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

**Electronic Meeting, 3 – 13 Nov., 2020**

**Agenda item: 7.5.2.1, 7.5.3.1, 7.5.3.2**

**Source:** Moderator (Nokia, Nokia Shanghai Bell)

**Title:** Email discussion summary for [97e][210] LTE\_NR\_DC\_CA\_RRM\_1

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

Core requirements are closed, and work needs to be finalized. Hence, RAN4 should strive to reach a compromise agreement for MR-DC EMR in this meeting.

To facilitate the discussion, it is proposed to go one step back and focus on the where the main open aspects are and solve those. Based on the contributions and work so far, the biggest open topics are:

* UE idle mode CA measurement requirements and s-NonIntraSearch.
* Overlapping and non-overlapping carriers.

There re other open items as well, but they depend in some degree on having agreements on the 2 aspects above. If these two aspects can be agreed in RAN4#97 it is also feasible continue the detailed performance work including test case development.

From the discussion, if RAN4 agree to define same measurement requirements for all carriers configured for EMR, then there is likely no reason to define overlapping and non-overlapping carriers for Rel-16 EMR.

Hence, to progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

This way RAN4 would initially discuss the UE idle mode CA measurement requirements for idle mode CA measurements in a generic manner for a carrier which is configured for mobility and idle mode CA measurements.

Once agreement is reached on this scenario, RAN4 can continue the discussion and see if agreement can be reached that same UE idle mode CA measurement requirements can apply also for a carrier only configured for idle mode CA measurements (and not mobility).

Following the UE idle mode CA measurement requirements and s-NonIntraSearch discussion RAN4 can then discuss the issue of overlapping and non-overlapping carriers.

Some companies are proposing to define same measurement requirements for overlapping and non-overlapping carriers without explicitly stating whether to define overlapping and non-overlapping carriers. Other companies have explicitly stated there is no need to define overlapping and non-overlapping carriers. And yet other companies propose how to define the overlapping and non-overlapping carriers.

## Discussions in 1st round

Hence, in the 1st round discussion the focus is on discussing and reach agreements related to:

* Topic #1: UE idle mode CA measurement requirements and s-NonIntraSearch.
	+ Sub-topic #1-1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configured
		- Issue 1-1-1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configured
	+ Sub-topic #1-2: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured
		- Issue 1-2-1:Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier not configured)
		- Issue 1-2-2: Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier configured)
		- Issue 1-2-3: Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier configured)
		- Issue 1-2-4: Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier not configured)
* Topic #2: Overlapping and non-overlapping carriers.
	+ Sub-topic 2-1: Need for RAN4 define different UE idle mode CA measurement requirements depending on whether the EMR carrier is measured for mobility or not
	+ Sub-topic #2-2: Can the EMR carrier dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds?
	+ Sub-topic #2-3: Is there a need for the definition of overlapping and non-overlapping carriers?
* Topic #3: Performance – accuracy requirements
	+ Sub-topic 3-1: Introduction of accuracy requirements for all MR-DC EMR cases introduced.
	+ Sub-topic 3-2: Re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements
	+ sub-topic 3-3: Measurement accuracy relaxation compared to existing connected mode requirements
* Topic #4: Test cases for MD-DC EMR
	+ Sub-topic 4-1: Time plan
	+ Sub-topic 4-2: Test case list

If agreements are reached RAN4 can continue to other topics as listed in 2nd round discussion.

## Discussions in 2nd round

Based on the progress of 1st round discussions:

1. UE measurement requirements and scaling according to measured carriers
2. Timer T331 length.
3. UE Idle mode CA measurement requirements and UE conditions
4. Measurement requirement for UE who supports the beam level EMR reporting

# Topic #1: UE idle mode CA measurement requirements and s-NonIntraSearch

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

Moderator comment: In the following table all proposals and observations have been copied and those which were not seen relevant for this discussion has been ‘removed’ by use of strikethrough.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014361  | Mediatek | Tdoc Title: Discussion on LTE CRS based and NR SSB based measurement in NR IDLE/INACTIVE mode~~Proposal 1: The same measurement requirements for both overlapping and non-overlapping EMR carriers are specified.~~Proposal 2: According to R4-2009264, different EMR measurement requirements are specified for Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and for Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ.Proposal 3: Ran4 to follow the measurement rules of cell re-selection and update the overlapping and non-overlapping EMR carrier definitions as following table Table 3: Definition of overlapping and non-overlapping EMR carrier

|  |  |  |
| --- | --- | --- |
| Inter-frequency/Inter-RAT E-UTRAN layers configured for both re-selection and EMR | higher priority layers | equal/lower priority layers |
| Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | Overlapping | Non-overlapping |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Overlapping | Overlapping |

Proposal 4: Introduce measurement periodicity requirements for non-overlapping EMR carriersProposal 5: For measurement requirement of EMR carriers, evaluating time should be multiplied by the total carrier number to be monitored, i.e., the summation of total overlapping EMR carrier number, total non-overlapping EMR carrier number, and total reselection carriers without EMR configured Proposal 6: RAN4 to reuse the evaluating time for overlapping inter-freq. and inter-RAT EMR carriers as the evaluating time for non-overlapping inter-freq. and inter-RAT EMR carriersProposal 7: RAN4 to specify the measurement requirements for non-overlapping EMR carriers when serving cell quality is lower than the s-NonIntraSearch thresholds as below table Table 5: Measurement requirements for cell re-selection purpose and EMR purpose (Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ)

|  |  |  |
| --- | --- | --- |
|  | Un-detected cell | detected cell |
| Inter-freq. overlapping | Kcarrier’ \* Tdetect,NR\_Inter  | Kcarrier’ \* Tevaluate,NR\_Inter |
| Inter-freq. non-overlapping | Kcarrier’ \* Tdetect,NR\_Inter\_nonOverEMR  | Kcarrier’ \* Tevaluate,NR\_Inter\_nonOverEMR |
| Inter-RAT overlapping | NEUTRA\_carrier’ \* Tdetect,EUTRAN | NEUTRA\_carrier’ \* Tevaluate,EUTRAN |
| Inter-RAT non-overlapping | NEUTRA\_carrier’ \* Tdetect,EUTRA\_nonOverEMR  | NEUTRA\_carrier’ \* Tevaluate,EUTRAN\_nonOverEMR  |

Proposal 8: RAN4 to specify the measurement requirements for non-overlapping EMR carriers when serving cell quality is higher than the s-NonIntraSearch thresholds as below table Table 6: Measurement requirements for cell re-selection purpose and EMR purpose (Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ)

|  |  |  |
| --- | --- | --- |
|  | Un-detected cell | detected cell |
| Inter-freq. overlapping | Kcarrier’ \* (Thigher\_priority\_search + Tevaluate,NR\_Inter)  | Kcarrier’ \* Tevaluate,NR\_Inter |
| Inter-freq. non-overlapping | Kcarrier’ \* (Thigher\_priority\_search + Tevaluate,NR\_Inter\_nonOverEMR) | Kcarrier’ \* Tevaluate,NR\_Inter\_nonOverEMR |
| Inter-RAT overlapping | NEUTRA\_carrier’ \* (Thigher\_priority\_search + Tevaluate,EUTRAN) | NEUTRA\_carrier’ \* Tevaluate,EUTRAN |
| Inter-RAT non-overlapping | NEUTRA\_carrier’ \* (Thigher\_priority\_search + Tevaluate,EUTRAN\_nonOverEMR) | NEUTRA\_carrier’ \* Tevaluate,EUTRAN\_nonOverEMR  |

~~Proposal 9: RAN4 to introduce additional time period T~~~~timeIndex,NR\_Inter~~ ~~in measurement requirement for UE who supports the beam level EMR reporting, where T~~~~timeIndex,NR\_Inter~~ ~~equals to 3\* T~~~~measure,NR\_Inter~~ ~~in FR1 and 5\* T~~~~measure,NR\_Inter~~ ~~in FR2~~ |
| R4-2015587 | ZTE | Tdoc Title: Remaining issues on NR EMRProposal 1: The same measurement requirements for both overlapping and non-overlapping EMR carriers are specified.Proposal 2: EMR carrier measurement interval is Thigher\_priority\_search if signal strength and signal quality is above search threshold.Proposal 3: EMR carrier measurement interval is (Tdetect,NR\_Inter, Tmeasure,NR\_Inter) if signal strength or signal quality is below search threshold.Proposal 4: The EMR carrier measurement accuracy requirements are irrelevant of search threshold. ~~Proposal 5: LS RAN2 to ask for adding additional candidate value of timer T331.~~~~Proposal 6: The additional candidate value for timer T331 is up to 1200s.~~~~Proposal 7: UE additional time period in measurement requirement for UE who supports the beam level EMR reporting is TtimeIndex,NR\_Interf = [3]\* Tmeasure,NR\_Interf.~~Proposal 8: EMR carriers are actively measured for EMR while T331 is running |
| R4-2015742 | Huawei | Tdoc Title: Discussion on remaining issues in EMR requirementsProposal 1: Define EMR measurement period requirements to be same as that for high priority mobility measurement. Proposal 2: The measurement period requirements should be scaled by the number of carriers actively measured for mobility plus the number of carriers that is actively measured for EMR only.~~Proposal 3: RAN4 to not define overlapping and non-overlapping carriers.~~ |
| R4-2015881 | Nokia | Tdoc Title: Early Measurement Reporting1. *~~An overlapping carrier is an actively measured carrier configured by higher layer for mobility and early measurement reporting. A non-overlapping carrier is defined as an actively measured carrier configured by higher layer for early measurement reporting while not configured for mobility. A carrier configured for early measurement reporting is actively measured provided T331 has not expired, the serving cell is supporting early measurement reporting and the serving cell is in the validity area.~~*
2. ~~If Proposal 1 is not agreeable, the definitions of overlapping and non-overlapping carriers follow Rel-15 definition directly:~~
	1. ~~An overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements.~~
	2. ~~A non-overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.~~
3. Decouple the definitions of overlapping and non-overlapping carriers from s-NonIntraSearch thresholds.
4. Rel-16 UE measurement requirements for EMR follow Rel-15 baseline and RAN4 requirements allow flexibility in applying the s-NonIntraSearch thresholds to prevent inter-frequency/RAT measurements with different periodicities.
5. Allow UEs to measure, and perform EMR measurements, according to its preference, accounting any UE specific complexity related to measuring inter-frequency/RAT measurements with different measurement periods.
6. Enable more advanced UEs to benefit from performing more advanced measurements for EMR.
7. When s-NonIntraSearch thresholds are not configured (hence, s-NonIntraSearch is infinite and Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ conditions are always fulfilled) the UE shall measure all configured overlapping EMR carriers according to 4.2.2.4 (and not 4.2.2.7).
8. When s-NonIntraSearch threshold are configured (hence, s-NonIntraSearch is not infinite) Srxlev > SnonIntraSearchP or Squal > SnonIntraSearchQ conditions may be fulfilled or not. In this case, the UE measurement requirements are as follows:
	1. If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ: UE shall follow measurement requirements according to 4.2.2.4 (not 4.2.2.7) for overlapping EMR carriers.
	2. If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is not configured with any high priority carriers: UE shall follow measurement requirement according to 4.2.2.4 without applying s-NonIntraSearch threshold for EMR carriers.
	3. If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers: UE shall at least measure at least high priority carriers according to 4.2.2.7 and 7 and shall at least measure at least measure configured, overlapping EMR carriers according 4.2.2.7.
	4. If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ: and UE is configured with one or more high priority carriers: UE may measure configured carriers according to 4.2.2.4.
9. Agree on proposal 7 and proposal 8 as a package.
10. ~~The UE indicates to the network if the reported EMR results are performed while applying s-NonIntraSearch thresholds to the EMR carriers or not.~~
11. For Rel-16 the requirements in proposal 7 and proposal 8 applies.
12. ~~RAN4 to send LS to RAN2 to introduce means for UE to indicate whether the UE applied search thresholds when measuring the reported early measurement or not. Indication should be defined in Rel-16, if possible, otherwise in Rel-17~~
13. ~~If RAN2 cannot introduce the solution in Rel-16, we propose that for Rel-16, if s-NonIntraSearch thresholds are configured, and Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers, the UE may measure overlapping EMR according to section 4.2.2.7 or 4.2.2.4.~~
14. ~~If RAN2 cannot introduce the solution in Rel-16, we propose that or Rel-16 the network will not be aware of UE which UE requirements the UE applies if s-NonIntraSearch thresholds are configured, and Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers~~
15. ~~Agree Proposals 11 - 14 as a package.~~

Related to measurement requirements on EMR carriers a number of cases are missing. for those we suggest following:1. For non-overlapping NR FR2 carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
2. For non-overlapping LTE inter-RAT carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
3. Measurement requirements for an overlapping NR inter-RAT EMR carrier follow the principles of of proposal 15.
4. For non-overlapping NR inter-RAT carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
5. ~~For an inter-frequency carrier, the UE is required to acquire the index of the SSB within 3 DRX cycles. Hence, X = 3.~~
6. ~~For an inter-RAT NR carrier, the UE is required to acquire the index of the SSB within 3 DRX cycles. Hence, X = 3.~~
7. ~~When a cell will remain detectable after entering idle mode after connection release should not be conditioned by a future condition which is unknown at the time of the connection release.~~
8. ~~The cell detected state conditions during transitioning to idle mode need to be conditioned by the cell conditions at the time of release and not on potential future cell conditions once the connection is established.~~
9. ~~New condition would be: The detected cell and SSBs remains detectable during the state transitioning to idle mode.~~
 |
| R4-2016573 | Qualcomm | Tdoc Title: Early measurement reporting in MR-DC**~~Proposal 1: Whether overlapping or non-overlapping EMR carrier is dynamically defined depending on the following attributes:~~*** ~~Whether T331 is running or not~~
* ~~Whether S-criteria condition is met or not~~
* ~~Whether EMR carrier is also configured as a measurement carrier for idle/inactive mode or not, and if configured whether it is higher priority frequency layer than serving/camped cell or not~~
* ~~Based on the attributes, if the carrier is determined to be measured for EMR and cell reselection at a given condition, it is defined as overlapping EMR carrier~~

**Proposal 2: A unified minimum measurement interval requirement applies to both EMR carriers and cell reselection inter-frequency layers.*** When S-criteria condition is met (Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ), the carriers shall be measured at least every Thigher\_priority\_search(=Nlayers x 60s), and Nlayers is the number of higher priority frequency layers plus the number of non-overlapping EMR carriers
* When S-criteria condition is not met (Srxlev ≤ SnonIntraSearchP and Squal ≤ SnonIntraSearchQ), the carriers shall be measured at least every Kcarrier x Tmeasure,NR\_Inter, and Kcarrier is the number of higher/equal/lower priority frequency layers plus the number of non-overlapping EMR carriers
 |

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

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

*Interested companies are expected to add their views directly under the respective issues in a dialogue-like form, i.e., identical to how the chair would record views during a f2f meeting.*

*Please add further table rows as required and do not change previous comments of your company or other companies. Answering to questions from other companies is encouraged.*

Introduction to the discussion:

When discussing the measurement requirements, it is important to take into account both UE aspects and network aspects, with the target of defining requirements which are acceptable to all parties and useful in real field deployments.

As pointed out in R4-2015587:

* RAN4 also agrees that UE will perform EMR measurements no matter the signal strength is above or below the threshold.
* The controversial part is how the requirements are specified when signal strength is above the threshold.

This is also clear from other contributions.

In R4-2016573 a good reference figure is given to illustrate the possible different scenarios:



And the different scenarios described in the different contributions can be summarized in a table like (modified from R4-2015881):

|  |  |
| --- | --- |
| SnonIntraSearchP/Q configured | SnonIntraSearchP/Q not configured |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | N/A  |
| High Priority carrier not configured | High Priority carrier configured | High Priority carrier not configured | High Priority carrier configured |  N/A |
| 4.2.2.x | 4.2.2.x | 4.2.2.x | 4.2.2.x | 4.2.2.x |

RAN4 need to reach an agreement related to the UE measurement requirements for idle mode CA measurements for each of the scenarios in the table.

To get common baseline understanding among the group, it is important to understand how RAN2 has defined the procedures for idle mode CA measurements. 38.133 section 5.7.8 and mobility idle mode measurements in 38.304 section 5.2.4.2:

#### 5.7.8.2a Performing measurements

*When performing measurements on NR carriers according to this clause, the UE shall derive the cell quality as specified in 5.5.3.3 and consider the beam quality to be the value of the measurement results of the concerned beam, where each result is averaged as described in TS 38.215 [9].*

*While in RRC\_IDLE or RRC\_INACTIVE, and T331 is running, the UE shall:*

*1> perform the measurements in accordance with the following:*

*2> if the VarMeasIdleConfig includes the measIdleCarrierListEUTRA and the SIB1 contains idleModeMeasurementsEUTRA:*

*3> for each entry in measIdleCarrierListEUTRA within VarMeasIdleConfig:*

*4> if UE supports NE-DC between the serving carrier and the carrier frequency indicated by carrierFreqEUTRA within the corresponding entry:*

*5> perform measurements in the carrier frequency and bandwidth indicated by carrierFreq and allowedMeasBandwidth within the corresponding entry;*

This is allowed for idle mode mobility measurements as stated in 38.304 section 5.2.4.2:

5.2.4.2 Measurement rules for cell re-selection

*Following rules are used by the UE to limit needed measurements:*

*- If the serving cell fulfils Srxlev> SIntraSearchP and Squal > SIntraSearchQ, the UE may choose not to perform intra-frequency measurements.*

*- Otherwise, the UE shall perform intra-frequency measurements.*

*- The UE shall apply the following rules for NR inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:*

*- For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8].*

*- For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:*

*- If the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, the UE may choose not to perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority;*

*- Otherwise, the UE shall perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 38.133 [8].*

*- If the UE supports relaxed measurement and relaxedMeasurement is present in SIB2, the UE may further relax the needed measurements, as specified in clause 5.2.4.9.*

RAN4 has agreed to use the measurements requirements in sections 4.2.2.4 and 4.2.2.5, and the open aspect is how to define the UE measurement requirements for idle mode CA measurements, if s-NonIntraSearch thresholds are configured.

To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

### Sub-topic 1-1

*Sub-topic description:* *UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configured*

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

**Issue 1-1-1:** UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configuredProposals

* + Option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configured, follow requirements in section 4.2.2.4 table 4.2.2.4-1
	+ Option 2: -
* Recommended WF
	+ Agree on option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are not configured, follow requirements in section 4.2.2.4 table 4.2.2.4-1.

Note: To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

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

### Sub-topic 1-2

*Sub-topic description:* UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured

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

Next focus point is then when s-NonIntraSearch thresholds are configured. When this is the case at least one complexity concern has been raised by some companies:

* If UE is configured with high priority carrier for mobility and idle mode CA measurements on EMR carrier(s), this may lead to that the UE need to measure different carriers with different measurement interval.

This problem arises from the fact that the UE may be configured with one or more high priority mobility carriers (and not configured for idle mode CA measurements) and one or more carriers for idle mode CA measurements.

RAN4 can in this case split the discussion into following four aspects:

* Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier not configured)
* Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier configured)
* Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier not configured)
* Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier configured)

Each of these are handled in next 4 issues.

**Issue 1-2-1:** Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier not configured)

* Proposals
	+ Option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow requirements in section 4.2.2.4 table 4.2.2.4-1.
	+ Option 2: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow other requirements.
		- For companies preferring this option: list exactly which other requirements (section and possibly table).
* Recommended WF
	+ Agree on option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow requirements in section 4.2.2.4 table 4.2.2.4-1.

Note: To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

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

**Issue 1-2-2:** Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ (high priority carrier configured)

* Proposals
	+ Option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow requirements in section 4.2.2.4 table 4.2.2.4-1.
	+ Option 2: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow other requirements.
		- For companies preferring this option: list exactly which other requirements (section and possibly table).
* Recommended WF
	+ Agree on option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, and when Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ follow requirements in section 4.2.2.4 table 4.2.2.4-1.

Hence, same as proposed WF as for Issue 1-2-1.

Note: To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

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

**Issue 1-2-3:** Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier configured)

* Proposals
	+ Option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the UE is configured with one or more higher priority carrier, at least follow requirements in section 4.2.2.7.
	+ Option 2: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the UE is configured with one or more higher priority carrier, follow other requirements.
		- For companies preferring this option: list exactly which other requirements (section and possibly table).
* Recommended WF
	+ Agree on option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the UE is configured with one or more higher priority carrier, at least follow requirements in section 4.2.2.7.

Note: To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

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

**Issue 1-2-4:** Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ (high priority carrier not configured)

* Proposals
	+ Option 1: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the UE is configured with one or more higher priority carrier, at least follow requirements in section 4.2.2.7.
	+ Option 2: UE measurement requirements for idle mode CA measurements, when SnonIntraSearchP/Q are configured, when Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and the UE is configured with one or more higher priority carrier, at least follow requirements in section 4.2.2.4 table 4.2.2.4-1.
* Recommended WF
	+ More discussion needed.

Note: To progress the work, it is proposed decouple the idle mode CA measurement requirements discussion from the discussion related to overlapping and non-overlapping carriers.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

# Topic #2: Overlapping and non-overlapping carriers

Moderator comment: In the following table all proposals and observations have been copied and those which were not seen relevant for this discussion has been ‘removed’ by use of strikethrough.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014361  | Mediatek | Tdoc Title: Discussion on LTE CRS based and NR SSB based measurement in NR IDLE/INACTIVE modeProposal 1: The same measurement requirements for both overlapping and non-overlapping EMR carriers are specified.~~Proposal 2: According to R4-2009264, different EMR measurement requirements are specified for S~~~~rxlev~~ ~~> S~~~~nonIntraSearchP~~ ~~and S~~~~qual~~ ~~> S~~~~nonIntraSearchQ~~ ~~and for S~~~~rxlev~~ ~~≤ S~~~~nonIntraSearchP~~ ~~or S~~~~qual~~ ~~≤ S~~~~nonIntraSearchQ~~~~.~~Proposal 3: Ran4 to follow the measurement rules of cell re-selection and update the overlapping and non-overlapping EMR carrier definitions as following table Table 3: Definition of overlapping and non-overlapping EMR carrier

|  |  |  |
| --- | --- | --- |
| Inter-frequency/Inter-RAT E-UTRAN layers configured for both re-selection and EMR | higher priority layers | equal/lower priority layers |
| Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | Overlapping | Non-overlapping |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Overlapping | Overlapping |

~~Proposal 4: Introduce measurement periodicity requirements for non-overlapping EMR carriers~~~~Proposal 5: For measurement requirement of EMR carriers, evaluating time should be multiplied by the total carrier number to be monitored, i.e., the summation of total overlapping EMR carrier number, total non-overlapping EMR carrier number, and total reselection carriers without EMR configured~~ ~~Proposal 6: RAN4 to reuse the evaluating time for overlapping inter-freq. and inter-RAT EMR carriers as the evaluating time for non-overlapping inter-freq. and inter-RAT EMR carriers~~~~Proposal 7: RAN4 to specify the measurement requirements for non-overlapping EMR carriers when serving cell quality is lower than the s-NonIntraSearch thresholds as below table~~ ~~Table 5: Measurement requirements for cell re-selection purpose and EMR purpose (Srxlev ≤ S~~~~nonIntraSearchP~~ ~~or Squal ≤ S~~~~nonIntraSearchQ~~~~)~~

|  |  |  |
| --- | --- | --- |
|  | ~~Un-detected cell~~ | ~~detected cell~~ |
| ~~Inter-freq. overlapping~~ | ~~K~~~~carrier’~~ ~~\* T~~~~detect,NR\_Inter~~ | ~~K~~~~carrier’~~ ~~\* T~~~~evaluate,NR\_Inter~~ |
| ~~Inter-freq. non-overlapping~~ | ~~K~~~~carrier’~~ ~~\* T~~~~detect,NR\_Inter\_nonOverEMR~~ | ~~K~~~~carrier’~~ ~~\* T~~~~evaluate,NR\_Inter\_nonOverEMR~~ |
| ~~Inter-RAT overlapping~~ | ~~N~~~~EUTRA\_carrier’~~ ~~\* T~~~~detect,EUTRAN~~ | ~~N~~~~EUTRA\_carrier’~~ ~~\* T~~~~evaluate,EUTRAN~~ |
| ~~Inter-RAT non-overlapping~~ | ~~N~~~~EUTRA\_carrier’~~ ~~\* T~~~~detect,EUTRA\_nonOverEMR~~ | ~~N~~~~EUTRA\_carrier’~~ ~~\* T~~~~evaluate,EUTRAN\_nonOverEMR~~ |

~~Proposal 8: RAN4 to specify the measurement requirements for non-overlapping EMR carriers when serving cell quality is higher than the s-NonIntraSearch thresholds as below table~~ ~~Table 6: Measurement requirements for cell re-selection purpose and EMR purpose (Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ)~~

|  |  |  |
| --- | --- | --- |
|  | ~~Un-detected cell~~ | ~~detected cell~~ |
| ~~Inter-freq. overlapping~~ | ~~Kcarrier’ \* (Thigher~~~~\_priority\_search~~ ~~+ Tevaluate~~~~,NR\_Inter~~~~)~~  | ~~Kcarrier’ \* Tevaluate~~~~,NR\_Inter~~ |
| ~~Inter-freq. non-overlapping~~ | ~~Kcarrier’ \* (Thigher~~~~\_priority\_search~~ ~~+ Tevaluate~~~~,NR\_Inter\_nonOverEMR~~~~)~~ | ~~Kcarrier’ \* Tevaluate~~~~,NR\_Inter\_nonOverEMR~~ |
| ~~Inter-RAT overlapping~~ | ~~NEUTRA~~~~\_carrier’~~ ~~\* (Thigher~~~~\_priority\_search~~ ~~+ Tevaluate~~~~,EUTRAN~~~~)~~ | ~~NEUTRA~~~~\_carrier’~~ ~~\* Tevaluate~~~~,EUTRAN~~ |
| ~~Inter-RAT non-overlapping~~ | ~~NEUTRA~~~~\_carrier’~~ ~~\* (Thigher~~~~\_priority\_search~~ ~~+ Tevaluate~~~~,EUTRAN\_nonOverEMR~~~~)~~ | ~~NEUTRA~~~~\_carrier’~~ ~~\* Tevaluate~~~~,EUTRAN\_nonOverEMR~~ |

~~Proposal 9: RAN4 to introduce additional time period T~~~~timeIndex,NR\_Inter~~ ~~in measurement requirement for UE who supports the beam level EMR reporting, where T~~~~timeIndex,NR\_Inter~~ ~~equals to 3\* T~~~~measure,NR\_Inter~~ ~~in FR1 and 5\* T~~~~measure,NR\_Inter~~ ~~in FR2~~ |
| R4-2015587 | ZTE | Tdoc Title: Remaining issues on NR EMRProposal 1: The same measurement requirements for both overlapping and non-overlapping EMR carriers are specified.~~Proposal 2: EMR carrier measurement interval is T~~~~higher\_priority\_search~~ ~~if signal strength and signal quality is above search threshold.~~~~Proposal 3: EMR carrier measurement interval is (T~~~~detect,NR\_Inter,~~ ~~T~~~~measure,NR\_Inter~~~~) if signal strength or signal quality is below search threshold.~~~~Proposal 4: The EMR carrier measurement accuracy requirements are irrelevant of search threshold.~~ ~~Proposal 5: LS RAN2 to ask for adding additional candidate value of timer T331.~~~~Proposal 6: The additional candidate value for timer T331 is up to 1200s.~~~~Proposal 7: UE additional time period in measurement requirement for UE who supports the beam level EMR reporting is TtimeIndex,NR\_Interf = [3]\* Tmeasure,NR\_Interf.~~Proposal 8: EMR carriers are actively measured for EMR while T331 is running |
| R4-2015742 | Huawei | Tdoc Title: Discussion on remaining issues in EMR requirements~~Proposal 1: Define EMR measurement period requirements to be same as that for high priority mobility measurement.~~ ~~Proposal 2: The measurement period requirements should be scaled by the number of carriers actively measured for mobility plus the number of carriers that is actively measured for EMR only.~~Proposal 3: RAN4 to not define overlapping and non-overlapping carriers. |
| R4-2015881 | Nokia | Tdoc Title: Early Measurement Reporting1. *An overlapping carrier is an actively measured carrier configured by higher layer for mobility and early measurement reporting. A non-overlapping carrier is defined as an actively measured carrier configured by higher layer for early measurement reporting while not configured for mobility. A carrier configured for early measurement reporting is actively measured provided T331 has not expired, the serving cell is supporting early measurement reporting and the serving cell is in the validity area.*
2. If Proposal 1 is not agreeable, the definitions of overlapping and non-overlapping carriers follow Rel-15 definition directly:
	1. An overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements.
	2. A non-overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.
3. Decouple the definitions of overlapping and non-overlapping carriers from s-NonIntraSearch thresholds.
4. ~~Rel-16 UE measurement requirements for EMR follow Rel-15 baseline and RAN4 requirements allow flexibility in applying the s-NonIntraSearch thresholds to prevent inter-frequency/RAT measurements with different periodicities.~~
5. ~~Allow UEs to measure, and perform EMR measurements, according to its preference, accounting any UE specific complexity related to measuring inter-frequency/RAT measurements with different measurement periods.~~
6. ~~Enable more advanced UEs to benefit from performing more advanced measurements for EMR.~~
7. ~~When s-NonIntraSearch thresholds are not configured (hence, s-NonIntraSearch is infinite and Srxlev ≤ SnonIntraSearchP or Squal ≤ S~~~~nonIntraSearchQ~~ ~~conditions are always fulfilled) the UE shall measure all configured overlapping EMR carriers according to 4.2.2.4 (and not 4.2.2.7).~~
8. ~~When s-NonIntraSearch threshold are configured (hence, s-NonIntraSearch is not infinite) Srxlev > SnonIntraSearchP or Squal > SnonIntraSearchQ conditions may be fulfilled or not. In this case, the UE measurement requirements are as follows:~~
	1. ~~If Srxlev ≤ SnonIntraSearchP or Squal ≤ S~~~~nonIntraSearchQ~~~~: UE shall follow measurement requirements according to 4.2.2.4 (not 4.2.2.7) for overlapping EMR carriers.~~
	2. ~~If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is not configured with any high priority carriers: UE shall follow measurement requirement according to 4.2.2.4 without applying s-NonIntraSearch threshold for EMR carriers.~~
	3. ~~If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers: UE shall at least measure at least high priority carriers according to 4.2.2.7 and 7 and shall at least measure at least measure configured, overlapping EMR carriers according 4.2.2.7.~~
	4. ~~If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ: and UE is configured with one or more high priority carriers: UE may measure configured carriers according to 4.2.2.4.~~
9. ~~Agree on proposal 7 and proposal 8 as a package.~~
10. ~~The UE indicates to the network if the reported EMR results are performed while applying s-NonIntraSearch thresholds to the EMR carriers or not.~~
11. ~~For Rel-16 the requirements in proposal 7 and proposal 8 applies.~~
12. ~~RAN4 to send LS to RAN2 to introduce means for UE to indicate whether the UE applied search thresholds when measuring the reported early measurement or not. Indication should be defined in Rel-16, if possible, otherwise in Rel-17~~
13. ~~If RAN2 cannot introduce the solution in Rel-16, we propose that for Rel-16, if s-NonIntraSearch thresholds are configured, and Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers, the UE may measure overlapping EMR according to section 4.2.2.7 or 4.2.2.4.~~
14. ~~If RAN2 cannot introduce the solution in Rel-16, we propose that or Rel-16 the network will not be aware of UE which UE requirements the UE applies if s-NonIntraSearch thresholds are configured, and Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ and UE is configured with one or more high priority carriers~~
15. ~~Agree Proposals 11 - 14 as a package.~~

Related to measurement requirements on EMR carriers a number of cases are missing. for those we suggest following:1. For non-overlapping NR FR2 carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
2. For non-overlapping LTE inter-RAT carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
3. Measurement requirements for an overlapping NR inter-RAT EMR carrier follow the principles of of proposal 15.
4. For non-overlapping NR inter-RAT carriers, at least prior to transmission of the idle mode measurement report, the UE shall perform at least a single measurement on detected cells on the non-overlapping inter-frequency carrier(s) configured to be measured for early measurement reporting.
5. ~~For an inter-frequency carrier, the UE is required to acquire the index of the SSB within 3 DRX cycles. Hence, X = 3.~~
6. ~~For an inter-RAT NR carrier, the UE is required to acquire the index of the SSB within 3 DRX cycles. Hence, X = 3.~~
7. ~~When a cell will remain detectable after entering idle mode after connection release should not be conditioned by a future condition which is unknown at the time of the connection release.~~
8. ~~The cell detected state conditions during transitioning to idle mode need to be conditioned by the cell conditions at the time of release and not on potential future cell conditions once the connection is established.~~
9. ~~New condition would be: The detected cell and SSBs remains detectable during the state transitioning to idle mode.~~
 |
| R4-2016573 | Qualcomm | Tdoc Title: Early measurement reporting in MR-DC**Proposal 1: Whether overlapping or non-overlapping EMR carrier is dynamically defined depending on the following attributes:*** Whether T331 is running or not
* Whether S-criteria condition is met or not
* Whether EMR carrier is also configured as a measurement carrier for idle/inactive mode or not, and if configured whether it is higher priority frequency layer than serving/camped cell or not
* Based on the attributes, if the carrier is determined to be measured for EMR and cell reselection at a given condition, it is defined as overlapping EMR carrier

**~~Proposal 2: A unified minimum measurement interval requirement applies to both EMR carriers and cell reselection inter-frequency layers.~~*** ~~When S-criteria condition is met (Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ), the carriers shall be measured at least every Thigher\_priority\_search(=Nlayers x 60s), and Nlayers is the number of higher priority frequency layers plus the number of non-overlapping EMR carriers~~
* ~~When S-criteria condition is not met (Srxlev ≤ SnonIntraSearchP and Squal ≤ SnonIntraSearchQ), the carriers shall be measured at least every Kcarrier x Tmeasure,NR\_Inter, and Kcarrier is the number of higher/equal/lower priority frequency layers plus the number of non-overlapping EMR carriers~~
 |

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

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

*Interested companies are expected to add their views directly under the respective issues in a dialogue-like form, i.e., identical to how the chair would record views during a f2f meeting.*

*Please add further table rows as required and do not change previous comments of your company or other companies. Answering to questions from other companies is encouraged.*

Introduction to the discussion:

To facilitate the discussion, we can use following figure from R4-2016573



And the table (R4-2014361):

**Table 3: Definition of overlapping and non-overlapping EMR carrier**

|  |  |  |
| --- | --- | --- |
| Inter-frequency/Inter-RAT E-UTRAN layers configured for both re-selection and EMR | higher priority layers | equal/lower priority layers |
| Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | Overlapping | Non-overlapping |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Overlapping | Overlapping |

And from R4-2015881:

Based on these agreements, RAN4 then in [R4-2005847] agreed concerning overlapping and non-overlapping carriers:

* Definition of overlapping and non-overlapping (sub-topic 1-2) (R4-2005847)
	+ An overlapping carrier is a carrier which the UE is actively measuring for EMR and mobility.
	+ A non-overlapping carrier is a carrier which the UE is actively measuring for EMR.
	+ Note: overlapping and overlapping carrier relates to a carrier configured for EMR.

Additionally, RAN4 made agreements related to the conditions for actively measured [R4-2005847]:

* At least following conditions apply for an actively measured EMR carrier (R4-2005847):
	+ T331 timer is running.
	+ Serving cell is in the validity area.
	+ Serving cell support EMR.

In Rel-15 following definition was introduced mainly to ensure minimum impact on the UE power consumption:

* An overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements.
* A non-overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.

During RAN4#97 following proposals related to overlapping/non-overlapping carriers have been put forward:

Proposals:

1. Qualcomm:
	1. Proposal 1: Whether overlapping or non-overlapping EMR carrier is dynamically defined depending on the following attributes:
		1. Whether T331 is running or not
		2. Whether S-criteria condition is met or not
		3. Whether EMR carrier is also configured as a measurement carrier for idle/inactive mode or not, and if configured whether it is higher priority frequency layer than serving/camped cell or not
		4. Based on the attributes, if the carrier is determined to be measured for EMR and cell reselection at a given condition, it is defined as overlapping EMR carrier
2. MTK:
	1. Proposal 3:

|  |  |  |
| --- | --- | --- |
| Inter-frequency/Inter-RAT E-UTRAN layers configured for both re-selection and EMR | higher priority layers | equal/lower priority layers |
| Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | Overlapping | Non-overlapping |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Overlapping | Overlapping |

* 1. Proposal 6: RAN4 to reuse the evaluating time for overlapping inter-freq. and inter-RAT EMR carriers as the evaluating time for non-overlapping inter-freq. and inter-RAT EMR carriers
1. Huawei:
	1. Proposal 3: RAN4 to not define overlapping and non-overlapping carriers.
2. Nokia:
	1. Proposal 1: An overlapping carrier is an actively measured carrier configured by higher layer for mobility and early measurement reporting. A non-overlapping carrier is defined as an actively measured carrier configured by higher layer for early measurement reporting while not configured for mobility. A carrier configured for early measurement reporting is actively measured provided T331 has not expired, the serving cell is supporting early measurement reporting and the serving cell is in the validity area.
	2. Proposal 2: If Proposal 1 is not agreeable, the definitions of overlapping and non-overlapping carriers follow Rel-15 definition directly:
		1. An overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting and inter-frequency mobility measurements.
		2. A non-overlapping carrier is defined as a carrier configured by higher layer for early measurement reporting while not configured for inter-frequency mobility measurements.
3. ZTE:
	1. no proposal
	2. Proposal 1: The same measurement requirements for both overlapping and non-overlapping EMR carriers are specified.
4. Ericsson:
	1. An overlapping carrier is a carrier which the UE is actively measuring for EMR and mobility.
	2. A non-overlapping carrier is a carrier which the UE is actively measuring for EMR.

Proposals 1, 4 and 6 target an actual definition of overlapping and non-overlapping carriers.

Proposals 2 and 5 target to have same measurement requirements for overlapping and non-overlapping carriers.

Proposal 3 suggest to not define overlapping and non-overlapping carriers.

From the contributions three main aspects which RAN4 group has to address:

* Is there a need for RAN4 define different UE idle mode CA measurement requirements depending on whether the EMR carrier is measured for mobility or not?
* Can the EMR carrier dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds?
* Is there a need for the definition of overlapping and non-overlapping carriers?

To progress the discussion - assuming proposed agreements are acceptable to companies - the open issues relates to whether there is need to differ UE idle mode CA measurements requirements between overlapping and non-overlapping carriers. Following table can be used as guide in the discussion:

|  |  |
| --- | --- |
| SnonIntraSearchP/Q configured | SnonIntraSearchP/Q not configured |
| Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ | Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ | N/A  |
| EMR measurement requirements when high Priority carrier not configured | EMR measurement requirements when high Priority carrier configured | EMR measurement requirements when high Priority carrier not configured | EMR measurement requirements when high Priority carrier configured |  N/A |
| 4.2.2.2 (Kcarrier \* Tdetect,NR\_Inter, Kcarrier \* Tmeasure,NR\_Inter) | 4.2.2.2 (Kcarrier \* Tdetect,NR\_Inter, Kcarrier \* Tmeasure,NR\_Inter) | 4.2.2.x | 4.2.2.7 (Thigher\_priority\_search = (60 \* Klayers), Klayers \* Tmeasure,NR\_Inter) | 4.2.2.2 (Kcarrier \* Tdetect,NR\_Inter, Kcarrier \* Tmeasure,NR\_Inter) |

### Sub-topic 2-1: need for RAN4 define different UE idle mode CA measurement requirements depending on whether the EMR carrier is measured for mobility or not

Sub-topic description: Is there a need for RAN4 define different UE idle mode CA measurement requirements depending on whether the EMR carrier is measured for mobility or not?

Is there a need for RAN4 define different UE idle mode CA measurement requirements depending on whether the EMR carrier is measured for mobility or not?

* Proposals
	+ Option 1: Agree to have same UE idle mode CA measurement requirements for all configured EMR carriers. Hence, UE idle mode CA measurement requirements do not depend on whether the carrier is configured for mobility or not.
	+ Option 2: Agree to have different UE idle mode CA measurement requirements for configured EMR carriers, dependent on whether the carrier is additionally configured for mobility or not.
		- For companies preferring this option: list exactly which requirements (overlapping and non-overlapping)
* Recommended WF
	+ Agree on option 1: RAN4 agree to have same UE idle mode CA measurement requirements for all configured EMR carriers. Hence, UE idle mode CA measurement requirements do not depend on whether the carrier is configured for mobility or not.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### Sub-topic 2-2: Can the EMR carrier dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds

Sub-topic description: Can the EMR carrier dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds

* Proposals
	+ Option 1: A configured EMR carrier can dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds.
	+ Option 2: A configured EMR carrier cannot dynamically change between overlapping and non-overlapping based on the UE conditions and the s-NonIntraSearch thresholds.
* Recommended WF
	+ Needs more discussion and depends on Sub-topic 2-1. If RAN4 agrees to have same UE idle mode CA measurement requirements for all configured EMR carriers, there is no clear reason to discuss this topic further.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### Sub-topic 2-3: Is there a need for the definition of overlapping and non-overlapping carriers

Sub-topic description: Is there a need for the definition of overlapping and non-overlapping carriers

* Proposals
	+ Option 1: Yes.
	+ Option 2: No.
* Recommended WF:
	+ Needs more discussion and depends on Sub-topic 2-1. If RAN4 agrees to have same UE idle mode CA measurement requirements for all configured EMR carriers, there is no clear reason for defining overlapping and non-overlapping carriers.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2014362 | CR on TS38.133 for measurement capability of IDLE mode DC/CA measurement, MediaTek inc., Huawei, HiSilicon |
| Company A |
| Company B |
|  |
| R4-2015743 | CR on EMR requirements in 36.133, Huawei, HiSilicon, MediaTek |
| Company A |
| Company B |
|  |
| R4-2015882 | CR on UE requirement for MR-DC early measurement reporting in 36.133, Nokia, Nokia Shanghai Bell |
| Company A |
| Company B |
|  |
| R4-2015883 | CR on UE requirement for MR-DC early measurement reporting in 38.133, Nokia, Nokia Shanghai Bell |
| Company A |
| Company B |
|  |
| R4-2016388 | Updates in EMR requirements, Ericsson |
| Company A |
| Company B |
|  |
| R4-2016389 | Updates in EMR requirements, Ericsson |
| Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

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

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #3: Performance – accuracy requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-20 15746 | Huawei, HiSilicon | Proposal 1: For LTE-NR inter-RAT EMR, the measurement accuracy requirements for NR inter-frequency EMR are reused.Proposal 2: RAN4 to define same measurement accuracy requirements for all NR EMR carriers.Proposal 3: Measurement accuracy for EMR is relaxed compared to existing connected mode requirements- For RSRP, accuracy is relaxed by 1.5dB and side condition is defined at -4dB- For RSRQ, accuracy is relaxed by 1.5dBProposal 4: For all NR-LTE inter-RAT EMR carriers, reuse the existing LTE inter-frequency accuracy requirements for CA Idle mode measurements for overlapping carrier. |
| R4-2016017 | Ericsson | Moved to test Topic #4 related to test cases. |

Introduction to the discussion:

It is assumed that RAN4 will need to define accuracy requirements for MR-DC EMR for the newly defined core requirement cases, covering:

1. 36.133:
	1. NR inter-RAT:
		1. FR1
		2. FR2
2. 38.133:
	1. NR inter-frequency:
		1. FR1
		2. FR2
	2. LTE inter-RAT

In earlier meetings RAN4 has agreed following:

Measurement accuracies:

* RAN4 agreed that for overlapping EMR carriers, the UE measurement accuracy requirements for carriers configured for EMR:
	+ RAN4 to define relaxed NR measurement requirements for overlapping carrier compared to existing NR inter-frequency requirements in terms of SNR and accuracy
* Sub-topic#2-5: Measurement accuracy requirements for NR Inter-RAT EMR carrier:
	+ For Measurement accuracy requirements for NR Inter-RAT EMR carrier same principles as in Issue 1-2-5-2 will be applied.
* Sub-topic#2-5: Measurement accuracy requirements for NR Inter-RAT EMR carrier:
	+ For Measurement accuracy requirements for NR Inter-RAT EMR carrier same principles as in Issue 1-2-5-2 will be applied.

## Open issues summary

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

Based on the input RAN4 will need to discuss agree following:

* Introduction of accuracy requirements for all MR-DC EMR cases introduced.
* Re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements.
* Measurement accuracy relaxation compared to existing connected mode requirements

### Sub-topic 3-1 Introduction of accuracy requirements for all MR-DC EMR cases introduced

Sub-topic description: Introduction of accuracy requirements for all MR-DC EMR cases introduced

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

RAN4 will need to define accuracy requirements for MR-DC EMR for the newly defined core requirement cases, covering:

1. 36.133:
	1. NR inter-RAT:
		1. FR1
		2. FR2
2. 38.133:
	1. NR inter-frequency:
		1. FR1
		2. FR2
	2. LTE inter-RAT
* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF
	+ Agree on option 1. RAN4 will define accuracy requirements for MR-DC EMR for the newly introduced core requirement cases listed above.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### Sub-topic 3-2 Re-use of existing connected mode accuracy requirements

*Sub-topic description*

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

Discuss and agree whether to re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements

* Proposals
	+ Option 1: Yes, RAN4 will re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements
	+ Option 2: No, RAN4 will not re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements, but will develop new accuracy requirements.
* Recommended WF
	+ Agree on option1 and RAN4 will re-use of existing connected mode accuracy requirements as baseline for developing EMR idle mode CA measurement accuracy requirements.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### Sub-topic 3-2 Measurement accuracy relaxation compared to existing connected mode requirements

*Sub-topic description*

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

Discuss and agree the measurement accuracy relaxation compared to existing connected mode requirements

* Proposals
	+ Option 1: Measurement accuracy for EMR is relaxed compared to existing connected mode requirements:
		- For RSRP, accuracy is relaxed by 1.5dB and side condition is defined at -4dB
		- For RSRQ, accuracy is relaxed by 1.5dB
* Recommended WF
	+ As there is only input from one company in this meeting it is recommended to continue the discussion to allow other companies to provide input.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015747 | draftCR to introduce accuracy requirements for EMR 38.133, Huawei, HiSilicon |
| Company A |
| Company B |
|  |
| R4-2015748 | draftCR to introduce accuracy requirements for EMR 36.133, Huawei, HiSilicon |
| Company A |
| Company B |
|  |
| R4-2016378 | Accuracy requirements for MR-DC EMR (36.133), Nokia Corporation |
| Company A |
| Company B |
|  |
| R4-2016386 | Accuracy requirements for MR-DC EMR (38.133), Nokia Corporation |
| Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **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**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #4: Test cases for MD-DC EMR

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2016018 | Ericsson | **Proposal 1:** RAN4 develops test cases for MR-DC based on the test case list in Table 1.**Proposal 2:** Time plan for developing MR-DC test cases:* RAN4#97-e (November 2020):
	+ Agree on high-level list for test cases.
	+ Agree on work split between interested companies.
* RAN4#98-e (January 2021):
	+ Provide draft CRs for test cases.
* RAN4#98bis-e (April 2021):
	+ Provide final CRs for test cases.
 |
| R4-2015749 | Huawei, HiSilicon | Proposal 1: Define EMR measurement period and measurement accuracy tests for the following cases (totally 8 test cases):* Case 1: NR inter-frequency EMR, target cell is in FR1 and has been detected when UE is in connected mode, without beam level measurement
* Case 2: NR inter-frequency EMR, target cell is in FR2 and has not been detected when UE is in connected mode, with beam level measurement
* Case 3: LTE-NR inter-RAT EMR, target cell is in FR1 and has not been detected when UE is in connected mode, with beam level measurement
* Case 4: LTE-NR inter-RAT EMR, target cell is in FR2 and has been detected when UE is in connected mode, without beam level measurement
* In all the tests, the EMR carrier is also configured for mobility, and the serving cell is below the search threshold (meaning the EMR carrier is also actively measured for mobility)
 |
| R4-2015884 | Nokia, Nokia Shanghai Bell | 1. RAN4 to discuss and agree on a list of test cases for MR-DC EMR.
2. RAN4 introduces measurement performance test cases.

38.133:Cell detected state:

|  |  |  |
| --- | --- | --- |
| Carrier | Frequency Range | Carrier type |
| inter-frequency | FR1 | non-overlapping |
| inter-frequency | FR2 | overlapping |
| inter-RAT | N/A | overlapping |

EMR:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Carrier | Frequency Range | Carrier type | Cell type | SSB Measurements |
| inter-frequency | FR1 | overlapping | new cell | Yes |
| inter-frequency | FR1 | non-overlapping | known cell | No |
| inter-frequency | FR2 | overlapping | known cell | No |
| inter-frequency | FR2 | non-overlapping | known cell | Yes |
| inter-frequency | FR2 | overlapping | new cell | Yes |
| inter-frequency | FR2 | non-overlapping | new cell | No |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Carrier | Frequency Range | Carrier type | Cell type | SSB Measurements |
| Inter-RAT | LTE | overlapping | known cell | N/A |
| Inter-RAT | LTE | non-overlapping | new cell | N/A |

36.133:cell detected state:

|  |  |  |
| --- | --- | --- |
| Carrier | Frequency Range | Carrier type |
| inter-RAT | FR1 | overlapping |
| inter-RAT | FR2 | non-overlapping |

EMR:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Carrier | Frequency Range | Carrier type | Cell type | SSB Measurements |
| Inter-RAT | FR1 | non-overlapping | new cell | Yes |
| Inter-RAT | FR1 | overlapping | known cell | No |
| Inter-RAT | FR2 | non-overlapping | known cell | No |
| Inter-RAT | FR2 | overlapping | known cell | Yes |
| Inter-RAT | FR2 | non-overlapping | new cell | Yes |
| Inter-RAT | FR2 | overlapping | new cell | No |

 |
| R4-2016017 | Ericsson | Introduce following test case for EMR:38.133:* Idle Mode measurements of inter-frequency CA/DC candidate cells in FR1 for early reporting
* Idle Mode measurements of inter-frequency CA/DC candidate cells in FR2 for early reporting
* Idle Mode measurements of inter-RAT EUTRA DC candidate cells for early reporting

36.133:* Idle Mode measurements of inter-RAT NR DC candidate cells for early reporting
 |

## Open issues summary

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

Based on the input RAN4 will need to discuss agree following:

* Time plan.
* Test case list.

### Sub-topic 4-1 Time plan

Time plan for developing MR-DC test cases:

* RAN4#97-e (November 2020):
	+ Agree on high-level list for test cases.
	+ Agree on work split between interested companies.
* RAN4#98-e (January 2021):
	+ Provide draft CRs for test cases.
* RAN4#98bis-e (April 2021):
	+ Provide final CRs for test cases
* Proposals
	+ Option 1: Agree the time plan.
	+ Option 2: N/A
* Recommended WF:
	+ Agree on the time plan

### Sub-topic 4-2 Test case list

* Proposals
	+ Option 1: Use following as template baseline for discussing test cases:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Serving Carrier | Target Carrier | Target cell Frequency Range | Target Carrier type(mobility or not carrier) | Target Cell type | Beam level Measurements | s-NonIntraSearch thresholds |
| *LTE, NR (FR1, FR2)* | *LTE, NR* | *FR1 or FR2* | *overlapping or not (pending discussion)* | *New cell or detected cell* | *yes/no* | *yes/no* |

* + Option 2:
* Recommended WF:
	+ Agree on using the template table for collecting initial views. More discussion is needed concerning which test cases to define.

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| xxxx | Company A |
| Company B |
|  |
|  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **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**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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