RADIO TEST REPORT

Product	:	W04A
Model Name	:	Whistle GO
Series Model Name		Whistle GO Explore
FCC ID	:	S8W-W04A
Test Regulation	:	FCC 47 CFR Part 27, Subpart C, L
Received Date	:	Mar. 4, 2019
Test Date	:	Mar. 4, 2019 ~ Apr 8, 2019
Issued Date	:	May. 23, 2019
Applicant	:	Whistle Labs, Inc. 1355 Market Street Suite 210 San Francisco, CA 94103, USA
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4788872713-US-R3-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4788872713-US-R3-V0	May. 23, 2019	-	Initial issue

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1. Attestation of Test Results

APPLICANT:	Whistle Labs, Inc 1355 Market Street Suite 210 San Francisco, CA 94103, USA
MANUFACTURER	Whistle Labs, Inc 1355 Market Street Suite 210 San Francisco, CA 94103, USA
EUT DESCRIPTION:	W04A
BRAND:	Whistle
MODEL: **SERIES MODEL:**	Whistle GO Whistle GO Explore
SAMPLE STAGE:	PVT
DATE of TESTED:	Mar. 4, 2019 ~ Apr 8, 2019

APPLICABLE STANDARDS	
STANDARD	**Test Results**
FCC 47 CFR PART 27	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Evelyn Lee Date : May. 23, 2019
Project Handler

Approved and Authorized By:

Stanley Wu Date : May. 23, 2019
Senior Project Engineer

2. Summary of Test Results

LTE 4		
FCC Clause	**Test Items**	**Result**
§ 2.1046 § 27.50 (d)(4)	RF Output Power	PASS
§ 27.50 (d)(5)	Peak-to-Average Power Ratio	PASS
§ 2.1049	Occupied Bandwidth	PASS
§ 2.1055 § 27.54	Frequency Stability	PASS
§ 27.53 (h)	Band Edge Measurements	PASS
§ 2.1051 § 27.53 (h)	Spurious Emissions at Antenna Terminal	PASS
§ 2.1053 § 27.53 (h)	Radiated Spurious Emission	PASS

LTE 12		
FCC Clause	**Test Items**	**Result**
§ 2.1046 § 27.50 (c)(10)	RF Output Power	PASS
§ 27.50 (d)(5)	Peak-to-Average Power Ratio	PASS
§ 2.1049	Occupied Bandwidth	PASS
§ 2.1055 § 27.54	Frequency Stability	PASS
§ 27.53 (g)	Band Edge Measurements	PASS
§ 2.1051 § 27.53 (g)	Spurious Emissions at Antenna Terminal	PASS
§ 2.1053 § 27.53 (g)	Radiated Spurious Emission	PASS

3. Test Methodology

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, 47 CFR FCC Part 27, KDB 971168 D01 Power Meas License Digital Systems v03r01, ANSI C63.26-2015 and ANSI/TIA-603-E.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=3398

5. Measurement Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Test Item	Measurement Frequency Range	K	U(dB)
RF Output Power	30MHz ~ 40GHz	2	0.7dB
Effective Radiated Power	30MHz ~ 1GHz	2	5.6dB
Equivalent Isotropic Radiated Power	1GHz ~ 18GHz	2	4.2dB
Peak-to-Average Power Ratio	30MHz ~ 40GHz	2	3.10%
Occupied Bandwidth	30MHz ~ 40GHz	2	3.10%
Spurious Emissions at Antenna Terminal	30MHz ~ 40GHz	2	1.1dB
Frequency Stability	30MHz ~ 40GHz	2	299Hz
Radiated Spurious Emission	30MHz ~ 1GHz	2	5.6dB
	1GHz ~ 18GHz	2	4.2dB
	18GHz ~ 40GHz	2	4.4dB

6. Equipment under Test

6.1. Description of EUT

Product	W04A
Brand Name	Whistle
Model Name	Whistle GO
Series Model Name	Whistle GO Explore
Normal Voltage	5Vdc (adapter or host equipment) 3.8Vdc for battery
Voltage Operation Range	3.35~4.35 Vdc
Hardware Version	PVT1
Software Version	0.0.1-d2aa817
Model difference	Whistle GO is with small LED window while Whistle GO Explore is with big LED window

Note :

1. The EUT contains following accessory devices.

Product	Brand	Model	Description
USB Cable	Whistle	NA	0.77 meter, non-shielded cable, w/o ferrite core
Collar Attachment	Whistle	N/A	N/A

The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Technical Information

Frequency Bands	**■ LTE Cat-M1 Band 4**	1710 MHz to 1755 MHz (Uplink) 2110 MHz to 2155 MHz (Downlink)
	■ LTE Cat-M1 Band 12	699 MHz to 716 MHz (Uplink) 729 MHz to 746 MHz (Downlink)
Modulation Mode	QPSK / 16QAM	

6.3. Emission Designator

Frequency Bands	**■ LTE Band 4**	**BW 1.4 MHz**	1M10G7D
		BW 3 MHz	1M10G7D
		BW 5 MHz	1M09G7D
		BW 10 MHz	1M09G7D
		BW 15 MHz	1M10G7D
		BW 20 MHz	1M10G7D
	■ LTE Band 12	**BW 1.4 MHz**	1M09G7D
		BW 3 MHz	1M10G7D
		BW 5 MHz	1M10G7D
		BW 10 MHz	1M10G7D

6.4. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	22°C / 66%RH	120Vac / 60 Hz	Mar. 4, 2019 ~ Apr. 8, 2019	Howard Kao
Radiated Spurious Emission	966-2	25°C / 68%RH	120Vac / 60 Hz	Mar. 8, 2019 ~ Mar. 29, 2019	Will Chen

FCC Test Firm Registration Number: 498077

6.5. Description Of Available Antennas

Band	Antenna Type	Antenna Gain(dBi)
LTE Band 4	PCB	-5.7
LTE Band 12	PCB	-7.9

6.6. Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all mode and data rates and positions and RB size and modulations were investigated. Subsequently, only the worst case emissions are reported.

The EUT have two kinds of the enclosure and six colors, and other circuits design and PCB layout are the same; therefore, there is no more testing need to be verified.

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

Radiated measurements are performed by rotating the EUT in three different orthogonal (XYZ axis) test planes, the worst case was found when positioned as the table below.

Band	Axis
LTE Band 4	Z-plane
LTE Band 12	Z-plane

Following channel(s) was (were) selected for the final test as listed below

LTE Band 4

Test item	Bandwidth (MHz)	Modulation		Test Channel			RB		
		QPSK	16QAM	L	M	H	1	Partially	100%
RF Output Power	1.4	V	V	V	V	V	V	-	V
	3	V	V	V	V	V	V	-	V
	5	V	V	V	V	V	V	-	V
	10	V	V	V	V	V	V	V	V
	15	V	V	V	V	V	V	-	V
	20	V	V	V	V	V	V	-	V
Frequency Stability	1.4	V	-	V	-	V	-	-	V
	3	V	-	V	-	V	-	-	V
	5	V	-	V	-	V	-	-	V
	10	V	-	V	-	V	-	-	V
	15	V	-	V	-	V	-	-	V
	20	V	-	V	-	V	-	-	V
Occupied Bandwidth	1.4	V	-	V	V	V	-	-	V
	3	V	-	V	V	V	-	-	V
	5	V	-	V	V	V	-	-	V
	10	V	-	V	V	V	-	-	V
	15	V	-	V	V	V	-	-	V
	20	V	-	V	V	V	-	-	V
Band Edge	1.4	V	-	V	-	V	V	-	V
	3	V	-	V	-	V	V	-	V
	5	V	-	V	-	V	V	-	V
	10	V	-	V	-	V	V	-	V
	15	V	-	V	-	V	V	-	V
	20	V	-	V	-	V	V	-	V

Test item	Bandwidth (MHz)	Modulation		Test Channel			RB		
		QPSK	16QAM	L	M	H	1	Partially	100%
Peak to Average Ratio	1.4	V	V	V	V	V	V	-	-
	3	V	V	V	V	V	V	-	-
	5	V	V	V	V	V	V	-	-
	10	V	V	V	V	V	V	-	-
	15	V	V	V	V	V	V	-	-
	20	V	V	V	V	V	V	-	-
Spurious Emissions at Antenna Terminal	1.4	V	-	V	V	V	V	-	-
	3	V	-	V	V	V	V	-	-
	5	V	-	V	V	V	V	-	-
	10	V	-	V	V	V	V	-	-
	15	V	-	V	V	V	V	-	-
	20	V	-	V	V	V	V	-	-
Radiated Spurious Emissions	20	V	-	V	V	V	V	-	-

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

LTE Band 12

Test item	Bandwidth (MHz)	Modulation		Test Channel			RB		
		QPSK	16QAM	L	M	H	1	Partially	100%
RF Output Power	1.4	V	V	V	V	V	V	-	V
	3	V	V	V	V	V	V	-	V
	5	V	V	V	V	V	V	-	V
	10	V	V	V	V	V	V	V	V
Frequency Stability	1.4	V	-	V	-	V	-	-	V
	3	V	-	V	-	V	-	-	V
	5	V	-	V	-	V	-	-	V
	10	V	-	V	-	V	-	-	V
Occupied Bandwidth	1.4	V	-	V	V	V	-	-	V
	3	V	-	V	V	V	-	-	V
	5	V	-	V	V	V	-	-	V
	10	V	-	V	V	V	-	-	V
Band Edge	1.4	V	-	V	-	V	V	-	V
	3	V	-	V	-	V	V	-	V
	5	V	-	V	-	V	V	-	V
	10	V	-	V	-	V	V	-	V
Peak to Average Ratio	1.4	V	-	V	V	V	V	-	-
	3	V	-	V	V	V	V	-	-
	5	V	-	V	V	V	V	-	-
	10	V	-	V	V	V	V	-	-
Spurious Emissions at Antenna Terminal	1.4	V	-	V	V	V	V	-	-
	3	V	-	V	V	V	V	-	-
	5	V	-	V	V	V	V	-	-
	10	V	-	V	V	V	V	-	-
Radiated Spurious Emissions	10	V	-	V	V	V	V	-	-

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

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 8, 2018	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Nov. 8, 2018	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 11, 2018	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck	VULB 9168 & N-6-05	774 & AT-N0538	Jan. 14, 2019	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck	VULB 9168 & N-6-05	773 & AT-N0539	Jan. 14, 2019	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 25, 2019	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01686	Jan. 16, 2019	1 year
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	Jan.16, 2019	1 year
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	759	Nov. 13, 2018	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Jan. 30, 2019	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Jan. 29, 2019	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SE E	980426	Apr. 26, 2018	1 year
Signal Generator	Keysight	N5173B	MY53271122	Jan. 14,2019	1 year
RF Cable (9 KHz~18 GHz)	UltraPhase & EMC Instrument	A1K50-UP0358-A1K50-1500&EMC106-NM-SM-2500/7000	170111-4&170219/170102	Jan. 29, 2019	1 year
RF Cable (18 GHz~40 GHz)	UltraPhase	K1K50-UP0264-K1K50-2500/2500/600	170214-2/170214-6/170111-1	Jan. 29, 2019	1 year

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Spectrum Analyzer	Keysight	N9010A	MY56070834	Nov. 8, 2018	1 year
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	161254	Dec. 5, 2018	1 year
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150-40-CP-AR	MAA1701-010	Mar.20,2018 Apr. 3, 2019	1 year

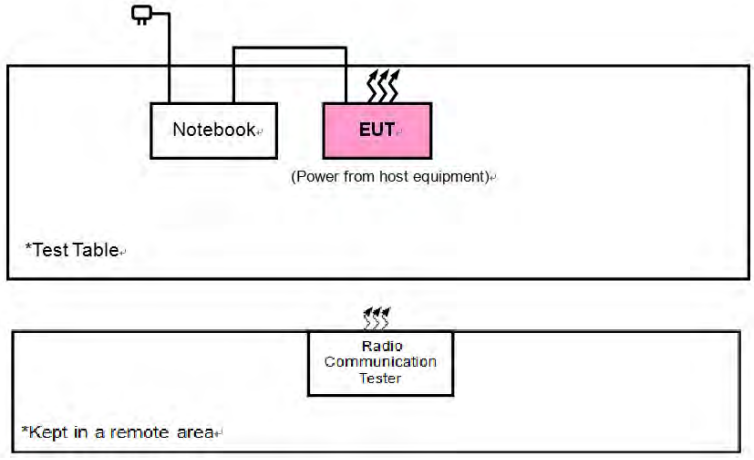
UL Software		
Description	**Name**	**Version**
Radiated measurement	AUDIX_E3	9.0

8. Description of Test Setup

Support Equipment

Item	Equipment	Brand Name	Model Name	S/N
1	DC Power Supply	GW Insrek	GPD-2303S	GEQ902318
2	Notebook	DELL	Latitude E5470	3JFKWF2

Setup Diagram for Test



9. Test Results

9.1. RF Output Power

Requirements

Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

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

Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

Test procedure

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum conducted RF output power under transmission mode and specific channel frequency.

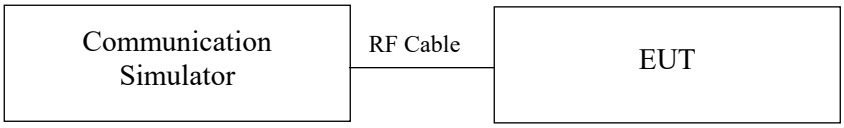
The relevant equation for determining the ERP or EIRP from the conducted RF output power measured using the guidance provided above is:

$$ERP \text{ or } EIRP = P_{Meas} + GT - LC$$

where:

ERP or EIRP = effective radiated power or equivalent isotropically radiated power, respectively (expressed in the same units as P_{Meas}, typically dBW or dBm);
P_{Meas} = measured transmitter output power or PSD, in dBm or dBW;
G_T = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP);
L_C = signal attenuation in the connecting cable between the transmitter and antenna, in dB

Test Setup



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

Test Results

Conducted Output Power (dBm)

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 19957	Mid Ch 20175	High Ch 20393		Low Ch 19957	Mid Ch 20175	High Ch 20393	
				1710.7 MHz	1732.5 MHz	1754.3 MHz		1710.7 MHz	1732.5 MHz	1754.3 MHz	
4 / 1.4M	1	0	0	23.04	23.08	23.14	0	21.84	21.77	21.97	1
	1	5	0	23.07	23.07	23.16	0	21.83	21.73	21.96	1
	6	0	0	21.02	21.15	20.97	2				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 19965	Mid Ch 20175	High Ch 20385		Low Ch 19965	Mid Ch 20175	High Ch 20385	
				1711.5 MHz	1732.5 MHz	1753.5 MHz		1711.5 MHz	1732.5 MHz	1753.5 MHz	
4 / 3M	1	0	0	23.12	23.12	23.21	0	22.05	22.08	22.17	1
	1	5	0	23.15	23.13	23.21	0	22.04	22.07	22.22	1
	6	0	0	21.05	21.07	21.12	2				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 19975	Mid Ch 20175	High Ch 20375		Low Ch 19975	Mid Ch 20175	High Ch 20375	
				1712.5 MHz	1732.5 MHz	1752.5 MHz		1712.5 MHz	1732.5 MHz	1752.5 MHz	
4 / 5M	1	0	0	23.20	23.18	23.22	0	23.09	23.11	23.16	0
	1	5	3	23.20	23.19	23.24	0	23.08	23.13	23.18	0
	1	0	3	23.17	23.19	23.21	0	23.09	23.13	23.19	0
	1	5	0	23.18	23.18	23.23	0	23.05	23.11	23.12	0
	6	0	0	22.01	21.99	22.01	1				2
	6	0	3	22.00	21.98	22.00	1				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 20000	Mid Ch 20175	High Ch 20350		Low Ch 20000	Mid Ch 20175	High Ch 20350	
				1715.0 MHz	1732.5 MHz	1750.0 MHz		1715.0 MHz	1732.5 MHz	1750.0 MHz	
4 / 10M	1	0	0	23.17	23.18	23.21	0	23.09	23.12	23.09	0
	1	5	7	23.18	23.20	23.24	0	23.09	23.13	23.12	0
	1	0	3	23.17	23.21	23.22	0	23.07	23.12	23.07	0
	1	5	4	23.17	23.19	23.22	0	23.05	23.14	23.11	0
	4	0	0	22.94	22.92	22.92	0	22.07	22.00	22.10	1
	4	2	7	22.95	22.96	22.94	0	21.88	21.92	21.88	1
	6	0	0	22.00	21.99	22.01	1				2
	6	0	7	21.99	22.00	22.02	1				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 20025	Mid Ch 20175	High Ch 20325		Low Ch 20025	Mid Ch 20175	High Ch 20325	
				1717.5 MHz	1732.5 MHz	1747.5 MHz		1717.5 MHz	1732.5 MHz	1747.5 MHz	
4 / 15M	1	0	0	23.13	23.25	23.03	-	23.02	23.11	23.06	-
	1	5	11	23.09	23.28	23.07	-	23.05	23.13	23.15	-
	1	0	3	23.13	23.25	23.03	-	23.04	23.12	23.13	-
	1	5	8	23.09	23.28	23.06	-	23.04	23.13	23.16	-
	6	0	0	22.87	23.03	22.73	-				-
	6	0	11	22.86	23.02	22.75	-				-

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 20050	Mid Ch 20175	High Ch 20300		Low Ch 20050	Mid Ch 20175	High Ch 20300	
				1720.0 MHz	1732.5 MHz	1745.0 MHz		1720.0 MHz	1732.5 MHz	1745.0 MHz	
4 / 20M	1	0	0	23.21	23.27	23.15	-	23.03	23.01	23.13	-
	1	5	15	23.25	23.30	23.24	-	23.06	23.03	23.12	-
	1	0	3	23.12	23.14	23.06	-	23.03	23.03	23.12	-
	1	5	12	23.14	23.18	23.14	-	23.04	23.01	23.12	-
	6	0	0	22.88	22.92	22.90	-				-
	6	0	15	22.89	22.94	22.89	-				-

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 23017	Mid Ch 23095	High Ch 23173		Low Ch 23017	Mid Ch 23095	High Ch 23173	
				699.7 MHz	707.5 MHz	715.3 MHz		699.7 MHz	707.5 MHz	715.3 MHz	
12 / 1.4M	1	0	0	23.61	23.55	23.41	0	22.21	22.16	21.98	1
	1	5	0	23.60	23.54	21.54	0	22.25	22.14	21.96	1
	6	0	0	21.78	21.55	21.87	2				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 23025	Mid Ch 23095	High Ch 23165		Low Ch 23025	Mid Ch 23095	High Ch 23165	
				700.5 MHz	707.5 MHz	714.5 MHz		700.5 MHz	707.5 MHz	714.5 MHz	
12 / 3M	1	0	0	23.65	23.60	23.56	0	22.59	22.58	22.44	1
	1	5	0	23.66	23.63	23.59	0	22.62	22.57	22.45	1
	6	0	0	21.64	21.64	21.59	2				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 23035	Mid Ch 23095	High Ch 23155		Low Ch 23035	Mid Ch 23095	High Ch 23155	
				701.5 MHz	707.5 MHz	713.5 MHz		701.5 MHz	707.5 MHz	713.5 MHz	
12 / 5M	1	0	0	23.56	23.57	23.55	0	23.54	23.56	23.54	0
	1	5	3	23.56	23.51	23.50	0	23.53	23.50	23.52	0
	1	0	3	23.54	23.54	23.54	0	23.53	23.53	23.53	0
	1	5	0	23.54	23.57	23.51	0	23.54	23.56	23.51	0
	6	0	0	22.57	22.47	22.42	1				2
	6	0	3	22.54	22.45	22.39	1				2

Band / BW	RB Size	RB Offset	RB Index	QPSK			3GPP MPR (dB)	16QAM			3GPP MPR (dB)
				Low Ch 23060	Mid Ch 23095	High Ch 23130		Low Ch 23060	Mid Ch 23095	High Ch 23130	
				704.0 MHz	707.5 MHz	711.0 MHz		704.0 MHz	707.5 MHz	711.0 MHz	
12 / 10M	1	0	0	23.51	23.45	23.46	0	23.44	23.64	23.56	0
	1	5	7	23.47	23.32	23.38	0	23.41	23.58	23.46	0
	1	0	3	23.55	23.67	23.54	0	23.44	23.59	23.49	0
	1	5	4	23.49	23.33	23.39	0	23.42	23.60	23.48	0
	4	0	0	23.58	23.61	23.52	0	23.08	22.56	22.47	1
	4	2	7	23.52	23.64	23.44	0	23.37	22.38	22.30	1
	6	0	0	22.67	22.58	22.47	1				2
	6	0	7	22.59	22.52	22.39	1				2

E.I.R.P (dBm)

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 19957	Mid CH 20175	High CH 20393	Low CH 19957	Mid CH 20175	High CH 20393
	Frequency	1710.7 MHz	1732.5 MHz	1754.3 MHz	1710.7 MHz	1732.5 MHz	1754.3 MHz
4 / 1.4M	Conducted power(dBm)	23.07	23.08	23.16	21.84	21.77	21.97
	Conducted power (Watts)	0.20	0.20	0.21	0.15	0.15	0.16
	E.I.R.P (dBm)	17.37	17.38	17.46	16.14	16.07	16.27
	E.I.R.P (Watts)	0.05	0.05	0.06	0.04	0.04	0.04

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 19965	Mid CH 20175	High CH 20385	Low CH 19965	Mid CH 20175	High CH 20385
	Frequency	1711.5 MHz	1732.5 MHz	1753.5 MHz	1711.5 MHz	1732.5 MHz	1753.5 MHz
4 / 3M	Conducted power(dBm)	23.15	23.13	23.21	22.05	22.08	22.22
	Conducted power (Watts)	0.21	0.21	0.21	0.16	0.16	0.17
	E.I.R.P (dBm)	17.45	17.43	17.51	16.35	16.38	16.52
	E.I.R.P (Watts)	0.06	0.06	0.06	0.04	0.04	0.04

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 19975	Mid CH 20175	High CH 20375	Low CH 19975	Mid CH 20175	High CH 20375
	Frequency	1712.5 MHz	1732.5 MHz	1752.5 MHz	1712.5 MHz	1732.5 MHz	1752.5 MHz
4 / 5M	Conducted power(dBm)	23.2	23.19	23.24	23.09	23.13	23.19
	Conducted power (Watts)	0.21	0.21	0.21	0.20	0.21	0.21
	E.I.R.P (dBm)	17.5	17.49	17.54	17.39	17.43	17.49
	E.I.R.P (Watts)	0.06	0.06	0.06	0.05	0.06	0.06

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 20000	Mid CH 20175	High CH 20350	Low CH 20000	Mid CH 20175	High CH 20350
	Frequency	1715 MHz	1732.5 MHz	1750 MHz	1715 MHz	1732.5 MHz	1750 MHz
4 /10M	Conducted power(dBm)	23.18	23.21	23.24	23.09	23.14	23.12
	Conducted power (Watts)	0.21	0.21	0.21	0.20	0.21	0.21
	E.I.R.P (dBm)	17.48	17.51	17.54	17.39	17.44	17.42
	E.I.R.P (Watts)	0.06	0.06	0.06	0.05	0.06	0.06

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 20025	Mid CH 20175	High CH 20325	Low CH 20025	Mid CH 20175	High CH 20325
	Frequency	1717.5 MHz	1732.5 MHz	1747.5 MHz	1717.5 MHz	1732.5 MHz	1747.5 MHz
4 / 15M	Conducted power(dBm)	23.13	23.28	23.07	23.05	23.13	23.16
	Conducted power (Watts)	0.21	0.21	0.20	0.20	0.21	0.21
	E.I.R.P (dBm)	17.43	17.58	17.37	17.35	17.43	17.46
	E.I.R.P (Watts)	0.06	0.06	0.05	0.05	0.06	0.06

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 20050	Mid CH 20175	High CH 20300	Low CH 20050	Mid CH 20175	High CH 20300
	Frequency	1720 MHz	1732.5 MHz	1745 MHz	1720 MHz	1732.5 MHz	1745 MHz
4 / 20M	Conducted power(dBm)	23.25	23.3	23.24	23.06	23.03	23.13
	Conducted power (Watts)	0.21	0.21	0.21	0.20	0.20	0.21
	E.I.R.P (dBm)	17.55	17.6	17.54	17.36	17.33	17.43
	E.I.R.P (Watts)	0.06	0.06	0.06	0.05	0.05	0.06

E.R.P (dBm)

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 23017	Mid CH 23095	High CH 23173	Low CH 23017	Mid CH 23095	High CH 23173
	Frequency	699.7 MHz	707.5 MHz	715.3 MHz	699.7 MHz	707.5 MHz	715.3 MHz
12 / 1.4M	Conducted power(dBm)	23.61	23.55	23.41	22.25	22.16	21.98
	Conducted power (Watts)	0.23	0.23	0.22	0.17	0.16	0.16
	E.R.P (dBm)	13.56	13.5	13.36	12.2	12.11	11.93
	E.R.P (Watts)	0.02	0.02	0.02	0.02	0.02	0.02

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 23025	Mid CH 23095	High CH 23165	Low CH 23025	Mid CH 23095	High CH 23165
	Frequency	700.5 MHz	707.5 MHz	714.5 MHz	700.5 MHz	707.5 MHz	714.5 MHz
12 / 3M	Conducted power(dBm)	23.66	23.63	23.59	22.62	22.58	22.45
	Conducted power (Watts)	0.23	0.23	0.23	0.18	0.18	0.18
	E.R.P (dBm)	13.61	13.58	13.54	12.57	12.53	12.4
	E.R.P (Watts)	0.02	0.02	0.02	0.02	0.02	0.02

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 23035	Mid CH 23095	High CH 23155	Low CH 23035	Mid CH 23095	High CH 23155
	Frequency	701.5 MHz	707.5 MHz	713.5 MHz	701.5 MHz	707.5 MHz	713.5 MHz
12 / 5M	Conducted power(dBm)	23.56	23.57	23.55	23.54	23.56	23.54
	Conducted power (Watts)	0.23	0.23	0.23	0.23	0.23	0.23
	E.R.P (dBm)	13.51	13.52	13.5	13.49	13.51	13.49
	E.R.P (Watts)	0.02	0.02	0.02	0.02	0.02	0.02

Band / BW	Mode	QPSK			16QAM		
	Channel	Low CH 23060	Mid CH 23095	High CH 23130	Low CH 23060	Mid CH 23095	High CH 23130
	Frequency	704 MHz	707.5 MHz	711 MHz	704 MHz	707.5 MHz	711 MHz
12 /10M	Conducted power(dBm)	23.58	23.67	23.54	23.44	23.64	23.56
	Conducted power (Watts)	0.23	0.23	0.23	0.22	0.23	0.23
	E.R.P (dBm)	13.53	13.62	13.49	13.39	13.59	13.51
	E.R.P (Watts)	0.02	0.02	0.02	0.02	0.02	0.02

9.2. Peak to Average Power Ratio

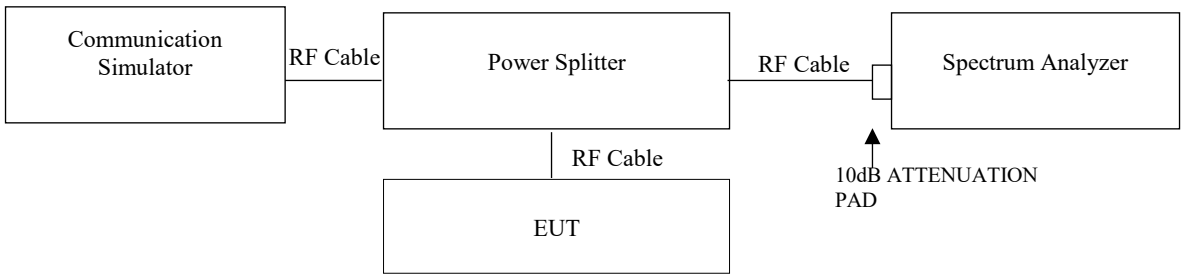
Requirements

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.

Test procedure

1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

Test Setup

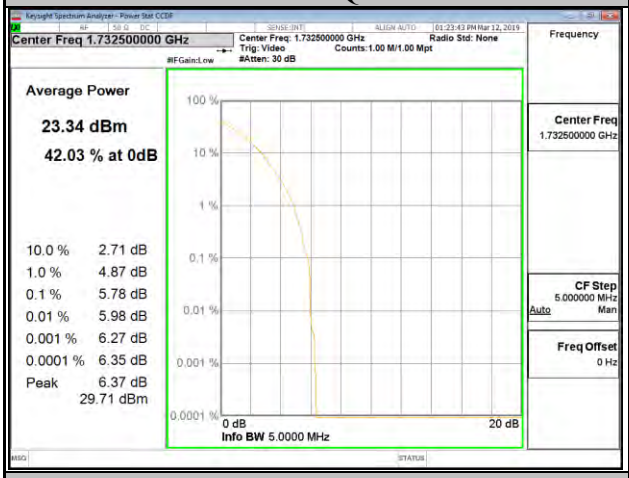
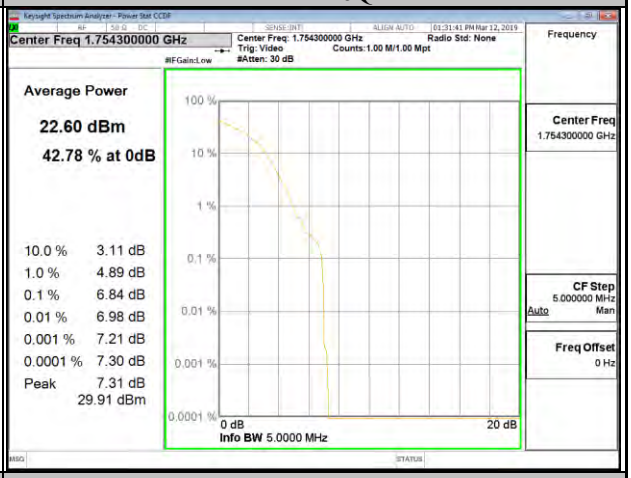
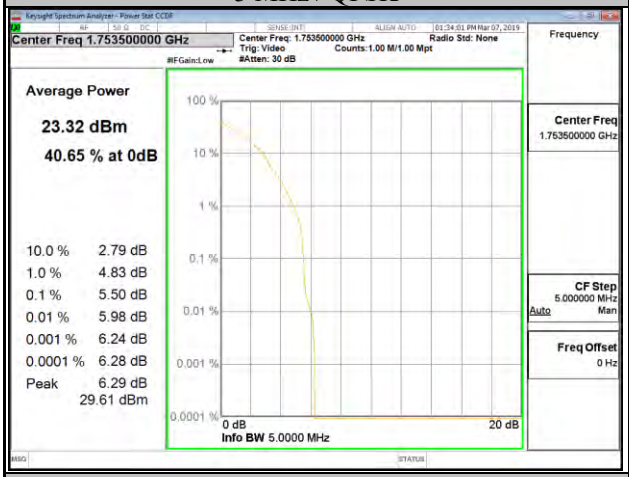
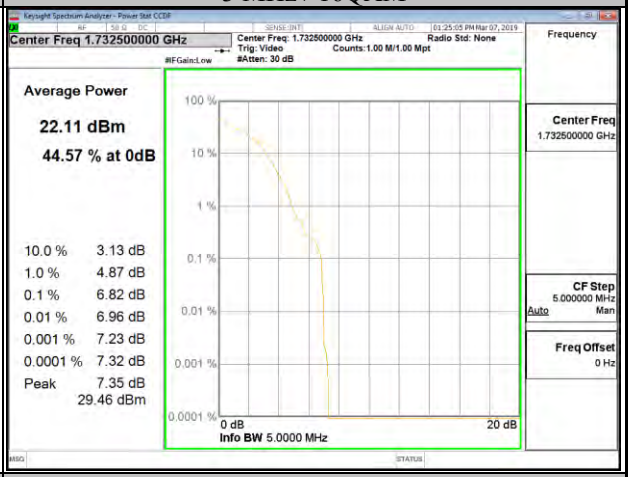
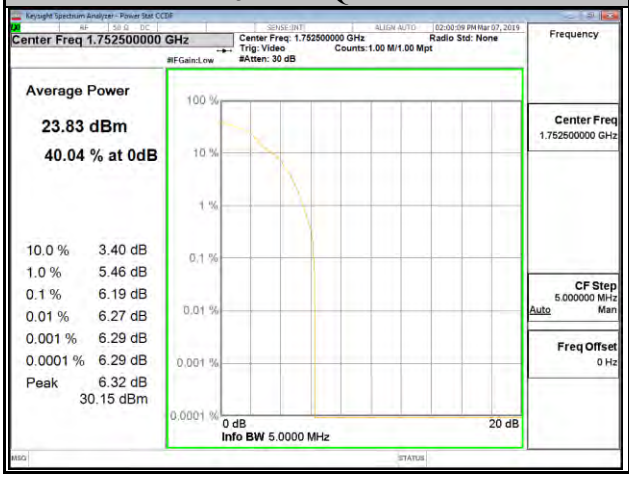
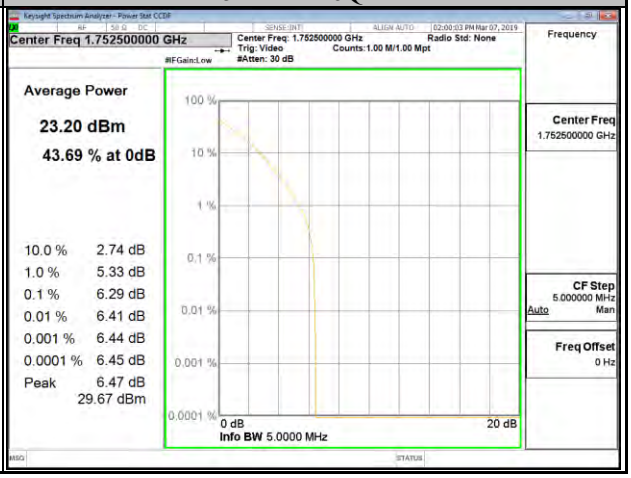


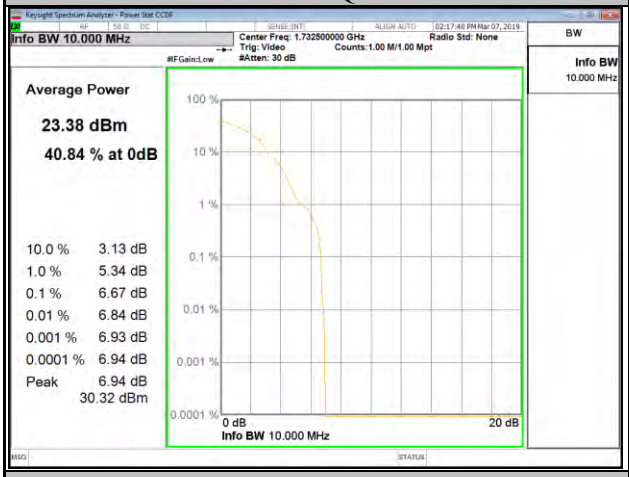
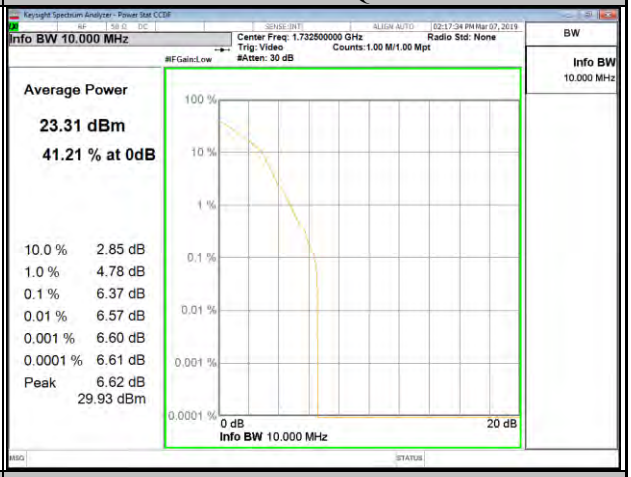
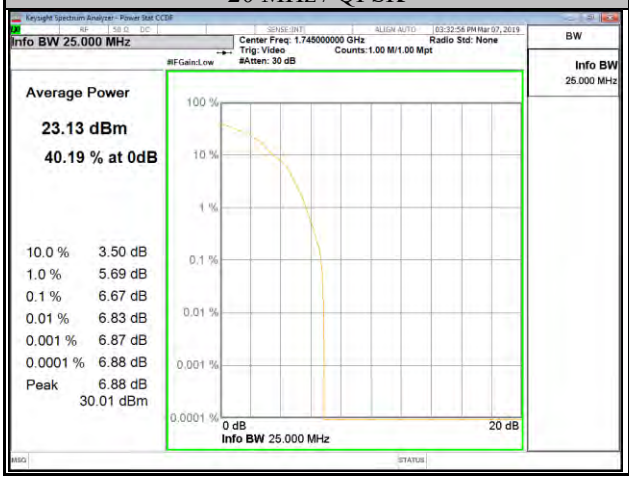
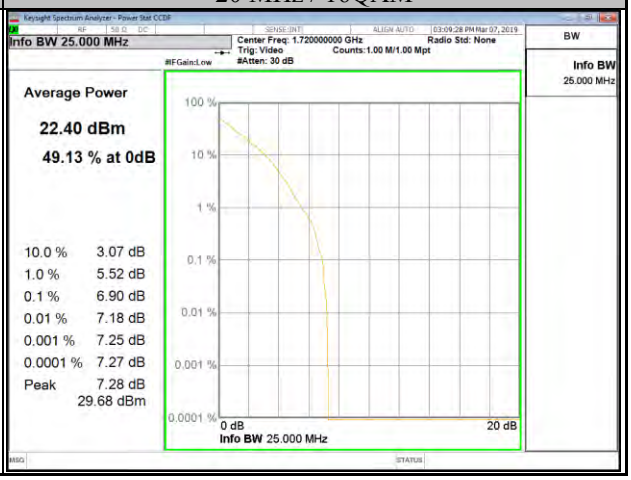
The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Test Results

LTE Band 4

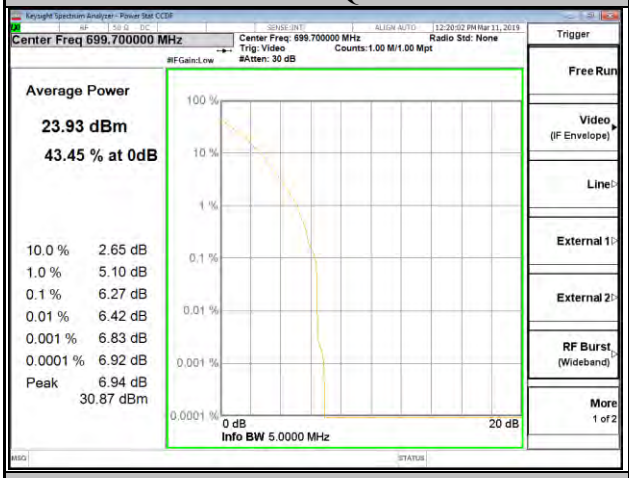
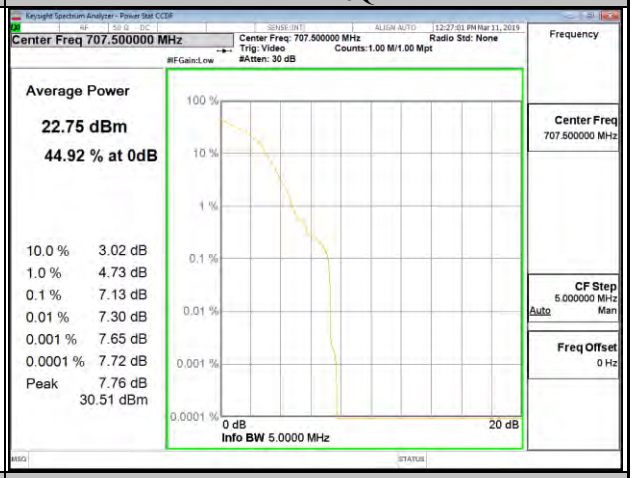
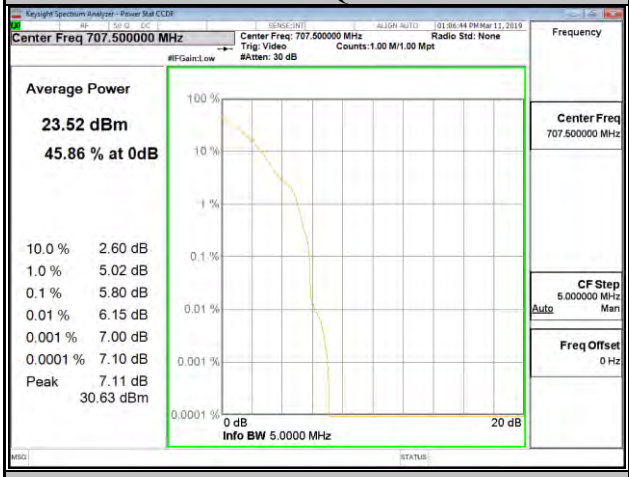
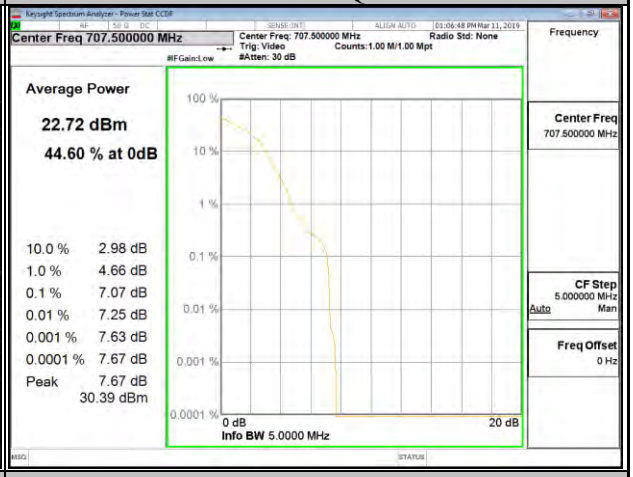
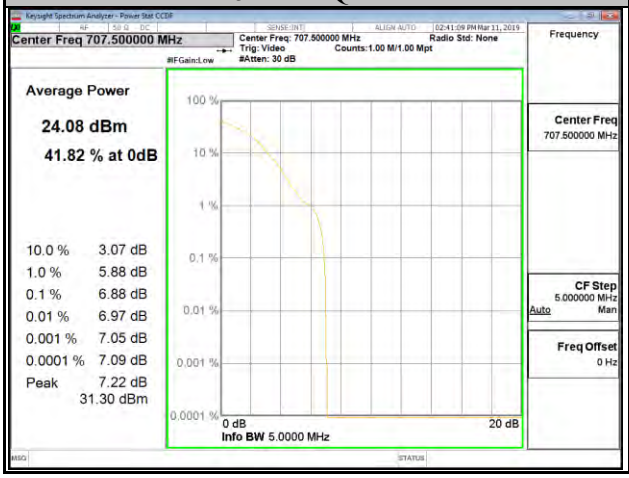
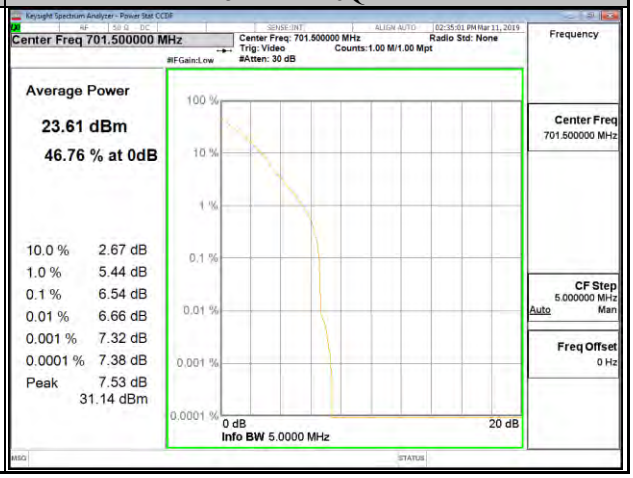
Bandwidth (MHz)	Channel	Peak to Average Ratio (dB)		Bandwidth (MHz)	Channel	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
1.4	19957	5.26	6.60	3	19965	5.37	6.55
	20175	5.78	6.08		20175	5.38	6.82
	20393	5.58	6.84		20385	5.50	6.48
5	19975	5.92	6.04	10	20000	5.96	5.97
	20175	6.11	6.22		20175	6.67	6.37
	20375	6.19	6.29		20350	6.29	6.28
15	20025	7.07	6.61	20	20050	6.22	6.90
	20175	6.61	6.69		20175	6.45	6.87
	20325	6.40	7.24		20300	6.67	6.68

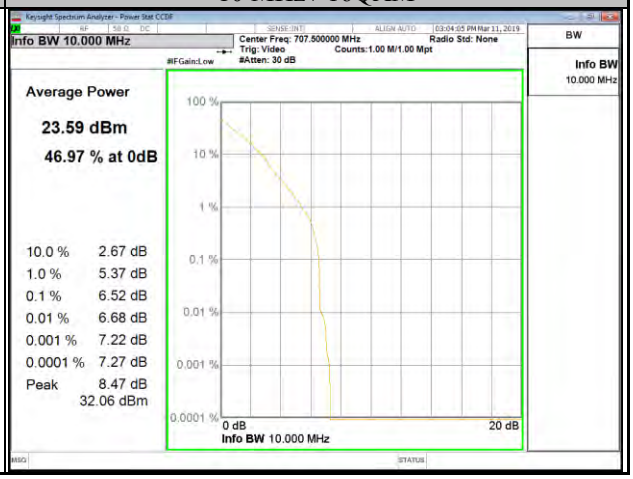
Spectrum Plot of Worst Value	
1.4 MHz / QPSK	1.4 MHz / 16QAM
	
3 MHz / QPSK	3 MHz / 16QAM
	
5 MHz / QPSK	5 MHz / 16QAM
	

10 MHz / QPSK	10 MHz / 16QAM
	
15 MHz / QPSK	15 MHz / 16QAM
	
20 MHz / QPSK	20 MHz / 16QAM
	

LTE Band 12

Bandwidth (MHz)	Channel	Peak to Average Ratio (dB)		Bandwidth (MHz)	Channel	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
1.4	23017	6.27	6.12	3	23025	5.62	6.51
	23095	5.77	7.13		23095	5.80	7.07
	23173	5.60	7.04		23165	5.66	7.06
5	23035	6.54	6.54	10	23060	6.78	6.40
	23095	6.88	6.26		23095	6.52	6.52
	23155	6.52	6.49		23130	6.43	6.32

Spectrum Plot of Worst Value	
1.4 MHz / QPSK	1.4 MHz / 16QAM
	
3 MHz / QPSK	3 MHz / 16QAM
	
5 MHz / QPSK	5 MHz / 16QAM
	

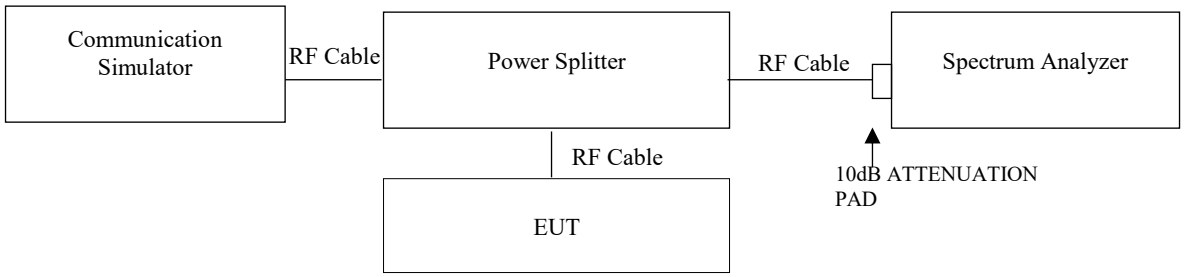
10 MHz / QPSK	10 MHz / 16QAM
	

9.3. Occupied Bandwidth

Test procedure

The EUT makes a call to the communication simulator. All measurements were done at low, middle and high operational frequency range. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

Test Setup

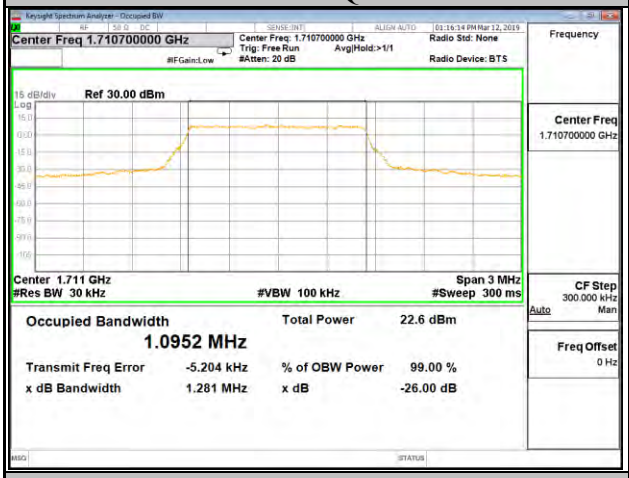
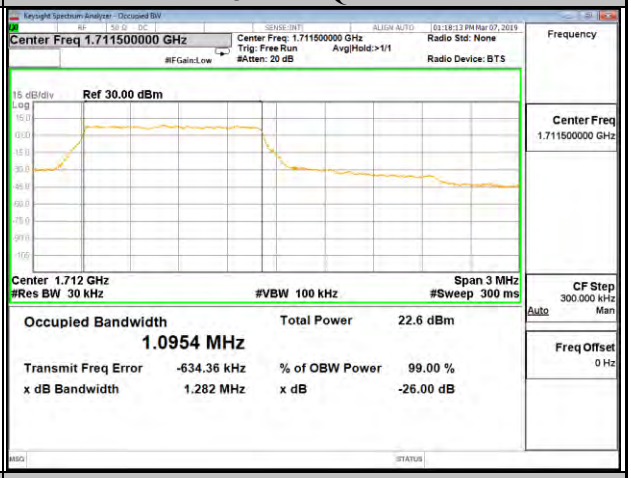
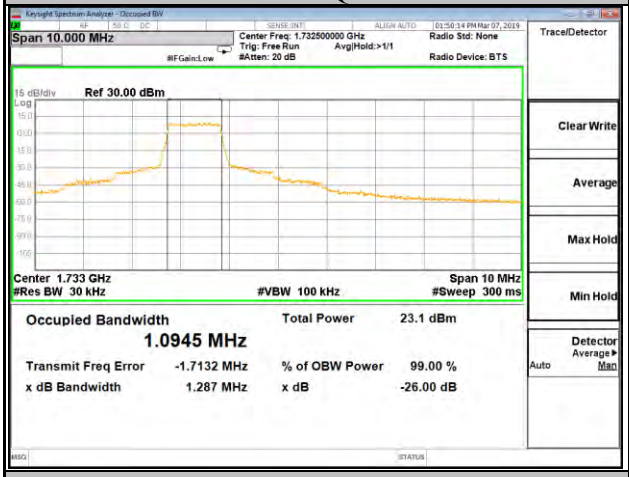
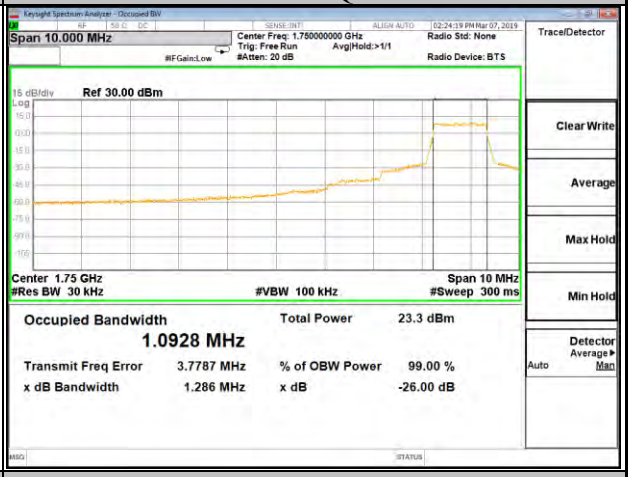
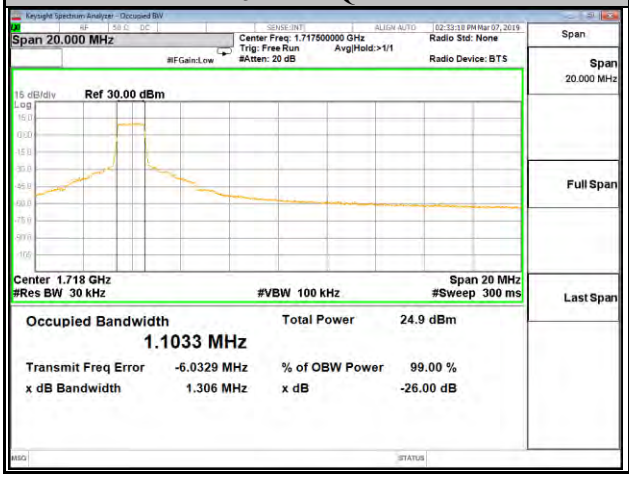
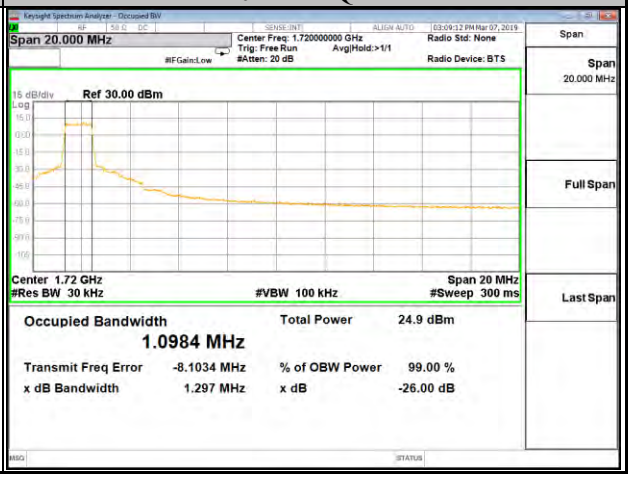


The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

Test Results

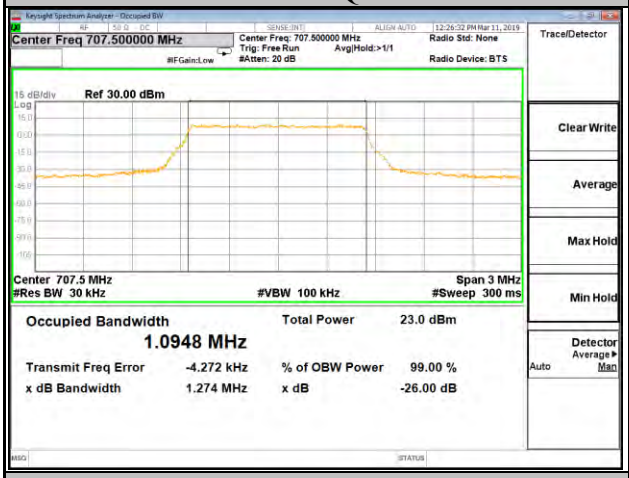
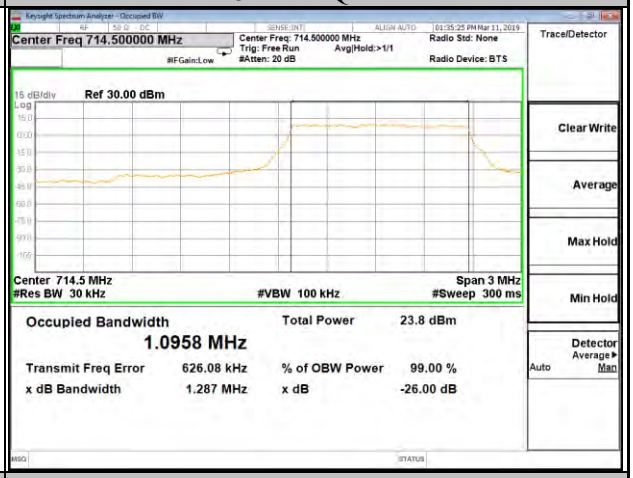
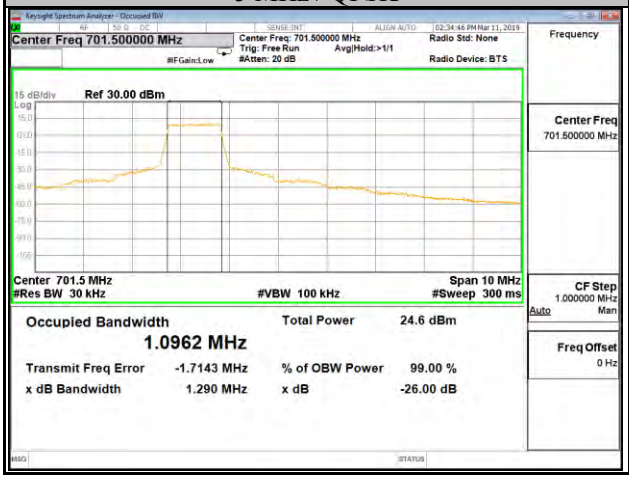
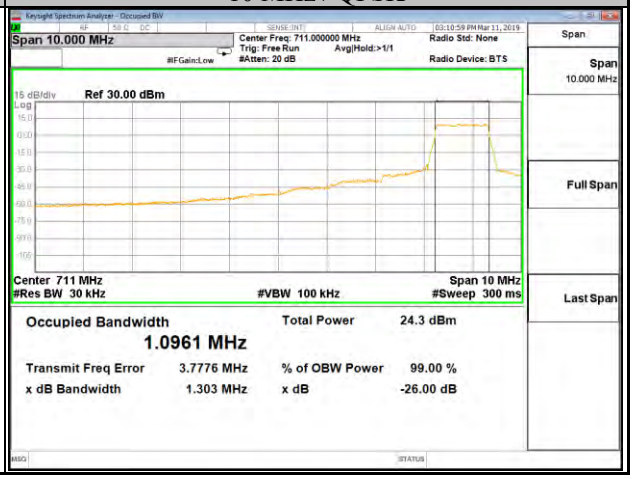
LTE Band 4

Bandwidth (MHz)	Channel	99 % Occupied Bandwidth (MHz)	Bandwidth (MHz)	Channel	99 % Occupied Bandwidth (MHz)
		QPSK			QPSK
1.4	19957	1.0952	3	19965	1.0954
	20175	1.0913		20175	1.0943
	20393	1.0952		20385	1.0940
5	19975	1.0910	10	20000	1.0889
	20175	1.0945		20175	1.0907
	20375	1.0930		20350	1.0928
15	20025	1.1033	20	20050	1.0984
	20175	1.1018		20175	1.0959
	20325	1.0961		20300	1.0943

Spectrum Plot of Worst Value	
1.4 MHz / QPSK	3 MHz / QPSK
	
5 MHz / QPSK	10 MHz / QPSK
	
15 MHz / QPSK	20 MHz / QPSK
	

LTE Band 12

Bandwidth (MHz)	Channel	99 % Occupied Bandwidth (MHz)	Bandwidth (MHz)	Channel	99 % Occupied Bandwidth (MHz)
		QPSK			QPSK
1.4	23017	1.0911	3	23025	1.0940
	23095	1.0948		23095	1.0936
	23173	1.0936		23165	1.0958
5	23035	1.0962	10	23060	1.0890
	23095	1.0925		23095	1.0892
	23155	1.0956		23130	1.0961

Spectrum Plot of Worst Value	
1.4 MHz / QPSK	3 MHz / QPSK
	
5 MHz / QPSK	10 MHz / QPSK
	

9.4. Frequency Stability

Requirements

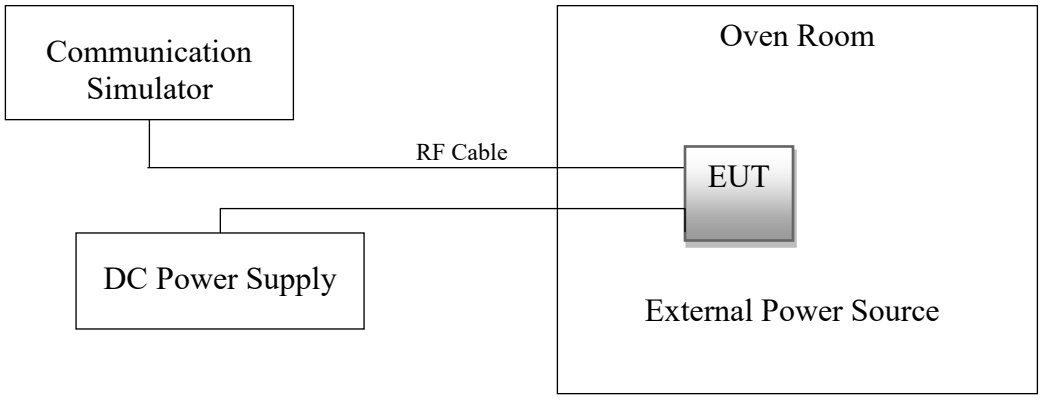
The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test procedure

1. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
2. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
3. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the ±0.5℃ during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

Note: The frequency error was recorded frequency error from the communication simulator.

Test Setup



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

Test Results

LTE Band 4

Channel Bandwidth: 1.4 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1710.700005	0.003	1754.300011	0.006
V_{min}		1710.700005	0.003	1754.300005	0.003
V_{max}		1710.700010	0.006	1754.300008	0.005

Channel Bandwidth: 1.4 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1710.700005	0.003	1754.300015	0.008
	10	1710.700007	0.004	1754.300006	0.003
	20	1710.700011	0.006	1754.300006	0.004
	30	1710.700011	0.007	1754.300006	0.003
	40	1710.700011	0.007	1754.300007	0.004

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 3 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1711.500004	0.003	1753.499985	-0.009
V_{min}		1711.500004	0.002	1753.499990	-0.005
V_{max}		1711.500007	0.004	1753.499989	-0.006

Channel Bandwidth: 3 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1711.500015	0.009	1753.499988	-0.007
	10	1711.500015	0.009	1753.499989	-0.006
	20	1711.500012	0.007	1753.499988	-0.007
	30	1711.500008	0.005	1753.499988	-0.007
	40	1711.500012	0.007	1753.499992	-0.005

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 5 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1712.500008	0.005	1752.500006	0.003
V_{min}		1712.500011	0.006	1752.500005	0.003
V_{max}		1712.499994	-0.004	1752.500004	0.002

Channel Bandwidth: 5 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1712.500007	0.004	1752.500011	0.006
	10	1712.500008	0.005	1752.500007	0.004
	20	1712.500012	0.007	1752.500011	0.007
	30	1712.500005	0.003	1752.500007	0.004
	40	1712.500005	0.003	1752.500010	0.006

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 10 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1715.000003	0.002	1749.999995	-0.003
V_{min}		1715.000003	0.002	1750.000006	0.003
V_{max}		1715.000004	0.002	1749.999995	-0.003

Channel Bandwidth: 10 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1715.000009	0.005	1750.000006	0.003
	10	1715.000011	0.006	1750.000010	0.006
	20	1715.000014	0.008	1750.000007	0.004
	30	1715.000010	0.006	1750.000010	0.006
	40	1715.000008	0.005	1750.000007	0.004

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 15 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1717.500004	0.002	1747.499997	-0.002
V_{min}		1717.500005	0.003	1747.499996	-0.002
V_{max}		1717.500008	0.005	1747.499996	-0.002

Channel Bandwidth: 15 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1717.500011	0.006	1747.500004	0.002
	10	1717.500006	0.003	1747.499998	-0.001
	20	1717.500008	0.005	1747.500005	0.003
	30	1717.500007	0.004	1747.500011	0.007
	40	1717.500004	0.003	1747.500008	0.005

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 20 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	1720.000005	0.003	1745.000007	0.004
V_{min}		1720.000003	0.002	1745.000003	0.002
V_{max}		1720.000005	0.003	1745.000009	0.005

Channel Bandwidth: 20 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	1720.000004	0.002	1745.000011	0.006
	10	1720.000008	0.004	1745.000016	0.009
	20	1720.000011	0.007	1745.000013	0.008
	30	1720.000010	0.006	1745.000006	0.003
	40	1719.999997	-0.002	1745.000010	0.006

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

LTE Band 12

Channel Bandwidth: 1.4 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	699.700010	0.015	715.300004	0.006
V_{min}		699.700014	0.020	715.300006	0.008
V_{max}		699.700014	0.020	715.300007	0.010

Channel Bandwidth: 1.4 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	699.700011	0.016	715.300009	0.012
	10	699.700012	0.017	715.300012	0.017
	20	699.700013	0.019	715.299993	-0.009
	30	699.700005	0.007	715.299990	-0.014
	40	699.700007	0.009	715.299998	-0.003

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 3 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	700.500008	0.012	714.499995	-0.008
V_{min}		700.500009	0.012	714.499994	-0.008
V_{max}		700.500010	0.014	714.499994	-0.009

Channel Bandwidth: 3 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	700.500009	0.013	714.499996	-0.005
	10	700.500009	0.013	714.499996	-0.006
	20	700.500008	0.011	714.499995	-0.007
	30	700.500006	0.008	714.499998	-0.003
	40	700.500007	0.010	714.499998	-0.003

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 5 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	701.500009	0.013	713.500007	0.009
V_{min}		701.500011	0.015	713.500008	0.011
V_{max}		701.500009	0.013	713.500007	0.009

Channel Bandwidth: 5 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	701.500003	0.004	713.500008	0.012
	10	701.500003	0.004	713.500008	0.012
	20	701.500005	0.007	713.500009	0.013
	30	701.500001	0.001	713.500007	0.010
	40	701.500002	0.003	713.500006	0.009

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

Channel Bandwidth: 10 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
V_{nom}	T_{nom}	704.000005	0.007	710.999997	-0.004
V_{min}		704.000007	0.009	711.000002	0.003
V_{max}		704.000004	0.006	711.000004	0.006

Channel Bandwidth: 10 MHz					
Voltage (V)	Temp. (°C)	Low Channel		High Channel	
		Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
	0	704.000005	0.007	711.000004	0.006
	10	704.000006	0.009	711.000002	0.003
	20	704.000006	0.008	711.000003	0.004
	30	704.000004	0.006	711.000003	0.005
	40	704.000003	0.005	711.000003	0.005

Note:

1. The applicant declared that the normal operating temperature of the EUT is from 0° C to 40° C.
2. The EUT would shut down automatically as below 0° C.

9.5. Band Edge Measurements

Requirements

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

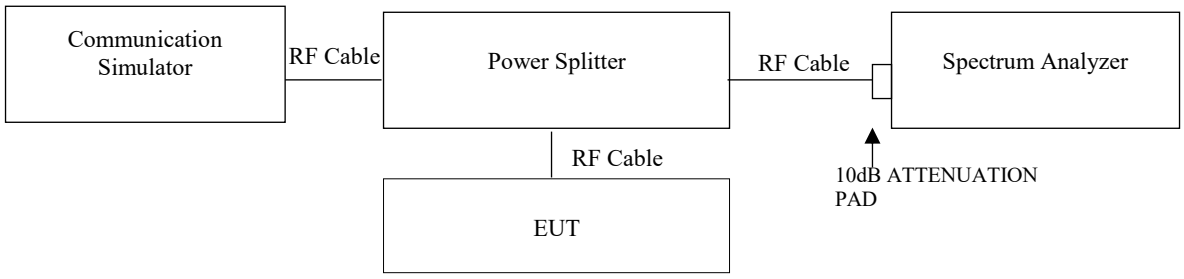
For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts by at least 43 + 10 log (P) dB.
On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

For operations in the 1710-1755 MHz and 1755-1780 MHz 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 log10 (P) dB.

Test procedure

1. All measurements were done at low and high operational frequency range.
2. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RBW of the spectrum is 16 kHz and VBW of the spectrum is 51 kHz (LTE CAT-M1 Band 4).
3. The center frequency of spectrum is the band edge frequency and span is 5 MHz. RBW of the spectrum is 30 kHz and VBW of the spectrum is 100 kHz (LTE CAT-M1 Band 12).
4. Record the max trace plot into the test report.

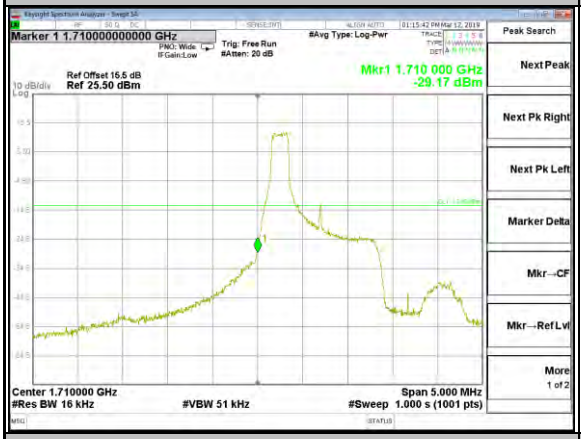
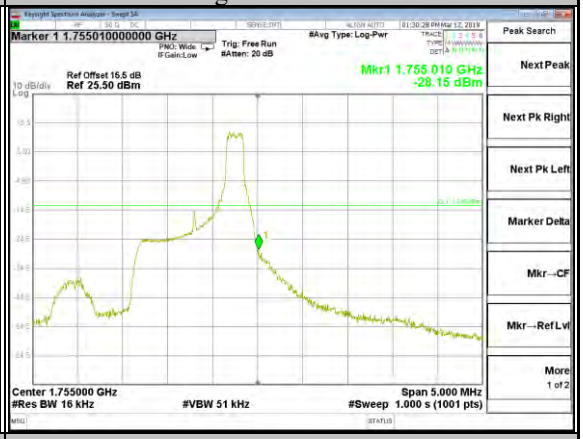
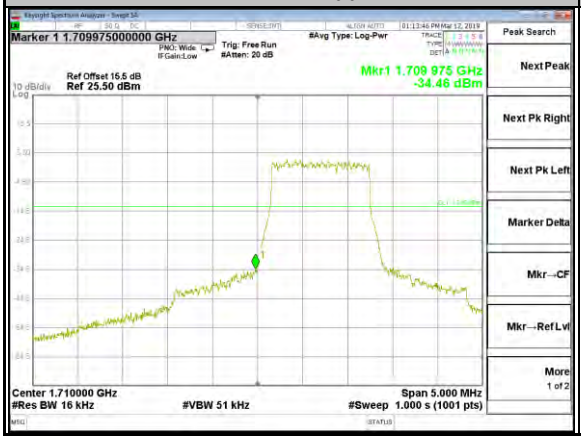
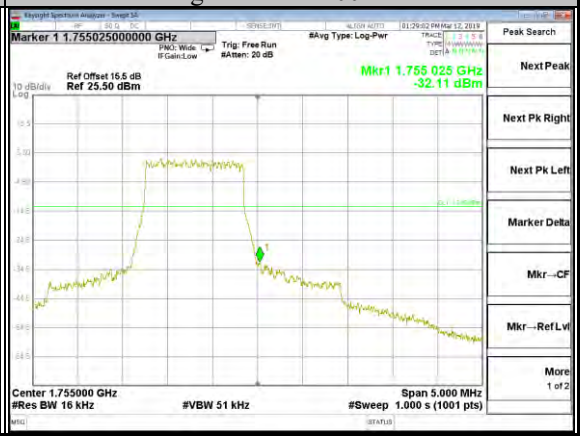
Test Setup

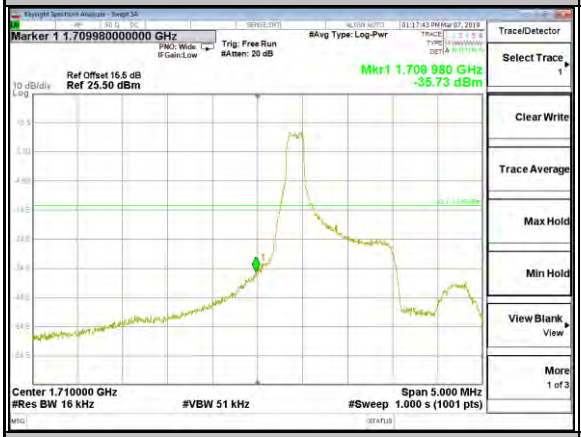
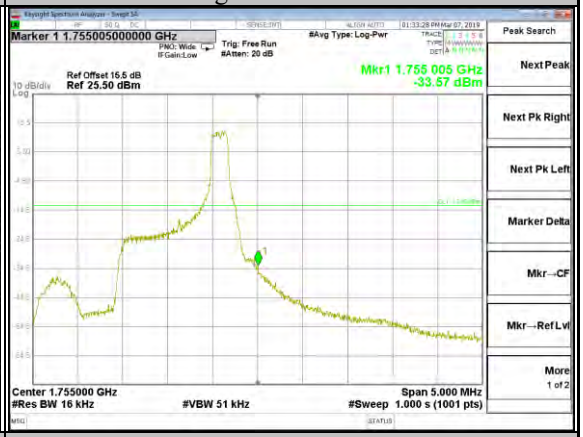
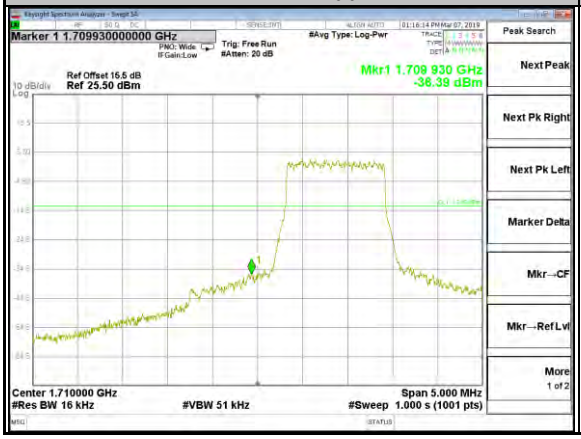
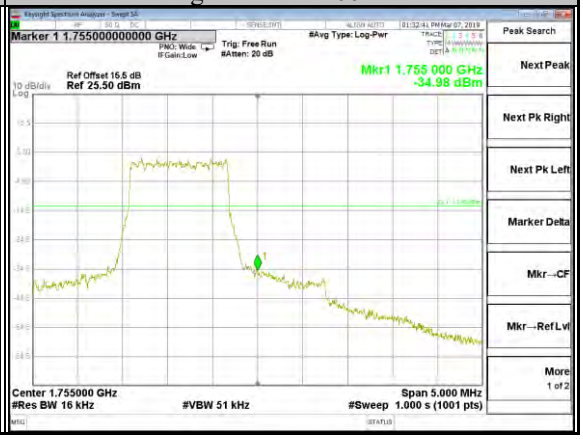


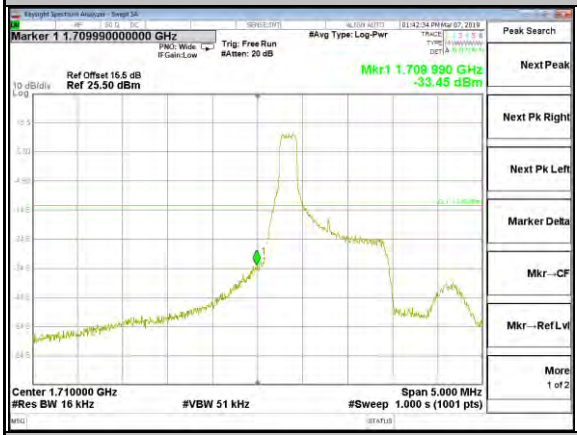
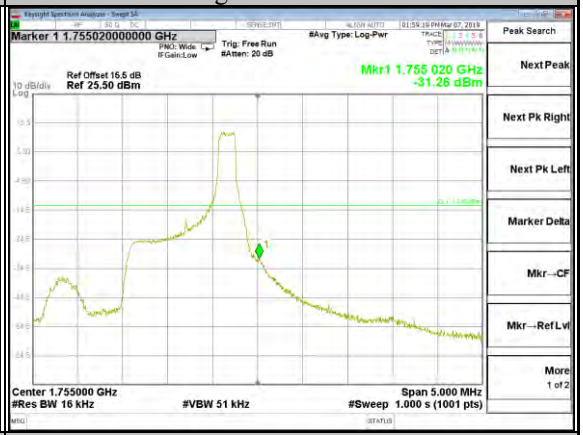
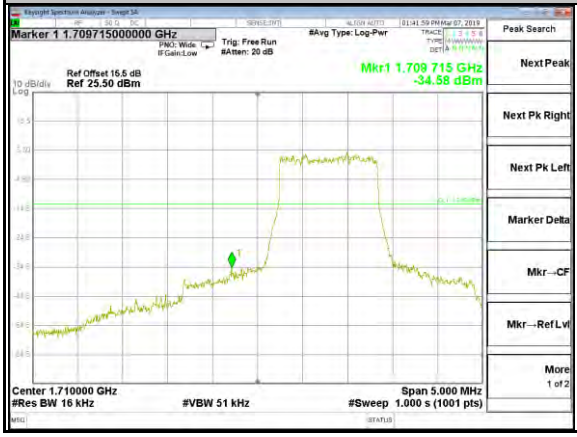
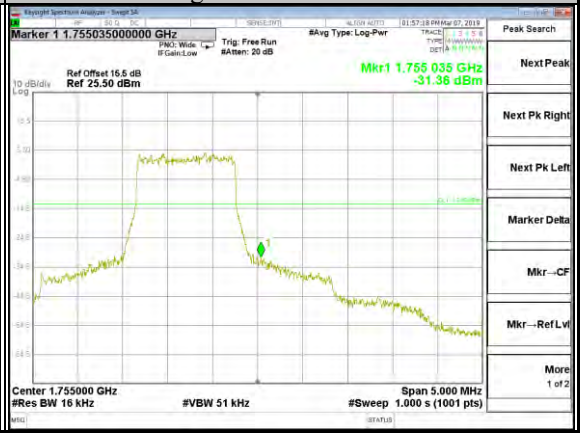
The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

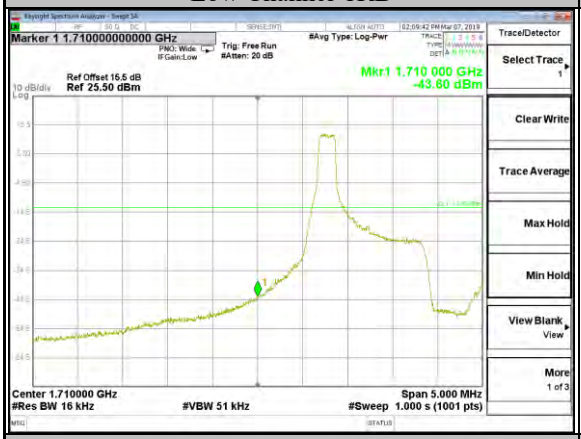
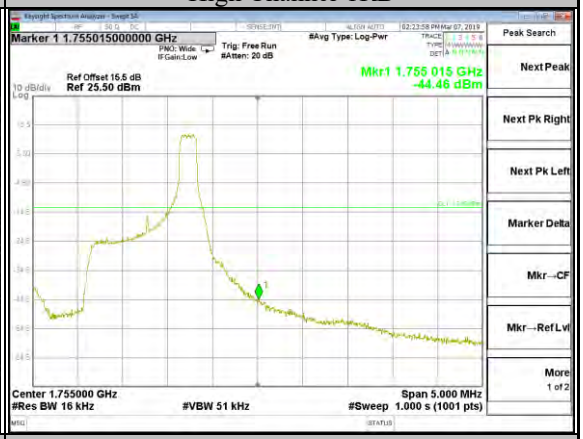
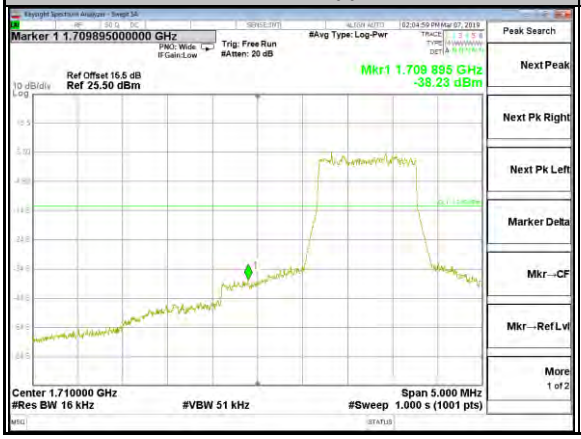
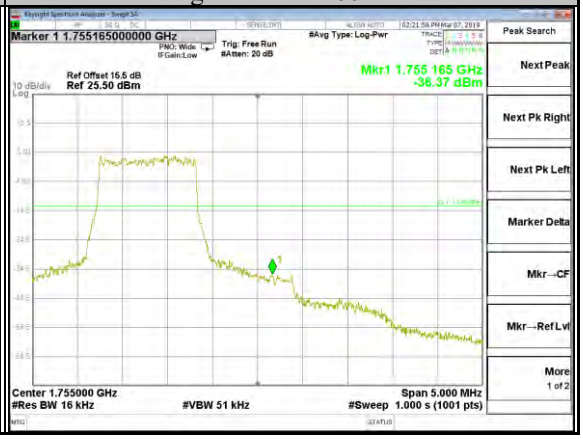
Test Results

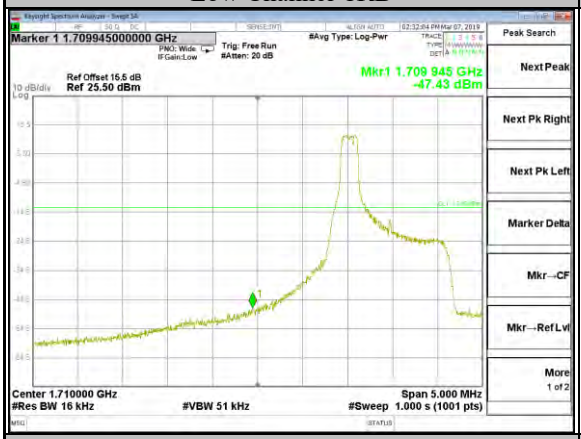
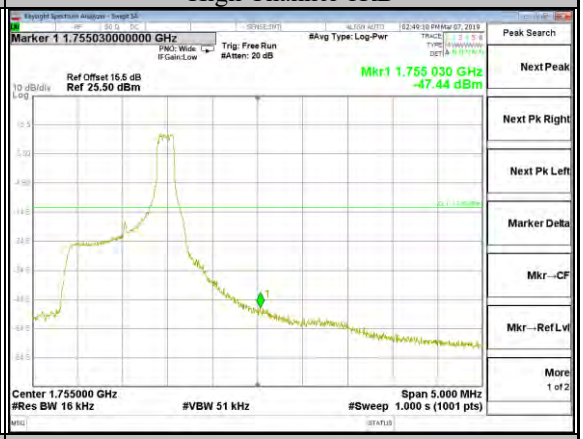
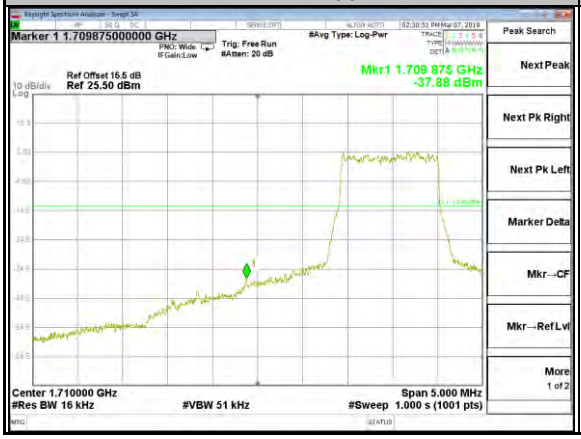
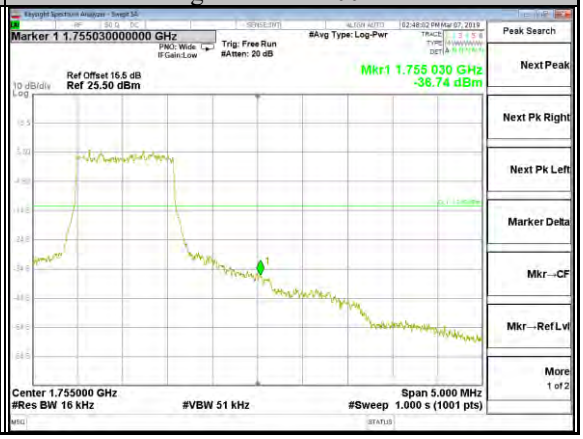
LTE Band 4

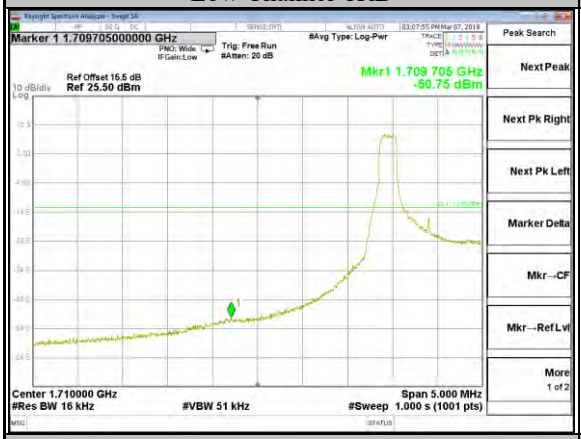
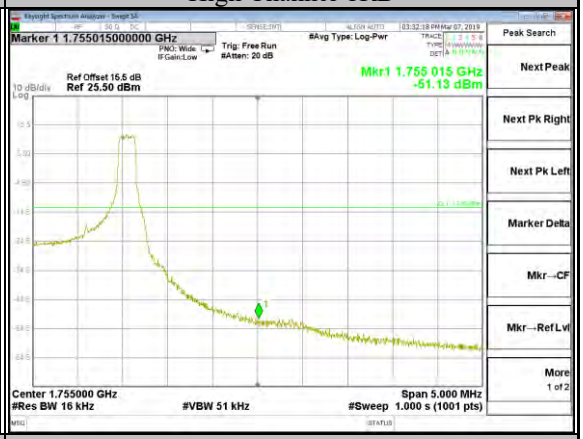
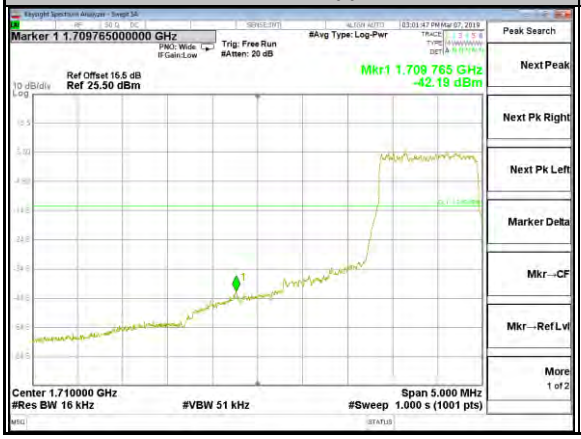
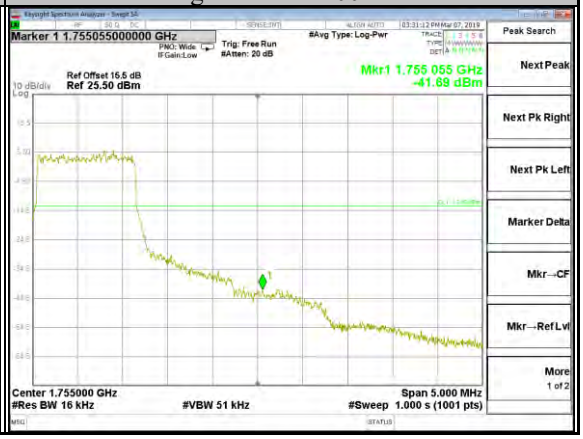
Channel Bandwidth: 1.4 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

Channel Bandwidth: 3 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

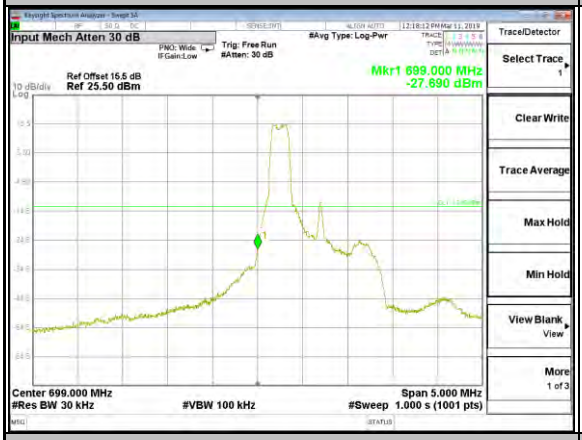
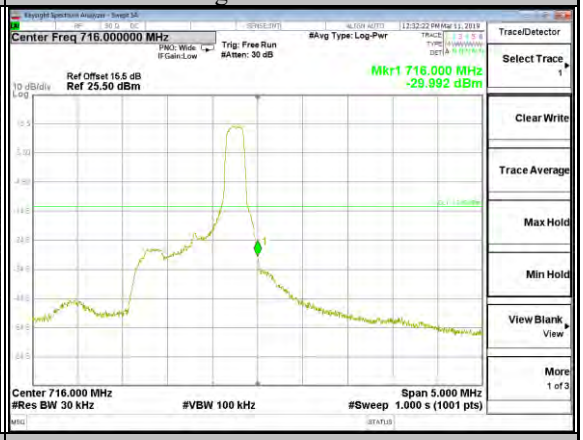
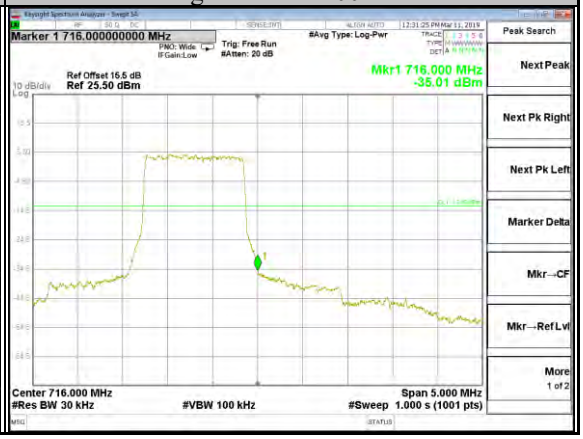
Channel Bandwidth: 5 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

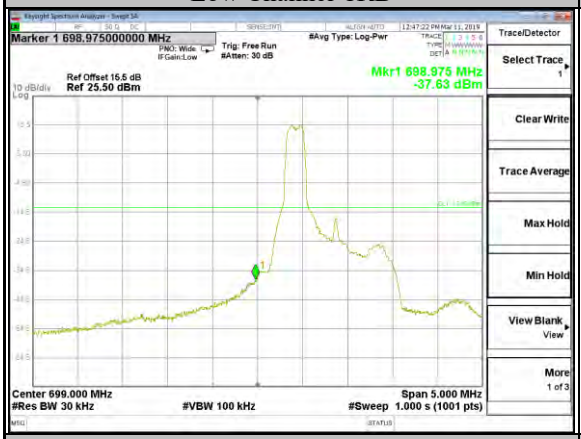
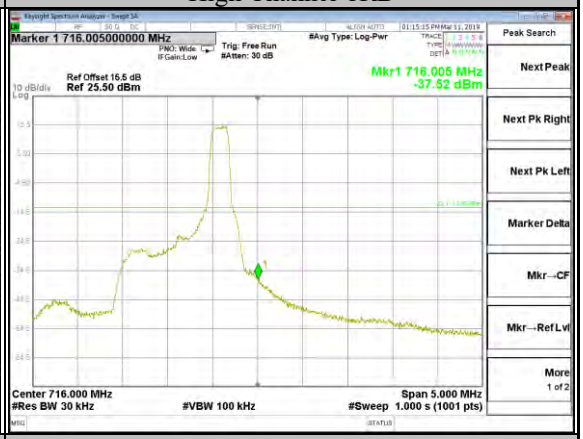
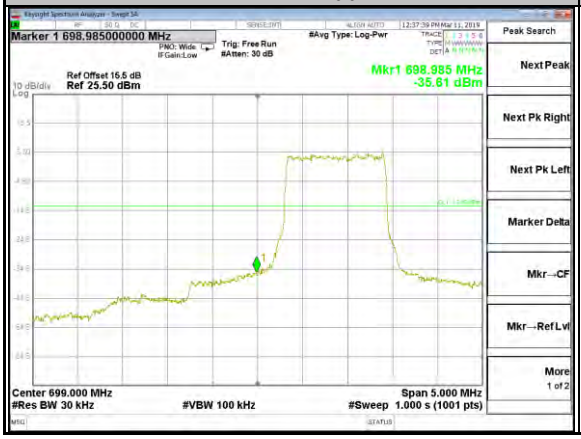
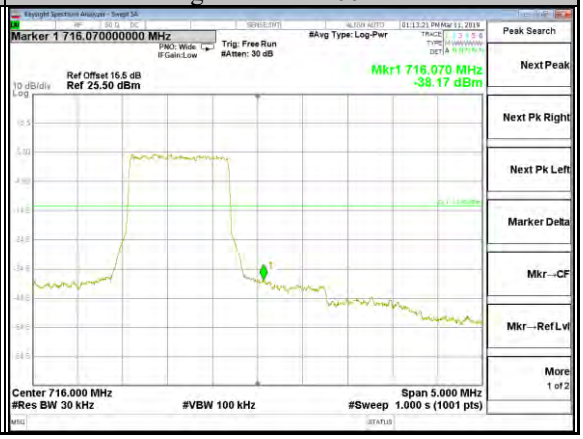
Channel Bandwidth: 10 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

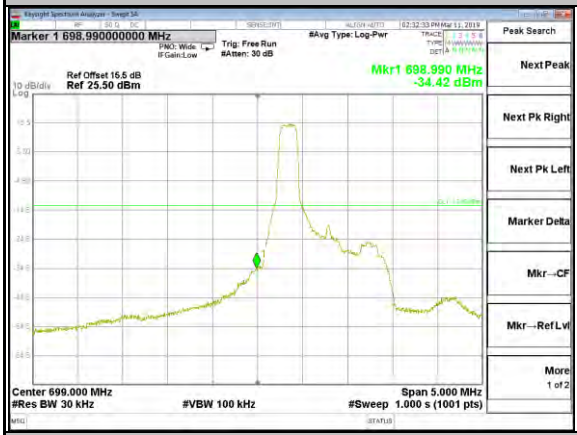
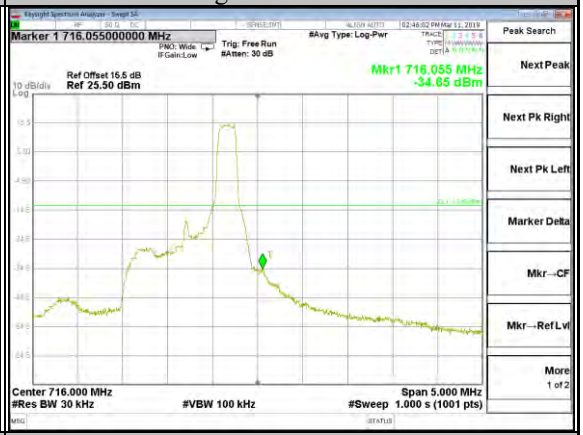
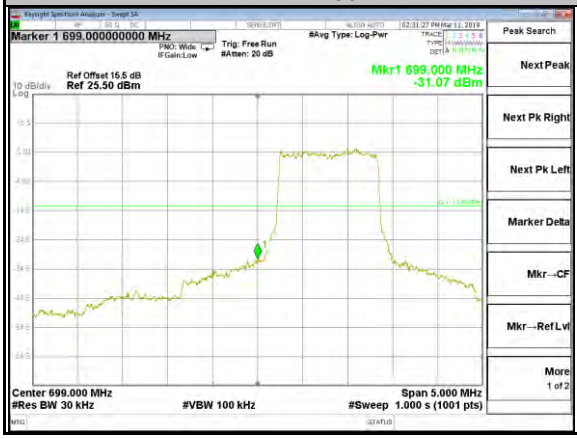
Channel Bandwidth: 15 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

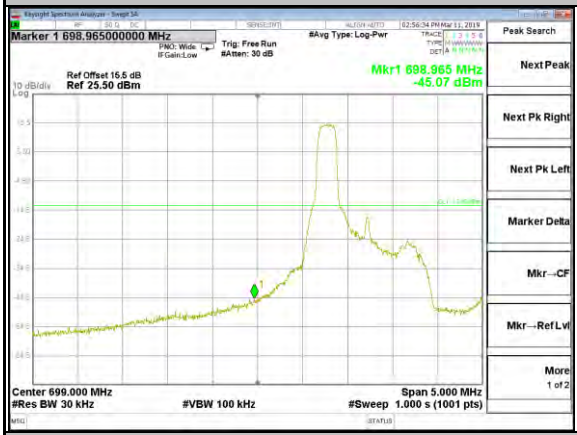
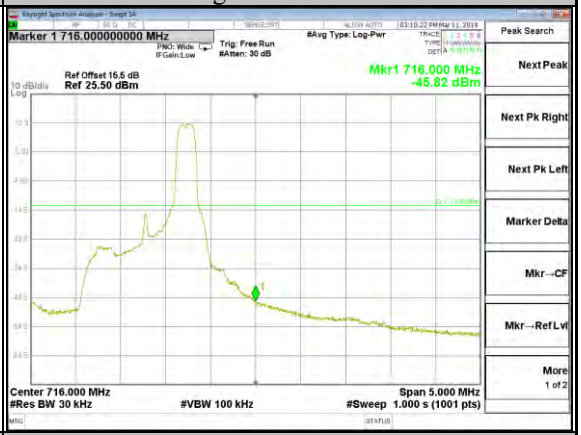
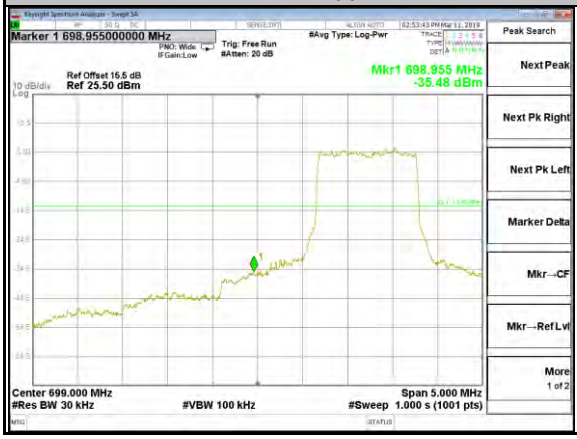
Channel Bandwidth: 20 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

LTE Band 12

Channel Bandwidth: 1.4 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

Channel Bandwidth: 3 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

Channel Bandwidth: 5 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

Channel Bandwidth: 10 MHz	
Low Channel-1RB	High Channel-1RB
	
Low Channel-100%RB	High Channel-100%RB
	

9.6. Spurious Emissions at Antenna Terminal

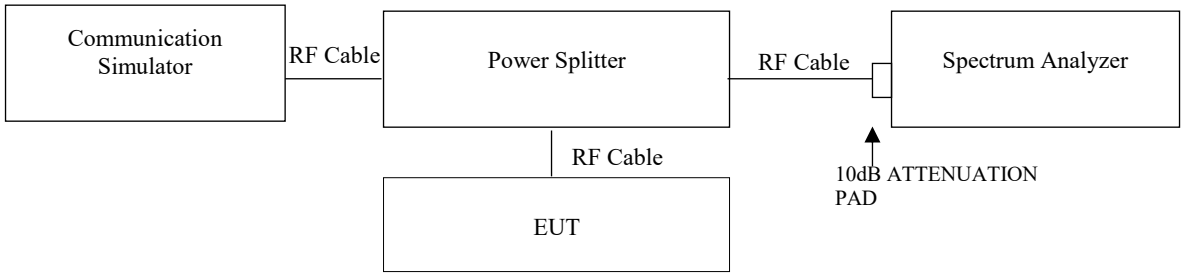
Requirements

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit equal to –13 dBm.

Test procedure

1. The EUT was connected to Spectrum Analyzer and Communication Simulator via power Splitter. All measurements were done at low, middle and high operational frequency range. The measurement is carried out using a spectrum analyzer.
2. Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz is used for conducted emission measurement.

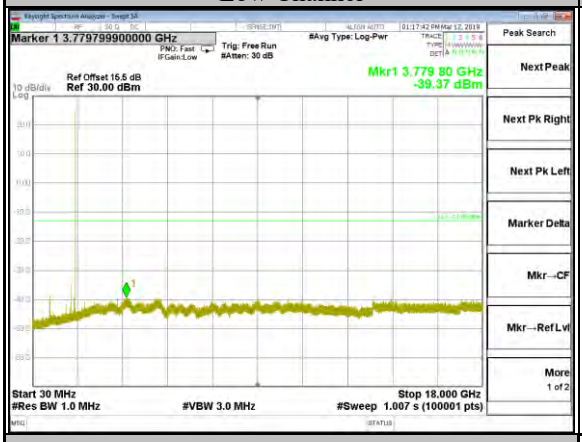
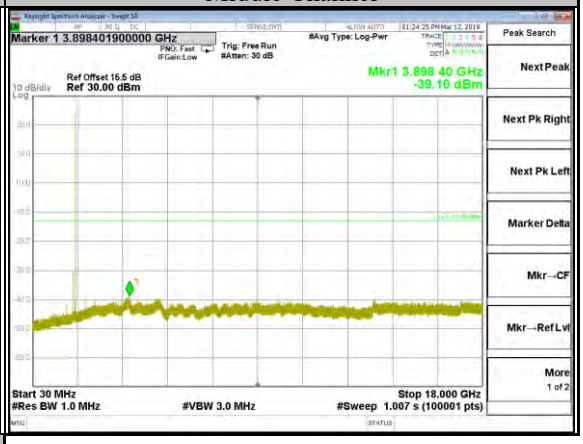
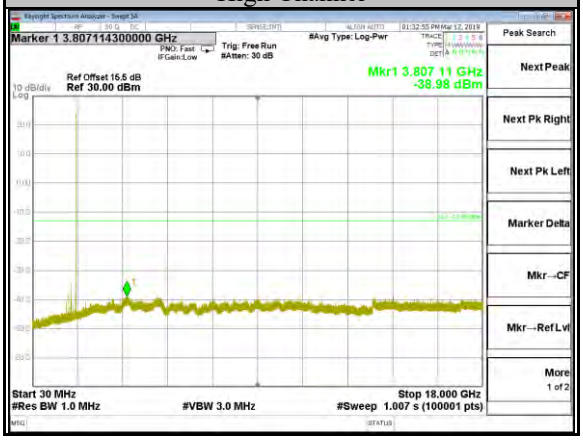
Test Setup

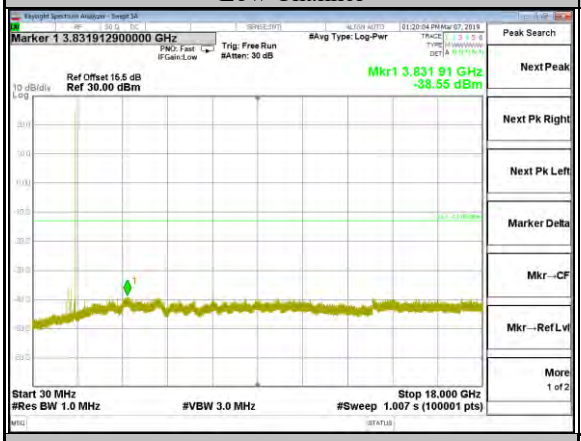
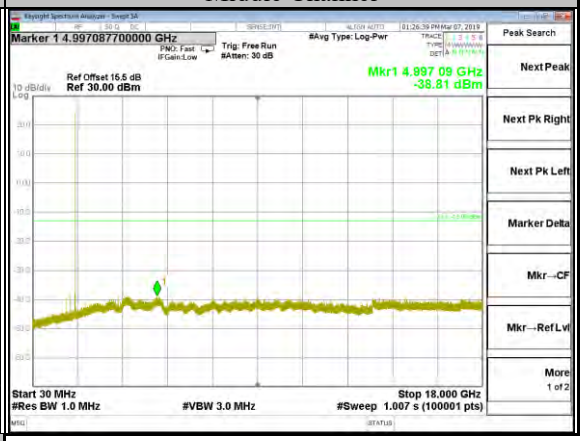
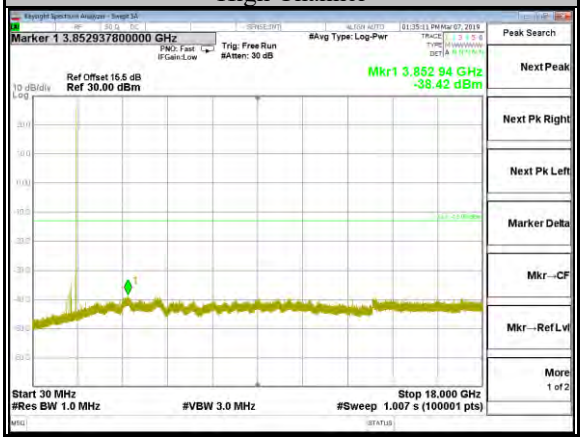


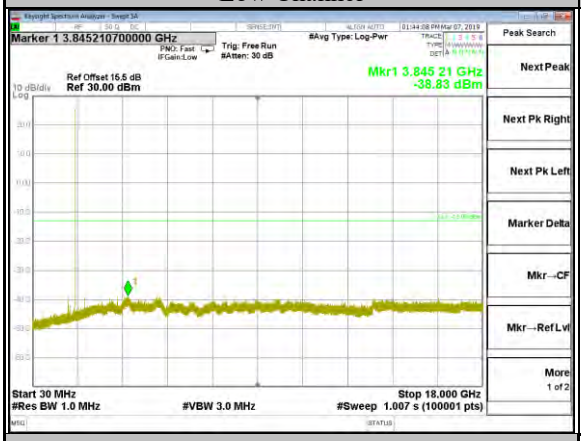
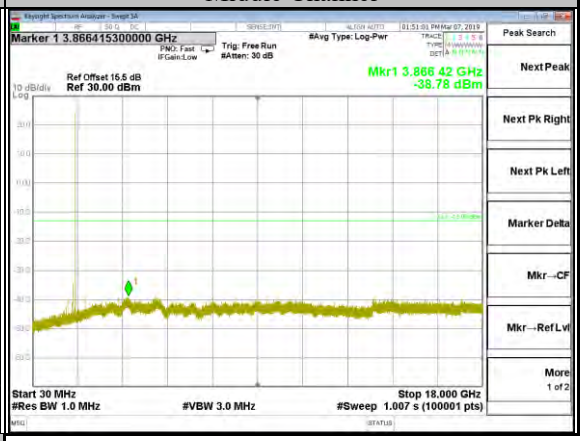
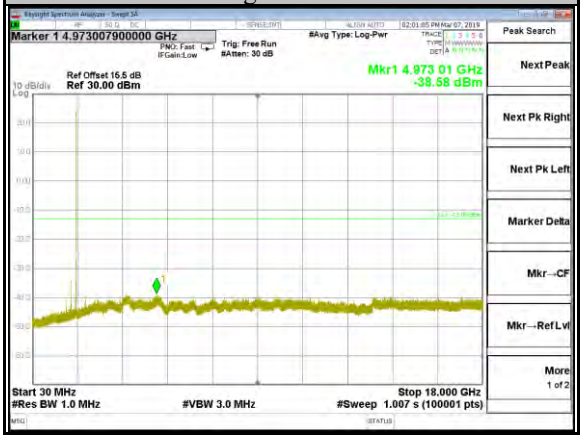
The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.

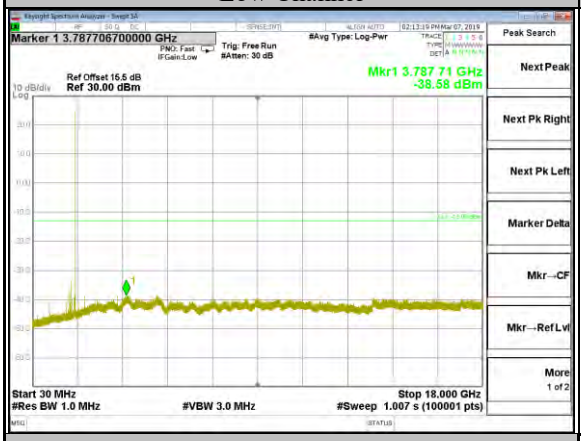
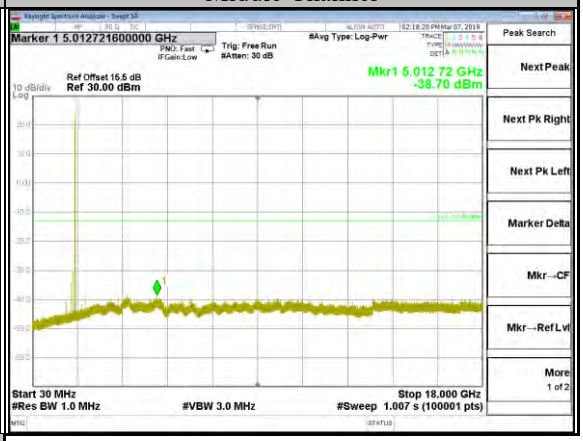
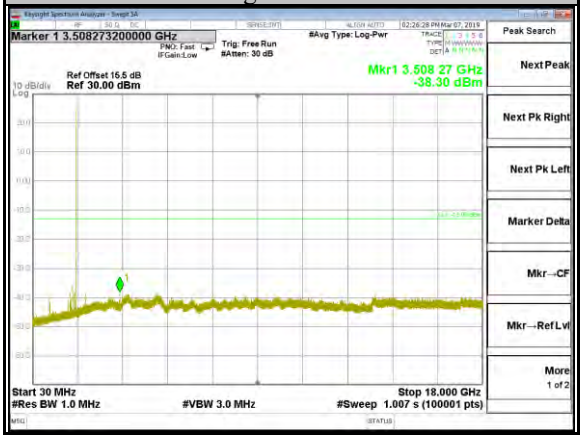
Test Results

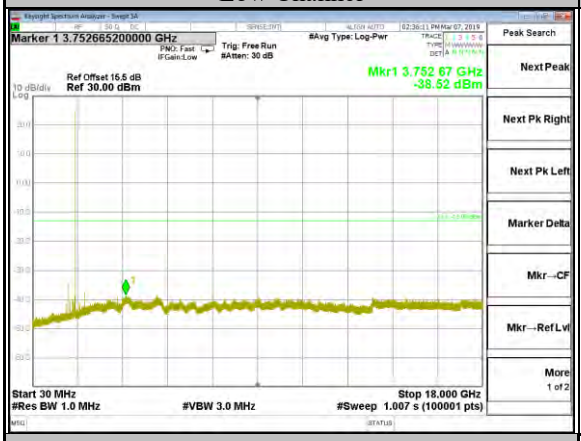
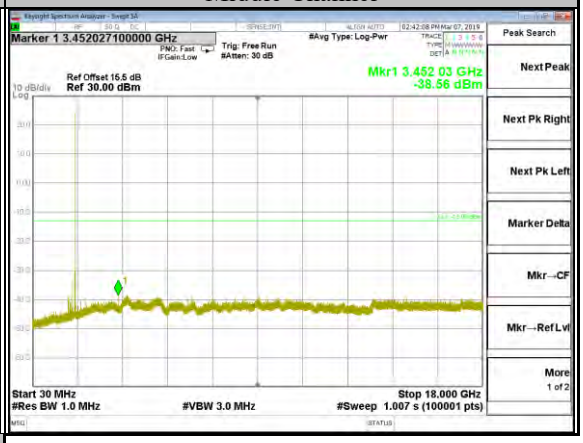
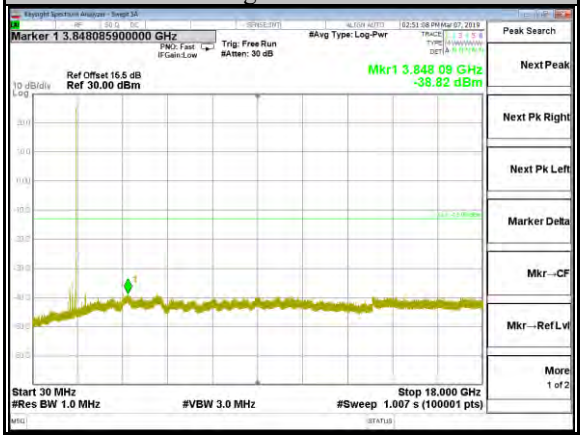
LTE Band 4

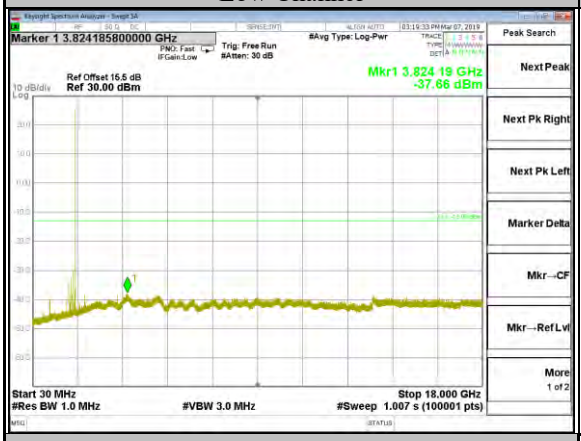
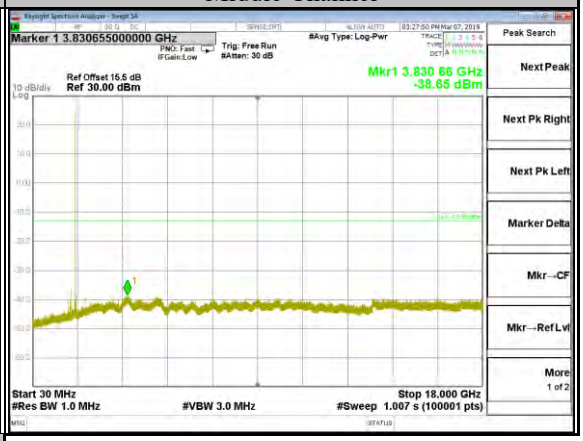
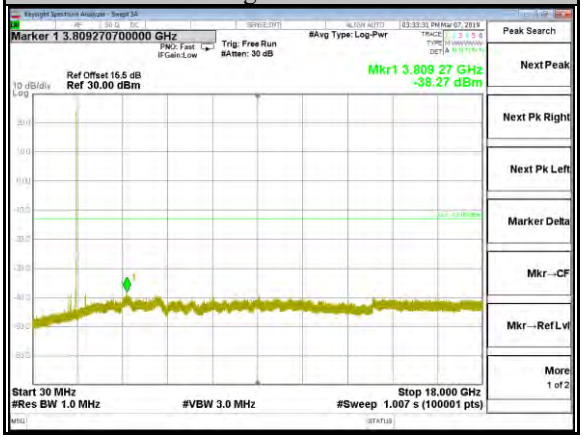
Channel Bandwidth: 1.4 MHz	
Low Channel	Middle Channel
	
High Channel	
	

Channel Bandwidth: 3 MHz	
Low Channel	Middle Channel
	
High Channel	
	

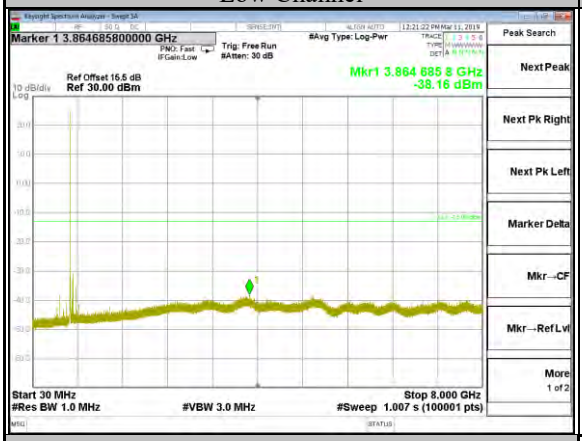
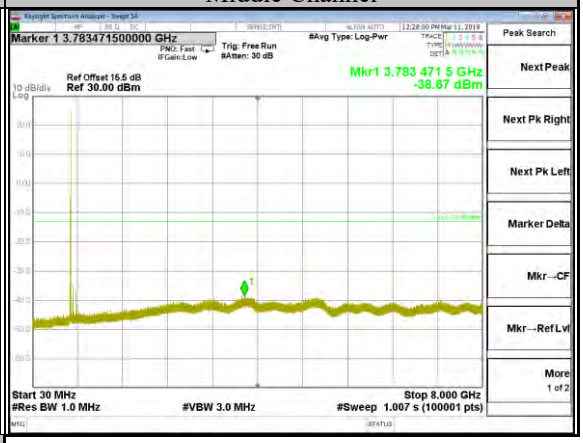
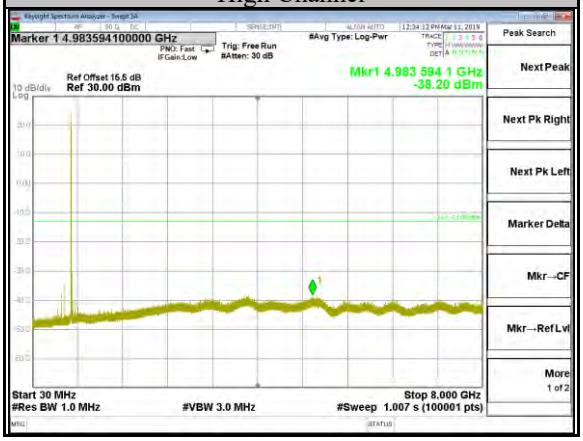
Channel Bandwidth: 5 MHz	
Low Channel	Middle Channel
	
High Channel	
	

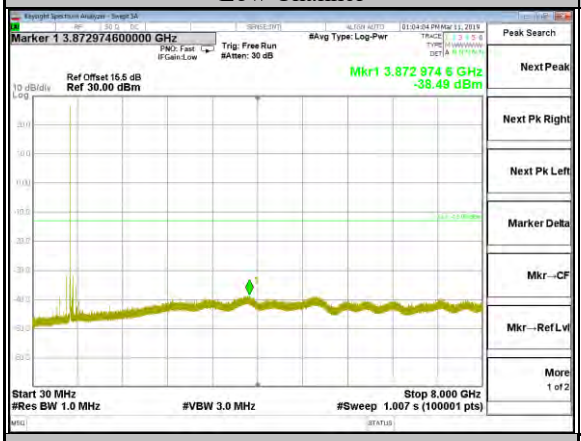
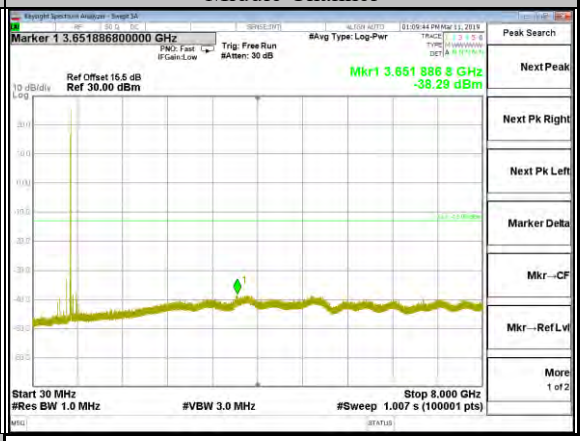
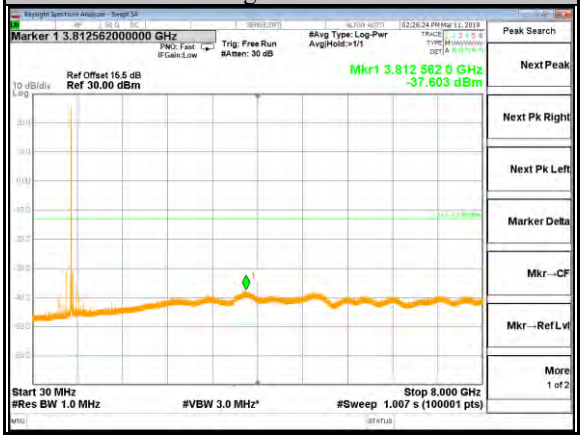
Channel Bandwidth: 10 MHz	
Low Channel	Middle Channel
	
High Channel	
	

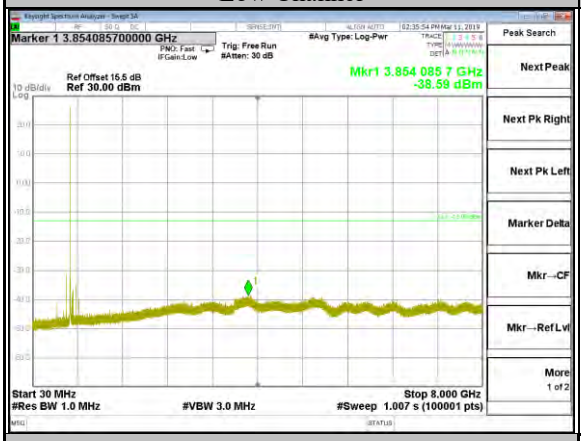
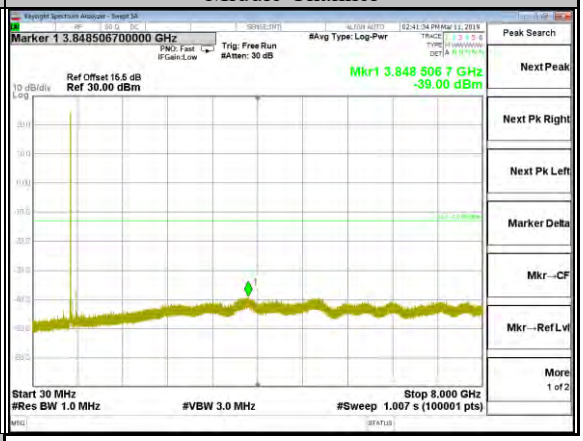
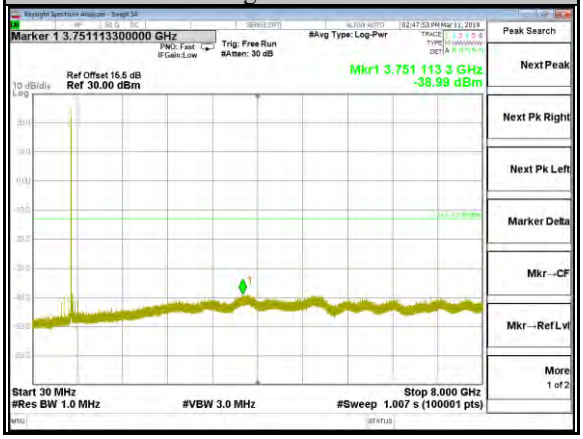
Channel Bandwidth: 15 MHz	
Low Channel	Middle Channel
	
High Channel	
	

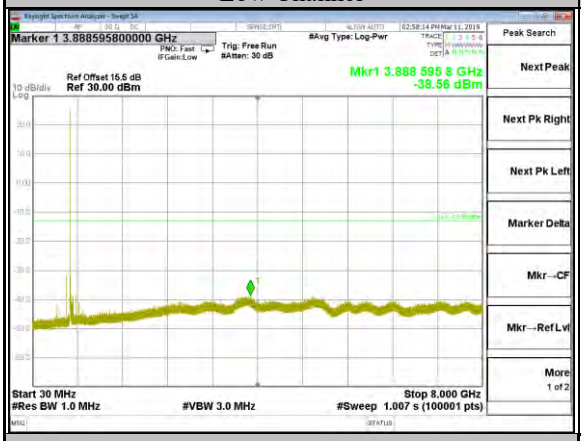
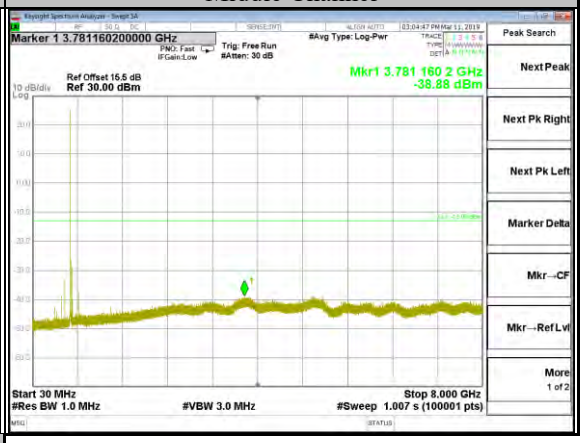
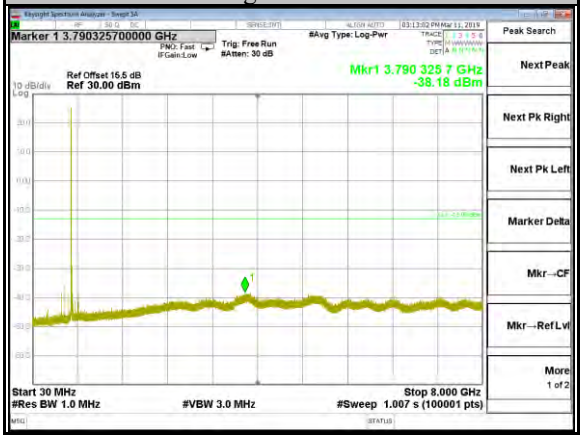
Channel Bandwidth: 20 MHz	
Low Channel	Middle Channel
	
High Channel	
	

LTE Band 12

Channel Bandwidth: 1.4 MHz	
Low Channel	Middle Channel
	
High Channel	
	

Channel Bandwidth: 3 MHz	
Low Channel	Middle Channel
	
High Channel	
	

Channel Bandwidth: 5 MHz	
Low Channel	Middle Channel
	
High Channel	
	

Channel Bandwidth: 10 MHz	
Low Channel	Middle Channel
	
High Channel	
	

9.7. Radiated Spurious Emission

Requirements

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. The emission limit is equal to –13 dBm.

Test procedure

1. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1 m to 4 m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
2. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G.

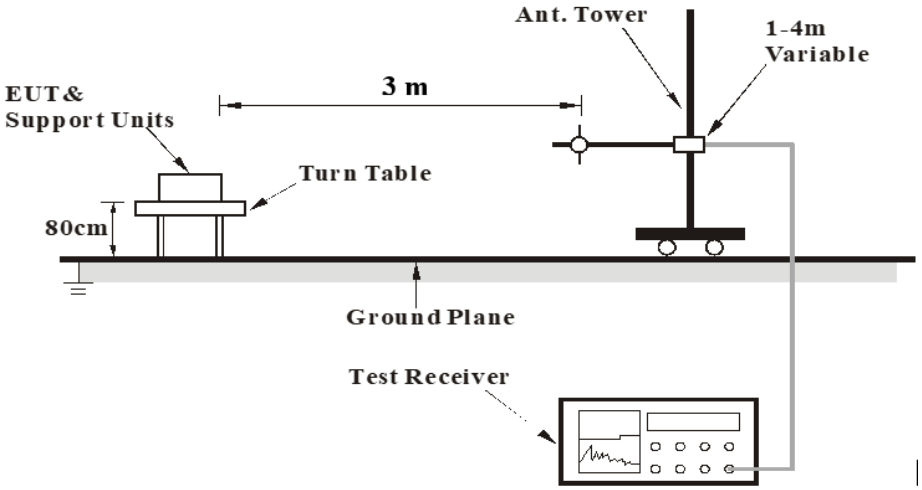
   EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

   E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15 dBi.

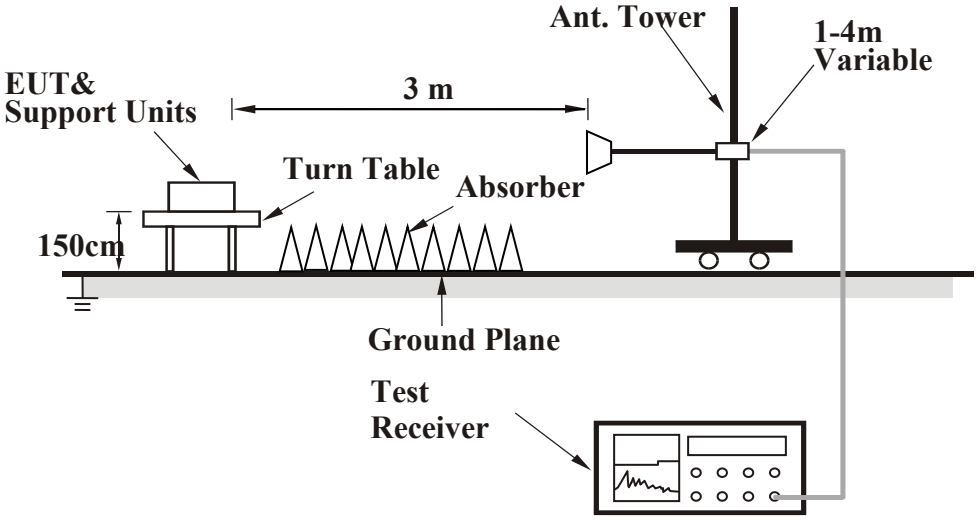
Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz/3 MHz.

Test Setup

<Frequency Range 30 MHz ~ 1 GHz >



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the Setup Configurations.

Test Results

LTE Band 4

- Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier.
- The spurious emissions within 30-1000MHz were found more than 20dB below the permissible value is not required to be report.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	20MHz	Frequency Range	Above 1 GHz
Channel	Low Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
3440	-43.44	-13	-30.44	-47.66	-54.11	10.67	H
5160	-49.20	-13	-36.20	-57.37	-59.66	10.46	H
8600	-50.90	-13	-37.90	-65.14	-60.15	9.25	H
3440	-41.86	-13	-28.86	-45.84	-52.53	10.67	V
5160	-48.95	-13	-35.95	-57.10	-59.41	10.46	V
8600	-52.30	-13	-39.30	-66.12	-61.55	9.25	V
12040	-51.68	-13	-38.68	-71.25	-61.40	9.72	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	20MHz	**Frequency Range**	Above 1 GHz
Channel	Middle Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
3465	-44.95	-13	-31.95	-49.19	-55.48	10.53	H
5197.5	-46.02	-13	-33.02	-54.18	-56.72	10.70	H
6930	-54.93	-13	-41.93	-66.93	-64.74	9.81	H
8662.5	-49.92	-13	-36.92	-64.37	-59.21	9.29	H
3465	-44.15	-13	-31.15	-48.15	-54.68	10.53	V
5197.5	-46.71	-13	-33.71	-54.86	-57.41	10.70	V
6930	-52.68	-13	-39.68	-65.38	-62.49	9.81	V
8662.5	-48.28	-13	-35.28	-62.10	-57.57	9.29	V
12127.5	-50.29	-13	-37.29	-69.83	-60.06	9.77	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	20MHz	**Frequency Range**	Above 1 GHz
Channel	High Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
3490	-42.52	-13	-29.52	-46.78	-52.81	10.30	H
5235	-43.24	-13	-30.24	-51.40	-54.19	10.95	H
8725	-50.70	-13	-37.70	-65.37	-59.58	8.88	H
3490	-43.14	-13	-30.14	-47.16	-53.43	10.30	V
5235	-49.32	-13	-36.32	-57.47	-60.27	10.95	V
8725	-52.61	-13	-39.61	-66.44	-61.49	8.88	V
12215	-50.38	-13	-37.38	-69.88	-60.27	9.89	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.

LTE Band 12

- Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier.
- The spurious emissions within 30-1000MHz were found more than 20dB below the permissible value is not required to be report.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	10MHz	**Frequency Range**	Above 1 GHz
Channel	Low Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
1408	-32.42	-13	-19.42	-32.12	-37.92	5.50	H
2112	-19.09	-13	-6.09	-19.57	-26.87	7.78	H
2816	-29.70	-13	-16.70	-33.02	-39.09	9.40	H
3520	-51.41	-13	-38.41	-55.73	-61.66	10.25	H
4224	-50.90	-13	-37.90	-56.96	-61.69	10.79	H
4928	-53.40	-13	-40.40	-61.38	-64.30	10.90	H
1408	-22.88	-13	-9.88	-22.27	-28.38	5.50	V
2112	-19.30	-13	-6.30	-19.71	-27.08	7.78	V
2816	-25.35	-13	-12.35	-28.45	-34.74	9.40	V
3520	-48.06	-13	-35.06	-52.16	-58.31	10.25	V
4224	-52.20	-13	-39.20	-58.35	-62.99	10.79	V
4928	-53.83	-13	-40.83	-61.77	-64.73	10.90	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	10MHz	**Frequency Range**	Above 1 GHz
Channel	Middle Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
1415	-32.63	-13	-19.63	-32.33	-38.21	5.58	H
2122.5	-20.83	-13	-7.83	-21.36	-28.56	7.73	H
2830	-26.69	-13	-13.69	-30.06	-36.17	9.481	H
3537.5	-47.91	-13	-34.91	-52.28	-58.20	10.29	H
4245	-54.67	-13	-41.67	-60.77	-65.46	10.788	H
4952.5	-53.61	-13	-40.61	-61.67	-64.46	10.853	H
1415	-22.06	-13	-9.06	-21.46	-27.64	5.58	V
2122.5	-18.48	-13	-5.48	-18.94	-26.21	7.73	V
2830	-30.42	-13	-17.42	-33.56	-39.90	9.48	V
3537.5	-49.99	-13	-36.99	-54.15	-60.28	10.29	V
4245	-56.66	-13	-43.66	-62.84	-67.45	10.788	V
4952.5	-52.71	-13	-39.71	-60.72	-63.56	10.853	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.

EUT Test Condition		Measurement Detail	
Channel Bandwidth	10MHz	Frequency Range	Above 1 GHz
Channel	High Channel		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA. Reading (dBm)	S.G. Value (dBm)	Correction Factor (dB)	Polarization (H/V)
1422	-31.75	-13	-18.75	-31.46	-37.41	5.66	H
2133	-21.83	-13	-8.83	-22.41	-29.53	7.70	H
2844	-29.61	-13	-16.61	-33.02	-39.21	9.60	H
3555	-47.18	-13	-34.18	-51.60	-57.51	10.33	H
4266	-53.33	-13	-40.33	-59.47	-64.02	10.69	H
1422	-23.30	-13	-10.30	-22.72	-28.96	5.66	V
2133	-18.28	-13	-5.28	-18.78	-25.98	7.70	V
2844	-25.46	-13	-12.46	-28.64	-35.06	9.60	V
3555	-49.59	-13	-36.59	-53.81	-59.92	10.33	V
4266	-55.58	-13	-42.58	-61.80	-66.27	10.69	V

Remarks:

1. Correction Factor (dB) = Substitution Antenna Gain (dB) + Cable Loss (dB).
2. EIRP (dBm) = S.G Value (dBm) + Correction Factor (dB).
3. The other emission levels were very low against the limit.