**3GPP TSG-RAN WG4 Meeting # 98-e R4-21XXXXX**

**Electronic Meeting, 25 January – 5 February 2021**

**Agenda item:** 12.4

**Source:** Ericsson

**Title:** Email discussion summary for [98e][148] FS\_NR\_600MHz\_ext

**Document for:** Information

# Introduction

This email discussion is divided into five topics

1. General (work plan and TR)
2. Regulatory aspects
3. Need for coexistence studies
4. Band plan and feasibility of implementation
5. Reply LS to AWG

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

* 1st round:
	+ agree the work plan and TR skeleton
	+ decide on which regulatory requirements that should be considered for the APT 600 MHz band
	+ include regulatory background in the TR (from contributions)
	+ narrow down options for the APT 600 band arrangement (if other than B1 and B2, based on proposals)
	+ reply to AWG from this meeting or not?
* 2nd round: TBA

# Topic #1: General (work plan and TR)

A work plan and a TR skeleton must be agreed.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100055 | Spark NZ | Title: Details of workplan for study of extended 600MHz NR band |
| R4-2100167 | Spark NZ | Title: Blank TR for extended 600MHz NR band |

## Open issues summary

### Sub-topic 1-1 Work plan

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

**Issue 1-1: approval of work plan**

* Proposals
	+ Option 1: Agree work plan as proposed in R4-2100055
	+ Option 2: Modify the work plan proposed R4-2100055 (specify how)
* Recommended WF
	+ Option 1

### Sub-topic 1-2 TR skeleton

*Sub-topic description*

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

**Issue 1-2: approval of TR skeleton**

* Proposals
	+ Option 1: Agree the TR skeleton as proposed in R4-2100167
	+ Option 2: Modify the work plan proposed R4-2100167 (specify how)
* Recommended WF
	+ Option 1 (the outline of the TR can always be modified)

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1: Sub topic 1-2: |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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.*

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| --- | --- |
|  | **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*

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| --- | --- |
| **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: Regulatory aspects

Several companies contribute with information on regulatory aspects. A regulatory background should be included in the TR, possibly in a joint TP.

See also 2.3.2 (comments on TP in R4-2102572)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100744 | Nokia, Nokia Shanghai Bell | Title: Regulatory study for APT 600 MHz***Proposal 1: It is assumed that there is no specific regulatory requirement (such as additional spurious emissions) to study in RAN4 other than ones that can be reused from band n71.*** |
| R4-2102162 | Ericsson | Title: Extended 600MHz band - Regulatory aspects |
| R4-2102572 | Huawei | Title: Regulatory aspects for the 600MHz range in APT regionBased on the discussion, it is proposed to agree in the following proposals: **Proposal 1**: approve the attached TP to TR on regulatory aspects.  |
|  |  |  |

## Open issues summary

### Sub-topic 2-1 Coexistence with other services

*Sub-topic description: what to include in the TR, adoption of Band n71 limit/requirements for B1/B2.*

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

**Issue 2-1: Coexistence with other services, regulatory background to be captured in the TR**

* Proposals
	+ Option 1: Agree the TP as proposed in R4-2102572
	+ Option 2: Merge information in R4-2100744 and R4-2102162 with R4-2102572 into a revised joint TP
	+ Option 3: other (specify what)
* Recommended WF
	+ Option 2

### Sub-topic 2-2 Requirements relevant for APT600

*Regulatory requirements*

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

**Issue 2-2-1: Regulatory requirements relevant for B1/B2 for BS and UE**

* Proposals
	+ Option 1: no specific regulatory requirement (such as additional spurious emissions) to study in RAN4 other than ones that can be reused from band n71 as proposed in R4-2100744.
	+ Option 2: Other (specify what)
* Recommended WF
	+ TBA

**Issue 2-2-2: BS/UE requirements for coexistence with other 3GPP bands for B1/B2**

* Proposals
	+ Option 1: for B1/B2 adopt the Band 71 requirements for coexistence with other 3GPP bands
	+ Option 2: other (specify what)
* 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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2102572TP for TR | Company A |
| Company B |
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## Summary for 1st round

### Open issues

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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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## Summary on 2nd round (if applicable)

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| --- | --- |
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# Topic #3: Need for coexistence studies

Which coexistence requirements should be considered for the APT 600 MHz band?

It is remarked that studies of coexistence with other radio services are not in the scope of 3GPP (RAN4).

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100745 | Nokia, Nokia Shanghai Bell, CBN | Title: Coexistence for APT 600 MHz***Observation 1: Option B1 and B2 can coexist with the broadcast service below 610 and 605 MHz, respectively, assuming the minimum guard-band of 7 MHz.******Observation 2: Option B2 may require vacating one more TV channel depending on TV channel raster.******Proposal 1: No specific BS spurious emission requirement to protect the broadcast service is considered in this study item.*** ***Observation 3: The coexistence requirement with radio astronomy are out of scope of 3GPP.******Proposal 2: No specific BS spurious emission requirement to protect the radio astronomy service is considered in this study item.*** ***Proposal 3: There is no specific coexistence issue with band n28 for APT 600 MHz.*** |
| R4-2101957 | ZTE Corporation, CBN | Title: Coexistence study for extended 600MHz NR band**Observation 1: for Option B1, frequency separation between upper frequency edge of DTV37 and lower frequency edge of extended 600MHz is 6MHz which is less than minimum 7MHz frequency separation requested by FCC.** **Observation 2: for Option B2, frequency separation between upper frequency edge of DTV37 and lower frequency edge of extended 600MHz is 11MHz which is large than the minimum 7MHz frequency separation requested by FCC and existing frequency separation 9MHz between n71 and DTV CH 36.** |
| R4-2102573 | Huawei | Title: Initial considerations on the coexistence studies for 600MHz SI**Observation 1:** before (potential) analysis on co-existence scenarios starts, RAN4 shall first conclude on the preferred frequency arrangement (B1, B2 or other) for the extended 600MHz band in Region 3. **Observation 2:** TR 36.755 shall be used as the starting point for the (potential) co-existence studies in this SI, with consideration of Region 3 regulations on adjacent services.  |
| [R4-2100501](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100501.zip) | CATT, CBN | **It is seen that both option B1 and option B2 remain the same duplex direction as Band n71. Thus both options keep well harmonized with nearby 3GPP bands from co-existence point of view.** **Usually large geographic separation is used to protect such service (RAR) and there is no need to introduce additional emission requirement for the 600MHz BS transmitter.** |

## Open issues summary

### Sub-topic 3-1 Consideration of Region 3 specific requirements

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

**Issue 3-1-1: account of coexistence with broadcast services for BS (for B1/B2 or other proposed arrangement)**

* Proposals
	+ Option 1: for B1/B2, no specific BS spurious emission requirement to protect the broadcast service is considered as proposed in R4-2100745
	+ Option 2: other (specify what)
* Recommended WF
	+ TBA

**Issue 3-1-2: account of coexistence with RAS for BS (for B1/B2 or other proposed arrangement)**

* Proposals
	+ Option 1: for B1/B2, no specific spurious emission requirement to protect the radio astronomy service is considered as proposed in R4-2100745
	+ Option 2: other (specify what)
* Recommended WF
	+ TBA

**Issue 3-1-3 Requirements for coexistence with Band n28**

* Proposals
	+ Option 1: for B1/B2, there is no specific coexistence issue with band n28 for APT 600 as proposed in R4-2100745
	+ Option 2: other (specify what)
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 3-1: ….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** |
| XXX | Company A |
| Company B |
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| YYY | Company A |
| Company B |
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## Summary for 1st round

### Open issues

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|  |  |
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| **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*

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| **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: Band plan and feasibility of implementation

Two band arrangements, B1 and B2, have been proposed by AWG. The SI is also open for studies of other possible band arrangements.

Views on feasibility of different duplexer/band arrangements are also collected under this topic.

See also 4.3.2 (comments on TP in R4-2102574)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2100056 | Spark NZ | Title: Frequency band arrangements and duplexer options for extended 600MHz NR bandThe frequency band arrangements are presented in this contribution. |
| R4-2100501 | CATT, CBN | Title: Consideration on extended 600MHz NR band**Proposal 1: It is proposed to use Option B2 as the starting point for 600MHz frequency arrangement.****Proposal 2: It is proposed to investigate supporting larger carrier bandwidth (>25MHz) in the extended 600MHz NR band.** |
| R4-2100542 | Skyworks Solutions Inc. | Title: Extended 600MHz NR Duplexer Feasibility and Band Arrangement**Proposal:** * **Alternative solutions using band n71 as-is plus an additional NR band are studied**
* **Additional band may reuse existing or extended band for filter implementations**
* **These options except option 5 do not preclude the use of a 2x40MHz duplexer once feasible without compromising the performance of band n71 while option 5 enables direct reuse of existing UE transceivers**
* **This approach enables immediate reuse of band n71 without impacting its performance and enables additional 5MHz of spectrum at reasonable additional size and cost.**
 |
| R4-2100746 | Nokia, Nokia Shanghai Bell | Title: Frequency arrangements for APT 600 MHz***Observation 1: The ecosystem of band n71 should be maximally reused for APT.******Observation 2: The passband bandwidth extension is not practically feasible without significant degradation from band n71 due to its larger insertion loss.******Observation 3: Option B2 is more harmonized with band n71 in terms of UE implementation and duplexer performance.******Observation 4: Option B2 is a natural extension of n71 and is not harmful to n71 ecosystem.*** ***Proposal 1: Option B1 shall be discouraged for APT/AWG to proceed.******Observation 5: The upper duplexer passband bandwidth can be up to UE implementation as far as UE can support any channel bandwidth in any carrier frequency within the band and can meet the same requirement as band n71 for the entire frequency range.******Proposal 2: The set of the channel bandwidths shall be the same as band n71.******Proposal 3: UE RF requirement (such as MOP, REFSENS, etc) shall be the same as n71.******Proposal 4: Other duplexer implementation is not precluded but the frequency arrangement and RF requirement baseline should be based on Option B2 without relaxing any requirement from band n71.*** |
| R4-2101372 | Xiaomi | Title: Discussion on frequency arrangement for extended 600MHz NR Band**Proposal: Prefer to Option B1 for extended 600MHz NR band.** |
| R4-2101958 | ZTE Corporation, CBN | Title: Discussions on Option B1 and B2 for extended 600MHz**Observation 1: there should be no issues between extended 600MHz and n28;****Observation 2: both Option B1 and B2 should be feasible from BS perspective;** **Observation 3: it might be not easy to support 30MHz with single duplexer from UE perspective;** **Observation 4: to reuse asymmetric UL 20MHz/DL 35MHz bandwidth configuration in n71 UE side for extended 600MHz;** |
| R4-2102161 | Ericsson | Title: APT 600 MHz band – frequency arrangements**Proposal: Consider frequency arrangement option B2 for the new 600MHz band with a 2 x 30 MHz split-duplexer arrangement.**  |
| R4-2102407 | Qualcomm Incorporated | Title: 600 MHz band for Region 3Further study is recommended. |
| R4-2102574 | Huawei, CBN | Title: Feasibility analysis of the frequency arrangement in 600MHz range for APT**Proposal 1**: agree on the recommendation of option B2, with the channel bandwidth of 35 MHz, as follows: *Option B2 is recommended for the frequency arrangements in the band 470-703 MHz for APT Members that wish to implement both the APT700 and a 600 MHz frequency arrangements, considering the channel bandwidth of 35 MHz.***Proposal 2**: approve the attached TP to TR on the B1/B2 frequency arrangement feasibility aspects.  |
| R4-2102589 | Apple | Title: Band Plan for 600MHz SIObservation 1: In the 600MHz frequency range the maximum realizable bandwidth for a single duplexer solution using available technologies is 35 MHz, better performance is achieved with 30MHzObservation 2: A dual duplexer band is quite complicated to specify, as the band definition depends on the UE implementation of the duplexers used to specify the band.Observation 3: Specifying a new dual duplexer band is technically possible but has the disadvantage of not using the economy of scale of existing band 71/n71 phonesProposal 1: Option B1 should not be used as a 2x 40MHz duplexer doesn’t seem to be possible with reasonable performance, size and costProposal 2: RAN4 should not specify a new dual duplexer band as proposed in option B2, but a new single duplexer band covering the additional spectrum in APT as proposed in Option B2aProposal 3: Specify a new single duplexer FDD band covering 673-703MHz UL and 627-657MHz DL and mandate support of band 71/n71 to be supported together with this band |

## Open issues summary

### Sub-topic 4-1 Duplex arrangement

*Sub-topic description: feasibility of different duplexer arrangements, recognizing that there are inter-dependencies*

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

**Issue 4-1-1: Passband width of the duplexer for a band arrangement with a 11(6) MHz duplex gap for B1(B2)**

* Proposals (more than one can apply, per duplexer if split, dependence on BC protection can also be stated)
	+ Option 1: 40 MHz for B1
	+ Option 2: 35 MHz for B1
	+ Option 3: 40 MHz for B2
	+ Option 4: 35 MHz for B2
	+ Option 5: 30 MHz
	+ Option 6: other (specify which)
	+ Option 7: passband width for band arrangement other than B1/B2 (state which)
* Recommended WF
	+ TBA

**Issue 4-1-2: Split duplexer or single duplexer (performance, complexity and cost)**

* Proposals
	+ Option 1: single 2 x 40 MHz duplexer for B1 or possibly B2
	+ Option 2: single duplexer (of different passband width) and another band arrangement
	+ Option 3: split duplexer for B1/B2
	+ Option 4: other (specify which)
* Recommended WF
	+ TBA

**Issue 4-1-3: Feasibility of 6 MHz duplex gap with ‘standard’ FDD requirements (B2)**

* Proposals
	+ Option 1: feasible for single 2 x 40 MHz duplexer
	+ Option 2: feasible for split duplexer (state passband width)
	+ Option 3: other (specify which)
* Recommended WF
	+ TBA

### Sub-topic 4-2 Channel bandwidth

*Sub-topic description: channel bandwidths, can be asymmetric*

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

**Issue 4-2: maximum channel bandwidth for B1/B2 or alternative band arrangements**

* Proposals
	+ Option 1: 30 MHz
	+ Option 2: 20 MHz
	+ Option 3: other (state for which band arrangement if other than B1/B2)
* Recommended WF
	+ TBA

### Sub-topic 4-3 Band arrangement

*Sub-topic description: down-select band options, preference for B1 or B2, other arrangements for study if any*

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

**Issue 4-3-1: B1 or B2?**

* Proposals
	+ Option 1: B1
	+ Option 2: B2
	+ Option 3: other (next issue)
* Recommended WF
	+ TBA

**Issue 4-3-2: other band arrangements for study**

* Proposals (more than one possible)
	+ Option 1: consider only B1 or B2
	+ Option 2: specify a new single duplexer FDD band covering 673-703MHz UL and 627-657MHz DL and mandate support of band 71/n71 to be supported together with this band as proposed in R4-2102589
	+ Option 3: consider Band n71 + Band X using extended n28A UL + 5MHz SDL (Option 3 in R4-2100542)
	+ Option 4: consider Band n71 + Band X using band n85 UL + 5MHz SDL (Option 4 in R4-2100542)
	+ Option 5: consider band n71 + FDD band nX with 6MHz gap between bands based on 5MHz shifted n71B duplexer (Option 5 in R4-2100542)
	+ Option 6: consider band n71 + FDD band nX with 11MHz gap between bands (Option 6 in R4-2100542)
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 4-1: Sub topic 4-2:….Others: |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2102574TP to TR | 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.*

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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

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## 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: Reply LS to AWG

A reply to the LS from AWG in RP-202934 is proposed.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| Revision\_of\_R4-2102575 | Huawei, CBN | Title: [DRAFT] Reply LS on technical feasibilities for frequency arrangements for IMT in 470 – 703 MHz band, cover**Proposal 1**: send reply LS to AWG, based on the attached Draft Reply LS proposal on the B1/B2 frequency arrangement feasibility aspects. [Moderator: approval of draft reply LS assumed.] |

## Open issues summary

### Sub-topic 5-1 Reply LS to AWG

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

**Issue 5-1: Reply LS to AWG from RAN4#98-e**

* Proposals
	+ Option 1: Agree Reply LS as proposed in R4-2102575
	+ Option 2: Modify the proposed Reply LS in R4-2102575 (specify how)
	+ Option 3: reply to AWG at a later RAN4 meeting
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 5-1: ….Others: |

### CRs/TPs comments collection

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

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## Summary on 2nd round (if applicable)

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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”* |