**3GPP TSG-RAN WG4 Meeting # 97-e R4-2017014**

**Electronic Meeting, November 2-13, 2020**

**Agenda item:** 7.7.3.3

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [97e][215] NR\_pos\_RRM\_Part\_3

**Document for:** Information

# Introduction

The documents in agenda item 7.7.3.3 contains the following main topics and sub-topics under each main topic:

* Topic #1: gNB requirements
	+ Sub-topic 1-1: gNB measurements for accuracy requirements
	+ Sub-topic 1-2: Optionality of gNB measurement accuracy requirements
	+ Sub-topic 1-3: Side conditions for accuracy
	+ Sub-topic 1-4: Antenna/beam configuration
	+ Sub-topic 1-5: SRS configuration
	+ Sub-topic 1-6: Factors impacting accuracy for different gNB types
	+ Sub-topic 1-7: Accuracy requirements
* Topic #1: gNB report mapping
	+ Sub-topic 2-1: gNB timing positioning measurement report mapping updates

# Topic #1: gNB requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014002**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014002.zip) | ZTE Corporation | **Proposal 1: Once a gNB supports one particular method, it has to meet the accuracy requirements to guarantee the positioning accuracy.****Proposal 2: Separate side conditions to meet accuracy for UE in serving and for UE in neighbour cells. Define side conditions based on clause 7.2 in TS 36.111.****Proposal 3: The accuracy is defined for all SRS configurations but is met only for subset of SRS configurations declared by the manufacturer.** |
| [**R4-2014453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014453.zip) | CATT | **Proposal 1: Define accuracy for SRS-RSRP, gNB Rx-Tx time difference and UL RTOA.****Proposal 2: Mandatory for gNB to meet accuracy for supported positioning measurement.****Proposal 3: One set of side conditions is defined to meet accuracy for UE’s serving as well as neighbor cell, and the value can be derived from system simulation.****Proposal 4: gNB measurement accuracy requirement is applied when gNB receives in beam direction which UL signal is transmitted.** |
| [**R4-2015767**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015767.zip) | Huawei, HiSilicon, CMCC | Generic principles**Observation 1: gNB measurement requirements are necessary to guarantee the minimum performance of UL-based positioning techniques and UL-and-DL-based positioning techniques.****Observation 2: Defining requirements for a measurement type does not mandate every gNB to implement the measurement; whereas not defining requirements for a measurement type means the measurement performance cannot be tested even the measurement is implemented.****Observation 3: UL-based positioning is an important use case, and it will not be supported by RAN4 requirements if RAN4 only defines gNB requirements for Rx-Tx time difference and SRS-RSRP.**UL-RTOA related**Observation 4: The measurement requirements for UL-RTOA are already defined in LTE.****Observation 5: In NR, UL-ROTA measurement is taken by gNB, same as Rx-Tx time difference and SRS-RSRP measurement.****Observation 6: From gNB measurement performance point of view, UL-RTOA is quite similar as Rx-Tx time difference, so RAN4 effort to introduce requirements for UL-RTOA is not an issue.****Proposal 1: RAN4 to define gNB measurement accuracy requirements for UL-RTOA in the Perf part of the WI. The requirements and side conditions for gNB Rx-Tx time difference are re-used.** |
| [**R4-2015768**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015768.zip) | Huawei, HiSilicon | **Proposal 1: If a gNB declares support of a positioning technique, it should be able to meet the accuracy requirements defined for the corresponding measurement.****Proposal 2: Define two sets of Es/Iot conditions for gNB positioning requirements at -15dB and 3dB agnostic to cell type. No separate side conditions for serving cell and neighbour are defined.** **Proposal 3: gNB accuracy requirements does not depend on antenna beam configuration in gNB. The testing direction can be further discussed for the tests.****Proposal 4: gNB accuracy requirements are defined for subset of SRS configurations.*** **define accuracy requirements for multiple SRS BWs larger than 24 RB.**
* **define the accuracy requirements agnostic to comb and symbols size.**

**The accuracy requirements to be met for a certain gNB may be depending on gNB declaration.****Proposal 5: RAN4 to discuss the calibration error for the group delay and RSRP calibration error for different gNb types.** |
| [**R4-2015769**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015769.zip) | Huawei, HiSilicon | System level**Observation 1: the Es/Iot condition is quite dependent on the deployment scenario****Observation 2: the Es/Iot condition is quite dependent on the interference assumption****Observation 3: the Es/Iot condition is also different for different cells****Proposal 1: Define two sets of Es/Iot conditions for gNB positioning requirements at -15dB and 3dB, respectively.** Link level**Observation 4: The performance is very dependent on SNR conditions.****Observation 5: The performance difference between different comb and symbol size is mainly seen at low SNR and small BW.****Observation 6: The performance are quite dependent on the channel profile.** **Observation 7: The accuracy improves in proportion with BW in Hz due to better resolution.****Proposal 2: RAN4 to define accuracy requirements for multiple SRS BWs larger than 24 RB.****Proposal 3: RAN4 to define the accuracy requirements agnostic to comb and symbols size.** |
| [**R4-2015770**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015770.zip) | Huawei, HiSilicon | draftCR to introduce accuracy requirements for gNB positioning measurement |
| [**R4-2016088**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016088.zip) | Ericsson | **Proposal 1: Define accuracy only for SRS-RSRP and gNB Rx-Tx time difference (Option 1).** **Proposal 2: Optional for gNB to meet accuracy for supported positioning measurement (Option 2).** **Proposal 3: Separate side conditions to meet accuracy for UE in serving and for UE in neighbour cells (Option 2).****Proposal 4: Side conditions derived from system simulations (Option 2).****Proposal 5: Fixed antenna beams are assumed in gNB for deriving accuracy (Option 1).****Proposal 6: Accuracy is defined and met for subset of SRS configurations (Option 2).****Proposal 7: Divide the requirements for the Rx-Tx timing measurements in a PRS/SRS detection requirement (38.104) and timing requirements (38.133).** |
| [**R4-2016109**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016109.zip) | Ericsson | **Observation 1: The signal to noise ration Ês/Iot depends strongly on the bandwidth****Observation 2: The signal to noise ration Ês/Iot depends strongly on the cannel conditions.****Observation 3: The signal to noise ration Ês/Iot depends strongly on the frequency range.****Observation 4: The signal to noise ration Ês/Iot independent on the number of scheduled UEs in a large range.****Observation 5: The power control has a significant influence.** **Observation 6: The SNR of the UEs in the serving cell and the SNR of UEs in the neighbor cell is at least 20 dB.** **Proposal 1: Define one value for the signal to noise ration Ês/Iot in the serving cell and on for the signal to noise ration Ês/Iot in the neighbor cell.** |
| R4-2016154 | Ericsson |  |
| [**R4-2016157**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016157.zip) | Nokia, Nokia Shanghai Bell | 1. Agree option 1. No RTOA minimum accuracy requirements will be defined.
2. Agree option 2. Alternatively, option 2 can be reworded to state: “gNB shall meet accuracy requirements for supported positioning measurement as declared by the manufacturer”.
3. a) Side conditions for gNB Rx-Tx time difference and SRS-RSRP will be separately specified for

 UE’s serving gNB and for UE’s neighbor gNB (Issue-1, Option 2). b) Side condition for UE’s serving gNB is according to proposals for FR1 and FR2 in [6]. **c) Side condition for UE’s neighbor gNB for FR1 and FR2 is Ês/Iot = -16.9 dB.**1. For deriving accuracy requirements and for defining requirements for conformance testing, static gNB antenna beams with peak / main lobe directed towards the UE will be assumed for FR1 and FR2.
2. Accuracy requirements are specified for suitable SRS configurations and are met at least for a subset of suitable SRS configurations as declared by the manufacturer (new Option 3).
3. RAN4 to discuss the suitability of candidate SRS configurations, as depicted in Table 1 and 2, for deriving gNB minimum accuracy requirements for gNB Rx-Tx time difference and SRS-RSRP.
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| [**R4-2016158**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016158.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: Take into account the system simulation results reported in section 3 in the discussion related to the definition of Ês/Iot ratio as side condition for the serving cell and1a) Select Ês/Iot = -12.9 dB as side condition for serving cell in FR1.1b) Select Ês/Iot = FFS as side condition for serving cell in FR2. |
| R4-2016159 | Nokia, Nokia Shanghai Bell |  |
| [**R4-2016506**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016506.zip) | Qualcomm Incorporated | **Proposal 1: Mandatory for gNB to meet accuracy for supported positioning measurement.****Proposal 2: Define accuracy requirements for SRS-RSRP and gNB Rx-Tx time difference.****Proposal 3: One set of side conditions applicable to both serving and neighbor gNB to derive the gNB Rx-Tx time difference measurement accuracy requirements.****Proposal 4: Serving cell and neighbor cell side conditions derived from system simulations (values in TS 36.111 can be used as baseline).****Proposal 5: Clarify why gNB antenna beam configuration would matter for the purpose of defining measurement accuracy requirements. For OTA testing purposes, it would be appropriate to assume a fixed beam configuration provided that initial beam selection is included in the test procedure and that the test set-up remains static after initial beam selection is performed by the gNB.****Proposal 6: RAN4 to consider defining accuracy requirements in a tiered model (i.e., different accuracy requirements for different SRS BW).** **Proposal 7: RAN4 to agree on link-level simulation assumptions for gNB Rx-Tx time difference measurement to determine the suitable SRS configurations and their corresponding accuracy requirements.** |

## Open issues summary

### Sub-topic 1-1: gNB measurements for accuracy requirements

**Issue 1-1-1: Selection of option for gNB measurement accuracy requirements**

* Option 1: E///, Nokia, QC
	+ Define accuracy for SRS-RSRP and gNB Rx-Tx time difference
* Option 2: CATT, HW, CMCC
	+ Define accuracy for SRS-RSRP, gNB Rx-Tx time difference and UL RTOA
* Recommended WF
	+ Need further discussion

### Sub-topic 1-2: Optionality of gNB measurement accuracy

**Issue 1-2-1: Optionality of gNB measurement accuracy requirements**

* Option 1: QC, CATT, ZTE, HW
	+ Mandatory for gNB to meet accuracy for supported positioning measurement
* Option 2: E///, Nokia
	+ gNB shall meet accuracy requirements for supported positioning measurement as declared by the manufacturer
* Recommended WF
	+ Need further discussion

### Sub-topic 1-3: Side conditions for accuracy

**Issue 1-3-1: Side conditions (e.g. SINR) for applicability of accuracy**

* Option 1: CATT, QC
	+ One set of side conditions to meet accuracy for UE in serving as well as in neighbour cells
* Option 2: ZTE, HW, E///, Nokia
	+ Accuracy is defined for two different side conditions (two sets of Es/Iot).
* Recommended WF
	+ Collect companies’ feedback on the above proposals

**Issue 1-3-2: If two conditions are used for applicability of accuracy then whether they depend on cell type?**

* Option 1: ZTE, Nokia, E///
	+ One side condition is to meet accuracy for UE in serving and another one for UE in neighbour cells
* Option 2: HW
	+ The two sets of Es/Iot conditions are agnostic to cell type
* Recommended WF
	+ Collect companies’ feedback on the above proposals

**Issue 1-3-3: How to derive side conditions (e.g. SINR)**

* + Option 1: ZTE
		- Based on TS 36.111 clause 7.2
	+ Option 2: CATT, HW, Nokia, E///, CATT, QC
		- Based on system simulations
* Recommended WF
	+ Collect companies’ feedback on the above proposals

**Issue 1-3-4: Proposed side conditions (e.g. SINR) based on system results:**

**Table 1: System simulation results on side conditions (SRS Es/Iot)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Es/Iot [dB] (side condition 1/serving cell)** | **Es/Iot [dB] (side condition 2 /neighbour cell)** |
| **FR1** | **FR2** | **FR1** | **FR2** |
| HW | 3 | 3 | -15 | -15 |
| Nokia | -12.9 | TBD | -16.9 | -16.9 |
| Ericsson | X | Y | X-20 | Y-20 |

* Recommended WF
	+ Results are diverse. Collect companies’ feedback on alignment.

### Sub-topic 1-4: Antenna/beam configuration

**Issue 1-4-1: Antenna configuration in accuracy requirement**

* Option 1: Nokia, E///
	+ Fixed antenna beams are assumed in gNB for deriving accuracy
* Option 2: CATT, HW
	+ Accuracy does not depend on antenna beam configuration in gNB, i.e. do not assume fixed gNB antenna beams.
* Option 3: QC
	+ gNB antenna beam configuration is not needed in the requirement definition
* Recommended WF
	+ Collect companies’ feedback on the above proposals

**Issue 1-4-2: How to set antenna beam if fixed beam is assumed in accuracy requirement**

* Option 1: Nokia
	+ Accuracy to apply provided beam peak/main beam lobe directed towards the UE in FR1 and FR2.
* Other options not precluded
* Recommended WF
	+ Collect companies’ feedback on the above proposals

### Sub-topic 1-5: SRS configuration

**Issue 1-5-1: SRS configurations for defining and meeting accuracy requirements**

* Option 1: ZTE
	+ Accuracy is defined for all SRS configurations but is met only for subset of SRS configurations declared by the manufacturer
* Option 2: E///, HW, Nokia
	+ Accuracy is defined only for subset of suitable SRS configurations and is met for only subset of SRS configurations declared by the manufacturer
* Recommended WF
	+ Further discuss whether accuracy is defined for all SRS configurations or for only suitable/subset of SRS configurations.
	+ A set of SRS configurations for which the accuracy is met is declared by the gNB manufacturer.

**Issue 1-5-2: If accuracy is defined for subset of suitable SRS configurations, how to derive suitable configurations**

* Option 1: HW, E///, Nokia, QC
	+ Derive suitable SRS configurations based on link simulations.
* Other options not precluded
* Recommended WF
	+ Agree SRS configuration parameters in table 2 based on approved assumptions [R4-2012142]:

**Table 2: SRS configuration parameters for FR1 and FR2**

|  |  |
| --- | --- |
| **SRS configuration parameters** | **Value** |
| Number of SRS Resource sets | 1 |
| Number of SRS resources within one SRS resource set | 1 |
| SRS repetition factor | 1 |
| SRS frequency hopping | OFF |

* + Interested companies provide other SRS configuration parameters in tables 3 and 4 based on their results/analysis.

**Table 3: Other SRS configuration parameters for FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **SRS bandwidth [MHz]** | **SRS comb size** | **No. of SRS symbols** | **SRS resource periodicity TSRS [slots]** |
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**Table 4: Other SRS configuration parameters for FR2**

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| --- | --- | --- | --- |
| **SRS bandwidth [MHz]** | **SRS comb size** | **No. of SRS symbols** | **SRS resource periodicity TSRS [slots]** |
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### Sub-topic 1-6: Factors impacting accuracy for different gNB types

**Issue 1-6-1: Factors impacting timing measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)**

* Option 1: HW
	+ Calibration error for the group delay between the antenna and the baseband differs for different gNB types
* Other factors not precluded
* Recommended WF
	+ Collect companies’ feedback on the above proposal

**Issue 1-6-2: Factors impacting SRS-RSRP measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)**

* Option 1: HW
	+ RF calibration error differs for different gNB types
* Other factors not precluded
* Recommended WF
	+ Collect companies’ feedback on the above proposal

### Sub-topic 1-7: Accuracy requirements

Directly provide comments on the cat B CR (R4-2015770), if any, in section 1.3.2.

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1-1: Selection of option for gNB measurement accuracy requirements**

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| **Company** | **Comments** |
| Huawei | Support option 2.In our view, UL-based positioning is an important use case, and it will not be supported by RAN4 requirements if RAN4 only defines gNB requirements for Rx-Tx time difference and SRS-RSRP. We have already compromised to not define requirements for AoA/ZoA in Rel-16, and if UL-RTOA requirements are not defined, there would be nothing in RAN4 requirements to support UL-based positioning.On the other hand, we still do not see valid technical reasons why UL-RTOA requirements should not be defined.* One concern on defining requirements for UL-RTOA is the timeline of the WI. However, this is not an issue, as the requirements can be reused from gNB Rx-Tx.
* Another concern is the gNB sync. However, accuracy for UL-RTOA is a measurement performance requirement, and it does not mandate any NW synchronization requirements. We do not understand why NW synchronization is a concern particularly for UL-RTOA, because it is the same thing for DL part. If we follow the logic, RAN4 should just not define UE requirements for RSTD.
* Yet another concern is that use of UL-RTOA is different from that of gNB Rx-Tx. Here we are only defining accuracy requirements for the gNB measurement, and how the measurements are used in the positioning method is not relevant for RAN4. Also, the two measurements are used for different positioning methods, so only gNB supporting UL-TDOA needs to meet the accuracy requirements for UL-RTOA.

As there are clear interests from operators and vendors on UL-TDOA in RAN4, we suggest to define the measurement accuracy requirements for UL-RTOA. |
| Ericsson | Support option 1. It is not possible to reuse other requirements (e.g. gNB Rx-Tx) for UL RTOA without analysis and studies. |
| CATT | Support option 2.  |
| Intel  | Both options can be acceptable for us but slightly prefer Option 2 because the UL RTOA requirements can reuse these of gNB time difference in principle, which will increase few efforts. |
| Qualcomm | We would support either option 1 or option 2 (preferred). |
| CMCC | Support option 2. UL RTOA only rely on gNB, it is an important positioning type. It is necessary to define requirements for this positioning type. |
| Nokia | We support option 1. We provided justification in our discussion paper (R4-2016157). |

 **Issue 1-2-1: Optionality of gNB measurement accuracy requirements**

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| **Company** | **Comments** |
| ZTE | This is perhaps the 3rd meeting we discuss this issue. From technical point of view we believe it only makes sense for gNB to meet the requirements once gNB claims to support the positioning function. |
| Huawei | Support option 1.  |
| Ericsson | Support option 2. The “accuracy” is an accuracy in time (gNB Rx-Tx) or signal level (for SRS-RSRP), not a positioning accuracy. This accuracy gives guidance. |
| CATT | Support option 1.  |
| Intel | Support Option1. For gNB support such NR Pos, it shall declare these functionality. That is such requirements shall be applicable.  |
| Qualcomm | What is the difference between options 1 and 2? Please clarify. |
| CMCC | In our view, if gNB claims to support the positioning measurement type, gNB need to meet the related measurement requirements specified for the positioning measurement type.  |
| Nokia | We support option 2. Whether gNB actually satisfies a particular accuracy requirement is matter of manufacturer’s declaration.  |

**Issue 1-3-1: Side conditions (e.g. SINR) for applicability of accuracy**

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| **Company** | **Comments** |
| ZTE | We still support Option 2, which means that for serving cell and neighbour cells different side conditions are defined. We can further study the detailed values. |
| Huawei | We support option 2, based on our observation from system level that there is a large range of Es/Iot depending on the deployment scenario and interference assumption. |
| Ericsson | Support option 2. The conditions in the serving cell are very different compared to those in the neighbour cells (nearly not comparable). |
| CATT | We can support option 2 as well.  |
| Intel | Both options are fine for us. But slightly prefer Option 1. In our view, non-serving cell is enough for gNB based positioning. No need to define the side condition for the serving cell.  |
| Nokia | We support option 2. For one set of side conditions, we are not sure, how to define it, so that it covers different scenarios from strong reception levels to weaker reception levels. |

**Issue 1-3-2: If two conditions are used for applicability of accuracy then whether they depend on cell type?**

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| **Company** | **Comments** |
| ZTE | We support Option 1. Side conditions shall be specified for the serving cell and neighbour cells respectively. |
| Huawei  | We support option 2. None of the positioning techniques can work if gNB can measure SRS from UE in the serving cell only. The ultimate positioning performance is limited by measurement of UE in neighbor cells, so defining a separate accuracy for serving cell UE would not help.In addition, the performance is depending on the Es/Iot condition but not the cell type (serving or neighbor). Given the same Rx Es/Iot, the gNB should achieve same accuracy for a UE no matter if the UE is served by the gNB or by another neighbor gNB. |
| Ericsson | Support Option 1. One for serving cell and one for neighbour cell. |
| CATT | Support option 1. Generally the serving cell and neighbor cell can represent the different levels of side condition.  |
| Nokia | We support option 1. The serving cell scenario is important (it always exists) and hence will yield better Ês/Iot side condition. The cell type in our view has a smaller impact here, i.e. UMi will further improve Ês/Iot versus UMa, as already seen for DL. This should be accounted for. |
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**Issue 1-3-3: How to derive side conditions (e.g. SINR)**

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| **Company** | **Comments** |
| ZTE | We think that simulation based approach is time consuming. Our concern is to finalize on the side conditions soon to complete the work item. |
| Huawei | Support option 2. Based on our observation from system level that there is a large range of Es/Iot depending on the deployment scenario and interference assumption. Using only the condition in TS 36.111 clause 7.2 may not degrade the applicability of the requirements.  |
| Ericsson | Option 2 i.e. based on system simulations. The results up to now are not completely aligned between the companies. It must be checked whether the results are sufficient to agree on the starting values for the link level simulations. It seems possible to reach an agreement on the values in this meeting. |
| CATT | Support option 2.  |
| Intel | Option 2 is quite straightforward way since the simulation assumption and results are available.  |
| Nokia | We support option 2.  |

**Issue 1-3-4: Proposed side conditions (e.g. SINR) based on system results**

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| **Company** | **Comments** |
| Huawei | We suggest to define two sets of Es/Iot at 3 and -15dB, and we are open to discuss the detailed values. |
| Ericsson | Es/Iot = 7 dB for serving cell and Es/Iot= -13 dB for neighbour cell as start point. Same values for FR1 and FR2. Possible additional values for extreme conditions (e.g. very large distance, complicate channel models). |
| Intel | Can firstly calibrate the results. |
| Nokia | In our view, it is difficult to compare the contributed system results, as based on non-identical modelling assumptions regarding system aspects and interference. We focused on UMa case, which can be considered the most challenging one. We can agree to not define Es/Iot side condition as derived from UMa. UMi scenario in FR1 and FR2 could thus be selected to derive the two sets of Es/Iot side conditions, one for UE’s serving cell and one for UE’s neighbor cell. We can continue this analysis and conclude the side conditions in next meeting. |
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**Issue 1-4-1: Antenna configuration in accuracy requirement**

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| **Company** | **Comments** |
| Huawei | Support option 2.We think accuracy requirements does not need to depend on certain beam. The testing direction can be further discussed, e.g. using fixed declared beams. |
| Ericsson | Support option 1. An agreement could be the antenna beam configuration correspond to the approach used in the BS specs: 38.104 and 38.141. |
| CATT | We are fine with option 2 and option 3.  |
| Intel | Prefer Option 2. |
| Qualcomm | We tend to agree with options 2 and 3 but welcome further discussion. |
| Nokia | We support option 1.  |

**Issue 1-4-2: How to set antenna beam if fixed beam is assumed in accuracy requirement**

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| **Company** | **Comments** |
| Ericsson | Support option 1. Accuracy to apply provided beam peak/main beam lobe directed towards the UE. |
| Nokia | We support option 1.  |
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**Issue 1-5-1: SRS configurations for defining and meeting accuracy requirements**

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| **Company** | **Comments** |
| ZTE | We can agree on Option 2 as well. |
| Huawei | Support option 2, which is same as UE side.  |
| Ericsson | Support option 2. Accuracy is defined only for subset of suitable SRS configurations declared by the manufacturer. |
| CATT | Support option 2.  |
| Intel | Support Option 2 |
| Nokia | We support option 2. We are fine with 2nd bullet of the Recommended WF. |

**Issue 1-5-2: If accuracy is defined for subset of suitable SRS configurations, how to derive suitable configurations**

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| **Company** | **Comments** |
| Huawei | Support option 1, which is same as UE side.We are fine with parameters in Table 2. For Table 3, we suggest to define requirements only for SRS BW > 24 RB. We are open to further discuss if requirements are dependent on or agnostic to comb size and symbol size.  |
| Ericsson | Support option 1. To derive suitable SRS configurations based on link simulations.**Table 3: Other SRS configuration parameters for FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Bandwith SRS [MHz] / SCS [kHz]** | **SRS comb size** | **No. of SRS symbols** | **SRS resource periodicity TSRS [slots]** |
| 5 / 15 | Com4 | 4 | 160 |
| 20 / 15 | Com2 | 2 | 160 |
| 20 / 30 | Com4 | 4 | 160 |
| 20 / 30 | Com8 | 8 | 40 |
| 20 / 60 | Com8 | 8 | 40 |
| 100 | Com4 | 4 | 40 |

**Table 4: Other SRS configuration parameters for FR2**

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| --- | --- | --- | --- |
| **Bandwidth****SRS [MHz] / SCS kHz** | **SRS comb size** | **No. of SRS symbols** | **SRS resource periodicity TSRS [slots]** |
| 50 / 60 | Com8 | 8 | 40 |
| 50 / 120 | Com8 | 8 | 40 |
| 200 / 60 | Com8 | 8 | 40 |
| 400 / 120 | Com8 | 8 | 40 |

 |
| CATT | Support option 1.  |
| Intel | The recommended WF can be agreed.  |
| Nokia | We support option 1. Further selection between [Tx comb no/SRS symbols] of [8/8] and [8/12] should be done based on link simulation results. We prefer to keep 5 MHz SRS BW. |
|  |  |

**Issue 1-6-1: Factors impacting timing measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)**

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| **Company** | **Comments** |
| ZTE | We should not preclude other factors. |
| Huawei | At least RAN4 need to study the Calibration error for the group delay, and we are open to discuss other factors. |
| Ericsson | We need further analysis to identify impact of option 1 on the timing measurement accuracy. |
| Nokia | We agree, calibration error for the group delay and other impairments for gNB Rx time measurement accuracy should be studied by RAN4. |
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**Issue 1-6-2: Factors impacting SRS-RSRP measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)**

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| --- | --- |
| **Company** | **Comments** |
| ZTE | We should not preclude other factors. |
| Huawei | At least RAN4 need to study the RF calibration error, and we are open to discuss other factors. |
| Ericsson | We need further analysis to identify impact of option 1 on the timing measurement accuracy. |
| Nokia | We agree, RF calibration error and other impairments for SRS-RSRP measurement accuracy should be studied by RAN4. |
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### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2015770**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015770.zip) | **Nokia: It is premature to endorse the draftCR given issue 1-1-1. The tables on last page are obsolete.** |
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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#1-1** | **Issue 1-1-1: Selection of option for gNB measurement accuracy requirements****Agreements from GTW session (5th Nov):**Define measurement accuracy requirements for * SRS-RSRP
* gNB Rx-Tx time difference
* FFS: UL RTOA
	+ Further investigate whether the accuracy requirements for gNB Rx-Tx can be reused. If there are no technical issues to reuse gNB Rx-Tx time difference requirements, then the UL RTOA requirements will be defined.

Further study the impact from non-guaranteed SRS transmission for different methods*Recommendations for 2nd round:* None |
| **Sub-topic#1-2** | **Issue 1-2-1: Optionality of gNB measurement accuracy requirements** **Agreements from GTW session (5th Nov):**gNB shall meet accuracy requirements for supported positioning measurement for the test configurations (e.g. CBW, SRS configurations, etc) declared by the manufacturer*Recommendations for 2nd round:* None |
| **Sub-topic#1-3** | **Issue 1-3-1: Side conditions (e.g. SINR) for applicability of accuracy****Agreements from GTW session (5th Nov):**Accuracy is defined for two different side conditions (two sets of Es/Iot)* High SNR side condition (Es/Iot1) which corresponds to for example typical serving cell conditions or low interference neighbor cell conditions
* Low SNR side condition (Es/Iot2) which corresponds to for example typical neighbor cell conditions

*Recommendations for 2nd round:* None |
| **Sub-topic#1-3** | **Issue 1-3-2: If two conditions are used for applicability of accuracy then whether they depend on cell type?**Covered by the agreements on Issue 1-3-1.*Recommendations for 2nd round:* None |
| **Sub-topic#1-3** | **Issue 1-3-3: How to derive side conditions (e.g. SINR)***Tentative agreements:* Based on system simulations. Note: as agreed in issue 1-3-1 there will be two different side conditions: low Es/Iot and high Es/Iot values.*Recommendations for 2nd round:* None |
| **Sub-topic#1-3** | **Issue 1-3-4: Proposed side conditions (e.g. SINR) based on system results***Tentative agreements:* No consensus on Es/Iot values. Results are not well aligned. Need further discussion on side conditions (Es/Iot values).Review system simulation assumptions and update if needed.*Recommendations for 2nd round:* Discuss side conditions. Review system simulation assumptions in R4-2012141. |
| **Sub-topic#1-4** | **Issue 1-4-1: Antenna configuration in accuracy requirement***Tentative agreements:* No consensus*Candidate options:** Option 1: Nokia, E///
	+ Fixed antenna beams are assumed in gNB for deriving accuracy
* Option 2: CATT, HW, QC
	+ Accuracy does not depend on antenna beam configuration in gNB, i.e. do not assume fixed gNB antenna beams.
* Option 3: QC, CATT
	+ gNB antenna beam configuration is not needed in the requirement definition

*Recommendations for 2nd round:* Continue discussion on options |
| **Sub-topic#1-4** | **Issue 1-4-2: How to set antenna beam if fixed beam is assumed in accuracy requirement***Tentative agreements:* Accuracy to apply provided beam peak/main beam lobe directed towards the UE in FR1 and FR2*Recommendations for 2nd round:* None |
| **Sub-topic#1-5** | **Issue 1-5-1: SRS configurations for defining and meeting accuracy requirements***Tentative agreements:* * Accuracy is defined only for subset of suitable SRS configurations and is met for only subset of SRS configurations declared by the manufacturer.
* Subset of suitable SRS configurations are derived based on link simulations (uphold earlier agreement at RAN4#96-e in R4-2012140):

*Recommendations for 2nd round:* None |
| **Sub-topic#1-5** | **Issue 1-5-2: If accuracy is defined for subset of suitable SRS configurations, how to derive suitable configurations***Tentative agreements:** SRS configuration parameters in the following table are agreed:

**SRS configuration parameters for FR1 and FR2**

|  |  |
| --- | --- |
| **SRS configuration parameters** | **Value** |
| Number of SRS Resource sets | 1 |
| Number of SRS resources within one SRS resource set | 1 |
| SRS repetition factor | 1 |
| SRS frequency hopping | OFF |

* Continue discussing other SRS parameters (SRS BW, SRS comb size, No. of SRS symbols and SRS resource periodicity). If needed continue with link simulations to derive parameters.

*Recommendations for 2nd round:* Continue discussion on other SRS parameters |
| **Sub-topic#1-6** | **Issue 1-6-1: Factors impacting timing measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)***Tentative agreements:* * Study impact of calibration error for the group delay between the antenna and the baseband on gNB timing measurement accuracy,
* Study whether calibration error for the group delay between the antenna and the baseband differs for different gNB types and
* Study other impairments impacting gNB timing measurement accuracy.

*Recommendations for 2nd round:* Continue discussion |
| **Sub-topic#1-6** | **Issue 1-6-2: Factors impacting SRS-RSRP measurement accuracy for different gNB types (1-C, 1-H, 1-O, 2-O)***Tentative agreements:*RF calibration error differs for different gNB types* Study impact of RF calibration error on SRS-RSRP measurement accuracy,
* Study whether RF calibration error differs for different gNB types and
* Study other impairments impacting SRS-RSRP measurement accuracy.

*Recommendations for 2nd round:* Continue discussion |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on gNB positioning measurement requirements | Ericsson (WF for approval) |
| #2 | Updated system simulation assumptions for deriving side conditions | Ericsson (for approval) |

### 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**  |
| [R4-2015770](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015770.zip) | Noted |

## 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: gNB measurement report mapping

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2016062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016062.zip) | Ericsson | CR on updating parameter k used in the gNB timing measurement report mapping |

### Sub-topic 2-1: Correction to gNB measurement report mapping

• Directly provide comments on the cat F CR in R4-2016062, if any, in section 2.2.2.

## Companies views’ collection for 1st round

### Open issues

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2016062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016062.zip) | Huawei: We are not sure if the changes are needed. The proposed changes are imposing restrictions on gNB selection of k value, and the benefit is just reduced number of bits in the report signaling. We understand the signaling overhead might be an issue for UE which reports via LPP, but it is not an issue for gNB which reports via NRPPa.In this sense, there is no need to have such restrictions on the gNB side, but what is important is that the reports can meet the accuracy requirements.  |
| Intel: we share same view as Huawei. The benefit with such addtional restriction is meaningless.  |
| Nokia: The applicability is RAN, not UE on cover page. |
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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.*

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

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2016062 | 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”* |