3GPP RAN TSG Meeting #98 RP-22xxxx

Electronic meeting, December 12 – 16, 2022 (revision of RP-223196)

Agenda item: 9.2.2

Source: Apple Inc, AT&T

Title: Text proposal for Study on UE support of regionally-defined subsets of an NR band

WI/SI: FS\_NR\_subset\_band\_support

Release: Rel-18

Document for: Approval

# 1 Introduction

During the RAN#95 meeting an issue of so-called phased introduction of frequency ranges was raised and discussed. And as further discussed in [1-3], this issue comes from the fact that while 3GPP tends to define, when possible, large bands covering large contiguous chunk of spectrum, it is not necessarily the case that all countries or geographical areas will have the same allocation. Some countries or regions might have only a sub-range within an NR band, and the UEs will support this sub-range and will be tested for it. However, if a particular country/region extends further available frequencies within the same band – effectively resulting in phased introduction of frequency (sub-)ranges within the same NR band – there will be two types of UEs supporting only the initial set of frequency sub-ranges and supporting an extended set of frequencies.

While 3GPP resolved this issue for US and Canada, several companies expressed the preference to have a common solution or framework for similar cases. As a result, RAN#96 agreed a new RAN SI [5], which aims at studying further general solutions for this problem.

This paper presents a text proposal for potential solutions that do not require a new band number. The content of the text proposal is based on input from the following documents:

- RP-223196 (Apple Inc.)

- RP-223339 (AT&T)

- RP-223357 (Huawei, HiSilicon)

# 2 Text proposal for TR 38.893

-------------------- TEXT PROPOSAL (BEGIN) --------------------

# 6 Possible solutions

### 6.y Solution Y (reuse NR band number, new signalling)

With this solution, the existing NR band is re-used, but there is also explicit signalling – either from the UE to the network,from the network to the UE, or both – providing further information to the communicating entities regarding which sub-bands are supported. Hence for the sake of clarity we will focus separately on potential options for signalling for both communication sides.

The premise for introduction of signalling from the network to the UE is to prevent legacy UEs from camping on particular sub-bands for which they are not certified, i.e., sub-bands added in later releases. The easiest way to accomplish this is to define new NS flag(s) associated with the corresponding band. With this approach the network broadcasting new NS flag(s) can be always sure that a legacy UE will not camp on a particular sub-band. It does not matter how many sub-bands are added and in which release – as long as every sub-band is associated with a particular NS flag, the network remains in controls of permissible cells for camping destinations.

As for the UE to the network signalling, one of the main reasons to have it is to provide the network with additional information regarding which sub-bands a UE supports to facilitate network sub-band selection for re-direction and handover procedures.This information on supported sub-bands can be implemented in at least the following ways:

- **Explicit UE capability**. As follows from its name, the UE capability is implemented as an explicit capability in the UE capability container, whereupon it can be as simple as one bit or something more versatile as a bitmap container. Since such a generic UE capability does not exist, RAN WG4 will need to contact RAN WG2 every time such a capability is needed (as it already happened with the DOD-band). To reduce such issues, a generic approach (as illustrated by the next alternative) could be preferable

- **Implicit UE capability (via e.g., *modifiedMPR-Behaviour* field bitmap or a new bitmap)**. This approach is logically identical to the previous alternative, with the difference being that instead of the asking RAN WG2 to define a new capability for each new sub-band, a more generic signalling is used, which can be defined as per-band signalling and whose content can be defined by RAN WG4. Two options below are examples of how it can be accomplished.

1. One option is that the existing capability *modifiedMPR-Behaviour* can be leveraged for this purpose. The *modifiedMPR-Behaviour* can already be signalled for every band not requiring any RAN WG2 changes. Since it is up to RAN WG4 to define the purpose and meaning of every value of that field, UE can use this capability to indicate supported sub-bands based on meaning defined in RAN4. However, this would be changing the original intent of this capability since it relates to MPR, not to sub-bands, which could create some drawbacks.
2. Another option is to include a new band subset indication to UE capabilities. In this proposal, the parent 3GPP band designation may be followed by an indicator which identifies which sub-allocation of the band applies to the region in question. From the signalling perspective this approach is similar to *modifiedMPR-Behaviour* described above, but a new dedicated capability will be defined by RAN2 WG2, content of which will be further specified by RAN WG4. This proposal avoids the issue of parent-band association, but at the cost of defining new signalling and requiring constant overhead whenever present (since a bitmap typically needs to be of fixed size).

As an example, the solution adopted for band n77 was a combination of the following elements:

- UE-to-NW signalling: defining the explicit UE capability indications (extendedBand-n77-r16 and extendedBand-n77-2-r17); and

- NW-to-UE signalling: defining new flags NS\_55 and NS\_57 for barring UE access to the sub-bands.

-------------------- TEXT PROPOSAL (END) --------------------

# 3 Conclusions

# 4 References

1. RP-220457, "Views on phased introduction of operation frequency ranges in an NR Band", Apple
2. RP-220545, "Regulatory Issues with wide global bands", T-Mobile USA
3. RP-220762, "Handling of Canada n77 band", MediaTek Inc.
4. RP-220899, "Moderator’s summary of discussion [95e-39-R17-TEIs]", Moderator (RAN4 Chair)
5. RP-221872, "New SI on generalizing the specification for subsets of NR band support", Qualcomm Inc.
6. RP-222210, "TP for TR38.xxx Band Subsets; Root cause and New band number", T-Mobile USA Inc.
7. RP-222223, "TP for TR 38.893: Views on UE support of regionally-defined subsets of an NR band", Qualcomm Inc.
8. RP-222365, "On UE support of regionally-defined bands", Nokia, Nokia Shanghai Bell
9. RP-222368, "Generic solution for n77-like issues", Ericsson
10. RP-222510, "Discussion on UE support of regionally-defined subsets of an NR band", Huawei, HiSilicon