

MCNS Training Program

5G mMIMO Advanced Planning

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This course will offer delegates a good and deep understanding on the MIMO/mMIMO performance on 5G RAN planning and Optimization, with some useful hands-on and practical RAN planning and optimization hints

COURSE REVIEW

This 5G training course leads the audience into a good understanding of the MIMO/mMIMO radio channel modeling and impairments. **It explains how OFDM is coupled to MIMO/mMIMO performance** and give optimization hints on radio channel impairment performance.

It gives good insight on how CSI ports are related to channel estimation, emphasizing on how RAN performance is biased by the MIMO/mMIMO beamforming, System level SINR parameter. It analytically explains how throughput is related to MIMO/mMIMO along with real KPI behavior. The course is supported by mathematical analysis, simulation results and drive measurement analysis results.

AIMED AT

This course is mainly aimed at a technical audience. It is suitable **for 5G RAN Engineers, Radio Planners, Network Optimization Engineers, System Engineers and Researchers and finally Advanced Telecom Trainers and Architects** , who currently are or will be involved in deploying and designing 5G networks and services.

Prerequisites: Those wishing to take this course should have an introductory level of understanding on **5G Physical Layer and 5G RAN technology**.



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Course Benefits for individuals (Professionals)

- Ability to analytically interpret 5G MIMO/mMIMO KPIs
- Clear understanding of CSI, SINR, and throughput mMIMO coupling
- Understand the best MIMO/mMIMO antenna pannel based on planning scenarios
- Improved system-level optimization decisions
- Capability to bridge theory with real network behavior

Course Benefits for your Organization

- Equip organization engineers with the necessary knowledge to accomplish difficult and complex tasks related to 5G NR RAN planning, design and optimization.
- Keep ahead of competitors in offering well planned and high quality customers' 5G services
- Identify new revenue streams that can be enabled through 5G proper planning, NR Layer 1 configuration and channel settings.
- Prepare for future network expansions and quality performance optimization

Training Format

Instructor-Led Training
On-Site Classroom: 2 days
Web delivered (Virtual): 2 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



Section 1: 5G Radio Channel Performance Foundations

Course Program Outline

Module 1: 5G RAN Structure Overview

- 5G NR radio channel fundamentals
- Large-scale vs small-scale fading
- Time, frequency, and spatial coherence
- OFDM waveform principles and guard intervals
- Physical Resource Block (PRB) structure
- Numerology and subcarrier spacing impact
- OFDM simulation models and channel assumptions
- Noise, interference, and SINR formulation
- Relationship between SINR, BLER, and throughput
- Introduction to system-level KPIs

Module 2: 5G RAN Channel Estimation

- Reference signals in 5G NR
- CSI-RS design and reporting framework
- DMRS performance framework
- Channel estimation accuracy limits
- Impact of mobility and Doppler
- Interpolation in time and frequency
- Effective SINR mapping concepts
- CSI feedback errors and performance loss



Section 2: mMIMO and Beamforming Performance

Course Program Outline

Module 3: 5G MIMO RAN Planning Performance

- MIMO 3GPP Release 8 to Release 14 overview
- MIMO channel matrix modeling
- MIMO Spatial correlation and rank
- SMUX vs. Beamforming/Diversity principles
- CRS based beam selection
- CSI-based beam selection
- Impact of antenna count and array geometry
- Beamforming gain vs beam width

Module 4: 5G mMIMO RAN Planning Performance

- mMIMO overview
- mMIMO channel matrix modeling
- mMIMO Spatial correlation and rank
- Beamforming principles (digital, hybrid)
- CSI-based beam selection
- Impact of antenna count and array geometry
- Beamforming gain vs beam width Pilot contamination and reciprocity



Course Program Outline

Module 5: 5G RAN Design vs. mMIMO

- mMIMO vs. Downlink and uplink throughput modeling
- mMIMO vs. Scheduler behavior and resource allocation
- SMUX transmission limits
- CSI quality vs achievable rank
- Load impact on mMIMO performance
- Energy efficiency considerations
- Realistic KPI interpretation and troubleshooting

