RAN Tuning Guideline

Multivendor Optimization - Ericsson

Nokia Siemens Networks
MS NPO
Sub region Indonesia

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Document Info

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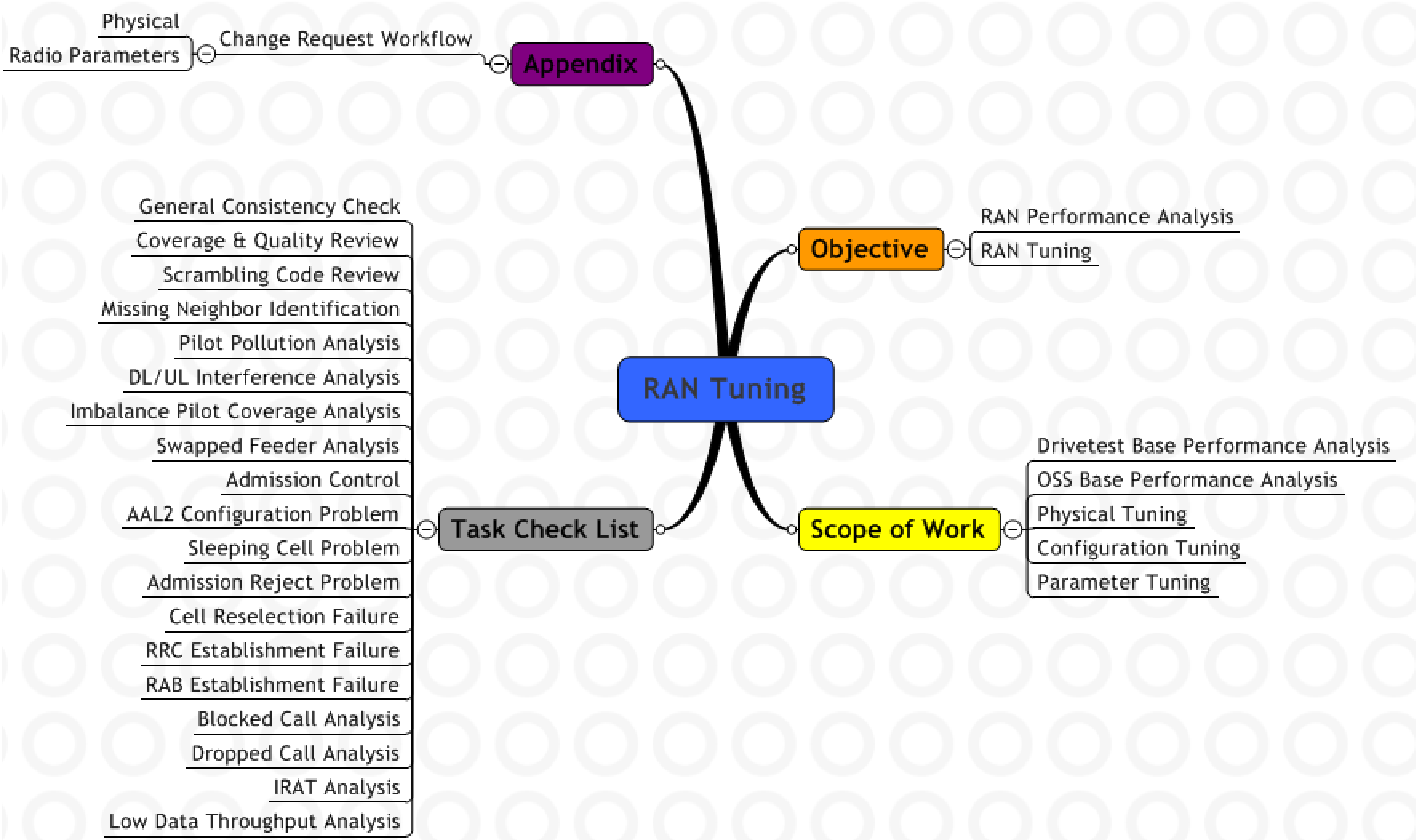
1.0	26 May 2009	Gigih Suhartanto	All	First Draft

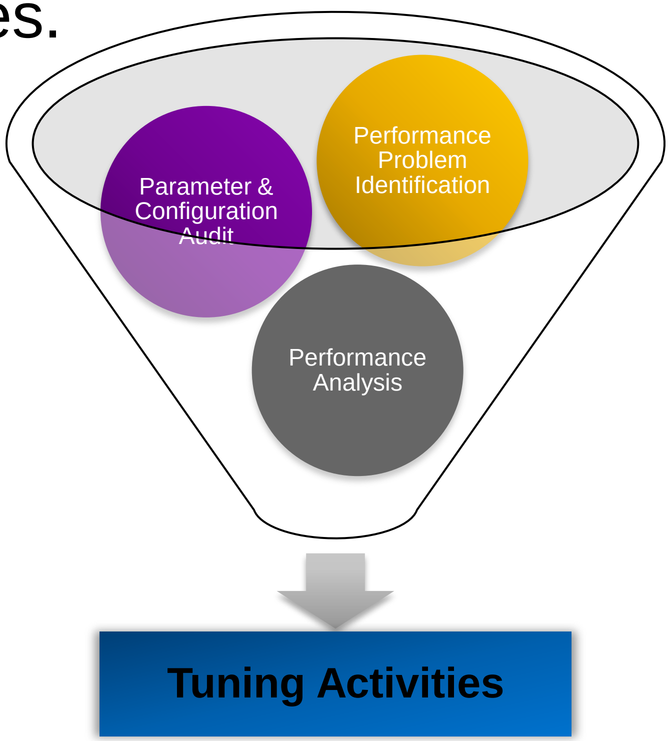
Document Map



Contents

Objectives

- The objective of RAN Tuning is to perform network and service performance analysis that lead to tuning activities both physical and radio parameters.
- This service module involves activity of performance data collection, performance evaluation, parameter audit and parameter or physical changes.



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Scope of Work

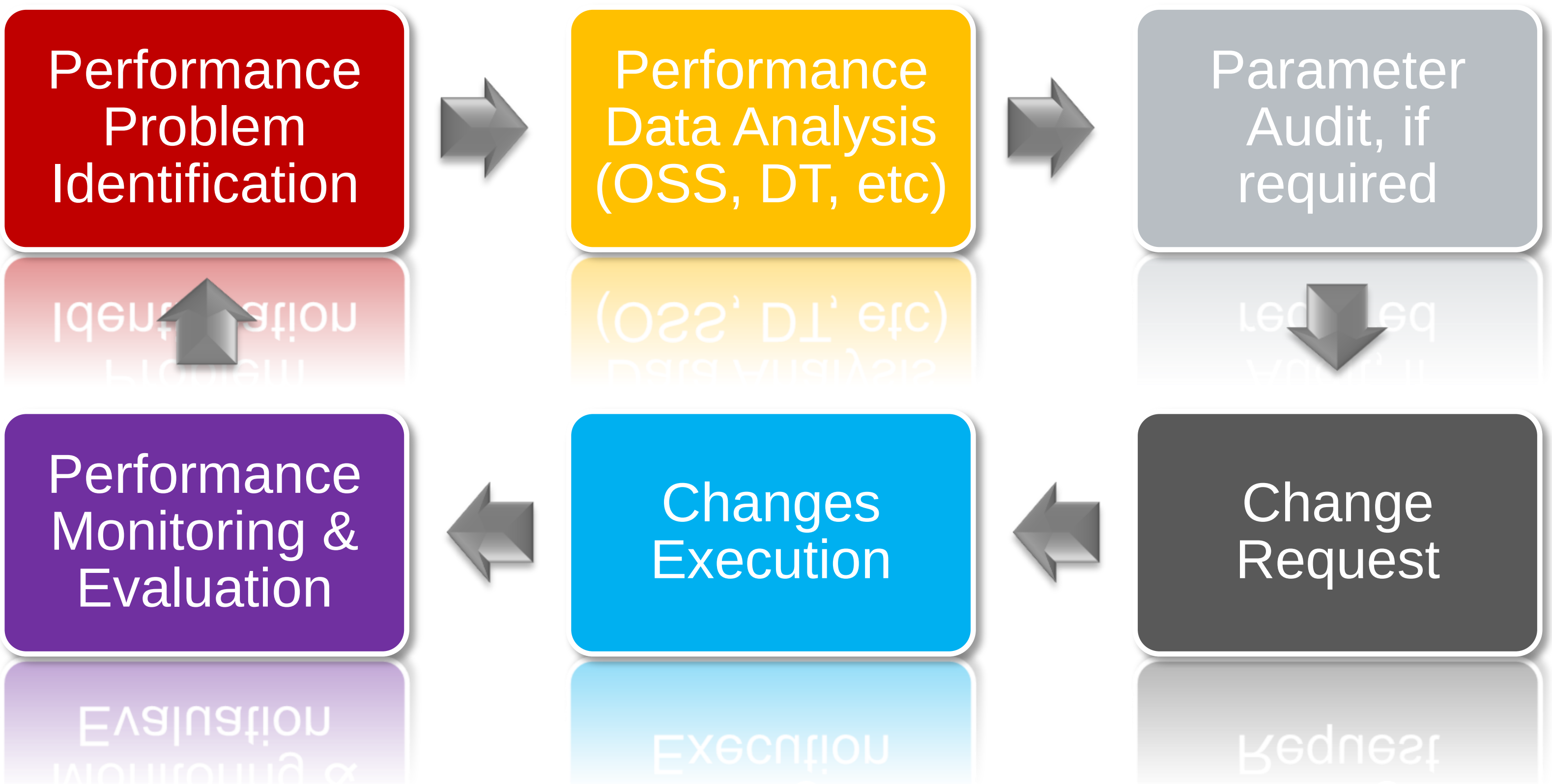
Scope of RAN Tuning will follow below working items:

1. **Performance Problem Identification**, refer to KPI Definition and Performance Evaluation result from Drivetest and OSS performance data (input).
2. **Radio Parameter Audit**, refer to Parameter Assessment result (input, only if required)
3. **Performance Analysis** (input)
4. **Parameter/Physical Tuning** to implement the changes

Contents

RAN Tuning
RAN Tuning Lifecycle

General lifecycle of RAN tuning is started from performance problem identification (input), the analysis (main activity), tuning/change (output), and performance verification (follow up).



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RAN Tuning
List of Activity Information

- The basic methodology that going to be used for performance analysis will follow previous defined scope of work, i.e. performance problem identification, performance analysis, and parameter tuning.
- Since the analysis itself might be actualized into a lot of type of activities depending on the faced problem, for simplification purpose this document will cover only limited analysis activity and will directly be incorporated into troubleshooting sample.
- Thus, meaning of guideline for RAN tuning will not always cover all activities in ordered manner, i.e. flexibly chosen for each faced troubleshooting requirement.

RAN Tuning
List of Activity

Item	RAN Tuning Activity	Responsible
1	General Consistency Check	NPO Engineer
2	Coverage & Quality Review	NPO Engineer
3	Scrambling Code Review	NPO Engineer
4	Missing Neighbor Identification	NPO Engineer
5	Pilot Pollution Analysis	NPO Engineer
6	Downlink Interference Analysis	NPO Engineer
7	Uplink Interference Analysis	NPO Engineer
8	Imbalance Pilot Coverage Analysis	NPO Engineer
9	Swapped Feeders Analysis	NPO Engineer
10	AAL2 Configuration Problem	NPO Engineer
11	Sleeping Cell Problem	NPO Engineer
12	Admission Reject Problem	NPO Engineer

RAN Tuning
List of Activity

Item	RAN Tuning Activity	Responsible
13	Cell Reselection Failure	NPO Engineer
14	RRC Establishment Failure	NPO Engineer
15	RAB Establishment Failure	NPO Engineer
16	Blocked Call Analysis	NPO Engineer
17	Dropped Call Analysis	NPO Engineer
18	IRAT Analysis (1)	NPO Engineer
19	IRAT Analysis (2)	NPO Engineer
20	IRAT Analysis (3)	NPO Engineer
21	Traffic Sharing	NPO Engineer
22	Low Data Throughput Analysis	NPO Engineer

Contents

- Objectives
- Scope of Work
- **RAN Tuning**
  - RAN Tuning Lifecycle
  - List of Activity
  - Analysis Activity
- Appendix
  - Change Request

RAN Tuning
General Consistency Check

Item 1

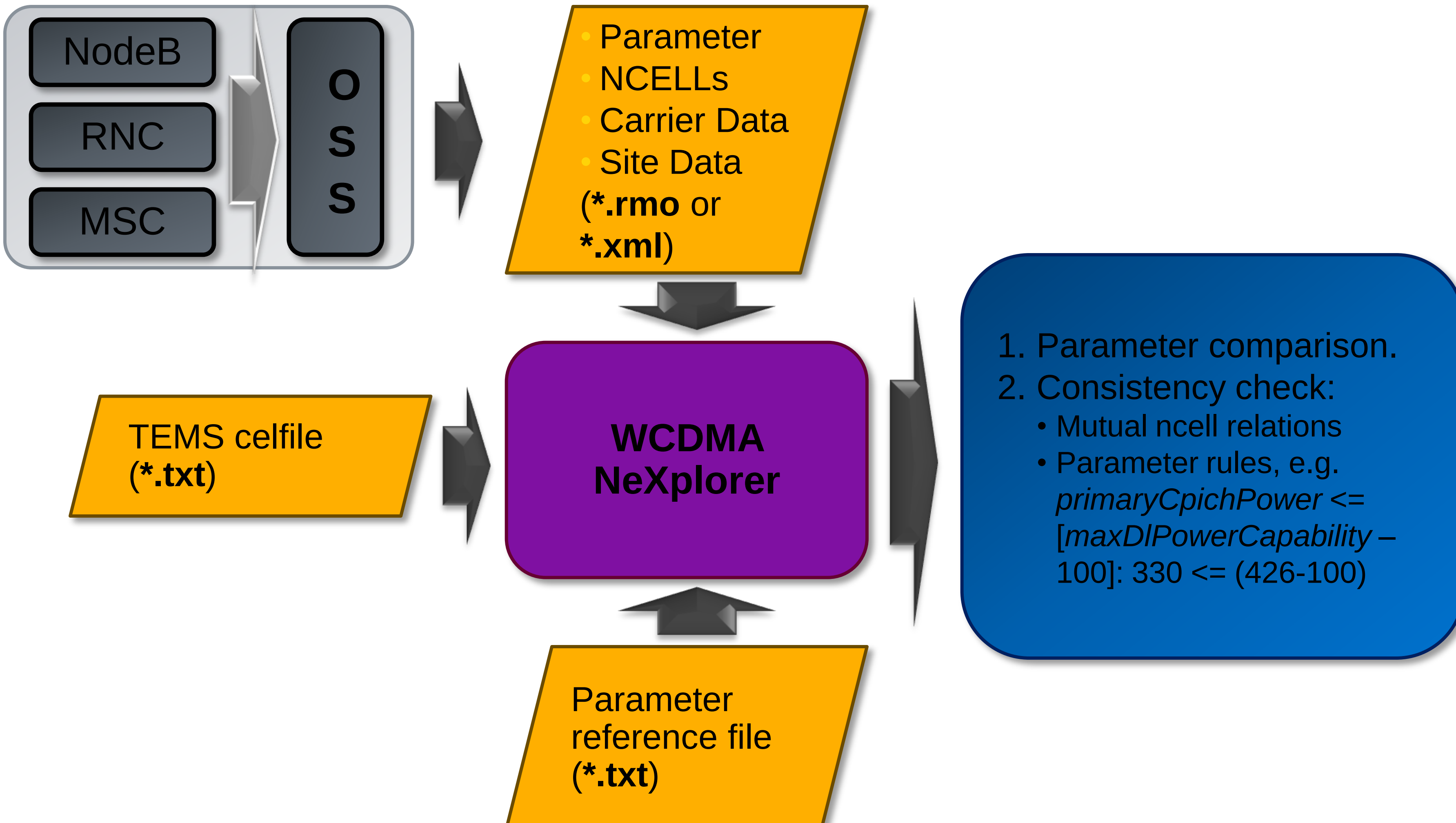
- **Objective**

  Basic step to find any discrepancy on parameter or configuration data that affect on performance problem.

- **Methodology**
  - *Refer to Parameter Assessment module.*
  - Compare the actual radio parameters against Default Parameter Design.
  - Consistency check.
  - Please see next diagram.

RAN Tuning
General Consistency Check

Item 1



RAN Tuning
General Consistency Check

Item 1

- **Analysis**

  Identify which KPI that having problem, e.g. degradation, and correlate it against possible radio parameter that control the performance status, e.g. Handover Success Rate might relate to neighbor creation and power control, Accessibility might relate to capacity configuration and admission control, etc.

- **Solution**

  Find the discrepancy radio parameter or configuration and set it back to default value, unless it is under exception list.

RAN Tuning
Coverage and Quality Review

Item 2

- **Objective**

  To verify actual (pilot) coverage of cell(s) on particular area against Design Criteria or KPI.

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module.*
  - Plotting strongest cell' Ec and EcIo using scanner and/or UEs log data taken from field test measurement.
  - When it is found that those metrics on particular area/route under test below the target, then it would be stated that coverage and/or quality problem is exist.

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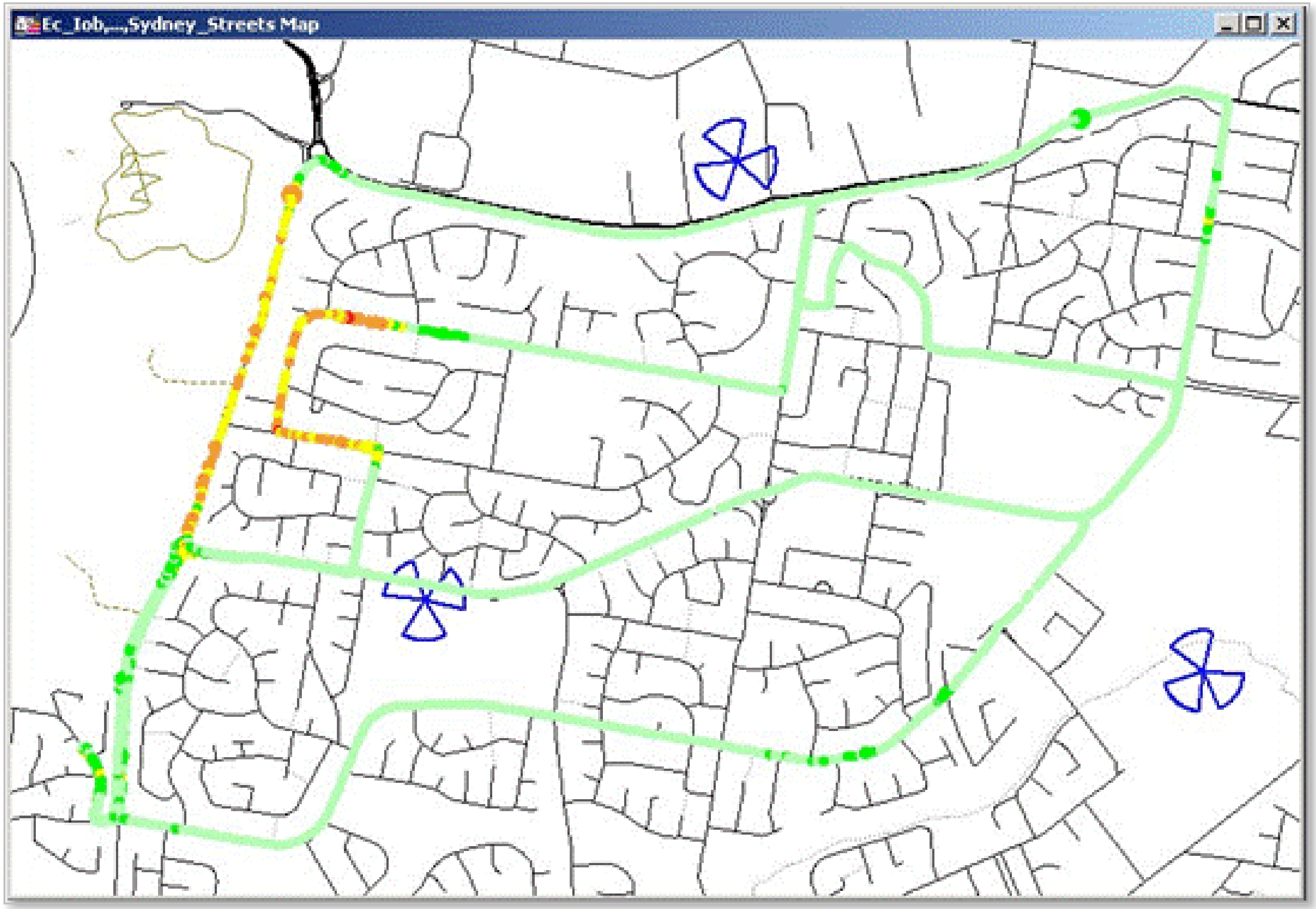
Item 2

RAN Tuning
Coverage and Quality Review



RAN Tuning
Coverage and Quality Review

Item 2

- **Analysis**
  - Site down
  - No site in the test area
  - Missing neighbor relationship
  - Incorrect antenna implementation
  - Not good antenna position and configuration
  - High Loss in feeder
- **Solution**
  - Check the hardware in the case of cell down
  - Recommend new site if possible
  - Neighbor optimization
  - Recommend new antenna configuration e.g. Tilt, azimuth, height
  - Change bigger feeder

RAN Tuning
Scrambling Code Review

- **Objective**

  Aim of the scrambling code review is to ensure all cells have been on services with the correct scrambling codes according to the radio network design.

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module.*
  - Review/verification can be done by exporting the scanner log files to the MapInfo tables and open with the site information tables.
  - Displays Ec, EcIo or EcNo of a particular SC using the scanner.
  - If the result shows not correct scrambling code area related to the plan, it may be either swapped feeders or wrong scrambling code implementation in the network.
  - Other discrepancy should be checked is a Co-Scrambling Code assignment in which UE try to send the measurement report to add one cell that has the same scrambling code with another, but the RNC cannot differentiate the cell between two same scrambling codes.

RAN Tuning

Scrambling Code Review

Item 3

MapInfo Table exported from TEMS Log files

- Site table
- Carrier table
- Neighbor table

MCOM3G

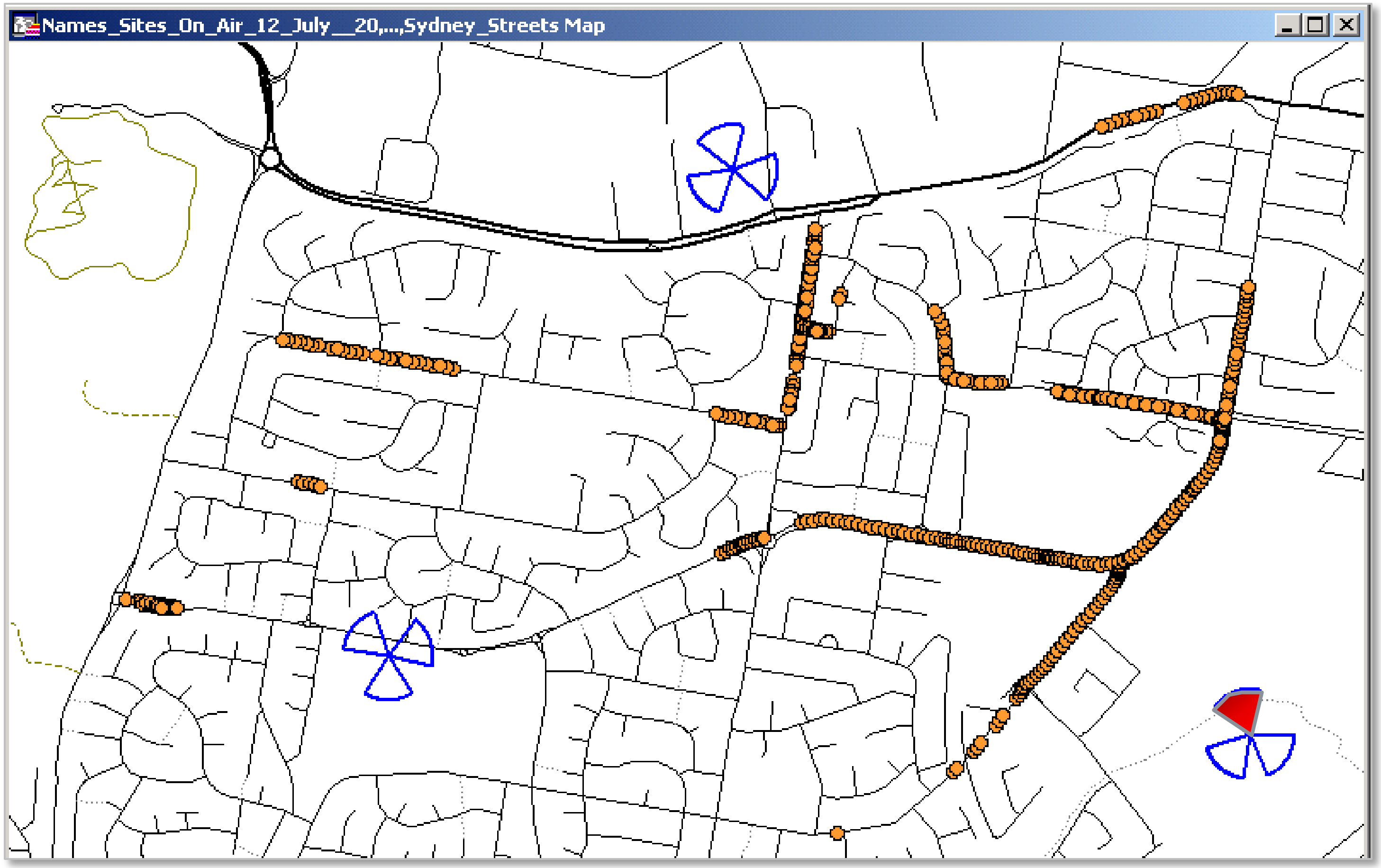
Plot the Best Server SC

Check and report if some cells are not on-services during the test

- Verify the SC is correct compare between scanner log file and planning database
- Verify if there are no co-SC

Item 3

RAN Tuning
Scrambling Code Review



Displays Ec, EcIo or EcNo of a particular SC using the scanner to verify how far particular SC coverage being propagated.

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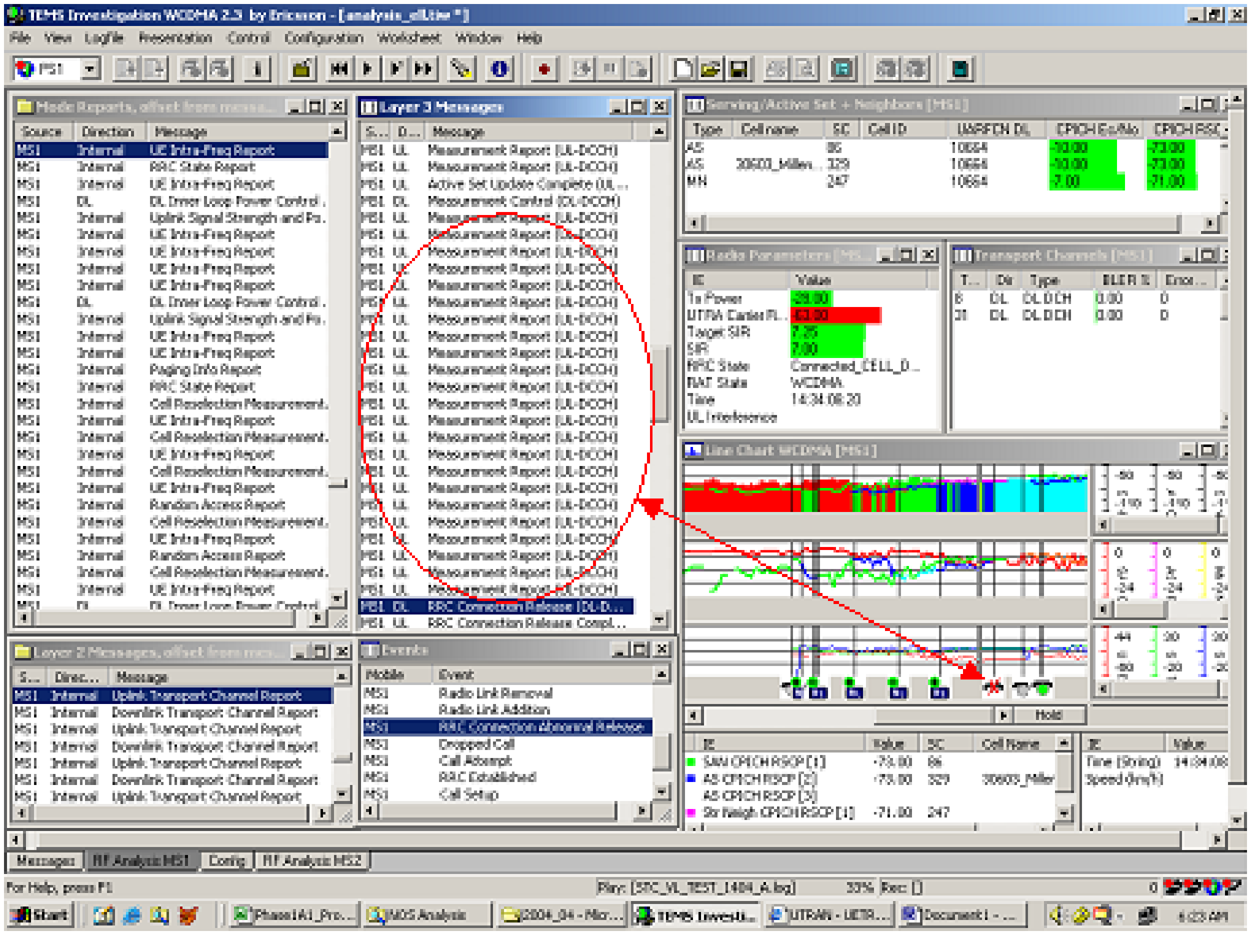
Item 3

RAN Tuning
Scrambling Code Review



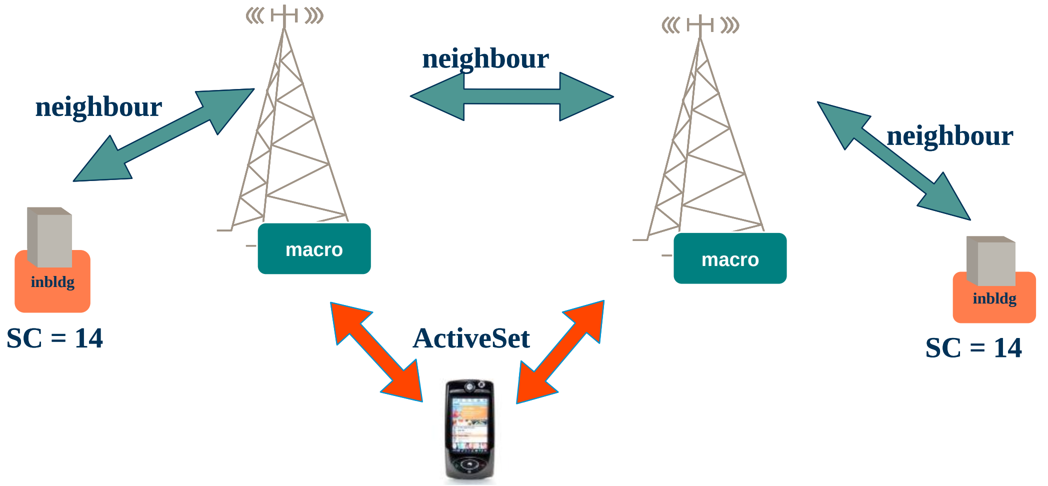
Co-Scrambling Code assignment identified during field test using UE.

RAN Tuning

Scrambling Code Review

Item 3

- **Analysis**
  - The analysis shall be rectified to
    - ✓Faulty scrambling code implementation compared to the design plan.
    - ✓Swapped feeder implementation.
- **Solution**
  - The solution is to check the configuration in the network and check the feeder implementation.



Example of the co-scrambling code problem during soft handover.

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Item 4

RAN Tuning
Missing Neighbor Identification

- **Objective**

  Aim of the missing neighbor identification is to find Missing Neighbour events detected by the scanner and try to analyze the missing neighbor relations, thus as the output we able to redefine the neighbor data.

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module (using TIPP-W).*
  - Enable function of Missing Neighbor Analysis in TIPP-W (method-4)
  - The raw output from TEMS log would be broken down to provide more detail. Scanner uses celfile to determine if an undefined NCELL is stronger than defined ones.
  - Many filters set in Input sheet used to remove less important MN relation:
    - ✓ When serving cell has poor Ec, EcIo
    - ✓ If missing relation is within a certain dB of the strongest
    - ✓ If missing relation occurs a certain number of times.

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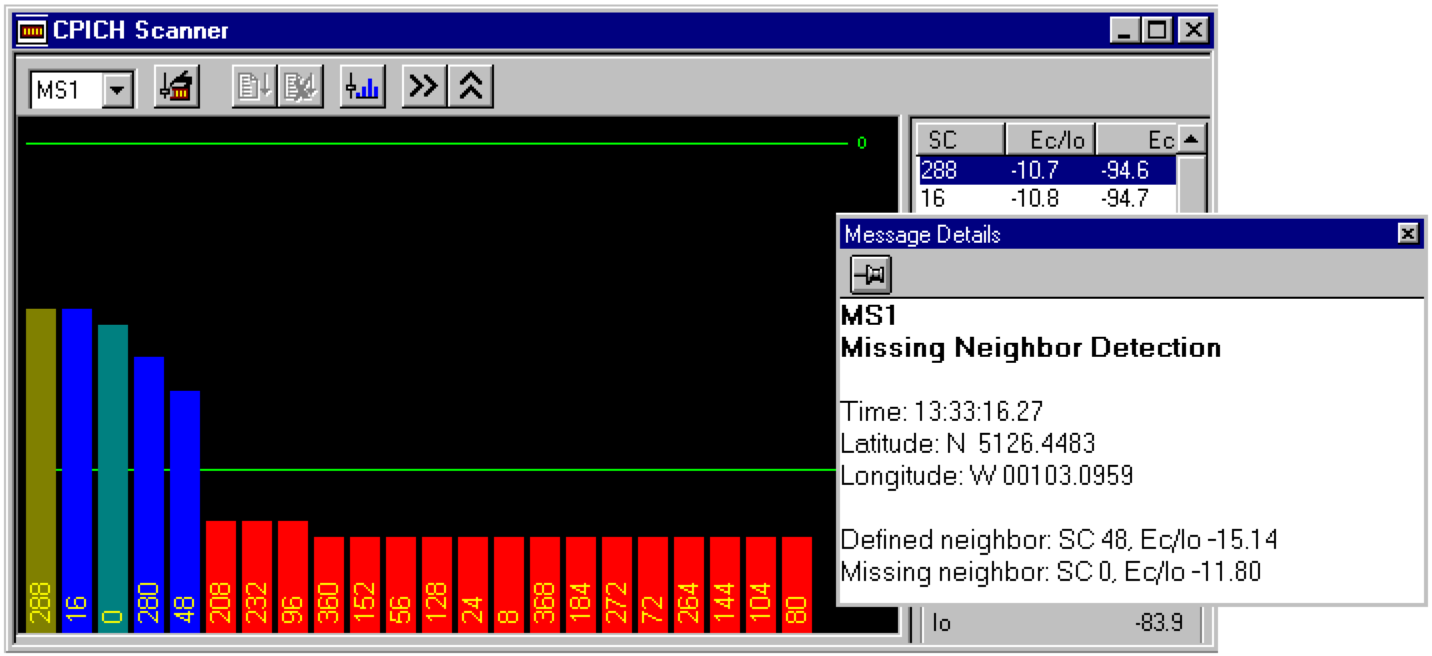
RAN Tuning

Missing Neighbor Identification

Item 4

- Using TEMS Scanner to verify neighbor/monitoring set relation:.



Use pre-defined events to detect “missing neighbors”:

- **P-CPICH RSCP**
- **P-CPICH Ec/No**

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RAN Tuning

Missing Neighbor Identification

Item 4

- Preparing menu setting on TIPP-W to enable missing neighbor identification.

14	Pilot Pollution Threshold dB difference (Default = 5)	5
15	Soft Handover Threshold dB difference (Default = 3)	3
16	CS Short Call Time (Default = 90 seconds = 01:30)	01:30
17	BLER/Data: Filter seconds before drop (Default = 5 seconds = 00:05)	00:05
18	Data: Filter seconds during TCP slow start (Default = 6 seconds = 00:06)	00:00
19	MN Analysis: Filter out if Strongest Ec Threshold (dBm) less than	-98.0
20	MN Analysis Filter out if Missing Neighbour Ec/Io Threshold (dB) less than	-12
21	MN Analysis: Strongest SC to Missing SC Ec/Io Margin (dB)	-6
22	MN Analysis: Recurrence Threshold	3
23	Throughput Type	Application
24	Percentile BLER Voice	95%
25	Percentile BLER Video	90%
26	Percentile BLER Data	95%

- [ ] UL TX Power
- [ ] Dropout Rate
- [ ] Accessibility
- [ ] BLER
- [ ] Neighbour Prioritisation
- [x] Missing Neighbor Analysis
- [ ] Detected Neighbor Analysis

Run Selected Macros

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RAN Tuning
Missing Neighbor Identification

Item 4

- **Analysis**
  - Many filters set in Input sheet used to remove less important MN relation:
    - ✓When serving cell has poor Ec, EcIo
    - ✓If missing relation is within a certain dB of the strongest
    - ✓If missing relation occurs a certain number of times.

Item 4

RAN Tuning

Missing Neighbor Identification

- **Analysis continue ..**
  - Check the relation on Missing Neighbor Analysis result, e.g. SC, RSCP and EcIo.
  - Validate with the site distance information and number of MN occurrence.

Strongest Cell Name	Strongi	Stronges	Strongest	Missing Neighbour Ce	Missing Ne	Missing Ne	Missing Ne	Distance b	Number of Occurrences
Abbotsbury_1	292	-78.92	-6.92	Cecil Hills_1	340	-82.96	-8.83	2.17	4
Bossley Park_3	212	-90.91	-5.91	Wetherill Park West_3	20	-93.40	-8.67	3.12	4
Wetherill Park_2	84	-84.55	-5.68	Fairfield West_3	164	-84.74	-8.74	2.77	4
Cecil Hills_1	340	-86.54	-7.54	Wetherill Park West_3	20	-89.36	-10.23	6.58	3
Wetherill Park West_3	20	-90.98	-6.98	Bossley Park_3	212	-93.89	-9.89	3.12	3
Wetherill Park West_3	20	-90.13	-6.13	Prospect South_3	405	-92.61	-9.61	3.59	3
Wetherill Park West_3	20	-85.00	-8.16	Wetherill Park_1	76	-87.99	-10.62	1.73	3

- **Solution**
  - Create new relation for those validated Missing Neighbors.
  - In case the cause of missing neighbor is overshooting, then tilt the antenna on overshooting cell.

RAN Tuning
Pilot Pollution Analysis

Item 5

- **Objective**

  Aim is to identify Pilot Pollution area and its contributor. Pilot pollution definition is the detection of many high power pilots as compared to Best Serving Pilot that do not contribute to the received signal.

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module (using TIPP-W).*
  - The concept is to find drivetest logfile data (e.g. Ec/No, RSCP, and the number of possible Active Set cells) on which below equation has been met:

$$E_c / N_o |_i \geq E_c / N_o |_{BestServer} - E_c / N_o |_{Threshold\_PilotPollution}$$

  - Where $E_c / N_o |_{Threshold\_PilotPollution}$ is set as parameter reportingRange1b.
  - When the number of pilots exceeds the MaxActiveSet, pilot pollution occurs.

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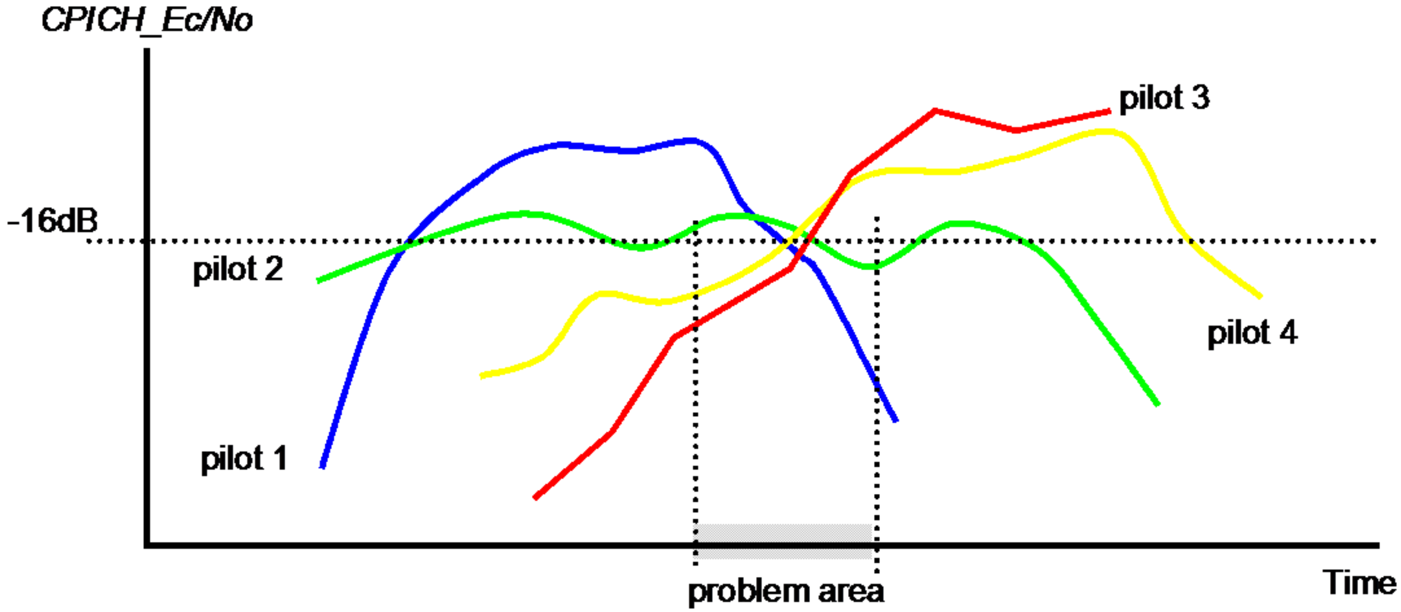
RAN Tuning
Pilot Pollution Analysis

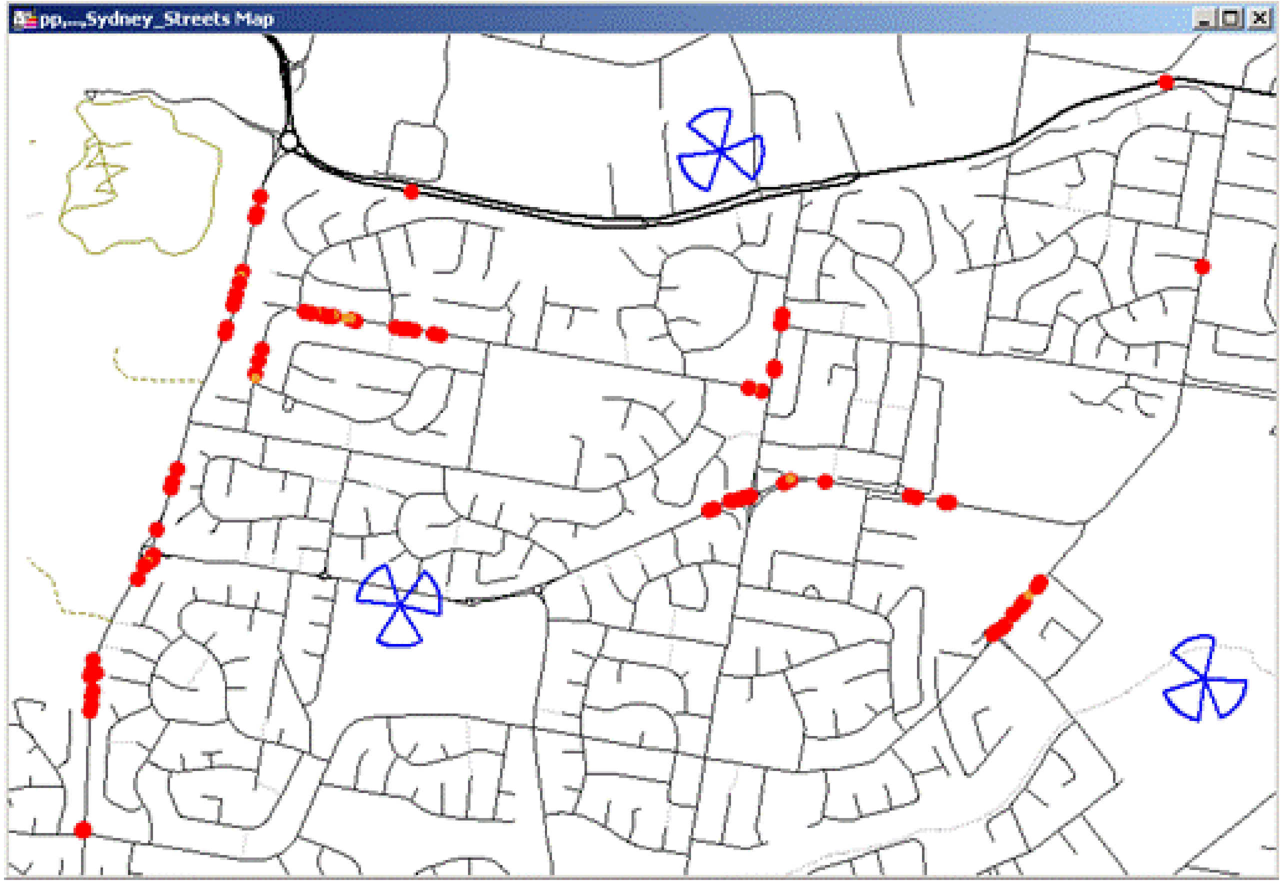
Item 5



Pilot Pollution Situation.

RAN Tuning
Pilot Pollution Analysis

Item 5



Displays areas with 4 or more pilots within a set dB ("Pilot Pollution Threshold") of the strongest cell using TIPP-W tool.

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RAN Tuning
Pilot Pollution Analysis

- **Methodology continue**

  Using TIPP-W tool, displays and ranks cells which have caused most pollution and those which have suffered most pollution.

Highest Polluters			Highest Polluted Cells		
Polluter Cell Name	**SC**	**Polluter Count**	**Polluted Cell Name**	**SC**	**Polluted Count**
Prairiewood - LUCENT_2	228	17	Prairiewood - LUCENT_3	236	51
Prairiewood - LUCENT_3	236	15	Prairiewood - LUCENT_2	228	49
Wetherill Park_1	76	15	Wetherill Park West_3	20	46
Bossley Park_1	196	14	Wetherill Park_2	84	41
Cecil Hills_1	340	12	Bossley Park_3	212	32
Fairfield West_3	164	12	Cecil Hills_1	340	27
Wetherill Park_2	84	12	Bossley Park_1	196	26
Prospect South_3	405	10	Wetherill Park_1	76	22
Wetherill Park West_3	20	9	Prospect South_3	405	20
Abbotsbury_1	292	7	Abbotsbury_3	308	16
Bossley Park_3	212	6	Abbotsbury_2	300	14
Abbotsbury_2	300	4	Abbotsbury_1	292	11
Wetherill Park_3	92	4	Fairfield West_3	164	9
Abbotsbury_3	308	2	Wetherill Park_3	92	4
Bossley Park_2	204	1	Fairfield South_3	23	2
			Wetherill Pk Nth_2	60	2

Item 5

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RAN Tuning
Pilot Pollution Analysis

- **Methodology continue**

  Pilot pollution identified on Active Set size distribution with varying threshold:

$$AS_{size} = count\left(\frac{E_c}{N_0} \geq \frac{E_c}{N_0}_{serving} - threshold\right)$$

AS	Threshold 1	2	3	4	5	6	7	8	9	10
1	90%	81%	73%	66%	59%	53%	48%	43%	39%	35%
2	9%	16%	21%	25%	28%	29%	31%	31%	32%	32%
3	1%	2%	5%	7%	10%	12%	14%	16%	17%	18%
4	0%	0%	1%	2%	3%	4%	5%	7%	8%	9%
5	0%	0%	0%	0%	1%	1%	2%	2%	3%	4%
6	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
7	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
9	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

RAN Tuning
Pilot Pollution Analysis

Item 5

- **Analysis**
  - Find the possible problem cause:
    - ✓Not suitable antenna tilting angle?
    - ✓Not suitable antenna pattern use?
    - ✓Not suitable antenna azimuth?
    - ✓Not suitable antenna location at the site?
- **Solution**
  - Tilt the antenna mechanically or electrically to reduce the coverage of polluter.
  - Antenna type change.
  - Antenna azimuth change.
  - Antenna positioning change.

RAN Tuning
Downlink Interference Analysis

Item 6

- **Objective**

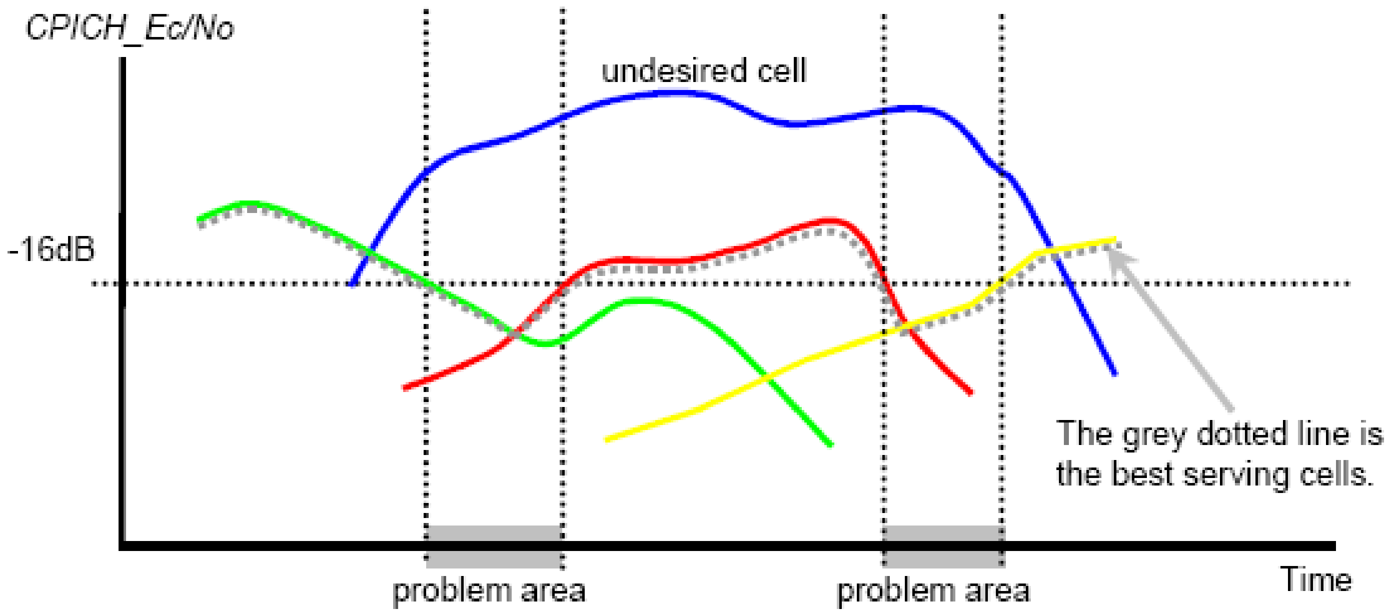
  Aim is to identify particular area with interference case (DL path).

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module.*
  - The observed symptoms that can be derived from drivetest shall be:
    - ✓ Received Ec/No of the pilot channel is less than -16dB and;
    - ✓ Received RSCP of the pilot channel is high enough to maintain the connection, e.g. > -100dBm and;
    - ✓ DL RSSI is very high and;
    - ✓ The connection finally drops.

RAN Tuning
Downlink Interference Analysis

Item 6

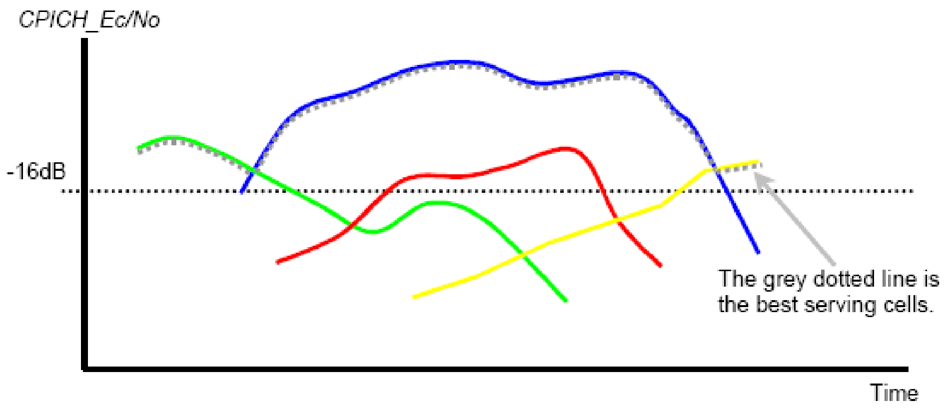
- **Analysis**
  - One of main analysis shall be correlated to identification of an undesired cell with very high signal strength is found in the problem area.



RAN Tuning
Downlink Interference Analysis

Item 6

- **Solution-1**
  - The simplest solution to overcome this problem is to include the overshooting cell into the neighboring cell list. This means the interferer now becomes a useful radio link.

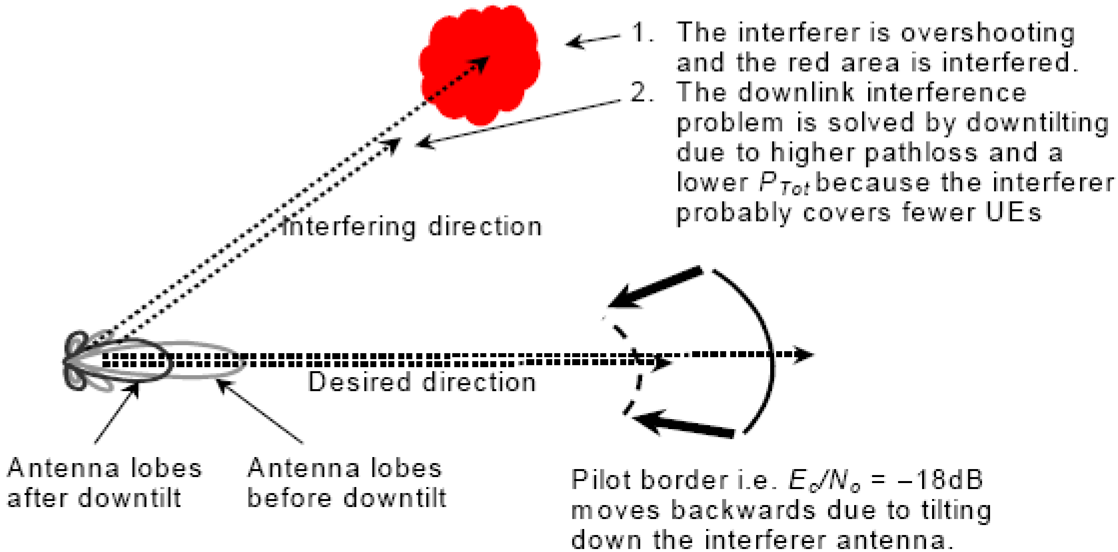


  - The drawback of this solution are
    - It creates more unnecessary handovers and excessive numbers of UEs are in soft handover.
    - If the overshooting cell is physically far way to the problem area, the handover sequence might be messed up after including it into the neighboring cell list.
    - Additional radio link will cause out of hardware resources in both interferer and interfered cell, including possibility of cell blocking.

RAN Tuning
Downlink Interference Analysis

Item 6

- **Solution-2**
  - An alternative solution is to change the antenna configuration of the overshooting cell, e.g. tilting down the antenna, re-directing the antenna orientation, reducing the antenna height.



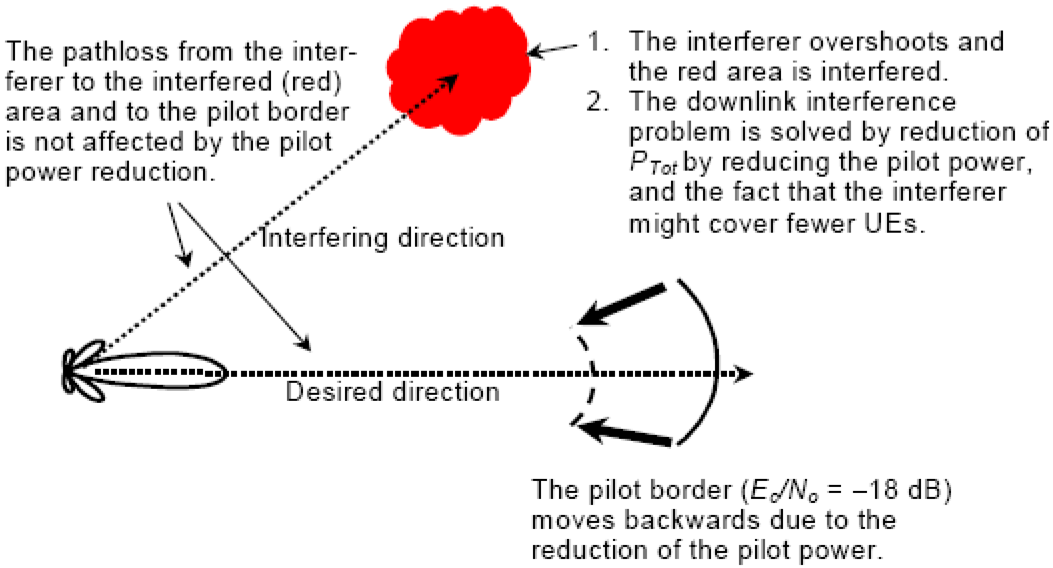
  - The drawback of this solution are coverage hole might be occurred, and neighboring cells of the interferer will cover a larger area and will thus absorb additional UEs.

RAN Tuning

Downlink Interference Analysis

Item 6

- **Solution-3**
  - The third possible solution is to decrease the pilot power Primary CPICH power of the overshooting cell.



  - After decreasing the pilot power, the total downlink power for the common channels of the interferer decreases. When the pilot power is reduced, the power of all other common channel decreases simultaneously because their parameter settings are relative to the pilot power value.

RAN Tuning

Item 6

Downlink Interference Analysis

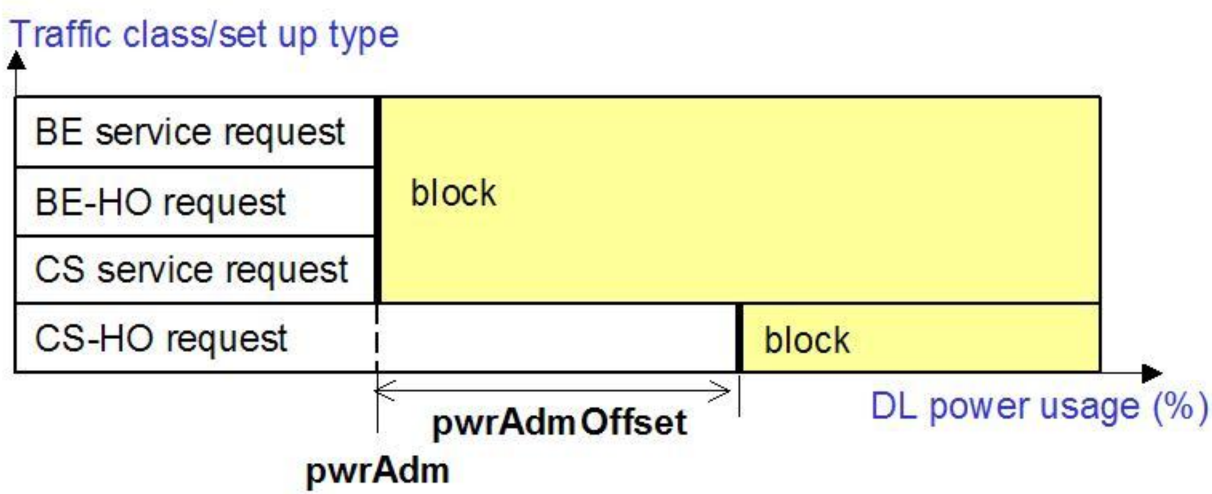
- **Solution-3**
  - The drawback of this solution are
    - ✓ It is not a solution for long term.
    - ✓ This solution is not suitable for a capacity limited interferer.
    - ✓ The uplink is not optimized due to uneven pilot power setting.
    - ✓ Reducing the pilot power, the downlink channel estimation in the UE is affected. This influences the downlink quality. In the end, the UE might request more power from base stations.
    - ✓ When the pilot power is reduced, the maximum allowed DL DCH power decreases simultaneously because this parameter setting is relative to the pilot power value.
    - ✓ The desired coverage of the interferer is modified. Coverage hole might occur. Verification of the coverage should be done again.
    - ✓ Neighboring cells of the interferer will cover a larger area and will thus absorb additional UEs.

RAN Tuning

Downlink Interference Analysis

Item 6

- **Solution-4**
  - Capacity Management Threshold using Downlink Admission Tuning:
    - ✓ Reduction of the downlink capacity thresholds e.g. maxTxPowerDl, pwrAdm and pwrAdmOffset in the RNC can lower the DL interference. However, the change will affect the maximum allowed DL capacity and then may cause high cell blocking rate.
    - ✓ Therefore, it is recommended to change them only for capacity purpose, not interference.



RAN Tuning
Uplink Interference Analysis

Item 7

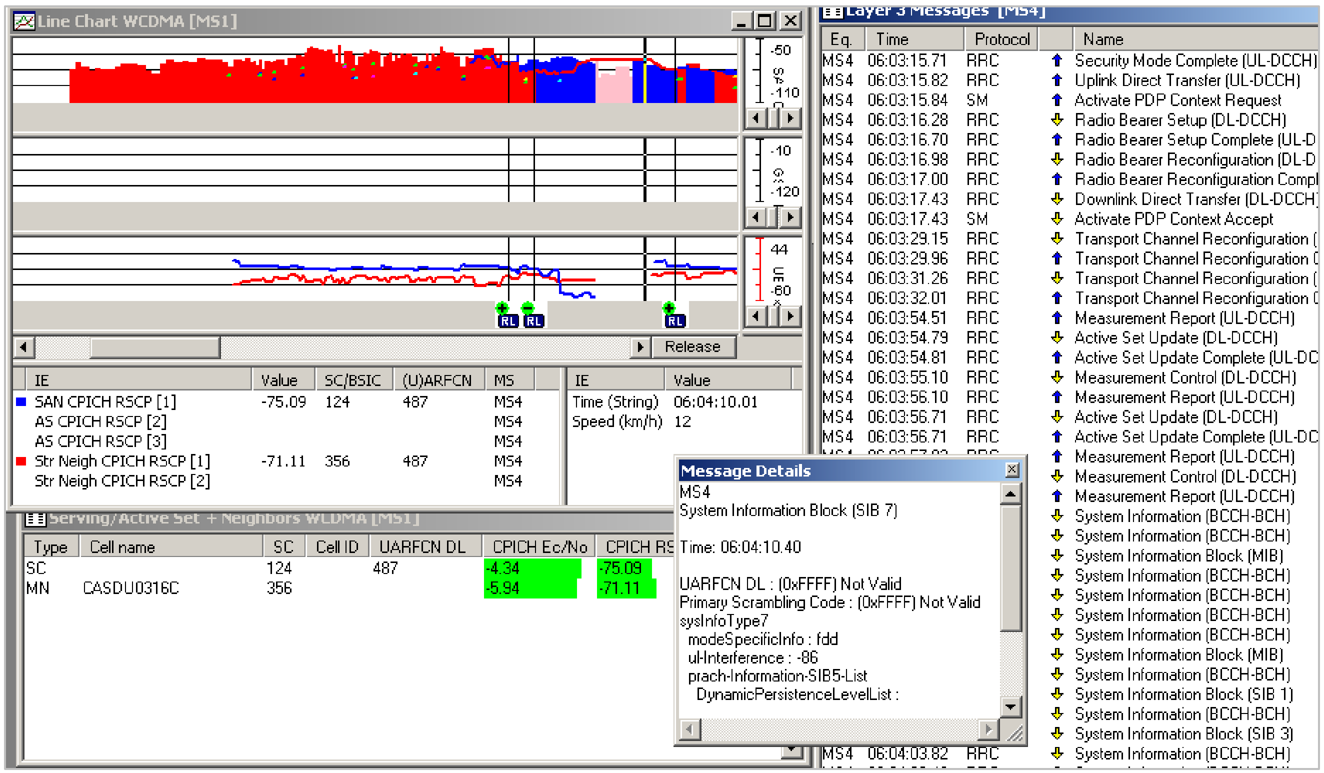
- **Objective**

  Aim is to identify particular area with interference case (UL path).

- **Methodology**
  - *Refer to 3G Drivetest Measurement Evaluation module.*
  - Uplink interference leads the call drops. This can be monitored by either the initial tuning drive test or collect the RBS counter
  - The RBS counter pmAverageRssi can summarize and interpret as the uplink interference load of the base station.
  - This can be seen in TEMS Investigation during the call has been drop as well. After the call drop, checking the System Information Block 7 can verify the uplink interference level.

RAN Tuning
Uplink Interference Analysis

- **Methodology**
  - *High Uplink Interference on TEMS Screen ..*



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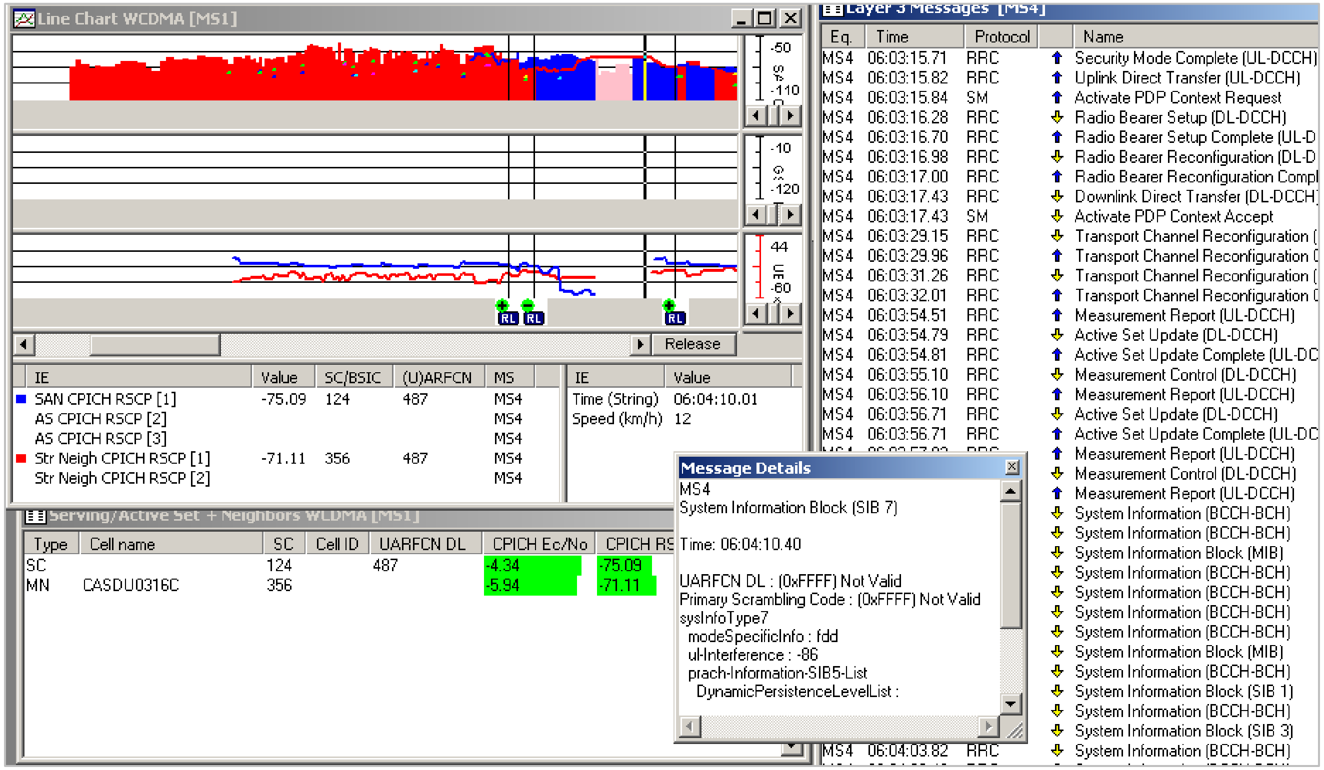
Item 7

RAN Tuning
Uplink Interference Analysis

- **Methodology**
  - *High Uplink Interference on TEMS Screen ..*



RAN Tuning
Uplink Interference Analysis

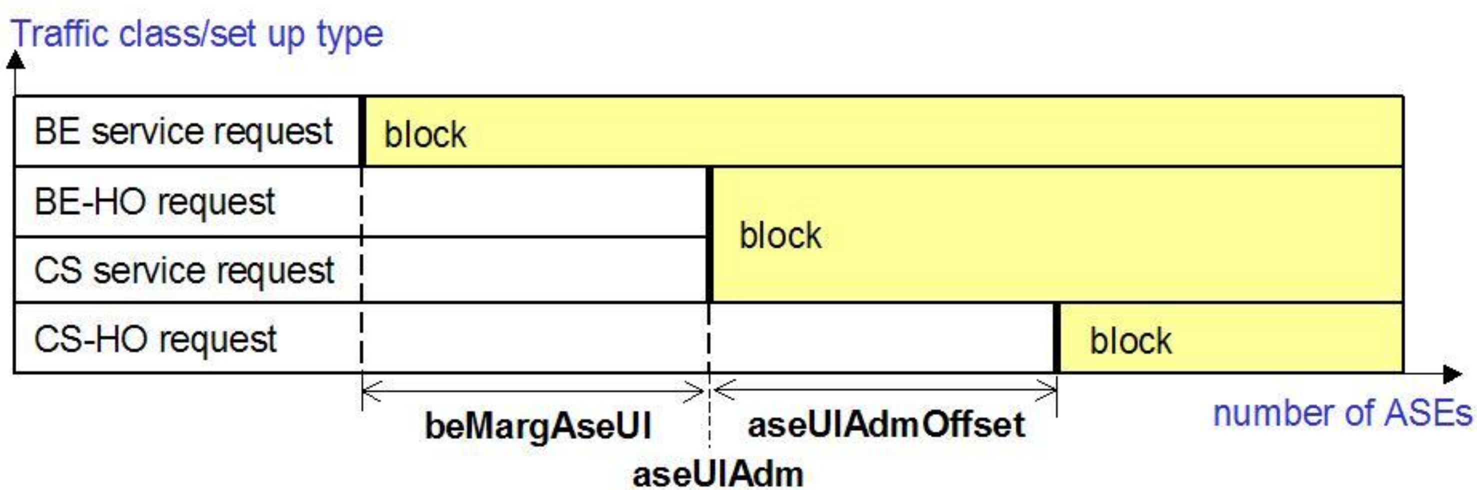
Item 7

- **Analysis**
  - Find the possible problem cause:
    - ✓ Too far from the site? The UE which is far from the site have to transmit higher power, causing higher interference in uplink part to the network.
    - ✓ Too many users in compressed mode?
    - ✓ Uneven pilot power setting? This can cause the UE serve with the higher pathloss cell, which cause the UE use higher transmitted power.
- **Solution**
  - Optimize the coverage of the network.
  - Optimize the time in compressed mode and number of compressed mode users.
  - Balance the pilot power setting between cells.
  - Capacity management threshold

Item 7

RAN Tuning
Uplink Interference Analysis

- Capacity Management Threshold using Downlink Admission Tuning:
  - ✓ Reduction of the uplink capacity thresholds e.g. aseAdmUl and aseAdmUlOffset (together with beMargAseUl)in the RNC can enlarge the UL cell coverage and lower UL interference from its UEs to other cells.
  - ✓ However, in order to maintain capacity requirement, it is not recommended to change them for these purposes.



RAN Tuning
Imbalance Pilot Coverage Analysis

Item 8

- **Objective**

  Aim is to identify particular area being served by imbalanced pathloss between downlink and uplink coverage.

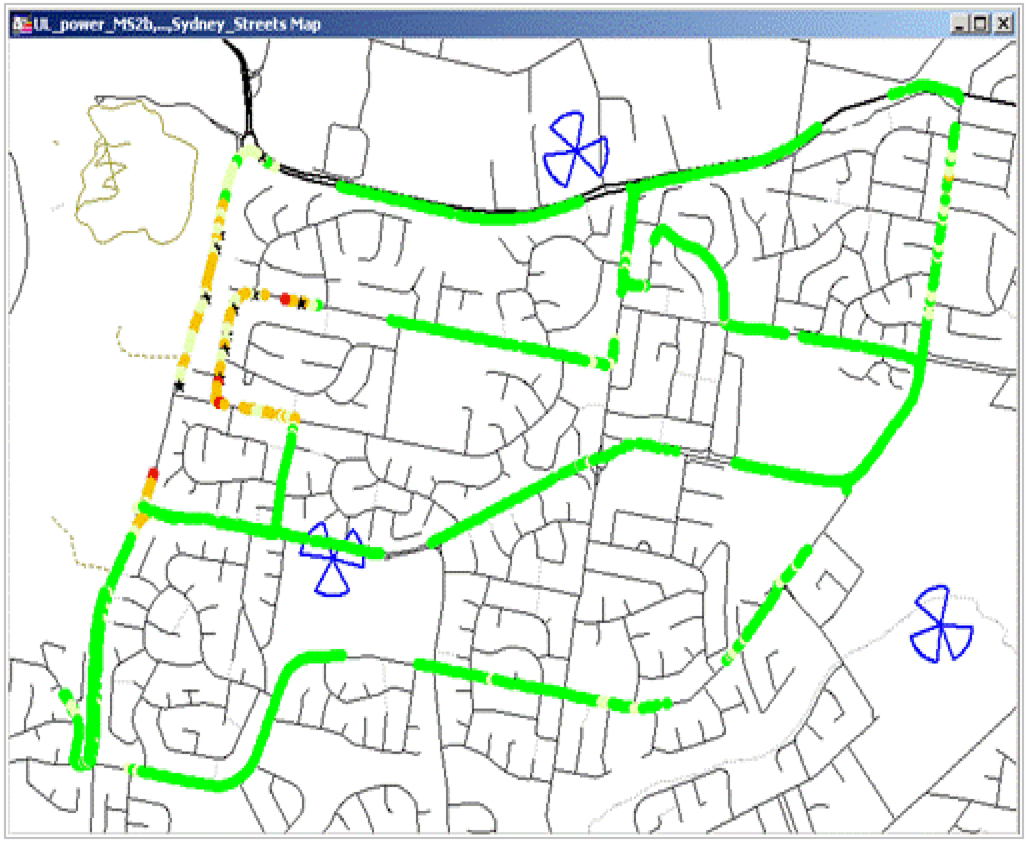
- **Methodology**
  - The observed symptoms that can be derived from drivetest shall be:
    - ✓ Received Ec/No of the pilot channel is larger than -16dB and;
    - ✓ Transmitted UE Power reaches to maximum allowed value and;
    - ✓ The connection finally drops.

RAN Tuning

Imbalance Pilot Coverage Analysis

Item 8

- Using TIPP-W, displaying UE Tx Power during active mode would help us to identify areas that are UL limited.
- Imbalance Pilot Coverage can be identified from here.



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RAN Tuning
Imbalance Pilot Coverage Analysis

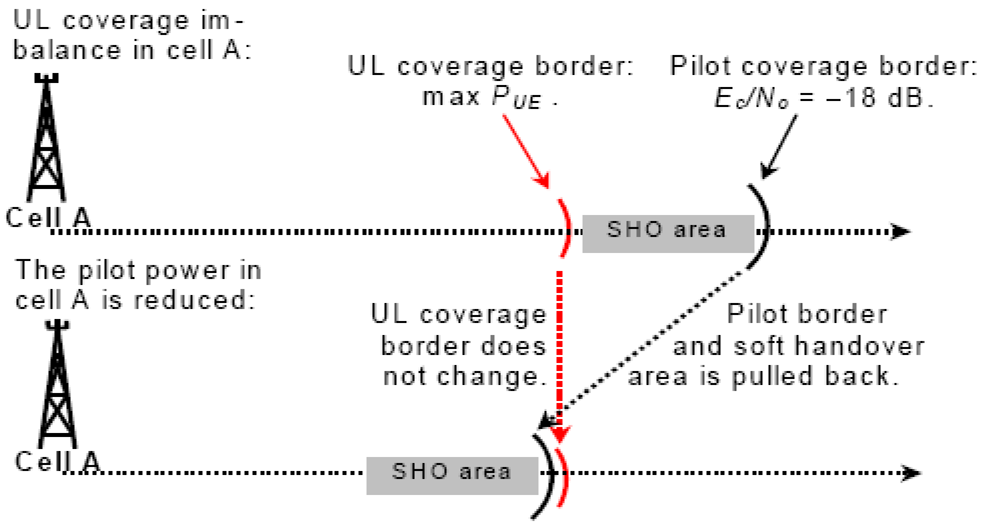
Item 8

- **Analysis**
  a) Verify whether the cause of uplink and pilot coverage imbalance due to the pilot power of the cell is set too large.
  b) Check whether too high UE Tx power restriction has been applied, i.e. too low UE Max Transmission Power. Thus, the UE Tx power is limited by this parameter setting.
  c) When implementing TMA, pathloss calculation that including uplink feeder attenuation, downlink feeder attenuation, uplink TMA gain, downlink TMA insertion loss, etc. one should verify the sum of all parameters for uplink antenna path. If it is larger than the sum of the real values, the uplink RSSI then will be under-estimated.

RAN Tuning
Imbalance Pilot Coverage Analysis

Item 8

- **Solution continue**
  a) When the uplink coverage border (PRACH or DPCH) cannot reach the soft handover area location, the pilot coverage is larger than the uplink coverage. The only way to solve this problem is to reduce the pilot power Primary CPICH power.



This modification will reduce the downlink coverage and pull back the soft handover area. Nothing can be done on the uplink side since UE Tx power is restricted by terminal design.

RAN Tuning

Imbalance Pilot Coverage Analysis

- **Solution continue**

  b) When the UE Tx power restriction has been too high, i.e. too low UE Max Transmission Power, then UE Max Transmission Power should be set as the one used in dimensioning or cell planning. For example, if the maximum UE Tx power is assumed to be 24dBm for all UE classes in the dimensioning, the UE Max Transmission Power should be set to be 24dBm.

  The UE Max Transmission Power parameter will affect the cell re-selection procedures in idle mode. If it is set too high, the “Pcompensation”, which is equal to maximum value between “the UE Max Transmission Power - output power of the UE according to its class” and zero, becomes large and the idle mode cell coverage for some UE classes will then be shrunk.

RAN Tuning

Imbalance Pilot Coverage Analysis

Item 8

- **Solution continue**
  c) When incorrect power measurement due to TMA is the case, the unique way to solve this problem is to correct these parameters as the real ones. However, it is a time consuming solution and difficult to measure the accurate feeder loss and TMA gain value.

RAN Tuning
Swapped Feeders Analysis

Item 9

- **Objective**

  Aim is to identify case of swapped installation on feeders or antenna that affect to radio interface performance of WCDMA cells.

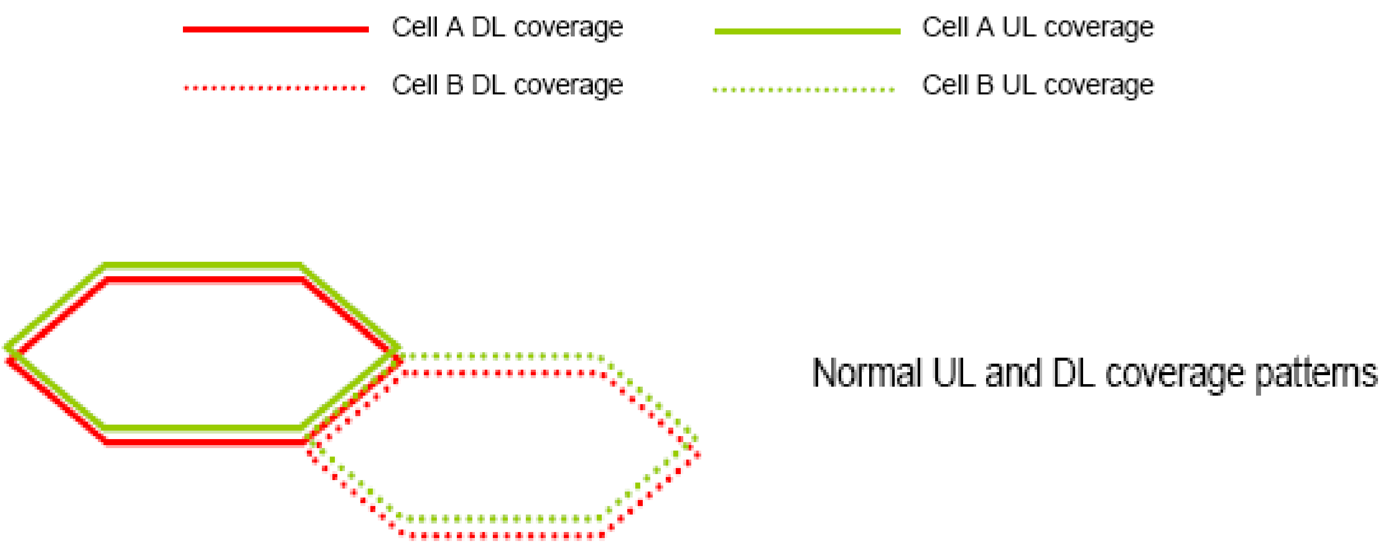
- **Methodology**
  - The monitoring tools for swapped feeder problem are pilot scanner and TEMS.
  - The observed symptoms that can be:
    - ✓ High downlink interference;
    - ✓ Slight high UE Tx power;
    - ✓ Connection setup failure during random access or uplink DPCH synchronization procedures;
    - ✓ No downlink coverage;
    - ✓ Handover failure;
    - ✓ Wrong scrambling code coverage, etc.

RAN Tuning

Swapped Feeders Analysis

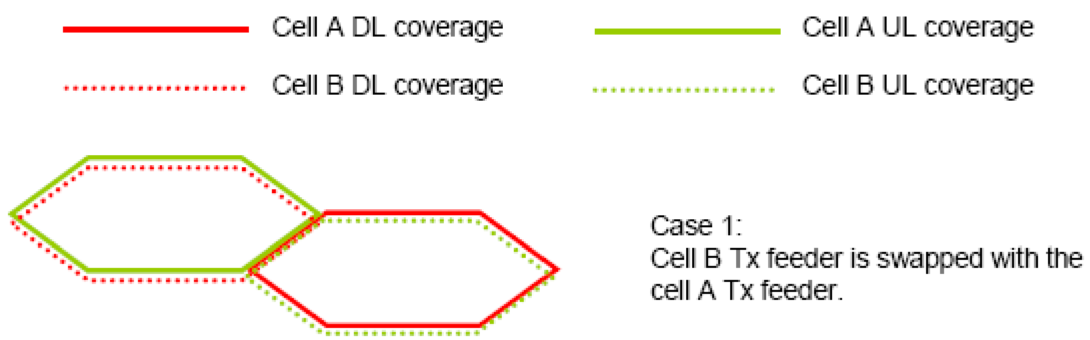
Item 9

- **Analysis**
  - Swapped feeders can cause many major problems in the network, e.g. no downlink coverage, no uplink coverage or high UL/DL interference. Normal UL and DL coverage pattern should follow:



RAN Tuning
Swapped Feeders Analysis

- **Analysis**
  - Below are some (not all) examples of swapped feeders:

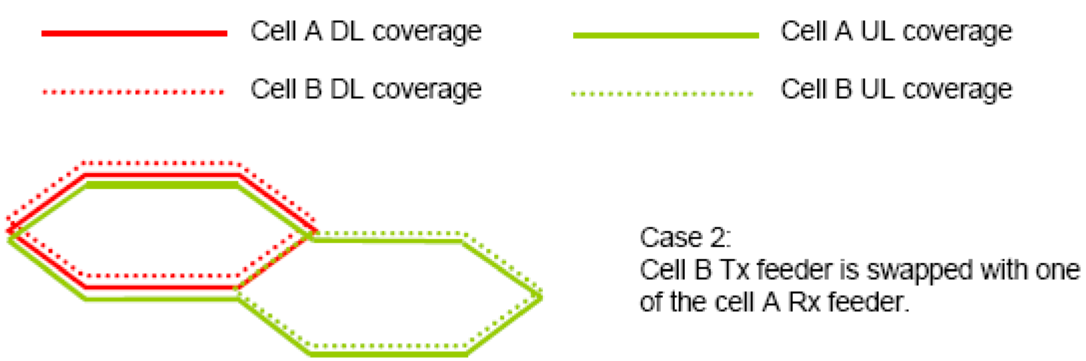


  - Using Pilot Scanner will be found the scrambling codes cover wrong directions.
  - Using TEMS can be identified:
    - ✓ Handover may fail from other cells to them due to improper handover relationship or uplink DPCH synchronization problem.
    - ✓ Connection setup will fail during random access or uplink DPCH synchronization procedures.

RAN Tuning
Swapped Feeders Analysis

Item 9

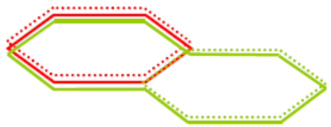
- **Analysis**
  - Below are some (not all) examples of swapped feeders:



- Using Pilot Scanner will be found:
  - ✓ Scrambling codes cover wrong directions.
  - ✓ No downlink coverage, i.e. low RSCP in somewhere.
  - ✓ High downlink interference, i.e. low Ec/No and high DL RSSI in somewhere.

RAN Tuning
Swapped Feeders Analysis

Item 9



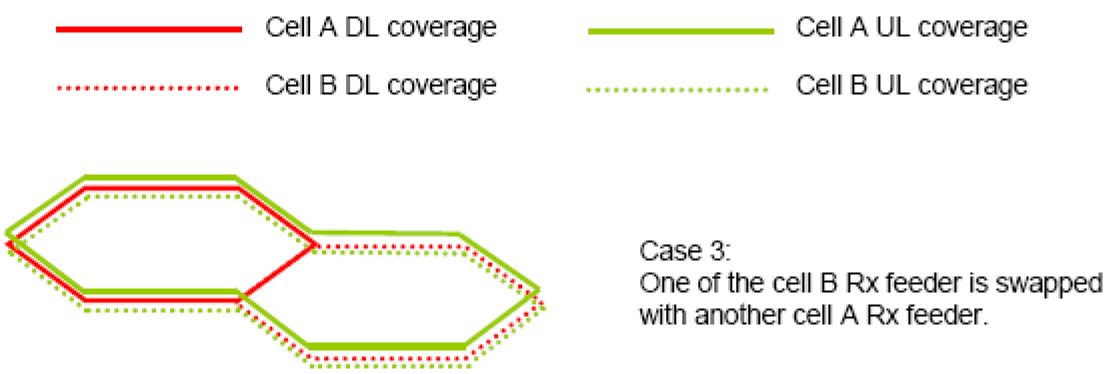
Case 2:
Cell B Tx feeder is swapped with one of the cell A Rx feeder.

- **Analysis**
  - Using TEMS can be identified:
    - ✓ If the UE tries to connect to cell B in cell A area, connection setup may fail during random access or uplink DPCH synchronization procedures.
    - ✓ If the UE tries to handover to cell B in cell A area, the UE may always send addition handover events to UTRAN but handover function always fails due to uplink DPCH synchronization problem.
    - ✓ The UE connected to cell A slightly transmits higher UE Tx power more than that in normal feeder case due to higher UL interference, i.e. UL RSSI.
    - ✓ Connection may drop if the UE moves to the planned cell B area due to no coverage

RAN Tuning
Swapped Feeders Analysis

Item 9

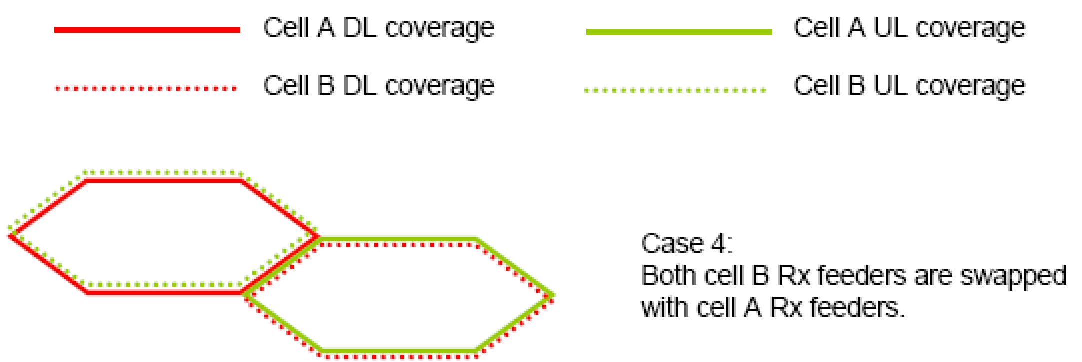
- **Analysis**
  - Below are some (not all) examples of swapped feeders:



  - Using TEMS will be found:
    - ✓ The UE connected to cell A or/and cell B slightly transmits higher UE Tx power more than that in normal feeder case due to higher UL interference, i.e. UL RSSI.

RAN Tuning
Swapped Feeders Analysis

- **Analysis**
  - Below are some (not all) examples of swapped feeders:

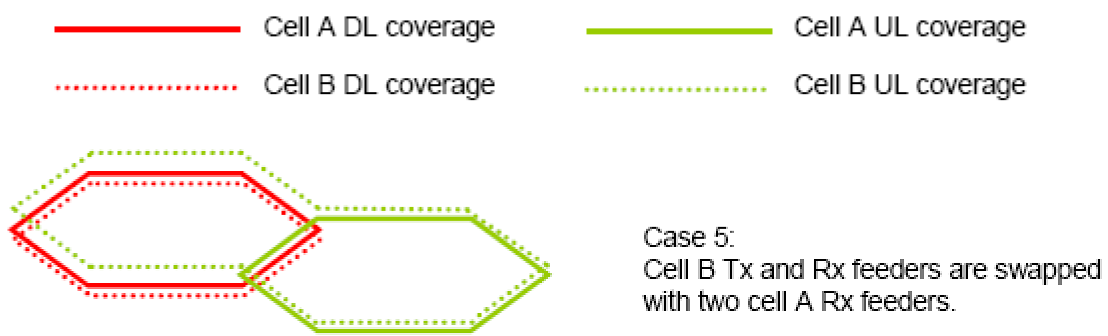


  - Using TEMS will be found:
    - ✓ Connection setup will fail in both cells during random access or uplink DPCH synchronization procedures.
    - ✓ Handover will fail from other cells to either cell A or cell B due to uplink DPCH synchronization problem or improper handover relationship.

"Item 9"

RAN Tuning
Swapped Feeders Analysis

- **Analysis**
  - Below are some (not all) examples of swapped feeders:



  - Using Pilot Scanner will be found:
    - ✓ No downlink coverage, i.e. low RSCP in somewhere.
    - ✓ High downlink interference, i.e. low Ec/No and high RSSI in somewhere.
    - ✓ Scrambling code covers wrong direction.

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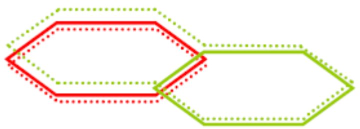
RAN Tuning
Swapped Feeders Analysis



Case 5:
Cell B Tx and Rx feeders are swapped with two cell A Rx feeders.

- **Analysis**
  - Using TEMS can be identified:
    - ✓ Connection setup will fail in cell A during random access or uplink DPCH synchronization procedures.
    - ✓ Connection may drop if the UE moves to the planned cell B area due to no coverage.
    - ✓ Handover will fail from other cells to either cell A due to uplink DPCH synchronization problem or improper handover relationship.
    - ✓ The UE connected to cell B slightly transmits higher UE Tx power more than that in normal feeder case due to higher UL interference, i.e. UL RSSI.

RAN Tuning
Swapped Feeders Analysis

- **Solution**
  - The direct solution is to check that feeders are not crossed and the scrambling codes are set correctly for the all cells in the site.

RAN Tuning
AAL2 Problem

Item 10

- **Objective**

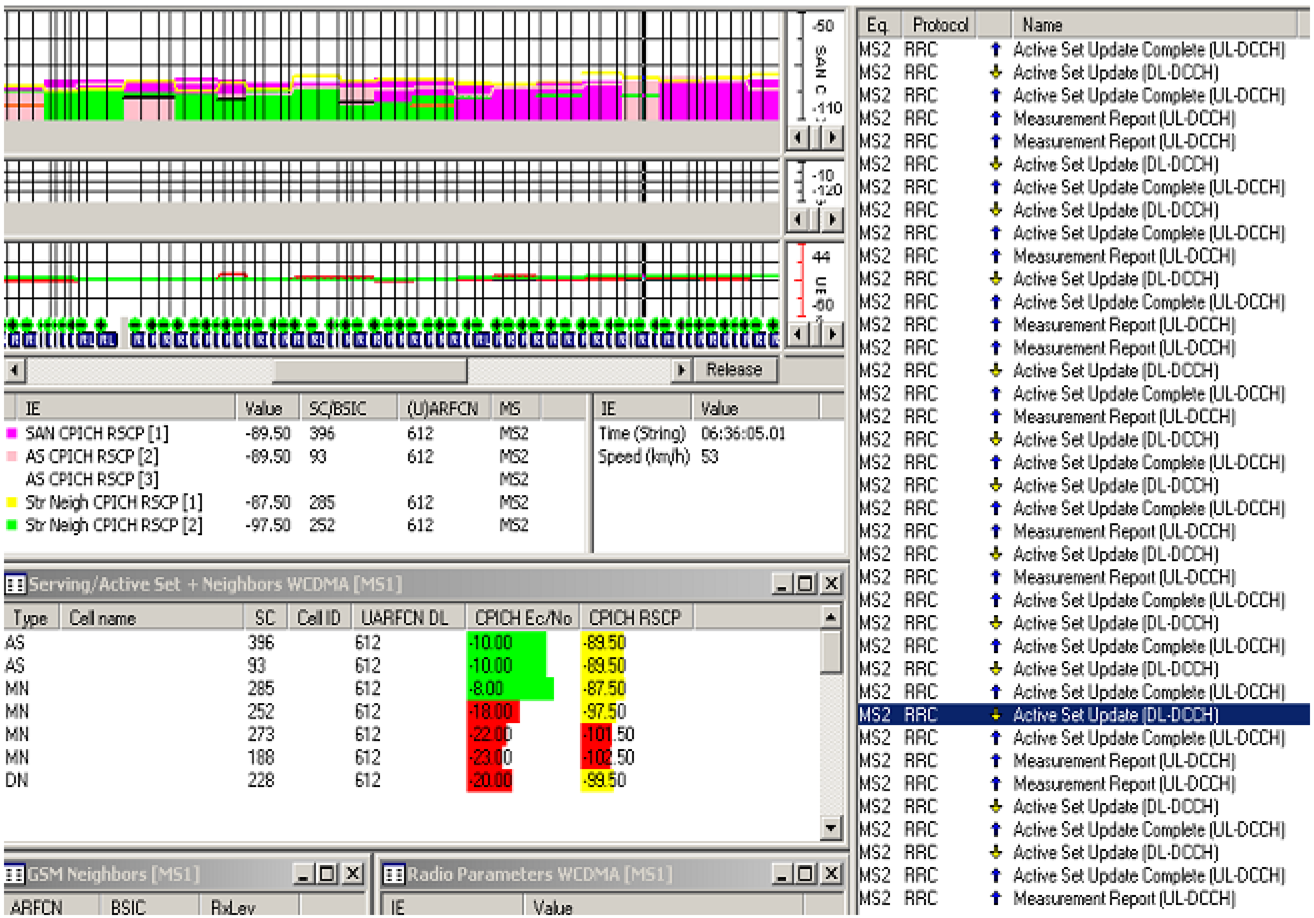
Aim is to identify most common AAL2 problem and its impact during Handover procedure.

- **Methodology**
  - During field test was observed that particular situation on which a radio link was keep continue added and then removed immediately without measurement report.
  - Observation of handover performance on OSS statistic is found degraded, especially on the 3G cluster on which (new) HSDPA cell exist.
  - Finding SHO failure & DCR PS/HS due to unsupported AAL2QoS class in some sites which are surrounding HSDPA sites

RAN Tuning
AAL2 Problem

Item 10

Common AAL2 problem and its impact during soft handover procedure ..



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RAN Tuning
AAL2 Problem

Item 10

- **Analysis**

  Analysis may be focused to verify whether AAL2 problem is exist, e.g. QoS profile setting, transmission problem, etc.

- **Solution**

  Set the transport parameter of AAL2 QoS profile in that way so addition of a new radio link able to provide suitable barrier capability.

  Sample of action after there was finding of SHO failure & DCR PS/HS due to unsupported AAL2QoS class in some sites which are surrounding HSDPA sites can be seen on the next slides.

Example of AA2QoS Profile Setting before changes

Item 10

```
RXYOG01>
081030-15:59:17 10.200.0.89 7.1 CPP_MOM_MOM-CPP6-LSV31_1 stopfile=/tmp/932
===================================================================================
1147                TransportNetwork=1,Aal2PathVccTp=b562a2
===================================================================================
Aal2PathVccTpId              b562a2
aal2PathId                   5622
aal2PathOwner                true
aal2QoSAvailableProfiles     3 (CLASS_A_B)
aal2QoSProfileId             Aal2QosProfile=ad10bd20
administrativeState          1 (UNLOCKED)
alarmReport                  2 (ALARM_LOC)
availabilityStatus           0 (NO_STATUS)
continuityCheck              false
counterActivation            false
counterMode                  6 (PM_MODE_FPM_BR)
nomPmBlocksize               1024 (NOM_PM_BLKSIZE_2_10)
operationalState             1 (ENABLED)
remoteBlockingState          1 (REMOTELY_UNBLOCKED)
reservedBy                   Aal2Sp=1,Aal2Ap=b562,Aal2PathDistributionUnit=b562
timerCu                      10
userLabel                    Aal2PathVccTp b562a2
vclTpId                      AtmPort=MS-8-1-52,VplTp=vp1,VpcTp=1,VclTp=vc46
===================================================================================
```

Class A support Speech, Video Streaming etc
Class B support Packet Interactive R99

Example of AA2QoS Profile Setting after changes

Item 10

RXYOG01>
081030-16:00:50 10.200.0.89 7.1 CPP_MOM_MOM-CPP6-LSV31_1 stopfile=/tmp/932
==
1147 TransportNetwork=1,Aal2PathVccTp=b562a2
==
Aal2PathVccTpId b562a2
aal2PathId 5622
aal2PathOwner true
aal2QoSAvailableProfiles 7 (CLASS_A_B_C)
aal2QoSProfileId Aal2QosProfile=ad10bd20
administrativeState 1 (UNLOCKED)
alarmReport 2 (ALARM_LOC)
availabilityStatus 0 (NO_STATUS)
continuityCheck false
counterActivation false
counterMode 6 (PM_MODE_FPM_BR)
nomPmBlocksize 1024 (NOM_PM_BLKSIZE_2_10)
operationalState 1 (ENABLED)
remoteBlockingState 1 (REMOTELY_UNBLOCKED)
reservedBy Aal2Sp=1,Aal2Ap=b562,Aal2PathDistributionUnit=b562
timerCu 10
userLabel Aal2PathVccTp b562a2
vclTpId AtmPort=MS-8-1-52,VplTp=vp1,VpcTp=1,VclTp=vc46
==

Class C support HSDPA

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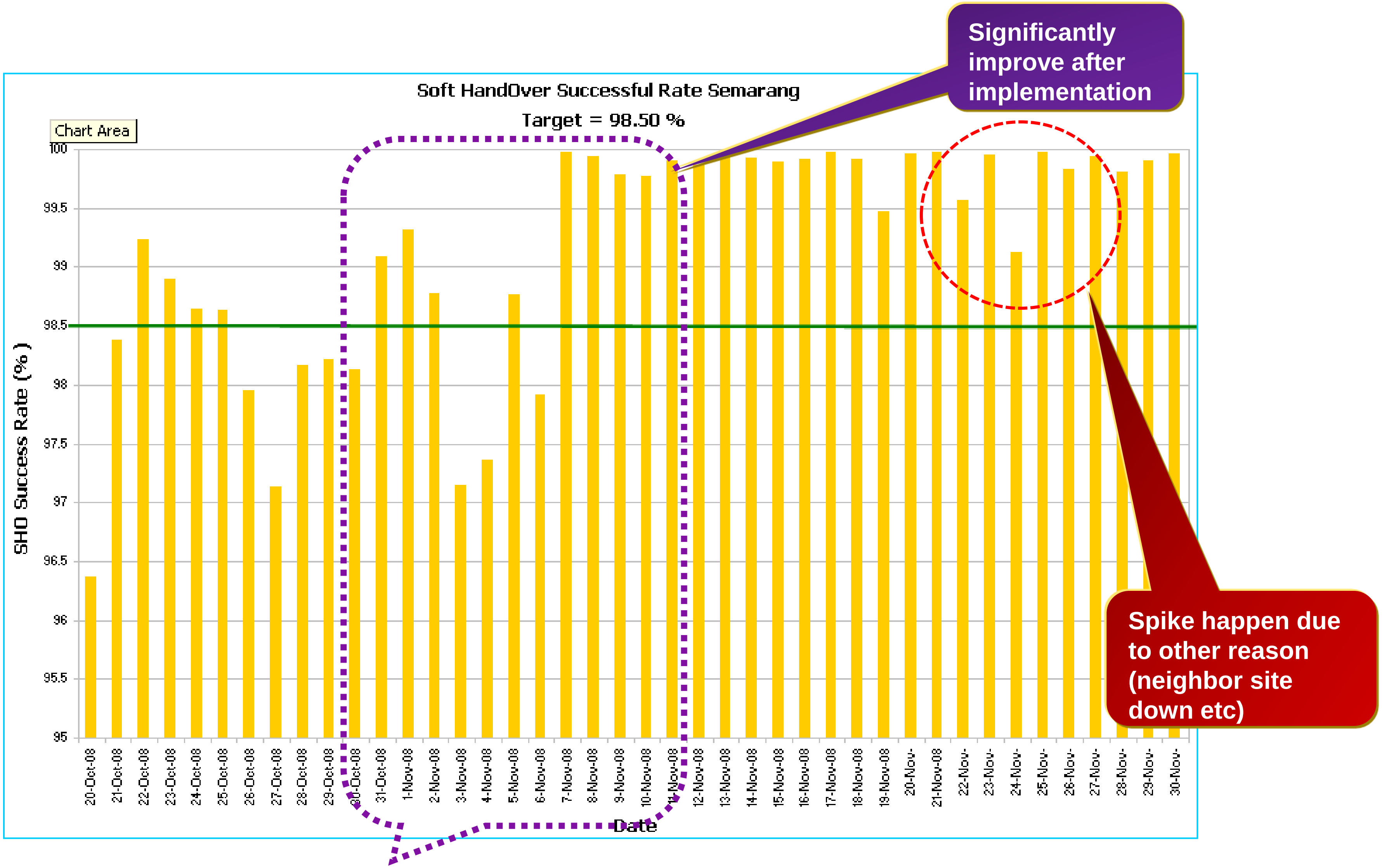
SHO Success Rate Improvement

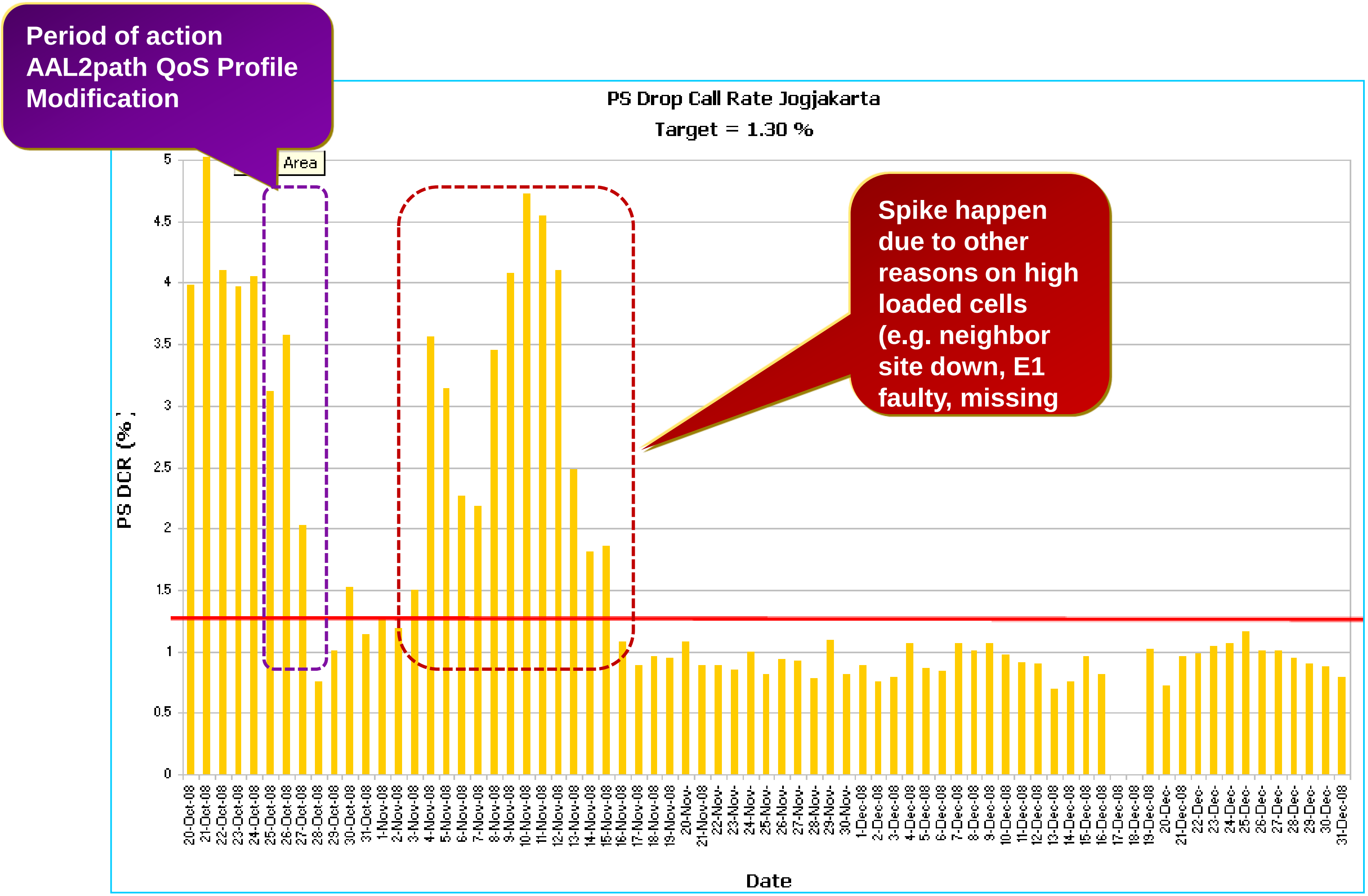
Item 10



Period of action AAL2path Qos Profile Modification

DCR PS Improvement

Item 10



An improve after AAL2 QoS profile modification.

RAN Tuning
Sleeping Cell Problem

Item 11

- **Objective**

  Aim is to find sleeping cells on which the cell that is on-services and can be camped on but somehow the UE can not establish the call nor handover.

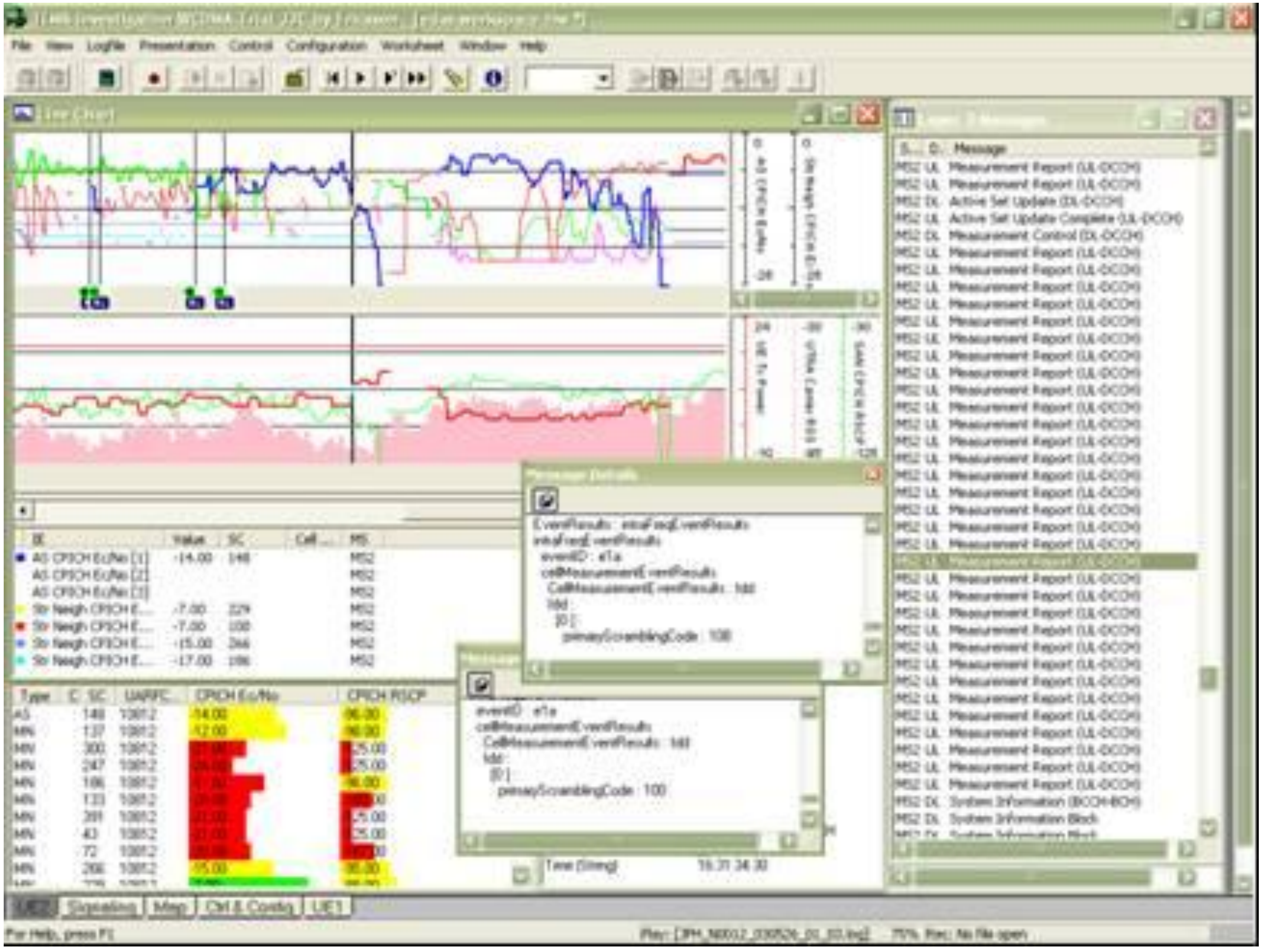
- **Methodology**
  - Finding the cells with no traffic being carried from statistic.
  - Conduct test call to verify call establishment and handover process.

- **Analysis**
  - Have a look on layer 3, in the case of handover, the UE sends many measurement reports to add the cell into the active set. However, the UTRAN does not reply the measurement report by sending active set update message even the uplink RF performance is very good. After connection drop, the UE still can't be connected to that sleeping cell.
  - It is possible that the RNC does not send the radio link setup request to the RBS for resource allocation.

RAN Tuning
Sleeping Cell Problem

Item 11

Captured screen of TEMS windows during sleeping cell test.



RAN Tuning
Sleeping Cell Problem

Item 11

- **Solution**

In most cases, it is a hardware problem. Consult to supplier support.

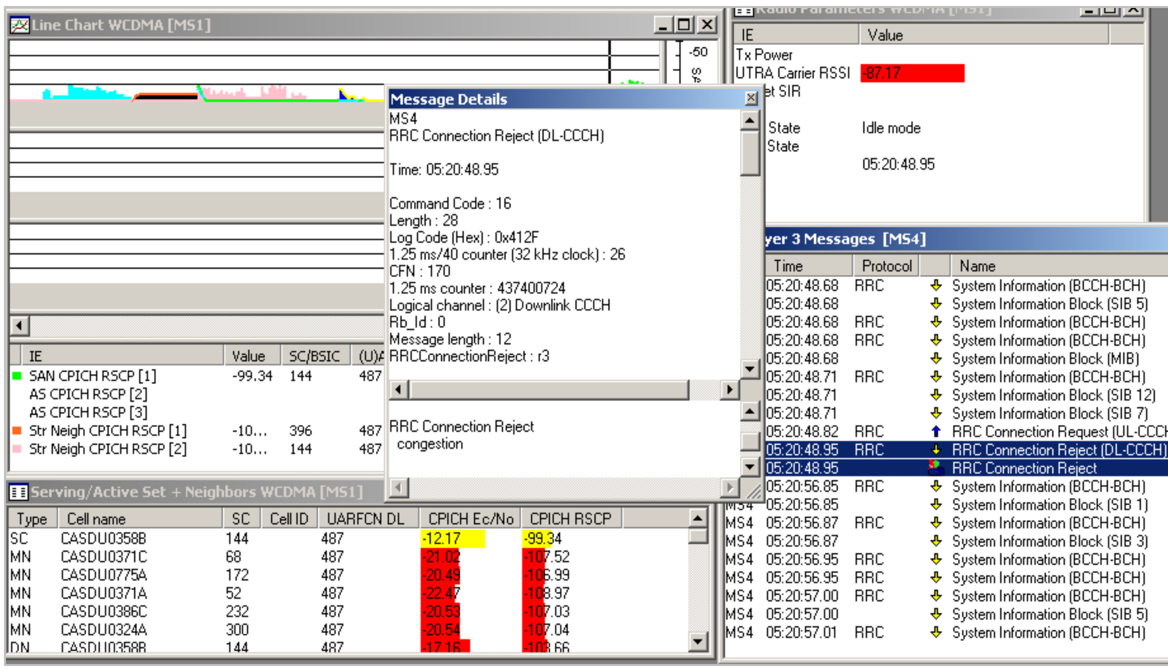
RAN Tuning
Admission Reject Problem

Item 12

- **Objective**

  Aim is to identify cause of admission reject problem that might be identified during drive test.

- **Methodology**
  - Refer to analysis.



RRC Connection Reject message.

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Item 12

RAN Tuning
Admission Reject Problem

- **Analysis**
  - The analysis shall be rectified to verify cell load and power setting.
  - Possible reason on this case:
    - ✓ Higher load in cells. This can be caused by the number of traffic in cells, or not enough power left in the cell due to high feeder loss.
    - ✓ Improper common channel power setting.
    - ✓ Improper admission control parameter setting.
  - There is a small macro to verify the load of the cell for admission control as the below attachment.

Microsoft Office
xcel 97-2003 Workshe

RAN Tuning
Admission Reject Problem

- **Solution**
  - Check if the feeder loss is high, recommend to change the bigger one or change the MCPA to get higher output power.
  - Verify and correct improper parameter setting for both common channel power and admission control power.

Attached is sample power audit report in managing power setting that giving benefit of RRC Connection Success Rate.

C:\Documents and ttings\User\My Docur

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RAN Tuning
Cell Reselection Failure

Item 13

- **Objective**

  Aim is to identify cause of cell reselection failure for UE in idle or cell_FACH mode.

- **Methodology**
  - From the drive test, following symptoms will be found that by using TEMS and pilot scanner:
    - ✓ The UE in cell_FACH mode does not send ‘cell update’ message to the UTRAN even it has entered coverage area of the desired cell or
    - ✓ The UE in idle mode camps on the wrong cell even it has entered coverage area of the desired cell.
  - Method of identification to find the failure shall be following the analysis part.

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Item 13

RAN Tuning
Cell Reselection Failure

- **Analysis**

  The following possible reasons shall be analyzed to identify the exact cause of cell reselection failure:

  - **Incorrect cell re-selection series.**

    The UE might have camped on to wrong cell and this cell does not have neighboring relationship with the desired cell. Re-selection series could be messed up because: cell update procedure failure or too many unnecessary neighboring relationships or unwanted cell overshooting.

  - **Missing neighboring relationship.**

    The possible reason why the cell re-selection detection fails is because of missing neighboring cell relationship. In the drive test, the engineer can monitor the neighboring cell window to check if the desired cell is included in the neighboring cell list.

RAN Tuning
Cell Reselection Failure

Item 13

- **Analysis**
  - **Pilot pollution in idle or cell_FACH mode.**

    Pilot pollution can lead failure in the cell re-selection event detection.
  - **Improper cell re-selection offset setting.**

    If the cell re-selection offset Q Offset 1sn (CPIC RSCP) or Q Offset 2sn (CPIC RSCP) between the camped cell and the desired cell is too positive, the ranking in the cell re-selection procedure of the desired cell becomes very low. Therefore, even though the actual quality and signal strength of the pilot in the desired cell are good enough to provide coverage, the UE does not camp on the cell, i.e. cell re-selection fails.

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Item 13

RAN Tuning
Cell Reselection Failure

- **Solution**
  - **Incorrect cell re-selection series.**

    If the problem is due to too many unnecessary neighboring relationships, the engineer should carefully justify the usefulness of these relationships and remove the unnecessary ones.

    If the problem is due to overshooting of the unwanted cell, the engineer should check why the cell is overshooting.
  - **Missing neighboring relationship.**

    The direct solution is to add the desired cell into the neighboring cell list. However, it should be noted that too many neighboring cell relationships might slow down the search for the pilot channels in the UE.

RAN Tuning
Cell Reselection Failure

Item 13

- **Solution**
  - **Pilot pollution in idle or cell_FACH mode.**

    Refer to pilot pollution identification and solution.
  - **Improper cell re-selection offset setting.**

    The Q Offset 1sn (CPIC RSCP) or Q Offset 2sn (CPIC RSCP) should be changed to not too large positive.

RAN Tuning
RRC Establishment Failure

Item 14

- **Objective**

  Aim is to identify causes of RRC establishment failure.

- **Methodology**

  Drivetest analysis approach.

- **Analysis**
  - RRC connection Establishment provides the ability to establish an RRC connection, which is a logical connection, between the UE and UTRAN at L3. A radio connection comprises the connection between a UE and UTRAN including all the resources, i.e., L1, L2 and L3. The UE makes the initial access to UTRAN and requests for a RRC connection. Radio resources are allocated and a RRC connection is established between UE and UTRAN.
  - From the drive test, the following symptoms will be identify as starting point of analysis:

RAN Tuning
RRC Establishment Failure

Item 14

- **Analysis continue**
  - ✓ Case-1: The UE does not send out RRC connection request message to the UTRAN.

    It's probably due to there is a failure in RRC connection release. If a RRC connection had been established, it is impossible to connect more than one RRC connection unless the previous RRC connection is released.
  - ✓ Case-2: The UE receives RRC connection setup message and starts the transmission. However, target RBS does not send out Radio link restore indicator to the RNC.

    It's probably due to there is a uplink dedicated radio link synchronization failure. The UE receives RRC connection setup message and starts the transmission. However, target RBS does not send out Radio link restore indicator to the RNC. It implies the UE and UTRAN are trying to synchronize each other but uplink is not synchronized.

RAN Tuning
RRC Establishment Failure

- **Analysis continue**
  - ✓ Case-3: The UE receives RRC connection setup message and starts the transmission. However, the UE does not send out RRC connection setup complete message to the UTRAN.

    It is probably due to downlink dedicated radio link synchronization failure. The UE receives RRC connection setup message and starts the transmission. However, the UE does not send out RRC connection setup complete message to the UTRAN. It implies the UE and UTRAN are trying to synchronize each other but downlink is not synchronized.

Item 14

RAN Tuning
RRC Establishment Failure

- **Analysis continue**
  - ✓ Case 4: The UE receives RRC connection setup message and starts the transmission. After a while, the UE sends out RRC connection setup complete message to the UTRAN; however, the RRC connection establishment fails.

    It is probably due to poor quality in uplink. the UE sends out RRC connection setup complete message to the UTRAN via the established dedicated channel; however, the RRC connection establishment still fails. It implies the UTRAN does not receive the RRC connection setup complete message.

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RAN Tuning
RRC Establishment Failure

Item 14

- **Analysis continue**
  - ✓ Case 5: The UE receives RRC connection reject message with cause value congestion.

    It is probably due to connection rejected by load supervision function. At each request for establishment of a new RRC connection, it is checked that this is accepted by the processor load supervision function in the RNC. In case of reject from the load supervision function, the S-RCH will send RRC connection reject message to the UE and the procedure ends. The cause value of the message is congestion.
  - ✓ Case 6: The UE receives RRC connection reject message with cause value “unspecified”.

    It is probably due to dedicated radio link setup failure.

RAN Tuning
RRC Establishment Failure

Item 14

- **Analysis continue**
  - ✓ Case-7: The UE repeatedly sends RRC connection request messages but the number of transmission is less than N300 + 1 times.

    It is because of no suitable cell. Normally, the UE will repeatedly transmit RRC connection request in or more than N300 + 1 times if the UE does not receive any RRC connection setup message. Therefore, if the number of transmissions is less than N300 + 1 times, it implies no suitable cell event happens during RRC connection establishment.
  - ✓ Case 8: The UE does not receive any message from the UTRAN.

    The RRC connection reject or RRC connection setup message is transmitted via S-CCPCH (FACH). If the UE does not receive any message from the UTRAN, the possible reason is because of S-CCPCH (FACH) failure.

RAN Tuning
RRC Establishment Failure

- **Solution**
  - ✓ Case-2: One of below solutions might be reason of uplink dedicated radio link synchronization failure:
  - Uplink and Pilot Coverage Imbalance. Refer to previous solutions.
  - Improper cell re-selection offset setting. Q Offset 1sn (CPIC RSCP) or Q Offset 2sn (CPIC RSCP) of the camped cell is given too large positive value, the new idle mode coverage may be larger than the maximum allowed UL DPCH coverage, i.e. the location where UE transmits maximum allowed UE Tx power. Those offsets should be changed to not too large positive.
  - Incorrect initial power calculation for dedicated channel. Try to adjust the UL initial SIR target and UL DPCCH power offset to suitable values.

RAN Tuning
RRC Establishment Failure

Item 14

- **Solution continue**
  - ✓ Case-3: One of below solutions might be reason of downlink dedicated radio link synchronization failure:
  - DL DPCH and pilot coverage imbalance. Review power setting between DL DPCH and pilot channel.
  - Improper cell re-selection offset setting. Refer to previous case.
  - Too low initial downlink SIR target. Consider to increase this value.
  - Improper backoff constant setting. The Cbackoff: Constant to backoff the open loop estimate is a constant to back off the Open Loop Power Control estimate to a conservative starting point. Higher Cbackoff: Constant to backoff the open loop estimate means the RBS will transmit higher initial downlink DPCH power. On the other hand, if it is set improperly, synchronization in downlink dedicated radio link during connection setup will fail because of not enough initial downlink DPCH power.

RAN Tuning
RRC Establishment Failure

Item 14

- **Solution continue**
  - ✓ Case-5: The engineer should re-dimension the capacity of the existing RNC. If need be, more processors are added.
  - ✓ Case-6: Refer to RAB Establishment Failure description.
  - ✓ Case-7: No suitable cell can be due to high interference or not enough coverage that might causes out of pilot coverage.
  - ✓ Case-8: S-CCPCH (FACH) failure shall be due to low common channel powers. Engineer has to carefully plan enough common channel powers to fulfill the assumed downlink load.

Item 15

RAN Tuning
RAB Establishment Failure (1)

- **Objective**

  Aim is to identify causes of RAB establishment failure.

- **Methodology**

  Signaling trace analysis from EUTR.

- **Analysis**
  - From the UETR, it is found the core network sends out RAB assignment Request to the S-RNC; however, the S-RNC replies RAB assignment response with cause RABs failed to setup or modify to the core network.

- **Solution**
  - Check pmNoInvalidRabEstablishAttempts statistic for further RAB mapping.
  - Verify whether the UE has enough capability to setup the RAB type.
  - Verify no failure on Iu bearer due to AAL2 connection setup or Iu-c initialization procedure.

RAN Tuning
RAB Establishment Failure (2)

Item 16

- **Objective**

  Aim is to identify causes of RAB establishment failure.

- **Methodology**

  Signaling trace analysis from TEMS.

- **Analysis**
  - Found and relate the problem against the following symptoms:
    - ✓ Case 1: The UTRAN does not send Radio bearer setup message to the UE.
    - ✓ Case 2: The UTRAN sends out Radio bearer setup message to the UE; however, the UE does not receive it.
    - ✓ Case 3: The UE receives Radio bearer setup; however, it does not send out Radio bearer setup complete to the UTRAN.
    - ✓ Case 4: The UE sends out Radio bearer setup complete message to the UTRAN; however, the UTRAN does not receive it.

RAN Tuning
RAB Establishment Failure (2)

Item 16

- **Solution**
  - Case-1: most possibly due to cell blocking. The cell does not have enough radio or hardware resources for the new radio bearer.
  - Case-2: most possibly due to poor quality in downlink.
  - Case-3: most possibly due to non-radio issues.
  - Case-4: most possibly due to poor quality in uplink.

RAN Tuning
Blocked Call Analysis

Item 17

- **Objective**

  Aim is to identify causes of the blocked call event that happens during the call setup phase during drive test.

- **Methodology**

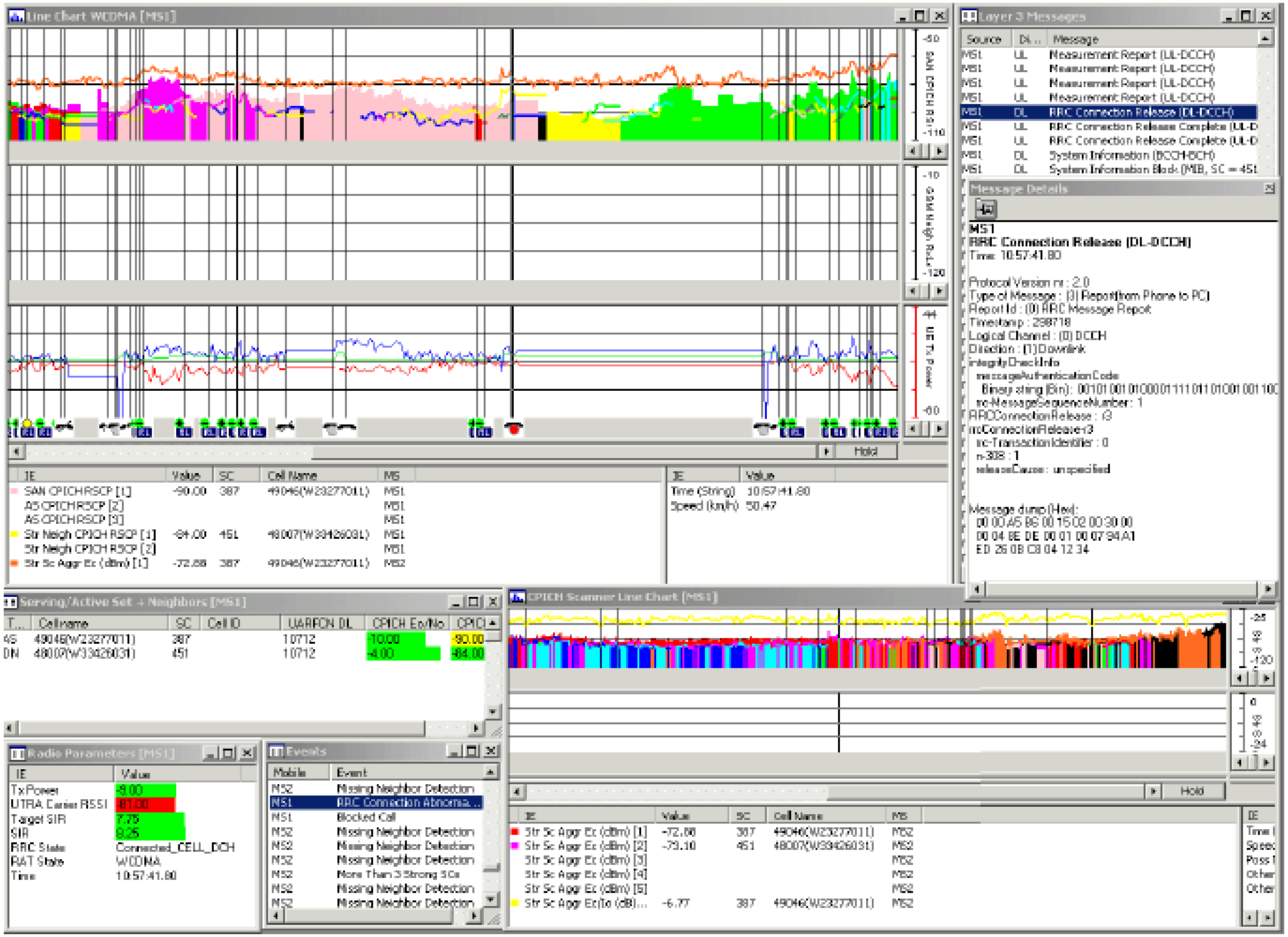
  Signaling trace analysis from TEMS.

- **Analysis**
  - The analysis shall be related to identify below issues:
    - ✓ Missing neighbor reason.
    - ✓ Poor coverage reason.
    - ✓ Security and Authentication Failure reason.
    - ✓ UE freeze.
    - ✓ Disconnect on RAB setup.
    - ✓ Congestion.
    - ✓ UE sensitivity fault.
    - ✓ Unanswered RRC request.
    - ✓ Barred network reason.
    - ✓ Call initiation during LUP signaling.

RAN Tuning
Blocked Call Analysis

Item 17

- **Missing neighbor reason, sample:**



Problem Description: An example of a blocked call caused by a missing neighbor is shown in figure above. The call is being set up on cell 49046 (SC= 387). During the set up sector 48007 (SC=451) becomes the strongest sector but is not added to the active set as the two cells are not defined neighbors. This can be seen in the Serving/Active Set window in TEMS. The cell 48007 act as an increasing interferer until eventually the call itself is released. The release cause is classified as unspecified.

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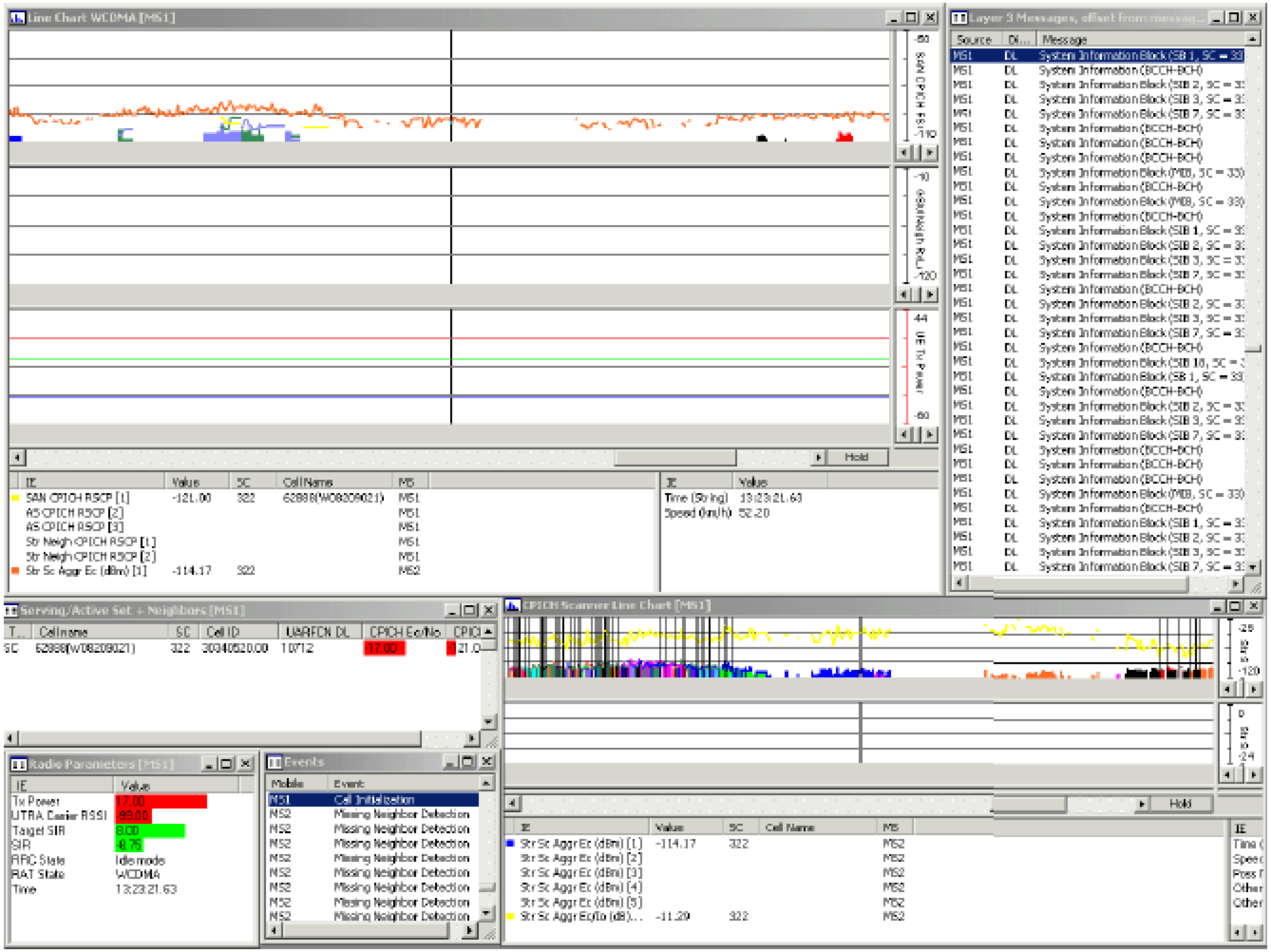
RAN Tuning
Blocked Call Analysis

- **Poor coverage reason, sample:**



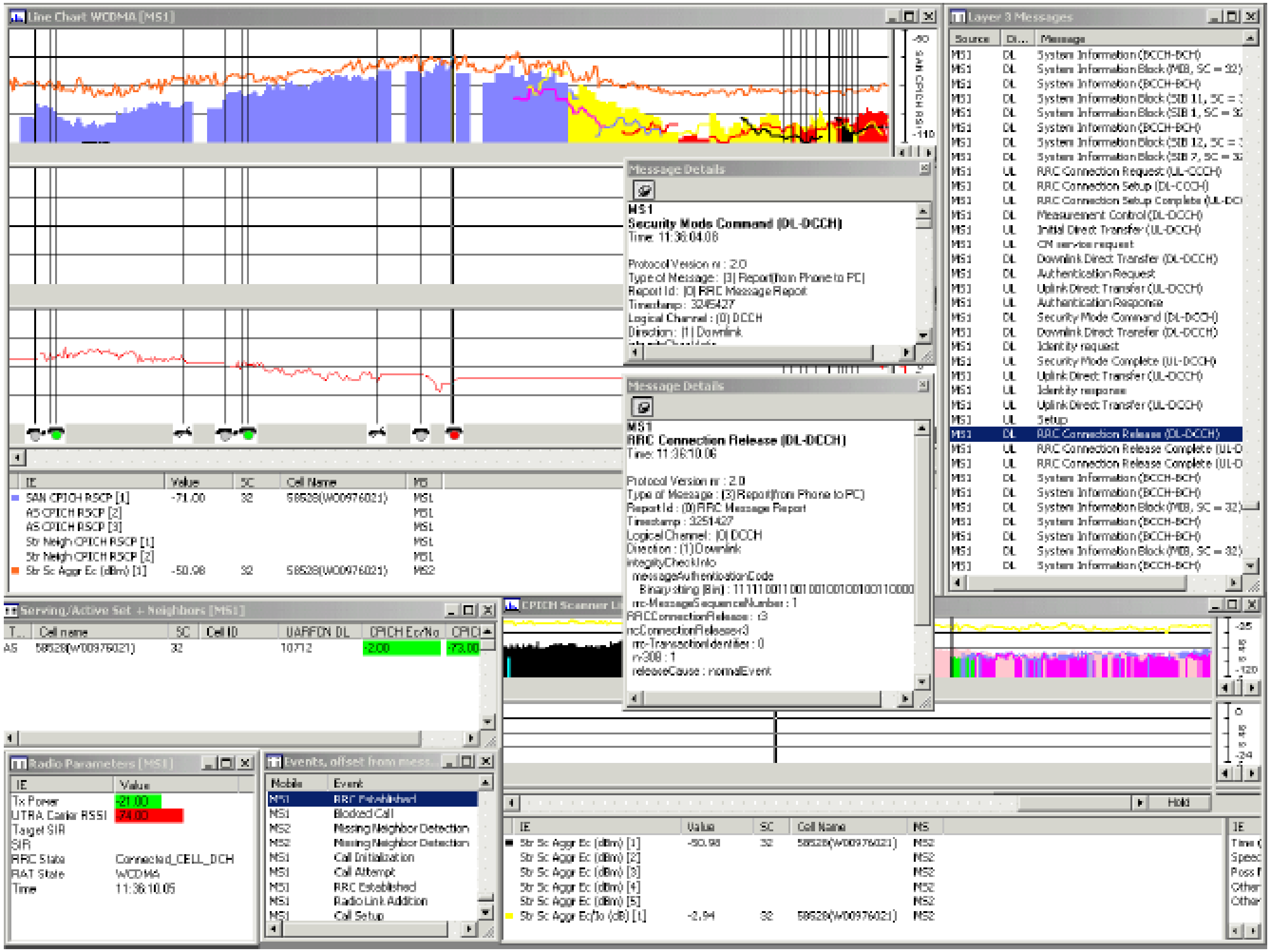
Problem Description: In this case the RF environment as reported by the UE is very poor when the UE attempts to initiate a call. The attempt is indicated by the event “Call Initialization” in TEMS Investigation, which is triggered at the start of a command sequence. The best server RSCP=-121dBm and Ec/No=-21dB. The scanner also reports poor radio conditions for the same SC at the same instant i.e. RSCP =-114.17dBm and Ec/Io = -11.29dB.

RAN Tuning

Blocked Call Analysis

Item 17

- **Security and Authentication Failure reason, sample:**

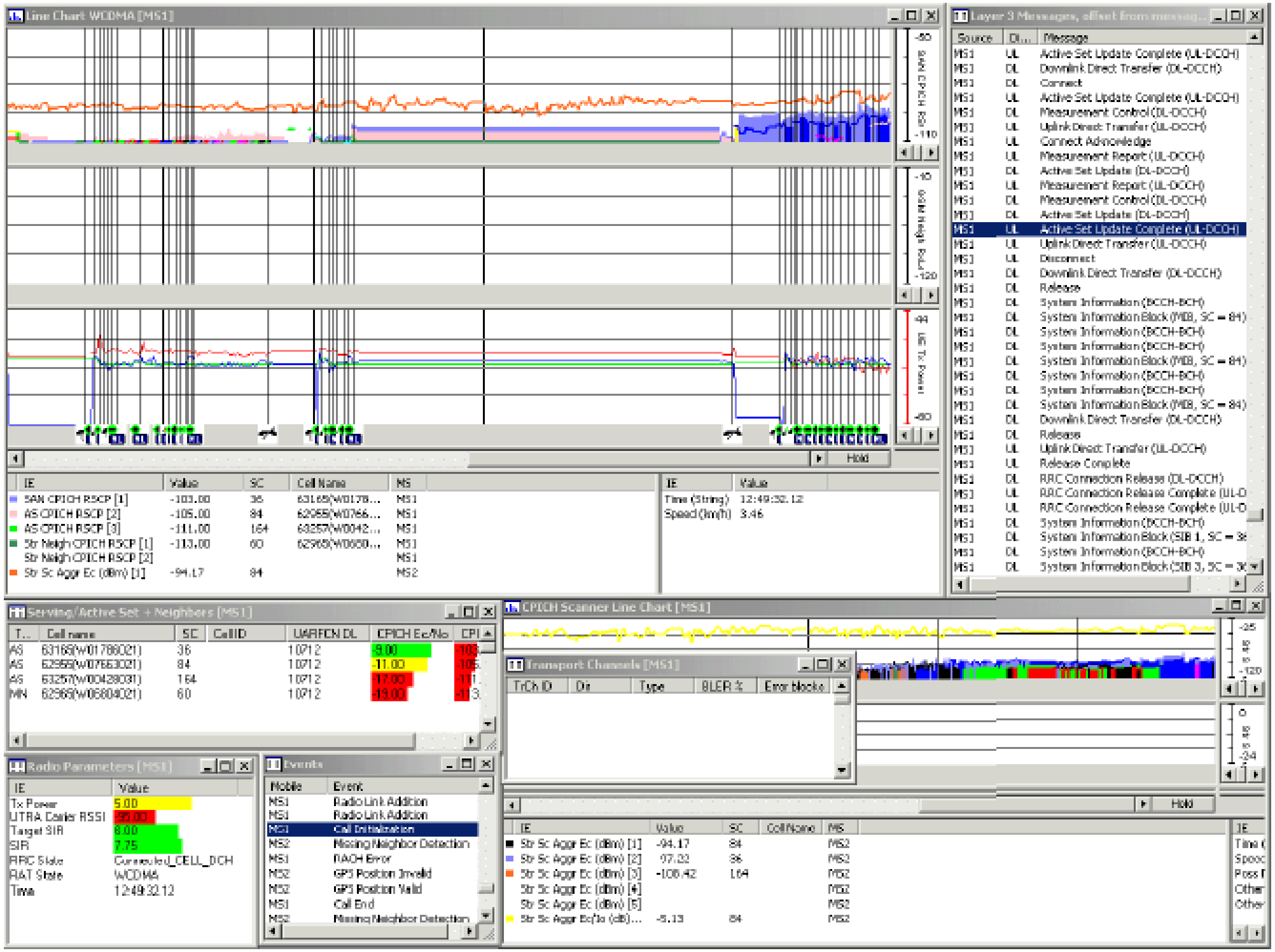


Problem Description: In this case there is a problem with the security and Authentication procedure, which causes the connection to be dropped and result in a blocked call. As can be seen in figure above the radio environment at the time of the blocked call is good i.e. Best server RSCP=-71dBm and Ec/No=-2dB.

The call is released normally during call set up and 6 seconds after the network sends the security command. There is a timer for the correct response to this security command, which is set to 6 seconds. This indicates a problem in the security and authentication response by the UE.

RAN Tuning
Blocked Call Analysis

- **UE freeze, sample:**



Problem Description:
This type of dropped call classification is caused by the UE “freezing” which can be seen in figure below. In the example the UE sends a UL Active Set Update Complete message and then the UE freezes. There are no further massages sent between the network and the UE before the next call attempt, which is indicated by the Call initialization event in TEMS investigation. The RF environment was good at the time of the drop as can be seen from the scanner information i.e. RSCP = -94.17dBm and Ec/Io = -5.13dB.

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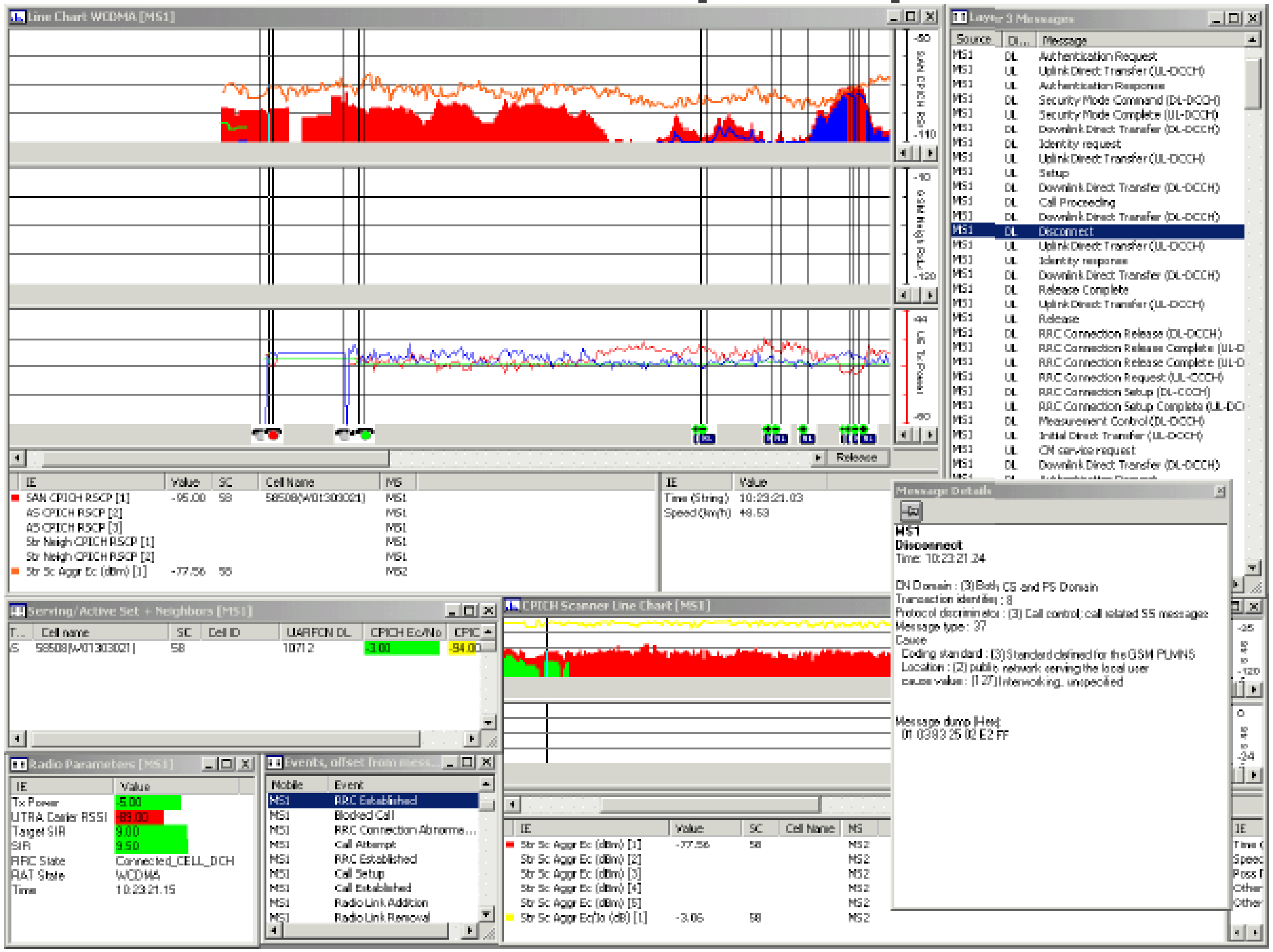
RAN Tuning

Blocked Call Analysis

- **Disconnect on RAB setup, sample:**



Problem Description: In this case the radio environment is good as shown in figure above (i.e. Best server RSCP= -94dBm and Ec/No= -3dB). During call set up, after the “DL Call Proceeding” message the network sends a Disconnect message. This can be seen in the Layer 3 messages window below. The cause value is (127) Interworking, unspecified as shown in L3 message details window. The call is then released.

This case can include both DC Config Failure and RAB setup failure.

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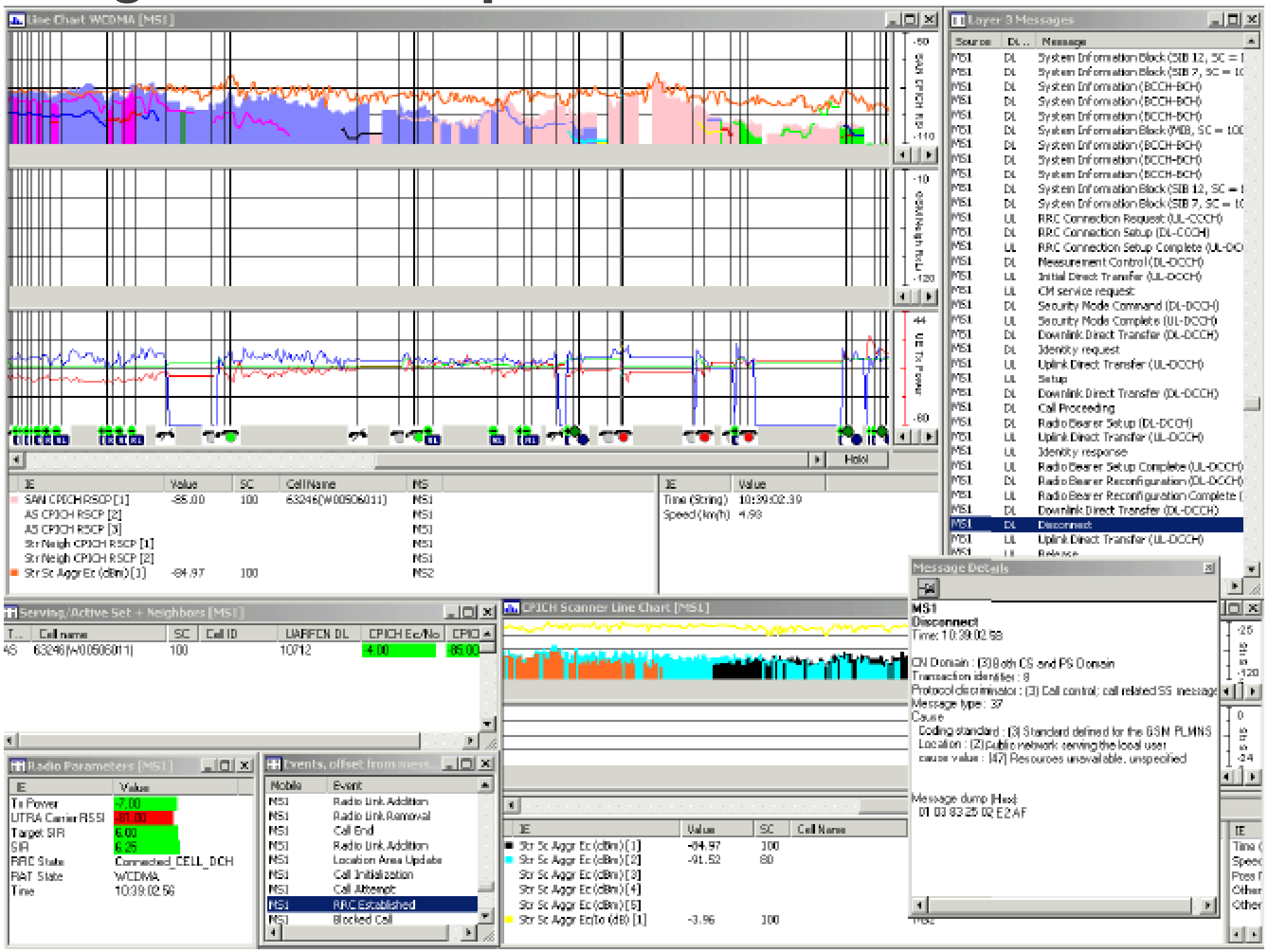
RAN Tuning
Blocked Call Analysis

- **Congestion, sample:**



Problem Description: In this example the network sends a Disconnect message with the following message: cause value (47) Resources Unavailable, Unspecified. This can be seen in the Layer 3 messages window in figure above. The Disconnect message occurs after the Radio Bearer is set up. The radio environment is good at the time of the Disconnect message as seen in figure above.

Sometimes this example of blocked call can be also referred to Congestion problems in the measured cell.

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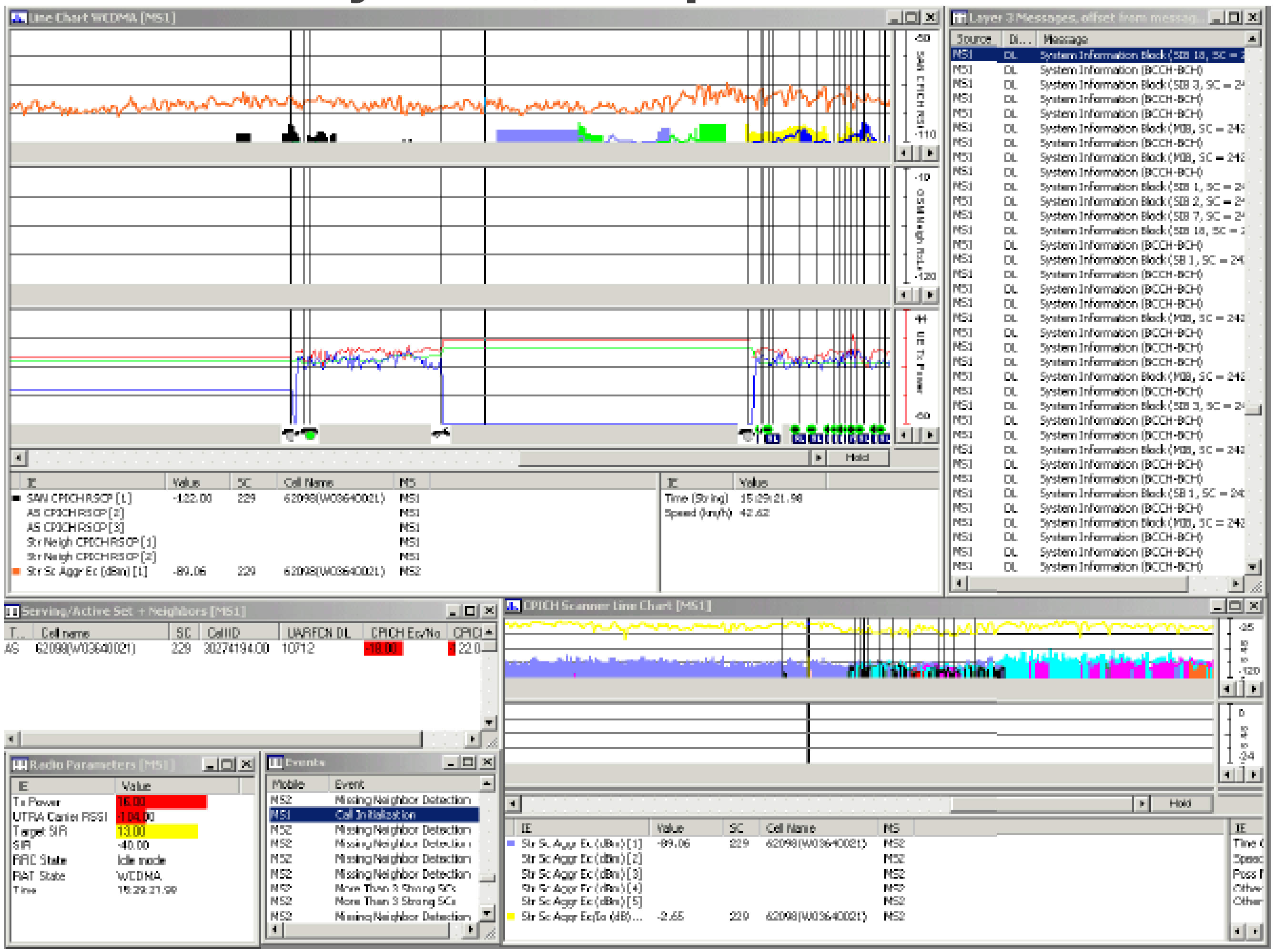
Item 17

RAN Tuning
Blocked Call Analysis

- **UE sensitivity fault, sample:**



Problem Description: In figure above, an example of a drop classified as UE sensitivity fault is shown. The radio environment as reported by the UE is very poor when the UE attempts to initiate a call (i.e. Best server RSCP=-122dBm and Ec/No=-18dB). The scanner reports much better radio conditions for the same SC at the same instant i.e. RSCP =-89.06dBm and Ec/Io = -2.65dB.

Although the blocked call is as a result of low RSCP as measured by the UE it should not be classified, as a poor RF block since the scanner indicates the radio conditions should be sufficient to set up a call.

RAN Tuning
Blocked Call Analysis

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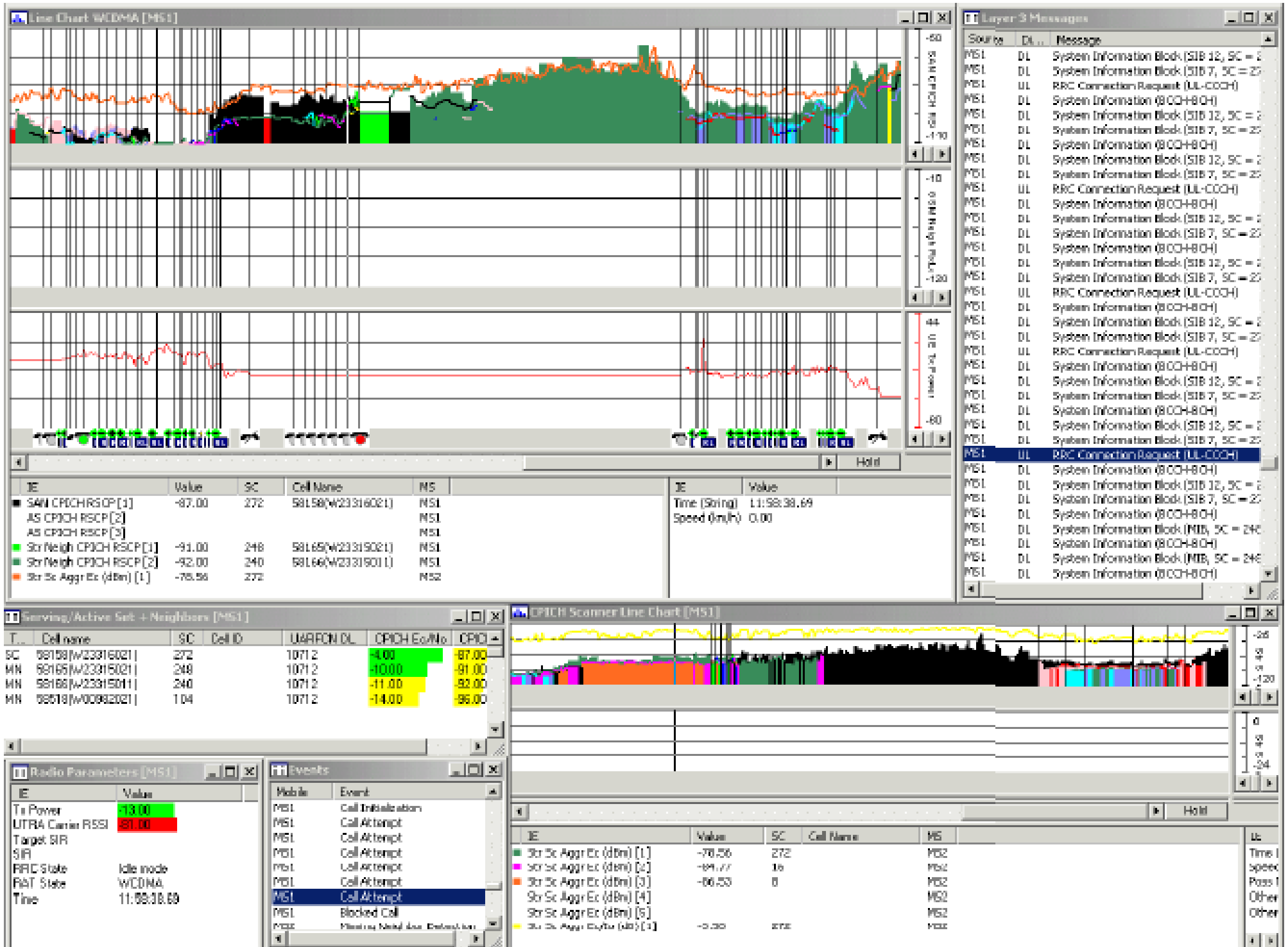
- **Unanswered RRC request, sample:**



Problem Description: In this example an RRC request is sent but the network never responds with an RRC connection setup message. It is not clear whether or not the network receives the RRC request. The radio environment in the downlink as seen by TEMS is good i.e. good RSPC, low CPICH Ec/No.

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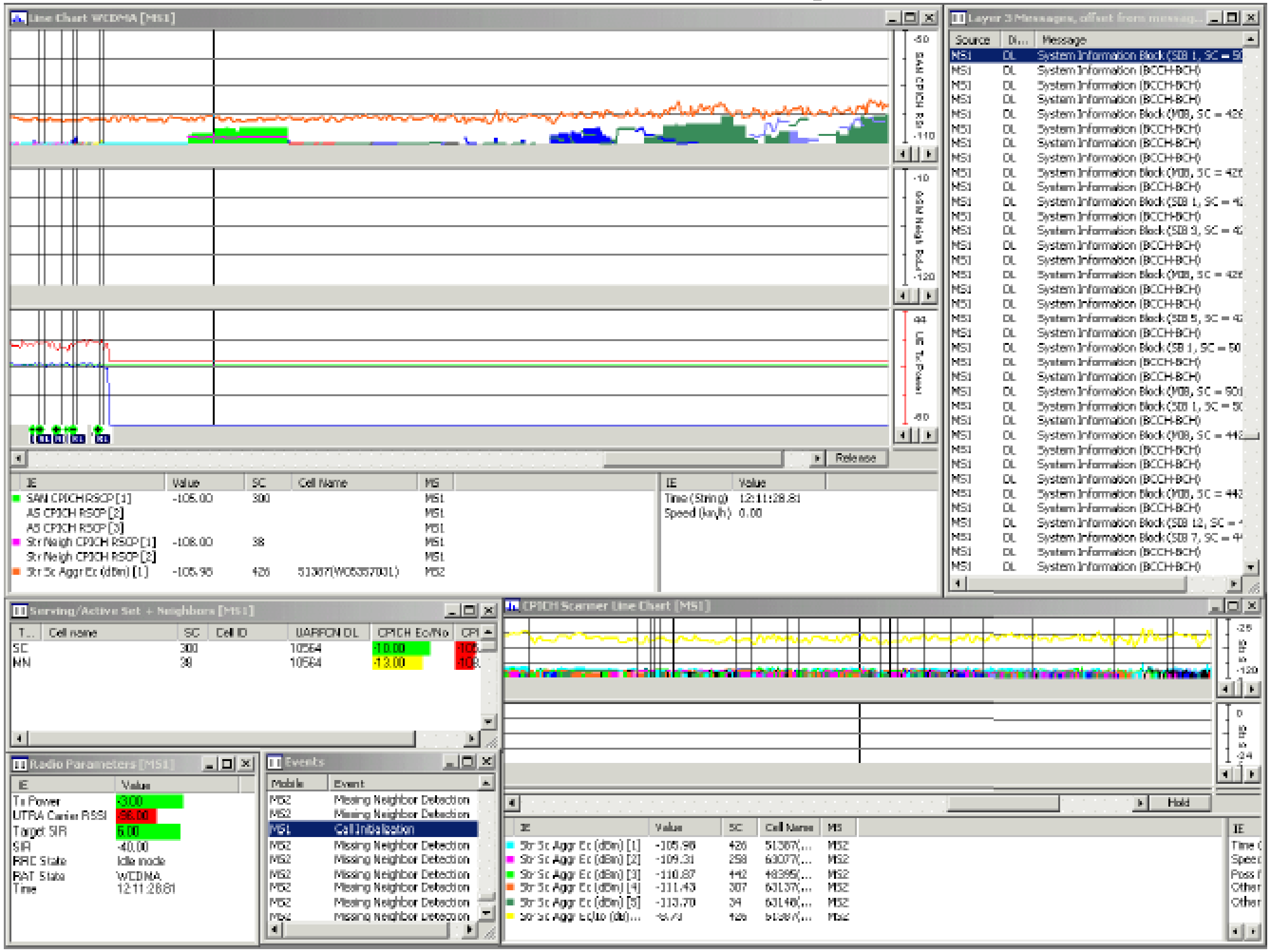
RAN Tuning
Blocked Call Analysis

- **Barred network reason, sample:**



Problem Description:
This occurs when the UE attempts to initiate a call on a network other than the measured one (in our case MTN). In the serving/Active Set window in TEMS in figure above it can be seen that the DL UARFCN for the network the UE is camped on in idle mode is 10564.

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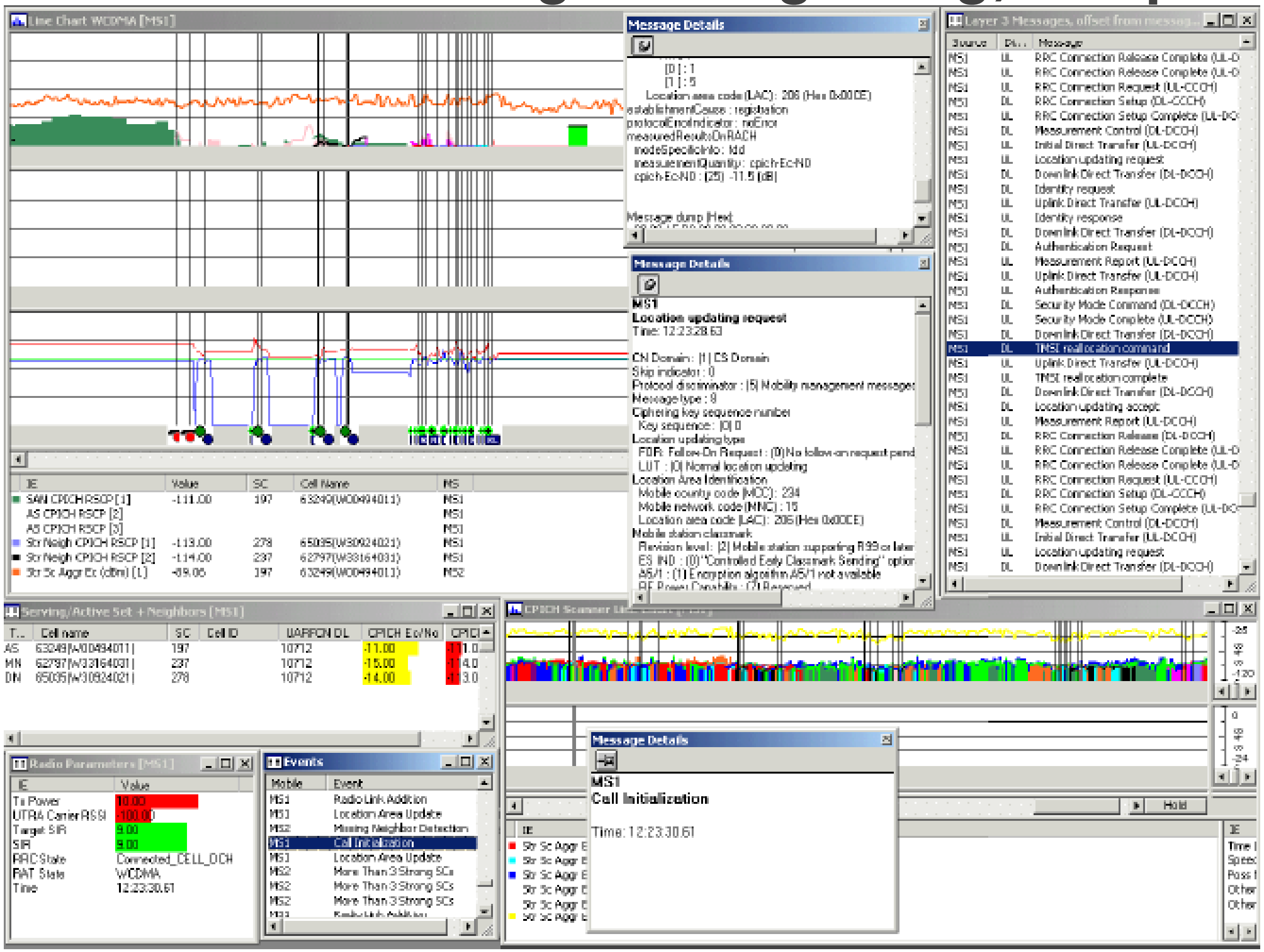
RAN Tuning
Blocked Call Analysis

- **Call initiation during LUP signaling, sample:**



Problem Description: In this case the UE is involved in Location Update signaling. As seen in the RRC Connection Request message the establishment cause is registration and the Location Update request message is for Normal Location Updating. During the L.U. signaling a new call attempt is triggered by the command sequence in TEMS Investigation. This can be seen in the events window in figure above.

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Item 18

RAN Tuning
Dropped Call Analysis

- **Objective**

  Aim is to identify causes of the dropped call event during drive test.

- **Methodology**

  Signaling trace analysis from TEMS.

- **Analysis**
  - The analysis shall be related to identify below issues:
    - ✓ Missing neighbor reason.
    - ✓ Poor coverage reason.
    - ✓ Bad radio environment.
    - ✓ Congestion.
    - ✓ Non-radio reason.
    - ✓ Equipment fault.

RAN Tuning
Dropped Call Analysis

Item 18

Dropped Call Analysis Criteria

Criteria	Description
Poor Coverage	The Drop occurs in regions where conditions CPICH RSCP and/or CPICH Ec/No are measured in critical values not suitable for a proper connection.
Bad Radio Environment	Every drop that occurs when Best Server is Missing (Mostly in good CPICH RSCP conditions). The UE active set update cannot follow the quick coverage changes. In this case Pilot Pollution situations are included as well (3 cells in AS and more than 1 strong SCs is interfering the connection within a range of 5 dB - Ec/No basis evaluation).
Congestion	Every drop that occurs when there are no more available radio resources for the connection. The network sends an RRC Connection Release when the RBS reaches the maximum available Power in DL.
Non-Radio	Every drop that occurs when the radio conditions are good, the logging equipment is working properly and the RRC connection release cause (marked usually as "Unspecified") could be attributed to a RBS/Network fault, (including UL UE power going to maximum even if the CPICH RSCP is measured at good values, crossed feeders causing false missing neighbors, crossed ULDL feeders, wrong parameter settings that can affect accessibility/SHOs in the cell).
Equipment Fault	Every drop that occurs when TEMS Investigation/UE are Blocking or Freezing and/or SW is crashing, so that it's not possible to maintain the connection.
Missing Neighbours	Every drop that occurs when there are poor RSCP and/or Ec/No levels/quality on the Best Server/AS, with the contemporary possibility for the UE to perform a SHO on a better cell that is not declared as a Neighbour for the AS cells themselves.

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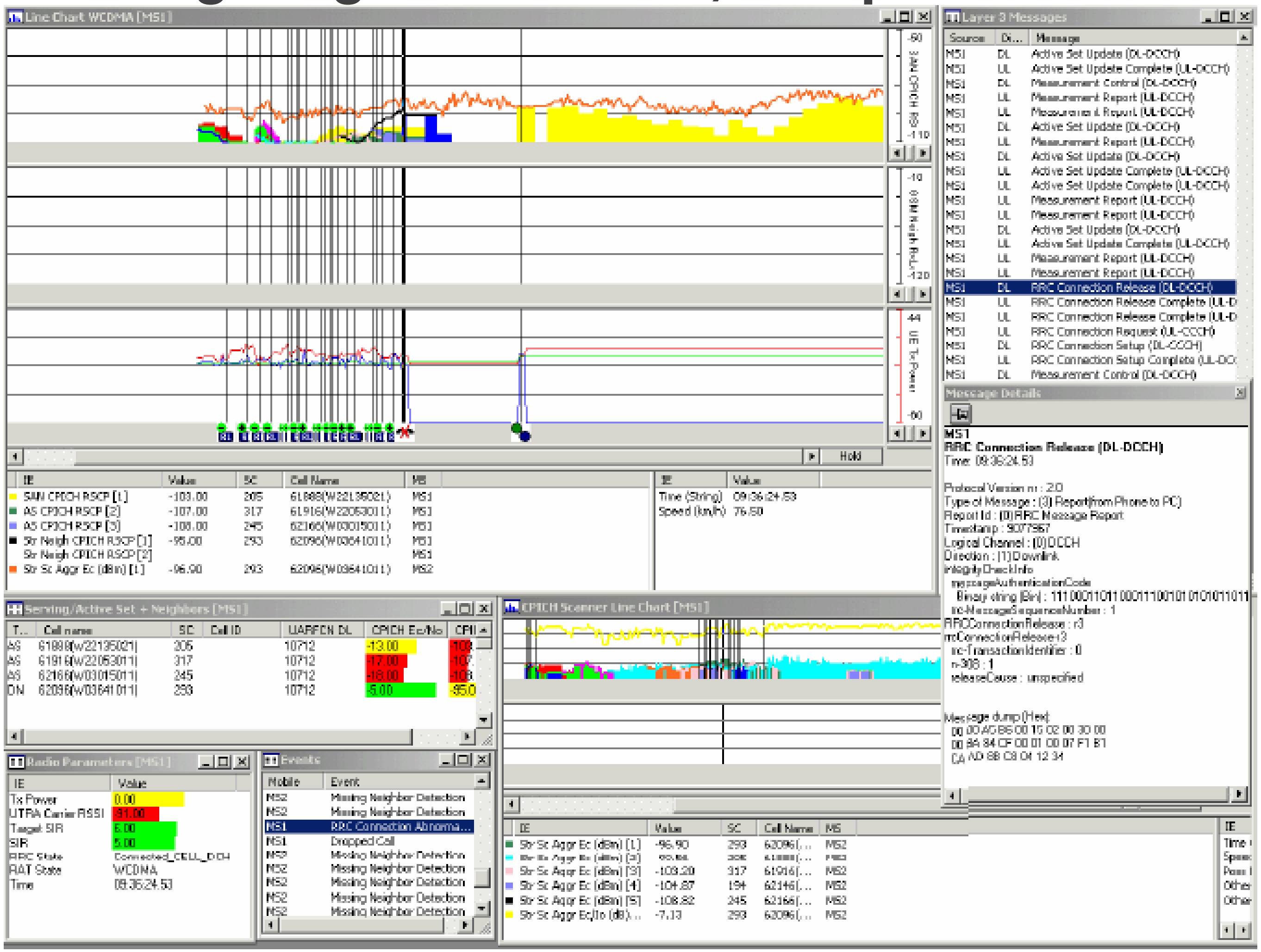
RAN Tuning
Dropped Call Analysis

- **Missing neighbor reason, sample:**



Problem Description:
The Active Set best server is cell 61888 (SC = 205). During the call sector 62096 (SC = 293) becomes the strongest sector but is not added to the active set, as the two cells are not defined neighbors. This can be seen in the Serving/Active Set window in TEMS. The cell 62096 act as an increasing interferer until eventually the call is released. The release cause is classified as unspecified.

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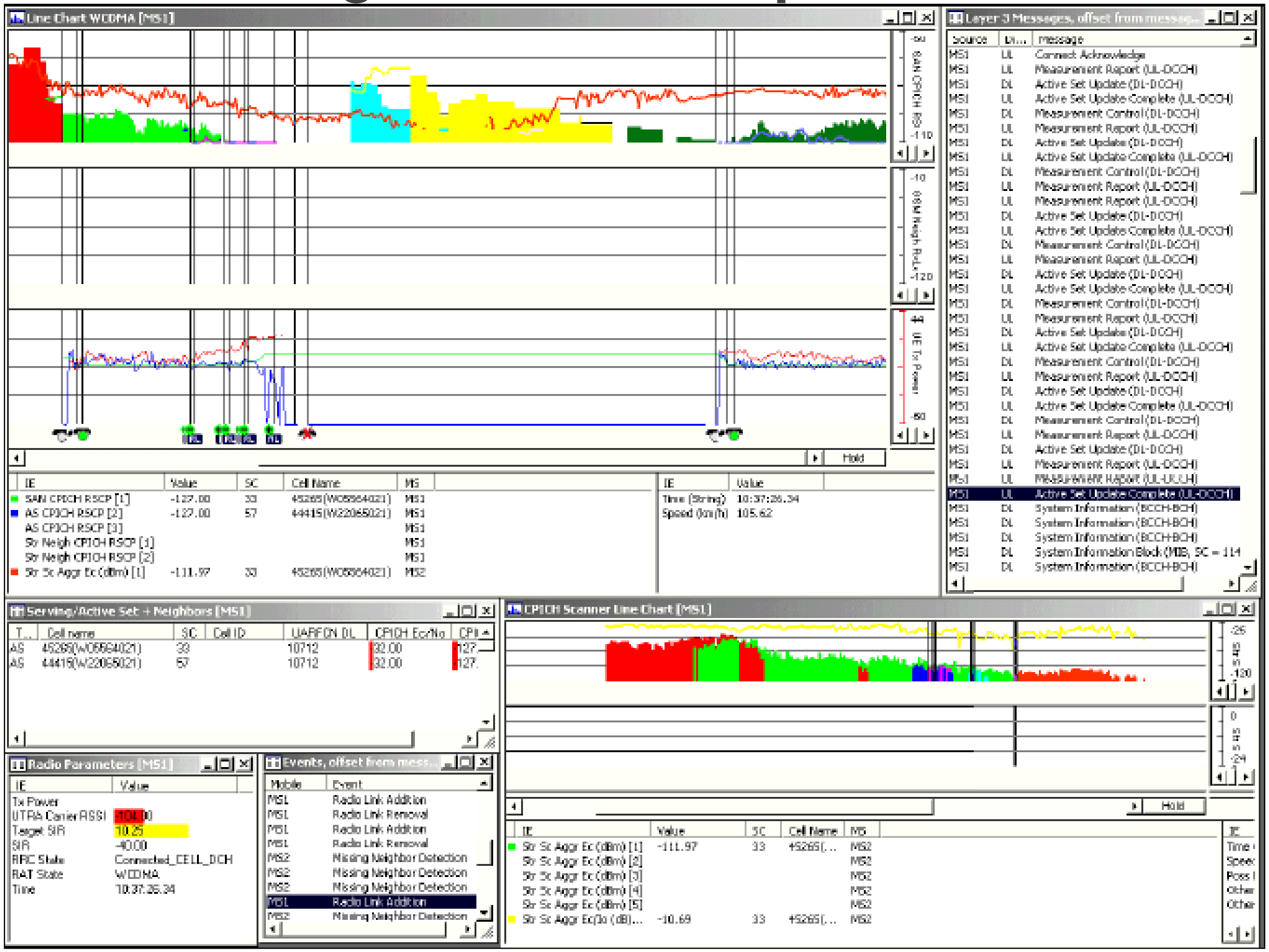
RAN Tuning

Dropped Call Analysis

Item 18

- **Poor coverage reason, sample:**

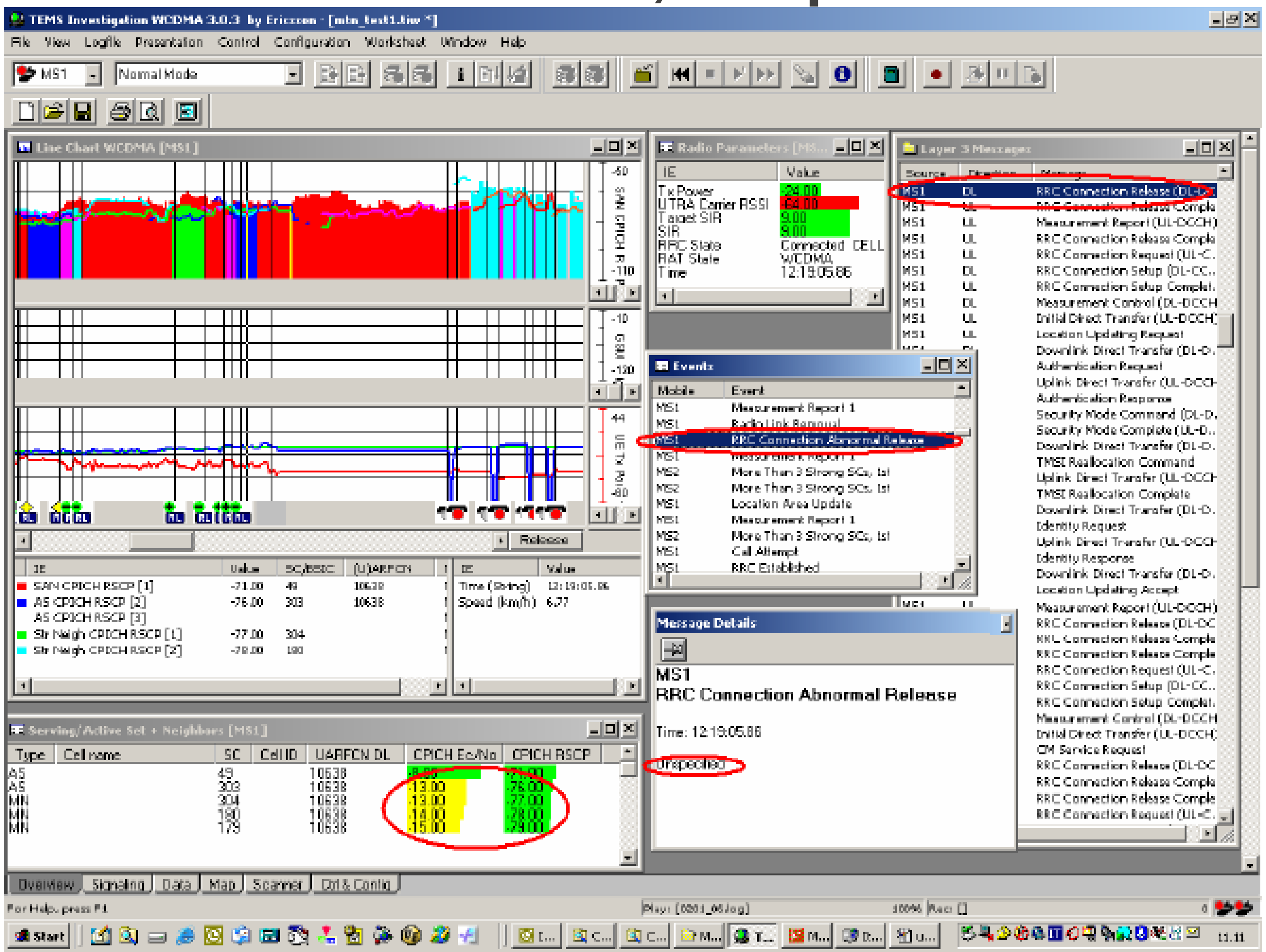


Problem Description: In this case the RF environment as reported by the UE is very poor before the call is dropped. The best server RSCP=-127dBm and Ec/No=-32dB. The scanner also reports poor radio conditions for the same SC at the same instant i.e. RSCP = -11.97dBm and Ec/Io = -10.69dB. The last message sent is the UL Active Set Complete message sent by the UE. The UE then goes into idle mode.

RAN Tuning
Dropped Call Analysis

Item 18

- **Bad radio environment, sample:**



Problem Description:
Every drop that occurs when Best Server is Missing (Mostly in good CPICH RSCP conditions). The UE active set update cannot follow the quick coverage changes. In this case Pilot Pollution situations are included as well (3 cells in AS and more than 1 strong SCs is interfering the connection within a range of 5 dB - Ec/No basis evaluation).

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RAN Tuning

Dropped Call Analysis

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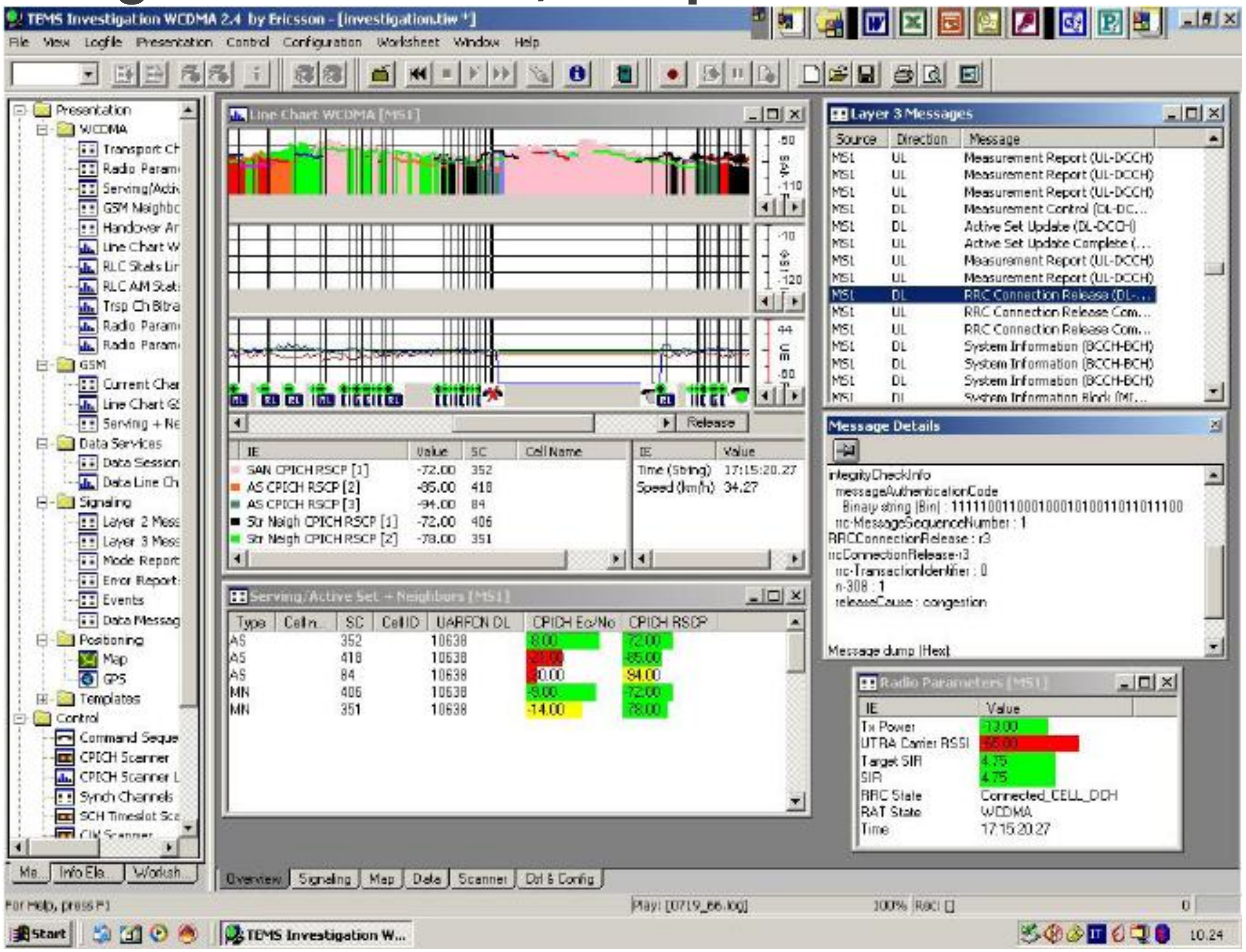
- **Congestion reason, sample:**



Problem Description: In this case the radio environment doesn't show any critical issue: the AS is full, and there is a Best Server cell (SC 352) with two more cells that are carrying the service. Also the MN set is good, and the Layer 3 messages sequence is regular. The radio resource unavailability pops up suddenly after a certain number of fast SHOs, and an "RRC Connection Release" message from the network comes to interrupt the call. In the TEMS L3 messages window details the release cause is clearly marked as "Congestion".

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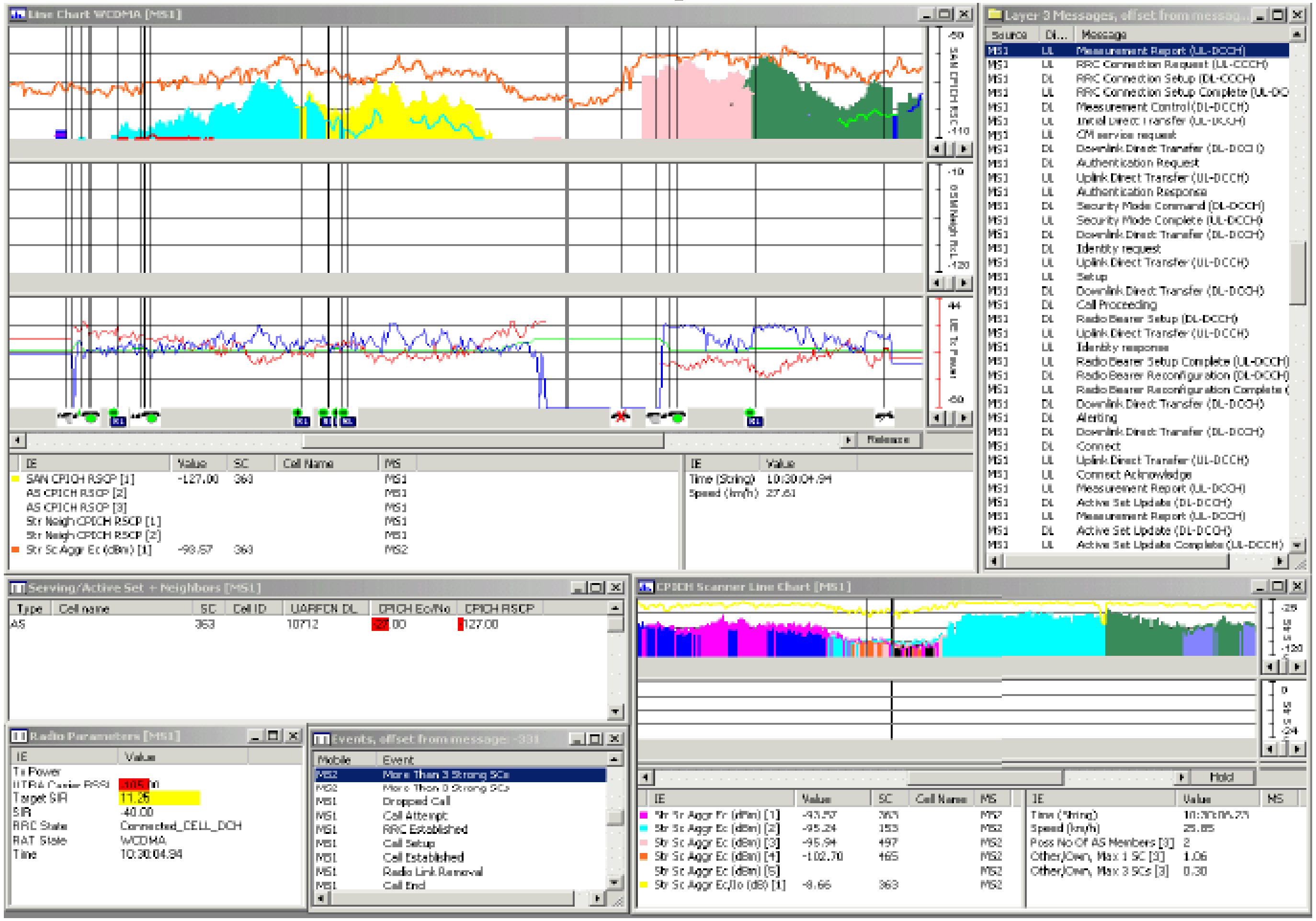
Item 18

RAN Tuning
Dropped Call Analysis

- **Non-radio reason, sample:**



Problem Description: Every drop that occurs when the radio conditions are good, the logging equipment is working properly and the RRC connection release cause (marked usually as "Unspecified") could be attributed to a RBS/Network fault, (including UL UE power going to maximum even if the CPICH RSCP is measured at good values, crossed feeders causing false missing neighbors, crossed UL-DL feeders, wrong parameter settings that can affect accessibility/SHOs in the cell).

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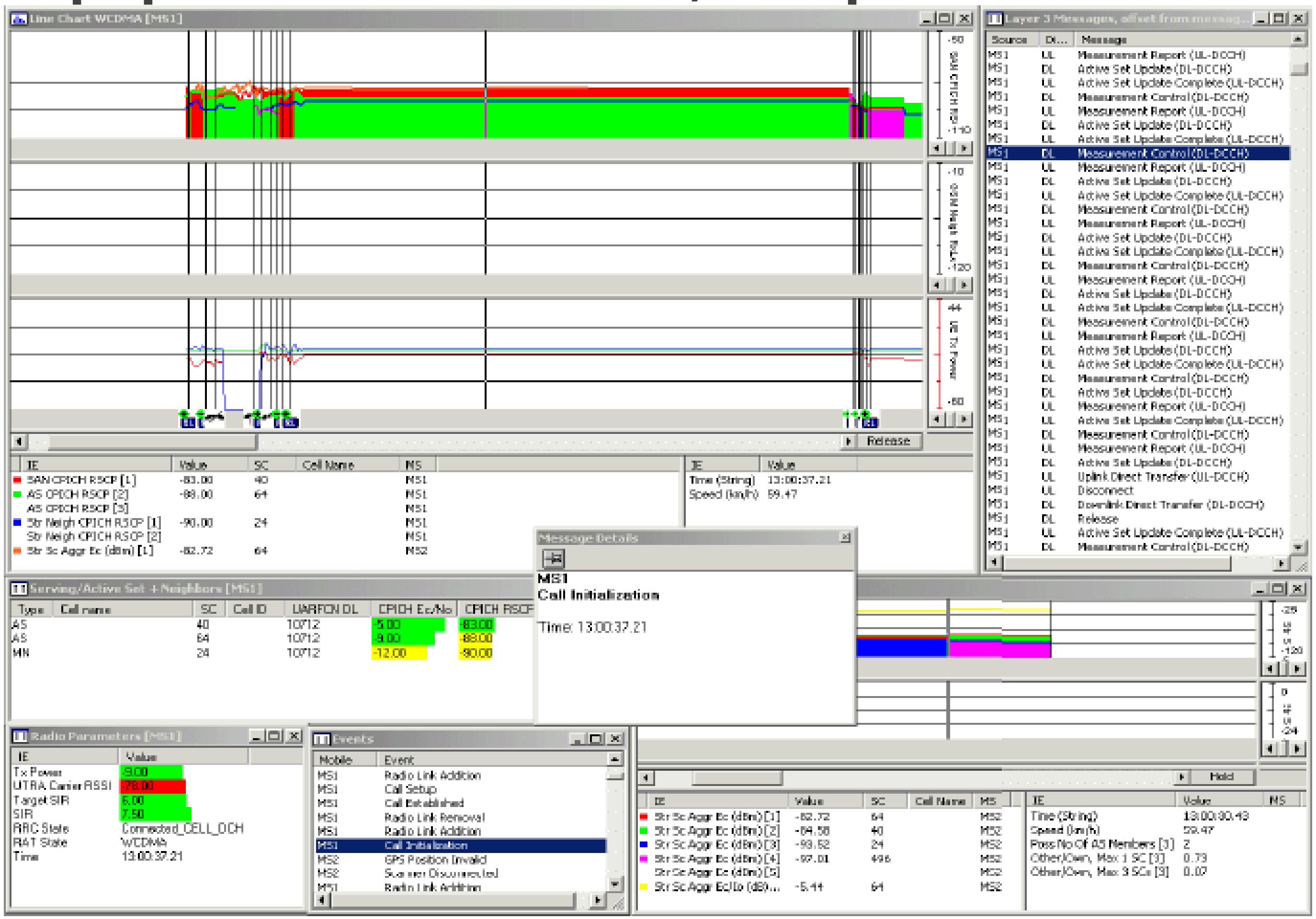
RAN Tuning
Dropped Call Analysis

Item 18

- **Equipment fault reason, sample:**



Problem Description:
Every drop that occurs when TEMS Investigation/UE are Blocking or Freezing and/or SW is crashing, so that it's not possible to maintain the connection.

In the example the network sends a DL Measurement Control message and then the UE freezes. There are no further massages sent between the network and the UE. The RF Environment was good at the time of the drop as can be seen from the scanner information i.e. RSCP =-82.72dBm and Ec/Io = -5.44dB.

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RAN Tuning
IRAT Analysis (1)

Item 19

- ## Objective

  Aim is to identify any problem that might occurred during IRAT handover with **mobility event detection failure**.

- ## Methodology

  IRAT verification using mobile test with the following symptom recognized:

  - The UE has started compressed mode to measure GSM cells and receives the measurement control from the UTRAN to indicate the GSM neighboring cells.
  - Received Ec/No of the best serving cell in active set is less than WCDMA RAN threshold and;
  - A suitable GSM cell is found and received RSSI of that cell is larger than
  - GSM threshold 3a and;
  - Event 3a measurement report is not sent from the UE to the UTRAN or the event 3a measurement report is sent to the UTRAN; however, the UTRAN does not receive it.

  Note: The received RSSI of the suitable GSM cell can be measured by using GSM carrier scanner or GSM TEMS.

Item 19

RAN Tuning
IRAT Analysis (1)

- **Analysis**

The following reasons should be verified as causes of the mobility event detection failure.

- Poor uplink quality.
- Missing GSM neighbor cells.
- UTRAN coverage rapidly fades.
- Too long GSM neighboring list.

RAN Tuning
IRAT Analysis (1)

Item 19

- **Solution**

○ Poor uplink quality might caused by:

✓ Pilot channel failure: Due to poorer downlink qualities, the UE will stop transmitting, i.e. PUE = 0, and the quality on uplink consequently becomes poor. Please refer to solution on pilot pollution, downlink or uplink interference that causes pilot channel failures.

✓ Poor quality in downlink: It might cause errors on the TPC. If the UE follows the wrong TPC pattern to adjust its transmission power, the uplink quality becomes poor. Please refer to solution on pilot pollution, downlink or uplink interference that causes pilot channel failures.

✓ Uplink and pilot coverage imbalance: If the UE has transmitted maximum allowed UE transmission power, i.e. PUE = maximum, the reason of causing poor quality in uplink is because of uplink and pilot channel imbalance. Please refer to solution on Pilot coverage imbalance.

RAN Tuning
IRAT Analysis (1)

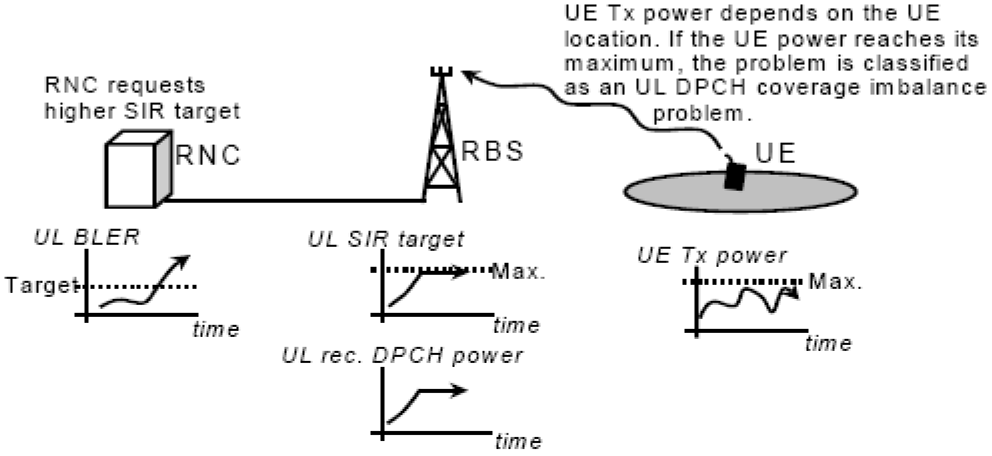
Item 19

▪ Solution continue

○ Poor uplink quality might caused by:

✓ Insufficient received UL DPCH power: The possible reason of causing poor quality in uplink is because of insufficient received UL DPCH power.

The base station cannot receive sufficient power from the uplink dedicated physical channel if the maximum allowed UL SIR target SIRmax: Maximum allowed SIR target is set too low. It should be set sufficiently high.



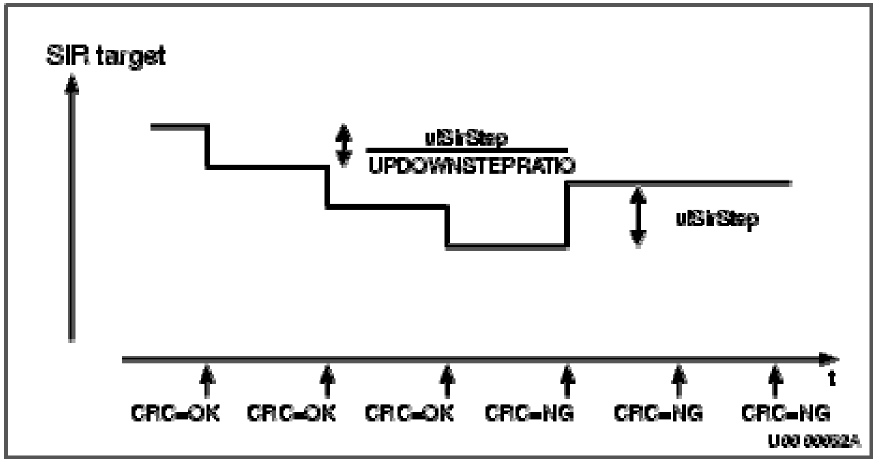
RAN Tuning
IRAT Analysis (1)

- **Solution continue**

○ Poor uplink quality might caused by:

✓ Rapidly changing radio environment: The possible reason of causing poor quality in uplink is because of rapidly changing radio environment.

If a cell covers several diverse radio environments, e.g. outdoor, indoor, tunnels etc., the outer loop power control may not properly be able to adapt the rapid environment changes. Check whether the uplink outer loop power control algorithm is set to "Jump" regulator, i.e. UL Outer Loop Regulator = 1.



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RAN Tuning
IRAT Analysis (1)

Item 19

- **Solution continue**

- Missing GSM neighbor cell might caused by:
  - ✓ The direct solution is to add the desired cell into the neighboring cell lists of the cells in the active set. However, it should be noted that too many neighboring cell relationships might slow down the search for the GSM carriers.
- UTRAN coverage rapidly fades:
  - ✓ If the UTRAN coverage rapidly fades out, e.g. outdoor to indoor, the UE might not have enough time to move the GSM network. The solution is WCDMA RAN threshold should be increased so that the WCDMA RAN threshold is far away 16dB and the event, i.e. event 3a, for the inter-RAT handover or cell change is triggered early.

Item 19

RAN Tuning
IRAT Analysis (1)

- **Solution continue**
  - Too long GSM neighboring list:
    - ✓ If there are too many unnecessary GSM handover relationships, the engineer should carefully justify the usefulness of the GSM handover relationships and remove the unnecessary ones.

RAN Tuning
IRAT Analysis (2)

Item 20

- **Objective**

  Aim is to identify any problem that might occurred during IRAT handover with **handover function failure**.

- **Methodology**

  IRAT verification using mobile test & UETR with the following symptom recognized:

  - Case 1: Relocation preparation failure RANAP message is sent to the SRNC from the circuited switch core network.
  - Case 2: Relocation cancel RANAP message with cause value relocation canceled (10) is sent out to the circuited switch core network from the SRNC.
  - Case 3: Relocation cancel RANAP message with cause value TRELOCprep expiry (3) is sent out to the circuited switch core network from the S-RNC.
  - Case 4: The UE sends Handover from UTRAN failure message to the UTRAN.
  - Case 5: Connection drops during the inter-RAT handover.

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RAN Tuning
IRAT Analysis (2)

Item 20

- **Methodology continue**
  - Case 6: The successful ratio of inter-RAT handover to GSM per cell relation is very low (i.e. pmNoOutIratHoSuccess / pmNoOutIratHoAtt).
  - Case 7: The ratio of inter-RAT handover attempts to GSM where the UE returns to old channel per cell relation is very high (i.e. pmNoOutIratHoReturnOldChOther / pmNoOutIratHoAtt).
  - Case 8: The number of inter-RAT handover attempts to GSM where the resource allocation in the GSM network fails per cell relation is very high (i.e. pmNoOutIratHoResourceAllocFail)

RAN Tuning
IRAT Analysis (2)

Item 20

- **Analysis**

The following reasons should be verified as causes of the handover function failure:

- Case 1: No resource available in GSM network.
- Case 2: Cannot fulfill the GSM request.
- Case 3: No response from core network.
- Case 4 & 7: Failure to access GSM cell.
- Case 5: Abnormal disconnection in inter-RAT handover.
- Case 6: Failure of outgoing inter-RAT handover attempt.
- Case 8: No GSM resources or no response from core network.

RAN Tuning
IRAT Analysis (2)

Item 20

- **Solution**

- Case 1: No resource available in GSM network.

  Optimize the GSM network to lower the congestion, e.g. add more TRXs or re-dimension the GSM network. Or the GSM amount proposal repeat can be increased so that the congested GSM cell can be repeatedly attempted more.

- Case 2: Cannot fulfill the GSM request → no solution and the connection still kept.

- Case 3: No response from core network → no solution and the connection still kept.

- Case 4 & 7: Failure to access GSM cell.

  Optimize the GSM network to make the GSM connection setup successful.

RAN Tuning
IRAT Analysis (2)

Item 20

- **Solution continue**

- Case 5: Abnormal disconnection in inter-RAT handover.

  Optimize the GSM network to reduce connection setup fails. When the UE is camping on the GSM network. For UTRAN side, please refer to the solution of poor downlink quality.

- Case 6: Failure of outgoing inter-RAT handover attempt. Refer to case number 4 and 5.

- Case 8: No GSM resources or no response from core network. Refer to case number 1 and 3.

RAN Tuning
IRAT Analysis (3)

Item 21

- **Objective**

  Aim is to identify any problem that might occurred during IRAT handover with **cell change function failure**.

- **Methodology**

  IRAT verification using mobile test & UETR with the following symptom recognized:

  - Case 1: The UE sends Cell change order from UTRAN failure message to the UTRAN.
  - Case 2: Connection drops during the inter-RAT cell change.
  - Case 3: The ratio of inter-RAT cell change attempts to GSM where the UE on dedicated channel returns to old channel per cell relation is very high (i.e. pmNoOutIratCcReturnOldCh / pmNoOutIratCcAtt).

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RAN Tuning
IRAT Analysis (3)

- **Analysis**

  The following reasons should be verified as causes of the cell change function failure:

  - Case 1 & 3: Failure to camp on GSM cell.
  - Case 2: abnormal disconnection in inter-RAT cell change.

- **Solution**

  - Case 1 & 3: Try to optimize the GSM network to make the GSM connection setup successful.
  - Case 2: abnormal disconnection in inter-RAT cell change.

    Optimize the GSM network to reduce connection setup fails. When the UE is camping on the GSM network. For UTRAN side, please refer to the solution of poor downlink quality.

RAN Tuning
Traffic Sharing

Item 22

- **Objective**

  Aim is to show one of method to perform traffic sharing between GSM and WCDMA cell.

- **Methodology**

  The traffic sharing method in this part will be performed through :

  - IRAT neighbor creation.
  - Change the initial cell reselection's concept based on CPICH EcNo measurements.
  - Aggressive cell reselection setting.
  - On some part also CPICH power tuning.

- **Analysis**

  Changing criteria based on CPICH EcNo will enable us to manage the traffic sharing between 2G and 3G in idle mode using below threshold and offset:

  - FDDQMIN, FDDQOFF
  - qQualmin, sRatSearch

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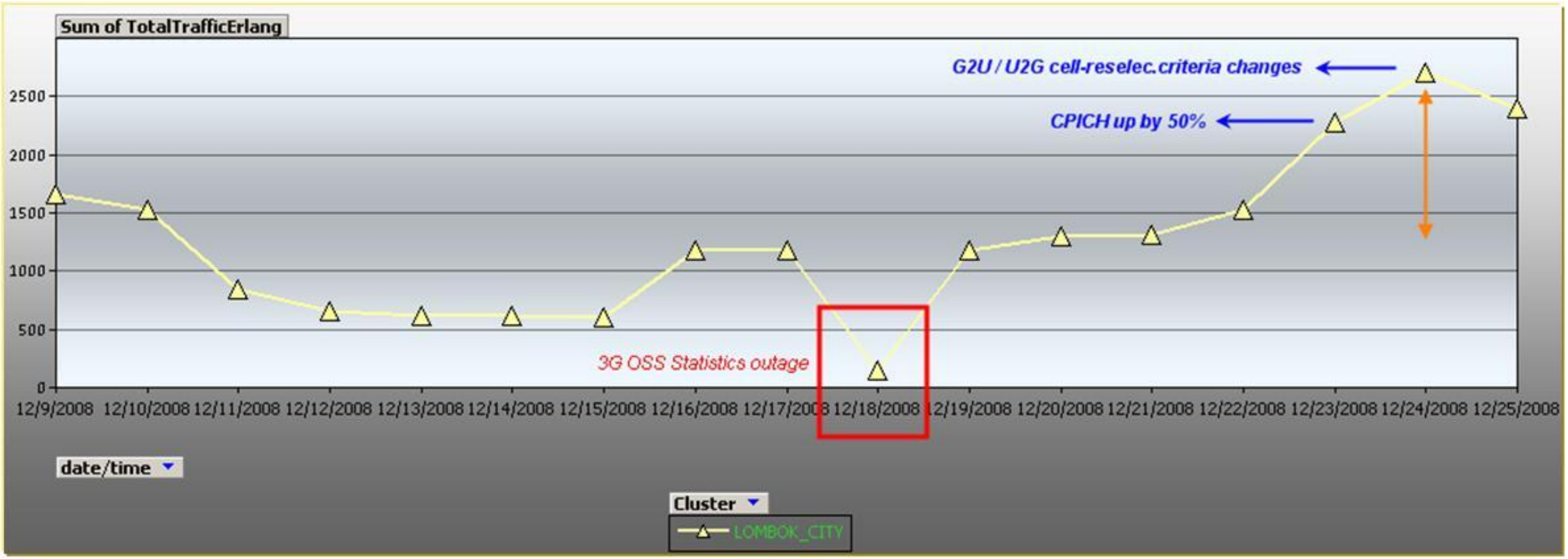
Item 22

RAN Tuning
Traffic Sharing

- **Analysis continue**



WCDMA cells have successfully absorbed more traffic start from idle mode.

Detain sample report on this activity:

C:\Documents and ttings\User\My Docur

RAN Tuning
Low Data Throughput Analysis

Item 23

- **Objective**

  Aim is to identify reasons of low data throughput for PS service, e.g. FTP download.

- **Methodology**

  Verification is performed using particular download test, e.g. FTP download using mobile test equipment.

- **Analysis**

  Analysis shall be rectified to see the following cases:

  - Average UL or DL throughput of the radio access bearer is much lower than the data rate of the known source.
  - Round trip time is very long.
  - Many missing packets.

RAN Tuning
Low Data Throughput Analysis

Item 23

- **Solution**
  - Improve the radio link quality.

    Poor radio links lead error bits in packet. In order to recover the packet, AM RLC retransmits the problematic packets. However, too many retransmissions cause longer RTT and the date throughput consequently decreases.
  - Improve the occurrence of too many down-switches due to admission control (i.e. $[s^{-1}]$*pmNoOfSwDownNgAdm / (15*60) very high).

    Best effort cleanup mechanism allows more system accessibility to guaranteed and non-guaranteed users. However, the throughput for non-guaranteed users is slightly reduced. The solution is to control high blocking rate throughout:

    ✓Adjust congestion control policy;

    ✓Admission limit for compressed mode shall be set to higher value;

    ✓Adjust the DL Admission Limit to a higher value;

    ✓ DL admission limit for power utilization + DL admission offset for power utilization;

RAN Tuning

Item 23

Low Data Throughput Analysis

- **Solution continue**
  - Improve the occurrence of too many down-switches due to coverage triggering (i.e. [s^{-1}]*(pmChSwitchP384P128+pmChSwitchP128P64) / (15*60) very high.

    If PS64/384 or PS64/128 radio bearer and pilot coverage are imbalance, the channel switching function then switches it down to the radio bearer in the next lower bit rate so as to maintain the connection when it reaches to the coverage border. However, the overall throughput of the connection becomes lower. The solution is to improve coverage imbalance. Please refer to solution on pilot coverage imbalanced.

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RAN Tuning
Low Data Throughput Analysis

Item 23

- **Solution continue**
  - Improve the occurrence of too many down-switches in soft or softer handover (i.e. [s^{-1}]*pmNoOfSwDownNgHo / (15*60) very high)..

    If an addition or replacement fails in soft or softer handover due to out of radio resource in the target cell, PS64/384 or PS64/128 radio bearer may be switched down to PS64/64 so as to maintain the mobility. However, the overall throughput of the connection becomes lower.

    The solution is to control high blocking rate throughout:

    ✓Adjust congestion control policy;

    ✓Admission limit for compressed mode shall be set to higher value;

    ✓Adjust the DL Admission Limit to a higher value;

    ✓DL admission limit for power utilization + DL admission offset for power utilization;

RAN Tuning
Low Data Throughput Analysis

Item 23

- **Solution continue**
  - Improve the occurrence of too many down-switches due to congestion control (i.e. $[s^{-1}]$*pmNoOfSwDownNgCong / (15*60) very high).

    Due to congestion, the connection might be switched down to the common channel. Therefore, the overall throughput of the connection becomes very low.

    The solution are:

    - If pmTransmittedCarrierPower is very high:
      - ✓ Improve the soft/softer handover.
      - ✓ Improve the DL admission threshold.
      - ✓ Traffic load sharing among the neighbor cells.
      - ✓ Remove unnecessary neighboring cells.
    - If RSSI on uplink is too high:
      - ✓ Set the SIRmin: Minimum allowed SIR target to a suitable value (i.e. lower).
      - ✓ Check the power measurement in case using TMA (e.g. uplink feeder attenuation, downlink feeder attenuation, uplink TMA gain, downlink TMA insertion loss, etc.).
      - ✓ Improve the UL admission threshold and UL congestion Threshold.

RAN Tuning
Low Data Throughput Analysis

Item 23

- **Solution continue**
  - Control FACH usage that possible too high (i.e. ratio of pmSumRabFach / pmSamplesRabFach is very high).

The solution shall be:

- ✓ Adjust the up-switch thresholds.

  The up-switch thresholds Upswitch (FACH -> DCH) threshold for single RAB UL and Upswitch (FACH -> DCH) threshold for single RAB DL should be adjusted to the suitable values.

- ✓ Adjust the down-switch timer setting.

  The down-switch timer Downswitch timer single RAB should be adjusted to a suitable value.

- ✓ Adjust the down-switch threshold.

  The down-switch threshold Throughput threshold starting downswitch timer single RAB should be adjusted to a suitable value.

RAN Tuning

Low Data Throughput Analysis

Item 23

- **Solution continue**
  - Improve the occurrence of too high switching rates between dedicated and common channels.
  - ✓ Adjust the up-switch thresholds.

    The up-switch thresholds Upswitch (FACH -> DCH) threshold for single RAB UL and Upswitch (FACH -> DCH) threshold for single RAB DL should be adjusted to the suitable values.
  - ✓ Adjust the down-switch threshold.

    The down-switch threshold Throughput threshold starting downswitch timer single RAB should be adjusted to a suitable value.

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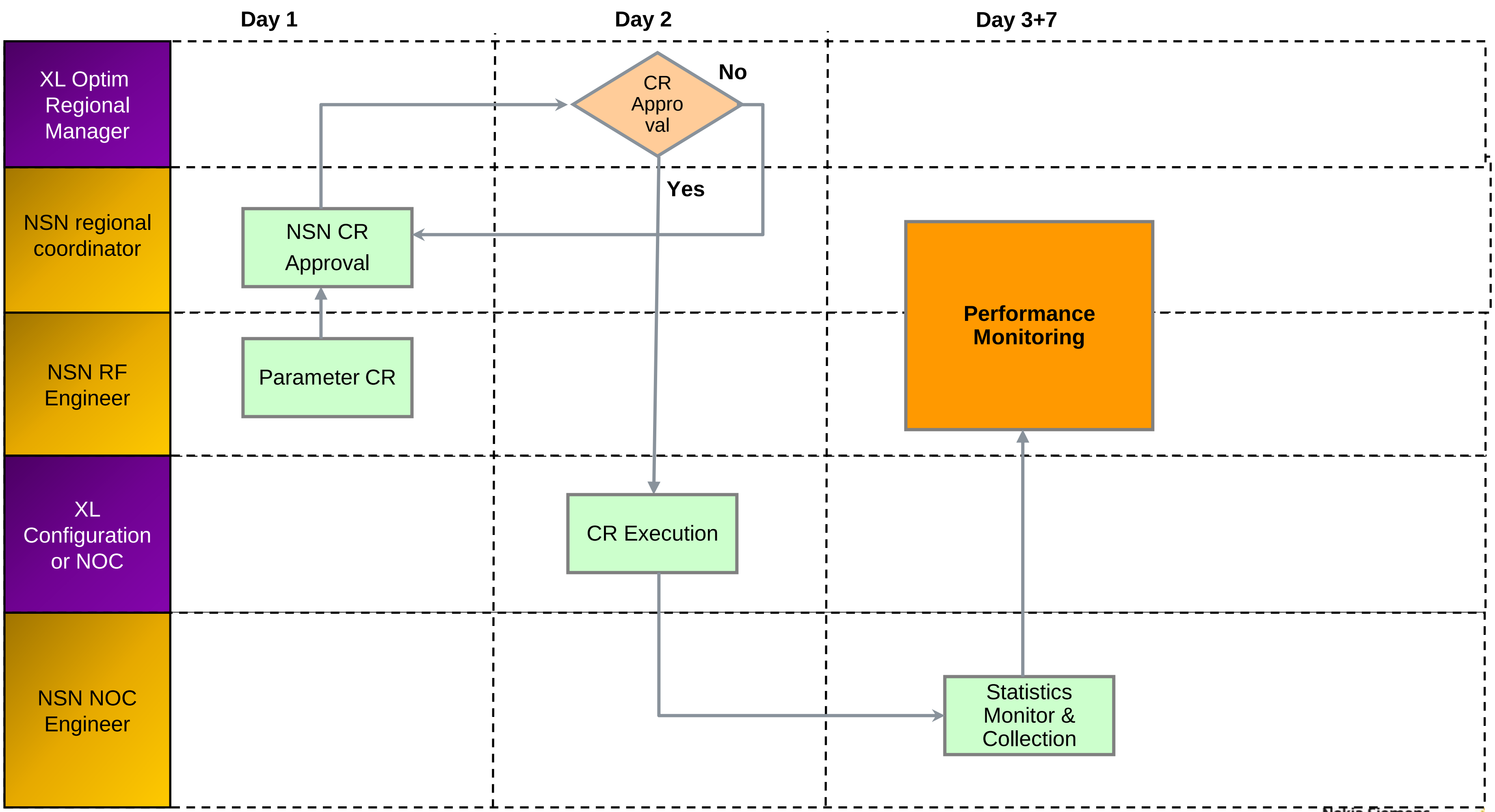
Contents

Appendix

Change Request CR

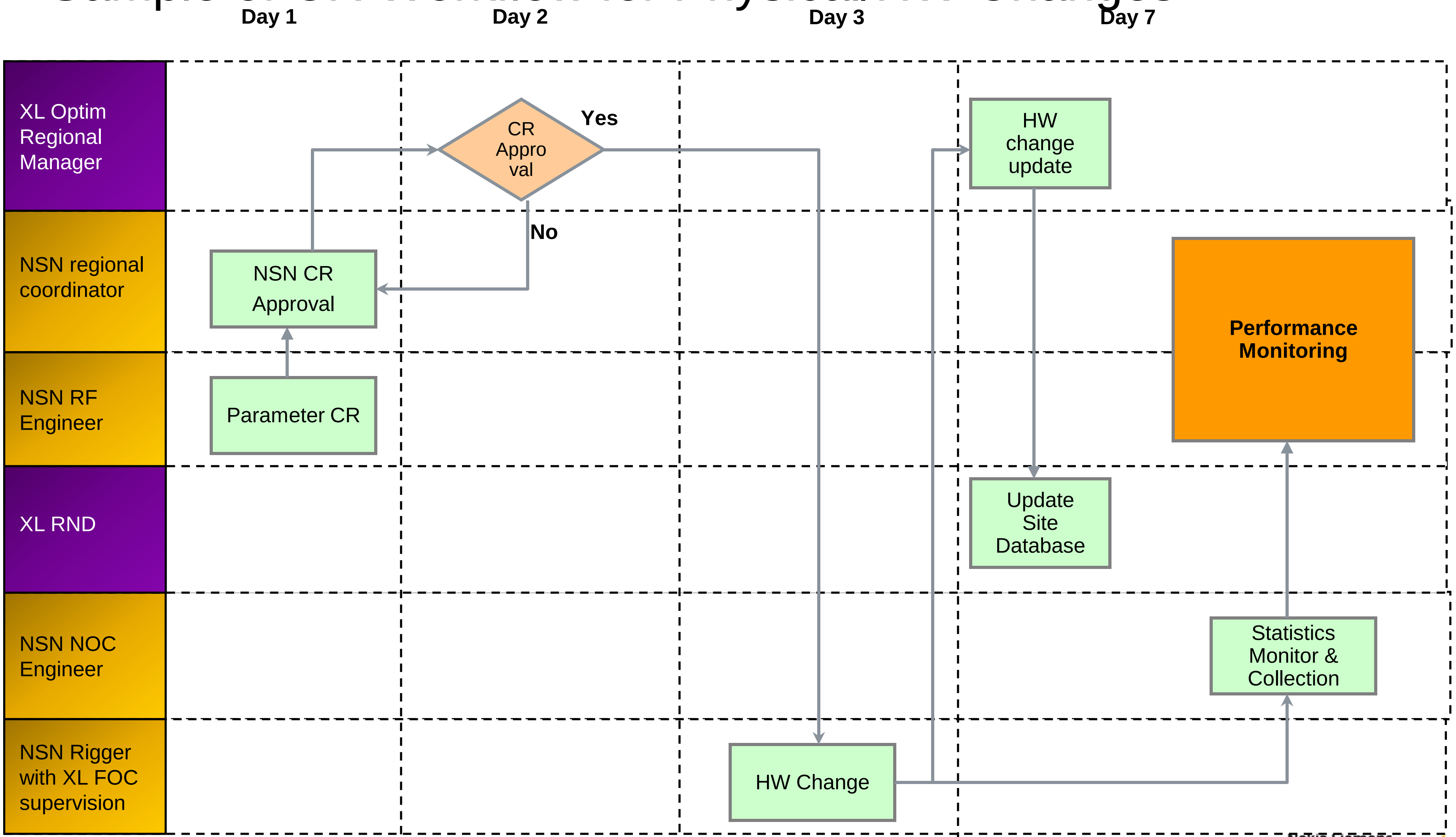
- Sample of CR Workflow for Parameter Changes



Appendix

Change Request CR

- Sample of CR Workflow for Physical/HW Changes



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Thank You