**3GPP TSG-RAN Meeting # 90-e RP-202859**

**Electronic Meeting, December 7-11, 2020**

**Agenda item:** 9.1.4

**Source:** Moderator (Nokia)

**Title:** Moderator's summary of email discussion [90E][12][600MHz\_SI]

**Document for:** Information

# Introduction

The documents intent to capture companies’ comments on the SID on extended 600 MHz NR band in[**RP-202515**](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_90e/Docs/RP-202515.zip)[1]. This is spectrum related SI.

# Comments on extended 600 MHz NR band

## Topics for discussion

* Sub-topic 1-1: SI objectives
* Sub-topic 1-2: Timeline e.g. number of meetings
* Sub-topic 1-3: Any other issue

## Companies’ views collected

Interested companies to provide comments on the following objectives:

The purpose of this study item is to:

Study a harmonised frequency variant approach within the frequency range of 612-652/663-703 MHz. The liaison statement from AWG to RAN4 has given two options B1 and B2 respectively. For each option it will be desirable to study the technical feasibility of the duplex filters needed, centre band gap, insertion loss.

For option B2 the duplex distance is 46 MHz as is the case with NR band n71. The bottom duplexer is the same as that of n71, with an additional upper duplexer that should have as large possible overlap as possible with the lower duplexer in n71 but at the same time being able to handle the duplex gap of 6 MHz. The size of this upper duplexer needs to be studied. The co-existence requirement with adjacent broadcast service below 617 MHz can be fulfilled with the same condition as in band n 71. It is assumed that there are no services in 657- 663 MHz.

For option B1 the duplex distance is 51 MHz , which may be considered in case of an additional broadcasting channel can be vacated such that the guard band to the adjacent broadcast service is still maintained similarly to band n 71. In addition, the protection of radio astronomy is required in certain countries in Region 3 ( WRC 15).

Both options B1 and B2 addressed here are just starting point for the feasibility study to enable the utilization on extended 600MHz band..

The AWG work plan forwarded to the 3GPP shows this work to be completed by September 2021.

Specifically, this study item includes the following objectives:

* Regulatory study of the frequency range around 600MHz
* Co-existence study for the frequency range of 612-652/663-703 MHz, (if needed)
* Study the two band plan (options B1 and B2 )for the frequency range of 612-652/663-703 MHz.
* Study the channel arrangement for the potential band, e.g. channel bandwidth, channel raster, center frequency, etc.
* Study of transmitter emissions and appropriate receiver characteristics for both BS and UE based on the band plans.
* Answer the request from AWG regarding the technical feasibility of option B1 and B2, respectively.
* Further extension of this study item may also involve a similar study for LTE

### Sub-topic 1-1: SI objectives

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| **Company** | **Comments** |
| Spark NZ Ltd | The objectives and the tasks listed in section 1.2 represent a fair and accurate representation of the study items needed. AWG has a meeting in March 2021. It will be desirable to send a response to their LS. |
| CBN | The B1 and B2 options are reasonable and suitable as the starting point of this study item, other potential extended 600MHz options are possible for further study as well depending on the actual regulatory in regions. |
| Huawei, HiSilicon | Support to have a SI for 600MHz. For the objectives, agree with CBN that option B1 and B2 should be starting point. The appropriate band plan depends on further study in RAN4.  |
| DISH | Add the following note into the objectives for clarity “NOTE: The SI does not impact any requirements defined for US 600MHz band” |
| Skyworks | In low band, n71 requires the most difficult duplexer for full band support and some solution still have dual duplexer approach for n71 but unlike B2 that has 35MHz overlap, these have only 20MHz overlap. If achievable, extending by 5MHz like for B1 will potentially result in degraded performance for the n71 related spectrum. Regarding B2 the very small 6MHz gap will potentially result in limited band protection for the upper 5MHz DL, also if 35MHz bandwidth is currently discussed for n71, Recent RAN4 agreement are for DL only and UL stays limited to 20MHz. Finally its unclear how DTV coex can be achieved by the BS without any guard-band if the same DTV allocation than the one studied for n71 is assumed. For all this the study cannot be limited to B1 and B2 only:Default assumption should be the reuse of n71 full band duplexer and RAN4 to study how to potentially cover the additional 5MHz (DL and/or UL). Other solutions that B1 and B2 shall not be precluded and there may be constraint to support 35MHz in DL. |
| ZTE | Respect the APT’s request and we support to have a SI to study 600MHz. Option B1/B2 could be starting point for further front-end duplexer analysis.  |
| Apple | Since the aim of the SI is to perform regulatory and co-existence study including potential channel arrangements and band plans, it would be premature to consider options B1 and B2 as the baseline or starting points for this discussion. As explained in comments from Skyworks, both B1 and B2 have certain challenges and thus RAN WG4 will need to take a broader look at how new spectrum can be supported accounting for existing bands and solutions. Nevertheless, B1 and B2 are the options that RAN WG4 will have to analyze to answer the request from AWG. |
| Nokia | It is not clear why system parameters/requirements would need to be studied at this stage; we propose to focus on aspects related to the received LS (technical feasibility of option B1 and B2) and modify the objectives as follows. Due to extreme R4 workload, we propose to focus on NR only.The proposed objectives are* Regulatory study of the frequency range around 600MHz
* Co-existence study for the frequency range of 612-652/663-703 MHz, (if needed)
* Study the two frequency arrangements (options B1 and B2) and conclude the possible implications (such as insertion loss, transmitter and receiver characteristics, system limitations such as channel bandwidths, etc.) of different duplex filter implementations.
* Answer the request from AWG regarding the technical feasibility of option B1 and B2, respectively.
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| T-Mobile USA | We support the proposal from DISH Network to add a note, but would prefer to modify it as follows since a SI cannot impact Technical Specifications “NOTE: The SI and subsequent Work Item shall ~~does~~ not impact any requirements defined for US 600MHz band.” We would prefer Option B2 over B1 because of the commonality with Band 71/n71 which should be good for the ecosystem and roaming. B1 would use a different UL/DL spacing which we think would make it incompatible with existing n71 devices. We would support a potential other alternative option mentioned by Skyworks.  |
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### Sub-topic 1-2: Timeline e.g. Number of meetings

The target completion date is RAN#92 (2 quarters)

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| **Company** | **Comments** |
| CBN | Okay with RAN#92 |
| Huawei, HiSilicon | Okay with RAN#92 |
| Nokia | Propose to extend this SI to September as mentioned in the objectives |
| Spark | Okay with Ran #92 |
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### Sub-topic 1-3: Any other issue

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| **Company** | **Comments** |
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## Initial summary of discussion

Based on the comments received in the first round, further discussion is needed on which objectives need to be included in the final version of SID. Furthermore, there was a request to consider a note this SI will not impact any requirements defined for US 600MHz band. It was also proposed to extend SI target completion to RAN#93.

## Topics for discussion in the 2nd round

* Sub-topic 1-4: Objectives of the SI
* Sub-topic 1-5: SI target completion

## Companies’ views collected in the 2nd round

### Sub-topic 1-4: Objectives of the SI

Based on the comments received, the following SI objectives are proposed:

* Regulatory study of the frequency range around 600MHz
* Co-existence study for the frequency range of 612-652/663-703 MHz, (if needed)
* Study the two frequency arrangements (options B1 and B2) and conclude the possible implications (such as insertion loss, transmitter and receiver characteristics, system limitations such as channel bandwidths, etc.) of different duplex filter implementations. Other options are not precluded.
* Answer the request from AWG regarding the technical feasibility of option B1 and B2, respectively. Further options are not precluded and may be included in LS to AWG.

NOTE: The SI shall not impact any requirements defined for US 600MHz band.

Are above mentioned SI objectives acceptable? If not, kindly provide alternative.

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| **Company** | **Comments** |
| Nokia | Yes |
| Spark | Yes |
| Qualcomm Incorporated | We don’t understand the need for the NOTE and prefer to remove it. This is a SI whose output will not be a CR to the specification so we don’t understand how any existing requirement can be impacted. Moreover, we think that if there is an eventual work item and there is an eventual new band defined, then we should not exclude the possibility to leverage UE implementation across common frequency ranges. There are examples in the specification where “for the UE that supports X and Y, then …” which may also apply here. Obviously, this would not impact Band 71/n71 devices that do not support the new band. |
| Telstra  | We are supportive of the proposed objectives. However, we agree with Qualcomm and do not understand how the proposed study can impact requirements on the US 600 MHz band and thought the Justification was quite clear that the study is intended to be scoped for use in Region 3. Any future normative stage can be clearer on applicability of the requirements however we do not see the need for the proposed note from North American operators. |
| CBN | The updated objectives are acceptable to us. We don’t think the note is necessary for a study item either.  |
| Samsung | We also would like to clarify the meaning of note based on the clear justifications in the SID. In our understanding, such note can be removed. Maybe to make the objective clear enough, we can say “regulatory study of frequency range around 600MHz in Region 3” to focus on the region 3 regulatory study  |
| DISH | We are NOT ok with the SI unless it is made very clear that SI outcome does not impact US600MHz requirements. For instance, B71/n71 UE Co-existence protection levels shall remain the same etc. |
| EBU | The band 470 – 694/698 MHz which includes the targeted spectrum range is widely used for digital terrestrial broadcast (DTT) networks around the world. These networks will continue to exist for many years. It has been demonstrated in the bands below 1 GHz that compatibility between mobile uplink and DTT is technically difficult to achieve with reasonable effort on both sides. EBU therefore requests that the objectives of the study include finding frequency arrangements that facilitate co-existence between the 3GPP system and DTT. |
| Huawei, HiSilicon | The suggested objective of the study of frequency ranges is mixed with other aspects together, e.g. Tx/Rx characteristics, channel arrangements, which is not clear as a guidance for the study in RAN4. Recommended revisions are:* Study the two frequency arrangements (options B1 and B2). Other options are not precluded.
* Study UE architectures, transmitter and receiver characteristics, channel arrangement such as channel bandwidths, etc., which are related to the potential band plan.

We think that no need to consider the note at this moment since the study is targeted for Region 3 according to the justification part.  |
| Apple | The item 3 on the objective list should be changed as presented below. Study potential frequency arrangements and conclude the possible implications (such as insertion loss, transmitter and receiver characteristics, system limitations such as channel bandwidths, etc.) accounting for different duplex filter implementations. @**Huawei**: We do not see a need to split this item into two separate items as potential frequency arrangements go hand-in-hand with UE architectures and implementation peculiarities. |
| ZTE | We also support the proposed objectives. In addition, current wording in the objectives could cover both UE and BS, it’s more appropriate than only mentioning UE side.* Study of transmitter emissions and appropriate receiver characteristics for both BS and UE based on the band plans.

Regarding NOTE for US600MHz, we also think the Note could be removed based on the SID justification and we only focus on Region 3 regulatory requirement study which is requested by APT LS.  |
| Skyworks | We are OK with most objective since other solutions than B1 and B2 can be studied and their potential benefit versus proposed B1 and B2 can be assessed. Regarding the coexistence objective though we believe it is needed to study impact to DTV on the same basis as for band 71 especially if the same implementation is used to cover this new band and band 71. |
| Ericsson | We support the objectives. We agree with Dish and T-Mobile that the SI should not impact the EXISTING US 600 MHz band. It is true that the requirements will not be defined in SI rather in the WI phase. However, the foundation will be laid in the SI. So it is important to take into account this important aspect in the SI. |

### Sub-topic 1-5: SI target completion

SI target completion: RAN#92 or RAN#93?

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| **Company** | **Comments** |
| Nokia | RAN#93 |
| Telstra  | We don’t have a strong view but feel the work needs to fit around the existing RAN4 bandwidth. We would however like to see a timely response to the LS from AWG. |
| Spark | Agree with Telstra. We should also send an interim response to the AWG as they have a meeting in March 2021 |
| CBN | RAN#92 |
| Samsung | No strong view but it is assumed RAN4 will send response as long as RAN4 reach consensus on the LS even before the completion of SI.  |
| Huawei | We prefer setting the initial target for RAN#92.  |
| Apple | No strong view on the target completion date, RAN#93 seems more realistic accounting for the overall RAN4 workload. Nevertheless, RAN4 can send the LS response before the completion of the SI.  |
| Ericsson | RAN#93. Given the RAN4 workload, nature of e-meetings and the scope of the SI, in our view RAN#93 is more realistic time plan. However, we don’t have any concern to send LS to AWG as early as possible. |

## Summary of discussion

Based on the comments received it is proposed to agree on the following objectives, it is proposed to set SI target completion to RAN#93:

* Regulatory study of the frequency range around 600MHz in Region 3
* Co-existence study for the frequency range of 612-652/663-703 MHz such as with DTV (if needed)
* Study potential frequency arrangements and conclude the possible implications (such as insertion loss, transmitter and receiver characteristics for both BS and UE, system limitations such as channel bandwidths, etc.) of different duplex filter implementations.
* Consider options B1 and B2 from AWG LS, but other options are not precluded.
* Answer the request from AWG regarding the technical feasibility of option B1 and B2, respectively. Further options are not precluded and may be included in LS to AWG.

NOTE: Since regulatory study of frequency range around 600MHz is for Region 3, the SI outcome will not impact any requirements defined for US 600MHz band.

# References

[1] RP-202515 Study on extended 600MHz NR band Spark NZ Ltd