3GPP TSG RAN Meeting #23 Tdoc RP-040134
Phoenix, AZ, USA, March 10 – 12, 2004

Source: Alcatel, Nortel Networks

Title: Proposed WID for Improvement of support of existing Beam-forming techniques

Agenda Item: 8.12

Document for: Approval

~~**3GPP TSG RAN Meeting #21 RP-030556**~~
~~**Frankfurt, Germany, 16 - 19 September 2003**~~

~~**Agenda Item:** 8.11~~
~~**Source:** Alcatel, Nortel Networks~~
~~**Title:** Proposed WID for Improvement of support of existing Beam-forming techniques~~
~~**Document for:** Approval~~

Work Item Description

Title: Improvement of support of existing beam-forming techniques

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

None

3 Justification

Beam-forming refers to in the 3GPP specification as the use of dedicated pilots or Secondary CPICH as a phase reference by the UE on the downlink. Beam-forming with dedicated pilot symbols or with S-CPICH has potential to improve system capacity. It is applicable to downlink transmission with dedicated channels and high speed downlink shared channels.

Beam-forming is supported from R99 on the Uu. Minimal support of beam-forming on the UTRAN side was introduced as a correction in Rel-5 at RAN#21. Such support relies on the addition of one dedicated UTRAN uplink measurement and modification of existing signaling procedures over the Iub and Iur to allow for the SRNC to indicate to the Node B the phase reference expected to be used by the UE and measurement reporting by Node B to the RNC. A release-6 WI (Beam-forming enhancement) considers further improvement of the support of beam-forming on the UTRAN by adding common UTRAN measurements, without any impact on the UE or any enhancement of the signaling procedures, beyond the reporting of these new measurements.

It is expected that beam-forming, as specified in Rel-5 or with the ~~expected~~ additions in Rel-6 from the WI on beam-forming enhancement, will bring performance improvement compared to the “no beam-forming” case. However there are a number of limitations with the Rel-5 Specifications or with the ~~expected~~ additions to the

released Rel-6 specifications which may reduce performance improvement. Below are some identified limitations:

- Any change of phase reference requires Radio Link Reconfiguration type of procedures. This causes delays in determining and applying the optimum phase reference, hence reducing achievable downlink gain, and increasing significantly the signaling load on the radio as well as the network interfaces. Phase reference change may be frequently needed as follows:
    - Phase reference change is required when the UE is moving from one beam to the next in the fixed grid case.
    - A phase change may also be needed if UE is configured a link without beam-forming. Initial configuration of the link without beam-forming may happen at call set-up because of insufficient uplink measurement to assign the correct fixed beam (in the S-CPICH based beam-forming) or to adjust a tracking beam (for the dedicated pilots), or before UE capability in terms of the support of dedicated pilot is known to the UTRAN (for R99 UEs). A new radio link may also be configured without beam-forming in case of the SHO as there is no measurement available (no downlink measurement on S-CPICH exists and there is no measurement on the RACH in case of SHO).
- UTRAN measurements are only available.
    - This may prevent selecting the appropriate S-CPICH, respectively adjusting the beam, when a radio link is added as explained above, in the case of beam-forming based on S-CPICH, respectively if dedicated pilots are used.
    - As there is some de-correlation between uplink and downlink conditions, adjustment of beam for either beam-forming methods may not be optimum.

The efficiency of beamforming with dedicated pilot symbols or S-CPICH could be improved and the load on the Iub/Iur interface be reduced if we could lift up some of the restrictions/drawbacks of Rel-5 or Rel-6 UTRAN support of beam-forming. This could be done by introducing improved procedures or signalling and possibly new measurements..

4 Objective

The objective of this work item is to identify appropriate new measurements, new or enhanced procedures and signalling support to improve the efficiency of beam-forming with dedicated pilot symbols or S-CPICH.

5 Service Aspects

None/Text

6 MMI-Aspects

None/Text

7 Charging Aspects

None/Text

8 Security Aspects

None/Text

9 Impacts

Affects:	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't					

know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
New TR	Improvement of support of existing beamforming techniques	TSG RAN WG1	TSG RAN WG3	TSG RAN#26~~23~~	TSG RAN#27 ~~24~~	

Affected existing specifications				
Spec No.	CR	Subject	Approved at plenary#	Comments
TS 25.133		Requirements for Support of Radio Resource Management (FDD)	TSG RAN#27~~24~~	
TS 25.211		Physical Channels and Mapping of Transport Channels onto Physical Channels (FDD)	TSG RAN#27~~24~~	
TS 25.214		Physical layer procedures (FDD)	TSG RAN#27~~24~~	
TS 25.215		Physical layer measurements (FDD)	TSG RAN#27~~24~~	
TS 25.306		Radio UE capability	TSG RAN#27~~24~~	
TS 25.331		RRC Protocol	TSG RAN#27~~24~~	
TS 25.423		UTRAN Iur Interface RNSAP Signalling	TSG RAN#27~~24~~	
TS 25.433		UTRAN Iub Interface NBAP Signalling	TSG RAN#27~~24~~	

11 Work item raporteurs

Volker Braun, Alcatel.

12 Work item leadership

TSG-RAN WG1

13 Supporting Companies

Alcatel, Nortel Networks

14 Classification of the WI (if known)

	Feature (go to 14a)
x	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

14b The WI is a Building Block: parent Feature

UTRAN Improvement feature

14c The WI is a Work Task: parent Building Block