



RF TEST REPORT

Applicant ZTE Corporation
FCC ID SRQ-VFD510S-D
Brand ZTE
Product LTE/WCDMA/GSM (GPRS)
Multi-Mode Digital Mobile Phone
Model VFD 510
Report No. RXC1703-0086RF04R1
Issue Date May 24 ,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.

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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: March 30, 2017~ May 10, 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 (recognition number is 428261)

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.

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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City: Shanghai
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2 General Description of Equipment under Test

Client Information

Applicant	ZTE Corporation
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R. China
Manufacturer	ZTE Corporation
Manufacturer address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R. China

General information

General information

EUT Description			
Model:	VFD 510		
Product IMEI:	357849080011835		
Hardware Version:	VFD 510 MP		
Software Version:	VFD-510_ATPB03		
Power Supply:	Battery/AC adapter		
Antenna Type:	Internal Antenna		
Test Mode(s):	LTE Band 7;		
Maximum E.I.R.P./ E.R.P.	LTE Band 7: 23.54dBm		
Rated Power Supply Voltage:	3.8V		
Extreme Voltage:	Minimum: 3.6V Maximum: 4.35V		
Extreme Temperature:	Lowest: -10°C Highest: +55°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	LTE Band 7	2500 ~ 2570	2620 ~ 2690
EUT Accessory			
Adapter (Note 3)	Manufacturer: DOKOCOM Model: STC-A51-I Input power:100-240 V ~ 50/60Hz 250mA		
Battery	Manufacturer: BYD Model: Li3822T43P4h736040 Power Rating: DC 3.8V, 2200mAh, Li-ion		
Earphone	Manufacturer: Shen zhen FDC Electronic Co.,Ltd. Model: DEM-94A		
Note: 1.The information of the EUT is declared by the manufacturer. 2. Please refer to the specifications or user manual for details. 3.The EUT don't have standard Adapter. The adapter used for testing in this report is the after-market accessory.			



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/TIA-603-D (2010)

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	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF power output	LTE 7	-	-	O	O	O	O	O	O	O	O	O	O	O	O
Effective Isotropic Radiated power	LTE 7	-	-	O	O	O	O	O	O	-	-	O	O	O	O
Occupied Bandwidth	LTE 7	-	-	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	LTE 7	-	-	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	LTE 7	-	-	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	LTE 7	-	-	O	O	O	O	O	O	-	-	O	-	O	-
Spurious Emissions at Antenna Terminals	LTE 7	-	-	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	LTE 7	-	-	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

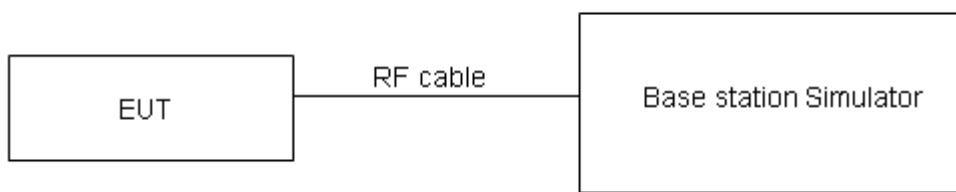
Ambient condition

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 Hotspot Off				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	23.15	23.19	23.23	23.50
		1	13	23.19	22.94	22.89	
		1	24	23.00	23.09	22.39	
		12	0	22.37	22.08	22.35	22.50
		12	6	22.23	22.15	22.20	
		12	13	22.27	21.90	22.06	
		25	0	22.34	21.99	22.20	22.50
	16QAM	1	0	22.51	22.22	22.30	22.50
		1	13	22.50	22.49	22.36	
		1	24	22.10	21.98	21.76	
		12	0	21.52	21.16	21.43	21.50
		12	6	21.39	21.06	21.25	
		12	13	21.37	21.19	21.31	
		25	0	21.42	21.23	21.34	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	23.17	23.20	23.26	23.50
		1	25	23.22	22.99	22.93	
		1	49	23.02	23.13	22.42	
		25	0	22.40	22.13	22.39	22.50
		25	13	22.26	22.20	22.24	
		25	25	22.29	21.94	22.11	
		50	0	22.42	22.01	22.24	22.50
	16QAM	1	0	22.53	22.25	22.32	22.50
		1	25	22.53	22.53	22.39	
		1	49	22.13	22.00	21.79	
		25	0	21.55	21.21	21.47	21.50
		25	13	21.41	21.10	21.28	
		25	25	21.40	21.24	21.35	
		50	0	21.45	21.28	21.38	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	23.38	23.37	23.44	23.50
		1	38	23.44	23.21	23.08	
		1	74	23.13	23.29	22.39	



		36	0	22.52	22.12	22.39	22.50
		36	18	22.38	22.20	22.30	
		36	39	22.27	22.15	22.23	
		75	0	22.28	22.21	22.45	22.50
	16QAM	1	0	22.24	22.24	22.48	22.50
		1	38	22.37	22.29	22.38	
		1	74	21.96	21.79	21.65	
		36	0	21.41	21.24	21.40	21.50
		36	18	21.39	21.05	21.14	
		36	39	21.37	21.08	21.19	
		75	0	21.36	21.15	21.27	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	23.35	23.33	23.41	23.50
		1	50	23.43	23.17	23.06	
		1	99	23.11	23.28	22.36	
		50	0	22.49	22.07	22.35	22.50
		50	25	22.36	22.16	22.27	
		50	50	22.24	22.10	22.19	
		100	0	22.36	22.04	22.28	22.50
	16QAM	1	0	22.35	22.55	22.64	22.50
		1	50	22.34	22.37	22.48	
		1	99	22.07	21.83	21.62	
		50	0	21.36	20.94	21.34	21.50
		50	25	21.41	21.39	21.30	
		50	50	21.32	21.03	21.15	
		100	0	21.34	21.11	21.24	21.50

LTE FDD Band 7 Hotspot On				Conducted Power(dBm)			Tune-up Limit (dBm)
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			
				20775/2502.5	21100/2535	21425/2567.5	
5MHz	QPSK	1	0	21.27	21.42	21.20	21.50
		1	13	21.45	21.34	21.12	
		1	24	21.29	21.36	21.04	
		12	0	21.18	21.20	21.01	21.50
		12	6	21.19	21.02	20.99	
		12	13	20.99	21.18	21.03	
		25	0	20.98	21.20	21.12	21.50
	16QAM	1	0	20.93	21.37	21.14	21.50
		1	13	20.58	20.96	21.18	
		1	24	20.76	21.18	20.90	
		12	0	20.71	20.97	20.98	21.50
		12	6	20.91	21.16	21.00	
		12	13	20.95	20.87	20.96	
		25	0	20.87	21.08	20.94	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20800/2505	21100/2535	21400/2565	
10MHz	QPSK	1	0	21.29	21.43	21.23	21.50
		1	25	21.48	21.39	21.16	
		1	49	21.31	21.40	21.07	
		25	0	21.21	21.25	21.05	21.50
		25	13	21.22	21.07	21.03	
		25	25	21.01	21.22	21.08	
		50	0	21.06	21.22	21.16	21.50
	16QAM	1	0	20.95	21.40	21.16	21.50
		1	25	20.61	21.00	21.21	
		1	49	20.79	21.20	20.93	
		25	0	20.74	21.02	21.02	21.50
		25	13	20.93	21.20	21.03	
		25	25	20.98	20.92	21.00	
		50	0	20.90	21.13	20.98	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20825/2507.5	21100/2535	21375/2562.5	
15MHz	QPSK	1	0	21.28	21.39	21.21	21.50
		1	38	21.46	21.38	21.13	
		1	74	21.28	21.35	21.03	
		36	0	21.19	21.21	21.02	21.50



		36	18	21.19	21.02	20.99	
		36	39	20.98	21.19	21.04	
		75	0	21.04	21.18	21.11	
	16QAM	1	0	20.90	21.38	21.14	21.50
		1	38	20.59	20.97	21.19	
		1	74	20.76	21.16	20.90	
		36	0	20.71	21.00	20.99	21.50
		36	18	20.90	21.15	20.99	
		36	39	20.96	20.88	20.97	
		75	0	20.87	21.08	20.94	21.50
Bandwidth	Modulation	RB size	RB offset	Channel/Frequency (MHz)			Tune-up Limit (dBm)
				20850/2510	21100/2535	21350/2560	
20MHz	QPSK	1	0	21.25	21.35	21.18	21.50
		1	50	21.45	21.34	21.11	
		1	99	21.26	21.34	21.00	
		50	0	21.16	21.16	20.98	21.50
		50	25	21.17	20.98	20.96	
		50	50	20.95	21.14	21.00	
		100	0	21.13	21.01	21.07	21.50
	16QAM	1	0	20.88	21.34	21.09	21.50
		1	50	20.55	20.95	21.15	
		1	99	20.74	21.13	20.88	
		50	0	20.68	20.96	20.96	21.50
		50	25	20.87	21.13	20.96	
		50	50	20.93	20.83	20.93	
		100	0	20.85	21.04	20.91	21.50

4.2 Effective Isotropic Radiated Power

Ambient condition

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

Methods of Measurement

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. 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).
3. 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.
4. 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 for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 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:

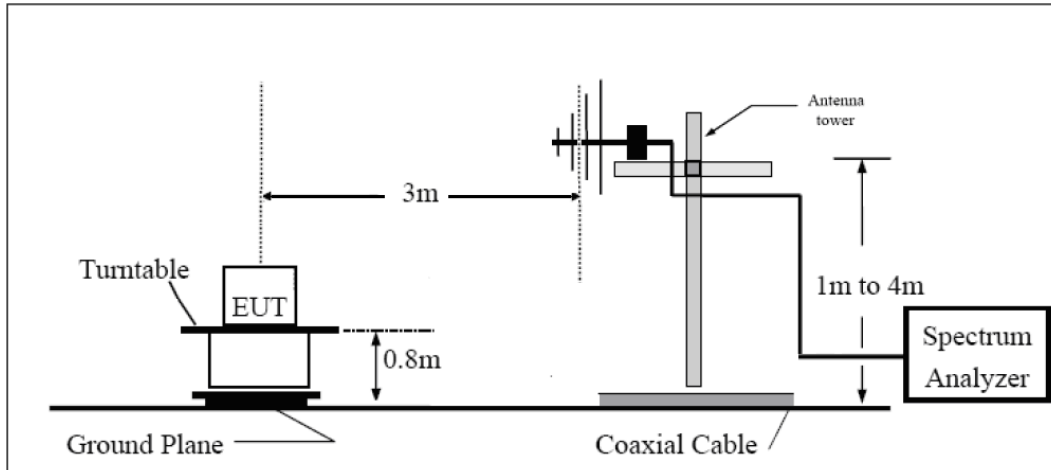
Power(EIRP)=PMea- Pcl + Ga

7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

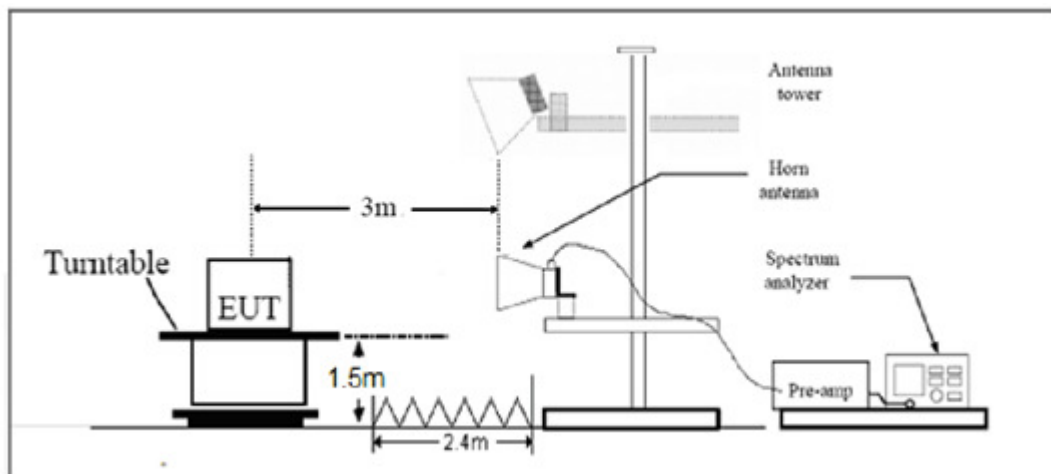
and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

**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)-LTE 7	$\leq 2 \text{ W}$ (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	-37.86	-59.64	0.00	1.81	20.90	Pass
	2535	H	-38.97	-59.72	0.00	1.81	22.70	Pass
	2567.5	H	-39.83	-59.98	0.00	1.83	23.54	Pass
	2502.5	V	-42.22	-59.31	0.00	1.81	21.02	Pass
	2535	V	-43.04	-59.11	0.00	1.81	21.80	Pass
	2567.5	V	-44.31	-59.59	0.00	1.83	22.89	Pass
5MHz (16QAM)	2502.5	H	-38.13	-59.64	0.00	1.81	20.60	Pass
	2535	H	-39.24	-59.72	0.00	1.81	22.38	Pass
	2567.5	H	-40.10	-59.98	0.00	1.83	23.23	Pass
	2502.5	V	-42.49	-59.31	0.00	1.81	20.72	Pass
	2535	V	-43.31	-59.11	0.00	1.81	21.50	Pass
	2567.5	V	-44.58	-59.59	0.00	1.83	22.68	Pass
10MHz (QPSK)	2505	H	-38.94	-59.61	0.00	1.82	21.13	Pass
	2535	H	-38.78	-59.72	0.00	1.81	22.84	Pass
	2565	H	-38.11	-60.02	0.00	1.81	23.42	Pass
	2505	V	-43.66	-59.33	0.00	1.82	21.21	Pass
	2535	V	-42.79	-59.11	0.00	1.81	22.06	Pass
	2565	V	-42.48	-59.59	0.00	1.81	22.60	Pass
10MHz (16QAM)	2505	H	-39.34	-59.61	0.00	1.82	20.82	Pass
	2535	H	-39.18	-59.72	0.00	1.81	22.54	Pass
	2565	H	-38.51	-60.02	0.00	1.81	23.10	Pass
	2505	V	-44.06	-59.33	0.00	1.82	20.90	Pass
	2535	V	-43.19	-59.11	0.00	1.81	21.75	Pass
	2565	V	-42.88	-59.59	0.00	1.81	22.30	Pass
15MHz (QPSK)	2507.5	H	-38.11	-59.71	0.00	1.80	21.35	Pass
	2535	H	-39.27	-59.72	0.00	1.81	22.79	Pass
	2562.5	H	-39.82	-60.08	0.00	1.82	23.51	Pass
	2507.5	V	-42.92	-59.29	0.00	1.80	21.42	Pass
	2535	V	-43.74	-59.72	0.00	1.81	21.83	Pass
	2562.5	V	-44.11	-59.46	0.00	1.82	22.68	Pass
15MHz (16QAM)	2507.5	H	-38.68	-59.71	0.00	1.80	21.05	Pass
	2535	H	-39.84	-59.72	0.00	1.81	22.49	Pass
	2562.5	H	-40.39	-60.08	0.00	1.82	23.20	Pass
	2507.5	V	-43.49	-59.29	0.00	1.80	21.11	Pass
	2535	V	-44.31	-59.72	0.00	1.81	21.51	Pass
	2562.5	V	-44.68	-59.46	0.00	1.82	22.35	Pass
20MHz (QPSK)	2510	H	-38.03	-59.52	0.00	1.77	21.36	Pass
	2535	H	-39.27	-59.72	0.00	1.81	22.78	Pass
	2560	H	-39.78	-60.01	0.00	1.82	23.32	Pass



	2510	V	-41.35	-59.09	0.00	1.77	21.41	Pass
	2535	V	-42.70	-59.72	0.00	1.81	21.76	Pass
	2560	V	-43.19	-59.52	0.00	1.82	22.64	Pass
20MHz (16QAM)	2510	H	-38.82	-59.52	0.00	1.77	21.05	Pass
	2535	H	-40.06	-59.72	0.00	1.81	22.45	Pass
	2560	H	-40.57	-60.01	0.00	1.82	23.00	Pass
	2510	V	-42.14	-59.09	0.00	1.77	21.10	Pass
	2535	V	-43.49	-59.72	0.00	1.81	21.45	Pass
	2560	V	-43.98	-59.52	0.00	1.82	22.33	Pass

Note: 1. EIRP= E.R.P+2.15

4.3 Occupied Bandwidth

Ambient condition

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

Method of Measurement

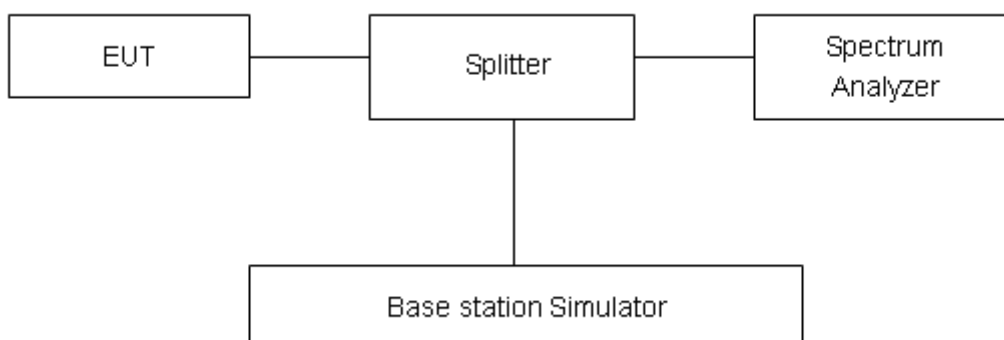
The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

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

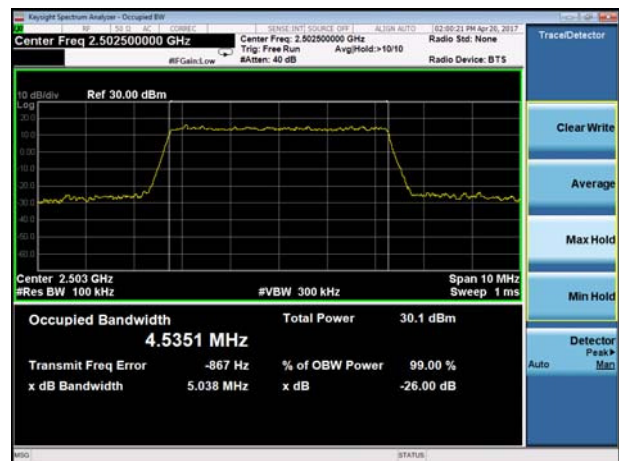
LTE Band 7						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	20775	2502.5	4.518	5.054
			21100	2535	4.514	5.031
			21425	2567.5	4.529	5.000
		10	20800	2505	9.040	10.09
			21100	2535	9.068	10.13
			21400	2565	9.063	10.06
		15	20825	2507.5	13.483	14.72
			21100	2535	13.551	14.84
			21375	2562.5	13.502	14.81
		20	20850	2510	17.902	19.25
			21100	2535	17.942	19.34
			21350	2560	17.928	19.53
	16QAM	5	20775	2502.5	4.535	5.038
			21100	2535	4.533	5.059
			21425	2567.5	4.511	5.011
		10	20800	2505	9.035	10.07
			21100	2535	9.081	10.05
			21400	2565	9.045	10.04
		15	20825	2507.5	13.517	14.76
			21100	2535	13.503	14.86
			21375	2562.5	13.528	14.76
		20	20850	2510	17.923	19.25
			21100	2535	17.954	19.27
			21350	2560	17.896	19.20



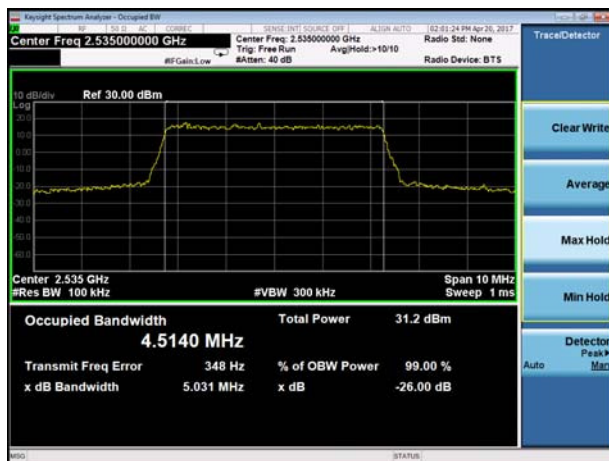
LTE Band 7 QPSK 5MHz CH-Low



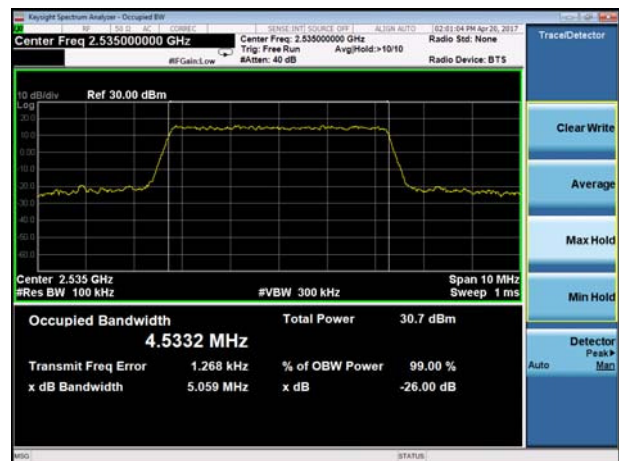
LTE Band 7 16QAM 5MHz CH-Low



LTE Band 7 QPSK 5MHz CH-Middle



LTE Band 7 16QAM 5MHz CH-Middle



LTE Band 7 QPSK 5MHz CH-High



LTE Band 7 16QAM 5MHz CH-High





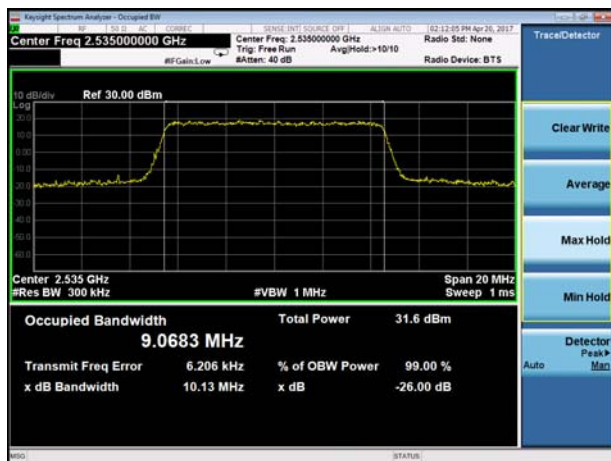
LTE Band 7 QPSK 10MHz CH-Low



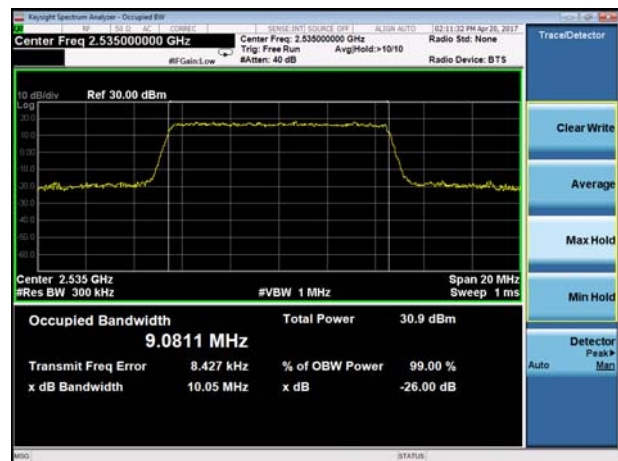
LTE Band 7 16QAM 10MHz CH-Low



LTE Band 7 QPSK 10MHz CH-Middle



LTE Band 7 16QAM 10MHz CH-Middle



LTE Band 7 QPSK 10MHz CH-High

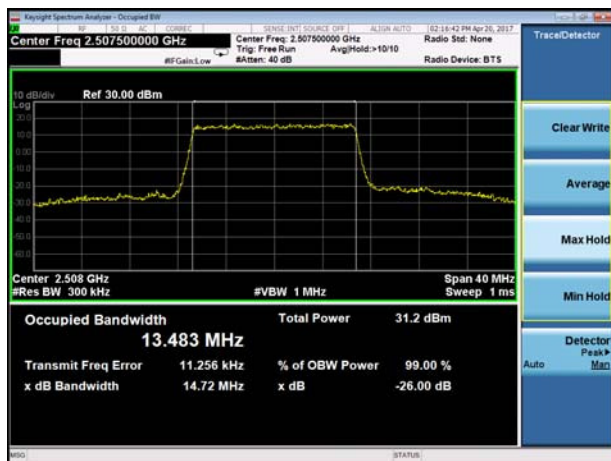


LTE Band 7 16QAM 10MHz CH-High

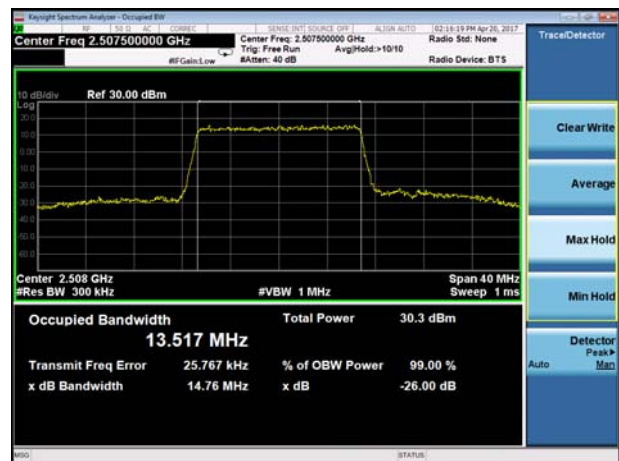




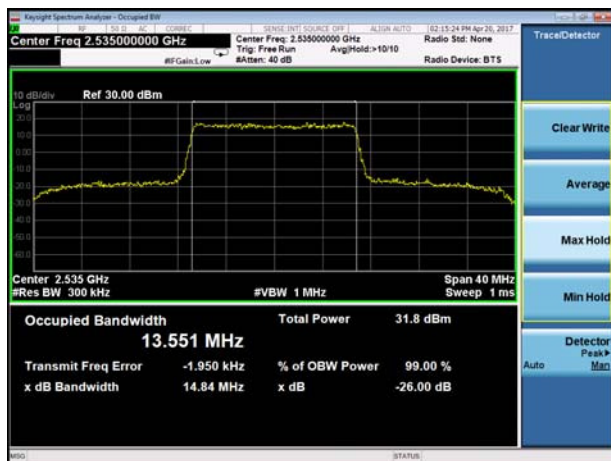
LTE Band 7 QPSK 15MHz CH-Low



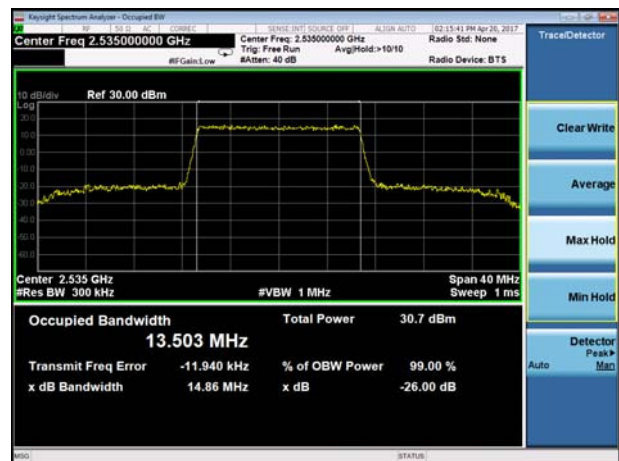
LTE Band 7 16QAM 15MHz CH-Low



LTE Band 7 QPSK 15MHz CH-Middle



LTE Band 7 16QAM 15MHz CH-Middle



LTE Band 7 QPSK 15MHz CH-High

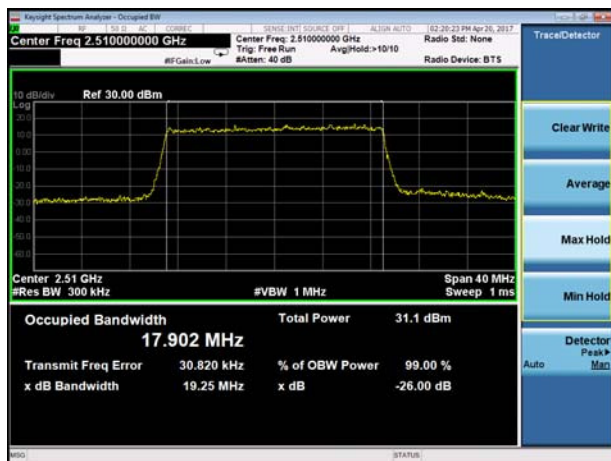


LTE Band 7 16QAM 15MHz CH-High

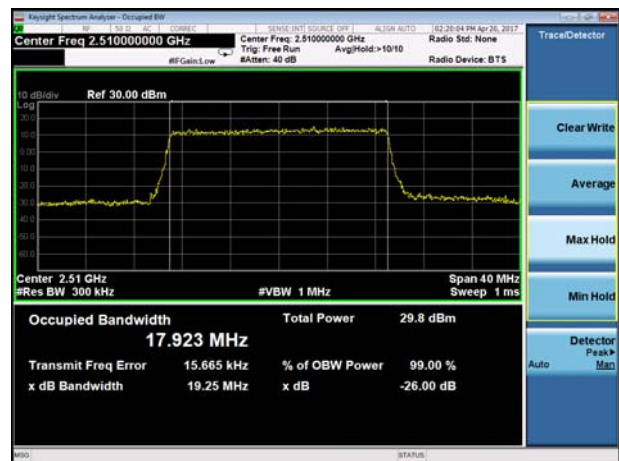




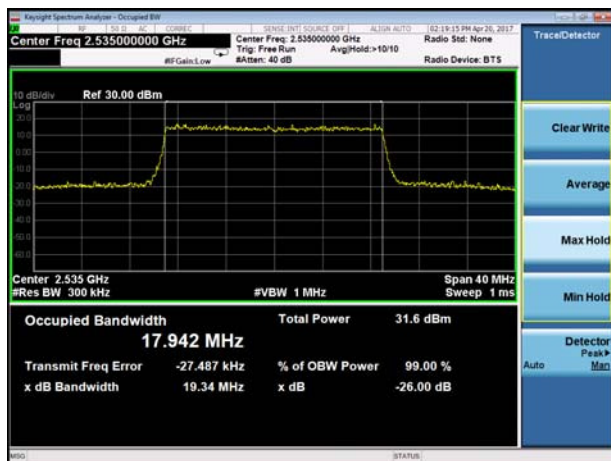
LTE Band 7 QPSK 20MHz CH-Low



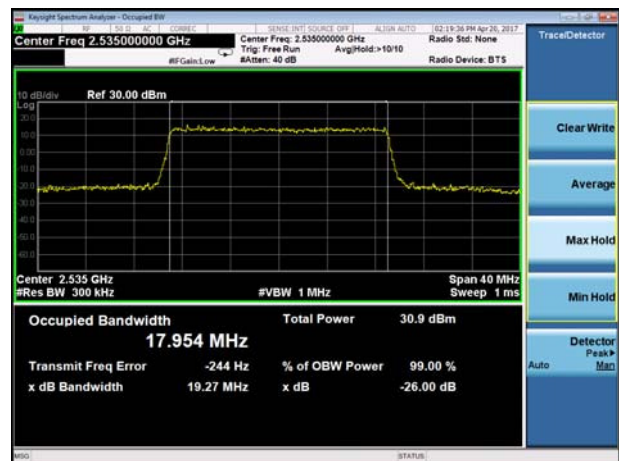
LTE Band 7 16QAM 20MHz CH-Low



LTE Band 7 QPSK 20MHz CH-Middle



LTE Band 7 16QAM 20MHz CH-Middle



LTE Band 7 QPSK 20MHz CH-High



LTE Band 7 16QAM 20MHz CH-High



4.4 Band Edge Compliance

Ambient condition

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

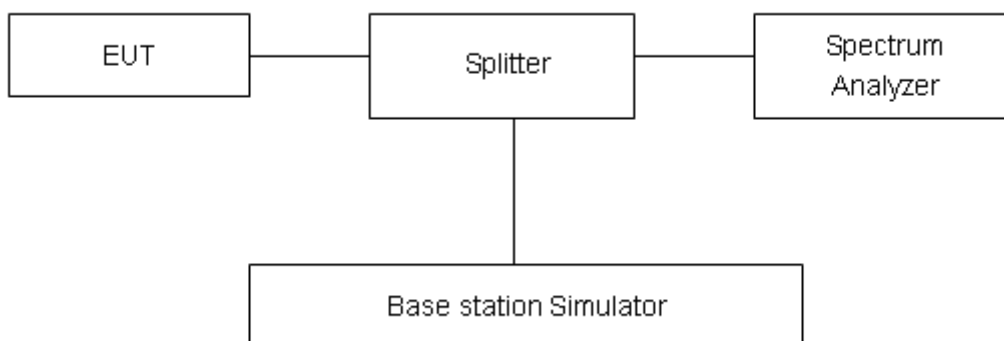
Method of Measurement

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

Rule Part 27.53(h)/ specifies that “ for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB”

Part 27.53(g) specifies that “ For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log_{10} (P)$ dB.”

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.

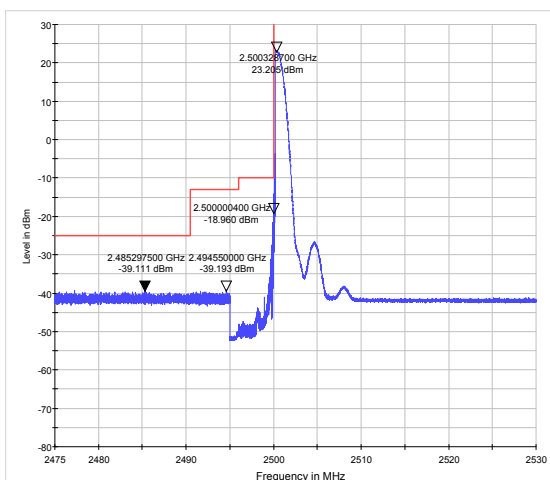
Measurement Uncertainty

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.

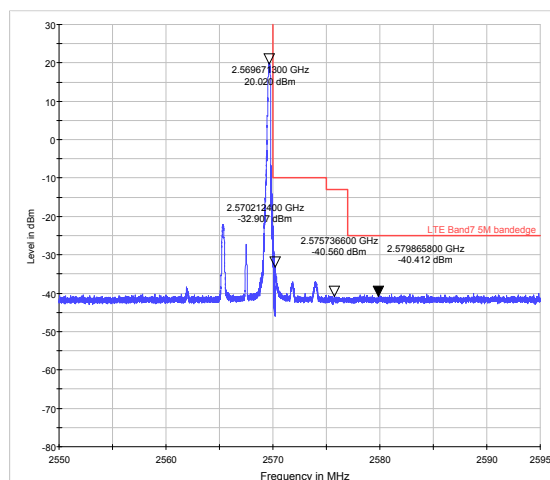
Test Result

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

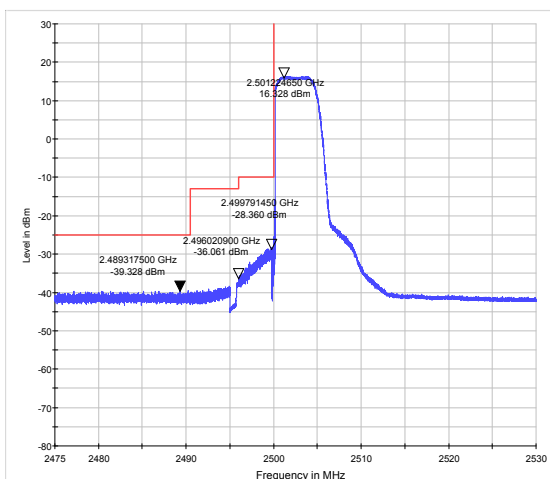
LTE Band 7 QPSK 5MHz CH-Low, RB 1



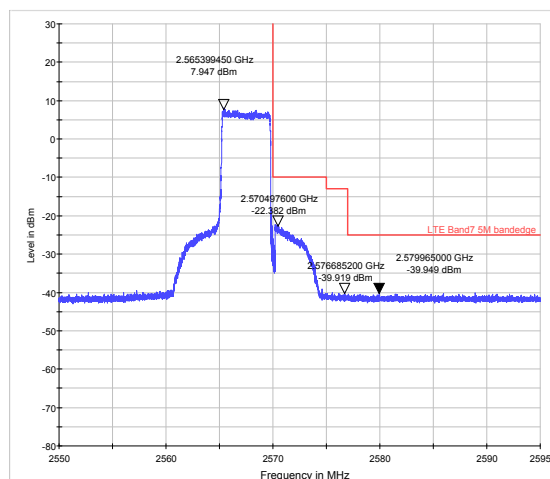
LTE Band 7 QPSK 5MHz CH-High, RB 1



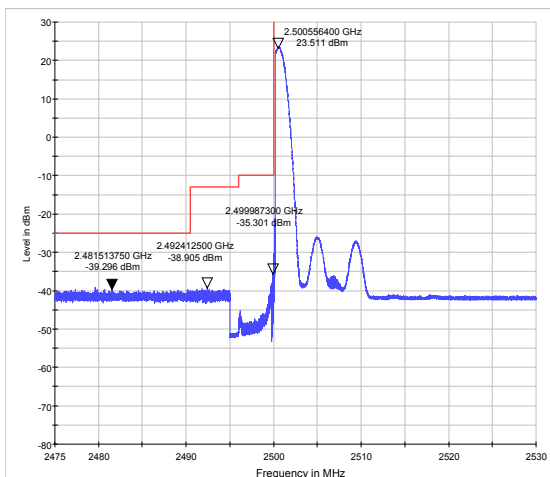
LTE Band 7 QPSK 5MHz CH-Low, RB 25



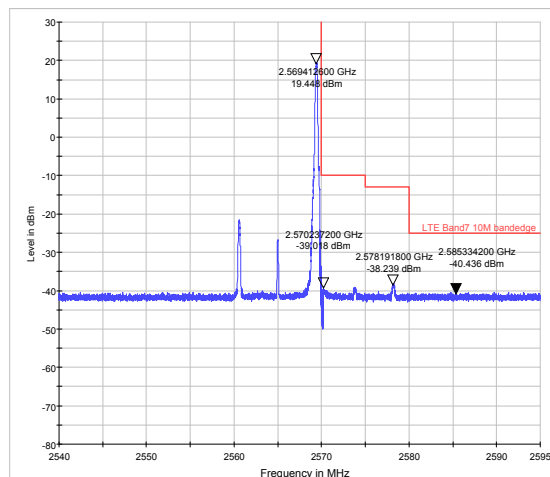
LTE Band 7 QPSK 5MHz CH-High, RB 25



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

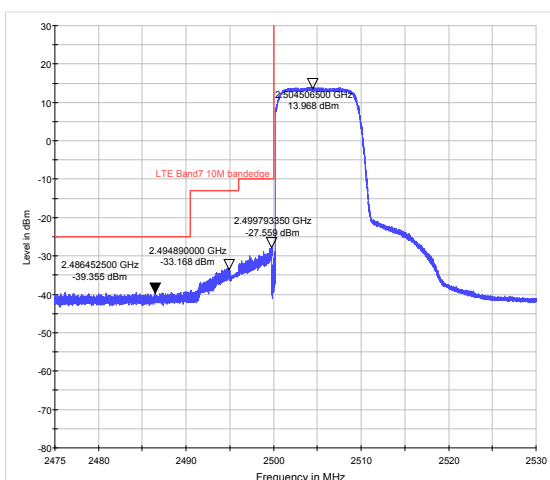


LTE Band 7 QPSK 10MHz CH-High, RB 1

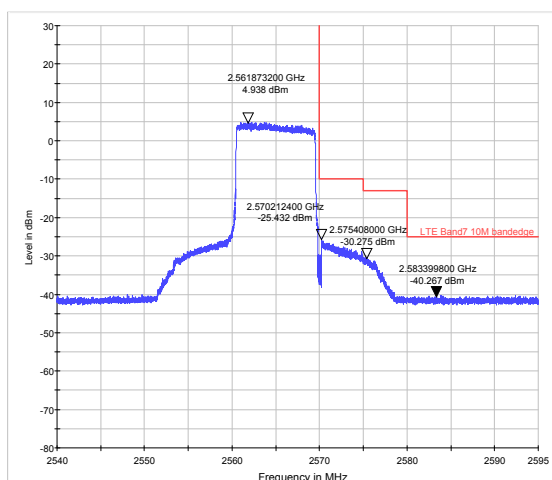




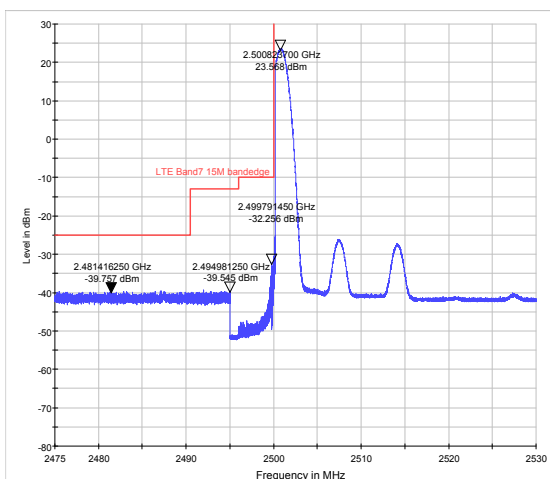
LTE Band 7 QPSK 10MHz CH-Low, RB 50



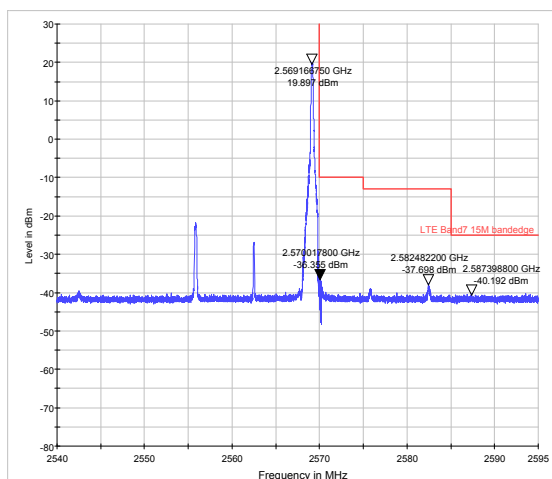
LTE Band 7 QPSK 10MHz CH-High, RB 50



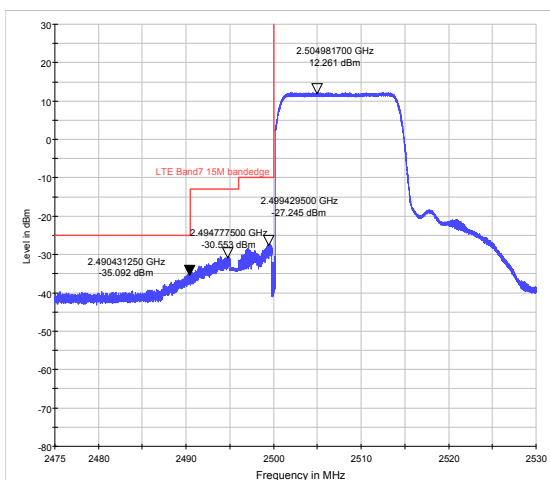
LTE Band 7 QPSK 15MHz CH-Low, RB 1



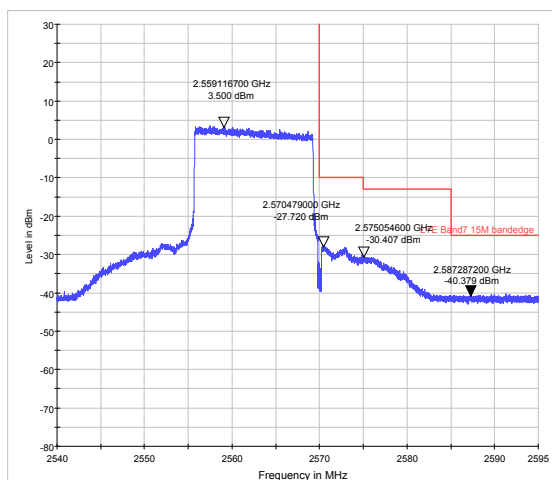
LTE Band 7 QPSK 15MHz CH-High, RB 1



LTE Band 7 QPSK 15MHz CH-Low, RB 75

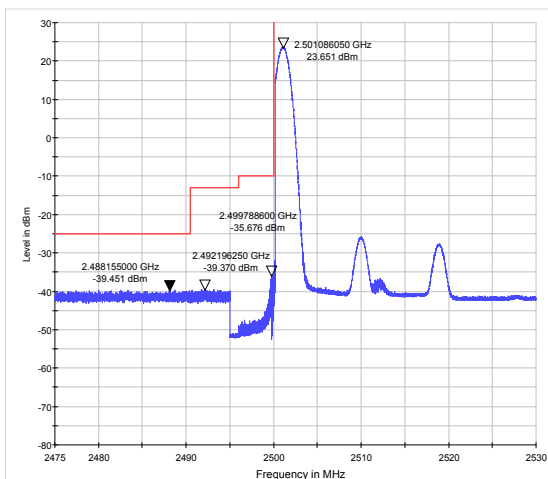


LTE Band 7 QPSK 15MHz CH-High, RB 75

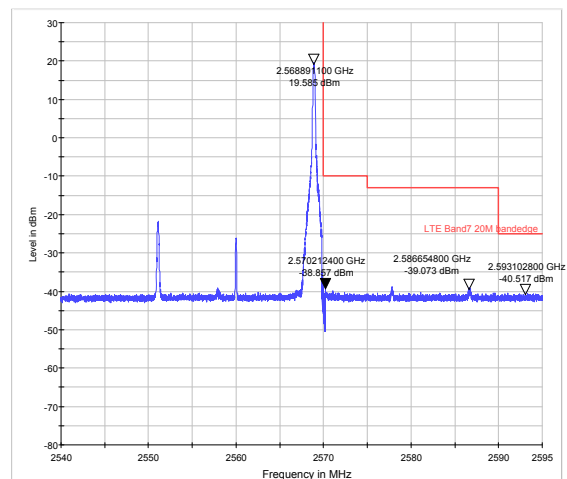




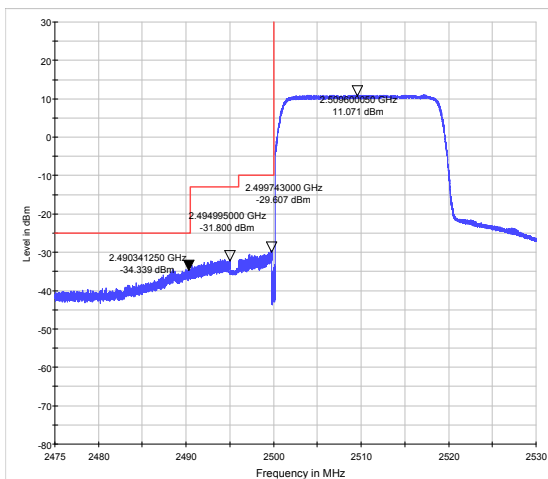
LTE Band 7 QPSK 20MHz CH-Low, RB 1



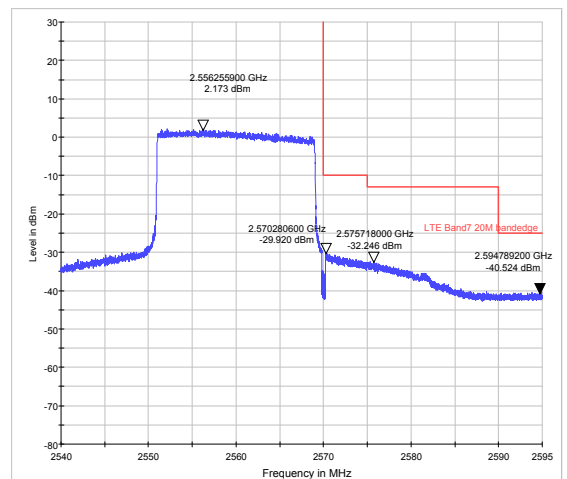
LTE Band 7 QPSK 20MHz CH-High, RB 1



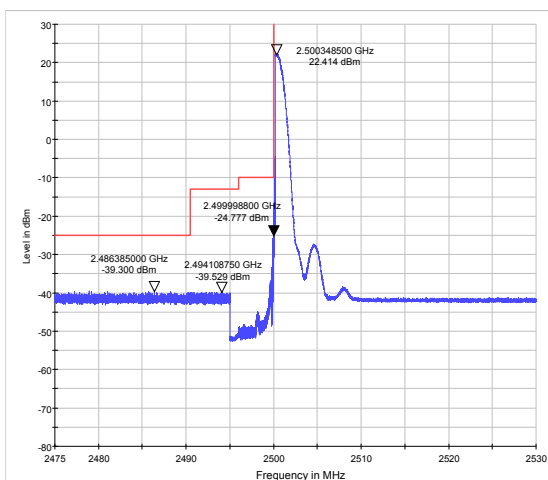
LTE Band 7 QPSK 20MHz CH-Low, RB 100



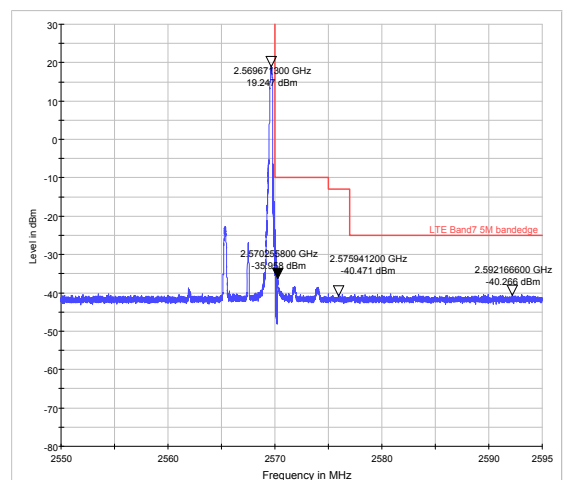
LTE Band 7 QPSK 20MHz CH-High, RB 100



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

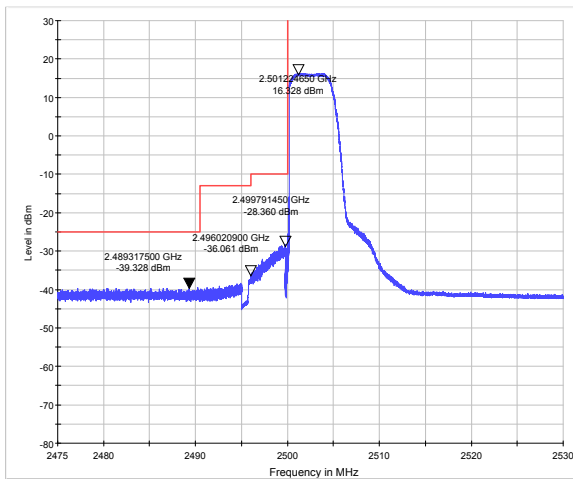


LTE Band 7 16QAM 5MHz CH-High, RB 1

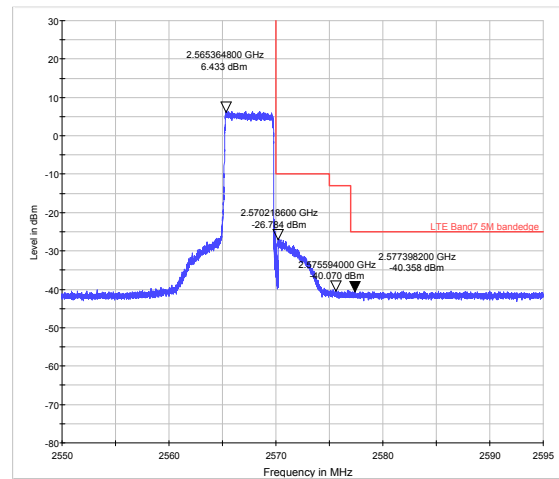




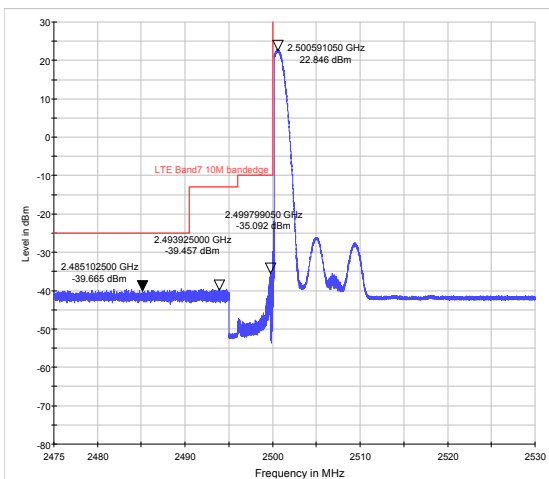
LTE Band 7 16QAM 5MHz CH-Low, RB 25



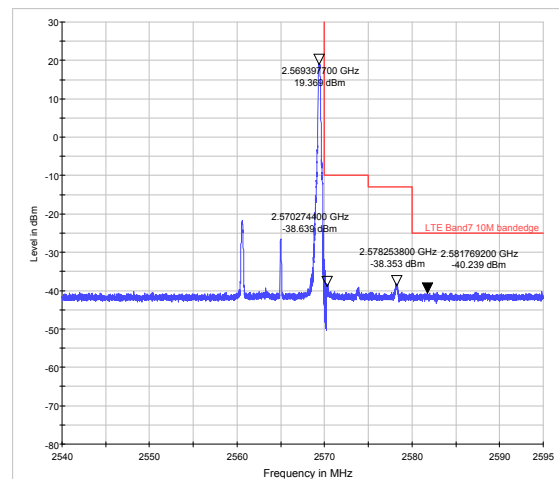
LTE Band 7 16QAM 5MHz CH-High, RB 25



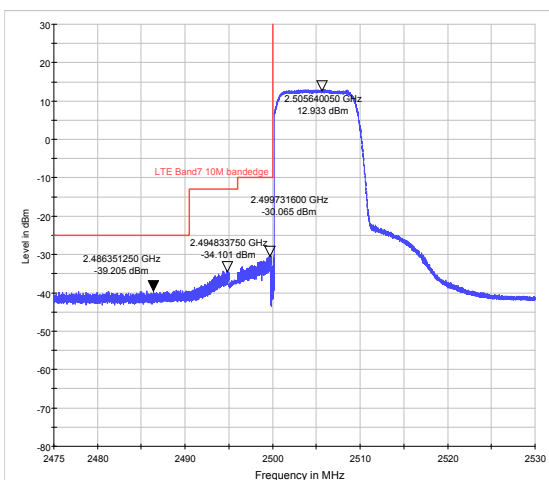
LTE Band 7 16QAM 10MHz CH-Low, RB 1



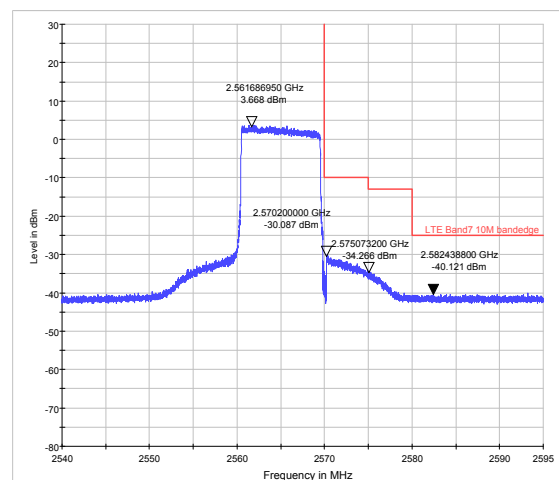
LTE Band 7 16QAM 10MHz CH-High, RB 1



LTE Band 7 16QAM 10MHz CH-Low, RB 50

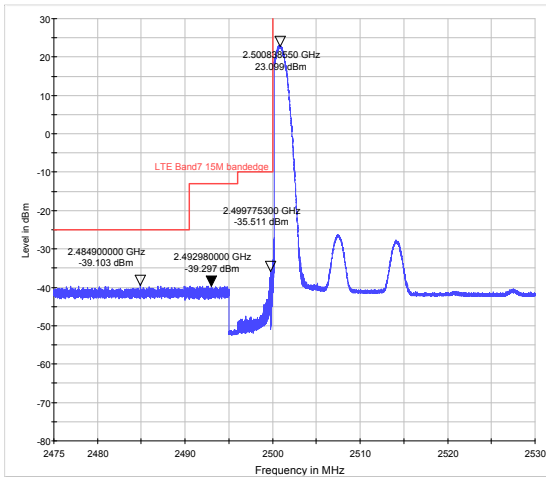


LTE Band 7 16QAM 10MHz CH-High, RB 50

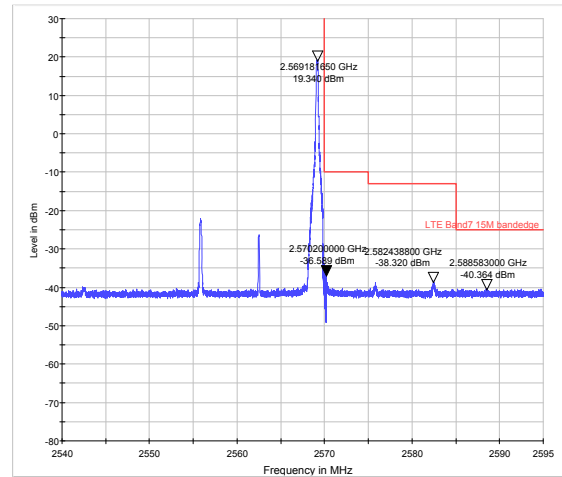




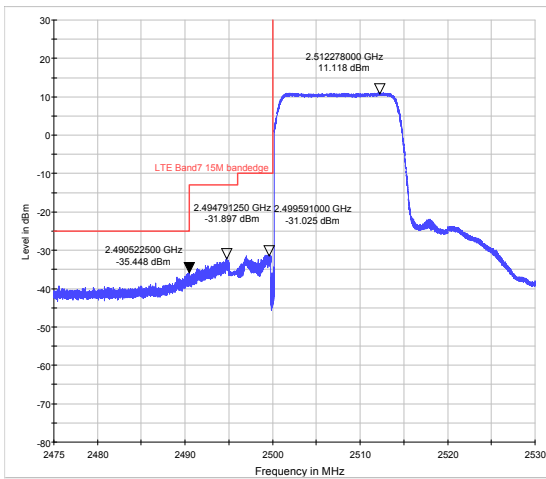
LTE Band 7 16QAM 15MHz CH-Low, RB 1



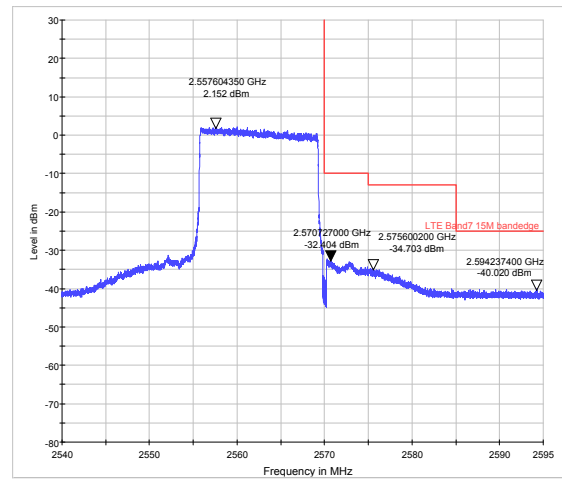
LTE Band 7 16QAM 15MHz CH-High, RB 1



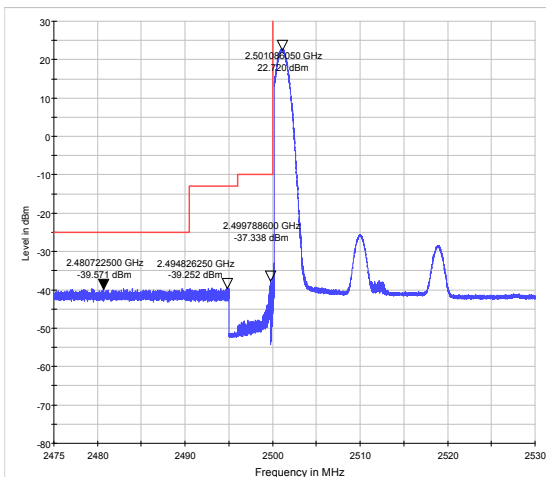
LTE Band 7 16QAM 15MHz CH-Low, RB 75



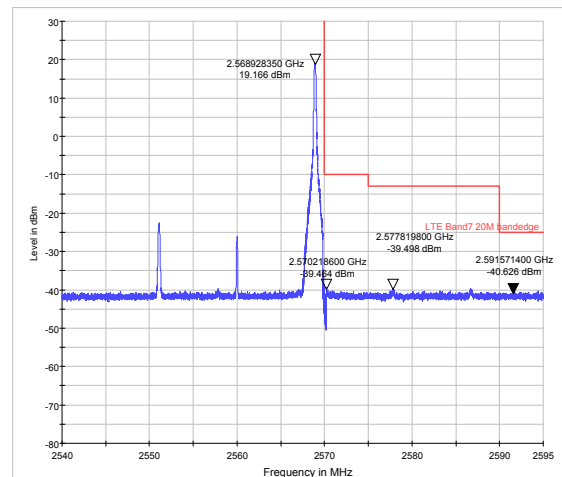
LTE Band 7 16QAM 15MHz CH-High, RB 75



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

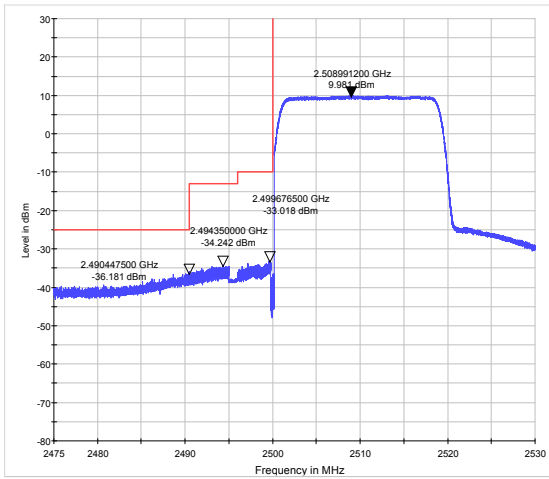


LTE Band 7 16QAM 20MHz CH-High, RB 1

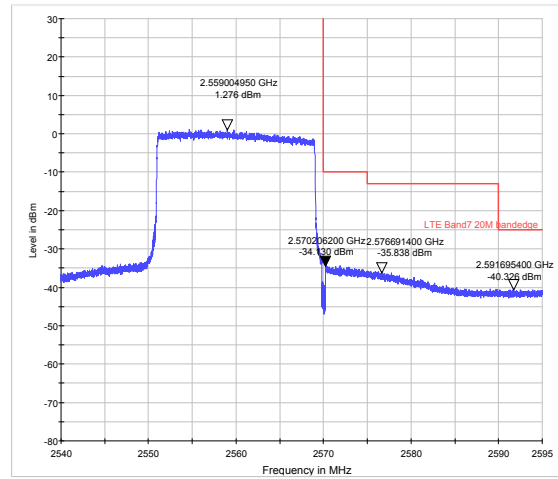




LTE Band 7 16QAM 20MHz CH-Low, RB 100



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



4.5 Peak-to-Average Power Ratio (PAPR)

Ambient condition

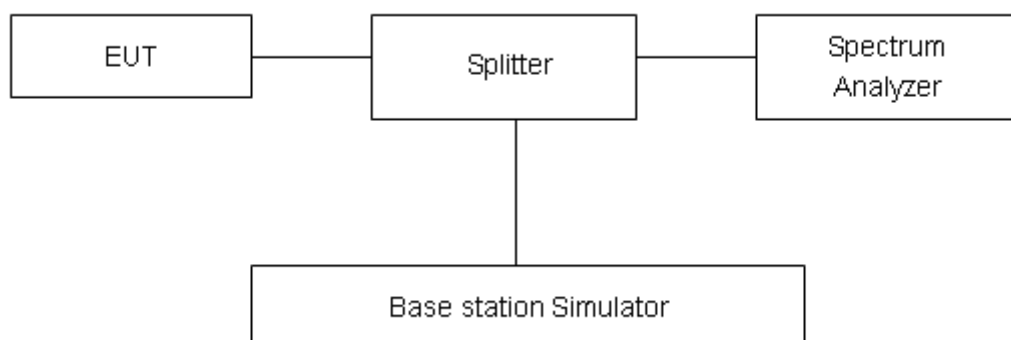
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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:

$$\text{PAPR (dB)} = \text{PPk (dBm)} - \text{PAvg (dBm)}.$$

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)	Conclusion
QPSK	5	20775	2502.5	27.35	22.33	5.02	PASS
		21100	2535	27.04	22.11	4.93	PASS
		21425	2567.5	27.27	22.33	4.94	PASS
	10	20800	2505	27.43	22.41	5.02	PASS
		21100	2535	27.03	22.13	4.90	PASS
		21400	2565	27.22	22.37	4.85	PASS
	15	20825	2507.5	27.63	22.39	5.24	PASS
		21100	2535	27.19	22.09	5.10	PASS
		21375	2562.5	27.42	22.32	5.10	PASS
	20	20850	2510	27.32	22.36	4.96	PASS
		21100	2535	26.94	22.04	4.90	PASS
		21350	2560	27.22	22.28	4.94	PASS
16QAM	5	20775	2502.5	27.16	21.36	5.80	PASS
		21100	2535	26.90	21.15	5.75	PASS
		21425	2567.5	27.01	21.27	5.74	PASS
	10	20800	2505	27.22	21.39	5.83	PASS
		21100	2535	26.88	21.20	5.68	PASS
		21400	2565	26.95	21.31	5.64	PASS
	15	20825	2507.5	27.31	21.36	5.95	PASS
		21100	2535	26.97	21.15	5.82	PASS
		21375	2562.5	27.05	21.27	5.78	PASS
	20	20850	2510	27.15	21.34	5.81	PASS
		21100	2535	26.83	21.11	5.72	PASS
		21350	2560	26.95	21.24	5.71	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 -30°C to +50°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 -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

2. Frequency Stability (Voltage Variation)

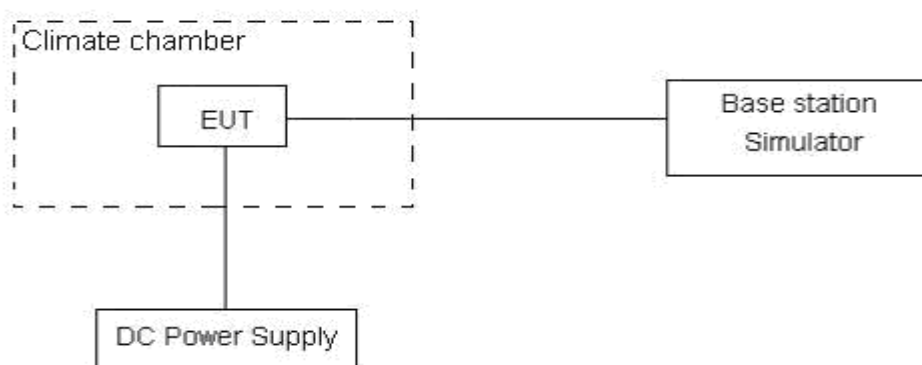
The frequency stability shall be measured with variation of primary supply voltage as follows:

(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 3.6 V and 4.35 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	Conclusion
5MHz	-30°C/Normal Voltage	0.00819	0.010338	PASS
	-20°C/Normal Voltage	0.01031	0.012833	PASS
	-10°C/Normal Voltage	0.00857	0.010575	PASS
	0°C/Normal Voltage	0.00821	0.008093	PASS
	10°C/Normal Voltage	0.01167	0.010287	PASS
	20°C/Normal Voltage	0.00865	0.00964	PASS
	30°C/Normal Voltage	0.01113	0.008341	PASS
	40°C/Normal Voltage	0.00578	0.010626	PASS
	50°C/Normal Voltage	0.00674	0.008172	PASS
	20°C/Min Voltage	0.01289	0.01124	PASS
	20°C/Max Voltage	0.01110	0.00789	PASS
10MHz	-30°C/Normal Voltage	0.00241	0.0006	PASS
	-20°C/Normal Voltage	0.00253	-0.00279	PASS
	-10°C/Normal Voltage	0.00277	-0.00224	PASS
	0°C/Normal Voltage	-0.00227	-0.00108	PASS
	10°C/Normal Voltage	0.00252	0.001323	PASS
	20°C/Normal Voltage	0.00242	0.00145	PASS
	30°C/Normal Voltage	0.00066	-0.00195	PASS
	40°C/Normal Voltage	-0.00273	-0.00174	PASS
	50°C/Normal Voltage	-0.00218	-0.00283	PASS
	20°C/Min Voltage	0.00061	0.000935	PASS
	20°C/Max Voltage	0.00121	0.002353	PASS
15MHz	-30°C/Normal Voltage	0.00200	0.000202	PASS
	-20°C/Normal Voltage	0.00212	-0.0032	PASS
	-10°C/Normal Voltage	0.00237	-0.00265	PASS
	0°C/Normal Voltage	-0.00268	-0.00147	PASS
	10°C/Normal Voltage	0.00211	-0.00093	PASS
	20°C/Normal Voltage	0.00201	-0.00106	PASS
	30°C/Normal Voltage	-0.00344	0.002343	PASS
	40°C/Normal Voltage	0.00314	-0.00215	PASS
	50°C/Normal Voltage	-0.00260	-0.00058	PASS
	20°C/Min Voltage	0.00018	0.000537	PASS
	20°C/Max Voltage	0.00081	0.00195	PASS
20MHz	-30°C/Normal Voltage	0.00117	-0.00284	PASS
	-20°C/Normal Voltage	0.00062	-0.00296	PASS
	-10°C/Normal Voltage	-0.00060	-0.0024	PASS



	0°C/Normal Voltage	-0.00277	-0.00169	PASS
	10°C/Normal Voltage	-0.00109	-0.00249	PASS
	20°C/Normal Voltage	-0.00158	-0.00139	PASS
	30°C/Normal Voltage	-0.00151	-0.00119	PASS
	40°C/Normal Voltage	-0.00459	-0.00019	PASS
	50°C/Normal Voltage	-0.00249	-0.00203	PASS
	20°C/Min Voltage	-0.00211	-0.00187	PASS
	20°C/Max Voltage	-0.00187	-0.00189	PASS

4.7 Spurious Emissions at Antenna Terminals

Ambient condition

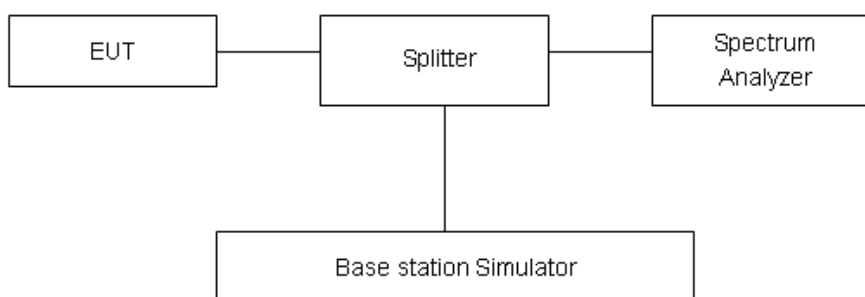
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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. RBW and VBW are set to 100 kHz for the carrier frequency, or RBW and VBW are set to 1MHz (other frequency), Sweep is set to ATUO.

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

Test setup



Limits

LTE -4 Rule Part 27.53(h) specifies that “for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB..”

LTE -12 Rule Part 27.53 (g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least $43 + 10 \log (P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

LTE -13 Rule Part 27.53(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to –70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and –80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be



tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

LTE -7/41 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	-25 dBm
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Measurement Uncertainty

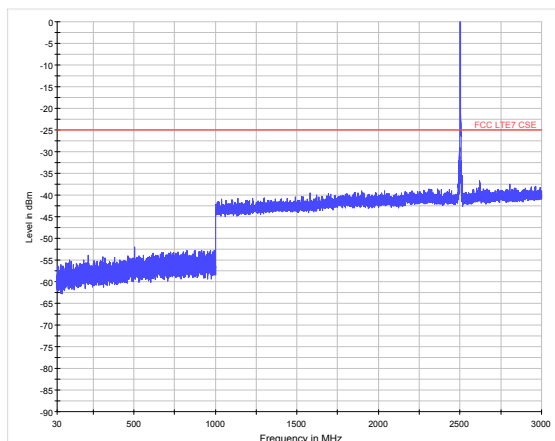
The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

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

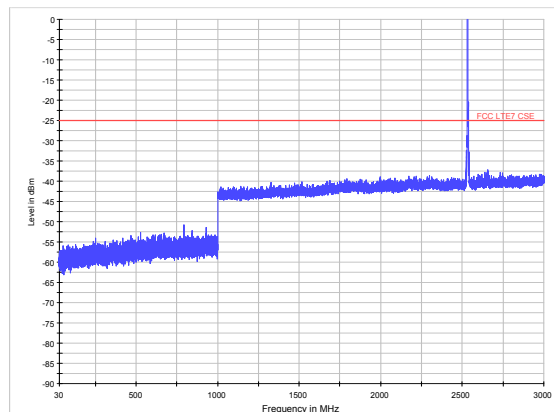
Test Result: PASS

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.

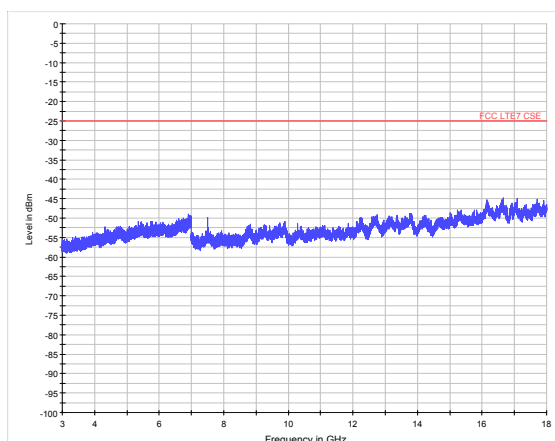
LTE Band 7 5MHz CH-Low 30MHz~3GHz



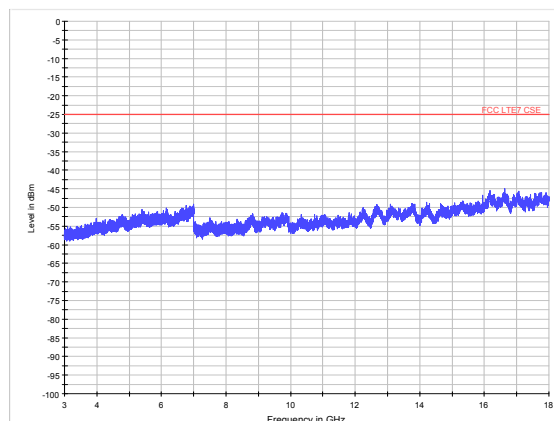
LTE Band 7 5MHz CH-Middle 30MHz~3GHz



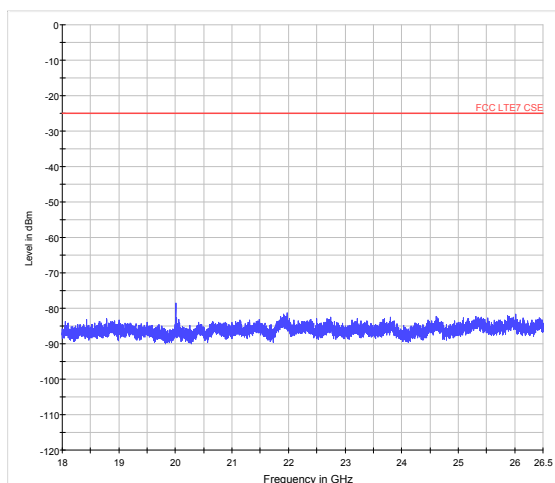
LTE Band 7 5MHz CH-Low 3GHz~18GHz



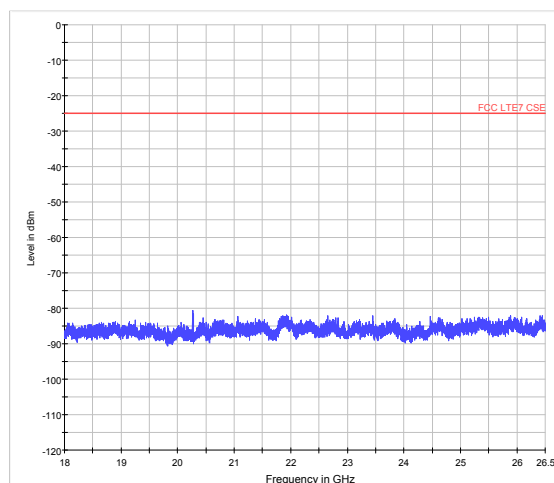
LTE Band 7 5MHz CH-Middle 3GHz~18GHz



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

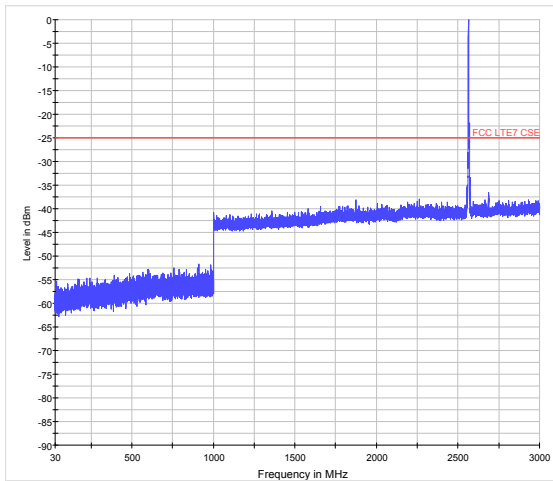


LTE Band 7 5MHz CH-Middle 18GHz~26.5GHz

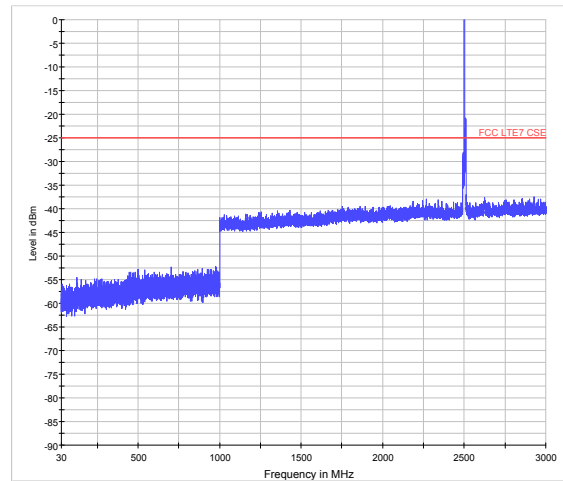




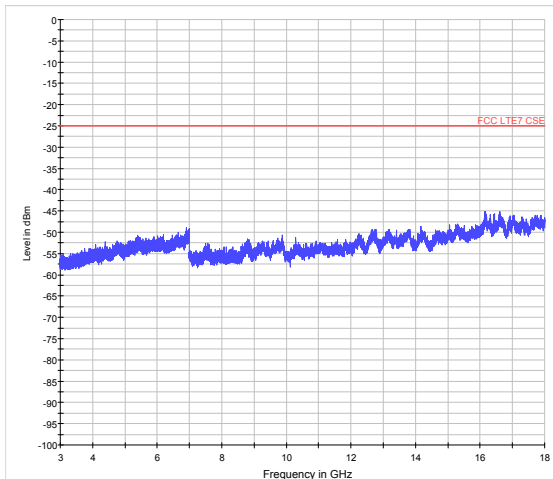
LTE Band 7 5MHz CH-High 30MHz~3GHz



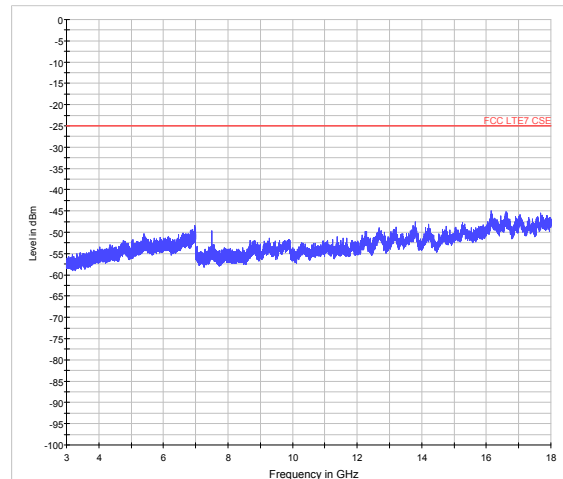
LTE Band 7 10MHz CH-Low 30MHz~3GHz



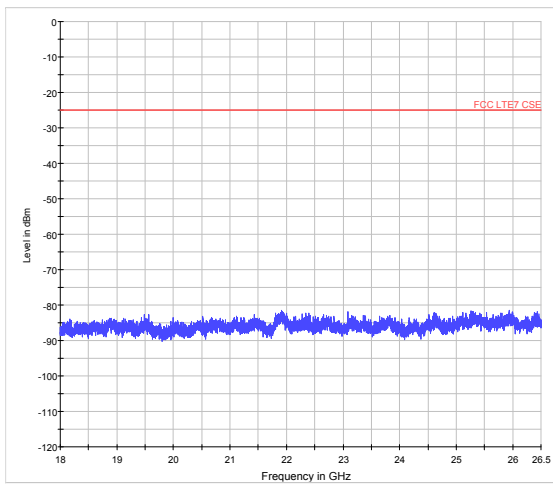
LTE Band 7 5MHz CH-High 3GHz~18GHz



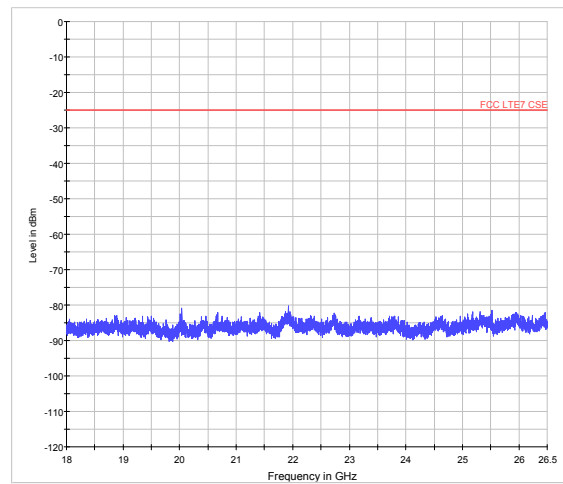
LTE Band 7 10MHz CH-Low 3GHz~18GHz



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

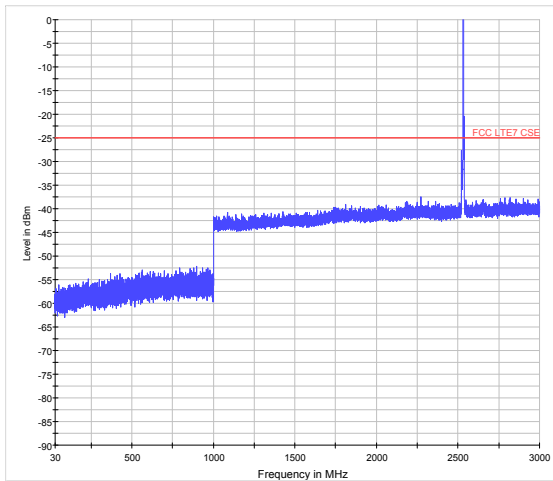


LTE Band 7 10MHz C CH-Low 18GHz~26.5GHz

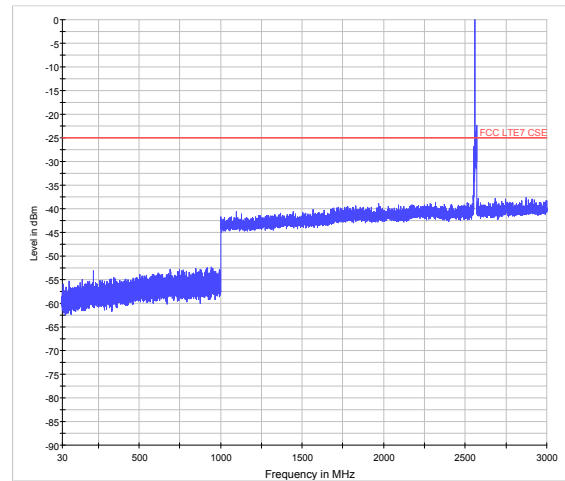




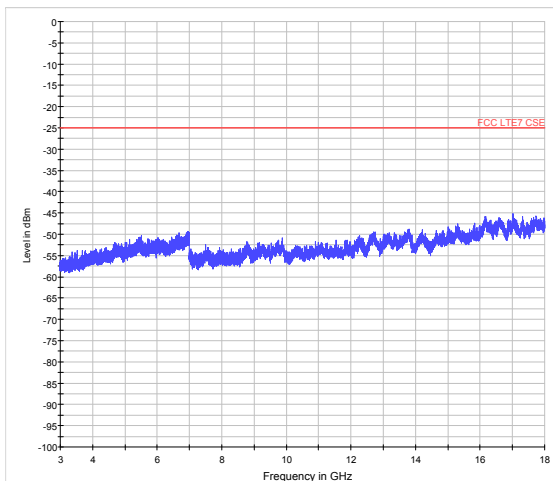
LTE Band 7 10MHz CH-Middle 30MHz~3GHz



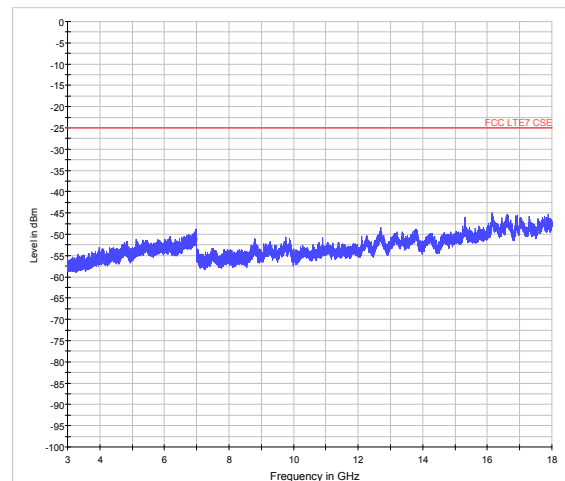
LTE Band 7 10MHz CH-High 30MHz~3GHz



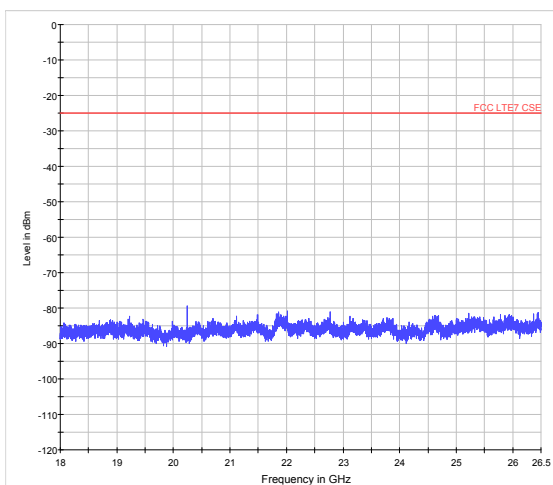
LTE Band 7 10MHz CH-Middle 3GHz~18GHz



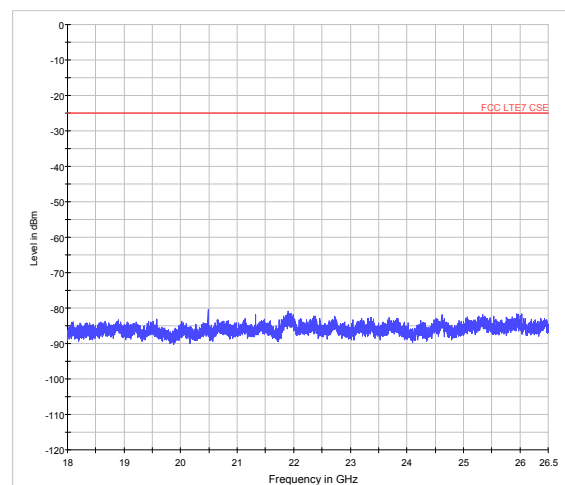
LTE Band 7 10MHz CH-High 3GHz~18GHz



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

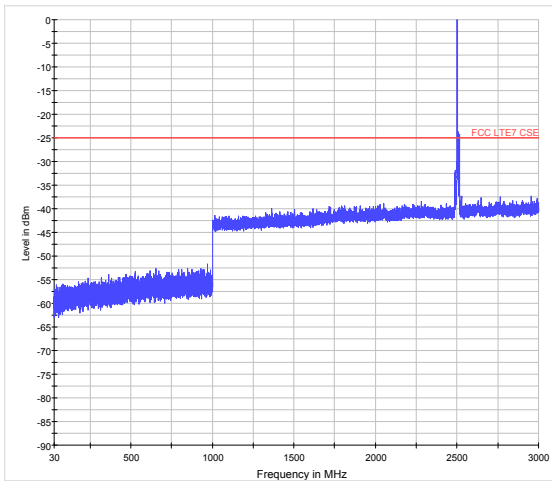


LTE Band 7 10MHz CH-High 18GHz~26.5GHz

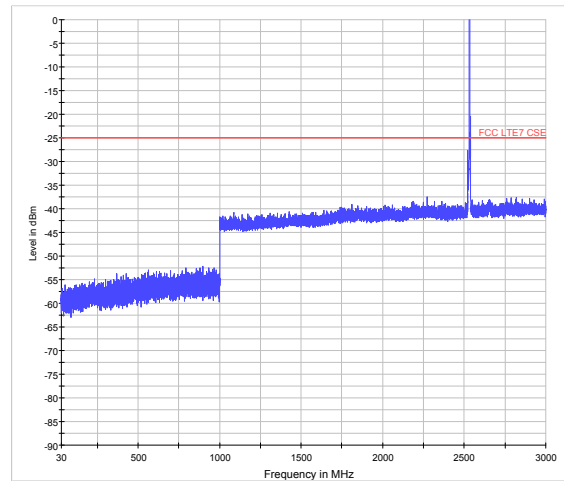




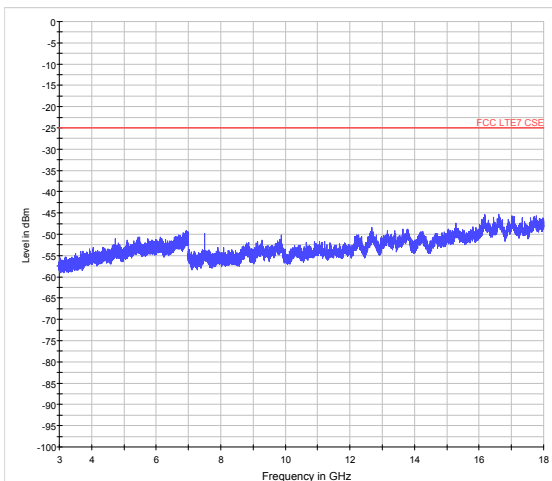
LTE Band 7 15MHz CH-Low 30MHz~3GHz



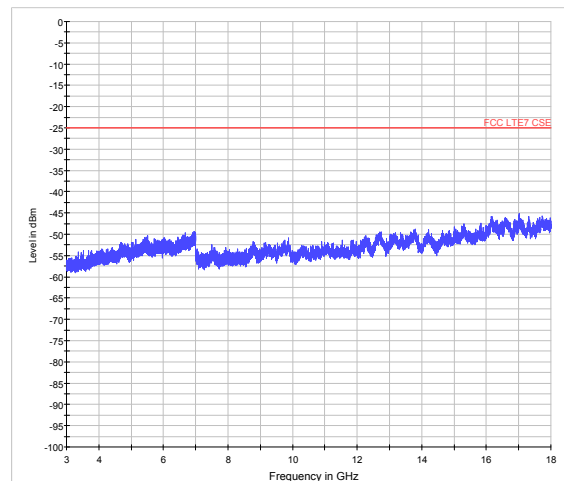
LTE Band 7 15MHz CH-Middle 30MHz~3GHz



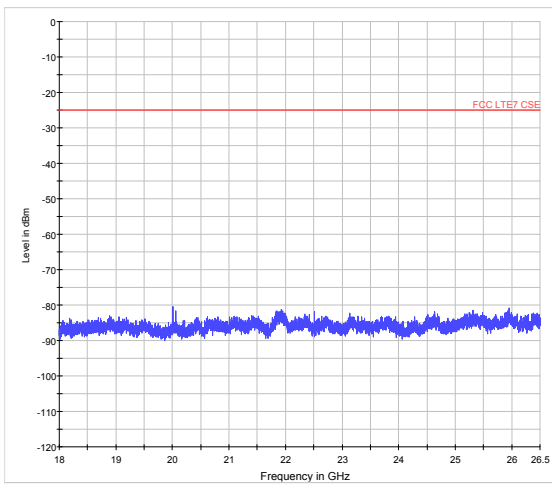
LTE Band 7 15MHz CH-Low 3GHz~18GHz



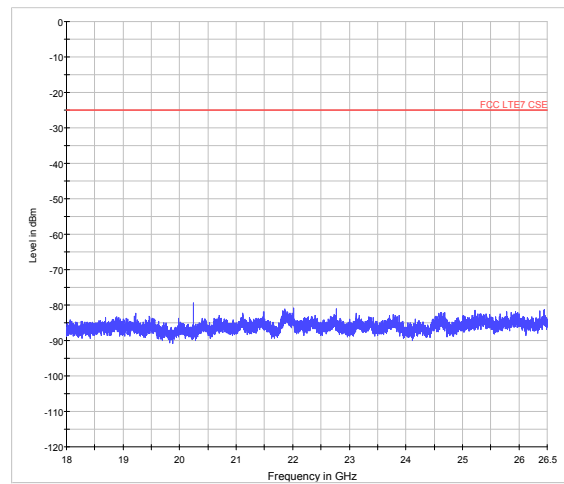
LTE Band 7 15MHz CH-Middle 3GHz~18GHz



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

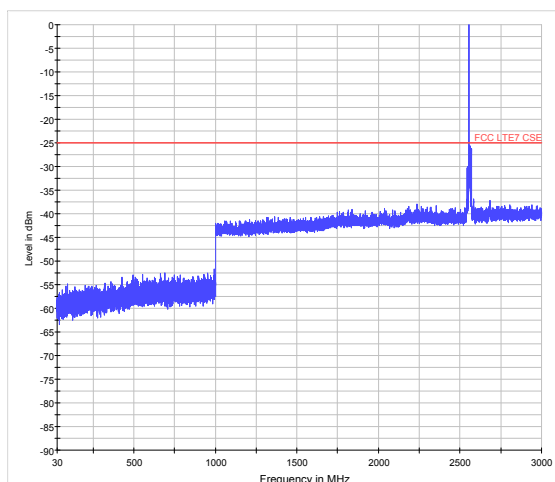


LTE Band 7 15MHz CH-Middle 18GHz~26.5GHz

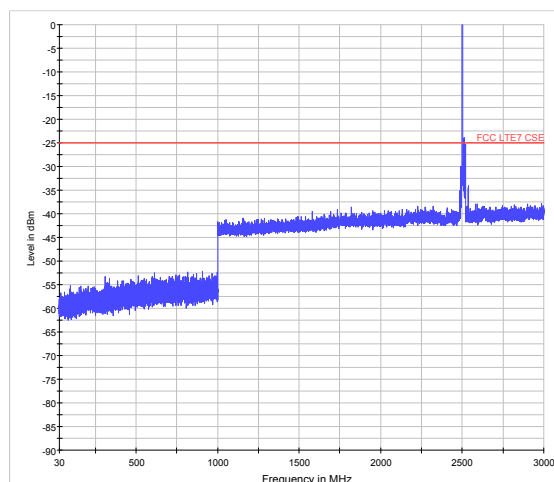




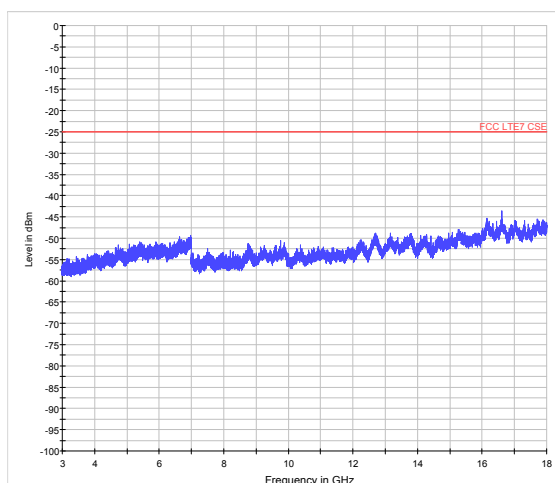
LTE Band 7 15MHz CH-High 30MHz~3GHz



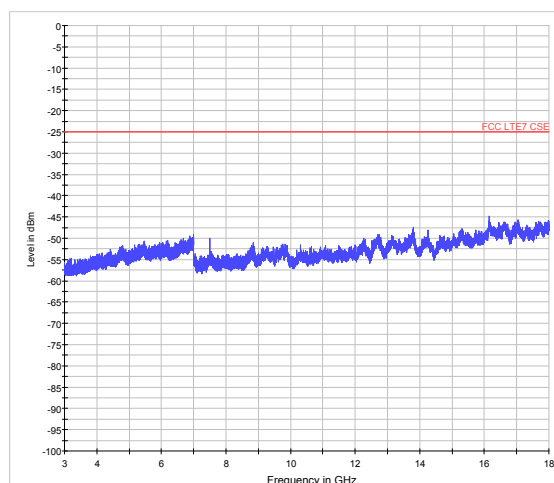
LTE Band 7 20MHz CH-Low 30MHz~3GHz



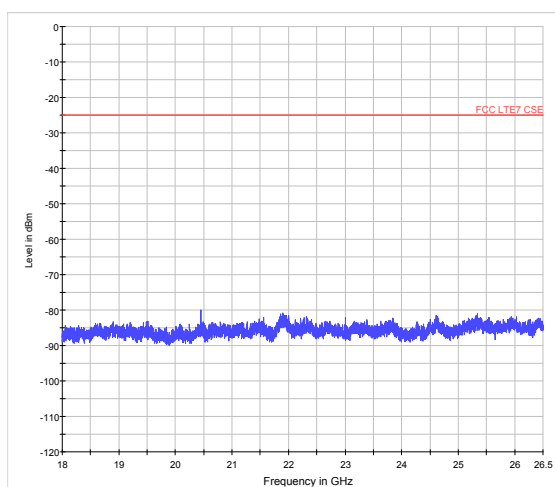
LTE Band 7 15MHz CH-High 3GHz~18GHz



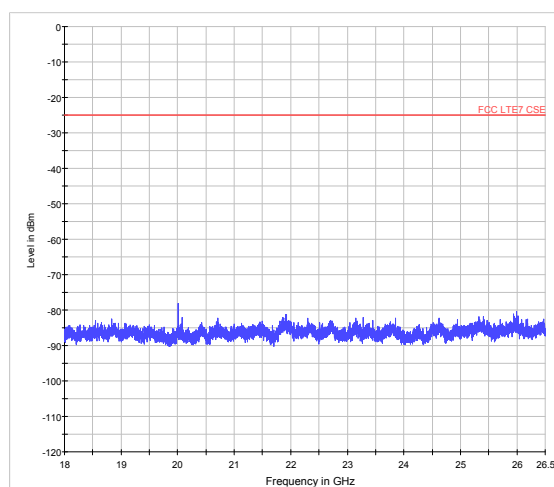
LTE Band 7 20MHz CH-Low 3GHz~18GHz



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

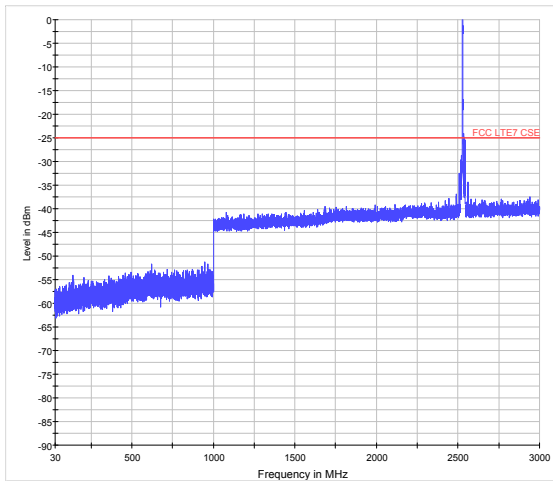


LTE Band 7 20MHz CH-Low 18GHz~26.5GHz

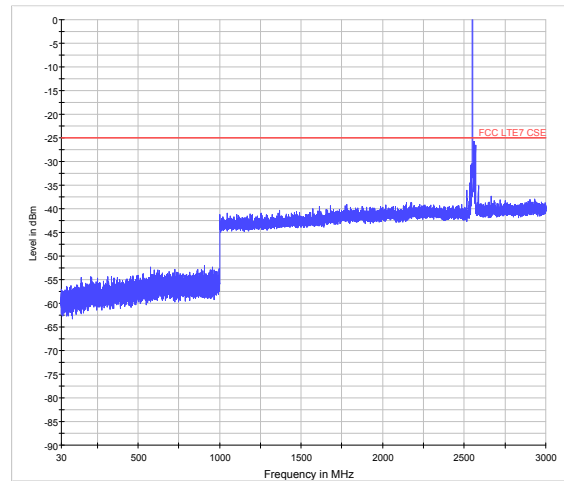




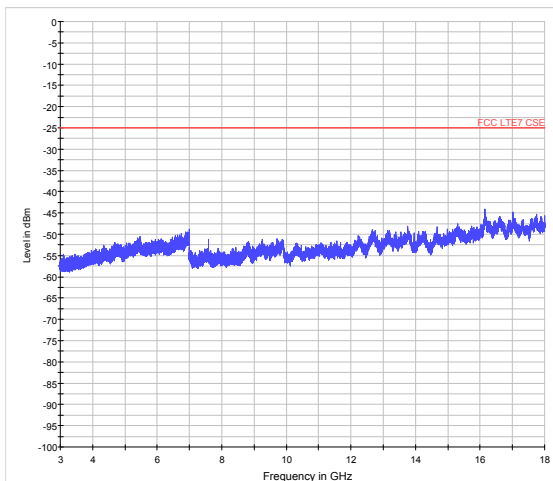
LTE Band 7 20MHz CH-Middle 30MHz~3GHz



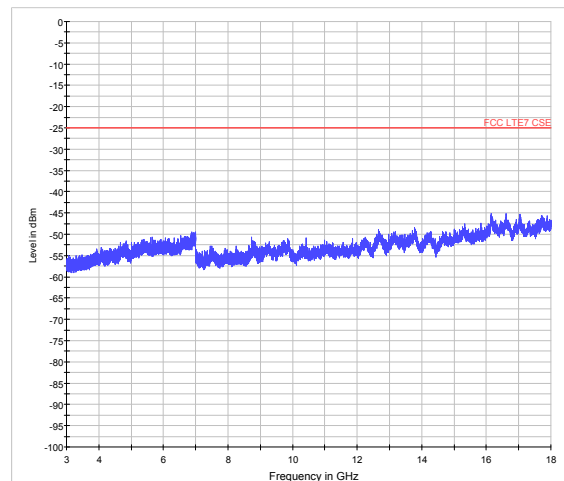
LTE Band 7 20MHz CH-High 30MHz~3GHz



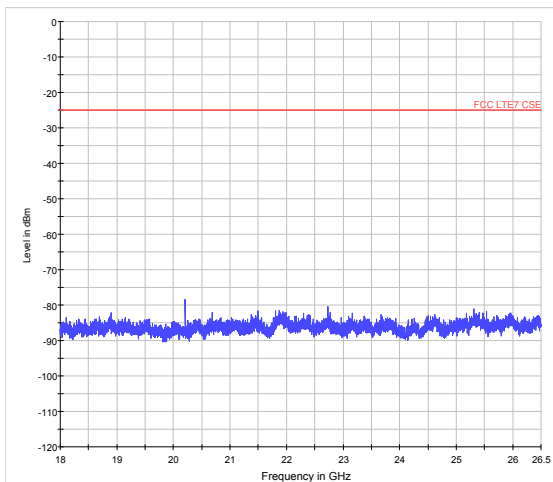
LTE Band 7 20MHz CH-Middle 3GHz~18GHz



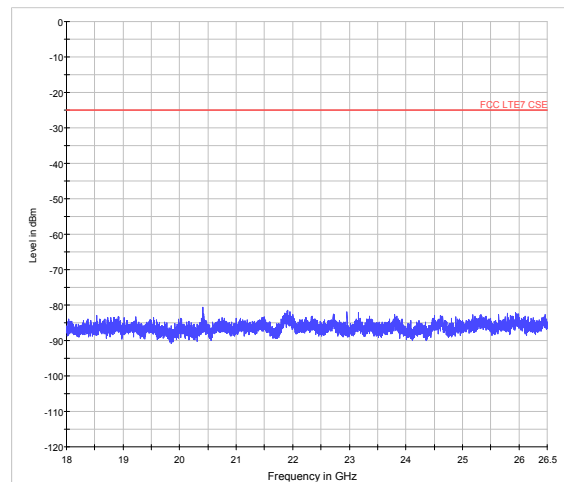
LTE Band 7 20MHz CH-High 3GHz~18GHz



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

1. The testing follows FCC KDB 971168 v02r02 Section 5.8 and ANSI / TIA-603-D-2010 Section 2.2.12.
2. 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).
3. 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.
4. 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 for above 1GHz and RBW=100kHz, VBW=300kHz for 30MHz to 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:

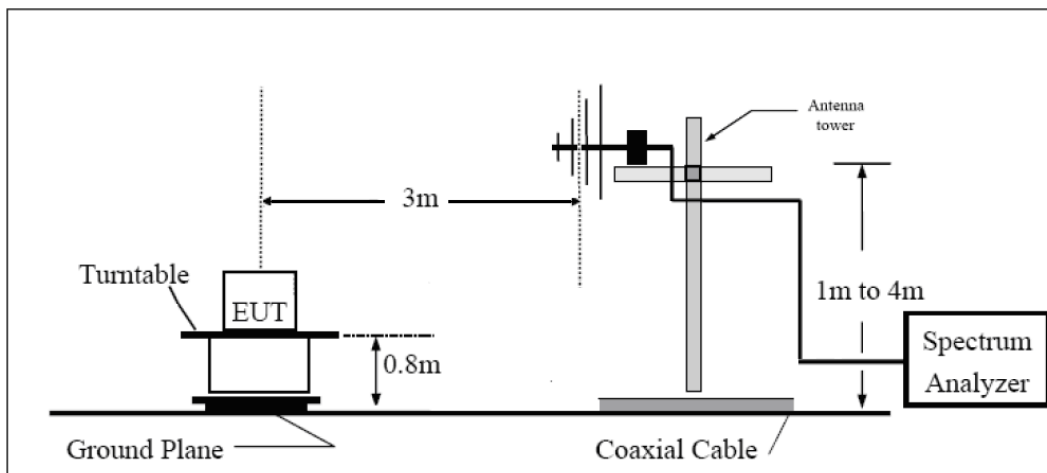
Power(EIRP)=PMea- Pcl + Ga

7. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

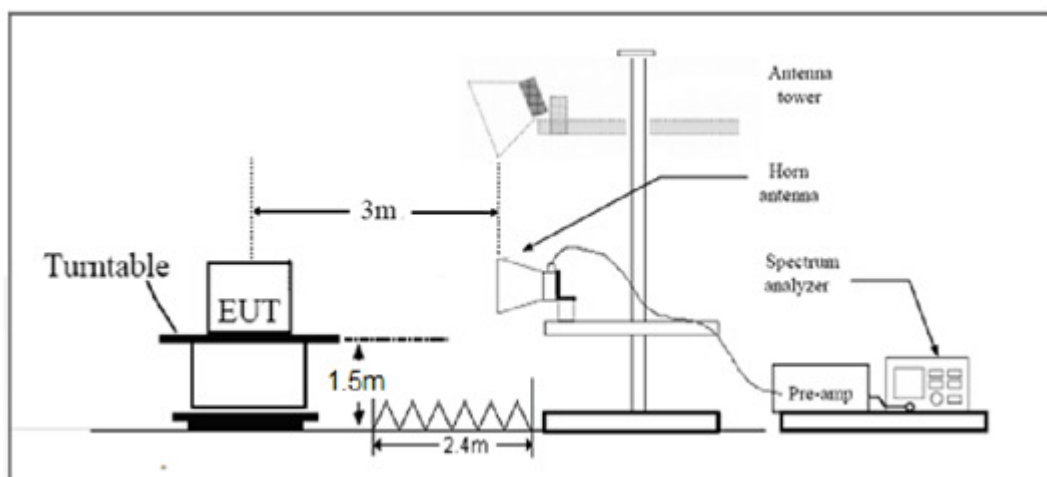
and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

Test setup

30MHz~~~ 1GHz



Above 1GHz



Note: Area side: 2.4m x 3.6m

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

LTE -7 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	5000.6	-47.05	2.00	9.15	Vertical	-39.9	-25.0	14.9	135
3	7501.1	-54.15	2.50	11.35	Vertical	-45.3	-25.0	20.3	270
4	10001.3	-49.05	4.20	12.05	Vertical	-41.2	-25.0	16.2	45
5	12512.5	-47.75	5.20	12.85	Vertical	-40.1	-25.0	15.1	225
6	15015.0	-45.33	5.50	14.23	Vertical	-36.6	-25.0	11.6	270
7	17517.5	-43.65	5.70	14.15	Vertical	-35.2	-25.0	10.2	90
8	20002.4	-41.66	6.30	13.76	Vertical	-34.2	-25.0	9.2	45
9	22502.7	-40.75	6.80	14.05	Vertical	-33.5	-25.0	8.5	90
10	25003.0	-40.04	6.90	14.84	Vertical	-32.1	-25.0	7.1	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.

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	5065.8	-47.85	2.00	9.15	Vertical	-40.7	-25.0	15.7	45
3	7598.6	-51.65	2.50	11.35	Vertical	-42.8	-25.0	17.8	225
4	10130.6	-47.05	4.20	12.05	Vertical	-39.2	-25.0	14.2	270
5	12675.0	-43.95	5.20	12.85	Vertical	-36.3	-25.0	11.3	90
6	15210.0	-43.33	5.50	14.23	Vertical	-34.6	-25.0	9.6	45
7	17745.0	-41.65	5.70	14.15	Vertical	-33.2	-25.0	8.2	90
8	20280.0	-40.06	6.30	13.76	Vertical	-32.6	-25.0	7.6	270
9	22815.0	-39.35	6.80	14.05	Vertical	-32.1	-25.0	7.1	45
10	25350.0	-40.44	6.90	14.84	Vertical	-32.5	-25.0	7.5	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 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	5130.8	-44.45	2.00	9.15	Vertical	-37.3	-25.0	12.3	270
3	7696.1	-47.55	2.50	11.35	Vertical	-38.7	-25.0	13.7	90
4	10261.1	-44.65	4.20	12.05	Vertical	-36.8	-25.0	11.8	45
5	12837.5	-42.15	5.20	12.85	Vertical	-34.5	-25.0	9.5	90
6	15405.0	-45.13	5.50	14.23	Vertical	-36.4	-25.0	11.4	270
7	17972.5	-42.35	5.70	14.15	Vertical	-33.9	-25.0	8.9	45
8	20540.0	-40.96	6.30	13.76	Vertical	-33.5	-25.0	8.5	225
9	23107.5	-39.85	6.80	14.05	Vertical	-32.6	-25.0	7.6	270
10	25675.0	-40.04	6.90	14.84	Vertical	-32.1	-25.0	7.1	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 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	5001.0		2.00	9.15	Vertical	-40.7	-25.0	15.7	45
3	7515.0	-47.85	2.50	11.35	Vertical	-34.6	-25.0	9.6	90
4	10002.4	-43.45	4.20	12.05	Vertical	-34.6	-25.0	9.6	270
5	12525.0	-42.45	5.20	12.85	Vertical	-35.5	-25.0	10.5	45
6	15030.0	-43.15	5.50	14.23	Vertical	-36.4	-25.0	11.4	225
7	17535.0	-45.13	5.70	14.15	Vertical	-35.6	-25.0	10.6	270
8	20040.0	-44.05	6.30	13.76	Vertical	-35.2	-25.0	10.2	90
9	22545.0	-42.66	6.80	14.05	Vertical	-34.3	-25.0	9.3	45
10	25050.0	-41.55	6.90	14.84	Vertical	-33.5	-25.0	8.5	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 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	-45.75	2.00	9.15	Vertical	-38.6	-25.0	13.6	45
3	75915.0	-47.05	2.50	11.35	Vertical	-38.2	-25.0	13.2	270
4	10140.0	-44.25	4.20	12.05	Vertical	-36.4	-25.0	11.4	45
5	12675.0	-43.95	5.20	12.85	Vertical	-36.3	-25.0	11.3	225
6	15210.0	-45.93	5.50	14.23	Vertical	-37.2	-25.0	12.2	270
7	17745.0	-44.15	5.70	14.15	Vertical	-35.7	-25.0	10.7	90
8	20280.0	-41.66	6.30	13.76	Vertical	-34.2	-25.0	9.2	45
9	22815.0	-41.35	6.80	14.05	Vertical	-34.1	-25.0	9.1	90
10	25350.0	-41.54	6.90	14.84	Vertical	-33.6	-25.0	8.6	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.

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	5121.4	-44.85	2.00	10.15	Vertical	-36.7	-25.0	11.7	45
3	7681.9	-47.35	2.50	11.35	Vertical	-38.5	-25.0	13.5	225
4	10242.0	-45.15	4.20	12.05	Vertical	-37.3	-25.0	12.3	270
5	12825.0	-46.75	5.20	14.85	Vertical	-37.1	-25.0	12.1	90
6	15390.0	-44.73	5.50	13.23	Vertical	-37.0	-25.0	12.0	45
7	17955.0	-42.15	5.70	12.15	Vertical	-35.7	-25.0	10.7	90
8	20520.0	-41.96	6.30	13.76	Vertical	-34.5	-25.0	9.5	270
9	23085.0	-40.85	6.80	14.05	Vertical	-33.6	-25.0	8.6	45
10	25650.0	-40.44	6.90	14.84	Vertical	-32.5	-25.0	7.5	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-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	5001.8	-49.15	2.00	10.15	Vertical	-41.0	-25.0	16.0	270
3	7502.6	-43.55	2.50	11.35	Vertical	-34.7	-25.0	9.7	90
4	1000.4	-41.75	4.20	12.05	Vertical	-33.9	-25.0	8.9	45
5	12537.5	-43.85	5.20	14.85	Vertical	-34.2	-25.0	9.2	90
6	15045.0	-42.93	5.50	13.23	Vertical	-35.2	-25.0	10.2	270
7	17552.5	-41.35	5.70	12.15	Vertical	-34.9	-25.0	9.9	45
8	20060.0	-40.96	6.30	13.76	Vertical	-33.5	-25.0	8.5	225
9	22567.5	-40.35	6.80	14.05	Vertical	-33.1	-25.0	8.1	270
10	25075.0	-40.54	6.90	14.84	Vertical	-32.6	-25.0	7.6	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 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	5056.9	-47.25	2.00	10.15	Vertical	-39.1	-25.0	14.1	45
3	7584.8	-46.55	2.50	11.35	Vertical	-37.7	-25.0	12.7	90
4	10140.0	-43.85	4.20	12.05	Vertical	-36.0	-25.0	11.0	270
5	12675.0	-46.25	5.20	14.85	Vertical	-36.6	-25.0	11.6	45
6	15210.0	-44.23	5.50	13.23	Vertical	-36.5	-25.0	11.5	225
7	17745.0	-42.15	5.70	12.15	Vertical	-35.7	-25.0	10.7	270
8	20280.0	-42.56	6.30	13.76	Vertical	-35.1	-25.0	10.1	90
9	22815.0	-41.45	6.80	14.05	Vertical	-34.2	-25.0	9.2	45
10	25350.0	-41.74	6.90	14.84	Vertical	-33.8	-25.0	8.8	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 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	5112.0	-47.25	2.00	10.15	Vertical	-39.1	-25.0	14.1	45
3	7667.3	-46.75	2.50	11.35	Vertical	-37.9	-25.0	12.9	270
4	10250.0	-44.65	4.20	12.05	Vertical	-36.8	-25.0	11.8	45
5	12812.5	-45.25	5.20	14.85	Vertical	-35.6	-25.0	10.6	225
6	15375.0	-44.93	5.50	13.23	Vertical	-37.2	-25.0	12.2	270
7	17937.5	-41.15	5.70	12.15	Vertical	-34.7	-25.0	9.7	90
8	20500.0	-41.06	6.30	13.76	Vertical	-33.6	-25.0	8.6	45
9	23062.5	-40.75	6.80	14.05	Vertical	-33.5	-25.0	8.5	90
10	25625.0	-40.44	6.90	14.84	Vertical	-32.5	-25.0	7.5	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.

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	5002.5	-50.35	2.00	10.15	Vertical	-42.2	-25.0	17.2	45
3	7503.4	-47.35	2.50	11.35	Vertical	-38.5	-25.0	13.5	225
4	10040.0	-44.95	4.20	12.05	Vertical	-37.1	-25.0	12.1	270
5	12550.0	-44.05	5.20	14.85	Vertical	-34.4	-25.0	9.4	90
6	15060.0	-43.23	5.50	13.23	Vertical	-35.5	-25.0	10.5	45
7	17570.0	-41.05	5.70	12.15	Vertical	-34.6	-25.0	9.6	90
8	20080.0	-41.26	6.30	13.76	Vertical	-33.8	-25.0	8.8	270
9	22590.0	-39.75	6.80	14.05	Vertical	-32.5	-25.0	7.5	45
10	25100.0	-40.04	6.90	14.84	Vertical	-32.1	-25.0	7.1	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 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	5052.0	-47.85	2.00	10.15	Vertical	-39.7	-25.0	14.7	270
3	7578.0	-45.75	2.50	11.35	Vertical	-36.9	-25.0	11.9	90
4	10140.0	-43.75	4.20	12.05	Vertical	-35.9	-25.0	10.9	45
5	12675.0	-46.55	5.20	14.85	Vertical	-36.9	-25.0	11.9	90
6	15210.0	-45.33	5.50	13.23	Vertical	-37.6	-25.0	12.6	90
7	17745.0	-41.15	5.70	12.15	Vertical	-34.7	-25.0	9.7	270
8	20280.0	-40.06	6.30	13.76	Vertical	-32.6	-25.0	7.6	45
9	22815.0	-38.75	6.80	14.05	Vertical	-31.5	-25.0	6.5	225
10	25350.0	-39.14	6.90	14.84	Vertical	-31.2	-25.0	6.2	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.

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	5102.3	-47.05	2.00	10.15	Vertical	-38.9	-25.0	13.9	90
3	7653.4	-46.35	2.50	11.35	Vertical	-37.5	-25.0	12.5	45
4	10240.0	-43.15	4.20	12.05	Vertical	-35.3	-25.0	10.3	90
5	12800.0	-45.35	5.20	14.85	Vertical	-35.7	-25.0	10.7	270
6	15360.0	-44.73	5.50	13.23	Vertical	-37.0	-25.0	12.0	45
7	17920.0	-40.85	5.70	12.15	Vertical	-34.4	-25.0	9.4	225
8	20480.0	-41.66	6.30	13.76	Vertical	-34.2	-25.0	9.2	270
9	23040.0	-40.35	6.80	14.05	Vertical	-33.1	-25.0	8.1	90
10	25600.0	-41.14	6.90	14.84	Vertical	-33.2	-25.0	8.2	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.

5 Main Test Instruments

Name	Type	Manufacturer	Serial Number	Calibration Date	Expiration Time
Base Station Simulator	CMW500	R&S	113645	2016-05-21	2017-05-20
Power Splitter	SHX-GF2-2-13	Hua Xiang	10120101	NA	NA
Universal Radio Communication Tester	E5515C	Agilent	MY48367192	2016-05-21	2017-05-20
Spectrum Analyzer	N9010A	Agilent	MY47191109	2016-05-21	2017-05-20
Signal Analyzer	FSV30	R&S	100815	2016-12-16	2017-12-15
Signal generator	SMB 100A	R&S	102594	2016-05-22	2017-05-21
Signal generator	SMR27	R&S	100365	2016-05-22	2017-05-21
EMI Test Receiver	ESCI	R&S	100948	2016-06-01	2017-05-31
Trilog Antenna	VUBL 9163	SCHWARZBECK	9163-201	2014-12-06	2017-12-05
Trilog Antenna	VUBL 9163	SCHWARZBECK	9163-391	2014-12-06	2017-12-05
Horn Antenna	HF907	R&S	100126	2014-12-06	2017-12-05
Horn Antenna	HF907	R&S	100125	2014-12-06	2017-12-05
Horn Antenna	3160-09	ETS-Lindgren	00102643	2015-01-30	2018-01-29
Horn Antenna	3160-09	ETS-Lindgren	00102644	2014-12-06	2017-12-05
Climatic Chamber	PT-30B	Re Ce	20101891	2016-07-17	2017-07-16
RF Cable	SMA 15cm	Agilent	0001	2017-02-06	2017-08-05

ANNEX A: EUT Appearance and Test Setup

A.1 EUT Appearance



Front Side



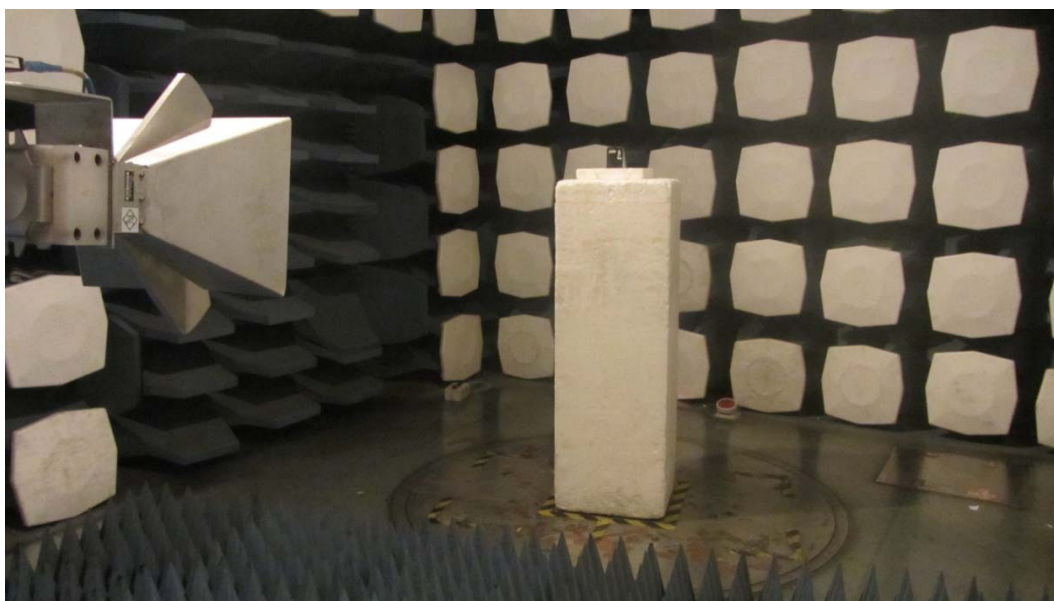
Back Side
a: EUT



b: Battery

Picture 1 EUT and Accessory

A.2 Test Setup



Picture 2: Radiated Spurious Emissions Test setup