1) - LTE Introduction

1.1: Overview and Objectives

1.2: User Expectation

1.3: Operator expectation

1.4: Mobile Broadband Evolution: the roadmap from HSPA to LTE

1.5: Technology comparison

- IEEE
- 3GPP
- 3GPP2

1.6: 3G Vs 4G Technology comparison

1.7: Requirements of LTE

- Peak data rate
- Up to 200 active users in a cell (5 Megahertz)
- Less than 5 millisecond user-plane latency

1.8: LTE Vs UMTS Network Architecture

1.9: LTE Network Architecture

1.10: Orthogonal frequency division multiplexing (OFDM)

1.11: Overview of LTE air interface

- MIMO
- HARQ

1.12: Key Features of LTE

- LTE uses adaptive modulation and coding
- LTE uses Advanced MIMO spatial multiplexing techniques
- LTE supports both FDD and TDD
- LTE offers scalable bandwidths.

1.13: FDD and TDD
1.14: FDD and TDD Bands
1.15: Terminals, modules and fixed wireless terminals
1.16: LTE UE Categories
1.17: LTE specification work
1.18: LTE Standard Specification

2) - EPS Architecture

2.1: Overview and Objectives
2.2: System Architecture Evolution (SAE)-Targets
2.3: Architecture Evolution
2.4: EPS Network Architecture
   - User Equipment (UE)
   - Evolved UTRAN (E-UTRAN)
   - Evolved Packet Core Network (EPC)
   - Services domain
2.5: Functionality of e-NodeB & UE
2.6: Functionality of MME
2.7: Functionality of S-GW
2.8: Functionality of P-GW
2.9: Functionality of PCRF
2.10: Functionality of HSS
2.11: Roaming in Basic System Architecture Configuration
2.12: EPS Roaming Architecture
   - Home Routed model
   - Local Breakout model
2.13: EPS inter-working with 2G/3G Networks
2.14: 3GPP and Non-3GPP Inter-working
2.15: EPS inter-working with Non-3GPP access technologies
3) - Traffic Mobility & Management

3.1: Overview and Objectives

3.2: EPS Network Identifiers

3.3: Tracking area update concept

- Tracking area
- Routing area

3.4: EPS Mobility Management (EMM) states

- Emm-Deregistered
- Emm-Registered

3.5: EPS connection management (ECM) state

3.6: RRC states in E-UTRAN

- RRC_IDLE state
- RRC_CONNECTED state

3.7: EPS bearer service architecture

3.8: EPS bearer services: Default bearer

3.9: EPS bearer services: Dedicated bearer

3.10: SAE Bearer QoS Awareness

3.11: SAE Bearer QoS Attributes

- GBR (Guaranteed Bit Rate) or NGBR (Non-Guaranteed Bit Rate)
- Maximum Bit rate(MBR)
- Label or QoS class Identifier(QCI)

3.12: QoS Class Identifier (QCI) Characteristic

- Resource type
- Priority
- Packet delay budget
- Packet loss rate

3.13: LTE / SAE Handover

3.14: LTE / SAE Handover principles

- Handover preparation
Handover execution
Handover completion

3.15: Handover Preparation
3.16: Handover Execution
3.18: Inter-system Handovers
3.19: Differences in E-UTRAN and UTRAN Mobility
3.20: Policy and Charging Control (PCC)
3.21: Basic Policy and Charging Control (PCC)
3.22: PCC in roaming with PMIP: home routed model
3.23: PCC in roaming: local breakout model

4) - Air Interface (OFDMA & SCFDMA)

4.1: Overview and Objectives
4.2: Duplexing and Multiple Access
   Orthogonal Frequency Division Multiple Access (OFDMA)
   Single Carrier Frequency Division Multiple Access (SC-FDMA)
4.3: LTE Multiple Access Background: Single Transmitter
4.4: LTE Multiple Access Background: FDMA Principle
4.5: LTE Multiple Access Background: Multi-carrier Principle
4.6: Orthogonal Frequency Division Multiplexing (OFDM) principle
4.7: OFDM: Nutshell
4.8: OFDM: Frequency-Time Representation
4.9: OFDM and FFT / IFFT
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4.11: Solution to ISI: Cyclic Prefix
4.12: Cyclic Prefix: Short & Long
4.13: OFDM Transmitter and Receiver
4.14: OFDM Key Parameters
Variable Bandwidth (BW)
Subcarrier Spacing (Delta f = 15 Kilohertz)

4.15: OFDM Key Parameters 2

4.16: OFDM Key Parameters - Fast Fourier Transform size (Nfft)

4.17: OFDM Key Parameters - Sampling rate (fs)

4.18: OFDM Key Parameters for FDD and TDD Modes

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- High Peak-to-Average power ratio (PAPR)

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4.21: OFDMA vs SC-FDMA: QPSK Example

4.22: SC-FDMA: Multiplexing

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4.24: LTE/EUTRAN: Bandwidth Distribution

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4.33: Special Subframe configurations (No. of OFDM symbols)

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- Time Division Multiple Access via OFDM
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5.1: Overview and Objectives

5.2: Aspirations

5.3: Conventional (Single) & New(Multiple) Antenna Configurations

5.4: MIMO System Model (Principle)

5.5: Multiple Antenna Arrangements

- single input and single output arrangement (SISO)
- multiple input and single output arrangement (MISO)
- single input and multiple output arrangement (SIMO)
- multiple inputs and multiple output arrangement (MIMO)

5.6: MIMO Design Criterion

- Spatial Multiplexing Gain
- Transmit Diversity Gain

5.7: Overview of physical channel processing - transmitter side

- Layer mapping
- Precoding

5.8: Example of MIMO Usage

5.9: Summary