**3GPP TSG-RAN WG4 Meeting #104-e R4-22xxxx**

**Electronic Meeting, Aug 15-26, 2022**

**Agenda item:** 9.10.3

**Source:** Moderator (China Telecom)

**Title:** Email discussion summary for [104-e][321] NR\_perf\_enh2\_Demod

**Document for:** Information

# Introduction

This email thread discusses the Rel-17 further demodulation performance enhancement WI in agenda 9.10.

List of candidate target of email discussion for 1st round and 2nd round:

* 1st round:
	+ Invite companies to provide comments and responses in section 1.3 and 2.3 before 17:00 UTC Thursday (18th Aug).
	+ Invite companies to update simulation results in the summary spreadsheets before 17:00 UTC Wednesday (17th Aug).
* 2nd round: there will be 3 sub-threads
	+ 1 sub-thread on ‘[104-e][321] NR\_perf\_enh2\_Demod - LS’ (led by QC)

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| R4-22xxxxx, QC | LS on CRS-IM network assistance signalling |

* + 1 sub-thread on ‘[104-e][321] NR\_perf\_enh2\_Demod - Simulation results and CRs for MMSE-IRC receiver’ (led by HW)

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| --- | --- |
| R4-2213785, Huawei | Summary of simulation results for intra cell inter user MMSE receiver requirements |
| R4-2213786, Huawei | Summary of simulation results for inter cell interference MMSE-IRC receiver requirements |
| R4-2212751, Ericsson | Summary of simulation results for Inter-cell MMSE-IRC CQI reporting |
| R4-22xxxx, Huawei, HiSilicon | CR for introduction release independence for MMSE-IRC receiver requirements |
| Revision of R4-2211864, Apple | Draft CR on PDSCH demod requirements in ICI-FDD |
| Revision of R4-2212102, Nokia | draftCR for 38\_101-4 Interference model for enhanced performance requirements |
| Revision of R4-2212292, CMCC | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC |
| Revision of R4-2213912, MediaTek, Ericsson | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver |
| Revision of R4-2211786, China Telecom | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC |
| Revision of R4-2213788, Huawei, HiSilicon | CR: Addtion requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX |

* + 1 sub-thread on ‘[104-e][321] NR\_perf\_enh2\_Demod - Simulation results and CRs for CRS-IM’ (led by China Telecom)

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| R4-2211779, China Telecom | Summary of CRS-IM simulation results (15 kHz SCS FDD and TDD) |
| R4-2212297, CMCC | Simulation results collection for 30kHz SCS CRS-IM |
| Revision of R4-2211785, China Telecom | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario |
| Revision of R4-2212104, Nokia | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability |
| Revision of R4-2212295, CMCC | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS |
| Revision of R4-2212296, CMCC | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 |
| Revision of R4-2212557, Ericsson | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD |
| Revision of R4-2213989, HW | draftCR: Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 |

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

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| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Nokia, Nokia Shanghai Bell | Karsten Petersen | Karsten.petersen@nokia-bell-labs.com |
| Apple | Manasa Raghavan | Manasa.raghavan@apple.com |
| China Telecom | Shan YANG | yangshan@chinatelecom.cn |
| Qualcomm | Gaurav Nigam | gnigam@qti.qualcomm.com |
| Ericsson | Jiakai Shi | Jiakai.shi@ericsson.com |
| MediaTek | Licheng Lin | licheng.lin@mediatek.com |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: MMSE-IRC receiver for inter-cell and intra-cell inter-user interference

## Companies’ contributions summary

|  |  |  |
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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211789 | China Telecom | Proposal 1: Assume PDCCH transmission from interference cells, and for each cell, OCNG signal is transmitted on each RE that is not occupied by the PDCCH of this cell.Observation 1: According to all companies’ simulation results summarized in [3], the averaged T-put gain is at least 2.11 for 2Rx, and 2.53 for 4Rx.Proposal 2: T-put gain requirement of 2.0 for 2Rx and 2.5 for 4Rx.Observation 2: In NR Rel-15 SNR requirement derivation, the SPAN of the ideal results was kept within 2dB and the same rule is reused for BS PUSCH 256QAM requirement definition.Proposal 3: Keep the SPAN of the ideal results within 2.0dB for both inter-cell and intra-cell inter-user requirements. |
| R4-2211863 | Apple Inc. | Proposal #1: For interference modelling in PDCCH assume PDCCH transmission from interference cells, with OCNG on unoccupied Res.Proposal #2: Set the TP gain requirement for CQI reporting in ICI as 1.8 for 2RX and 1.9 for 4RX considering impairment margin. |
| R4-2211864 | Apple Inc. | Draft CR on PDSCH demod requirements in ICI-FDD |
| R4-2212100 | Nokia, Nokia Shanghai Bell | Interference model for scenario 1, PDSCH demodulationProposal 1: Use option 1 which is to reuse LTE PDSCH IRC test approach of filling unused RE’s in control region with QPSK randomly modulated symbols with random precoding. T-put ratio for 2 Rx, CQI reportingProposal 2: Use TP ratio (γ) value of 2 (Option 1) for 2 Rx CQI reporting requirementsT-put ratio for 4 Rx, CQI reportingProposal 3: Use TP ratio (γ) value of 2 (Option 2) for 4 Rx CQI reporting requirements |
| R4-2212101 | Nokia, Nokia Shanghai Bell | Simulation Results on PDSCH demodulation and CQI requirements for inter-cell interference MMSE-IRC |
| R4-2212102 | Nokia, Nokia Shanghai Bell | draftCR for 38\_101-4 Interference model for enhanced performance requirements |
| R4-2212291 | CMCC | Proposal 1: All the Res in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports. |
| R4-2212292 | CMCC | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC |
| R4-2212747 | Ericsson | Proposal 1: RAN4 to assume PDCCH transmission overlapping with interference cells with the following configuration. All the Res in the control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports.Proposal 2: RAN4 to use 2.5dB span to derive the results.Proposal 3: RAN4 to define CQI reporting test metric with γ=2 for 2Rx.Proposal 4: RAN4 to define CQI reporting test metric with γ=2 for 4Rx. |
| R4-2212748 | Ericsson | Simulation results on PDSCH performance for inter-cell interference |
| R4-2212749 | Ericsson | Simulation results on CSI reporting for inter-cell interference |
| R4-2212751 | Ericsson | Summary of simulation results for Inter-cell MMSE-IRC CQI reporting |
| R4-2213782 | Huawei | Proposal 1: Use Table 2-1 as PDCCH configurations. I.e. Option 3Proposal 2: RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes X dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within X dB. X=2.5 |
| R4-2213783 | Huawei | Simulation results on CQI requirements for MMSE-IRC receiver with inter cell interference |
| R4-2213784 | Huawei | Proposal 1: Set TP gain to 2 for 2RXProposal 2: Set TP gain 2 for 4RX |
| R4-2213786 | Huawei | Summary of simulation results for inter cell interference MMSE-IRC receiver requirements |
| R4-2213907 | MediaTek inc. | Proposal 1: Prefer Option 1 and Option 2, assuming overlapping PDCCH among serving cell and interference cell.Proposal 2: Define CQI reporting test metric with γ=2 for both 2Rx and 4Rx. |
| R4-2213912 | MediaTek inc | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver |
| R4-2214068 | Qualcomm Incorporated | Proposal 1: Use throughput ratio of 2.0 for both 2Rx and 4Rx. |
| R4-2211786 | China Telecom | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC |
| R4-2211865 | Apple | Simulation results for PDSCH requirements in MU-MIMO scenarios |
| R4-2212750 | Ericsson | Simulation results on PDSCH performance for intra-cell inter-user interference |
| R4-2213785 | Huawei, HiSilicon | Summary of simulation results for intra cell inter user MMSE receiver requirements |
| R4-2213787 | Huawei, HiSilicon | BigCR for IRC for intra cell inter user MMSE receiver requirements |
| R4-2213788 | Huawei, HiSilicon | CR: houldz requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX |

## Open issues

### Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRC

**Issue 1-1: Interference modelling in PDCCH region**

* *Status in RAN#103-e in the WF R4-2210681:*
	+ *Option 1: All the Res in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports.*
	+ *Option 2: Assume PDCCH transmission from interference cells, and for each cell, OCNG signal is transmitted on each RE that is not occupied by the PDCCH of this cell.*
	+ *Option 3: Assume PDCCH transmission from interference cells which is non-overlapping with serving cell.*
* Proposals
	+ Option A: Assume PDCCH is interfered by the neighbor cell interference (China Telecom, Apple, Nokia, CMCC, Ericsson, MTK)
		- Option A1: All the REs in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports (Nokia, CMCC slightly preferred, Ericsson, MTK)
* Nokia, CMCC: option 1 is easiest, while option 2 will require companies to reach an agreement on defining the PDCCH parameters
	+ - Option A2: Assume PDCCH transmission from interference cells, and for each cell, OCNG signal is transmitted on each RE that is not occupied by the PDCCH of this cell (China Telecom, Apple, MTK)
	+ Option B: Assume PDCCH transmission from interference cells which is non-overlapping with serving cell. (Huawei)
* Recommended WF
	+ Can we follow majority companies’ view and agree option A to reflect the practical scenario?
	+ Use option A1 supported by more companies?

GTW discussion on Aug 16

* Proposals
	+ Option A: Assume PDCCH is interfered by the neighbor cell interference (China Telecom, Apple, Nokia, CMCC, Ericsson, MTK, NTT DOCOMO)
		- Option A1: All the REs in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports (Nokia, CMCC slightly preferred, Ericsson, MTK, NTT DOCOMO)
			* Nokia, CMCC: option 1 is easiest, while option 2 will require companies to reach an agreement on defining the PDCCH parameters
		- Option A2: Assume PDCCH transmission from interference cells, and for each cell, OCNG signal is transmitted on each RE that is not occupied by the PDCCH of this cell (China Telecom, Apple – slightly preferred, MTK)
	+ Option B: Assume PDCCH transmission from interference cells which is non-overlapping with serving cell. (Huawei)
* Discussion:
	+ Apple: We prefer A2, we can reuse same configuration from serving cell for interference. We are fine with A1 as well since no difference from UE performance aspect.
	+ Huawei: We can compromise to A1 to simplify the test.
	+ CMCC: How to reflect option A1 into specification, similar way as LTE?
	+ Nokia: We can reuse the same way as LTE.
* Agreement: Option A1 agreed. “All the Res in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports”

### Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRC

**Issue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting**

* *Status in RAN#103-e in the WF R4-2210681:*
	+ *For 2Rx:*
		- *Option 1: 2*
		- *Option 2: 1.5*
	+ *For 4Rx:*
		- *Option 1: 2.5*
		- *Option 2: 2*
		- *Option 3: 1.5*
* Proposals
	+ For 2Rx:
		- Option 1: 2.0 (CTC, Nokia, Ericsson, Huawei, MTK, Qualcomm)
		- Option 2: 1.8 (Apple)
	+ For 4Rx:
		- Option 1: 2.5 (CTC)
		- Option 2: 2.0 (Nokia, Ericsson, Huawei, MTK, Qualcomm)
		- Option 3: 1.9 (Apple)
	+ CTC: the averaged T-put gain is at least 2.11 for 2Rx, and 2.53 for 4Rx.
	+ Apple: From the simulation results setting the TP gain as requirement a 2.0 for 2RX and 2.2 for 4RX seems suitable. Taking into account impairment and implementation margin.
* Recommended WF
	+ Can we agree 2.0 for both 2Rx and 4Rx based on the majorities’ view?

GTW discussion on Aug 16

* + Apple: Based on the simulation results and considering the extra implementation margin, we proposed option 2 (1.8) for 2Rx and option 3(1.9) for 4Rx.
	+ Ericsson: We will provide the summary on results and we can further check based on the collected results
* Discussion after GTW on Aug 16
	+ E/// summarized the updated simulation results as below

|  |
| --- |
| Alignment Results |
| **Duplex mode** | **Antenna config** | **SINR (dB)** | **TP ratio** | **Average TP ratio** | **TP ratio Span** |
|
| Apple | Ericsson | Huawei | Intel | MTK | Nokia | Qualcomm |   |   |
| FDD | 2T2R | -2 | 2 | 2.8 | 3.0 | 2.9 | 2.7 | 3.1 | 2.0 | 2.63 | 1.07 |
| 2T4R | -2 | 2.3 | 2.6 | 2.6 | 3.0 | 2.7 | 2.9 | 2.0 | 2.60 | 1.02 |
| TDD | 2T2R | -2 | 2.1 | 2.5 | 2.7 | 2.9 | 2.81 | 2.2 | 2.19 | 2.48 | 0.84 |
| 2T4R | -2 | 2.2 | 2.4 |   | 3.1 | 2.56 | 2.1 | 2.23 | 2.42 | 1.06 |

* + Based on the updated simulation result summary, moderator would like to check again if TP gain of 2.0 for both 2Rx and 4Rx would be acceptable.

### Sub-topic 1-3: SNR test requirement

**Issue 1-3: SNR deriving rule**

* *Status in RAN#103-e in the WF R4-2210681:*
	+ *RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes X dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within X dB.*
		- *Option 1: X = 2dB*
		- *Option 2: X = 2.5dB*
* Proposals
	+ Option 1: X = 2.0 dB (China Telecom)
	+ Option 2: X=2.5dB (Ericsson, Huawei)
		- E///: Based on current simulation results, the span for inter-cell and intra-cell inter-user cases is mostly larger than 3dB. The best span cases are still larger than 2dB.
* Recommended WF
	+ Companies are encouraged to add the updated results in the summary spreadsheets before 17:00 UTC Wednesday (17th Aug).
	+ Further discuss the option 1 and option 2.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments collection** |
|  | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionSub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingSub-topic 1-3: SNR test pointIssue 1-3: SNR deriving rule |
|  | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionSub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingSub-topic 1-3: SNR test pointIssue 1-3: SNR deriving rule |
| Ericsson | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionOption A1From our understanding, PDCCH performance is very robust to inter-cell interference and there is no PDCCH impact on PDSCH performance. It is also impractical to expect non-overlapping PDCCH between serving cell and interference cells.Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingWe agree with the recommended WF to use 2 for both 2Rx and 4Rx.The gain aligns with our simulation.Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleOption 2 based on current simulation results. We’re fine with option 1 if the bias among companies’ results are small. |
| Nokia, Nokia Shanghai Bell | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionWe are ok with the recommended way forward (Option A1) as we see this to be the most practical in the given time frame.Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingWe are ok with the recommended way forward to use 2.0 for both 2Rx and 4Rx |
| Apple | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionOption A would be more realistic in our understanding. In real deployment in ICI conditions UE would see interference in PDCCH region as well and would be unrealistic to assume that PDCCH is interference free. Between option A1, A2 there will be no difference or impact to performance, but just a matter of configuration. Since we specify configuration for serving cell PDCCH, we can use the same for interfering cells as well without needing any further discussion or update. We think that would be the most straight forward approach. We don’t think it would be difficult to either specify this or TE vendors to implement it. Hence slight preference for option A2. Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingWe prefer Option 2 for 2RX and Option 3 for 4Rx based on our results and to account for some implementation margin. Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleFrom last meetings results summary the span was > 2dB for most test cases. We prefer to discuss after the simulation results summary this meeting is updated. |
| Docomo | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionOur preference is Option A1, but also Option A2 is fine for us.We don’t think it would be practical to assume fully non-overlapped PDCCH among cells in actual network. |
| CMCC | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionWe slightly prefer Option A1, while Option A2 is also fine for us.Based on our observation, PDCCH is robust enough even under interference scenario. Therefore, we prefer to use non-overlapped PDCCH, which is more typical in the network.  |
| Discussion after GTW |
|  | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH region*No further discussion.*Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting* + Based on the updated simulation result summary from E///, whether the TP gain of 2.0 for both 2Rx and 4Rx would be acceptable?

Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving rule |
| Qualcomm | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH region*No further discussion.*Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting* + Based on the updated simulation result summary from E///, whether the TP gain of 2.0 for both 2Rx and 4Rx would be acceptable?

Slightly prefer 1.9 since some of our tput gains are very close to 2.0.Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving rulePrefer Option 2 (X = 2.5dB), same as other tests in the past. |
| Apple2 | Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting* + Based on the updated simulation result summary from E///, whether the TP gain of 2.0 for both 2Rx and 4Rx would be acceptable?

Based on the results we propose 1.9 for 2RX and 2.0 for 4RX, or 1.9 for both 2RX and 4RX is also fine.Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleWe propose to use X=2.5 dB. In the past we have considered additional margin if span is results |
| China Telecom | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH regionWe would like to answer to CMCC on ‘how to reflect option A1 into specification, similar way as LTE’Yes, we can capture the agreement in the interference modeling annex and no need to explicitly specify PDCCH configurations for each cell.Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingBased on the simulation results summarized by Ericsson, we think 2.0 would be fair enough for all companies. Never had we ever considered an additional margin to the TP ratio in the previous releases in our understanding (including Rel-15/16 PMI and Rel-16 CA CQI)Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleOur purpose of proposing the legacy 2.0 dB SPAN is just to have more accurate SNR requirements.Based on our observation, for MMSE-IRC for MU-MIMO, we will have to remove 11 simulation results to control the SPAN for the ideal results within 2.0. Considering this, we are also fine to use 2.5 dB. |
| Huawei | Sub-topic 1-1: PDSCH demod for inter-cell interference MMSE-IRCIssue 1-1: Interference modelling in PDCCH region*No further discussion.*Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting* + Based on the updated simulation result summary from E///, whether the TP gain of 2.0 for both 2Rx and 4Rx would be acceptable?

Both 1.9 and 2 are OK for us.Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleWe support 2.5dB which is aligned with legacy procedure. |
| MediaTek | Sub-topic 1-2: CQI reporting for inter-cell interference MMSE-IRCIssue 1-2: T-put gain requirement for MMSE-IRC based CQI reportingEither 1.9 or 2.0 is OK to us.Sub-topic 1-3: SNR test pointIssue 1-3: SNR deriving ruleWe prefer Option 2, X = 2.5dB. |

### Draft CR comments collection

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| --- | --- | --- |
| **tdoc number** | **Title/Content** | **Comment collection** |
| R4-2211864, Apple | Draft CR on PDSCH demod requirements in ICI-FDD | Company A: |
| Ericsson: The CR should be postponed till RAN4 achieves the SNR values |
| Apple: We will update the CR based on conclusion of Issue 1-1 and tentative SNR requirements. If PDCCH interference model is captured in B.6.2, then we can delete the PDCCH config rows. |
| CTC: 1) Remove the PDCCH configuration in the test parameter. 2) The [] for the reference channel can be removed.  |
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| R4-2212102, Nokia | draftCR for 38\_101-4 Interference model for enhanced performance requirements | Ericsson: Is the “unallocated REs” term used in the draft same as “unused RE”? If yes, it’s better to align the terminology. Also clarify that Control Region is the (CORESET). With “applied to QPSK randomly modulated symbols” does it mean “Uncorrelated pseudo random QPSK modulated data”? For the number of antenna ports in the requirement scenario is it still Single Tx port transmission? |
| Apple: For the wording corresponding to Option A1, we think unallocated REs can be removed, as we don’t think there is any other transmission but PDCCH in control region. Suggested wording for option A1:For Res in the control region, random precoding for the number of TX antenna ports as in the requirement scenario shall be applied to QPSK randomly modulated symbols. |
| Nokia: We thank for Ericsson and Apple for their comments. We will provide an updated version with the following changes:1. Changed unallocated REs to “For REs in control region”
2. Clarified that random precoding is for the number of ‘Tx’ antenna ports as in the requirements section.
3. Added information EPRE ratio for the control region REs in line with LTE definition

@Ericsson – We prefer to not explicitly define pseudo random QPSK modulated data and leave the random implementation to Test vendors. This is in line with LTE definition from 36.211. |
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| R4-2212292, CMCC | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC | Ericsson: We need to differentiate which cell is interfering cell and serving cell in Tables 5.2.2.2.16-2 and 5.2.3.2.16-2. To add the SNR values to the tables when agreed. |
| Qualcomm: We also need to add a note that BW/SCS, antenna configuration will be same for all cells. Propagation condition is same for all cells but independently generated. |
| CTC: A note is needed for the reference of ‘INR’. |
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| R4-2213912, MediaTek, Ericsson | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver | CTC: The interference modeling and the INR definition has been implemented in the annex. Please remove the [] and use the final clause number. |
| MediaTek: Thanks for the comment. We will provide a revision for second round review.  |
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| R4-2211786, China Telecom | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC | Ericsson: The format of the definition for the test parameters in the tables are not aligned with 38.101-4, see for example Table 5.2-1 in 38.101-4, but no strong opinion. SNR values need to be added in all tables when agreed. |
| Apple: Annex B.4.2 doesn’t exist in spec and no CR to introduce it either. Same for the reference channels for Rank 2. |
| Qualcomm: We need to add a note that DMRS scrambling sequence is same for both Ues. Also, SNR definition needs to be clarified in Clause 4.4.2 as agreed in previous meetings emphasizing that signal power is the total signal power across Ues. |
| CTC: Thanks for the comments. To Apple: the [] for B.4.2 will be kept until the beamforming model is implemented in the TS.To Quclcomm & E///: The missing parameters will be added in the second round review. |
| R4-2213788, Huawei, HiSilicon | CR: houldz requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX | Apple: These sub-clauses don’t exist in spec. Hence they should all be introduced with revision marks/ track changes. |
| Qualcomm: We need to add a note that DMRS scrambling sequence is same for both Ues. Also, SNR definition needs to be clarified in Clause 4.4.2 as agreed in previous meetings emphasizing that signal power is the total signal power across Ues. |
| CTC: This should be a draft CR for endorsement only and all the changes will be captured in R4-2213787. Missing of change marks. |
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## Summary for 1st round

### Open issues

**Issue 1-1: Interference modelling in PDCCH region**

GTW Agreement:

“All the REs in control region filled with QPSK randomly modulated symbols with random precoding for the number of antenna ports”

*Recommendations for 2nd round:*

* + Capture the agreement in CR.

**Issue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting**

*Candidate options:*

* + For 2Rx:
		- Option 1: 2.0 (CTC, Nokia, Ericsson, Huawei, MTK, Qualcomm)
		- Option 2: 1.8 (Apple)
		- Option 3: 1.9 (QC slightly prefer, Apple, Huawei, MTK)
	+ For 4Rx:
		- Option 1: 2.5 (CTC)
		- Option 2: 2.0 (Nokia, Ericsson, Huawei, MTK, Qualcomm, Apple, CTC as compromise)
		- Option 3: 1.9 (Apple, QC slightly prefer, Huawei, MTK)

*Recommendations for 2nd round:*

* + To move forward, can we agree 1.9 for 2Rx and 2.0 for 4Rx?
	+ Capture the values in CR.

**Issue 1-3: SNR deriving rule**

*Tentative agreements:*

* + RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes 2.5 dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within 2.5 dB.

### Draft CRs

|  |  |  |
| --- | --- | --- |
| **tdoc number** | **Title/Content** | **CRs/TPs Status update recommendation**  |
| R4-2211864, Apple | Draft CR on PDSCH demod requirements in ICI-FDD | *To be revised.* |
| R4-2212102, Nokia | draftCR for 38\_101-4 Interference model for enhanced performance requirements | *To be revised.* |
| R4-2212292, CMCC | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC | *To be revised.* |
| R4-2213912, MediaTek, Ericsson | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver | *To be revised.* |
| R4-2211786, China Telecom | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC | *To be revised.* |
| R4-2213788, Huawei, HiSilicon | CR: Addtion requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX | *To be revised.* |

## Discussion on 2nd round

### Open issue

**Issue 1-2: T-put gain requirement for MMSE-IRC based CQI reporting**

*Candidate options:*

* + For 2Rx:
		- Option 1: 2.0 (CTC, Nokia, Ericsson, Huawei, MTK, Qualcomm)
		- Option 2: 1.8 (Apple)
		- Option 3: 1.9 (QC slightly prefer, Apple, Huawei, MTK)
	+ For 4Rx:
		- Option 1: 2.5 (CTC)
		- Option 2: 2.0 (Nokia, Ericsson, Huawei, MTK, Qualcomm, Apple, CTC as compromise)
		- Option 3: 1.9 (Apple, QC slightly prefer, Huawei, MTK)

*Recommendations for 2nd round:*

* + To move forward, can we agree 1.9 for 2Rx and 2.0 for 4Rx?
	+ Capture the values in CR.

|  |  |
| --- | --- |
| **Company** | **Comment collection** |
|  Apple |  Option 2 or Option 3 are fine with us for both 2RX and 4RX. |
| Qualcomm | We slightly prefer Option 3 for both 2Rx and 4Rx. |
| MediaTek | We are fine with option2 or option 3 for both 2Rx and 4Rx. |
| Huawei | We prefer option 3 but no strong views |
| Nokia, Nokia Shanghai Bell | We can compromise to option 3 for 2Rx.We prefer option 2 for 4Rx but can also compromise to option 3 for 4Rx. |
| China Telecom | We can compromise to the moderator’s recommendation for 1.9 for 2Rx and 2.0 for 4Rx. |
| Ericsson | We can compromise to 1.9 for 2Rx and 2.0 for 4Rx. |

GTW Agreement: 1.9 for 2Rx and 2.0 for 4Rx

### Simulation results and CRs

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Title** | **Comment collection** |
| R4-2213785, Huawei | Summary of simulation results for intra cell inter user MMSE receiver requirements |  Apple: Could Ericsson please check their impairment results. Some results are lower than or close to alignment results. Ericsson: Thanks. We have already updated our results. |
| R4-2213786, Huawei | Summary of simulation results for inter cell interference MMSE-IRC receiver requirements | Qualcomm: We request Ericsson to provide their impairment results.Ericsson: Thanks. We have already added our results. |
| R4-2212751, Ericsson | Summary of simulation results for Inter-cell MMSE-IRC CQI reporting |  |
| R4-22xxxx, Huawei, HiSilicon | CR for introduction release independence for MMSE-IRC receiver requirements |  |
| Revision of R4-2211864, Apple | Draft CR on PDSCH demod requirements in ICI-FDD | Qualcomm: Suggest to modify Note 2 as: “Bandwidth/ Sub carrier spacing,Propagation condition, Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.” |
| Revision of R4-2212102, Nokia | draftCR for 38\_101-4 Interference model for enhanced performance requirements | Qualcomm: Minor correction: It should be “shall” in “The EPRE ratio of these REsshal be” |
| Revision of R4-2212292, CMCC | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC | Qualcomm: Suggest to modify Note 2 as: “Bandwidth/ Sub carrier spacing,Propagation condition, Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.”Qualcomm2: Please also update the Note2 as above for 4Rx requirements in Table 5.2.3.2.16-3. |
| Revision of R4-2213912, MediaTek, Ericsson | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver | Apple: Capture requirements in “[]” based on latest summary. Qualcomm: Prefer to keep Huawei’s change for Clause 4.4 in revised R4-2213788. Please correct “co-scheduled” in “DMRS scrambling ID is the same for both target and co-shceduled UEs”CTC: Thanks for the comments, will be revised in the final version, and our changes in clause 4 for will be removed, |
| Revision of R4-2211786, China Telecom | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC |  |
| Revision of R4-2213788, Huawei, HiSilicon | CR: Addtion requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX | Apple: In parameters for co-scheduled UE precoder - typo should be precodermatrix. Section number and table number are not consistent. For FDD 5.2.2.1.16 is used for section, but tables are 5.2.2.1.X-[1-3]. For TDD 5.2.2.2.17 is used for section, but tables are 5.2.2.3.Y-[1-3]. Suggest to capture requirement in “[ ]” since its first time we are introducing these requirements. Signal power clarification is also in Revision of R4-2211786, dont see the necessity in this CR.Qualcomm: X and Y in table numbers should be replaced with 16 and 17. Note for DMRS scrambling sequence is missing in TDD Test Parameters table. Prefer to keep requirements in [].Qualcomm2: Please update the requirements based on latest simulation results summary. It should be 18dB and 18.9dB for FDD and TDD. |

# Topic #2: CRS-IM in scenarios with overlapping spectrum for LTE and NR

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211779 | China Telecom | Summary of CRS-IM simulation results (15 kHz SCS FDD and TDD) |
| R4-2211784 | China Telecom | Proposal 1: Use same requirement for the two sets of test setup in scenario 2 for 15kHz SCS.Proposal 2: For Ues declare to support CRS-IM both with and without NWA on a certain each SCS, at least the performance requirements without NWA signaling based test setup should be passed.Proposal 3: Keep the CRS-IM requirements for TDD scenario 2 with 15kHz SCS and 30kHz SCS in the same clause in TS38.101-4.Proposal 4: For this meeting, make decision on the SNR requirement values for CRS-IM with the following rule:RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes 2.0 dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within 2.0 dB. |
| R4-2211785 | China Telecom | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario |
| R4-2211866 | Apple Inc. | Observation #1: For the weaker LTE cell, in the presence of interference from other LTE cell, for 99.99% successful decoding 6 samples are needed for 2x2 and 5 samples are needed for 4x2. Proposal #1: Set period 2 for PBCH decoding as at least 800ms.Proposal #2: Set initial period for LTE parameter acquisition as at least 4.64 s. |
| R4-2212103 | Nokia, Nokia Shanghai Bell | Test ApplicabilityObservation 1: The requirements are intended to test the UE Demodulation performance of CRS-IM and not the UE capability of detecting the CBW.Proposal 1: If a UE supports both without NWA and NWA based CRS-IM for 15kHz SCS, the UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#3.Proposal 2: If a UE supports both without NWA and NWA based CRS-IM for 30kHz SCS, the UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#5.Suggestions for Corrections to Draft Big CRObservation 2: The current headline numbering might result in wrong references when the Big CR is adapted to the specification as there are several headlines with the same number. MCC is recommending the .X1, .X2, etc. notation.Proposal 3: Change headline numbering to include a number after the x (i.e. 5.2.2.1.x1, 5.2.2.1.x2, etc.) to secure all references are correctly implemented.Observation 3: The same headline is used for 15kHz and 30kHz SCS under the same sub section number.Proposal 4: If possible, merge the 15kHz and 30kHz sections which currently have the same section number.Observation 4: The current form of the draft Big CR headlines makes it not easy to read, as the surrounding structure is not included.Proposal 5: For easier read, include surrounding headlines in the draft Big CR to more clearly visualise the added structure. Example:Observation 5: The test numbering for 15kHz and 30kHz does not have the same sequence of with and without NWA (for 15kHz “Test 1-1” is with NWA whereas for 30kHz “Test 1-1” is without NWA).Proposal 6: Align the tests so “Test 1-x” is without NWA and “Test 2-x” is with NWA. |
| R4-2212104 | Nokia, Nokia Shanghai Bell | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario – General and applicability |
| R4-2212293 | CMCC | Proposal 1: Set the extra time period length to 4.34s.Proposal 2: If a UE supports both without NWA and NWA based CRS-IM, UE is only required to pass performance requirements without NWA signalling based test setup.Proposal 3: Specify single set of requirements for two sets with NWA and only inter-RAT MO configured. |
| R4-2212294 | CMCC | Simulation results for CRS-IM 30kHz SCS |
| R4-2212295 | CMCC | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS |
| R4-2212296 | CMCC | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 |
| R4-2212297 | CMCC | Simulation results collection for 30kHz SCS CRS-IM |
| R4-2212555 | Ericsson | Proposal 1: Consider Option 1 as the way of calculation for the time period length before PDSCH scheduling with period 1 as 7680ms (2 interference cells) and period 2 as 500msProposal 2: Specify the PDSCH scheduling delay in TS38.101-4Proposal 3: Option 1 for both 15kHz SCS and 30kHz SCS scenarios. |
| R4-2212556 | Ericsson | Simulation results for CRS-IM |
| R4-2212557 | Ericsson | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD |
| R4-2212562 | ZTE Corporation | Proposal 1: The time period length before PDSCH scheduling is set to 4.34s which include 3840ms and 500ms.Proposal 2: UE capability #2 and capability# 4 to be tested if UE support both capability #2 and #3, capability #4 and #5. |
| R4-2213779 | Huawei, HiSilicon | Proposal 1: Confirm option 1 as time period before PDSCH scheduling for both 15kHz and 30kHz SCS.Proposal 2: Configure gap offset to 7 for FDD and 0 for TDD to make LTE’s PBCH in middle of measurement gap.Proposal 3: If a UE supports both without NWA and NWA based CRS-IM for 15kHz SCS (i.e., UE Capability #2 and #3), UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#3.Proposal 4: If a UE supports both without NWA and NWA based CRS-IM for 30kHz SCS (i.e., UE Capability #4 and #5), UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#5.Proposal 5: Invite companies to give some feedback how to solve the problem that if default assumptions is invalid and UE doesn’t know that, UE will perform CRS-IM with wrong assumptions and system performance degradation will be observed. |
| R4-2213780 | Huawei, HiSilicon | Withdrawn |
| R4-2213781 | Huawei, HiSilicon | Simulation results for CRS-IM receiver |
| R4-2213989 | Huawei, HiSilicon | draftCR:Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 |
| R4-2213990 | Qualcomm Incorporated | Proposal 1: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.Proposal 2: Although Cell Id is optional to be indicated in network assistance signaling, if network decides to indicate other parameters in network assistance information, it should also indicate the Cell Id so that the UE can distinguish which cell that information belongs to.Proposal 3: Specify single set of requirements for two sets with NWA and only inter-RAT MO configured. |
| R4-2214050 | Qualcomm Incorporated | Simulation results for CRS Interference Mitigation in NR |

## Open issues summary

### Sub-topic 2-1: CRS-IM test in scenario 2

**Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2**

* *Status in RAN#103-e in the WF R4-2210659*
	+ *RAN4 target to specify single set of requirements for two sets with NWA and only inter-RAT MO configured pending on the performance with power detection method.*
* Proposals:
	+ Option 1: Same requirement applies for the two sets of test setup (i.e., with NWA and with only inter-RAT MO configured) in scenario 2. (China Telecom, CMCC, QC)
* Recommended WF
	+ Option 1 can be agreeable.

GTW discussion on Aug 16

* Proposals:
	+ Option 1: Same requirement applies for the two sets of test setup (i.e., with NWA and with only inter-RAT MO configured) in scenario 2. (China Telecom, CMCC, QC, E///, Nokia, ZTE, Apple)
* Agreement: Option 1 agreed

**Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2**

* *Status in RAN#103-e in the WF R4-2210659*
	+ *Schedule NR PDSCH and measure the throughput after a certain time period*
	+ *Use following for time period configuration before PDSCH scheduling and inter-RAT MO configuration:*
		- *Use Measurement gap 0 (MGL=6ms, MGRP=40ms) in Table 9.1.2-1 of TS 38.133 and configure the measurement gap overlap with LTE PBCH*
	+ *For time period length before PDSCH scheduling*
* *Option 1:*
* *The time period length before PDSCH scheduling is set to 4.34s including two periods:*
	+ - *Period 1: TIdentify, E-UTRAN FDD for FDD and TIdentify, E-UTRAN TDD for TDD defined in clause 9.4.2.2 of TS 38.133.*
		- *Period 2: PBCH decoding time which is set to 500ms.*
		- *Where*
		- *TIdentify, E-UTRAN FDD*
		- *No DRX is assumed*
		- *TIdentify, E-UTRAN FDD= TBasicIdentify(480ms)\*480/TInter1(60ms)\*CSSFinterRAT (1)=3840ms*
* *Where*
* *TIdentify, E-UTRAN TDD*
	+ - *No DRX is used*
		- *Configuration 0 in Table 9.4.3.2-1 of TS 38.133*
		- *TIdentify, E-UTRAN TDD= TBasicIdentify(480ms)\*480/TInter1(60ms)\*CSSFinterRAT (1)=3840ms*
* *Other options are not precluded*
* **Proposals on the Measurement Gap offset:**
	+ Proposal 1: For 15 kHz SCS, configure gap offset to 7 for FDD and 0 for TDD to make LTE’s PBCH in middle of measurement gap. (Huawei)



**Figure: Measurement gap pattern for 15 kHz FDD**



**Figure: Measurement gap pattern for 15 kHz TDD**

* **Proposals on the time period length before PDSCH scheduling**
	+ Proposals on Period 1 for cell identification
		- Option 1: 3840ms (CMCC, ZTE, Huawei, Apple)
		- Option 2: 2 x 3840ms = 7680ms (Ericsson)
			* E///: Considering 2 interference cells, parameter CSSFinterRAT should be as 2
	+ Proposals on Period 2 for PBCH decoding
		- Option 1: 500 ms (CMCC, ZTE, Huawei, Ericsson)
		- Option 2: 800 ms (Apple)
			* Apple: For the weaker LTE cell, in the presence of interference from other LTE cell, for 99.99% successful decoding 6 samples are needed for 2x2 and 5 samples are needed for 4x2. Considering implementation margin, we think 8 coherence times are necessary for successful PBCH decoding on both LTE cells.
* Recommended WF
	+ For the Measurement gap offset configuration, encourage feedback on proposal 1
	+ For the lengths of two periods before PDSCH scheduling, encourage further discussion

GTW discussion on Aug 16

* Proposals on the Measurement Gap offset:
	+ Option 1: For 15 kHz SCS, configure gap offset to 7 for FDD and 0 for TDD to make LTE’s PBCH in middle of measurement gap. (Huawei)
	+ Option 2: No need to restrict the PBCH decoding to be in the middle of the gap. (E///, ZTE, Apple)
		- E///: There is a description in 38.133: ‘When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1 and 0.25ms for frequency range FR2’
* Proposals on the time period length before PDSCH scheduling
	+ Proposals on Period 1 for cell identification
		- Option 1: 3840ms (CMCC, ZTE, Huawei, Apple, Qualcomm)
			* Apple: both LTE cells are on the same frequency layer
		- Option 2: 2 x 3840ms = 7680ms (Ericsson)
			* E///: Considering 2 interference cells, parameter CSSFinterRAT should be as 2
	+ Proposals on Period 2 for PBCH decoding
		- Option 1: 500 ms (CMCC, ZTE, Huawei, Ericsson)
		- Option 2: 800 ms (Apple, E/// - fine, Qualcomm)
			* Apple: For the weaker LTE cell, in the presence of interference from other LTE cell, for 99.99% successful decoding 6 samples are needed for 2x2 and 5 samples are needed for 4x2. Considering implementation margin, we think 8 coherence times are necessary for successful PBCH decoding on both LTE cells.
* Discussion:

Measurement gap offset

* + Huawei: Option 1 with configured PBCH in the middle can ensure the best performance to avoid the overlapping with serving cell PBCH and CSI-RS signals.
	+ Apple: CSI-RS can always be configured to avoid the overlapping with PBCH.
	+ CMCC: Option 2 is the criteria we can follow; option 1 is detailed configured which also following the criteria. We are fine with option 1 or other configuration options.
	+ MTK: We slightly prefer no limitation in RAN4 specification, we can leave the details of test set-up to RAN5.
	+ Ericsson: We believe TS 38.133 already have clear definition; we should not introduce any additional restrictions.
	+ Qualcomm: We would like to check with our RRM colleagues and come back later.
	+ China Telecom: We agree with CMCC, the criteria in option 2 is the correct understanding. For detailed test set-up, option 1 also fine with us. We also need to consider NR carrier 30kHz SCS. We think this parameter need to be specified in RAN4.

Period 1 for cell identification/ Period 2 for PBCH decoding

* + Ericsson: We are fine with option 1 based on the clarifications from companies.
	+ Qualcomm: For period 1, we support option 1; for period 2, we support option 2.
	+ Apple: We proposed 800ms for PBCH decoding based on the evaluation results with implementation margin into account.
	+ Huawei: Our results show 500ms feasible, but we are also fine with 800ms.
	+ MTK: For period 1, we support option 1; and period 2 we support option 2.
	+ ZTE: For period 1, option 1 fine; period 2, we think 500ms enough.
	+ CMCC: For period 1, option 1 fine; period 2 we are fine with option 2 also we prefer shorter value.
	+ China Telecom: For period 2, we think 500ms enough based on the analysis in previous RAN4 meeting; meanwhile considering the major purpose of this requirement is to verify CRS-IM processing we are also fine to have more margin on period 2.
* Agreement:
	+ Measurement gap offset: The test set-up for measurement gap offset shall follow the criteria specified in TS 38.133; companies further check RRM specification.
	+ Period 1 for cell identification/ Period 2 for PBCH decoding:
		- Period 1: 3840ms
		- Period 2: 800ms
* Discussion after GTW on Aug 16
	+ Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD
	+ Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD

### Sub-topic 2-2: Test applicability for scenario 2

**Issue 2-2-1: Test applicability for CRS-IM scenario 2**

* *Status in RAN#103-e in the WF R4-2210659*
	+ *If a UE supports both without NWA and NWA based CRS-IM for 15kHz SCS (i.e., UE Capability #2 and #3),*
		- *Option 1: UE is only required to pass performance requirements without NWA signalling based test setup, i.e. UE capability#2.*
		- *Option 2: UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#3.*
	+ *If a UE supports both without NWA and NWA based CRS-IM for 30kHz SCS (i.e., UE Capability #4 and #5),*
		- *Option 1: UE is only required to pass performance requirements without NWA signalling based test setup, i.e. UE capability#4.*
		- *Option 2: UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability#5.*
* Proposed test applicability for Ues declare to support CRS-IM both with and without NWA on a certain each SCS
	+ Option 1: UE is only required to pass performance requirements **without** NWA signalling based test setup, i.e. UE capability #2 and #4. (China Telecom, CMCC, Ericsson, ZTE)
	+ Option 2: The UE is only required to pass performance requirements **with** NWA signalling based test setup, i.e. UE capability #3 and #5. (Nokia, Huawei slightly preferred)
* Recommended WF
	+ Go with option 1 with majority companies’ preference?

GTW discussion on Aug 16

* Proposed test applicability for Ues declare to support CRS-IM both with and without NWA on a certain each SCS
	+ Option 1: UE is only required to pass performance requirements without NWA signalling based test setup, i.e. UE capability #2 and #4. (China Telecom, CMCC, Ericsson, ZTE, Nokia – compromise)
	+ Option 2: The UE is only required to pass performance requirements with NWA signalling based test setup, i.e. UE capability #3 and #5. (Nokia, Huawei slightly preferred, Apple)
* Discussion:
	+ Apple: Our preference is option 2 since the baseline assumption will be with NWA signaling.
	+ China Telecom: We prefer option 1. We believe without NWA require more UE complexity with detection on BW required.
	+ CMCC: We share same view as China Telecom, if UE can ensure performance without NWA, then UE can also support CRS-IM with NWA signaling.
	+ Huawei: We slightly prefer option 2 since test case without NWA signaling require more complicated test set-up.
	+ ZTE: We prefer option 1. We need to verify UE no mis-detection if UE declares to support CRS-IM without NWA.
	+ Nokia: This is specific for the case UE support both cases with and without NWA signaling. We think the test cases already be there.
	+ Ericsson: We support option 1, otherwise we can’t ensure UE shall detect parameters without NWA signaling.
* Agreement: Option 1: UE is only required to pass performance requirements without NWA signaling based test setup, i.e. UE capability #2 and #4.

### Sub-topic 2-3: Specification structure

**Issue 2-3-1: Test case structure for TDD scenario 2**

* *Status in RAN#103-e in the discussion summary R4-2210524*
	+ *Whether to define the CRS-IM requirements for TDD scenario 2 with 15kHz SCS and 30kHz SCS in the same or different sections can be further discussed in the next meeting.*
* Proposals
	+ Option 1: Keep the CRS-IM requirements for TDD scenario 2 with 15kHz SCS and 30kHz SCS in the same clause in TS38.101-4 (China Telecom, Nokia)
		- CTC: Most of the test configurations and all the necessary test procedures for TDD scenario 2 for 15kHz SCS and 30kHz SCS are the same.
		- Nokia: Align the tests so “Test 1-x” is without NWA and “Test 2-x” is with NWA.
* Recommended WF
	+ Encourage feedback.

**Issue 2-3-2: Test case clause heading in the big CR**

* Proposals
	+ Proposal 1: (Nokia, see details in R4-2212103)
		- Change headline numbering to include a number after the x (i.e. 5.2.2.1.x1, 5.2.2.1.x2, etc.) to secure all references are correctly implemented
		- For easier read, include surrounding headlines in the draft Big CR to more clearly houldze the added structure.
* Recommended WF
	+ Encourage feedback

### Sub-topic 2-4: Network assistance signalling

**Issue 2-4-1: How to solve the problem that if default assumptions is invalid**

* Proposals:
	+ Proposal 1: Invite companies to give some feedback how to solve the problem that if default assumption is invalid and UE doesn’t know that, UE will perform CRS-IM with wrong assumptions and system performance degradation will be observed. (Huawei)
	+ Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not. (Qualcomm)
* Recommended WF
	+ Encourage feedback

GTW discussion on Aug 16

* Proposals:
	+ Proposal 1: Invite companies to give some feedback how to solve the problem that if default assumption is invalid and UE doesn’t know that, UE will perform CRS-IM with wrong assumptions and system performance degradation will be observed. (Huawei)
	+ Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not. (Qualcomm, Apple, Huawei, MTK)
	+ Nokia: From RAN4-102e WF: “Note: It’s RAN4 common understanding it’s up to UE implementation to turn on/off CRS-IM with reasonable performance.”
* Discussion:
	+ Huawei: We support proposal 2 since it can avoid the performance degradation and bring benefits for saving power assumption.
	+ QC: We understand that there is agreement in previous meeting to leave it for UE implementation. We would like to avoid performance degradation.
	+ Nokia: We brought up this issue 2 meetings ago, at that time we leave it to UE implementation with reasonable performance. We should be careful for the cross WG impact given Rel-17 ASN.1 already frozen.
	+ CMCC: If the default assumption not valid, NWA signaling can be indicated to UE; not clear what’s the issue?
	+ China Telecom: We think option2 can’t fully resolve the issue mentioned in option 1. For new bit on disable CRS-IM receiver, we are open for the discussion.
	+ Apple: We are discussing if the default assumption not valid, and UE not aware of this, then performance will be degraded.
	+ MTK: We support proposal 2.
	+ Huawei: Inform UE that default assumption not valid, then it’s up to UE implementation turn on/off CRS-IM receiver.
	+ QC: We have similar comment as Huawei.
	+ Nokia: In previous agreement, UE need to ensure reasonable performance.
	+ CMCC: It’s still not clear what’s the purpose of this 1bit signaling.
	+ ZTE: We think this can leave to UE implementation.
* Discussion after GTW on Aug 16
	+ Further discuss Proposal 2:
		- Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.

**Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE**

* Proposals:
	+ Proposal 1: if network decides to indicate other parameters in network assistance information, it should also indicate the Cell Id so that the UE can distinguish which cell that information belongs to. (Qualcomm)
* Recommended WF
	+ Encourage feedback

GTW discussion on Aug 16

* Proposals:
	+ Proposal 1: if network decides to indicate other parameters in network assistance information, it should also indicate the Cell Id so that the UE can distinguish which cell that information belongs to. (Qualcomm, Apple)
	+ Not support proposal 1 (E///, Nokia, ZTE, CMCC, Huawei)
		- Nokia, ZTE: v-shift information shall not be informed. So if Cell ID is mandatory to be signalled
* Discussion:
	+ QC: NW can inform information with up to 8 cells, it’s better to inform Cell ID information otherwise it’s difficult for UE to use NWA information. V-shift can be acquired by cell ID information.
	+ Huawei: We don’t think cell ID information is always necessary.
	+ Nokia: We think existing NWA didn’t preclude to include cell ID information. If no cell ID information provided, then the parameters applied for cells. Currently NWA design quite flexible and we didn’t strong need to need to update.
	+ ZTE: In previous meeting, we already agreed cell ID/v-shift can be informed.
	+ CMCC: We share similar view as Huawei.
	+ QC: Cell ID information still be optional, we are proposing if other NWA information except v-shift informed, then cell ID information shall be provided as well. I don’t it’s reasonable the parameters applied for all cells if cell ID not provided.
	+ Nokia: We still see the possibility the information can be generic.
	+ QC: How does UE know the parameters applied for all cells or single cell?
		- If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.
		- If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.
* Discussion after GTW on Aug 16
	+ Further discuss the following proposal:
		- If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.
		- If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.

### Sub-topic 2-5: Test requirement value derivation

**Issue 2-5-1: SNR value requirement derivation for CRS-IM**

* Proposals
	+ Proposal 1: (China Telecom)
		- Make decision on the SNR requirement values for CRS-IM with the following rule:
			* RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes 2.0 dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within 2.0 dB.
* Recommended WF
	+ Companies are encouraged to add the updated results in the summary spreadsheets before 17:00 UTC Wednesday (17th Aug).
	+ Further discuss based on the latest simulation result summary.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Company A | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Issue 2-3-2: Test case clause heading in the big CRSub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidIssue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UESub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
|  | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Issue 2-3-2: Test case clause heading in the big CRSub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidIssue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UESub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
| Ericsson | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2Agree with the recommended WF.Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 Lengths of two periods before PDSCH schedulingCompanies can discuss whether to consider 2 interfering cells for calculating the period 1. We are fine with Apple’s approach in their paper. If majorities think Apple’s proposal is too loose than maybe we can consider adding a smaller margin, e.g. consider 700ms.Measurement gap offset configurationThere is a description in 38.133: *‘When measurement gaps are needed, the UE is not expected to detect SSB which start earlier than the gap starting time + switching time, nor detect SSB which end later than the gap end – switching time. Switching time is 0.5ms for frequency range FR1 and 0.25ms for frequency range FR2*’, which is clear enough. No need to restrict the PBCH decoding to be in the middle of the gap.Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2Agree with the recommended WF.Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2OK with option 1. Issue 2-3-2: Test case clause heading in the big CROK with option 1. Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidOur understanding is that if the default assumption is not valid, the NW should send NWA signalling with LTE-NeighCellsCRS-AssistInfo-r17 as agreed.On the other hand for proposal 2, the UE can shut down the CRS-IM as well when it is not capable for running self-detection or there is no NWA signalling sent.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UEIt is Network’s implementation what information (including Cell ID) is provided to the Ues.Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
| Nokia, Nokia Shanghai Bell | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2Assuming the UE detect the CBW correctly in the non-NWA setup, there should be no difference in UE performance between NWA and non-NWA setup.Based on this, we can agree to option 1 (Same requirement applies for the two sets of test setup (i.e., with NWA and with only inter-RAT MO configured) in scenario 2.Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2We see the NWA configuration to be the most used setup, hence we prefer to have the “with NWA signalling” based test setup. However, assuming the test requirements are the same for with and without NWA, we can compromise to option 1 (test applicability for Ues declare to support CRS-IM both with and without NWA on a certain/each SCS: UE is only required to pass performance requirements **without** NWA)Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2We support option 1 to keep the CRS-IM requirements for TDD scenario 2 with 15kHz SCS and 30kHz SCS in the same clause in TS38.101-4 and align the tests so “Test 1-x” is without NWA and “Test 2-x” is with NWA.Issue 2-3-2: Test case clause heading in the big CRWe kindly request for companies to check the details on proposal 1 in our t-doc R4-2212103.Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidIn RAN4#102e we proposed to include a field in the NWA signalling to invalidate the all the default assumption under “Issue 1-1-5: A field in the NWA signalling to invalidate all default assumptions” in case the default assumptions were not valid.In addition, we also proposed to use NWA signalling to enable CRS-IM under “Issue 1-1-6: Trigger for enabling CRS-IM by NWA signalling”.The majority of companies did not find the above proposals relevant, and the general agreement was made to add a note to the WF:From RAN4-102e WF: “Note: It’s RAN4 common understanding it’s up to UE implementation to turn on/off CRS-IM with reasonable performance.”In our understanding this is a RAN4 agreement, that Ues are able to detect when CRS-IM would not provide any performance advantage (or reduces performance), in cases where default configurations are used, and thus would not enable CRS-IM in such cases.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UERAN4 has previously agreed that all parameters in the IE should be optional. It was also agreed, that if CellID is provided, vShift should not be provided. Thus, changing CellID to mandatory would effectively mean that vShift can never be provided in situations where network may signal the vShift together with additional values to UE.The current agreements are what RAN2 has already implemented in RRC and since Rel-17 Core WI is closed only corrections are allowed.Based on above we cannot accept this proposal as it goes against previous RAN4 agreements and ASN.1 for Rel.17 is frozen. |
| ZTE | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2Option 1 is OK. For UE acquire LTE bandwidth, one is NWA signaling, and the other is PBCH decoding. We expected that there is no misdetection for PBCH decoding. So there is hould be no performance difference between NWA signaling and PBCH decoding. Thus specify the same CRS-IM test requirements for two sets of test setup in scenario 2.Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 For the Measurement gap offset configurationBased on our understanding, there is no need to make PBCH decoding in middle of measurement gap.For the lengths of two periods before PDSCH schedulingWe think option 1 is OK. In our understanding, *TIdentify, E-UTRAN FDD*  and *TIdentify, E-UTRAN TDD* are indicate the UE shall be able to identify a new detectable FDD cell within period. On the other hand, for PBCH decoding, UE needs a small time period for PBCH decoding. So we think 500ms is enough.Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2We are ok with option 1. Based on our understanding, we have defined some parameters(e.g. time period for LTE CHBW) for without NWA signaling. We need to make sure that these parameters are able to perform LLR weighting accurately for UE and no influence on other aspects. On the other hand, in order to make sure that UE acquire LTE bandwidth accurately and no misdetection happened. We think option 1 is reasonable.Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Option 1 is ok.Issue 2-3-2: Test case clause heading in the big CROK with the Recommended WF.Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidBased on our understanding, If default assumptions is invalid, it means that bandwidth and CRS ports are different for neighbour cells. Moreover our simulation is based on the same bandwidth and CRS ports. So UE maybe shouldn’t perform CRS-IM.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UEIn RAN4 102-e meeting, RAN4 has agreed v-shift information can be included in NWA signaling as optional and if cell-ID information informed, then v-shift information shall not be informed. So if Cell ID is mandatory to be signalled, it looks like the v-shift is invalid. This will conflict with the previous conclusion. Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
| Apple | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2We are fine with the recommended WF from moderator. Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 For MG config: We don’t follow the reason to configure such that LTE PBCH is in the middle of the MG. Our preference would be to configure the MG starting the SF before LTE PBCH. On Time period before PDSCH scheduling: For time period 1 , time for cell identification in our understanding the CSSFinterRAT would be 1 since both LTE cells are on the same frequency layer. Could @Ericsson please clarify why CSSFinterRAT would be 2.For time period 2 as explained in our paper for 99% successful PBCH decoding on weaker LTE cell number of samples is 6 and we propose 8 to account for additional implementation margin. We don’t think allowing additional 300ms would largely impact testing time. Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2We prefer Option 2. If UE supports both capabilities, it should be tested with NWA configured as that would be the baseline and with NWA would be advanced UE capability. But we are not sure what it means for UE to support both Capability #2 and #3 together for 15KHz SCS or Capability #4 and #5 together for 30KHz SCSSub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Our preference is to have requirements for CRS-IM in TDD for both 15KHz and 30KHz in the same sub-clause. Issue 2-3-2: Test case clause heading in the big CROkay to use X1, X2 etc for sub-clause heading in Big CR/ draft CRs.Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidWe support proposal 2 to introduce some kind of indication when default NW assumptions are not valid. With the current assumptions since all NWA is optional if default assumptions are not valid, it is up to the UE to detect if default assumptions are valid or not. If UE always assumes default NW assumptions are valid, then it might lead to performance degradation rather than ny gain. Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UEWe support Proposal 1. Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IMBased on the results span is > 2.5 dB across all cases. We are not sure if 2 dB span is achievable. We might need to allow 2.5 dB span.  |
| CMCC | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2We support the recommended WF.Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 For the time period 1, we share similar views with Apple, Since the LTE interference cells are in the same frequency layer, the CSSF should be 1.For the time period 2, we are fine to compromise to 800ms.Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2We support Option 1. We are more interest about without NWA scenario, we think it can help to speed up the commercial application of this feature. Besides, we think Option 1 need more UE efforts since UE should detect PBCH, if UE can pass without NWA case, we think UE can pass with NWA case, on the contrary, we don’t think so.Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2We are fine with Option 1.We are willing to capture the requirements for TDD scenario 2 with 30kHz SCS in our draft CR R4-2212295.Issue 2-3-2: Test case clause heading in the big CROK with Option 1Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalidWe share similar views with Ericsson.If the default assumptions are invalid, then network should configure NWA signalling.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UEBased on our understanding, the UE could perform CRS-IM even cell ID is not provided. Therefore, we agreed that the Cell-ID and V-shift should be optional.  |
| Discussion after GTW |
| Huawei | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2*No further discussion*Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 * + *Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD*
	+ *Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD*

Firstly we should decide which PBCH within one measurement(40ms) should be used for decoding. I.e. Overlapping with gaps. And we propose to make NR CSI-RS, PBCH and TRS not overlapped with gaps to avoid performance loss. Within each measurement gap period: * For 15kHz:
	+ FDD:
		- LTE PBCH is transmitted in slot with index: 0,10,20,30
		- NR PBCH and CSI-RS are transmitted in slot with index: 0,20
		- NR TRS are transmitted in slot with index 10,11,30,31

 1st PBCH and 3rd PBCH are overlapped with NR PBCH and CSI-RS; 2nd PBCH and 4th PBCH are overlapped with NR TRS. Considering PBCH position can’t be changed. We propose to use 2nd PBCH for decoding(Gap is overlapped with 2nd LTE PBCH each 40ms) and configure TRS offset to avoid overlapping with gaps. Hence we propose the following: gap offset is 7 (Gap is from7 to 12)and TRS offset is 13,14 * For 15kHz:
	+ TDD:
		- LTE PBCH is transmitted in slot with index: 2,12,22,32
		- NR PBCH and CSI-RS are transmitted in slot with index: 0,20
		- NR TRS are transmitted in slot with index 10,11,30,31

 LTE PBCH is not overlapped with any NR reference signals. We propose the following: Gap offset is set to 1.(Gap is from 1 to 6). 1st LTE PBCH is used for decoding* For 30kHz:
	+ - LTE PBCH is transmitted in slot with index: 5,25,45,65
		- NR PBCH and CSI-RS are transmitted in slot with index: 0,40
		- NR TRS are transmitted in slot with index 20,21,60,61

 LTE PBCH is not overlapped with any NR reference signals. We propose the following:Gap offset is set to 1.(Gap is from 1 to 12). 1st LTE PBCH is used for decodingSub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2*No further discussion*Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Issue 2-3-2: Test case clause heading in the big CRSub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We support proposal 2. The current agreements indicates that network signaling is optional to send if default assumptions are invalid which means there may be probably large system performance degradation if UE perform CRS-IM with misaligned assumptions without any information indicating invalid assumptions.If this single bit is informed to UE, UE can stop perform CRS-IM with default assumptions which will degrade the performance largely ( Not turning off CRS-IM directly!), UE can decide whether to perform CRS-IM with blind detection to acquiring LTE cells’ information or not. Hence, with this important single bit signaling, potentially performance degradation can be avoid. Furthermore, we don’t think one bit has big change to RRC signaling. Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

Now we suggest to make cell ID mandatory when network decides to indicate other parameters to the UE. We don’t want to make the logic of network signaling too complex considering the limiting time of Rel-17 and we don’t think it has big change to current network signaling and this change can bring much convenience for use of network signaling.Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
|  | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2*No further discussion*Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 * + *Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD*
	+ *Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD*

Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2*No further discussion*Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Issue 2-3-2: Test case clause heading in the big CRSub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
| Qualcomm | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2*No further discussion*Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 * + *Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD*
	+ *Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD*

Ok with Huawei’s proposal above.Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2*No further discussion*Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Ok with Option 1Issue 2-3-2: Test case clause heading in the big CRNo strong preference. Ok with the proposal. If RAN4 can agree on actual clause numbers, that is also fine. But we agree that every CR having .x may cause some confusion in Big CR.Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We support Proposal 2. We had following agreement from WF R4-2203131 in RAN4#101bis-e:*Signalling design when the default NW configuration assumptions are NOT valid** CRS-IM requirements are not applicable if the default configuration is not valid and NWA signalling is not provided.

*Blind detection when the default NW configuration assumptions are NOT valid** Not expect UE blind detection of the following NW configurations
	+ Scenario 1: CRS muting, MBSFN configuration and LTE channel bandwidth/center frequency
	+ Scenario 2: CRS muting and MBSFN configuration

Based on above agreements, performance is not guaranteed if default assumptions are not valid. Also, UE is not expected to do blind detection, if default assumptions are not valid. However, it is up to UE implementation how to handle such scenario when default assumptions are not valid. If UE does not know that default assumptions are not valid, it can not take any measures to handle this situation. It will keep doing CRS-IM based on default network assumptions which will result in system level performance degradation. To avoid this degradation, it is necessary for UE to know whether default assumptions are valid or not.Based on previous agreements, UE can only know when default assumptions are not valid if NW indicates any of the misaligned parameters in NWA. But getting those parameters for multiple cells is a lot of overhead on the NW backhaul and sometimes, it may not be able to get all the information. In those cases, NW can indicate whether it “knows” that default assumptions are aligned or not. This will need less backhaul overhead from NW side and less RRC signaling overhead. With this signaling, we will also be able to avoid the scenario where Rel-17 system performance may be worse than Rel-15 or Rel-16. We prefer to have this signalling as mandatory but to accommodate operators’ concerns, we are open to making it optional with the default assumption that UE can assume that this field’s value is set to 1, i.e., default assumptions hold true.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

As we explained in the GTW, main objective of this proposal is for UE to be able to easily use the NWA information provided to it. If NW indicates NWA for multiple cells without indicating cell ID, it will be hard for the UE to figure out which information is useful for it and all that NWA sent by the NW will not be used properly by the UE, hence wasting the resources. Therefore, we propose to indicate the cell Id, whenever NWA is provided except v-shift. For providing common NWA for all cells, it should be up to RAN2 how this can be indicated, as per previous agreement in RAN4#102e, R4-2207239. From the current implementation of this signalling in 38.331, it looks like per cell NWA signalling and nothing is being said about sending common signalling for all cells. We think proponent companies of common NWA signalling should bring this issue in RAN2 rather than RAN4.Therefore, our proposal is as below:* Cell Id should be indicated, if any NWA except vshift is provided to the UE.
* RAN2 can further decide how to define this for common signalling for all cells. One candidate option is to not indicate Cell Id and only one set of signalling is sent.

Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IMWe prefer to keep the threshold of 2.5dB, similar to other tests in the past. |
| Apple2 | Sub-topic 2-1: CRS-IM test in scenario 2 Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2*No further discussion*Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 * + *Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD*
	+ *Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD*

Proposal from Huawei above is fine with us. Sub-topic 2-2: Test applicability for scenario 2Issue 2-2-1: Test applicability for CRS-IM scenario 2*No further discussion*Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Issue 2-3-2: Test case clause heading in the big CRSub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We support the proposal. The requirements are meant to be met only during testing where the default assumptions are still valid. To make this feature useful in real deployment, this 1 bit signaling is necessary, otherwise there might be more degradation than benefit from introducing this. Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

Proposal from Qualcomm above is fine with us.Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IMPropose to use 2.5 dB as span for deriving requirements and also additional margin to derive the final requirement value.  |
| China Telecom | Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Support option 1.Issue 2-3-2: Test case clause heading in the big CRNo strong view on this.Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

As expressed in the GTW, this new Rel-17 NWA maintenance will do no help for the old Rel-15/16 networks since the whole NWA is not transmitted regardless of whether the default network assumption is valid or not. Moreover, we have agreed in the previous meetings that the possibility that the default configuration is not valid, is very small.At the same time, if companies have strong view to introduce such new bit for Rel-17 BSs, we are open to discuss. But we need to firstly carefully discuss: 1) IS the new single bit is still optional or mandatory for the BS to configure if the default network assumption is not valid; 2) Is the new bit is configured for each neighbour cell? Or the whole Network? 3)…Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

We expect more specified clarification on how the possible mismatch would happen, if NWA conveys information for multiple cells without Cell IDs. Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IMWe are fine to use the same rule for IRC tests, which is very likely to be 2.5 dB SPAN. |
| Nokia, Nokia Shanghai Bell | Sub-topic 2-3: Specification structure Issue 2-3-1: Test case structure for TDD scenario 2Support Option 1Issue 2-3-2: Test case clause heading in the big CRSupport option 1Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We share the same opinion as China Telecom. We indicated the advantages of such signaling in RAN4#102e, hence we are not opposed to discuss this again, however as China Telecom has highlighted, there are several open issues which needs to be clarified.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

We see the current RAN2 agreed definition of the NWA IE as very flexible and made following the agreements reached by RAN4.RAN2 also used the explicit license from RAN4 to design the details for signaling under each serving cell with flexibility to support per UE level configuration.The RAN2 designed signaling enables the NW to provide as much information as possible to the UE without restrictions. The UE can then evaluate the provided information in the NWA IE and decide if it is useful enough to allow turning on CRS-IM with reasonable performance.In addition, we cannot see why the NW would provide NWA IE values without CellID included, if the NW has the CellID for the individual values available. Though, there might be cases where cellIDs are not known, but interferer configurations are known or can be estimated.Placing restrictions on the NWA IE to provide a CellID, with each IE that contains an interferer configuration (i.e., virtually making cellID mandatory) would effectively remove this possibility to give the UE all available information.If a NW provides interferer configurations without CellID to the UE, some UE implementations will likely be able to still utilize this information and chose to enable CRS-IM with reasonable, or rather improved, performance.As such, we do not see the need to add further restriction to the current RAN2 agreed NWA IE.Sub-topic 2-5: Test requirement value derivationIssue 2-5-1: SNR value requirement derivation for CRS-IM |
| Qualcomm2 | Issue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

@ China Telecom, Nokia: While we prefer this signalling to be mandatory, we are open to compromising to optional. This signalling should be valid across cells, i.e., whole network. So, if NW doesn’t know whether default assumptions are true or NW knows that default assumptions are not true, they can just indicate that by setting this bit to 0. By default, it can be assumed to be set to 1, i.e., it is known that default assumptions are true.Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

@China Telecom, Nokia: To clarify it further, we can take following example. Let’s assume that for non-DSS scenario, NW indicates 4 sets of NWA. Those 4 sets have BWs of 5MHz, 10MHz, 15MHz, 20MHz. None of those sets have the Cell ID indicated. Then, the UE which cannot detect the BW, doesn’t know which BW to use for it’s mitigation. But it will know the stronger interferers’ Cell Ids through IRAT measurements. So, if Cell ID was provided, that UE could have performed CRS-IM. There could be many other such cases for other parameters in the NWA. That is why we are proposing to include the Cell Id when any NWA (except vshift) is provided to keep the logic simple. Currently, NWA in 38.331 is defined as below, which is per cell NWA. So, we think that Cell Id is important to distinguish different sets of NWA.-- ASN1START-- TAG-LTE-NEIGHCELLSCRS-ASSISTINFOLIST-STARTLTE-NeighCellsCRS-AssistInfoList-r17 ::= SEQUENCE (SIZE (1..maxNrofCRS-IM-InterfCell-r17)) OF LTE-NeighCellsCRS-AssistInfo-r17LTE-NeighCellsCRS-AssistInfo-r17 ::= SEQUENCE {neighCarrierBandwidthDL-r17 ENUMERATED {n6, n15, n25, n50, n75, n100, spare2, spare1} OPTIONAL, -- Cond CRS-IMneighCarrierFreqDL-r17 INTEGER (0..16383) OPTIONAL, -- Need SneighCellId-r17 EUTRA-PhysCellId OPTIONAL, -- Need MneighCRS-muting-r17 ENUMERATED {enabled} OPTIONAL, -- Need RneighMBSFN-SubframeConfigList-r17 EUTRA-MBSFN-SubframeConfigList OPTIONAL, -- Need SneighNrofCRS-Ports–r17 ENUMERATED {n1, n2, n4} OPTIONAL, -- Need SneighV-Shift-r17 ENUMERATED {n0, n1, n2, n3, n4, n5} OPTIONAL -- Cond NotCellID}-- TAG-LTE-NEIGHCELLSCRS-ASSISTINFOLIST-STOP-- ASN1STOP |
| Huawei2 | Issue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We support to define this signaling as mandatory. We share the same views with QualcommIf Network confirm default assumptions are valid, the bit is set to 0 which is common scenarios.If network confirm default assumptions are invalid or network can’t confirm default assumptions are valid such as scenarios that network are deployed in boundaries of operators, the bit is set to 1 |
| Ericsson | Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2 * + *Further discuss the gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD*
	+ *Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD*

We don’t agree such option. If we really need to specify such gap offset, we suggest to directly follow RRM test case configurations. Here we copy-pasted the related RRM test cases and requirements.The purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.6.6.1.3 SA event triggered reporting tests with per-UE gaps under non-DRXA.6.6.1.3.1 Test purpose and EnvironmentThe purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.A.6.6.1.3.2 Test parametersTwo cells are deployed in the test, which are FR1 PCell (Cell 1) and a FR1 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for PCell are given in Table A.6.6.1.3.1-1 and A.6.6.1.3.1-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.Table A.6.6.1.3.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

Table A.6.6.1.3.2-2: General test parameters for SA intra-frequency event triggered reporting with per-UE gaps for PCell in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3 | Cell 1 |  |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| Measurement gap type |  | 1, 2, 3 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3 | 40 |  |
| Measurement gap length | ms | 1, 2, 3 | 6 |  |
| Measurement gap offset | ms | 1, 2, 3 | 39 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CSI-RS parameters |  | 1 | CSI-RS.1.2 FDD resource #0 |  |
|  |  | 2 | CSI-RS.1.2 TDD resource #0 |  |
|  |  | 3 | CSI-RS.2.2 TDD resource #0 |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| Hysteresis | dB | 1, 2, 3 | 0 |  |
| Time To Trigger | s | 1, 2, 3 | 0 |  |
| Filter coefficient |  | 1, 2, 3 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2, 3 |  | OFF |
| Time offset between serving and neighbour cells |  | 1 | 3 ms | Asynchronous cells.The timing of Cell 2 is 3ms later than the timing of Cell 1. |
|  |  | 2 | 3 μs | Synchronous cells |
|  |  | 3 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 5 |  |

…… |

Here we have gap offset configuration for measuring NR cells. But we only have gap pattern here and we don’t specify such offset for measuring LTE cells, see:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.6.6.3 Inter-RAT MeasurementsA.6.6.3.1 SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1A.6.6.3.1.1 Test Purpose and EnvironmentThe purpose of this set of tests is to verify that the UE makes correct event-triggered reporting of inter-RAT E-UTRAN measurements when operating in standalone (SA) operation with PCell in FR1. This test shall partly verify the cell search and measurement requirements in Clauses 9.4.2 and 9.4.3.In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the NR PCell and Cell 2 is an inter-RAT E-UTRAN inter-RAT neighbour cell. In the measurement control information from the PCell it is indictated to the UE that event-triggered reporting with Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2) is to be used. Each test consists of two consecutive time periods, with durations T1 and T2, respectively. Prior to the start of time duration T1, the UE shall be fully synchronized to Cell 1. During T1, the UE shall not have any information on Cell 2.Supported test configurations are shown in table A.6.6.3.1.1-1. General test parameters are provided in Table A.6.6.3.1.1-2 below. Test parameters for Cell 1 and Cell 2, valid for both time duration T1 and T2, are provided in Tables A.6.6.3.1.1-3 and A.6.6.3.1.1-4, respectively.Table A.6.6.3.1.1-1: Supported test configurations in SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations |

Table A.6.6.3.1.1-2: General test parameters for SA inter-RAT E-UTRAN event triggered reporting in non-DRX with PCell in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | 1 NR carrier frequency is used in the test |
| LTE RF Channel Number |  | 1 | 1 LTE carrier frequency is used in the test |
| Channel Bandwidth | MHz | As specified in Tables A.6.6.3.1.1-2 and A.6.6.3.1.1-3. |  |
| Active cell |  | Cell 1 | Cell 1 is on RF channel number 1 |
| Neighbour cell |  | Cell 2 | Cell 2 is on RF channel number 2 |
| Gap Pattern Id |  | 0 | As specified in Clause Table 9.1.2-1. Per-UE gap pattern. |
| NR measurement quantity |  | SS-RSRP | Measurement quantity for Cell 1 |
| Inter-RAT E-UTRAN measurement quantity |  | RSRP | Measurement quantity for Cell 2 |
| b2-Threshold1 | dBm | Note 1 | SS-RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| b2-Threshold2EUTRA | dBm | -95 | E-UTRAN RSRP threshold for SS-RSRP measurement on cell1 for event B2 |
| Hysteresis | dB | 0 |  |
| TimeToTrigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| DRX |  | OFF | OFF |
| T1 | s | 5 |  |
| T2 | s | 5 |  |
| Note 1: Values are defined in Table A.6.6.3.1.1-3 |

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Given the reference above, we don’t see the need to specify a particular offset here.If companies have different views on such RRM test case configurations and requirements, then companies should discuss it on RRM session. Sub-topic 2-4: Network assistance signallingIssue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

We recalled the previous agreement (From R4-2120705, RAN4#101-e) as:

|  |
| --- |
| *For scenario 1 and 2, by default, UE follow below assumption of Network configuration for CRS-IM receiver* * *no CRS muting,*
* *MBSFN configuration same as serving cell for scenario 1; NO MBSFN configuration for scenario 2*
* *Channel bandwidth and centre frequency aligned for the serving and neighbouring cells for scenario 1*

*If above assumption not aligned with NW configuration:* *- Network can inform to UE by NWA signalling. FFS for the details of NWA signalling* * *It’s Network decision whether need to be informed to UE even the network configuration not aligned with default assumption. From network perspective, if such information conveys to UE, network expect UE should not follow the default assumption.*
 |

Then it is clear what will be the next when the default assumption is not aligned, which is that the Network can (may or may not) inform UE about the neighboring cell’s information.We don’t see the any additional benefit for introducing another network signaling unless it also indicates the disable of CRS-IM, which means that if such 1 bit signaling is sent, then the UE is not expected to do the CRS-IM even if it has the ability of blind detection of parameters. Even with the above, like mentioned by China Telecom, we still have some unclear points: is it cell-based or UE-based? Is it also optional (which is the only possibility) or mandatory? And if it is optional what if it is not sent when the default assumption is not valid? Are we keep going and to have further discussion on the possible next move? The point is, we need to specify what is the difference behavior for UE between after receiving the new proposed 1 bit signaling and the agreed NWA signaling? If we expect the same UE behavior (e.g., up to UE implementation to turn on/off the CRS-IM), then we don’t agree on introducing such additional 1 bit signaling. Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE* + *Further discuss the following proposal:*
		- *If no cell-D/v-shift informed, then parameters indicated by NWA are applied for cells from UE receiver baseline assumption.*
		- *If NW indicated NWA information except v-shift for multiple cells, then associated cell-ID shall be included.*

We share similar view as Nokia. We hardly see the possibility that the Network sends the interfering cell’s information but without cell ID. From the IE of *LTE-NeighCellsCRS-AssistInfo*, all contents on the left are optional. Are we going to set such restriction on that only for a scenario with tiny possibility?As we know, with information of neighboring cells but except Cell ID, there are still some UEs can do the CRS-IM by their implementation, which again makes it meaningless for adding such restriction for a particular case.  |
| MediaTek | Issue 2-4-1: How to solve the problem that if default assumptions is invalid* + *Further discuss Proposal 2:*
		- *Proposal 2: Define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.*

It was agreed that NWA are optional and only to be signalled when the default assumption is not valid. If the default assumption is not valid, NW may not transmit NWA for UE. Therefore, UE may follow the default assumption for receiving PDSCH. It might be possible for UE to detect whether the default assumption is valid or not. However, it will increase the complexity of UE. To reduce the burden of UE and help UE preventing some potential performance degradation in real field, we prefer to define such indication as mandatory.  |

### Draft CR comments collection

|  |  |  |
| --- | --- | --- |
| **tdoc number** | **Title/Content** | **Comment collection** |
| R4-2211785, China Telecom | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario | CTC: SNR value will be added for the second round review. |
|  |
|  |
|  |
|  |
| R4-2212104, Nokia | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability | Apple: Add applicability notes for 30KHz SCS without NWA- - same as 15KHz SCS without NWA. Update the Capability # with the UE capability IEs. Capability 4: *crs-IM-nonDSS-30kHzSCS-r17*Capability 5: crs*-IM-nonDSS-NWA-30kHzSCS-r17*Nokia: Thanks for the review and comments. We did not include changes for 30kHz as the capability section is split between two companies. |
| CTC: Update the test applicability as agreed in Issue 2-2-1. We think 30kHz capabilities should be captured in R4-2212296.Nokia: Thanks for the review and comments. We will make the updates as agreed in Issue 2-2-1 and provide a new version. We agree that 30kHz related capabilities shall be handled in R4-2212296. |
| Nokia: Thanks to Apple and CTC for the review and comments. We will make the updates as agreed in Issue 2-2-1 and provide a new version.We did not include changes for 30kHz as the capability section is split between two companies, hence we agree that 30kHz related capabilities shall be handled in R4-2212296. |
|  |
|  |
| R4-2212295, CMCC | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS | Apple: Is there another CR for 30KHz SCS? We suggest to add 30KHz SCS tests in the same sub-clause to avoid repetition of all the test parameters which are common to 15KHz SCS case. |
| CMCC: We will capture the 30kHz SCS tests in our CR |
| CTC: Note for INR definition is needed. |
|  |
|  |
| R4-2212296, CMCC | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 | Apple: Overlaps withR4-2212104, NokiaSame comments on adding IEs for UE capability #4,#5 |
| CMCC: We need the guidance about whether this CR should be merged to R4-2212104 |
| CTC: Update the test applicability as agreed in Issue 2-2-1. Personally, we think we do not need to merge to R4-2212104 since the 2 CRs are for different capabilities and should be naturally belong to different rows in Table 5.1.1.3-1. Just need to keep the correct test clause number. |
|  |
| R4-2212557, Ericsson | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD | CTC: Note for INR definition is needed. |
|  |
|  |
|  |
| R4-2213989, HW | draftCR: Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 | Apple: Its not clear why sections 3.3, 5.1.1.4 are added in the draft CR when there are no changes to them.Sections with requirements for CRS-IM don’t exist in spec and need to be added with revision marks/ track changes.PDSCH is not scheduled and throughput is not ~~countered~~ counted during ~~within~~ [4.34s] at the beginning of test. Recommend to follow the same order for FDD and TDD tests. For FDD 1-1 is with NWA and 2-1 is without NWA and is switched for TDD. Also need to merge the 30KHz SCS tests in TDD 15KHz SCS sections. No revision marks in Annex sections, so its not clear what has changed or what has been added.FRC for test with inter-RAT MO needs to be updated based on progress on MG configuration issue. |
| CTC: Please keep the last meeting endorsed changes with change marks since they are not implemented in the spec yet. For example, R.PDSCH.1-7.3 FDD FRC, |
|  |
|  |

## Summary for 1st round

### Open issues

**Issue 2-1-1: Whether the same CRS-IM test requirements can be applied in the two sets of test setup in scenario 2**

* + GTW agreement: Same requirement applies for the two sets of test setup (i.e., with NWA and with only inter-RAT MO configured) in scenario 2. (China Telecom, CMCC, QC, E///, Nokia, ZTE, Apple)

**Issue 2-1-2: Extra time for CHBW information detection in the test with only inter-RAT MO configured in scenario 2**

*Summary of round 1 discussion:*

* + On the Measurement Gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD:
	+ ~~Option 1: gap offset is 7 for 15 kHz FDD and 0 for 15 kHz TDD~~
	+ Option 2: (Huawei, QC, Apple)
		- * For 15kHz FDD: gap offset is 7 and TRS offset is 13,14
			* For 15 kHz TDD and 30kHz TDD: Gap offset is set to 1
	+ Option 3: directly follow RRM test case configurations or not to specify a particular offset (E///)
	+ On the time period length before PDSCH scheduling
	+ GTW agreement: 3840ms for Period 1 for cell identification, 800ms for Period 2 for PBCH decoding

*Recommendation for round 2:*

* + On the Measurement Gap offset, check if option 2 is agreeable.
	+ Capture the agreement in the CR.

**Issue 2-2-1: Test applicability for CRS-IM scenario 2**

* + GTW agreement: UE is only required to pass performance requirements without NWA signaling based test setup, i.e. UE capability #2 and #4.

*Recommendation for round 2:*

* + Capture the agreement in the CR.

**Issue 2-3-1: Test case structure for TDD scenario 2**

*Tentative agreements:*

* + Keep the CRS-IM requirements for TDD scenario 2 with 15kHz SCS and 30kHz SCS in the same **sub-**clause in TS38.101-4 (China Telecom, Nokia, Ericsson, ZTE, Apple, CMCC, QC)

*Recommendation for round 2:*

* + Capture the requirements for TDD scenario 2 with 30kHz SCS in the revised draft CR R4-2212295.

**Issue 2-3-2: Test case clause heading in the big CR**

*Tentative agreements:*

* + Change headline numbering to include a number after the x (i.e. 5.2.2.1.x1, 5.2.2.1.x2, etc.) to secure all references are correctly implemented
	+ For easier read, include surrounding headlines in the draft Big CR to more clearly visualise the added structure.

*Recommendation for round 2:*

* + Capture the agreement in the post-meeting big CR.

**Issue 2-4-1: How to solve the problem that if default assumptions is invalid**

*Summary of round 1 discussion:*

* + Whether to define a single bit network assistance signaling to indicate whether it is known that deployment is aligned with default network assumptions or not.
	+ Option 1: Yes (QC, Huawei, Apple, MTK)
	+ Option 2: No (E///, [ZTE, CMCC])
	+ If the single bit network assistance signaling is introduced, following should be discussed:
	+ Optional or mandatory for the BS to configure if the default network assumption is not valid:
		- * Option 1: Mandatory (QC, HW)
			* Option 2: Optional (QC)
	+ Is configured for each neighbour cell or the whole Network:
		- * Option 1: For the whole Network (QC, HW)

*Recommendations for 2nd round:*

* + Further discuss. A tdoc number for LS will be requested, and whether the LS can be agreeable is pending on round 2 discussion.

**Issue 2-4-2: Whether Cell ID should be mandatory to be signalled when network decides to indicate other parameters to the UE**

*Summary of round 1 discussion:*

* + Option 1: Not to have such limitation (E///, ZTE, CMCC, Nokia)
	+ Option 2: (QC, Apple, [HW])
		- Cell Id should be indicated, if any NWA except vshift is provided to the UE.
		- RAN2 can further decide how to define this for common signalling for all cells. One candidate option is to not indicate Cell Id and only one set of signalling is sent.

*Recommendations for 2nd round:*

* + Further discuss.

**Issue 2-5-1: SNR value requirement derivation for CRS-IM**

*Tentative agreements:*

* + RAN4 does not consider the farthest result(s) from the ideal AVERAGE value, until the span becomes 2.5 dB or less. The final requirements are derived from AVERAGE impairment results with the corresponding ideal results whose span is within 2.5 dB.

### Draft CRs

|  |  |  |
| --- | --- | --- |
| **tdoc number** | **Title/Content** | **CRs/TPs Status update recommendation**  |
| R4-2211785, China Telecom | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario | *To be revised.* |
| R4-2212104, Nokia | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability | *To be revised.* |
| R4-2212295, CMCC | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS | *To be revised.* |
| R4-2212296, CMCC | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 | *To be revised.* |
| R4-2212557, Ericsson | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD | *To be revised.* |
| R4-2213989, HW | draftCR: Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 | *To be revised.* |

## Discussion on 2nd round

### Open issue

**Issue 2-1-2: Measurement Gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD in the test with only inter-RAT MO configured in scenario 2**

* On the Measurement Gap offset for 15 kHz FDD, 15 kHz TDD and 30 kHz TDD:
	+ Option 2: (Huawei, QC, Apple, CMCC, China Telecom)
		- * For 15kHz FDD: gap offset is 7 and TRS offset is 13,14
			* For 15 kHz TDD and 30kHz TDD: Gap offset is set to 1
	+ Option 3: directly follow RRM test case configurations or not to specify a particular offset (E///)
* GTW Agreement: Option 2 with [ ] on the value.

### Simulation results and CRs

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| --- | --- | --- |
| **Tdoc number** | **Title** | **Comment collection** |
| Revision of R4-2211785, China Telecom | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario | Qualcomm: We assume that the requirements will be added before the final upload? |
| Apple: Capture the requirements in “[ ]” from summary, excluding outlier results if any.INR is defined in Annex B.6.1 |
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| Revision of R4-2212104, Nokia | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability | Qualcomm: Rows for capability#4 and #5 should be removed since it is conflicting with the CMCC draft CR R4-2212296. |
| Apple: Suggest to capture test applicability similar to CMCC’s draft CR. Same comment as Qualcomm on rows for Cap#4,#5. |
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| Revision of R4-2212295, CMCC | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS | Qualcomm: We assume that the requirements will be added before the final upload? 30kHz simulation results spreadsheet doesn’t have 0.5dB margin added to the average SNR. Please make sure that it is added when capturing the requirements. |
| Apple: INR is defined in Annex B.6.1For test procedure with inter-RAT MO,Schedule NR PDSCH transmission after Extra time = 4640msAdd some additional description like in HWs draft CR R4-2213989Capture the requirements in “[ ]” from summary, excluding outlier results if any. |
| CMCC: Thank you for your comments, all comments have been captured in v01. |
| CTC: Configure the measurement gap **according to Table xxx**. |
| Qualcomm2:Based on the latest summary, requirement for TDD 15kHz Non-DSS 4Rx should be 8.6dB. |
|  |  | CMCC2: The comments from CTC and QC have been captured in v02. |
| Revision of R4-2212296, CMCC | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 |  |
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| Revision of R4-2212557, Ericsson | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD | Qualcomm: Need to update the requirement to 12.6dB for 2Rx. |
| Apple: INR is defined in Annex B.6.1 |
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| Revision of R4-2213989, HW | draftCR: Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 | Ericsson: We don’t agree on specifying the gap offset value in those Measurement Gap configuration tables. This is RRM related issue and we don’t here is the right place and right time to add or revise something that are already settled in the RRM spec. It can be specified here only if it just simply follow what RRM has already agreed.  |
| Qualcomm: Some of the interfering cell parameters are missing for FDD such as CRS pattern, Transmission mode, Power allocation etc. Requirements for 15kHz needs to be updated. It is missing impairment results from Qualcomm and MTK. TDD non-DSS requirements are already captured in CMCC draft CR R4-2212295. So, it should be removed. |
| Apple: Replace with INR like other draft CRs. Align the test parameters for interference cells with other draftCRs. Align test procedure with CMCCs draft CR R4-2212295. Same comments as Qualcomm on TDD non-DSS requirements. |
| In the test procedure description, the 4.64 should be 4.64s. |
| CTC: Please also add the new FRCs for other scenarios endorsed in the last meeting in R4-2210924. |
| Huawei: @ Qualcomm and Apple: Thanks for your comments, we have uploaded the updated CR in:[Revised R4-2213989 DraftCR Introduce test setup and FRC for CRS-IM without NWA for FDD scenario 2\_v1.docx](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Inbox/Drafts/%5B104-e%5D%5B321%5D%20NR_perf_enh2_Demod/draft%20CRs%20for%20CRS-IM/Revised%20R4-2213989%20DraftCR%20Introduce%20test%20setup%20and%20FRC%20for%20CRS-IM%20without%20NWA%20for%20FDD%20scenario%202_v1.docx)@Ericsson: We think we should define the gap offset since it affects the FRC. What’s more, the gap should be configured to not be overlapped with NR TRS and PBCH. Because UE should acquire the Doppler spread and delay spread from TRS and PBCH. Performance degradation can be observed if gap is overlapped with TRS/PBCH. Noted that we have reached agreements that we define the same agreements for CRS-IM with/without inter-RAT MO.@ CTC: We prefer to create a new table for FRC with inter-RAT MO because it has very different scheduled pattern compared to NWA cases which make it hard to merge them in one table.  |
| Qualcomm2: Revised version still has TDD Non-DSS 15kHz requirements, which are already captured in CMCC draft CR. We request to remove it. Also, please updated the FDD requirements based on latest simulation results summary to 11.8 and 7.9dB for 2Rx and 4Rx, respectively.Apple2: Same comments as Qualcomm2. |
|  |  | HW: It is noted that we also capture all FRCs in this CR.@Qualcomm and Apple. Thanks for your comments but I don’t follow itIn our CR: 5.2.2.1.x is corresponding to Non-DSS scenario, FDD 2RX,15kHz SCS5.2.3.1.x is corresponding to Non-DSS scenario, FDD 4RX,15kHz,SCS5.2.2.2.x is corresponding to Non-DSS scenario, TDD 2RX,30kHz SCS5.2.3.1.x is corresponding to Non-DSS scenario, TDD 2RX,30kHz SCSThere is no TDD Non-DSS scenario requirements in this CR. In order to distinguish the requirements with 15kHz TDD and 30kHz TDD. We change the clause name from” Minimum requirements for PDSCH with inter cell CRS interference ” to Minimum requirements for PDSCH with inter cell CRS interference for NR 30kHz SCS. |

### LS

**R4-2214362 LS on CRS-IM network assistance signalling**

 *Type: LS out For: Approval*

 *To: RAN2
 Source: Qualcomm*

**Decision: Approved**

Qualcomm:

Based on the 1st round summary and some offline discussions with companies, I have uploaded the draft LS with a possible compromise between UE and NW/Infra vendors at: draft\_R4-2214362\_LS\_CRS-IM\_NWA\_v1.docx

We hope that it is acceptable to everyone and we can focus on the wording. Our plan is to get this LS approved in Wednesday GTW and send it to RAN2 for implementation in this meeting. So, it will be great if you could provide your comments as soon as possible, preferably before Wed GTW.

Nokia:

We have taken the liberty to upload a new version of the LS (v3) which seemly includes a large number of modifications.

After consulting with our RAN2 colleagues, they have suggested that some stylistic choices are adapted along the following lines:

• Avoid referring to exact RAN2 signalling elements.

• Try to separate the cases into all the components, and make it clear which information is prioritized.

Additionally we tried to add the following technical compromises in the CellID part:

• The now deleted section seemed to be trying to deal with the situation where list items conflict in their content, and no v-shift or PCI was included. We don't think that this clarification is necessary as this would constitute a misconfiguration from the nw. However if such a clarification is deemed necessary we could include this point in the proposed section of prioritisation of entries.

o PCI vs. v-Shift: The provided content (the two sub bullets), effectively meant that only a single v-Shift could ever be provided, and for all other list entries it would have been forced to only cellIDs are used. This would be against the agreement that network can also choose to indicate only the v-Shifts. We replaced this part with a clarification on what a UE can assume if no vShift OR PCI is provided.

Finally we proposed to remove the N/A-bit dependent activation of CRS-IM, as we only discussed this behaviour in the PCI inclusion discussion.

Nokia:

We have seen that Huawei has rejected all of our proposed changes, hence we are now back to the initial version proposed by Qualcomm, which was not agreeable to us.

As we tried to explain previously, we have the following technical concerns with the initial version, that we tried to address with our proposal:

• Default network configuration

o New mandatory signalling: The RRC is frozen, adding new mandatory signalling is not backwards compatible. Additionally we did not discuss or agree to make this signalling mandatory in the previous meetings.

o RAN2 communication: It is not up to RAN4 to decide how to implement signalling. RAN4 should only tell RAN2 the intend of the signalling. As such it is not advisable to indicate IE names and bits/values directly.

• CellID optionality

o CellID becoming virtually mandatory: The initial text means that only a single v-Shift could ever be provided, and for all other list entries it would have been forced to only cellIDs are used. This would be against the agreement that network can also choose to indicate only the v-Shifts and makes the CellID mandatory for all but one list entry.

o Combination of CellID and non-CellID entries: The initial wording does not allow to signal combination of CellID and non-CellID entries, which goes against our prior agreements and prior LS.

o UE behaviour with non-CellID: The NW should give all available information to the UE, but the UE might not be able to integrate every partial information into the IM processing. The UE should be allowed to not use the information, if CRS-IM implementation would not achieve reasonable performance. However there should not be an expectation to not use no-cellID information from the start, which decreases system performance.

o Hierarchy of signalling: When allowing CellID and non-CellID list entries there is potential overlap in configurations, which could be resolved by introducing a hierarchy among entries (“PCI > vshift > other”).

 In the case that list items conflict in their content, and no v-shift or PCI was included, this would constitute a NW misconfiguration, which the spec does not need to protect against.

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  | CR for introduction release independence for MMSE-IRC receiver requirements | Huawei, HiSilicon | The CR was endorsed in R4-2210951 at RAN4 #103e, and needs to be re-submitted for formal agreement. |
|  | LS on CRS-IM network assistance signalling | Qualcomm | To RAN2A tdoc number for LS is requested, and whether the LS can be agreeable is pending on round 2 discussion. |
|  | Big CR for inter-cell MMSE-IRC | Apple | For post-meeting email agreement |
|  | Big CR for CRS-IM | Ericsson | For post-meeting email agreement |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-2211789 |  | Discussion on UE MMSE-IRC receiver requirements for both inter-cell and intra-cell inter-user scenarios | China Telecom | Noted |  |
| R4-2211863 |  | Discussion and Simulation results for requirements in intercell interference scenarios | Apple Inc. | Noted |  |
| R4-2211864 |  | Draft CR on PDSCH demod requirements in ICI-FDD | Apple Inc. | Revised |  |
| R4-2212100 |  | On PDSCH demodulation and CQI requirements for inter-cell interference MMSE-IRC | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2212101 |  | Simulation Results on PDSCH demodulation and CQI requirements for inter-cell interference MMSE-IRC | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2212102 |  | draftCR for 38\_101-4 Interference model for enhanced performance requirements | Nokia, Nokia Shanghai Bell | Revised |  |
| R4-2212291 |  | Discussion on R17 demodulation enhancement for inter-cell interference | CMCC | Noted |  |
| R4-2212292 |  | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC | CMCC | Revised |  |
| R4-2212747 |  | Remaining issues on inter-cell interference IRC | Ericsson | Noted |  |
| R4-2212748 |  | Simulation results on PDSCH performance for inter-cell interference | Ericsson | Noted |  |
| R4-2212749 |  | Simulation results on CSI reporting for inter-cell interference | Ericsson | Noted |  |
| R4-2212751 |  | Summary of simulation results for Inter-cell MMSE-IRC CQI reporting | Ericsson | Return to |  |
| R4-2213782 |  | Discussion on PDSCH requirements for MMSE-IRC receiver with inter cell interference | Huawei | Noted |  |
| R4-2213783 |  | Simulation results on CQI requirements for MMSE-IRC receiver with inter cell interference | Huawei | Noted |  |
| R4-2213784 |  | Discussios on CQI requirements for MMSE-IRC receiver with inter cell interference | Huawei | Noted |  |
| R4-2213786 |  | Summary of simulation results for inter cell interference MMSE-IRC receiver requirements | Huawei | Return to |  |
| R4-2213907 |  | Discussion for PDSCH demodulation and CSI requirements for inter-cell interference MMSE-IRC | MediaTek inc. | Noted |  |
| R4-2213912 |  | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver | MediaTek inc | Revised |  |
| R4-2214068 |  | Views and Simulation Results for Inter-cell Interference CQI Reporting Tests | Qualcomm Incorporated | Noted |  |
| R4-2211786 |  | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC | China Telecom | Revised |  |
| R4-2211865 |  | Simulation results for PDSCH requirements in MU-MIMO scenarios | Apple | Noted |  |
| R4-2212750 |  | Simulation results on PDSCH performance for intra-cell inter-user interference | Ericsson | Noted |  |
| R4-2213785 |  | Summary of simulation results for intra cell inter user MMSE receiver requirements | Huawei, HiSilicon | Return to |  |
| R4-2213787 |  | BigCR for IRC for intra cell inter user MMSE receiver requirements | Huawei, HiSilicon | For post-meeting email agreement |  |
| R4-2213788 |  | CR: Addtion requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX | Huawei, HiSilicon | Revised |  |
| R4-2211779 |  | Summary of CRS-IM simulation results (15 kHz SCS FDD and TDD) | China Telecom | Return to |  |
| R4-2211784 |  | Discussion on the CRS-IM test with only inter-RAT MO configured for scenario 2 | China Telecom | Noted |  |
| R4-2211785 |  | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario | China Telecom | Revised |  |
| R4-2211866 |  | Discussion and Simulation results for CRS-IM requirements | Apple Inc. | Noted |  |
| R4-2212103 |  | On CRS-IM receiver in scenarios with overlapping spectrum for LTE and NR | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2212104 |  | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability | Nokia, Nokia Shanghai Bell | Revised |  |
| R4-2212293 |  | Discussion on the CRS-IM in Scenario 2 | CMCC | Noted |  |
| R4-2212294 |  | Simulation results for CRS-IM 30kHz SCS | CMCC | Noted |  |
| R4-2212295 |  | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS | CMCC | Revised |  |
| R4-2212296 |  | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 | CMCC | Revised |  |
| R4-2212297 |  | Simulation results collection for 30kHz SCS CRS-IM | CMCC | Return to |  |
| R4-2212555 |  | Discussion on the test setup with only inter-RAT MO configured for scenario 2 | Ericsson | Noted |  |
| R4-2212556 |  | Simulation results for CRS-IM | Ericsson | Noted |  |
| R4-2212557 |  | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD | Ericsson | Revised |  |
| R4-2212562 |  | Discussion on CRS-IM receiver | ZTE Corporation | Noted |  |
| R4-2213779 |  | Discussion on remaining issues for CRS-IM test setup | Huawei, HiSilicon | Noted |  |
| R4-2213781 |  | Simulation results for CRS-IM receiver | Huawei, HiSilicon | Noted |  |
| R4-2213989 |  | draftCR:Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 | Huawei, HiSilicon | Revised |  |
| R4-2213990 |  | Views on CRS Interference Mitigation in NR | Qualcomm Incorporated | Noted |  |
| R4-2214050 |  | Simulation results for CRS Interference Mitigation in NR | Qualcomm Incorporated | Noted |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2211779 |  | Summary of CRS-IM simulation results (15 kHz SCS FDD and TDD) | China Telecom | Noted |  |
| R4-2212297 |  | Simulation results collection for 30kHz SCS CRS-IM | CMCC | Noted |  |
| R4-2212751 |  | Summary of simulation results for Inter-cell MMSE-IRC CQI reporting | Ericsson | Noted |  |
| R4-2213785 |  | Summary of simulation results for intra cell inter user MMSE receiver requirements | Huawei,HiSilicon | Noted |  |
| R4-2213786 |  | Summary of simulation results for inter cell interference MMSE-IRC receiver requirements | Huawei,HiSilicon | Noted |  |
| R4-2214365 |  | CR for introduction of release independence for MMSE-IRC receiver requirements | Huawei,HiSilicon | Agreed | *Formal CR to be agreed* |
| R4-2214547 |  | CR: Addtion requirements for MMSE-IRC receiver for intra cell inter user interference for 2RX | Huawei,HiSilicon | Endorsed |  |
| R4-2214743 |  | Draft CR on FDD PDSCH CRS-IM demod requirements for DSS Scenario | China Telecom | Endorsed |  |
| R4-2214744 |  | Draft CR on PDSCH 4Rx demod requirements for MU-MIMO IRC | China Telecom | Endorsed |  |
| R4-2214750 |  | Draft CR on PDSCH demod requirements in ICI-FDD | Apple | Endorsed |  |
| R4-2214754 |  | draftCR for 38\_101-4 Interference model for enhanced performance requirements | Nokia, Nokia Shanghai Bell | Endorsed |  |
| R4-2214755 |  | draftCR for 38\_101-4 CRS-IM 15KHz SCS Scenario - General and applicability | Nokia, Nokia Shanghai Bell | Endorsed |  |
| R4-2214763 |  | Draft CR for TS38.101-4 PDSCH TDD demodulation requirements for inter-cell interference MMSE-IRC | CMCC | Endorsed |  |
| R4-2214764 |  | Draft CR on TDD PDSCH CRS-IM demod requirements for Scenario2 with overlapping spectrum for LTE and NR 15kHz SCS | CMCC | Endorsed |  |
| R4-2214765 |  | Draft CR for introduction of general applicability section of CRS-IM with serving cell 30kHz SCS in TS38.101-4 | CMCC | Endorsed |  |
| R4-2214782 |  | draft CR to 38.101-4: PDSCH requirement for CRS-IM TDD | Ericsson | Endorsed |  |
| R4-2214860 |  | Draft CR to TS38.101-4, Correction to antenna correlation configuration for CQI requirements for inter-cell interference MMSE-IRC receiver | MediaTek inc., Ericsson | Endorsed |  |
| R4-2214870 |  | draftCR:Introduce test setup and FRC for CRS-IM without NWA for FDD scenario2 | Huawei,HiSilicon | Endorsed |  |
| R4-2214362 |  | LS on CRS-IM network assistance signalling | Qualcomm | Approved | Already sent to RAN2 MCC |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents