5G NTN Architecture and Operations

5G_210 | Expert-Led Live | 5G Access | Expert
Course Duration: 1 day

This comprehensive full-day course on 5G Non-Terrestrial Networks (NTN) provides an in-depth exploration of the latest advancements and technical details in NTN, including architectures, air interface considerations, signaling protocols, and timing relationships. Participants will gain insights into additional considerations such as frequency pre-compensation for Doppler effect and idle measurements. This course delves into mobility between NTN and terrestrial networks (TN) as well as technical enhancements in 3GPP releases 18 and 19.

Intended Audience

A medium-level technical course for personnel involved in product management, planning, design, engineering, and operations

Objectives

After completing this course, the learner will be able to:

- Identify the different types and applications of Non-Terrestrial Networks
- Explain the key components and architectures of 5G NTN
- Demonstrate the procedures for frequency pre-compensation and uplink synchronization in NTN
- Compare the deployment options for NTN, including roaming and MORAN
- Assess the constraints and solutions for beam management and timing issues in NTN
- Discuss direct-to-cellular using satellite network operators like SpaceX/Starlink and AST Space Mobile
- Describe mobility between terrestrial and non-terrestrial networks

Outline

1. 5G Non-Terrestrial Networks (NTN) Overview
1.1 Types of NTN
1.2 Applications for NTN
1.3 Satellite Communications for NTN
1.4 NTN Devices

2. NTN Architectures and Deployment Options
2.1 NTN Architectures
2.2 NTN Link Budget and Delay Constraints
2.3 NTN Deployments - Roaming vs MORAN
Exercise: 5G NTN Architecture

3. Air Interface Considerations for NTN
3.1 Spectrum for NTN
3.2 NTN Air Interface Constraints
3.3 Beam Management for NTN
3.4 NTN Cells and Tracking Areas

4. NTN Timing and Frequency Compensations
4.1 NTN Timing Issues and Solutions
4.2 Uplink Synchronization for NTN
4.3 Scheduling and HARQ for NTN
4.4 Frequency Pre-compensation for NTN
Exercise: 5G SA Setup for NTN

5. NTN Mobility Considerations
5.1 NTN Handover and Idle Mode Operations
5.2 Mobility Between TN/NTN for Roaming
5.3 Mobility Between TN/NTN for MORAN
Exercise: Handover from NTN to TN (Roaming)
Exercise: CHO Handover

6. 3GPP Releases 18 and 19 NTN Enhancements
6.1 Further Integration of Satellite Access in 5G
6.2 Support for IoT and Machine-type Communication
6.3 Enhanced Integration of NTN and TN

7. Pre-Release 17 Direct-to-Cellular (LTE)
7.1 Direct-to-Cellular
7.2 AST Space Mobile and SpaceX/Starlink