o OFDM-SCFDMA
    - OFDM principles
    - OFDM time-frequency frame structure
    - OFDM performance over dispersive channels
  o MIMO overview
    - MIMO principles of operation
    - MU-MIMO and SU-MIMO
    - MIMO implementation on LTE
    - MIMO performance
    - MIMO simulations
    - Exercises

- LTE Radio Interface Techniques

    - Radio Interface techniques: Uplink/downlink
    - Radio channel structure
    - Radio channel descriptions

- - Radio interface
  - Synchronization channels
  - Exercises

- UE Transmitter/Receiver: Technical Characteristics

  - Power transmission
  - GSM and WCDMA short transmitter presentation
  - Maximum Output Power (MOP)
  - UE power classes
  - Transmitter characteristics: Maximum Power Reduction (MPR), power control, MOP, transmit on/off power, out of synch output power, bandwidth requirements and allocation, out of band emission, spurious emission
  - Receiver diversity characteristics
  - Receiver sensitivity: Reference level, Maximum Sensitivity Reduction (MSR)
  - Maximum input level
  - Adjacent channel selectivity
  - Blocking characteristics
  - Inter-modulation characteristics
  - Receiver performance
  - Dual antenna receiver

- Physical Layer Procedures

  - Synchronization procedures
  - Timing synchronization
  - Radio link monitoring
  - Inter cell synchronization
  - Inter Cell Interference Cancellation (ICIC) principles
  - Power control: Uplink/downlink
  - Random access procedures: Preample selection
  - Channel quality: Channel Quality Indication (CQI) Report
  - Precoding Matrix Indicators (PMI)
  - Rank Indicator (RI)

- Course Wrap-up : Recap and Discussion

DCN NTDR-Ltm-v2f