Application
For
Title 47 USC Part 2, Subpart J, Paragraph 2.902, Equipment Authorization of Verification for an Unintentional Radiator per Part 15, Subpart B for an Unintentional Radiator
And
Paragraph 2.907 Equipment Authorization of Certification for an Intentional Radiator per Part 15, Subpart C, for an Intentional Radiator

For

Nivis, LLC

2.4 GHz Raptor RF Module

FCC ID: SQB-NIVISMOD0002

UST Project: 08-0184
Issue Date: September 24, 2008

Total Pages: 77

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I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: 

Name: John Livingston

Title: Laboratory Manager

Date: September 24, 2008

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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: Nivis, LLC

MODEL: 2.4 GHz Raptor RF Module

FCC ID: SQB-NIVISMOD0002

DATE: September 24, 2008

This report concerns (check one): Original grant [X]
Class II change

Equipment type: 2.4 GHz Raptor RF Module

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until: N/A
date
agrees to notify the Commission by N/A
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

US Tech
3505 Francis Circle
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Table of Contents

Table of Contents

List of Figures

List of Figures

List of Tables

1 General Information

1.1 Characterization of Test Sample

The sample used for testing was received by US Tech on September 12, 2008 in good operating condition.

1.2 Product Description

The Equipment under Test (EUT) is a Nivis, LLC, Model Raptor RF module, 2.4 GHz Direct-Sequence Spread Spectrum transceiver. The EUT will be used with one of two possible removable antennae.

1.3 Configuration of Tested System

The Test Sample was tested per *ANSI C63.4, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2003)* for FCC subpart B Digital equipment Verification requirements and per FCC KDB Publication number 558074 for Digital Transmission Systems Operating Under section 15.247. Digital RF conducted and radiated emissions data (FCC 15.107 and 109) below 1 GHz were taken with the measuring receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements performed above 1.0 GHz were made with a RBW of 1 MHz. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figures 2 through 5.

1.4 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5117. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 2982A-1.

1.5 Related Submittal(s)/Grant(s)

The EUT will be used to send/receive data. The transceiver presented in this report will be used with other like transceivers:

The EUT is subject to the following FCC Equipment Authorizations:

a) Certification as a transceiver (with limited modular approval)
b) Verification as a digital device

The manufacturer desires to seek a limited modular approval on this device.

Table 1 - EUT and Peripherals

PERIPHERAL MANUFACTURER.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
(EUT) Nivis, LLC	2.4 GHz Mod2	None	Pending: SQB-NIVISMOD0002	6' U - P
Antenna, see antenna descriptions			None	30 cm Coax
Power Supply GlobTek Inc.	GT-410-52-1509	None	None	6' U 120 VAC/ 60 Hz - P
Laptop Computer Hewlett Packard	None	None	None	6' U -P
Power Supply Hewlett Packard	HPP181a	00629710	None	6' U - P 120 VAC/ 60 Hz

2 Tests and Measurements

2.1 Test Equipment

Table 2 below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are included herewith.

Table 2 - Test Instruments

TEST INSTRUMENT	MODEL NUMBER	MANUFACTURER	SERIAL NUMBER	DATE OF LAST CALIBRATION
SPECTRUM ANALYZER	8566B	HEWLETT-PACKARD	2332A10055	10/10/08
SPECTRUM ANALYZER	8593E	HEWLETT-PACKARD	3205A00124	1/15/08
SIGNAL GENERATOR	8648B	HEWLETT-PACKARD	3642U01679	10/30/07
RF PREAMP 100 kHz to 1.3 GHz	8447D	HEWLETT-PACKARD	2944A06291	9/12/08
BICONICAL ANTENNA 25 MHz to 200 MHz	3110B	EMCO	9307-1431	11/15/07
LOG PERIODIC 100 MHz to 1000 MHz	3146	EMCO	3110-3236	11/21/07
LISN (x 2) 9247-50-TS-50-N	9247	Solar Electronics	955824 & 955826	4/02/08
HORN ANTENNA 1 GHz to 18 GHz	SAS-571	A.H. Systems	605	12/6/2007 2 Year
HORN ANTENNA 1 GHz to 18 GHz	3115	EMCO	9107-3723	10/16/06 2 Year
PREAMP 1 GHz to 26.5 GHz	8449B	HEWLETT-PACKARD	3008A00480	9/2/08
CALCULATION PROGRAM	N/A	N/A	Ver. 6.0	N/A

2.2 Modifications to EUT Hardware

No modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) Requirements.

2.3 Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated with the device operating at the number of frequencies in each band specified in Table 3 as follows:

Table 3 - Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

2.4 Frequency Range of Radiated Measurements (Part 15.33)

2.4.1 Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2 Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation.

2.5 Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1 Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2 Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz.

2.5.3 Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may also be expressed logarithmically in dB.

2.6 EUT Antenna Requirements (CFR 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. Nivis, LLC will sell the Raptor RF Module with the following antennae listed in Table 4.

Table 4 - Allowed Antennae

MANUFACTURER	TYPE OF ANTENNA	MODEL	REPORT REFERENCE	GAIN dB_i	TYPE OF CONNECTOR
Nearson, Inc.	External Monopole	S181FL-RMM-2450S	Antenna 1	2.0	MMCX
Antenna Factor, Inc.	½ Wave	ANT-2.4-CW-RCT-xx	Antenna 2	2.0	RP-SMA

2 Test and Measurements (Cont'd)

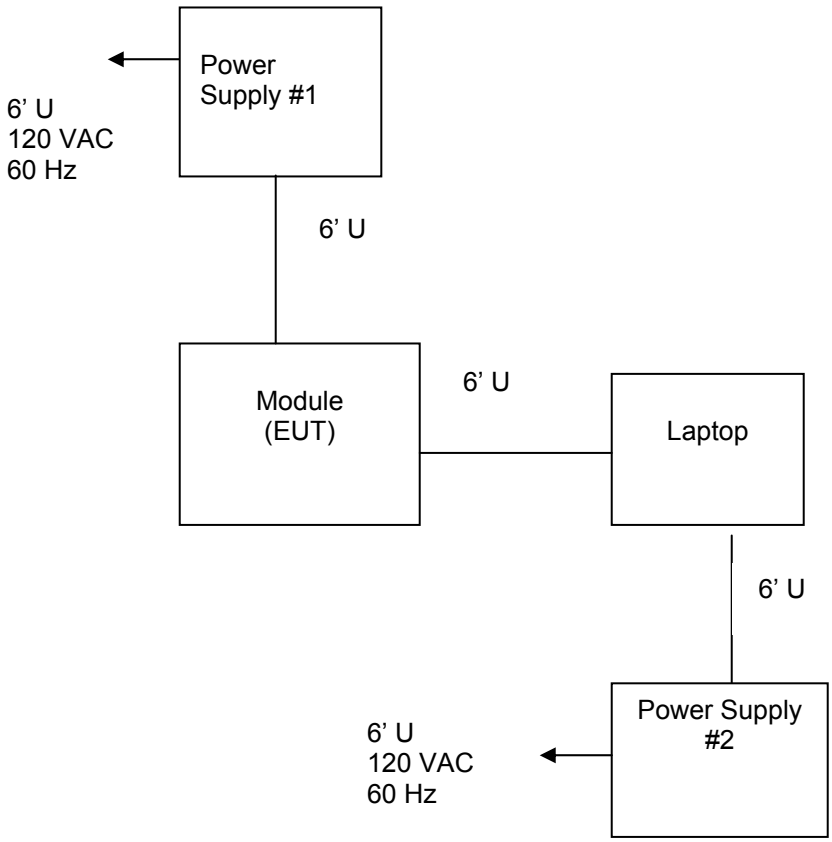


Figure 1- Test Configuration

2 Test and Measurements (Cont'd)

2.7 Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious cannot exceed the limits of 15.209. Radiated harmonics and other Spurious are examined for this requirement see paragraph 2.10.

2.8 Transmitter Duty Cycle (CFR 35 (c))

The duty cycle de-rating factor used in the calculation of average radiated limits (per CFR 15.209 and 15.35(c)) is described below. This factor was calculated by first determining the worst case scenario for system operation.

The worst case operating scenario is as follows:

The transmission duty cycle is calculated as:

Total ON time: 42.56 milliseconds(42.56 mS/100 mS)*100% = 42.6%

In terms of logarithmic voltage (dB); 20 log(0.4256) = - 7.42 dB

2.9 Unintentional Radiator Power Lines Conducted Emissions (CFR 15.107)

The power line conducted voltage measurements for Receiver and Digital Devices have been carried out in accordance with CFR 15.107 and ANSI C63.4, Paragraph 7, with a spectrum analyzer connected to an LISN and the EUT placed into an idle condition or a continuous mode of receive (non-transmitting). There were no signals within 19 dB of the limit. Please refer to the results as shown in Table 5.

2 Test and Measurements (Cont'd)

Table 5 - Power Line Conducted Emissions Data, Class B Part 15.107, Quasi-Peak Measurement vs. Avg. Limits

CONDUCTED EMISSIONS						
Tested By: D.A.	Specification Requirement: FCC Part 15, Para 15.107 Class B		Project No.: 08-0184	Date: 09/17/ 2008	Manufacturer/Model: Nivis, LLC model 2.4 GHz Raptor Module	
Frequency (MHz)	Test Data (dBuV)	LISN+CL-PA (dB)	Corrected Results (dBuV)	Avg Limits (dBuV)	Margin (dB)	Detector
120 VAC, 60 Hz, Supply Line						
0.153	36.9	-0.4	36.5	55.8	**19.3**	**QP**
0.255	30.0	-0.2	29.8	51.6	**21.8**	**QP**
0.42	25.2	0.0	25.2	47.5	**22.3**	**QP**
1.06	26.4	0.0	26.4	46.0	**19.6**	**PK**
7.66	23.3	0.3	23.6	50.0	**26.4**	**PK**
21.08	25.8	0.5	26.3	50.0	**23.7**	**PK**
120 VAC, 60 Hz, Neutral Line						
0.16	34.9	-0.4	34.5	55.6	**21.0**	**QP**
0.255	25.7	-0.2	25.5	51.6	**26.1**	**QP**
0.42	14.6	-0.1	14.5	47.5	**33.0**	**QP**
2.42	22.9	0.0	22.9	46.0	**23.1**	**PK**
7.61	22.8	0.3	23.1	50.0	**26.9**	**PK**
14.4	25.4	0.2	25.6	50.0	**24.4**	**PK**

Tested from 150 kHz to 30 MHz
SAMPLE CALCULATIONS: At 255 kHz, = 30.0 + (- 0.2) = 29.8 dBuV

Tester Signature: Daniel Aparaschivei Name: Daniel Aparaschivei

2 Test and Measurements (Cont'd)

2.10 Intentional Radiator Power Lines Conducted Emissions (CFR 15.207)

The power line conducted voltage measurements have been carried out in accordance with CFR 15.207, per ANSI C63.4, Paragraph 7, with a spectrum analyzer connected to an LISN and the EUT placed into a continuous mode of transmission.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission on the low channel. There were no signals within 19 dB of the Average limits. Those results are given in Table 6 below.

Table 6 - Power Line Conducted Emissions Data, Class B Part 15.207, Quasi-Peak Measurement vs. Avg. Limits

CONDUCTED EMISSIONS						
Tested By: D.A.	Specification Requirement: FCC Part 15, Para 15.207 Class B		Project No.: 08-0184	Date: 09/17/ 2008	Manufacturer/Model: Nivis, LLC model 2.4 GHz Raptor Module	
Frequency (MHz)	Test Data (dBuV)	LISN+CL-PA (dB)	Corrected Results (dBuV)	Avg Limits (dBuV)	Margin (dB)	Detector
120 VAC, 60 Hz, Supply Line						
0.153	36.9	-0.4	36.5	55.8	**19.3**	**QP**
0.255	30.0	-0.2	29.8	51.6	**21.8**	**QP**
0.42	25.2	0.0	25.2	47.5	**22.3**	**QP**
1.06	26.4	0.0	26.4	46.0	**19.6**	**PK**
7.66	23.3	0.3	23.6	50.0	**26.4**	**PK**
21.08	25.8	0.5	26.3	50.0	**23.7**	**PK**
120 VAC, 60 Hz, Neutral Line						
0.16	34.9	-0.4	34.5	55.6	**21.0**	**QP**
0.255	25.7	-0.2	25.5	51.6	**26.1**	**QP**
0.42	14.6	-0.1	14.5	47.5	**33.0**	**QP**
2.42	22.9	0.0	22.9	46.0	**23.1**	**PK**
7.61	22.8	0.3	23.1	50.0	**26.9**	**PK**
14.4	25.4	0.2	25.6	50.0	**24.4**	**PK**

Tested from 150 kHz to 30 MHz
SAMPLE CALCULATIONS: At 153 kHz, = 36.9 + (- 0.4) = 36.5 dBuV

Tester Signature: Daniel Aparaschivei Name: Daniel Aparaschivei

2.11 Unintentional Radiator, Radiated Emissions (CFR 15.109 (a))

Radiated emissions were evaluated from 30 MHz to 25000 MHz per ANSI C63.4, Paragraph 8. Exploratory measurements showed that the EUT, configured with the integral antenna under continuous transmission on the low channel, produced the worst-case radiated emissions.

Measurements were made with the analyzer's bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made greater than or equal to 1 GHz. The video bandwidth was set to three times the resolution bandwidth. The test data were maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters in height as a part of the measurement procedure. All measured signals were at least 7 db below the specification limit. The results are shown in Table 7 below.

Table 7 – Unintentional Radiator, Radiated Emissions.

Unintentional Radiator Radiated Spurious Emissions							
Test By: DA	Test: FCC Part 15.109			Client: Nivis, LLC			
	Project: 08-0184 Class: B			Model: Raptor RF Module w/ Monopole Antenna			
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP
Tested from 30 MHz to 25 GHz							
1228.00	43.8	-11.5	32.3	54	3 m/VERT	21.7	PK
2323.09	48.0	-6.3	41.7	54	3 m/HORZ	12.3	PK
3328.00	45.7	-2.7	43.0	54	3 m/VERT	11.0	PK
5563.00	41.2	3.7	44.9	54	3 m/HORZ	9.1	PK
*8610.00	38.3	8.7	47.0	54	3 m/HORZ	7.0	PK
*10713.00	38.5	12.5	51.0	54	3 m/HORZ	3.0	PK

No other emissions detected within 20 dB of the FCC Part 15.109 limits

CL is cable loss. PA is preamplifier gain

* - These frequencies were Receiver noise level only.

SAMPLE CALCULATION:

RESULTS: At 1228 MHz: = (43.8 + (-11.5)) = 32.3 dBuV/m @ 3m

Margin = (54 – 32.3) = 21.7 dB

Tester Signature: Daniel Aparaschivei _____ Name: Daniel Aparaschivei

2 Tests and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a))

The EUT was put into a continuous-transmit mode of operation and tested per FCC KDB Publication 558074 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to 25 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna Conducted Emissions of a significant magnitude that fell within restricted bands were then measured as radiated emissions on the OATS. The conducted emissions graphs are found in figures 19 through 30 below. For radiated measurements, the EUT was set into continuous transmission mode. Below 1 GHz, the RBW was set equal to 120 kHz. Peak measurements above 1 GHz were measured using a RBW = 1 MHz, with a VBW ≥ RBW. The results of peak radiated spurious emissions falling within restricted bands are given in table 9 below.

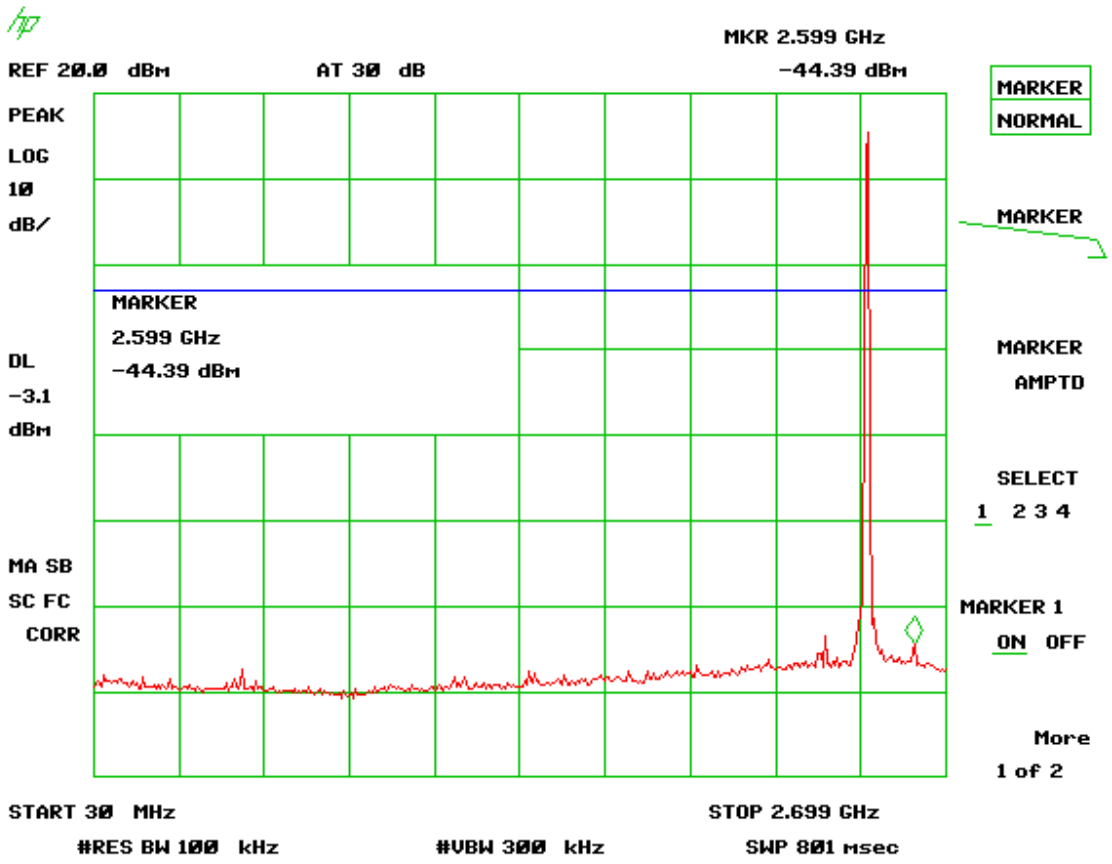
For Average Voltage measurements above 1 GHz, the emissions were measured using RBW = 1 MHz and VBW = 10 Hz. For a pulse-modulated transmitter, the EUT's average emissions are further modified by adding to them the worst-case duty cycle, determined by adding the EUT's pulse widths over a 100 ms period and dividing by 100 ms.

On the OATS, the EUT was mounted on top of a non-conductive table, 80 cm above the floor, by placing it in the X-Z plane along the Z axis with its bottom cover in parallel with the ground. The front of the EUT faced the measurement antenna located 3 meters away. Each signal measured was maximized by raising and lowering the receive antenna between 1 and 4 meters in height while monitoring the ever changing spectrum analyzer display (with channel A in the Clear-Write mode and channel B in the Max-Hold mode) for the largest signal visible. That exact antenna height where the signal was maximized was recorded for reproducibility purposes. Also, the EUT was rotated about its Y-axis while monitoring the Spectrum Analyzer display for maximum. The EUT azimuth was recorded for reproducibility purposes. The EUT was measured when both maxima were simultaneously satisfied.

For test data, see Tables 9 and 10. Radiated emissions above 5 GHz were measured at a distance of 1 meter. The measured value at 1 meter was then extrapolated to the resultant at 3 meters using an inverse distance extrapolation factor of -20 dB/decade. There were no test failures.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).



Note: Signal shown represents Fundamental Frequency

Figure 6 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel, part 1.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

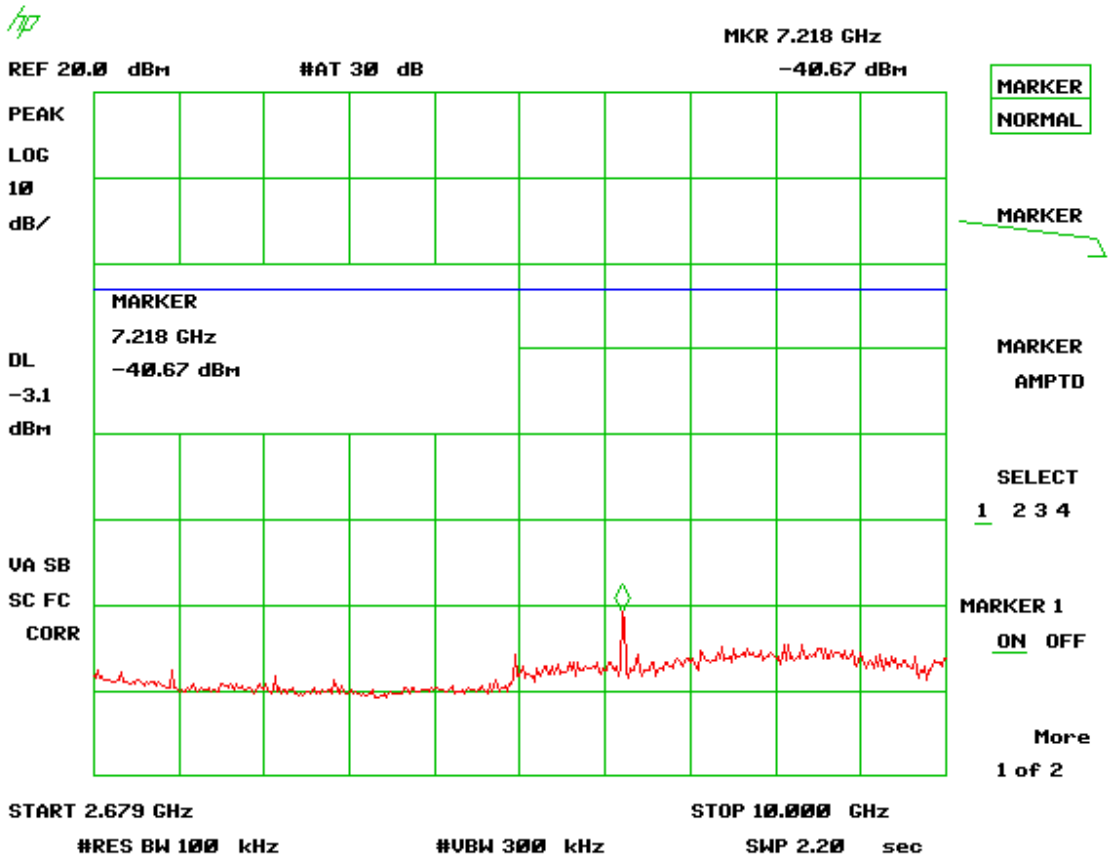


Figure 7 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel , part 2.

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2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

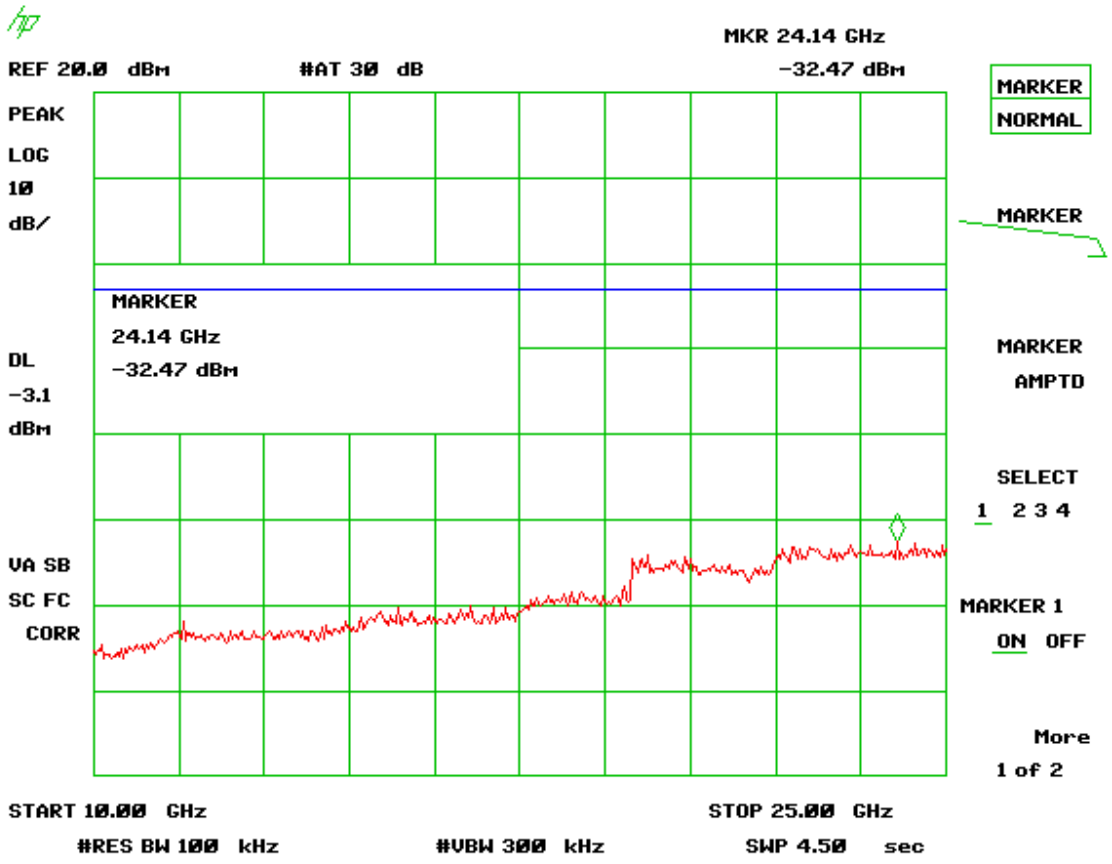
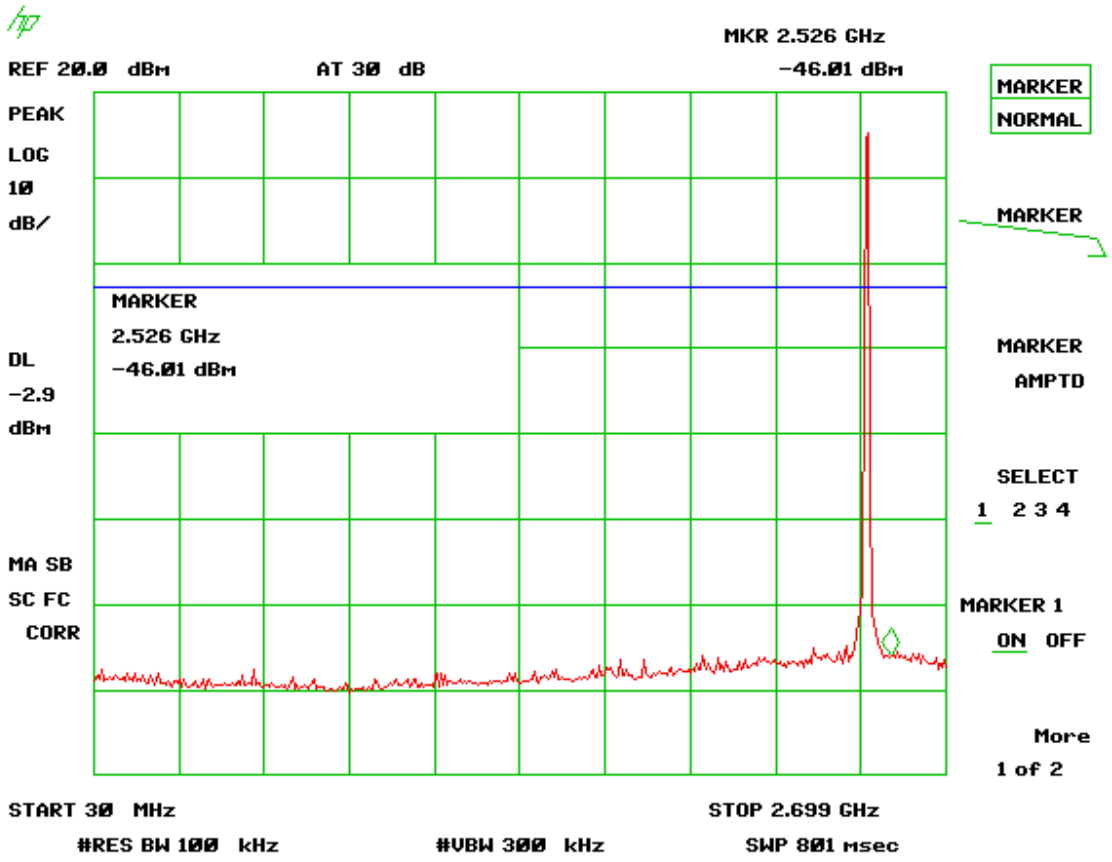


Figure 8 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Low Channel , part 3.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).



Note: Signal shown represents Fundamental Frequency

Figure 9 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel, part 1.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

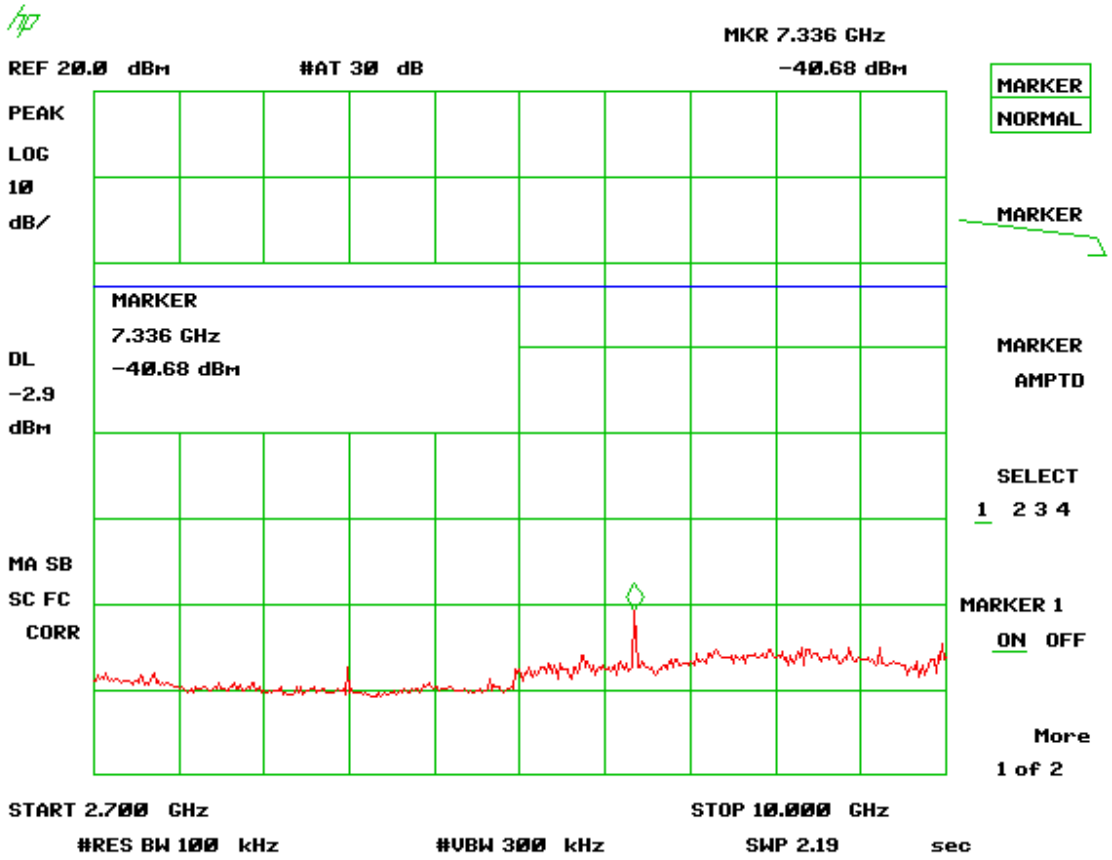


Figure 10 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel , part 2.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

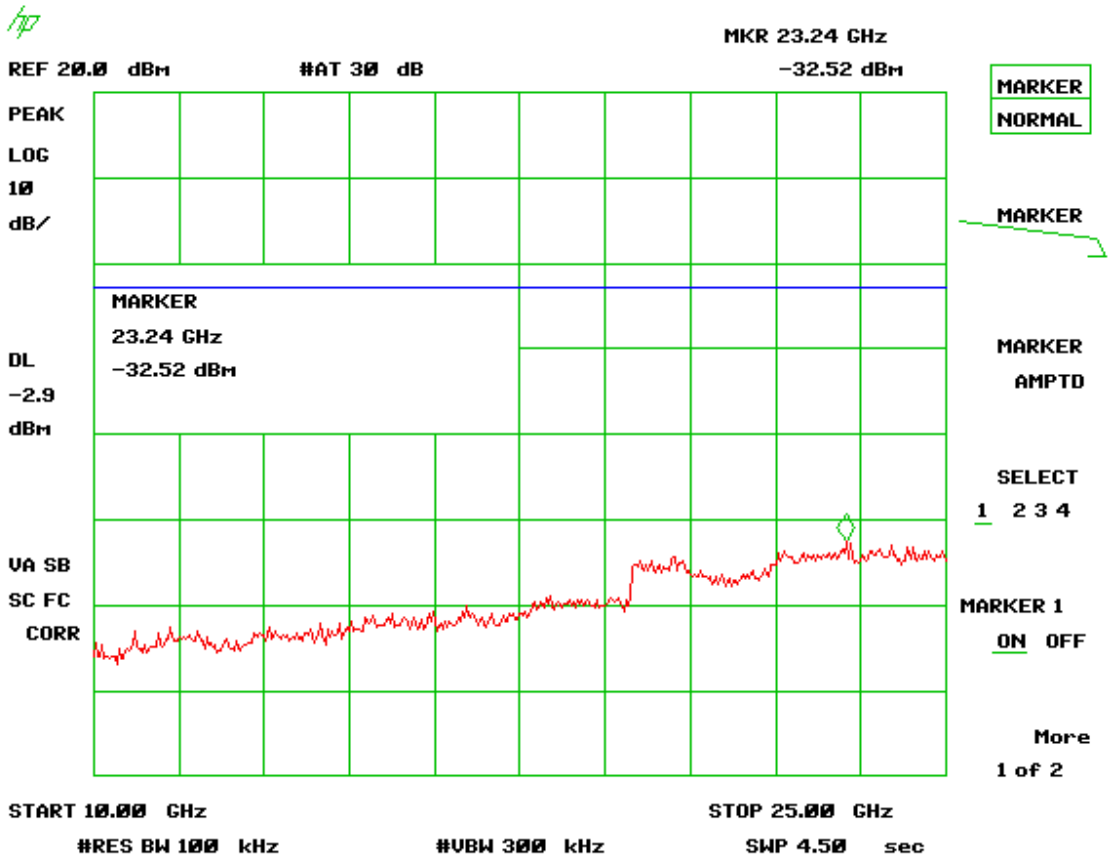
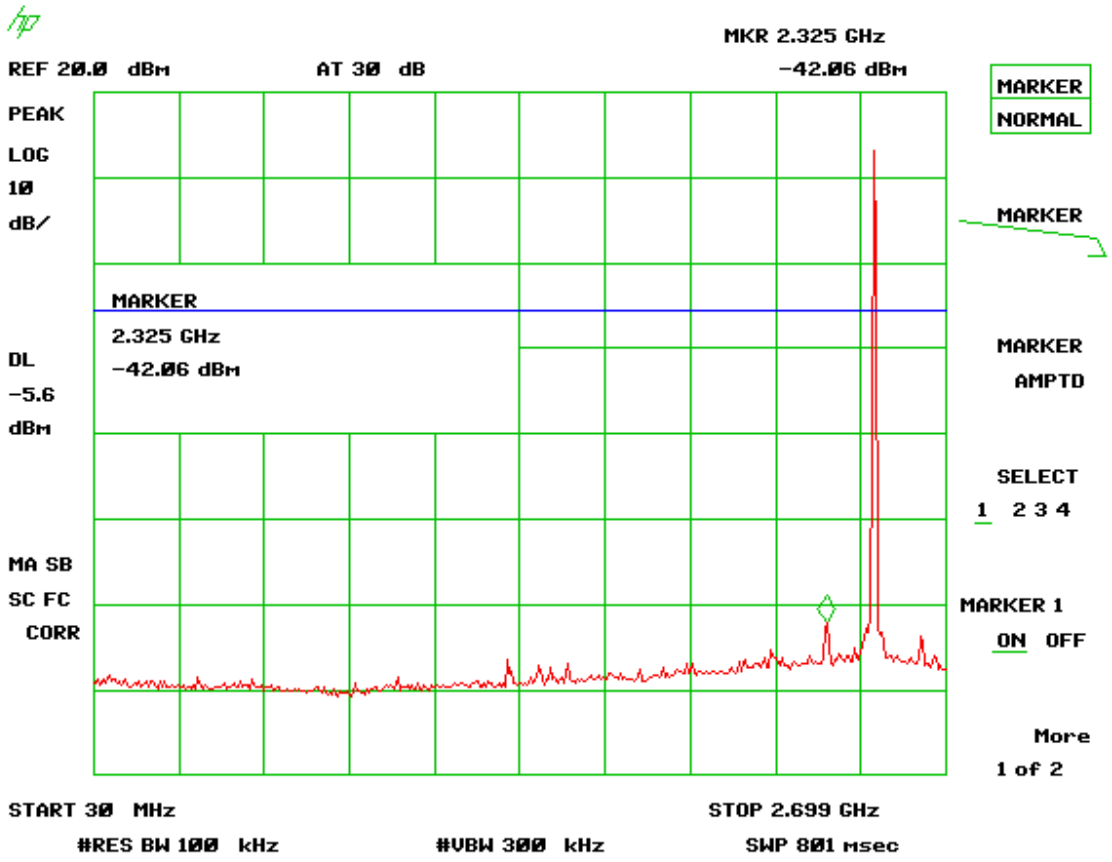


Figure 11 - Antenna Conducted Spurious Emissions – CFR 15.247 (d) - Mid Channel , part 3.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).



Note: Large Signal shown is Fundamental Frequency

Figure 12 - Antenna Conducted Spurious Emissions – CFR 15.247 (b) - High Channel 14, part 1.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

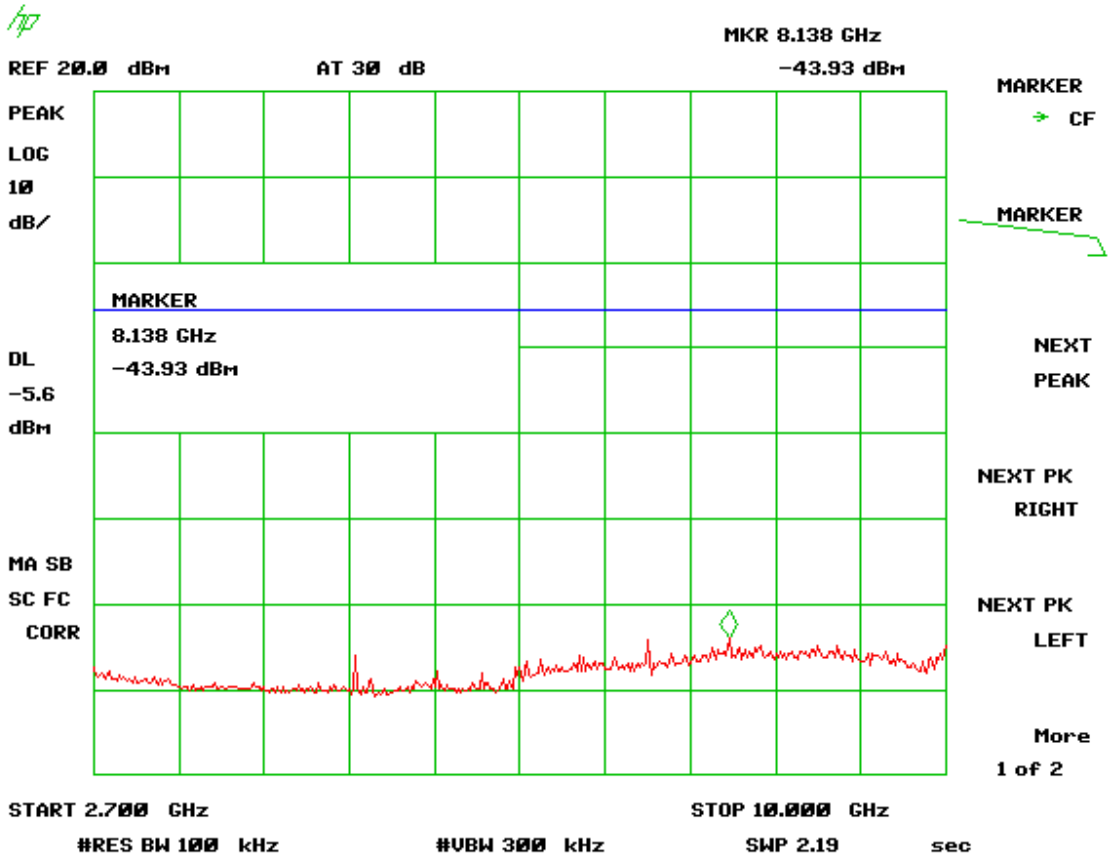


Figure 13 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel 14, part 2.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

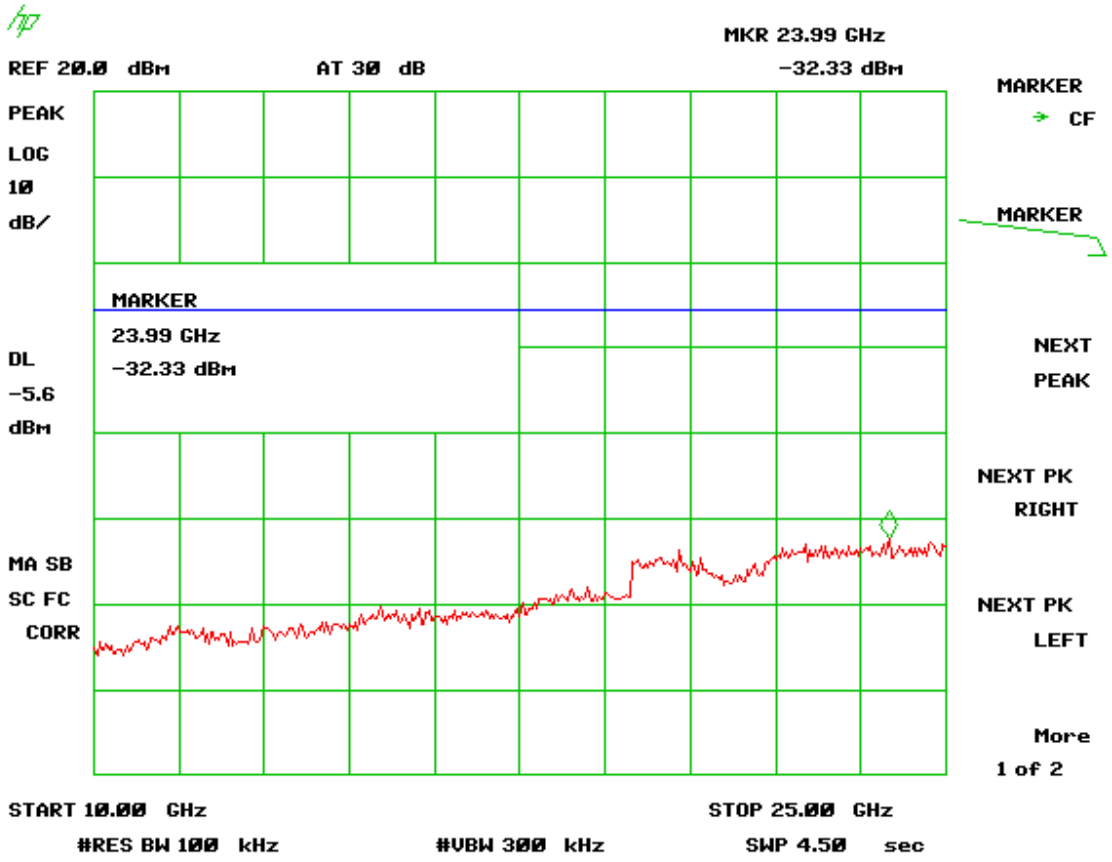


Figure 14 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel 14, part 3.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

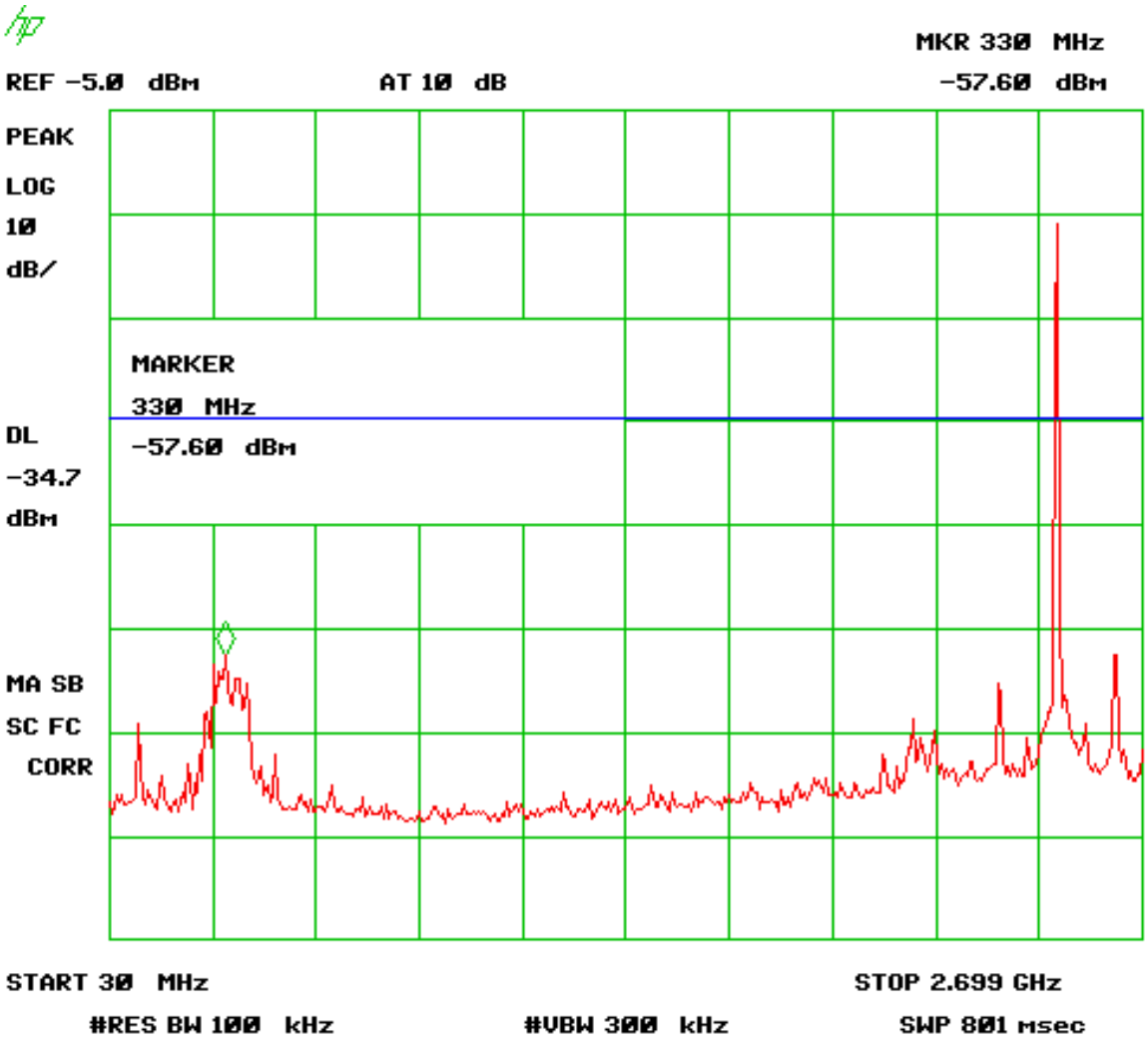


Figure 15 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel 15, part 1.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

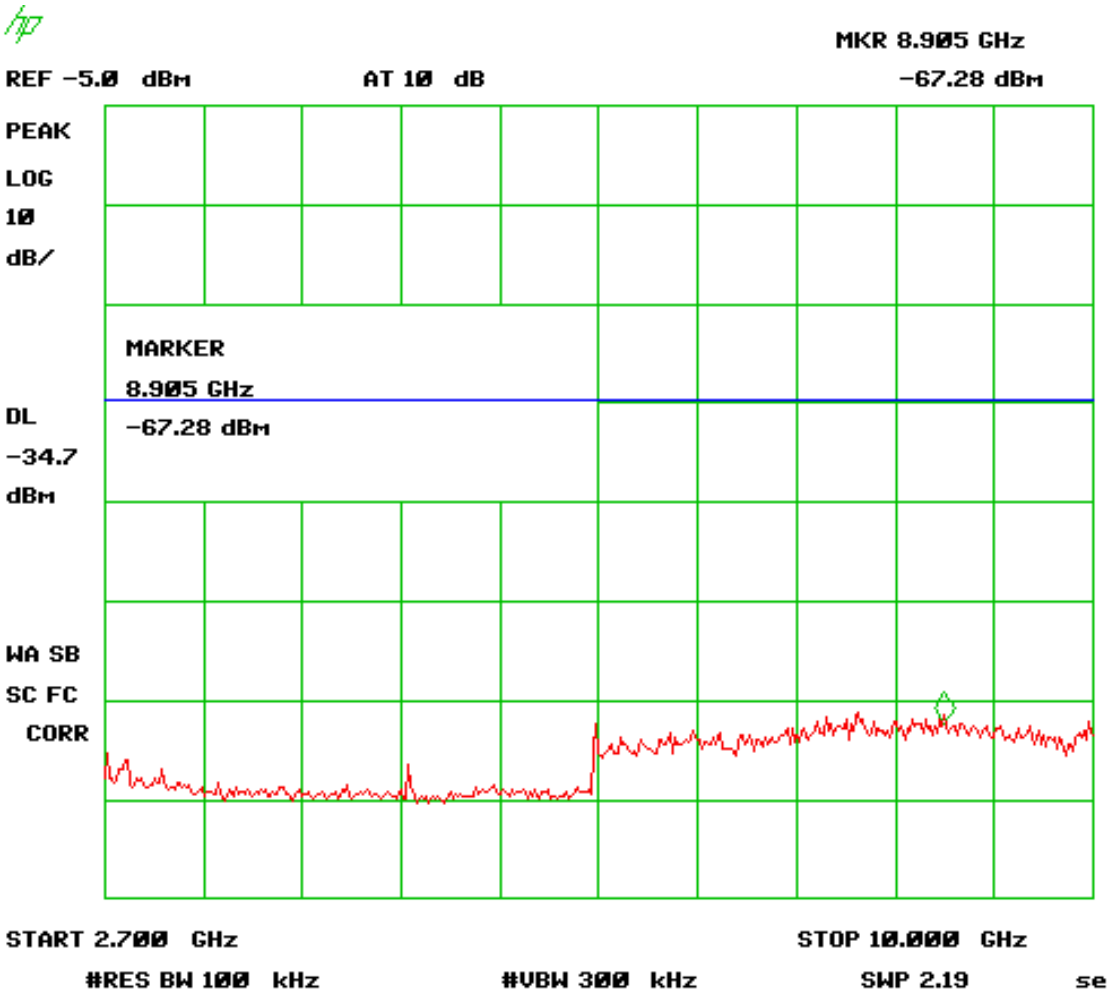


Figure 16 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel 15, part 2.

2 Test and Measurements (Cont'd)

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

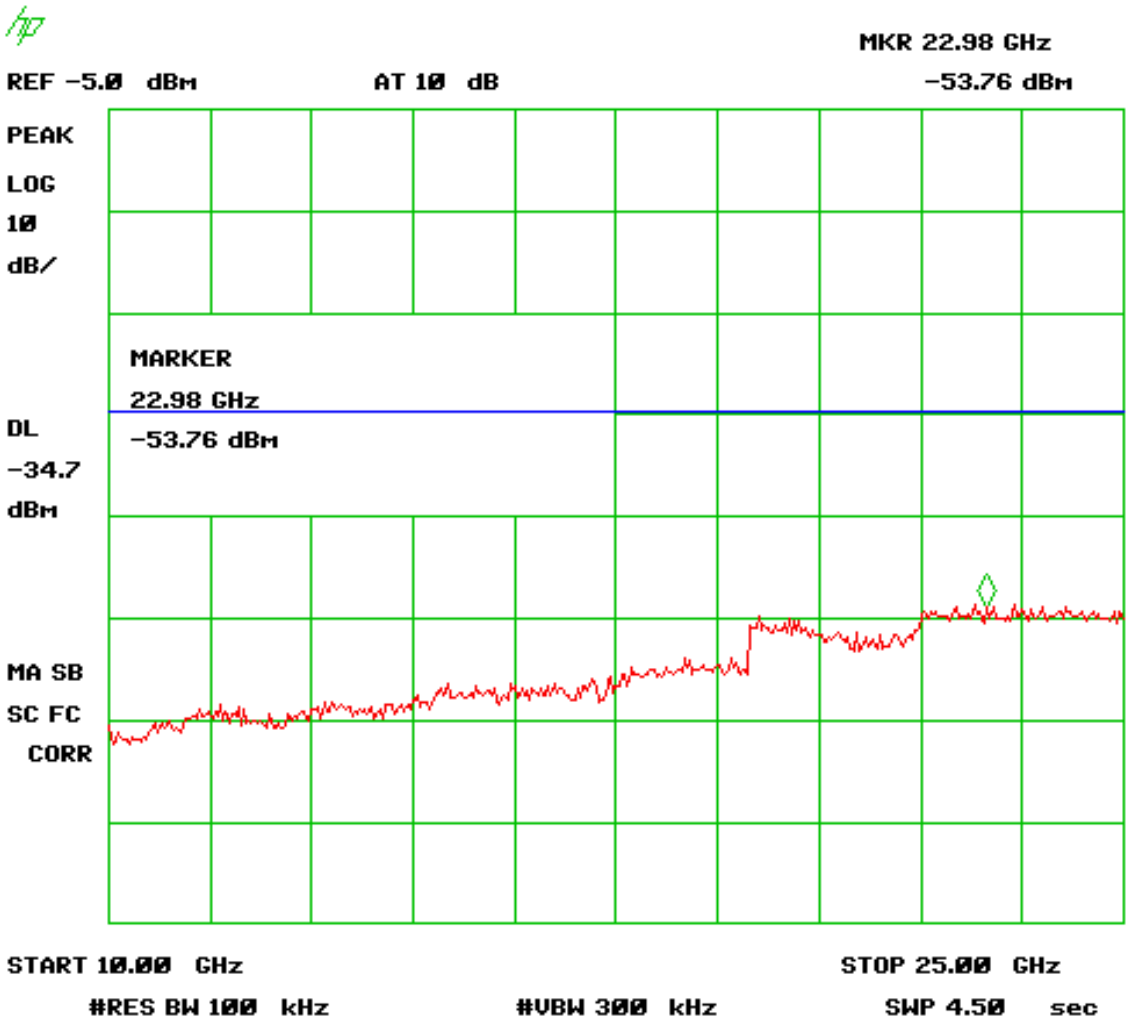


Figure 17 - Antenna Conducted Spurious Emissions - CFR 15.247 (d), High Channel 15, part 3.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd)

Table 8 - Peak Radiated Spurious Emissions, Antenna Type 1

Radiated Spurious Emissions, Antenna 1, Tested from 30 MHz – 25 GHz							
Tested By: DA	Test: FCC Part 15, Para 15.247(d)			Client: Nivis, LLC			
	Project: 08-0184			Model: Raptor RF Module W/Antenna 1			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Corrected Results (dBuV/m)**	**Limits (dBuV/m)**	**Distance / Polarization**	**Pass Margin (dB)**	**Detector PK / AVG**
LOW BAND - PEAK							
Fund. 2405.43	85.04	31.4	116.4	--	3m/VERT	--	PK
2nd *4809.13	57.0	2.1	59.1	74.0	3m/HORZ	13.9	PK
5th *12022.63	57.5	15.5	73.0	74.0	3m/HORZ	1.0	PK
MID BAND- PEAK							
Fund. 2439.45	85.7	31.5	117.2	--	3m./VERT	--	PK
2nd *4879.03	52.05	2.4	54.45	74.0	3m./HORZ	19.95	PK
3rd *7318.53	64.21	6.3	67.21	74.0	3m./HORZ	6.79	PK
5th *12197.60	50.8	15.7	66.1	74.0	3m./HORZ	7.9	PK
HIGH BAND- PEAK							
Fund. Ch14 2475.48	84.5	31.5	116.0	--	3m./VERT	--	PK
2nd *4948.93	54.5	2.6	56.5	74.0	3m./HORZ	17.5	PK
3rd *7423.53	53.7	6.7	60.4	74.0	3m./HORZ	13.6	PK
5th 12375.13	48.55	15.7	64.25	96	3m./VERT	31.75	PK
Fund. Ch15 2480.48	56.45	31.5	87.95	--	3m./VERT	--	PK
2nd 4961.05	44.24	2.6	46.84	74	3m./VERT	27.16	PK
3rd 7441.40	52.41	6.7	59.11	74	3m./VERT	14.89	PK
5th 12398.30	48.03	15.7	63.73	67.95	3m./VERT	4.22	PK

* - Falls within the restricted bands of CFR 15.205. ND = No other signals detected within 20 dB of specification limit.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 9 - Peak Radiated Spurious Emissions, Antenna Type 2

Radiated Spurious Emissions, Antenna 2, Tested from 30 MHz – 25 GHz							
Tested By: DA	Test: FCC Part 15, Para 15.247(d)			Client: Nivis, LLC			
	Project: 08-0184			Model: Raptor RF Module W/Antenna 2			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Corrected Results (dBuV/m)**	**Limits (dBuV/m)**	**Distance / Polarization**	**Pass Margin (dB)**	**Detector PK / AVG**
LOW BAND - PEAK							
Fund. 2404.48	86.8	31.8	118.6	--	3m/VERT	--	PK
2nd *4810.8	58.0	2.1	60.1	74.0	3m/HORZ	13.9	PK
3rd 7213.44	ND						
4TH 9617.92	ND						
5th *12022.63	51.4	15.5	66.9	74.0	3m/HORZ	1.0	PK
MID BAND- PEAK							
Fund. 2439.45	85.9	31.5	117.4	--	3m./VERT	--	PK
2nd *4879.03	58.8	2.4	61.2	74.0	3m./HORZ	19.95	PK
3rd *7318.53	55.7	6.3	62.0	74.0	3m./HORZ	6.79	PK
4TH 9760.08	ND						
5th *12197.73	47.2	15.7	62.9	74.0	3m./HORZ	7.9	PK
HIGH BAND- PEAK							
Fund. Ch14 2475.5	84.5	31.5	116.0	--	3m./VERT	--	PK
2nd *4951.00	54.5	2.6	57.1	74.0	3m./HORZ	17.5	PK
3rd *7426.5	53.7	6.7	60.4	74.0	3m./HORZ	13.6	PK
4TH 9902.00	ND						
5th *12375.13	ND						
Fund. Ch15 2480.48	56.45	31.5	87.95	--	3m./VERT	--	PK
2nd *4958.98	41.63	2.6	44.23	74	3m./VERT	29.77	PK
3rd *7438.5	48.12	6.7	54.82	74	3m./VERT	14.89	PK

* - Falls within the restricted bands of CFR 15.205. ND = No other signals detected within 20 dB of specification limit.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 10 - Average Radiated Spurious, Antenna 1

Avg Radiated Spurious Emissions, Antenna 1, Tested from 30 MHz – 25 GHz							
Tested By: DA	Test: FCC Part 15, Para 15.247(d)			Client: Nivis, LLC			
	Project: 08-0184			Model: Raptor RF Module W/Antenna 1			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA (dB/m)**	**Corrected Results (dBuV/m)**	**Average Limits (dBuV/m)**	**Distance / Polarization**	**Pass Margin (dB)**	**Detector PK / AVG**
LOW BAND - AVERAGE							
Fund. 2404.48	79.4	25.1	107.8	--	3m./VERT	--	PK
2nd 4810.8	51.19	-5.4	45.8	54.0	3m./VERT	8.2	PK
5th 12022.68	*41.5	9.17	50.7	54.0	1m./VERT	3.3	PK
MID BAND- AVERAGE							
Fund. 2439.53	78.52	25.1	108.57	--	3m./VERT	--	PK
2nd 4881.03	43.0	-4.6	38.4	54.0	3m/VERT	15.6	PK
3rd 7321.5	*47.4	1.15	48.6	54.0	1m./VERT	5.4	PK
5th 12197.73	*35.01	9.8	41.37	54.0	1m./VERT	12.6	PK
HIGH BAND- AVERAGE							
Fund. Ch14 2475.5	77.14	25.36	108.82	--	3m./VERT	--	PK
2nd 4951.0	44.96	-4.62	40.34	54.0	3m./HORZ	13.7	PK
3rd 7426.5	*42.09	1.15	40.36	54.0	1m./VERT	13.6	PK
Fund. Ch 15 2480.48	66.2	25.2	91.4	--	3m/VERT		PK
2nd Ch15 4958.98	31.09	-4.6	26.5	54.0	3m./VERT	27.5	PK
3rd Ch 15 7438.50	38.86	1.28	40.14	54.0	3m/VERT	13.9	PK

No other emissions detected within 20 dB of the Part 15.209 limits for spurious emissions within Restricted Bands.

*- Corrected -9.5 dB for distance. ND = Nothing detected within 20 dB of specification limit.

2.12 Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d)) (IC RSS 210, A2.9 (a)) (Cont'd).

Table 11 – Average Radiated Spurious Emissions Antenna 2

Radiated Spurious Emissions, Antenna 2, Tested from 30 MHz – 25 GHz							
Tested By: DA	Test: FCC Part 15, Para 15.247(d)			Client: Nivis, LLC			
	Project: 08-0184			Model: Raptor RF Module W/Antenna 2			
Frequency (MHz)	**Test Data (dBuV)**	**AF+CL-PA-DC (dB/m)**	**Corrected Results (dBuV/m)**	**Average Limits (dBuV/m)**	**Distance / Polarization**	**Pass Margin (dB)**	**Detector PK / AVG**
LOW BAND - AVERAGE							
Fund 2405	82.71	25.08	107.79	--	3m./VERT	--	AVG
2nd 4810	50.39	-5.42	44.97	54.0	3m./VERT	9.0	AVG
5th 12025	*38.45	9.15	47.60	54.0	1m./VERT	6.4	AVG
MID BAND- AVERAGE							
Fund 2440	83.47	25.21	108.68	--	3m./VERT	--	AVG
2nd 4880	42.77	-4.96	37.81	54.0	3m./VERT	16.2	AVG
3rd 7320	*44.16	1.13	45.29	54.0	1m./VERT	8.7	AVG
5th 12200	*32.53	9.78	42.31	54.0	1m./VERT	11.7	AVG
HIGH BAND- AVERAGE							
Fund. Ch14 2475	81.73	25.34	107.07	--	3m./VERT	--	AVG
2nd 4950	38.88	-4.49	34.39	54.0	3m./VERT	19.6	AVG
3rd 7425	*38.22	1.13	39.35	54.0	1m./VERT	14.7	AVG
5th 12375	*40.01	9.97	49.98	54.0	1m./HORZ	4.0	AVG
Fund. Ch15 2480	53.06	25.36	78.42	--	3m./VERT	--	AVG
3rd 7440	*34.79	1.15	35.94	54.0	1m./VERT	18.1	AVG

No other emissions detected within 20 dB of the Part 15.209 limits for spurious emissions within Restricted Bands.

* - Test data values at frequencies > 5 GHz include a factor of -9.5 dB for distance extrapolation from a test distance of 1 meter to 3 meters

Duty Cycle, DC = -7.42 dB

2 Test and Measurements (Cont'd)

2.13 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. Measurements were performed similar to the method of FCC DA 00-7.5 for a bandwidth of 6 dB. The RBW was set to approximately 1/100 of the manufacturers claimed RBW and with the VBW ≥ RBW. The results of this test are given in Table 12 and Figures 31 through 34.

Table 12 – Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
2405	1.60	0.5
2440	1.55	0.5
2475	1.61	0.5
2480	1.58	0.5

Tester Signature: Daniel Aparaschivei Name: Daniel Aparaschivei

2 Test and Measurements (Cont'd)

2.13 Six dB Bandwidth per CFR 15.247(a)(2), (IC RSS 210, A8.2(a))

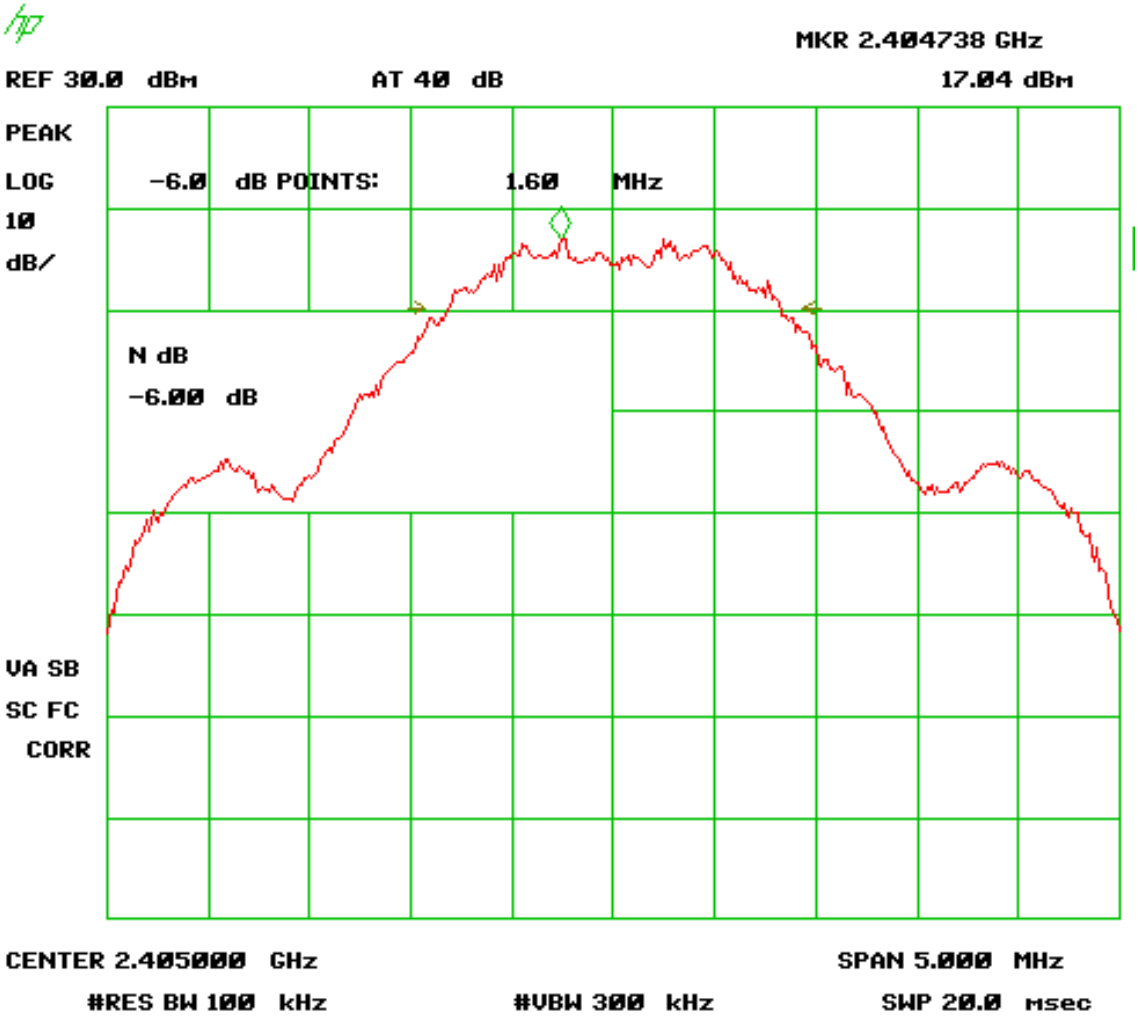


Figure 18. Six (6) dB Bandwidth - 15.247 (a)(2) - Low Channel.