

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART27 SUBPART C & SUBPART L REQUIREMENT

OF

Product Name: Router
Model No.: QTAIG1
Model Difference: N/A
FCC ID: HFS-QTAIG1
Report No.: E2/2016/B0021
Issue Date: Dec. 19, 2016
FCC Rule Part: 2 , 27C & L
Prepared for: Quanta Computer Inc.
No.188, Wenhua 2nd Rd., Guishan Dist.,
Taoyuan City 33377, Taiwan
Prepared by: SGS Taiwan Ltd.
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VERIFICATION OF COMPLIANCE

Applicant: Quanta Computer Inc.
No.188, Wenhua 2nd Rd., Guishan Dist., Taoyuan City 33377,
Taiwan

Product Name: Router

Model No.: QTAIG1

Model Difference: N/A

FCC ID: HFS-QTAIG1

Report Number: E2/2016/B0022

Date of test: Nov. 17, 2016 ~ Dec. 09, 2016

Date of EUT Received: Nov. 17, 2016

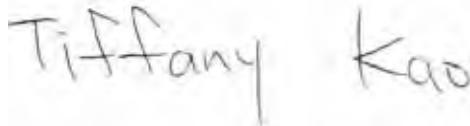
We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in TIA/EIA-603-D-2010 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

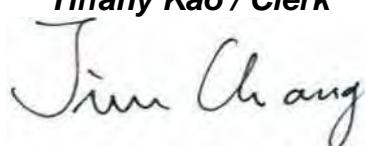
The test results of this report relate only to the tested sample identified in this report.

Test By:**Date:**

Dec. 19, 2016

Jerry Lu / Sr. Engineer**Prepared By:****Date:**

Dec. 19, 2016

Tiffany Kao / Clerk**Approved By:****Date:**

Dec. 19, 2016

Jim Chang / Asst. Manager

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Revision History

Report Number	Revision	Description	Issue Date
E2/2016/B0021	Rev.00	Initial creation of document	Dec. 19, 2016

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Contents

1. GENERAL PRODUCT INFORMATION	6
1.1. Product Description.....	6
1.2. Product Feature of Equipment Under Test.....	8
1.3. Test Methodology of Applied Standards.....	9
1.4. Test Facility	9
1.5. Special Accessories	9
1.6. Equipment Modifications.....	9
2. SYSTEM TEST CONFIGURATION	10
2.1. EUT Configuration	10
2.2. EUT Exercise	10
2.3. Test Procedure.....	10
2.4. Measurement Results Explanation Example	11
2.5. Final Amplifier Voltage and Current Information:	11
2.6. Configuration of Tested System	12
3. SUMMARY OF TEST RESULTS	13
4. DESCRIPTION OF TEST MODES.....	13
4.1. The Worst Test Modes and Channel Details.....	13
5. MEASUREMENT UNCERTAINTY.....	16
6. RF CONDUCTED OUTPUT POWER MEASUREMENT.....	17
6.1. Standard Applicable	17
6.2. Test Set-up.....	17
6.3. Measurement Procedure	17
6.4. Measurement Equipment Used	18
6.5. Measurement Result.....	19
7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT	21
7.1. Standard Applicable	21
7.2. Test SET-UP	21
7.3. Measurement Procedure	23
7.4. Measurement Equipment Used	24
7.5. Measurement Result: (Peak) –using option of peak measurement.....	25
8. OCCUPIED BANDWIDTH MEASUREMENT	31
8.1. Standard Applicable	31
8.2. Test Set-up.....	31
8.3. Measurement Procedure	31

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8.4. Measurement Equipment Used	32
8.5. Measurement Result.....	32
9. OUT OF BAND EMISSION AT ANTENNA TERMINALS	51
9.1. Standard Applicable	51
9.2. Test SET-UP	52
9.3. Measurement Procedure	52
9.4. Measurement Equipment Used	53
9.5. Measurement Result:.....	53
10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	86
10.1. Standard Applicable	86
10.2. Measurement Procedure:	89
10.3. Measurement Equipment Used:	90
10.4. Measurement Result:.....	91
11. FREQUENCY STABILITY MEASUREMENT.....	103
11.1. Standard Applicable:	103
11.2. Test Set-up:.....	103
11.3. Measurement Procedure:	103
11.4. Measurement Equipment Used:	104
11.5. Measurement Result:.....	105
12. PEAK TO AVERAGE RATIO.....	107
12.1. Standard Applicable	107
12.2. Test SET-UP	107
12.3. Measurement Procedure	107
12.4. Measurement Equipment Used	108
12.5. Measurement Result.....	109
13. Maximum Permissible Exposure (MPE)	118
13.1. Related Submittal(s) / Grant (s)	118
13.2. Special Accessories	118
13.3. Equipment Modifications.....	118
13.4. Limitation.....	118
13.5. Exposure (MPE) Evaluation	118
13.6. Collocated MPE Analysis	121

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1. GENERAL PRODUCT INFORMATION

1.1. Product Description

General:

Product Name:	Router	
Model No.:	QTAIG1	
Model Difference:	N/A	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	3.7Vdc from Rechargeable Li-ion Battery or 5.0V from AC/DC Adapter	
	Battery:	Model No.: IG1, Supplier: GETAC TECHNOLOGY CORP. in China
	Adapter:	Model No.: AD10290LF, Supplier: PI ELECTRONICS (H.K.) Ltd.

LTE:

Cellular Phone Standards Frequency Range and Power	Operating Frequency		Rated Power
	LTE-Band 4 (Bandwidth 5MHz)	1712.5MHz – 1752.5MHz	23dBm
	LTE-Band 4 (Bandwidth 10MHz)	1715.0MHz – 1750.0MHz	23dBm
	LTE-Band 4 (Bandwidth 15MHz)	1717.5MHz – 1747.5MHz	23dBm
	LTE-Band 4 (Bandwidth 20MHz)	1720.0MHz – 1745.0MHz	23dBm
	LTE-Band 13 (Bandwidth 5MHz)	779.5MHz – 784.5MHz	23dBm
	LTE-Band 13 (Bandwidth 10MHz)	782.0MHz – 782.0MHz	23dBm

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Type of Emission

LTE Band	BW (MHz)	Modulation	Type of Emission
LTE Band 4	5	QPSK	4M59G7D
LTE Band 4	5	16QAM	4M56D7W
LTE Band 4	10	QPSK	9M06G7D
LTE Band 4	10	16QAM	9M11D7W
LTE Band 4	15	QPSK	13M7G7D
LTE Band 4	15	16QAM	13M6D7W
LTE Band 4	20	QPSK	18M1G7D
LTE Band 4	20	16QAM	18M2D7W
LTE Band 13	5	QPSK	4M59G7D
LTE Band 13	5	16QAM	4M61D7W
LTE Band 13	10	QPSK	9M09G7D
LTE Band 13	10	16QAM	9M10D7W

Max ERP/EIRP measurement result:

LTE Band	Bandwidth	Modulation	(dBm)	ERP /	(W)
LTE Band 4	5MHz	QPSK	23.01	EIRP	0.200
LTE Band 4	5MHz	16QAM	22.99	EIRP	0.199
LTE Band 4	10MHz	QPSK	22.75	EIRP	0.188
LTE Band 4	10MHz	16QAM	22.87	EIRP	0.194
LTE Band 4	15MHz	QPSK	22.86	EIRP	0.193
LTE Band 4	15MHz	16QAM	23.03	EIRP	0.201
LTE Band 4	20MHz	QPSK	23.23	EIRP	0.210
LTE Band 4	20MHz	16QAM	22.97	EIRP	0.198
LTE Band 13	5MHz	QPSK	22.17	ERP	0.165
LTE Band 13	5MHz	16QAM	22.35	ERP	0.172
LTE Band 13	10MHz	QPSK	22.06	ERP	0.161
LTE Band 13	10MHz	16QAM	22.71	ERP	0.187

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1.2. Product Feature of Equipment Under Test

The equipment under Test (Hereafter Called: EUT) is supporting Wi-Fi 802.11b/g/n, Bluetooth and NFC features, and below is details of information.

Product Feature	
Product Name:	Router
Model No.:	QTAIG1
Model Difference:	N/A
FCC ID:	HFS-QTAIG1
Wi-Fi- Specification	802.11b/g/n
LTE Operating Band (s)	FCC Band 4 / 13
LTE Rel. Version	Rel.10

Note: The above EUT information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

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1.3. Test Methodology of Applied Standards

FCC 47 CFR Part 2, 27.

ANSI / TIA / EIA 603D-2010

KDB971168 D01 Power Meas license Digital System

TS 151 010-1 is used to set, and measure the output power.

Note:

1. All test items have been performed and record as per the above standards.
2. The composite system is compliance with FCC Subpart B is authorized under the certification procedure.

1.4. Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333, (TAF code 0513)

FCC Registration Numbers are: 735305

1.5. Special Accessories

No special accessories were used during testing.

1.6. Equipment Modifications

There were no modifications incorporated into the EUT.

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2. SYSTEM TEST CONFIGURATION

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Measurement at Antenna Port

According to measurement procured TIA/EIA 603C, the EUT is placed on a turn table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

According to measurement procured TIA/EIA 603C, The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

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2.4. Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation example with cable loss and attenuator.

Band 4: Offset = RF cable loss (0.3dB) + splitter (4dB) + attenuator (10dB) = 14.3(dB)

Band 13: Offset = RF cable loss (0.9dB) + splitter (3dB) + attenuator (10dB) = 13.9(dB)

2.5. Final Amplifier Voltage and Current Information:

Test mode	DC voltage (V)	DC current (mA)
LTE Band 4_5M QPSK	3.8	713
LTE Band 4_5M 16QAM	3.8	679
LTE Band 4_10M QPSK	3.8	712
LTE Band 4_10M 16QAM	3.8	684
LTE Band 4_15M QPSK	3.8	785
LTE Band 4_15M 16QAM	3.8	751
LTE Band 4_20M QPSK	3.8	791
LTE Band 4_20M 16QAM	3.8	761
LTE Band 13_5M QPSK	3.8	716
LTE Band 13_5M 16QAM	3.8	678
LTE Band 13_10M QPSK	3.8	721
LTE Band 13_10M 16QAM	3.8	687

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2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)

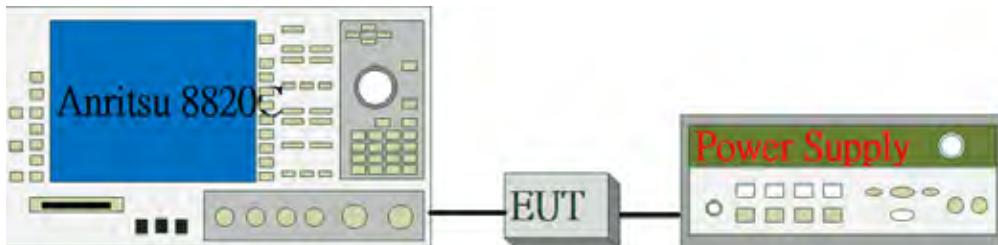


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)

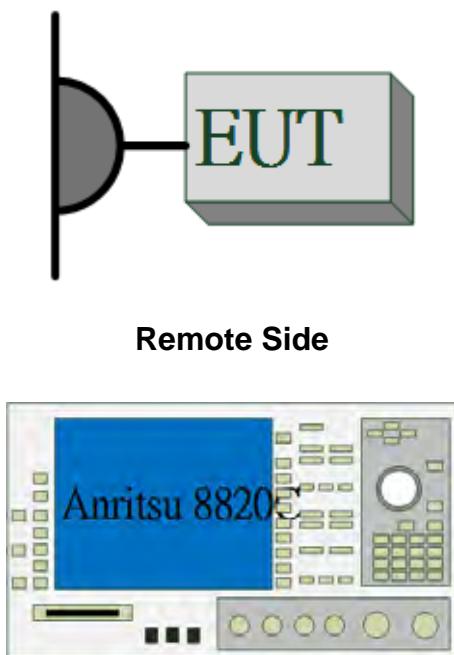


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Radio Communication Analyzer	Anritsu	8820C	6201107337	shielded	Un-shielded
2.	DC Power Supply	Agilent	E3640A	MY53140006	shielded	Un-shielded
3.	Test Software	N/A	N/A	N/A	N/A	N/A

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§2.1046(a)	RF Power Output	Compliant
§2.1046(a) §27.50(b)(9) §27.50(d)(4)	ERP/ EIRP measurement	Compliant
§2.1049(h)	99% Occupied Bandwidth	Compliant
§2.1051 §27.53(c)(2), §27.53(c)(4), §27.53(c)(5), §27.53(h)	Out of Band Emissions at Antenna Terminals and Band Edge	Compliant
§2.1051 §27.53(c)(2), §27.53(c)(4), §27.53(c)(5), §27.53(h)	Field Strength of Spurious Radiation	Compliant
§27.53(d) (5) §27.50(i) (B)	Peak to Average Ratio	Compliant
§2.1055(a)(1) §27.54	Frequency Stability	Compliant

4. DESCRIPTION OF TEST MODES

4.1. The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. 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 as listed below. Following channel(s) was (were) selected for the final test as listed below:

BAND	ERP/EIRP	RADIATED EMISSION
LTE Band 4 / 13	H-plan	H-plan

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LTE Band 4 MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	19975 to 20375	19975, 20175, 20375	5MHz	QPSK, 16QAM	1 RB/ 0,24 RB Offset
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK, 16QAM	1 RB/ 0,49 RB Offset
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK, 16QAM	1 RB/ 0,74 RB Offset
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK, 16QAM	1 RB/ 0,99 RB Offset
FREQUENCY STABILITY	20000 to 20350	20175	10MHz	QPSK,	Full RB
OCCUPIED BANDWIDTH	19975 to 20375	19975, 20175, 20375	5MHz	QPSK, 16QAM	Full RB
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK, 16QAM	Full RB
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK, 16QAM	Full RB
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	19975 to 20375	19975, 20175, 20375	5MHz	16QAM	Full RB
	20000 to 20350	20000, 20175, 20350	10MHz	16QAM	Full RB
	20025 to 20325	20025, 20175, 20325	15MHz	16QAM	Full RB
	20050 to 20300	20050, 20175, 20300	20MHz	16QAM	Full RB
BAND EDGE	19975 to 20375	19975, 20375	5MHz	QPSK,	1 RB/ 0,24 RB Offset Full RB
	20000 to 20350	20000, 20350	10MHz	QPSK,	1 RB/ 0,49 RB Offset Full RB
	20025 to 20325	20025, 20325	15MHz	QPSK,	1 RB/ 0,74 RB Offset Full RB
	20050 to 20300	20050, 20300	20MHz	QPSK,	1 RB/ 0,99 RB Offset Full RB
CONDUCTED EMISSION	19975 to 20375	19975, 20175, 20375	5MHz	QPSK,	1 RB, 0 RB Offset
	20000 to 20350	20000, 20175, 20350	10MHz	QPSK,	1 RB, 0 RB Offset
	20025 to 20325	20025, 20175, 20325	15MHz	QPSK,	1 RB, 0 RB Offset
	20050 to 20300	20050, 20175, 20300	20MHz	QPSK,	1 RB, 0 RB Offset
RADIATED EMISSION	20050 to 20300	20050, 20175, 20300	20MHz	QPSK,	1 RB/ 0 RB Offset

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LTE Band 13 MODE

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23205 to 23255	23205, 23230, 23255	5MHz	QPSK, 16QAM	1 RB/ 0,24 RB Offset
	23230	23230	10MHz	QPSK, 16QAM	1 RB/ 0,49 RB Offset
FREQUENCY STABILITY	23230	23230	10MHz	QPSK,	Full RB
OCCUPIED BANDWIDTH	23205 to 23255	23205, 23230, 23255	5MHz	QPSK, 16QAM	Full RB
	23230	23230	10MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	23205 to 23255	23205, 23230, 23255	5MHz	16QAM	Full RB
	23230	23230	10MHz	16QAM	Full RB
BAND EDGE	23205 to 23255	23205, 23255	5MHz	QPSK,	1 RB/ 0,24 RB Offset Full RB
	23230	23230	10MHz	QPSK,	1 RB/ 0,49 RB Offset Full RB
CONDUCUDET EMISSION	23205 to 23255	23205, 23230, 23255	5MHz	QPSK,	1 RB, 0 RB Offset
	23230	23230	10MHz	QPSK,	1 RB, 0 RB Offset
RADIATED EMISSION	23230	23230	10MHz	16QAM	1 RB, 0 RB Offset

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5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
99% Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz-30MHz: +/- 2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/- 2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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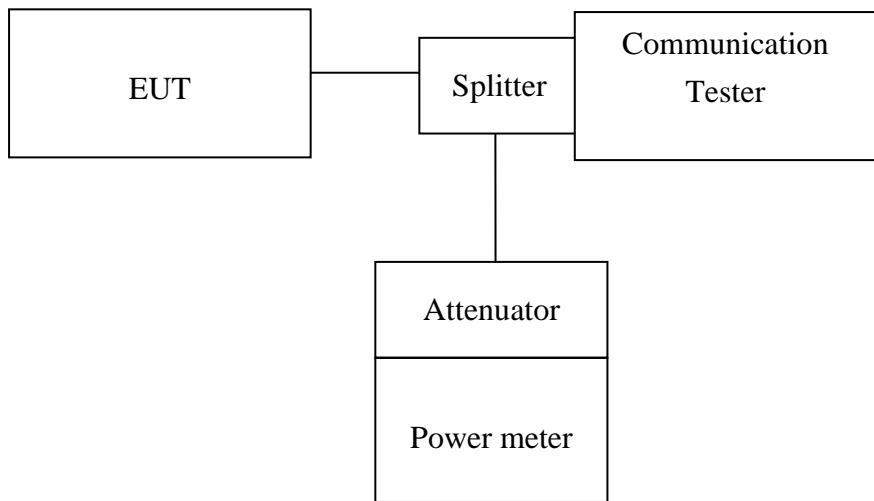
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6. RF CONDUCTED OUTPUT POWER MEASUREMENT

6.1. Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

6.2. Test Set-up



Note: Measurement setup for testing on Antenna connector

6.3. Measurement Procedure

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the test measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCDMA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results

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6.4. Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/16/2016	06/15/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Communication Tester	R&S	CMU200	120239	11/25/2015	11/24/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017

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6.5. Measurement Result

LTE Band 4

LTE Band 4_Uplink frequency band : 1710 to 1755 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 19975	Channel (Mid) 20175	Channel (High) 20375	Channel (Low) 19975	Channel (Mid) 20175	Channel (High) 20375
5	1	0	23.01	23.11	22.73	22.04	22.31	21.94
	1	24	22.91	22.91	22.44	22.50	22.44	21.79
	12	6	22.22	22.51	21.95	21.30	21.56	21.11
	25	0	22.25	22.39	21.87	21.31	21.59	20.93

LTE Band 4_Uplink frequency band : 1710 to 1755 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 20000	Channel (Mid) 20175	Channel (High) 20350	Channel (Low) 20000	Channel (Mid) 20175	Channel (High) 20350
10	1	0	22.67	22.51	22.57	21.78	21.60	22.01
	1	49	22.85	22.51	22.14	21.62	21.41	21.37
	25	12	22.38	22.47	21.96	21.35	21.53	21.00
	50	0	22.08	22.19	21.85	21.16	21.34	20.92

LTE Band 4_Uplink frequency band : 1710 to 1755 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 20025	Channel (Mid) 20175	Channel (High) 20325	Channel (Low) 20025	Channel (Mid) 20175	Channel (High) 20325
15	1	0	23.41	23.84	23.49	22.95	23.19	22.91
	1	74	23.8	23.51	23.04	23.19	22.92	22.6
	36	19	22.76	23.08	22.5	21.85	22.13	21.65
	75	0	22.89	22.95	22.42	21.8	21.87	21.43

LTE Band 4_Uplink frequency band : 1710 to 1755 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 20050	Channel (Mid) 20175	Channel (High) 20300	Channel (Low) 20050	Channel (Mid) 20175	Channel (High) 20300
20	1	0	23.68	24.15	23.87	23.15	23.32	22.88
	1	99	23.85	23.67	23.22	23.28	22.74	22.37
	50	25	22.92	22.84	22.48	21.89	21.89	21.59
	100	0	23.13	22.93	22.58	22.09	21.85	21.63

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LTE Band 13

LTE Band 13_Uplink frequency band : 777 to 787 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 23205	Channel (Mid) 23230	Channel (High) 23255	Channel (Low) 23205	Channel (Mid) 23230	Channel (High) 23255
5	1	0	23.06	22.68	22.67	22.17	21.93	22.04
	1	24	22.63	22.92	22.56	21.64	21.9	21.64
	12	6	22.14	21.85	21.9	21.16	21.05	20.81
	25	0	22.16	21.88	21.78	21.32	21.02	20.84

LTE Band 13_Uplink frequency band : 777 to 787 MHz								
BW (MHz)	RB Size	RB Offset	Conducted power(dBm)					
			QPSK			16QAM		
			Channel (Low) 23230	Channel (Mid) 23230	Channel (High) 23230	Channel (Low) 23230	Channel (Mid) 23230	Channel (High) 23230
10	1	0		23.40			22.56	
	1	49		23.15			22.34	
	25	12		22.48			21.54	
	50	0		22.66			21.73	

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7. EFFECTIVE RADIATED POWER AND EQUIVALENT ISOTROPIC RADIATED POWER MEASUREMENT

7.1. Standard Applicable

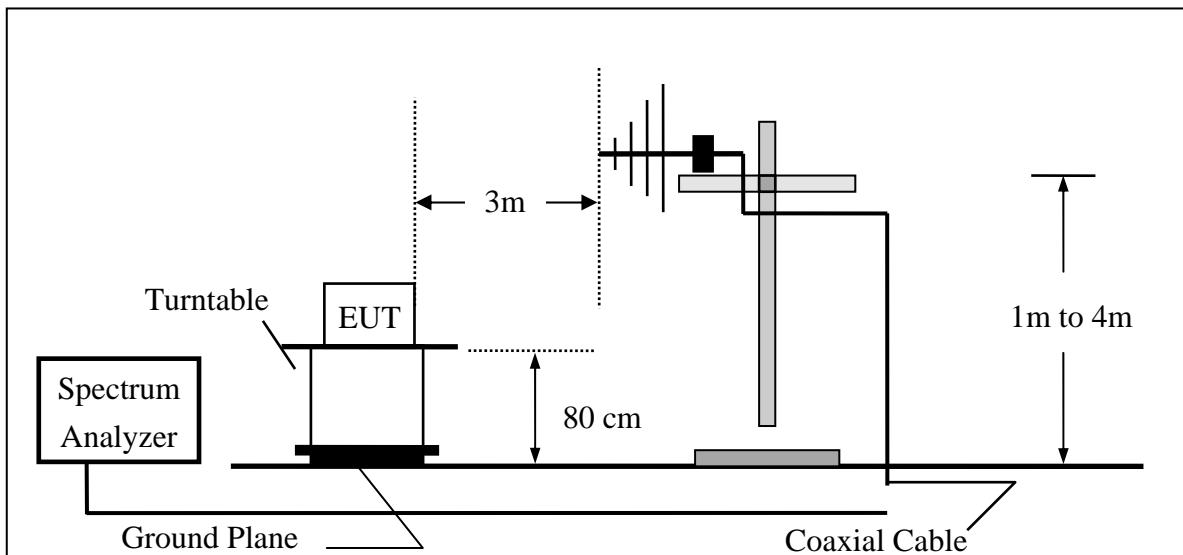
According to FCC §2.1046

FCC 27, 50(b)(9) Control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 30 watts ERP.

FCC 27, 50(d)(4) Fixed, mobile, and portable (hand-held) stations are limited to 1W.

7.2. Test SET-UP

(A) Radiated Power Test Set-Up, Frequency Below 1000MHz

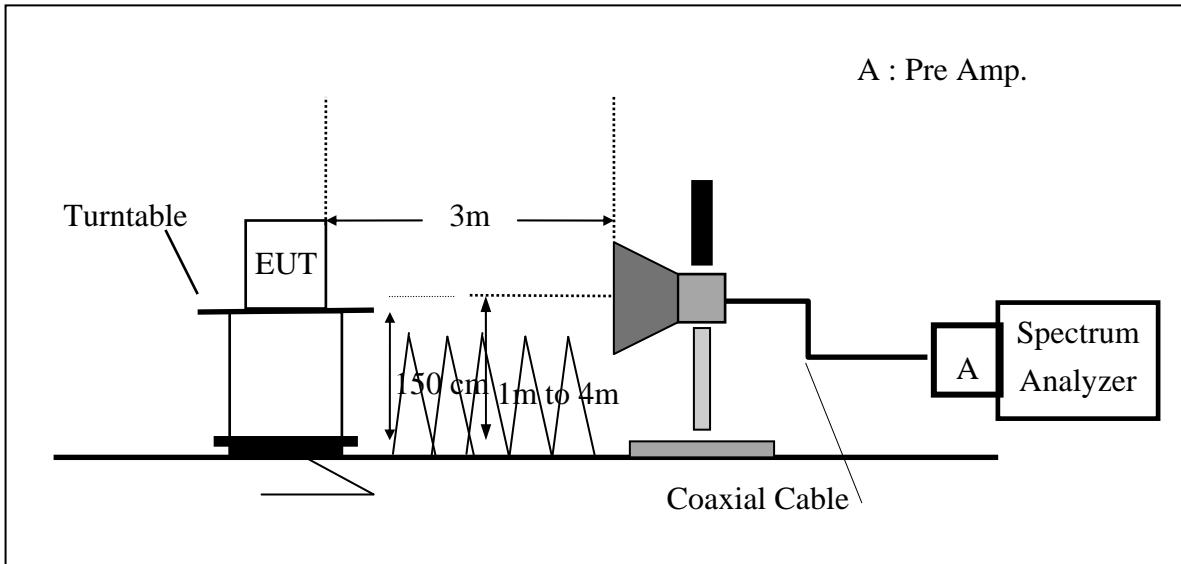


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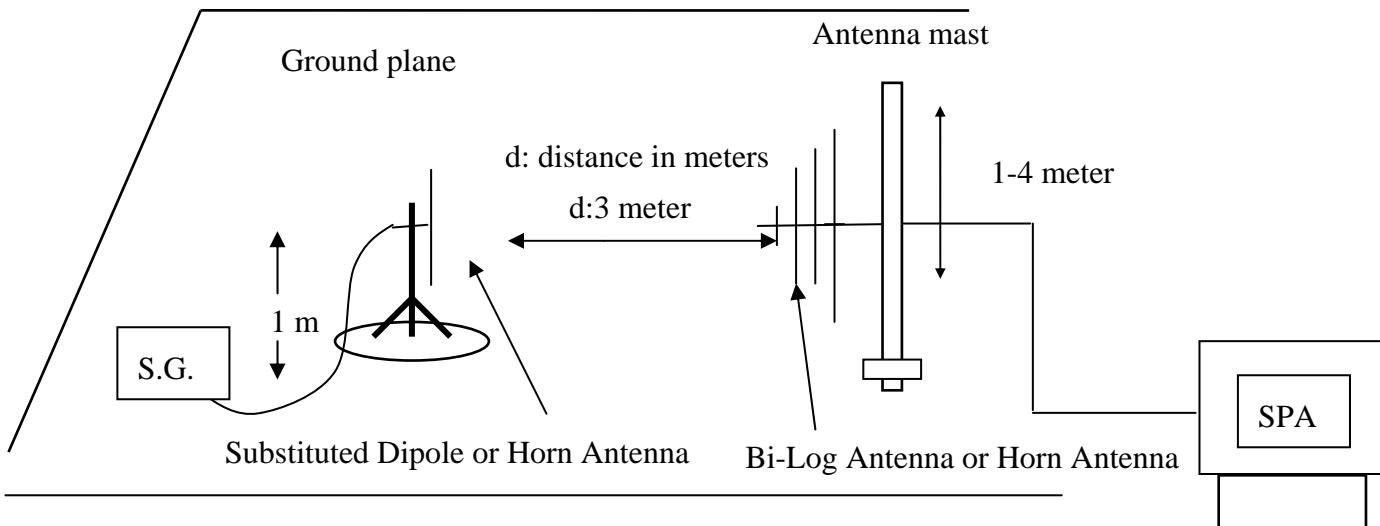
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(B) Radiated Power Test Set-UP Frequency Over 1 GHz



(C) Substituted Method Test Set-UP



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7.3. Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 971168 D01
2. The EUT was placed on a non-conductive turntable using a non-conductive support. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and EMI spectrum analyzer.
3. During the measurement, the EUT was communication with the station. The highest emission was recorded with the rotation of the turntable and the lowering of the test antenna from 4m to 1m. The reading was recorded and the field strength (E in dBuV/m) was calculated
4. The testing follows the Measurement Procedure of FCC KDB 971168 D01
5. 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.
6. $ERP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBd)} + \text{Cable Loss (dB)}$
7. $EIRP = S.G. \text{ output (dBm)} + \text{Antenna Gain (dBi)} + \text{Cable Loss (dB)}$
8. Spectrum setting:

(1) Detector = Peak, marker the highest value of the detector by maximum hold, set RBW wide enough to capture the entire signal of emission, and $VBW > =3 \times RBW$.

(2) KDB 971168 D01 is adopted, and the procedure as lists under item 4, Measurement of the Average Power over the Fundamental Signal Bandwidth, is followed to set correspondingly for the acquisition of proper measurement data.

Set frequency = nominal signal center frequency;

Set span = 2 X occupied BW;

Set RBW $\approx 1\text{--}5\%$ of the span, not to exceed 1 MHz

Set VBW = 3 x RBW;

Select average power (RMS) detector

Set sweep time and number of measurement points to achieve a minimum of 1 millisecond/pt

integration time (ex. Point = 601points, then sweet time = $601 \times 10^{-3} = 6\text{s}$.

Activate trace averaging routine over a minimum of 10 sweeps;

Activate marker/span pair and set span = signal or channel bandwidth;

Activate the band/interval power marker function;

Record the band power level;

Record adjusted value as the average signal power level. Then activate the occupied bandwidth measurement function.

The proper adjustment due to limitation of spectrum capability is given compensated to spectrum with conversion factor of $10 \times \log(TBW/RBW)$, where TBW is the transmission of UE exceeding the maximum BW UE can extends, and RBW is the resolution BW in UE.

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7.4. Measurement Equipment Used

SGS SAC-III

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017
Broadband Antenna	VULB	9168	617	10/17/2016	10/16/2017
Broadband Antenna	VULB	9168	628	09/22/2016	09/21/2017
Horn Antenna	Schwarzbeck	9120D	1341	05/27/2016	05/26/2017
Horn Antenna	Schwarzbeck	9120D	673	10/14/2016	10/13/2017
Horn Antenna	Schwarzbeck	BBHA9170	184	12/11/2015	12/10/2016
Horn Antenna	Schwarzbeck	BBHA9170	185	07/18/2016	07/17/2017
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016
Pre Amplifier	R&S	SCU-26	100780	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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7.5. Measurement Result: (Peak) –using option of peak measurement

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
BAND 4 BW: 5M QPSK RB: 1,0	1712.5	19975	V	11.94	9.17	-2.49	18.62	30.00
			H	16.33	9.17	-2.49	23.01	30.00
	1732.5	20175	V	12.34	9.23	-2.51	19.06	30.00
			H	15.37	9.23	-2.51	22.09	30.00
	1752.5	20375	V	10.85	9.3	-2.52	17.63	30.00
			H	14.71	9.3	-2.52	21.49	30.00
BAND 4 BW: 5M QPSK RB: 1,24	1712.5	19975	V	12.34	9.18	-2.49	19.03	30.00
			H	16.05	9.18	-2.49	22.74	30.00
	1732.5	20175	V	11.44	9.25	-2.51	18.18	30.00
			H	14.74	9.24	-2.51	21.47	30.00
	1752.5	20375	V	10.42	9.31	-2.52	17.21	30.00
			H	14.44	9.31	-2.52	21.23	30.00
BAND 4 BW: 5M 16QAM RB: 1,0	1712.5	19975	V	12.13	9.17	-2.49	18.81	30.00
			H	16.31	9.17	-2.49	22.99	30.00
	1732.5	20175	V	12.25	9.23	-2.51	18.97	30.00
			H	15.19	9.23	-2.51	21.91	30.00
	1752.5	20375	V	10.51	9.3	-2.52	17.29	30.00
			H	14.97	9.3	-2.52	21.75	30.00
BAND 4 BW: 5M 16QAM RB: 1,24	1712.5	19975	V	12.18	9.18	-2.49	18.87	30.00
			H	16.14	9.18	-2.49	22.83	30.00
	1732.5	20175	V	11.43	9.25	-2.51	18.17	30.00
			H	14.65	9.25	-2.51	21.39	30.00
	1752.5	20375	V	10.51	9.31	-2.52	17.3	30.00
			H	14.76	9.31	-2.52	21.55	30.00

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
BAND 4 BW: 10M QPSK RB: 1,0	1715.0	20000	V	12.04	9.17	-2.49	18.72	30.00
			H	16.08	9.17	-2.49	22.76	30.00
	1732.0	20175	V	12.55	9.22	-2.5	19.27	30.00
			H	15.57	9.22	-2.5	22.29	30.00
	1750.0	20350	V	9.93	9.28	-2.51	16.7	30.00
			H	14.26	9.28	-2.51	21.03	30.00
BAND 4 BW: 10M QPSK RB: 1,49	1715.0	20000	V	12.75	9.2	-2.5	19.45	30.00
			H	16.05	9.2	-2.5	22.75	30.00
	1732.0	20175	V	10.57	9.25	-2.51	17.31	30.00
			H	14.34	9.25	-2.51	21.08	30.00
	1750.0	20350	V	10.26	9.31	-2.52	17.05	30.00
			H	10.04	9.31	-2.52	16.83	30.00
BAND 4 BW: 10M 16QAM RB: 1,0	1715.0	20000	V	11.89	9.17	-2.49	18.57	30.00
			H	16.06	9.17	-2.49	22.74	30.00
	1732.0	20175	V	12.68	9.22	-2.5	19.4	30.00
			H	15.49	9.22	-2.5	22.21	30.00
	1750.0	20350	V	9.93	9.28	-2.52	16.69	30.00
			H	14.37	9.28	-2.52	21.13	30.00
BAND 4 BW: 10M 16QAM RB: 1,49	1715.0	20000	V	12.75	9.2	-2.5	19.45	30.00
			H	16.17	9.2	-2.5	22.87	30.00
	1732.0	20175	V	10.68	9.25	-2.51	17.42	30.00
			H	14.39	9.25	-2.51	21.13	30.00
	1750.0	20350	V	10.41	9.31	-2.52	17.2	30.00
			H	14.23	9.31	-2.52	21.02	30.00

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
BAND 4 BW: 15M QPSK RB: 1,0	1717.5	20025	V	12.13	9.17	-2.49	18.81	30.00
			H	16.18	9.17	-2.49	22.86	30.00
	1732.5	20175	V	13.21	9.22	-2.5	19.93	30.00
			H	16.05	9.22	-2.5	22.77	30.00
	1747.5	20325	V	9.92	9.26	-2.51	16.67	30.00
			H	14.46	9.26	-2.51	21.21	30.00
BAND 4 BW: 15M QPSK RB: 1,74	1717.5	20025	V	13.17	9.21	-2.5	19.88	30.00
			H	16.13	9.21	-2.5	22.84	30.00
	1732.5	20175	V	10.22	9.26	-2.51	16.97	30.00
			H	14.35	9.26	-2.51	21.1	30.00
	1747.5	20325	V	10.61	9.31	-2.52	17.4	30.00
			H	14.31	9.31	-2.52	21.1	30.00
BAND 4 BW: 15M 16QAM RB: 1,0	1717.5	20025	V	12.07	9.17	-2.49	18.75	30.00
			H	16.35	9.17	-2.49	23.03	30.00
	1732.5	20175	V	13.27	9.22	-2.5	19.99	30.00
			H	16.05	9.22	-2.5	22.77	30.00
	1747.5	20325	V	10.05	9.26	-2.51	16.8	30.00
			H	14.62	9.26	-2.51	21.37	30.00
BAND 4 BW: 15M 16QAM RB: 1,74	1717.5	20025	V	13.08	9.21	-2.5	19.79	30.00
			H	16.26	9.21	-2.5	22.97	30.00
	1732.5	20175	V	10.23	9.26	-2.51	16.98	30.00
			H	14.48	9.26	-2.51	21.23	30.00
	1747.5	20325	V	10.63	9.31	-2.52	17.42	30.00
			H	14.52	9.31	-2.52	21.31	30.00

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
BAND 4 BW: 20M QPSK RB: 1,0	1720.0	20050	V	12.25	9.17	-2.49	18.93	30.00
			H	16.43	9.17	-2.49	23.11	30.00
	1732.5	20175	V	13.59	9.21	-2.5	20.3	30.00
			H	16.52	9.21	-2.5	23.23	30.00
	1745.0	20300	V	10.96	9.25	-2.51	17.7	30.00
			H	14.55	9.25	-2.51	21.29	30.00
BAND 4 BW: 20M QPSK RB: 1,99	1720.0	20050	V	12.55	9.23	-2.51	19.27	30.00
			H	15.71	9.23	-2.51	22.43	30.00
	1732.5	20175	V	9.96	9.27	-2.51	16.72	30.00
			H	14.46	9.27	-2.51	21.22	30.00
	1745.0	20300	V	10.97	9.31	-2.52	17.76	30.00
			H	14.44	9.31	-2.52	21.23	30.00
BAND 4 BW: 20M 16QAM RB: 1,0	1720.0	20050	V	12.33	9.17	-2.49	19.01	30.00
			H	16.22	9.17	-2.49	22.9	30.00
	1732.5	20175	V	13.5	9.21	-2.5	20.21	30.00
			H	16.26	9.21	-2.5	22.97	30.00
	1745.0	20300	V	10.94	9.25	-2.51	17.68	30.00
			H	14.7	9.25	-2.51	21.44	30.00
BAND 4 BW: 15M 16QAM RB: 1,99	1720.0	20050	V	12.45	9.23	-2.51	19.17	30.00
			H	15.59	9.23	-2.51	22.31	30.00
	1732.5	20175	V	10.22	9.27	-2.51	16.98	30.00
			H	14.48	9.27	-2.51	21.24	30.00
	1745.0	20300	V	10.83	9.31	-2.52	17.62	30.00
			H	14.26	9.31	-2.52	21.05	30.00

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
BAND 13 BW: 5M QPSK RB: 1,0	779.5	23205	V	23.77	0.03	-1.63	22.17	44.77
			H	19.22	0.03	-1.63	17.62	44.77
	782.0	23230	V	22.87	0.06	-1.62	21.31	44.77
			H	18.83	0.06	-1.62	17.27	44.77
	784.5	23255	V	22.03	0.08	-1.61	20.5	44.77
			H	17.97	0.08	-1.61	16.44	44.77
BAND 13 BW: 5M QPSK RB: 1,24	779.5	23205	V	22.25	0.07	-1.62	20.7	44.77
			H	17.99	0.07	-1.62	16.44	44.77
	782.0	23230	V	21.68	0.09	-1.61	20.16	44.77
			H	17.83	0.09	-1.61	16.31	44.77
	784.5	23255	V	20.75	0.11	-1.6	19.26	44.77
			H	17.57	0.11	-1.6	16.08	44.77
BAND 13 BW: 5M 16QAM RB: 1,0	779.5	23205	V	23.95	0.03	-1.63	22.35	44.77
			H	19.78	0.03	-1.63	18.18	44.77
	782.0	23230	V	23.21	0.05	-1.62	21.64	44.77
			H	18.6	0.05	-1.62	17.03	44.77
	784.5	23255	V	22.42	0.07	-1.61	20.88	44.77
			H	17.92	0.07	-1.61	16.38	44.77
BAND 13 BW: 5M 16QAM RB: 1,24	779.5	23205	V	22.58	0.07	-1.61	21.04	44.77
			H	18.24	0.07	-1.61	16.7	44.77
	782.0	23230	V	22.07	0.1	-1.62	20.55	44.77
			H	18.46	0.1	-1.62	16.94	44.77
	784.5	23255	V	21.86	0.11	-1.6	20.37	44.77
			H	17.31	0.11	-1.6	15.82	44.77

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
BAND 13 BW: 10M QPSK RB: 1,0	782.0	23230	V	23.66	0.03	-1.63	22.06	44.77
			H	19.56	0.03	-1.63	17.96	44.77
BAND 13 BW: 10M QPSK RB: 1,49	782.0	23230	V	21.21	0.11	-1.6	19.72	44.77
			H	18.25	0.11	-1.6	16.76	44.77
BAND 13 BW: 10M 16QAM RB: 1,0	782.0	23230	V	24.31	0.03	-1.63	22.71	44.77
			H	20.19	0.03	-1.63	18.59	44.77
BAND 13 BW: 10M 16QAM RB: 1,49	782.0	23230	V	22.06	0.11	-1.6	20.57	44.77
			H	18.57	0.11	-1.6	17.08	44.77

Remark :

- (1) The RBW,VBW of SPA for frequency RBW= 8MHz , VBW= 8MHz

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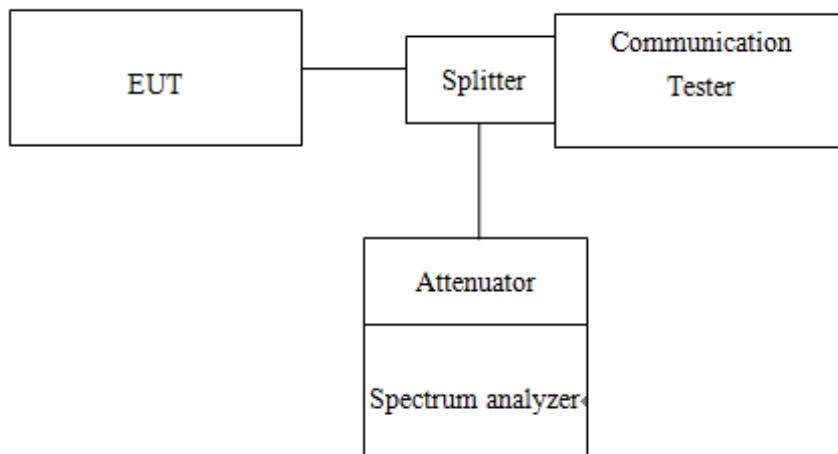
8. OCCUPIED BANDWIDTH MEASUREMENT

8.1. Standard Applicable

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

According to §FCC 2.1049 (99%)

8.2. Test Set-up



8.3. Measurement Procedure

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display arrow was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

NOTE: For the plot of bandwidth measurement, the marker of the 99% bandwidth is diamond-shape while the marker of the 20dB BW is arrow-mark

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8.4. Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/16/2016	06/15/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Communication Tester	R&S	CMU200	120239	11/25/2015	11/24/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017

8.5. Measurement Result

99% Bandwidth

LTE BAND 4							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	99% Bandwidth (MHz)		Frequency (MHz)	CH	99% Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
1712.5	19957	4.5826	4.5550	1715.0	20000	9.0406	9.0713
1732.5	20175	4.5949	4.5548	1732.5	20175	9.0629	9.1115
1752.5	20375	4.5610	4.5457	1750.0	20350	9.0512	9.0725

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LTE BAND 4							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Frequency (MHz)	CH	99% Bandwidth (MHz)		Frequency (MHz)	CH	99% Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
1717.5	20025	13.651	13.647	1720.0	20050	18.104	18.154
1732.5	20175	13.575	13.607	1732.5	20175	18.062	18.075
1747.5	20325	13.600	13.623	1745.0	20300	18.106	18.119

LTE BAND 13							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	99% Bandwidth (MHz)		Frequency (MHz)	CH	99% Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
779.5	23205	4.5620	4.5859	23230	782	9.0936	9.0998
782.0	23230	4.5860	4.6067				
784.5	23255	4.5658	4.5826				

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26 Bandwidth

LTE BAND 4							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	26 Bandwidth (MHz)		Frequency (MHz)	CH	26 Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
1712.5	19957	5.998	5.855	1715.0	20000	11.227	11.511
1732.5	20175	6.313	5.955	1732.5	20175	11.817	11.694
1752.5	20375	5.902	5.858	1750.0	20350	11.266	11.311

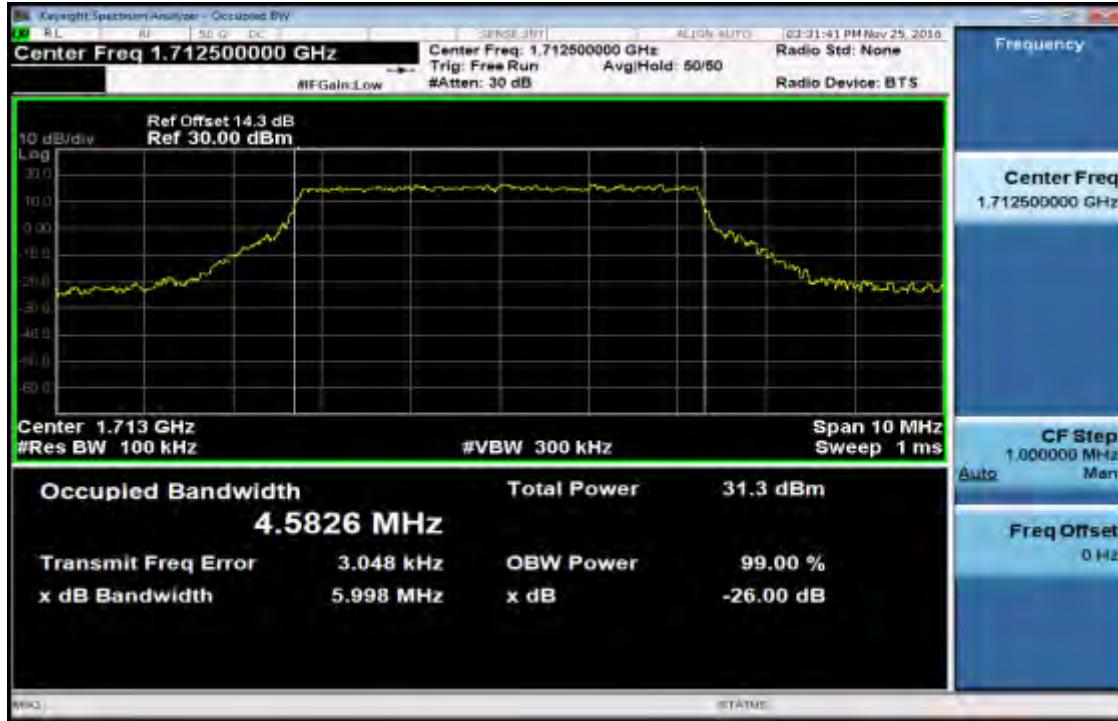
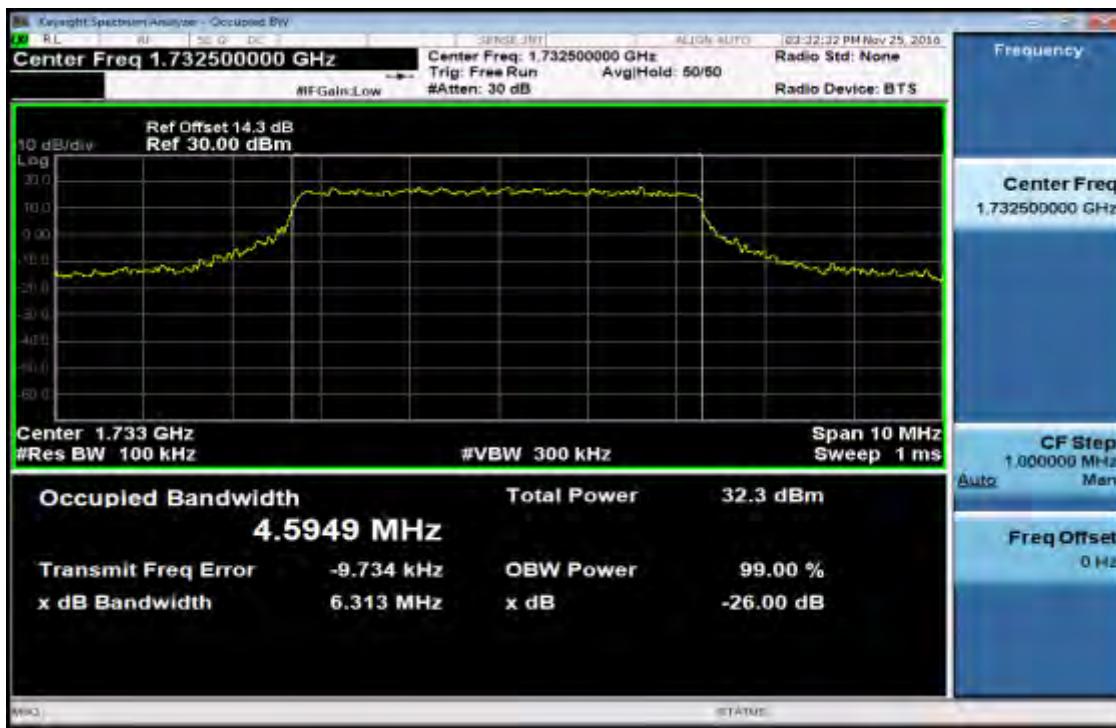
LTE BAND 4							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Frequency (MHz)	CH	26 Bandwidth (MHz)		Frequency (MHz)	CH	26 Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
1717.5	20025	16.41	16.57	1720.0	20050	20.72	20.71
1732.5	20175	16.74	16.54	1732.5	20175	21.23	20.81
1747.5	20325	16.37	16.48	1745.0	20300	20.90	20.86

LTE BAND 13							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	26 Bandwidth (MHz)		Frequency (MHz)	CH	26 Bandwidth (MHz)	
		QPSK	16QAM			QPSK	16QAM
779.5	23205	5.865	5.929	23230	782	11.278	11.436
782.0	23230	6.034	6.010				
784.5	23255	5.918	5.949				

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99% & 26dB Bandwidth Test Data**5MHz BW LTE-Band 4 QPSK Channel Low****5MHz BW LTE-Band 4 QPSK Channel Mid**

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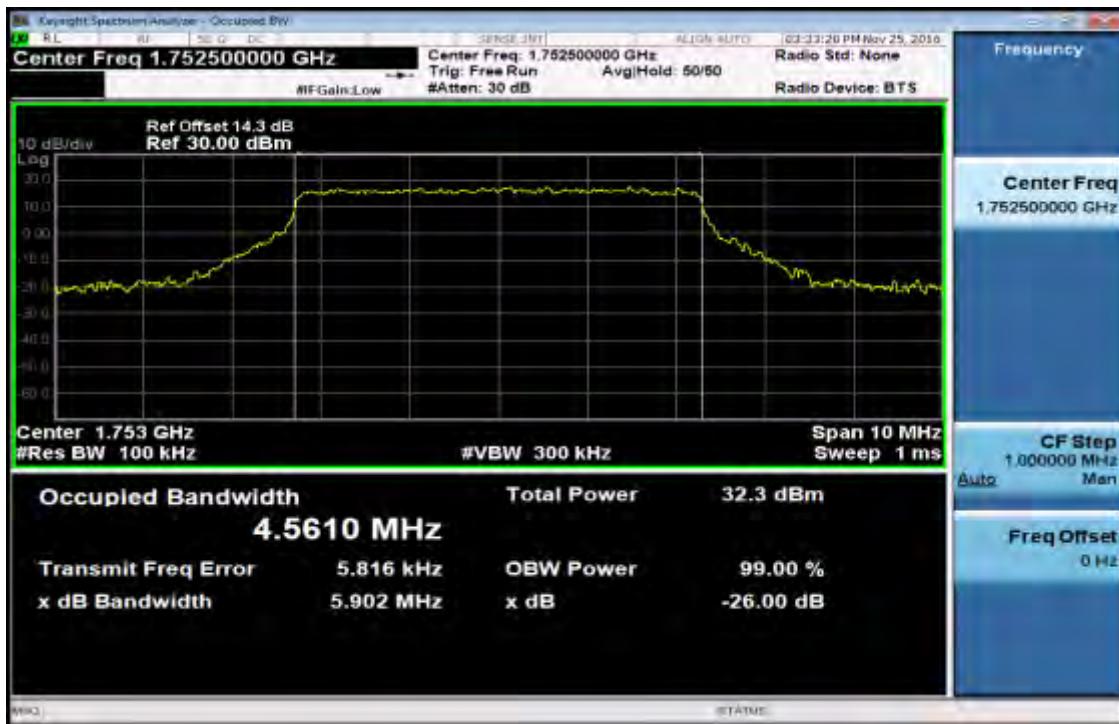
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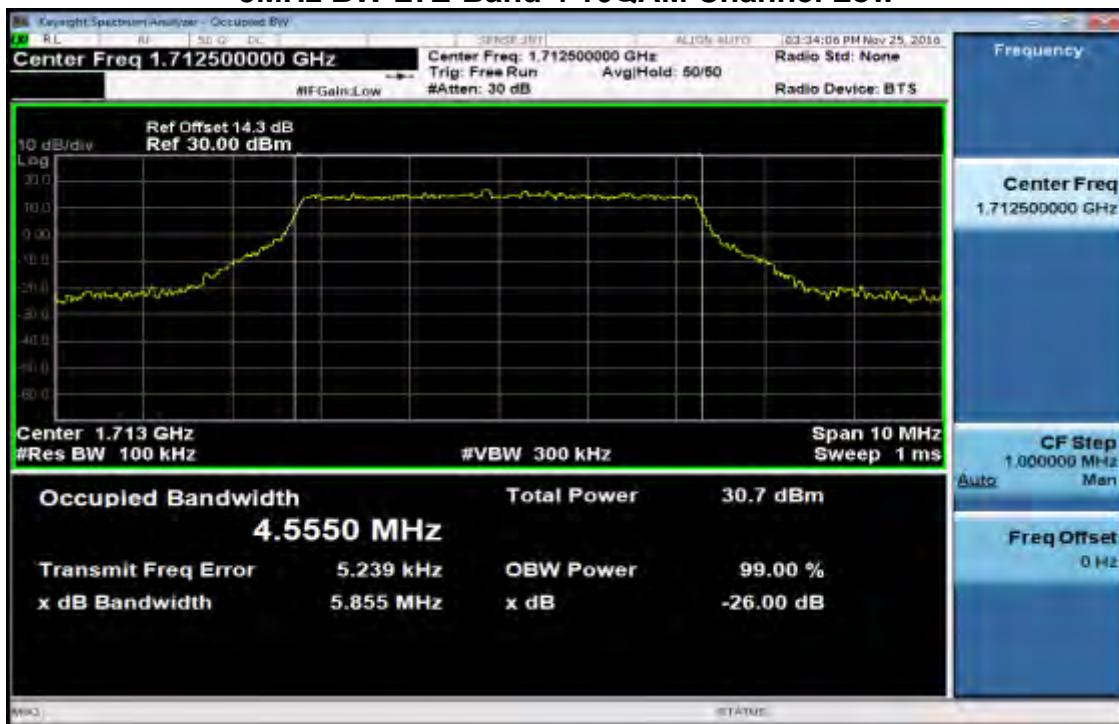
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5MHz BW LTE-Band 4 QPSK Channel High



5MHz BW LTE-Band 4 16QAM Channel Low



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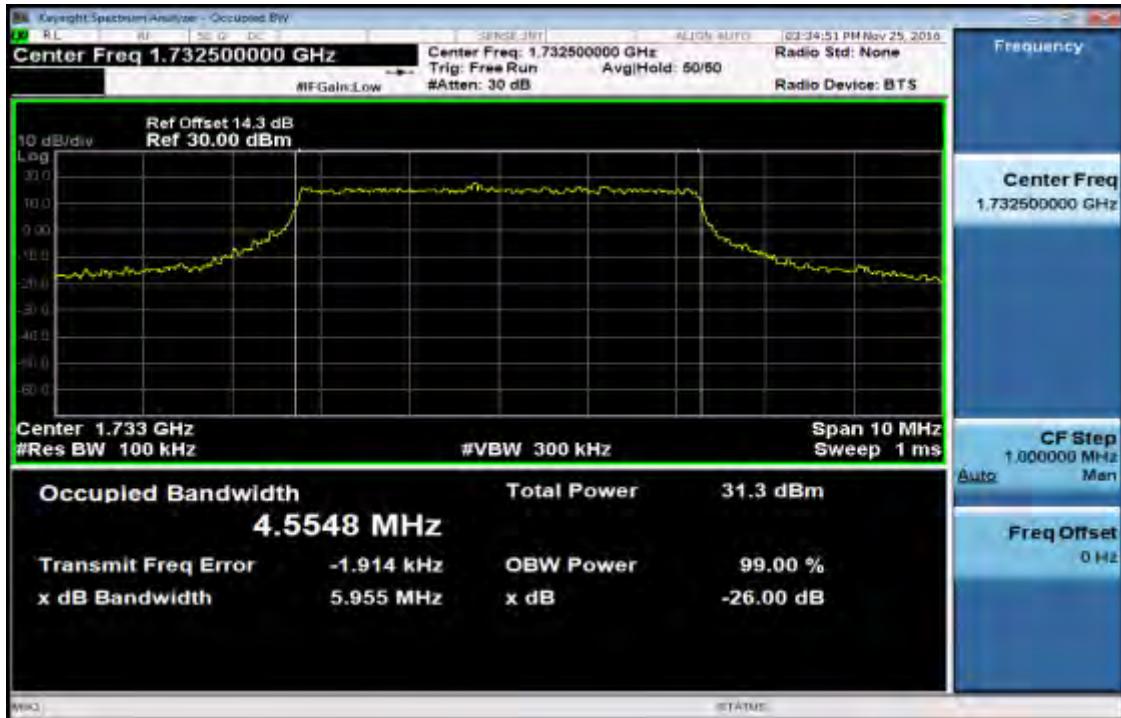
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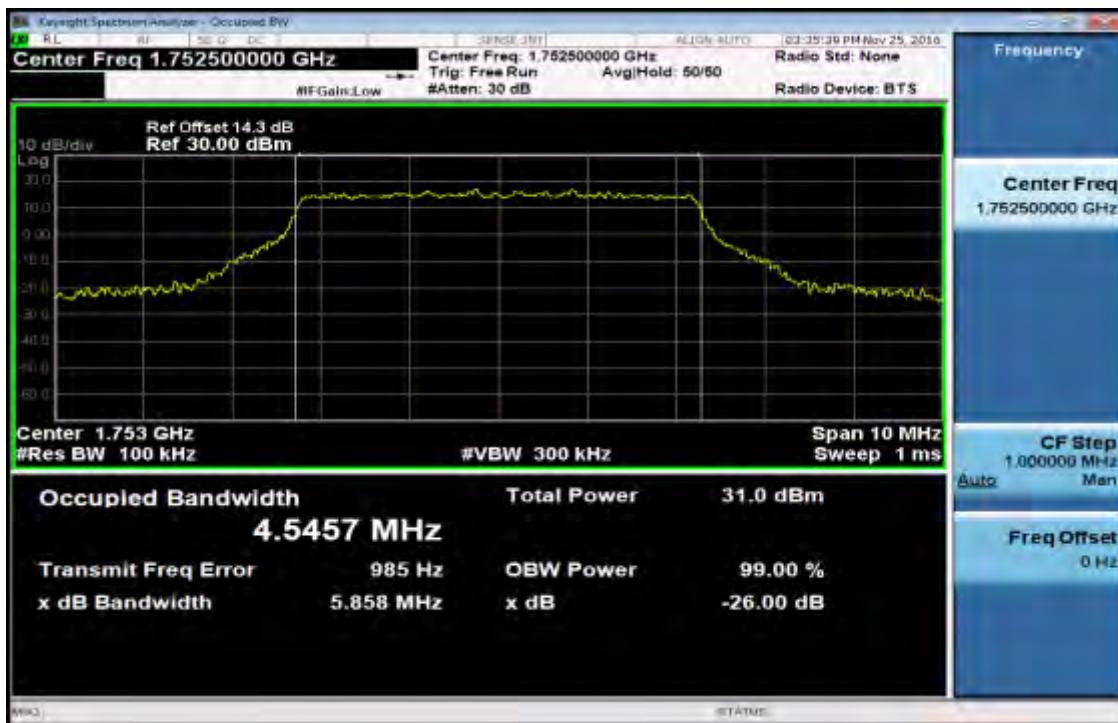
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5MHz BW LTE-Band 4 16QAM Channel Mid



5MHz BW LTE-Band 4 16QAM Channel High



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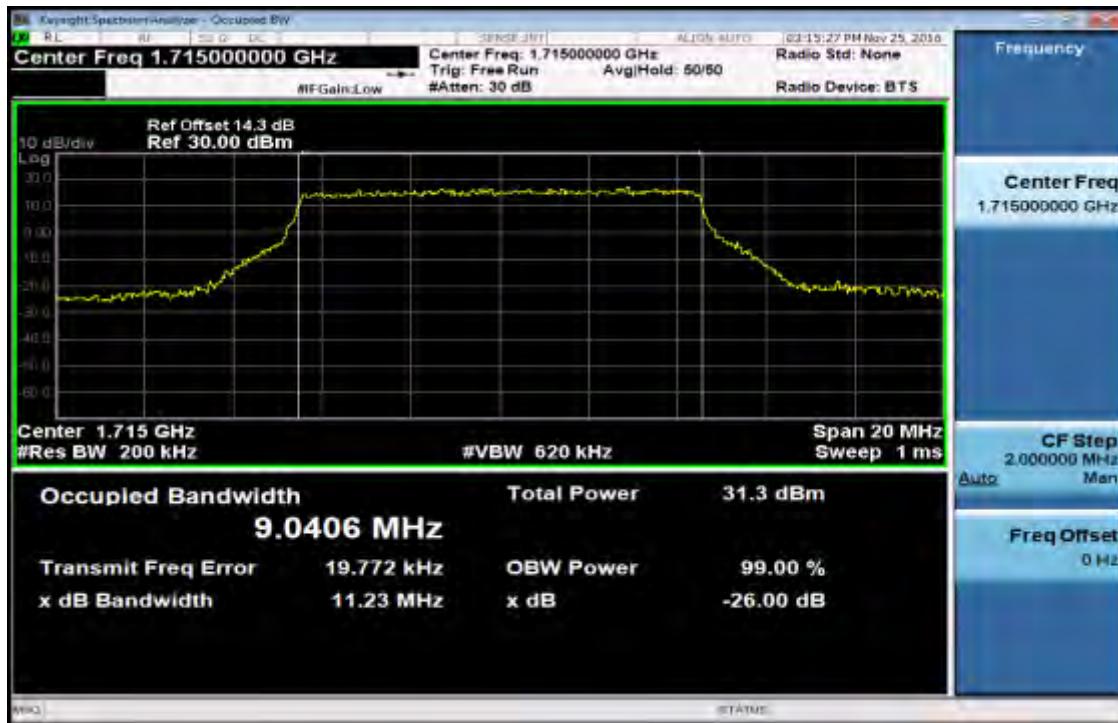
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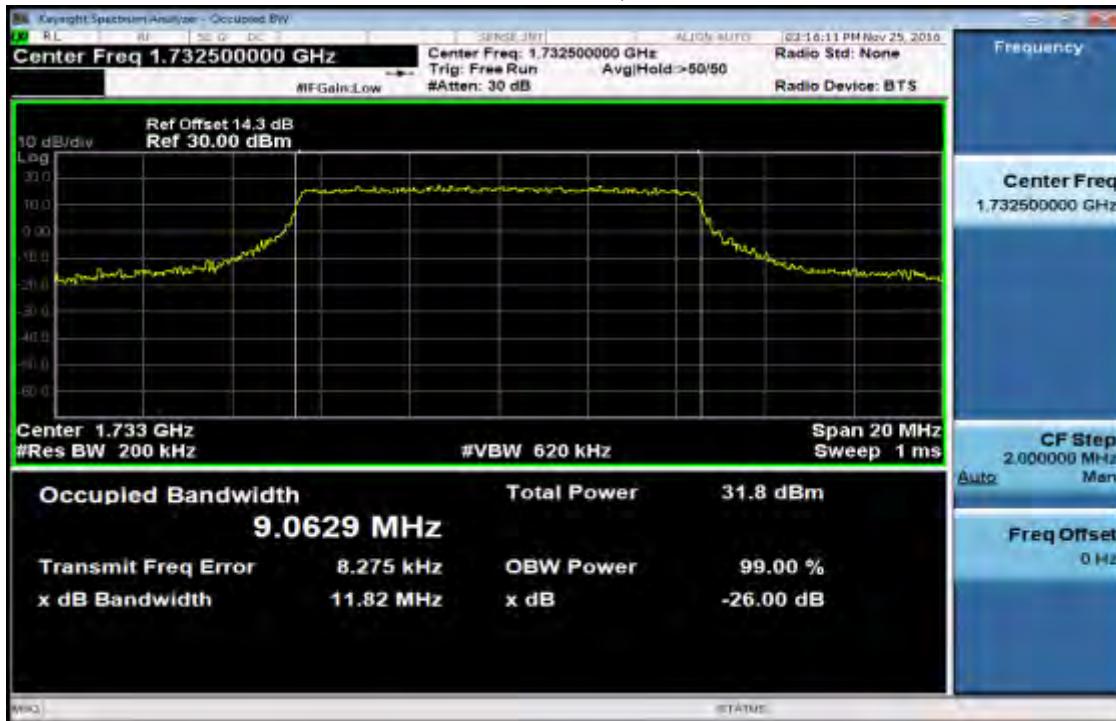
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10MHz BW LTE-Band 4 QPSK Channel Low



10MHz BW LTE-Band 4 QPSK Channel Mid



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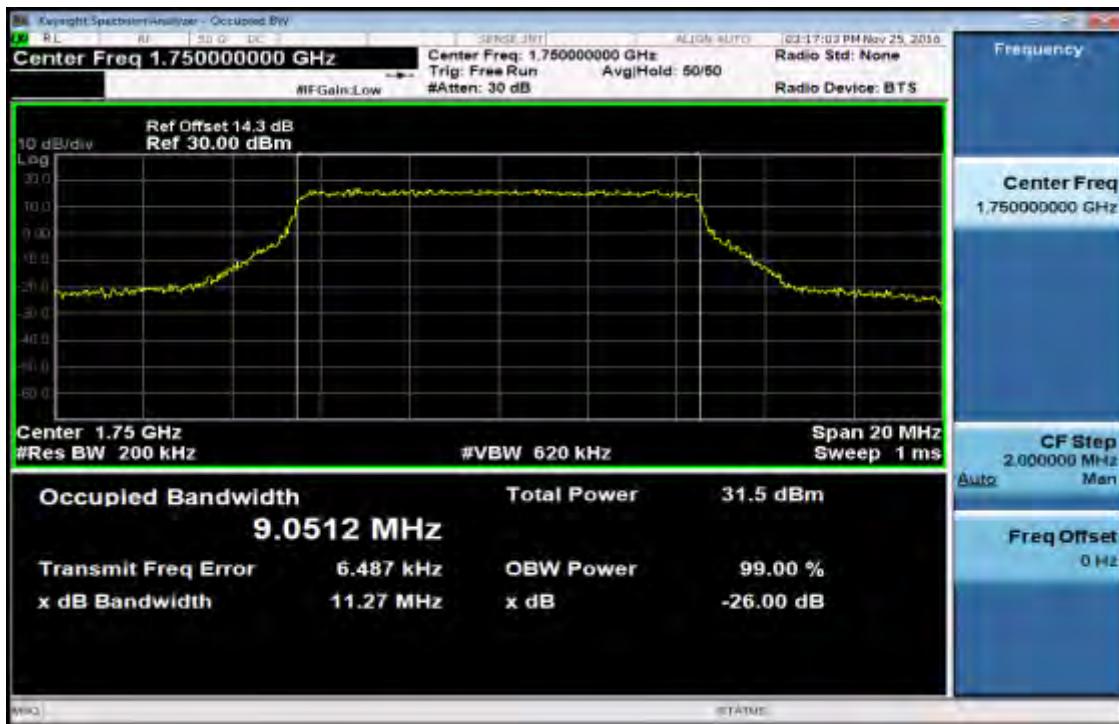
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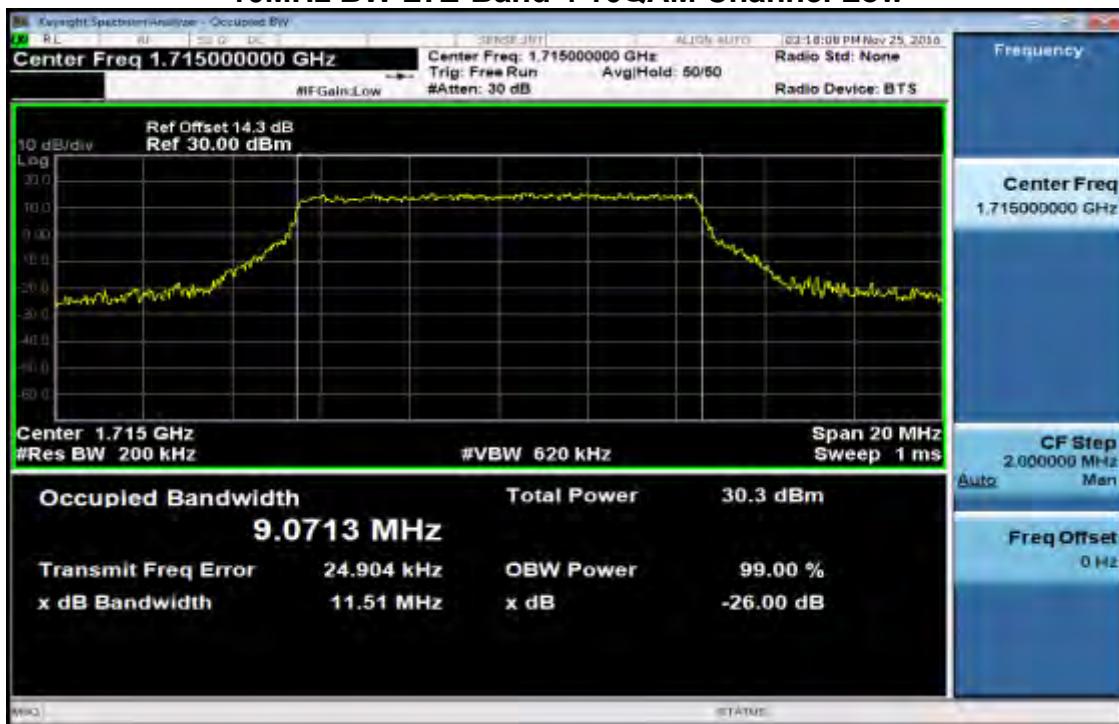
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10MHz BW LTE-Band 4 QPSK Channel High



10MHz BW LTE-Band 4 16QAM Channel Low



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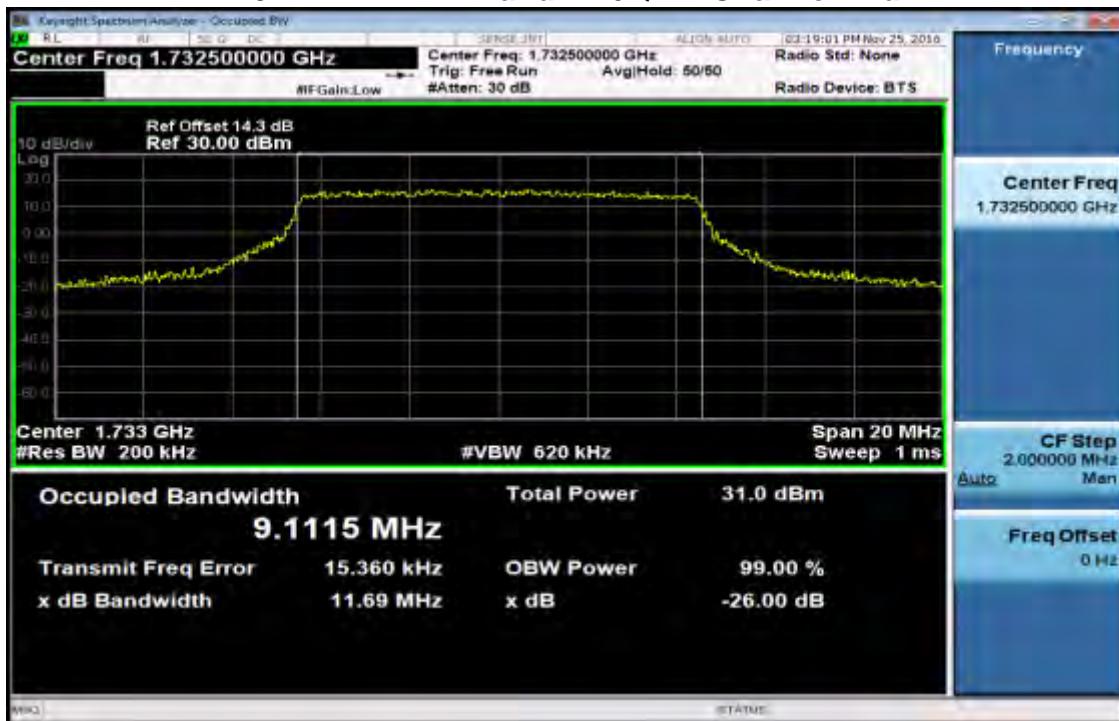
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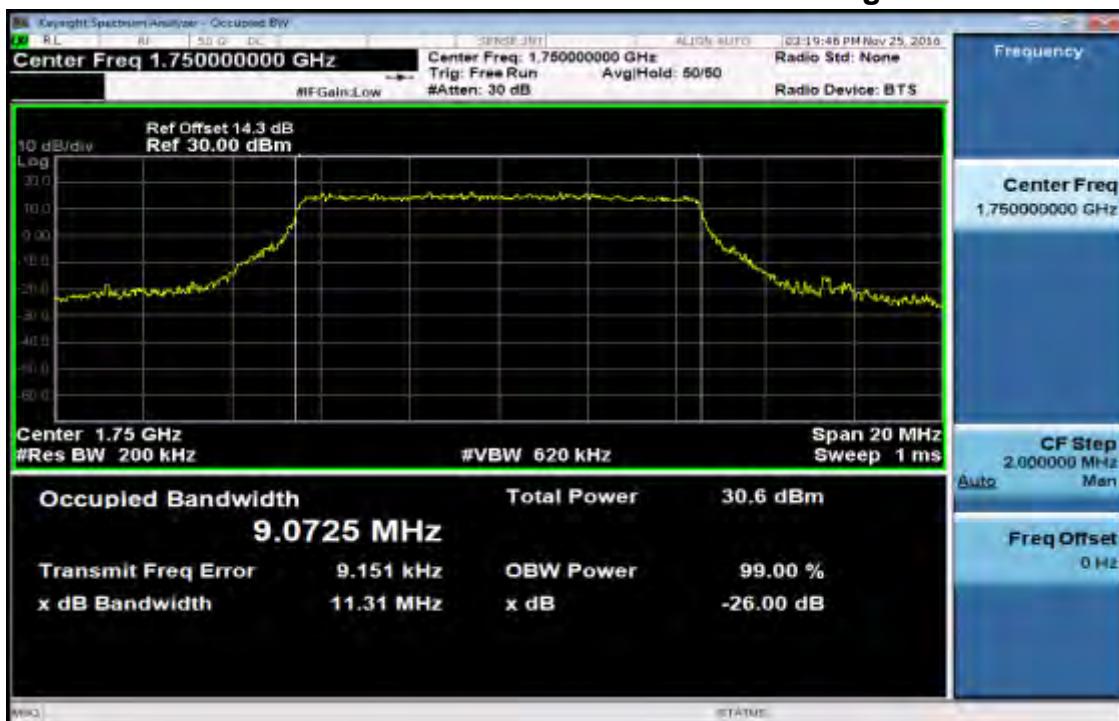
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10MHz BW LTE-Band 4 16QAM Channel Mid



10MHz BW LTE-Band 4 16QAM Channel High



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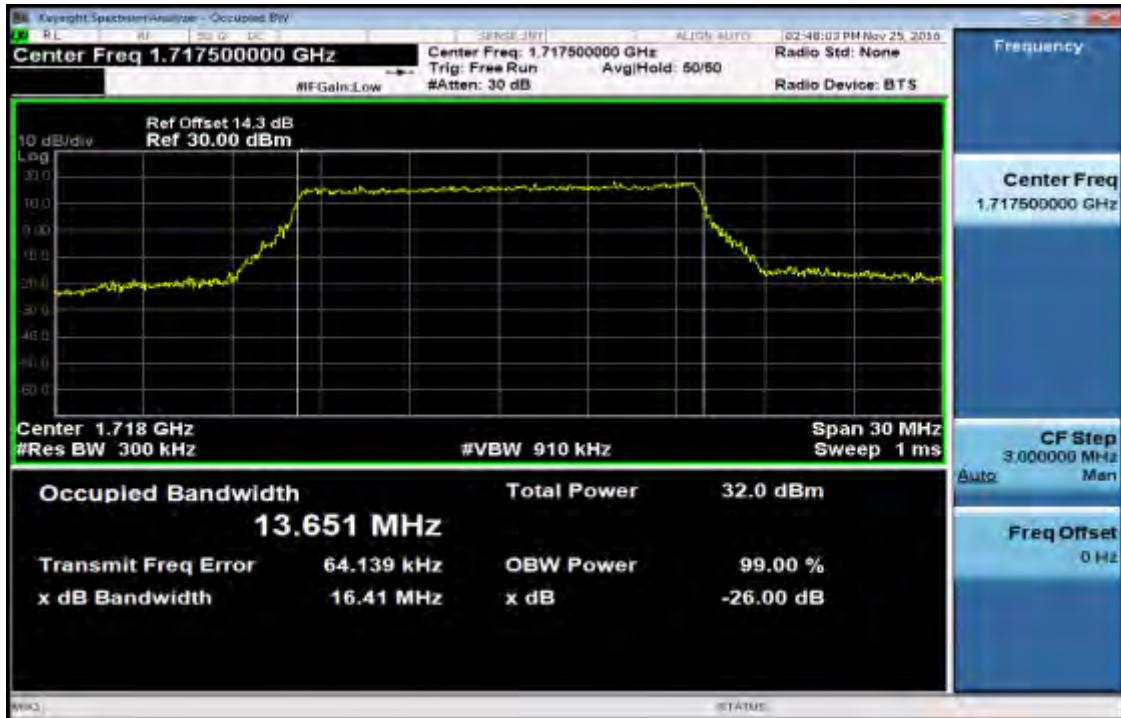
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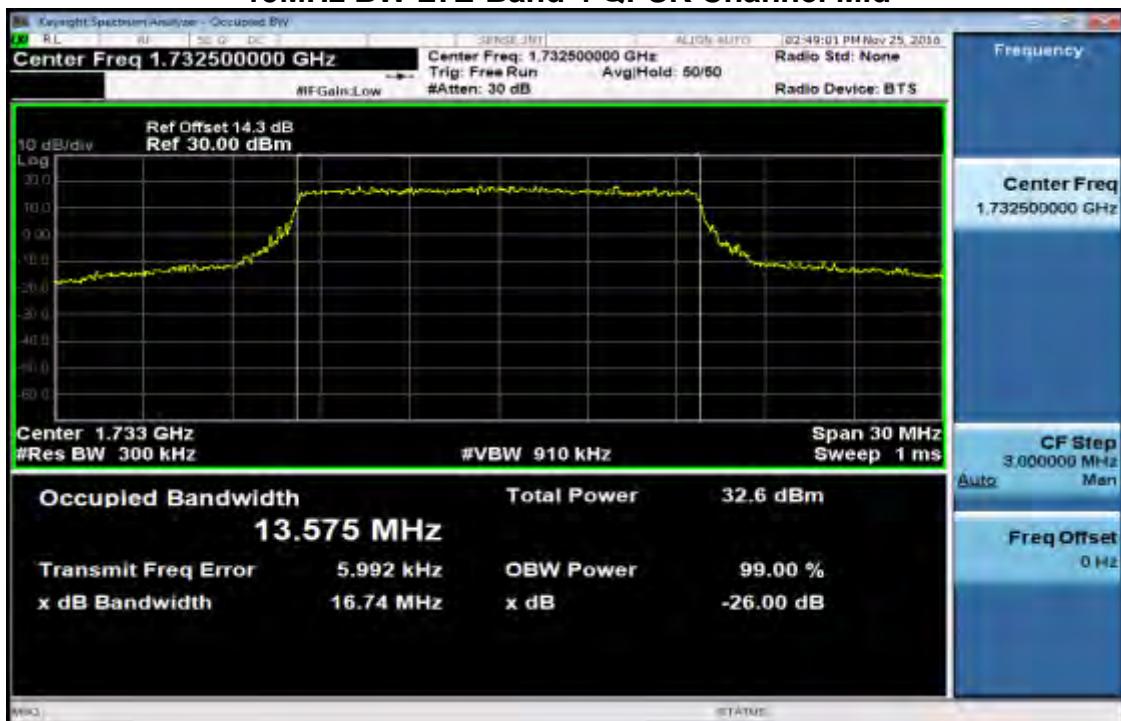
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15MHz BW LTE-Band 4 QPSK Channel Low



15MHz BW LTE-Band 4 QPSK Channel Mid



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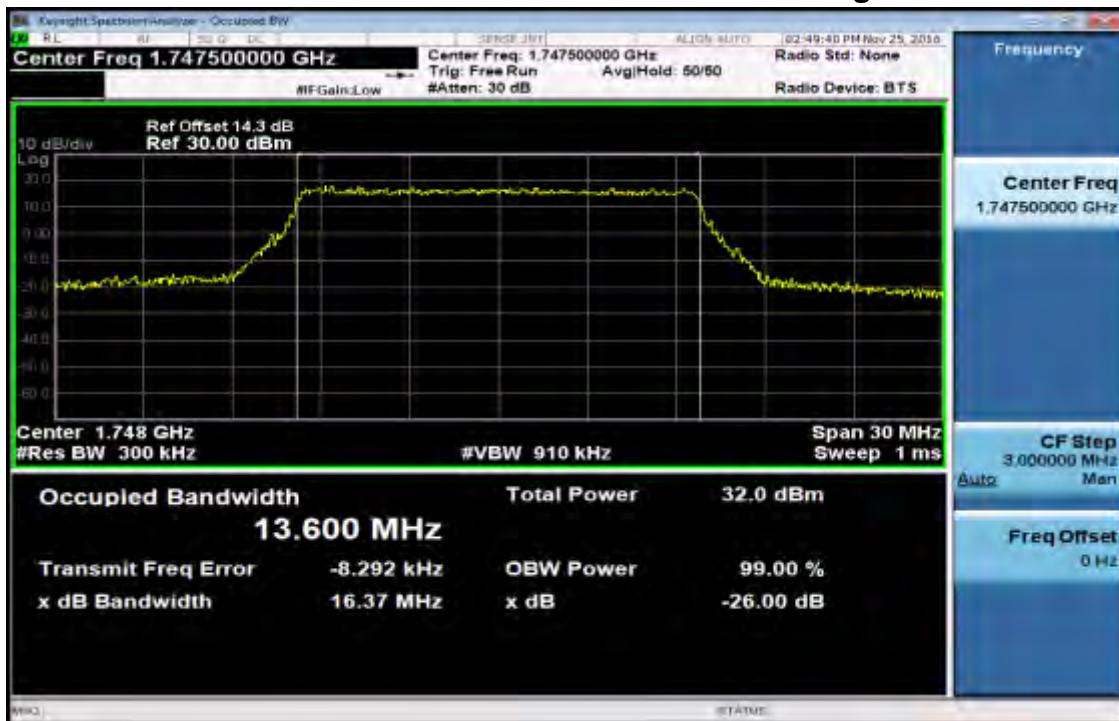
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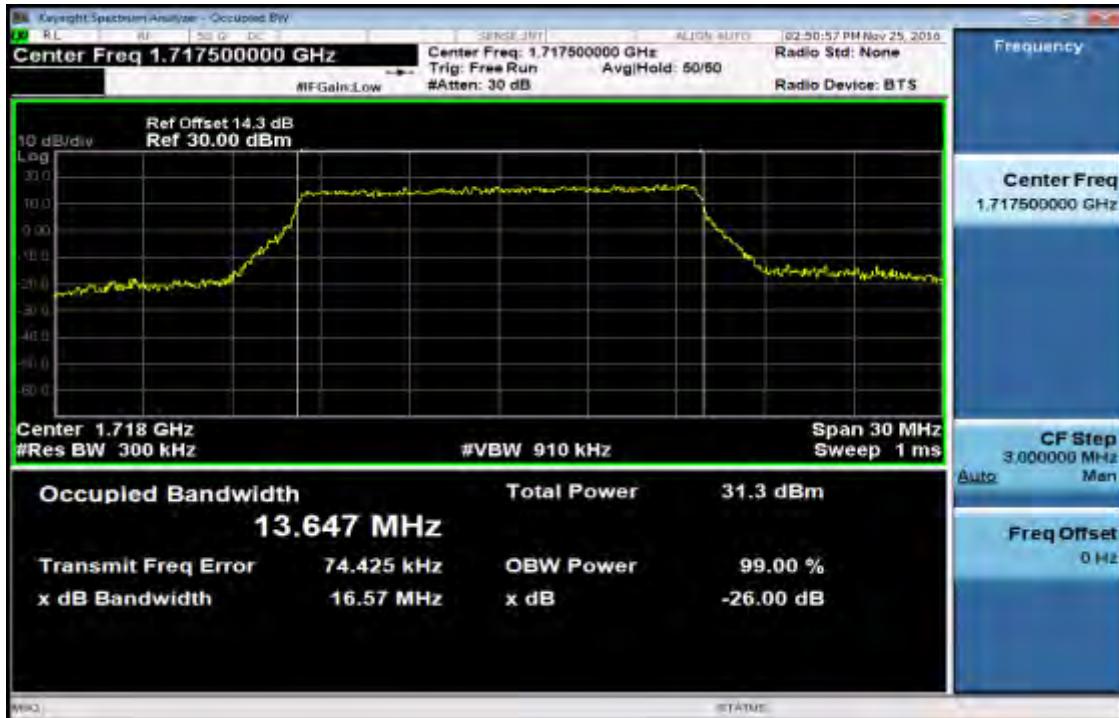
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15MHz BW LTE-Band 4 QPSK Channel High



15MHz BW LTE-Band 4 16QAM Channel Low



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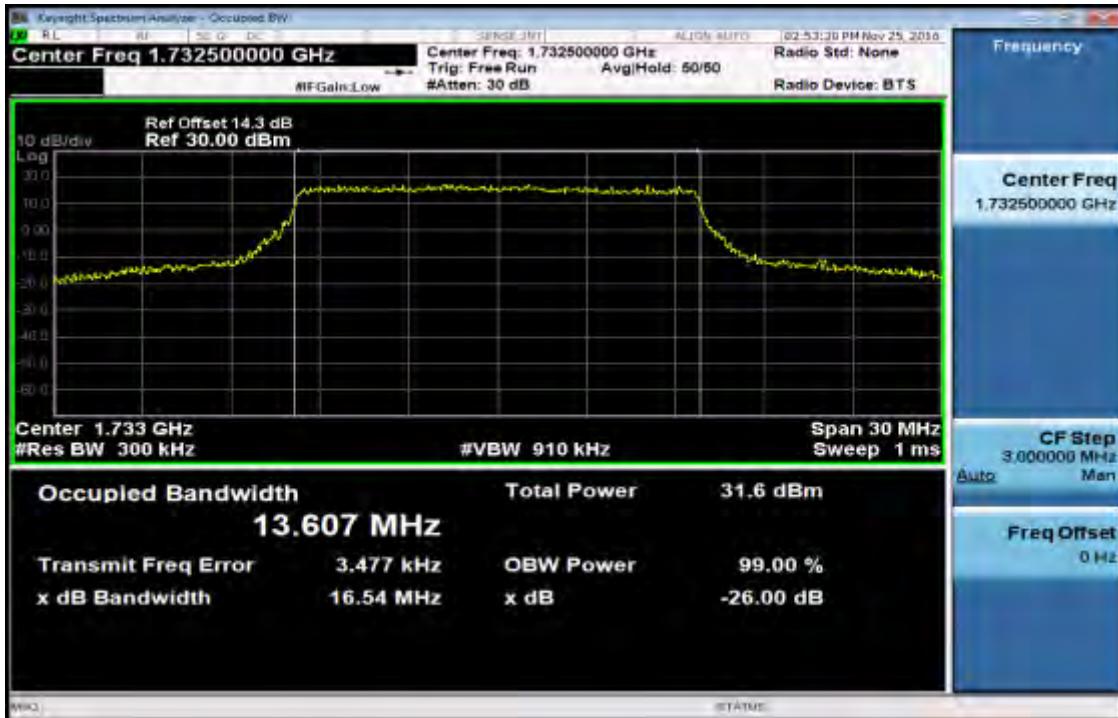
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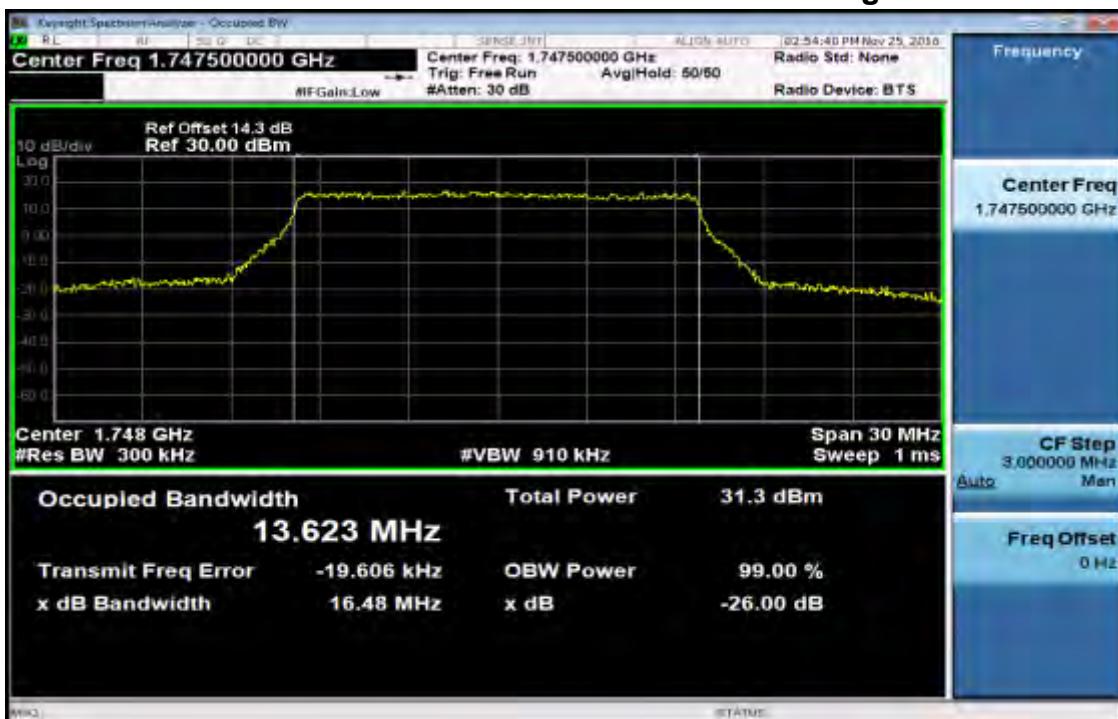
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15MHz BW LTE-Band 4 16QAM Channel Mid



15MHz BW LTE-Band 4 16QAM Channel High



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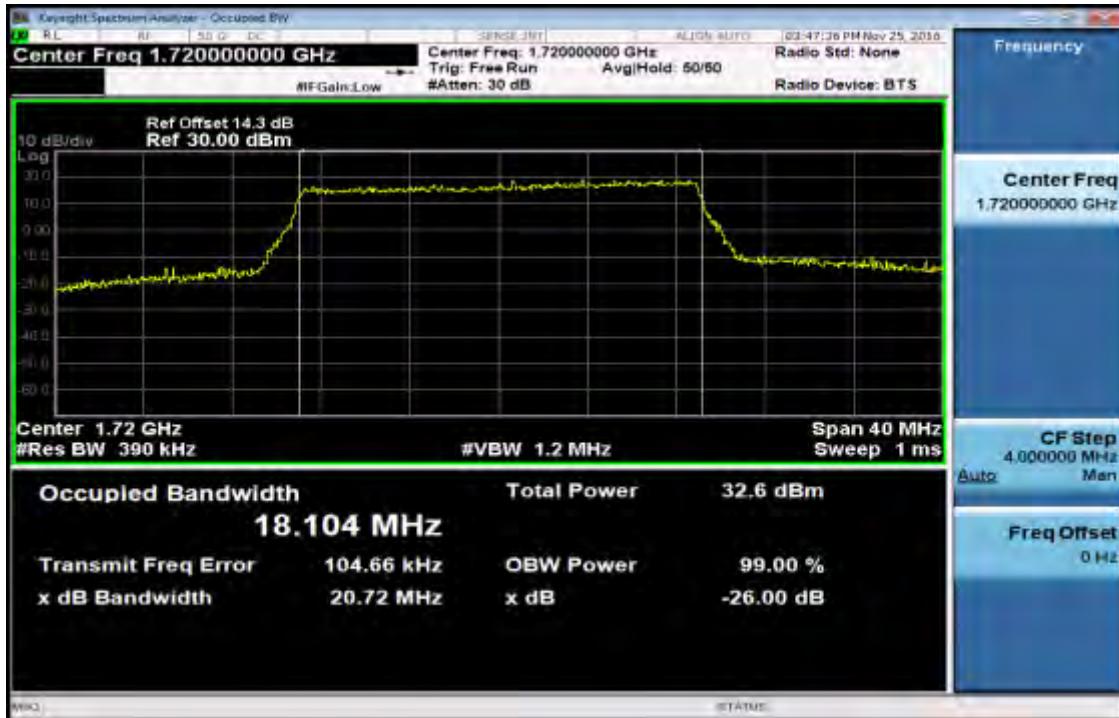
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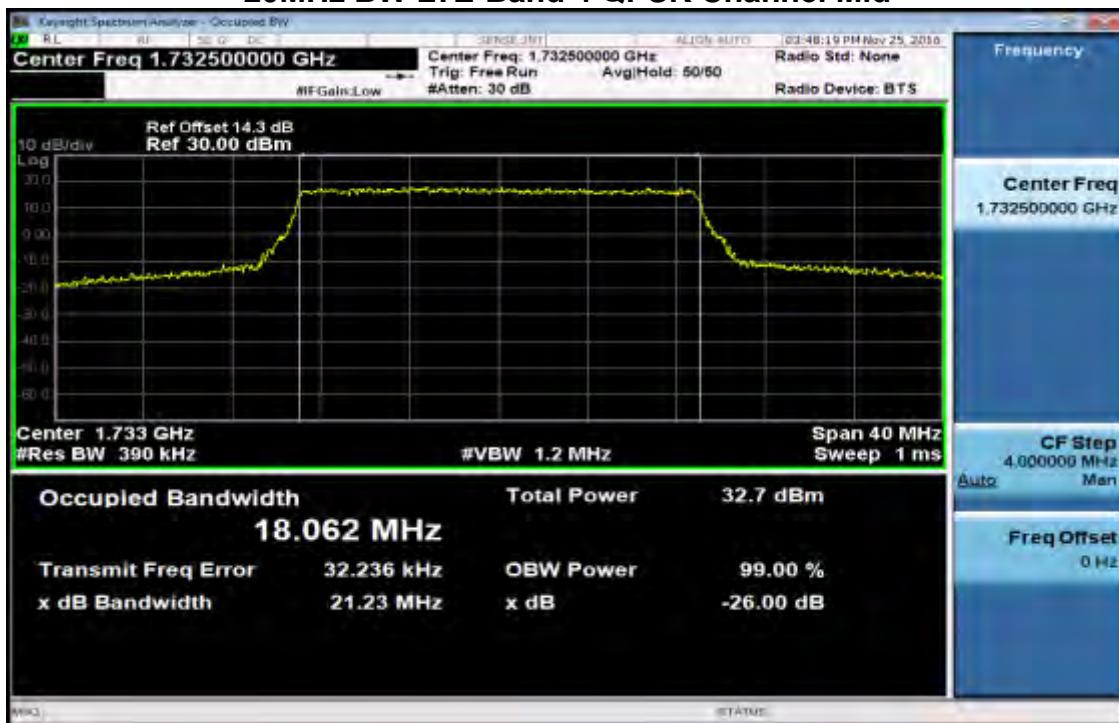
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20MHz BW LTE-Band 4 QPSK Channel Low



20MHz BW LTE-Band 4 QPSK Channel Mid



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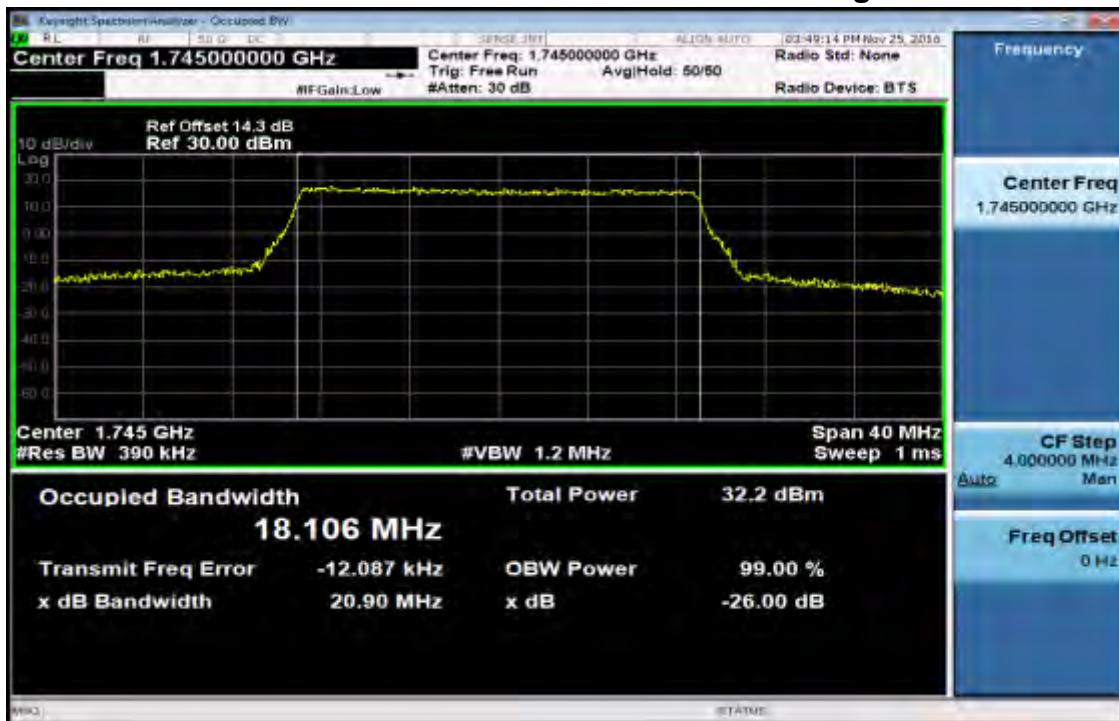
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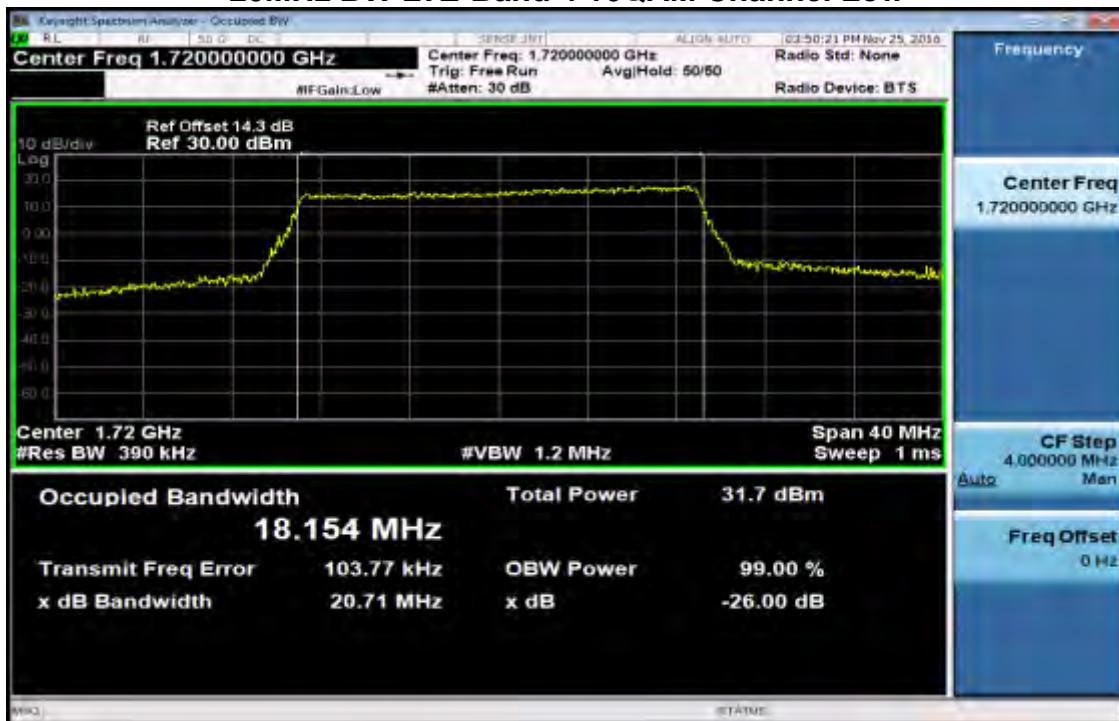
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20MHz BW LTE-Band 4 QPSK Channel High



20MHz BW LTE-Band 4 16QAM Channel Low



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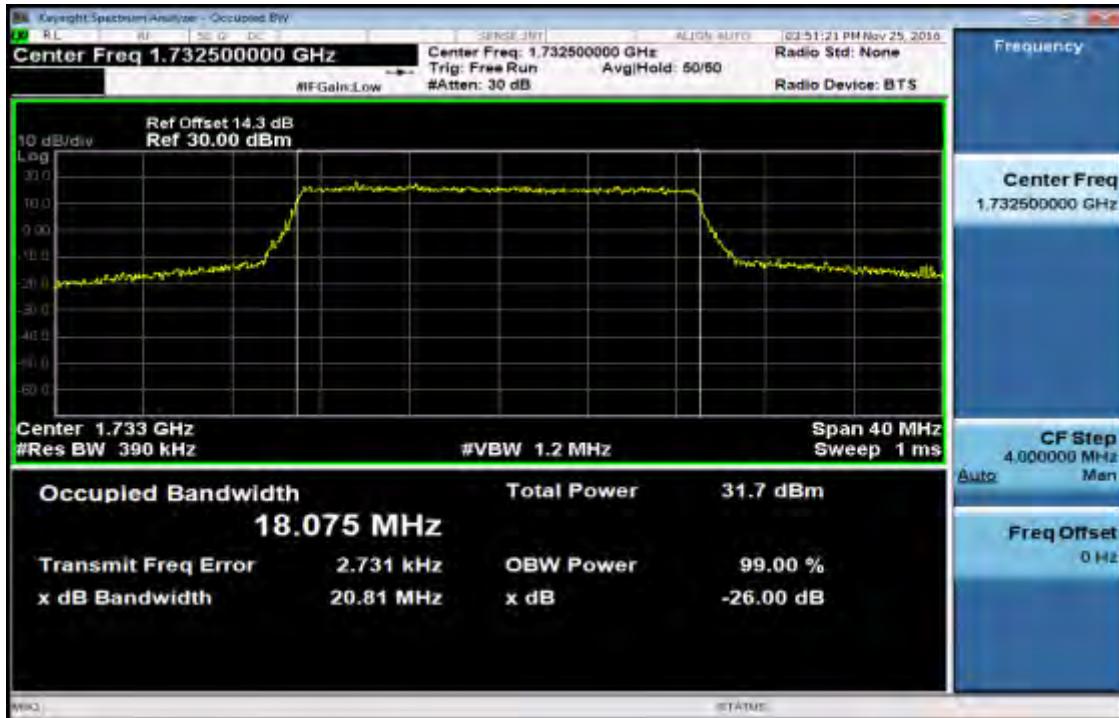
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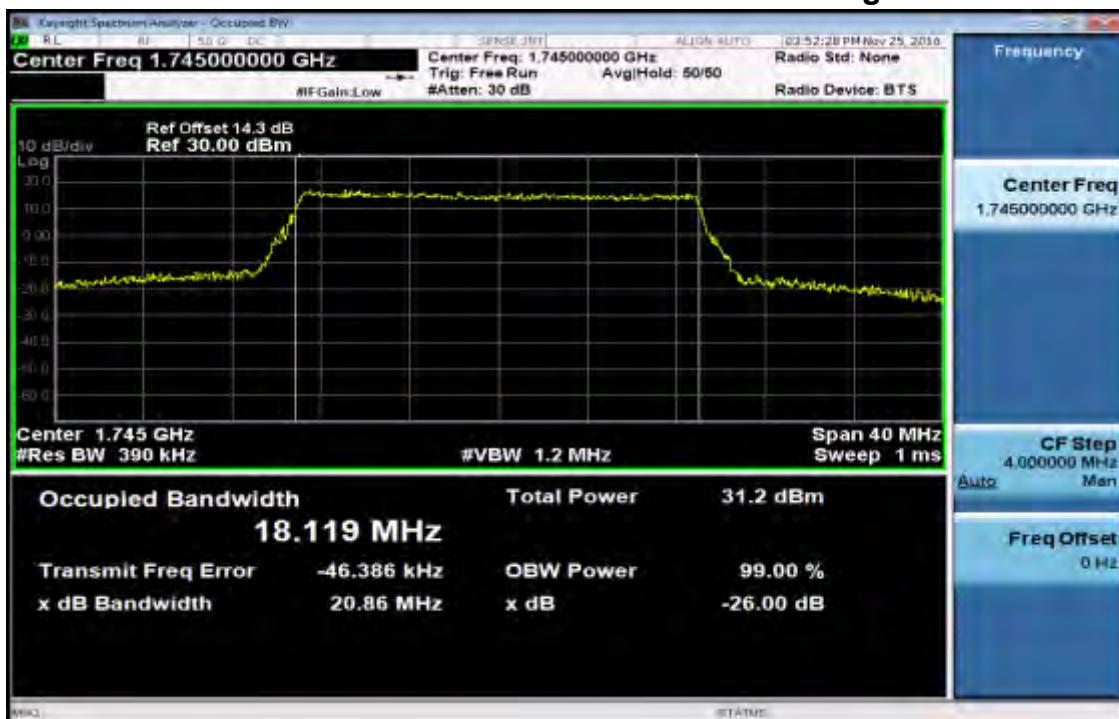
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20MHz BW LTE-Band 4 16QAM Channel Mid



20MHz BW LTE-Band 4 16QAM Channel High



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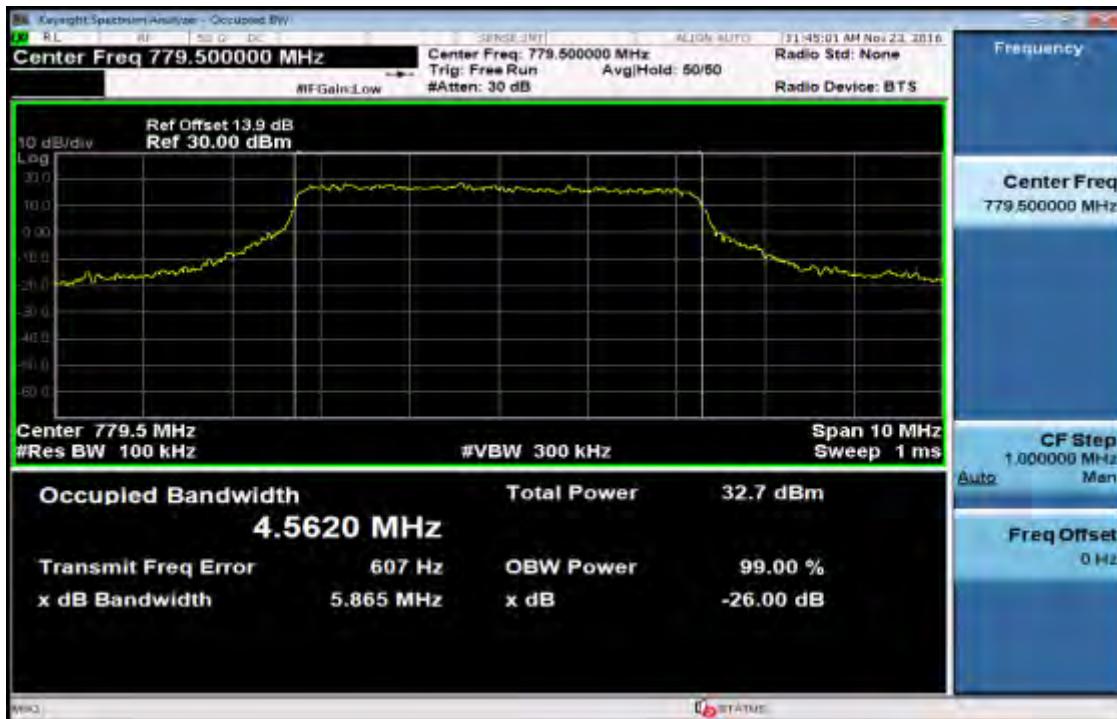
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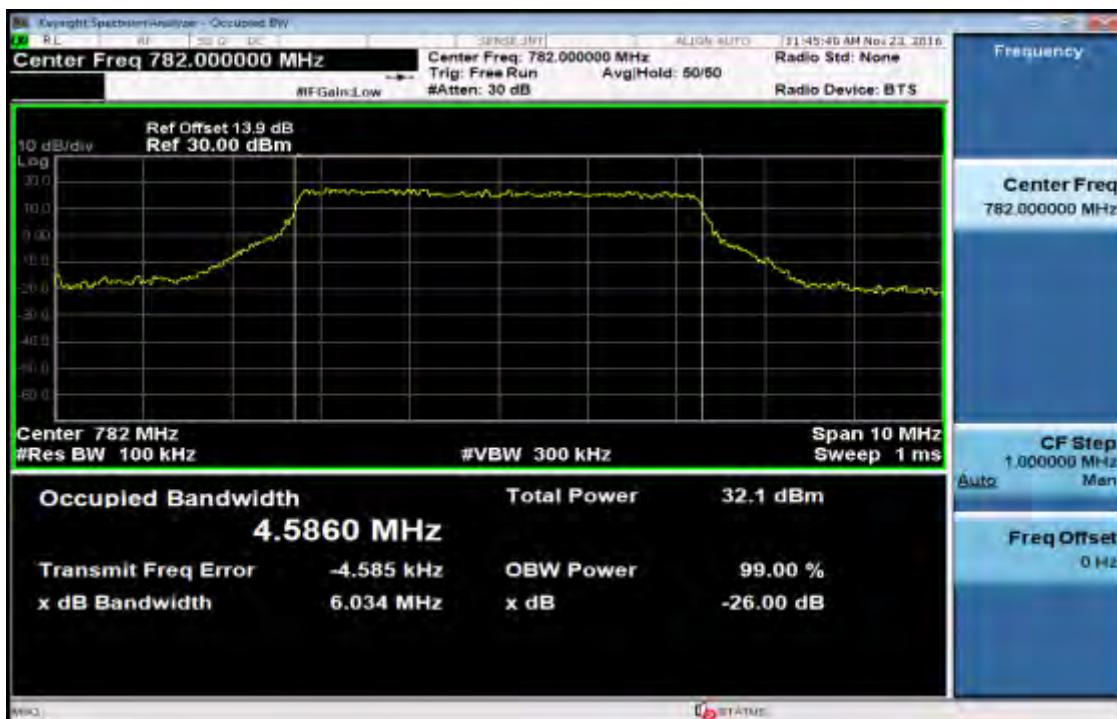
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5MHz BW LTE-Band 13 QPSK Channel Low



5MHz BW LTE-Band 13 QPSK Channel Mid



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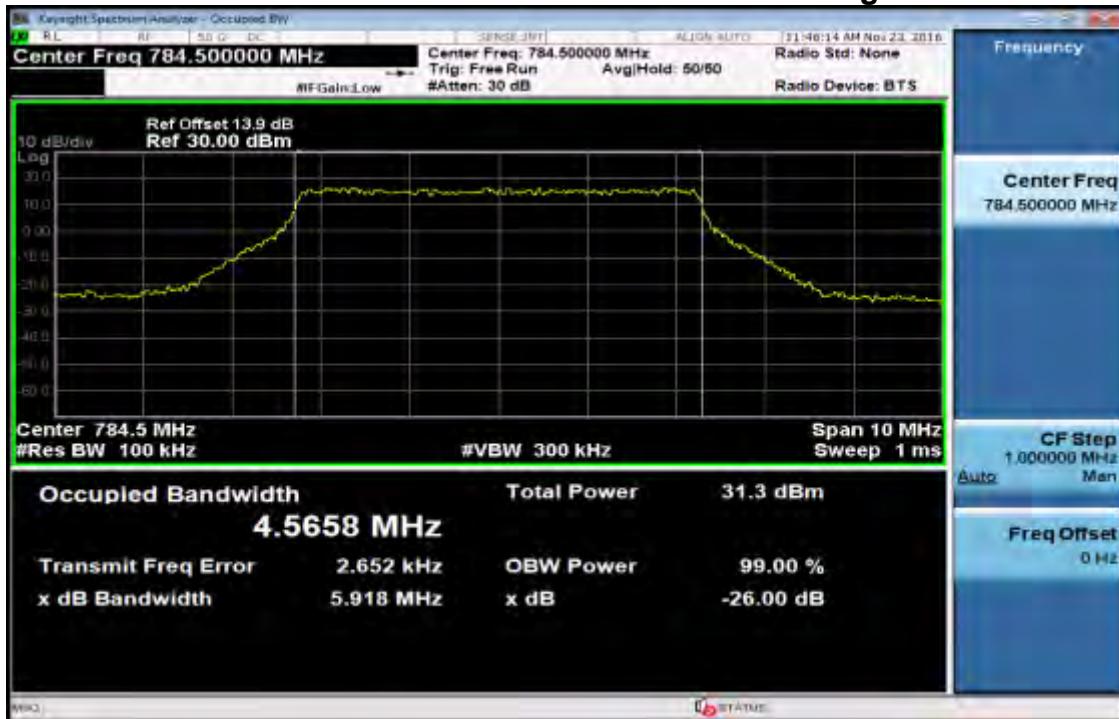
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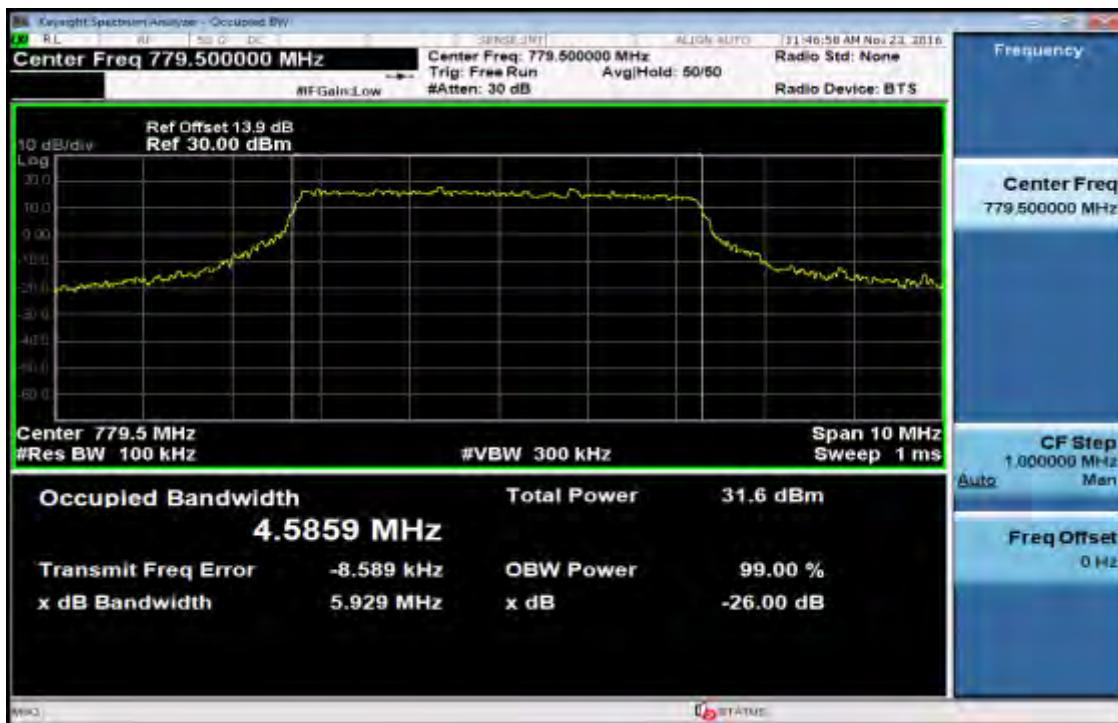
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5MHz BW LTE-Band 13 QPSK Channel High



5MHz BW LTE-Band 13 16QAM Channel Low



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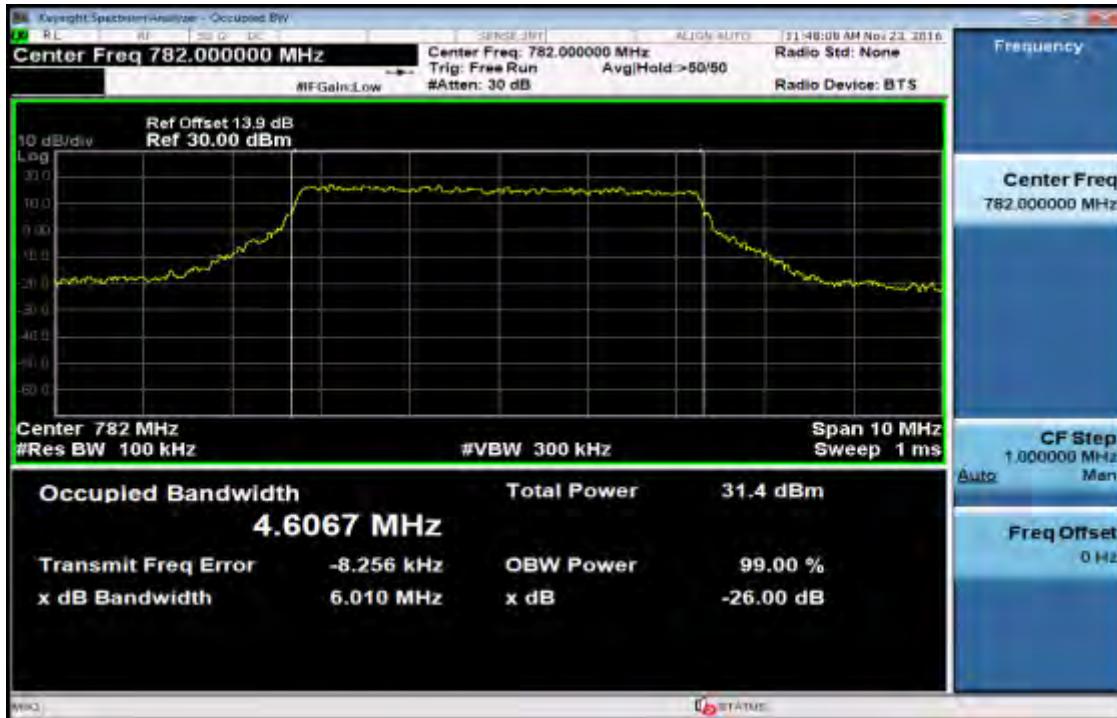
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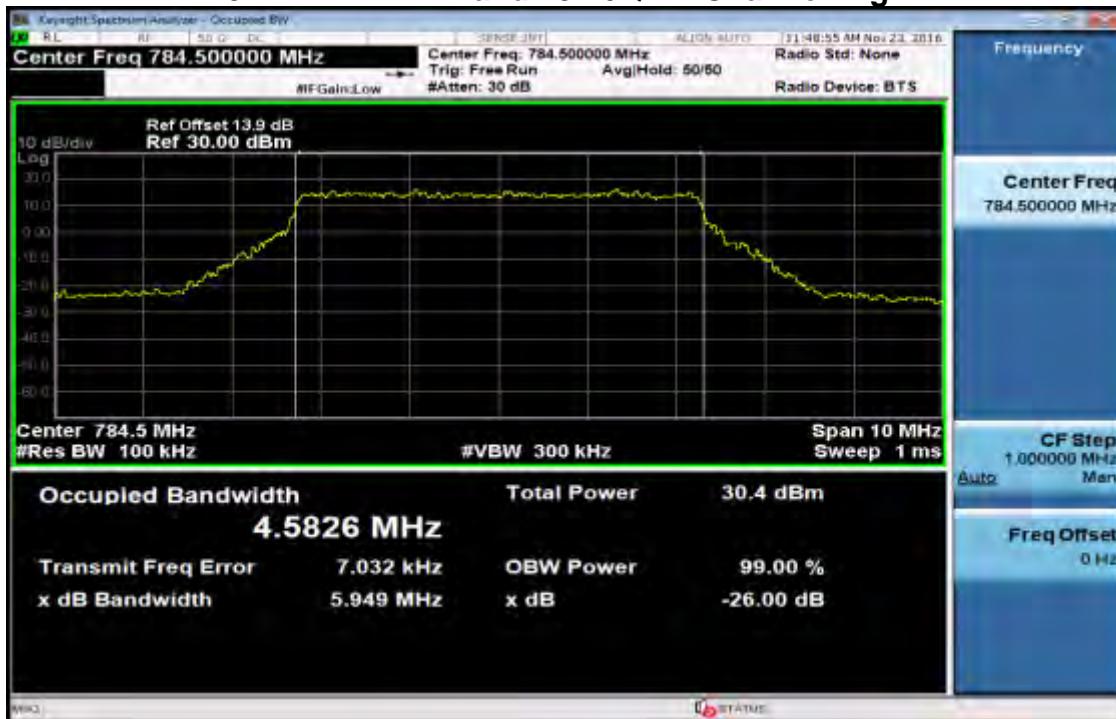
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5MHz BW LTE-Band 13 16QAM Channel Mid



5MHz BW LTE-Band 13 16QAM Channel High



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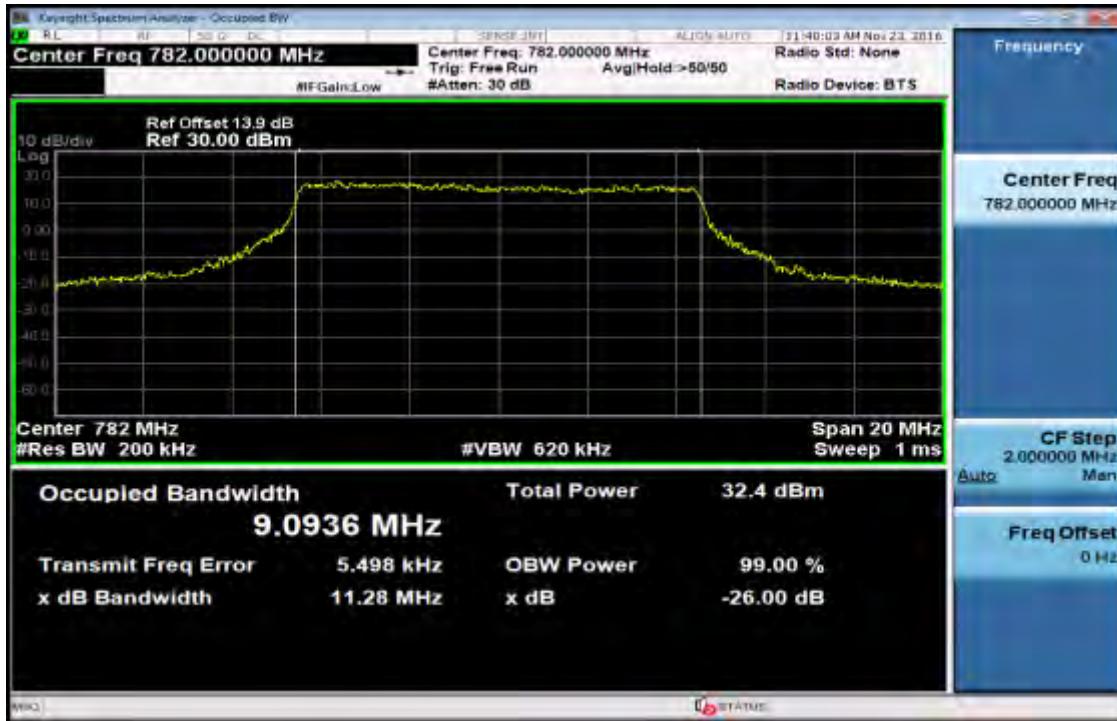
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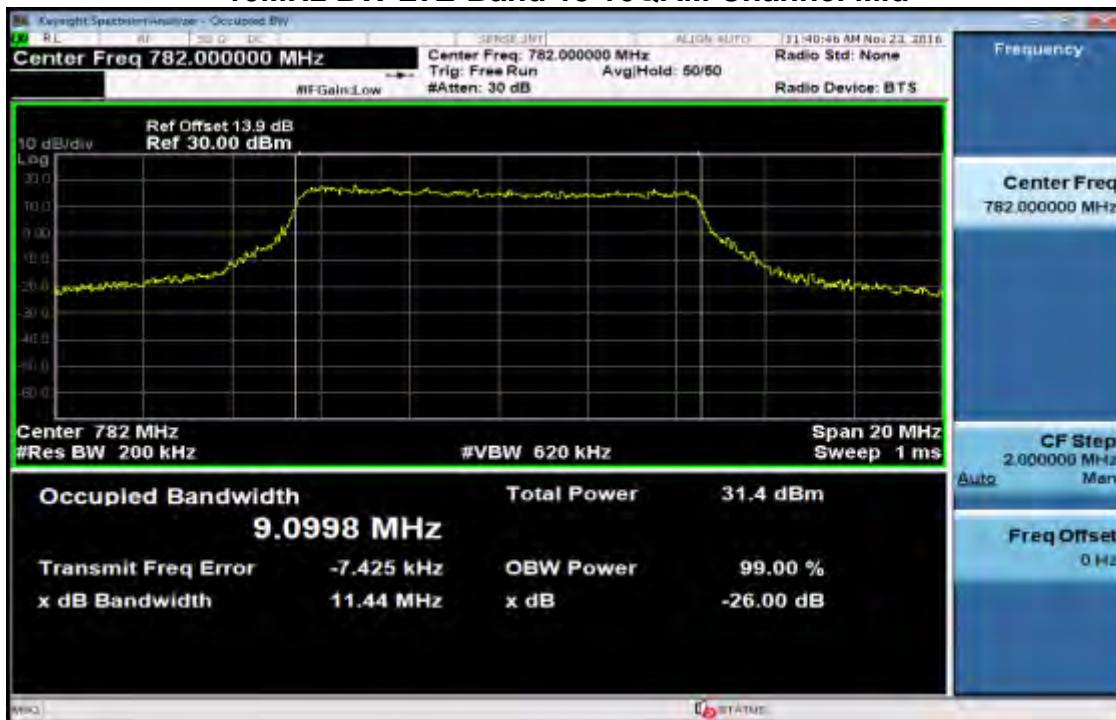
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10MHz BW LTE-Band 13 QPSK Channel Mid



10MHz BW LTE-Band 13 16QAM Channel Mid



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9. OUT OF BAND EMISSION AT ANTENNA TERMINALS

9.1. Standard Applicable

FCC §27.53(h), §27.53(c)(2) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

FCC §27.53(c) (4)

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

Band Edge Measurement:

FCC §27.53(c) (5)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC §27.53(h)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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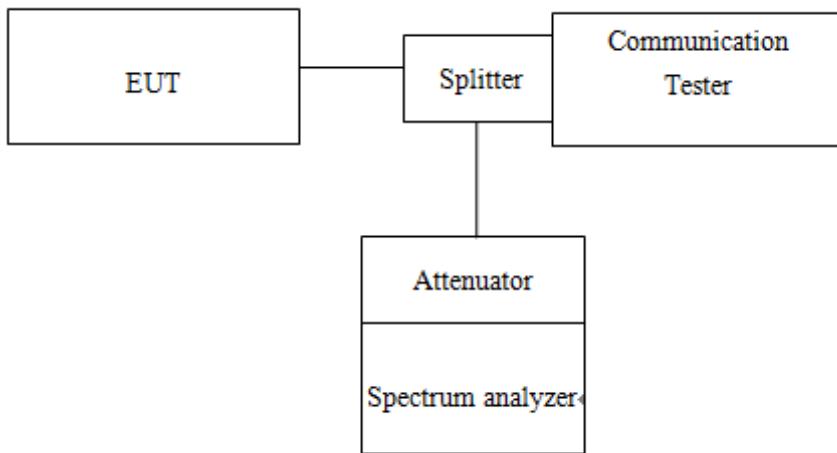
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9.2. Test SET-UP



9.3. Measurement Procedure

Conducted Emission

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting RBW \geq 1% EBW.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

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9.4. Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/16/2016	06/15/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Communication Tester	R&S	CMU200	120239	11/25/2015	11/24/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017

9.5. Measurement Result:

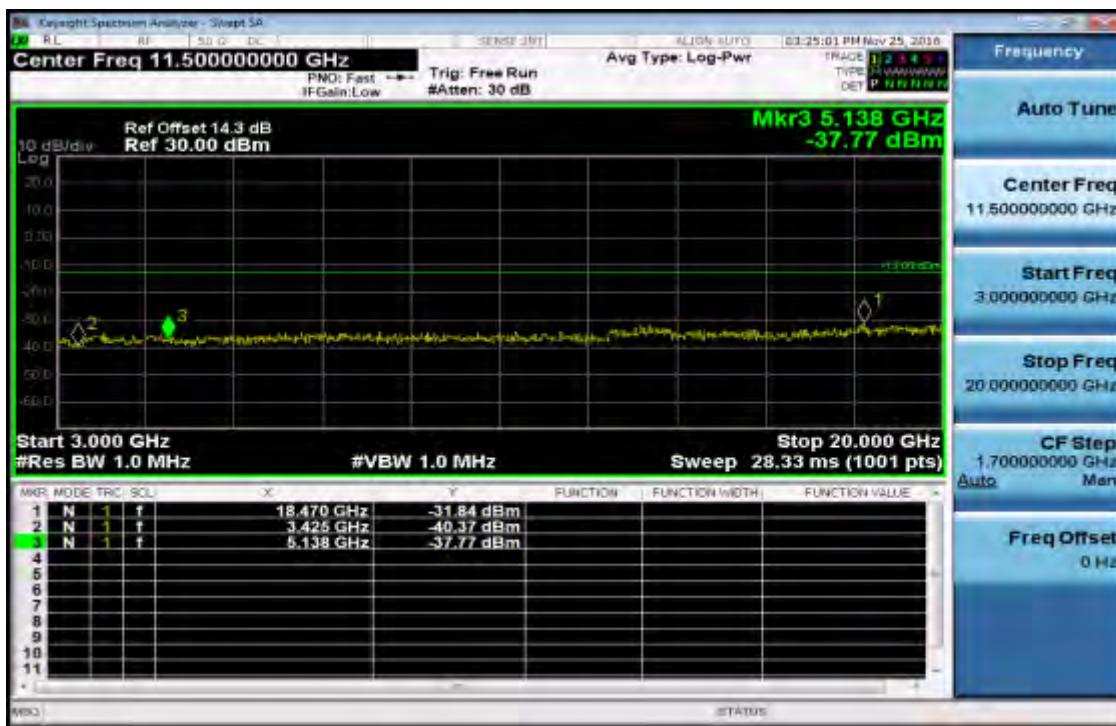
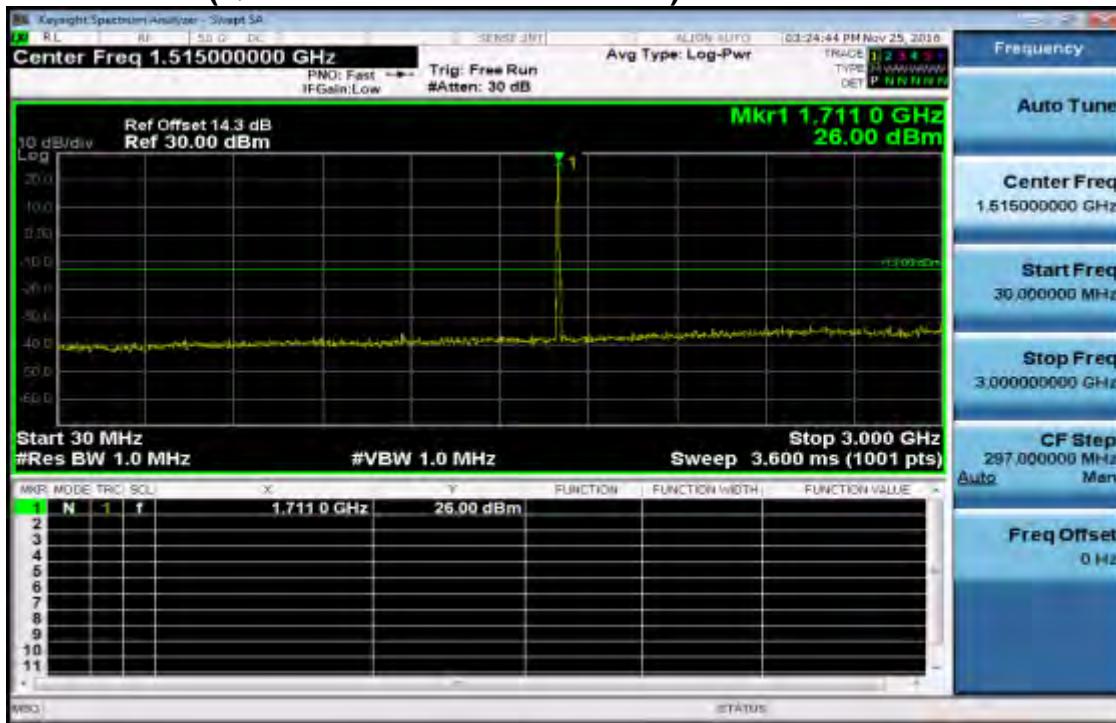
Refer to next pages.

NOTE: The occurrence of the spike on the conducted emission is the signal of the fundamental emission.

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Out of Band emission at antenna terminals–5MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0)Channel Lowest

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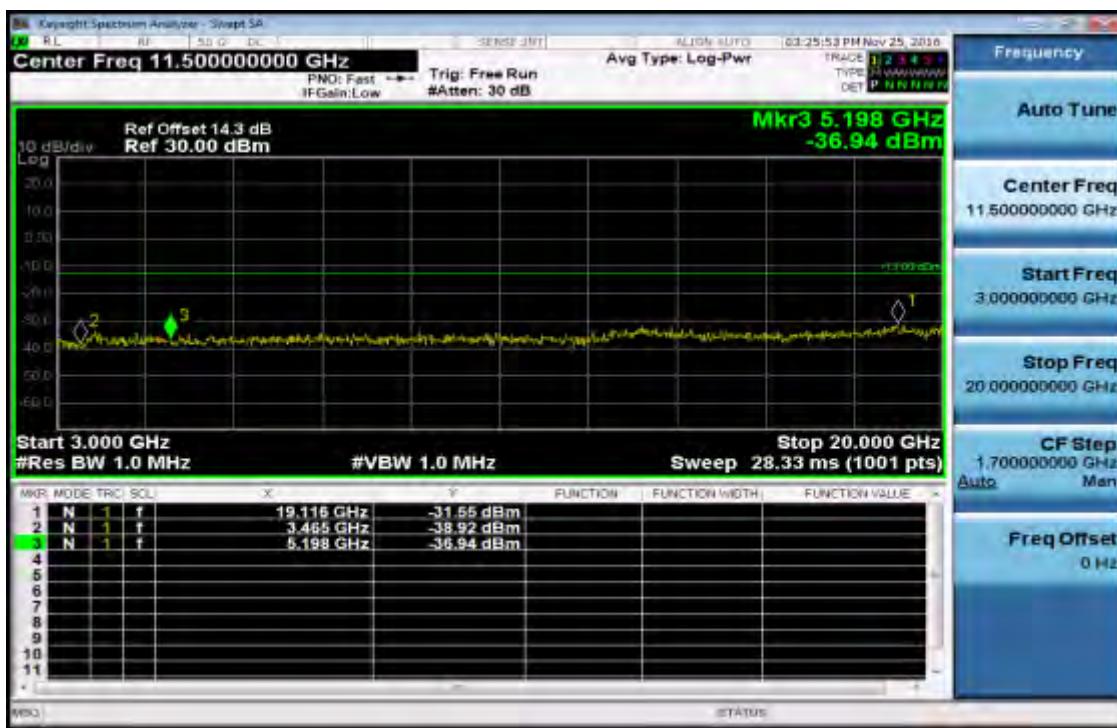
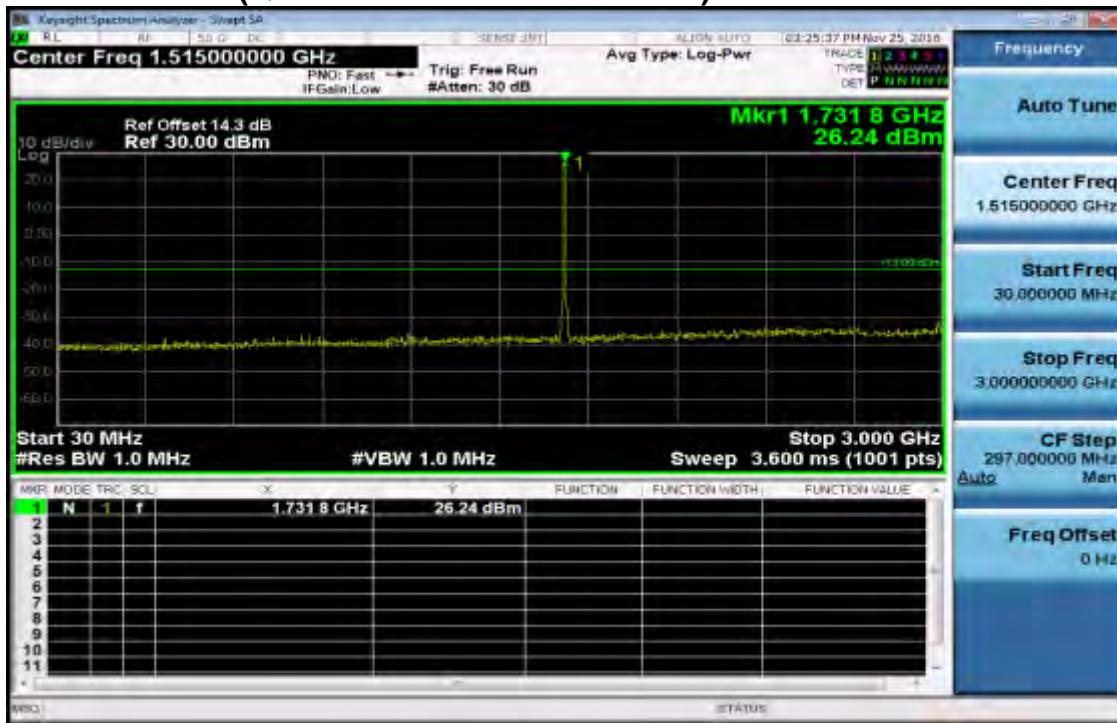
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Out of Band emission at antenna terminals –5MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0) Channel Mid

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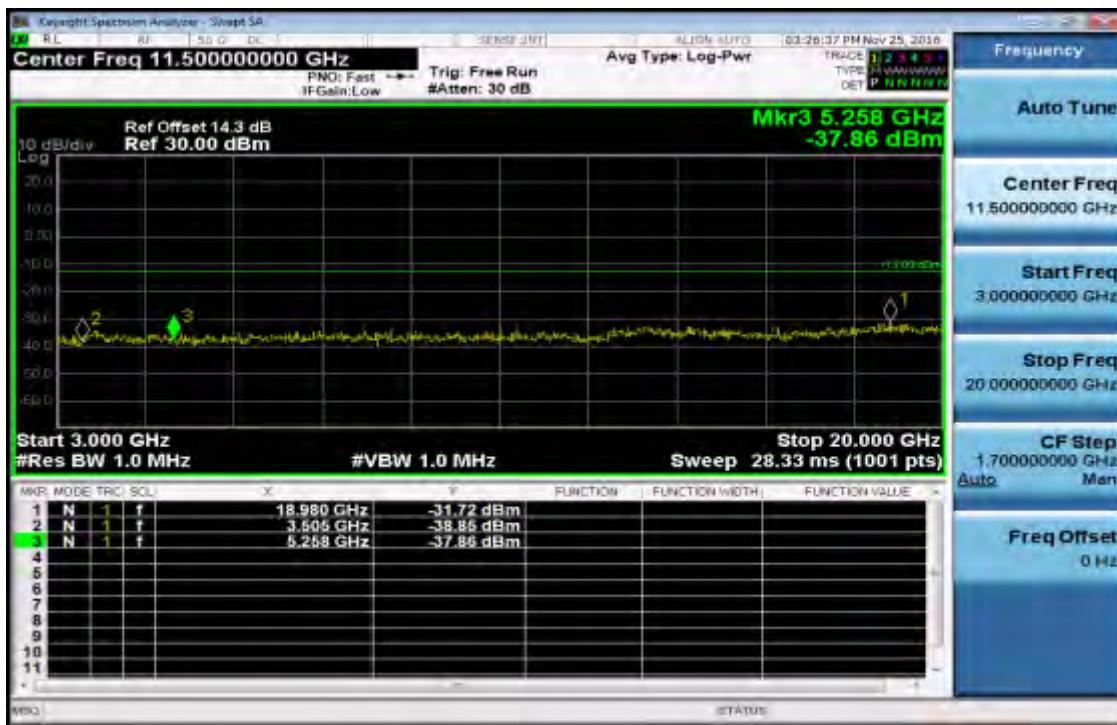
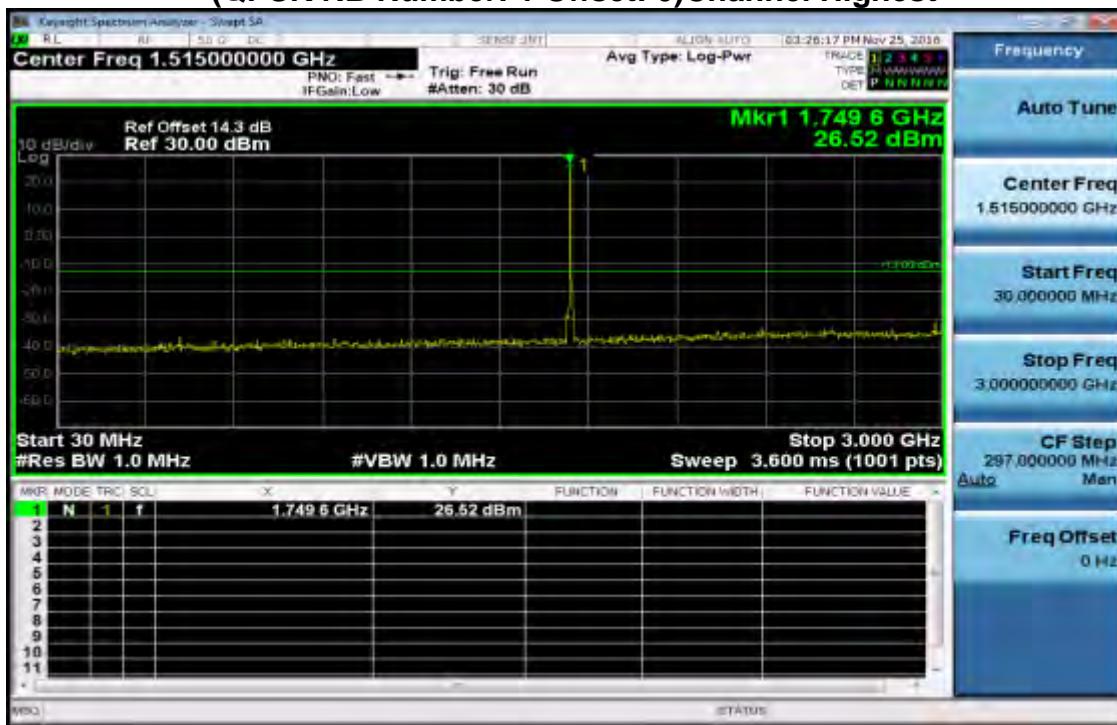
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Out of Band emission at antenna terminals—5MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0)Channel Highest



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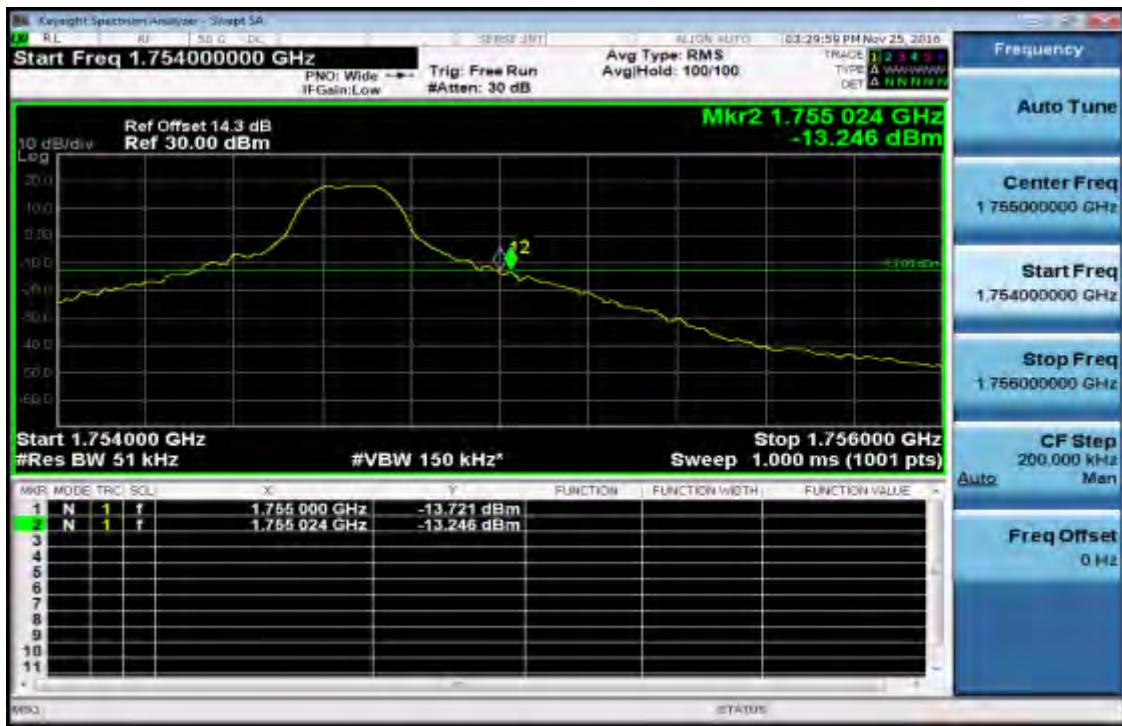
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Band edge emission at antenna terminals –5MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –5MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 24) Channel Highest



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**Band edge emission at antenna terminals –5MHz BW LTE-Band 4
(QPSK RB Number: 25 Offset: 0) Channel Lowest**



**Band edge emission at antenna terminals –5MHz BW LTE-Band 4
(QPSK RB Number: 25 Offset: 0) Channel Highest**



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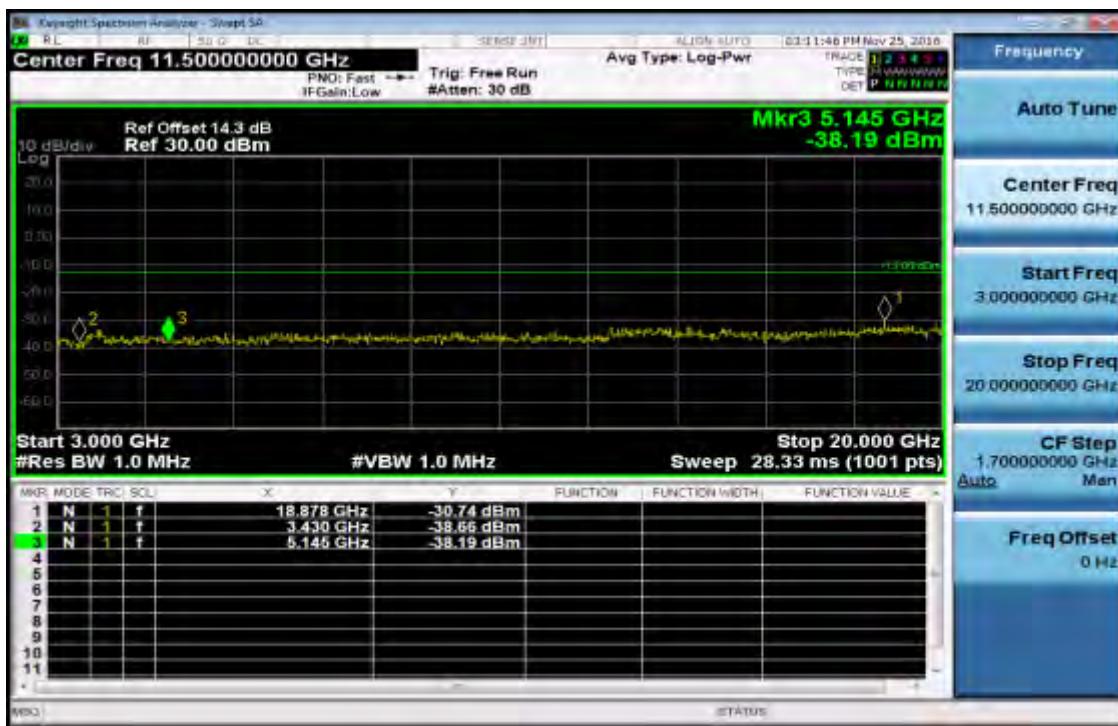
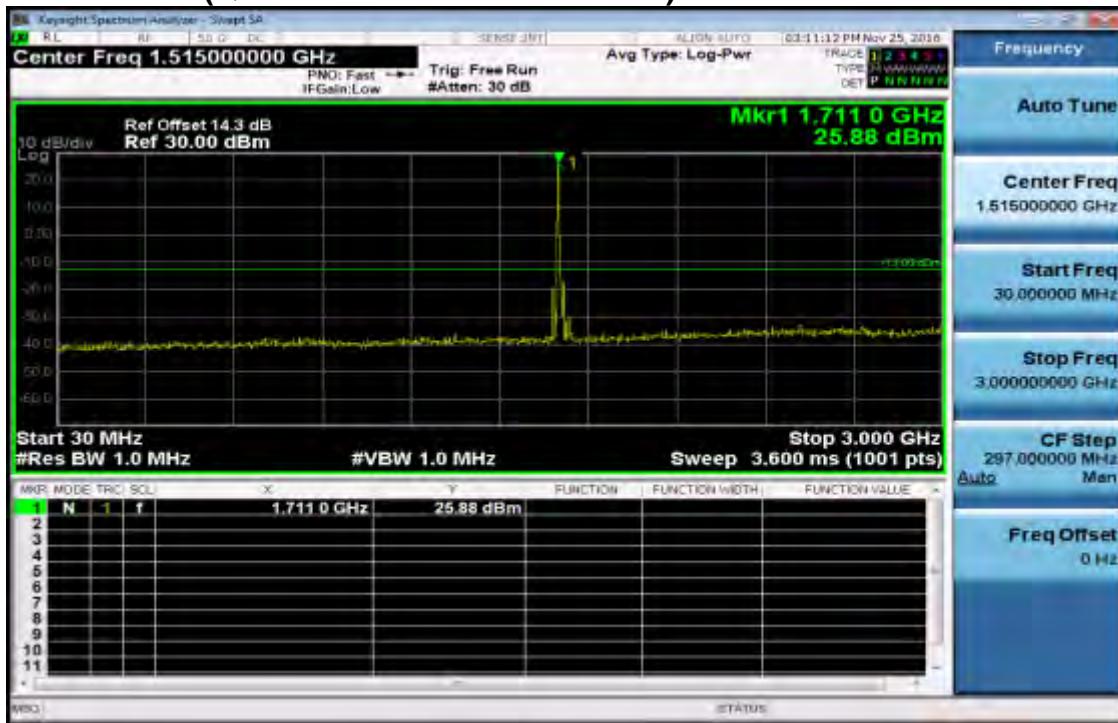
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**Out of Band emission at antenna terminals–10MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0) Channel Lowest**



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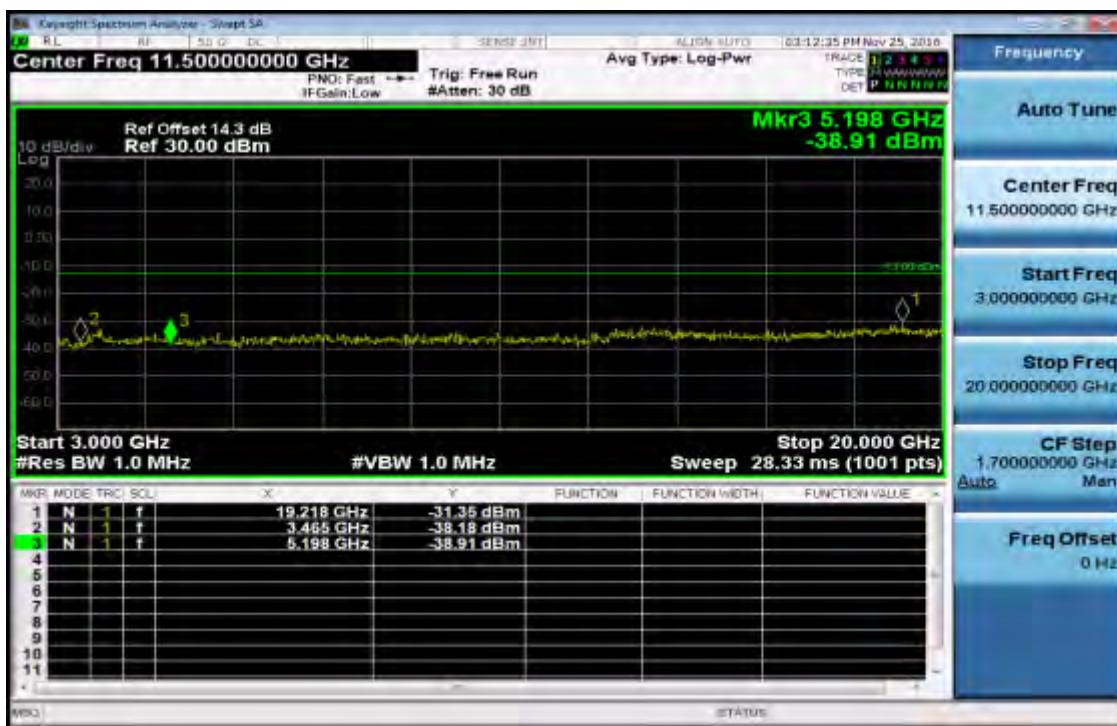
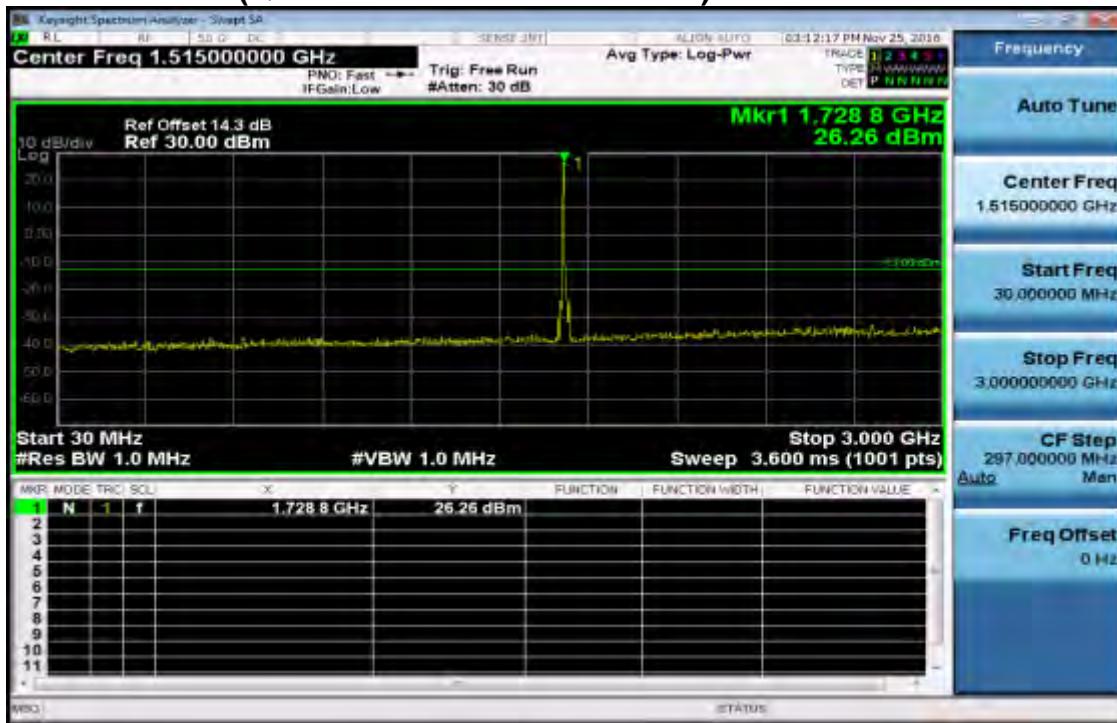
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Out of Band emission at antenna terminals –10MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Mid

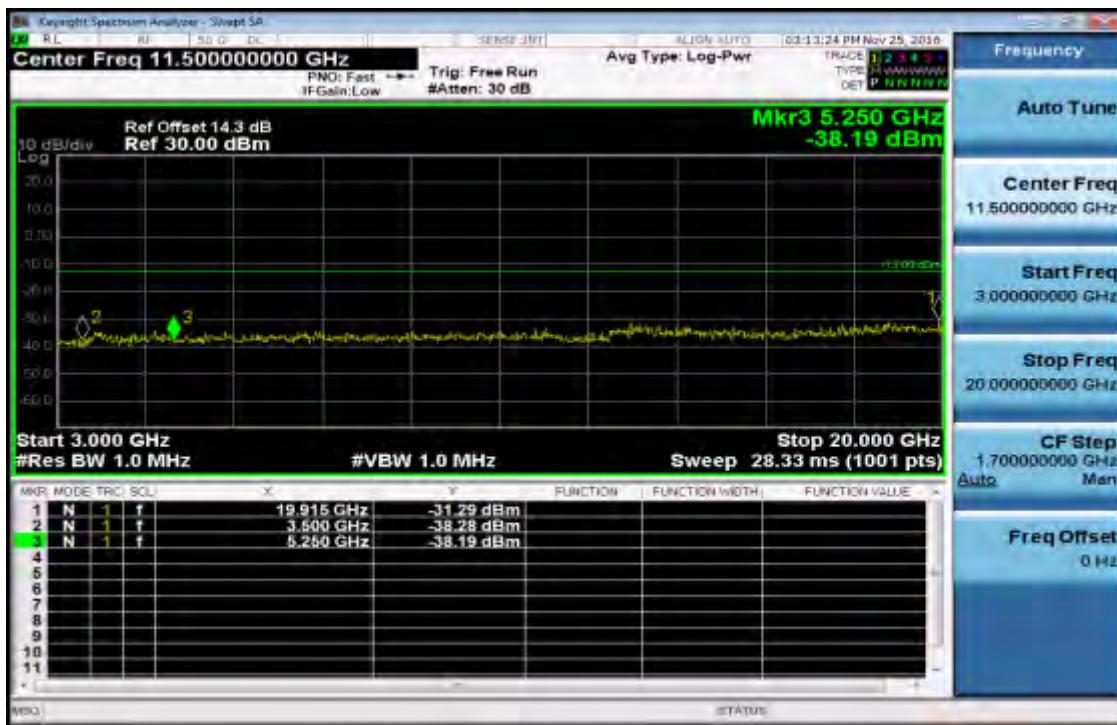
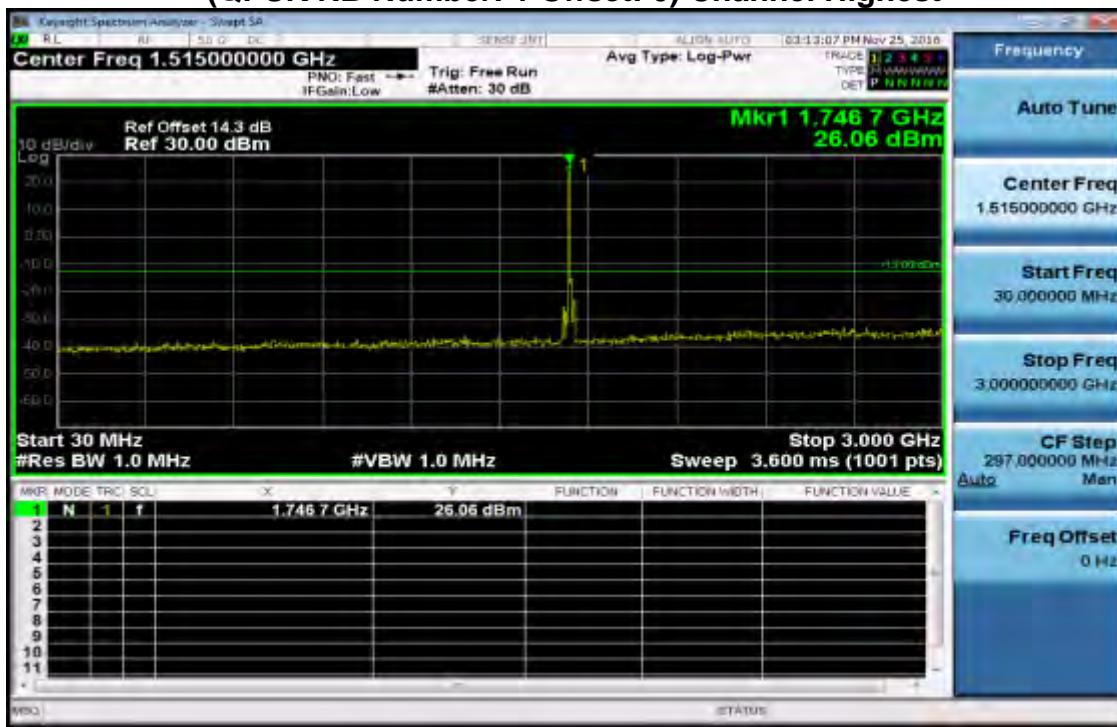


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Out of Band emission at antenna terminals—10MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Highest



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Band edge emission at antenna terminals –10MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –10MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 49) Channel Highest



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Band edge emission at antenna terminals –10MHz BW LTE-Band 4 (QPSK RB Number: 50 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –10MHz BW LTE-Band 4 (QPSK RB Number: 50 Offset:) Channel Highest



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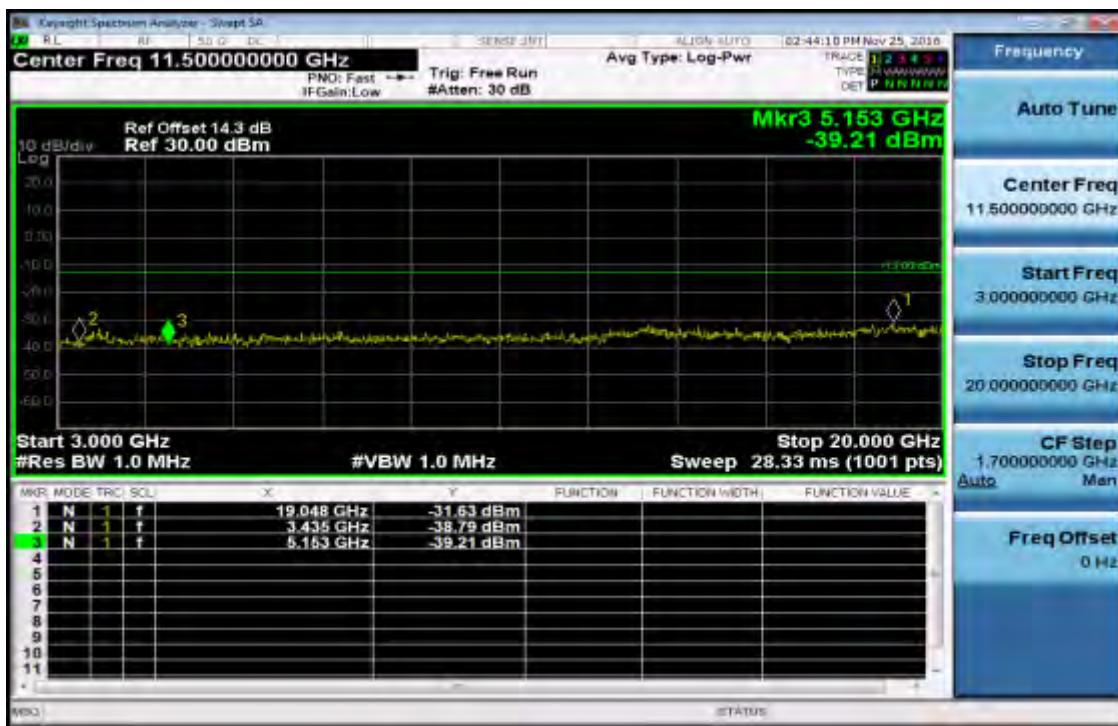
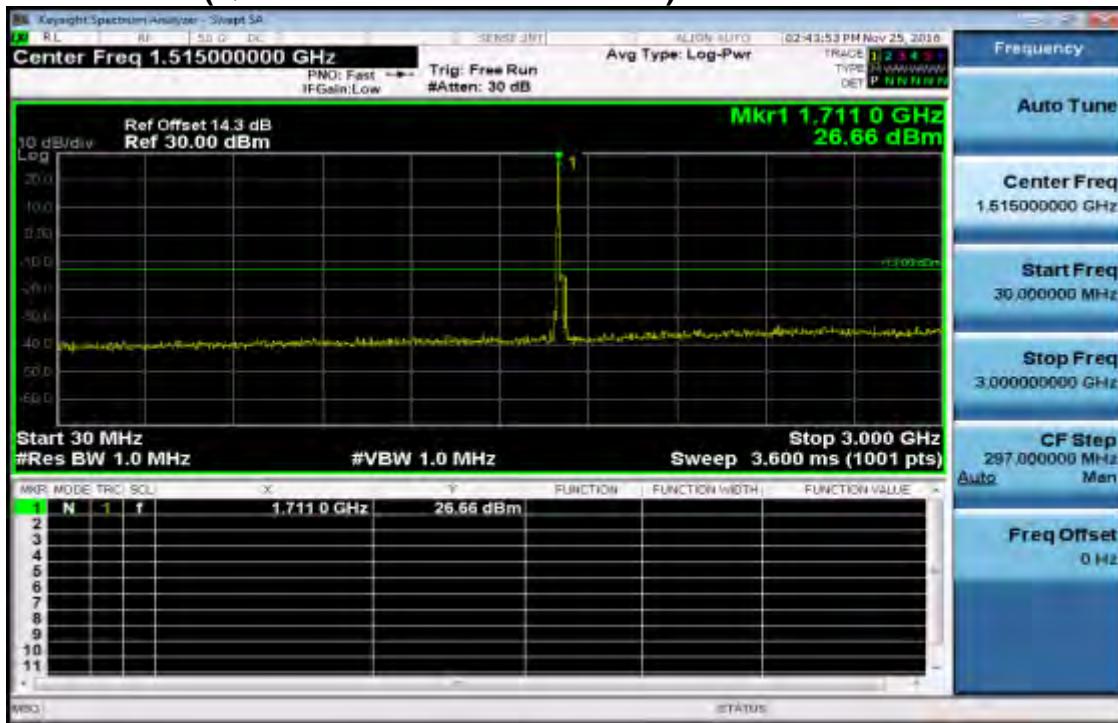
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**Out of Band emission at antenna terminals–15MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0) Channel Lowest**



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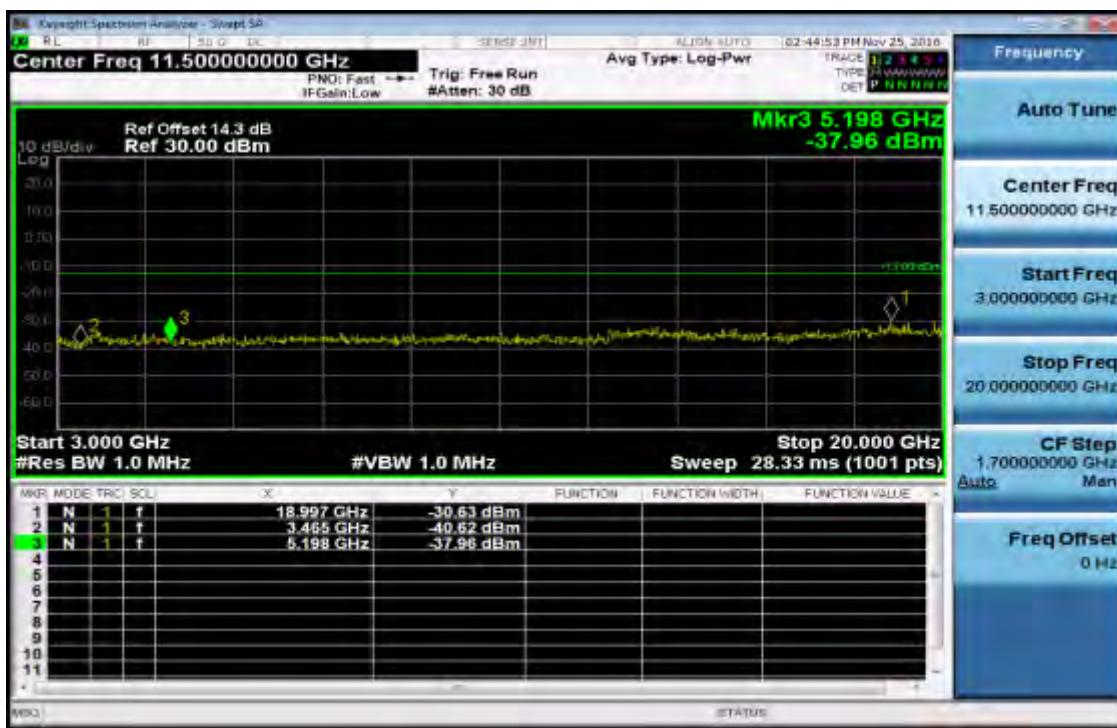
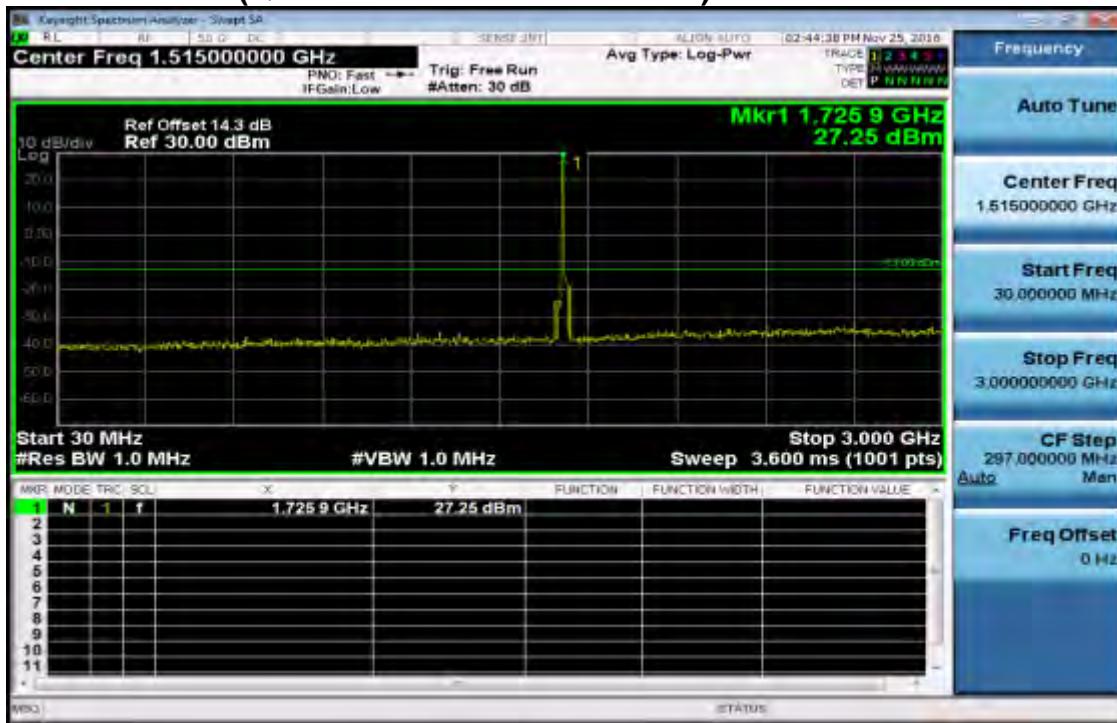
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Out of Band emission at antenna terminals –15MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0) Channel Mid

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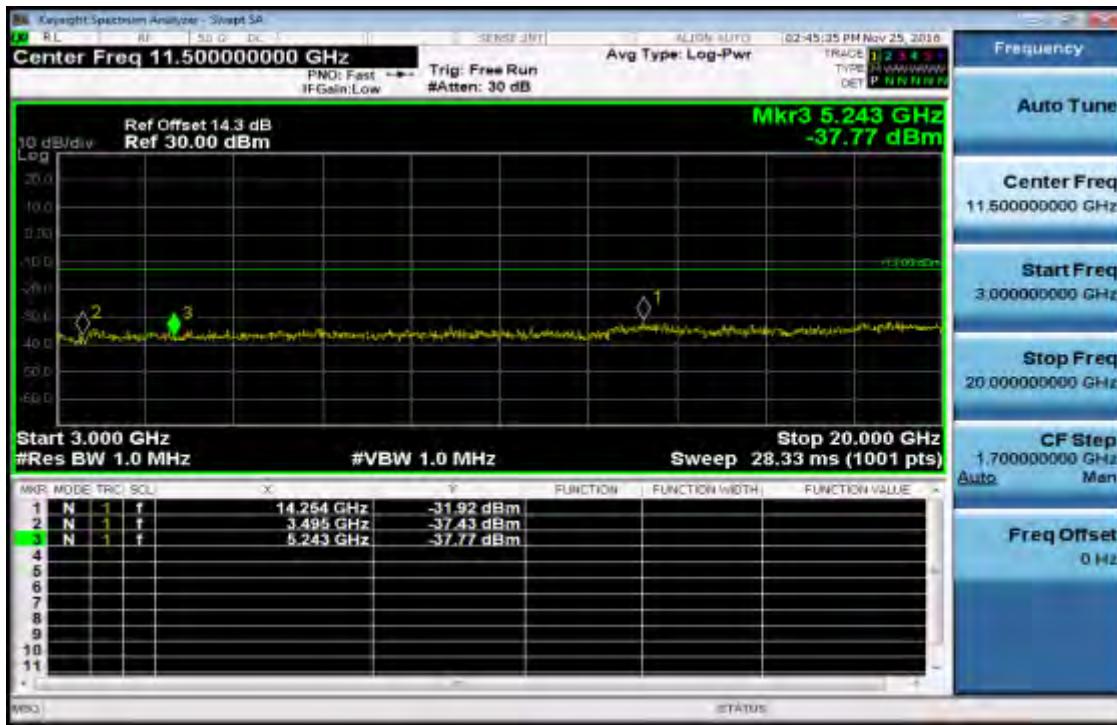
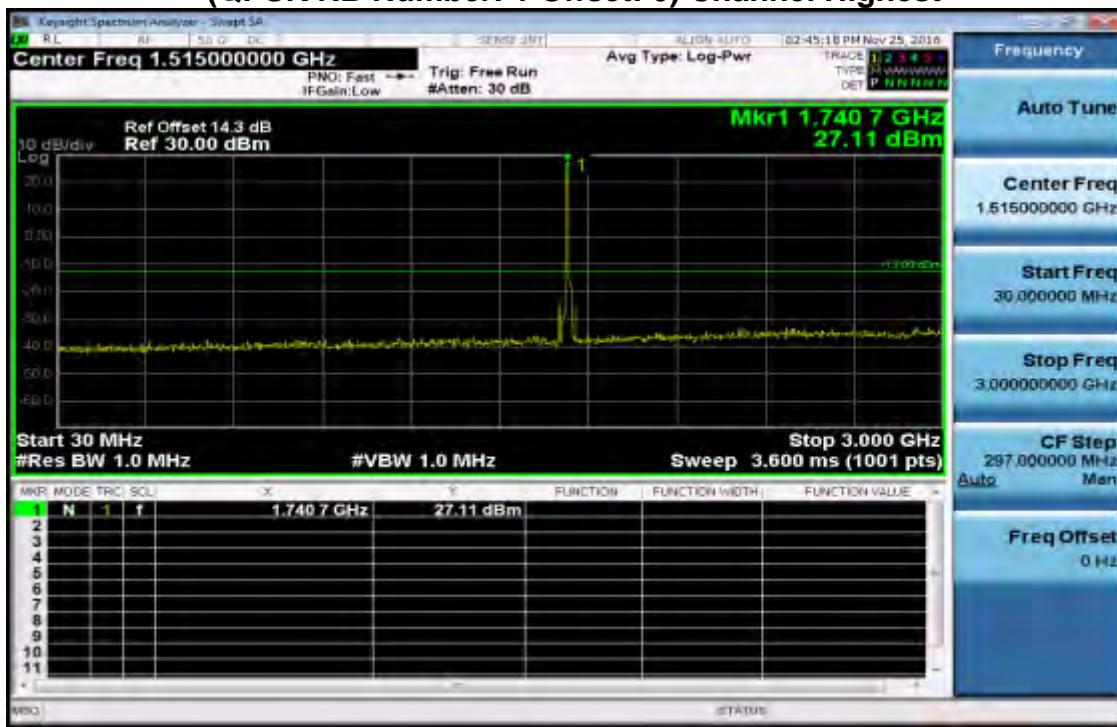
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Out of Band emission at antenna terminals—15MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Highest



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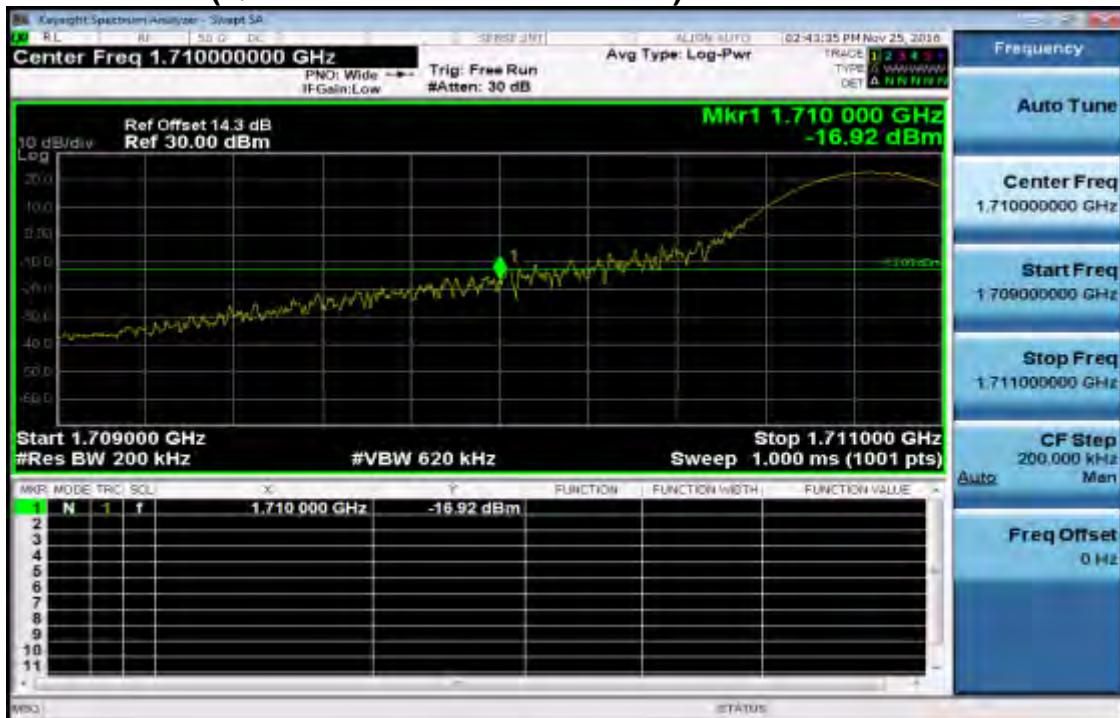
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Band edge emission at antenna terminals –15MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –15MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 74) Channel Highest



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**Band edge emission at antenna terminals –15MHz BW LTE-Band 4
(QPSK RB Number: 75 Offset: 0) Channel Lowest**



**Band edge emission at antenna terminals –15MHz BW LTE-Band 4
(QPSK RB Number: 75 Offset: 0) Channel Highest**



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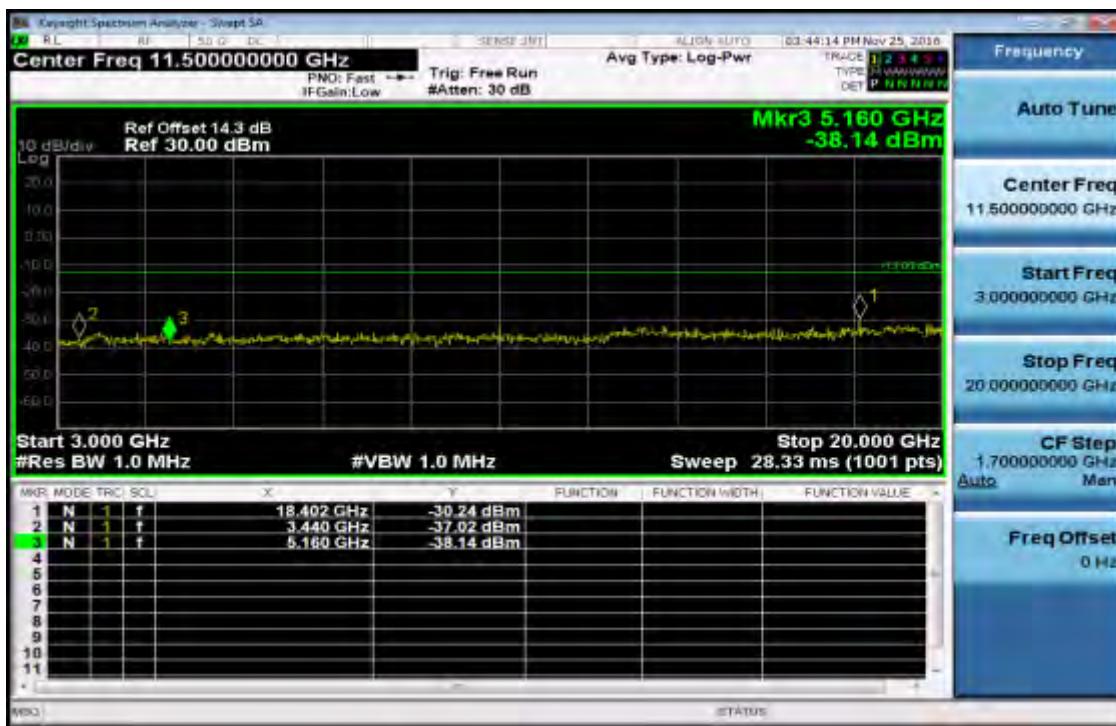
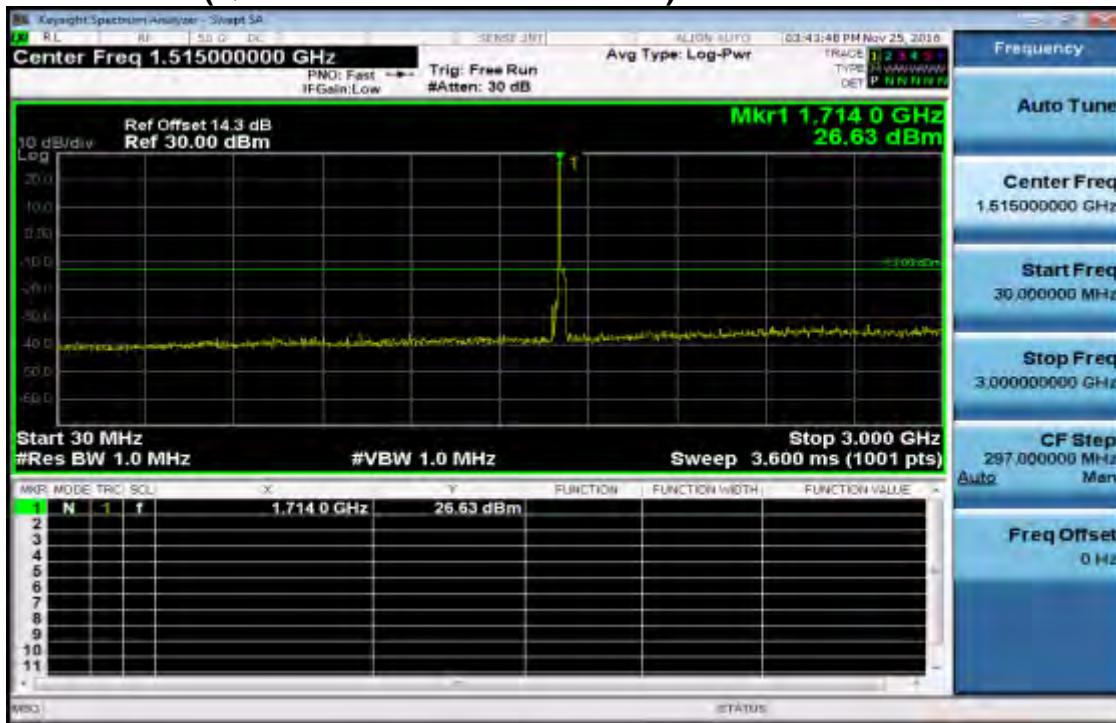
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**Out of Band emission at antenna terminals–20MHz BW LTE-Band 4
(QPSK RB Number: 1 Offset: 0) Channel Lowest**



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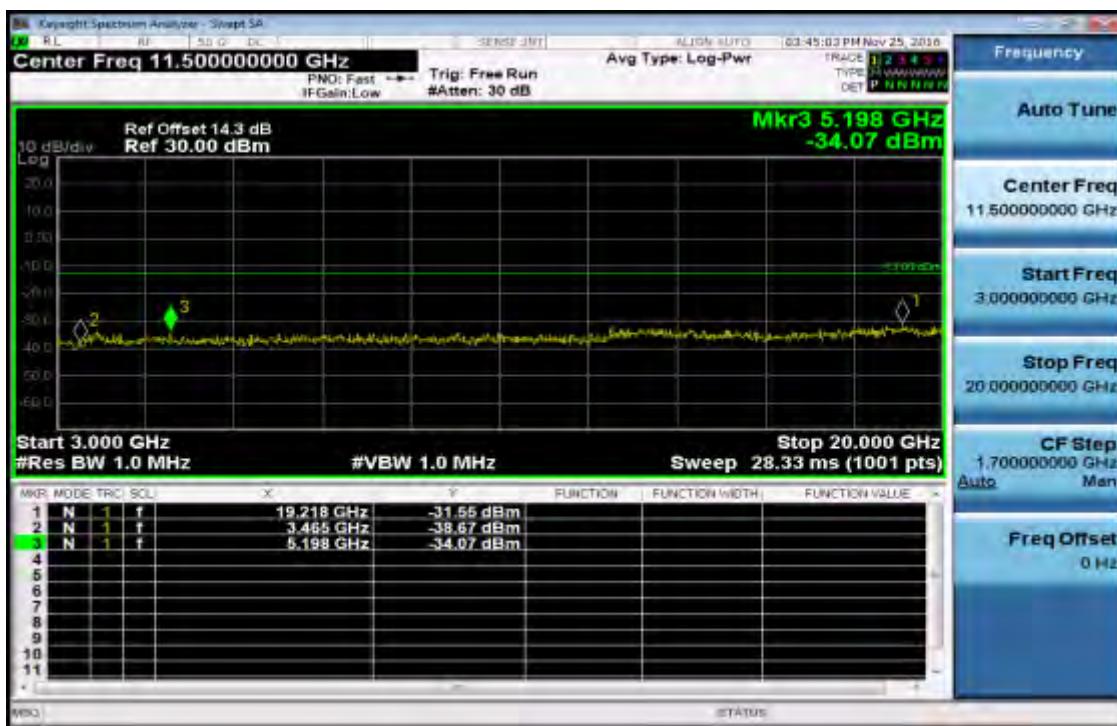
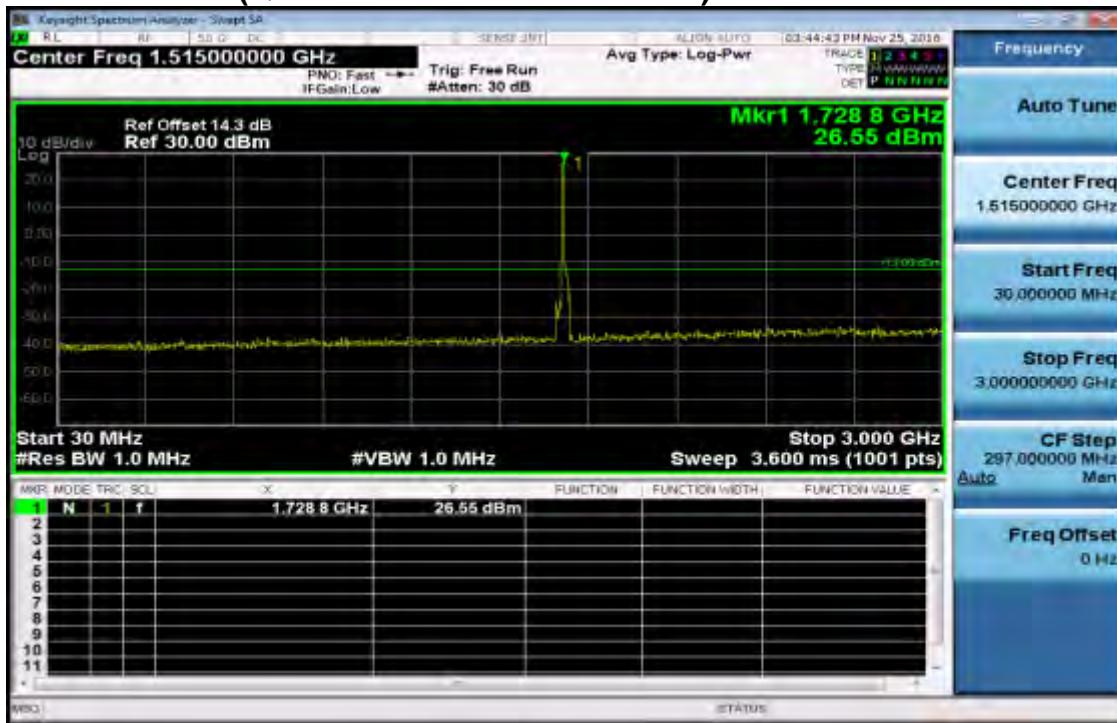
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Out of Band emission at antenna terminals –20MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Mid

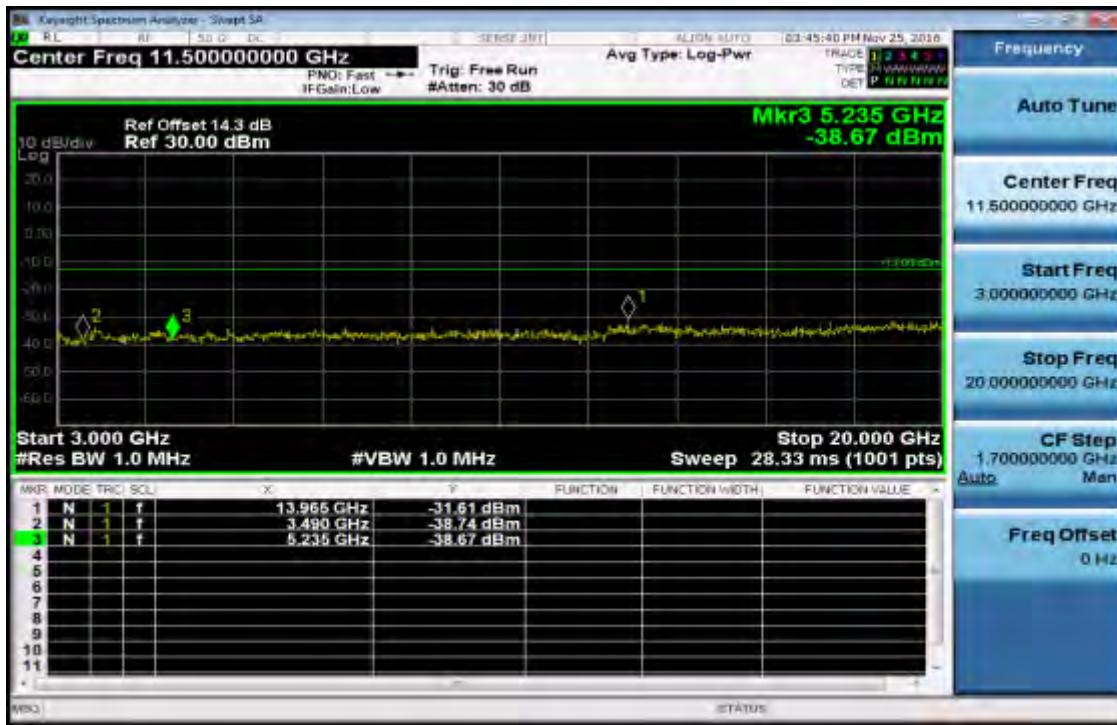
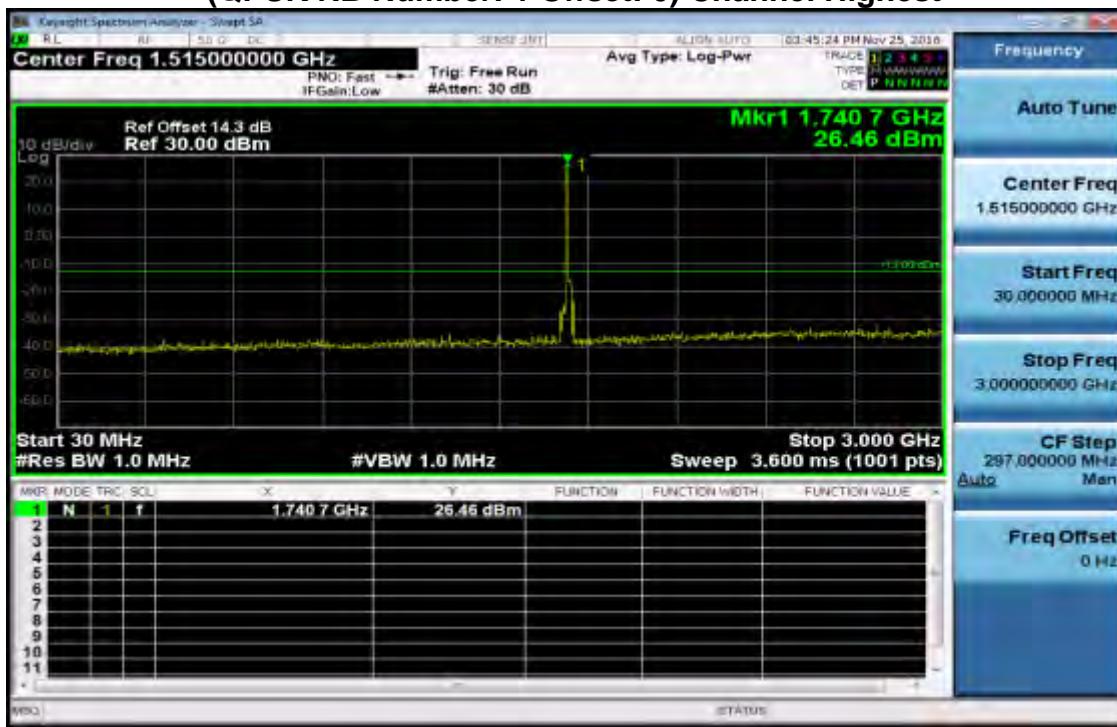


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Out of Band emission at antenna terminals—20MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Highest



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Band edge emission at antenna terminals –20MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –20MHz BW LTE-Band 4 (QPSK RB Number: 1 Offset: 99) Channel Highest



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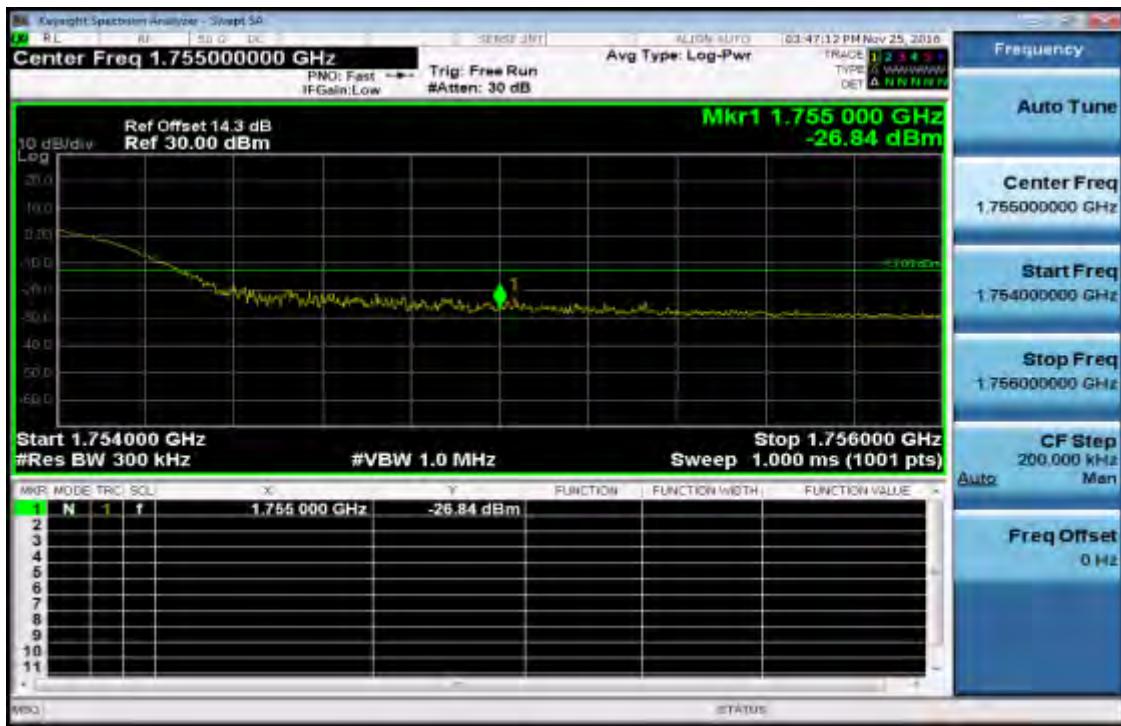
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**Band edge emission at antenna terminals –20MHz BW LTE-Band 4
(QPSK RB Number: 100 Offset: 0) Channel Lowest**



**Band edge emission at antenna terminals –20MHz BW LTE-Band 4
(QPSK RB Number: 100 Offset: 0) Channel Highest**



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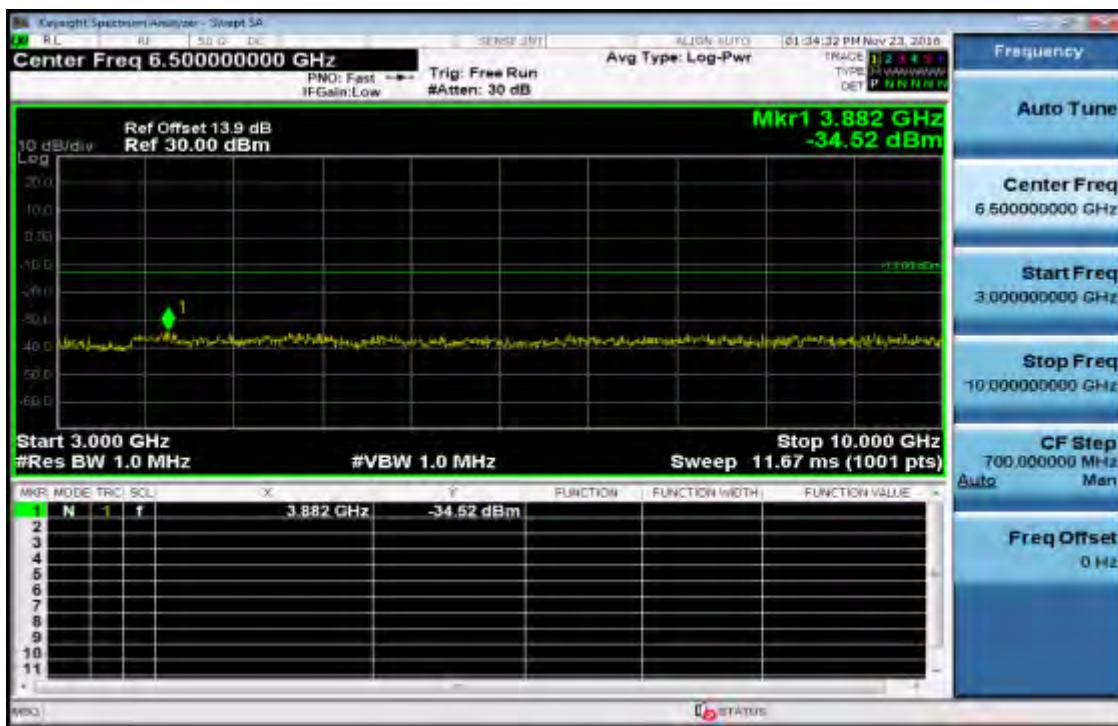
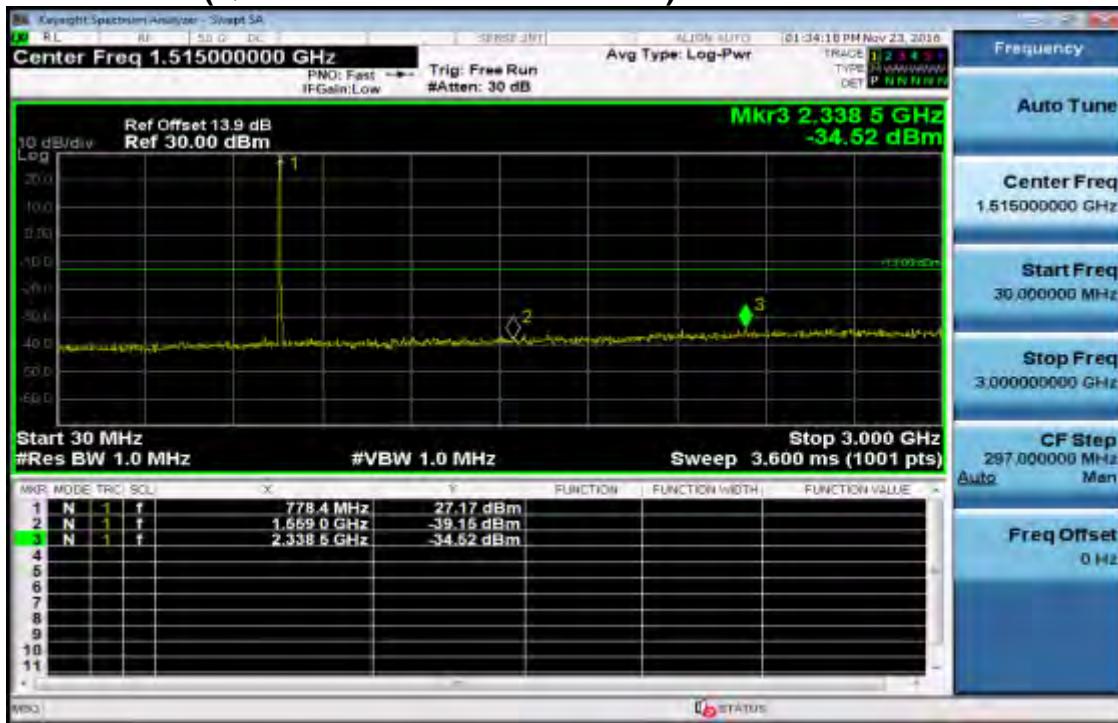
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**Out of Band emission at antenna terminals–5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Lowest**



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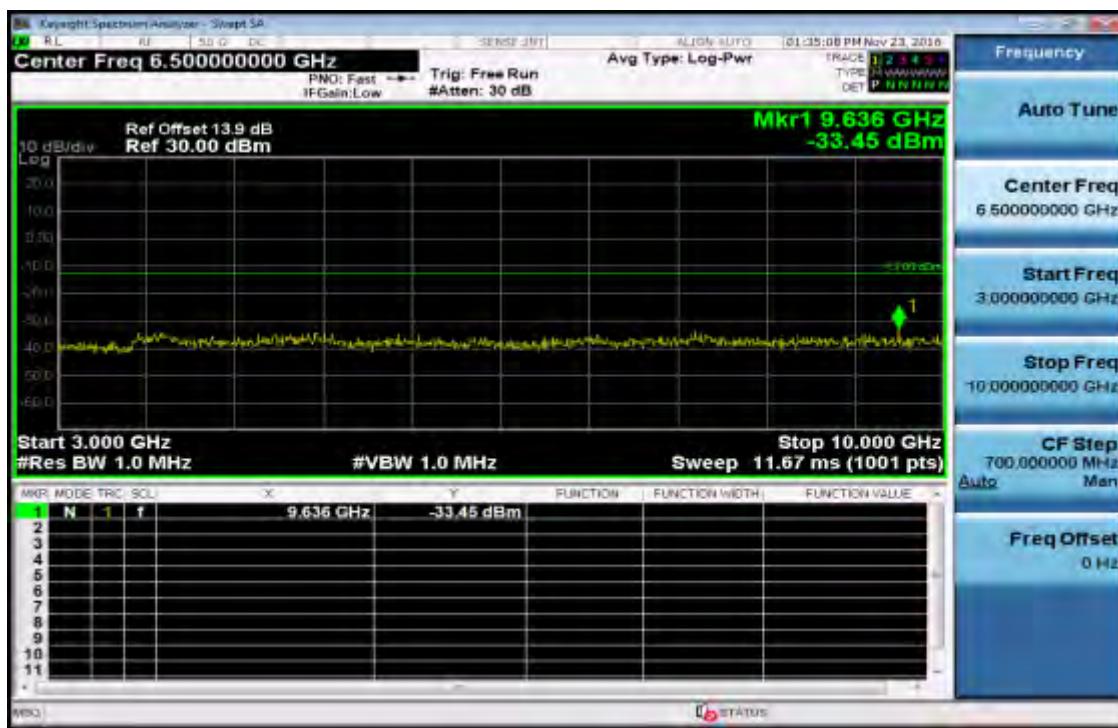
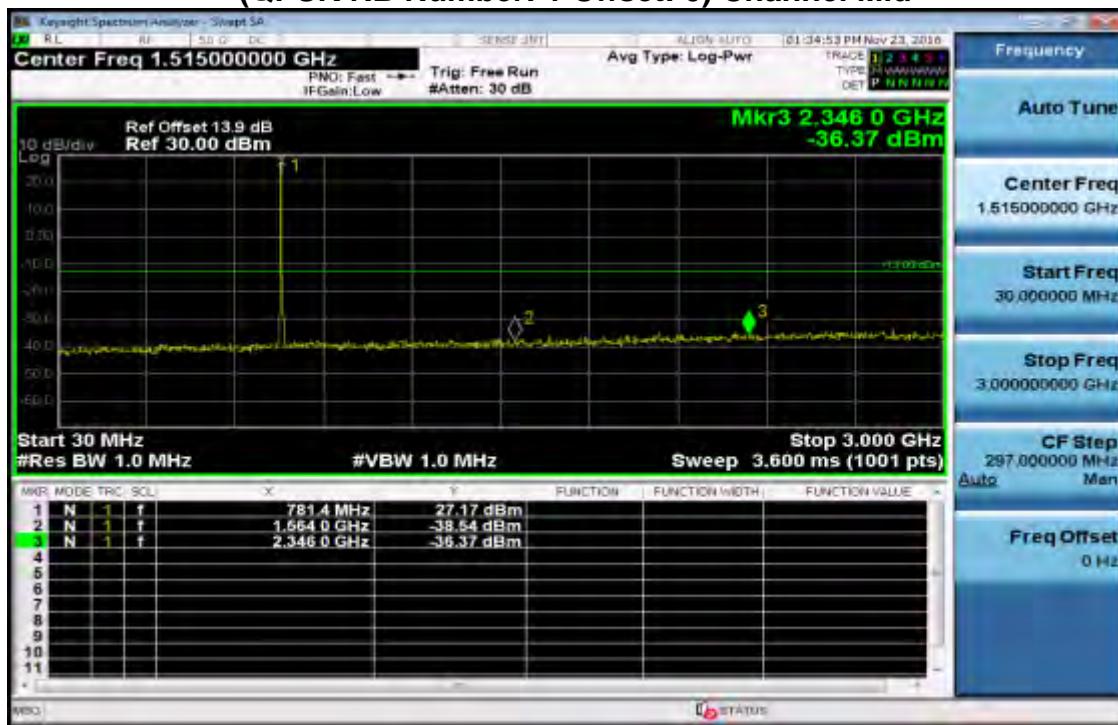
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**Out of Band emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Mid**

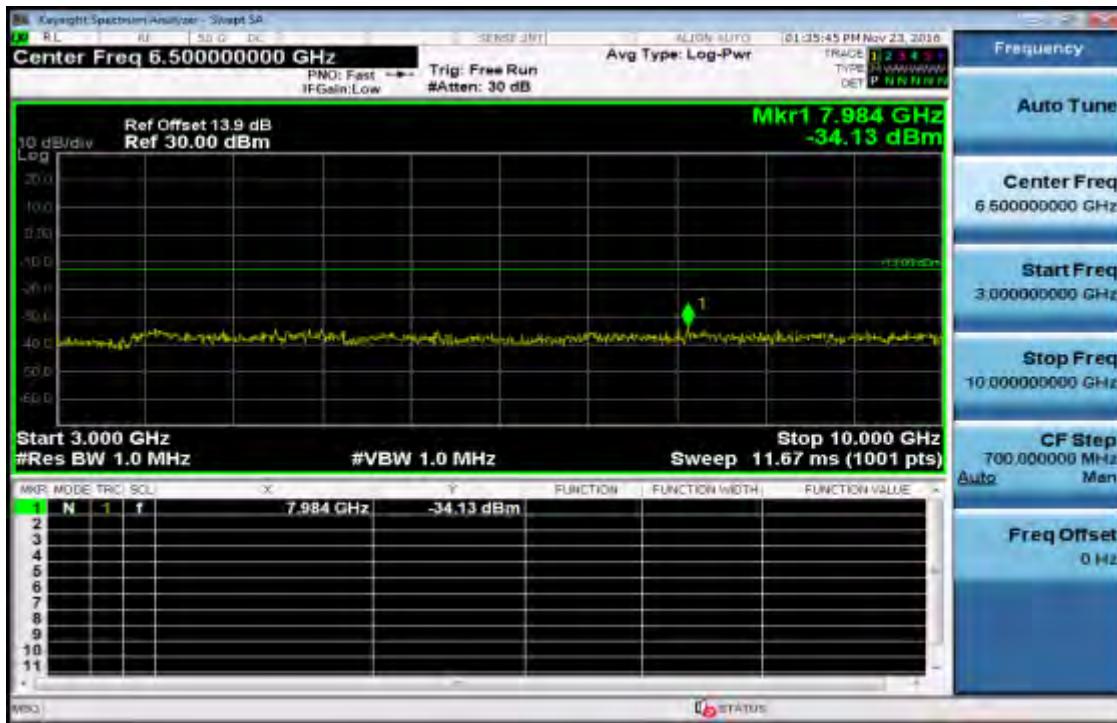
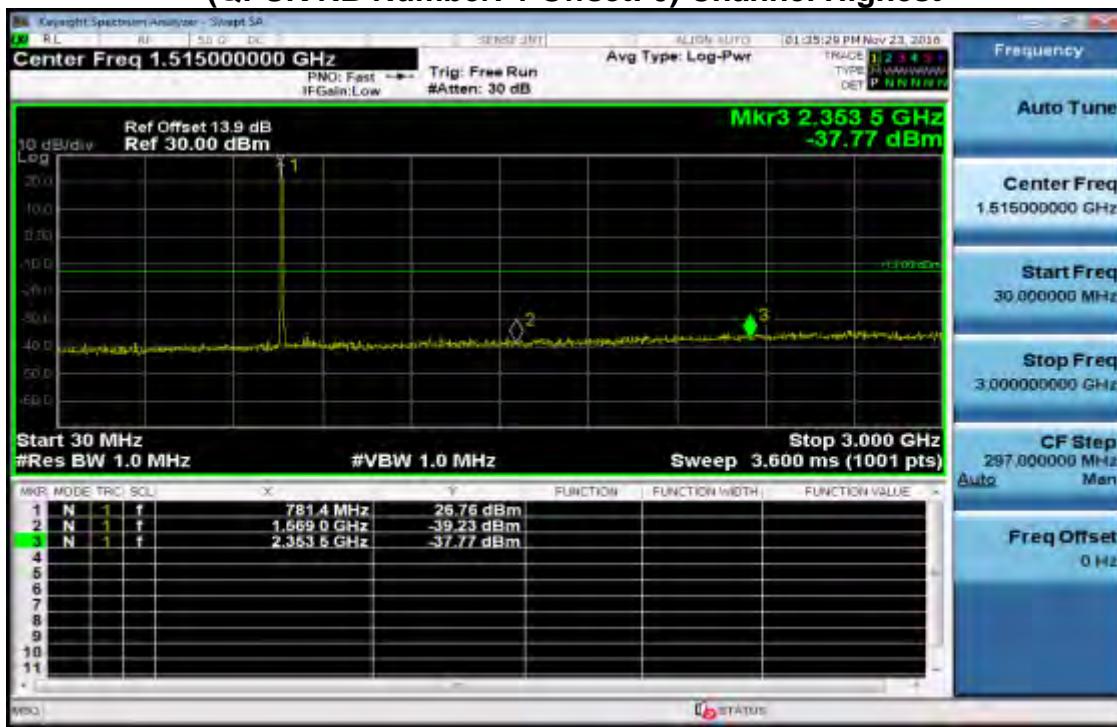


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**Out of Band emission at antenna terminals—5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Highest**



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(QPSK RB Number: 1 Offset: 0) Channel LowestBand edge emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 24) Channel Highest

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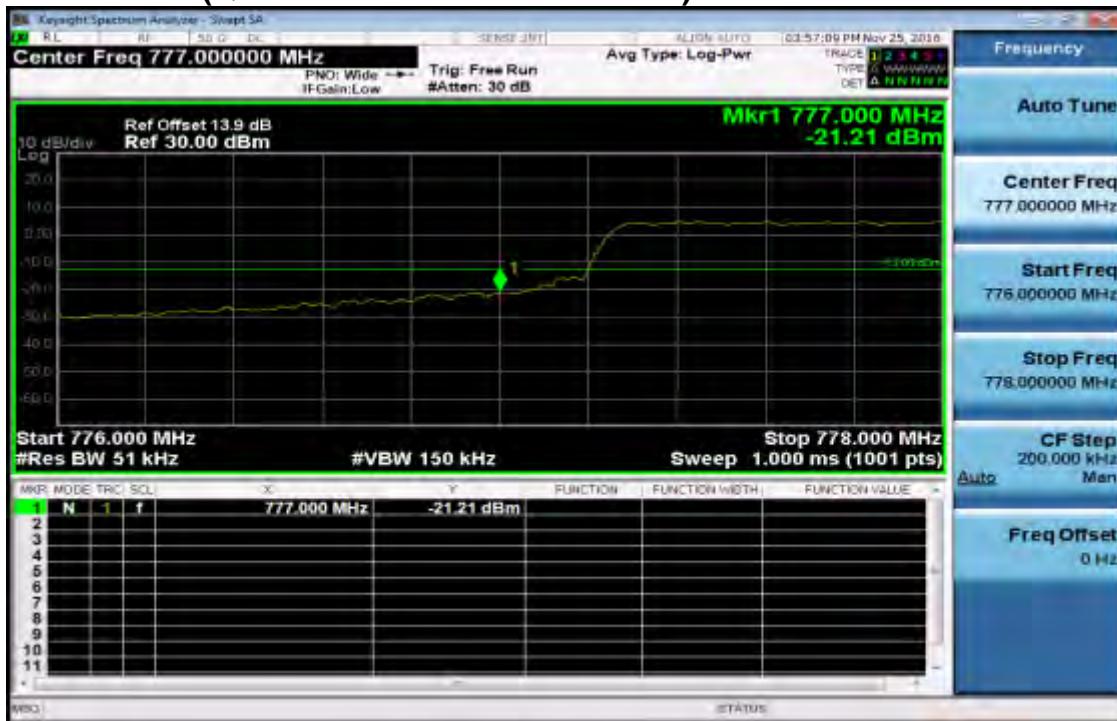
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Band edge emission at antenna terminals –5MHz BW LTE-Band 13 (QPSK RB Number: 25 Offset: 0) Channel Lowest



Band edge emission at antenna terminals –5MHz BW LTE-Band 13 (QPSK RB Number: 25 Offset: 0) Channel Highest



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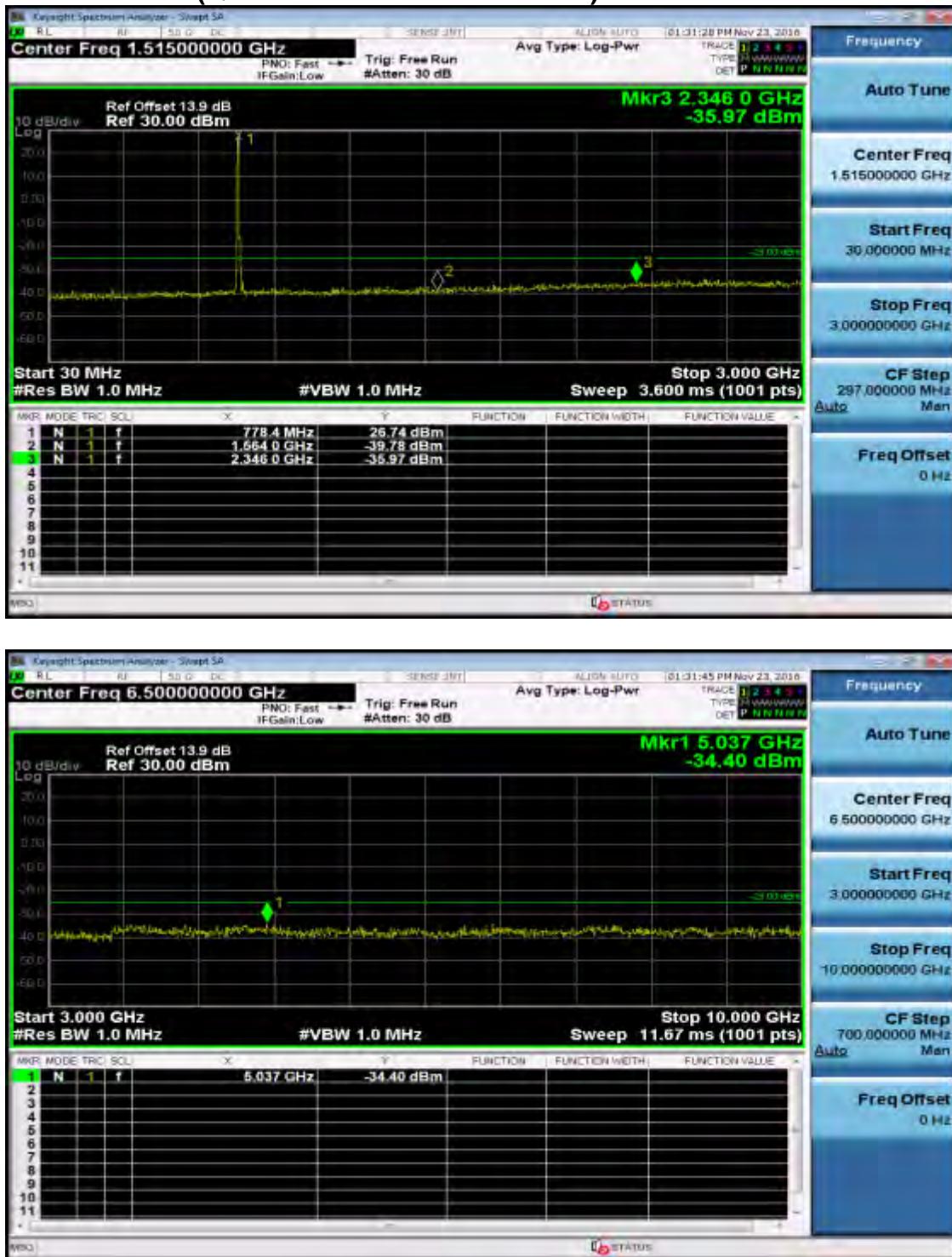
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**Out of Band emission at antenna terminals–10MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Mid**



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Band edge emission at antenna terminals –10MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel LowestBand edge emission at antenna terminals –10MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 49) Channel Highest

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Band edge emission at antenna terminals –10MHz BW LTE-Band 13
(QPSK RB Number: 50 Offset: 0) Channel LowestBand edge emission at antenna terminals –10MHz BW LTE-Band 13
(QPSK RB Number: 50 Offset: 0) Channel Highest

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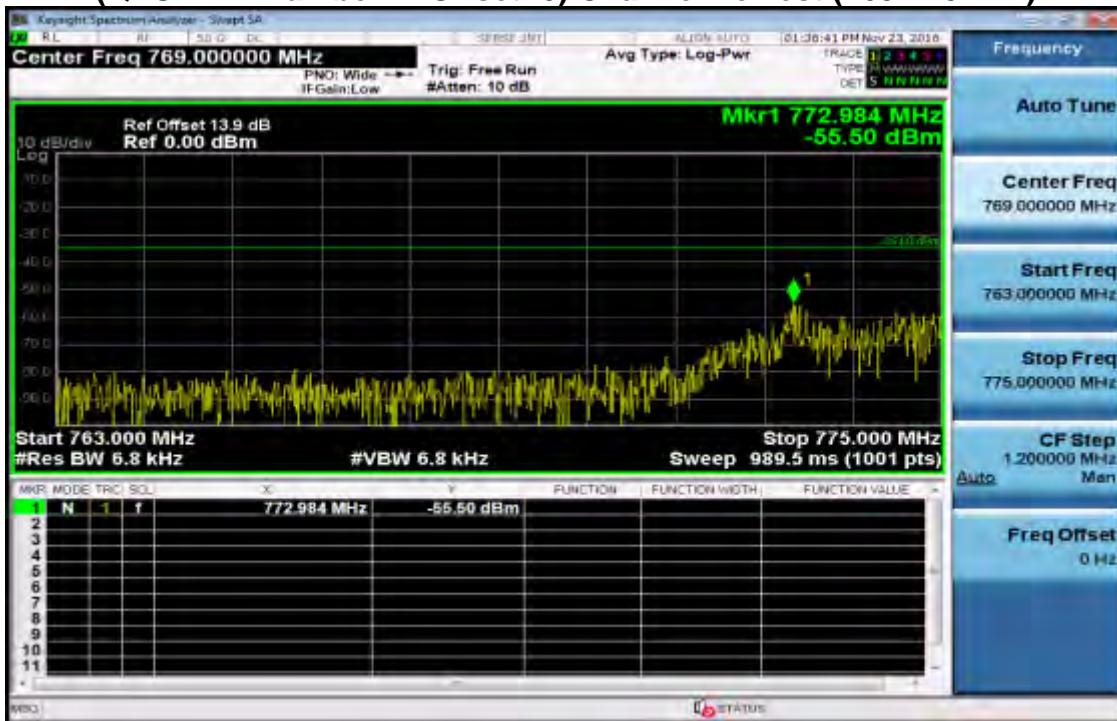
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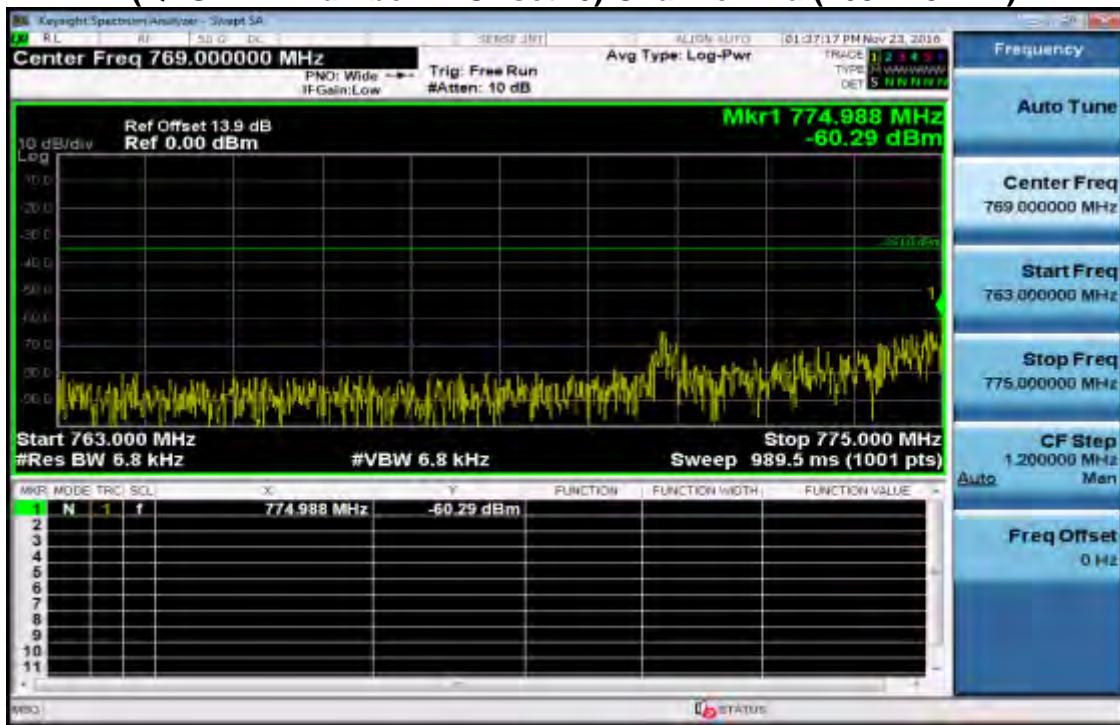
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**Out of Band emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Lowest (763-775MHz)**



**Out of Band emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Mid (763-775MHz)**



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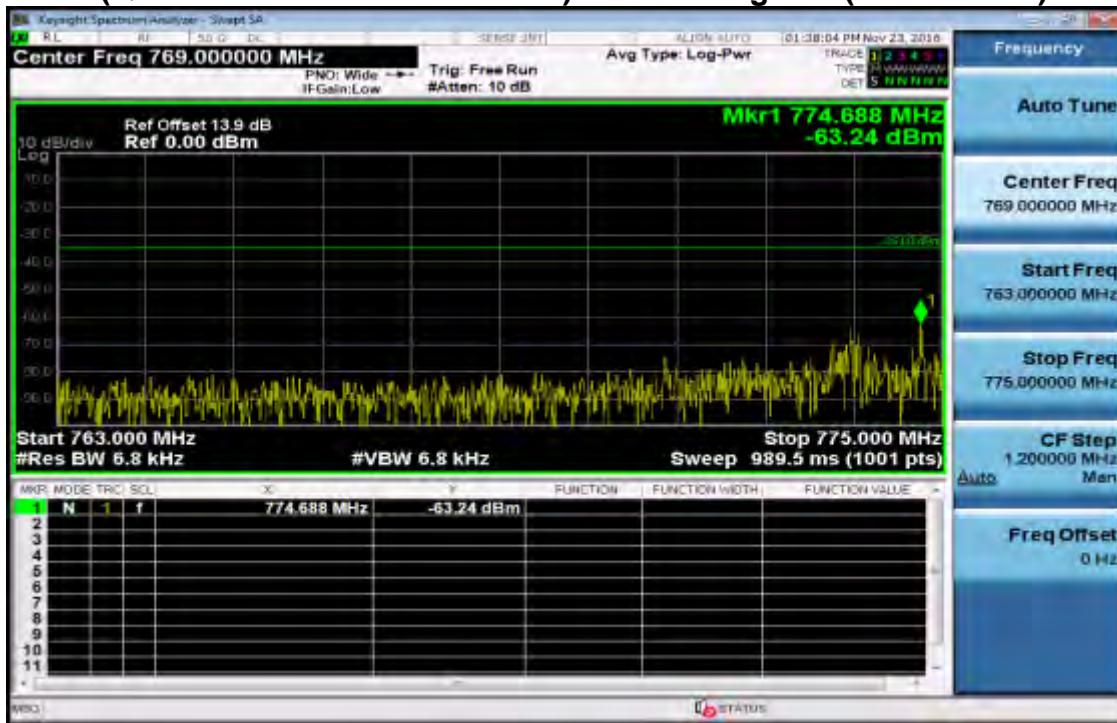
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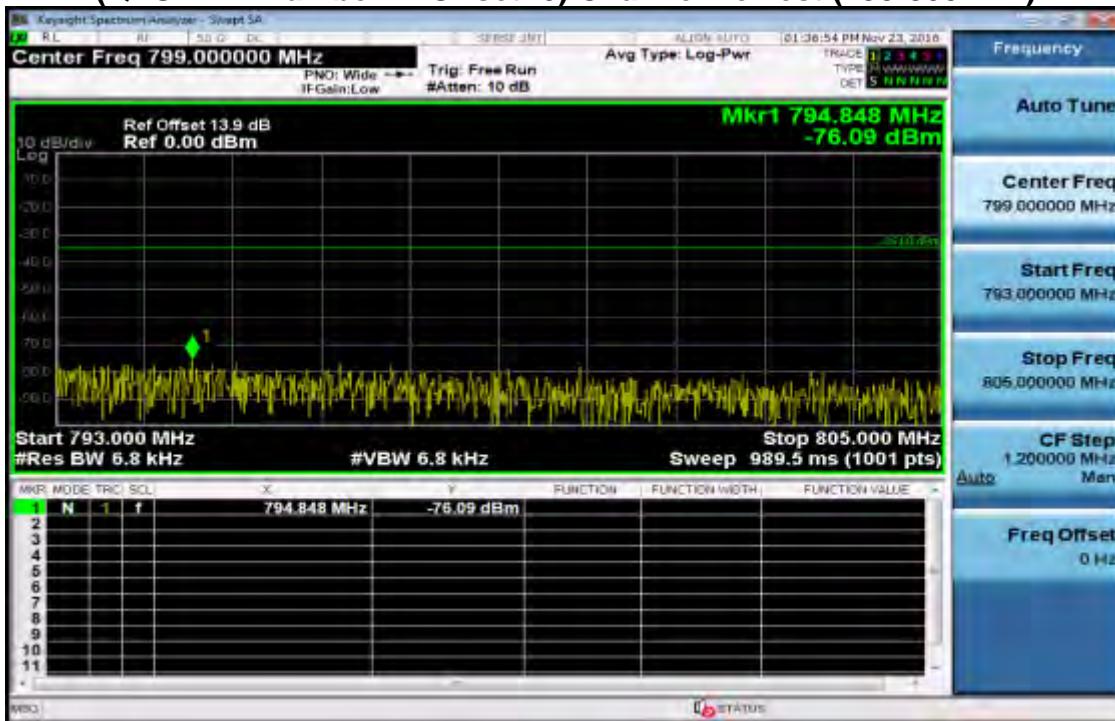
**Out of Band emission at antenna terminals—5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Highest (763-775MHz)**

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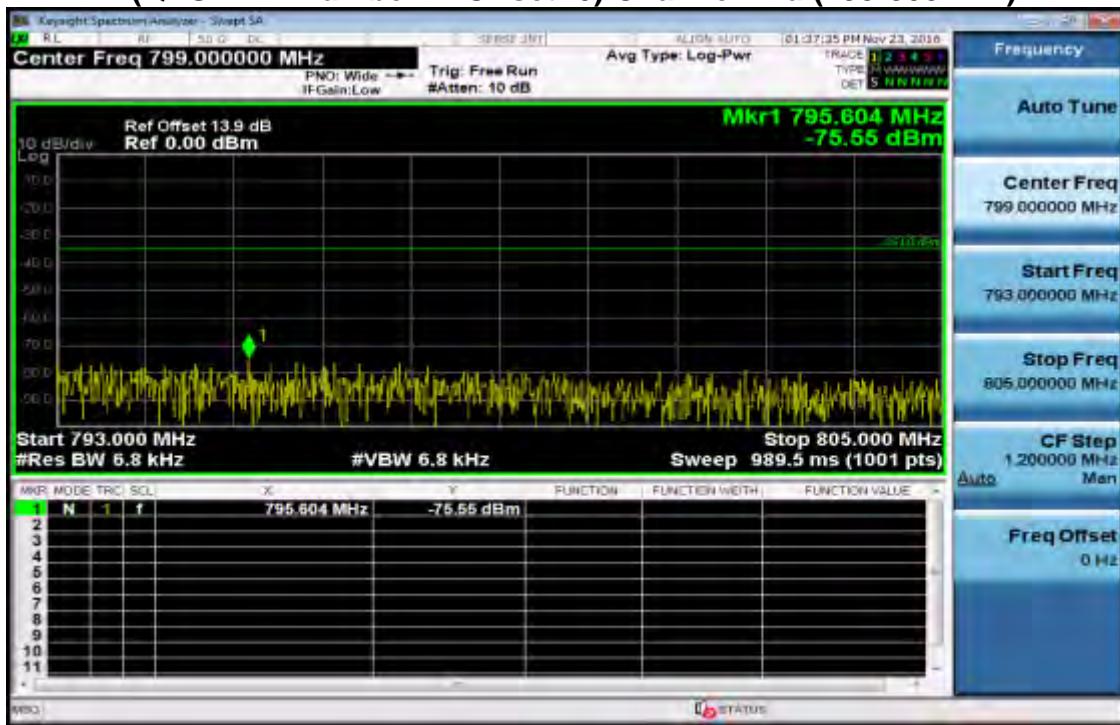
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**Out of Band emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Lowest (793-805MHz)**



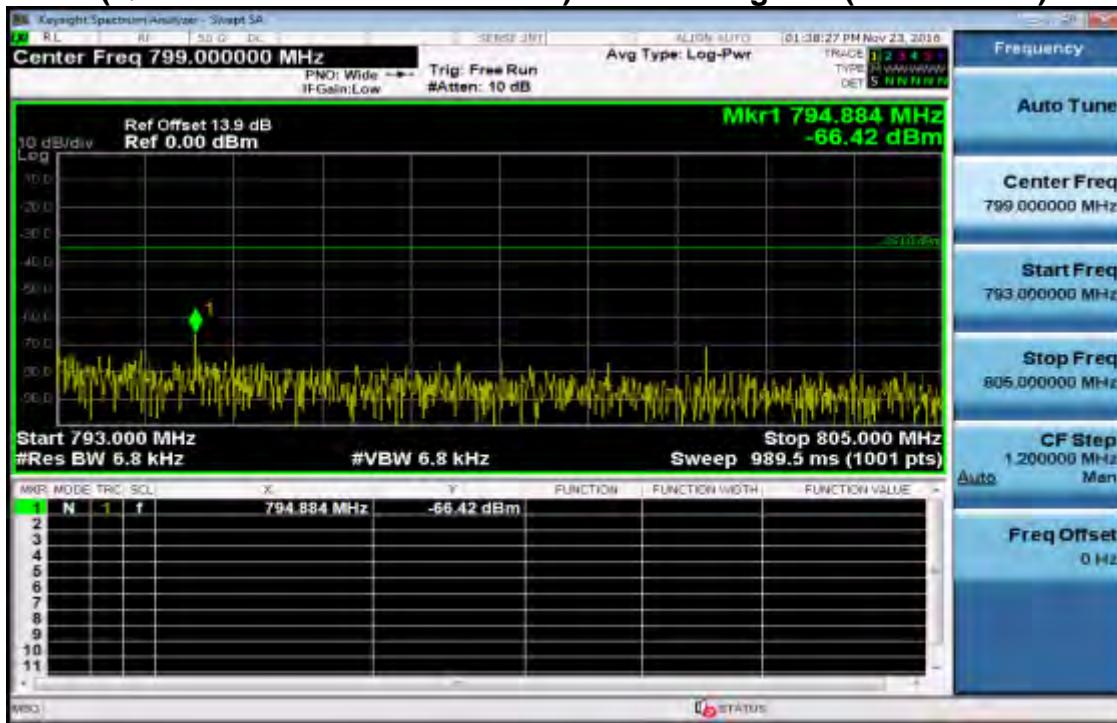
**Out of Band emission at antenna terminals –5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Mid (793-805MHz)**



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**Out of Band emission at antenna terminals—5MHz BW LTE-Band 13
(QPSK RB Number: 1 Offset: 0) Channel Highest (793-805MHz)**

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10. FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

10.1. Standard Applicable

According to FCC §2.1053,

FCC §27.53(h), §27.53(c)(2) the magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under the conditions specified in the instruction manual and/ or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a license's frequency block (-13dBm).

FCC §27.53(c) (4)

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log (P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

Band Edge Measurement:

FCC §27.53(c) (5)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

FCC §27.53(h)

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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FCC §27.53 (f)

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

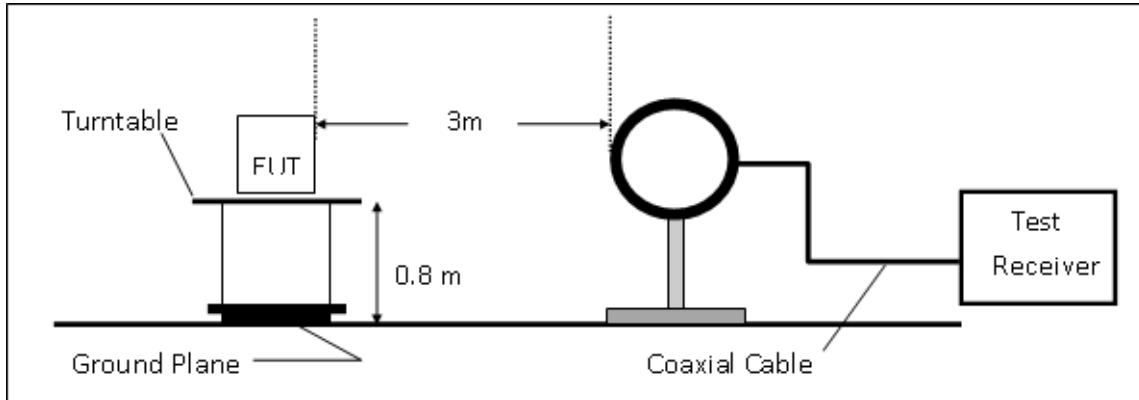
EUT Setup

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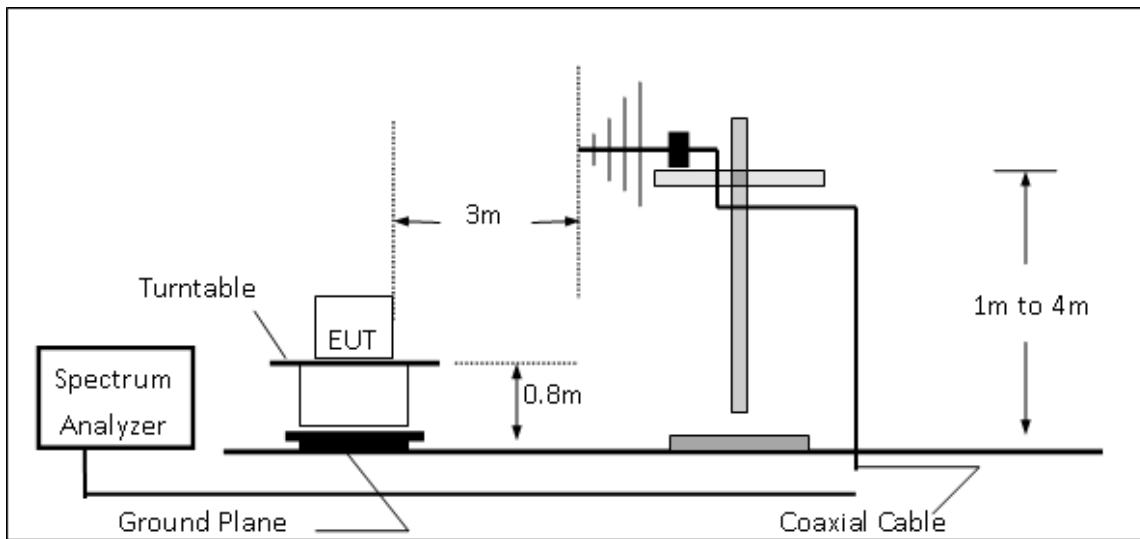
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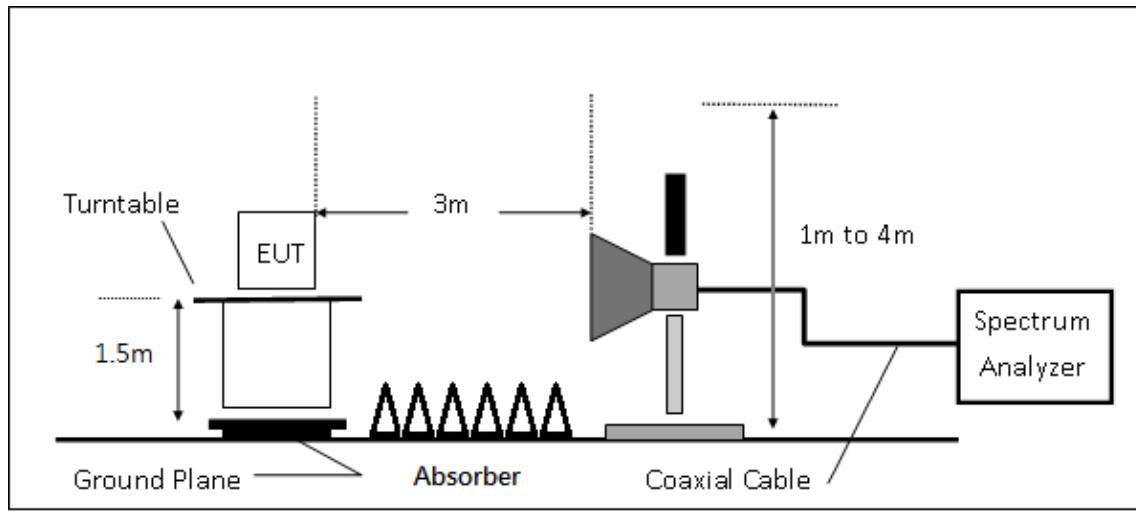
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency from 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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10.2. Measurement Procedure:

The EUT was placed on a non-conductive; the measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

The frequency range up to tenth harmonic was investigated for each of three fundamental frequencies (low, middle and high channels). Once spurious emission was identified, the power of the emission was determined using the substitution method.

The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and the spurious emissions frequency.

ERP= SG Level (dBm) + Antenna Gain (dBd) + Cable Loss (dB)

EIRP = SG Level(dBm) + Antenna Gain(dBi) + Cable Loss(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.
“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.
“---” : denotes Noise Floor.

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10.3. Measurement Equipment Used:

SGS SAC-III					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/12/2016	04/11/2017
Broadband Antenna	VULB	9168	617	10/17/2016	10/16/2017
Broadband Antenna	VULB	9168	628	09/22/2016	09/21/2017
Horn Antenna	Schwarzbeck	9120D	1341	05/27/2016	05/26/2017
Horn Antenna	Schwarzbeck	9120D	673	10/14/2016	10/13/2017
Horn Antenna	Schwarzbeck	BBHA9170	184	12/11/2015	12/10/2016
Horn Antenna	Schwarzbeck	BBHA9170	185	07/18/2016	07/17/2017
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2015	12/11/2016
Pre Amplifier	R&S	SCU-18	10204	12/12/2015	12/11/2016
Pre Amplifier	R&S	SCU-26	100780	12/12/2015	12/11/2016
Pre Amplifier	EMC Instruments	EMC184045B	980135	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2015	12/11/2016
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF27	12/12/2015	12/11/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
Site VSWR	SGS	966 Chamber C	SAC-C	03/04/2016	03/03/2017
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2016	05/03/2017
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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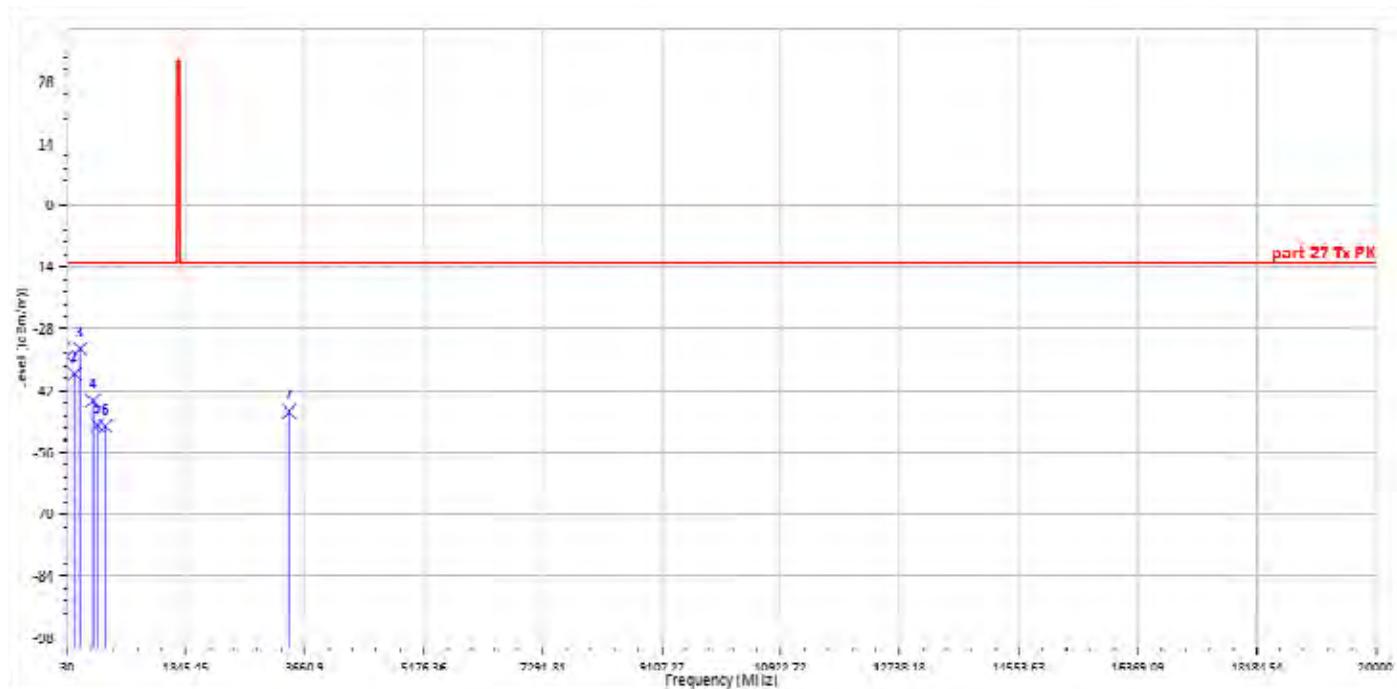
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10.4. Measurement Result:

Radiated Spurious Emission Measurement Result: 10MHz BW LTE-Band 4 (The Worst Case)

Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0 Test Date : 2016/12/2
Fundamental
 Frequency : 1720 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx CH Low Test Engineer : Pony
 EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output		Antenna	Cable	Limit dBm/m	Margin dB
			Level dBm	Gain dBi				
32.91	S	-34.24	-15.92	-18.00	-0.31	-13.01	-21.23	
151.25	S	-38.19	-32.05	-5.37	-0.77	-13.01	-25.18	
239.52	S	-32.55	-32.35	0.72	-0.92	-13.01	-19.54	
429.64	S	-44.28	-43.73	0.69	-1.24	-13.01	-31.27	
498.51	S	-49.80	-49.21	0.81	-1.39	-13.01	-36.79	
622.67	S	-50.07	-48.89	0.20	-1.38	-13.01	-37.06	
3421.00	H	-46.74	-55.31	12.14	-3.57	-13.01	-33.73	

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Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0

Test Date :

2016/12/2

Fundamental

Frequency : 1720 MHz

Temp. / Humi. :

22.7deg_C/57RH

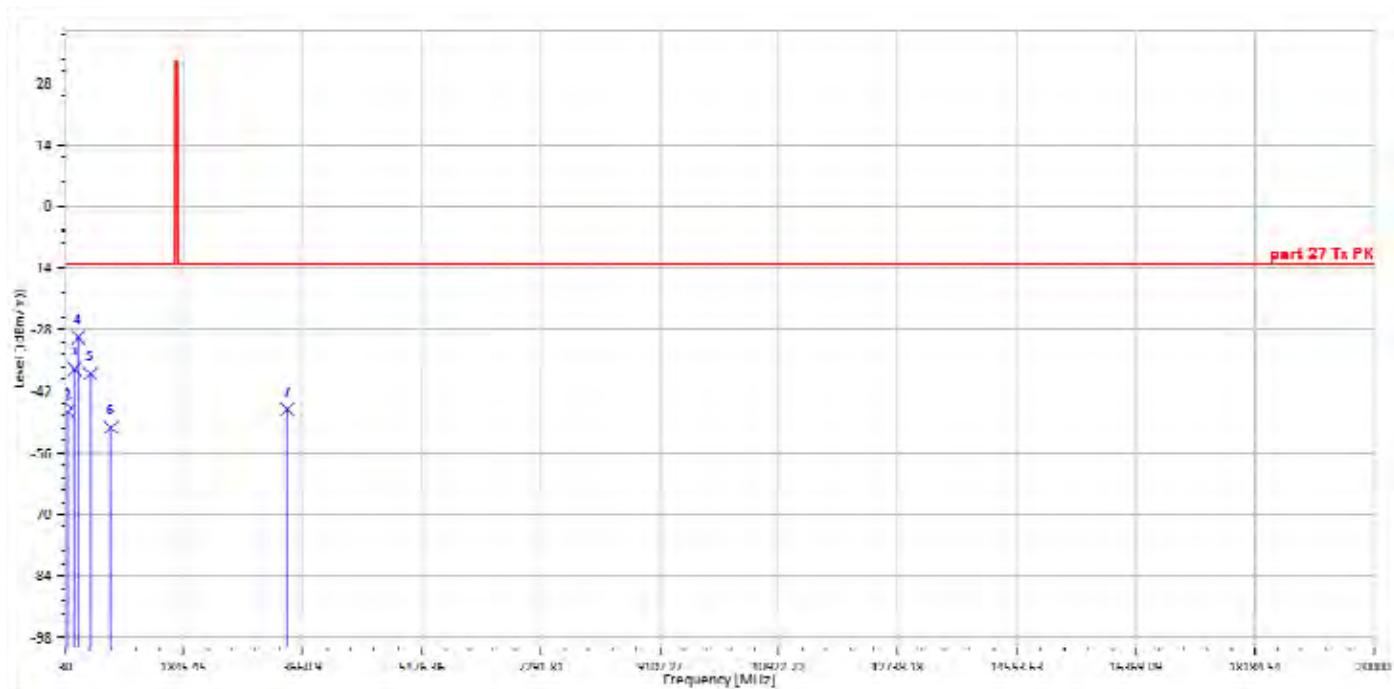
Operation Band : Tx CH Low

Test Engineer :

Pony

EUT Pol. : H

Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit	Margin
						@3m dBm/m	dB
32.91	S	-44.50	-26.19	-18.00	-0.31	-13.01	-31.49
76.56	S	-46.61	-38.12	-7.98	-0.51	-13.01	-33.60
179.38	S	-37.00	-33.81	-2.43	-0.75	-13.01	-23.99
242.43	S	-29.80	-29.59	0.70	-0.92	-13.01	-16.79
420.91	S	-37.94	-37.38	0.71	-1.27	-13.01	-24.93
738.10	S	-50.20	-48.70	-0.05	-1.45	-13.01	-37.19
3421.00	H	-46.14	-54.71	12.14	-3.57	-13.01	-33.13

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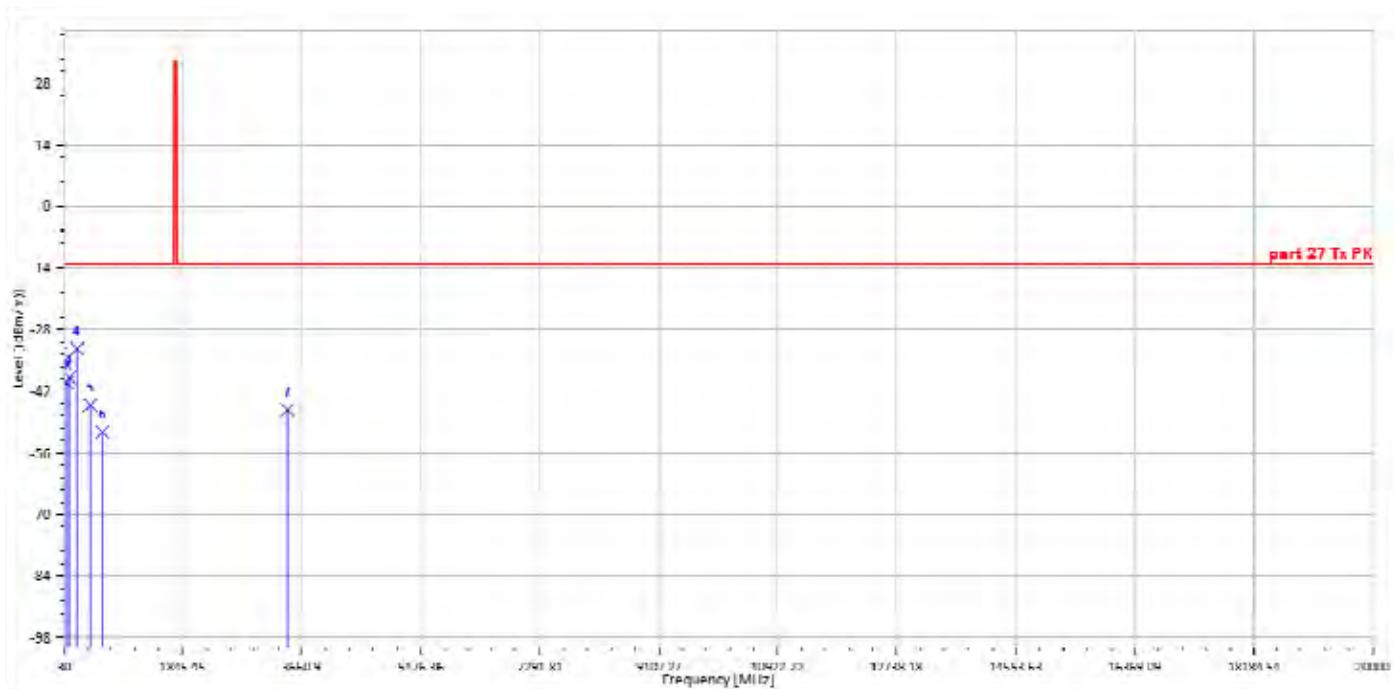
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Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0 Test Date : 2016/12/2
 Fundamental
 Frequency : 1732.5 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx CH Mid Test Engineer : Pony
 EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit	Margin
						@3m dBm/m	dB
33.88	S	-35.25	-17.09	-17.84	-0.32	-13.01	-22.24
74.62	S	-40.08	-30.90	-8.67	-0.50	-13.01	-27.07
115.36	S	-38.86	-32.77	-5.47	-0.61	-13.01	-25.85
240.49	S	-32.34	-32.10	0.68	-0.92	-13.01	-19.33
433.52	S	-45.14	-44.59	0.68	-1.23	-13.01	-32.13
624.61	S	-51.27	-50.10	0.20	-1.37	-13.01	-38.26
3443.00	H	-46.29	-54.90	12.19	-3.57	-13.01	-33.28

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Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0

Test Date :

2016/12/2

Fundamental

Frequency : 1732.5 MHz

Temp. / Humi. :

22.7deg_C/57RH

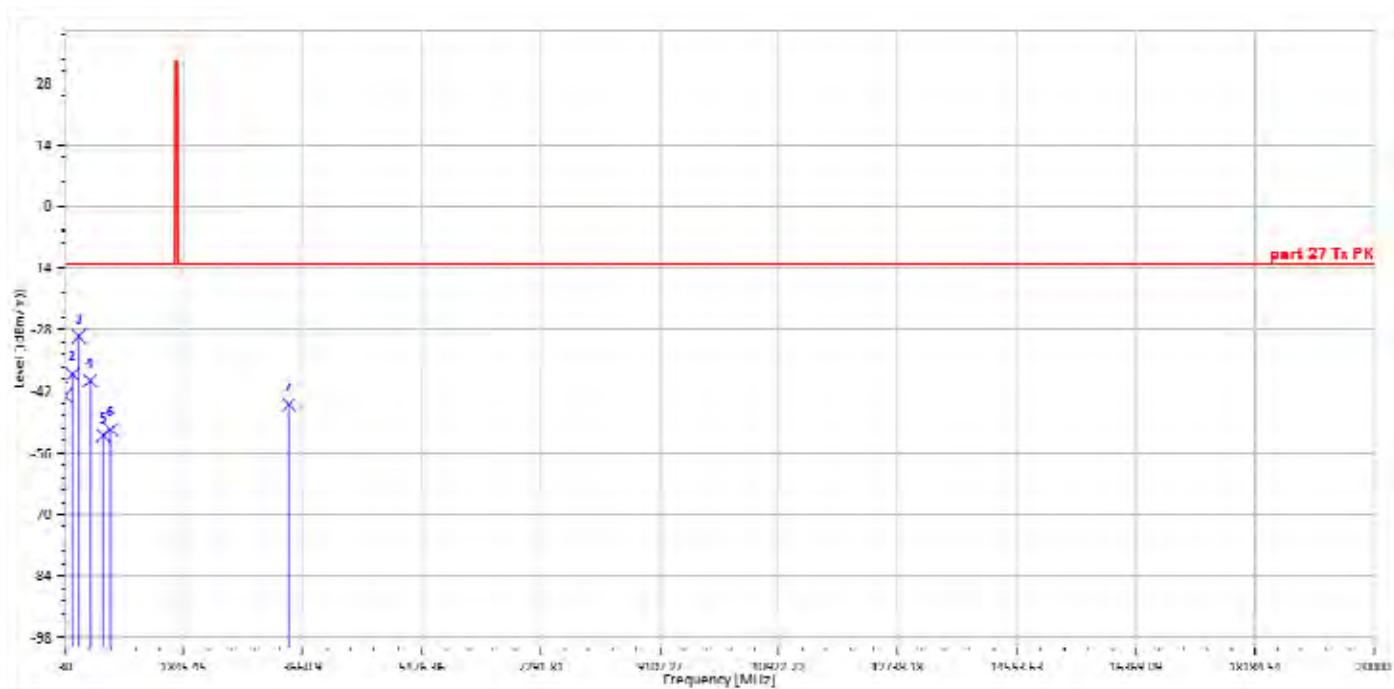
Operation Band : Tx CH Mid

Test Engineer :

Pony

EUT Pol. : H

Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output		Antenna	Cable	Limit dBm/m	Margin dB
			Level dBm	Gain dBi				
33.88	S	-43.01	-24.86	-17.84	-0.32	-13.01	-30.00	
151.25	S	-38.04	-31.89	-5.37	-0.77	-13.01	-25.03	
248.25	S	-29.56	-29.39	0.76	-0.93	-13.01	-16.55	
417.03	S	-39.55	-38.98	0.71	-1.29	-13.01	-26.54	
620.73	S	-52.01	-50.82	0.19	-1.38	-13.01	-39.00	
731.31	S	-50.64	-49.23	0.04	-1.45	-13.01	-37.63	
3450.00	H	-45.04	-53.66	12.20	-3.58	-13.01	-32.03	

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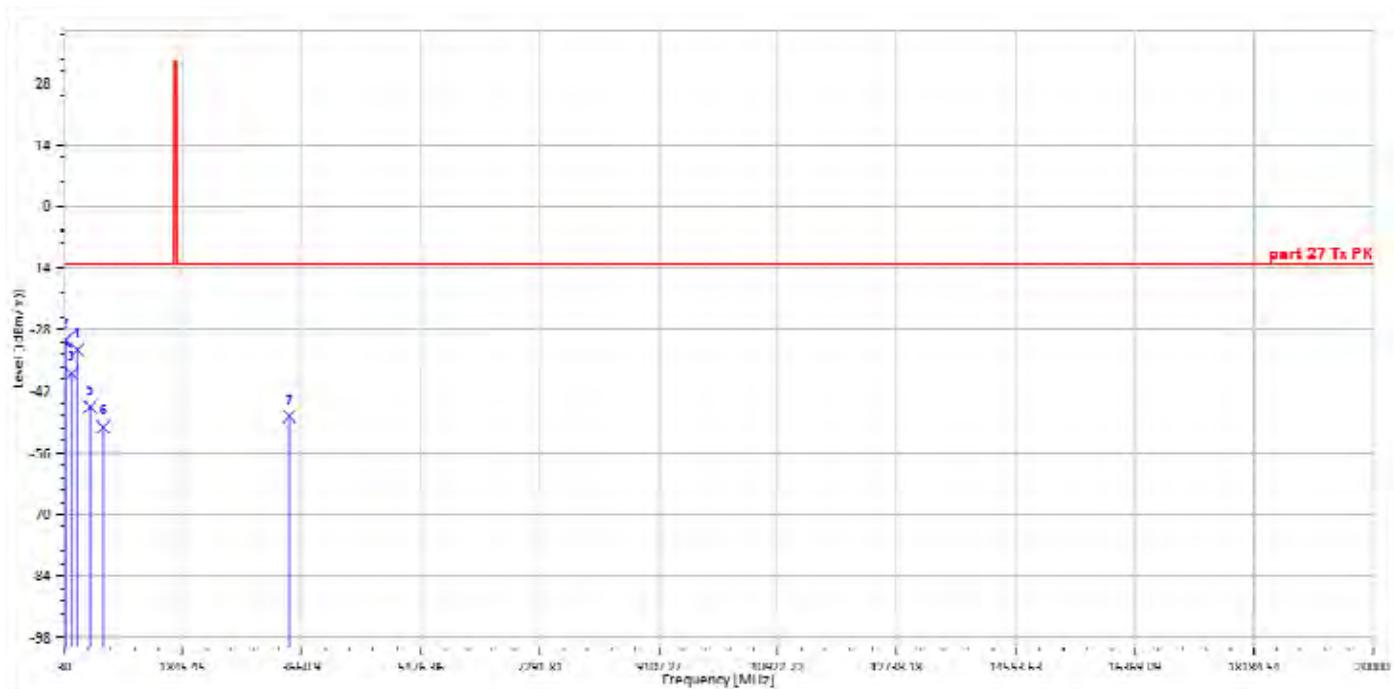
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Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0 Test Date : 2016/12/2
 Fundamental
 Frequency : 1745 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx CH High Test Engineer : Pony
 EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output		Antenna	Cable	Limit dBm/m	Margin dB
			Level dBm	Gain dBi				
42.61	S	-30.63	-13.79	-16.46	-0.38	-13.01	-17.62	
56.19	S	-30.39	-15.95	-13.98	-0.46	-13.01	-17.38	
151.25	S	-37.89	-31.74	-5.37	-0.77	-13.01	-24.88	
241.46	S	-32.57	-32.34	0.69	-0.92	-13.01	-19.56	
431.58	S	-45.56	-45.01	0.69	-1.23	-13.01	-32.55	
636.25	S	-50.09	-48.93	0.22	-1.38	-13.01	-37.08	
3472.00	H	-47.69	-56.36	12.24	-3.58	-13.01	-34.68	

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Operation Mode : LTE_B4_BW_20M_QPSK_RB_1_0

Test Date :

2016/12/2

Fundamental

Frequency : 1745 MHz

Temp. / Humi. :

22.7deg_C/57 RH

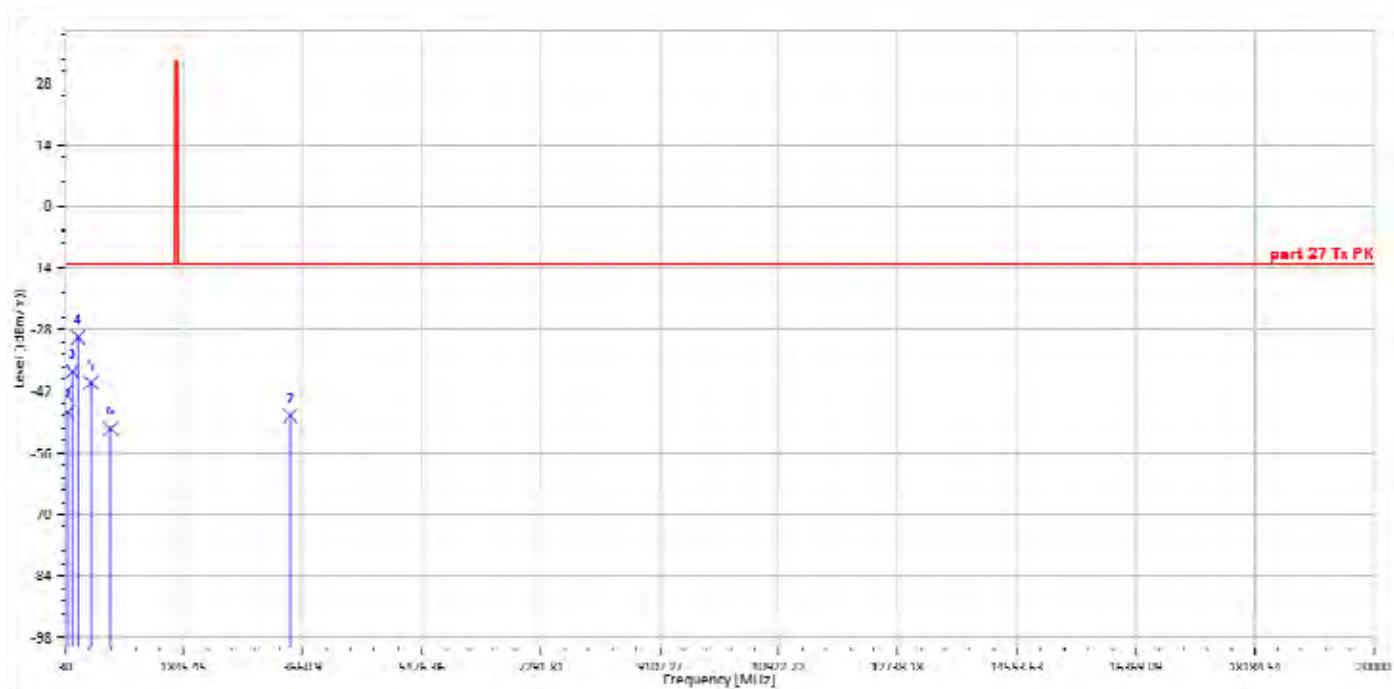
Operation Band : Tx CH High

Test Engineer :

Pony

EUT Pol. : H

Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	EIRP dBm	SG Output		Antenna	Cable	Limit dBm/m	Margin dB
			Level dBm	Gain dBi				
33.88	S	-42.46	-24.30	-17.84	-0.32	-13.01	-29.45	
76.56	S	-46.78	-38.28	-7.98	-0.51	-13.01	-33.77	
149.31	S	-37.48	-31.27	-5.42	-0.78	-13.01	-24.47	
241.46	S	-29.77	-29.54	0.69	-0.92	-13.01	-16.76	
429.64	S	-40.11	-39.56	0.69	-1.24	-13.01	-27.10	
730.34	S	-50.45	-49.06	0.06	-1.45	-13.01	-37.44	
3472.00	H	-47.56	-56.22	12.24	-3.58	-13.01	-34.55	

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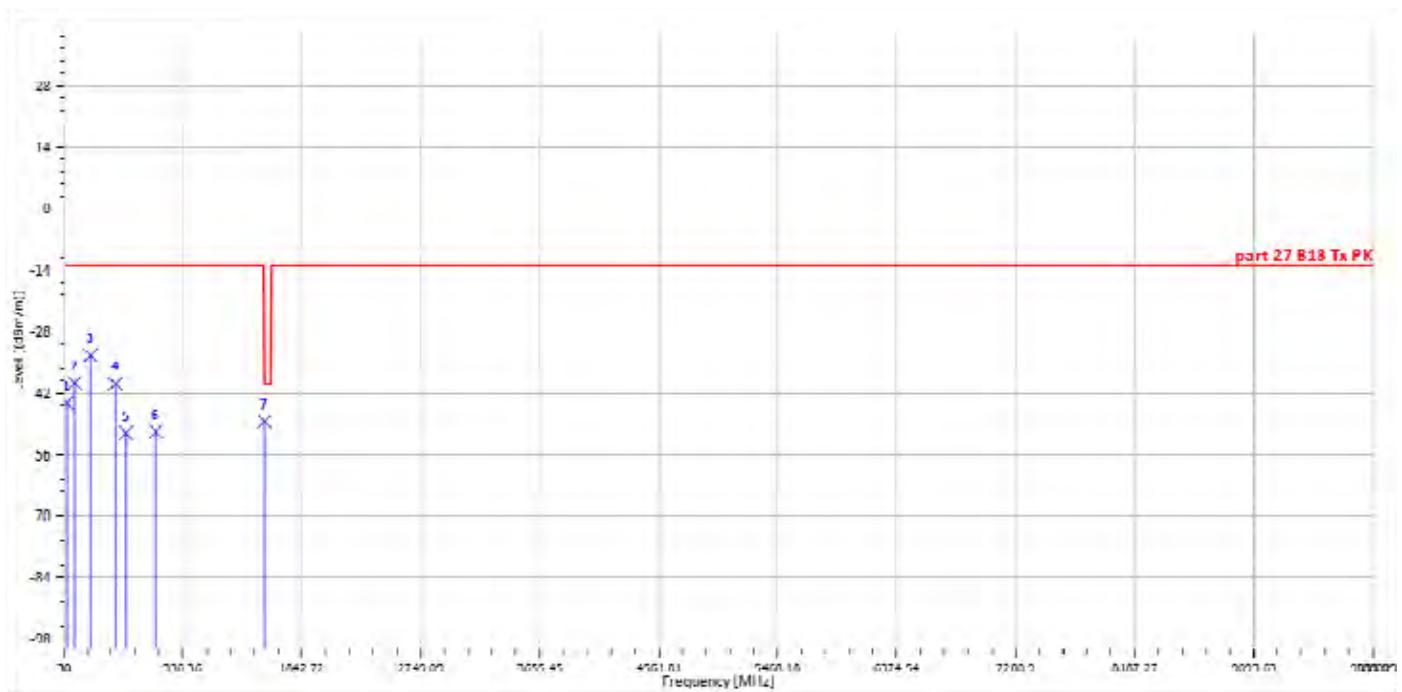
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Radiated Spurious Emission Measurement Result: 10MHz BW LTE-Band 13 (The Worst Case)

Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0 Test Date : 2016/12/2
 Fundamental
 Frequency : 782 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx CH Mid Test Engineer : Pony
 EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	ERP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit	Margin
						@3m dBm/m	dB
55.22	S	-44.25	-29.58	-14.20	-0.46	-13	-31.25
114.39	S	-39.70	-33.66	-5.43	-0.61	-13	-26.70
232.73	S	-33.41	-33.80	1.29	-0.91	-13	-20.41
423.82	S	-39.89	-39.33	0.70	-1.26	-13	-26.89
504.33	S	-51.15	-50.55	0.81	-1.41	-13	-38.15
732.28	S	-50.85	-49.43	0.03	-1.45	-13	-37.85
1560.00	H	-48.50	-54.81	8.69	-2.38	-40	-8.50

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Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0

Test Date :

2016/12/2

Fundamental

Frequency : 782 MHz

Temp. / Humi. :

22.7deg_C/57RH

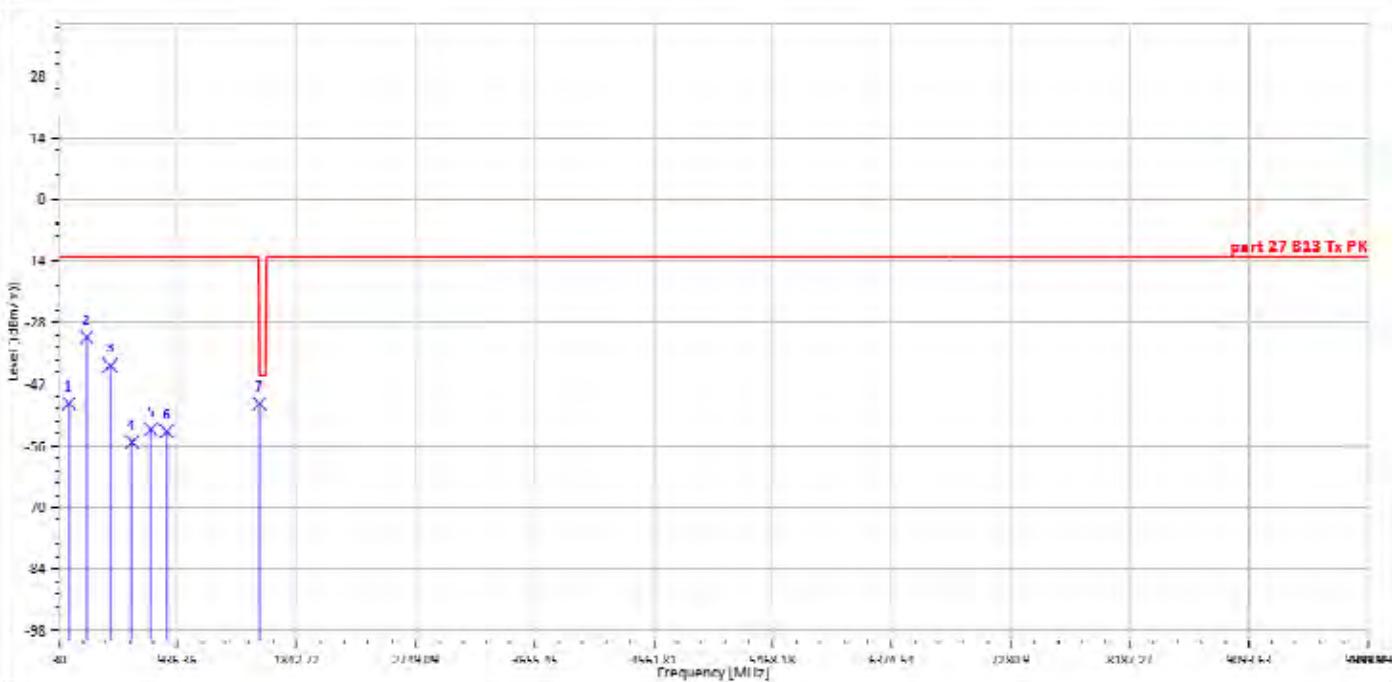
Operation Band : Tx CH Mid

Test Engineer :

Pony

EUT Pol. : H

Measurement Antenna Pol. : Horizontal



Freq. MHz	Note F/H/E/S	ERP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit	Margin
						@3m dBm/m	dB
109.54	S	-46.39	-40.59	-5.21	-0.59	-13	-33.39
242.43	S	-31.28	-31.06	0.70	-0.92	-13	-18.28
422.85	S	-37.69	-37.13	0.70	-1.27	-13	-24.69
589.69	S	-55.11	-53.90	0.27	-1.48	-13	-42.11
733.25	S	-52.30	-50.86	0.01	-1.45	-13	-39.30
850.62	S	-52.73	-51.26	0.19	-1.67	-13	-39.73
1560.00	H	-46.49	-52.79	8.69	-2.38	-40	-6.49

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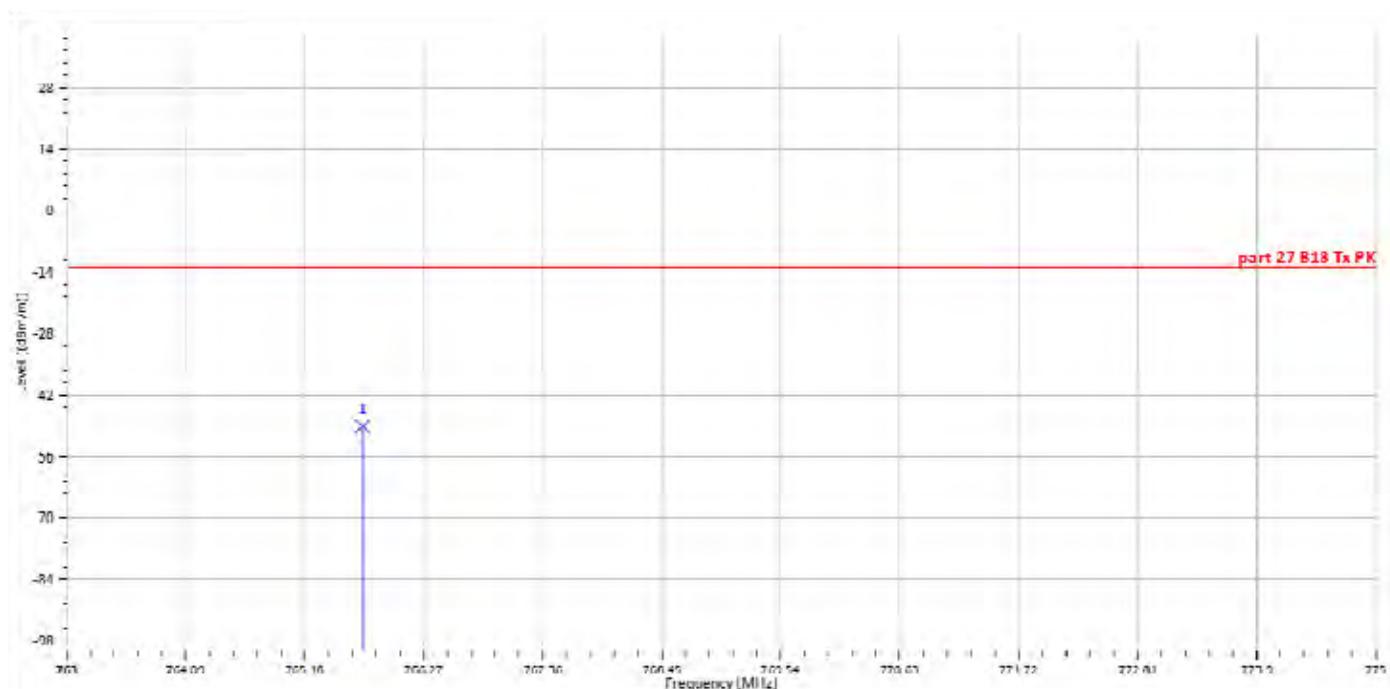
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Radiated Spurious Emission Measurement Result: 10MHz BW LTE-Band13 (763MHz-775MHz)

Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0 Test Date : 2016/12/2
Fundamental
Frequency : 782 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq.	Note	ERP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Level dBm	Gain dBi	Loss dB	@3m dBm/m	dB
765.71	S	-49.17	-47.51	-0.07	-1.59	-13	-36.17

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Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0 Test Date : 2016/12/2

Fundamental

Frequency : 782 MHz

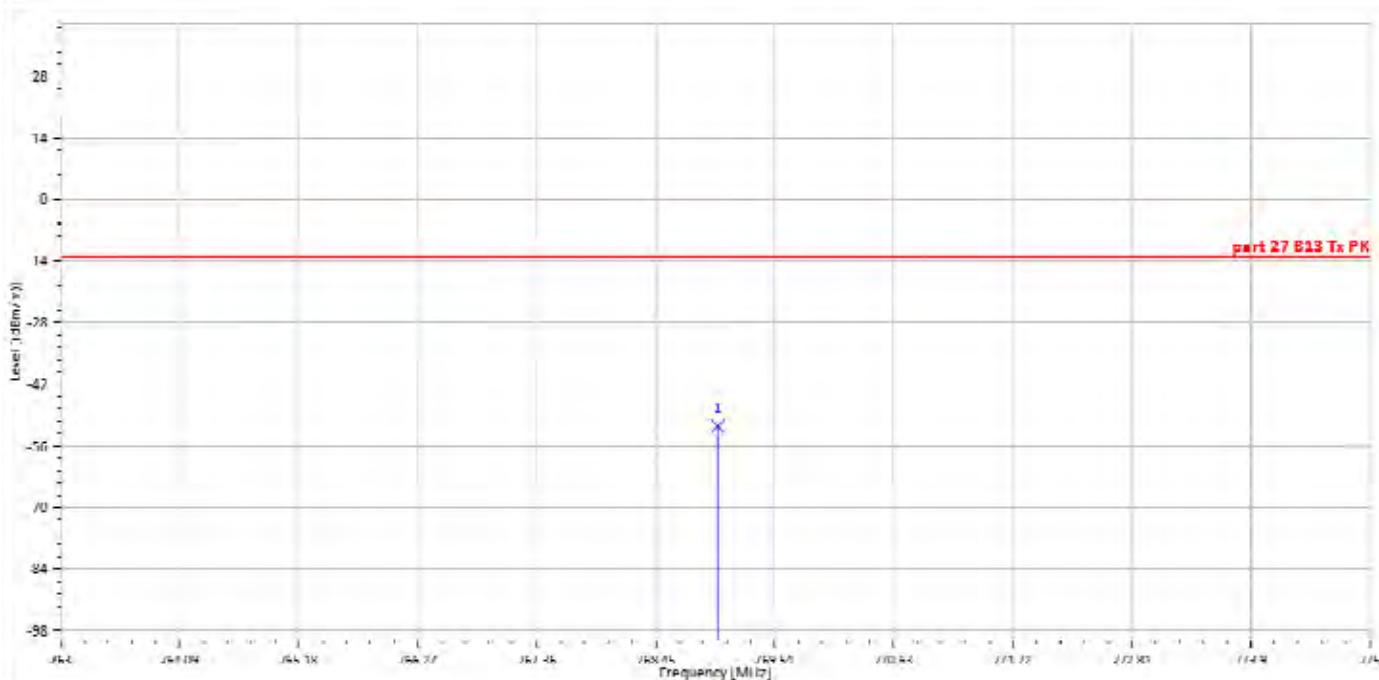
Temp. / Humi. : 22.7deg_C/57RH

Operation Band : Tx CH Mid

Test Engineer : Pony

EUT Pol. : H

Measurement Antenna Pol. : Horizontal



Freq.	Note	ERP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Level dBm	Gain dBi	Loss dB	@3m dBm/m	dB
769.02	S	-51.51	-49.86	-0.04	-1.61	-13	-38.51

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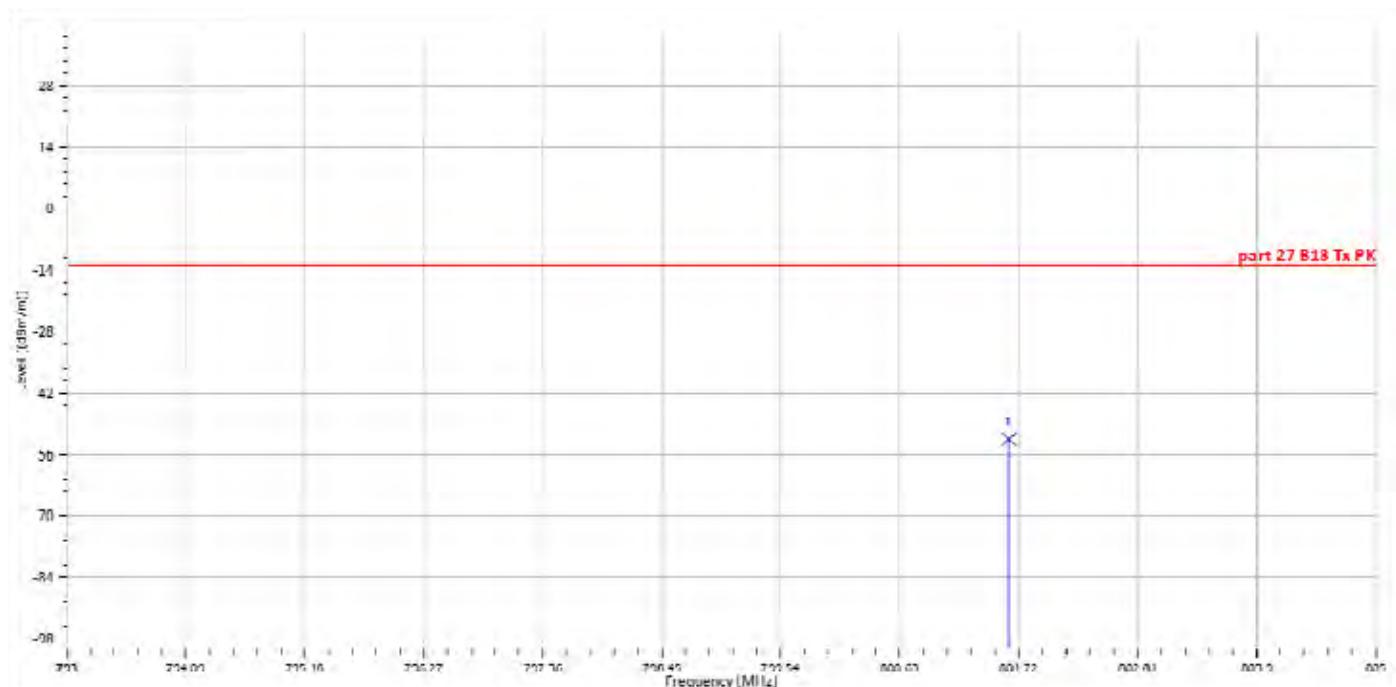
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**Radiated Spurious Emission Measurement Result: 10MHz BW LTE-Band13
(793MHz-805MHz)**

Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0 Test Date : 2016/12/2
Fundamental
Frequency : 782 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx CH Mid Test Engineer : Pony
EUT Pol. : H Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	ERP dBm	SG Output Level dBm	Antenna Gain dBi	Cable Loss dB	Limit	Margin
						@3m dBm/m	dB
801.64	S	-52.46	-51.10	0.24	-1.60	-13	-39.46

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Operation Mode : LTE_B13_BW_10M_16QAM_RB_1_0 Test Date : 2016/12/2

Fundamental

Frequency : 782 MHz

Temp. / Humi. :

22.7deg_C/57RH

Operation Band : Tx CH Mid

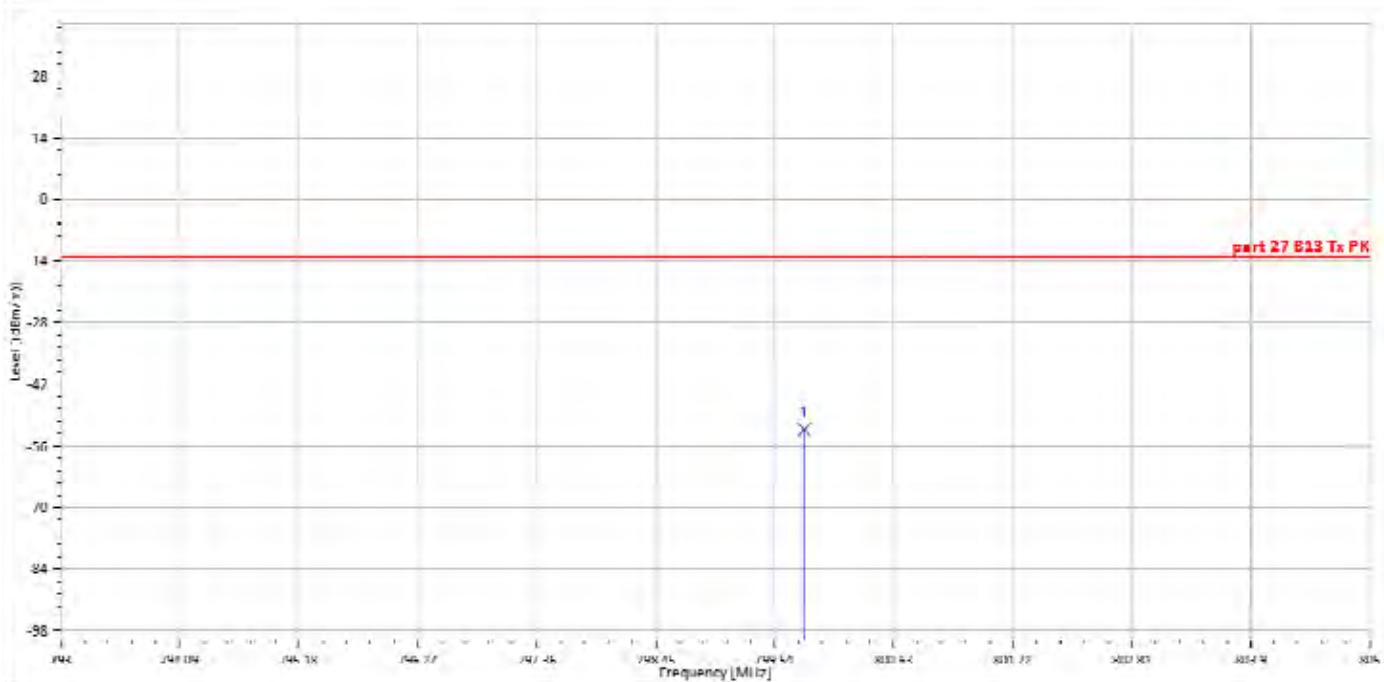
Test Engineer :

Pony

EUT Pol. : H

Measurement Antenna Pol. :

Horizontal



Freq.	Note	ERP	SG Output	Antenna	Cable	Limit	Margin
MHz	F/H/E/S	dBm	Level dBm	Gain dBi	Loss dB	@3m dBm/m	dB
799.82	S	-52.33	-50.97	0.24	-1.60	-13	-39.33

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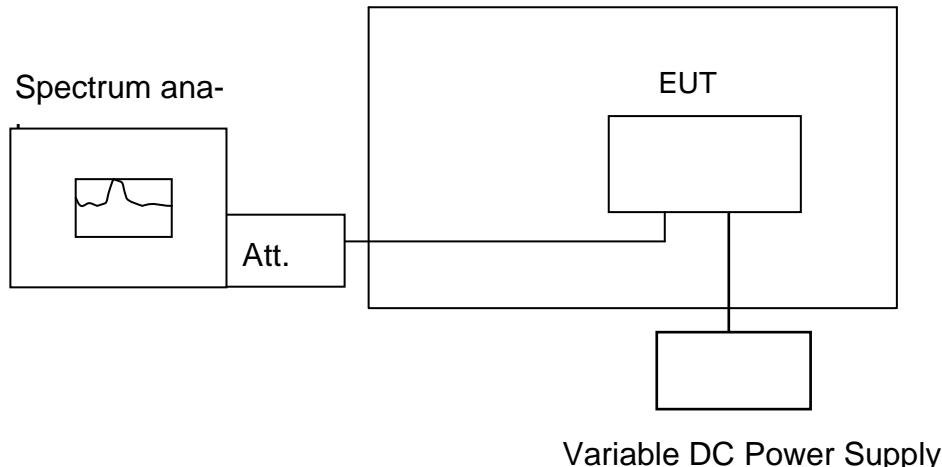
11. FREQUENCY STABILITY MEASUREMENT

11.1. Standard Applicable:

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

11.2. Test Set-up:

Temperature Chamber



Note: Measurement setup for testing on Antenna connector

11.3. Measurement Procedure:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

Set chamber temperature to 25°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (+/- 15%) and endpoint as declared by the manufacturer, record the maximum frequency change.

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11.4. Measurement Equipment Used:

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/16/2016	06/15/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Communication Tester	R&S	CMU200	120239	11/25/2015	11/24/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017

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11.5. Measurement Result:

FREQUENCY ERROR vs. VOLTAGE

Reference Frequency:		LTEB4 Mid Channel	1732.5 MHz	20M QPSK CH 20175
Limit: +/- 2.5 ppm = Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ()	(MHz)		
4.37	25	1732.5	-5	4331
3.8	25	1732.5	0	4331
3.23	25	1732.5	14.2	4331
3 (End Point)	25	1732.5	12.9	4331

FREQUENCY ERROR vs. TEMPERATURE

Reference Frequency:		LTEB4 Mid Channel	1732.5 MHz	20M QPSK CH 20175
Limit: +/- 2.5 ppm = Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
Vdc	Temperature ()	(MHz)		
3.8	-30	1732.5	-0.5	4331
3.8	-20	1732.5	11	4331
3.8	-10	1732.5	-2.4	4331
3.8	0	1732.5	5.2	4331
3.8	10	1732.5	1.3	4331
3.8	20	1732.5	0	4331
3.8	30	1732.5	-3.3	4331
3.8	40	1732.5	8.6	4331
3.8	50	1732.5	11.8	4331

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FREQUENCY ERROR vs. VOLTAGE

Reference Frequency: LTEB13 Mid Channel			782.0	MHz 10M QPSK CH 23230
Limit: +/- 2.5 ppm = Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
	Temperature ()	(MHz)		
4.37	25	781.999988	-31	1955
3.8	25	782.000019	0	1955
3.23	25	782.000011	-8	1955
3 (End Point)	25	782.000015	-4	1955

FREQUENCY ERROR vs. TEMPERATURE

Reference Frequency: LTEB13 Mid Channel			782.0	MHz 10M QPSK CH 23230
Limit: +/- 2.5 ppm = Hz				
Power Supply	Environment	Frequency	Delta (Hz)	Limit (Hz)
	Temperature ()	(MHz)		
3.8	-30	781.999991	-27	1955
3.8	-20	781.999989	-29	1955
3.8	-10	781.999993	-25	1955
3.8	0	782.000012	-6	1955
3.8	10	781.999992	-26	1955
3.8	20	782.000018	0	1955
3.8	30	782.000014	-4	1955
3.8	40	782.000007	-11	1955
3.8	50	782.000013	-5	1955

Note: The battery is rated 3.8Vdc.

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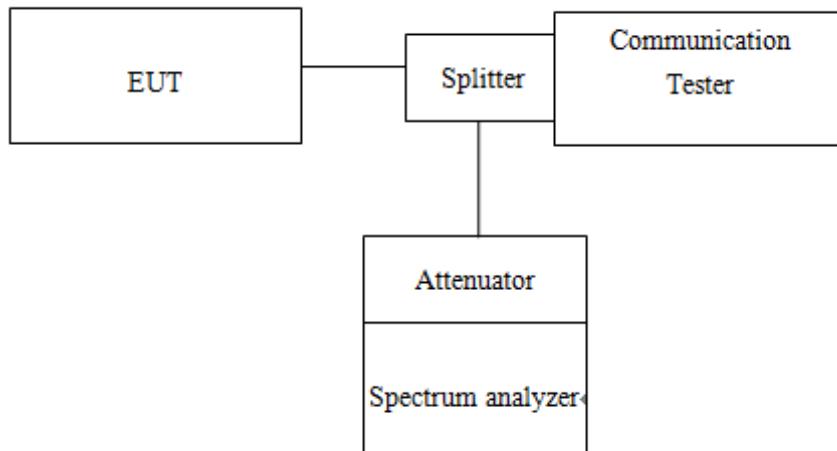
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12. PEAK TO AVERAGE RATIO

12.1. Standard Applicable

The peak-to-average ratio (PAR) of the transmission may not exceed 13dB.

12.2. Test SET-UP



12.3. Measurement Procedure

1. KDB 971168 D01 is employed as the following procedure is proper adjusted accordingly;
2. Set resolution/measurement bandwidth \geq signal's occupied bandwidth; & internal =1ms
3. Set the number of counts to a value that stabilizes the measured CCDF curve.

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12.4. Measurement Equipment Used

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	04/14/2016	04/13/2017
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/12/2015	12/11/2016
Temperature Chamber	TERCHY	MHK-120LK	1020582	06/16/2016	06/15/2017
DC Block	PASTERNACK	PE8210	RF29	12/12/2015	12/11/2016
Splitter	RF-LAMBAD	RFLT2W1G18G	RF35	12/12/2015	12/11/2016
Attenuator	WOKEN	218FS-10	RF23	12/12/2015	12/11/2016
DC Power Supply	Agilent	E3640A	MY53140006	05/04/2016	05/03/2017
Communication Tester	R&S	CMU200	120239	11/25/2015	11/24/2016
Communication Tester	Anritsu	MT8820C	6201107337	05/25/2016	05/24/2017

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12.5. Measurement Result

Tabular Results:

LTE BAND 4							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	Peak-to-Average Ratio (dB)		Frequency (MHz)	CH	Peak-to-Average Ratio (dB)	
		16QAM	LIMIT			16QAM	LIMIT
1712.5	19957	6.1	13	1715.0	20000	6.11	13
1732.5	20175	4.92	13	1732.5	20175	5.35	13
1752.5	20375	5.92	13	1750.0	20350	5.95	13

LTE BAND 4							
Channel bandwidth: 15MHz				Channel bandwidth: 20MHz			
Frequency (MHz)	CH	Peak-to-Average Ratio (dB)		Frequency (MHz)	CH	Peak-to-Average Ratio (dB)	
		16QAM	LIMIT			16QAM	LIMIT
1717.5	20025	6.21	13	1720.0	20050	6.72	13
1732.5	20175	5.75	13	1732.5	20175	6.46	13
1747.5	20325	6.06	13	1745.0	20300	6.7	13

LTE BAND 13							
Channel bandwidth: 5MHz				Channel bandwidth: 10MHz			
Frequency (MHz)	CH	Peak-to-Average Ratio (dB)		Frequency (MHz)	CH	Peak-to-Average Ratio (dB)	
		16QAM	LIMIT			16QAM	LIMIT
779.5	23205	5.14	13				
782.0	23230	5.85	13				
782.0	23255	6.23	13				
				23230	782	5.91	13

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Measurement Results:

5MHz BW LTE-Band 4 16QAM Channel Low



5MHz BW LTE-Band 4 16QAM Channel Mid



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5MHz BW LTE-Band 4 16QAM Channel High



10MHz BW LTE-Band 4 16QAM Channel Low



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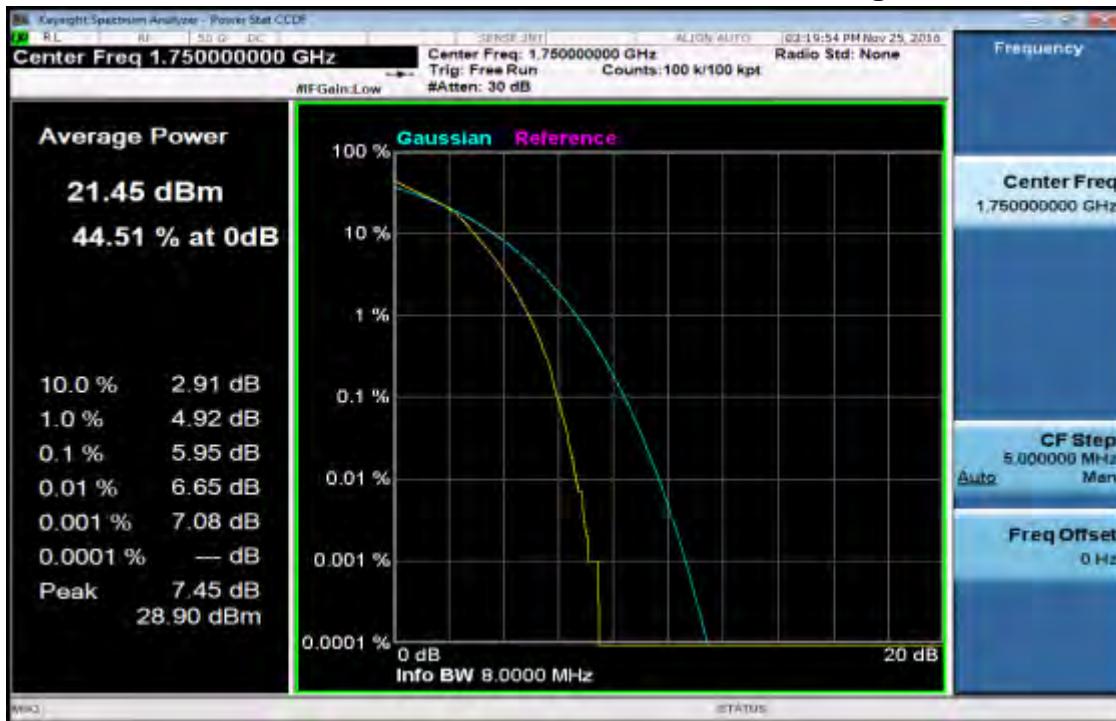
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10MHz BW LTE-Band 4 16QAM Channel Mid



10MHz BW LTE-Band 4 16QAM Channel High



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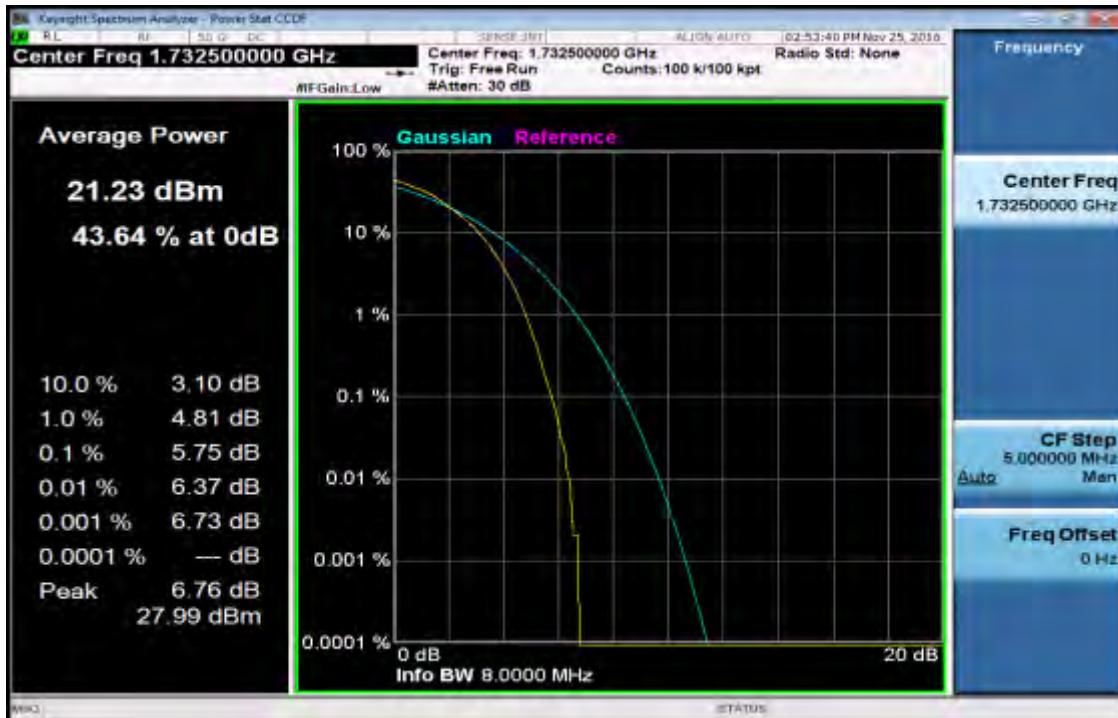
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15MHz BW LTE-Band 4 16QAM Channel Low



15MHz BW LTE-Band 4 16QAM Channel Mid



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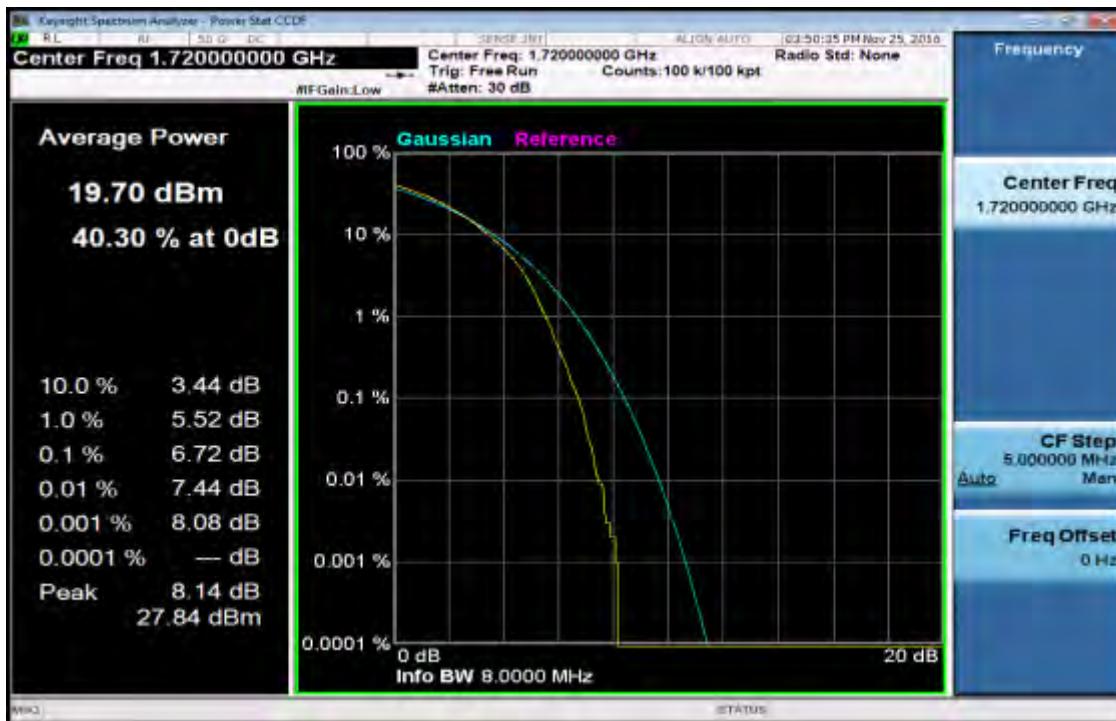
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15MHz BW LTE-Band 4 16QAM Channel High



20MHz BW LTE-Band 4 16QAM Channel Low



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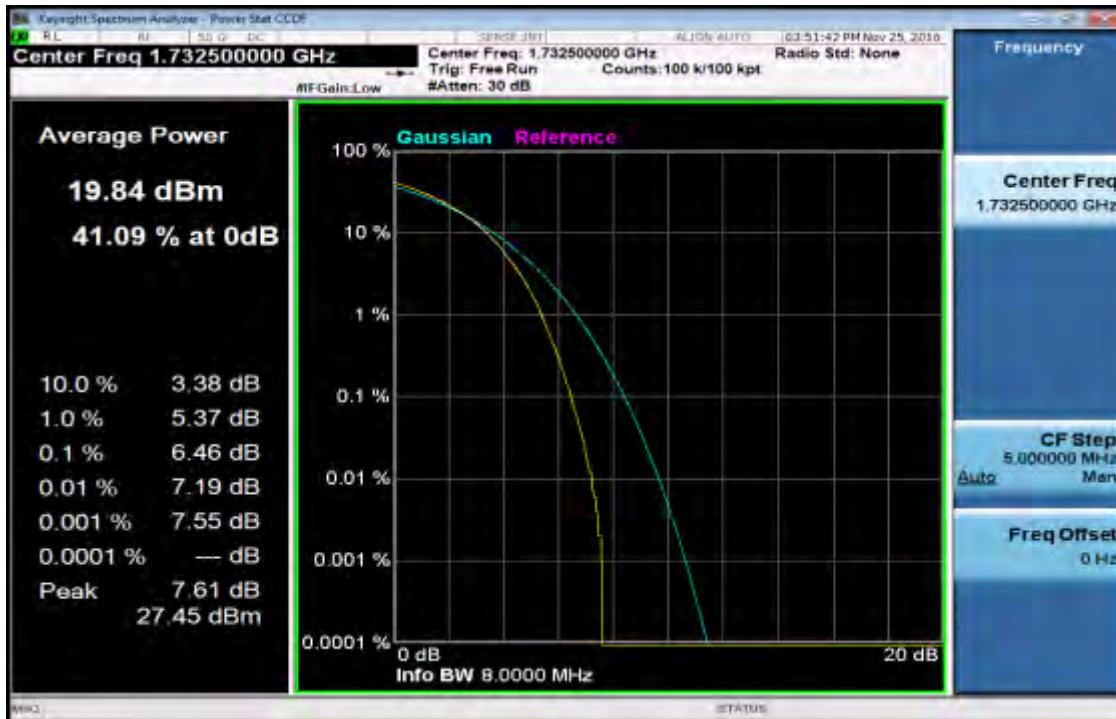
台灣檢驗科技股份有限公司

t (886-2) 2299-3279

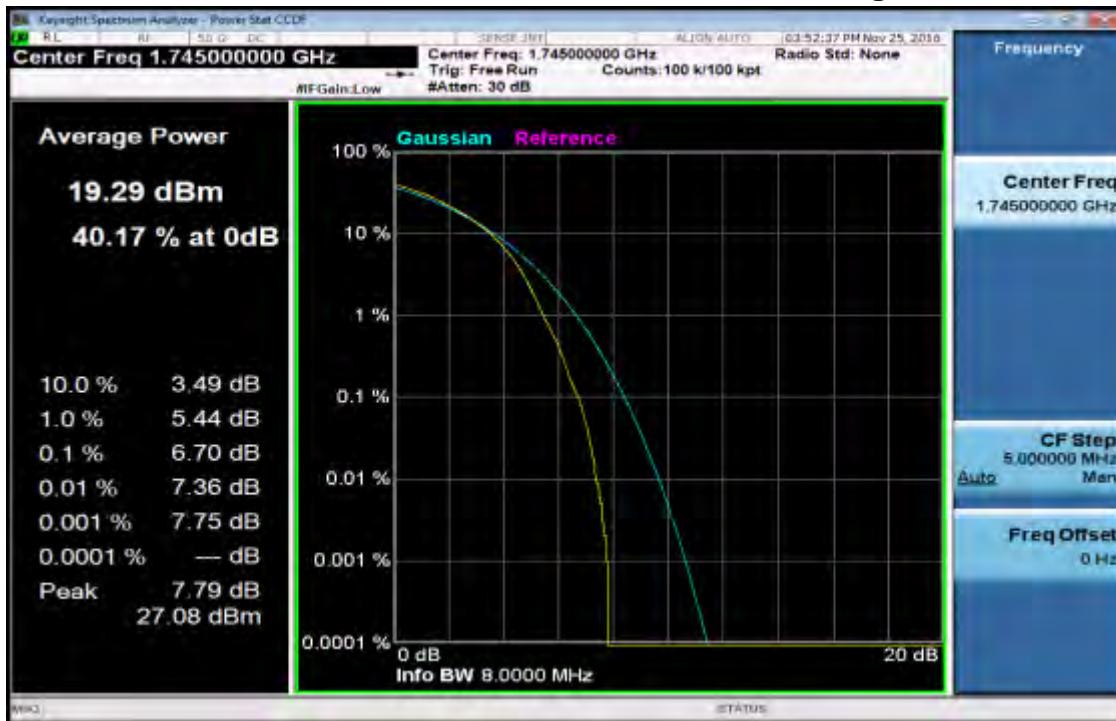
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20MHz BW LTE-Band 4 16QAM Channel Mid



20MHz BW LTE-Band 4 16QAM Channel High



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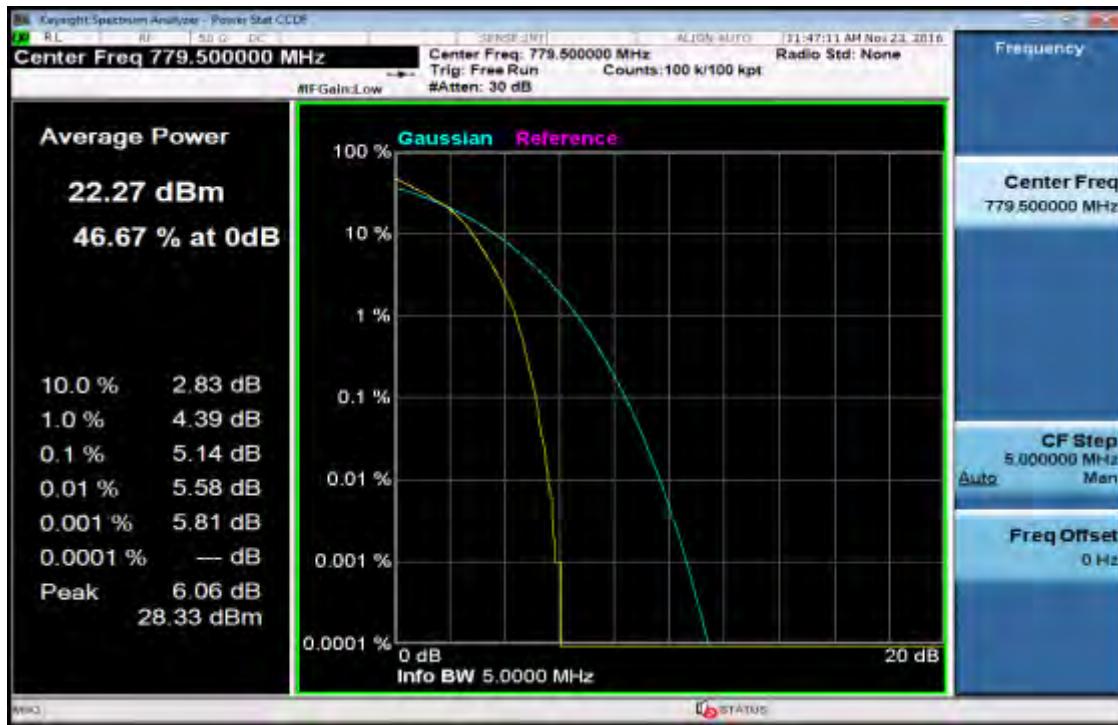
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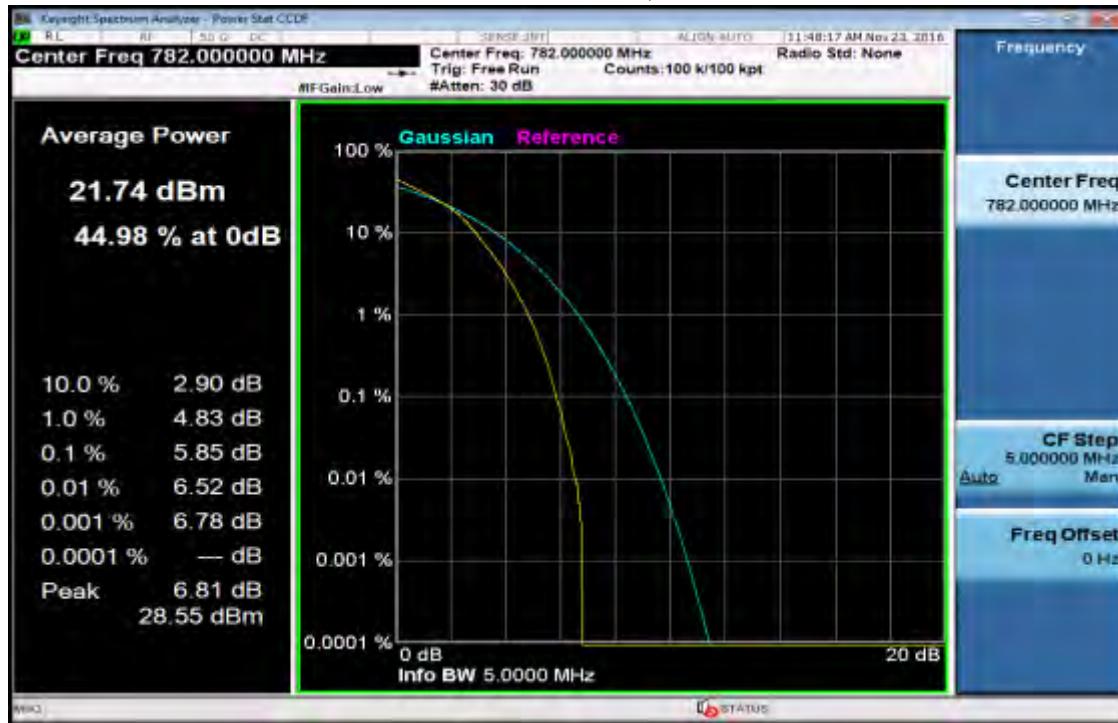
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5MHz BW LTE-Band 13 16QAM Channel Low



5MHz BW LTE-Band 13 16QAM Channel Mid



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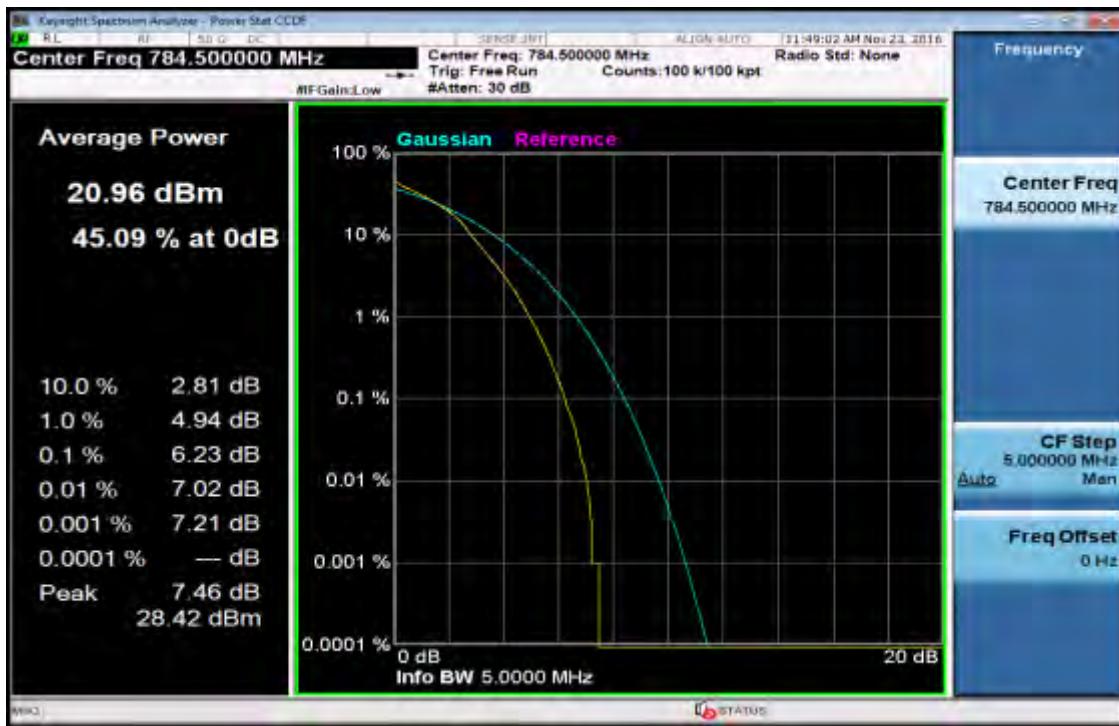
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5MHz BW LTE-Band 13 16QAM Channel High



10MHz BW LTE-Band 13 16QAM Channel Mid



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13. Maximum Permissible Exposure (MPE)

13.1. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with § 2.1091 Radiofrequency radiation exposure evaluation: mobile devices of the FCC CFR 47 Rules, CFR 1.1310 (b) Radio frequency Radiation Exposure Requirement.

13.2. Special Accessories

Not available for this EUT intended for grant

13.3. Equipment Modifications

Not available for this EUT intended for grant.

13.4. Limitation

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

13.5. Exposure (MPE) Evaluation

The evaluation and calculation as deduces below presents only worst-case that produces highest value of the result:

Operation Configuration of the Worst-Case picked up to evaluate:

LTE Band 4 / 13

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Operation in LTE Band 4 (1710 to 1755 MHz)

BAND 4 / BW: 20M / QPSK / RB: 1,0

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	EIRP	Limit
	MHz		V/H	dBm	dBi	dB	dBm	dBm
LTE BAND 4	1720	20050	V	12.25	9.17	-2.49	18.93	30
			H	16.43	9.17	-2.49	23.11	30
	1732.5	20175	V	13.59	9.21	-2.5	20.3	30
			H	16.52	9.21	-2.5	23.23	30
	1745	20300	V	10.96	9.25	-2.51	17.7	30
			H	14.55	9.25	-2.51	21.29	30

Power Density = EIRP*Duty Cycle/(4πR²)

Duty Cycle is 1 for LTE band operation and R is 20cm.

EIRP	23.23	(dBm)
EIRP	210.378	(mW)
Duty cycle:	100	(%)
Maximum Pav :	210.377844	(mW)
Prediction distance:	20	(cm)
Prediction frequency:	1732.5	(MHz)
MPE limit for uncontrolled exposure at prediction	1.0000	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.04187	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.04187 mW/cm².

This is below the uncontrolled exposure limit of 1 mW/cm² at 1732.5MHz.

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Operation in LTE Band 13 (777 to 787 MHz)

BAND 13 / BW: 10M / 16QAM / RB: 1,0

EUT			Measurement					
Operation Band	Fundamental Frequency	CH	Antenna Pol.	S.G. Output	Antenna Gain	Cable Loss	ERP	Limit
	MHz		V/H	dBm	dBd	dB	dBm	dBm
LTE BAND 13	782.0	23230	V	24.31	0.03	-1.63	22.71	44.77
			H	20.19	0.03	-1.63	18.59	44.77

Power Density = EIRP*Duty Cycle/(4πR²)

Duty Cycle is 1 for LTE band operation and R is 20cm.

ERP	22.71	(dBm)
ERP	186.638	(mW)
Duty cycle:	100	(%)
Maximum Pav :	186.637969	(mW)
Prediction distance:	20	(cm)
Prediction frequency:	782	(MHz)
MPE limit for uncontrolled exposure at prediction	0.5213	(mW/cm ²)
Power density at predication frequency at 20 (cm)	0.03715	(mW/cm ²)

Measurement Result

The predicted power density level at 20 cm is 0.03715 mW/cm².

This is below the uncontrolled exposure limit of 0.5213 mW/cm² at 782MHz.

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13.6. Collocated MPE Analysis

The modem may transmit simultaneously with other collocated radio transmitters within a host device, provided the following conditions are met:

- Each collocated radio transmitter has been certified by FCC for mobile application (that will be met since SQNS module will have its own FCC ID and host device will have its own FCC ID)
- At least 20 cm separation distance between the antennas of the collocated transmitters and the user's body must be maintained at all times (host installation should take care of that)

The output power and antenna gain in a collocated configuration must not exceed the limits and configurations stipulated in the following table 1. The power density calculations for the individual transmitters per wireless technology at an exposure minimum separation distance of 20cm.

Exclusion of test condition:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0 .

MPE ratio1 + MPE ratio2+MPE ratio3 ≤ 1.0

The spreadsheet as FCC deduces, and releases is employed to conduct the measurement:

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Table 1: Collocated MPE Calculation (Worst Case Table)

Technology	Frequency (MHz)	Max. Conducted Power (dBm)	Max. Gain (dBi)	Duty Cycle	FCC Power Density @20cm (mW/cm^2)	FCC MPE Limit (mW/cm^2)
WLAN 2.4G	2412	15.53	0.4	48.34	0.004	1.000
LTE Band 4	1732.5	24.15	0.8	100	0.062	1.000
LTE Band 13	782	23.40	-1.2	100	0.033	0.521

Scenario 1:

WLAN 2.4G + LTE B4 + LTE B13

WLAN (mW/cm^2)	WLAN / MPE limit	(WLAN) / MPE limit	LTE B4 (mW/cm^2)	LTE B4 / MPE limit	LTE B4 / MPE limit	LTE B13 (mW/cm^2)	LTE B13 / MPE limit	LTE B13 / MPE limit	WLAN+ LTE B4+ LTE B13	FCC Limit (mW/cm^2)
0.004	1.00	0.004	0.062	1.00	0.062	0.033	0.521	0.063	0.129	1.000

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