HCT CO.,LTD

HCT CO., LTD.

CERTIFICATE OF COMPLIANCE
FCC Certification

Applicant Name:
Pantech Co., Ltd.

Address:
Pantech Bldg, I-2, DMC, Sangam-dong, Mapo-gu,
Seoul, 121-792, Korea

Date of Issue:
August 16, 2012
Location:
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon,
Icheon-si, Kyunggi-Do, Korea
Test Report No.: HCTR1207FR07-2
HCT FRN: 0005866421

FCC ID:	**JYCSPARKLE**
APPLICANT:	**Pantech Co., Ltd.**

FCC Model(s):	UML295	
EUT Type:	CDMA/GSM/WCDMA/LTE Data Dongle	
FCC Classification:	PCS Licensed Transmitter (PCB)	
FCC Rule Part(s):	§2 , §27	
Tx Frequency:	782 MHz (LTE_13) 1712.5 MHz – 1752.5 MHz (LTE_4: 5 MHz)/ 1715.0 MHz – 1750.0 MHz (LTE_4: 10 MHz) 1717.5 MHz – 1747.5 MHz (LTE_4: 15 MHz)/ 1720.0 MHz – 1745.0 MHz (LTE_4: 20 MHz)	
Max. RF Output Power:	Band 13 (10 MHz):	0.218W ERP (QPSK) (23.38 dBm) 0.228W ERP (16-QAM) (23.58 dBm)
	Band 4 (5 MHz):	1.052 W EIRP (QPSK) (28.40 dBm) 0.979 W EIRP (16-QAM) (28.37 dBm)
	Band 4 (10 MHz):	0.838 W EIRP (QPSK) (28.33 dBm) 0.778 W EIRP (16-QAM) (28.11 dBm)
	Band 4 (15 MHz):	0.914 W EIRP (QPSK) (28.51 dBm) 0.885 W EIRP (16-QAM) (28.47 dBm)
	Band 4 (20 MHz):	0.566 W EIRP (QPSK) (27.53 dBm) 0.593 W EIRP (16-QAM) (27.73 dBm)

The measurements shown in this report were made in accordance with the procedures specified in §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Hyo Sun Kwak

Report prepared by
: Hyo Sun Kwak
Test engineer of RF Team

Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1207FR07	July 18, 2012	First Approval Report
HCTR1207FR07-1	July 30, 2012	Revise page 4
HCTR1207FR07-2	August 16, 2012	Revise section 7.5, 7.6 note

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	**Pantech Co., Ltd.**
Address:	Pantech Bldg, I-2, DMC, Sangam-Dong, Mapo-gu, Seoul,121-792, Korea
FCC ID:	JYCSPARKLE
Application Type:	Certification
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EUT Type:	CDMA/GSM/WCDMA/LTE Data Dongle
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Max. RF Output Power:	Band 13: 0.218W (23.38 dBm) ERP (QPSK) 0.228W (23.58 dBm) ERP (16-QAM) Band 4 (5 MHz): 1.052 W EIRP (QPSK) (28.40 dBm) 0.979 W EIRP (16-QAM) (28.37 dBm) Band 4 (10 MHz): 0.838 W EIRP (QPSK) (28.33 dBm) 0.778 W EIRP (16-QAM) (28.11 dBm) Band 4 (15 MHz): 0.914 W EIRP (QPSK) (28.51 dBm) 0.885 W EIRP (16-QAM) (28.47 dBm) Band 4 (20 MHz): 0.566 W EIRP (QPSK) (27.53 dBm) 0.593 W EIRP (16-QAM) (27.73 dBm)
Emission Designator(s):	Band 13: 8M96G7D (QPSK) / 8M95W7D (16-QAM) Band 4 (5 MHz): 4M50G7D (QPSK) / 4M49W7D (16-QAM) Band 4 (10 MHz): 8M98G7D (QPSK) / 8M99W7D (16-QAM) Band 4 (15 MHz): 13M5G7D (QPSK) / 13M5W7D (16-QAM) Band 4 (20 MHz): 18M0G7D (QPSK) / 17M9W7D (16-QAM)
Date(s) of Tests:	June 10, 2012 ~ July 13, 2012
Antenna Specification	Manufacturer: Karam Solution Antenna type: INTERNAL Antenna Peak Gain: Band 4 : 3.77 dBi Band 13 : 1.58 dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Pantech Co., Ltd. UML295 CDMA/GSM/WCDMA/LTE Data Dongle consists of GSM850, GSM1900, GPRS Class10, GPRS mode Class B(GPRS and GSM, but not simultaneously), EDGE, WCDMA850, WCDMA1900, HSDPA and HSUPA.

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

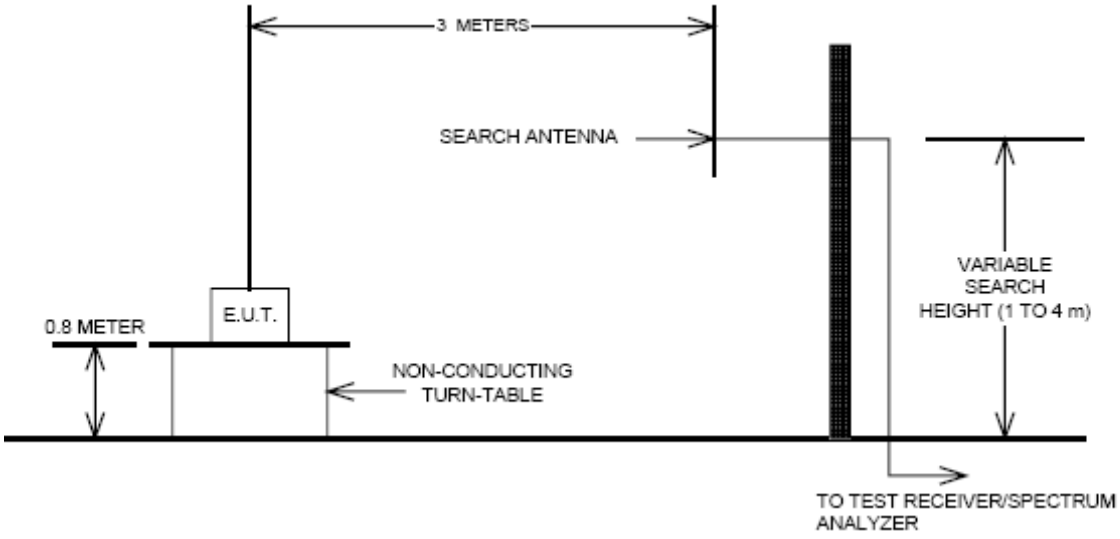
2.3. TEST FACILITY

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated March 02, 2011 (Registration Number: 90661)

3. DESCRIPTION OF TESTS

3.1 EFFECTIVE RADIATED POWER/EQUIVALENT ISOTROPIC RADIATED POWER

Test Set-up



Test Procedure

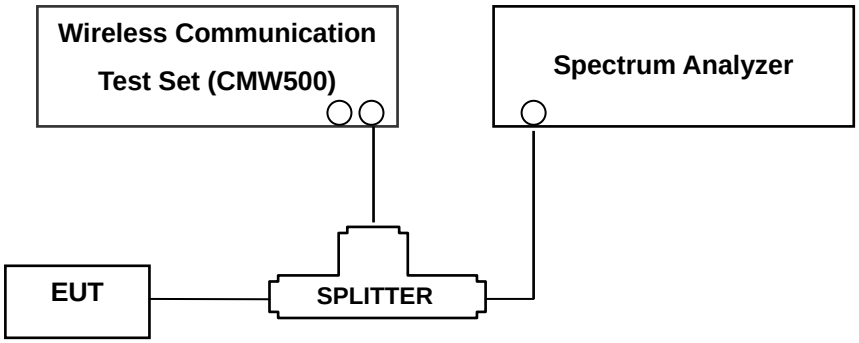
Radiated emission measurements were performed at an SAC(Semi-Anechoic Chamber)

The equipment under test is placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. A styrofoam turntable was rotated 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the previously recorded signal was duplicated.

The maximum EIRP was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.2 OCCUPIED BANDWIDTH.

Test set-up



(Configuration of conducted Emission measurement)
Test Procedure

The EUT was setup to maximum output power at its lowest channel. The occupied bandwidth was measured using a spectrum analyzer. The measurements are repeated for the highest and a middle channel. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Plots of the EUT's occupied bandwidth are shown herein.

3.3 BLOCK FREQUENCY RANGE

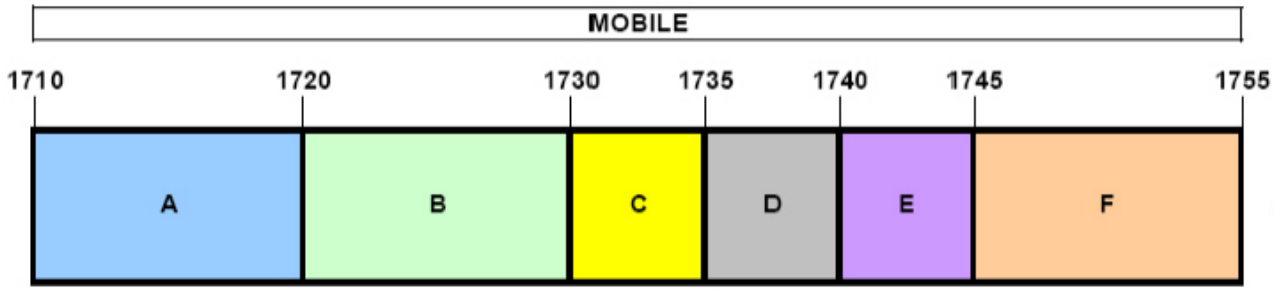
Two paired channels of 11 megahertz each are available for assignment in Block C in the 746–757 MHz and 776 – 787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746 – 757 MHz and 776 – 787 MHz bands will instead be made available for assignment at a subsequent auction as follows:

(i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746–752 MHz and 776–782 MHz bands.

(ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752–757 MHz and 782–787 MHz bands

3.4 AWS – MOBILE FREQUENCY BLOCKS

§27.5(h)



BLOCK 1: 1710 – 1720 MHz (A)

BLOCK 2: 1720 – 1730 MHz (B)

BLOCK 3: 1730 – 1735 MHz (C)

BLOCK 4: 1735 – 1740 MHz (D)

BLOCK 5: 1740 – 1745 MHz (E)

BLOCK 6: 1745 – 1755 MHz (F)

3.5 PEAK-AVERAGE RATIO.

§27.50(d)(5)

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a giver bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

Test Procedure

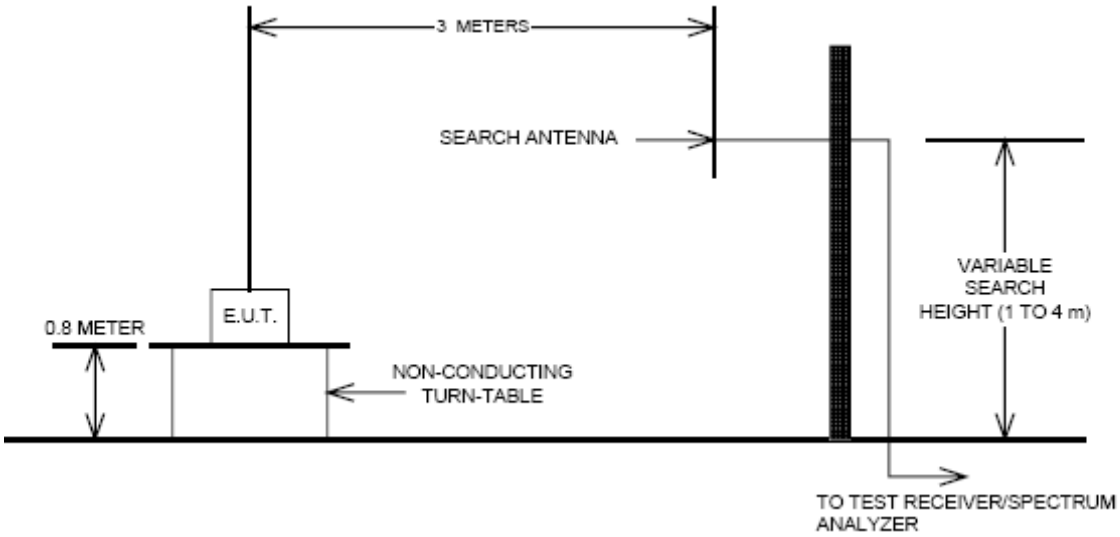
The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.

The EUT was setup to maximum output power at its lowest channel. The Resolution BW of the analyzer is set to 1 % of the emission bandwidth to show compliance with the – 13 dBm limit, in the 1 MHz bands immediately outside and adjacent to the edge of the frequency block. The 1 MHz RBW was used to scan from 30 MHz to 26.5 GHz. A display line was placed at – 13 dBm to show compliance. The high, lowest and a middle channel were tested for out of band measurements.

- Band Edge Requirement : In the 1MHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit, -13dBm.

3.7 RADIATED SPURIOUS AND HARMONIC EMISSIONS

Test Set-up



The measurement facilities used for this test have been documented in previous filings with the commission pursuant to section § 2.948. The Fully-anechoic chamber meets requirements in ANSI C63.4 –2003. A mast capable of lifting the receiving antenna from a height of one to four meters is used together with a rotatable platform mounted at three from the antenna mast.

1) The unit mounted on a turntable 1.5 m × 1.0 m × 0.80 m is 0.8 meter above test site ground level.
2) During the emission test, the turntable is rotated and the EUT is manipulated to find the configuration resulting in maximum emission under normal condition of installation and operation.
3) The antenna height and polarization are also varied from 1 to 4 meters until the maximum signal is found.
4) The spectrum shall be scanned up to the 10^{th} harmonic of the fundamental frequency.

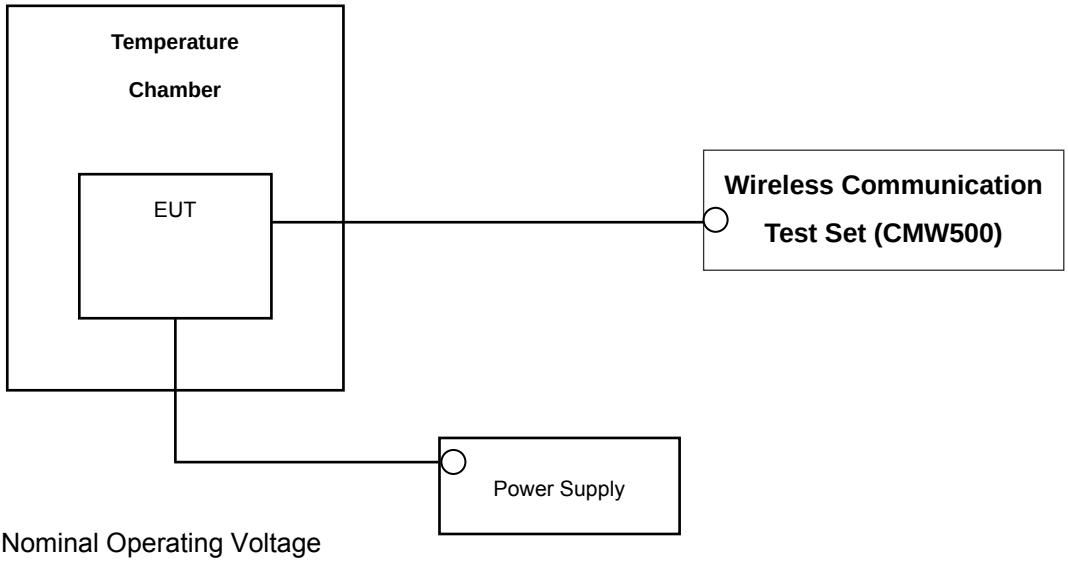
Test Procedure

The equipment under test is placed on a non-conductive table 3-meters from the receive antenna. A turntable was rotated 360° and the receiving antenna scanned from 1-4m in order to capture the maximum emission. A half wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the previously recorded signal was duplicated.

The maximum EIRP was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



* Nominal Operating Voltage

Test Procedure

The frequency stability of the transmitter is measured by:
a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

Time Period and Procedure:

The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
1. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.
NOTE: The EUT is tested down to the battery endpoint.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	N9020A	MY51110020	Annual	09/23/2012
Agilent	E9327A/ Power Sensor	MY4442009	Annual	05/02/2013
R&S	CMW500/ Base Station	1201.0002K50_116858	Annual	01/17/2013
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/24/2012
Wainwright	WHK1.2/15G-10EF/H.P.F	2	Annual	05/02/2013
Wainwright	WHK3.3/18G-10EF/H.P.F	1	Annual	05/02/2013
Hewlett Packard	11667B / Power Splitter	10126	Annual	11/04/2012
Digital	EP-3010/ Power Supply	3110117	Annual	11/07/2012
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/11/2013
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/11/2013
Korea Engineering	KR-1005L / Chamber	KRAB05063-3CH	Annual	11/07/2012
Schwarzbeck	BBHA 9120D/ Horn Antenna	296	Biennial	02/20/2014
Agilent	E4440A/Spectrum Analyzer	US45303008	Annual	05/02/2013
WEINSCHEL	ATTENUATOR	BR0592	Annual	11/07/2012
REOHDE&SCHWARZ	FSP30/Spectrum Analyzer	839117/011	Annual	02/09/2013
Agilent	8960 (E5515C)/ Base Station	GB44400269	Annual	02/10/2013

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049, 27.53(h)(1)	Occupied Bandwidth	N/A	CONDUCTED	PASS
2.1051, 27.53(h)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	< 43 +10 $\log_{10}$ (P[Watts]) at Band Edge and for all-of-band emissions		PASS
27.50(d)(5)	Peak-Average Ratio	< 13 dB		PASS
2.1046	Conducted Output Power	N/A		PASS
2.1055, 27.54	Frequency stability / variation of ambient temperature	< 2.5 ppm		PASS
27.50(c)(10)	Effective Radiated Power(Band 13)	< 3 Watts max. ERP	RADIATED	PASS
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts max. EIRP		PASS
2.1053, 27.53(h),27.53(g)	Undesirable Out-of-Band Emissions	< 43 +10 $\log_{10}$ (P[Watts]) for all out-of-band emissions		PASS

6. SAMPLE CALCULATION

A. ERP Sample Calculation

Mode	Ch./ Freq.		Measured Level(dBm)	Substitude LEVEL(dBm)	Ant. Gain	C.L	Pol.	ERP	
	channel	Freq.(MHz)						W	dBm
LTE	23230	782	-11.56	34.28	-8.32	1.17	H	0.30	24.79

ERP = SubstitudeLEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a wooden tripod is 0.8 meter above test site ground level.
2) During the test , the turn table is rotated and the antenna height is also varied from 1 to 4 meters until the maximum signal is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power (**ERP**).

B. Emission Designator

QPSK Modulation

Emission Designator = 8M95G7D

LTE BW = 8.95 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Amplitude/Angle Modulated

16QAM Modulation

Emission Designator = 8M94W7D

LTE BW = 8.94 MHz

D = Amplitude/Angle Modulated

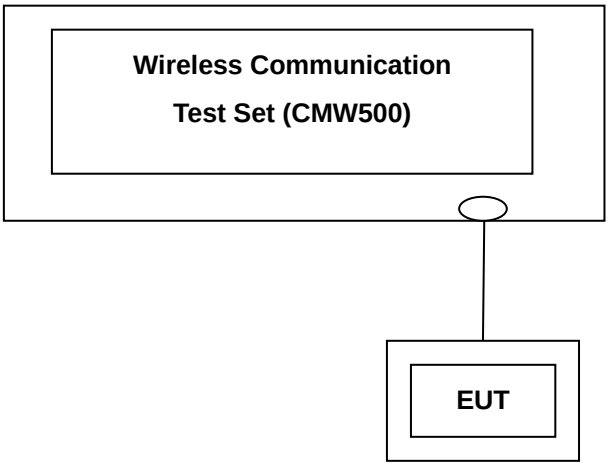
7 = Quantized/Digital Info

W = Combination (Audio/Data)

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

A base station simulator was used to establish communication with the EUT. The base station simulator parameters were set to produce the maximum power from the EUT. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



Test Result

Band	Frequency(Mhz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	782	23230	1	0	23.10	21.75
			1	49	23.15	21.76
			25	12	21.69	20.72
			50	0	21.69	20.68

LTE Conducted Average Output Powers (Band 13)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1712.5	19975	1	0	23.96	22.51
			1	24	23.99	22.62
			12	6	22.97	21.90
			25	0	22.82	21.85

LTE Conducted Average Output Powers (5 MHz Band 4 LTE – Low Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1732.5	20175	1	0	23.86	22.65
			1	24	23.74	22.57
			12	6	22.83	21.70
			25	0	22.70	21.68

LTE Conducted Average Output Powers (5 MHz Band 4 LTE – Mid Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1752.5	20375	1	0	23.65	22.39
			1	24	23.89	22.69
			12	6	22.73	21.65
			25	0	22.70	21.73

LTE Conducted Average Output Powers (5 MHz Band 4 LTE – High Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1715.0	20000	1	0	23.76	22.47
			1	49	23.92	22.62
			25	12	22.80	21.81
			50	0	22.75	21.78

LTE Conducted Average Output Powers (10 MHz Band 4 LTE – Low Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1732.5	20175	1	0	23.79	22.45
			1	49	23.69	22.36
			25	12	22.71	21.75
			50	0	22.73	21.69

LTE Conducted Average Output Powers (10 MHz Band 4 LTE – Mid Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1750.0	20350	1	0	23.54	22.06
			1	49	23.56	22.24
			25	12	22.30	21.38
			50	0	22.20	21.18

LTE Conducted Average Output Powers (10 MHz Band 4 LTE – High Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1717.5	20025	1	0	23.99	22.72
			1	74	23.92	22.67
			36	18	22.80	21.77
			75	0	22.70	21.72

LTE Conducted Average Output Powers (15 MHz Band 4 LTE – Low Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1732.5	20175	1	0	23.68	22.51
			1	74	23.67	22.40
			36	18	22.47	21.46
			75	0	22.48	21.33

LTE Conducted Average Output Powers (15 MHz Band 4 LTE – Mid Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1747.5	20325	1	0	23.60	22.23
			1	74	23.70	22.57
			36	18	22.32	21.35
			75	0	22.36	21.33

LTE Conducted Average Output Powers (15 MHz Band 4 LTE – High Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1720.0	20050	1	0	23.90	22.78
			1	99	23.93	22.72
			50	25	22.74	21.68
			100	0	22.73	21.74

LTE Conducted Average Output Powers (20 MHz Band 4 LTE – Low Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1732.5	20175	1	0	23.83	22.78
			1	99	23.53	22.33
			50	25	22.61	21.55
			100	0	22.59	21.58

LTE Conducted Average Output Powers (20 MHz Band 4 LTE – Mid Channel)

Band	Frequency(MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
					QPSK	16-QAM
LTE	1745.0	20300	1	0	23.63	22.65
			1	99	23.55	22.60
			50	25	22.23	21.30
			100	0	22.29	21.38

LTE Conducted Average Output Powers (20 MHz Band 4 LTE – High Channel)

Note : Detecting mode is average.

7.2 PEAK-TO-AVERAGE RATIO

Band	Channel	Frequency(MHz)	Bandwidth	Modulation	P A R
LTE BAND 13	23230	782	10 MHz	QPSK	4.50
				16-QAM	5.42
LTE BAND 4	20175	1732.5	5 MHz	QPSK	4.39
			10 MHz	QPSK	4.59
			15 MHz	QPSK	4.54
			20 MHz	QPSK	4.78

- Plots of the EUT's Peak- to- Average Ratio are shown Page 43 ~ 45.

7.3 OCCUPIED BANDWIDTH

Band 13

Band	Frequency(Mhz)	Modulation	Resource Block Size	Resource Block Offset	Data (RB 1 : KHz / RB 25,50 : MHz)
LTE	782	QPSK	1	0	-
	782		1	49	-
	782		25	12	-
	782		50	-	8.9641
	782	16-QAM	1	0	-
	782		1	49	-
	782		25	12	-
	782		50	-	8.9535

Band 4

Band	Frequency(MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (RB 1 : KHz / RB 25,50 : MHz)
LTE Band 4	1732.5	QPSK	1	0	-
			1	24	-
			12	6	-
			25	0	4.5033
		16-QAM	1	0	-
			1	24	-
			12	6	-
			25	0	4.4943
		QPSK	1	0	-
			1	49	-
			25	12	-
			50	0	8.9827
		16-QAM	1	0	-
			1	49	-
			25	12	-
			50	0	8.9860
		QPSK	1	0	-
			1	74	-
			36	18	-
			75	0	13.4480
		16-QAM	1	0	-
			1	74	-
			36	18	-
			75	0	13.4790
		QPSK	1	0	-
			1	99	-
			50	25	-
			100	0	17.9740
		16-QAM	1	0	-
			1	99	-
			50	25	-
			100	0	17.9190

- Plots of the EUT's Occupied Bandwidth are shown Page 38 ~ 42.

7.4 CONDUCTED SPURIOUS EMISSIONS

Band 13

Band	Frequency (Mhz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
LTE	782	QPSK	1	0	-	-
	782		1	49	7.7140	-39.064
	782		25	12	-	-
	782		50	-	-	-
	782	16-QAM	1	0	-	-
	782		1	49	6.0970	-38.670
	782		25	12	-	-
	782		50	-	-	-

Band 4

Band	Frequency (Mhz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
LTE Band 4	1712.5	QPSK (5 MHz)	1	24	3.42977	-39.030
	1732.5		1	0	3.42977	-39.399
	1752.5		1	24	3.50953	-36.546
	1715.0	QPSK (10 MHz)	1	49	3.43974	-35.212
	1732.5		1	0	3.45968	-42.765
	1750.0		1	49	3.50953	-36.767
	1717.5	QPSK (15 MHz)	1	0	3.41980	-34.205
	1732.5		1	0	3.44971	-35.006
	1747.5		1	0	3.47962	-30.466
	1720.0	QPSK (20 MHz)	1	99	3.45968	-34.151
	1732.5		1	0	3.44971	-37.799
	1745.0		1	0	3.46965	-34.292

- Plots of the EUT's Conducted Spurious Emissions are shown Page 66 ~ 79.

7.4.1 BAND EDGE

Note : In the 763 – 775 MHz and 793 – 805 MHz band, the FCC limit is 65 + $10\log_{10}(P_{[Watts]})$ = - 35 dBm in a 6.25 KHz bandwidth.

By using a 10KHz bandwidth, the limit was adjusted by $10\log_{10}(10KHz/6.25KHz)$ = 2.04 dB.

LIMIT : - 35 dBm + 2.04 dB = - 32.96 dBm.

- Plots of the EUT's Band Edge are shown Page 46 ~ 65.

7.5 EFFECTIVE RADIATED POWER OUTPUT

Ch / Freq		Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
channel	Freq (MHz)							W	dBm
23230	782.00	QPSK	-12.75	35.43	-10.52	1.53	H	0.218	23.38
		16-QAM	-12.55	35.63	-10.52	1.53	H	0.228	23.58

Effective Radiated Power Output Data (Band 13_10 MHz)

Note: Worst case is 1 resource block size and 49 resource block offset. This unit was tested with a notebook computer.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method

according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For 1 MHz BW signals, a peak detector is used, with RBW = VBW = 1 MHz. For 10 MHz BW signals, a peak detector is used, with RBW = VBW = 10 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is x plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

7.6 EQUIVALENT ISOTROPIC RADIATED POWER OUTPUT

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	ERP	
								W	dBm
1712.5	5 MHz	QPSK	-10.87	20.49	9.55	1.64	V	0.69	28.40
		16-QAM	-10.90	20.46	9.55	1.64	V	0.69	28.37
1732.5		QPSK	-13.23	18.27	9.65	1.65	V	0.42	26.27
		16-QAM	-13.71	17.79	9.65	1.65	V	0.38	25.79
1752.5		QPSK	-12.68	18.84	9.75	1.69	V	0.49	26.90
		16-QAM	-12.81	18.71	9.75	1.69	V	0.48	26.77

Equivalent Isotropic Radiated Power Output Data (Band 4_5 MHz)

Note: Worst case is low channel(1712.5MHz), 1 resource block size and 24 resource block offset.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	ERP	
								W	dBm
1715.0	10 MHz	QPSK	-10.94	20.42	9.55	1.64	V	0.68	28.33
		16-QAM	-11.16	20.20	9.55	1.64	V	0.65	28.11
1732.5		QPSK	-13.04	18.46	9.65	1.65	V	0.44	26.46
		16-QAM	-13.01	18.49	9.65	1.65	V	0.45	26.49
1750.0		QPSK	-12.46	19.06	9.75	1.69	V	0.52	27.12
		16-QAM	-12.62	18.90	9.75	1.69	V	0.50	26.96

Equivalent Isotropic Radiated Power Output Data (Band 4_10 MHz)

Note: Worst case is low channel(1715.0MHz), 1 resource block size and 49 resource block offset.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	ERP	
								W	dBm
1717.5	15 MHz	QPSK	-10.76	20.60	9.55	1.64	V	0.71	28.51
		16-QAM	-10.80	20.56	9.55	1.64	V	0.70	28.47
1732.5		QPSK	-12.95	18.55	9.65	1.65	V	0.45	26.55
		16-QAM	-13.19	18.31	9.65	1.65	V	0.43	26.31
1747.5		QPSK	-11.89	19.63	9.75	1.69	V	0.59	27.69
		16-QAM	-12.04	19.48	9.75	1.69	V	0.57	27.54

Equivalent Isotropic Radiated Power Output Data (Band 4_15 MHz)

Note: Worst case is low channel(1717.5MHz), 1 resource block size and 0 resource block offset.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	ERP	
								W	dBm
1720.0	20 MHz	QPSK	-13.71	18.04	10.03	1.71	V	0.433	26.36
		16-QAM	-13.44	18.31	10.03	1.71	V	0.460	26.63
1732.5		QPSK	-12.52	19.20	10.06	1.73	V	0.566	27.53
		16-QAM	-12.32	19.40	10.06	1.73	V	0.593	27.73
1745.0		QPSK	-13.23	18.50	10.10	1.73	V	0.486	26.87
		16-QAM	-13.07	18.66	10.10	1.73	V	0.505	27.03

Equivalent Isotropic Radiated Power Output Data (Band 4_20 MHz)

Note: Worst case is mid channel(1732.5MHz), 1 resource block size and 0 resource block offset.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method

according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For 1 MHz BW signals, a peak detector is used, with RBW = VBW = 1 MHz. For 10 MHz BW signals, a peak detector is used, with RBW = VBW = 10 MHz. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is x plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

7.7 RADIATED SPURIOUS EMISSIONS

7.7.1 RADIATED SPURIOUS EMISSIONS (Band 13)

▣ OPERATING FREQUENCY : 782.00 MHz

▣ MEASURED OUTPUT POWER: 23.58 dBm = 0.228 W

▣ MODULATION SIGNAL: QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 $\log_{10}$ (W)) = - 36.58 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
23230 (782.00)	2346.00	-55.77	10.57	-61.21	2.14	V	-52.78	-76.36
	3128.00	-	-	-	-	-	-	-
	3910.00	-	-	-	-	-	-	-

NOTES:
1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.
3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. Worst case is 1 resource block.

7.7.2 RADIATED SPURIOUS EMISSIONS (Band 4)

▣ OPERATING FREQUENCY : 1712.5 MHz

▣ MEASURED OUTPUT POWER: 30.22 dBm = 0.692W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 $\log_{10}$ (W)) = - 41.40 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
19975 (1712.5)	3,425.00	-42.55	12.03	-46.64	5.14	V	-39.75	-68.15
	5,137.50	-	-	-	-	-	-	-
	6,850.00	-	-	-	-	-	-	-
20175 (1732.5)	3,465.00	-51.52	12.12	-55.78	4.56	H	-48.22	-76.62
	5,197.50	-	-	-	-	-	-	-
	6,930.00	-	-	-	-	-	-	-
20375 (1752.5)	3,505.00	-44.73	12.22	-47.68	5.07	V	-40.53	-68.93
	5,257.50	-	-	-	-	-	-	-
	7,010.00	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

▣ OPERATING FREQUENCY : 1715.0 MHz

▣ MEASURED OUTPUT POWER: 28.33 dBm = 0.681W

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 lo_{g10} (W)) = - 41.33 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
20000 (1715.0)	3,430.00	-45.31	12.03	-49.40	5.14	H	-42.51	-70.84
	5,145.00	-	-	-	-	-	-	-
	6,860.00	-	-	-	-	-	-	-
20175 (1732.5)	3,465.00	-52.02	12.12	-56.28	4.56	H	-48.72	-77.05
	5,197.50	-	-	-	-	-	-	-
	6,930.00	-	-	-	-	-	-	-
20350 (1750.0)	3,500.00	-45.72	12.22	-48.67	5.07	H	-41.52	-69.85
	5,250.00	-	-	-	-	-	-	-
	7,000.00	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

▣ OPERATING FREQUENCY : 1717.5 MHz

▣ MEASURED OUTPUT POWER: 28.51 dBm = 0.710W

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 lo_{g10} (W)) = - 41.51 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
20025 (1717.5)	3,435.00	-39.81	12.03	-43.90	5.14	H	-37.01	-65.52
	5,152.50	-	-	-	-	-	-	-
	6,870.00	-	-	-	-	-	-	-
20175 (1732.5)	3,465.00	-51.39	12.12	-55.65	4.56	H	-48.09	-76.60
	5,197.50	-	-	-	-	-	-	-
	6,930.00	-	-	-	-	-	-	-
20325 (1747.5)	3,495.00	-49.60	12.22	-52.55	5.07	H	-45.40	-73.91
	5,242.50	-	-	-	-	-	-	-
	6,990.00	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

▣ OPERATING FREQUENCY : 1732.50 MHz

▣ MEASURED OUTPUT POWER: 27.73 dBm = 0.593W

▣ MODULATION SIGNAL: 20 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: - (43 + 10 $\log_{10}$ (W)) = - 40.73 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
20050 (1720.0)	3,440.00	-50.06	12.16	-56.63	2.52	H	-46.99	-74.72
	5,160.00	-	-	-	-	-	-	-
	6,880.00	-	-	-	-	-	-	-
20175 (1732.5)	3,465.00	-47.04	12.24	-53.51	2.49	H	-43.76	-71.49
	5,197.50	-	-	-	-	-	-	-
	6,930.00	-	-	-	-	-	-	-
20300 (1745.0)	3,490.00	-50.94	12.34	-56.96	2.53	H	-47.15	-74.88
	5,235.00	-	-	-	-	-	-	-
	6,980.00	-	-	-	-	-	-	-

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.7.3 RADIATED SPURIOUS EMISSIONS (1559 ~ 1610 MHz Band)_Band 13

▣ OPERATING FREQUENCY : 782.00 MHz

▣ MODULATION SIGNAL: QPSK

▣ DISTANCE: 3 meters

▣ NARROWBAND EMISSION LIMIT: - 50 dBm

▣ WIDEBAND EMISSION LIMIT: - 40 dBm/MHz

FREQUENCY (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	MARGIN (dB)
1596.1	WIDEBAND	-53.75	8.91	-62.25	1.71	H	-55.05	-15.05

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. The magnitude of spurious emissions attenuated more than 20dB below the limit above 5th Harmonic for all channel.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.8.1 FREQUENCY STABILITY (LTE Band 13)

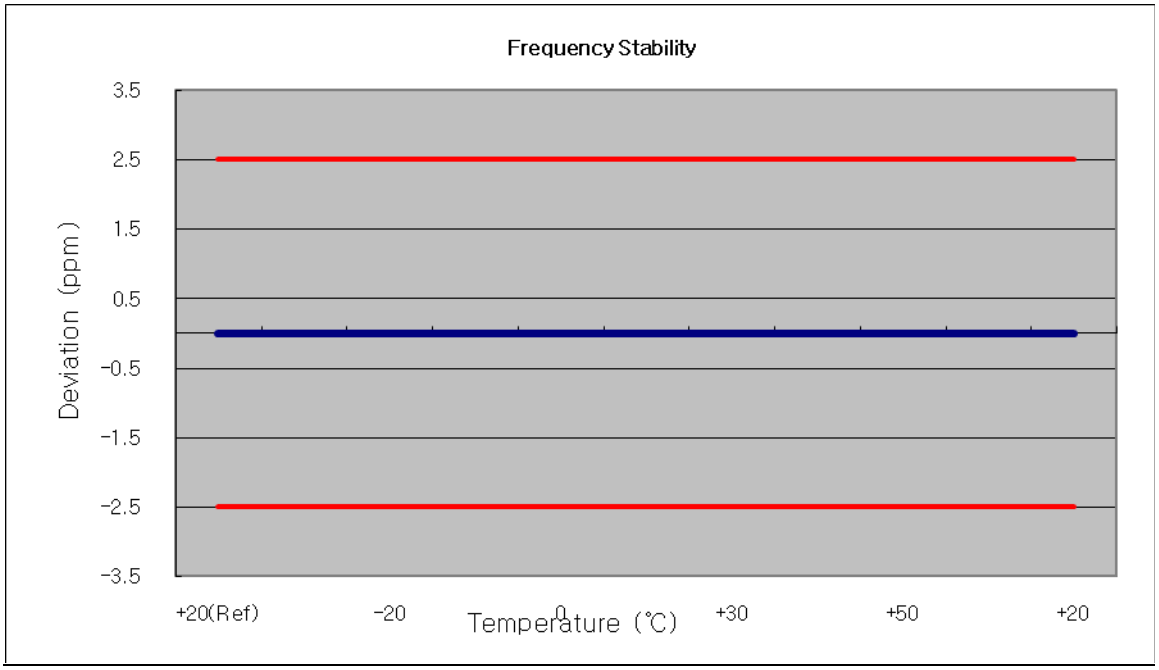
OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 5 VDC

DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	781 999 999	0	0.000 000	0.000
100%		-30	781 999 998	-2.20	0.000 000	-0.003
100%		-20	781 999 997	-3.10	0.000 000	-0.004
100%		-10	781 999 999	-0.51	0.000 000	-0.001
100%		0	782 000 003	3.09	0.000 000	0.004
100%		+10	781 999 997	-2.95	0.000 000	-0.004
100%		+30	782 000 002	1.76	0.000 000	0.002
100%		+40	781 999 998	-1.60	0.000 000	-0.002
100%		+50	781 999 997	-3.20	0.000 000	-0.004
115%	4.255	+20	781 999 995	-4.56	-0.000 001	-0.006
Batt. Endpoint	3.400	+20	782 000 001	1.12	0.000 000	0.001



7.8.2 FREQUENCY STABILITY (LTE Band 4)

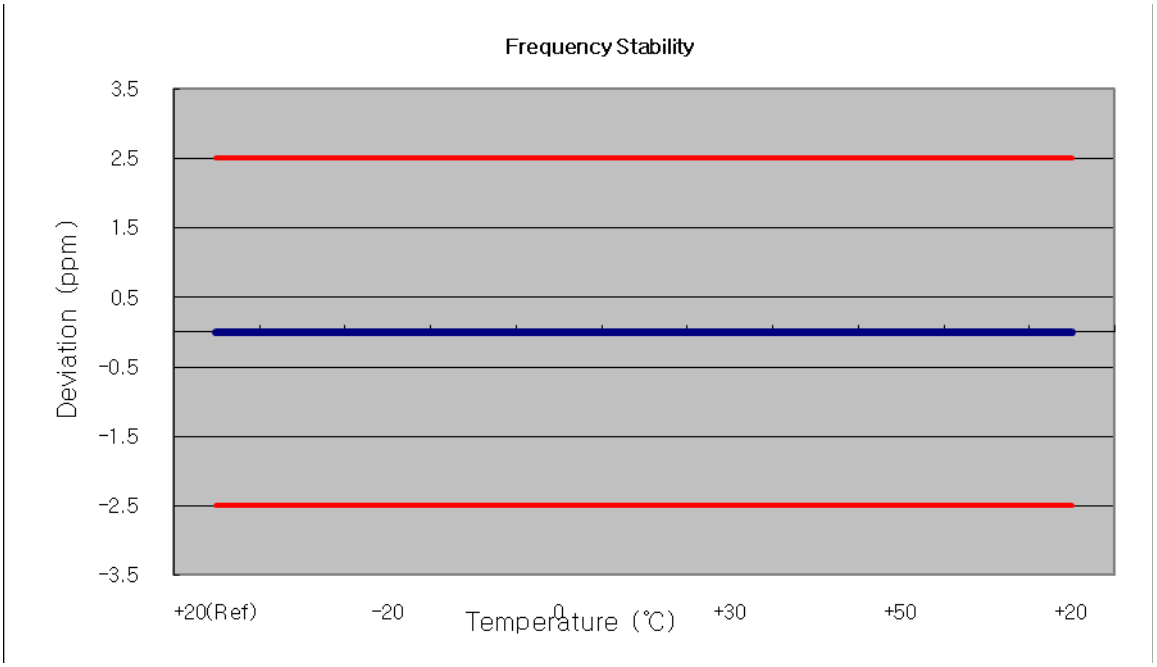
OPERATING FREQUENCY: 1732,500,000 Hz

CHANNEL: 20175 (5 MHz)

REFERENCE VOLTAGE: 3.70 VDC

DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1732 499 998	0	0.000 000	0.000
100%		-30	1732 500 005	5.14	0.000 000	0.003
100%		-20	1732 500 003	3.18	0.000 000	0.002
100%		-10	1732 500 007	7.16	0.000 000	0.004
100%		0	1732 500 005	4.82	0.000 000	0.003
100%		+10	1732 499 998	-1.93	0.000 000	-0.001
100%		+30	1732 500 002	2.26	0.000 000	0.001
100%		+40	1732 500 002	1.97	0.000 000	0.001
100%		+50	1732 499 998	-1.65	0.000 000	-0.001
115%	4.255	+20	1732 500 001	0.90	0.000 000	0.001
Batt. Endpoint	3.400	+20	1732 500 004	3.99	0.000 000	0.002



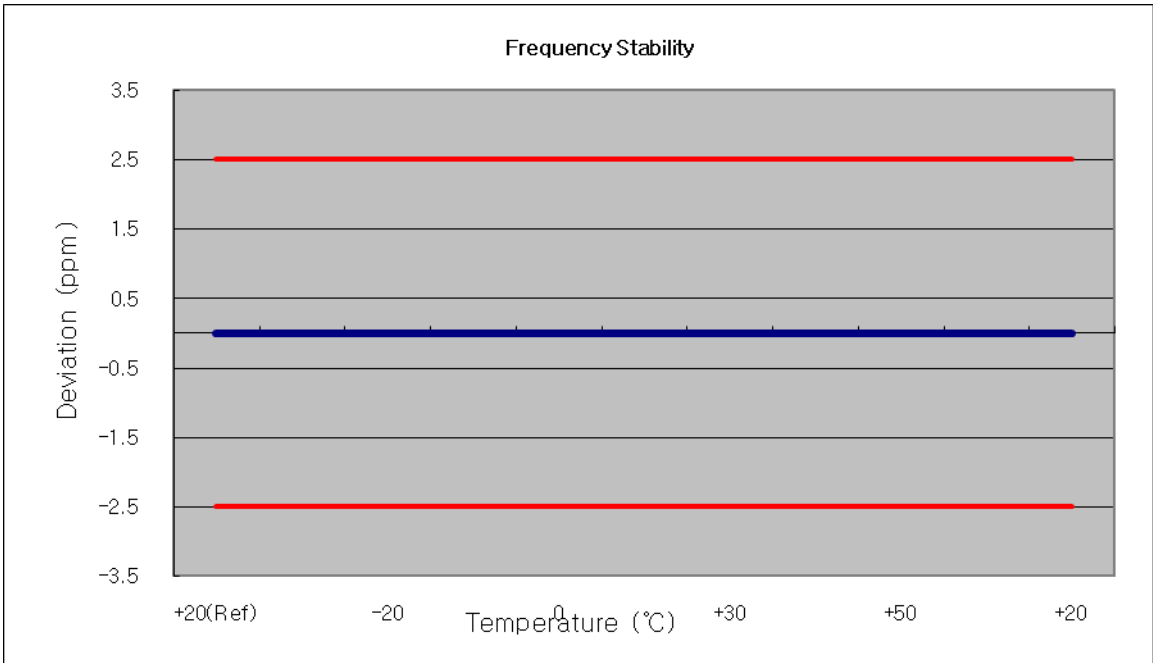
OPERATING FREQUENCY: 1732,500,000 Hz

CHANNEL: 20175 (10 MHz)

REFERENCE VOLTAGE: 3.70 VDC

DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1732 499 998	0	0.000 000	0.000
100%		-30	1732 500 004	4.18	0.000 000	0.002
100%		-20	1732 499 999	-1.39	0.000 000	-0.001
100%		-10	1732 500 002	1.89	0.000 000	0.001
100%		0	1732 500 001	0.67	0.000 000	0.000
100%		+10	1732 500 002	2.25	0.000 000	0.001
100%		+30	1732 500 003	2.78	0.000 000	0.002
100%		+40	1732 499 998	-2.15	0.000 000	-0.001
100%		+50	1732 500 002	1.82	0.000 000	0.001
115%	4.255	+20	1732 499 998	-1.77	0.000 000	-0.001
Batt. Endpoint	3.400	+20	1732 500 008	7.60	0.000 000	0.004



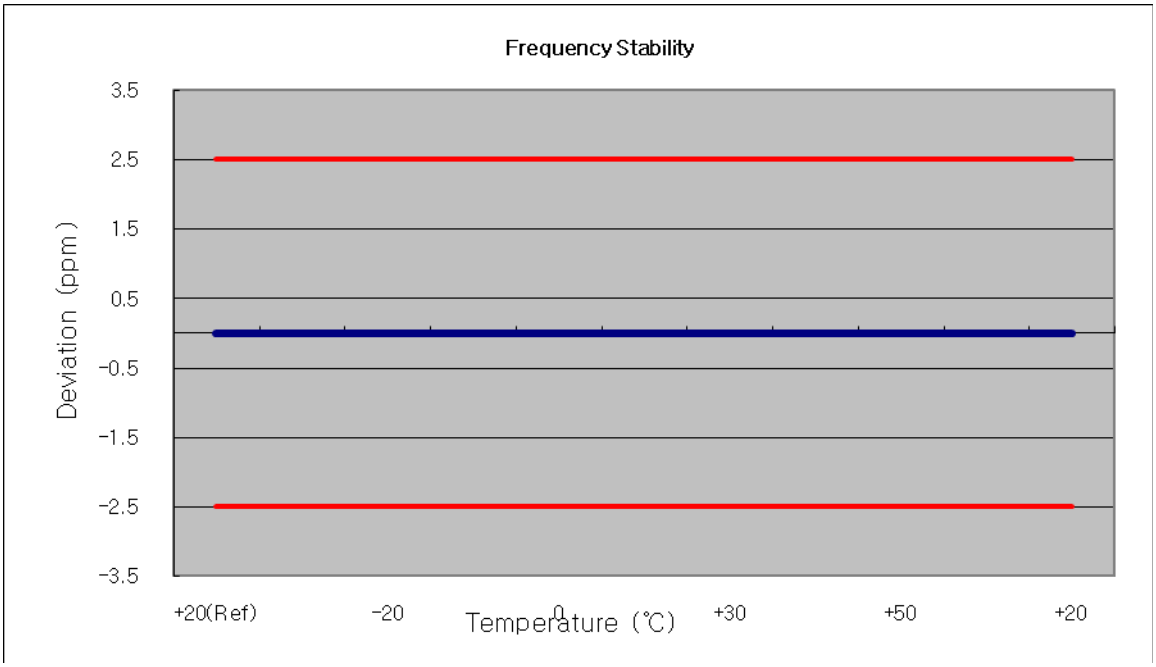
OPERATING FREQUENCY: 1732,500,000 Hz

CHANNEL: 20175 (15 MHz)

REFERENCE VOLTAGE: 3.70 VDC

DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1732 500 003	0	0.000 000	0.000
100%		-30	1732 500 002	2.42	0.000 000	0.001
100%		-20	1732 500 004	4.17	0.000 000	0.002
100%		-10	1732 499 997	-3.00	0.000 000	-0.002
100%		0	1732 500 004	3.91	0.000 000	0.002
100%		+10	1732 499 997	-3.12	0.000 000	-0.002
100%		+30	1732 500 005	5.06	0.000 000	0.003
100%		+40	1732 500 002	1.56	0.000 000	0.001
100%		+50	1732 500 005	4.76	0.000 000	0.003
115%	4.255	+20	1732 500 000	-0.44	0.000 000	0.000
Batt. Endpoint	3.400	+20	1732 500 005	5.25	0.000 000	0.003



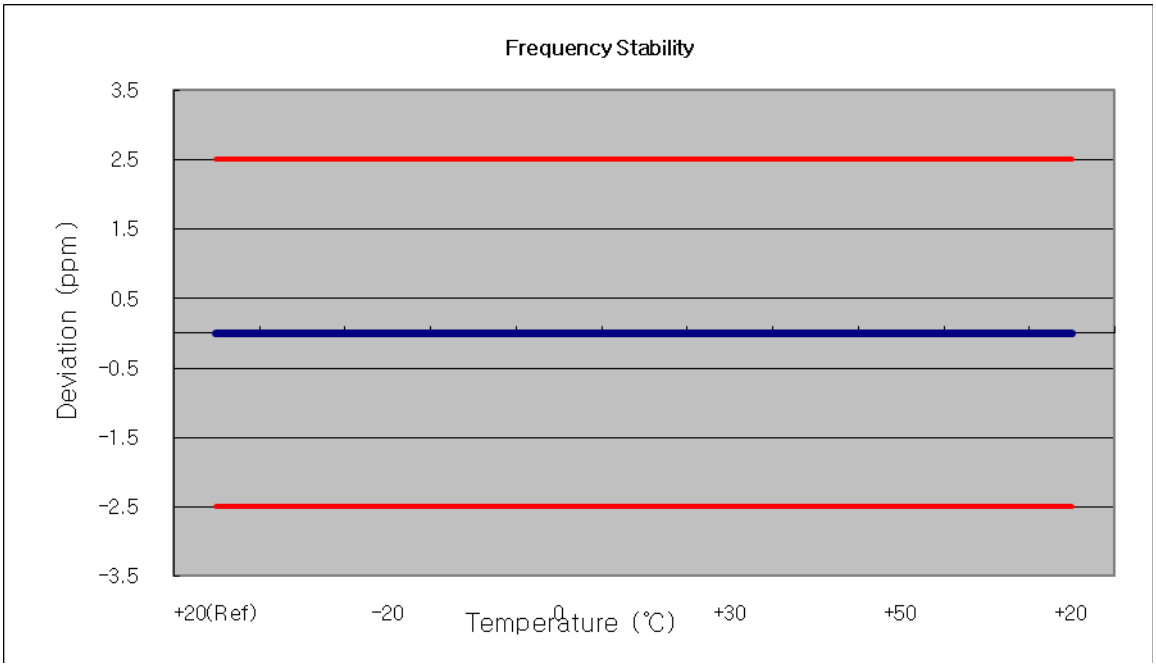
OPERATING FREQUENCY: 1732,500,000 Hz

CHANNEL: 20175 (20 MHz)

REFERENCE VOLTAGE: 3.70 VDC

DEVIATION LIM IT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.700	+20(Ref)	1732 500 002	0	0.000 000	0.000
100%		-30	1732 500 006	6.38	0.000 000	0.004
100%		-20	1732 499 996	-4.36	0.000 000	-0.003
100%		-10	1732 499 999	-1.03	0.000 000	-0.001
100%		0	1732 500 002	1.96	0.000 000	0.001
100%		+10	1732 499 998	-2.31	0.000 000	-0.001
100%		+30	1732 500 005	4.75	0.000 000	0.003
100%		+40	1732 499 996	-3.59	0.000 000	-0.002
100%		+50	1732 500 004	4.35	0.000 000	0.003
115%	4.255	+20	1732 500 006	5.71	0.000 000	0.003
Batt. Endpoint	3.400	+20	1732 500 003	2.76	0.000 000	0.002

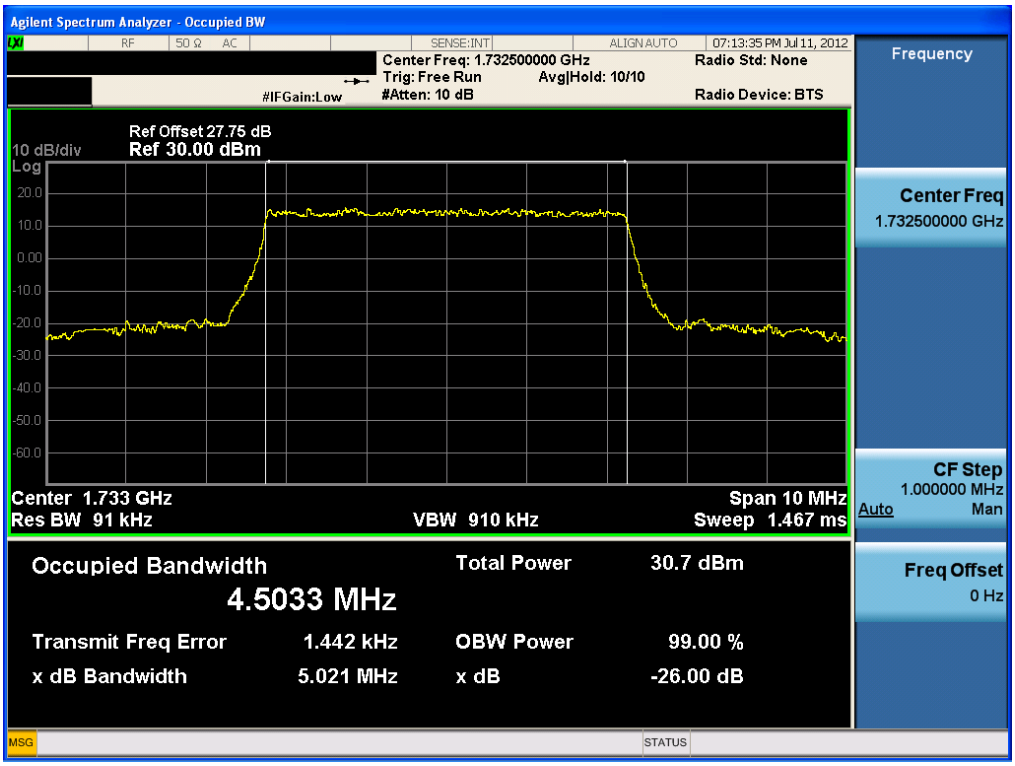


8. TEST PLOTS

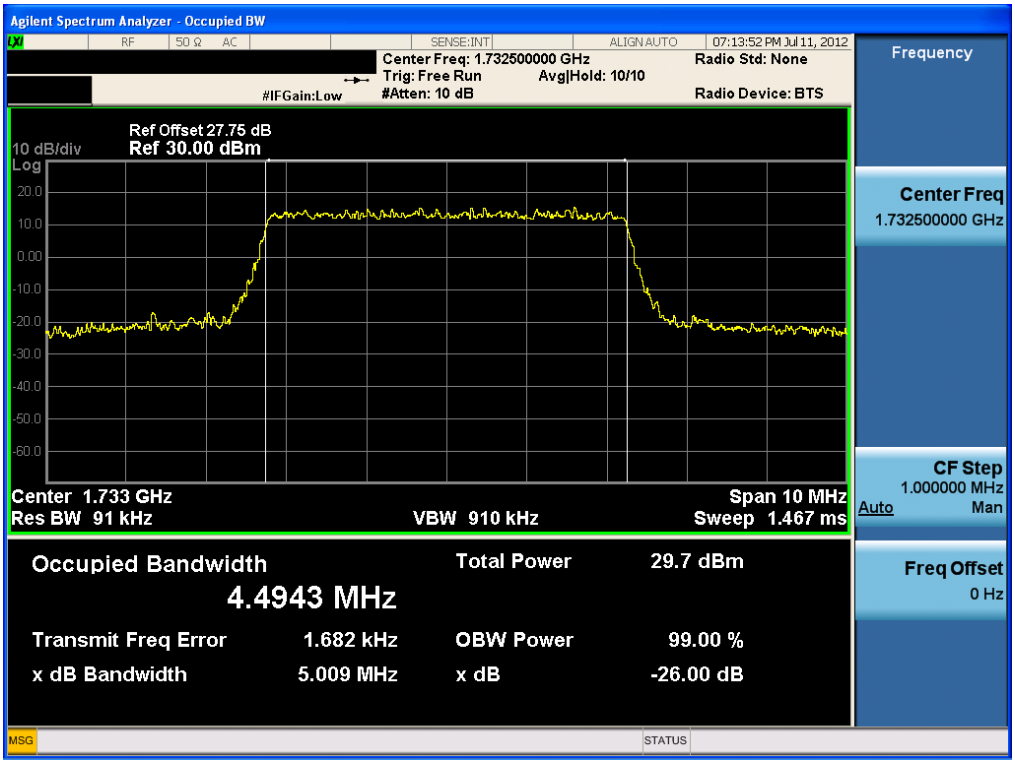
■ Occupied Bandwidth (LTE Band 13_QPSK – RB Size 50)

■ Occupied Bandwidth (LTE Band 13_16-QAM – RB Size 50)

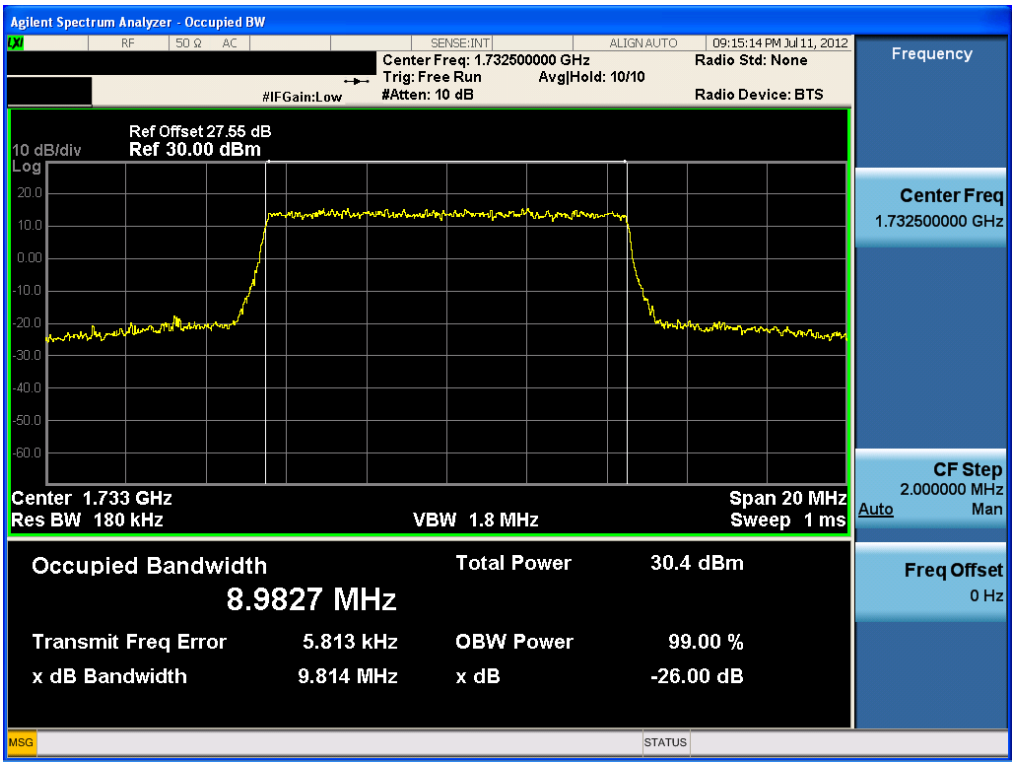
Occupied Bandwidth Plot (LTE Band 4_5MHz QPSK - RB Size 25)



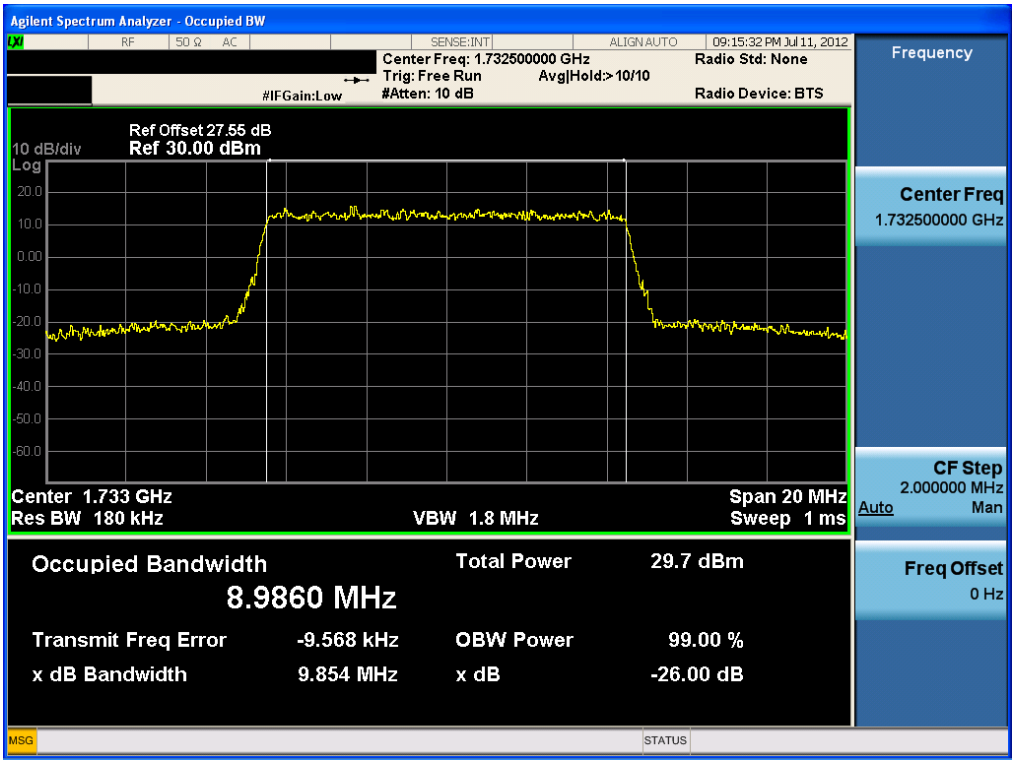
Occupied Bandwidth Plot (LTE Band 4_5MHz 16-QAM - RB Size 25)



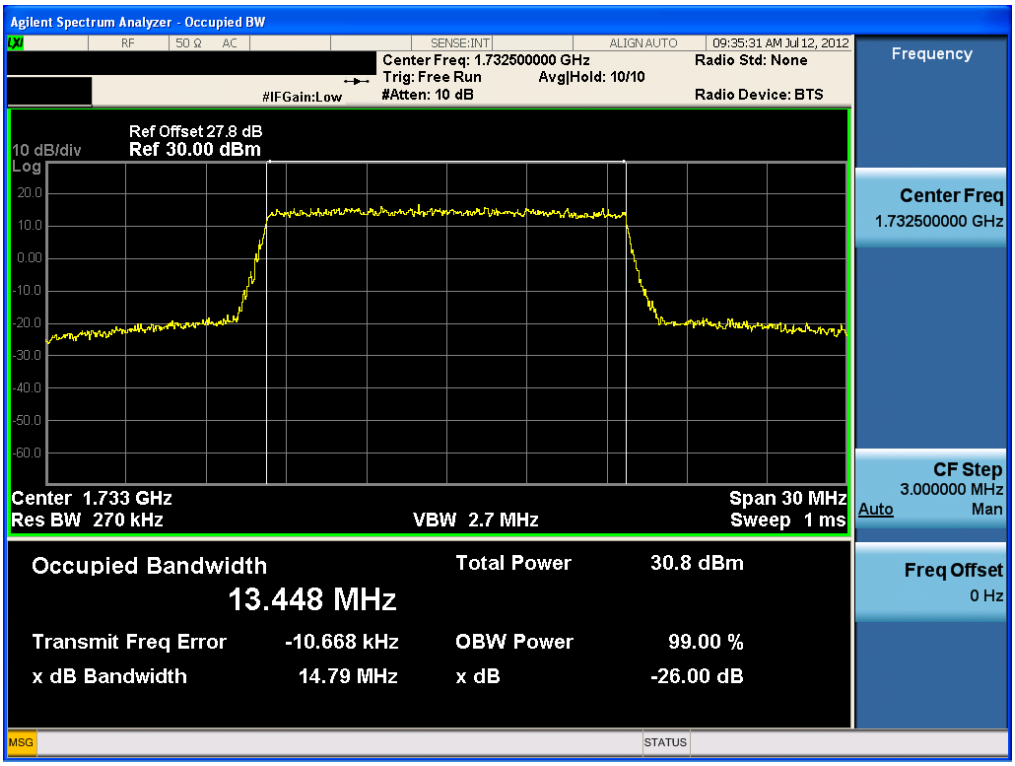
Occupied Bandwidth Plot (LTE Band 4_10MHz QPSK - RB Size 50)



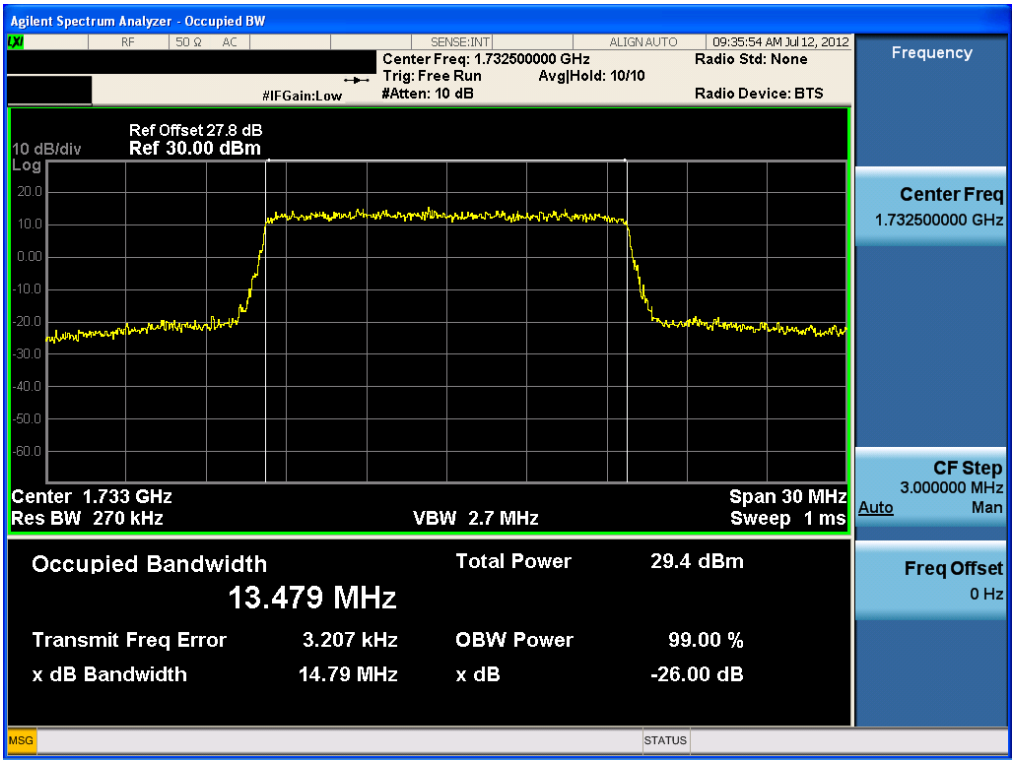
Occupied Bandwidth Plot (LTE Band 4_10MHz 16-QAM - RB Size 50)



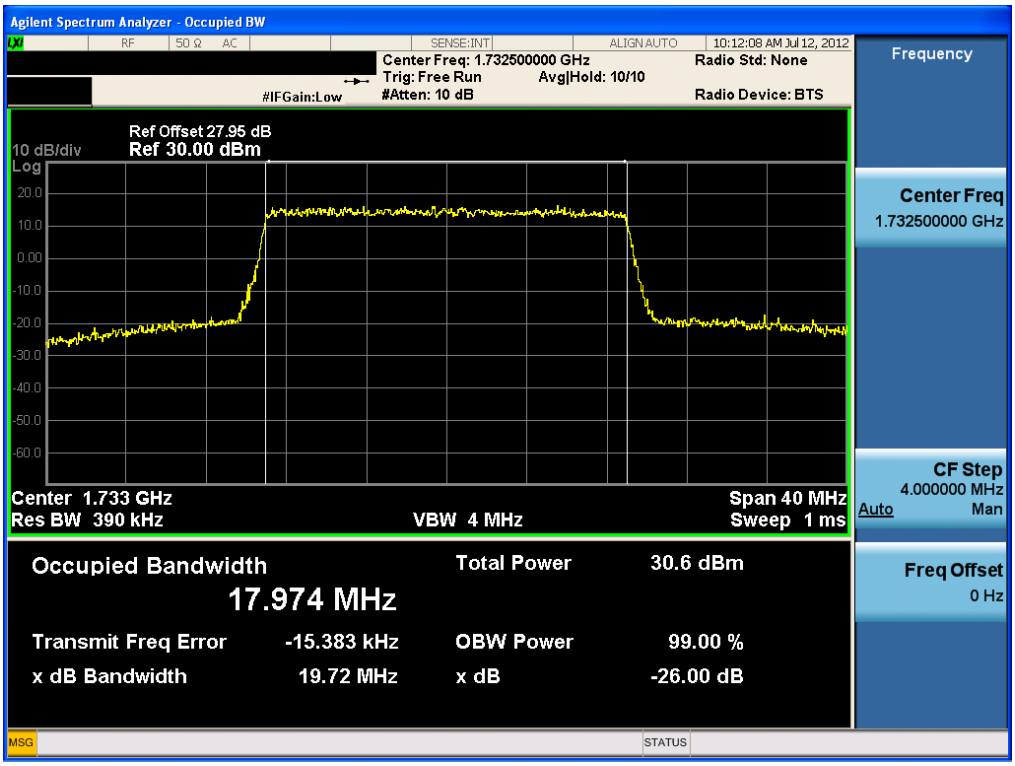
Occupied Bandwidth Plot (LTE Band 4_15MHz QPSK - RB Size 75)



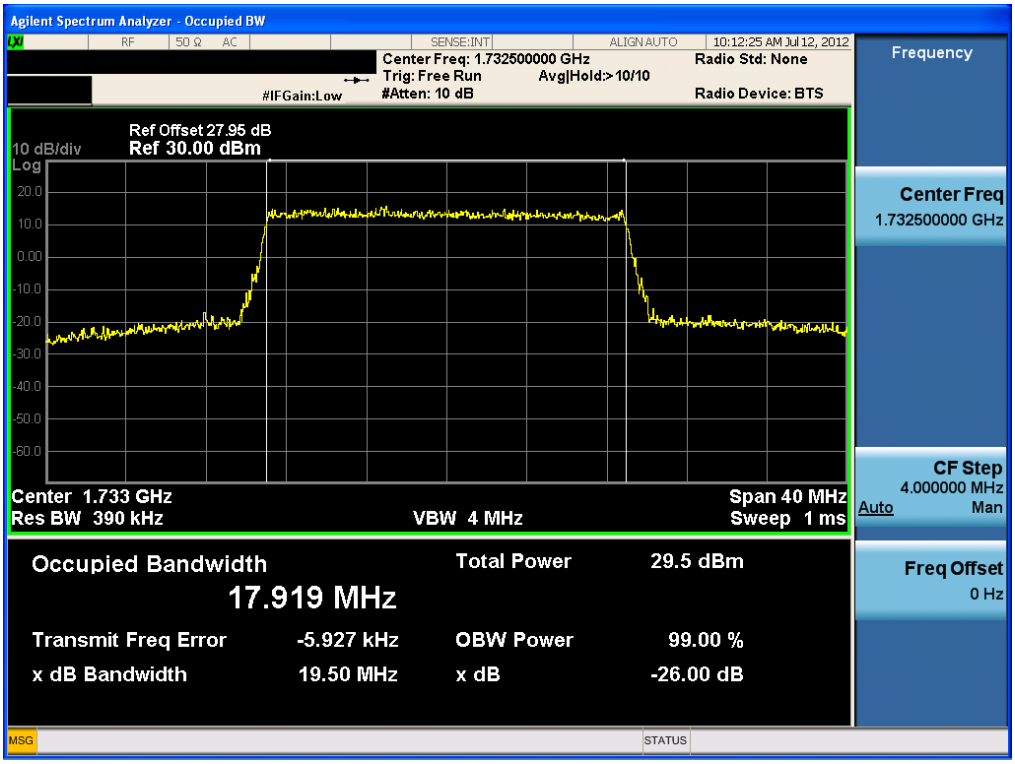
Occupied Bandwidth Plot (LTE Band 4_15MHz 16-QAM - RB Size 75)



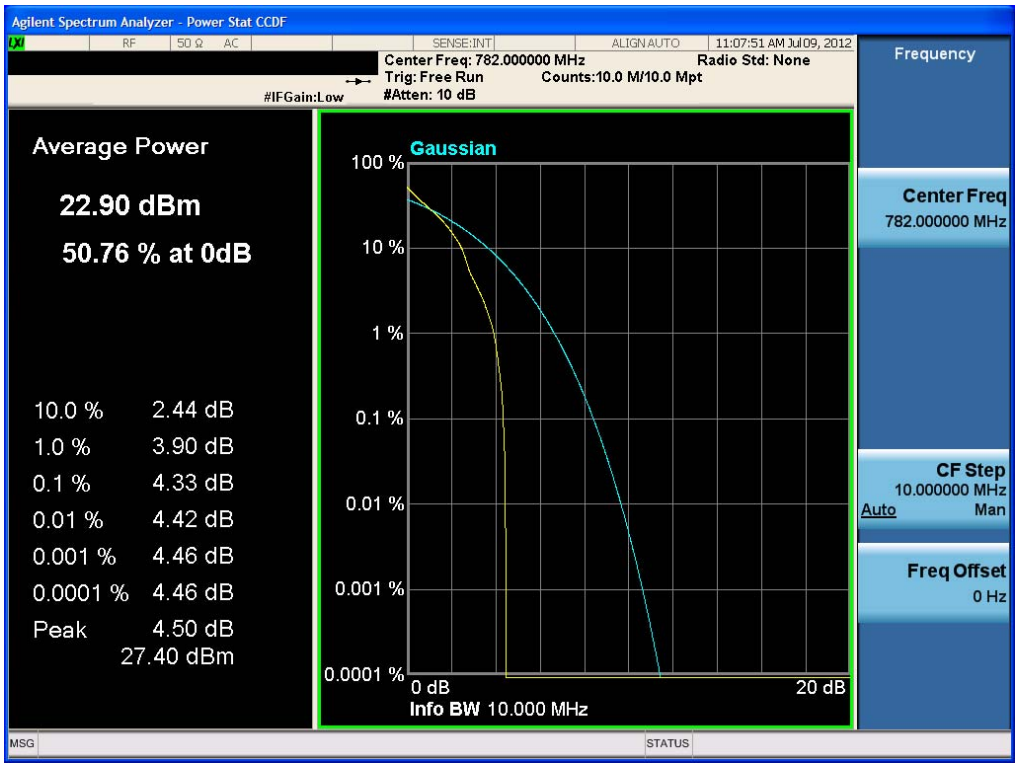
Occupied Bandwidth Plot (LTE Band 4_20MHz QPSK - RB Size 100)



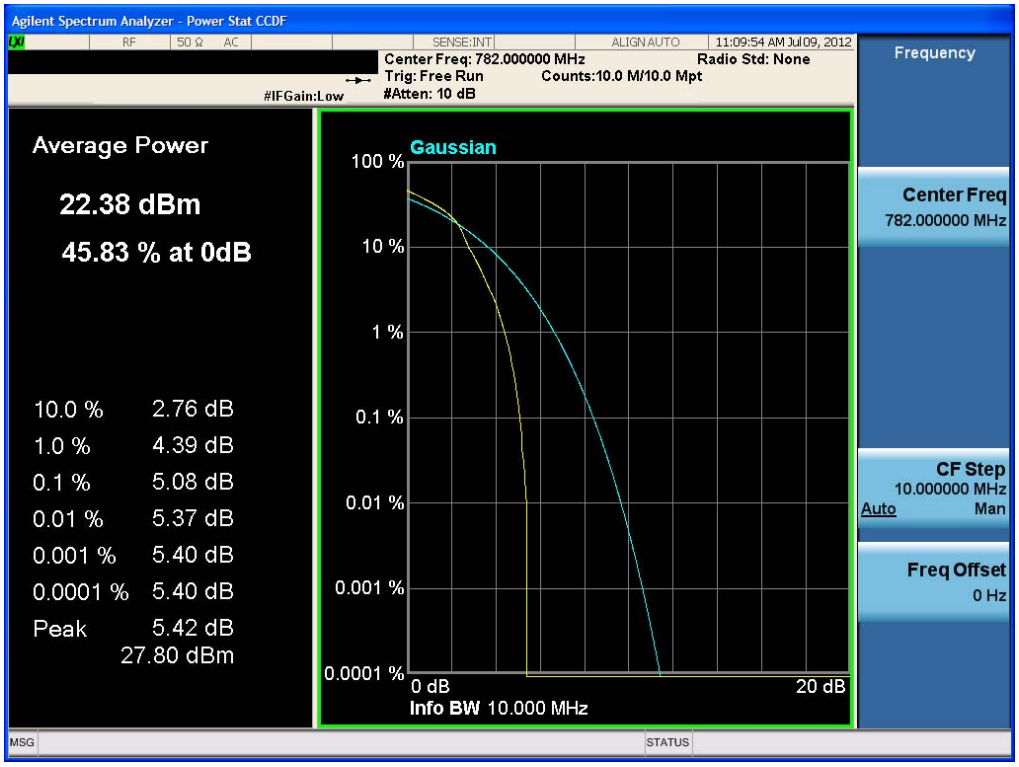
Occupied Bandwidth Plot (LTE Band 4_20MHz 16-QAM - RB Size 100)



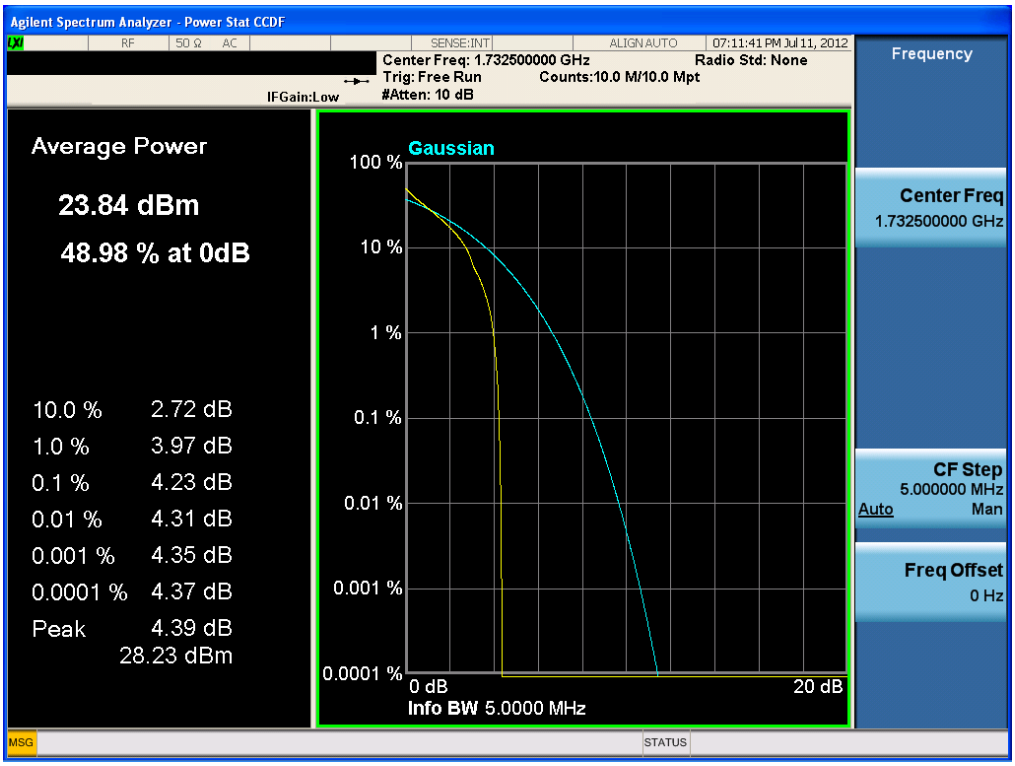
■ Peak-Average Ratio Plot (LTE Band 13_ QPSK)



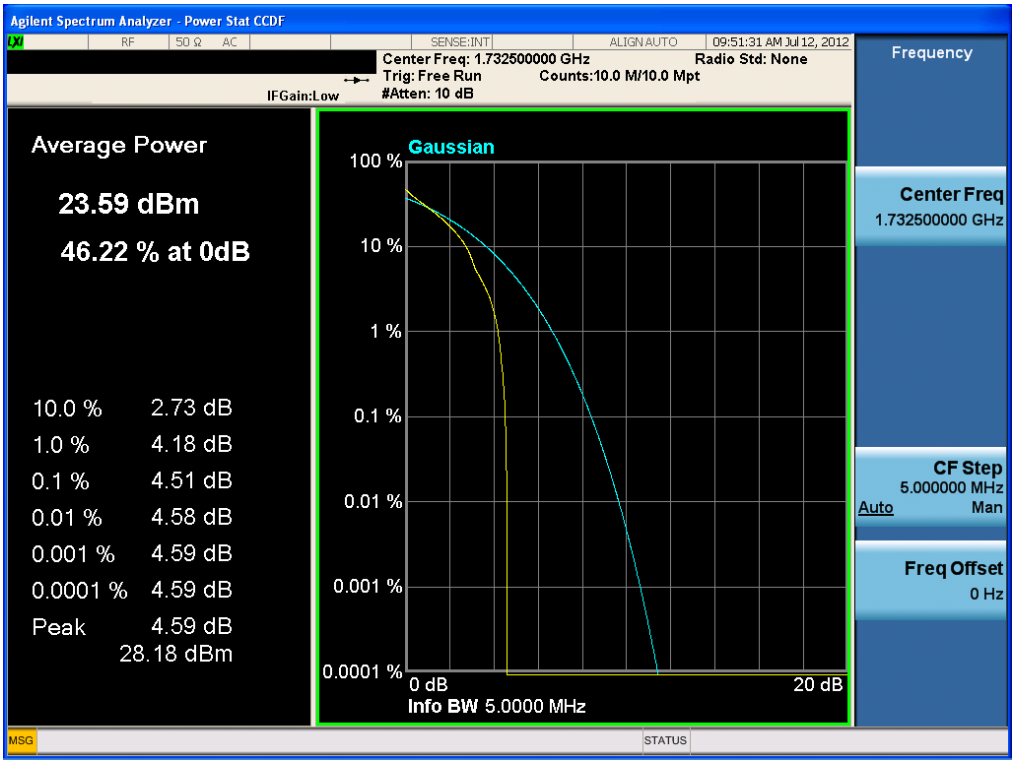
■ Peak-Average Ratio Plot (LTE Band 13_ 16-QAM)



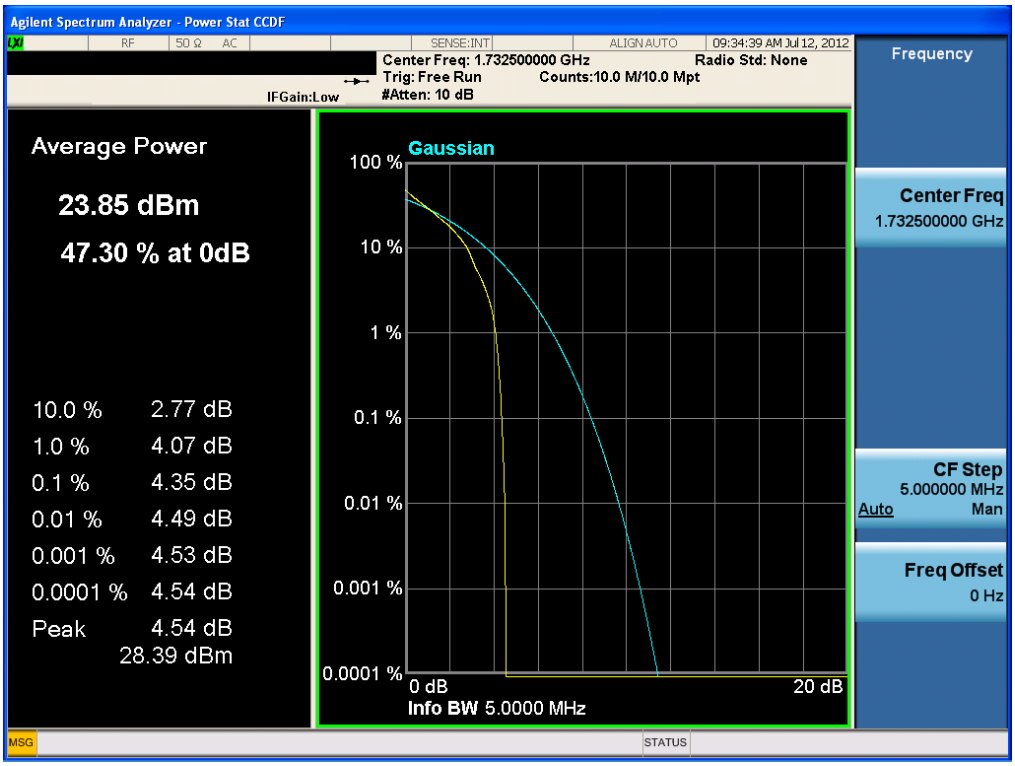
PAR Plot (LTE Band 4_5MHz QPSK - RB Size 1)



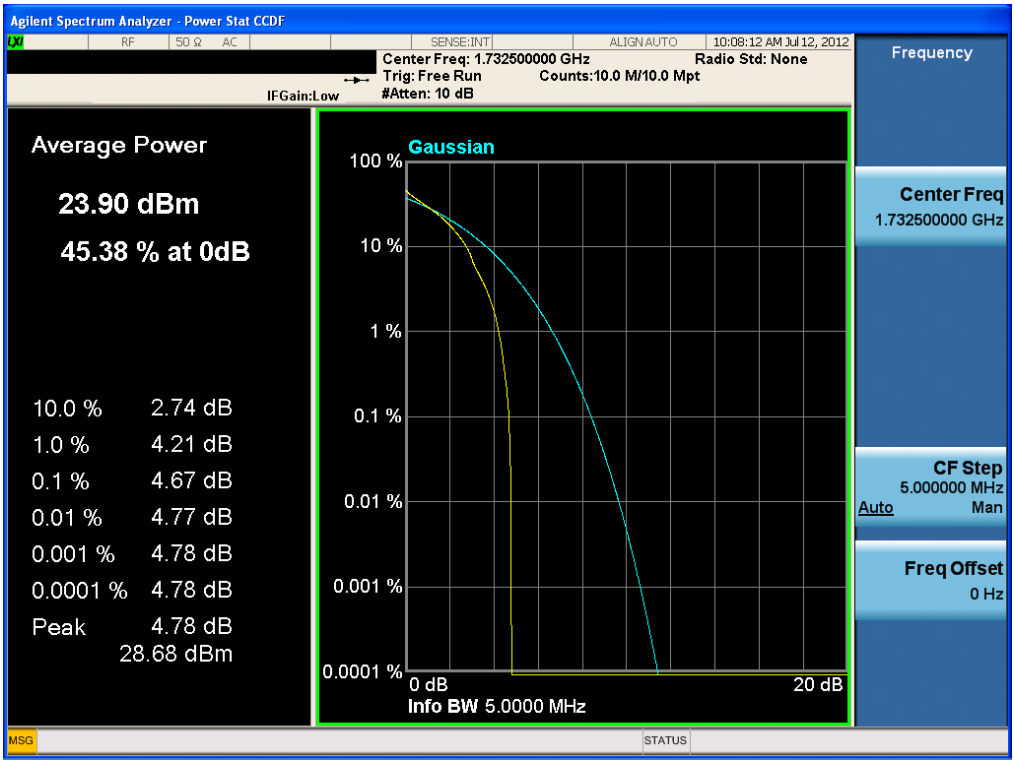
PAR Plot (LTE Band 4_10MHz QPSK - RB Size 1)



PAR Plot (LTE Band 4_15MHz QPSK - RB Size 1)



PAR Plot (LTE Band 4_20MHz QPSK - RB Size 1)



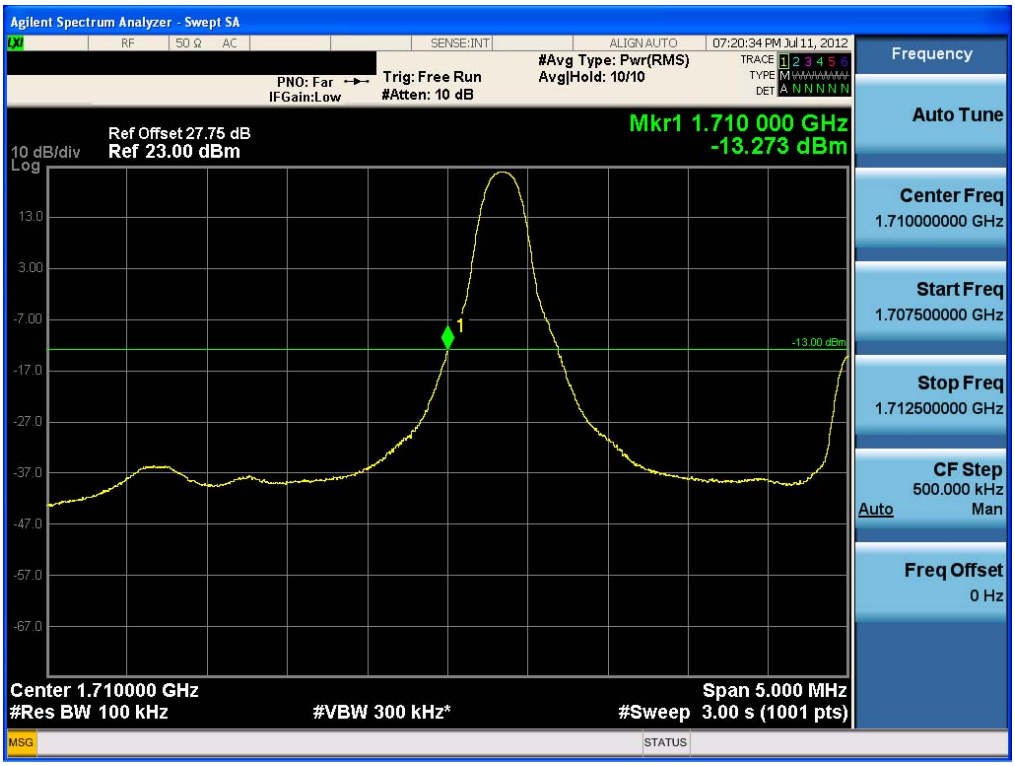
■ Low Band Edge (LTE Band 13_QPSK – RB Size 50)

■ Upper Band Edge (LTE Band 13_ QPSK – RB Size 50)

■ Low Band Edge (LTE Band 13_16-QAM – RB Size 50)

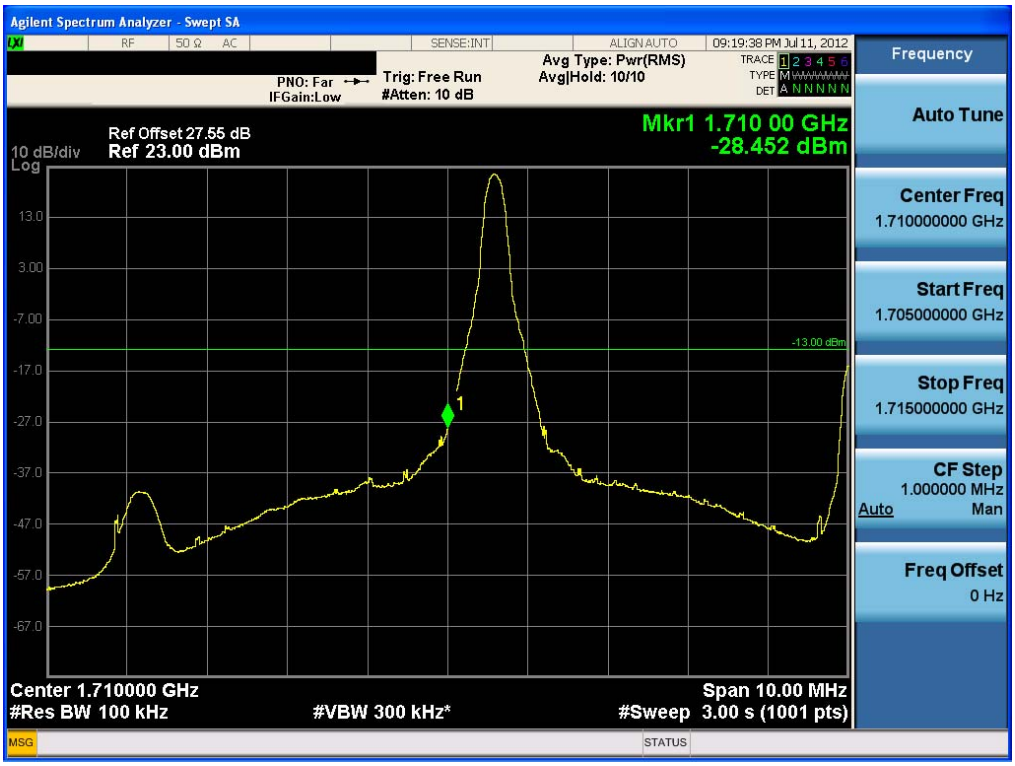
■ Upper Band Edge (LTE Band 13_16-QAM – RB Size 50)

Lower Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 1, Offset 0)



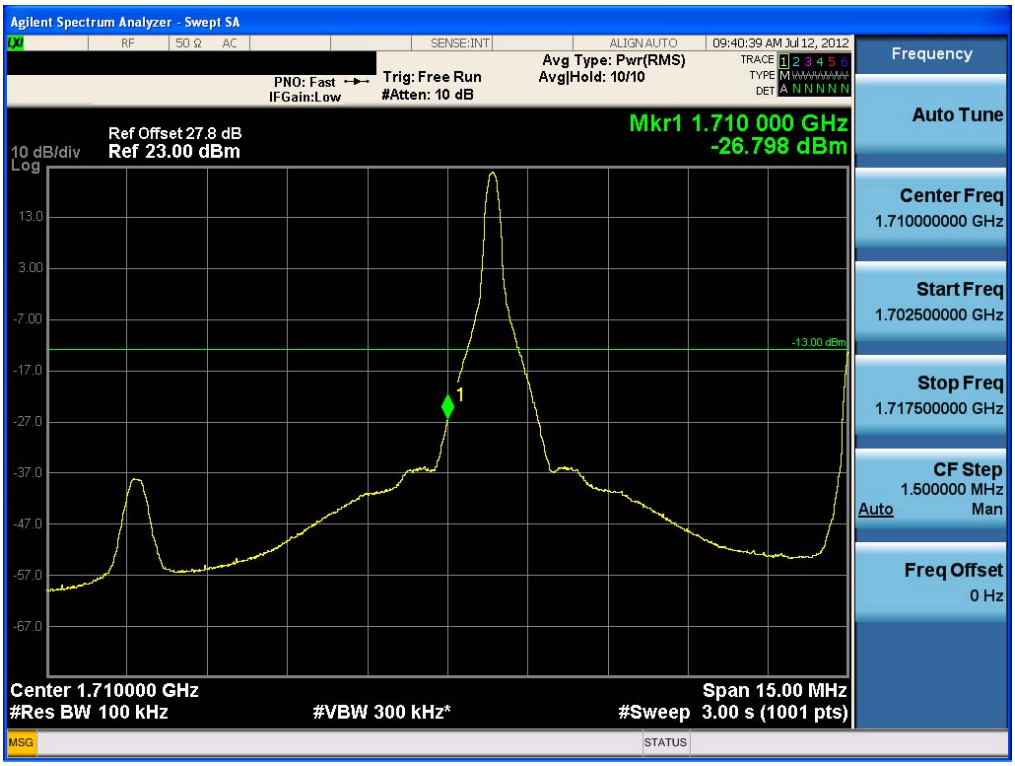
Lower Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 25, Offset 0)

Lower Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 1, Offset 0)

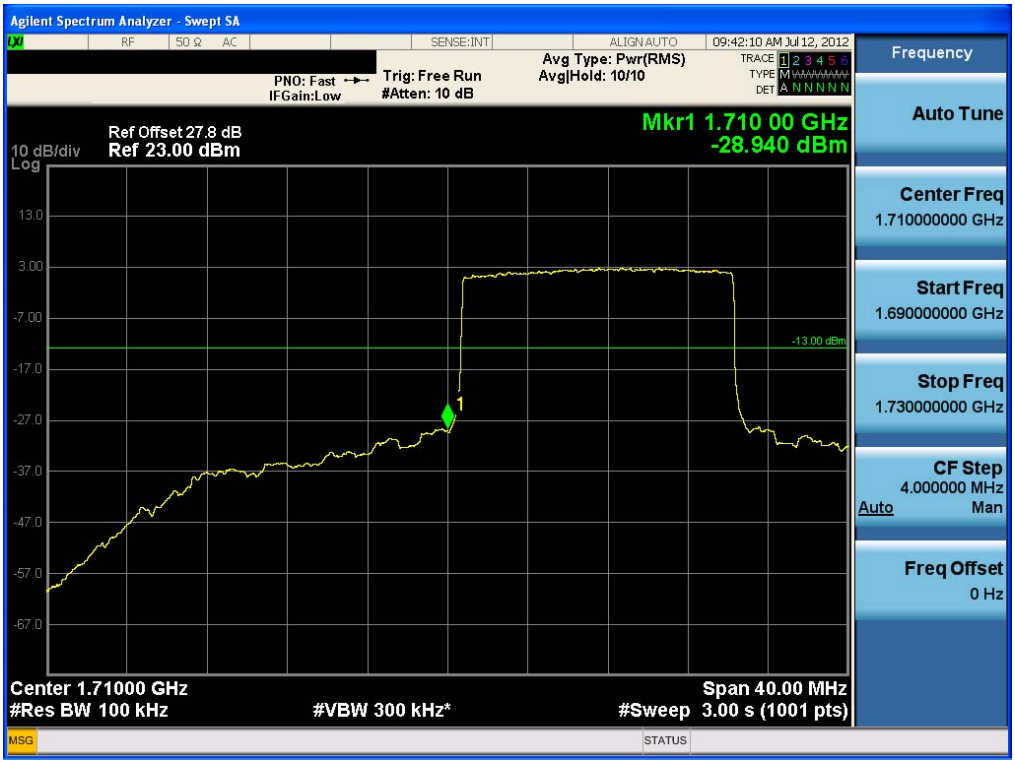


Lower Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 50, Offset 0)

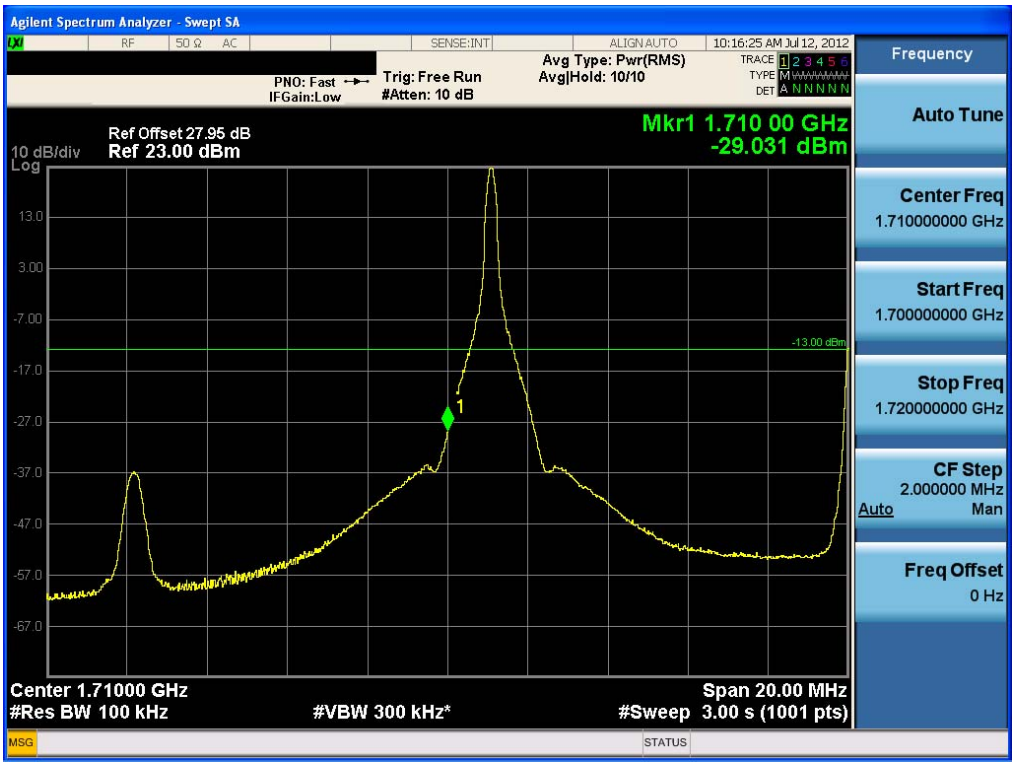
Lower Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 1, Offset 0)



Lower Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 75, Offset 0)

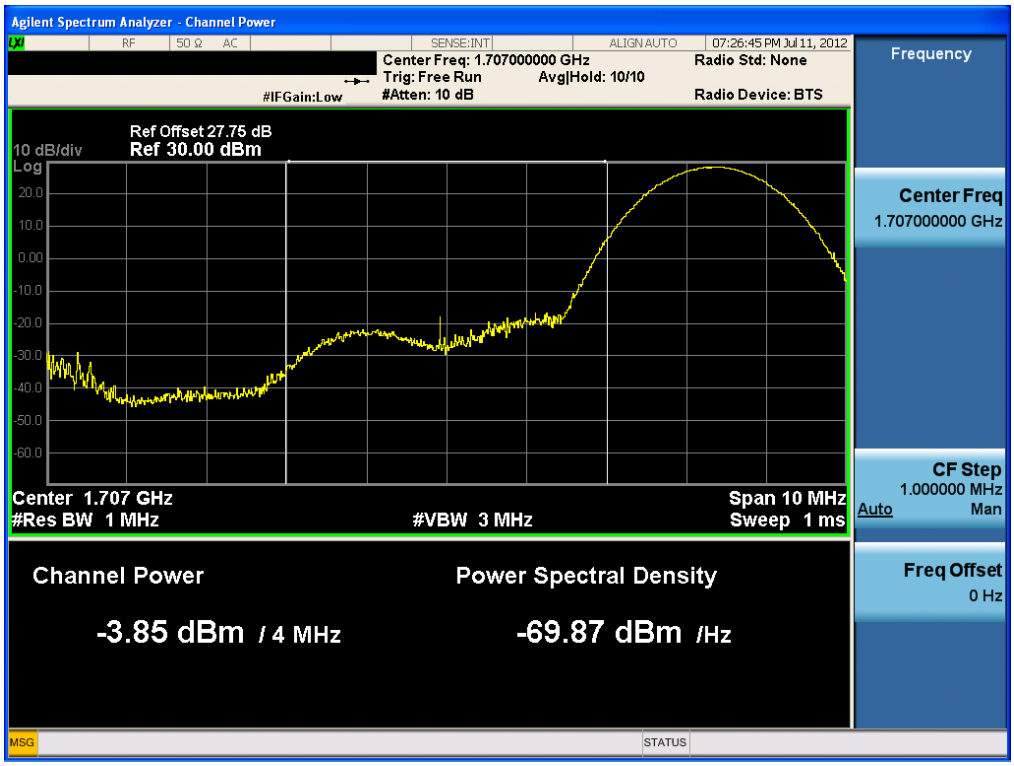


Lower Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 1, Offset 0)



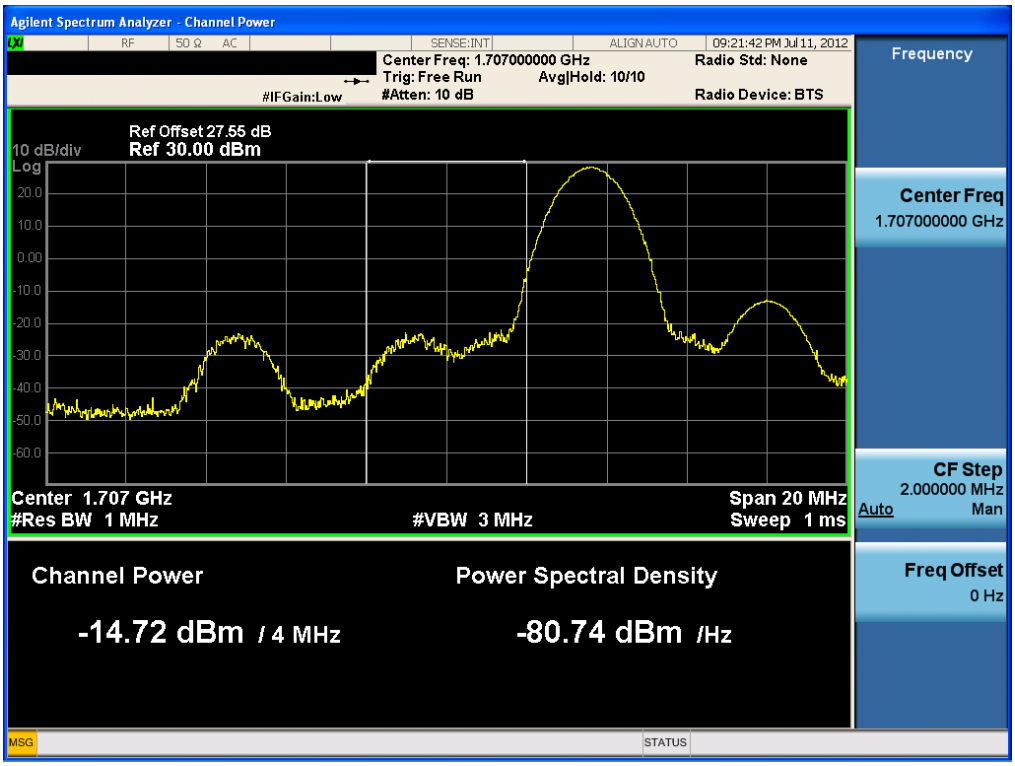
Lower Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 100, Offset 0)

Lower Extended Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 1, Offset 0)

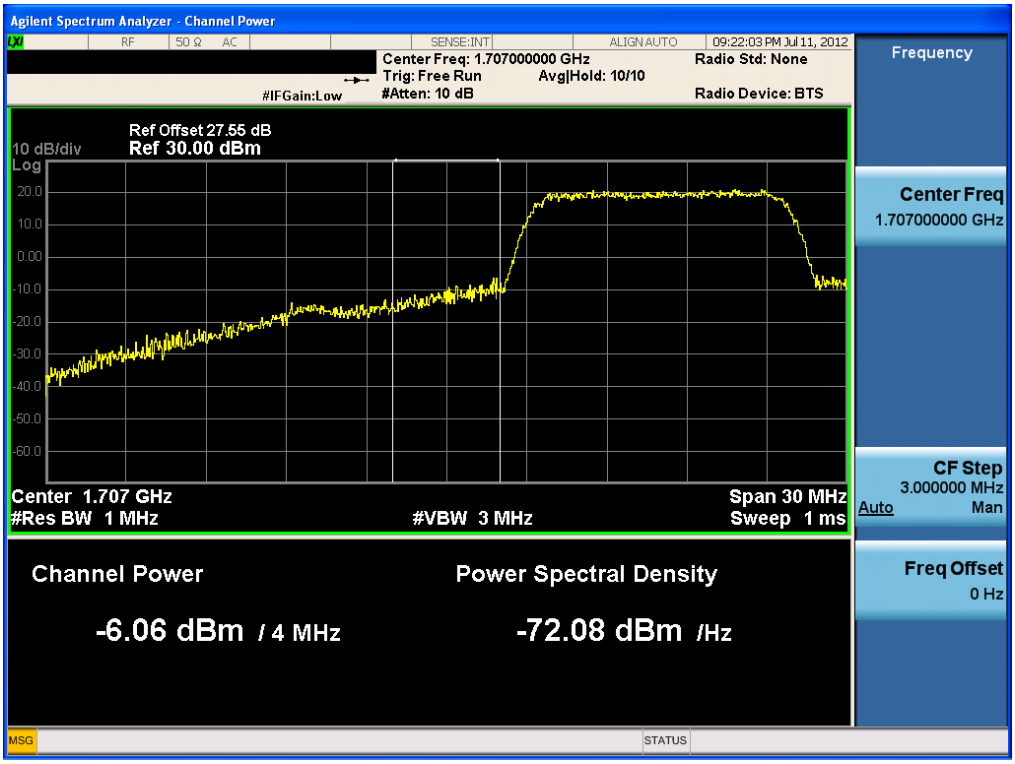


Lower Extended Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 25, Offset 0)

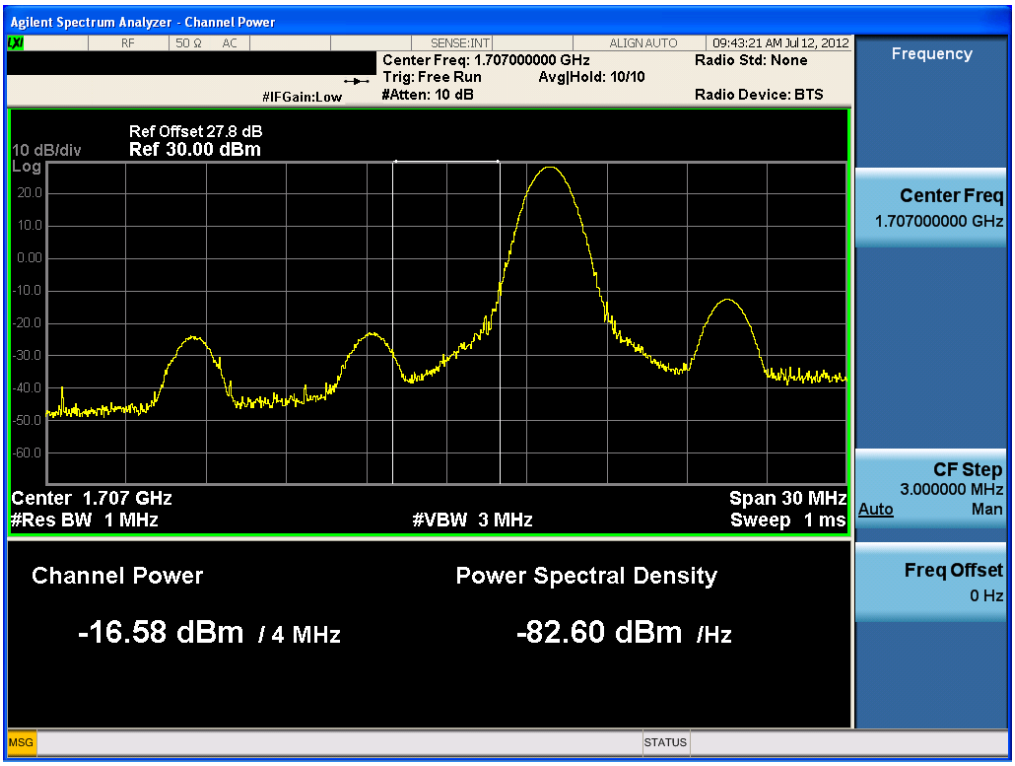
Lower Extended Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 1, Offset 0)



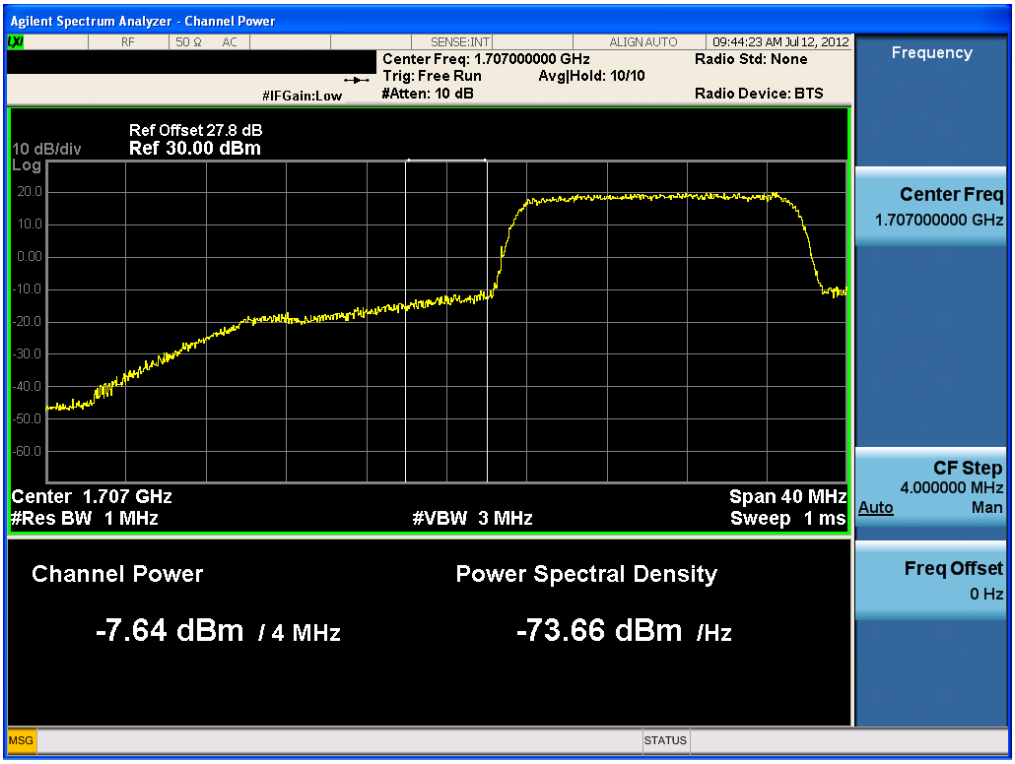
Lower Extended Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 50, Offset 0)



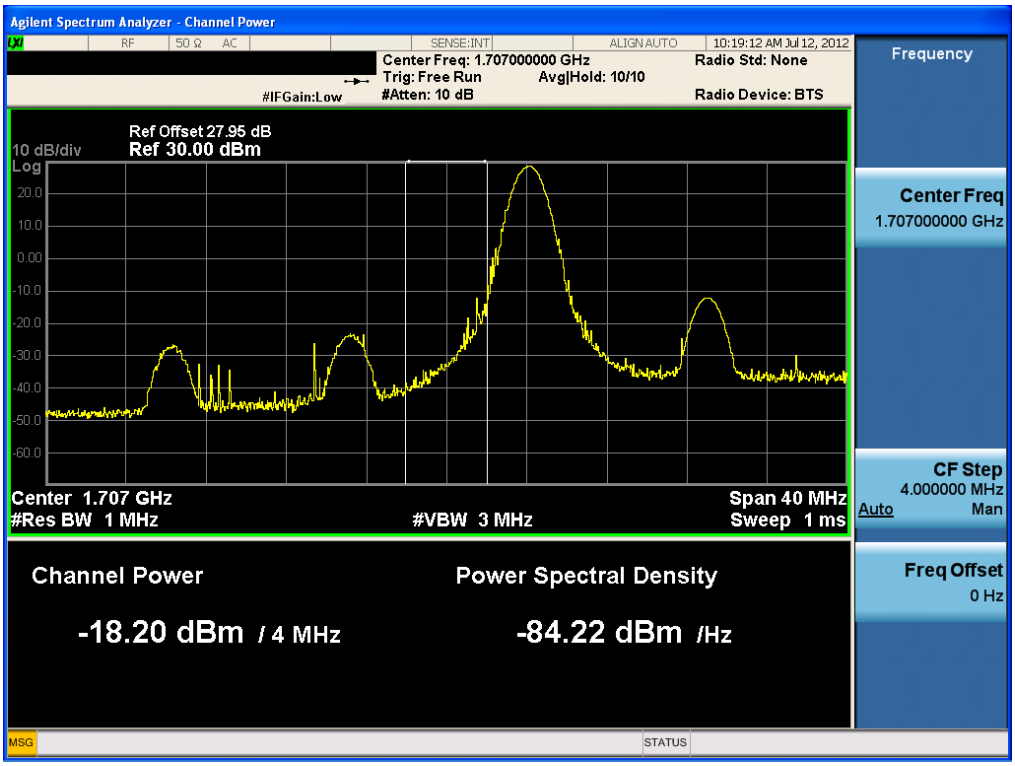
Lower Extended Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 1, Offset 0)



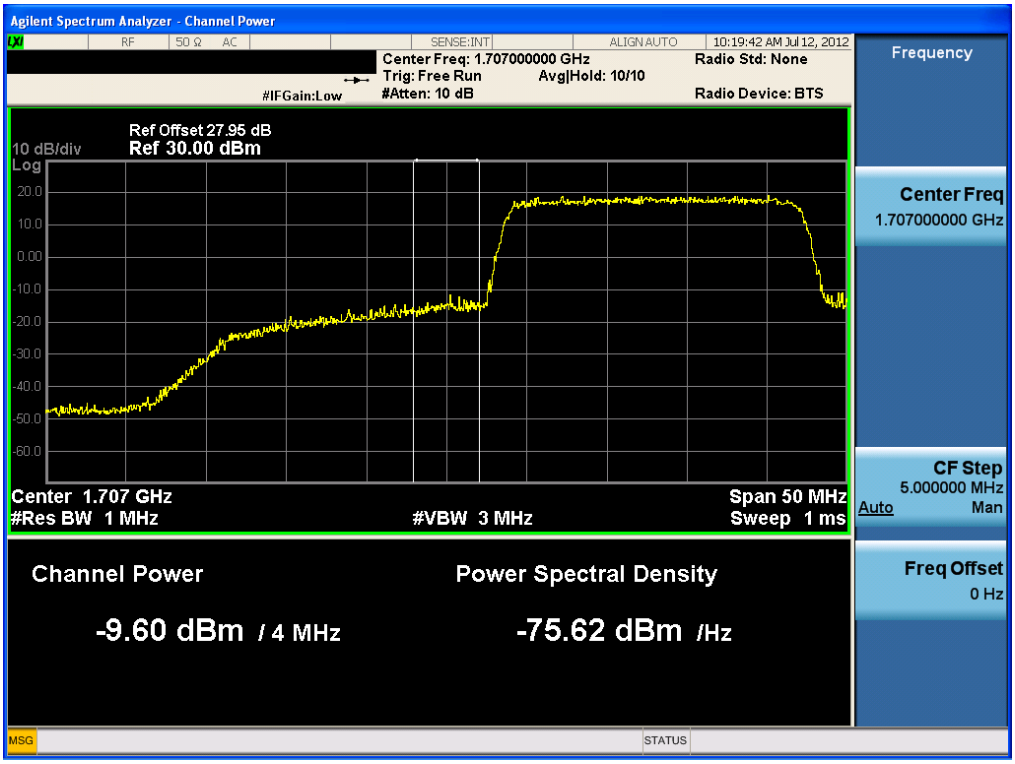
Lower Extended Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 75, Offset 0)



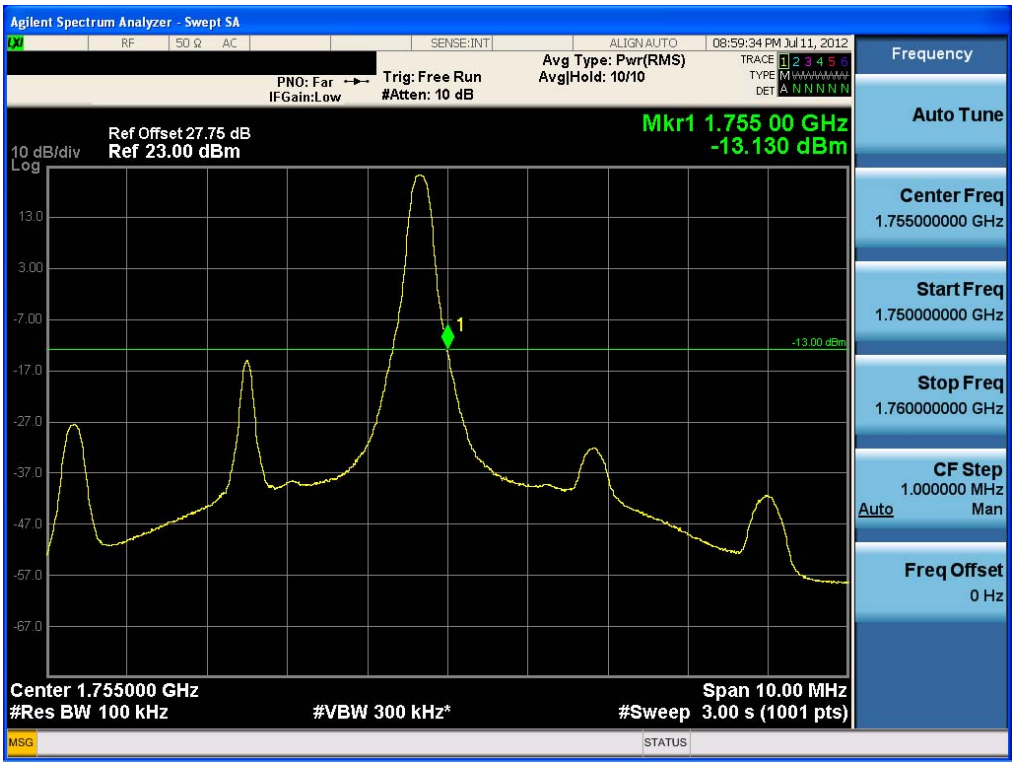
Lower Extended Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 1, Offset 0)



Lower Extended Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 100, Offset 0)

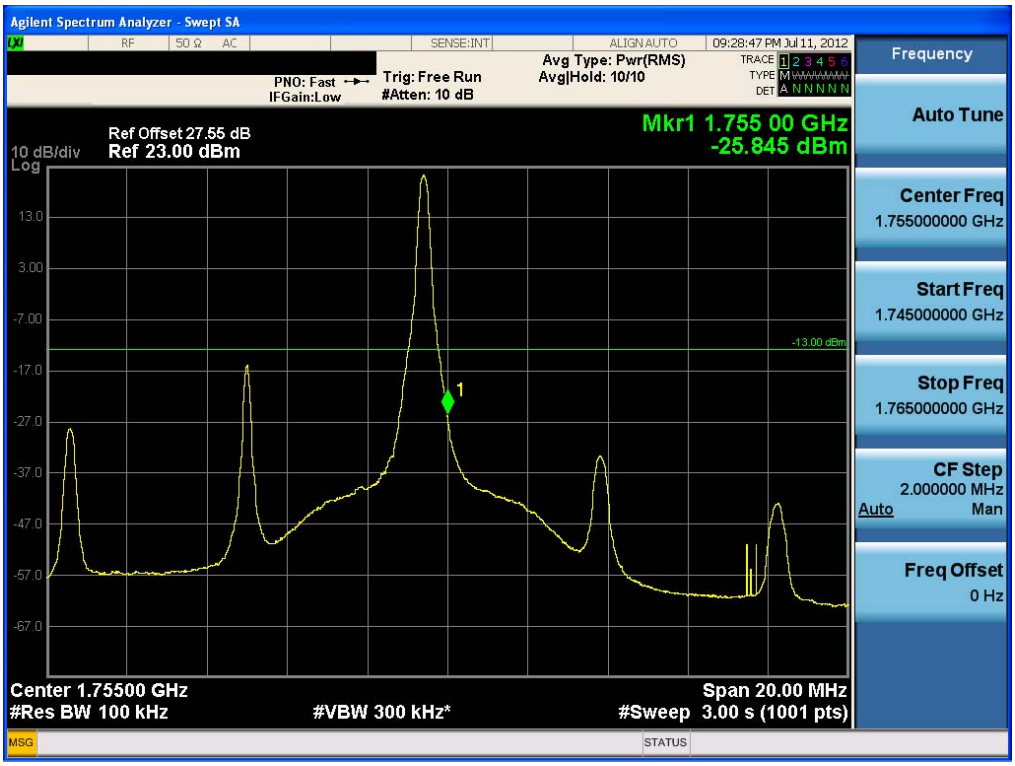


Upper Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 1, Offset 24)

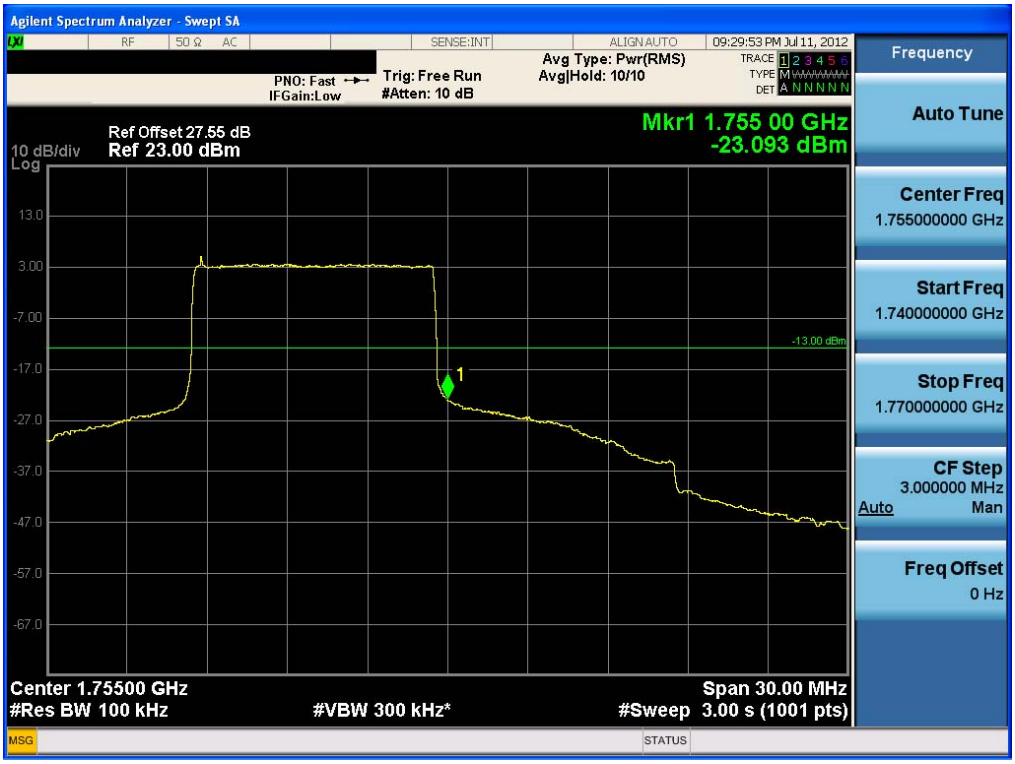


Upper Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 25, Offset 0)

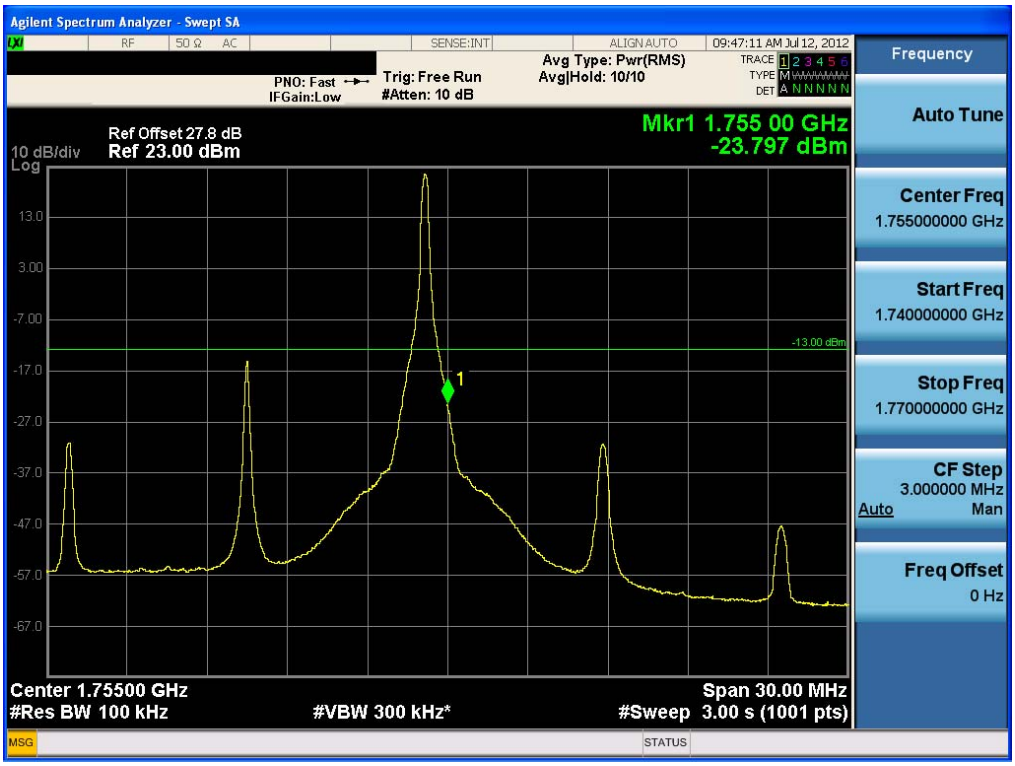
Upper Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 1, Offset 49)



Upper Band Edge Plot (LTE Band 4_10MHz QPSK - RB Size 50, Offset 0)

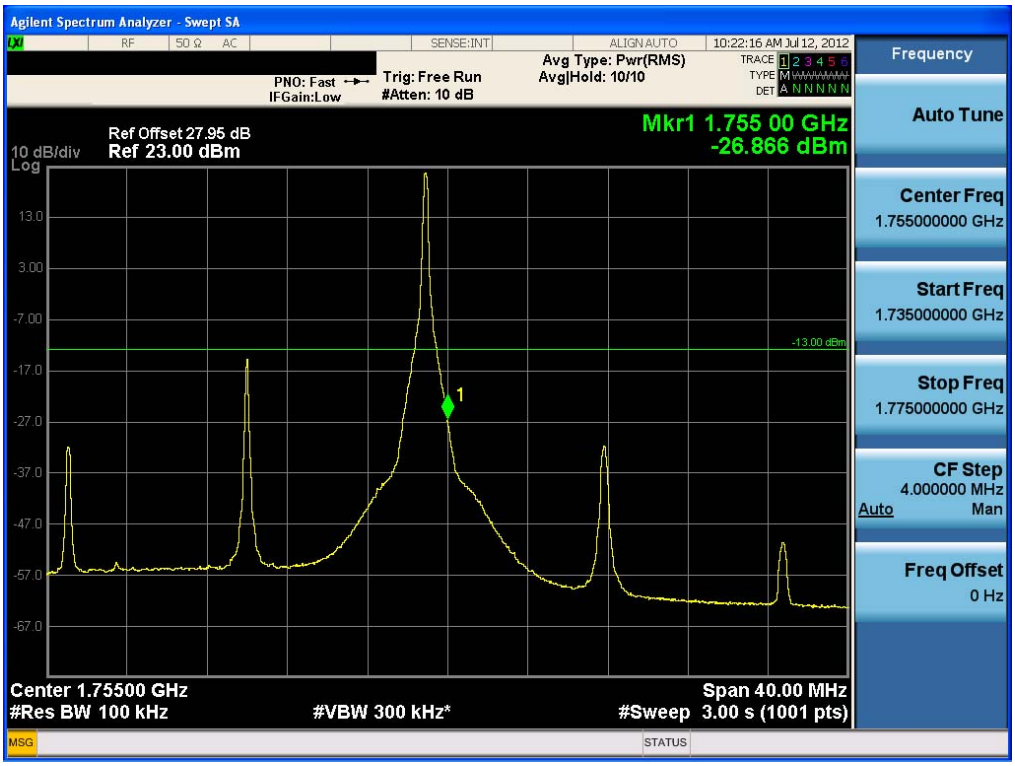


Upper Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 1, Offset 74)



Upper Band Edge Plot (LTE Band 4_15MHz QPSK - RB Size 75, Offset 0)

Upper Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 1, Offset 99)



Upper Band Edge Plot (LTE Band 4_20MHz QPSK - RB Size 100, Offset 0)

Upper Extended Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 1, Offset 24)

Upper Extended Band Edge Plot (LTE Band 4_5MHz QPSK - RB Size 25, Offset 0)