

AT&T Radiated Performance Requirements for IoT Devices

For Public Release at www.att.com/iotdevices; TRP and TIS requirements for IoT devices.

Foreword

The tables below describe the TRP and TIS radiated performance requirements which must be met for devices undergoing AT&T approval. Not all bands listed in these tables are mandatory for IoT devices. However, devices are required to meet the requirements for all bands supported by the wireless module and/or chipset being used.

All testing must be performed in accordance with the current “CTIA Test Plan for Wireless Device Over-The-Air Performance” as specified by the requirements defined in PTCRB. A copy of the CTIA test plan may be obtained by following the instructions on the following CTIA web site: <https://ctiacertification.org/test-plans/>

All Internet of Things (IoT) LTE devices are required to support LTE Bands 2, 4, and 12, bands 5, 14, 29, and 30 are highly desired. If a device is destined for FirstNet operation, then support of Band 14 is required (excluding LTE-M devices where Band 14 must be disabled)

If 5G is supported then the 5G Bands, n2, n5, n66 are required, and n77 is highly desired. Absence of any of these bands will lead to the device being unable to receive certification and significant coverage gaps on the network. For FR2 support is optional, where it is supported band n260 must be enabled.

Devices using a module supporting LTE bands beyond 2, 4 and 12 may, at the discretion of the device maker, disable those additional bands for PTCRB and AT&T certification. Note that bands must be disabled in the device and the certification records must reflect the active bands in the device for both PTCRB and AT&T.

5G Devices are required to support 4x4 MIMO by default. Under certain situations 2x2 MIMO can be supported, talk to your BPC if you feel you need 2x2 MIMO. Single antenna implementations for NR FR1 are not permissible.

All requirements accurate according to 13340 v23.1

LTE Category 1 and Above Antenna Performance Requirements

Table 1: LTE Requirements Category 1 and higher: Free-Space

Band	Minimum TRP	Minimum C-TIS	Minimum TIS Primary ¹²
2	+20.0 dBm	-92.5 dBm/10 MHz	-89.5 dBm/10MHz
4	+20.0 dBm	-92.5 dBm/10 MHz	-93 dBm/10MHz
5	+18.0 dBm	-90.5 dBm/10 MHz	-89 dBm/10MHz
12	+18.0 dBm	-92.5 dBm/5 MHz	-89 dBm/5MHz
14	+17.0 dBm	-88.5 dBm/10 MHz	-87 dBm/10MHz
17	+18.0 dBm	-89.5 dBm/10 MHz	-89 dBm/10MHz
29	--	-89.5 dBm/10 MHz	-88 dBm/10MHz
30	+19.0 dBm	-92.5 dBm/10MHz	-91 dBm/10MHz
66	+20.0 dBm	-94.5 dBm/10 MHz	-93 dBm/10MHz

Note: Devices supporting Carrier Aggregation should reference 13340 Requirement CDR-LTE-797 for guidance on bands and combinations to be tested.

Reference 13340 for details of MIMO antenna performance requirements.

Table 2: LTE Requirements, Cat1bis, Cat 1 and higher: Wearables ⁽⁹⁾

Band	Minimum TRP	Minimum C-TIS	Minimum TIS Primary ¹²
2	+12.0 dBm	-84.5 dBm/10 MHz	-83 dBm/10 MHz
4	+12.0 dBm	-84.5 dBm/10 MHz	-83 dBm/10 MHz
5	+10.0 dBm	-82.5 dBm/10 MHz	-81 dBm/10 MHz
12	+10.0 dBm	-84.5 dBm/5 MHz	-83 dBm/5 MHz
14	+9.0 dBm	-80.5dBm/10MHz	-79dBm/10MHz
17	+10.0 dBm	-81.5 dBm/10 MHz	-80 dBm/10 MHz

Low Power Wide Area (LPWA) Antenna Performance Requirements

Table 3: LTE-M Requirements: Free-Space ⁽⁴⁾

Band	Minimum TRP Power Class 3	Minimum TRP Power Class 5	Minimum TIS
2	+20.0 dBm	+17.0 dBm	-96 dBm
4	+20.0 dBm	+17.0 dBm	-98 dBm
12	+18.0 dBm	+15.0 dBm	-93 dBm

Table 4: Small Form Factor ⁽⁵⁾ Devices: LTE-M and Wearable Requirements: Free-Space ⁽⁶⁾

Band	Minimum TRP Power Class 3	Minimum TRP Power Class 5	Minimum TIS
2	+12.0 dBm	+9.0 dBm	-88 dBm
4	+12.0 dBm	+9.0 dBm	-90 dBm
12	+10.0 dBm	+7.0 dBm	-85 dBm

 Table 5: NB-IoT Requirements: Free Space ⁽¹⁰⁾

Band	Minimum TRP Power Class 3	Minimum TRP Power Class 5	Minimum TIS
2	+20.0 dBm	+17.0 dBm	-105 dBm
4	+20.0 dBm	+17.0 dBm	-105 dBm
12	+18.0 dBm	+15.0 dBm	-103 dBm

 Table 6: Small Form Factor Devices: NB-IoT and Wearable Requirements: Free-Space ^(6,10)

Band	Minimum TRP Power Class 3	Minimum TRP Power Class 5	Minimum TIS
2	+12.0 dBm	+9.0 dBm	-97 dBm
4	+12.0 dBm	+9.0 dBm	-97 dBm
12	+10.0 dBm	+7.0 dBm	-95 dBm

5G NR FR1 and FR2 Antenna Performance Requirements

Table 7: 5G NR FR1 and FR2: Free-Space

Band	Minimum TRP Power Class1	Minimum TRP Power Class 1.5 ¹³	Minimum TRP Power Class 2	Minimum TRP Power Class 3	Minimum C-TIS
n2	N/A		+20.0 dBm	+20.0 dBm	-95.5 dBm/5 MHz -92.5 dBm/10 MHz
n5	N/A		+20.0 dBm	+18.0 dBm	-93.5 dBm/5 MHz -90.5 dBm/10 MHz
n66	N/A		+20.0 dBm	+20.0 dBm	-97.5 dBm/5 MHz -94.5 dBm/10 MHz
n30 ⁽¹¹⁾	N/A		N/A	+20 dBm	-92.5 dBm/5 MHz -89.5 dBm/10 MHz
n77	N/A	+29 dBm	+20.0 dBm	+17 dBm	-85.0 dBm/100MHz
n260	+38.0 dBm		N/A	+20.6 dBm	N/A

Notes

1. Secondary antenna branch TIS must be no more than 4 dB below primary antenna.
2. Secondary antenna branch is mandatory for LTE Category 1 and higher devices, review 20059 for further details.
3. Devices supporting Carrier aggregation and Band 29, must test at least one CA band combination which includes Band 29 (e.g., CA_2A-29A, CA_4A-29A, etc.).
4. TRP/TIS is applicable for all LTE-M devices with: (1) An embedded antenna or (2) An external antenna cabled less than 20cm. Testing shall be performed according to the requirements of CTIA Test Plan for Wireless Device Over-The-Air Performance version 3.8 or later. Testing is required for AT&T certification even if it is not yet mandatory for PTCRB.
5. Small Form Factor device is a device under 107mm in the longest direction.
6. LTE-M and NB-IoT Wearable Devices shall comply with the Small Form Factor radiated performance limits. Wearable devices shall be tested using the wrist phantom for wrist worn devices, or the body phantom for all other wearable device types.
7. Secondary antenna branch TIS must be no more than 5 dB below primary antenna.
8. Receive diversity is not required for wrist worn devices that do not support VoLTE. For wearables supporting VoLTE, seek guidance from ATT SME concerning the Envelope Correlation Coefficient (ECC) requirements for receive diversity primary and secondary antennas.
9. To be tested using the wrist phantom for wrist worn devices.
10. TRP/TIS applicable for all NB-IoT devices with an embedded antenna or external antenna cabled less than 20cm. Testing shall be performed according to the requirements of CTIA Test Plan for Wireless Device Over-The-Air Performance version 3.9 or later. Testing is required for AT&T certification even if it is not yet mandatory for PTCRB.
11. Only applicable to 5G Stand Alone (SA) devices
12. Cat1bis devices and single antenna channel devices shall use the Primary TIS requirements
13. Power class 1.5 for Band n77 SA mode TRP +29 dBm achieved via dual Tx (+2dB/-1dB) tolerance can be applied for the total power.

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History

Version	Date	Summary of Changes
1.8	4/16/2023	Added 5G TRP TIS Requirements, corrected LTE B4 TIS, aligned to 13340 v23.1, TRP for power class 1.5 for n77
1.7		Alignment with 13340 v20.1
1.6		Updated format. Updated to C-TIS
1.5	7/15/2019	Updated requirements on wearable device testing. Added Band 14 for wearables. Added TRP & TIS requirements for NB-IoT in table 4. Updated table 3 to add band 14 TRP and TIS requirements.
1.4	9/27/2018	Clarified Cat M1 requirements. Added Band 29. Removed UMTS requirements. Clarified Wearable requirements.
1.3	5/18/2018	Added small form factor.
1.2	12/8/2017	Initial public release