**3GPP TSG-RAN5 Meeting #102R5-24XXXX**

**Athens, Greece, February 26 – March 1 , 2024**

**3GPP TSG RAN Meeting #103 RP-24xxxx**

**Maastricht, Netherlands, March 18-21, 2024**

**Source: CMCC, MediaTek, CAICT**

**Title: New WID on UE Conformance - IoT NTN enhancements plus CT1 aspects**

**Document for: Endorsement**

**Agenda Item: 4.1**

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](http://www.3gpp.org/ftp/Specs/html-info/21900.htm) [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: UE Conformance - IoT NTN enhancements

Acronym: IoT\_NTN\_enh\_plus\_CT1-UEConTest

Unique identifier:

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

Potential target Release: Rel-18

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | 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 a

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

### 2.2 Parent Work Item

The following lists of RAN2, RAN4, CT1 work items that will be tested in this RAN5 work item will be maintained in future revisions of this WI description:

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| [IoT\_NTN\_enh](https://www.3gpp.org/DynaReport/WiSpec--941004.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) | R2 | 941004 | [IoT (Internet of Things) NTN (non-terrestrial network) enhancements](https://www.3gpp.org/DynaReport/WiCr--941004.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) |
| [IoT\_NTN\_enh](https://www.3gpp.org/DynaReport/WiSpec--941004.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank)[-Core](https://www.3gpp.org/DynaReport/WiSpec--950175.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) | R4 | [94](https://www.3gpp.org/DynaReport/GanttChart-Level-2.htm%22%20%5Cl%20%22bm950175%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank)0104 | [Core part:](https://www.3gpp.org/DynaReport/WiCr--950175.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) [IoT (Internet of Things) NTN (non-terrestrial network) enhancements](https://www.3gpp.org/DynaReport/WiCr--940104.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) |
| [IoT\_NTN\_enh](https://www.3gpp.org/DynaReport/WiSpec--941004.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank)[-Perf](https://www.3gpp.org/DynaReport/WiSpec--950275.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) | R4 | [95028](https://www.3gpp.org/DynaReport/GanttChart-Level-2.htm%22%20%5Cl%20%22bm950275%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank)4 | [Perf. part:](https://www.3gpp.org/DynaReport/WiCr--950275.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) [IoT (Internet of Things) NTN (non-terrestrial network) enhancements](https://www.3gpp.org/DynaReport/WiCr--950284.htm%22%20%5Ct%20%22https%3A//www.3gpp.org/_blank) |
| 5GSAT\_Ph2 | CT1 | 990024 | 5GC/EPC enhancement for satellite access Phase 2 |

### 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}*  |

# 3 Justification

Release 17 RAN1/2/3/4 work item LTE\_NBIOT\_eMTC\_NTN was carried out to enable NB-IoT and eMTC to support Non-Terrestrial Networks (NTN) under the following assumptions:

* Transparent payload based GEO and NGSO network scenarios addressing at least 3GPP power class 3 UE with GNSS capability in both Earth fixed &/or moving cell configurations.

Release 18 RAN1/2/3/4 work item IoT\_NTN\_enh defines further enhancements for NB-IoT NTN and eMTC NTN in order to:

* Improve mobility aspects:
	+ Support of neighbour cell measurements and corresponding measurement triggering before RLF, using Rel‑17 (TN) NB-IoT, eMTC as a baseline. [RAN2]
	+ Support signalling in system information of neighbour cell ephemeris, for eMTC and NB-IoT [RAN2]
	+ Re-use the solutions introduced in Rel-17 NR NTN for mobility enhancements for eMTC, with minimum necessary changes to adapt them to eMTC [RAN2]
	+ Define UE RRM core requirements for the above mobility enhancement features [RAN4].
* Improve performance in terms of throughput:
	+ Disabling of HARQ feedback to mitigate impact of HARQ stalling on UE data rates [RAN1,RAN2]
	+ Specify UE RRM performance requirements to support the agreed mobility enhancements for NB-IoT/eMTC [RAN4]
	+ Specify UE and Base Station demodulation requirements for operation with disabled HARQ feedback for NB-IoT/eMTC [RAN4]
* Optimize the GNSS operation with sparse use of GNSS and power efficiency for long-term connection (compared to Rel-17):
	+ Specify needed improved GNSS operations for a new position fix for UE pre-compensation during long connection times and for reduced power consumption. Simultaneous GNSS and NTN NB-IoT/eMTC operation is not assumed. [RAN1, RAN2]
* Further enhance support for discontinuous coverage:
	+ Specify mobility management enhancements and power saving enhancements for discontinuous coverage, taking into account the conclusions from the SA2 study FS\_5GSAT\_Ph2. [RAN2, RAN3].

NOTE: It is expected a UE can move while under discontinuous coverage.

The Release18 work item carried out by RAN1/2/3/4 aims to specify further enhancements for E-UTRA (LTE-RAN) based NTN (non-terrestrial networks) according to the following assumptions:

- GEO and NGSO (LEO and MEO).

- Earth fixed Tracking area. Earth fixed & Earth moving cells for NGSO

- FDD mode

- UEs with GNSS capabilities

Release 18 CT1 work item 5GSAT\_Ph2 defines the following contents:

1. Procedures for determining and negotiating out-of-coverage period due to discontinuous coverage and for power saving during coverage gaps:
	* Negotiation of “discontinuous coverage support” capability between the UE and the AMF
	* Negotiation of “out-of-coverage period” between the UE and the AMF
	* Indication of losing coverage by the UE
	* AMF requesting the UE to perform Registration update upon return to coverage
2. Handling signalling overload due to loss of coverage and return to coverage of many UEs at the same time.

For Rel-18 RAN1/2/3/4 work item IoT\_NTN\_enh, the overall completion level for core part has reached 100% after RP#102 (RAN1: 100%, RAN2: 100%, RAN3: 100%, RAN4: 100%). The overall completion level for performance part has reached 10% after RP#102, and the target completion date for performance part is RP#104 (2024-06).

For Rel-18 CT1 work item 5GSAT\_Ph2, the overall completion level has reached 90% after CT#102, and is expected to be completed by CT#103 (2024-03).

Therefore it is justified to introduce the conformance testing for IoT NTN enhancement UE requirements into RAN5 specifications.

# 4 Objective

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

The objective of this RAN5 work item is to define the corresponding IoT NTN enhancement UE conformance requirements, the test cases for IoT NTN enhancement UE, applicability, test environment, test points and update the relevant conformance specifications for the R18 IoT NTN enhancement UE requirements introduced by the RAN1, RAN2 and RAN4 work item IoT\_NTN\_enh.

Due to lack of real commercial deployment interest of eMTC NTN, conformance test development of eMTC enhancement is considered to be outside of the scope of this WI.

### 4.2 Objective of Performance part WI

N/A

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

N/A

# 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: 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 |
| TS 36.508 | Introduction of common test environment for RRM/SIG test cases impacted by Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.521-3 | Introduction of the RRM test cases for Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.521-4 | Introduction of the Demod test cases for Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.521-2 | Introduction of test applicability and ICS for RRM test cases impacted by Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.509 | Introduction of testing functions for RRM test cases impacted by Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TR 36.903 | Introduction of TT&MU for RRM test cases impacted by Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.523-1 | Introduction of SIG test cases for Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.523-2 | Introduction of test applicability for Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |
| TS 36.523-3 | Introduction of test model for Rel-18 IoT NTN enh. | TSG RAN#110(Dec-25) |  |

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)

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# 7 Work item leadership

RAN5

# 8 Aspects that involve other WGs

None

# 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| CMCC |
| China Telecom |
| CAICT |
| CATT |
| Ericsson |
| Huawei |
| Hisilicon |
| Keysight |
| MediaTek |
| Verizon |
| ZTE |
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