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# MCNS Training Program LTE (4G) RAN Planning

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# LTE (4G) RAN Planning

LTE (4G) RAN Planning will offer delegates a good and deep understanding on LTE NR Radio Access Network (RAN) planning, with emphasis on LTE capacity and coverage

#### COURSE REVIEW

#### AIMED AT

**This LTE(4G) training course** leads the audience into a deep dive towards **LTE RAN planning principles**, both from understanding as well as configuration perspective. It offers a thorough description of the opportunities, challenges, and risks that's needed to exploit and deploy the **LTE physical layer** from the throughput perspective up to coverage and cell range.

It teaches how to maximize LTE RAN network capacity and enhance DL/UL data transmission. The course is supported by proper excel dimensioning (calculator) files for practical exercises and case studies

**LTE (4G) RAN Planning** is mainly aimed at a technical audience. It is suitable for technical professionals, **RAN operators**, **Radio planning engineers**, **RAN optimization engineers**, **Research Institutes**, **defense sector**, who currently are or will be involved in LTE RAN planning and dimensioning with emphasis on throughput enhancements and LTE coverage deployments.

<u>Prerequisites</u>: Those wishing to take this course should have a good and solid understanding of LTE technology, with emphasis on **LTE air interface** and physical layer procedures.





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Course Benefits for individuals (Professionals)		Course Benefits for your Organization	
<ul> <li>Understanding LTE RAN planning and dimensioning</li> <li>Explore LTE RAN coverage and capacity principles</li> <li>Learn how to plan for cell edge users as well as avera conditions</li> <li>Understand the principles behind the control channe capacity and coverage requirements</li> <li>Learn how to configure basic physical and MAC layer</li> <li>Practice on capacity and coverage planning tools (e. examples) through practical exercises</li> </ul>	requirements ge cell performance els and reference signals parameters <b>excel calculators</b>	<ul> <li>Equip organization engineers with the necessary knowledge to accomplish difficult and complex tasks related to LTE RAN planning and dimensioning.</li> <li>Keep ahead of competitors in offering well planned network, maximizing coverage and capacity (throughput) targeting to good quality customers' 5G services</li> <li>Identify new revenue streams that can be enabled through LTE network</li> <li>Prepare for future network expansions and quality performance optimization</li> </ul>	

### **Training Format**

Instructor-Led Training On-Site Classroom: 3 days Web delivered (Virtual): 3 days Excellent and descriptive course material (pdf file) will be provided

# **Customer Tailored!**

We can tailor the included topics, tech level, and duration of this course right to your team's technical requirements and needs



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Section 1: LTE Radio Technology Review	Course Program Outline		
Module 1: LTE Technology Preview	Module 2: MIMO Technology overview	Module 3: LTE Channel Modeling	
		•What is a Mobile Channel model ?– general principles	
•LTE Air interface overview	•LTE MIMO review	•Non-Line of Sight and Rayleigh modeling	
•LTE frame structure	•3GPP Rel.8-14 MIMO standardization •TX Diversity, Spatial Mux and Beam-forming principles	•LoS and Rice modeling	
•EDD - TDD modes		•nLoS and Shadowing modeling	
ישטיי שטיי שטיי		Site modeling : Macro, micro, pico     Doppler effects and shappel models	
•LTE frequency bands	•2x2, 4x4, 8x8 MIMO gains	•LTE sub 3GHz Pathloss models (400 MHz -2.6 GHz)	
<ul> <li>LTE signals and channels review</li> </ul>	•SU-MIMO	•LTE C-Band Pathloss models (3.4-3.8 GHz, 5-6 GHz)	
•LTE Service: eMBB, NB-IoT, VoLTE	•MU-MIMO	•Example: Link budget analysis overview; various cases	
		(rural, urban, dense urban, O2I)	
		•Exercise: Link Budget calculations using Excel	

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### Section 2: LTE Planning

### Module 4: Uplink Planning

- •Network quality requirements
- •Vendor (equipment) UL requirements
- •Power control factor
- •Uplink Interference factor: Optional features for Interference mitigation
- •Coverage planning for PUSCH channel
- •Coverage planning for PUCCH channel

#### See next box

# **Course Program Outline**

### Module 4: Uplink Planning

•Coverage planning for UL reference signals

•LTE UL cell capacity estimations – eMBB service

•LTE UL Carrier Aggregation capacity (FDD-TDD and Unlicensed band)

•LTE UL throughput estimation (average, cell edge, max) vs SINR

•LTE UL Dynamic Spectrum Sharing (DSS) throughput estimation

•Exercise: UL capacity estimations using Excel spread-sheet calculator







#### Section 2: LTE Planning

### Module 5: Downlink Planning

- Network quality requirements
- •Vendor (equipment) DL requirements
- •Power gain calculation
- •DL Interference factor: Optional features for Interference mitigation
- •Coverage planning for PDSCH channel
- •Coverage planning (including aggregation level) for control channel PDCCH

#### See next box

### **Course Program Outline**

Module 5: Downlink Planning

Cont'd from previous box

•Coverage planning for DL reference signals

•LTE DL cell capacity estimations – eMBB service

•LTE DL Carrier Aggregation capacity (FDD-TDD and Unlicensed band)

•LTE DL throughput calculation (average, cell edge, max) vs SINR

•LTE DL Dynamic Spectrum Sharing (DSS) throughput estimation

•Exercise: DL capacity estimations using Excel spread-sheet calculator





#### Section 3: LTE Special Planning

### Module 6: LTE VolTE planning

- •VoLTE network quality requirements
- •VoLTE DL/UL requirements
- VoLTE SINR vs coverage
- •VoLTE capacity (number of users) planning
- •VoLTE optional features parameter configuration
- •Exercise: UL/DL capacity and coverage estimations using Excel spread-sheet calculator

## **Course Program Outline**

Module 7: LTE special planning

•LTE over Li-Fi

- •LTE over GEO satellite
- •LTE over LEO satellite
- •LTE NB-IoT badic planning principles
- •LTE Fixed Wireless Access UL/DL capacity
- •LTE Fixed Wireless Access coverage
- •Excel spread-sheet calculator examples