74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
TEL: +82-31-645-6300 FAX: +82-31-645-6401

REPORT

FCC Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 Rep. of Korea

Date of Issue:
October 14, 2014

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

Report No.: HCT-R-1409-F010-1

HCT FRN: 0005866421

FCC ID:	**A3LSMG3608**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

FCC Model(s):	SM-G3608	
EUT Type:	Mobile Phone	
FCC Classification:	Licensed Portable Transmitter Held to Ear (PCE)	
FCC Rule Part(s):	§2 , §27	
Tx Frequency:	2577.5 MHz – 2632.5 MHz (LTE – Band 41): 5 MHz 2580.0 MHz – 2630.0 MHz (LTE – Band 41): 10 MHz 2582.5 MHz – 2627.5 MHz (LTE – Band 41): 15 MHz 2585.0 MHz – 2625.0 MHz (LTE – Band 41): 20 MHz	
Max. RF Output Power:	Band 41 (5 MHz) :	0.381 W (QPSK) (25.81 dBm) 0.380 W (16-QAM) (25.80 dBm)
	Band 41 (10 MHz) :	0.383 W (QPSK) (25.83 dBm) 0.377 W (16-QAM) (25.76 dBm)
	Band 41 (15 MHz) :	0.272 W (QPSK) (24.34 dBm) 0.292 W (16-QAM) (24.66 dBm)
	Band 41 (20 MHz) :	0.355 W (QPSK) (25.50 dBm) 0.313 W (16-QAM) (24.95 dBm)
Emission Designator(s):	Band 41 (5 MHz) :	4M50G7D (QPSK) / 4M50W7D (16-QAM)
	Band 41 (10 MHz) :	8M97G7D (QPSK) / 8M95W7D (16-QAM)
	Band 41 (15 MHz) :	13M4G7D (QPSK) / 13M5W7D (16-QAM)
	Band 41 (20 MHz) :	17M9G7D (QPSK) / 17M9W7D (16-QAM)

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

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

Report prepared by
: Jong Seok Lee
Test engineer of RF Team

Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1409-F010	September 25, 2014	- First Approval Report
HCT-R-1409-F010-1	October 14, 2014	- Add the Duty Cycle - Retest the PAR - Add the Note for Detector mode of Block edge on Page 17 and 18 - Revised the Limit for Band edge on Page 7 - Add the Block edge Test for within 1 MHz from Block edge on Page 18

Table of Contents

MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 Rep. of Korea
FCC ID:	A3LSMG3608
Application Type:	Certification
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Date(s) of Tests:	September 18, 2014 ~ September 25, 2014
Antenna Specification	Manufacturer: SkyCross Antenna type: Internal Antenna Peak Gain: LTE Band 41 : -1.55 dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The SAMSUNG Electronics Co., Ltd. SM-G3608 Mobile Phone 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, Korea**.

3. DESCRIPTION OF TESTS

3.1 ERP/EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

ERP/EIRP

Note: ERP(Effective Radiated Power), 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-C-2004 Clasue 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 positive peak 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.

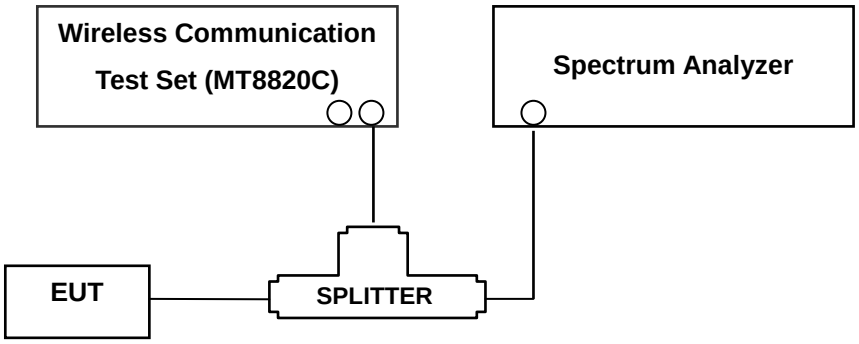
The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

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)
Test Procedure

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

3.3 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

Test Procedure

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.
The EUT was setup to maximum output power. 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 32.0 dBm = 20 dBm attenuator + 6 dBm Divider + 6.0 dBm RF cables.

3.4 PEAK-AVERAGE RATIO.

Test Procedure

Peak to Average Power Ratio is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r01, June 7, 2013, Section 5.7.

- 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)

5.1.2 Peak power measurements with a peak power meter

The total peak output power may be measured using a broadband peak RF power meter. The power meter must have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.

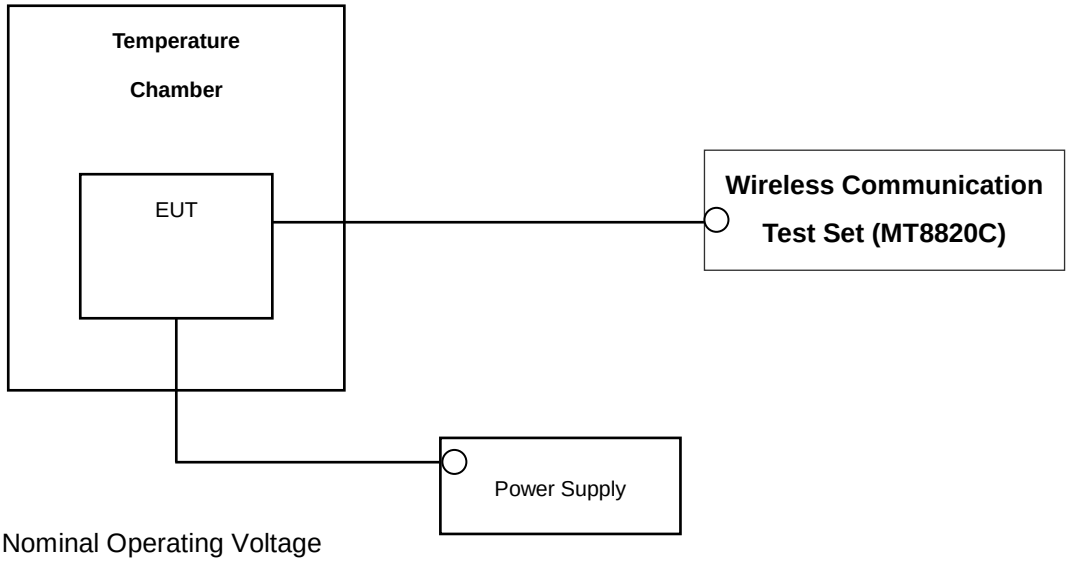
5.2.3 Average power measurement with average power meter

As an alternative th the use of a spectrum/signal analyzer or EMI receiver to perform a measurement of the total in-bnad average output power, a wideband RF average power meter with a thermocouple detector or equivalent can be used under certain conditions.

If the EUT cannot be configured to transmit continuously(i.e.,the burst duty cycle<98 %), then there are two options for the use of an average power meter. First, a gated average power meter can be used to perform the measurement if the gating parameters can be adjusted such that the power is measured only over active transmission bursts at maximum output power levels. A conventional average power meter can also be used if the measured burst duty cycle is constant(i.e., duty cycle variations are less than ±2 percent) by performing the measurement over the on/off burst cycles and then correcting(increasing) the measured level by a factor equal to 10*log(1/duty cycle).

3.5 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



* Nominal Operating Voltage

Test Procedure

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

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

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

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.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
Agilent	N1921A/ Power Sensor	MY45241059	07/09/2014	Annual	07/09/2015
Agilent	N1911A/ Power Meter	MY45100523	01/24/2014	Annual	01/24/2015
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	09/04/2014	Annual	09/04/2015
Wainwright	WHK1.2/15G-10EF/H.P.F	4	06/17/2014	Annual	06/17/2015
Wainwright	WHK3.3/18G-10EF/H.P.F	2	06/17/2014	Annual	06/17/2015
Hewlett Packard	11667B / Power Splitter	10545	02/22/2014	Annual	02/22/2015
Digital	EP-3010/ Power Supply	3110117	10/29/2013	Annual	10/29/2014
Schwarzbeck	UHAP/ Dipole Antenna	557	03/05/2013	Biennial	03/05/2015
Schwarzbeck	UHAP/ Dipole Antenna	558	05/03/2013	Biennial	05/03/2015
Korea Engineering	KR-1005L / Chamber	KRAB05063-3CH	10/30/2013	Annual	10/30/2014
Schwarzbeck	BBHA 9120D/ Horn Antenna	1191	12/03/2013	Biennial	12/03/2015
Schwarzbeck	BBHA 9120D/ Horn Antenna	1151	10/05/2013	Biennial	10/05/2015
Agilent	E4440A/Spectrum Analyzer	US45303008	04/09/2014	Annual	04/09/2015
WEINSCHEL	ATTENUATOR	BR0592	10/28/2013	Annual	10/28/2014
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	06/09/2014	Annual	06/09/2015
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6200863156	04/01/2014	Annual	04/01/2015

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.	Cf.) Section 3.3		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	< 2.5 ppm		PASS
27.50(h)(2)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP	RADIATED	PASS
2.1053, 27.53(m)(4)	Undesirable Emissions	< 43 +10 $\log_{10}$ (P[Watts]) for all out-of-band emissions		PASS

*See SAR Report

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 Band 41	40620.0	2,593.0	-16.35	18.26	10.72	1.38	V	**0.575**	**27.60**

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

1) The EUT mounted on a wooden tripod is 0.8 meter above test site ground level.
2) During the test , the turn table is rotated 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 = 8.95 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

10 MHz Bandwidth

Emission Designator = 8M95G7D

LTE BW = 8.95 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

15 MHz Bandwidth

Emission Designator = 13M5G7D

LTE BW = 13.47 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

20 MHz 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 = 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

10 MHz 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

15 MHz 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

20 MHz 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 DUTY CYCLE

TX on time (ms)	Total Time (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)
2	5	40	3.98

Note : Duty Cycle Factor = 10*log(1/0.4)

- Plots of the EUT's Occupied Bandwidth are shown Page 30.

7.2 PEAK-TO-AVERAGE RATIO

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Peak Power (dBm)	Average Power (dBm)	Duty Cycle Factor (dB)	Data (dB)
Band 41	5	2605.0	QPSK	25	0	31.50	21.19	3.98	10.31
			16-QAM	25	0	31.70	20.19		11.51
	10	2605.0	QPSK	50	0	31.57	21.07		10.50
			16-QAM	50	0	31.53	20.01		11.52
	15	2605.0	QPSK	75	0	31.72	21.08		10.64
			16-QAM	75	0	31.76	20.07		11.69
	20	2605.0	QPSK	100	0	31.57	21.09		10.48
			16-QAM	100	0	31.73	20.20		11.53

Note : PAR = Peak power – Average power + Duty Cycle Factor

7.3 OCCUPIED BANDWIDTH

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 41	5 MHz	2605.0	QPSK	25	0	4.4988
			16-QAM	25	0	4.5005
	10 MHz	2605.0	QPSK	50	0	8.9673
			16-QAM	50	0	8.9505
	15 MHz	2605.0	QPSK	75	0	13.4330
			16-QAM	75	0	13.4570
	20 MHz	2605.0	QPSK	100	0	17.9230
			16-QAM	100	0	17.9040

- Plots of the EUT's Occupied Bandwidth are shown Page 31 ~ 34.

7.4 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 41	5	2,577.5	QPSK	1	0	20.069720	-27.80
		2,605.0		1	0	20.039280	-28.31
		2,632.5		1	0	19.589020	-28.50
	10	2,580.0		1	0	20.374420	-27.79
		2,605.0		1	0	19.615780	-27.33
		2,630.0		1	0	19.281380	-27.81
	15	2,582.5		1	0	19.613580	-26.68
		2,605.0		1	0	19.305580	-27.32
		2,627.5		1	0	19.478280	-27.83
	20	2,585.0		1	0	19.644020	-28.12
		2,605.0		1	0	19.335280	-27.79
		2,625.0		1	0	19.549420	-27.94

Note : The detector mode is peak. So, we do not need to apply for duty cycle.

- Plots of the EUT's Conducted Spurious Emissions are shown Page 47 ~ 58.

7.4.1 BAND EDGE

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Channel Edge Data [dBm]					
						1 MHz ~ 5 MHz form the Channel Edge (Limit: -10dBm)		5 MHz ~ X Mhz from the Channel Edge (Limit: -13dBm)		X Mhz ~ from the Channel Edge (Limit: -25dBm)	
						Lower	Upper	Lower	Upper	Lower	Upper
Band 41	5	2,577.5	QPSK	25	0	-18.69	-23.62	-31.18	-32.66	-32.53	-33.01
		2,605.0		25	0	-17.65	-18.86	-25.64	-27.55	-26.71	-29.76
		2,632.5		25	0	-14.07	-12.48	-28.19	-27.89	-30.84	-30.59
	10	2,580.0		50	0	-22.45	-21.59	-23.81	-29.86	-28.79	-31.29
		2,605.0		50	0	-23.63	-23.46	-27.30	-29.26	-30.09	-32.52
		2,630.0		50	0	-16.56	-16.03	-22.15	-22.63	-30.65	-26.69
	15	2,582.5		75	0	-23.41	-24.36	-23.51	-23.63	-30.09	-31.49
		2,605.0		75	0	-22.55	-22.73	-22.96	-23.85	-30.12	-30.98
		2,627.5		75	0	-17.77	-17.38	-21.95	-21.19	-31.00	-31.25
	20	2,585.0		100	0	-24.87	-26.79	-24.85	-25.81	-31.20	-32.07
		2,605.0		100	0	-26.00	-22.52	-25.88	-23.46	-32.25	-32.81
		2,625.0		100	0	-18.98	-18.22	-20.02	-21.22	-30.46	-32.59

Note : The detector mode is average. And this result has been already applied to the duty cycle factor

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Channel Edge Data [dBm]	
						1 MHz ~ 5 MHz form the Channel Edge (Limit: -10dBm)	
						Lower	Upper
Band 41	5	2,577.5	QPSK	25	0	-25.23	-26.87
		2,605.0		25	0	-26.02	-26.88
		2,632.5		25	0	-24.10	-24.34
	10	2,580.0		50	0	-29.79	-29.43
		2,605.0		50	0	-27.43	-27.91
		2,630.0		50	0	-25.81	-26.53
	15	2,582.5		75	0	-28.81	-31.79
		2,605.0		75	0	-26.57	-27.57
		2,627.5		75	0	-24.14	-25.58
	20	2,585.0		100	0	-30.10	-31.46
		2,605.0		100	0	-27.55	-26.50
		2,625.0		100	0	-24.12	-25.29

Note : The detector mode is average. And this result has been already applied to the duty cycle factor

- Plots of the EUT's Band Edge are shown Page 35 ~ 46.

7.5 EQUIVALENT ISOTROPIC RADIATED POWER OUTPUT

Effective Radiated Power Data (Band 41 – 5 MHz)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2,577.5	5	QPSK	-19.55	17.28	10.72	2.19	H	0.381	25.81
		16-QAM	-19.56	17.27	10.72	2.19	H	0.380	25.80
2,605.0		QPSK	-21.26	15.90	10.72	2.21	H	0.276	24.41
		16-QAM	-21.13	16.03	10.72	2.21	H	0.284	24.54
2,632.5		QPSK	-20.89	16.22	10.73	2.22	H	0.297	24.73
		16-QAM	-20.96	16.15	10.73	2.22	H	0.292	24.66

Note: Worst case is 1 resource block.

Effective Radiated Power Data (Band 41 – 10 MHz)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2,580.0	10 MHz	QPSK	-19.56	17.30	10.72	2.19	H	0.383	25.83
		16-QAM	-19.63	17.23	10.72	2.19	H	0.377	25.76
2,605.0		QPSK	-19.94	17.22	10.72	2.21	H	0.374	25.73
		16-QAM	-20.89	16.27	10.72	2.21	H	0.301	24.78
2,630.0		QPSK	-20.52	16.56	10.73	2.22	H	0.321	25.07
		16-QAM	-20.58	16.50	10.73	2.22	H	0.317	25.01

Note: Worst case is 1 resource block.

Effective Radiated Power Data (Band 41 – 15 MHz)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2,582.5	15 MHz	QPSK	-20.41	14.80	10.63	2.19	H	0.211	23.24
		16-QAM	-19.68	15.53	10.63	2.19	H	0.249	23.97
2,605.0		QPSK	-21.66	15.50	10.72	2.21	H	0.252	24.01
		16-QAM	-21.33	15.83	10.72	2.21	H	0.272	24.34
2,627.5		QPSK	-21.46	15.83	10.73	2.22	H	0.272	24.34
		16-QAM	-21.14	16.15	10.73	2.22	H	0.292	24.66

Note: Worst case is 1 resource block.

Effective Radiated Power Data (Band 41 – 20 MHz)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
2,585.0	20 MHz	QPSK	-19.96	16.98	10.72	2.20	H	0.355	25.50
		16-QAM	-20.51	16.43	10.72	2.20	H	0.313	24.95
2,605.0		QPSK	-21.64	15.52	10.72	2.21	H	0.253	24.03
		16-QAM	-21.65	15.51	10.72	2.21	H	0.252	24.02
2,625.0		QPSK	-21.21	16.06	10.73	2.22	H	0.286	24.57
		16-QAM	-21.12	16.15	10.73	2.22	H	0.292	24.66

Note: Worst case is 1 resource block.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method

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

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. Turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For LTE signals, a peak detector is used, with RBW ≥ OBW, VBW ≥ 3 x RBW. 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 horizontal polarization in LTE mode.

7.6 RADIATED SPURIOUS EMISSIONS

7.6.1 RADIATED SPURIOUS EMISSIONS (Band 41_5 MHz)

▣ OPERATING FREQUENCY : 2605.00 MHz

▣ MEASURED OUTPUT POWER: 25.81 dBm = 0.381 W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.81 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
40465.0 (2577.5)	5,155.0	-53.88	12.42	-50.38	3.22	H	-41.18	66.99
	7,732.5	-55.59	11.43	-43.81	4.07	H	-36.45	62.26
	10,310.0	-55.53	11.36	-37.28	4.62	V	-30.54	56.35
40740.0 (2605.0)	5,210.0	-54.47	12.69	-50.38	3.27	V	-40.96	66.77
	7,815.0	-56.63	11.30	-44.61	3.98	H	-37.29	63.10
	10,420.0	-56.29	11.16	-37.68	4.73	H	-31.25	57.06
41015.0 (2632.5)	5,265.0	-52.19	13.01	-48.79	3.35	V	-39.13	64.94
	7,897.5	-55.70	11.16	-42.84	4.10	H	-35.78	61.59
	10,530.0	-58.19	11.03	-39.11	4.75	H	-32.83	58.64

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

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. Worst case is 1 resource block.

7.6.2 RADIATED SPURIOUS EMISSIONS (Band 41_10 MHz)

▣ OPERATING FREQUENCY : 2605.00 MHz

▣ MEASURED OUTPUT POWER: 25.83 dBm = 0.383 W

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.83 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
40490.0 (2580.0)	5,160.0	-52.44	12.44	-48.90	3.20	H	-39.66	65.49
	7,740.0	-52.54	11.42	-40.88	4.02	H	-33.48	59.31
	10,320.0	-55.79	11.34	-37.39	4.60	V	-30.65	56.48
40740.0 (2605.0)	5,210.0	-55.07	12.69	-50.98	3.27	V	-41.56	67.39
	7,815.0	-60.35	11.30	-48.33	3.98	H	-41.01	66.84
	10,420.0	-56.38	11.16	-37.77	4.73	V	-31.34	57.17
40990.0 (2630.0)	5,260.0	-53.71	13.04	-50.35	3.41	V	-40.72	66.55
	7,890.0	-56.92	11.19	-44.07	4.06	H	-36.94	62.77
	10,520.0	-55.55	11.04	-36.47	4.67	V	-30.10	55.93

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
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. Worst case is 1 resource block.

7.6.3 RADIATED SPURIOUS EMISSIONS (Band 41_15 MHz)

▣ OPERATING FREQUENCY : 2605.00 MHz

▣ MEASURED OUTPUT POWER: 24.66 dBm = 0.292 W

▣ MODULATION SIGNAL: 15 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 37.66 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
40515.0 (2582.5)	5,165.0	-49.37	12.47	-45.57	3.20	H	-36.30	60.96
	7,747.5	-53.31	11.41	-41.71	3.97	H	-34.27	58.93
	10,330.0	-56.21	11.33	-39.11	4.60	V	-32.38	57.04
40740.0 (2605.0)	5,210.0	-51.24	12.69	-47.15	3.27	H	-37.73	62.39
	7,815.0	-56.82	11.30	-44.80	3.98	V	-37.48	62.14
	10,420.0	-55.39	11.16	-36.78	4.73	V	-30.35	55.01
40965.0 (2627.5)	5,255.0	-55.10	12.88	-49.39	3.27	V	-39.78	64.44
	7,882.5	-57.44	11.10	-44.58	4.20	V	-37.68	62.34
	10,510.0	-56.56	11.04	-37.35	4.66	V	-30.97	55.63

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
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. Worst case is 1 resource block.

7.6.4 RADIATED SPURIOUS EMISSIONS (Band 41_20 MHz)

▣ OPERATING FREQUENCY : 2605.00 MHz

▣ MEASURED OUTPUT POWER: 25.50 dBm = 0.355 W

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.50 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
40540.0 (2585.0)	5,170.0	-50.56	12.49	-46.78	3.20	H	-37.49	62.99
	7,755.0	-54.35	11.15	-42.73	4.37	H	-35.95	61.45
	10,340.0	-56.82	11.31	-38.63	4.65	V	-31.97	57.47
40740.0 (2605.0)	5,210.0	-51.51	12.69	-47.42	3.27	H	-38.00	63.50
	7,815.0	-55.52	11.30	-43.50	3.98	H	-36.18	61.68
	10,420.0	-56.40	11.16	-37.79	4.73	H	-31.36	56.86
40940.0 (2625.0)	5,250.0	-55.51	12.87	-50.30	3.28	H	-40.71	66.21
	7,875.0	-59.14	12.21	-47.40	4.19	H	-39.38	64.88
	10,500.0	-56.61	11.05	-37.66	4.79	H	-31.40	56.90

NOTES:

1. Radiated Spurious Emission Measurements at 1 meter and 3 meter by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
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. Worst case is 1 resource block.

7.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.7.1 FREQUENCY STABILITY (LTE Band 41_5 MHz)

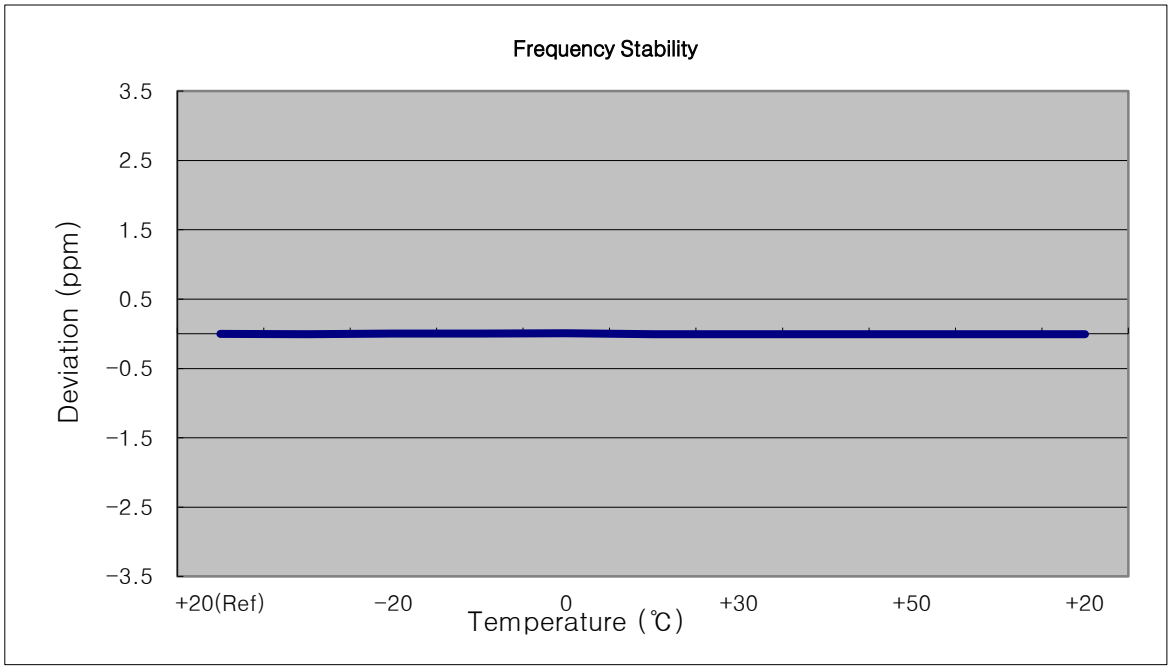
▣ OPERATING FREQUENCY: 2605.000,000 Hz

▣ CHANNEL: 40740 (5 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.85	+20(Ref)	2604 999 983	0	0.000 000	0.000
100%		-30	2604 999 970	-12.5	0.000 000	-0.005
100%		-20	2604 999 994	11.4	0.000 000	0.004
100%		-10	2604 999 997	14.8	0.000 001	0.006
100%		0	2605 000 000	17.0	0.000 001	0.007
100%		+10	2604 999 970	-13.0	0.000 000	-0.005
100%		+30	2604 999 971	-11.1	0.000 000	-0.004
100%		+40	2604 999 972	-10.9	0.000 000	-0.004
100%		+50	2604 999 967	-15.3	-0.000 001	-0.006
115%	4.43	+20	2604 999 973	-10.0	0.000 000	-0.004
Batt. Endpoint	3.27	+20	2604 999 971	-11.3	0.000 000	-0.004



7.7.2 FREQUENCY STABILITY (LTE Band 41_10 MHz)

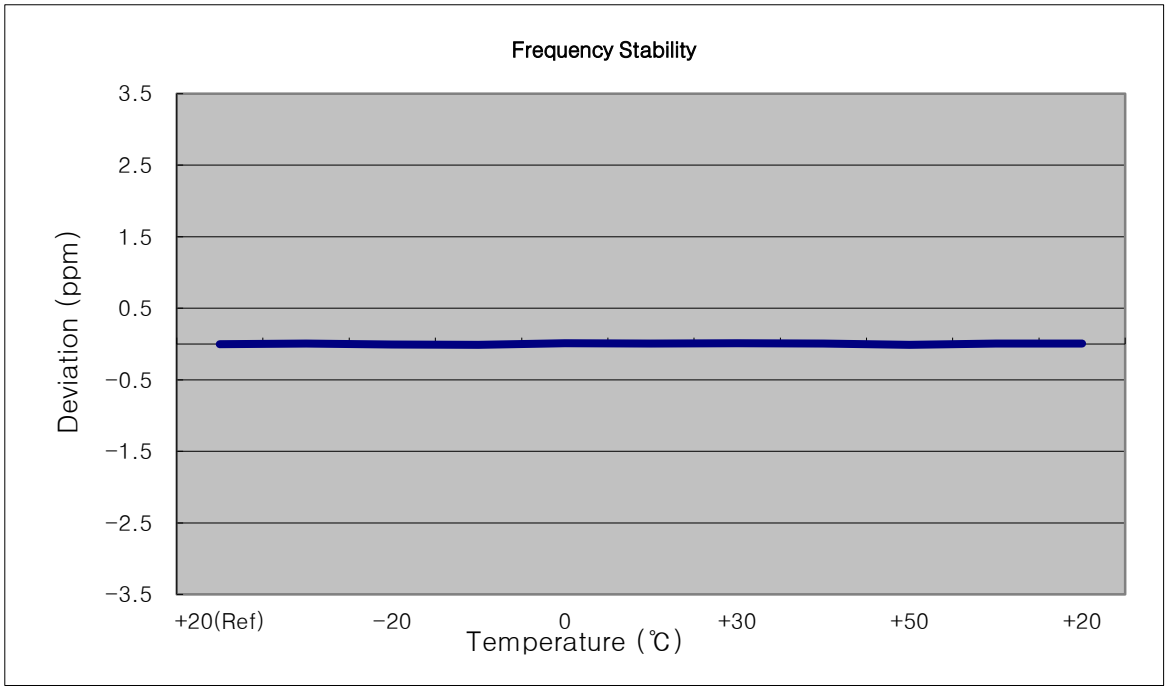
▣ OPERATING FREQUENCY: 2605.000,000 Hz

▣ CHANNEL: 40740 (10 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.85	+20(Ref)	2605 000 028	0	0.000 000	0.000
100%		-30	2605 000 051	23.6	0.000 001	0.009
100%		-20	2605 000 005	-22.1	-0.000 001	-0.008
100%		-10	2605 000 003	-24.8	-0.000 001	-0.010
100%		0	2605 000 054	26.6	0.000 001	0.010
100%		+10	2605 000 049	21.5	0.000 001	0.008
100%		+30	2605 000 054	26.6	0.000 001	0.010
100%		+40	2605 000 045	17.6	0.000 001	0.007
100%		+50	2604 999 999	-28.4	-0.000 001	-0.011
115%	4.43	+20	2605 000 050	22.8	0.000 001	0.009
Batt. Endpoint	3.27	+20	2605 000 049	21.5	0.000 001	0.008



7.7.3 FREQUENCY STABILITY (LTE Band 41_15 MHz)

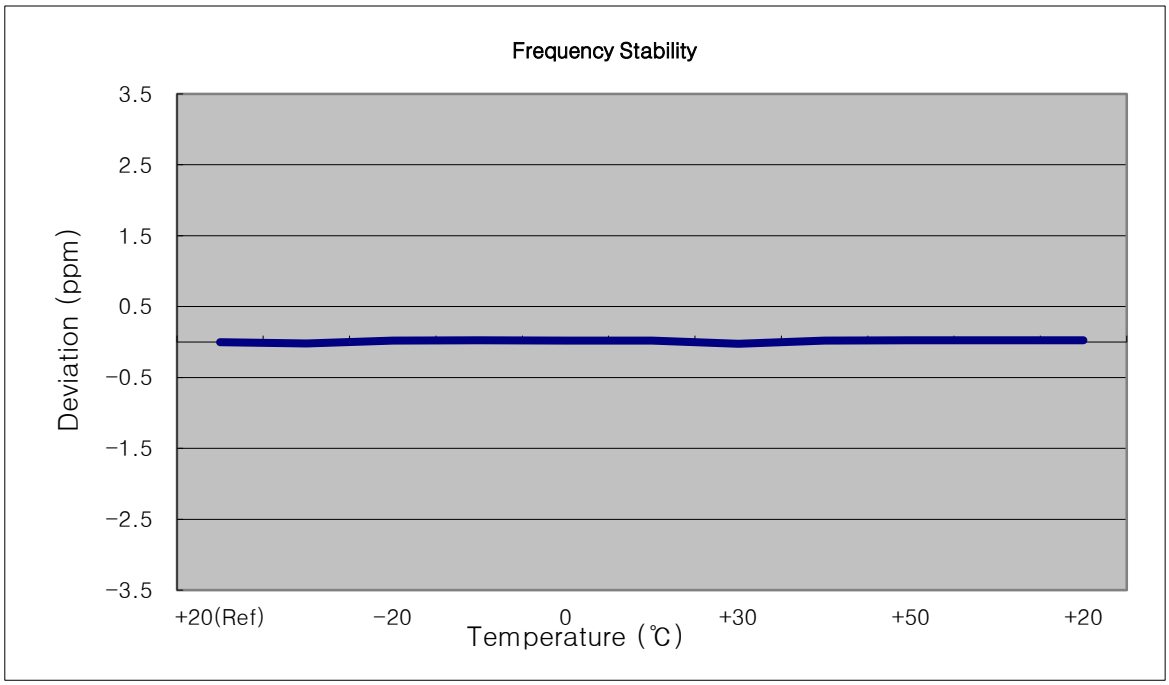
▣ OPERATING FREQUENCY: 2605.000,000 Hz

▣ CHANNEL: 40740 (15 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.85	+20(Ref)	2604 999 951	0	0.000 000	0.000
100%		-30	2604 999 893	-57.2	-0.000 002	-0.022
100%		-20	2605 000 002	51.0	0.000 002	0.020
100%		-10	2605 000 017	66.8	0.000 003	0.026
100%		0	2605 000 006	55.5	0.000 002	0.021
100%		+10	2605 000 007	55.9	0.000 002	0.021
100%		+30	2604 999 885	-65.3	-0.000 003	-0.025
100%		+40	2605 000 007	56.2	0.000 002	0.022
100%		+50	2605 000 015	64.2	0.000 002	0.025
115%	4.43	+20	2605 000 014	63.5	0.000 002	0.024
Batt. Endpoint	3.27	+20	2605 000 010	59.5	0.000 002	0.023



7.7.4 FREQUENCY STABILITY (LTE Band 41_20 MHz)

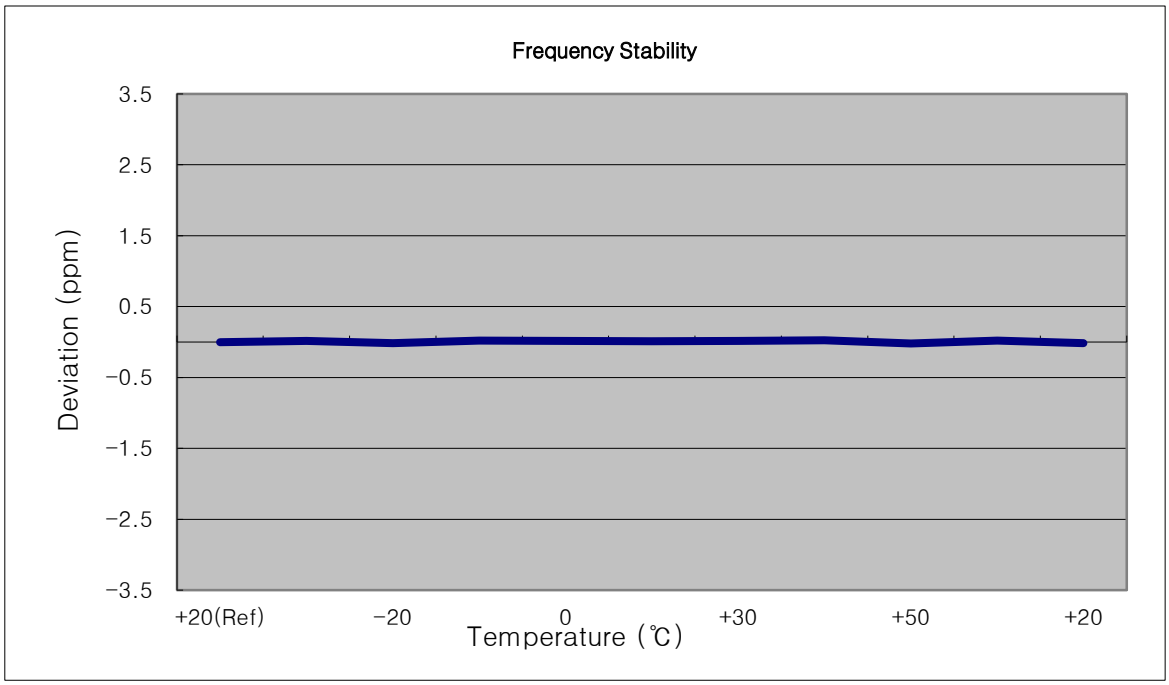
▣ OPERATING FREQUENCY: 2605.000,000 Hz

▣ CHANNEL: 40740 (20 MHz)

▣ REFERENCE VOLTAGE: 3.85 VDC

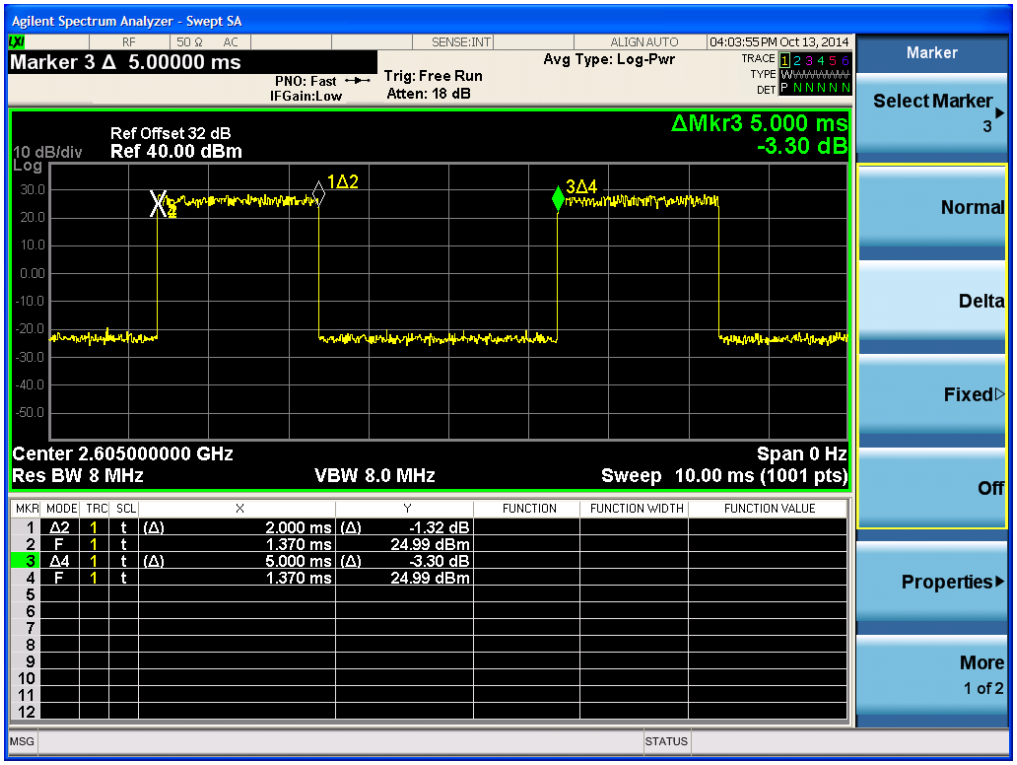
▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.85	+20(Ref)	2604 999 942	0	0.000 000	0.000
100%		-30	2604 999 987	45.5	0.000 002	0.017
100%		-20	2604 999 898	-43.6	-0.000 002	-0.017
100%		-10	2604 999 989	47.4	0.000 002	0.018
100%		0	2604 999 984	42.3	0.000 002	0.016
100%		+10	2604 999 976	34.2	0.000 001	0.013
100%		+30	2604 999 985	43.3	0.000 002	0.017
100%		+40	2605 000 005	63.4	0.000 002	0.024
100%		+50	2604 999 893	-48.4	-0.000 002	-0.019
115%	4.43	+20	2605 000 000	58.7	0.000 002	0.023
Batt. Endpoint	3.27	+20	2604 999 898	-44.0	-0.000 002	-0.017

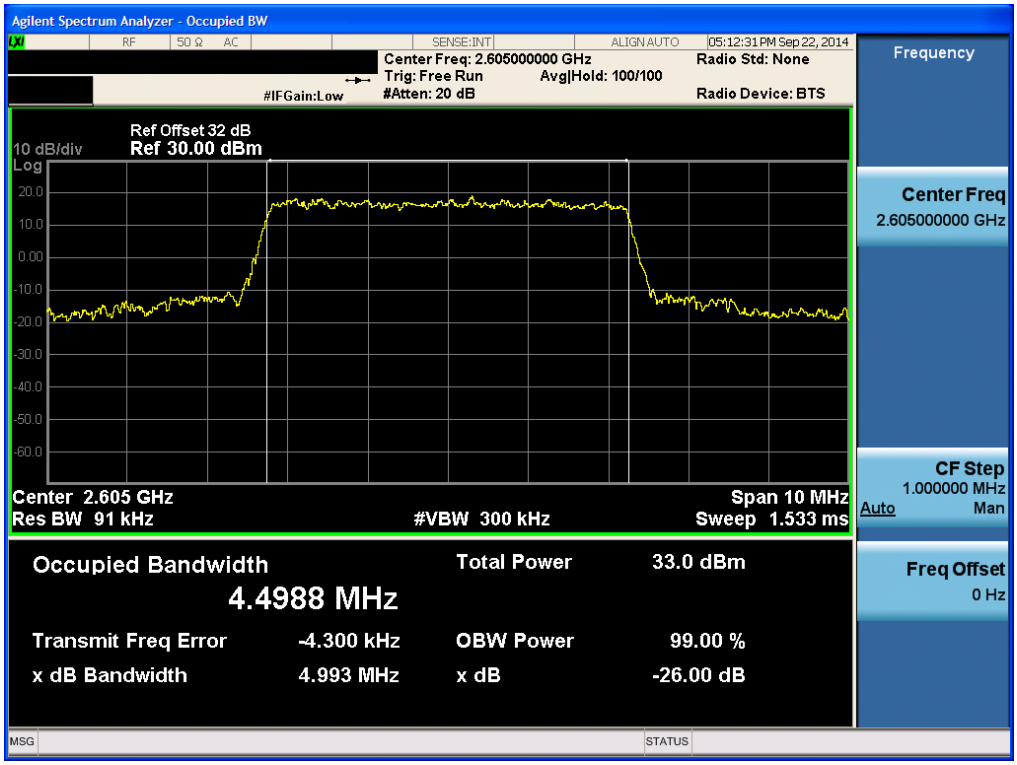


8. TEST PLOTS

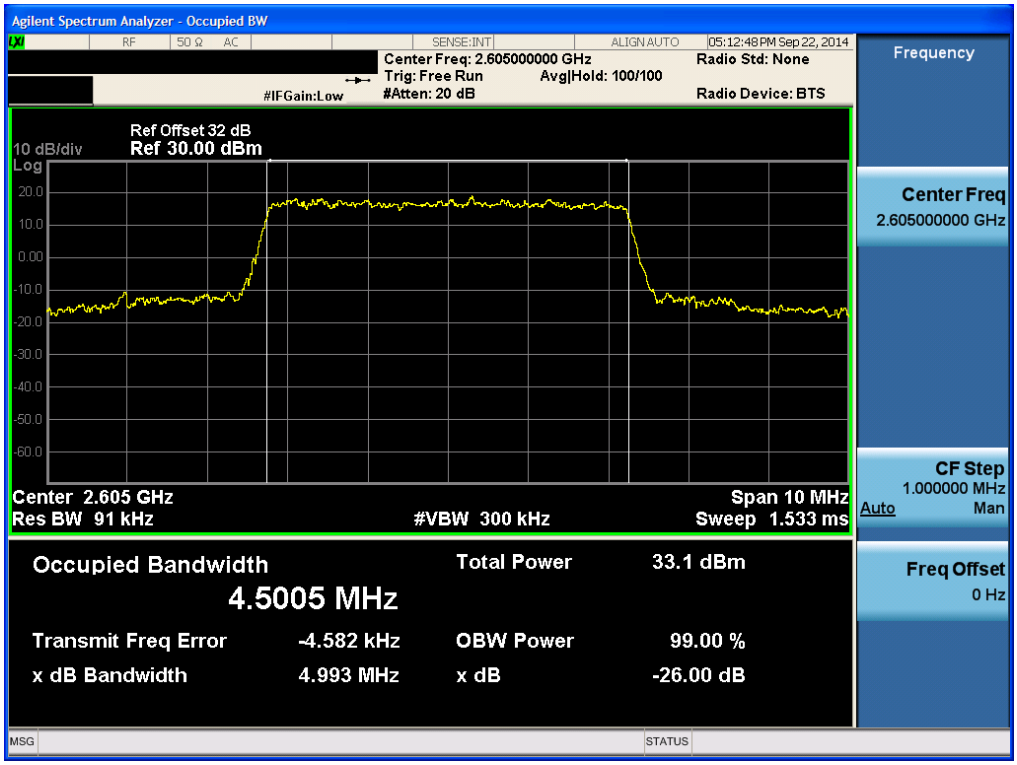
Duty Cycle


Agilent Spectrum Analyzer - Swept SA
RF 50 Ω AC
SENSE:INT
ALIGN AUTO
04:03:55 PM Oct 13, 2014
Marker 3 Δ 5.00000 ms
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 18 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE W
DET P N N N N N
Ref Offset 32 dB
10 dB/div Ref 40.00 dBm
Log
ΔMkr3 5.000 ms
-3.30 dB
1Δ2
3Δ4
30.0
20.0
10.0
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
Center 2.605000000 GHz
Res BW 8 MHz
VBW 8.0 MHz
Span 0 Hz
Sweep 10.00 ms (1001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 Δ2 1 t (Δ) 2.000 ms (Δ) -1.32 dB
2 F 1 t 1.370 ms 24.99 dBm
3 Δ4 1 t (Δ) 5.000 ms (Δ) -3.30 dB
4 F 1 t 1.370 ms 24.99 dBm
5
6
7
8
9
10
11
12
Marker
Select Marker 3
Normal
Delta
Fixed
Off
Properties
More 1 of 2
MSG
STATUS

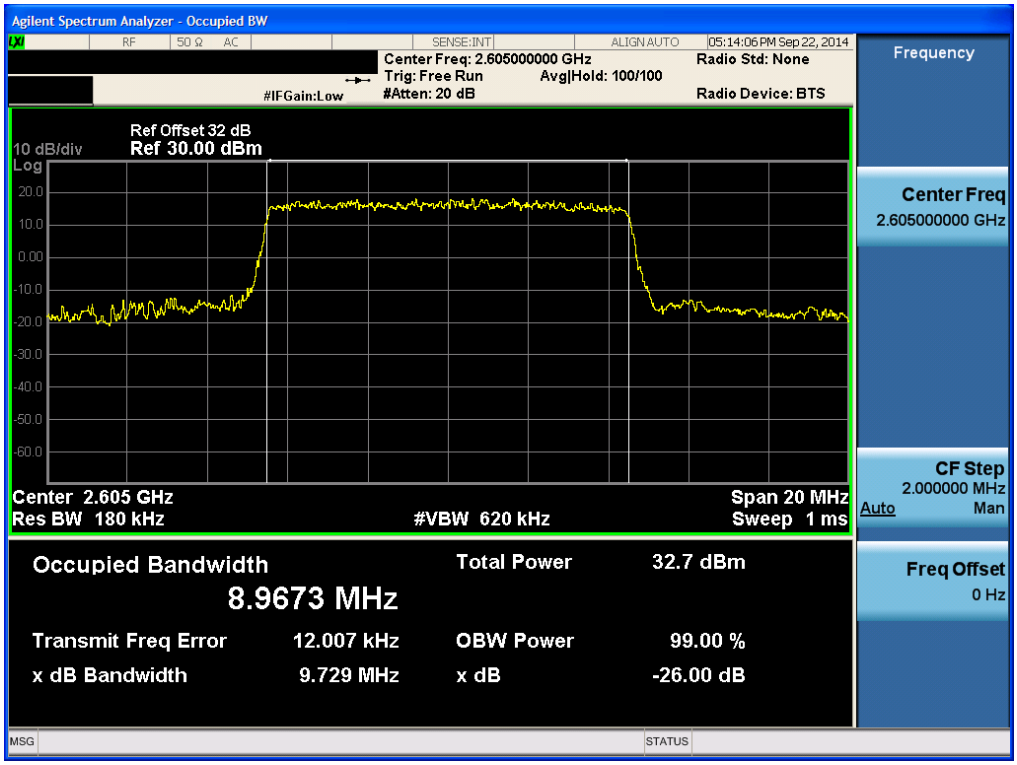
Occupied Bandwidth Plot (5 MHz BW Ch.40740 QPSK_ RB Size 25)



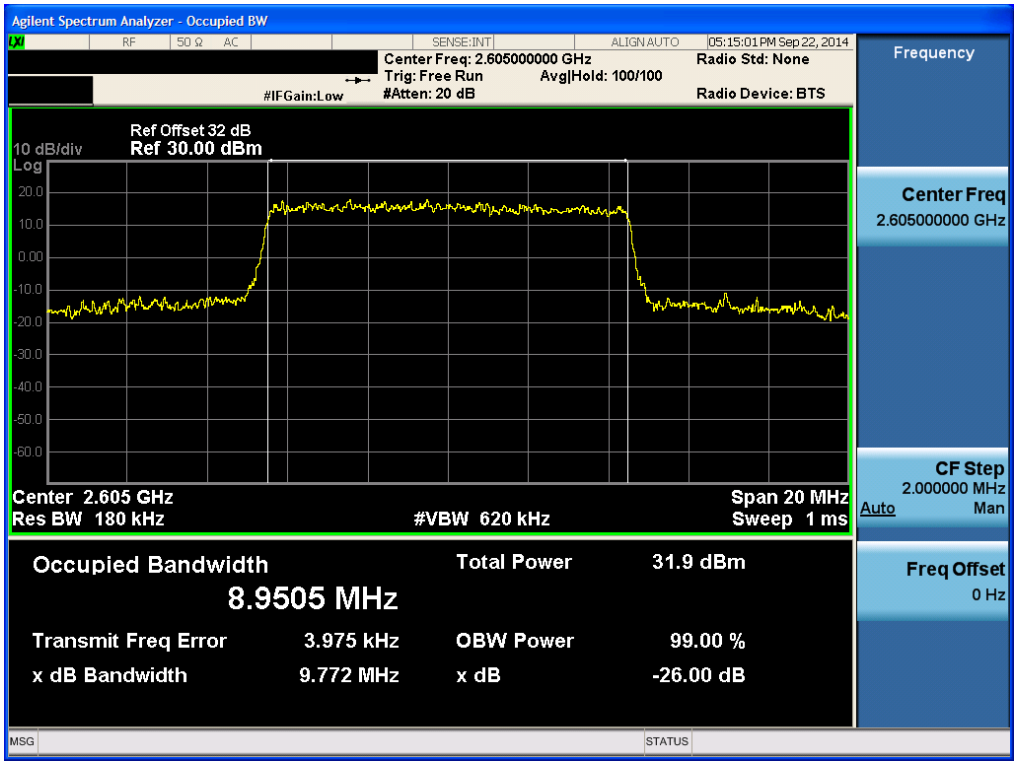
Occupied Bandwidth Plot (5 MHz BW Ch.40740 16-QAM _ RB Size 25)



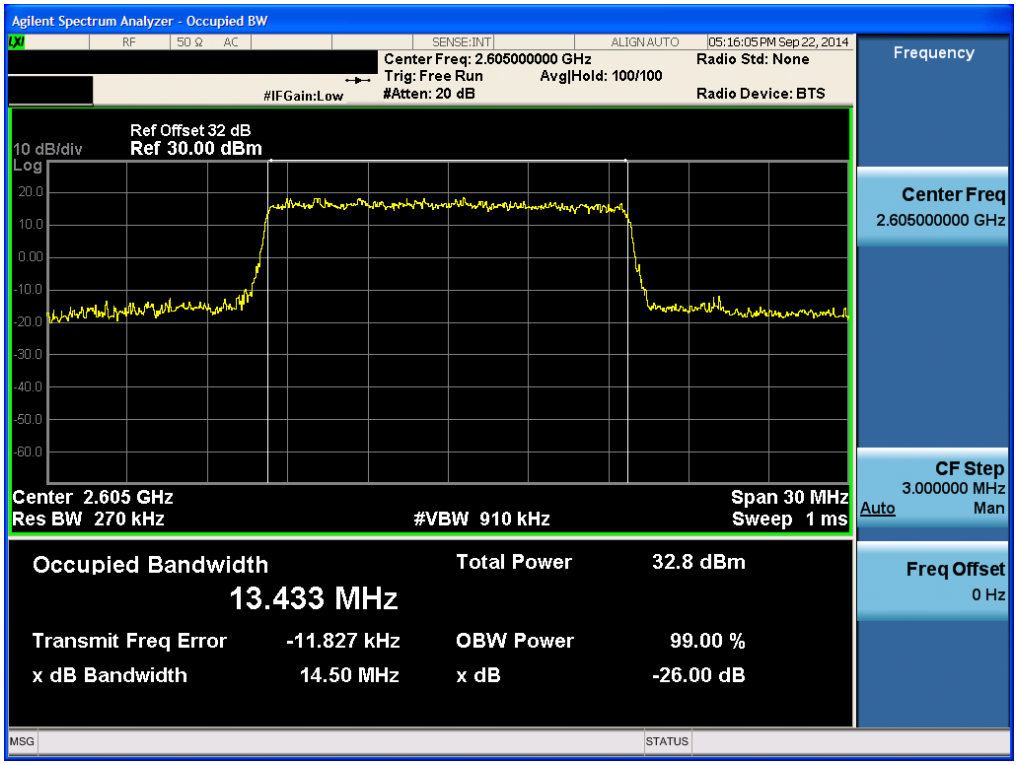
Occupied Bandwidth Plot (10 MHz BW Ch.40740 QPSK_ RB Size 50)



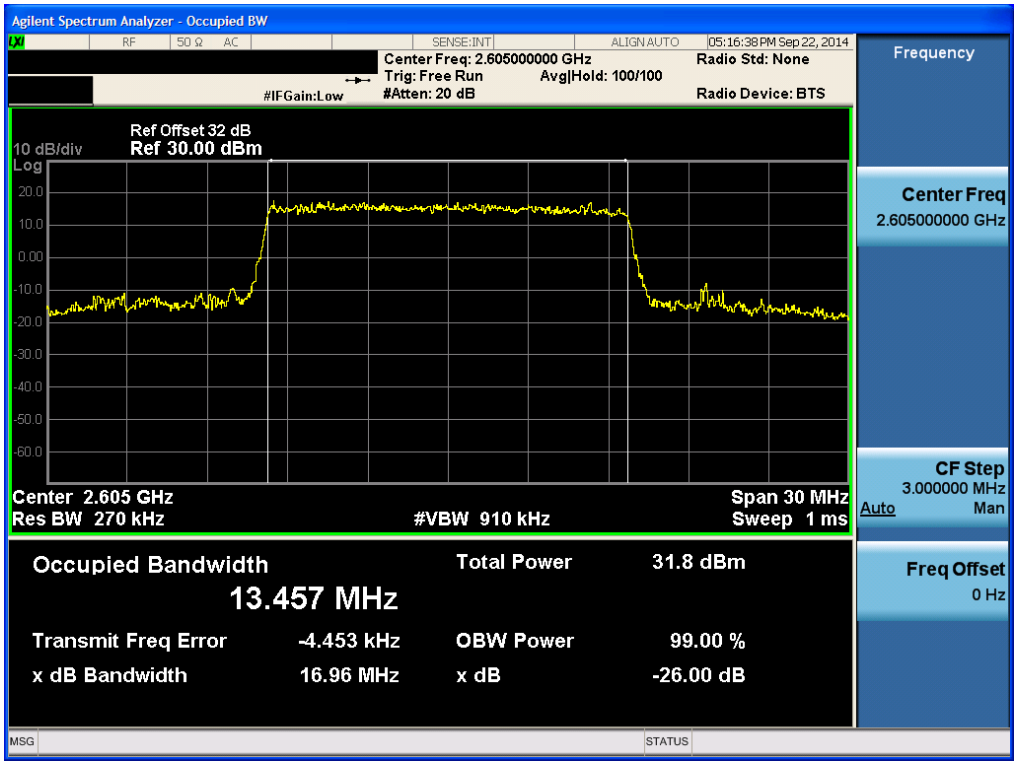
Occupied Bandwidth Plot (10 MHz BW Ch.40740 16-QAM _ RB Size 50)



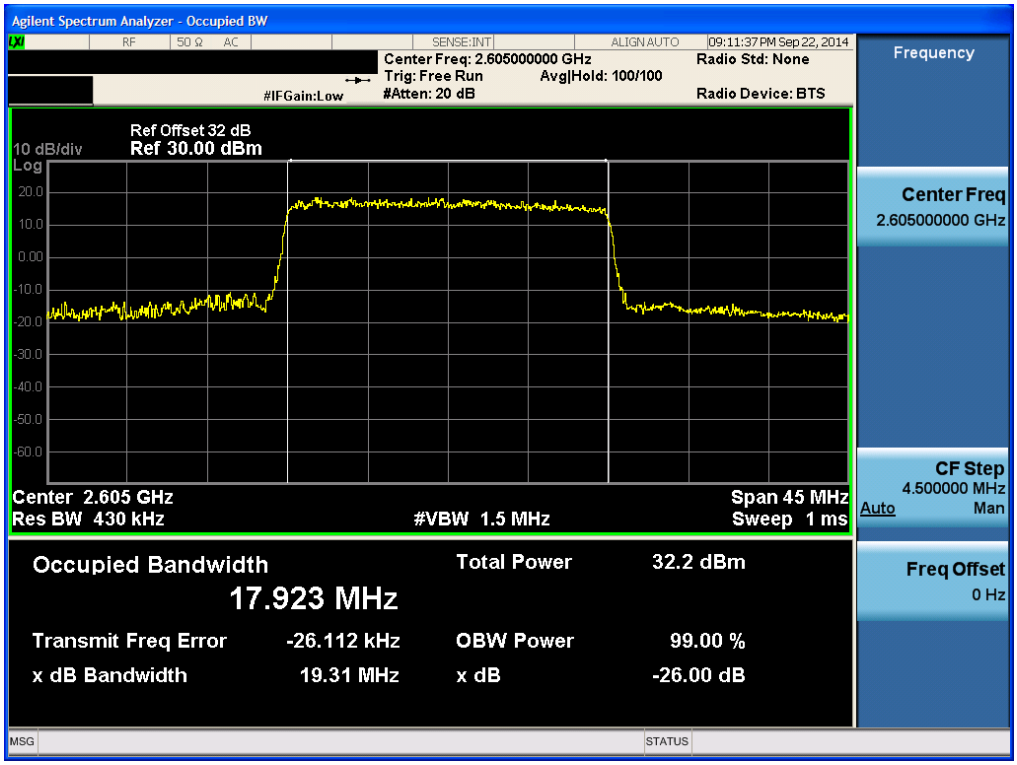
Occupied Bandwidth Plot (15 MHz BW Ch.40740 QPSK_ RB Size 75)



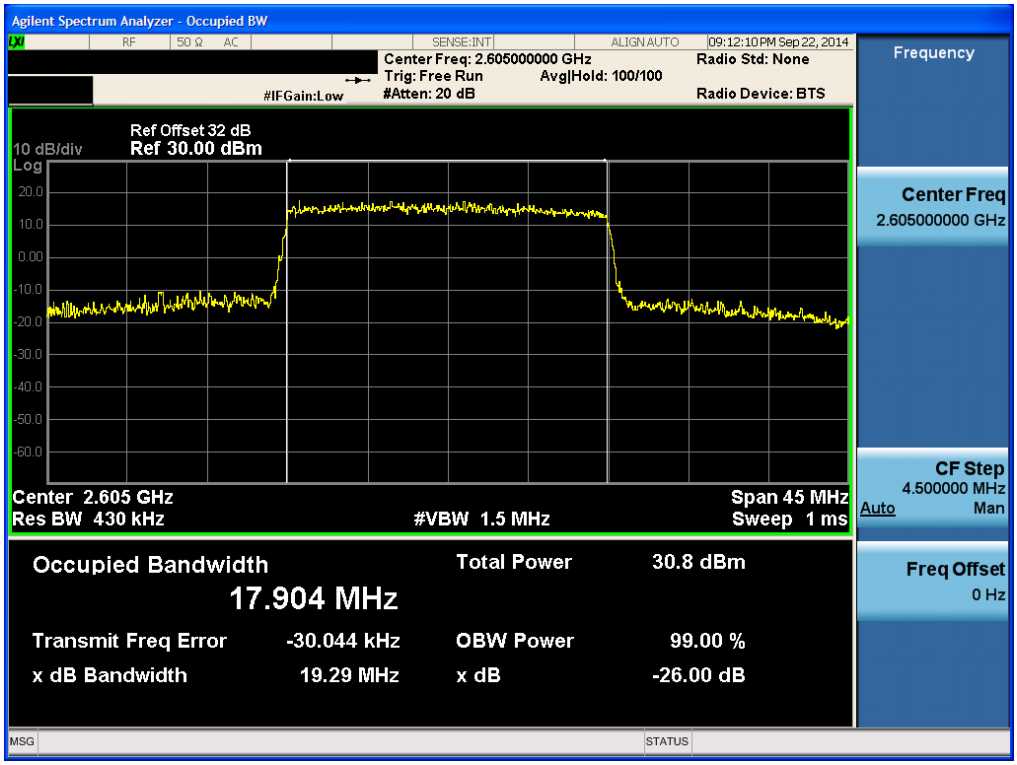
Occupied Bandwidth Plot (15 MHz BW Ch.40740 16-QAM _ RB Size 75)



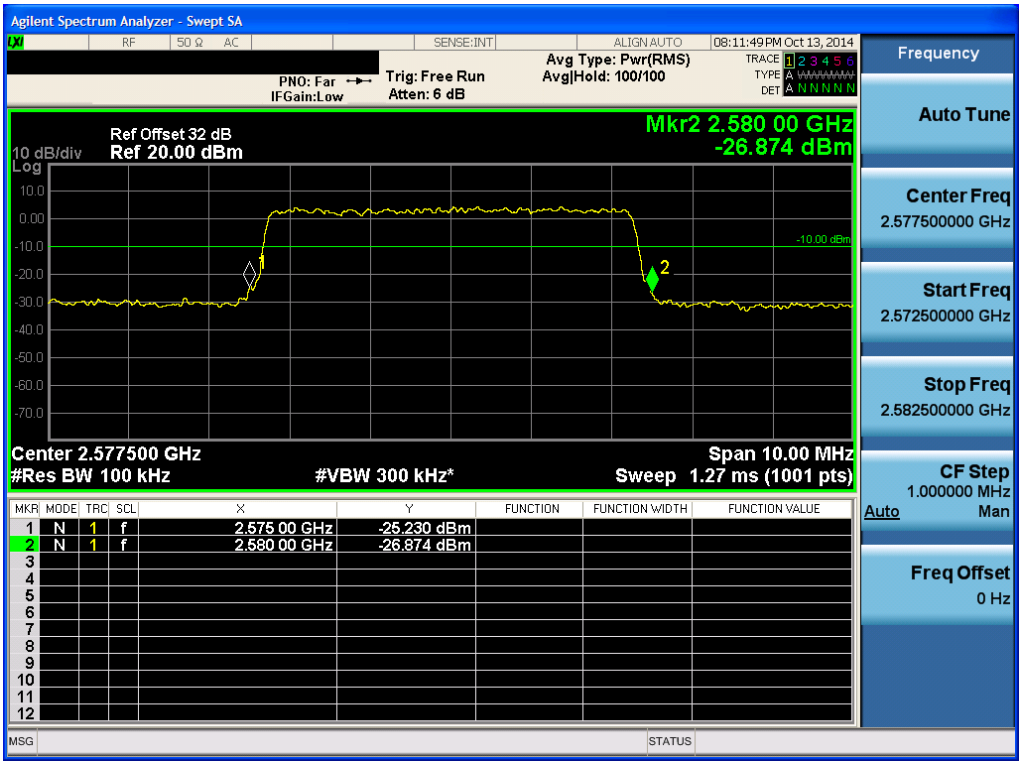
Occupied Bandwidth Plot (20 MHz BW Ch.40740 QPSK_ RB Size 100)



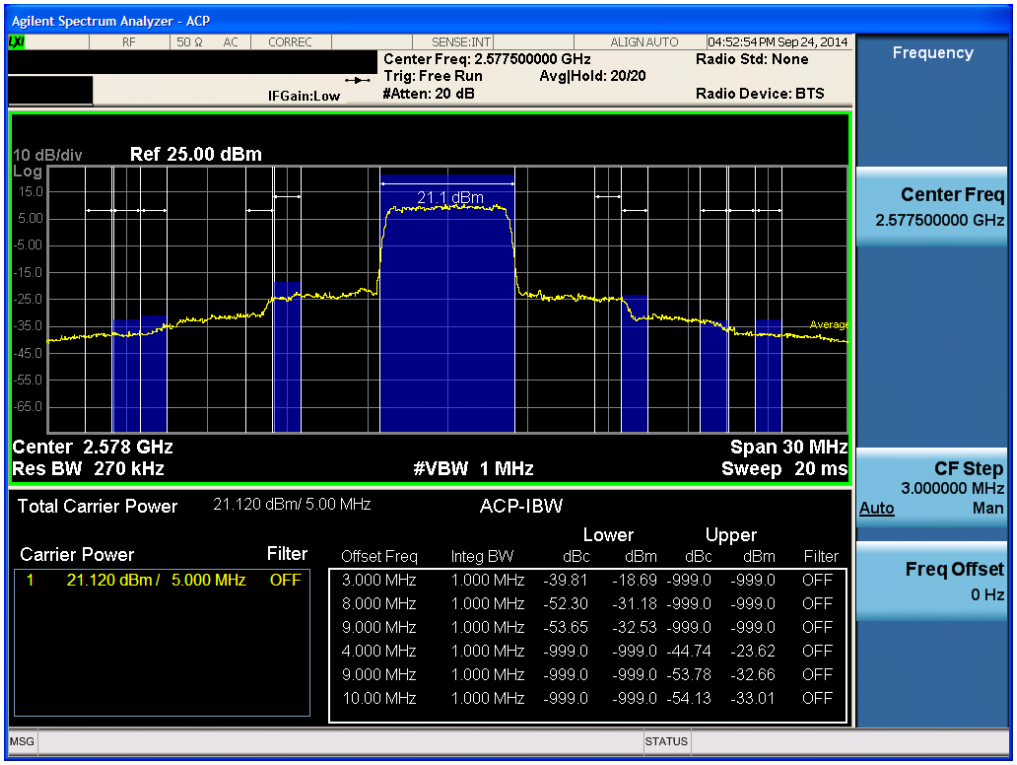
Occupied Bandwidth Plot (20 MHz BW Ch.40740 16-QAM _ RB Size 100)



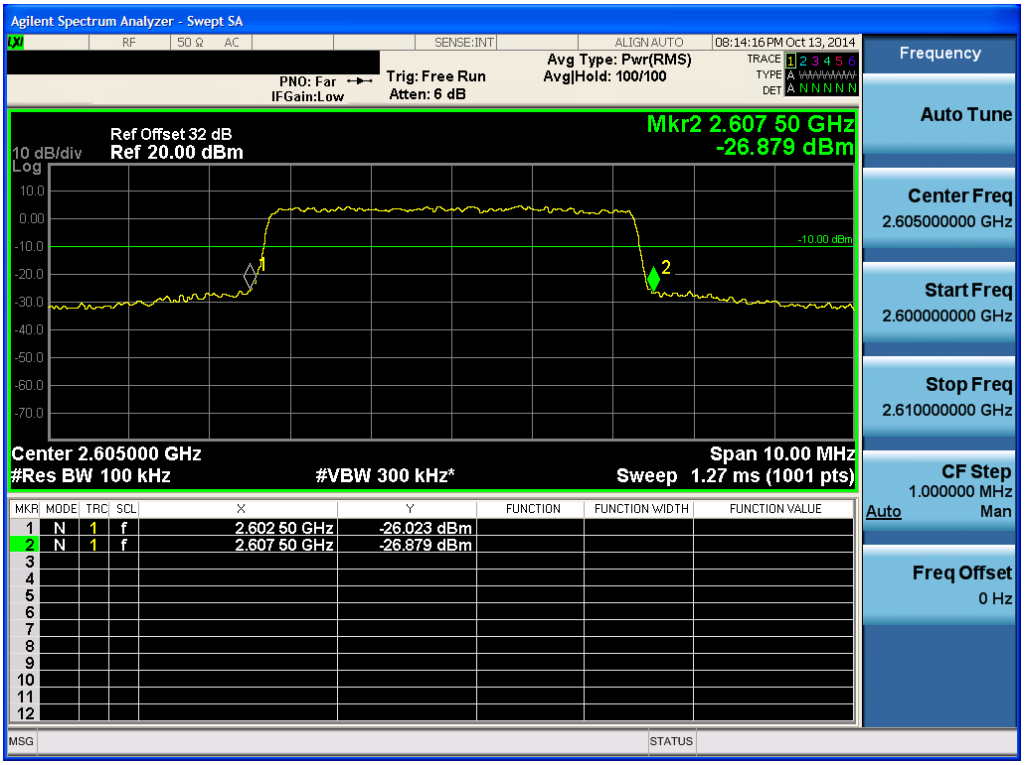
Lower Plot (5 MHz Ch.40465 QPSK -RB size 25)-1



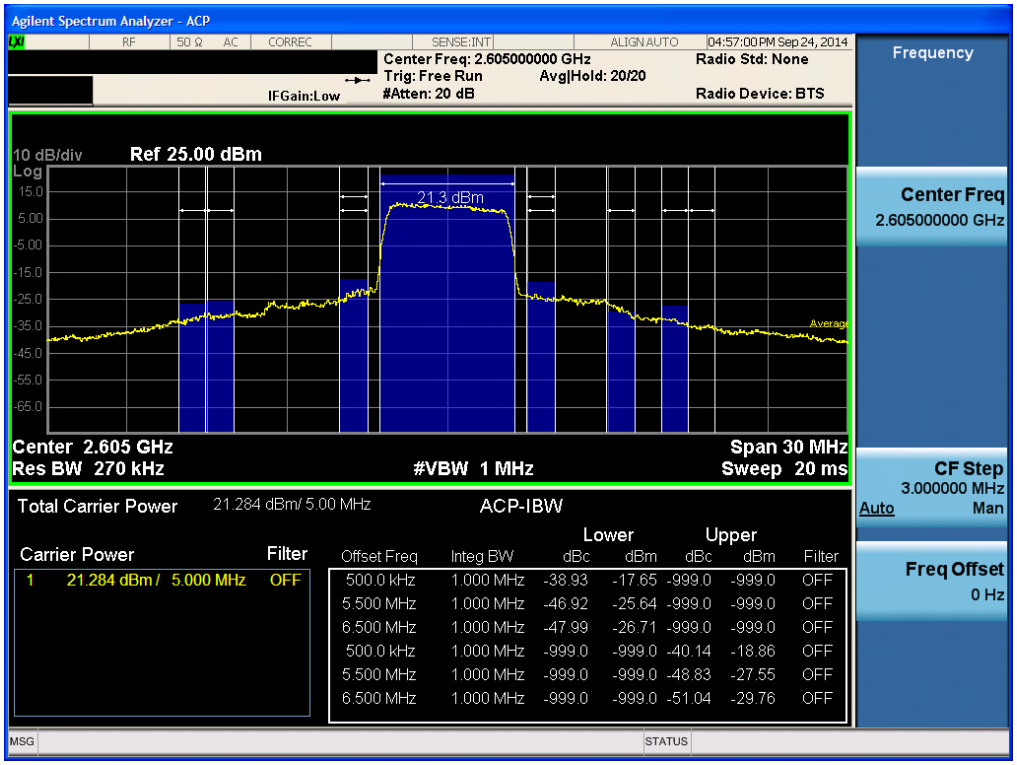
Lower ACP Plot (5 MHz Ch.40465 QPSK -RB size 25)-2



Middle Plot (5 MHz Ch.40740 QPSK -RB size 25)-3

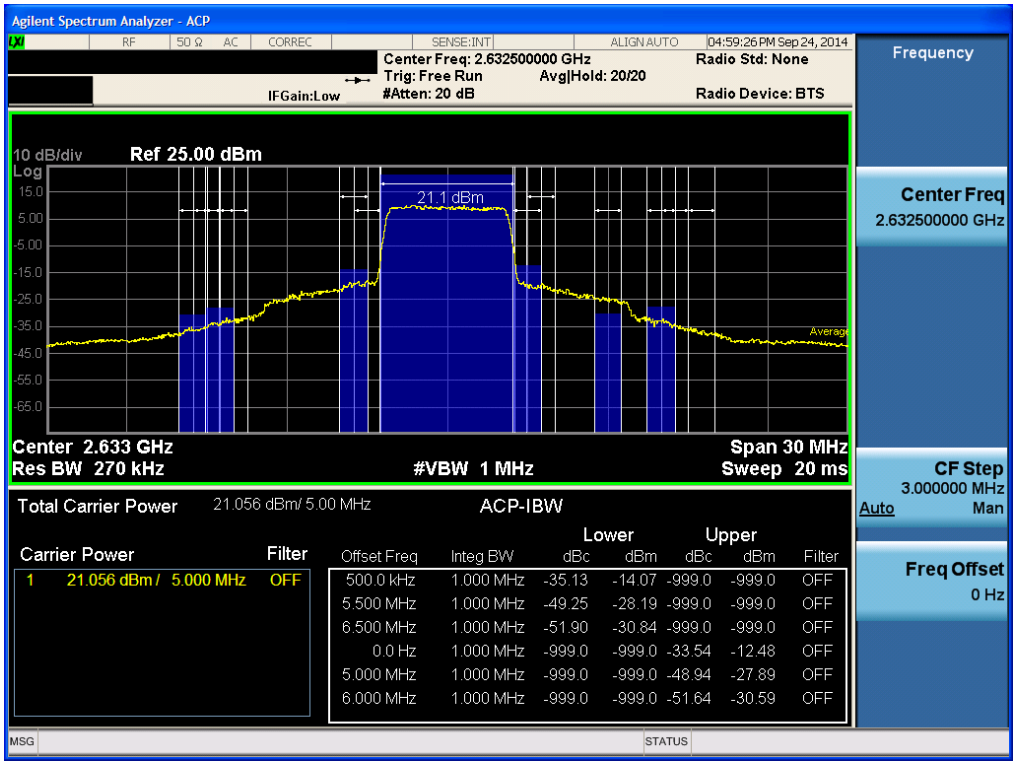


Middle ACP Plot (5 MHz Ch.40740 QPSK -RB size 25)-4

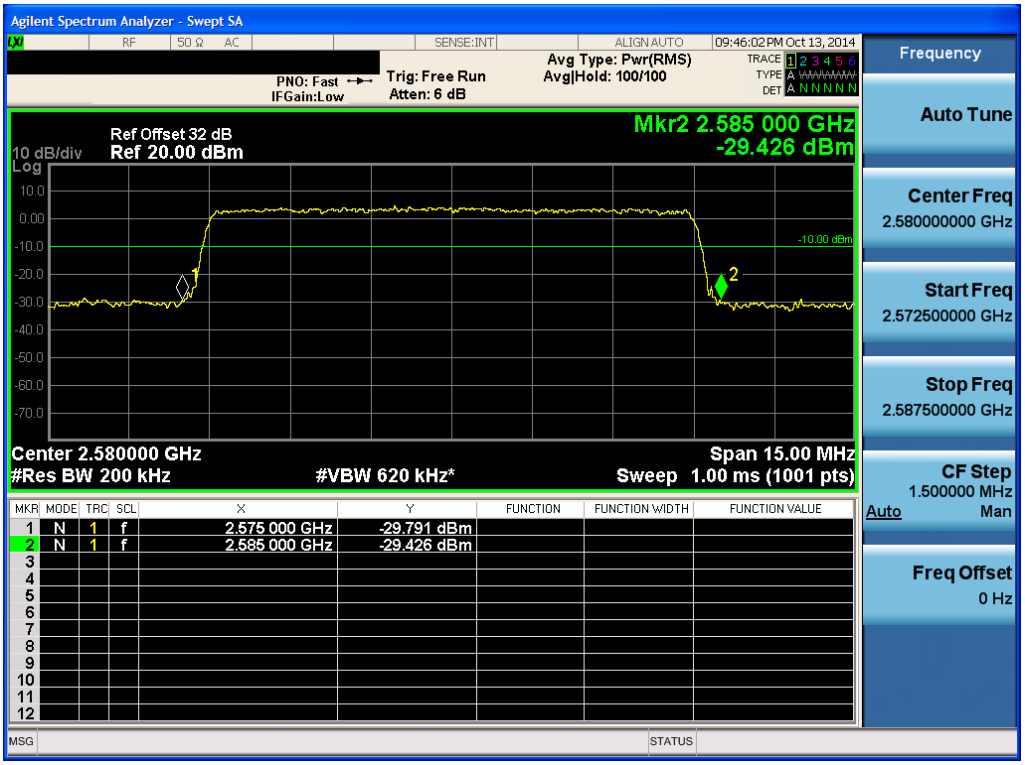


High Plot (5 MHz Ch.41015 QPSK -RB size 25)-5

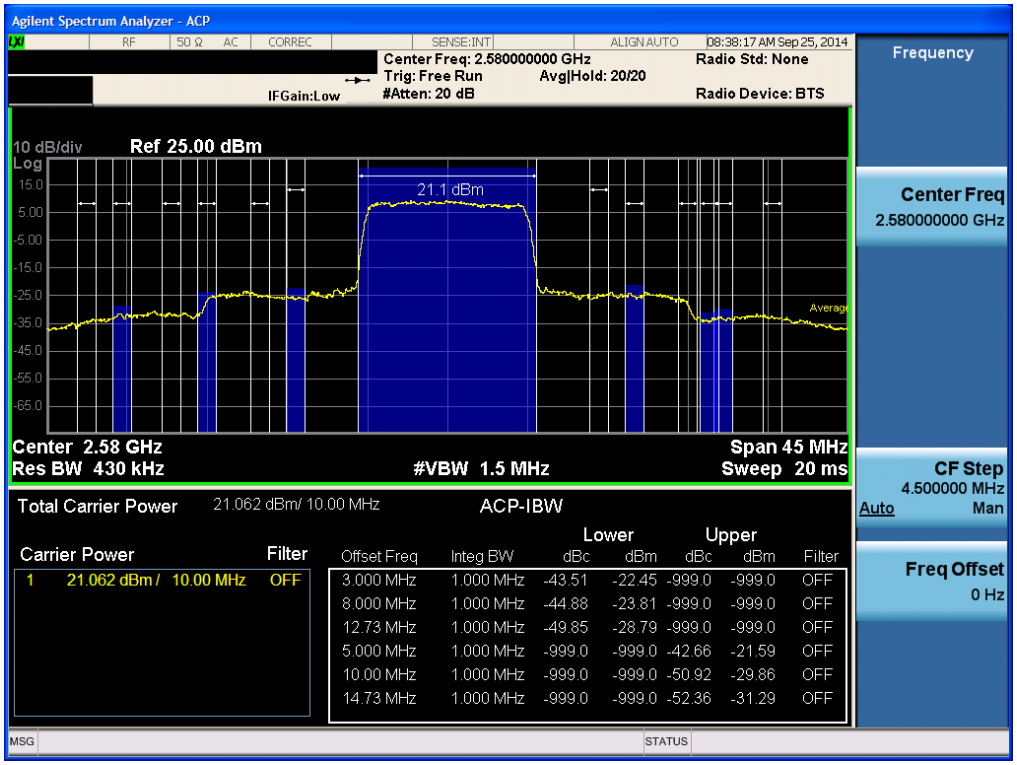
High ACP Plot (5 MHz Ch.41015 QPSK -RB size 25)-6



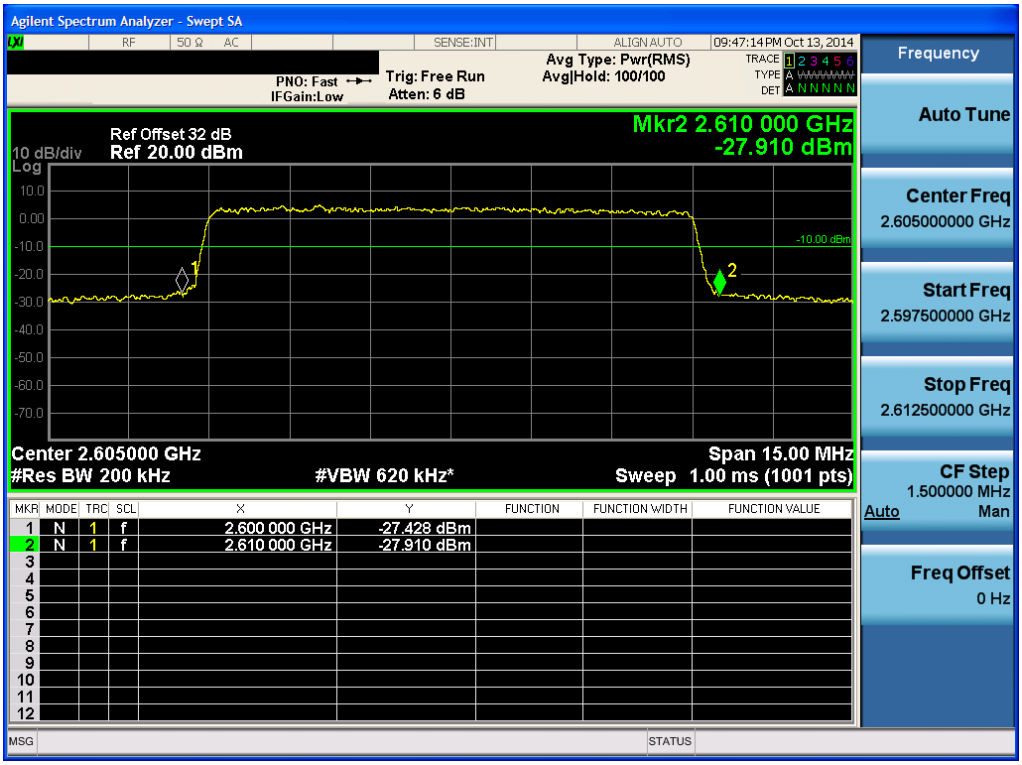
Lower Plot (10 MHz Ch.40490 QPSK -RB size 50)-1



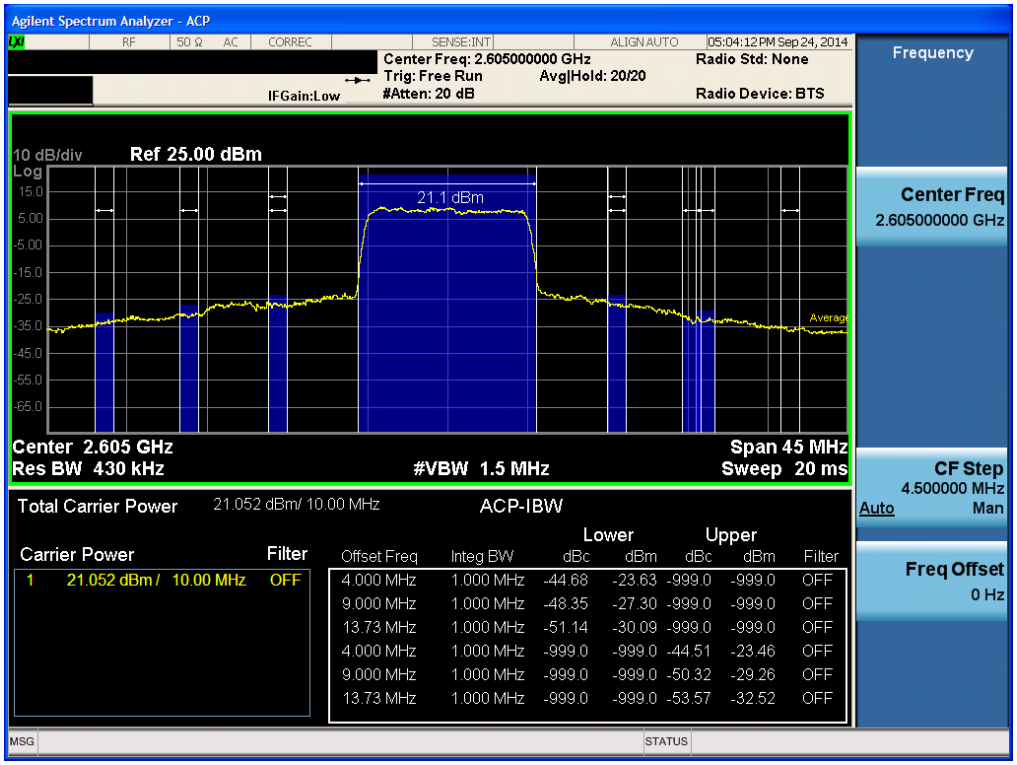
Lower ACP Plot (10 MHz Ch.40490 QPSK -RB size 50)-2



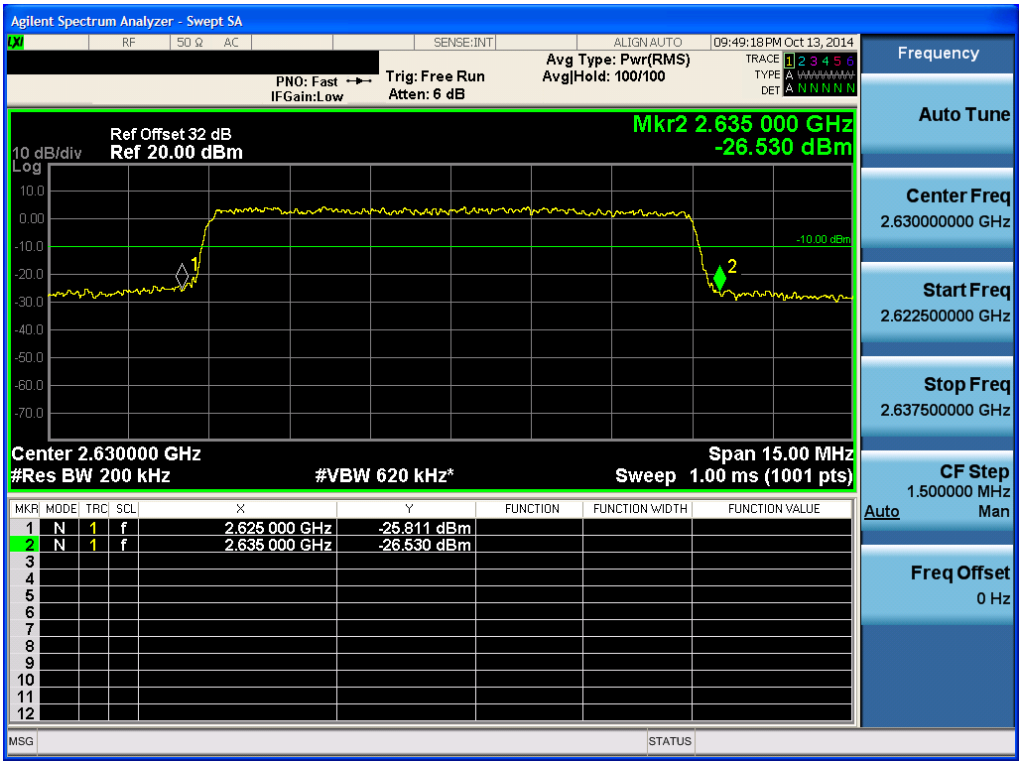
Middle Plot (10 MHz Ch.40740 QPSK -RB size 50)-3



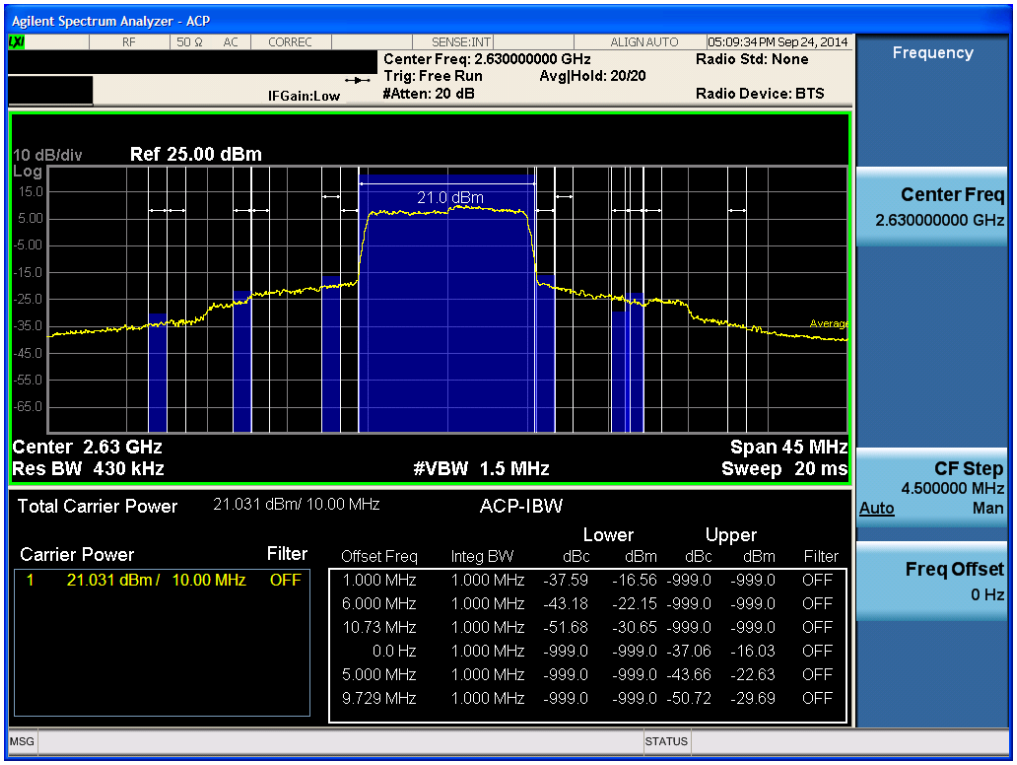
Middle ACP Plot (10 MHz Ch.40740 QPSK -RB size 50)-4



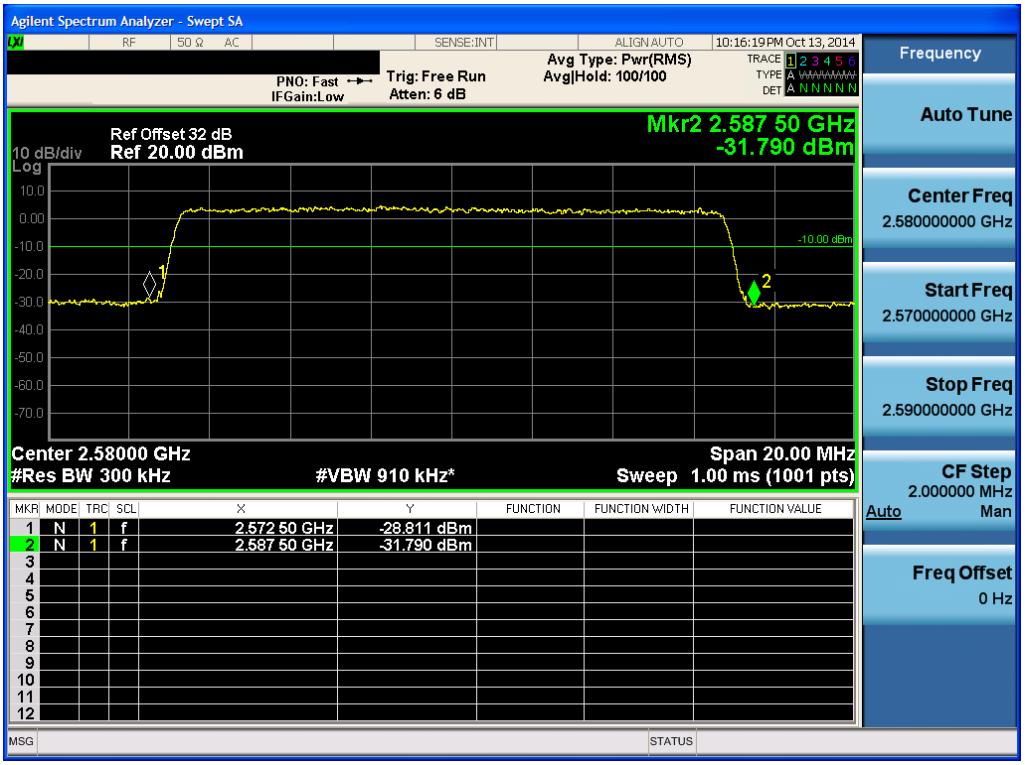
High Plot (10 MHz Ch.40990 QPSK -RB size 50)-5



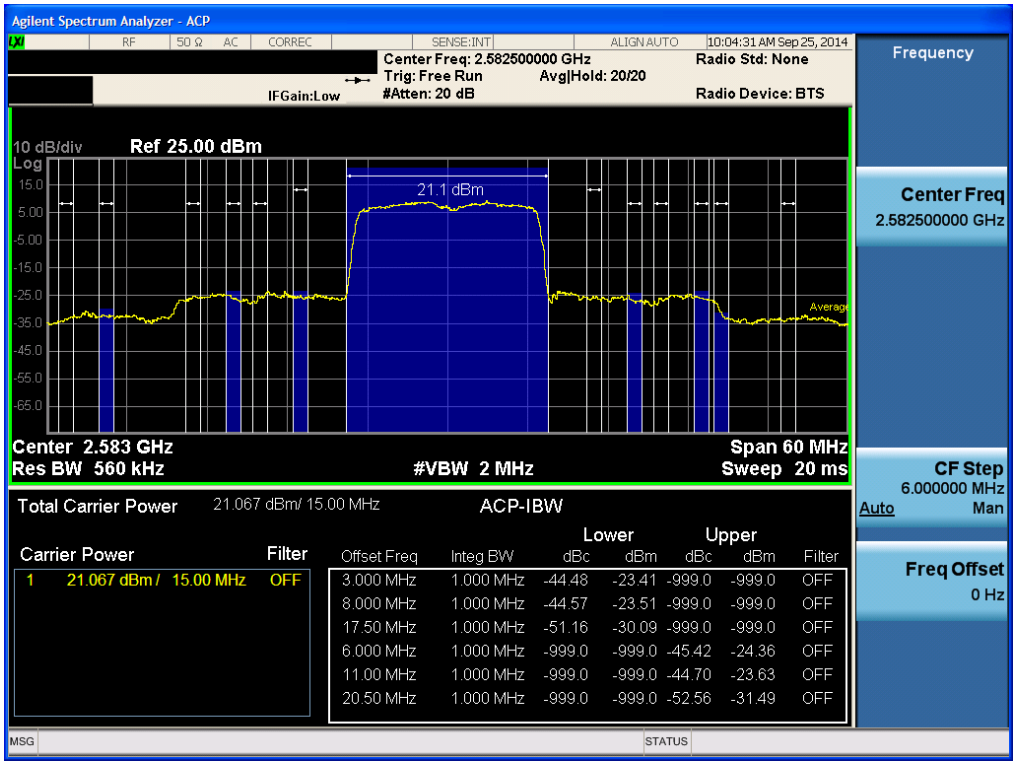
High ACP Plot (10 MHz Ch.40990 QPSK -RB size 50)-6



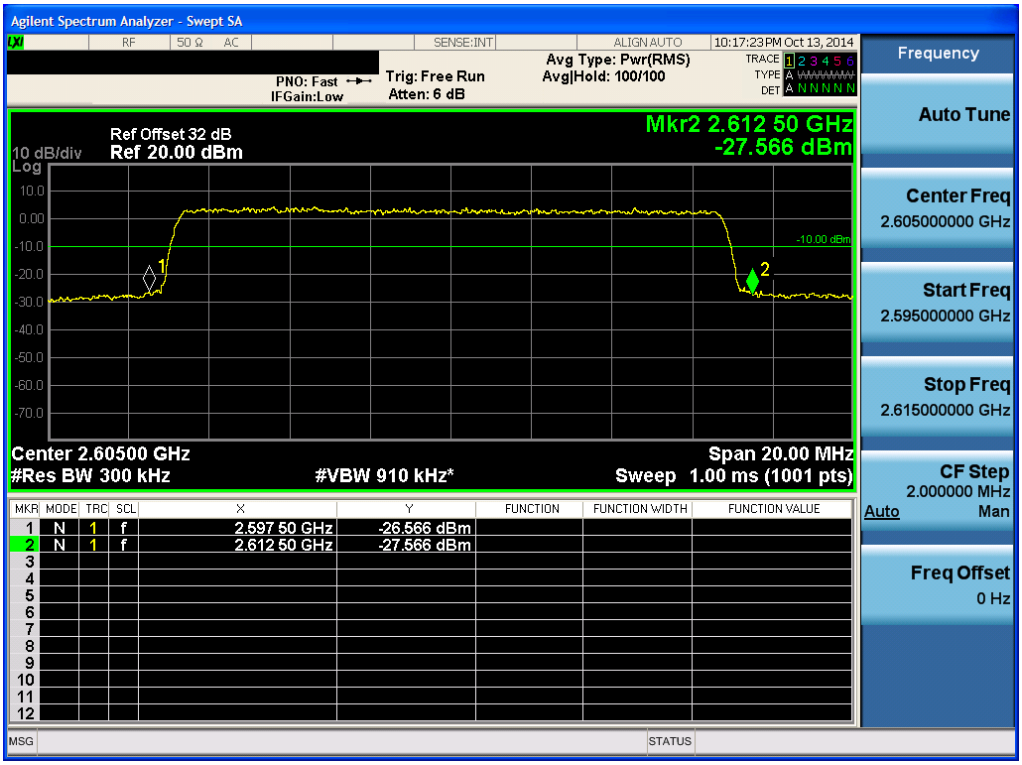
Lower Plot (15 MHz Ch.40515 QPSK -RB size 75)-1



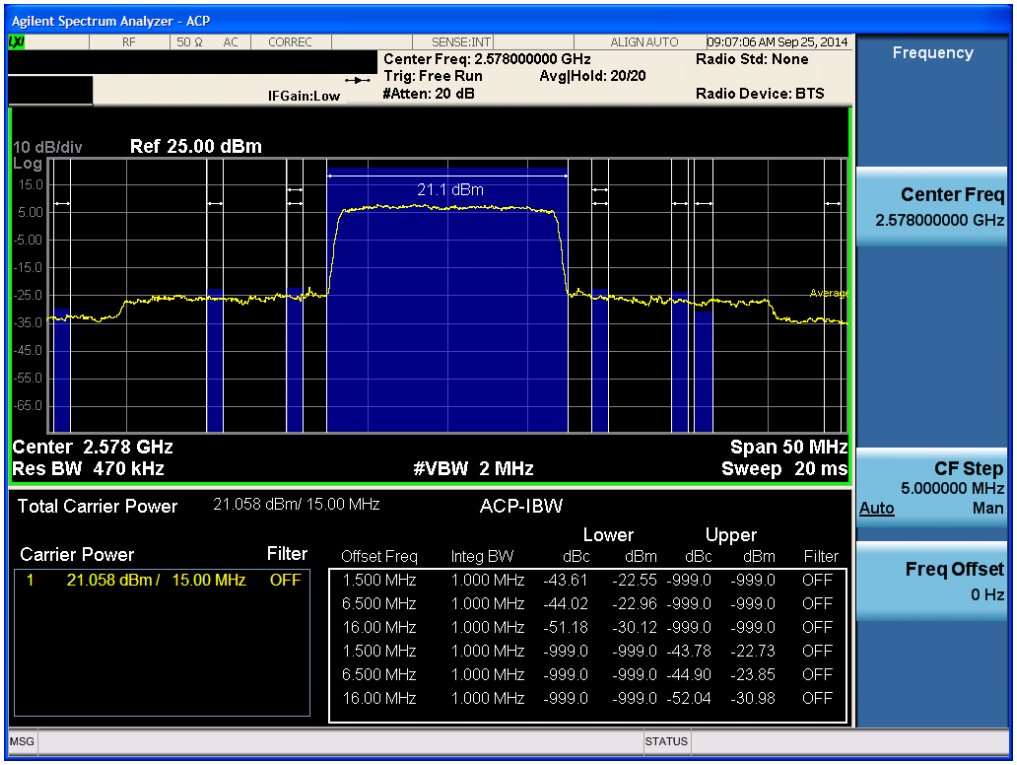
Lower ACP Plot (15 MHz Ch.40515 QPSK -RB size 75)-2



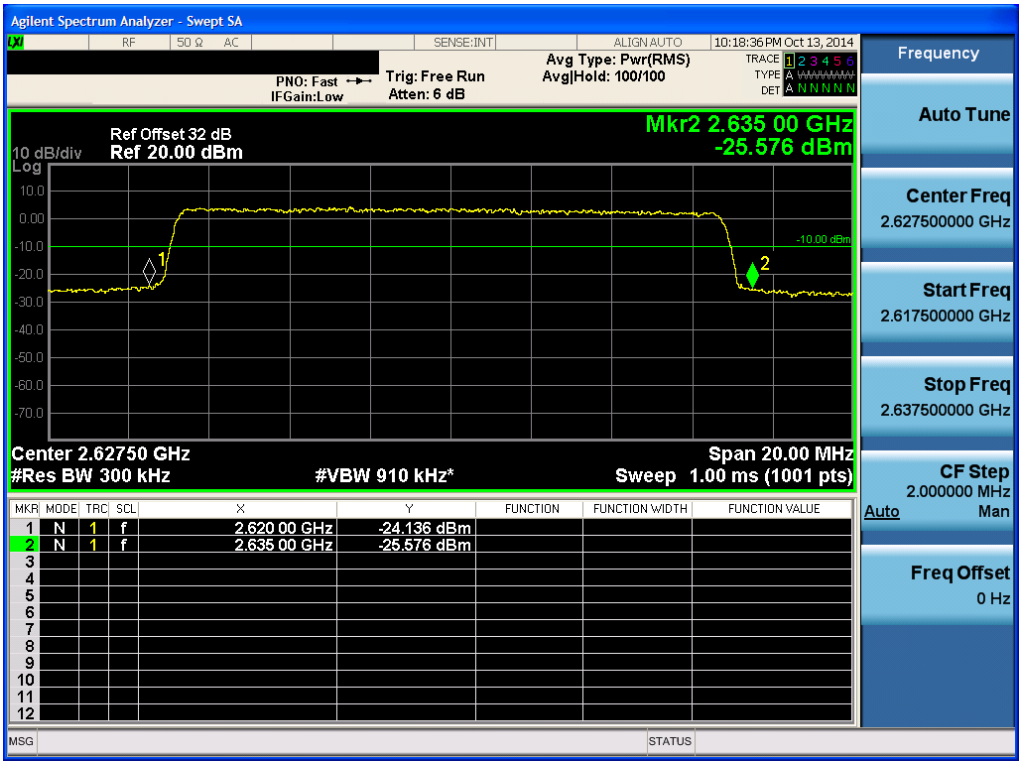
Middle Plot (15 MHz Ch.40740 QPSK -RB size 75)-3



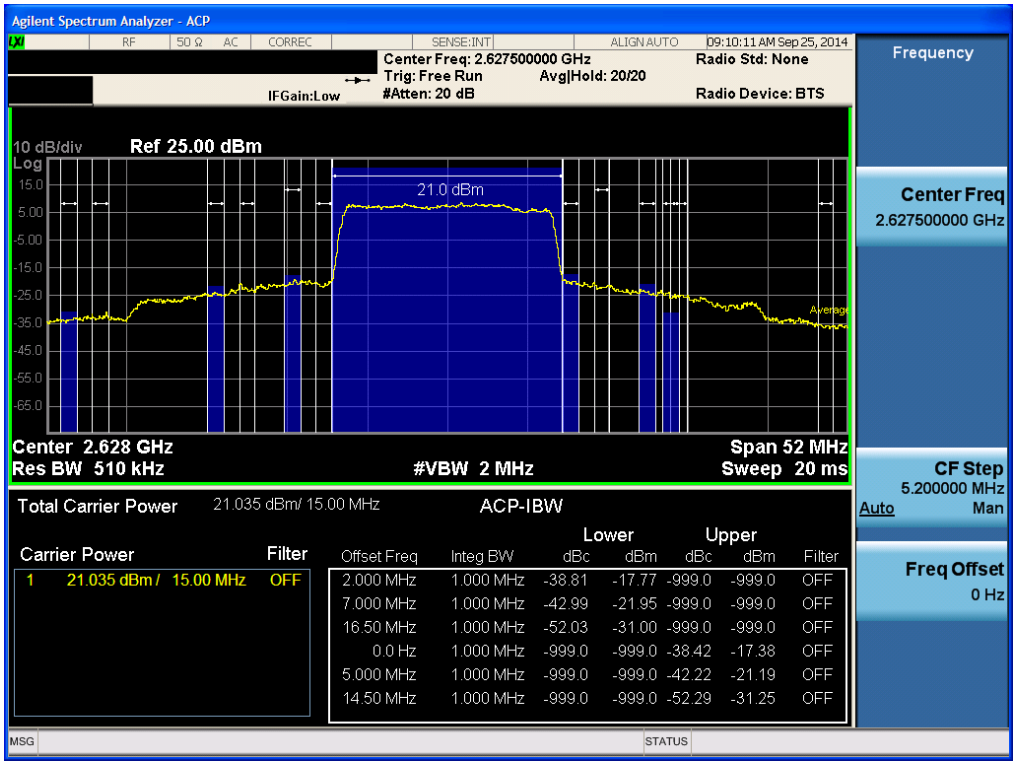
Middle ACP Plot (15 MHz Ch.40740 QPSK -RB size 75)-4



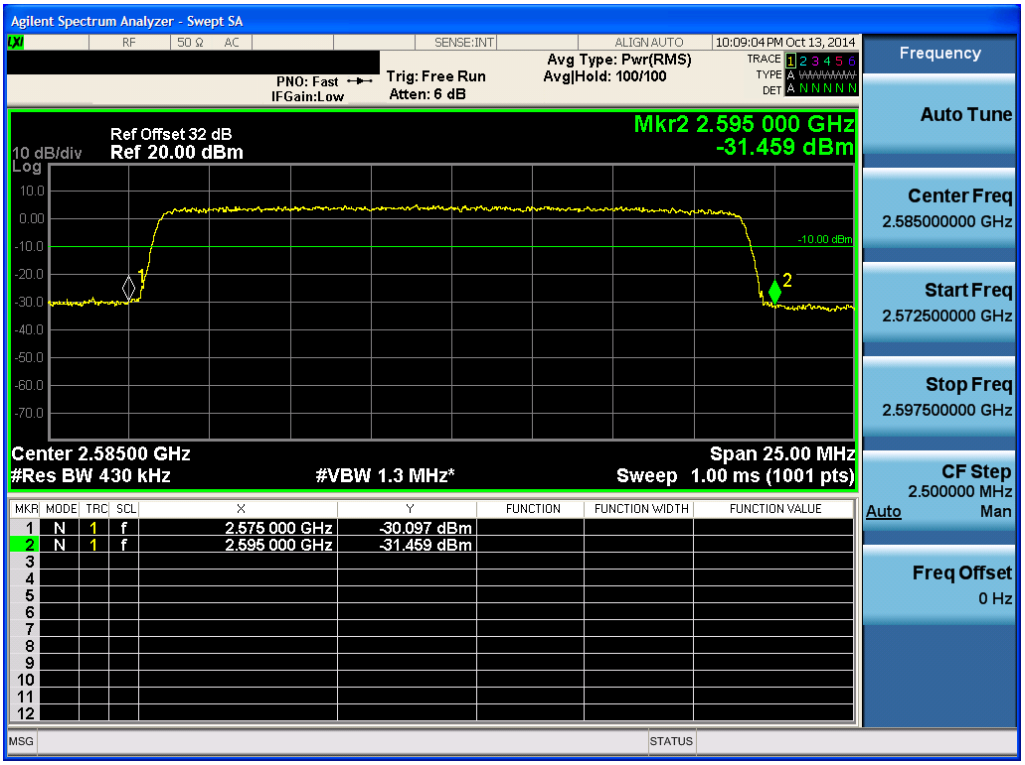
High ACP Plot (15 MHz Ch.40965 QPSK -RB size 75)-5



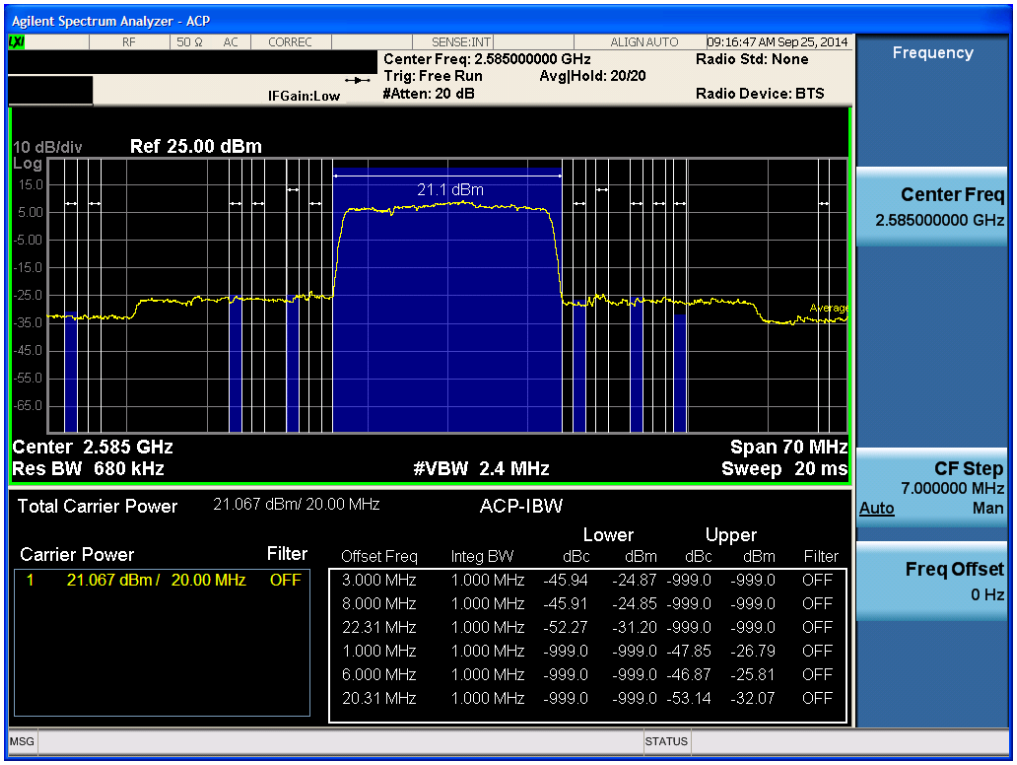
High Plot (15 MHz Ch.40965 QPSK -RB size 75)-6



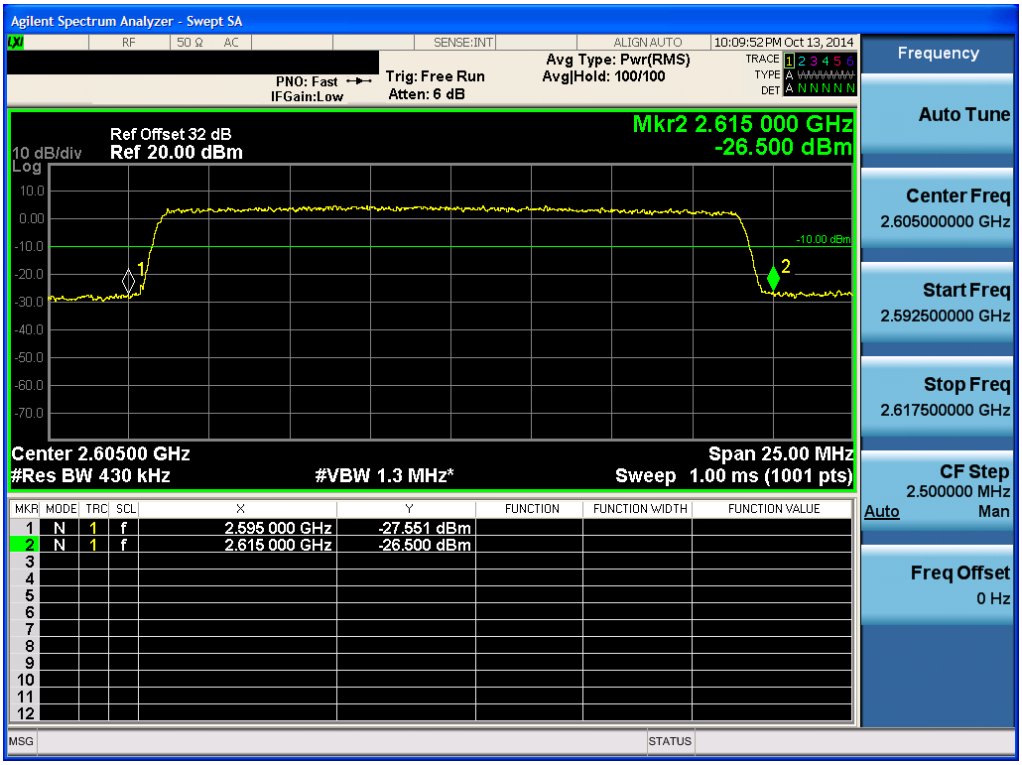
Lower Plot (20 MHz Ch.40540 QPSK -RB size 100)-1



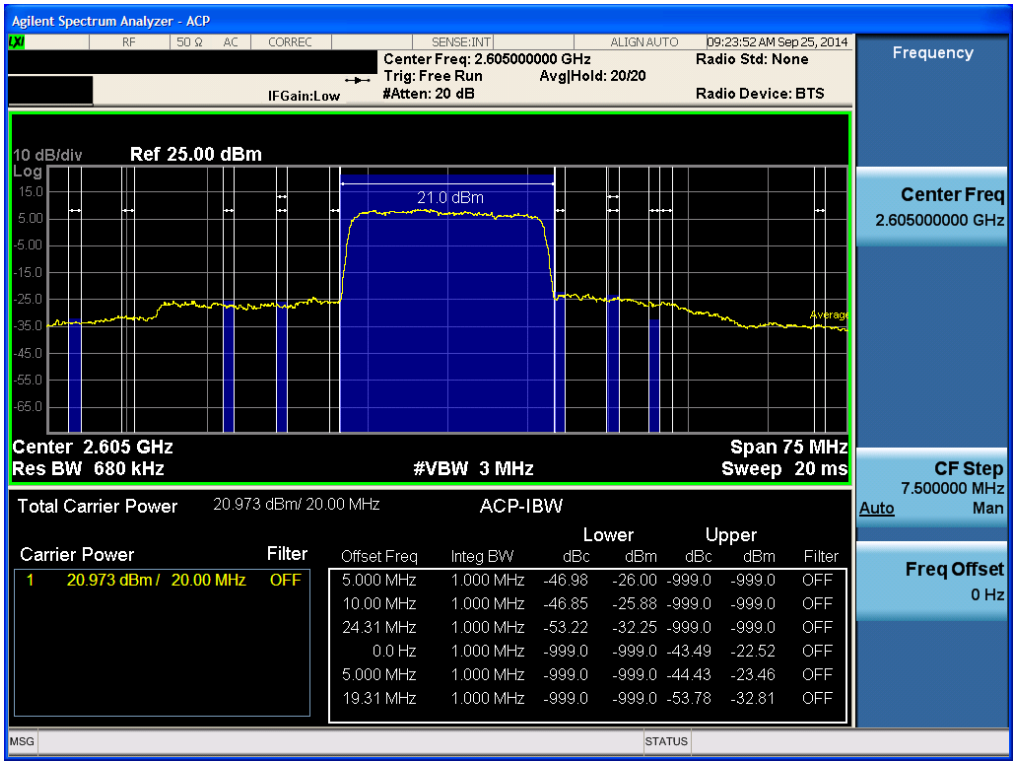
Lower ACP Plot (20 MHz Ch.40540 QPSK -RB size 100)-2



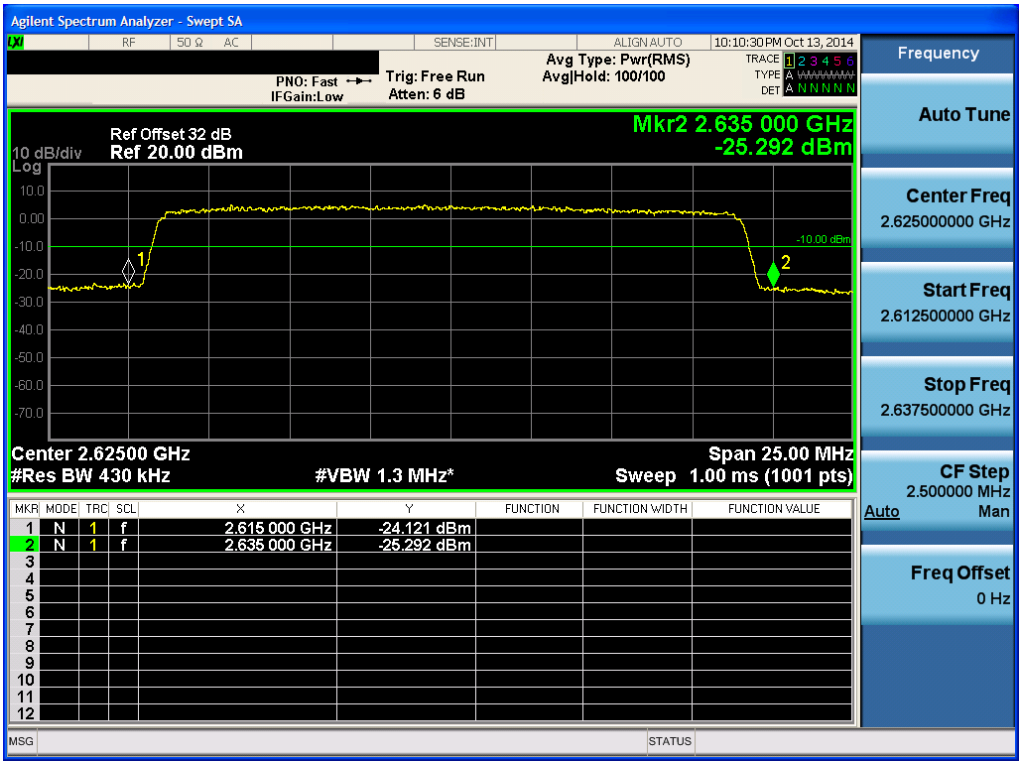
Middle Plot (20 MHz Ch.40740 QPSK -RB size 75)-3



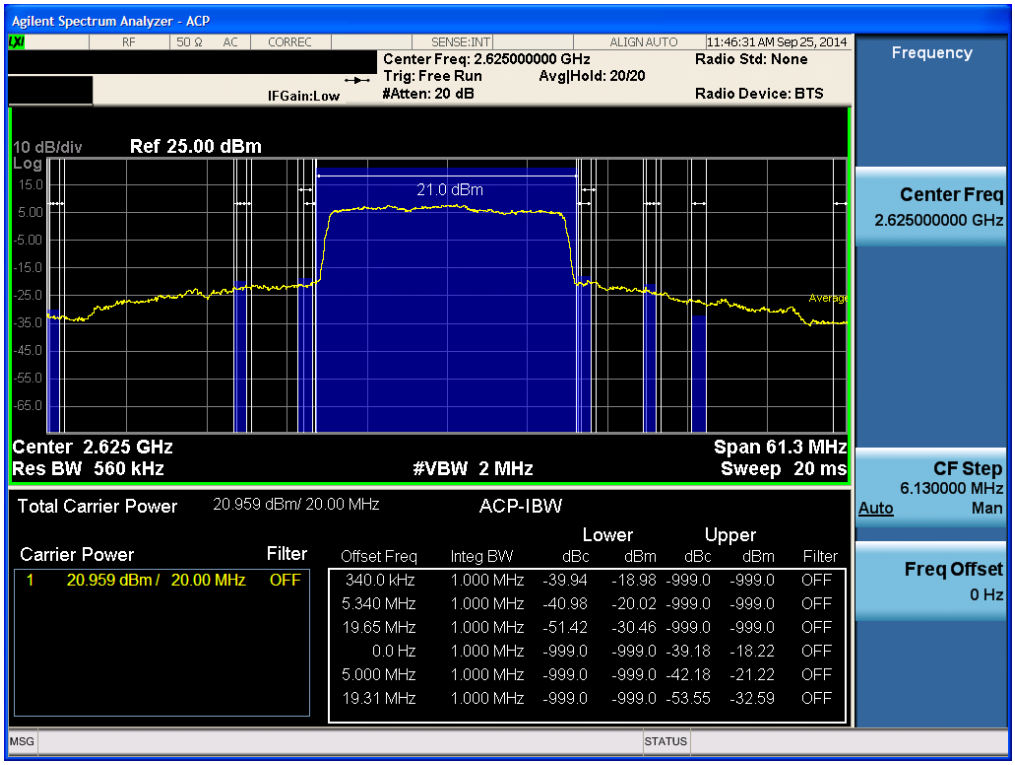
Middle ACP Plot (20 MHz Ch.40740 QPSK -RB size 75)-4



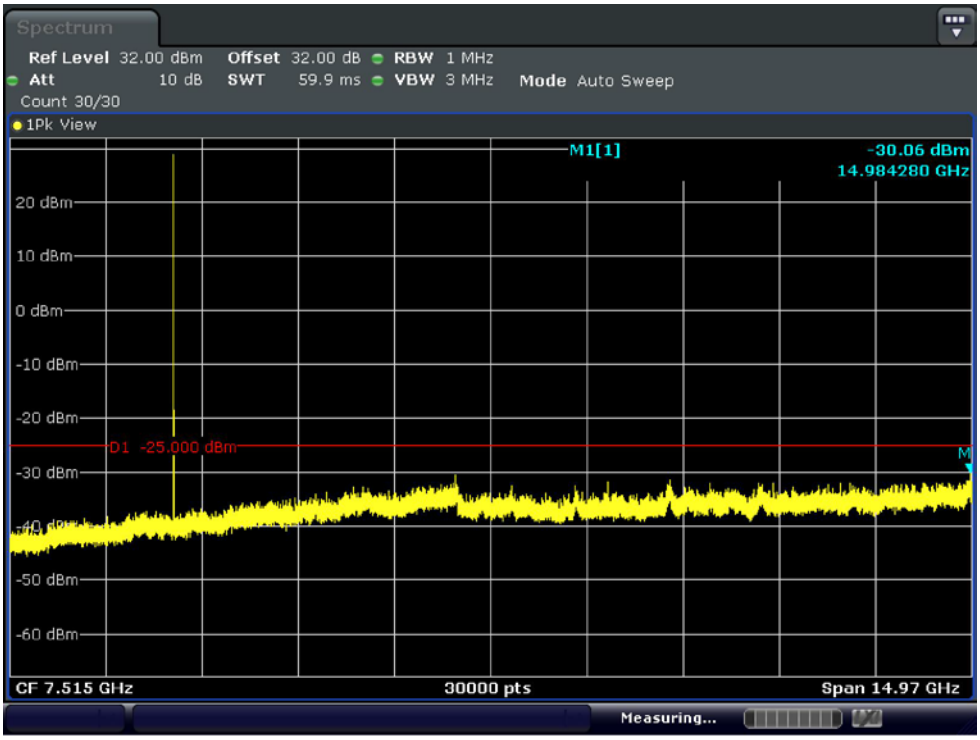
High Plot (20 MHz Ch.40940 QPSK -RB size 100)-5



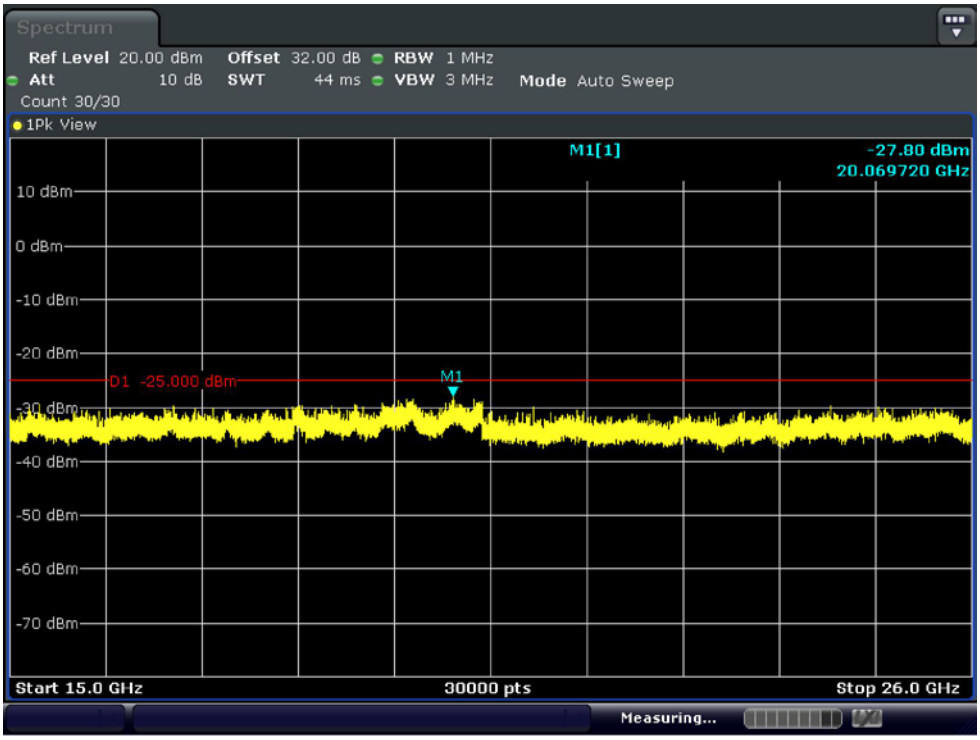
High ACP Plot (20 MHz Ch.40940 QPSK -RB size 100)-6



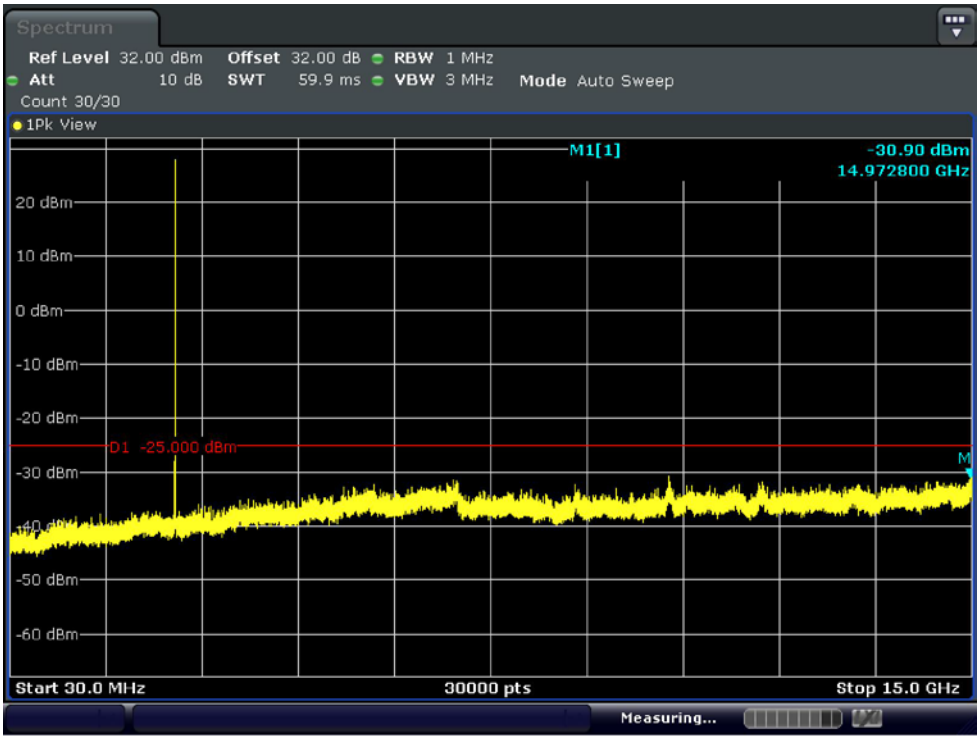
Conducted Spurious Plot (Low ch_5 MHz_QPSK_RB 1_0) -1



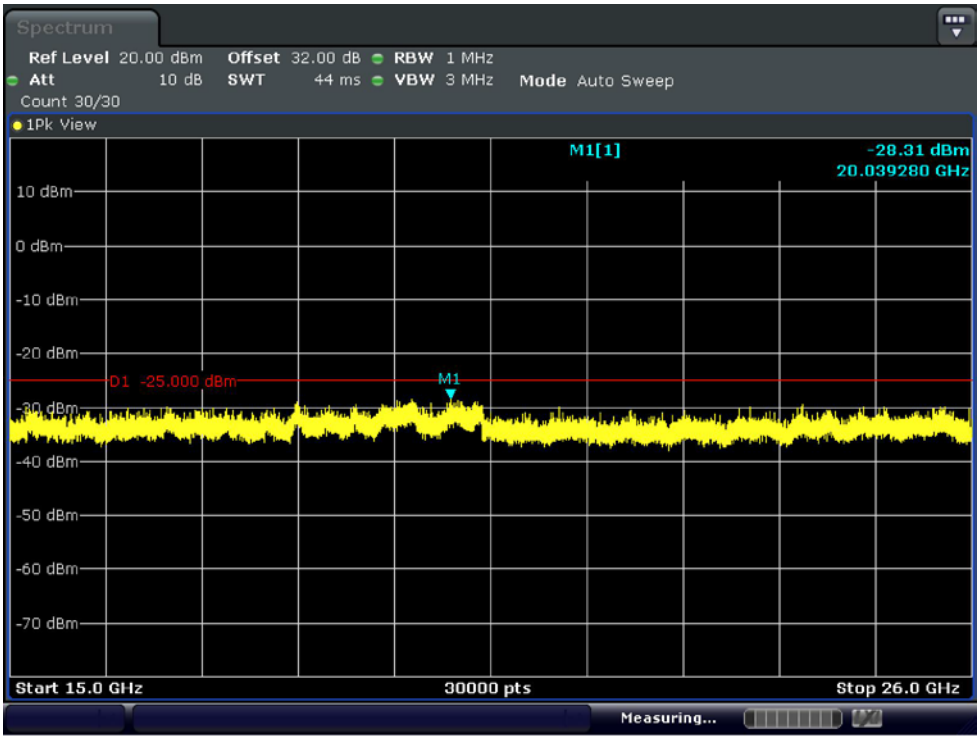
Conducted Spurious Plot (Low ch_5 MHz_QPSK_RB 1_0) -2



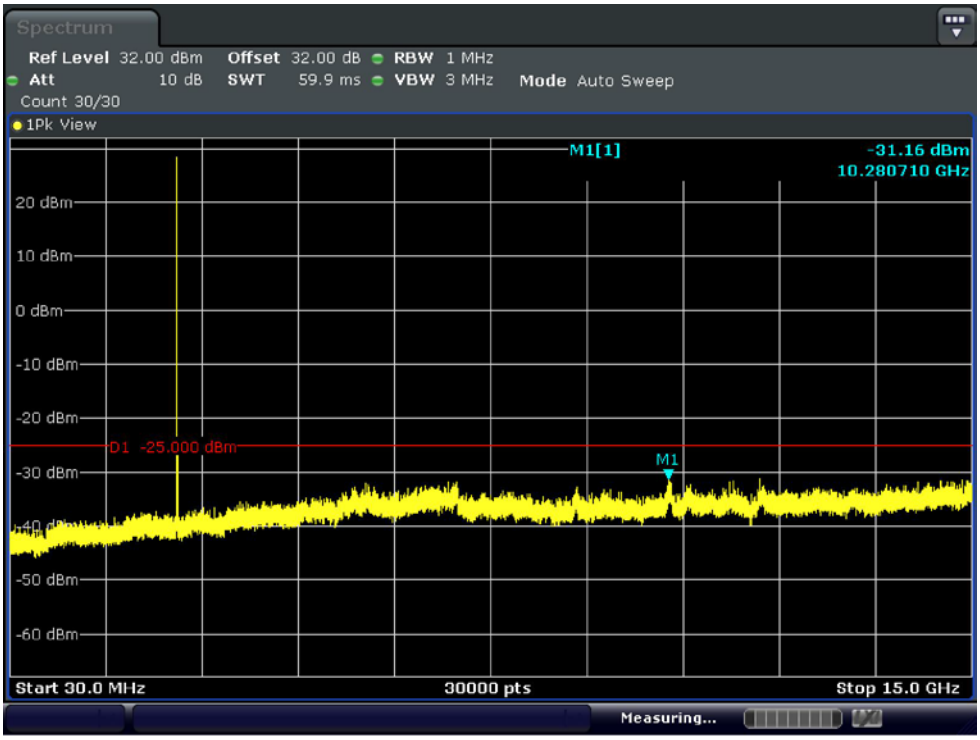
Conducted Spurious Plot (Mid ch_5 MHz_QPSK_RB 1_0) -1



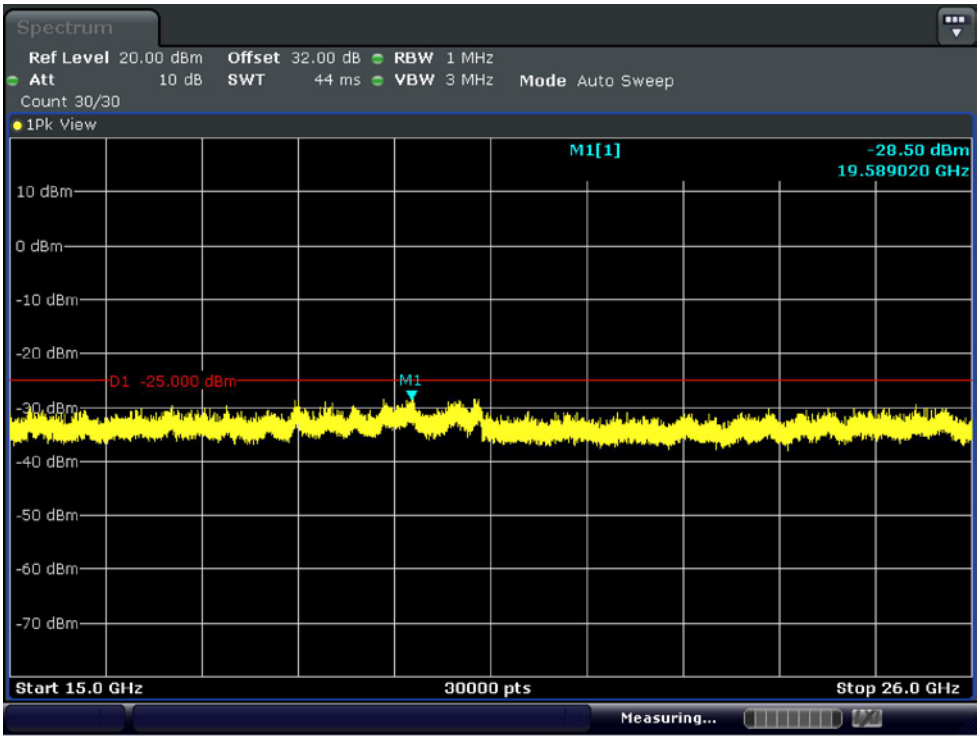
Conducted Spurious Plot (Mid ch_5 MHz_QPSK_RB 1_0) -2



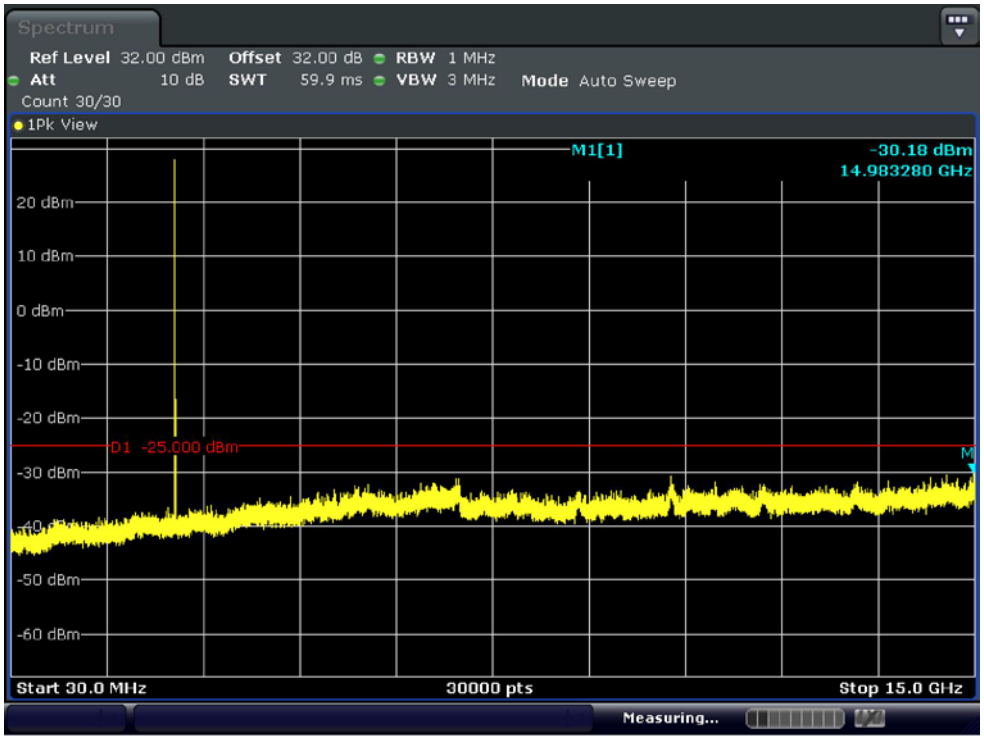
Conducted Spurious Plot (High ch_5 MHz_QPSK_RB 1_0) -1



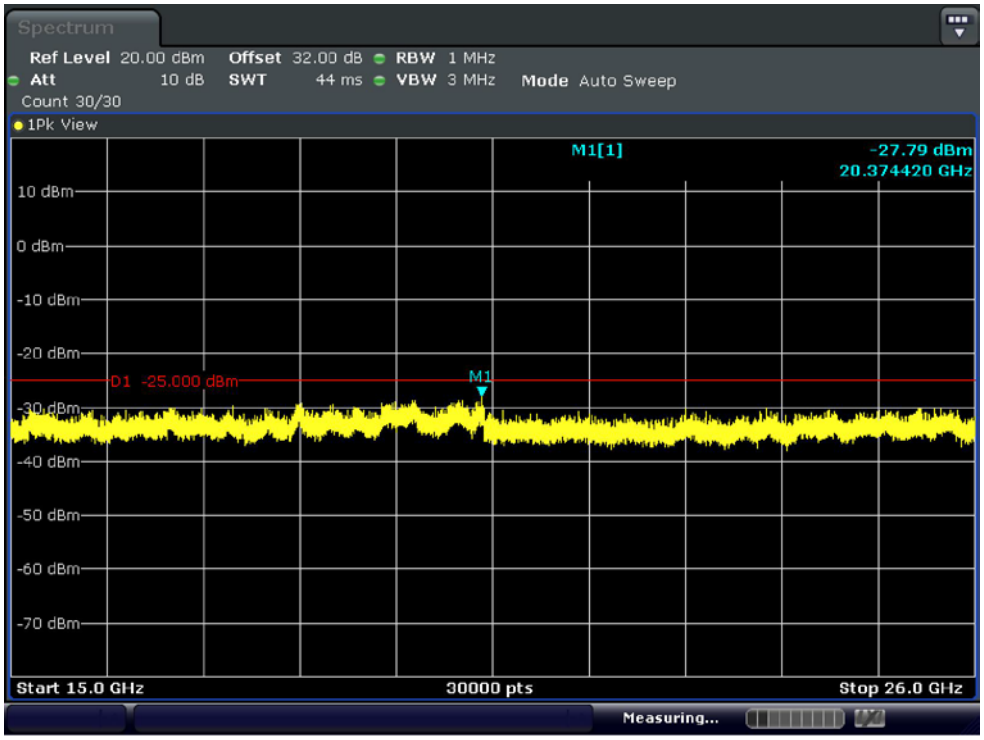
Conducted Spurious Plot (High ch_5 MHz_QPSK_RB 1_0) -2



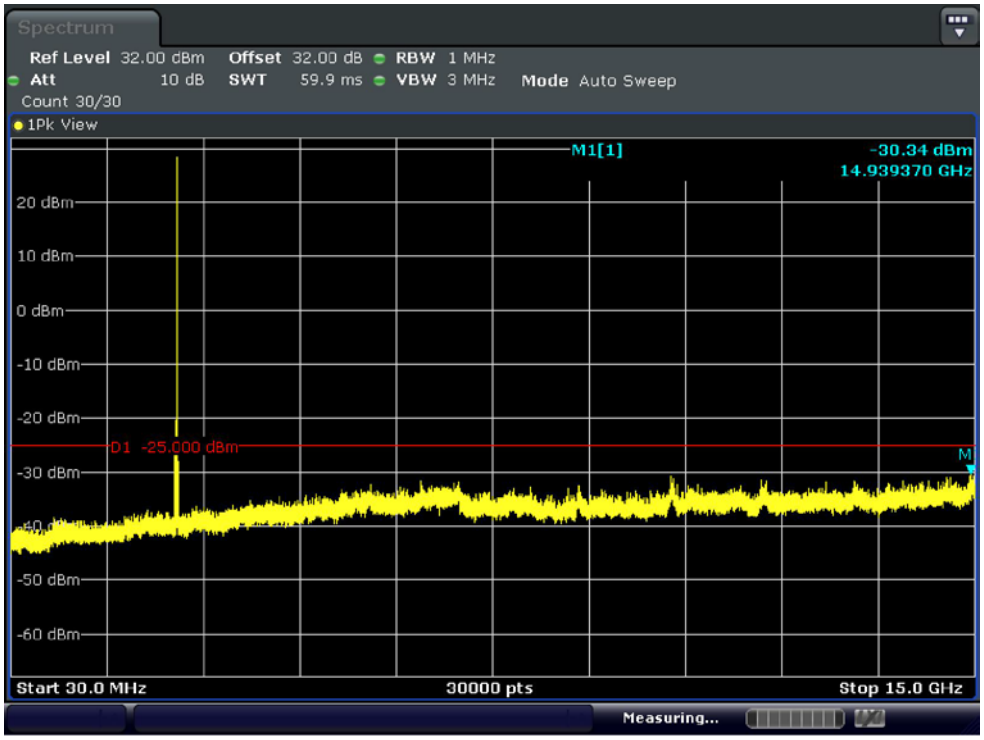
Conducted Spurious Plot (Low ch_10 MHz_QPSK_RB 1_0) -1



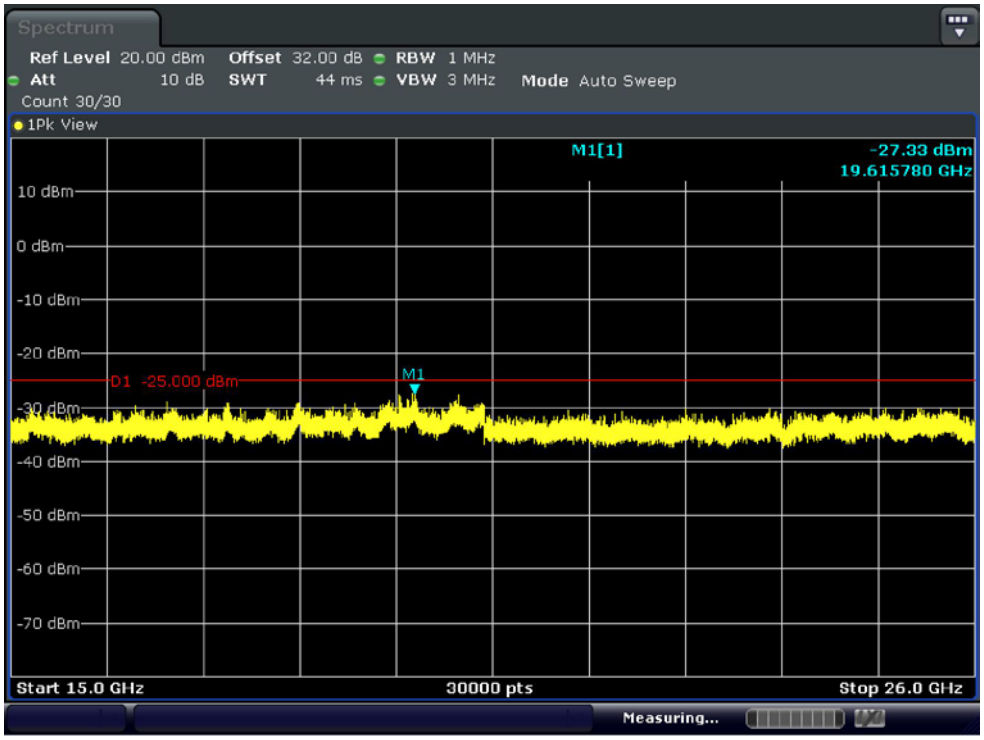
Conducted Spurious Plot (Low ch_10 MHz_QPSK_RB 1_0) -2



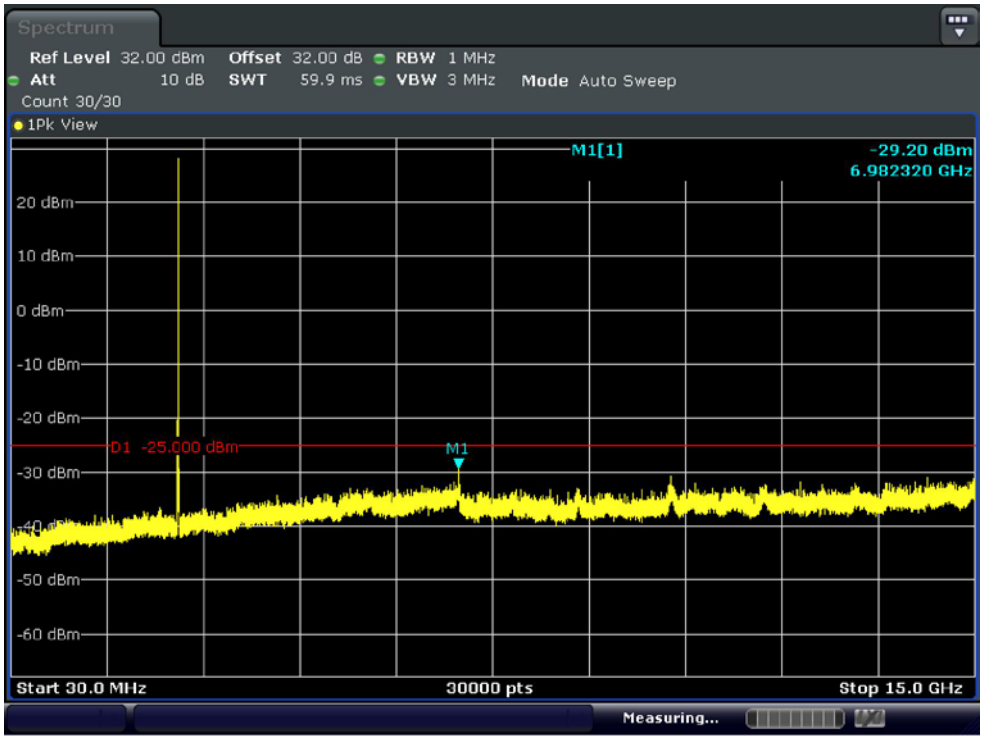
Conducted Spurious Plot (Mid ch_10 MHz_QPSK_RB 1_0) -1



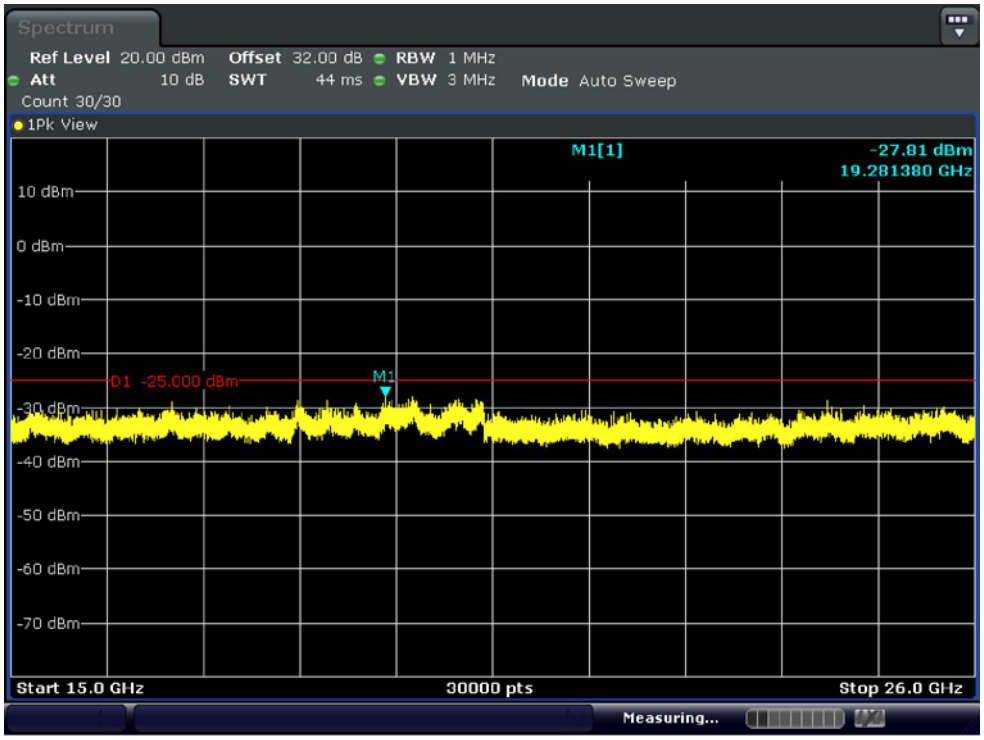
Conducted Spurious Plot (Mid ch_10 MHz_QPSK_RB 1_0) -2



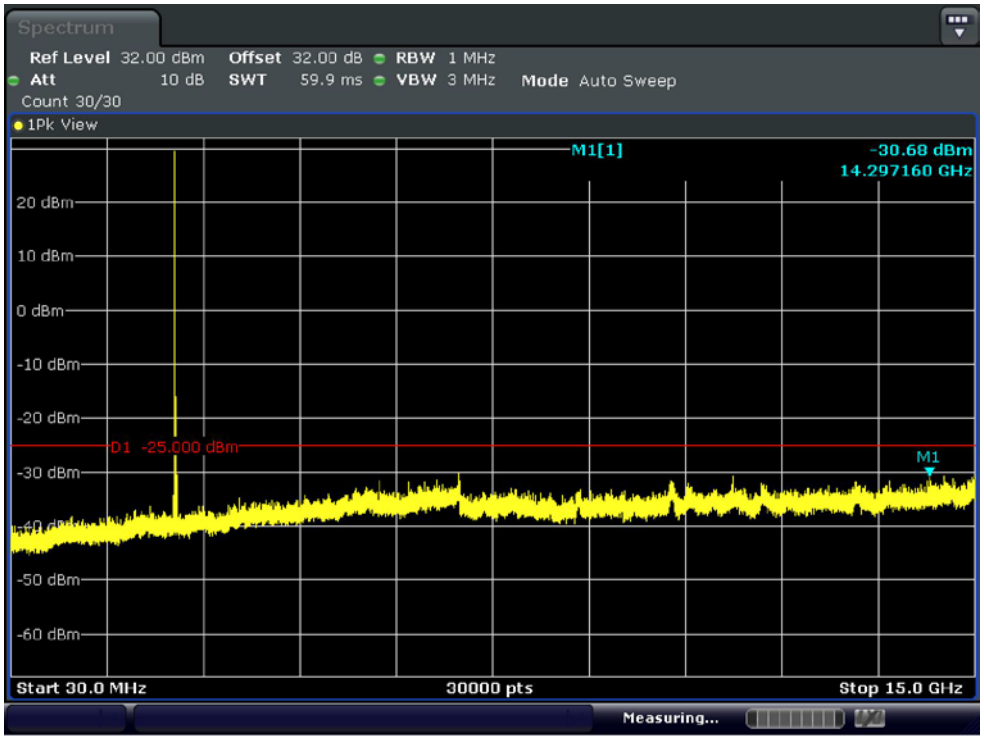
Conducted Spurious Plot (High ch_10 MHz_QPSK_RB 1_0) -1



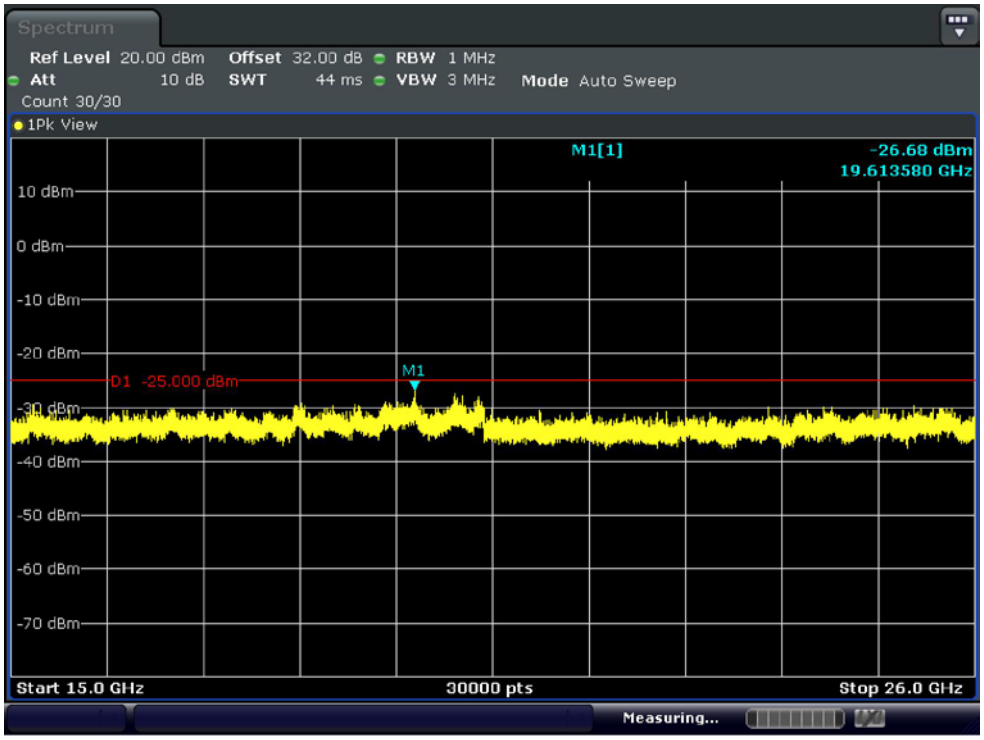
Conducted Spurious Plot (High ch_10 MHz_QPSK_RB 1_0) -2



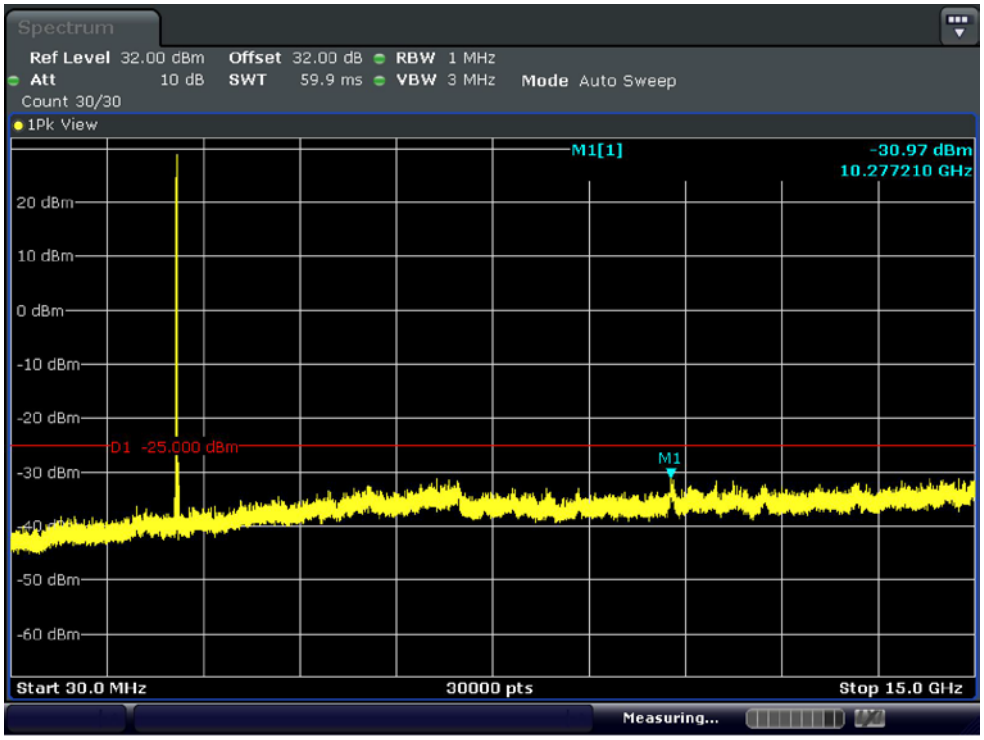
Conducted Spurious Plot (Low ch_15 MHz_QPSK_RB 1_0) -1



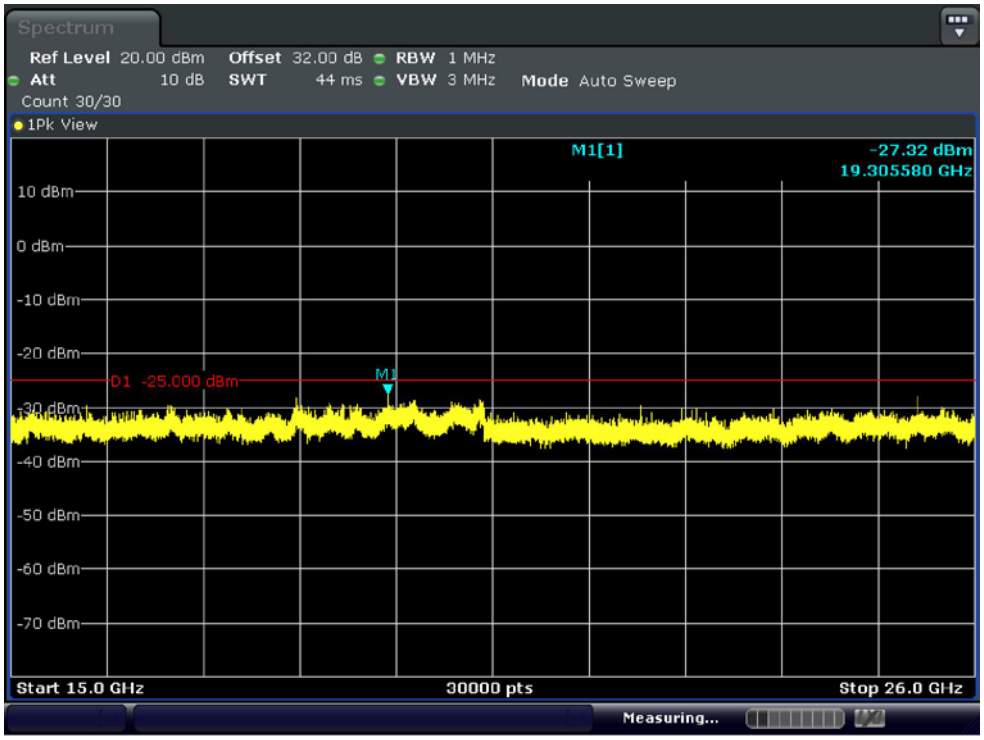
Conducted Spurious Plot (Low ch_15 MHz_QPSK_RB 1_0) -2



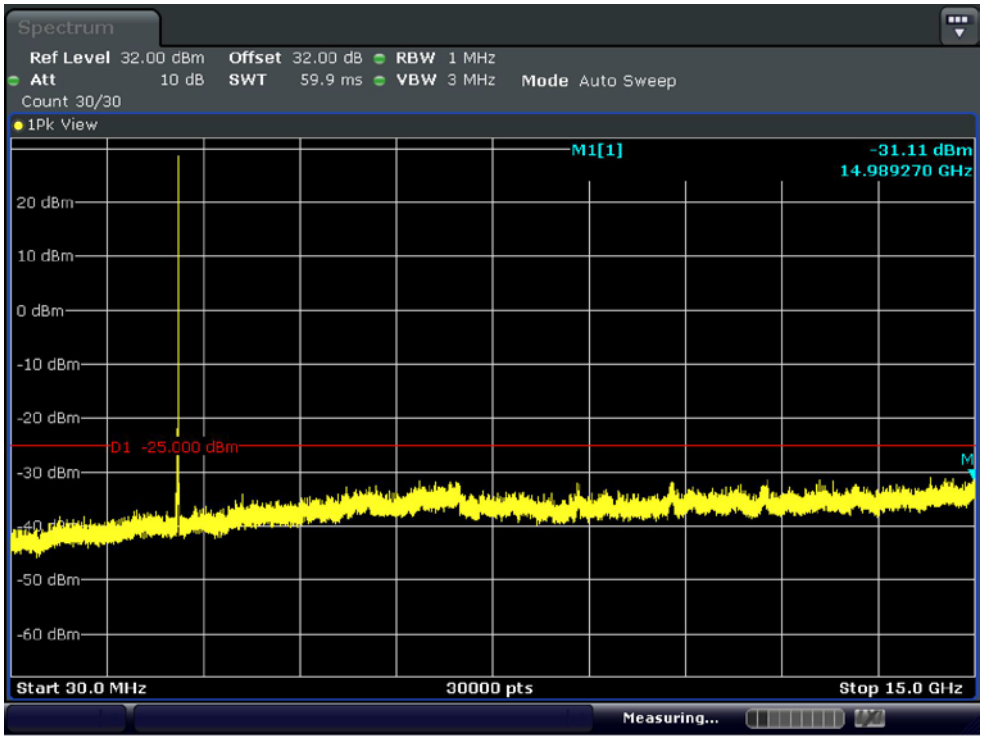
Conducted Spurious Plot (Mid ch_15 MHz_QPSK_RB 1_0) -1



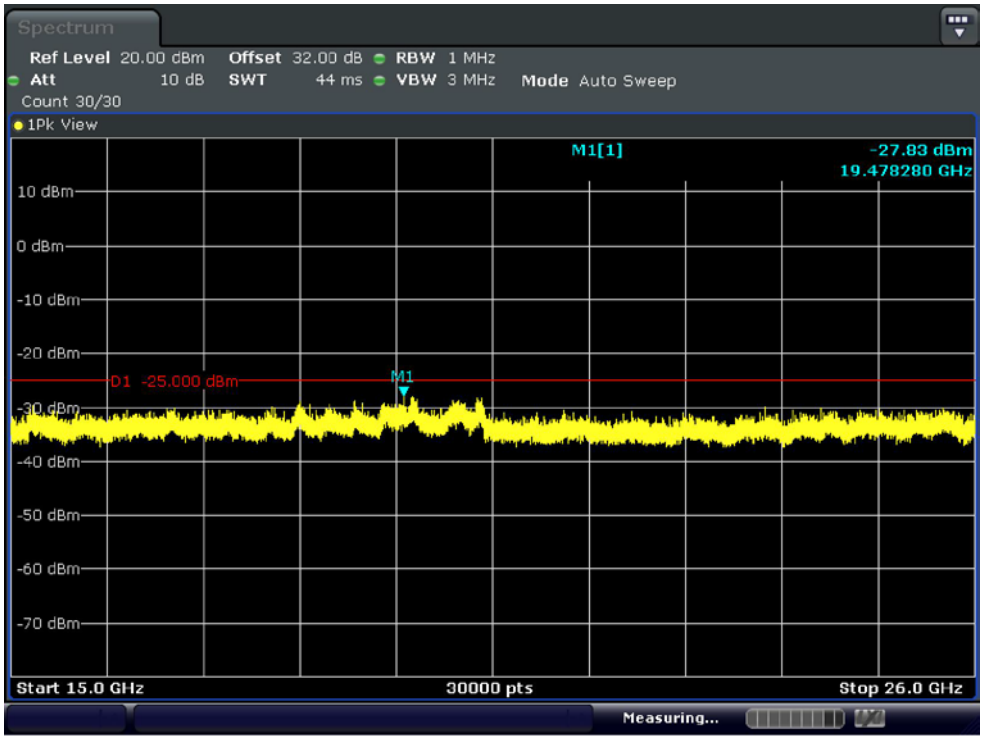
Conducted Spurious Plot (Mid ch_15 MHz_QPSK_RB 1_0) -2



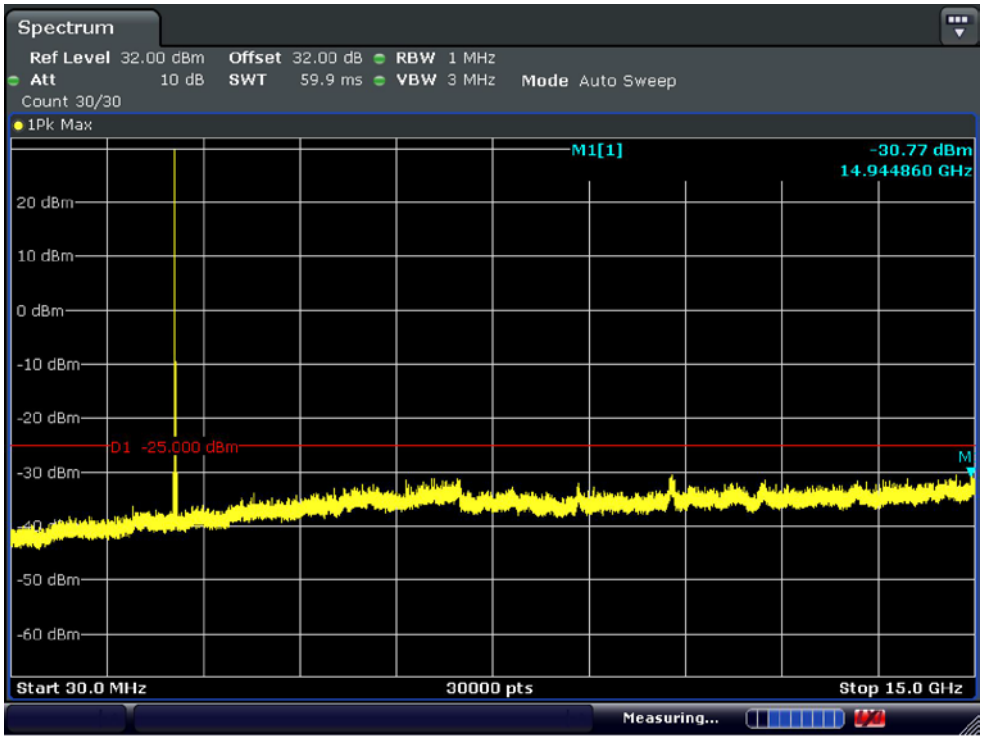
Conducted Spurious Plot (High ch_15 MHz_QPSK_RB 1_0) -1



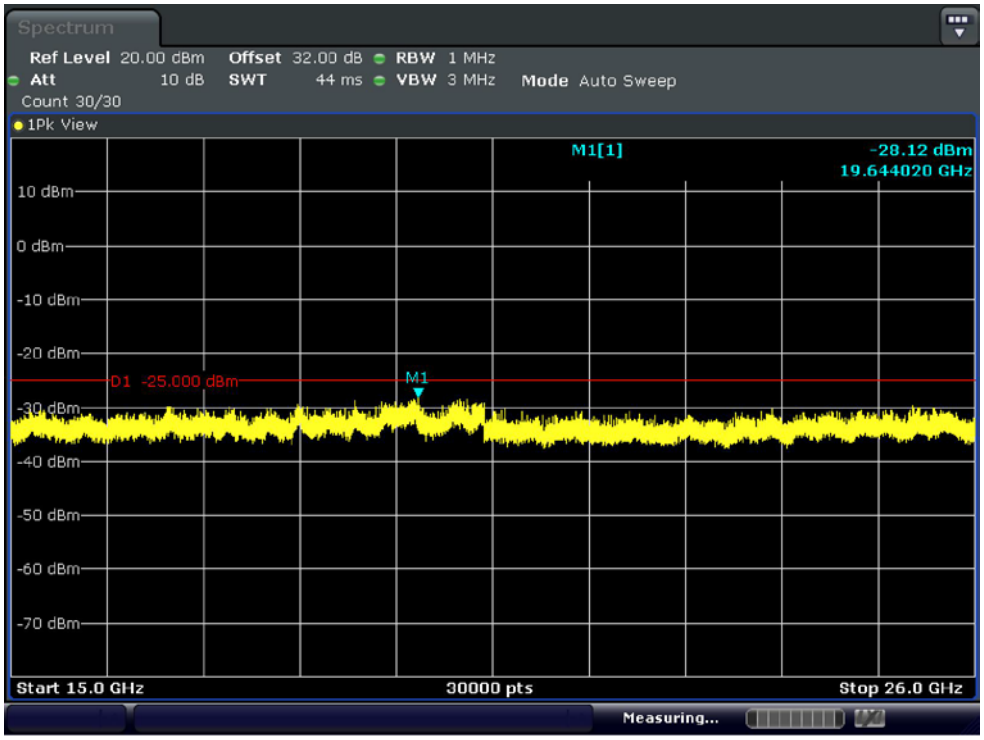
Conducted Spurious Plot (High ch_15 MHz_QPSK_RB 1_0) -2



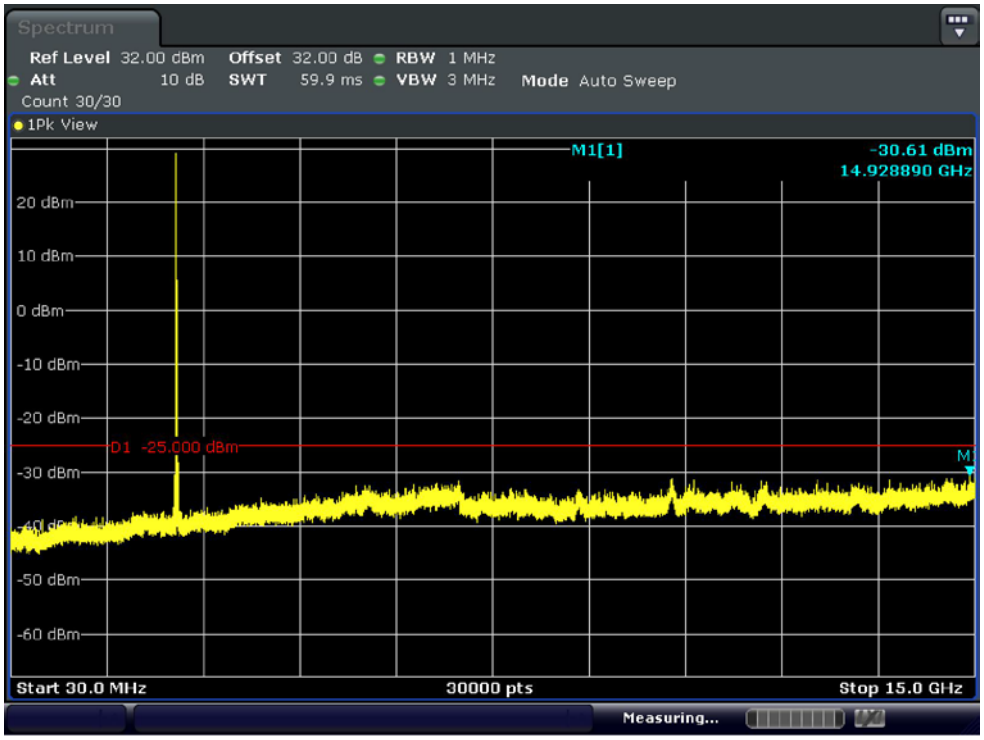
Conducted Spurious Plot (Low ch_20 MHz_QPSK_RB 1_0) -1



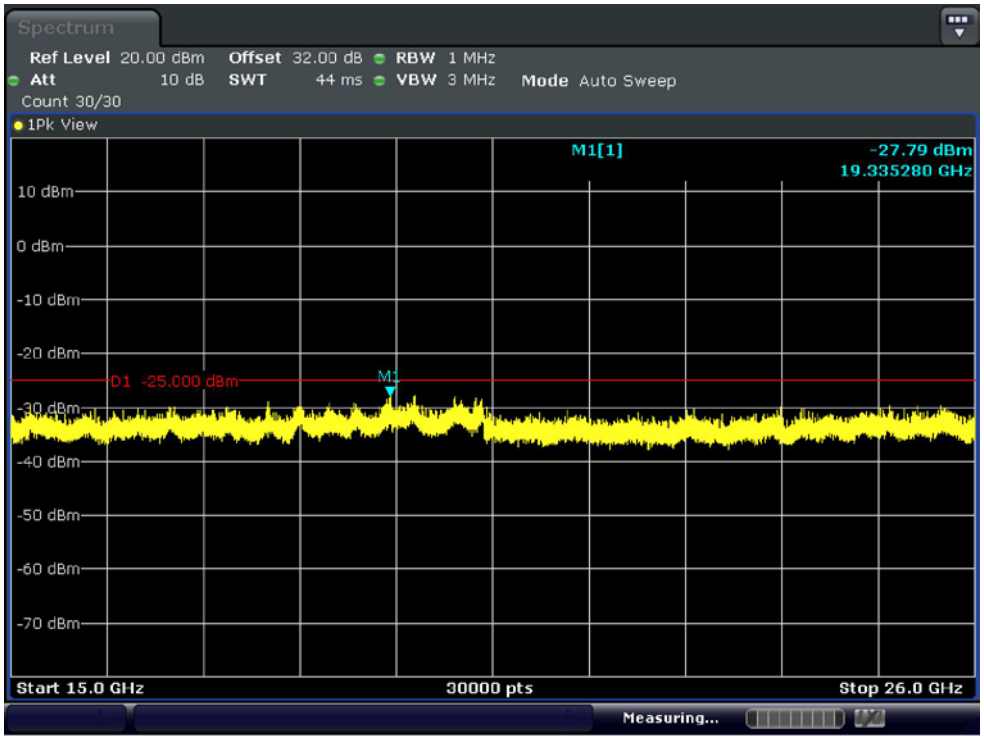
Conducted Spurious Plot (Low ch_20 MHz_QPSK_RB 1_0) -2



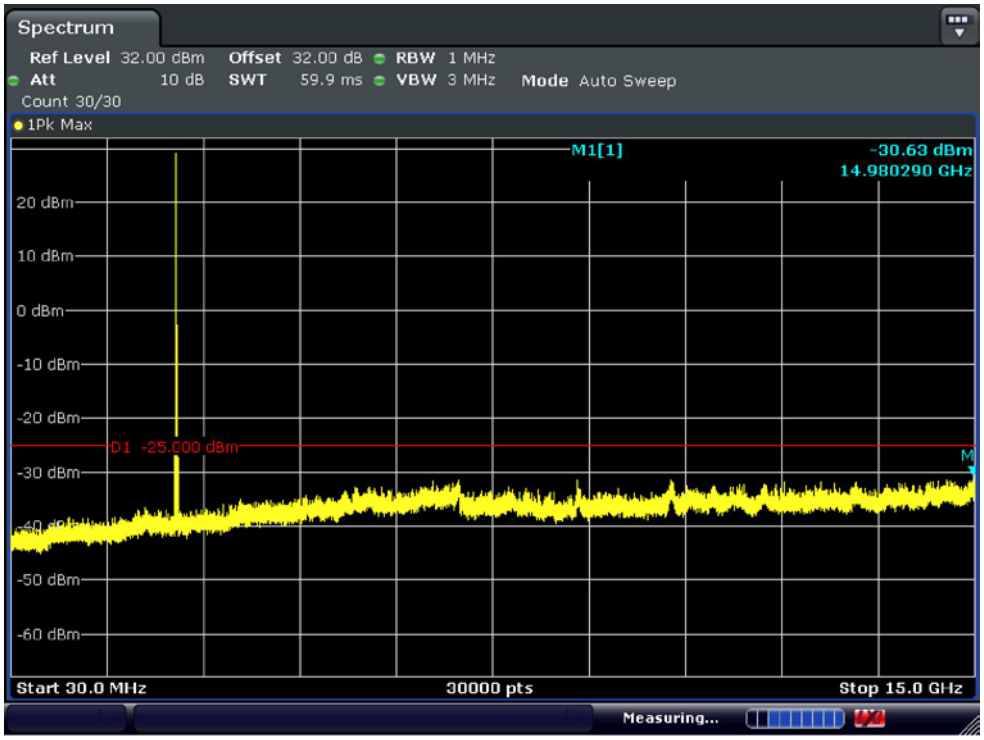
Conducted Spurious Plot (Mid ch_20 MHz_QPSK_RB 1_0) -1



Conducted Spurious Plot (Mid ch_20 MHz_QPSK_RB 1_0) -2



Conducted Spurious Plot (High ch_20 MHz_QPSK_RB 1_0) -1



Conducted Spurious Plot (High ch_20 MHz_QPSK_RB 1_0) -2