**3GPP TSG-RAN WG4 Meeting #104-e draft R4-2214454**

**<Electronic Meeting>, 15 ‒ 26 August, 2022**

**Title:** WF on test metric for BC in RRC\_INACTIVE and initial access

**Agenda Item:** 11.7.4

**Source: Nokia**

**Document for:** Approval

# Sub-topic 1: Rel-16 RRC\_Connected Beam Correspondence applicability to Rel-18 RRC\_INACTIVE/IA Beam Correspondence

**Way forward/Agreements:**

* There is no UL beam sweep for IA BC requirements
* At least Msg1 will be tested.
* A ~~new~~ requirement is needed for Msg1 for all UEs regardless of Rel-16 BC IEs.
  + CMCC clarify what the new req is? spherical requirement? minimum peak EIRP or tolerance requirements?
  + Nokia: at least our intention is requirement for Msg1. We could remove new.
  + Qualcomm: Nokia comment is OK.
  + CMCC: removing new is oK for us. Do we consider the tolerance requirement? I did not see any description about the tolerance.
  + Ericssson: we would like to add at least Msg 1 it does not preclude the combinations with other metrics like RAR performance. Check the correlation between Rx and Tx beams.
  + Qualcomm: beam correspondence tolerance is associated with UE bit-0 to do beam sweeping. The requirement on the delta is not relevant there. There is not beam sweeping requirement here, i.e., tolerance.
  + Samsung: we just say beam correspondence is relative.
  + Huawei: share the same view as Qualcomm and Samsung. BC requirement is OK for me. For RAR requirement, currently companies agree with requirement of Msg1.
  + OPPO: regarding this bullet, it said requirement is needed regardless of Rel-16 BC IEs. In the later stage we will discuss the test reduction. We do not want to preclude Rel-16 BC.
  + CMCC: for UE to reporting supporting BC without beam sweeping, it means that we totally trust UE and no requirement.
  + Ericsson: we disagree with Huawei that RAR is FFS. We should not preclude it. The spherical coverage requirement would be relaxed and cannot guarantee the performance of BC.
  + Apple: Similar question as Ericsson. For connected mode, we have no additional step measurement similarity of Rx and Tx. Why do we need to do it for initial stage. We are OK to keep the door open. Currently stage we not sure.
  + ZTE: Missing part is whether there is BC in the initial access. We need to consider other metric.
  + Sony: to CMCC, for initial access, network cannot configure UE to do beam sweeping. All the UE should support BC without sweeping. We support not to preclude RAR. Whether to check RAR depends on how to set requirement.
  + Huawei: FFS does not preclude the RAR. We have already check UL and DL beam similarity.
  + Ericsson: does any spherical coverage requirement guarantee the beam correspondence?
  + Qualcomm: BC we have to talk about what is meaning of BC. It means that enough EIRP should be gotten. If checking the spatial filter, UL and DL may be different.
  + Samsung: the similarity was discussed. After discussion we only keep EIRP. We need to stick to previous. We just use EIRP metric. At the current stage, we do not think RAR metric and similarity is reasonable.
  + Apple: similar view as Samsung. The EIRP based requirement is sufficient. If Ericson believe the current requirement is not sufficient, it may be beyond the scope of WI.
  + Vivo: we are not ready to accept to take EIRP as the only values in this meeting. We do not know how UE generate the rough beam.
  + Qualcomm:
* If UEs support both IEs *beamCorrespondenceWithoutUL-BeamSweeping* and *beamCorrespondenceSSB-based-r16*, and performs IA with 4-step RACH then no new requirement is needed for Msg3
  + OPPO against
  + OPPO: for the Msg 3 it is premature to say whether it is needed or not. There is no consensus on it.
  + Apple: Share the similar view as OPPO. We think the sentence is misleading.
  + Qualcomm: the concern from companies are not automatically true.
  + Samsung: it is a slightly misleading.
* Use PC3 as baseline for testing and requirements and handle specific values for other PC afterwards and based on the same method
* At least spherical coverage requirements will be tested for RRC\_Inactive Beam correspondence for Msg1
  + Huawei/Xiaomi proposes RRC\_IDLE instead of RRC\_Inactive
  + Huawei: there is related discussion on whether the requirement should be specified for both. Majority view is that RRC\_idle is OK. We can only list idle.
  + Xiaomi: there is FFS on STD test and inactive mode test. The spherical need be test is unreasonable.
  + Nokia: this WI name is using RRC\_idle and initial access. We should align the terms.
  + OPPO: Echo Huawei and Xiaomi.
* Define a specific EIRP value at N% of the distribution of radiated power
  + QC/Samsung/Sony/ZTE not agree. Existing ones reused. vivo against the existing metric. Huawei to move this to FFS.
* Discuss the value of N, e.g. N=[X]% for PC3
  + QC/Samsung/Sony/ZTE not agree. Existing value X=50% reused. vivo against the existing metric. Huawei to move this to FFS.
* BC is defined at maximum output power. [Samsung, Sony]

Agreement:

* There is no UL beam sweep for IA BC requirements
* At least Msg1 will be tested.
* Use PC3 as baseline for testing and requirements and handle specific values for other PC afterwards and based on the same method
* BC is defined at maximum output power

**Way forward/FFS:**

* FFS: Study the relevancy of adding min peak EIRP requirements in addition with spherical coverage requirements for BC Inactive (for each of the cases: Msg1/MsgA/RA-SDT/CG-SDT)
  + QC against, Huawei IDLE instead of Inactive.
* FFS: values for the requirements (EIRP, X%, etc)
  + Samsung for keeping the existing X=50%
* FFS: Discuss whether BC requirements values will be the same for RA-SDT, CG-SDT and initial access (Msg1, MsgA, Msg 3), if yes should all be tested?
  + Huawei to remove Msg3.
* FFS: Discuss whether Msg1 and Msg A should have the same requirements? If yes, should both be tested?
* FFS: BC side conditions
* FFS whether RAR reception need to be also tested to verify the similarity between Tx and Rx beams. [Sony]

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| Company | Agree/Disagree, include justification |
| Qualcomm | We are not sure we need to redefine N % . We prefer to use the N specified for connected mode. Would proponents clarify why EIRP @ N must be studied again? (Do not agree to last 2 proposed agreements)  In the FFS list, why are we wanting to study the relevancy of min peak EIRP? (do not agree) |
| vivo | Before we figure out the baseline should be “rough” beam or “fine” beam and whether the beam refinement procedure is allowed during initial access, we can not agree the last 2 agreement above, and we prefer keep it open for further discussion. |
| Samsung | We agree with Qualcomm that the existing N% value of each power class should be reused, i.e. N=50% for PC3.  The same comment applys to the 2nd bullet of FFS list.  Besides beam correspondence test is at UE maximum output power in terms of testability, the beam correspondence requirements should also be specified at UE maximum output power. So we suggest to also capture this agreement in this WF for requiremen  t perspective. |
| OPPO | Regarding 4th bullet:  We don’t see there is agreement in 1st round that MSG3 will be specified, instead clear majority prefer only MSG1. Not clear why this MSG3 requirement are captured here as an agreement. Suggest to remove it.  And also not clear how to use “performs IA with 4-step RACH” as a precondition to determine whether MSG3 requirement is needed or not in conformance testing, this is not a beforehand information. |
| HW | Regarding 5th Agreement bullet:  In 1st round discussion, majority are interested in discussion on IDLE mode. Propose to change this bullet to :  “At least spherical coverage requirements will be tested for RRC\_IDLE Beam correspondence for Msg1”  Regarding last 2 Agreement bullets:  The exact spherical requirements would depend on discussion of ‘fine’ beam and ‘rough’ beam. Propose to keep these bullets FFS.  Regarding 1st FFS bullet:  Same as above. Propose to replace ‘Inactive’ by ‘IDLE’  Regarding 3rd FFS bullet:  As per Issue 2-2-3 in 1st round discussion, Msg 3 doesn’t need further study. |
| Sony | In general, considering this is the first meeting, it would be good enough if we could agree to take the EIRP spherical coverage of msg 1 as a starting point. Therefore, we are fine to remove the last two bullets in the agreement as suggested by QC.  We also support Samsung’s proposal on capturing the maximum output power.  In addition, we suggest to also add a point in the WF/FFS section that RAR need to be FFS:   * FFS whether RAR reception need to be also tested to verify the similarity between Tx and Rx beams. |
| CMCC | More detailed clarification is needed on the third bullet. The new requirement is spherical requirement? or new minimum peak EIRP or tolerance requirements? |
| ZTE | I would suggest to group the WF/agreements into two categories: core requirements and tests  Core requirements:   * There is no UL beam sweep for IA BC requirements * ~~At least Msg1 will be tested.~~ * A new requirement is needed for Msg1 for all UEs regardless of Rel-16 BC IEs. * If UEs support both IEs *beamCorrespondenceWithoutUL-BeamSweeping* and *beamCorrespondenceSSB-based-r16*, and performs IA with 4-step RACH then no new requirement is needed for Msg3 * ~~Use PC3 as baseline for testing and requirements and handle specific values for other PC afterwards and based on the same method~~ * ~~At least spherical coverage requirements will be tested for RRC\_Inactive Beam correspondence for Msg1~~ * Define a specific EIRP value at N% of the distribution of radiated power * Discuss the value of N, e.g. N=[X]% for PC3   Tests:   * At least Msg1 will be tested. * Use PC3 as baseline for testing and requirements and handle specific values for other PC afterwards and based on the same method * At least spherical coverage requirements will be tested for RRC\_Inactive Beam correspondence for Msg1   In addition, we also would like to know why percentage of each PC cannot be reused? |
| Xiaomi | Regarding 5th Agreement bullet  In another WF for BC testability, feasibility of testing UEs in Inactive mode is for further study, based on first round discussion, we have the similar view with HW, it should change Inactive mode to RRC\_IDLE. |
| Ericsson | Beam correspondence is a fundamental part of FR2. Testing this has been discussed since Rel-15. It has been argued that BC is implicitly verified by the spherical coverage test – the latter cannot be met without beam correspondence. Is this true for any spherical coverage requirement level for msg1? We note that UEs requiring beam sweeping in connected more are allowed a relaxed spherical coverage requirement.  We propose to amend the WF as follows   * “At least Msg1 will be tested. This does not precludc combination with other metrics like RAR performance in the test.” |