TSG-RAN WG4 meeting #8 **TSGR4#8(99)643**
26th – 29th of October 1999, Sophia Antipolis, France

Agenda item: 8.6
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Title: Testing Intra-frequency Measurements for Soft Handover (FDD)
Document for: Discussion

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1. Introduction

This document proposes some principles for the performance tests of soft handover evaluation. Based on discussion requirements can be concluded and input to appropriate sections can be created. We feel that in order to generate requirements for appropriate quantities both TSG RAN WG1 and TSG RAN WG2 descriptions needs to be taken into account. Hence the neighbour measurement accuracy is not only the accuracy of measured quantities, but also time to reach to an event. We also feel that requirement for false reporting must be given. The RNC capacity will be affected if the quantity of false SHO's is large in the system.

Since the specifications TS 25.331 and TS 25.922 contain so many different events, which could trigger measurement report, it is quite exhaustive to test them all. In stead of that we propose that we choose couple of events and then we define test parameters and requirements so that we can meet the requirements set for all of these events.

For clarification we have included principle picture and definitions of terms based on TS25.922.

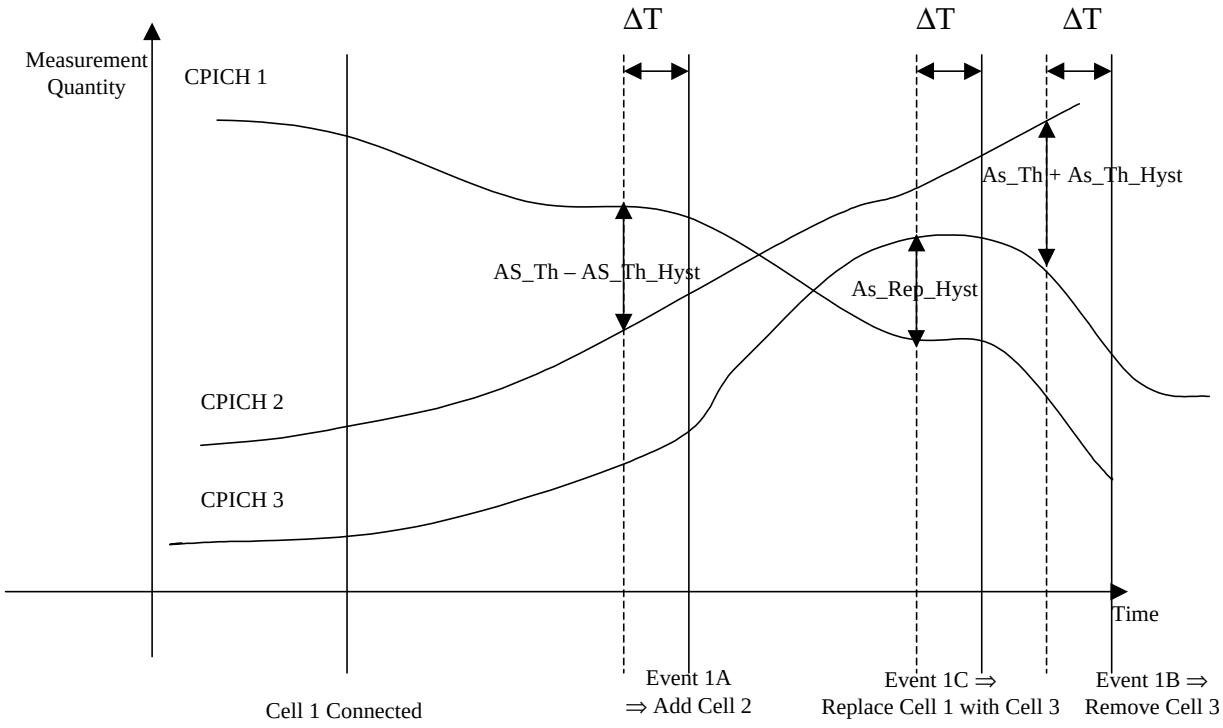

Figure 1

AS_Th: Threshold for macro diversity (reporting range);
AS_Th_Hyst: Hysteresis for the above threshold;
AS_Rep_Hyst: Replacement Hysteresis;
ΔT: Time to Trigger;

2. Test Principles

2.1. Correct reporting of neighbours

2.1.1. Event 1a: A Primary CPICH enters the Reporting Range

The power of neighbour cell is increased as step function into the reporting range and it is kept there longer than defined **Time to Trigger (T)** parameter. The reporting of the event 1a has to occur within certain predefined time period from the ideal time of the event and the accuracy of measurement quantities (e.g. Ec/Io and time difference between cells) has to be within given limits. The test is repeated number of times to obtain certain confidence level.

2.1.2. Event 1b: A Primary CPICH leaves the Reporting Range

The power of neighbour cell is now decreased as step function out from the reporting range and the event 1b has to be reported within predefined time from the ideal time of the event. The test is also repeated number of times to obtain certain confidence level.

2.2. Incorrect reporting of neighbours

2.2.1. A Primary CPICH level is increased close to the Reporting Range

Power of neighbour cell is increased as step function to a certain level from the reporting range (or into the reporting range but it does not stay inside the reporting the whole time to trigger period). Measurement report should not be sent to the network in this case. The test is repeated number of times to obtain certain confidence level.

2.2.2. A Primary CPICH decreased almost out of the Reporting Range

The power of neighbour cell is now decreased as step function but it still kept within reporting range. Measurement report should not be sent to the network in this case. The test is repeated number of times to obtain certain confidence level.

3. Propagation Condition

In order to test that the UE implementation is correct we propose that both AWGN and fading propagation conditions are considered. We propose following partitioning.

- Fading propagation condition: Event has to be triggered within required time limit from the ideal time of the event.
- AWGN propagation condition: Accuracy requirements for CPICH Ec/Io and relative time difference have to be met.

4. Test Parameters

Network should provide a list of neighbour cells as specified in TS25.331. We propose that the number of neighbour cells is 24. Network has to also provide information whether SFN has to be decoded. During the test procedure the actual detectable cell is randomly chosen from those cells in the neighbour cell list. We also propose that the detectable cell is changed during the test meaning that the scrambling code would vary during the test.

4.1. Correct reporting of neighbours

4.1.1. AWGN Propagation condition

This test will derive the terminal's measurement accuracy for the neighbour Cell power *(CPICH_Ec/Io)* measurement and the timing difference measurement between Cell 1 and Cell 2. Both Cell 1 and Cell 2 powers ($\hat{I}_{or}/I_{oc}$) are changed during the test. Hysteresis, Threshold and Time to Trigger are predefined and signalled from test device.

Parameter	**Unit**	**Cell 1**		**Cell 2**	
		Time 1	**Time 2**	**Time 1**	**Time 2**
CPICH_Ec/Ior	dB	[ ]			
PCCPCH_Ec/Ior	dB	[ ]			
SCH_Ec/Ior	dB	[ ]			
DPCH_Ec/Ior	dB	[ ]			
OCNS		[ ]			
$\hat{I}_{or}/I_{oc}$	dB	[ ]	[ ]	[ ]	[ ]
I_{oc}	dBm/3.84 MHz	[ ]			
CPICH_Ec/Io	dB	[ ]			
Threshold	dB	[ ]			
Hysteresis	dB	[ ]			
Time to Trigger		[ ]			

4.1.2. Fading Propagation Condition

As mentioned in section 3, the reporting accuracy is tested in this condition. For the valid reporting the terminal should send report to UTRAN latest in agreed time after the time to Trigger condition has become true.

Parameter	**Unit**	**Cell 1**		**Cell 2**	
		Time 1	**Time 2**	**Time 1**	**Time 2**
CPICH_Ec/Ior	dB	[ ]			
PCCPCH_Ec/Ior	dB	[ ]			
SCH_Ec/Ior	dB	[ ]			
DPCH_Ec/Ior	dB	[ ]			
OCNS		[ ]			
$\hat{I}_{or}/I_{oc}$	dB	[ ]	[ ]	[ ]	[ ]
I_{oc}	dBm/3.84 MHz	[ ]			
CPICH_Ec/Io	dB	[ ]			
Threshold	dB	[ ]			
Hysteresis	dB	[ ]			
Time to Trigger		[ ]			
Propagation Condition	TBD				

4.2. Incorrect reporting of neighbours

4.2.1. Fading Propagation Condition

This test will derive the terminal's measurement accuracy for neighbour Cell power *(CPICH_Ec/Io)* from the false detection point of view. The amount of erroneous reports is recorded and it has to be below a required level. Both Cell 1 and Cell 2 powers ($\hat{I}_{or}/I_{oc}$) are changed during the test and they are either near to reporting range or does not stay time to trigger period within reporting range. Hysteresis, Treshold and Time to Trigger are predefined and signalled from test device.

Parameter	Unit	Cell 1		Cell 2	
		Time 1	Time 2	Time 1	Time 2
CPICH_Ec/Ior	dB	[ ]			
PCCPCH_Ec/Ior	dB	[ ]			
SCH_Ec/Ior	dB	[ ]			
DPCH_Ec/Ior	dB	[ ]			
OCNS		[ ]			
$\hat{I}_{or}/I_{oc}$	dB	[ ]	[ ]	[ ]	[ ]
I_{oc}	dBm/3.84 MHz	[ ]			
CPICH_Ec/Io	dB	[ ]			
Threshold	dB	[ ]			
Hysteresis	dB	[ ]			
Time to Trigger		[ ]			
Propagation Condition	TBD				

5. Performance Requirements

5.1. Correct Reporting

5.1.1. AWGN propagation condition

The correct reporting of the event shall be greater than [X%] with [95%] confidence. The reporting is correct if the report has been sent before Maximum Delay time period from the ideal reporting time and the measurement quantities fulfil accuracy requirements.

Measured quantity	Unit	Requirement
Maximum Delay	msec	
CPICH Ec/Io	dB	
Relative time difference	Chips	[±1]

5.1.2. Fading propagation condition

The correct reporting of the event shall be greater than [X%] with [95%] confidence. The reporting is correct if the report has been sent before Maximum Delay time period from the ideal reporting time.

Measured quantity	Unit	Requirement
Maximum Delay	msec	

5.2. Incorrect Reporting

5.2.1. Fading propagation condition

Incorrect reporting shall be less than [X%] with [95%] confidence.

6. Conclusion

In this contribution performance test principles for soft handover evaluation have been presented. This document highlights that the CPICH Ec/Io measurement accuracy is complicated feature, and hence we feel that both erroneous reporting and time to report requirements are closely related to the terminal capability. Therefore we propose to include erroneous reporting requirement into specification as well.

The test procedure is proposed to include several neighbours on the neighbour cell list but only one neighbour cell is present. The cell, which is present, will randomly change during the test. Cell switching is performed as a step function since it's easy to implement in test devices.