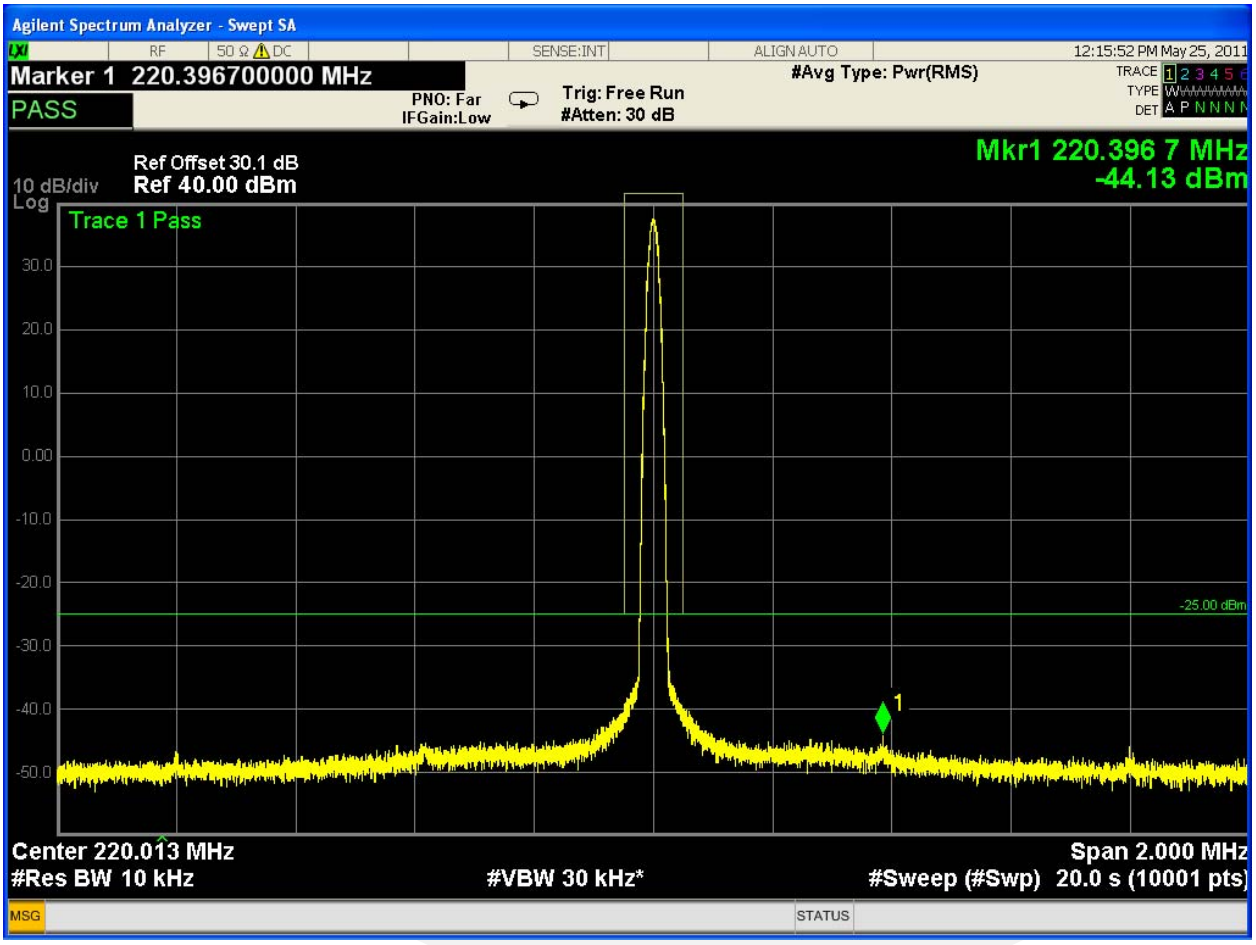
FCC Conducted Emissions below 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK_HALF
Low channel: 220.0125 MHz
Close in emissions

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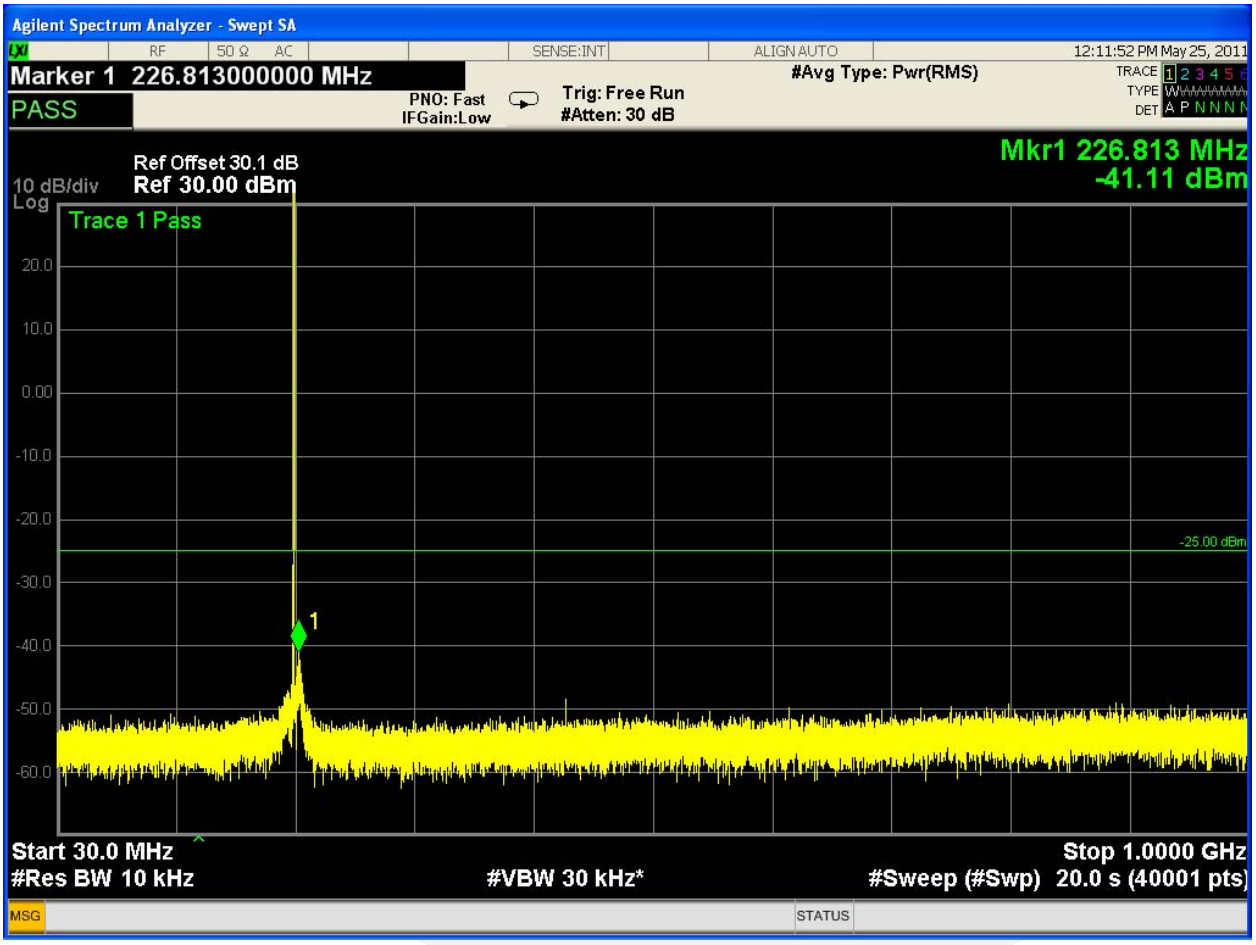
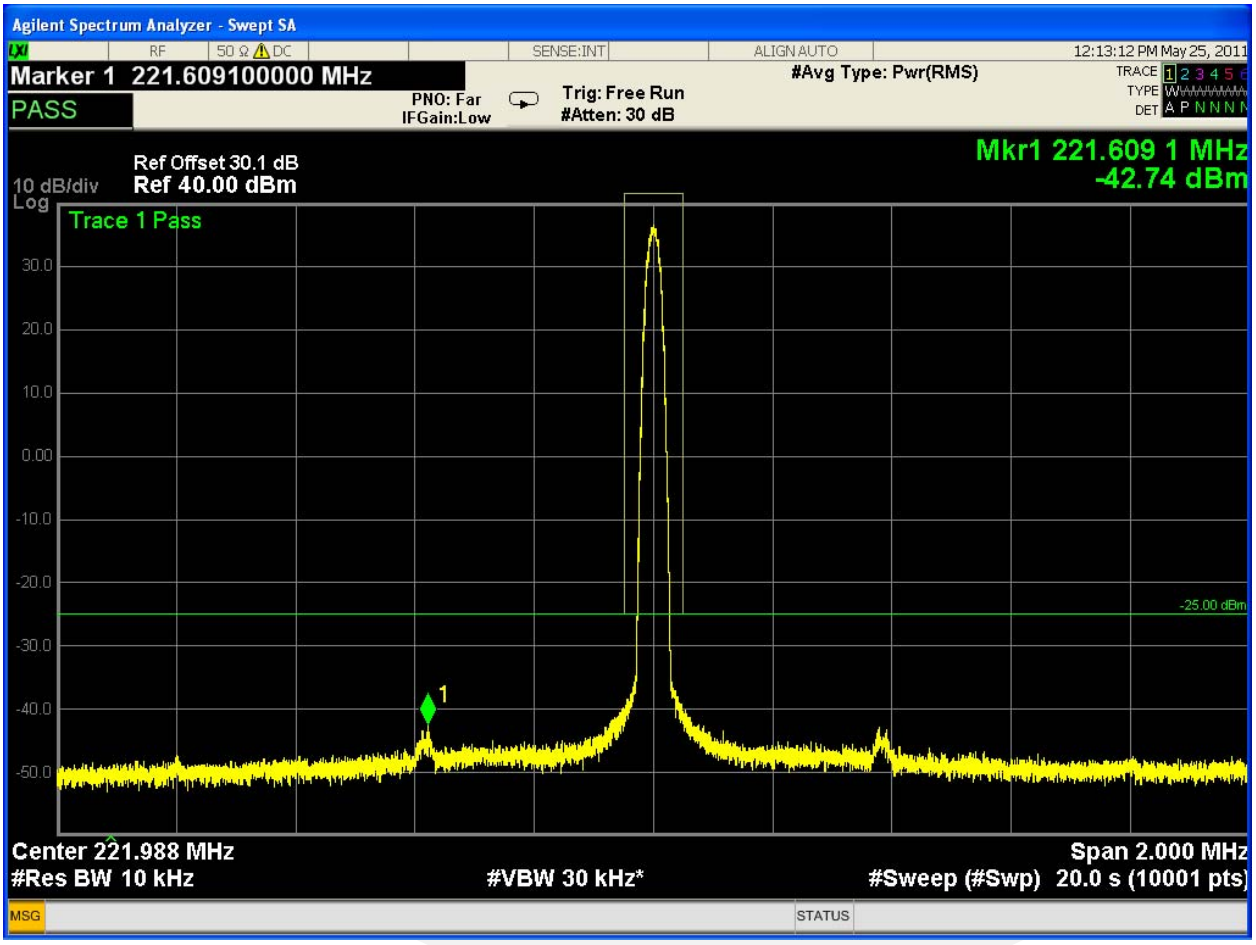
FCC Conducted Emissions below 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK
High channel: 221.9875 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

FCC Conducted Emissions below 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK
High channel: 221.9875 MHz
Close in emissions

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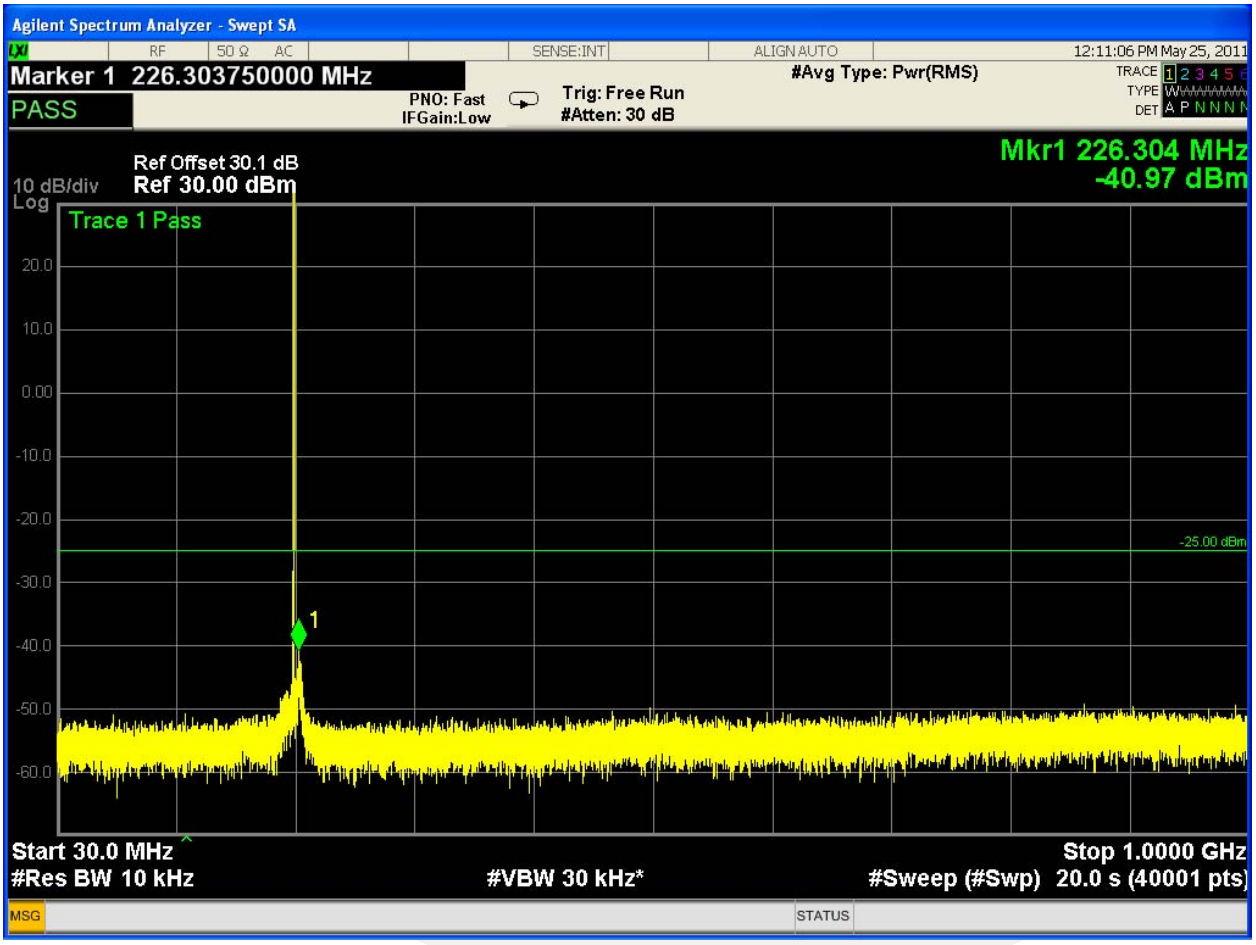
FCC Conducted Emissions below 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK_HALF
High channel: 221.9875 MHz

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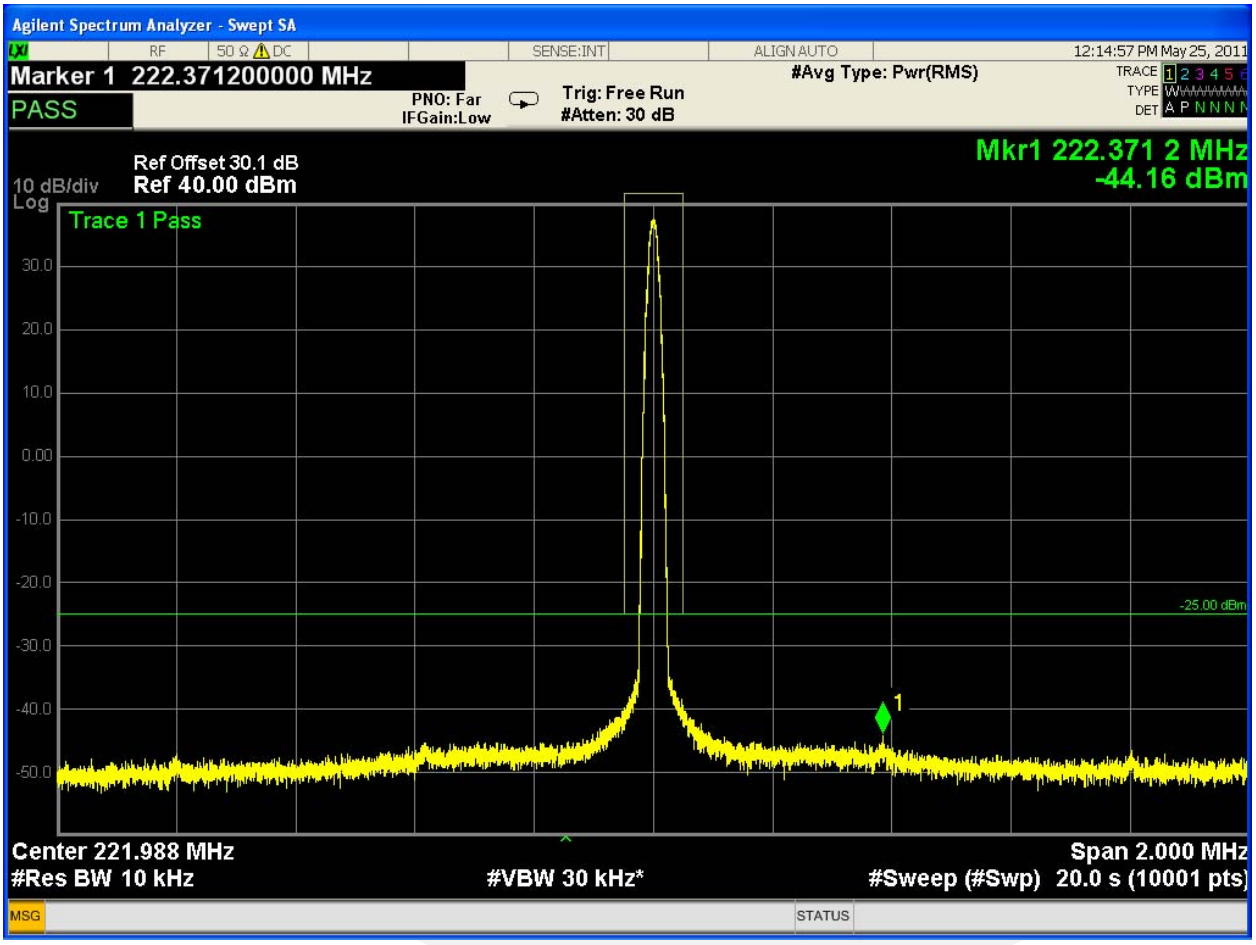
FCC Conducted Emissions below 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK_HALF
High channel: 221.9875 MHz
Close in emissions

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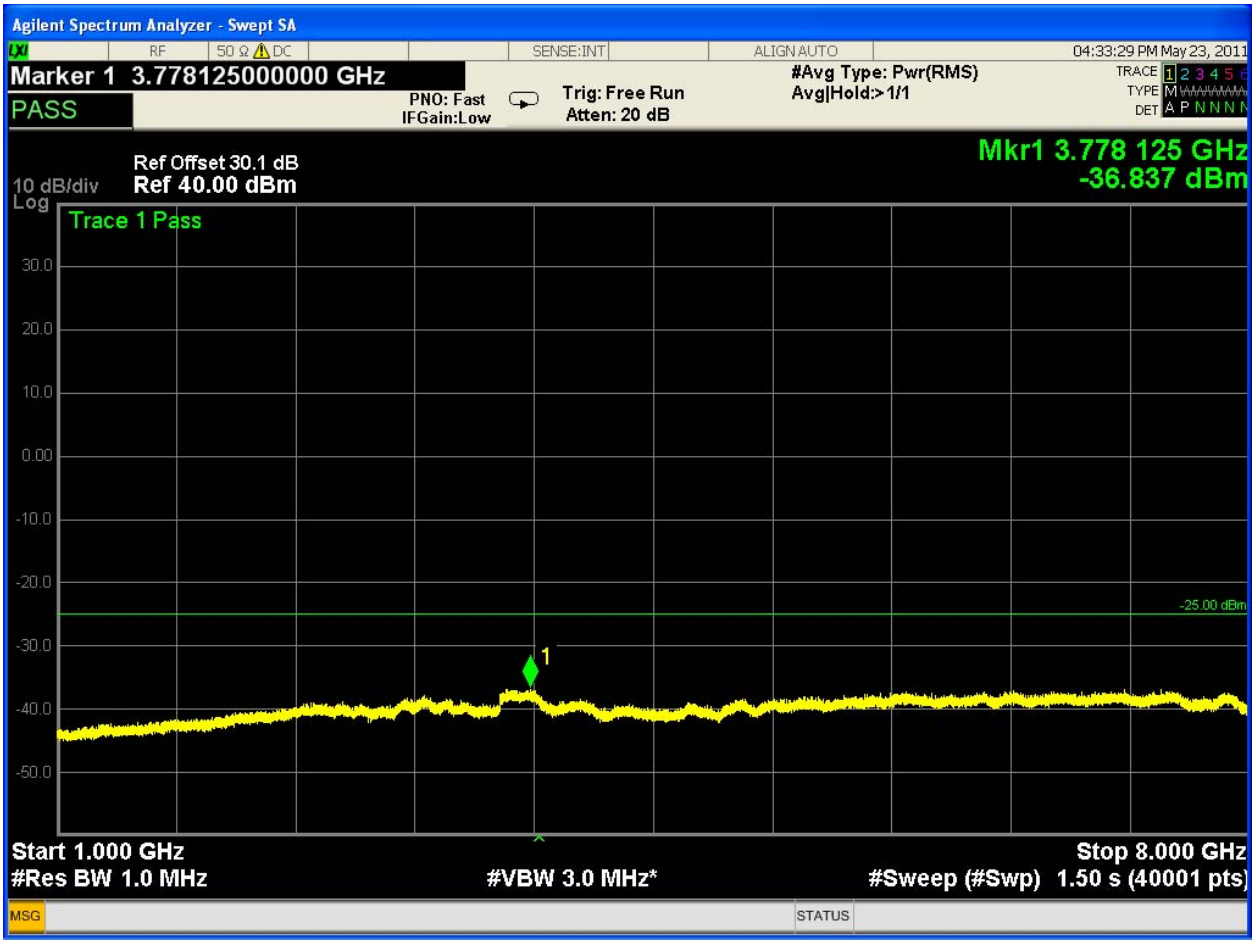
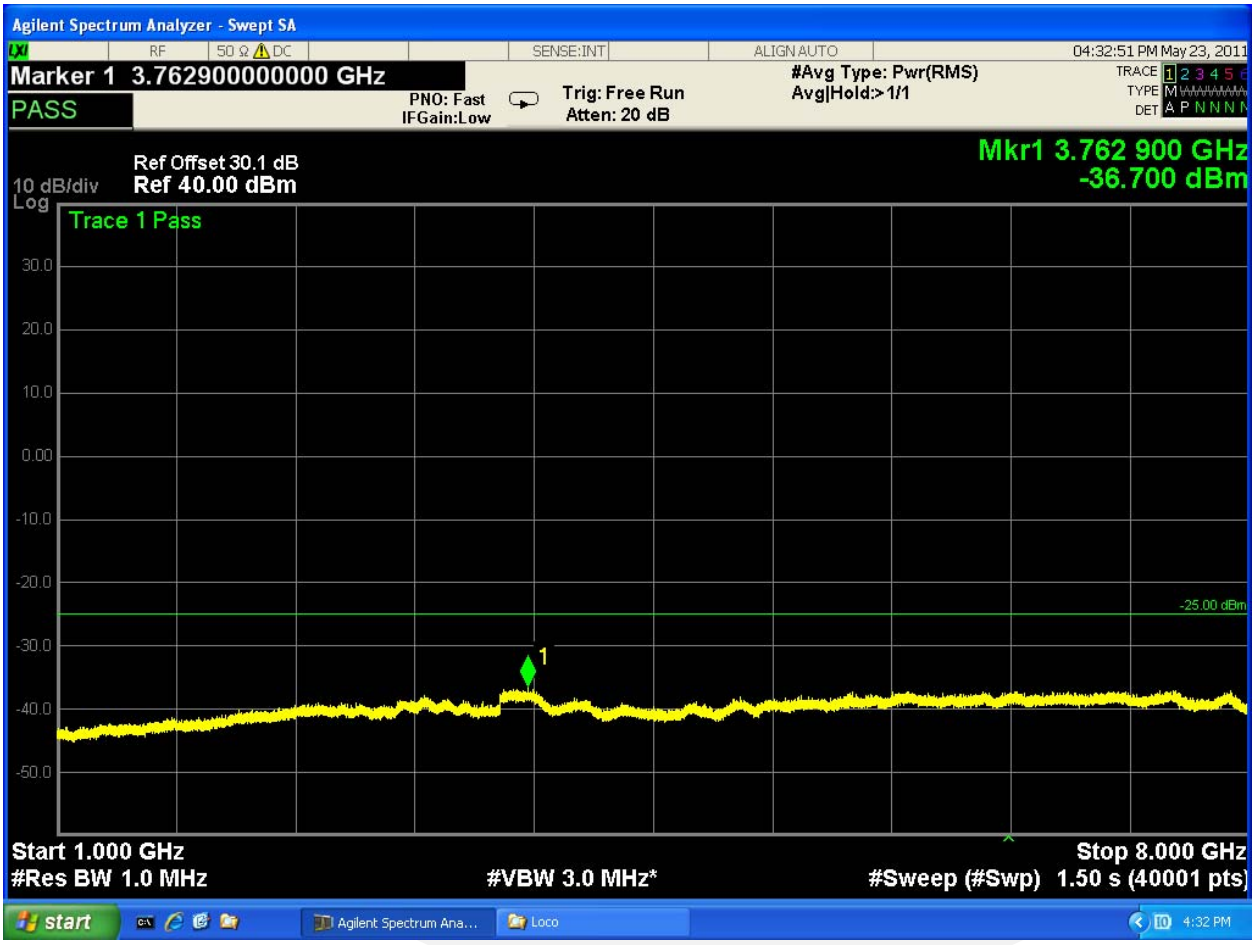
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
50 watt peak power



Modulation: DQPSK
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

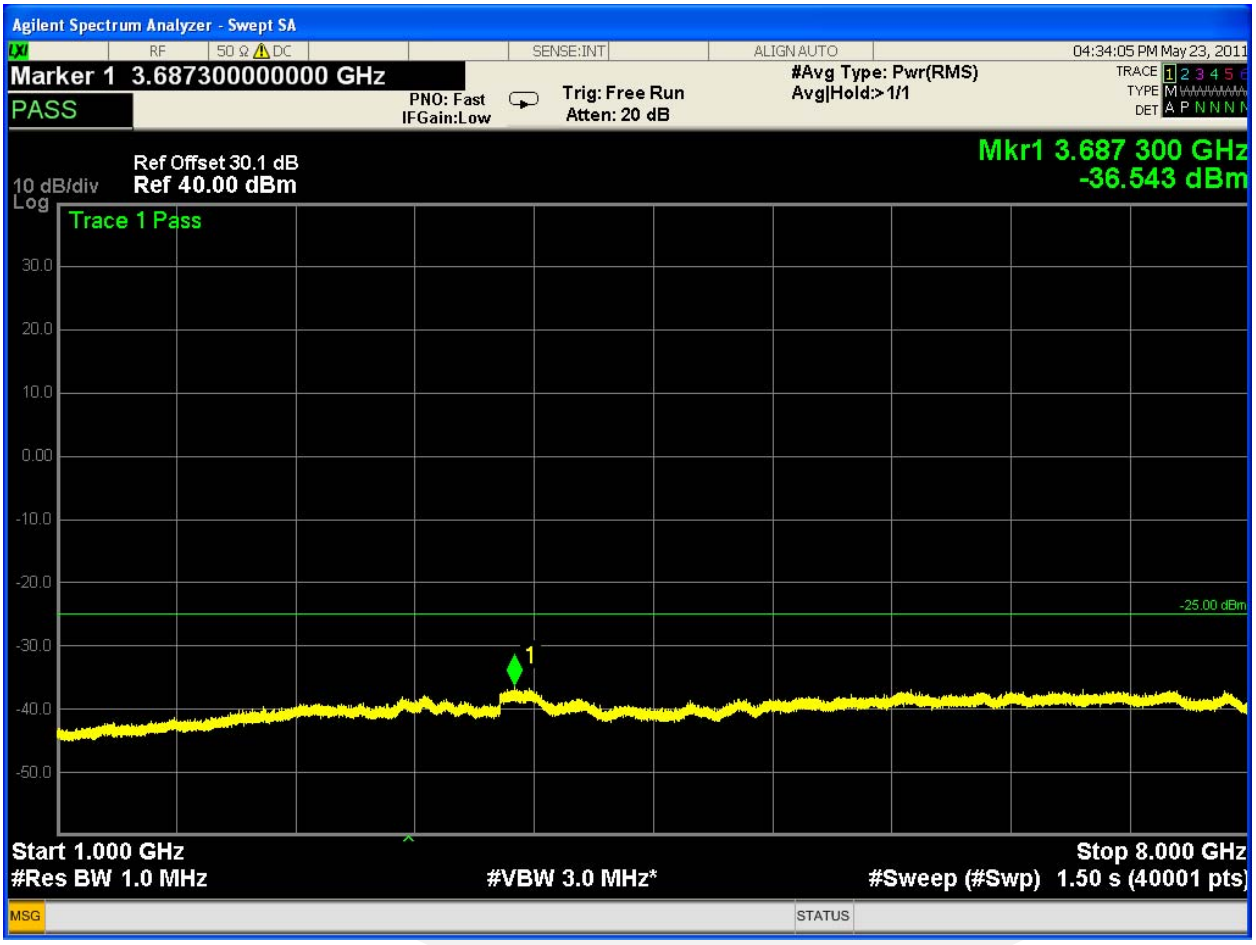
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
50 watt peak power



Modulation: DQPSK_HALF
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

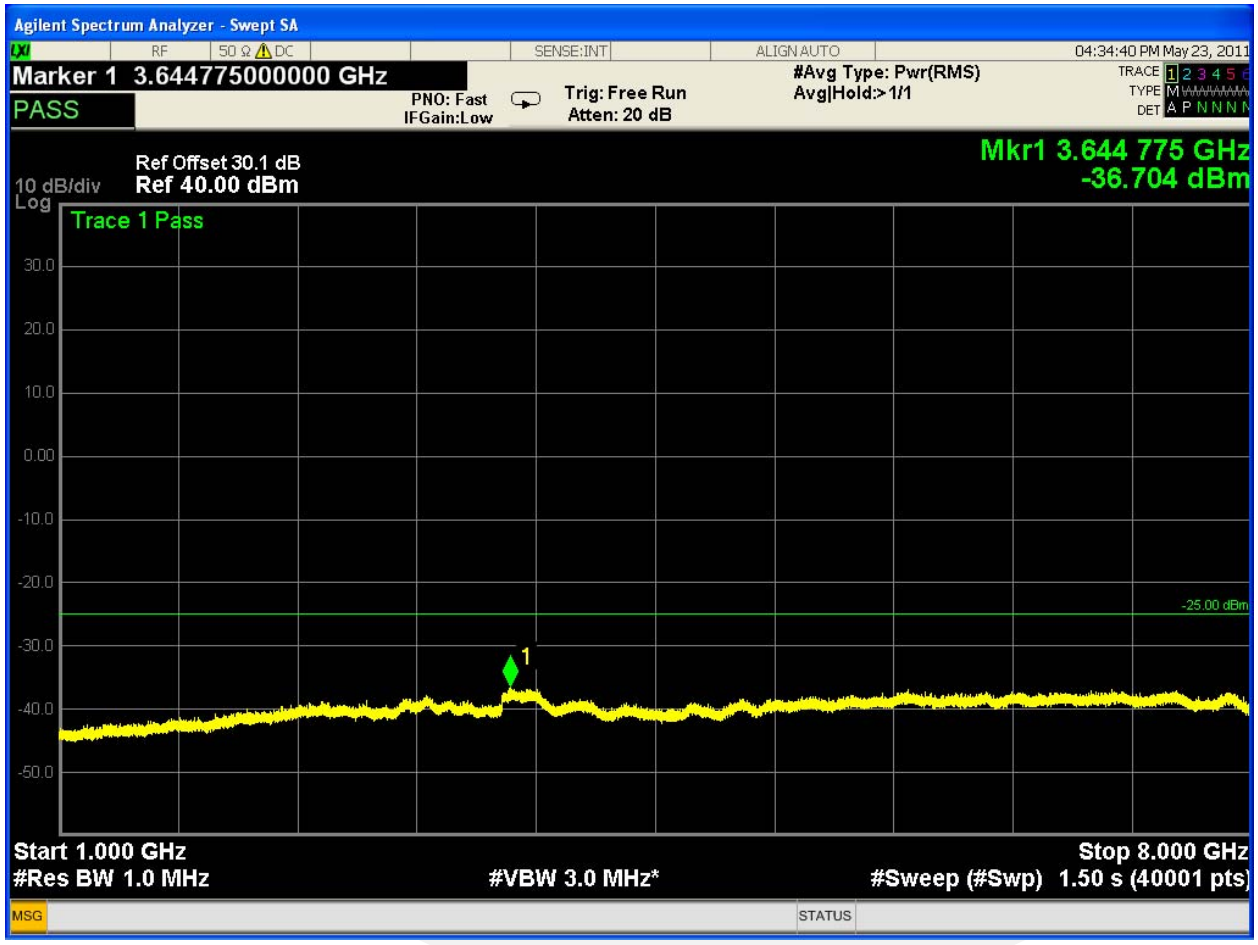
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
50 watt peak power



Modulation: DQPSK
High channel: 221.9875 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

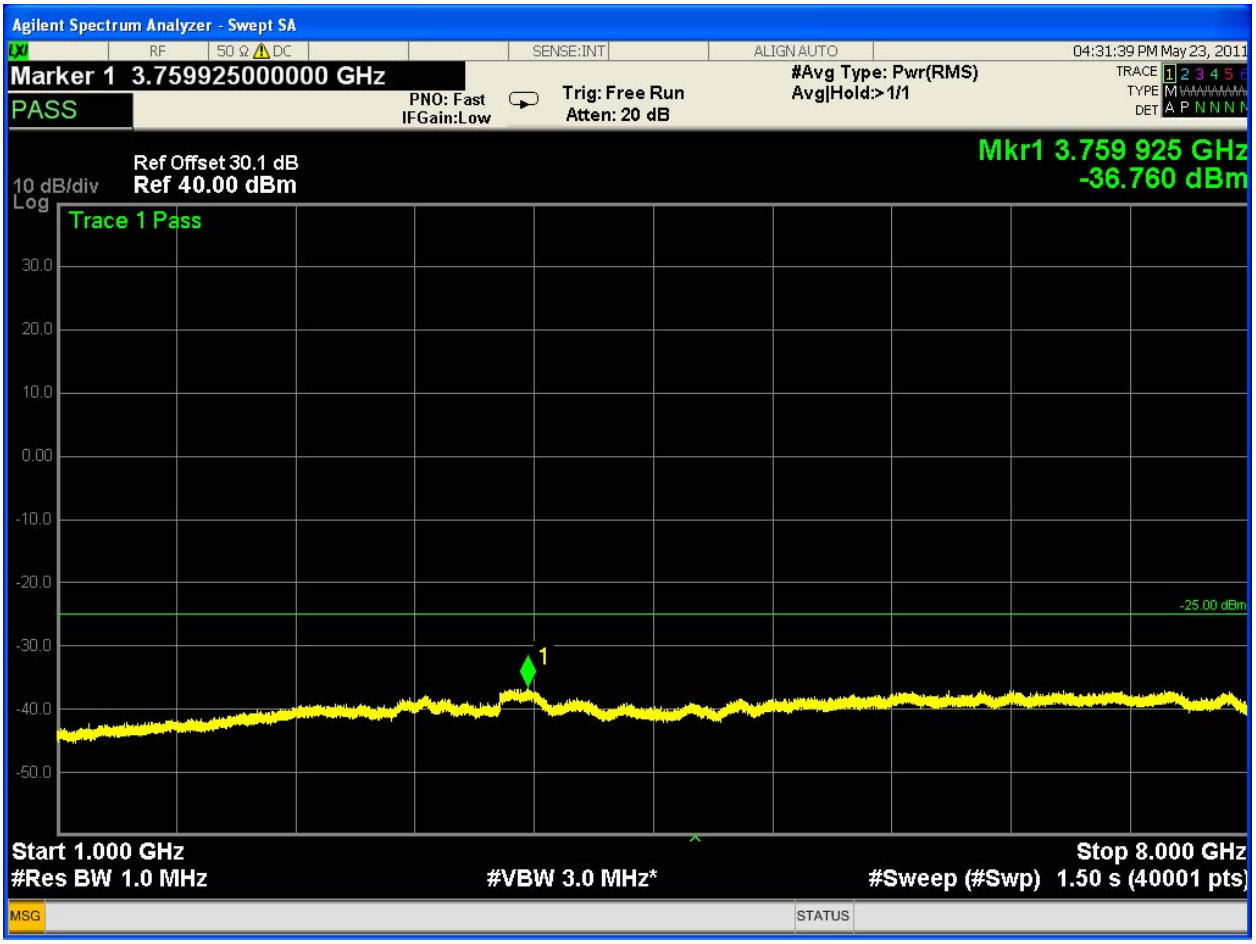
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
50 watt peak power



Modulation: DQPSK_HALF
High channel: 221.9875 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

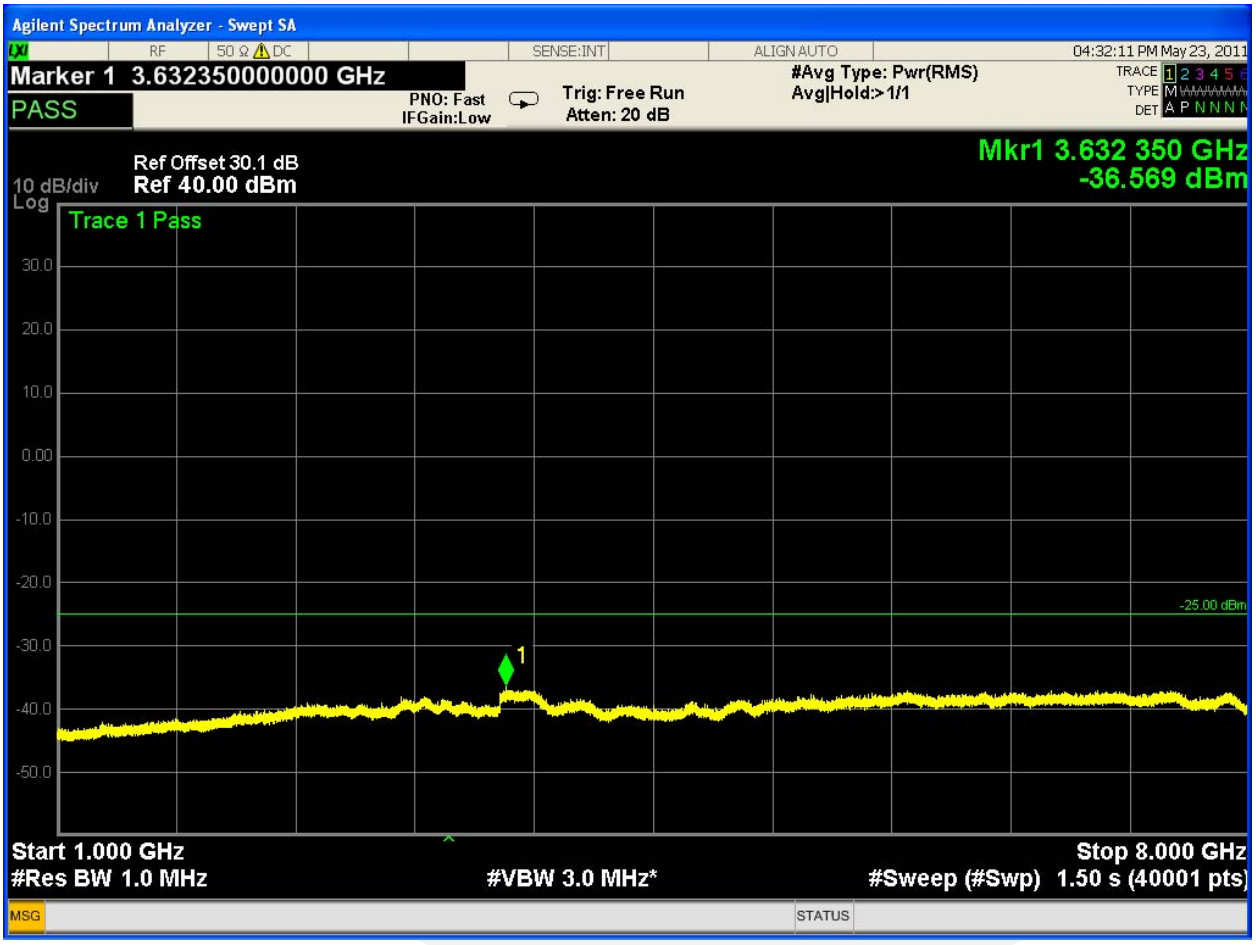
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

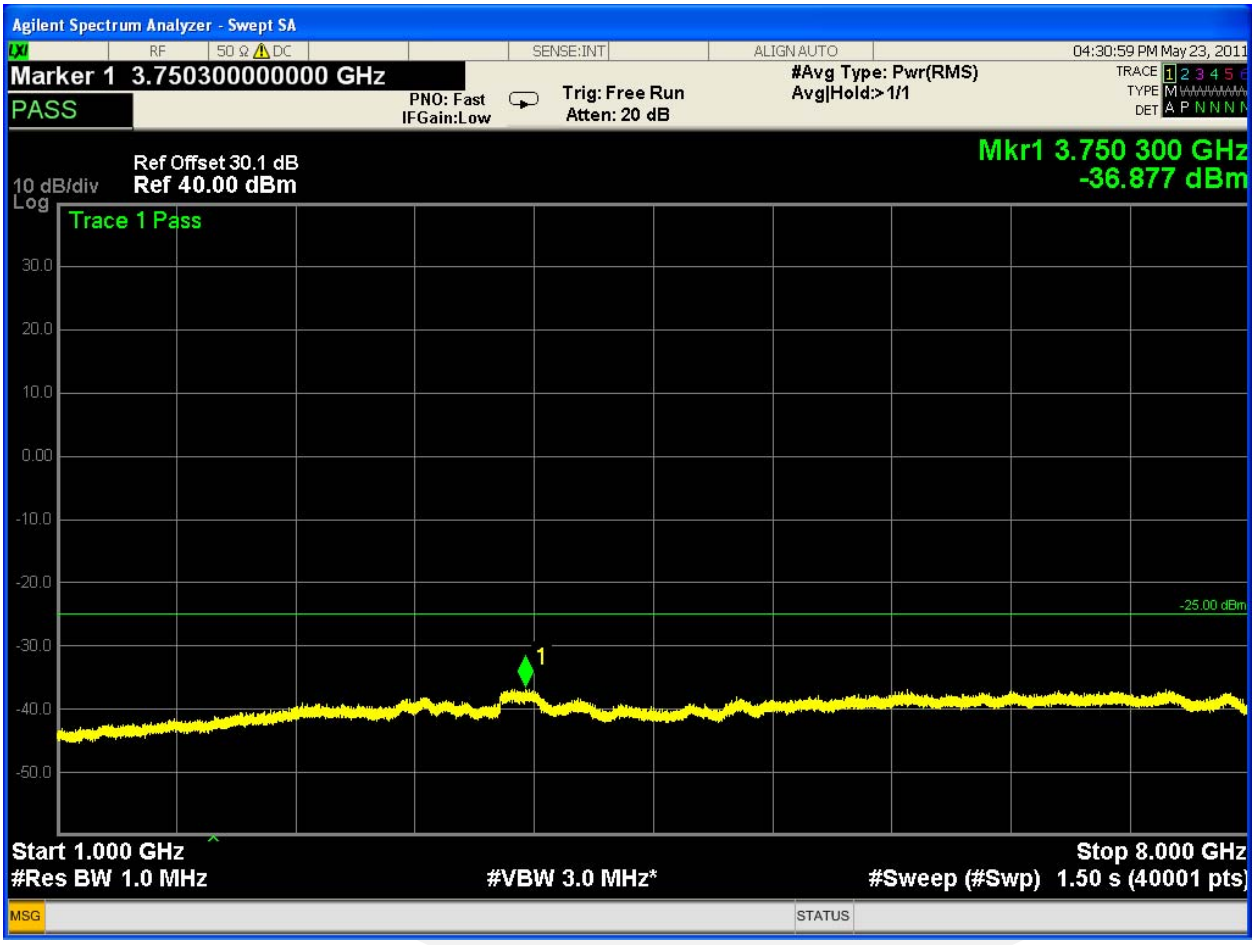
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK_HALF
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298

FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK
High channel: 221.9875 MHz

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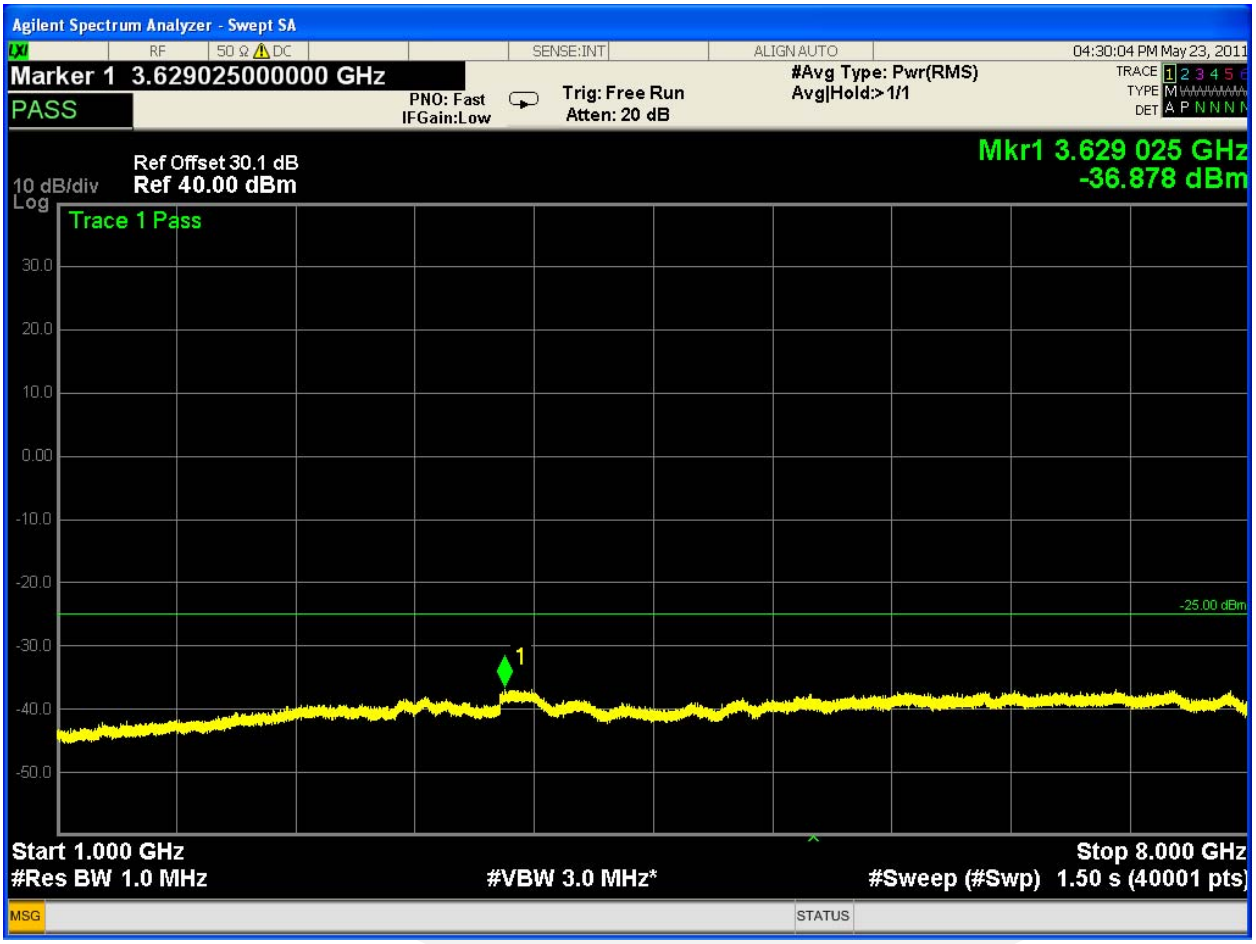
FCC / Industry Canada Conducted Emissions above 1 GHz
Tx port
Transmit mode
15 watt peak power



Modulation: DQPSK_HALF
High channel: 221.9875 MHz

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8.6 Frequency stability

Test summary
The requirements are: ■ - MET ☐ - NOT MET

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
■ - NextGen RF Design

Test equipment

	Vendor	Model	Serial Number	Cal Date / Cal Due Date
Spectrum Analyzer	Agilent	PSA N9030A	US4S230321	03-03-2011 / 04-21-2012
Power Supply	HP/Agilent	6030A	2934A-01826	12-16-2010 / 07-07-2011
Computer	Dell	XPS M170	36134745733	N/A
30 dB power attenuator	Weinschel	5009	MA907	Cal by user
Multimeter	Fluke	87V	86670404	04/21/2011 – 04/21/2012
Rx1 Load	Weinschel	2-40	T1328	Cal by user
Rx2 Load	Systron Doner	108328	N/A	Cal by ser
DC Block	PE8210		N/A	Cal by user
50 ohm load	Inmet 3016		N/A	Cal by user
Temperature Chamber	Thermotron	S1.2 MiniMax	NGRF16	N/A

Test limits

FCC 90.213
1.5 ppm – 220-222 MHz
1 ppm – 217-220 MHz – N/A

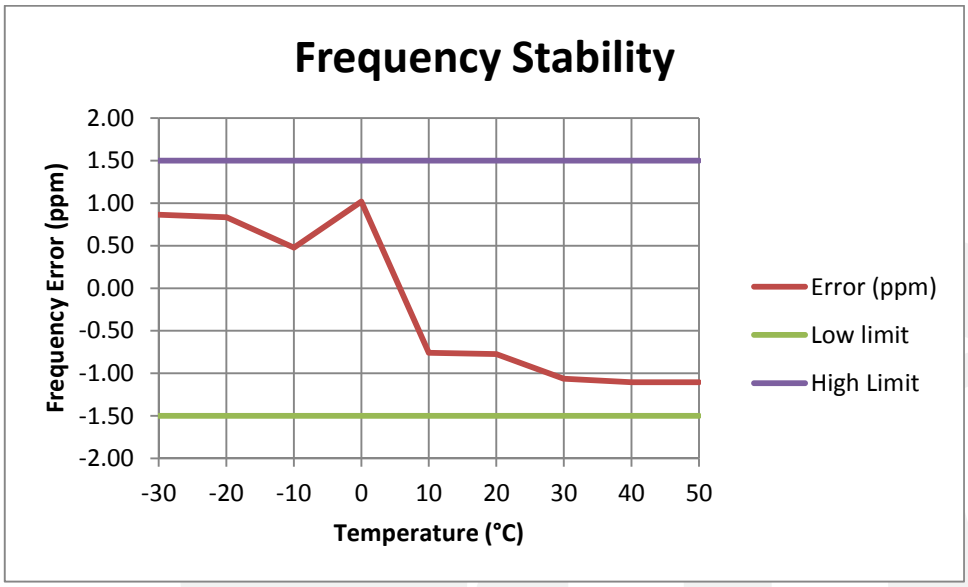
RSS-119 5.3
1.5 ppm – 220-222 MHz
5 ppm – 217-218 MHz 5 ppm – 219-220 MHz – N/A

Test Data
See following pages

Frequency error data has been collected by recording the frequency error information as reported from the vector signal analyzer digital demodulation measurement function contained within the N9030A spectrum analyzer. Knowing the data rate, modulation format, and filter parameters, the digital demodulator is configured to decode the transmission data. The demodulated data is then processed by the vector signal analyzer and is then able to determine the fundamental frequency error result referenced to the center frequency of the spectrum analyzer. This method of frequency error measurement is used on digital transmissions when a suitable unmodulated RF signal is not available.

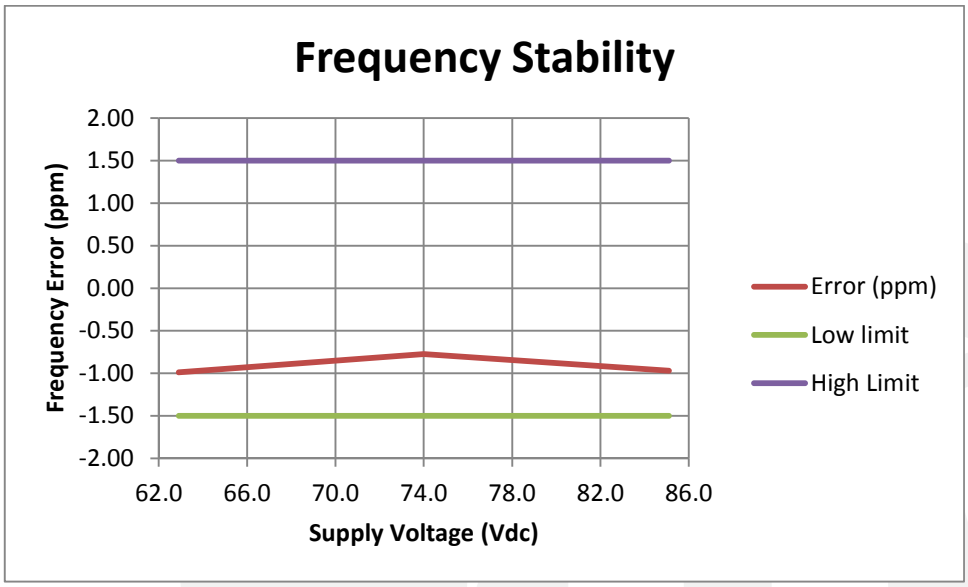
For each data point, the product was unpowered at the test temperature for a sufficient time to ensure that the frequency determining circuitry was also at the test temperature. Power was then applied to the product and a frequency error measurement was performed as soon as data communications with the test computer allowed, typically around 2 minutes after power was applied.

Frequency Stability versus temperature
Frequency: 221.0000 MHz
Modulation: DQPSK
Supply Voltage: 74.0 Vdc



Frequency (MHz)	221.000000	
Temperature °C	Freq Error (Hz)	Error (ppm)
-30	190.94	0.8640
-20	184.39	0.8343
-10	105.21	0.4761
0	224.47	1.0157
10	-167.93	-0.7599
20	-171.81	-0.7774
30	-235.83	-1.0671
40	-244.95	-1.1084
50	-244.9	-1.1081

Frequency Stability versus supply voltage
Frequency: 221.0000 MHz
Modulation: DQPSK
Temperature: 20°C



Frequency (MHz)	221.000000	
Voltage	Freq Error (Hz)	Error (ppm)
62.9	-218.61	-0.9892
74.0	-171.81	-0.7774
85.1	-215.12	-0.9734

8.7 Receiver emissions

Test summary
The requirements are: ■ - MET ☐ - NOT MET

Test location
☐ - Wild River Lab Large Test Site (Open Area Test Site)
■ - Oakwood Lab (Open Area Test Site)
■ - NextGen RF Design

Test equipment

	Vendor	Model	Serial Number	Cal Date / Cal Due Date
Spectrum Analyzer	Agilent	PSA N9030A	US4S230321	03-03-2011 / 04-21-2012
Power Supply	HP/Agilent	6030A	2934A-01826	12-16-2010 / 07-07-2011
Computer	Dell	XPS M170	36134745733	N/A
30 dB power attenuator	Weinschel	5009	MA907	Cal by user
Multimeter	Fluke	87V	86670404	04/21/2011 – 04/21/2012
Rx1 Load	Weinschel	2-40	T1328	Cal by user
Rx2 Load	Systron Doner	108328	N/A	Cal by ser
DC Block	PE8210		N/A	Cal by user
50 ohm load	Inmet 3016		N/A	Cal by user

Test equipment (radiated)

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
OWLE02074	3115	Electro-Mechanics	Ridge Guide Antenna	2504	24-Feb-12
WRLE02674	85662A	Hewlett-Packard	Analyzer Display	2050A02007	05-Nov-11
WRLE02690	8568B	Hewlett-Packard	Spectrum Analyzer	2430A00930	05-Nov-11
WRLE02680	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00343	15-Jun-11
OWLE02671	8447D	Hewlett-Packard	Preamplifier	2648A04942	Code B 05-Jan-12
WRLE03958	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B 05-Jan-12
WRLE03204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	21-Apr-12

Test limits
Radiated, FCC 15.109, RSS-Gen

Frequncy (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
30 - 88	100, QP	40.0
88 - 216	150, QP	43.5
216 - 960	200, QP	46.0
Above 960	500, QP	54.0
> 1000	500, AV 5000, PK	54.0 74.0

FCC 15.111
2.0 nwatts (-57dBm)

RSS-Gen 6.2
2.0 nwatts (-57 dBm) 30-1000 MHz
5.0 nwatts (-53 dBm) > 1000 MHz

Test Data
See following pages

Radiated emissions

Below 1 GHz

Measurement summary for limit1: FCC-B <1GHz 3m (Qp)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC-B <1GHz 3m
499.982 MHz	49.35 Qp	2.37 / 17.46 / 24.75 / 0.0	44.43	V / 1.20 / 165	-1.57
400.008 MHz	46.72 Qp	2.16 / 15.95 / 24.72 / 0.0	40.11	V / 1.50 / 185	-5.89
200.007 MHz	49.29 Qp	1.61 / 10.7 / 24.68 / 0.0	36.92	V / 1.00 / 10	-6.58
30.606 MHz	36.15 Qp	0.7 / 20.91 / 25.13 / 0.0	32.63	V / 1.00 / 90	-7.37
179.007 MHz	47.35 Qp	1.53 / 10.22 / 24.85 / 0.0	34.25	V / 1.00 / 0	-9.25

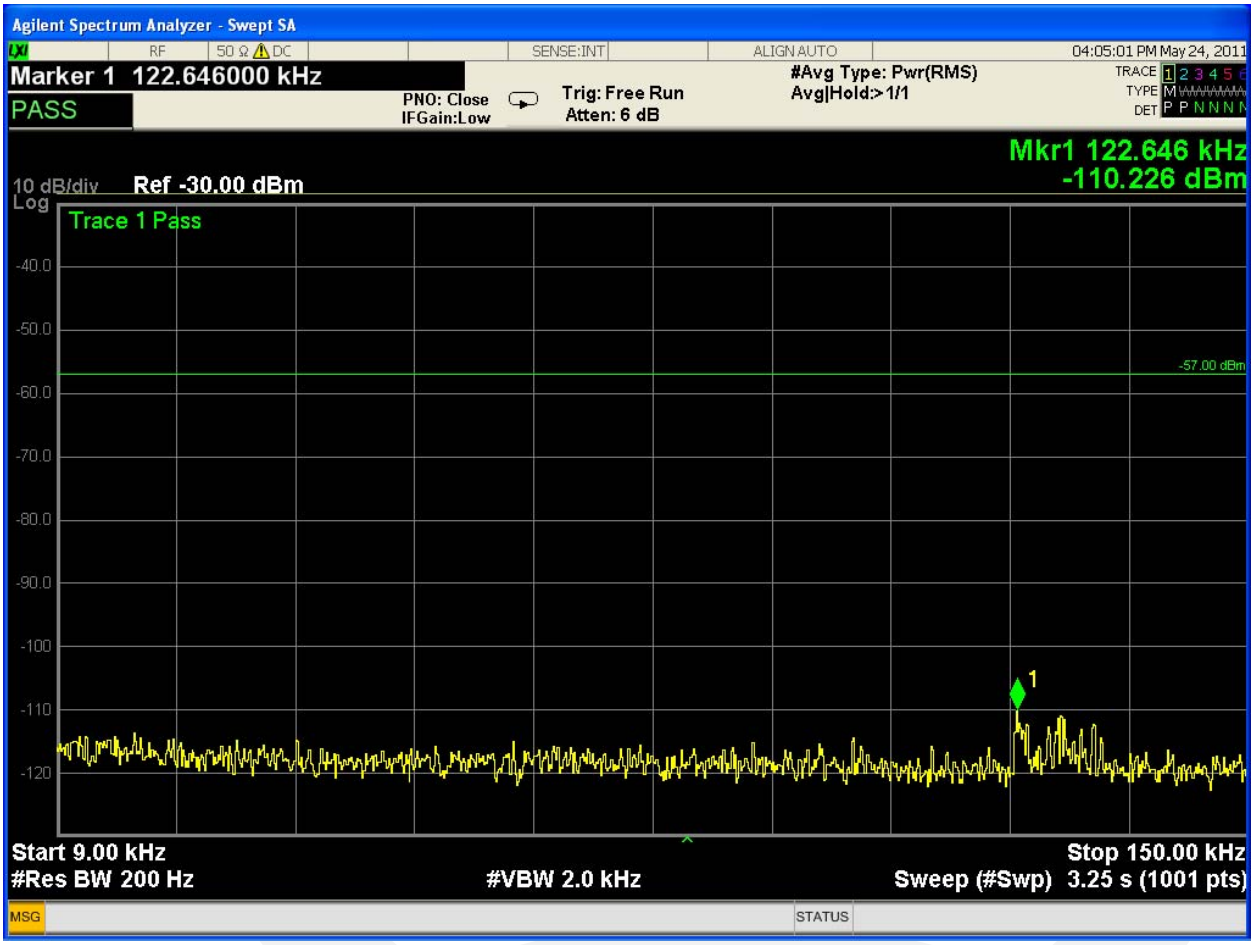
≥ 1 GHz

Measurement summary for limit1: FCC B >1GHz 3m av (Av)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC B >1GHz 3m av
2.338 GHz	55.37 Av	6.33 / 28.22 / 50.01 / 0.0	39.9	V / 1.60 / 80	-14.1
1.4 GHz	57.63 Av	4.2 / 25.7 / 51.32 / 0.0	36.2	H / 1.00 / 180	-17.8
1.0 GHz	58.54 Av	3.61 / 24.6 / 50.6 / 0.0	36.15	H / 1.00 / 155	-17.85
1.5 GHz	56.85 Av	4.36 / 26.05 / 51.23 / 0.0	36.04	V / 1.00 / 180	-17.96
2.0 GHz	53.38 Av	5.46 / 27.9 / 50.86 / 0.0	35.87	V / 1.00 / 150	-18.13

Measurement summary for limit2: FCC B >1G 3 M peak (Pk)					
FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC B >1G 3 M peak
2.494 GHz	59.15 Pk	6.73 / 28.57 / 49.21 / 0.0	45.25	V / 1.00 / 0	-28.75
2.338 GHz	60.55 Pk	6.33 / 28.22 / 50.01 / 0.0	45.08	V / 1.60 / 80	-28.92
2.0 GHz	60.15 Pk	5.46 / 27.9 / 50.86 / 0.0	42.64	V / 1.00 / 150	-31.36
1.0 GHz	65.0 Pk	3.61 / 24.6 / 50.6 / 0.0	42.61	H / 1.00 / 165	-31.39
1.4 GHz	63.15 Pk	4.2 / 25.7 / 51.32 / 0.0	41.72	H / 1.00 / 180	-32.28

The emission limits shown in the above tables are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits above 1000 MHz are based on measurements employing an average detector. When average radiated emission measurements are specified in this part, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, *e.g.*, see §§ 15.250, 15.252, 15.255, and 15.509–15.519, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with a 120 kHz / 6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz RBW/VBW / 6 dB bandwidth and peak detection, 1 MHz RBW/ 10 Hz VBW for average detection. Table top equipment is placed on a non-conductive support 80 cm above the ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT is rotated 360 degrees. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB / decade (inverse linear-distance for field strength measurements).

Conducted emissions



Rx1 Port
Receive mode
Low channel: 220.0125 MHz

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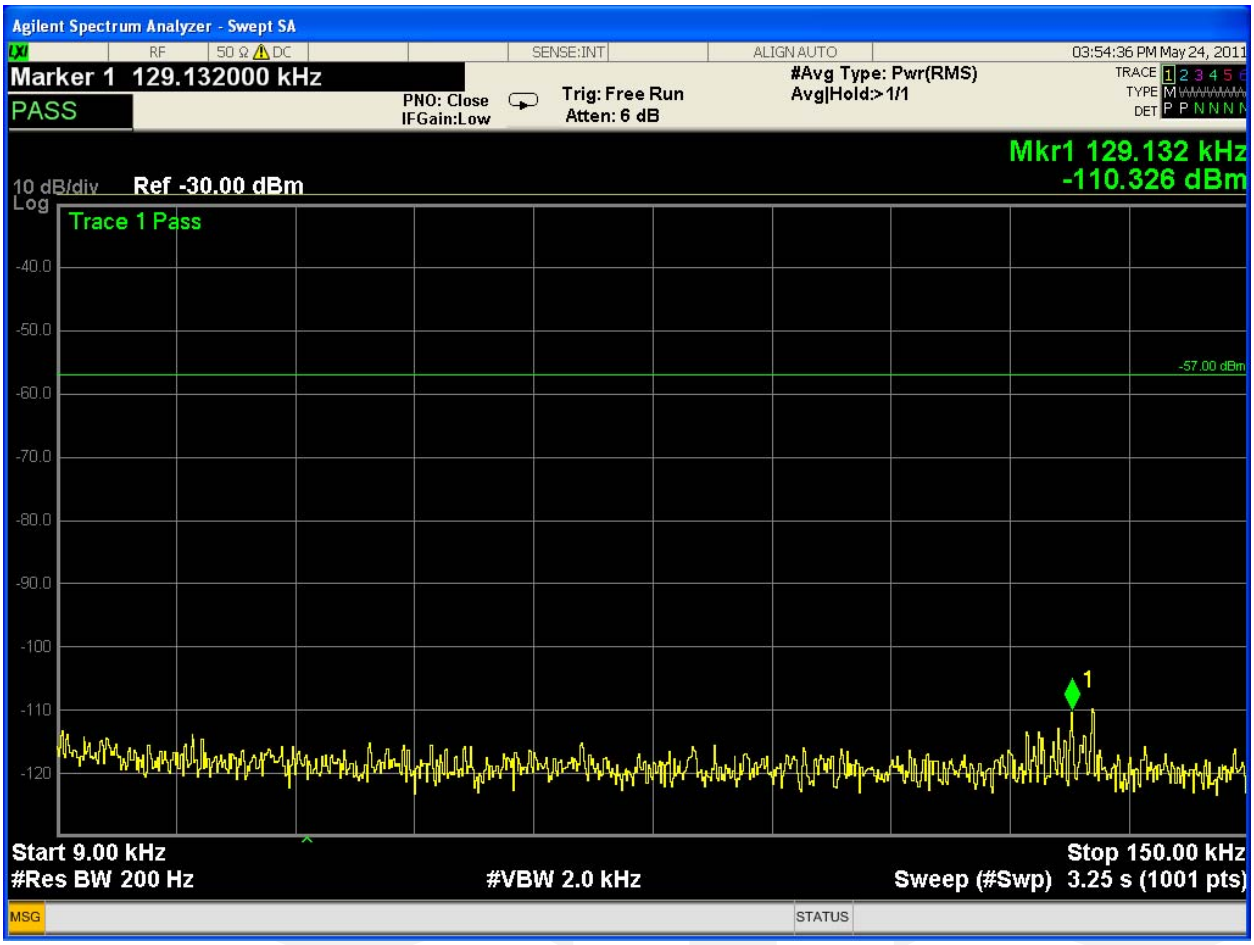
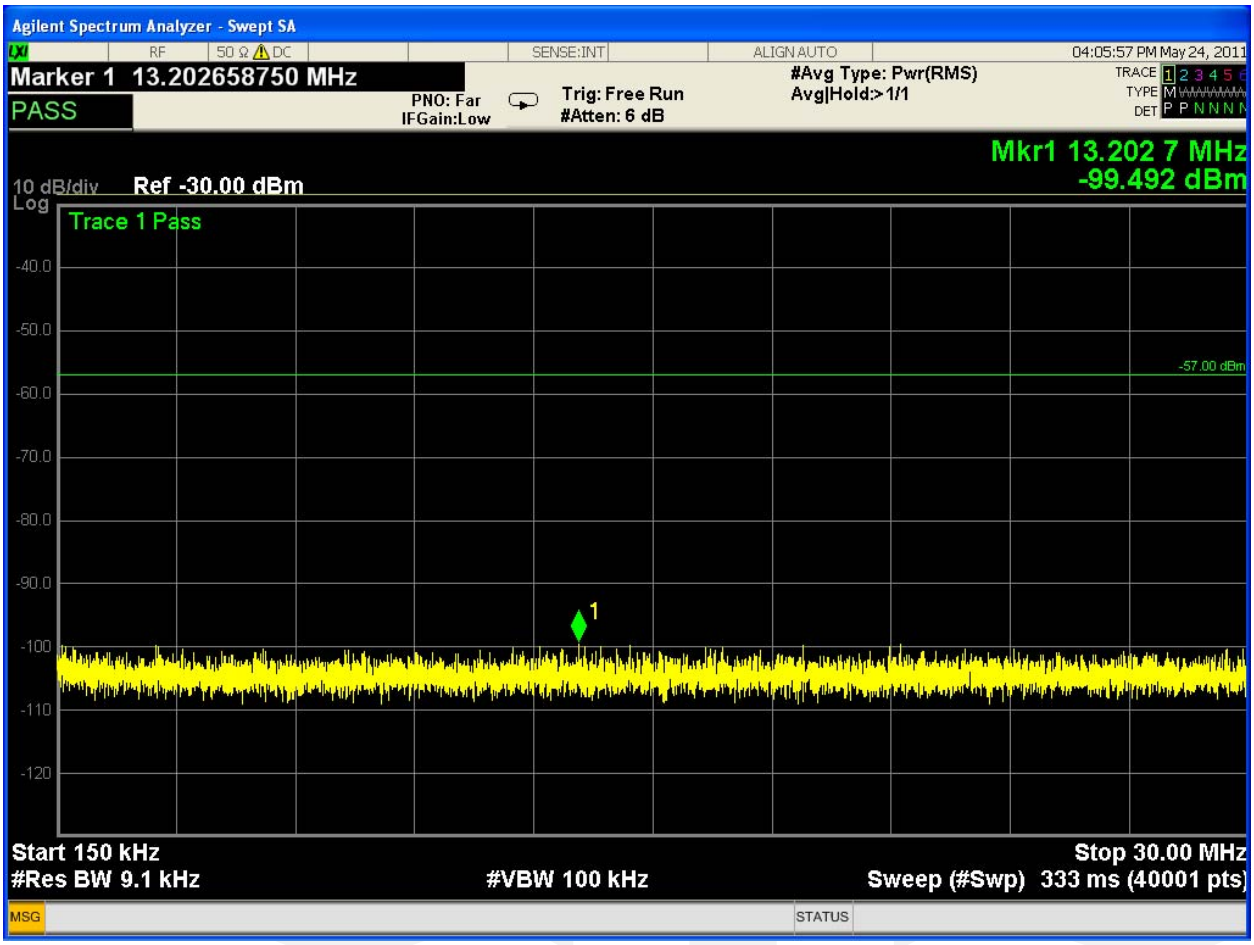


Rx2 port
Receive mode
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298



Rx1 Port
Receive mode
Low channel: 220.0125 MHz

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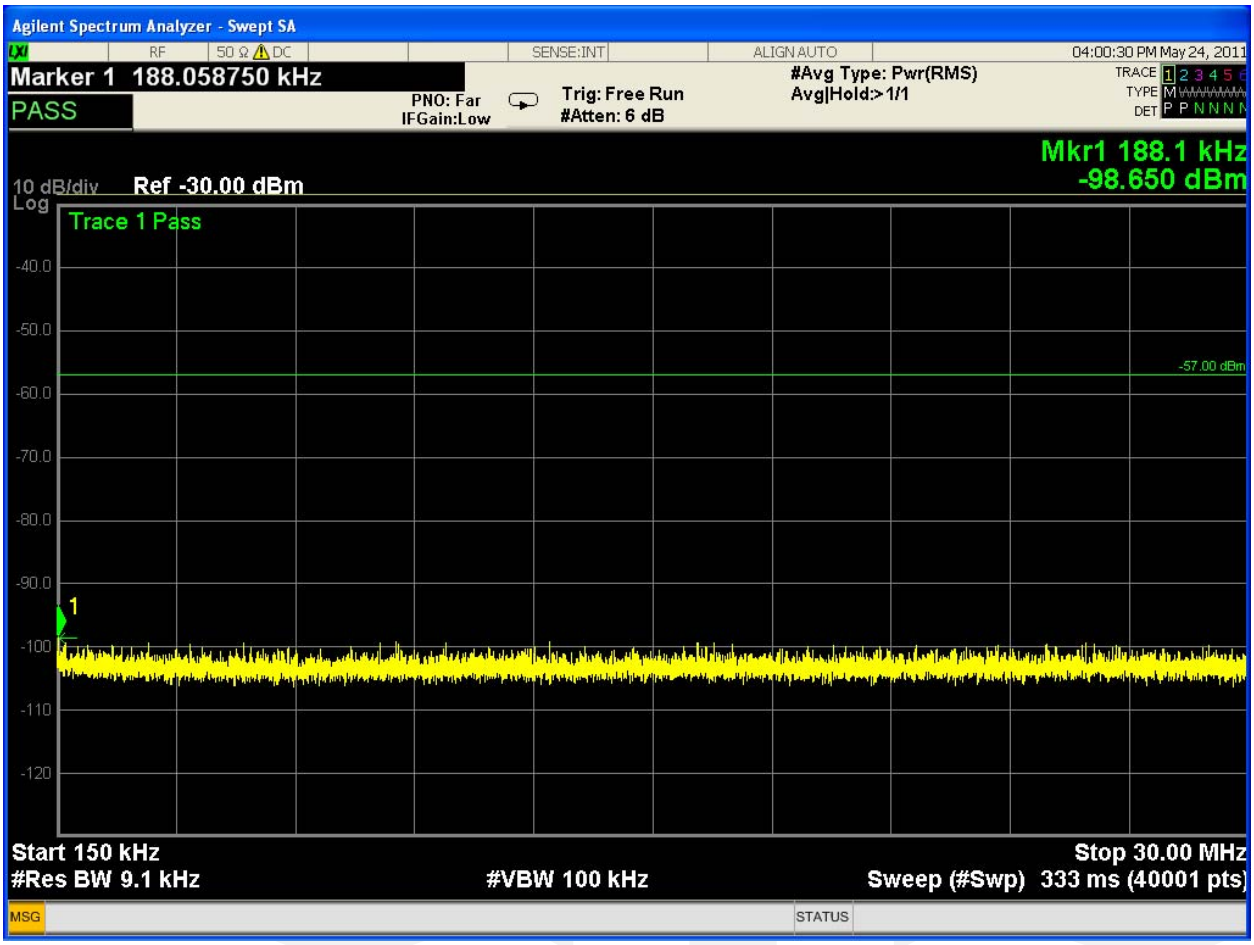
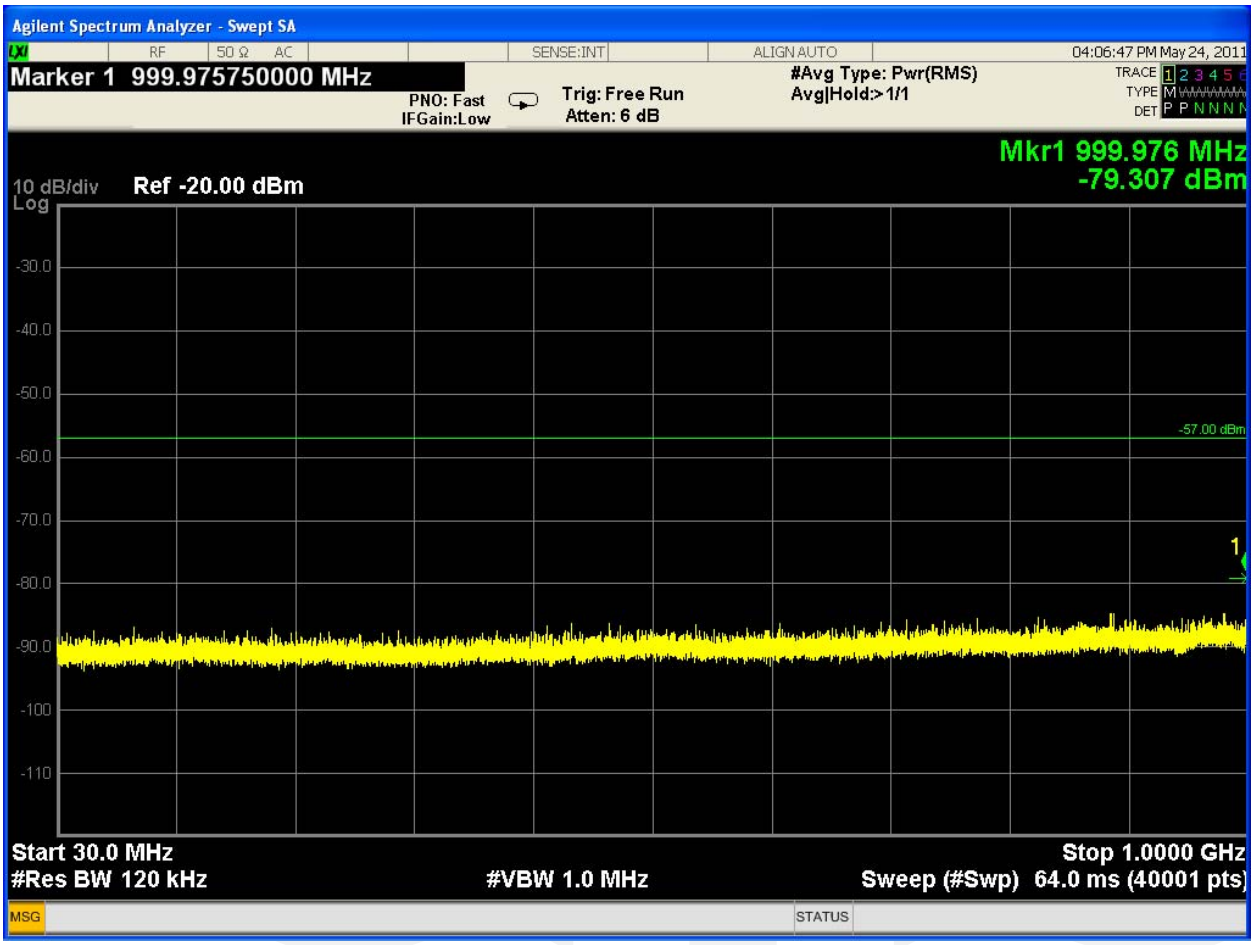


Rx2 port
Receive mode
Low channel: 220.0125 MHz

TÜV SÜD AMERICA INC 19333 Wild Mountain Road Taylors Falls MN USA 55084-1786 Tel: 651 638 0297 Fax: 651 638 0298



Rx1 Port
Receive mode
Low channel: 220.0125 MHz

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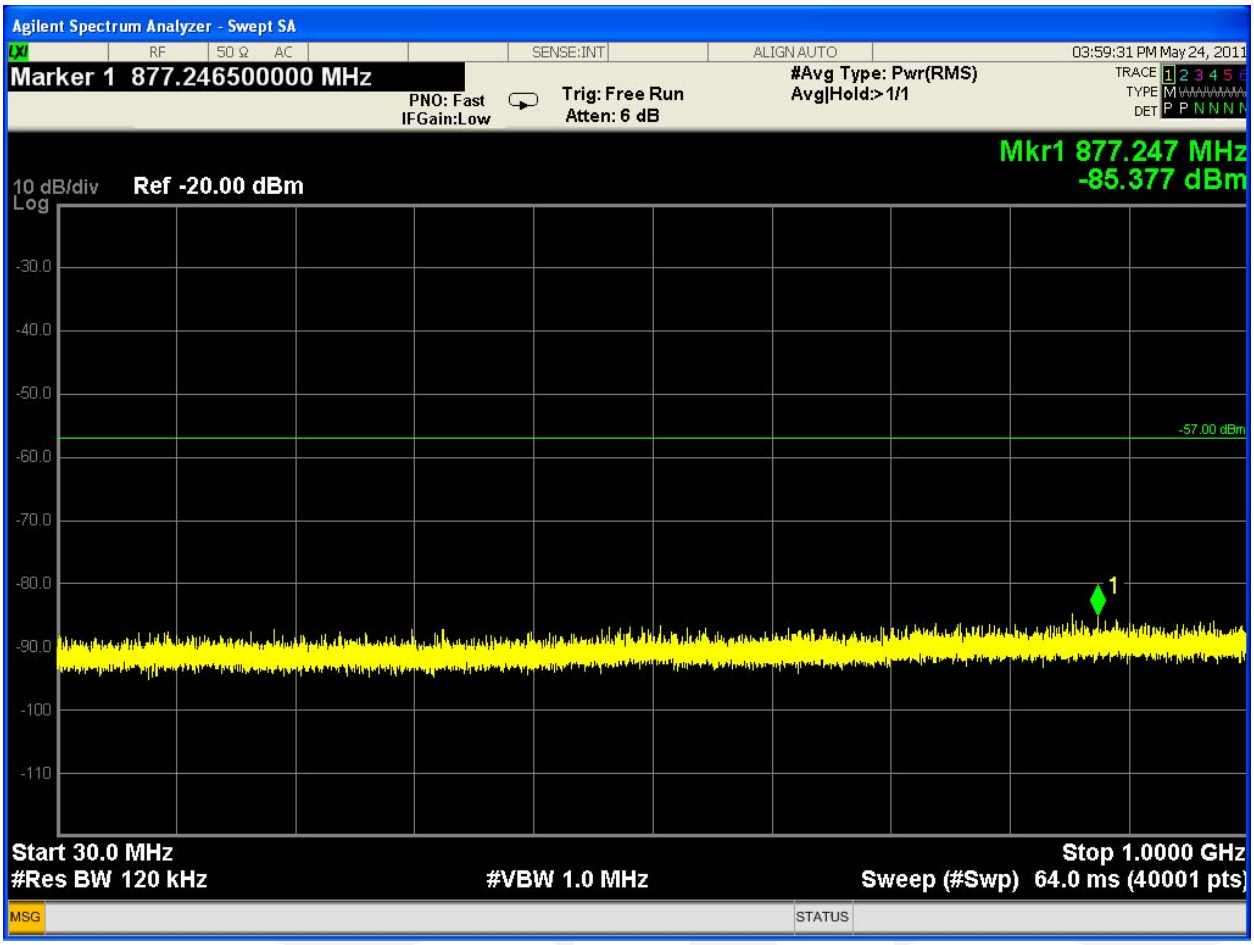

Rx2 port
Receive mode
Low channel: 220.0125 MHz

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