

FCC CFR47 PART 22H, 24E, 27 CERTIFICATION TEST REPORT FCC ID: 2A4J3-PADDLE

Product: Pettlor pet smart collar

Trade Mark: N/A

Model Number: paddle

Family Model: N/A

Report No.: S21072103603003

Prepared for

ShenZhen ZOOMMAX International Supply Chain Co., LTD
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TEST RESULT CERTIFICATION

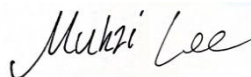
Applicant's name	ShenZhen ZOOMMAX International Supply Chain Co., LTD
Address	Room 901, Building 1, Xinzhouyuan, No.158, Xinzhou Ninth Street, Xinhua Community, Shatou Street, Futian District, Shenzhen, China
Manufacturer's Name	SHENZHEN EVIEW GPS TECHNOLOGY
Address	Rm 201, building 1-A, Nankechuang Yuangu, Dalang, Longhua District, Shenzhen, China
Product name	Pettlor pet smart collar
Model and/or type reference ..	paddle
Family Model:	N/A
Standards	FCC CFR 47 Part 22H, Part 24E, Part 27
Test procedure	ANSI C63.26:2015 ANSI/TIA-603-E-2016

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test	
Date (s) of performance of tests	Oct 10. 2021 ~Apr 12, 2022
Date of Issue	Apr 12, 2022
Test Result	Pass

Testing Engineer :



(Mukzi Lee)

Authorized Signatory :



(Alex Li)

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1. GENERAL INFORMATION

1.1 PRODUCT DESCRIPTION

A major technical description of EUT is described as following:

Product Designation:	Pettlor pet smart collar
Trade Mark	N/A
Model Name	paddle
Family Model	N/A
Model Difference	N/A
FCC ID:	2A4J3-PADDLE
Frequency Bands:	U.S. Bands: ☒ eMTC / NB IoT Band 2, 4, 5, 12,13, 25
Frequency Range:	eMTC / NB IoT Band 2 Uplink: 1850MHz-1910MHz, Downlink: 1930MHz-1990MHz; eMTC / NB IoT Band 4 Uplink: 1710MHz-1755MHz, Downlink: 2110MHz-2155MHz; eMTC / NB IoT Band 5 Uplink: 824MHz-849MHz, Downlink: 869MHz-894MHz; eMTC / NB IoT Band 12 Uplink: 699MHz-716MHz, Downlink: 729MHz-746MHz; eMTC / NB IoT Band 13 Uplink:777MHz-787MHz, Downlink: 746MHz-756MHz; eMTC / NB IoT Band 25 Uplink: 1850MHz-1915MHz, Downlink: 1930MHz-1995MHz;
Type of Modulation:	QPSK/16QAM
Power Class	Class 3
Antenna:	LDS dipole Antenna
Antenna gain:	-2.5dBi
Adapter	N/A
Battery	DC 3.7V, 400mAh, 1.48Wh
Power supply	DC 3.7V from battery or DC 5V from Adapter.
Extreme Vol. Limits:	DC 3.4V to DC 4.2V (Nominal DC 3.7V) (Note 1)
HW Version	EC207M_V1.0
SW Version	N/A
** Note1: The High Voltage 4.2V and Low Voltage 3.4V was declared by manufacturer, The EUT couldn't be operate normally with higher or lower voltage.	

1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for **FCC ID: 2A4J3-PADDLE** filing to comply with the FCC Part 22H&24E &27.

1.3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI/TIA-603-E-2016, FCC CFR 47 Part 2, Part 22, Part 24, Part 27, ANSI C63.26:2015.

1.4 TEST FACILITY

The test site used to collect the radiated data is located at:

ShenZhen NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R.China.

The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.26:2015& ANSI C63.4: 2014.

FCC Registration No.:463705

IC Registration No.:9270A-1,

CNAS Registration No.:L5516

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.5dB
2	Conducted Emission Test	$\pm 1.38\text{dB}$
3	RF power, conducted	$\pm 0.16\text{dB}$
4	Spurious emissions, conducted	$\pm 0.21\text{dB}$
5	All emissions, radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions, radiated(>1G)	$\pm 4.89\text{dB}$
7	Temperature	$\pm 0.5^{\circ}\text{C}$
8	Humidity	$\pm 2\%$
9	Frequency error, conducted	$\pm 0.19\text{ ppm}$

1.5 SPECIAL ACCESSORIES

The battery and the charger, earphone supplied by the applicant were used as accessories and being tested with EUT intended for FCC grant together.

1.6 WORST-CASE CONFIGURATION AND MODE

The worst-case scenario for all measurements is based on the investigation results.

The device has eMTC / NB IoT Bands of: Band 2, Band 4, Band 5, Band 12, Band 13, Band 25
The RB Size was selected to measure for peak or average ERP and EIRP, which was based on the conducted power verification baseline data.

For the fundamental investigation of radiated emissions, the EUT is investigated for vertical and horizontal antenna orientations and X Y and Z orientations of the EUT alone. After the investigations the worst case was determined to be at X orientation for all LTE bands.

1.6 SUMMARY OF TEST RESULTS

FCC Part22, Subpart H/ FCC Part24, Subpart E, FCC Part27, Subpart L, KDB 971168 D01 Power Meas License Digital Systems v03			
FCC Rule	Test Item	Verdict	Remark
2.1046	Conducted Output Power	PASS	
22.913(d) 24.232(d) 27.50 KDB 971168 D01 Clause 5.7	Peak-to-Average Ratio	PASS	
2.1049 22.917(b) 24.238(b) KDB 971168 D01 Clause 4.2	Occupied Bandwidth	PASS	
2.1051 22.917(a) 24.238(a) 27.53 KDB 971168 D01 Clause 6	Band Edge	PASS	
22.913(a)(2) 27.50(c)(10) KDB 971168 D01 Clause 5.6	Effective Radiated Power	PASS	
24.232(c) 27.50 KDB 971168 D01 Clause 5.6	Equivalent Isotropic Radiated Power	PASS	

2.1053 22.917(a) 24.238(a) 27.53(g)(h)(m) KDB 971168 D01 Clause 7	Field Strength of Spurious Radiation	PASS	
2.1055 22.355 24.235 27.54 KDB 971168 D01 Clause 9	Frequency Stability for Temperature & Voltage	PASS	
2.1051 22.917(a) 24.238(a) 27.53(g)(h)(m) KDB 971168 D01 Clause 6	Conducted Emission	PASS	
1. Remark: 2. "N/A" denotes test is not applicable in this Test Report. 3. All test items were verified and recorded according to the standards and without any deviation during the test. 4. No modifications are made to the EUT during all test items. 5. For LTE CAT M1 (eMTC):Only support system bandwidth 1.4 MHz bandwidth modes for LTE Bands 2, 4 and 25; 1.4 MHz bandwidth modes for LTE Band 5 and 12; 5 MHz bandwidth modes for LTE Band 13.			

2. SYSTEM TEST CONFIGURATION

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT EXERCISE

The Transmitter was operated in the maximum output power mode through Communication Tester. The TX frequency was fixed which was for the purpose of the measurements.

2.3 CONFIGURATION OF EUT SYSTEM

Table 2-1 Equipment Used in EUT System

Item	Equipment	Model No.	ID or Specification	Note
1	Pettlor pet smart collar	paddle	FCC ID: 2A4J3-PADDLE	EUT

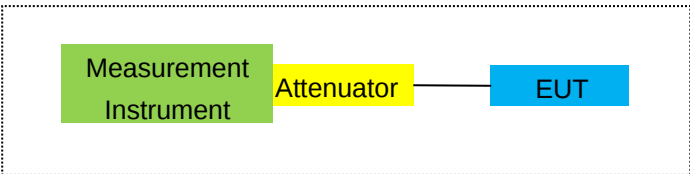
*Note: All the accessories have been used during the test.
the following "EUT" in setup diagram means EUT system.*

2.4 TEST SETUP

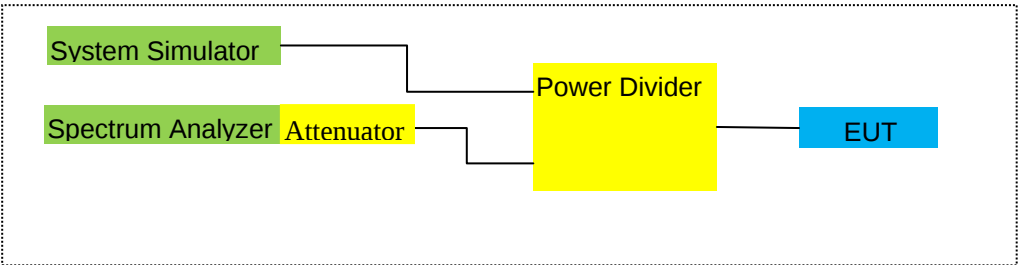
For Radiated Test Cases



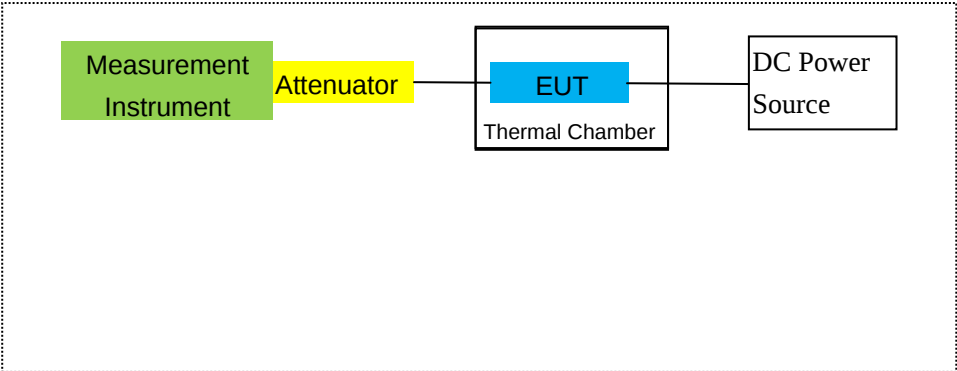
For Conducted Output Power



For Peak-to Average Ratio, Occupied Bandwidth, Conducted Band edge and Conducted Spurious Emission



For Frequency Stability



Note: EUT built-in battery-powered, the battery is fully-charged.

3.TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	MXA Signal Analyzer	Agilent	N9020A	MY49100060	2021.07.01	2022.06.30	1 year
2	Test Receiver	R&S	ESPI	101318	2021.04.27	2022.04.26	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2021.03.29	2022.03.28	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11	2023.05.10	3 year
5	Horn Antenna	EM	EM-AH-10180	2011071402	2021.03.29	2022.03.28	1 year
6	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2021.11.07	2022.11.06	1 year
7	Amplifier	EM	EM-30180	060538	2021.07.01	2022.06.30	1 year
8	Loop Antenna	ARA	PLA-1030/B	1029	2021.04.27	2022.04.26	1 year
9	Power Meter	R&S	NRVS	100696	2021.07.01	2022.06.30	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2021.04.27	2022.04.26	1 year
11	Test Cable	N/A	R-01	N/A	2019.08.06	2022.08.05	3 year
12	Test Cable	N/A	R-02	N/A	2019.08.06	2022.08.05	3 year
13	Test Cable	N/A	R-03	N/A	2019.06.28	2022.06.27	3 year
14	Test Receiver	R&S	ESCI	101160	2021.04.27	2022.04.26	1 year
15	LISN	R&S	ENV216	101313	2021.04.27	2022.04.26	1 year
16	LISN	EMCO	3816/2	00042990	2021.04.27	2022.04.26	1 year
17	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	2021.04.27	2022.04.26	1 year
18	Passive Voltage Probe	R&S	ESH2-Z3	100196	2021.04.27	2022.04.26	1 year
19	Test Cable	N/A	C01	N/A	2020.05.11	2023.05.10	3 year
20	Test Cable	N/A	C02	N/A	2020.05.11	2023.05.10	3 year
21	Test Cable	N/A	C03	N/A	2020.05.11	2023.05.10	3 year
22	Attenuator	MCE	24-10-34	BN9258	2020.04.07	2023.04.06	1 year
23	Spectrum Analyzer	agilent	e4440a	us44300399	2021.04.27	2022.04.26	1 year
24	test receiver	R&S	ESCI	a0304218	2021.04.27	2022.04.26	1 year
25	Communication Tester	R&S	CMU200	A0304247	2021.07.01	2022.06.30	1 year
26	Thermal Chamber	Ten Billion	TTC-B3C	TBN-960502	2021.04.27	2022.04.26	1 year

27	DC Power Source	N/A	PS-6005D	2017040292 3	2020.05.11	2023.05.10	3 year
28	PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2021.07.01	2022.06.30	1 year
29	Communication Tester	R&S	CMW500	148500	2021.07.01	2022.06.30	1 year
30	PSG Analog Signal Generator	Agilent	E8257D	MY51110112	2021.07.01	2022.06.30	1 year

Note: Each piece of equipment is scheduled for calibration once a year except the Test Cable& DC Power Source which is scheduled for calibration every 3 years.

4. OUTPUT POWER

4.1 OUTPUT POWER MEASUREMENT

LTE Measurement Procedure:

All LTE bands conducted power peak and average are obtained from the CMW500 telecommunication test set. The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS_01".³

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (N_{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	NA
NS_03	6.6.2.2.1	2, 4, 10, 23, 25, 35, 36	3	>5	≤ 1
			5	>6	≤ 1
			10	>6	≤ 1
			15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2	41	5	>6	≤ 1
			10, 15, 20	See Table 6.2.4-4	
NS_05	6.6.3.3.1	1	10, 15, 20	≥ 50	≤ 1
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	n/a
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table 6.2.4-2	Table 6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10, 15	> 40	≤ 1
				> 55	≤ 2
NS_10		20	15, 20	Table 6.2.4-3	Table 6.2.4-3
NS_11	6.6.2.2.1	23 ¹	1.4, 3, 5, 10	Table 6.2.4-5	Table 6.2.4-5
..					
NS_32	-	-	-	-	-

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

Test data reference attachment.

5. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

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 the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

MODES TESTED

- ☐ eMTC / NB IoT Band 2/4/5/12/13/25

RESULTS

PASS

Test data reference attachment.

6. BANDEDGE AND EMISSION MASK

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

FCC: §2.1046, §22.913, §24.232

LIMITS

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P[\text{Watts}])$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is as following.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is $65 + 10\log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth.

TEST PROCEDURE

The transmitter output was connected to a CMW500Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.

For each band edge measurement:

Set the spectrum analyzer span to include the block edge frequency

Set a marker to point the corresponding band edge frequency in each test case.

Set display line

Set resolution bandwidth to at least 1% of emission bandwidth.

MODES TESTED

- ☐ eMTC / NB IoT Band 2/4/5/12/13/25

RESULTS

Test data reference attachment.

7. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

LIMITS

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P[\text{Watts}])$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 7 is as following.

Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is $65 + 10\log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

- ☐ Set display line
- ☐ Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

MODES TESTED

- ☐ eMTC / NB IoT Band 2/4/5/12/13/25

7.1 MEASUREMENT METHOD

The test set up and general procedure is similar to conducted peak output power test. Only different for setting the measurement configuration of the measuring instrument of Spectrum Analyzer.

Test data reference attachment.

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported (eMTC / NB IoT Band 2/4/25: above 10GHz).

8. RADIATED MEASUREMENT

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §2.1046, §22.913(a)(2), §24.232(c) and §27.50 (h)(2), (b)(10), (c)(10), (d)(4)

LIMITS:

22.913(a) (2)- The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.
24.232 (c) Mobile and portable stations are limited to 2 watts EIRP.
27.50 (c) (10) the following power and antenna height requirements apply to stations transmitting in the 698–746 MHz band, the portable stations (hand-held devices) are limited to 3 watts ERP.
27.50 (b)(10) Portable stations (hand-held devices) transmitting in the 746–757 MHz, 758–763 MHz, 776–793 MHz, and 805–806 MHz bands are limited to 3 watts ERP.
27.50 (d)(4) The following power and antenna height requirements apply to stations transmitting in the 1710–1755 MHz and 2110–2155 MHz bands: Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.
27.50 (h)(2) Mobile and other user stations in the 2500–2570 MHz and 2620–2690 MHz bands. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

TEST PROCEDURE

ANSI/TIA-603-E Clause 2.2.17

KDB 971168 v02r01 RF power output using broadband peak and average power meter method.

KDB 971168 D01 Power Meas License Digital Systems v02r01, "Measurement Guidance for Certification of Licensed Digital Transmitters"

MODES TESTED

☐ eMTC / NB IoT Band 2/4/5/12/13/25

RESULTS

Pass

8.2 eMTC BAND 2

Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band QPSK	1/#Mid	1850.7	-8.90	3.76	28.24	15.58	36.141	Horizontal	Pass
		1880	-8.69	3.91	28.22	15.62	36.475	Horizontal	Pass
		1909.3	-8.63	3.93	28.20	15.64	36.644	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1850.7	-8.81	3.76	28.24	15.67	36.898	Vertical	Pass
		1880	-8.72	3.91	28.22	15.59	36.224	Vertical	Pass
		1909.3	-8.65	3.93	28.20	15.62	36.475	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

Radiated Power (EIRP) for Band 2									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level (dBm)	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP Average (dBm)	Max. EIRP	Polarization Of Max. ERP	
							Average		
							(mW)		
1.4MHz Band 16 QAM	1/#Mid	1850.7	-9.69	3.76	28.24	14.79	30.130	Horizontal	Pass
		1880	-9.44	3.91	28.22	14.87	30.690	Horizontal	Pass
		1909.3	-9.51	3.93	28.20	14.76	29.923	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	1850.7	-9.72	3.76	28.24	14.76	29.923	Vertical	Pass
		1880	-9.41	3.91	28.22	14.90	30.903	Vertical	Pass
		1909.3	-9.45	3.93	28.20	14.82	30.339	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.3 eMTC BAND 4

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)	(dBm)	(dB)	Average	Average		
						(dBm)	(mW)		
1.4MHz Band QPSK	1/#Mid	1710.7	-9.80	3.12	27.58	14.66	29.242	Horizontal	Pass
		1732.5	-9.69	3.27	27.61	14.65	29.174	Horizontal	Pass
		1754.3	-9.57	3.29	27.63	14.77	29.992	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1710.7	-9.68	3.12	27.58	14.78	30.061	Vertical	Pass
		1732.5	-9.68	3.27	27.61	14.66	29.242	Vertical	Pass
		1754.3	-9.59	3.29	27.63	14.75	29.854	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)			Average	Average		
						(dBm)	(mW)		
1.4MHz Band 16 QAM	1/#Mid	1710.7	-10.59	3.12	27.58	13.87	24.378	Horizontal	Pass
		1732.5	-10.35	3.27	27.61	13.99	25.061	Horizontal	Pass
		1754.3	-10.44	3.29	27.63	13.90	24.547	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	1710.7	-10.54	3.12	27.58	13.92	24.660	Vertical	Pass
		1732.5	-10.36	3.27	27.61	13.98	25.003	Vertical	Pass
		1754.3	-10.42	3.29	27.63	13.92	24.660	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.4 eMTC BAND 5

Radiated Power (ERP) for Band 5										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
1.4MHz Band QPSK	3/#Mid	824.7	-1.19	2.01	19.68	2.15	14.33	27.102	Horizontal	Pass
		836.5	-1.35	2.01	19.77	2.15	14.26	26.669	Horizontal	Pass
		848.3	-1.28	2.02	19.82	2.15	14.37	27.353	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	824.7	-1.13	2.01	19.68	2.15	14.39	27.479	Vertical	Pass
		836.5	-1.24	2.01	19.77	2.15	14.37	27.353	Vertical	Pass
		848.3	-1.29	2.02	19.82	2.15	14.36	27.290	Vertical	Pass

Radiated Power (ERP) for Band 5										
Mode	RB Size/RB Position	Frequency	Result						Polarization	Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP		
								Average		
								(mW)		
1.4MHz Band 16 QAM	3/#Mid	824.7	-1.93	2.01	19.68	2.15	13.59	22.856	Horizontal	Pass
		836.5	-1.97	2.01	19.77	2.15	13.64	23.121	Horizontal	Pass
		848.3	-2.00	2.02	19.82	2.15	13.65	23.174	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	824.7	-1.93	2.01	19.68	2.15	13.59	22.856	Vertical	Pass
		836.5	-2.06	2.01	19.77	2.15	13.55	22.646	Vertical	Pass
		848.3	-1.97	2.02	19.82	2.15	13.68	23.335	Vertical	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.5 eMTC BAND 12

Radiated Power (ERP) for Band 12										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
1.4MHz Band QPSK	3/#Mid	699.7	0.53	1.91	19.21	2.15	15.68	36.983	Vertical	Pass
		707.5	0.44	1.91	19.26	2.15	15.64	36.644	Vertical	Pass
		715.3	0.30	1.93	19.34	2.15	15.56	35.975	Vertical	Pass
1.4MHz Band QPSK	1/#Mid	699.7	0.54	1.91	19.21	2.15	15.69	37.068	Horizontal	Pass
		707.5	0.44	1.91	19.26	2.15	15.64	36.644	Horizontal	Pass
		715.3	0.40	1.93	19.34	2.15	15.66	36.813	Horizontal	Pass

Radiated Power (ERP) for Band 12										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
1.4MHz Band 16 QAM	3/#Mid	699.7	-0.78	1.91	19.21	2.15	14.37	27.353	Vertical	Pass
		707.5	-0.82	1.91	19.26	2.15	14.38	27.416	Vertical	Pass
		715.3	-0.91	1.93	19.34	2.15	14.35	27.227	Vertical	Pass
1.4MHz Band 16 QAM	1/#Mid	699.7	-0.70	1.91	19.21	2.15	14.45	27.861	Horizontal	Pass
		707.5	-0.76	1.91	19.26	2.15	14.44	27.797	Horizontal	Pass
		715.3	-0.83	1.93	19.34	2.15	14.43	27.733	Horizontal	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.5 eMTC BAND 13

Radiated Power (ERP) for Band 13										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
5MHz Band QPSK	1/#Mid	779.5	0.49	1.95	19.23	2.15	15.62	36.475	Vertical	Pass
		782	0.42	1.95	19.26	2.15	15.58	36.141	Vertical	Pass
		784.5	0.40	1.96	19.33	2.15	15.62	36.475	Vertical	Pass
5MHz Band QPSK	1/#Mid	779.5	0.43	1.95	19.23	2.15	15.56	35.975	Horizontal	Pass
		782	0.48	1.95	19.26	2.15	15.64	36.644	Horizontal	Pass
		784.5	0.45	1.96	19.33	2.15	15.67	36.898	Horizontal	Pass

Radiated Power (ERP) for Band 13										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
5MHz Band 16 QAM	1/#Mid	779.5	-0.63	1.95	19.23	2.15	14.50	28.184	Vertical	Pass
		782	-0.79	1.95	19.26	2.15	14.37	27.353	Vertical	Pass
		784.5	-0.83	1.96	19.33	2.15	14.39	27.479	Vertical	Pass
5MHz Band 16 QAM	1/#Mid	779.5	-0.41	1.95	19.23	2.15	14.72	29.648	Horizontal	Pass
		782	-0.41	1.95	19.26	2.15	14.75	29.854	Horizontal	Pass
		784.5	-0.50	1.96	19.33	2.15	14.72	29.648	Horizontal	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.6 eMTC BAND 25

Radiated Power (EIRP) for Band 25									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)	(dBm)	(dB)	Average	Average		
						(dBm)	(mW)		
1.4MHz Band QPSK	1/#Mid	1850.7	-8.58	3.12	27.58	15.88	38.726	Horizontal	Pass
		1882.5	-8.45	3.27	27.61	15.89	38.815	Horizontal	Pass
		1914.3	-8.44	3.29	27.63	15.90	38.905	Horizontal	Pass
1.4MHz Band QPSK	1/#Mid	1850.7	-8.49	3.12	27.58	15.97	39.537	Vertical	Pass
		1882.5	-8.47	3.27	27.61	15.87	38.637	Vertical	Pass
		1914.3	-8.39	3.29	27.63	15.95	39.355	Vertical	Pass

Radiated Power (EIRP) for Band 25									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)			Average	Average		
						(dBm)	(mW)		
1.4MHz Band 16 QAM	1/#Mid	1850.7	-9.68	3.12	27.58	14.78	30.061	Horizontal	Pass
		1882.5	-9.56	3.27	27.61	14.78	30.061	Horizontal	Pass
		1914.3	-9.62	3.29	27.63	14.72	29.648	Horizontal	Pass
1.4MHz Band 16 QAM	1/#Mid	1850.7	-9.78	3.12	27.58	14.68	29.376	Vertical	Pass
		1882.5	-9.57	3.27	27.61	14.77	29.992	Vertical	Pass
		1914.3	-9.59	3.29	27.63	14.75	29.854	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

8.7 NB-IoT BAND 2

Mode	RB/R B SIZE	Frequenc y	Result						Conclusio n
			SG Level (dBm)	Cable Loss (dBm)	Antenn a Gain (dB)	Max. EIRP Averag e (dBm)	Max. EIRP	Polarizatio n Of Max. ERP	
							Averag e		
							(mW)		
BPSK 3.75kHz z	1/#Mid	1850.2	-10.53	3.76	28.24	13.95	24.831	Horizontal	Pass
		1880	-10.21	3.91	28.22	14.10	25.704	Horizontal	Pass
		1909.8	-10.32	3.93	28.20	13.95	24.831	Horizontal	Pass
BPSK 3.75kHz z	1/#Mid	1850.2	-10.44	3.76	28.24	14.04	25.351	Vertical	Pass
		1880	-10.27	3.91	28.22	14.04	25.351	Vertical	Pass
		1909.8	-10.31	3.93	28.20	13.96	24.889	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

Radiated Power (EIRP) for Band 2									
Mode	RB/R B SIZE	Frequenc y	Result						Conclusio n
			SG Level (dBm)	Cable Loss (dBm)	Antenn a Gain (dB)	Max. EIRP Averag e (dBm)	Max. EIRP	Polarizatio n Of Max. ERP	
							Averag e		
							(mW)		
QPSK 3.75kHz z	1/#Mid	1850.2	-10.49	3.76	28.24	13.99	25.061	Horizontal	Pass
		1880	-10.24	3.91	28.22	14.07	25.527	Horizontal	Pass
		1909.8	-10.24	3.93	28.20	14.03	25.293	Horizontal	Pass
QPSK 3.75kHz z	1/#Mid	1850.2	-10.47	3.76	28.24	14.01	25.177	Vertical	Pass
		1880	-10.37	3.91	28.22	13.94	24.774	Vertical	Pass
		1909.8	-10.35	3.93	28.20	13.92	24.660	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

8.8 NB-IoT BAND 4

Radiated Power (EIRP) for Band 4									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss	Antenna Gain	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)	(dBm)	(dB)	Average (dBm)	Average (mW)		
BPSK 3.75kHz	1/#Mid	1710.2	-11.48	3.12	27.58	12.98	19.861	Horizontal	Pass
		1732.5	-11.39	3.27	27.61	12.95	19.724	Horizontal	Pass
		1754.8	-11.41	3.29	27.63	12.93	19.634	Horizontal	Pass
BPSK 3.75kHz	1/#Mid	1710.2	-11.59	3.12	27.58	12.87	19.364	Vertical	Pass
		1732.5	-11.34	3.27	27.61	13.00	19.953	Vertical	Pass
		1754.8	-11.36	3.29	27.63	12.98	19.861	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

Radiated Power (EIRP) for Band 4									
Mode	RB/R B SIZE	Frequenc y	Result						Conclusio n
			SG Level	Cable Loss (dBm)	Antenn a Gain (dB)	Max. EIRP	Max. EIRP	Polarizatio n Of Max. ERP	
			(dBm)			Averag e	Averag e		
						(dBm)	(mW)		
QPSK 3.75kHz z	1/#Mid	1710.2	-11.60	3.12	27.58	12.86	19.320	Horizontal	Pass
		1732.5	-11.54	3.27	27.61	12.80	19.055	Horizontal	Pass
		1754.8	-11.53	3.29	27.63	12.81	19.099	Horizontal	Pass
QPSK 3.75kHz z	1/#Mid	1710.2	-11.60	3.12	27.58	12.86	19.320	Vertical	Pass
		1732.5	-11.50	3.27	27.61	12.84	19.231	Vertical	Pass
		1754.8	-11.49	3.29	27.63	12.85	19.275	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

8.9 NB-IoT BAND 5

Radiated Power (ERP) for Band 5										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP	Max. ERP	Polarization	
							Average (dBm)	Average		
								(mW)		
BPSK 3.75kHz	1/#Mid	824.2	-0.19	2.01	19.68	2.15	15.33	34.119	Horizontal	Pass
		836.5	-0.27	2.01	19.77	2.15	15.34	34.198	Horizontal	Pass
		848.8	-0.25	2.02	19.82	2.15	15.40	34.674	Horizontal	Pass
BPSK 3.75kHz	1/#Mid	824.2	-0.15	2.01	19.68	2.15	15.37	34.435	Vertical	Pass
		836.5	-0.34	2.01	19.77	2.15	15.27	33.651	Vertical	Pass
		848.8	-0.39	2.02	19.82	2.15	15.26	33.574	Vertical	Pass

Radiated Power (ERP) for Band 5										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP	Max. ERP	Polarization	
							Average (dBm)	Average		
								(mW)		
QPSK 3.75kHz	1/#Mid	824.2	-0.27	2.01	19.68	2.15	15.25	33.497	Horizontal	Pass
		836.5	-0.39	2.01	19.77	2.15	15.22	33.266	Horizontal	Pass
		848.8	-0.36	2.02	19.82	2.15	15.29	33.806	Horizontal	Pass
QPSK 3.75kHz	1/#Mid	824.2	-0.23	2.01	19.68	2.15	15.29	33.806	Vertical	Pass
		836.5	-0.30	2.01	19.77	2.15	15.31	33.963	Vertical	Pass
		848.8	-0.32	2.02	19.82	2.15	15.33	34.119	Vertical	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

8.10 NB-IoT BAND 12

Radiated Power (ERP) for Band 12										
Mode	RB Size/RB Position	Frequency	Result						Polarization	Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP		
								Average (mW)		
BPSK 3.75kHz	1/#Mid	699.2	-0.15	1.91	19.21	2.15	15.00	31.623	Vertical	Pass
		707.5	-0.21	1.91	19.26	2.15	14.99	31.550	Vertical	Pass
		715.8	-0.24	1.93	19.34	2.15	15.02	31.769	Vertical	Pass
BPSK 3.75kHz	1/#Mid	699.2	-0.09	1.91	19.21	2.15	15.06	32.063	Horizontal	Pass
		707.5	-0.12	1.91	19.26	2.15	15.08	32.211	Horizontal	Pass
		715.8	-0.27	1.93	19.34	2.15	14.99	31.550	Horizontal	Pass

Radiated Power (ERP) for Band 12										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
QPSK 3.75kHz	1/#Mid	699.2	-0.17	1.91	19.21	2.15	14.98	31.477	Vertical	Pass
		707.5	-0.35	1.91	19.26	2.15	14.85	30.549	Vertical	Pass
		715.8	-0.27	1.93	19.34	2.15	14.99	31.550	Vertical	Pass
QPSK 3.75kHz	1/#Mid	699.2	-0.25	1.91	19.21	2.15	14.90	30.903	Horizontal	Pass
		707.5	-0.24	1.91	19.26	2.15	14.96	31.333	Horizontal	Pass
		715.8	-0.26	1.93	19.34	2.15	15.00	31.623	Horizontal	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

8.11 NB-IoT BAND 13

Radiated Power (ERP) for Band 13										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
BPSK 3.75kHz	1/#Mid	777.2	-1.20	1.95	19.23	2.15	13.93	24.717	Vertical	Pass
		782	-1.22	1.95	19.26	2.15	13.94	24.774	Vertical	Pass
		786.8	-1.27	1.96	19.33	2.15	13.95	24.831	Vertical	Pass
BPSK 3.75kHz	1/#Mid	777.2	-1.14	1.95	19.23	2.15	13.99	25.061	Horizontal	Pass
		782	-1.26	1.95	19.26	2.15	13.90	24.547	Horizontal	Pass
		786.8	-1.25	1.96	19.33	2.15	13.97	24.946	Horizontal	Pass

Radiated Power (ERP) for Band 13										
Mode	RB Size/RB Position	Frequency	Result							Conclusion
			SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Correction (dB)	Max. ERP Average (dBm)	Max. ERP	Polarization	
								Average		
								(mW)		
QPSK 3.75kHz	1/#Mid	777.2	-1.08	1.95	19.23	2.15	14.05	25.410	Vertical	Pass
		782	-1.09	1.95	19.26	2.15	14.07	25.527	Vertical	Pass
		786.8	-1.27	1.96	19.33	2.15	13.95	24.831	Vertical	Pass
QPSK 3.75kHz	1/#Mid	777.2	-1.04	1.95	19.23	2.15	14.09	25.645	Horizontal	Pass
		782	-1.18	1.95	19.26	2.15	13.98	25.003	Horizontal	Pass
		786.8	-1.26	1.96	19.33	2.15	13.96	24.889	Horizontal	Pass

Note:

ERP=EIRP-2.15

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

8.12 NB-IoT BAND 25

Radiated Power (EIRP) for Band 25									
Mode	RB/RB SIZE	Frequency	Result						Conclusion
			SG Level	Cable Loss (dBm)	Antenna Gain (dB)	Max. EIRP	Max. EIRP	Polarization Of Max. ERP	
			(dBm)			Average	Average		
						(dBm)	(mW)		
BPSK 3.75kHz	1/#Mid	1850.2	-8.08	3.12	27.58	16.38	43.451	Horizontal	Pass
		1882.5	-7.86	3.27	27.61	16.48	44.463	Horizontal	Pass
		1914.8	-7.97	3.29	27.63	16.37	43.351	Horizontal	Pass
BPSK 3.75kHz	1/#Mid	1850.2	-8.00	3.12	27.58	16.46	44.259	Vertical	Pass
		1882.5	-7.89	3.27	27.61	16.45	44.157	Vertical	Pass
		1914.8	-7.85	3.29	27.63	16.49	44.566	Vertical	Pass

Radiated Power (EIRP) for Band 25									
Mode	RB/R B SIZE	Frequenc y	Result						Conclusio n
			SG Level	Cable Loss (dBm)	Antenn a Gain (dB)	Max. EIRP	Max. EIRP	Polarizatio n Of Max. ERP	
			(dBm)			Averag e	Averag e		
						(dBm)	(mW)		
QPSK 3.75kHz z	1/#Mid	1850.2	-7.75	3.12	27.58	16.71	46.881	Horizontal	Pass
		1882.5	-7.55	3.27	27.61	16.79	47.753	Horizontal	Pass
		1914.8	-7.57	3.29	27.63	16.77	47.534	Horizontal	Pass
QPSK 3.75kHz z	1/#Mid	1850.2	-7.80	3.12	27.58	16.66	46.345	Vertical	Pass
		1882.5	-7.58	3.27	27.61	16.76	47.424	Vertical	Pass
		1914.8	-7.59	3.29	27.63	16.75	47.315	Vertical	Pass

Note:

SG Level= Signal generator output

Max. EIRP Average (dBm)= Antenna Gain(dB)+ SG Level (dBm)- Cable Loss(dBm)

The worst mode is 3.75kHz and the report only shows the worst mode.

9. SPURIOUS RADIATION EMISSION

RULE PART(S)

FCC: §2.1051, §22.917(a), §24.238(a), §27.53(c)(g)(h)(m)

LIMIT

For Band 7, the minimum permissible attenuation level of any spurious emission is $55 + \log_{10} (P \text{ [Watts]})$.

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10} (P \text{ [Watts]})$, where P is the transmitter power in Watts.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth in the 1 MHz band immediately outside and adjacent to the channel edge of the equipment. Beyond the 1 MHz band immediately outside the channel edge of the equipment, a resolution bandwidth of 1 MHz shall be employed. A narrower resolution bandwidth is allowed to be used provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz or 1% of the occupied bandwidth as applicable.

The power of any unwanted emissions measured from the channel edge of the equipment shall be attenuated below the transmitter power, P (dBW), as follows:

- a. for base station and subscriber equipment, other than mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \log_{10}(p)$, dB; and
- b. for mobile subscriber equipment, the attenuation shall not be less than $43 + 10 \log_{10}(p)$, dB at the channel edges and $55 + 10 \log_{10}(p)$ at 5.5 MHz away and beyond the channel edges where p in (a) and (b) is the transmitter power measured in watts.

MODES TESTED

- ☐ eMTC / NB IoT Band 2/4/5/12/13/25

RESULTS

PASS

9.1 e MTC BAND 2

QPSK EIRP POWER FOR LTE BAND 2 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1850.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3701.4	-47.27	4.04	33.51	-17.80	-13	-4.80	Horizontal
3701.4	-44.88	4.04	33.51	-15.41	-13	-2.41	Vertical
5552.1	-51.73	5.24	35.84	-21.13	-13	-8.13	Vertical
5552.1	-52.84	5.24	35.84	-22.24	-13	-9.24	Horizontal
175.8	-40.66	1.43	16.02	-26.07	-13	-13.07	Vertical
242.0	-44.33	1.30	17.99	-27.64	-13	-14.64	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-45.55	4.04	33.56	-16.03	-13	-3.03	Horizontal
3760.0	-45.84	4.04	33.56	-16.32	-13	-3.32	Vertical
5640.0	-46.10	5.24	35.91	-15.43	-13	-2.43	Vertical
5640.0	-51.04	5.24	35.91	-20.37	-13	-7.37	Horizontal
192.8	-39.00	1.62	16.97	-23.65	-13	-10.65	Vertical
310.4	-38.38	1.74	15.98	-24.15	-13	-11.15	Horizontal
Test Results for High Channel 1909.3MHz							
3818.6	-46.81	4.04	34.00	-16.85	-13	-3.85	Horizontal
3818.6	-44.20	4.04	34.00	-14.24	-13	-1.24	Vertical
5727.9	-51.76	5.24	36.04	-20.96	-13	-7.96	Vertical
5727.9	-53.31	5.24	36.04	-22.51	-13	-9.51	Horizontal
186.0	-34.54	1.42	17.29	-18.67	-13	-5.67	Vertical
413.1	-34.74	1.50	17.90	-18.33	-13	-5.33	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

Margin = Spurious Emission Level - Limit

Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.2 e MTC BAND 4

QPSK EIRP POWER FOR LTE BAND 4 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1710.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3421.4	-53.91	4.02	29.80	-28.13	-13	-15.13	Horizontal
3421.4	-49.35	4.02	29.80	-23.57	-13	-10.57	Vertical
5132.1	-47.11	5.24	35.84	-16.51	-13	-3.51	Vertical
5132.1	-50.53	5.24	35.84	-19.93	-13	-6.93	Horizontal
185.3	-39.94	1.68	16.04	-25.58	-13	-12.58	Vertical
345.9	-42.27	1.78	17.74	-26.31	-13	-13.31	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-46.66	4.03	30.00	-20.69	-13	-7.69	Horizontal
3465.0	-48.30	4.03	30.00	-22.33	-13	-9.33	Vertical
5197.5	-50.35	5.25	35.86	-19.74	-13	-6.74	Vertical
5197.5	-52.90	5.25	35.86	-22.29	-13	-9.29	Horizontal
202.6	-40.80	1.72	17.69	-24.83	-13	-11.83	Vertical
403.5	-44.01	1.62	16.02	-29.60	-13	-16.60	Horizontal
Test Results for High Channel 1754.3MHz							
3508.6	-50.37	4.05	30.01	-24.41	-13	-11.41	Horizontal
3508.6	-48.63	4.05	30.01	-22.67	-13	-9.67	Vertical
5262.9	-44.76	5.26	35.86	-14.16	-13	-1.16	Vertical
5262.9	-52.23	5.26	35.86	-21.63	-13	-8.63	Horizontal
204.3	-41.54	1.80	16.69	-26.65	-13	-13.65	Vertical
322.7	-40.17	1.75	16.66	-25.27	-13	-12.27	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.3 e MTC BAND 5

QPSK EIRP POWER FOR LTE BAND 5 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 824.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1649.4	-49.90	2.78	27.50	-25.18	-13	-12.18	Horizontal
1649.4	-47.80	2.78	27.50	-23.08	-13	-10.08	Vertical
2474.1	-51.72	2.90	27.80	-26.82	-13	-13.82	Vertical
2474.1	-53.15	2.90	27.80	-28.25	-13	-15.25	Horizontal
207.3	-43.01	1.76	17.59	-27.18	-13	-14.18	Vertical
310.0	-39.69	1.63	15.87	-25.45	-13	-12.45	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-46.58	2.80	27.48	-21.90	-13	-8.90	Horizontal
1673.0	-51.52	2.80	27.48	-26.84	-13	-13.84	Vertical
2509.5	-45.76	2.91	27.70	-20.97	-13	-7.97	Vertical
2509.5	-52.89	2.91	27.70	-28.10	-13	-15.10	Horizontal
182.8	-34.26	1.61	15.68	-20.19	-13	-7.19	Vertical
334.5	-35.11	1.59	17.52	-19.19	-13	-6.19	Horizontal
Test Results for High Channel 848.3MHz							
1696.6	-53.08	2.82	27.43	-28.47	-13	-15.47	Horizontal
1696.6	-45.93	2.82	27.43	-21.32	-13	-8.32	Vertical
2544.9	-52.78	2.92	27.74	-27.96	-13	-14.96	Vertical
2544.9	-49.06	2.92	27.74	-24.24	-13	-11.24	Horizontal
180.4	-40.88	1.69	16.67	-25.89	-13	-12.89	Vertical
374.7	-35.80	1.70	17.18	-20.32	-13	-7.32	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.4 e MTC BAND 12

QPSK EIRP POWER FOR LTE BAND 12 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 699.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1399.4	-51.76	2.60	27.20	-27.16	-13	-14.16	Horizontal
1399.4	-50.09	2.60	27.20	-25.49	-13	-12.49	Vertical
2099.1	-51.07	2.85	27.54	-26.38	-13	-13.38	Vertical
2099.1	-49.54	2.85	27.54	-24.85	-13	-11.85	Horizontal
205.0	-34.83	1.49	17.78	-18.54	-13	-5.54	Vertical
326.8	-40.72	1.36	17.33	-24.75	-13	-11.75	Horizontal
Test Results for Mid Channel 707.5MHz							
1415.0	-46.53	2.61	27.28	-21.86	-13	-8.86	Horizontal
1415.0	-47.96	2.61	27.28	-23.29	-13	-10.29	Vertical
2122.5	-53.92	2.87	27.59	-29.20	-13	-16.20	Vertical
2122.5	-51.05	2.87	27.59	-26.33	-13	-13.33	Horizontal
209.3	-35.30	1.73	15.74	-21.29	-13	-8.29	Vertical
395.4	-39.17	1.62	15.79	-25.00	-13	-12.00	Horizontal
Test Results for High Channel 715.3MHz							
1430.6	-48.63	2.63	27.28	-23.98	-13	-10.98	Horizontal
1430.6	-53.37	2.63	27.28	-28.72	-13	-15.72	Vertical
2145.9	-48.11	2.88	27.60	-23.39	-13	-10.39	Vertical
2145.9	-52.04	2.88	27.60	-27.32	-13	-14.32	Horizontal
200.4	-36.85	1.61	18.00	-20.46	-13	-7.46	Vertical
336.3	-43.71	1.45	15.49	-29.68	-13	-16.68	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.5 e MTC BAND 13

QPSK EIRP POWER FOR LTE BAND 13 (5MHZ BANDWIDTH)

Test Results for Low Channel 779.5MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1559.0	-74.63	2.61	27.28	-49.96	-40	-9.96	Horizontal
1559.0	-75.37	2.61	27.28	-50.70	-40	-10.70	Vertical
2338.5	-70.54	2.87	27.59	-45.82	-13	-32.82	Vertical
2338.5	-68.34	2.87	27.59	-43.62	-13	-30.62	Horizontal
180.5	-70.62	1.71	16.15	-56.18	-13	-43.18	Vertical
289.5	-68.26	1.41	17.32	-52.35	-13	-39.35	Horizontal
Test Results For Mid Channel 782MHz							
1564.0	-71.86	2.62	27.30	-47.18	-40	-7.18	Horizontal
1564.0	-74.72	2.62	27.30	-50.04	-40	-10.04	Vertical
2346.0	-67.29	2.87	27.62	-42.54	-13	-29.54	Vertical
2346.0	-73.76	2.87	27.62	-49.01	-13	-36.01	Horizontal
209.5	-74.66	1.42	15.25	-60.84	-13	-47.84	Vertical
412.1	-74.92	1.36	17.19	-59.09	-13	-46.09	Horizontal
Test Results for High Channel 784.5MHz							
1569.0	-75.66	2.66	27.28	-51.04	-40	-11.04	Horizontal
1569.0	-67.31	2.66	27.28	-42.69	-40	-2.69	Vertical
2353.5	-73.01	2.88	27.60	-48.29	-13	-35.29	Vertical
2353.5	-70.71	2.88	27.60	-45.99	-13	-32.99	Horizontal
180.7	-70.07	1.32	17.29	-54.10	-13	-41.10	Vertical
461.4	-72.27	1.72	16.89	-57.10	-13	-44.10	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.6 e MTC BAND 25

QPSK EIRP POWER FOR LTE BAND 25 (1.4MHZ BANDWIDTH)

Test Results for Low Channel 1850.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3701.4	-44.74	4.26	29.80	-19.20	-13	-6.20	Horizontal
3701.4	-48.76	4.26	29.80	-23.22	-13	-10.22	Vertical
5552.1	-45.96	5.36	35.84	-15.48	-13	-2.48	Vertical
5552.1	-49.92	5.36	35.84	-19.44	-13	-6.44	Horizontal
200.7	-40.05	1.68	16.04	-25.69	-13	-12.69	Vertical
280.5	-43.69	1.78	17.74	-27.73	-13	-14.73	Horizontal
Test Results For Mid Channel 1882.5MHz							
3765.0	-45.24	4.28	30.00	-19.52	-13	-6.52	Horizontal
3765.0	-51.84	4.28	30.00	-26.12	-13	-13.12	Vertical
5647.5	-46.80	5.41	35.86	-16.35	-13	-3.35	Vertical
5647.5	-50.26	5.41	35.86	-19.81	-13	-6.81	Horizontal
197.3	-44.13	1.72	17.69	-28.16	-13	-15.16	Vertical
418.9	-34.52	1.62	16.02	-20.11	-13	-7.11	Horizontal
Test Results for High Channel 1914.3MHz							
3828.6	-51.93	4.31	30.01	-26.23	-13	-13.23	Horizontal
3828.6	-47.07	4.31	30.01	-21.37	-13	-8.37	Vertical
5742.9	-46.44	5.43	35.86	-16.01	-13	-3.01	Vertical
5742.9	-53.29	5.43	35.86	-22.86	-13	-9.86	Horizontal
199.0	-43.56	1.80	16.69	-28.67	-13	-15.67	Vertical
237.5	-35.69	1.75	16.66	-20.79	-13	-7.79	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. Both QPSK and 16QAM has been tested, the worst case is QPSK mode, the report just reported the worst case.

9.7 NB-IoT BAND 2

BPSK EIRP POWER FOR LTE BAND 2 (3.75kHz)

Test Results for Low Channel 1850.1MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3700.4	-47.98	4.04	33.51	-18.51	-13	-5.51	Horizontal
3700.4	-49.37	4.04	33.51	-19.90	-13	-6.90	Vertical
5550.6	-50.10	5.24	35.84	-19.50	-13	-6.50	Vertical
5550.6	-50.44	5.24	35.84	-19.84	-13	-6.84	Horizontal
211.8	-35.48	1.43	16.02	-20.89	-13	-7.89	Vertical
458.2	-42.65	1.30	17.99	-25.96	-13	-12.96	Horizontal
Test Results for Mid Channel 1880MHz							
3760.0	-53.39	4.04	33.56	-23.87	-13	-10.87	Horizontal
3760.0	-45.94	4.04	33.56	-16.42	-13	-3.42	Vertical
5640.0	-51.75	5.24	35.91	-21.08	-13	-8.08	Vertical
5640.0	-53.64	5.24	35.91	-22.97	-13	-9.97	Horizontal
212.5	-42.59	1.62	16.97	-27.24	-13	-14.24	Vertical
366.6	-38.06	1.74	15.98	-23.83	-13	-10.83	Horizontal
Test Results for High Channel 1909.9MHz							
3819.6	-52.62	4.04	34.00	-22.66	-13	-9.66	Horizontal
3819.6	-49.23	4.04	34.00	-19.27	-13	-6.27	Vertical
5729.4	-44.31	5.24	36.04	-13.51	-13	-0.51	Vertical
5729.4	-49.50	5.24	36.04	-18.70	-13	-5.70	Horizontal
184.1	-44.90	1.42	17.29	-29.03	-13	-16.03	Vertical
338.6	-38.15	1.50	17.90	-21.74	-13	-8.74	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. The worst mode is BPSK(3.75kHz) and the report only shows the worst mode.

9.8 NB-IoT BAND 4

BPSK EIRP POWER FOR LTE BAND 4 (3.75kHz)

Test Results for Low Channel 1710.7MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3420.4	-44.21	4.02	29.80	-18.43	-13	-5.43	Horizontal
3420.4	-51.09	4.02	29.80	-25.31	-13	-12.31	Vertical
5130.6	-45.67	5.24	35.84	-15.07	-13	-2.07	Vertical
5130.6	-51.01	5.24	35.84	-20.41	-13	-7.41	Horizontal
210.3	-36.24	1.68	16.04	-21.88	-13	-8.88	Vertical
312.9	-40.04	1.78	17.74	-24.08	-13	-11.08	Horizontal
Test Results for Mid Channel 1732.5MHz							
3465.0	-52.23	4.03	30.00	-26.26	-13	-13.26	Horizontal
3465.0	-53.33	4.03	30.00	-27.36	-13	-14.36	Vertical
5197.5	-44.65	5.25	35.86	-14.04	-13	-1.04	Vertical
5197.5	-52.75	5.25	35.86	-22.14	-13	-9.14	Horizontal
209.1	-38.07	1.72	17.69	-22.10	-13	-9.10	Vertical
243.2	-37.37	1.62	16.02	-22.96	-13	-9.96	Horizontal
Test Results for High Channel 1754.9MHz							
3509.6	-46.38	4.05	30.01	-20.42	-13	-7.42	Horizontal
3509.6	-52.30	4.05	30.01	-26.34	-13	-13.34	Vertical
5264.4	-51.37	5.26	35.86	-20.77	-13	-7.77	Vertical
5264.4	-49.80	5.26	35.86	-19.20	-13	-6.20	Horizontal
197.2	-44.73	1.80	16.69	-29.84	-13	-16.84	Vertical
452.3	-44.09	1.75	16.66	-29.19	-13	-16.19	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

- Margin = Spurious Emission Level - Limit
- The worst mode is BPSK(3.75kHz) and the report only shows the worst mode.

9.9 NB-IoT BAND 5

BPSK EIRP POWER FOR LTE BAND 5 (3.75kHz)

Test Results for Low Channel 824.1MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1648.4	-44.12	2.78	27.50	-19.40	-13	-6.40	Horizontal
1648.4	-47.67	2.78	27.50	-22.95	-13	-9.95	Vertical
2472.6	-44.39	2.90	27.80	-19.49	-13	-6.49	Vertical
2472.6	-49.70	2.90	27.80	-24.80	-13	-11.80	Horizontal
193.5	-42.48	1.76	17.59	-26.65	-13	-13.65	Vertical
252.1	-39.78	1.63	15.87	-25.54	-13	-12.54	Horizontal
Test Results For Mid Channel 836.5MHz							
1673.0	-52.69	2.80	27.48	-28.01	-13	-15.01	Horizontal
1673.0	-46.57	2.80	27.48	-21.89	-13	-8.89	Vertical
2509.5	-51.73	2.91	27.70	-26.94	-13	-13.94	Vertical
2509.5	-51.36	2.91	27.70	-26.57	-13	-13.57	Horizontal
176.1	-36.32	1.61	15.68	-22.25	-13	-9.25	Vertical
426.7	-36.06	1.59	17.52	-20.14	-13	-7.14	Horizontal
Test Results for High Channel 848.9MHz							
1697.6	-47.39	2.82	27.43	-22.78	-13	-9.78	Horizontal
1697.6	-53.80	2.82	27.43	-29.19	-13	-16.19	Vertical
2546.4	-48.49	2.92	27.74	-23.67	-13	-10.67	Vertical
2546.4	-53.49	2.92	27.74	-28.67	-13	-15.67	Horizontal
189.0	-44.86	1.69	16.67	-29.87	-13	-16.87	Vertical
426.4	-34.46	1.70	17.18	-18.98	-13	-5.98	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. The worst mode is BPSK(3.75kHz) and the report only shows the worst mode..

9.10 NB-IoT BAND 12

BPSK EIRP POWER FOR LTE BAND 12 (3.75kHz)

Test Results for Low Channel 699.1MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1398.4	-47.49	2.60	27.20	-22.89	-13	-9.89	Horizontal
1398.4	-51.88	2.60	27.20	-27.28	-13	-14.28	Vertical
2097.6	-47.04	2.85	27.54	-22.35	-13	-9.35	Vertical
2097.6	-51.42	2.85	27.54	-26.73	-13	-13.73	Horizontal
183.8	-43.56	1.49	17.78	-27.27	-13	-14.27	Vertical
251.6	-34.50	1.36	17.33	-18.53	-13	-5.53	Horizontal
Test Results for Mid Channel 707.5MHz							
1415.0	-48.67	2.61	27.28	-24.00	-13	-11.00	Horizontal
1415.0	-53.73	2.61	27.28	-29.06	-13	-16.06	Vertical
2122.5	-53.29	2.87	27.59	-28.57	-13	-15.57	Vertical
2122.5	-51.24	2.87	27.59	-26.52	-13	-13.52	Horizontal
192.0	-40.98	1.73	15.74	-26.97	-13	-13.97	Vertical
313.0	-42.01	1.62	15.79	-27.84	-13	-14.84	Horizontal
Test Results for High Channel 715.9MHz							
1431.6	-45.36	2.63	27.28	-20.71	-13	-7.71	Horizontal
1431.6	-45.70	2.63	27.28	-21.05	-13	-8.05	Vertical
2147.4	-44.92	2.88	27.60	-20.20	-13	-7.20	Vertical
2147.4	-50.87	2.88	27.60	-26.15	-13	-13.15	Horizontal
179.1	-35.70	1.61	18.00	-19.31	-13	-6.31	Vertical
433.7	-41.01	1.45	15.49	-26.98	-13	-13.98	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. The worst mode is BPSK(3.75kHz) and the report only shows the worst mode.

9.11 NB-IoT BAND 13

BPSK EIRP POWER FOR LTE BAND 13 (3.75kHz)

Test Results for Low Channel 777.1MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
1554.4	-75.78	2.61	27.28	-51.11	-40	-11.11	Horizontal
1554.4	-74.30	2.61	27.28	-49.63	-40	-9.63	Vertical
2331.6	-68.79	2.87	27.59	-44.07	-13	-31.07	Vertical
2331.6	-72.33	2.87	27.59	-47.61	-13	-34.61	Horizontal
181.8	-69.97	1.71	16.15	-55.53	-13	-42.53	Vertical
431.1	-69.44	1.41	17.32	-53.53	-13	-40.53	Horizontal
Test Results For Mid Channel 782MHz							
1564.0	-70.61	2.62	27.30	-45.93	-40	-5.93	Horizontal
1564.0	-71.62	2.62	27.30	-46.94	-40	-6.94	Vertical
2346.0	-72.46	2.87	27.62	-47.71	-13	-34.71	Vertical
2346.0	-70.83	2.87	27.62	-46.08	-13	-33.08	Horizontal
192.5	-70.73	1.42	15.25	-56.91	-13	-43.91	Vertical
327.1	-68.57	1.36	17.19	-52.74	-13	-39.74	Horizontal
Test Results for High Channel 786.9MHz							
1573.6	-77.53	2.66	27.28	-52.91	-40	-12.91	Horizontal
1573.6	-70.84	2.66	27.28	-46.22	-40	-6.22	Vertical
2360.4	-69.04	2.88	27.60	-44.32	-13	-31.32	Vertical
2360.4	-68.76	2.88	27.60	-44.04	-13	-31.04	Horizontal
194.9	-74.04	1.32	17.29	-58.07	-13	-45.07	Vertical
315.7	-69.04	1.72	16.89	-53.87	-13	-40.87	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. The worst mode is BPSK(3.75kHz) and the report only shows the worst mode.

9.12 NB-IoT BAND 25

BPSK EIRP POWER FOR LTE BAND 25 (3.75kHz)

Test Results for Low Channel 1850.1MHz							
Frequency (MHz)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Antenna Gain(dB)	Spurious Emission Level (dBm)	Limit (dBm)	Margin (dB)	Polarity
3700.4	-52.93	4.26	29.80	-27.39	-13	-14.39	Horizontal
3700.4	-51.62	4.26	29.80	-26.08	-13	-13.08	Vertical
5550.6	-45.36	5.36	35.84	-14.88	-13	-1.88	Vertical
5550.6	-52.78	5.36	35.84	-22.30	-13	-9.30	Horizontal
191.6	-42.44	1.68	16.04	-28.08	-13	-15.08	Vertical
374.4	-34.53	1.78	17.74	-18.57	-13	-5.57	Horizontal
Test Results For Mid Channel 1882.5MHz							
3765.0	-52.50	4.28	30.00	-26.78	-13	-13.78	Horizontal
3765.0	-47.17	4.28	30.00	-21.45	-13	-8.45	Vertical
5647.5	-44.95	5.41	35.86	-14.50	-13	-1.50	Vertical
5647.5	-50.17	5.41	35.86	-19.72	-13	-6.72	Horizontal
202.3	-43.42	1.72	17.69	-27.45	-13	-14.45	Vertical
451.5	-43.11	1.62	16.02	-28.70	-13	-15.70	Horizontal
Test Results for High Channel 1914.9MHz							
3829.6	-47.15	4.31	30.01	-21.45	-13	-8.45	Horizontal
3829.6	-46.26	4.31	30.01	-20.56	-13	-7.56	Vertical
5744.4	-52.88	5.43	35.86	-22.45	-13	-9.45	Vertical
5744.4	-50.48	5.43	35.86	-20.05	-13	-7.05	Horizontal
183.8	-34.13	1.80	16.69	-19.24	-13	-6.24	Vertical
257.0	-40.72	1.75	16.66	-25.82	-13	-12.82	Horizontal

Note: Spurious Emission Level = Spectrum Analyzer Read Value - Cable Loss+ Antenna Gain

. Margin = Spurious Emission Level - Limit

. The worst mode is BPSK(3.75kHz) and the report only shows the worst mode.

10. FREQUENCY STABILITY

RULE PART(S)

FCC: §2.1055, §22.355, §24.235, §27.54

LIMITS

§22.355 - The carrier frequency shall not depart from the reference frequency in excess of ± 2.5 ppm for mobile stations.

§24.235 - The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

TEST PROCEDURE

Use CMW 500 with Frequency Error measurement capability.

- ☐ Temp. = -30° to $+50^{\circ}\text{C}$
- ☐ Voltage = low voltage, DC 3.7V, Normal, DC 3.7V and High voltage, DC 4.43V.

Frequency Stability vs Temperature:

The EUT is placed inside a temperature chamber. The temperature is set to -30°C and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until $+50^{\circ}\text{C}$ is reached.

Frequency Stability vs Voltage:

The peak frequency error is recorded (worst-case).

MODES TESTED

- ☐ eMTC / NB IoT Band 2/4/5/12/13/25

RESULTS

See the following pages.

10.1 eMTC BAND 2

Band 2 QPSK, (1.4MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1880	12.6	0.006706	2.5
3.7	1880	13.4	0.007103	2.5
4.2	1880	12.8	0.006825	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	12.3	0.006567	2.5
Extreme (50C)	1880	12.1	0.006436	2.5
Extreme (40C)	1880	13.2	0.007044	2.5
Extreme (30C)	1880	13.3	0.007059	2.5
Extreme (10C)	1880	14.1	0.007491	2.5
Extreme (0C)	1880	11.9	0.006306	2.5
Extreme (-10C)	1880	12.6	0.006681	2.5
Extreme (-20C)	1880	14.3	0.007610	2.5
Extreme (-30C)	1880	14.8	0.007879	2.5

Band 2 16QAM, (1.4MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1880	10.1	0.005391	2.5
3.7	1880	9.1	0.004815	2.5
4.2	1880	8.5	0.004498	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	9.9	0.005265	2.5
Extreme (50C)	1880	8.9	0.004744	2.5
Extreme (40C)	1880	7.8	0.004148903	2.5
Extreme (30C)	1880	8.6	0.004569974	2.5
Extreme (10C)	1880	9.2	0.004883325	2.5
Extreme (0C)	1880	8.0	0.004264357	2.5
Extreme (-10C)	1880	8.5	0.004525427	2.5
Extreme (-20C)	1880	8.7	0.004642762	2.5
Extreme (-30C)	1880	8.4	0.004486422	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.2 eMTC BAND 4

Band 4 QPSK, (1.4MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1732.5	9.3	0.005360	2.5
3.7	1732.5	8.4	0.004855	2.5
4.2	1732.5	8.1	0.004652	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	8.2	0.004746	2.5
Extreme (50C)	1732.5	9.0	0.005190	2.5
Extreme (40C)	1732.5	7.0	0.004049	2.5
Extreme (30C)	1732.5	6.1	0.003495	2.5
Extreme (10C)	1732.5	7.5	0.004341	2.5
Extreme (0C)	1732.5	9.7	0.005579	2.5
Extreme (-10C)	1732.5	8.5	0.004918	2.5
Extreme (-20C)	1732.5	6.8	0.003946	2.5
Extreme (-30C)	1732.5	8.3	0.004774	2.5

Band 4 16QAM, (1.4MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1732.5	10.0	0.005750	2.5
3.7	1732.5	8.8	0.005061	2.5
4.2	1732.5	8.4	0.004861	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	9.7	0.005584	2.5
Extreme (50C)	1732.5	8.7	0.005015	2.5
Extreme (40C)	1732.5	8.6	0.004945	2.5
Extreme (30C)	1732.5	8.9	0.005152	2.5
Extreme (10C)	1732.5	8.9	0.005121	2.5
Extreme (0C)	1732.5	8.4	0.004873	2.5
Extreme (-10C)	1732.5	9.2	0.005331	2.5
Extreme (-20C)	1732.5	8.9	0.005145	2.5
Extreme (-30C)	1732.5	7.9	0.004586	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.3 eMTC BAND 5

Band 5 QPSK, (1.4MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	836.5	5.8	0.006947	2.5
3.7	836.5	7.0	0.008428	2.5
4.2	836.5	4.5	0.005420	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	6.0	0.007195	2.5
Extreme (50C)	836.5	5.6	0.006724	2.5
Extreme (40C)	836.5	5.7	0.006777	2.5
Extreme (30C)	836.5	6.2	0.007424	2.5
Extreme (10C)	836.5	5.0	0.005968	2.5
Extreme (0C)	836.5	5.2	0.006162	2.5
Extreme (-10C)	836.5	5.8	0.006937	2.5
Extreme (-20C)	836.5	6.4	0.007613	2.5
Extreme (-30C)	836.5	6.1	0.007328	2.5

Band 5 16QAM, (1.4MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	836.5	5.9	0.007046	2.5
3.7	836.5	6.2	0.007437	2.5
4.2	836.5	4.6	0.005530	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	5.9	0.007092	2.5
Extreme (50C)	836.5	6.4	0.007627	2.5
Extreme (40C)	836.5	5.7	0.006801	2.5
Extreme (30C)	836.5	6.6	0.007864	2.5
Extreme (10C)	836.5	5.2	0.006266	2.5
Extreme (0C)	836.5	5.0	0.005978	2.5
Extreme (-10C)	836.5	5.3	0.006312	2.5
Extreme (-20C)	836.5	6.0	0.007170	2.5
Extreme (-30C)	836.5	6.6	0.007939	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.4 eMTC BAND 12

Band 12 QPSK, (1.4MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	707.5	8.6	0.012096	2.5
3.7	707.5	10.0	0.014156	2.5
4.2	707.5	8.7	0.012341	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	707.5	9.1	0.012904	2.5
Extreme (50C)	707.5	7.8	0.010971	2.5
Extreme (40C)	707.5	7.6	0.010732	2.5
Extreme (30C)	707.5	8.6	0.012205	2.5
Extreme (10C)	707.5	7.1	0.010076	2.5
Extreme (0C)	707.5	9.4	0.013332	2.5
Extreme (-10C)	707.5	8.1	0.011477	2.5
Extreme (-20C)	707.5	8.9	0.012562	2.5
Extreme (-30C)	707.5	8.0	0.011238	2.5

Band 12 16QAM, (1.4MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	707.5	7.7	0.010859	2.5
3.7	707.5	7.8	0.011034	2.5
4.2	707.5	7.3	0.010279	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	707.5	9.4	0.013256	2.5
Extreme (50C)	707.5	8.8	0.012383	2.5
Extreme (40C)	707.5	9.0	0.012737	2.5
Extreme (30C)	707.5	7.8	0.011055	2.5
Extreme (10C)	707.5	8.6	0.012154	2.5
Extreme (0C)	707.5	7.4	0.010527	2.5
Extreme (-10C)	707.5	7.8	0.011081	2.5
Extreme (-20C)	707.5	8.8	0.012503	2.5
Extreme (-30C)	707.5	8.8	0.012475	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.5 eMTC BAND 13

Band 13 QPSK, (5MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	782.0	12.7	0.016209	2.5
3.7	782.0	13.7	0.017457	2.5
4.2	782.0	13.0	0.016600	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	14.4	0.018388	2.5
Extreme (50C)	782.0	13.5	0.017224	2.5
Extreme (40C)	782.0	14.9	0.019038	2.5
Extreme (30C)	782.0	13.7	0.017497	2.5
Extreme (10C)	782.0	14.2	0.018151	2.5
Extreme (0C)	782.0	14.3	0.018258	2.5
Extreme (-10C)	782.0	14.3	0.018252	2.5
Extreme (-20C)	782.0	13.7	0.017498	2.5
Extreme (-30C)	782.0	13.8	0.017698	2.5

Band 13 16QAM, (5MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	782.0	12.3	0.015734	2.5
3.7	782.0	13.6	0.017380	2.5
4.2	782.0	13.2	0.016851	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	12.3	0.015724	2.5
Extreme (50C)	782.0	11.3	0.014431	2.5
Extreme (40C)	782.0	13.7	0.017477	2.5
Extreme (30C)	782.0	13.3	0.017050	2.5
Extreme (10C)	782.0	14.0	0.017873	2.5
Extreme (0C)	782.0	12.5	0.015957	2.5
Extreme (-10C)	782.0	13.1	0.016806	2.5
Extreme (-20C)	782.0	13.8	0.017645	2.5
Extreme (-30C)	782.0	14.4	0.018391	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.6 eMTC BAND 25

Band 25 QPSK, (1.4MHz BANDWIDTH RB size 6 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1882.5	6.5	0.003441	2.5
3.85	1882.5	7.4	0.003911	2.5
4.2	1882.5	7.0	0.003731	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1882.5	5.5	0.002927	2.5
Extreme (50C)	1882.5	7.7	0.004079	2.5
Extreme (40C)	1882.5	7.0	0.003695	2.5
Extreme (30C)	1882.5	7.1	0.003757	2.5
Extreme (10C)	1882.5	7.5	0.004002	2.5
Extreme (0C)	1882.5	6.9	0.003683	2.5
Extreme (-10C)	1882.5	5.8	0.003060	2.5
Extreme (-20C)	1882.5	6.0	0.003190	2.5
Extreme (-30C)	1882.5	5.5	0.002937	2.5

Band 25 16QAM, (1.4MHz BANDWIDTH RB size 5 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1882.5	8.3	0.004425	2.5
3.7	1882.5	7.5	0.003962	2.5
4.2	1882.5	9.4	0.004996	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1882.5	8.7	0.004598	2.5
Extreme (50C)	1882.5	7.7	0.004077	2.5
Extreme (40C)	1882.5	8.4	0.004470	2.5
Extreme (30C)	1882.5	8.2	0.004355	2.5
Extreme (10C)	1882.5	8.1	0.004277	2.5
Extreme (0C)	1882.5	6.7	0.003569	2.5
Extreme (-10C)	1882.5	8.7	0.004601	2.5
Extreme (-20C)	1882.5	8.7	0.004626	2.5
Extreme (-30C)	1882.5	6.0	0.003187	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.7 NB-IoT BAND 2

Band 2 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1880	13.2	0.007013	2.5
3.7	1880	13.7	0.007286	2.5
4.2	1880	13.4	0.007113	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	12.8	0.006782	2.5
Extreme (50C)	1880	11.5	0.006138	2.5
Extreme (40C)	1880	13.6	0.007244	2.5
Extreme (30C)	1880	13.4	0.007102	2.5
Extreme (10C)	1880	13.5	0.007188	2.5
Extreme (0C)	1880	11.8	0.006274	2.5
Extreme (-10C)	1880	12.6	0.006708	2.5
Extreme (-20C)	1880	14.4	0.007639	2.5
Extreme (-30C)	1880	14.7	0.007807	2.5

Band 2 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1880	9.9	0.005287	2.5
3.7	1880	9.3	0.004947	2.5
4.2	1880	8.6	0.004566	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1880	9.2	0.004870	2.5
Extreme (50C)	1880	8.7	0.004638	2.5
Extreme (40C)	1880	8.5	0.004510759	2.5
Extreme (30C)	1880	9.0	0.004761917	2.5
Extreme (10C)	1880	9.1	0.004844383	2.5
Extreme (0C)	1880	7.7	0.004069716	2.5
Extreme (-10C)	1880	9.5	0.005040962	2.5
Extreme (-20C)	1880	9.3	0.004970612	2.5
Extreme (-30C)	1880	8.2	0.004363663	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.8 NB-IoT BAND 4

Band 4 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1732.5	8.6	0.004958	2.5
3.7	1732.5	9.1	0.005281	2.5
4.2	1732.5	8.7	0.005019	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	8.3	0.004780	2.5
Extreme (50C)	1732.5	9.3	0.005388	2.5
Extreme (40C)	1732.5	7.5	0.004325	2.5
Extreme (30C)	1732.5	5.7	0.003302	2.5
Extreme (10C)	1732.5	7.5	0.004328	2.5
Extreme (0C)	1732.5	9.6	0.005565	2.5
Extreme (-10C)	1732.5	8.7	0.005006	2.5
Extreme (-20C)	1732.5	7.1	0.004094	2.5
Extreme (-30C)	1732.5	8.8	0.005067	2.5

Band 4 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1732.5	9.3	0.005373	2.5
3.7	1732.5	9.1	0.005226	2.5
4.2	1732.5	8.1	0.004671	2.5

Frequency error vs. Temperature

Temperature [°C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1732.5	9.6	0.005549	2.5
Extreme (50C)	1732.5	8.6	0.004951	2.5
Extreme (40C)	1732.5	7.9	0.004582	2.5
Extreme (30C)	1732.5	9.4	0.005409	2.5
Extreme (10C)	1732.5	8.5	0.004908	2.5
Extreme (0C)	1732.5	8.0	0.004639	2.5
Extreme (-10C)	1732.5	8.5	0.004910	2.5
Extreme (-20C)	1732.5	8.8	0.005080	2.5
Extreme (-30C)	1732.5	8.4	0.004823	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.9 NB-IoT BAND 5

Band 5 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	836.5	6.2	0.007384	2.5
3.7	836.5	7.1	0.008479	2.5
4.2	836.5	4.8	0.005709	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	6.3	0.007590	2.5
Extreme (50C)	836.5	6.3	0.007561	2.5
Extreme (40C)	836.5	6.5	0.007716	2.5
Extreme (30C)	836.5	6.2	0.007471	2.5
Extreme (10C)	836.5	5.4	0.006450	2.5
Extreme (0C)	836.5	5.3	0.006356	2.5
Extreme (-10C)	836.5	5.5	0.006517	2.5
Extreme (-20C)	836.5	6.4	0.007602	2.5
Extreme (-30C)	836.5	6.1	0.007290	2.5

Band 5 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	836.5	6.1	0.007331	2.5
3.7	836.5	6.2	0.007464	2.5
4.2	836.5	4.7	0.005673	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	836.5	6.6	0.007871	2.5
Extreme (50C)	836.5	6.1	0.007265	2.5
Extreme (40C)	836.5	6.6	0.007870	2.5
Extreme (30C)	836.5	6.0	0.007151	2.5
Extreme (10C)	836.5	5.9	0.007041	2.5
Extreme (0C)	836.5	5.1	0.006121	2.5
Extreme (-10C)	836.5	5.1	0.006123	2.5
Extreme (-20C)	836.5	5.7	0.006862	2.5
Extreme (-30C)	836.5	6.4	0.007640	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.10 NB-IoT BAND 12

Band 12 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	707.5	8.3	0.011777	2.5
3.7	707.5	10.4	0.014743	2.5
4.2	707.5	9.1	0.012849	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	707.5	8.6	0.012222	2.5
Extreme (50C)	707.5	7.5	0.010594	2.5
Extreme (40C)	707.5	7.1	0.010000	2.5
Extreme (30C)	707.5	8.3	0.011776	2.5
Extreme (10C)	707.5	7.1	0.010055	2.5
Extreme (0C)	707.5	8.9	0.012624	2.5
Extreme (-10C)	707.5	8.7	0.012355	2.5
Extreme (-20C)	707.5	8.9	0.012581	2.5
Extreme (-30C)	707.5	7.9	0.011097	2.5

Band 12 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	707.5	7.2	0.010133	2.5
3.7	707.5	8.3	0.011673	2.5
4.2	707.5	7.1	0.010017	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	707.5	8.9	0.012647	2.5
Extreme (50C)	707.5	8.5	0.011980	2.5
Extreme (40C)	707.5	9.0	0.012660	2.5
Extreme (30C)	707.5	7.7	0.010897	2.5
Extreme (10C)	707.5	9.1	0.012898	2.5
Extreme (0C)	707.5	7.7	0.010829	2.5
Extreme (-10C)	707.5	6.9	0.009792	2.5
Extreme (-20C)	707.5	9.4	0.013244	2.5
Extreme (-30C)	707.5	8.0	0.011251	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.11 NB-IoT BAND 13

Band 13 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	782.0	13.0	0.016592	2.5
3.7	782.0	13.4	0.017184	2.5
4.2	782.0	12.9	0.016434	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	14.5	0.018583	2.5
Extreme (50C)	782.0	13.5	0.017212	2.5
Extreme (40C)	782.0	15.4	0.019686	2.5
Extreme (30C)	782.0	13.8	0.017637	2.5
Extreme (10C)	782.0	14.3	0.018251	2.5
Extreme (0C)	782.0	13.7	0.017551	2.5
Extreme (-10C)	782.0	13.7	0.017534	2.5
Extreme (-20C)	782.0	14.1	0.018088	2.5
Extreme (-30C)	782.0	13.9	0.017828	2.5

Band 13 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	782.0	13.1	0.016747	2.5
3.7	782.0	14.3	0.018242	2.5
4.2	782.0	13.8	0.017590	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	782.0	12.4	0.015797	2.5
Extreme (50C)	782.0	12.1	0.015452	2.5
Extreme (40C)	782.0	13.3	0.016968	2.5
Extreme (30C)	782.0	13.1	0.016689	2.5
Extreme (10C)	782.0	14.0	0.017849	2.5
Extreme (0C)	782.0	12.2	0.015587	2.5
Extreme (-10C)	782.0	12.6	0.016134	2.5
Extreme (-20C)	782.0	14.5	0.018565	2.5
Extreme (-30C)	782.0	14.8	0.018935	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

10.12 NB-IoT BAND 25

Band 25 BPSK, (15kHz RB size 1 RB Offset 11)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1882.5	6.1	0.003238	2.5
3.85	1882.5	6.6	0.003480	2.5
4.2	1882.5	7.3	0.003880	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1882.5	5.1	0.002686	2.5
Extreme (50C)	1882.5	7.1	0.003790	2.5
Extreme (40C)	1882.5	6.3	0.003346	2.5
Extreme (30C)	1882.5	6.8	0.003634	2.5
Extreme (10C)	1882.5	7.7	0.004108	2.5
Extreme (0C)	1882.5	6.5	0.003473	2.5
Extreme (-10C)	1882.5	5.9	0.003154	2.5
Extreme (-20C)	1882.5	6.2	0.003286	2.5
Extreme (-30C)	1882.5	5.6	0.002995	2.5

Band 25 QPSK, (15kHz RB size 12 RB Offset 0)

Frequency error vs. Voltage

Voltage [Vdc]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
3.4	1882.5	8.2	0.004337	2.5
3.7	1882.5	7.8	0.004146	2.5
4.2	1882.5	9.7	0.005156	2.5

Frequency error vs. Temperature

Temperature [° C]	Frequency [MHz]	Frequency* Error[Hz]	Frequency Error[ppm]	Limit [ppm]
Normal (25C)	1882.5	8.3	0.004403	2.5
Extreme (50C)	1882.5	8.0	0.004254	2.5
Extreme (40C)	1882.5	8.6	0.004593	2.5
Extreme (30C)	1882.5	8.1	0.004303	2.5
Extreme (10C)	1882.5	8.4	0.004456	2.5
Extreme (0C)	1882.5	6.9	0.003664	2.5
Extreme (-10C)	1882.5	8.3	0.004390	2.5
Extreme (-20C)	1882.5	8.9	0.004720	2.5
Extreme (-30C)	1882.5	5.9	0.003146	2.5

***Note:** Frequency error measurements were made by using the build-in capability of the Wireless Communication Test Set.

11. Peak-to-Average Ratio

11.1 Description of the PAR Measurement

The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

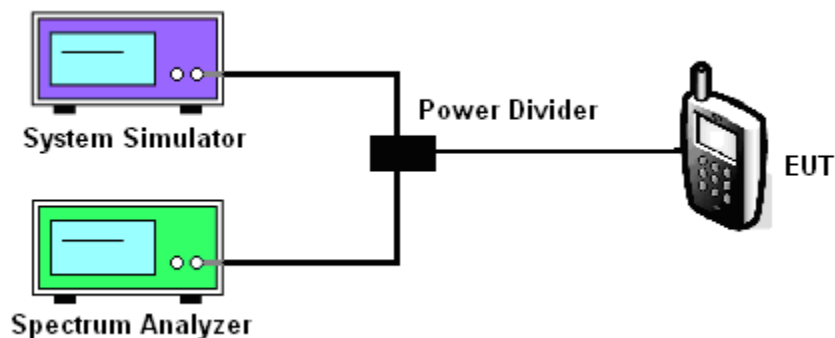
11.2 Measuring Instruments

See list of measuring instruments of this test report.

11.3 Test Procedures

1. The EUT was connected to Spectrum Analyzer and Base Station via power divider.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. For LTE operating modes:
 - a. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
 - b. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.

11.4 Test Setup



MODES TESTED

- ☒ eMTC / NB IoT Band 2/4/5/12/13/25
☐

Test data reference attachment.

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