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FCC LTE REPORT

FCC Certification

Applicant Name:
Franklin Technology Inc.

Address:
906(Gasan-Dong, JEI Platz), 186, Gasan digital 1-ro, Geumcheon-gu, Seoul, Korea(08502)

Date of Issue:
November 26, 2015

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon,
Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-R-1511-F026
HCT FRN: 0005866421

MODEL: XHG-R850

APPLICANT: Franklin Technology Inc.

FCC Model(s): R850
EUT Type: LTE Mobile Router
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §27, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band41 (5)	2498.5–2687.5	4M48G7D	QPSK	0.269	24.29
		4M47W7D	16QAM	0.208	23.17
LTE – Band41 (10)	2501.0–2685.0	8M95G7D	QPSK	0.323	25.09
		8M94W7D	16QAM	0.251	24.00
LTE – Band41 (15)	2503.5–2682.5	13M5G7D	QPSK	0.285	24.54
		13M5W7D	16QAM	0.228	23.58
LTE – Band41 (20)	2506.0–2680.0	17M9G7D	QPSK	0.245	23.88
		17M9W7D	16QAM	0.242	23.83

The measurements shown in this report were made in accordance with the procedures specified inCFR47 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
: Ki Hyun Kim
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1511-F026	November 26, 2015	- First Approval Report

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	Franklin Technology Inc.
Address:	906(Gasan-Dong, JEI Platz), 186, Gasan digital 1-ro, Geumcheon-gu, Seoul, Korea(08502)
FCC ID:	XHG-R850
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§27, §2
EUT Type:	LTE Mobile Router
FCC Model(s):	R850
Tx Frequency:	2498.5 MHz–2687.5 MHz (LTE – Band 41): 5 MHz 2501.0 MHz–2685.0 MHz (LTE – Band 41): 10 MHz 2503.5 MHz–2682.5 MHz (LTE – Band 41): 15 MHz 2506.0MHz–2680.0 MHz (LTE – Band 41): 20 MHz
Max. RF Output Power:	Band 41 (5 MHz) : 0.269 W (QPSK) (24.29 dBm) 0.208 W (16-QAM) (23.17 dBm) Band 41 (10 MHz) : 0.323 W (QPSK) (25.09 dBm) 0.251 W (16-QAM) (24.00 dBm) Band 41 (15 MHz) : 0.285 W (QPSK) (24.54 dBm) 0.228 W (16-QAM) (23.58 dBm) Band 41 (20 MHz) : 0.245W (QPSK) (23.88 dBm) 0.242 W (16-QAM) (23.83 dBm)
Emission Designator(s):	Band 41 (5 MHz) : 4M48G7D (QPSK) / 4M47W7D (16-QAM) Band 41 (10 MHz) : 8M95G7D (QPSK) / 8M94W7D (16-QAM) Band 41 (15 MHz) : 13M5G7D (QPSK) / 13M5W7D (16-QAM) Band 41 (20 MHz) : 17M9G7D (QPSK) / 17M9W7D (16-QAM)
Date(s) of Tests:	October 20, 2015 ~ November 25, 2015
Antenna Specification	Manufacturer: Hutec Antenna type: Internal Antenna Peak Gain: Band 41: 2.47dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Franklin Technology Inc.R850LTE Mobile Router consists of LTE 41.

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, 17383, Rep. of KOREA**.

3. DESCRIPTION OF TESTS

3.1 EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: EIRP(Equivalent 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 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.

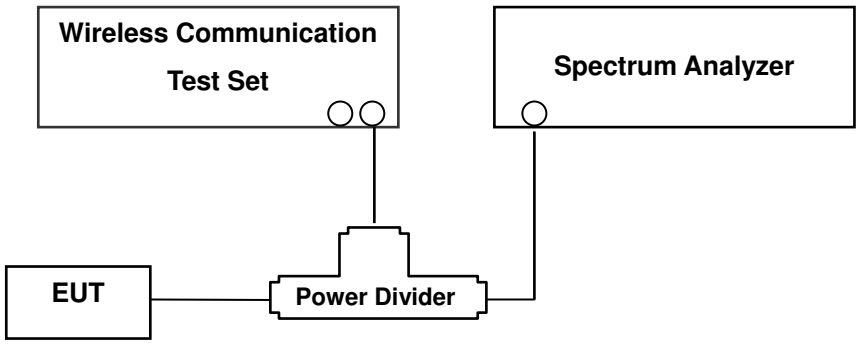
The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

Radiated spurious emissions

1. Frequency Range : 30 MHz ~ 10th Harmonics of highest channel fundamental frequency.
2. Measured distance : 30 MHz ~ 11 GHz at 3 m
   11 GHz ~ 27 GHz at 1m
3. The EUT was setup to maximum output power.
4. The high, low and a middle channel were tested for out of band measurements.

3.2 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

3.3 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 EUT was setup to maximum output power. The 1 MHz RBW was used to scan from 30 MHz to 26.5 GHz. And limit is -25 dBm. The high, low and a middle channel were tested for out of band measurements.

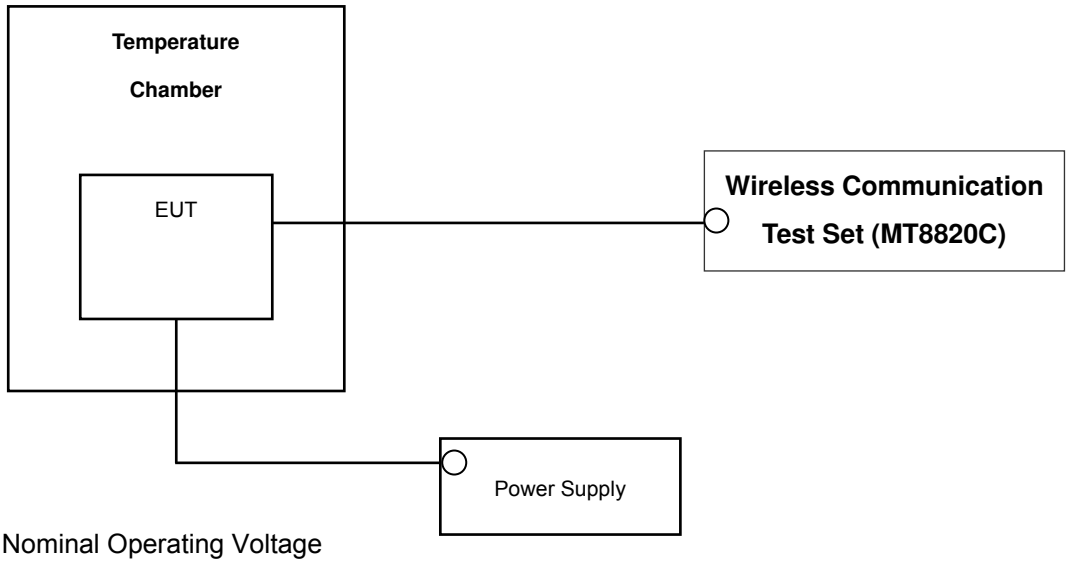
- Channel Edge Requirement : In the 1MHz bands immediately outside and adjacent to the channel, a resolution bandwidth of at least 2% of the emission bandwidth of the fundamental emission of the transmitter may be employed to measure the out of band Emissions. Limit is -10 dBm on all frequencies between the channel edge and 5 MHz from the channel edge, -13 dBm on all frequencies between 5 MHz and X MHz from the channel edge, -25 dBm on all frequencies more than X MHz from channel edge, where X is the greater of 6 MHz or the actual emission bandwidth.In addition, the attenuation factor shall not be less that -13 dBm on all frequencies between 2490.5 MHz and 2496 MHz and -25 dBm at below 2490.5 MHz.

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

- For LTE Band 41, total offset 26.5 dBm = 20 dBm attenuator + 6 dBm Divider + 0.5 dBm RF cables.

3.4 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 battery 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	07/09/2016
Agilent	N1911A/ Power Meter	MY45100523	Annual	07/09/2016
CERNEX	CBLU1183540B-01/POWER AMP	25540	Annual	05/21/2016
Wainwright	WHKX 10-900-1000-15000-40SS/H.P.F	5	Annual	08/11/2016
Wainwright	WHKX10-2700-3000-18000-40SS/H.P.F	3	Annual	08/05/2016
Hewlett Packard	11667B / Power Splitter	10545	Annual	02/16/2016
Hewlett Packard	11667B / Power Splitter	11275	Annual	04/29/2016
ITECH	IT6720/ Power Supply	0100215626700119	Annual	11/02/2016
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/23/2017
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/23/2017
EXP	EX-TH400/ Chamber	None	Annual	05/29/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	9210D-1298	Biennial	10/16/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	9210D-1299	Biennial	10/16/2016
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	Biennial	04/30/2017
Schwarzbeck	BBHA 9170/ Horn Antenna(15~35GHz)	BBHA9170124	Biennial	04/30/2017
Agilent	N9020A/Signal Analyzer	MY51110063	Annual	04/29/2016
Hewlett Packard	8493C/ATTENUATOR	17280	Annual	06/29/2016
REOHDE&SCHWARZ	FSV40-N/Signal Analyzer	101068-SZ	Annual	09/23/2016
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/04/2016
Agilent	8960 (E5515C)/ Base Station	MY48360800	Annual	10/30/2016
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(m)(4)	Band Edge / Conducted Spurious Emissions.	< 40 + 10log10 (P[Watts]) at Channel edges < 43 + 10log10 (P[Watts]) between 5 and X MHz from Channel edges <55 + 10log10 (P[Watts]) beyond X MHz beyond from Channel edges		PASS
2.1046	*Conducted Output Power	N/A		PASS
2.1055, 27.54	Frequency stability	Emission must remain in band		PASS
27.50(h)(2)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP	RADIATED	PASS
2.1053, 27.53(m)(4)	Undesirable Emissions	< 40 + 10log10 (P[Watts]) at Channel edges < 43 + 10log10 (P[Watts]) between 5 and X MHz from Channel edges <55 + 10log10 (P[Watts]) beyond X MHz beyond from Channel edges		PASS

*See SAR Report

6. SAMPLE CALCULATION

A. EIRP Sample Calculation

Mode	Ch./ Freq.		Measured	Substitude	Ant. Gain	C.L	Pol.	EIRP	
	channel	Freq.(MHz)	Level(dBm)	LEVEL(dBm)	(dBi)			W	dBm
LTE Band 41	40620.0	2593.0	-30.45	5.33	10.72	1.62	Z-V	0.028	14.43

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 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 Equivalent Isotropic Radiated Power (**EIRP**).

B. Emission Designator

QPSK Modulation

5 MHz Bandwidth

Emission Designator = 4M50G7D

LTE BW = 4.50 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

15MHz Bandwidth

Emission Designator = 13M5G7D

LTE BW = 13.47 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

20MHz Bandwidth

Emission Designator = 18M0G7D

LTE BW = 18.03 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

16QAM Modulation

5 MHz Bandwidth

Emission Designator = 4M51W7D

LTE BW = 4.51 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 = 8M94W7D

LTE BW = 8.94 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

15MHz Bandwidth

Emission Designator = 13M5W7D

LTE BW = 13.47MHz

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

20MHz Bandwidth

Emission Designator = 18M0W7D

LTE BW = 18.03 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 EQUIVALENT ISOTROPIC RADIATED POWER (Band 41)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2498.5	5 MHz	QPSK	-21.94	11.64	10.95	1.69	V	0.123	20.90
		16-QAM	-23.32	10.26	10.95	1.69	V	0.090	19.52
2593.0		QPSK	-19.98	13.62	11.03	1.72	V	0.196	22.93
		16-QAM	-20.85	12.75	11.03	1.72	V	0.161	22.06
2687.5		QPSK	-19.15	14.96	11.10	1.77	V	0.269	24.29
		16-QAM	-20.27	13.84	11.10	1.77	V	0.208	23.17

Equivalent Isotropic Radiated Power Data (5 MHz Band 41 LTE)

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

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2501.0	10 MHz	QPSK	-22.57	11.01	10.95	1.69	V	0.106	20.27
		16-QAM	-22.83	10.75	10.95	1.69	V	0.100	20.01
2593.0		QPSK	-19.24	14.36	11.03	1.72	V	0.233	23.67
		16-QAM	-20.64	12.96	11.03	1.72	V	0.169	22.27
2685.0		QPSK	-18.32	15.76	11.09	1.76	V	0.323	25.09
		16-QAM	-19.41	14.67	11.09	1.76	V	0.251	24.00

Equivalent Isotropic Radiated Power Data (10 MHz Band 41 LTE)

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

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2503.5	15 MHz	QPSK	-22.47	11.11	10.95	1.69	V	0.109	20.37
		16-QAM	-23.80	9.78	10.95	1.69	V	0.080	19.04
2593.0		QPSK	-19.04	14.56	11.03	1.72	V	0.244	23.87
		16-QAM	-20.65	12.95	11.03	1.72	V	0.168	22.26
2682.5		QPSK	-18.83	15.21	11.09	1.76	V	0.285	24.54
		16-QAM	-19.79	14.25	11.09	1.76	V	0.228	23.58

Equivalent Isotropic Radiated Power Data (15 MHz Band 41 LTE)

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

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2506.0	20 MHz	QPSK	-22.16	11.42	10.95	1.69	V	0.117	20.68
		16-QAM	-22.73	10.85	10.95	1.69	V	0.103	20.11
2593.0		QPSK	-20.60	13.00	11.03	1.72	V	0.170	22.31
		16-QAM	-21.81	11.79	11.03	1.72	V	0.129	21.10
2680.0		QPSK	-19.49	14.55	11.09	1.76	V	0.245	23.88
		16-QAM	-19.54	14.50	11.09	1.76	V	0.242	23.83

Equivalent Isotropic Radiated Power Data (20 MHz Band 41 LTE)

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

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method

according to ANSI/TIA/EIA-603-D-2010June 24, 2010:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. Turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For LTE signals, RBW = 1-5% of the OBW,not to exceed 1MHz, VBW ≥ 3 x RBW, Detector = RMS. 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 z plane in LTE mode. Also worst case of detecting Antenna is vertical polarization in LTE mode.

7.2RADIATED SPURIOUS EMISSIONS

7.2.1 RADIATED SPURIOUS EMISSIONS (5 MHz Band 41 LTE)

▣ OPERATING FREQUENCY : 2687.50 MHz

▣ MEASURED OUTPUT POWER: 24.29 dBm = 0.269 W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 37.29dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
39675.0 (2498.5)	4,997.0	-41.22	12.57	-42.21	2.41	H	-32.05	56.34
	7,495.5	-48.44	11.71	-41.42	2.92	H	-32.63	56.92
	9,994.0	-55.31	11.03	-42.98	3.62	H	-35.56	59.85
40620.0 (2593.0)	5,186.0	-41.66	12.84	-42.19	2.46	H	-31.81	56.10
	7,779.0	-51.94	11.50	-45.64	3.05	H	-37.19	61.48
	10,372.0	-64.87	10.81	-50.94	3.62	H	-43.75	68.04
41565.0 (2687.5)	5,375.0	-39.28	13.10	-40.03	2.49	H	-29.42	53.71
	8,062.5	-58.02	11.44	-49.64	3.02	V	-41.22	65.51
	10,750.0	-59.07	10.70	-44.45	3.86	V	-37.61	61.90

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 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. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.2 RADIATED SPURIOUS EMISSIONS (10 MHz Band 41 LTE)

▣ OPERATING FREQUENCY : 2685.00 MHz

▣ MEASURED OUTPUT POWER: 25.09 dBm = 0.323 W

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.09dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
39700.0 (2501.0)	5,002.0	-41.18	12.57	-42.17	2.41	H	-32.01	57.10
	7,503.0	-44.91	11.71	-37.91	2.93	V	-29.13	54.22
	10,004.0	-59.22	11.02	-46.97	3.63	V	-39.58	64.67
40620.0 (2593.0)	5,186.0	-41.89	12.84	-42.42	2.46	H	-32.04	57.13
	7,779.0	-51.27	11.50	-44.97	3.05	V	-36.52	61.61
	10,372.0	-64.91	10.81	-50.98	3.62	H	-43.79	68.88
	12,965.0	-58.17	13.49	-44.19	4.11	V	-34.81	59.90
41540.0 (2685.0)	5,370.0	-39.74	13.10	-40.58	2.49	H	-29.97	55.06
	8,055.0	-54.90	11.43	-46.62	3.01	V	-38.20	63.29
	10,740.0	-63.28	10.70	-49.03	3.66	V	-41.99	67.08
	13,425.0	-61.28	12.72	-46.66	4.03	V	-37.97	63.06

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 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. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.3 RADIATED SPURIOUS EMISSIONS (15 MHz Band 41 LTE)

▣ OPERATING FREQUENCY : 2682.50 MHz

▣ MEASURED OUTPUT POWER: 24.54 dBm = 0.285 W

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 37.54dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
39725.0 (2503.5)	5,007.0	-47.92	12.58	-48.86	2.39	H	-38.67	63.21
	7,510.5	-43.21	11.70	-36.14	2.97	H	-27.41	51.95
	10,014.0	-56.24	11.01	-44.09	3.38	H	-36.45	60.99
	12,517.5	-55.77	14.02	-43.15	4.37	V	-33.50	58.04
40620.0 (2593.0)	5,186.0	-44.75	12.84	-45.28	2.46	H	-34.90	59.44
	7,779.0	-47.57	11.50	-41.27	3.05	H	-32.82	57.36
	10,372.0	-64.26	10.81	-50.33	3.62	H	-43.14	67.68
	12,965.0	-59.28	13.49	-45.30	4.11	V	-35.92	60.46
41515.0 (2682.5)	5,365.0	-36.85	13.09	-37.72	2.50	H	-27.13	51.67
	8,047.5	-52.99	11.42	-44.81	3.01	H	-36.40	60.94
	10,730.0	-62.98	10.71	-48.38	3.72	V	-41.39	65.93
	13,412.5	-61.19	12.74	-46.82	4.04	H	-38.12	62.66

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 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. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.4 RADIATED SPURIOUS EMISSIONS (20 MHz Band 41 LTE)

▣ OPERATING FREQUENCY : 2680.00 MHz

▣ MEASURED OUTPUT POWER: 23.88 dBm = 0.245 W

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 36.88dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
39750.0 (2506.0)	5,012.0	-42.64	12.58	-43.58	2.39	H	-33.39	57.27
	7,518.0	-48.69	11.70	-41.83	2.98	V	-33.11	56.99
	10,024.0	-57.28	11.01	-44.68	3.72	V	-37.38	61.26
	12,530.0	-52.50	14.01	-40.03	4.14	H	-30.16	54.04
40620.0 (2593.0)	5,186.0	-45.13	12.84	-45.66	2.46	V	-35.28	59.16
	7,779.0	-50.09	11.50	-43.79	3.05	V	-35.34	59.22
	10,372.0	-61.28	10.81	-47.35	3.62	H	-40.16	64.04
	12,965.0	-60.13	13.49	-46.15	4.11	V	-36.77	60.65
41490.0 (2680.0)	5,360.0	-37.83	13.09	-38.75	2.51	H	-28.17	52.05
	8,040.0	-45.42	11.40	-37.26	3.01	H	-28.87	52.75
	10,720.0	-61.28	10.71	-46.97	3.62	V	-39.88	63.76
	13,400.0	-56.63	12.75	-42.11	4.09	H	-33.45	57.33

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 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. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.3OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Band 41	5 MHz	2593.0	QPSK	25	0	4.4790
			16-QAM	25	0	4.4718
	10 MHz		QPSK	50	0	8.9506
			16-QAM	50	0	8.9365
	15 MHz		QPSK	75	0	13.4620
			16-QAM	75	0	13.4580
	20 MHz		QPSK	100	0	17.9200
			16-QAM	100	0	17.9280

- Plots of the EUT's Occupied Bandwidth are shown Page 28 ~31.

7.4CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 41	5	2498.5	QPSK	1	0	13.7343	-29.560
		2593.0		1	0	13.7096	-29.427
		2687.5		1	0	13.7290	-29.841
	10	2501.0		1	0	13.7350	-29.749
		2593.0		1	0	12.5389	-29.351
		2685.0		1	0	13.7261	-29.533
	15	2503.5		1	0	13.7276	-29.187
		2593.0		1	0	13.7141	-30.146
		2682.5		1	0	13.7276	-29.227
	20	2506.0		1	0	13.8316	-29.627
		2593.0		1	0	13.7223	-28.537
		2680.0		1	0	13.8308	-28.450

- Plots of the EUT's Conducted Spurious Emissions are shown Page 38 ~ 49.

7.4.1 BAND EDGE

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Channel Edge Data [dBm]					
						Channel Edge (Limit: -10 dBm)		5MHz ~ X MHz from the Channel Edge (Limit: -13 dBm)		X MHz ~ from the Channel Edge (Limit: -25 dBm)	
						Lower	Upper	Lower	Upper	Lower	Upper
Band 41	5	2498.5	QPSK	25	0	-24.20	-24.15	-22.51	-21.65	-33.57	-31.53
		2593.0		25	0	-24.23	-24.34	-20.33	-20.96	-33.55	-34.01
		2687.5		25	0	-24.45	-25.97	-22.34	-22.56	-36.32	-36.72
	10	2501.0		50	0	-26.65	-26.17	-25.43	-24.18	-28.74	-27.34
		2593.0		50	0	-25.76	-26.08	-22.64	-23.87	-26.39	-28.01
		2685.0		50	0	-28.80	-26.81	-26.05	-26.64	-29.13	-29.46
	15	2503.5		75	0	-25.74	-24.50	-28.42	-27.79	-37.81	-36.96
		2593.0		75	0	-22.80	-24.13	-25.55	-27.59	-38.42	-39.66
		2682.5		75	0	-26.23	-26.42	-28.48	-29.23	-41.03	-42.37
	20	2506.0		100	0	-26.02	-25.62	-29.04	-28.02	-38.22	-36.57
		2593.0		100	0	-24.75	-26.33	-27.37	-29.55	-39.73	-42.06
		2680.0		100	0	-27.51	-27.94	-30.48	-30.53	-42.92	-44.37

- Plots of the EUT's Band Edge are shown Page 32 ~ 37

7.5 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.5.1 FREQUENCY STABILITY (5 MHz Band 41 LTE)

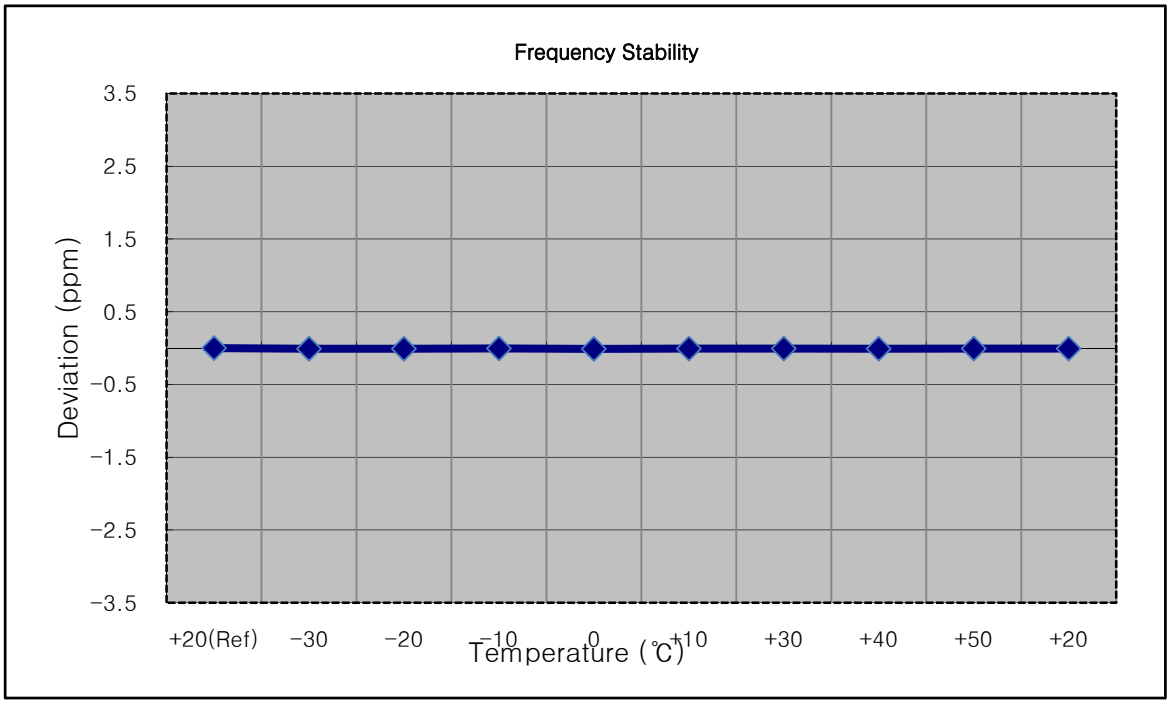
▣OPERATING FREQUENCY: 2593.000,000 Hz

▣CHANNEL: 40620 (5 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	2592 999 980	0.0	0.000 000	0.000
100%		-30	2592 999 958	-22.0	-0.000 001	-0.008
100%		-20	2592 999 960	-20.6	-0.000 001	-0.008
100%		-10	2592 999 969	-11.0	0.000 000	-0.004
100%		0	2592 999 952	-28.1	-0.000 001	-0.011
100%		+10	2592 999 963	-17.4	-0.000 001	-0.007
100%		+30	2592 999 961	-19.4	-0.000 001	-0.007
100%		+40	2592 999 957	-23.1	-0.000 001	-0.009
100%		+50	2592 999 963	-17.3	-0.000 001	-0.007
Batt. Endpoint	3.75	+20	2592 999 960	-20.0	-0.000 001	-0.008



7.5.2 FREQUENCY STABILITY (10 MHz Band 41 LTE)

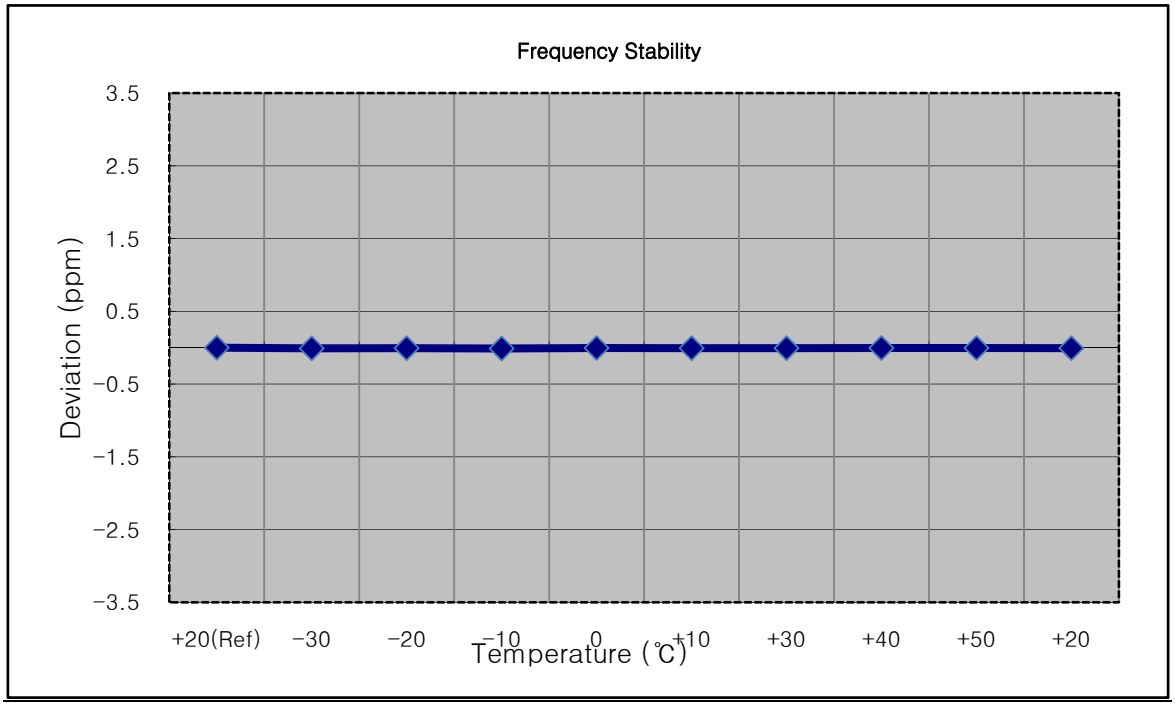
▣OPERATING FREQUENCY: 2593.000,000 Hz

▣CHANNEL: 40620 (10 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	2592 999 985	0.0	0.000 000	0.000
100%		-30	2592 999 962	-23.3	-0.000 001	-0.009
100%		-20	2592 999 966	-19.1	-0.000 001	-0.007
100%		-10	2592 999 959	-26.5	-0.000 001	-0.010
100%		0	2592 999 973	-11.9	0.000 000	-0.005
100%		+10	2592 999 970	-15.6	-0.000 001	-0.006
100%		+30	2592 999 966	-19.8	-0.000 001	-0.008
100%		+40	2592 999 973	-12.6	0.000 000	-0.005
100%		+50	2592 999 976	-9.8	0.000 000	-0.004
Batt. Endpoint	3.75	+20	2592 999 970	-15.1	-0.000 001	-0.006



7.5.3 FREQUENCY STABILITY (15 MHz Band 41 LTE)

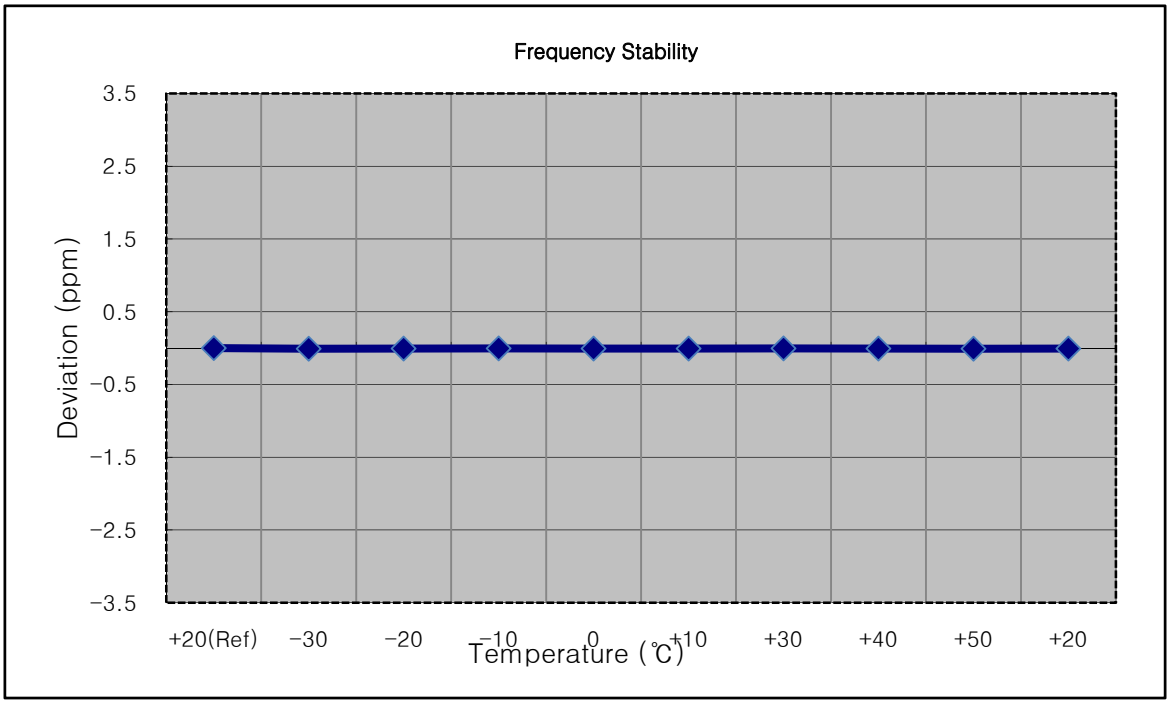
▣OPERATING FREQUENCY: 2593.000,000 Hz

▣CHANNEL: 40620 (15 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	2592 999 983	0.0	0.000 000	0.000
100%		-30	2592 999 959	-23.8	-0.000 001	-0.009
100%		-20	2592 999 968	-14.7	-0.000 001	-0.006
100%		-10	2592 999 973	-9.6	0.000 000	-0.004
100%		0	2592 999 963	-19.9	-0.000 001	-0.008
100%		+10	2592 999 964	-19.3	-0.000 001	-0.007
100%		+30	2592 999 969	-14.2	-0.000 001	-0.005
100%		+40	2592 999 968	-14.8	-0.000 001	-0.006
100%		+50	2592 999 963	-20.3	-0.000 001	-0.008
Batt. Endpoint	3.75	+20	2592 999 967	-16.1	-0.000 001	-0.006



7.5.4 FREQUENCY STABILITY (20 MHz Band 41 LTE)

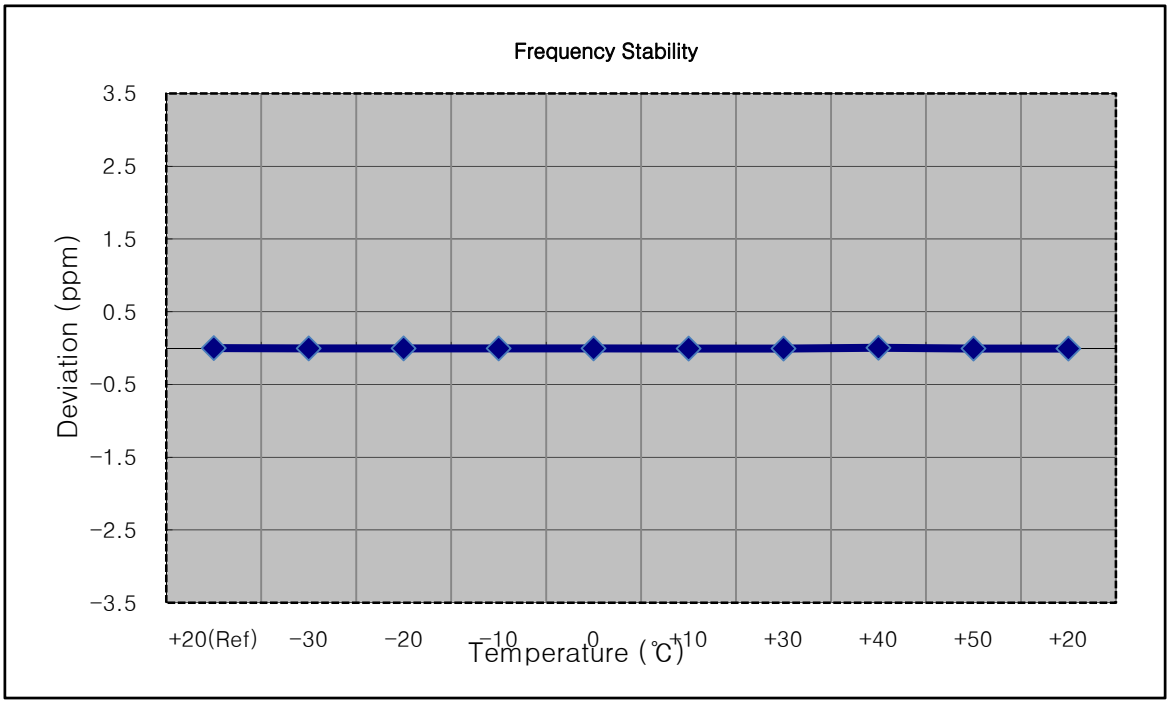
▣OPERATING FREQUENCY: 2593.000,000 Hz

▣CHANNEL: 40620 (20 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

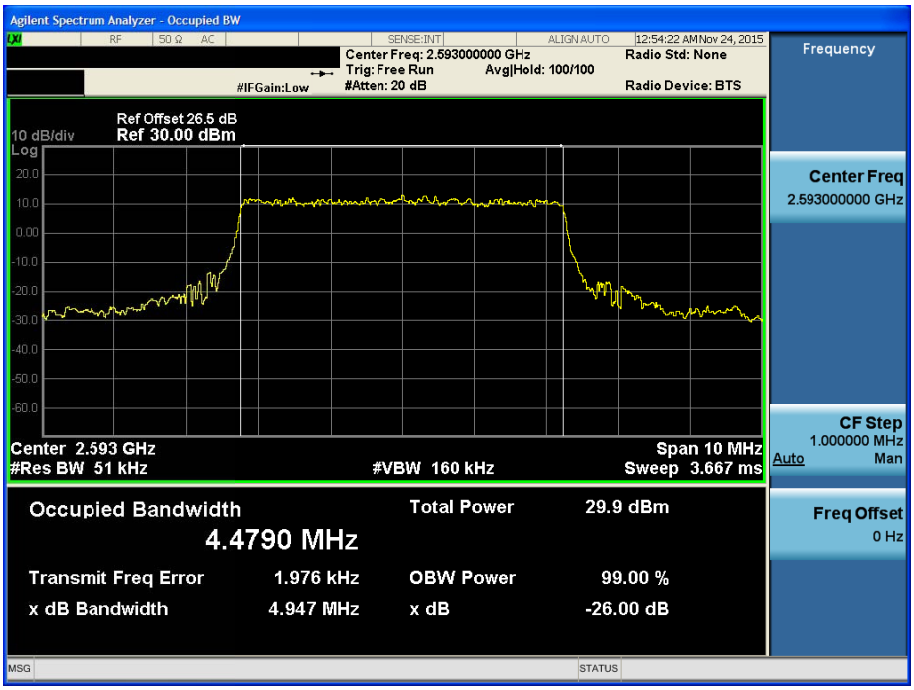
▣DEVIATION LIMIT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	2592 999 987	0.0	0.000 000	0.000
100%		-30	2592 999 974	-12.4	0.000 000	-0.005
100%		-20	2592 999 976	-10.5	0.000 000	-0.004
100%		-10	2592 999 973	-13.8	-0.000 001	-0.005
100%		0	2592 999 976	-10.2	0.000 000	-0.004
100%		+10	2592 999 970	-16.9	-0.000 001	-0.007
100%		+30	2592 999 969	-17.6	-0.000 001	-0.007
100%		+40	2592 999 996	9.0	0.000 000	0.003
100%		+50	2592 999 969	-17.6	-0.000 001	-0.007
Batt. Endpoint	3.75	+20	2592 999 968	-18.3	-0.000 001	-0.007

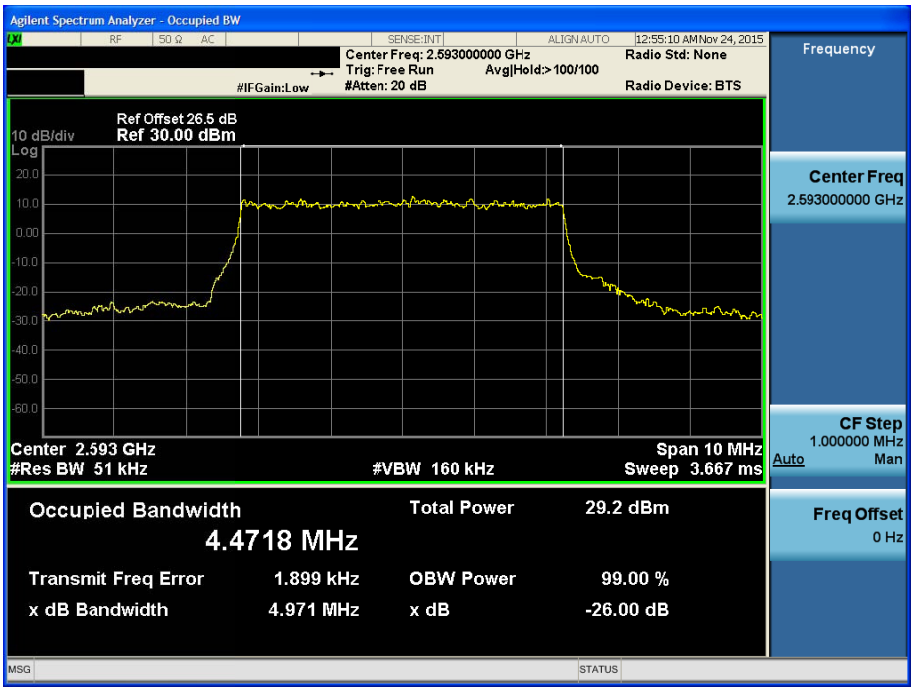


8. TEST PLOTS

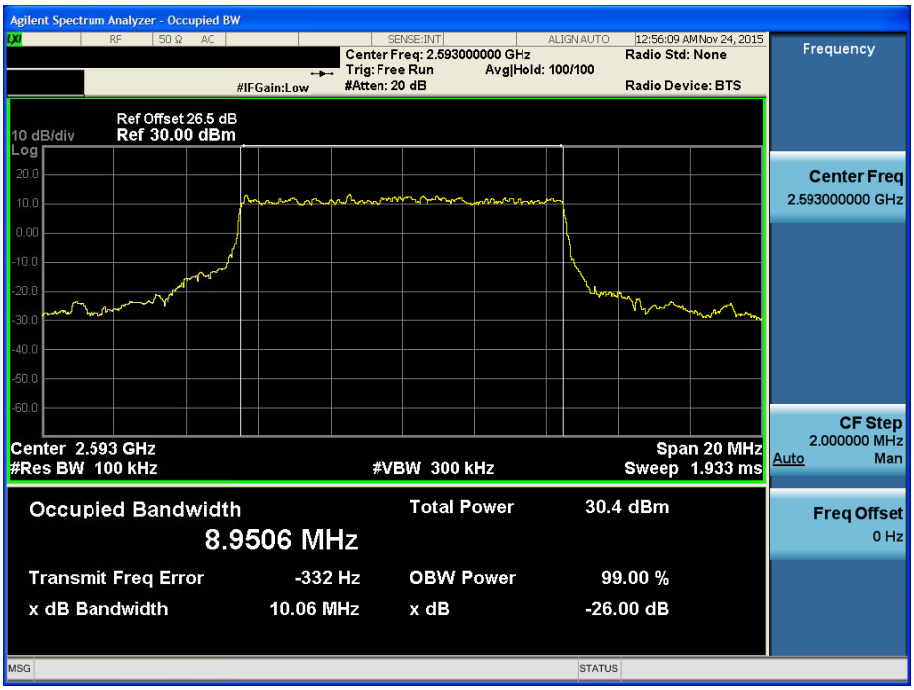
BAND 41. Occupied Bandwidth Plot (5 MHz Ch.40620 QPSK RB 25)



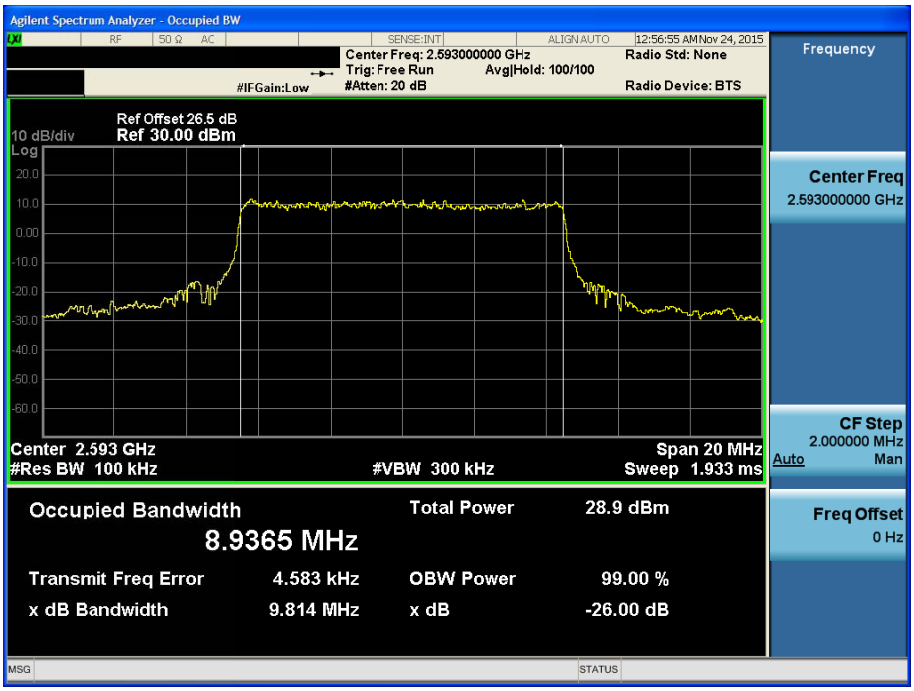
BAND 41. Occupied Bandwidth Plot (5 MHz Ch.40620 16-QAM RB 25)



BAND 41. Occupied Bandwidth Plot (10 MHz Ch.40620 QPSK RB 50)



BAND 41. Occupied Bandwidth Plot (10 MHz Ch.40620 16-QAM RB 50)

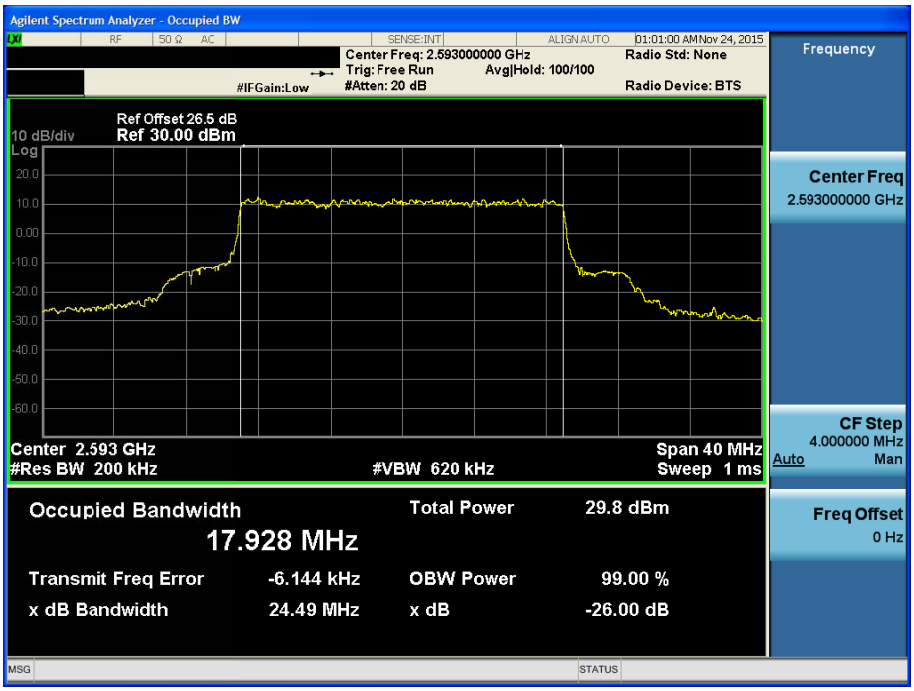


BAND 41. Occupied Bandwidth Plot (15 MHz Ch.40620 QPSK RB 75)

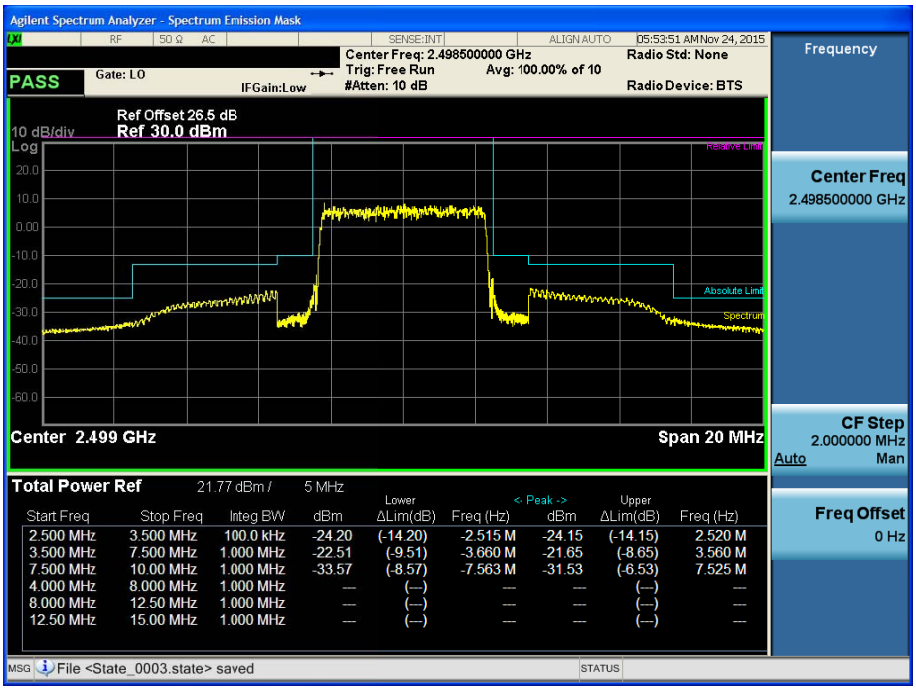
BAND 41. Occupied Bandwidth Plot (15 MHz Ch.40620 16-QAM RB 75)

BAND 41. Occupied Bandwidth Plot (20 MHz Ch.40620 QPSK RB 100)

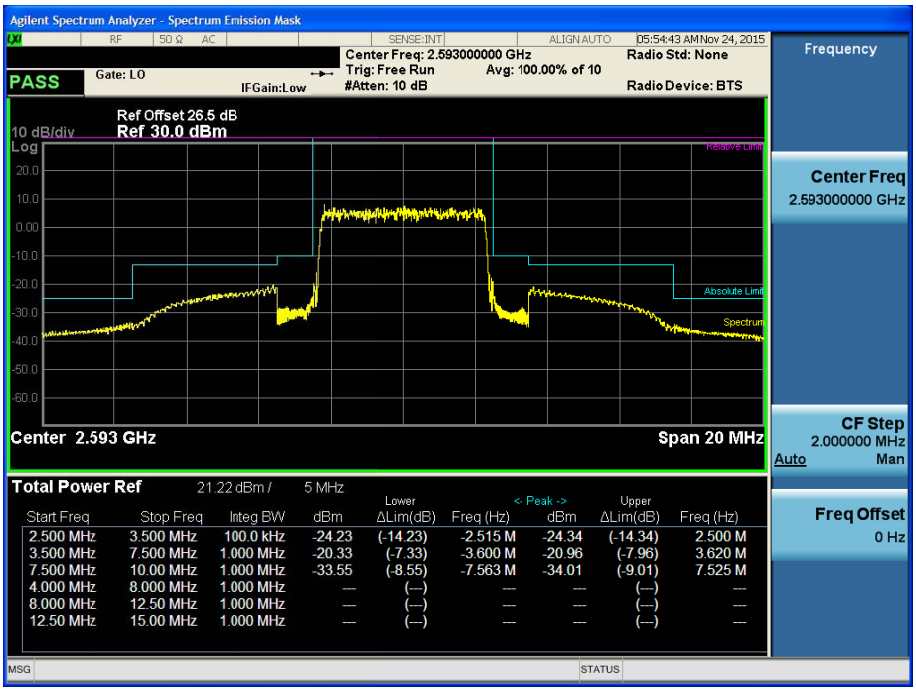
BAND 41. Occupied Bandwidth Plot (20 MHz Ch.40620 16-QAM RB 100)



BAND 41. Low Channel Edge Plot (5 MHz Ch.39675 QPSK RB 25)

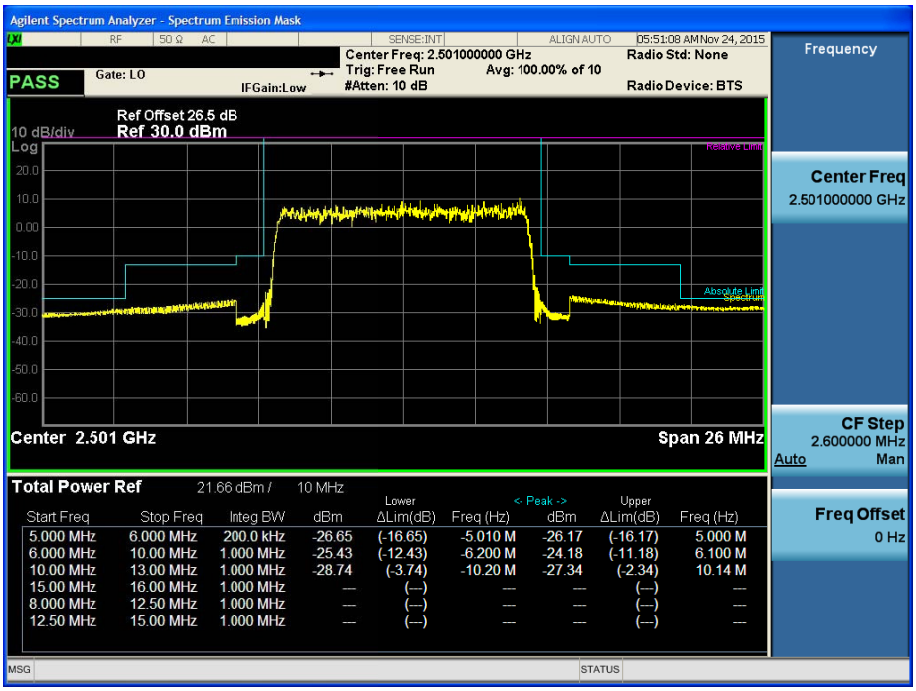


BAND 41. Mid Channel Edge Plot (5 MHz Ch.40620 QPSK RB 25)

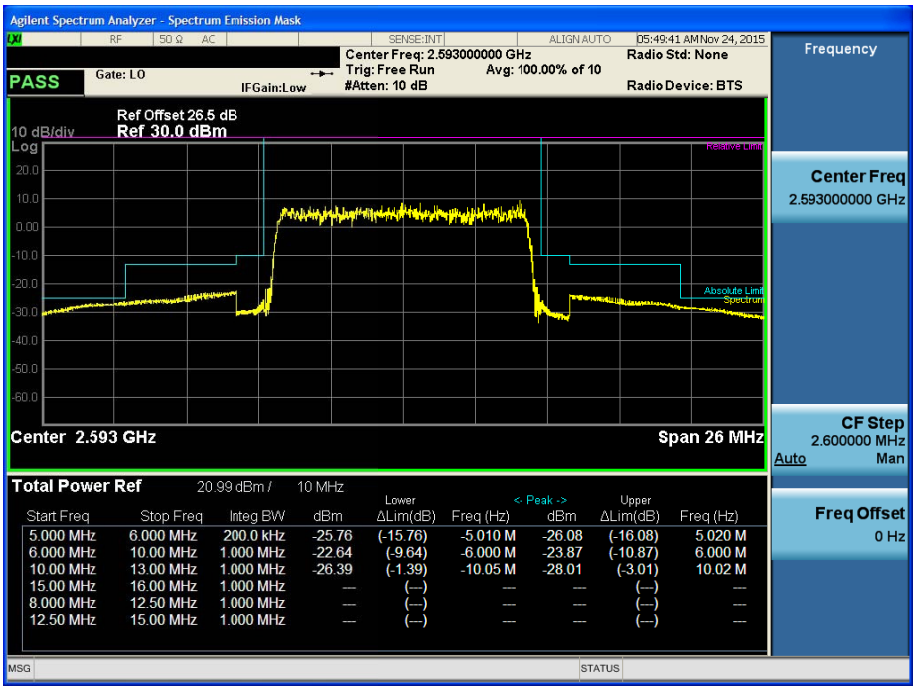


BAND 41. High Channel Edge Plot (5 MHz Ch.41565 QPSK RB 25)

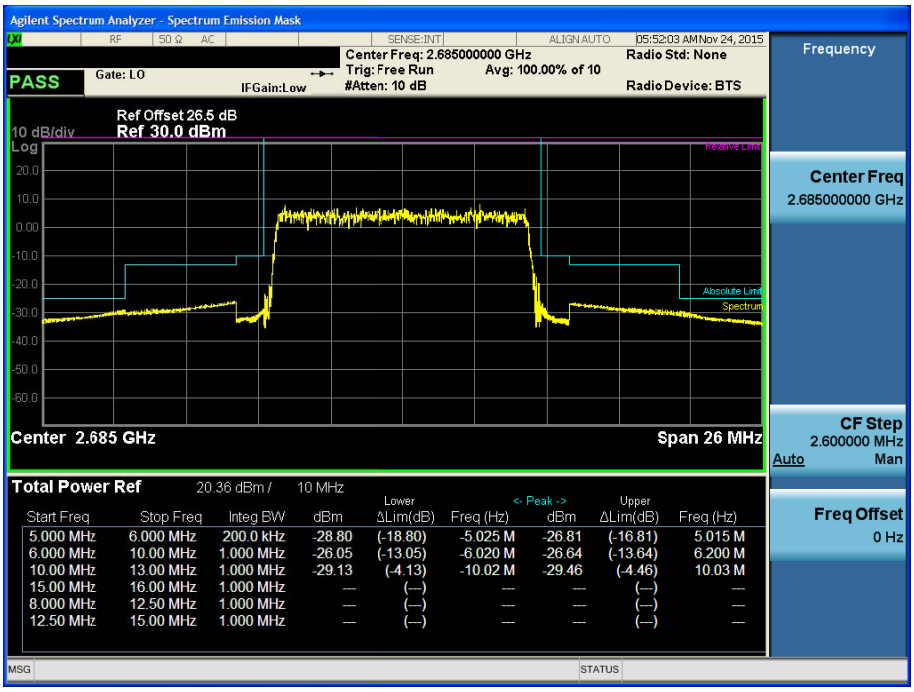
BAND 41. Low Channel Edge Plot (10 MHz Ch.39700 QPSK RB 50)



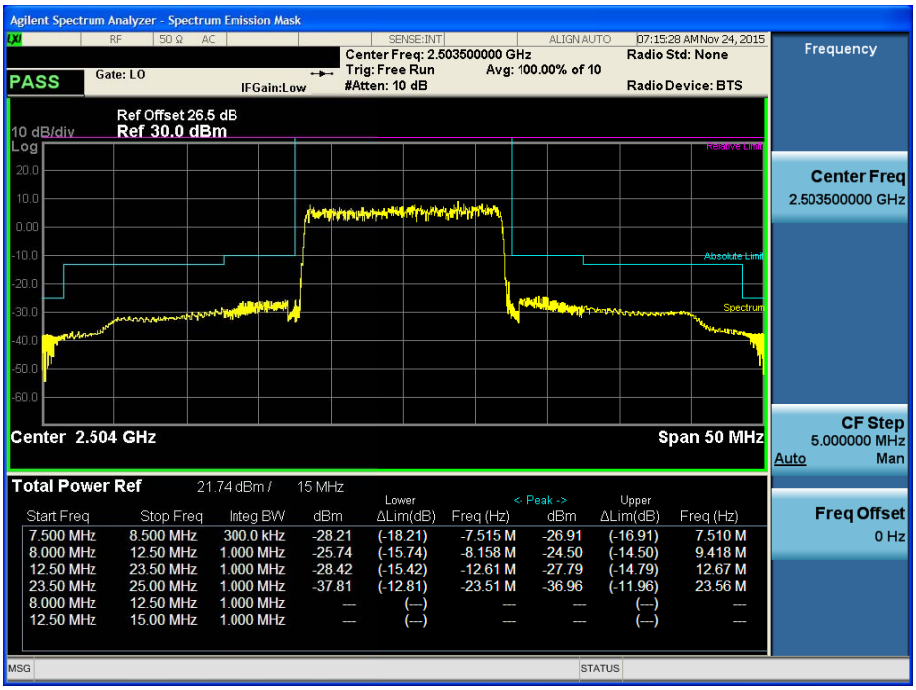
BAND 41. Mid Channel Edge Plot (10 MHz Ch.40620 QPSK RB 50)



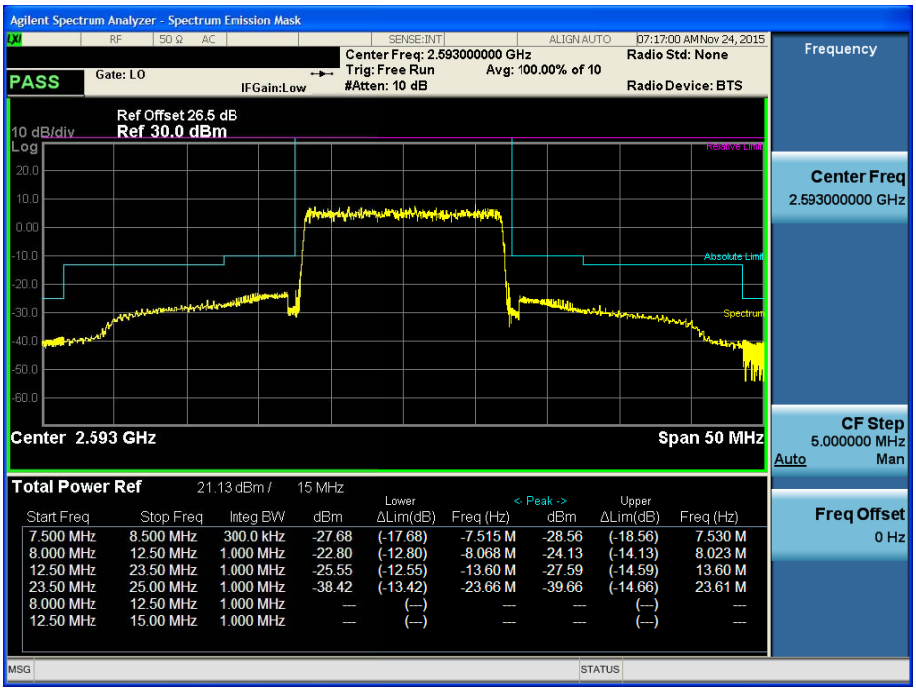
BAND 41. High Channel Edge Plot (10 MHz Ch.41540 QPSK RB 50)



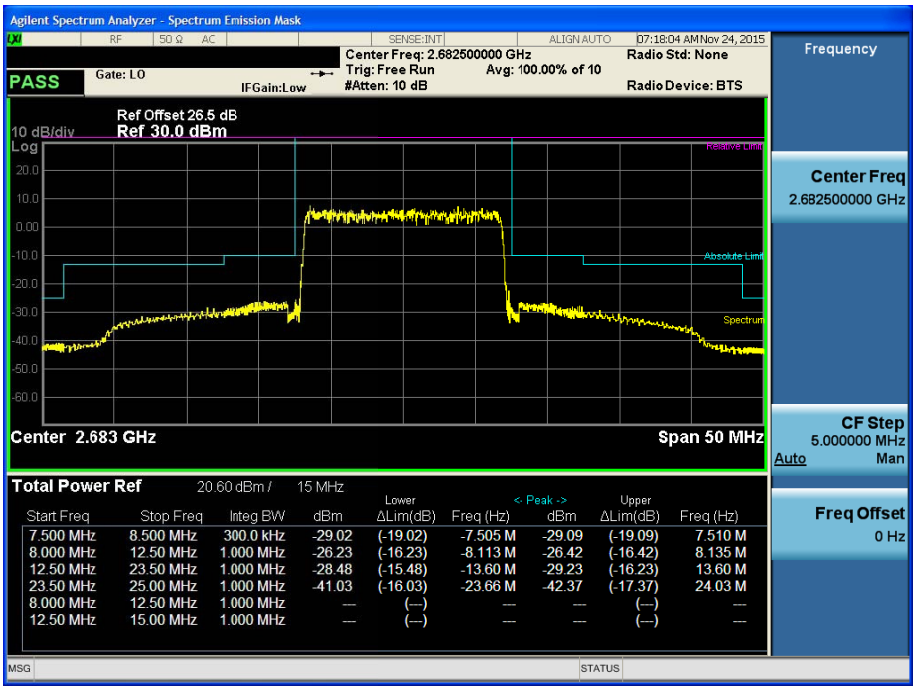
BAND 41. Low Channel Edge Plot (15 MHz Ch.39725 QPSK RB 75)



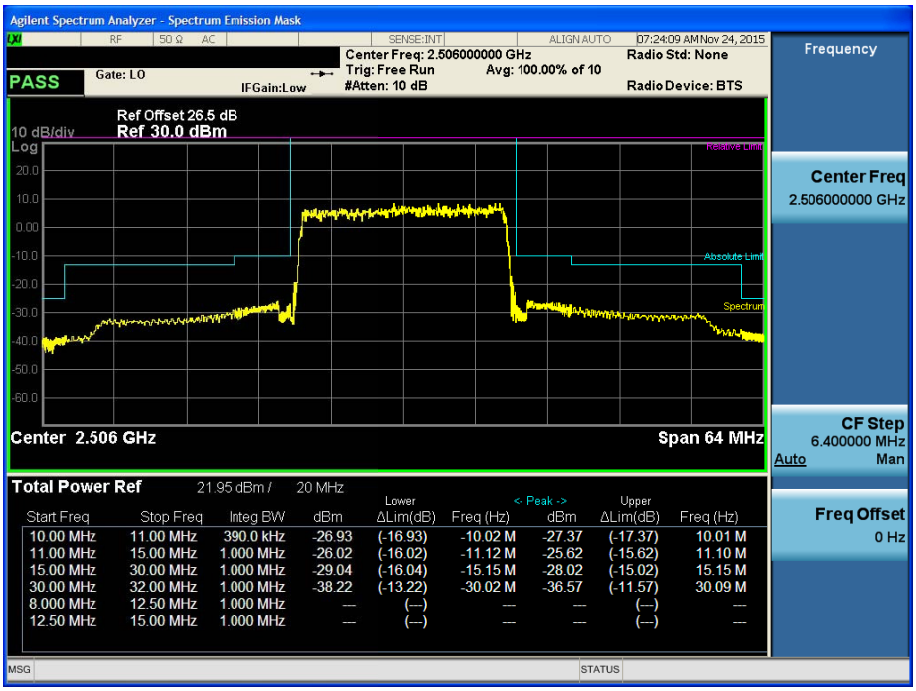
BAND 41. Mid Channel Edge Plot (15 MHz Ch.40620 QPSK RB 75)



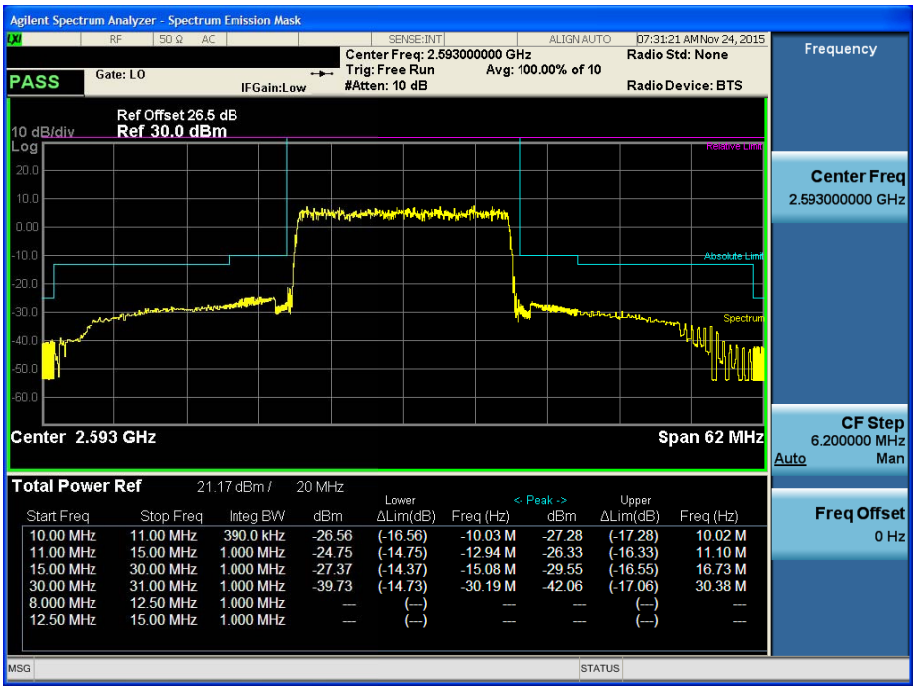
BAND 41. High Channel Edge Plot (15 MHz Ch.41515 QPSK RB 75)



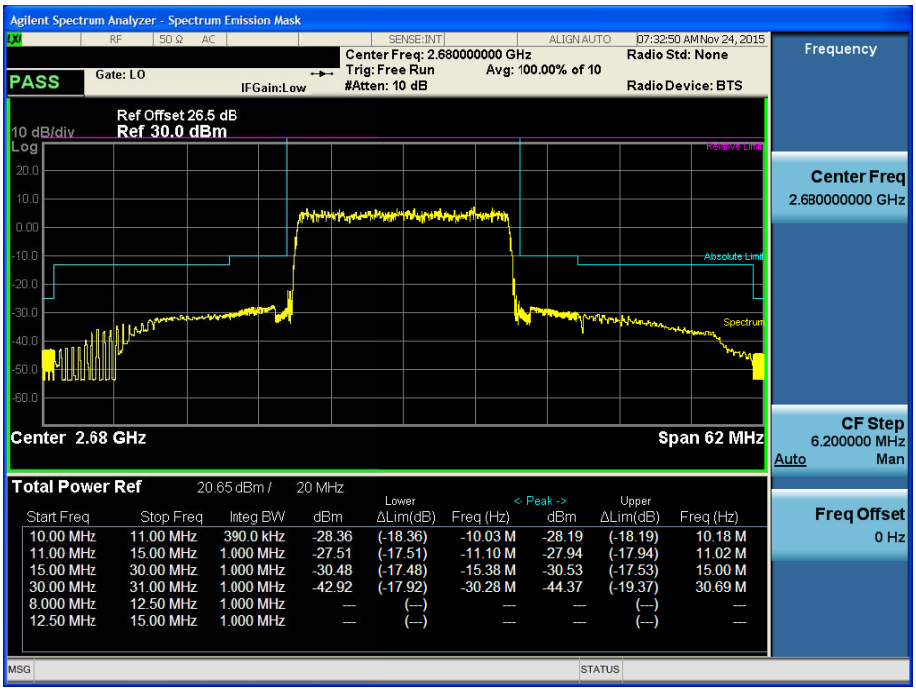
BAND 41. Low Channel Edge Plot (20 MHz Ch.39750 QPSK RB 100)



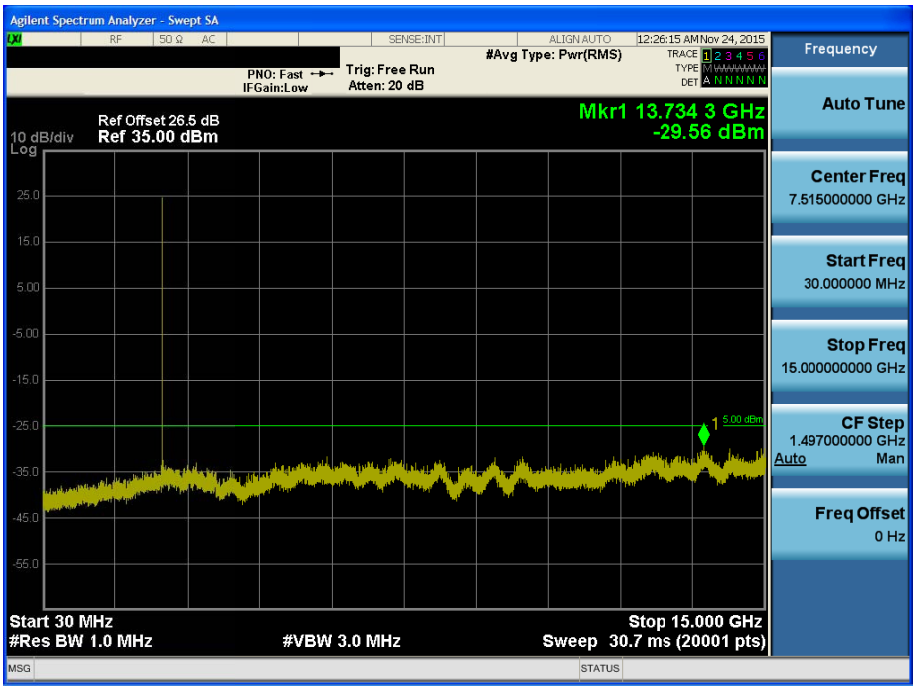
BAND 41. Mid Channel Edge Plot (20 MHz Ch.40620 QPSK RB 100)



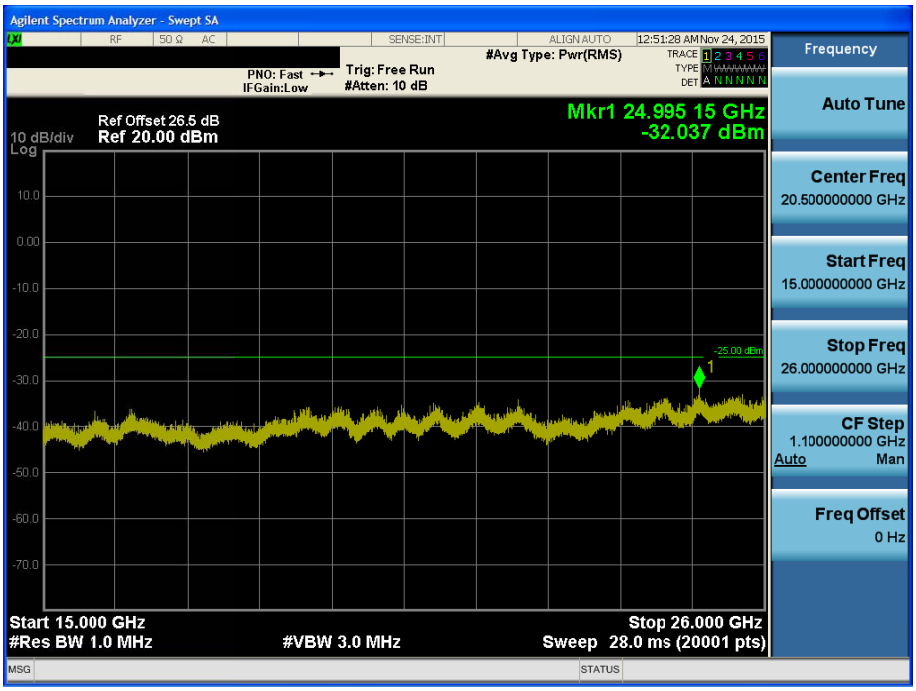
BAND 41. High Channel Edge Plot (20 MHz Ch.41490 QPSK RB 100)



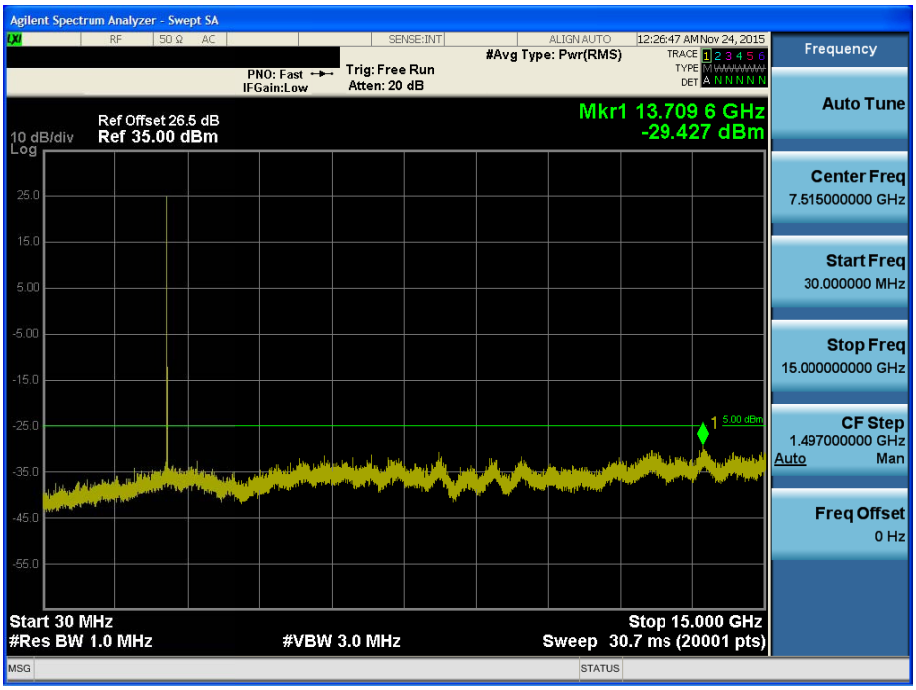
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.39675 QPSK RB 1, Offset 0)



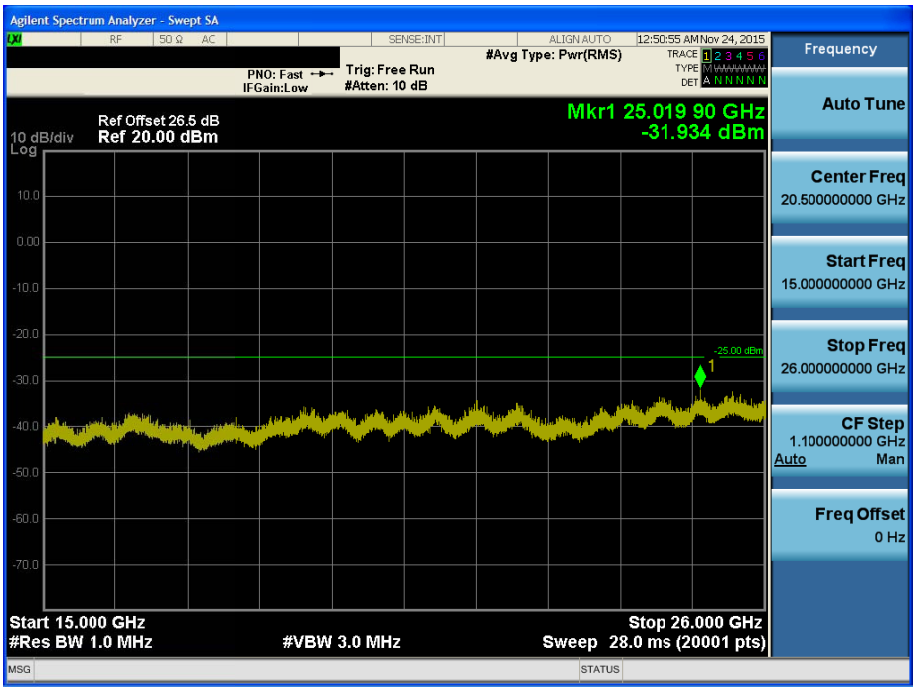
BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 39675 QPSK RB 1, Offset 0)



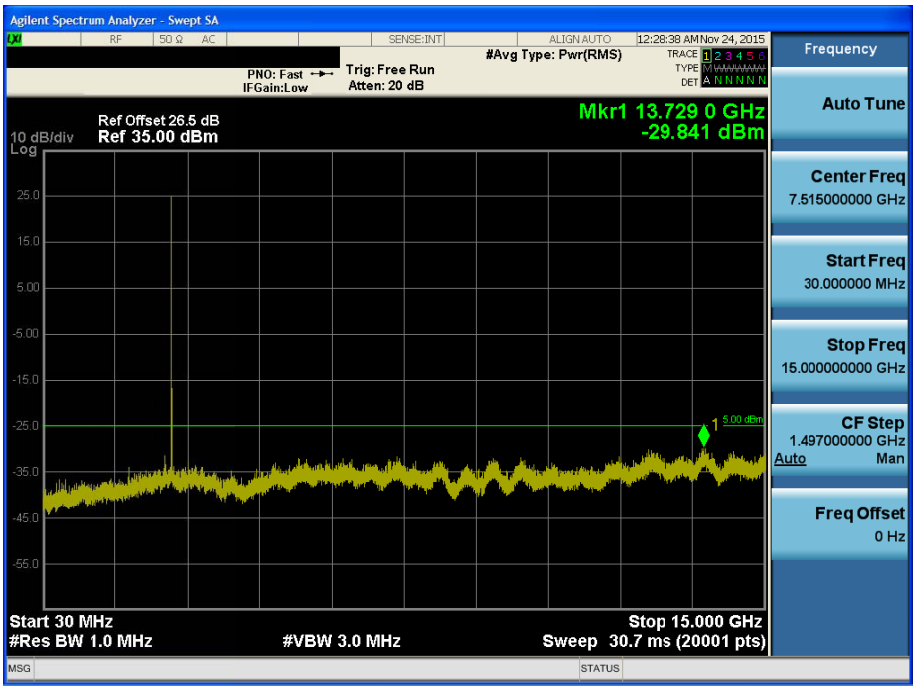
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.40620 QPSK RB 1, Offset 0)



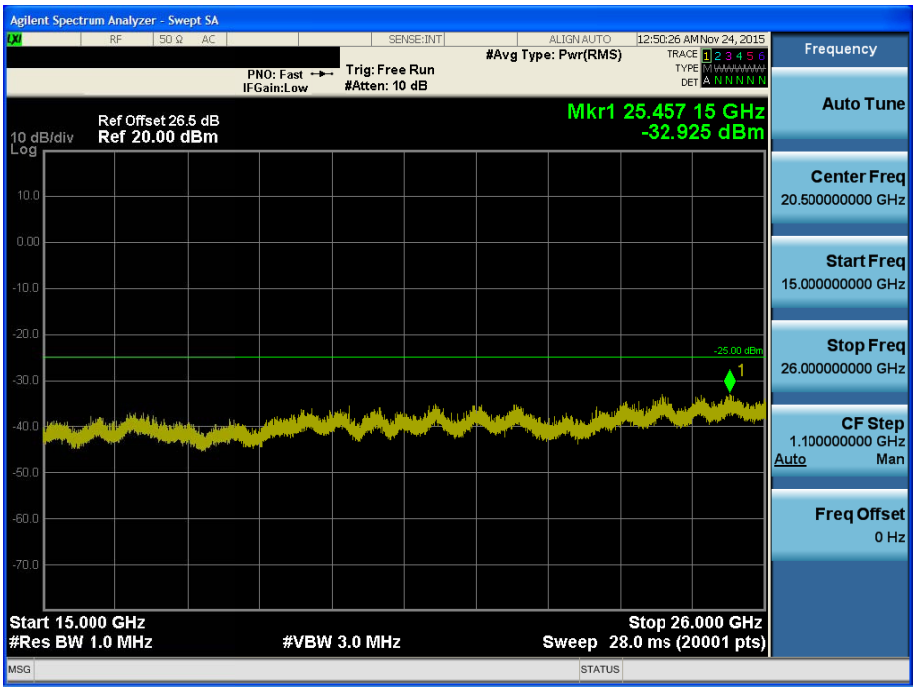
BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 40620 QPSK RB 1, Offset 0)



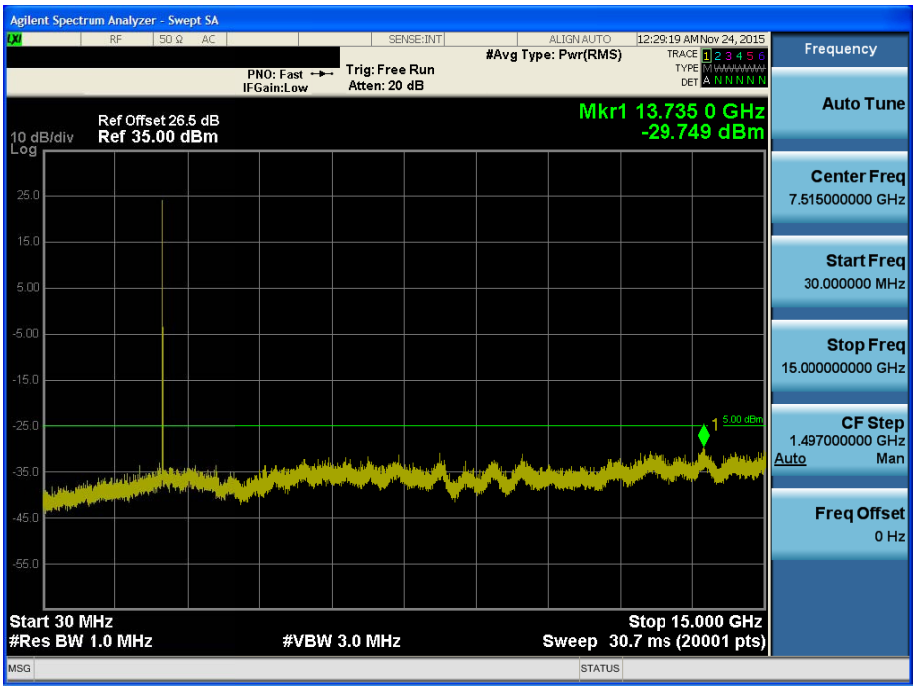
BAND 41. Conducted Spurious Plot 1 (5 MHz Ch.41565 QPSK RB 1, Offset 0)



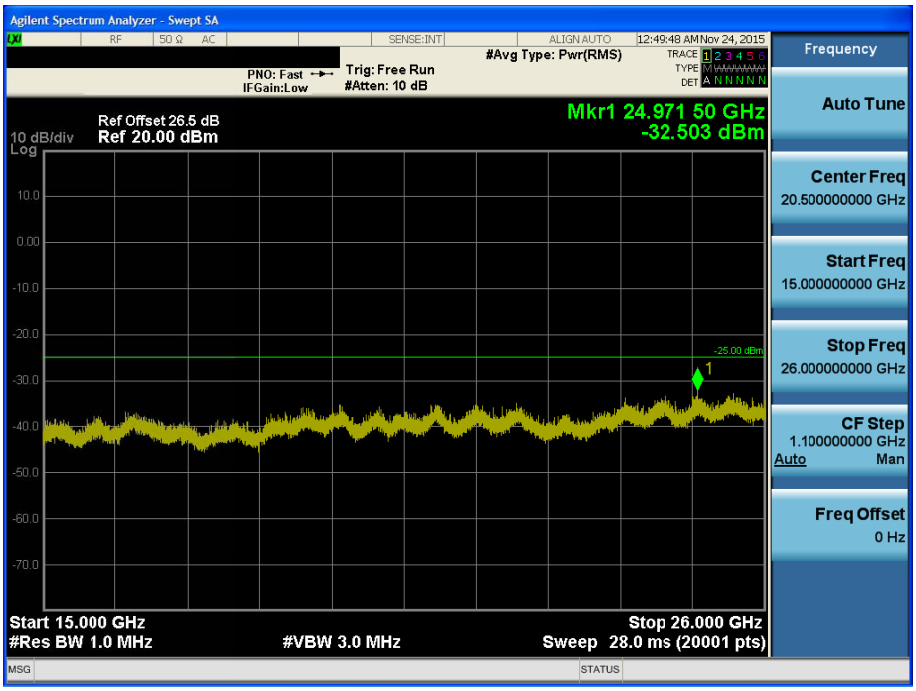
BAND 41. Conducted Spurious Plot 2 (5 MHz Ch. 41565 QPSK RB 1, Offset 0)



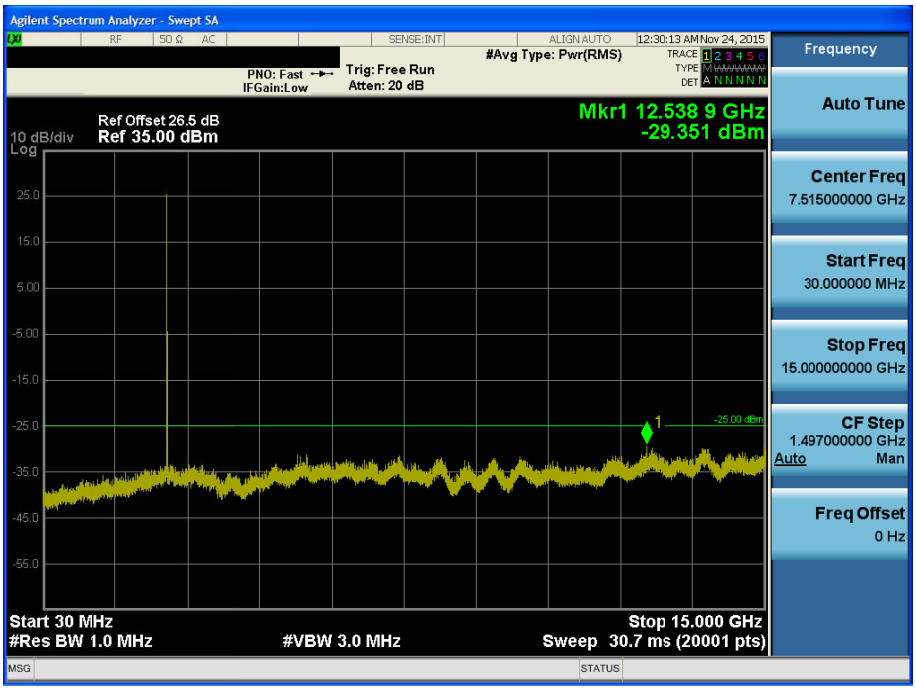
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch.39700 QPSK RB 1, Offset 0)



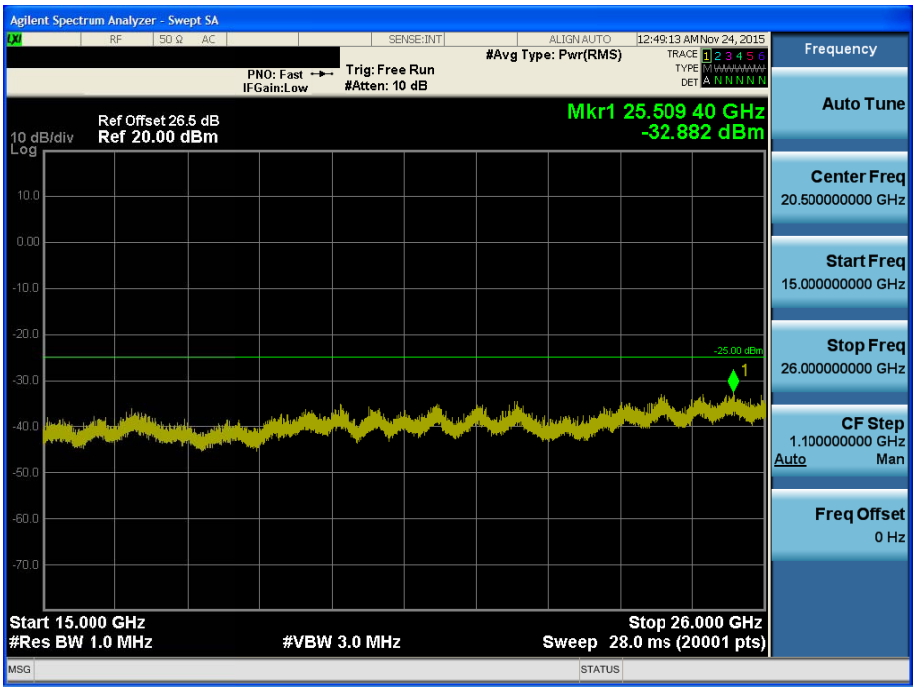
BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 39700 QPSK RB 1, Offset 0)



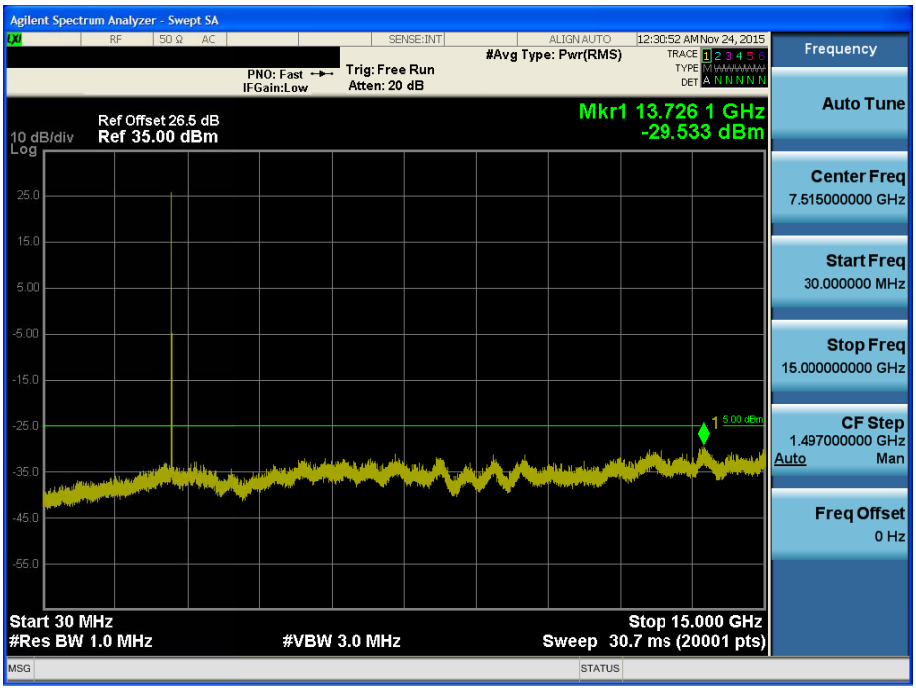
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch.40620 QPSK RB 1, Offset 0)



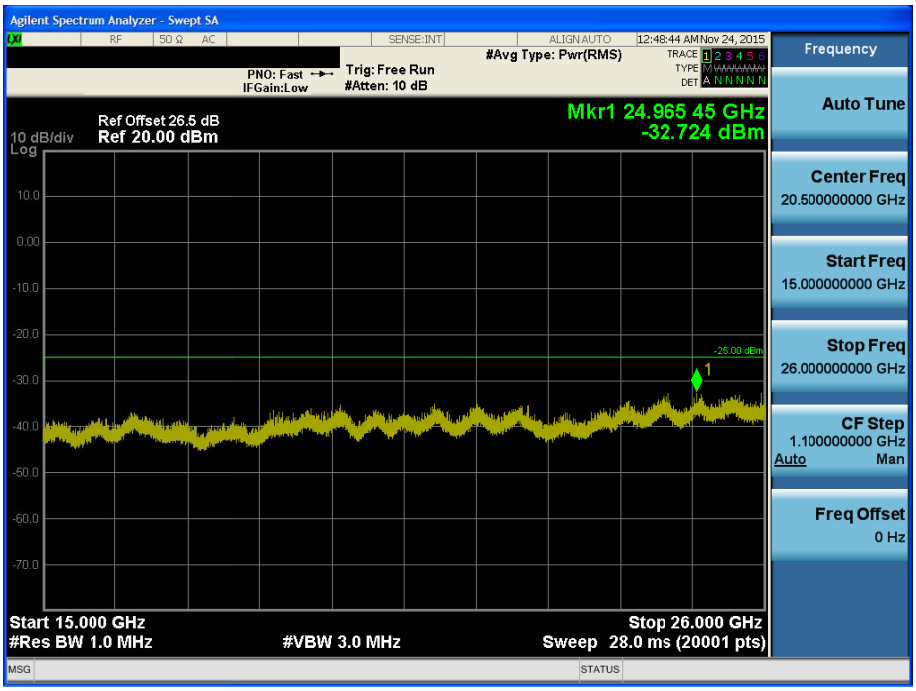
BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 40620 QPSK RB 1, Offset 0)



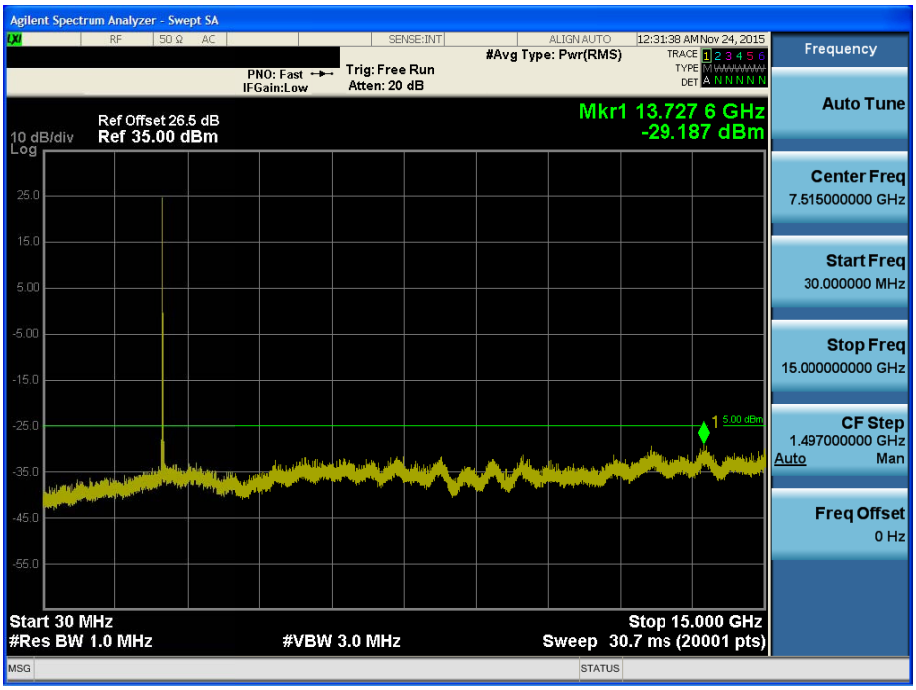
BAND 41. Conducted Spurious Plot 1 (10 MHz Ch.41540 QPSK RB 1, Offset 0)



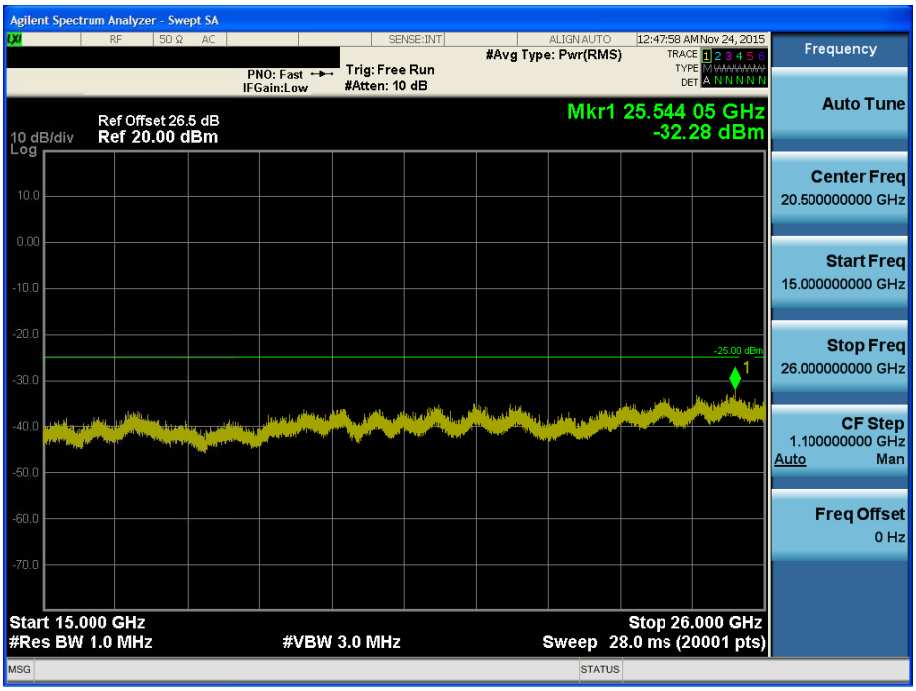
BAND 41. Conducted Spurious Plot 2 (10 MHz Ch. 41540 QPSK RB 1, Offset 0)



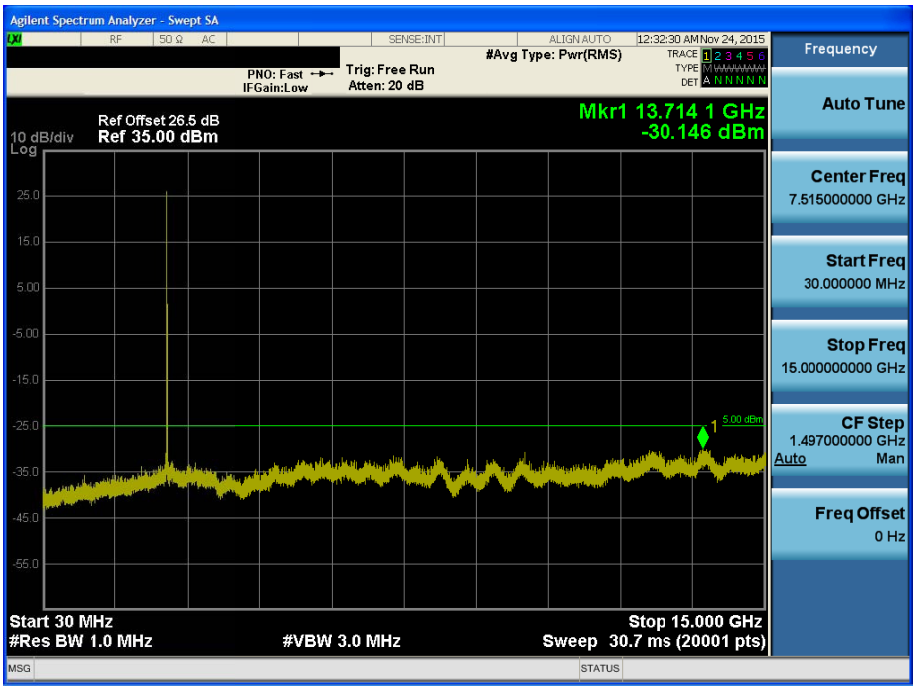
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.39725 QPSK RB 1, Offset 0)



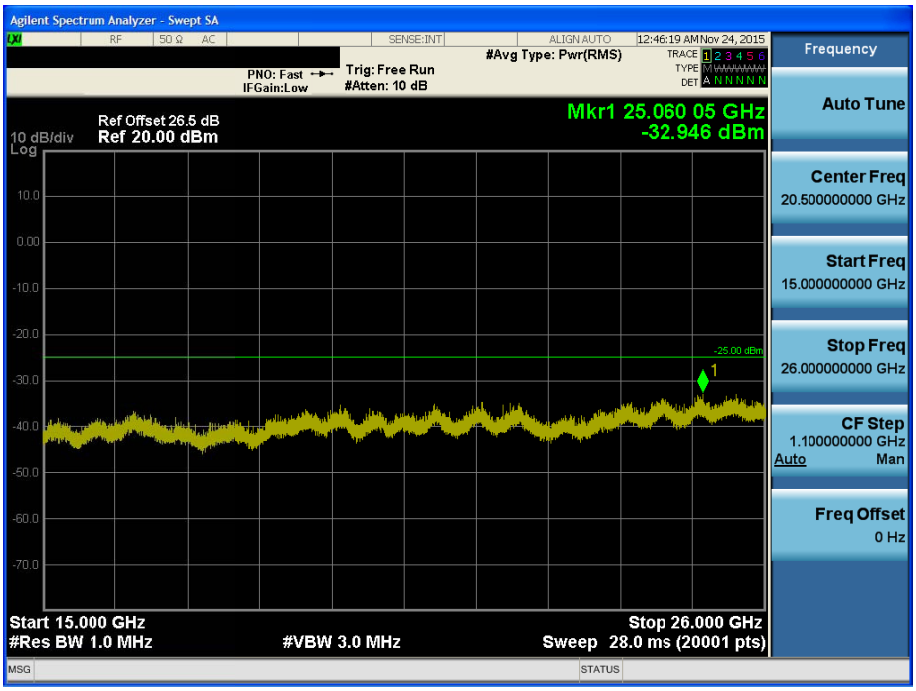
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 39725 QPSK RB 1, Offset 0)



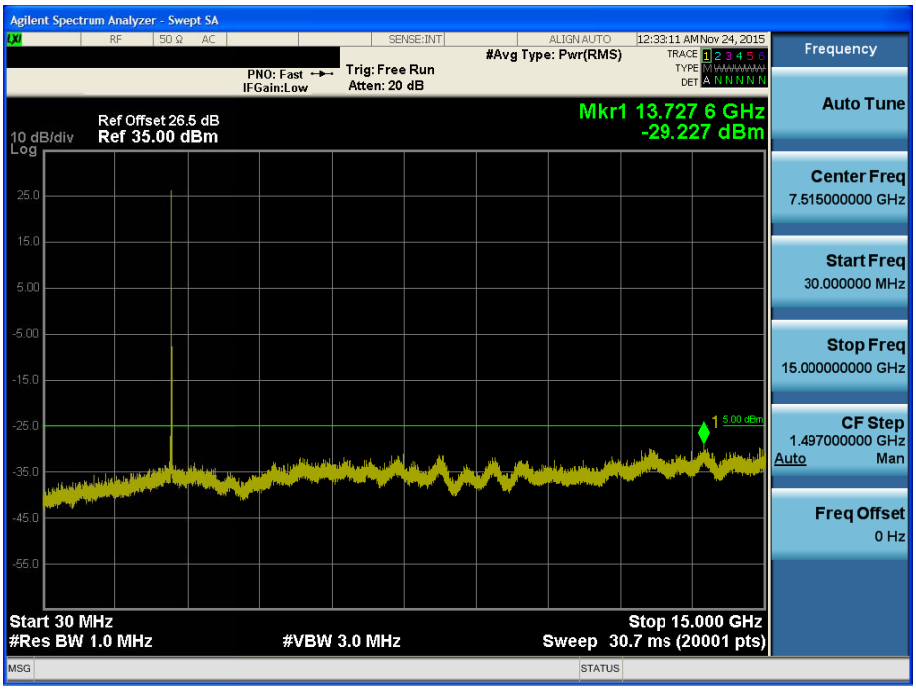
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.40620 QPSK RB 1, Offset 0)



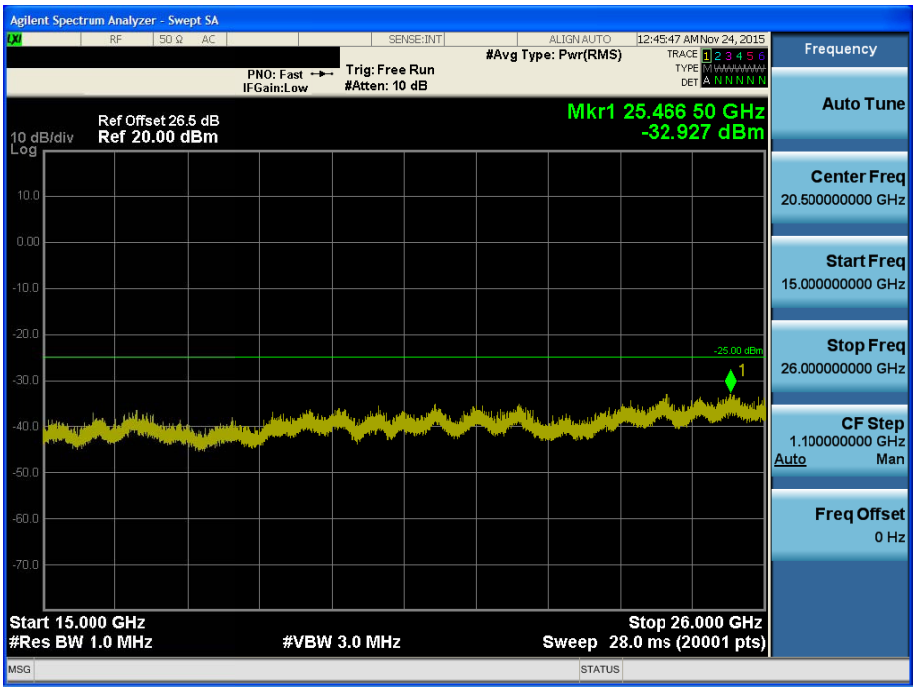
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 40620 QPSK RB 1, Offset 0)



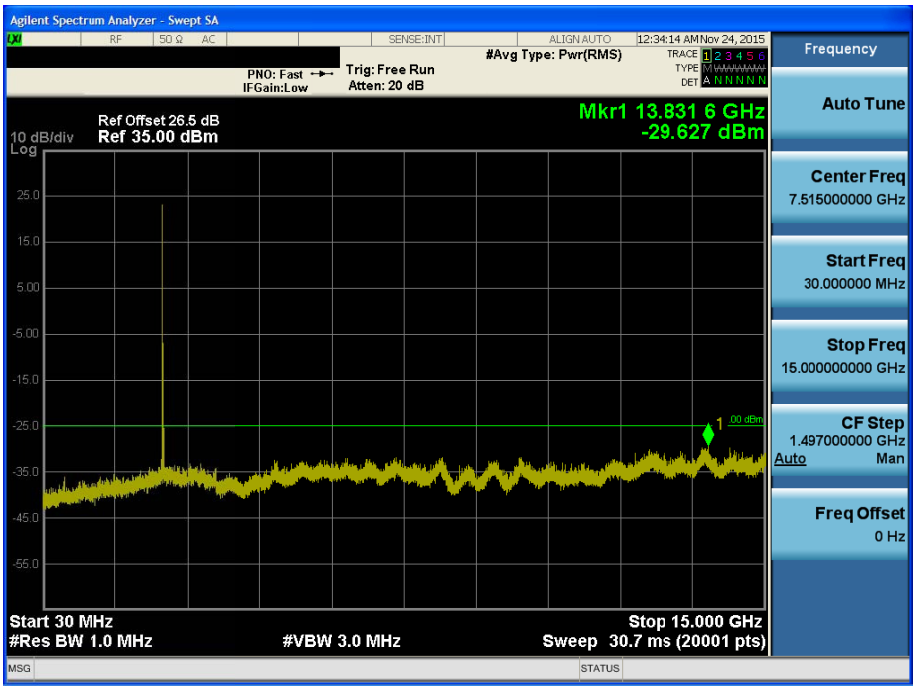
BAND 41. Conducted Spurious Plot 1 (15 MHz Ch.41515 QPSK RB 1, Offset 0)



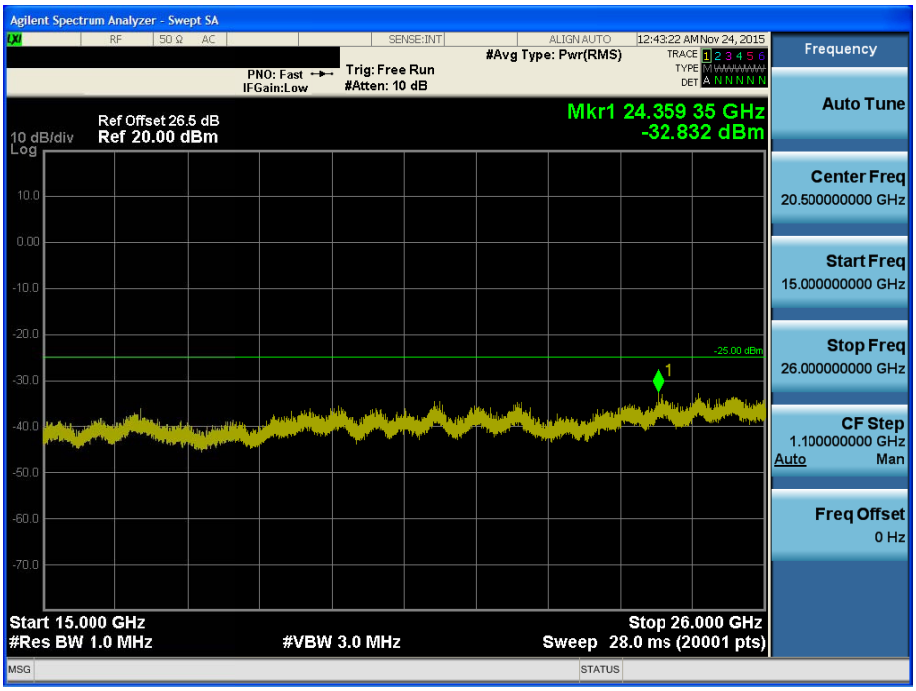
BAND 41. Conducted Spurious Plot 2 (15 MHz Ch. 41515 QPSK RB 1, Offset 0)



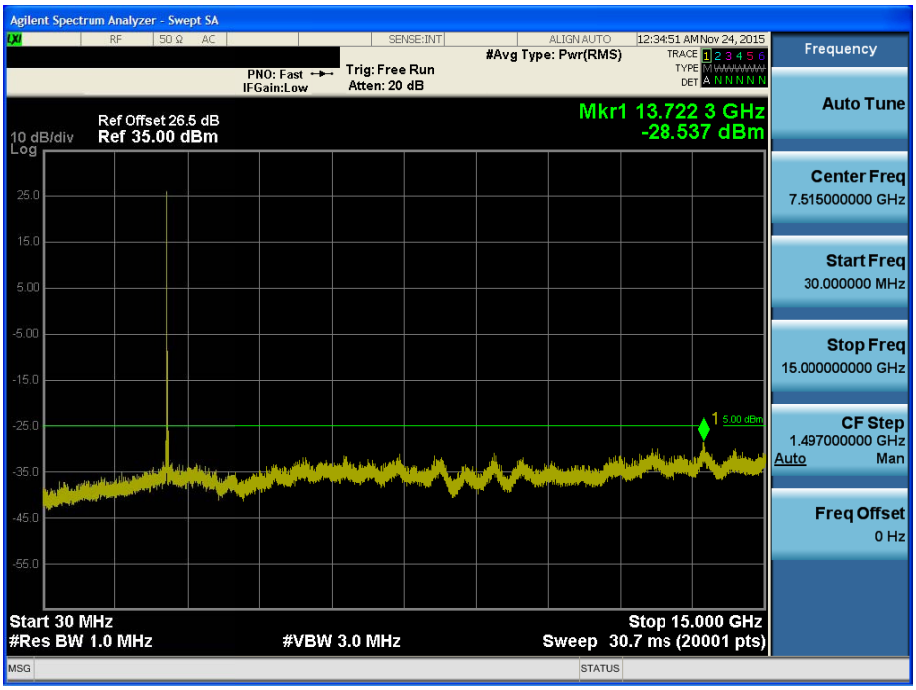
BAND 41. Conducted Spurious Plot 1 (20 MHz Ch 39750 QPSK RB 1, Offset 0)



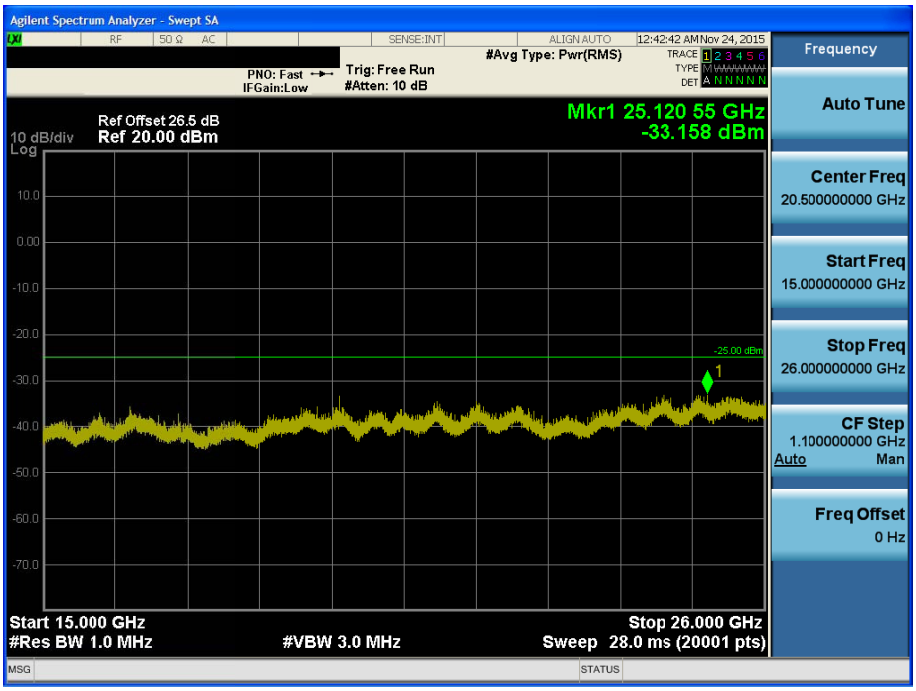
BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 39750 QPSK RB 1, Offset 0)



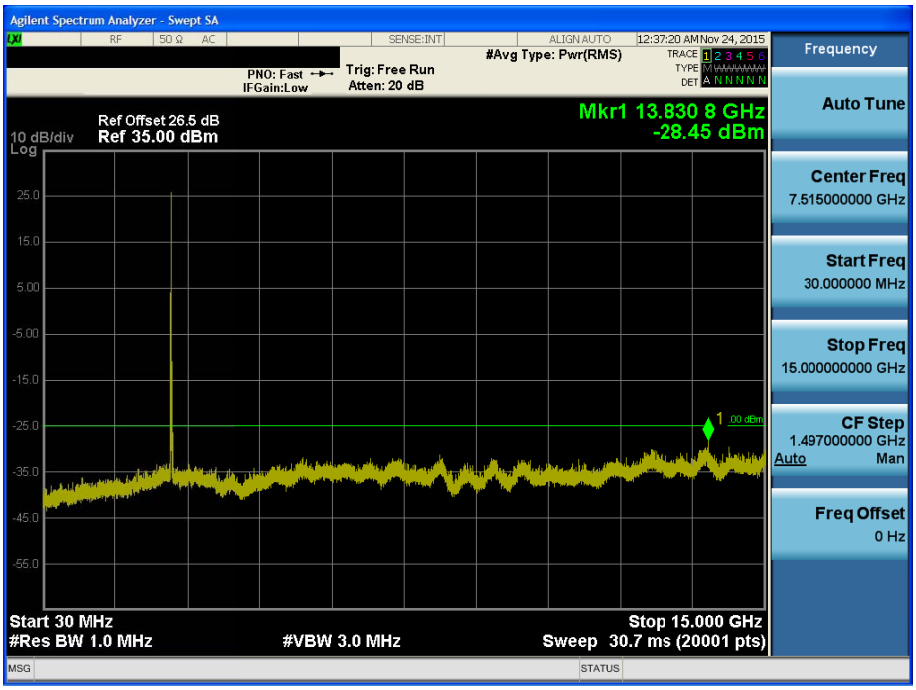
BAND 41. Conducted Spurious Plot 1 (20 MHz Ch.40620 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 40620 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 1 (20 MHz Ch.41490 QPSK RB 1, Offset 0)



BAND 41. Conducted Spurious Plot 2 (20 MHz Ch. 41490 QPSK RB 1, Offset 0)