FCC Test Report

(PART 27)

Report No.:	RF190628C20-3
FCC ID:	ZMOL850GL
Test Model:	Lenovo Yoga C640-13IML LTE
Series Model:	81XL (refer to item 3.1 for more details)
Received Date:	Jun. 28, 2019
Test Date:	Jul. 08 ~ Jul. 16, 2019
Issued Date:	Aug. 01, 2019
Applicant:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Address:	Section 304-305, Building No. 4, # 222, Meiyue Road, China (Shanghai) Pilot Free Trade Zone
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C)
Test Location:	No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
RF190628C20-3	Original Release	Aug. 01, 2019

1 Certificate of Conformity

Product:	Notebook Computer
Brand:	Lenovo
Test Model:	Lenovo Yoga C640-13IML LTE
Series Model:	81XL (refer to item 3.1 for more details)
Sample Status:	Engineering Sample
Applicant:	Lenovo (Shanghai) Electronics Technology Co., Ltd.
Test Date:	Jul. 08 ~ Jul. 16, 2019
Standards:	FCC Part 27, Subpart C, M

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** Aug. 01, 2019

Ivonne Wu / Supervisor

Approved by : _____ , **Date:** Aug. 01, 2019

Dylan Chiou / Project Engineer

2 Summary of Test Results

Applied Standard: FCC Part 27 & Part 2			
FCC Clause	**Test Item**	**Result**	**Remarks**
2.1046 27.50(h)(2)	Equivalent Isotropic Radiated Power	Pass	Meet the requirement of limit.
2.1047	Modulation Characteristics	Pass	Meet the requirement.
2.1055 27.54	Frequency Stability	Pass	Meet the requirement of limit.
2.1049 27.53(m)(6)	Occupied Bandwidth	Pass	Meet the requirement of limit.
--	Peak to Average Ratio	Pass	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Out-of-Band Emissions Measurements	Pass	Meet the requirement of limit.
2.1051 27.53(m)(4)(6)	Conducted Spurious Emissions	Pass	Meet the requirement of limit.
2.1053 27.53(m)(4)(6)	Radiated Spurious Emissions	Pass	Meet the requirement of limit. Minimum passing margin is -4.53 dB at 15210.00 MHz.

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.04 dB
	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Test Site and Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2019	Mar. 17, 2020
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 13, 2018	Dec. 12, 2019
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 15, 2019	Apr. 14, 2020
Spectrum Analyzer ROHDE & SCHWARZ	FSW26	102023	Oct. 11, 2018	Oct. 10, 2019
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 25, 2018	Nov. 24, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 23, 2018	Nov. 22, 2019
BILOG Antenna SCHWARZBECK	VULB 9168	9168-153	Nov. 23, 2018	Nov. 22, 2019
Double Ridge Guide Horn Antenna EMCO	3115	5619	Nov. 25, 2018	Nov. 24, 2019
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 15, 2019	Apr. 14, 2020
MXG Vector signal generator Agilent	N5182B	MY53050430	Nov. 19, 2018	Nov. 18, 2019
Preamplifier EMCI	EMC 012645	980115	Oct. 12, 2018	Oct. 11, 2019
Preamplifier EMCI	EMC 330H	980112	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	EMC104-SM-SM-8000&3000	140811+170717	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(140807)	Oct. 12, 2018	Oct. 11, 2019
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 12, 2018	Oct. 11, 2019
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower &Turn Table Controller MF	MF-7802	NA	NA	NA
Radio Communication Analyzer Anritsu	MT8820C	6201300640	Aug. 16, 2017	Aug. 15, 2019
Temperature & Humidity Chamber	GTH-120-40-CP-AR	MAA1306-019	Sep. 05, 2018	Sep. 04, 2019
DC Power Supply Topward	33010D	807748	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 / 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Chamber 10.

3 General Information

3.1 General Description of EUT

Product	Notebook Computer	
Brand	Lenovo	
Test Model	Lenovo Yoga C640-13IML LTE	
Series Model	81XL	
Status of EUT	Engineering Sample	
Power Supply Rating	12 Vdc (Adapter)	
Modulation Type	QPSK, 16QAM	
Frequency Range	LTE Band 7 (Channel Bandwidth: 5 MHz)	2502.5 ~ 2567.5 MHz
	LTE Band 7 (Channel Bandwidth: 10 MHz)	2505 ~ 2565 MHz
	LTE Band 7 (Channel Bandwidth: 15 MHz)	2507.5 ~ 2562.5 MHz
	LTE Band 7 (Channel Bandwidth: 20 MHz)	2510 ~ 2560 MHz
	LTE Band 41 (Channel Bandwidth: 5 MHz)	2498.5 ~ 2687.5 MHz
	LTE Band 41 (Channel Bandwidth: 10 MHz)	2501.0 ~ 2685.0 MHz
	LTE Band 41 (Channel Bandwidth: 15 MHz)	2503.5 ~ 2682.5 MHz
	LTE Band 41 (Channel Bandwidth: 20 MHz)	2506.0 ~ 2680.0 MHz
Max. EIRP Power	LTE Band 7 (Channel Bandwidth: 5 MHz)	66.83 mW
	LTE Band 7 (Channel Bandwidth: 10 MHz)	71.12 mW
	LTE Band 7 (Channel Bandwidth: 15 MHz)	74.30 mW
	LTE Band 7 (Channel Bandwidth: 20 MHz)	76.38 mW
	LTE Band 41 (Channel Bandwidth: 5 MHz)	81.66 mW
	LTE Band 41 (Channel Bandwidth: 10 MHz)	83.95 mW
	LTE Band 41 (Channel Bandwidth: 15 MHz)	86.70 mW
	LTE Band 41 (Channel Bandwidth: 20 MHz)	89.54 mW
Emission Designator	LTE Band 7 (Channel Bandwidth: 5 MHz)	4M51D7W
	LTE Band 7 (Channel Bandwidth: 10 MHz)	9M00G7D
	LTE Band 7 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 7 (Channel Bandwidth: 20 MHz)	18M0G7D
	LTE Band 41 (Channel Bandwidth: 5 MHz)	4M50G7D
	LTE Band 41 (Channel Bandwidth: 10 MHz)	8M99D7W
	LTE Band 41 (Channel Bandwidth: 15 MHz)	13M5G7D
	LTE Band 41 (Channel Bandwidth: 20 MHz)	18M0G7D
Antenna Type	PIFA Antenna	
Antenna Gain	LTE Band 7	NB Mode: 1.77 dBi (Main) / 1.46 dBi (Aux.) Tablet Mode: -2.28 dBi (Main) / -1.75 dBi (Aux.)
	LTE Band 41	NB Mode: 1.39 dBi (Main) / 0.52 dBi (Aux.) Tablet Mode: -1.47 dBi (Main) / -2.19 dBi (Aux.)
Accessory Device	Refer to Note as below	
Data Cable Supplied	Refer to Note as below	

Note:

1. The WWAN module (Brand: Fibocom, Model: L850-GL) was installed in the EUT.
2. All models are listed as below.

Brand	Model	Difference
Lenovo	Lenovo Yoga C640-13IML LTE (Main test)	All models are electrically identical, different model names are for marketing purpose.
	81XL (Series model)	

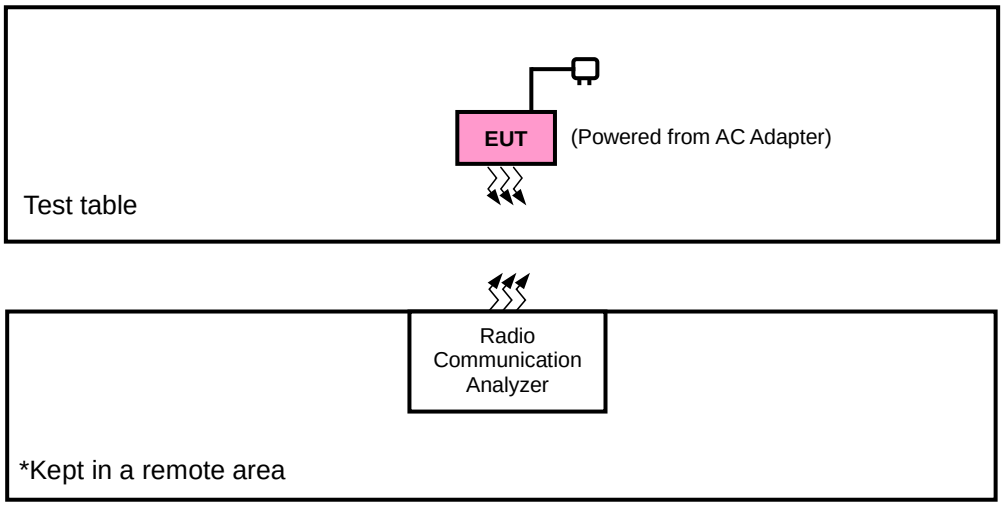
3. The EUT contains following accessory devices.

Product	Brand	Model	Description
Adapter	Lenovo	PA-1450-55LL	I/P: 100-240 Vac, 50/60 Hz, 1.7 A O/P: 12 Vdc, 2 A

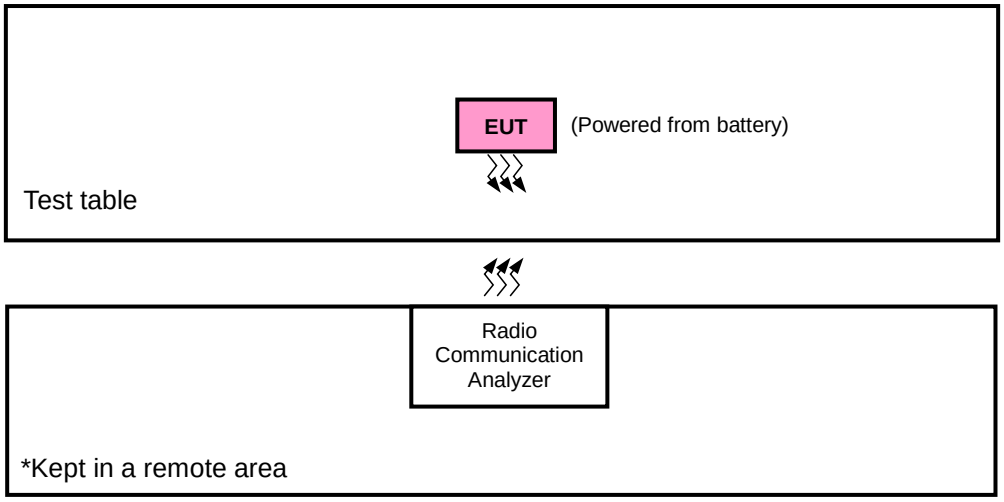
4. The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

3.2 Configuration of System under Test

<Radiated Emission Test>



<E.I.R.P. Test>



3.2.1 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.3 Test Mode Applicability and Tested Channel Detail

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis, and antenna ports.
The worst case was found when positioned as the table below. Following channel(s) was (were) selected for the final test as listed below:

Band	EIRP	Radiated Emission
LTE Band 7	Z-plane	X-axis
LTE Band 41	Z-plane	X-axis

LTE Band 7

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	20850 to 21350	21110	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	20775 to 21425	20775, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20800 to 21400	20800, 21400	10 MHz	QPSK	1 RB / 0 RB Offset
		20825 to 21375	20825, 21375	15 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21350	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Out-of-Band Emissions	20775 to 21425	20775, 21425	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 24 RB Offset
		20800 to 21400	20800, 21400	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 49 RB Offset
		20825 to 21375	20825, 21375	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 74 RB Offset
		20850 to 21350	20850, 21350	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 99 RB Offset
-	Conducted Emission	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10 MHz	QPSK	1 RB / 0 RB Offset
		20825 to 21375	20825, 21100, 21375	15 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100 21350	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	20775 to 21425	20775, 21100, 21425	5 MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100, 21350	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

LTE Band 41

EUT Configure Mode	Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
-	EIRP	39675 to 41565	39675, 40620, 41565	5 MHz	QPSK, 16QAM	12 RB / 0 RB Offset
		39700 to 41540	39700, 40620, 41540	10 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		39725 to 41515	39725, 40620, 41515	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		39750 to 41490	39750, 40620, 41490	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Modulation Characteristics	39750 to 41490	40620	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Frequency Stability	39675 to 41565	39675, 41565	5 MHz	QPSK	1 RB / 0 RB Offset
		39700 to 41540	39700, 41540	10 MHz	QPSK	1 RB / 0 RB Offset
		39725 to 41515	39725, 41515	15 MHz	QPSK	1 RB / 0 RB Offset
		39750 to 41490	39750, 41490	20 MHz	QPSK	1 RB / 0 RB Offset
-	Occupied Bandwidth	39675 to 41565	39675, 40620, 41565	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		39700 to 41540	39700, 40620, 41540	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset
		39725 to 41515	39725, 40620, 41515	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		39750 to 41490	39750, 40620, 41490	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset
-	Peak to Average Ratio	39675 to 41565	39675, 40620, 41565	5 MHz	QPSK, 16QAM	12 RB / 0 RB Offset
		39700 to 41540	39700, 40620, 41540	10 MHz	QPSK, 16QAM	25 RB / 0 RB Offset
		39725 to 41515	39725, 40620, 41515	15 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		39750 to 41490	39750, 40620, 41490	20 MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	Out-of-Band Emissions	39675 to 41565	39675, 41565	5 MHz	QPSK, 16QAM	25 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 24 RB Offset
		39700 to 41540	39700, 41540	10 MHz	QPSK, 16QAM	50 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 49 RB Offset
		39725 to 41515	39725, 41515	15 MHz	QPSK, 16QAM	75 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 74 RB Offset
		39750 to 41490	39750, 41490	20 MHz	QPSK, 16QAM	100 RB / 0 RB Offset 1 RB / 0 RB Offset 1 RB / 99 RB Offset
-	Conducted Emission	39675 to 41565	39675, 40620, 41565	5 MHz	QPSK	12 RB / 0 RB Offset
		39700 to 41540	39700, 40620, 41540	10 MHz	QPSK	25 RB / 0 RB Offset
		39725 to 41515	39725, 40620, 41515	15 MHz	QPSK	1 RB / 0 RB Offset
		39750 to 41490	39750, 40620, 41490	20 MHz	QPSK	1 RB / 0 RB Offset
-	Radiated Emission	39675 to 41565	39675, 40620, 41565	5 MHz	QPSK	12 RB / 0 RB Offset
		39750 to 41490	39750, 40620, 41490	20 MHz	QPSK	1 RB / 0 RB Offset

Note:

1. This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.
2. For radiated emission, according to 3GPP 36.521 Section 6.6.3.1.4, choose the lowest, 5 MHz & highest channel bandwidth for final test.

Test Condition:

Test Item	Environmental Conditions	Input Power	Tested By
EIRP	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei
Modulation Characteristics	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Frequency Stability	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Occupied Bandwidth	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Out-of-Band Emissions	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Peak to Average Ratio	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Conducted Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
Radiated Emission	25 deg. C, 65 % RH	120 Vac, 60 Hz	Thomas Wei / Tim Chen / Getaz Yang

3.4 EUT Operating Conditions

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

3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC 47 CFR Part 2
FCC 47 CFR Part 27
KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI/TIA/EIA-603-E 2016
ANSI 63.26-2015

Note: All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Output Power Measurement

4.1.1 Limits of Output Power Measurement

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that “Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2 watts transmitter output power” and 27.50(i) specific that “Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage.”

4.1.2 Test Procedures

EIRP Measurement:

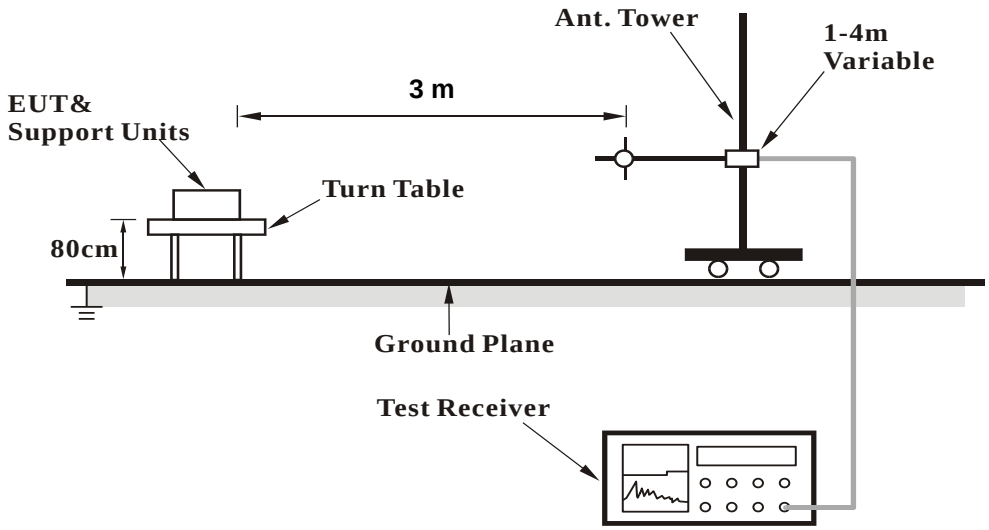
a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 10 MHz for LTE mode.
b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) height of Turn Table, 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.
c. 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 b. Record the power level of S.G.
d. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.

Conducted Power Measurement:

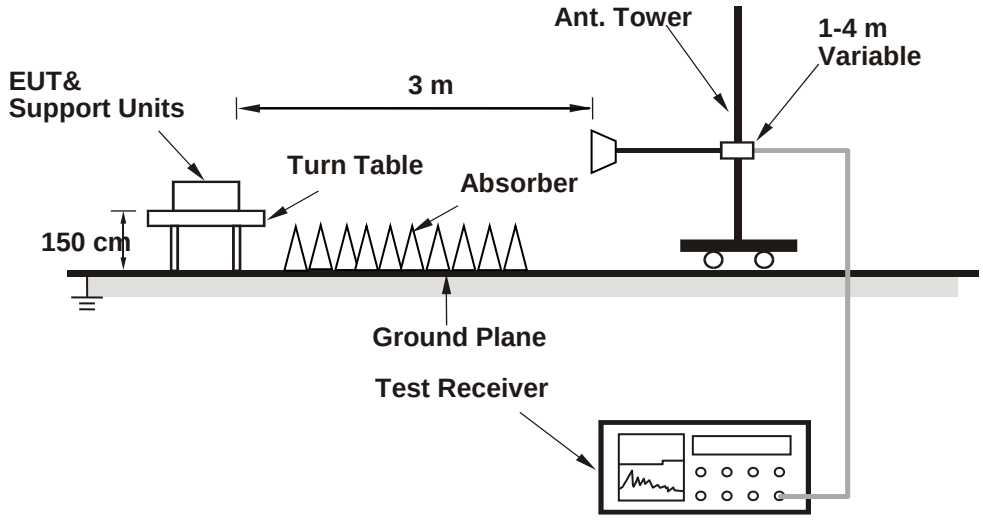
a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

4.1.3 Test Setup

EIRP / ERP Measurement:
<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

Conducted Power Measurement:

4.1.4 Test Results

Conducted Output Power (dBm)

LTE Band 7																
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20850	21100	21350				Channel		20825	21100	21375	
		Frequency (MHz)		2510.0	2535.0	2560.0				Frequency (MHz)		2507.5	2535.0	2562.5	
20M	QPSK	1	0	22.79	22.88	22.95	0	15M	QPSK	1	0	22.72	22.87	22.94	0
		1	50	22.52	22.63	22.68	0			1	37	22.42	22.66	22.73	0
		1	99	22.62	22.70	22.74	0			1	74	22.57	22.67	22.58	0
		50	0	21.58	21.77	21.84	1			36	0	21.43	21.67	21.66	1
		50	25	21.61	21.67	21.73	1			36	19	21.39	21.62	21.65	1
		50	50	21.56	21.72	21.80	1			36	39	21.51	21.56	21.62	1
		100	0	21.72	21.83	21.84	1			75	0	21.67	21.79	21.79	1
	16QAM	1	0	21.87	22.00	22.12	1		16QAM	1	0	21.77	21.98	22.10	1
		1	50	21.69	21.77	21.80	1			1	37	21.58	21.67	21.78	1
		1	99	21.75	21.87	21.93	1			1	74	21.61	21.68	21.78	1
		50	0	20.78	20.80	20.94	2			36	0	20.72	20.85	20.84	2
		50	25	20.64	20.75	20.86	2			36	19	20.58	20.74	20.79	2
		50	50	20.74	20.86	20.88	2			36	39	20.65	20.66	20.78	2
		100	0	20.82	20.88	20.99	2			75	0	20.70	20.80	20.83	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		20800	21100	21400				Channel		20775	21100	21425	
		Frequency (MHz)		2505.0	2535.0	2565.0				Frequency (MHz)		2502.5	2535.0	2567.5	
10M	QPSK	1	0	22.73	22.85	22.89	0	5M	QPSK	1	0	22.73	22.79	22.92	0
		1	24	22.46	22.66	22.60	0			1	12	22.59	22.63	22.58	0
		1	49	22.54	22.61	22.67	0			1	24	22.46	22.67	22.71	0
		25	0	21.54	21.65	21.66	1			12	0	21.47	21.67	21.76	1
		25	12	21.53	21.57	21.51	1			12	6	21.46	21.62	21.65	1
		25	25	21.63	21.68	21.75	1			12	13	21.58	21.69	21.63	1
		50	0	21.64	21.75	21.73	1			25	0	21.63	21.87	21.73	1
	16QAM	1	0	21.81	21.91	21.91	1		16QAM	1	0	21.86	21.86	22.02	1
		1	24	21.53	21.67	21.72	1			1	12	21.56	21.64	21.70	1
		1	49	21.58	21.69	21.83	1			1	24	21.58	21.68	21.77	1
		25	0	20.60	20.83	20.87	2			12	0	20.67	20.67	20.74	2
		25	12	20.60	20.62	20.85	2			12	6	20.59	20.71	20.68	2
		25	25	20.71	20.69	20.73	2			12	13	20.60	20.74	20.71	2
		50	0	20.73	20.86	20.89	2			25	0	20.81	20.84	20.96	2

LTE Band 41																
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		39750	40620	41490				Channel		39725	40620	41515	
		Frequency (MHz)		2506.0	2593.0	2680.0				Frequency (MHz)		2503.5	2593.0	2682.5	
20M	QPSK	1	0	22.21	22.28	22.18	0	15M	QPSK	1	0	22.16	22.23	22.12	0
		1	50	22.19	22.26	22.16	0			1	37	22.19	22.20	22.14	0
		1	99	22.17	22.24	22.14	0			1	74	22.07	22.17	22.13	0
		50	0	21.24	21.31	21.21	1			36	0	21.19	21.28	21.15	1
		50	25	21.18	21.25	21.15	1			36	19	21.14	21.24	21.10	1
		50	50	21.19	21.26	21.16	1			36	39	21.14	21.21	21.16	1
		100	0	21.19	21.26	21.16	1			75	0	21.13	21.17	21.11	1
	16QAM	1	0	21.31	21.38	21.28	1		16QAM	1	0	21.11	21.18	21.14	1
		1	50	21.23	21.30	21.20	1			1	37	21.10	21.19	21.13	1
		1	99	21.19	21.26	21.16	1			1	74	21.08	21.15	21.14	1
		50	0	20.34	20.41	20.31	2			36	0	20.14	20.24	20.11	2
		50	25	20.29	20.36	20.26	2			36	19	20.12	20.16	20.08	2
		50	50	20.33	20.40	20.30	2			36	39	20.10	20.20	20.12	2
		100	0	20.19	20.26	20.16	2			75	0	20.14	20.17	20.16	2
BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)	BW	MCS Index	RB Size	RB Offset	Low	Mid	High	3GPP MPR (dB)
		Channel		39700	40620	41540				Channel		39675	40620	41565	
		Frequency (MHz)		2501.0	2593.0	2685.0				Frequency (MHz)		2498.5	2593.0	2687.5	
10M	QPSK	1	0	22.08	22.16	22.12	0	5M	QPSK	1	0	22.08	22.18	22.07	0
		1	24	22.09	22.14	22.06	0			1	12	22.09	22.21	22.13	0
		1	49	22.11	22.15	22.07	0			1	24	22.06	22.18	22.02	0
		25	0	21.15	21.14	21.16	1			12	0	21.19	21.21	21.10	1
		25	12	21.05	21.15	21.10	1			12	6	21.15	21.15	21.11	1
		25	25	21.07	21.12	21.07	1			12	13	21.04	21.19	21.06	1
		50	0	21.10	21.18	21.02	1			25	0	21.07	21.12	21.01	1
	16QAM	1	0	21.11	21.20	21.10	1		16QAM	1	0	21.09	21.25	21.02	1
		1	24	21.07	21.19	21.04	1			1	12	21.07	21.14	21.07	1
		1	49	21.14	21.09	21.07	1			1	24	21.01	21.09	21.07	1
		25	0	20.19	20.19	20.12	2			12	0	20.21	20.20	20.10	2
		25	12	20.03	20.12	20.05	2			12	6	20.16	20.18	20.05	2
		25	25	20.10	20.18	20.11	2			12	13	20.01	20.09	20.11	2
		50	0	20.07	20.09	20.10	2			25	0	20.08	20.21	20.07	2

EIRP Power (dBm)

LTE Band 7							
Channel Bandwidth: 5 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	20775	2502.5	-20.34	38.52	18.18	65.77	H
	21100	2535.0	-20.11	38.36	18.25	66.83	
	21425	2567.5	-20.49	38.58	18.09	64.42	
	20775	2502.5	-26.12	38.92	12.80	19.05	V
	21100	2535.0	-26.41	39.26	12.85	19.28	
	21425	2567.5	-26.50	39.22	12.72	18.71	
Channel Bandwidth: 5 MHz / 16QAM							
Z	20775	2502.5	-21.60	38.52	16.92	49.20	H
	21100	2535.0	-21.34	38.36	17.02	50.35	
	21425	2567.5	-21.75	38.58	16.83	48.19	
	20775	2502.5	-27.54	38.92	11.38	13.74	V
	21100	2535.0	-27.81	39.26	11.45	13.96	
	21425	2567.5	-27.93	39.22	11.29	13.46	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 7							
Channel Bandwidth: 10 MHz / QPSK							
Plane	**Channel**	**Frequency (MHz)**	**Reading (dBm)**	**Correction Factor (dB)**	**EIRP (dBm)**	**EIRP (mW)**	**Polarization (H/V)**
Z	20800	2505.0	-20.20	38.65	18.45	69.98	H
	21100	2535.0	-19.84	38.36	18.52	71.12	
	21400	2565.0	-20.09	38.49	18.40	69.18	
	20800	2505.0	-25.86	38.84	12.98	19.86	V
	21100	2535.0	-26.19	39.26	13.07	20.28	
	21400	2565.0	-26.19	39.10	12.91	19.54	
Channel Bandwidth: 10 MHz / 16QAM							
Z	20800	2505.0	-21.34	38.65	17.31	53.83	H
	21100	2535.0	-20.99	38.36	17.37	54.58	
	21400	2565.0	-21.23	38.49	17.26	53.21	
	20800	2505.0	-27.14	38.84	11.70	14.79	V
	21100	2535.0	-27.47	39.26	11.79	15.10	
	21400	2565.0	-27.46	39.10	11.64	14.59	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 7							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20825	2507.5	-19.85	38.52	18.67	73.62	H
	21100	2535.0	-19.65	38.36	18.71	74.30	
	21375	2562.5	-20.00	38.58	18.58	72.11	
	20825	2507.5	-25.72	38.92	13.20	20.89	V
	21100	2535.0	-25.97	39.26	13.29	21.33	
	21375	2562.5	-26.08	39.22	13.14	20.61	
Channel Bandwidth: 15 MHz / 16QAM							
Z	20825	2507.5	-20.94	38.52	17.58	57.28	H
	21100	2535.0	-20.73	38.36	17.63	57.94	
	21375	2562.5	-21.06	38.58	17.52	56.49	
	20825	2507.5	-26.87	38.92	12.05	16.03	V
	21100	2535.0	-27.15	39.26	12.11	16.26	
	21375	2562.5	-27.25	39.22	11.97	15.74	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 7							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	20850	2510.0	-19.74	38.52	18.78	75.51	H
	21100	2535.0	-19.53	38.36	18.83	76.38	
	21350	2560.0	-20.86	38.58	17.72	59.16	
	20850	2510.0	-25.53	38.92	13.39	21.83	V
	21100	2535.0	-25.80	39.26	13.46	22.18	
	21350	2560.0	-25.91	39.22	13.31	21.43	
Channel Bandwidth: 20 MHz / 16QAM							
Z	20850	2510.0	-20.75	38.52	17.77	59.84	H
	21100	2535.0	-20.51	38.36	17.85	60.95	
	21350	2560.0	-20.88	38.58	17.70	58.88	
	20850	2510.0	-26.58	38.92	12.34	17.14	V
	21100	2535.0	-26.86	39.26	12.40	17.38	
	21350	2560.0	-26.93	39.22	12.29	16.94	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 41							
Channel Bandwidth: 5 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	39675	2498.5	-20.00	38.99	18.99	79.25	H
	40620	2593.0	-19.05	38.17	19.12	81.66	
	41565	2687.5	-19.50	38.55	19.05	80.35	
	39675	2498.5	-25.40	39.27	13.87	24.38	V
	40620	2593.0	-24.65	38.68	14.03	25.29	
	41565	2687.5	-24.60	38.55	13.95	24.83	
Channel Bandwidth: 5 MHz / 16QAM							
Z	39675	2498.5	-21.12	38.99	17.87	61.24	H
	40620	2593.0	-20.23	38.17	17.94	62.23	
	41565	2687.5	-20.65	38.55	17.90	61.66	
	39675	2498.5	-26.55	39.27	12.72	18.71	V
	40620	2593.0	-25.86	38.68	12.82	19.14	
	41565	2687.5	-25.76	38.55	12.79	19.01	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 41							
Channel Bandwidth: 10 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	39700	2501.0	-19.87	38.98	19.11	81.47	H
	40620	2593.0	-18.93	38.17	19.24	83.95	
	41540	2685.0	-19.27	38.45	19.18	82.79	
	39700	2501.0	-24.81	39.04	14.23	26.49	V
	40620	2593.0	-24.31	38.68	14.37	27.35	
	41540	2685.0	-24.30	38.60	14.30	26.92	
Channel Bandwidth: 10 MHz / 16QAM							
Z	39700	2501.0	-20.97	38.98	18.01	63.24	H
	40620	2593.0	-20.02	38.17	18.15	65.31	
	41540	2685.0	-20.37	38.45	18.08	64.27	
	39700	2501.0	-25.90	39.04	13.14	20.61	V
	40620	2593.0	-25.45	38.68	13.23	21.04	
	41540	2685.0	-25.41	38.60	13.19	20.84	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 41							
Channel Bandwidth: 15 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	39725	2503.5	-19.83	39.09	19.26	84.33	H
	40620	2593.0	-18.79	38.17	19.38	86.70	
	41515	2682.5	-19.21	38.52	19.31	85.31	
	39725	2503.5	-24.60	39.04	14.44	27.80	V
	40620	2593.0	-24.09	38.68	14.59	28.77	
	41515	2682.5	-24.16	38.66	14.50	28.18	
Channel Bandwidth: 15 MHz / 16QAM							
Z	39725	2503.5	-20.92	39.09	18.17	65.61	H
	40620	2593.0	-19.92	38.17	18.25	66.83	
	41515	2682.5	-20.31	38.52	18.21	66.22	
	39725	2503.5	-25.64	39.04	13.40	21.88	V
	40620	2593.0	-25.17	38.68	13.51	22.44	
	41515	2682.5	-25.19	38.66	13.47	22.23	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

LTE Band 41							
Channel Bandwidth: 20 MHz / QPSK							
Plane	Channel	Frequency (MHz)	Reading (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (mW)	Polarization (H/V)
Z	39750	2506.0	-19.85	39.26	19.41	87.30	H
	40620	2593.0	-18.65	38.17	19.52	89.54	
	41490	2680.0	-19.23	38.71	19.48	88.72	
	39750	2506.0	-24.66	39.33	14.67	29.31	V
	40620	2593.0	-23.91	38.68	14.77	29.99	
	41490	2680.0	-24.04	38.76	14.72	29.65	
Channel Bandwidth: 20 MHz / 16QAM							
Z	39750	2506.0	-20.90	39.26	18.36	68.55	H
	40620	2593.0	-19.68	38.17	18.49	70.63	
	41490	2680.0	-20.29	38.71	18.42	69.50	
	39750	2506.0	-25.70	39.33	13.63	23.07	V
	40620	2593.0	-24.94	38.68	13.74	23.66	
	41490	2680.0	-25.09	38.76	13.67	23.28	

Note: EIRP (dBm) = Reading (dBm) + Correction Factor (dB)

4.2 Modulation Characteristics Measurement

4.2.1 Limits of Modulation Characteristics

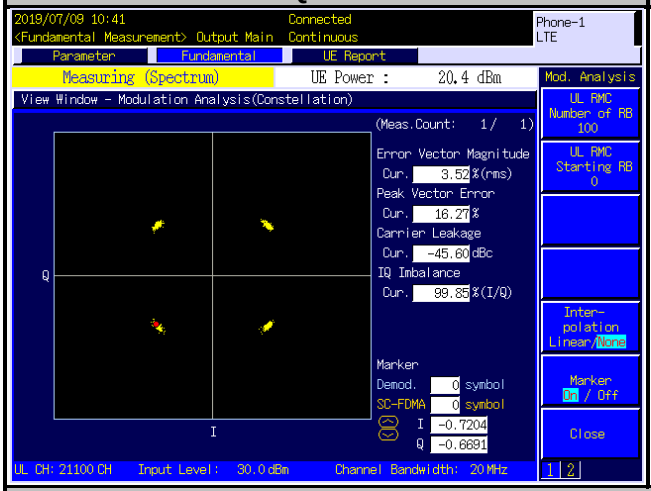
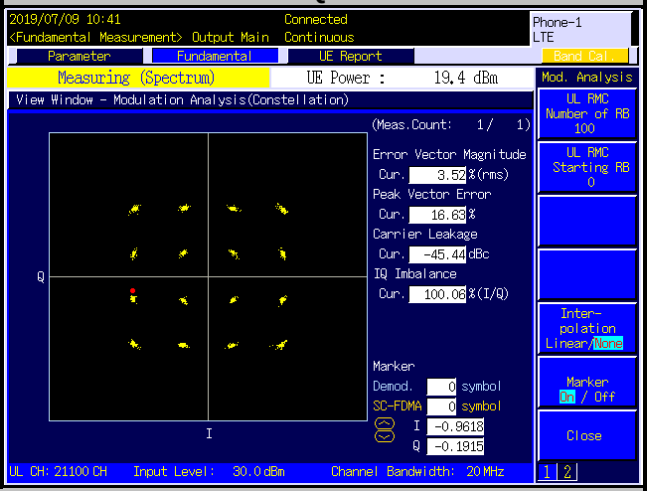
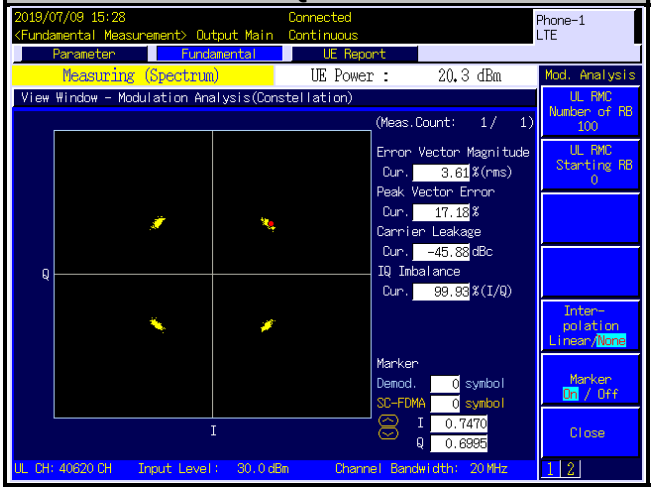
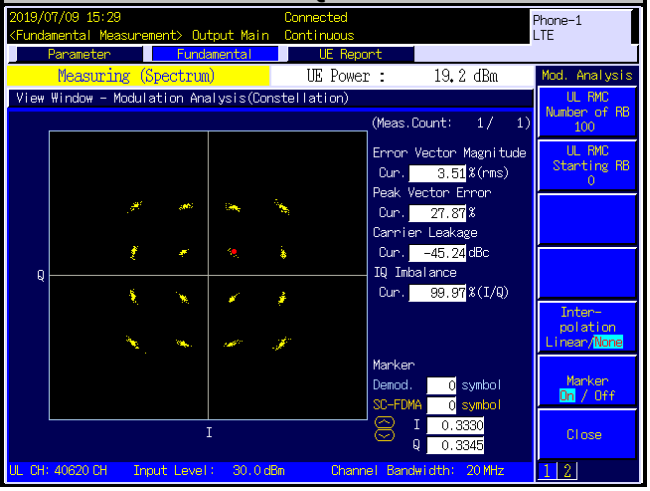
N/A

4.2.2 Test Setup

4.2.3 Test Procedure

Connect the EUT to Communication Simulator via the antenna connector. The frequency band is set as EUT supported Modulation and Channels, the EUT output is matched with 50 ohm load, the waveform quality and constellation of the EUT was tested.

4.2.4 Test Results

Spectrum Plot of Measurement	
LTE Band 7	
Channel 21110	
QPSK	16QAM
	
LTE Band 41	
Channel 40620	
QPSK	16QAM
	

4.3 Frequency Stability Measurement

4.3.1 Limits of Frequency Stability Measurement

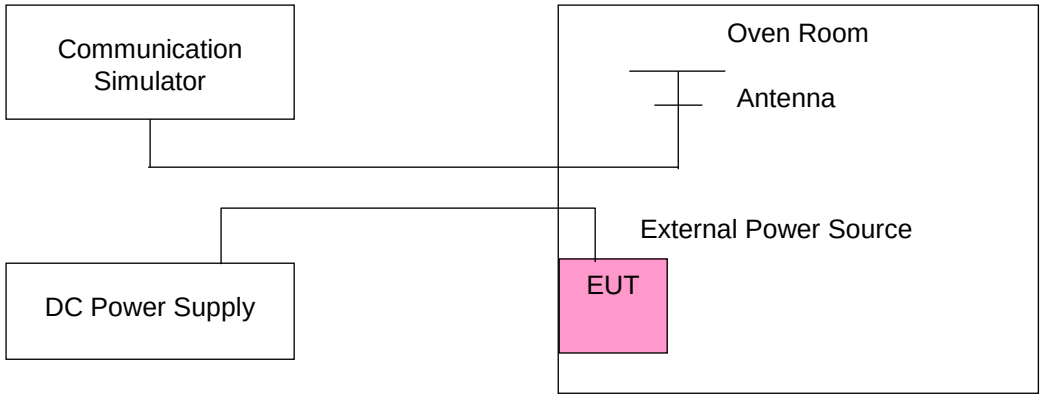
According to the FCC part 2.1055 shall be tested the frequency stability. The rule is defined that" The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block." The test extreme voltage is according to the 2.1055(d)(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment and the extreme temperature rule is comply with specification of EUT -30℃~ 50℃.

4.3.2 Test Procedure

a. 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.
b. 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.
c. 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.

4.3.3 Test Setup



4.3.4 Test Results

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2502.500002	0.001	2567.500001	0.000
102	2502.500004	0.001	2567.500003	0.001
138	2502.500001	0.000	2567.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 7			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2502.500004	0.001	2567.500002	0.001
-20	2502.500003	0.001	2567.500003	0.001
-10	2502.500004	0.002	2567.500004	0.001
0	2502.500002	0.001	2567.500004	0.001
10	2502.500002	0.001	2567.500003	0.001
20	2502.499998	-0.001	2567.499998	-0.001
30	2502.499997	-0.001	2567.499997	-0.001
40	2502.499997	-0.001	2567.499999	0.000
50	2502.499997	-0.001	2567.499997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2502.500004	0.002	2567.500002	0.001
102	2502.500004	0.002	2567.500002	0.001
138	2502.500004	0.001	2567.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 7			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2502.500003	0.001	2567.500002	0.001
-20	2502.500004	0.001	2567.500001	0.001
-10	2502.500002	0.001	2567.500002	0.001
0	2502.500003	0.001	2567.500003	0.001
10	2502.500002	0.001	2567.500003	0.001
20	2502.499998	-0.001	2567.499996	-0.002
30	2502.499998	-0.001	2567.499998	-0.001
40	2502.499997	-0.001	2567.499999	0.000
50	2502.499996	-0.002	2567.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2502.500004	0.002	2567.500002	0.001
102	2502.500004	0.002	2567.500004	0.001
138	2502.500003	0.001	2567.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 7			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2502.500002	0.001	2567.500004	0.002
-20	2502.500003	0.001	2567.500002	0.001
-10	2502.500003	0.001	2567.500004	0.002
0	2502.500001	0.000	2567.500002	0.001
10	2502.500003	0.001	2567.500003	0.001
20	2502.499998	-0.001	2567.499998	-0.001
30	2502.499997	-0.001	2567.499999	-0.001
40	2502.499997	-0.001	2567.499999	-0.001
50	2502.499999	0.000	2567.499996	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 7			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2502.500004	0.001	2567.500003	0.001
102	2502.500003	0.001	2567.500001	0.000
138	2502.500002	0.001	2567.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 7			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2502.500004	0.002	2567.500002	0.001
-20	2502.500002	0.001	2567.500002	0.001
-10	2502.500001	0.000	2567.500004	0.002
0	2502.500002	0.001	2567.500002	0.001
10	2502.500004	0.001	2567.500001	0.000
20	2502.499999	0.000	2567.499998	-0.001
30	2502.499999	0.000	2567.499998	-0.001
40	2502.499996	-0.002	2567.499997	-0.001
50	2502.499997	-0.001	2567.499997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 41			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2498.500003	0.001	2687.500003	0.001
102	2498.500002	0.001	2687.500002	0.001
138	2498.500002	0.001	2687.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2498.500002	0.001	2687.500002	0.001
-20	2498.500002	0.001	2687.500003	0.001
-10	2498.500002	0.001	2687.500003	0.001
0	2498.500003	0.001	2687.500002	0.001
10	2498.500002	0.001	2687.500002	0.001
20	2498.499997	-0.001	2687.499997	-0.001
30	2498.499997	-0.001	2687.499996	-0.001
40	2498.499998	-0.001	2687.499999	-0.001
50	2498.499998	-0.001	2687.499997	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 41			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2498.500004	0.002	2687.500003	0.001
102	2498.500001	0.001	2687.500003	0.001
138	2498.500001	0.001	2687.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2498.500002	0.001	2687.500004	0.001
-20	2498.500001	0.000	2687.500003	0.001
-10	2498.500003	0.001	2687.500003	0.001
0	2498.500004	0.001	2687.500003	0.001
10	2498.500001	0.001	2687.500004	0.001
20	2498.499998	-0.001	2687.499997	-0.001
30	2498.499997	-0.001	2687.499996	-0.001
40	2498.499998	-0.001	2687.499998	-0.001
50	2498.499998	-0.001	2687.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 41			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2498.500003	0.001	2687.500002	0.001
102	2498.500003	0.001	2687.500004	0.001
138	2498.500004	0.002	2687.500002	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2498.500003	0.001	2687.500004	0.001
-20	2498.500001	0.000	2687.500003	0.001
-10	2498.500004	0.002	2687.500003	0.001
0	2498.500001	0.001	2687.500004	0.001
10	2498.500002	0.001	2687.500001	0.000
20	2498.499998	-0.001	2687.499997	-0.001
30	2498.499997	-0.001	2687.499998	-0.001
40	2498.499998	-0.001	2687.499997	-0.001
50	2498.499996	-0.002	2687.499998	-0.001

Frequency Error vs. Voltage

Voltage (Volts)	LTE Band 41			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
120	2498.500004	0.001	2687.500002	0.001
102	2498.500004	0.001	2687.500004	0.001
138	2498.500003	0.001	2687.500003	0.001

Note: The applicant defined the normal working voltage of the battery is from 102 Vac to 138 Vac.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 41			
	Channel Bandwidth: 20 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-30	2498.500002	0.001	2687.500003	0.001
-20	2498.500004	0.001	2687.500003	0.001
-10	2498.500004	0.002	2687.500002	0.001
0	2498.500002	0.001	2687.500003	0.001
10	2498.500003	0.001	2687.500003	0.001
20	2498.499997	-0.001	2687.499999	-0.001
30	2498.499997	-0.001	2687.499998	-0.001
40	2498.499999	0.000	2687.499999	0.000
50	2498.499998	-0.001	2687.499996	-0.001

4.4 Occupied Bandwidth Measurement

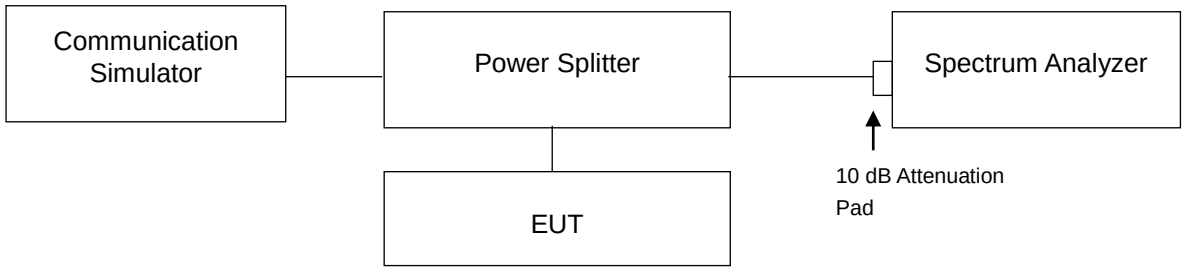
4.4.1 Limits of Occupied Bandwidth Measurement

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.2 Test Procedure

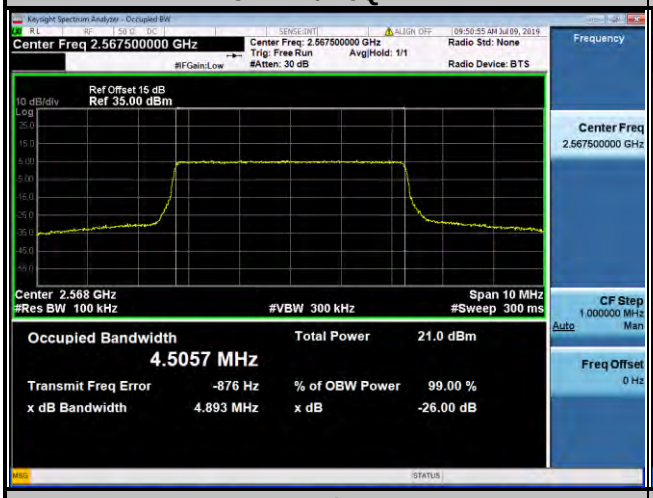
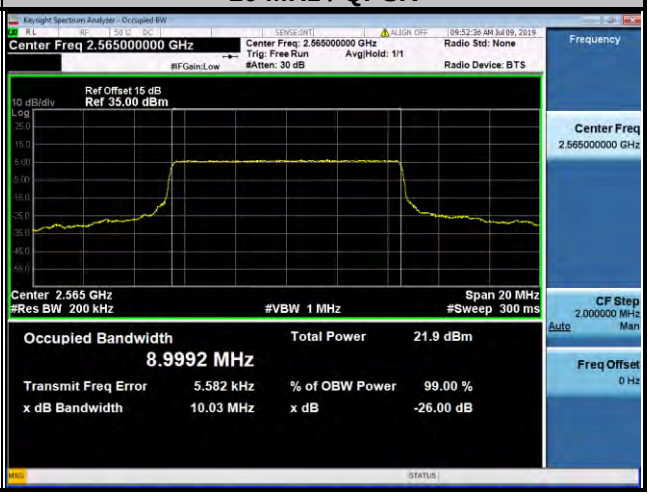
a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

4.4.3 Test Setup

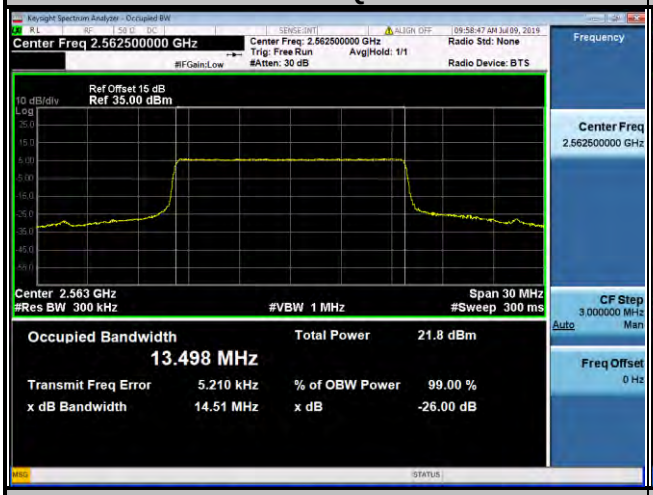
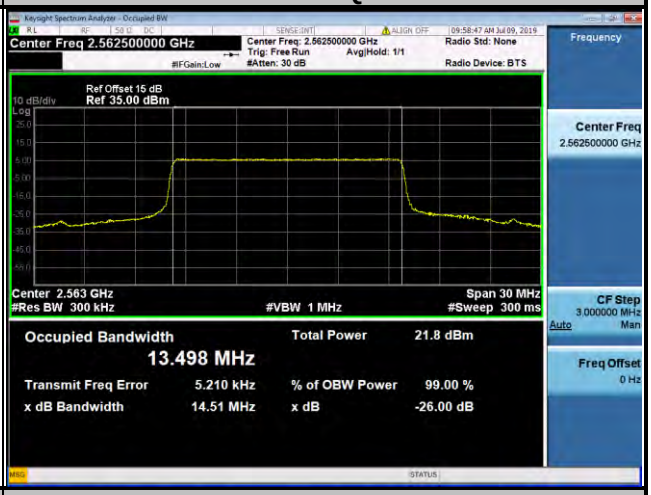
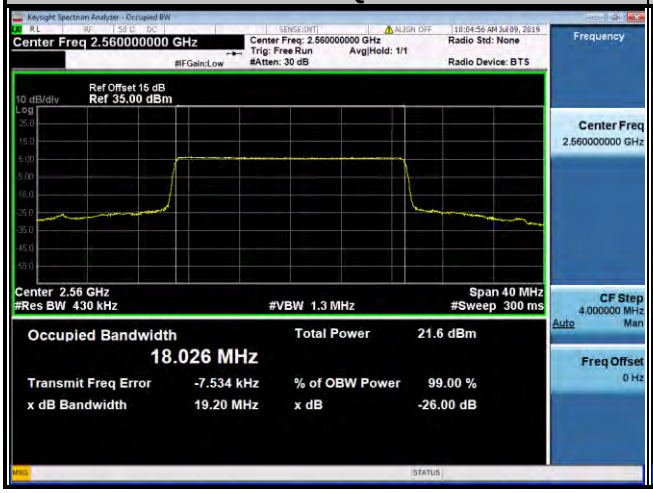
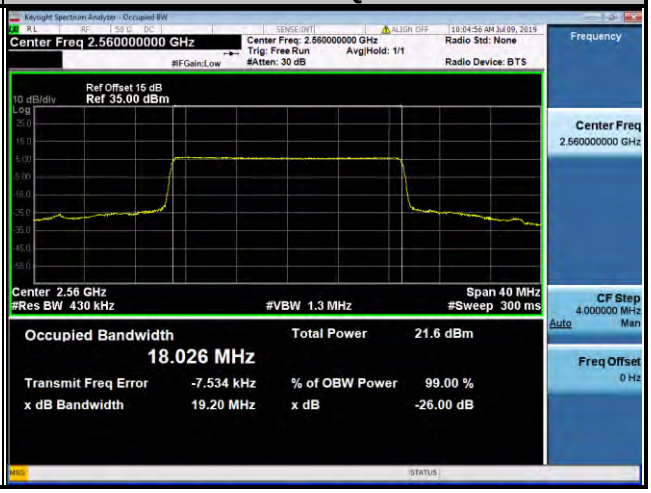


4.4.4 Test Results

LTE Band 7					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20775	2502.5	4.4987	4.4984	4.922	4.887
21100	2535.0	4.4948	4.5017	4.898	4.893
21425	2567.5	4.4976	4.5057	4.912	4.893
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20800	2505.0	8.9993	8.9892	9.982	9.972
21100	2535.0	8.9857	8.9810	9.920	9.875
21400	2565.0	8.9992	8.9913	10.030	9.932

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / 16QAM	5 MHz / QPSK
	
10 MHz / QPSK	10 MHz / QPSK
	

LTE Band 7					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20825	2507.5	13.496	13.481	14.39	14.42
21100	2535.0	13.448	13.454	14.31	14.36
21375	2562.5	13.498	13.482	14.51	14.39
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
20850	2510.0	18.023	18.011	19.13	19.11
21100	2535.0	17.938	17.929	19.06	19.06
21350	2560.0	18.026	18.005	19.20	19.11

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK
	
20 MHz / QPSK	20 MHz / QPSK
	

LTE Band 41					
Channel Bandwidth: 5 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
39675	2498.5	4.4989	4.4857	4.877	4.891
40620	2593.0	4.4904	4.4928	4.849	4.883
41565	2687.5	4.4923	4.4868	4.821	4.886
Channel Bandwidth: 10 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
39700	2501.0	8.9748	8.9883	9.806	9.788
40620	2593.0	8.9799	8.9733	9.791	9.846
41540	2685.0	8.9798	8.9776	9.741	9.728

Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
5 MHz / QPSK	5 MHz / 16QAM
	
10 MHz / 16QAM	10 MHz / 16QAM
	

LTE Band 41					
Channel Bandwidth: 15 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
39725	2503.5	13.472	13.453	14.34	14.28
40620	2593.0	13.490	13.450	14.34	14.26
41515	2682.5	13.473	13.446	14.30	14.26
Channel Bandwidth: 20 MHz					
Channel	Frequency (MHz)	99 % Occupied Bandwidth (MHz)		26 dB Bandwidth (MHz)	
		QPSK	16QAM	QPSK	16QAM
39750	2506.0	17.965	17.957	19.08	19.10
40620	2593.0	17.968	17.954	19.06	19.09
41490	2680.0	17.945	17.947	19.05	19.07

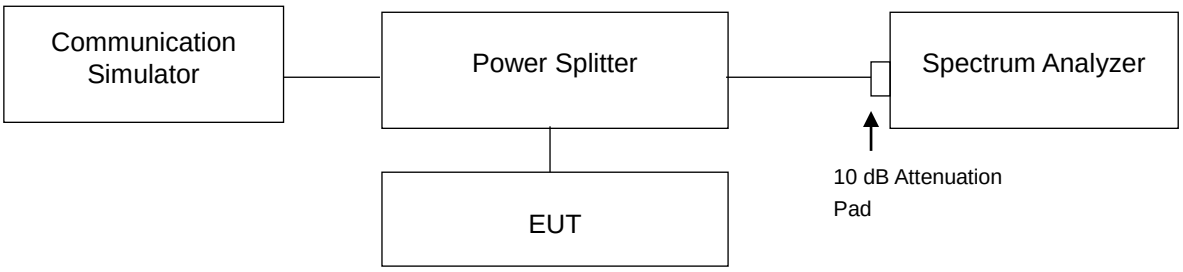
Spectrum Plot of Worst Value	
99 % Occupied Bandwidth	26 dB Bandwidth
15 MHz / QPSK	15 MHz / QPSK
	
20 MHz / QPSK	20 MHz / 16QAM
	

4.5 Out-of-Band Emissions Measurement

4.5.1 Limits of Out-of-Band Emissions Measurement

According to FCC 27.53(m)(4)&(6) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a 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. 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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.

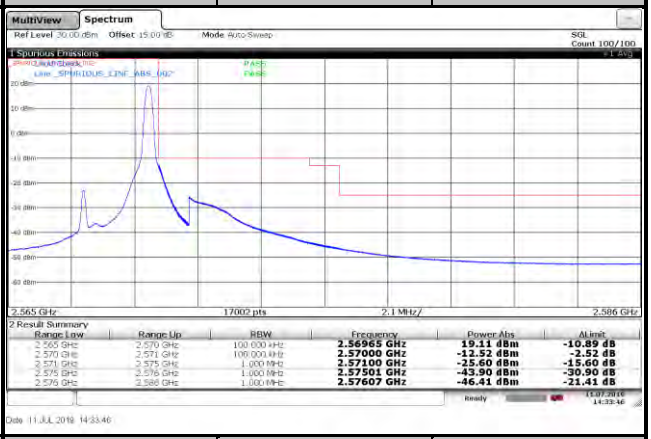
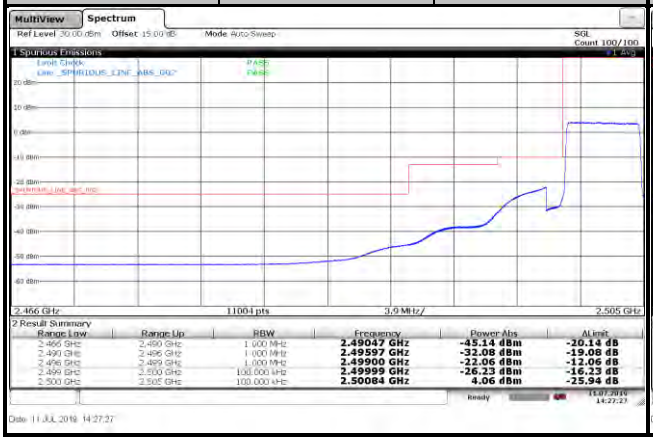
4.5.2 Test Setup

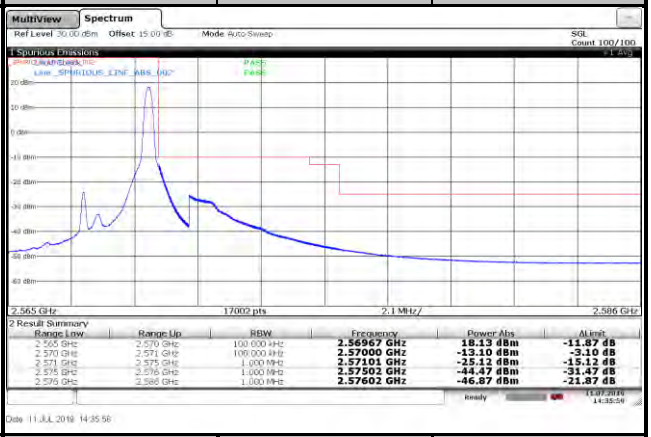
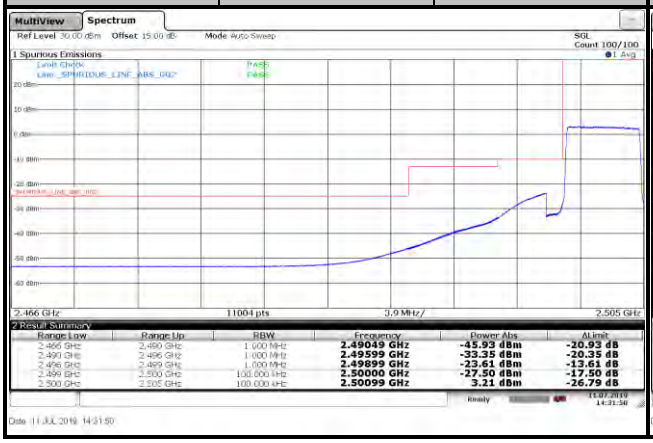


4.5.3 Test Procedures

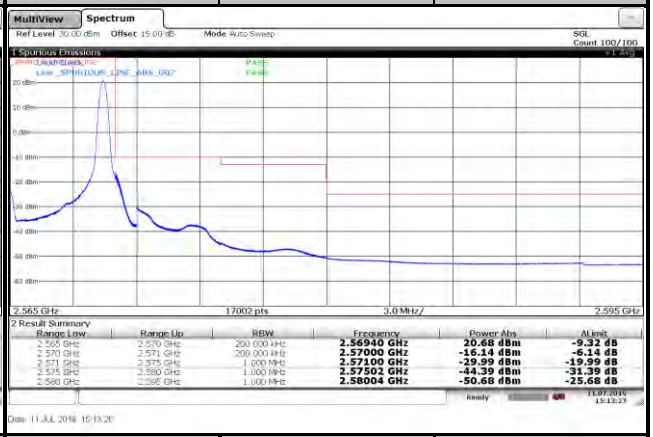
a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
b. The out-of-band emissions measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
c. Record the max. trace plot into the test report.

4.5.4 Test Results

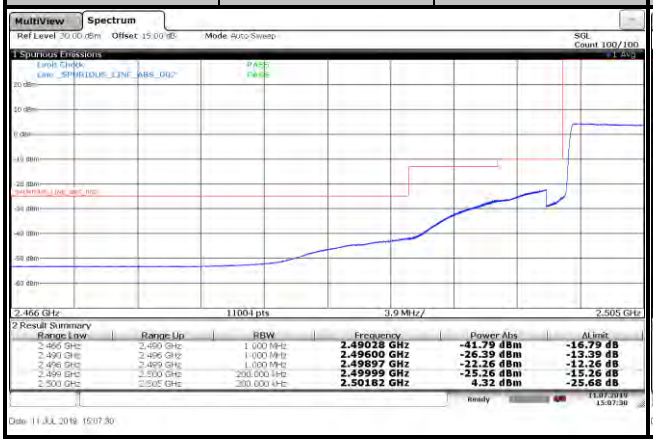
LTE Band 7					
Channel Bandwidth: 5 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	20775	1 RB	Channel	21425	1 RB
					
Channel	20775	25 RB	Channel	21425	25 RB
					

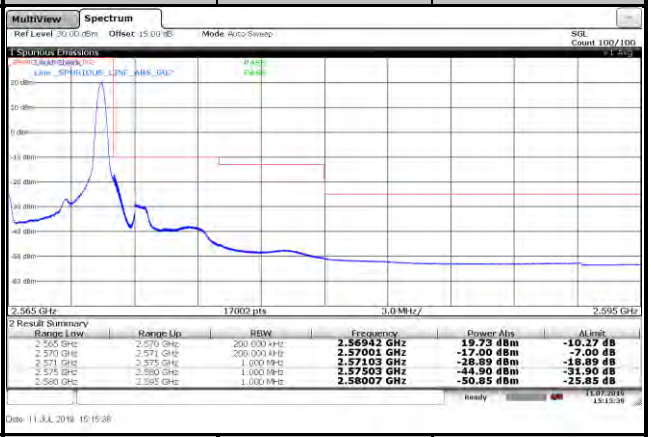
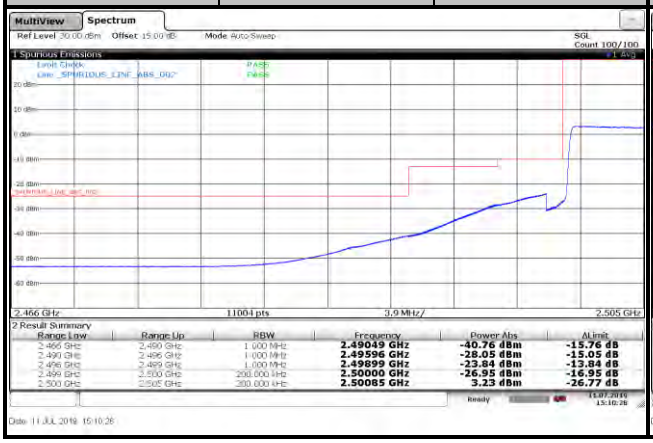
LTE Band 7					
Channel Bandwidth: 5 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	20775	1 RB	Channel	21425	1 RB
					
Channel	20775	25 RB	Channel	21425	25 RB
					

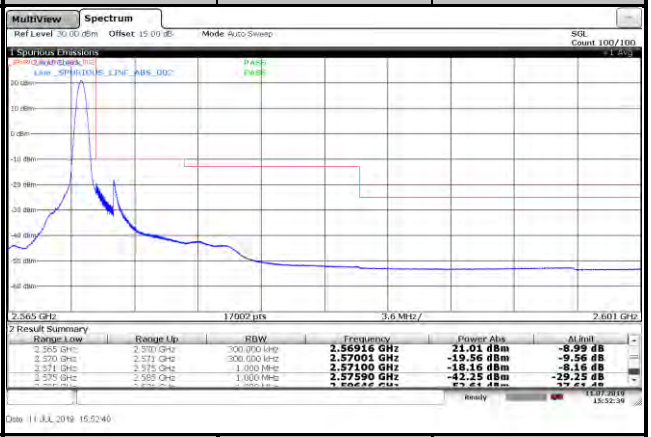
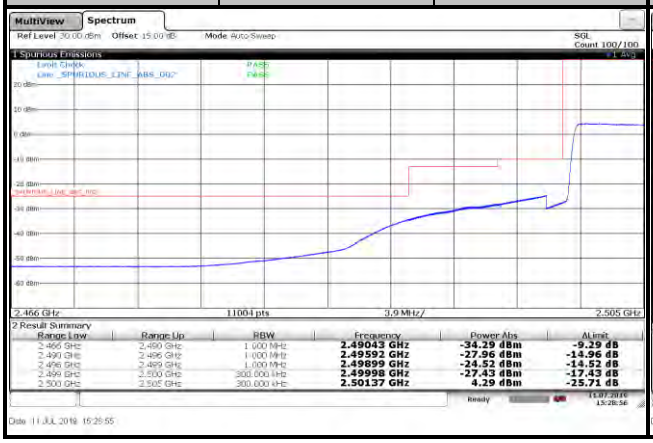
LTE Band 7					
Channel Bandwidth: 10 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	20800	1 RB	Channel	21400	1 RB

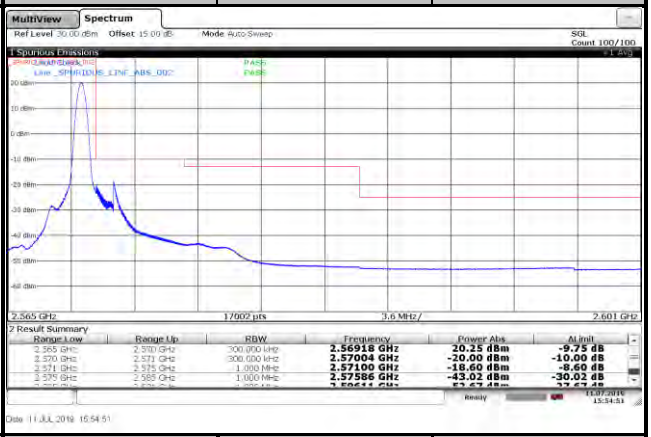
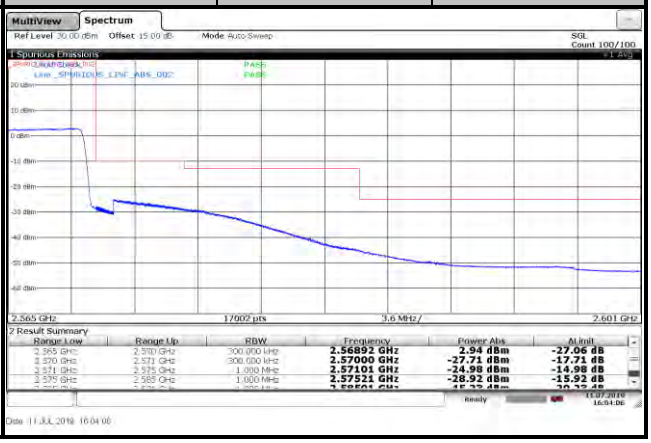


Channel	20800	50 RB	Channel	21400	50 RB

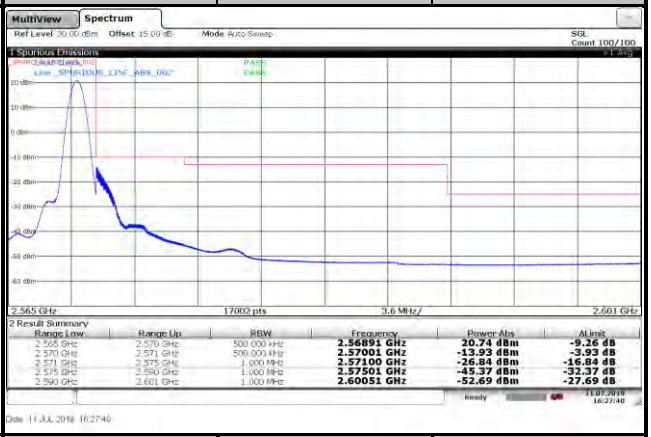
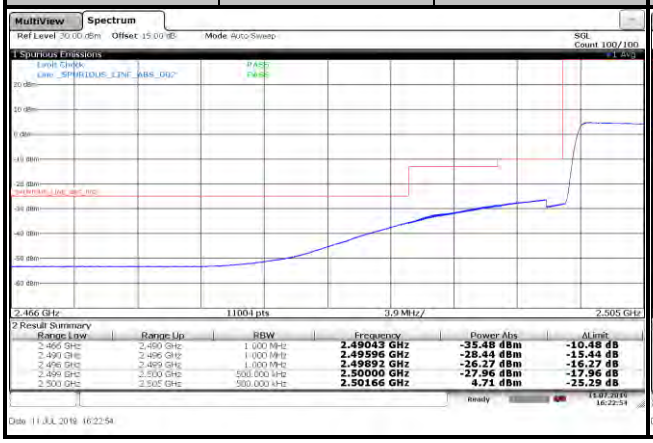


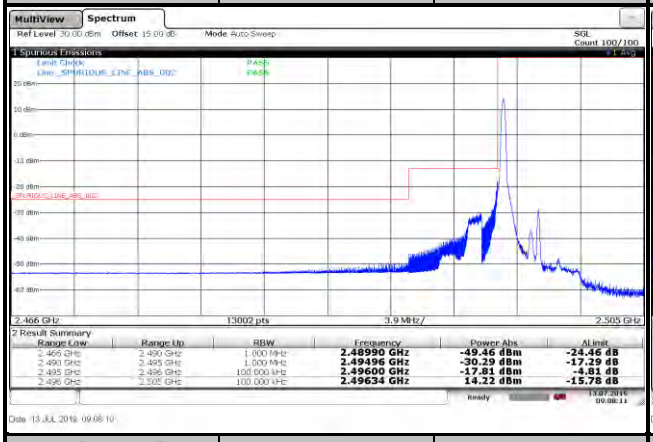
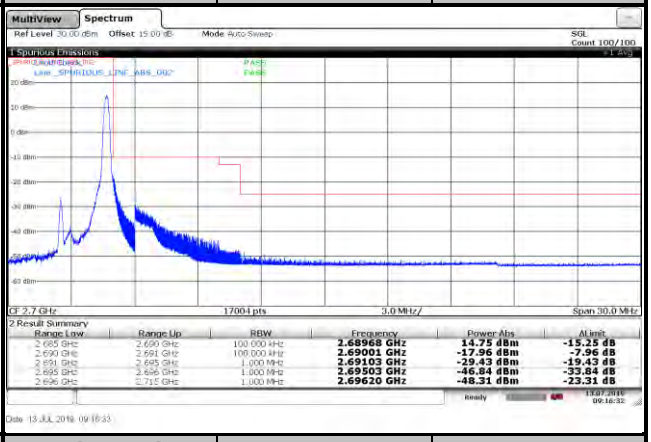
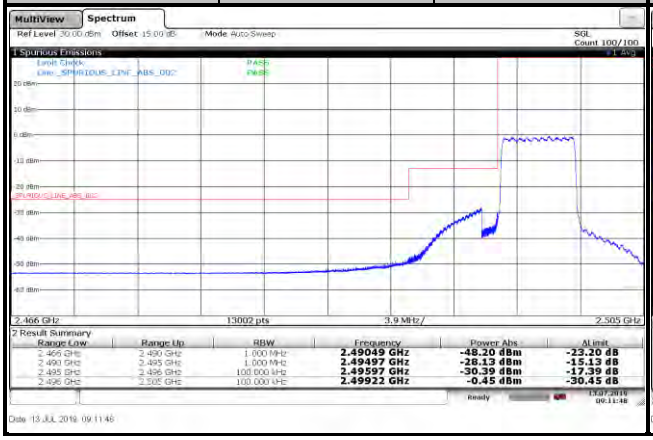
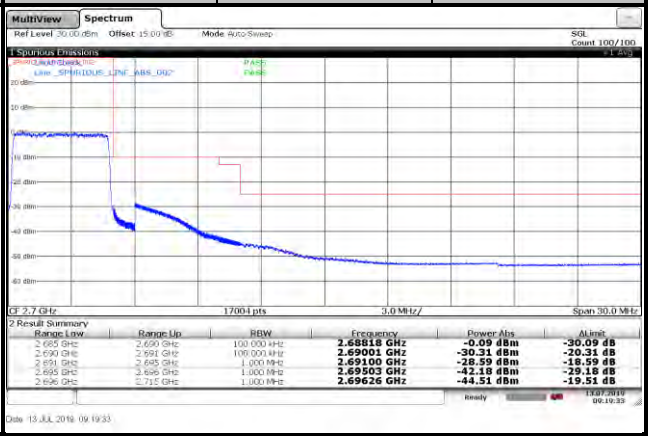
LTE Band 7					
Channel Bandwidth: 10 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	20800	1 RB	Channel	21400	1 RB
					
Channel	20800	50 RB	Channel	21400	50 RB
					

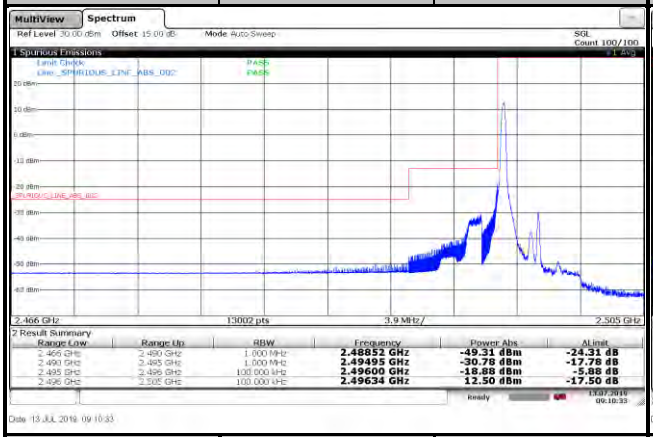
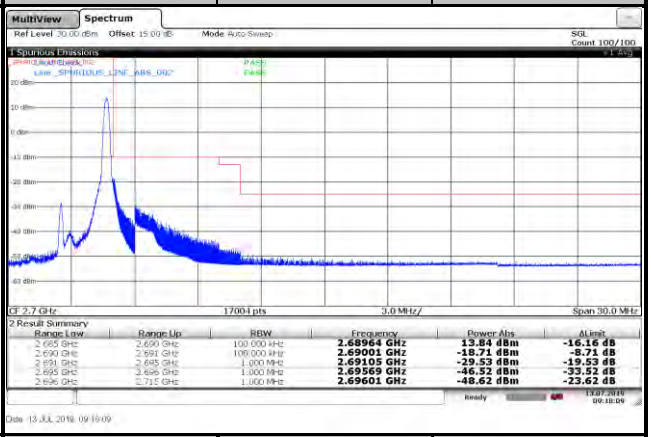
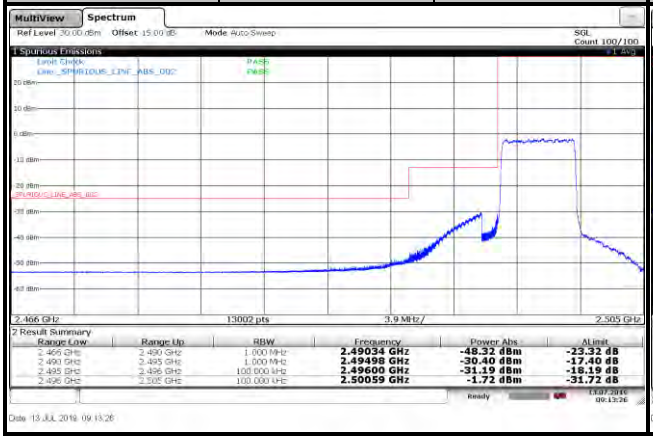
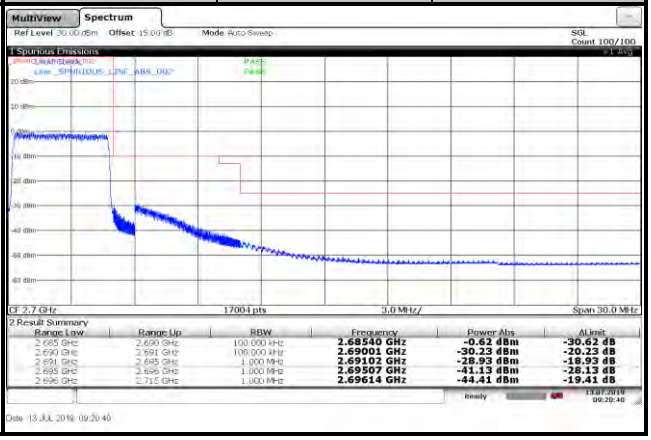
LTE Band 7					
Channel Bandwidth: 15 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	20825	1 RB	Channel	21375	1 RB
					
Channel	20825	75 RB	Channel	21375	75 RB
					

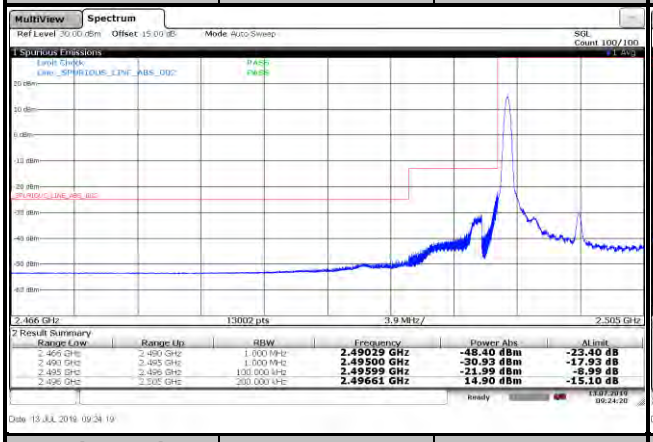
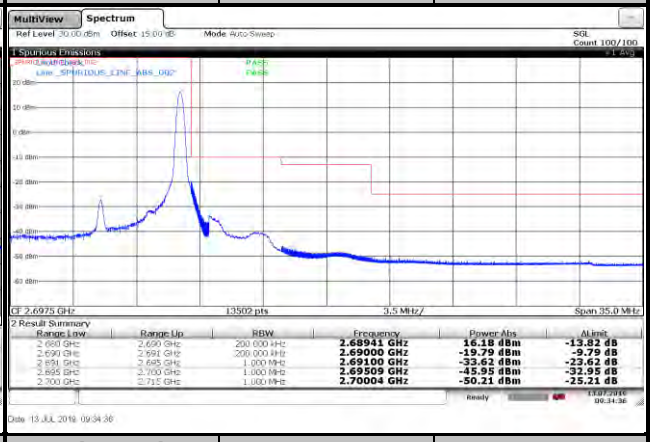
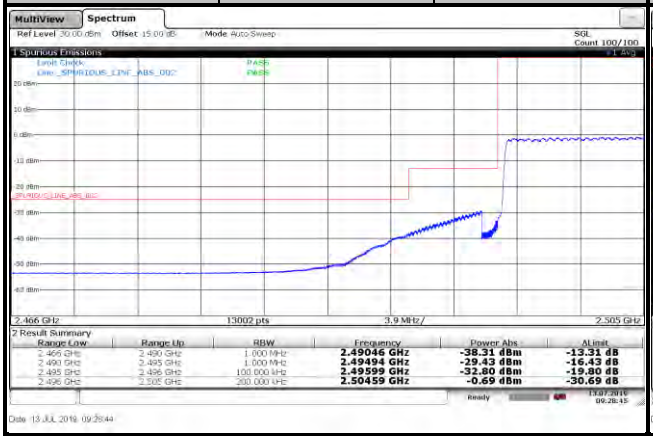
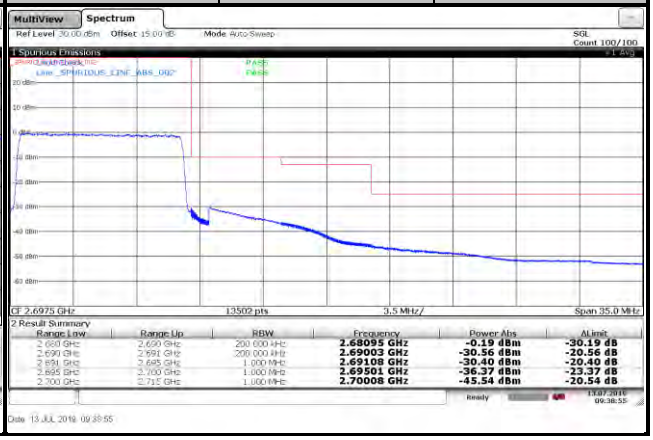
LTE Band 7					
Channel Bandwidth: 15 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	20825	1 RB	Channel	21375	1 RB
					
Channel	20825	75 RB	Channel	21375	75 RB
					

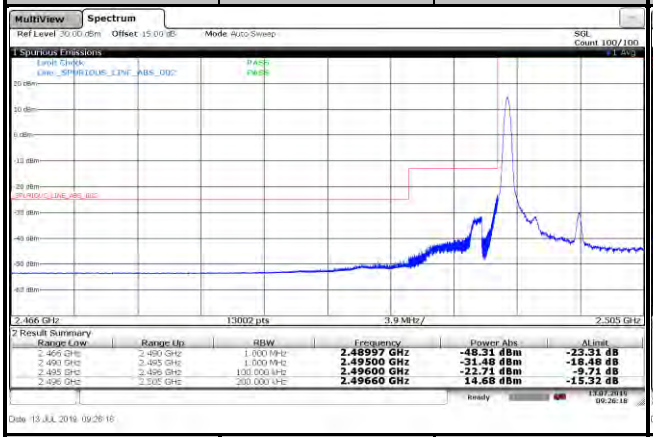
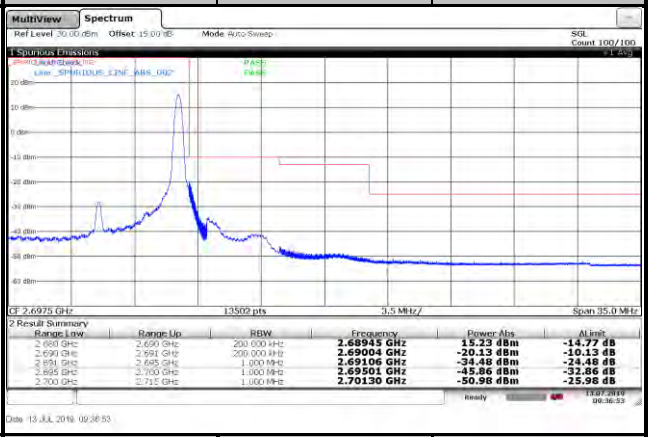
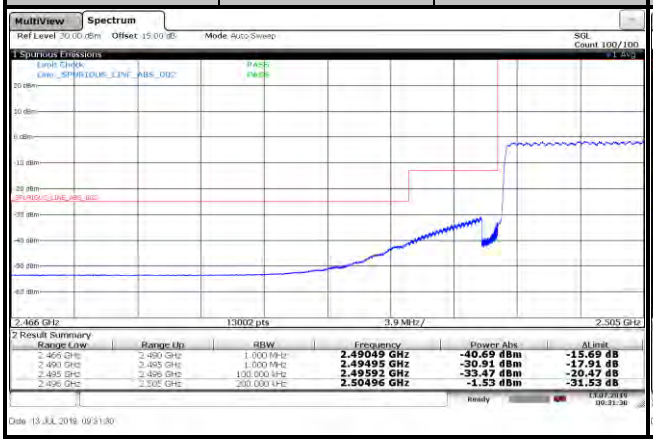
LTE Band 7					
Channel Bandwidth: 20 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	20850	1 RB	Channel	21350	1 RB
					
Channel	20850	100 RB	Channel	21350	100 RB
					

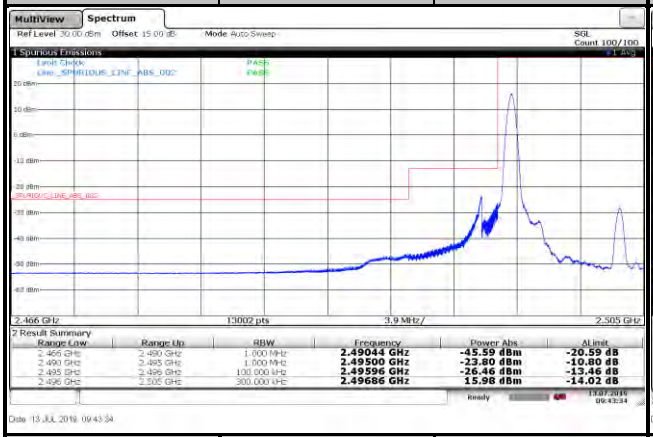
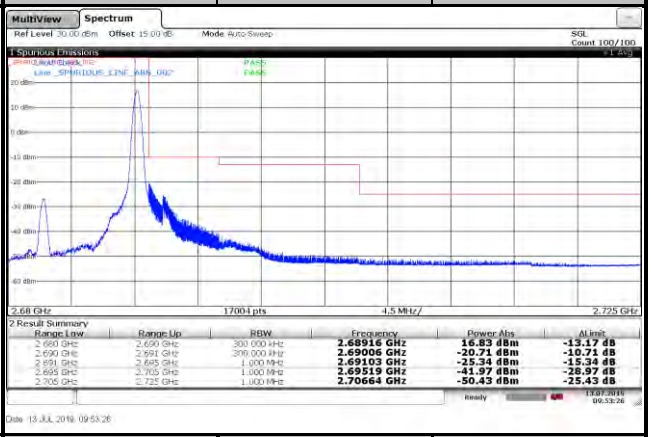
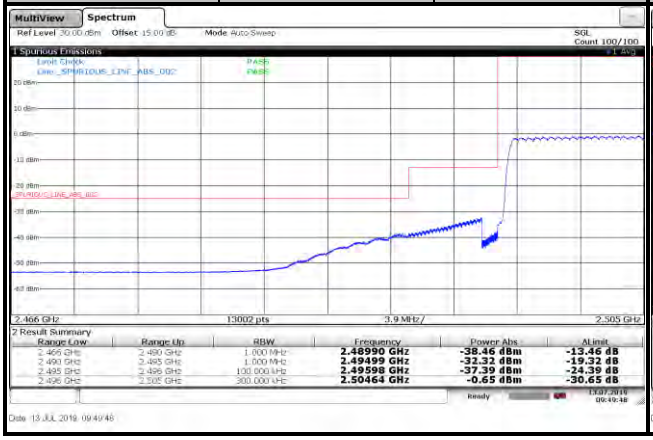
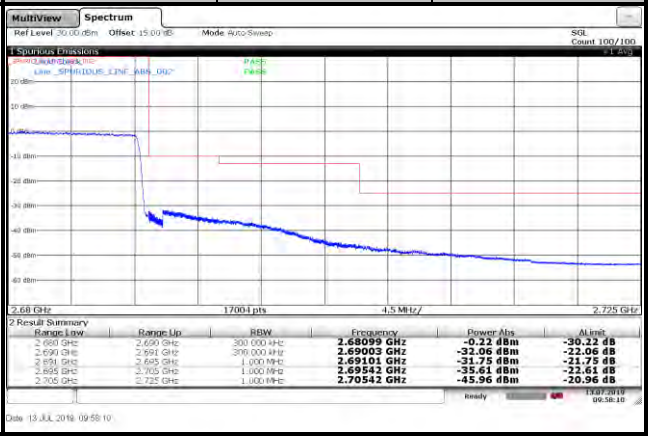
LTE Band 7					
Channel Bandwidth: 20 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	20850	1 RB	Channel	21350	1 RB
					
Channel	20850	100 RB	Channel	21350	100 RB
					

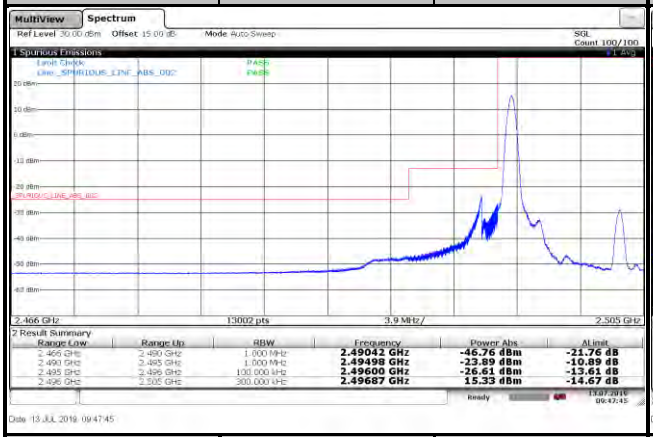
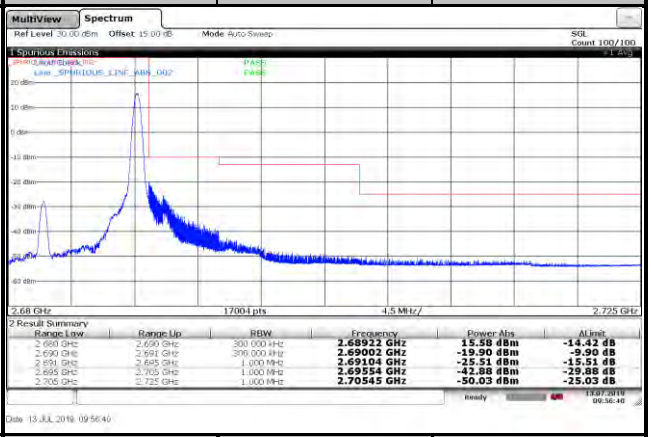
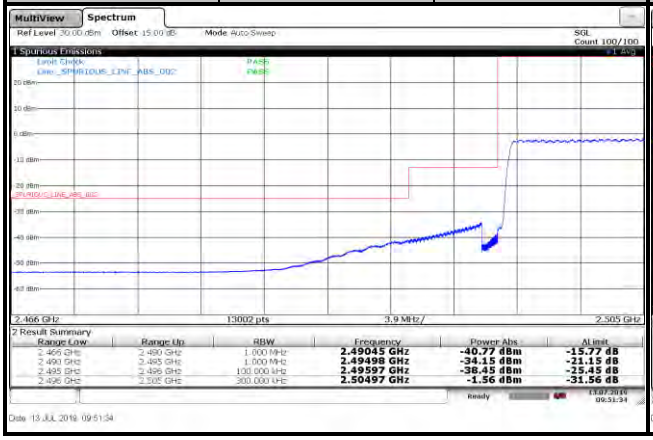
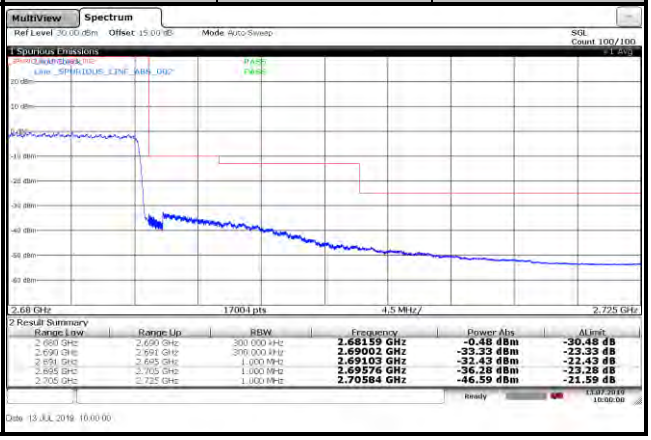
LTE Band 41					
Channel Bandwidth: 5 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	39675	1 RB	Channel	41565	1 RB
					
Channel	39675	25 RB	Channel	41565	25 RB
					

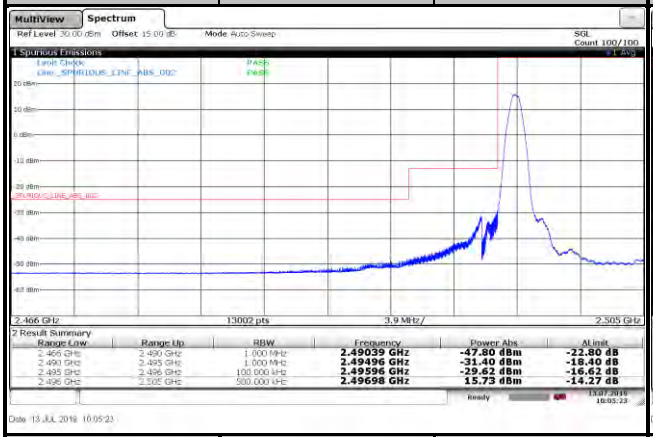
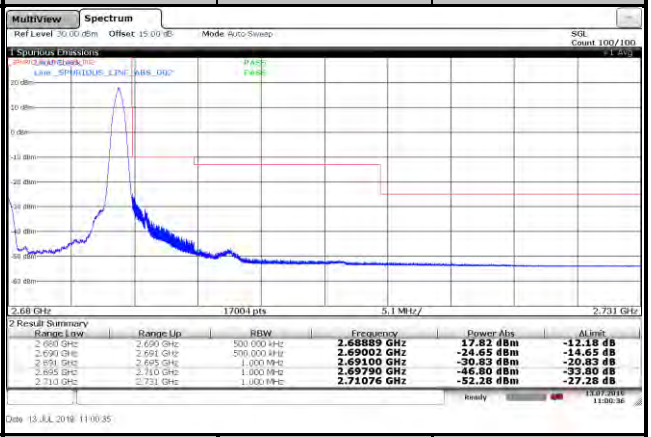
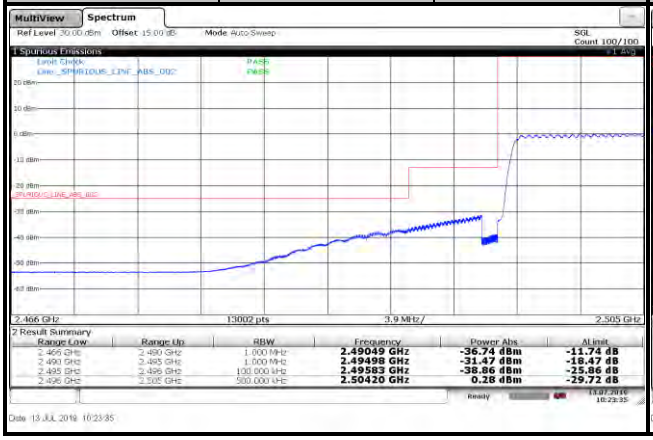
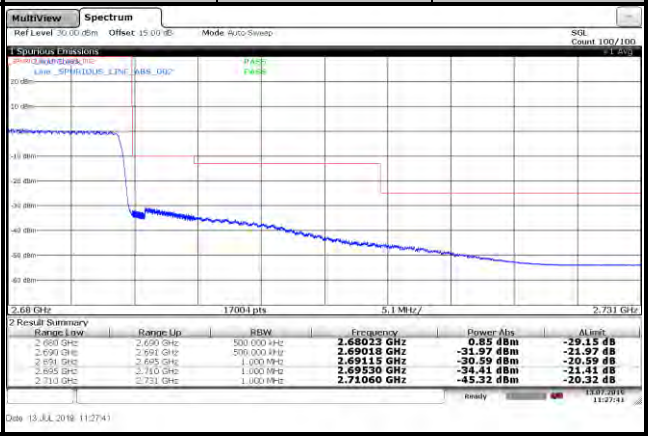
LTE Band 41					
Channel Bandwidth: 5 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	39675	1 RB	Channel	41565	1 RB
					
Channel	39675	25 RB	Channel	41565	25 RB
					

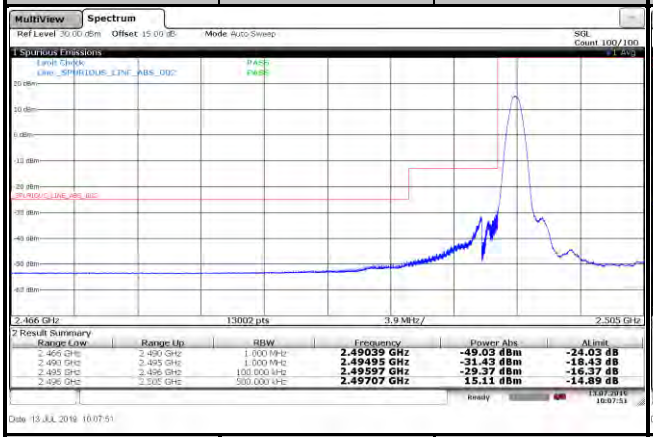
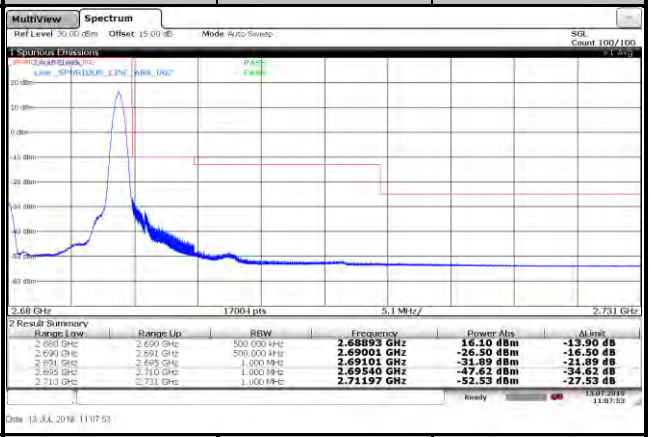
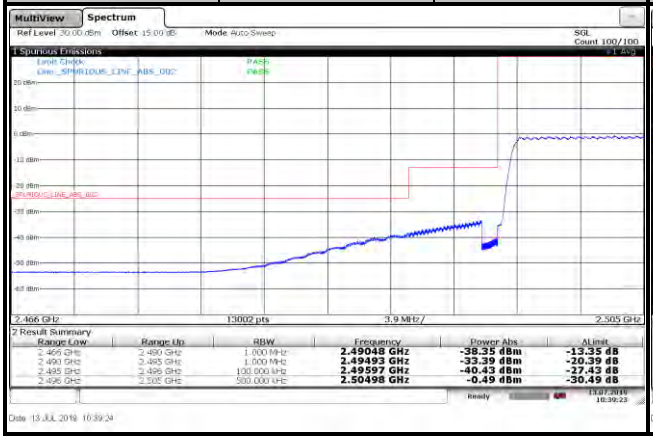
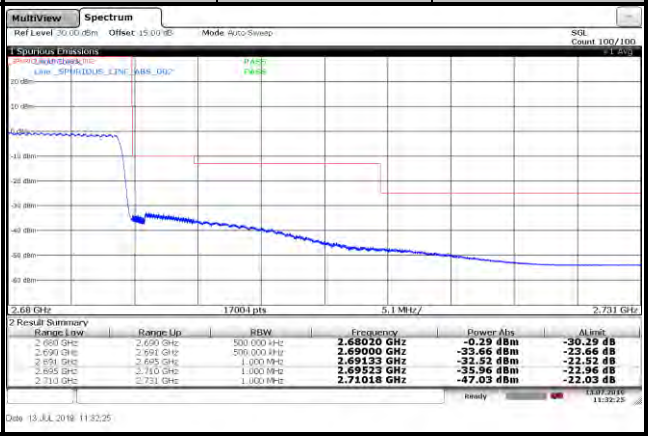
LTE Band 41					
Channel Bandwidth: 10 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	39700	1 RB	Channel	41540	1 RB
					
Channel	39700	50 RB	Channel	41540	50 RB
					

LTE Band 41					
Channel Bandwidth: 10 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	39700	1 RB	Channel	41540	1 RB
					
Channel	39700	50 RB	Channel	41540	50 RB
					

LTE Band 41					
Channel Bandwidth: 15 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	39725	1 RB	Channel	41515	1 RB
					
Channel	39725	75 RB	Channel	41515	75 RB
					

LTE Band 41					
Channel Bandwidth: 15 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	39725	1 RB	Channel	41515	1 RB
					
Channel	39725	75 RB	Channel	41515	75 RB
					

LTE Band 41					
Channel Bandwidth: 20 MHz / QPSK					
<Out-of-Band Emissions>					
Channel	39750	1 RB	Channel	41490	1 RB
					
Channel	39750	100 RB	Channel	41490	100 RB
					

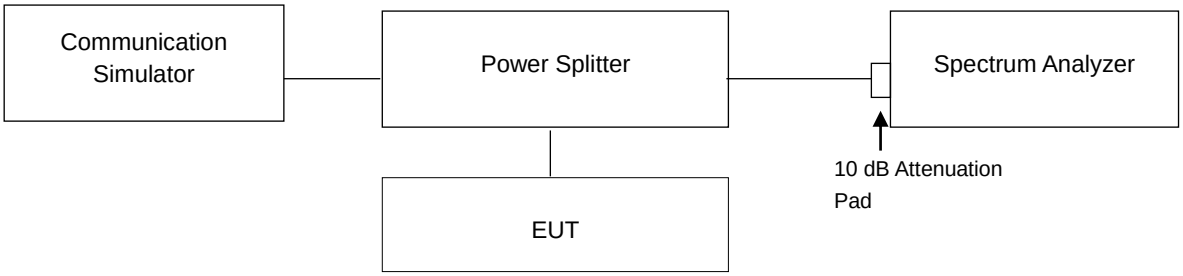
LTE Band 41					
Channel Bandwidth: 20 MHz / 16QAM					
<Out-of-Band Emissions>					
Channel	39750	1 RB	Channel	41490	1 RB
					
Channel	39750	100 RB	Channel	41490	100 RB
					

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

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.

4.6.2 Test Setup

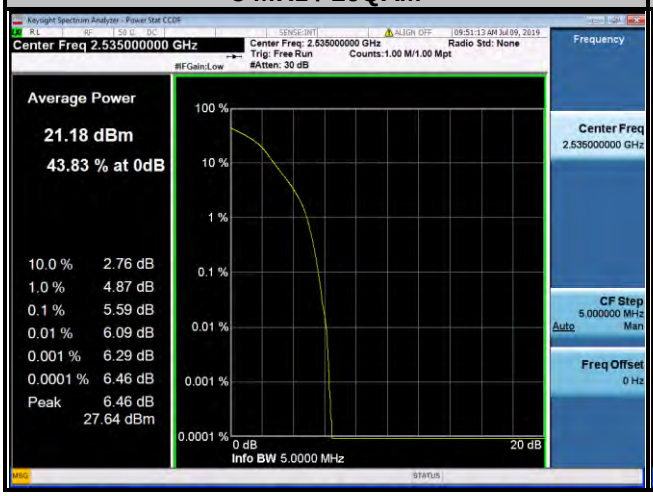
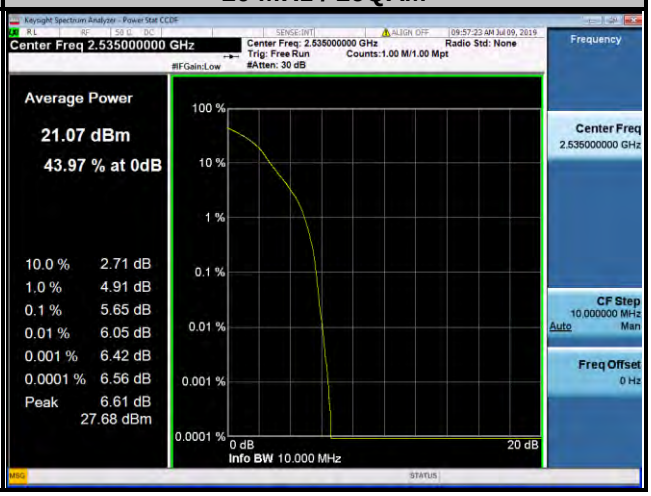


4.6.3 Test Procedures

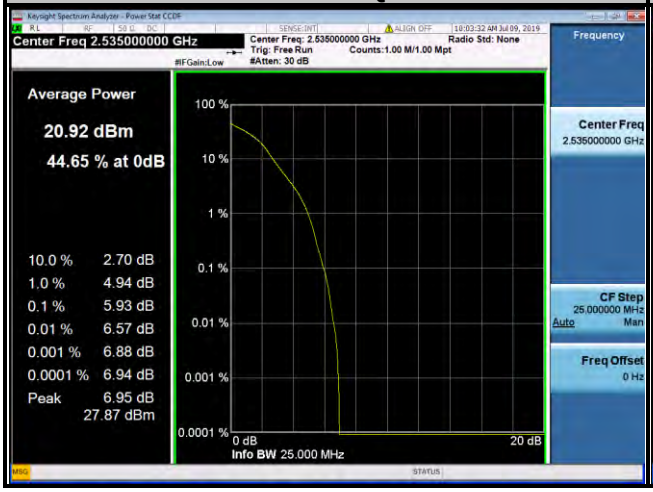
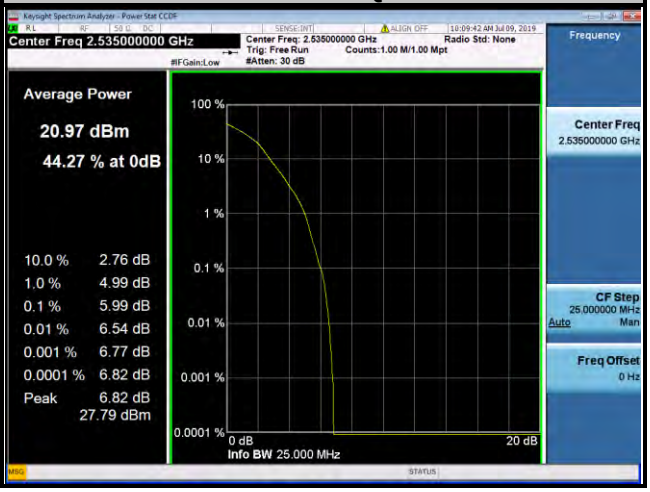
1. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1 %.

4.6.4 Test Results

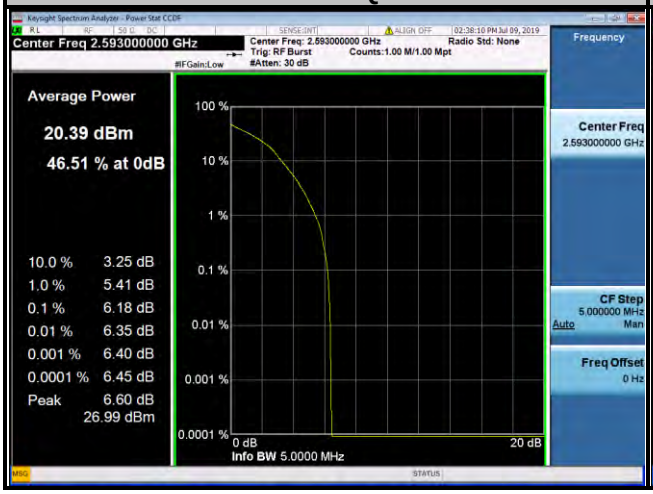
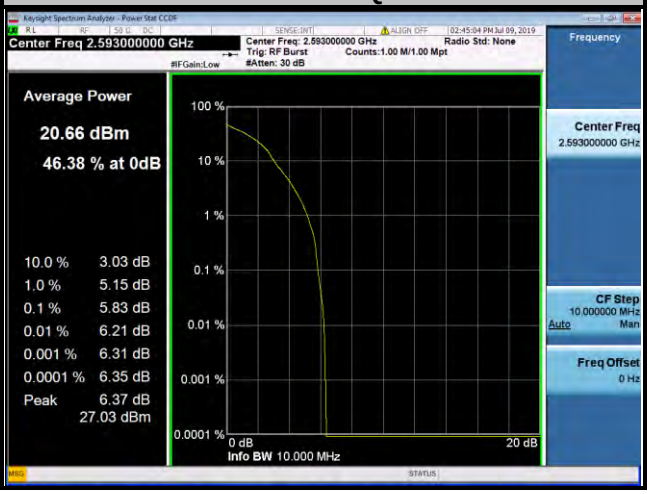
LTE Band 7							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20775	2502.5	4.64	5.20	20800	2505.0	4.59	5.25
21100	2535.0	4.92	5.59	21100	2535.0	4.88	5.65
21425	2567.5	4.77	5.45	21400	2565.0	4.56	5.46

Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / 16QAM
	

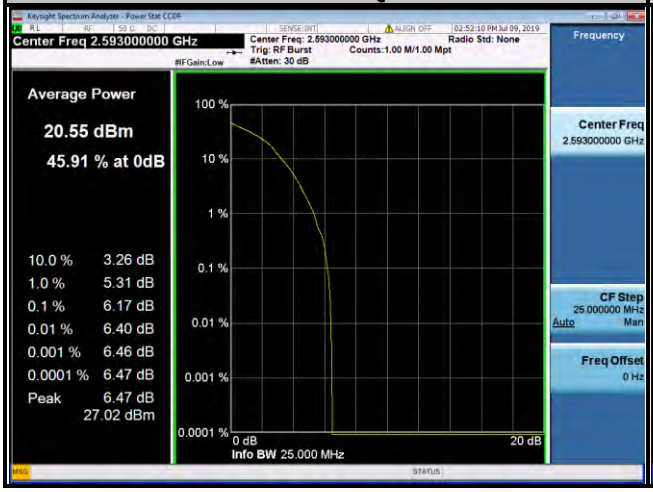
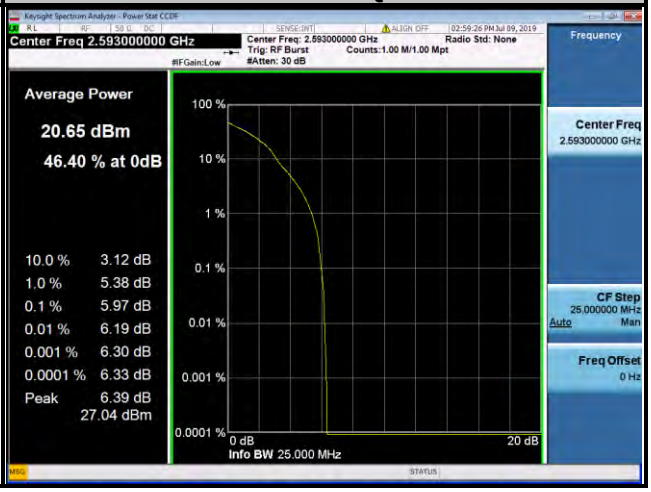
LTE Band 7							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
20825	2507.5	4.73	5.33	20850	2510.0	4.67	5.41
21100	2535.0	5.06	5.93	21100	2535.0	5.28	5.99
21375	2562.5	4.71	5.54	21350	2560.0	4.91	5.56

Spectrum Plot of Worst Value	
15 MHz / 16QAM	20 MHz / 16QAM
	

LTE Band 41							
Channel Bandwidth: 5 MHz				Channel Bandwidth: 10 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
39675	2498.5	5.21	5.99	39700	2501.0	5.57	5.57
40620	2593.0	5.50	6.18	40620	2593.0	5.58	5.83
41565	2687.5	5.11	5.71	41540	2685.0	5.04	5.39

Spectrum Plot of Worst Value	
5 MHz / 16QAM	10 MHz / 16QAM
	

LTE Band 41							
Channel Bandwidth: 15 MHz				Channel Bandwidth: 20 MHz			
Channel	Frequency (MHz)	Peak to Average Ratio (dB)		Channel	Frequency (MHz)	Peak to Average Ratio (dB)	
		QPSK	16QAM			QPSK	16QAM
39725	2503.5	5.39	5.68	39750	2506.0	5.12	5.68
40620	2593.0	5.93	6.17	40620	2593.0	5.94	5.97
41515	2682.5	5.13	5.71	41490	2680.0	5.45	5.86

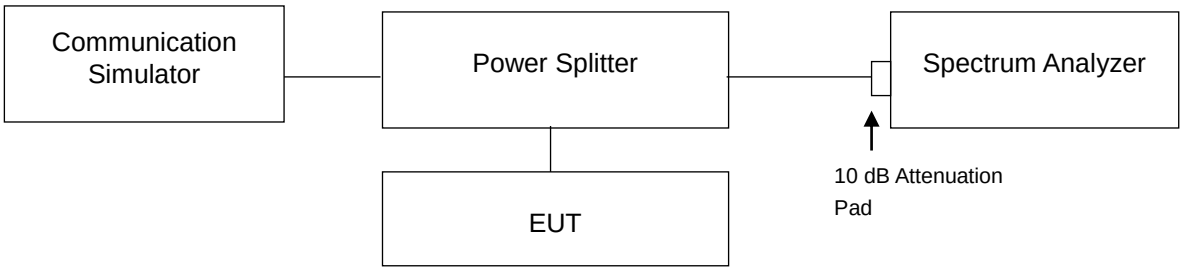
Spectrum Plot of Worst Value	
15 MHz / 16QAM	20 MHz / 16QAM
	

4.7 Conducted Spurious Emissions

4.7.1 Limits of Conducted Spurious Emissions Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB. The limit of emission is equal to -25 dBm.

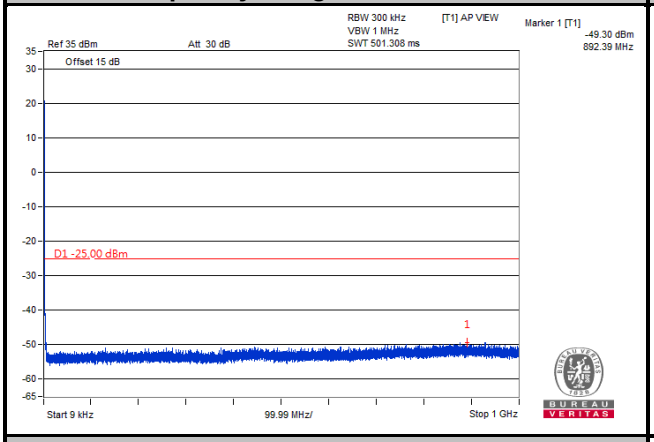
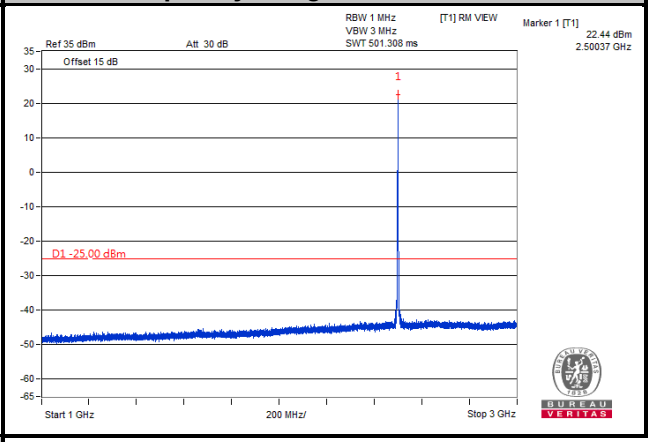
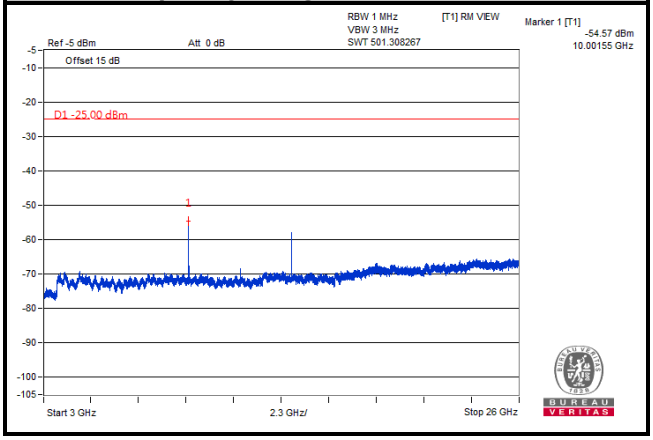
4.7.2 Test Setup



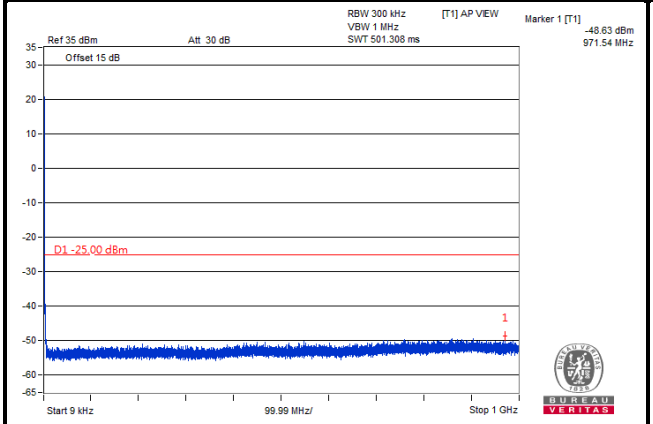
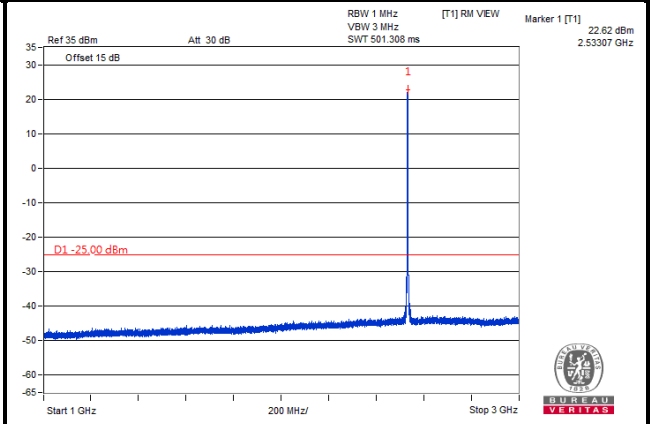
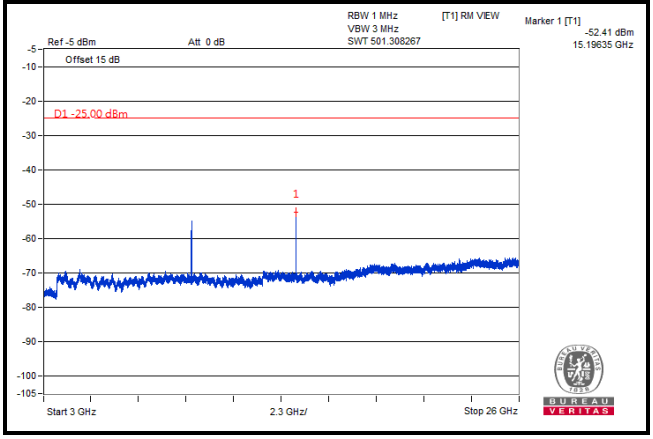
4.7.3 Test Procedure

a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
b. Measuring frequency range is from 9 kHz to 1 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 300 kHz and VBW = 1 MHz are used for conducted emission measurement.
c. Measuring frequency range is from 1 GHz to 26 GHz or 27 GHz. 10 dB attenuation pad is connected with spectrum. RBW = 1 MHz and VBW = 3 MHz are used for conducted emission measurement.
d. Spectrum RBW settings are referenced to ANSI C63.26 section 5.7.2 and KDB 971168 D01 Power Meas License Digital Systems v03r01 section 6.1.

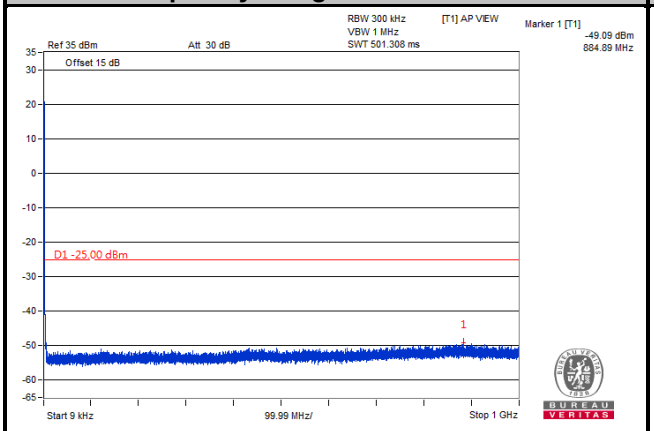
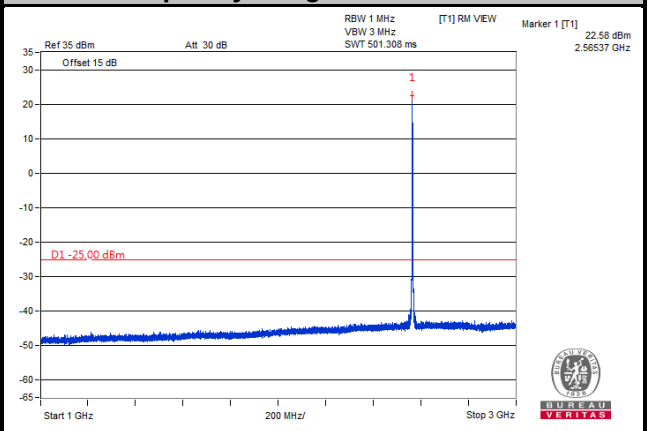
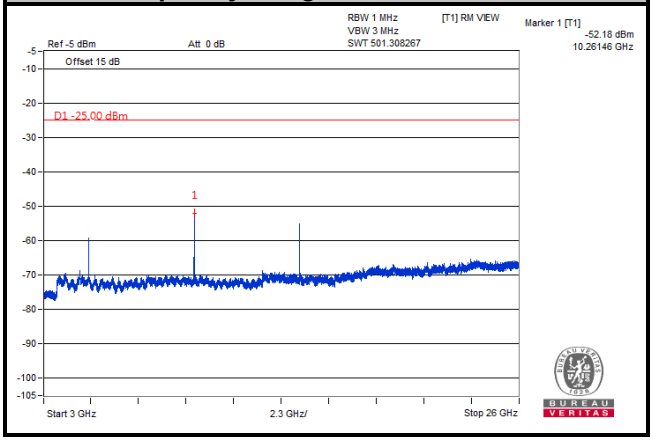
4.7.4 Test Results

LTE Band 7	
Channel Bandwidth: 5 MHz	
Channel 20775	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

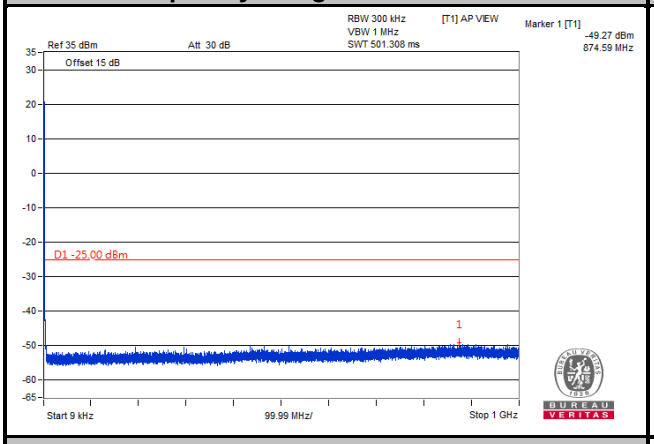
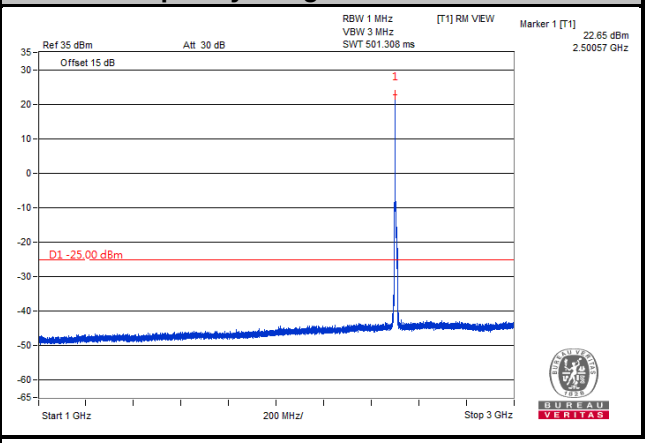
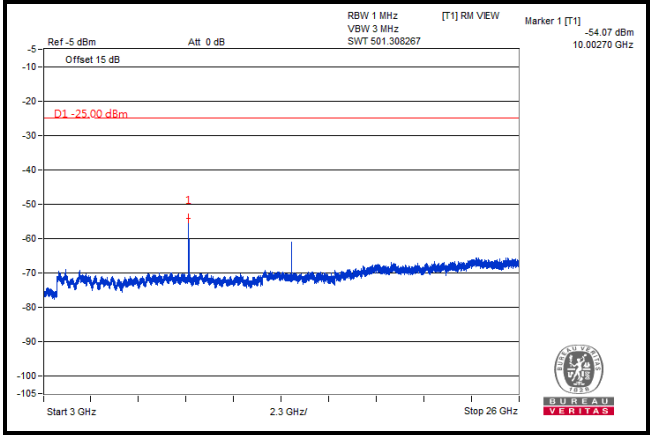
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 5 MHz	
Channel 21100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

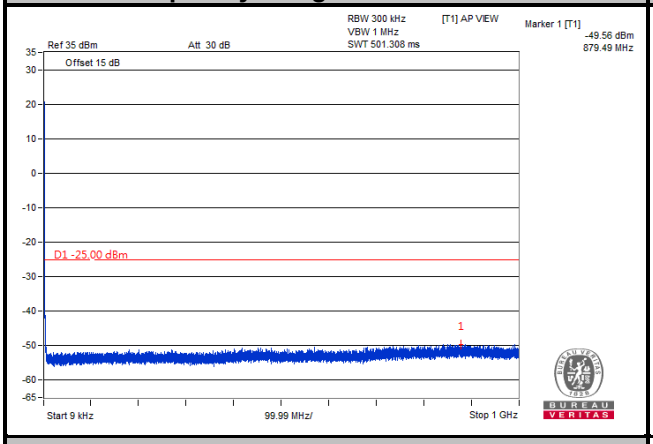
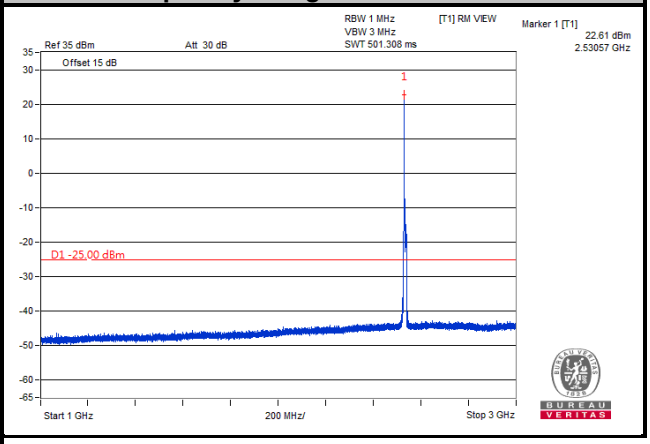
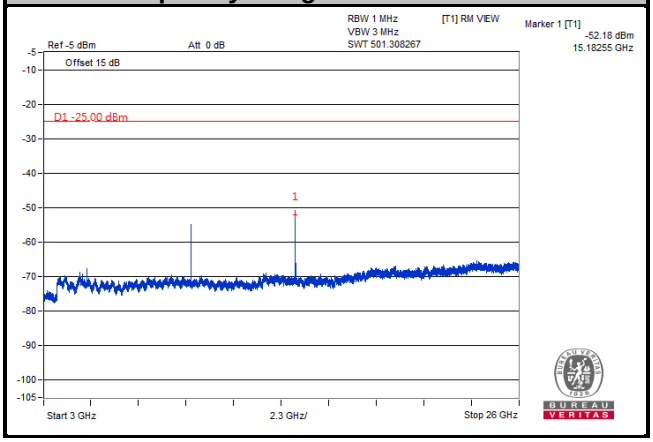
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 5 MHz	
Channel 21425	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

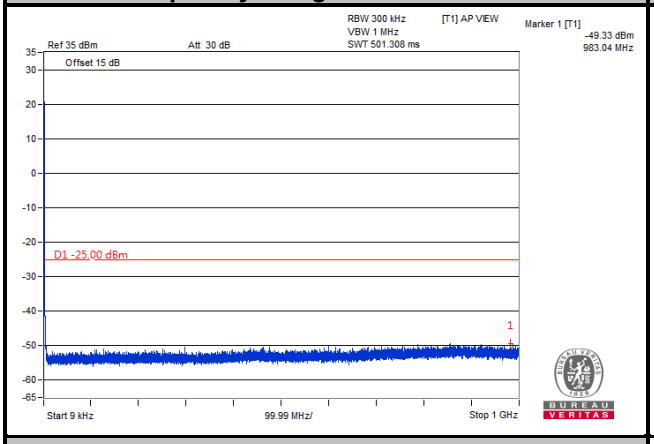
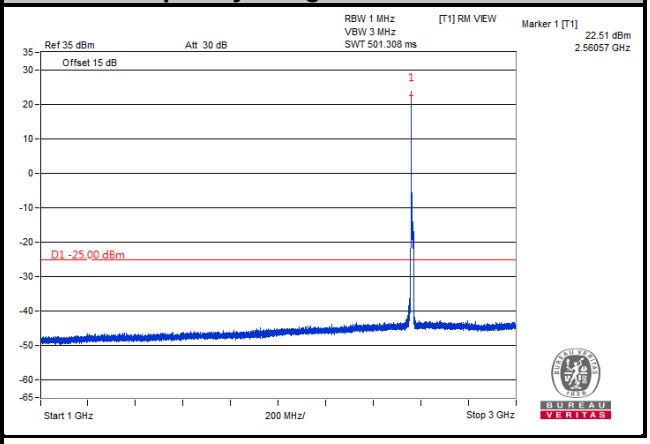
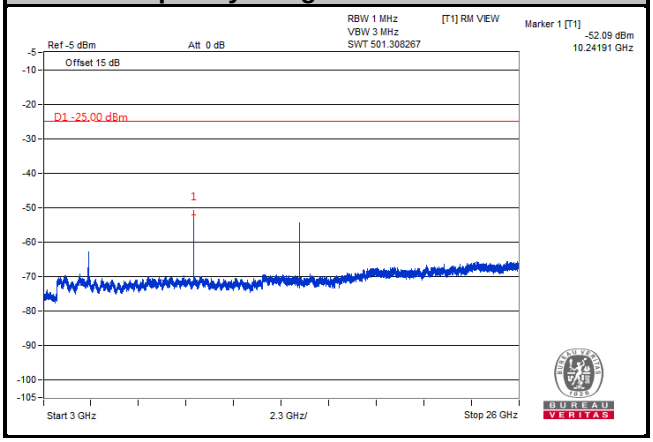
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 10 MHz	
Channel 20800	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

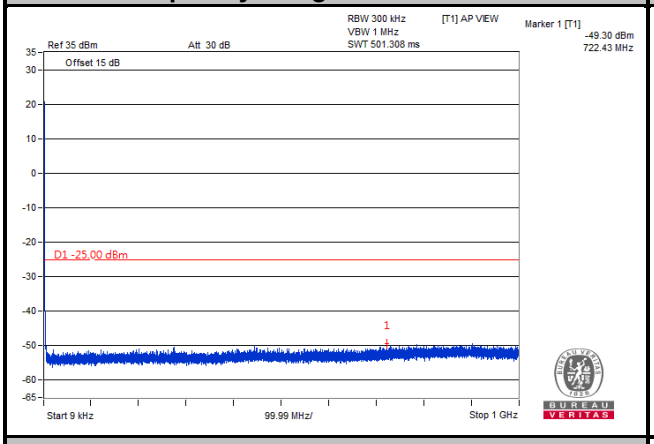
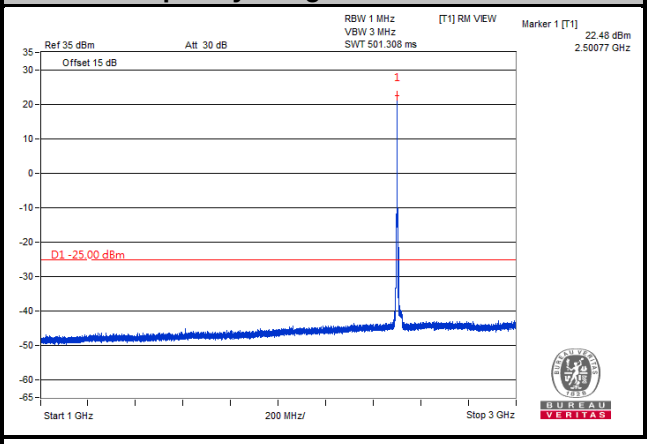
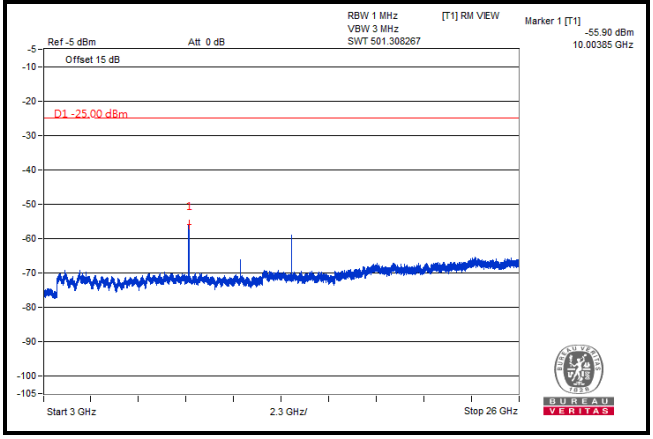
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 10 MHz	
Channel 21100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

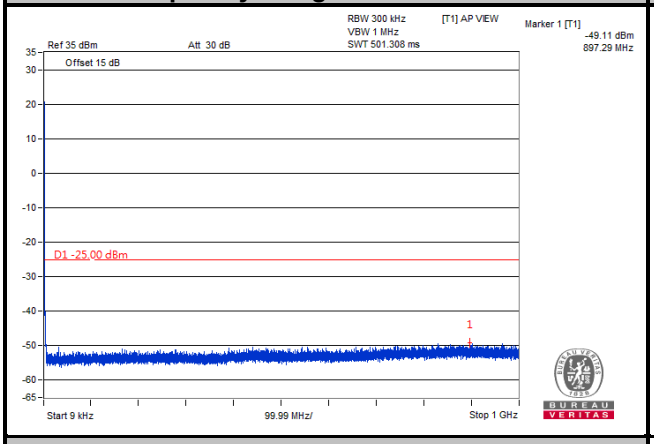
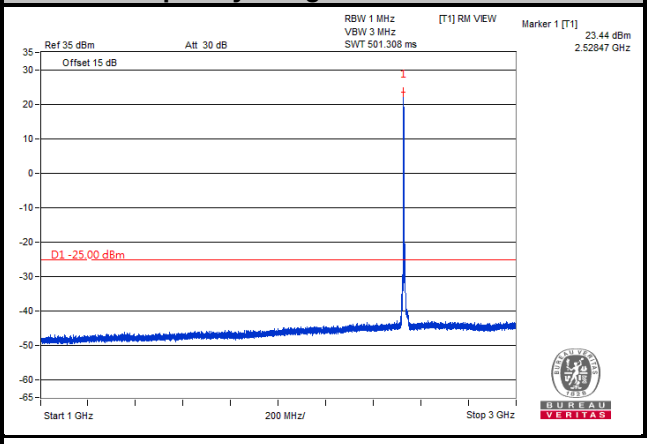
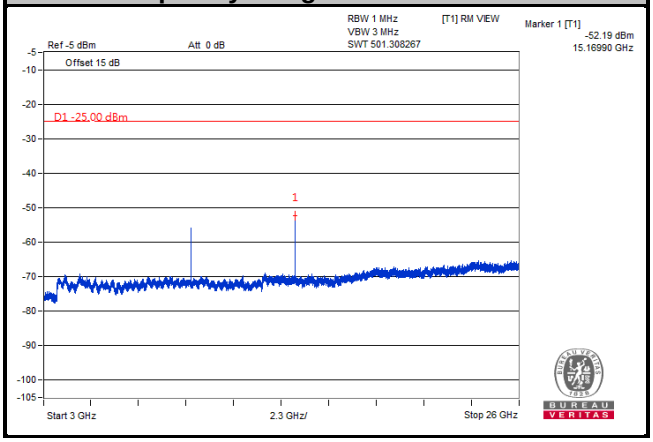
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 10 MHz	
Channel 21400	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

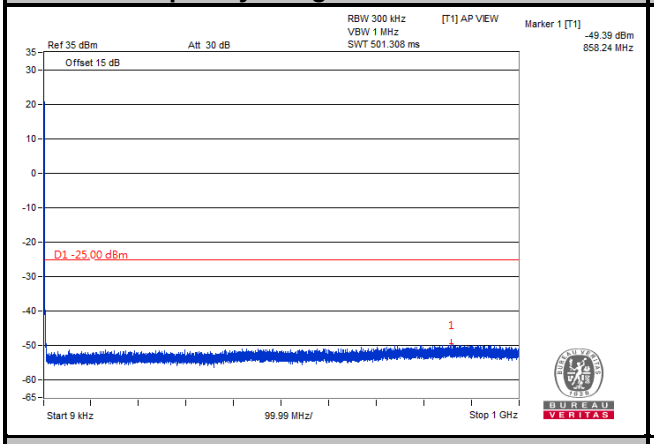
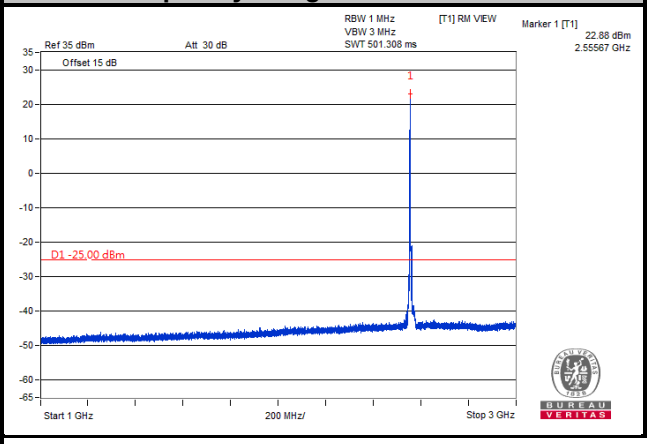
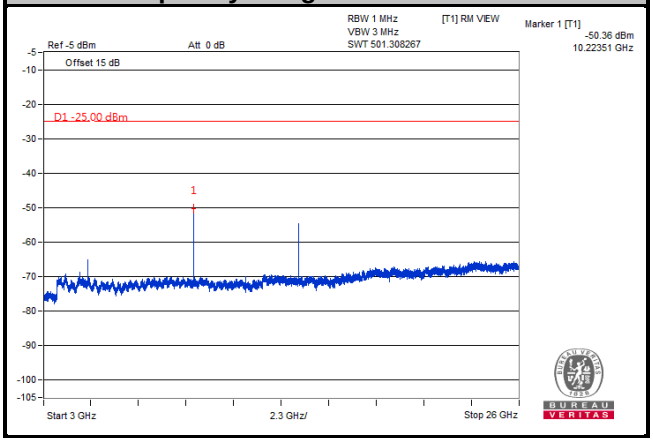
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 15 MHz	
Channel 20825	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

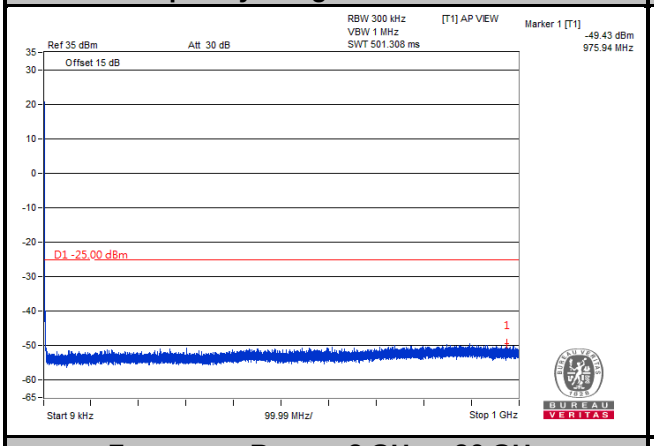
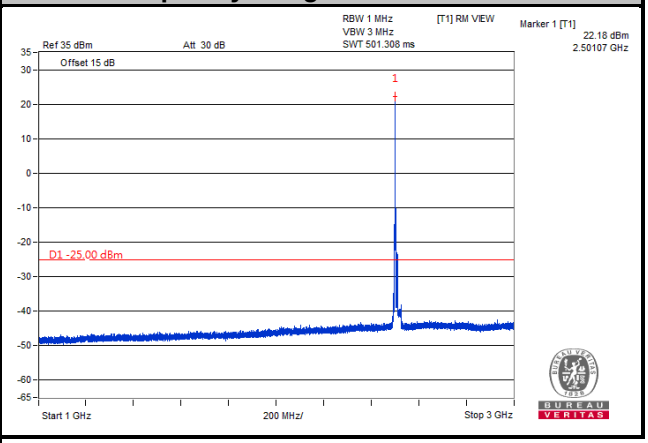
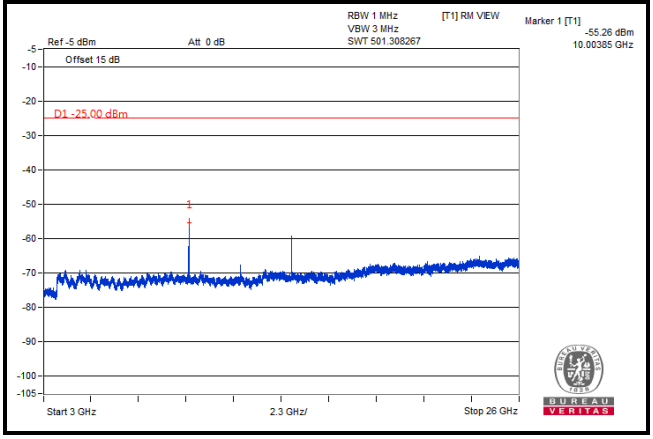
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 15 MHz	
Channel 21100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

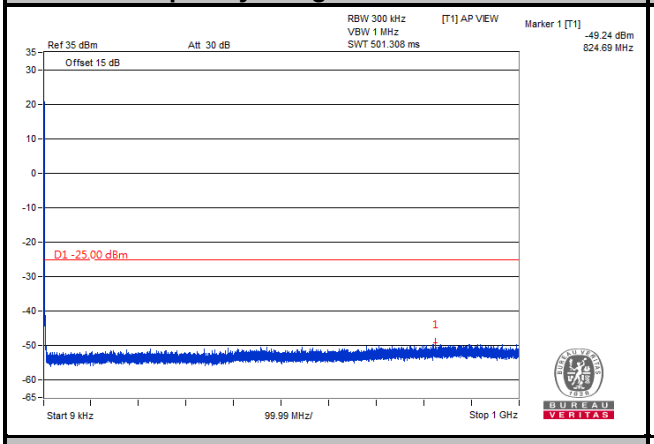
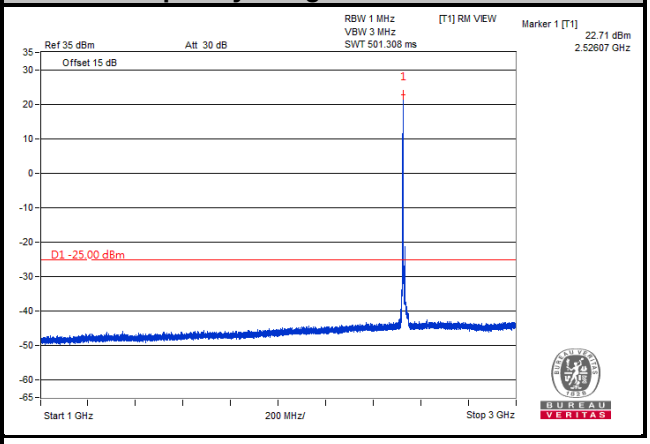
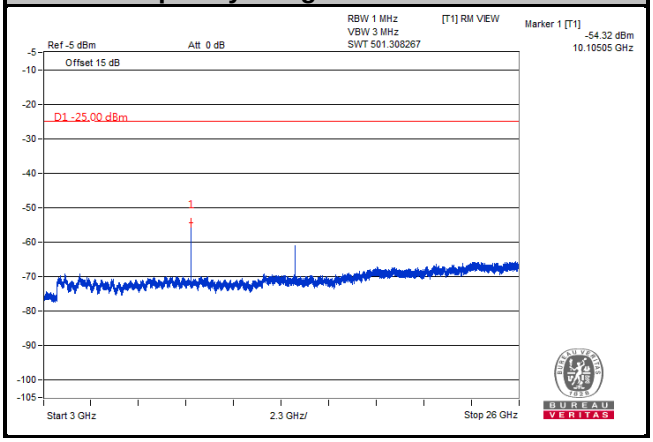
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 15 MHz	
Channel 21375	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

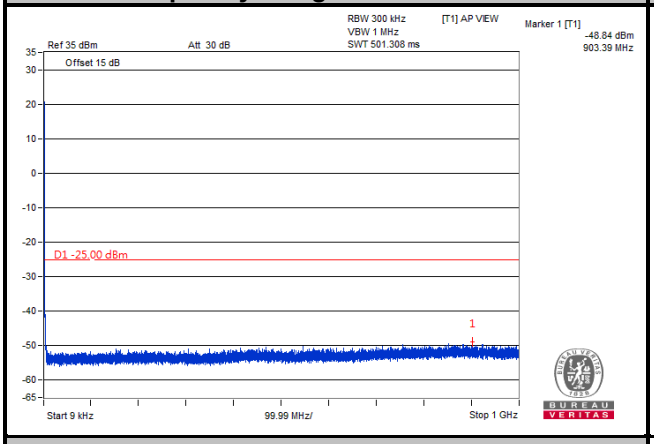
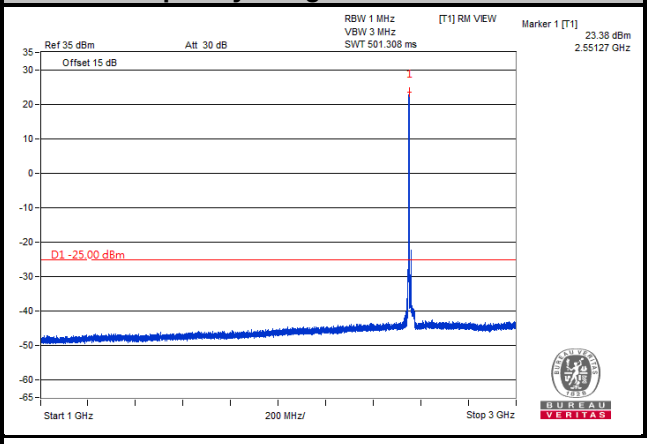
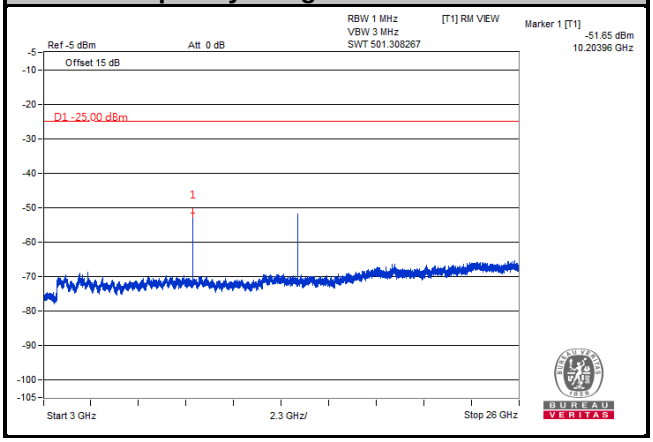
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 20 MHz	
Channel 20850	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

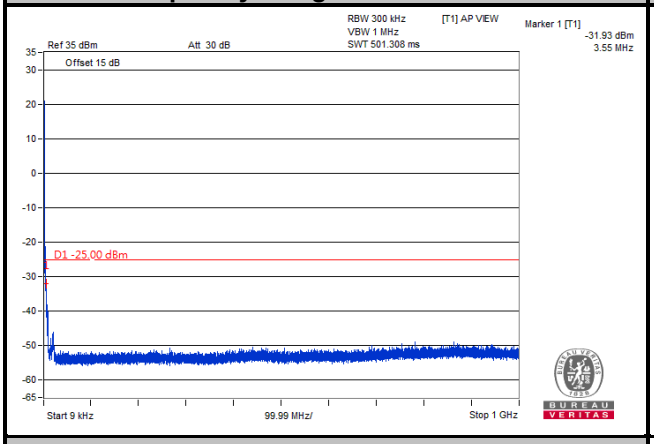
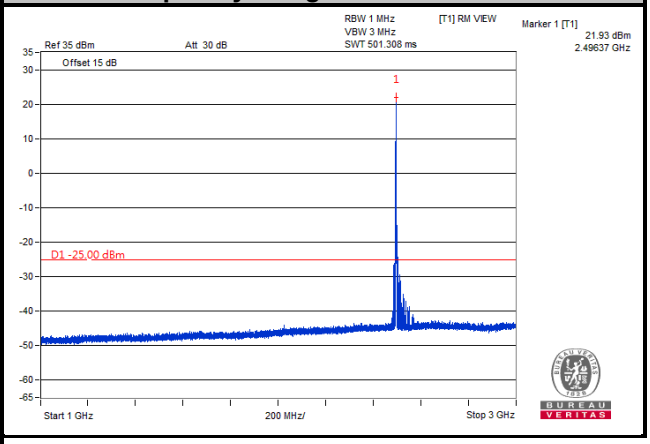
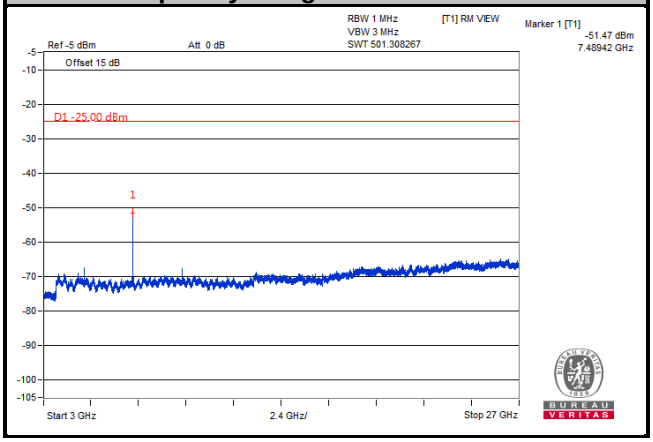
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 20 MHz	
Channel 21100	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

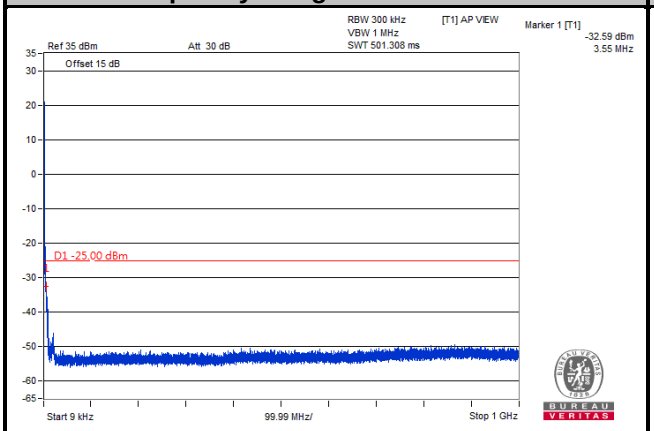
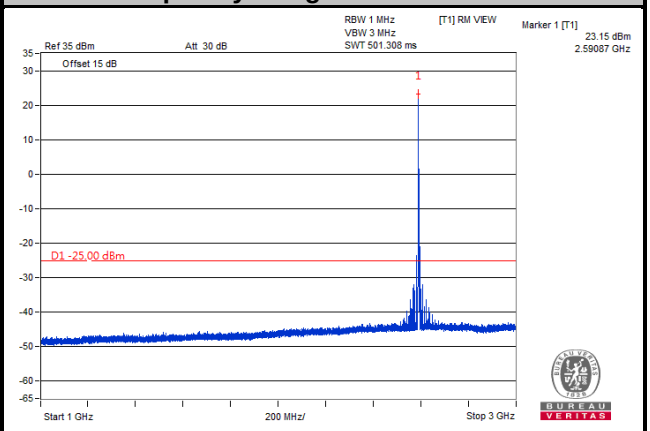
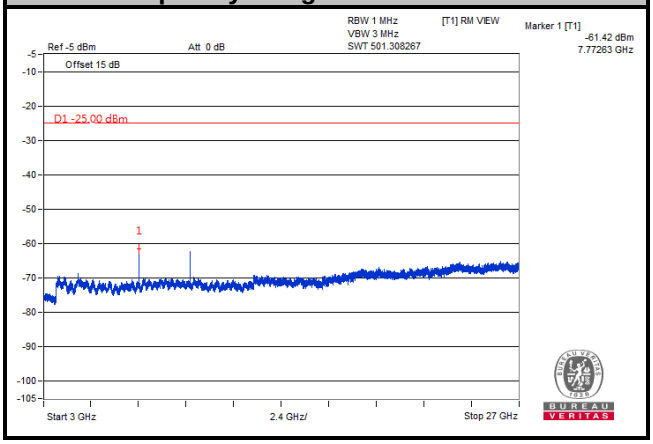
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 7	
Channel Bandwidth: 20 MHz	
Channel 21350	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 26 GHz	
	

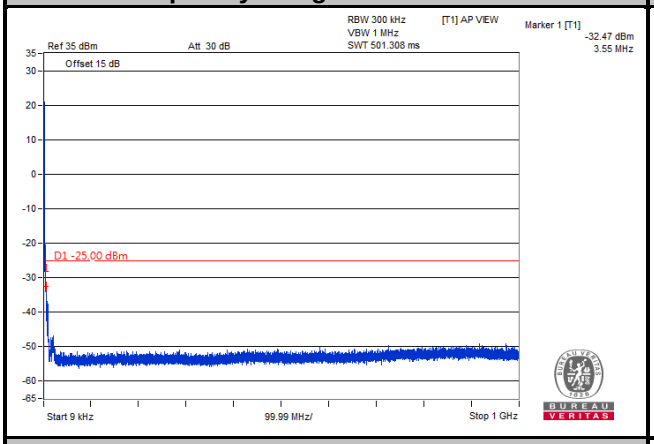
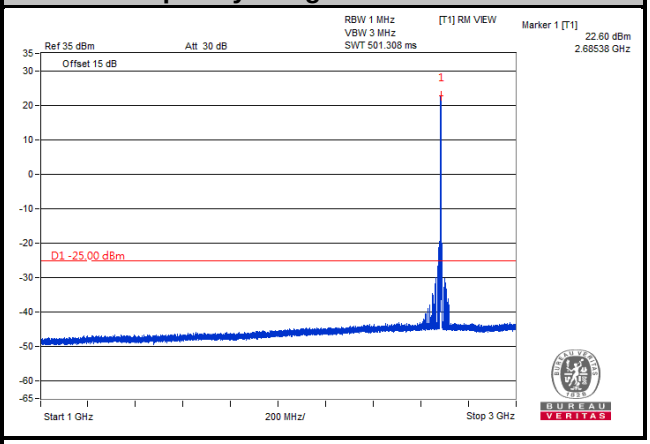
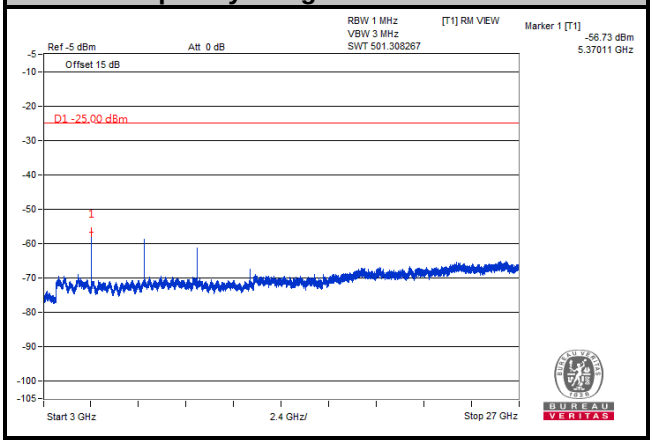
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 5 MHz	
Channel 39675	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

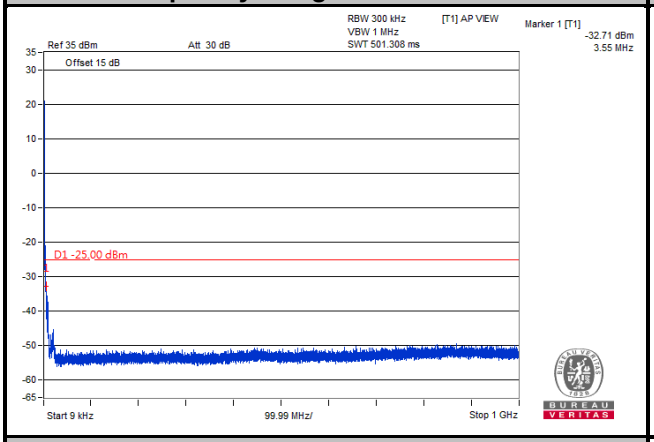
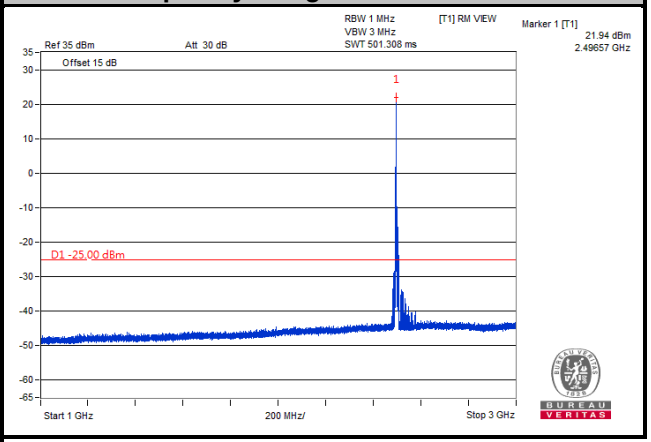
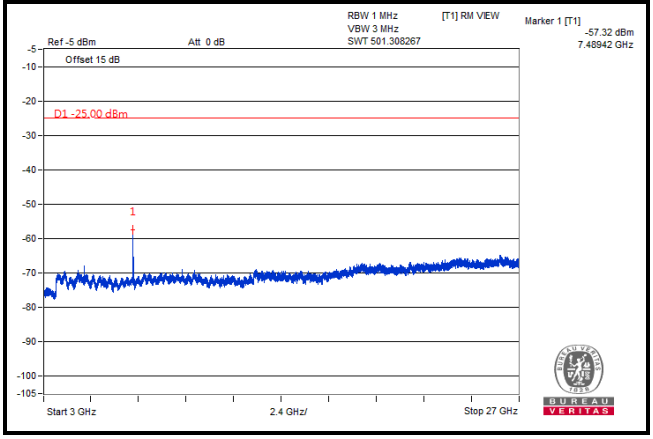
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 5 MHz	
Channel 40620	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

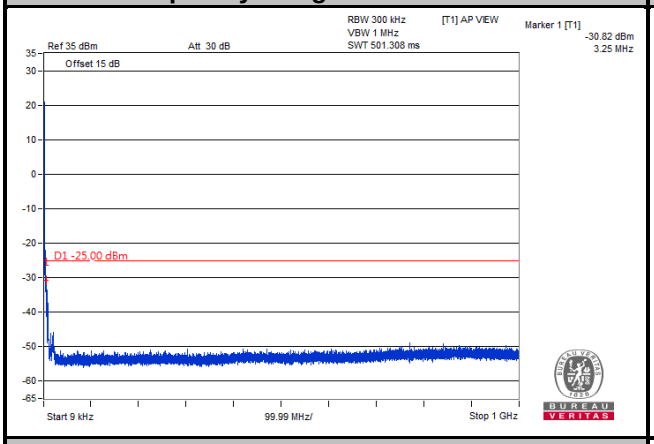
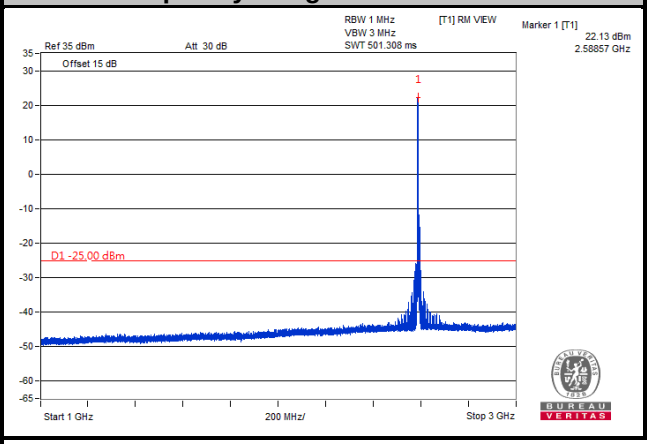
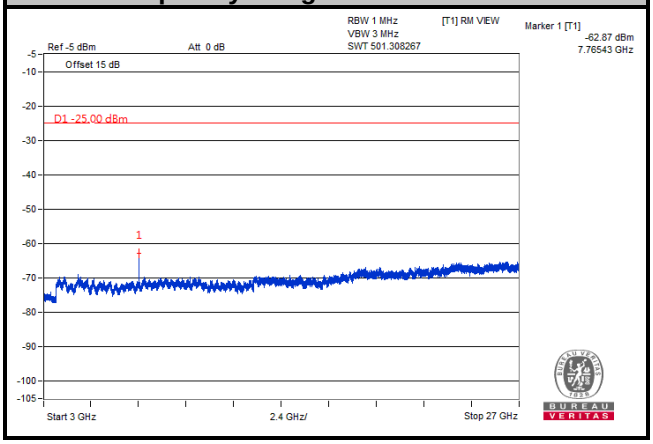
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 5 MHz	
Channel 41565	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

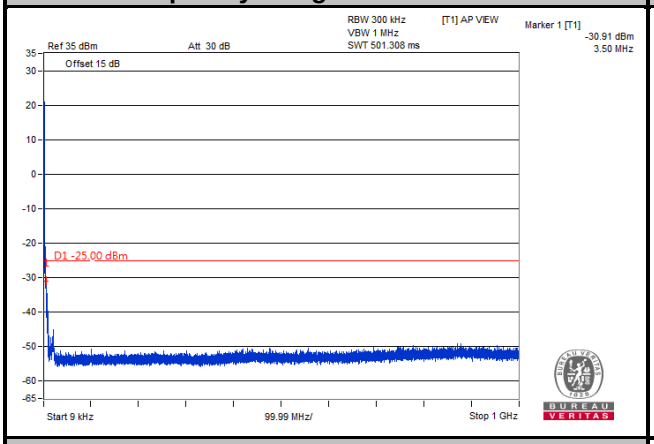
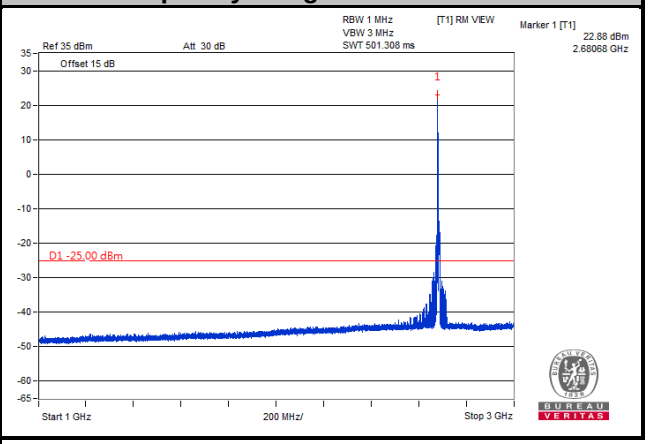
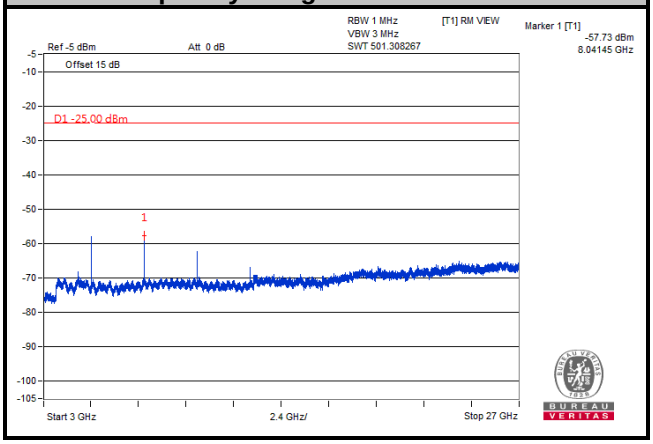
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 10 MHz	
Channel 39700	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

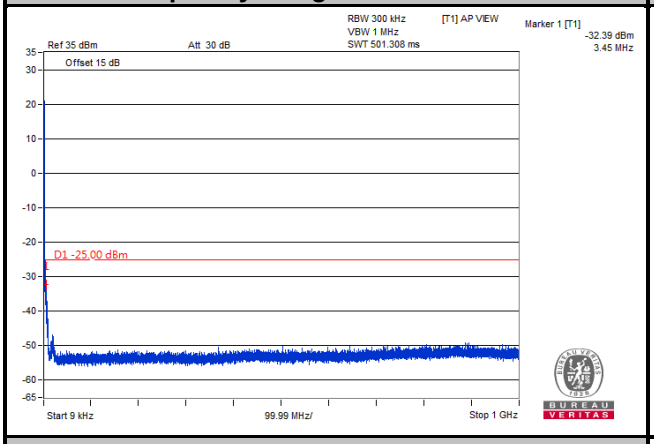
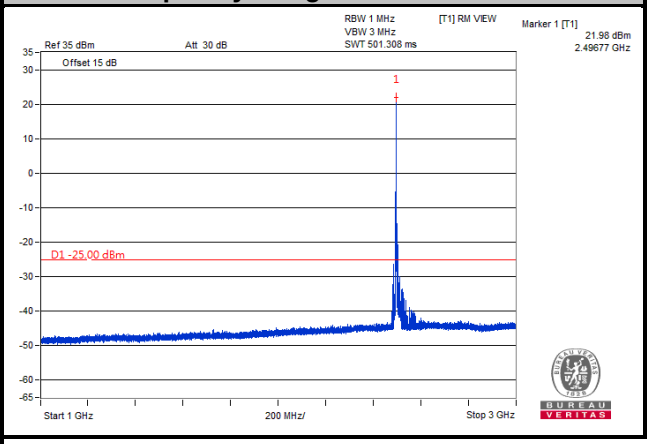
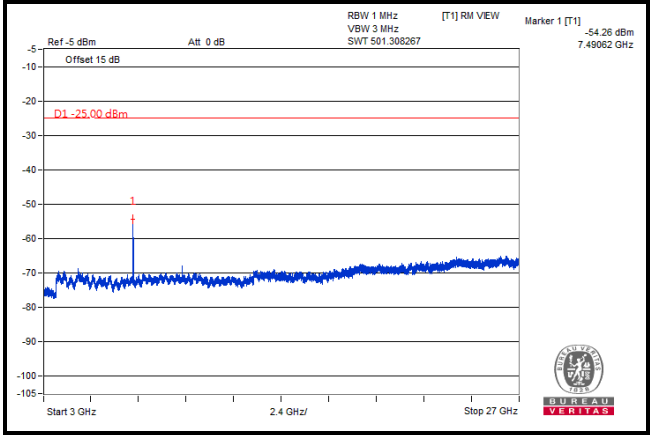
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 10 MHz	
Channel 40620	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

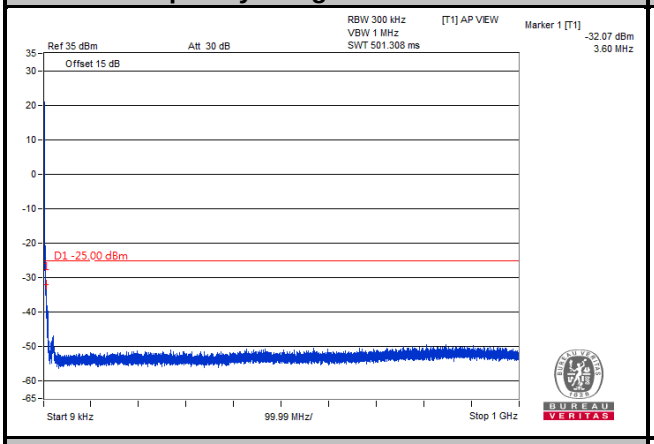
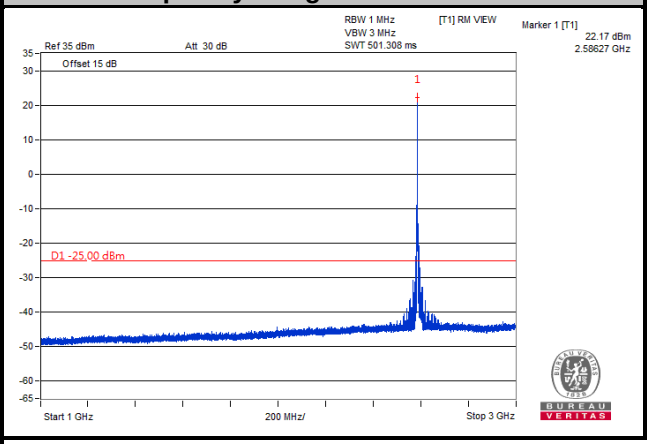
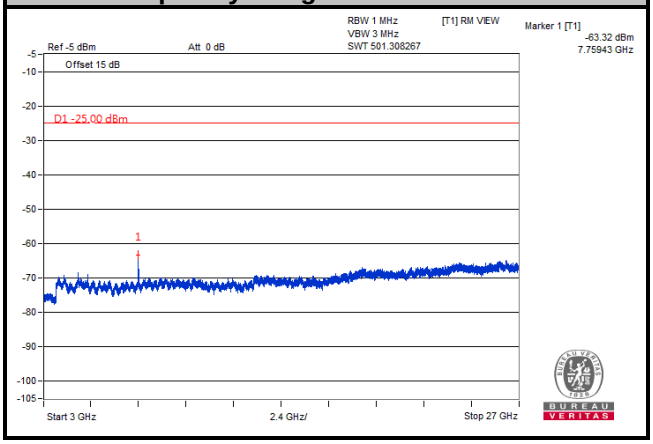
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 10 MHz	
Channel 41540	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

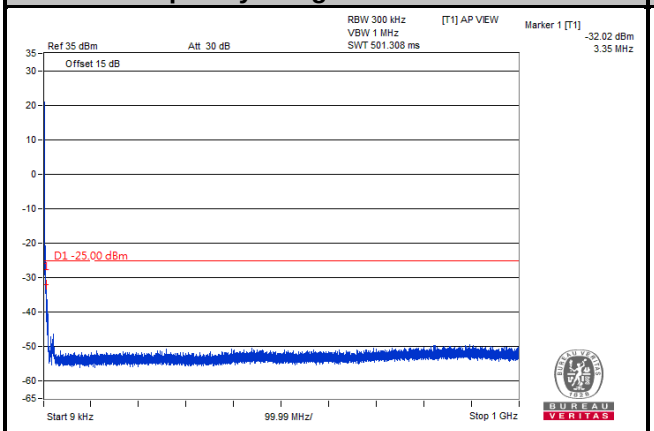
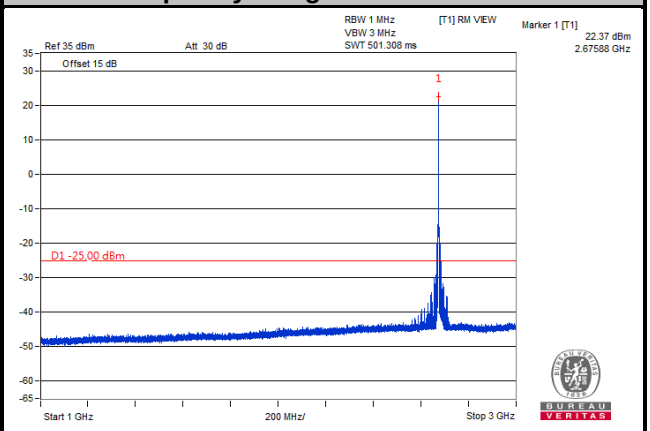
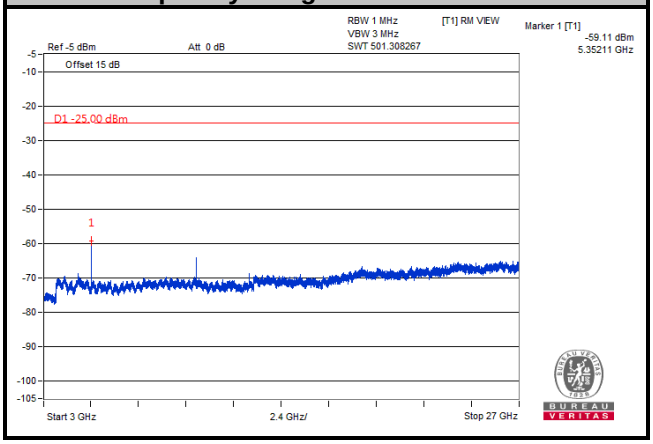
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 15 MHz	
Channel 39725	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

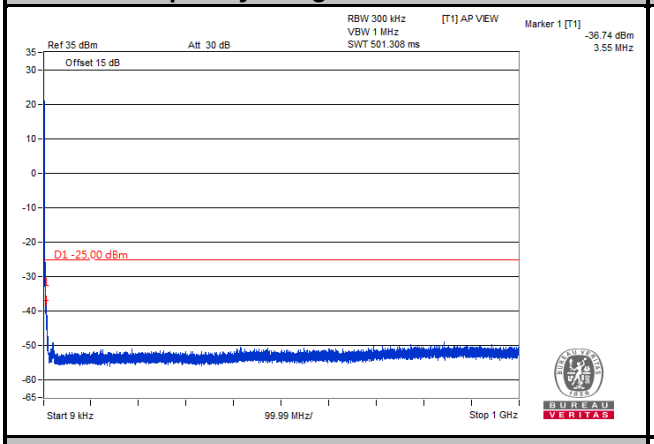
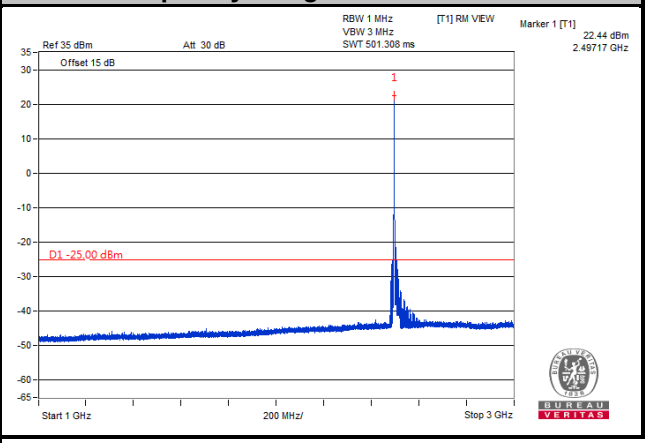
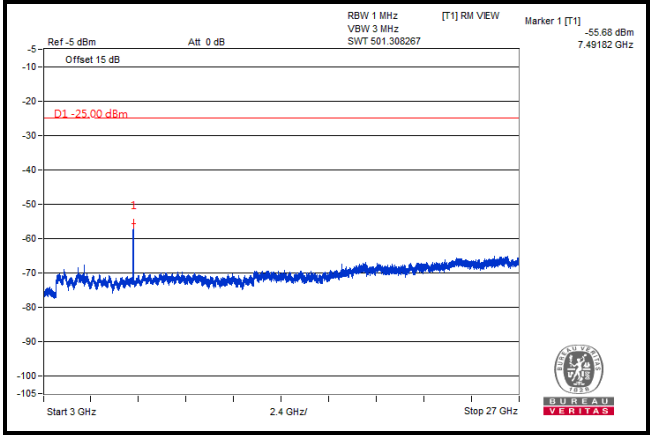
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 15 MHz	
Channel 40620	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

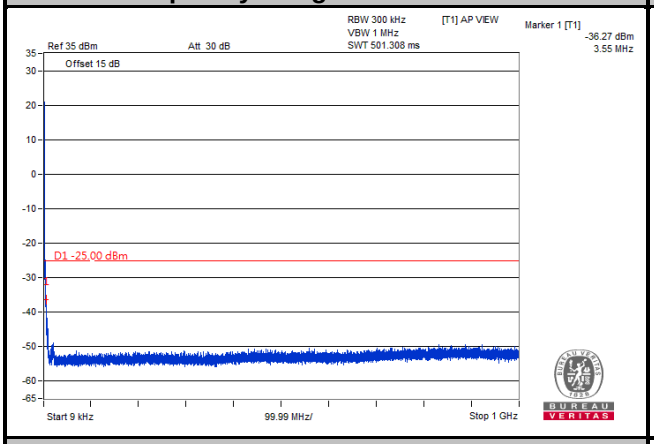
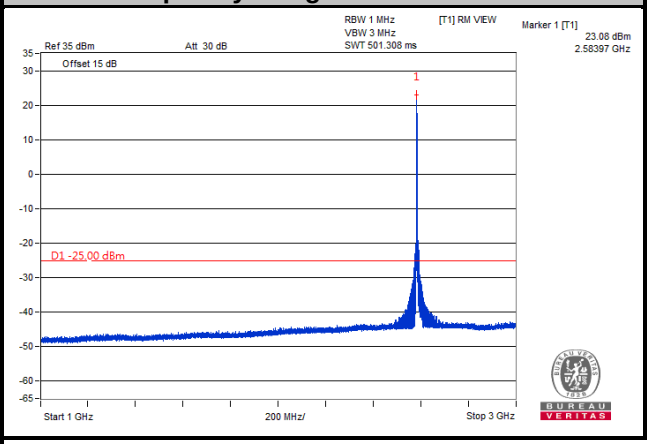
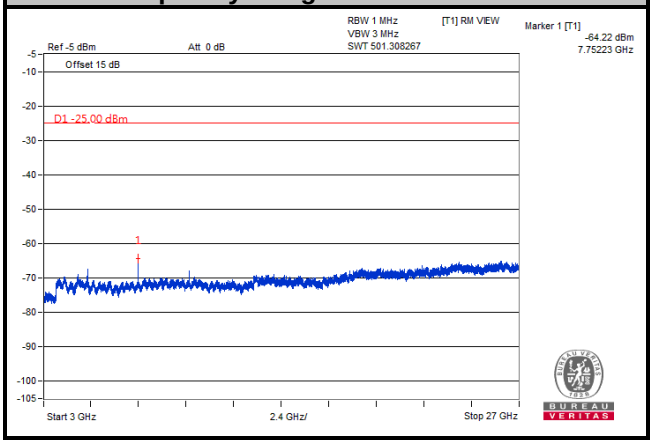
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 15 MHz	
Channel 41515	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

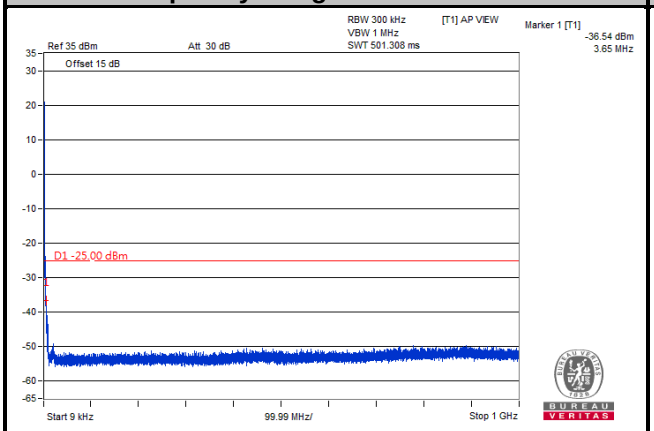
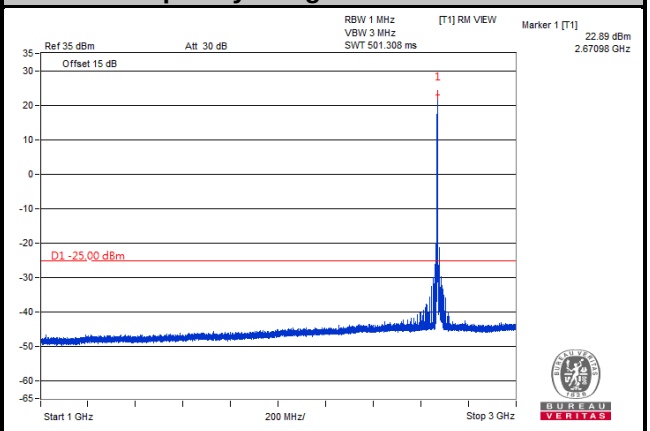
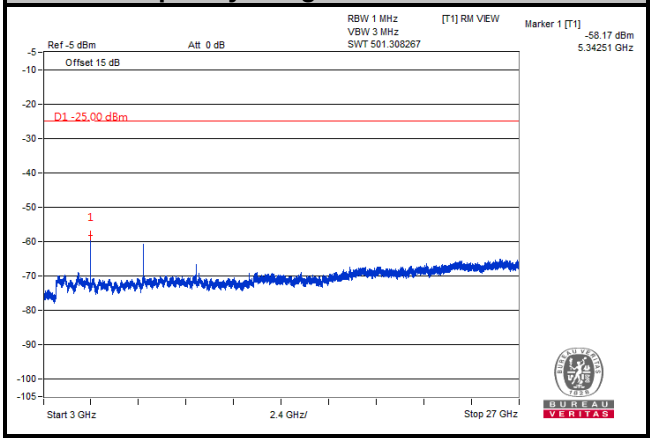
Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 20 MHz	
Channel 39750	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 20 MHz	
Channel 40620	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

LTE Band 41	
Channel Bandwidth: 20 MHz	
Channel 41490	
Frequency Range: 9 kHz ~ 1 GHz	Frequency Range: 1 GHz ~ 3 GHz
	
Frequency Range: 3 GHz ~ 27 GHz	
	

Note: The signal over the limit in 9 kHz is from spectrum analyzer.

4.8 Radiated Emission Measurement

4.8.1 Limits of Radiated Emission Measurement

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 + 10 log (P) dB. The limit of emission is equal to -25 dBm.

4.8.2 Test Procedure

a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8 m (below or equal 1 GHz) and/or 1.5 m (above 1 GHz) 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.
b. 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.
c. EIRP = Output power level of S.G – TX cable loss + Antenna gain of substitution horn.
d. 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.R.P power - 2.15 dB.

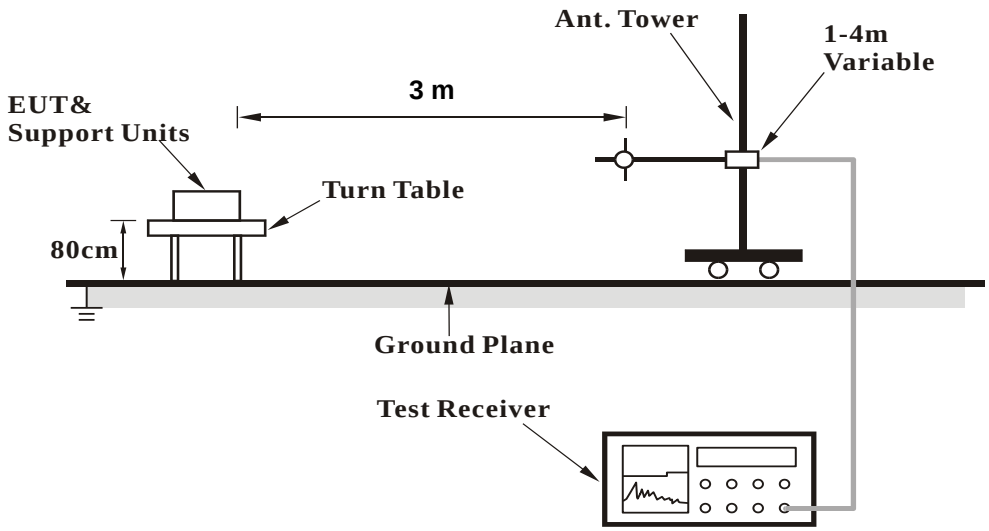
NOTE: The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

4.8.3 Deviation from Test Standard

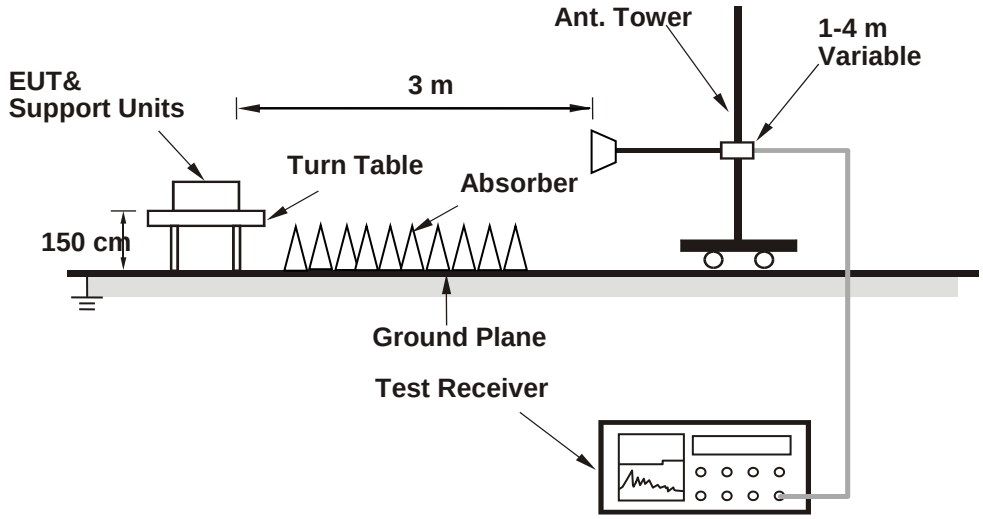
No deviation.

4.8.4 Test Setup

<Radiated Emission below or equal 1 GHz>



<Radiated Emission above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

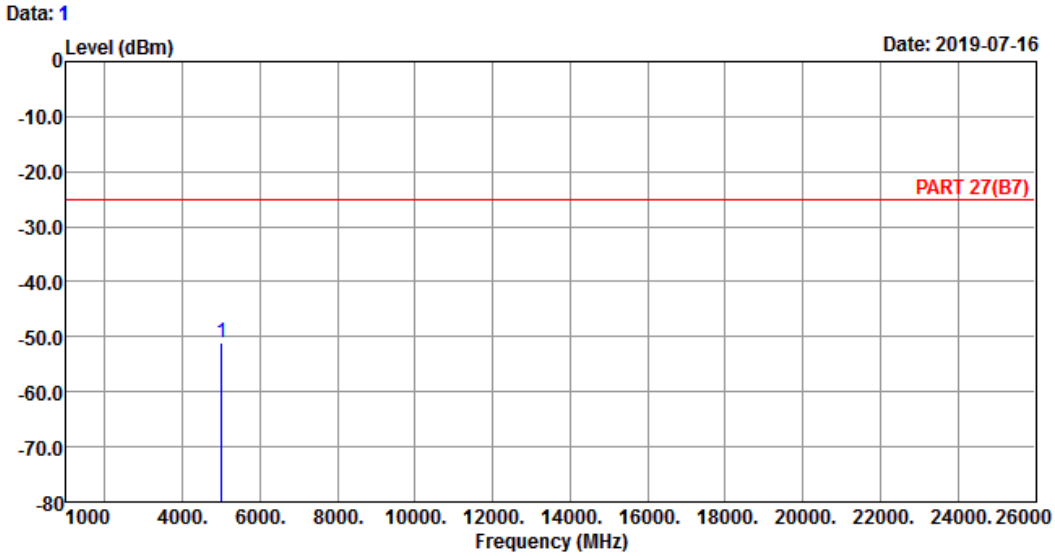
4.8.5 Test Results

LTE Band 7

Channel Bandwidth: 5 MHz / QPSK

Low Channel

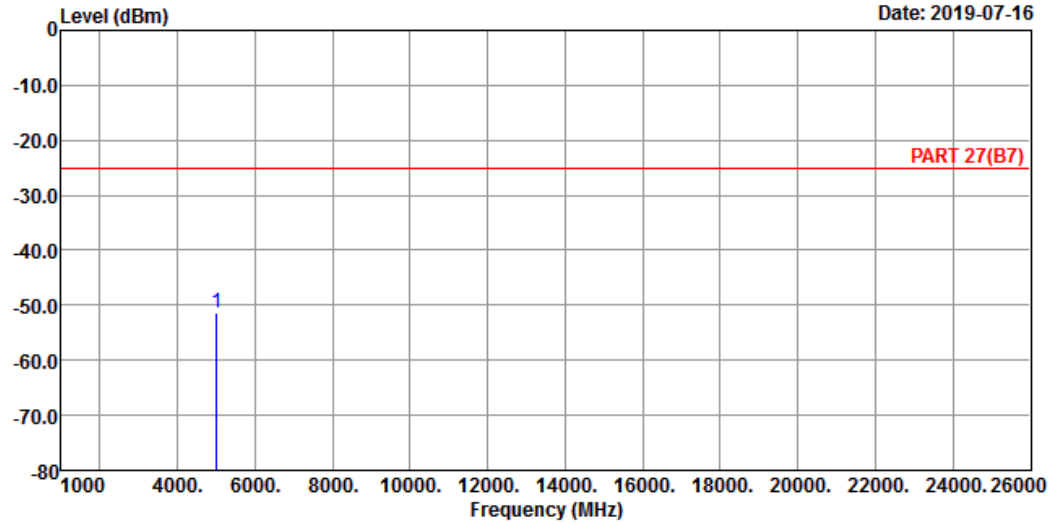
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_5M Link_L-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5005.00	-51.18	-48.72	-25.00	-2.46	-26.18	Peak

Data: 2

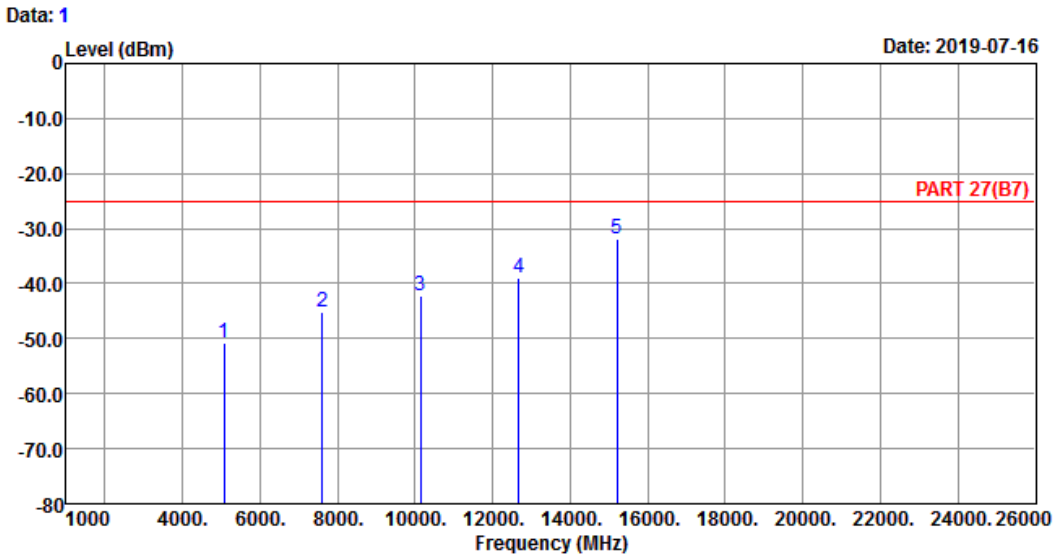


Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_5M Link_L-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5005.00	-51.38	-48.92	-25.00	-2.46	-26.38	Peak

Middle Channel

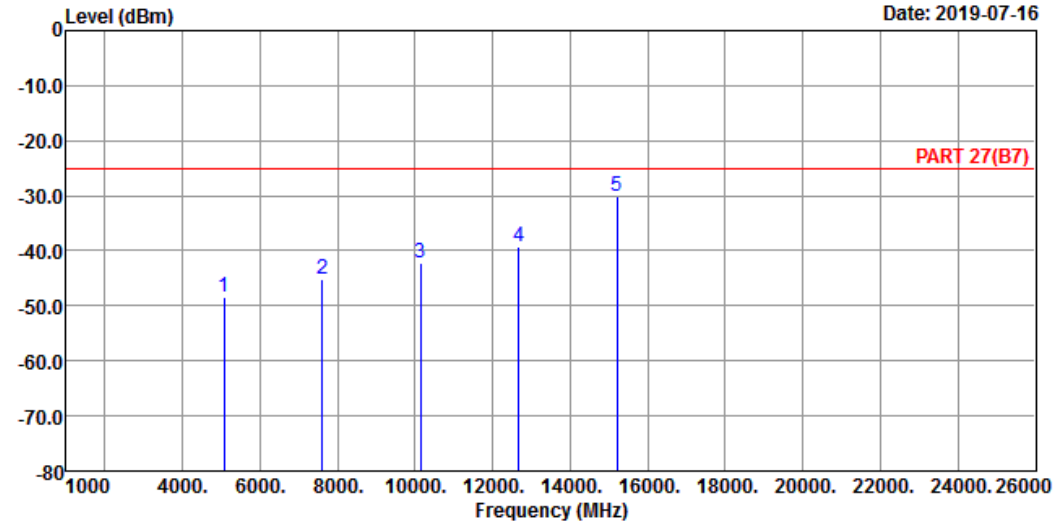
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_5M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5070.00	-50.79	-48.92	-25.00	-1.87	-25.79	Peak
2	7605.00	-45.19	-49.66	-25.00	4.47	-20.19	Peak
3	10140.00	-42.25	-48.23	-25.00	5.98	-17.25	Peak
4	12675.00	-38.90	-47.45	-25.00	8.55	-13.90	Peak
5 pp	15210.00	-31.92	-42.57	-25.00	10.65	-6.92	Peak

Data: 2

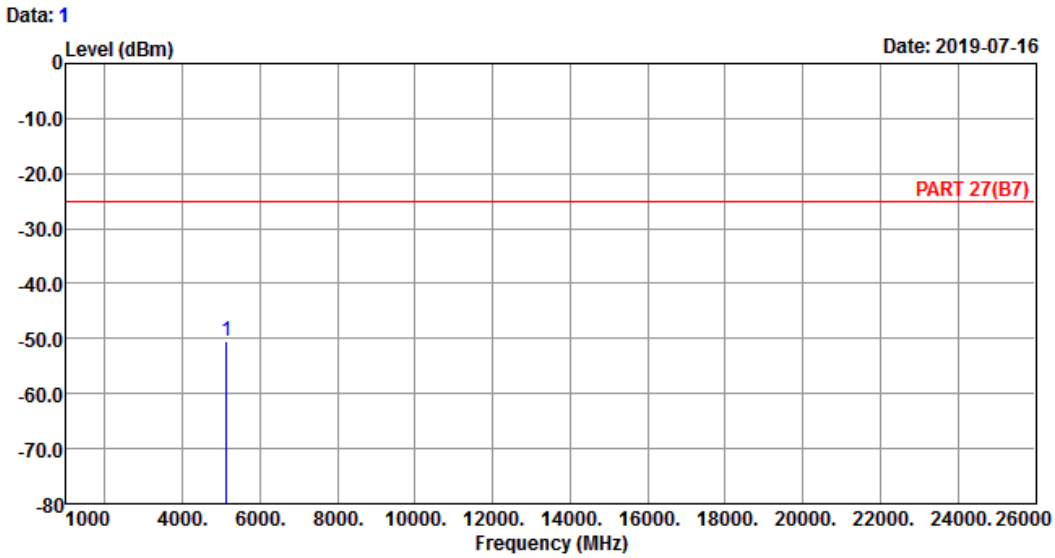


Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_5M Link_M-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5070.00	-48.40	-46.53	-25.00	-1.87	-23.40	Peak
2	7605.00	-45.31	-49.78	-25.00	4.47	-20.31	Peak
3	10140.00	-42.13	-48.11	-25.00	5.98	-17.13	Peak
4	12675.00	-39.37	-47.92	-25.00	8.55	-14.37	Peak
5 pp	15210.00	-29.98	-40.63	-25.00	10.65	-4.98	Peak

High Channel

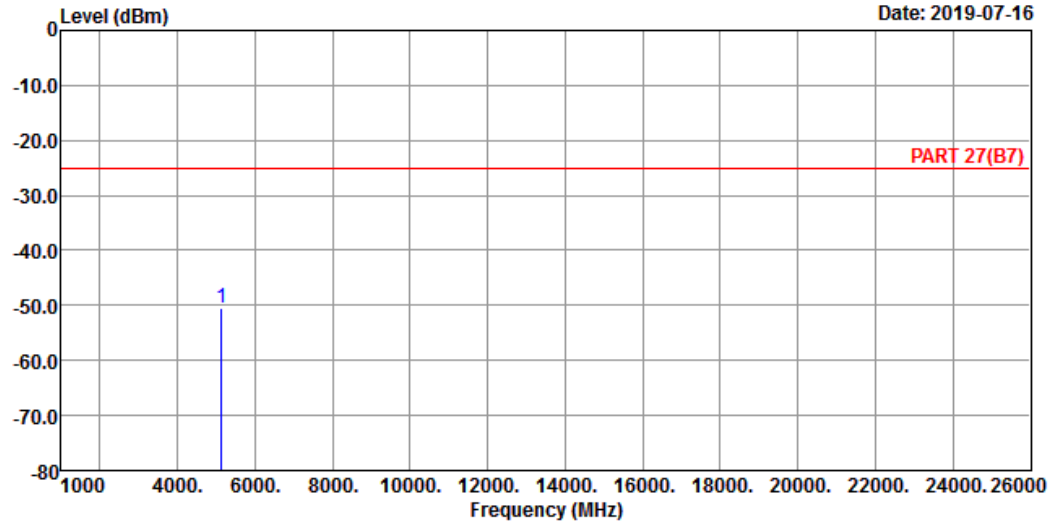
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_5M Link_H-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5135.00	-50.57	-48.83	-25.00	-1.74	-25.57	Peak

Data: 2



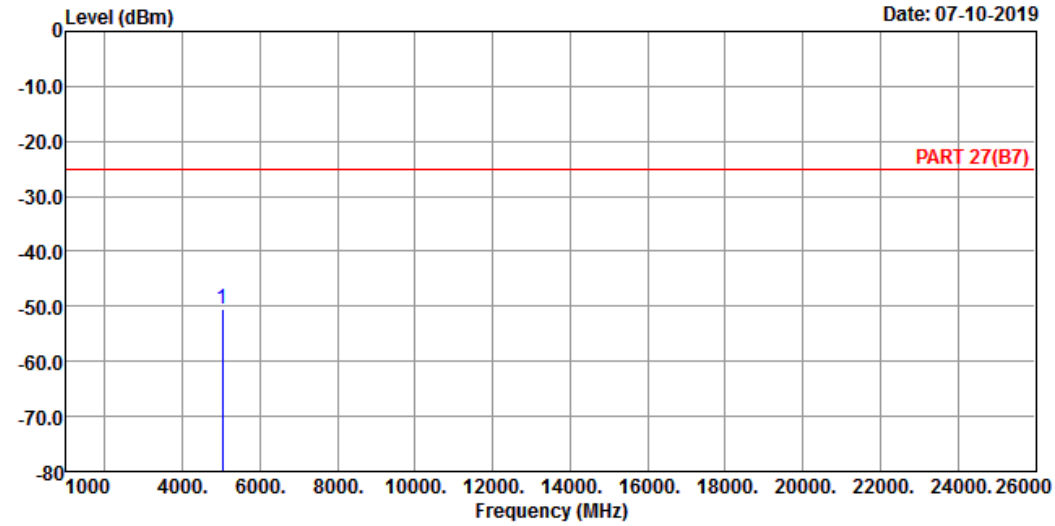
Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_5M Link_H-CH
Tested by: tim-chen

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5135.00	-50.46	-48.72	-25.00	-1.74	-25.46	Peak

Channel Bandwidth: 20 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch

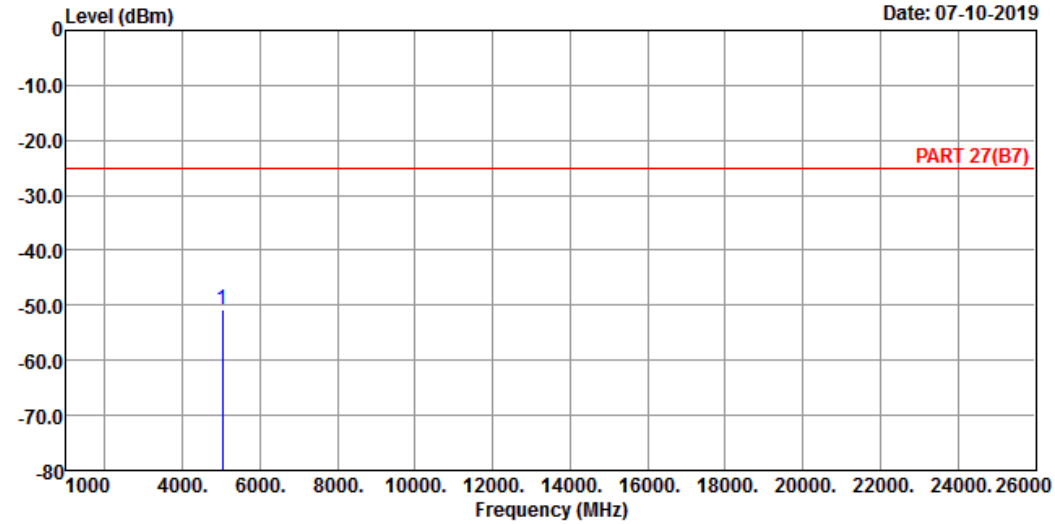
Data: 3



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_20M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5020.00	-50.61	-48.29	-25.00	-2.32	-25.61	Peak

Data: 4

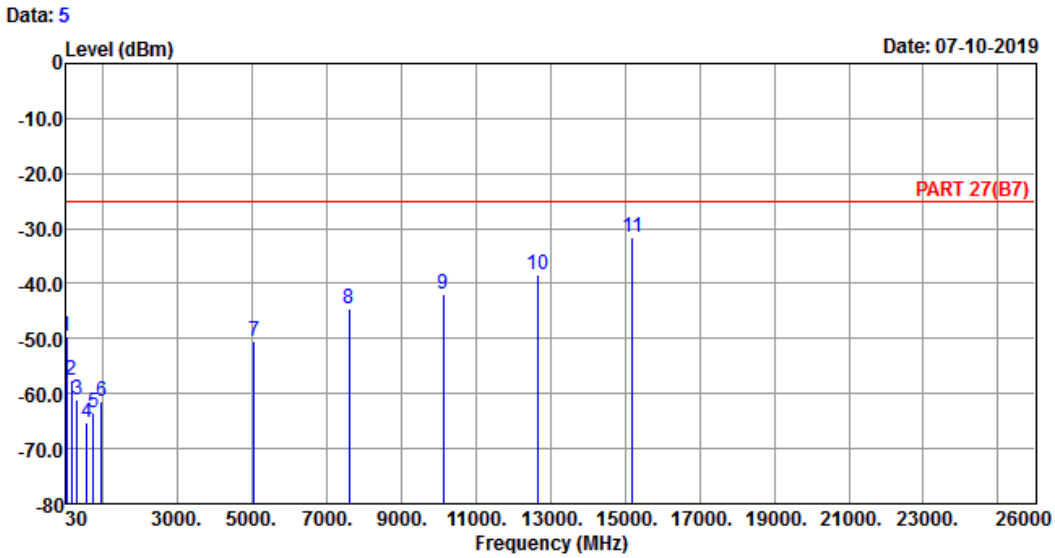


Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_20M Link_L-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5020.00	-50.85	-48.53	-25.00	-2.32	-25.85	Peak

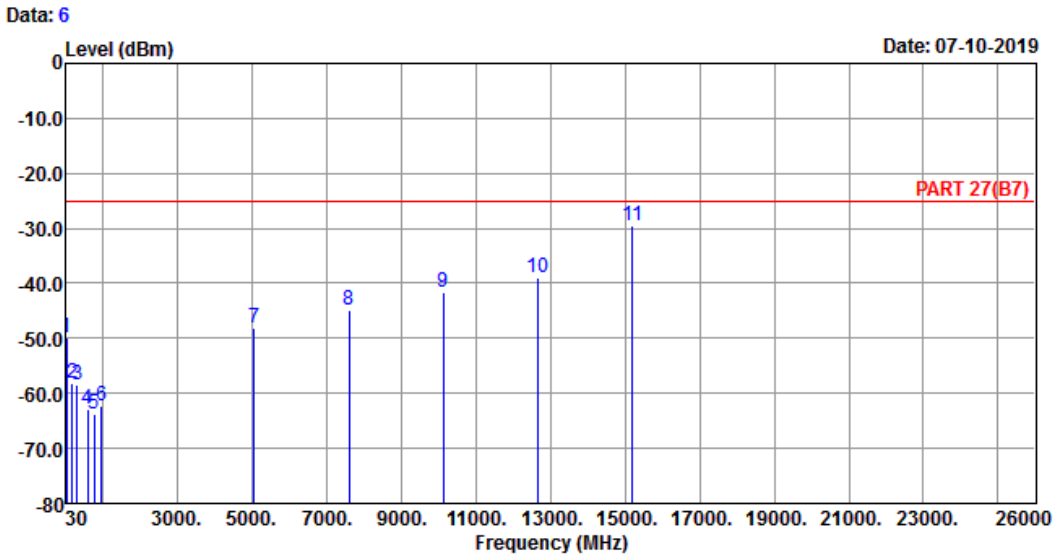
Middle Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_20M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-49.68	-48.21	-25.00	-1.47	-24.68	Peak
2	167.74	-57.49	-52.10	-25.00	-5.39	-32.49	Peak
3	311.30	-61.13	-54.30	-25.00	-6.83	-36.13	Peak
4	578.05	-65.18	-63.50	-25.00	-1.68	-40.18	Peak
5	759.44	-63.45	-64.30	-25.00	0.85	-38.45	Peak
6	965.08	-61.27	-63.62	-25.00	2.35	-36.27	Peak
7	5070.00	-50.41	-48.54	-25.00	-1.87	-25.41	Peak
8	7605.00	-44.68	-49.15	-25.00	4.47	-19.68	Peak
9	10140.00	-41.85	-47.83	-25.00	5.98	-16.85	Peak
10	12675.00	-38.50	-47.05	-25.00	8.55	-13.50	Peak
11 pp	15210.00	-31.59	-42.24	-25.00	10.65	-6.59	Peak

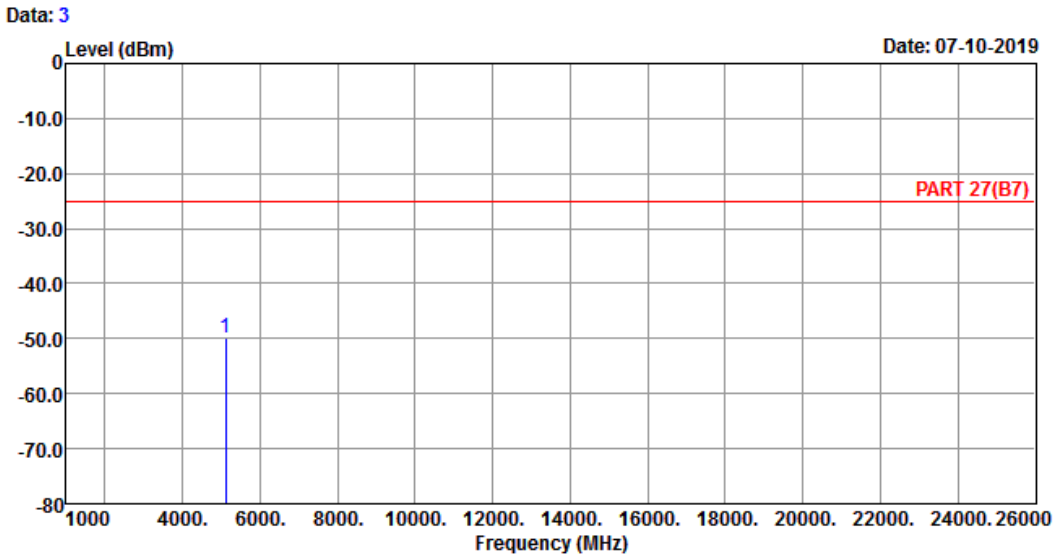


Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_20M Link_M-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-50.03	-48.56	-25.00	-1.47	-25.03	Peak
2	197.81	-58.26	-50.43	-25.00	-7.83	-33.26	Peak
3	320.03	-58.34	-51.64	-25.00	-6.70	-33.34	Peak
4	600.36	-62.96	-62.21	-25.00	-0.75	-37.96	Peak
5	774.96	-63.62	-64.43	-25.00	0.81	-38.62	Peak
6	967.02	-62.40	-64.81	-25.00	2.41	-37.40	Peak
7	5070.00	-47.98	-46.11	-25.00	-1.87	-22.98	Peak
8	7605.00	-44.87	-49.34	-25.00	4.47	-19.87	Peak
9	10140.00	-41.72	-47.70	-25.00	5.98	-16.72	Peak
10	12675.00	-38.88	-47.43	-25.00	8.55	-13.88	Peak
11 pp	15210.00	-29.53	-40.18	-25.00	10.65	-4.53	Peak

High Channel

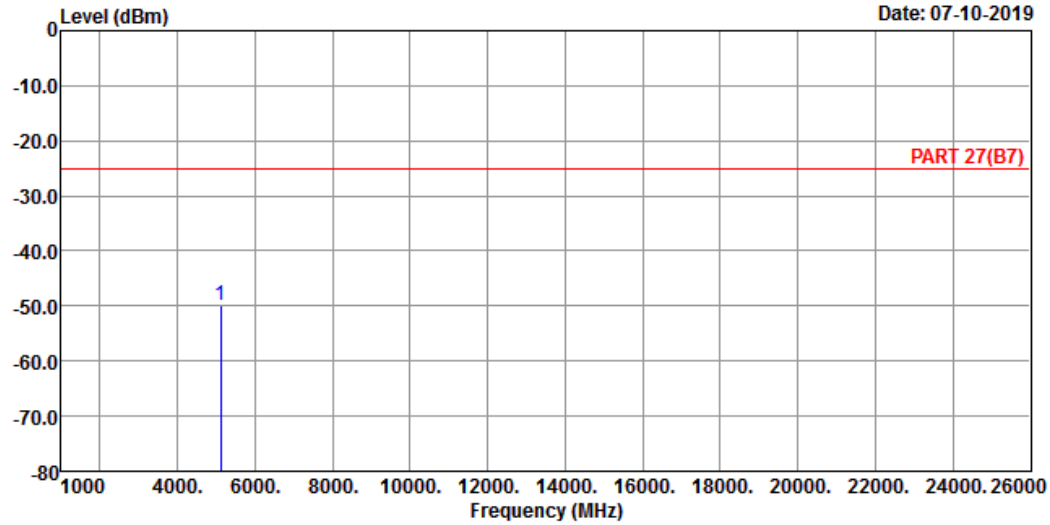
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B7) HORIZONTAL
Remak : LTE Band 7 QPSK_20M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5120.00	-49.98	-48.32	-25.00	-1.66	-24.98	Peak

Data: 4

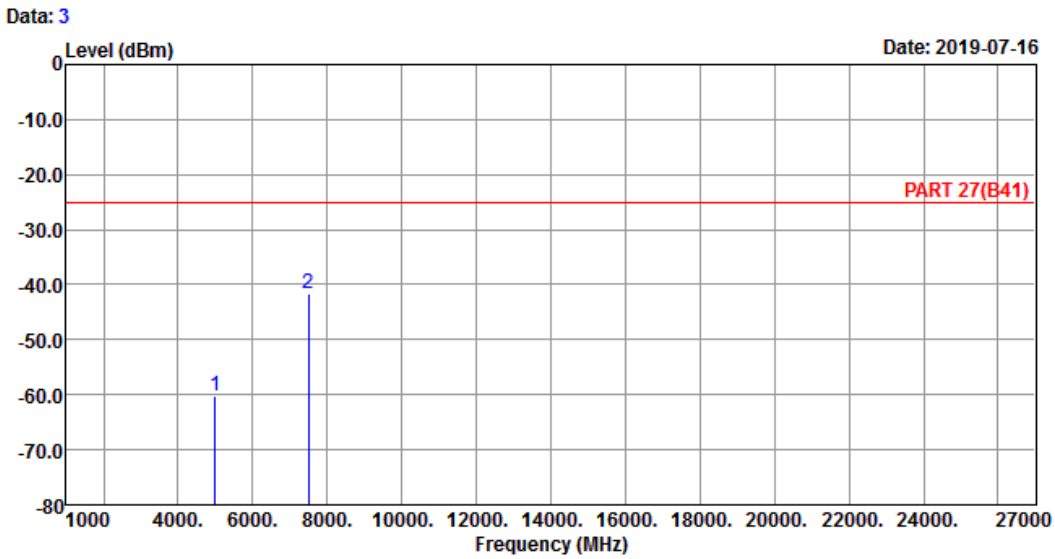


Site : 966 Chamber 5
Condition: PART 27(B7) VERTICAL
Remak : LTE Band 7 QPSK_20M Link_H-CH
Tested by: Thomas Wei

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1 pp	5120.00	-50.02	-48.36	-25.00	-1.66	-25.02	Peak

LTE Band 41
Channel Bandwidth: 5 MHz / QPSK
Low Channel

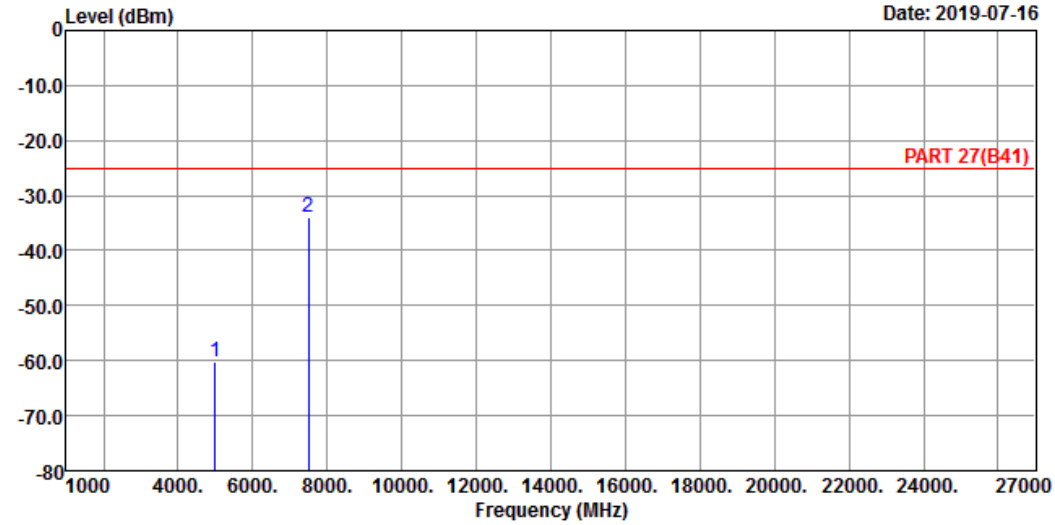
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	4997.00	-60.35	-57.74	-25.00	-2.61	-35.35	Peak
2 pp	7495.50	-41.64	-45.83	-25.00	4.19	-16.64	Peak

Data: 4

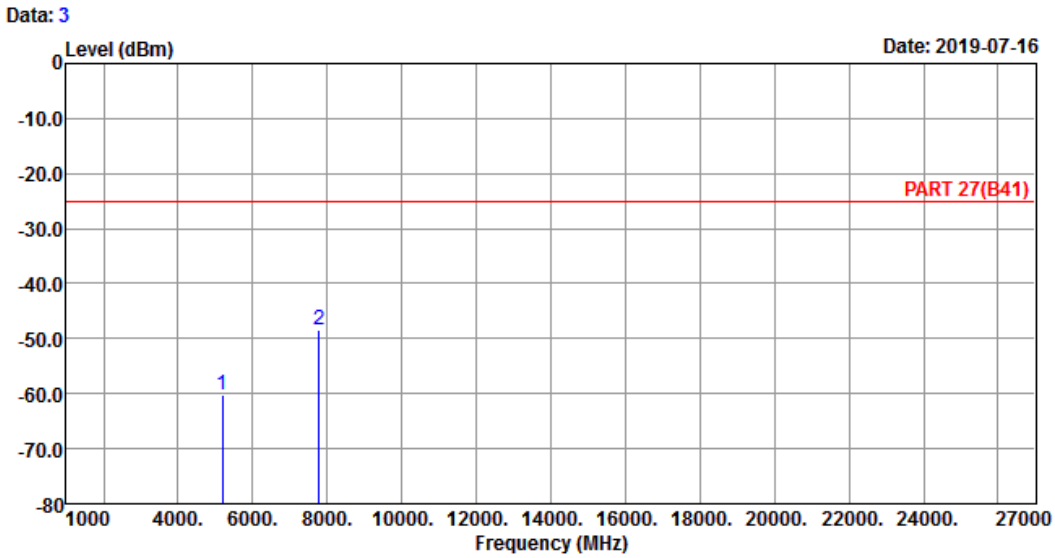


Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_5M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	4997.00	-60.08	-57.47	-25.00	-2.61	-35.08	Peak
2 pp	7495.50	-33.92	-38.11	-25.00	4.19	-8.92	Peak

Middle Channel

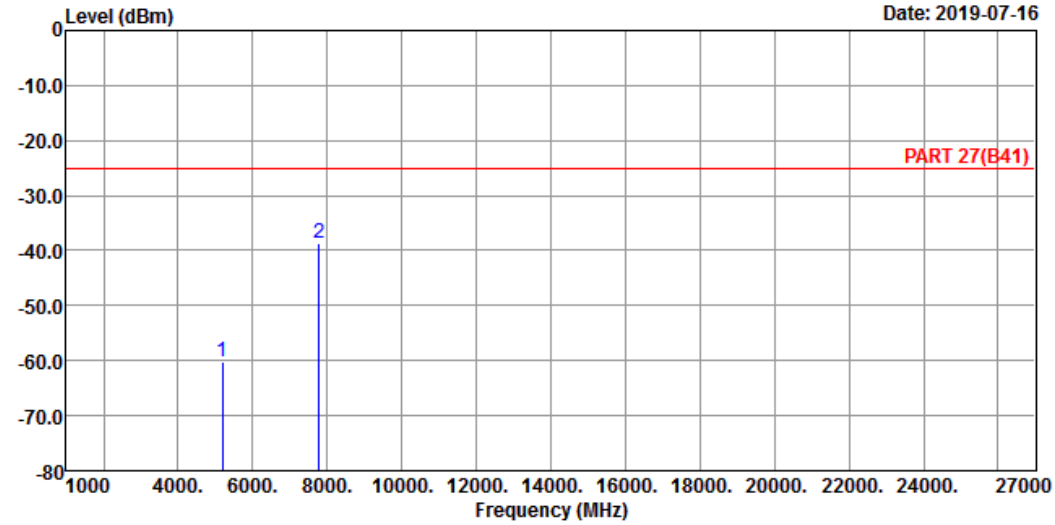
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5186.00	-60.16	-58.17	-25.00	-1.99	-35.16	Peak
2 pp	7779.00	-48.31	-53.05	-25.00	4.74	-23.31	Peak

Data: 4

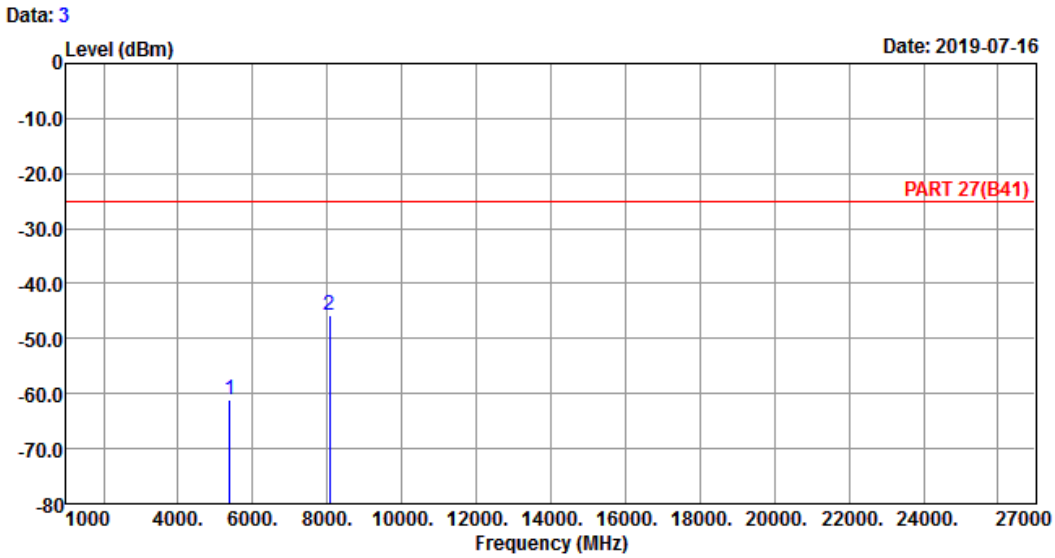


Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_5M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5186.00	-60.27	-58.28	-25.00	-1.99	-35.27	Peak
2 pp	7779.00	-38.76	-43.50	-25.00	4.74	-13.76	Peak

High Channel

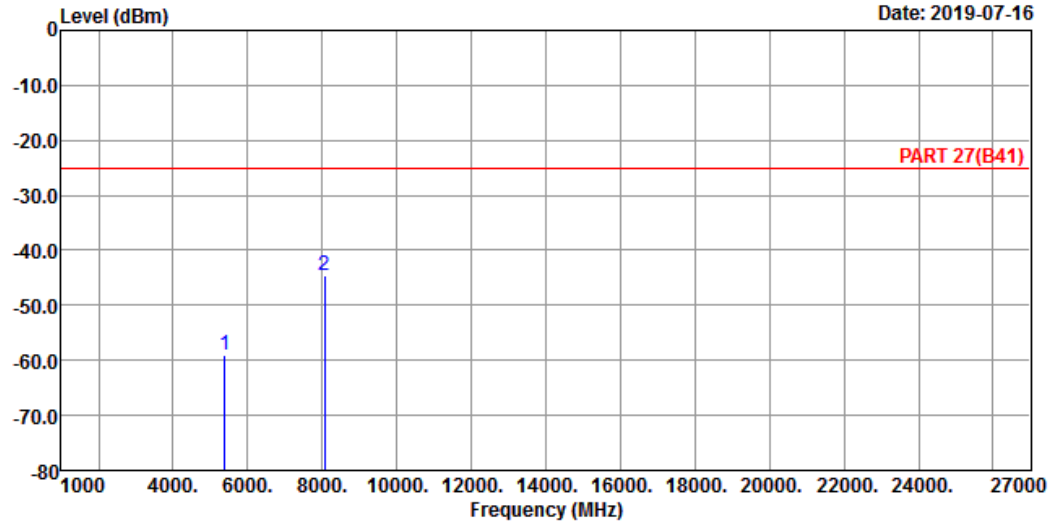
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5375.00	-61.20	-58.80	-25.00	-2.40	-36.20	Peak
2 pp	8062.50	-45.78	-50.88	-25.00	5.10	-20.78	Peak

Data: 4

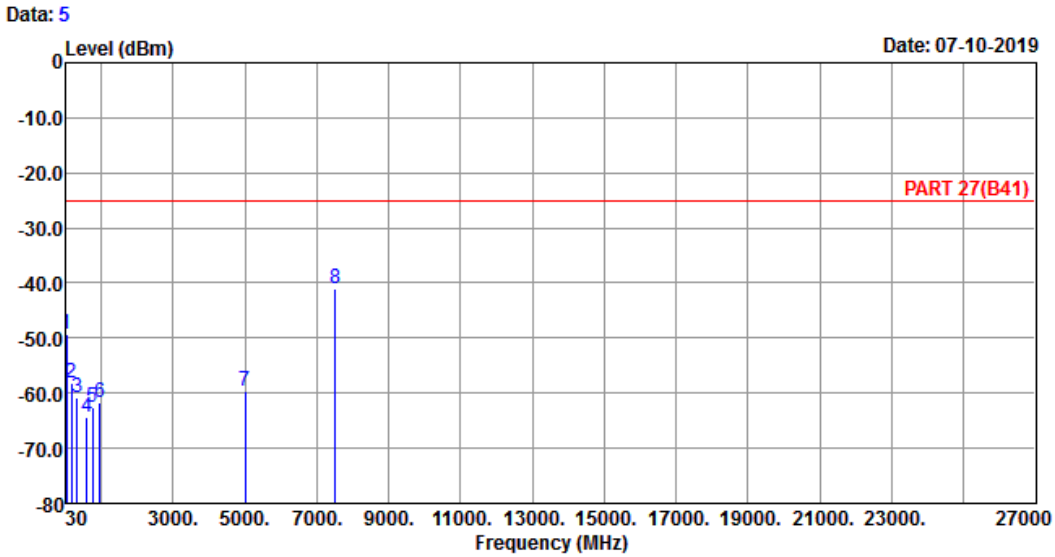


Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_5M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5375.00	-59.13	-56.73	-25.00	-2.40	-34.13	Peak
2 pp	8062.50	-44.56	-49.66	-25.00	5.10	-19.56	Peak

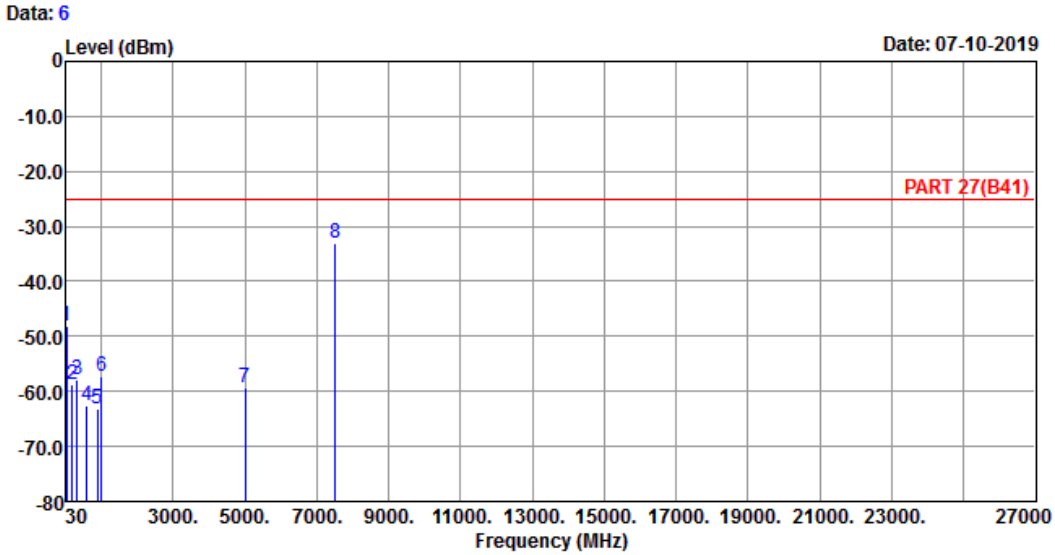
Channel Bandwidth: 20 MHz / QPSK
Low Channel

Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-49.18	-47.71	-25.00	-1.47	-24.18	Peak
2	167.74	-58.20	-52.81	-25.00	-5.39	-33.20	Peak
3	327.79	-60.88	-54.30	-25.00	-6.58	-35.88	Peak
4	609.09	-64.26	-63.48	-25.00	-0.78	-39.26	Peak
5	756.53	-62.69	-63.55	-25.00	0.86	-37.69	Peak
6	961.20	-61.82	-64.03	-25.00	2.21	-36.82	Peak
7	5012.00	-59.68	-57.22	-25.00	-2.46	-34.68	Peak
8 pp	7518.00	-41.00	-45.21	-25.00	4.21	-16.00	Peak



Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_20M Link_L-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	43.58	-48.01	-46.54	-25.00	-1.47	-23.01	Peak
2	195.87	-58.87	-51.22	-25.00	-7.65	-33.87	Peak
3	327.79	-57.98	-51.40	-25.00	-6.58	-32.98	Peak
4	600.36	-62.48	-61.73	-25.00	-0.75	-37.48	Peak
5	899.12	-63.17	-63.74	-25.00	0.57	-38.17	Peak
6	1000.00	-57.17	-60.75	-25.00	3.58	-32.17	Peak
7	5012.00	-59.35	-56.89	-25.00	-2.46	-34.35	Peak
8 pp	7518.00	-32.94	-37.15	-25.00	4.21	-7.94	Peak

Middle Channel

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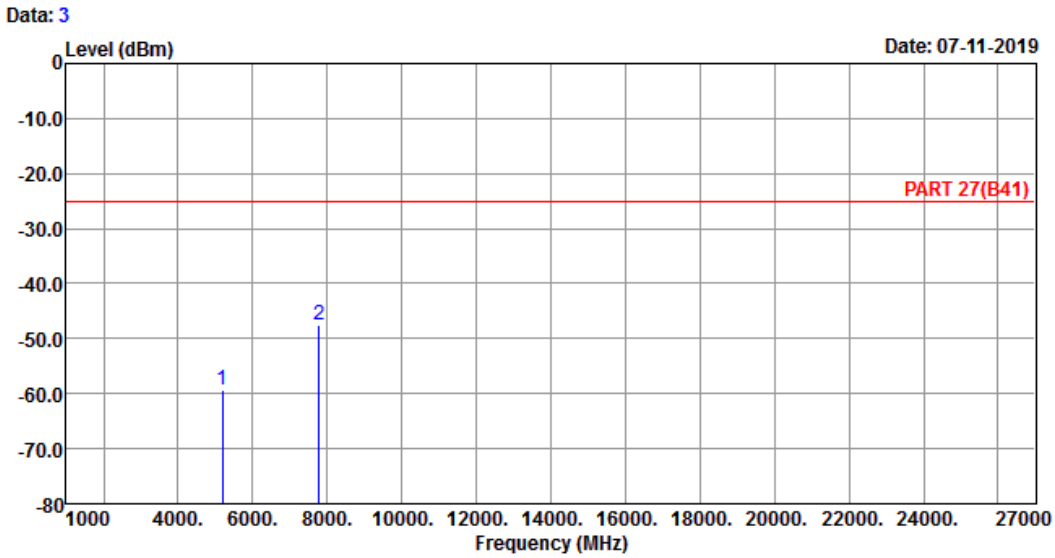
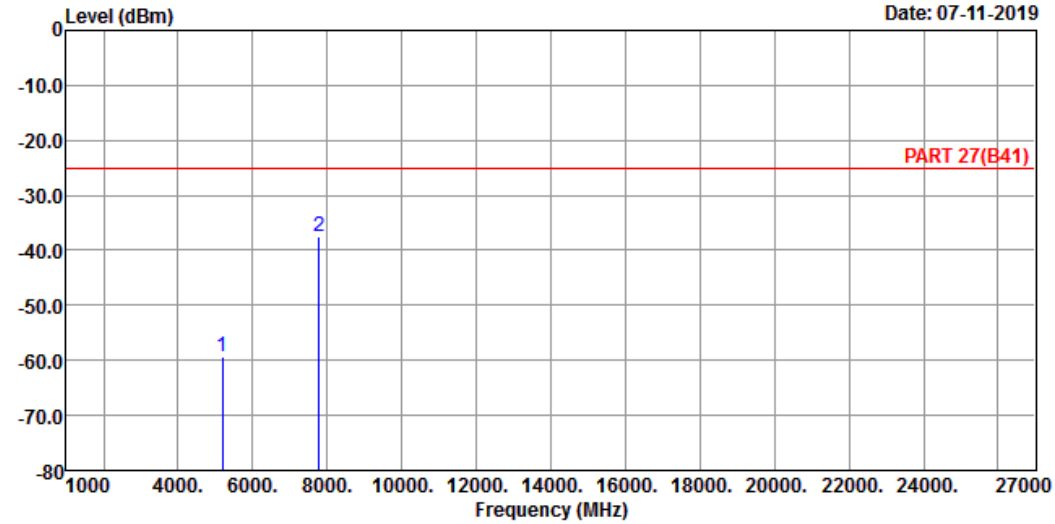


Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5186.00	-59.39	-57.40	-25.00	-1.99	-34.39	Peak
2 pp	7779.00	-47.46	-52.20	-25.00	4.74	-22.46	Peak

Data: 4

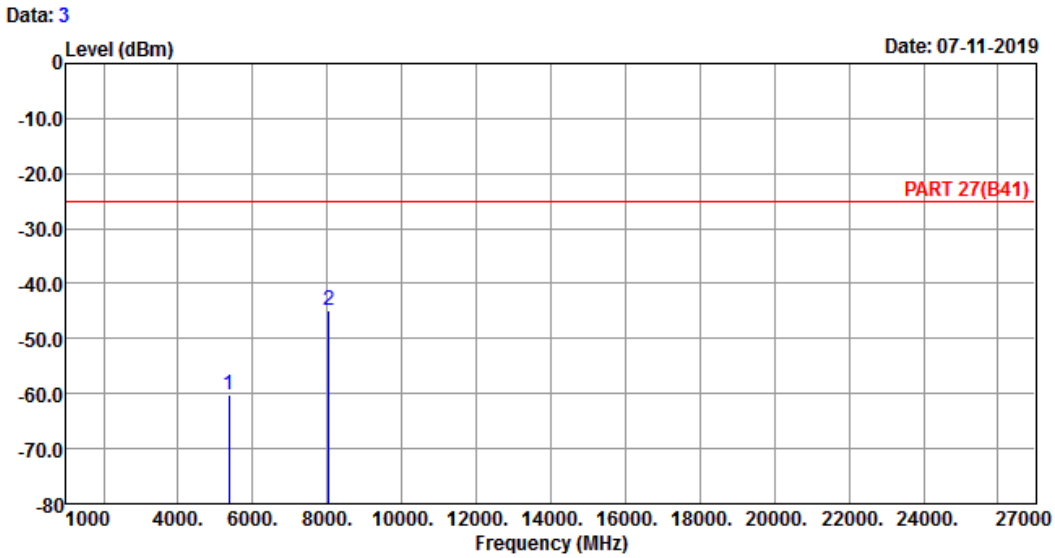


Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_20M Link_M-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5186.00	-59.42	-57.43	-25.00	-1.99	-34.42	Peak
2 pp	7779.00	-37.38	-42.12	-25.00	4.74	-12.38	Peak

High Channel

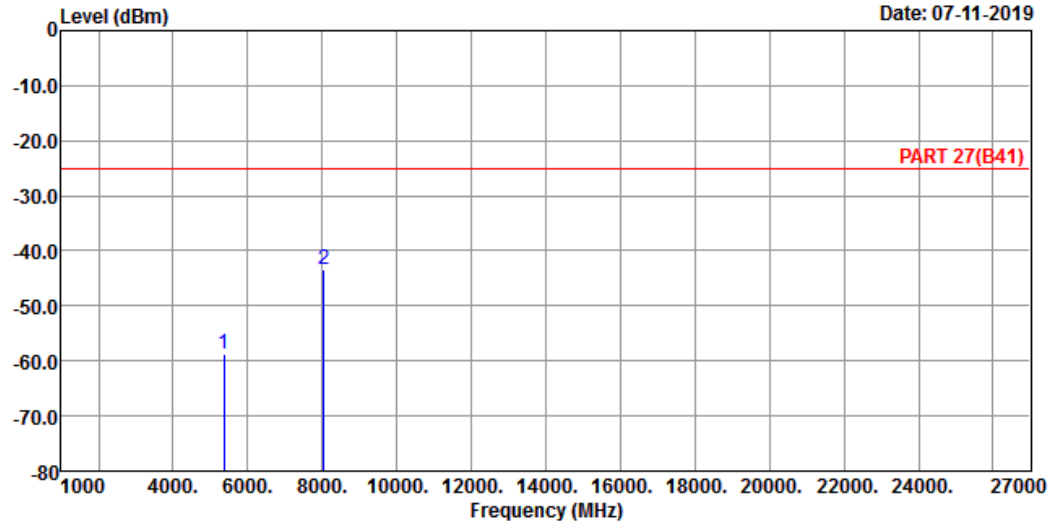
Bureau Veritas Consumer Products Services Ltd.,Taoyuan Branch



Site : 966 Chamber 5
Condition: PART 27(B41) HORIZONTAL
Remak : LTE Band 41 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5360.00	-60.17	-57.66	-25.00	-2.51	-35.17	Peak
2 pp	8040.00	-44.76	-50.04	-25.00	5.28	-19.76	Peak

Data: 4



Site : 966 Chamber 5
Condition: PART 27(B41) VERTICAL
Remak : LTE Band 41 QPSK_20M Link_H-CH
Tested by: Getaz Yang

	Freq	Level	Read Level	Limit Line	Factor	Over Limit	Remark
	MHz	dBm	dBm	dBm	dB	dB	
1	5360.00	-58.80	-56.29	-25.00	-2.51	-33.80	Peak
2 pp	8040.00	-43.37	-48.65	-25.00	5.28	-18.37	Peak

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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