**3GPP TSG-RAN WG4 Meeting # 96-e R4-20XXXX**

**Electronic Meeting, August 17-28, 2020**

**Agenda item:** 7.7.2

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [96e][217] NR\_pos\_RRM\_Part\_3

**Document for:** Information

# Introduction

The documents in agenda items 7.7.2.2, 7.7.2.3 and 7.7.2.4 contains the following main topics and sub-topics under each main topic:

* Topic #1: New measurement gap patterns for positioning measurements (AI 7.7.2.2)
  + Sub-topic 1-1: Measurement gaps for positioning measurements
  + Sub-topic 1-2: Gap sharing
  + Sub-topic 1-3: CRs on gaps
* Topic #2: gNB requirements (AI 7.7.2.3)
  + Sub-topic 2-1: Selection of option for gNB measurement accuracy requirements
  + Sub-topic 2-2: Optionality of gNB measurement accuracy requirements
  + Sub-topic 2-3: Basic scenario/condition for gNB measurement accuracy requirements
* Topic #3: Other requirements (AI 7.7.2.4)
  + Sub-topic 3-1: CRs on report mapping for gNB positioning measurements
  + Sub-topic 3-2: SRS transmission during DRX inactive

# Topic #1: New measurement gap patterns for positioning measurements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2009741**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009741.zip) | ZTE | ***Proposal 10: For RSTD measurement with gap, the measurement delay extension with the similar gap sharing scaling factor as NR SA measurements for the equal splitting gap scheme shall be considered, e.g.***   * ***CSSFRSTD = CSSFwithin\_gap,i which is defined in clause 9.1.5.2.2 of TS38.133 [6] for the inter-frequency SSB measurements with equal splitting gap sharing scheme*** |
| [**R4-2009881**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009881.zip) | Qualcomm | CR to 38.133 update CSSF within gap to include NR positioning measurements with gap sharing. The proposed changes are independent of whether new MG patterns are adopted for positioning or not. |
| [**R4-2009674**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009674.zip) | ZTE | **Proposal 1: New gap patterns for PRS measurements shall use only current MGRP.**  **Proposal 2: Add two new gap patterns as listed below:**   |  |  |  | | --- | --- | --- | | **Gap Pattern Id** | **Measurement Gap Length (MGL, ms)** | **Measurement Gap Repetition Period**  **(MGRP, ms)** | | 24 | 20 | 160 | | 25 | 40 | 160 |   **Proposal 3: When a UE is configured a gap pattern different than it requested, it shall still measure PRS and meet all the requirements (RRM and positioning related requirements).**  **Observation 1:** The current signaling supported by RAN2 doesn’t support indication of new MGL.  **Proposal 4: Send LS to RAN2 cc RAN1 on the new gap patterns and new configurations.**  **Proposal 5: Active BWP switching is prioritized over PRS measurement in a gap where active BWP switching is triggered.**  **Proposal 6: The UE is not required to meet PRS measurement requirements if Option 1 (prioritize BWP switch over PRS measurements) is adopted.** |
| [**R4-2009740**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009740.zip) | Intel | **Observation 1: For NR new gap patterns in [1], the more complicated scenarios of collision between the measurement gap and SMTC need to be analyzed carefully.**  **Observation 2: The separated new gap pattern can’t be used for PRS measurement only in Rel16.**  ***Proposal 1: The new measurement gap for PRS measurement can be FFS beyond Rel16.*** |
| [**R4-2009849**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009849.zip) | CATT | **Proposal 1: The combination of MGL and MGRP is {10, 80}ms and {10, 160}ms if introduced in Rel-16.**  **Proposal 2: The new gap patterns are applied for positioning measurement only.**  **Proposal 3: The PRS measurement and RRM measurement will impact each other by gap overlapping.**  **Proposal 4: When positioning measurement is performed using existing gap, the PRS and RRM measurement will impact each other by gap sharing defined as CSSF.**  **Proposal 5: When positioning measurement is performed in new gap pattern, since the gap cannot be used for RRM, one of measurement will be dropped due to gap collision.**  **Proposal 6: PRS measurement is performed in a gap even if active BWP switching is triggered in that gap i.e. PRS measurement is prioritized in gaps.** |
| [**R4-2009879**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009879.zip) | Qualcomm | **Observation 1. The useable portion of MGL for PRS is significantly reduced in typical deployments (TSMTC < TPRS) given that one MG pattern must cover both SMTC and PRS and the fact that PRS cannot be transmitted in SSB symbols.**  **Proposal 1. RAN4 to adopt new measurement gap patterns as in Table 1 for NR positioning.**  Table 1 New measurement gap patterns for NR positioning   |  |  |  | | --- | --- | --- | | New gap pattern ID | MG length (ms) | MG period (ms) | | 24 | **20** | **160** | | 25 | **40** | **160** |   **Proposal 2. New MG patterns for positioning shall be defined per-UE and per-FR similar to R15 MG patterns.**  **Proposal 3. RAN4 to introduce capability signaling for each of the two new measurement gap patterns.**  **Proposal 4. When UE is in a positioning session and new MG patterns are configured, RRM measurements also share the same MG pattern.**  **Proposal 5. Tables 9.1.2-2 and 9.1.2-3 in TS 38.133 are updated to include new MG patterns and their applicability when measurement purpose is NR.**  **Proposal 6a. In synchronous EN-DC, NR standalone operation, and NE-DC, and on all serving cells in MCG for NR standalone operation with per-UE and per-FR measurement gaps for FR1, the total number of interrupted slots on serving cells are:**   * **20 slots when MGTA = 0 and 21 slots when MGTA = 0.5ms for 15 kHz SCS if MGL = 20ms** * **40 slots when MGTA = 0 and 41 slots when MGTA = 0.5ms for 15 kHz SCS if MGL = 40ms** * **40 slots for 30 kHz SCS if MGL = 20 ms** * **80 slots for 30 kHz SCS if MGL = 40 ms** * **80 slots for 60 kHz SCS if MGL = 20 ms** * **160 slots for 60 kHz SCS if MGL = 40 ms** * **160 slots for 120 kHz SCS if MGL = 20 ms** * **320 slots for 120 kHz SCS if MGL = 40 ms**   **Proposal 6b. In asynchronous EN-DC, and on all serving cells in SCG for NR standalone operation with per-UE and per-FR measurement gaps for FR1, the total number of interrupted slots on serving cells are:**   * **21 slots for 15 kHz SCS if MGL = 20ms** * **41 slots for 15 kHz SCS if MGL = 40ms** * **41 slots for 30 kHz SCS if MGL = 20ms** * **81 slots for 30 kHz SCS if MGL = 40ms** * **81 slots for 60 kHz SCS if MGL = 20ms** * **161 slots for 60 kHz SCS if MGL = 40ms** * **161 slots for 120 kHz SCS if MGL = 20ms** * **321 slots for 120 kHz SCS if MGL = 40ms**   **Proposal 6c. Total number of interrupted slots on FR2 serving cells during MGL for EN-DC, NR SA, and NE-DC with per-UE and per-FR measurement gap are:**   * **80 slots for 60 kHz SCS if MGL = 20ms** * **160 slots for 60 kHz SCS if MGL = 40ms** * **160 slots for 120 kHz SCS if MGL = 20ms** * **320 slots for 120 kHz SCS if MGL = 40ms**   **Observation 2. For NR positioning measurements with MG, maximum PRS periodicity can be 10.24s. Moreover,**   * **For TPRS  10ms, excluding TPRS = 8ms, the effective MGRP is 20ms** * **For TPRS = 8ms, the effective MGRP is 40ms** * **For TPRS = 16ms, the effective MGRP is 80ms** * **For TPRS = 32ms, the effective MGRP is 160ms**   Table 2 Scenarios with CSSFwithin\_gap,i=1 for NR positioning measurements   |  |  | | --- | --- | | Max DL-PRS-Periodicity in positioning frequency layer *i* (TPRS) (ms) | Max bitmap size of DL-PRS-MutingPattern in positioning frequency layer *i* | | 64, 320, 640, … ,10240 | **With or without muting** | | 32, 160 | **With muting of any bitmap size** | | 16, 80 | **With muting of bitmap size ≥ 4 bits** | | 8, 40 | **With muting of bitmap size 8 bits** |   **Proposal 7. Use CSSFwithin\_gap,i=1 for NR positioning configurations outlined in Table 2.**  **Proposal 8. An NR positioning frequency layer is a candidate to be measured in a gap if there is at least one DL PRS resource from that frequency layer that is fully contained (including the time duration spanned by its unmuted slots as configured by *DL-PRS-ResourceRepetitionFactor* ± its corresponding *DL-PRS-expectedRSTD-uncertainty*) by the gap.** |
| [**R4-2009882**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009882.zip) | Qualcomm | **CR to 38.133 on new MG patterns ID 24 and 25** |
| [**R4-2009913**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009913.zip) | Apple | ***Proposal 1: the new positioning MGs can only be requested by UE or configured by network when UE has PRS measurement.***  ***Proposal 2: the new NR positioning MG cannot be used when any 2G/3G MO is configured or when LTE RSTD measurement is configured.***  ***Observation1: the UE capability for concurrent RRM/PRS processing/measurement is still open and therefore how to use the legacy independent MG capability for new positioning MG is unclear.***  ***Proposal 3: RAN4 needs more discussion on the applicability of legacy independent MG capability indication to the new positioning MG patterns.***  ***Observation2: the UE capability for concurrent RRM/PRS processing/measurement is still open and therefore how to use the legacy effective MG assumption for new positioning MG is unclear.***  ***Proposal 4: RAN4 needs more discussion on the applicability of legacy effective MG when the new positioning MG patterns is used for legacy RRM measurement.***  ***Proposal 5: RAN4 needs more discussion on whether the legacy CSSF design could be reused when new positioning MG is used for both RRM measurement and positioning measurement.***  ***Proposal 6: In Rel-16, the legacy RRM requirements shall not applied during the period when UE is configured with new positioning MG patterns for PRS measurement.*** |
| [**R4-2010205**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2010205.zip) | MediaTek | **Proposal 1**: Introduce the following MGL for POS  - MGL: 10ms, 18ms, 34ms, 66 ms  **Proposal 2**: Introduce the following MGRP for MGL in proposal 1:  - MGRP: 40ms, 80ms, 160ms, 320ms, 640ms, where  - MGRP 40ms is applicable for MGL 10ms  - MGRP 80ms is applicable for MGL 10ms, 18ms  - MGRP 160ms is applicable for MGL 10ms, 18ms, 34m  - MGRP 320ms is applicable for MGL 18ms, 34ms  - MGRP 640ms is applicable for MGL 34ms, 66ms  **Proposal 3**: If active BWP switching overlaps/collides with gaps used for PRS measurements, then UE performs active BWP switch after the current gap occasion, i.e., UE prioritizes PRS measurement in gap |
| [**R4-2010709**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2010709.zip) | OPPO | **Proposal 1: Define new gap patterns with 10ms MGL and {80, and 120}ms MGRP.**   |  |  |  | | --- | --- | --- | | New gap pattern ID | MG length (ms) | MG period (ms) | | X | 10 | 80 | | Y | 10 | 160 |   **Observation 1: Try to reduce the impact on existing RRM measurements by introducing new gap patterns for positioning measurement in Rel-16.**  **Proposal 3: No extra impact on existing RRM measurements is introduced by new gap patterns with 10ms MGL and {80, and 120}ms MGRP.**  **Proposal 4: Active BWP switching should be prioritized over PRS measurement in a gap where active BWP switching is triggered. If active BWP switching interrupts any PRS/SRS then the UE is not required to meet positioning measurement requirements** |
| [**R4-2010756**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2010756.zip) | NEC | **Proposal 1: RAN4 to introduce new MG pattern with MGL=10 and MGRP=80ms and newly introduced MG pattern shall be only applicable for PRS measurements in Rel-16.**  **Proposal 2: RAN4 to study further enhancement of newly introduced MG pattern to make it applicable for both PRS and RRM measurements in Rel-17.** |
| [**R4-2011162**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011162.zip) | Huawei, Hisilicon | **Proposal 1: Performing PRS measurement in successive MG occasions is subject to signaled UE capability {N,T}.**  **Proposal 2: Introduce the following two new MG patterns in Rel-16**   * **MGL = 10ms, MGRP = 80ms** * **MGL = 20ms, MGRP = 160ms**   **Proposal 3: New MG patterns are applicable for PRS measurement as well as RRM measurement for NR/LTE.**  **Proposal 4: Per UE gap and per FR gap apply for PRS and PRS+RRM measurement.**   * **Applicability of Rel-15 MG patterns as per UE and per FR gap remains unchanged** * **New MG patterns can also be used as per UE gap and per FR gap for both FR1 and FR2**   **Proposal 5: Configuration of MG for PRS measurement does not impact the existing rule for gapless RRM measurement** **in case of per FR gap configuration.**  **Proposal 6: MG is half-half shared between RRM and PRS measurement. The measurement period of both PRS and RRM measurements are scaled by a factor of 2 in case MG sharing applies.**  **Draft LS**:  RAN4 agreed to introduce the following 2 new measurement gap patterns in Rel-16:   * Gap pattern #24: MGL = 10ms, MGRP = 80ms * Gap pattern #25: MGL = 20ms, MGRP = 160ms   UE can optionally support one or both of the 2 new measurement gap patterns.  The 2 new measurement gap patterns can be used for measurement of   * NR PRS only, or * NR PRS and RRM measurement (for NR and/or E-UTRA measurement objects).   The 2 new measurement gap patterns can also be used as per UE gap and per FR gap for both FR1 and FR2. Existing capability independentGapConfig also applies for the 2 new measurement gap patterns. |
| [**R4-2011163**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011163.zip) | Huawei, Hisilicon | CR to 38.133 on CSSF and measurement gap related requirements for positioning |
| [**R4-2011164**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011164.zip) | Huawei, Hisilicon | CR to 36.133 on measurement gap related requirements for positioning |
| [**R4-2011360**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011360.zip) | Ericsson | * ***Observation****: Among the agreed in [1] candidate patterns, the following measurement gap configurations satisfy MGL/MGRP≤0.3 and MGRP≤160 ms:*   + *MGL=10 ms, MGRP=80 ms*   + *MGL=10 ms, MGRP=160 ms*   + *MGL=20 ms, MGRP=80 ms*   + *MGL=20 ms, MGRP=160 ms* * ***Proposal 1****: Introduce the following two new measurement gap patterns*   + *Gap pattern ID 24: MGL=10 ms, MGRP=80 ms*   + *Gap pattern ID 25: MGL=20 ms, MGRP=160 ms* * ***Proposal 2****: The new measurement gap patterns can be requested for FDD and TDD NR positioning measurements.* * ***Proposal 3****: The new measurement gap patterns are configured as per-UE measurement gap patterns if the UE does not support per-FR measurement gaps, otherwise the new measurement gap patterns are configured for the FR in which the positioning measurements are to be performed.* * ***Proposal 4****: The new measurement gap patterns can be requested only when the UE is configured with NR positioning measurements requiring such gaps via LPP and can only be used during the corresponding positioning measurement period.* * ***Proposal 5****: If configured, any of the two new measurement gap patterns shall be used also for RRM measurements if the UE needs to perform RRM measurements requiring measurement gaps during the positioning measurement period. This applies for:*    + *RRM measurements in any FR with per-UE measurement gaps, and*   + *For RRM measurements in the same FR as positioning measurements when the UE supports per-FR measurement gaps.* * ***Proposal 6****: Reuse for PRS-based positioning measurements the same approach as for other gap-based measurements. New sections need to be added in 9.1.5.2 for all PRS-based positioning measurements in any gaps, including the new gaps.* * ***Proposal 7****: In the definition of CSSF, NR positioning measurements are counted together with inter-frequency and inter-RAT measurement objects.* * ***Proposal 8****: No need to differentiate between the new and legacy measurement gaps in the definition CSSF.*   **Draft LS:**   * The two new measurement gap patterns:   + Gap pattern ID 24: MGL=10 ms, MGRP=80 ms   + Gap pattern ID 25: MGL=20 ms, MGRP=160 ms * The new measurement gap patterns can be requested for FDD and TDD NR positioning measurements. * The new measurement gap patterns are configured as per-UE measurement gap patterns if the UE does not support per-FR measurement gaps, otherwise the new measurement gap patterns are configured for the FR in which the positioning measurements are to be performed. * The new measurement gap patterns can be requested only when the UE is configured with NR positioning measurements requiring such gaps via LPP and can only be used during the corresponding positioning measurement period. * If configured, any of the two new measurement gap patterns shall be used also for RRM measurements if the UE needs to perform RRM measurements requiring measurement gaps during the positioning measurement period. This applies for:   + RRM measurements in any FR with per-UE measurement gaps, and   + For RRM measurements in the same FR as positioning measurements when the UE supports per-FR measurement gaps. |
| [**R4-2011361**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011361.zip) | Ericsson | CR to 38.133 on measurement gaps for PRS-based measurements |
| [**R4-2011506**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011506.zip) | Nokia, Nokia Shanghai Bell | 1. Specify following two new MG patterns for NR positioning, optional for UE, in Rel-16: 2. **MGL=10 ms and MGRP=80 ms** 3. **MGL=40 ms and MGRP=160 ms** 4. Define the two new MG patterns for performing combined RRM/NR positioning measurements. |

## Open issues summary

Scope of RAN4 core work according to the approved exception sheet in [RP-201343](http://3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_88e/Docs/RP-201343.zip):

1. PRS RSTD measurement requirements:

* Measurement period requirement
* Measurement capability

1. UE Rx-Tx time difference measurement requirements:

* Measurement period requirement
* Measurement capability

1. PRS RSRP measurement requirements

* Measurement delay requirement
* Measurement capability

1. Other RRM impacts

* New measurement gap patterns for positioning measurements and impacts on existing RRM measurements

Note: In case RRM requirements for new MG are not finalized in RAN4#96-e then no new MG will be introduced in Rel-16.

### Sub-topic 1-1: Measurement gaps for positioning measurements

**Issue 1-1-1: New MG patterns**

In RAN4#95-e according to the approved WI in [R4-2009266](http://3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_95_e/Docs/R4-2009266.zip) the following was agreed:

“*Introduce 2 new MG patterns with MGL ≥ 10 ms and MGRP ≥ 80 ms…New MG patterns shall be UE capability.*”

* **Proposals on new MG patterns:**
  + Option 1: ZTE, QC

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| Gap pattern ID | MG length (ms) | MG period (ms) |
| 24 | 20 | 160 |
| 25 | 40 | 160 |

* + Option 2: CATT, OPPO

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| Gap pattern ID | MG length (ms) | MG period (ms) |
| 24 | 10 | 80 |
| 25 | 10 | 160 |

* + Option 3: MTK
    - * MGRP 40ms is applicable for MGL 10ms
      * MGRP 80ms is applicable for MGL 10ms, 18ms
      * MGRP 160ms is applicable for MGL 10ms, 18ms, 34m
      * MGRP 320ms is applicable for MGL 18ms, 34ms
      * MGRP 640ms is applicable for MGL 34ms, 66ms
  + Option 3: NEC

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| Gap pattern ID | MG length (ms) | MG period (ms) |
| 24 | 10 | 80 |

* + Option 4: HW, E///

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| Gap pattern ID | MG length (ms) | MG period (ms) |
| 24 | 10 | 80 |
| 25 | 20 | 160 |

* + Option 4: Nokia

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| --- | --- | --- |
| Gap pattern ID | MG length (ms) | MG period (ms) |
| 24 | 10 | 80 |
| 25 | 40 | 160 |

* Recommended WF:
  + Need further discussion

**Issue 1-1-2: New MG patterns are used only when UE is configured with at least PRS measurements i.e. cannot be used for only RRM**

* Proposals
  + Option 1: CATT, Apple, Oppo, QC, E///
    - Yes
* Recommended WF:
  + New MG patterns can only be configured when the UE is configured with PRS measurements.

**Issue 1-1-3: Whether new MG patterns is applicable for only PRS measurements or for both PRS and RRM measurements?**

* Proposals
  + Option 1: CATT, Oppo, NEC, Apple
    - New MG patterns are applicable only for PRS measurements i.e. new gaps cannot be shared with RRM measurements.
  + Option 2: QC, ZTE, HW, E///, Nokia
    - New MG patterns are applicable for PRS and all RRM measurements i.e. new gaps can be shared between PRS and RRM measurements.
* Recommended WF:
  + Collect companies’ view.

**Issue 1-1-4: New MG patterns defined as per-UE or per-UE and per-FR capabilities for both FR1 and FR2?**

* Proposals
  + Option 1: QC, HW, E///
    - Defined as per-UE and per-FR capabilities for both FR1 and FR2
  + Option 2. Apple
    - Defined as only per-UE capability for both FR1 and FR2
* Recommended WF:
  + Collect companies’ view.

### Sub-topic 1-2: Gap sharing rules for new MG gaps

**Issue 1-2-1: Whether performing PRS measurement in successive MG occasions subject to signalled UE capability {N, T}? N = duration of DL PRS symbols in ms processed every T ms?**

* Proposals
  + Option 1: QC
    - Yes.
  + Option 2:
    - No
* Recommended WF:
  + - Collect companies’ view.

**Issue 1-2-2: Use existing CSSF for sharing new MG pattern between RRM and PRS measurements?**

* Proposals
  + Option 1: ZTE, QC, HW, E///
    - Yes.
  + Option 2: Apple
    - No
* Recommended WF:
  + - Collect companies’ view.

**Issue 1-2-3: If existing CSSF is used then rules for new MG sharing between RRM and PRS measurements**

* Proposals
  + Option 1: ZTE, HW
    - Equal split of gaps between PRS and all RRM measurements
  + Option 2: E///
    - NR positioning measurements are counted together with inter-frequency and inter-RAT measurement objects
  + Option 3: QC
    - gap sharing of NR positioning should be based on the same principle of LTE-PRS, i.e., scarce PRS (corresponding to long periodicities) should be prioritized over other candidates for measurement in the same gap instance.
  + Other option not precluded
* Recommended WF:
  + - Collect companies’ view.

### Sub-topic 1-3: CRs on measurement gaps/CSSF

Directly provide comments on the following CRs in section 1.3.2:

* R4-2009881
* R4-2009882
* R4-2011163
* R4-2011164
* R4-2011361

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1-1: New MG patterns**

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| **Company** | **Comments** |
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**Issue 1-1-2: New MG patterns are used only when UE is configured with at least PRS measurements i.e. cannot be used for only RRM**

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| **Company** | **Comments** |
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**Issue 1-1-3: Whether new MG patterns is applicable for only PRS measurements or for both PRS and RRM measurements?**

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| **Company** | **Comments** |
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**Issue 1-1-4: New MG patterns defined as per-UE or per-UE and per-FR capabilities for both FR1 and FR2?**

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| **Company** | **Comments** |
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**Issue 1-2-1: Whether performing PRS measurement in successive MG occasions subject to signalled UE capability {N, T}?**

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| **Company** | **Comments** |
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**Issue 1-2-2: Use existing CSSF for sharing new MG pattern between RRM and PRS measurements?**

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| **Company** | **Comments** |
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**Issue 1-2-3: If existing CSSF is used then rules for new MG sharing between RRM and PRS measurements**

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

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| **CR/TP number** | **Comments collection** |
| [**R4-2009881**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009881.zip) |  |
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| [**R4-2009882**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009882.zip) |  |
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| [**R4-2011163**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011163.zip) |  |
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| [**R4-2011164**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011164.zip) |  |
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| [**R4-2011361**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011361.zip) |  |
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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:* |

*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** |
| 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: gNB requirements

## Companies’ contributions summary

|  |  |  |
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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2009672**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009672.zip) | ZTE | **Proposal 1: Once a gNB supports one particular method, it has to meet the accuracy requirements to guarantee the positioning accuracy.**  **Proposal 2: Have different accuracy requirements for different types of BS.** |
| [**R4-2009850**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009850.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 in clause 7.2 in 36.111 can be reused.**  **Proposal 4: gNB measurement accuracy requirement is applied when gNB receives in beam direction which UL signal is transmitted.**  **Proposal 5: Accuracy requirement is defined based on a subset of SRS configuration.** |
| [**R4-2009878**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009878.zip) | Qualcomm | **Proposal 1. gNB positioning measurement accuracy requirements are NOT optional if supported by a gNB.**  **Proposal 2. One set of side conditions applicable to both serving and neighbor gNB to derive the gNB Rx-Tx time difference measurement accuracy requirements.**  **Proposal 3. Select side conditions to meet accuracy for UE’s serving as well as neighbor cells; SINR value is FFS (side conditions in TS 36.111 can be used as a baseline).**  **Proposal 4. Performance requirements shall not limit the applicability to fixed antenna beams. Performance test setting can be further discussed to use fixed antenna beam.**  **Proposal 5. RAN4 to consider defining accuracy requirements in a tiered model (i.e., different accuracy requirements for different SRS BW).**  **Proposal 6. 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.** |
| [**R4-2011165**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011165.zip) | Huawei, Hisilicon, CMCC | **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.**  **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.** |
| [**R4-2011166**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011166.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 one set of side condition for gNB accuracy requirements for UEs in both serving cell and neighbor cell. The side conditions defined in 36.111 are used as starting point but can be revisited based on simulations.**  **Proposal 3: gNB accuracy requirements does not depend on antenna beam configuration in gNB.**  **Proposal 4: gNB accuracy requirements are defined for subset of SRS configurations. The accuracy requirements to be met for a certain gNB may be depending on gNB declaration.**  Proposal 5: gNB accuracy requirements are defined depending on gNB types. |
| [**R4-2011303**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011303.zip) | Ericsson | **Proposal 1: Divide the requirements for the Rx-Tx timing measurements in a PRS/SRS detection requirement (38.104) and timing requirements (38.133).**  **Proposal 2: Take the decision about the optionality on the end of the WI and concentrate the work on SRS-RSRP, Rx-Tx time difference.** |
| [**R4-2011507**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011507.zip) | Nokia, Nokia Shanghai Bell | 1. No RTOA minimum accuracy requirements will be defined. 2. It is optional for gNB to meet accuracy for supported positioning measurement. Which requirements are met for each measurement type, will be declared by the BS 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 gNBs (Issue-1, Option 2).   b) Side conditions for UE’s serving gNB and for UE’s neighbor gNBs are FFS and need to be derived from system level simulations (Issue-2, new Option 3).  **c) Scenarios are based on those in the NR positioning study item [5], i.e. UMi and UMa for FR1, and UMi for FR2, similar as done for defining side conditions for RSTD and UE Rx-Tx time difference.**  **d) UL SINR figures for UMi and UMa in FR1 and for UMi in FR2 are to be collected for UE’s strongest cell and at least 4 weaker cells and ratios are derived from the CDF percentile of 5%.**   1. For deriving accuracy requirements and for defining requirements for conformance testing, fixed gNB antenna beams will be assumed for FR1 and FR2. 2. Accuracy requirements are defined for all SRS configurations but is met only for subset of SRS configurations declared by the manufacturer (Issue-2, Option 2). 3. RAN4 to discuss the suitability of candidate SRS configurations, as depicted in Table 2 and 3, as starting point for deriving gNB minimum accuracy requirements for gNB Rx-Tx time difference and SRS-RSRP. 4. Accuracy requirements for SRS-RSRP and gNB Rx-Tx time difference depend on BS type (1-C, 1-H, 1-O and 2-O). |

## Open issues summary

Companies are requested to provide comments on the test case CRs in the table in section 3.3.2.

### Sub-topic 2-1

**Issue 2-1-1: Selection of option for gNB measurement accuracy requirements**

* Option 1: E///, Nokia
  + 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 2-2

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

Question: Is gNB positioning measurement accuracy requirement optional for a gNB if it is supported by the gNB?

* Proposals
  + Option 1: QC, CATT, ZTE, HW
    - No
  + Option 2: E///, Nokia
    - Declared by manufacturer
  + Recommended WF
    - Need further discussion

### Sub-topic 2-3

**Issue 2-3-1: Side conditions (e.g. SINR) for applicability of accuracy**

* Proposals
  + Option 1: QC, CATT, HW
    - One set of side conditions to meet accuracy for UE in serving as well as in neighbour cells
  + Option 2: Nokia, E///
    - Separate side conditions to meet accuracy for UE in serving and for UE in neighbour cells
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals

**Issue 2-3-2: How to derive side conditions (e.g. SINR)**

* Proposals
  + Option 1: QC, CATT, HW
    - Based on TS 36.111 clause 7.2
  + Option 2: Nokia, E///
    - Based on system simulations
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals

**Issue 2-3-3: Antenna configuration in accuracy requirement**

* Proposals
  + Option 1: Nokia, E///
    - Assume fixed gNB antenna beams
  + Option 2: QC, CATT, HW
    - Do not assume fixed gNB antenna beams
  + Other options not precluded (differentiation between test and application)
* Recommended WF
  + Collect companies’ feedback on the above proposals

**Issue 2-3-4: SRS configurations for accuracy requirements**

* Proposals
  + Option 1: QC
    - Accuracy is defined and met for all SRS configurations
  + Option 2: Nokia
    - Accuracy is defined for all SRS configurations but is met only for subset of SRS configurations declared by manufacturer
  + Option 3: CATT, HW
    - Accuracy is defined and met for only subset of SRS configurations
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals’

**Issue 2-3-5: If accuracy defined or met for subset of SRS configurations, how to derive such configurations?**

* Proposals
  + Option 1: QC
    - Derive SRS configurations based on link simulations for the suitable SRS configurations and their corresponding accuracy requirements.
  + Option 2: HW, Nokia
    - SRS configurations are declared by manufacturer
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals

**Issue 2-3-6: Accuracy dependency on SRS BW**

* Proposals
  + Option 1: QC
    - Define accuracy based on SRS BW
  + Option 2: Nokia
    - Define same accuracy regardless of SRS BW
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals

**Issue 2-3-7: Accuracy requirements for different BS types (1-C, 1-H, 1-O, 2-O)**

* Proposals
  + Option 1: ZTE, Nokia, HW
    - Accuracy requirement depends on BS type
  + Option 2: E///
    - Agree accuracy requirement depends on BS type as current working assumption but prove at the end if this is needed or not.
  + Other options not precluded
* Recommended WF
  + Collect companies’ feedback on the above proposals

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1-1: Selection of option for gNB measurement accuracy requirements**

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

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| **Company** | **Comments** |
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**Issue 2-3-1: Side conditions (e.g. SINR) for applicability of accuracy**

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| **Company** | **Comments** |
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**Issue 2-3-2: How to derive side conditions (e.g. SINR)**

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| **Company** | **Comments** |
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**Issue 2-3-3: Antenna configuration in accuracy requirement**

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| **Company** | **Comments** |
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**Issue 2-3-4: SRS configurations for accuracy requirements**

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| **Company** | **Comments** |
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**Issue 2-3-5: If accuracy defined or met for subset of SRS configurations, how to derive such configurations?**

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| **Company** | **Comments** |
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**Issue 2-3-6: Accuracy dependency on SRS BW**

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| **Company** | **Comments** |
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**Issue 2-3-7: Accuracy requirements for different BS types (1-C, 1-H, 1-O, 2-O)**

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| **Company** | **Comments** |
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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** | **Comments collection** |
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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:* |

*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** |
| 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 #3: Other requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2009914**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2009914.zip) | Apple | ***Proposal 1: reuse the same principle of legacy SRS transmission in CDRX for positioning SRS transmission in CDRX, that is,***   * ***Periodic and SP positioning SRS is not transmitted during DRX inactive time, while aperiodic positioning SRS is transmitted regardless of the active/inactive time for DRX***   ***Observation: without the DRX information or MG information, positioning TRPs may waste the resource or power to measurement all the positioning SRS occasion from target UE.***  ***Proposal 2: RAN4 continues the study to see if it’s necessary to let serving gNB report the DRX and MG information of target positioning UE to LMF.*** |
| [**R4-2011167**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011167.zip) | Huawei, Hisilicon | **Observation 1: It is feasible for UE to transmit positioning SRS during DRX inactive time.**  **Observation 2: Transmission of positioning SRS during DRX inactive time will cause additional power consumption and implementation complexity for UE.**  **Observation 3: Transmit timing, power and beam may be sub-optimal for positioning SRS during DRX inactive time.**  **Draft LS:**  RAN4 discussed the positioning SRS transmission during DRX inactive time, and reached the conclusion that it is feasible to allow positioning SRS transmission during DRX inactive time. However, it will cause additional power consumption and implementation complexity for UE, and the transmit timing, power and beam may be sub-optimal for positioning SRS transmission during DRX inactive time which may cause interference to other UEs in the serving cell, or degraded performance for the reception of the positioning SRS itself. |
| [**R4-2011168**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011168.zip) | Huawei, Hisilicon | CR to 38.133 to add CSI-RS related reporting criteria for ECID |
| [**R4-2011249**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011249.zip) | Ericsson | * **Observation 1:** UE needs to acquire DL synchronization before transmitting SRS during its DRX inactive time. * **Observation 2:** UE receiver activity due to synchronization and transmitter activity due to SRS in DRX inactive time increases UE power consumption. * **Observation 3:** Legacy BS implementation, which will also receive positioning SRS, does not support periodic/semi-persistent SRS reception during DRX inactive time. * **Observation 4:** Due to additional complexity, not all BS implementations are expected to process periodic/semi-persistent SRS reception during DRX inactive time. * **Proposal 1:** LMF should assume that by default the BS is unable to receive periodic/semi-persistent positioning SRS during the DRX inactive time. * **Proposal 2:** The UE can be allowed to transmit DRX during the DRX inactive time provided that the BS is able to receive periodic/semi-persistent positioning SRS during the DRX inactive time. |
| [**R4-2011363**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011363.zip) | Ericsson | CR to 38.133 on reporting criteria for NR positioning measurements |
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## Open issues summary

### Sub-topic 3-1: reporting criteria

**Issue 3-1-1: Reporting criteria for positioning measurements**

* Directly provide comments on the following CRs in section 3.3.2:
* R4-2011168
* R4-2011363

### Sub-topic 3-2: SRS transmission during DRX inactive

**Issue 3-2-1: Impact of SRS transmission during DRX inactive on UE**

* Is it feasible for UE to transmit SRS for positioning during the DRX inactive period from UE power consumption and UE complexity perspective?
  + Option 1: Huawei
    - Yes
  + Option 2: Apple, E///
    - No
* Recommended WF
  + Need further discussion

**Issue 3-2-2: Impact of SRS transmission during DRX inactive on BS/TRP**

* Is it feasible for every BS/TRP to receive and process positioning SRS transmitted SRS during the DRX inactive period from BS/TRP implementation/complexity perspective?
  + Option 1:
    - Yes
  + Option 2: E///
    - No
* Recommended WF
  + Need further discussion

**Issue 3-2-3: Is periodic and semi-persistent positioning SRS transmission allowed during DRX inactive time?**

* Option 1: HW
  + Yes
* Option 2: Apple
  + No
* Option 3: E///
  + Yes but only if the BS is capable of processing SRS during DRX inactive time.
* Recommended WF
  + Need further discussion

## Companies views’ collection for 1st round

### Open issues

**Issue 3-2-1: Impact of SRS transmission during DRX inactive on UE**

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| **Company** | **Comments** |
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**Issue 3-2-2: Impact of SRS transmission during DRX inactive on BS/TRP**

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| **Company** | **Comments** |
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**Issue 3-2-3: Is periodic and semi-persistent positioning SRS transmission allowed during DRX inactive time?**

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| **Company** | **Comments** |
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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** | **Comments collection** |
| [**R4-2011168**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011168.zip) |  |
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| [**R4-2011363**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_96_e/Docs/R4-2011363.zip) |  |
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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:* |

*Suggestion on WF/LS assignment*

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