**3GPP TSG RAN Meeting #106 RP-242871**

**Madrid, ES, December 9-12, 2024**

**Source: China Telecom,** **T-Mobile USA**

**Title: New WID on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths**

**Document for: Approval**

**Agenda Item: 9.1.5**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths

Acronym: [NR\_eff\_BW\_util]

Unique identifier:

NOTE: For new WIs/SIs leave the Unique identifier empty and make a proposal for an Acronym.

 For a revised WI/SI: Take Unique identifier and acronym as shown in 3GPP workplan.

 If this is a RAN WID including Core and Perf. part, then Title, Acronym and Unique identifier refer to the feature WI.

 Please tick (X) the applicable box(es) in the table below:

 Either:

|  |  |
| --- | --- |
| **This WID includes a Core part** | **X** |
| **This WID includes a Performance part** |  |

 or:

|  |  |
| --- | --- |
| **This WID includes a Testing part** |  |
| **and it addresses the following 3GPP work area:** | **Radio Access** |  |
| **Core Network** |  |
| **Services** |  |

Potential target Release: *Rel-19*

NOTE: In case of contradiction with the target dates of clause 5, clause 5 determines the target release.

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | X | X |  |  |
| **No** | X |  |  | X | X |
| **Don't know** |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

### 2.1 Primary classification

This description is either a …

|  |  |
| --- | --- |
|  | Study Item |

or a

|  |
| --- |
| Normative Work Item:*tick applicable boxes below* |
|  | Stage 1 |
|  | Stage 2 |
| X | Stage 3 |
|  | Other (e.g. testing) |

### 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| FS\_NR\_eff\_BW\_util | RAN4 | 890040 | Study on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths |

NOTE: RAN agreed some time ago, that it describes the feature WI + Core/Perf. part WI or Testing part WI in one WID. Therefore the table above should include the feature WI data (In case the feature covers Core and Perf. part, please list under Working Group the leading WG of the Core part).

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work/Study Items (if any) |
| **Acronym** | Unique ID | Title | Nature of relationship |
| NR\_channel\_raster\_enh | 991045 | NR channel raster enhancement | The WI “NR\_channel\_raster\_enh” introduced new channel rasters to address the issue raised by the SI “FS\_NR\_eff\_BW\_util”, namely the location of the possible channel raster in some NR bands with 100kHz channel raster entries. |

NOTE: Also related or dependent WIs/SIs in other TSGs shall be indicated here.

# 3 Justification

3GPP Rel-8 TS 36.101 specified various channel bandwidths for 4G LTE systems including 1.4, 3, 5, 10, 15 and 20 MHz channel sizes. The combinations of these channel bandwidths allowed for effective utilization of operator’s license spectrum via carrier aggregation, even if the license spectrum was not a multiple of 5 MHz. With the introduction of 5GNR, the channel bandwidths were limited to increments of 5 MHz. Now that the 3 MHz channel bandwidth has been added, there is the possibility of coverage of additional operator’s spectrum including 8 and 13 MHz via CA, but there is still not a good way to cover other channel bandwidths that have been requested by operators including 6, 7, 11 and 12 MHz. Given the large investment in spectrum, especially low band spectrum, it is critical that operators have a way to efficiently utilize all their spectrum.

In Release 18, a Study Item (SI) titled "FS\_NR\_eff\_BW\_util" was established to facilitate more efficient utilization of licensed spectrum that does not conform to existing NR channel bandwidths, commonly referred to as "irregular channel bandwidth." To date, the following irregular channel bandwidths have been proposed:

|  |  |
| --- | --- |
| Band (s) | Channel Bandwidth(s) |
| n5 | 6, 7, 11, 12 MHz |
| n12, n85 | 6, 12 MHz |
| n26 | 7 MHz |
| n28 | 13 MHz |
| n29 | 6, 11 MHz |

The SI was concluded at RAN#99 meeting with the general conclusions that two promising methods – overlapping channels from network perspective and the next larger channel – can be used to support irregular channels. However, there has been no follow-on work that could lead to commercialization of any of the techniques studied in the study item. Also, there are concerns about next lager channel BWs for coverage bands, and the need for frequency overlapped, time offset SSBs for 6 and 7 MHz channels which may not be supported by legacy UEs.

During the study of solutions to achieve the highest spectral efficiency, a long-standing discussion was raised on how/whether to locate a narrower UE channel bandwidth within a wider cell-specific BS channel bandwidth. The WI " NR\_channel\_raster\_enh " addressed this issue by introducing enhanced channel raster (10kHz entry) for the FR1 bands with 100kHz channel raster.

Considering the findings from both the SI and WI, it is advisable to initiate consideration for corresponding normative work in Release 19.

# 4 Objective

### 4.1 Objective of SI or Core part WI or Testing part WI

Potential objectives for this work can be formulated as presented below:

* New standard channel bandwidth for 6 and 7MHz:
	+ Specify necessary RAN4 requirements to support deploying NR channel bandwidths of 6 and 7 MHz [RAN4]:
		- Specify RF requirements:
			* Specify the required RF requirements for optional 6 and 7 MHz channel bandwidths, including PRB numbers, minimum guard band and reference sensitivity
			* Use n85/n12/n5 for example bands for 6 MHz and n5/n26 as example bands for 7 MHz:
			* Limit to 15 kHz for FDD bands only to minimize RAN4 workload
* Define BS requirements for Next larger channel bandwidth and Overlapping channels from network perspective as optional solutions:
	+ If needed, define new BS requirements for 11 MHz for n5, 12 MHz for n5, n12 and n85, and 13MHz for n28 for Next larger channel bandwidth solution and Overlapping channels from network perspective solution if implemented by define new CBW for BS rather than through RF combining of 2 channels.
		- * Specify the Maximum transmission bandwidth configuration NRB for 11, 12 and 13 MHz channel bandwidth
	+ Add a new UE capability to indicate support for configuring UEs to the channels larger than SIB1 system bandwidth.

### 4.2 Objective of Performance part WI

Specify necessary UE/BS performance requirements for NR operation in dedicated FDD FR1 spectrum allocations for irregular channel bandwidths, corresponding to the core requirements:

* Specify necessary RRM performance requirements (RAN4)
* Specify necessary UE demodulation performance and CSI reporting requirements only for 6 and 7 MHz channel BWs. (RAN4)
	+ Reuse the existing UE requirements for overlapping carriers from the network perspective and next wider channel BW solution
* Specify necessary BS demodulation performance requirements (RAN4)
* Specify necessary BS conformance tests (RAN4)

### 4.3 RAN time budget request (not applicable to RAN5 WIs/SIs)

NOTE: For all new RAN related WIs/SIs which are not led by RAN WG5 the WI/SI rapporteur has to fill out the attached Excel table to request time budgets for corresponding RAN WG meetings.
The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI.
One time unit (TU) corresponds to ~ 2 hours in the meeting.
If no TU is needed, then leave the field empty otherwise enter a number >0 in the field.

 For revisions of already approved WI/SI descriptions: Please remove the Excel table from the WID/SID's zip file. The time budgets are already recorded. If you want to modify them, then this has to be done via the status report and not via a revised WID/SID.

 If this WID is covering Core and Performance part, then please fill out one line for each part in the attached Excel table.

**additional comments to the time budget request in the attached Excel table:**

# 5 Expected Output and Time scale

|  |
| --- |
| **New specifications**  |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Remarks |
|  | *{e.g.* *"22.XXX" or actual number if known}* | *{Title of the specification (as per TR 21.801 §6.1.1), to be aligned as much as possible with the WI/SI title}*  | *{E.g.* *"TSG#87"}* | *{E.g.* *"TSG#89"}* | *{e.g. rapporteur: <FamilyName>, <GivenName>, <Company>, <email address>}* |
|  |  |  |  |  |  |

NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
By default a new specs can only be new for one of both parts.

|  |
| --- |
| **Impacted existing TS/TR**  |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| 38.101-1 | NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone | RAN#109 | Core part |
| 38.101-4 | Add UE demodulation performance requirements | RAN#109 | Perf. part |
| 38.101-5 | NR; User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements | RAN#109 | Core part |
| 38.104 | NR; Base Station (BS) radio transmission and reception | RAN#109 | Core part |
| 38.104 | Add BS demodulation performance requirements if needed | RAN#109 | Perf. part |
| 38.108 | NR; Satellite Access Node radio transmission and reception | RAN#109 | Core part |
| 38.133 | Add RRM core requirements if needed | RAN#109 | Core part |
| 38.133 | Add RRM performance requirements if needed | RAN#109 | Perf. part |
| 38.141-1 | Add BS conformance tests including RF and demodulation part | RAN#109 | Perf part |
| 38.141-2 | Add BS conformance tests including RF and demodulation part | RAN#109 | Perf part |
| 38.306 | NR; User Equipment (UE) radio access capabilities | RAN#109 | Core part |
| 38.331 | NR; Radio Resource Control (RRC) protocol specification | RAN#109 | Core part |

NOTE: If this is a RAN WI including Core and Perf. part, then all new Core part specs have to be listed first and then all new Perf. part specs. Indicate "Core part" or "Perf. part" under Remarks for each spec.
If an existing spec is affected by both (Core part and Perf. part), then it has to be listed twice with appropriate approval dates.

# 6 Work item Rapporteur(s)

Lei GAO, China Telecom, gaol8@chinatelecom.cn

Bill Shvodian, T-Mobile USA, bill.shvodian@t-mobile.com

NOTE: The first listed Rapporteur has the overall responsibility for this WI (incl all secondary tasks).

# 7 Work item leadership

RAN4

Secondary responsible Working Group(s):

RAN2

# 8 Aspects that involve other WGs

NOTE: For RAN WIs: Section 8 applies only toWGs outside of TSG RAN because all RAN WG aspects have to be covered in section 4.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| China Telecom |
| T-Mobile USA |
| AT&T |
| Verizon |
| Qualcomm |
| Murata |
| Deutsche Telekom |
| TELUS |
| Ericsson |
| Boost Mobile |
| Iridium |
| Ericsson |
|  |