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APT600 MHz NR Band ;

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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# 1 Scope

The present document is a technical report for the work item of APT 600 MHz NR band.

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] ETSI EN 300 422-1 (V1.4.2) (2011-08): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement".

[3] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[4] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[5] 3GPP TR 36 820, "LTE for 700 MHz digital dividend".

[6] 3GPP TR 36 755, "US 600 Mhz band for LTE".

[7] RP 221778, WID on APT 600 MHz band.

[8] 3GPP TR 38 860, "Study on Extended 600 MHz NR band".

[9] R4-2215942, "Asymmetric bandwidths for APT 600 MHz", Ericsson.

[10] R4-2220016, "TP for TR 38.892: n105 compatibility with legacy n71 UEs", T-Mobile USA.

[11] R4-2300031, "Text Proposals for section 6 of TR 38 892", Spark NZ, Nokia.

[12] R4-2302457, "TP to TR 38.892: n71 and n105 compatibility (section 6)", Huawei, HiSilicon.

[13] R4-2302708, "TP for TR 38.892: Compatibility with Band 71/n71", Qualcomm Incorporated.

[14] RP-223265, "Revised WID on APT 600 MHz NR band", ZTE.

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

*BW* Bandwidth

*Δf* Separation between the channel edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency

*Δfmax* The largest value of Δf used for defining the requirement

*FDL\_low*The lowest frequency of the downlink operating band

*FDL\_high*The highest frequency of the downlink operating band

*FUL\_low*The lowest frequency of the uplink operating band

*FUL\_high*The highest frequency of the uplink operating band

*f\_offset* Separation between the channel edge frequency and the centre of the measuring filter

*f\_offsetmax* The maximum value of f\_offset used for defining the requirement

*NDL* Downlink EARFCN

*NOffs-DL* Offset used for calculating downlink EARFCN

*NOffs-UL* Offset used for calculating uplink EARFCN

*NUL* Uplink EARFCN

*PREFSENS* Reference Sensitivity power level

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply.   
An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ACLR Adjacent Channel Leakage Ratio

BS Base Station

CBRS Citizens Broadband Radio Service

CIM Counter-InterModulation

CW Continuous Wave

DL Downlink

DTV Digital Television

EARFCN E-UTRA Absolute Radio Frequency Channel Number

eCFR electronic Code of Federal Regulation

EIRP Effective Isotropic Radiated Power

ERP Effective Radiated Power

ETSI European Telecommunications Standards Institute

E-UTRA Evolved UTRA

FCC Federal Communications Commission

FDD Frequency Division Duplex

HAAT Height Above Average Terrain

LA Local Area

LO Local Oscillator

MOP Maximum Output Power

MR Medium Range

MSR Multi-Standard Radio

NF Noise Figure

NRAO National Radio Astronomy Observatory

NSF National Science Foundation

PA Power Amplifier

PRB Physical Resource Block

RAS Radio Astronomy Service

REFSENS Reference Sensitivity

RF Radio Frequency

RX Receiver

SEM Spectrum Emission Mask

TX Transmitter

UE User Equipment

UHF Ultra High Frequency

UL Uplink

UMTS Universal Mobile Telecommunications System

UTRA UMTS Terrestrial Radio Access

VLBA Very Long Baseline Array

WA Wide Area

WMTS Wireless Medical Telemetry Service

# 4 Background

The text in this section is largely from the WID [7], [14]

The 470-694 MHz frequency range is allocated to the broadcasting service and mobile service on a co-primary basis in ITU Region 3. The frequency band 470-698 MHz, or parts thereof, was identified by WRC-15 in 7 countries in Region 3 through new footnote No. **5.296A** for use by those administrations as listed wishing to implement terrestrial IMT systems. In addition, there is interest from other significant markets to do the same.Elsewhere, USA, Mexico and several other countries in ITU Region 2 also identified this band for IMT through footnotes **5.295** and **5.308A**. It is noted that *resolves 2* of revised Resolution **224 (Rev.WRC-19)** to encourage administrations to take into account results of the existing relevant ITU Radio communication Sector studies, when implementing IMT applications/systems in the frequency bands 694-862 MHz in Region 1, in the frequency band 470-806 MHz in Region 2, in the frequency band 790-862 MHz in Region 3, in the frequency band 470-698 MHz, or portions thereof, for those administrations mentioned in No. **5.296A**, and in the frequency band 698‑790 MHz, or portions thereof, for those administrations mentioned in No. **5.313A**.

Spectrum below 1 GHz is expectedly well suited for mobile broadband applications. In particular, the unique propagation characteristics of the bands below 1 GHz allow for wider area coverage, which in turn requires fewer infrastructures and facilitates service delivery to rural or sparsely populated areas. In this regard, the 700MHz ecosystem is growing swiftly: there are over 34 commercial networks deployments. (see https://gsacom.com/paper/gsa-apt700-global-status-regulatory-deployments-devices/).The APT700 band plan coming out from Region 3 played a huge role in its success globally. Outside of APAC, countries in Region 2 have adopted or plan to adopt the APT700 band plan (3GPP band 28) for LTE system deployments. The lower duplexer of APT700 plan has also been adopted for Region 1 since the conclusion of WRC-15.

As the utilisation of the 700MHz spectrum increases over time, it is desirable to look at additional spectrum that could be considered as a companion besides 3GPP Band 28. Therefore, the use of parts of the 600MHz band for the mobile broadband service would provide a vital means of delivering high quality, wide area broadband services including in rural areas and deep inside buildings. The timely availability of frequency arrangements is essential for the development of IMT specifications and standards and the early consideration by Administrations in the footnotes referred to above of suitable frequency arrangements.

The APT region is very diverse and consists of highly developed and developing countries and some with extremely large and rural population base. The sub 1 GHz bands is well suited for the later.

During the last year or so, 3GPP RAN 4 has completed a study item on the feasibility of various duplex filter options for use in this band. The results of this study are documented in TR 38.860 [8] This study was sent to the AWG in an LS RP-212629 in Sep 2021 with a request to provide guidance on a preferred band plan and information on regulatory aspects for the normative work to begin.

The AWG 28 meeting has considered the request of the 3GPP and has provided a response to this LS. In this response the LS has indicated a preference for option B1 (full band)- seer Fig 4-1 below, and has also requested for the work to begin immediately with a view to completion by Dec 2022. Additionally, the answers to the regulatory questions sought by the 3GPP have now been provided via a reply LS RP 221045.

To facilitate the development of additional spectrum in the APT region it is proposed to develop the following band option:

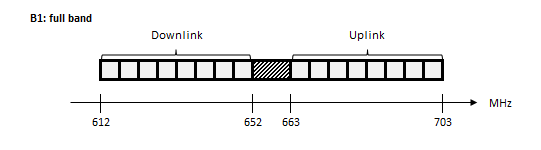


Figure 4-1: Proposed band option.

# 5 Frequency band arrangement

## 5.1 Operating band, channel bandwidth and channel arrangement

NR band APT600 is designed to operate in the operating band defined in Table 5.1-1.

**Table 5.1-1: NR operating band for APT600 band**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating Band** | **Uplink (UL) operating band BS receive UE transmit** | | | **Downlink (DL) operating band BS transmit  UE receive** | | | **Duplex Mode** |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| n105 | 663 MHz | – | 703 MHz | 612 MHz | – | 652 MHz | FDD |

The requirements in the TR apply to the combination of channel bandwidths, SCS and operating bands shown in Table 5.1-2.

**Table 5.1-2: Channel bandwidth and SCS parameters for APT600 band**

| **SCS (kHz)** | ***channel bandwidth* (MHz)** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 15 | 5 | 10 | 15 | 20 | 253 | 303 | 353 | |
| 30 |  | 10 | 15 | 20 | 253 | 303 | 353 | |
| NOTE 3: This UE channel bandwidth is applicable only to downlink. | | | | | | | | |

The channel raster of APT600 band is 100 kHz based (the same as band 71/n71). The applicable NR-ARFCN entries for band n105 are defined in Table 5.1-3.

**Table 5.1-3: Applicable NR-ARFCN for APT600 band**

|  |  |  |  |
| --- | --- | --- | --- |
| **NR *operating band*** | **ΔFRaster**  **(kHz)** | **Uplink**  **range of NREF**  **(First – <Step size> – Last)** | **Downlink**  **range of NREF**  **(First – <Step size> – Last)** |
| n105 | 100 | 132600 – <20> – 140600 | 122400 – <20> – 130400 |

The synchronization raster for APT600 band is give in Table 5.1-4.

**Table 5.1-4: Applicable SS raster entries for APT600 band**

|  |  |  |  |
| --- | --- | --- | --- |
| **NR *operating band*** | **SS Block SCS** | **SS Block pattern (NOTE 1)** | **Range of GSCN**  **(First – <Step size> – Last)** |
| n105 | 15 kHz | Case A | 1535 – <1> – 1624 |

## 5.2 Duplex spacing

The default TX channel (carrier centre frequency) to RX channel (carrier centre frequency) separation (default duplex spacing) for NR band n105 as given by Table 5.1-1: NR operating band for APT600 band is 51 MHz as defined in Table 5.2-1.

**Table 5.2-1: UE TX-RX frequency separation for APT600 band**

| **NR Operating Band** | **TX – RX  carrier centre frequency separation** |
| --- | --- |
| n105 | -51 MHz |

# 6 Compatibility with B71/n71

Band n71 was introduced for Region 2 during Rel-15 back in 2017, under the LTE600\_US work item [6]. UEs supporting operating band n71 are already on the market.

Even if it was not the objective of the APT600 band introduction, consideration of band n71 eco-system reuse was recognized during the discussion to be beneficial from both market, and international UE roaming point of view.

The main difference among band n105 and band n71 is in their frequency arrangement, where duplex spacing of the n105 is 5 MHz larger as compared to band n71, with its DL starting as 612 MHz (compared to 617 MHz for band n71), as detailed in Table 6-1.

The band plan for Band n105 shares a similar frequency range with that of the existing Band 71/n71, but differs in two important aspects. The first difference is Band n105 enables an additional 2x5 MHz of spectrum for a total of 2x40 MHz whereas Band 71/n71 is only specified for 2x35 MHz. The second difference is that the default Tx-Rx separation between uplink and downlink frequency blocks within Band n105 is 51 MHz while it is 46 MHz for Band 71/n71.



Figure 6-1: Band n71 and Band n105 differ in passband bandwidth and Tx-Rx separation.

Table 6-1: Comparison of n71 and n105 frequency arrangement

|  |  |  |  |
| --- | --- | --- | --- |
| **NR *operating band*** | **Uplink (UL) *operating band* BS receive / UE transmit**  **FUL,low – FUL,high** | **Downlink (DL) *operating band* BS transmit / UE receive**  **FDL,low – FDL,high** | **Duplex mode** |
| n71 | 663 MHz – 698 MHz | 617 MHz – 652 MHz | FDD |
| n105 | 663 MHz – 703 MHz | 612 MHz – 652 MHz | FDD |

Studies have been conducted to explore the possibility of enabling compatibility between Band n105 and Band 71/n71. Specifically, the feasibility and modifications needed to enable existing Band 71/n71 UE’s to operate in a network intended for Band n105 was studied. This would be advantageous before Band n105 devices are widely available. In the longer term, it is expected that devices would support both Band n71 and Band n105 [13].

One scheme described in [9] proposed to mandate the support of asymmetric UL/DL bandwidths for the Band n105 UE using the same asymmetric bandwidth combination set mandated for band n71 (BCS set 0). A variable duplex was claimed to be a byproduct of the support for asymmetric UL/DL bandwidths since the narrower UL channel could be placed arbitrarily within a frequency range where the fullband UL channel would have resided for a symmetric UL/DL configuration. Not all companies agreed with this interpretation and also observed UE requirements are not tested for variable duplex by virtue of asymmetric channel bandwidth. One example of a configuration is shown below with four 10 MHz symmetric operator blocks. The DL channel bandwidth configured by the BS is wider than the DL operator block. In order to fully allocate all channels within the band for different operators , PRB blanking would need to be used at the network side with active PRBs strictly within the DL operator block aligning to the Band n105 spectrum allocation. This may imply degraded selectivity for UEs and may be also imply coordination between neighboring networks and potential interference across networks if not properly coordinated. The edge spectrum blocks are unusable by Band n71 UE’s since they are outside of the range of Band n71 and therefore outside of the Tx and Rx filter passband for the UE. These blocks would only be accessible to Band n105 UE’s.

Diagram

Description automatically generated

Figure 6-2: An example of one variable duplex scheme with PRB blanking

Another scheme described in [1] proposes to use different configurations depending on whether the channel is located at the bottom, middle, or upper part of Band n105. For channels in the lower part of the band, n71 devices would be configured for symmetric UL and DL using 46 MHz duplex. There is 2x5 MHz blocks which are not accessible to these n71 devices, but might be available to n105 devices using a larger UE specific channel bandwidth configuration with 51 MHz duplex or by intra-band contiguous carrier aggregation using mixed duplex between PCC and SCC.



Figure 6-3: An example of another variable duplex scheme for partial coverage with n71 and using channel specific bandwidth configuration or CA for n105.

For channels in the middle and upper part of the band the n71 devices use asymmetric channel bandwidth with DL 5 MHz larger than uplink. The remaining 5 MHz uplink is lost to n71 devices but could be used by n105 devices with UE specific channel configuration or intra-band contiguous UL CA. For this scheme, Band n71 devices are limited in the spectrum available to them. For example, assuming the 2x40 MHz of Band n105 is allocated equally to 4 operators in 2x10 MHz blocks, n71 is only able to access 50% of the spectrum. Band n105 devices can access all of the spectrum, but would need to support UE specific channel bandwidth configurations larger than SIB bandwidth and channel location off of the 100 kHz raster. Or the network would need to be divided into two networks and then recombined using carrier aggregation losing efficiency.

None of these schemes to enable compatibility of Band 71/n71 devices to a network intended for Band n105 could be agreed. They all have shortcomings, introducing additional requirements in Band n105 UE design and network deployment complexity. At the same time, it is unclear whether the benefit of a Band 71/n71 UE ecosystem – even in a short-term transitionary phase – would actually be realizable. The Band 71/n71 UE ecosystem is predominantly composed of devices designed and intended for networks in the US. These devices do not support the bands and CA combinations needed for countries in Asia Pacific or future use of this band in ITU Region 1 where Band n105 is expected to be deployed. Thus, the benefit might only be for US operators and devices roaming into Band n105 for temporary connectivity. The benefit for APT operators and users is limited since these devices would not be useful as home devices native to the n105 countries in the absence of support for the other APT bands. Instead, it is recommended to maximize the use of spectrum in the most efficient manner by developing a Band n105 ecosystem directly. It is anticipated that devices will support both Band n71 and Band n105 using common modem and RF hardware to fulfil market demands.

Referring to the LS in [12], AWG has indicated that from the UE perspective, the device should ideally support both band n105, as well as n71 for international UE roaming purposes. From roaming point of view, we can distinguish the following cases:

1. Legacy n71 UE trying to access network operating n105 band: despite lack of -51 MHz duplex support, in this case a legacy n71 UEs would not be able to access downlink on 612-617 MHz, or uplink on 698-703 MHz.

2. n105 UE trying to access n71 network: such n105 UE would need to support -46 MHz duplex spacing; such duplex spacing flexibility was discussed in this work item under term “variable duplex”, but not concluded. As the n71 frequency range is embedded within n105 band, one may expect that some of the future n105 UE implementations may support both bands to enable roaming.

Considering high level of commonalities among those bands the underlying duplexer designs, it is expected that future UE devices supporting band n71 will also support band n105. Whether this would be achieved with the same RF frontend or not, is an implementation issue. However, possibility of using existing n71 devices with their ‑46 MHz duplex in n105 markets is not technically feasible with the existing Rel-17 specification.

Finally, it shall be stressed that APAC region mobile network operators willing to deploy band n105 with -51 MHz Tx-Rx spacing, will not be mandated by their regional regulations to support band n71, which was defined in 3GPP for Region 2 based on FCC guidance.

The NR bands n71 and n105 have transmit/receive (duplex) spacings of -46 and -51 MHz respectively. Concurrent operation of UEs with both duplex spacings are not considered as this is a short-term measure only according to R4-2302708. Due to the essentially large commonality of the transmitter/receiver requirement for the modem, specifications of n71 and n105 it is expected that new generation n71 UEs and n105 UEs will support both bands. The immediate issue using existing n71 UEs in an n105 market will not be there in the long term. Therefore, it is anticipated that devices will support both Band n71 and Band n105 using common modem and RF hardware to fulfill market demands [11].

# 7 UE and BS requirements for APT 600 MHz

## 7.1 UE requirements

### 7.1.1 UE transmitter characteristics

#### 7.1.1.1 UE TX maximum output power

Power class 3 is specified for Band n105 with a maximum output power of 23 dBm. The tolerance is +2/-2.5 dB similar to Band n71.

Table 7.1.1.1-1: UE TX maximum output power

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 1.5 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) |
| n105 |  |  |  |  |  |  | 23 | +2/-2.5 |

#### 7.1.1.2 NS value and Spectrum Emission Mask

No additional spurious emission requirements have at this time been identified for Band n105. Therefore, no NS other than the default NS\_01 has been specified. In the future if regulators deem it necessary to impose additional spurious emission requirements to protect adjacent or nearby services for deployment in certain countries, the NS specifications for Band n105 can be revised accordingly.

The spectrum emission mask follows the general mask as specified in clause 6.5.2.2 of TS 38.101-1. No additional spectrum mask is applicable to Band n105.

### 7.1.2 UE receiver characteristics

#### 7.1.2.1 UE REFSENS

Reference sensitivity for Band n105 has been agreed as follows

Table 7.1.2.1-1: UE REFSENS

| Operating band / SCS / Channel bandwidth | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 35 MHz (dBm) | 40  MHz (dBm) | 45 MHz (dBm) | 50  MHz (dBm) |
| n105 | 15 | -97.28 | -94.0 | -91.6 | -86.9 | -85.1 | -83.8 | -82.5 |  |  |  |
| 30 |  | -94.3 | -91.9 | -87.9 | -85.5 | -84.3 | -82.6 |  |  |  |
| NOTE 8: DL channels overlapping the 612-617MHz range have 0.5dB added to the REFSENS | | | | | | | | | | | |

#### 7.1.2.2 In-band blocking

In-band blocking for Band n105 has been specified as Case 1, Case2, and Case 5. Case 5 is specified with an interferer power of -22 dBm except for Band n105 channels overlapping the lowermost 5 MHz of the band where it is relaxed to -34 dBm.

Table 7.1.2.2.-1: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 | Case 5 |
|  | Pinterferer | dBm | -56 | -44 | -15 | -38 | -224 |
|  | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |  | -BWChannel/2-11 |  |
| n105 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 |  |  | FDL\_low – 7 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.  NOTE 4: For Band n105 channels overlapping the 612 - 617 MHz frequency range, Pinterferer is modified to -34 dBm. | | | | | | | |

#### 7.1.2.3 Out-of-band blocking

Out-of-band blocking for Band n105 is specified generally as it is for other bands below 2700 MHz.

Table 7. 1.2.3-1: Out of-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range 1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -44 | -30 | -15 |
| n105 | Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |

## 7.2 Network nodes requirements

With the introduction on band n105, the following network node specifications were updated to reflect required modifications:

- NR BS core and conformance testing specifications,

- IAB core and conformance testing specifications,

- NR Repeater core and conformance testing specifications.

The following technical modifications were implemented, where applicable:

- Adding n105 to the list of operating bands for Operating Band Unwanted Emission (Category A, and Category B Option 1) limits,

- Transmitter spurious emission requirements:

- co-existence requirements updated for n105 introduction,

- co-location requirements updated for n105 introduction,

- Receiver blocking: co-location requirements updated for n105 introduction.

# 8 Expected Output and Time Scale

Table 8-1: New specifications to be introduced

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 |
| *Internal TR* | [38.892](https://www.3gpp.org/DynaReport/38892.htm) | APT 600 MHz NR band |  | RAN#99 |  |

Table 8-2: Impacted specifications

|  |  |  |  |
| --- | --- | --- | --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
| 38.101-1 | NR; UE Radio transmission and reception | RAN#99 | Core part |
| 38.133 | NR; Requirements for support of radio resource management | RAN#99 | Core part |
| 38.104 | NR; BS Radio transmission and reception | RAN#99 | Core part |
| 38.141-1 | NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing | RAN#99 | Perf. Part |
| 38.141-2 | NR; Base Station (BS) conformance testing Part 2:  Radiated conformance testing | RAN#99 | Perf. Part |
| 36.104 | E-UTRA; BS Radio transmission and reception | RAN#99 | Core part |
| 36.141 | E-UTRA; BS conformance testing | RAN#99 | Perf. Part |
| 37.104 | E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception | RAN#99 | Core part |
| 37.141 | E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing | RAN#99 | Perf. Part |
| 37.105 | Active Antenna System (AAS) Base Station (BS) transmission and reception | RAN#99 | Core part |
| 37.145-1 | Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: conducted conformance testing | RAN#99 | Perf. Part |
| 37.145-2 | Active Antenna System (AAS) Base Station (BS) conformance testing; Part 2: radiated conformance testing | RAN#99 | Perf. Part |
| 38.174 | NR; Integrated access and backhaul radio transmission and reception | RAN#99 | Core part |
| 38.176-1 | NR; Integrated Access and Backhaul (IAB) conformance testing; Part 1: Conducted conformance testing | RAN#99 | Perf. Part |
| 38.176-2 | NR; Integrated Access and Backhaul (IAB) conformance testing; Part 2: Radiated conformance testing | RAN#99 | Perf. Part |
| 38.106 | NR repeater radio transmission and reception | RAN#99 | Core part |
| 38.115-1 | NR; Repeater conformance testing - Part 1: Conducted conformance testing | RAN#99 | Perf. Part |

# Annex A: Change history

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| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2022-08 | 3GPP RAN4#104e | R4-2211530 |  |  |  | TR skeleton | 0.1.0 |
| 2022-08 | 3GPP RAN4#104e | R4-2211532 |  |  |  | Text Proposals to the TR, for sections 2, 3, and 4. | 0.1.0 |
| 2022-10 | 3GPP RAN4#104ebis | R4-2217125 |  |  |  | Text Proposals to the TF, for section 5.1 | 0.2.0 |
| 2022-11 | 3GPP RAN4#105 | R4-220486 |  |  |  | Text Proposals to the TR for section 5.2 | 0.3.0 |
| 2022-11 | 3GPP  RAN4#105 | R4-2219860 |  |  |  | Text Proposals to the TR for section 7.2 | 0.3.0 |
| 2023-03 | 3GPP  RAN4#106 | R4-2300029 |  |  |  | TR 38.982 update to include expected output and time scale at section 8 | 0.4.0 |
| 2023-03 | 3GPP  RAN4#106 | R4-2303726 |  |  |  | Revised TP for TR 38.892: Compatibility with Band 71/n71 (R4-2303697)  TP for section 6, B71/n71 compatibility ( R4 2302457)  TP for section 6 B71/n71 compatibility ( R4-2300031)  TP for section 7.2 BS RF requirements ( R4-2302458)  TP for section 7.1 UE requirements ( R4-2302707)  TP for section 6 B71/n71 compatibility ( R4 23027080) | 0.5.0 |
| 2023-03 | RP-99 | RP-230059 |  |  |  | TR 38.892 as submitted to RAN #99 for 1-step approval | 1.0.0 |

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| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2023-03 | RP-99 |  |  |  |  | Approved by plenary – Rel-18 spec under change control | 18.0.0 |