

# **UMTS**

## **Network Optimization & Trouble Shooting**

### **Course Duration:**

- ▶ 3 Days

### **Course Description:**

- ▶ This course is targeted at engineers and technicians who are involved in the operation, optimization and troubleshooting of UTRA-networks.
- ▶ This fascinating blend of practical experience and theoretical knowledge is a must for everybody who shall tune a UTRA-network.
- ▶ The course starts with a detailed description of important UTRA-parameters throughout the various protocols and continues with the consideration of how specific parameter settings and setting combinations influence the system operation.
- ▶ In another part, the course answers your questions with respect to network dimensioning and load aspects in both the terrestrial and the wireless parts of UTRA.
- ▶ Finally, the course provides guidance on how and where to setup performance measurements for circuit-switched and packet-switched performance measurements within UTRA.
- ▶ The course concludes with the detailed analysis of typical errors and failures in UTRA networks, discriminating mobile station issues from network problems.

As in all INACON courses we integrated several interactive exercises for a perfect learning experience.

### **Pre-Requisites:**

- ▶ Previous practical exposure to network optimization and trouble shooting in GSM, GPRS or UMTS (second level) is required.
- ▶ Very good understanding of the related UTRA- and NAS-protocols is necessary.
- ▶ We strongly recommend to join our training courses "UMTS – Design Details & System Engineering" and "UMTS - Signaling & Protocol Analysis (RAN & UE)" before visiting this course.
- ▶ Previous practical experience with network protocol testers and test UE's (e.g. TEMS) is desirable.

## **Course Target:**

- ▶ The student is enabled to troubleshoot and optimize UTRA FDD networks and UE's.

## **Some of your questions that will be answered:**

- ▶ What does network performance in UMTS stand for and how does it compare to GSM- or GPRS-network performance?
- ▶ How can I determine our actual network performance?
- ▶ What is meaning of the parameter "Received-total-wide-band-power" which is conveyed from the NodeB to the RNC during radio link setup?
- ▶ How can I measure and compare the quality (Bit Error Rate / Frame Erasure Rate) per cell, per NodeB or per RNS on the Iub-Interface for both uplink and downlink?
- ▶ How can I distinguish application and user equipment failures which are outside of our scope from real network problems?
- ▶ What is the meaning of the various timers and counters which are broadcast in the System Information Blocks
- ▶ Which system parameters can I tune to optimize the UE's idle mode behavior? (e.g. S-intrasearch, t-Reselection-S, Qhyst, Qoffset, ...)?
- ▶ How can I nail down performance bottlenecks in the different parts of our network?
- ▶ How can I minimize the interference through the use of diversity transmission methods?
- ▶ How can I optimize the network access procedure for both, minimum delay times and minimum interference.
- ▶ What is the optimum configuration of the different RLC counter and timer values (e.g. Max-DAT, timerPoll, transmissionWindowSize, ...) to provide the best possible service for transparent, unacknowledged and acknowledged operation modes.
- ▶ What are the best measurement tools for the Uu-interface and within UTRA?

## **Who should attend this class?**

- ▶ Network operator staff who are involved in the optimization of UTRA and who need to continuously improve the network performance
- ▶ System vendors who are involved in second and third level troubleshooting activities

## **Table of Contents:**

### **The Idle Mode Behavior of the UE – Optimization of the related Parameters**

#### **Constraints of the PLMN and Cell Selection Procedure**

- ⇒ SIM/USIM Configuration
- ⇒ UE Radio Access Capabilities
- ⇒ Network
- ⇒ The last RPLMN has always the highest Priority
- Key Principles for performing Registration to the serving Mobile Network
- UICC and USIM considerations

#### **NAS Aspects of the PLMN and Cell Selection Procedure**

##### **NAS-Selection of the PLMN**

- ⇒ User Controlled PLMN Selector with Access Technology (⇔ 3GTS 11.11 (10.3.35))
- ⇒ Operator Controlled PLMN Selector with Access Technology (⇔ 3GTS 11.11 (10.3.36))
- ⇒ H-PLMN Selection with Access Technology (⇔ 3GTS 11.11 (10.3.37))
- ⇒ PLMN-Identification through System Information Broadcast
  - SIB Scheduling Information – Example SIB5
- ⇒ Prioritization of PLMN's

##### **The Cell Selection Process**

- ⇒ Measurement Parameters
  - UTRA Carrier RSSI
  - CPICH RSCP
  - CPICH Ec/No
- ⇒ The Cell Selection Criterion for UTRA-FDD Cells
- ⇒ Cell Selection Criterion S
- ⇒ Meaning of Q-Qualmin and Q-Rxlevmin
- ⇒ Q-Qualmin, Q-Rxlevmin, UE\_TXPWR\_MAX\_RACH in SIB3
- New Rel. 5 Parameter: DeltaQrxlevmin
- Benefit of DeltaQrxlevmin

##### **Implications of Different Settings of:**

- ⇒ Q-Qualmin
- ⇒ Q-Rxlevmin

##### **Cell (Re)-Selection Consideration with SIB-1**

- ⇒ DRX Cycle Lengths – Sleep Cycles
  - Measurement and evaluation of cell selection criteria S of serving cell
  - Measurements of intra-frequency cells
  - Measurements of inter-frequency FDD cells
  - Measurements of inter-RAT GSM cells

NOM/NMO and the IRAT Reselection – Pingpong?  
Battery Saving in UMTS – RRC States and SCRI

### **The Cell Reselection Process**

- ⇒ Initial Considerations
- ⇒ Options for Neighbor Cell Configuration in UTRAN
- ⇒ General Rules for Cell Reselection in UTRAN

### **S-x search Thresholds – Non HCS & no MBMS Preferred Layer**

- ⇒ Overall Rel. 5 Search Thresholds – w/o HCS
  - New in Rel.5: RSCP based Neighbor Search without HCS
  - SsearchHCS
  - SHCS,RAT
- ⇒ High Mobility State when HCS is not used (Rel. 5 feature)
- ⇒ T-Reselection and T300 for Call Setup Success
  - Cell Re-selection or T300 Timeout
  - T-Reselection Setting
  - T300 - Guarding of RRC Connection Establishment
- ⇒ Cell Ranking
- ⇒ The Cell Ranking Criterion
  - For the Serving Cell:
    - Consideration of the Parameter “CellSelectQualityMeasure”
    - Q-Hyst-S – Hysteresis for Serving Cell
  - For Neighbor Cells
    - Q-offset-S-N – Offset for Neighbor Cells
- ⇒ Example for Intra Frequency Cell Reselection
- ⇒ Vertical Inter-Freq vs. Horizontal Intra-Freq Reselection
- ⇒ Inter-Freq Reselection & Cell Selection Quality Measure
  - InterFrequency Cell Reselection Latency
  - Cell Select Quality Measure – CPICH\_Ec/No versus CPICH\_RSCP
- ⇒ Example of an Intra-Frequency NC Description in SIB 11

### **FACH Measurement Occasions (FMO's) in CELL\_FACH state**

#### **Practical Exercise:**

#### **2G to 3G Reselection - Measurement Thresholds**

- ⇒ Measurement Thresholds while Camping on 2G-Cells
- ⇒ Example for Measurements on WCDMA Cells

#### **Cell Reselection from GSM to UTRAN**

- ⇒ Algorithm for Cell Re-selection from GSM to UTRAN
- ⇒ Cell Reselection Criterion from 2G to 3G
  - Measurement Quantity for other RAT – UTRAN FDD
  - Ping-Pong 3G2G Reselections if solely based on Ec/No
- ⇒ RAU Reject in 3G after incomplete RAU in (E)GPRS

#### **Improved Cell Reselection Criterion from 2G to 3G**

⇒ Algorithm for cell re-selection from GSM to UTRAN

**Practical Exercise:**

- ⇒ MS specific Channel Release Message in GSM
  - UTRAN Frequency List ⇔ 3GTS 44.018 (10.5.2.1d)
  - Cell selection indicator after release of all TCH and SDCCH IE ⇔ 3GTS 44.018 (10.5.2.1e)
  - Details to MS specific Channel Release Message
  - Cell Reselection Timing from 2G to 3G
- ⇒ FDD\_Qoffset
  - How to prevent IRAT Reselection from GSM to UMTS and still get WCDMA Measurements done?
- ⇒ Applicability of Qsearch\_I, Qsearch\_C\_Initial and Qsearch\_C
- ⇒ Maximum Number of Inter RAT Neighbors for GSM

**Hierarchical Cell Structures (HCS) in UMTS**

- ⇒ The Quality Threshold Criterion H for Serving Cell
- ⇒ Quality Threshold Criterion H Usage
- ⇒ The Quality Threshold Criterion H for Neighbor Cells with HCS
  - Trigger Conditions for Timer T(n)
  - Timer T(n) and Temporary Offset for H
- ⇒ The Cell Ranking Criterion for Neighbor Cells with HCS
- ⇒ Timer T(n) and Temporary Offset for R
- ⇒ Important HCS-Parameters for an Intra-Freq NC in SIB 11

**Measurement Rules for fast moving UE's**

- ⇒ Important HCS-Parameters for the Serving Cell in SIB 3
  - Example of Measurement Rules for fast moving UE's
- ⇒ Cell Reselection Rules with HCS
  - High Mobility
- ⇒ H
- ⇒ (2) HCS and Non HCS Cell Ranking **Fehler! Textmarke nicht definiert.**CS and Non HCS Cell Rank
- ⇒ (3) HCS and Non HCS Cell Ranking
- ⇒ Considerations for a HCS network with same HCS\_PRIO values for all Cells
- ⇒ Level and Quality based Neighbor Search with & w/o HCS
  - Measurement rules for cell re-selection when HCS is used
  - Parameter Values and Ranges for HCS

**Practical Exercise:**

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**Inter-RAT Cell Change Orders & Inter-RAT Handovers****3G2G CS Handover – Consideration of various Types**

- ⇒ Service Handover from UMTS to GSM

### **3G to 2G Handover for Voice – basic Considerations**

- ⇒ Reasons for Compressed Mode in UMTS
- ⇒ UTRA-FDD ⇒ GSM HO with periodical RXLEV Reporting
- ⇒ H
- ⇒ (2) Hard Handover UTRA-FDD ⇒ GSM – Event 3A **Fehler! Textmarke nicht definiert.** Hard Handover UTRA-FDD ⇒ GSM – Event
- ⇒ (3) Hard Handover UTRA-FDD ⇒ GSM – Event 3A  
Directed Retry  
Handover Access Refresher in GSM

### **Practical Exercise:**

#### **Practical Exercise:**

- ⇒ M
- ⇒ (2) Measurement Control for Event 2D / 2F **Fehler! Textmarke nicht definiert.** Measurement Control for Event 2D /
- ⇒ C
- ⇒ (2) Compressed Mode Config – BSIC Identification **Fehler! Textmarke nicht definiert.** Compressed Mode Config – GSM RSSI Measurem
- ⇒ (3) Compressed Mode Config – BSIC Reconfirmation
- ⇒ (4) Compressed Mode Config – Alternative Scrambling Code  
Compressed Mode Pattern – Example
- ⇒ M
- ⇒ (2) Measurement Control for Event 3A **Fehler! Textmarke nicht definiert.** Measurement Control for Event
- ⇒ (3) Measurement Control for Event 3A
- ⇒ E
- ⇒ (2) Physical Channel Reconfiguration – GSM Gap Configurations **Fehler! Textmarke nicht definiert.** Event 1F as Compressed Mode Trig
- ⇒ (3) Measurement Control for Periodical RXLEV Reporting
- ⇒ (4) Periodical GSM RXLEV Reporting while in 3G
- ⇒ (5) Handover from UTRAN Command GSM

### **Practical Exercise:**

E-t-E view on 3G to 2G Handover

### **Use Case – Drop during 3G → 2G HO**

3G to 2G Handover Drop – UE Trace  
Inter-RAT Cell Info Indication – Tagging the IRAT Neighborlist  
Impact of frequent (ping-pong) ASU during CM

### **3G2G PS Cell Change Order Scenario**

- ⇒ 3G to 2G Cell Change Order Message Flow  
lu mode to A/Gb mode Intra SGSN Change  
lu mode to A/Gb mode Inter-SGSN Change
- ⇒ CM with Higher Layer Scheduling
- ⇒ Measurement Control for Event 3A - Cell Change Order PS

Event 3A Reporting – Cell Change Order PS  
Cell Change Order from UTRAN  
Cell Change Order Failure

**Cell Change Order – Alternative Method**

- ⇒ Physical Channel Reconfiguration – Two Gaps but only RXLEV being measured
- ⇒ Measurement Control for Activating RXLEV/RSSI Gap only
- ⇒ Periodical RXLEV Measurement Reporting
- ⇒ Cell Change Order – Blind PS “Handover”

**2G to 3G CS Handover Scenario**

- ⇒ Call Setup in GSM – UTRAN Class Mark Change
- ⇒ GSM Meas. Report carrying 3G Neighbor Cell Measurement Measurement Results
  - Deriving the 3G Neighbour Cell list from the 3G Neighbour Cell Description sent on BCCH or on SACCH
- ⇒ Inter System to UTRAN Handover Command
  - HANDOVER TO UTRAN COMMAND
  - Predefined Configuration in 2G to 3G Handover
  - UTRAN Mobility Information
  - Radio Bearer Setup
  - MSC sends Release – CS Domain Problem
- ⇒ 2G to 3G HO Message Flow – Intra MSC

**2G to 3G Handover Types**

- ⇒ Better Cell HO from GSM to UMTS
- ⇒ Sufficient UMTS Coverage HO from GSM to UMTS – Traffic Reason HO
- ⇒ Imperative HO from GSM to UMTS
- ⇒ Mobile Speed-sensitive HO from GSM to UMTS
- ⇒ Directed Retry from GSM to UMTS
  - More Details on Directed Retry from GSM to UMTS
  - Measurement Information vs. SI-2Quater
- ⇒ Radio Sub System Link Control Parameters
  - Parameters broadcast in SI2Quater
  - (1) Handover and Power Control Parameters – SACCH/BCCH
  - (2) Handover and Power Control Parameters – SACCH/BCCH

**2G to 3G Packet Cell Change – Message Flow**

- ⇒ Packet Cell Change Order vs. MS autonomous IRAT Reselection
- ⇒ Meaning of 3G Search Priority while in Packet Transfer

**GERAN to UTRAN NACC (Network Assisted Cell Change)**

- ⇒ Network Assisted Cell Change
- ⇒ CCN Mode
- ⇒ CCN setting procedure & Cell Change Notification procedure

**PS Handover from (E)GPRS to UMTS**

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## Radio Link Control – Optimization of the related Parameters

### Radio Link Control

- ⇒ Introduction
- ⇒ Overview
  - TMD
  - UMD
  - AMD
- ⇒ The AMD-PDU
  - D/C-Bit
  - Sequence Number (12 bit)
  - P-Bit
  - HE-Field (2 bit)
  - Length Indicator (7 bit / 15 bit) plus E-Bit
- ⇒ The STATUS- and Piggybacked STATUS-PDU (SUF1 1 – 4)
  - NO\_MORE-SUF1
  - WINDOW-SUF1
  - ACK-SUF1
  - LIST-SUF1
  - Example of a STATUS-PDU with SUF1's LIST and ACK
- ⇒ The STATUS- and Piggybacked STATUS-PDU (SUF1 5 – 8)
  - BITMAP-SUF1
  - RLIST-SUF1
  - MRW-SUF1
  - MRW-ACK-SUF1
  - Example of a BITMAP SUF1

### Practical Exercise:

Example: RB Setup with MRW configured

### Practical Exercise:

- ⇒ The RESET- and RESET-ACK-PDU

### Overflow Protection ⇔ RLC-SDU-Discard

- ⇒ Timer Based RLC-SDU-Discard
  - With Signaling
  - Without Signaling
- ⇒ Retransmission Based RLC-SDU-Discard
  - With Signaling
  - Reset-Procedure
- ⇒ Transmit Buffer Overflow Based RLC-SDU Discard
- ⇒ SDU Discard Function
  - SDU Discard Mode – preventing RLC-buffer from overflow
- ⇒ Parameter and Timer in RLC-AM (Acknowledged Mode)
  - RLC Timers
  - RLC Protocol Parameter



- RLC-AM Sender State Variables
- RLC-AM Receiver State Variables
- ⇒ RLC-AM Transmission and Reception Window
  - Transmission Window
  - Reception Window
- ⇒ Transmitting\_Window\_Size
- ⇒ Receive\_Window\_Size
- ⇒ Example for RLC-AM Data Transfer
- ⇒ Polling Methods in RLC-AM
- ⇒ Timer\_Poll and Timer Poll\_Prohibit in RLC-AM
  - Polling Successful
  - Polling Unsuccessful
- ⇒ Implications of Different Settings of Timer\_Poll
- ⇒ Timer\_Poll\_Prohibit
- ⇒ Poll every Poll\_PDU
- ⇒ Poll\_SDU
- ⇒ Last Transmission PDU Poll
- ⇒ Last Re-transmission PDU Poll
- ⇒ STATUS Transmission Mechanism in RLC-AM
  - Missing PDU Indicator
    - Timer Based
    - Timer\_Status\_Prohibit
  - EPC Based Retransmission
- ⇒ Missing PDU Indicator
- ⇒ Timer\_Status\_Prohibit
- ⇒ Buffer Overflow Protection in RLC-AM
- ⇒ SDU Discard after MaxDAT Retransmissions (MRW)
- ⇒ No Discard after MaxDAT Retransmissions (Reset)
- ⇒ MaxDAT – maximum Number of (Re-) Transmissions
- ⇒ MaxDAT – maximum Number of (Re-) Transmissions
- ⇒ RLC Unrecoverable Error – Layer 2 Drop
- ⇒ MaxRST – Maximum Number of Resets
- ⇒ Screenshot of Layer 2 Drop
- ⇒ RLC-AM Setting and their Influence on TCP/IP

### **Signaling Radio Bearers (SRB's with RB-ID < 5)**

- ⇒ Signaling Radio Bearer 0 (SRB 0)
- ⇒ Signaling Radio Bearer 1 (SRB 1)
- ⇒ Signaling Radio Bearer 2 (SRB 2)
- ⇒ Signaling Radio Bearer 3 (SRB 3)
- ⇒ Signaling Radio Bearer 4 (SRB 4)

### **RLC Unrecoverable Error Optimization on User RB's**

## **Variations of Macro Diversity / Soft Handover**

### **Overview of Downlink Measurements**

- ⇒ Intra-Frequency Measurements
- ⇒ Inter-Frequency Measurements
- ⇒ Inter-RAT-Measurements
- ⇒ Traffic Volume-Measurements
- ⇒ Quality-Measurements
- ⇒ UE Internal-Measurements
- ⇒ UE-Positioning-Measurements

### **Measurement Control**

- ⇒ Event-triggered vs. Periodical Reporting
  - Event-Triggered Measurement Reporting
  - Periodical Reporting
  - SHO Event 1A - Event Triggered Periodical Reporting
- ⇒ Filtering
- ⇒ Cell Individual Offsets (CIO)

### **Other Important Measurement Parameters**

- ⇒ Measurement Quantity
- ⇒ Filter-Coefficient
- ⇒ Weighting Factor
- ⇒ Reporting Range
- ⇒ Hysteresis
- ⇒ Periodic Event Reporting
- ⇒ Time-to-Trigger
- ⇒ Reporting Range (only Event ID 1A and 1B)
  - Example of a MEAS\_CTRL-Message (Part 1)
  - Example of a MEAS\_CTRL-Message (Part 2)
  - Bit Error Rate on TrCH and Physical Channel
  - Example: QE in lub-FP: UL-DATA represents the BER

### **Intra-Frequency Measurements**

- ⇒ Event ID 1A: Primary CPICH enters the reporting range
- ⇒ Event ID 1B: Primary CPICH leaves the reporting range
- ⇒ Event ID 1C: Non-active primary CPICH becomes better than an active primary CPICH
- ⇒ Event ID 1D: Change of best cell
- ⇒ Event ID 1E: Primary CPICH becomes better than an absolute threshold
- ⇒ Event ID 1F: Primary CPICH becomes worse than an absolute threshold
- ⇒ Triggering Event ID 1A (Example for other Events)

## **Traffic Volume Measurements and Radio Bearer Control**

### **UTRAN Timing**

- ⇒ System Frame Number (SFN)

- ⇒ UE Timing – Connection Frame Number (CFN)  
SFN-CFN Observed Time Difference (OTD)

### **Synchronization Issues in UMTS**

- ⇒ Network Synchronisation
- ⇒ Node Synchronisation
- ⇒ Transport Channel Synchronisation
- ⇒ Radio Interface Synchronisation
- ⇒ Time Alignment Handling
- ⇒ Transport Channel Synchronisation – CFN based
- ⇒ Time of Arrival Monitoring on Iub/Iur Interfaces
  - Timing Adjustments on Iub – Scrambling Code Re-use Issue
  - Strong Neighbor not included in RRC Measurement Report

### **Compressed Mode Issues**

- ⇒ Dual Receiver:
- ⇒ Frame Structures for Compressed Mode
  - Frame structure in Uplink:
  - Frame Structure in Downlink:
- ⇒ Transmission Gap Position
  - Single-frame method:
  - Double-frame method:
- ⇒ Methods for Compressed Mode
  - Transmission time reduction by Puncturing:
  - Transmission time reduction by splitting the spreading factor:
  - Transmission time reduction by higher layer scheduling:
- ⇒ Impact of Compressed Mode
  - Transmission time reduction by Puncturing: removed from Specifications – see 3GPP 25.214
  - Transmission time reduction by splitting the spreading factor:
  - Transmission time reduction by higher layer scheduling:
- ⇒ Slot Formats for Compressed Mode
  - Downlink:
  - Uplink:
  - DL Power Control during Compressed Mode
- ⇒ UL PC during Compressed Mode
- ⇒ Compressed Mode Patterns for GSM Measurements

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### **Important UTRA Procedures and their Optimization**

- ⇒ RRC-States in UMTS
- ⇒ RRC State Transitions & iRAT-Transitions to/from (E)GPRS
- ⇒ RRC State Transitions & iRAT-Transitions to/from GSM (CS)

### **Gross Bit Rate versus Net Bit Rate and possible Application**

- ⇒ Calculated Transport Format Combination (= TFCI?)  
Example for CTFC / TFCI: 12.2 AMR + 3.4 SRB

## **Practical Exercise:**

### **Paging Type 1**

- ⇒ General
  - Initiation of Paging Procedure
  - Reception of a PAGING TYPE 1 message by the UE

### **UE dedicated Paging- Paging Type 2**

- ⇒ General
- ⇒ Initiation of Paging Type 2
- ⇒ Reception of a PAGING TYPE 2 message by the UE

### **RRC Connection Release**

- ⇒ Reception of an RRC CONNECTION RELEASE message by the UE
- ⇒ High RTWP Peaks during RRC Connection Release

### **Radio Frame Timing**

#### **Uplink / Downlink Timing at UE**

- ⇒ Why DOFF

### **Radio Link Establishment**

#### **Power Control Challenge**

- ⇒ Goals of Power Control
- ⇒ Uplink Power Control
- ⇒ Downlink Power Control
- ⇒ Open Loop versus Closed Loop Power Control
  - Open Loop Power Control
- ⇒ CDMA Power Control Basics for DPCH
- ⇒ Example of DL Inner and Outer Loop Interworking
  - UL Closed Loop Power Control
  - Outer Loop Power Control
  - Inner Loop Power Control
- ⇒ UL Power Control in Soft Handover
- ⇒ UL Power Control Algorithms
- ⇒ DL Power Control – Power Weighting
- ⇒ UL DPCH and DPCH Power Control Stepping

## **Practical Exercise:**

- Uplink Gain Factor for UE

### **Soft versus Softer Handover**

- ⇒ Soft Handover
- ⇒ Softer Handover

### **The Random Access Procedure**

- ⇒ Initial Conditions and Overview

- ⇒ Layer 2 Random Access Procedure
  - Layer 1 Parameters required for Random Access
  - Layer 2 Parameters required for Random Access
  - Flow of Layer 2 Random Access Procedure
  - Layer 1 Random Access Procedure

### **The Physical Random Access Procedure**

- ⇒ Determination of the Preamble Initial Power
  - The Formula
- ⇒ The Issue of UE Inaccuracies for Open Loop Power Control

### **Conclusions and Suggestions**

- ⇒ Parameters of the Physical Random Access Procedure
- ⇒ Setting up the Parameter Constant Value
- ⇒ Setting up the Parameter Power Ramp Step
- ⇒ Setting up the Parameter Max No of Preambles
  - Constant Value / Power Ramp Step and Max No of Preambles
- ⇒ Setting up the Parameter Pp-m
- ⇒ Setting up the Parameter AICH-Transmission Timing

### **The MAC-Random Access Procedure**

- ⇒ Determination of the Access Priority
  - Transfer of an RRC\_CONN\_REQ-Message
  - Other Cases (MLP)
  - Determination of the Persistence Value P
  - Persistence Value P and Random Number R
- ⇒ Interworking of MAC and Physical Random Access (Part 1)
- ⇒ Interworking of MAC and Physical Random Access (Part 2)

### **Conclusions and Suggestions**

- ⇒ Parameters of the MAC Random Access Procedure
- ⇒ Setting up the Persistence Scaling Factors
- ⇒ Setting up Mmax
- ⇒ Setting up the Parameter ASC-Setting
- ⇒ Setting up NB01min and NB01max
- ⇒ Random Access Procedure Parameters in SIB 5

### **SRNS Relocation**

- ⇒ SRNS Relocation with Drop – no lur in place

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## **Selected Scenarios in UMTS - Repetition**

### **Explanations of the Used Message Descriptors**

- ⇒ Message Descriptors on Uu-Interface
- ⇒ Message Descriptors on lu-cs-, lu-ps- and lur-Interface
- ⇒ Message Descriptors on lub-Interface

NBAP-Messages (always over AAL-5)

RLC-PDU's (always over AAL-2)

ALCAP-Messages (over AAL-5)

⇒ M

Initial Conditions **Fehler! Textmarke nicht definiert.** Mobile Terminating  
Conversational C

Applicability of this Procedure

Description

⇒ S

Initial Conditions **Fehler! Textmarke nicht definiert.** Soft Handover (Radio Link  
Addition)

Applicability of this Procedure

Description

⇒ Soft Handover (Radio Link Removal)

Initial Conditions

Applicability of this Procedure

Description

⇒ S

Initial Conditions **Fehler! Textmarke nicht definiert.** Soft Handover (Intra-RNC /  
Inter-NodeB / Branch Addition)

Applicability of this Procedure

Description

⇒ S

Initial Conditions **Fehler! Textmarke nicht definiert.** Soft Handover (Inter-RNC /  
Branch Addition)

Applicability of this Procedure

Description

⇒ H

Initial Conditions **Fehler! Textmarke nicht definiert.** Hard Handover UTRA-FDD

⇒ GSM (Message FI)

Applicability of this Procedure

Description

⇒ H

Initial Conditions **Fehler! Textmarke nicht definiert.** Hard Handover GSM ⇒  
UTRA-FDD (Message FI)

Applicability of this Procedure

Description

### **UTRAN Mobility Management Procedures**

⇒ Cell Update (Intra-RNC / Cell Reselection, Periodic, Page Rsp.)

Initial Conditions

Applicability of this Procedure

Description

⇒ C

Initial Conditions **Fehler! Textmarke nicht definiert.** Cell Update (Inter-RNC / Cell  
Reselection / UE initiated)

Applicability of this Procedure

Description

- ⇒ U  
Initial Conditions **Fehler! Textmarke nicht definiert.** RA Update (Inter-RNC / Cell  
Reselection / UE initiat  
Applicability of this Procedure  
Description
- ⇒ P  
Initial Conditions **Fehler! Textmarke nicht definiert.** DP-Context Activation  
(Mobile Originati  
Applicability of this Procedure  
Description

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## Use Cases: Trouble Shooting Examples in UTRAN

### (1) Call Tracing

#### Practical Exercise:

#### DPCCH In-Sync and Out-of-Sync Detection

- ⇒ Uplink Synchronization Estimation in NodeB
- ⇒ Downlink Synchronization Estimation in UE
- ⇒ Radio Link Failure Downlink (Option 1)
- ⇒ Radio Link Failure Downlink (Option 2)
- ⇒ Radio Link Failure Uplink (Option 1)
- ⇒ Radio Link Failure Uplink (Option 2)

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## Optimization from Planning Perspective

### (1) Cell Search Procedure

- ⇒ CPICH
- ⇒ P-SCH
- ⇒ P-CCPCH
- ⇒ Slot synchronization
- ⇒ Frame synchronization and code group identification
- ⇒ Scrambling code identification
- ⇒ Differences between the codes

#### Practical Exercise:

#### AMR Speech Connection Establishment

- ⇒ AMR Codec Modes – Code Mode Adaptation

#### Inter Frequency Planning – Dual Carrier Network

- ⇒ Parameter Snapshot about SIB-3 and SIB-11 & CM Thresholds
- ⇒ Define the parameters for SIB-3 and SIB-11/12 of a Two Carrier UMTS Network as well the IRAT thresholds for Compressed Mode

Possible Limitations and Considerations about the Cell Reselection Behavior in RRC Idle and CELL\_FACH

⇒ Planning of Dual Freq-Layer w/o contiguous Coverage on F2

### **Call Redirection and/or UE Differentiation between F1 & F2**

⇒ Call Redirections – Blind Handover

### **Uplink Admission and Congestion Control**

⇒ Uplink Interference – Load Calculation

⇒ Uplink Load Factor and Noise Rise

UL Admission Control Function – Admitting a new Bearer

### **I(Ref) Update over Night @ Zero Load**

⇒ RTWP Peak – Higher Layer Filtering

Higher layer filtering:

Measurement Filter Coefficient

### **Downlink Interference – Load Calculation**

⇒ DL Admission Control Function – Admitting a new Bearer

### **Downlink Admission Control and Congestion Control**

### **RTWP Measurements and Analysis**

⇒ Normal macro cell uplink interference calculation as reference

⇒ Indoor solutions

⇒ Split Macro cells

### **Reasons for abnormal high uplink RTWP**

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## **Solutions for the Practical Exercises**

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## **References**

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