3GPP TSG-RAN WG2 Meeting #109bis\_e R2-20xxxxx

Electronic meeting, 20th April to 24th April 2020

Agenda Item: x.x.x

Source: Ericsson (rapporteur)

Title: RRC Open issues for DCCA

Document for: Discussion, Decision

# Introduction

This document captures the following email discussion:

* [Post109e#37][DCCA] RRC open Issues (Ericsson)

Scope: WI RRC review Resolve FFSs that don’t require major technical discussion (like need codes). Ensure that all agreements are captured properly

Intended outcome: Agreeable CR (deadline as above)

Intended outcome 2: Open Issues list with RRC impact (April 1)

In Section 2, the known open issues already identified during previous meetings are discussed.

In Section 3, new open issues identified by the rapporteur are discussed.

In Section 4, companies are invited to provide input regarding any open issues not addressed by the rapporteur.

# Known Open issues

In RRC CRs [1] [2], the following editor notes are left:

38.331

*#1: 5.3.13.4 Reception of the RRCResume by the UE*

Editor’s note: FFS if the *idleModeMeasuremnetReq* indicates all results (EUTRA and NR), or can request only NR results. The procedure below assumes the former.

*#2: 5.7.z.3 Reception of the UEInformationRequest message*

Editor’s note: FFS if the *idleModeMeasurementReq* indicates all results (EUTRA and NR), or can request only E-UTRA or NR results. The procedure below assumes the former.

*#3: 5.7.x.2 Initiation*

Editor’s note: FFS if one IE (*idleModeMeasurements* with ENUMERATED {eutra, nr, both}) or two separate IEs (i.e. one for NR, one for EUTRA) is to be used to indicate to the UE to perform EUTRA and/or NR early measurements.

*#4: 6.3.2 MeasIdleConfig*

Editor’s note: FFS if *nrofSS-BlocksToAverage* and *absThreshSS-BlocksConsolidation* should be defined together with the *carrierFreqNR* (i.e. outside the *ssb-MeasConfig* structure)

36.331

*#5: 5.3.3.4a Reception of the RRCConnectionResume by the UE*

Editor’s note: FFS if the *idleModeMeasurementReq* indicates all results (EUTRA and NR), or can request only EUTRA or NR results. The procedure below assumes the former.

*#6: 5.6.5.3 Reception of the UEInformationRequest message*

Editor’s note: FFS if the *idleModeMeasurementsReq* indicates all results (EUTRA and NR), or can request only EUTRA or NR results. The procedure below assumes the former.

*#7: 6.2.2 RRCConnectionResumeComplete*

Editors Note: FFS whether to have a separate availability indicator for rel-16 idle/inactive measurements.

*#8: 6.2.2 RRCConnectionSetupComplete*

Editors Note: FFS whether to have a separate availability indicator for rel-16 idle/inactive measurements.

*#9: 6.2.2 UEInformationRequest*

Editors Note: FFS whether to have a separate rel-16 idle/inactive measurement request or the idleModeMeasurementReq-r15 can be reused for rel-16 as well.

*#10: 6.3.5 MeasIdleConfig*

Editors note: FFS if *maxRS-IndexCellQual* and *threshRS-Index* should be defined together with the carrierFreqNR (i.e. outside the *ssb-MeasConfig* structure)

Issues #1,#2, #5, #6, #7, #8, and #9 are related to the granular early measurement request/reporting that was discussed before/during RAN2-109e [3][4][5]. The proponents of the granular reporting proposed to have both granular request (where the network can explicitly request E-UTRA, NR, or both measurements) and granular availability indication (where the UE can explicitly indicate it has E-UTRA, NR, or both measurements), and this was captured in a TP in [6]. In [7], it is proposed that the indicator *idleModeMeasurements* (SIB2 in LTE, SIB1 in NR) is used to implicitly indicate to the UE whether it should report E-UTRA, NR, or both measurements (but no granular availability indication from the UE). The companies that didn’t support the granular request/reporting cited as their main reason that it will lead to unnecessary complexity [3].

**Question 1: For LTE/NR rel-16, which of the following options discussed above should be adopted for the network to request early measurements and for the UE to indicate early measurement availability:**

1. ***Granular (Explicit):* UE explicitly indicates the measurements it has (in *RRC(connection)SetupComplete, RRC(Connection)ResumeComplete*) and network explicitly indicates the measurements it wants (in *UEInformationRequest, RRC(Connection)Resume*) (as captured in the TP in [6])**
2. ***Granular (Implicit):* network explicitly indicates the measurements it wants to be performed/reported in the** *idleModeMeasurements* in **SIB (SIB2 in LTE, SIB1 in NR), (as proposed in [7])**
3. ***Non-Granular:* UE has one indicator to indicate early measurements (be them for E-UTRA and/or NR carriers), and network has one indicator to request early measurements (upon which the UE sends all measurement results it has available)**

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| **Company** | **Preferred option** | **Comments** |
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Issue #3 is related to the RAN2-109e agreement:

* In NR rel-16, the *idleModeMeasurements* can be used to specify whether the UE is required to perform early measurements on EUTRA, NR or both carriers. FFS if one IE (i.e. ENUMERATED {eutra, nr, both} or separate IEs (i.e. one for EUTRA, one for NR) is to be used.

In [8], it was proposed to define the *idleModeMeasurements* in SIB1 to be of type ENUMERATED {eutra, nr, both}, and the UE performing the early measurements accordingly. In [7], it was proposed to use separate IEs, *idleModeMeasurementsNR* and *idleModeMeasurementsEUTRA* instead. From both functionality and complexity point of view, there seems to be no significant difference between the two options.

**Question 2: For NR rel-16, which of the following options discussed above should be adopted for the network to indicate to the UE which RAT(s) to perform early measurements on:**

1. ***One IE:*** *idleModeMeasurements* in SIB1, with type ENUMERATED {eutra, nr, both} (as captured in the TP in [8])
2. ***Two IEs:*** *idleModeMeasurementsNR* and *idleModeMeasurementsEUTRA**(as proposed in [7])*

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Issues #4 and #10 is related to the issue raised in [9], and the reason cited there was:

In addition, *nrofSS-BlocksToAverage-r16* and *absThreshSS-BlocksConsolidation-r16* are also defined in ssb-MeasConfig-r16 for early measurement configurations. These are used for derivation of cell measurement results. But parameters related to cell level measurement results do not have to be updated from SIB during cell re-selection. For example, *qualityThreshold-r16* for each SSB measurement object, which defines the threshold of cell level quality for early measurement reporting, is defined out of *ssbMeasConfig-r16*. Therefore, we propose that *nrofSS-BlocksToAverage-r16* and *absThreshSS-BlocksConsolidation-r16* are defined out of ssb-MeasConfig-r16.

**Question 3: In *MeasIdleConfig*, where should the IEs *nrofSS-BlocksToAverage-r16* and *absThreshSS-BlocksConsolidation-r16 (*NR*)* and *maxRS-IndexCellQual* and *threshRS-Index* (LTE) be defined:**

1. ***Within ssb-MeasConfig (as in the current CRs [1][2])***
2. ***Outside ssb-MeasConfig (directly under MeasIdleCarrierNR)***

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In both 36.331 and 38.331, there is an FFS regarding the maximum number of cells per carrier for idle/inactive measurements for rel-16

36.331

maxCellMeasIdle-r16 INTEGER ::= 8 -- Value FFS

38.331

maxCellMeasIdle-r16 INTEGER ::= 65535 -- Maximum number of cells per carrier for idle/inactive measurements is FFS

In LTE euCA, the *maxCellMeasIdle-r15* is defined to be 8. A simple approach in rel-16 could be to adopt the same limitation as in LTE euCA (i.e. up to 8 cells per carrier can be included in the idle/inactive measurement results).

**Question 4: Do companies agree to adopt the LTE euCA limitation of a maximum of 8 cells per carrier for idle/inactive measurement results also for LTE/NR rel-16?**

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| **Company** | **Preferred option** | **Comments** |
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Another issue is related to the need codes of the IEs in *MeasIdleConfig*. Since the *MeasIdleCarrierListEUTRA* and *MeasIdleCarrierListNR* are utilized both in *MeasIdleConfigSIB* and *MeasIdleConfigDedicated*, it is not clear on how to specify the need code of the IEs within that. Also, the way the need codes for the corresponding IEs to specify the SSB configuration are defined in SIBs in LTE and NR differently. For example, in SIB24 of LTE, we have:

CarrierFreqNR-r15 ::= SEQUENCE {

carrierFreq-r15 ARFCN-ValueNR-r15,

multiBandInfoList-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

multiBandInfoListSUL-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

measTimingConfig-r15 MTC-SSB-NR-r15 OPTIONAL, -- Need OR

subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240},

ss-RSSI-Measurement-r15 SS-RSSI-Measurement-r15 OPTIONAL, -- Cond RSRQ2

cellReselectionPriority-r15 CellReselectionPriority OPTIONAL, -- Need OP

cellReselectionSubPriority-r15 CellReselectionSubPriority-r13 OPTIONAL, -- Need OR

threshX-High-r15 ReselectionThreshold,

threshX-Low-r15 ReselectionThreshold,

threshX-Q-r15 SEQUENCE {

threshX-HighQ-r15 ReselectionThresholdQ-r9,

threshX-LowQ-r15 ReselectionThresholdQ-r9

} OPTIONAL, -- Cond RSRQ

q-RxLevMin-r15 INTEGER (-70..-22),

q-RxLevMinSUL-r15 INTEGER (-70..-22) OPTIONAL, -- Need OR

p-MaxNR-r15 P-MaxNR-r15,

ns-PmaxListNR-r15 NS-PmaxListNR-r15 OPTIONAL, -- Need OR

q-QualMin-r15 INTEGER (-43..-12) OPTIONAL, -- Need OP

deriveSSB-IndexFromCell-r15 BOOLEAN,

maxRS-IndexCellQual-r15 MaxRS-IndexCellQualNR-r15 OPTIONAL, -- Need OR

threshRS-Index-r15 ThresholdListNR-r15 OPTIONAL, -- Need OR

...,

[[ multiBandNsPmaxListNR-v1550 MultiBandNsPmaxListNR-1-v1550 OPTIONAL, -- Need OR

multiBandNsPmaxListNR-SUL-v1550 MultiBandNsPmaxListNR-v1550 OPTIONAL, -- Need OR

ssb-ToMeasure-r15 SSB-ToMeasure-r15 OPTIONAL -- Need OR

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}

While in SIB4 of NR, we have:

InterFreqCarrierFreqInfo ::= SEQUENCE {

dl-CarrierFreq ARFCN-ValueNR,

frequencyBandList MultiFrequencyBandListNR-SIB OPTIONAL, -- Cond Mandatory

frequencyBandListSUL MultiFrequencyBandListNR-SIB OPTIONAL, -- Need R

nrofSS-BlocksToAverage INTEGER (2..maxNrofSS-BlocksToAverage) OPTIONAL, -- Need S

absThreshSS-BlocksConsolidation ThresholdNR OPTIONAL, -- Need S

smtc SSB-MTC OPTIONAL, -- Need S

ssbSubcarrierSpacing SubcarrierSpacing,

ssb-ToMeasure SSB-ToMeasure OPTIONAL, -- Need S

deriveSSB-IndexFromCell BOOLEAN,

ss-RSSI-Measurement SS-RSSI-Measurement OPTIONAL,

q-RxLevMin Q-RxLevMin,

q-RxLevMinSUL Q-RxLevMin OPTIONAL, -- Need R

q-QualMin Q-QualMin OPTIONAL, -- Need S

p-Max P-Max OPTIONAL, -- Need S

t-ReselectionNR T-Reselection,

t-ReselectionNR-SF SpeedStateScaleFactors OPTIONAL, -- Need S

threshX-HighP ReselectionThreshold,

threshX-LowP ReselectionThreshold,

threshX-Q SEQUENCE {

threshX-HighQ ReselectionThresholdQ,

threshX-LowQ ReselectionThresholdQ

} OPTIONAL, -- Cond RSRQ

cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need R

cellReselectionSubPriority CellReselectionSubPriority OPTIONAL, -- Need R

q-OffsetFreq Q-OffsetRange DEFAULT dB0,

interFreqNeighCellList InterFreqNeighCellList OPTIONAL, -- Need R

interFreqBlackCellList InterFreqBlackCellList OPTIONAL, -- Need R

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}

**Question 5: In LTE, do companies agree to use the same need codes for the IEs within *ssb-MeasConfig* of *MeasIdleCarrierNR* as in the corresponding IEs in SIB24?**

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**Question 6: In NR, do companies agree to use the same need codes for the IEs within *ssb-MeasConfig* of *MeasIdleCarrierNR* as in the corresponding IEs in SIB4?**

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# Other Open issues

The idle/inactive measurement procedures in the endorsed CRs [1][2] have been checked by the rapporteur and the following open issues have been identified:

1. The idle/inactive measurement procedure (5.7.x.2 in 38.331 and 5.6.20.2 in 36.331) contains the procedure for handling both the early measurement configuration as well as the early measurement performance. This seems to make the procedure hard to comprehend and different from the way connected mode measurements were handled, where we have separate clauses for measurement configuration and performing measurements.
2. The current procedures do not capture the cell quality derivation from beams.
3. The current procedures do not properly capture how the beam index and beam results are included in the early measurements.

The rapporteur has updated the running CRs (attached with this email discussion document) to address the above aspects.

**Question 7: Do companies agree with splitting the idle/inactive measurement procedures into the handling of measurement configurations and performing measurements, as captured in the updated running CRs?**

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| **Company** | **Preferred option** | **Comments** |
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**Question 8: Do companies agree with the way the cell quality derivation from beams is handled in the updated running CRs?**

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| **Company** | **Preferred option** | **Comments** |
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**Question 9: Do companies agree with the way the beam index/results are included in the early measurements in the updated running CRs?**

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| **Company** | **Preferred option** | **Comments** |
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Another open issue related to early measurements in LTE is regarding how to capture the RAN2-109e agreements on the number of carriers that can be reported, i.e.

* *For early measurement configuration and reporting, ASN.1 signalling to allow the configuration of*
  + *up to 8 E-UTRA and 8 NR carries to be measured*
  + *up to 8 E-UTRA and 8 NR carriers to be reported*
  + *up to 32 beams to be included in the NR results*

MeasResultListIdle-r15 ::= SEQUENCE (SIZE (1..maxIdleMeasCarriers-r15)) OF MeasResultIdle-r15

and

maxIdleMeasCarriers-r15 INTEGER ::= 3 -- Maximum number of neighbouring inter-frequency carriers measured in RRC\_IDLE and RRC\_INACTIVE

One way of capturing this could be to define a rel-16 IE for E-UTRA measurements, for example:

MeasResultListIdle-r16 ::= SEQUENCE (SIZE (1..maxIdleMeasCarriers-r16)) OF MeasResultIdle-r15

VarMeasIdleReport-r16 ::= SEQUENCE {

measReportIdle-r16 MeasResultListIdle-r16,

measReportIdleNR-r16 MeasResultListIdleNR-r16 OPTIONAL

}

If such an approach is to be employed, the idle/inactive measurement procedure text has to be checked to see if any corresponding updates are necessary.

**Question 10: What are companies views regarding on how to capture the agreement from RAN2-109e in 36.331 to enable up to 8 EUTRA and 8 NR carriers to be reported for early measurements?**

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It has been agreed to support the SCell addition/modification in RRCConnectionResume, as well as be able to set the SCell state. However, it was not clear on how to capture the SCell configuration from the way it was used in the *RRCConnectionReconfiguration* as there were several extensions of the *SCellToAddModList* IEs:

SCellToAddModList-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-r10

SCellToAddModList-v10l0 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-v10l0

SCellToAddModList-v13c0 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-v13c0

SCellToAddModListExt-r13 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-r13

SCellToAddModListExt-v1370 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-v1370

SCellToAddModListExt-v13c0 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddMod-v13c0

SCellToAddModListExt-v1430 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-v1430

SCellGroupToAddModList-r15 ::= SEQUENCE (SIZE (1..maxSCellGroups-r15)) OF SCellGroupToAddMod-r15

Most of these IEs are building on top of each other, as explained in the field description:

***sCellToAddModList, sCellToAddModListExt***

Indicates the SCell to be added or modified. E-UTRAN uses field *sCellToAddModList-r10* to add or modify SCells (with *sCellIndex-r10*) for a UE that does not support carrier aggregation with more than 5 component carriers. If E-UTRAN includes *sCellToAddModListExt-v1430* it includes the same number of entries, and listed in the same order, as in *sCellToAddModListExt-r13*. If E-UTRAN includes *sCellToAddModList-v10l0* it includes the same number of entries, and listed in the same order, as in *sCellToAddModList-r10*. If E-UTRAN includes *sCellToAddModListExt-v1370* it includes the same number of entries, and listed in the same order, as in *sCellToAddModListExt-r13*. If E-UTRAN includes *sCellToAddModListExt-v13c0* it includes the same number of entries, and listed in the same order, as in *sCellToAddModListExt-r13.*

In order to enable the proper SCell addition/modification during connection resume in LTE, several of the above IEs have to be included in the *RRCConnectionResume* message or a new IE has to be introduced that includes all the relevant rel-15 SCell configuration (including the SCell state).

**Question 11: What are companies views regarding the ASN.1 signalling for SCell addition/modification in *RRCConnectionResume* message?**

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Another open issue is related to SCell dormancy (38.331):

*6.3.2 BWP-DownlinkDedicated* (*radioLinkMonitoringConfig*)

FFS: the implicit BFD-RS configuration for dormant BWP is supported or not.

This was raised in [10], and the reason cited there was:

RAN2 agreed that the *PDCCH-Config* IE will not be configured in the dormant DL BWP. So it is impossible to configure the BFD-RS for dormant BWP implicitly due to no TCI state configuration for PDCCH.

**Question 12: Which option is preferred regarding implicit configuration of BFD-RS for dormant BWP:**

1. ***Do not support the implicit configuration of BFD-RS for an SCell in dormancy.***
2. ***Revise the prior agreement so that the PDCCH-config IE can be configured for the dormant BWP in order to support the implicit BFD-RS configuration for dormant BWP***
   1. ***Only tci-StatesPDCCH-ToAddList is applied for the dormant BWP and other configurations in PDCCH-config are ignored (not applied).***
   2. ***No search space is configured in PDCCH-Config of dormant BWP, so that the UE does not monitor PDCCH in dormant BWP but can apply tci-StatesPDCCH-ToAddList included in ControlResourceSet.***
3. ***If MAC-CE is used to activate TCI of PDCCH in the associated non-dormant BWP (i.e. firstWithinActiveTimeBWP-Id configured in RRC), UE will use such TCI state to perform BFD in the dormant BWP*.**

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| **Company** | **Preferred option** | **Comments** |
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# Other issues

Besides the issues discussed in previous sections, companies are invited to list other open issues related to the DCCA RRC CRs (including the additional aspects/agreements captured in the updated CRs).

**Question 13: Any other open issues related to the DCCA RRC CRs?**

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| **Company** | **Comments** |
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# Summary

# References

1. R2-2002392, CR for 38.331 for CA\_DC\_enhancements, Ericsson (Rapporteur), RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
2. R2-2002391, CR for 36.331 for CA\_DC\_enhancements, Ericsson (Rapporteur), RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
3. R2-2001252**,** Report on Email Discussion [108#54][DCCA] Early measurements Ericsson, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
4. R2-2002131, Report on offline discussion [AT109e][045][DCCA] Early measurement reporting – Phase 1, Ericsson, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
5. R2-2002289, Report on Email Discussion [108#54][DCCA] Early measurements – part 2, Ericsson, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
6. R2-2001251, Granular reporting of early measurement results, Ericsson, MediaTek Inc., ZTE Corporation, LG Electronics Inc., RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
7. R2-2000298,Granularity of early measurement and reporting, vivo, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
8. R2-2001124, Early measurement indication in NR SIB1, ZTE Corporation, Sanechips, Ericsson, MediaTek Inc, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
9. R2-2000252, Remaining issues for SSB measurement configuration, CATT, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
10. R2-2002224, Email discussion [AT109e#46][DCCA] Scell Dormancy Open Issues, OPPO, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020