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Beijing, China

Agenda Item: **9.10**
Source: **TSG RAN WG1 Chairman**
Title: Rel'5 **WI Status Report: "Beamforming"**
Document for: **Information**

At the TSG RAN #12 the topic of UE specific beamforming and shortcomings in the Rel'99 specification was raised. Tdoc RP-010483 proposed a WI on "UE Specific beamforming with dedicated pilots" and following the discussed it was agreed that in TSG RAN that support of beamforming shall be made as a UE capability.

Since TSG RAN#12 discussed have taken place in WG1 and WG2 and WG4, including the joint meeting between WG2/WG4.

The joint WG2/WG4 meeting concluded the following: (see ref. at the end)

1. UE Performance requirements will be inputted into rel-5 specifications, but WG1, WG2 & WG3 parts should
be in Release-99. (Note: Rel'99 means now from my understanding issues required for beamforming to work in the first place, optimisation e.g. new UTRAN measurements should be Rel'5 issue)

2. UE capability signaling to indicate the support of dedicated
pilots only (as phase reference) will be added into release 99 and rel-4.

3. If UE indicates that it supports the dedicated pilots
in rel-99, it shall support the performance requirements from
release 5.

4. RAN 2 shall remove the S-CPICH info from S-CCPCH info
(as it is not needed)

Based on this what remains to be done:

WG1:
Define the behavior of UTRAN when beamforming is used (especially in connection with phase reference change for the radio link(s) and in connection set up. The following action points were identified in Tdoc R1-010903 presented in WG1#21:

1) When the phase reference used is dedicated pilots, the synchronisation procedure might not remain the same and therefore RAN WG1 should define the relevant synchronisation procedure so that the synchronisation procedure might have a different figure for dedicated pilot case. A synchronisation procedure for this case should be defined, or this case should be included into

current procedures so that it allows different performance requirements for different phase references. Note that according to the current specification the synchronisation procedure B seem to assume that uplink transmission is maintained although there is a break in DL synchronisation. It should be studied whether this causes some unexpected problems especially because there is only one link active (i.e. no soft HO) Could it happen that Node B receives no signal in uplink through the beam and it starts ramping up TX power until the synchronisation is achieved?

2) There is a possibility that the active set is changed so that at least one of the current radio links remains in the active set but its phase reference changes e.g. from P-CPICH to dedicated pilots. RAN WG1 should either exclude this case or define the synchronisation procedure for it.
3) What to do when the phase references of all radio links in the active set change.
4) UTRAN measurements to support beamforming.

Also based on the reflector discussion and submitted CRs, review of other system options in case of beamforming is used, e.g. SSDT, needs to be done to ensure common understanding what can be used together with beamforming and what not (with dedicated pilots or with S-CPICH). The SSDT related CR has been directly submitted to TSG RAN.

WG2:
To implement the necessary modifications for the UE capability to indicate that support for beamforming is optional for Rel'99/Rel'4 UEs (This means now dedicated pilots, see later for S-CPICH) + removal of the unnecessary IE
for S-CCPCH.

WG4:
Take the input from WG1 regarding the syncronization procedure with beamforming operation and define the necessary cases. For the beamforming with S-CPICH the requirements are there, it should be noted that in those cases the delay components are the same with P-CPICH and S-CPICH and on that condition the beamforming is expected work properly with Rel'99/Rel'4 UEs with S-CPICH as phase reference. For other delay profile conditions operation is not required by the performance test cases.

The issue of active set size has been discussed in WG4 in terms of requirements for the active set when using dedicated pilots only. Discussed on this topic needs to continue as well.

Some further limitations of regarding minimum number of dedicated pilot symbols are also discussed, and this topic needs further discussions

Additionally there has been proposal for additional UTRAN measurements for the S-CPICH case and it has been noted in those discussion that both cases should be covered for the measurements (S-CPICH and Dedicated pilots only) (WG1 to follow up) (see ref at the end)

TSG RAN: Proposal from the WI point of view is to enhance the WI scope so that issues impacting both UE and UTRAN can be addressed, including e.g. new measurements. It is recomended TSG RAN also should be informed of the expected actions and how work is proceeding.

References:

R2-011723 "Draft Report of the joint TSG-RAN WG2/WG4 meeting" and the documents mentioned therein in agenda item 6.

R1-01-0768 "Draft Minutes of the TSG RAN WG1 Release-5 Ad Hoc", and discussions related there to R1-010704 "New UTRAN Measurement to support beamforming".

Summary: As there still exists a lot of work to be done, it is proposed that the work item presented in TSG RAN#12 UE specific beamforming with dedicated pilots would be revised for the name e.g. "UTRAN beamforming enhancement " to cover both UE and UTRAN behaviours, possible new UTRAN or UE measurents and performance requirements. A proper WI would ensure consistant monitoring of the progress in different WI.