**3GPP TSG-RAN WG4 Meeting # 96-e R4-200XXXX**

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

**Agenda item: 10.27, 10.28**

**Source:** Ashish Gupta (Reliance Jio)

**Title:** Email discussion summary for [96e][138] DSS\_bands

**Document for:** Information

# Introduction

Email discussion for contributions submitted under agenda item 10.27, 10.28 for dynamic spectrum sharing in band n40 and n38.

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

* 1st round: Discussion on the following topics:

a) DSS band n40 CRs: R4-2009589, R4-2009590, R4-2009591 for approval

b) DSS band n38 CRs: R4-2009859, R4-2009707 for approval

c) Decision on R4-2009944. Enabling LTE/NR spectrum sharing with 4-port LTE

transmissions

d) R4-2010274. Discussion the test model in DSS

e) R4-2010752, R4-2010751. UL shift for LTE/NR spectrum sharing in band

40,38 / n40,n38

* 2nd round: If required on topics in 1st round

# Topic #1: DSS band n40 CRs for approval

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009589 | Reliance Jio | CR to spec 38.101-1 (REL-17) |
| R4-2009590 | Reliance Jio | CR to spec 38.104 (REL-17) |
| R4-2009591 | Reliance Jio | CR to spec 38.307 (REL-17) |

## Open issues summary

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

### Sub-topic 1-1

*Sub-topic description:*

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

**Issue 1-1: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 1-2

*Sub-topic description*

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

**Issue 1-2: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| CR/TP number | Comments collection |
| R4-2009589 | Qualcomm: The CR doesn’t limit the UL shift to 15kHz SCS which was the plenary agreement. Should be revised to contain some wording that the shift is only applicable to UE transmissions with 15kHz SCS. Also, I believe the CRs should be for Rel.15, not 17 for which there is no spec yet. |
| Apple: With regards to UL shift, there is the same discussion for band n48 DSS on whether to make UL shift applicable for both 15 and 30kHzkHz, whether mandate it for 15kHz and keep optional for 30kHz, or whether deprecate 30kHz completely. We do not have a particularly strong view, but UL shift is the common baseband feature that it is not band or even FDD/TDD specific. We do not have any restriction for FDD bands, even though the same concern could have been raised also for FDD bands. From that perspective limiting UL shift only to 15kHz might cause more confusion and problems in specs. As a reminder, when UL shift was added for TDD band n90, it was also made generic for both 15 and 30kHz.  There is a good point from Qualcomm on whether the CR should be for Rel-17 or Rel-15. Since band n40 is Rel-15 band, then UL shift should be ideally added to Rel-15 specs to avoid UE fragmentation. That will also align CRs with band n38 approach, in which CRs are for Rel-15. That should be discussed/checked further to make sure that we do not break any procedural things in 3GPP. |
|  |
| R4-2009590 | Qualcomm: See our comment for 9589 |
| Company B |
|  |
| R4-2009591 | Qualcomm: See our comment for 9589 |
| Company B |
|  |

## Summary for 1st round

### Open issues

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

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

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #2: DSS band n38 CRs for approval

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009859 | Vodafone | CR to spec 38.101-1 (REL-15) |
| R4-2009707 | Vodafone | CR to spec 38.101-1 (REL-16) |

## Open issues summary

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

### Sub-topic 2-1

*Sub-topic description:*

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

**Issue 2-1: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 2-2

*Sub-topic description*

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

**Issue 2-2: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-1:  Sub topic 2-2:  ….  Others: |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| CR/TP number | Comments collection |
| R4-2009859 | Qualcomm: The CR doesn’t limit the UL shift to 15kHz SCS which was the plenary agreement. Should be revised to contain some wording that the shift is only applicable to UE transmissions with 15kHz SCS. |
| Apple: With regards to UL shift, there is the same discussion for band n48 DSS on whether to make UL shift applicable for both 15 and 30kHzkHz, whether mandate it for 15kHz and keep optional for 30kHz, or whether deprecate 30kHz completely. We do not have a particularly strong view, but UL shift is the common baseband feature that it is not band or even FDD/TDD specific. We do not have any restriction for FDD bands, even though the same concern could have been raised also for FDD bands. From that perspective limiting UL shift only to 15kHz might cause more confusion and problems in specs. As a reminder, when UL shift was added for TDD band n90, it was also made generic for both 15 and 30kHz. |
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| R4-2009707 | Qualcomm: see our comments for 9859 |
| Company B |
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## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #3: Enabling LTE/NR spectrum sharing with 4-port LTE transmissions

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009944 | Apple, Reliance Jio | Observations:   1. NR sync pattern C can work with 1-2 port LTE deployments, but 4 port LTE CRS transmission will collide with all NR SSB instances. 2. 4-port LTE transmission modes are widely supported by UEs and used in commercial deployments. 3. Letting NR SSB to collide with LTE CRS has unknown negative impact on both technologies, but NR impact will be worse because LTE CRS are transmitted more often. 4. Since candidate LTE MBSFN sub-frames do not overlap with OFDM symbols where NR SSB is transmitted, LTE MBSFN cannot be considered as a viable solution to avoid overlaps (unless some further changes are introduced impacting other WGs) 5. Blanking LTE sub-frames with the MBSFN feature will diminish the whole point of the DSS feature as it will result in almost static partitioning of resources between LTE and NR. 6. Adding synchronisation pattern B will avoid collision between NR SSB and LTE CRS. 7. The main concern is that enabling synchronisation pattern B might cause larger cell search time if a particular TDD band overlaps with another band that uses only pattern C.   Proposal:   1. RAN WG4 to devise a solution that would enable dynamic spectrum sharing between NR and LTE using 4-port CRS transmission. |
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## Open issues summary

Enable dynamic spectrum sharing between NR and LTE using 4-port CRS transmission.

### Sub-topic 3-1

RAN WG4 to devise a solution that would enable dynamic spectrum sharing between NR and LTE using 4-port CRS transmission.

Issue 3-1:

* Proposals
  + Option 1: SSB Sync Pattern B for 30KHz SSB SCS
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| Company | Comments |
| OPPO | Sub topic 3-1: A few questions to Apple.   1. Objectives of these WIs   In RP-201314 WID of Band 38/n38, the objective is described as “Adapt n38 RF requirements to enable Dynamic Spectrum Sharing between devices operating LTE B38 and devices operating n38, by introducing a UL 7.5 kHz frequency shift for this band for 15 kHz SCS operation. This requirement shall be Release independent from Rel-15.”  In RP=201362, WID of Band 40/n40, the objective is captured as “The work item aims to specify spectrum sharing requirements for n40. Introduce UL 7.5kHz frequency shift for 15kHz data SCS [RAN4],Study for backward compatibility”  As you may notice the sync pattern and 4-port LTE supported were not mentioned in the corresponding proposals and the objectives of the WIDs is more focused on UL 7.5KHz frequency shift. So we are wondering whether the discussion of sync pattern here is out the scope of this AI.   1. Sync Pattern   If Sync Pattern were to be considered here. Could you elaborate on how the issues on band 38/n38, band 40/n40 are different from that on band 48/n48 since Apple is the moderator of the latter topic. With regards to sync pattern, if band 38, 40, 48 share the same issue which is 4-port LTE cannot be supported with existing pattern C , we would recommend to start another WI (or AI) to discuss DSS support for bands share the same challenges. |
| Qualcomm | Sync pattern was already agreed in the last meeting, what is the issue with pattern C?  Regarding the 4 port LTE issue, this was brought up before but we believe it’s a non-issue. The SSB is only sent once every 20ms and only some of the CRS Res are impacted. So far, nobody has actually quantified this performance loss but it should be very small. The simplest solution is for the eNB not to schedule and LTE transmission on the 3rd and 4th layer on the RBs occupied by SSB. 3rd and 4th layer CRS are not used by the UE for measurements so there will be no impact. |
| Nokia | Sub topic 3-1: This issue has been discussed for n48 for a long time but no consensus is made. We are ok to add pattern B on top of pattern C.  We prefer the same conclusion (whatever it is) about sync pattern is made for all band n38, n40 and n48. |
| Apple | As pointed out in our discussion paper and mentioned by other companies, the issue indeed concerns several TDD bands: n41, n48, n38, and n40. In fact, this problem applies to any TDD band in which DSS will run.  At least during the DSS for band n48 discussion the following “solutions” were mentioned: “let’s conclude that 4-port LTE CRS is not possible with DSS”, “let them collide”, “mute LTE CRS”, “use LTE MBSFN”, “add sync pattern B”. Unfortunately, none of the approaches was perfect and there was not enough time either to actually evaluate properly pros and cons.  Our major preference is not to ignore the problem, because otherwise the same discussion will emerge every time DSS is considered for a new DSS band. Instead, we would welcome companies to look deeper into what we can do. How we do it – offline discussions, TEI, SI/WI – can be contemplated further and will depend just on us. |
| Jio | Band n40 does not overlap with any other band. Hence, we believe, Sync Pattern B is an ideal mode of operation for DSS in this band. Any degradation in LTE performance due to collision with NR will be detrimental to our network experience. Neither we can afford excessive LTE Muting. |
| Samsung | It seems operator shared the view to have SSB pattern B in previous meeting discussion for band n40. However, it is not addressed in the final CR to update the SSB pattern for this band. We would support to resolve the issue to avoid restriction on NW configuration, such as add SSB pattern B on top of pattern C, or replace SSB pattern C by pattern B. And other solution is not preclude as well. We also agree that the solution should be generic and applied to all sub6GHz NR with the use case of DSS. |

### CRs/TPs comments collection

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

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| --- | --- |
| **CR/TP number** | **Comments collection** |
|  | Company A |
| Company B |
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|  | Company A |
| Company B |
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## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #4: Discussion the test model in DSS

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2010274 | Samsung | Proposal 1: The test model should be introduced for DSS to measurement timing/framing alignment error  Proposal 2: Define the minimum requirement of timing/framing alignment error for DSS scenarios  Proposal 3: Common physical channel parameters for PDCCH for BS type 1-C and BS type 1-H test models for DSS. Refer TDOC  Proposal 4: Common physical channel parameters for PDSCH for BS type 1-C and BS type 1-H test models for DSS. Refer TDOC  Proposal 5: Common physical channel parameters for PDSCH by RNTI for BS type 1-C and BS type 1-H test models for DSS. Refer TDOC  Proposal 6: Common physical channel parameter for LTE CRS and MBSFN for DSS with considering NR and LTE deployed in the same or different center frequency, respectively. Refer TDOC |

## Open issues summary

### Sub-topic 4-1

Discussion on Samsung Proposal

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| Company | Comments |
| Nokia | Sub topic 4-1: We are not convinced to have a new test model. We wonder what additional RF impairments would be tested with such a new test model, which cannot be tested with existing test models. The need of such a new test model has never been discussed in n90 DSS and n48 DSS work items. |
| Apple | Just for our understanding, the proposed test model will be for the network, not for UE, right? |
| Samsung | In case of NR co-exist with LTE, NR and LTE can interfere each other. When deploying NR systems in a certain LTE site, new NR DUs shall be combined with LTE DUs for the DSS. Regarding resource slot-level sharing, where the NR DUs combined with LTE DUs in a time domain, NR and LTE can interfere each other at the presence of timing alignment error between NR and LTE systems  The current test model in RAN4 cannot guarantee the basic performance considering frame timing error for more complex system performance, we see a need to introduce the related test model.  The test model is applied for network |

### CRs/TPs comments collection

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

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

## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #5: UL shift for LTE/NR spectrum sharing in band 40,38/n40,n38

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2010751 | OPPO | Proposal 1: Define requirements for the existing n38 band without introducing new band  Proposal 2: UE optionally support UL 7.5KHz shift for SCS =30KHz, UE mandated to support 7.5 KHz for SCS = 15KHz. |
| R4-2010752 | OPPO | Proposal 1: Define requirements for the existing n40 band without introducing new band  Proposal 2: A UE is not mandated to support UL 7.5 KHz shift |

## Open issues summary

### Sub-topic 5-1

Discussion on R4-2010751

Issue 5-1:

* Proposals
  + Option 1: UE optionally support UL 7.5KHz shift for SCS =30KHz, UE mandated to support 7.5 KHz for SCS = 15KHz
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 5-2

Discussion on R4-2010752

Issue 5-1:

* Proposals
  + Option 1: A UE is not mandated to support UL 7.5 KHz shift
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| Company | Comments |
| XXX | Sub topic 5-1: Support Proposal 1 by OPPO not to define a new band.  We do not support an optional capability only for 30 kHz. Either the shift shall not be applicable at all to 30kHz, or it shall follow 15 kHz. The same conclusion between band n38 and n40 are preferred regarding mandatory/optional shift.  Sub topic 5-2: Support Proposal 1 by OPPO not to define a new band.  The same conclusion between band n38 and n40 are preferred regarding mandatory/optional shift. |
| Jio | Sub topic 5-2:  7.5KHz UL shift is required for 15KHz RE level Rate matching when operated in DSS. We don’t support making it optional. |

### CRs/TPs comments collection

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

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

## Summary for 1st round

### Open issues

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

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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