74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
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FCC LTE REPORT

FCC Class II Permissive Change

Applicant Name:
LG Electronics Inc.

Address:
19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si,
Gyeonggi-do 451-713, Korea

Date of Issue:
June 11, 2015

Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Report No.: HCT-R-1506-F023

HCT FRN: 0005866421

FCC ID: **BEJLTTC10**

APPLICANT: **LG Electronics Inc.**

FCC Model(s): GEN10NADNA
EUT Type: GSM/WCDMA/LTE Telematics NAD module
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §2 , §27

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band13 (5)	779.5 –784.5	4M51G7D	QPSK	0.204	23.10
		4M50W7D	16QAM	0.161	22.07

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band4 (1.4)	1710.7 – 1754.3	1M10G7D	QPSK	0.213	23.28
		1M10W7D	16QAM	0.167	22.22
LTE – Band4 (3)	1711.5 – 1753.5	2M69G7D	QPSK	0.216	23.34
		2M70W7D	16QAM	0.171	22.33
LTE – Band4 (15)	1717.5 – 1747.5	13M5G7D	QPSK	0.211	23.25
		13M4W7D	16QAM	0.171	22.32
LTE – Band4 (20)	1720.0 – 1745.0	17M9G7D	QPSK	0.215	23.33
		17M9W7D	16QAM	0.172	22.35

The measurements shown in this report were made in accordance with the procedures specified in CFR47 section §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)

Report prepared by
: Kyoung Houn Seo
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1506-F023	June 11, 2015	- First Approval Report

Table of Contents

MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	LG Electronics Inc.	
Address:	19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do 451-713, Korea	
FCC ID:	BEJLTTC10	
Application Type:	FCC Class II Permissive Change	
FCC Classification:	PCS Licensed Transmitter (PCB)	
FCC Rule Part(s):	§2 , §27	
EUT Type:	GSM/WCDMA/LTE Telematics NAD module	
FCC Model(s):	GEN10NADNA	
Tx Frequency:	779.5 MHz –784.5 MHz (LTE – Band 13 (5MHz))	
	1710.7 MHz – 1754.3 MHz (LTE – Band 4 (1.4 MHz)) 1711.5 MHz – 1753.5 MHz (LTE – Band 4 (3 MHz)) 1717.5 MHz – 1747.5 MHz (LTE – Band 4 (15 MHz)) 1720.0 MHz – 1745.0 MHz (LTE – Band 4 (20 MHz))	
Max. RF Output Power:	Band 13 (5 MHz) :	0.204 W (QPSK) (23.10 dBm) 0.161 W (16-QAM) (22.07 dBm)
	Band 4 (1.4 MHz):	0.213 W (QPSK) (23.28 dBm) 0.167 W (16-QAM) (22.22 dBm)
	Band 4 (3 MHz):	0.216 W (QPSK) (23.34 dBm) 0.171 W (16-QAM) (22.33 dBm)
	Band 4 (15 MHz):	0.211 W (QPSK) (23.25 dBm) 0.171 W (16-QAM) (22.32 dBm)
	Band 4 (20 MHz):	0.215 W (QPSK) (23.33 dBm) 0.172 W (16-QAM) (22.35 dBm)
Emission Designator(s):	Band 13 (5 MHz) :	4M51G7D (QPSK) / 4M50W7D (16-QAM)
	Band 4 (1.4 MHz):	1M10G7D (QPSK) / 1M10W7D (16-QAM)
	Band 4 (3 MHz):	2M69G7D (QPSK) / 2M70W7D (16-QAM)
	Band 4 (15 MHz):	13M5G7D (QPSK) / 13M4W7D (16-QAM)
	Band 4 (20 MHz):	17M9G7D (QPSK) / 17M9W7D (16-QAM)
Date(s) of Tests:	May 19, 2015 ~ June 09, 2015	
Antenna Specification	Manufacturer: Laird Technologies Antenna type: MIMO capable vehicle dome antenna Peak Gain: Band 4: -1.6 dBi Band 17: -0.3 dBi Band 13: -1.5 dBi	

2. INTRODUCTION

2.1. EUT DESCRIPTION

The LG Electronics Inc. GEN10NADNA GSM/WCDMA/LTE Telematics NAD module consists of LTE 4 and 13.

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 Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea**.

3. DESCRIPTION OF TESTS

3.1 CONDUCTED OUTPUT POWER

Test Procedure

Conducted Output Power is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 5.2.

5.2.1 Procedure for use with a spectrum/signal analyzer when EUT can be configured to transmit continuously or when sweep triggering/signal gating can be properly implemented

The EUT is considered to transmit continuously if it can be configured to transmit at a burst duty cycle of greater than or equal to 98% throughout the duration of the measurement. If this condition can be achieved, then the following procedure can be used to measure the average output power of the EUT.

This procedure can also be used when the EUT cannot be configured to transmit continuously, provided that the measurement instrument can be configured to trigger a sweep at the beginning of each full-power transmission burst, and the sweep time is less than or equal to the minimum transmission time during each burst (*i.e.*, no burst off-time is to be included in the measurement).

a) Set span to at least 1.5 times the OBW.

b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.

c) Set VBW ≥ 3 x RBW.

d) Set number of points in sweep ≥ 2 × span / RBW.

e) Sweep time = auto-couple.

f) Detector = RMS (power averaging).

g) If the EUT can be configured to transmit continuously (*i.e.*, burst duty cycle ≥ 98%), then set the trigger to free run.

h) If the EUT cannot be configured to transmit continuously (*i.e.*, burst duty cycle < 98 %), then use a sweep trigger with the level set to enable triggering only on full power bursts and configure the EUT to transmit at full power for the entire duration of each sweep. Ensure that the sweep time is less than or equal to the transmission burst duration.

i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode.

j) Compute the power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with the band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

3.2 ERP/EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective Radiated Power), EIRP(Effective Isotropic Radiated Power)

Test Procedure

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-D-2010 Clause 2.2.17. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a RMS detector.

A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.

The power is calculated by the following formula;

$$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

Radiated spurious emissions

: Frequency Range : 30 MHz ~ 10^{th} Harmonics of highest channel fundamental frequency.

3.3 BLOCK B FREQUENCY RANGE (704 – 710 and 734 – 740 MHz, 777 – 792 MHz)

§27.5(c)

698-746 MHz Band. The following frequencies are available for licensing pursuant to this part in the 698–746 MHz band: (1) Three paired channel blocks of 12 MHz each are available for assignment as follows :

Block A : 698 – 704 MHz and 728 – 734 MHz ;

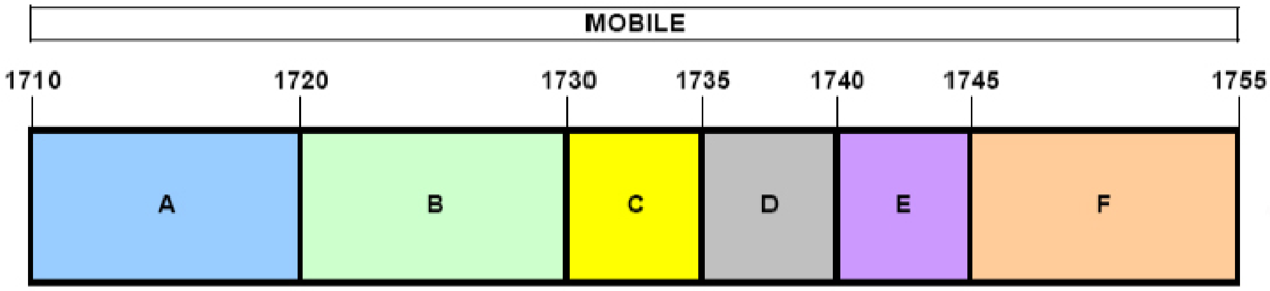
Block B : 704 – 710 MHz and 734 – 740 MHz ; and

Block C : 710 – 716 MHz and 740 – 746 MHz.

The EUT is only being authorized for operation in Blocks B and C.

3.4 AWS – MOBILE FREQUENCY BLOCKS (1710 – 1755 MHz)

§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.

Test Procedure

Peak to Average Power Ratio is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 5.7.

- Section 5.7.1 CCDF Procedure

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
b) Set the number of counts to a value that stabilizes the measured CCDF curve;
c) Set the measurement interval as follows:
   1) for continuous transmissions, set to 1 ms,
   2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
d) Record the maximum PAPR level associated with a probability of 0.1%.

- Section 5.7.2 Alternate Procedure

Use one of the procedures presented in 5.1 to measure the total peak power and record as P_{Pk}. Use one of the applicable procedures presented 5.2 to measure the total average power and record as P_{Avg}. Determine the P.A.R. from: $P.A.R_{(dB)} = P_{Pk\ (dBm)} – P_{Avg\ (dBm)}$ (P_{Avg} = Average Power + Duty cycle Factor)

5.1.1 Peak power measurements with a spectrum/signal analyzer or EMI receiver

The following procedure can be used to determine the total peak output power.

a) Set the RBW ≥ OBW.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 2 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Ensure that the number of measurement points ≥ span/RBW.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the peak amplitude level.

5.2.2 Procedures for use with a spectrum/signal analyzer when EUT cannot be configured to transmit continuously and sweep triggering/signal gating cannot be properly implemented

If the EUT cannot be configured to transmit continuously (burst duty cycle < 98%), then one of the following procedures can be used. The selection of the applicable procedure will depend on the characteristics of the measured burst duty cycle.

Measure the burst duty cycle with a spectrum/signal analyzer or EMC receiver can be used in zero-span mode if the response time and spacing between bins on the sweep are sufficient to permit accurate measurement of the burst on/off time of the transmitted signal.

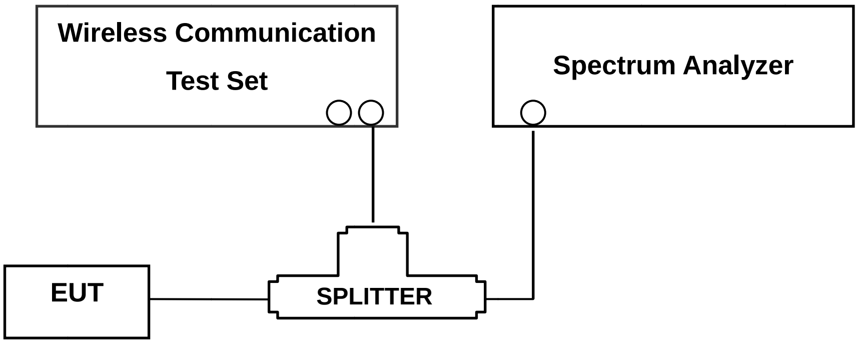
5.2.2.2 Constant burst duty cycle

If the measured burst duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then:

a) Set span to at least 1.5 times the OBW.
b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3 x RBW.
d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
e) Sweep time = auto.
f) Detector = RMS (power averaging).
g) Set sweep trigger to “free run”.
h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
j) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).
   For example, add 10 log (1/0.25) = 6 dB if the duty cycle is a constant 25%.

3.6 OCCUPIED BANDWIDTH.

Test set-up



(Configuration of conducted Emission measurement)

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

Test Procedure

OBW is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 4.2.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

3.7 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

Test Procedure

Spurious and harmonic emissions at antenna terminal is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 6.0.

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

The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz bandwidth 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

Additionally, for operations in the 776-788MHz band, the power of any emission outside the licensee's frequency band of operation shall be attenuated below the transmitted power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 776-788MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43+10log(P)dB.

(2) On all frequencies between 763-775 and 793-805MHz, by a factor not less than 65+10log(P)dB in a 6.25kHz band segment.

For operations in the 788–793 MHz band, the power of any emission outside the licensee's frequency bands 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:

(1) On all frequencies between 769–775 MHz and 799–805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

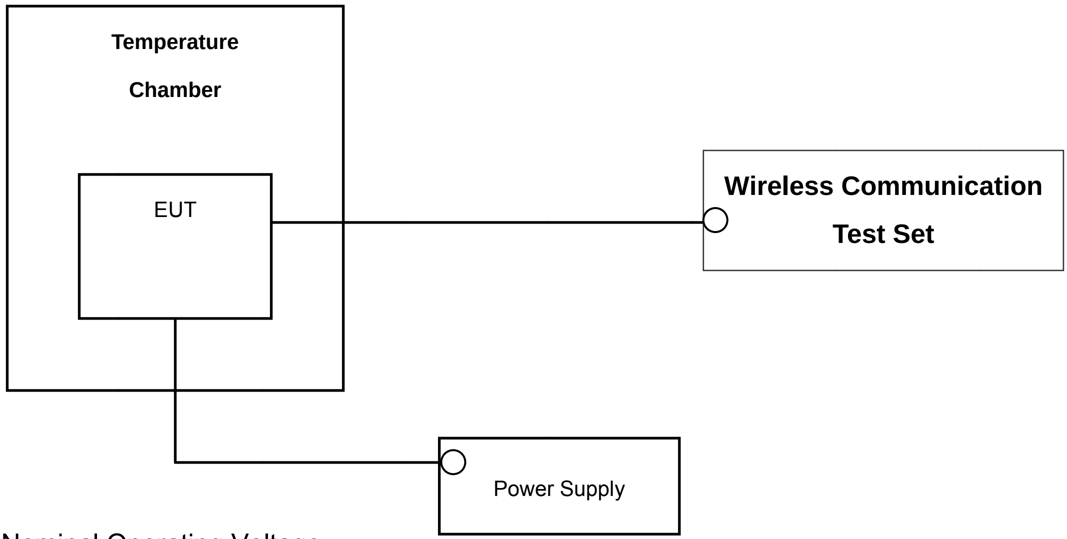
(2) On any frequency between 775–788 MHz, above 805 MHz, and below 758 MHz, by at least 43 + 10 log (P) dB

NOTES: The analyzer plot offsets were determined by below conditions.

- For LTE Band 4, total offset 26.7 dBm = 30 dBm attenuator + 6 dBm Divider + 0.7 dBm RF cables.
- For LTE Band 13, total offset 26.1 dBm = 30 dBm attenuator + 6 dBm Divider + 0.1 dBm RF cables.

3.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



* Nominal Operating Voltage

Test Procedure

Frequency stability is tested in accordance with ANSI/TIA-603-D-2010 section 2.2.2

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 the end point to 100 % 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

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	N1921A/ Power Sensor	MY45241059	Annual	07/09/2015
Agilent	N1911A/ Power Meter	MY45100523	Annual	01/15/2016
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/04/2015
Wainwright	WHK1.2/15G-10EF/H.P.F	4	Annual	04/27/2016
Wainwright	WRCJV2400/2483.5-2370/2520-60/12SS / B.R.F.	1	Annual	06/17/2015
Wainwright	WHK3.3/18G-10EF/H.P.F	2	Annual	04/27/2016
Hewlett Packard	11667B / Power Splitter	10545	Annual	02/22/2016
Hewlett Packard	11667B / Power Splitter	11275	Annual	04/29/2016
Digital	EP-3010/ Power Supply	3110117	Annual	10/29/2015
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/23/2017
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/23/2017
Korea Engineering	KR-1005L / Chamber	KRAC05063-3CH	Annual	10/29/2015
Schwarzbeck	BBHA 9120D/ Horn Antenna	147	Biennial	09/01/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	1151	Biennial	07/05/2015
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170541	Biennial	07/05/2015
WEINSCHEL	ATTENUATOR	BR0592	Annual	10/22/2015
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/04/2016
Agilent	8960 (E5515C)/ Base Station	MY48360222	Annual	08/26/2015
Agilent	N9020A/ Signal Analyzer	MY51240695	Annual	02/12/2016
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6200863156	Annual	03/24/2016

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS
2.1051, 27.53(c), 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 <65 + 10 log (P[Watts]) in a 6.25kHz bandwidth for emissions in the 776–788 MHz bands		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	Emission must remain in band		PASS
27.50(b)(10),(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(c), 27.53(h), 27.53(g)	Undesirable Out-of-Band Emissions	< 43 +10 $\log_{10}$ (P[Watts]) for all out-of-band emissions		PASS
2.1053,27.53(f)	Undesirable Emissions in the 1559 – 1610 MHz band	< -40dBm/MHz EIRP (wideband) < -50dBm EIRP (narrowband)		PASS

Note regarding all Emission Mask test plots:

The FCC limit is 65 + $10\log_{10}(P_{[Watts]})$ = -35dBm in a 6.25kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25kHz with the available equipment, a bandwidth of 10kHz was used instead to show compliance. By using a 10kHz bandwidth, the limit was adjusted by $10\log_{10}$(10kHz/6.25kHz) = 2.04dB. Thus, the limit shown in all emission mask plots for all available modulation types was -35dBm + 2.04dB = -32.96dBm.

6. SAMPLE CALCULATION

A. EIRP Sample Calculation

Mode	Ch./ Freq.		Measured Level(dBm)	Substitude LEVEL(dBm)	Ant. Gain (dBi)	C.L	Pol.	EIRP	
	channel	Freq.(MHz)						W	dBm
LTE Band4	20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

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

1) The EUT mounted on a wooden tripod is 2.5 meter above test site ground level.
2) During the test , the turn table is rotated and the antenna height 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 (**EIRP**).

B. Emission Designator

QPSK Modulation

5MHz Bandwidth
Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

10MHz Bandwidth
Emission Designator = 8M95G7D
LTE BW = 8.95 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

16QAM Modulation

5MHz Bandwidth
Emission Designator = 4M48W7D
LTE BW = 4.48 MHz
W = main carrier modulated in a combination of two or more of the following modes; amplitude, angle, pulse
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

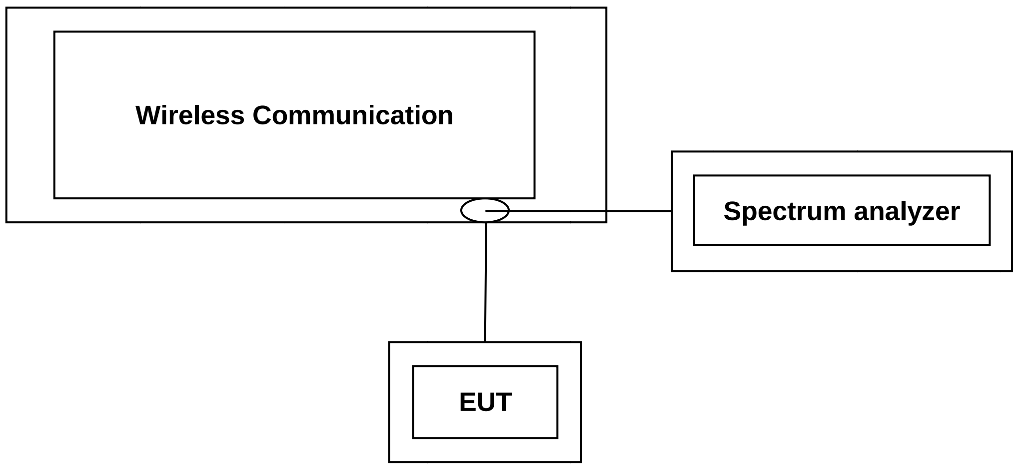
10MHz Bandwidth
Emission Designator = 8M95W7D
LTE BW = 8.95 MHz
W = main carrier modulated in a combination of two or more of the following modes; amplitude, angle, pulse
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

7. TEST DATA

7.1 CONDUCTED OUTPUT POWER

Conducted Output Power is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 5.2.

A base station simulator was used to establish communication with the EUT, and Spectrum analyzer was used for test results. This device was tested under all configurations and the highest power is reported. Conducted Output Powers of EUT are reported below.



Test Result

Band	Band Width (MHz)	Frequency (MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
						QPSK	16-QAM
Band 13	5	779.5	23205	1	0	22.76	21.61
				1	12	23.10	22.07
				1	24	22.61	21.54
				12	0	22.13	21.05
				12	6	22.04	20.97
				12	11	21.90	20.86
				25	0	21.78	20.64
		782.0	23230	1	0	23.03	21.80
				1	12	22.62	21.65
				1	24	22.90	21.78
				12	0	21.64	20.64
				12	6	21.58	20.62
				12	11	21.65	20.64
				25	0	21.47	20.42
		784.5	23255	1	0	22.60	21.54
				1	12	23.04	22.01
				1	24	22.75	21.64
				12	0	21.74	20.66
				12	6	21.86	20.84
				12	11	21.95	20.93
				25	0	21.63	20.54

LTE Conducted Average Output Powers (5 MHz Band 13 LTE)

Band	Band Width (MHz)	Frequency (MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
						QPSK	16-QAM
Band 4	1.4	1710.7	19957	1	0	22.94	22.06
				1	3	22.90	21.94
				1	5	22.92	22.08
				3	0	22.90	21.89
				3	1	22.94	21.90
				3	3	22.88	21.97
				6	0	21.93	21.05
		1732.5	20175	1	0	23.23	21.80
				1	3	23.25	21.65
				1	5	23.24	21.79
				3	0	22.97	22.06
				3	1	22.87	21.93
				3	3	23.02	21.94
				6	0	22.01	21.07
		1754.3	20393	1	0	23.28	22.01
				1	3	23.24	22.08
				1	5	23.28	22.12
				3	0	23.24	22.12
				3	1	23.26	22.17
				3	3	23.26	22.22
				6	0	22.36	21.35

LTE Conducted Average Output Powers (1.4 MHz Band 4 LTE)

Band	Band Width (MHz)	Frequency (MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
						QPSK	16-QAM
Band 4	3	1711.5	19965	1	0	23.08	22.06
				1	7	22.92	21.93
				1	14	23.01	22.05
				8	0	22.06	21.04
				8	3	22.07	20.95
				8	7	22.02	20.98
				15	0	22.00	21.01
		1732.5	20175	1	0	23.18	22.33
				1	7	22.94	22.26
				1	14	23.02	22.27
				8	0	22.15	21.07
				8	3	22.03	20.94
				8	7	22.00	20.97
				15	0	21.98	21.11
		1753.5	20385	1	0	23.24	22.33
				1	7	23.20	22.31
				1	14	23.34	22.30
				8	0	22.16	22.00
				8	3	22.14	21.07
				8	7	22.24	21.20
				15	0	22.17	21.24

LTE Conducted Average Output Powers (3 MHz Band 4 LTE)

Band	Band Width (MHz)	Frequency (MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
						QPSK	16-QAM
Band 4	15	1717.5	20025	1	0	23.25	22.15
				1	36	23.10	22.23
				1	74	22.95	22.11
				36	0	21.93	20.98
				36	18	21.86	20.96
				36	38	21.95	20.93
				75	0	21.86	20.88
		1732.5	20175	1	0	23.07	22.23
				1	36	23.01	22.28
				1	74	23.03	22.13
				36	0	21.95	21.00
				36	18	21.82	20.89
				36	38	21.81	20.88
				75	0	21.79	20.82
		1747.5	20325	1	0	22.98	22.25
				1	36	22.95	22.24
				1	74	23.25	22.32
				36	0	21.96	20.97
				36	18	21.84	20.88
				36	38	22.05	21.01
				75	0	21.97	20.88

LTE Conducted Average Output Powers (15 MHz Band 4 LTE)

Band	Band Width (MHz)	Frequency (MHz)	Channel	Resource Block Size	Resource Block Offset	Average Power [dBm]	
						QPSK	16-QAM
Band 4	20	1720.0	20050	1	0	23.15	22.34
				1	49	23.25	22.25
				1	99	22.96	22.13
				50	0	21.87	20.94
				50	25	21.85	20.88
				50	49	21.82	20.87
				100	0	21.83	20.90
		1732.5	20175	1	0	23.04	22.35
				1	49	23.05	22.34
				1	99	23.12	22.30
				50	0	21.94	20.96
				50	25	21.78	20.88
				50	49	21.76	20.85
				100	0	21.82	20.86
		1745.0	20300	1	0	23.15	22.34
				1	49	23.27	22.34
				1	99	23.33	22.33
				50	0	21.98	21.04
				50	25	21.83	20.89
				50	49	21.82	20.89
				100	0	21.94	21.07

LTE Conducted Average Output Powers (20 MHz Band 4 LTE)

Note : Detecting mode is average.

7.2 EFFECTIVE RADIATED POWER (Band 13)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
779.5	5 MHz	QPSK	-29.85	32.10	-9.92	0.86	H	0.136	21.32
		16-QAM	-30.97	30.98	-9.92	0.86	H	0.105	20.20
782.0		QPSK	-29.76	32.39	-9.93	0.87	H	0.144	21.59
		16-QAM	-30.93	31.22	-9.93	0.87	H	0.110	20.42
784.5		QPSK	-30.53	31.74	-9.95	0.87	H	0.124	20.92
		16-QAM	-31.60	30.67	-9.95	0.87	H	0.097	19.85

Effective Radiated Power Data (Band 13 – 5 MHz)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

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.
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.

7.3 EQUIVALENT ISOTROPIC RADIATED POWER (Band 4)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1710.7	1.4 MHz	QPSK	-22.42	10.06	9.88	1.31	V	0.073	18.63
		16-QAM	-23.40	9.08	9.88	1.31	V	0.058	17.65
1732.5		QPSK	-21.53	10.95	9.96	1.32	V	0.091	19.59
		16-QAM	-22.55	9.93	9.96	1.32	V	0.072	18.57
1754.3		QPSK	-20.41	12.04	10.01	1.33	V	0.118	20.72
		16-QAM	-21.39	11.06	10.01	1.33	V	0.094	19.74

Equivalent Isotropic Radiated Power Data (1.4 MHz Band 4 LTE)

Note: All of RB size has been tested for emissions and EIRP, with the 1RB configuration observed as the worst case

This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1711.5	3 MHz	QPSK	-22.46	10.02	9.88	1.31	V	0.072	18.59
		16-QAM	-23.45	9.03	9.88	1.31	V	0.058	17.60
1732.5		QPSK	-21.53	10.95	9.95	1.32	V	0.091	19.58
		16-QAM	-22.51	9.97	9.95	1.32	V	0.072	18.60
1753.5		QPSK	-20.49	11.95	10.01	1.33	V	0.116	20.63
		16-QAM	-21.51	10.93	10.01	1.33	V	0.091	19.61

Equivalent Isotropic Radiated Power Data (3 MHz Band 4 LTE)

Note: All of RB size has been tested for emissions and EIRP, with the 1RB configuration observed as the worst case

This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1717.5	15 MHz	QPSK	-22.37	10.11	9.88	1.31	V	0.074	18.68
		16-QAM	-23.30	9.18	9.88	1.31	V	0.060	17.75
1732.5		QPSK	-21.63	10.84	9.93	1.32	V	0.088	19.45
		16-QAM	-22.58	9.89	9.93	1.32	V	0.071	18.50
1747.5		QPSK	-21.60	10.96	9.98	1.32	V	0.092	19.62
		16-QAM	-22.56	10.00	9.98	1.32	V	0.074	18.66

Equivalent Isotropic Radiated Power Data (15 MHz Band 4 LTE)

Note: All of RB size has been tested for emissions and EIRP, with the 1RB configuration observed as the worst case

This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1720.0	20 MHz	QPSK	-22.30	10.18	9.88	1.31	V	0.075	18.75
		16-QAM	-23.22	9.26	9.88	1.31	V	0.061	17.83
1732.5		QPSK	-21.67	10.79	9.92	1.31	V	0.087	19.40
		16-QAM	-22.67	9.79	9.92	1.31	V	0.069	18.40
1745.0		QPSK	-21.53	11.00	9.97	1.32	V	0.092	19.65
		16-QAM	-22.53	10.00	9.97	1.32	V	0.073	18.65

Equivalent Isotropic Radiated Power Data (20 MHz Band 4 LTE)

Note: All of RB size has been tested for emissions and EIRP, with the 1RB configuration observed as the worst case

This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method
according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

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.
A Horn antenna was substituted in place of the EUT. This Horn 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 vertical polarization in LTE mode.

7.4 RADIATED SPURIOUS EMISSIONS

7.4.1 RADIATED SPURIOUS EMISSIONS (5 MHz Band 13 LTE)

- ▣ OPERATING FREQUENCY : 782.00 MHz
- ▣ MEASURED OUTPUT POWER: 21.59 dBm = 0.144 W
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: 43 + 10 $\log_{10}$ (W) = 34.59 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
23205 (779.5)	2,338.50	-57.21	9.83	-61.50	1.54	V	-53.21	74.80
	3,118.00	-57.24	11.34	-61.17	1.78	V	-51.61	73.20
	3,897.50	-57.24	12.29	-60.24	2.03	V	-49.98	71.57
	4,677.00	-56.97	12.37	-57.06	2.31	V	-47.00	68.59
23230 (782.0)	2,346.00	-57.69	9.89	-62.05	1.55	V	-53.71	75.30
	3,128.00	-57.46	11.33	-61.30	1.79	V	-51.76	73.35
	3,910.00	-58.55	12.30	-61.35	2.06	V	-51.11	72.70
	4,692.00	-58.82	12.35	-58.86	2.31	V	-48.82	70.41
23255 (784.5)	2,353.50	-57.13	9.95	-61.52	1.57	V	-53.14	74.73
	3,138.00	-56.24	11.33	-59.95	1.79	V	-50.41	72.00
	3,922.50	-58.00	12.32	-60.94	2.05	V	-50.67	72.26
	4,707.00	-56.96	12.33	-56.96	2.32	V	-46.95	68.54

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10^{th} harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

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

4. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

5. This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

7.4.1.1 RADIATED SPURIOUS EMISSIONS (1559 ~ 1610 MHz Band)

- ▣ OPERATING FREQUENCY : 779.5 MHz, 782.0 MHz, 784.5 MHz
- ▣ MODULATION SIGNAL: 5 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ WIDEBAND EMISSION LIMIT: -40 dBm/MHz

Operating Frequency (MHz)	Measured Frequency (MHz)	EMISSION TYPE	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	MARGIN (dB)
779.5	1599.0	WIDEBAND	-56.57	9.36	-64.21	1.27	V	-56.12	16.12
782.0	1559.0		-55.74	9.36	-63.38	1.27	V	-55.29	15.29
784.5	1600.0		-55.86	9.36	-63.50	1.27	H	-55.41	15.41

7.4.2 RADIATED SPURIOUS EMISSIONS (1.4 MHz Band 4 LTE)

- ▣ OPERATING FREQUENCY : 1754.30 MHz
- ▣ MEASURED OUTPUT POWER: 20.72 dBm = 0.118 W
- ▣ MODULATION SIGNAL: 1.4 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: 43 + 10 $\log_{10}$ (W) = 33.72 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
19957 (1710.7)	3,421.40	-56.46	12.36	-61.54	1.94	V	-51.12	71.84
	5,132.10	-59.01	12.34	-57.09	2.37	V	-47.12	67.84
	6,842.80	-58.52	12.17	-52.02	2.81	V	-42.66	63.38
20175 (1732.5)	3,465.00	-55.68	12.27	-60.24	1.87	V	-49.84	70.56
	5,197.50	-59.57	12.63	-58.02	2.45	V	-47.84	68.56
	6,930.00	-58.56	11.87	-50.96	2.84	V	-41.93	62.65
20393 (1754.3)	3,508.60	-56.30	12.15	-60.42	2.00	V	-50.27	70.99
	5,262.90	-58.63	12.91	-57.83	2.41	V	-47.33	68.05
	7,017.20	-60.68	11.57	-53.06	2.90	V	-44.39	65.11

7.4.3 RADIATED SPURIOUS EMISSIONS (3 MHz Band 4 LTE)

▣ OPERATING FREQUENCY : 1753.50 MHz

▣ MEASURED OUTPUT POWER: 20.63 dBm = 0.116 W

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 $\log_{10}$ (W) = 33.63 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
19965 (1711.5)	3,423.00	-56.65	12.35	-61.75	1.94	V	-51.34	71.97
	5,134.50	-59.57	12.35	-57.58	2.37	V	-47.60	68.23
	6,846.00	-59.04	12.16	-52.55	2.80	V	-43.19	63.82
20175 (1732.5)	3,465.00	-55.61	12.27	-60.17	1.87	V	-49.77	70.40
	5,197.50	-58.98	12.63	-57.43	2.45	V	-47.25	67.88
	6,930.00	-57.65	11.87	-50.05	2.84	V	-41.02	61.65
20385 (1753.5)	3,507.00	-56.00	12.15	-60.12	1.99	V	-49.96	70.59
	5,260.50	-58.44	12.90	-57.61	2.42	V	-47.13	67.76
	7,014.00	-60.65	11.59	-53.18	2.91	V	-44.50	65.13

7.4.4 RADIATED SPURIOUS EMISSIONS (15 MHz Band 4 LTE)

- ▣ OPERATING FREQUENCY : 1747.50 MHz
- ▣ MEASURED OUTPUT POWER: 19.62 dBm = 0.092 W
- ▣ MODULATION SIGNAL: 15 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: 43 + 10 $\log_{10}$ (W) = 32.62 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
20025 (1717.5)	3,435.00	-56.32	12.34	-61.30	1.92	V	-50.88	70.50
	5,152.50	-57.93	12.40	-56.04	2.39	V	-46.03	65.65
	6,870.00	-59.80	12.08	-53.54	2.79	V	-44.25	63.87
20175 (1732.5)	3,465.00	-55.44	12.27	-60.00	1.87	V	-49.60	69.22
	5,197.50	-57.46	12.63	-55.91	2.45	V	-45.73	65.35
	6,930.00	-57.12	11.87	-49.52	2.84	V	-40.49	60.11
20325 (1747.5)	3,495.00	-59.43	12.17	-63.70	1.93	V	-53.46	73.08
	5,242.50	-58.50	12.83	-57.51	2.41	V	-47.09	66.71
	6,990.00	-58.87	11.68	-50.96	2.80	V	-42.08	61.70

7.4.5 RADIATED SPURIOUS EMISSIONS (20 MHz Band 4 LTE)

- ▣ OPERATING FREQUENCY : 1745.00 MHz
- ▣ MEASURED OUTPUT POWER: 19.65 dBm = 0.092 W
- ▣ MODULATION SIGNAL: 20 MHz QPSK
- ▣ DISTANCE: 3 meters
- ▣ LIMIT: 43 + 10 $\log_{10}$ (W) = 32.65 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
20050 (1720.0)	3,440.00	-56.34	12.33	-61.05	1.89	V	-50.61	70.26
	5,160.00	-59.43	12.44	-57.64	2.40	V	-47.60	67.25
	6,880.00	-58.50	12.04	-51.79	2.78	V	-42.53	62.18
20175 (1732.5)	3,465.00	-58.87	12.27	-63.43	1.87	V	-53.03	72.68
	5,197.50	-59.54	12.63	-57.99	2.45	V	-47.81	67.46
	6,930.00	-59.39	11.87	-51.79	2.84	V	-42.76	62.41
20300 (1745.0)	3,490.00	-56.04	12.18	-60.44	1.90	V	-50.16	69.81
	5,235.00	-59.57	12.80	-58.38	2.42	V	-48.00	67.65
	6,980.00	-59.05	11.71	-50.89	2.79	V	-41.97	61.62

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010 June 24, 2010:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

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

4. All of RB size has been tested for emissions and EIRP, with the 1RB configuration observed as the worst case

5. This device uses 1.5m ~ 6m cables interchangeably. After testing under all configurations, worst case has been determined for the 1.5m cable.

7.5 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Band 4	1.4 MHz	1732.5	QPSK	6	0	5.62
			16-QAM	6	0	6.54
	3 MHz		QPSK	15	0	5.64
			16-QAM	15	0	6.49
	15 MHz		QPSK	75	0	5.53
			16-QAM	75	0	6.24
	20 MHz		QPSK	100	0	5.55
			16-QAM	100	0	6.29

- Plots of the EUT’s Peak- to- Average Ratio are shown Page 48~ 51.

7.6 OCCUPIED BANDWIDTH

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 13	5	782.0	QPSK	25	0	4.5078
			16-QAM	25	0	4.5030

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 4	1.4	1732.5	QPSK	6	0	1.0968
			16-QAM	6	0	1.0970
	3		QPSK	15	0	2.6944
			16-QAM	15	0	2.7041
	15		QPSK	75	0	13.4720
			16-QAM	75	0	13.4350
	20		QPSK	100	0	17.9060
			16-QAM	100	0	17.9430

- Plots of the EUT’s Occupied Bandwidth are shown Page 43 ~ 47.

7.7 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 13	5	782	QPSK	1	0	3.287338	-32.56
				1	0	3.131777	-32.28
				1	0	3.147681	-32.15

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 4	1.4	1710.7	QPSK	1	0	16.4435	-30.58
		1732.5		1	0	16.5710	-30.84
		1754.3		1	0	16.7290	-30.47
	3	1711.5		1	0	16.9515	-30.37
		1732.5		1	0	16.1430	-30.63
		1753.5		1	0	19.3870	-30.96
	15	1717.5		1	0	16.6915	-29.59
		1732.5		1	0	16.6245	-30.52
		1747.5		1	0	16.2475	-29.64
	20	1720.0		1	0	16.3300	-30.46
		1732.5		1	0	17.0215	-30.37
		1745.0		1	0	16.4220	-30.69

- Plots of the EUT’s Conducted Spurious Emissions are shown Page 67 ~ 81.

7.7.1 BAND EDGE

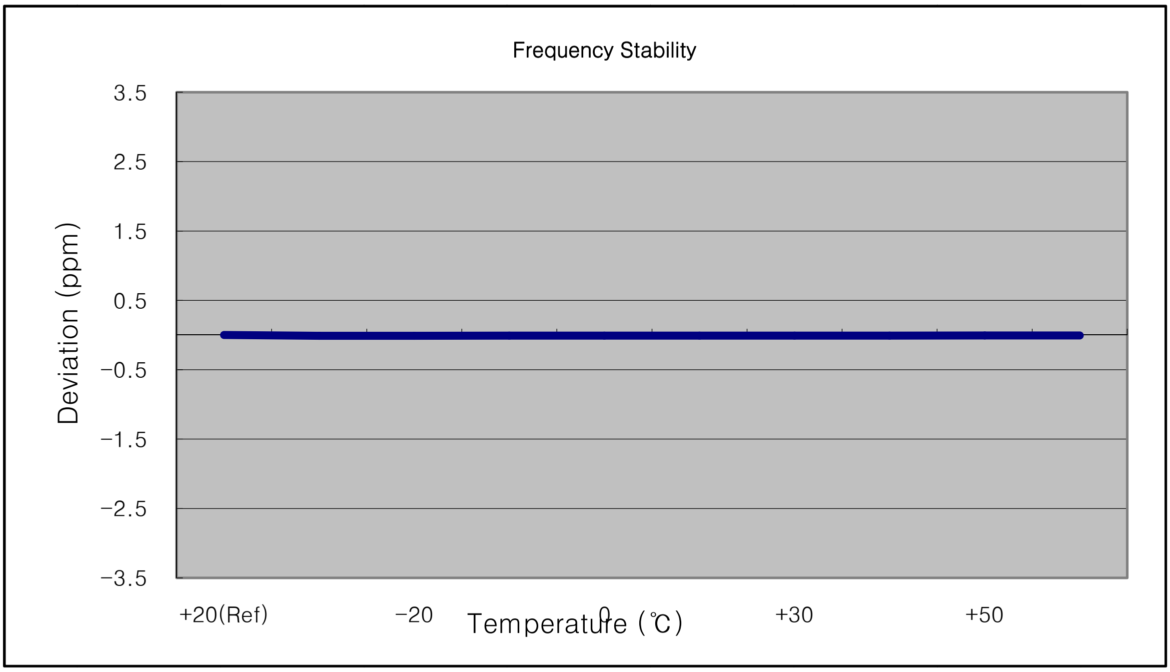
- Plots of the EUT’s Band Edge are shown Page 52 ~ 66

7.8 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.8.1 FREQUENCY STABILITY (5 MHz Band 13 LTE)

▣ OPERATING FREQUENCY: 782,000,000 Hz
▣ CHANNEL: 23230 (5 MHz)
▣ REFERENCE VOLTAGE: 12.0 VDC
▣ DEVIATION LIMIT: -

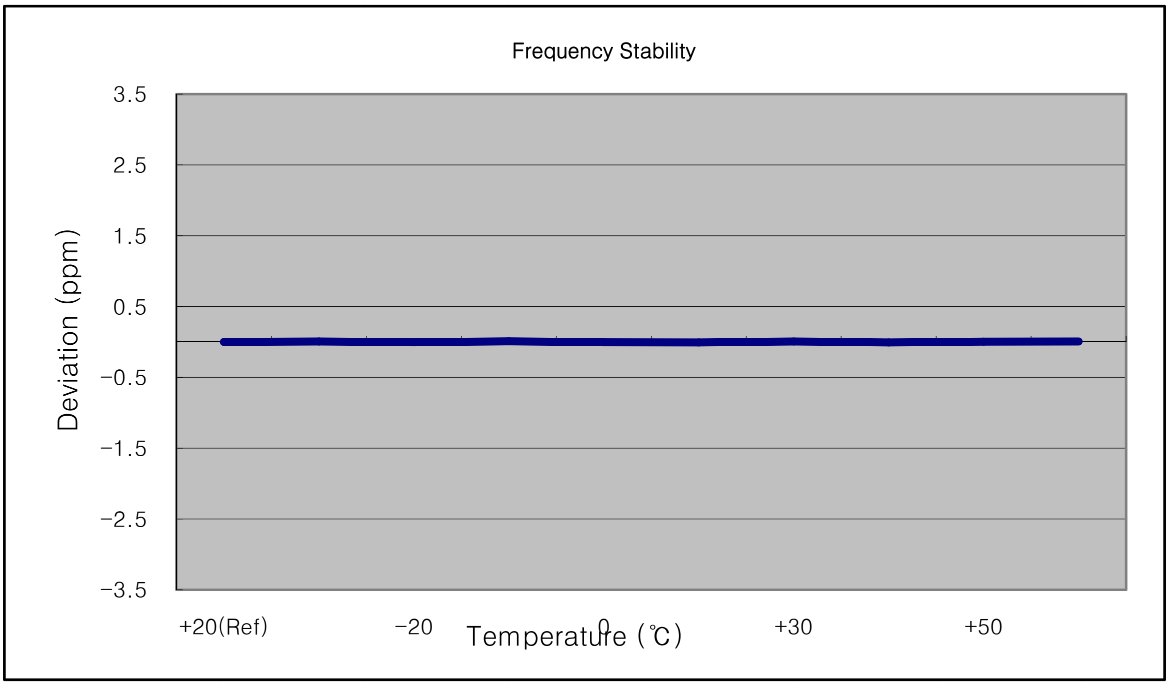
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	782 000 002	0	0.000 000	0.000
100%		-30	781 999 993	-8.70	-0.000 001	-0.011
100%		-20	781 999 994	-7.90	-0.000 001	-0.010
100%		-10	781 999 995	-7.20	-0.000 001	-0.009
100%		0	781 999 996	-6.10	-0.000 001	-0.008
100%		+10	781 999 996	-6.60	-0.000 001	-0.008
100%		+30	781 999 995	-7.20	-0.000 001	-0.009
100%		+40	781 999 996	-6.10	-0.000 001	-0.008
100%		+50	781 999 997	-4.90	-0.000 001	-0.006
Batt. Endpoint	10.2	+20	781 999 998	-4.00	-0.000 001	-0.005



7.8.2 FREQUENCY STABILITY (1.4 MHz Band 4 LTE)

▣ OPERATING FREQUENCY: 1732,500,000 Hz
▣ CHANNEL: 20175 (1.4 MHz)
▣ REFERENCE VOLTAGE: 12.0 VDC
▣ DEVIATION LIMIT: -

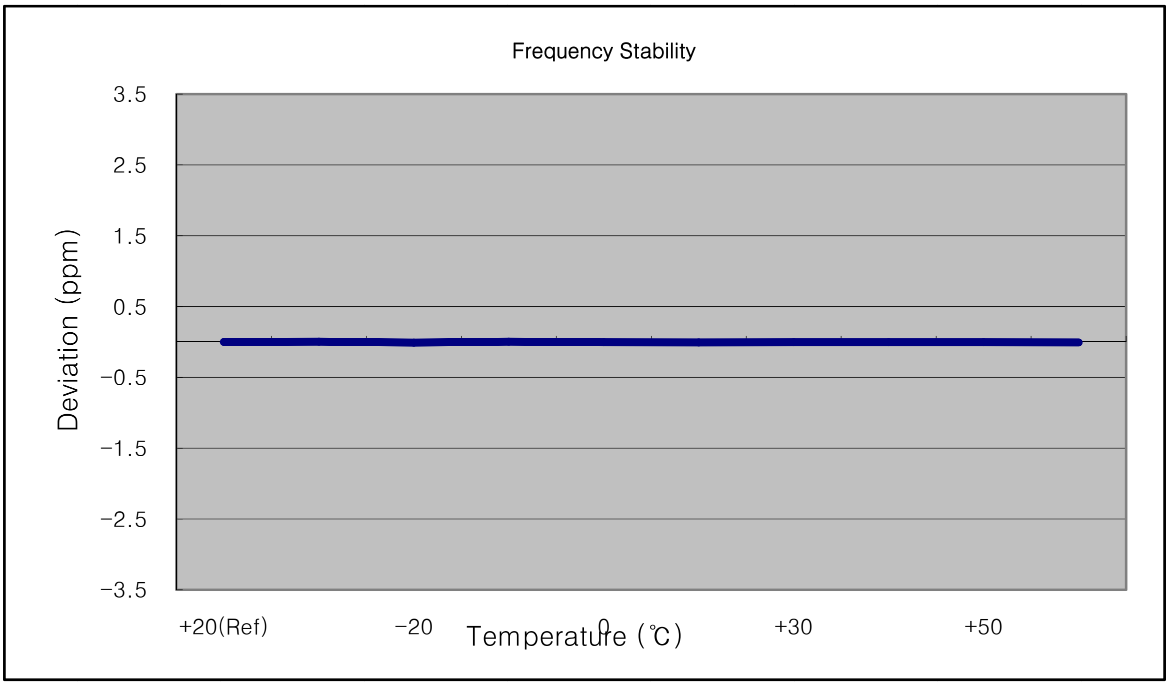
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	1732 499 987	0	0.000 000	0.000
100%		-30	1732 499 999	12.70	0.000 001	0.007
100%		-20	1732 499 980	-6.40	0.000 000	-0.004
100%		-10	1732 500 001	14.70	0.000 001	0.008
100%		0	1732 499 980	-7.20	0.000 000	-0.004
100%		+10	1732 499 977	-10.20	-0.000 001	-0.006
100%		+30	1732 499 997	10.10	0.000 001	0.006
100%		+40	1732 499 975	-11.80	-0.000 001	-0.007
100%		+50	1732 499 996	9.10	0.000 001	0.005
Batt. Endpoint	10.2	+20	1732 500 000	13.50	0.000 001	0.008



7.8.3 FREQUENCY STABILITY (3 MHz Band 4 LTE)

- ▣ OPERATING FREQUENCY: 1732,500,000 Hz
- ▣ CHANNEL: 20175 (3 MHz)
- ▣ REFERENCE VOLTAGE: 12.0 VDC
- ▣ DEVIATION LIMIT: -

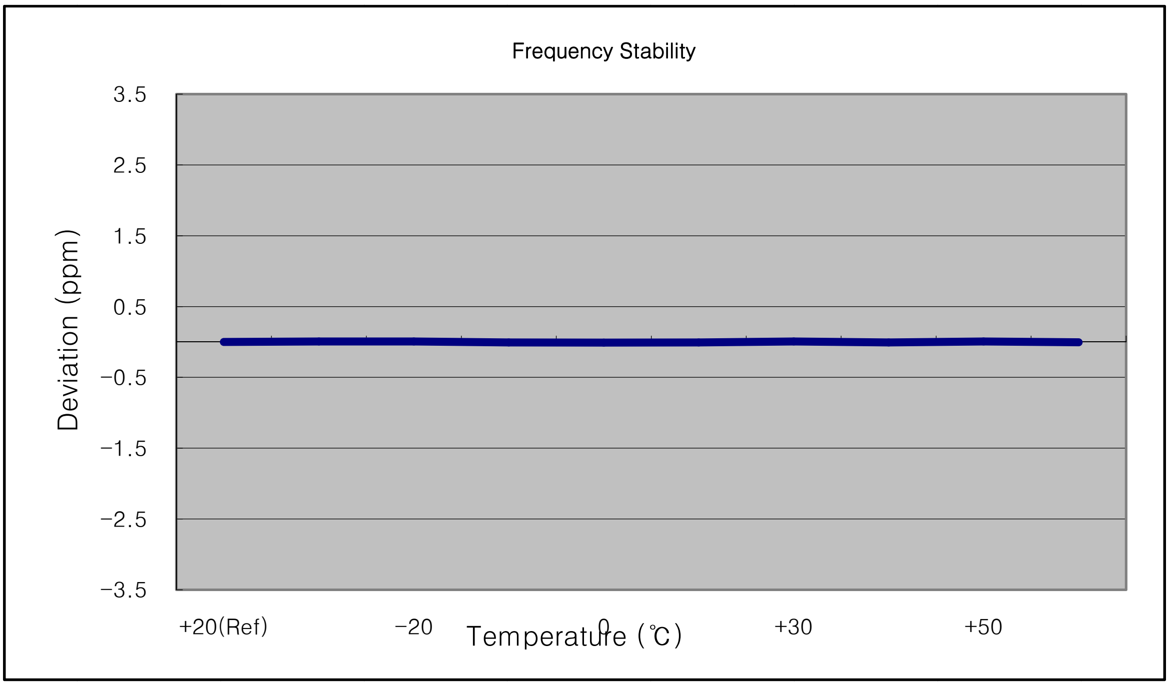
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	1732 499 988	0	0.000 000	0.000
100%		-30	1732 499 997	9.70	0.000 001	0.006
100%		-20	1732 499 972	-15.50	-0.000 001	-0.009
100%		-10	1732 499 996	8.80	0.000 001	0.005
100%		0	1732 499 979	-8.50	0.000 000	-0.005
100%		+10	1732 499 975	-12.30	-0.000 001	-0.007
100%		+30	1732 499 981	-6.50	0.000 000	-0.004
100%		+40	1732 499 979	-8.70	-0.000 001	-0.005
100%		+50	1732 499 978	-9.50	-0.000 001	-0.005
Batt. Endpoint	10.2	+20	1732 499 976	-11.80	-0.000 001	-0.007



7.8.4 FREQUENCY STABILITY (15 MHz Band 4 LTE)

- ▣ OPERATING FREQUENCY: 1732,500,000 Hz
- ▣ CHANNEL: 20175 (15 MHz)
- ▣ REFERENCE VOLTAGE: 12.0 VDC
- ▣ DEVIATION LIMIT: -

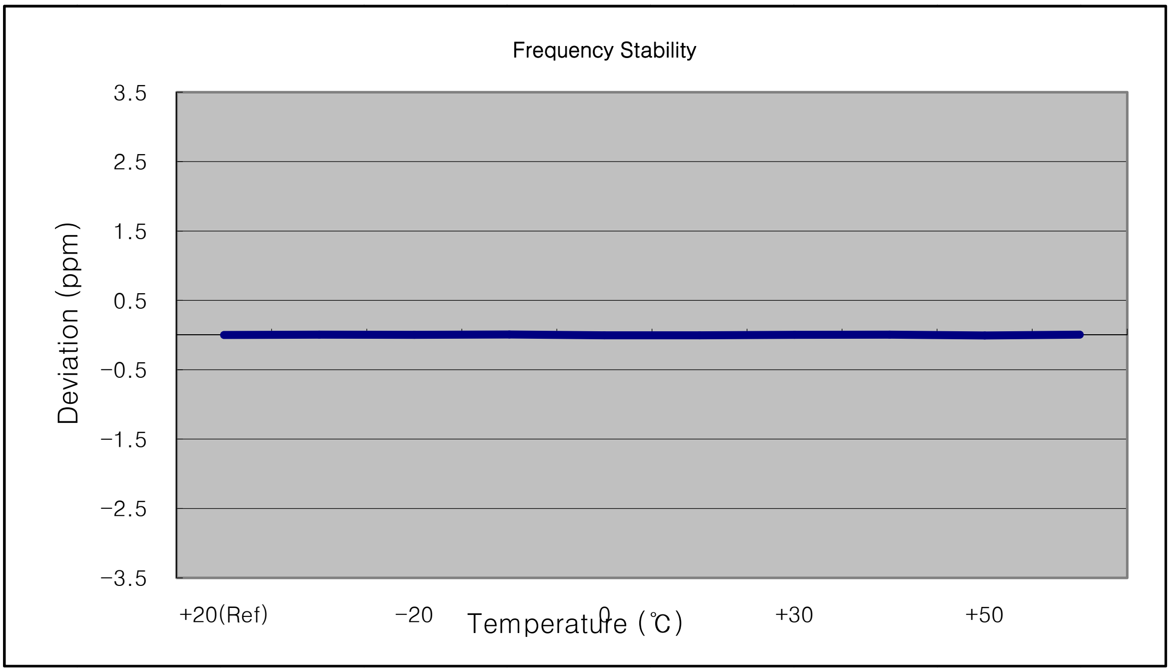
Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	1732 499 987	0	0.000 000	0.000
100%		-30	1732 499 998	11.10	0.000 001	0.006
100%		-20	1732 499 998	10.60	0.000 001	0.006
100%		-10	1732 499 976	-10.80	-0.000 001	-0.006
100%		0	1732 499 972	-14.90	-0.000 001	-0.009
100%		+10	1732 499 974	-12.90	-0.000 001	-0.007
100%		+30	1732 499 998	10.70	0.000 001	0.006
100%		+40	1732 499 977	-9.80	-0.000 001	-0.006
100%		+50	1732 499 999	12.20	0.000 001	0.007
Batt. Endpoint	10.2	+20	1732 499 981	-6.50	0.000 000	-0.004



7.8.5 FREQUENCY STABILITY (20 MHz Band 4 LTE)

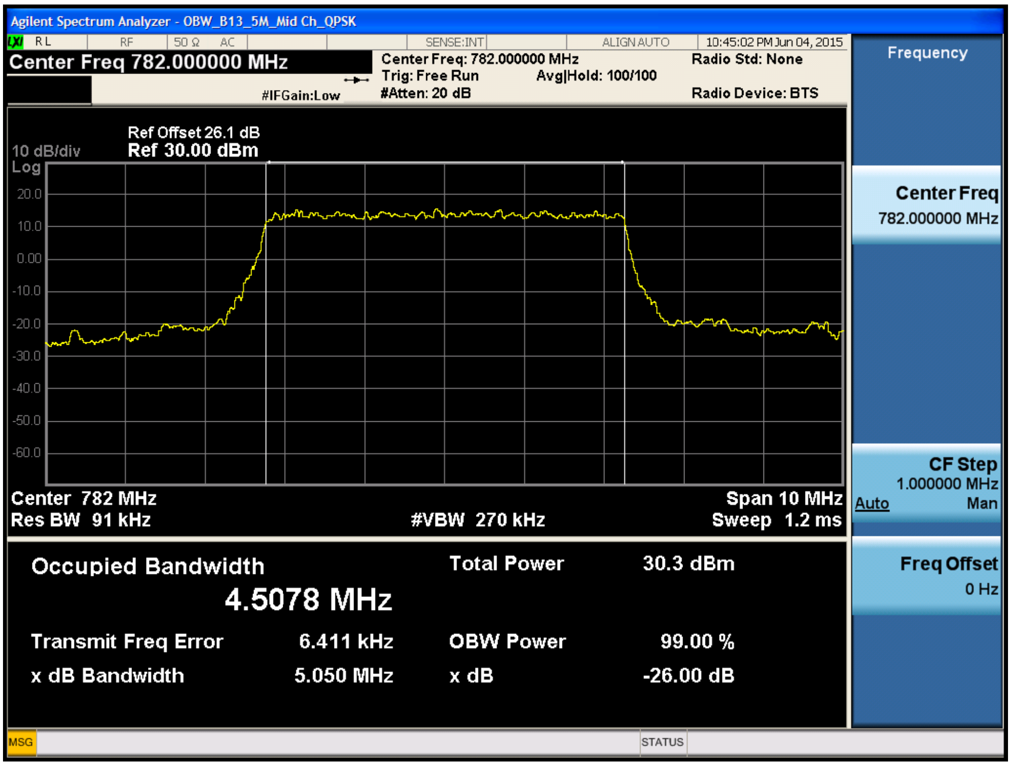
- ▣ OPERATING FREQUENCY: 1732,500,000 Hz
- ▣ CHANNEL: 20175 (20 MHz)
- ▣ REFERENCE VOLTAGE: 12.0 VDC
- ▣ DEVIATION LIMIT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	12.0	+20(Ref)	1732 500 007	0	0.000 000	0.000
100%		-30	1732 500 016	9.30	0.000 001	0.005
100%		-20	1732 500 015	7.40	0.000 000	0.004
100%		-10	1732 500 020	13.20	0.000 001	0.008
100%		0	1732 500 002	-5.40	0.000 000	-0.003
100%		+10	1732 499 999	-7.70	0.000 000	-0.004
100%		+30	1732 500 013	6.20	0.000 000	0.004
100%		+40	1732 500 018	11.00	0.000 001	0.006
100%		+50	1732 499 997	-10.30	-0.000 001	-0.006
Batt. Endpoint	10.2	+20	1732 500 019	11.40	0.000 001	0.007

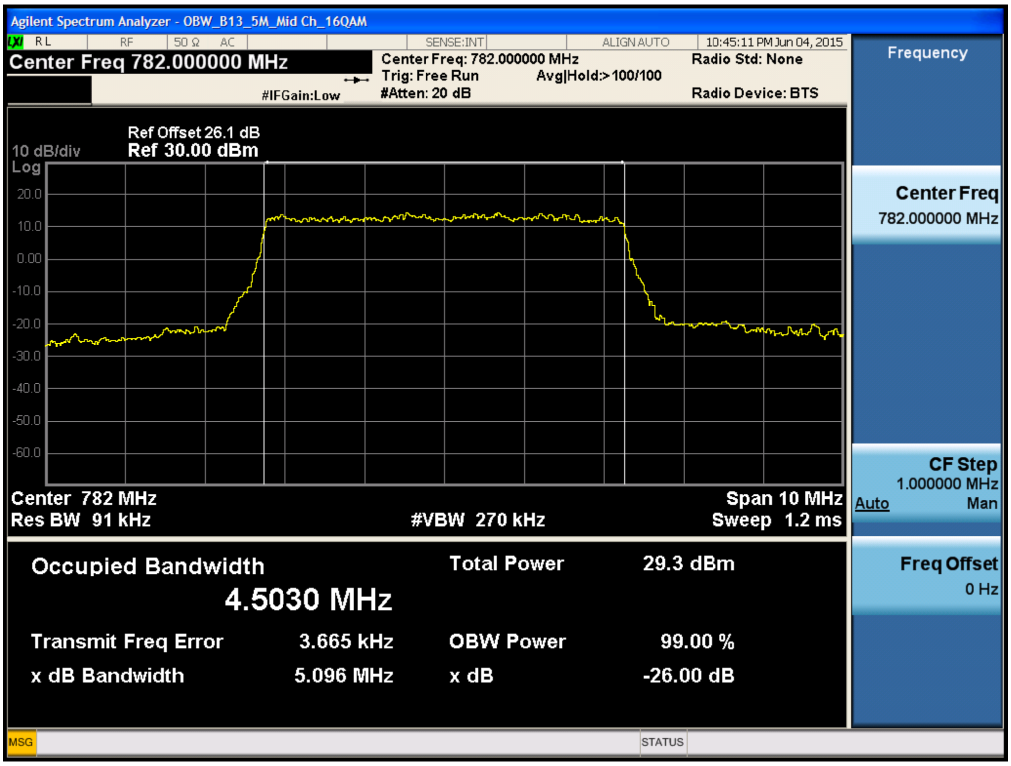


8. TEST PLOTS

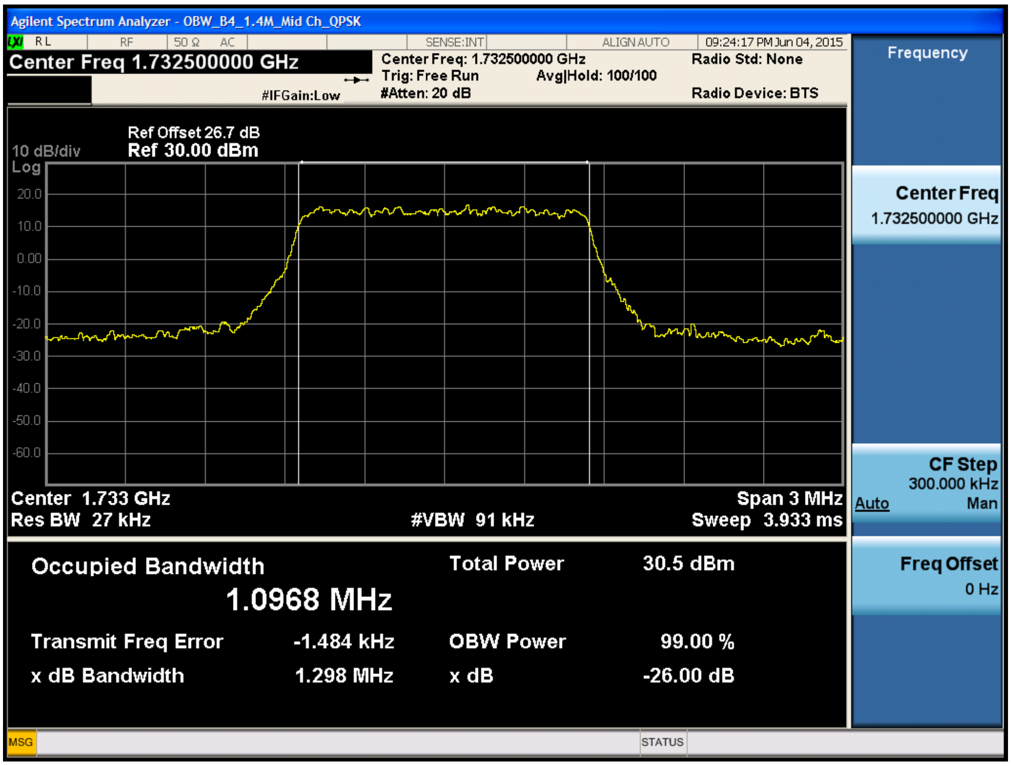
BAND 13. Occupied Bandwidth Plot (Ch.23230 QPSK RB 25) 5 MHz



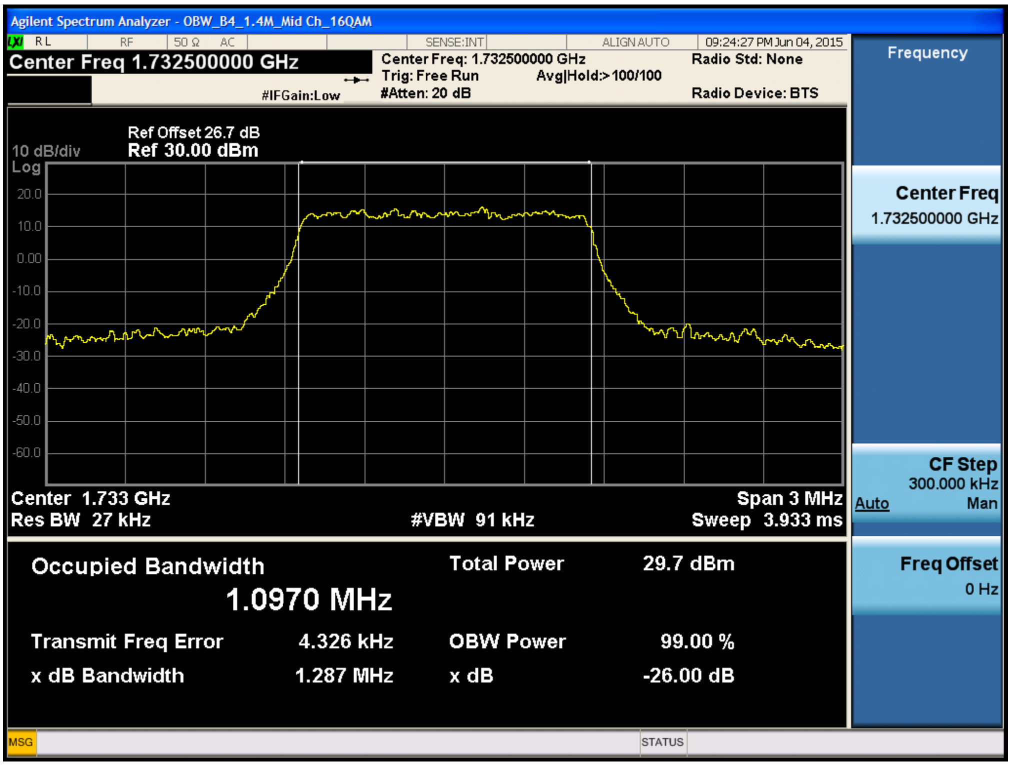
BAND 13. Occupied Bandwidth Plot (Ch.23230 16-QAM RB 25) 5 MHz



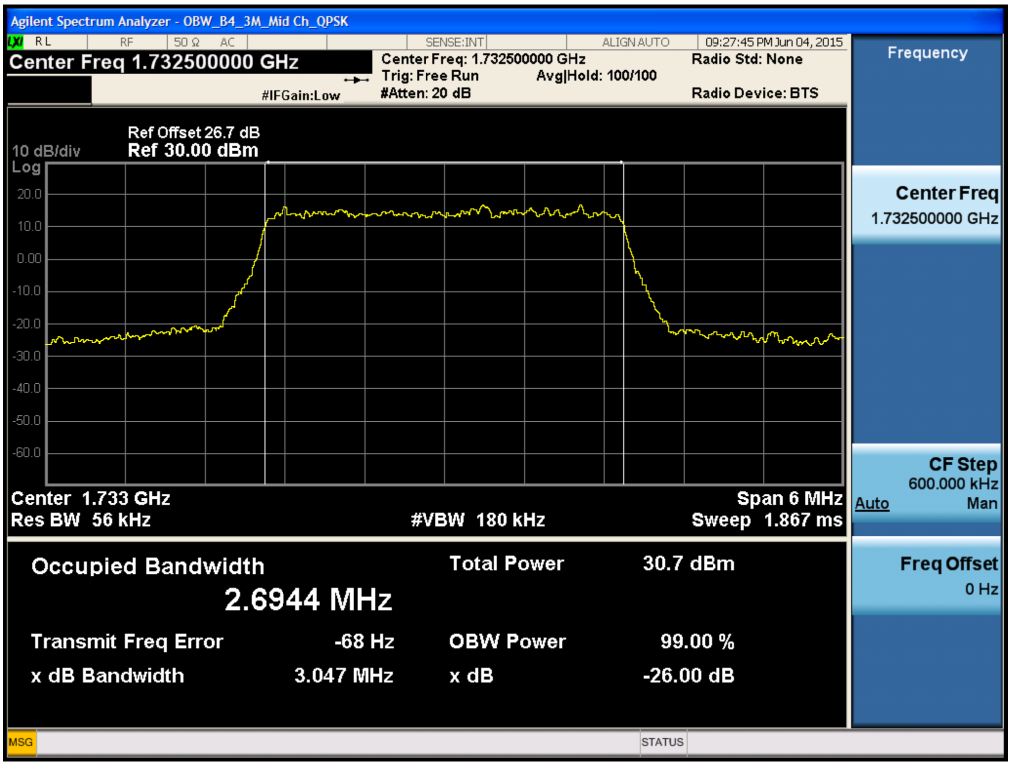
BAND 4. Occupied Bandwidth Plot (1.4M BW Ch.20175 QPSK RB 6)



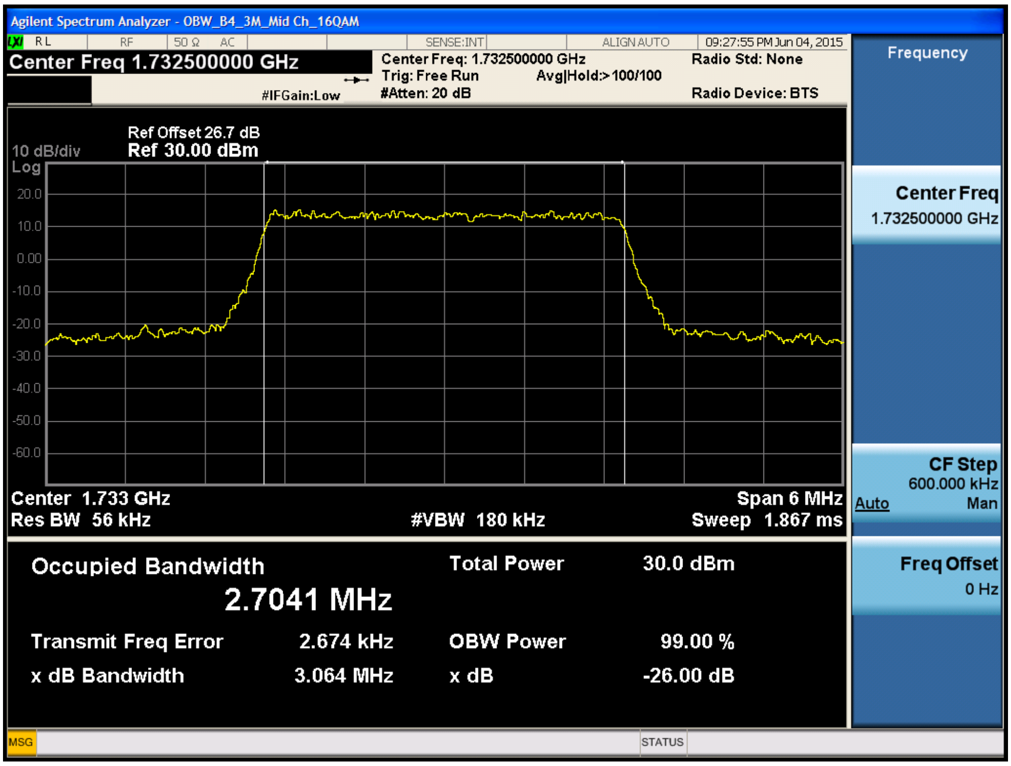
BAND 4. Occupied Bandwidth Plot (1.4M BW Ch.20175 16QAM RB 6)



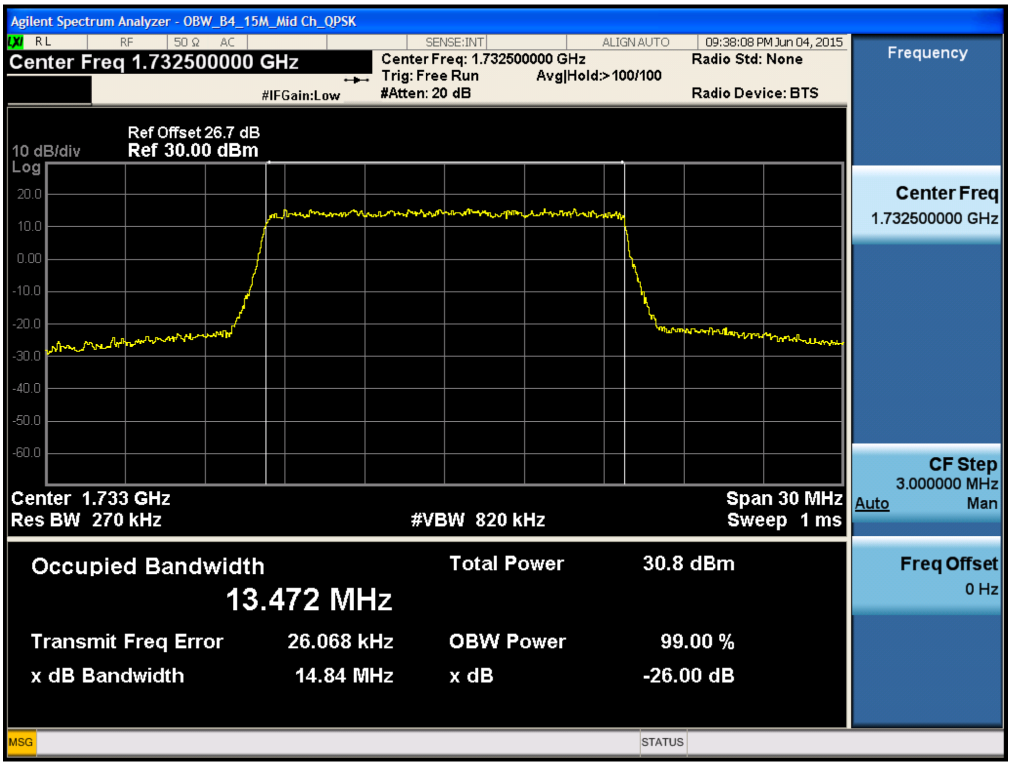
BAND 4. Occupied Bandwidth Plot (3M BW Ch.20175 QPSK RB 15)



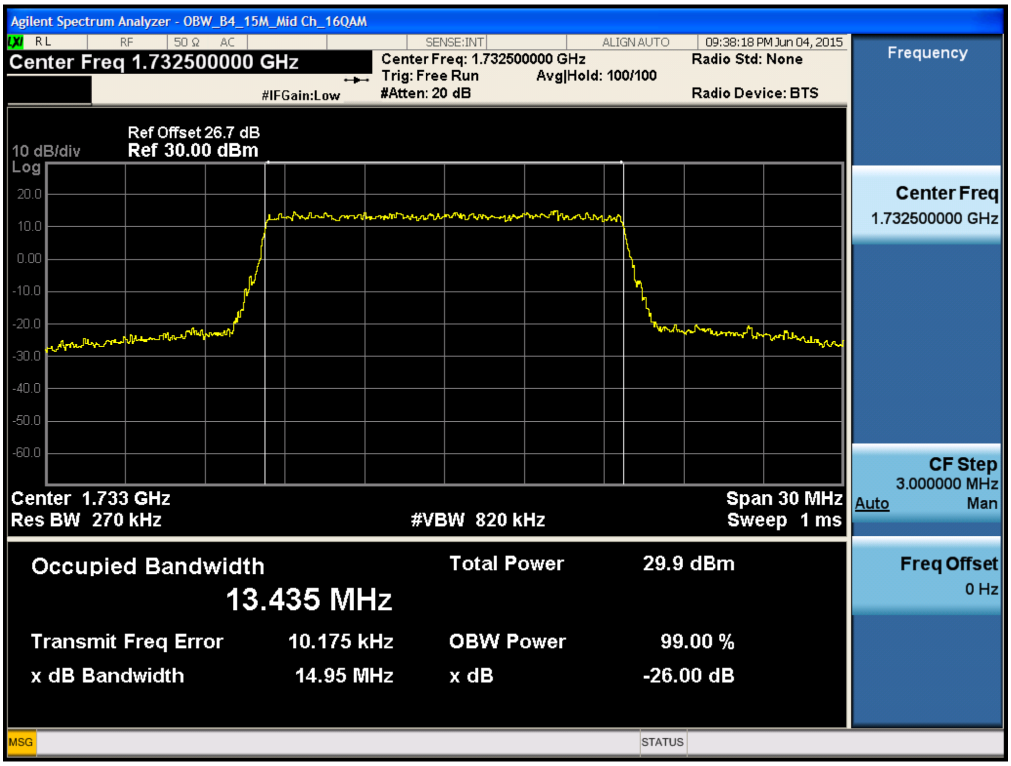
BAND 4. Occupied Bandwidth Plot (3M BW Ch.20175 16QAM RB 15)



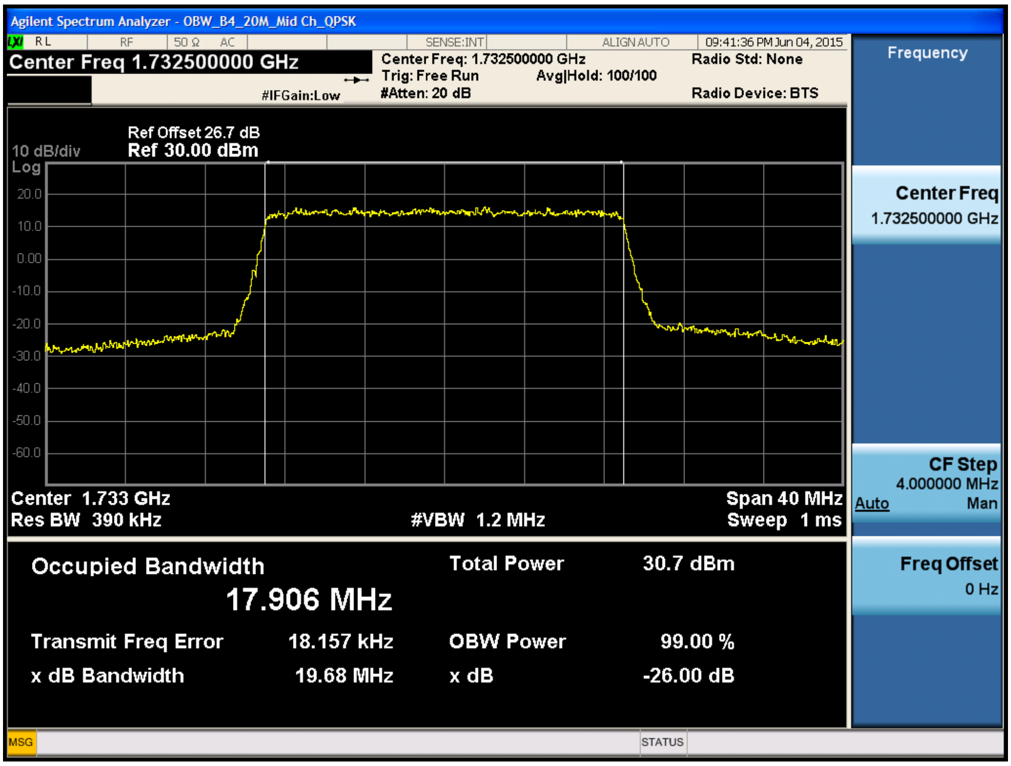
BAND 4. Occupied Bandwidth Plot (15M BW Ch.20175 QPSK RB 75)



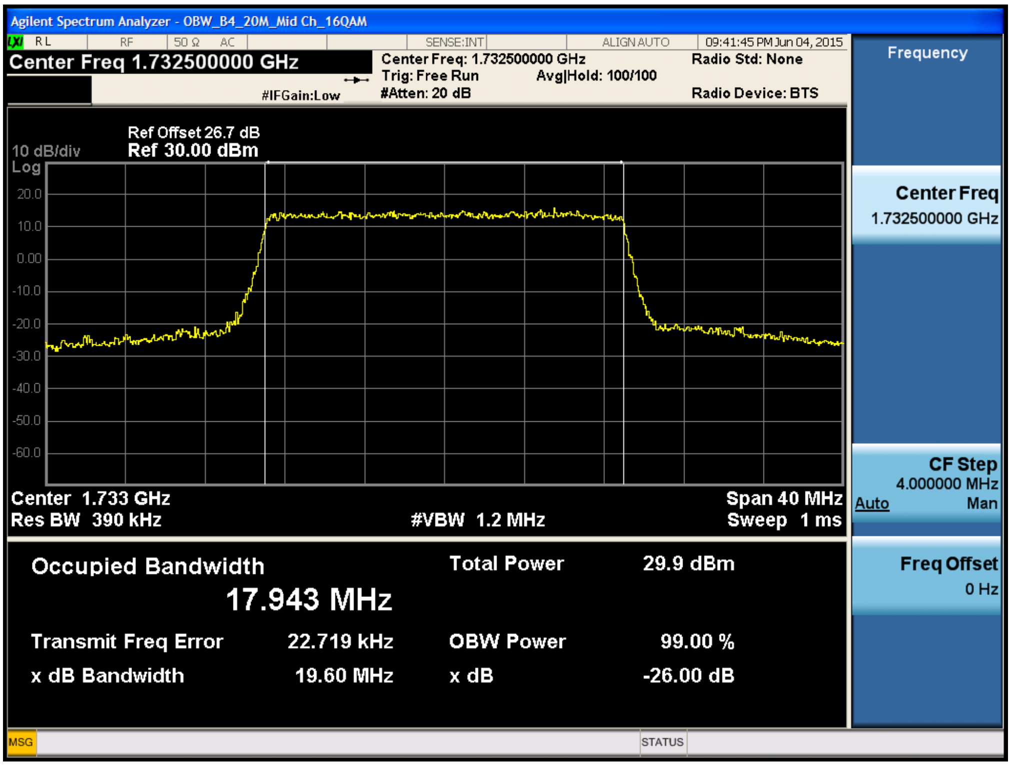
BAND 4. Occupied Bandwidth Plot (15M BW Ch.20175 16QAM RB 75)



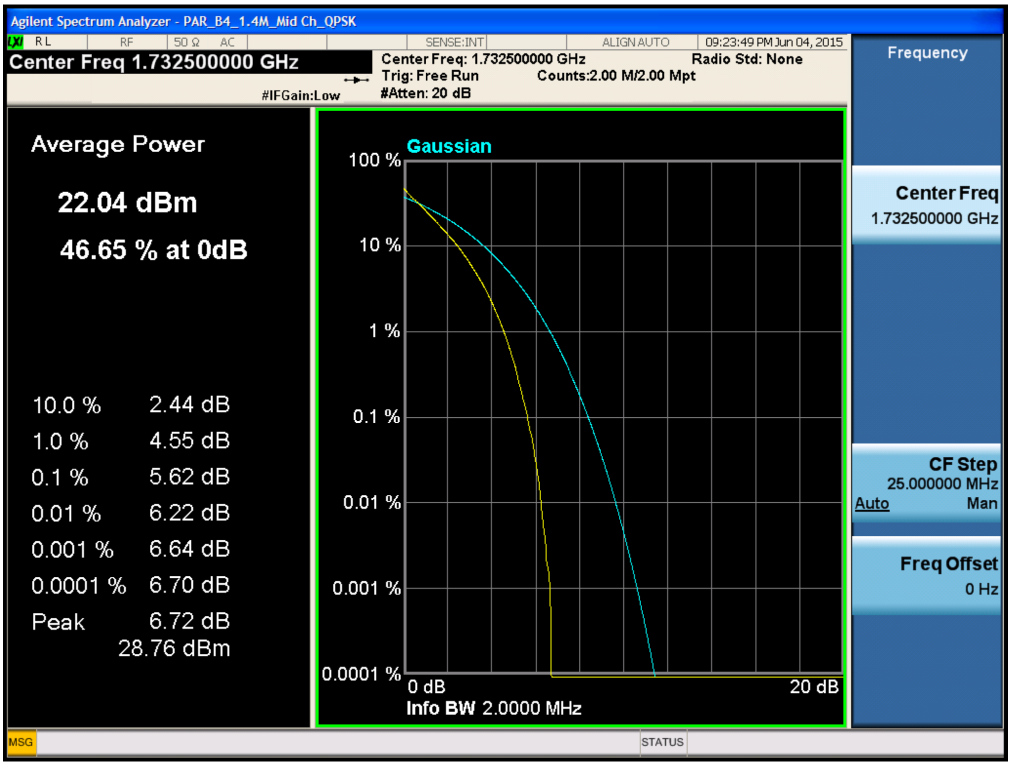
BAND 4. Occupied Bandwidth Plot (20M BW Ch.20175 QPSK RB 100)



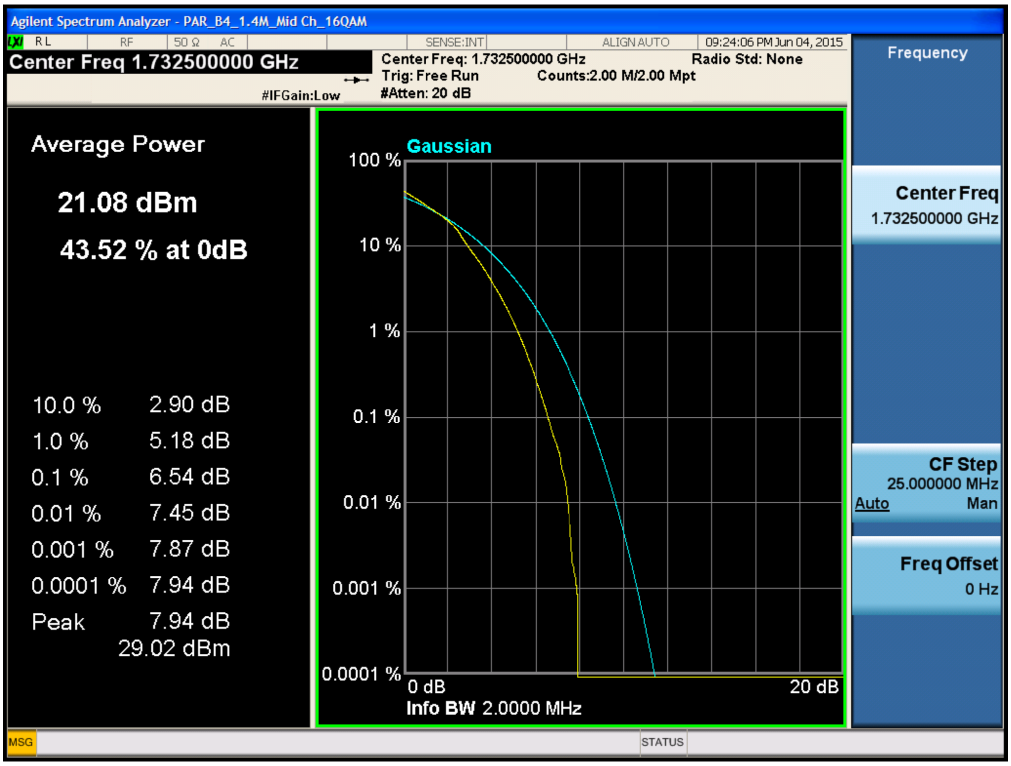
BAND 4. Occupied Bandwidth Plot (20M BW Ch.20175 16QAM RB 100)



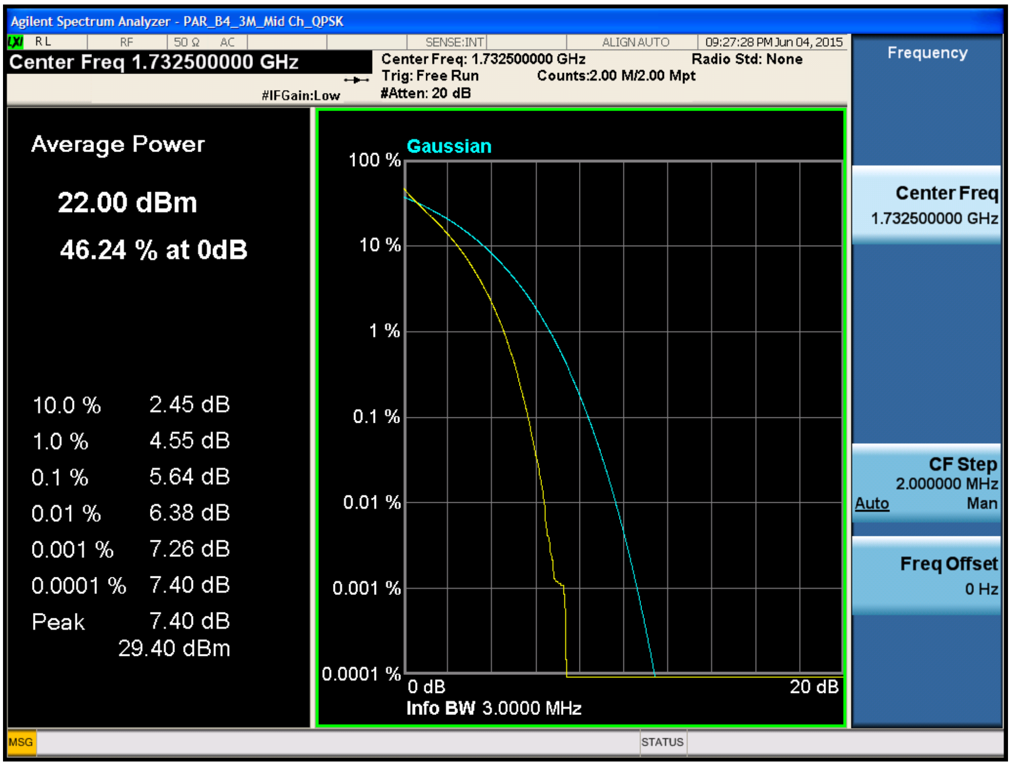
BAND 4. PAR Plot (1.4M BW_Ch.20175_QPSK_RB6_0)



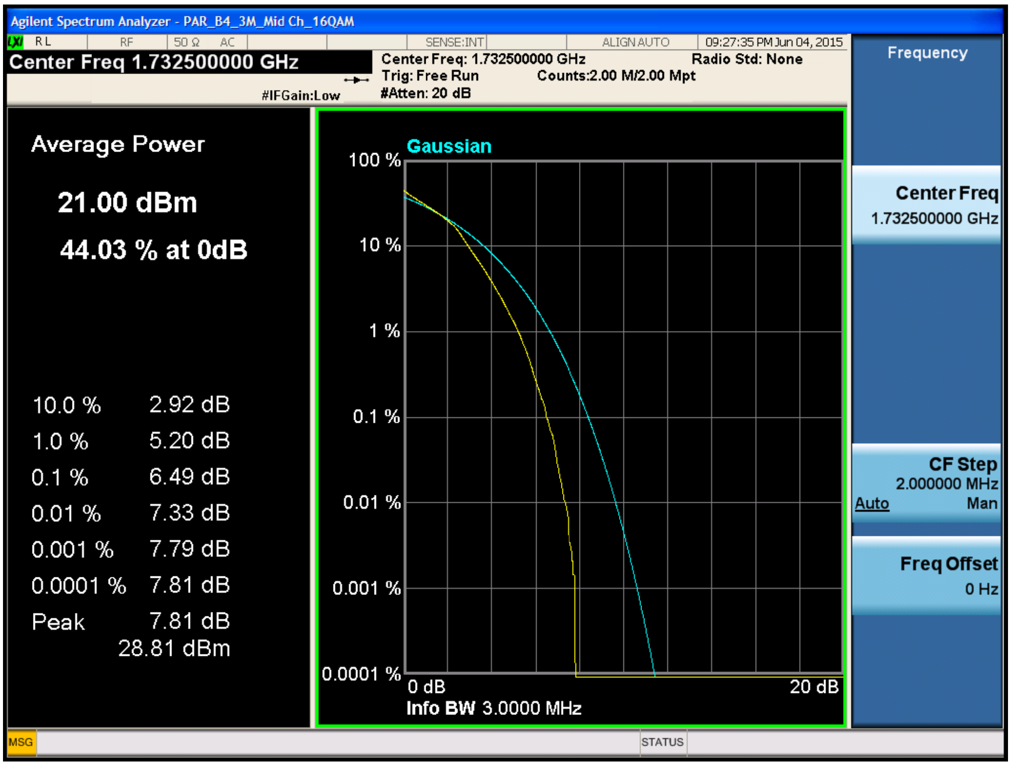
BAND 4. PAR Plot (1.4M BW_Ch.20175_16QAM_RB6_0)



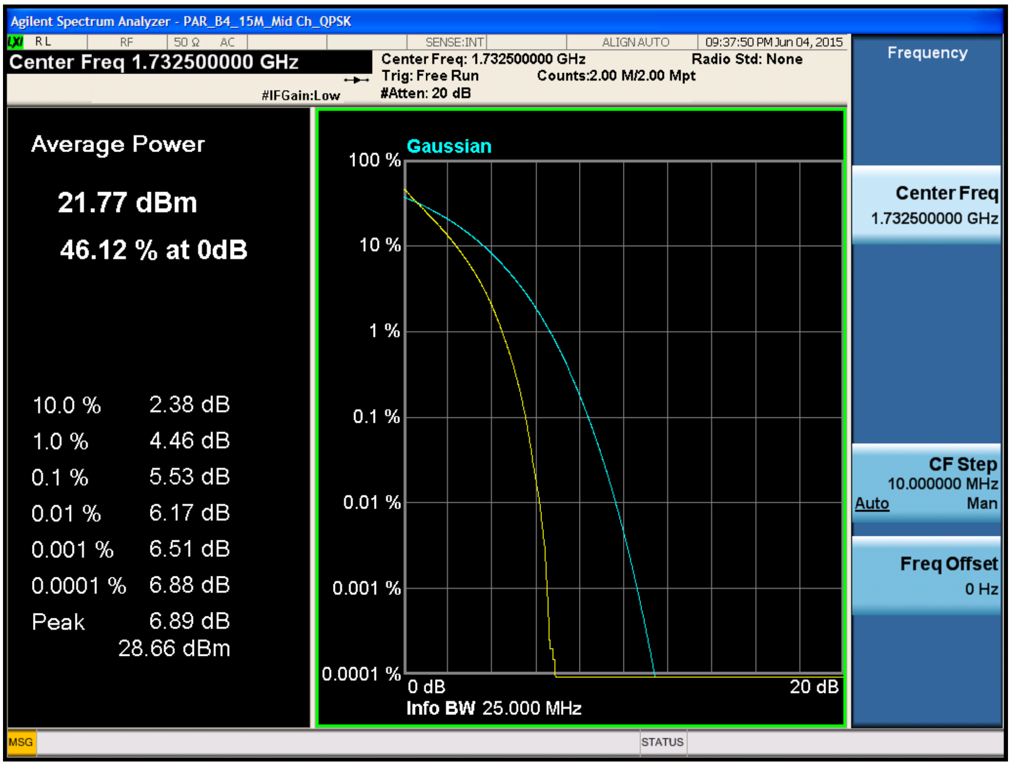
BAND 4. PAR Plot (3M BW_Ch.20175_QPSK_RB15_0)



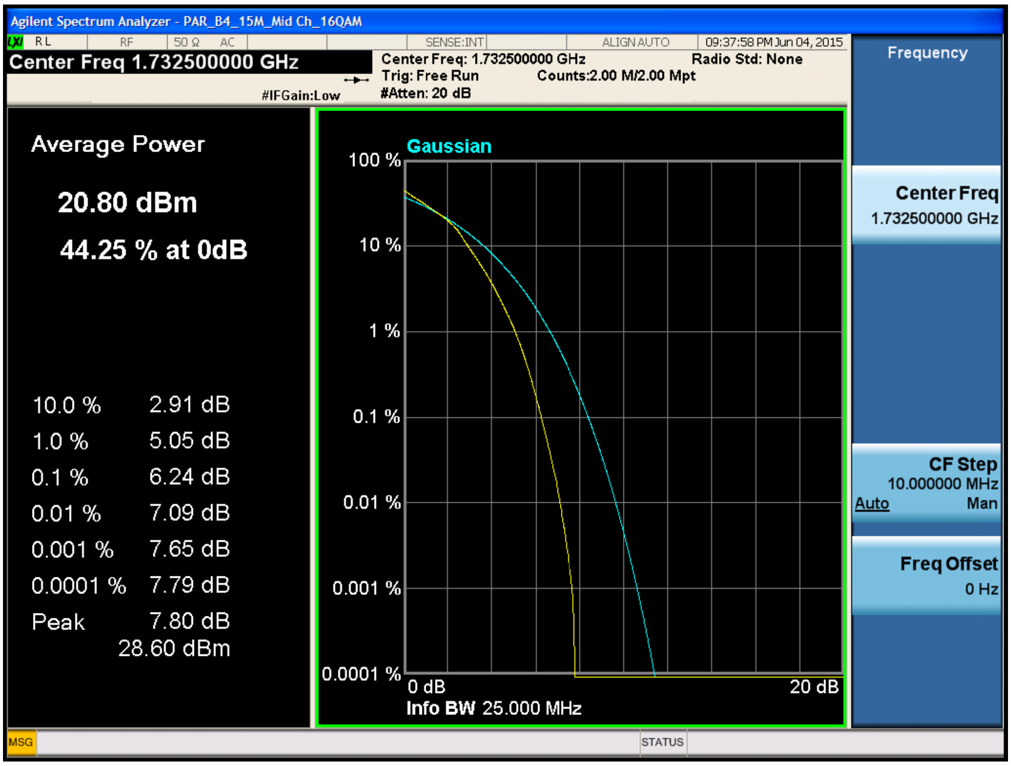
BAND 4. PAR Plot (3M BW_Ch.20175_16QAM_RB15_0)



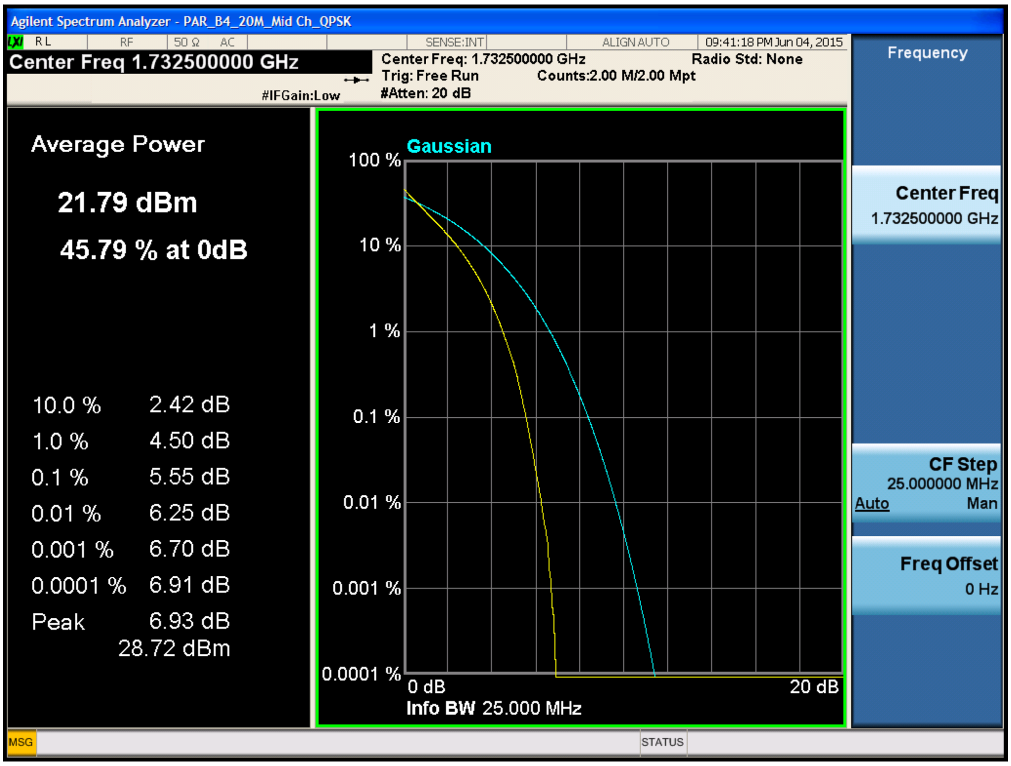
BAND 4. PAR Plot (15M BW_Ch.20175_QPSK_RB75_0)



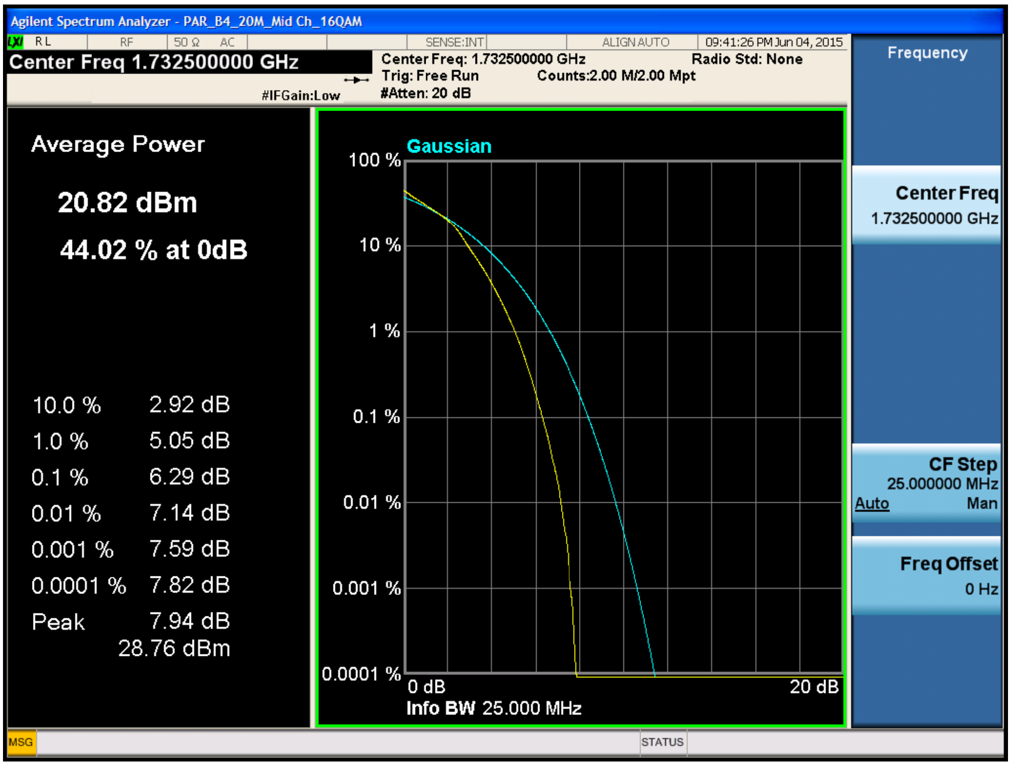
BAND 4. PAR Plot (15M BW_Ch.20175_16QAM_RB75_0)



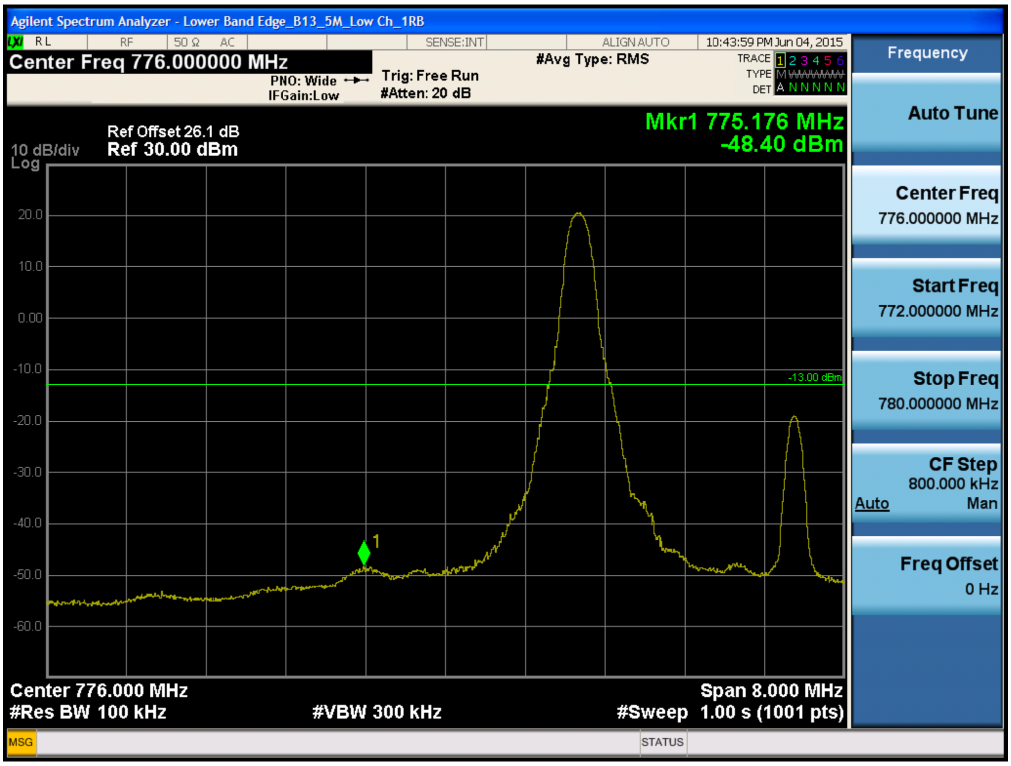
BAND 4. PAR Plot (20M BW_Ch.20175_QPSK_RB100_0)



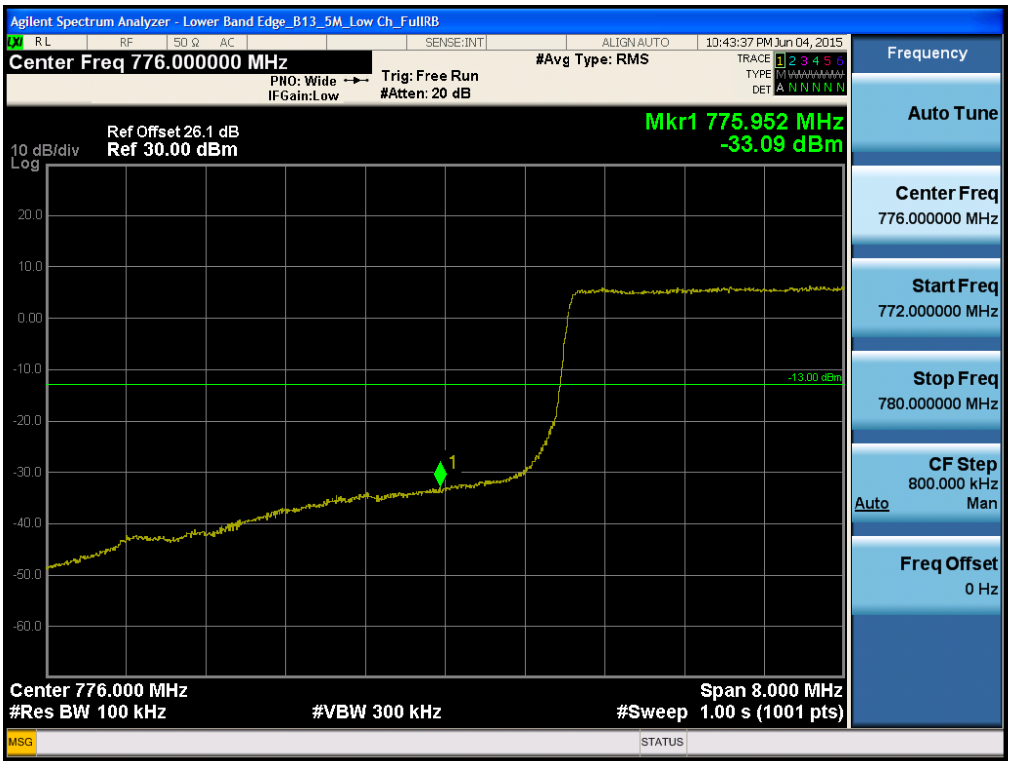
BAND 4. PAR Plot (20M BW_Ch.20175_16QAM_RB100_0)



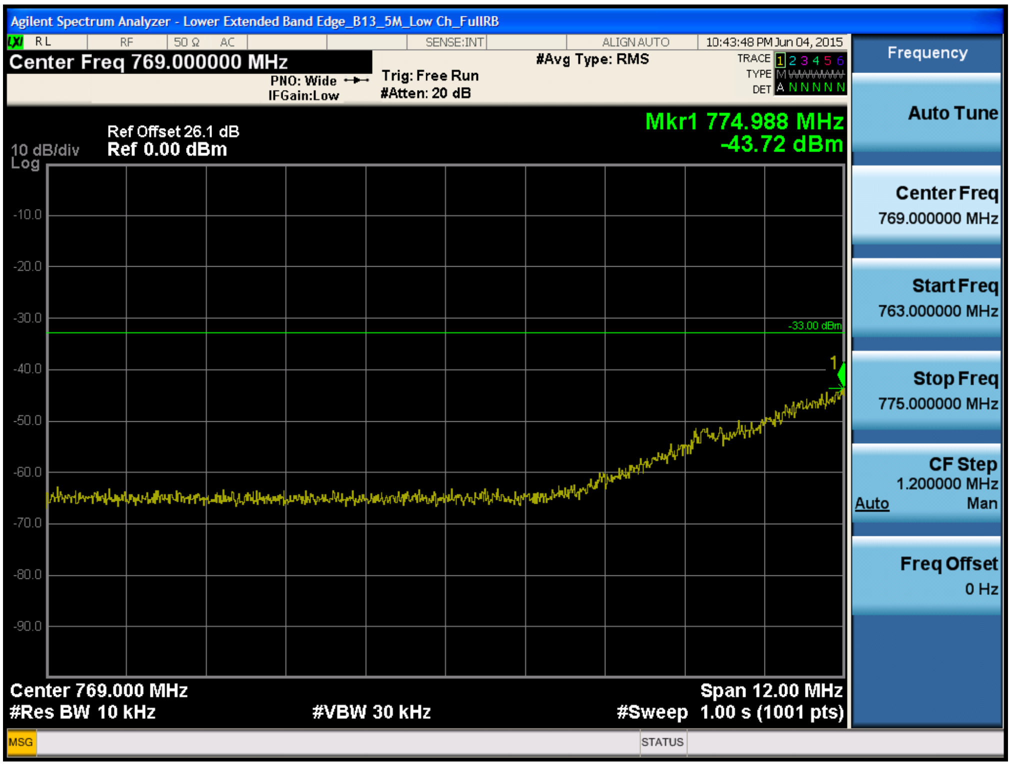
Band 13 Lower Band Edge Plot (5M BW Ch.23205 QPSK_RB1 OFFSET0)



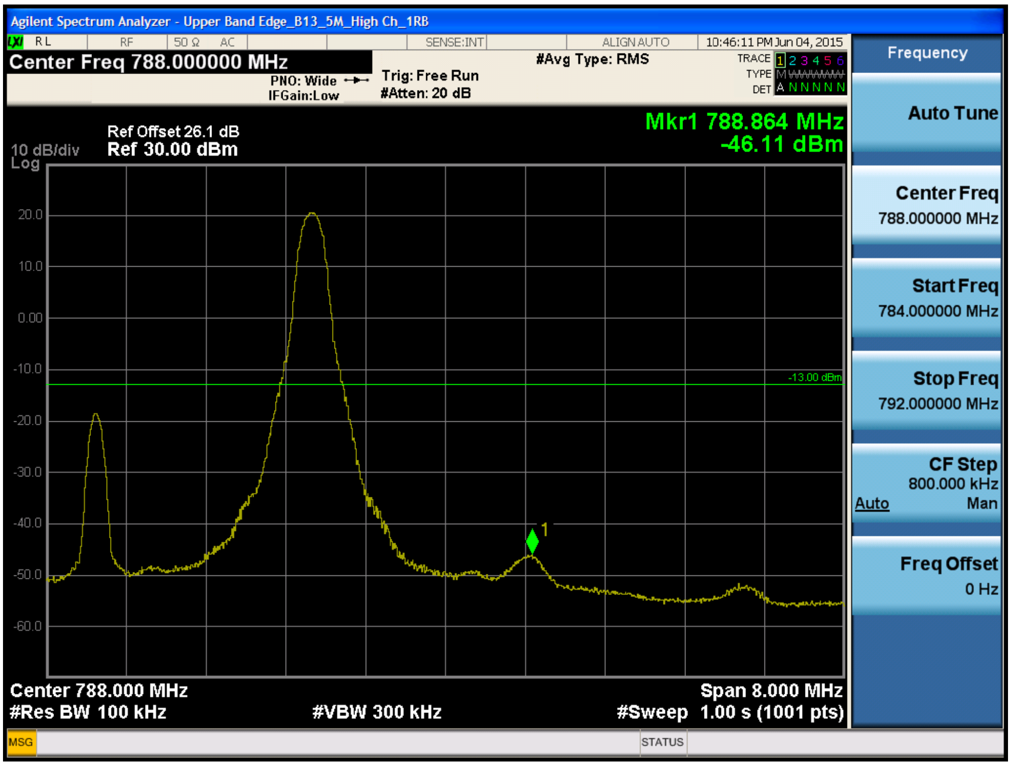
Band 13 Lower Band Edge Plot (5M BW Ch.23205 QPSK_RB25)



Band 13 Lower Extended Band Edge Plot (5M BW Ch.23205 QPSK_RB25_0)

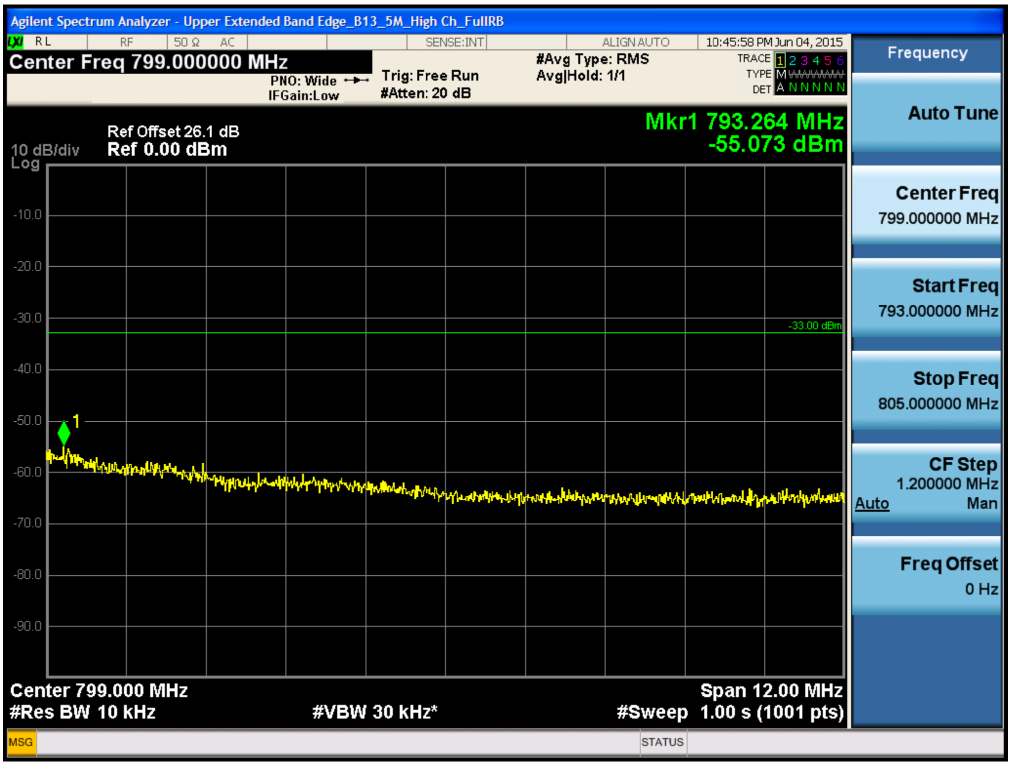


Band 13 Upper Band Edge Plot (5M BW Ch.23255 QPSK_RB1_Offset 24)

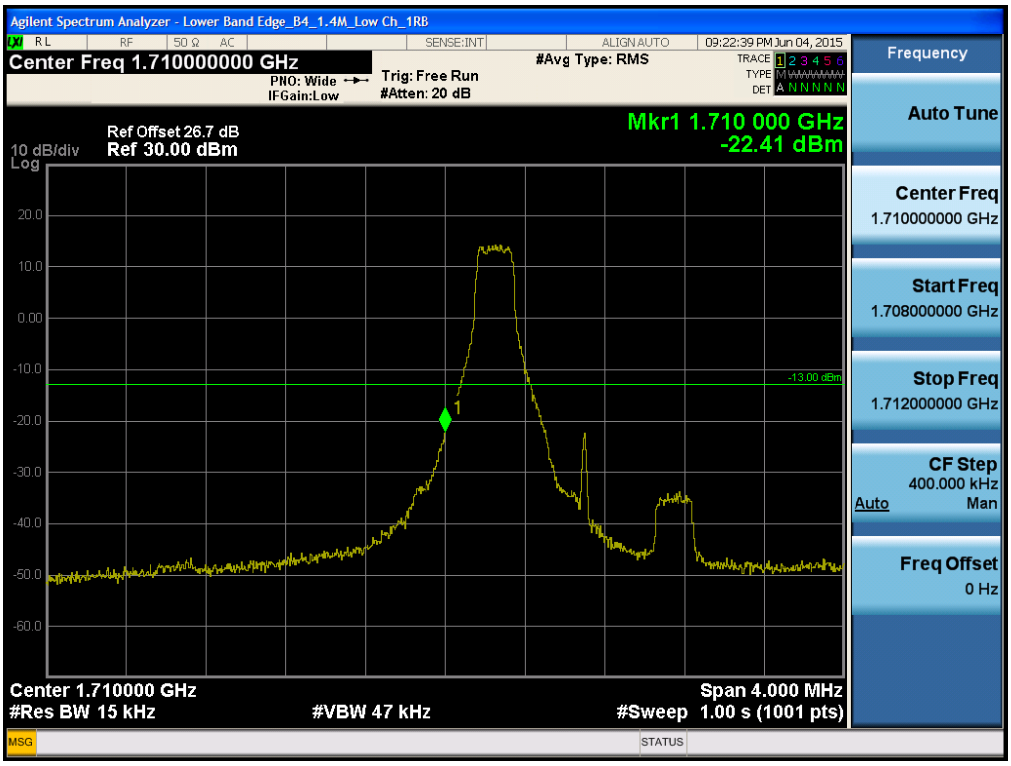


Band 13 Upper Band Edge Plot (5M BW Ch.23255 QPSK_RB25)

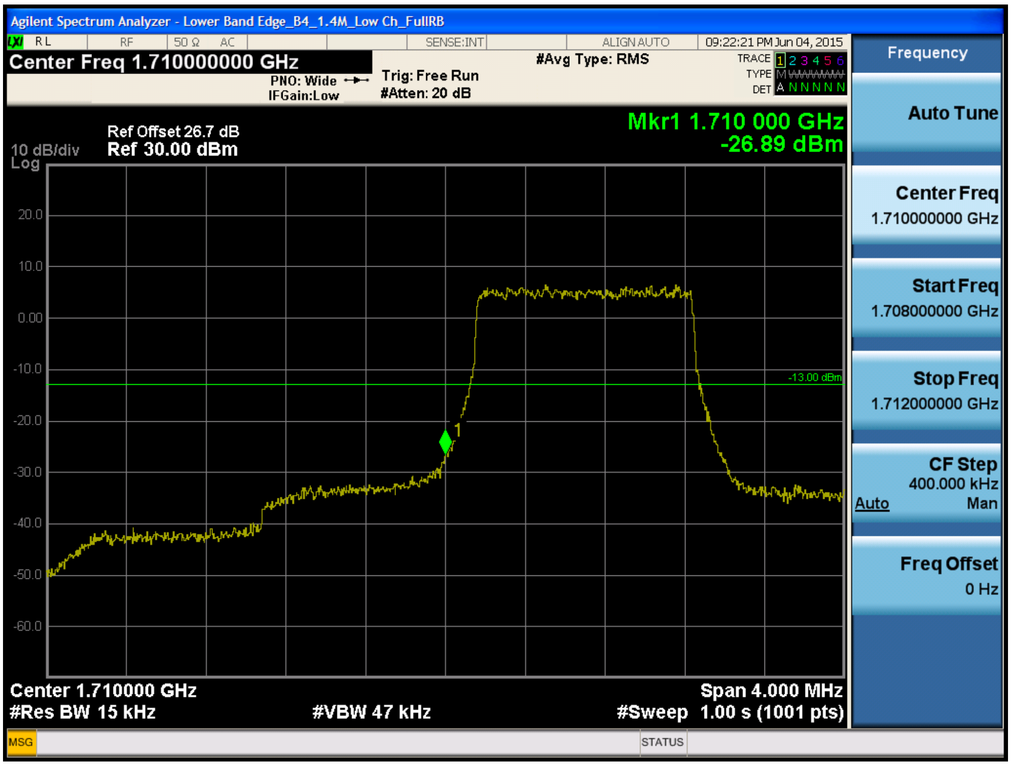
Band 13 Upper Extended Band Edge Plot (5M BW Ch.23255 QPSK_RB25_0)



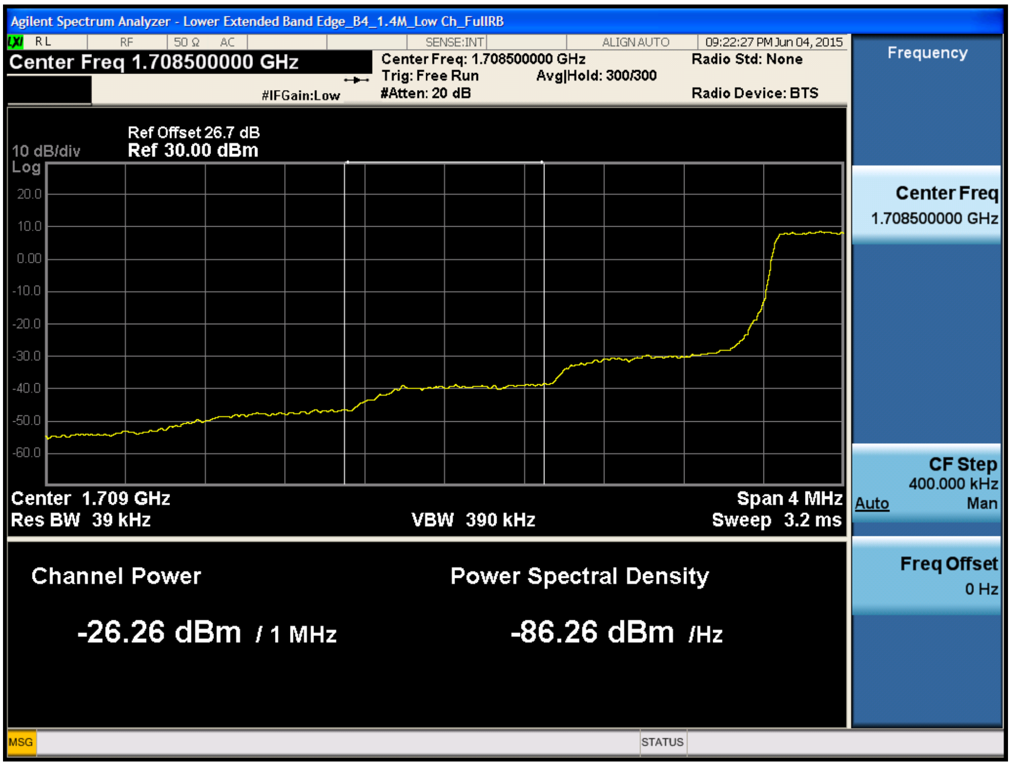
BAND 4. Lower Band Edge Plot (1.4M BW Ch.19957 QPSK RB 1, Offset 0) -1



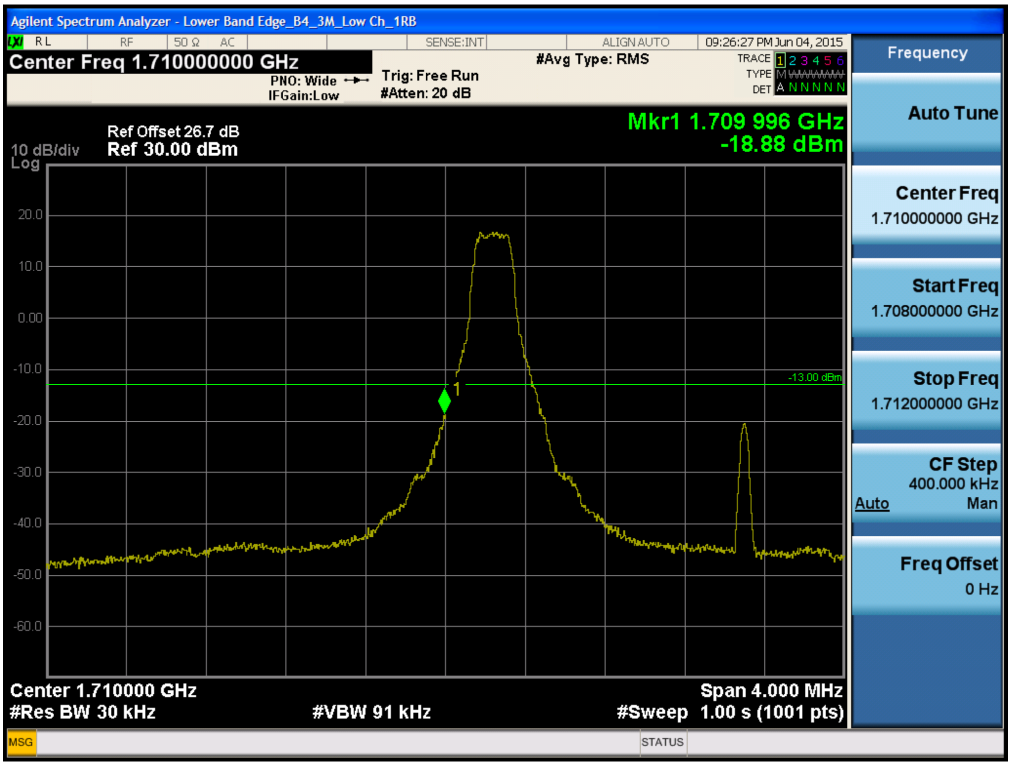
BAND 4. Lower Band Edge Plot (1.4M BW Ch.19957 QPSK RB 6) -2



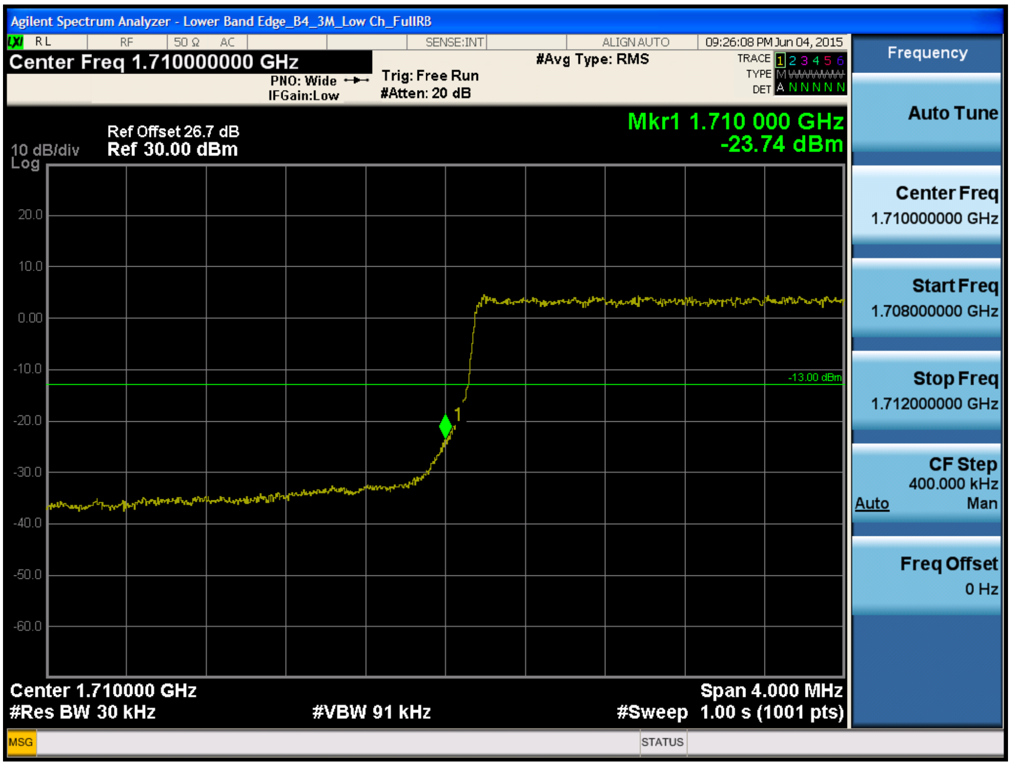
BAND 4. Lower Extended Band Edge Plot (1.4M BW Ch.19957 QPSK_RB6_0) -3



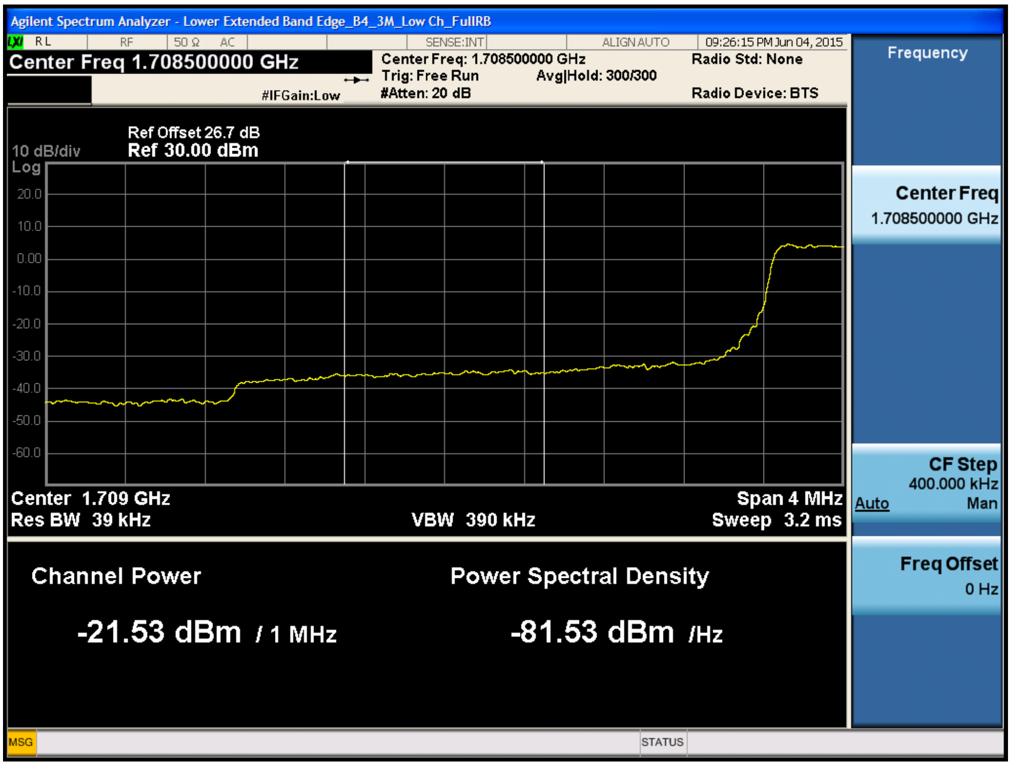
BAND 4. Lower Band Edge Plot (3M BW Ch.19965 QPSK RB 1, Offset 0) -1



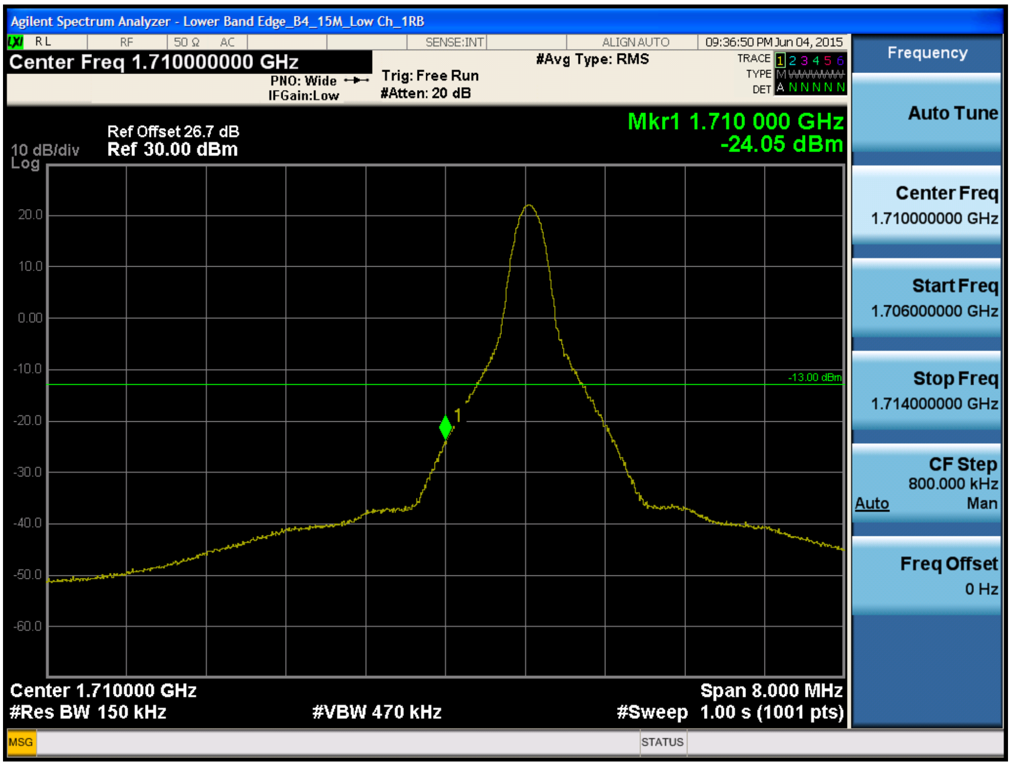
BAND 4. Lower Band Edge Plot (3M BW Ch.19965 QPSK RB 15) -2



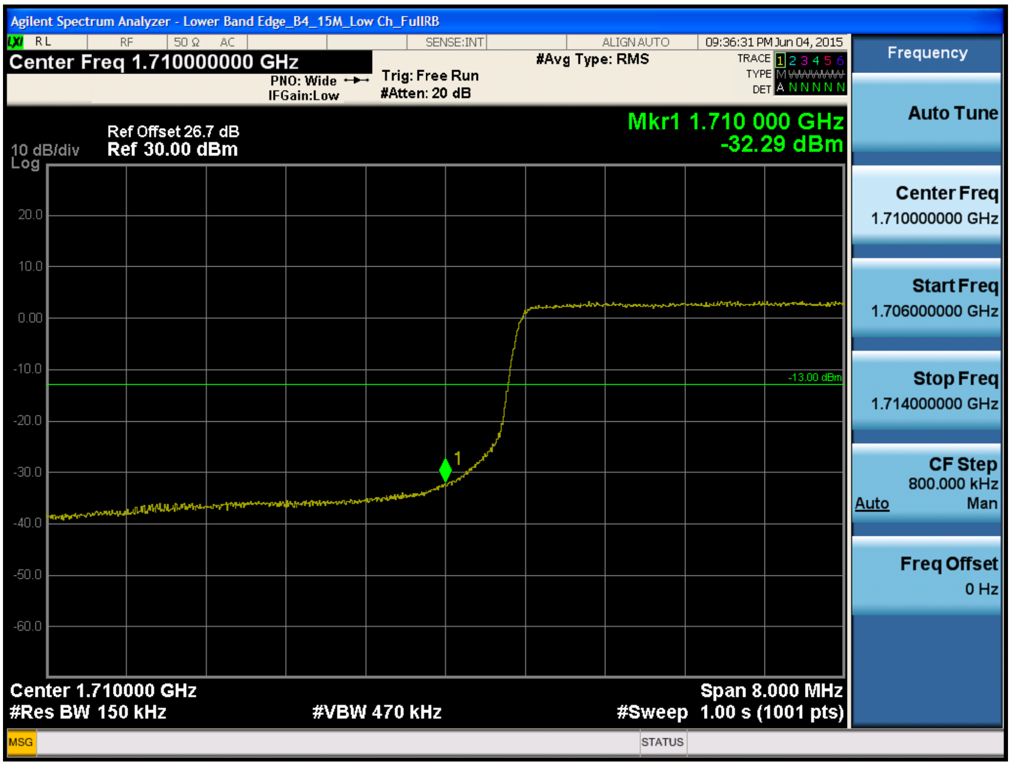
BAND 4. Lower Extended Band Edge Plot (3M BW Ch.19965 QPSK_RB15_0) -3



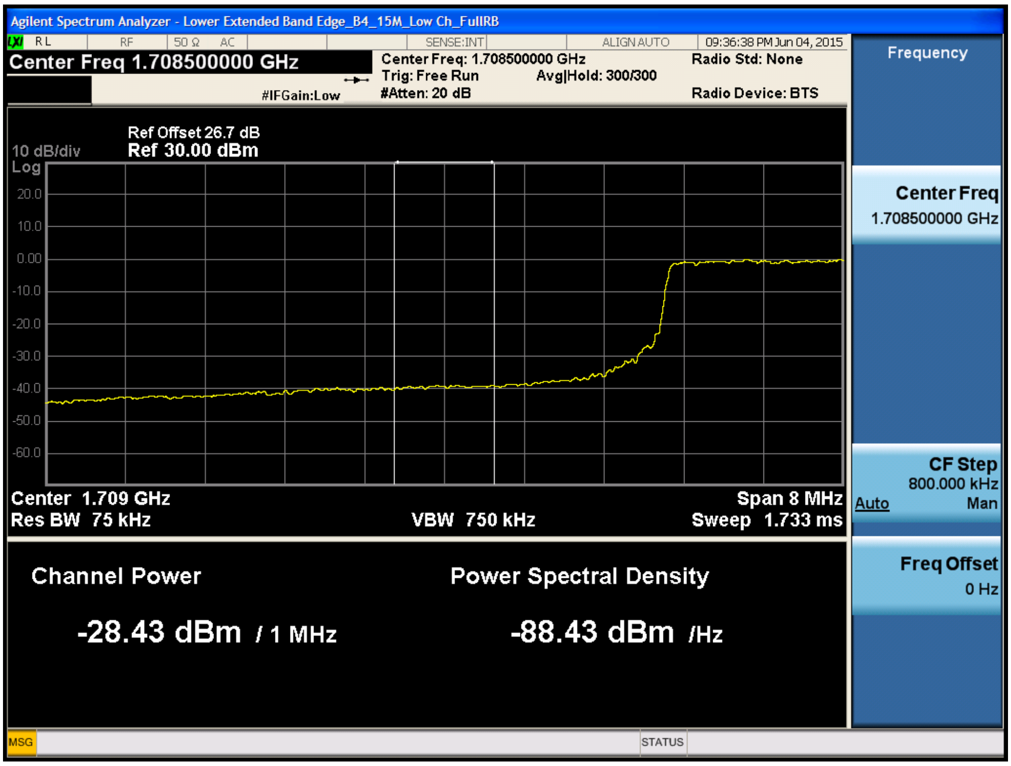
BAND 4. Lower Band Edge Plot (15M BW Ch.20025 QPSK RB 1, Offset 0) -1



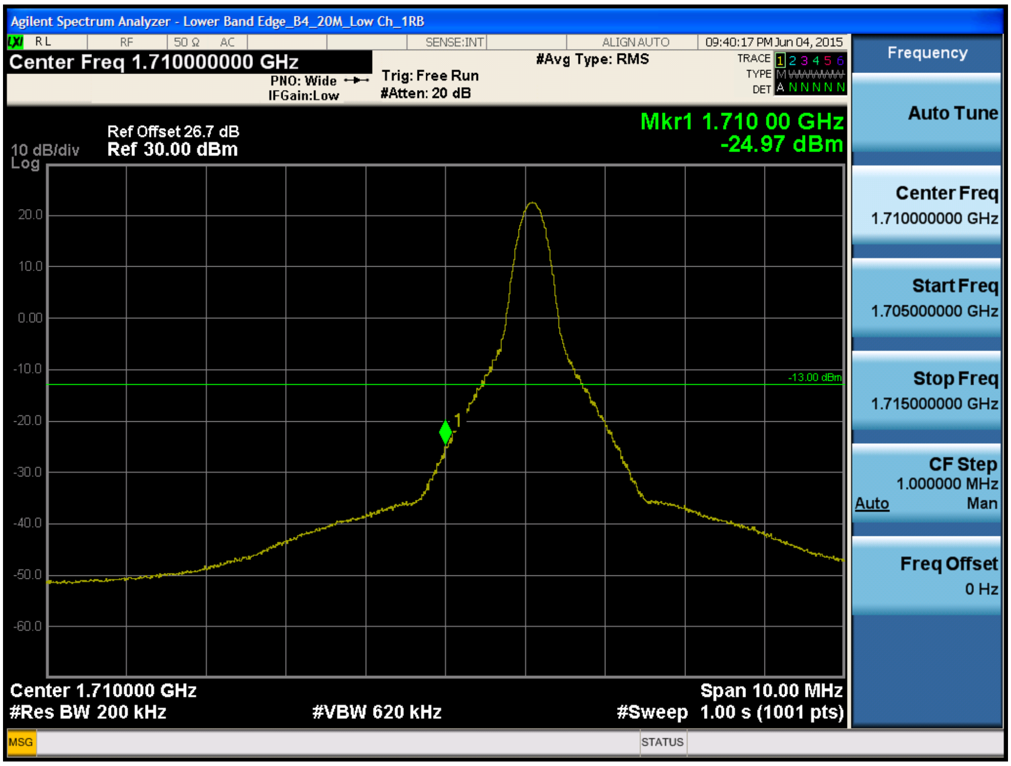
BAND 4. Lower Band Edge Plot (15M BW Ch.20025 QPSK RB 75) -2



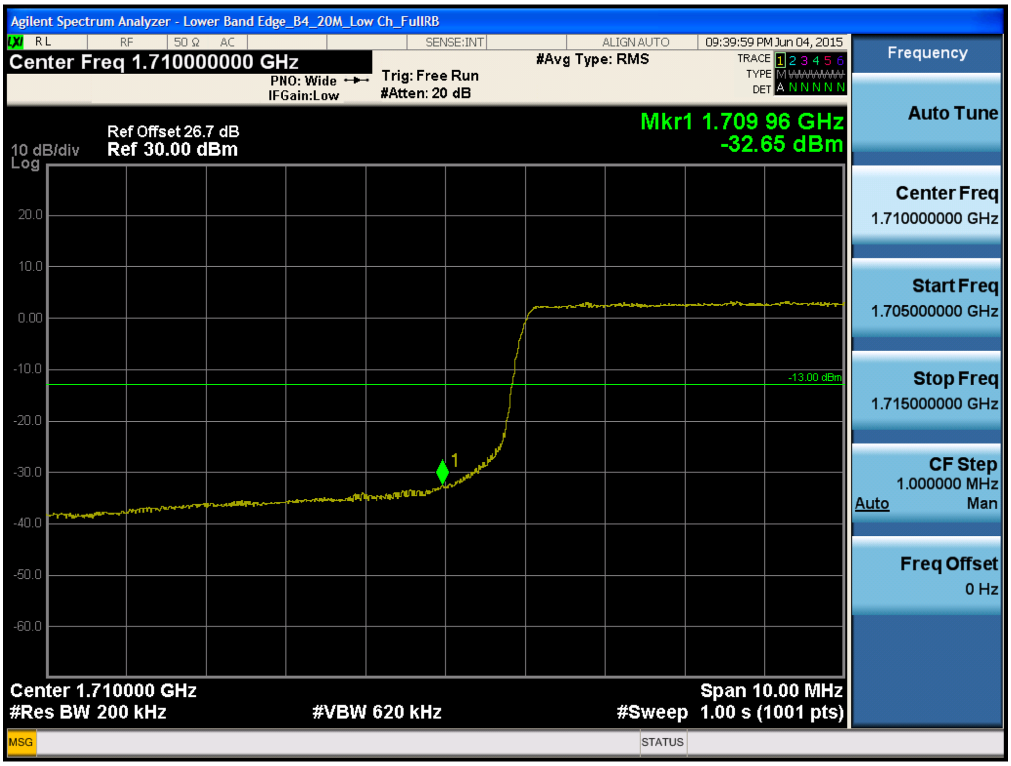
BAND 4. Lower Extended Band Edge Plot (15M BW Ch.20025 QPSK_RB75_0) -3



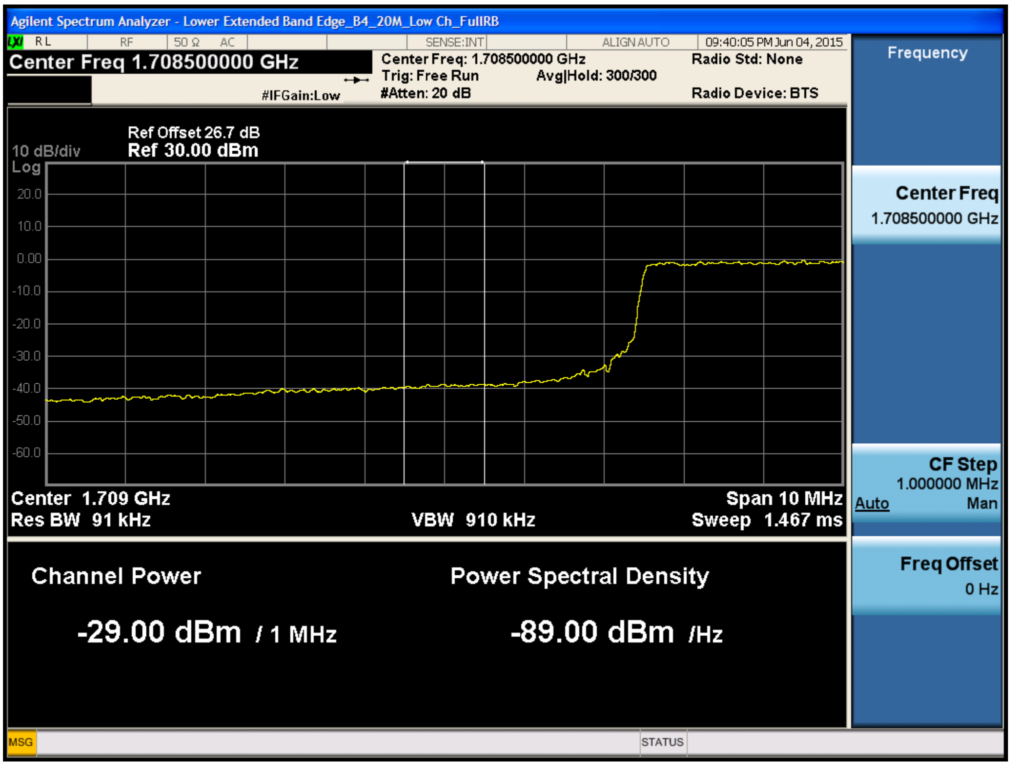
BAND 4. Lower Band Edge Plot (20M BW Ch.20050 QPSK RB 1, Offset 0) -1



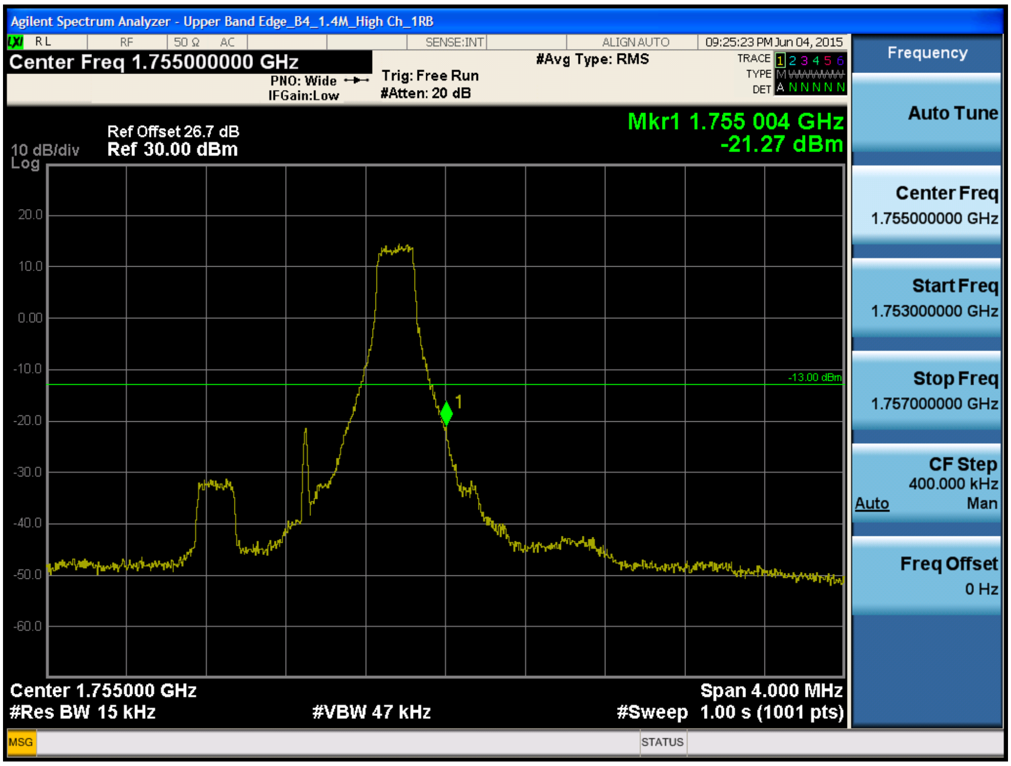
BAND 4. Lower Band Edge Plot (20M BW Ch.20050 QPSK RB 100) -2



BAND 4. Lower Extended Band Edge Plot (20M BW Ch.20050 QPSK_RB100_0) -3

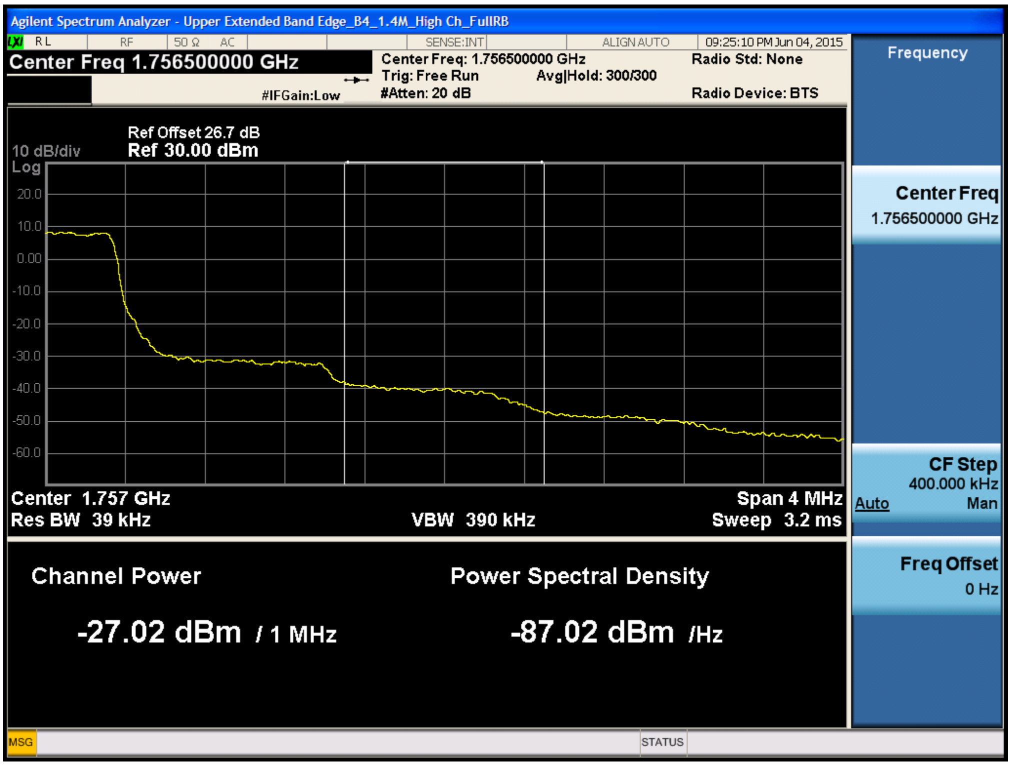


BAND 4. Upper Band Edge Plot (1.4M BW Ch.20393 QPSK_RB1_Offset) -1

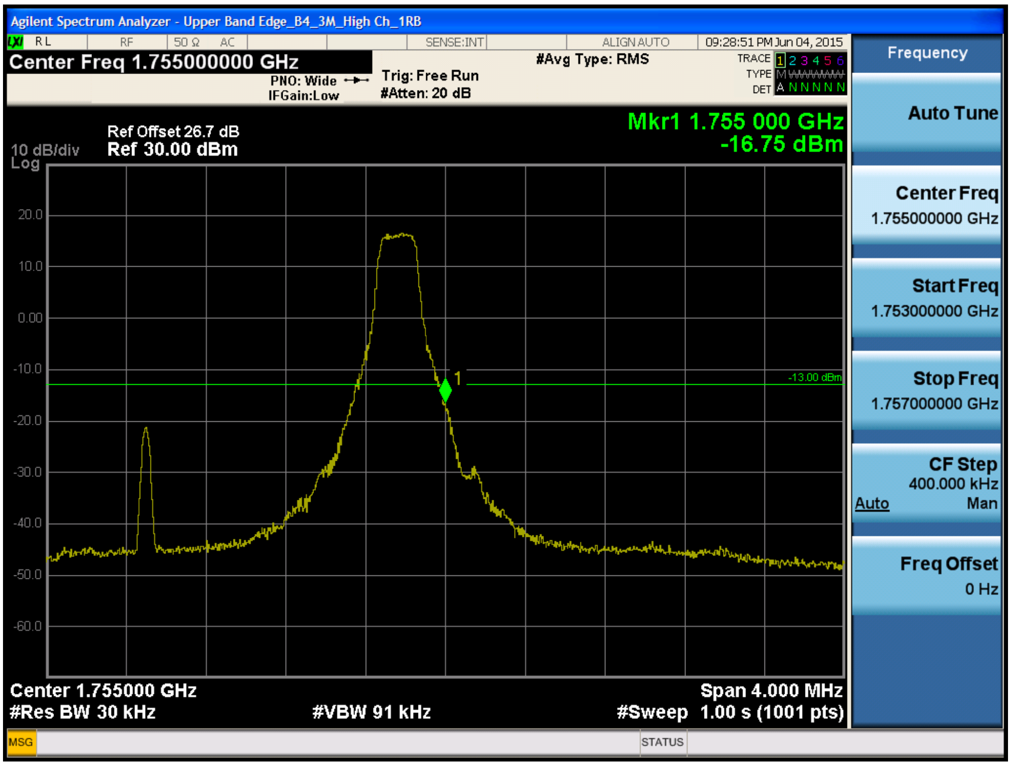


BAND 4. Upper Band Edge Plot (1.4M BW Ch.20393 QPSK_RB6) -2

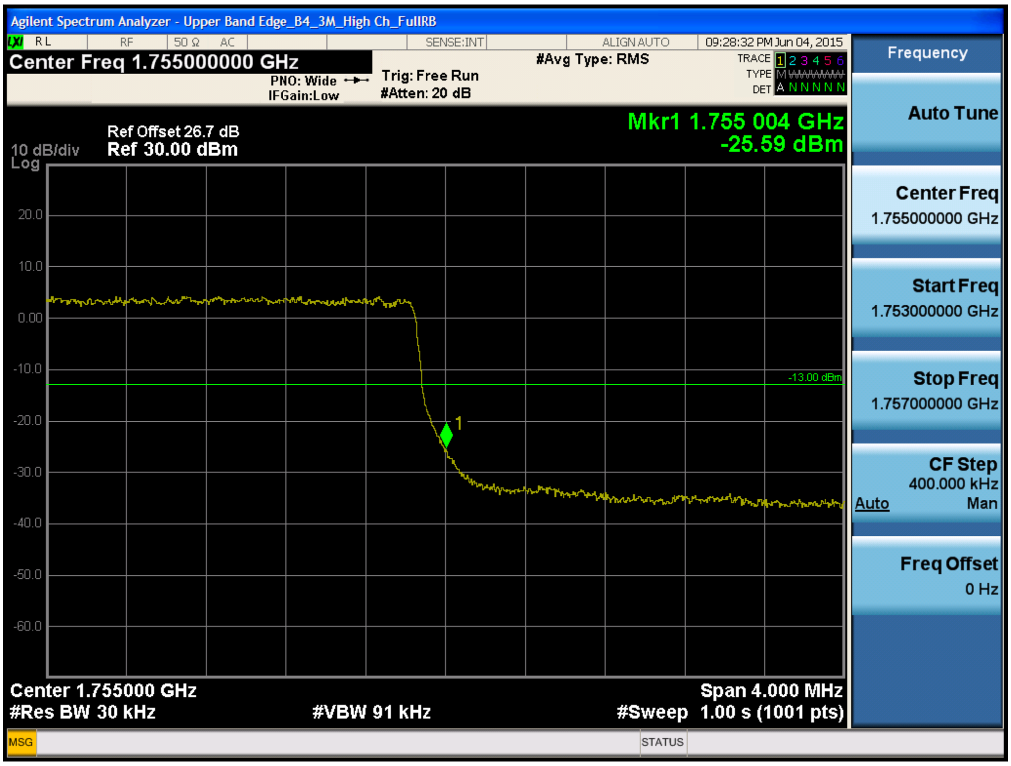
BAND 4. Upper Extended Band Edge Plot (1.4M BW Ch. 20393 QPSK_RB6_0) -3



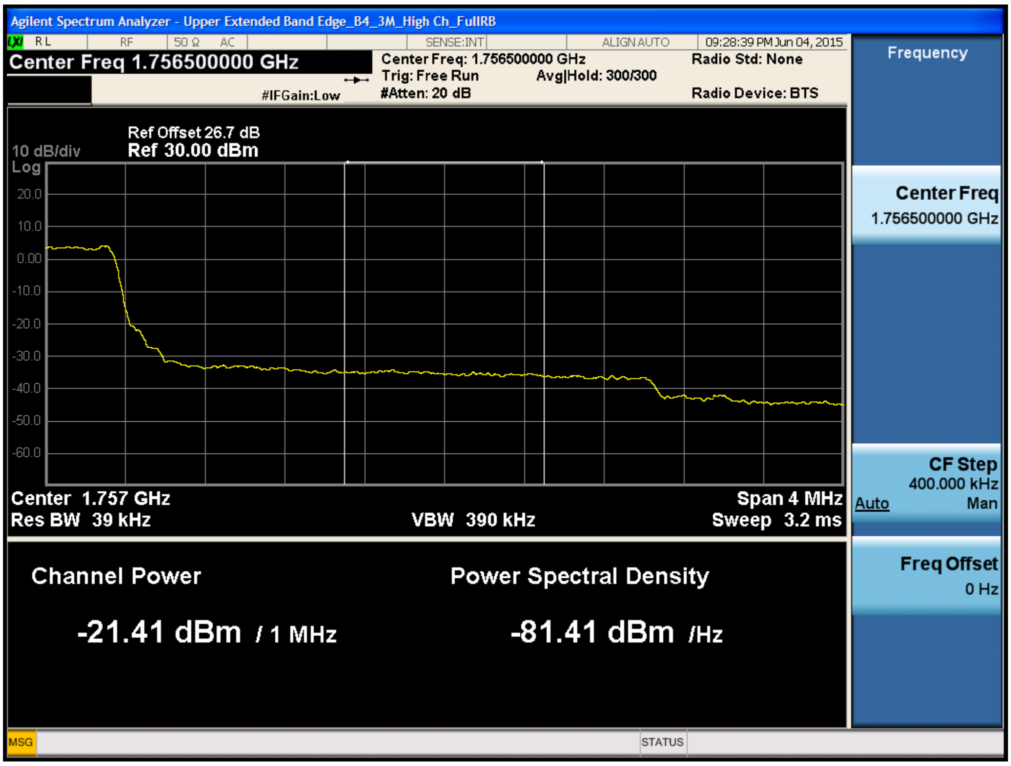
BAND 4. Upper Band Edge Plot (3M BW Ch.20385 QPSK_RB1_Offset 14) -1



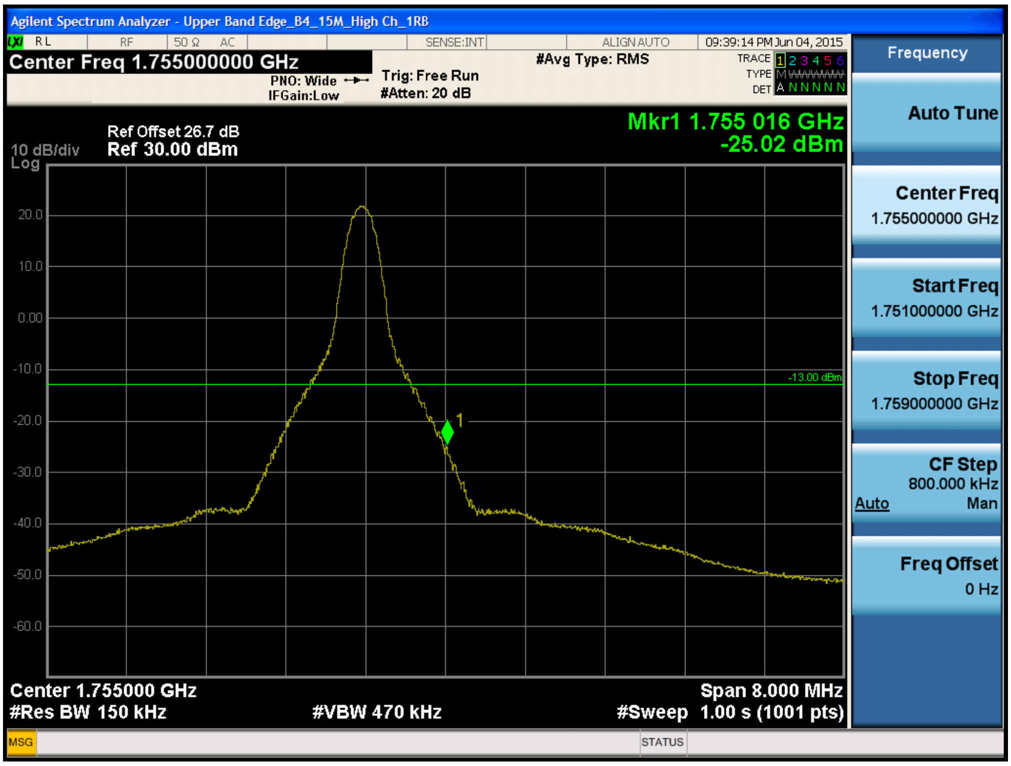
BAND 4. Upper Band Edge Plot (3M BW Ch.20385 QPSK_RB15) -2



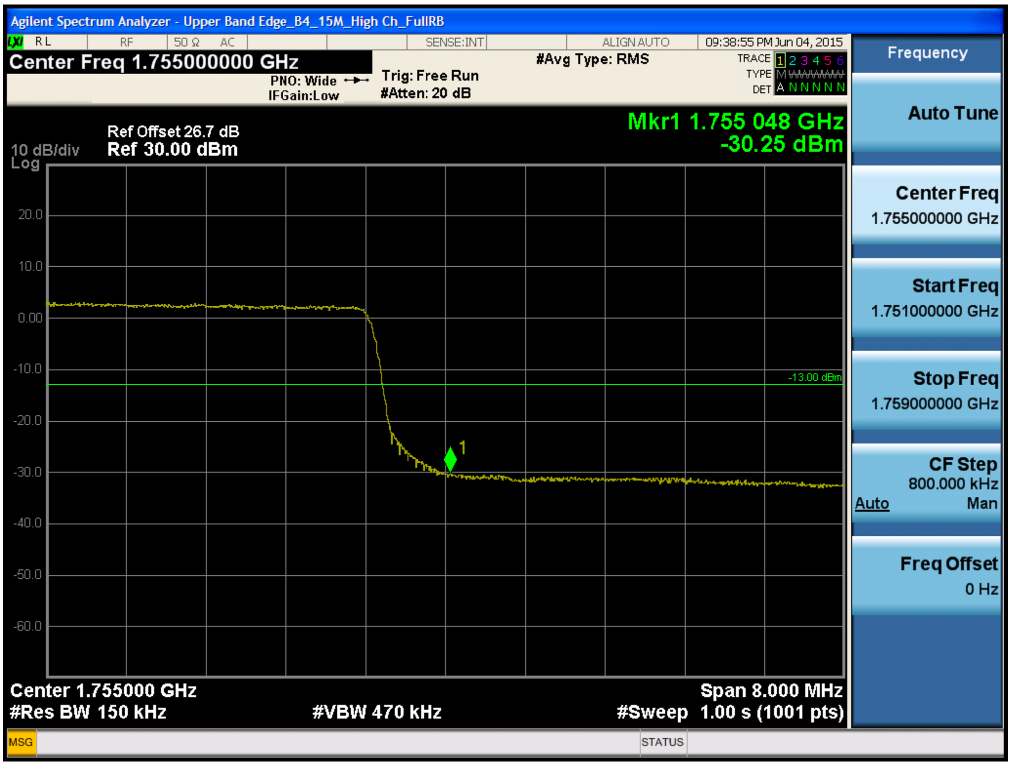
BAND 4. Upper Extended Band Edge Plot (3M BW Ch.20385 QPSK_RB15_0) -3



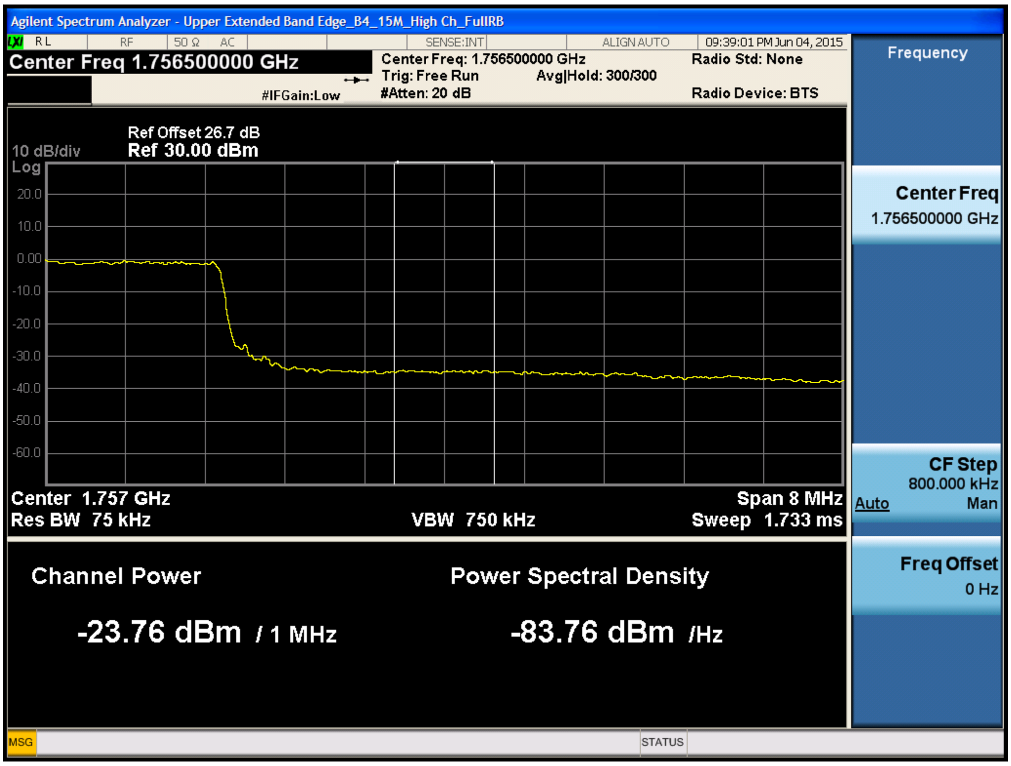
BAND 4. Upper Band Edge Plot (15M BW Ch.20325 QPSK_RB1_Offset 74) -1



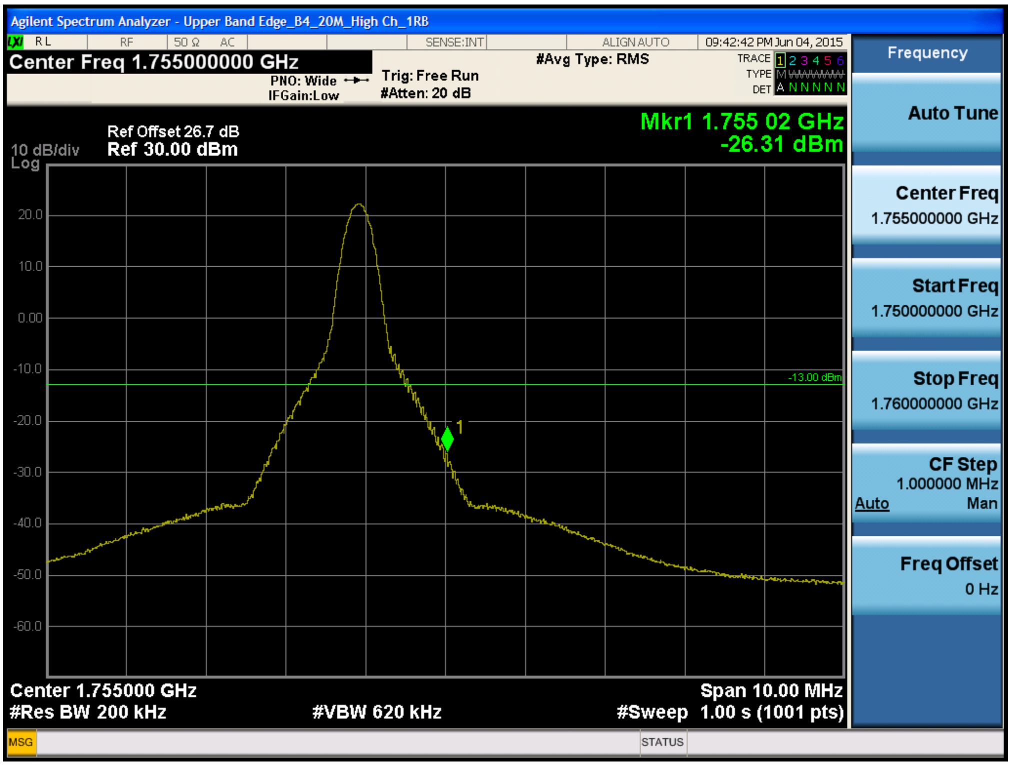
BAND 4. Upper Band Edge Plot (15M BW Ch.20325 QPSK_RB75) -2



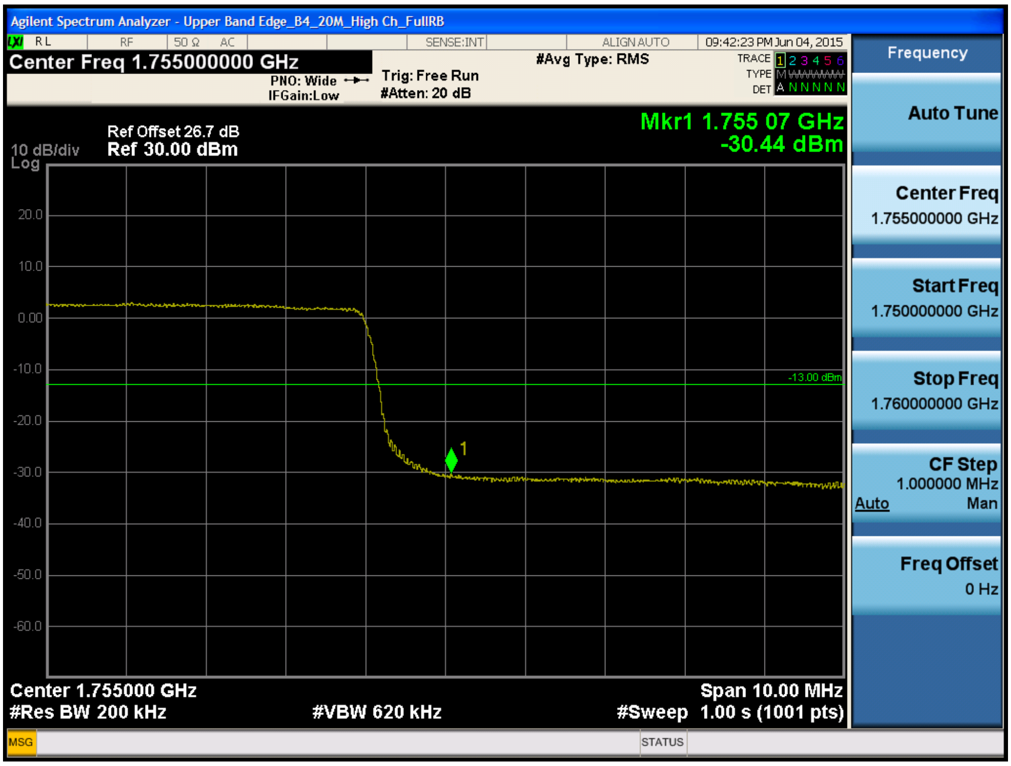
BAND 4. Upper Extended Band Edge Plot (15M BW Ch.20325 QPSK_RB75) -3



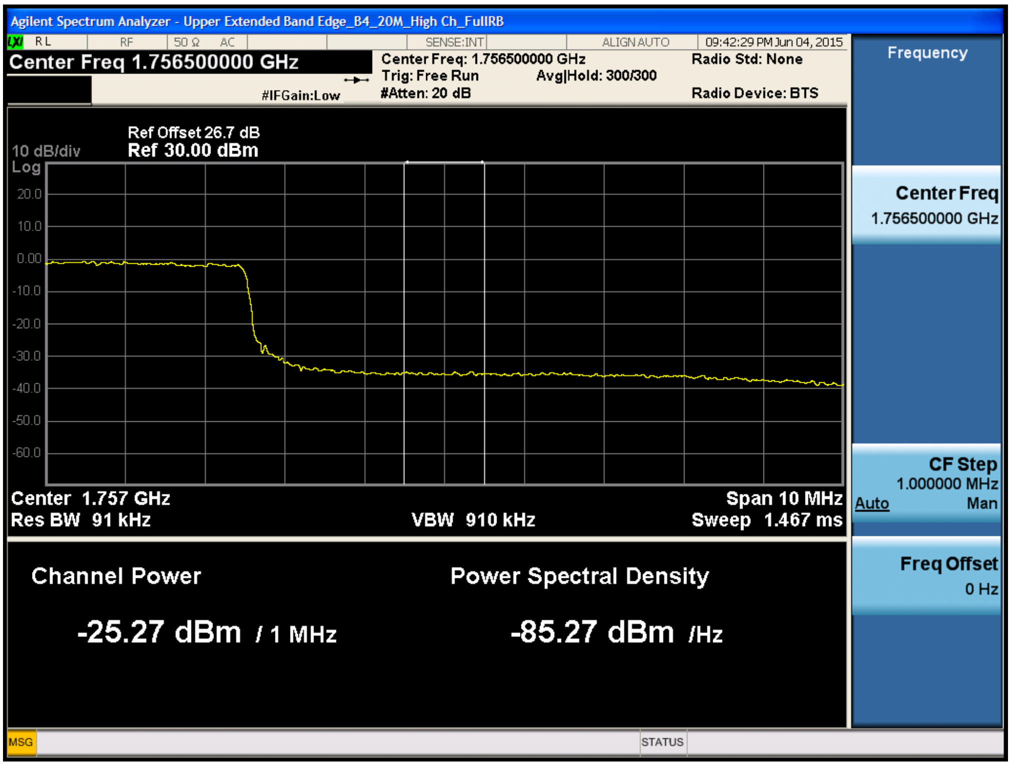
BAND 4. Upper Band Edge Plot (20M BW Ch.20300 QPSK_RB1_Offset 99) -1



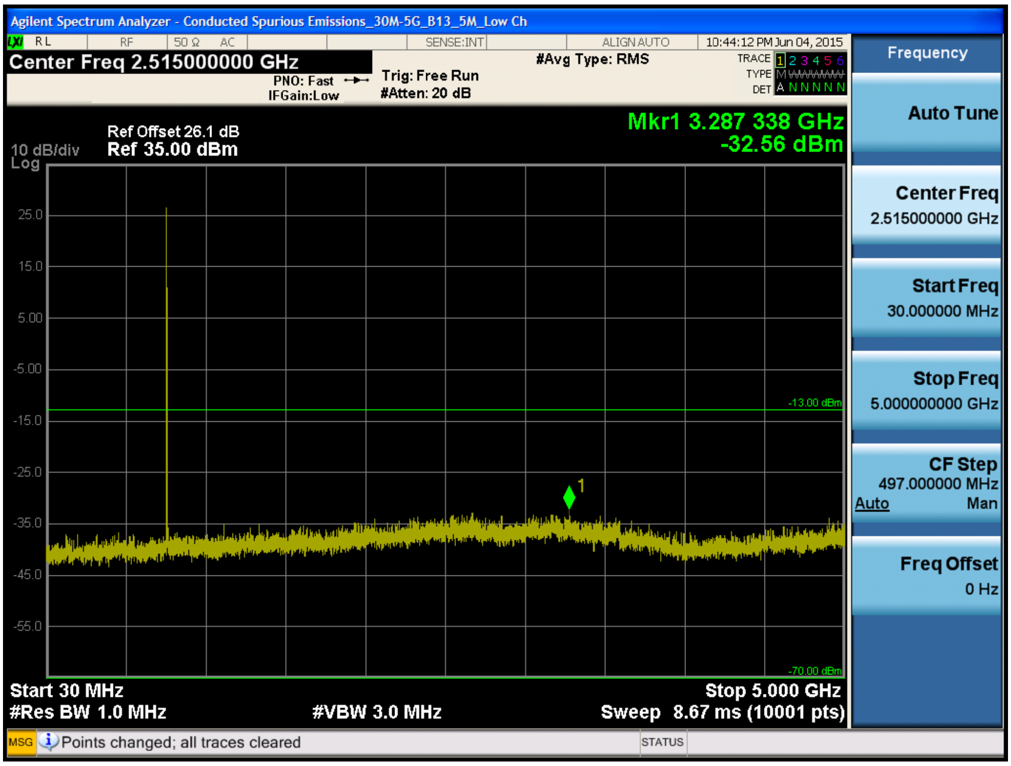
BAND 4. Upper Band Edge Plot (20M BW Ch.20300 QPSK_RB100) -2



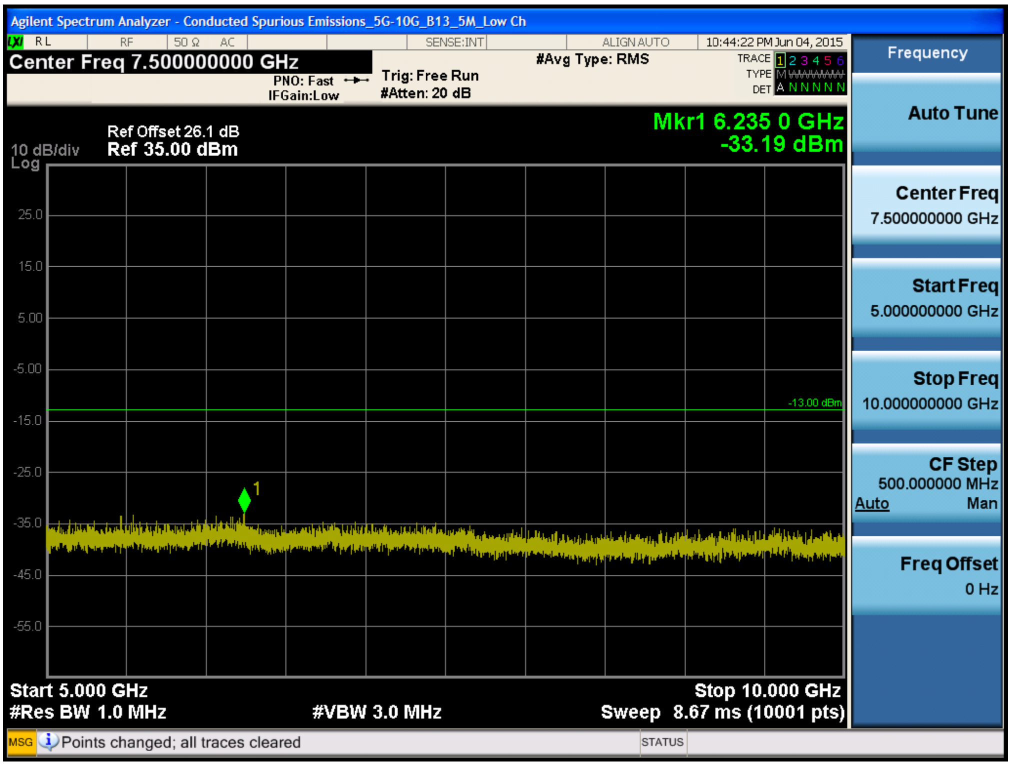
BAND 4. Upper Extended Band Edge Plot (20M BW Ch.20300 QPSK_RB100) -3



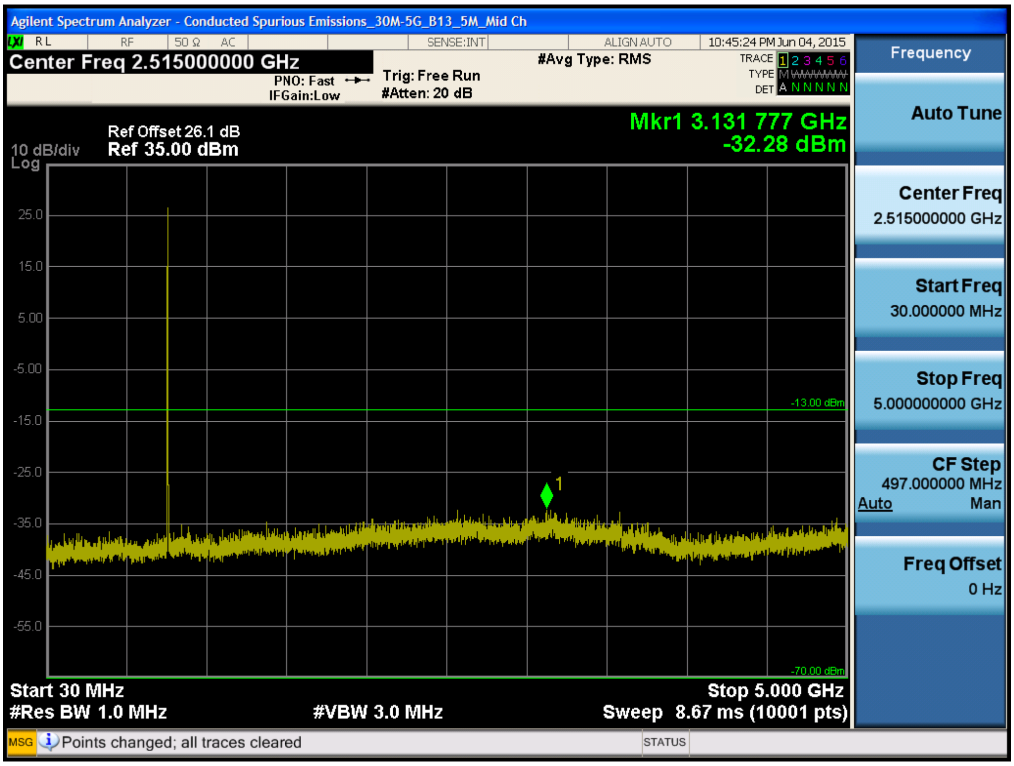
BAND 13. Conducted Spurious Plot_1 (23205ch_5MHz_QPSK_RB 1_0)



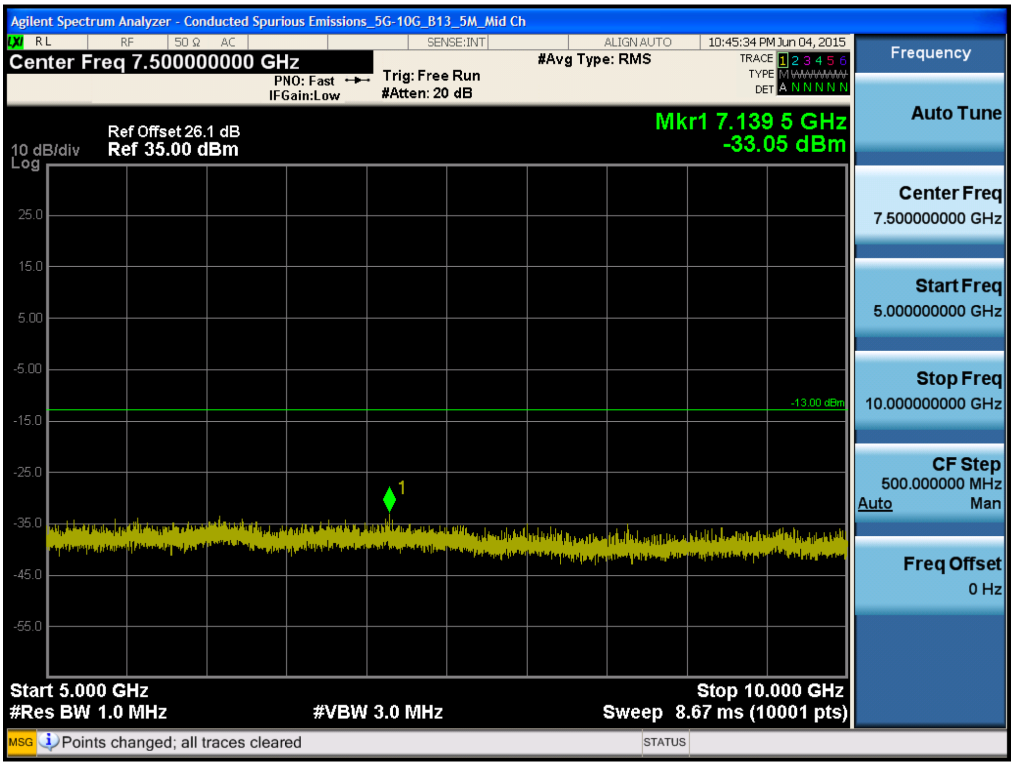
BAND 13. Conducted Spurious Plot_2 (23205ch_5MHz_QPSK_RB 1_0)



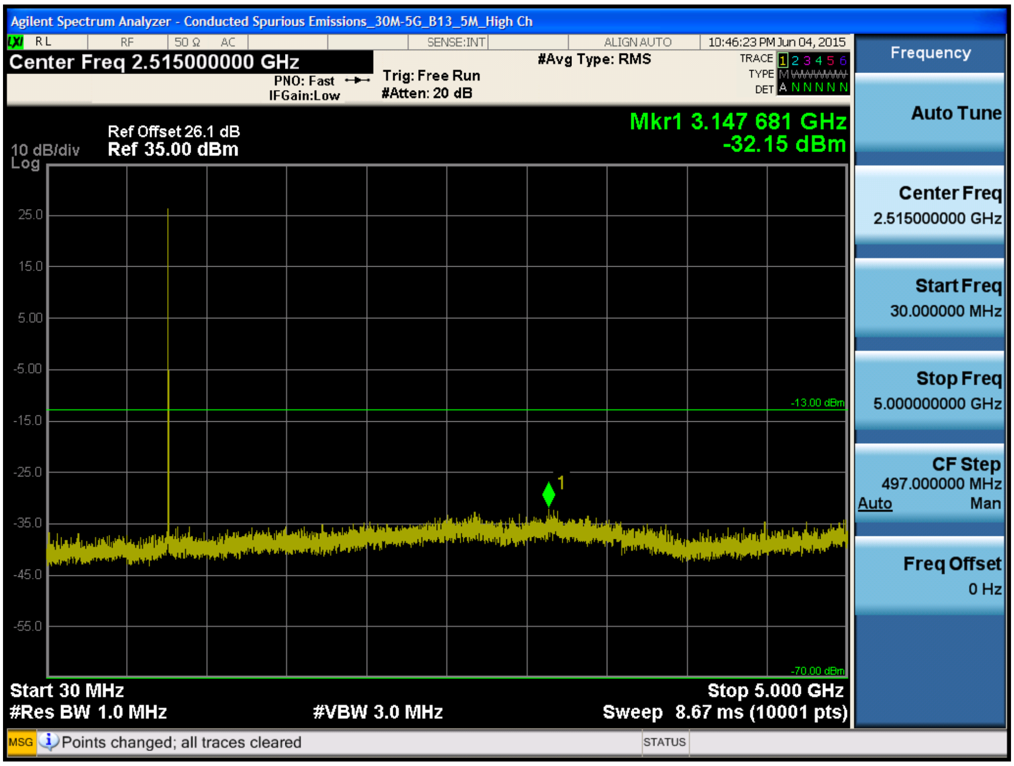
BAND 13. Conducted Spurious Plot_1 (23230ch_5MHz_QPSK_RB 1_0)



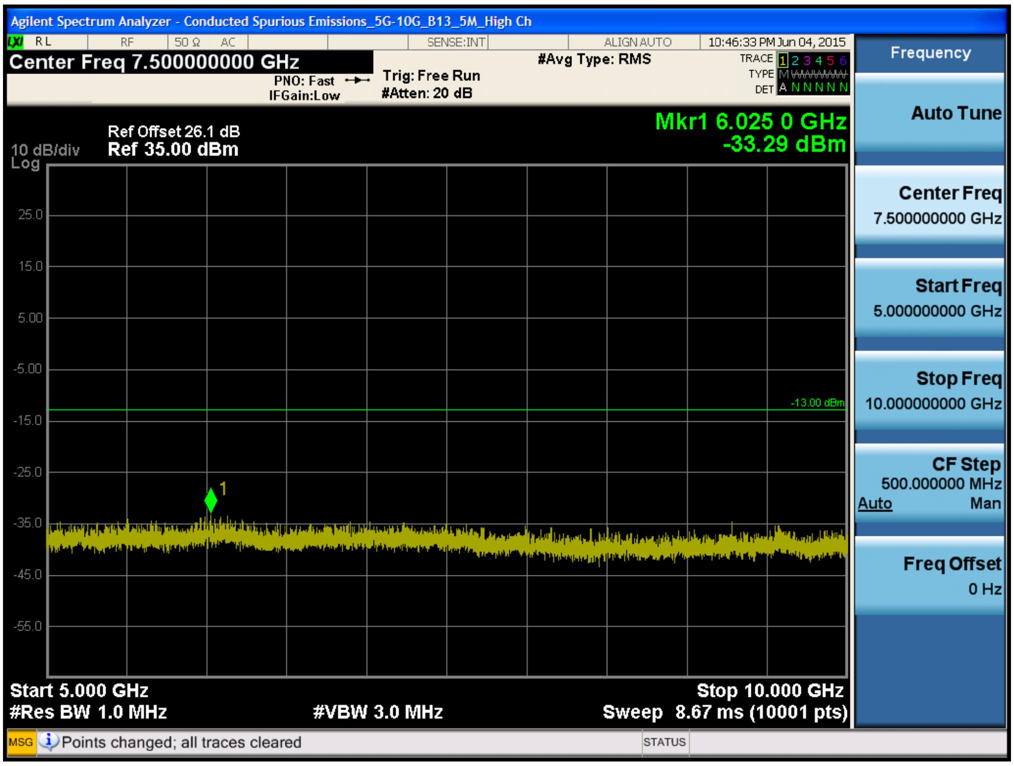
BAND 13. Conducted Spurious Plot_2 (23230ch_5MHz_QPSK_RB 1_0)



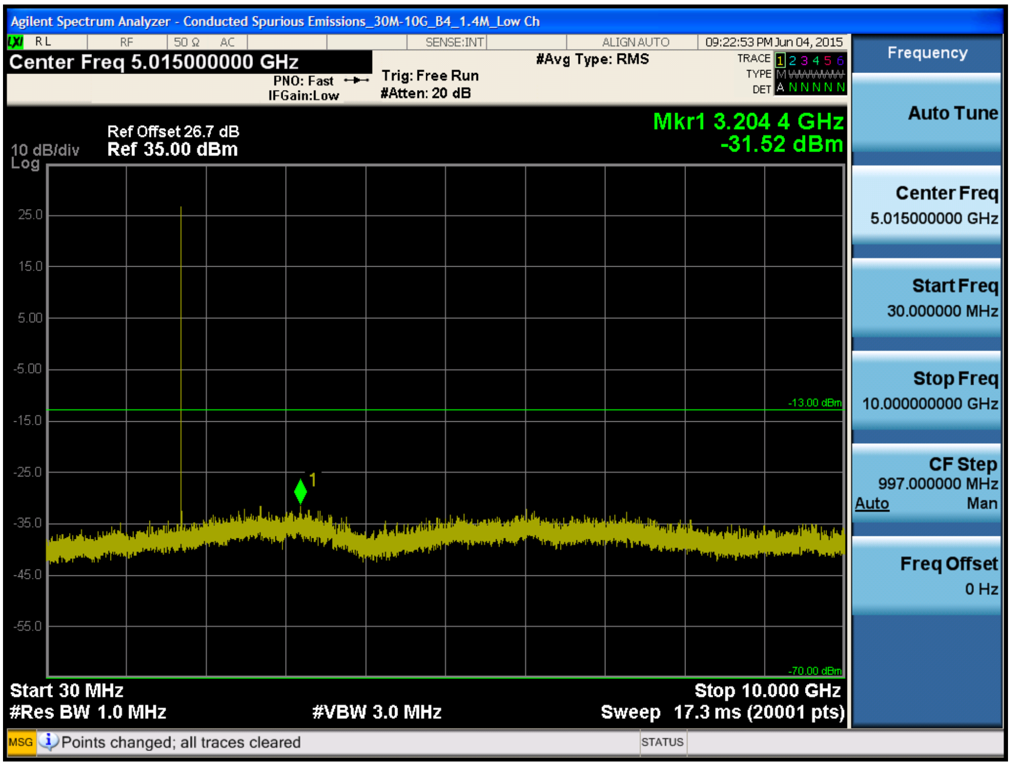
BAND 13. Conducted Spurious Plot_1 (23255ch_5MHz_QPSK_ RB 1_0)



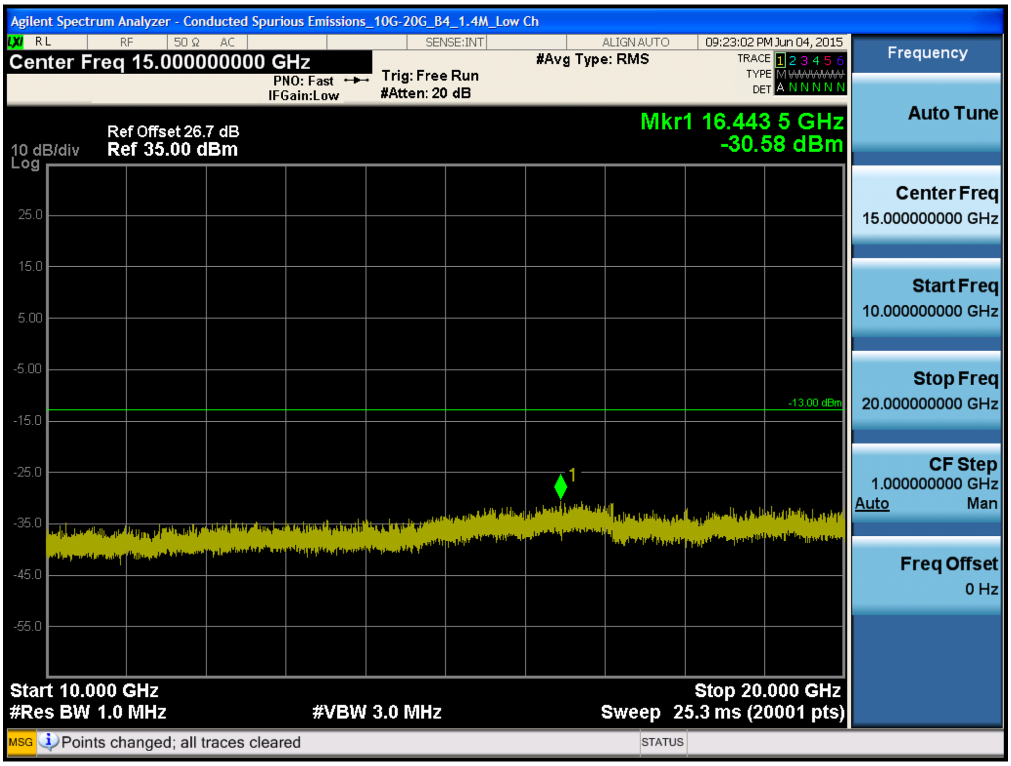
BAND 13. Conducted Spurious Plot_2 (23255ch_5MHz_QPSK_ RB 1_0)



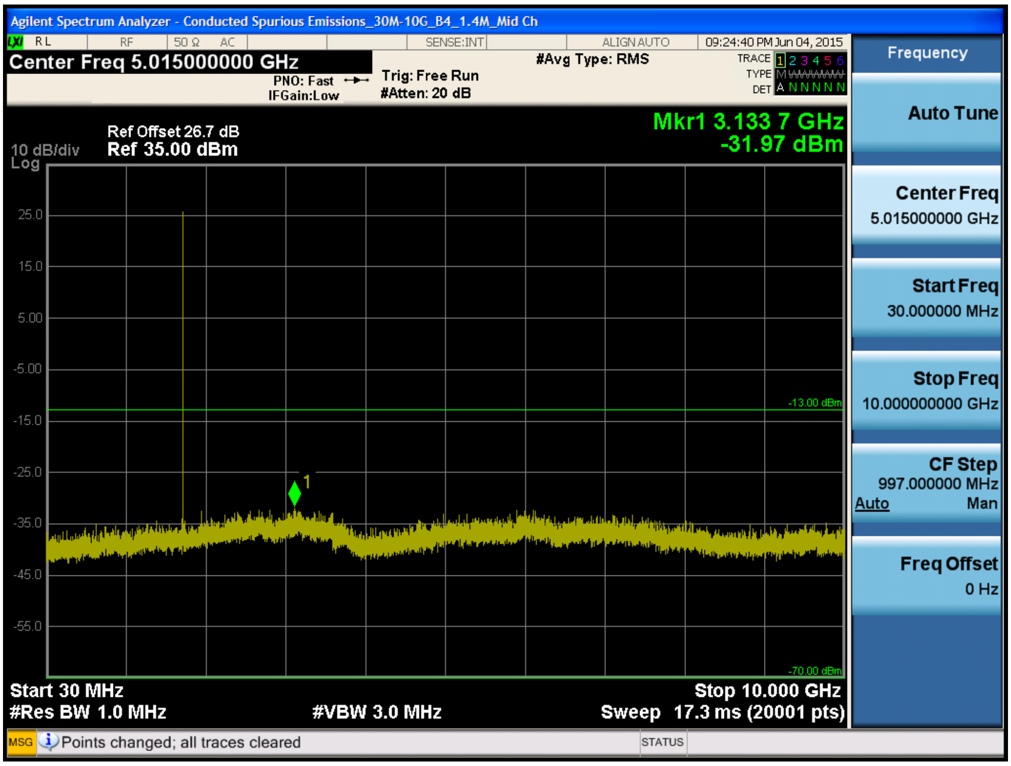
BAND 4. Conducted Spurious Plot_1 (19957ch_1.4MHz_QPSK_RB 1_0)



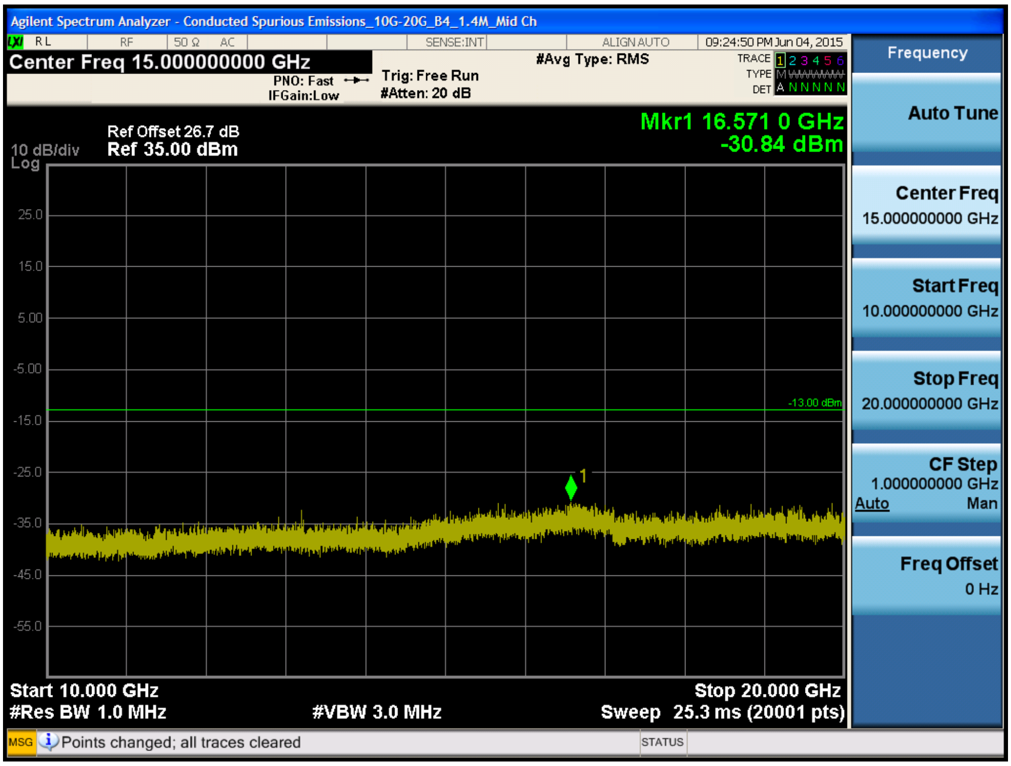
BAND 4. Conducted Spurious Plot_2 (19957ch_1.4MHz_QPSK_ RB 1_0)



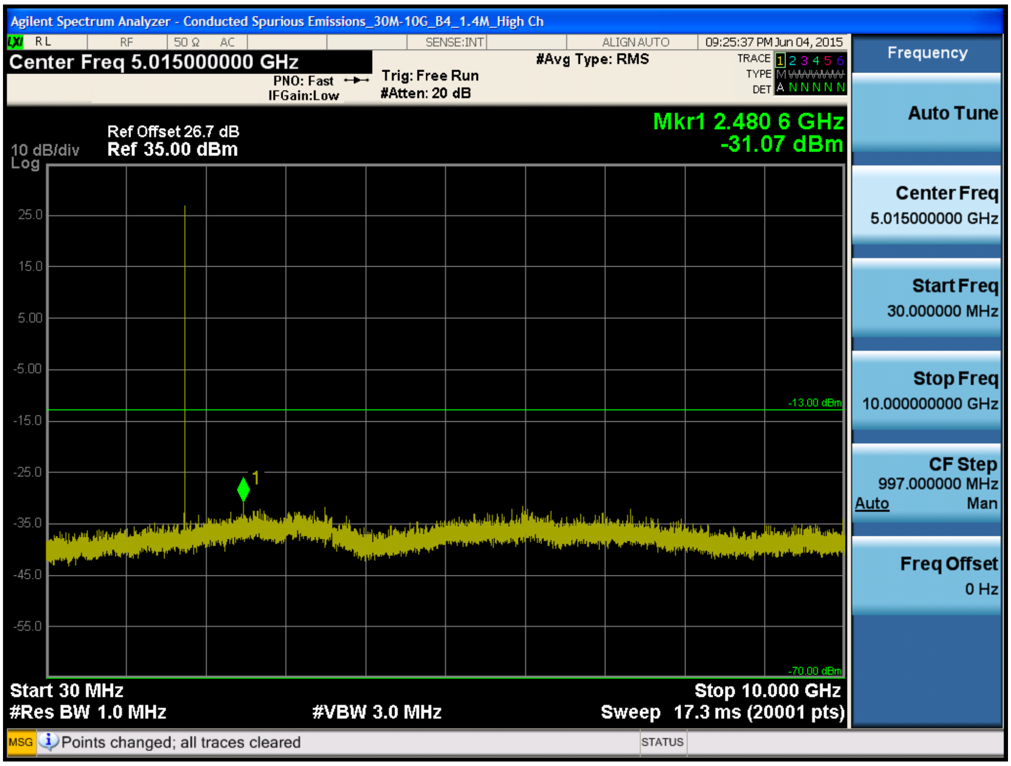
BAND 4. Conducted Spurious Plot_1 (20175ch_1.4MHz_QPSK_ RB 1_0)



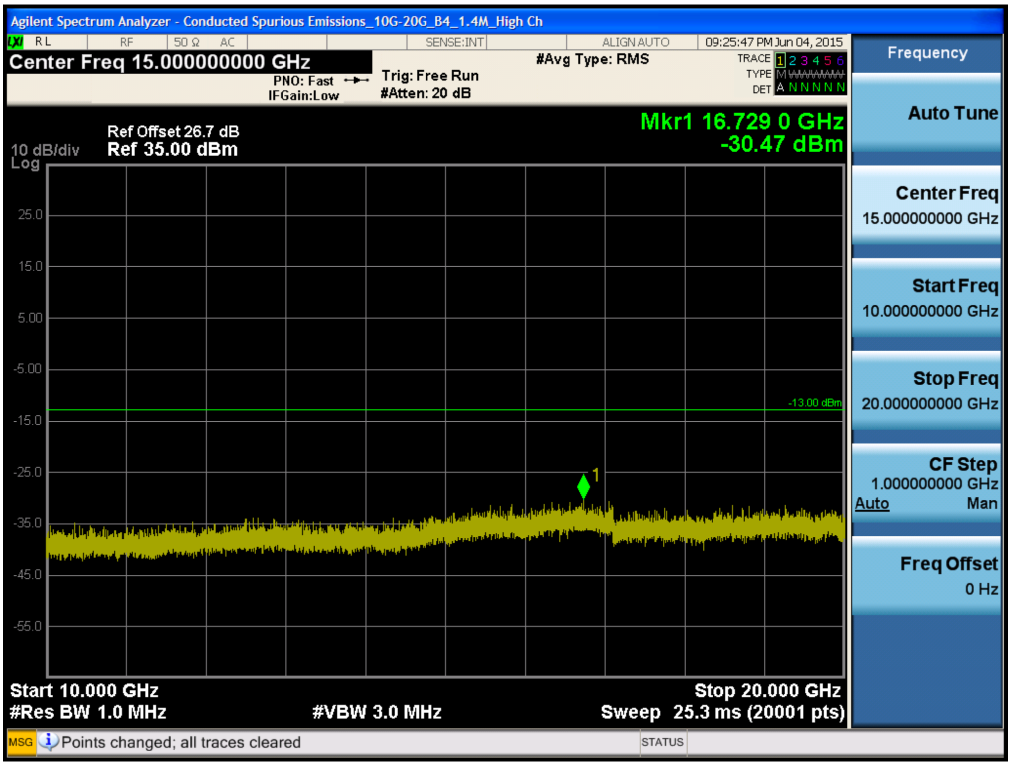
BAND 4. Conducted Spurious Plot_2 (20175ch_1.4MHz_QPSK_ RB 1_0)



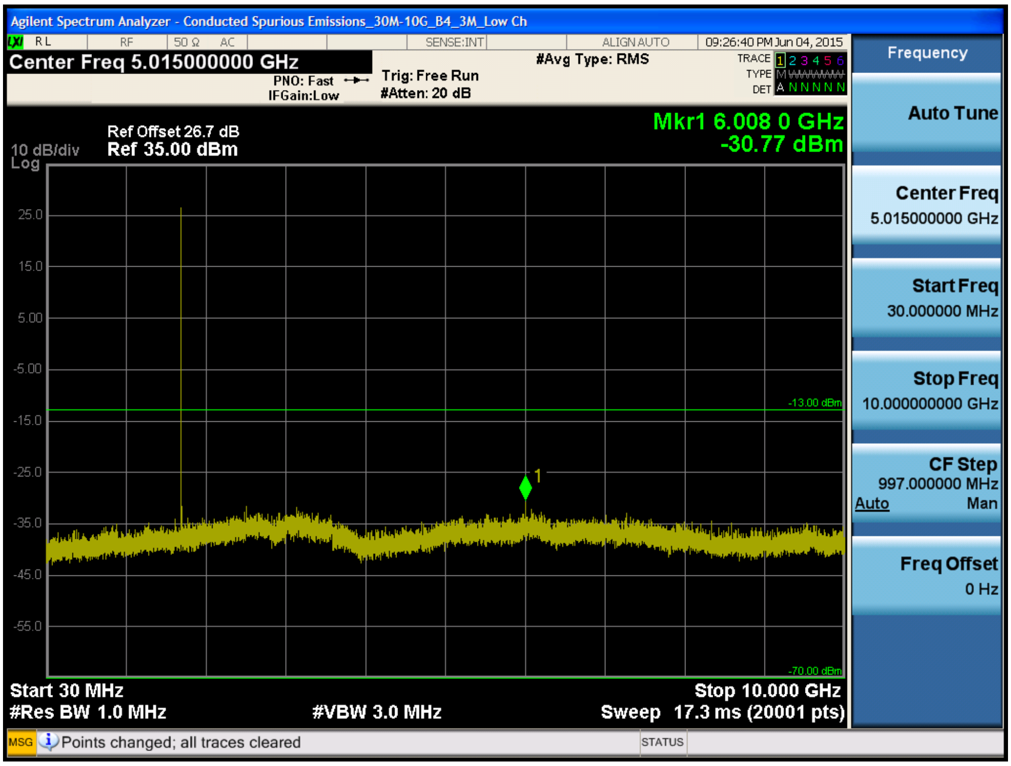
BAND 4. Conducted Spurious Plot_1 (20393ch_1.4MHz_QPSK_ RB 1_0)



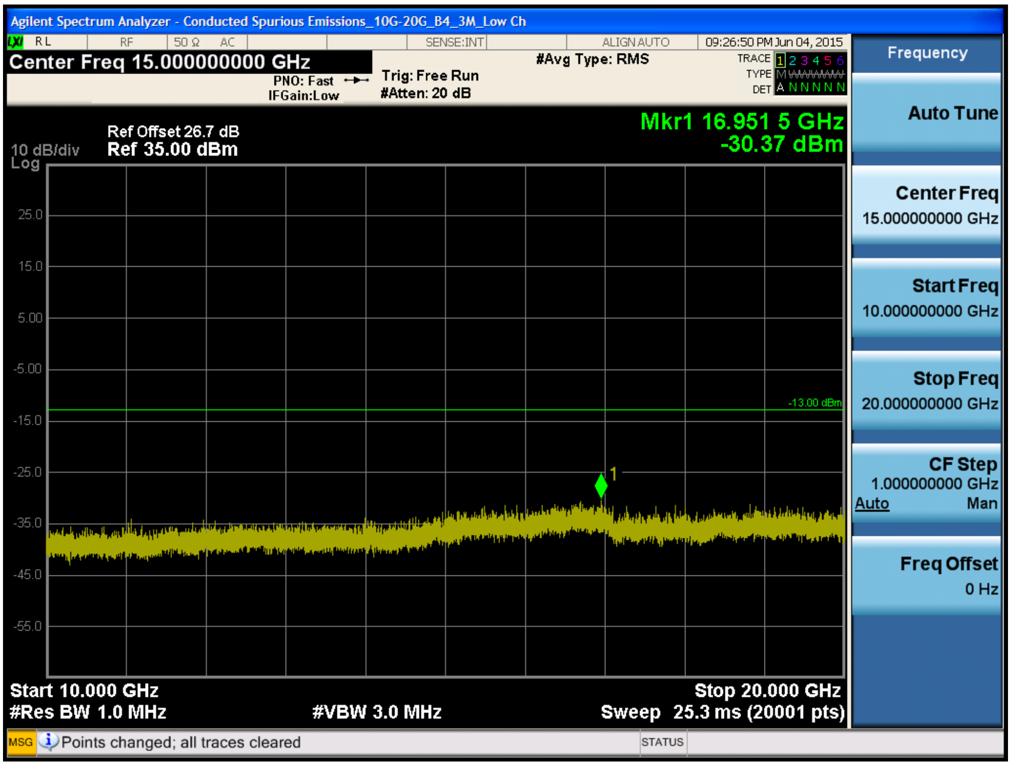
BAND 4. Conducted Spurious Plot_2 (20393ch_1.4MHz_QPSK_ RB 1_0)



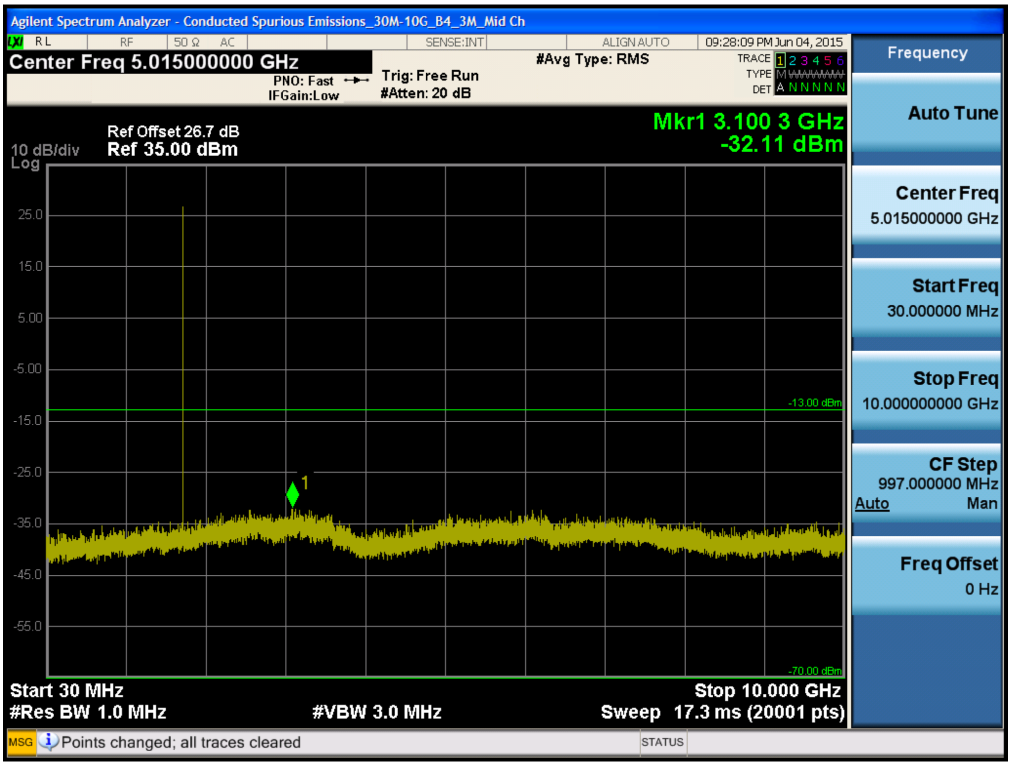
BAND 4. Conducted Spurious Plot_1 (19965ch_3MHz_QPSK_ RB 1_0)



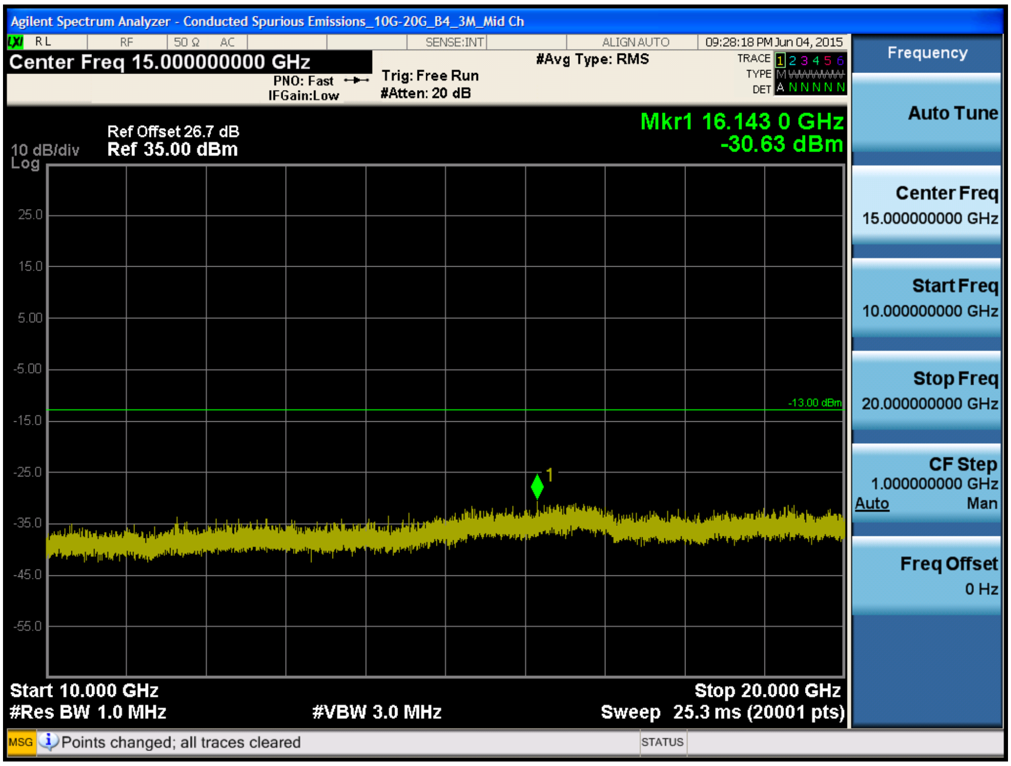
BAND 4. Conducted Spurious Plot_2 (19965ch_3MHz_QPSK_ RB 1_0)



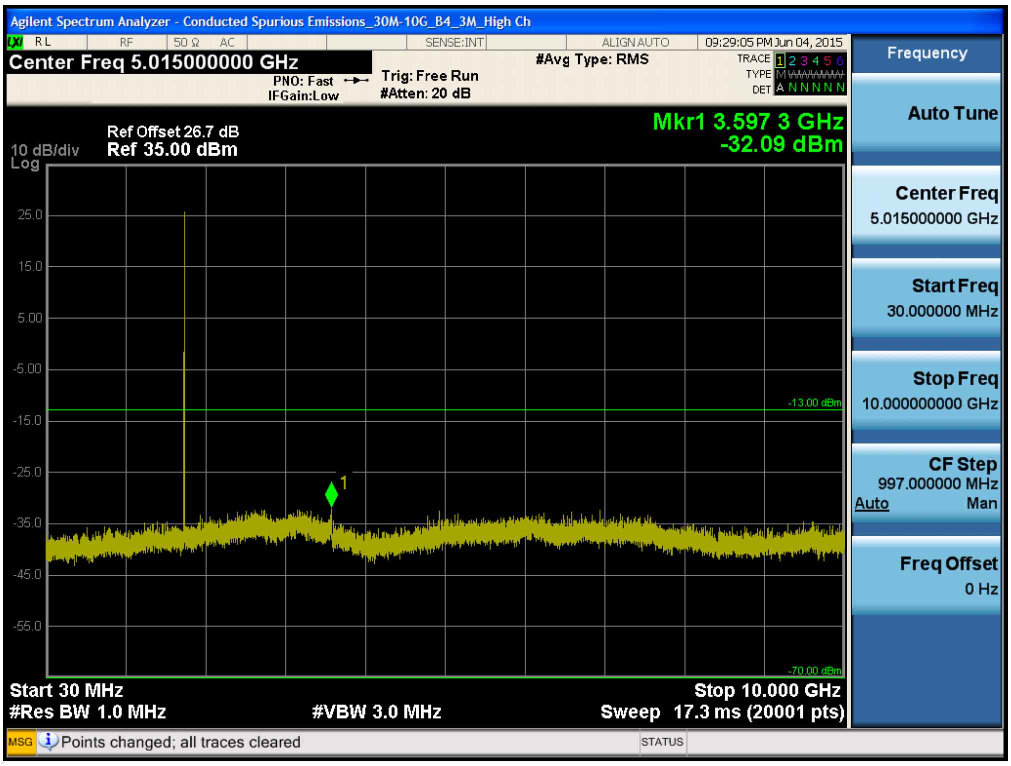
BAND 4. Conducted Spurious Plot_1 (20175ch_3MHz_QPSK_ RB 1_0)



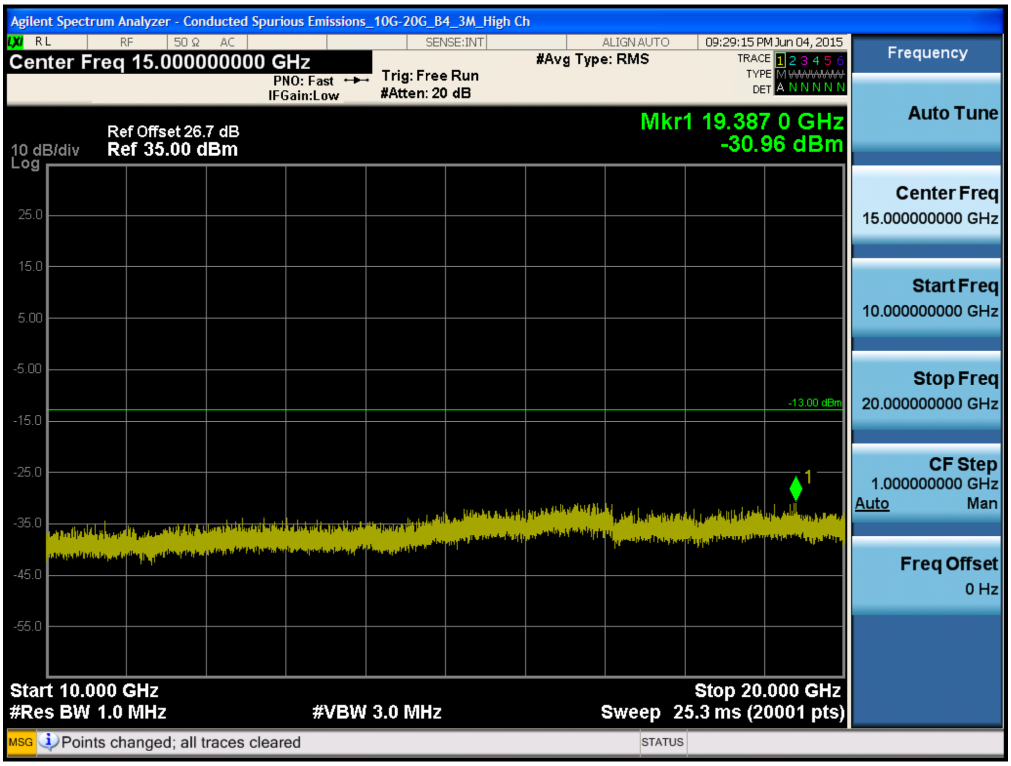
BAND 4. Conducted Spurious Plot_2 (20175ch_3MHz_QPSK_ RB 1_0)



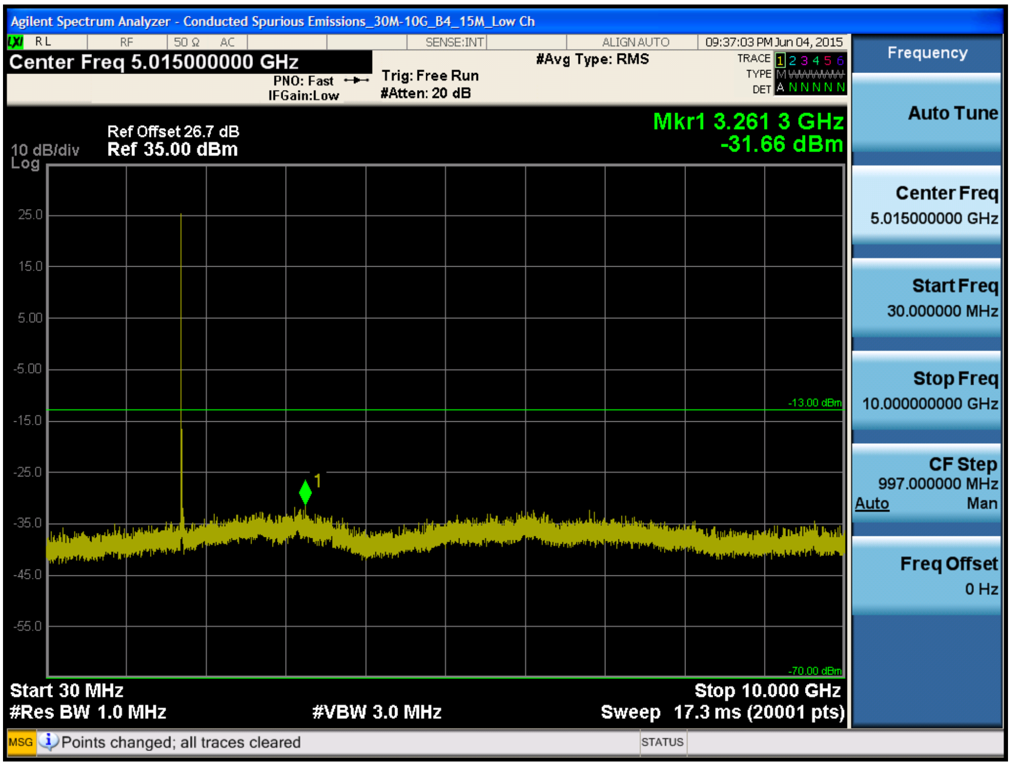
BAND 4. Conducted Spurious Plot_1 (20385ch_3MHz_QPSK_ RB 1_0)



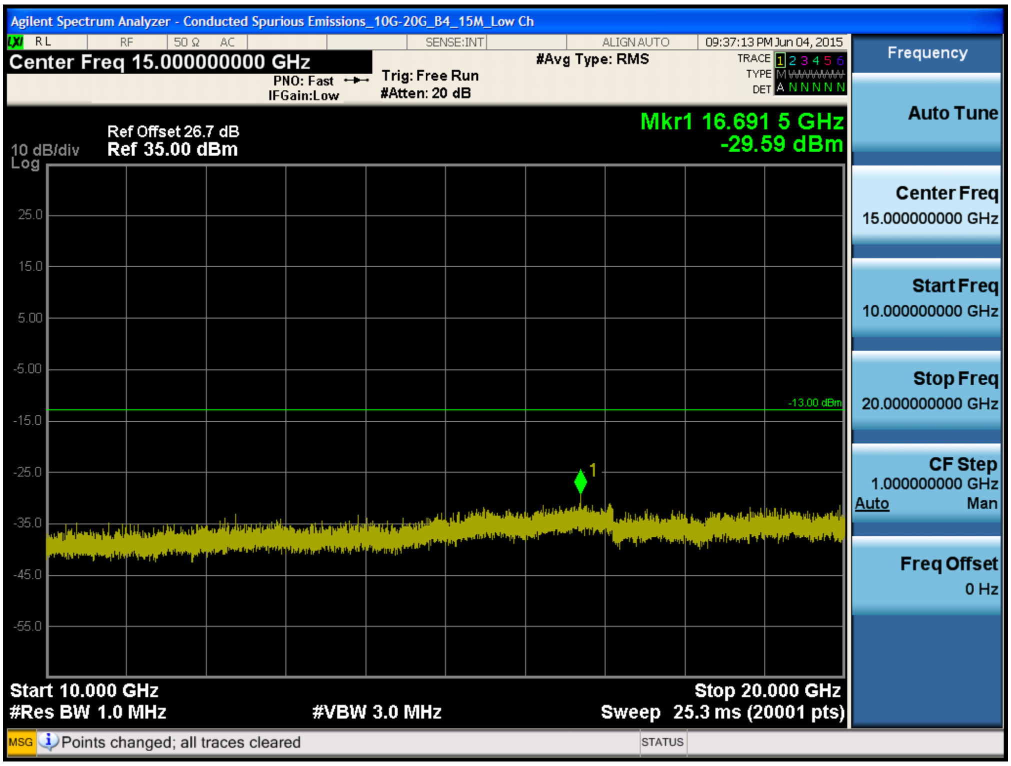
BAND 4. Conducted Spurious Plot_2 (20385ch_3MHz_QPSK_ RB 1_0)



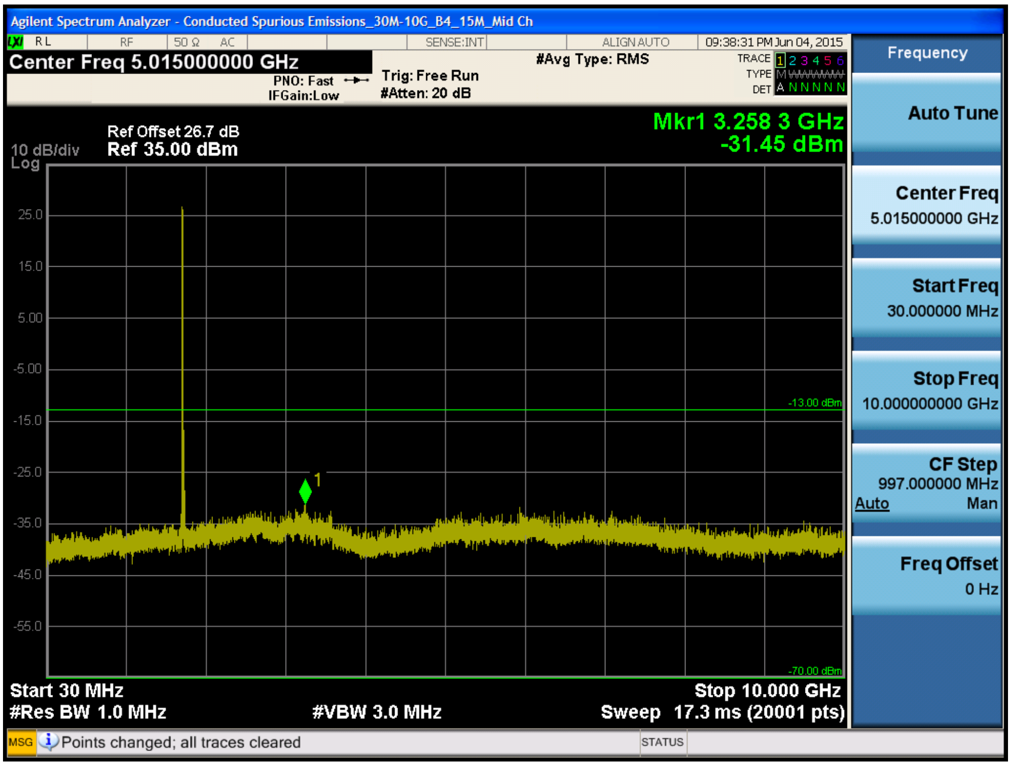
BAND 4. Conducted Spurious Plot_1 (20025ch_15MHz_QPSK_ RB 1_0)



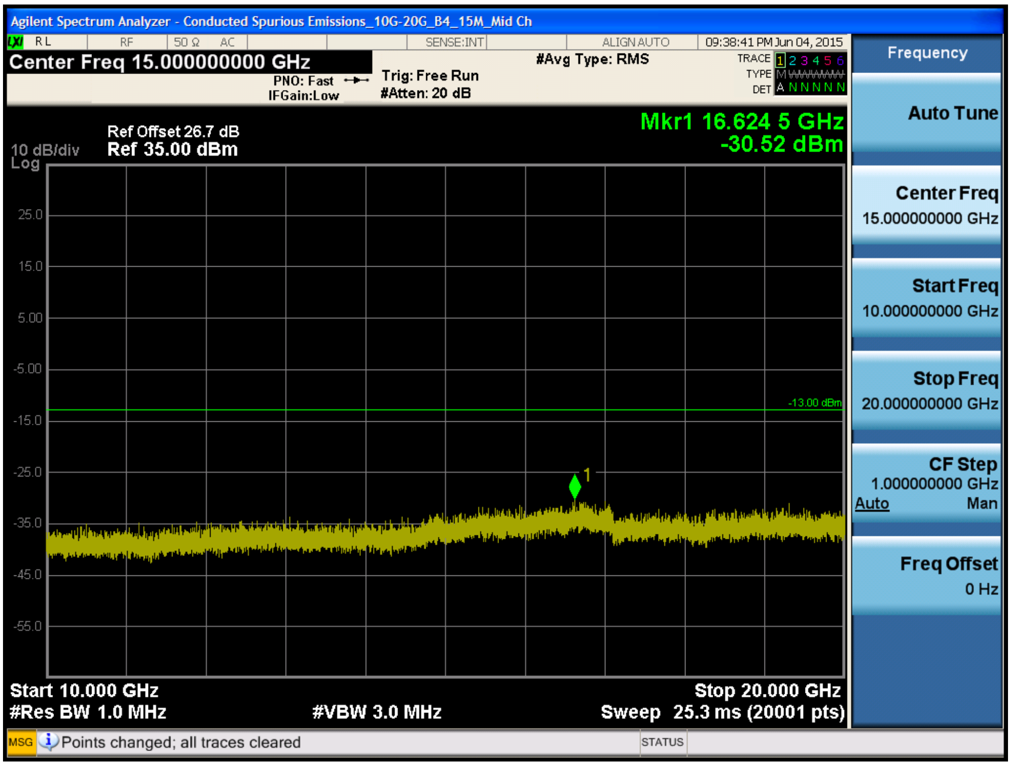
BAND 4. Conducted Spurious Plot_2 (20025ch_15MHz_QPSK_ RB 1_0)



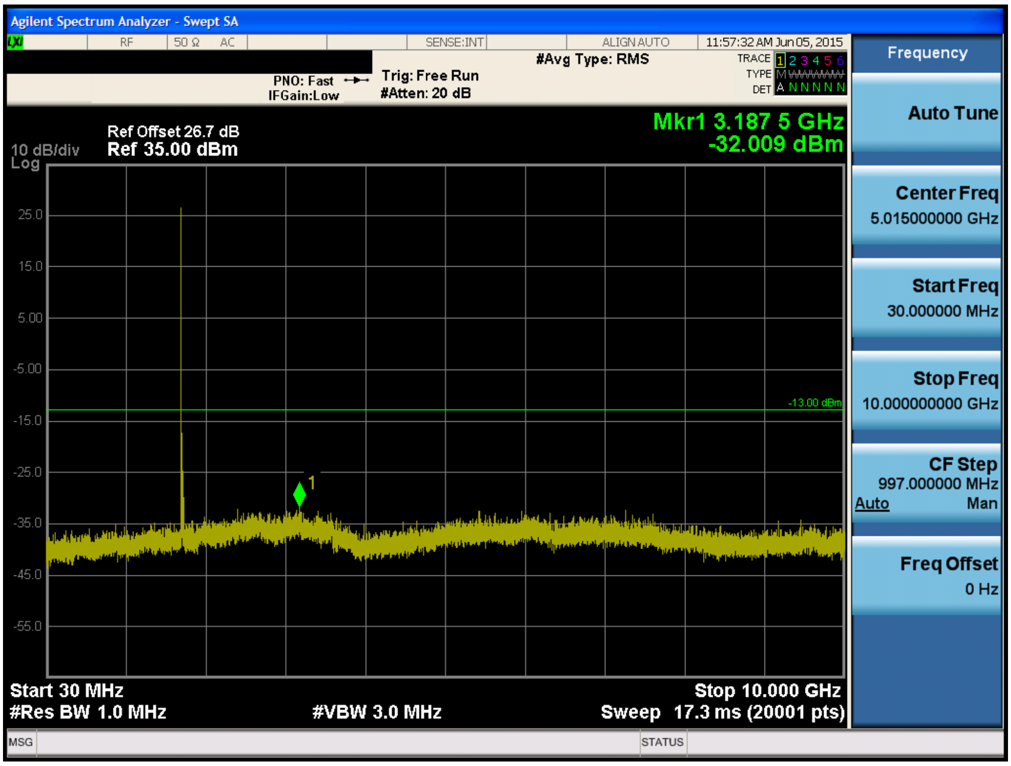
BAND 4. Conducted Spurious Plot_1 (20175ch_15MHz_QPSK_ RB 1_0)



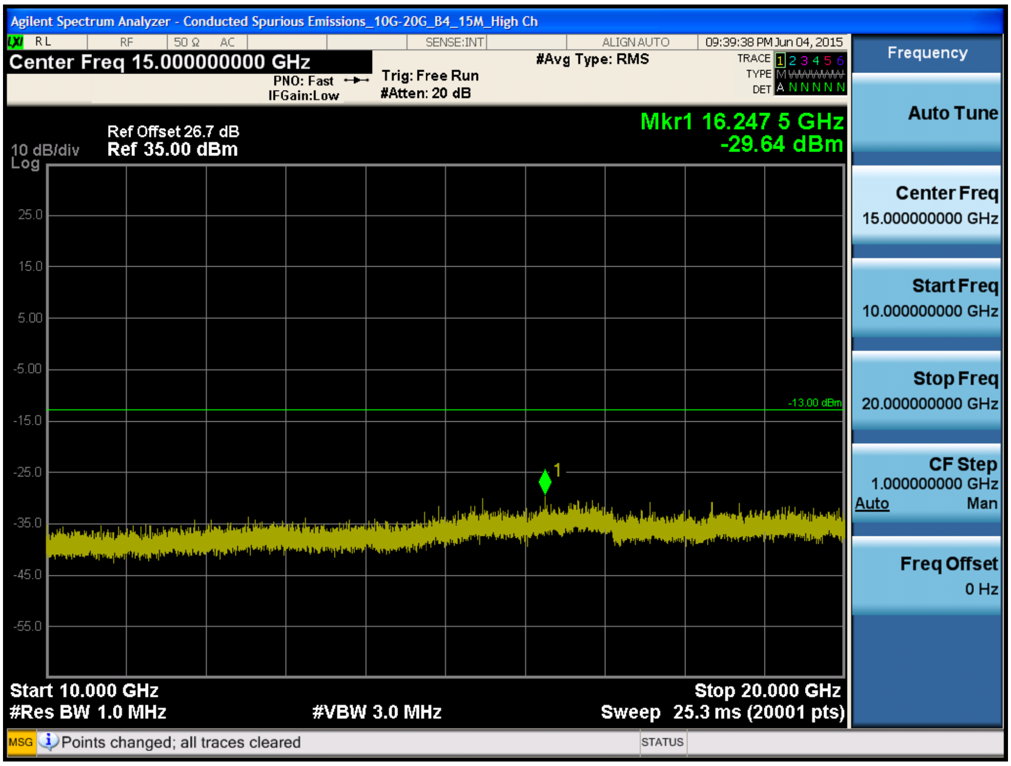
BAND 4. Conducted Spurious Plot_2 (20175ch_15MHz_QPSK_ RB 1_0)



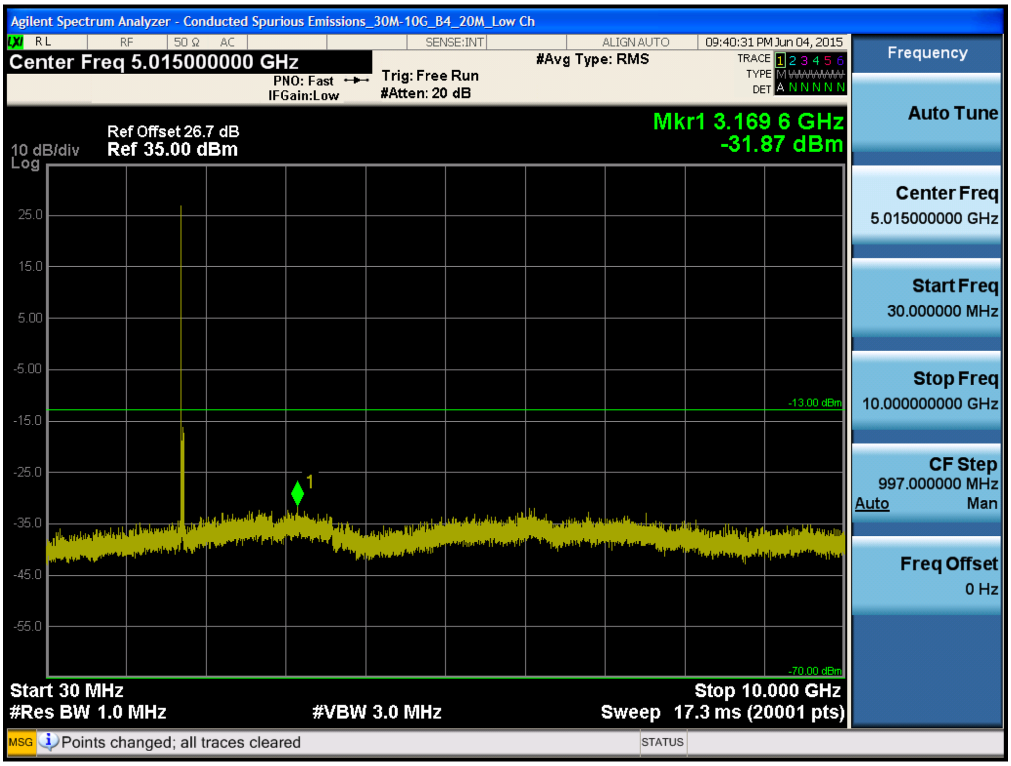
BAND 4. Conducted Spurious Plot_1 (20325ch_15MHz_QPSK_ RB 1_0)



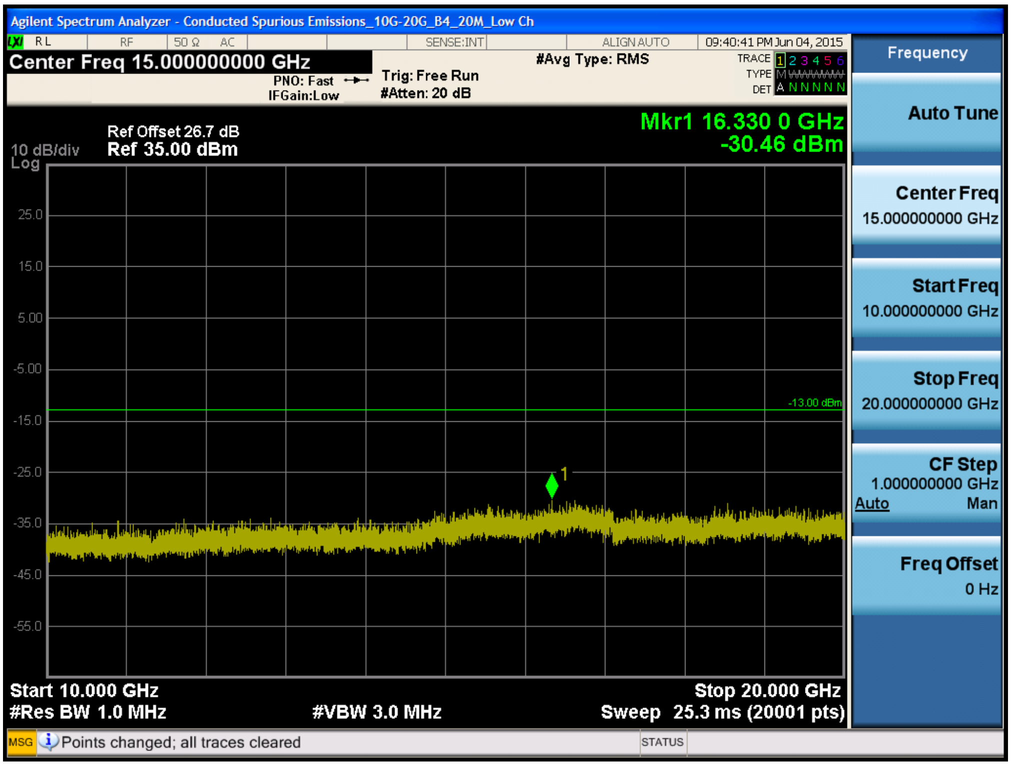
BAND 4. Conducted Spurious Plot_2 (20325ch_15MHz_QPSK_ RB 1_0)



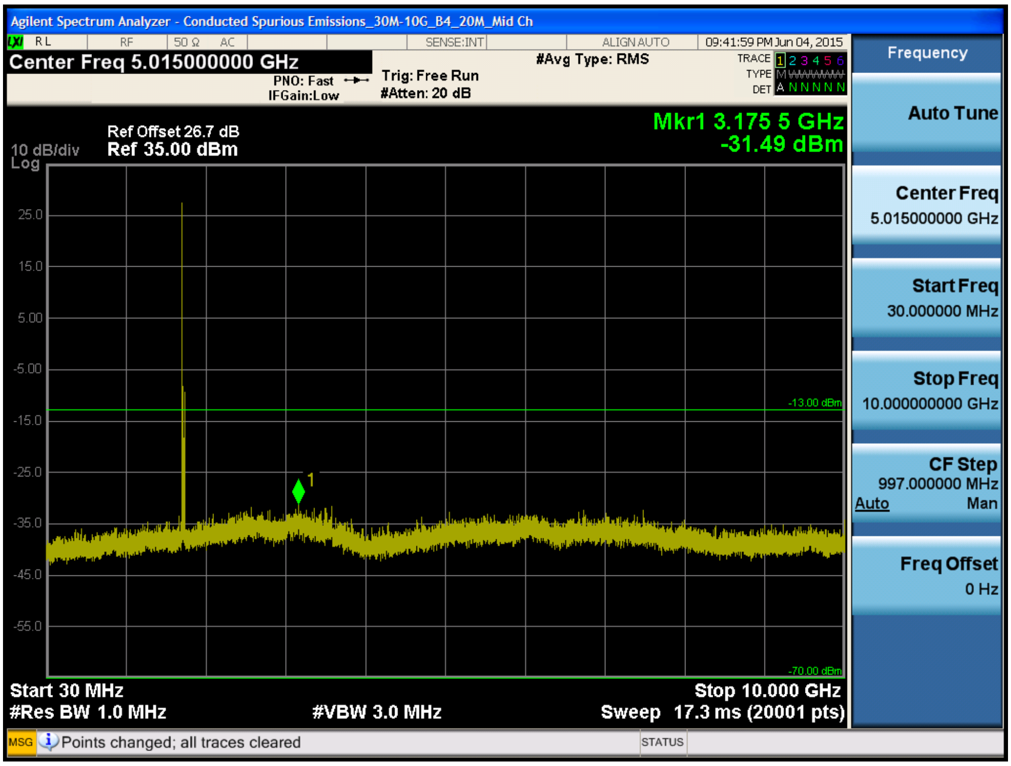
BAND 4. Conducted Spurious Plot_1 (20050ch_20MHz_QPSK_ RB 1_0)



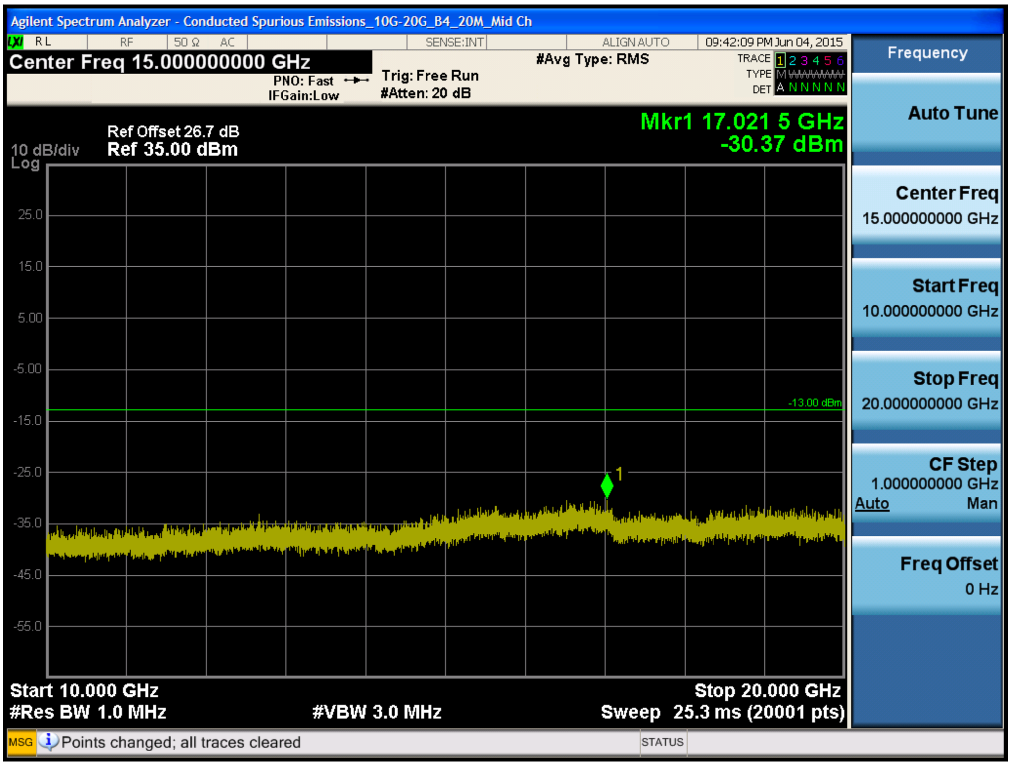
BAND 4. Conducted Spurious Plot_2 (20050ch_20MHz_QPSK_ RB 1_0)



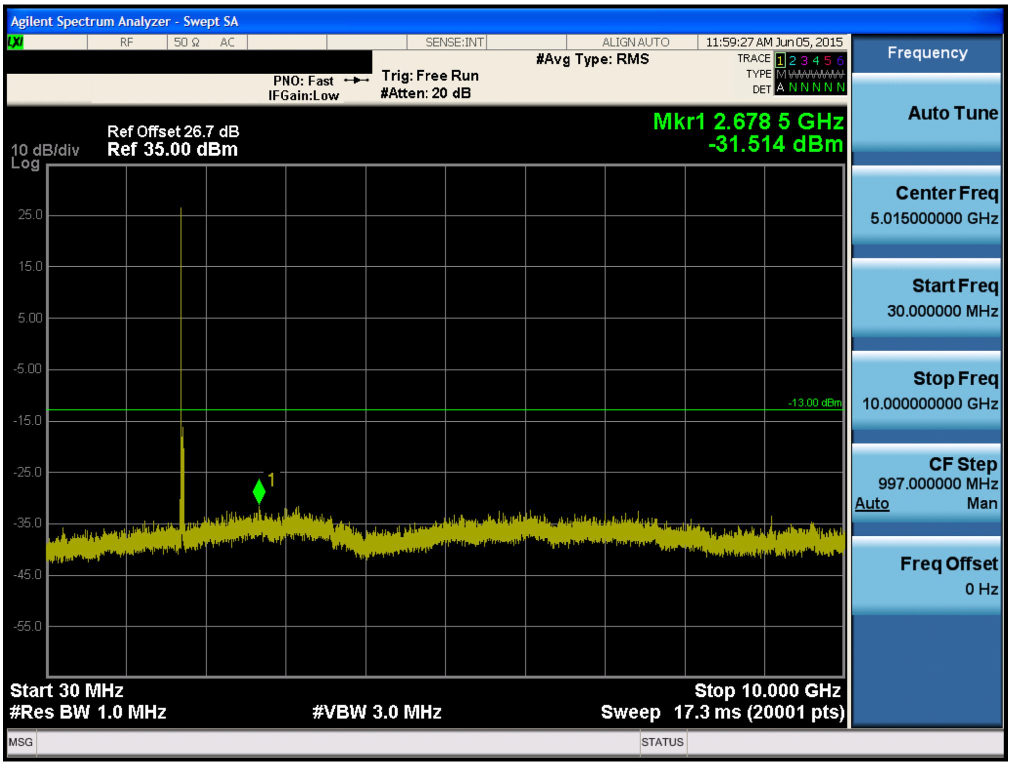
BAND 4. Conducted Spurious Plot_1 (20175ch_20MHz_QPSK_ RB 1_0)



BAND 4. Conducted Spurious Plot_2 (20175ch_20MHz_QPSK_ RB 1_0)



BAND 4. Conducted Spurious Plot_1 (20300ch_20MHz_QPSK_ RB 1_0)



BAND 4. Conducted Spurious Plot_2 (20300ch_20MHz_QPSK_ RB 1_0)