RF TEST REPORT

Applicant	Huawei Technologies Co., Ltd.
FCC ID	QISE3619U-828
Product	Huawei Locator
Model	E3619U-828
Report No.	R1812H0172-R5
Issue Date	January 19, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2018)/ FCC CFR 47 Part 22H (2018)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Peng Tao	*Approved by: Kai Xu*

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Summary of measurement results

No.	Test Type	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Radiated Power	22.913(a)(5)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	2.1051 / 22.917(a)	PASS
5	Peak-to-Average Power Ratio	22.913(d)/ KDB 971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 22.355	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	PASS
8	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS
Date of Testing: January 8, 2019 ~ January 18, 2019			
Note: PASS: The EUT complies with the essential requirements in the standard. FAIL: The EUT does not comply with the essential requirements in the standard.			

1. Test Laboratory

1.1. Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

CNAS (accreditation number: L2264)

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

IC (recognition number is 8510A)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
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2. General Description of Equipment under Test

Client Information

Applicant	Huawei Technologies Co., Ltd.
Applicant address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.
Manufacturer	Huawei Technologies Co., Ltd.
Manufacturer address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China.

General Information

EUT Description			
Model	E3619U-828		
IMEI	/		
Hardware Version	IM1E3619UM VER.E		
Software Version	1.0.0.35(H126SP9C00)		
Power Supply	Battery		
Antenna Type	Internal Antenna		
Antenna Gain	NB-IOT Band 5: -8.5dBi		
Test Mode(s)	NB-IOT Band 5;		
Test Modulation	BPSK, QPSK		
Category	NB1		
Deployment	stand-alone		
Sub-carrier spacing	3.75KHz, 15KHz		
Ntones	single, multi-tone		
Maximum E.R.P.	NB-IOT Band 5:	12.35dBm	
Rated Power Supply Voltage	3.82V		
Extreme Voltage	Minimum: 3.45V Maximum: 4.4V		
Extreme Temperature	Lowest: -15°C Highest: +55°C		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	NB-IOT Band 5	824 ~ 849	869 ~ 894
EUT Accessory			
Battery 1	Manufacturer: Amperex Technology Limited Model: HB642735ECW		
Battery 2	Manufacturer: Tianjin Lishen Battery Joint-Stock Co., Ltd Model: HB642735ECW		
USB Cable 1	Manufacturer: HUIZHOU DEHONG TECHENOLOGY CO., LTD 17cm, shielded		
USB Cable 2	Manufacturer: NINGBO BROAD TELECOMMUNICATION CO.,LTD		

	17cm, shielded
USB Cable 3	Manufacturer: Luxshare Precision Industry Co., Ltd. 17cm, shielded
EMI suppression Ferrite core	Manufacturer: Prosperity Electronic Co., Limited. Model: A2 RC 103B
Note: The information of the EUT is declared by the manufacturer. 2. There is more than one USB cable, one Battery, each one should be applied throughout the compliance test respectively, and however, only the worst case (USB cable 1 and Battery 1) will be recorded in this report.	

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC CFR47 Part 2 (2018)

FCC CFR 47 Part 22H (2018)

ANSI C63.26 (2015)

KDB 971168 D01 Power Meas License Digital Systems v03r01

4. Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (Z axis, vertical polarization) and the worst case was recorded.

All modes as Subcarrier Spacing, modulations, Channel were investigated.
Subsequently, only the worst case emissions are reported.
The following testing in NB-IOT is set based on the maximum RF Output Power.
The following testing in different mode is set to detail in the following table:

Test modes are chosen as the worst case configuration below for NB-IOT Band 5.

Test items	Deployment mode	Subcarrier Spacing (kHz)		Modulation		Test Channel		
	Stand-alone	3.75	15	BPSK	QPSK	L	M	H
RF power output	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	O	-	O	-
Frequency Stability	O	O	O	O	O	O	O	O
Spurious Emissions at Antenna Terminals	O	-	O	-	O	O	O	O
Radiates Spurious Emission	O	-	O	-	O	-	O	-

Note
1. The mark “O” means that this configuration is chosen for testing.
2. The mark “-” means that this configuration is not testing.

5. Test Case Results

5.1. RF Power Output

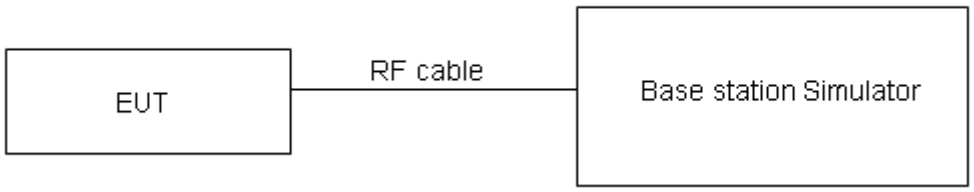
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Limits

No specific RF power output requirements in part 2.1046.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Conducted Power (dBm) Channel/Frequency(MHz)		
				20401/824.1	20525/836.5	20649/848.9
Band 5 Standalone	BPSK	3.75	1@0	22.73	22.62	22.68
			1@47	22.69	22.58	22.61
		15	1@0	22.87	22.66	22.75
			1@11	22.78	22.69	22.79
	QPSK	3.75	1@0	22.83	22.66	22.78
			1@47	22.72	22.53	22.75
		15	1@0	23.02	22.81	22.90
			1@11	22.94	22.75	22.86
		15	12@0	21.35	21.06	21.05

5.2. Effective Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading.LOSS = Generator Output Power (dBm) – Analyzer reading (dBm)

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation:ERP (dBm) = LVL (dBm) + LOSS (dB)

f) The maximum ERP is the maximum value determined in the preceding step.

g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:

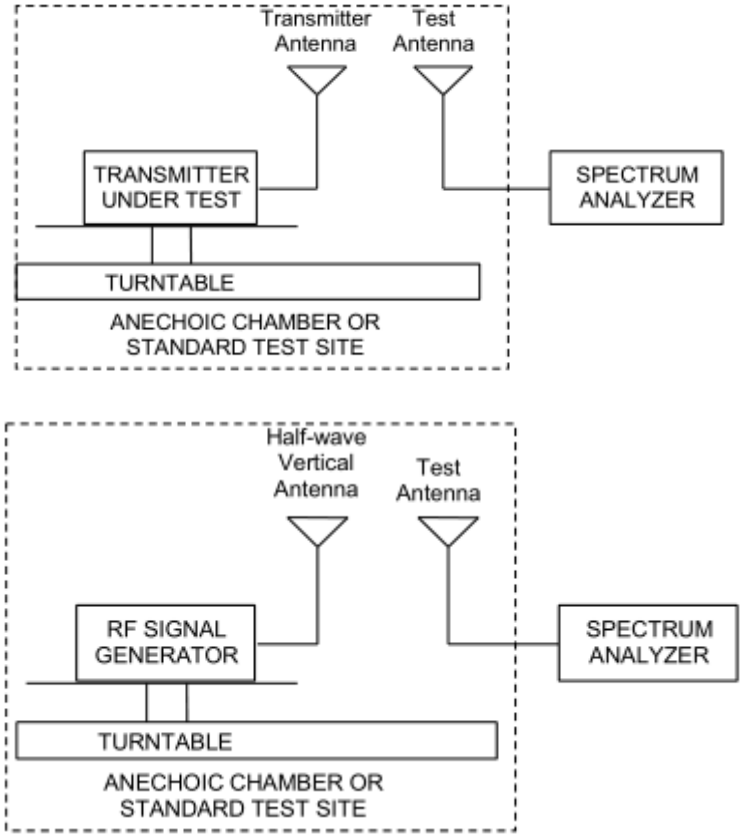
EIRP (dBm) = Output Power (dBm) - Losses (dB) + Antenna Gain (dBi)

where:dBd refers to gain relative to an ideal dipole.

EIRP (dBm) = ERP (dBm) + 2.15 (dB.)

The RB allocation refers to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 22.913(a)(5) specifies that "Mobile/portable stations are limited to 7 watts ERP".

Limit	≤ 7 W (38.45 dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 1.19 dB

Test Results:

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

Mode	Channel	Frequency (MHz)	Modulation	Polarization	Sub-carrier spacing (KHz)	Ntones	ERP (dBm)	Limit (dBm)	Conclusion
Band5 Standalone	20401	824.1	BPSK	vertical	3.75	1@0	11.33	38.45	Pass
			QPSK	vertical	3.75	1@0	11.33	38.45	Pass
			BPSK	vertical	15	1@0	12.09	38.45	Pass
			QPSK	vertical	15	1@0	12.21	38.45	Pass
	20525	836.5	BPSK	vertical	3.75	1@0	11.82	38.45	Pass
			QPSK	vertical	3.75	1@0	11.80	38.45	Pass
			BPSK	vertical	15	1@0	12.16	38.45	Pass
			QPSK	vertical	15	1@0	12.29	38.45	Pass
	20649	848.9	BPSK	vertical	3.75	1@0	11.74	38.45	Pass
			QPSK	vertical	3.75	1@0	11.90	38.45	Pass
			BPSK	vertical	15	1@0	12.11	38.45	Pass
			QPSK	vertical	15	1@0	12.35	38.45	Pass

5.3. Occupied Bandwidth

Ambient condition

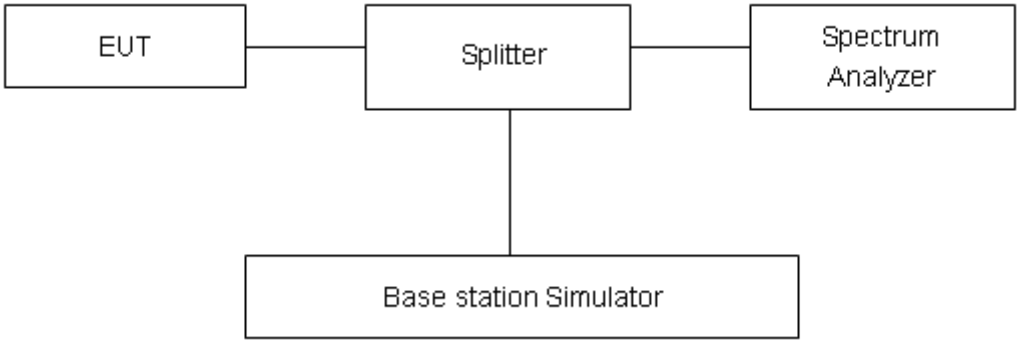
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.
RBW is set to 2kHz, VBW is set to 6.2kHz for NB-IOT Band 5

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

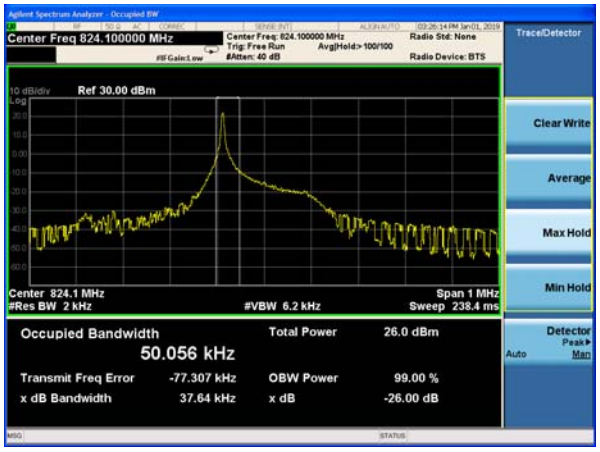
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 624Hz.

Test Result

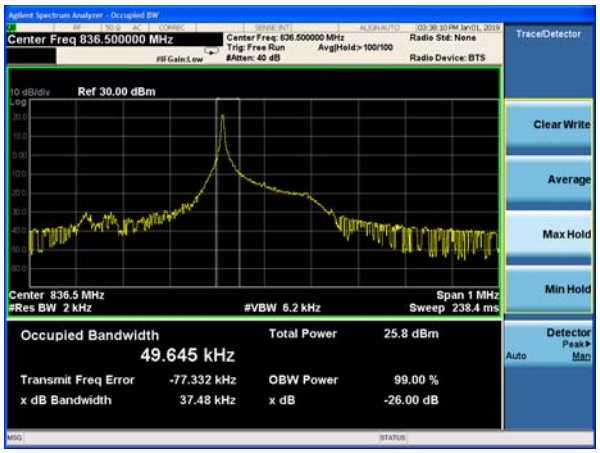
Mode	Modulation	Sub-carrier spacing (KHz)	Ntones	Bandwidth(KHz) Channel/Frequency(MHz)					
				20401/824.1		20525/836.5		20649/848.9	
				99% Power	-26dBc	99% Power	-26dBc	99% Power	-26dBc
Band 5 Standalone	BPSK	3.75	1@0	50.056	37.64	49.645	37.48	50.565	37.93
	QPSK	3.75	1@0	56.495	39.44	56.794	41.37	59.864	42.32
	BPSK	15	1@0	119.720	101.70	129.320	118.00	127.390	113.10
	QPSK	15	1@0	125.960	118.40	119.930	117.80	117.550	113.90
	QPSK	15	12@0	184.940	240.70	183.390	236.50	183.690	236.20

NB-IOT Band 5 BPSK 3.75kHz 1@0 CH-Low



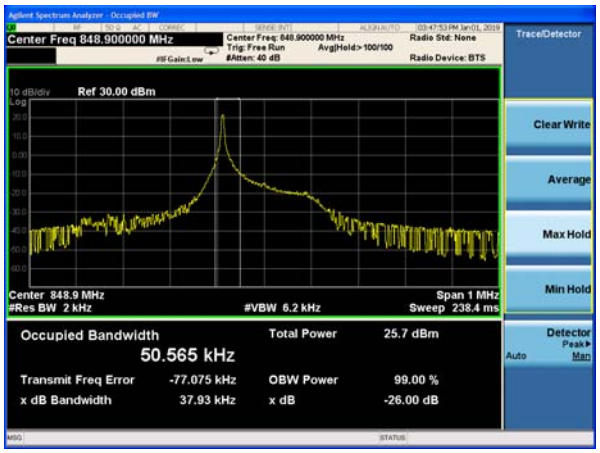
NB-IOT Band 5 BPSK 15kHz 1@0 CH-Low

NB-IOT Band 5 BPSK 3.75kHz 1@0 CH-Middle



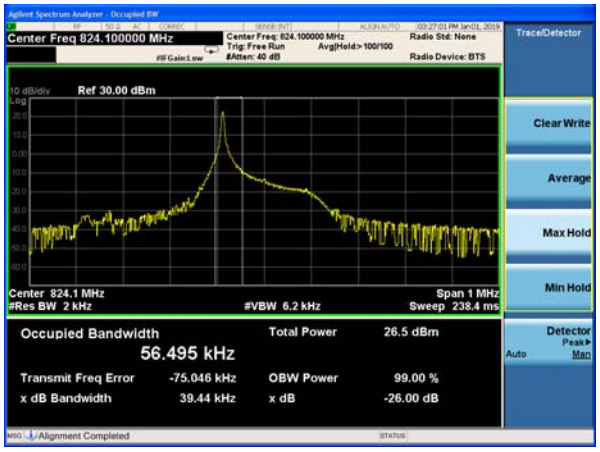
NB-IOT Band 5 BPSK 15kHz 1@0 CH-Middle

NB-IOT Band 5 BPSK 3.75kHz 1@0 CH-High



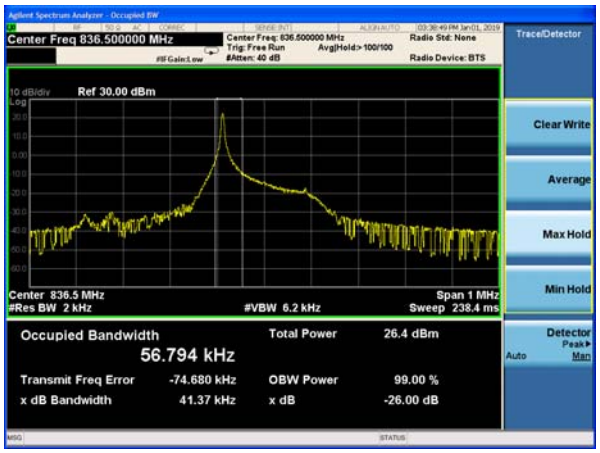
NB-IOT Band 5 BPSK 15kHz 1@0 CH-High

NB-IOT Band 5 QPSK 3.75kHz 1@0 CH-Low



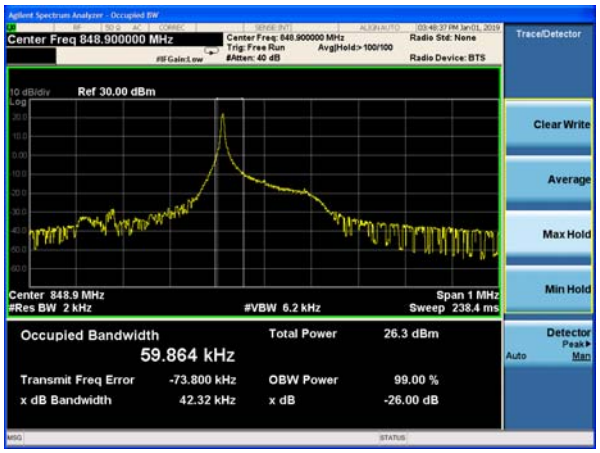
NB-IOT Band 5 QPSK 15kHz 1@0 CH-Low

NB-IOT Band 5 QPSK 3.75kHz 1@0 CH-Middle



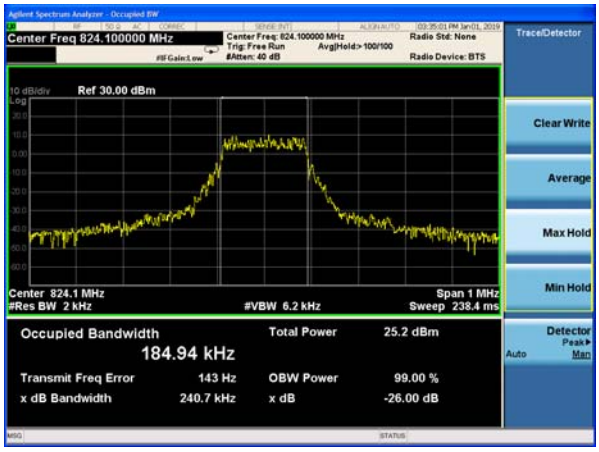
NB-IOT Band 5 QPSK 15kHz 1@0 CH-Middle

NB-IOT Band 5 QPSK 3.75kHz 1@0 CH-High



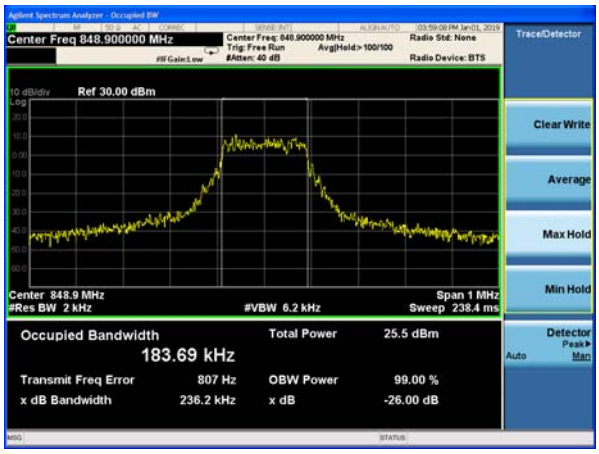
NB-IOT Band 5 QPSK 15kHz 1@0 CH-High

NB-IOT Band 5 QPSK 15kHz 12@0 CH-Low



NB-IOT Band 5 QPSK 15kHz 12@0 CH-Middle

NB-IOT Band 5 QPSK 15kHz 12@0 CH-High



5.4. Band Edge Compliance

Ambient condition

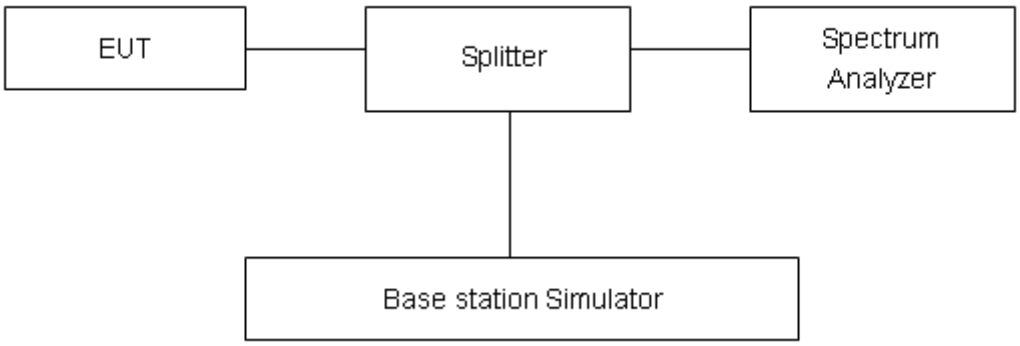
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured. The average detector is used.
RBW is set to 51Hz, VBW is set to 160Hz for 3.75KHz single carrier,
RBW is set to 200Hz, VBW is set to 620Hz for 15KHz single carrier,
RBW is set to 2kHz, VBW is set to 6.2KHz for 15KHz full carrier,

Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

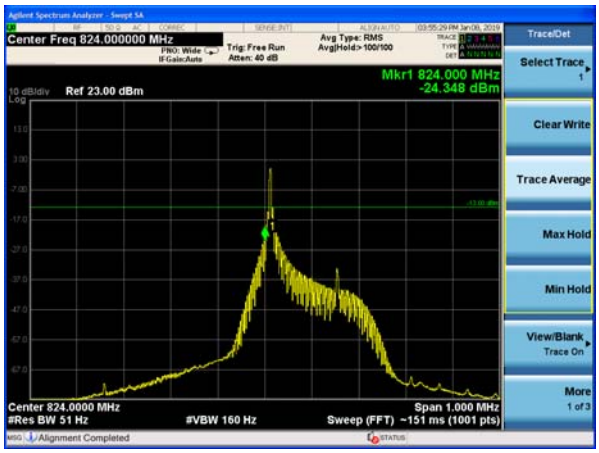
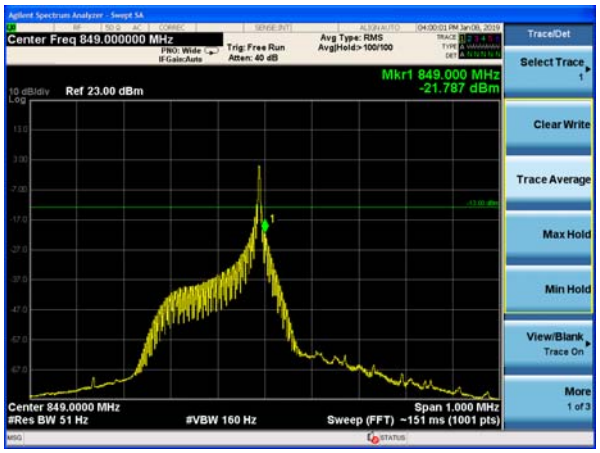
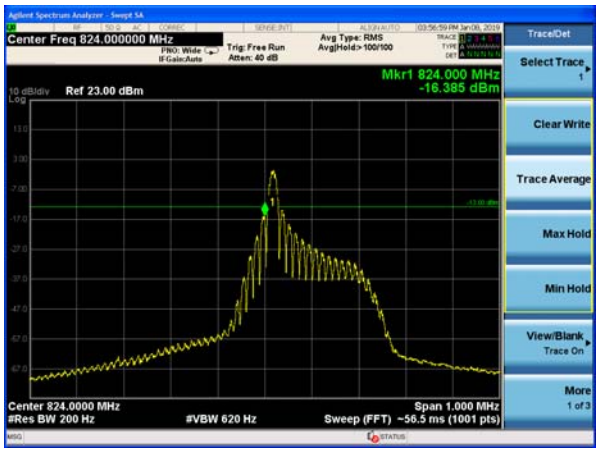
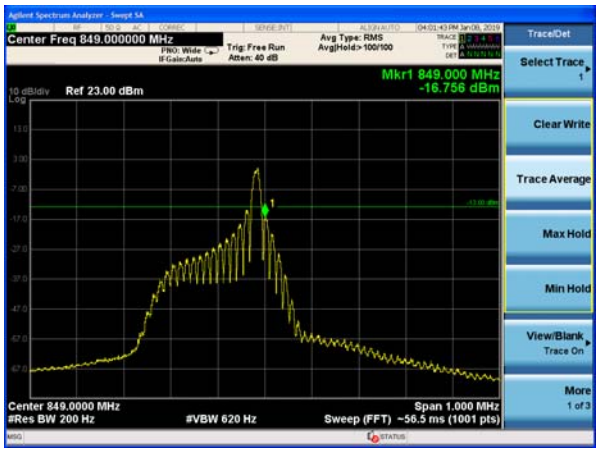
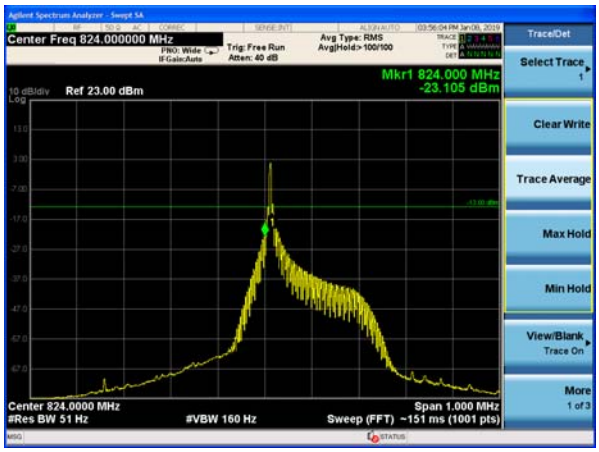
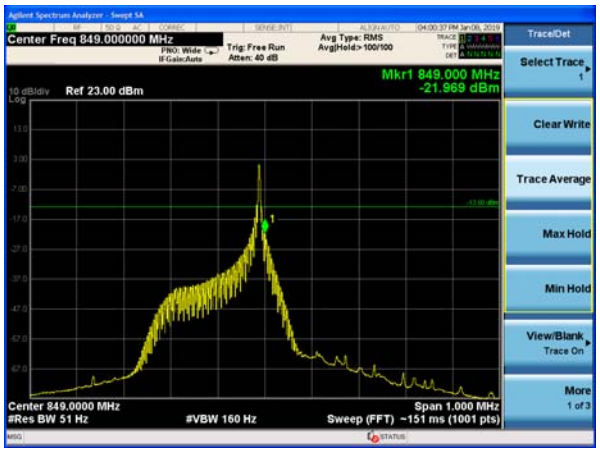
Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.”

Limit	-13 dBm

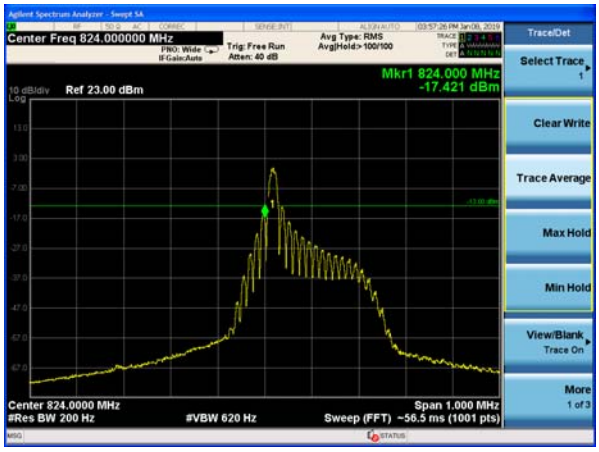
Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U=0.684dB.

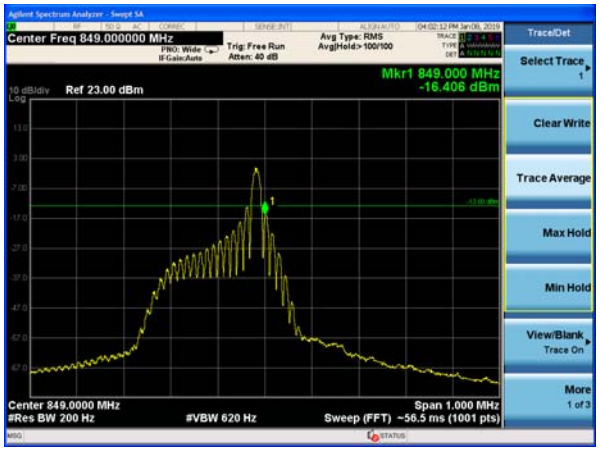
Test Result:

NB-IOT Band 5 BPSK 3.75kHz 1@0 CH-Low	NB-IOT Band 5 BPSK 3.75kHz 1@47 CH-High
	
NB-IOT Band 5 BPSK 15kHz 1@0 CH-Low	NB-IOT Band 5 BPSK 15kHz 1@11 CH-High
	
NB-IOT Band 5 QPSK 3.75kHz 1@0 CH-Low	NB-IOT Band 5 QPSK 3.75kHz 1@47 CH-High
	

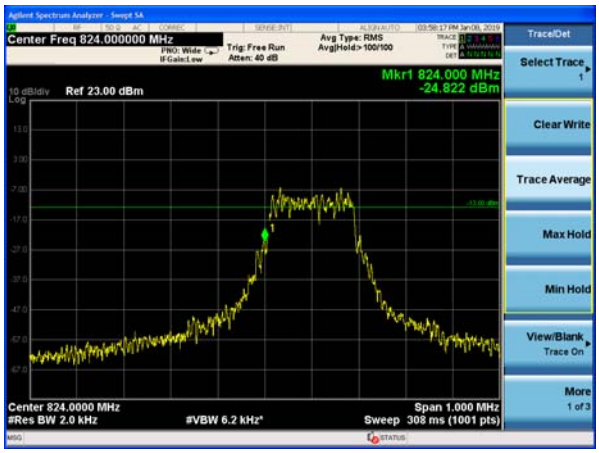
NB-IOT Band 5 QPSK 15kHz 1@0 CH-Low



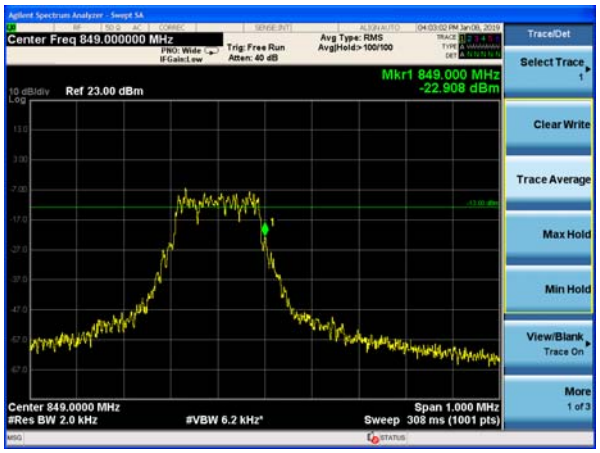
NB-IOT Band 5 QPSK 15kHz 1@11 CH-High



NB-IOT Band 5 QPSK 15kHz 12@0 CH-Low



NB-IOT Band 5 QPSK 15kHz 12@0 CH-High



5.5. Peak-to-Average Power Ratio (PAPR)

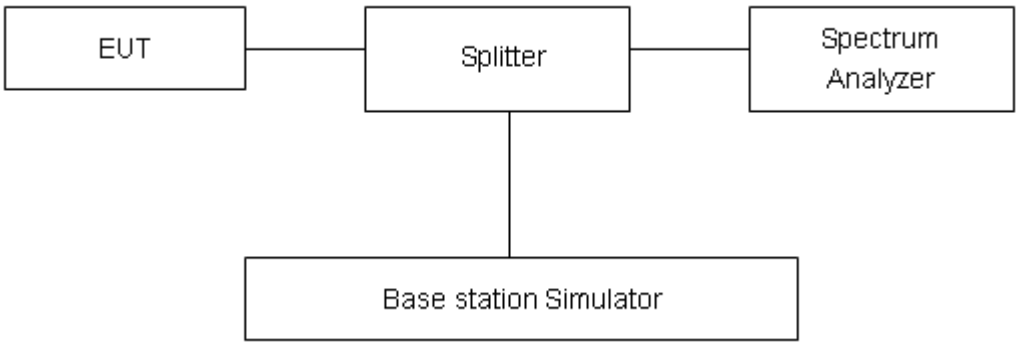
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as P_{Pk}. And measure the total average power and record as P_{Avg}. Both the peak and average power levels must be expressed in the same logarithmic units (*e.g.*, dBm). Determine the PAPR from:
PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).

Test Setup



Limits

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must not exceed 13 dB.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.4 dB.

Test Results

Mode	Modulation	Sub-carrier spacing (KHz)	Channel/ Frequency(MHz)	Peak-to-Average Power Ratio (PAPR)		
				Peak(dBm)	Avg(dBm)	PAPR(dB)
Band 5 Standalone	BPSK	3.75	20525/836.5	24.21	20.40	3.81
	QPSK	3.75	20525/836.5	23.69	20.30	3.39
	BPSK	15	20525/836.5	24.26	17.77	6.49
	QPSK	15	20525/836.5	24.07	17.63	6.44

5.6. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to +55°C in 10°C step size,

(1) With all power removed, the temperature was decreased to 0°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to +55°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements. Frequency Stability (Voltage Variation)

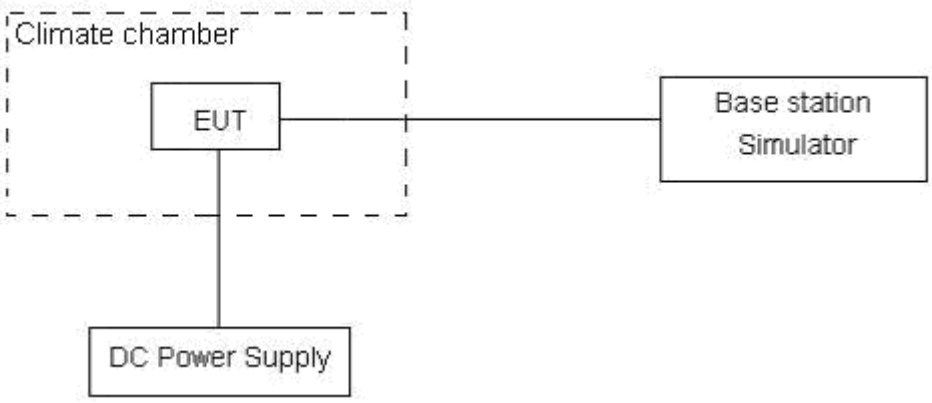
The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery-operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 3.45 V and 4.4 V, with a nominal voltage of 3.82V.

Test setup



Limits

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

Limits	≤ 2.5 ppm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75％ confidence level for the normal distribution is with the coverage factor k = 3, U= 0.01ppm.

Test Result

NB-IOT Band 5					
BPSK,(15KHz)					
Condition		824	849	Delta (Hz)	Frequency Stability(ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	824.0791	848.9683	8.32	0.00995
Extreme（55°C）		824.0762	848.9688	6.48	0.00775
Extreme（50°C）		824.0593	848.9603	2.89	0.00345
Extreme（40°C）		824.0773	848.9649	10.71	0.01280
Extreme（30°C）		824.0710	848.9642	15.83	0.01892
Extreme（20°C）		824.0669	848.9639	13.92	0.01664
Extreme（10C）		824.0688	848.9674	14.55	0.01739
Extreme（0°C）		824.0765	848.9615	1.73	0.00207
Extreme（-10°C）		824.0724	848.9678	2.98	0.00356
Extreme（-20°C）		824.0761	848.9637	7.57	0.00905
Extreme（-30°C）		824.0831	848.9691	7.05	0.00843
25°C	LV	824.0771	848.9639	3.89	0.00465
	HV	824.0734	848.9691	7.27	0.00869
QPSK,(15KHZ)					
Condition		824	849	Delta (Hz)	Frequency Stability(ppm)
Temperature	Voltage	F low@-13dBm(MHz)	F high@-13dBm(MHz)		
Normal（25°C）	Normal	824.0905	848.9729	17.68	0.02114
Extreme（55°C）		824.0900	848.9724	15.28	0.01827
Extreme（50°C）		824.0985	848.9809	11.91	0.01424
Extreme（40°C）		824.0939	848.9763	6.08	0.00727
Extreme（30°C）		824.0946	848.9777	9.27	0.01108
Extreme（20°C）		824.0949	848.9773	2.31	0.00276
Extreme（10C）		824.0914	848.9738	10.98	0.01313
Extreme（0°C）		824.0973	848.9797	2.76	0.00330
Extreme（-10°C）		824.0910	848.9734	4.32	0.00516
Extreme（-20°C）		824.0951	848.9775	1.40	0.00167
Extreme（-30°C）		824.0897	848.9721	10.96	0.01310
25°C	LV	824.0949	848.9773	8.58	0.01026
	HV	824.0898	848.9722	5.49	0.00656

5.7. Spurious Emissions at Antenna Terminals

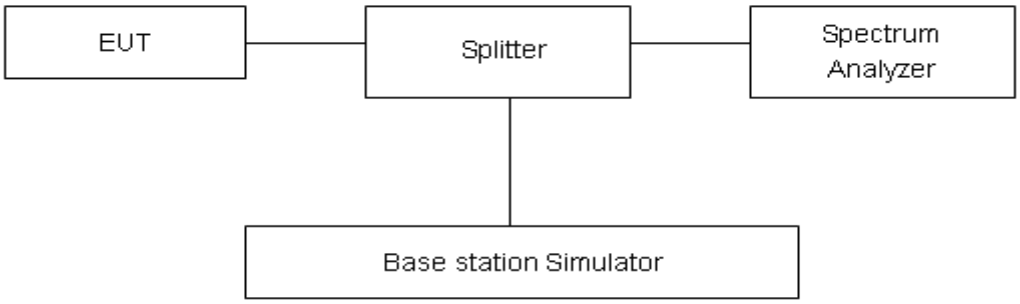
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier.
The peak detector is used. RBW are set to 100 kHz and VBW are set to 300 kHz for below 1G, RBW are set to 1MHz and VBW are set to 3MHz for above 1G, Sweep is set to ATUO.
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 22.917(a) specifies that “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.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-18GHz	1.407 dB

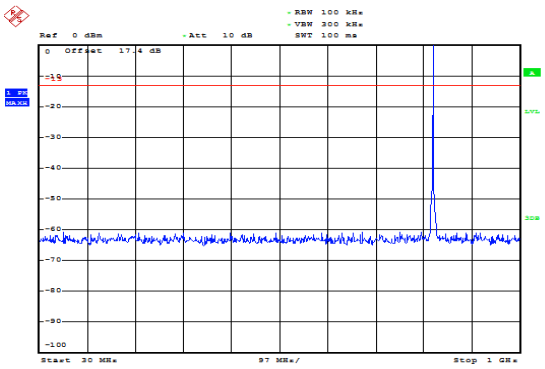
Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

For Spurious Emissions at Antenna Terminals test, the worst mode (15KHz+QPSK) should be reflected in the report.

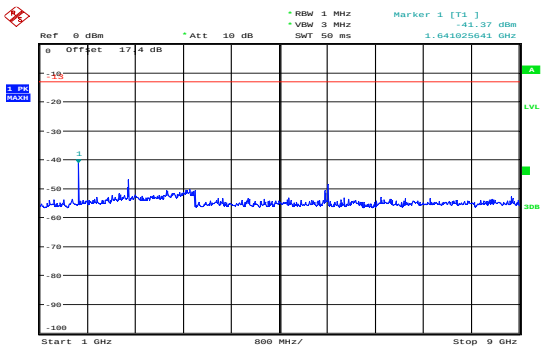
The signal beyond the limit is carrier.

NB-IOT Band 5 CH-Low 30MHz-1GHz



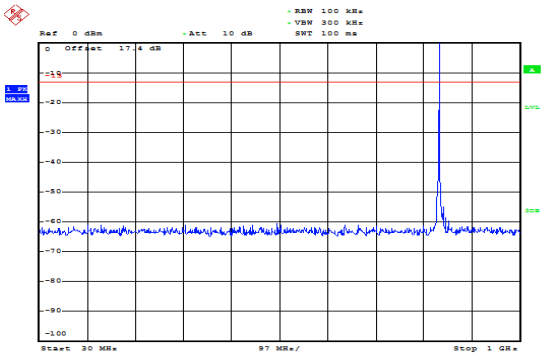
Date: 8.JAN.2019 12:03:24

NB-IOT Band 5 CH-Low 1GHz-9GHz



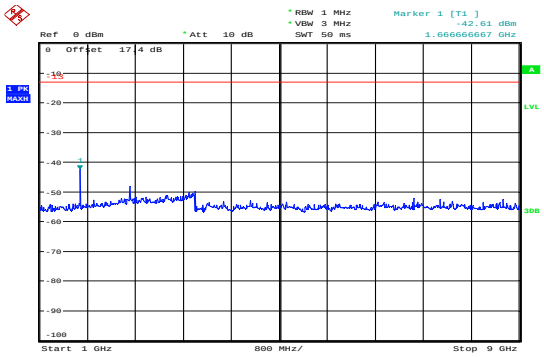
Date: 8.JAN.2019 12:04:06

NB-IOT Band 5 CH-Middle 30MHz-1GHz



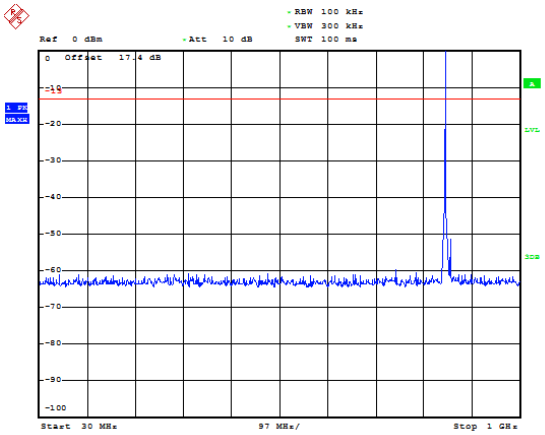
Date: 8.JAN.2019 12:06:43

NB-IOT Band 5 CH-Middle 1GHz-9GHz



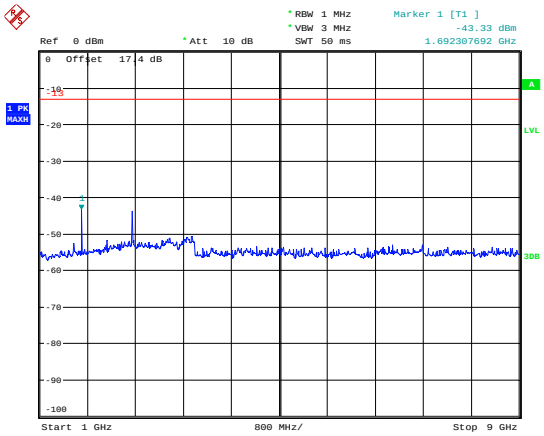
Date: 8.JAN.2019 12:06:25

NB-IOT Band 5 CH-High 30MHz-1GHz



Date: 8.JAN.2019 12:08:28

NB-IOT Band 5 CH-High 1GHz-9GHz



Date: 8.JAN.2019 12:09:24

5.8. Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

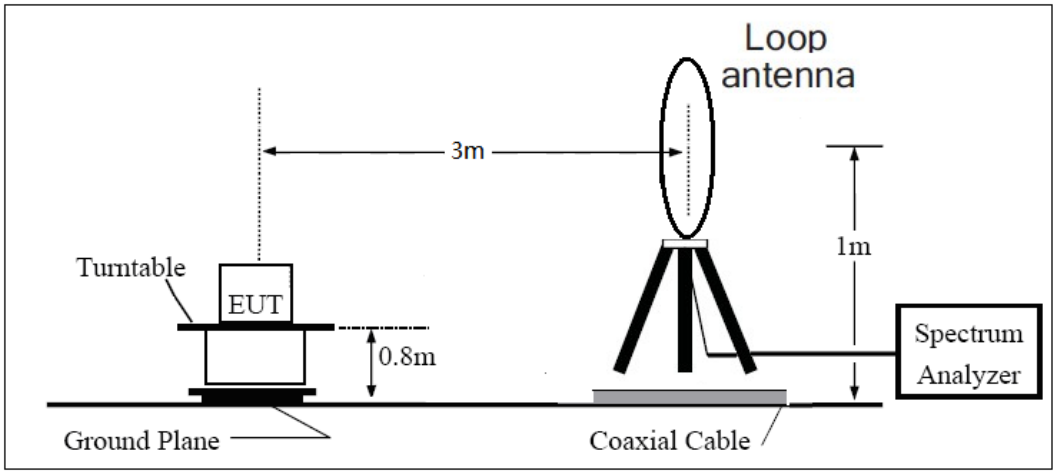
1. The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or 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.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=200Hz,VBW=600Hz for 9kHz150kHz , RBW=10kHz, VBW=30kHz 150kHz-30MHz , RBW=100kHz,VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz, And the maximum value of the receiver should be recorded as (Pr).
5. 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 (PMea) 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 (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. 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 (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:
Power(EIRP)=PMea- PAg - Pcl + Ga
The measurement results are amend as described below:
Power(EIRP)=PMea- Pcl + Ga
8. 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-2.15dBi.

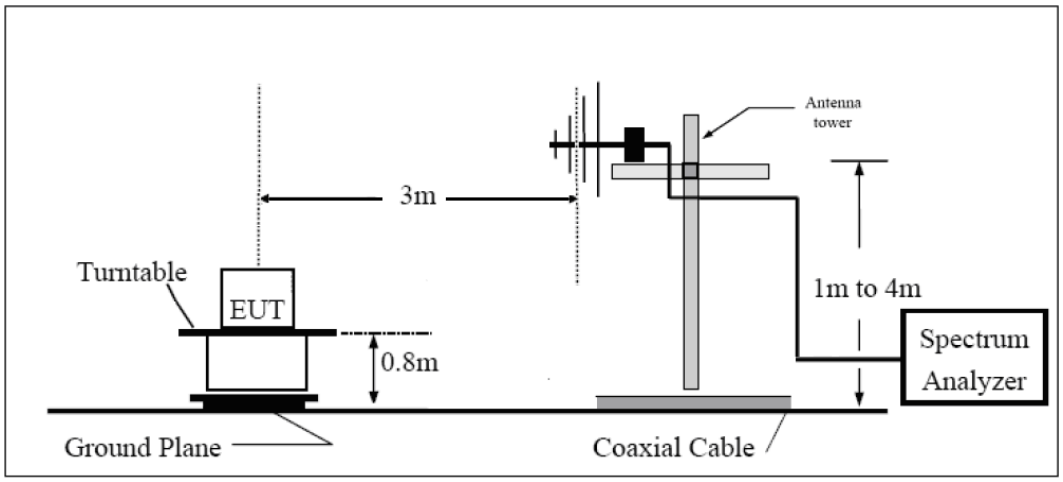
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

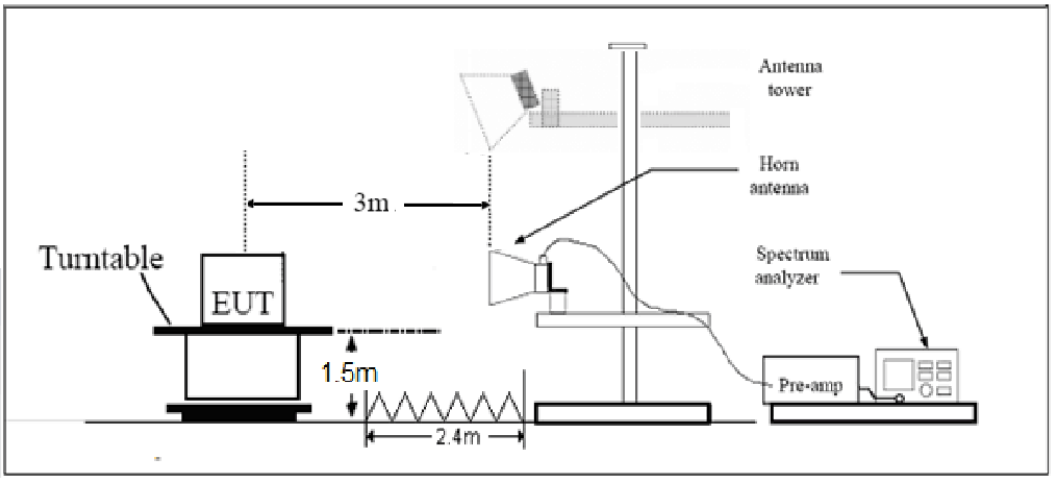
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 22.917(a) specifies that “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.”

Limit	-13 dBm

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95％ confidence level for the normal distribution is with the coverage factor k = 1.96, U= 3.55 dB.

Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.
For radiated spurious emissions test, the worst mode (15KHz+QPSK) should be reflected in the report.

NB-IOT Band 5 15KHz+QPSK CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.0	-64.31	2.00	10.75	Vertical	-57.71	-13.00	44.71	225
3	2509.5	-62.84	2.51	11.05	Vertical	-56.45	-13.00	43.45	0
4	3346.0	-63.87	4.20	11.15	Vertical	-59.07	-13.00	46.07	180
5	4182.5	-59.74	5.20	11.15	Vertical	-55.94	-13.00	42.94	225
6	5019.0	-57.79	5.50	11.95	Vertical	-53.49	-13.00	40.49	225
7	5855.5	-58.73	5.70	13.55	Vertical	-53.03	-13.00	40.03	90
8	6692.0	-56.33	6.30	13.75	Vertical	-51.03	-13.00	38.03	45
9	7528.5	-54.48	6.80	13.85	Vertical	-49.58	-13.00	36.58	180
10	8365.0	-54.63	6.90	14.25	Vertical	-49.43	-13.00	36.43	0
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2.The worst emission was found in the antenna is Vertical position.									

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2018-05-20	2019-05-19
Universal Radio Communication Tester	Key sight	E5515C	MY48367192	2018-05-20	2019-05-19
Signal Analyzer	R&S	FSV30	100815	2018-12-16	2019-12-15
EMI Test Receiver	R&S	ESCI	100948	2018-05-20	2019-05-19
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2017-09-26	2019-09-25
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Signal generator	R&S	SMB 100A	102594	2018-05-20	2019-05-19
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
Preampflier	R&S	SCU18	102327	2018-05-20	2019-05-19
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2018-05-21	2019-05-20
RF Cable	Agilent	SMA 15cm	0001	/	/
Software	R&S	EMC32	9.26.0	/	/
Wireless Test Set	StarPoint	SP8315	SP8315-1202	2018-05-20	2019-05-19
Wireless Test Set	StarPoint	SP8315	SP8315-1203	2018-05-20	2019-05-19

*******END OF REPORT *******