**3GPP TSG-RAN WG4 Meeting # 97e R4-200XXXX**

**Electronic Meeting, 2 – 13 Nov., 2020**

**Agenda item: 7.12.1**

**Source:** Moderator (Nokia)

**Title: Draft** Email discussion summary for [97e][113] NR\_RF\_FR2\_req\_enh\_Part\_4

**Document for:** Information

# Introduction

REL16 FR2 maintenance stream.

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: None
* 2nd round: TBA

# Topic #1: Beam Correspondence based on configured DL RS (SSB or CSI-RS)

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014320 | LG Electronics | Enhanced beam correspondence test applicability rules in rel-16  APPROVAL  Observation 1: In RRM measurement accuracy requirements, they specified same measurement accuracy requirements as 6.5 dB for each SSB based or CSI-RS based beam management with same side conditions.  Observation 2: In RF session, RAN4 decide the X = 3~6dB, then the SSB signalling quality is still useful to choose fine CSI-RS beam detection.  **Proposal 1: RAN4 specify X=3~6dB back off of SSB’ PSD for CSI-RS based eBC requirements.**  **Proposal 2: Based on Proposal 1, RAN4 allow test applicability rule with option1.**  • **Option1: If a UE meets beam correspondence requirements based on SSB, it is considered to have met the beam correspondence requirements based on CSI-RS.** |
| R4-2014512 | Nokia, Nokia Shanghai Bell | REL16 eBC capability alingment with 38.306  **CAT F CR**  **- REL-16 BC capability names are corrected to align with the RAN2 specifications.**  **- TBD for additional applicability rules is removed as additional applicability rules are not necessary. Separate UE capabilities are defined for BC based on SSB and BC based on CSI-RS. Both UE requirements have their own conditions and UEs should be verified against the Rel-16 eBC requirements that it indicate support for. Therefore, no further applicability rules are needed.** |
| R4-2014584 | Intel Corporation | On CSI-RS based beam correspondence  Approval  **Proposal: SSB’s PSD is backed-off by 6 dB from CSI-RS in CSI-RS based beam correspondence test.** |
| R4-2014722 | Samsung | Discussion on Rel-16 beam correspondence remaining issues  Discussion  **Proposal 1: For Rel-16 CSI-RS based beam correspondence, the X value is preferred as 3dB, and should be no more than 6dB at the worst case.**  **Proposal 2: Decide additional applicability rule between Alt 1-2-1-2 and Alt 1-2-1-3; and Alt 1-2-1-3 is preferred, i.e., if a UE meets beam correspondence requirements based on SSB, it is considered to have met the beam correspondence requirements based on CSI-RS.** |
| R4-2014923 | Apple Inc. | Remaining issues with beam correspondence enhancements  Discussion  **Proposal 1: Select X = 3 dB for the BC based on CSI-RS side conditions.**  **Proposal 2: For UEs which support both eBC based on SSB and eBC based on CSI-RS, the UE RF core requirements for both side conditions shall apply.**  **Proposal 3: For UEs which support both eBC based on SSB and eBC based on CSI-RS, beam correspondence performance is verified based on SSB only side conditions for all applicable TX RF requirements, and, additionally, for N EIRP points with EIRP ≥ 50%-tile minimum requirement are verified using the CSI-RS side condition.**  **Proposal 4: An LS informing RAN5 of the eBC applicability rule is needed, so that the information can be taken into account during their work on defining the conformance test specification.** |
| R4-2014924 | Apple Inc. | CR to **TR 38.831** on beam correspondence corrections  **CAT F CR**   1. **Define an applicability rule for UEs which support both eBC based on SSB and eBC based on CSI-RS** 2. **Define X = 3 dB in the CSI-RS side condition** |
| R4-2015344 | OPPO | Discussion on Rel-16 BC  Approval  **Applicability rules for UE support both SSB based and CSI-RS based BC**  ***Observation 1: L1-RSRP measurement accuracy is same for different reference signals if the reference signal density and side conditions (SINR/power levels) are same.***  ***Observation 2: Side conditions are same for SSB based and CSI-RS based BC, the difference is the density of reference signals for BC tests.***  ***Observation 3: RSRP measurement resources for CSI-RS based (without considering the SSB) is much smaller than the SSB based measurement which makes CSI-RS based is more stringent than the SSB based beam correspondence***  ***Observation 4: Proper choose the SSB power back off value comparing to CSI-RS can make the impact of SSB in CSI-RS based beam correspondence be neglected.***  ***Proposal 1: It is proposed to only test CSI-RS based beam correspondence for UEs that support both SSB based and CSI-RS based beam correspondence.***  ***SSB power back off value in CSI-RS based BC tests***  ***Proposal 2: It is proposed to adopt 7-9dB as the initial value and sent to RAN5 for further testability evaluation and the largest value will be adopted with the consideration of proposal 1 above.*** |
| R4-2015808 | Sony, Ericsson | Remaining issues in beam correspondence  Approval  Observation 1: Backing off the SSB PSD with X dB from CSI-RS PSD can emulate the real-life scenario.  Observation 2: Based on real field measurements, a minimum 7 dB RSRP difference can be observed between SSB and CSI -RS beam under LOS propagation conditions.  Observation 3: The SNR of SSB will be >= -1.0 dB for all grid points that satisfy spherical coverage requirement if it is backed off by 7 dB PSD from Rel-15 DL reference signals side condition. The SNR level is feasible for BC test.  Observation 4: According to the agreed applicable rules, a Rel-16 UE can pass the RF test without supporting the use of SSB for beam correspondence. Future enhancements are needed to guarantee the UE can support BC with SSB as SSB is the only always-on reference signal in the field.  Observation 5: The BC based on SSB may partially verify the BC based on CSI-RS, considering the BC performance is mainly affected by the SNR and number of RE.  **Proposal 1: For Rel-16 BC based on CSI-RS, SSB and CSI-RS are present, but SSB's PSD is backed-off by 7 dB from CSI-RS.** |
| R4-2016518 | Huawei, HiSilicon | CR on beam correspondence side condition  **CAT F CR**  **Define the SNR for CSI-RS signal as 3dB, and the corresponding Minimum CSI-RS\_RP values are provided with 3dB SNR**. |

## Open issues summary and views’ collection for 1st round

**Issue 1-1: SSB’s PSD is backed-off by X dB compared to CSI-RS in CSI-RS** **based eBC requirements**

* Proposals
  + Option 1: 3 dB
  + Option 2: 6 dB
  + Option 3: > 6 dB
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
| YYY |  |
| XXX |  |

**Issue 1-2: Additional applicability rules**

* Proposals
  + Option 1: None, remove current TBD
  + Option 2: Replace TBD with if a UE meets beam correspondence requirements based on SSB, it is considered to have met the beam correspondence requirements based on CSI-RS.
  + Option 3: Replace TBD with For UEs which support both eBC based on SSB and eBC based on CSI-RS, the UE RF core requirements for both side conditions shall apply.
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
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**Issue 1-3: Testing aspects**

* Proposals
  + Option 1: For UEs which support both eBC based on SSB and eBC based on CSI-RS, beam correspondence performance is verified based on SSB only side conditions for all applicable TX RF requirements, and, additionally, for N EIRP points with EIRP ≥ 50%-tile minimum requirement are verified using the CSI-RS side condition.
  + Option 2: Only test CSI-RS based beam correspondence for UEs that support both SSB based and CSI-RS based beam correspondence.
  + Option 3: Other
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
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### CRs/TPs comments collection

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| --- | --- | --- |
| **CR/TP number** | **Type/Source** | **Comments collection** |
| R4-2014512 | CAT F  Nokia | REL16 eBC capability alingment with 38.306 |
| Company A |
| Company B |
|  |
| R4-2014924 | CAT F  Apple Inc | CR to TR 38.831 on beam correspondence corrections |
| Company A |
| Company B |
|  |
| R4-2016518 | CAT F  Huawei, HiSilicon | CR for side condition of beam correspondence requirement |
| Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: DL interband CA

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014290 | Qualcomm Incorporated | Inter-band + intra-band CA FR2 frequency separation class  Approval  Observation 1: For combination of intra-band and inter-band CA, UE must support minimum of 1600 MHz BB bandwidth due to restrictions in available UE capabilities.  Observation 2: Without proper flexibility in the capabilities operators have to either accept UE with lower capabilities or then require over engineered devices for their needs.  **Proposal 1: Add 200, 400 and 600 MHz to the list of frequency separation classes in the Table 5.3A.4-2.** |
| R4-2014581 | Intel Corporation | CR to 38.101-2 (Rel-16) inter-band DL CA  **CAT F CR**  For inter-band DL CA, the current REFSENS and EIS spherical coverage requirements have brackets, remove the brackets |
| R4-2014585 | Intel Corporation | Rel-16 Inter-band DL CA requirements  Approval  **Proposal 1: Remove the brackets in the following sentence in the spec to keep PSD imbalance as specified:**  **[The requirement on each component carrier shall be met when the power in the component carrier in the other band is set to its EIS spherical coverage requirement for inter-band CA specified in sub-clause 7.3A.3.3].**  **Proposal 2: For ΔRIB,S,n in Table 7.3A.3.3-1, the brackets can be removed.**  **Proposal 3: For ΔRIB,P,n in Table 7.3A.2.3-1, the brackets can be removed.** |
| R4-2014597 | Qualcomm | Clarification of EIS spherical coverage for inter-band CA  **CAT F CR**  **Complete requirement specifications for EIS spherical coverage for inter-band CA for each power class by introducing passing criterion for common coverage area:**  **‘The common coverage requirement is determined as <100 - percentile rank> %, where ‘percentile rank’ is included in the specification of spherical coverage for that power class from section 7.3.4’**  **Note that ‘percentile rank’ is the number that goes before ‘%ile’.** |
| R4-2014932 | NTT DOCOMO, INC. | CR for PSD imbalance for FR2 DL inter-band CA  **CAT F CR**  **- Remove squeare bracket for the following sentence to apply PSD imbalance for FR2 DL inter-band CA**  **The requirement on each component carrier shall be met when the power in the component carrier in the other band is set to its EIS spherical coverage requirement for inter-band CA specified in sub-clause 7.3A.3.3.** |
| R4-2015088 | Nokia, Nokia Shanghai Bell | CR to TR 38.831 to include DL CA agreement  Approval  This TP propose to include the agreement on FR2 DL CA into TR 38.831 |
| R4-2015343 | OPPO | Discussion on Rel-16 FR2 inter-band DL CA  Approval  Observation 1: ΔRIB,P,n was introduced covering multi-band relaxation and large PSD imbalance relaxation where 2.5dB for multi-band relaxation seems agreeable.  Observation 2: During the peak EIS testing the other band will still transmit and the power is much higher than the band under testing which makes the other band is a blocking signal and performance degradation will happen.  **Proposal 1: It is proposed to agree on the 3.5dB total relaxation for inter-band DL CA and remove the [ ] from spec.** |
| R4-2016519 | Huawei, HiSilicon | CR for inter-band NC DL CA Rrefsens  **CAT F CR**  **Adding sentence: For a UE supporting a inter-band CA configuration, the ΔRIB applies for both SC and CA operation.** |
| R4-2016053 | Ericsson | Frequency separation class alignment  **CAT F CR**  Remove frequency separation class tables from RAN4 specs |
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## Open issues summary and views’ collection for 1st round

**Issue 2-1: Add 200, 400 and 600 MHz to the list of frequency separation classes in the Table 5.3A.4-2.**

* Proposals
  + Option 1: Add 200, 400 and 600 MHz
  + Option 2: Add nothing
  + Option 3: Add something
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
| YYY |  |
| XXX |  |

**Issue 2-2: Brackets removal from rel-16 Inter-band DL CA requirements**

* Proposals
  + Option 1: Remove all brackets (R4-2014585)
  + Option 2: Do not remove brackets
  + Option 3: Remove some of the brackets
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
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**Issue 2-3: Remove frequency separation class tables from RAN4 specs (R4-2016053)**

* Proposals
  + Option 1: Remove the tables
  + Option 2: Keep the tables
* Recommended WF
  + TBA

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| **Company** | **Comments** |
| XXX |  |
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### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Type/Source** | **Comments collection** |
| R4-2014581 | CAT F CR  Intel | CR to 38.101-2 (Rel-16) inter-band DL CA |
| Moderator: Cover sheet error as rev field is missing “-“, old CR template. |
| Company A |
| Company B |
| R4-2014597 | CAT F CR  Qualcomm | Clarification of EIS spherical coverage for inter-band CA |
| Moderator: Cover sheet error as rev says 1, old CR template. |
| Company A |
| Company B |
| R4-2014932 | CAT F CR  CAT F CR  NTT DOCOMO, INC. | CR for PSD imbalance for FR2 DL inter-band CA |
| Company A |
| Company B |
|  |
| R4-2015088 | Nokia, Nokia Shanghai Bell | CR to TR 38.831 to include DL CA agreement |
| Moderator: TR is under change control; real CR is required. |
| Company A |
| Company B |
| R4-2016519 | CAT F CR  Huawei, HiSilicon | CR for inter-band NC DL CA Rrefsens |
| Company A |
| Company B |
|  |
| R4-2016053 | CAT F CR  Ericsson | Frequency separation class alignment CR |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |