FCC CFR47 PART 27 SUBPART C

CERTIFICATION TEST REPORT

FOR

PC EXPRESS CARD

MODEL NUMBER: E351

FCC ID: PKRNVWE351

REPORT NUMBER: 11U13890-2

ISSUE DATE: AUGUST 01, 2011

Prepared for

NOVATEL WIRELESS
4122 SORRENTO VALLEY BLVD #104
SAN DIEGO, CA 92121, U.S.A.

Prepared by

COMPLIANCE CERTIFICATION SERVICES (UL CCS)
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
---	08/1/11	Initial Issue	T. Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: NOVATEL WIRELESS
4122 SORRENTO VALLEY BLVD #104
SAN DIEGO, CA 92121, U.S.A.

EUT DESCRIPTION: PC EXPRESS CARD

MODEL: E351

SERIAL NUMBER: 170192241

DATE TESTED: JULY 14-22, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 27 C	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

CHIN PANG
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA-603-C, FCC CFR 47 Part 2, FCC CFR 47 Part 27C.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

UL CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT is a PCI Mini Card operates on dual band CDMA2000, 1xRTT and EvDO and LTE band 13.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted and ERP / EIRP output powers as follows:

5MHz BANDWIDTH

Part 27 LTE Band 13

Frequency range (MHz)	QPSK	Conducted		ERP	
		dBm	mW	dBm	mW
779.5	RB1-0	27.38	547.0	31.32	1355.2
	RB1-24	27.98	628.1	32.16	1644.4
	RB12-6	27.18	522.4	31.94	1563.1
	RB25-0	28.00	631.0	32.42	1745.8
784.5	RB1-0	27.84	608.1	31.32	1355.2
	RB1-24	27.50	562.3	31.42	1386.8
	RB12-6	27.62	578.1	31.82	1520.5
	RB25-0	27.85	609.5	32.27	1686.6

5

10MHz BANDWIDTH

Part 27 LTE Band 13

Frequency range (MHz)	QPSK	Conducted		ERP	
		dBm	mW	dBm	mW
782	RB1-0	27.20	524.8	31.02	1264.7
	RB1-49	27.56	570.2	31.17	1309.2
	RB25-12	27.60	575.4	32.02	1592.2
	RB50-0	27.80	602.6	32.22	1667.2

5MHz BANDWIDTH

Part 27 LTE Band 13

Frequency range (MHz)	16QAM	Conducted		ERP	
		dBm	mW	dBm	mW
779.5	RB1-0	27.81	603.9	31.07	1279.4
	RB1-24	28.20	660.7	31.36	1367.7
	RB12-6	27.58	572.8	31.42	1386.8
	RB25-0	27.72	591.6	32.32	1706.1
784.5	RB1-0	28.13	650.1	31.12	1294.2
	RB1-24	27.70	588.8	30.92	1235.9
	RB12-6	27.52	564.9	31.52	1419.1
	RB25-0	27.72	591.6	31.72	1485.9

10MHz BANDWIDTH

Part 27 LTE Band 13

Frequency range (MHz)	16QAM	Conducted		ERP	
		dBm	mW	dBm	mW
782	RB1-0	27.88	613.8	30.92	1235.9
	RB1-49	28.20	660.7	30.12	1028.0
	RB25-12	27.82	605.3	32.02	1592.2
	RB50-0	27.90	616.6	32.42	1745.8

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a dipole antenna for the 700MHz with a maximum peak gain of 2dBi for band 13.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was

The EUT software installed during testing was

The EUT is linked with Agilent 8960 Communication and CMU500Test Set

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel for RF radiated emissions below 1GHz and AC conducted emissions are determined as the channel with the AC Power Adapter Source

Based on the investigation results, the highest peak power and enhanced data rate is the worst-case scenario for all measurements.

Worst-case modes:

- LTE Band 13, QPSK and 16QAM

The worst-case configuration has been evaluated on EUT with dipole antenna at Y-position for 700MHz, 850MHz, and 1900MHz bands.

5.6. DESCRIPTION OF TEST SETUP

I/O CABLES (RF CONDUCTED TEST)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	3	US 115V	Un-shielded	2m	NA
2	DC	2	DC	Un-shielded	1m	NA
3	RFOut	1	Directional Coupler	Un-shielded	None	NA
4	RF In/Out	1	Directional Coupler	Un-shielded	1.2 m	NA
5	RF In/Out	1	EUT	Un-shielded	0.2m	NA
6	USB	1	USB	Un-shielded	0.8m	NA

I/O CABLES (RF RADIATED TEST)

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	3	US 115V	Un-shielded	2m	No
2	DC	2	US 115V	Un-shielded	2m	No
3	USB	1	Test Jig Card	Un-shielded	1m	Yes
4	RF	1	Dipole Antenna	Un-shielded	none	Yes
5	RF In/Out	1	Horn	Un-shielded	2m	Yes

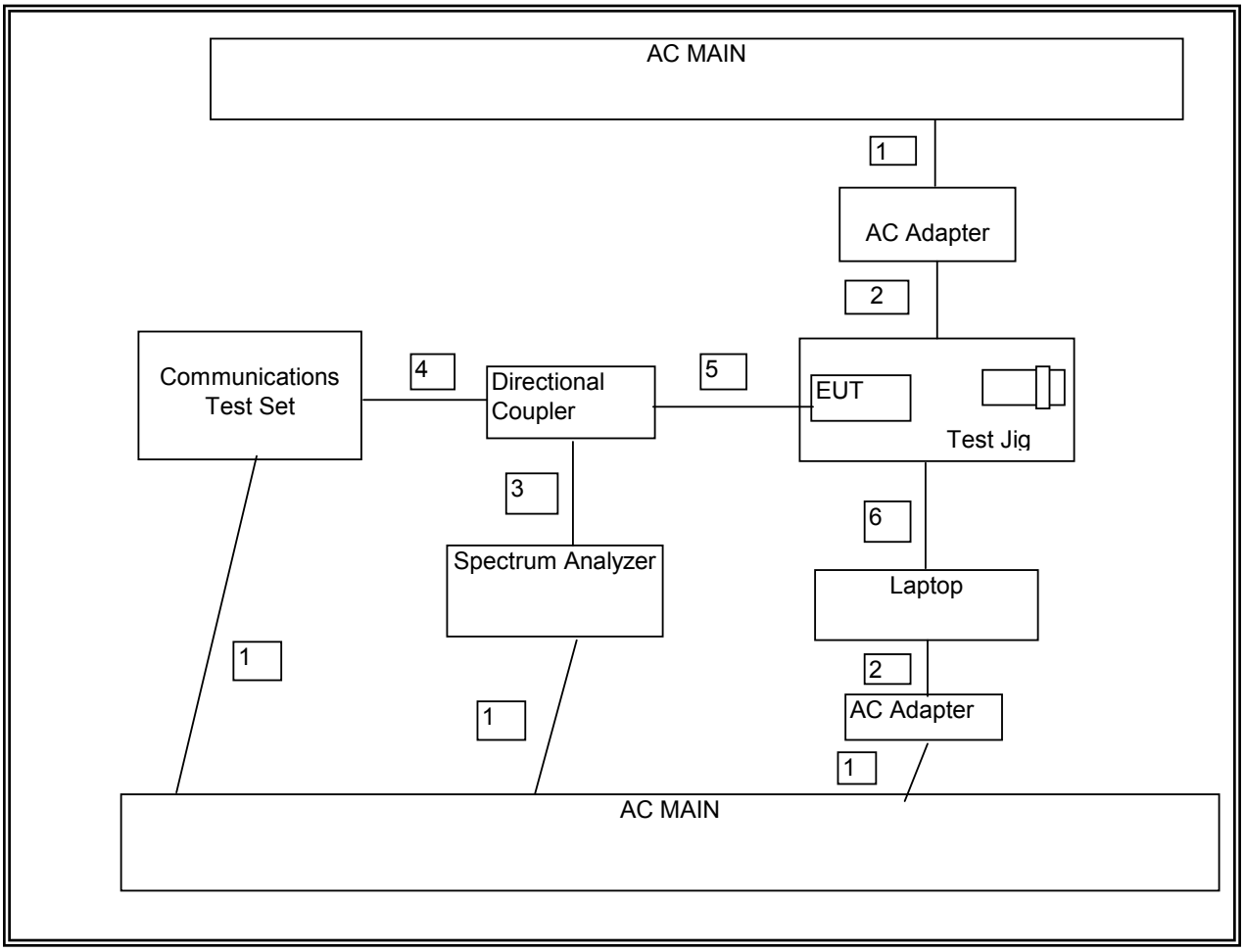
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop AC Adapter	Dell	LA90PS-00	CN-ODF2667161571K5BFF	DoC
Jig card	Novatel	NA	NA	NA
Jig Card AC Adapter	V-Infinity	3A-211DN05	ETS050400UTC-P5P-5C	DoC

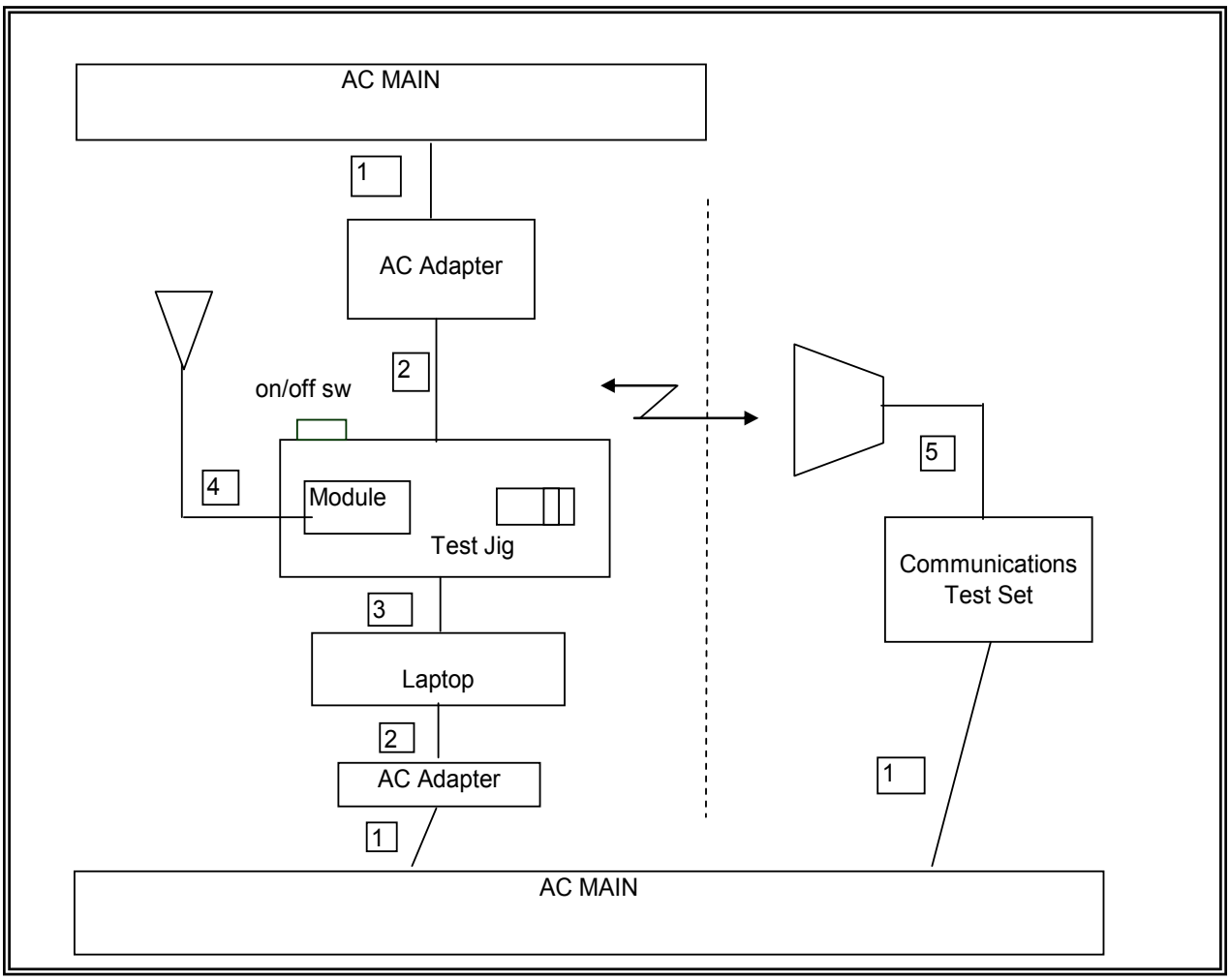
TEST SETUP

The EUT is a stand-alone device. The Wireless Communication test set exercised the EUT.

SETUP DIAGRAM FOR RF CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	06-08-12
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06-30-12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07-16-12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01-27-12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	07-12-12
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	None	07-06-12
Communication Test Set	Agilent / HP	E5515C	C01086	09-27-12
Wideband Communication Test Set	R & S	CMW 500	None	04-20-12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11-10-11
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04-20-12
Highpass Filter, 1.5 GHz	Micro-Tronics	HPM13193	N02689`	CNR
Highpass Filter, 2.7 GHz	Micro-Tronics	HPM13194	N02687	CNR
Directional Coupler, 4.2 GHz, 40 dB	A-R	DC7144A	C00983	CNR
Signal Generator, 20 GHz	Agilent / HP	83732B	C00774	07-14-12
Antenna, Tuned Dipole 400~1000 MHz	ETS	3121C DB4	C00993	07-16-12

7. CONDUCTED TEST RESULTS

7.1. OCCUPIED BANDWIDTH

RULE PART(S)

FCC: §2.1049

LIMITS

For reporting purposes only

TEST PROCEDURE

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The -26dB bandwidth was also measured and recorded.

MODES TESTED: LTE Band

Band	Mode	RB/RB SIZE	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
LTE	5 MHz BAND QPSK	1/0	779.5	223.7711	285.722
		1/24		237.7426	373.892
		12/6		2123.0	2335.0
		25/0		4438.1	4791.0
	5 MHz BAND 16QAM	1/0		229.7575	373.644
		1/49		215.0327	328.208
		25/12		2152.3	2460.0
		50/0		4476.2	4912.0

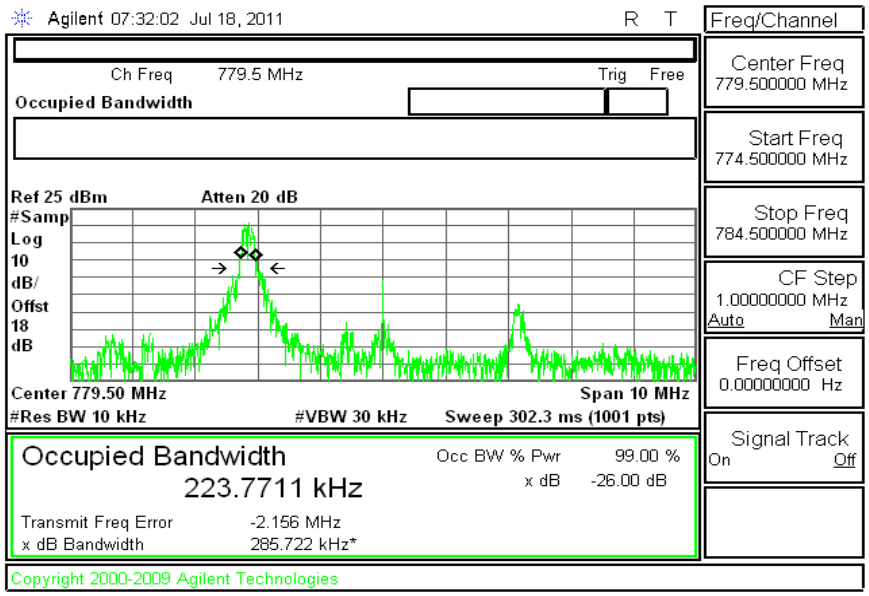
Band	Mode	RB/RB SIZE	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
LTE	5 MHz BAND QPSK	1/0	784.5	238.0753	366.822
		1/24		223.2116	359.117
		12/6		2143.1	2567.0
		25/0		4478.4	4910.0
	5 MHz BAND 16QAM	1/0		232.9010	373.204
		1/49		230.9877	348.469
		25/12		2154.4	2478.0
		50/0		4524.5	4908.0

Band	Mode	RB/RB SIZE	f (MHz)	99% BW (kHz)	-26dB BW (kHz)
LTE	10 MHz BAND QPSK	1/0	782	308.9693	434.448
		1/49		324.0962	393.393
		24/12		4408.5	5367.0
		50/0		8841.6	9206.0
	10 MHz BAND 16QAM	1/0		296.0656	418.097
		1/49		274.9292	405.046
		24/12		4388.3	5145.0
		50/0		8834.8	9162.0

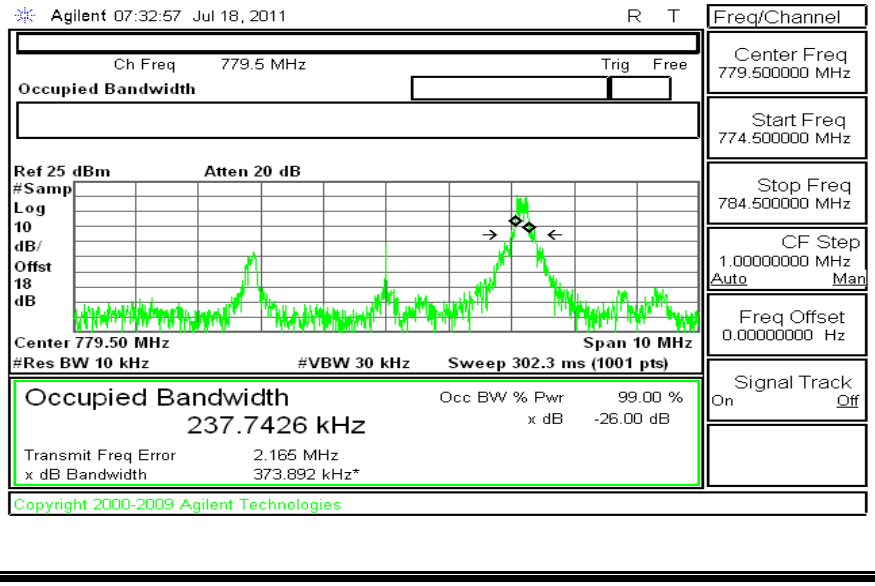
LTE Band 13

QPSK (5MHz Bandwidth) 779.5MHz

RB1-0



RB1-24



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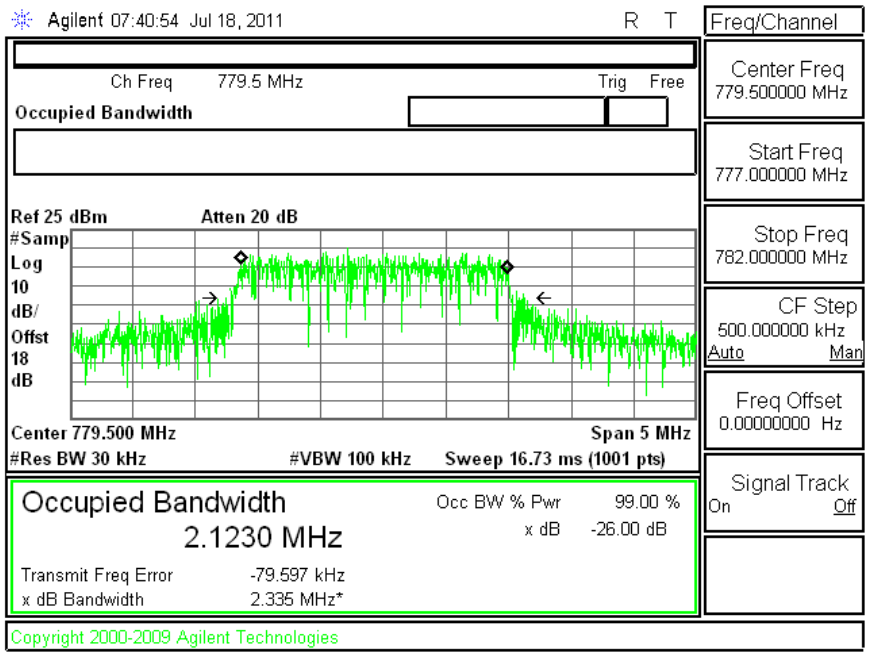

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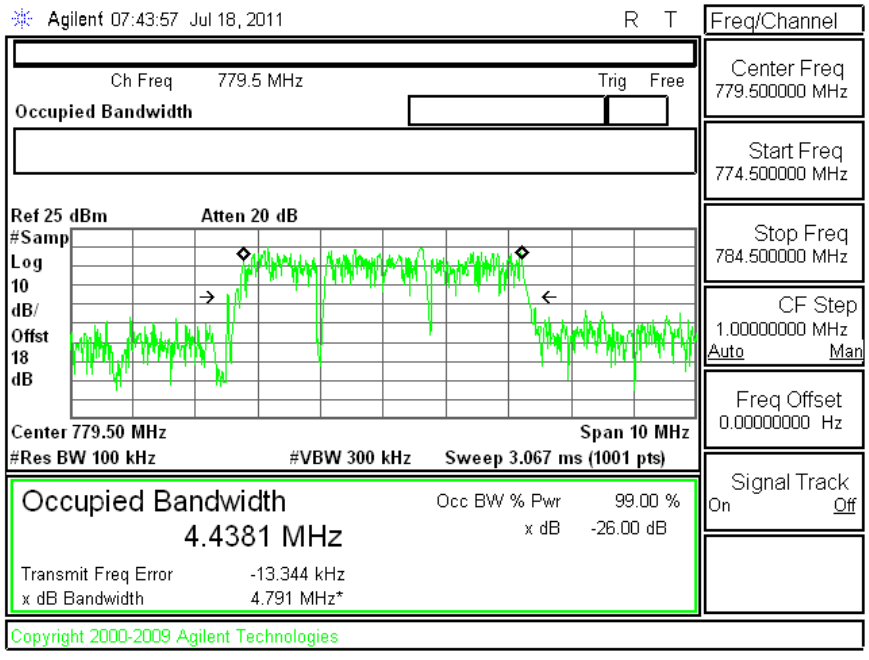
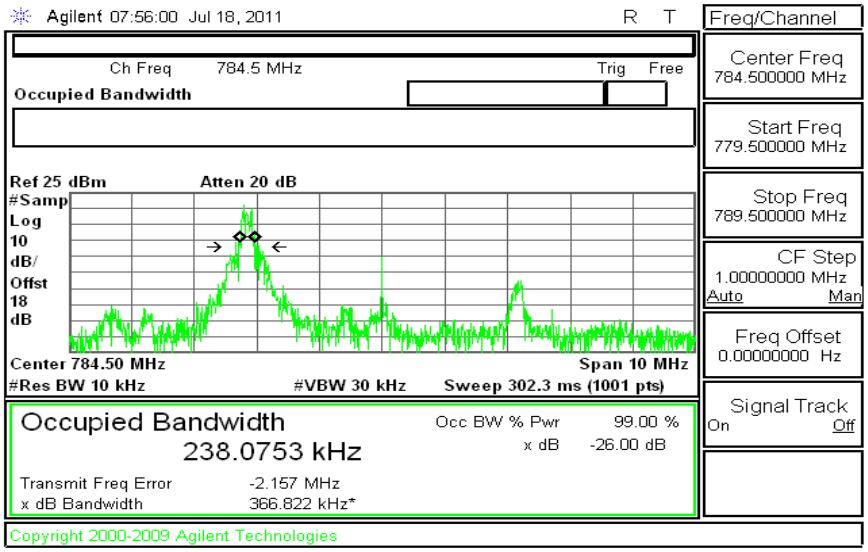


784.5MHz

RB1-0



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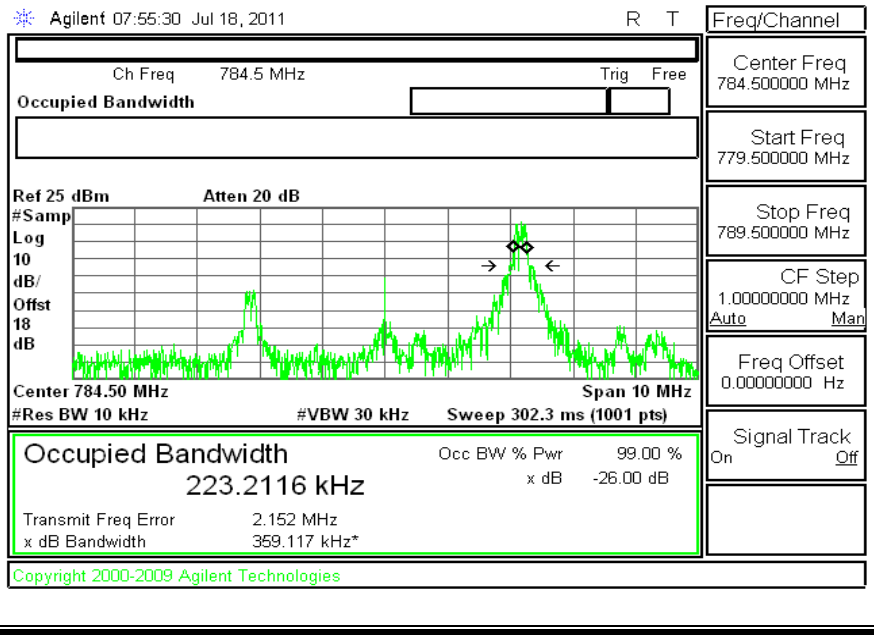
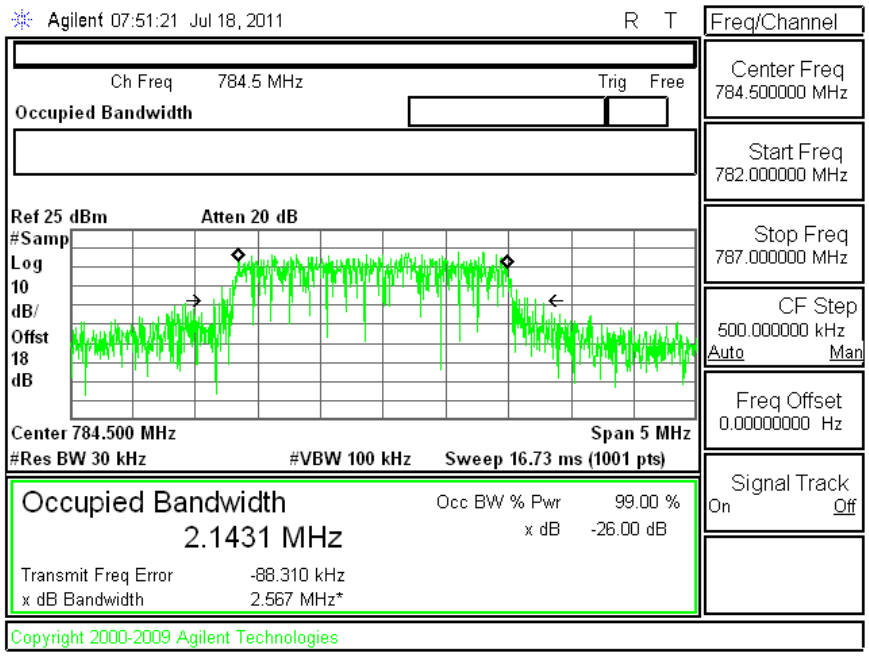


RB512-6



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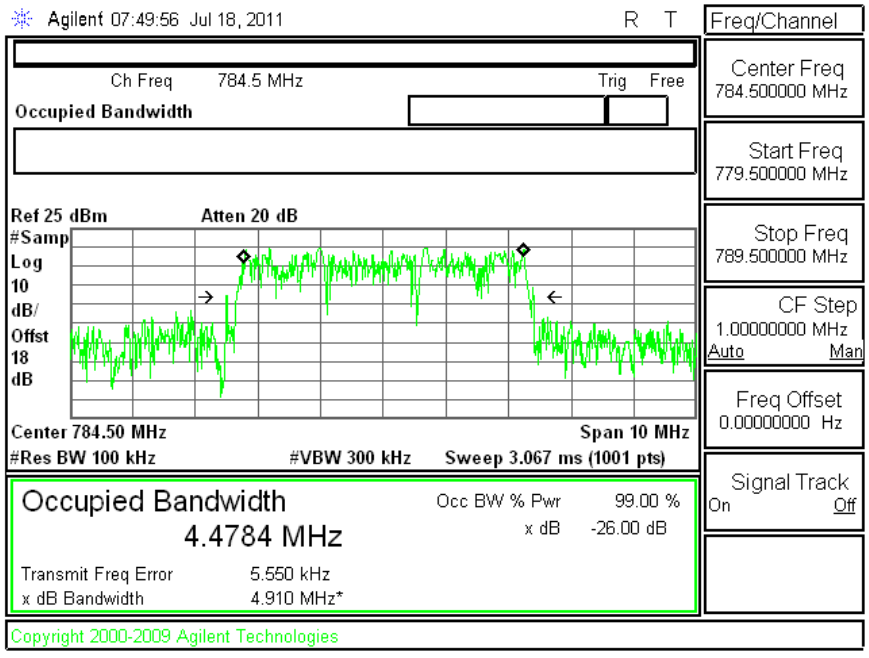
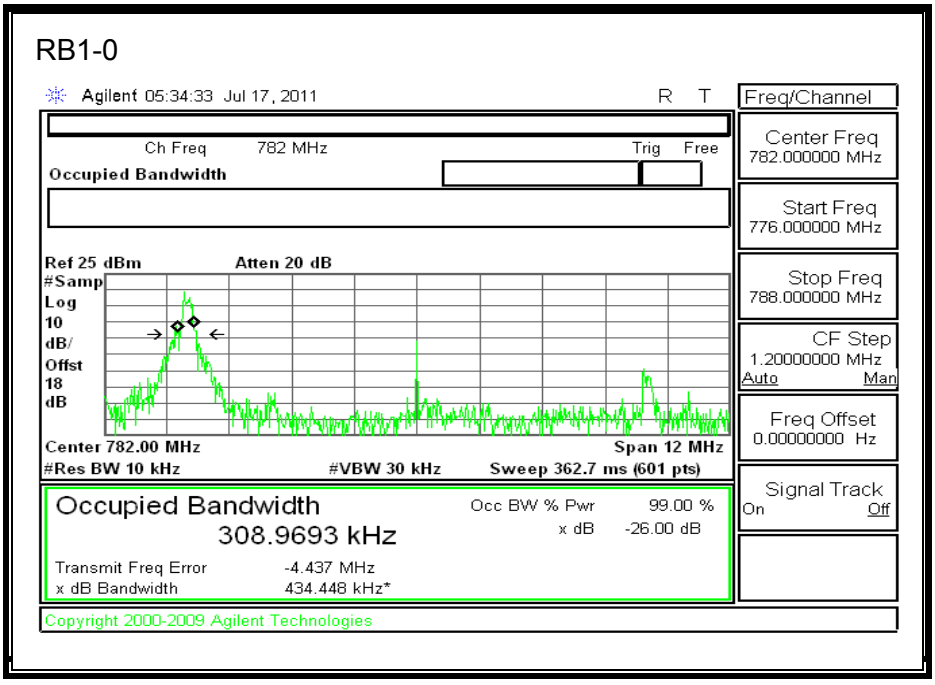


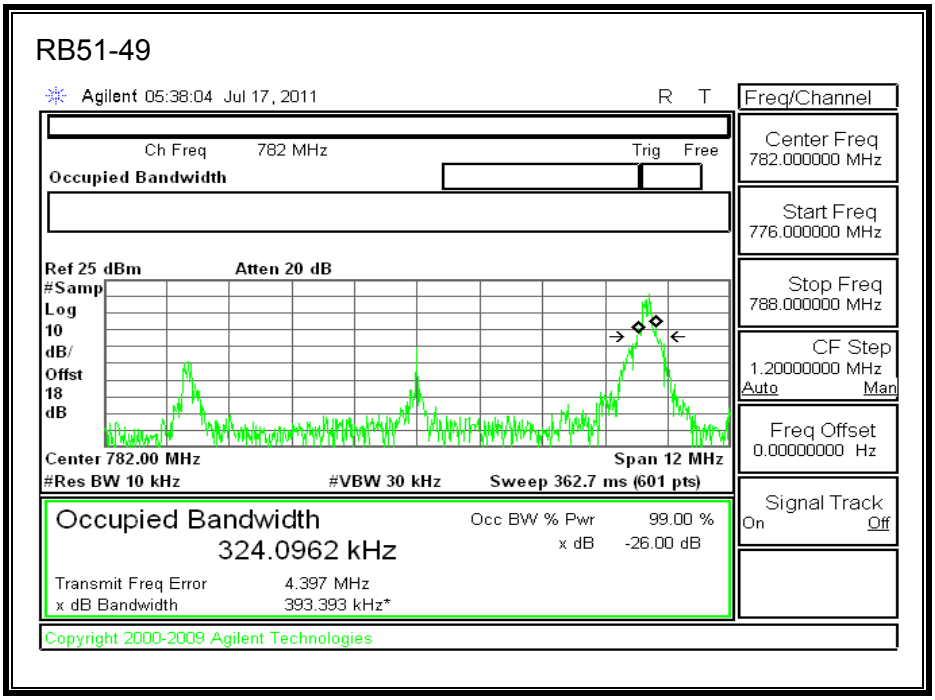
Band 13 QPSK (10MHz Bandwidth)

782MHz

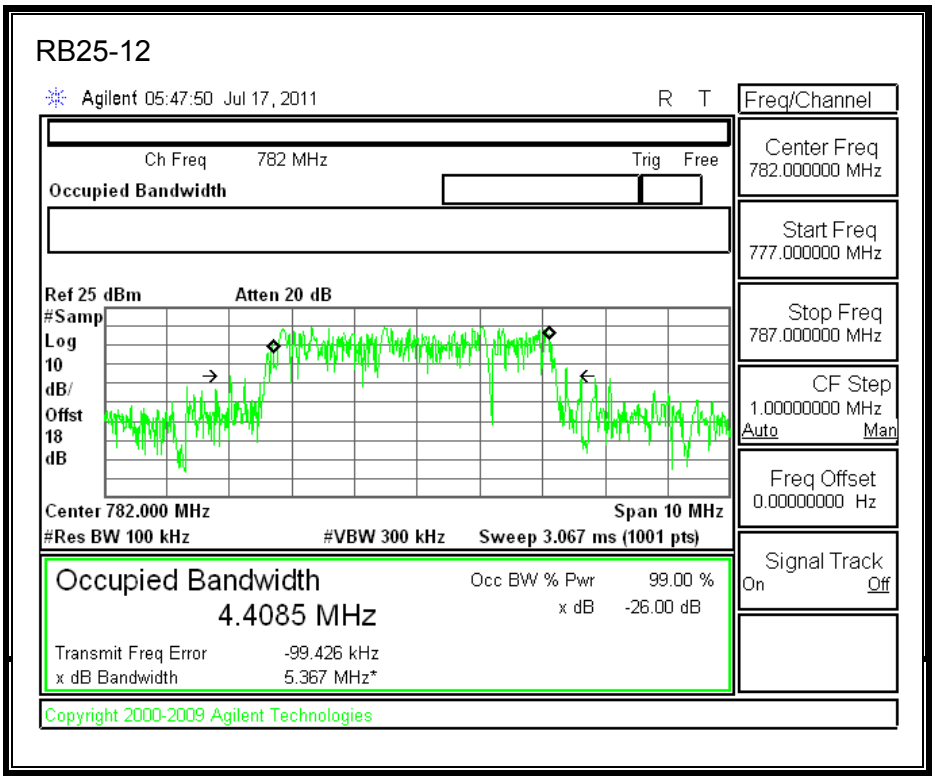
RB1-0



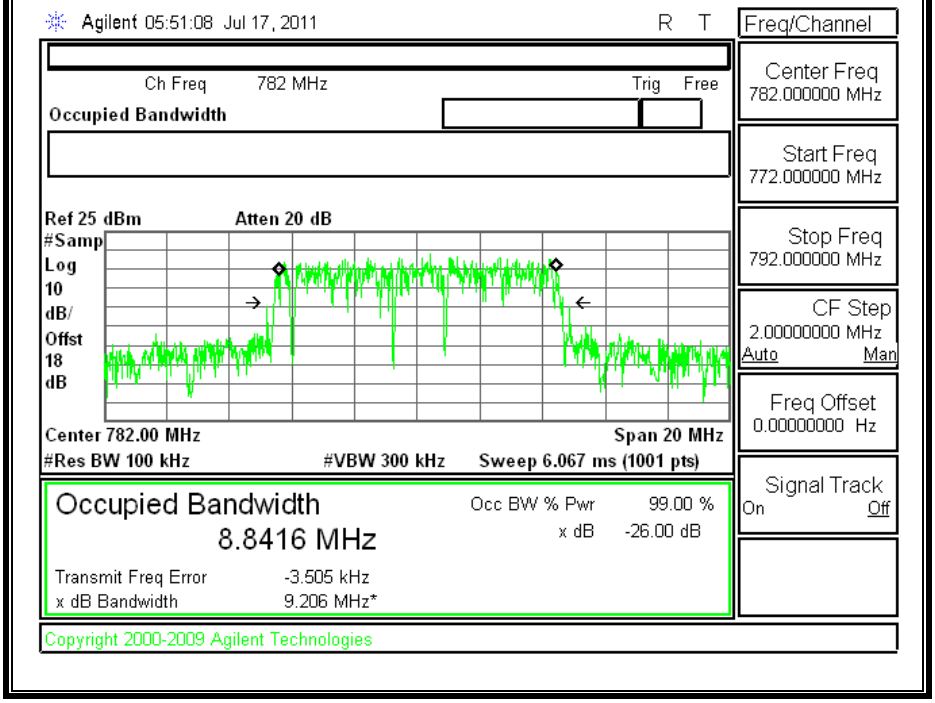
RB51-49



RB25-12



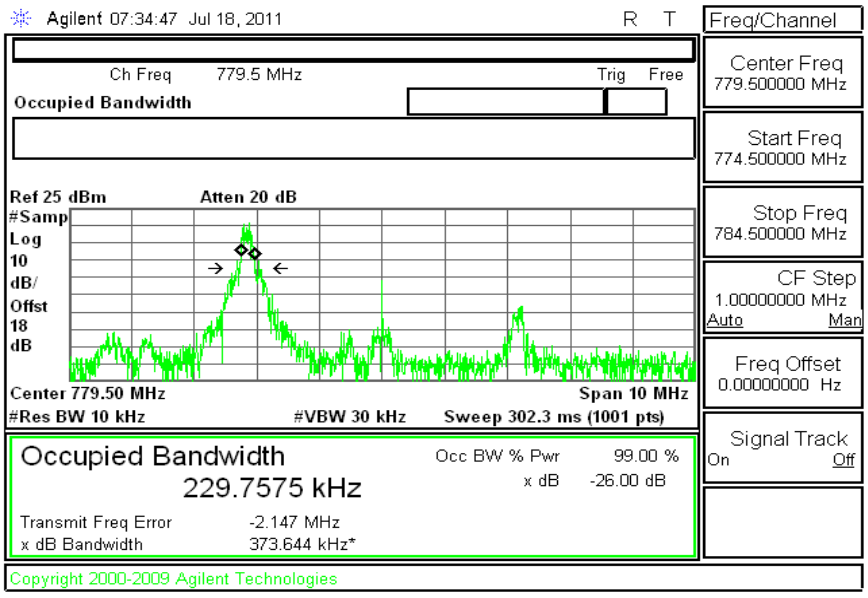
RB50-0



16QAM (5MHz Bandwidth)

Low Channel, 779.5MHz

RB1-0



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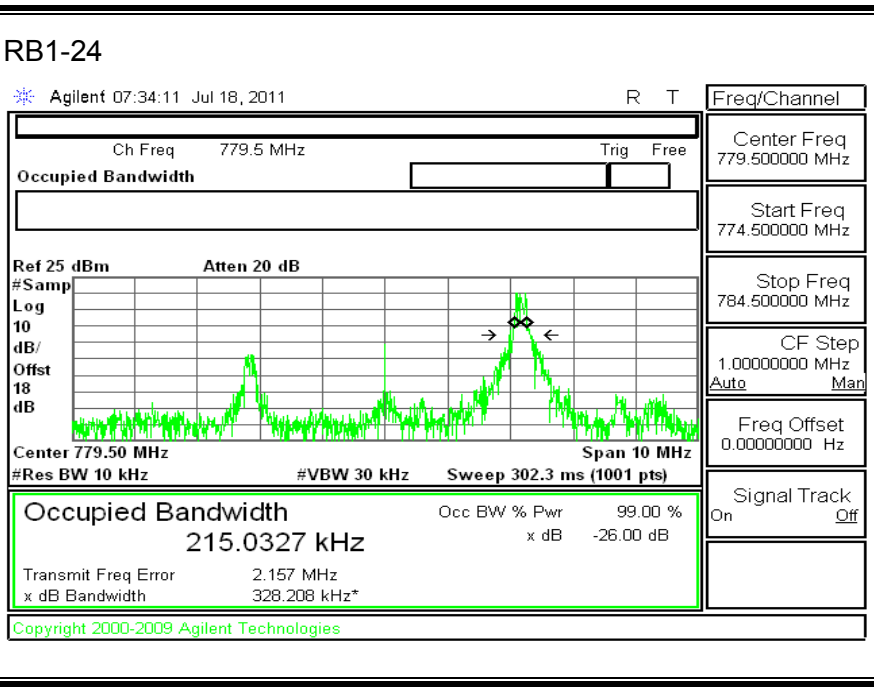

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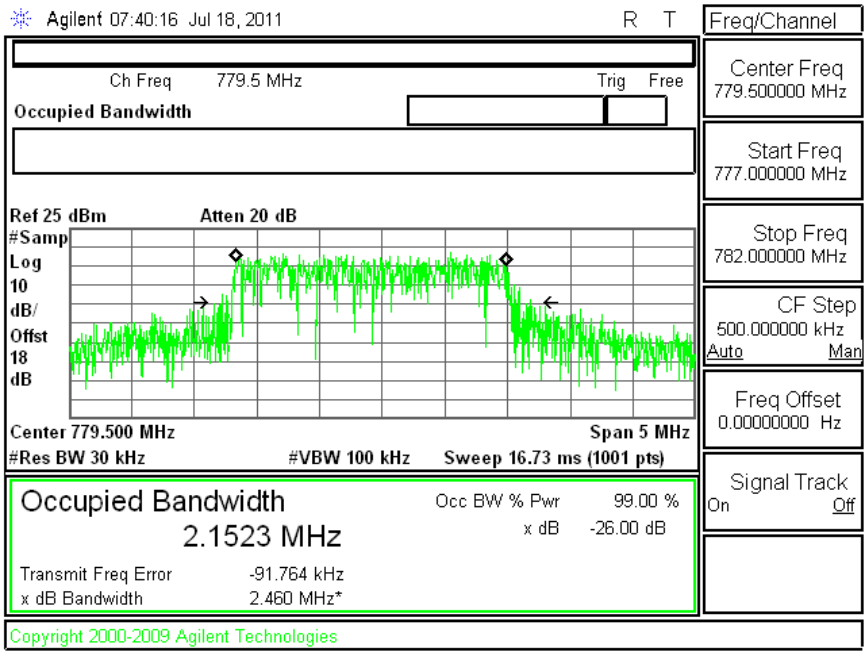

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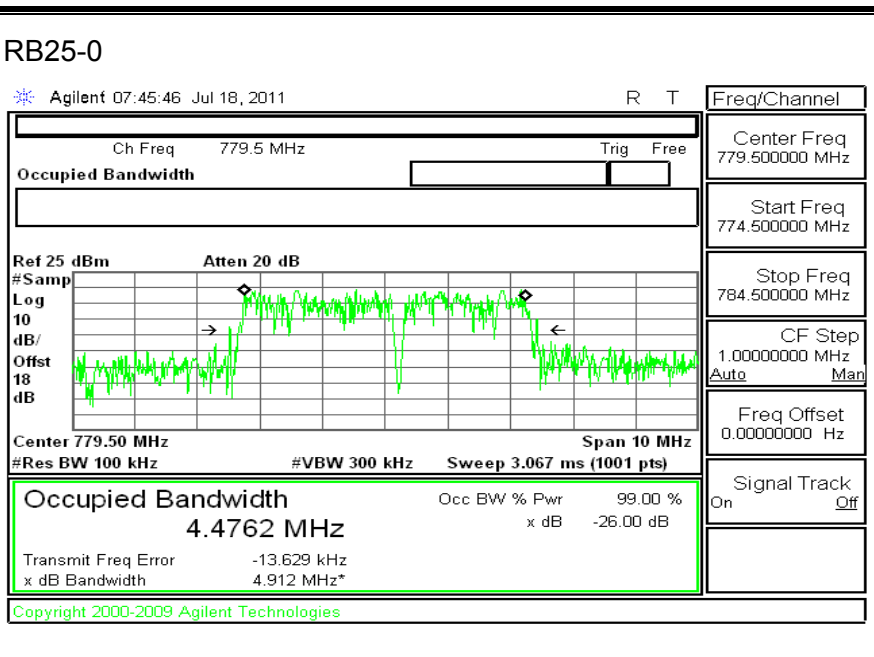
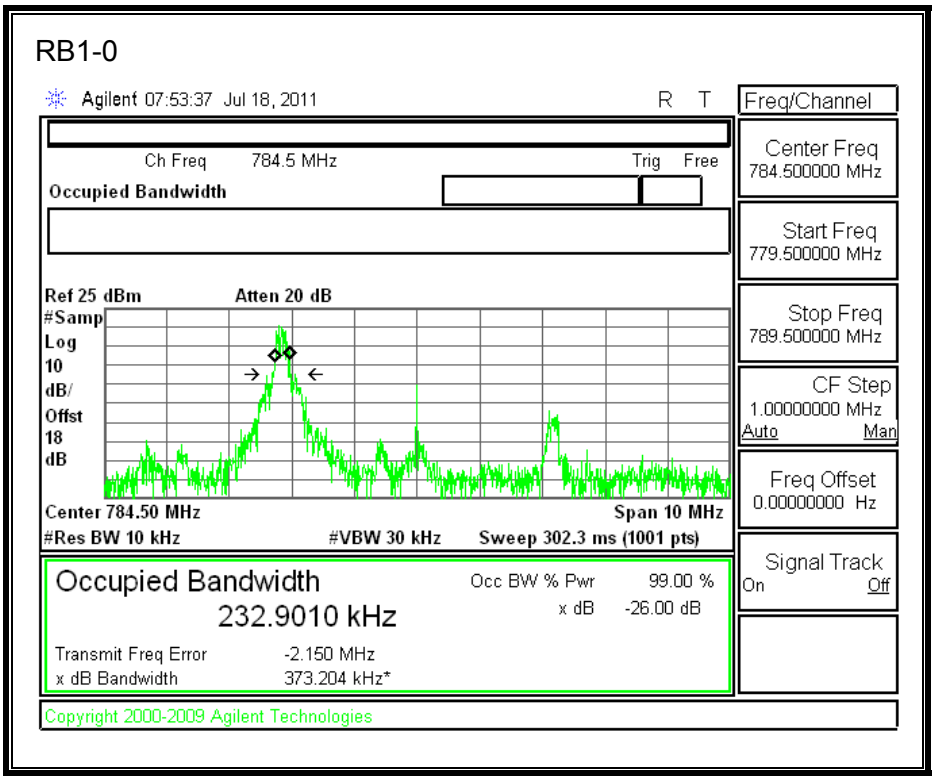
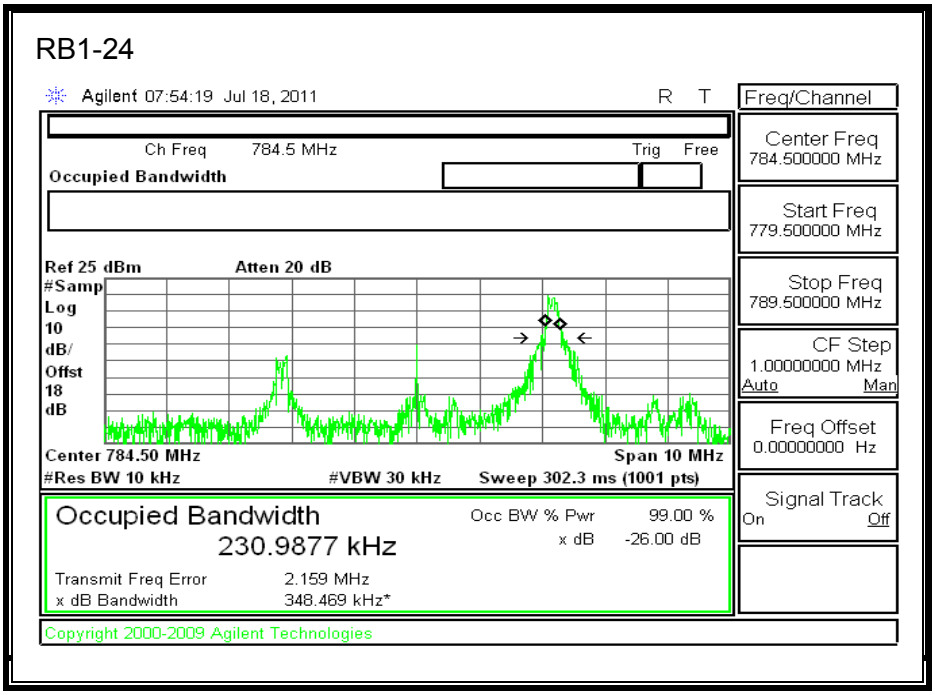
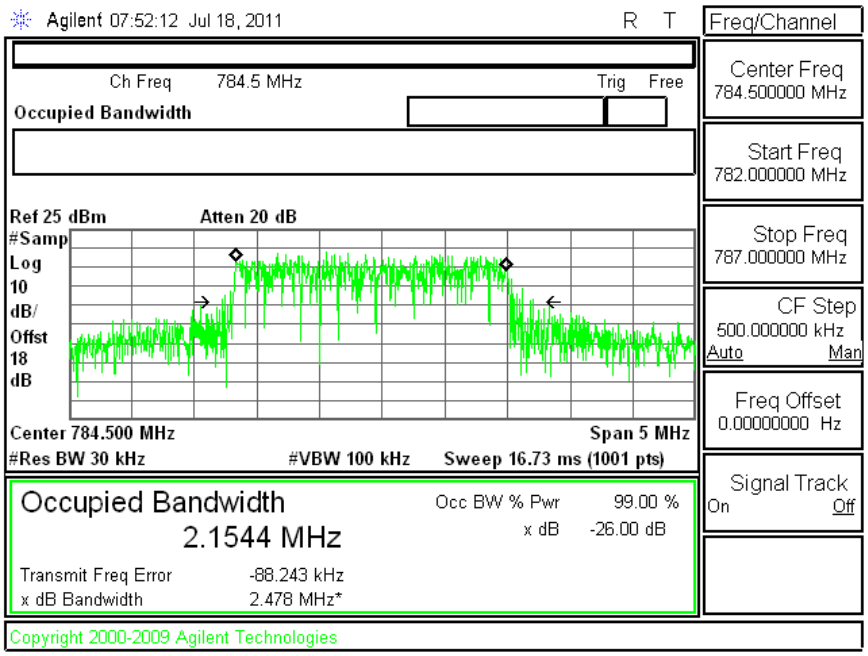


784.5MHz





RB512-6



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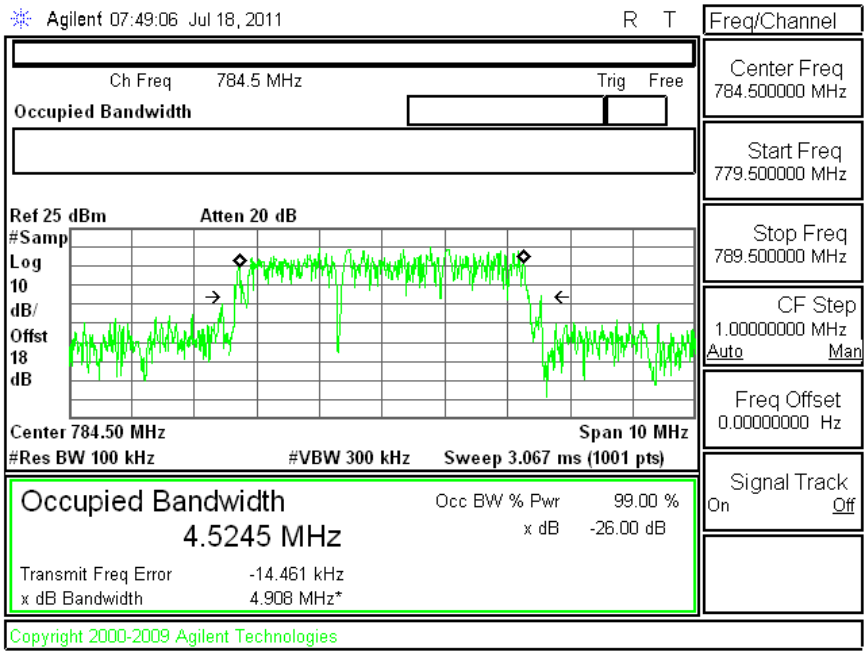
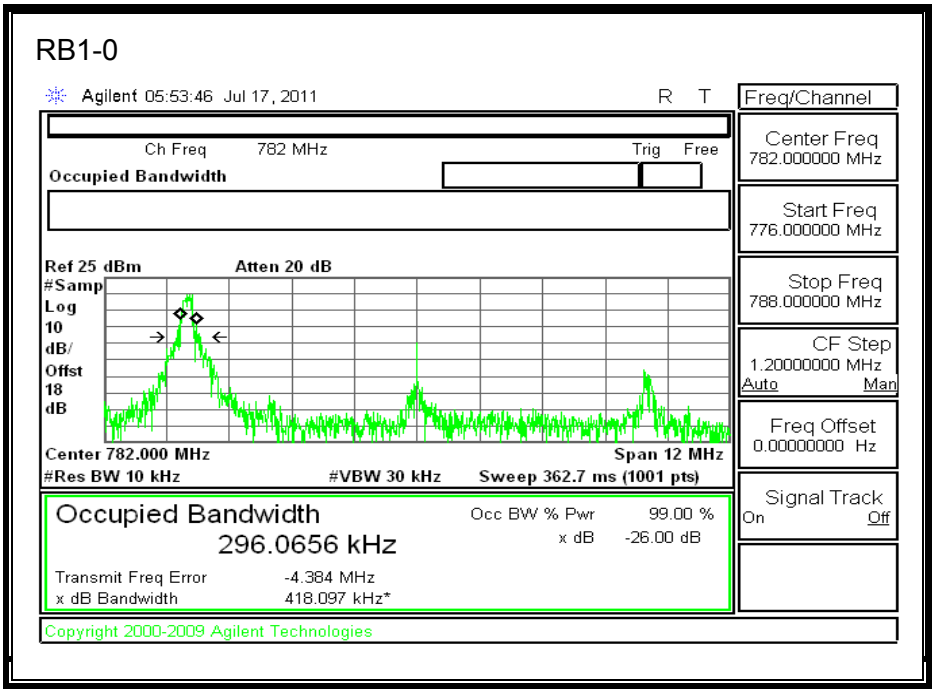
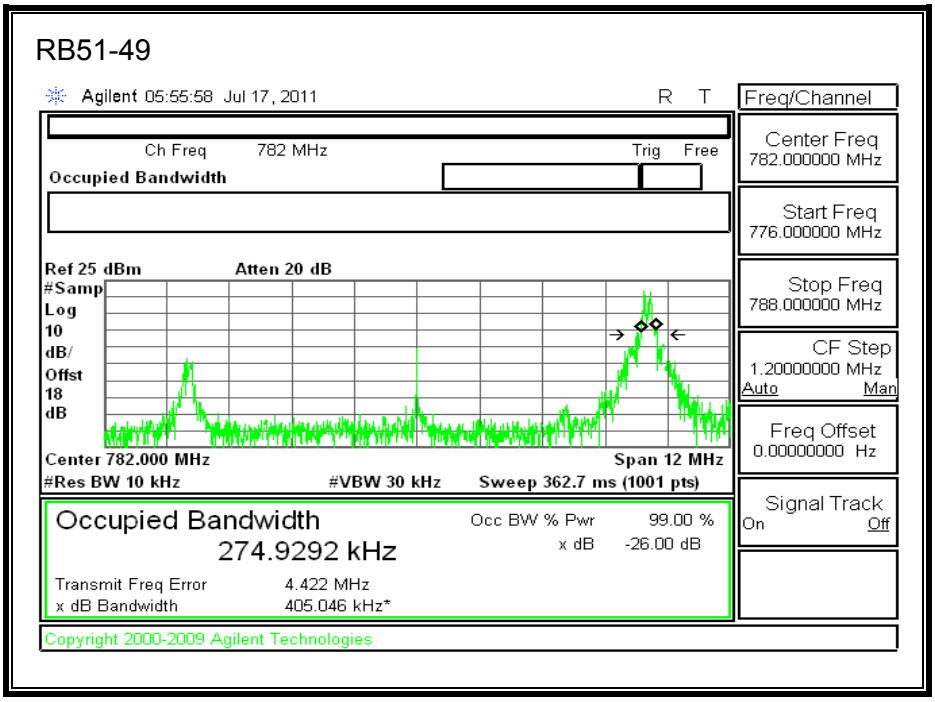


Band 13 16QAM (10MMHz Bandwidth)

782MHz





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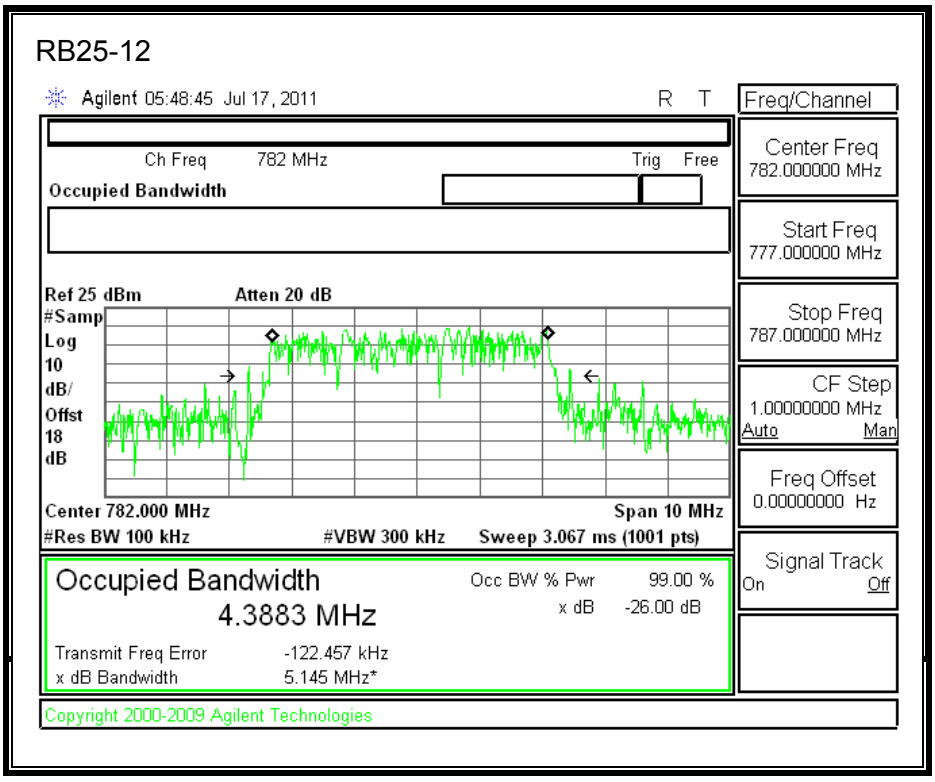
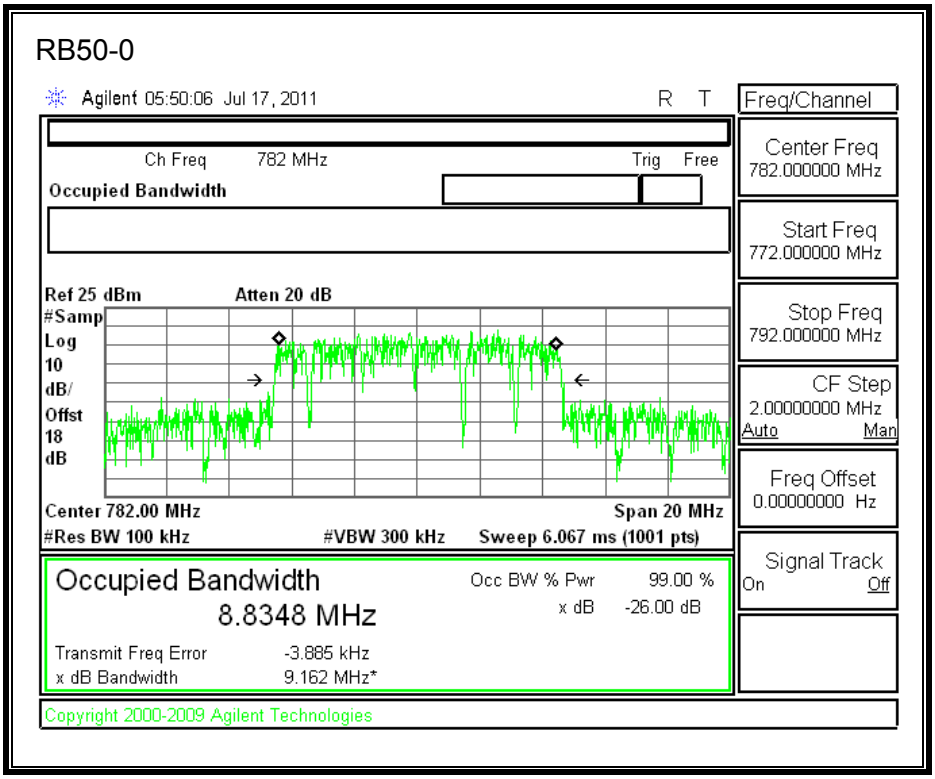


RB50-0



7.2. BAND EDGE

RULE PART(S)

FCC part 27.53(c)(2)

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

The transmitter output was connected to a Agilent 8960 Test Set and configured to operate at maximum power. The band edge emissions were measured at the required operating frequencies in each band on the Spectrum Analyzer.
For each band edge measurement:

- Set the spectrum analyzer span to include the block edge frequency.
- Set a marker to point the corresponding band edge frequency in each test case.
- Set display line at -13 dBm
- Set resolution bandwidth to at least 1% of emission bandwidth.

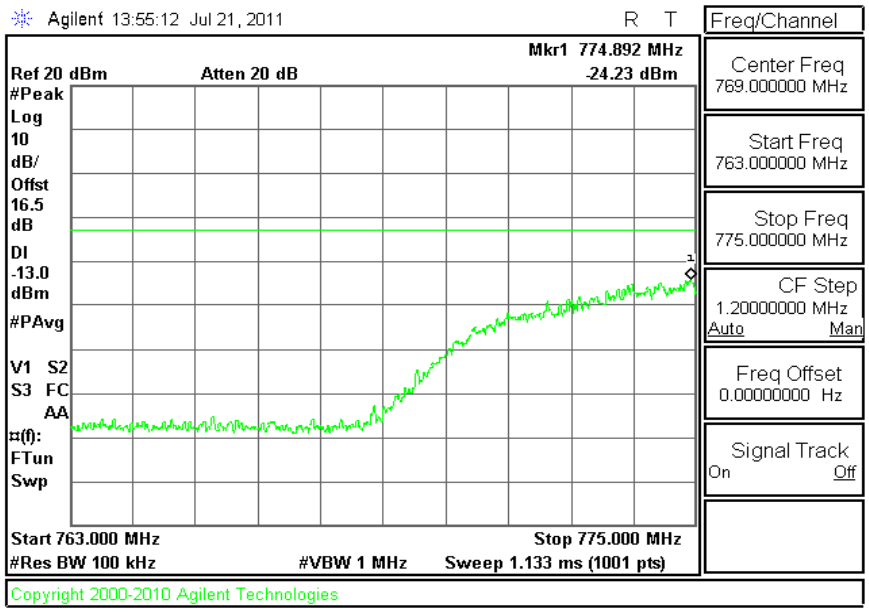
MODES TESTED

- LTE BAND 13

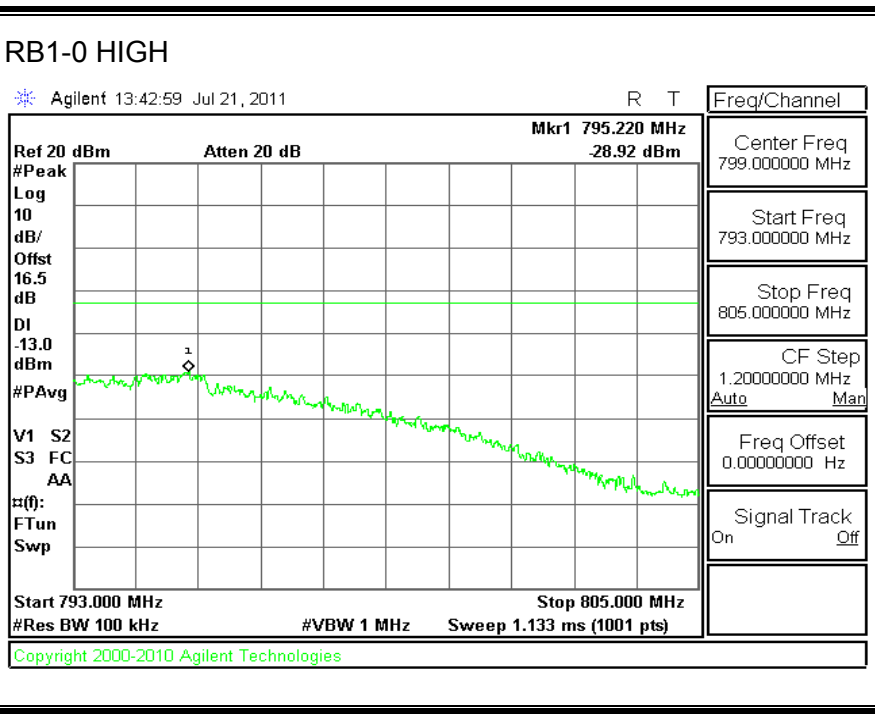
RESULTS

LTE QPSK Band 13

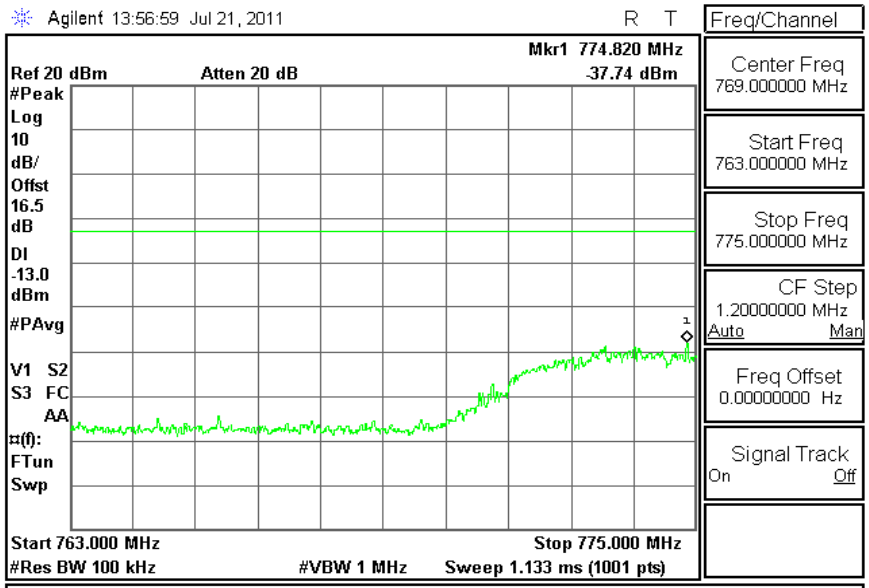
RB1-0 LOW



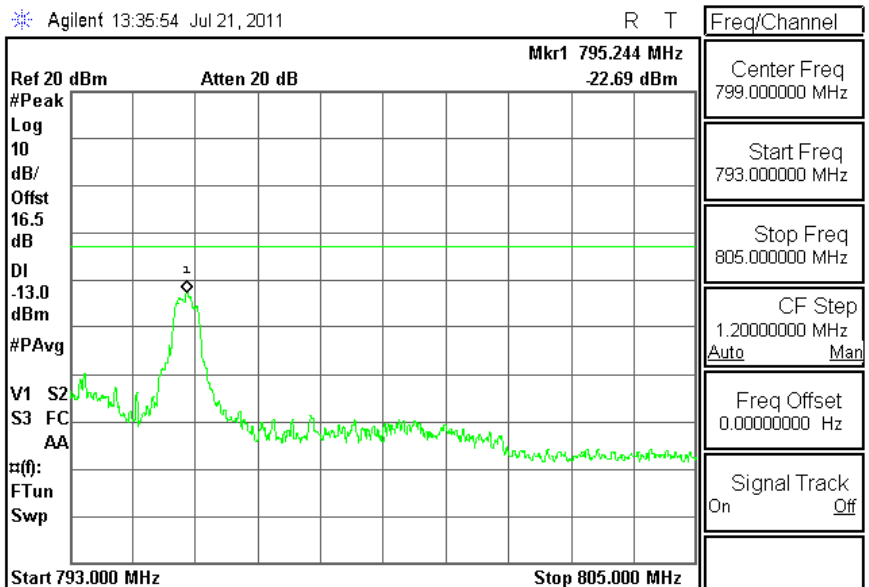
RB1-0 HIGH



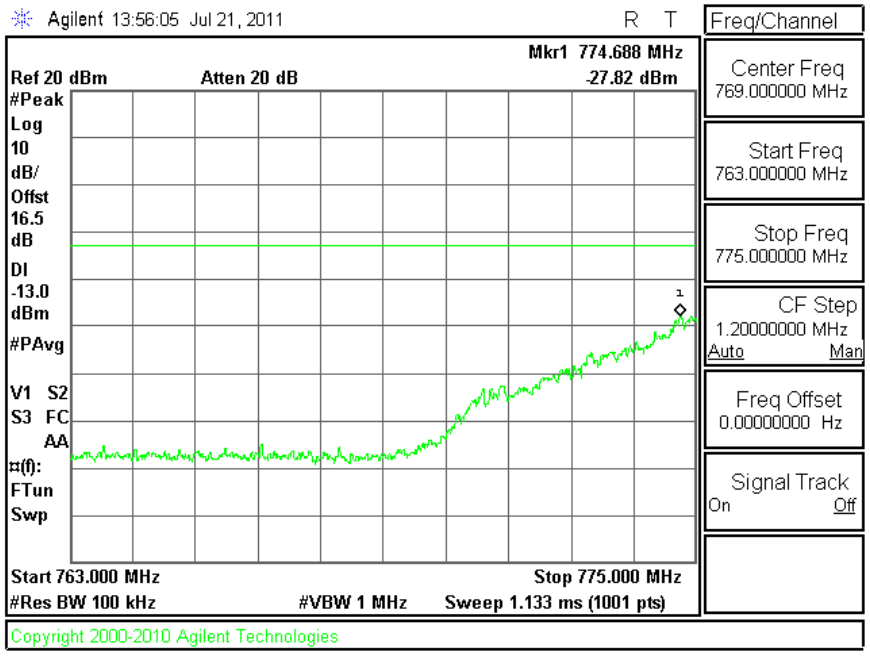
RB1-49 LOW



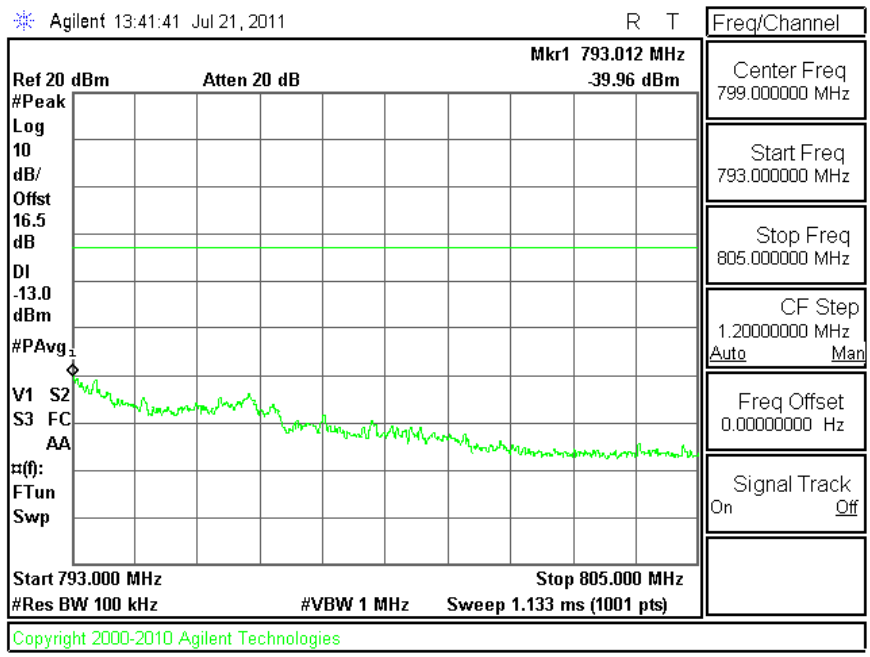
RB1-49 HIGH



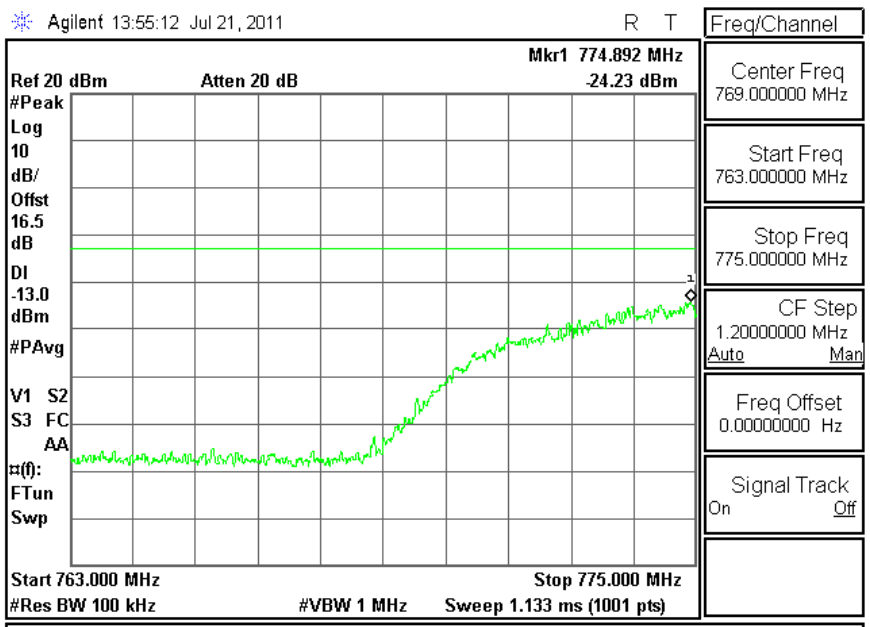
RB25-12 LOW



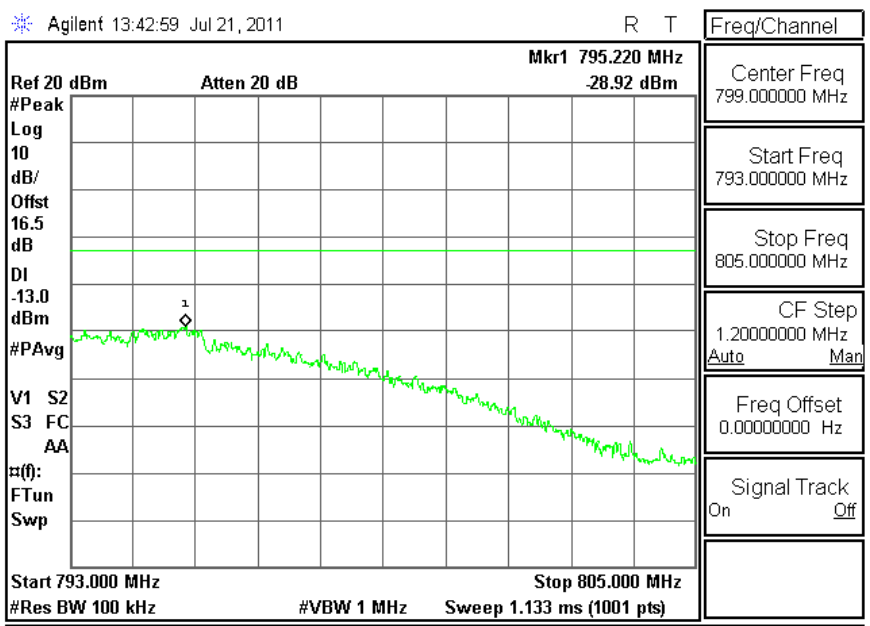
RB25-12 HIGH



RB50-0 LOW

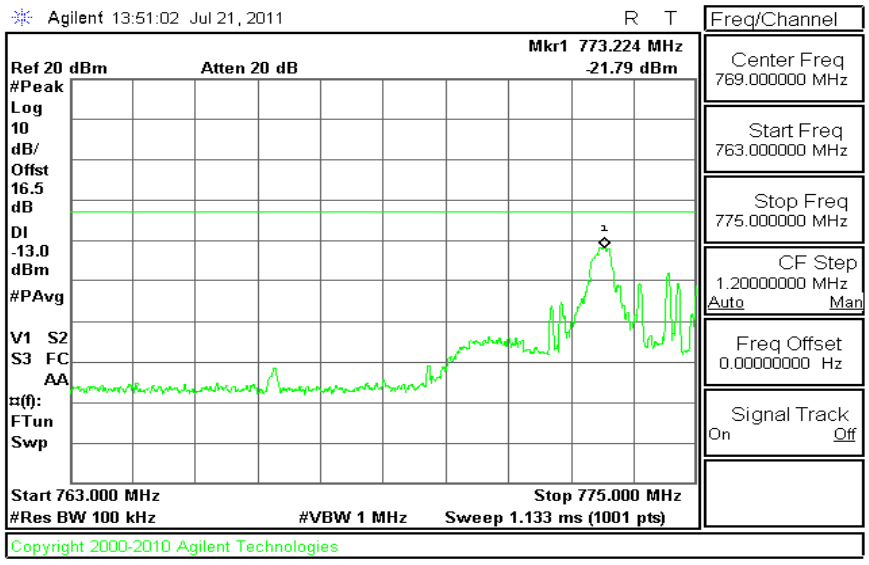


RB50-0 HIGH

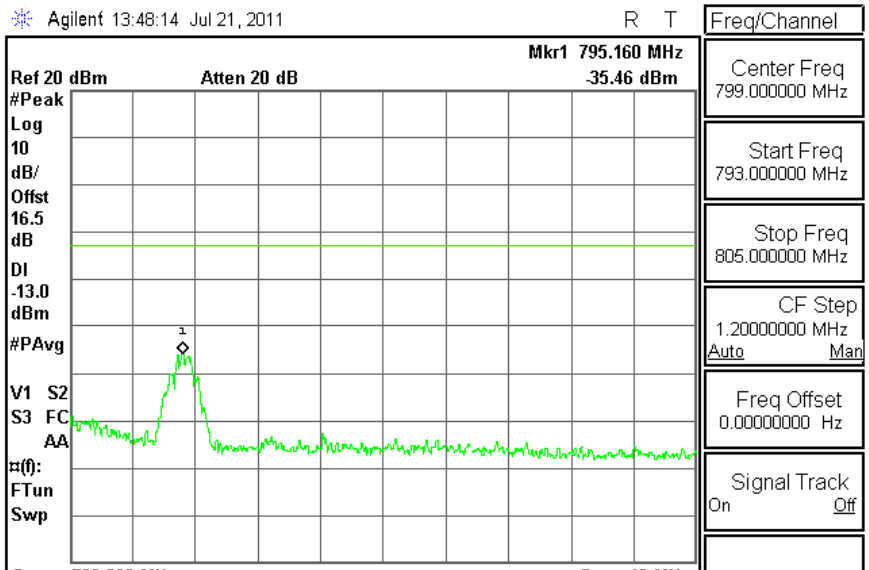


LTE 16QAM Band 13

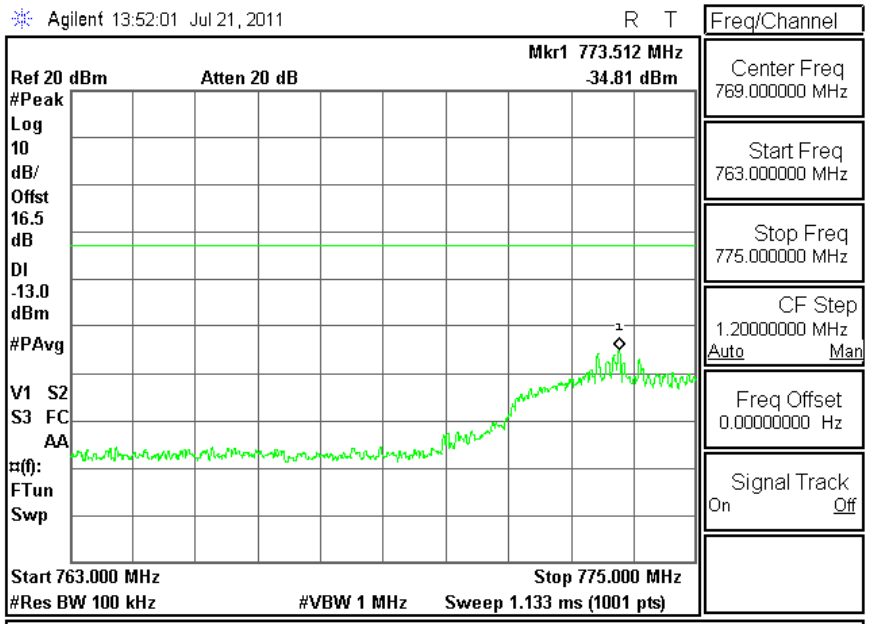
RB1-0 LOW



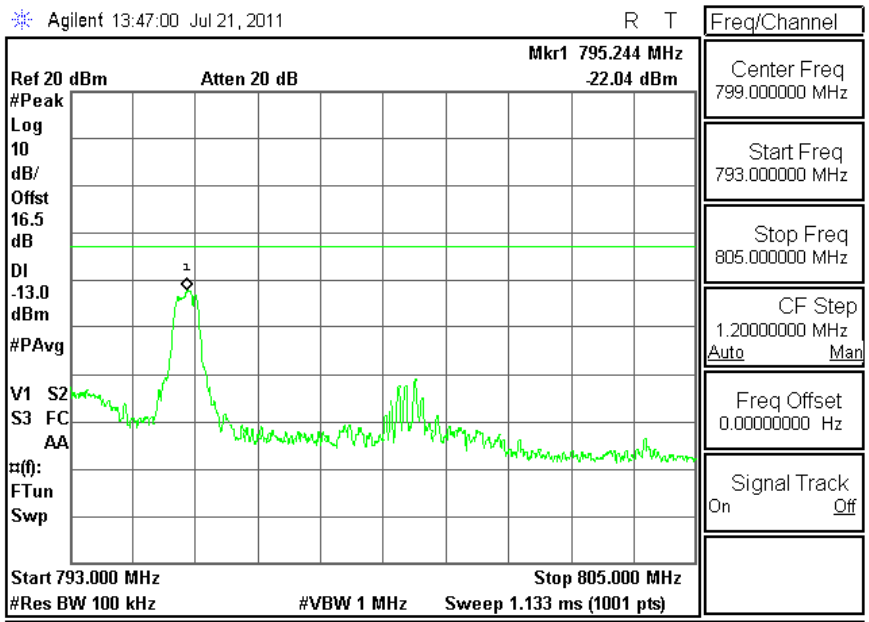
RB1-0 HIGH



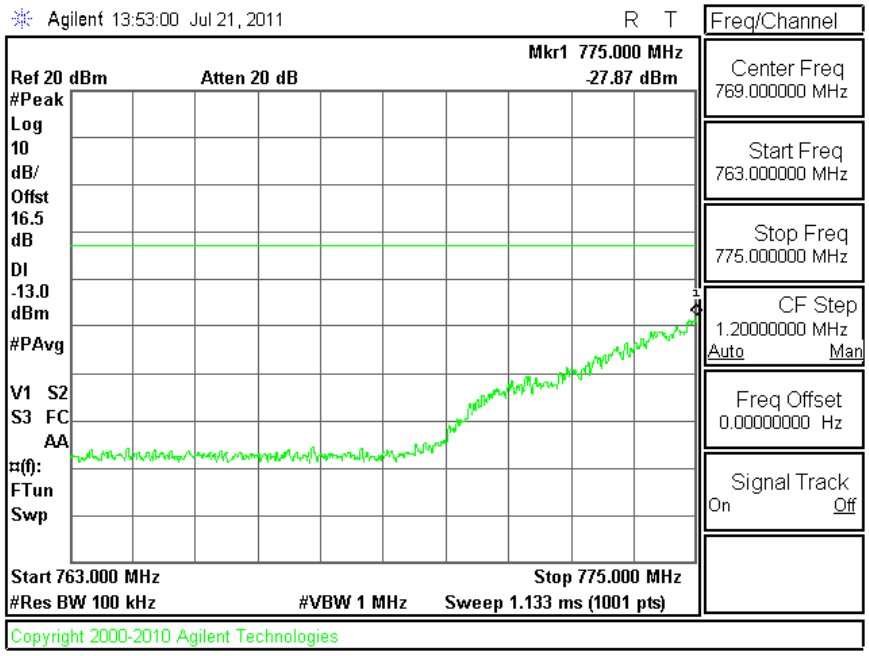
RB1-49 LOW



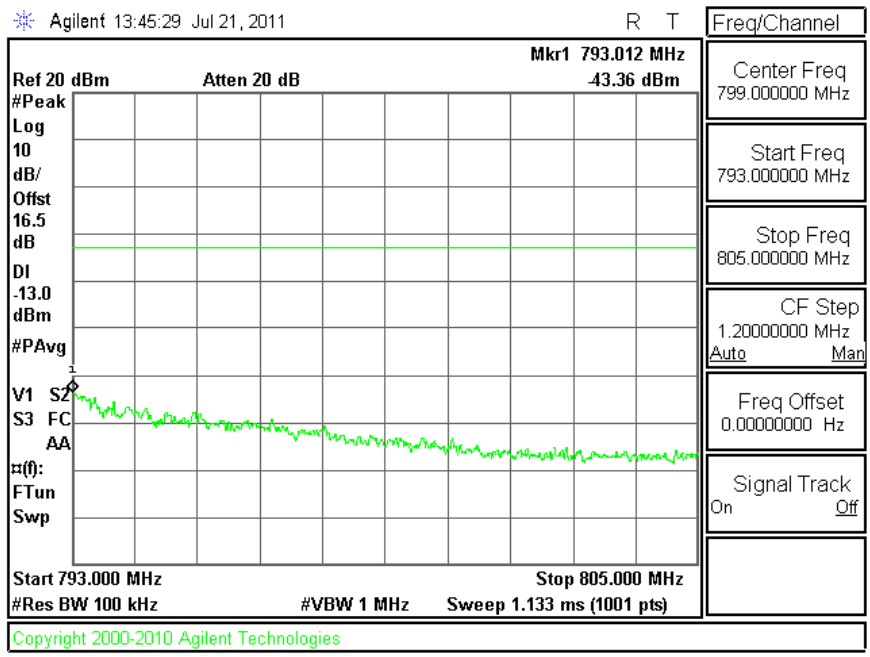
RB1-49 HIGH



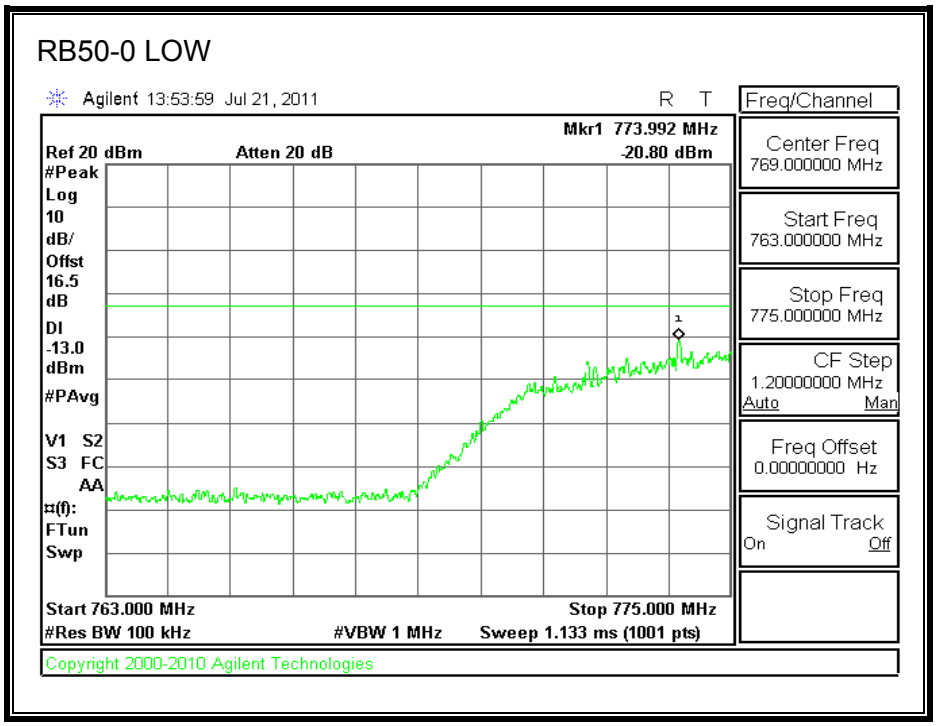
RB25-12 LOW



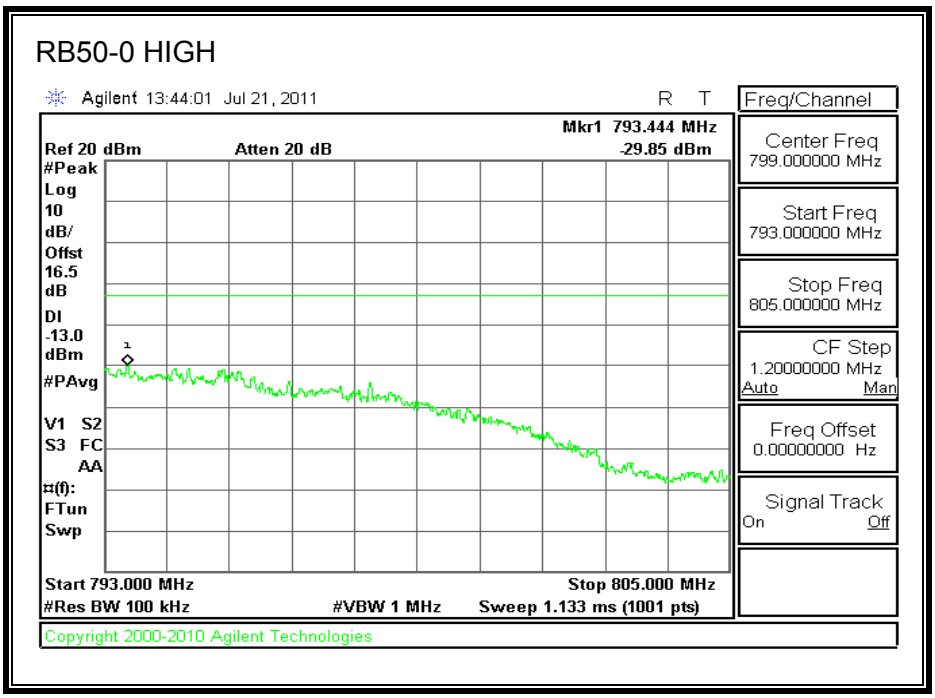
RB25-12 HIGH



RB50-0 LOW



RB50-0 HIGH



7.3. OUT OF BAND EMISSIONS

RULE PART(S)

FCC: §27.53

LIMITS

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

The RF output of the transmitter was connected to a spectrum analyzer through a calibrated coaxial cable. Sufficient scans were taken to show the out-of-band Emissions, if any, up to 10th harmonic. Multiple sweeps were recorded in maximum hold mode using a peak detector to ensure that the worst-case emissions were caught.

For each out of band emissions measurement:

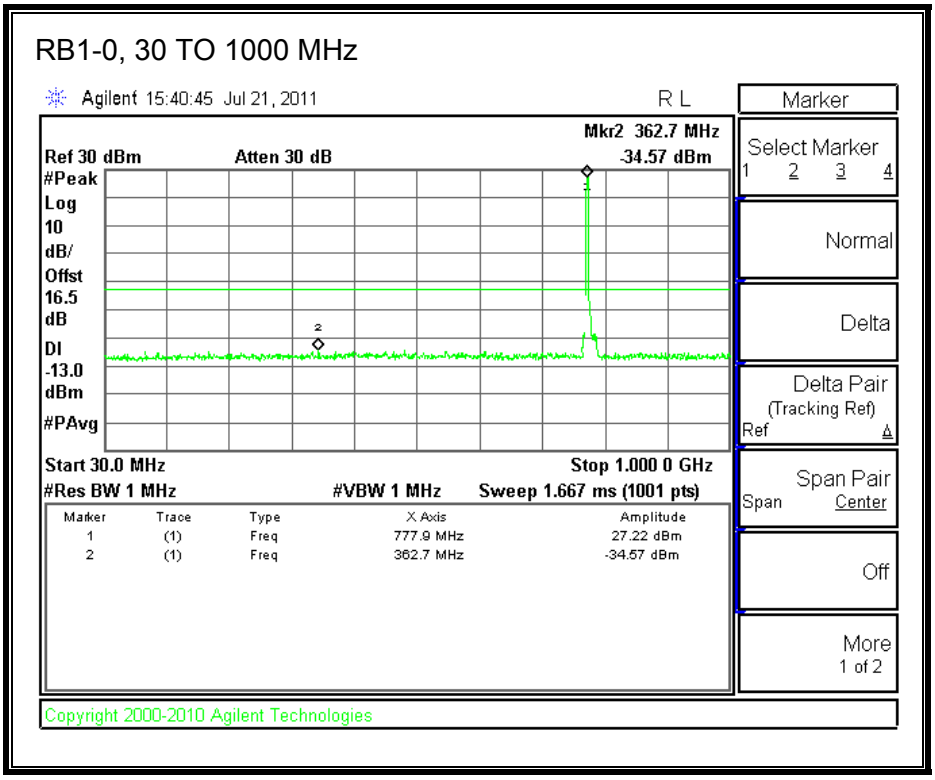
- Set display line at -13 dBm
- Set RBW & VBW to 100 kHz for the measurement below 1 GHz, and 1 MHz for the measurement above 1 GHz.

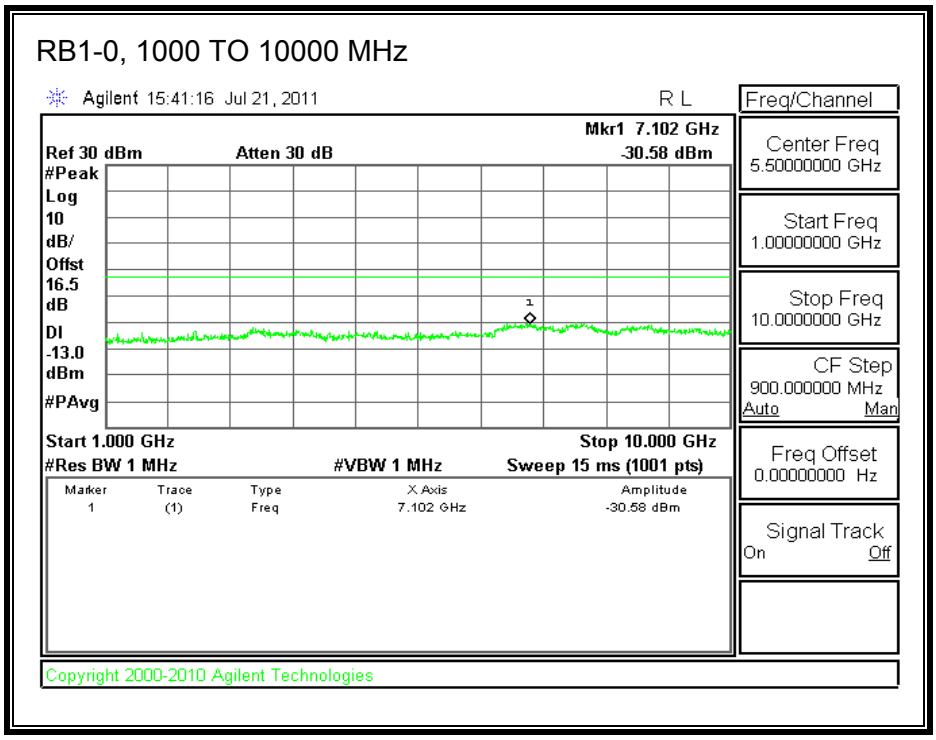
MODES TESTED

- LTE BAND 13

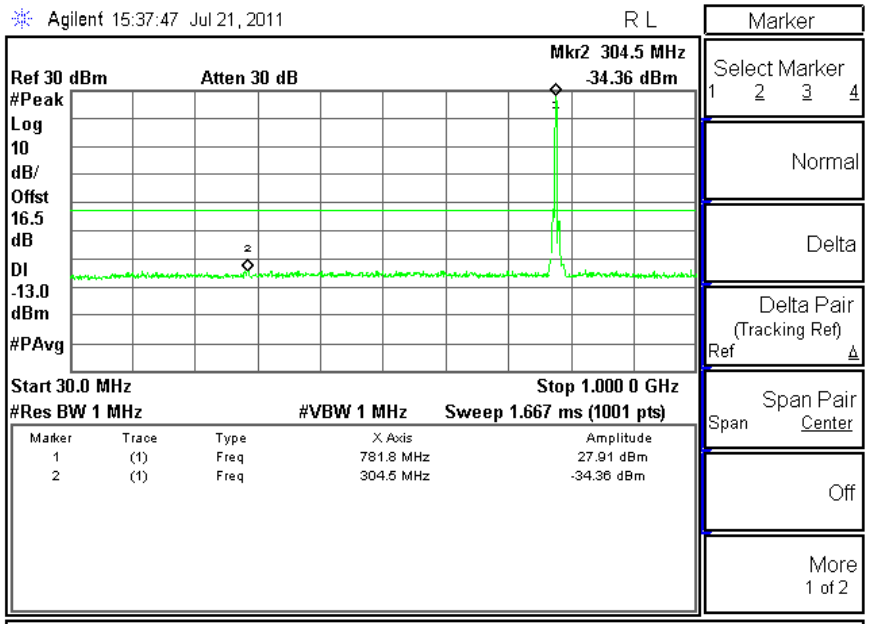
RESULTS

LTE QPSK Band 13, 779.5MHz

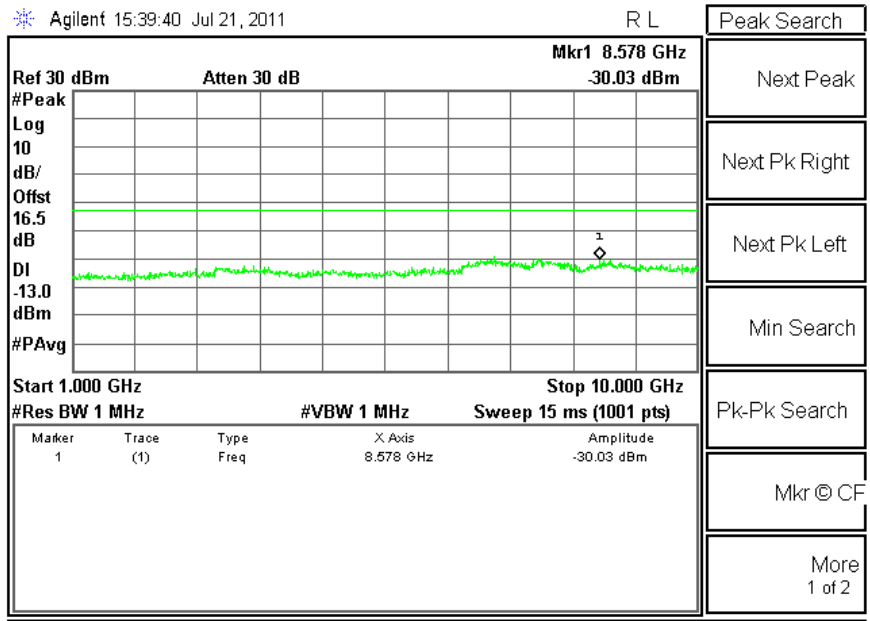




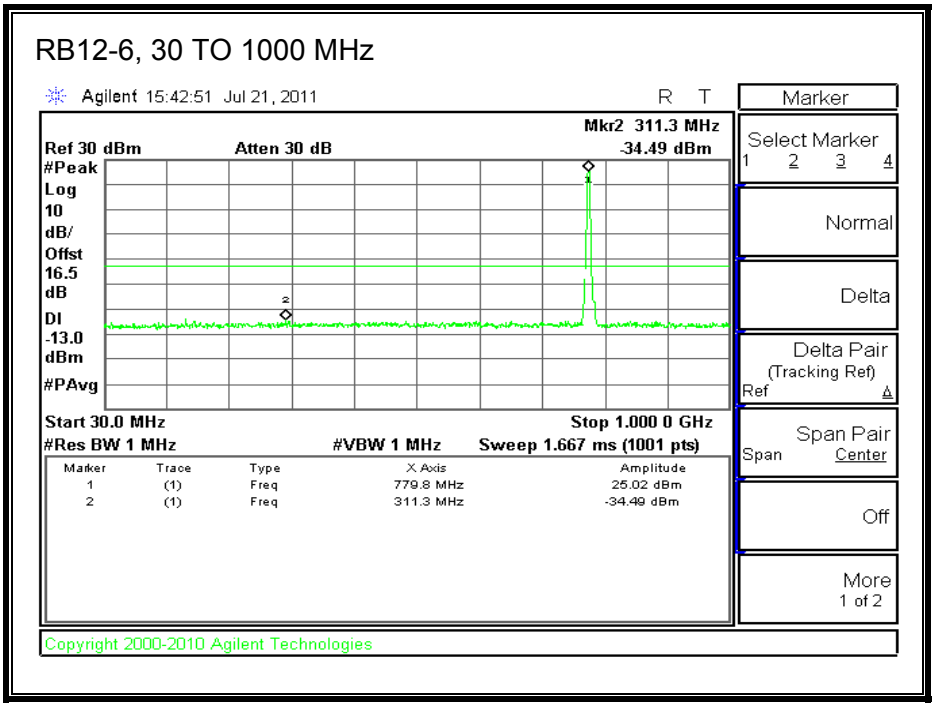
RB1-24, 30 TO 1000 MHz



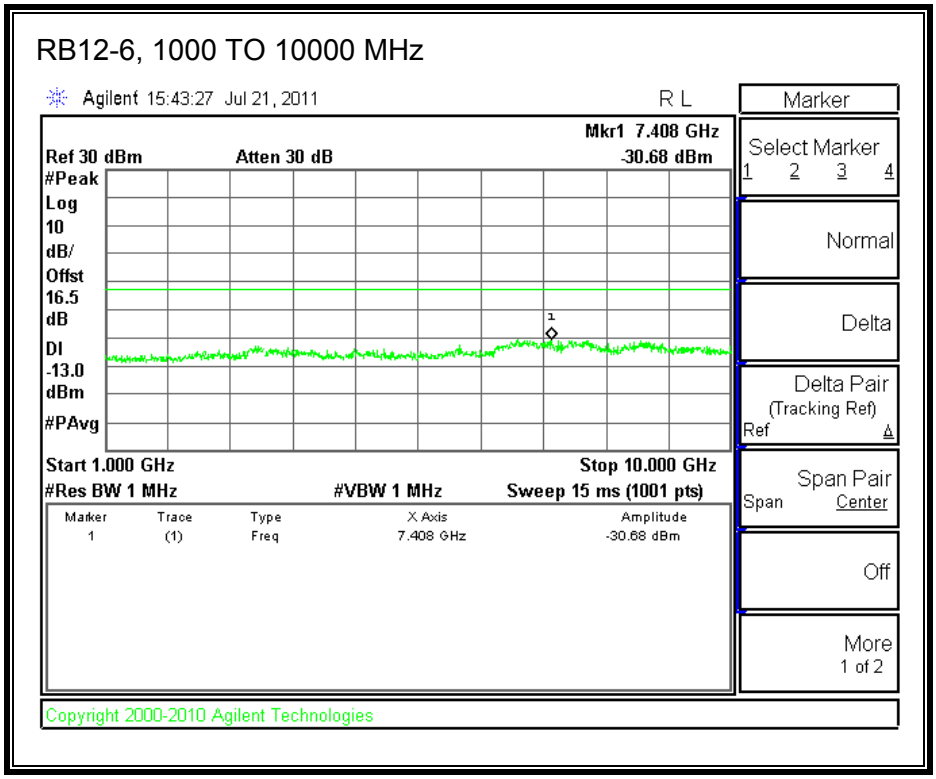
RB1-24, 1000 TO 10000 MHz



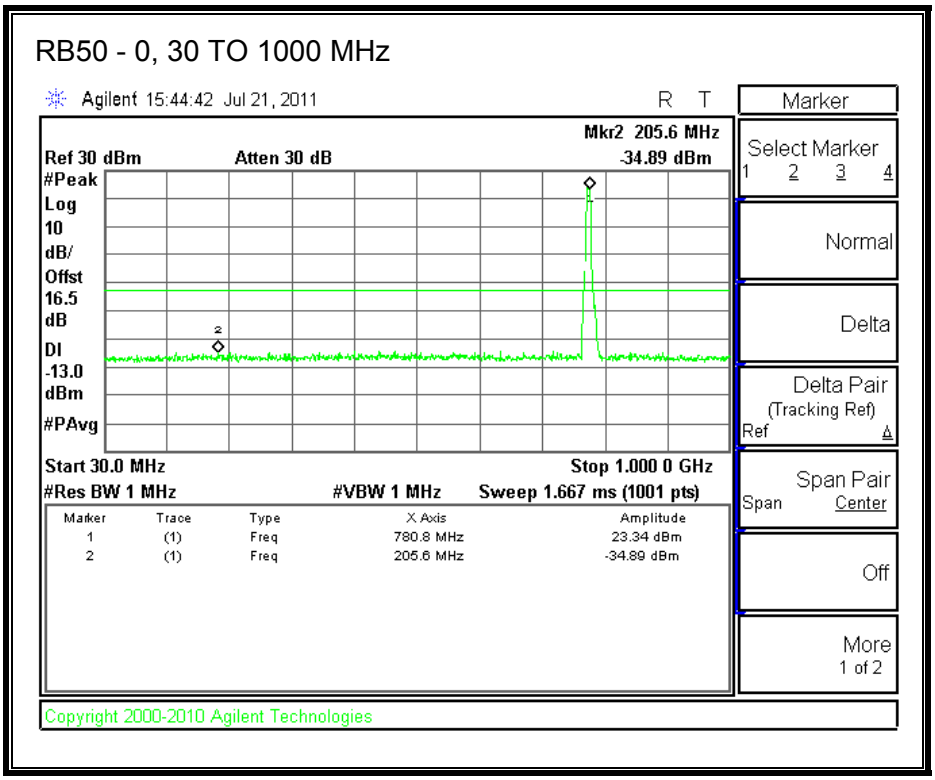
RB12-6, 30 TO 1000 MHz



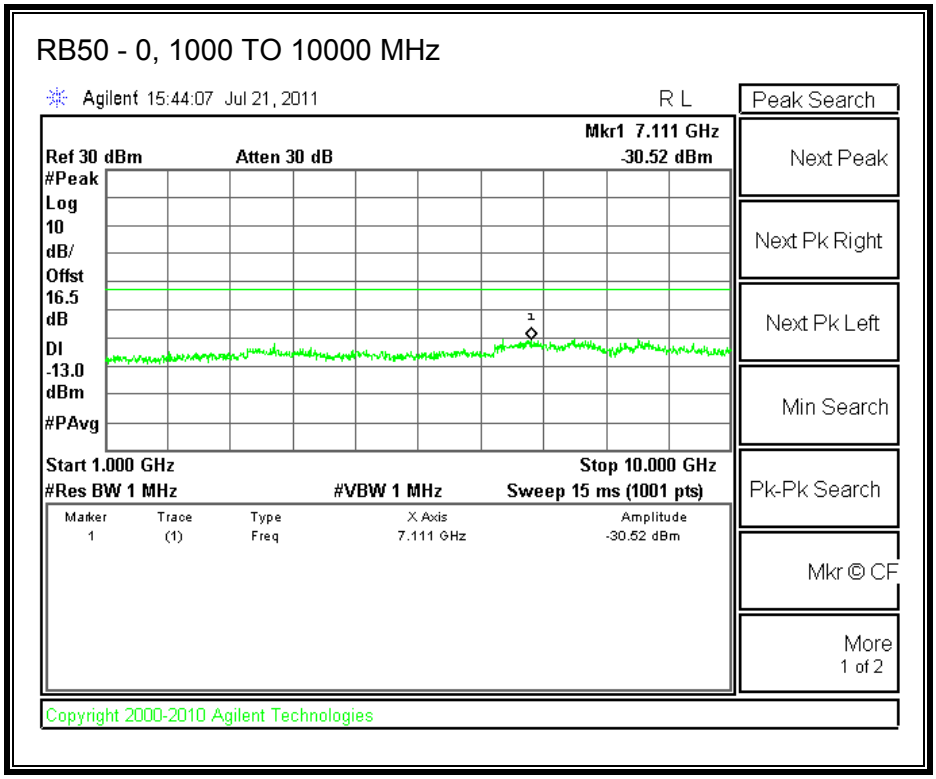
RB12-6, 1000 TO 10000 MHz



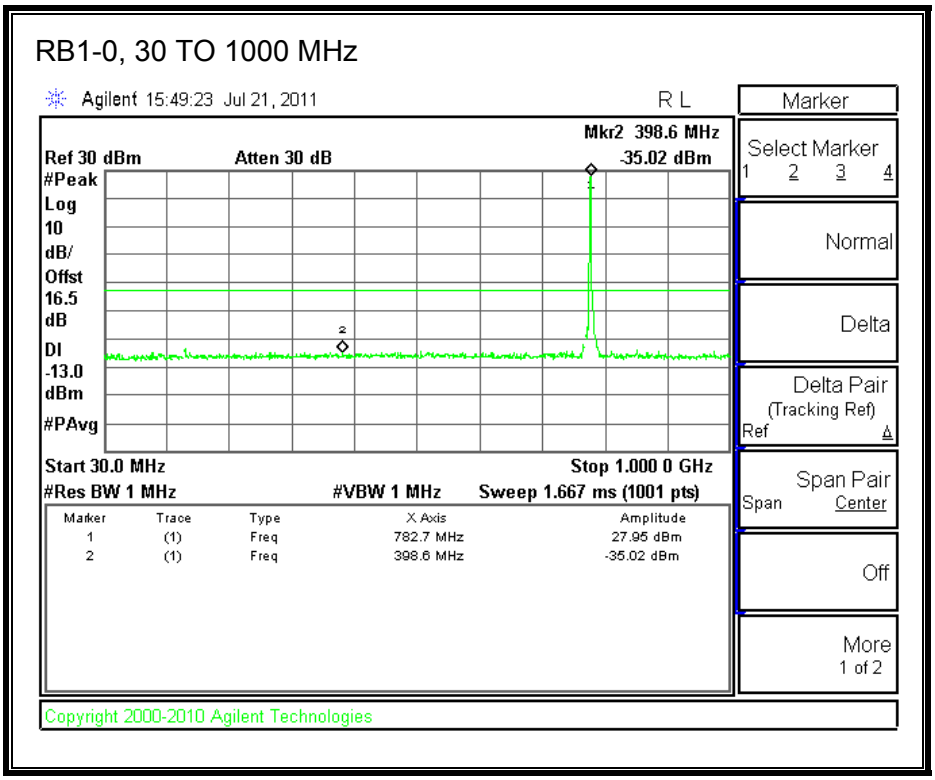
RB50 - 0, 30 TO 1000 MHz

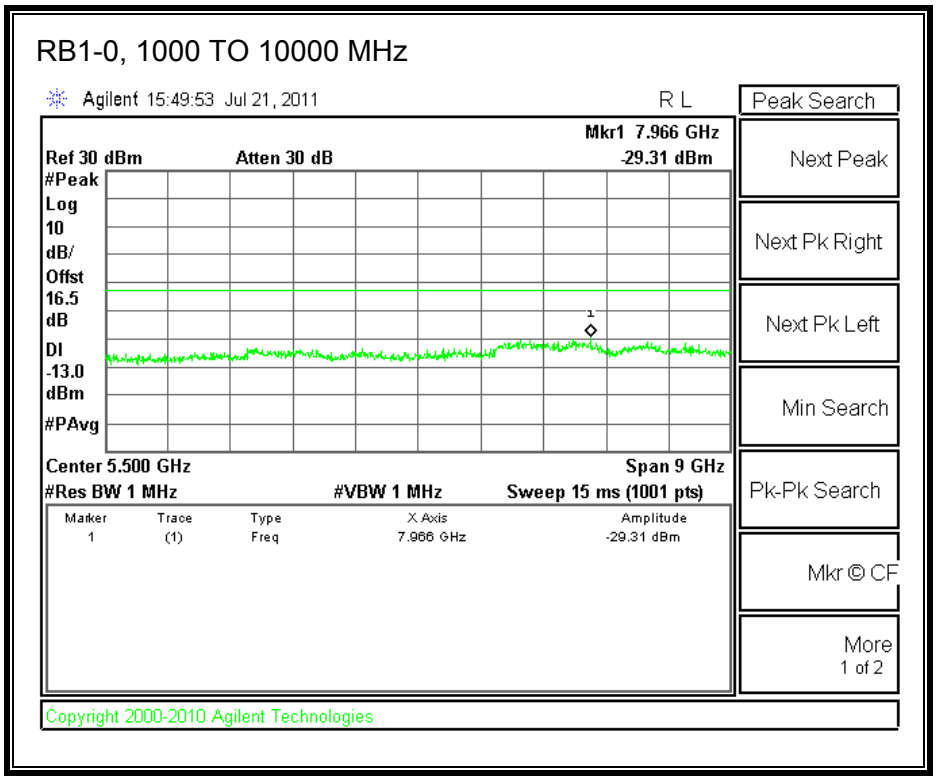


RB50 - 0, 1000 TO 10000 MHz

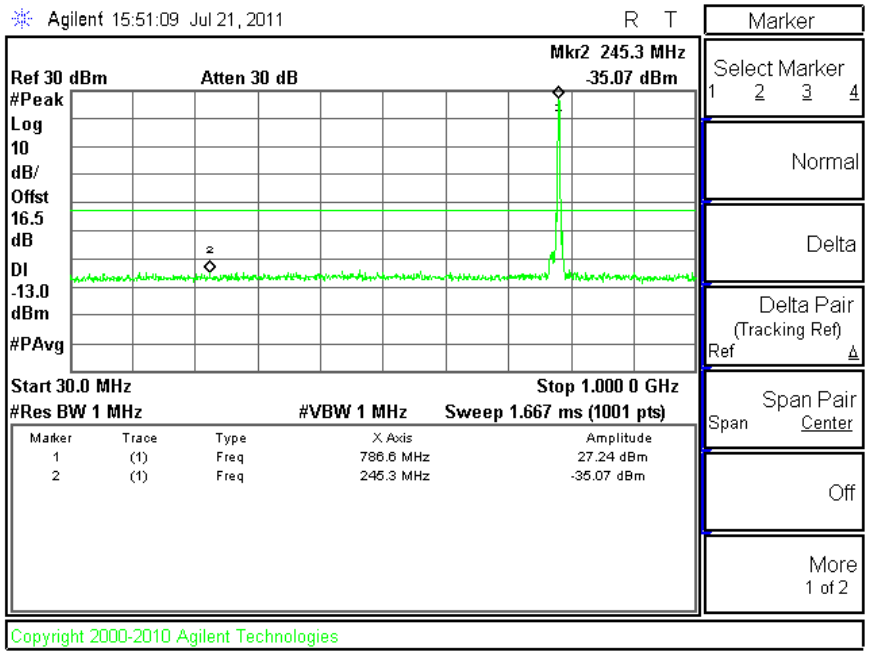


LTE QPSK Band 13, 784.5MHz

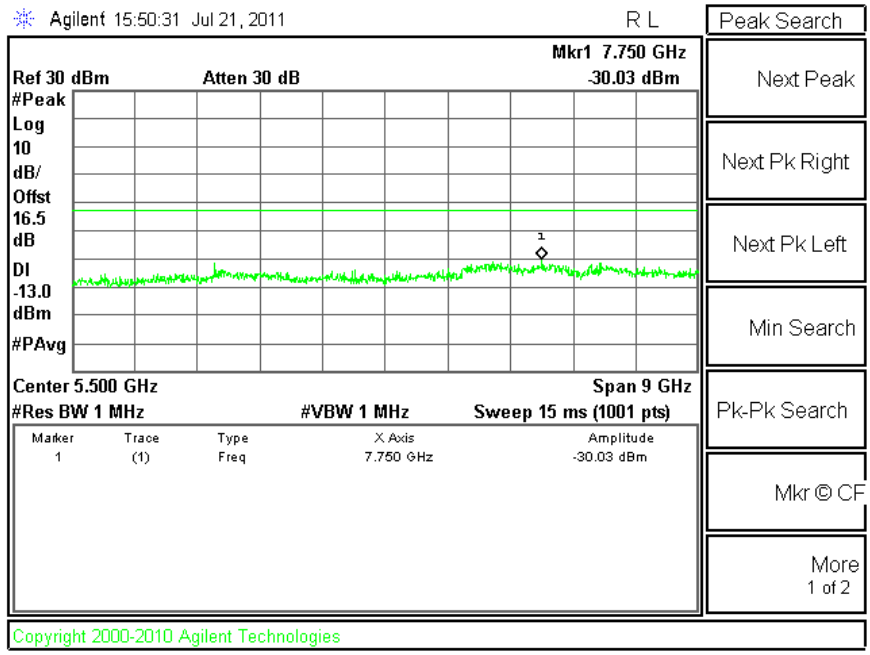




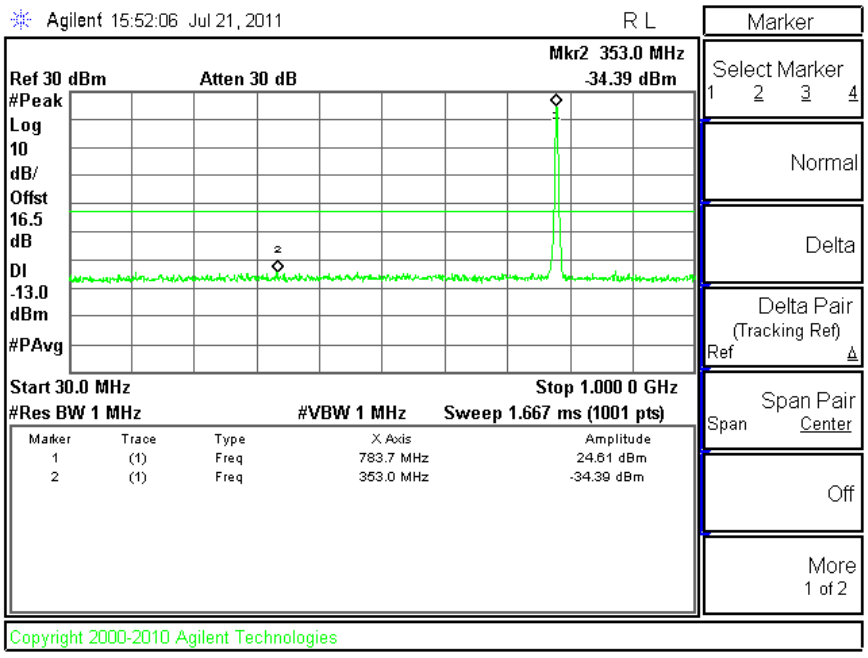
RB1-24, 30 TO 1000 MHz



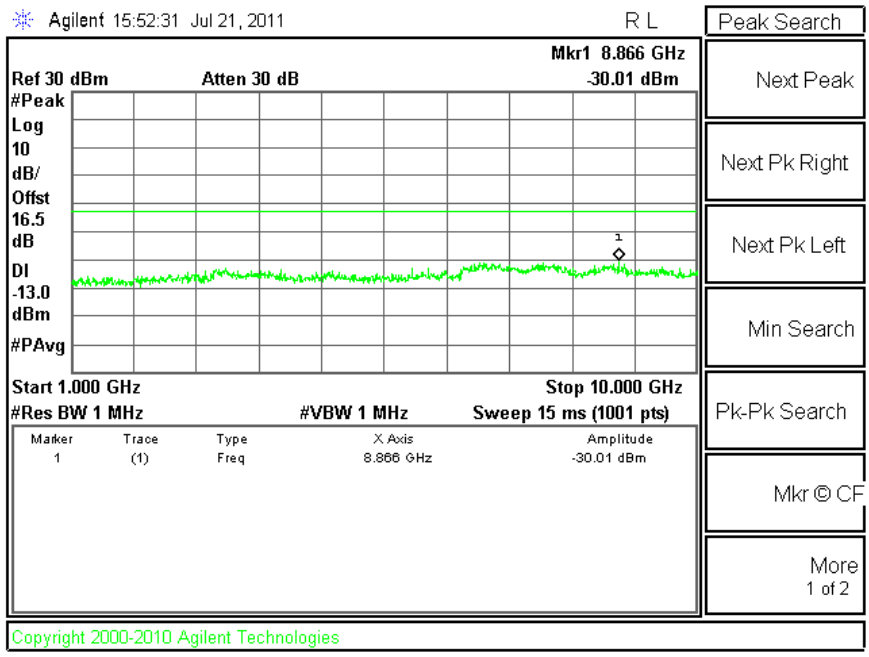
RB1-24, 1000 TO 10000 MHz



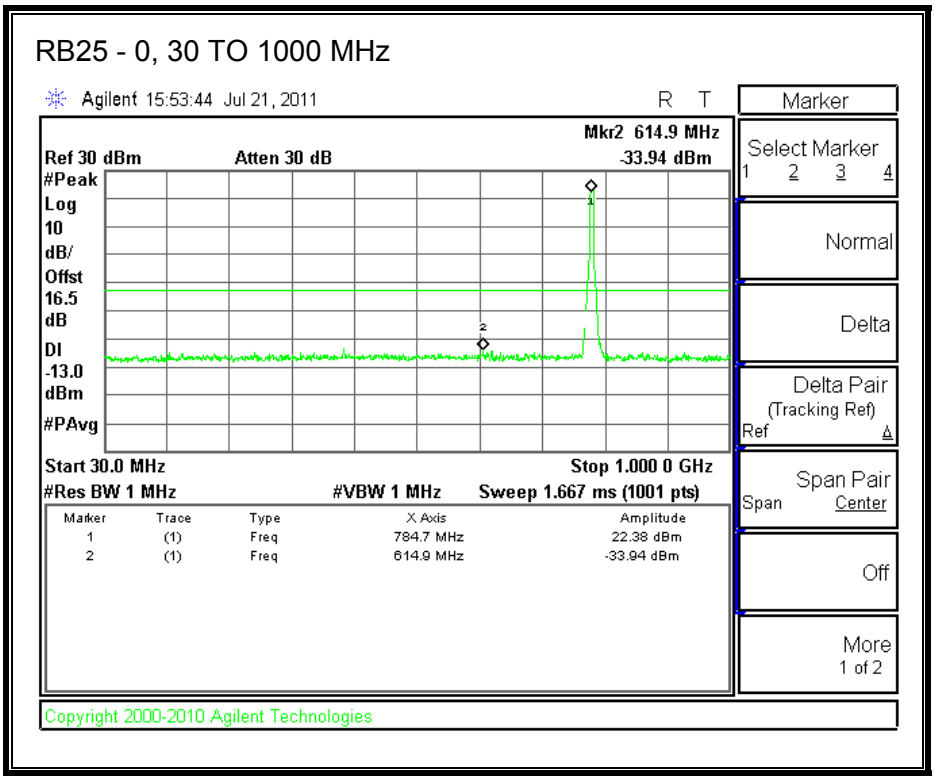
RB12-6, 30 TO 1000 MHz



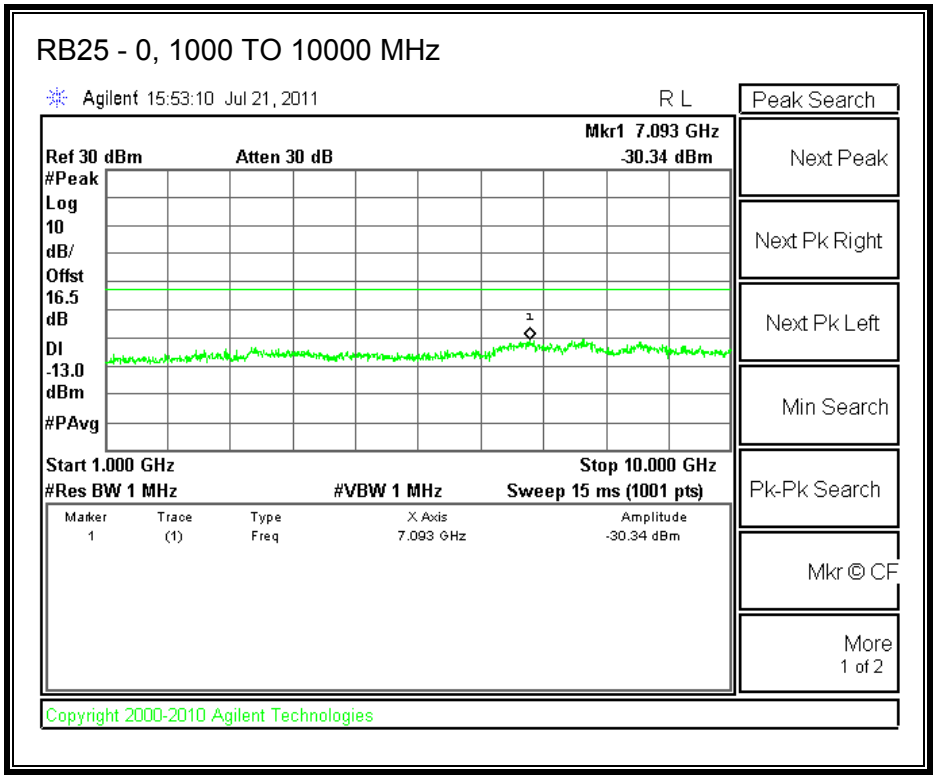
RB12-6, 1000 TO 10000 MHz



RB25 - 0, 30 TO 1000 MHz

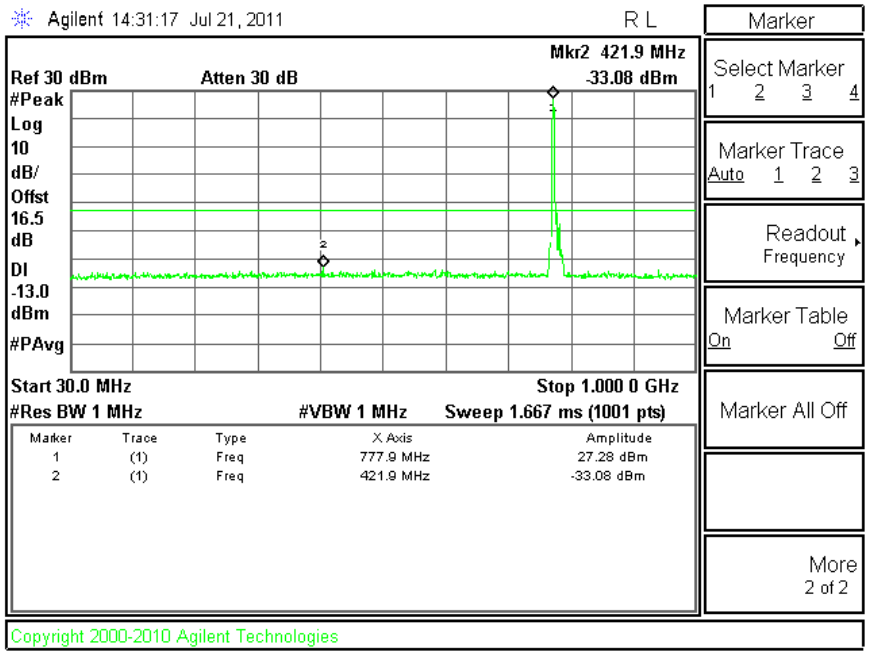


RB25 - 0, 1000 TO 10000 MHz

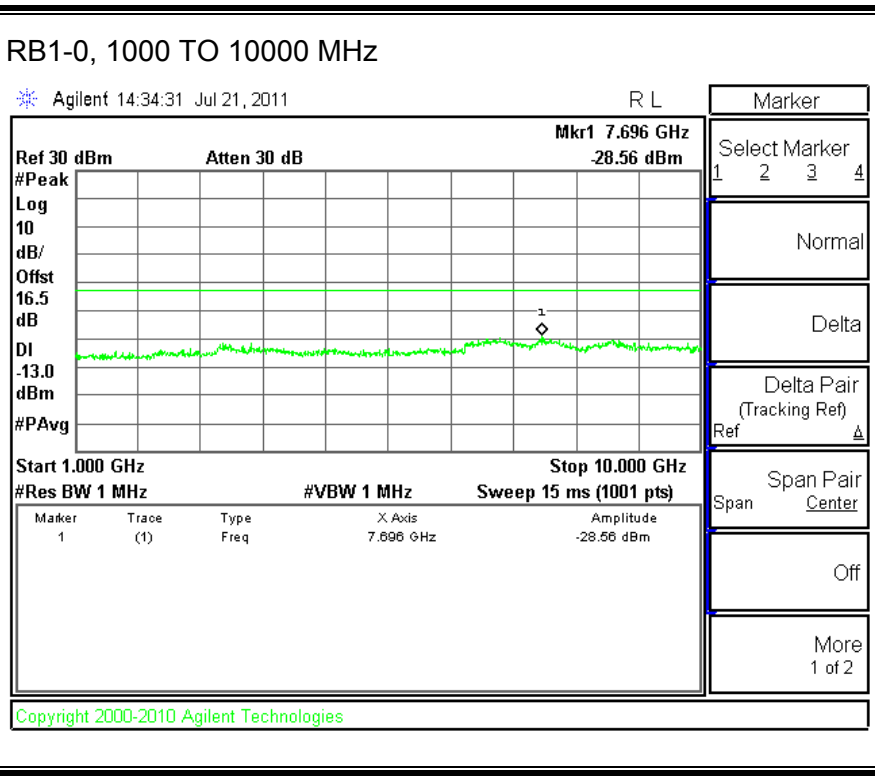


LTE QPSK Band 13, 872MHz

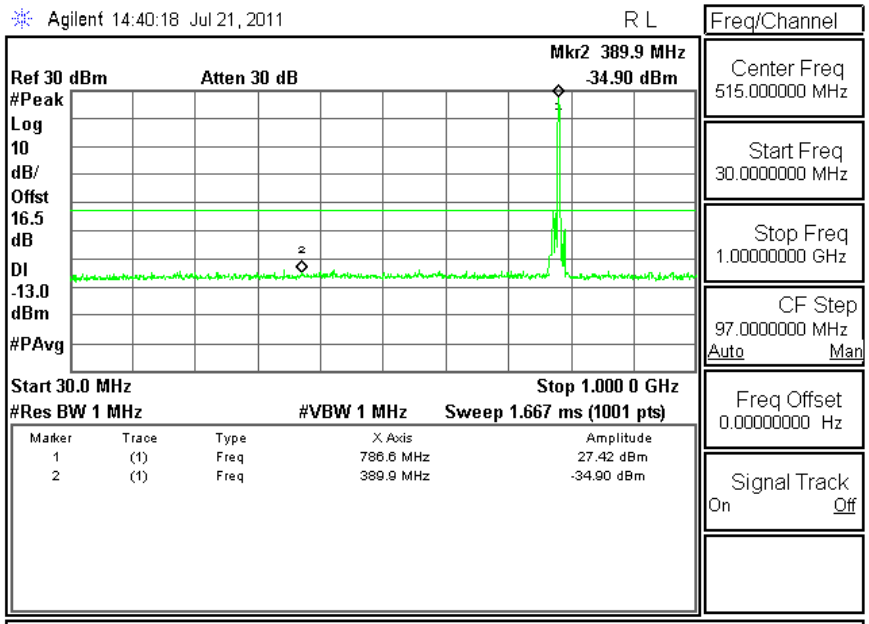
RB1-0, 30 TO 1000 MHz



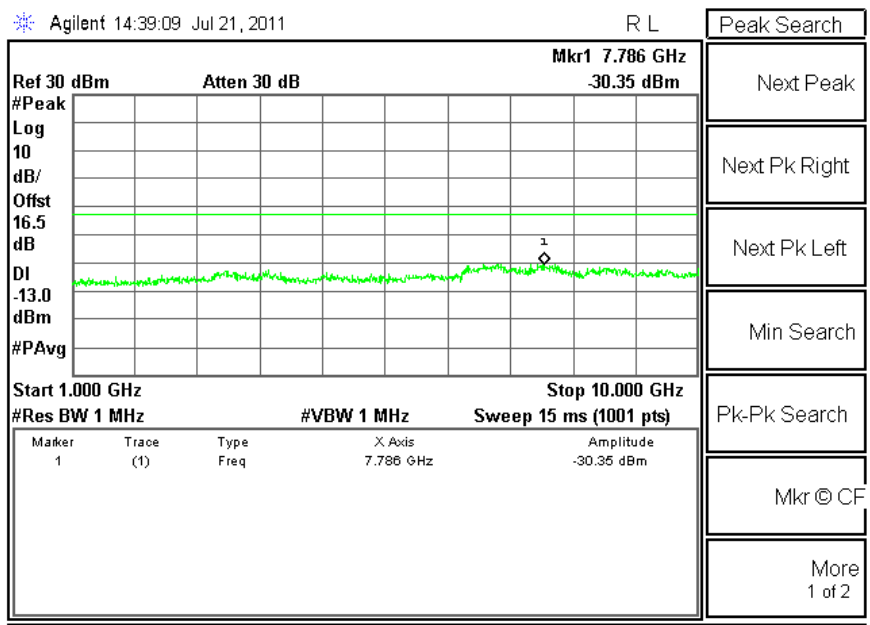
RB1-0, 1000 TO 10000 MHz



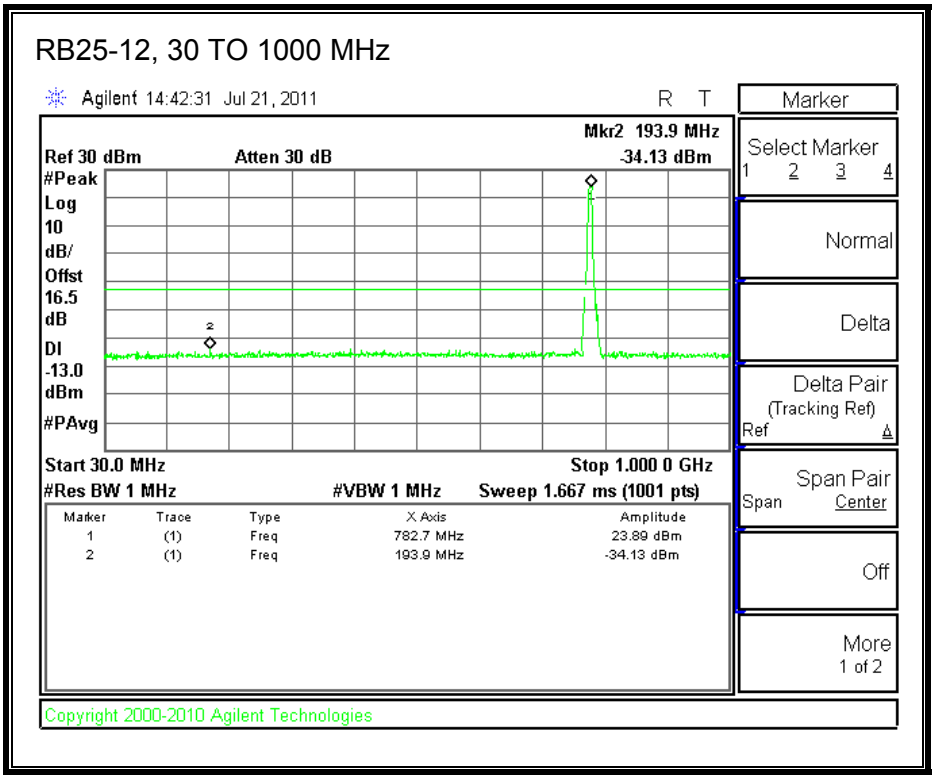
RB1-49, 30 TO 1000 MHz



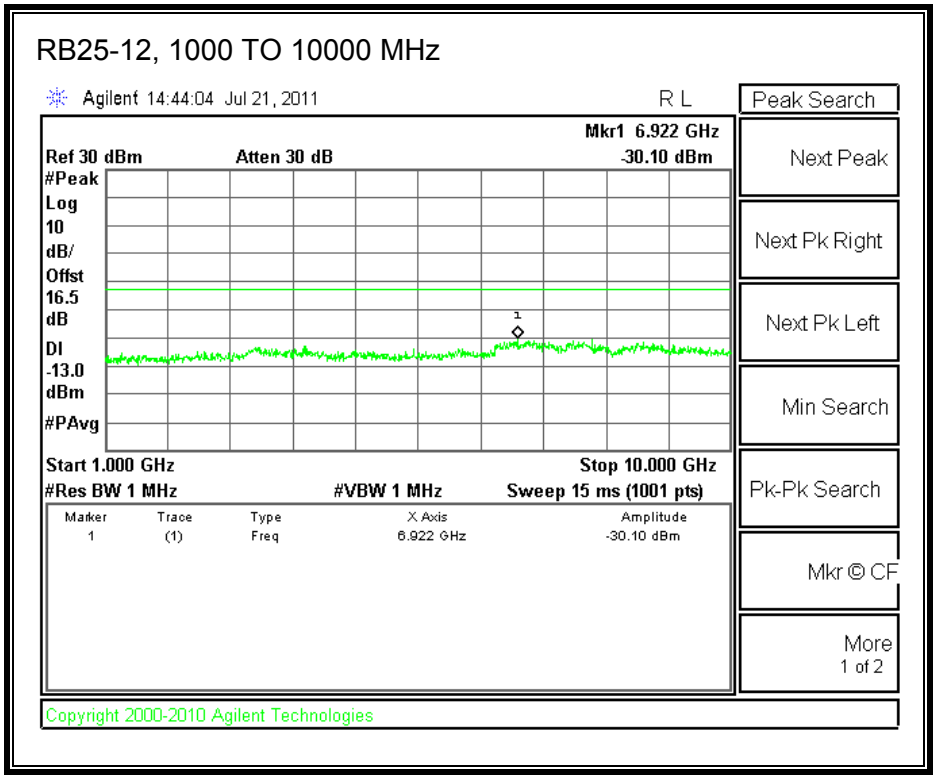
RB1-49, 1000 TO 10000 MHz



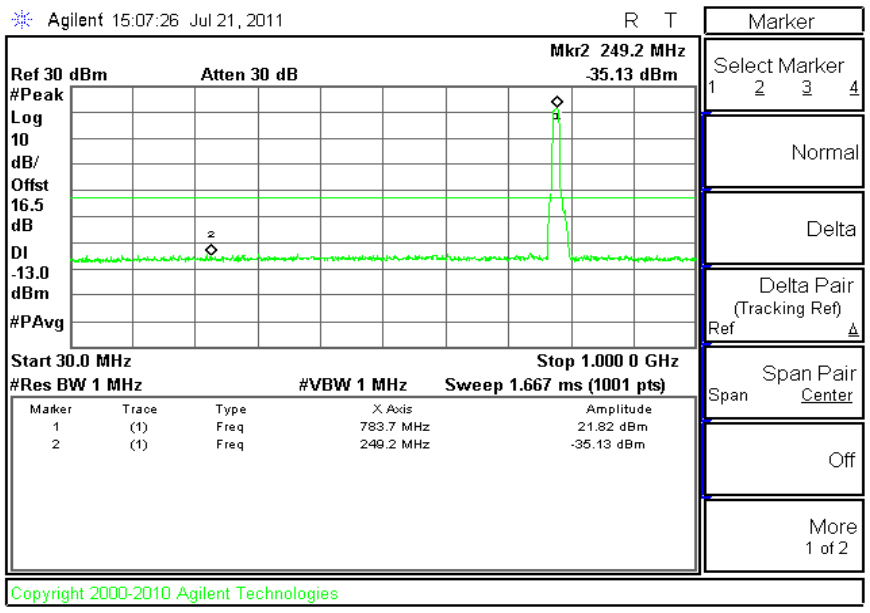
RB25-12, 30 TO 1000 MHz



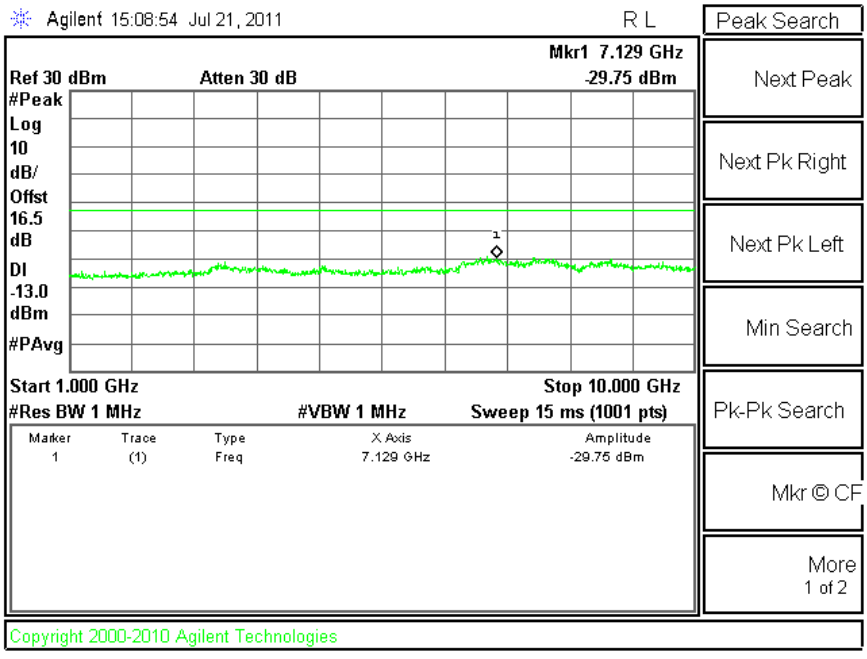
RB25-12, 1000 TO 10000 MHz



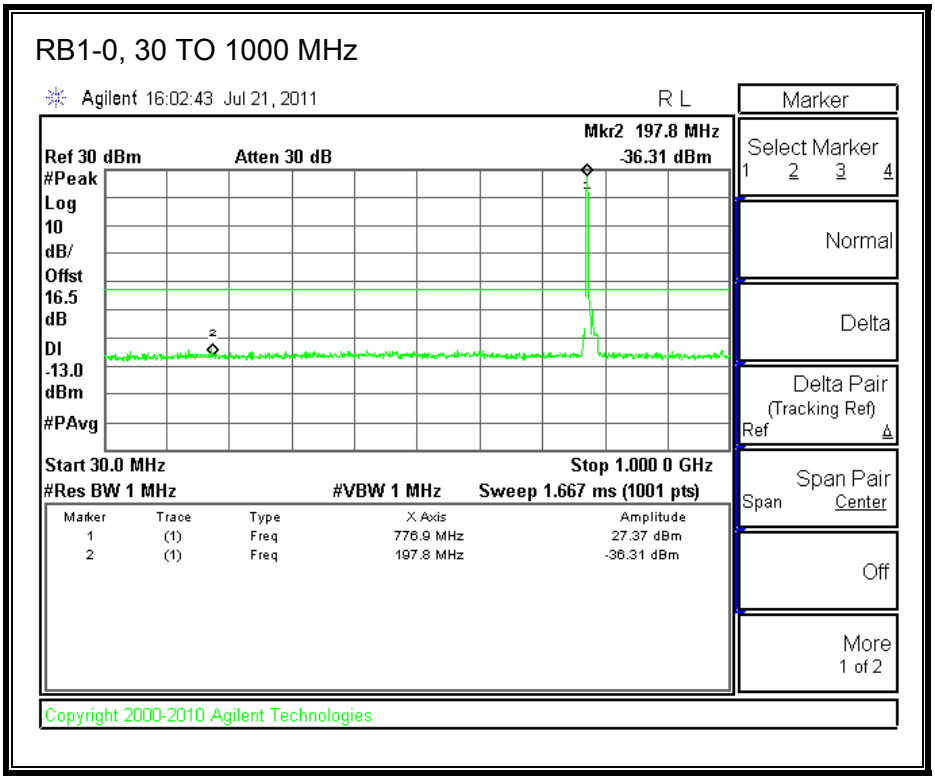
RB50 - 0, 30 TO 1000 MHz

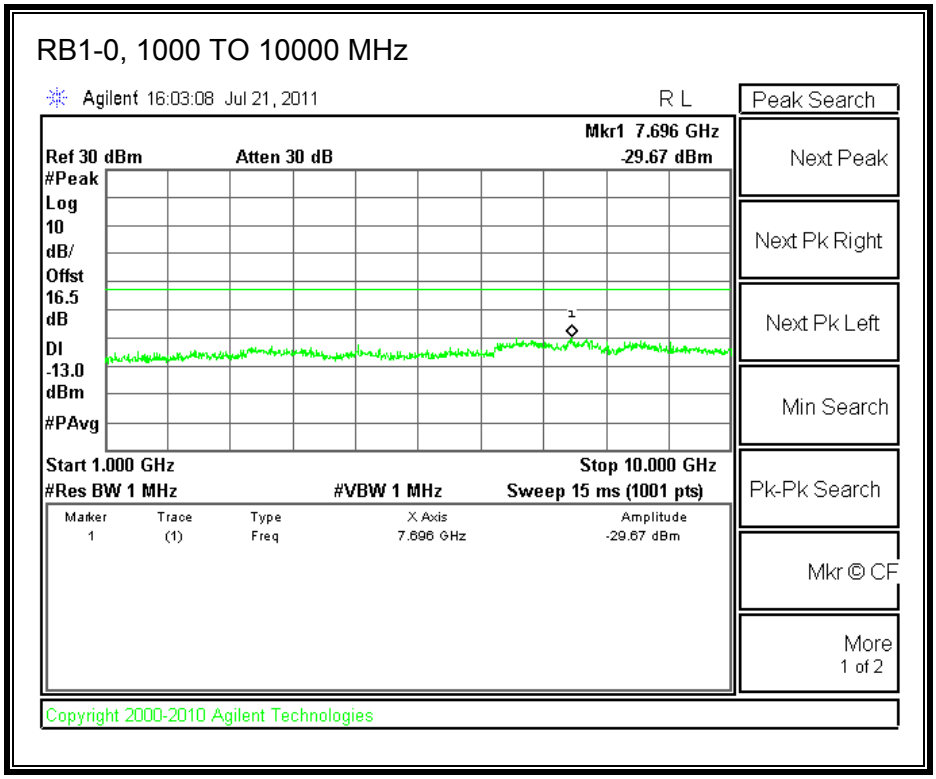


RB50 - 0, 1000 TO 10000 MHz

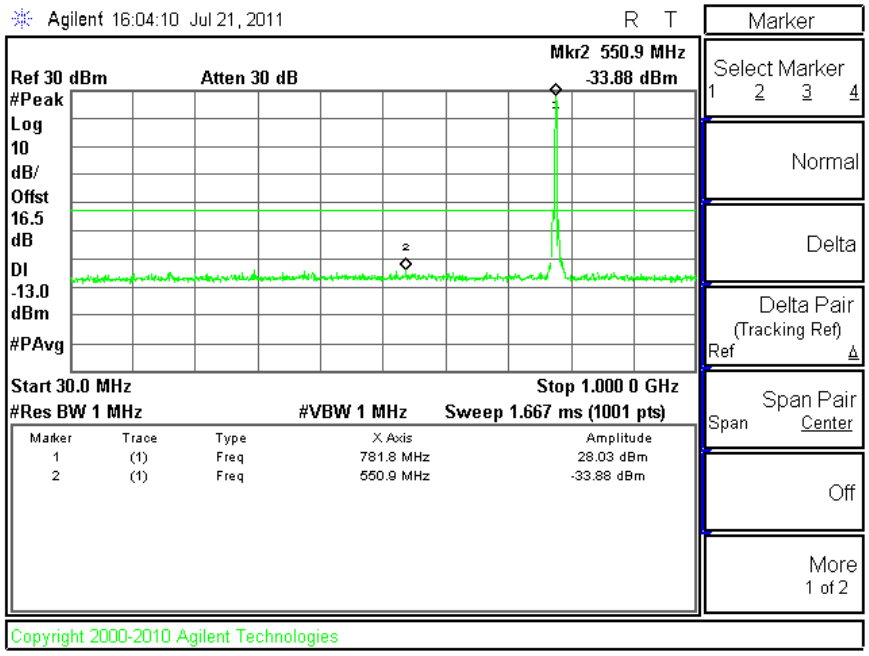


LTE 16QAM Band 13, 779.5MHz

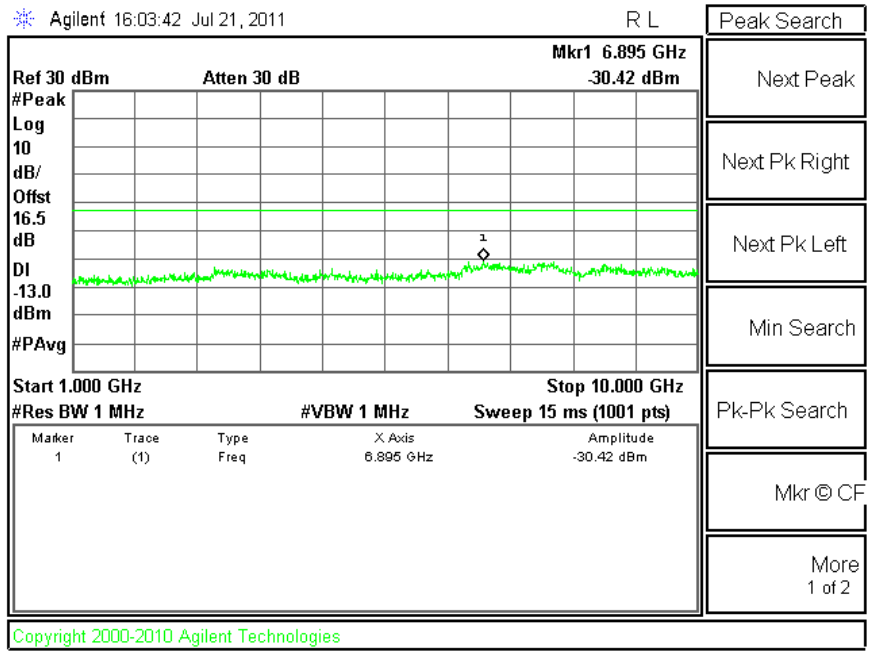




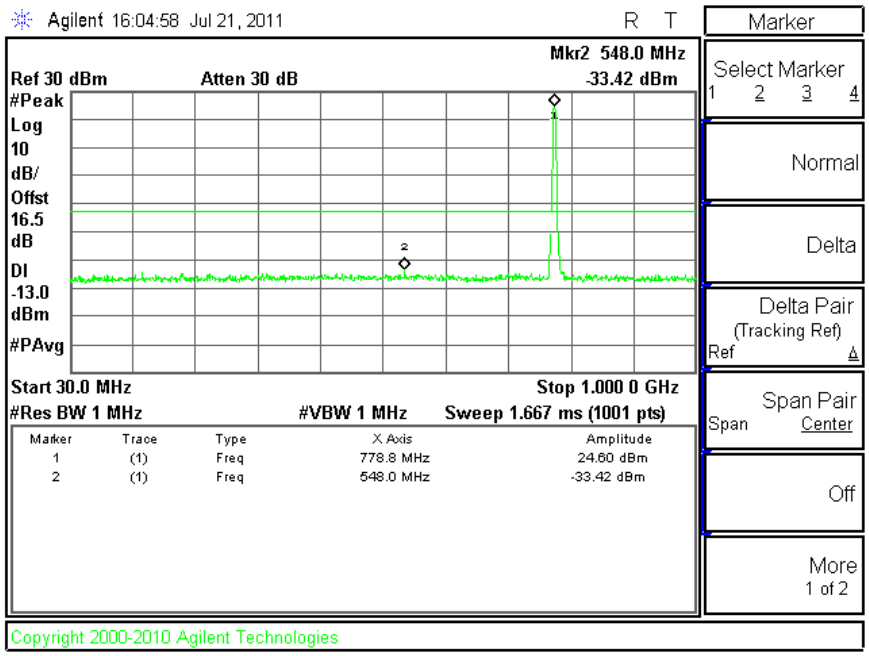
RB1-24, 30 TO 1000 MHz



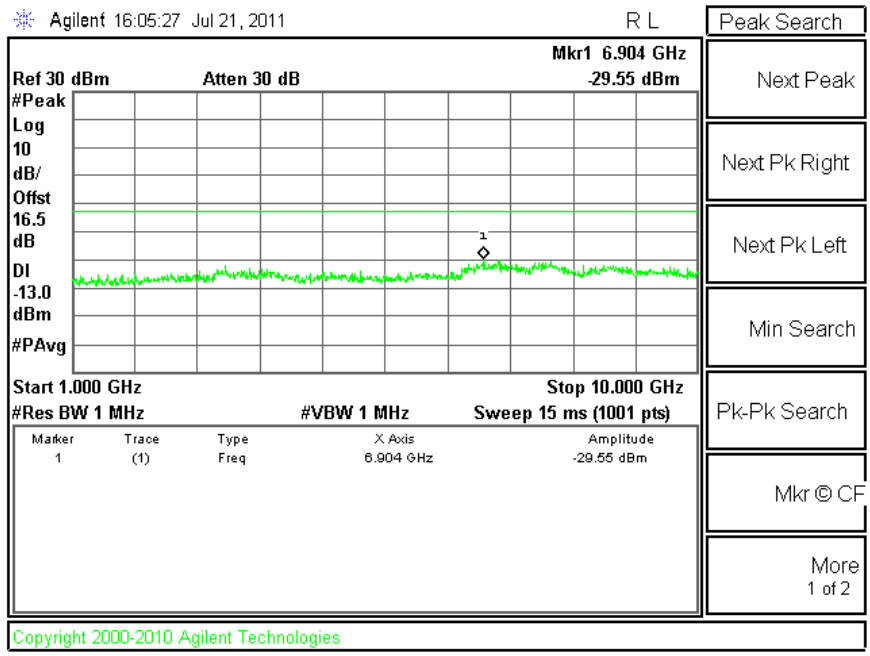
RB1-24, 1000 TO 10000 MHz



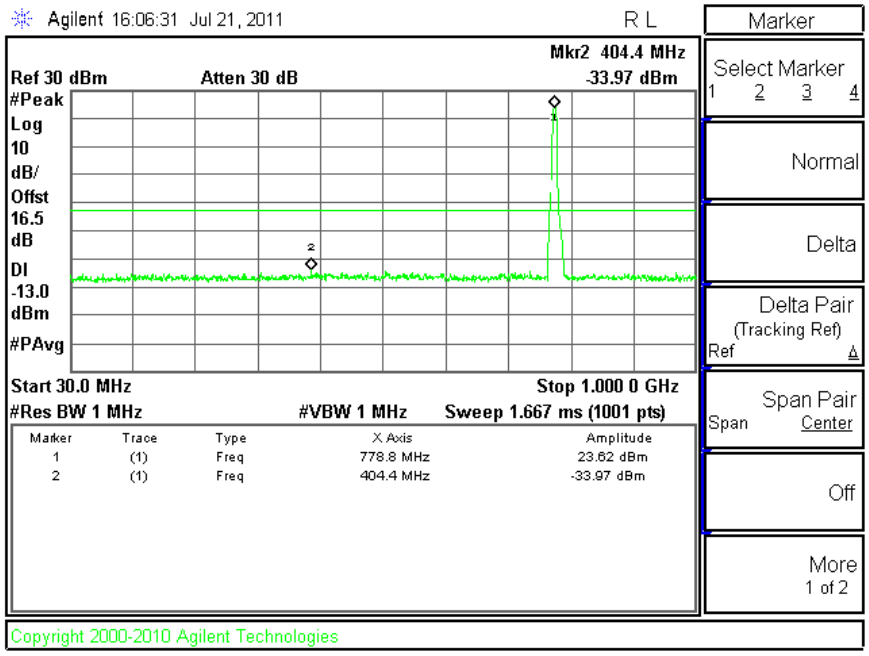
RB12-6, 30 TO 1000 MHz



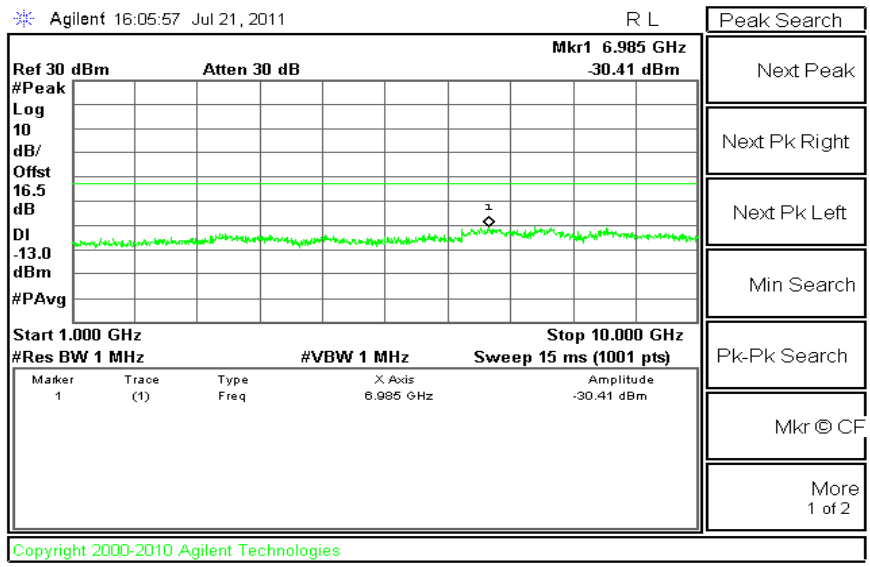
RB12-6, 1000 TO 10000 MHz



RB25-0, 30 TO 1000 MHz

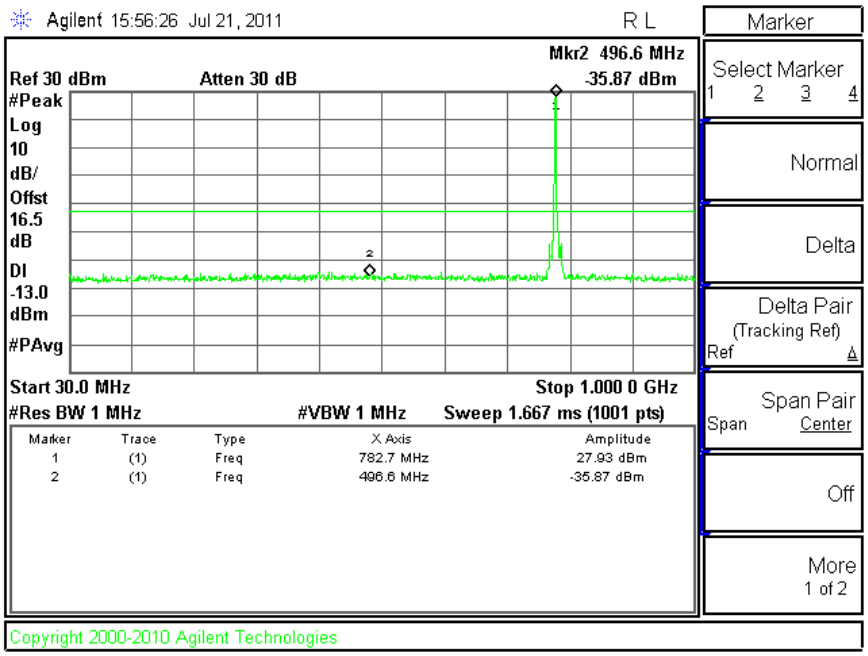


RB25 - 0, 1000 TO 10000 MHz

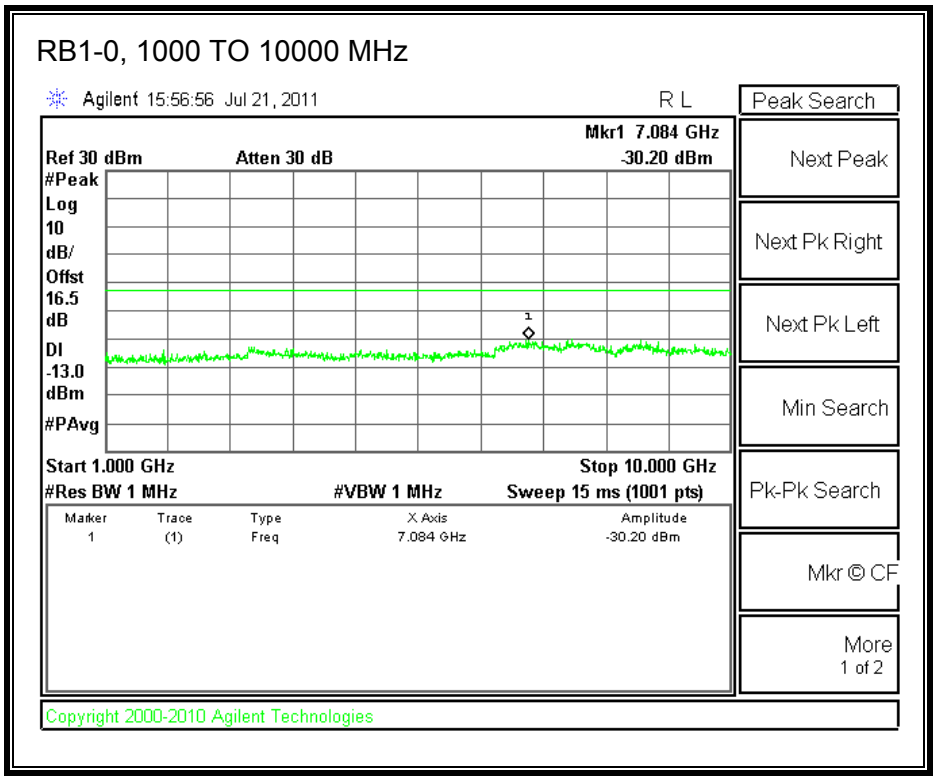


LTE 16QAM Band 13, 784.5MHz

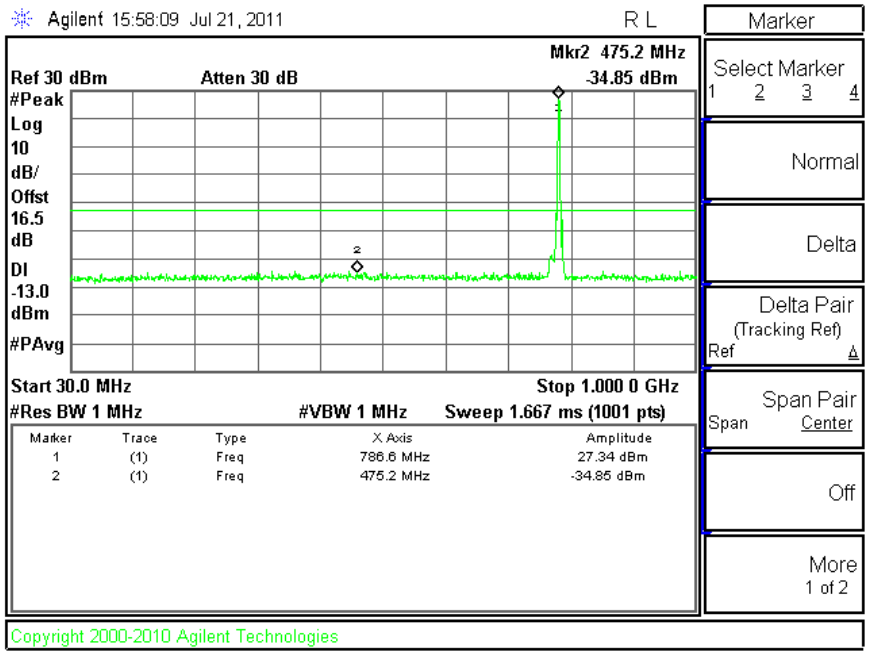
RB1-0, 30 TO 1000 MHz



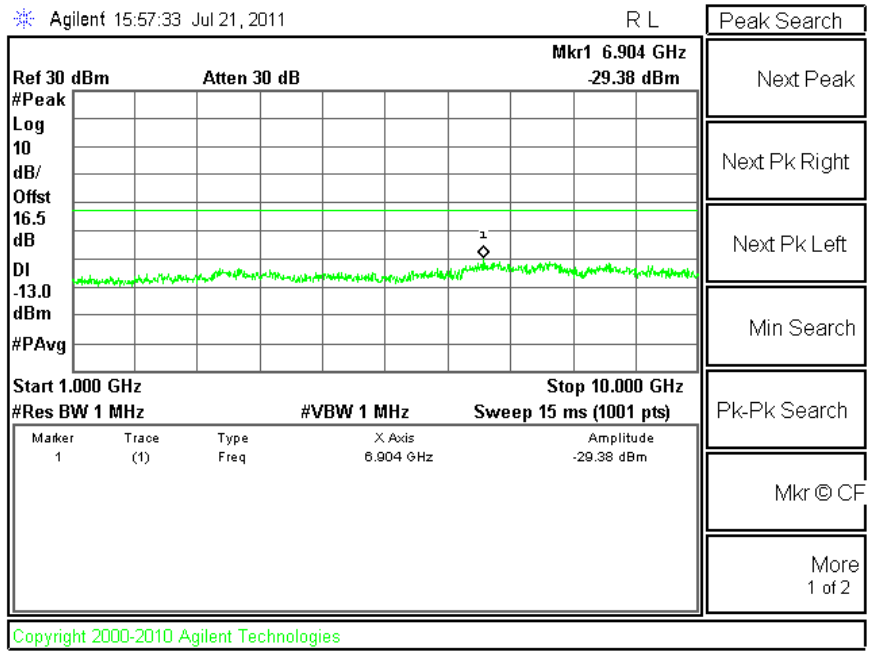
RB1-0, 1000 TO 10000 MHz



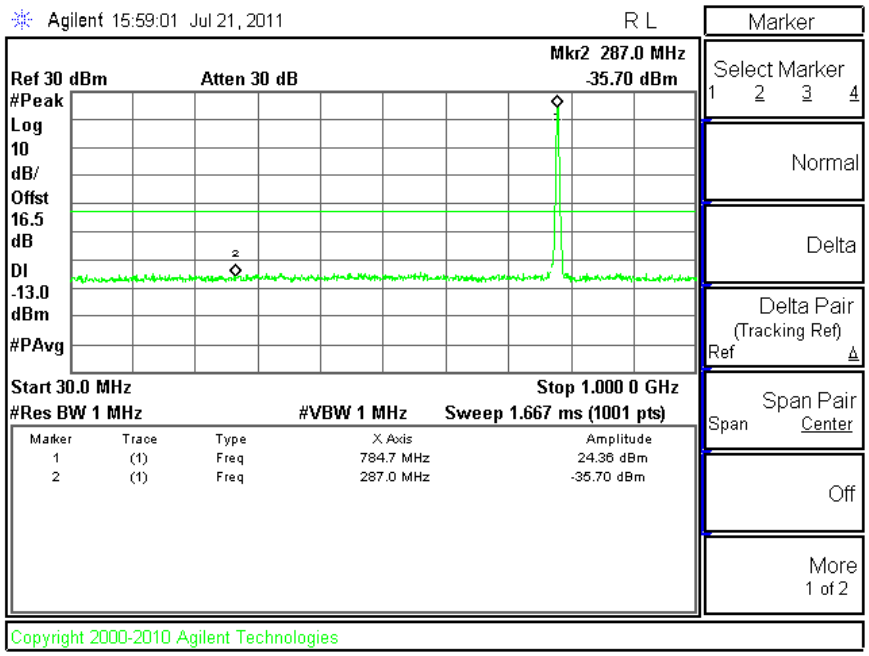
RB1-24, 30 TO 1000 MHz



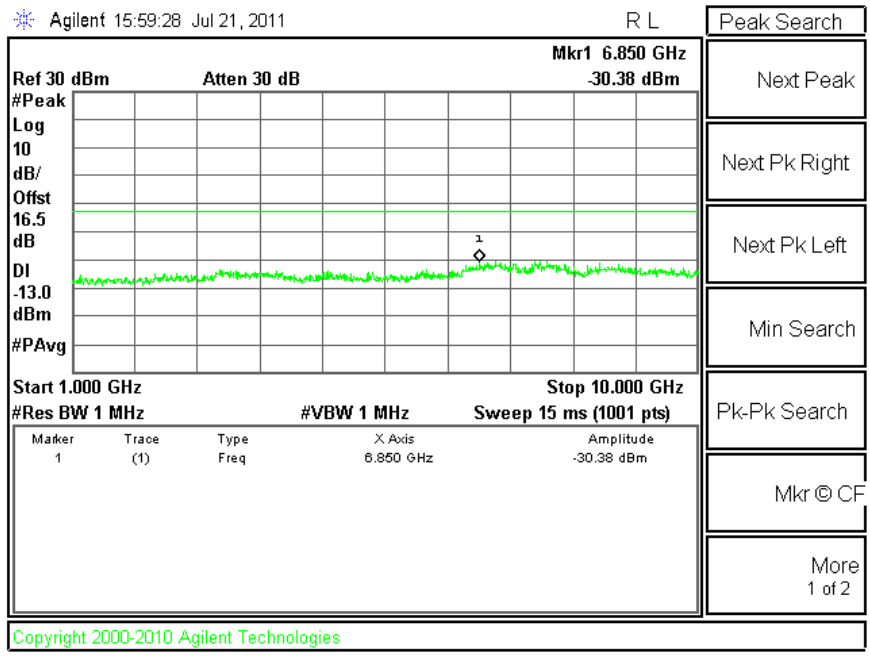
RB1-24, 1000 TO 10000 MHz



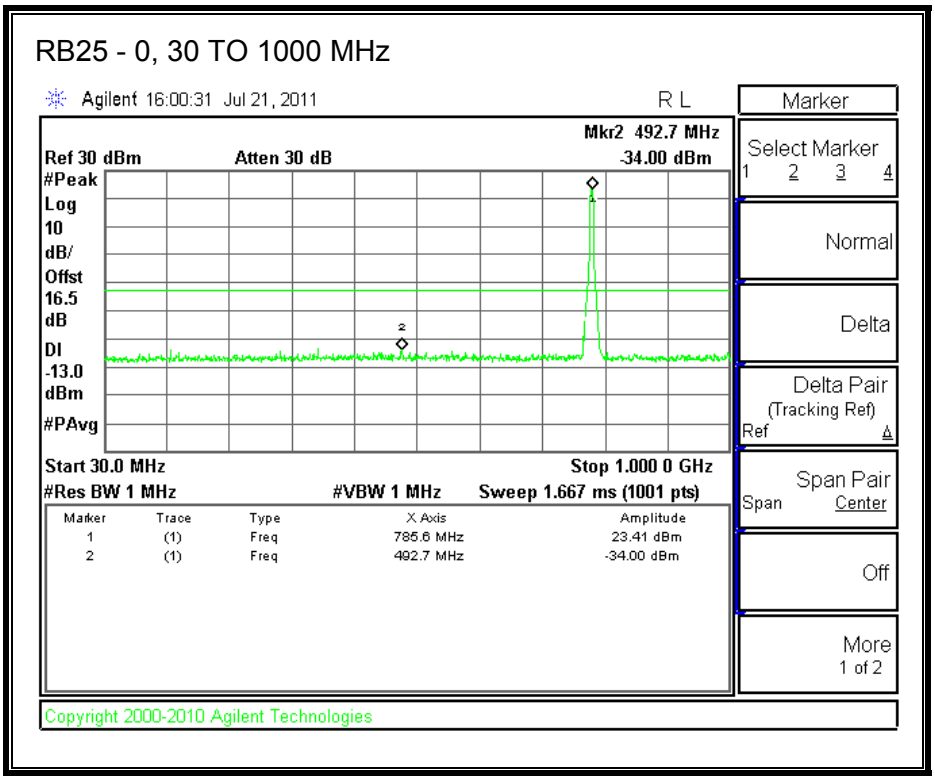
RB12-6, 30 TO 1000 MHz



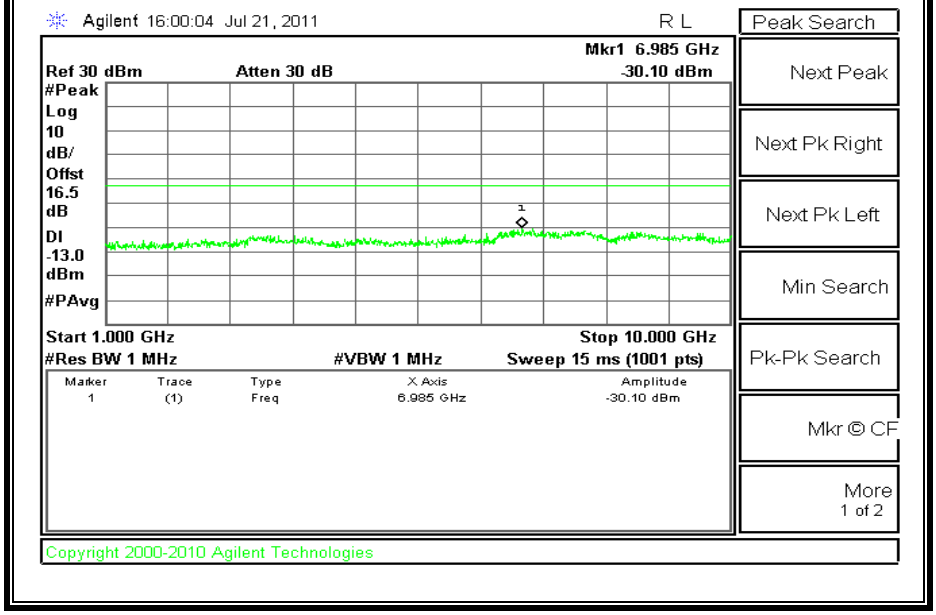
RB12-6, 1000 TO 10000 MHz



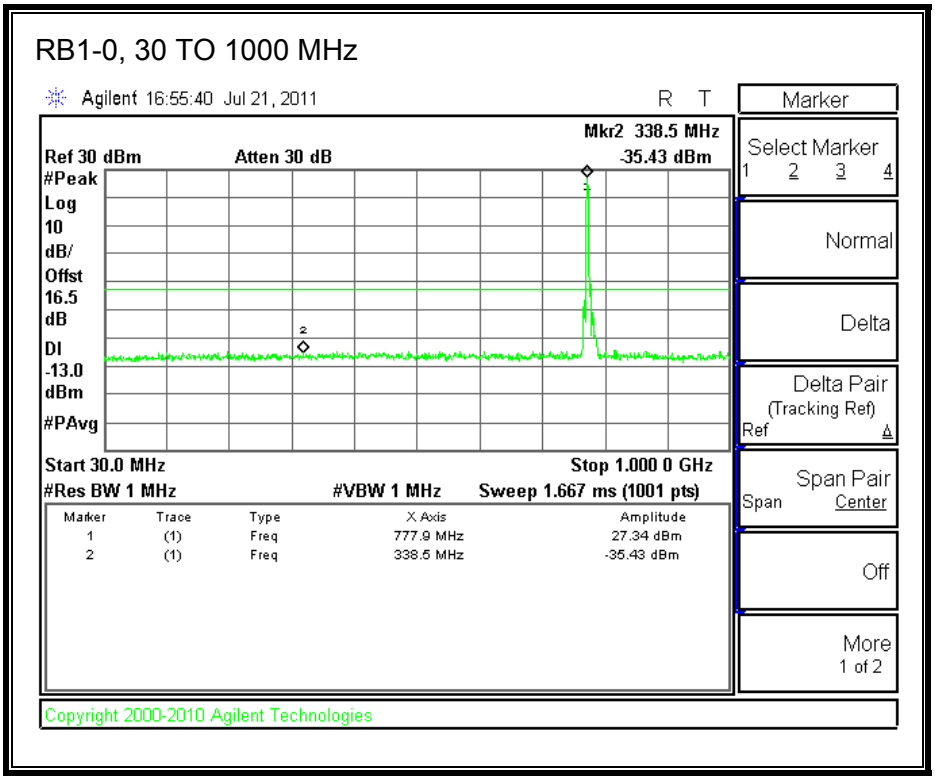
RB25 - 0, 30 TO 1000 MHz

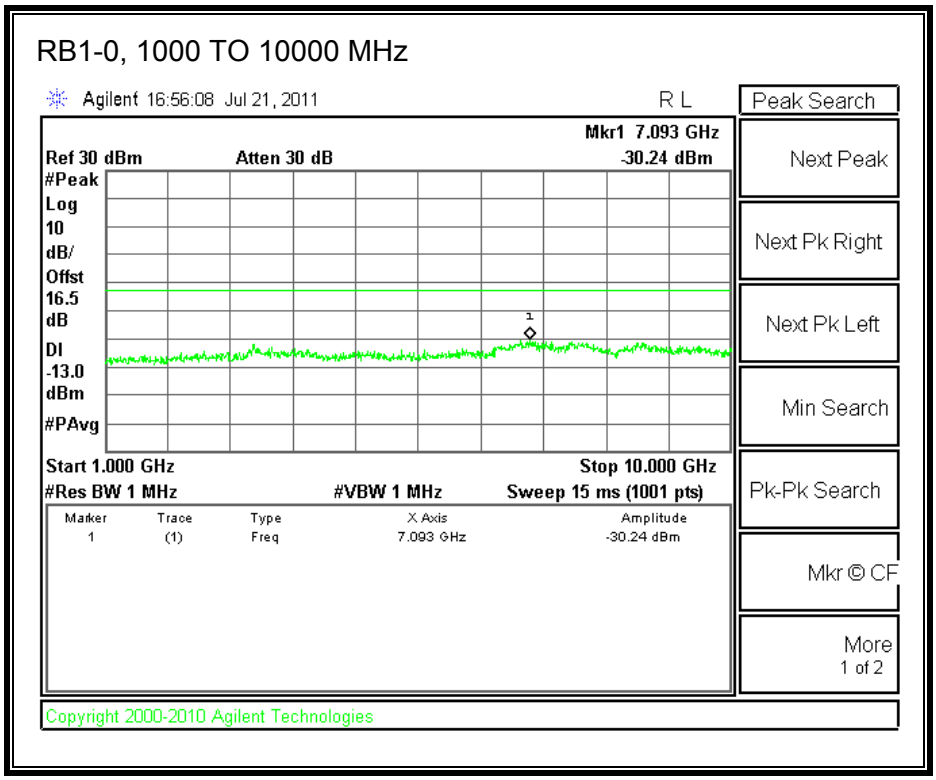


RB25 - 0, 1000 TO 10000 MHz

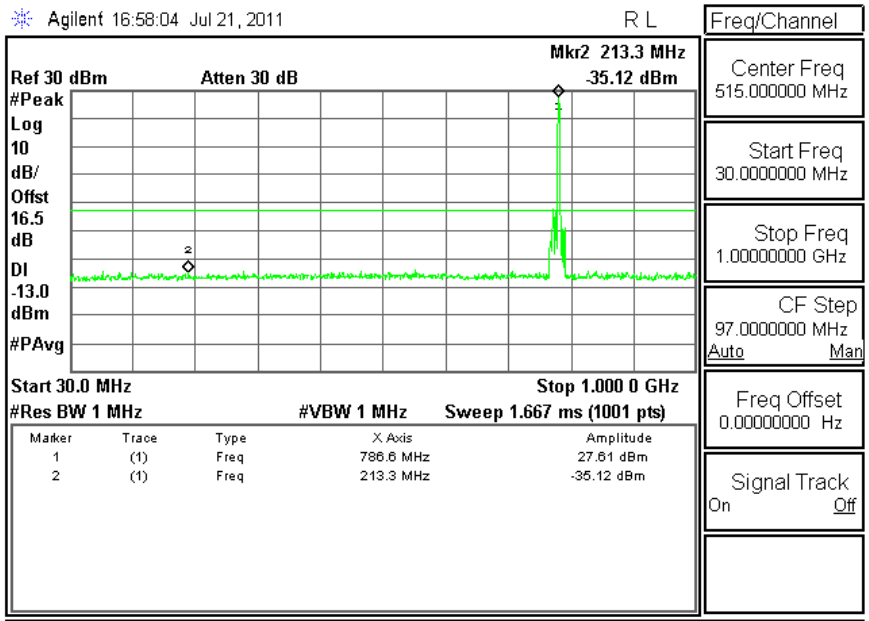


LTE 16QAM Band 13, 782MHz (10mHz Bandwidth)

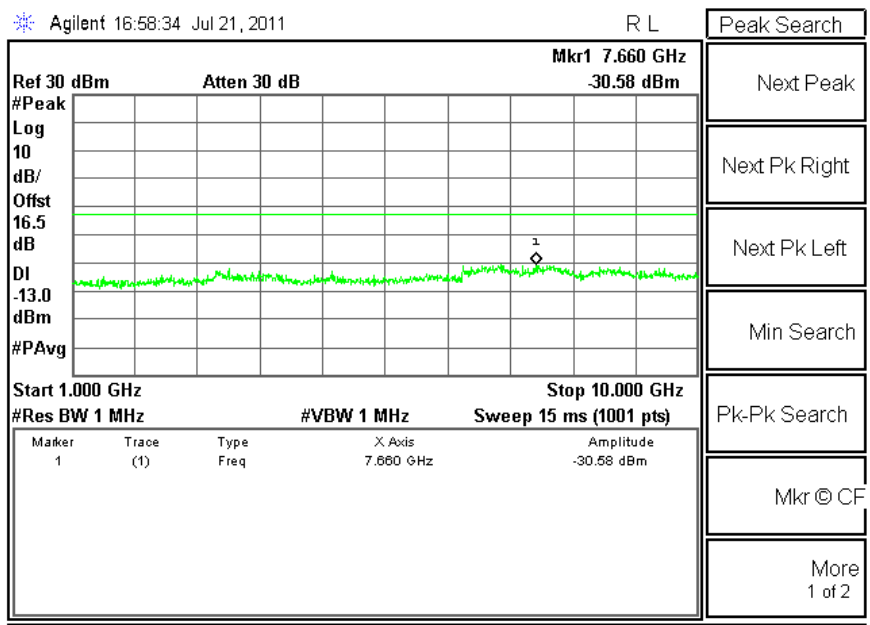




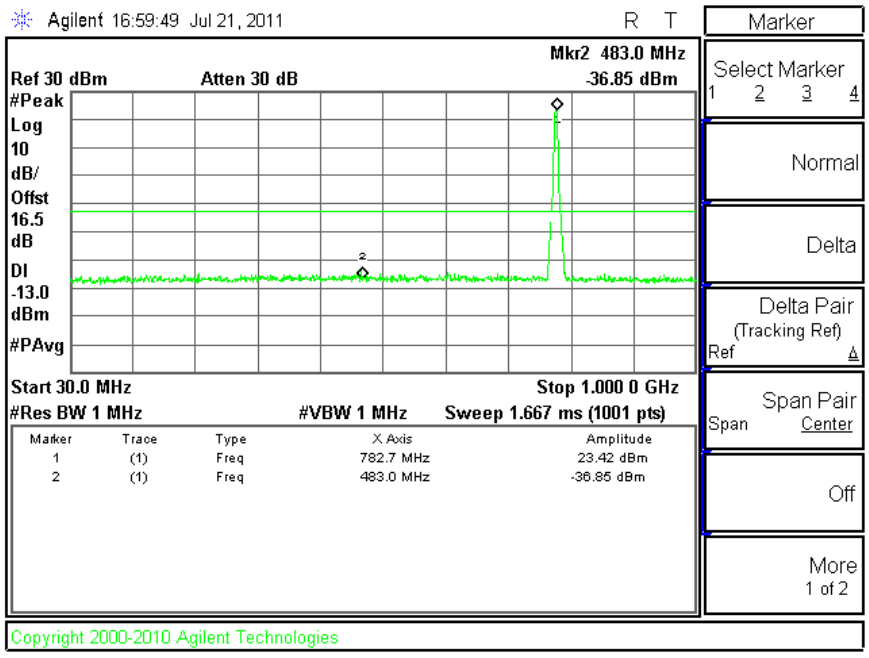
RB1-49, 30 TO 1000 MHz



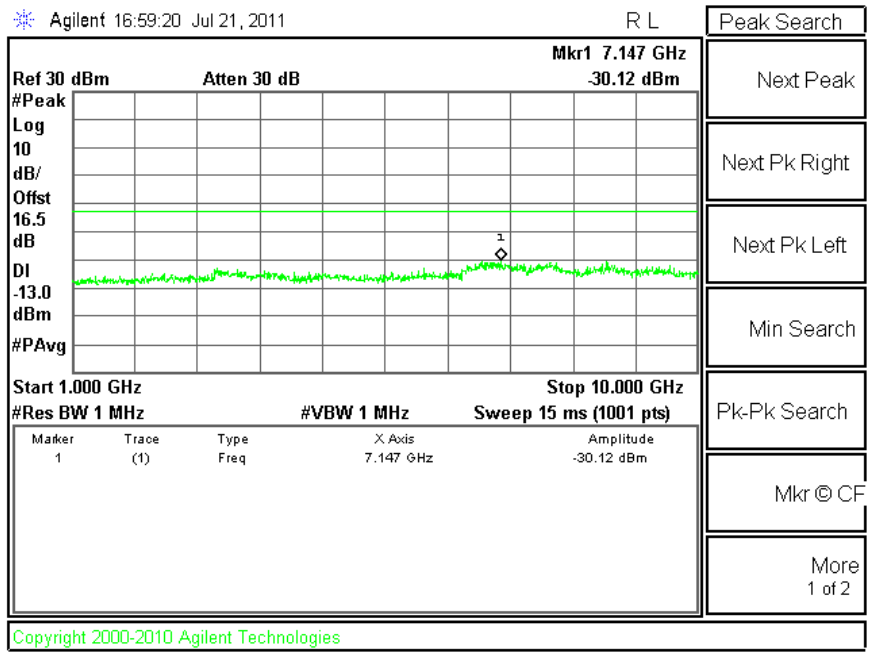
RB1-49, 1000 TO 10000 MHz



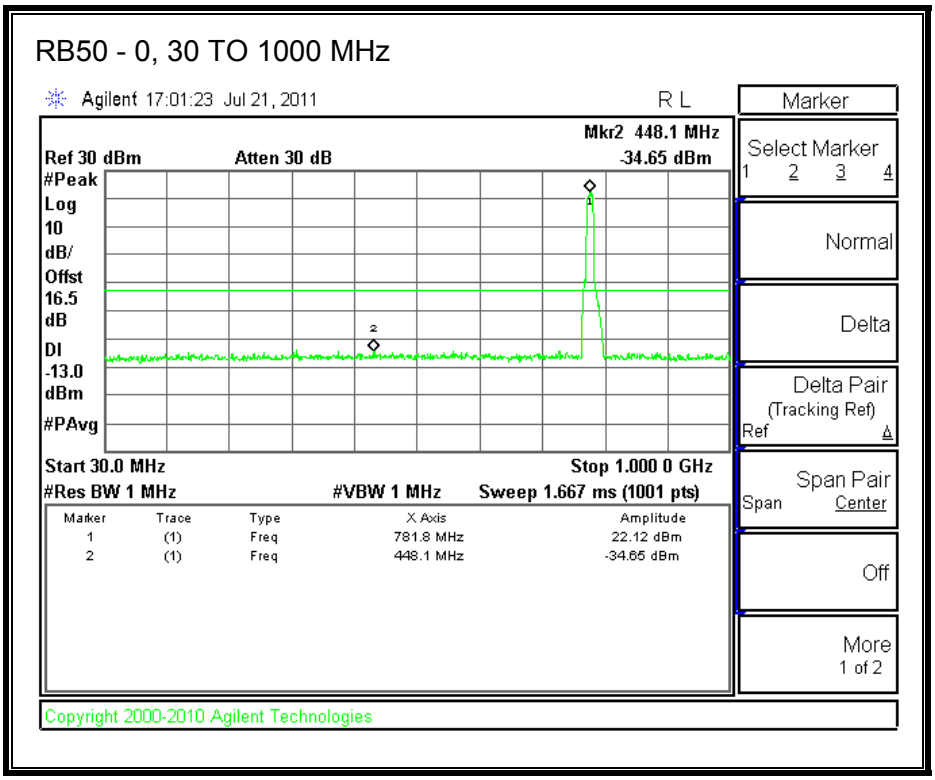
RB25-12, 30 TO 1000 MHz



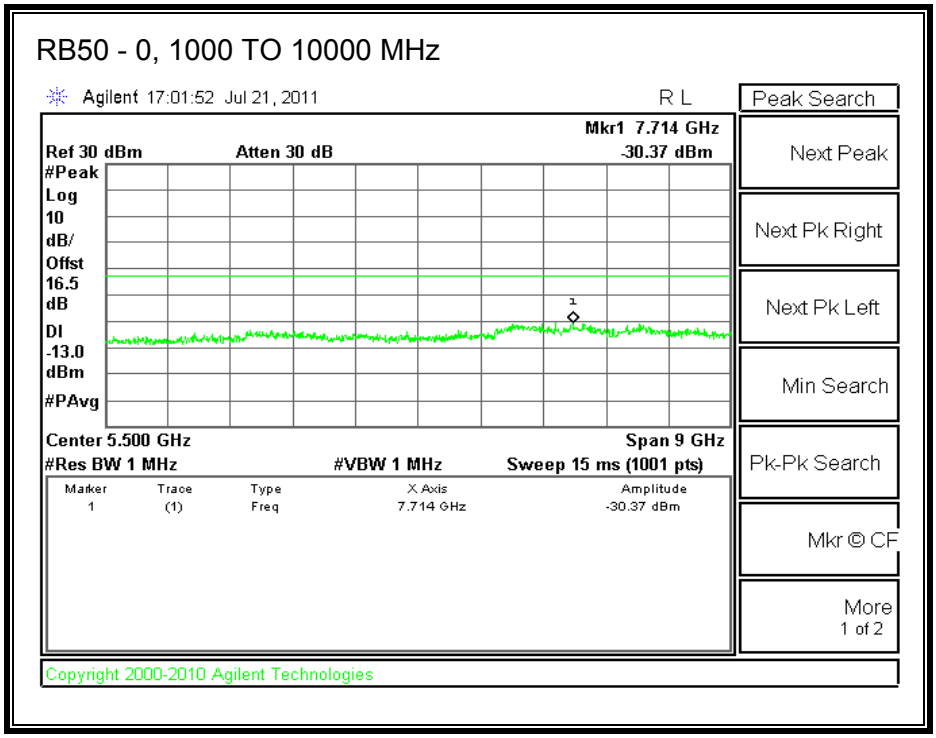
RB25-12, 1000 TO 10000 MHz



RB50 - 0, 30 TO 1000 MHz



RB50 - 0, 1000 TO 10000 MHz



7.4. Peak-To-Average Ratio:

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	5	RB1 0	779.5	27.22	23.74	3.48

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB1 24	779.5	27.9	23.89	4.01

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB12 6	779.5	27.84	23.15	4.69

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB25 0	779.5	28.67	22.83	5.84

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	5	RB1 0	784.5	27.8	23.78	4.02

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB1 24	784.5	27.31	23.67	3.64

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB12 6	784.5	27.8	22.56	5.24

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	5	RB25 0	784.5	28.8	22.87	5.93

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
16QAM	5	RB1 0	779.5	27.5	22.97	4.53

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB1 24	779.5	27.89	22.89	5

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB12 6	779.5	27.49	21.59	5.9

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB25 0	779.5	28.66	22.29	6.37

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
16QAM	5	RB1 0	784.5	28.17	22.93	5.24

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB1 24	784.5	27.94	22.85	5.09

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB12 6	784.5	28.16	21.69	6.47

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	5	RB25 0	784.5	29.15	22.13	7.02

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
QPSK	10	RB1 0	782	27.36	22.63	4.73

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	10	RB1 49	782	27.56	22.68	4.88

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	10	RB25 12	782	28.59	21.95	6.64

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
QPSK	10	RB50 0	782	28	20.83	7.17

*Peak Reading = Average Reading + Peak-to-Average Ratio

Mode	Channel Band-width (MHZ)	Modulation	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio (PAR)
				*Peak	Average	
16QAM	10	RB1 0	782	27.32	22.95	4.37

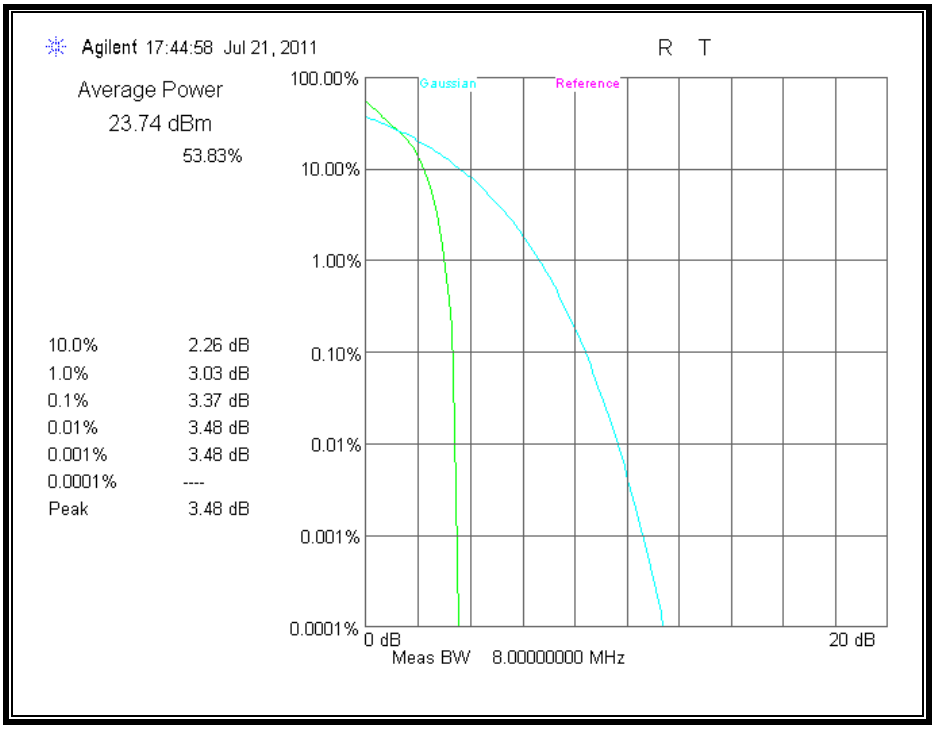
Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	10	RB1 49	782	27.58	22.67	4.91

Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	10	RB25 12	782	28.09	21.56	6.53

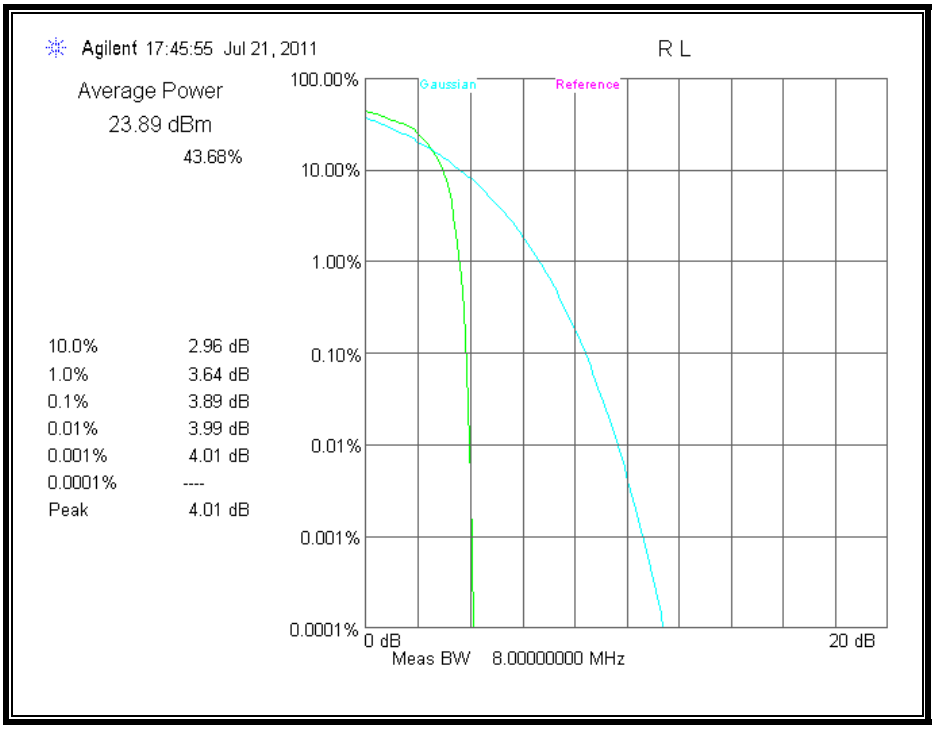
Mode	Channel Band-width	Ch. No.	f (MHz)	Couducted Power (dBm)		Peak-to-Average Ratio
				*Peak	Average	
16QAM	10	RB50 0	782	27.44	19.69	7.75

*Peak Reading = Average Reading + Peak-to-Average Ratio

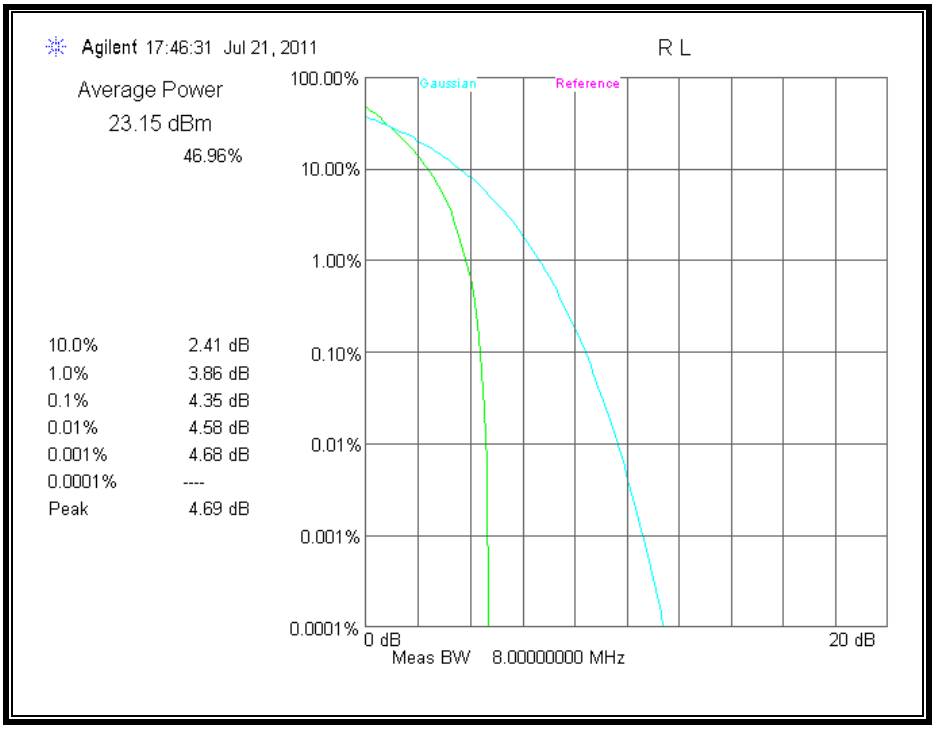
779.5MHz, 5MHz_QPSK, RB1 0



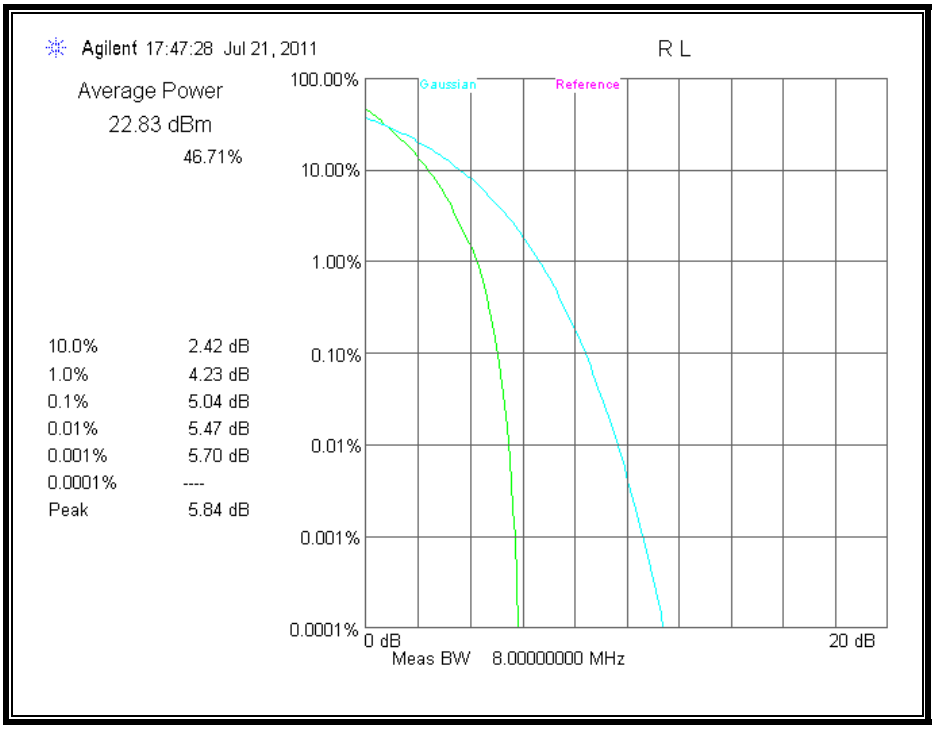
779.5MHz 5MHz_QPSK, RB1 24



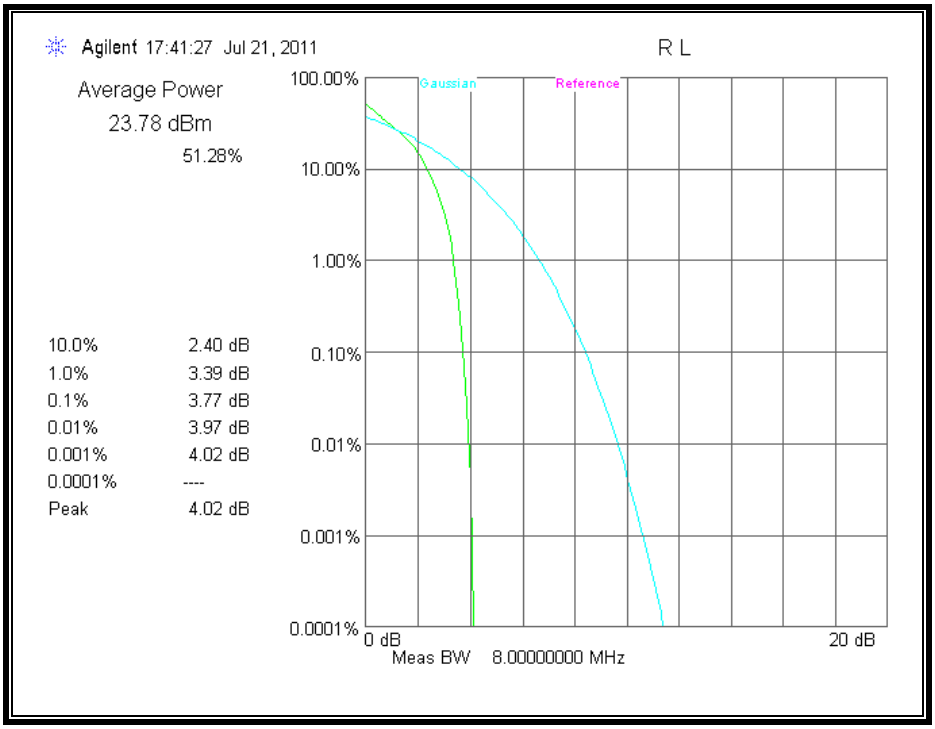
779.5MHz, 5MHz_QPSK, RB12 6



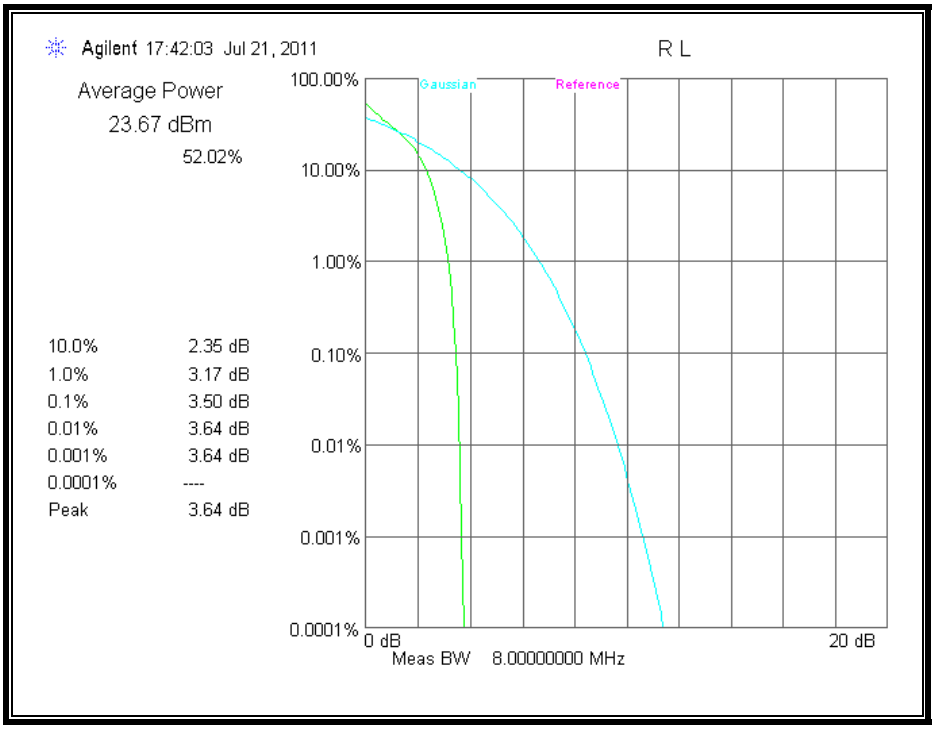
779.5MHz, 5MHz_QPSK, RB25 0



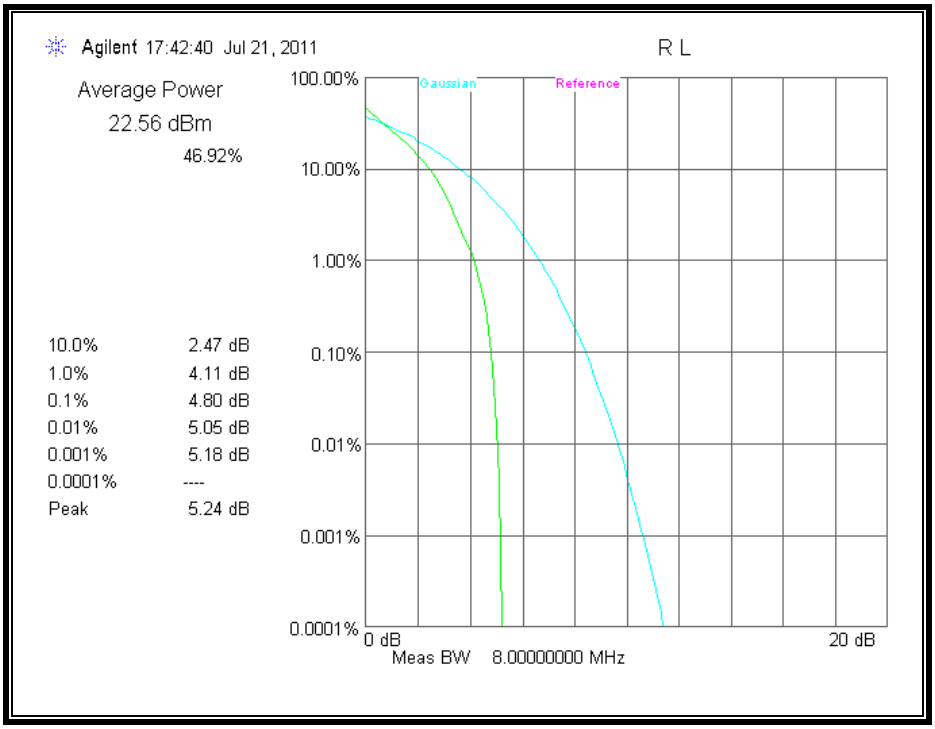
784.5MHz, 5MHz_QPSK, RB1 0



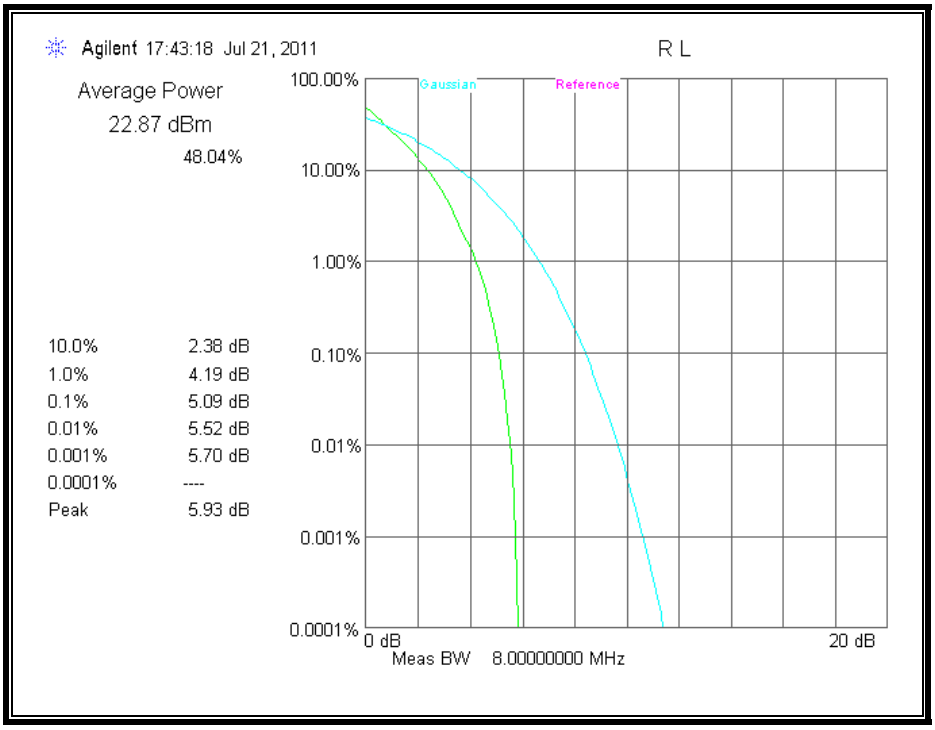
784.5MHz 5MHz_QPSK, RB1 24



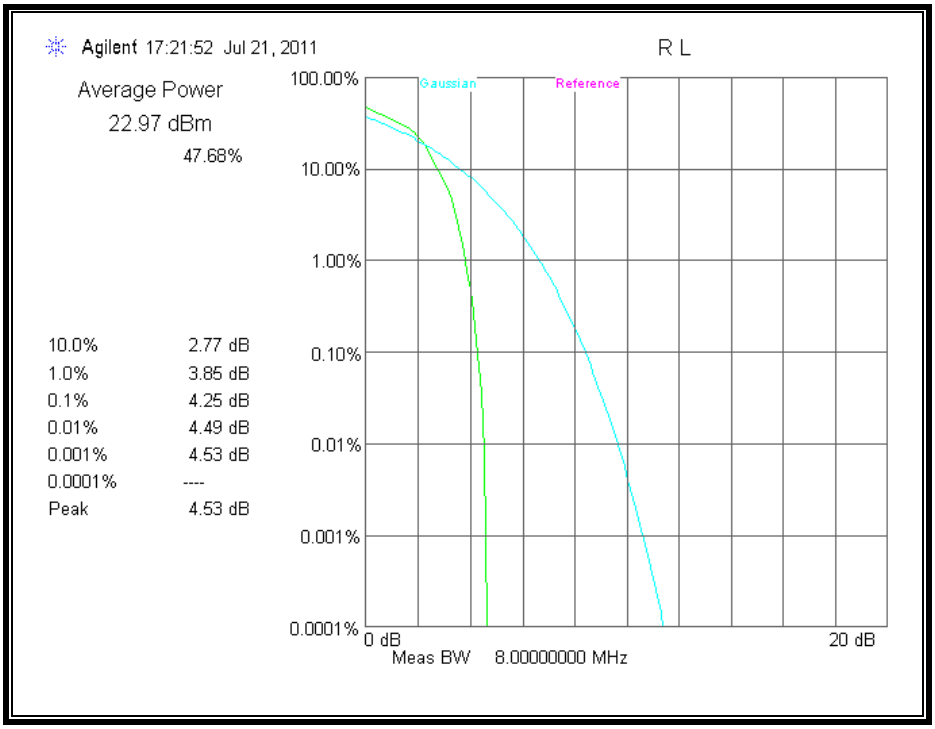
784.5MHz, 5MHz_QPSK, RB12 6



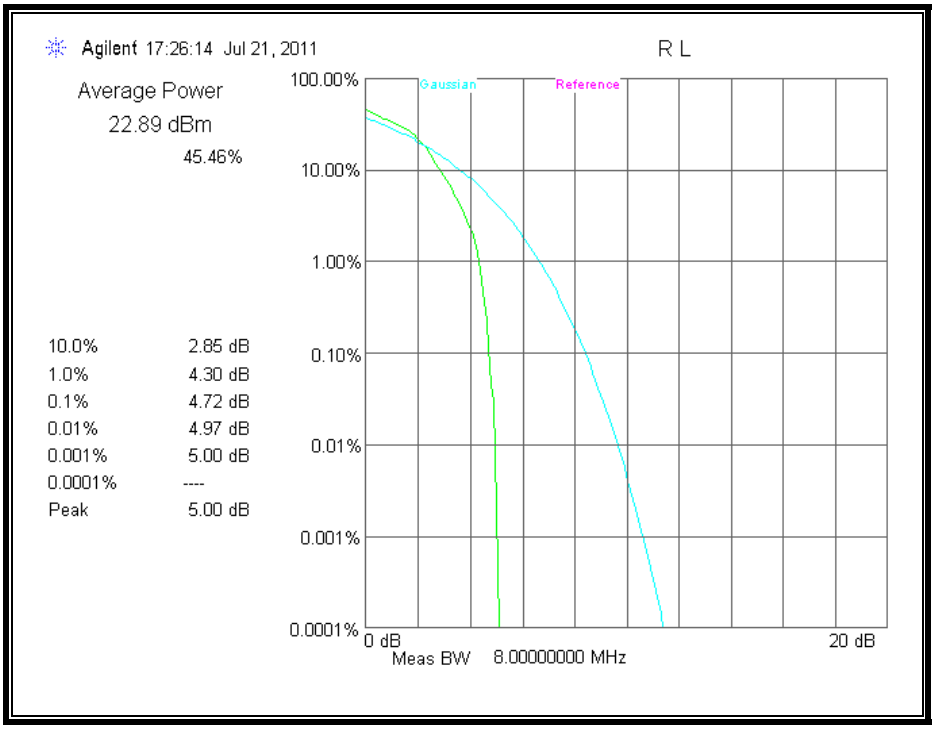
779.5MHz, 5MHz_QPSK, RB25 0



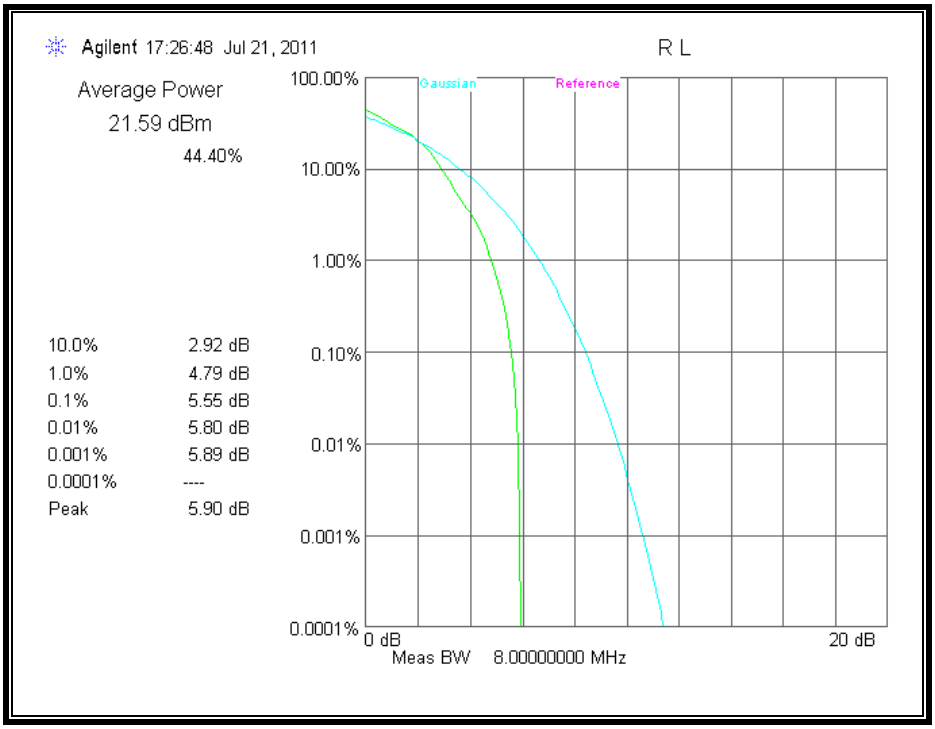
779,5MHz, 5MHz_16QAM, RB1 0



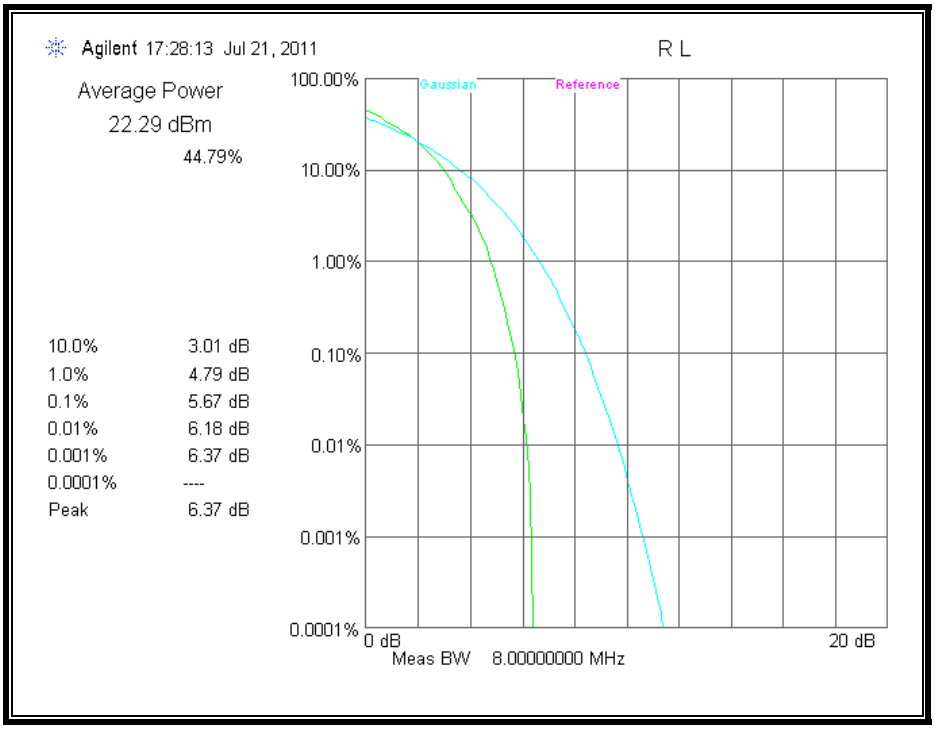
779.5MHz 5MHz_16QAM, RB1 24



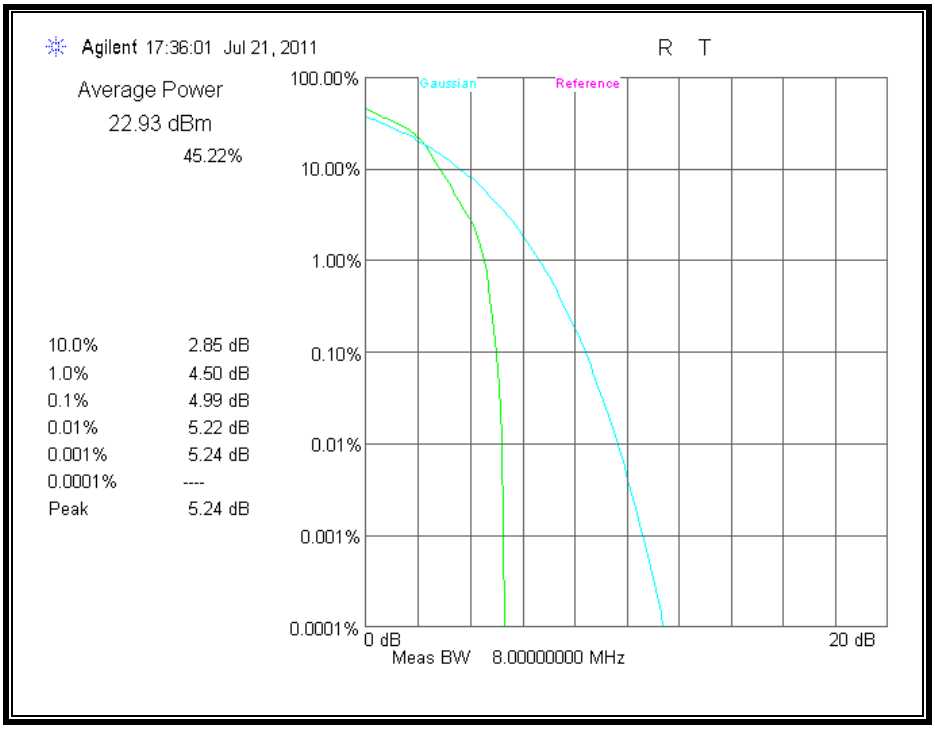
779.5MHz, 5MHz_16QAM, RB12 6



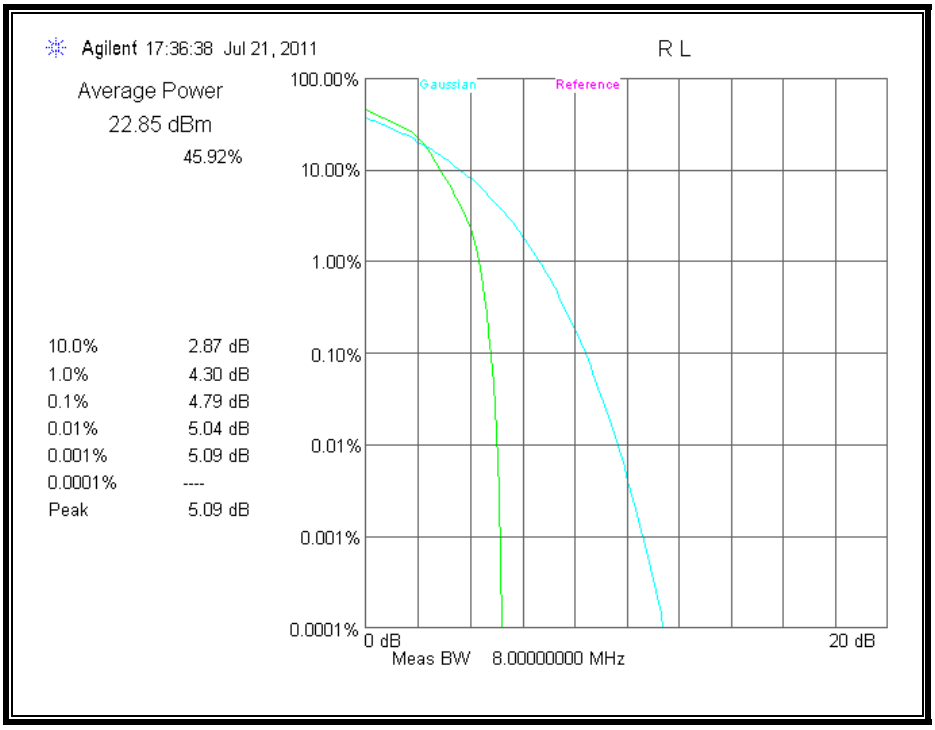
779.5MHz, 5MHz_16QAM, RB25 0



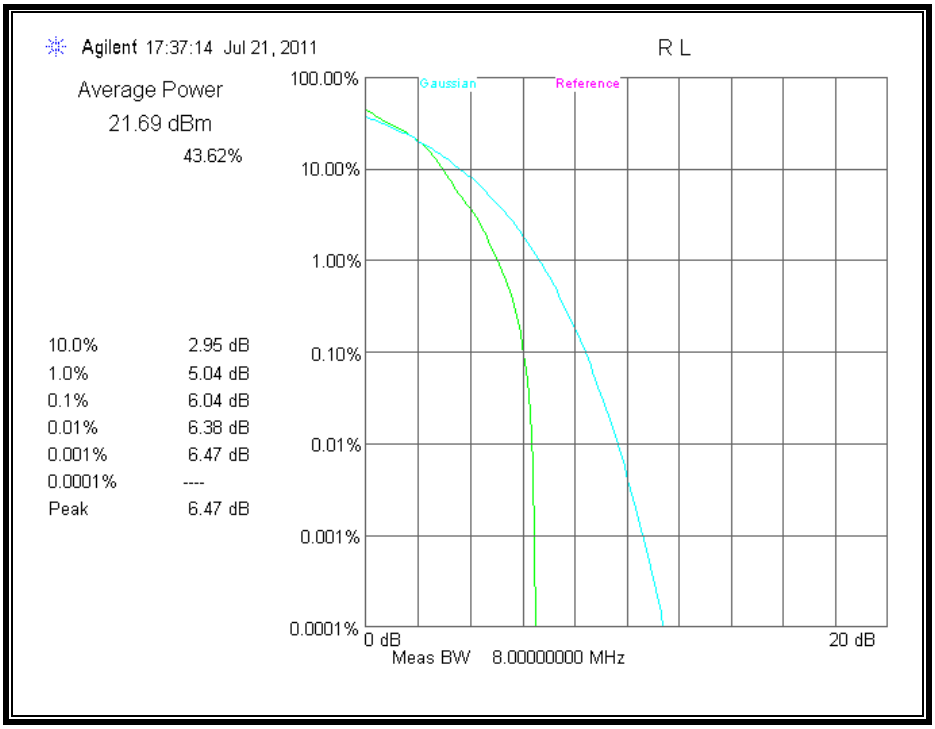
784.5MHz, 5MHz_16QAM, RB1 0



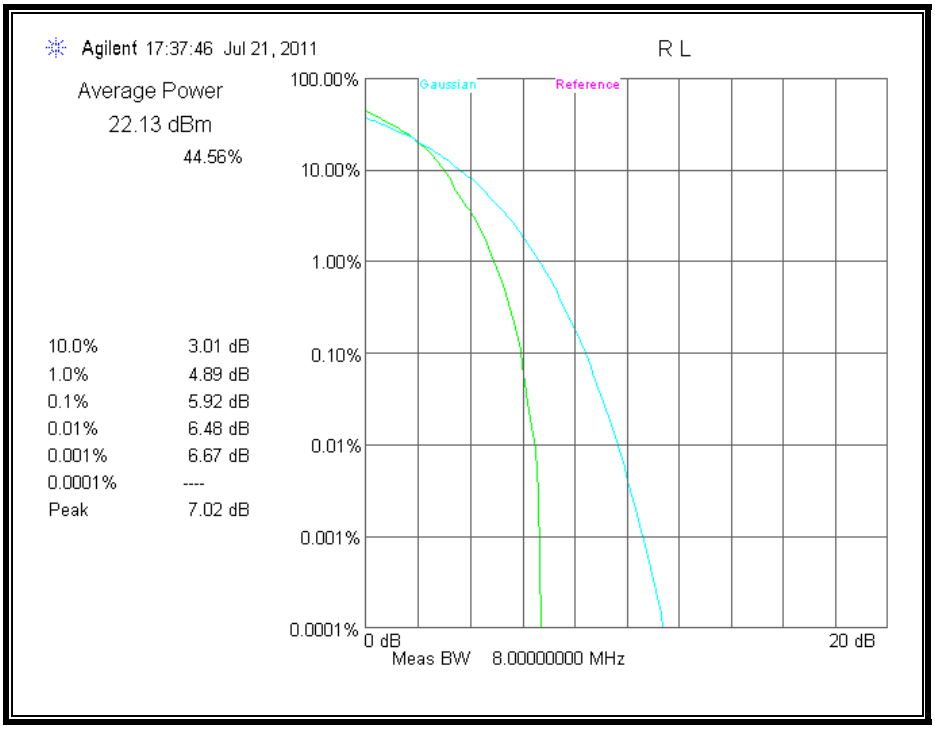
784.5MHz 5MHz_16QAM, RB1 24



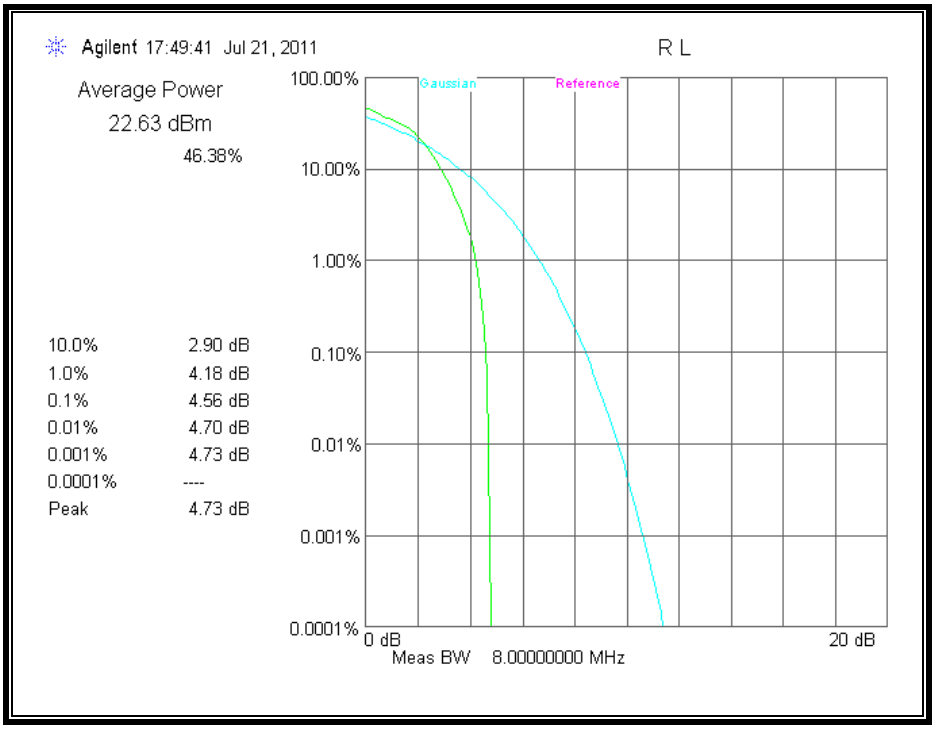
784.5MHz, 5MHz_16QAM, RB12 6



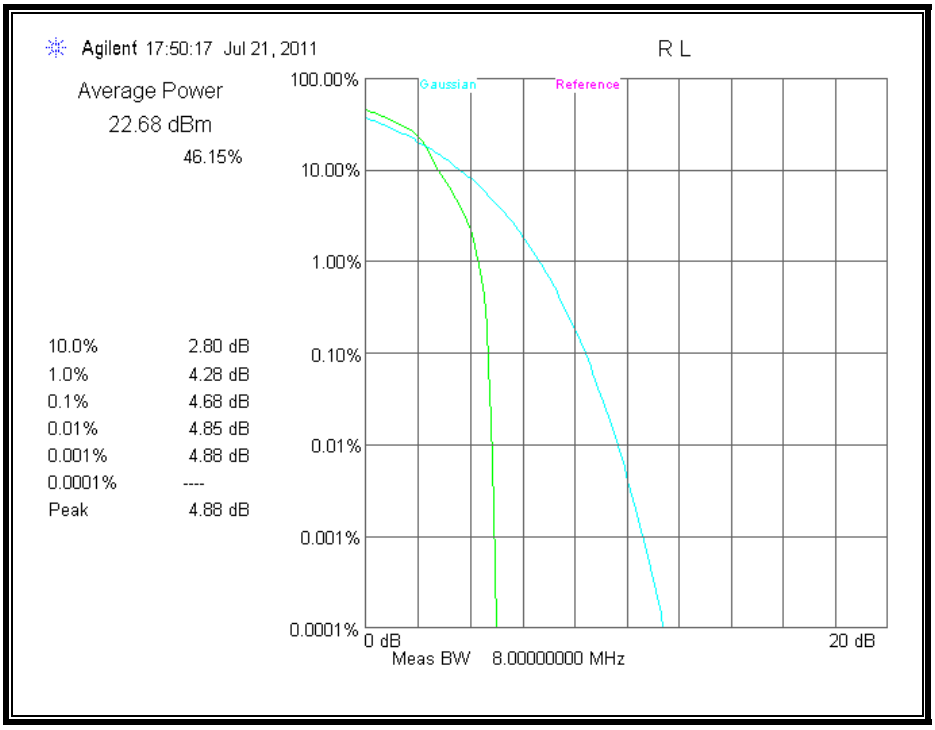
784.5MHz, 5MHz_16QAM, RB25 0



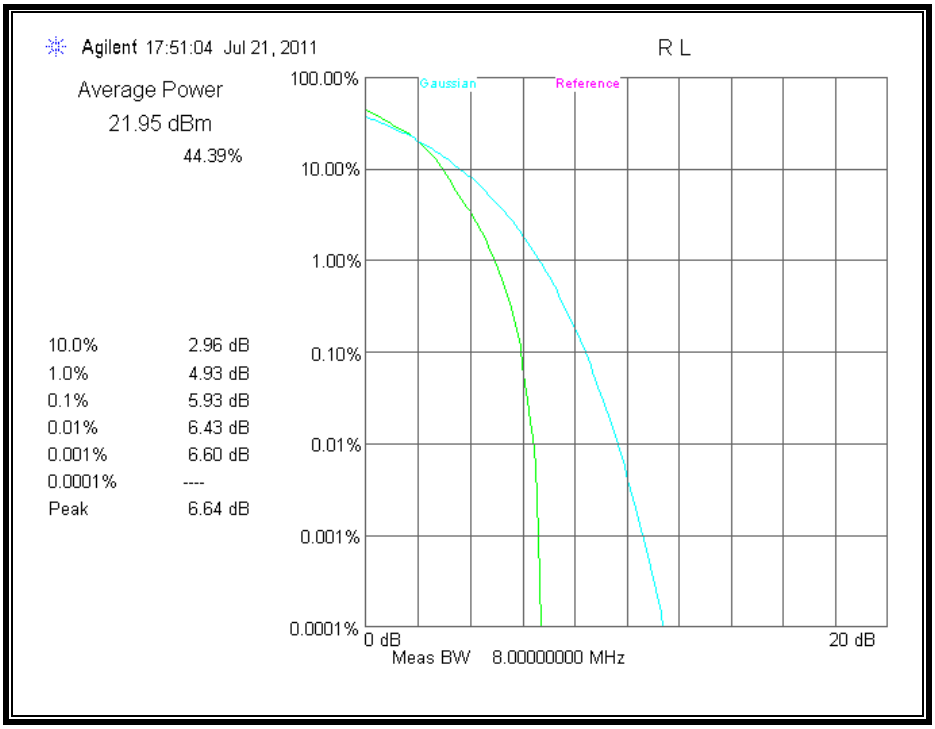
782MHz, 10MHz_QPSK, RB1 0



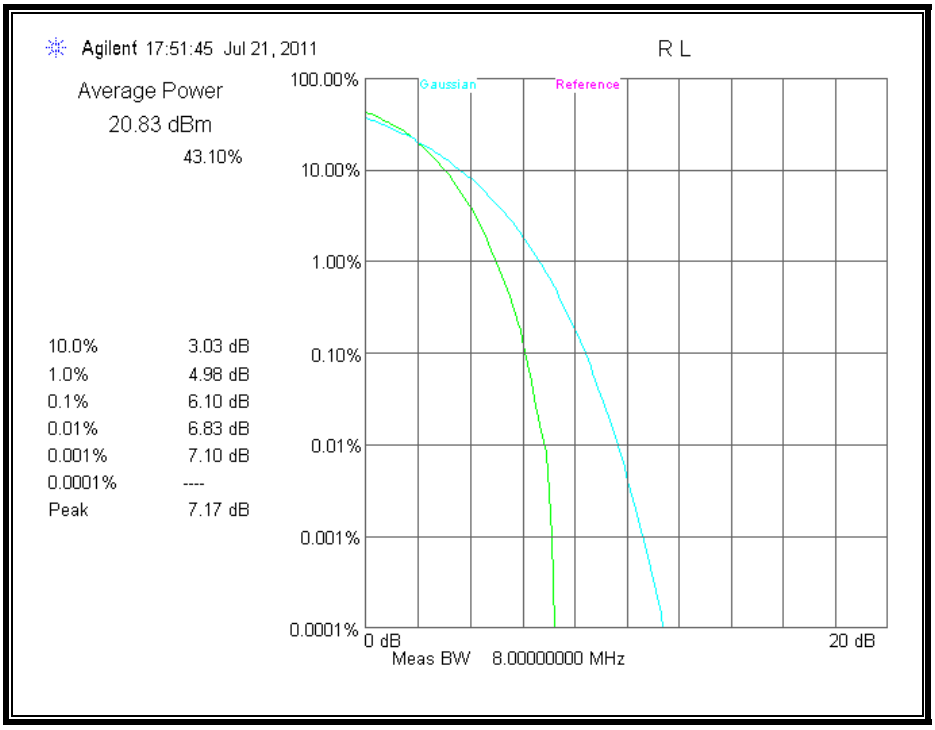
782MHz, 10MHz_QPSK, RB1 49



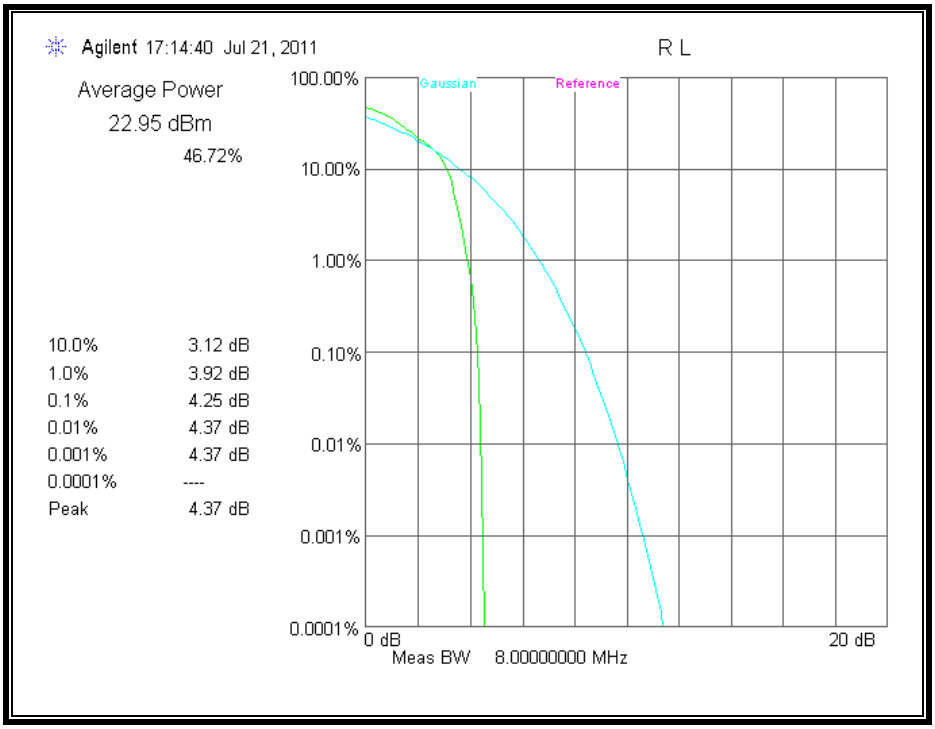
782MHz, 10MHz_QPSK, RB25 12



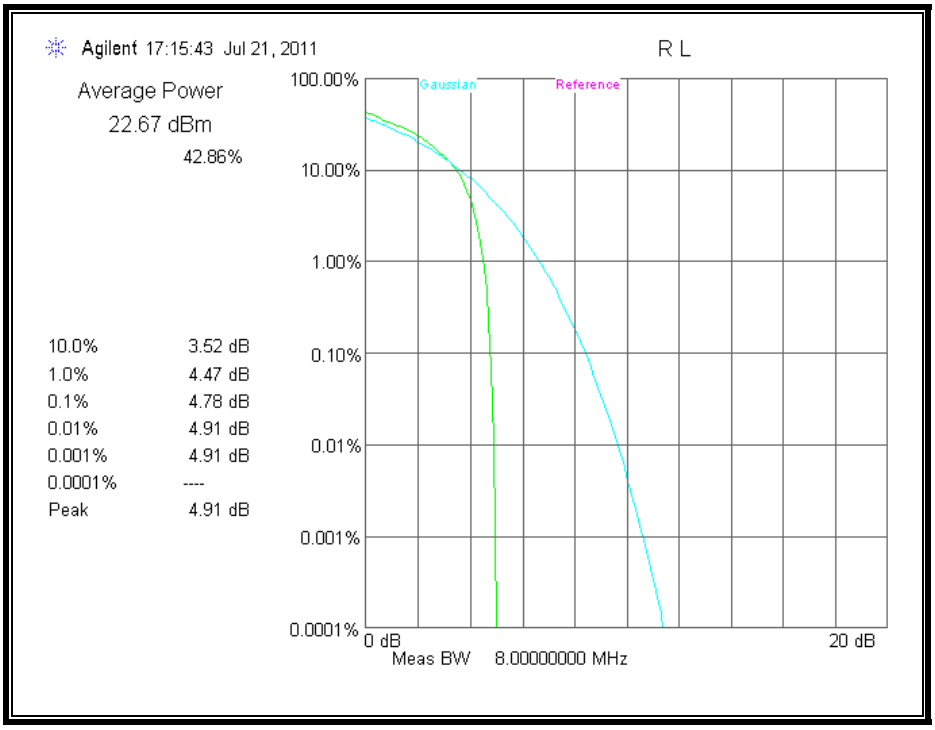
782MHz, 10MHz_QPSK, RB50 0



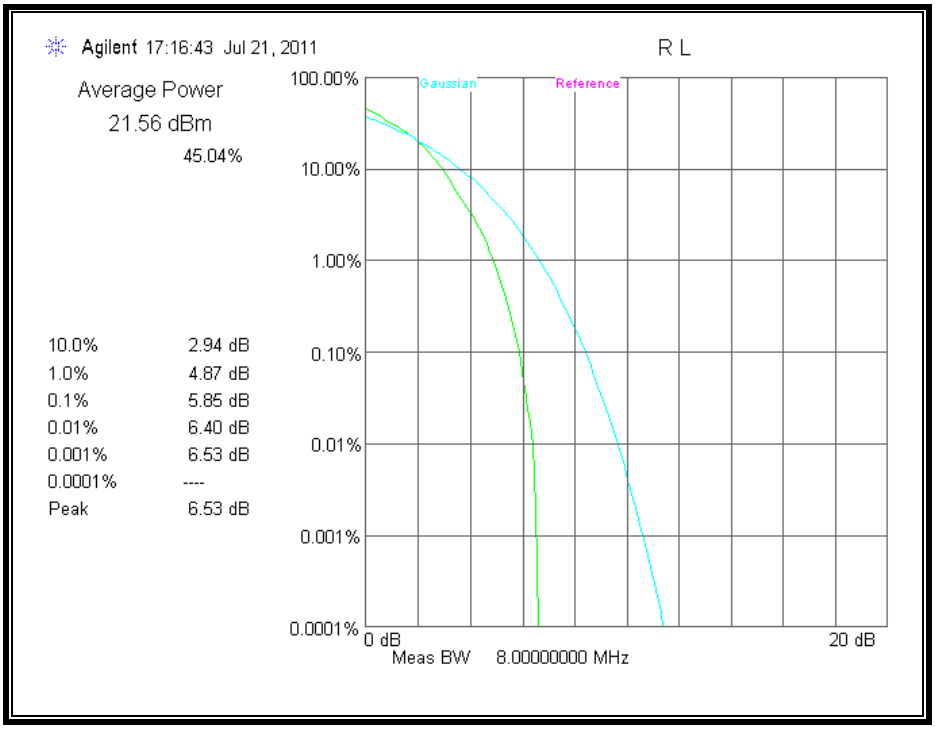
782MHz, 10MHz_16QAM, RB1 0



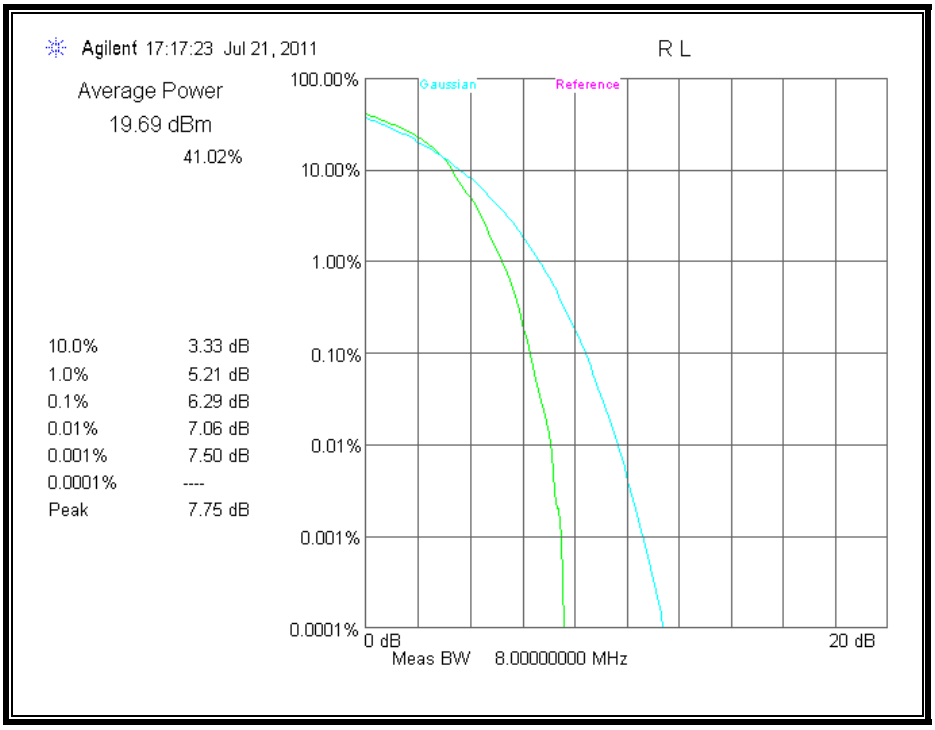
782MHz, 10MHz_16QAM, RB1 49



782MHz, 10MHz_16QAM, RB25 12



782MHz, 10MHz_16QAM, RB50 0



7.5. FREQUENCY STABILITY

RULE PART(S)

FCC: §27

LIMITS

- § 27.54 - The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

TEST PROCEDURE

Use Agilent 8960 with Frequency Error measurement capability.

- Temp. = −20° to +50°C
- Voltage = 3.00-3.6 Vdc

Frequency Stability vs Temperature:
The EUT is place inside a temperature chamber. The temperature is set to 20ºC and allowed to stabilize. After sufficient soak time, the transmitting frequency error is measured. The temperature is increased by 10 degrees, allowed to stabilize and soak, and then the measurement is repeated. This is repeated until +50ºC is reached.
Frequency Stability vs Voltage:
The peak frequency error is recorded (worst-case).

MODES TESTED

- LTE BAND 13

RESULTS

See the following pages.

LTE BAND 13 – 784.5 (5 MHz Bandwidth)

Reference Frequency: LTE Band 784.500006MHz @ 20°C Limit: to stay +- 2.5 ppm = 1961.250 Hz				
Power Supply (Vac)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.30	50	784.500013	-0.009	2.5
3.30	40	784.500010	-0.005	2.5
3.30	30	784.500008	-0.003	2.5
3.30	***20***	***784.500006***	***0***	2.5
3.30	10	784.499998	0.010	2.5
3.30	0	784.499992	0.018	2.5
3.30	-10	784.499986	0.025	2.5
3.30	-20	784.499990	0.020	2.5
3.30	-30	784.499985	0.027	2.5

Reference Frequency: Cellular Mid Channel 784.500006MHz @ 20°C Limit: to stay +- 2.5 ppm = 1961.250 Hz				
Power Supply (Vac)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.30	***20***	***784.500006***	***0***	***2.5***
3.60	20	784.500002	*0.005*	2.5
3.00	20	784.499992	*0.018*	2.5
2.65 (end voltage)	20	784.499935	*0.091*	2.5

LTE BAND 13 – 782 MHz

Reference Frequency: LTE Band 781.999995MHz @ 20°C Limit: to stay +- 2.5 ppm = 1955.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.30	50	782.000009	-0.018	2.5
3.30	40	782.000008	-0.017	2.5
3.30	30	782.000004	-0.012	2.5
3.30	***20***	***781.999995***	***0***	2.5
3.30	10	781.999990	0.006	2.5
3.30	0	781.999986	0.012	2.5
3.30	-10	781.999989	0.008	2.5
3.30	-20	781.999981	0.018	2.5
3.30	-30	781.999985	0.013	2.5

Reference Frequency: Cellular Mid Channel 781.999995MHz @ 20°C Limit: to stay +- 2.5 ppm = 1955.000 Hz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
3.30	***20***	***781.999995***	***0***	***2.5***
3.60	20	781.999990	*0.006*	2.5
3.00	20	782.000003	*-0.010*	2.5
2.65(end voltage)	20	781.999923	*0.092*	2.5

8. RADIATED TEST RESULTS

8.1. RADIATED POWER (ERP & EIRP)

RULE PART(S)

FCC: §27.53

LIMITS

22.913(a) - The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

24.232(c) - Mobile/portable stations are limited to 2 watts e.i.r.p. peak power and the equipment must employ means to limit the power to the minimum necessary for successful communications.

27.50 (b)(10) Portable stations (hand-held devices) transmitting in the 746–757 MHz, 758–763 MHz, 776–793 MHz, and 805–806 MHz bands are limited to 3 watts ERP.

TEST PROCEDURE

ANSI / TIA / EIA 603C

MODES TESTED

- LTE BAND 13

LTE BAND 13 (ERP)

Mode	RB/RB SIZE	f (MHz)	ERP	
			dBm	mW
5 MHZ BAND QPSK	1/0	779.5	31.32	1355.19
	1/24		32.16	1644.37
	12/6		31.94	1563.15
	25/0		32.42	1745.82
5 MHz BAND 16QAM	1/0		31.07	1279.38
	1/24		31.36	1367.73
	12/6		31.42	1386.76
	25/0		32.32	1706.08

Mode	RB/RB SIZE	f (MHz)	ERP	
			dBm	mW
5 MHZ BAND QPSK	1/0	784.5	31.32	1355.19
	1/24		31.42	1386.76
	12/6		31.82	1520.55
	25/0		32.27	1686.55
5 MHz BAND 16QAM	1/0		31.12	1294.20
	1/24		31.92	1555.97
	12/6		31.52	1419.06
	25/0		31.72	1485.94

Mode	RB/RB SIZE	f (MHz)	ERP	
			dBm	mW
10 MHZ BAND QPSK	1/0	782.0	31.02	1264.74
	1/49		31.17	1309.18
	25/12		32.02	1592.21
	50/0		32.22	1667.25
10 MHz BAND 16QAM	1/0		30.92	1235.95
	1/49		30.12	1028.02
	25/12		32.02	1592.21
	50/0		32.42	1745.82

ERP LTE BAND 13 QPSK

779.5MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
779.50	31.82	V	0.5	0.0	31.32	34.8	-3.5	
779.50	23.29	H	0.5	0.0	22.79	34.8	-12.0	
RB=1 & SRB=24								
779.50	32.66	V	0.5	0.0	32.16	34.8	-2.6	
779.50	19.95	H	0.5	0.0	19.45	34.8	-15.4	
RB=12 & SRB=6								
779.50	32.44	V	0.5	0.0	31.94	34.8	-2.9	
779.50	20.35	H	0.5	0.0	19.85	34.8	-15.0	
RB=25 & SRB=0								
779.50	32.92	V	0.5	0.0	32.42	34.8	-2.4	
779.50	24.55	H	0.5	0.0	24.05	34.8	-10.8	

Rev. 3.17.11

782MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE
10MHz BW

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
782.00	31.52	V	0.5	0.0	31.02	38.5	-7.4	
782.00	22.45	H	0.5	0.0	21.95	38.5	-16.5	
RB=1 & SRB=49								
782.00	31.67	V	0.5	0.0	31.17	38.5	-7.3	
782.00	23.25	H	0.5	0.0	22.75	38.5	-15.7	
RB=25 & SRB=12								
782.00	32.52	V	0.5	0.0	32.02	38.5	-6.4	
782.00	24.05	H	0.5	0.0	23.55	38.5	-14.9	
RB=50 & SRB=0								
782.00	32.72	V	0.5	0.0	32.22	38.5	-6.2	
782.00	24.85	H	0.5	0.0	24.35	38.5	-14.1	

Rev. 3.17.11

784.5MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
784.50	31.82	V	0.5	0.0	31.32	34.8	-3.5	
784.50	22.65	H	0.5	0.0	22.15	34.8	-12.7	
RB=1 & SRB=24								
784.50	31.92	V	0.5	0.0	31.42	34.8	-3.4	
784.50	22.95	H	0.5	0.0	22.45	34.8	-12.4	
RB=12 & SRB=6								
784.50	32.32	V	0.5	0.0	31.82	34.8	-3.0	
784.50	23.95	H	0.5	0.0	23.45	34.8	-11.4	
RB=25 & SRB=0								
784.50	32.77	V	0.5	0.0	32.27	34.8	-2.5	
784.50	24.35	H	0.5	0.0	23.85	34.8	-11.0	

Rev. 3.17.11

ERP LTE BAND 13 16QAM

779.5MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAM MODE

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
779.50	31.57	V	0.5	0.0	31.07	34.8	-3.7	
779.50	19.85	H	0.5	0.0	19.35	34.8	-15.5	
RB=1 & SRB=24								
779.50	31.86	V	0.5	0.0	31.36	34.8	-3.4	
779.50	20.15	H	0.5	0.0	19.65	34.8	-15.2	
RB=12 & SRB=6								
779.50	31.92	V	0.5	0.0	31.42	34.8	-3.4	
779.50	23.05	H	0.5	0.0	22.55	34.8	-12.3	
RB=25 & SRB=0								
779.50	32.82	V	0.5	0.0	32.32	34.8	-2.5	
779.50	23.75	H	0.5	0.0	23.25	34.8	-11.6	

Rev. 3.17.11

782MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAMMODE
10MHz BW

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
782.00	31.42	V	0.5	0.0	30.92	38.5	-7.5	
782.00	20.65	H	0.5	0.0	20.15	38.5	-18.3	
RB=1 & SRB=49								
782.00	30.62	V	0.5	0.0	30.12	38.5	-8.3	
782.00	20.85	H	0.5	0.0	20.35	38.5	-18.1	
RB=25 & SRB=12								
782.00	32.52	V	0.5	0.0	32.02	38.5	-6.4	
782.00	23.85	H	0.5	0.0	23.35	38.5	-15.1	
RB=50 & SRB=0								
782.00	32.92	V	0.5	0.0	32.42	38.5	-6.0	
782.00	24.55	H	0.5	0.0	24.05	38.5	-14.4	

Rev. 3.17.11

784.5MHz

High Frequency Substitution Measurement
Compliance Certification Services Chamber B

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAM MODE

Test Equipment:
Receiving: Sunol T130, and 3m Chamber N-type Cable (Setup this one for testing EUT)
Substitution: Dipole S/N: 00022117, 6ft SMA Cable (SN # 208947003) Warehouse.

f MHz	SG reading (dBm)	Ant. Pol. (H/V)	Cable Loss (dB)	Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
RB=1 & SRB=0								
784.50	31.62	V	0.5	0.0	31.12	38.5	-7.3	
784.50	23.45	H	0.5	0.0	22.95	38.5	-15.5	
RB=1 & SRB=24								
784.50	31.42	V	0.5	0.0	30.92	38.5	-7.5	
784.50	22.85	H	0.5	0.0	22.35	38.5	-16.1	
RB=12 & SRB=6								
784.50	32.02	V	0.5	0.0	31.52	38.5	-6.9	
784.50	20.75	H	0.5	0.0	20.25	38.5	-18.2	
RB=25 & SRB=0								
784.50	32.22	V	0.5	0.0	31.72	38.5	-6.7	
784.50	20.35	H	0.5	0.0	19.85	38.5	-18.6	

Rev. 3.17.11

8.2. FIELD STRENGTH OF SPURIOUS RADIATION

RULE PART(S)

FCC: §27.53

LIMIT

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB.

TEST PROCEDURE

For Cellular equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

For PCS equipment - Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

MODES TESTED

- LTE Band 13

RESULTS

LTE BAND 13, QPSK

779.5MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE, 5MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (779.50 MHz)									
RB1 AND START RB1 0									
1.554	-23.6	V	3.0	35.6	1.0	-58.2	-13.0	-45.2	
2.322	-14.7	V	3.0	35.4	1.0	-49.1	-13.0	-36.1	
1.554	-23.0	H	3.0	35.6	1.0	-57.6	-13.0	-44.6	
2.322	-18.6	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	
RB1 AND START RB1 24									
1.563	-22.8	V	3.0	35.6	1.0	-57.4	-13.0	-44.4	
2.345	-13.7	V	3.0	35.4	1.0	-48.1	-13.0	-35.1	
1.563	-21.1	H	3.0	35.6	1.0	-55.7	-13.0	-42.7	
2.345	-18.7	H	3.0	35.4	1.0	-53.1	-13.0	-40.1	
RB25 AND START RB12 6									
1.560	-23.2	V	3.0	35.6	1.0	-57.8	-13.0	-44.8	
2.340	-17.0	V	3.0	35.4	1.0	-51.4	-13.0	-38.4	
1.560	-22.8	H	3.0	35.6	1.0	-57.4	-13.0	-44.4	
2.340	-20.0	H	3.0	35.4	1.0	-54.5	-13.0	-41.5	
RB50 AND START RB25 0									
1.560	-22.8	V	3.0	35.6	1.0	-57.4	-13.0	-44.4	
2.339	-15.7	V	3.0	35.4	1.0	-50.1	-13.0	-37.1	
1.560	-22.9	H	3.0	35.6	1.0	-57.5	-13.0	-44.5	
2.339	-18.8	H	3.0	35.4	1.0	-53.3	-13.0	-40.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

782MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE, 10MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (782.0 MHz)									
RB1 AND START RB1 0									
1.555	-21.5	V	3.0	35.6	1.0	-56.1	-13.0	-43.1	
2.333	-12.5	V	3.0	35.4	1.0	-46.9	-13.0	-33.9	
1.555	-22.0	H	3.0	35.6	1.0	-56.6	-13.0	-43.6	
2.333	-16.1	H	3.0	35.4	1.0	-50.6	-13.0	-37.6	
RB1 AND START RB1 49									
1.573	-22.6	V	3.0	35.6	1.0	-57.2	-13.0	-44.2	
2.360	-10.2	V	3.0	35.4	1.0	-44.6	-13.0	-31.6	
1.573	-19.1	H	3.0	35.6	1.0	-53.7	-13.0	-40.7	
2.360	-17.1	H	3.0	35.4	1.0	-51.5	-13.0	-38.5	
RB25 AND START RB25 12									
1.564	-23.8	V	3.0	35.6	1.0	-58.3	-13.0	-45.3	
2.346	-15.8	V	3.0	35.4	1.0	-50.2	-13.0	-37.2	
1.564	-22.2	H	3.0	35.6	1.0	-56.8	-13.0	-43.8	
2.346	-17.4	H	3.0	35.4	1.0	-51.8	-13.0	-38.8	
RB50 AND START RB50 0									
1.564	-22.6	V	3.0	35.6	1.0	-57.1	-13.0	-44.1	
2.346	-15.7	V	3.0	35.4	1.0	-50.1	-13.0	-37.1	
1.564	-22.8	H	3.0	35.6	1.0	-57.4	-13.0	-44.4	
2.346	-18.9	H	3.0	35.4	1.0	-53.3	-13.0	-40.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

784.5MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND QPSK MODE, 5MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (784.50 MHz)									
RB1 AND START RB1 0									
1.565	-22.3	V	3.0	35.6	1.0	-56.9	-13.0	-43.9	
2.347	-12.9	V	3.0	35.4	1.0	-47.3	-13.0	-34.3	
1.565	-20.4	H	3.0	35.6	1.0	-55.0	-13.0	-42.0	
2.347	-18.2	H	3.0	35.4	1.0	-52.6	-13.0	-39.6	
RB1 AND START RB1 24									
1.574	-20.7	V	3.0	35.6	1.0	-55.3	-13.0	-42.3	
2.360	-11.1	V	3.0	35.4	1.0	-45.5	-13.0	-32.5	
1.574	-22.0	H	3.0	35.6	1.0	-56.6	-13.0	-43.6	
2.360	-15.5	H	3.0	35.4	1.0	-49.9	-13.0	-36.9	
RB25 AND START RB12 6									
1.568	-22.7	V	3.0	35.6	1.0	-57.3	-13.0	-44.3	
2.355	-16.5	V	3.0	35.4	1.0	-50.9	-13.0	-37.9	
1.568	-21.8	H	3.0	35.6	1.0	-56.4	-13.0	-43.4	
2.355	-18.7	H	3.0	35.4	1.0	-53.1	-13.0	-40.1	
RB50 AND START RB25 0									
1.558	-21.7	V	3.0	35.6	1.0	-56.3	-13.0	-43.3	
2.339	-15.5	V	3.0	35.4	1.0	-49.9	-13.0	-36.9	
1.558	-22.3	H	3.0	35.6	1.0	-56.9	-13.0	-43.9	
2.339	-18.5	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

LTE BAND 13, 16QAM

779.5MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAM MODE, 5MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (779.50 MHz)									
RB1 AND START RB1 0									
1.554	-22.5	V	3.0	35.6	1.0	-57.1	-13.0	-44.1	
2.322	-15.5	V	3.0	35.4	1.0	-49.9	-13.0	-36.9	
1.554	-23.1	H	3.0	35.6	1.0	-57.7	-13.0	-44.7	
2.322	-18.8	H	3.0	35.4	1.0	-53.2	-13.0	-40.2	
RB1 AND START RB1 24									
1.563	-22.6	V	3.0	35.6	1.0	-57.2	-13.0	-44.2	
2.345	-12.5	V	3.0	35.4	1.0	-46.9	-13.0	-33.9	
1.563	-20.0	H	3.0	35.6	1.0	-54.6	-13.0	-41.6	
2.345	-18.5	H	3.0	35.4	1.0	-52.9	-13.0	-39.9	
RB25 AND START RB12 6									
1.560	-23.5	V	3.0	35.6	1.0	-58.1	-13.0	-45.1	
2.340	-17.5	V	3.0	35.4	1.0	-51.9	-13.0	-38.9	
1.560	-23.1	H	3.0	35.6	1.0	-57.7	-13.0	-44.7	
2.340	-20.5	H	3.0	35.4	1.0	-55.0	-13.0	-42.0	
RB50 AND START RB25 0									
1.558	-24.1	V	3.0	35.6	1.0	-58.7	-13.0	-45.7	
2.339	-17.7	V	3.0	35.4	1.0	-52.1	-13.0	-39.1	
1.558	-23.6	H	3.0	35.6	1.0	-58.2	-13.0	-45.2	
2.339	-19.8	H	3.0	35.4	1.0	-54.3	-13.0	-41.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

782MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAM MODE, 10MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (782.0 MHz)									
RB1 AND START RB1 0									
1.555	-19.7	V	3.0	35.6	1.0	-54.3	-13.0	-41.3	
2.333	-12.7	V	3.0	35.4	1.0	-47.1	-13.0	-34.1	
1.555	-21.7	H	3.0	35.6	1.0	-56.3	-13.0	-43.3	
2.333	-16.8	H	3.0	35.4	1.0	-51.3	-13.0	-38.3	
RB1 AND START RB1 49									
1.573	-21.7	V	3.0	35.6	1.0	-56.3	-13.0	-43.3	
2.360	-10.9	V	3.0	35.4	1.0	-45.3	-13.0	-32.3	
1.573	-21.9	H	3.0	35.6	1.0	-56.5	-13.0	-43.5	
2.360	-17.6	H	3.0	35.4	1.0	-52.0	-13.0	-39.0	
RB25 AND START RB25 12									
1.564	-24.1	V	3.0	35.6	1.0	-58.6	-13.0	-45.6	
2.346	-16.2	V	3.0	35.4	1.0	-50.6	-13.0	-37.6	
1.564	-23.0	H	3.0	35.6	1.0	-57.6	-13.0	-44.6	
2.346	-20.4	H	3.0	35.4	1.0	-54.8	-13.0	-41.8	
RB50 AND START RB50 0									
1.564	-23.0	V	3.0	35.6	1.0	-57.5	-13.0	-44.5	
2.346	-15.2	V	3.0	35.4	1.0	-49.6	-13.0	-36.6	
1.564	-23.0	H	3.0	35.6	1.0	-57.6	-13.0	-44.6	
2.346	-20.9	H	3.0	35.4	1.0	-55.3	-13.0	-42.3	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

784.5MHz

Compliance Certification Services
Above 1GHz High Frequency Substitution Measurement

Company: Novatel
Project #: 11U13890
Date: 07-22-11
Test Engineer: Chin Pang
Configuration: EUT with Dipole Antenna
Mode: TX, LTE BAND 16QAM MODE, 5MHz BW

Chamber	Pre-amplifer	Filter	Limit
5m Chamber B	T145 8449B	Filter 1	Part 27

f GHz	SG reading (dBm)	Ant. Pol. (H/V)	Distance (m)	Preamp (dB)	Filter (dB)	ERP (dBm)	Limit (dBm)	Delta (dB)	Notes
BAND 13 (784.50 MHz)									
RB1 AND START RB1 0									
1.565	-22.3	V	3.0	35.6	1.0	-56.9	-13.0	-43.9	
2.347	-12.7	V	3.0	35.4	1.0	-47.1	-13.0	-34.1	
1.565	-20.6	H	3.0	35.6	1.0	-55.2	-13.0	-42.2	
2.347	-18.6	H	3.0	35.4	1.0	-53.0	-13.0	-40.0	
RB1 AND START RB1 24									
1.574	-22.0	V	3.0	35.6	1.0	-56.6	-13.0	-43.6	
2.360	-11.9	V	3.0	35.4	1.0	-46.3	-13.0	-33.3	
1.574	-21.7	H	3.0	35.6	1.0	-56.3	-13.0	-43.3	
2.360	-15.7	H	3.0	35.4	1.0	-50.1	-13.0	-37.1	
RB25 AND START RB12 6									
1.568	-24.6	V	3.0	35.6	1.0	-59.2	-13.0	-46.2	
2.355	-16.8	V	3.0	35.4	1.0	-51.2	-13.0	-38.2	
1.568	-22.9	H	3.0	35.6	1.0	-57.5	-13.0	-44.5	
2.355	-21.1	H	3.0	35.4	1.0	-55.5	-13.0	-42.5	
RB50 AND START RB25 0									
1.558	-23.8	V	3.0	35.6	1.0	-58.4	-13.0	-45.4	
2.339	-16.5	V	3.0	35.4	1.0	-50.9	-13.0	-37.9	
1.558	-21.4	H	3.0	35.6	1.0	-56.0	-13.0	-43.0	
2.339	-20.4	H	3.0	35.4	1.0	-54.9	-13.0	-41.9	

Rev. 03.03.09
Note: No other emissions were detected above the system noise floor.

8.3. RECEIVER SPURIOUS EMISSIONS

LIMIT

RSS-Gen 7.2.2

Spurious Emission Limits for Receivers:

Spurious Frequency (MHz)	Field Strength (microvolts/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

TEST PROCEDURE

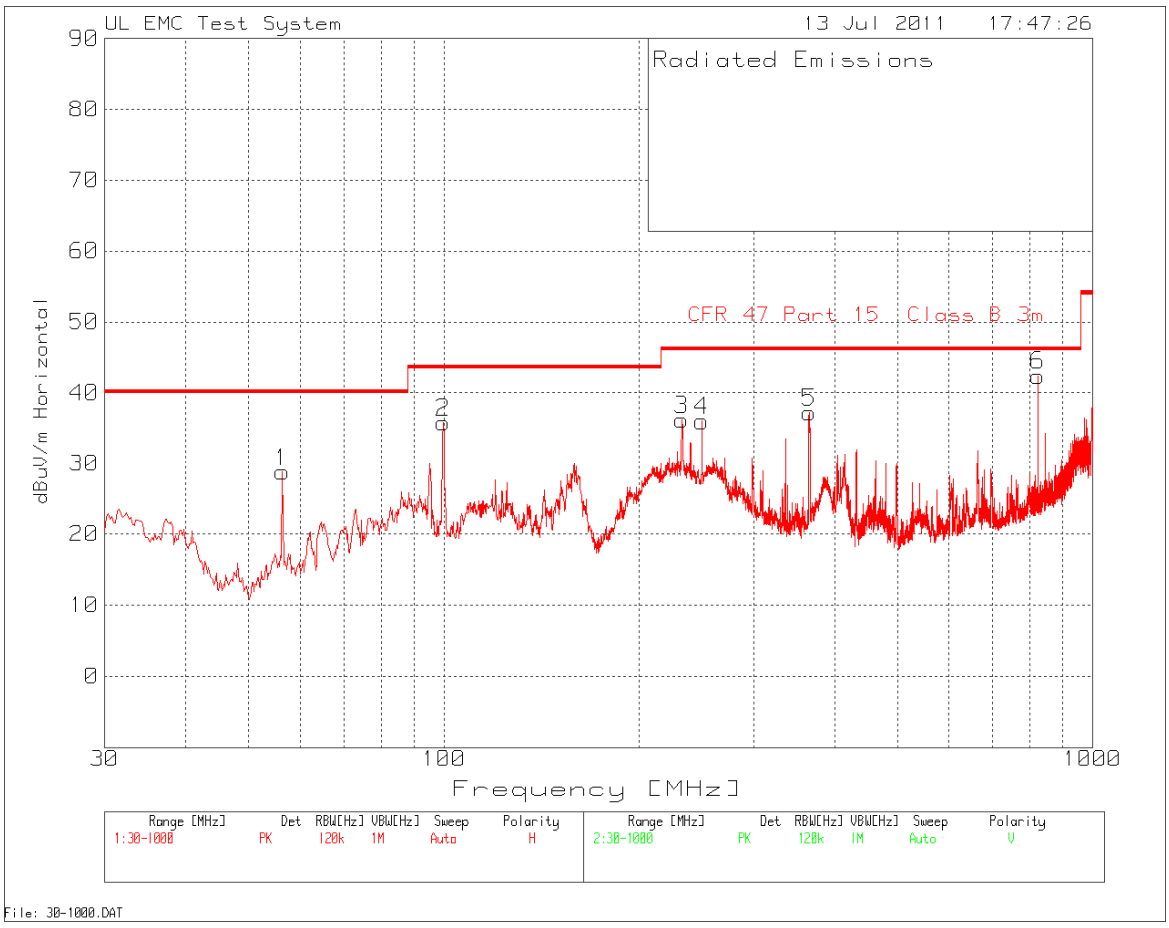
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (local oscillator frequency, intermediate frequency or carrier frequency),

or 30 MHz, whichever is the higher, to at least 3 times the highest tunable and local oscillator frequencies.

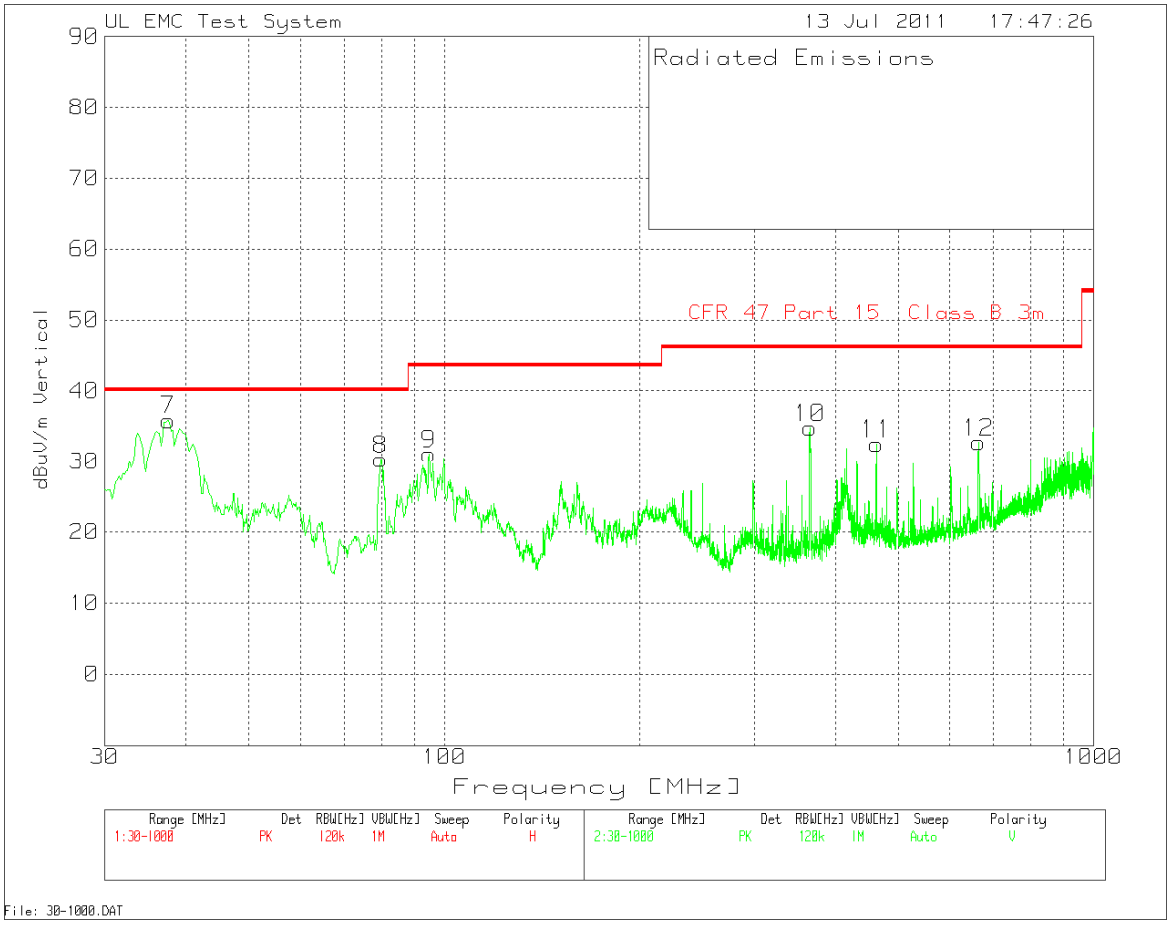
RESULTS

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Range 1 30 - 1000MHz									
Frequency	Reading	Detector	Cable. [dB]	PreAmp[dB]	Bilog Factors[dB]	dBuV/m	Part 15B 3m	Margin	Polarity
56.3629	49.18	PK	1.1	-29.4	7.9	28.78	40	-11.22	Horz
99.5903	53.69	PK	1.4	-29.3	10	35.79	43.5	-7.71	Horz
232.5679	50.99	PK	2.1	-28.8	11.9	36.19	46	-9.81	Horz
250.014	50.7	PK	2.2	-28.7	11.8	36	46	-10	Horz
366.3209	48.92	PK	2.7	-28.8	14.4	37.22	46	-8.78	Horz
824.5703	46.12	PK	4	-28.8	21.1	42.42	46	-3.58	Horz
2 30 - 1000MHz									
Frequency	Reading	Detector	Cable. [dB]	PreAmp[dB]	Bilog Factors[dB]	dBuV/m	Part 15B 3m	Margin	Polarity
37.56	48.47	PK	0.9	-29.5	16	35.87	40	-4.13	Vert
79.9151	50.81	PK	1.3	-29.4	7.6	30.31	40	-9.69	Vert
94.7442	50.29	PK	1.4	-29.3	8.7	31.09	43.5	-12.41	Vert
366.1271	46.44	PK	2.7	-28.8	14.4	34.74	46	-11.26	Vert
463.8249	42.62	PK	3	-29.3	16.2	32.52	46	-13.48	Vert
666.199	39.49	PK	3.6	-29.3	18.9	32.69	46	-13.31	Vert

SPURIOUS EMISSIONS ABOVE 1000 MHz (WORST-CASE CONFIGURATION)

Note: No emissions were detected above the system noise floor.

8.4. POWER LINE CONDUCTED EMISSION

LIMIT

RSS-Gen 7.2.2

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radio communication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

Table 2 – AC Power Lines Conducted Emission Limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

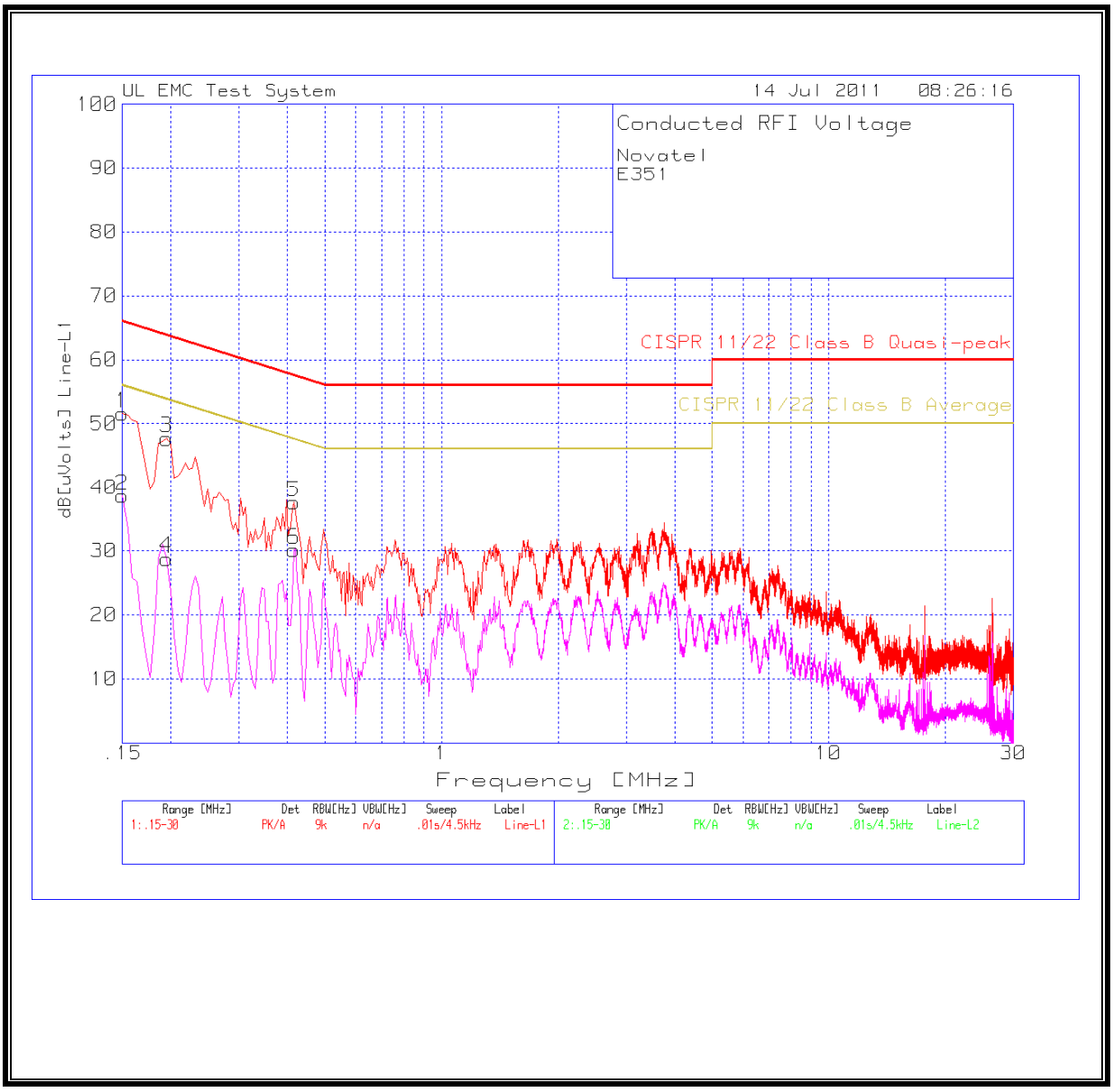
* Decreases with the logarithm of the frequency.

RESULTS

6 WORST EMISSIONS

Line-L1 .15 - 30MHz							
Frequency	Reading	Detector	dB[uVolts]	CISPR 22 B QP	Margin	CISPR 22 B Average	Margin
0.15	51.62	PK	51.62	66	-14.38	56	-4.38
0.15	38.61	Av	38.61	-	-	56	-17.39
0.195	47.67	PK	47.67	63.8	-16.13	53.8	-6.13
0.195	28.78	Av	28.78	-	-	53.8	-25.02
0.4155	37.57	PK	37.57	57.5	-19.93	47.5	-9.93
0.4155	30.14	Av	30.14	-	-	47.5	-17.36
Line-L2 .15 - 30MHz							
Frequency	Reading	Detector	dB[uVolts]	CISPR 22 B QP	Margin	CISPR 22 B Average	Margin
0.1545	52.29	PK	52.29	65.8	-13.51	55.8	-3.51
0.1545	32.08	Av	32.08	-	-	55.8	-23.72
0.195	47.51	PK	47.51	63.8	-16.29	53.8	-6.29
0.195	28.48	Av	28.48	-	-	53.8	-25.32
0.4065	38.73	PK	38.73	57.7	-18.97	47.7	-8.97
0.4065	23.58	Av	23.58	-	-	47.7	-24.12

LINE 1 RESULTS



LINE 2 RESULTS