



FCC TEST REPORT
FOR
EFENTO SP. Z O.O.
HC7 NB-IoT Sensor
Test Model: HC7

Prepared for : EFENTO SP. Z O.O.
Address : ul. Przemysłowa 12 30-701 Kraków Poland

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample : January 20, 2026
Number of tested samples : 2
Sample No. : A260119217-1, A260119217-2
Serial number : Prototype
Date of Test : January 20, 2026 ~ March 12, 2026
Date of Report : March 13, 2026



**FCC PART 22/24/27/90 TEST REPORT**
FCC Part 22H/Part 24E/Part 27/Part 90**Report Reference No. : LCSA01206014EB****FCC ID. : 2BALY-HC7****Date of Issue..... : March 13, 2026****Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.**Address..... : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park
Yabianxueziwei, Shajing Street, Baoan District, Shenzhen,
518000, China**Applicant's name : EFENTO SP. Z O.O.**

Address..... : ul. Przemysłowa 12 30-701 Kraków Poland

Test specification..... :Standard : **FCC CFR Title 47 Part 2, Part 22H, Part 24E, Part 27, Part 90**
TIA-603-E: 2016**KDB971168 D01 Power Meas License Digital Systems v03r01**

Test Report Form No : LCSEMC-1.0

TRF Originator : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF..... : Dated 2011-03

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Test item description..... : HC7 NB-IoT Sensor

Trade Mark..... : Efento

Test Model : HC7

Modulation Type : BPSK, QPSK

Ratings : Please Refer to Page 7

Result..... : **PASS****Compiled by:**

Vera Deng/ Administrator

Supervised by:

Kevin Huang/ RF Manager

Approved by:

Gavin Liang/ Manager



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TEST REPORT

Test Report No. :	LCSA01206014EB	March 13, 2026
		Date of issue

EUT.....	: HC7 NB-IoT Sensor
Test Model.....	: HC7
Applicant.....	: EFENTO SP. Z O.O.
Address.....	: ul. Przemysłowa 12 30-701 Kraków Poland
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: EFENTO SP. Z O.O.
Address.....	: ul. Przemysłowa 12 30-701 Kraków Poland
Telephone.....	: /
Fax.....	: /
Factory.....	: EFENTO SP. Z O.O.
Address.....	: ul. Przemysłowa 12 30-701 Kraków Poland
Telephone.....	: /
Fax.....	: /

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.



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Revision History

Report Version	Issue Date	Revision Content	Revised By
000	March 13, 2026	Initial Issue	---



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1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Part 22H](#): Cellular RadHC7elephone Service

[FCC Part 24E](#): Broadband PCS

[FCC Part 27](#): MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

[FCC Part 90](#): PRIVATE LAND MOBILE RADIO SERVICES

[TIA-603-E March 2016](#): Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

[47 CFR FCC Part 15 Subpart B](#): Unintentional Radiators

[FCC Part 2](#): FREQUENCY ALLOCA-TIONS AND RADIO TREATY MAT-TERS; GENERAL RULES AND REG-ULATIONS

[ANSI C63.4:2014](#): Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

[FCC KDB971168 D01](#): Power Meas License Digital Systems v03r01



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2 SUMMARY

2.1 Product Description

The **EFENTO SP. Z O.O.** 's Model: HC7 NB-IoT Sensor or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

EUT	: HC7 NB-IoT Sensor
Test Model	: HC7
Ratings	: Battery: DC 3.6V, 8500mAh
Hardware Version	: HC7
Software Version	: 7.x.x
Bluetooth	:
Frequency Range	: 2402MHz~2480MHz
Channel Number	: 40 channels for Bluetooth V5.0 (DTS)
Channel Spacing	: 2MHz for Bluetooth V5.0 (DTS)
Modulation Type	: GFSK for Bluetooth V5.0 (DTS)
Bluetooth Version	: V5.0
Antenna Description	: Internal Antenna, 2.15dBi(Max.)
NB-IoT	:
Support Band	: ☒ NB-IoT Band 2(U.S.-Band) ☒ NB-IoT Band 4(U.S.-Band) ☒ NB-IoT Band 5(U.S.-Band) ☒ NB-IoT Band 12(U.S.-Band) ☒ NB-IoT Band 13(U.S.-Band) ☒ NB-IoT Band 17(U.S.-Band) ☒ NB-IoT Band 25(U.S.-Band) ☒ NB-IoT Band 66(U.S.-Band)
Release Version	: R13
Type Of Modulation	: UL: BPSK, QPSK DL: QPSK
Antenna Description	: Internal Antenna 2.21dBi (max.) For NB-IoT Band 2 2.21dBi (max.) For NB-IoT Band 4 2.35dBi (max.) For NB-IoT Band 5 2.35dBi (max.) For NB-IoT Band 12 2.35dBi (max.) For NB-IoT Band 13 2.35dBi (max.) For NB-IoT Band 17 2.21dBi (max.) For NB-IoT Band 25 2.21dBi (max.) For NB-IoT Band 66
Power Class	: Class 3
Extreme temp. Tolerance	: -30°C to +50°C
Extreme vol. Limits	: 3.1VDC to 4.1VDC (nominal: 3.8VDC)

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.





2.2 Equipment under Test

Power supply system utilised

Power supply voltage	:	☐	120V / 60 Hz	☐	115V / 60Hz
		☐	12 V DC	☐	24 V DC
		☒	Other (specified in blank below) DC 3.6V		

2.3 Short description of the Equipment under Test (EUT)

2.4.1 GeneralDescription

BLE/ NB-IoT system. NB-IoT frequency band is band 2/4/5/12/13/17/25/66. The HC7 NB-IoT Sensor implements such functions as RF signal receiving/transmitting, NB-IoT protocol processing, video MMS service and etc.

2.4 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
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2.5 External I/O Port

I/O Port Description	Quantity	Cable
---	---	---

2.6 Normal Accessory setting

Fully charged battery was used during the test.

2.7 Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A260119217-1)	Engineer sample – continuous transmit
Sample 2(A260119217-2)	Normal sample – Intermittent transmit





2.8 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

○	Power Cable	Length (m) :	/
		Shield :	/
		Detachable :	/
○	Multimeter	Manufacturer :	/
		Model No. :	/

2.9 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: 2BALY-HC7 filing to comply with FCC Part 22, Part 24, Part 27 and Part 90 Rules

2.10 Modifications

No modifications were implemented to meet testing criteria.

2.11 General Test Conditions/Configurations

2.9.1 Test Environment

EnvironmentParameter	SelectedValuesDuringTests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	DC 3.1V
	VN	DC 3.6V
	VH	DC 4.1V

NOTE:VL=lower extreme testvoltage VN=nominal voltage
VH=upper extreme testvoltage TN=normal temperature





3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen LCS Compliance Testing Laboratory Ltd

101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

The sites are constructed in conformance with the requirements of ANSI C63.4 (2014) and CISPR Publication 22.

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4 Test Description

Band 2 (1850-1910MHz pairedwith 1930-1990MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §24.232	EIRP ≤ 2W	PASS
Peak-Average Ratio	§2.1046, §24.232	FCC:Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	PASS
Band Edges Compliance	§2.1051, §24.238	≤ -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to the frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤-13dBm/1MHz, from 9kHz to10 th harmonics but outside authorized Operating frequency ranges.	PASS
Field Strength of Spurious Radiation	§2.1053, §24.238	≤ -13dBm/1MHz.	PASS
Frequency Stability	§2.1055, §24.235	FCC: within authorized frequency block.	PASS

NOTE 1:For the verdict, the“N/A”denotes“not applicable”,the“N/T”de notes “not tested”.



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**Band 4 (1710-1755MHz pairedwith 2110-2155MHz)**

Test Item	FCC RuleNo.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)	EIRP $\leq$ 1W;	PASS
Peak-Average Ratio	§2.1046, §27.50(d)	Limit $\leq$ 13dB	Pass
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §27.53(h)	$\leq$ -13dBm/1%*EBW, in1 MHz bands immediately outside and adjacent to the frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	$\leq$ -13dBm/1MHz, from 9kHz to10 th harmonics but outside authorized operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(h)	$\leq$ -13dBm/1MHz.	PASS

NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" de notes "not tested"

Band 5 (824-849MHz pairedwith 869-894MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Output Power	§2.1046, §22.913	FCC: ERP $\leq$ 7W.	Pass
Modulation Characteristics	§2.1047	Digital modulation	N/A
Bandwidth	§2.1049	OBW: No limit. EBW: No limit.	Pass
Band Edges Compliance	§2.1051, §22.917	$\leq$ -13dBm/1%*EBW, In 1MHz bands immediately outside and adjacent to The frequency block.	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: $\leq$ -13dBm/100kHz, from 9kHz to 10th harmonics but outside authorized operating frequency ranges.	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: $\leq$ -13dBm/100kHz.	Pass
Frequency Stability	§2.1055, §22.355	$\leq$ $\pm$ 2.5ppm.	Pass

NOTE 1:For the verdict, the"N/A"denotes"not applicable",the"N/T"de notes "not tested".



**Band 12 (699-716MHz paired with 729-746MHz)**

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(c)	ERP ≤ 3W;	PASS
Peak-Average Ratio	§2.1046, §27.50(c)	Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §27.53(g)	≤ -13dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to The frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	≤ -13dBm/100KHz, from 9kHz to 10th harmonics but outside authorized Operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(g)	≤ -13dBm/100KHz.	PASS
NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".			

Band 13 (777-787MHz paired with 746-756MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(b)	ERP ≤ 3W;	PASS
Peak-Average Ratio	§2.1046, §27.50(b)	Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §27.53(c)	≤ -13dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to The frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(c)	≤ -13dBm/100KHz, from 9kHz to 10th harmonics but outside authorized Operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(c)	≤ -13dBm/100KHz.	PASS
NOTE 1: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".			



**Band 17(704-716MHz pairedwith 734-746MHz)**

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(b)	ERP ≤ 3W;	PASS
Peak-Average Ratio	§2.1046, §27.50(b)	Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §27.53(c)	≤ -13dBm/1%*EBW,in1 MHz bands immediately outside and adjacent to The frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(c)	≤ -13dBm/100KHz, from 9kHz to10th harmonics but outside authorized Operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(c)	≤ -13dBm/100KHz.	PASS

Band 25(1850-1915MHz pairedwith 1930-1995MHz)

Test Item	FCC Rule No.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §24.232	ERP ≤ 2W;	PASS
Peak-Average Ratio	§2.1046, §24.232	Limit≤13dB	PASS
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
BandEdges Compliance	§2.1051, §24.238	≤ -13dBm/1%*EBW,in1 MHz bands immediately outside and adjacent to The frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤ -13dBm/100KHz, from 9kHz to10th harmonics but outside authorized Operating frequency ranges.	PASS
Frequency Stability	§2.1053, §24.238	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1055, §24.235	≤ -13dBm/100KHz.	PASS

NOTE 1:For the verdict, the“N/A”denotes“not applicable”,the“N/T”de notes “not tested”.



**Band 66 (1710-1780MHz pairedwith 2110-2180MHz)**

Test Item	FCC RuleNo.	Requirements	Verdict
Effective(Isotropic) Radiated Power Output Data	§2.1046, §27.50(d)	EIRP ≤ 1W;	PASS
Peak-Average Ratio	§2.1046, §27.50(d)	Limit≤13dB	Pass
Modulation Characteristics	§2.1047	Digitalmodulation	N/A
Bandwidth	§2.1049	OBW: Nolimit. EBW: Nolimit.	PASS
Band Edges Compliance	§2.1051, §27.53(g)	≤ -13dBm/1%*EBW, in1 MHz bands immediately outside and adjacent to the frequency block.	PASS
Spurious Emission at Antenna Terminals	§2.1051, §27.53(g)	≤ -13dBm/1MHz, from 9kHz to10 th harmonics but outside authorized operating frequency ranges.	PASS
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	PASS
Radiated spurious emission	§2.1053, §27.53(g)	≤ -13dBm/1MHz.	PASS
NOTE 1: For the verdict, the “N/A” denotes “not applicable”, the “N/T” de notes “not tested”			



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3.5 Equipments Used during the Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2025-05-22	2026-05-21
2	Power Sensor	R&S	NRV-Z81	100458	2025-05-22	2026-05-21
3	Power Sensor	R&S	NRV-Z32	10057	2025-05-22	2026-05-21
4	LTE Test Software	Tonscend	JS1120-1	N/A	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-1	158060009	2025-11-07	2026-11-06
6	MXA Signal Analyzer	Agilent	N9020A	MY23311067	2025-05-22	2026-05-21
7	WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW 500	166586	2025-05-22	2026-05-21
8	DC Power Supply	Agilent	E3642A	N/A	2025-09-27	2026-09-26
9	EMI Test Software	Farad	EZ-EMC	Ver.FARAD-3A1.1+	N/A	N/A
10	3m Semi Anechoic Chamber	Maorui	966	/	2023-10-12	2026-10-11
11	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
12	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2024-07-13	2027-07-12
13	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2024-08-03	2027-08-02
14	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2024-07-13	2027-07-12
15	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2024-07-13	2027-07-12
16	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2024-07-30	2027-07-29
17	EMI Test Receiver	R&S	ESR 7	101181	2025-05-22	2026-05-21
18	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2025-05-22	2026-05-21
19	Low-frequency amplifier	SchwarzZBECK	BBV9745	00253	2025-09-27	2026-09-26
20	High-frequency amplifier	JS Denki Pte	PA0118-43	JSPA21009	2025-09-27	2026-09-26
21	6dB Attenuator	/	100W/6dB	1172040	2025-05-22	2026-05-21
22	3dB Attenuator	/	2N-3dB	/	2025-09-28	2026-09-27
23	Temperature & Humidity Chamber	Baro	/	/	2025-06-04	2026-06-03
24	EMI Test Software	Farad	EZ-EMC	Ver. EMC-CON 3A1.1+	N/A	N/A
25	Antenna Mast	Max-Full	MFA-515BSN	1308572	N/A	N/A
26	Pulse Limiter	R&S	ESH3-Z2	102750	2025-05-23	2026-05-22
27	RADIO COMMUNICATION TESTER	Anritsu	MT8821C	6262257865	2025-05-22	2026-05-21
28	RADIO COMMUNICATION TESTER	Anritsu	MT8000A	6262208376	2025-10-21	2026-10-20
29	Signal Analyzer	Anritsu	MS2840A	6201591940	2025-05-22	2026-05-21
30	Signal Generator	Anritsu	MG3710E	626220421	2025-05-22	2026-05-21
31	Signal Generator	Anritsu	MG3692C	222804	2025-02-13	2026-02-12
32	RF Filter	Micro-Tronics	BRC50718	017	2025-09-27	2026-09-26
33	RF Filter	Micro-Tronics	BRC50719	011	2025-09-27	2026-09-26
34	RF Filter	Micro-Tronics	BRC50720	011	2025-09-27	2026-09-26
35	RF Filter	Micro-Tronics	BRC50721	013	2025-09-27	2026-09-26
37	RF Filter	Micro-Tronics	BRM50702	S/N-195	2025-09-27	2026-09-26



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3.6 Measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to ETSI TR 100 028 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" and is documented in the Shenzhen LCS Compliance Testing Laboratory Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen LCS Compliance Testing Laboratory Ltd. is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	3.10 dB	(1)
Radiated Emission	1~18GHz	3.80 dB	(1)
Radiated Emission	18-40GHz	3.90 dB	(1)
Conducted Disturbance	0.15~30MHz	1.63 dB	(1)
Conducted Power	9KHz~18GHz	0.61 dB	(1)
Spurious RF Conducted Emission	9KHz~40GHz	1.22 dB	(1)
Band Edge Compliance of RF Emission	9KHz~40GHz	1.22 dB	(1)
Occupied Bandwidth	9KHz~40GHz	-	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.





4 TEST CONDITIONS AND RESULTS

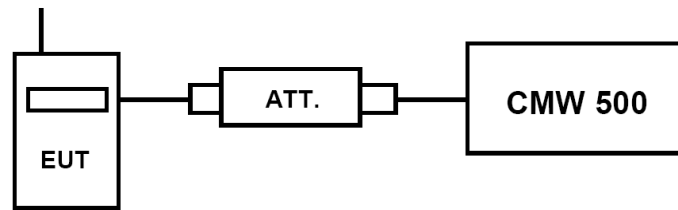
4.1 Output Power

TEST APPLICABLE

During the process of testing, the EUT was controlled via R&S Digital Radio Communication tester (CMW 500) to ensure max power transmission and proper modulation. This result contains output power and EIRP measurements for the EUT. In all cases, output power is within the specified limits.

4.1.1. Conducted Output Power

TEST CONFIGURATION



TEST PROCEDURE

Conducted Power Measurement:

- Place the EUT on a bench and set it in transmitting mode.
- Connect a low loss RF cable from the antenna port to a CMW 500 by an Att.
- EUT Communicate with CMW 500 then selects a channel for testing.
- Add a correction factor to the display CMW 500, and then test.

TEST RESULTS

Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
- For E-UTRA Band 2, please refer to Appendix B: Section B.1
- For E-UTRA Band 4, please refer to Appendix C: Section C.1
- For E-UTRA Band 5, please refer to Appendix D: Section D.1
- For E-UTRA Band 12, please refer to Appendix E: Section E.1
- For E-UTRA Band 13, please refer to Appendix F: Section F.1
- For E-UTRA Band 17, please refer to Appendix G: Section G.1
- For E-UTRA Band 25, please refer to Appendix H: Section H.1
- For E-UTRA Band 66, please refer to Appendix I: Section I.1





4.1.2. Radiated Output Power

LIMIT

This is the test for the maximum radiated power from the EUT.

Per §22.913(2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in §22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Rule Part 24.232(c) specifies, "Mobile/portable stations are limited to 2 watts e.i.r.p. Peak power" and 24.232(e) specifies that "Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage."

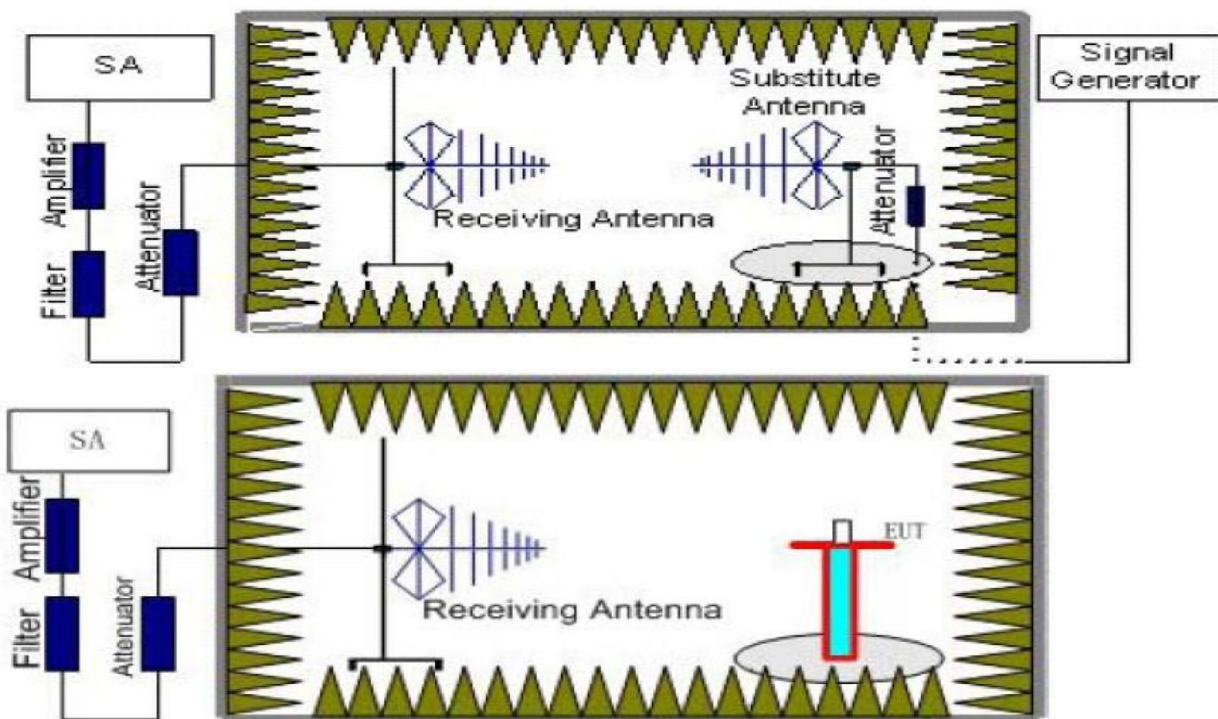
Per Part 27.50(d) (4) specifies, Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755MHz band are limited to 1W EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in this band must employ a means for limiting power to the minimum necessary for successful communications.

Per Part 27.50(c) (10) specifies, Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.

Per Part 27.50(h) (2) specifies Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Per Part 90.635(b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

TEST CONFIGURATION



TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.





- A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
- The EUT shall be replaced by a substitution antenna. In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
- A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
- This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
- ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

TEST RESULTS

Radiated Measurement:

Remark:

- We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
- $EIRP = P_{Mea}(\text{dBm}) - P_{cl}(\text{dB}) + P_{Ag}(\text{dB}) + G_a(\text{dBi})$
- $ERP = EIRP - 2.15\text{dBi}$ as EIRP by subtracting the gain of the dipole.
- Margin = Emission Level - Limit
- We tested the worst-case records for H and V directions, and only the worst-case records for V direction were recorded in the report.

NB-IoT Band 2_Channel Bandwidth 3.75kHz _BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-19.68	4.03	8.38	35.51	20.18	33.01	-12.83	V
1877.6	-19.56	4.08	8.33	35.56	20.25	33.01	-12.76	V
1909.9	-20.31	4.14	8.26	35.63	19.44	33.01	-13.57	V

NB-IoT Band 2_Channel Bandwidth 15kHz _BPSK

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	G_a Antenna Gain(dB)	P_{Ag} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-21.36	4.03	8.38	35.51	18.50	33.01	-14.51	V
1877.6	-21.32	4.08	8.33	35.56	18.49	33.01	-14.52	V
1909.9	-21.62	4.14	8.26	35.63	18.13	33.01	-14.88	V



*NB-IoT Band 2_Channel Bandwidth 3.75kHz_QPSK*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-20.02	4.03	8.38	35.51	19.84	33.01	-13.17	V
1877.6	-20.89	4.08	8.33	35.56	18.92	33.01	-14.09	V
1909.9	-20.05	4.14	8.26	35.63	19.70	33.01	-13.31	V

NB-IoT Band 2_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-21.84	4.03	8.38	35.51	18.02	33.01	-14.99	V
1877.6	-22.41	4.08	8.33	35.56	17.40	33.01	-15.61	V
1909.9	-21.63	4.14	8.26	35.63	18.12	33.01	-14.89	V

NB-IoT Band 4_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-19.25	3.93	9.05	34.96	20.83	30.00	-9.17	V
1732.5	-19.36	3.93	8.89	35.01	20.61	30.00	-9.39	V
1754.9	-19.57	3.94	8.76	35.08	20.33	30.00	-9.67	V

NB-IoT Band 4_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-18.62	3.93	9.05	34.96	21.46	30.00	-8.54	V
1732.5	-19.34	3.93	8.89	35.01	20.63	30.00	-9.37	V
1754.9	-19.46	3.94	8.76	35.08	20.44	30.00	-9.56	V

NB-IoT Band 4_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-19.14	3.93	9.05	34.96	20.94	30.00	-9.06	V
1732.5	-18.54	3.93	8.89	35.01	21.43	30.00	-8.57	V
1754.9	-18.50	3.94	8.76	35.08	21.40	30.00	-8.60	V

NB-IoT Band 4_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-18.93	3.93	9.05	34.96	21.15	30.00	-8.85	V
1732.5	-19.72	3.93	8.89	35.01	20.25	30.00	-9.75	V
1754.9	-19.15	3.94	8.76	35.08	20.75	30.00	-9.25	V



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**NB-IoT Band 5_Channel Bandwidth 3.75kHz_BPSK**

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.10	-16.41	3.45	8.45	2.15	33.79	20.23	38.45	-18.22	V
836.50	-16.22	3.49	8.45	2.15	33.85	20.44	38.45	-18.01	V
848.90	-15.83	3.55	8.36	2.15	33.88	20.71	38.45	-17.74	V

NB-IoT Band 5_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.10	-15.69	3.45	8.45	2.15	33.79	20.95	38.45	-17.50	V
836.50	-16.15	3.49	8.45	2.15	33.85	20.51	38.45	-17.94	V
848.90	-16.16	3.55	8.36	2.15	33.88	20.38	38.45	-18.07	V

NB-IoT Band 5_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.10	-17.13	3.45	8.45	2.15	33.79	19.51	38.45	-18.94	V
836.50	-16.61	3.49	8.45	2.15	33.85	20.05	38.45	-18.40	V
848.90	-16.67	3.55	8.36	2.15	33.88	19.87	38.45	-18.58	V

NB-IoT Band 5_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Peak ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
824.10	-16.86	3.45	8.45	2.15	33.79	19.78	38.45	-18.67	V
836.50	-16.52	3.49	8.45	2.15	33.85	20.14	38.45	-18.31	V
848.90	-17.24	3.55	8.36	2.15	33.88	19.30	38.45	-19.15	V

NB-IoT Band 12_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	Burst Avergae ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
699.10	-15.41	3.01	8.29	2.15	33.52	21.24	34.77	-13.53	V
707.50	-15.06	3.02	8.29	2.15	33.52	21.58	34.77	-13.19	V
715.90	-15.28	3.06	8.29	2.15	33.52	21.32	34.77	-13.45	V

NB-IoT Band 12_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	Burst Avergae ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
699.10	-16.43	3.01	8.29	2.15	33.52	20.22	34.77	-14.55	V
707.50	-16.28	3.02	8.29	2.15	33.52	20.36	34.77	-14.41	V
715.90	-16.28	3.06	8.29	2.15	33.52	20.32	34.77	-14.45	V

NB-IoT Band 12_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	Burst Avergae ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
699.10	-15.72	3.01	8.29	2.15	33.52	20.93	34.77	-13.84	V
707.50	-15.59	3.02	8.29	2.15	33.52	21.05	34.77	-13.72	V
715.90	-15.42	3.06	8.29	2.15	33.52	21.18	34.77	-13.59	V



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*NB-IoT Band 12_Channel Bandwidth 15kHz_QPSK*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	Burst Average ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
699.10	-16.91	3.01	8.29	2.15	33.52	19.74	34.77	-15.03	V
707.50	-16.64	3.02	8.29	2.15	33.52	20.00	34.77	-14.77	V
715.90	-16.83	3.06	8.29	2.15	33.52	19.77	34.77	-15.00	V

NB-IoT Band 13_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
777.1	-18.18	3.21	9.61	33.89	2.15	19.96	34.77	-14.81	V
782.0	-17.70	3.23	9.52	34.74	2.15	21.18	34.77	-13.59	V
786.9	-17.65	3.25	9.43	34.85	2.15	21.23	34.77	-13.54	V

NB-IoT Band 13_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
777.1	-18.57	3.21	9.61	33.89	2.15	19.57	34.77	-15.20	V
782.0	-18.72	3.23	9.52	34.74	2.15	20.16	34.77	-14.61	V
786.9	-18.84	3.25	9.43	34.85	2.15	20.04	34.77	-14.73	V

NB-IoT Band 13_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
777.1	-17.75	3.21	9.61	33.89	2.15	20.39	34.77	-14.38	V
782.0	-18.47	3.23	9.52	34.74	2.15	20.41	34.77	-14.36	V
786.9	-18.42	3.25	9.43	34.85	2.15	20.46	34.77	-14.31	V

NB-IoT Band 13_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	P _{Aq} (dB)	Correction (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarization
777.1	-19.15	3.21	9.61	33.89	2.15	18.99	34.77	-15.78	V
782.0	-19.29	3.23	9.52	34.74	2.15	19.59	34.77	-15.18	V
786.9	-19.29	3.25	9.43	34.85	2.15	19.59	34.77	-15.18	V

NB-IoT Band 17_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain (dB)	Correction (dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
706.1	-16.17	3.02	8.29	2.15	33.52	20.47	34.77	-14.30	V
711.0	-16.28	3.06	8.29	2.15	33.52	20.32	34.77	-14.45	V
715.9	-15.56	3.06	8.29	2.15	33.52	21.04	34.77	-13.73	V



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**NB-IoT Band 17_Channel Bandwidth 15kHz_BPSK**

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
706.1	-16.34	3.06	8.29	2.15	33.52	20.26	34.77	-14.51	V
711.0	-16.32	3.06	8.29	2.15	33.52	20.28	34.77	-14.49	V
715.9	-16.45	3.06	8.29	2.15	33.52	20.15	34.77	-14.62	V

NB-IoT Band 17_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
706.1	-16.32	3.02	8.29	2.15	33.52	20.32	34.77	-14.45	V
711.0	-16.57	3.06	8.29	2.15	33.52	20.03	34.77	-14.74	V
715.9	-17.02	3.06	8.29	2.15	33.52	19.58	34.77	-15.19	V

NB-IoT Band 17_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	Correction (dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
706.1	-16.35	3.06	8.29	2.15	33.52	20.25	34.77	-14.52	V
711.0	-16.79	3.06	8.29	2.15	33.52	19.81	34.77	-14.96	V
715.9	-16.36	3.06	8.29	2.15	33.52	20.24	34.77	-14.53	V

NB-IoT Band 25_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-19.68	4.03	8.38	35.51	20.18	33.01	-12.83	V
1882.5	-19.33	4.08	8.33	35.56	20.48	33.01	-12.53	V
1914.9	-17.99	4.14	8.26	35.63	21.76	33.01	-11.25	V

NB-IoT Band 25_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-18.76	4.03	8.38	35.51	21.10	33.01	-11.91	V
1882.5	-17.01	4.08	8.33	35.56	22.80	33.01	-10.21	V
1914.9	-19.15	4.14	8.26	35.63	20.60	33.01	-12.41	V

NB-IoT Band 25_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-18.98	4.03	8.38	35.51	20.88	33.01	-12.13	V
1882.5	-17.92	4.08	8.33	35.56	21.89	33.01	-11.12	V
1914.9	-17.40	4.14	8.26	35.63	22.35	33.01	-10.66	V



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*NB-IoT Band 25_Channel Bandwidth 3.75kHz_QPSK*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1850.1	-18.36	4.03	8.38	35.51	21.50	33.01	-11.51	V
1882.5	-19.44	4.08	8.33	35.56	20.37	33.01	-12.64	V
1914.9	-18.88	4.14	8.26	35.63	20.87	33.01	-12.14	V

NB-IoT Band 66_Channel Bandwidth 3.75kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-18.95	3.93	9.05	34.96	21.13	30.00	-8.87	V
1745.0	-19.62	3.93	8.89	35.01	20.35	30.00	-9.65	V
1779.9	-19.55	3.94	8.76	35.08	20.35	30.00	-9.65	V

NB-IoT Band 66_Channel Bandwidth 15kHz_BPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-19.08	3.93	9.05	34.96	21.00	30.00	-9.00	V
1745.0	-19.34	3.93	8.89	35.01	20.63	30.00	-9.37	V
1779.9	-19.04	3.94	8.76	35.08	20.86	30.00	-9.14	V

NB-IoT Band 66_Channel Bandwidth 3.75kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-18.84	3.93	9.05	34.96	21.24	30.00	-8.76	V
1745.0	-19.08	3.93	8.89	35.01	20.89	30.00	-9.11	V
1779.9	-19.35	3.94	8.76	35.08	20.55	30.00	-9.45	V

NB-IoT Band 66_Channel Bandwidth 15kHz_QPSK

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	G _a Antenna Gain(dB)	P _{Aq} (dB)	Burst Average EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1710.1	-19.05	3.93	9.05	34.96	21.03	30.00	-8.97	V
1745.0	-19.22	3.93	8.89	35.01	20.75	30.00	-9.25	V
1779.9	-19.06	3.94	8.76	35.08	20.84	30.00	-9.16	V



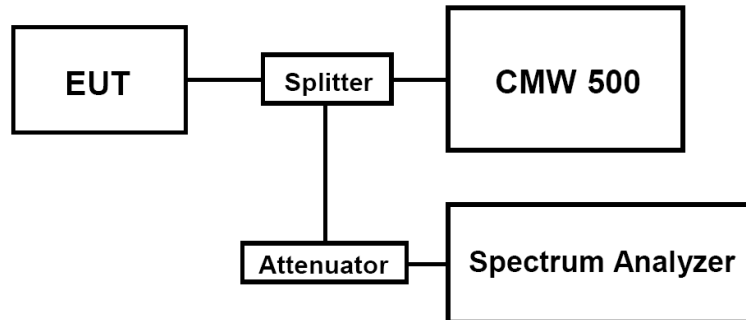


4.2 Peak-to-Average Ratio (PAR)

LIMIT

The Peak-to-Average Ratio (PAR) of the transmission may not exceed 13 dB.

TEST CONFIGURATION



TEST PROCEDURE

1. Refer to instrument's analyzer instruction manual for details on how to use the power statistics/CCDF function;
2. Set resolution/measurement bandwidth $\geq$ signal's occupied bandwidth;
3. Set the number of counts to a value that stabilizes the measured CCDF curve;
4. Set the measurement interval as follows:
 - 1). for continuous transmissions, set to 1 ms,
 - 2). for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
5. Record the maximum PAPR level associated with a probability of 0.1%.

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
2. For E-UTRA Band 2, please refer to Appendix B: Section B.2
3. For E-UTRA Band 4, please refer to Appendix C: Section C.2
4. For E-UTRA Band 5, please refer to Appendix D: Section D.2
5. For E-UTRA Band 12, please refer to Appendix E: Section E.2
6. For E-UTRA Band 13, please refer to Appendix F: Section F.2
7. For E-UTRA Band 17, please refer to Appendix G: Section G.2
8. For E-UTRA Band 25, please refer to Appendix H: Section H.2
9. For E-UTRA Band 66, please refer to Appendix I: Section I.2



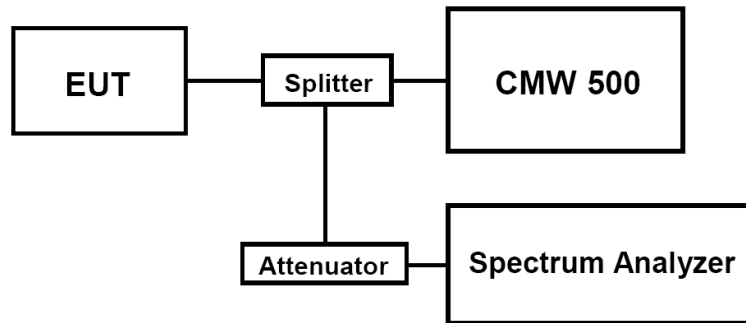


4.3 Occupied Bandwidth and Emission Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at low, middle and high channel in each band. The -26dBc Emission bandwidth was also measured and recorded. Set RBW was set to about 1% of emission BW, VBW $\geq$ 3 times RBW. -26dBc display line was placed on the screen (or 99% bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace.

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
2. For E-UTRA Band 2, please refer to Appendix B: Section B.3
3. For E-UTRA Band 4, please refer to Appendix C: Section C.3
4. For E-UTRA Band 5, please refer to Appendix D: Section D.3
5. For E-UTRA Band 12, please refer to Appendix E: Section E.3
6. For E-UTRA Band 13, please refer to Appendix F: Section F.3
7. For E-UTRA Band 17, please refer to Appendix G: Section G.3
8. For E-UTRA Band 25, please refer to Appendix H: Section H.3
9. For E-UTRA Band 66, please refer to Appendix I: Section I.3





4.4 Band Edge compliance

LIMIT

For NB-IoT Band 2: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 4: Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

For NB-IoT Band 5: Per FCC §22.917 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 12: Per §27.53 (g): For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

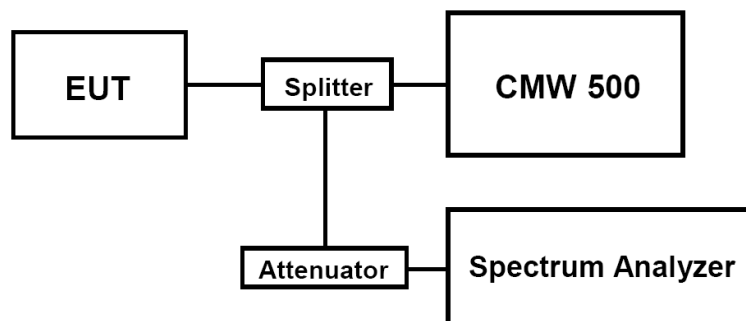
For NB-IoT Band 13: Per §27.53 (c): For operations in the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations

For NB-IoT Band 17: Per §27.53(g): (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For NB-IoT Band 25: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 66: Per §27.53(h): For operations in the 1710–1780 MHz and 2110–2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

TEST CONFIGURATION





TEST PROCEDURE

1. The transmitter output port was connected to base station.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator, the path loss was compensated to the results for each measurement.
3. Set EUT at maximum power through base station.
4. Select lowest and highest channels for each band and different modulation.
5. Measure Band edge using RMS (Average) detector by spectrum

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
2. For E-UTRA Band 2, please refer to Appendix B: Section B.4
3. For E-UTRA Band 4, please refer to Appendix C: Section C.4
4. For E-UTRA Band 5, please refer to Appendix D: Section D.4
5. For E-UTRA Band 12, please refer to Appendix E: Section E.4
6. For E-UTRA Band 13, please refer to Appendix F: Section F.4
7. For E-UTRA Band 17, please refer to Appendix G: Section G.4
8. For E-UTRA Band 25, please refer to Appendix H: Section H.4
9. For E-UTRA Band 66, please refer to Appendix I: Section I.4



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4.5 Spurious Emission on Antenna Port

LIMIT

For NB-IoT Band 2: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 4: Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

For NB-IoT Band 5: Per FCC §22.917 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 12: Per §27.53 (g): For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

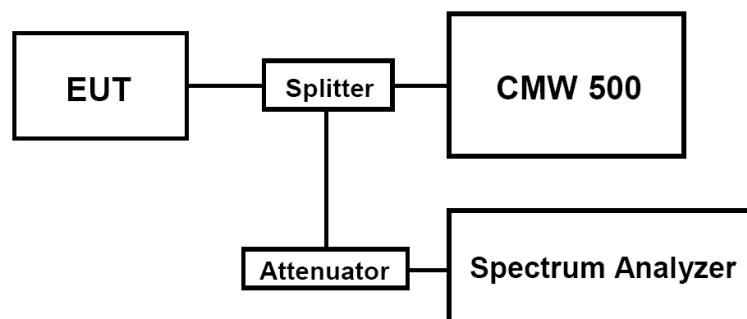
For NB-IoT Band 13: Per §27.53 (c): For operations in the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

For NB-IoT Band 17: Per §27.53(g): (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For NB-IoT Band 25: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 66: Per §27.53(h): For operations in the 1710–1780 MHz and 2110–2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

TEST CONFIGURATION





TEST PROCEDURE

The EUT was setup according to TIA-603-E

- a. Place the EUT on a bench and set it in transmitting mode.
- b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW 500 by a Directional Couple.
- c. EUT Communicate with CMW 500, then select a channel for testing.
- d. Add a correction factor to the display of spectrum, and then test.
- e. The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to 10th harmonic.
- f. Please refer to following tables for test antenna conducted emissions.



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Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
NB-IoT Band 2	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~20	1 MHz	3 MHz	Auto
NB-IoT Band 4	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~20	1 MHz	3 MHz	Auto
NB-IoT Band 5	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~10	1 MHz	3 MHz	Auto
NB-IoT Band 12	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~10	1 MHz	3 MHz	Auto
NB-IoT Band 13	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~16.1	1 MHz	3 MHz	Auto
NB-IoT Band 17	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~10	1 MHz	3 MHz	Auto
NB-IoT Band 25	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~20	1 MHz	3 MHz	Auto
NB-IoT Band 66	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.03	10KHz	30KHz	Auto
	0.03~20	1 MHz	3 MHz	Auto

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
2. For E-UTRA Band 2, please refer to Appendix B: Section B.5
3. For E-UTRA Band 4, please refer to Appendix C: Section C.5
4. For E-UTRA Band 5, please refer to Appendix D: Section D.5
5. For E-UTRA Band 12, please refer to Appendix E: Section E.5
6. For E-UTRA Band 13, please refer to Appendix F: Section F.5
7. For E-UTRA Band 17, please refer to Appendix G: Section G.5
8. For E-UTRA Band 25, please refer to Appendix H: Section H.5
9. For E-UTRA Band 66, please refer to Appendix I: Section I.5





4.6 Radiated Spurious Emission

LIMIT

For NB-IoT Band 2: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 4: Per §27.53(h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

For NB-IoT Band 5: Per FCC §22.917 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 12: Per §27.53 (g): For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB.

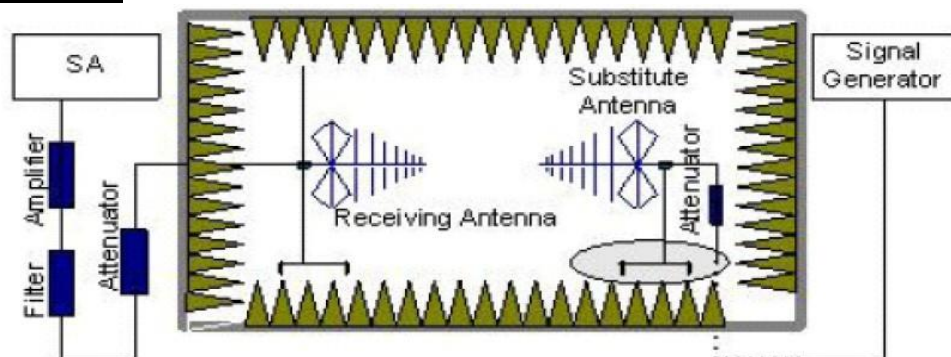
For NB-IoT Band 13: Per §27.53 (c): For operations in the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log (P)$ dB;
On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

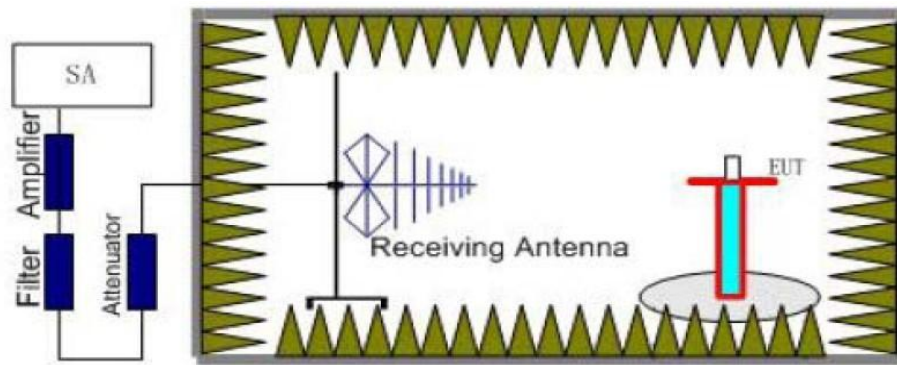
For NB-IoT Band 17: Per §27.53(g): (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

For NB-IoT Band 25: Per FCC §24.238 the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10\log(P)$ dB.

For NB-IoT Band 66: Per §27.53(h): For operations in the 1710–1780 MHz and 2110–2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

TEST CONFIGURATION





TEST PROCEDURE

1. EUT was placed on a 1.50 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.50m. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.
2. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
3. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (P_r).
4. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
5. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (P_{cl}), the Substitution Antenna Gain (G_a) and the Amplifier Gain (P_{Ag}) should be recorded after test. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = P_{Mea} + P_{Ag} - P_{cl} + G_a$$
6. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power.
7. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.
8. In order to make sure test results more clearly, we set frequency range and sweep time for difference frequency range as follows table:

Working Frequency	Subrange (GHz)	RBW	VBW	Sweep time (s)
NB-IoT Band 2	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2





NB-IoT Band 4	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
NB-IoT Band 5	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~9	1 MHz	3 MHz	3
NB-IoT Band 12	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
NB-IoT Band 13	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
NB-IoT Band 17	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
NB-IoT Band 25	0.00009~0.15	1KHz	3KHz	30
	0.00015~0.03	10KHz	30KHz	10
	0.03~1	100KHz	300KHz	10
	1~2	1 MHz	3 MHz	2
	2~5	1 MHz	3 MHz	3
	5~8	1 MHz	3 MHz	3
	8~11	1 MHz	3 MHz	3
	11~14	1 MHz	3 MHz	3
	14~18	1 MHz	3 MHz	3
	18~20	1 MHz	3 MHz	2





Frequency	Channel	Frequency Range	Verdict
NB-IoT Band 2	Low	9KHz -20GHz	PASS
	Middle	9KHz -20GHz	PASS
	High	9KHz -20GHz	PASS
NB-IoT Band 4	Low	9KHz -18GHz	PASS
	Middle	9KHz -18GHz	PASS
	High	9KHz -18GHz	PASS
NB-IoT Band 5	Low	9KHz -9GHz	PASS
	Middle	9KHz -9GHz	PASS
	High	9KHz -9GHz	PASS
NB-IoT Band 12	Low	9KHz -8GHz	PASS
	Middle	9KHz -8GHz	PASS
	High	9KHz -8GHz	PASS
NB-IoT Band 13	Low	9KHz -8GHz	PASS
	Middle	9KHz -8GHz	PASS
	High	9KHz -8GHz	PASS
NB-IoT Band 17	Low	9KHz -8GHz	PASS
	Middle	9KHz -8GHz	PASS
	High	9KHz -8GHz	PASS
NB-IoT Band 25	Low	9KHz -20GHz	PASS
	Middle	9KHz -20GHz	PASS
	High	9KHz -20GHz	PASS
NB-IoT Band 66	Low	9KHz -18GHz	PASS
	Middle	9KHz -18GHz	PASS
	High	9KHz -18GHz	PASS

TEST RESULTS

Remark:

1. We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66.
3. We were not recorded other points as values lower than limits.
4. $Power(EIRP) = P_{Mea} + P_{Ag} - P_{cl} + G_a$
5. $Margin = EIRP - Limit$

Note: All adapteres and all the modes have been tested and recorded worst mode in the report.

NB-IoT Band 2_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3715.0	-38.97	5.26	3.00	9.88	-34.35	-13.00	-21.35	H
5572.5	-45.23	6.11	3.00	11.36	-39.98	-13.00	-26.98	H
3715.0	-29.97	5.26	3.00	9.88	-25.35	-13.00	-12.35	V
5572.5	-34.04	6.11	3.00	11.36	-28.79	-13.00	-15.79	V



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*NB-IoT Band 2_Channel Bandwidth 3.75kHz_BPSK_Middle Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3720.0	-37.75	5.32	3.00	10.03	-33.04	-13.00	-20.04	H
5580.0	-46.47	6.19	3.00	11.41	-41.25	-13.00	-28.25	H
3720.0	-29.10	5.32	3.00	10.03	-24.39	-13.00	-11.39	V
5580.0	-33.31	6.19	3.00	11.41	-28.09	-13.00	-15.09	V

NB-IoT Band 2_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3800.0	-40.93	5.36	3.00	9.62	-36.67	-13.00	-23.67	H
5700.0	-46.19	6.24	3.00	11.46	-40.97	-13.00	-27.97	H
3800.0	-31.91	5.36	3.00	9.62	-27.65	-13.00	-14.65	V
5700.0	-35.07	6.24	3.00	11.46	-29.85	-13.00	-16.85	V

NB-IoT Band 2_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3715.0	-39.42	5.26	3.00	9.88	-34.80	-13.00	-21.80	H
5572.5	-43.47	6.11	3.00	11.36	-38.22	-13.00	-25.22	H
3715.0	-28.93	5.26	3.00	9.88	-24.31	-13.00	-11.31	V
5572.5	-36.75	6.11	3.00	11.36	-31.50	-13.00	-18.50	V

NB-IoT Band 2_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3720.0	-40.19	5.32	3.00	10.03	-35.48	-13.00	-22.48	H
5580.0	-44.80	6.19	3.00	11.41	-39.58	-13.00	-26.58	H
3720.0	-31.45	5.32	3.00	10.03	-26.74	-13.00	-13.74	V
5580.0	-34.13	6.19	3.00	11.41	-28.91	-13.00	-15.91	V

NB-IoT Band 2_Channel Bandwidth 15kHz_QPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3800.0	-40.74	5.36	3.00	9.62	-36.48	-13.00	-23.48	H
5700.0	-44.10	6.24	3.00	11.46	-38.88	-13.00	-25.88	H
3800.0	-30.87	5.36	3.00	9.62	-26.61	-13.00	-13.61	V
5700.0	-36.78	6.24	3.00	11.46	-31.56	-13.00	-18.56	V

NB-IoT Band 4_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3440.0	-43.65	4.62	3.00	9.81	-38.46	-13.00	-25.46	H
5160.0	-45.09	5.94	3.00	10.86	-40.17	-13.00	-27.17	H
3440.0	-33.70	4.62	3.00	9.81	-28.51	-13.00	-15.51	V
5160.0	-40.97	5.94	3.00	10.86	-36.05	-13.00	-23.05	V



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*NB-IoT Band 4_Channel Bandwidth 3.75kHz_BPSK_Middle Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-40.12	4.63	3.00	9.84	-34.91	-13.00	-21.91	H
5197.5	-45.71	5.94	3.00	10.86	-40.79	-13.00	-27.79	H
3465.0	-33.66	4.63	3.00	9.84	-28.45	-13.00	-15.45	V
5197.5	-41.24	5.94	3.00	10.86	-36.32	-13.00	-23.32	V

NB-IoT Band 4_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.0	-42.04	4.65	3.00	9.9	-36.79	-13.00	-23.79	H
5235.0	-47.35	5.95	3.00	10.91	-42.39	-13.00	-29.39	H
3490.0	-36.95	4.65	3.00	9.9	-31.70	-13.00	-18.70	V
5235.0	-38.67	5.95	3.00	10.91	-33.71	-13.00	-20.71	V

NB-IoT Band 4_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3440.0	-45.19	4.62	3.00	9.81	-40.00	-13.00	-27.00	H
5160.0	-48.57	5.94	3.00	10.86	-43.65	-13.00	-30.65	H
3440.0	-39.52	4.62	3.00	9.81	-34.33	-13.00	-21.33	V
5160.0	-43.29	5.94	3.00	10.86	-38.37	-13.00	-25.37	V

NB-IoT Band 4_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-42.21	4.62	3.00	9.81	-37.02	-13.00	-24.02	H
5197.5	-46.34	5.94	3.00	10.86	-41.42	-13.00	-28.42	H
3465.0	-36.59	4.62	3.00	9.81	-31.40	-13.00	-18.40	V
5197.5	-40.78	5.94	3.00	10.86	-35.86	-13.00	-22.86	V

NB-IoT Band 4_Channel Bandwidth 15kHz_QPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.0	-42.97	4.63	3.00	9.84	-37.76	-13.00	-24.76	H
5235.0	-48.74	5.94	3.00	10.86	-43.82	-13.00	-30.82	H
3490.0	-33.26	4.63	3.00	9.84	-28.05	-13.00	-15.05	V
5235.0	-39.88	5.94	3.00	10.86	-34.96	-13.00	-21.96	V

NB-IoT Band 5_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1658.00	-40.20	4.65	3.00	9.9	-34.95	-13.00	-21.95	H
2487.00	-46.74	5.95	3.00	10.91	-41.78	-13.00	-28.78	H
1658.00	-33.47	4.65	3.00	9.9	-28.22	-13.00	-15.22	V
2487.00	-41.15	5.95	3.00	10.91	-36.19	-13.00	-23.19	V



*NB-IoT Band 5_Channel Bandwidth 3.75kHz_BPSK_Middle Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.00	-39.28	3.86	3.00	8.56	-34.58	-13.00	-21.58	H
2509.50	-44.84	4.29	3.00	6.98	-42.15	-13.00	-29.15	H
1673.00	-34.10	3.86	3.00	8.56	-29.40	-13.00	-16.40	V
2509.50	-36.25	4.29	3.00	6.98	-33.56	-13.00	-20.56	V

NB-IoT Band 5_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1688.00	-40.04	3.9	3.00	8.58	-35.36	-13.00	-22.36	H
2532.00	-45.68	4.32	3.00	6.8	-43.20	-13.00	-30.20	H
1688.00	-35.79	3.9	3.00	8.58	-31.11	-13.00	-18.11	V
2532.00	-39.89	4.32	3.00	6.8	-37.41	-13.00	-24.41	V

NB-IoT Band 5_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1658.00	-38.31	3.91	3.00	9.06	-33.16	-13.00	-20.16	H
2487.00	-47.37	4.32	3.00	6.65	-45.04	-13.00	-32.04	H
1658.00	-34.38	3.91	3.00	9.06	-29.23	-13.00	-16.23	V
2487.00	-38.97	4.32	3.00	6.65	-36.64	-13.00	-23.64	V

NB-IoT Band 5_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1673.00	-40.08	3.86	3.00	8.56	-35.38	-13.00	-22.38	H
2509.50	-44.49	4.29	3.00	6.98	-41.80	-13.00	-28.80	H
1673.00	-35.79	3.86	3.00	8.56	-31.09	-13.00	-18.09	V
2509.50	-39.93	4.29	3.00	6.98	-37.24	-13.00	-24.24	V

NB-IoT Band 5_Channel Bandwidth 15kHz_QPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1688.00	-39.57	3.9	3.00	8.58	-34.89	-13.00	-21.89	H
2532.00	-46.96	4.32	3.00	6.8	-44.48	-13.00	-31.48	H
1688.00	-34.47	3.9	3.00	8.58	-29.79	-13.00	-16.79	V
2532.00	-38.76	4.32	3.00	6.8	-36.28	-13.00	-23.28	V

NB-IoT Band 12_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1408.00	-40.29	3.91	3.00	9.06	-35.14	-13.00	-22.14	H
2112.00	-47.76	4.32	3.00	6.65	-45.43	-13.00	-32.43	H
1408.00	-36.73	3.91	3.00	9.06	-31.58	-13.00	-18.58	V
2112.00	-39.58	4.32	3.00	6.65	-37.25	-13.00	-24.25	V



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*NB-IoT Band 12_Channel Bandwidth 3.75kHz_BPSK_Middle Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.00	-41.03	3.71	3.00	9.02	-35.72	-13.00	-22.72	H
2122.50	-44.33	4.22	3.00	8.64	-39.91	-13.00	-26.91	H
1415.00	-35.16	3.71	3.00	9.02	-29.85	-13.00	-16.85	V
2122.50	-39.74	4.22	3.00	8.64	-35.32	-13.00	-22.32	V

NB-IoT Band 12_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.00	-40.47	3.72	3.00	9.04	-35.15	-13.00	-22.15	H
2133.00	-46.47	4.23	3.00	8.6	-42.10	-13.00	-29.10	H
1422.00	-33.41	3.72	3.00	9.04	-28.09	-13.00	-15.09	V
2133.00	-39.39	4.23	3.00	8.6	-35.02	-13.00	-22.02	V

NB-IoT Band 12_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1408.00	-38.56	4.78	3.00	8.91	-34.43	-13.00	-21.43	H
2112.00	-44.30	4.25	3.00	8.26	-40.29	-13.00	-27.29	H
1408.00	-33.91	4.78	3.00	8.91	-29.78	-13.00	-16.78	V
2112.00	-39.98	4.25	3.00	8.26	-35.97	-13.00	-22.97	V

NB-IoT Band 12_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.00	-39.68	3.71	3.00	9.02	-34.37	-13.00	-21.37	H
2122.50	-45.52	4.22	3.00	8.64	-41.10	-13.00	-28.10	H
1415.00	-33.81	3.71	3.00	9.02	-28.50	-13.00	-15.50	V
2122.50	-39.52	4.22	3.00	8.64	-35.10	-13.00	-22.10	V

NB-IoT Band 12_Channel Bandwidth 15kHz_QPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.00	-40.01	3.72	3.00	9.04	-34.69	-13.00	-21.69	H
2133.00	-44.12	4.23	3.00	8.6	-39.75	-13.00	-26.75	H
1422.00	-36.51	3.72	3.00	9.04	-31.19	-13.00	-18.19	V
2133.00	-37.97	4.23	3.00	8.6	-33.60	-13.00	-20.60	V

NB-IoT Band 13_Channel Bandwidth 3.75kHz_BPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1564.0	-59.17	4.99	3.00	11.12	-53.04	-40.00	-13.04	H
2346.0	-46.16	5.85	3.00	12.02	-39.99	-13.00	-26.99	H
1564.0	-59.36	4.99	3.00	11.12	-53.23	-40.00	-13.23	V
2346.0	-36.26	5.85	3.00	12.02	-30.09	-13.00	-17.09	V



*NB-IoT Band 13_Channel Bandwidth 15kHz_QPSK_Middle Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1564.0	-60.18	4.99	3.00	11.12	-54.05	-40.00	-14.05	H
2346.0	-46.09	5.85	3.00	12.02	-39.92	-13.00	-26.92	H
1564.0	-60.25	4.99	3.00	11.12	-54.12	-40.00	-14.12	V
2346.0	-36.15	5.85	3.00	12.02	-29.98	-13.00	-16.98	V

NB-IoT Band 17_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1418.0	-40.97	3.72	3.00	9.04	-35.65	-13.00	-22.65	H
2127.0	-44.51	4.23	3.00	8.6	-40.14	-13.00	-27.14	H
1418.0	-33.42	3.72	3.00	9.04	-28.10	-13.00	-15.10	V
2127.0	-37.77	4.23	3.00	8.6	-33.40	-13.00	-20.40	V

NB-IoT Band 17_Channel Bandwidth 3.75kHz_BPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1420.0	-40.34	4.78	3.00	8.91	-36.21	-13.00	-23.21	H
2130.0	-46.06	4.25	3.00	8.26	-42.05	-13.00	-29.05	H
1420.0	-36.19	4.78	3.00	8.91	-32.06	-13.00	-19.06	V
2130.0	-37.65	4.25	3.00	8.26	-33.64	-13.00	-20.64	V

NB-IoT Band 17_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.0	-38.83	4.78	3.00	8.91	-34.70	-13.00	-21.70	H
2133.0	-47.21	4.25	3.00	8.26	-43.20	-13.00	-30.20	H
1422.0	-35.36	4.78	3.00	8.91	-31.23	-13.00	-18.23	V
2133.0	-37.84	4.25	3.00	8.26	-33.83	-13.00	-20.83	V

NB-IoT Band 17_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1418.0	-41.12	3.72	3.00	9.04	-35.80	-13.00	-22.80	H
2127.0	-47.55	4.23	3.00	8.6	-43.18	-13.00	-30.18	H
1418.0	-35.62	3.72	3.00	9.04	-30.30	-13.00	-17.30	V
2127.0	-37.90	4.23	3.00	8.6	-33.53	-13.00	-20.53	V

NB-IoT Band 17_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1420.0	-38.09	4.78	3.00	8.91	-33.96	-13.00	-20.96	H
2130.0	-44.77	4.25	3.00	8.26	-40.76	-13.00	-27.76	H
1420.0	-34.69	4.78	3.00	8.91	-30.56	-13.00	-17.56	V
2130.0	-37.97	4.25	3.00	8.26	-33.96	-13.00	-20.96	V



*NB-IoT Band 17_Channel Bandwidth 15kHz_QPSK_High Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.0	-39.57	4.78	3.00	8.91	-35.44	-13.00	-22.44	H
2133.0	-44.60	4.25	3.00	8.26	-40.59	-13.00	-27.59	H
1422.0	-33.11	4.78	3.00	8.91	-28.98	-13.00	-15.98	V
2133.0	-38.60	4.25	3.00	8.26	-34.59	-13.00	-21.59	V

NB-IoT Band 25_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3715.0	-41.94	5.26	3.00	9.88	-37.32	-13.00	-24.32	H
5572.5	-47.45	6.11	3.00	11.36	-42.20	-13.00	-29.20	H
3715.0	-41.93	5.26	3.00	9.88	-37.31	-13.00	-24.31	V
5572.5	-48.58	6.11	3.00	11.36	-43.33	-13.00	-30.33	V

NB-IoT Band 25_Channel Bandwidth 3.75kHz_BPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3765.0	-41.01	5.32	3.00	10.03	-36.30	-13.00	-23.30	H
5647.5	-46.72	6.19	3.00	11.41	-41.50	-13.00	-28.50	H
3765.0	-42.98	5.32	3.00	10.03	-38.27	-13.00	-25.27	V
5647.5	-51.42	6.19	3.00	11.41	-46.20	-13.00	-33.20	V

NB-IoT Band 25_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3810.0	-42.43	5.36	3.00	9.62	-38.17	-13.00	-25.17	H
5715.0	-50.34	6.24	3.00	11.46	-45.12	-13.00	-32.12	H
3810.0	-43.36	5.36	3.00	9.62	-39.10	-13.00	-26.10	V
5715.0	-51.41	6.24	3.00	11.46	-46.19	-13.00	-33.19	V

NB-IoT Band 25_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3715.0	-42.17	5.26	3.00	9.88	-37.55	-13.00	-24.55	H
5572.5	-50.25	6.11	3.00	11.36	-45.00	-13.00	-32.00	H
3715.0	-44.09	5.26	3.00	9.88	-39.47	-13.00	-26.47	V
5572.5	-47.39	6.11	3.00	11.36	-42.14	-13.00	-29.14	V

NB-IoT Band 25_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3765.0	-44.90	5.32	3.00	10.03	-40.19	-13.00	-27.19	H
5647.5	-46.36	6.19	3.00	11.41	-41.14	-13.00	-28.14	H
3765.0	-40.21	5.32	3.00	10.03	-35.50	-13.00	-22.50	V
5647.5	-46.49	6.19	3.00	11.41	-41.27	-13.00	-28.27	V



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*NB-IoT Band 25_Channel Bandwidth 15kHz_QPSK_High Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3810.0	-44.11	5.36	3.00	9.62	-39.85	-13.00	-26.85	H
5715.0	-54.15	6.24	3.00	11.46	-48.93	-13.00	-35.93	H
3810.0	-43.45	5.36	3.00	9.62	-39.19	-13.00	-26.19	V
5715.0	-54.46	6.24	3.00	11.46	-49.24	-13.00	-36.24	V

NB-IoT Band 66_Channel Bandwidth 3.75kHz_BPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3440.0	-43.08	4.92	3.00	10.45	-37.55	-13.00	-24.55	H
5160.0	-45.16	5.78	3.00	12.32	-38.62	-13.00	-25.62	H
3440.0	-34.98	4.92	3.00	10.45	-29.45	-13.00	-16.45	V
5160.0	-41.93	5.78	3.00	12.32	-35.39	-13.00	-22.39	V

NB-IoT Band 66_Channel Bandwidth 3.75kHz_BPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.0	-41.98	4.99	3.00	11.12	-35.85	-13.00	-22.85	H
5235.0	-45.05	5.85	3.00	12.02	-38.88	-13.00	-25.88	H
3490.0	-35.79	4.99	3.00	11.12	-29.66	-13.00	-16.66	V
5235.0	-38.22	5.85	3.00	12.02	-32.05	-13.00	-19.05	V

NB-IoT Band 66_Channel Bandwidth 3.75kHz_BPSK_High Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3540.0	-42.18	5.12	3.00	9.98	-37.32	-13.00	-24.32	H
5310.0	-48.12	5.93	3.00	11.66	-42.39	-13.00	-29.39	H
3540.0	-35.54	5.12	3.00	9.98	-30.68	-13.00	-17.68	V
5310.0	-40.14	5.93	3.00	11.66	-34.41	-13.00	-21.41	V

NB-IoT Band 66_Channel Bandwidth 15kHz_QPSK_Low Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3440.0	-40.79	4.92	3.00	10.45	-35.26	-13.00	-22.26	H
5160.0	-48.82	5.78	3.00	12.32	-42.28	-13.00	-29.28	H
3440.0	-33.47	4.92	3.00	10.45	-27.94	-13.00	-14.94	V
5160.0	-38.16	5.78	3.00	12.32	-31.62	-13.00	-18.62	V

NB-IoT Band 66_Channel Bandwidth 15kHz_QPSK_Middle Channel

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.0	-41.10	4.99	3.00	11.12	-34.97	-13.00	-21.97	H
5235.0	-46.84	5.85	3.00	12.02	-40.67	-13.00	-27.67	H
3490.0	-36.65	4.99	3.00	11.12	-30.52	-13.00	-17.52	V
5235.0	-41.04	5.85	3.00	12.02	-34.87	-13.00	-21.87	V



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*NB-IoT Band 66 Channel Bandwidth 15kHz_QPSK_High Channel*

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	Diatance	G _a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3540.0	-40.41	5.12	3.00	9.98	-35.55	-13.00	-22.55	H
5310.0	-45.00	5.93	3.00	11.66	-39.27	-13.00	-26.27	H
3540.0	-34.22	5.12	3.00	9.98	-29.36	-13.00	-16.36	V
5310.0	-39.76	5.93	3.00	11.66	-34.03	-13.00	-21.03	V

Notes: All channel bandwidth were tested,the report recorded the worst data.



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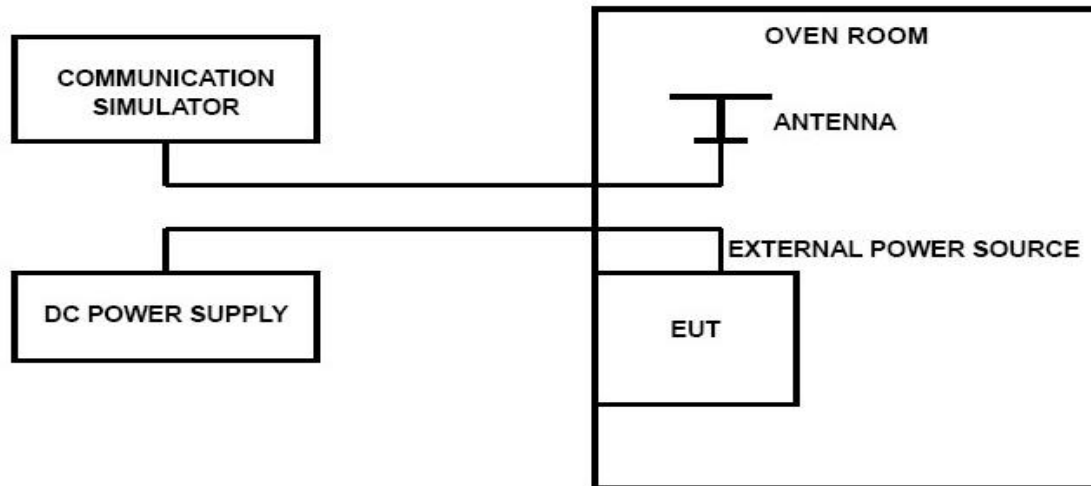


4.7 Frequency Stability under Temperature & Voltage Variations

LIMIT

According to FCC §2.1055, §22.355, §24.235, §27.54 and §90.213 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to TIA-603-E

Frequency Stability Under Temperature Variations:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of R&S CMW 500 DIGITAL RADIO COMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30°C.
3. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on middle channel for NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50°C.
7. With the EUT, powered via nominal voltage, connected to the CMW 500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 °C increments from +50°C to -30°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.





Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

TEST RESULTS

Remark:

We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66; recorded worst case for each Channel Bandwidth of NB-IoT Band 2, NB-IoT Band 4, NB-IoT Band 5, NB-IoT Band 12, NB-IoT Band 13, NB-IoT Band 17, NB-IoT Band 25, NB-IoT Band 66;

NB-IoT Band 2, BPSK, 15kHz bandwidth (worst case of all bandwidths)

NB-IoT Band 2					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-2	-0.001	± 2.50	PASS
VN	20	9	0.005	± 2.50	PASS
VH	20	6	0.003	± 2.50	PASS
VN	-30	18	0.010	± 2.50	PASS
VN	-20	10	0.005	± 2.50	PASS
VN	-10	-3	-0.002	± 2.50	PASS
VN	0	-6	-0.003	± 2.50	PASS
VN	10	7	0.004	± 2.50	PASS
VN	20	-16	-0.009	± 2.50	PASS
VN	30	2	0.001	± 2.50	PASS
VN	40	-6	-0.003	± 2.50	PASS
VN	50	15	0.008	± 2.50	PASS

NB-IoT Band 2, QPSK, 15KHz bandwidth (worst case of all bandwidths)

NB-IoT Band 2					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	14	0.007	± 2.50	PASS
VN	20	-10	-0.005	± 2.50	PASS
VH	20	-17	-0.009	± 2.50	PASS
VN	-30	3	0.002	± 2.50	PASS
VN	-20	19	0.010	± 2.50	PASS
VN	-10	4	0.002	± 2.50	PASS
VN	0	16	0.009	± 2.50	PASS
VN	10	-1	-0.001	± 2.50	PASS
VN	20	-13	-0.007	± 2.50	PASS
VN	30	14	0.007	± 2.50	PASS
VN	40	14	0.007	± 2.50	PASS
VN	50	17	0.009	± 2.50	PASS



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*NB-IoT Band 4, BPSK, 15kHz bandwidth (worst case of all bandwidths)*

NB-IoT Band 4					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-19	-0.011	±2.50	PASS
VN	20	33	0.019	±2.50	PASS
VH	20	14	0.008	±2.50	PASS
VN	-30	-13	-0.007	±2.50	PASS
VN	-20	34	0.019	±2.50	PASS
VN	-10	29	0.017	±2.50	PASS
VN	0	-7	-0.004	±2.50	PASS
VN	10	-35	-0.020	±2.50	PASS
VN	20	37	0.021	±2.50	PASS
VN	30	-5	-0.003	±2.50	PASS
VN	40	-26	-0.015	±2.50	PASS
VN	50	-46	-0.026	±2.50	PASS

NB-IoT Band 4, QPSK, 15kHz bandwidth (worst case of all bandwidths)

NB-IoT Band 4					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-37	-0.021	±2.50	PASS
VN	20	30	0.017	±2.50	PASS
VH	20	2	0.001	±2.50	PASS
VN	-30	24	0.014	±2.50	PASS
VN	-20	45	0.026	±2.50	PASS
VN	-10	-49	-0.028	±2.50	PASS
VN	0	-40	-0.023	±2.50	PASS
VN	10	-46	-0.026	±2.50	PASS
VN	20	-4	-0.002	±2.50	PASS
VN	30	-35	-0.020	±2.50	PASS
VN	40	30	0.017	±2.50	PASS
VN	50	42	0.024	±2.50	PASS

NB-IoT Band 5, BPSK, 15kHz bandwidth(worst case of all bandwidths)

NB-IoT Band 5					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	35	0.042	±2.50	PASS
VN	20	31	0.038	±2.50	PASS
VH	20	-38	-0.046	±2.50	PASS
VN	-30	-8	-0.010	±2.50	PASS
VN	-20	36	0.044	±2.50	PASS
VN	-10	33	0.040	±2.50	PASS
VN	0	-20	-0.024	±2.50	PASS
VN	10	-48	-0.058	±2.50	PASS
VN	20	-4	-0.005	±2.50	PASS
VN	30	-48	-0.058	±2.50	PASS
VN	40	14	0.017	±2.50	PASS
VN	50	-34	-0.041	±2.50	PASS



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*NB-IoT Band 5, QPSK, 15KHz bandwidth(worst case of all bandwidths)*

NB-IoT Band 5					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	23	0.028	±2.50	PASS
VN	20	-21	-0.025	±2.50	PASS
VH	20	-25	-0.030	±2.50	PASS
VN	-30	39	0.047	±2.50	PASS
VN	-20	46	0.056	±2.50	PASS
VN	-10	-8	-0.010	±2.50	PASS
VN	0	-50	-0.061	±2.50	PASS
VN	10	-31	-0.038	±2.50	PASS
VN	20	-45	-0.055	±2.50	PASS
VN	30	4	0.005	±2.50	PASS
VN	40	-28	-0.034	±2.50	PASS
VN	50	-1	-0.001	±2.50	PASS

NB-IoT Band 12, BPSK, 3.75kHz bandwidth (worst case of all bandwidths and modulation type)

NB-IoT Band 12					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-26	-0.037	±2.50	PASS
VN	20	1	0.001	±2.50	PASS
VH	20	-30	-0.042	±2.50	PASS
VN	-30	36	0.051	±2.50	PASS
VN	-20	15	0.021	±2.50	PASS
VN	-10	31	0.044	±2.50	PASS
VN	0	43	0.061	±2.50	PASS
VN	10	-48	-0.068	±2.50	PASS
VN	20	23	0.033	±2.50	PASS
VN	30	-15	-0.021	±2.50	PASS
VN	40	17	0.024	±2.50	PASS
VN	50	16	0.023	±2.50	PASS

NB-IoT Band 12, QPSK, 15kHz bandwidth (worst case of all bandwidths and modulation type)

NB-IoT Band 12					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	29	0.041	±2.50	PASS
VN	20	-23	-0.033	±2.50	PASS
VH	20	-16	-0.023	±2.50	PASS
VN	-30	-45	-0.064	±2.50	PASS
VN	-20	30	0.042	±2.50	PASS
VN	-10	34	0.048	±2.50	PASS
VN	0	-41	-0.058	±2.50	PASS
VN	10	-41	-0.058	±2.50	PASS
VN	20	14	0.020	±2.50	PASS
VN	30	-40	-0.057	±2.50	PASS
VN	40	20	0.028	±2.50	PASS
VN	50	-40	-0.057	±2.50	PASS



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*NB-IoT Band 13, 15kHz bandwidth, BPSK (worst case of all bandwidths)*

NB-IoT Band 13					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	25	0.032	2.50	PASS
VN	20	17	0.022	2.50	PASS
VH	20	42	0.054	2.50	PASS
VN	-30	-34	-0.043	2.50	PASS
VN	-20	-46	-0.059	2.50	PASS
VN	-10	-17	-0.022	2.50	PASS
VN	0	34	0.043	2.50	PASS
VN	10	39	0.050	2.50	PASS
VN	20	-34	-0.043	2.50	PASS
VN	30	15	0.019	2.50	PASS
VN	40	-15	-0.019	2.50	PASS
VN	50	23	0.029	2.50	PASS

NB-IoT Band 13, 15kHz bandwidth, BPSK (worst case of all bandwidths)

NB-IoT Band 13					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	41	0.052	2.50	PASS
VN	20	-1	-0.001	2.50	PASS
VH	20	48	0.061	2.50	PASS
VN	-30	27	0.035	2.50	PASS
VN	-20	6	0.008	2.50	PASS
VN	-10	-47	-0.060	2.50	PASS
VN	0	-24	-0.031	2.50	PASS
VN	10	32	0.041	2.50	PASS
VN	20	43	0.055	2.50	PASS
VN	30	49	0.063	2.50	PASS
VN	40	-6	-0.008	2.50	PASS
VN	50	4	0.005	2.50	PASS

LTE Band 17, QPSK, 5MHz bandwidth (worst case of all bandwidths and modulation type)

NB-IoT Band 17					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	11	0.015	±2.50	PASS
VN	20	-22	-0.031	±2.50	PASS
VH	20	-34	-0.048	±2.50	PASS
VN	-30	9	0.013	±2.50	PASS
VN	-20	32	0.045	±2.50	PASS
VN	-10	19	0.027	±2.50	PASS
VN	0	18	0.025	±2.50	PASS
VN	10	-30	-0.042	±2.50	PASS
VN	20	13	0.018	±2.50	PASS
VN	30	27	0.038	±2.50	PASS
VN	40	34	0.048	±2.50	PASS
VN	50	-28	-0.039	±2.50	PASS



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*LTE Band 17, 16QAM, 5MHz bandwidth (worst case of all bandwidths and modulation type)*

NB-IoT Band 17					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	-46	-0.065	±2.50	PASS
VN	20	50	0.070	±2.50	PASS
VH	20	-50	-0.070	±2.50	PASS
VN	-30	4	0.006	±2.50	PASS
VN	-20	-4	-0.006	±2.50	PASS
VN	-10	-34	-0.048	±2.50	PASS
VN	0	19	0.027	±2.50	PASS
VN	10	-21	-0.030	±2.50	PASS
VN	20	-19	-0.027	±2.50	PASS
VN	30	-38	-0.054	±2.50	PASS
VN	40	2	0.003	±2.50	PASS
VN	50	49	0.069	±2.50	PASS

NB-IoT Band 25, 15kHz bandwidth, BPSK (worst case of all bandwidths)

NB-IoT Band 25					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	25	0.013	2.50	PASS
VN	20	32	0.017	2.50	PASS
VH	20	78	0.041	2.50	PASS
VN	-30	59	0.031	2.50	PASS
VN	-20	58	0.031	2.50	PASS
VN	-10	11	0.006	2.50	PASS
VN	0	62	0.033	2.50	PASS
VN	10	16	0.008	2.50	PASS
VN	20	67	0.036	2.50	PASS
VN	30	54	0.029	2.50	PASS
VN	40	1	0.001	2.50	PASS
VN	50	45	0.024	2.50	PASS

NB-IoT Band 25, 15kHz bandwidth, BPSK (worst case of all bandwidths)

NB-IoT Band 25					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	91	0.048	2.50	PASS
VN	20	52	0.028	2.50	PASS
VH	20	15	0.008	2.50	PASS
VN	-30	23	0.012	2.50	PASS
VN	-20	15	0.008	2.50	PASS
VN	-10	67	0.036	2.50	PASS
VN	0	95	0.050	2.50	PASS
VN	10	13	0.007	2.50	PASS
VN	20	14	0.007	2.50	PASS
VN	30	65	0.035	2.50	PASS
VN	40	98	0.052	2.50	PASS
VN	50	66	0.035	2.50	PASS



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*NB-IoT Band 66, 15kHz bandwidth, BPSK (worst case of all bandwidths)*

NB-IoT Band 66					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	36	0.054	2.50	PASS
VN	20	45	0.068	2.50	PASS
VH	20	9	0.014	2.50	PASS
VN	-30	64	0.097	2.50	PASS
VN	-20	34	0.051	2.50	PASS
VN	-10	90	0.136	2.50	PASS
VN	0	92	0.139	2.50	PASS
VN	10	53	0.080	2.50	PASS
VN	20	44	0.066	2.50	PASS
VN	30	4	0.006	2.50	PASS
VN	40	56	0.084	2.50	PASS
VN	50	79	0.119	2.50	PASS

NB-IoT Band 66, 15kHz bandwidth, QPSK (worst case of all bandwidths)

NB-IoT Band 66					
DC Power	Temperature (°C)	Frequency error(Hz)	Frequency error(ppm)	Limit (ppm)	Verdict
VL	20	91	0.137	2.50	PASS
VN	20	13	0.020	2.50	PASS
VH	20	82	0.124	2.50	PASS
VN	-30	70	0.106	2.50	PASS
VN	-20	34	0.051	2.50	PASS
VN	-10	85	0.128	2.50	PASS
VN	0	42	0.063	2.50	PASS
VN	10	97	0.146	2.50	PASS
VN	20	25	0.038	2.50	PASS
VN	30	92	0.139	2.50	PASS
VN	40	11	0.017	2.50	PASS
VN	50	88	0.133	2.50	PASS



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5 Test Setup Photos of the EUT

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6 External Photos of the EUT

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7 Internal Photos of the EUT

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-----THE END OF REPORT-----



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