**3GPP TSG RAN WG1 Meeting #106bis-e R1-2110697**

**e-Meeting, October 11th-19th, 2021**

**Agenda Item: 8.13.2**

**Source: Rapporteur (Huawei)**

**Title: Summary of agreements for Rel-17 feMR-DC WI**

**Document for: Information**

# Introduction

A list of RAN1 agreements made until RAN1#106bis-e for the Rel-17 feMR-DC WI [1] is provided in this document.

# RAN1 agreements

### RAN1#102-e

Working Assumption:

At least for the case of known cell, temporary RS is supported to expedite the activation process during the SCell activation procedure for efficient SCell activation for both FR1 and FR2:

* The temporary RS should provide at least the functionalities of AGC settling and time/frequency tracking during SCell activation procedure.
* FFS potential functionalities of CSI measurement/acquisition and cell search

Agreements:

TRS is selected as temporary RS for Scell activation

* If more functionalities are confirmed to be supported by temporary RS, other RS candidates, e.g. aperiodic CSI-RS, P/SP-CSI RS, SRS and RS based on SSS/PSS, are not precluded.
* The TRS should be triggered by DCI or MAC-CE. FFS which exact triggering command.

Agreements:

UEs measure the triggered temporary RS during Scell activation procedure no earlier than a slot m:

* FFS timeline values m which may need coordination with RAN4.
* FFS If the triggered temporary RS can be associated with a BWP, then the measurement above is independent of the activation state of the BWP.

Agreements:

Companies are encouraged to provide design details of temporary RS next meeting, at least including:

* TRS structure, e.g. whether to fully reuse existing Rel-15/16 TRS structure and configuration restriction (refer to S5.1.6.1.1 of TS 38.214), or any modification
* QCL information, if any
* Triggering command: DCI format/fields or MAC-CE fields
* Triggering timeline/scheduling offset

### RAN1#103-e

Agreements:

As working assumption, with respect to efficient SCell activation, reuse existing Rel-15/16 TRS structure for temporary RS

* FFS: how many burst/symbols are required for both AGC settling and Time/Frequency tracking for different cases, e.g. FR1 and FR2, known and unknown SCell
	+ A burst of temporary RS is notated as in S5.1.6.1.1 of TS 38.214
		- “2-slot with four CSI-RSs resources (4 samples)” for FR1
		- either “1-slot with two CSI-RSs resources (2 samples)” or “2-slot with four CSI-RSs resources (4 samples)” for FR2
* The working assumption can be confirmed after RAN4 check. (A LS for such request is planned).

Agreements:

For efficient SCell activation, discuss and agree from the following alternatives at RAN1#104-e

* Alt 1:  the trigger of temporary RS is integrated into a single triggering signaling with the trigger of SCell activation transmitted on an activated cell.
	+ FFS detailed design of this integrated triggering signaling.
	+ Potential examples of single triggering signaling for further discussions
	+ A PDSCH TB, e.g. containing two respective MAC-CEs for both triggers, one MAC-CE for both triggers
	+ A DCI for both triggers
	+ A PDSCH TB and its scheduling DL grant, e.g. MAC-CE for activation and DL grant for temporary RS
	+ A DL grant and a UL grant received in the same slot/OFDM symbols of PDCCH where the DL grant is scheduling a MAC-CE for SCell activation and the UL grant is triggering the RS.
	+ Rel-15/16 SCell activation MAC-CE and a specific configuration of temporary RS being implicitly triggered as well
* Alt2: Triggering of temporary RS separately from SCell activation command is not precluded and both ‘separate’ triggers (examples below) and ‘integrated’ triggers (examples in Alt 1) are considered for SCell activation
	+ FFS detailed design of separate triggering signaling.
	+ Potential examples of separate triggering signaling for further discussions
	+ Rel-15/16 SCell activation MAC-CE and Rel 15/16 DCI triggering
	+ Rel-15/16 SCell activation MAC-CE and new DCI triggering for temporary RS
* Note: temporary RS should be triggered by DCI or MAC-CE.
* Note: the final mechanism of trigger signaling targets at applicability to one or more SCell activation.
* FFS handling of  SCell activation by existing Rel15/16 CA activation command when temporary RS is configured and triggered/not triggered

Draft LS ([R1-2009786](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_103%5CDocs%5CR1-2009786.zip)) to RAN4 is approved. Final LS in [R1-2009798](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_103%5CDocs%5CR1-2009798.zip).

### RAN1#104-e

Working Assumption

For efficient SCell activation with assistance of temporary RS, a SSB of the to-be-activated SCell can be indicated as a QCL source for the temporary RS in case of known SCell

* FFS: QCL type
* FFS: the case of unknown SCell
* FFS: other QCL source, e.g. the SSB/P-TRS of another active cell

Agreement

For efficient activation of SCells,down select at least one option from below:

* Option 1a: MAC CE(s) contained in a single PDSCH to trigger both SCell activation and corresponding temporary RS(s)
	+ Details FFS including timeline design for receiving temporary RS
* Option 1b: A single DCI to trigger both SCell activation and corresponding temporary RS(s)
	+ Details FFS including potential impact on SCell activation related procedures and, e.g. timeline design for SCell activation and for receiving temporary RS
	+ FFS: The same DCI for SCell deactivation
* Option 2: A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding temporary RS(s) with enhancement of timeline
	+ Details FFS including timeline design for receiving a DCI trigger of temporary RS, and for receiving temporary RS
* Note: Companies are encouraged to provide complete solutions for fast SCell activation.
* Note: the previous agreement on the definitions of Alt 1 and Alt 2 is still effective

### RAN1#104-bis-e

Agreement

For efficient activation of SCells

* Option 1a: MAC CE(s) contained in a single PDSCH to trigger both SCell activation and corresponding temporary RS(s)
	+ Details FFS including timeline design for receiving temporary RS

Note: Separate from the support of Option 1a, it is up to RAN4 whether or not to consider an activation time enhancement for Option 2 without requiring further RAN1 work

* Option 2: A Rel-15/16 SCell activation MAC-CE to trigger SCell activation and a Rel-15/16 DCI to trigger corresponding Rel-15/16 A-TRS(s)

Send an LS to RAN4.

Final version is approved in R1-2104110.

### RAN1#105-e

Agreement

For efficient activation of Scells, the triggered temporary RS is aperiodic.

Agreement

For efficient activation of a Scell (in known Scell case), at least the number of temporary RS bursts is indicated by a field in new MAC-CE

* The number of temporary RS bursts is RRC configurable.
* FFS: which field in MAC-CE is used and how this field is associated with the number of bursts
* For the purpose of designing temporary RS Scell activation, there is no RAN1 specification impact for the case where the number of indicated temporary RS bursts is smaller than what is expected by the UE

Agreement

To trigger temporary RS for efficient activation of SCells, the contents of the triggering MAC-CE(s) in a single PDSCH provide at least the following information (explicitly or implicitly):

* Whether or not temporary RS is triggered
* FFS detailed Information of temporary RS, e.g.:
	+ Resources used for triggered Temporary RS
	+ Triggering time offset of triggered Temporary RS
	+ QCL source for triggered Temporary RS
* FFS: Detailed signalling structure of the triggering MAC-CE(s) including the down-selection between the following example options and whether the decision should be made in RAN1 or RAN2
	+ Opt. 1.1: One new MAC CE for both SCell activation triggering and corresponding temporary RS triggering
	+ Opt. 1.2: One R15/16 SCell activation MAC CE for SCell activation triggering and one new MAC CE (in the same PDSCH) for corresponding temporary RS triggering

Agreement

For efficient activation of a Scell (in known Scell case), the triggering offset of temporary RS is indicated by a field in new MAC-CE

* The candidate value(s) of triggering offset(s) is RRC configurable
* FFS: which field in MAC-CE is used and how this field is associated with the value of triggering offset

Agreement

For the reference slot for triggering offset of temporary RS

* Option 2: the last DL slot of the to-be-activated Scell overlapping with slot n+k as defined in 38.213 sub-clause 4.3
* FFS: the earliest slot no earlier than the reference slot for a UE to receive a triggered temporary RS

Agreement

If a UE measures a temporary RS triggered by a MAC-CE during SCell activation procedure, the measurement is performed within the BWP bandwidth of BWP indicated by *firstActiveDownlinkBWP-Id*

### RAN1#106-e

Agreement

For efficient SCell activation, the earliest slot for a UE to receive a triggered temporary RS is the reference slot (i.e., the last DL slot of the to-be-activated Scell overlapping with slot n+k as defined in 38.213 sub-clause 4.3).

Conclusion

For the purpose of designing temporary RS for Scell activation, RAN1 will not discuss for the case where a gNB may assume the to-be-activated SCell with assistance of temporary RS is a known SCell for a UE but it is actually unknown SCell from the UE side during the SCell activation duration.

Agreement

For to-be-activated SCell, if any BWP ID is configured as part of temporary RS(s) configuration, the value of the BWP ID is expected to be equal to *firstActiveDownlinkBWP*-Id;

Agreement

To trigger temporary RS,

* MAC-CE at least provides the following information:
	+ temporary RSs are to be triggered on X out of Y (Y≥X) to-be-activated SCells, respectively, while no temporary RS is to be triggered on the other to-be-activated SCells.
* The following information can be provided by RRC for temporary RS for each SCell
	+ The number of RS bursts and the gap length between the RS bursts (Opt 2.3.3)
	+ Triggering offset of temporary RS (Opt 2.3.4)
		- ~~Triggering offset can be provided, e.g., by reusing existing CSI-RS framework~~
	+ QCL information (Opt 2.3.5)
		- ~~Triggering QCL information can be provided, e.g., by reusing existing CSI-RS framework~~
	+ ~~A unique temporary RS configuration index~~
	+ FFS: the maximum number of temporary RS per cell/per UE

Note: Reusing A-TRS triggering framework is not precluded.

* Information for 0, 1, or more temporary RS can be provided for each configured SCell

Agreement

* For triggering temporary RS, down-select based on the following alternatives, or let RAN2 be aware the status of this discussion
	+ Alt 1: Bitmap approach in MAC-CE ~~similar to SCell activation~~
		- Every Z-bit block in the bitmap corresponds to a SCell, Z>=0
		- A Z-bit block indicates the temporary RS [configuration index], and a value zero indicated by the bit block means no RS resource transmitted.
		- The to-be-activated SCell is indicated via the C values in the legacy SCell activation/de-activation MAC CE or in the new MAC-CE
	+ Alt 2: Reuse A-TRS triggering framework
		- A trigger state is indicated by the MAC-CE explicitly
		- The association between a trigger state and ~~aperiodic~~ temporary RS for one or multiple SCells is configured by RRC according Rel-16 A-TRS triggering framework
			* ~~SCell ID is configured as a part of the temporary RS configuration. Some SCell IDs derived from the trigger state triggered by the new MAC-CE may not refer to to-be-activated SCells that are indicated by the new MAC-CE or the legacy SCell activation/de-activation MAC-CE~~
		- FFS: The value zero of the MAC-CE indication means no temporary RS is triggered by the MAC-CE for all to-be-activated SCells
	+ Note: The down-selection targets at a RAN1 consensus on MAC-CE functionality and the list of RRC parameters for this feature. Any MAC-CE signaling design above are reference concept, its final MAC-CE signaling design is up to RAN2.

### RAN1#106-bis-e

Agreement

* Provide the functionality to be fulfilled, as well as the status about the understanding on Alt 1 and Alt 2, which could be provided by examples (including respective possible RRC parameters, if agreed, required by Alt 1 and Alt 2) to facilitate RAN2’ understanding.
* Send LS to ask RAN2 to consider the following alternatives and finalize the MAC-CE or RRC signalling design, including parameters.
* RAN1 only needs to focus on RRC parameters examples, if needed.
* ~~List of RAN1 endorsed RRC parameters for this issue will not be sent to RAN2~~

Alt 1: Bitmap approach in MAC-CE

* Every Z-bit block in the bitmap corresponds to a SCell, Z>=0
* A Z-bit block indicates the temporary RS [configuration index], and a value zero indicated by the bit block means no RS resource transmitted.
* The to-be-activated SCell is indicated via the C values in the legacy SCell activation/de-activation MAC CE or in the new MAC-CE

Alt 2: Reuse A-TRS triggering framework

* A trigger state is indicated by the MAC-CE explicitly
* The association between a trigger state and temporary RS for one or multiple SCells is configured by RRC according Rel-16 A-TRS triggering framework
* FFS: The value zero of the MAC-CE indication means no temporary RS is triggered by the MAC-CE for all to-be-activated SCells

Agreement

The detailed signaling structure of the triggering MAC-CE(s) including the down-selection between the following options is left to RAN2 to decide:

* Opt. 1: One new MAC CE for both SCell activation triggering and corresponding temporary RS triggering
* Opt. 2: One R15/16 SCell activation MAC CE for SCell activation triggering and one new MAC CE (in the same PDSCH) for corresponding temporary RS triggering

Agreement

If two temporary RS bursts are configured, both bursts share the same antenna port index, OFDM symbol location and PRB location of CSI-RS resources in a slot or CSI-RS resources in two consecutive slots.

### RAN1#107-e

**Agreement**

*The max number of NZP CSI-RS resource set configurations for temporary RS per serving cell is the same as current maxNrofNZP-CSI-RS-ResourceSetsPerConfig.*

**Agreement**

*For efficient SCell activation with assistance of temporary RS, a ~~SSB~~ P-TRS of the to-be-activated SCell is to be configured as a QCL source for the temporary RS in case of known SCell same as existing specification.*

* *Note: a SSB of the to-be-activated SCell is a QCL source for the P-TRS per existing specification*

*Note: It is RAN1 understanding that Scell activation latency can be reduced compared to Rel-16 even when P-TRS is configured as QCL source for the temporary RS in case of known SCell*

Below Working Assumption does not need to be confirmed.

**Working Assumption**

*For efficient SCell activation with assistance of temporary RS, a SSB of the to-be-activated SCell can be indicated as a QCL source for the temporary RS in case of known SCell*

* *FFS: QCL type*
* *FFS: the case of unknown SCell*
* *FFS: other QCL source, e.g. the SSB/P-TRS of another active cell*

***Agreement***

*For both Alt 1 and Alt 2 of temporary RS triggering,*

* *For Alt 1, the gap between temporary RS bursts is explicitly configured.*
* *A set of possible gap lengths from which the triggering MAC-CE can indicate one from RAN1 perspective. Up to RAN2 to decide details.*
* *For Alt 2, a gap length is configured by RRC for each temporary RS having two bursts. For different temporary RS, the value of the gap length can be different based on RRC configuration.*
* *the number of bursts is up to 2. It can be either explicitly configured, or implicitly indicated by the gap configuration ((Up to RAN2 to decide one)*

***Agreement***

*For Alt 2 of temporary RS triggering, to avoid potential impact on the existing CSI-AperiodicTriggerStateList, a separate trigger-state list is used.*

* *Note: it does not imply that Alt 2 has been selected by RAN2.*

***Agreement***

*For the RRC and MAC-CE designs of temporary RS triggering (both Alt1 and Alt2), from functionality perspective, the max number of to-be-activated SCells should be 15, irrespective of triggered number of temporary RS bursts per cell.*

* *Note: UE capability for the max number of to-be-activated SCells with 2-burst temporary RS is not precluded.*

# References

1. RP-201040 Revised WID on Further Multi-RAT Radio Dual-Connectivity enhancements, Huawei, RAN1#88e, June 2020

# Appendix: Received LS’s

**R1-2102300/R4-2104067:**

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| **1. Overall Description:**RAN4 thanks the LS from RAN1 on temporary RS for efficient SCell activation in NR CA. RAN4 has discussed these questions in RAN4#98e and achieved the following conclusions:**Q1:** to expedite SCell activation, RAN1 is studying whether and under which conditions (e.g. FR1/FR2, known/unknown cell, etc.), how many temporary RS bursts/symbols are required to achieve both UE AGC setting and time/frequency tracking. Does RAN4 have any information to share for these aspects?[RAN4 Response]: RAN4 had discussed on temporary RS for SCell activation in multiple scenarios (FR1/FR2, known/unknown cell, etc.). So far RAN4 reached the following conclusions:* SCell to be activated is known and belongs to FR1
	+ If SCell measurement cycle is equal to or smaller than 160ms
		- temporary RS can be used for time/frequency tracking
			* 1 burst (2-slot with four CSI-RS resources) is required based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.
	+ If SCell measurement cycle is larger than 160ms
		- temporary RS can be used for AGC
			* 1 burst (2-slot with four CSI-RS resources) is required
		- temporary RS can be used for time/frequency tracking
			* 1 separate burst (2-slot with four CSI-RS resources) is required in addition to the one burst required for AGC
		- The agreements above apply based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.
		- FFS: whether minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is considered to account for UE AGC application time delay
			* The minimum gap length is FFS
* SCell to be activated belongs to FR2
	+ If there is at least one active serving cell on that FR2 band and temporary RS for the target SCell is provided, no matter whether the SCell to be activated is known or unknown
		- temporary RS can be used for time/ frequency tracking
			* The number of temporary RS symbols is under discussion
	+ If there is no active serving cell on that FR2 band, and the SCell to be activated is known to UE
		- temporary RS can be used for fine timing tracking
			* The number of temporary RS symbols is under discussion

So far there is no conclusion on whether/how much benefit can be achieved for the temporary RS based SCell activation in other scenarios (e.g. SCell to be activated is unknown and belongs to FR1, SCell to be activated is unknown and belongs to FR2 if there is no active serving cell on that FR2 band). RAN4 will continue the discussion and provide feedback to RAN1 if there is conclusion.**Q2:** for AGC setting in intra-band CA comprising of a to-be-activated SCell and an activated serving cell, when a temporary RS is transmitted on the to-be-activated SCell, whether and under which conditions (e.g., FR1/FR2, known/unknown cell, etc.) the UE may require to receive another RS transmitted also on the other activated serving cell in the same band?[RAN4 Response]: This question is still under discussion in RAN4.* Based on the legacy requirement assumption, UE expects another RS and/or SSB (burst) is also transmitted on the other activated serving cell, having all the RSs time-aligned within MTRD requirement for intra-band CA
* FFS on new assumption where UE does not require to receive another RS transmitted also on the other activated serving cell in the same band

**Q3:** does the RAN1 working assumption for temporary RS (i.e., reuse existing Rel-15/16 TRS structure) provide~~s~~ reduction in maximum allowed activation delay requirements (specified in subclause 8.3.2 of TS 38.133)? Also, are there any suggested changes from RAN4 perspective?[RAN4 Response]: RAN1 working assumption for temporary RS (i.e., reuse existing Rel-15/16 TRS structure) can provide reduction in maximum allowed activation delay at least for some cases as listed above. RAN4 will continue the discussion if there are any suggested changes from RAN4 perspective and will provide additional agreements (if any) in RAN4 #99-e.**2. To RAN WG1 group.** **ACTION:** RAN4 respectfully asks RAN1 to take the above agreements into account. |

**R1-2104170/R4-2105799:**

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| **1. Overall Description:**RAN4 thanks the LS from RAN1 on temporary RS for efficient SCell activation in NR CA. In RAN4#98e, an LS reply on partial questions was sent to RAN1. During this RAN4 meeting, RAN4 further discussed the remaining questions and achieved the following conclusions:**Q1:** to expedite SCell activation, RAN1 is studying whether and under which conditions (e.g. FR1/FR2, known/unknown cell, etc.), how many temporary RS bursts/symbols are required to achieve both UE AGC setting and time/frequency tracking. Does RAN4 have any information to share for these aspects?[RAN4 Response]: In RAN4#98e, the following agreements are achieved in [R4-2104067]:

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| --- |
| * *SCell to be activated is known and belongs to FR1*
	+ *If SCell measurement cycle is equal to or smaller than 160ms*
		- *temporary RS can be used for time/frequency tracking*
			* *1 burst (2-slot with four CSI-RS resources) is required based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.*
	+ *If SCell measurement cycle is larger than 160ms*
		- *temporary RS can be used for AGC*
			* *1 burst (2-slot with four CSI-RS resources) is required*
		- *temporary RS can be used for time/frequency tracking*
			* *1 separate burst (2-slot with four CSI-RS resources) is required in addition to the one burst required for AGC*
		- *The agreements above apply based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.*
		- *FFS: whether minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is considered to account for UE AGC application time delay*
			* *The minimum gap length is FFS*
 |

In this meeting RAN4 further discussed the minimum gap and reached the following conclusions:* + - Minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed to account for UE AGC application time delay. The minimum gap length is,
			* Option 1: 2 slots
			* Option 2: 2 ms
		- RAN4 will continue to discuss the options above and provide feedback to RAN1 if there is conclusion
* SCell is unknown and belongs to FR1
	+ When SCell is contiguous to an active serving cell in the same band (Intra-band continuous CA)
		- UE can perform AGC adjustment based on temporary RS;
			* One temporary RS burst with only “2-slot with four CSI-RSs resources (4 samples)” is required when the power difference in serving cell and to be activated Scell is smaller than or equal to 6dB.
		- No cell detection provided the conditions specified for intra-band contiguous CA case in TS38.133 section 8.3.2 are satisfied;
		- UE can perform time-frequency tracking based on temporary RS
			* One temporary RS burst with only “2-slot with four CSI-RSs resources (4 samples)” is required.
		- The agreements above apply based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798.
	+ So far there is no conclusion on whether/how much benefit can be achieved for the temporary RS based SCell activation in other scenarios (when SCell is non-contiguous to an active serving cell in the same band, and when SCell to be activated and active serving cell are in the different band). RAN4 will continue the discussion and provide feedback to RAN1 if there is conclusion.
* SCell to be activated belongs to FR2
	+ If there is at least one active serving cell on that FR2 band and temporary RS for the target SCell is provided, no matter whether the SCell to be activated is known or unknown
		- Temporary RS can be used for time/ frequency tracking
			* 1 burst with only “2-slot with four CSI-RSs resources (4 samples)” is required
	+ If there is no active serving cell on that FR2 band, and the SCell to be activated is known to UE
		- Temporary RS can be used for fine timing tracking
			* 1 burst with only “2-slot with four CSI-RSs resources (4 samples)” is required
	+ If the SCell being activated is unknown and there is no active serving cell on that FR2 band,
		- Temporary RS can not be used for AGC
		- No conclusion on whether to consider the case for temporary RS based time/frequency tracking to enhance SCell activation latency.

**Q2:** for AGC setting in intra-band CA comprising of a to-be-activated SCell and an activated serving cell, when a temporary RS is transmitted on the to-be-activated SCell, whether and under which conditions (e.g., FR1/FR2, known/unknown cell, etc.) the UE may require to receive another RS transmitted also on the other activated serving cell in the same band?[RAN4 Response]: This question is still under discussion in RAN4. RAN4 will continue the discussion and provide feedback to RAN1 if there is conclusion.**2. To RAN WG1 group.** **ACTION:** RAN4 respectfully asks RAN1 to take the above agreements into account. |

**R1-2106427/R4-2108364:**

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| **1. Overall Description:**RAN4 thanks the LS from RAN1 on temporary RS for efficient SCell activation in NR CA. In RAN4#98e and RAN4#98bis-e, LS reply on partial questions were sent to RAN1 respectively. During this RAN4 meeting, RAN4 further discussed the remaining questions and achieved the following conclusions:**Q1:** to expedite SCell activation, RAN1 is studying whether and under which conditions (e.g. FR1/FR2, known/unknown cell, etc.), how many temporary RS bursts/symbols are required to achieve both UE AGC setting and time/frequency tracking. Does RAN4 have any information to share for these aspects?**[RAN4 Response]**: * SCell to be activated is known and belongs to FR1 and if SCell measurement cycle is larger than 160ms,

It is confirmed in [R4-2104067] [R4-2105799] that * + Temporary RS can be used for AGC
		- 1 burst (2-slot with four CSI-RS resources) is required
	+ Temporary RS can be used for time/frequency tracking
		- 1 separate burst (2-slot with four CSI-RS resources) is required in addition to the one burst required for AGC
	+ Minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed to account for UE AGC application time delay.

In this meeting RAN4 further discussed the minimum gap length and still no consensus was achieved. RAN4 will continue the discussion and provide feedback to RAN1 if there is conclusion.* SCell is unknown and belongs to FR1
	+ When SCell to be activated is non-contiguous to an active serving cell in the same band, or
	+ When SCell to be activated and active serving cell are in the different band
		- It is not a target scenario for temporary RS based SCell activation latency optimization.
		- The agreement above applies based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798
* SCell to be activated belongs to FR2
	+ If the SCell being activated is unknown and there is no active serving cell on that FR2 band,
		- It is not a target scenario for temporary RS based SCell activation latency optimization.
		- The agreement above applies based on RAN1 working assumptions on temporary RS design provided in the LS R1-2009798

**Q2:** for AGC setting in intra-band CA comprising of a to-be-activated SCell and an activated serving cell, when a temporary RS is transmitted on the to-be-activated SCell, whether and under which conditions (e.g., FR1/FR2, known/unknown cell, etc.) the UE may require to receive another RS transmitted also on the other activated serving cell in the same band?**[RAN4 Response]**: This question is still under discussion in RAN4. RAN4 will continue the discussion and provide feedback to RAN1 if there is conclusion.**2. To RAN WG1 and WG2 group.** **ACTION:** RAN4 respectfully ask RAN1 to take the above agreements into account. |

**R1-2108708/R4-2115370:**

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| **1. Overall Description:**RAN4 thanks the LS from RAN1 on temporary RS for efficient SCell activation in NR CA. In RAN4#98e and RAN4#98bis-e, LS reply on partial questions was sent to RAN1 respectively. During this RAN4 meeting, RAN4 further discussed the remaining questions and achieved the following conclusions:**Q1:** to expedite SCell activation, RAN1 is studying whether and under which conditions (e.g. FR1/FR2, known/unknown cell, etc.), how many temporary RS bursts/symbols are required to achieve both UE AGC setting and time/frequency tracking. Does RAN4 have any information to share for these aspects?**[RAN4 Response]**: * SCell to be activated is known and belongs to FR1 and if the measurement period of the SCell being activated is larger than [2400ms]. It is confirmed in previous LS reply that
	+ Temporary RS can be used for AGC
		- 1 burst (2-slot with four CSI-RS resources) is required
	+ Temporary RS can be used for time/frequency tracking
		- 1 separate burst (2-slot with four CSI-RS resources) is required in addition to the one burst required for AGC
	+ Minimum gap between the RS symbol(s) for AGC and the RS symbols for time/frequency acquisition is needed to account for UE AGC application time delay.

In this meeting RAN4 further discussed and agreed that the minimum gap length is* + - For 15kHz and 30kHz SCS: 2 slots
		- For 60kHz SCS: 3 slots

In addition, RAN4 would like to inform RAN1 an information that for the case where SCell to be activated is known and belongs to FR1, the condition of “SCell measurement cycle is larger than/less than/equal to 160ms” which was used in previous reply LS is replaced by the condition “the measurement period of the SCell being activated is larger than/less than/equal to [2400ms]” in RAN4.**Q2:** for AGC setting in intra-band CA comprising of a to-be-activated SCell and an activated serving cell, when a temporary RS is transmitted on the to-be-activated SCell, whether and under which conditions (e.g., FR1/FR2, known/unknown cell, etc.) the UE may require to receive another RS transmitted also on the other activated serving cell in the same band?**[RAN4 Response]**: RAN4 understand Q2 focus on two cases:* SCell to be activated is known and belongs to FR1, if the measurement period of the SCell being activated is larger than [2400ms].
* SCell is unknown and belongs to FR1, and SCell is contiguous to an active serving cell in the same band

In these above cases for AGC adjustment when a temporary RS is transmitted on the to-be-activated SCell,* the RSs on the other activated serving cell in the same band are not required to be transmitted in the same slot as the temporary RS.
* UE may report inaccurate non-zero CQI on the being-activated SCell during the SCell activation procedure in case the RSs on the other activated serving cell in the same band are not transmitted in the same slot as the temporary RS.

**2. To RAN WG1 and WG2 group.** **ACTION:** RAN4 respectfully ask RAN1 and RAN2 to take the above agreements into account. |

**R2-2111413:**

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| 1 Overall descriptionRAN2 discussed the TRS based SCell activation and mad the following agreements.* 1: For TRS based SCell activation, RAN2 finalizes the MAC CE based SCell activation case first and come back on RRC case if time allows.
* 2: The TRS can be activated for fast SCell activation, only when all following conditions are met:
* (a) The TRS for SCell activation is configured for this SCell;
* (b) The SCell is activated from deactivated state by New SCell A/D MAC CE;
* (c) The BWP indicated by firstActiveDownlinkBWP-Id is not dormant BWP;
* FFS how we handle the case when some Scells use TRS and some don't
* RAN2 will not specify UE behaviour for the case when new MAC CE is used but a)+c) are not fulfilled for the SCell that uses TRS
* 3: One new MAC CE for to trigger both SCell activation and corresponding temporary RS.
* 4: Define 2 eLCIDs for new MAC CEs with “one octet” SCell activation indication and with “four octet” SCell activation indication respectively.
* Wait for RAN1 input on RRC parameters and capabilities

RAN2 also discussed the design of new MAC CE for TRS activation, including the alternative of using per-SCell TRS configuration index and the alternative of using per cell group TRS trigger state id and would like to ask RAN1 to provide feedbacks for the following questions to help RAN2 to progress further.For Alt1 (include per SCell TRS configuration index in MAC CE):**Q1: What is the maximum number of TRS configurations supported per SCell? Is there a difference for FR1 and for FR2?**For Alt2 (include per cell group TRS trigger state id in MAC CE)**Q2: What is the maximum number of TRS trigger states (where a "trigger state" indicates a set of TRS used for activation of a set of SCell(s)) supported per cell group? Is there a difference for FR1 and for FR2?** |