**3GPP TSG RAN Meeting #104 RP-241666**

**Shanghai, China, 17th – 20th June 2024**

**Source: Inmarsat, Viasat, Thuraya**

**Title: New WID proposal: Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz)**

**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: Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz)

Acronym: NR\_NTN\_combinedLband

Unique identifier: 9xxxxx

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** | **X** |

 or:

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

Target Release: Rel-19

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

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 work item is a …

|  |  |
| --- | --- |
|  | Feature |
| X | Building Block |
|  | *Work Task* |
|  | Study Item |

NOTE: Normally, Core/Perf./Testing parts in RAN WIDs are Building Blocks. Only if they are under an SA or CT umbrella, they are defined as work tasks. If you are in doubt, please contact MCC.

### 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) |
|  |  |  |  |

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 |
|  |  |  | *{optional free text}*  |

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

# 3 Justification

When the initial NTN band specifications were defined as part of Release 17 WI for NR NTN Solutions, addressing the existing Mobile Satellite Service (MSS) spectrum, the support for MSS L-band frequency was limited to the so-called “Standard L-band” range of 1525 – 1559 MHz DL (space-to-Earth) and 1626.5 – 1660.5 UL (Earth-to-space), later specified as band n255. However, strong interest was manifested by satellite operators to include support of the full MSS L-band range, including the so-called “Extended L-band” range of 1518 – 1525 MHz DL (space-to-Earth) and 1668 – 1675 MHz UL (Earth-to-space) in the then new NR NTN band as a single band specification, in particular to allow usage of the contiguous DL range of 1518 – 1559 MHz, which provides up to 41 MHz of contiguous spectrum. At the time of Release 17, however, no agreement could be reached to this extent, and thus the n255 specification was limited to the “Standard L-band” range.

The lack of support for a contiguous DL covering the 1518 – 1559 MHz range, restricts the usage of any channel crossing the 1525 MHz boundary. This places a severe and unnecessary restriction to NTN operators in the deployment of NR NTN services. The definition of a new combined band would serve to remove such restriction. Furthermore, the lack of support for a contiguous DL covering the full 41 MHz prevents NR NTN systems from providing increased DL data rate services in areas where the spectrum is available. The urgency of introducing support for the Extended L-band range combined with the existing n255 range is now increasing as NR NTN systems are nearing commercial deployment, and the need to allow for larger amounts of spectrum to be supported in order to support higher data rates has already been identified.

A new IoT NTN band was specified as part of Release 18 scope, to introduce the MSS Extended L-band, under the acronym “IoT\_NTN\_extLband”, with goal of “Introduction of the Extended L-band (UL 1668-1675, DL 1518-1525) for IoT NTN” to cover the so-called Mobile Satellite Service (MSS) “Extended L-band”, which corresponds to 1518 – 1525 MHz DL (space-to-Earth) range and 1668 – 1675 MHz DL (Earth-to-space). The new band specification Core Part as Band 253 was officially completed in RAN#103. However, this was limited only to IoT NTN.

Interest to extend the support for MSS Extended L-band to NR NTN has been manifested as early as RAN#99, but it was decided to postpone the work to a future release due to concerns on RAN4 WG workload. Support for NR NTN in this band is currently missing. However, the urgency of introducing support for this band is increasing as NR NTN systems are nearing commercial deployment.

The new bands must be defined as early as possible, in order to allow the device ecosystem sufficient time for implementation.

Thus, the aim of this new spectrum WID is twofold:

1. Define a new NR NTN band to cover the Mobile Satellite Service (MSS) “Extended L-band”, with 1518 – 1525 MHz DL (space-to-Earth) range and 1668 – 1675 MHz UL (Earth-to-space), mirroring the current band 253 specified for IoT NTN. This frequency range is allocated to MSS globally at ITU and WRC level across all ITU-R regions, and available in numerous countries across the world
2. Define a new NR NTN band covering the complete Mobile Satellite Service (MSS) L-band spectrum allocation, combining the so-called “Standard L-band” range of 1525 – 1559 MHz DL (space-to-Earth) and 1626.5 – 1660.5 UL (Earth-to-space), currently specified as band n255, and the “Extended L-band” range of 1518 – 1525 MHz DL (space-to-Earth) range and 1668 – 1675 MHz UL (Earth-to-space). Both these frequency ranges are allocated to MSS globally at ITU and WRC level across all ITU-R regions, and available in numerous countries across the world.

This WI initially focuses on Power Class 3 (PC3) support, however, there is a strong interest in including HPUE power classes. Support of HPUE power classes will be revisited as soon as the Rel-19 baseline framework for HPUE for NTN in band n255 has been defined.

# 4 Objective

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

The objectives of the core part are as follows:

* Specify a new NR NTN FDD band with a UE transmitting at 1668 – 1675 MHz and SAN transmitting at 1518 – 1525 MHz;
	+ Support channel bandwidths and SCS as presented in Table 4.1-1 below as a starting point;

Table 4.1-1: Channel bandwidth and SCS system parameters.

| SCS (kHz) | Channel bandwidth (MHz) |
| --- | --- |
| 15 |  | 5 |  |  |  |
|  |

* Specify new NR NTN FDD band(s) with SAN transmitting at 1518 – 1559 MHz and UE transmitting at 1626.5 – 1660.5 MHz or 1668 – 1675 MHz;
	+ Support channel bandwidths and SCS as presented in Table 4.1-2 below:

Table 4.1-2: Channel bandwidth and SCS system parameters.

| NTN satellite band | SCSkHz | DL Channel bandwidth (MHz) |
| --- | --- | --- |
|  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|  | 15 |  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
| [n25x] | 30 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|  | 60 |  |  | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|  |

* + Support Asymmetric UE TX-RX Channel BW configurations in order to allow leveraging the 41 MHz contiguous DL allocation with a smaller UL allocation. The subset of supported UE TX channel BW is initially limited to a maximum of 30 MHz.
	+ UL channel bandwidth configurations shall take into account the restrictions in the available UL frequency blocks
	+ UL channel allocations spanning across the 1660.5-1668 MHz gap shall not be allowed
* For these bands, the following shall be specified:
	+ Support Flexible TX-RX Separation
	+ Support default channel raster points at step of 100kHz;
	+ Mandatory support for Enhanced Channel Raster with raster points at step of 10kHz
	+ Support UE Power class 3 (+23 dBm) as a starting point
	+ Introduce the corresponding SAN and UE RF core requirements;
	+ Introduce the corresponding RRM requirements.
	+ Requirements for protection of the Radio Astronomy in the 1660-1670 MHz range shall be captured
	+ Any relevant additional Regional requirements and restrictions will also be captured.
		- NOTE1: The introduction of ETSI-specific requirements is expected to be addressed at a later stage, due to ongoing discussions within ETSI in respect to NTN
		- NOTE2: The 1668-1675 MHz range is presently not available for MSS in the continental United States.

The specification work in this WI shall leverage the studies and requirements for NR NTN n255, and the corresponding IoT NTN Work Item (IoT\_NTN\_extLband) for Band 253, where applicable.

All UE requirements specified as part of this WI shall be Release-independent for the UE starting from Release-17.

### 4.2 Objective of Performance part WI

NOTE: Leave empty if the WI proposal does not contain a RAN performance part.

The objective of the performance part is to:

- Define conformance requirements for SAN.

### 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** *{One line per specification. Create/delete lines as needed}* |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Remarks |
|  |  |  |  |  |  |

*{Note 1: Only TSs may contain normative provisions. Study Items shall create or impact only TRs.
"Internal TR" is intended for 3GPP internal use only whereas "External TR" may be transposed by OPs.}*

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** *{One line per specification. Create/delete lines as needed}* |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| TR 38.863 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz)  | RAN#107 (Mar 2025) | Core |
| TS 38.101-5 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz) | RAN#107 (Mar 2025) | Core |
| TS 38.133 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz) | RAN#107 (Mar 2025) | Core |
| TS 38.108 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz) | RAN#107 (Mar 2025) | Core |
| TS 38.307 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz) | RAN#107 (Mar 2025) | Core |
| TS 38.181 | Introduction of new NR NTN bands to support the Extended L-band (UL 1668-1675MHz, DL 1518-1525MHz) and the combined MSS L-band and Extended L-band ranges (DL 1518-1559 MHz, UL 1626.5-1660.5 MHz and 1668-1675 MHz) | RAN#108 (June 2025) | Perf |

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)

*TBD*

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

# 7 Work item leadership

**RAN WG4**

# 8 Aspects that involve other WGs

{Specify all the other WG(s) to be involved and, if specific, their task. E.g.: "SA2, SA3, SA5. CT6 for storage, and potentially SA4". If not applicable, indicate "None" or "None identified yet".}

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

*{At least 4 supporting Individual Members are needed. There is an expectation that these companies will provide resources to progress the work. Note that having 4 supporting companies is a necessary but not sufficient condition: the usual TSG approval process by consensus is needed for the WID approval.}*

|  |
| --- |
| Supporting IM name |
| Inmarsat |
| Viasat |
| Thuraya |
| Skyworks Solutions Inc. |
| Terrestar Solutions |
| Airbus |
| Omnispace |
| Thales |
| ESA |
| AccelerComm |
| Fraunhofer IIS |
| Fraunhofer HHI |
| GateHouse |
| Novamint |
| EchoStar |
| Samsung |
| Ligado Networks |
| Apple |
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