



# RF TEST REPORT

<b>Applicant</b>	Quectel Wireless Solutions Company Limited
<b>FCC ID</b>	XMR201708EC21E
<b>Product</b>	LTE Module
<b>Brand</b>	Quectel
<b>Model</b>	EC21-E
<b>Report No.</b>	RXA1707-0250RF02R1
<b>Issue Date</b>	August 17, 2017

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2017)/ FCC CFR47 Part 27C (2017)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Performed by: Jiangpeng Lan

Approved by: Kai Xu

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## Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF power output	2.1046	PASS
2	Effective Isotropic Radiated power	27.50(h)(2)	PASS
3	Occupied Bandwidth	2.1049	PASS
4	Band Edge Compliance	27.53(m)	PASS
5	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
6	Frequency Stability	2.1055 / 27.54	PASS
7	Spurious Emissions at Antenna Terminals	2.1051 /27.53(m)	PASS
8	Radiates Spurious Emission	2.1053 /27.53(m)	PASS
Date of Testing: August 4, 2017 ~ August 9, 2017			
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. This report must not be used by the client to claim product certification, approval, or endorsement by any government agencies.

## 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.  
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## 2 General Description of Equipment under Test

### Client Information

<b>Applicant</b>	Quectel Wireless Solutions Company Limited
<b>Applicant address</b>	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
<b>Manufacturer</b>	Quectel Wireless Solutions Company Limited
<b>Manufacturer address</b>	7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

### General information

EUT Description			
Model:	EC21-E		
SN	/		
Hardware Version	R1.0		
Software Version	EC21EFAR02A07M4G		
Power Supply:	External power supply		
Antenna Type:	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna)		
Test Mode(s):	LTE Band 7		
LTE Release	11 (Don't support CA)		
Maximum E.I.R.P.	LTE Band 7:	25.99dBm	
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.3V    Maximum: 4.3V		
Extreme Temperature:	Lowest:-40°C    Highest: +85°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	LTE Band 7	2500 ~ 2570	2620 ~ 2690
Note: 1. The information of the EUT is declared by the manufacturer.			

Accessory equipment	
Evaluation Board	RF Cable
RS232-to-USB Cable	Antenna: Dipole Antenna
Headset	USB Cable

## **2.1 Applied Standards**

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

### **Test standards**

**FCC CFR47 Part 2 (2017)**

**FCC CFR47 Part 27C (2017)**

**ANSI C63.26 (2015)**

**KDB 971168 D01 Power Meas License Digital Systems v02r02**

### 3 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 mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 7

Test items	Bandwidth (MHz)				Modulation		RB			Test Channel		
	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	O	O	O	O	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	O	O	O	O	O	O	-	-	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	O	O	O	O	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	-	-	O	O	O
Radiates Spurious Emission	O	O	O	O	O	-	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.											



## 4 Test Information

### 4.1 RF Power Output

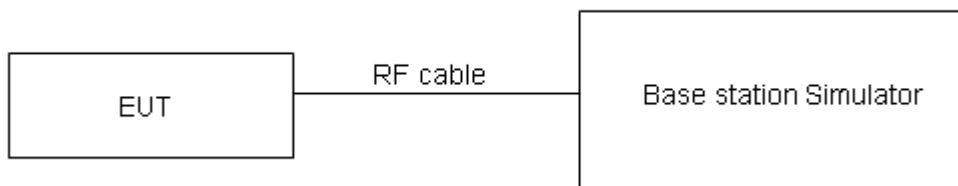
#### Ambient condition

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**

LTE FDD Band 7				Conducted Power(dBm)		
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20775/2502.5	21100/2535	21425/2567.5
5MHz	QPSK	1	0	22.89	23.11	22.73
		1	13	22.78	23.13	22.83
		1	24	22.64	22.53	22.85
		12	0	21.93	21.83	21.72
		12	6	21.82	21.81	21.61
		12	13	21.76	21.71	21.73
		25	0	21.73	21.91	21.74
	16QAM	1	0	22.43	22.08	22.06
		1	13	22.46	22.13	22.44
		1	24	22.33	21.71	22.10
		12	0	21.16	21.05	20.91
		12	6	21.25	21.12	21.01
		12	13	21.20	21.04	20.95
		25	0	21.27	21.21	21.09
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20800/2505	21100/2535	21400/2565
10MHz	QPSK	1	0	22.91	23.12	22.76
		1	25	22.81	23.18	22.87
		1	49	22.66	22.57	22.88
		25	0	21.96	21.88	21.76
		25	13	21.85	21.86	21.65
		25	25	21.78	21.75	21.78
		50	0	21.81	21.93	21.78
	16QAM	1	0	22.45	22.11	22.08
		1	25	22.49	22.17	22.47
		1	49	22.36	21.73	22.13
		25	0	21.19	21.10	20.95
		25	13	21.27	21.16	21.04
		25	25	21.23	21.09	20.99
		50	0	21.30	21.26	21.13
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20825/2507.5	21100/2535	21375/2562.5
15MHz	QPSK	1	0	22.90	23.08	22.74
		1	38	22.79	23.17	22.84
		1	74	22.63	22.52	22.84
		36	0	21.94	21.84	21.73
		36	18	21.82	21.81	21.61



Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)		
				20850/2510	21100/2535	21350/2560
	16QAM	36	39	21.75	21.72	21.74
		75	0	21.79	21.89	21.73
		1	0	22.40	22.09	22.06
		1	38	22.47	22.14	22.45
		1	74	22.33	21.69	22.10
		36	0	21.16	21.08	20.92
		36	18	21.24	21.11	21.00
		36	39	21.21	21.05	20.96
		75	0	21.27	21.21	21.09
		20MHz	QPSK	1	0	22.87
1	50			22.78	23.13	22.82
1	99			22.61	22.51	22.81
50	0			21.91	21.79	21.69
50	25			21.80	21.77	21.58
50	50			21.72	21.67	21.70
100	0			21.76	21.84	21.69
16QAM	1		0	22.38	22.05	22.01
	1		50	22.43	22.12	22.41
	1		99	22.31	21.66	22.08
	50		0	21.13	21.04	20.89
	50		25	21.21	21.09	20.97
	50		50	21.18	21.00	20.92
	100		0	21.25	21.17	21.06

## 4.2 Effective Isotropic Radiated Power

### Ambient condition

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

### Methods of Measurement

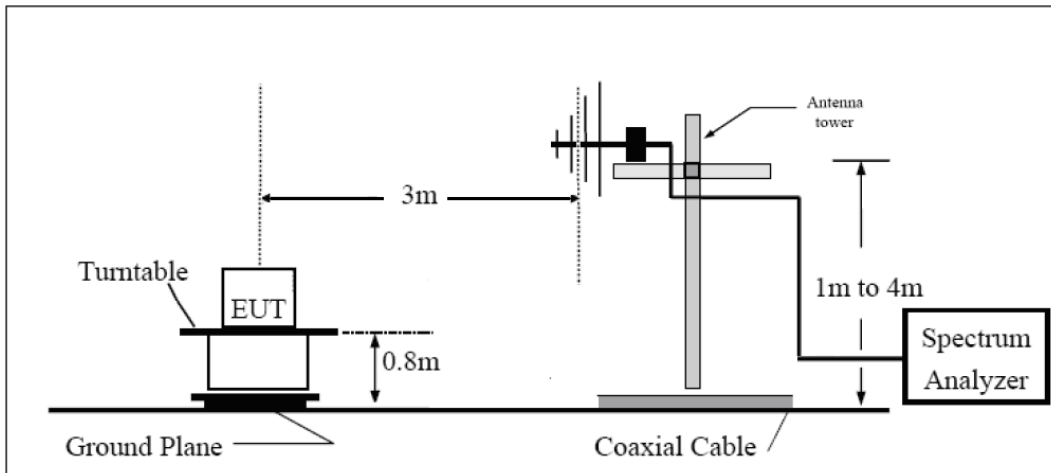
- The testing follows ANSI C63.26 (2015) Section 5.5.2.3.
- Above 30MHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the 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).
- A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
- 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.
- 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.
- The measurement results are obtained as described below:  

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:  

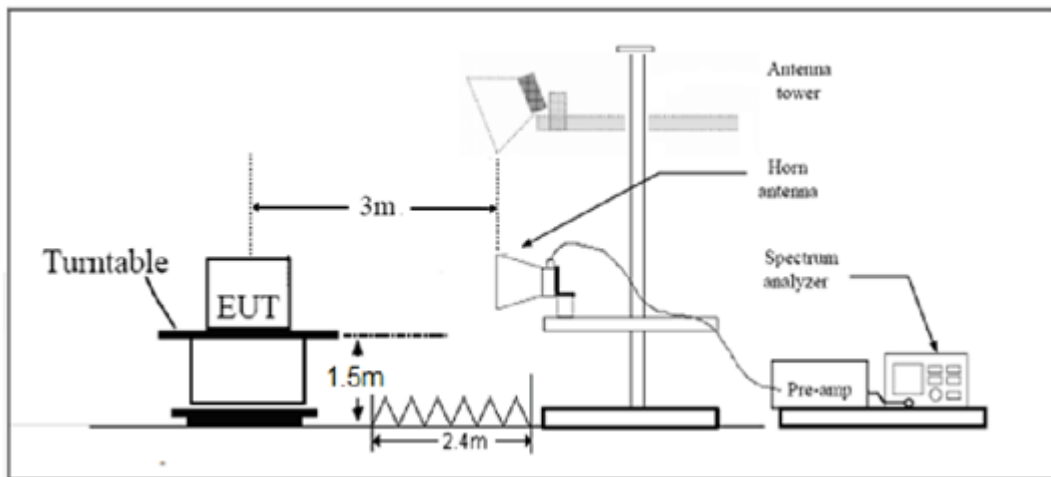
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
- This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

**Test setup**

**30MHz~~~ 1GHz**



**Above 1GHz**



Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

**Limits**

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

Part 27.50(h)(2) Limit (EIRP)	$\leq 2 \text{ W}$ (33 dBm)
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**Measurement Uncertainty**

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

**Test Results**

LTE Band 7								
Band width	Frequency (MHz)	Ant Pot (H/V)	Rt (dBm)	Rs (dBm)	Ps (dBm)	Gs (dBi)	EIRP (dBm)	Conclusion
5MHz (QPSK)	2502.5	H	-36.36	-59.64	0.00	1.81	25.09	Pass
	2535	H	-36.41	-59.72	0.00	1.81	25.12	Pass
	2567.5	H	-37.52	-59.98	0.00	1.83	24.29	Pass
	2502.5	V	-36.16	-59.31	0.00	1.81	24.96	Pass
	2535	V	-35.12	-59.11	0.00	1.81	25.80	Pass
	2567.5	V	-35.43	-59.59	0.00	1.83	25.99	Pass
5MHz (16QAM)	2502.5	H	-36.70	-59.64	0.00	1.81	24.75	Pass
	2535	H	-36.72	-59.72	0.00	1.81	24.81	Pass
	2567.5	H	-37.81	-59.98	0.00	1.83	24.00	Pass
	2502.5	V	-36.47	-59.31	0.00	1.81	24.65	Pass
	2535	V	-35.42	-59.11	0.00	1.81	25.50	Pass
	2567.5	V	-35.76	-59.59	0.00	1.83	25.66	Pass
10MHz (QPSK)	2505	H	-37.04	-59.61	0.00	1.82	24.39	Pass
	2535	H	-37.40	-59.72	0.00	1.81	24.13	Pass
	2565	H	-38.08	-60.02	0.00	1.81	23.75	Pass
	2505	V	-36.98	-59.33	0.00	1.82	24.17	Pass
	2535	V	-36.19	-59.11	0.00	1.81	24.73	Pass
	2565	V	-36.34	-59.59	0.00	1.81	25.06	Pass
10MHz (16QAM)	2505	H	-37.38	-59.61	0.00	1.82	24.05	Pass
	2535	H	-37.71	-59.72	0.00	1.81	23.82	Pass
	2565	H	-38.38	-60.02	0.00	1.81	23.45	Pass
	2505	V	-37.30	-59.33	0.00	1.82	23.85	Pass
	2535	V	-36.50	-59.11	0.00	1.81	24.42	Pass
	2565	V	-36.65	-59.59	0.00	1.81	24.75	Pass
15MHz (QPSK)	2507.5	H	-44.74	-59.71	0.00	1.80	16.77	Pass
	2535	H	-45.30	-59.72	0.00	1.81	16.23	Pass
	2562.5	H	-46.07	-60.08	0.00	1.82	15.83	Pass
	2507.5	V	-44.58	-59.29	0.00	1.80	16.51	Pass
	2535	V	-44.72	-59.72	0.00	1.81	16.81	Pass
	2562.5	V	-44.19	-59.46	0.00	1.82	17.09	Pass
15MHz (16QAM)	2507.5	H	-45.09	-59.71	0.00	1.80	16.42	Pass
	2535	H	-45.60	-59.72	0.00	1.81	15.93	Pass
	2562.5	H	-46.38	-60.08	0.00	1.82	15.52	Pass
	2507.5	V	-44.88	-59.29	0.00	1.80	16.21	Pass
	2535	V	-45.03	-59.72	0.00	1.81	16.50	Pass
	2562.5	V	-44.50	-59.46	0.00	1.82	16.78	Pass
20MHz (QPSK)	2510	H	-44.76	-59.52	0.00	1.77	16.53	Pass
	2535	H	-45.54	-59.72	0.00	1.81	15.99	Pass
	2560	H	-46.24	-60.01	0.00	1.82	15.59	Pass



	2510	V	-44.59	-59.09	0.00	1.77	16.27	Pass
	2535	V	-44.96	-59.72	0.00	1.81	16.57	Pass
	2560	V	-44.49	-59.52	0.00	1.82	16.85	Pass
<b>20MHz (16QAM)</b>	2510	H	-45.11	-59.52	0.00	1.77	16.18	Pass
	2535	H	-45.84	-59.72	0.00	1.81	15.69	Pass
	2560	H	-46.55	-60.01	0.00	1.82	15.28	Pass
	2510	V	-44.89	-59.09	0.00	1.77	15.97	Pass
	2535	V	-45.27	-59.72	0.00	1.81	16.26	Pass
	2560	V	-44.80	-59.52	0.00	1.82	16.54	Pass



### 4.3 Occupied Bandwidth

#### Ambient condition

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

#### Method of Measurement

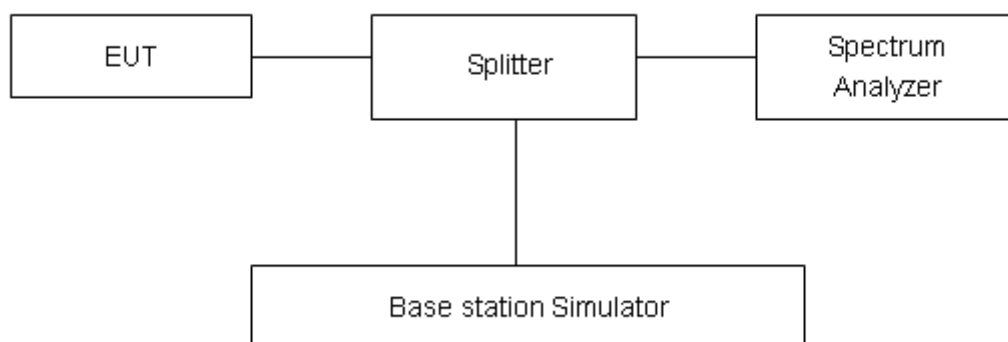
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 7 (5MHz).

RBW is set to 300 kHz, VBW is set to 1MHz for LTE Band 7 (10MHz/15MHz/20MHz).

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  $k = 2$ ,  $U=624\text{Hz}$ .

**Test Result**

LTE Band 7						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	20775	2502.5	4.534	4.998
			21100	2535	4.510	4.990
			21425	2567.5	4.512	4.984
		10	20800	2505	9.039	9.994
			21100	2535	9.043	10.160
			21400	2565	9.021	10.010
		15	20825	2507.5	13.468	14.770
			21100	2535	13.425	14.570
			21375	2562.5	13.449	14.740
		20	20850	2510	17.860	19.220
			21100	2535	17.885	19.160
			21350	2560	17.861	19.350
	16QAM	5	20775	2502.5	4.504	5.028
			21100	2535	4.536	5.027
			21425	2567.5	4.529	5.036
		10	20800	2505	9.020	9.978
			21100	2535	9.029	10.030
			21400	2565	9.013	9.978
		15	20825	2507.5	13.450	14.640
			21100	2535	13.462	14.740
			21375	2562.5	13.471	14.650
		20	20850	2510	17.889	19.300
			21100	2535	17.908	19.340
			21350	2560	17.860	19.190



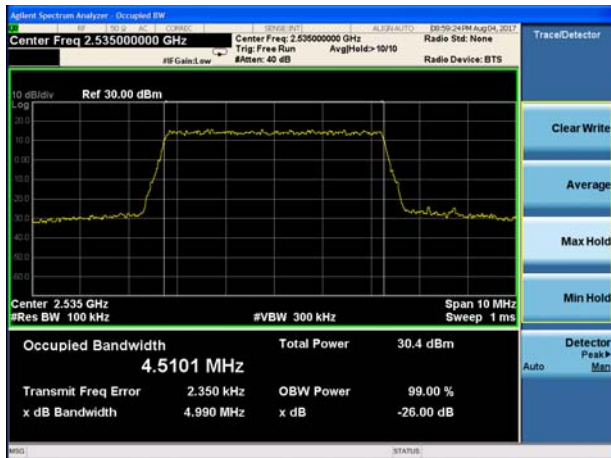
### LTE Band 7 QPSK 5MHz CH-Low



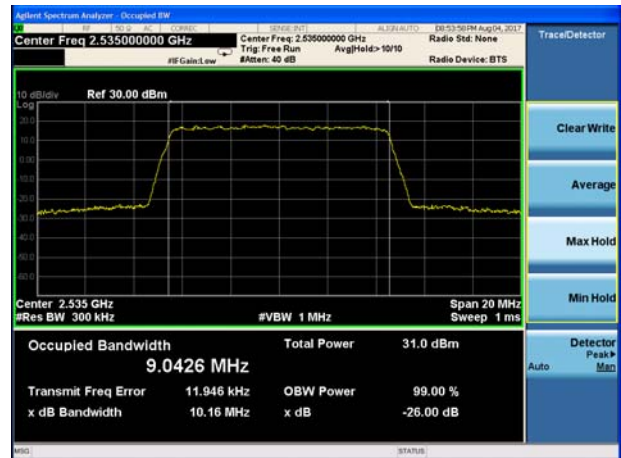
### LTE Band 7 QPSK 10MHz CH-Low



### LTE Band 7 QPSK 5MHz CH-Middle



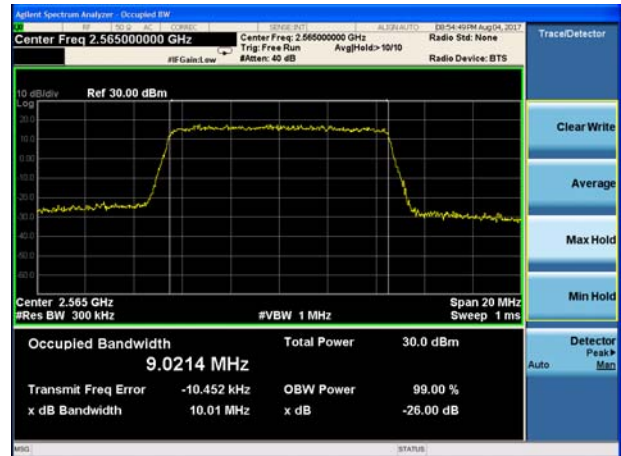
### LTE Band 7 QPSK 10MHz CH-Middle

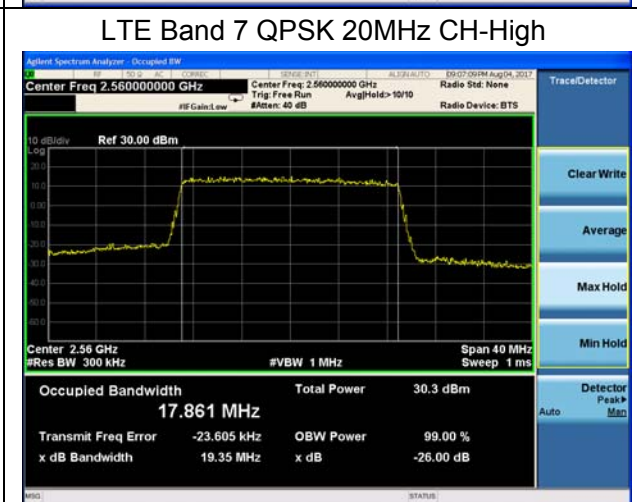
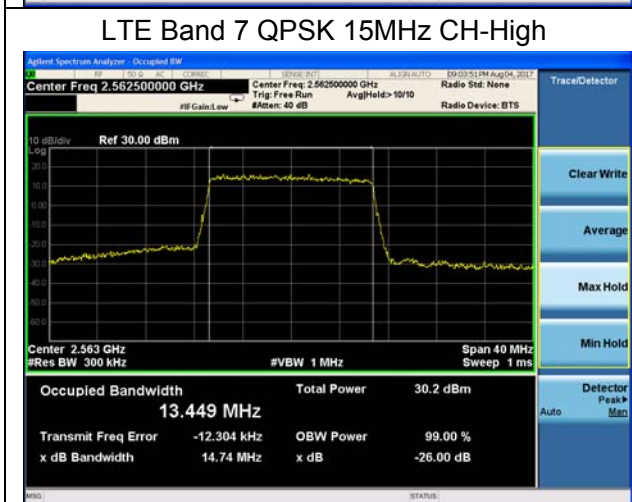
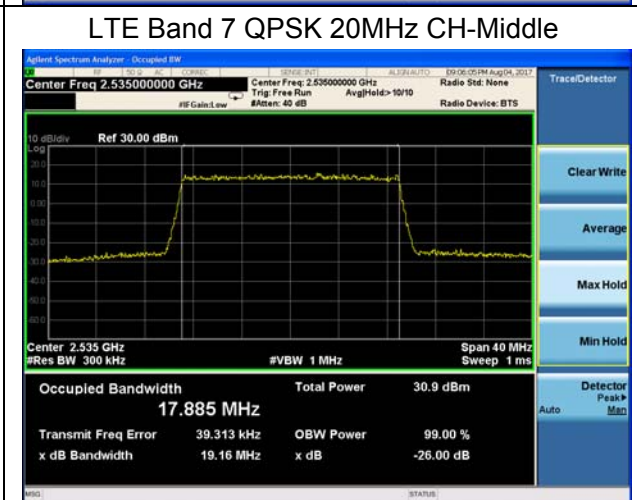
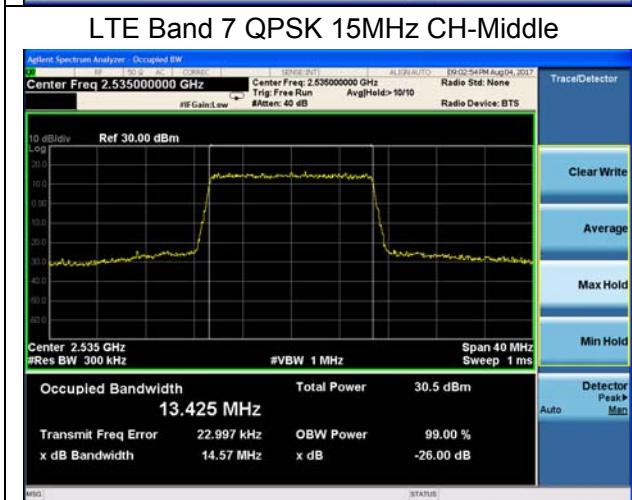
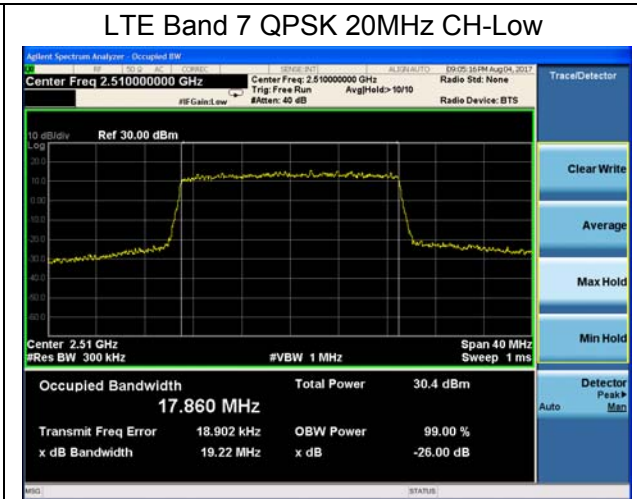
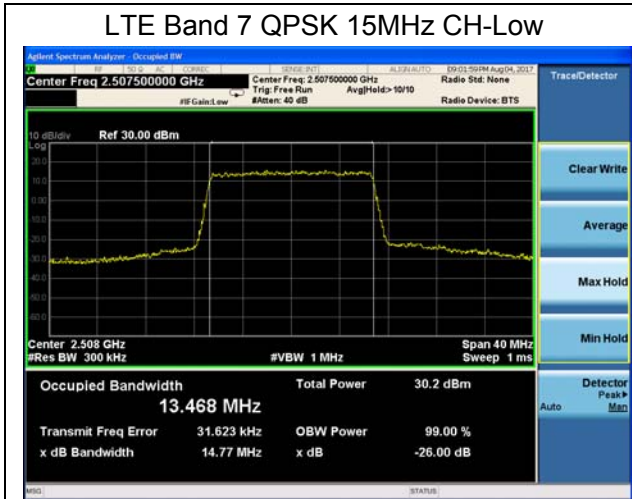


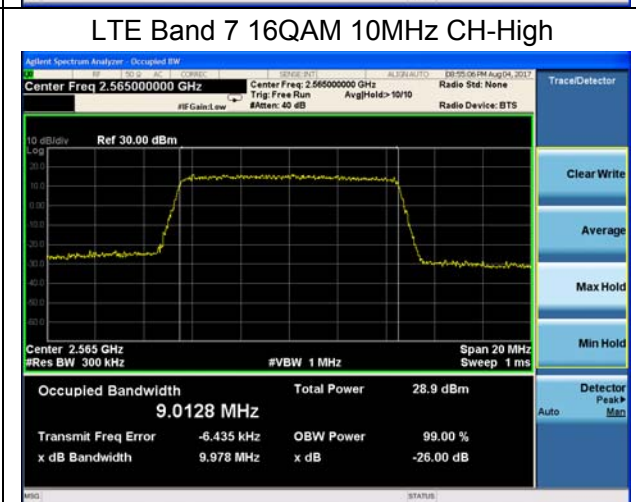
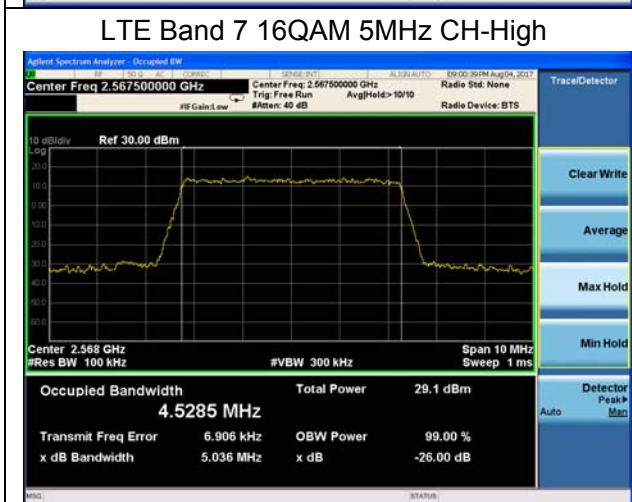
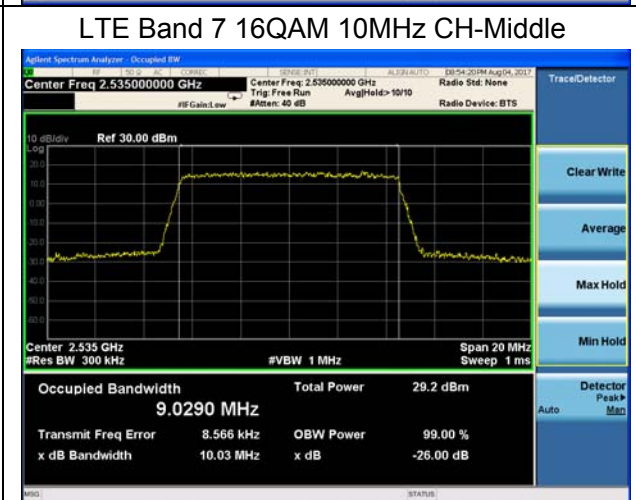
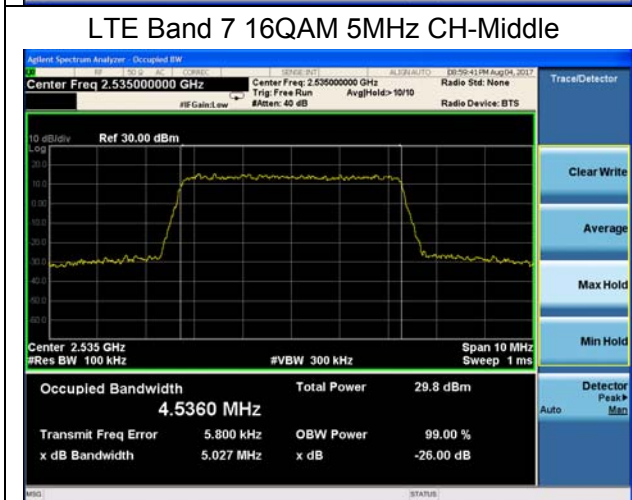
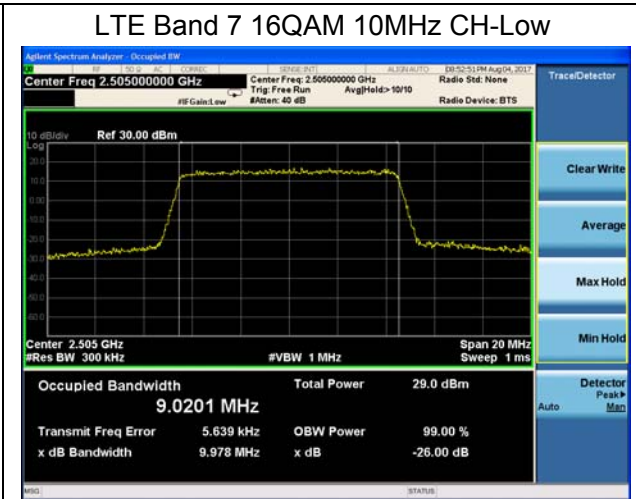
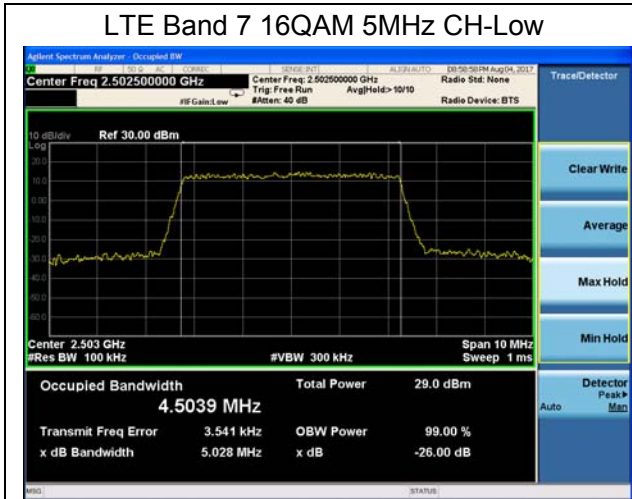
### LTE Band 7 QPSK 5MHz CH-High

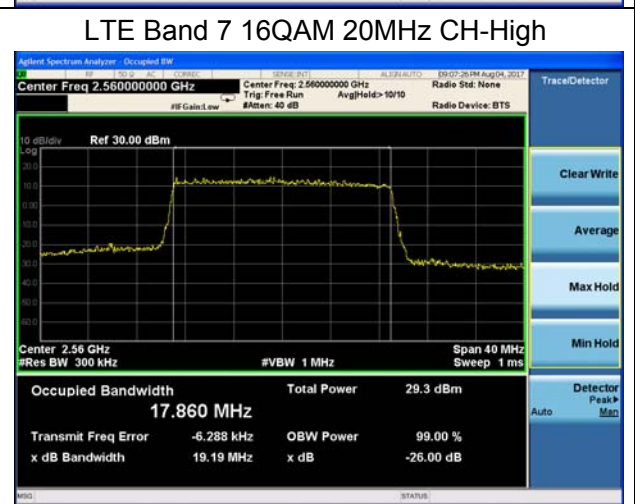
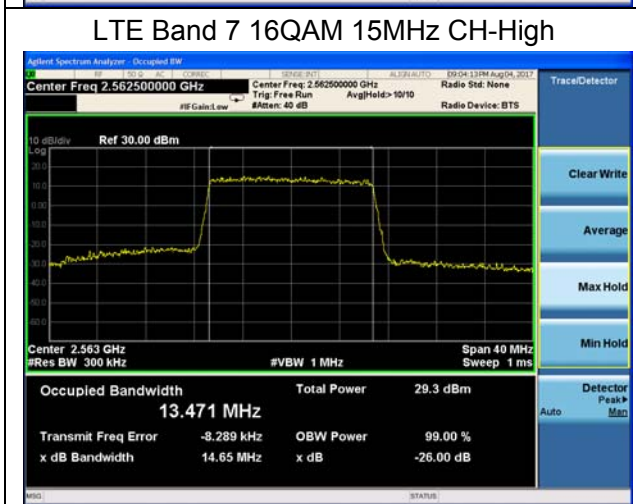
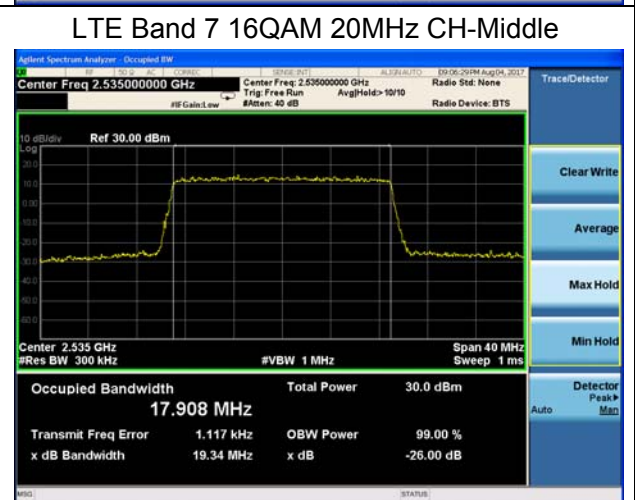
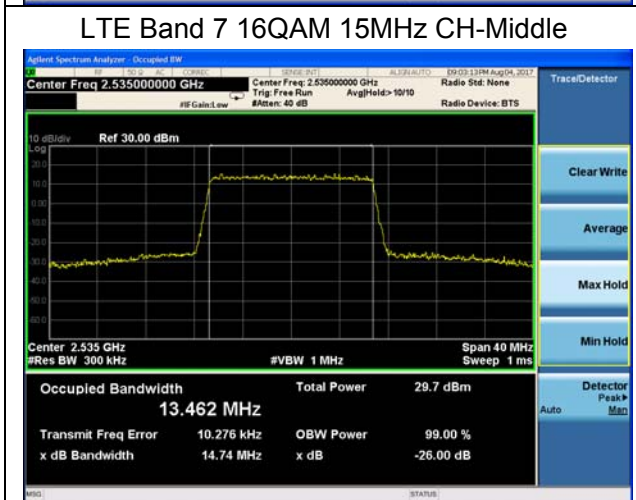
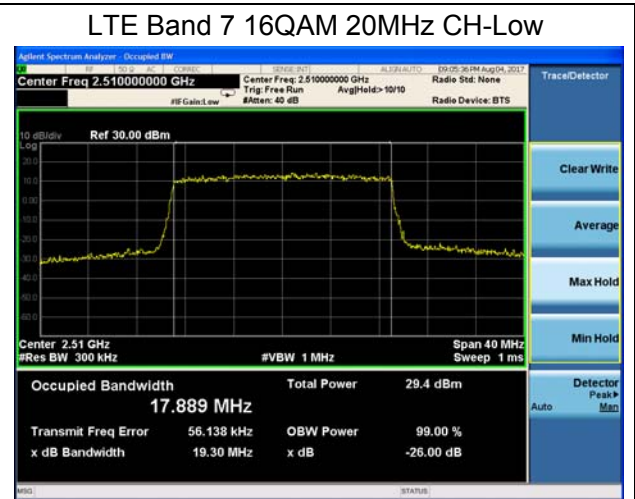
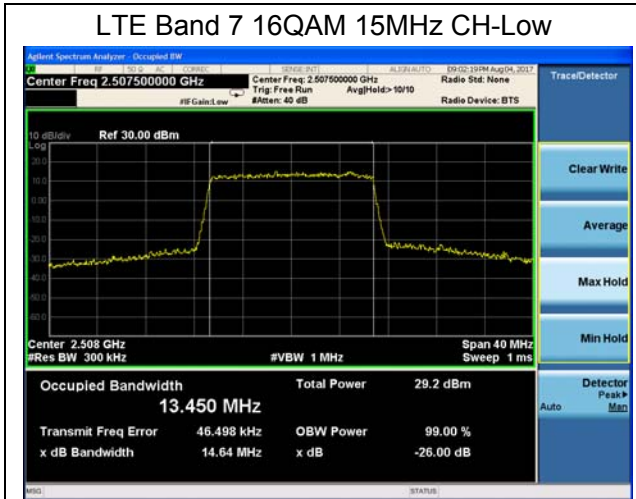


### LTE Band 7 QPSK 10MHz CH-High









## 4.4 Band Edge Compliance

### Ambient condition

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

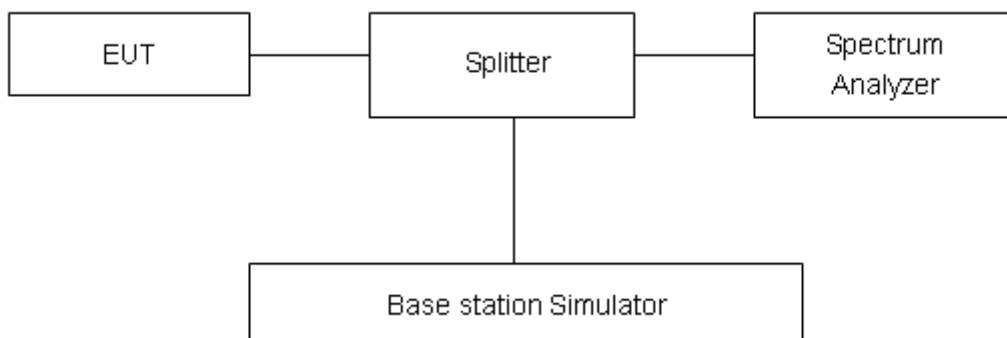
### Method of Measurement

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 testing follows KDB 971168 v02r02 Section 6.0

- 1.The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured.
3. For LTE Band 41 Set RBW  $\geq$  1% EBW in the 1MHz band immediately outside and adjacent to the band edge. Beyond the 1 MHz band from the band edge, RBW=1MHz was used.  
RBW is set to 51 kHz, VBW is set to 160 kHz for LTE Band 7(5MHz).  
RBW is set to 100 kHz, VBW is set to 300kHz for LTE Band 7 (10MHz).  
RBW is set to 150 kHz, VBW is set to 510 kHz for LTE Band 7 (15MHz).  
RBW is set to 200 kHz, VBW is set to 620 kHz for LTE Band 7(20MHz) on spectrum analyzer.
4. Set spectrum analyzer with RMS detector.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
6. Checked that all the results comply with the emission limit line.

### Test Setup



## Limits

Part 27.53(m) (4) specifies that “for BRS and EBS stations. For mobile digital stations, 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 as defined in paragraph (m)(4) of this section. In addition, the attenuation factor shall not be less that  $43 + 10 \log (P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log (P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Example:

The limit line is derived from  $43 + 10 \log (P)$  dB below the transmitter power P(Watts)  
=  $P(W) - [43 + 10 \log (P)]$  (dB)  
=  $[30 + 10 \log (P)]$  (dBm) -  $[43 + 10 \log (P)]$  (dB) = -13dBm.

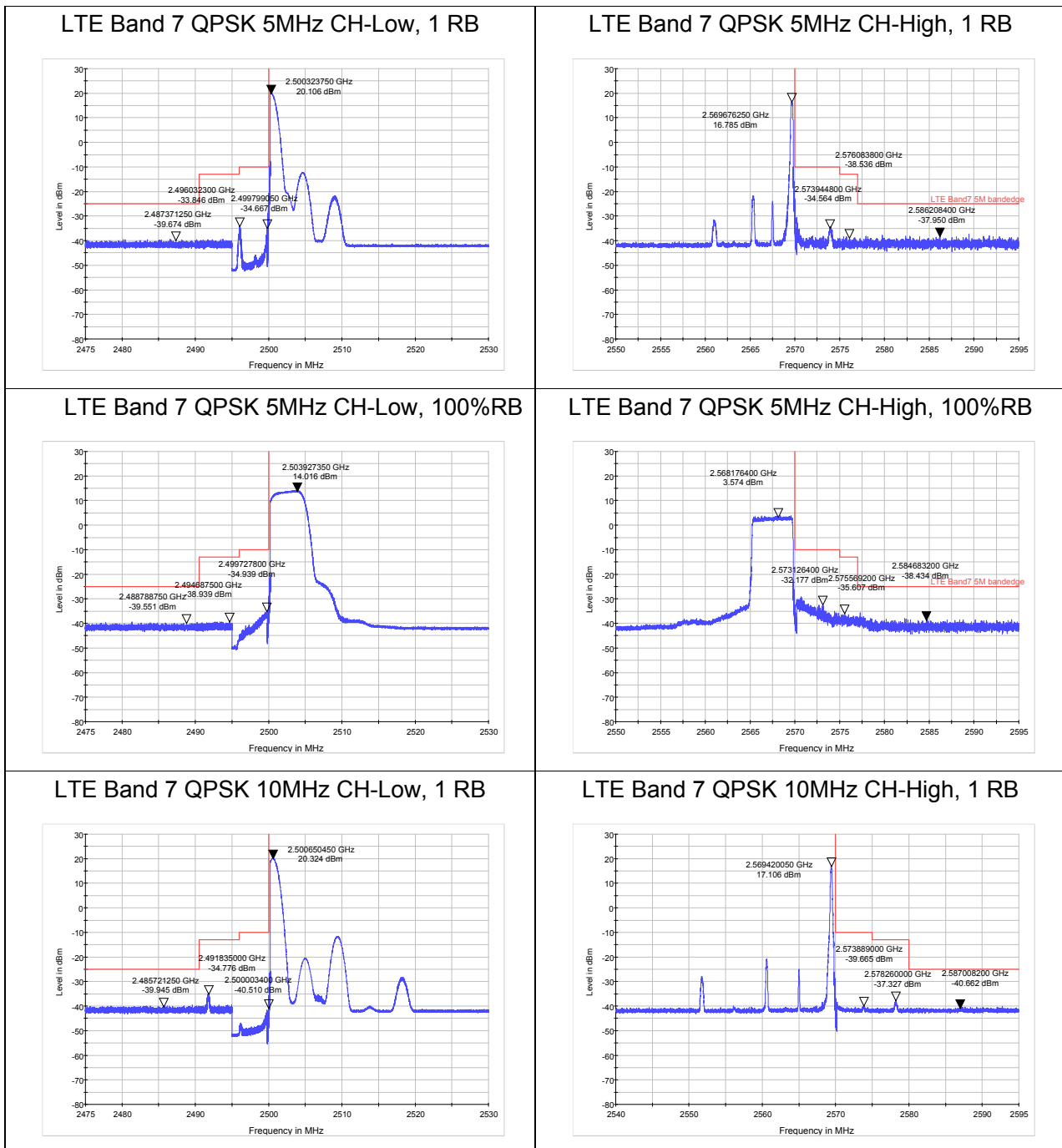
## Measurement Uncertainty

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



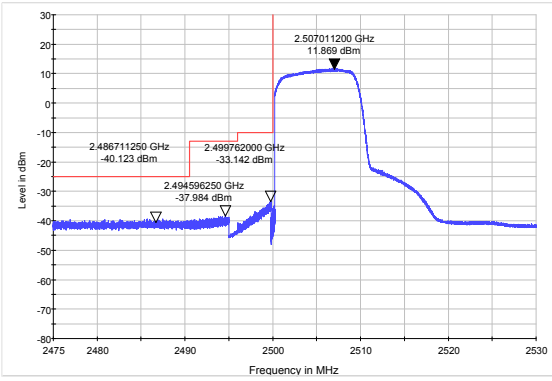
**Test Result**

All the test traces in the plots shows the test results clearly.

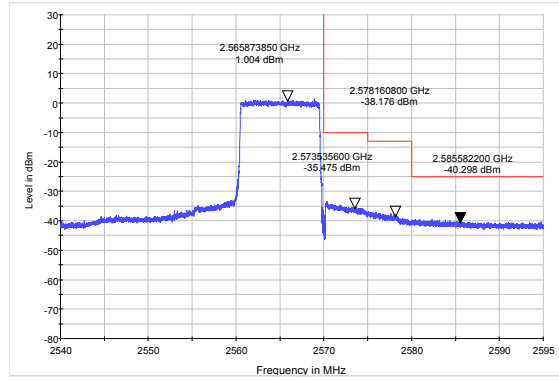




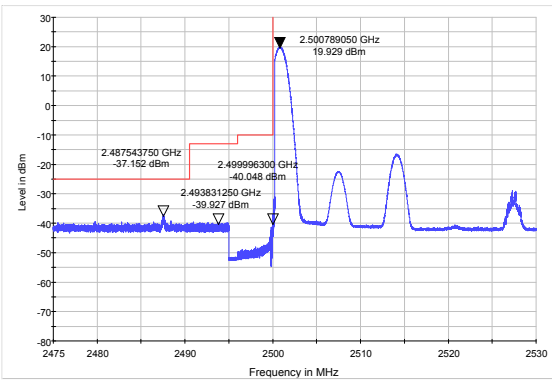
LTE Band 7 QPSK 10MHz CH-Low, 100%RB



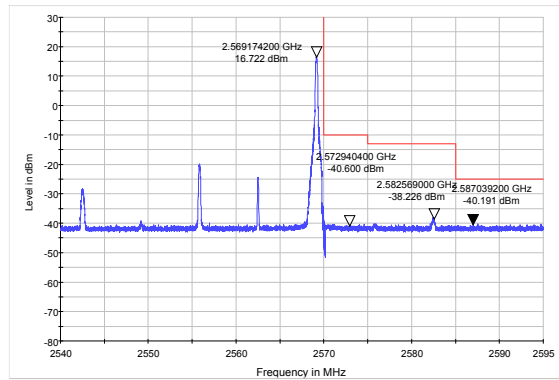
LTE Band 7 QPSK 10MHz CH-High, 100%RB



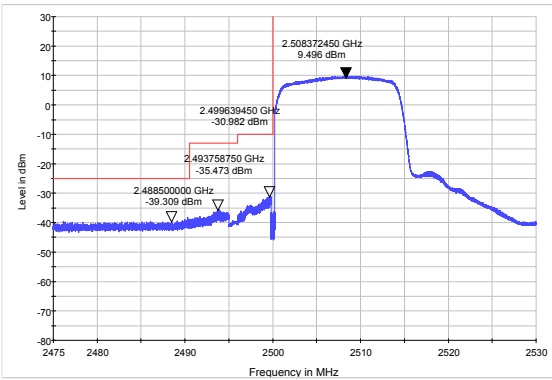
LTE Band 7 QPSK 15MHz CH-Low, 1 RB



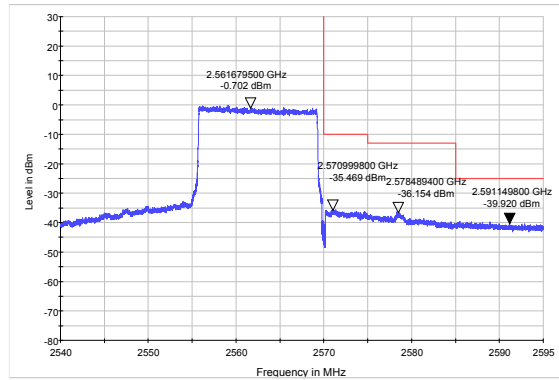
LTE Band 7 QPSK 15MHz CH-High, 1 RB



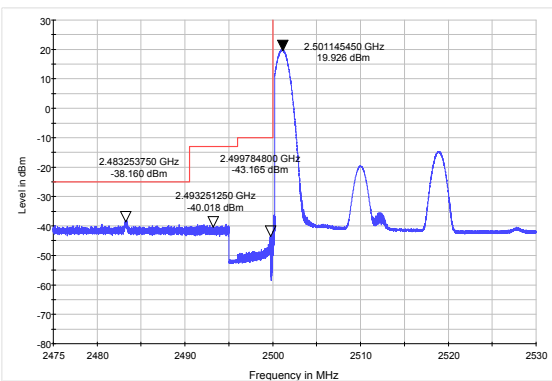
LTE Band 7 QPSK 15MHz CH-Low, 100%RB



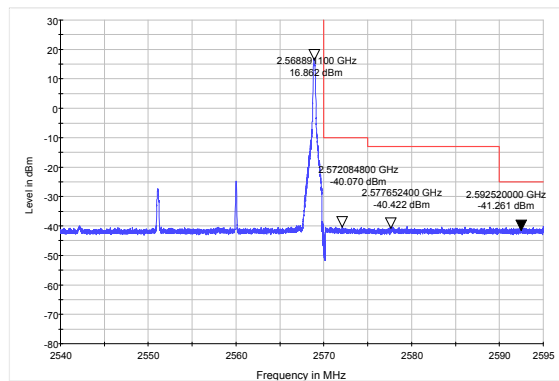
LTE Band 7 QPSK 15MHz CH-High, 100%RB



LTE Band 7 QPSK 20MHz CH-Low, 1 RB

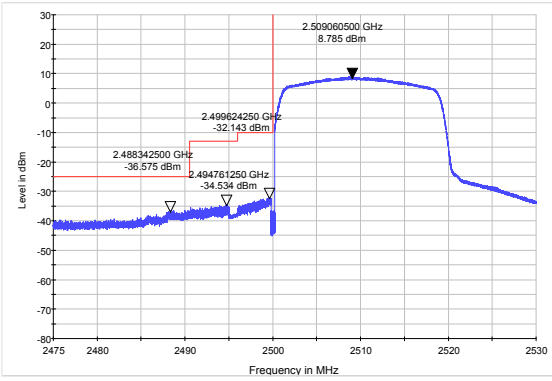


LTE Band 7 QPSK 20MHz CH-High, 1 RB

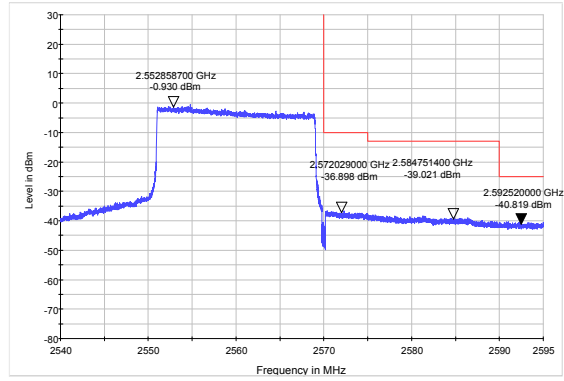




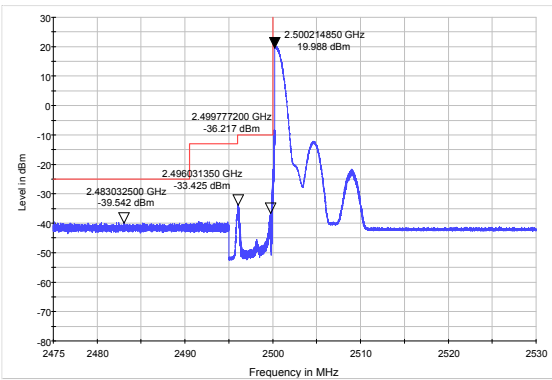
LTE Band 7 QPSK 20MHz CH-Low, 100%RB



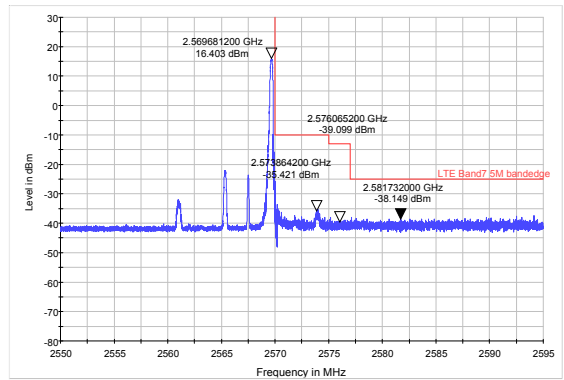
LTE Band 7 QPSK 20MHz CH-High, 100%RB



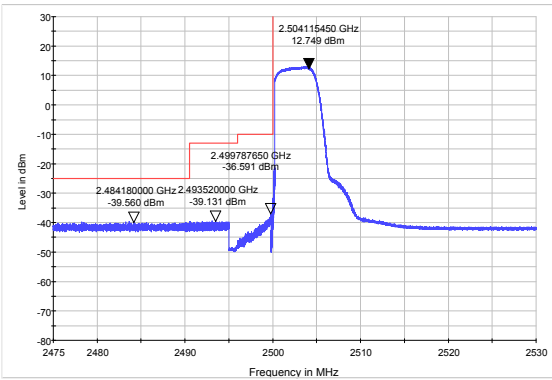
LTE Band 7 16QAM 5MHz CH-Low, 1 RB



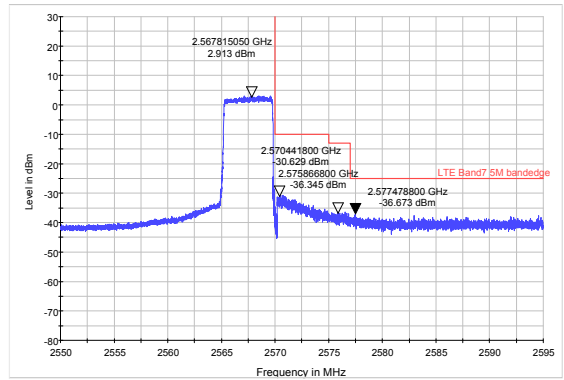
LTE Band 7 16QAM 5MHz CH-High, 1 RB



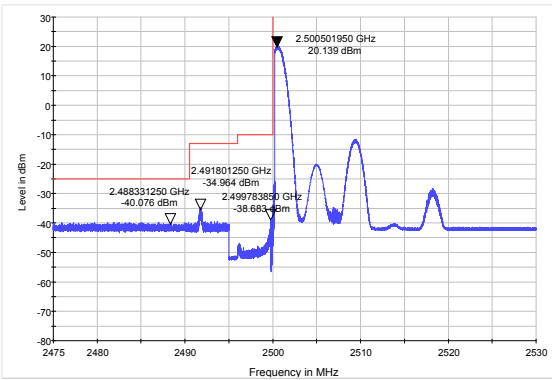
LTE Band 7 16QAM 5MHz CH-Low, 100%RB



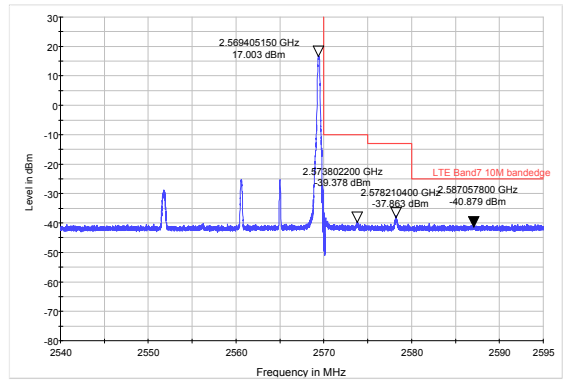
LTE Band 7 16QAM 5MHz CH-High, 100%RB



LTE Band 7 16QAM 10MHz CH-Low, 1 RB

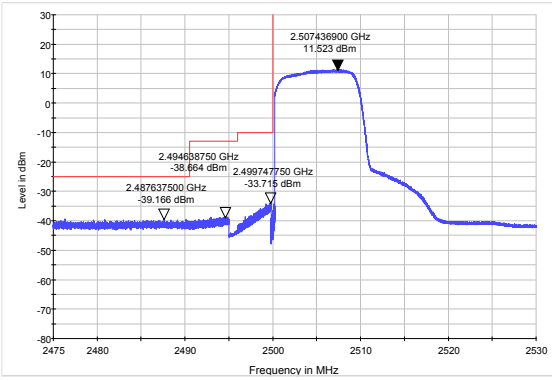


LTE Band 7 16QAM 10MHz CH-High, 1 RB

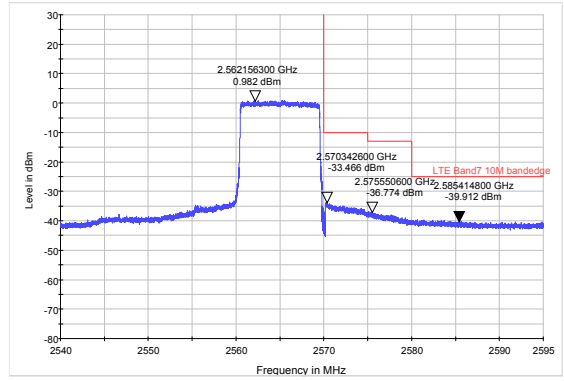




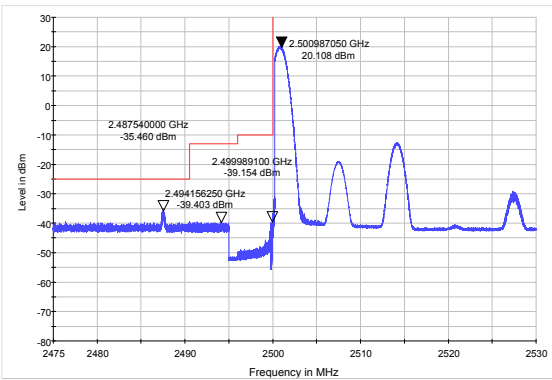
LTE Band 7 16QAM 10MHz CH-Low, 100%RB



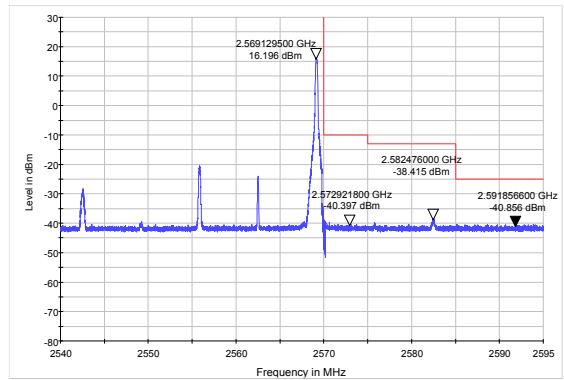
LTE Band 7 16QAM 10MHz CH-High, 100%RB



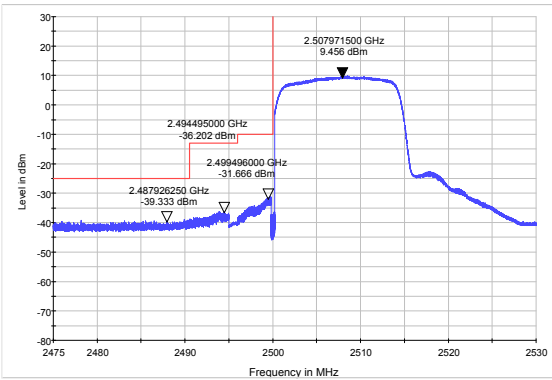
LTE Band 7 16QAM 15MHz CH-Low, 1 RB



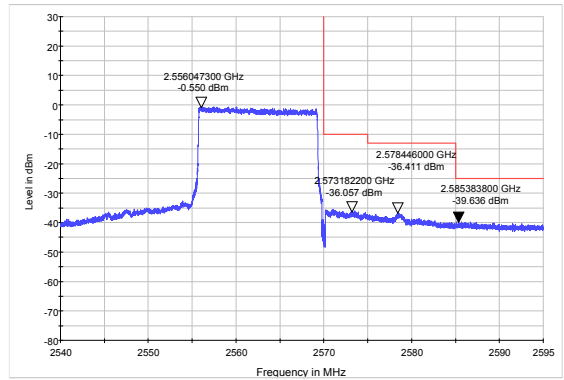
LTE Band 7 16QAM 15MHz CH-High, 1 RB



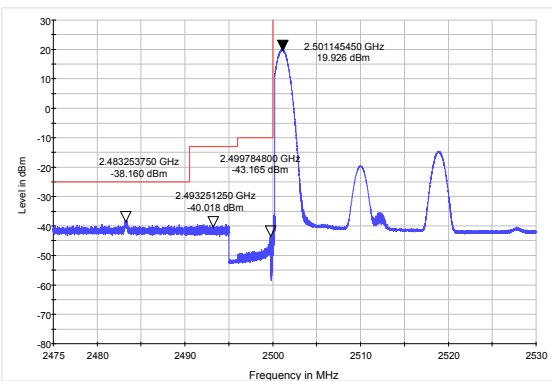
LTE Band 7 16QAM 15MHz CH-Low, 100%RB



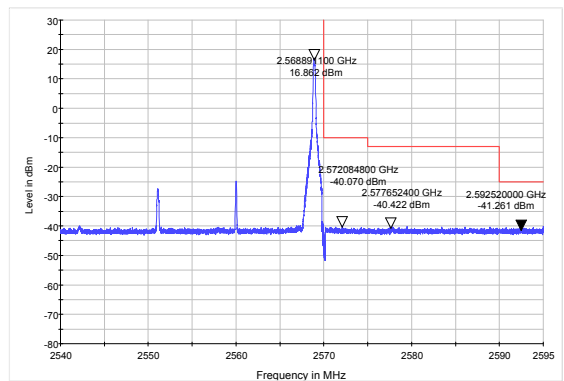
LTE Band 7 16QAM 15MHz CH-High, 100%RB



LTE Band 7 16QAM 20MHz CH-Low, 1 RB

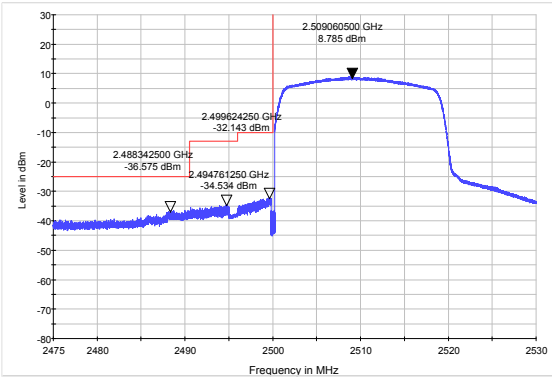


LTE Band 7 16QAM 20MHz CH-High, 1 RB

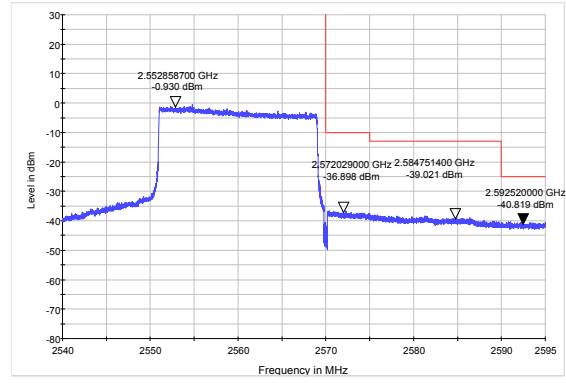




LTE Band 7 16QAM 20MHz CH-Low, 100%RB



LTE Band 7 16QAM 20MHz CH-High, 100%RB



### 4.5 Peak-to-Average Power Ratio (PAPR)

#### Ambient condition

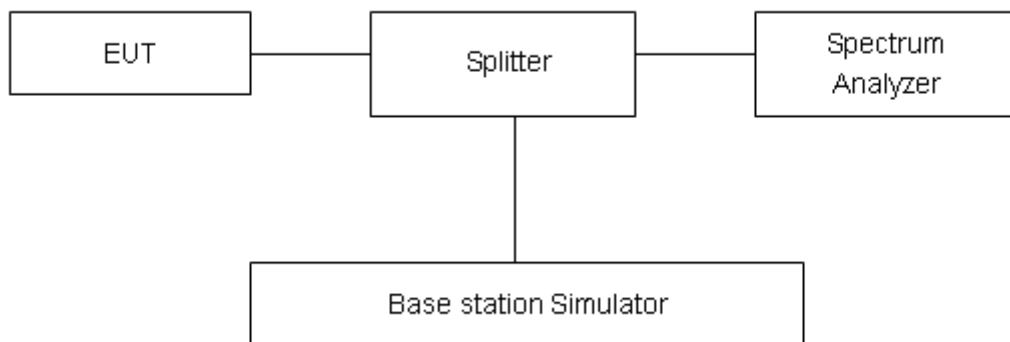
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$PAPR (dB) = PPk (dBm) - PAvg (dBm).$$

#### Test Setup



#### Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may 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**

LTE Band 7								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	5	20775	2502.5	26.66	21.73	4.93	≤13	PASS
		21100	2535	27.32	21.91	5.41	≤13	PASS
		21425	2567.5	27.10	21.74	5.36	≤13	PASS
	10	20800	2505	26.61	21.81	4.80	≤13	PASS
		21100	2535	27.24	21.93	5.31	≤13	PASS
		21400	2565	27.09	21.78	5.31	≤13	PASS
	15	20825	2507.5	26.71	21.79	4.92	≤13	PASS
		21100	2535	27.37	21.89	5.48	≤13	PASS
		21375	2562.5	27.18	21.73	5.45	≤13	PASS
	20	20850	2510	26.64	21.76	4.88	≤13	PASS
		21100	2535	27.07	21.84	5.23	≤13	PASS
		21350	2560	26.96	21.69	5.27	≤13	PASS
16QAM	5	20775	2502.5	26.98	21.27	5.71	≤13	PASS
		21100	2535	27.44	21.21	6.23	≤13	PASS
		21425	2567.5	27.30	21.09	6.21	≤13	PASS
	10	20800	2505	26.52	21.30	5.22	≤13	PASS
		21100	2535	26.99	21.26	5.73	≤13	PASS
		21400	2565	26.85	21.13	5.72	≤13	PASS
	15	20825	2507.5	26.52	21.27	5.25	≤13	PASS
		21100	2535	27.21	21.21	6.00	≤13	PASS
		21375	2562.5	26.98	21.09	5.89	≤13	PASS
	20	20850	2510	26.56	21.25	5.31	≤13	PASS
		21100	2535	26.98	21.17	5.81	≤13	PASS
		21350	2560	26.84	21.06	5.78	≤13	PASS

## 4.6 Frequency Stability

### Ambient condition

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

### Method of Measurement

#### 1. Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -40°C to +85°C in 10°C step size.

(1)With all power removed, the temperature was decreased to -10°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-40°C to +85°C Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

#### 2. Frequency Stability (Voltage Variation)

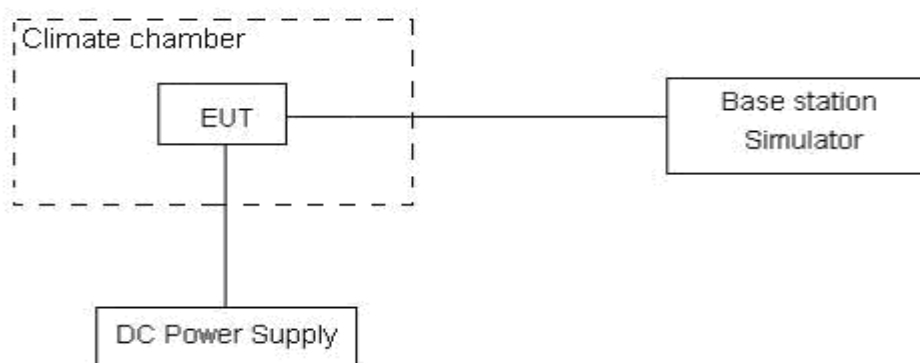
The frequency stability shall be measured with variation of primary supply voltage as follows:

(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 3.3 V and 4.3 V, with a nominal voltage of 3.8V.

### Test setup



### Limits

No specific frequency stability requirements in part 27.54

### Measurement Uncertainty

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



**Test Result**

Bandwidth	Test status	LTE Band 7 Channel 21100 Test Results (ppm)	
		QPSK	16QAM
5MHz	-40°C/Normal Voltage	-0.00076	-0.00004
	-30°C/Normal Voltage	-0.00196	0.00089
	-20°C/Normal Voltage	-0.00022	-0.00121
	-10°C/Normal Voltage	-0.00304	0.00141
	0°C/Normal Voltage	0.00037	0.00023
	10°C/Normal Voltage	0.00012	0.00093
	20°C/Normal Voltage	-0.00059	0.00138
	30°C/Normal Voltage	-0.00112	-0.00063
	40°C/Normal Voltage	-0.00133	0.00114
	50°C/Normal Voltage	-0.00162	0.00120
	60°C/Normal Voltage	-0.00134	0.00307
	70°C/Normal Voltage	-0.00247	-0.00040
	80°C/Normal Voltage	-0.00157	-0.00078
	85°C/Normal Voltage	-0.00389	-0.00308
	20°C/Minimum Voltage	0.00002	-0.00047
	20°C/Maximum Voltage	-0.00209	-0.00329
10MHz	-40°C/Normal Voltage	-0.00151	-0.00217
	-30°C/Normal Voltage	-0.00109	-0.00313
	-20°C/Normal Voltage	-0.00282	-0.00066
	-10°C/Normal Voltage	-0.00127	-0.00238
	0°C/Normal Voltage	-0.00007	-0.00038
	10°C/Normal Voltage	-0.00010	-0.00055
	20°C/Normal Voltage	-0.00172	-0.00034
	30°C/Normal Voltage	-0.00172	-0.00262
	40°C/Normal Voltage	-0.00031	-0.00085
	50°C/Normal Voltage	0.00165	0.00002
	60°C/Normal Voltage	-0.00006	0.00096
	70°C/Normal Voltage	-0.00112	-0.00164
	80°C/Normal Voltage	0.00026	-0.00014
	85°C/Normal Voltage	0.00277	0.00262
	20°C/Minimum Voltage	0.00201	-0.00118
	20°C/Maximum Voltage	0.00127	-0.00125
15MHz	-40°C/Normal Voltage	-0.00033	-0.00045
	-30°C/Normal Voltage	0.00052	-0.00132
	-20°C/Normal Voltage	0.00072	-0.00072



	-10°C/Normal Voltage	0.00110	0.00163
	0°C/Normal Voltage	0.00084	-0.00167
	10°C/Normal Voltage	0.00079	0.00002
	20°C/Normal Voltage	0.00047	-0.00171
	30°C/Normal Voltage	-0.00123	-0.00101
	40°C/Normal Voltage	-0.00249	-0.00166
	50°C/Normal Voltage	-0.00032	-0.00080
	60°C/Normal Voltage	-0.00114	-0.00164
	70°C/Normal Voltage	0.00050	-0.00084
	80°C/Normal Voltage	0.00039	-0.00054
	85°C/Normal Voltage	0.00248	-0.00034
	20°C/Minimum Voltage	0.00279	-0.00130
	20°C/Maximum Voltage	0.00169	-0.00371
	20MHz	-40°C/Normal Voltage	0.00090
-30°C/Normal Voltage		0.00202	0.00129
-20°C/Normal Voltage		0.00363	0.00053
-10°C/Normal Voltage		0.00181	-0.00131
0°C/Normal Voltage		0.00084	-0.00148
10°C/Normal Voltage		0.00030	0.00074
20°C/Normal Voltage		0.00080	-0.00195
30°C/Normal Voltage		0.00280	-0.00130
40°C/Normal Voltage		-0.00092	0.00035
50°C/Normal Voltage		0.00058	0.00133
60°C/Normal Voltage		-0.00241	-0.00228
70°C/Normal Voltage		0.00047	-0.00117
80°C/Normal Voltage		0.00004	0.00357
85°C/Normal Voltage		-0.00157	0.00286
20°C/Minimum Voltage	-0.00166	0.00215	
20°C/Maximum Voltage	-0.00162	-0.00101	

### 4.7 Spurious Emissions at Antenna Terminals

#### Ambient condition

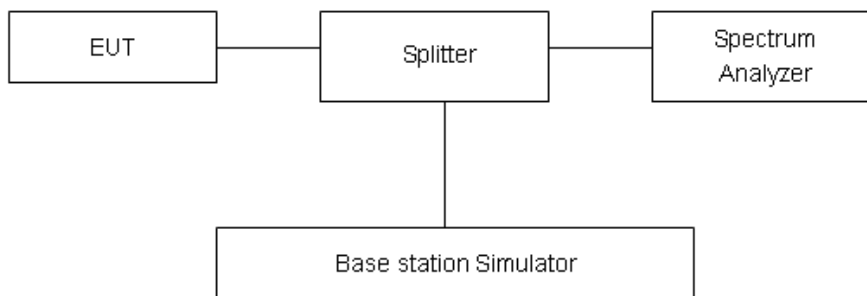
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

#### 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 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW 1MHz and VBW 3MHz, Sweep is set to ATUO.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.

#### Test setup



#### Limits

Rule Part 27.53(m) 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 as defined in paragraph (m)(4) of this section.

LTE -7 Limit	-25 dBm
--------------	---------

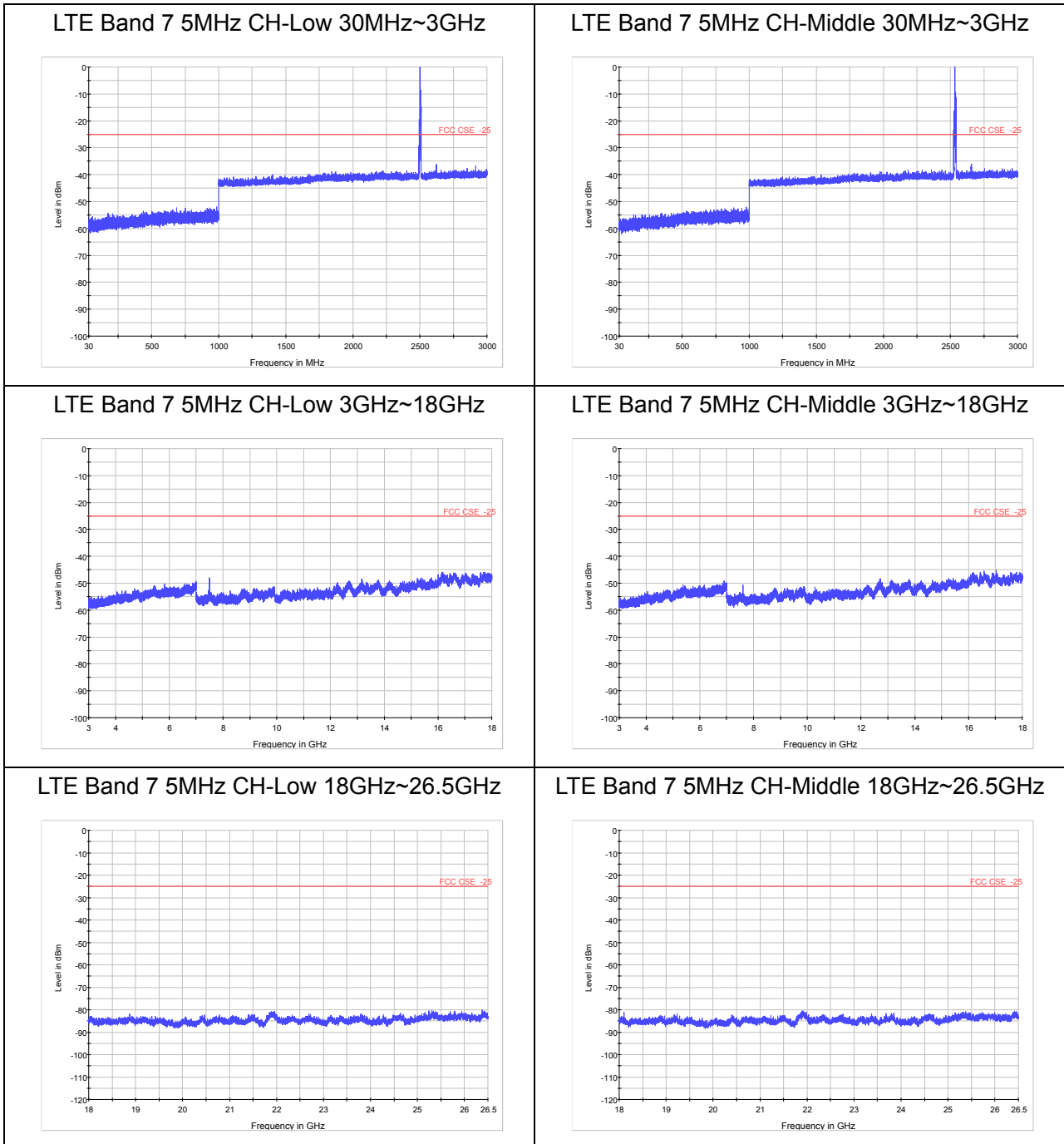
#### Measurement Uncertainty

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

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-12.75GHz	1.407 dB

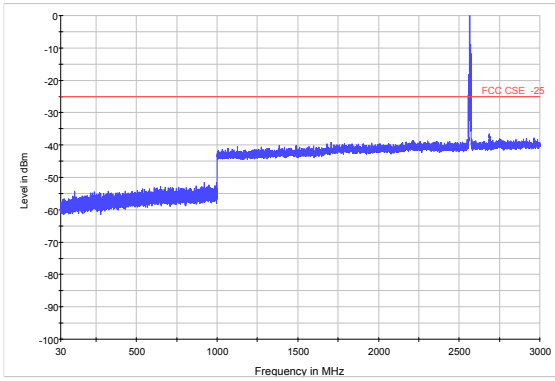
**Test Result: PASS**

If disturbances were found more than 20dB below limit line, the mark is not required for the EUT.  
The signal beyond the limit is carrier in the following plots.

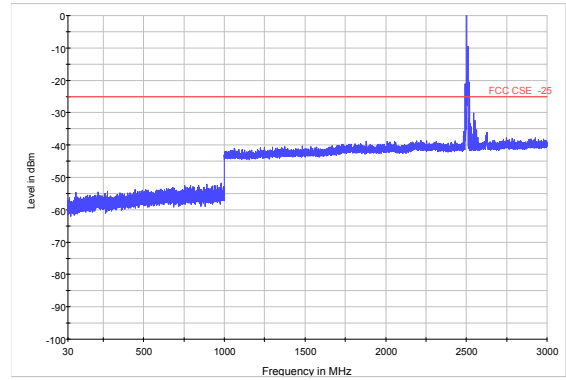




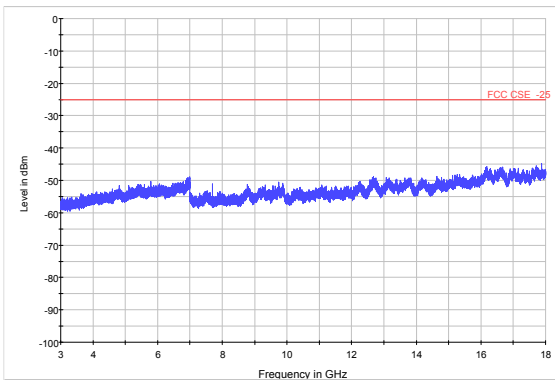
LTE Band 7 5MHz CH-High 30MHz~3GHz



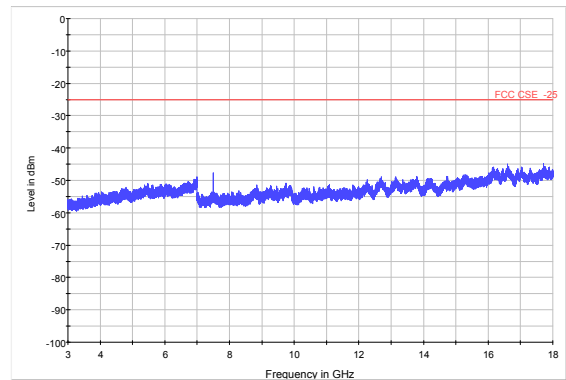
LTE Band 7 10MHz CH-Low 30MHz~3GHz



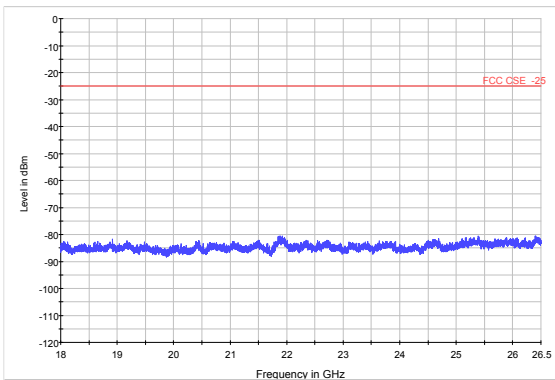
LTE Band 7 5MHz CH-High 3GHz~18GHz



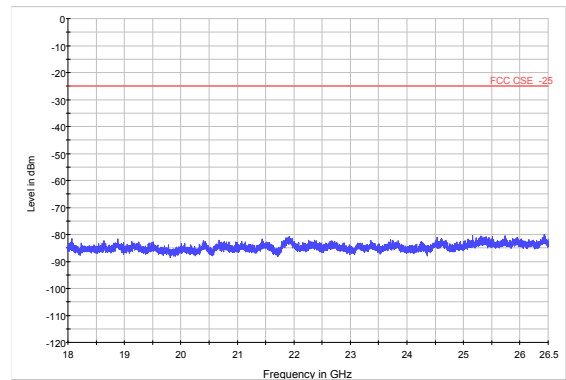
LTE Band 7 10MHz CH-Low 3GHz~18GHz



LTE Band 7 5MHz CH-High 18GHz~26.5GHz

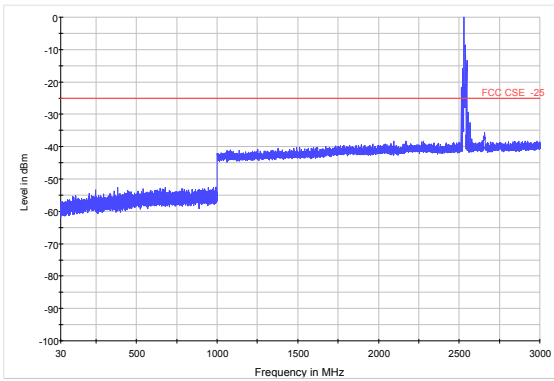


LTE Band 7 10MHz C CH-Low 18GHz~26.5GHz

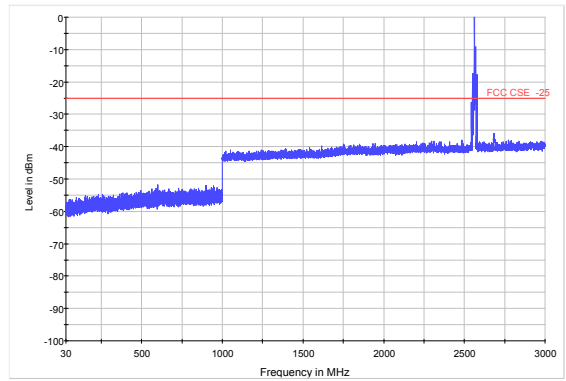




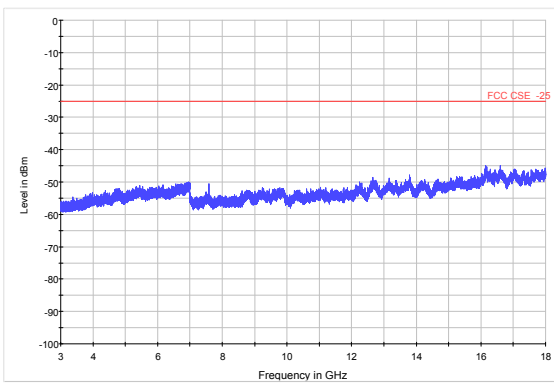
LTE Band 7 10MHz CH-Middle 30MHz~3GHz



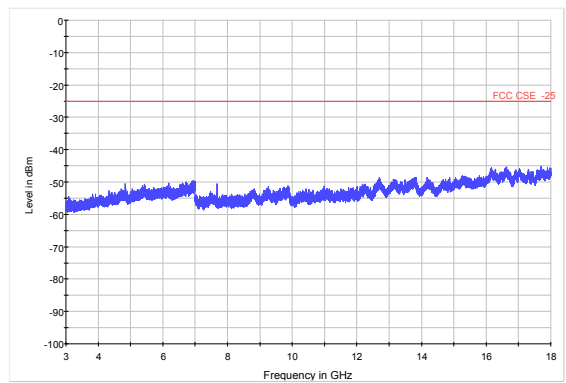
LTE Band 7 10MHz CH-High 30MHz~3GHz



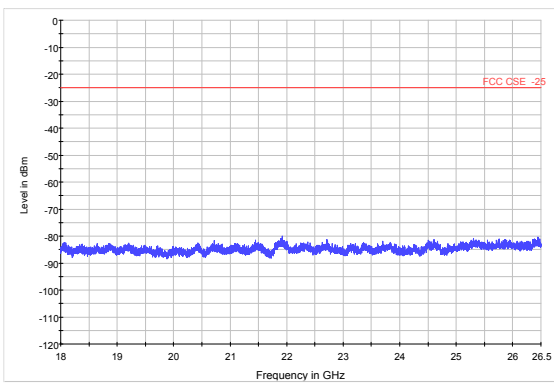
LTE Band 7 10MHz CH-Middle 3GHz~18GHz



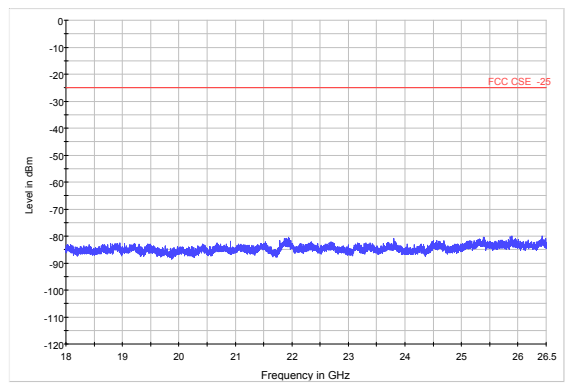
LTE Band 7 10MHz CH-High 3GHz~18GHz



LTE Band 7 10MHz CH-Middle 18GHz~26.5GHz

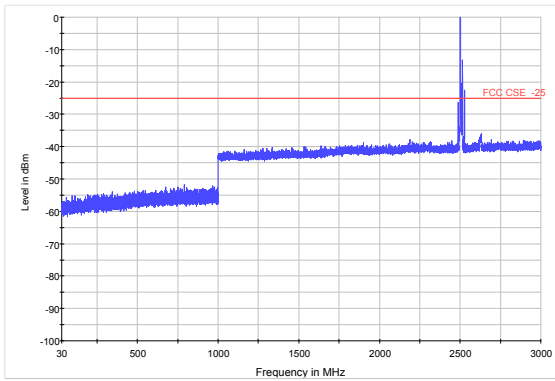


LTE Band 7 10MHz CH-High 18GHz~26.5GHz

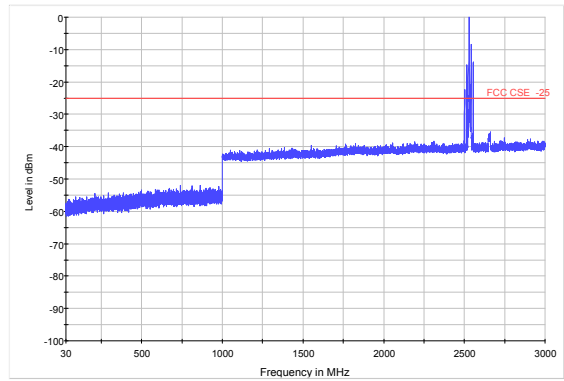




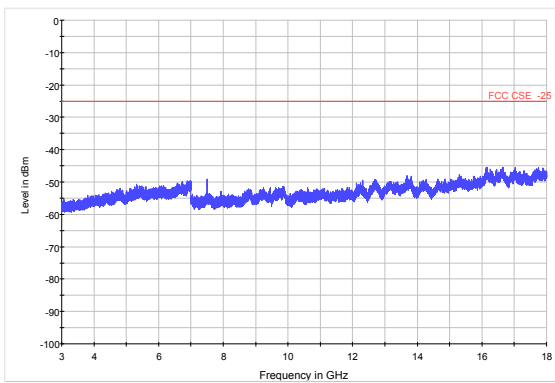
LTE Band 7 15MHz CH-Low 30MHz~3GHz



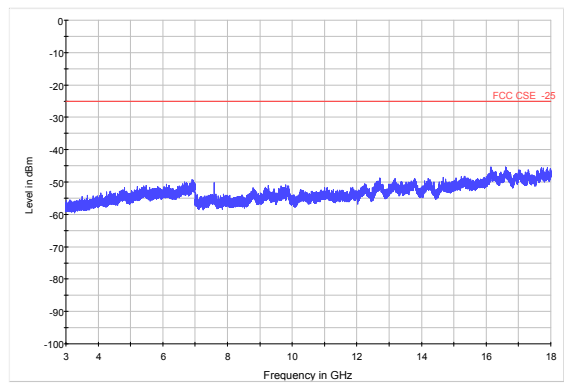
LTE Band 7 15MHz CH-Middle 30MHz~3GHz



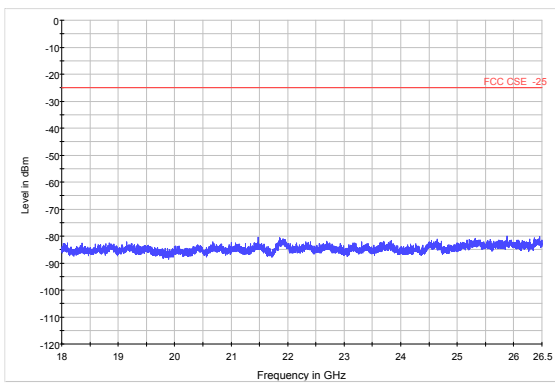
LTE Band 7 15MHz CH-Low 3GHz~18GHz



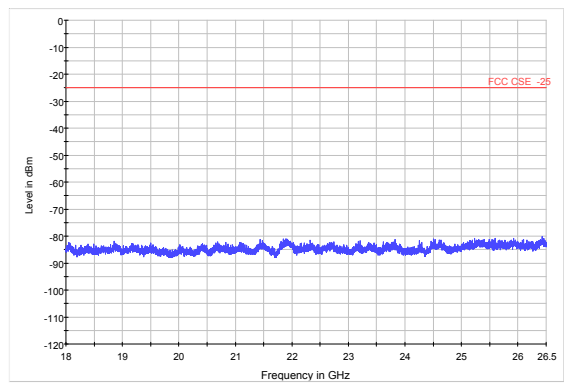
LTE Band 7 15MHz CH-Middle 3GHz~18GHz



LTE Band 7 15MHz CH-Low 18GHz~26.5GHz

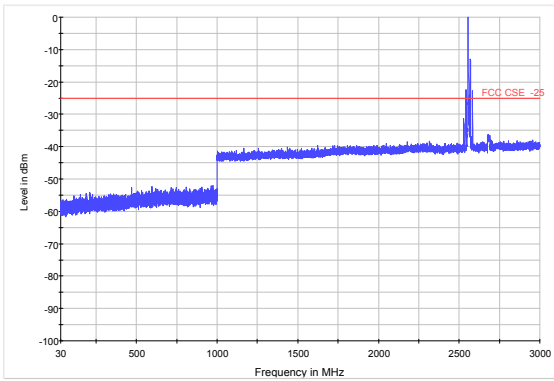


LTE Band 7 15MHz CH-Middle 18GHz~26.5GHz

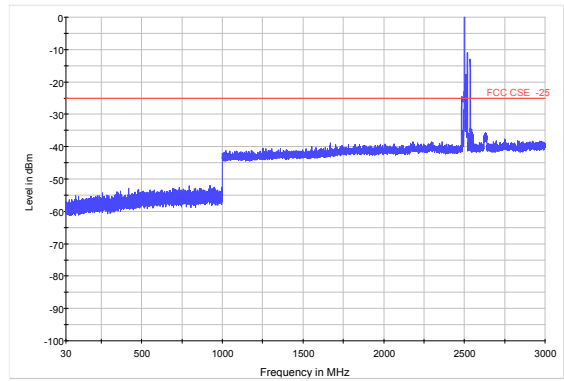




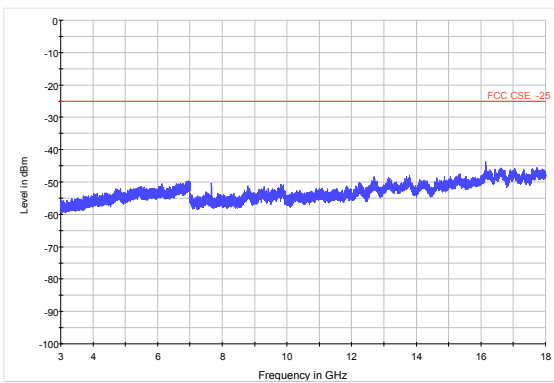
LTE Band 7 15MHz CH-High 30MHz~3GHz



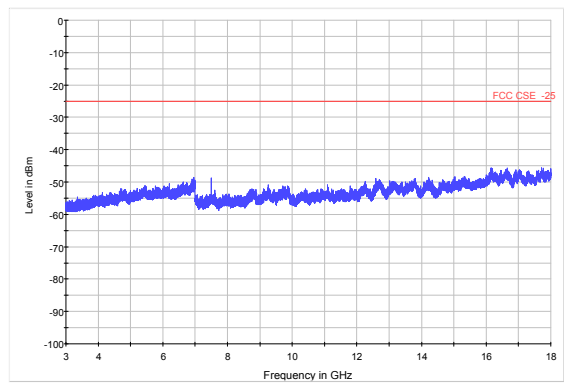
LTE Band 7 20MHz CH-Low 30MHz~3GHz



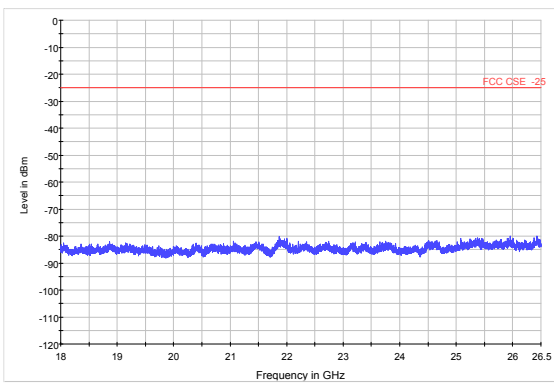
LTE Band 7 15MHz CH-High 3GHz~18GHz



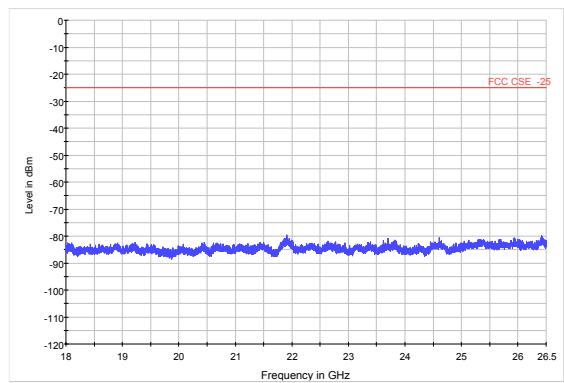
LTE Band 7 20MHz CH-Low 3GHz~18GHz



LTE Band 7 15MHz CH-High 18GHz~26.5GHz



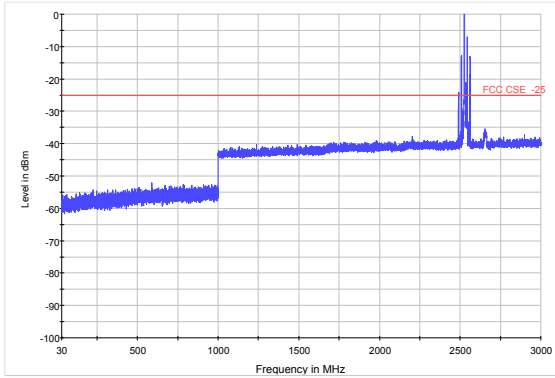
LTE Band 7 20MHz CH-Low 18GHz~26.5GHz



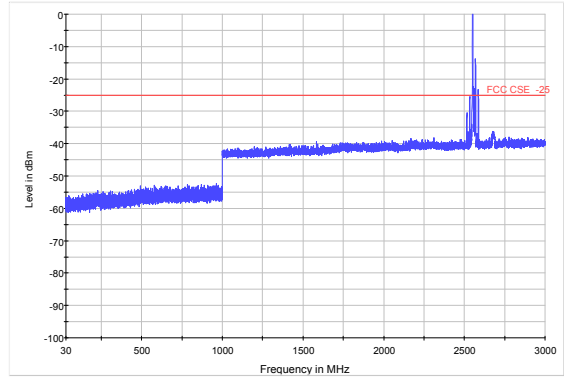




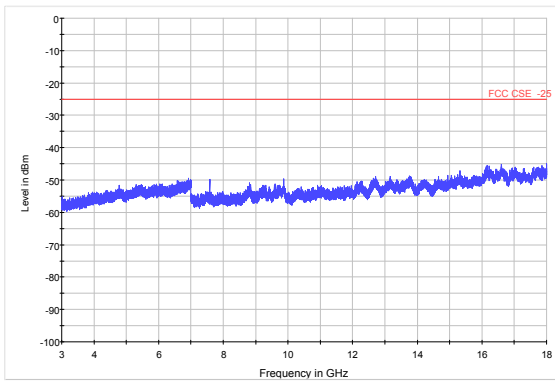
LTE Band 7 20MHz CH-Middle 30MHz~3GHz



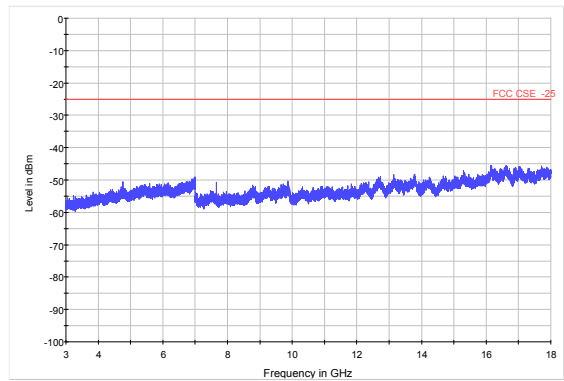
LTE Band 7 20MHz CH-High 30MHz~3GHz



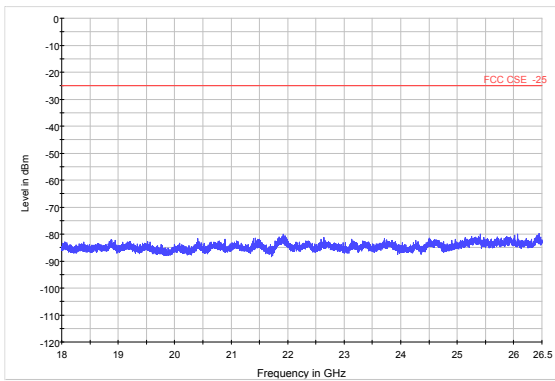
LTE Band 7 20MHz CH-Middle 3GHz~18GHz



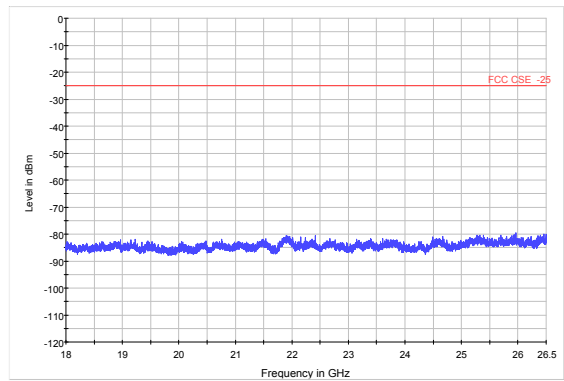
LTE Band 7 20MHz CH-High 3GHz~18GHz



LTE Band 7 20MHz CH-Middle 18GHz~26.5GHz



LTE Band 7 20MHz CH-High 18GHz~26.5GHz



## 4.8 Radiates Spurious Emission

### Ambient condition

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

### Method of Measurement

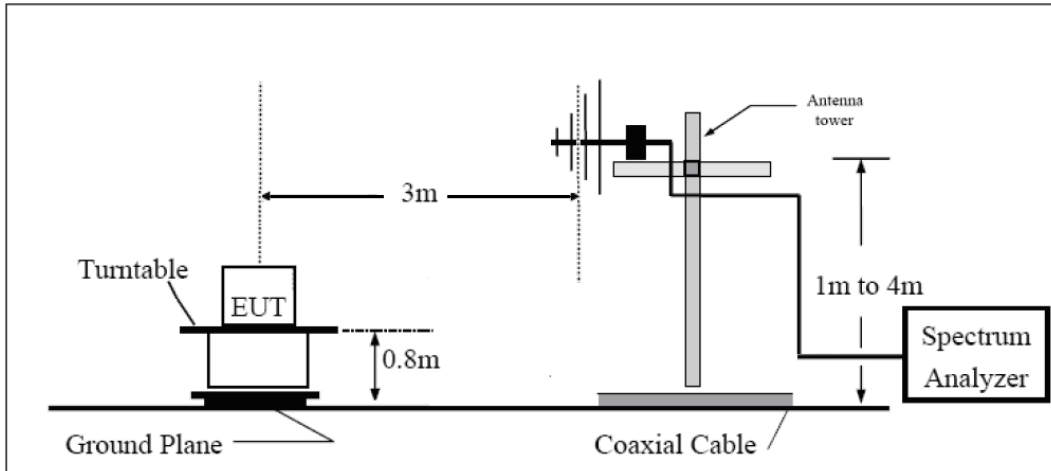
- The testing follows ANSI C63.26 (2015) Section 5.5.2.3.
- Above 30MHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the 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).
- A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
- The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
- 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.
- 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.
- The measurement results are obtained as described below:  

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:  

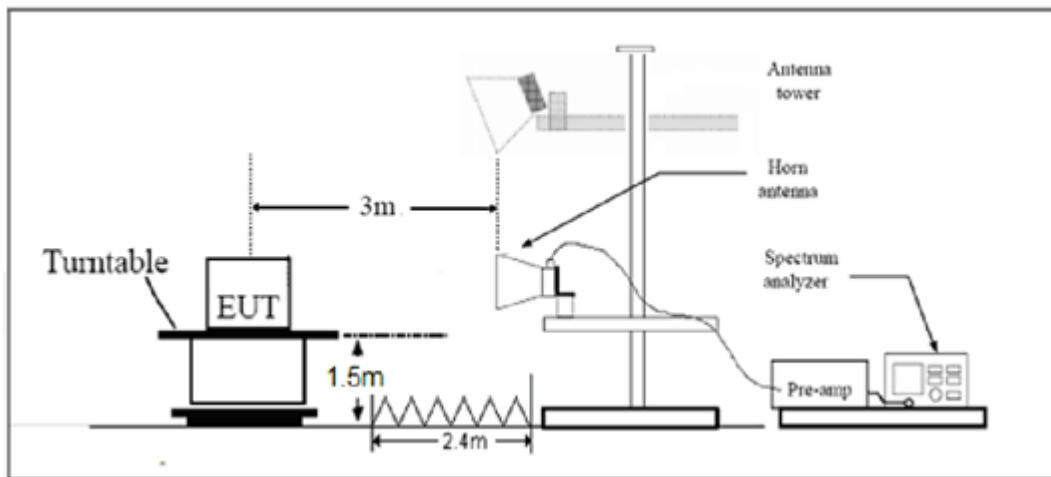
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
- This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole,  $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$ .

**Test setup**

**30MHz~~~ 1GHz**



**Above 1GHz**



Note: Area side:2.4mX3.6m

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

**Limits**

Rule Part 27.53(m) 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 as defined in paragraph (m)(4) of this section.

LTE -7 Limit	-25 dBm
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**Measurement Uncertainty**

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



**Test Result**

LTE Band 7 QPSK 5MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5005.0	-59.05	2.00	9.15	Vertical	-51.9	-25.0	26.9	225
3	7507.5	-55.25	2.50	11.35	Vertical	-46.4	-25.0	21.4	135
4	10010.0	-57.75	4.20	12.05	Vertical	-49.9	-25.0	24.9	45
5	12512.5	-54.45	5.20	12.85	Vertical	-46.8	-25.0	21.8	0
6	15015.0	-53.53	5.50	14.23	Vertical	-44.8	-25.0	19.8	45
7	17517.5	-50.95	5.70	14.15	Vertical	-42.5	-25.0	17.5	90
8	20020.0	-49.26	6.30	13.76	Vertical	-41.8	-25.0	16.8	135
9	22522.5	-48.25	6.80	14.05	Vertical	-41.0	-25.0	16.0	45
10	25025.0	-48.14	6.90	14.84	Vertical	-40.2	-25.0	15.2	315

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.

LTE Band 7 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5070.0	-56.35	2.00	9.15	Vertical	-49.2	-25.0	24.2	180
3	7605.0	-54.95	2.50	11.35	Vertical	-46.1	-25.0	21.1	270
4	10140.0	-55.75	4.20	12.05	Vertical	-47.9	-25.0	22.9	135
5	12675.0	-52.75	5.20	12.85	Vertical	-45.1	-25.0	20.1	225
6	15210.0	-52.23	5.50	14.23	Vertical	-43.5	-25.0	18.5	135
7	17745.0	-49.55	5.70	14.15	Vertical	-41.1	-25.0	16.1	45
8	20280.0	-48.06	6.30	13.76	Vertical	-40.6	-25.0	15.6	0
9	22815.0	-46.85	6.80	14.05	Vertical	-39.6	-25.0	14.6	45
10	25350.0	-46.44	6.90	14.84	Vertical	-38.5	-25.0	13.5	90

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.

**LTE Band 7 QPSK 5MHz CH-High, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5135.0	-57.45	2.00	9.15	Vertical	-50.3	-25.0	25.3	0
3	7702.5	-55.05	2.50	11.35	Vertical	-46.2	-25.0	21.2	45
4	10270.0	-56.15	4.20	12.05	Vertical	-48.3	-25.0	23.3	45
5	12837.5	-54.35	5.20	12.85	Vertical	-46.7	-25.0	21.7	180
6	15405.0	-51.13	5.50	14.23	Vertical	-42.4	-25.0	17.4	270
7	17972.5	-49.65	5.70	14.15	Vertical	-41.2	-25.0	16.2	135
8	20540.0	-47.96	6.30	13.76	Vertical	-40.5	-25.0	15.5	225
9	23107.5	-47.05	6.80	14.05	Vertical	-39.8	-25.0	14.8	135
10	25675.0	-46.14	6.90	14.84	Vertical	-38.2	-25.0	13.2	45

- 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.

**LTE Band 7 QPSK 10MHz CH-Low, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5010.0	-59.95	2.00	9.15	Vertical	-52.8	-25.0	27.8	45
3	7515.0	-55.65	2.50	11.35	Vertical	-46.8	-25.0	21.8	180
4	10020.0	-58.15	4.20	12.05	Vertical	-50.3	-25.0	25.3	90
5	12525.0	-53.05	5.20	12.85	Vertical	-45.4	-25.0	20.4	0
6	15030.0	-52.53	5.50	14.23	Vertical	-43.8	-25.0	18.8	45
7	17535.0	-51.35	5.70	14.15	Vertical	-42.9	-25.0	17.9	45
8	20040.0	-49.56	6.30	13.76	Vertical	-42.1	-25.0	17.1	225
9	22545.0	-48.85	6.80	14.05	Vertical	-41.6	-25.0	16.6	135
10	25050.0	-48.24	6.90	14.84	Vertical	-40.3	-25.0	15.3	45

- 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.

**LTE Band 7 QPSK 10MHz CH-Middle, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5070.0	-57.15	2.00	9.15	Vertical	-50.0	-25.0	25.0	45
3	7605.0	-57.65	2.50	11.35	Vertical	-48.8	-25.0	23.8	180
4	10140.0	-54.65	4.20	12.05	Vertical	-46.8	-25.0	21.8	90
5	12675.0	-53.75	5.20	12.85	Vertical	-46.1	-25.0	21.1	0
6	15210.0	-52.33	5.50	14.23	Vertical	-43.6	-25.0	18.6	45
7	17745.0	-52.45	5.70	14.15	Vertical	-44.0	-25.0	19.0	45
8	20280.0	-49.96	6.30	13.76	Vertical	-42.5	-25.0	17.5	180
9	22815.0	-48.85	6.80	14.05	Vertical	-41.6	-25.0	16.6	225
10	25350.0	-48.44	6.90	14.84	Vertical	-40.5	-25.0	15.5	135

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.

**LTE Band 7 QPSK 10MHz CH-High, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5130.0	-58.25	2.00	10.15	Vertical	-50.1	-25.0	25.1	270
3	7695.0	-55.45	2.50	11.35	Vertical	-46.6	-25.0	21.6	45
4	10260.0	-57.35	4.20	12.05	Vertical	-49.5	-25.0	24.5	180
5	12825.0	-55.85	5.20	14.85	Vertical	-46.2	-25.0	21.2	90
6	15390.0	-52.33	5.50	13.23	Vertical	-44.6	-25.0	19.6	0
7	17955.0	-48.65	5.70	12.15	Vertical	-42.2	-25.0	17.2	45
8	20520.0	-48.66	6.30	13.76	Vertical	-41.2	-25.0	16.2	45
9	23085.0	-47.85	6.80	14.05	Vertical	-40.6	-25.0	15.6	225
10	25650.0	-46.54	6.90	14.84	Vertical	-38.6	-25.0	13.6	135

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.



## LTE Band 7 QPSK 15MHz CH-Low, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5015.0	-58.65	2.00	10.15	Vertical	-50.5	-25.0	25.5	270
3	7522.5	-55.95	2.50	11.35	Vertical	-47.1	-25.0	22.1	45
4	10030.0	-56.25	4.20	12.05	Vertical	-48.4	-25.0	23.4	180
5	12537.5	-55.95	5.20	14.85	Vertical	-46.3	-25.0	21.3	90
6	15045.0	-49.93	5.50	13.23	Vertical	-42.2	-25.0	17.2	0
7	17552.5	-47.45	5.70	12.15	Vertical	-41.0	-25.0	16.0	45
8	20060.0	-47.66	6.30	13.76	Vertical	-40.2	-25.0	15.2	45
9	22567.5	-46.45	6.80	14.05	Vertical	-39.2	-25.0	14.2	180
10	25075.0	-46.44	6.90	14.84	Vertical	-38.5	-25.0	13.5	225

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.

## LTE Band 7 QPSK 15MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5070.0	43.05	2.00	10.15	Vertical	51.2	-25.0	-76.2	180
3	7605.0	-56.75	2.50	11.35	Vertical	-47.9	-25.0	22.9	270
4	10140.0	-56.25	4.20	12.05	Vertical	-48.4	-25.0	23.4	45
5	12675.0	-56.25	5.20	14.85	Vertical	-46.6	-25.0	21.6	180
6	15210.0	-51.93	5.50	13.23	Vertical	-44.2	-25.0	19.2	90
7	17745.0	-47.85	5.70	12.15	Vertical	-41.4	-25.0	16.4	0
8	20280.0	-49.56	6.30	13.76	Vertical	-42.1	-25.0	17.1	45
9	22815.0	-48.75	6.80	14.05	Vertical	-41.5	-25.0	16.5	45
10	25350.0	-49.24	6.90	14.84	Vertical	-41.3	-25.0	16.3	180

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.



**LTE Band 7 QPSK 15MHz CH-High, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5125.0	-60.45	2.00	10.15	Vertical	-52.3	-25.0	27.3	315
3	7687.5	-55.75	2.50	11.35	Vertical	-46.9	-25.0	21.9	270
4	10250.0	-58.95	4.20	12.05	Vertical	-51.1	-25.0	26.1	180
5	12812.5	-55.25	5.20	14.85	Vertical	-45.6	-25.0	20.6	270
6	15375.0	-50.93	5.50	13.23	Vertical	-43.2	-25.0	18.2	45
7	17937.5	-48.05	5.70	12.15	Vertical	-41.6	-25.0	16.6	180
8	20500.0	-48.46	6.30	13.76	Vertical	-41.0	-25.0	16.0	90
9	23062.5	-47.75	6.80	14.05	Vertical	-40.5	-25.0	15.5	0
10	25625.0	-47.54	6.90	14.84	Vertical	-39.6	-25.0	14.6	45

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.

**LTE Band 7 QPSK 20MHz CH-Low, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5020.0	-59.95	2.00	10.15	Vertical	-51.8	-25.0	26.8	90
3	7530.0	-56.35	2.50	11.35	Vertical	-47.5	-25.0	22.5	135
4	10040.0	-56.15	4.20	12.05	Vertical	-48.3	-25.0	23.3	45
5	12550.0	-56.05	5.20	14.85	Vertical	-46.4	-25.0	21.4	315
6	15060.0	-53.43	5.50	13.23	Vertical	-45.7	-25.0	20.7	270
7	17570.0	-48.75	5.70	12.15	Vertical	-42.3	-25.0	17.3	180
8	20080.0	-46.06	6.30	13.76	Vertical	-38.6	-25.0	13.6	270
9	22590.0	-45.35	6.80	14.05	Vertical	-38.1	-25.0	13.1	45
10	25100.0	-45.14	6.90	14.84	Vertical	-37.2	-25.0	12.2	180

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.

**LTE Band 7 QPSK 20MHz CH-Middle, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5070.0	-59.25	2.00	10.15	Vertical	-51.1	-25.0	26.1	45
3	7605.0	-56.65	2.50	11.35	Vertical	-47.8	-25.0	22.8	0
4	10140.0	-57.85	4.20	12.05	Vertical	-50.0	-25.0	25.0	45
5	12675.0	-55.55	5.20	14.85	Vertical	-45.9	-25.0	20.9	90
6	15210.0	-50.63	5.50	13.23	Vertical	-42.9	-25.0	17.9	135
7	17745.0	-47.95	5.70	12.15	Vertical	-41.5	-25.0	16.5	45
8	20280.0	-48.06	6.30	13.76	Vertical	-40.6	-25.0	15.6	315
9	22815.0	-48.25	6.80	14.05	Vertical	-41.0	-25.0	16.0	270
10	25350.0	-47.44	6.90	14.84	Vertical	-39.5	-25.0	14.5	180

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.

**LTE Band 7 QPSK 20MHz CH-High, RB 1**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5120.0	-58.75	2.00	10.15	Vertical	-50.6	-25.0	25.6	0
3	7680.0	-57.25	2.50	11.35	Vertical	-48.4	-25.0	23.4	45
4	10240.0	-55.55	4.20	12.05	Vertical	-47.7	-25.0	22.7	90
5	12800.0	-55.15	5.20	14.85	Vertical	-45.5	-25.0	20.5	135
6	15360.0	-48.53	5.50	13.23	Vertical	-40.8	-25.0	15.8	45
7	17920.0	-46.55	5.70	12.15	Vertical	-40.1	-25.0	15.1	315
8	20480.0	-47.06	6.30	13.76	Vertical	-39.6	-25.0	14.6	270
9	23040.0	-46.35	6.80	14.05	Vertical	-39.1	-25.0	14.1	180
10	25600.0	-46.44	6.90	14.84	Vertical	-38.5	-25.0	13.5	270

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

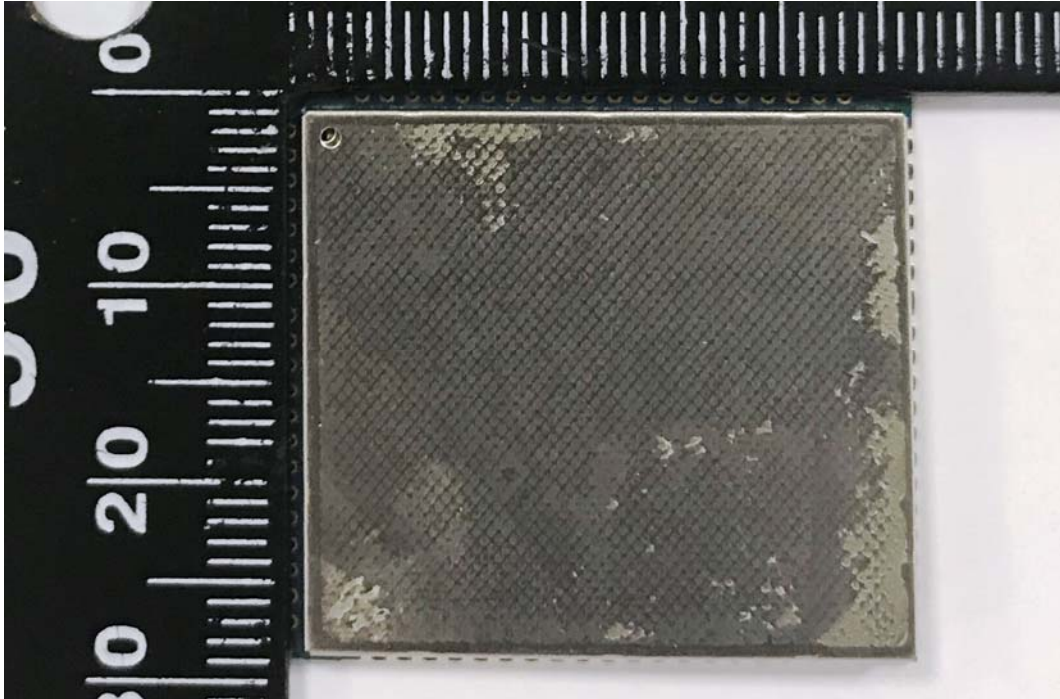
2. The worst emission was found in the antenna is vertical position.

## 5 Main Test Instruments

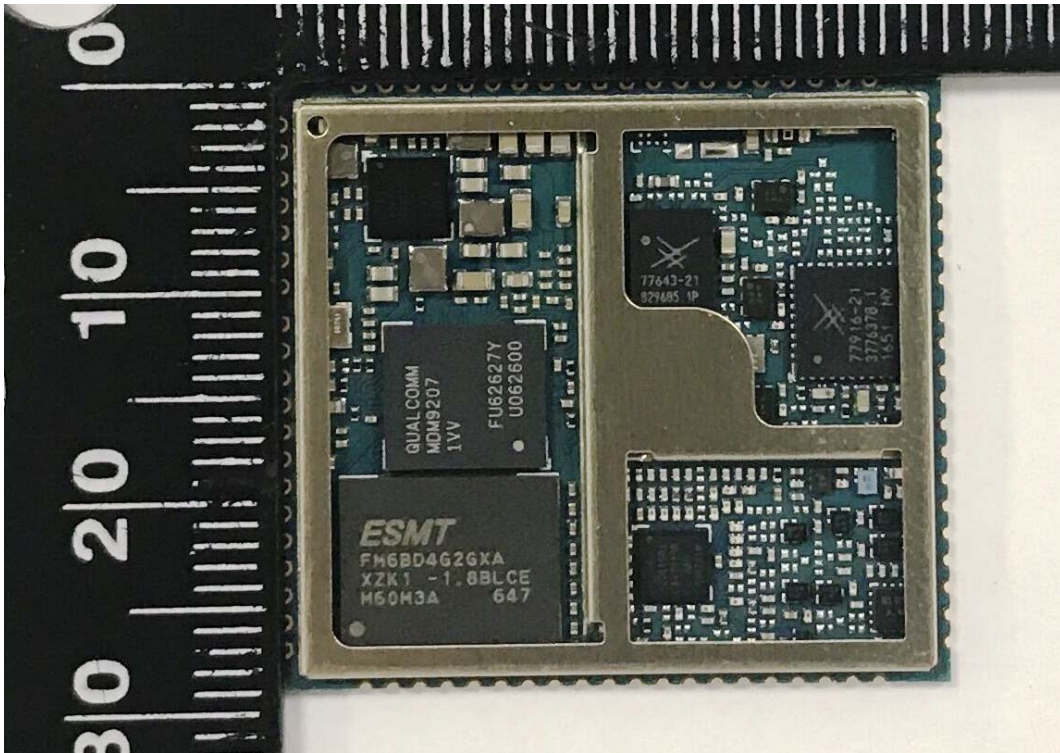
Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Base Station Simulator	R&S	CMW500	113645	2017-05-14	2018-05-13
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	2017-05-14	2018-05-13
Universal Radio Communication Tester	Agilent	E5515C	MY48367192	2017-05-14	2018-05-13
Spectrum Analyzer	Agilent	N9010A	MY47191109	2017-05-14	2018-05-13
Signal Analyzer	R&S	FSV30	100815	2016-12-16	2017-12-15
Signal generator	R&S	SMB 100A	102594	2017-05-14	2018-05-13
EMI Test Receiver	R&S	ESCI	100948	2017-05-20	2018-05-19
Trilog Antenna	SCHWARZBECK	VUBL 9163	9163-201	2014-12-06	2017-12-05
Horn Antenna	R&S	HF907	100126	2014-12-06	2017-12-05
Horn Antenna	ETS-Lindgren	3160-09	00102643	2015-01-30	2018-01-29
Climatic Chamber	Re Ce	PT-30B	20101891	2015-07-18	2018-07-17
RF Cable	Agilent	SMA 15cm	0001	2017-08-04	2018-02-03
Preampfier	R&S	SCU18	102327	2017-06-18	2018-06-17

## ANNEX A: EUT Appearance and Test Setup

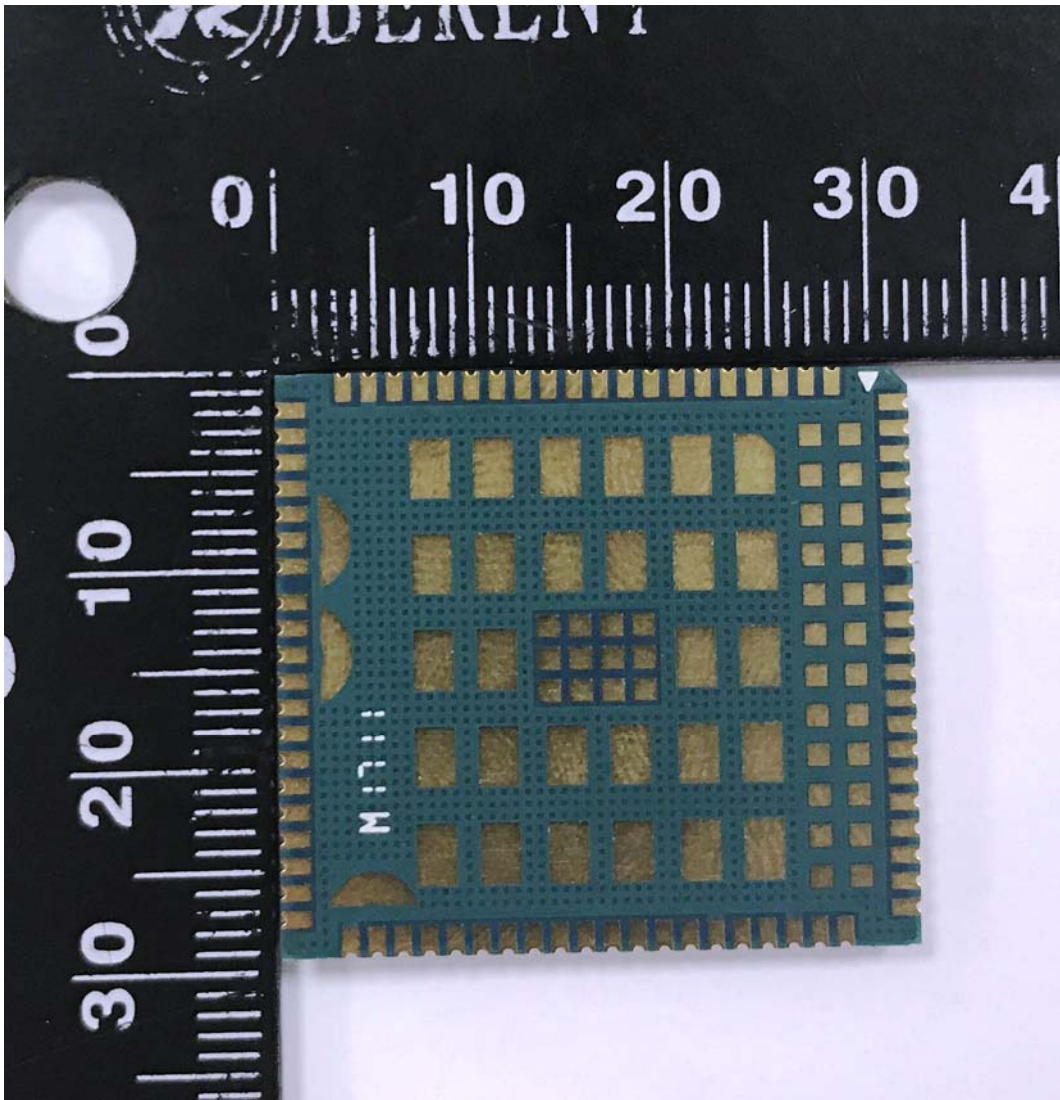
### A.1 EUT Appearance



Shielding



No shielding  
Front Side

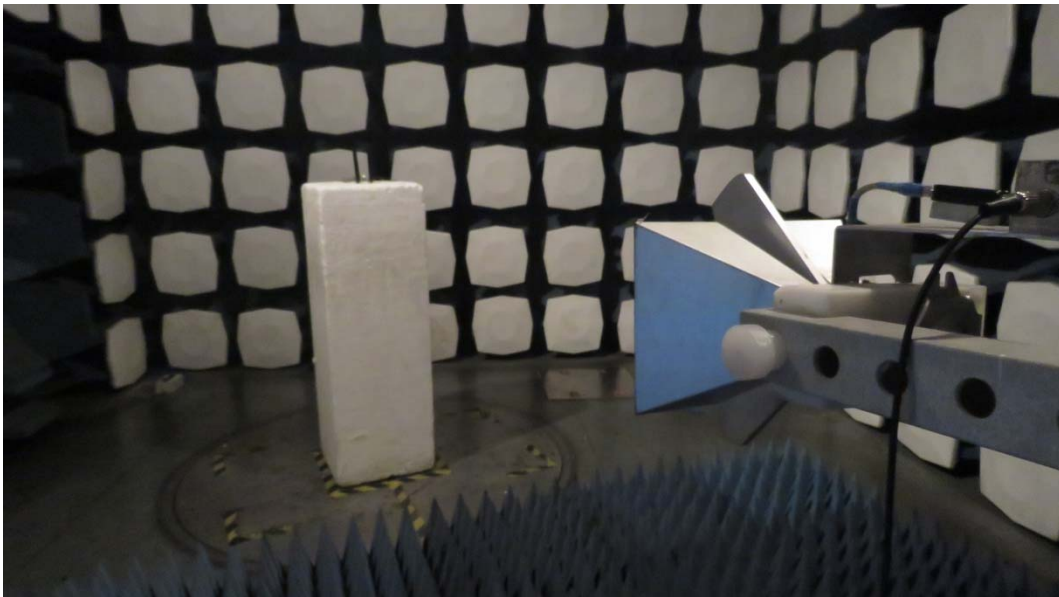


Back Side

a: EUT

**Picture 1 EUT and Accessory**

## A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup