**3GPP TSG-RAN WG4 Meeting # 98-e R4-2102971**

**Electronic Meeting, 25 Jan. - 5 Feb., 2021**

**Agenda item:** 9.24.1, 9.24.4

**Source:** Moderator (SoftBank Corp.)

**Title:** Email discussion summary for [98e][123] NR\_FR2\_FWA\_Bn257\_Bn258

**Document for:** Information

# Introduction

This work item is to introduce the requirements on FWA UE, which maintains the max EIRP of 43dBm and max TRP of 23dBm upper power limitation, and to study and specify corresponding RF requirements for such kind of UE type. Both RF part and RRM/Demod part are planed to be completed by #98-e (this meeting).

As announced in the reflector, R4-2101423 is treated in the thread [98e][327] NR\_R17\_SpectrumWI\_Demod because this CR is related to the Demod part and it makes that many Demod experts can check it more easily.

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

* 1st round: the following topics are discussed.
  + Beam Correspondence
  + Release independence
* 2nd round: TBA

# Topic #1: Beam Correspondence

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100566 | Sony, Ericsson | Observation 1: The SNR condition for FWA devices is likely to be good and stable, and thus an FWA device should obtain a good RSRP estimation.  Observation 2 : The degradation due to the phase shifter errors have been included in the peak EIRP and spherical coverage requirement.  Observation 3: The beam correspondence depends on the SNR condition. Therefore, it is questionable whether it is useful for the network to know a UE BC capability with bit-1 or bit-0.  Proposal 1 : Define only BC bit 1 requirement for new FWA UE. |
| R4-2100692 | MediaTek Beijing Inc. | Proposal 1: If FR2 power class 5 beam correspondence is required, both beam correspondence bit-0 and bit-1 requirement shall be defined.  Proposal 2: As Table2, UE beam correspondence tolerance for FR2 power class 5:  • n257 = [3.0] dB at 85th %-tile ∆EIRPBC CDF  • n258 = [3.0] dB at 85th %-tile ∆EIRPBC CDF |
| R4-2101282 | Intel Corporation | Observation 1: In FWA deployments, the overhead for UL beam sweeping is significantly low comparing with PC3 deployments.  Proposal: Keep bit-0 UE as a beam correspondence design choice in addition to bit-1 UE. |
| R4-2101753 | OPPO | Observation 1: The nature of low/no mobility of FWA UE type makes the beam correspondence is not as meaningful as handheld UE.  Observation 2: The beam correspondence simulation assumptions for handheld UE in Rel-15 cannot be reused directly for this FWA device.  Observation 3: The beam correspondence simulation and discussion will probably be lengthy and controversial which will delay the urgent FWA WI completion date.  Proposal 1: It is proposed to follow PC1 approach, i.e. no requirement defined in RAN4 Rel-17. And whether to specify in the future can be discussed further when the market demands are shown. |
| R4-2102560 | Nokia, Nokia Shanghai Bell | Observation 1: The beam correspondence tolerance requirement has been introduced specific to the early handheld device with relatively large beam width support, thus, it cannot be simplify applied to FWA.  Proposal 1: bit-0 (BC tolerance requirement) shall not be allowed for FWA. |
| R4-2102631 | Huawei, HiSilicon | Observation 1: beam correspondence requirement for FWA UE is not critical on providing service and could leave to the market.  Observation 2: Beam correspondence UE capability is used to differentiate whether UL beam sweeping is needed, bit 1/0 is allowed to indicate regardless of UE power class.  Proposal 1: 2 options are provided for PC5 beam correspondence requirement:  Option 1: there is no BC requirement defined for PC5 in RAN4.  Option 2: Define both bit 0 and bit 1 beam correspondence requirement for the new FWA UE. The requirement follow BC requirement of PC3. |
| R4-2102669 | Qualcomm Incorporated | Proposal: The FR2 PC5 UE that declares beamCorrespondenceWithoutUL-BeamSweeping = 0 shall not be supported. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 1-1: Beam correspondence capability**

* Proposals
  + Option 1: Define only BC bit 1 requirement (Sony, Ericsson, Nokia, Qualcomm)
  + Option 2: Define both BC bit 0 and bit 1 requirement (MediaTek, Intel, Huawei)
  + Option 3: Follow PC1 approach, no requirement define in RAN4 Rel-17 (OPPO, Huawei)
* Recommended WF
  + Collect company's comments in the 1st round considering the following moderator's suggestion.
    - For Option 3, in the last meeting, many companies had the same concern as follows. It should be clarified whether it can be solved or not.
      * With no specification of BC requirements in 6.6, there is no assurance for the network that the UE has any beam correspondence ability before network assistance with UL beam sweeping.
    - If it is not easy to solve the above concern for Option 3, we should focus on the discussion on the selection of Option 1 or Option 2. Given two options, at least we can agree to introduce bit-1 requirement in the spec. The CR (R4-2102688) will be updated to add it.
    - The necessity of bit-0 should be discussed.

### Sub-topic 1-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-2: Beam correspondence tolerance**

* Proposals
  + Option 1: Follow the requirement of PC3 (MediaTek, Huawei)
* Recommended WF
  + Since there is only one option, but it depends on the discussion on Issue 1-1. It will be determined automatically with the discussion result of Issue 1-1.
    - If Option 1 or Option 2 is selected in Issue 1-1, it will be agreeable to follow the requirement of PC3.
    - If Option 3 is selected in Issue 1-1, there is no need to discuss for this issue.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Huawei | Sub topic 1-1:  Beam correspondence capability is indicated regardless of UE power class. Even PC1 is allowed to indicate bit 0 BC, though there is no bit-0 RF requirement for PC1.  As the spherical coverage requirement is the same for PC1 and PC5, we see PC5 could just PC1 approach as in option 3.  However, Option 2 is also OK for us.  Sub topic 1-2:  If Option 2 can be agreed, we support to follow PC3. |
| MediaTek | Sub topic 1-1:  **Issue 1-1: Beam correspondence capability**  We have different view on the observation “Given two options, at least we can agree to introduce bit-1 requirement in the spec.”; In our understanding, “bit-1 only” or “bit-0/1” is an open and bundled issue, it doesn’t mean we all have consensus to introduce “bit-1 part” firstly.  MediaTek’s support on option2 is listed and shared before. We believe beam sweep can further enhance UE Tx and overall network performance; and then, to have bit-0 requirement to clarify extra UE performance improvement by BC with beam sweep is needed.  Sub topic 1-2: **Issue 1-2: Beam correspondence tolerance**  If Option 2 can be agreed, we support to follow PC3 as starting point. |
| NTT DOCOMO, INC. | Sub topic 1-1:  We have an objection on option 3. Option 1 is preferable.  Option 3 seems that we cannot confirm BC performance in real environment.  Regarding option 1 or 2, Option 1 is better from operator perspective. In our understanding, the motivation of introduction of this new power class is to achieve higher EIRP and EIS to enhance coverage area and throughput in specific use cases. However, if we introduce bit-0 BC, then we need to take care about additional about [3dB] margin when we use this new PC in real environment. And we may take care about which FWA devices support bit-1 or bit-0 when we deploy PC5 UEs. |
| CHTTL | Sub topic 1-1: prefer option 1. |
| Sony | **Issue 1-1: Beam correspondence capability**  Option 1: Define only BC bit 1 requirement.  Bit-0 was introduced in Rel-15 to facilitate the early launching of mmwave handheld devices back in time. Two releases have passed until now, and we are also talking about a UE type with much higher design freedom than handheld mobile devices. Therefore, we think there is no need to define bit-0 for PC5. |
| Ericsson | **Issue 1-1: Option 1** |
| Qualcomm | **Issue 1-1: Option 1**  **We should carefully consider if we want to allow a new PC to have partial beam correspondence despite being 2 release cycles newer than the rest. There is no physical impediment to implementing full BC in an FWA UE due to relaxed packaging and power consumption constraints.** |
| Samsung | **Issue 1-1: Option 1**  **Introducing bit-0 UE capability to the new power class needs further discussion and consensus as we strived for PC3 in Rel-15. Since PC5 is about FWA devices that may not need additional network assistance or the UE test, it would be better for this WI not to discuss the tolerance requirement for the bit-0 UE which is not able to be completed in the meeting.** |
| Intel | **Issue 1-1: Beam correspondence capability**  Option 2 is preferred |

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| OPPO | **Issue 1-1: Beam correspondence capability**  Option 3 is our preference from the viewpoint that if bit-0 introduced then the tolerance would need simulations to derive the final value and it is not appropriate to directly reuse the PC3 tolerance since the simulation assumptions like antennas, space, form factors are tightly connected to smart phone rather than FWA. And if we follow this approach then this discussion will be lengthy and delay the PC5 WI and urgent market demands.  However, if this is not considered as an issue, then we are ok with Option2.  **Issue 1-2: Beam correspondence tolerance**  In our view,it is not appropriate to directly reuse the PC3 tolerance since the simulation assumptions like antennas, space, form factors are tightly connected to smart phone rather than FWA. |
| Nokia | Issue 1-1: Option 1 |

### 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** | **Comments collection** |
| R4-2102688 | 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:*  The agreement in the GTW session is the following.   * Requirements for bit 1 PC5 UE will be defined * FFS in this meeting if PC5 UE can rely on UL beam sweeping to meet min peak EIRP and spherical requirements * Recommend to RAN:   + close this WI at RAN#91   + RAN4 to continue the discussion on bit 0 PC5 UE requirements in R17 TEI, if we agree to define bit 0 PC5 UE requirements   *Candidate options:*  Whether PC5 UE can rely on UL beam sweeping to meet min. peak EIRP and spherical requirements.  *Recommendations for 2nd round:*  Continue the discussion for the above option. |

*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on Beam correspondece for FR2 FWA | SoftBank |

### CRs/TPs

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

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2102688 | To be revised to reflect the agreement in GTW session.  Samsung: Current version assumes that bit-0 capability is introduced. Unless that part is further updated only for bit-1 or removed, the CR cannot be agreed in this meeting as we agreed in GTW session. |

## Discussion on 2nd round (if applicable)

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| **Company** | **Comments** |
|  | **Issue: Whether PC5 UE can rely on UL beam sweeping to meet min. peak EIRP and spherical requirements:**  **MediaTek:** BC bit-0/1 applicability shall be power class agnostic. Hence, we support PC5 has BC bit-0/1 corresponding requirement.**Qualcomm: During the Rel-15 work phase, requirements for BC with beam sweeping was defined only for PC3 and Rel-15 was deemed complete. There was no interest to pursue bit 0 BC for other power classes (no contributions). This is consistent with the intent of bit 0, which was to help early implementation PC3 UEs along in a new network. These is no technical justification to allow a new UE type that relies on UL beam sweeping to meet spherical coverage requirements.**  Samsung: Still, we do not have the why/rationale behind that the bit-0 should apply to the FWA form factor which has better performance than the PC3 UE given the simple and clear antenna environment. Without any technical justification, we do not agree to introduce the bit-0 for the FWA device, PC5. ‘No need’ shall precede ‘no harm’ in technical discussions unless every UE has to have every capability in RAN4 specs. We shall avoid further debates in RAN4 even in RAN on the unnecessary feature without common understanding for the real product and network performance. |

## 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: Release independence

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100709 | SoftBank Corp. | This is a CR. |
| R4-2102700 | Qualcomm Incorporated | This is a CR. |
| R4-2102701 | Qualcomm Incorporated | This is a CR. |

## Open issues summary

### Sub-topic 1-1

Since R4-2102700 and R4-2102701 covers the content of R4-2100709, we can focus on only R4-2102700 and R4-2102701.

**Issue 2-1: Check the content of R4-2102700 and R4-2102701.**

* Recommended WF
  + Collect company's comment whether the revision is needed or not in the 1st round.

## Companies views’ collection for 1st round

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2102700 | Huawei: In our understanding, Rel-15 and Rel-16 CR is needed for TS 38.307. we are open to discuss. |
| CHTTL: In our understanding, R4-2100709 is the correct way to specify the release independent. The new PC is added in the present release (Rel-17) of 38.307,and the description about “release independent from Rel.15” is mmentioned in the content. There is no need for Rel.15/Rel.16 CR. |
| Qualcomm: to CHTTL: the referenced CR only introduces PC5 in rel17. RF requirements for Rel15 or Rel16 PC5 would be captured in the respective release of 38.307 |
| R4-2102701 | CHTTL: same comment above. |
| Company B |
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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:*  Based on the discussion in the GTW session, R4-2100709 is enough for updating the spec for release independence. R4-2100709 is agreed.  *Candidate options:*  Nothing  *Recommendations for 2nd round:*  We do not need to discuss further in the 2nd round. |

*Suggestion 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 provided recommendation on CRs/TPs Status update suggestion*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2100709 | Agreeable |

## 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”* |