Global EMC Inc. Labs

EMC & RF Test Report

As per

RSS 210 Issue 6:2005

&

FCC Part 15 Subpart C: 2006

Unlicensed Intentional Radiators

on the

Audio frequency wireless Transmitter / Receiver

770102

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Testing produced for

SONAVOX Audio Solution

See Appendix A for full customer & EUT details.

Industry Canada

LAB REGISTRATION #6844A-1

FCC REGISTRATION #612361

ACCREDITED TESTING LABORATORY CERTIFICATE #2565.01

Table of Contents

Report Scope

This report addresses the EMC verification testing and test results of the 770102 Wireless audio frequency transmitter / receiver, herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.

Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

Client	Sonavox Canada Inc.
Product	770102
Standard(s)	RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Summary

The results contained in this report relate only to the item(s) tested.

EUT FCC Certification #, FCC ID:	WUO - 770102
EUT Industry Canada Certification #, IC:	7985A-770102
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Ashwani Malhotra

Client	Sonavox Canada Inc.
Product	770102
Standard(s)	RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203 RSS 210 Section 5.5	Antenna Requirement	PCB Antenna	Pass See Justification
FCC 15.205 RSS 210 Section 6.3 (Table 2)	Restricted Bands for intentional operation	None within chart	Pass See description
FCC 15.207 RSS 210 Section 6.6	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS 210 Section 6.2.1 (Tables 3 & 7)	Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)(1) RSS 210 6.2.2(o)	Channel Separation	> 2/3 20db BW of channels	Pass
FCC 15.247(a)(1)(iii) RSS 210 6.2.2(o)	Number of channels	> 15	Pass
FCC 15.247(a)(1)(iii) RSS 210 6.2.2(o)	Time of occupancy	< 400 mSec in 10 sec period	Pass
FCC 15.247(a)(i) RSS 210 6.2.2(o)	Max output power	< 125 mWatt	Pass
FCC 15.247(b)(4) RSS 210 6.2.2(o)	Antenna Gain	< 6 dBi	Pass See Justification
FCC 15.247(d) RSS 210 6.2.2(d)	Antenna conducted spurious	> 20 dBc	Pass
FCC 15.247(h)	FHSS Intelligence	No coordination	Pass See Justification
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure	> 2.50 cm separation.	Pass See justification and calculations
Overall Result			**PASS**

All tests were performed by Ashwani Malhotra.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a ‘PASS’ grade. If not ‘FAIL’ grade will be issued. Note that ‘PASS’ / ‘FAIL’ grade is independent of any measurement uncertainties. A ‘PASS’ / ‘FAIL’ grade within measurement uncertainty is marked with a ‘*’.

Justifications, Descriptions, or Deviations

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the Antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), the manufacturer has a permanently connected wire antenna on the board.

For the Restricted Bands of operation, the EUT is designed to only operate between 2404 to 2475 MHz.

The EUT uses a PCB trace antenna; gain of this is less than 6 dbi. Actual gain of antenna is 4.0 dbi.

For maximum permissible exposure, this device operates at less then 1 Watt at 2404 MHz – 2475 MHz. Minimum output power needed for SAR testing for product sold to general public with separation distance greater than 20.0 cm is 1 mW/cm^2. No testing is required, however worst case calculated exposure compliance follows later in this report.

The unit can be configured as a transmitter or receiver by changing a resistor on the board. The receiver uses the same tables, power output, channel occupancy as the transmitter, but uses a smaller duty cycle. This duty cycle was verified during the testing and spurious emissions were recorded from the receiver. All other tests were performed on the transmitter as worst case measurements.

Applicable Standards, Specifications and Methods

ANSI C63.4:2003	- Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CFR 47 FCC 15	- Code of Federal Regulations – Radio Frequency Devices
CISPR 22:1997	- Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
ICES-003:2004	- Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard
ISO 17025:2005	- General Requirements for the competence of testing and calibration laboratories
RSS 210:2005	- Issue 6: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power License-Exempt Radio communication Devices

Sample calculation(s)

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)
Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)
Margin = 8.5 dB

Document Revision Status

Revision 1 - Initial report released November 7th, 2008

Definitions and Acronyms

The following definitions and acronyms are applicable in this report.
See also ANSI C63.14.

AE – Auxiallary Equipment.

BW – Bandwidth. Unless otherwise stated, this is refers to the 6 dB bandwidth.

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

ITE – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

LISN – Line impedance stabilization network

NCR – No Calibration Required

RF – Radio Frequency

Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

Calibrations and Accreditations

The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Oct 25 – 31, 2008	All	AM	22-25ºC	41-45%	100.2 - 100.5kPa

Detailed Test Results Section

Spurious Radiated Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4:2003.

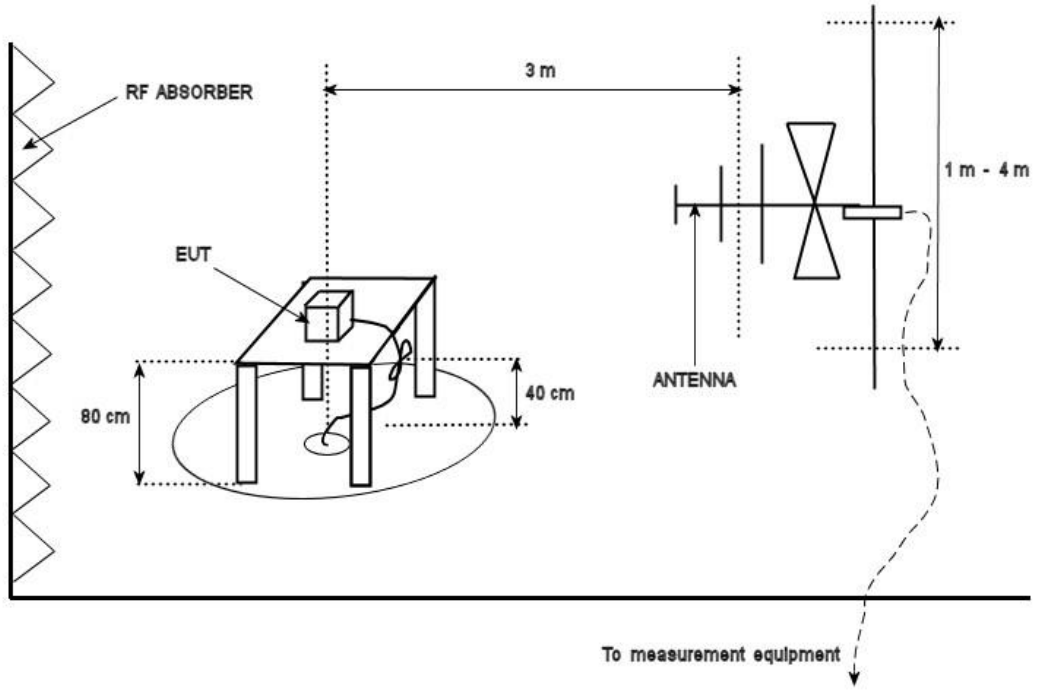
The limits, as defined in 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

All unintentional emissions must also meet the 'Spurious Conducted Emissions' requirements of -20 dBc or greater. See also 'Spurious Conducted Emissions' for further details.

30 MHZ – 88 MHz, 100 uV/m (40.0 dBuV/m[1]) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m[1]) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.4 dBuV/m[1]) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m[1]) at 3 m
Above 1000 MHz, 500 uV/m (54.0 dBuV/m[2]) at 3m

[1]Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector, scanned in accordance with 15.33 to above the 10th harmonic (24 GHz).

Typical Radiated Emissions Setup



Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-4.4 dB with a 'k=2' coverage factor and a %95 confidence level.

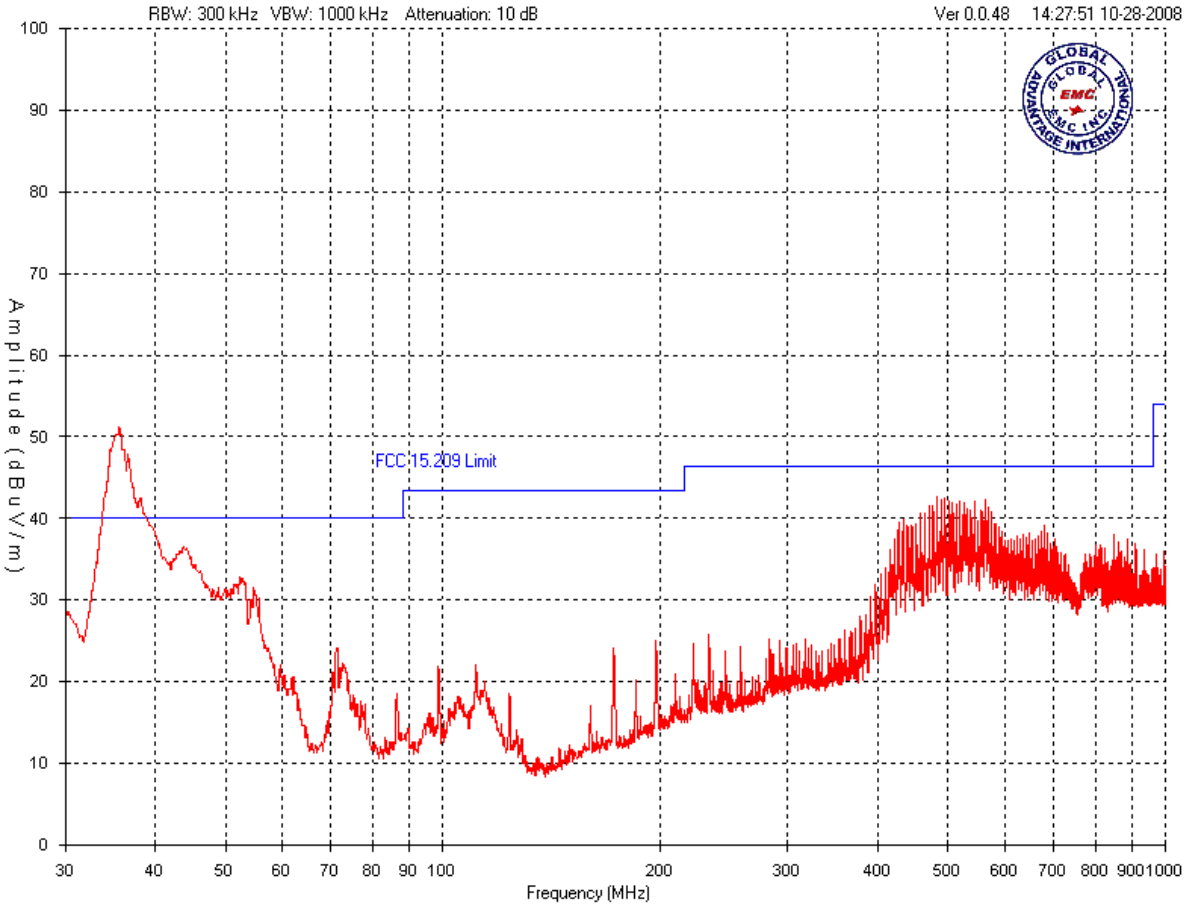
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater then the final required detector and over a full 0-360 rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

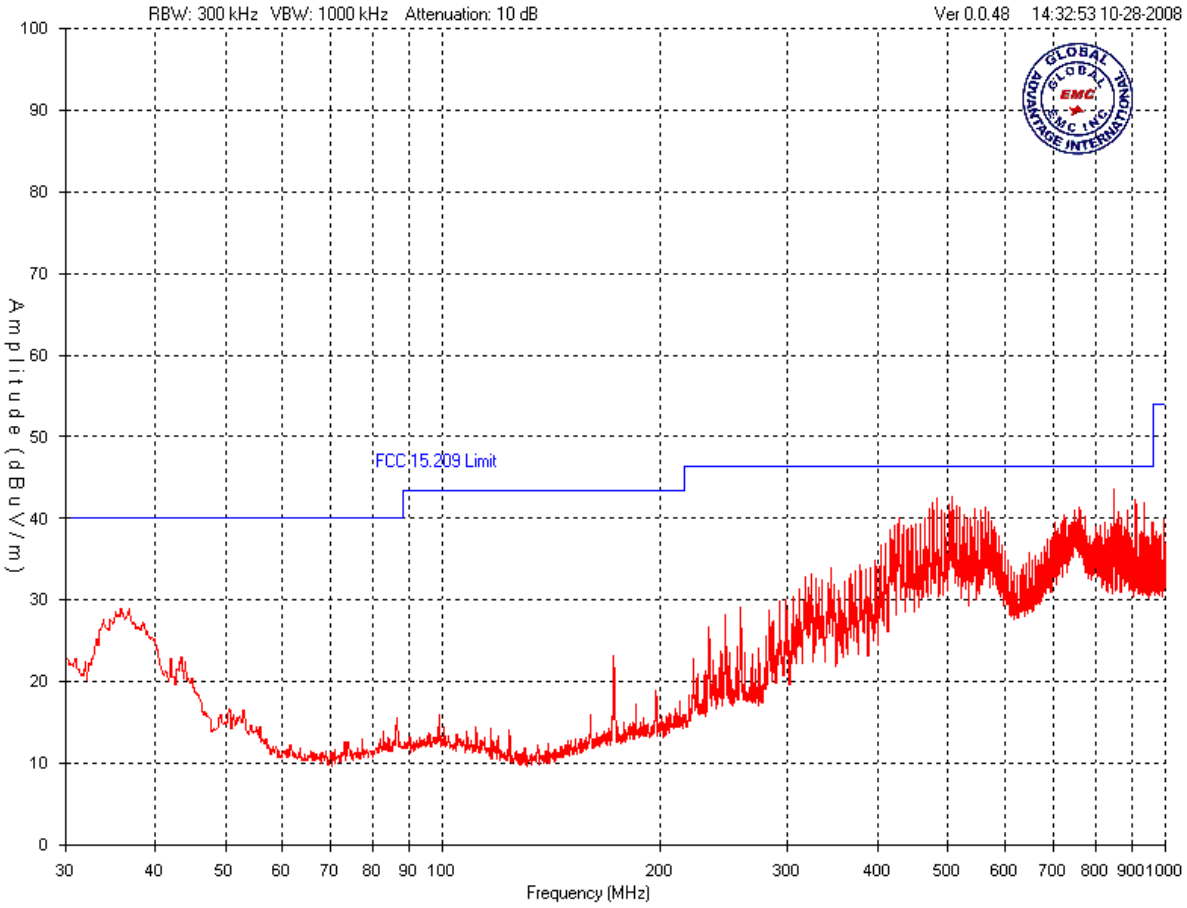
In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to a minimum of a 24 GHz.

For receiver hopping mode was worst case and is shown below. For transmitter the worst case readings are shown here and labeled appropriately.

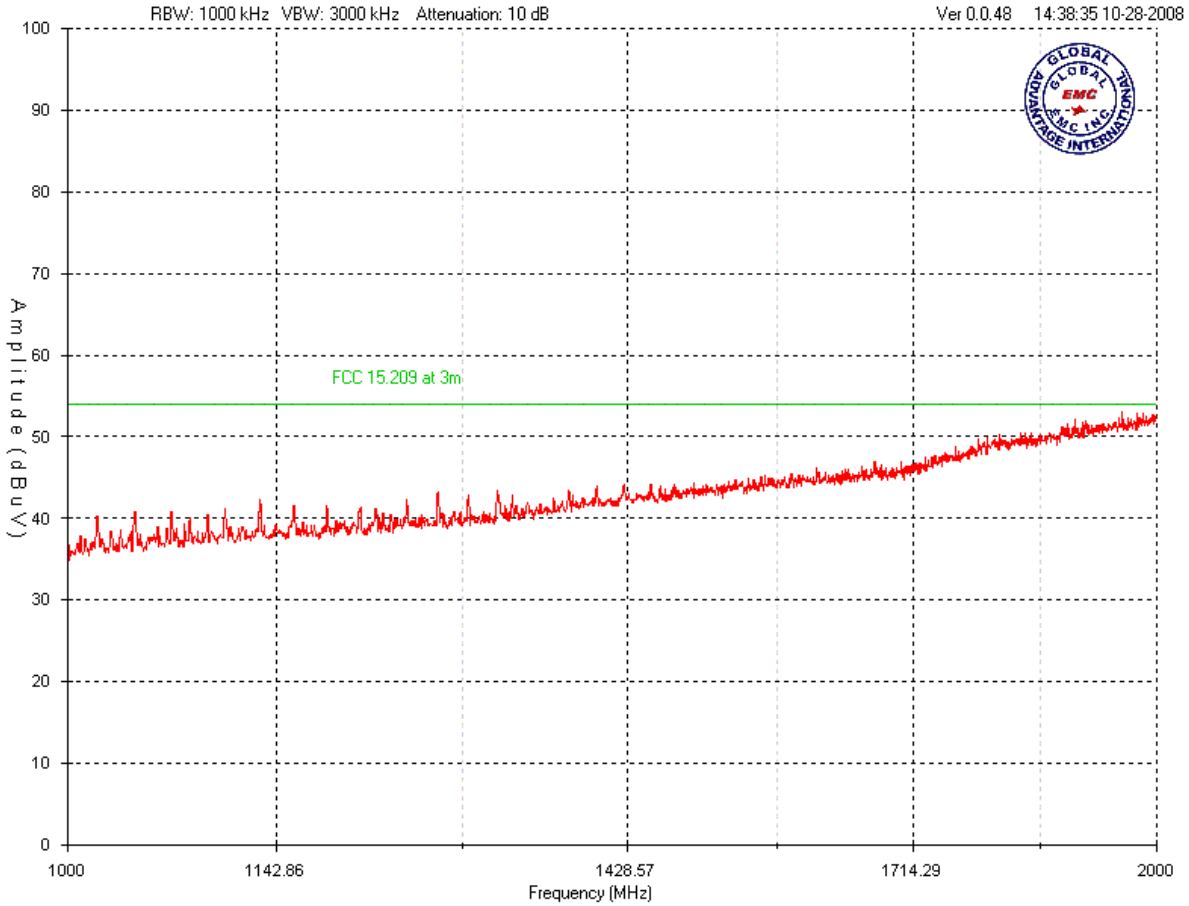
Vertical – Peak Emissions Graph – Low channel
30 MHz – 1 GHz



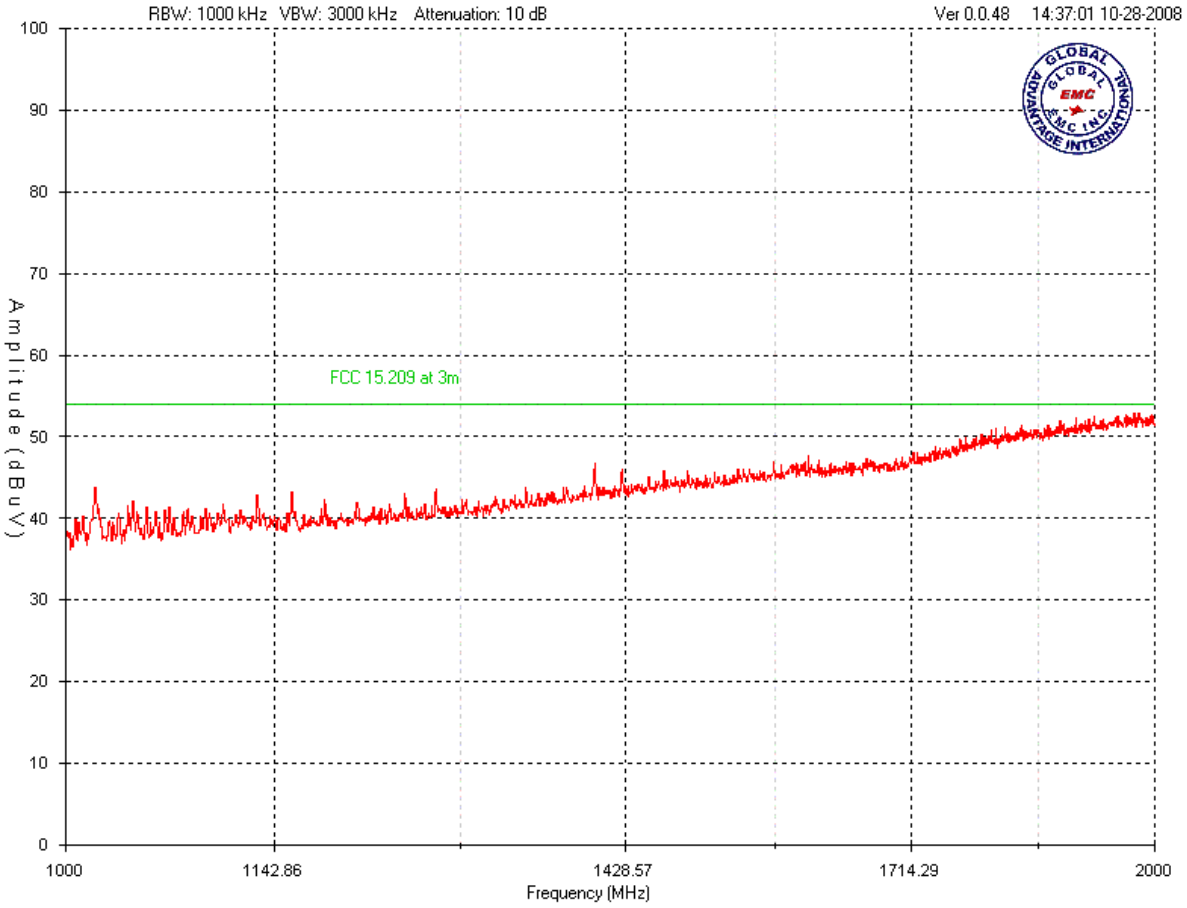
Horizontal – Peak Emissions Graph – Low channel
30 MHz – 1 GHz



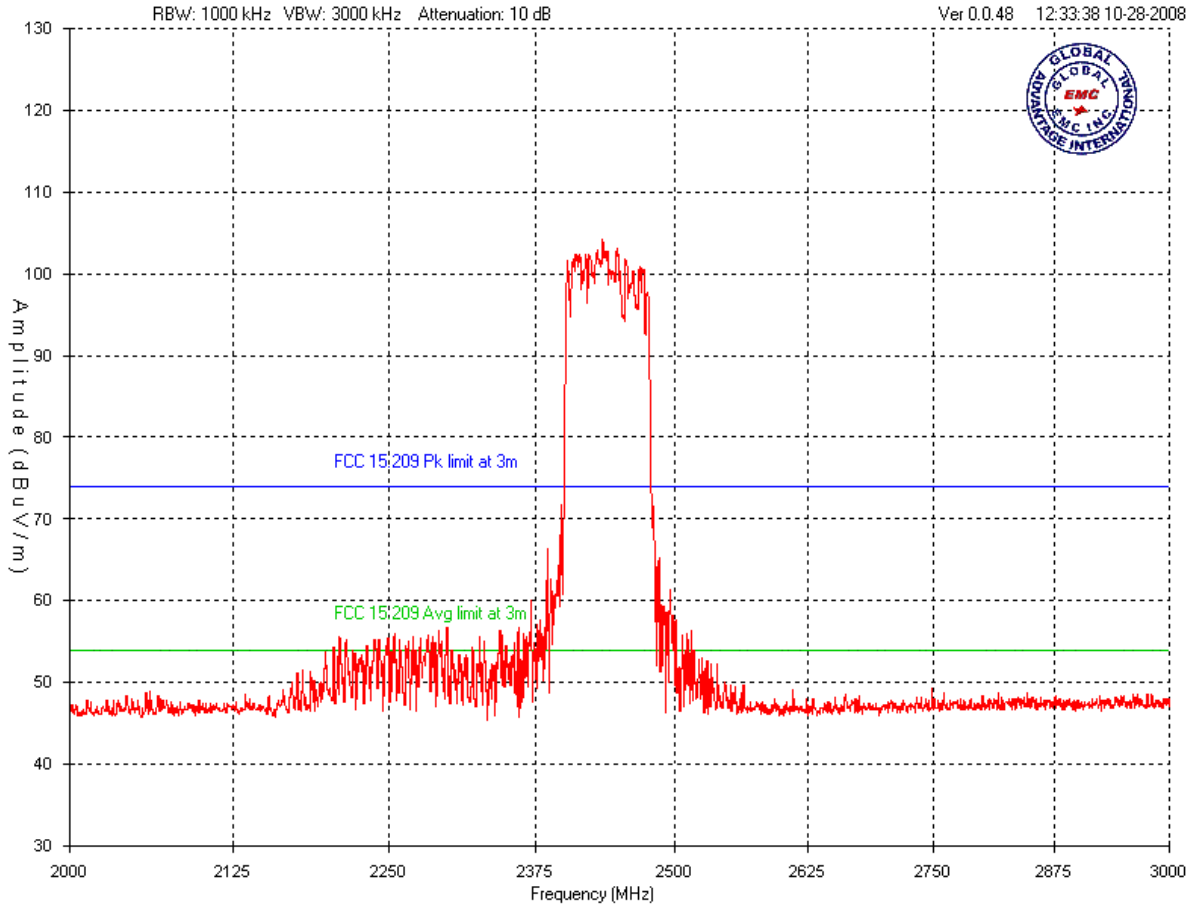
Vertical – Peak Emissions Graph – Low Band
1 GHz – 2 GHz



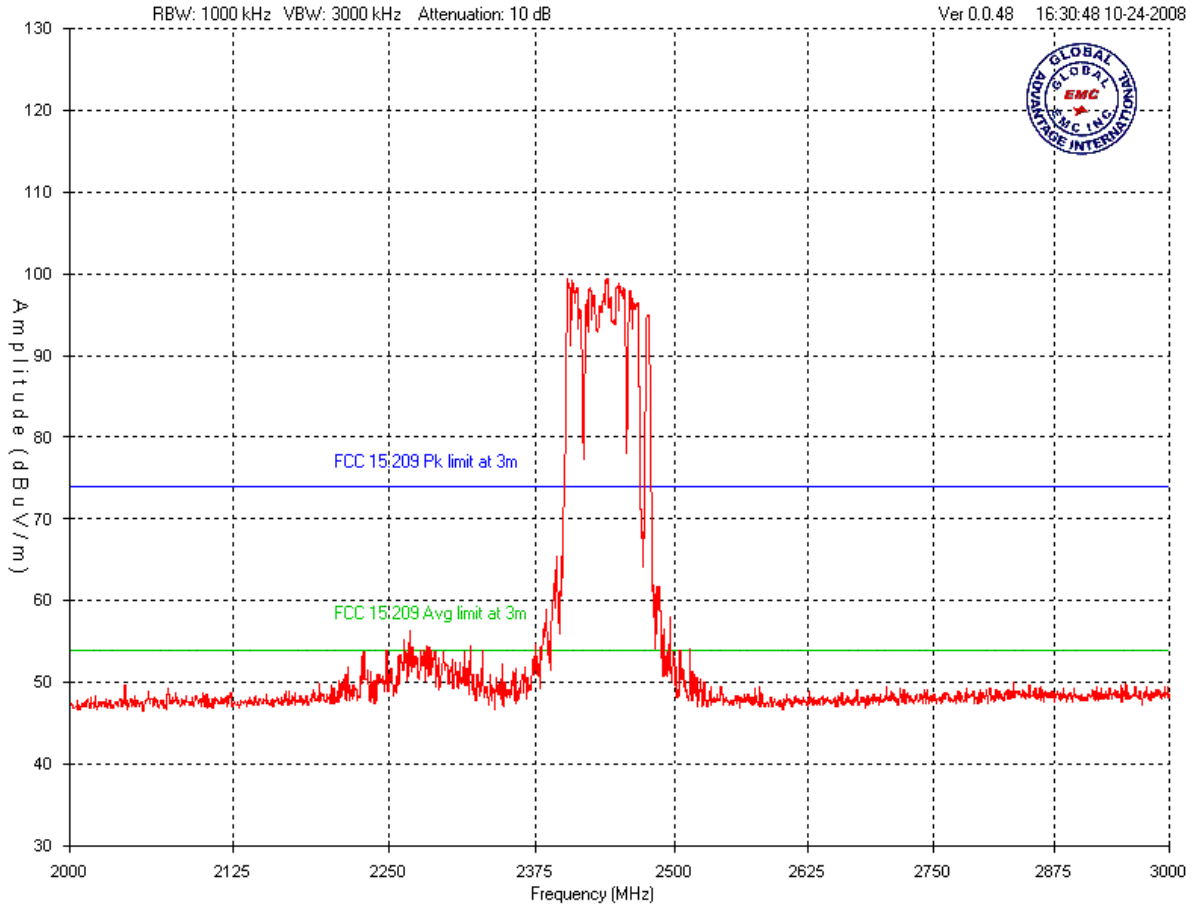
Vertical – Peak Emissions Graph – Low Band
1 GHz – 2 GHz



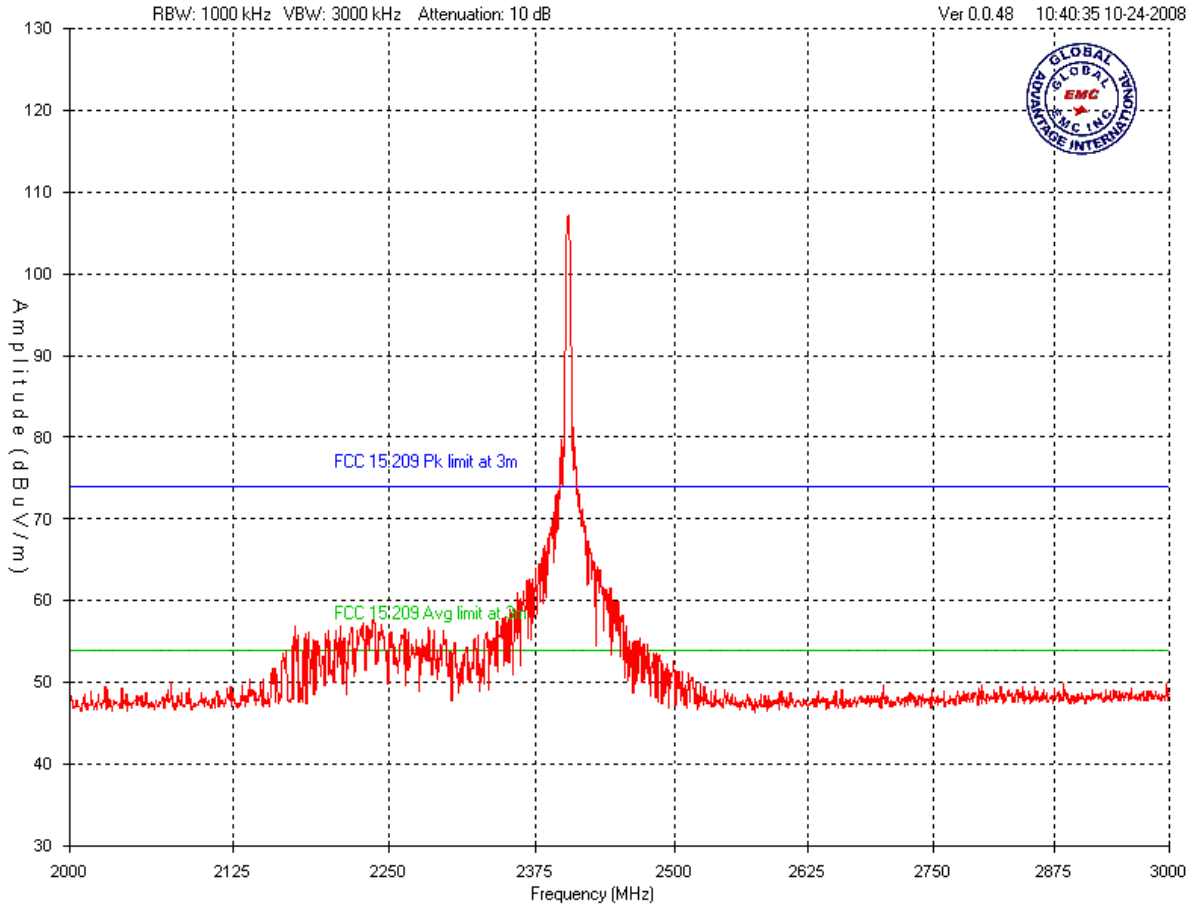
Vertical – Peak Emissions Graph – Hop mode
2 GHz – 3 GHz



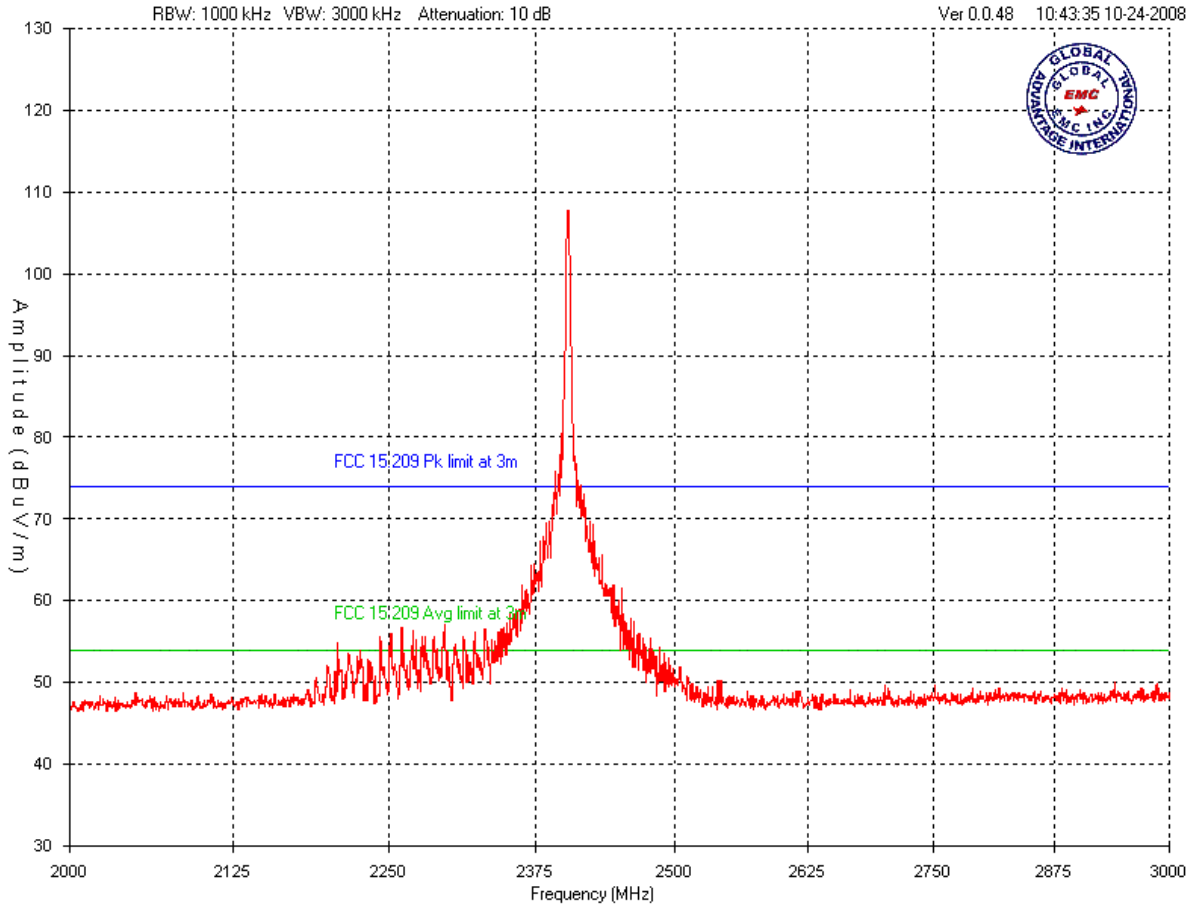
Horizontal – Peak Emissions Graph – Hop mode
2 GHz – 3 GHz



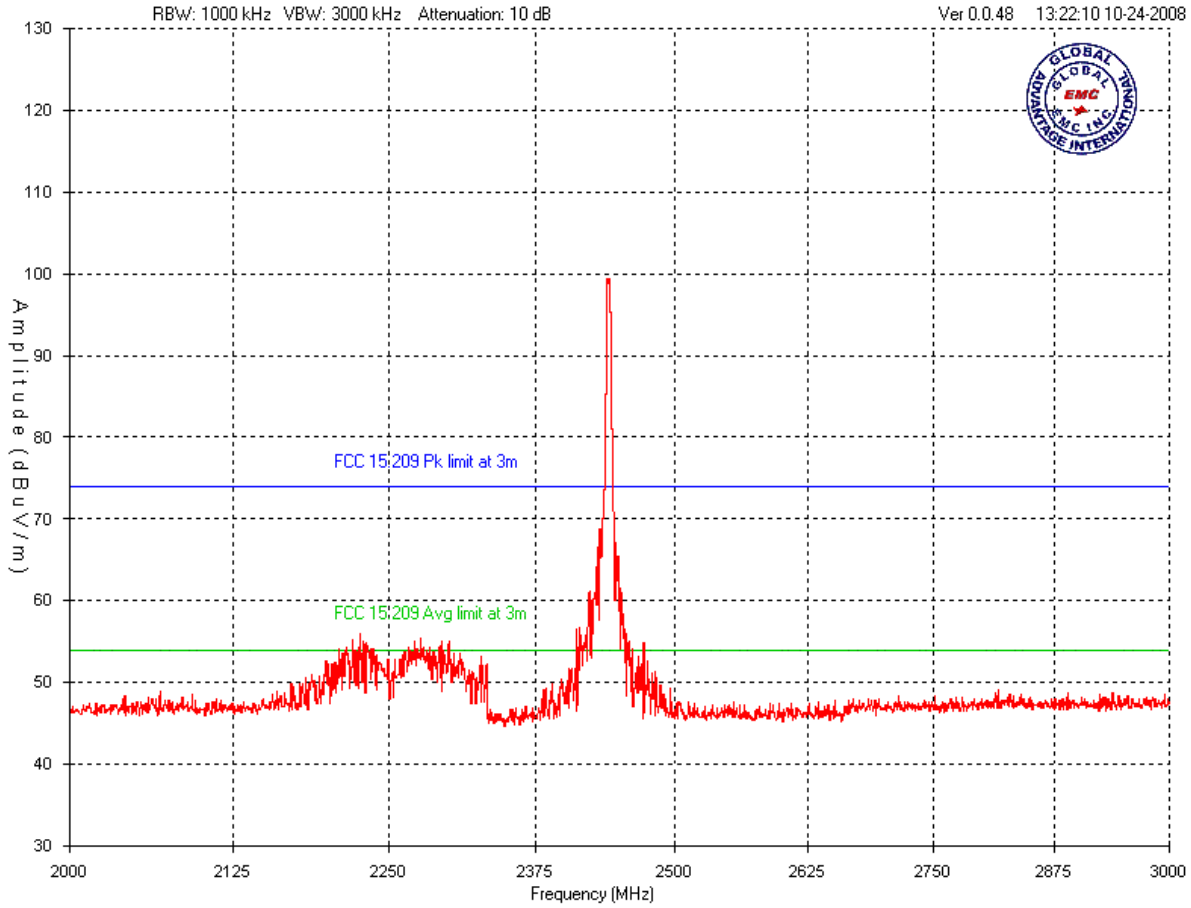
Vertical – Peak Emissions Graph – Low Band
2 GHz – 3 GHz



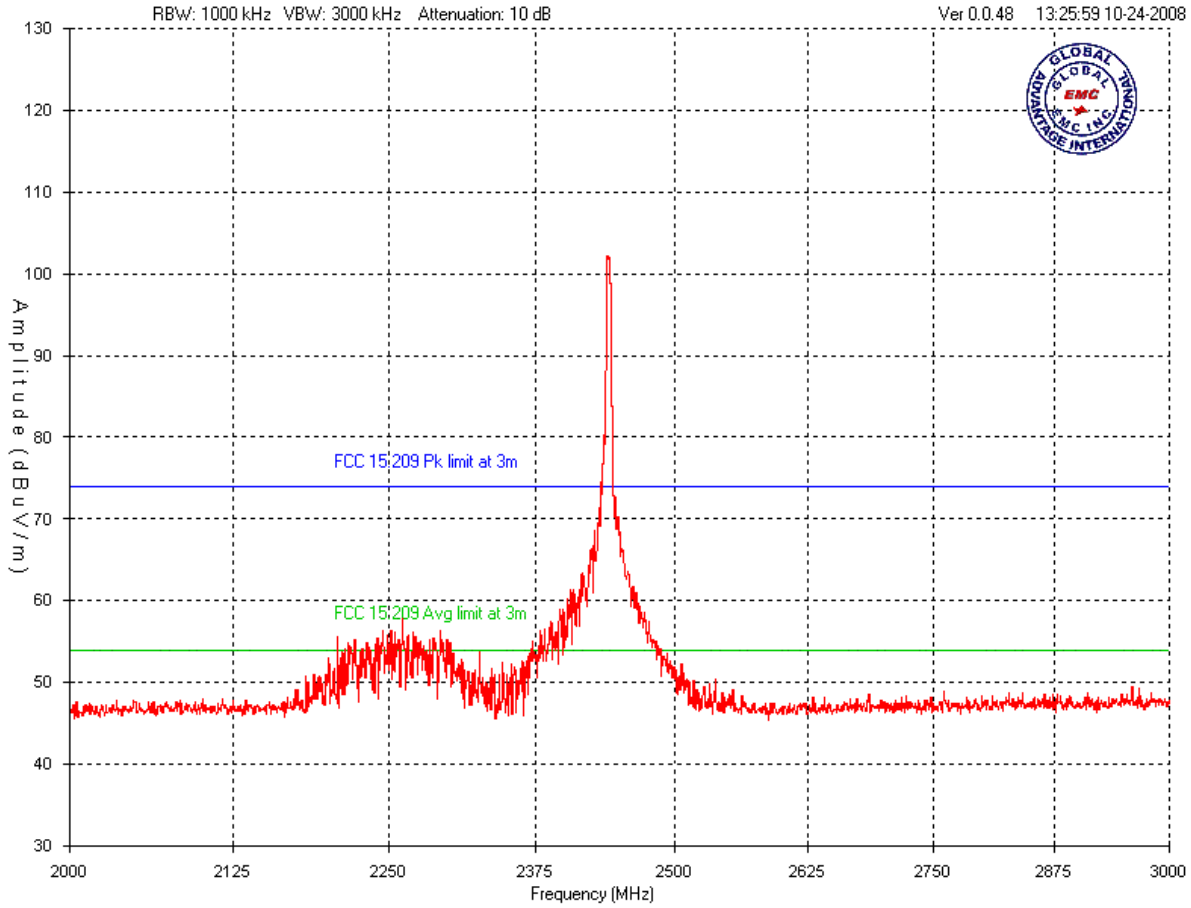
Horizontal – Peak Emissions Graph – Low Band
2 GHz – 3 GHz



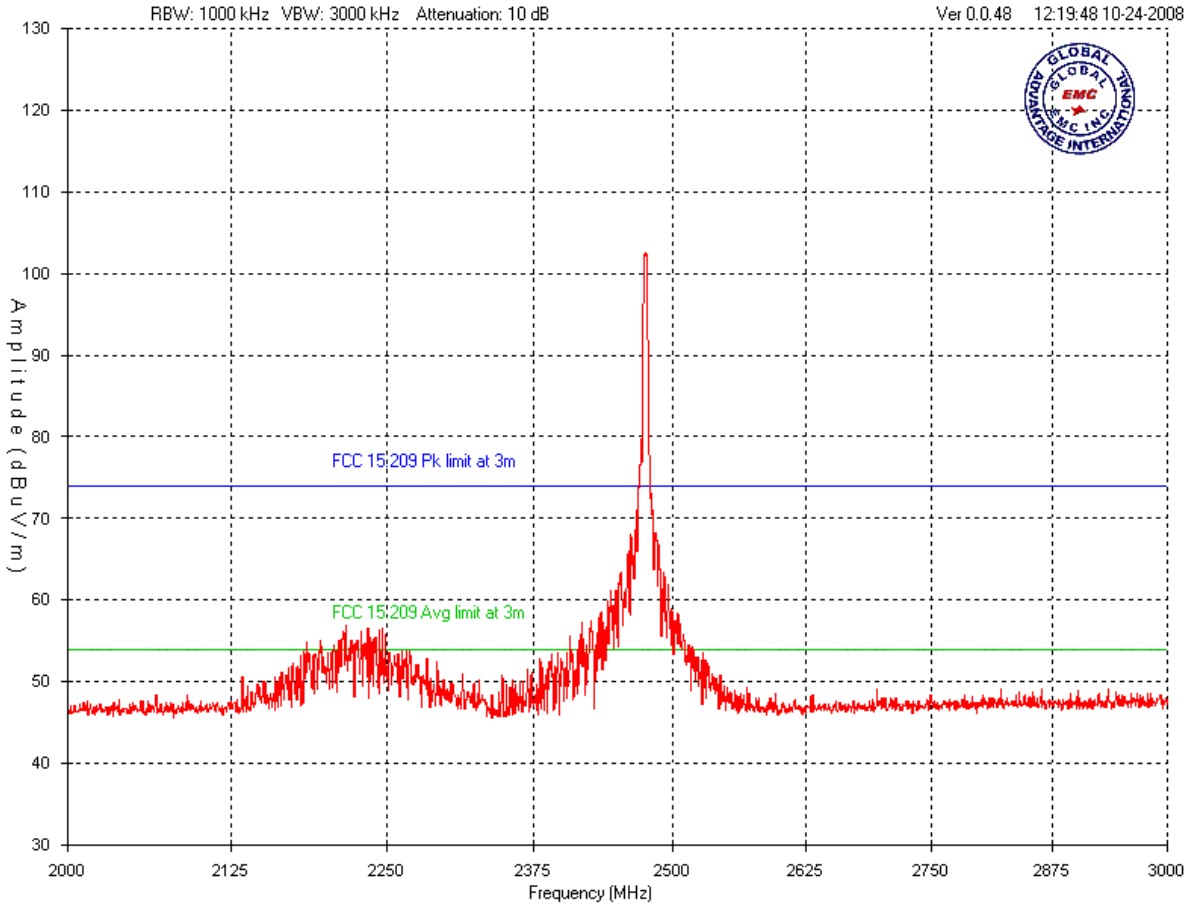
Vertical – Peak Emissions Graph – Mid Band
2 GHz – 3 GHz



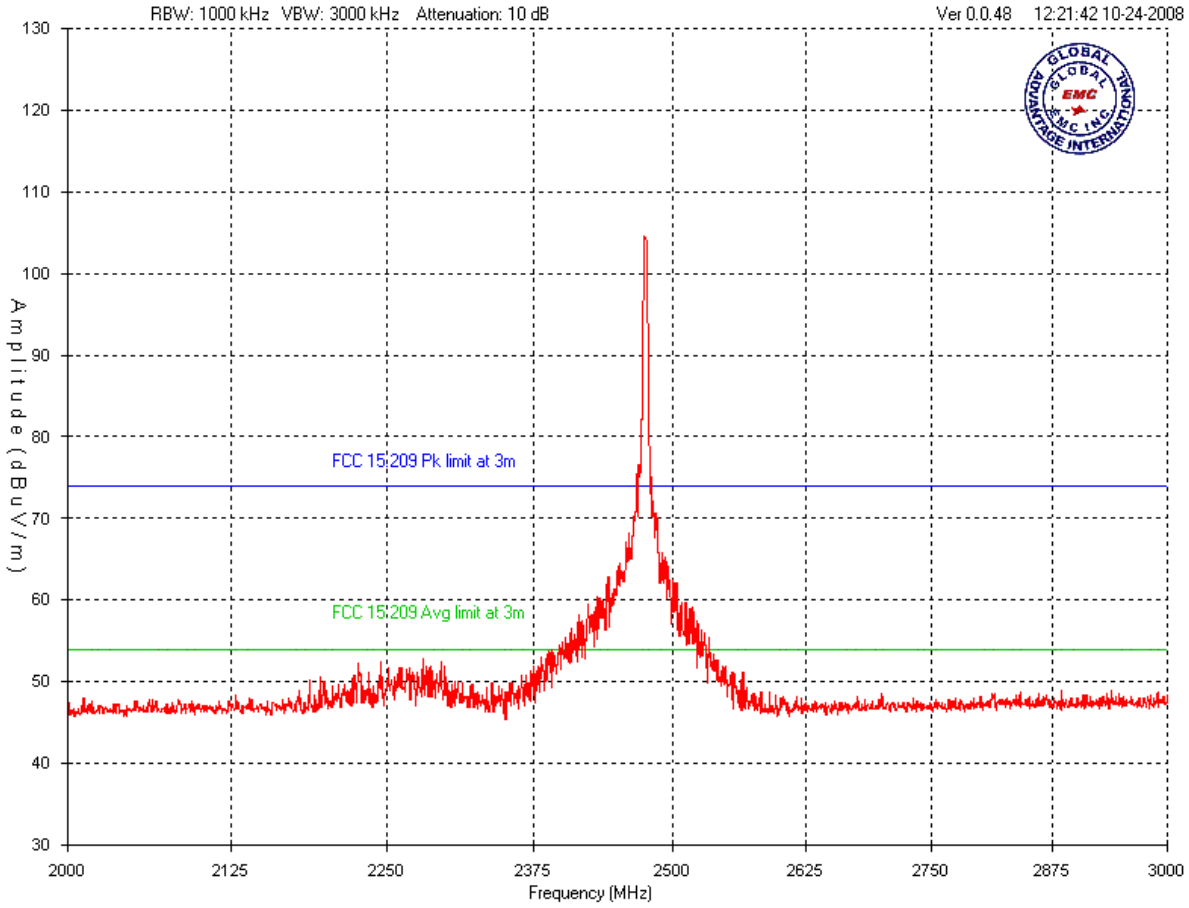
Horizontal – Peak Emissions Graph – Mid Band
2 GHz – 3 GHz



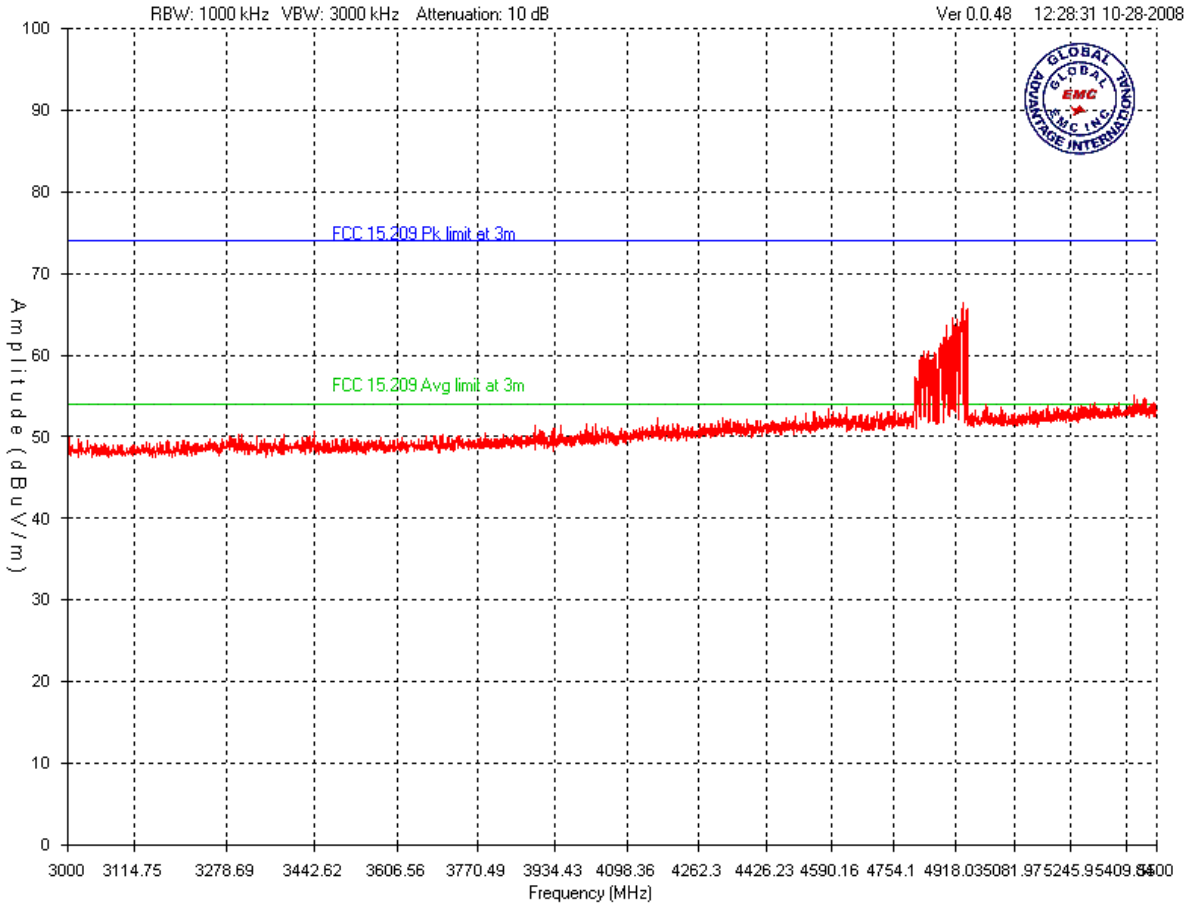
Vertical – Peak Emissions Graph – Hi Band
2 GHz – 3 GHz



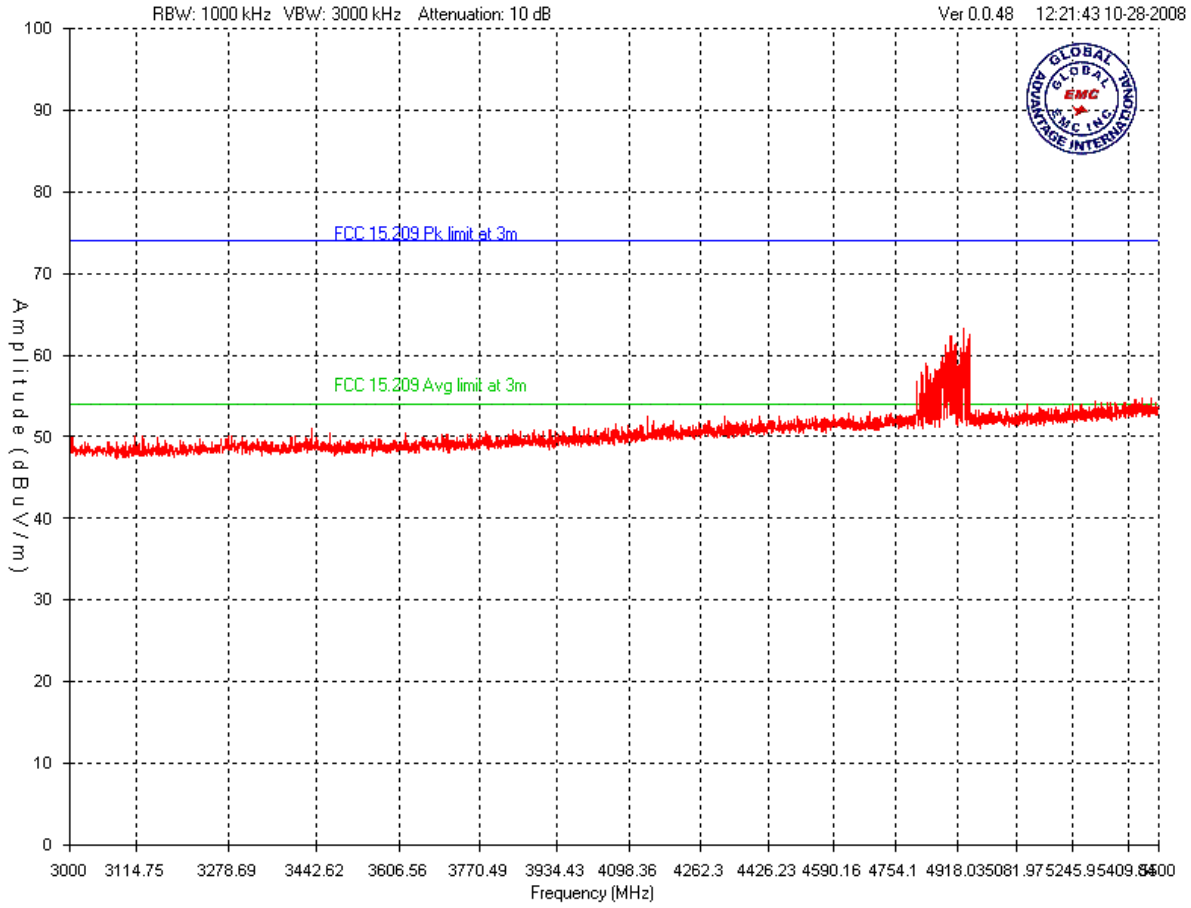
Horizontal – Peak Emissions Graph – Hi Band
2 GHz – 3 GHz



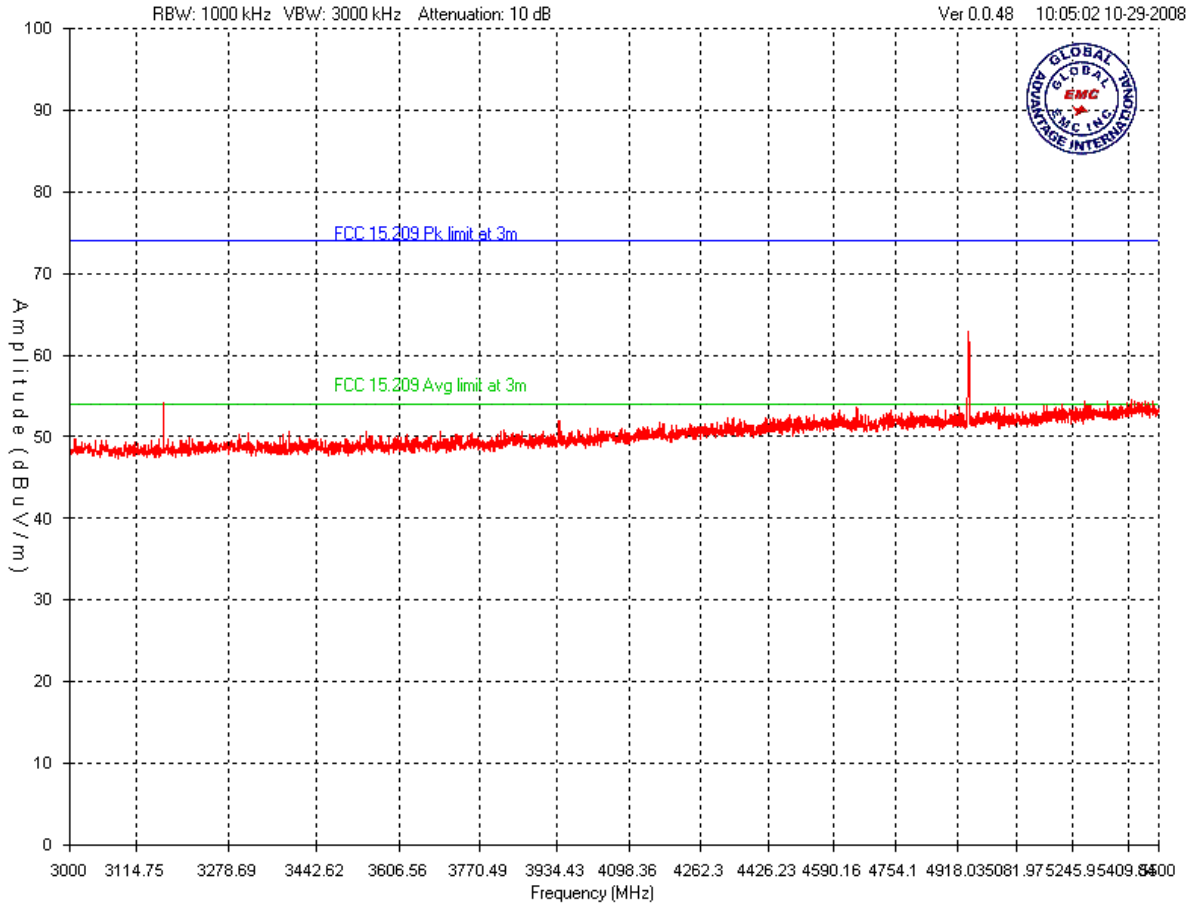
Vertical – Peak Emissions Graph – Hop mode
3 GHz – 5.5 GHz



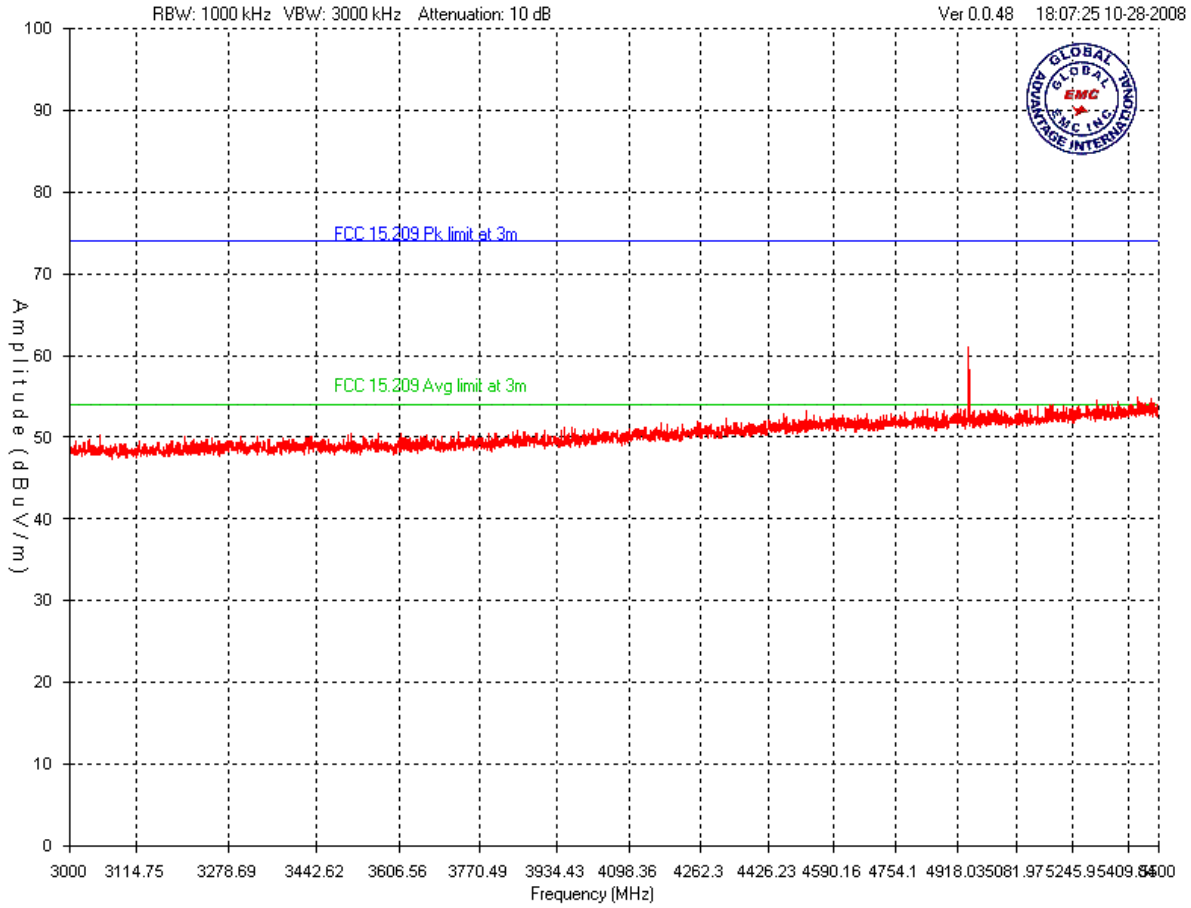
Horizontal – Peak Emissions Graph – Hop mode
3 GHz – 5.5 GHz



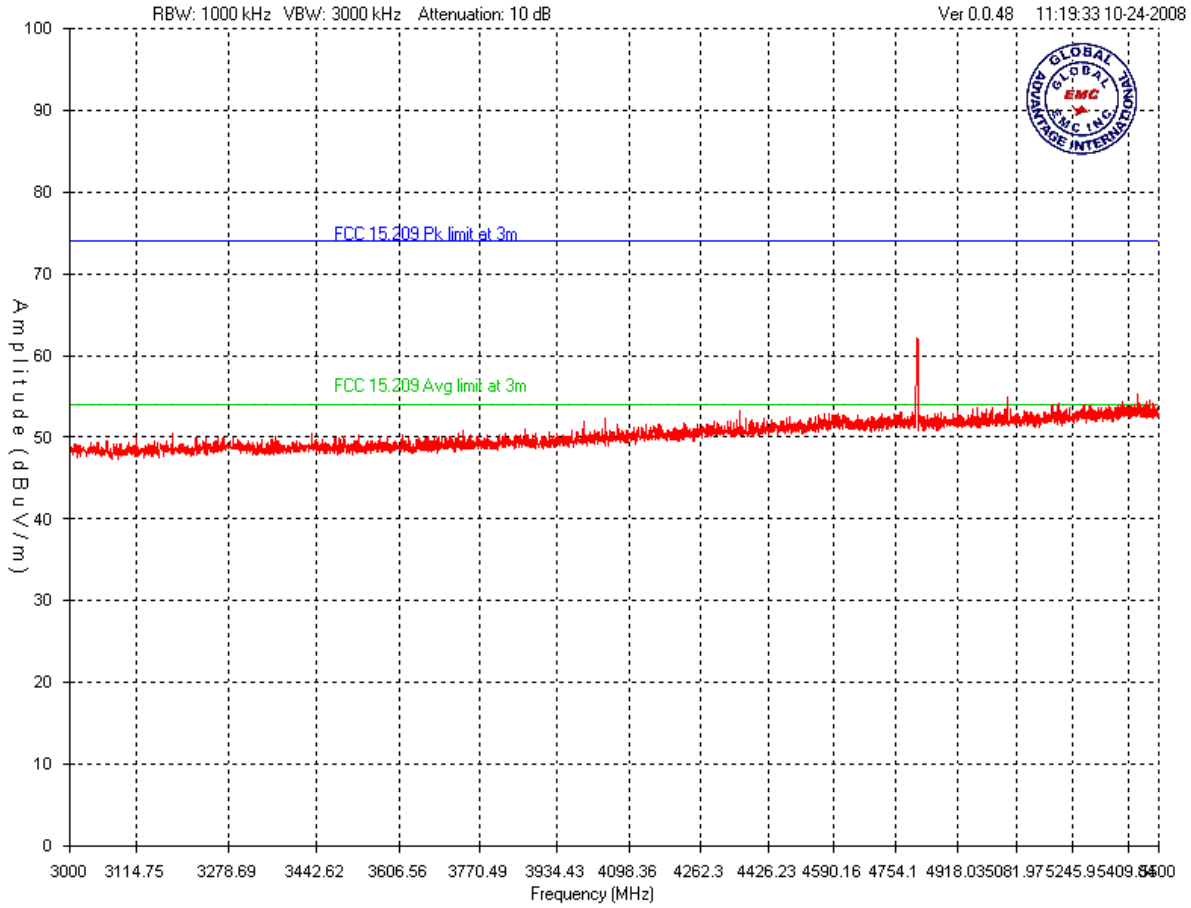
Vertical – Peak Emissions Graph – Hi Band
Receiver
3 GHz – 5.5 GHz



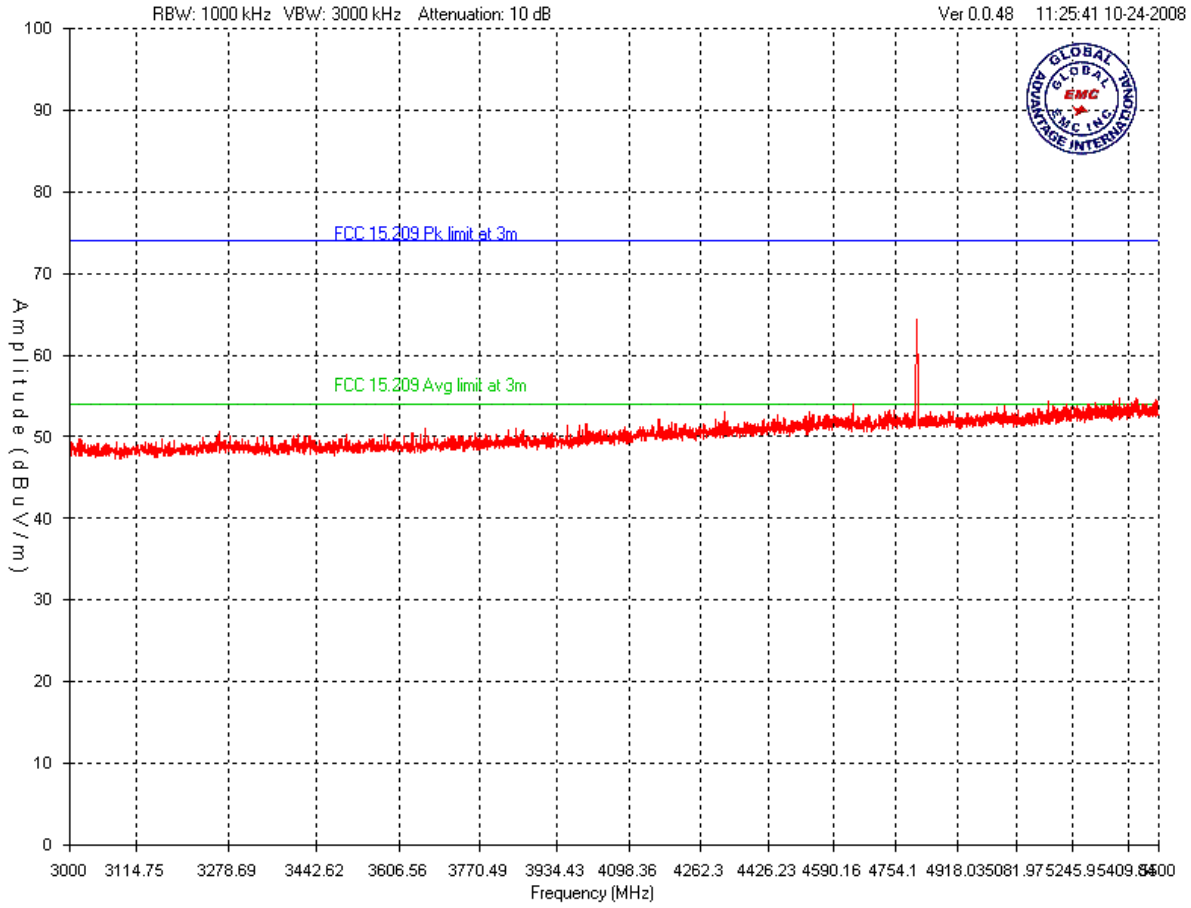
Horizontal – Peak Emissions Graph – Hi Band
Receiver
3 GHz – 5.5 GHz



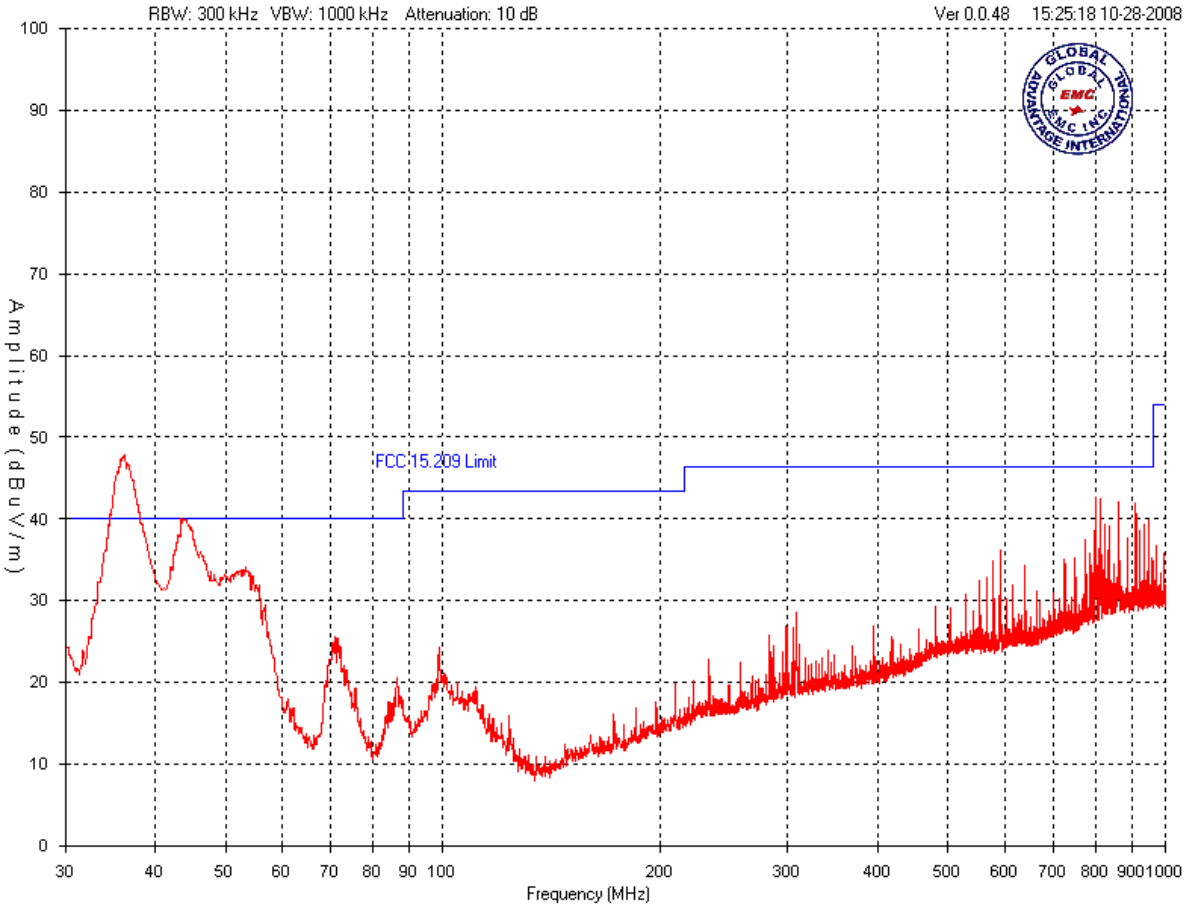
Vertical – Peak Emissions Graph – Low Band
3 GHz – 5.5 GHz



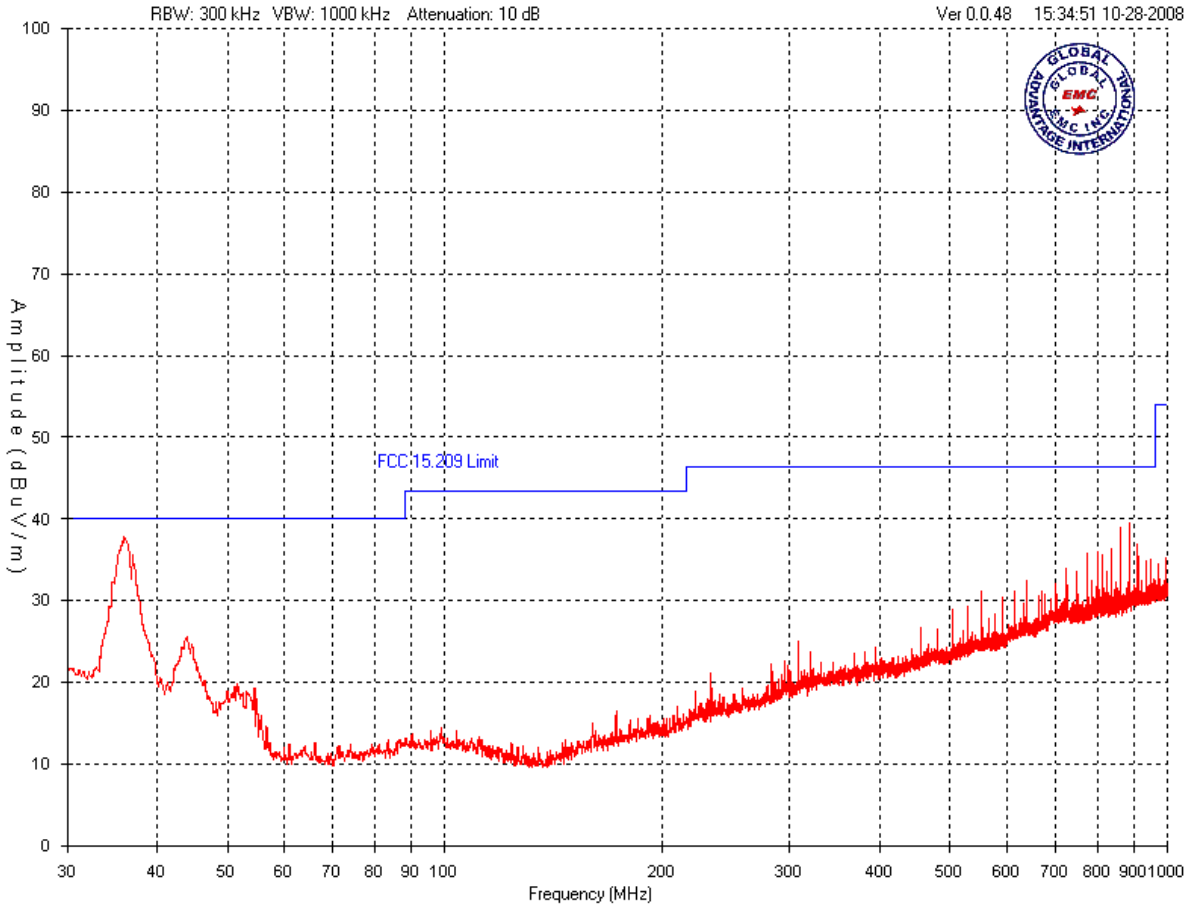
Horizontal – Peak Emissions Graph – Low Band
3 GHz – 5.5 GHz



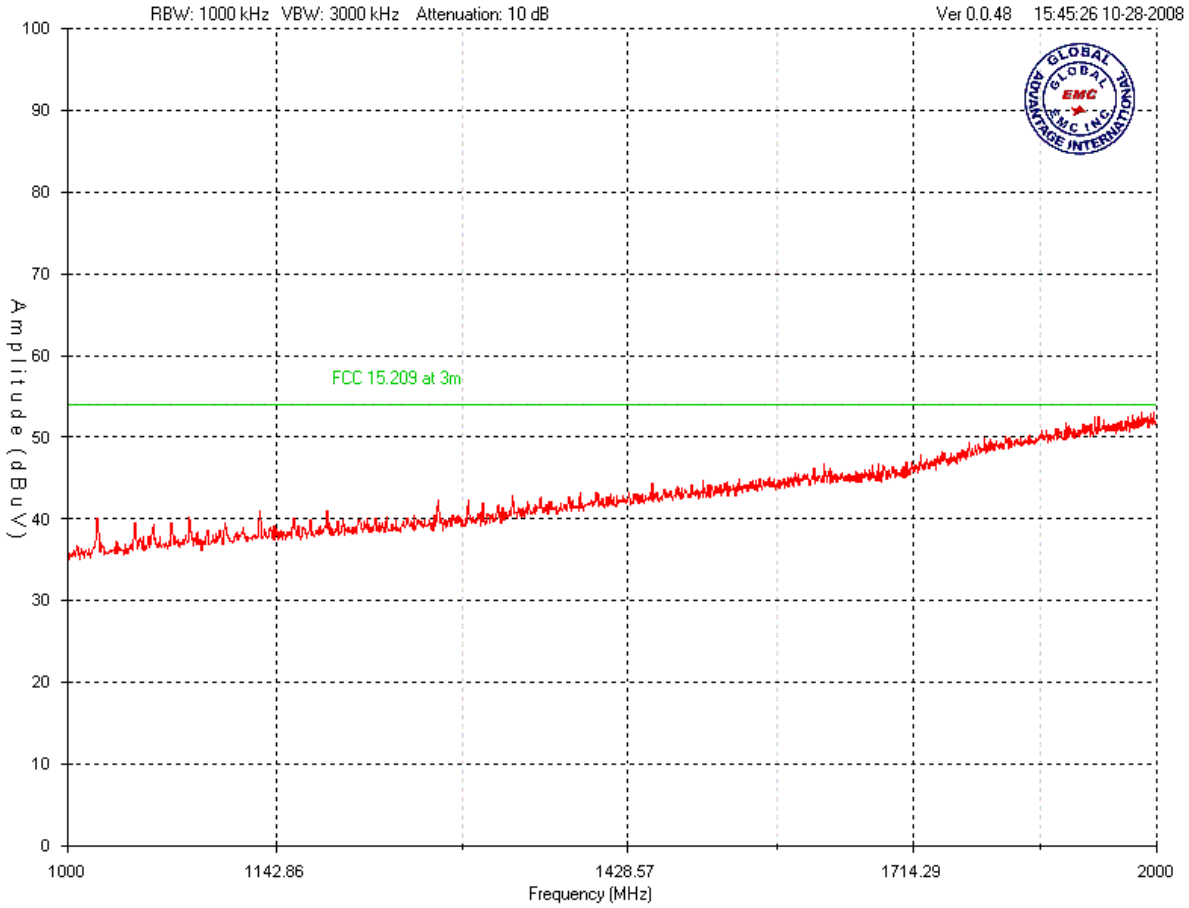
Vertical – Peak Emissions Graph –
Receiver
Hopping On



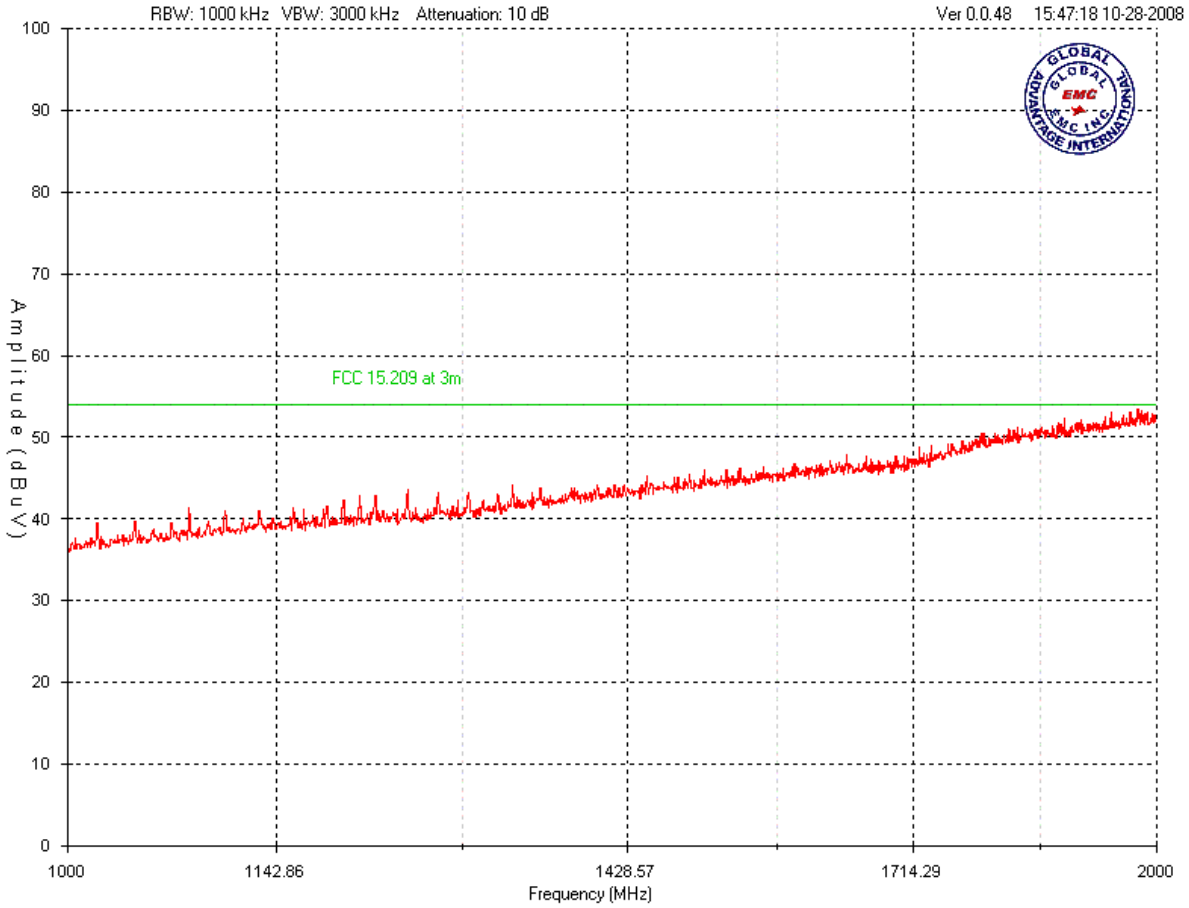
Horizontal – Peak Emissions Graph –
Receiver
Hopping On



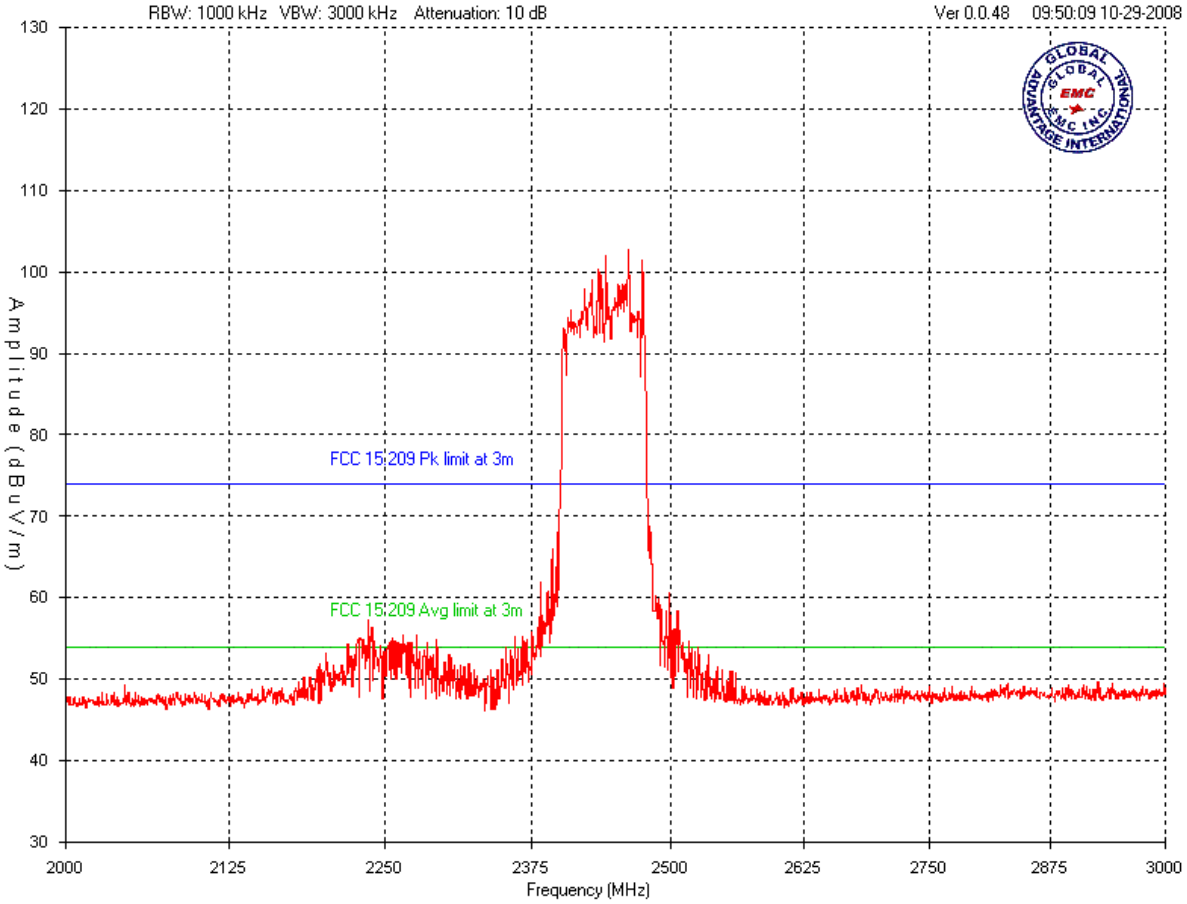
Vertical – Peak Emissions Graph – Low Band
Receiver
1 GHz – 2 GHz



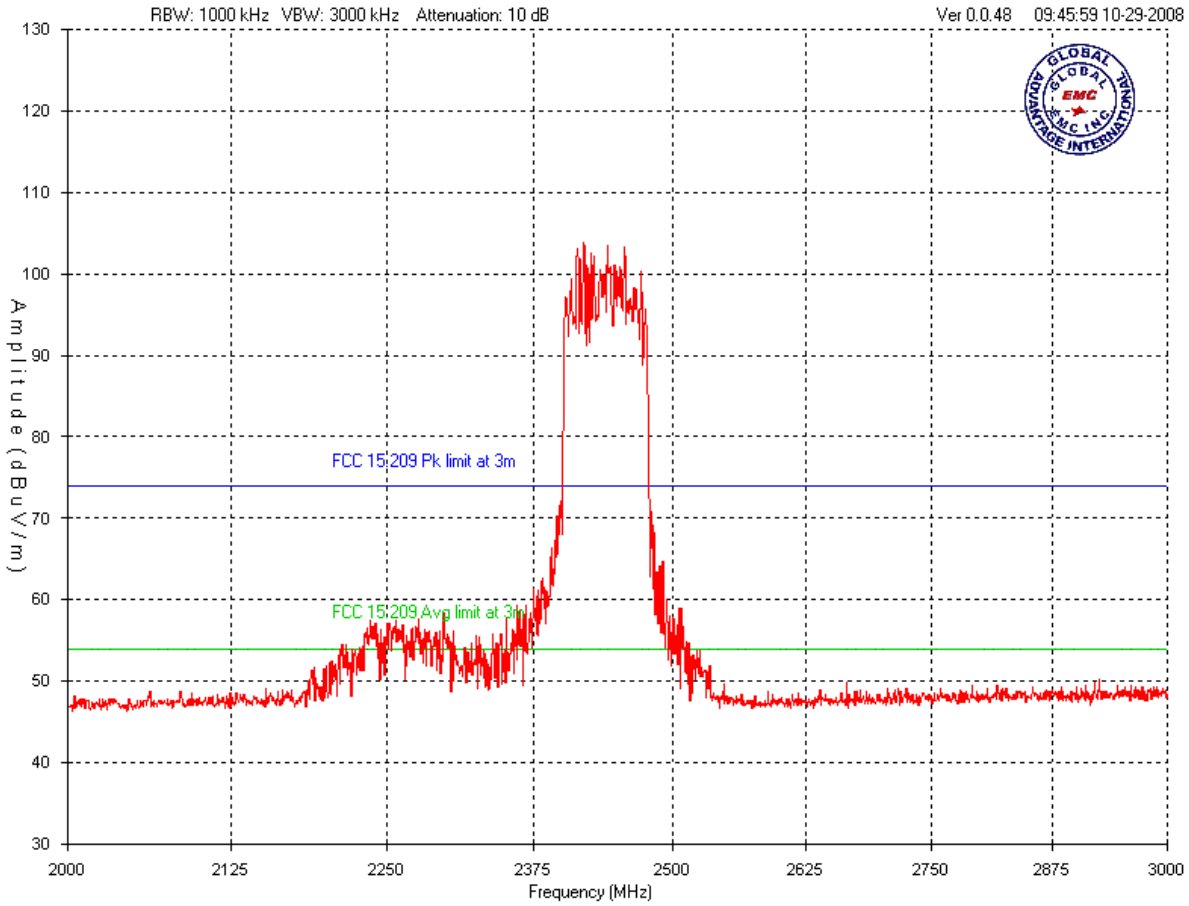
Vertical – Peak Emissions Graph – Low Band
Receiver
1 GHz – 2 GHz



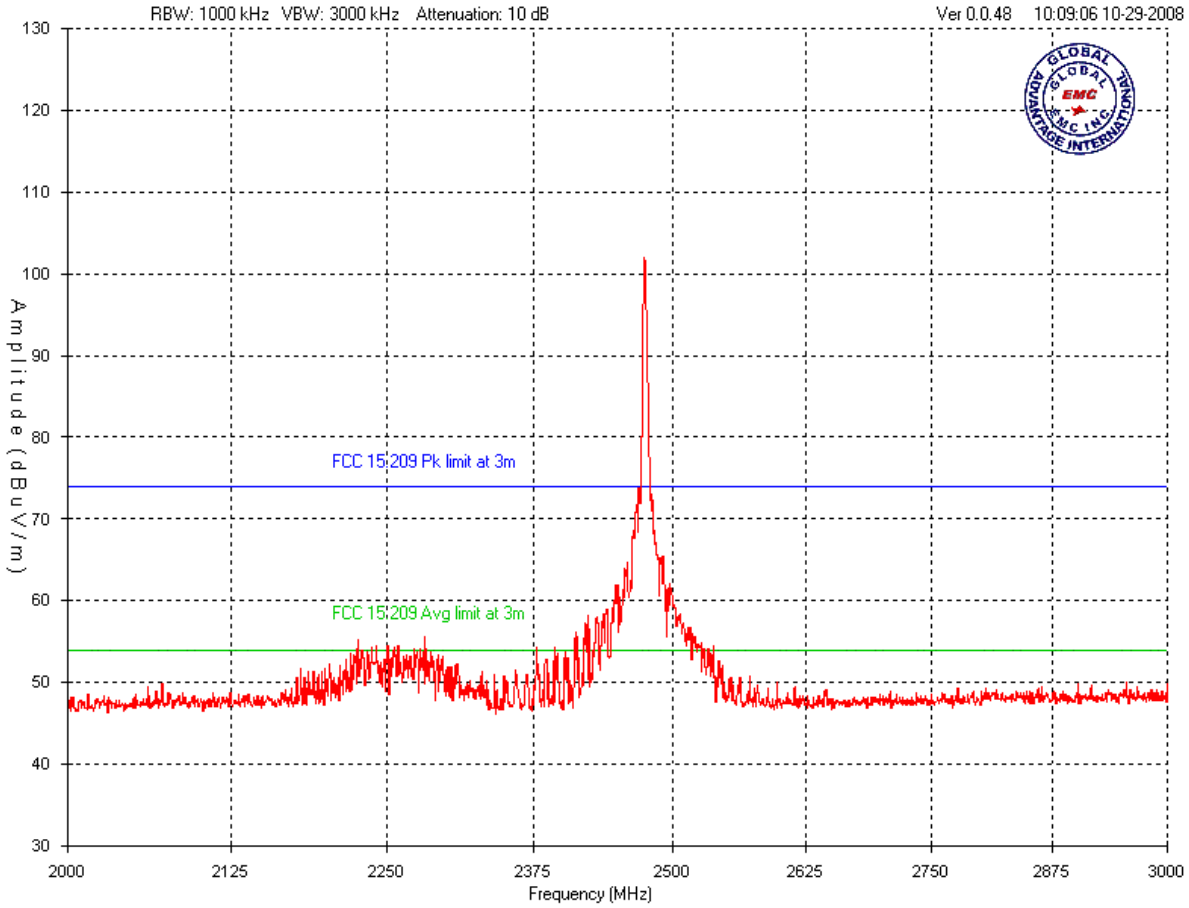
Vertical – Peak Emissions Graph – Hop mode
Receiver
2 GHz – 3 GHz



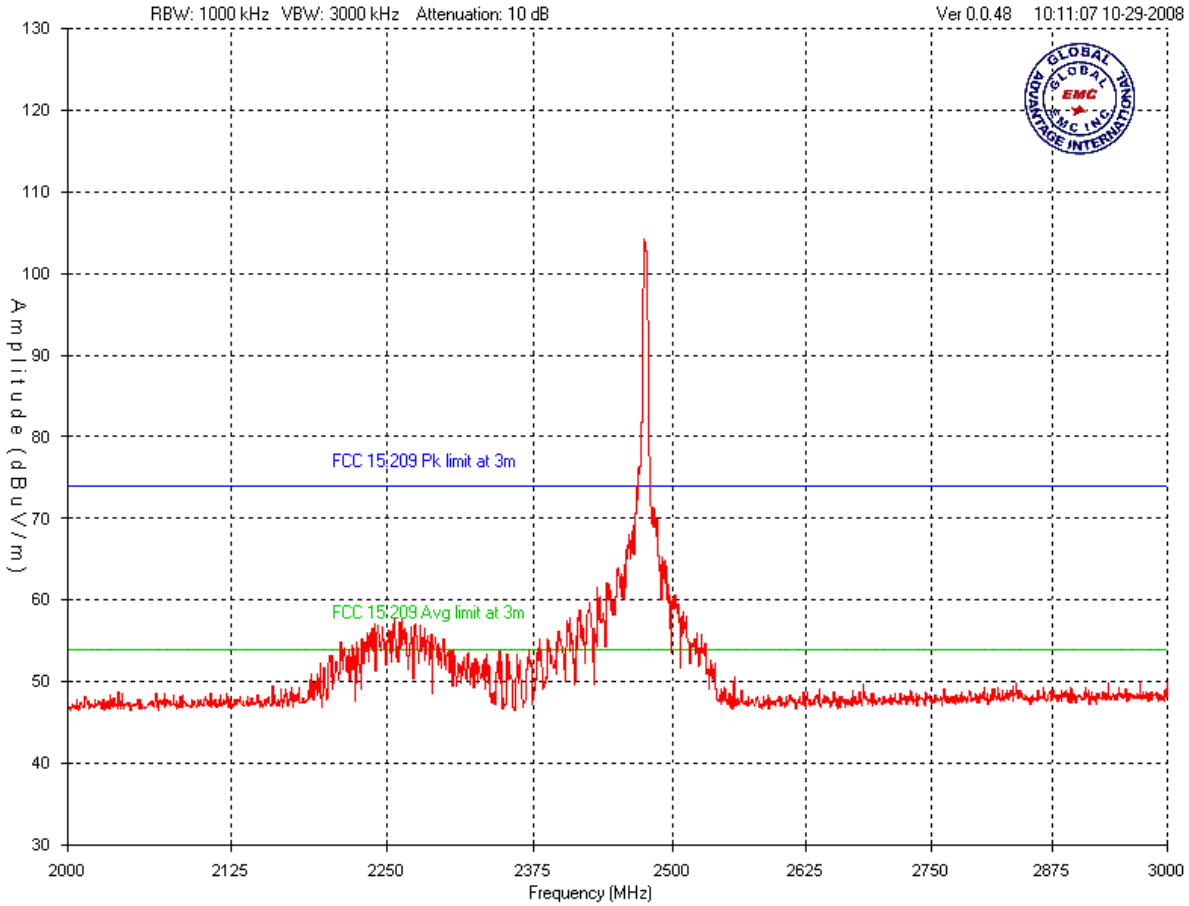
Horizontal – Peak Emissions Graph – Hop mode
Receiver
2 GHz – 3 GHz



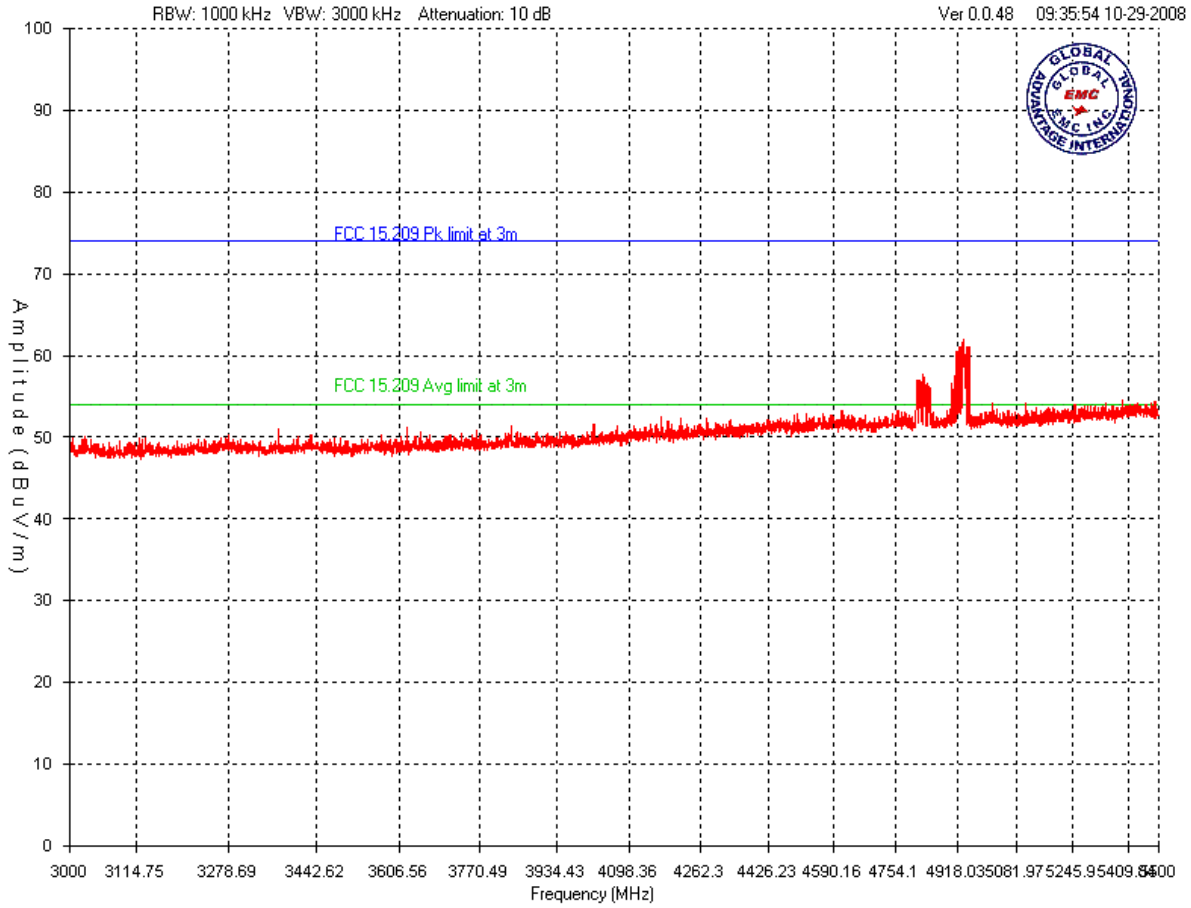
Vertical – Peak Emissions Graph – Hi Band
Receiver
2 GHz – 3 GHz



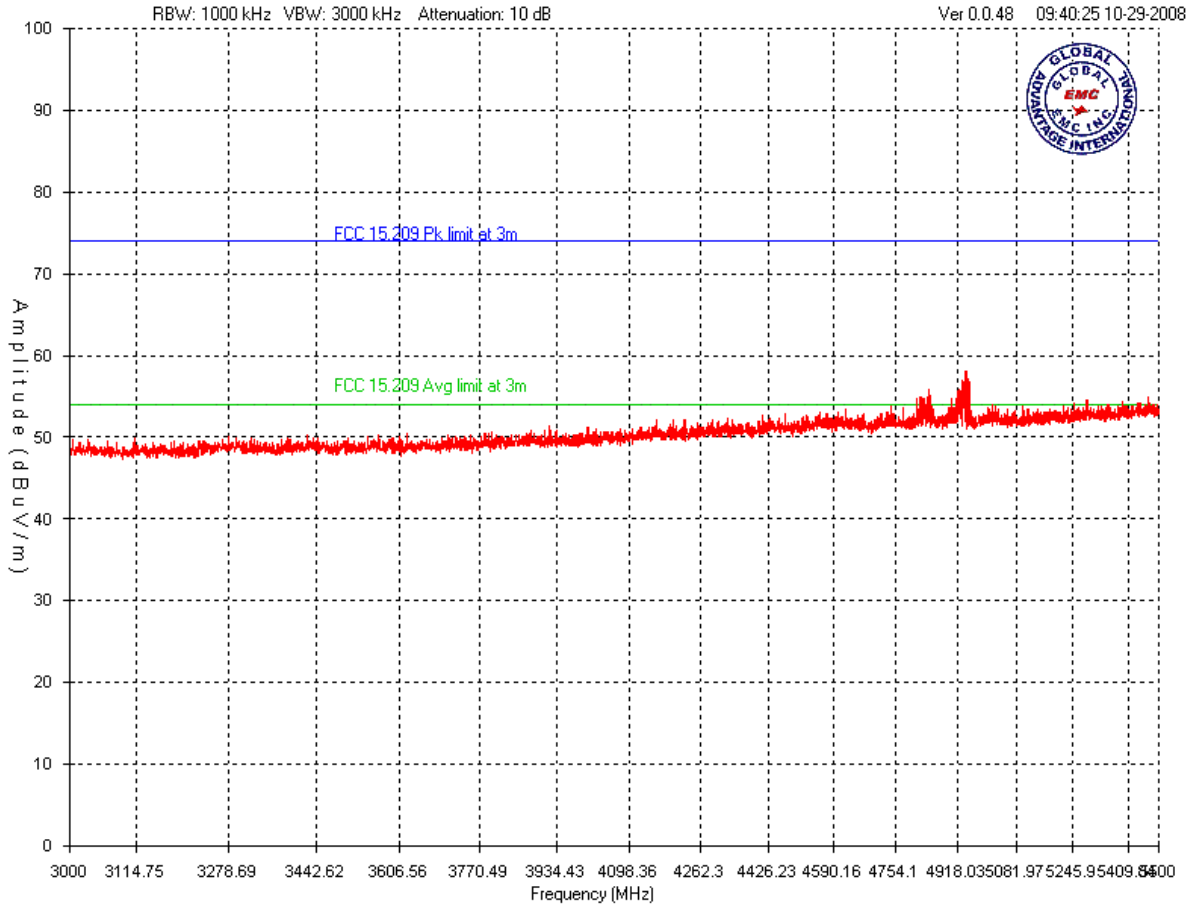
Horizontal – Peak Emissions Graph – Hi Band
Receiver
2 GHz – 3 GHz



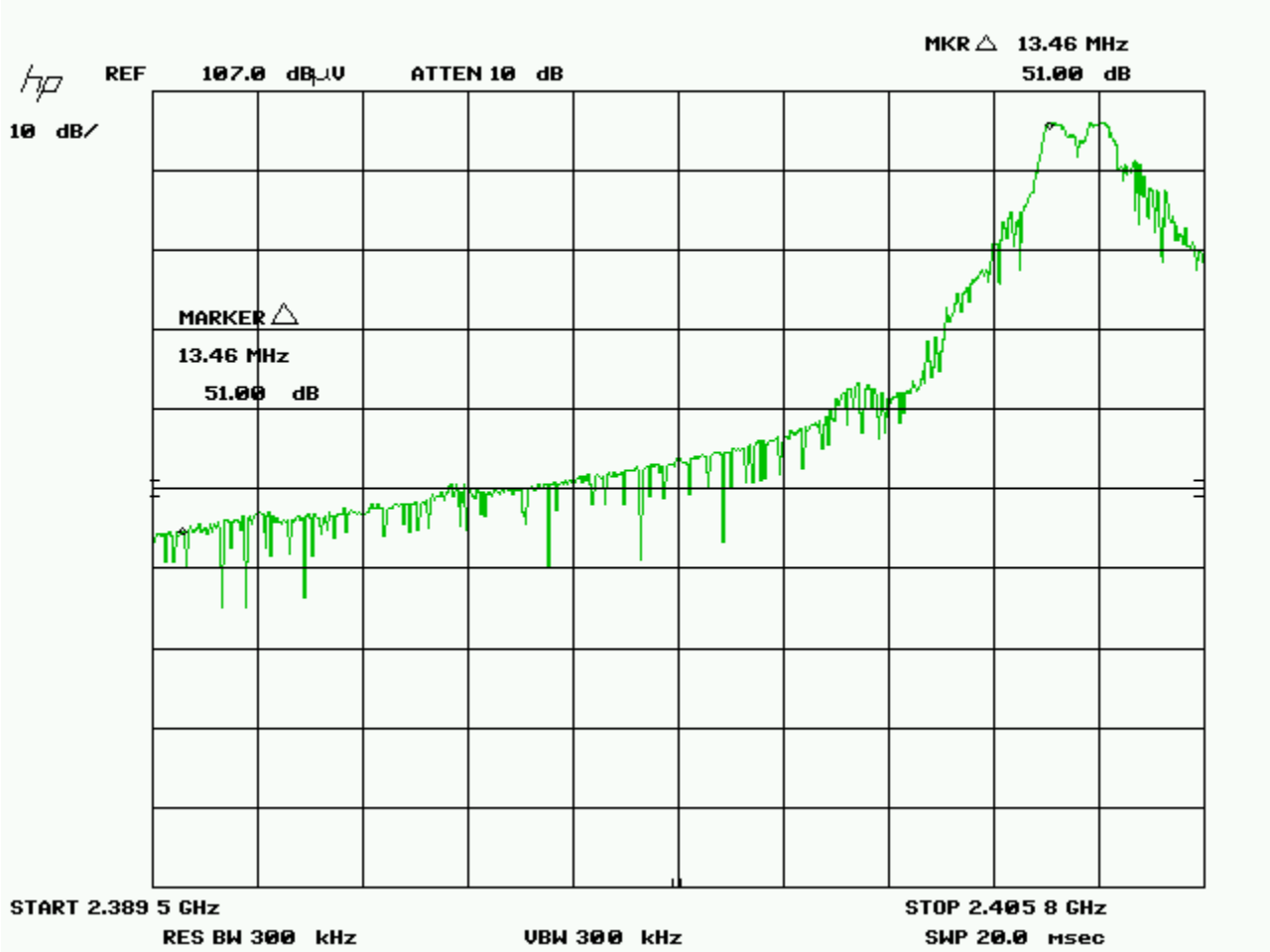
Vertical – Peak Emissions Graph – Hop mode
Receiver
3 GHz – 5.5 GHz



Horizontal – Peak Emissions Graph – Hop mode
Receiver
3 GHz – 5.5 GHz

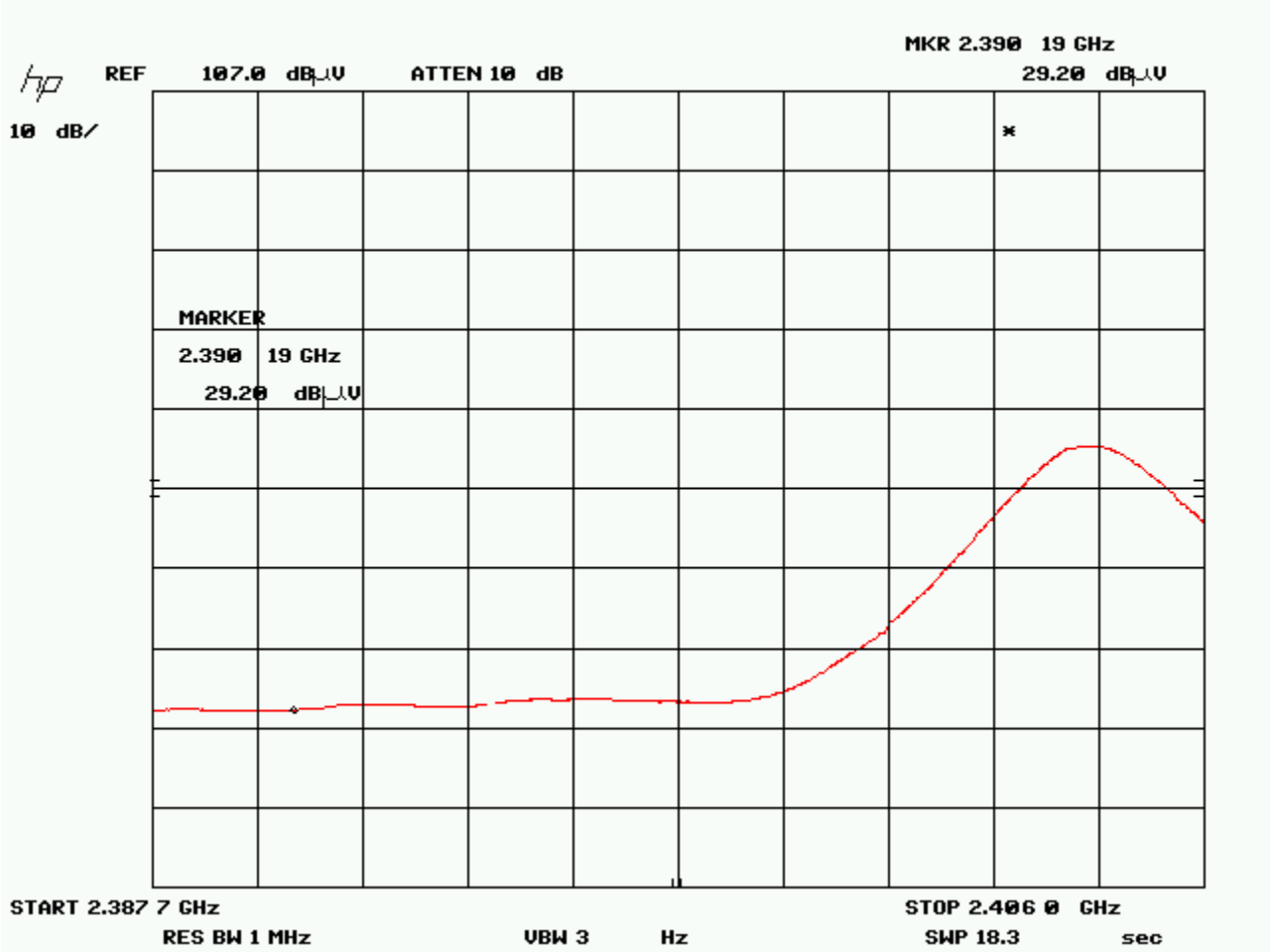


Band Edge
Low Channel Marker Delta
Horz

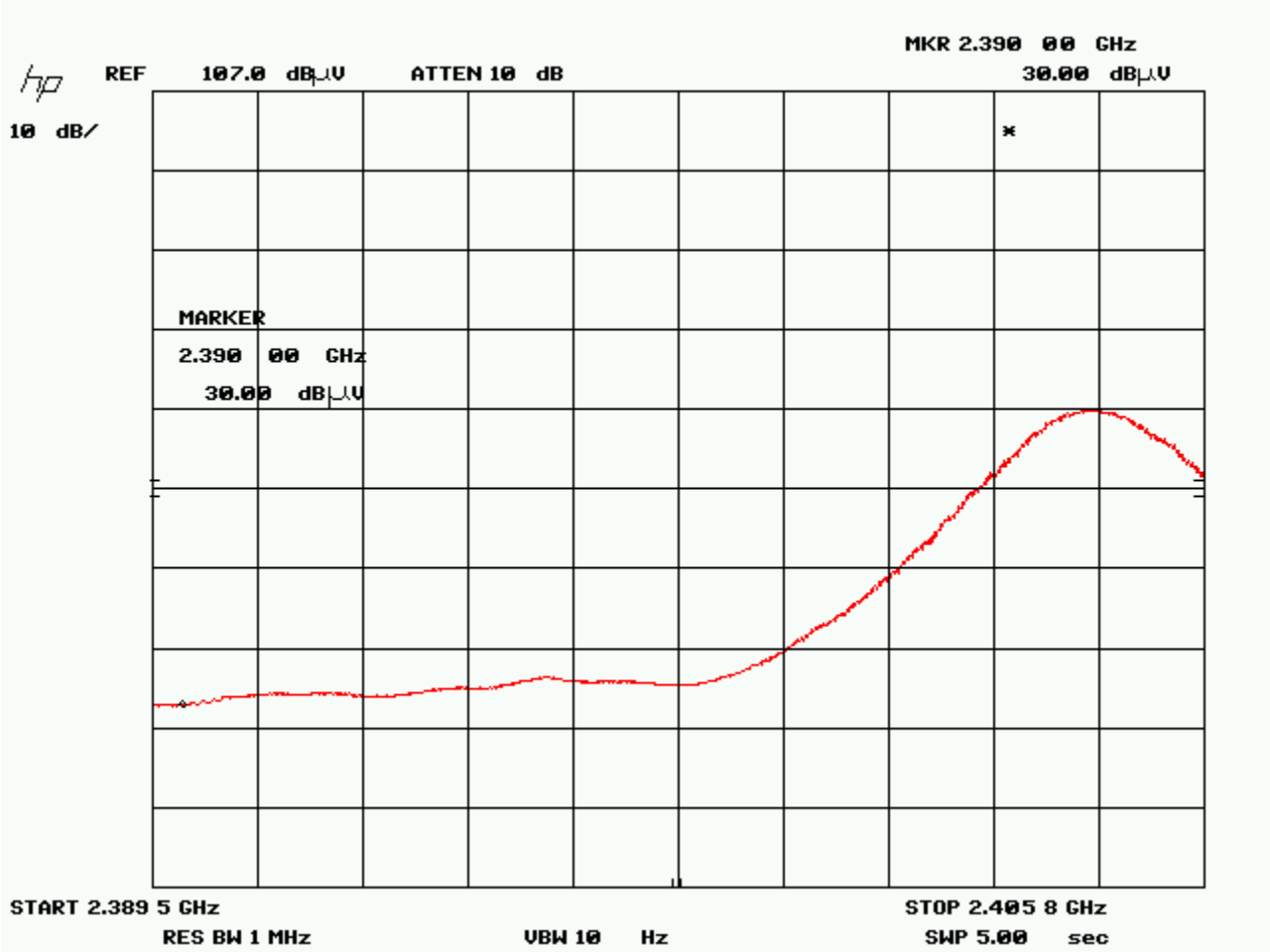


Band Edge
Low Channel
Vert – Peak emissions

Band Edge
Low Channel
Horz –Avg emissions

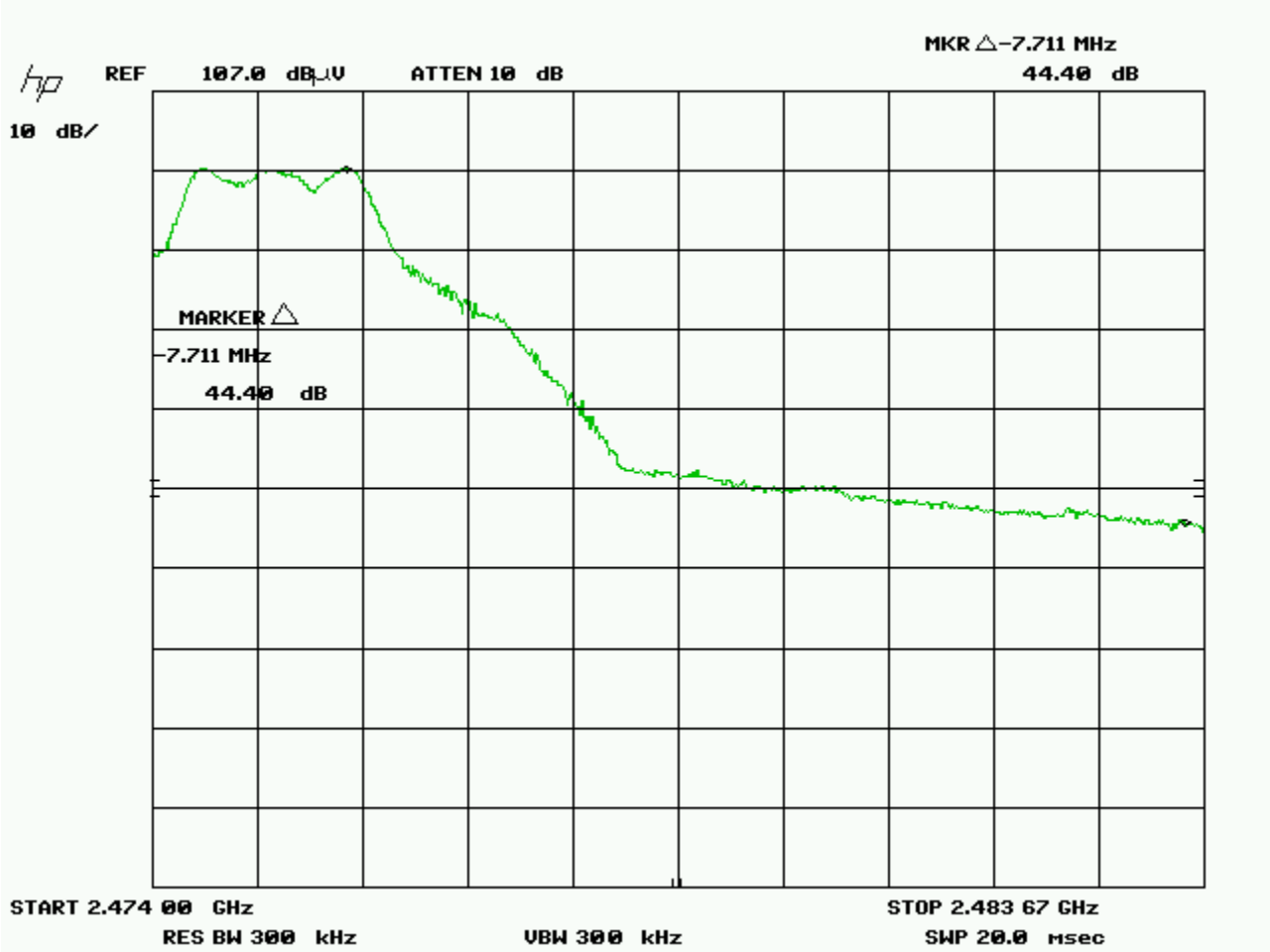


Band Edge
Low Channel
Vert – Avg emissions

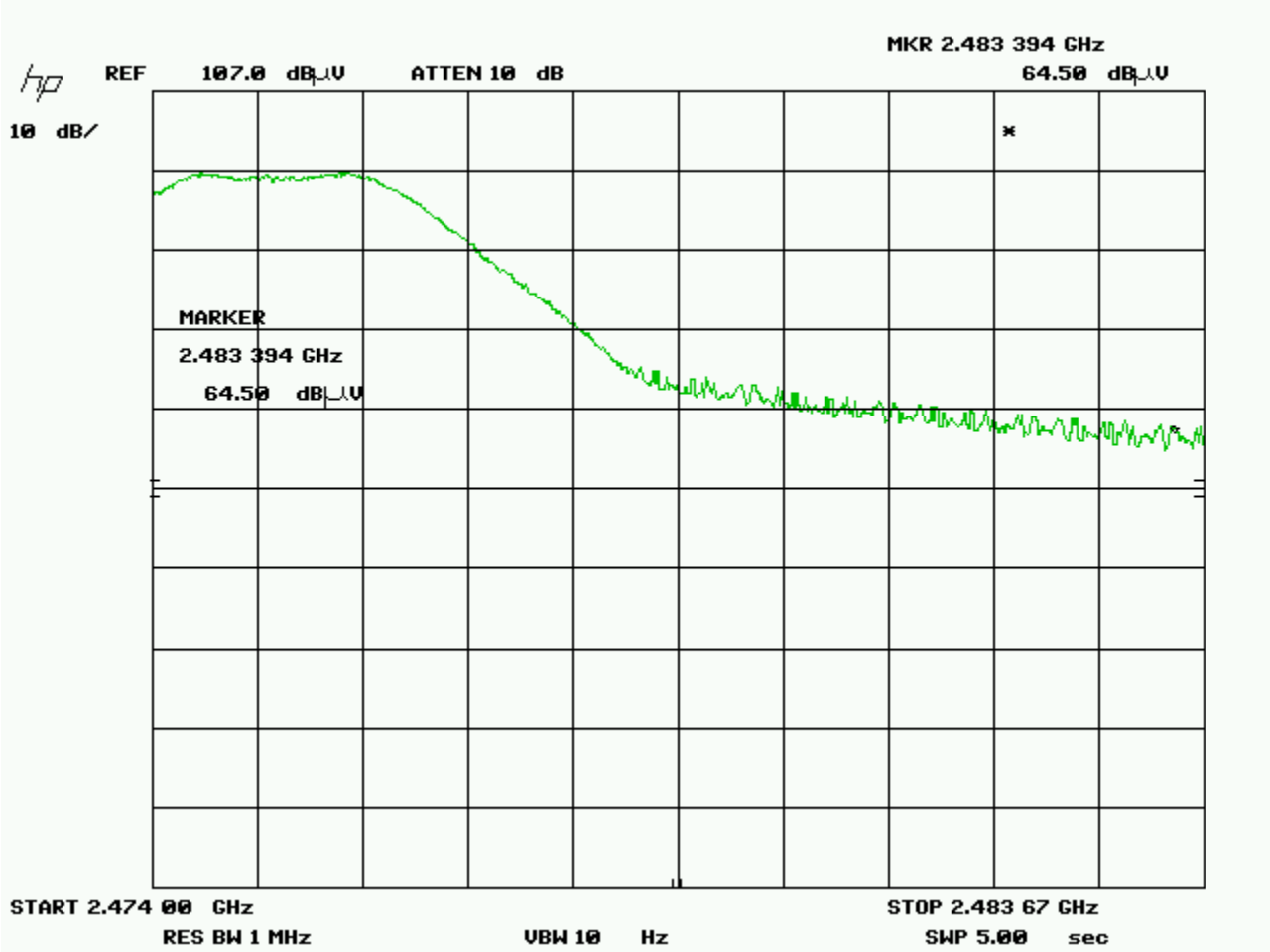


emissions

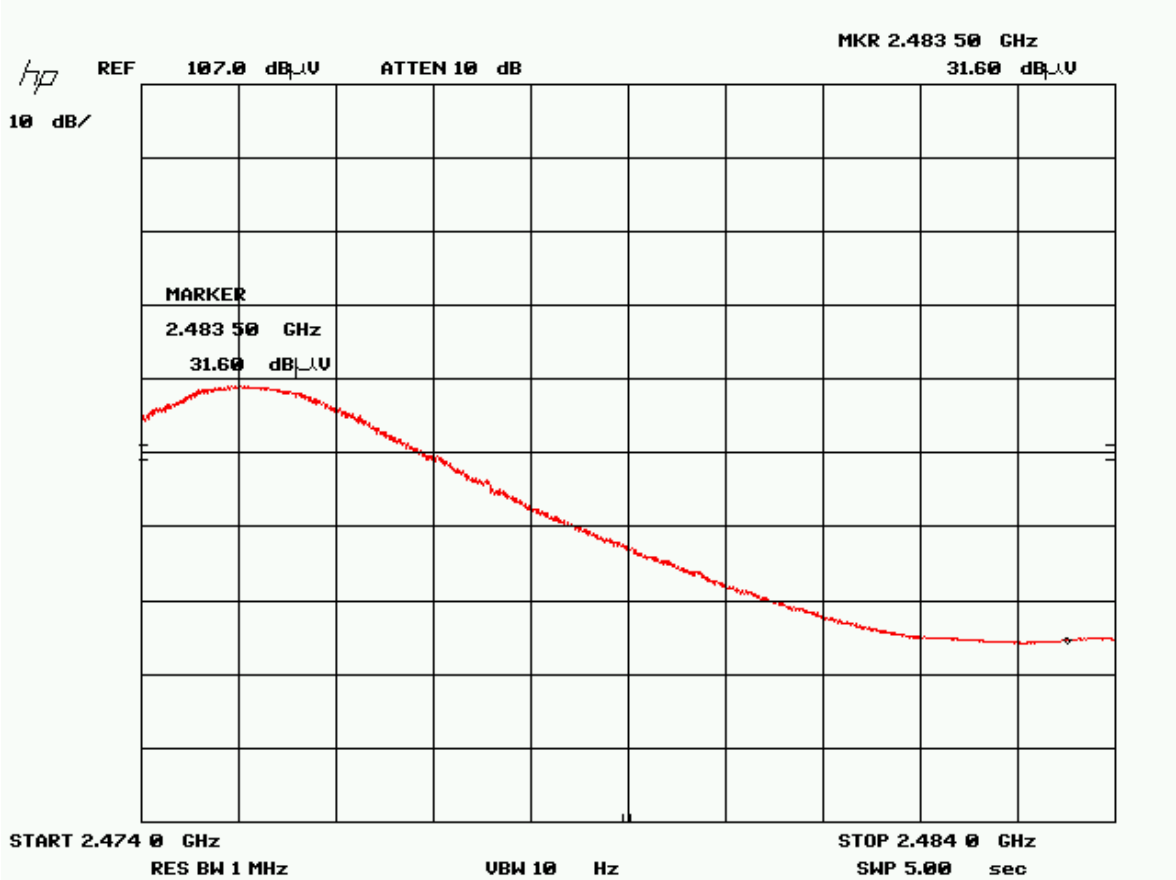
Band Edge
Hi Channel
Horz – Peak emissions Marker Delta



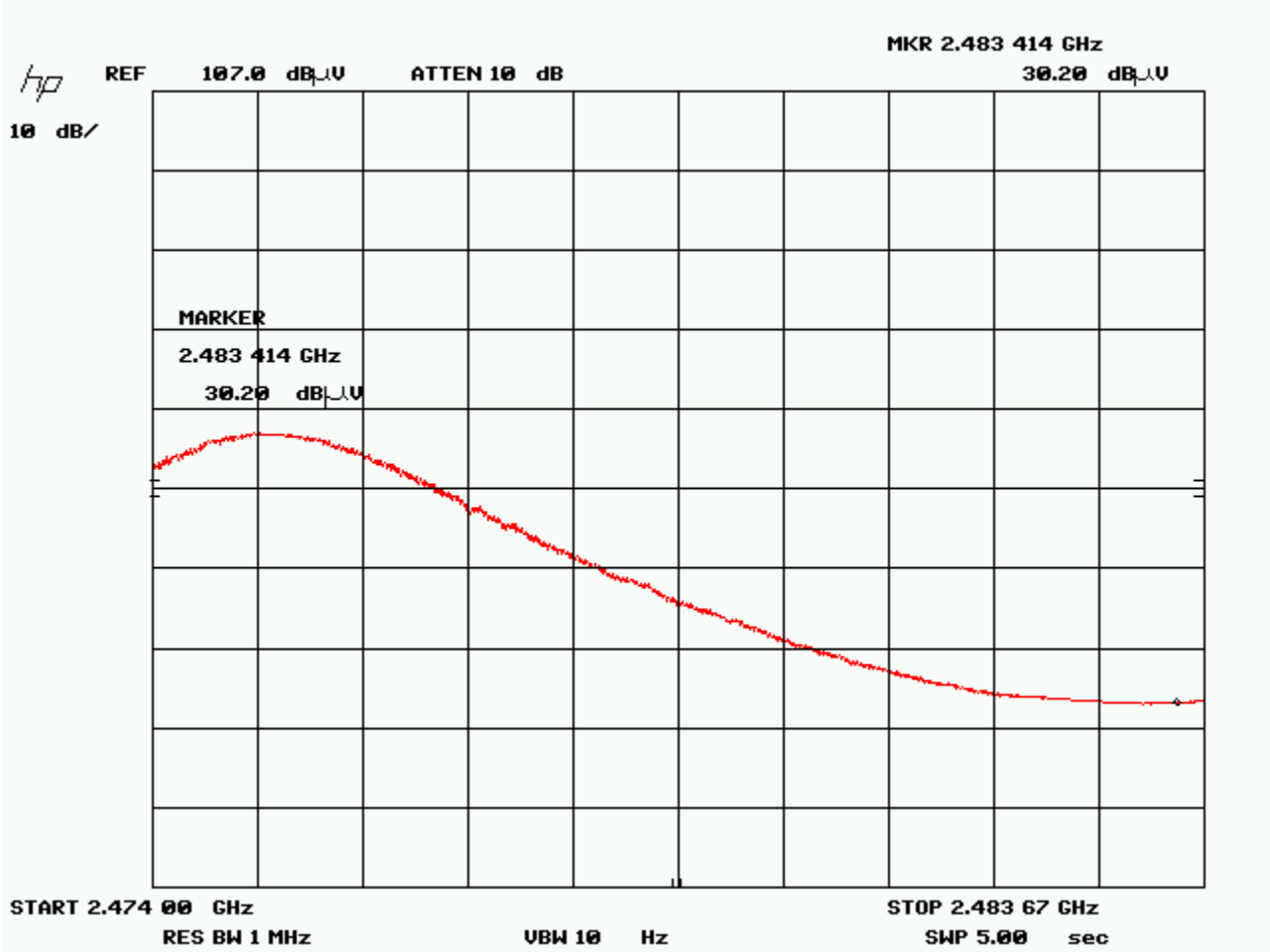
Band Edge
Hi Channel
Vert – Peak emissions Marker Delta



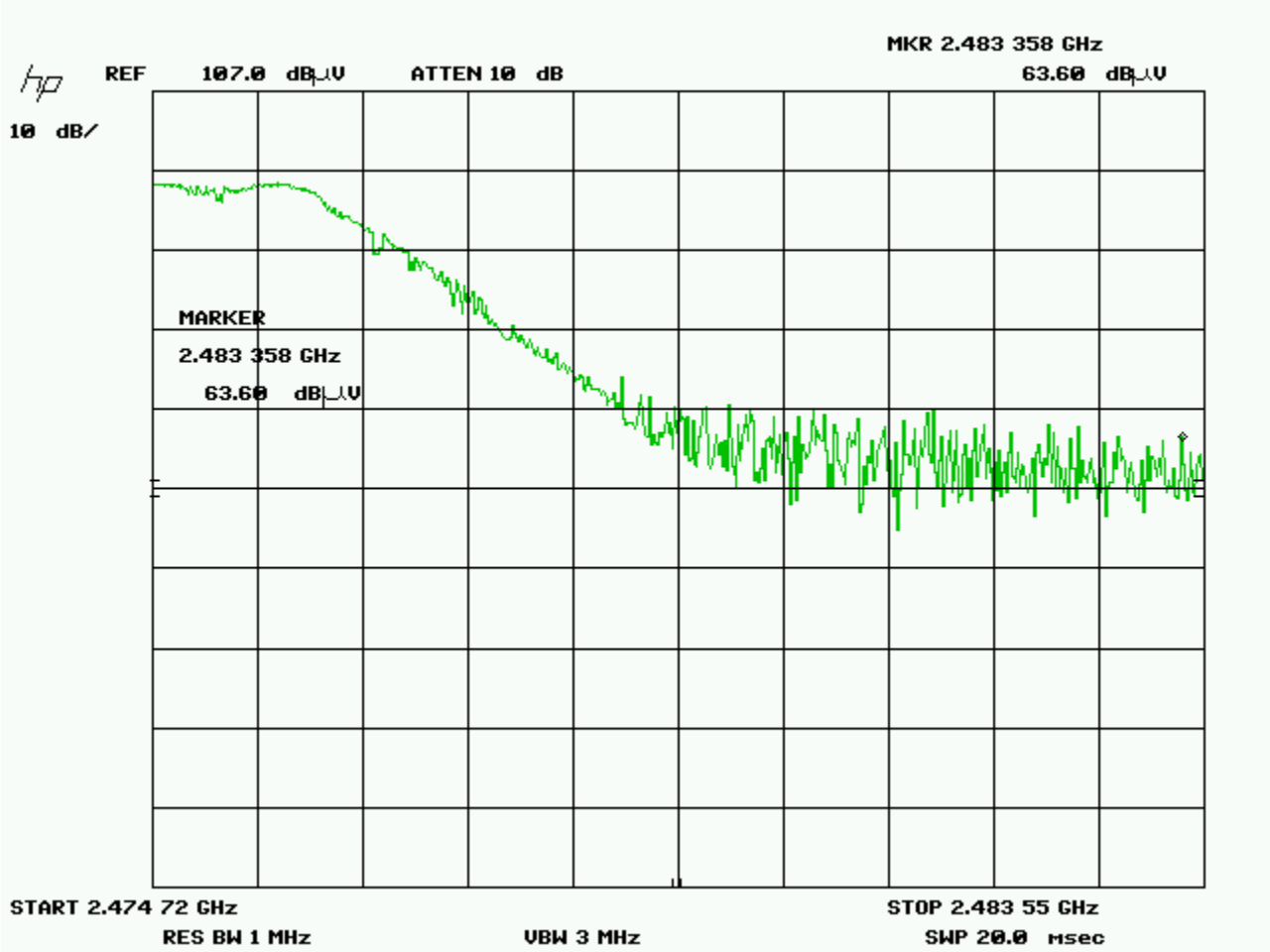
Band Edge
Hi Channel
Horz – Avg emissions



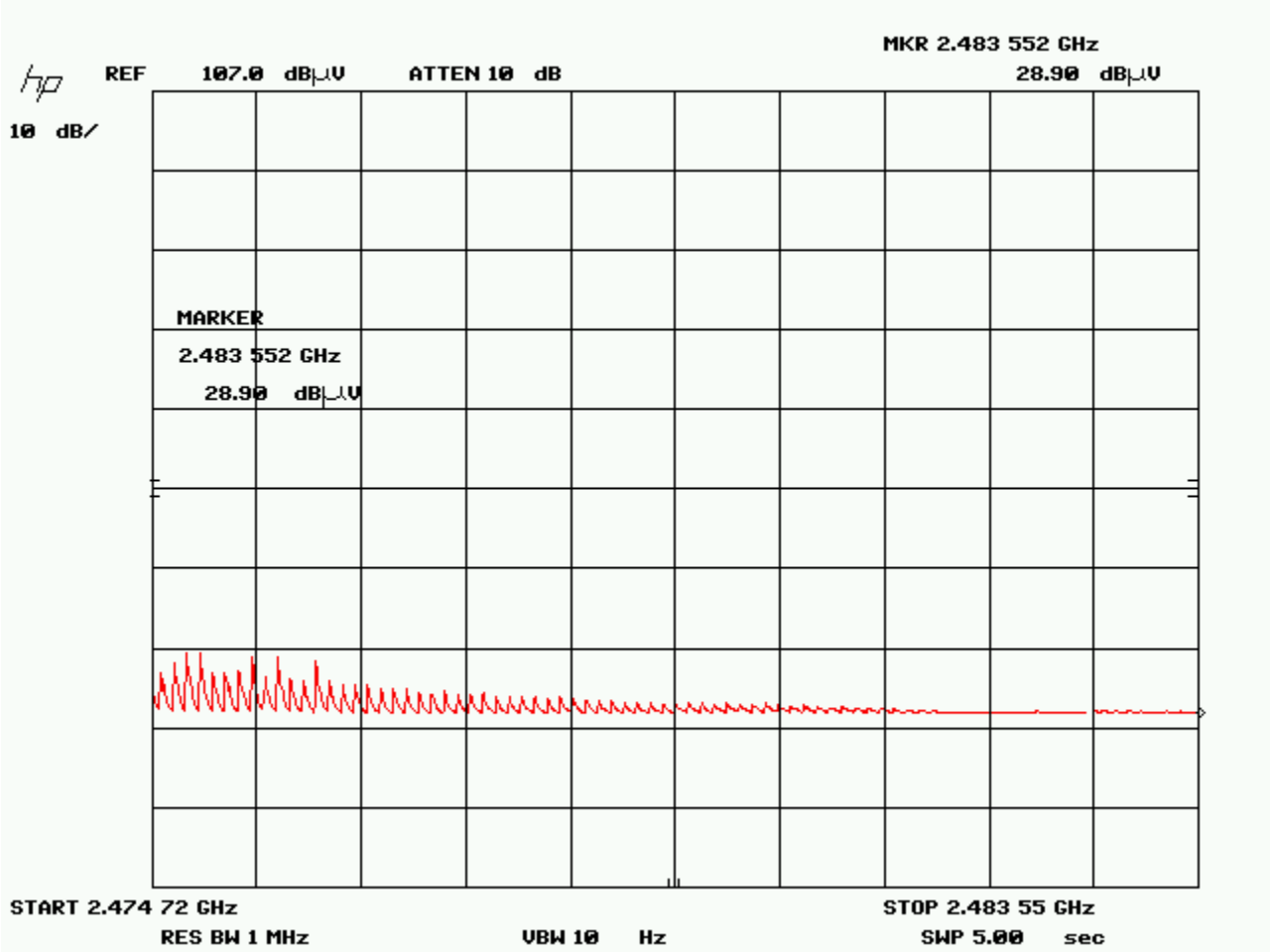
Band Edge
Hi Channel
Vert – Avg emissions



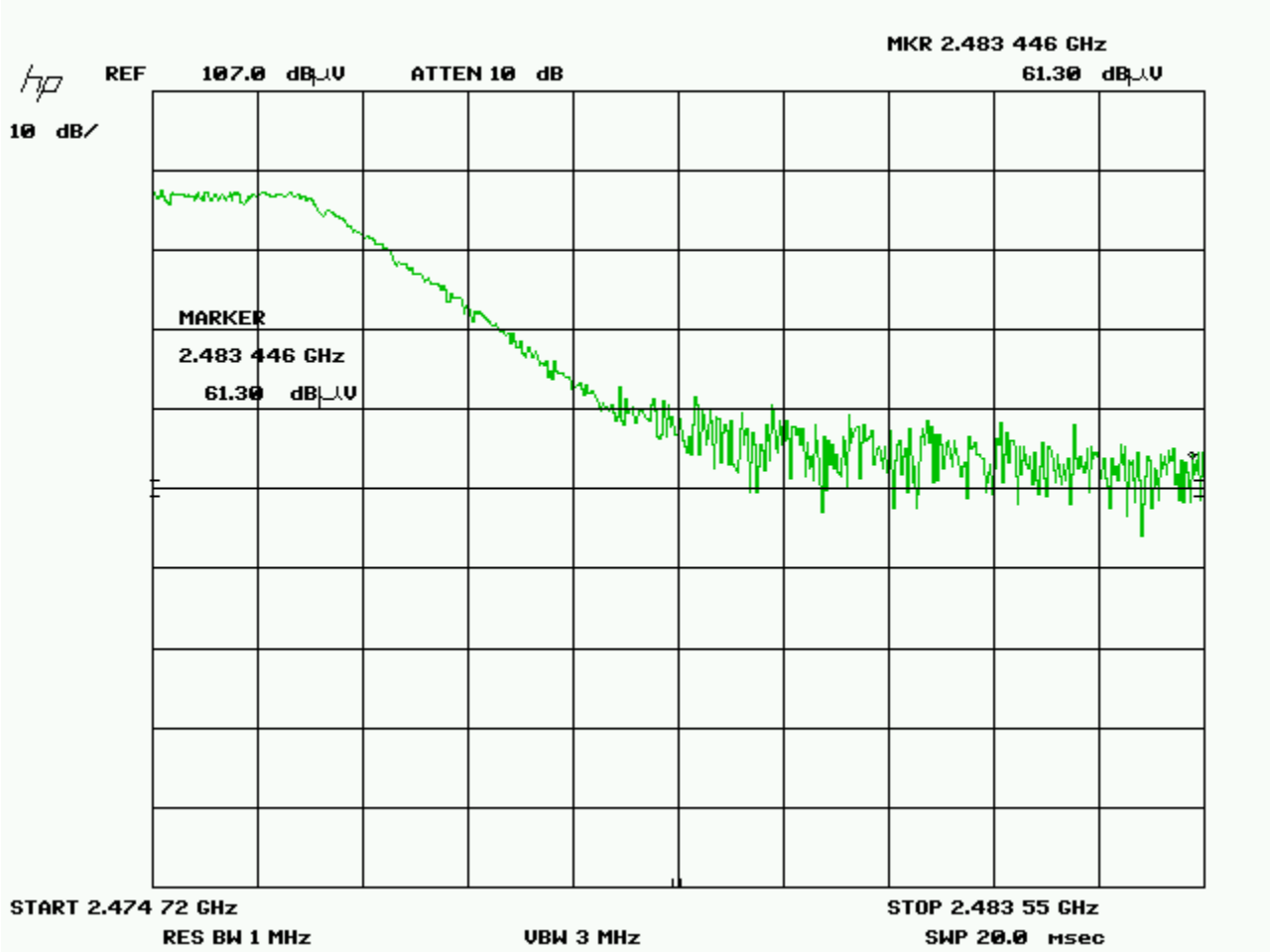
Hi Band Edge
Hopping on
Horz – Peak emissions



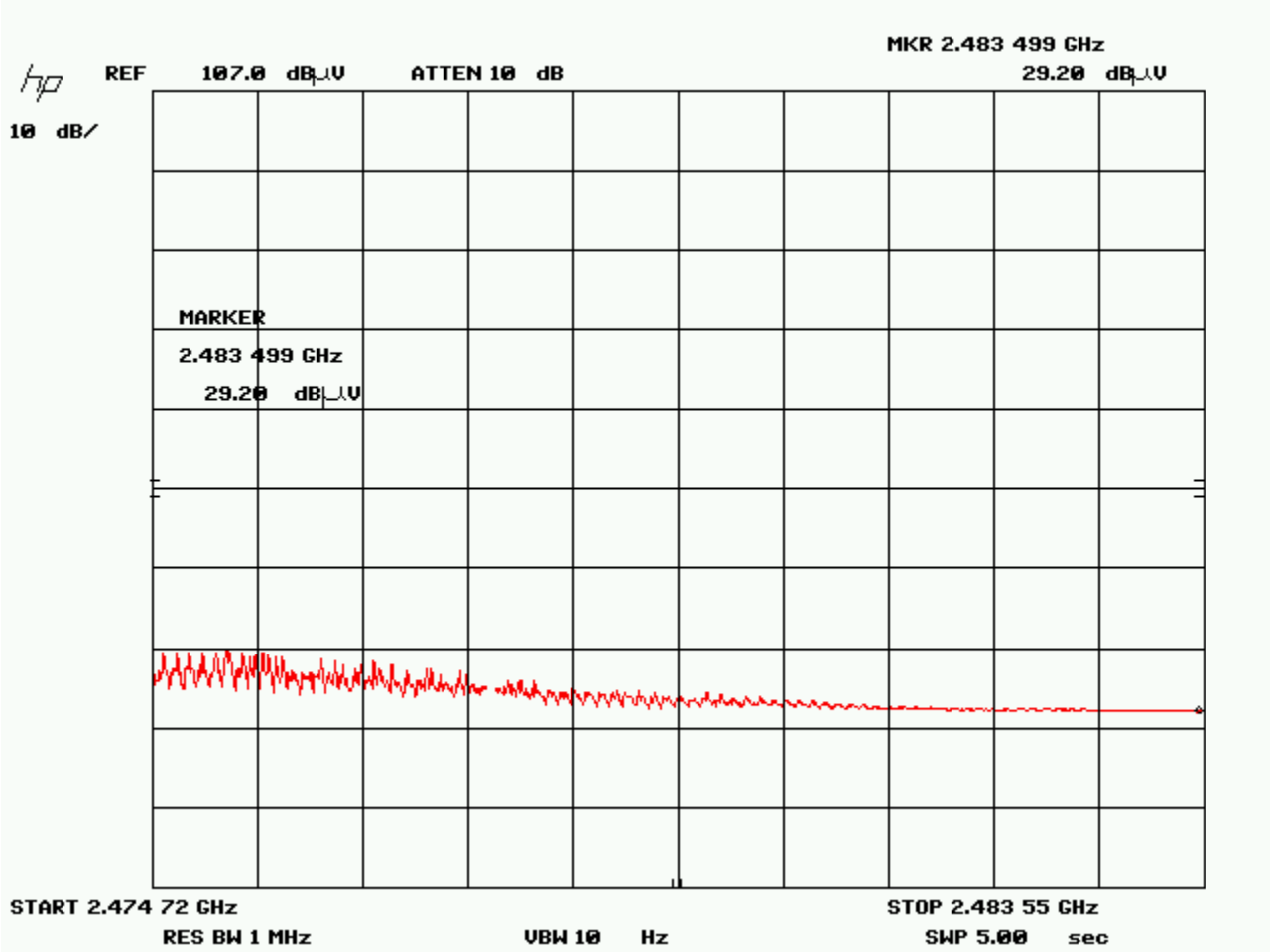
Hi Band Edge
Hopping on
Horz – Avg emissions



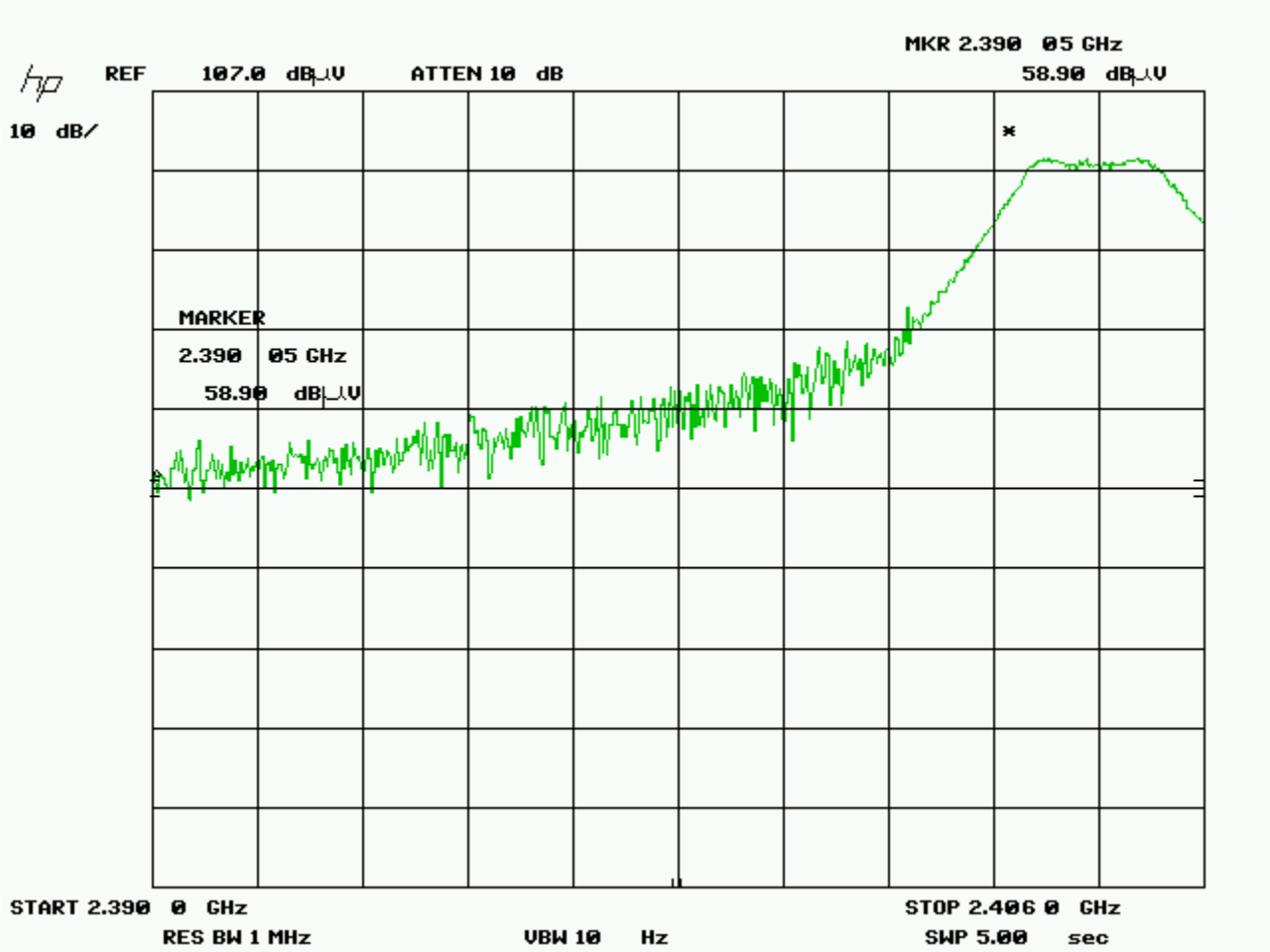
Hi Band Edge
Hopping on
Vert – Peak emissions



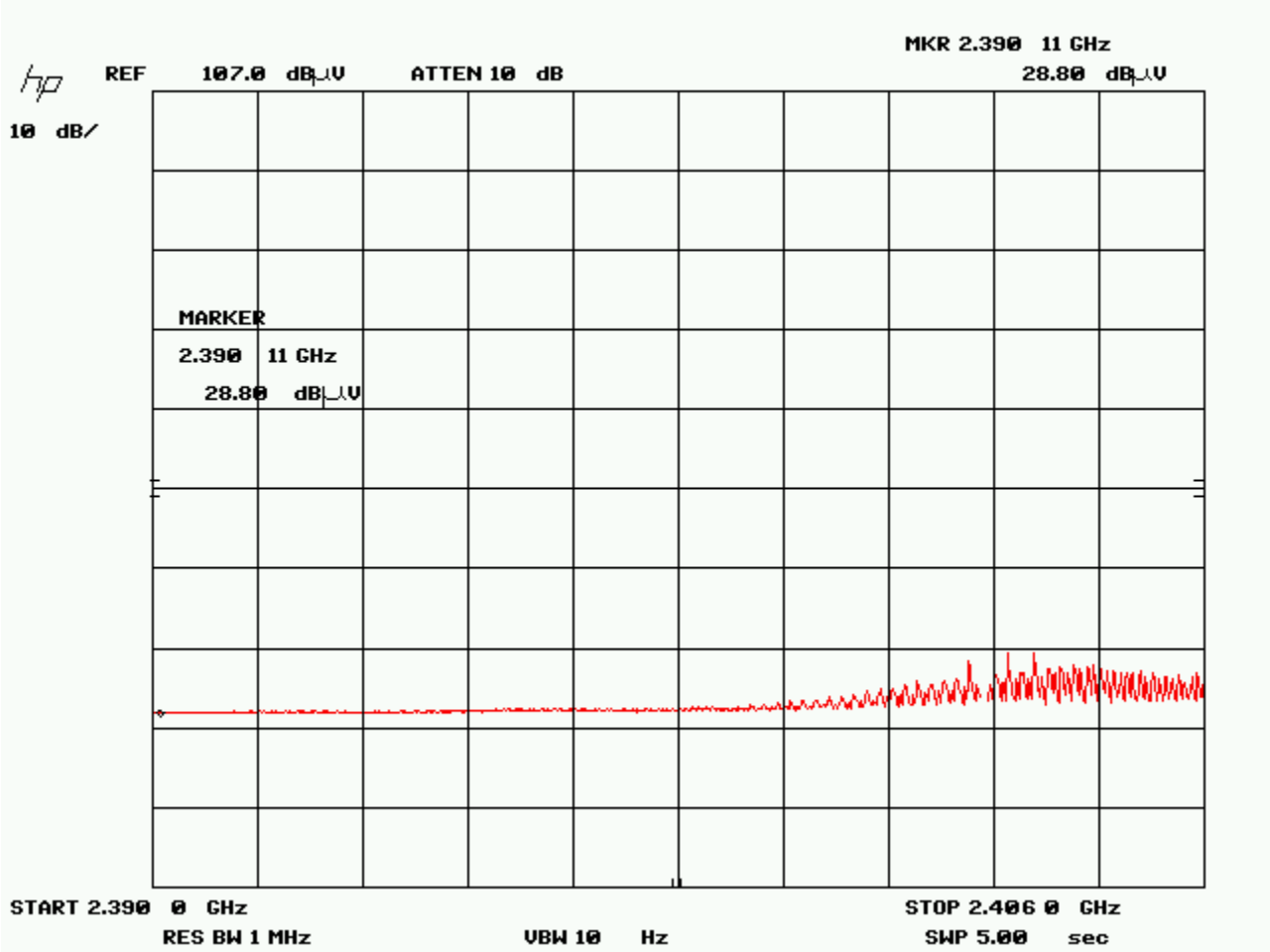
Hi Band Edge
Hopping on
Vert – Avg emissions



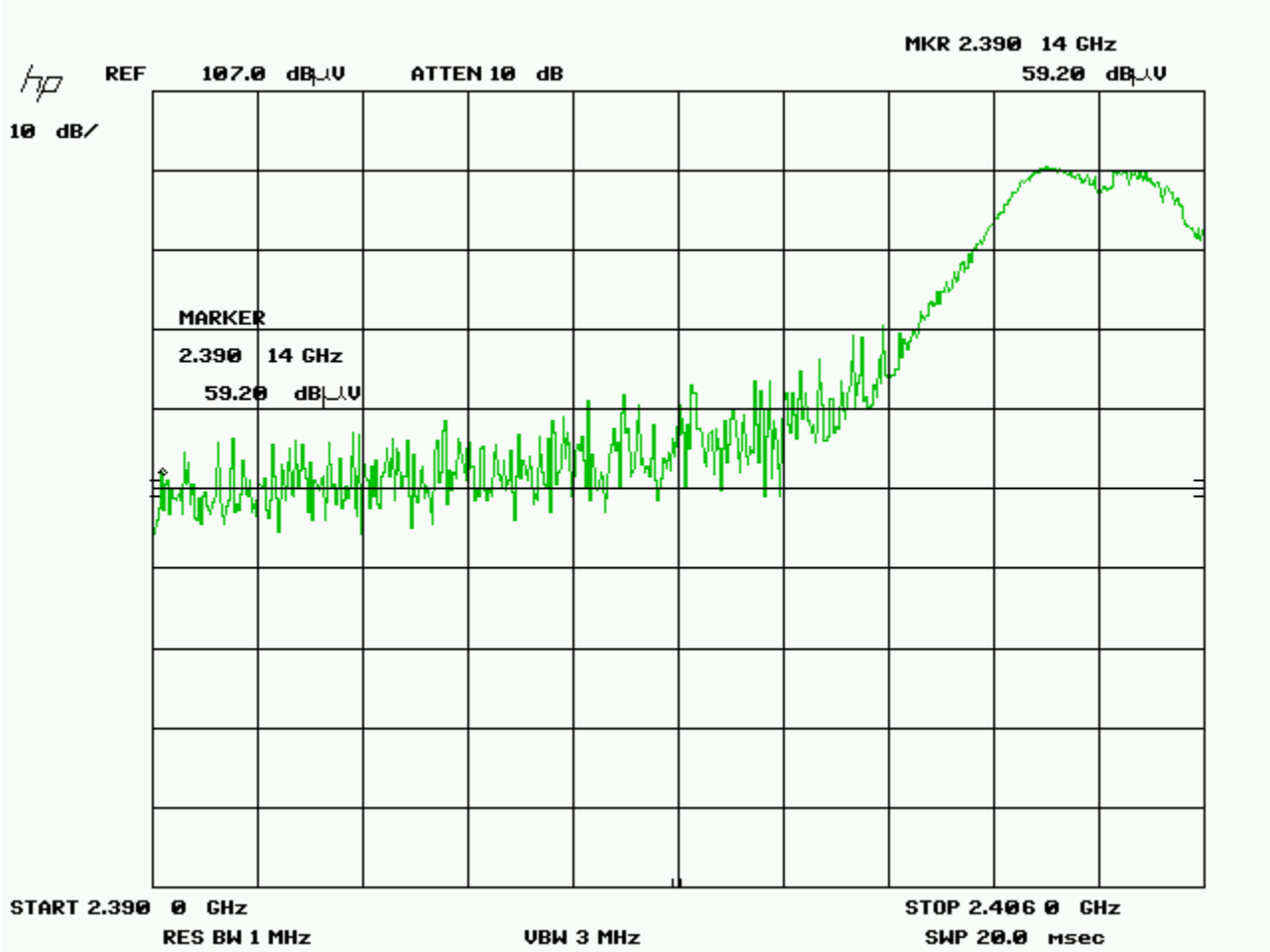
Lo Band Edge
Hopping on
Horz – Peak emissions



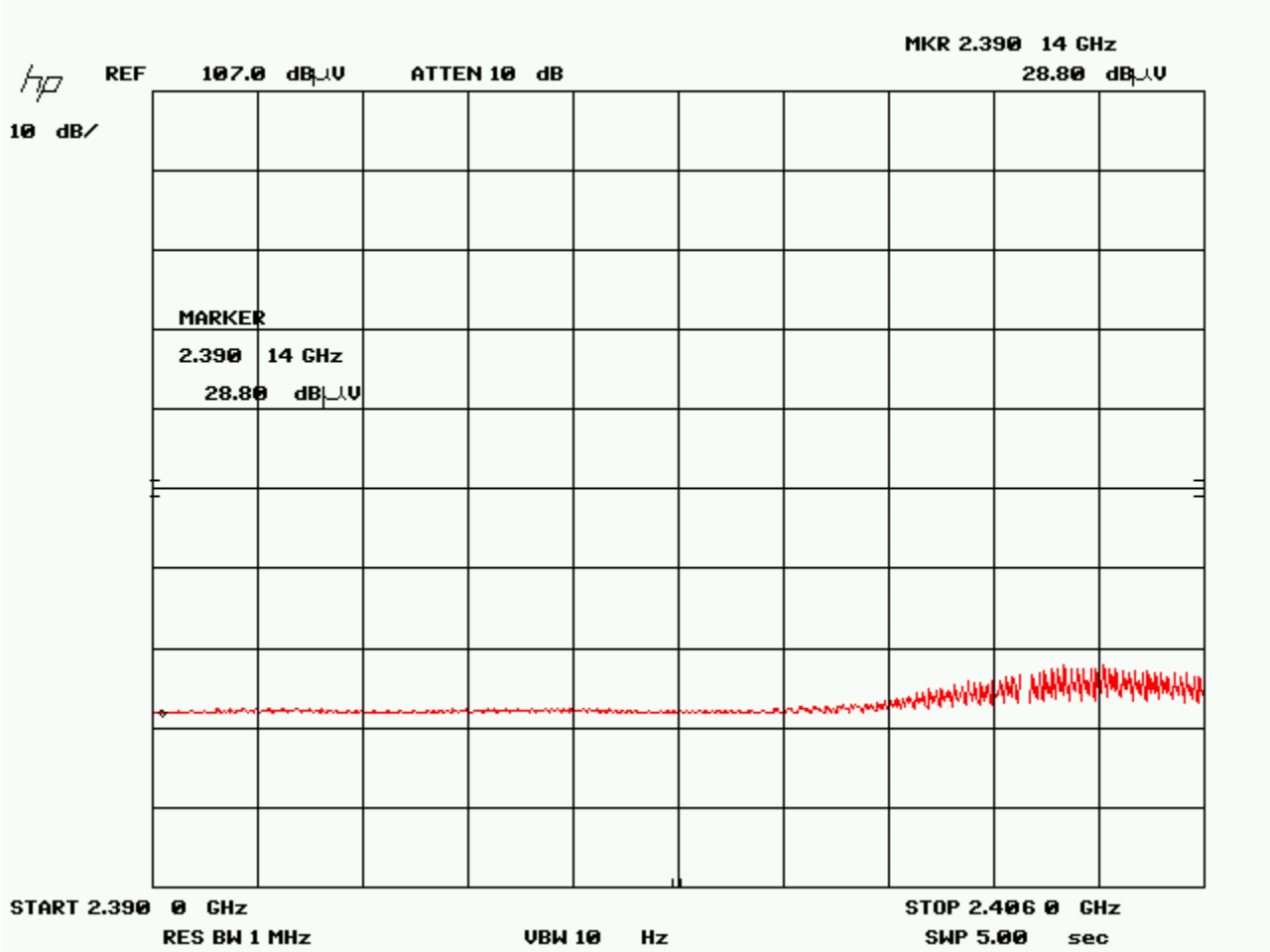
Lo Band Edge
Hopping on
Horz – Avg emissions



Lo Band Edge
Hopping on
Vert – Peak emissions



Lo Band Edge
Hopping on
Vert – Avg emissions



Final Measurements

Note: In accordance with 15.247(d), only radiated emissions exceeding the 15.209 limit that occur within the bands listed in 15.205, need to be verified with a quasi-peak detector or an average detector.

The requirement of -20dBc is verified by the conducted method; please see 'Spurious Antenna Conducted Emissions' section of this report.

For information purposes, the fundamental was measured to be 110.9 dbuV/m at 3 meters, and none of the unintentional radiated emissions that fall outside of the restricted bands exceeded the -20dBc (or 90.9 dbuV/m) requirement.

The following measurements were made at the harmonics shown in the above graphs.

See 'Spurious Antenna Conducted Emissions' measurements for -20 dBc requirements.

All measurements were recorded for Hi, Mid, Lo and Hopping mode on configurations. The worst case plots are shown above.

Client	Sonavox Canada Inc.
Product	770102
Standard(s)	RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Radiated Emissions Measurements

Product category	FCC 15.247 Spurious Radiated Emissions										
Project Name / Number	770120 15.247 TX										
Test Frequency (MHz)	**Detection mode (Q-Peak)**	**Antenna polarity (Horz/Vert)**	**Raw signal dB(µV)**	**Antenna factor dB**	**Cable loss dB + Preselecor**	**Attenuator dB**	**Pre-Amp Gain dB**	**Received signal dB(µV/m)**	**Emission limit dB(µV/m)**	**Margin dB(µV)**	**Result**
Low Channel - EUT Horz											
2404	Peak	Vert	100.4	29.7	4.0	10.0	36.0	108.1			PASS
2390	Peak	Vert	63.6	29.7	4.0	10.0	36.0	71.3	74.0	2.7	PASS
2390	Avg	Vert	30.0	29.7	4.0	10.0	36.0	37.7	54.0	16.3	PASS
2404	Peak	Horz	103.2	29.7	4.0	10.0	36.0	110.9			PASS
2404	Avg	Horz	62.8	29.7	4.0	10.0	36.0	70.5			PASS
2388	Peak	Horz	63.2	29.7	4.0	10.0	36.0	70.9	74.0	3.1	PASS
2388	Avg	Horz	30.0	29.7	4.0	10.0	36.0	37.7	54.0	16.3	PASS
2390	Peak	Horz	52.2	29.7	4.0	10.0	36.0	59.9	74.0	14.1	PASS
2390	Avg	Horz	11.8	29.7	4.0	10.0	36.0	19.5	54.0	34.5	PASS

4806	Peak	Horz	53.2	31.6	4.0	10.0	36.0	62.8	74.0	11.2	PASS
4806	Avg	Horz	32.1	31.6	4.0	10.0	36.0	41.7	54.0	12.3	PASS
4809	Peak	Vert	50.2	31.6	4.0	10.0	36.0	59.8	74.0	14.2	PASS
4809	Avg	Vert	31.2	31.6	4.0	10.0	36.0	40.8	54.0	13.2	PASS
7212	Peak	Horz	52.9	36.0	5.0	10.0	36.0	67.9	74.0	6.1	PASS
7212	Avg	Horz	36.7	36.0	5.0	10.0	36.0	51.7	54.0	2.3	PASS
7212	Peak	Vert	52.2	36.0	5.0	10.0	36.0	67.2	74.0	6.8	PASS
7212	Avg	Vert	36.0	36.0	5.0	10.0	36.0	51.0	54.0	3.0	PASS
Hi Channel - EUT Horz											
2475	Peak	Vert	96.8	29.7	4.0	10.0	36.0	104.5			PASS
2475	Avg	Vert	64.1	29.7	4.0	10.0	36.0	71.8			PASS
2483.5	Peak	Vert	64.5	29.7	4.0	10.0	36.0	72.2	74.0	1.8	PASS
2483.5	Avg	Vert	30.2	29.7	4.0	10.0	36.0	37.9	54.0	16.1	PASS
2475	Peak	Horz	98.6	29.7	4.0	10.0	36.0	106.3			PASS
2475	Avg	Horz	66.0	29.7	4.0	10.0	36.0	73.7			PASS
2485.5	Peak	Horz	63.6	29.7	4.0	10.0	36.0	71.3	74.0	2.7	PASS
2485.5	Avg	Horz	30.4	29.7	4.0	10.0	36.0	38.1	54.0	15.9	PASS
2483.5	Peak	Horz	54.2	29.7	4.0	10.0	36.0	61.9	74.0	12.1	PASS
2483.5	Avg	Horz	21.6	29.7	4.0	10.0	36.0	29.3	54.0	24.7	PASS
4950	Peak	Horz	57.2	31.6	4.0	10.0	36.0	66.8	74.0	7.2	PASS
4950	Avg	Horz	29.1	31.6	4.0	10.0	36.0	38.7	54.0	15.3	PASS
4950	Peak	Vert	59.0	31.6	4.0	10.0	36.0	68.6	74.0	5.4	PASS

4950	Avg	Vert	36.9	31.6	4.0	10.0	36.0	46.5	54.0	7.5	PASS
7423	Peak	Horz	55.6	36.0	5.0	10.0	36.0	70.6	74.0	3.4	PASS
7423	Avg	Horz	35.4	36.0	5.0	10.0	36.0	50.4	54.0	3.6	PASS
7425	Peak	Vert	55.3	36.0	5.0	10.0	36.0	70.3	74.0	3.7	PASS
7425	Avg	Vert	38.0	36.0	5.0	10.0	36.0	53.0	54.0	1.0	PASS
Mid Channel - EUT Horz											
2440	Peak	Vert	98.7	29.7	4.0	10.0	36.0	106.4			PASS
2440	Avg	Vert	66.0	29.7	4.0	10.0	36.0	73.7			PASS
2440	Peak	Horz	96.3	29.7	4.0	10.0	36.0	104.0			PASS
2440	Avg	Horz	59.1	29.7	4.0	10.0	36.0	66.8			PASS
4880	Peak	Horz	54.2	31.6	4.0	10.0	36.0	63.8	74.0	10.2	PASS
4880	Avg	Horz	32.5	31.6	4.0	10.0	36.0	42.1	54.0	11.9	PASS
4880	Peak	Vert	53.4	31.6	4.0	10.0	36.0	63.0	74.0	11.0	PASS
4880	Avg	Vert	35.9	31.6	4.0	10.0	36.0	45.5	54.0	8.5	PASS
7318	Peak	Horz	54.7	36.0	5.0	10.0	36.0	69.7	74.0	4.3	PASS
7318	Avg	Horz	37.5	36.0	5.0	10.0	36.0	52.5	54.0	1.5	PASS
7320	Peak	Vert	54.2	36.0	5.0	10.0	36.0	69.2	74.0	4.8	PASS
7320	Avg	Vert	37.8	36.0	5.0	10.0	36.0	52.8	54.0	1.2	PASS
Hopping on - EUT Horz											
2404	Peak	Vert	97.6	29.7	4.0	10.0	36.0	105.3			PASS
2404	Avg	Vert	35.7	29.7	4.0	10.0	36.0	43.4			PASS
2390	Peak	Vert	59.2	29.7	4.0	10.0	36.0	66.9	74.0	7.1	PASS

2390	Avg	Vert	28.8	29.7	4.0	10.0	36.0	36.5	54.0	17.5	PASS
2404	Peak	Horz	98.6	29.7	4.0	10.0	36.0	106.3			PASS
2404	Avg	Horz	38.1	29.7	4.0	10.0	36.0	45.8			PASS
2390	Peak	Horz	58.9	29.7	4.0	10.0	36.0	66.6	74.0	7.4	PASS
2390	Avg	Horz	28.8	29.7	4.0	10.0	36.0	36.5	54.0	17.5	PASS
2483.5	Peak	Vert	61.3	29.7	4.0	10.0	36.0	69.0	74.0	5.0	PASS
2483.5	Avg	Vert	29.2	29.7	4.0	10.0	36.0	36.9	54.0	17.1	PASS
2483.5	Peak	Horz	63.6	29.7	4.0	10.0	36.0	71.3	74.0	2.7	PASS
2483.5	Avg	Horz	28.9	29.7	4.0	10.0	36.0	36.6	54.0	17.4	PASS
2475	Peak	Vert	94.6	29.7	4.0	10.0	36.0	102.3			PASS
2475	Avg	Vert	35.2	29.7	4.0	10.0	36.0	42.9			PASS
2475	Peak	Horz	95.9	29.7	4.0	10.0	36.0	103.6			PASS
2475	Avg	Horz	34.2	29.7	4.0	10.0	36.0	41.9	54.0	12.1	PASS
4922	Peak	Horz	51.2	31.6	4.0	10.0	36.0	60.8	74.0	13.2	PASS
4931	Avg	Horz	31.2	31.6	4.0	10.0	36.0	40.8	54.0	13.2	PASS
4943	Peak	Vert	53.6	31.6	4.0	10.0	36.0	63.2	74.0	10.8	PASS
4917	Avg	Vert	32.0	31.6	4.0	10.0	36.0	41.6	54.0	12.4	PASS
7366	Peak	Horz	53.4	36.0	5.0	10.0	36.0	68.4	74.0	5.6	PASS
7407	Avg	Horz	32.8	36.0	5.0	10.0	36.0	47.8	54.0	6.2	PASS
7424	Peak	Vert	55.1	36.0	5.0	10.0	36.0	70.1	74.0	3.9	PASS
7222	Avg	Vert	34.0	36.0	5.0	10.0	36.0	49.0	54.0	5.0	PASS
2251	Peak	Vert	50.2	29.7	4.0	10.0	36.0	57.9	74.0	16.1	PASS

2390	Avg	Vert	30.0	29.7	4.0	10.0	36.0	37.7	54.0	16.3	PASS
2251	Peak	Horz	52.1	29.7	4.0	10.0	36.0	59.8	74.0	14.2	PASS
2390	Avg	Horz	28.7	29.7	4.0	10.0	36.0	36.4	54.0	17.6	PASS
Hi Channel - EUT Horz RX Mode											
2475	Peak	Vert	95.3	29.7	4.0	10.0	36.0	103.0			PASS
2475	Avg	Vert	58.2	29.7	4.0	10.0	36.0	65.9			PASS
2483.5	Peak	Vert	61.8	29.7	4.0	10.0	36.0	69.5	74.0	4.5	PASS
2483.5	Avg	Vert	29.0	29.7	4.0	10.0	36.0	36.7	54.0	17.3	PASS
2475	Peak	Horz	96.9	29.7	4.0	10.0	36.0	104.6			PASS
2475	Avg	Horz	59.7	29.7	4.0	10.0	36.0	67.4			PASS
2485.5	Peak	Horz	63.5	29.7	4.0	10.0	36.0	71.2	74.0	2.8	PASS
2485.5	Avg	Horz	29.3	29.7	4.0	10.0	36.0	37.0	54.0	17.0	PASS
2483.5	Peak	Horz	55.2	29.7	4.0	10.0	36.0	62.9	74.0	11.1	PASS
2483.5	Avg	Horz	30.3	29.7	4.0	10.0	36.0	38.0	54.0	16.0	PASS
4948	Peak	Horz	46.6	31.6	4.0	10.0	36.0	56.2	74.0	17.8	PASS
4950	Avg	Horz	31.5	31.6	4.0	10.0	36.0	41.1	54.0	12.9	PASS
4950	Peak	Vert	45.3	31.6	4.0	10.0	36.0	54.9	74.0	19.1	PASS
4950	Avg	Vert	29.3	31.6	4.0	10.0	36.0	38.9	54.0	15.1	PASS
7423	Peak	Vert	54.0	36.0	5.0	10.0	36.0	69.0	74.0	5.0	PASS
7423	Avg	Vert	36.6	36.0	5.0	10.0	36.0	51.6	54.0	2.4	PASS
7425	Peak	Horz	53.0	36.0	5.0	10.0	36.0	68.0	74.0	6.0	PASS
7424	Avg	Horz	36.7	36.0	5.0	10.0	36.0	51.7	54.0	2.3	PASS

Client	Sonavox Canada Inc.
Product	770102
Standard(s)	RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Hopping on - EUT Horz Recv											
2404	Peak	Vert	95.9	29.7	4.0	10.0	36.0	103.6			PASS
2404	Avg	Vert	33.4	29.7	4.0	10.0	36.0	41.1			PASS
2390	Peak	Vert	55.7	29.7	4.0	10.0	36.0	63.4	74.0	10.6	PASS
2390	Avg	Vert	28.7	29.7	4.0	10.0	36.0	36.4	54.0	17.6	PASS
2404	Peak	Horz	96.7	29.7	4.0	10.0	36.0	104.4			PASS
2404	Avg	Horz	34.0	29.7	4.0	10.0	36.0	41.7			PASS
2390	Peak	Horz	58.6	29.7	4.0	10.0	36.0	66.3	74.0	7.7	PASS
2390	Avg	Horz	28.7	29.7	4.0	10.0	36.0	36.4	54.0	17.6	PASS
2483.5	Peak	Vert	62.1	29.7	4.0	10.0	36.0	69.8	74.0	4.2	PASS
2483.5	Avg	Vert	28.8	29.7	4.0	10.0	36.0	36.5	54.0	17.5	PASS
2483.5	Peak	Horz	50.9	29.7	4.0	10.0	36.0	58.6	74.0	15.4	PASS
2483.5	Avg	Horz	29.0	29.7	4.0	10.0	36.0	36.7	54.0	17.3	PASS
4817	Peak	Horz	43.6	31.6	4.0	10.0	36.0	53.2	74.0	20.8	PASS
4817	Avg	Horz	27.6	31.6	4.0	10.0	36.0	37.2	54.0	16.8	PASS
4853	Peak	Vert	44.4	31.6	4.0	10.0	36.0	54.0	74.0	20.0	PASS
4917	Avg	Vert	31.3	31.6	4.0	10.0	36.0	40.9	54.0	13.1	PASS
7411	Peak	Horz	50.5	36.0	5.0	10.0	36.0	65.5	74.0	8.5	PASS
7402	Avg	Horz	35.3	36.0	5.0	10.0	36.0	50.3	54.0	3.7	PASS
7341	Peak	Vert	52.1	36.0	5.0	10.0	36.0	67.1	74.0	6.9	PASS
7330	Avg	Vert	34.3	36.0	5.0	10.0	36.0	49.3	54.0	4.7	PASS
2380	Peak	Vert	50.1	29.7	4.0	10.0	36.0	57.8	74.0	16.2	PASS

2390	Avg	Vert	30.0	29.7	4.0	10.0	36.0	37.7	54.0	16.3	PASS
2251	Peak	Horz	49.0	29.7	4.0	10.0	36.0	56.7	74.0	17.3	PASS
2390	Avg	Horz	32.0	29.7	4.0	10.0	36.0	39.7	54.0	14.3	PASS
Low Channel - EUT Recv Horz											
2404	Peak	Vert	94.1	29.7	4.0	10.0	36.0	101.8			PASS
2404	Avg	Vert	58.3	29.7	4.0	10.0	36.0	66.0			PASS
2390	Peak	Vert	58.4	29.7	4.0	10.0	36.0	66.1	74.0	7.9	PASS
2390	Avg	Vert	29.3	29.7	4.0	10.0	36.0	37.0	54.0	17.0	PASS
2404	Peak	Horz	97.9	29.7	4.0	10.0	36.0	105.6			PASS
2404	Avg	Horz	63.8	29.7	4.0	10.0	36.0	71.5			PASS
2390	Peak	Horz	61.7	29.7	4.0	10.0	36.0	69.4	74.0	4.6	PASS
2390	Avg	Horz	29.0	29.7	4.0	10.0	36.0	36.7	54.0	17.3	PASS
4806	Peak	Horz	44.3	31.6	4.0	10.0	36.0	53.9	74.0	20.1	PASS
4806	Avg	Horz	31.0	31.6	4.0	10.0	36.0	40.6	54.0	13.4	PASS
4809	Peak	Vert	46.1	31.6	4.0	10.0	36.0	55.7	74.0	18.3	PASS
4806	Avg	Vert	33.0	31.6	4.0	10.0	36.0	42.6	54.0	11.4	PASS
7210	Peak	Horz	50.5	36.0	5.0	10.0	36.0	65.5	74.0	8.5	PASS
7210	Avg	Horz	35.0	36.0	5.0	10.0	36.0	50.0	54.0	4.0	PASS
7212	Peak	Vert	50.4	36.0	5.0	10.0	36.0	65.4	74.0	8.6	PASS
7212	Avg	Vert	33.3	36.0	5.0	10.0	36.0	48.3	54.0	5.7	PASS

Note: No emissions above the 3rd harmonic were detected.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
BiLog Antenna	3142-C	ETS	2006-08-06	2008-12-06	GEMC 8
Horn Antenna	6878/24	Q-Par	On file	2008-12-01	GEMC 65
1-26G pre-amp	HP 8449B	HP	On file	2008-12-01	GEMC 68
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Pre-Amplifier	PA-2.5-26	Vican	2006-09-12	2008-12-12	GEMC 9
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev2.doc"

Channel Carrier Separation for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	25 kHz or 20 dB BW[1]	25 kHz or 20 dB BW[1]	25 kHz or 20 dB BW[1]
< 125 mW	25 kHz or 20 dB BW[1]	25 kHz or 2/3 of 20 dB BW[1]	25 kHz or 20 dB BW[1]

Note

1. The unit has a maximum power output of 35 mW. Hence the 2/3 of 20 db bandwidth applies to it.
2. The 20 dB BW of the system was measured to be 3.17 MHz, so a limit of 2/3 x 3.17 MHz = 2.11 MHz applies.

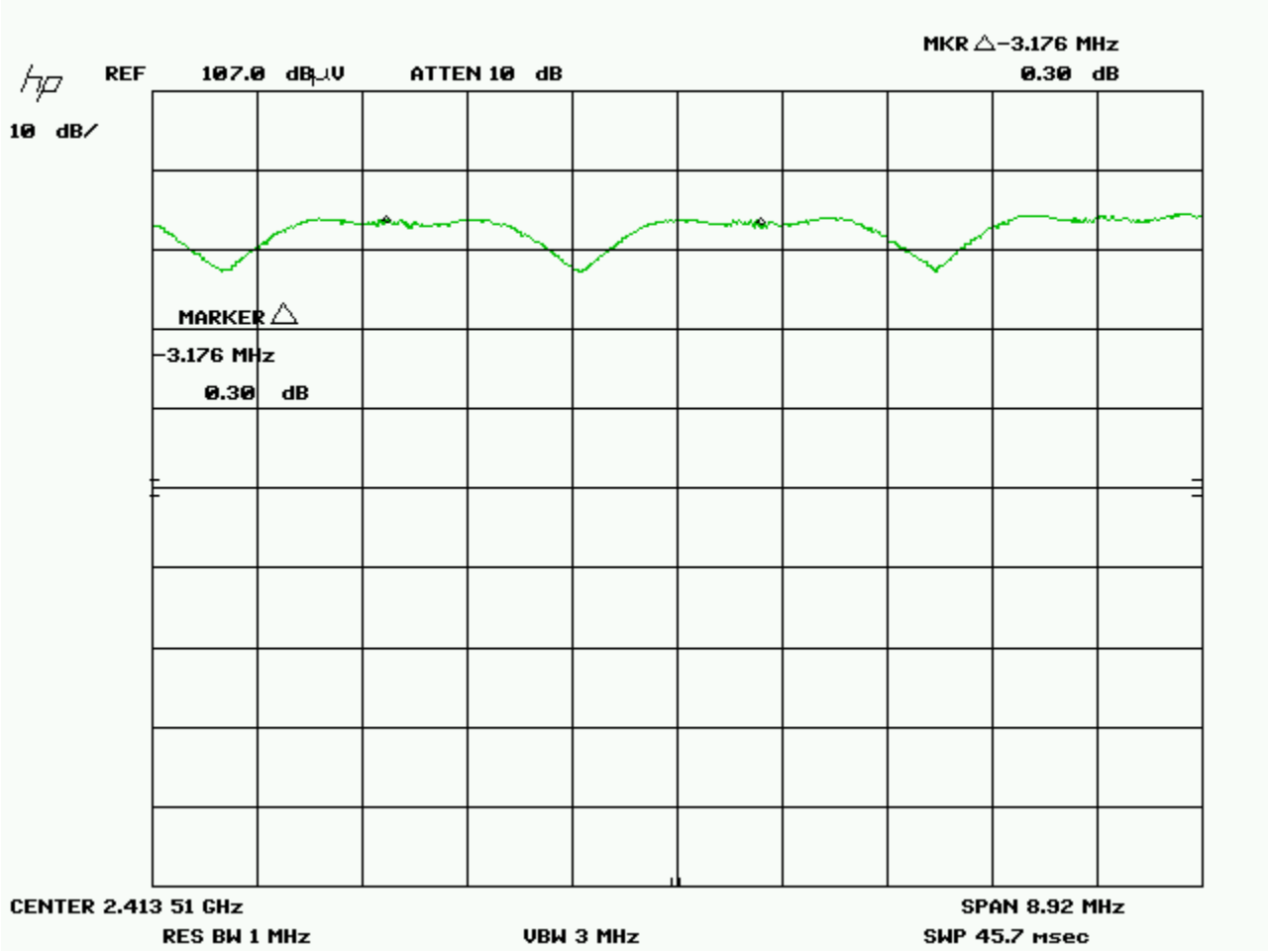
Results

The EUT passed the requirements of channel carrier spacing exceeding the measured 2/3 x 20 dB BW of the EUT. The 2/3 x 20 dB BW measured was 2.11 MHz, and the device had a channel spacing of 3.033 MHz.

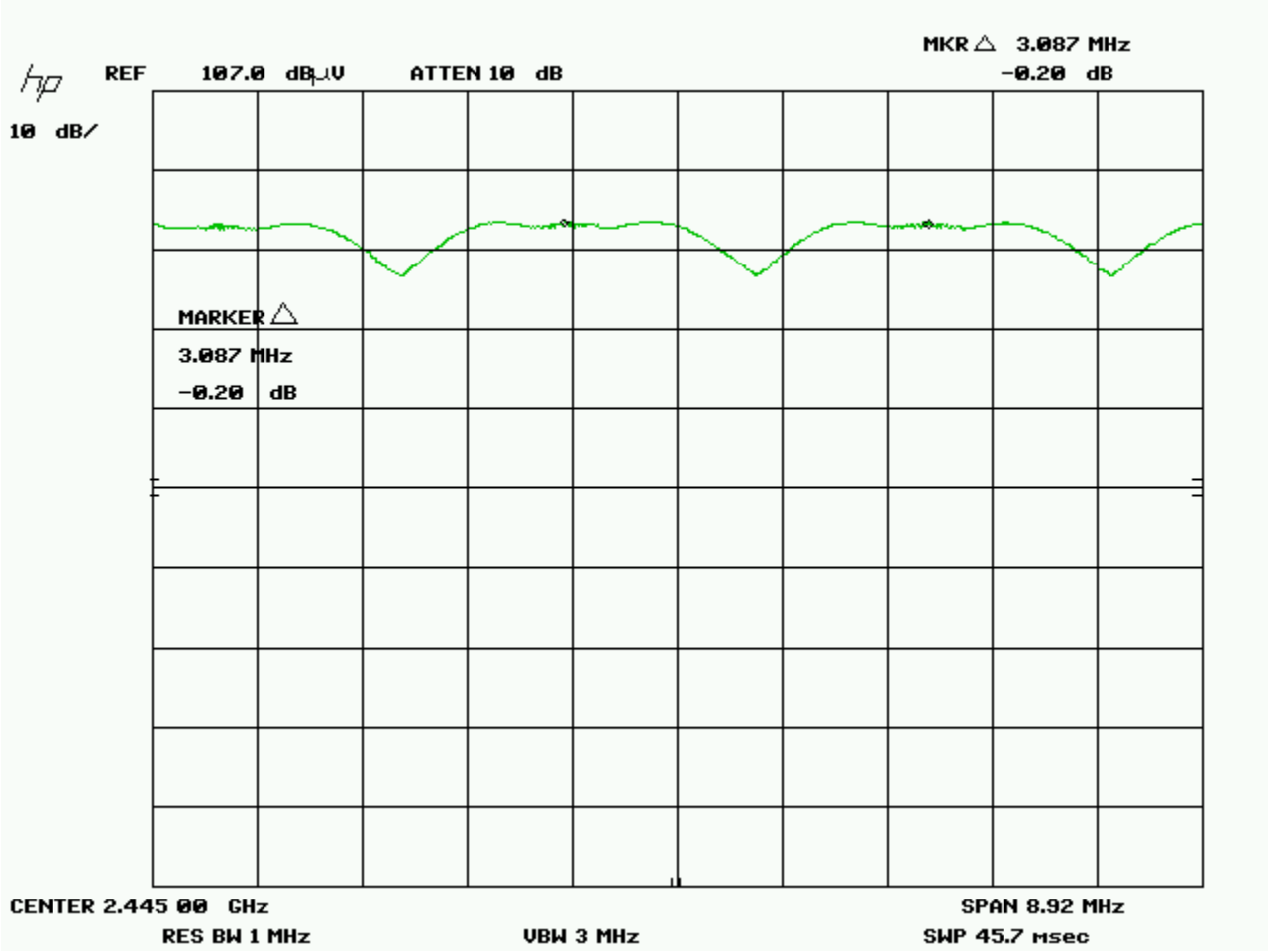
Graph(s)

The graphs below show the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the channel spacing of the signal being measured. This measurement is a peak measurement.

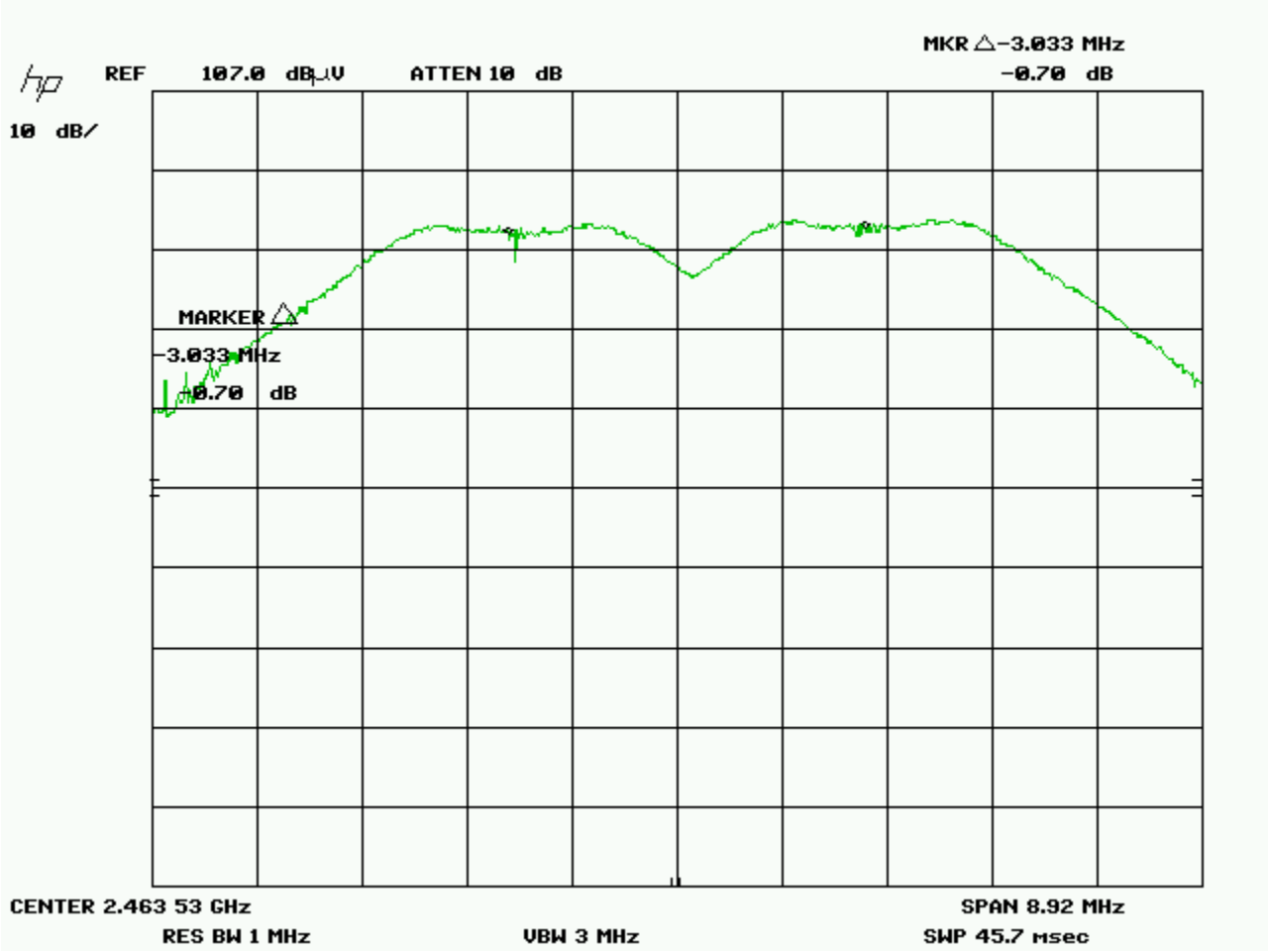
Low Channel



Mid Channel



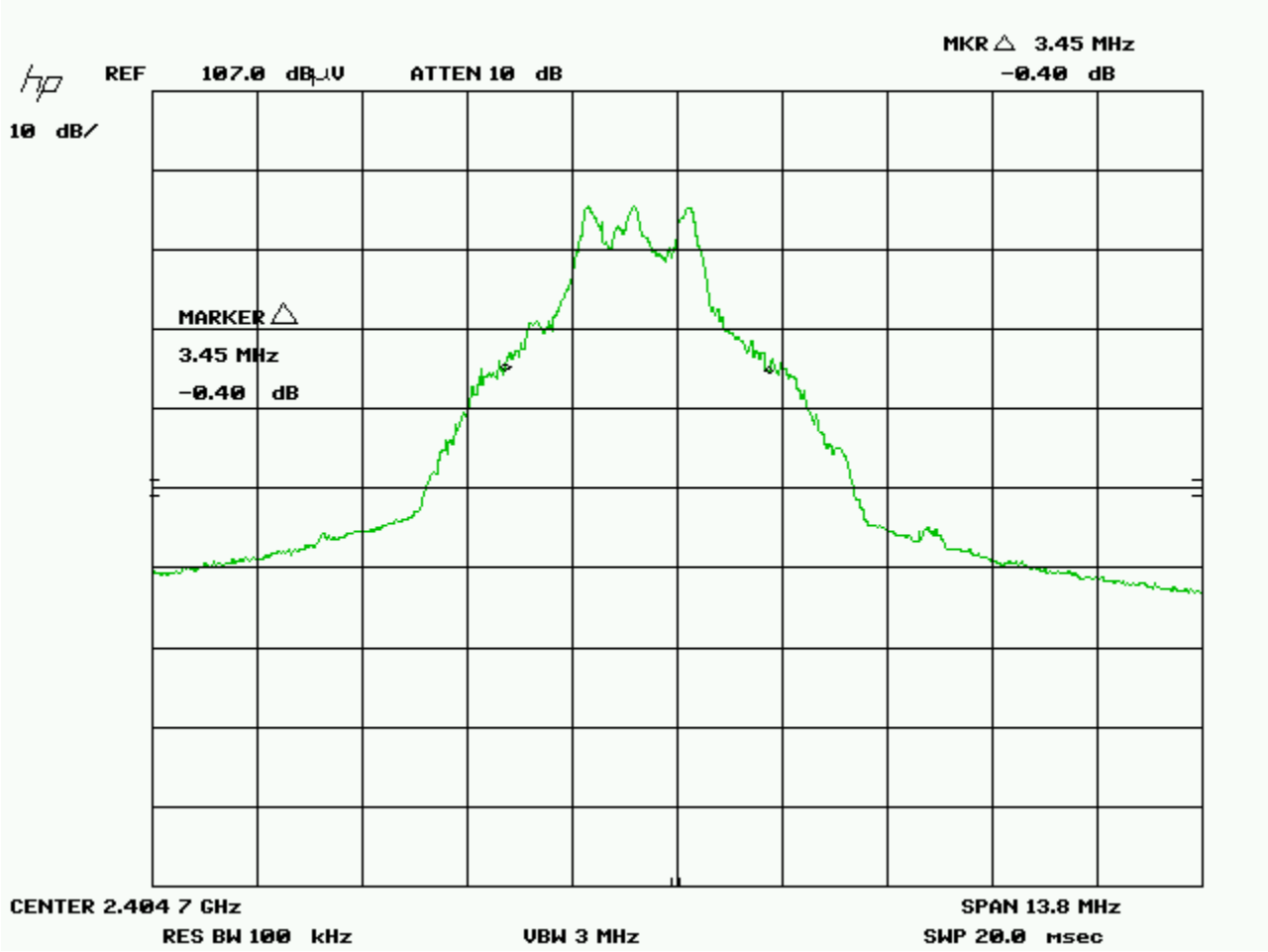
High Channel



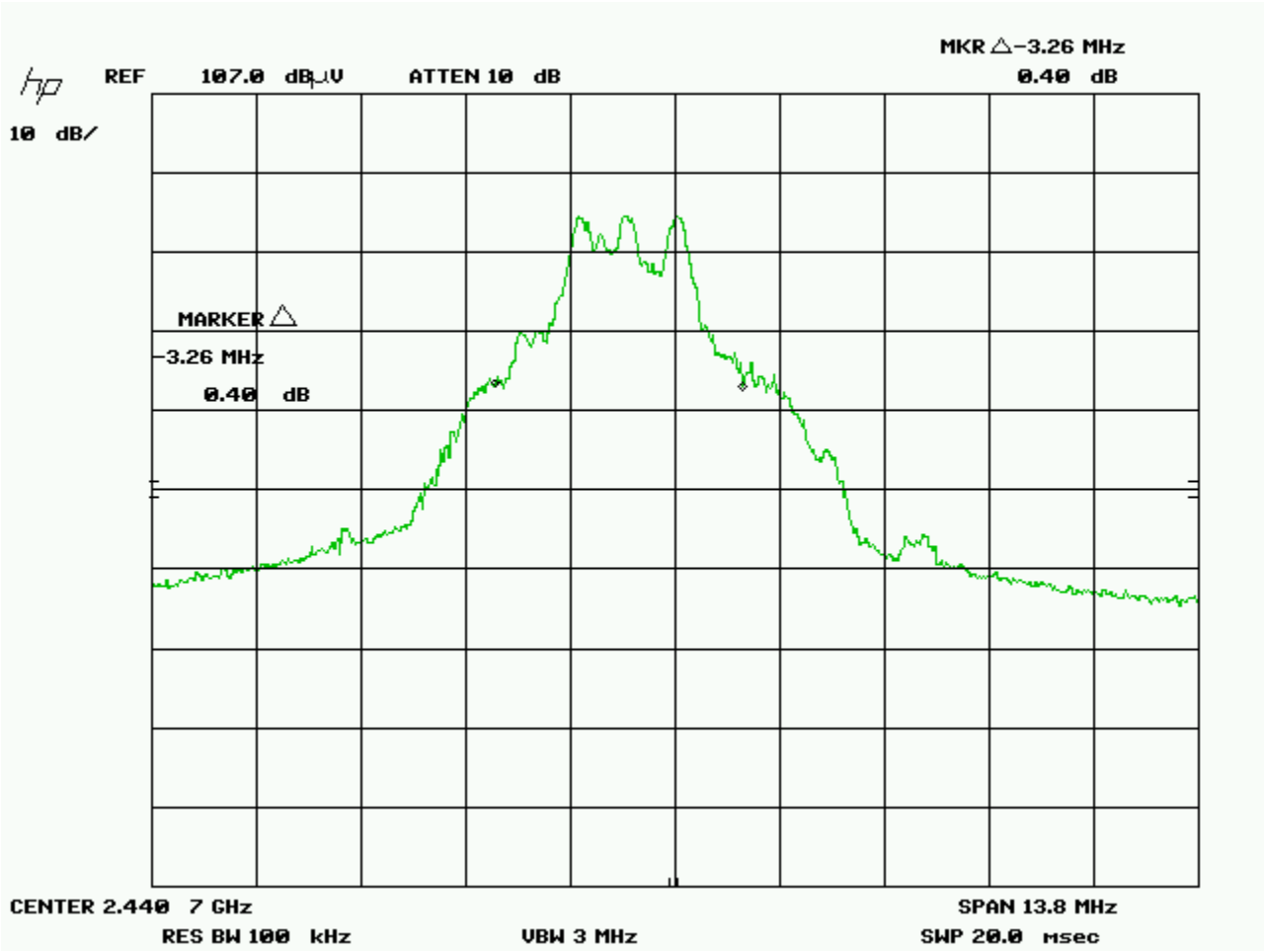
Note:

1. See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.
2. A plot of 20db BW is also attached below. This is to illustrate the measured 20 db BW at Low, Medium and High channels.

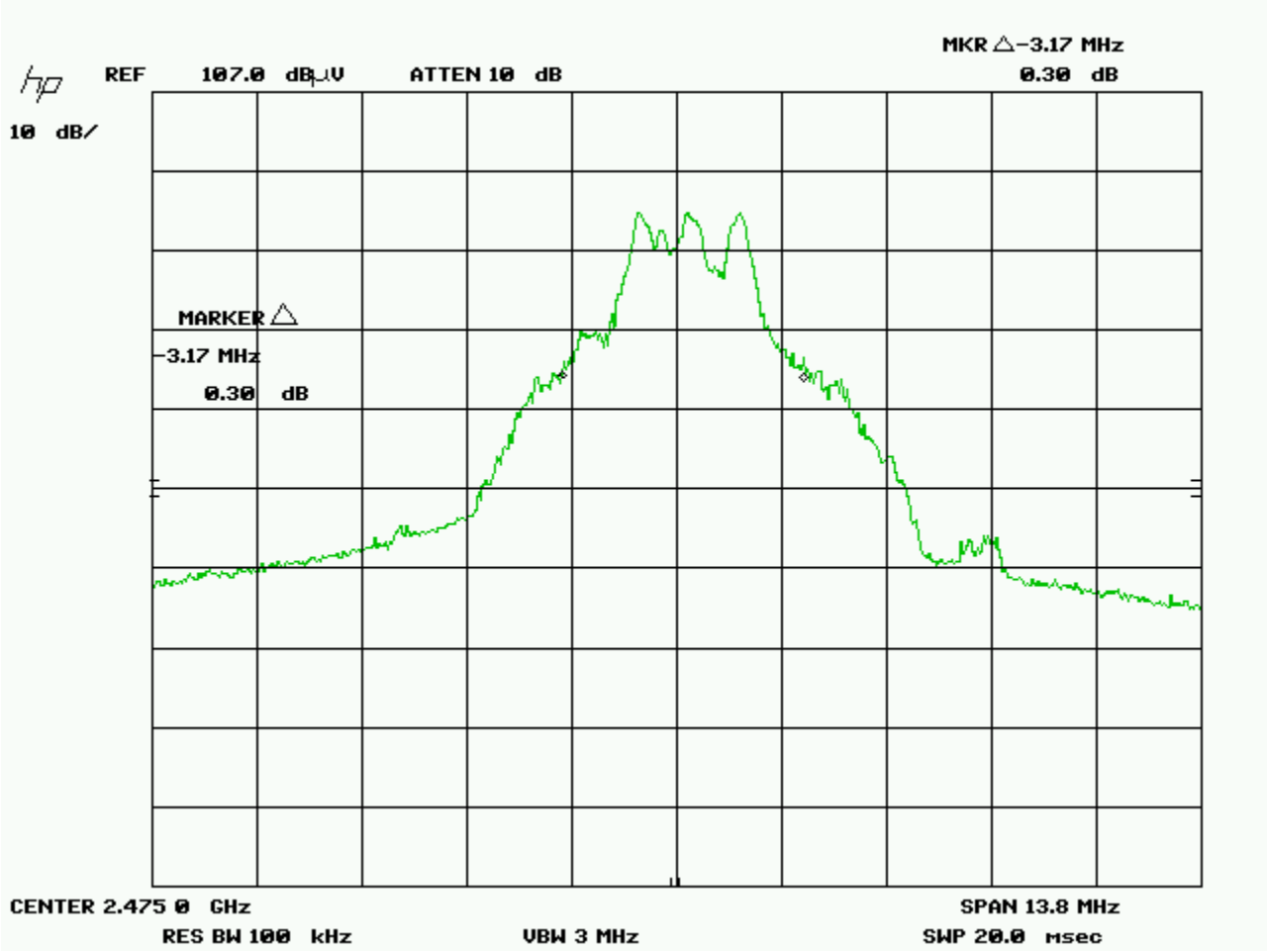
20 db BW Low channel



20 db BW Medium channel



20 db BW High channel



Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Number of Channels for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is sufficiently spread over a spectrum and that the radio energy is not overly dense. This limit helps allow for other spread spectrum devices to co-exist in the same frequency spectrum. This also helps prevent corruption of data by ensuring adequate channel separation to distinguish the reception of the intended information.

Limits

The limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)

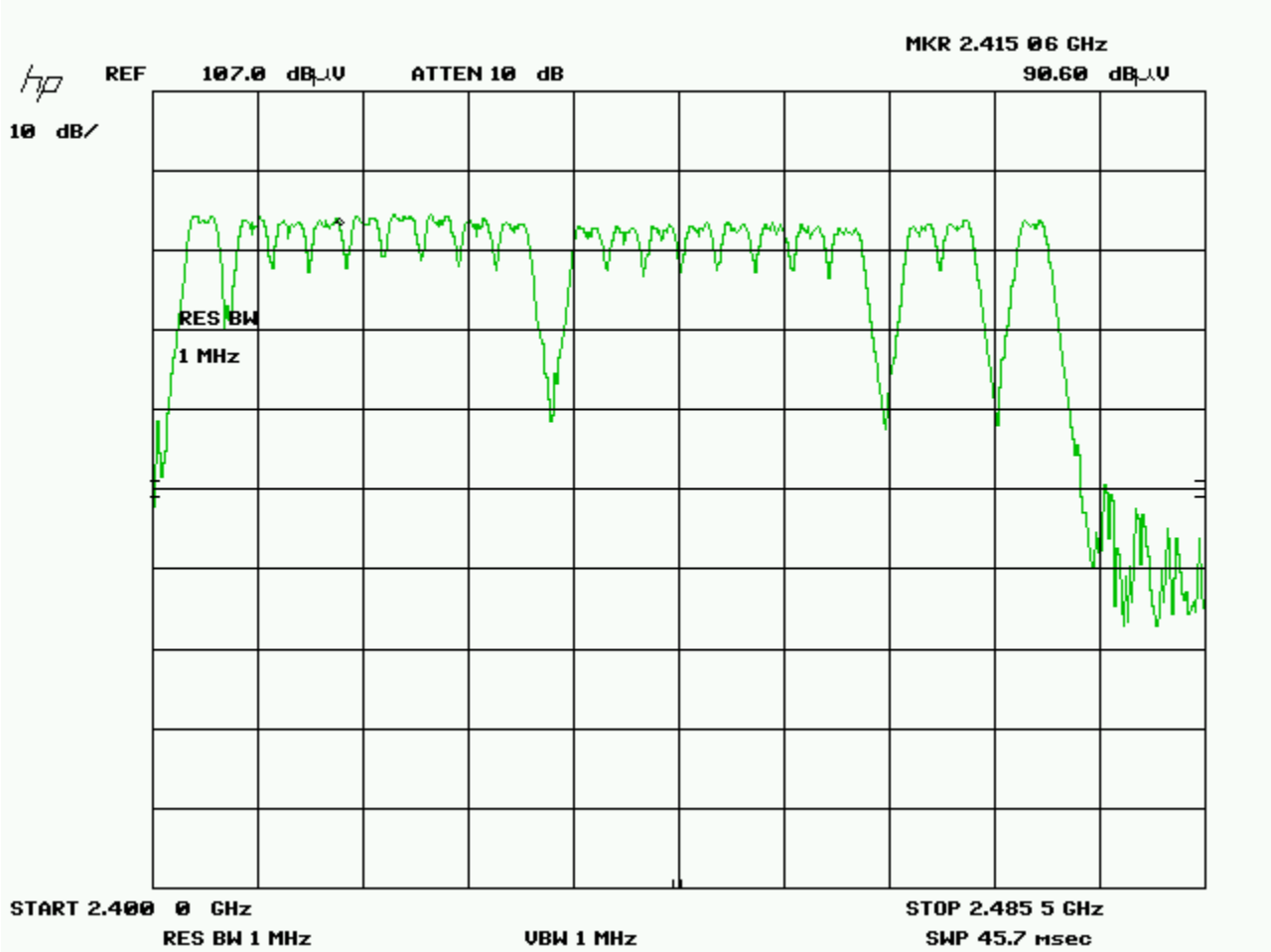
	902 to 928 MHz	2.4 to 2.4835 GHz	5.275 to 5.85 GHz
No conditions	>= 50 channels	>= 15 channels	>= 75 channels
20 dB BW exceeds 250 kHz	>= 25 channels	>= 15 channels	>= 75 channels

Results

Since the EUT operates in 2.404 – 2.475 GHz spectrum it has a limit of minimum 15 channels. The EUT passed the requirements of the number of channels. The minimum number of channels the device occupies is 20 in the allocation band of 2.4 – 2.4835 GHz.

Graph(s)

The graph shown below shows the number of occupied channels during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the channel spacing of the signal being measured. This measurement is a peak measurement.



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Frequency Occupancy for Frequency Hopping Systems

Purpose

The purpose of this test is to ensure that the RF energy of frequency hopping systems is hopping at a minimum defined rate. This helps ensure sufficient time off to enable other frequency hopping devices to co-operate within this allocated band.

Limits

For 2400 – 2483.5 MHz systems, the limits are as defined in 47 CFR FCC Part 15 Section 15.247(a)(1)(i).

For systems in 2400 – 2483.5 MHz using at least 15 channels, the average time of occupancy should not be greater than 400 ms in a time of 400ms X # of channels occupied.

Results

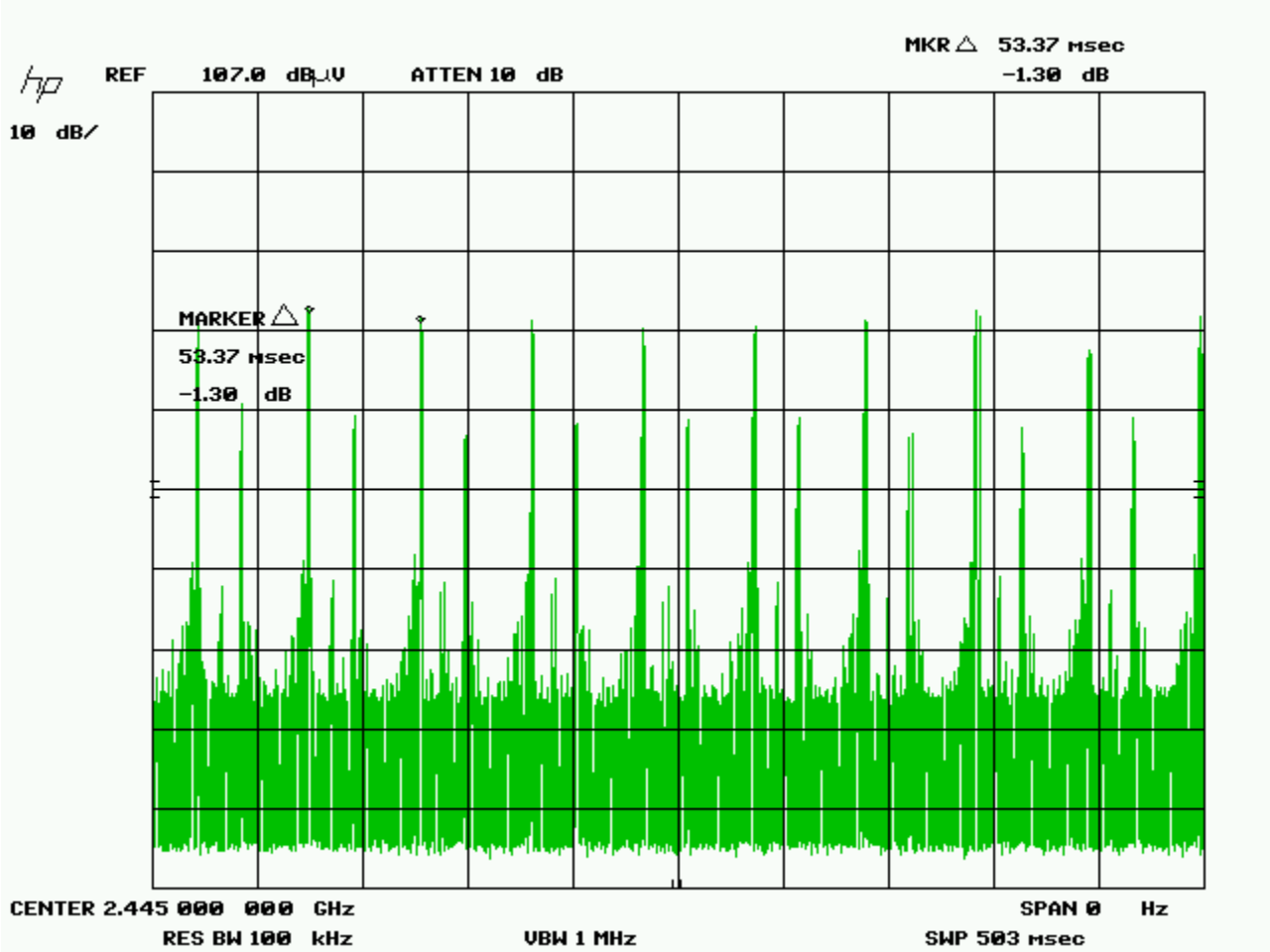
The EUT passed the requirements. The EUT cycles through its pseudo-random generated list of hopping frequencies every 53.37 ms. The on time duration of each hop is 1.2 msec.

Number of channels	20
Time between occupancy on same channel	53.37 ms
Total observation time (20 x 400 ms)	8000ms
Number of spikes in observation period (8000ms)	150
Total on time in 8000 ms period for a frequency (150 x 1.2)	180 ms

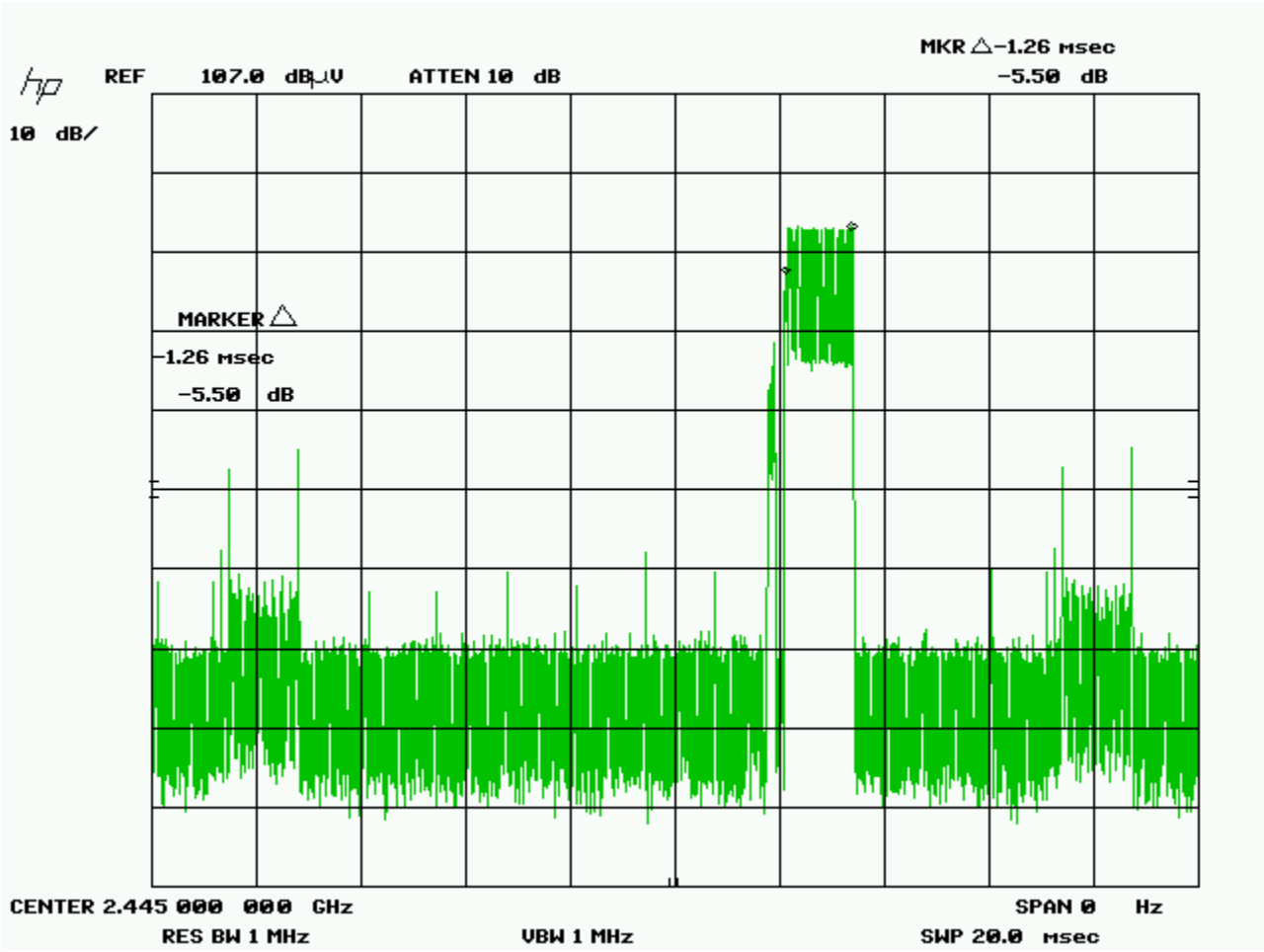
Graph(s)

The first graph shown below shows the repeat time of the pseudorandom generated hopping list. Note that in the first graph, the peak represents the 'on' of the frequency being measured. The lower signals are artifacts of nearby channels due to the wide resolution BW used.

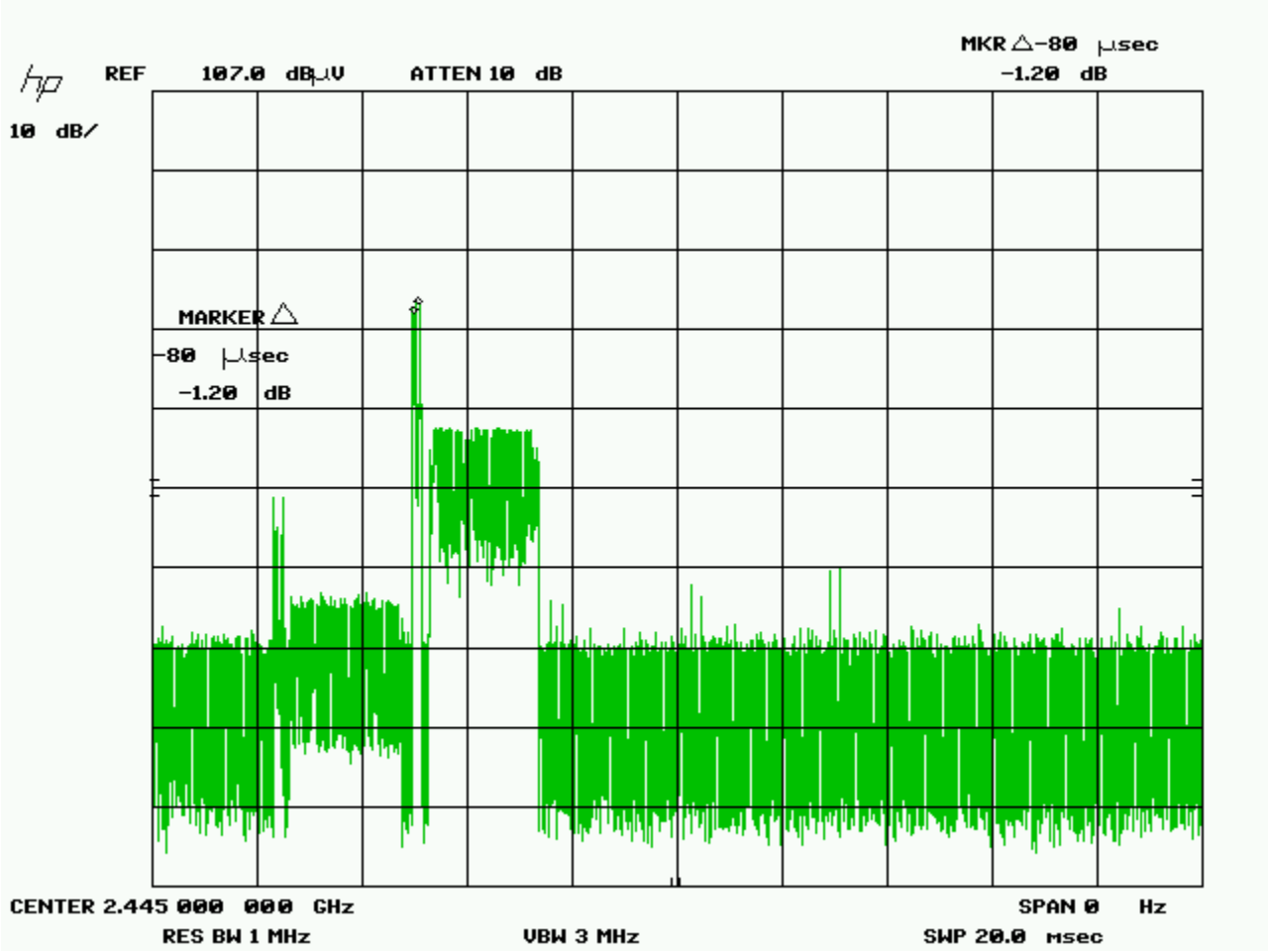
Hopping List repeat rate



On time during each channel transmitter



On time during each channel receiver



Note:

1. Occupancy time on receiver is smaller than the transmitter. This was verified during the tests and a plot is shown above. The channel repeat rate is the same between the transmitter and receiver whereas the duty cycle is smaller on the receiver.
2. In the plot of receiver On time the wider occupancy channel is the transmitter which was setup inside the room to establish a connection.
3. See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Maximum Peak Envelope Conducted Power

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

Limits

The limits are defined in 15.247(a) (i).
For frequency hopping systems operating in the 2400 – 2483.5 MHz band employing at least 15 hopping channels separated by atleast 2/3 x 20 db bandwidth, the peak limit is 125 mW.

Results

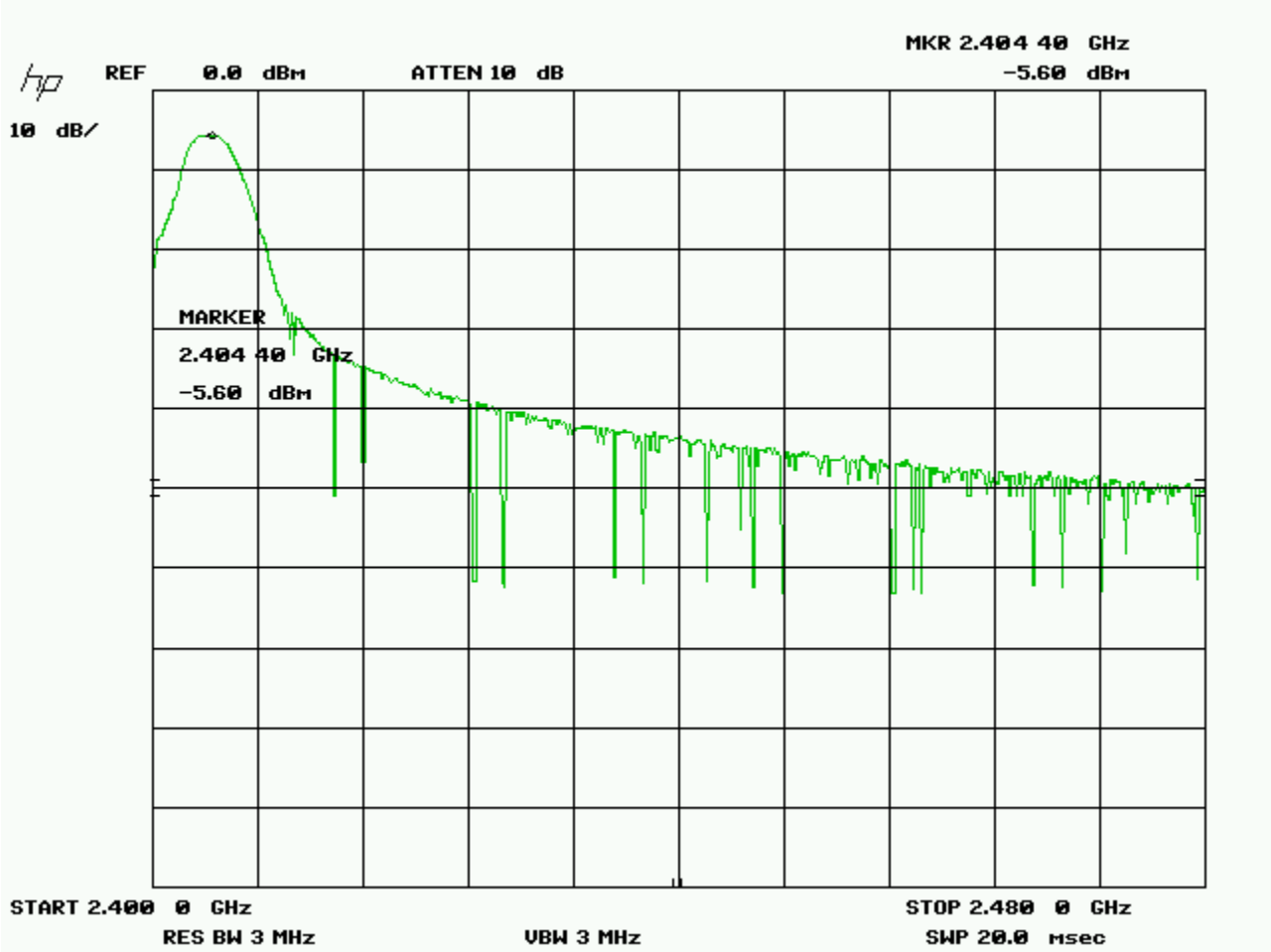
The EUT passed. The peak power measured was 15.45 dbm (35.0 mW). The peak power was measured using a power meter. The power was also verified using a Spectrum analyzer. Plots of these are shown below.

Sample calculation:
-5.1 dbm + 20 db (attenuator) + 0.2 db (cable loss) = 15.1 dbm.

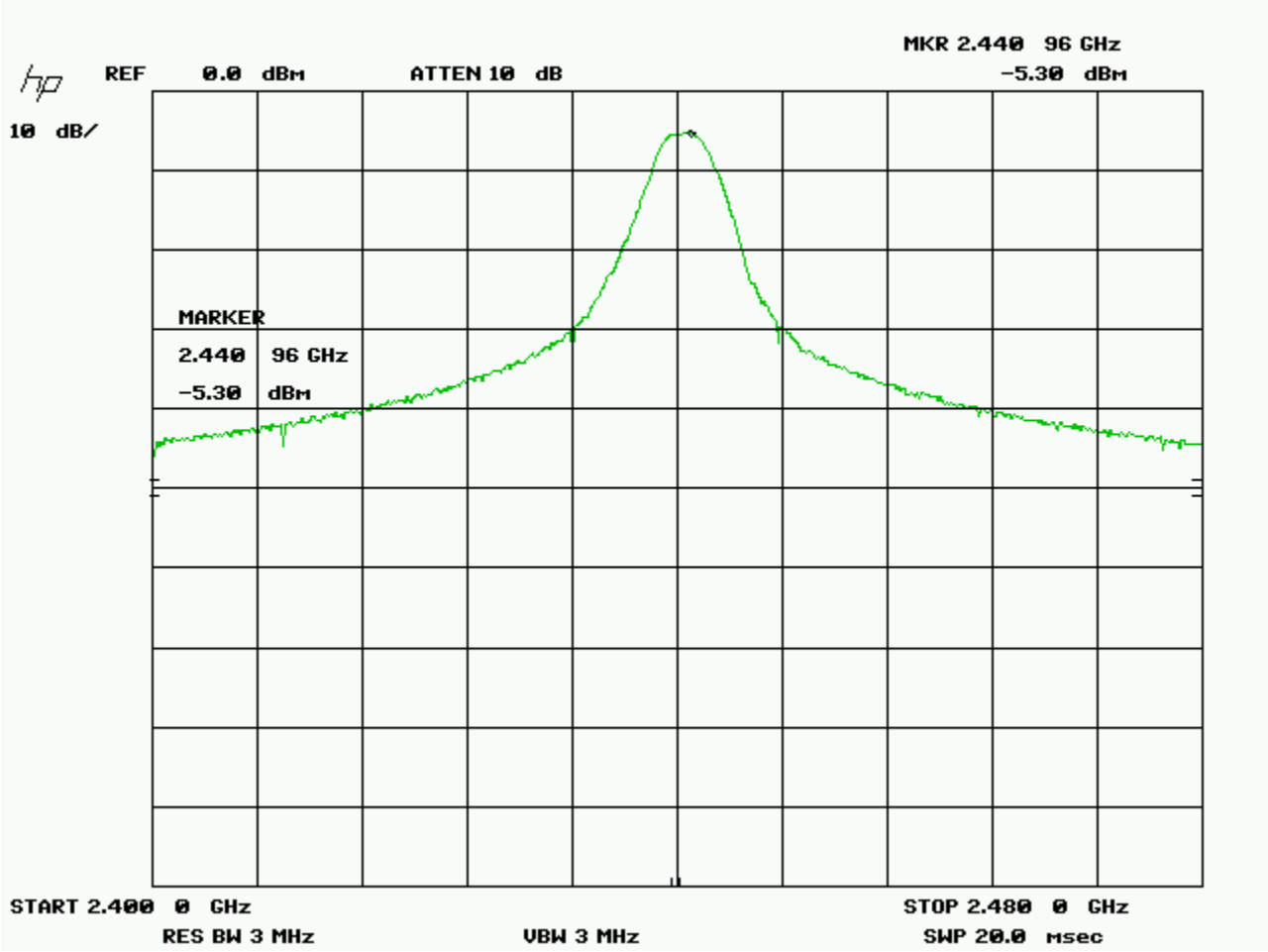
Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

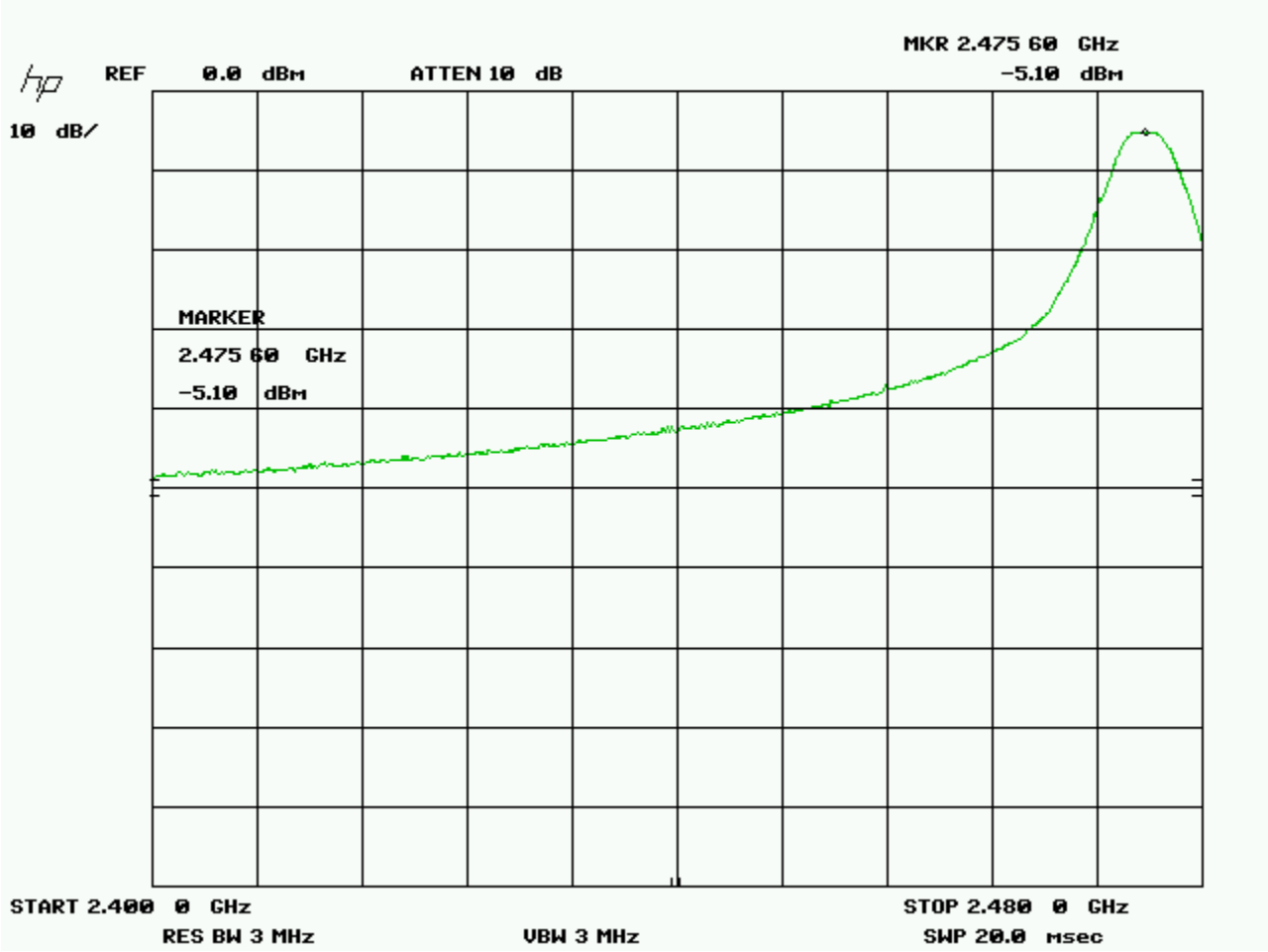
Low channel



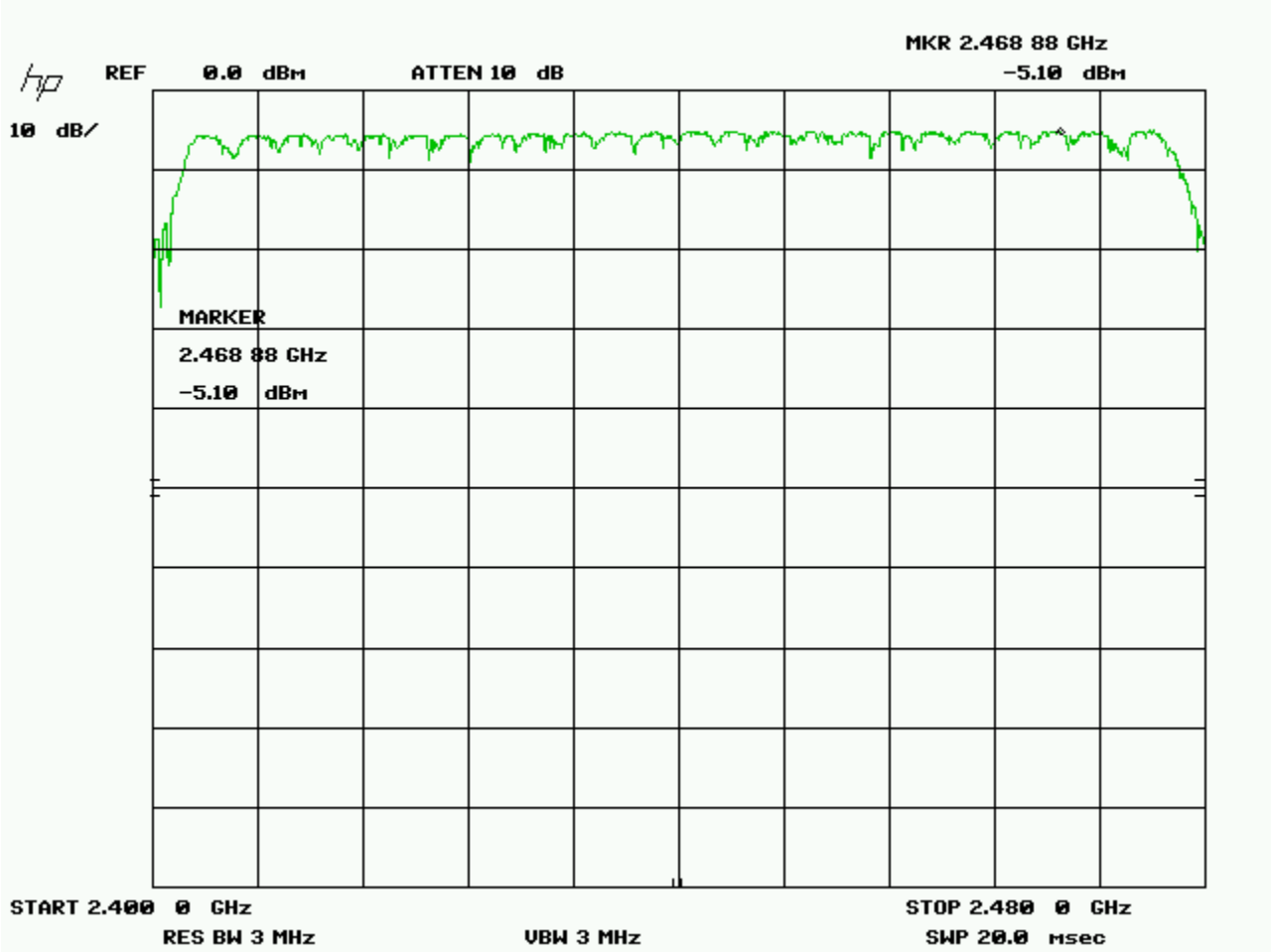
Medium channel



High channel



Hop on



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2006-08-09	2008-08-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-08-07	GEMC 7
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49
Power meter	PM 2002	AR	2006-10-13	2008-12-13	GEMC 16

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Spurious Emissions -20 dbc Rule

Purpose

The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified.

Limits

The limits are defined in 15.247(d).
In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental.

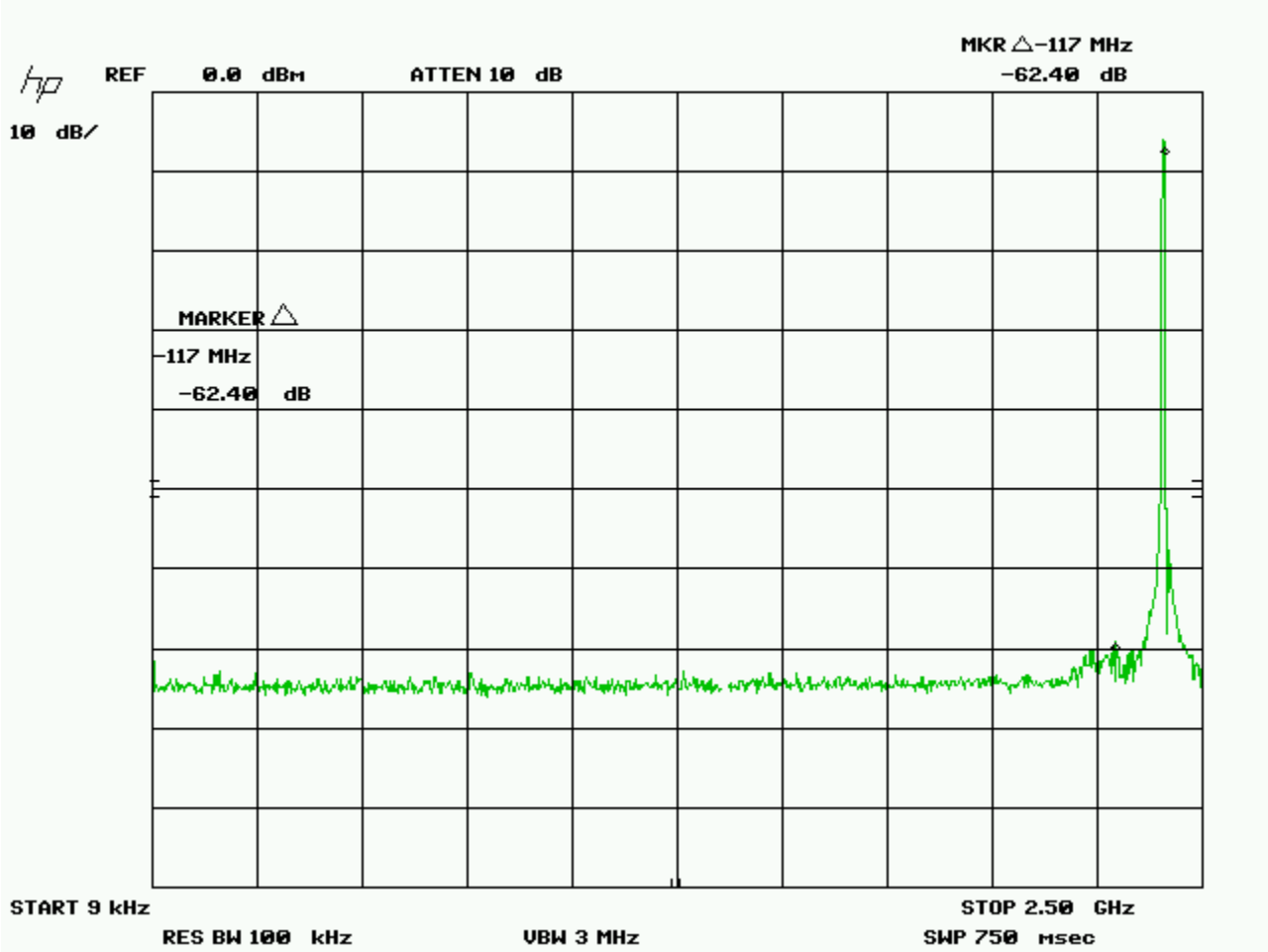
Results

The EUT passed. The peak power measured was 15.45 dBm (35 mW). The worst case reading was on low channel band edge at -41.2 dbc. This is well within the limits of -20 dbc rule.

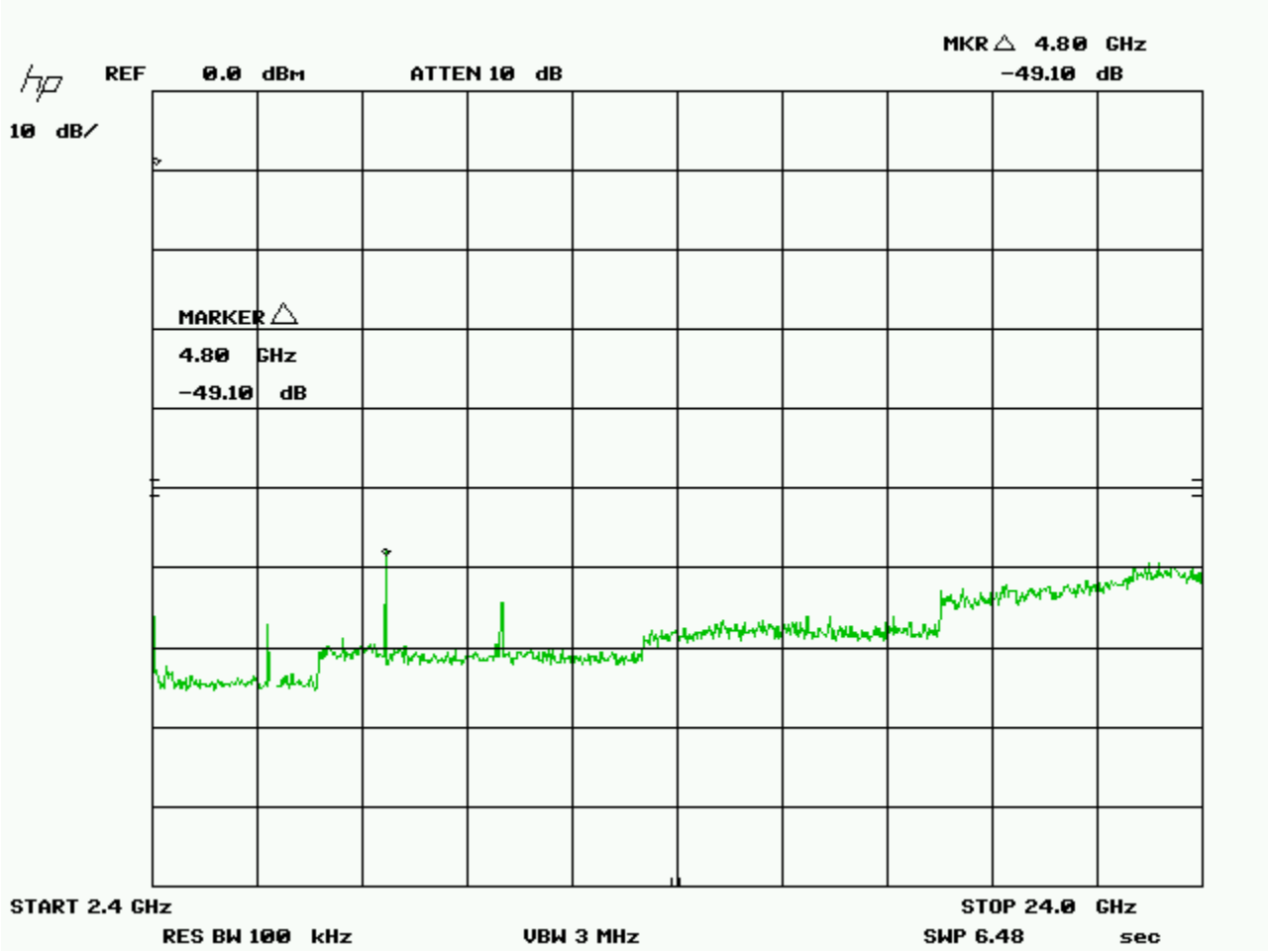
Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT

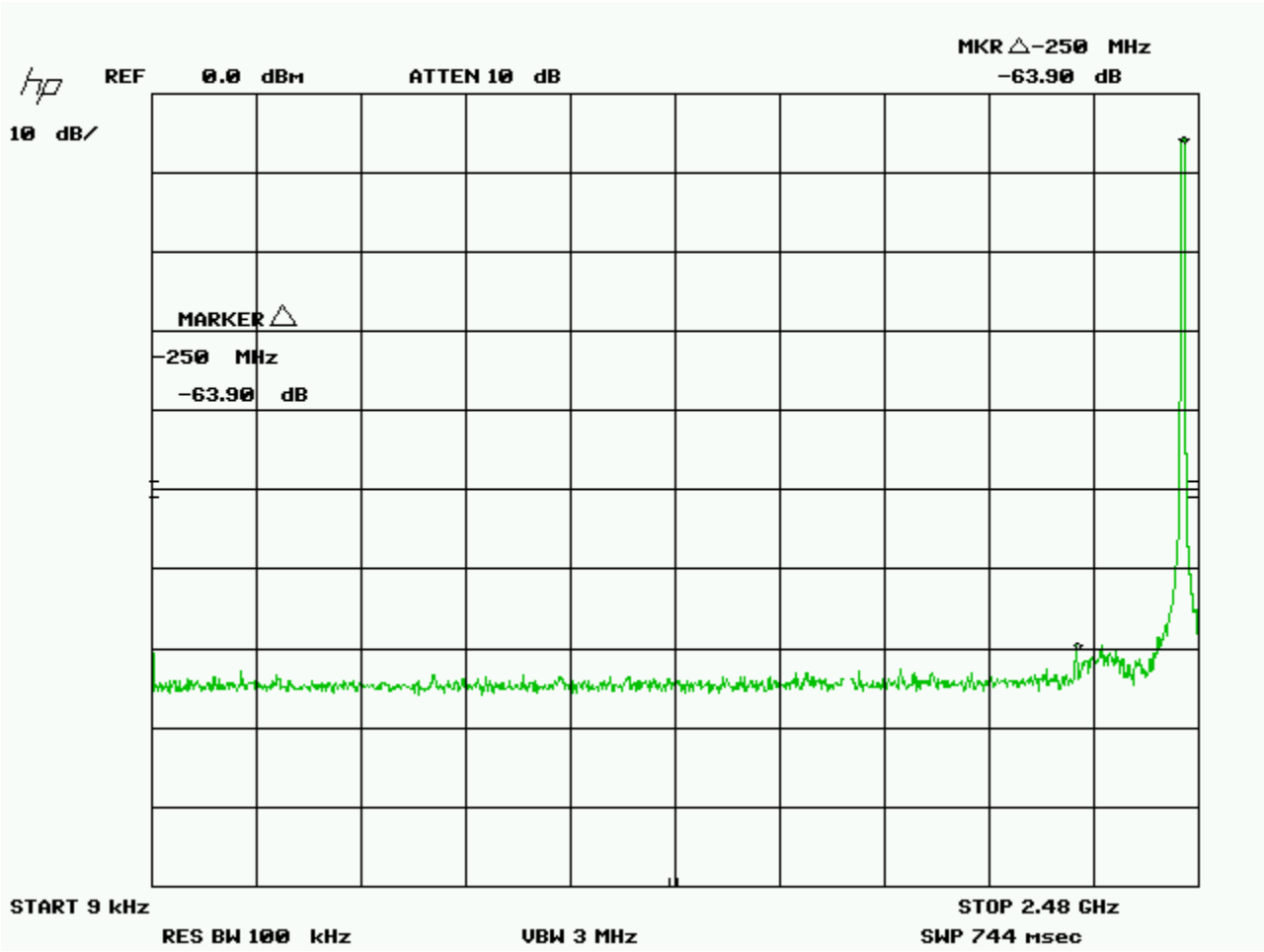
Low channel 9 kHz – 2.5 GHz



Lo channel 2.4 GHz – 24 GHz

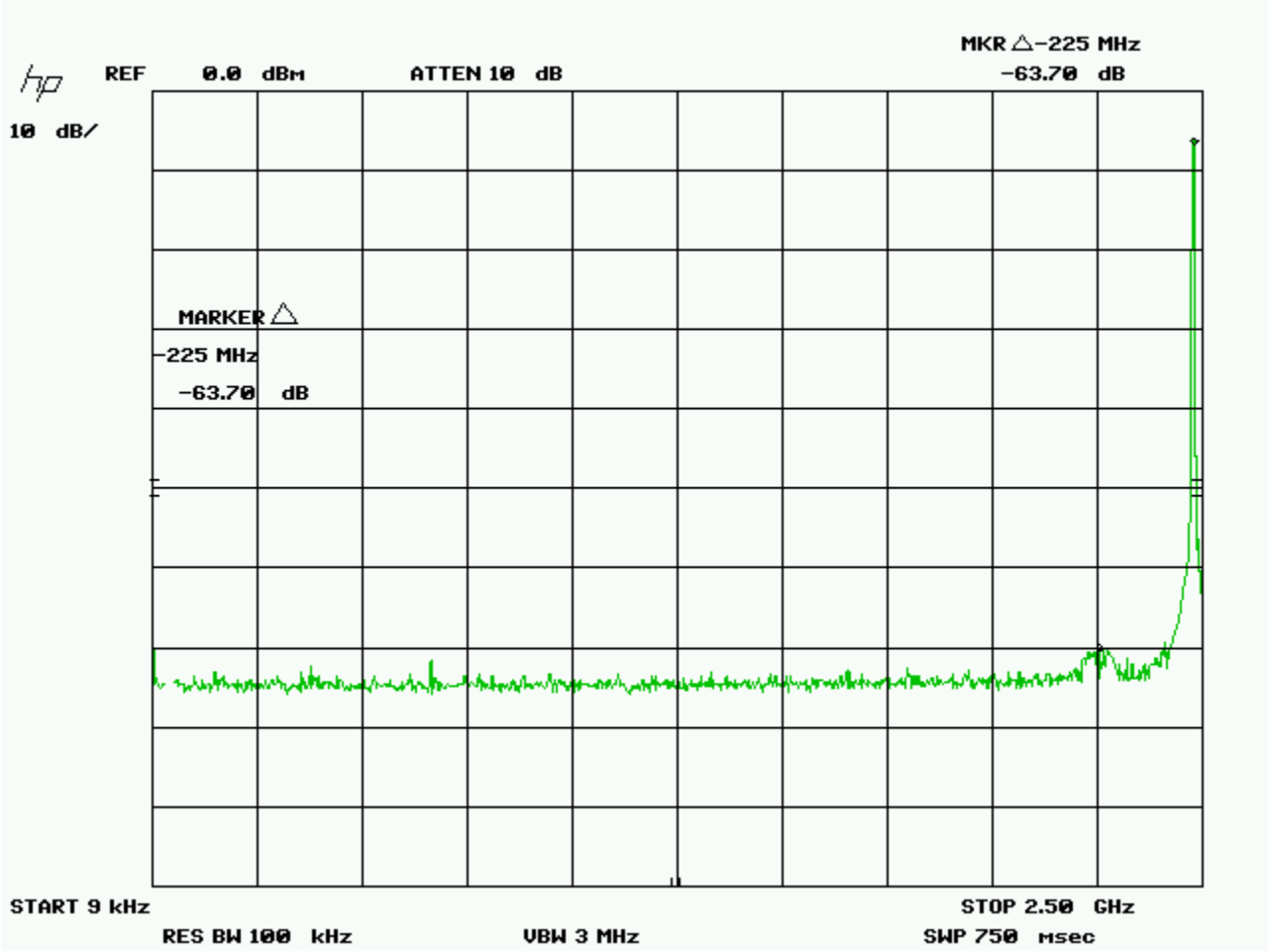


Mid channel 9kHz – 2.5 GHz

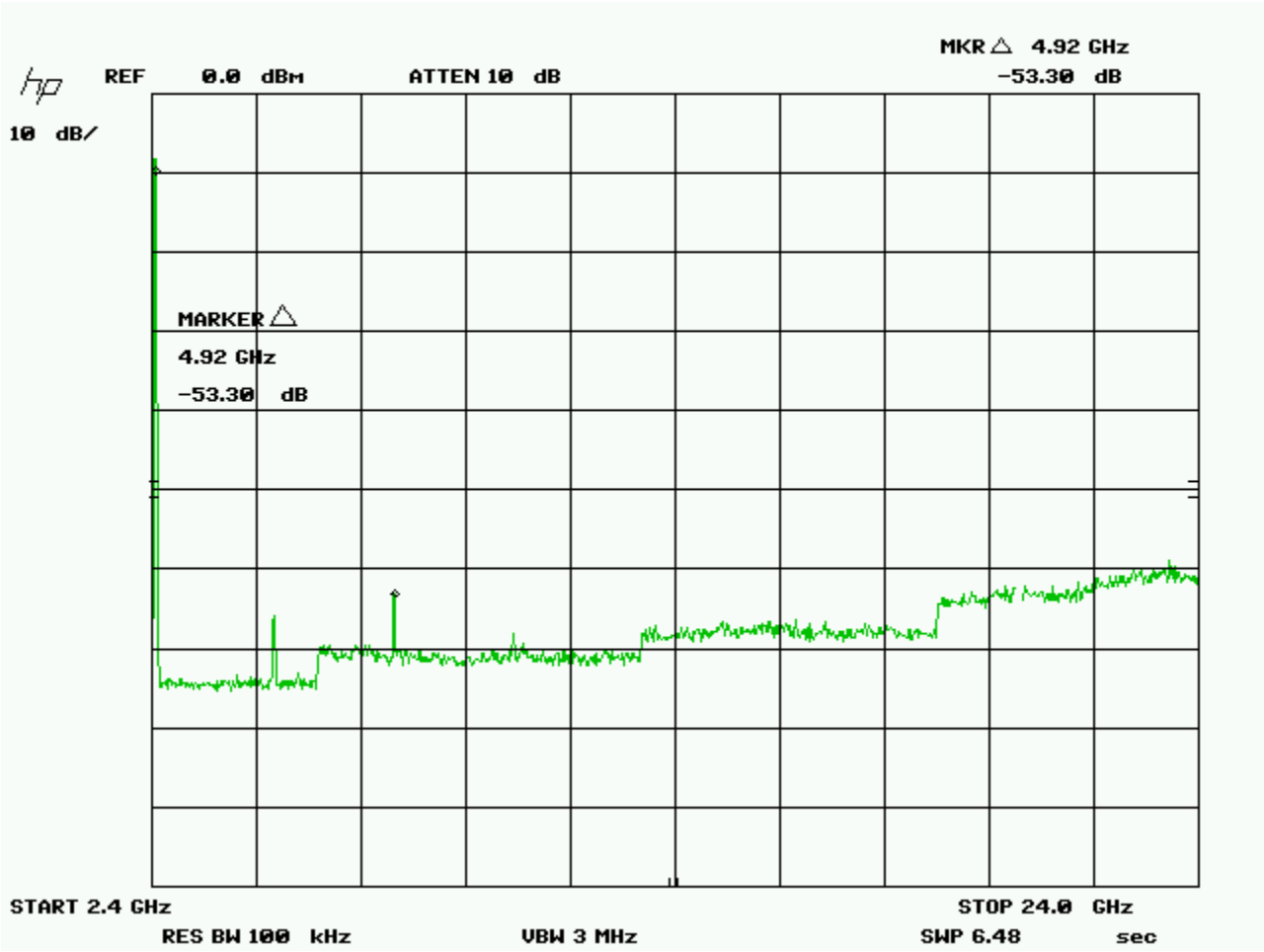


Mid channel 2.4 GHz – 24 GHz

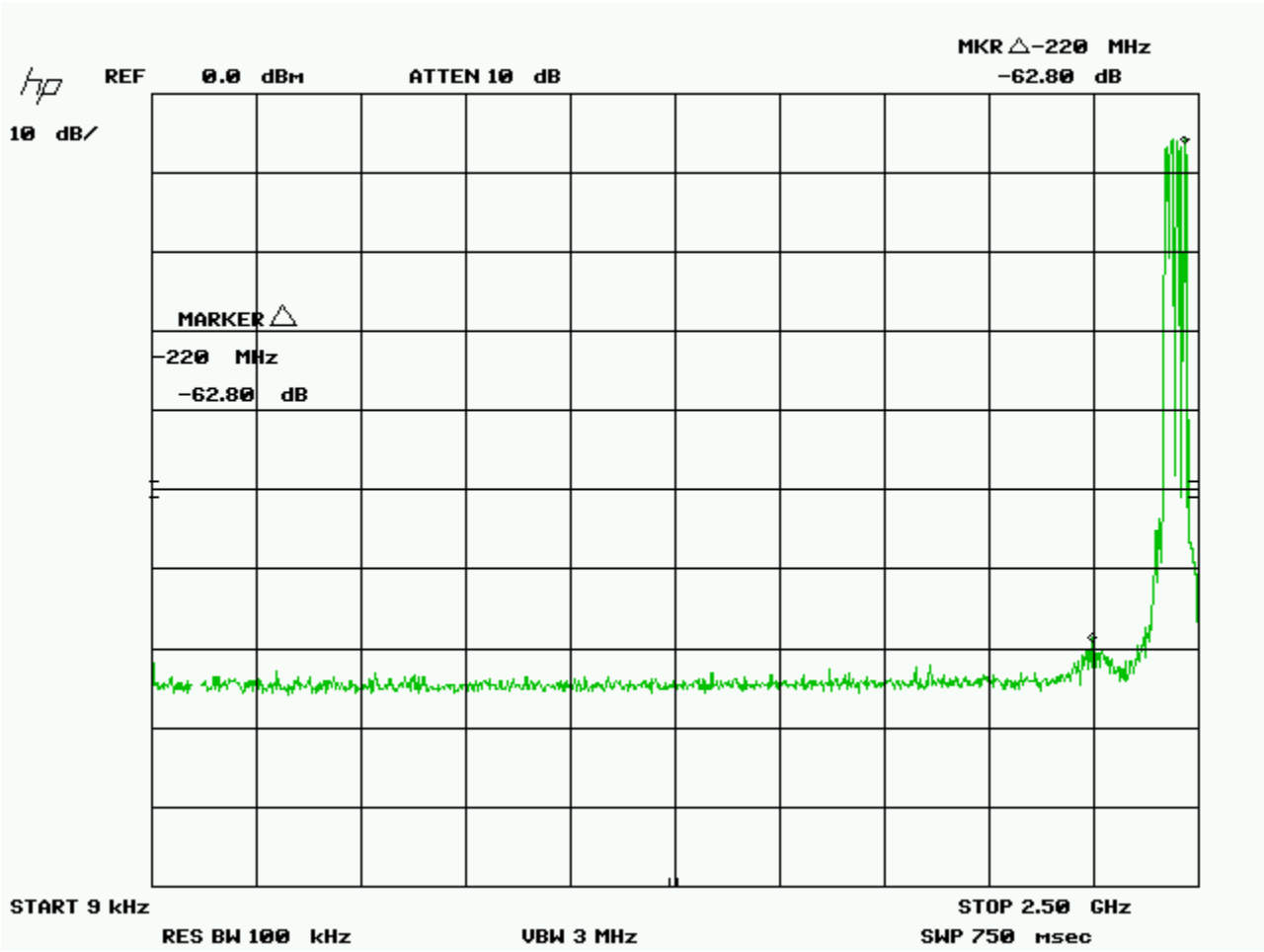
Hi channel 9 kHz – 2.5 GHz



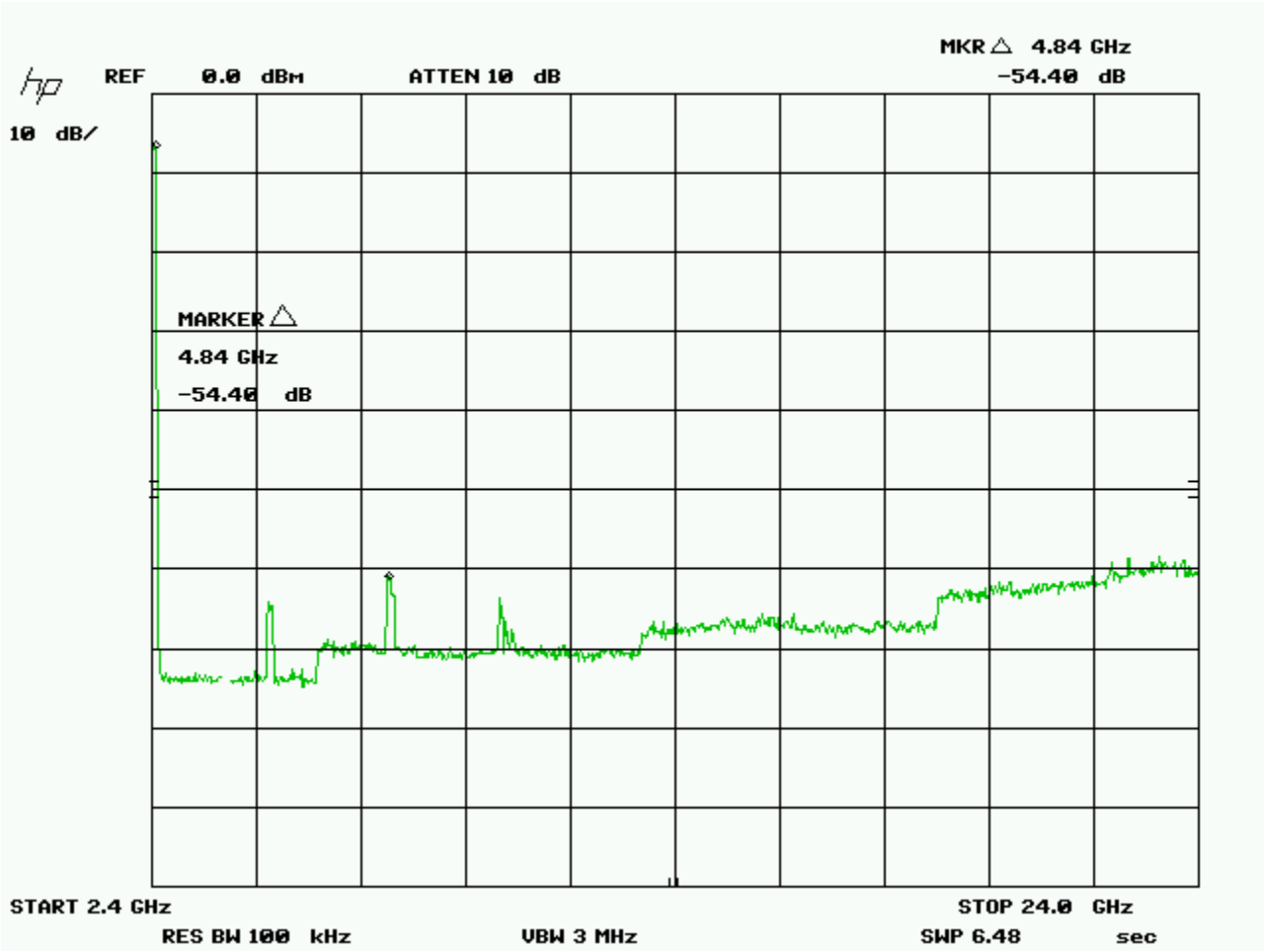
Hi channel 2.4 GHz – 24 GHz



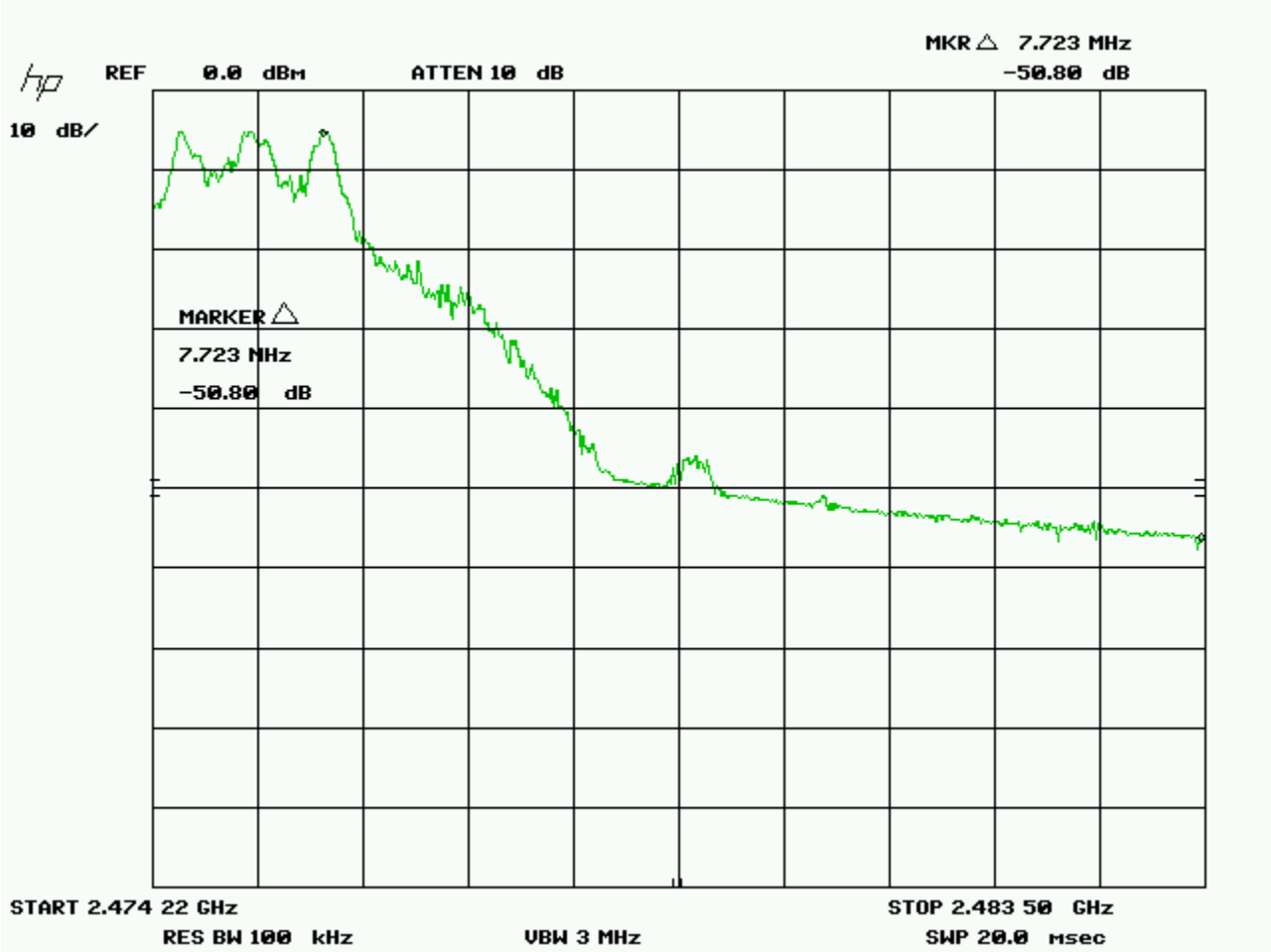
Hop mode 9 kHz – 2.5 GHz



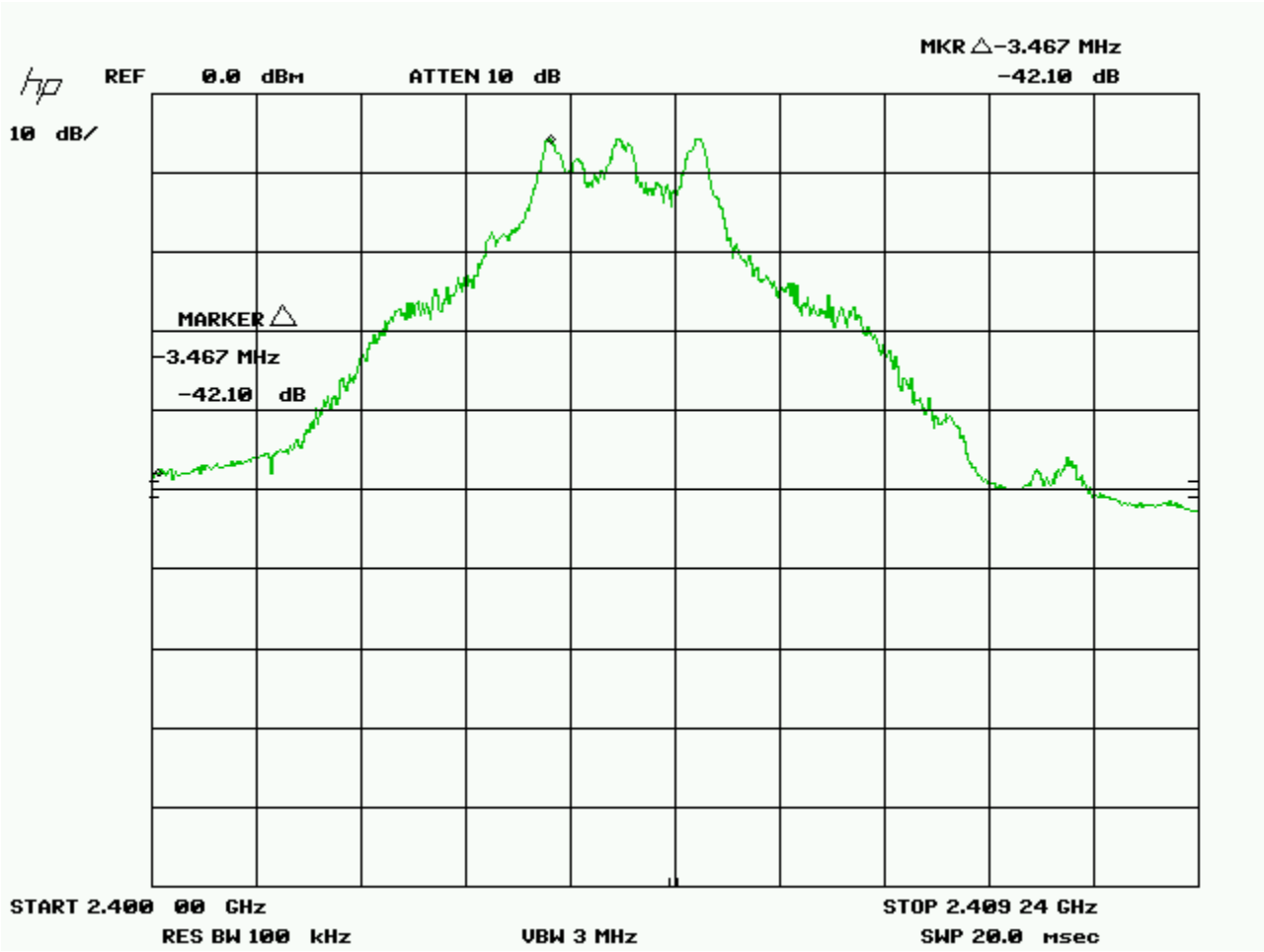
Hop mode 2.4 GHz – 24 GHz



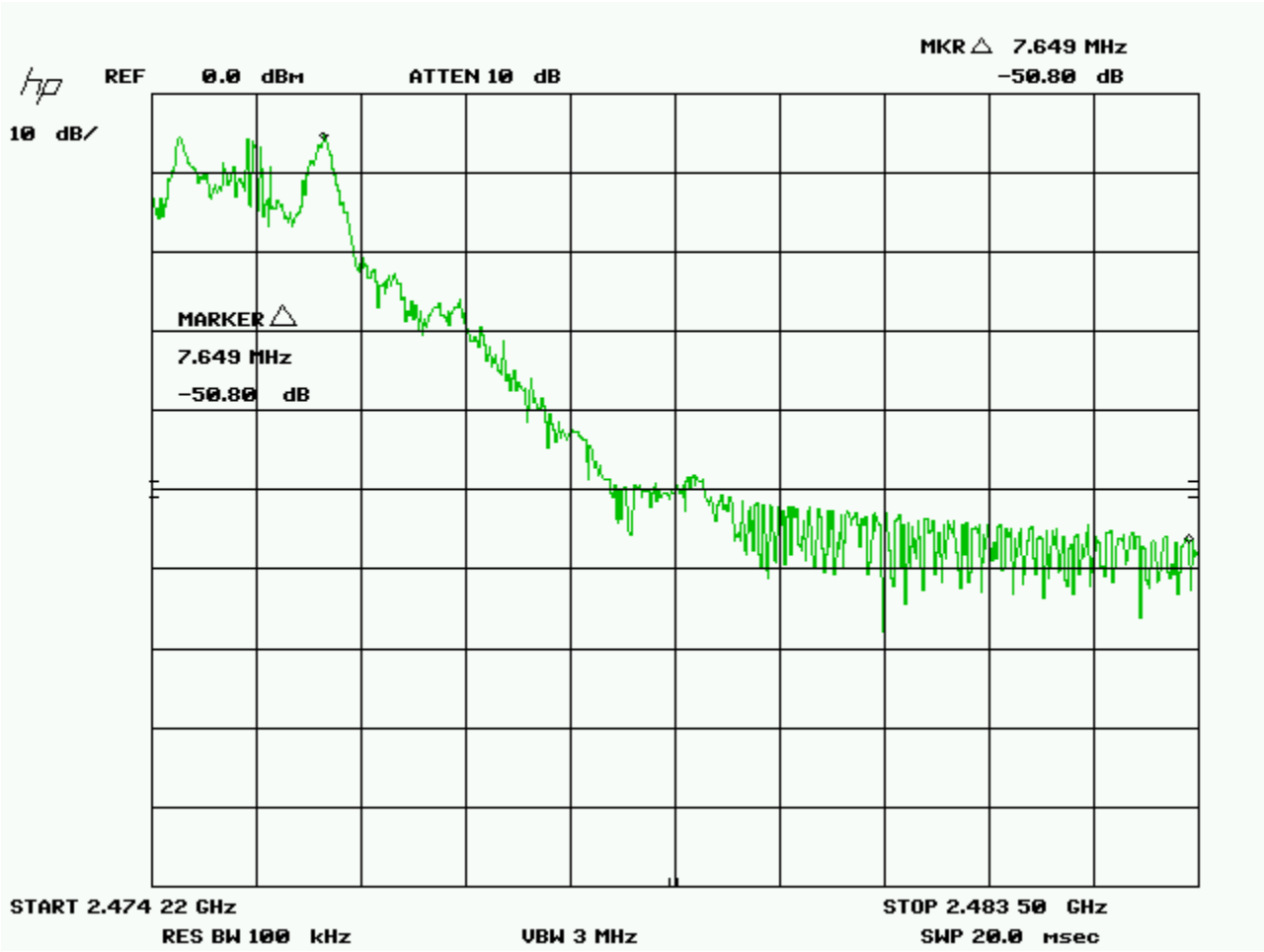
-20 dbc rule for out of band emissions
Hi channel



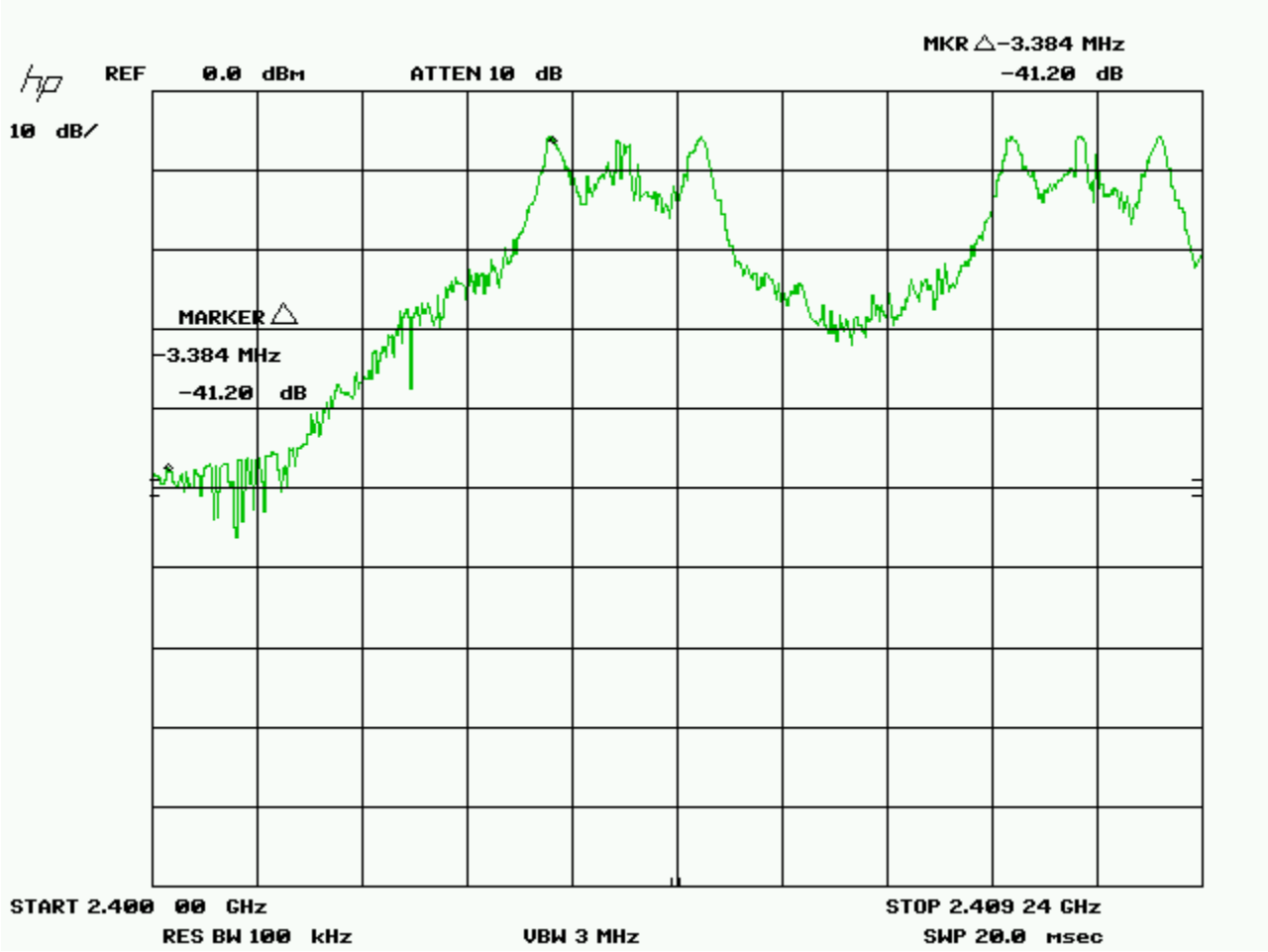
Low channel



Hop on Hi channel



Hop on Low channel



Note: The peak power shown here is raw data and no factors are applied to the reading.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41

Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
IFR Spectrum Analyzer	AN940	IFR	May 4/2006	May 4/2009	GEMC 6350
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Power Line Conducted Emissions

Purpose

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

Limits & Method

The limits are as defined in 47 CFR FCC Part 15 Section 15.207
Method is as defined in ANSI C64:2003

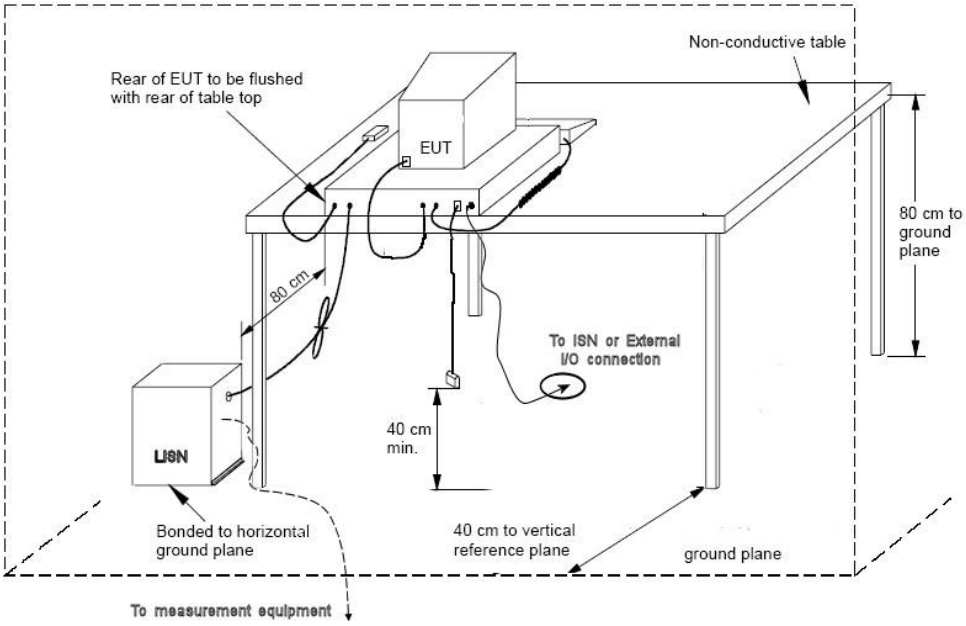
Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth.

Typical Setup Diagram



Note: The vertical reference plane is optional as per ANSI C63.4 section 5.2.2

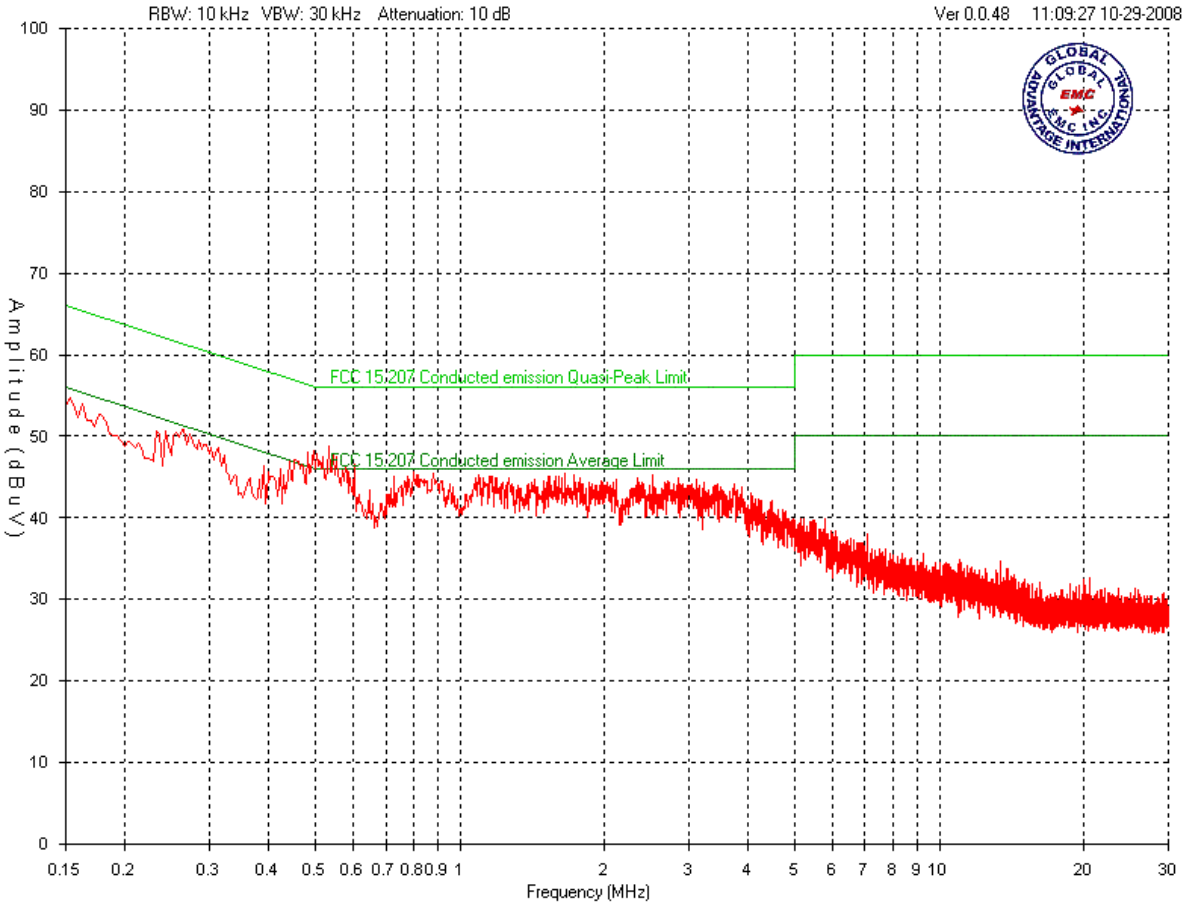
Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-3.6 dB with a 'k=2' coverage factor and a %95 confidence level.

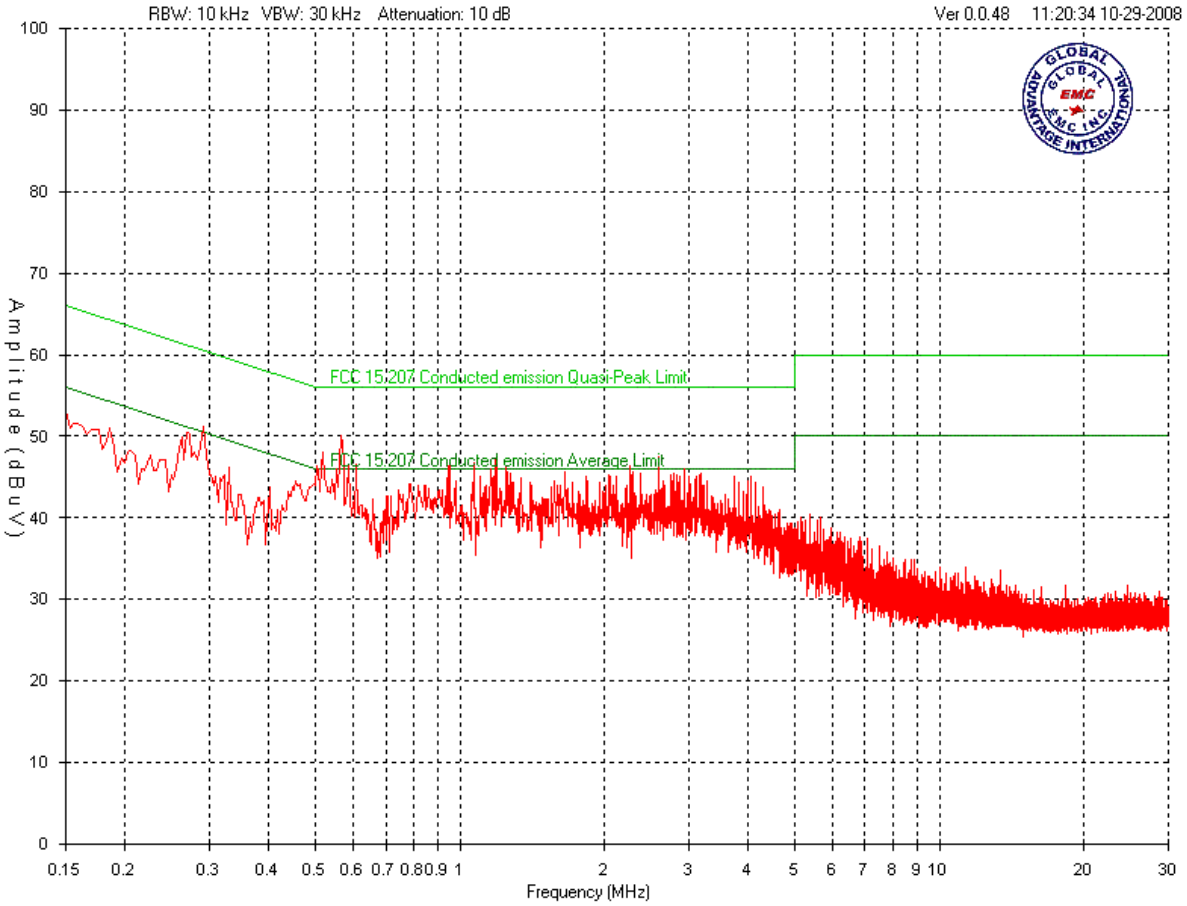
Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graph shown below is a peak measurement graph, measured with a resolution bandwidth greater then or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings.

120V Line
Peak emissions



120V Neutral
Peak emissions



Client	Sonavox Canada Inc.
Product	770102
Standard(s)	RSS 210 Issue 6:2005 / FCC Part 15 Subpart C 15:2006

Final Measurements

Average Emissions Table

Product category	Class B Avg								
Project	770102								
Test Frequency (MHz)	**Detection mode (Q-Peak / Avg)**	**Raw signal (dBuV)**	**Cable loss (dB)**	**Attenuator (dB)**	**LISN factor (dB)**	**Received signal (dBuV)**	**Emission limit (dBuV)**	**Margin (dBuV)**	**Result**
120V 60Hz Line Verified using QP									
0.15	QP	35.3	0.2	10	1.75	47.25	56	8.75	PASS
0.538	QP	28.9	0.2	10	0.4	39.5	46	6.5	PASS
0.863	QP	29	0.2	10	0.45	39.65	46	6.35	PASS
1.15	QP	27	0.2	10	0.25	37.45	46	8.55	PASS
2	QP	27.3	0.2	10	0.25	37.75	46	8.25	PASS
3.2	QP	26	0.2	10	0.3	36.5	46	9.5	PASS
3.86	QP	25	0.2	10	0.3	35.5	46	10.5	PASS
4.5	QP	23.1	0.2	10	0.3	33.6	46	12.4	PASS
120V 60Hz Neutral Verified using QP									
0.15	QP	34.1	0.2	10	1.75	46.05	56	9.95	PASS
0.468	QP	27.8	0.2	10	0.4	38.4	47	8.6	PASS
0.9	QP	25.7	0.2	10	0.35	36.25	46	9.75	PASS

1.6	QP	25	0.2	10	0.25	35.45	46	10.55	PASS
2	QP	24.4	0.2	10	0.25	34.85	46	11.15	PASS
3.2	QP	23.6	0.2	10	0.3	34.1	46	11.9	PASS
3.86	QP	22.1	0.2	10	0.3	32.6	46	13.4	PASS
4.6	QP	21.1	0.2	10	0.3	31.6	46	14.4	PASS

Note:

1. All readings were recorded using QP detector and compared against Average limits.
2. See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up for the highest line conducted emission

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-12-07	GEMC 7
LISN	LISN 275-25-1	Vican	2006-09-12	2008-12-12	GEMC 12
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

Maximum Permissible Exposure

Purpose

The purpose of this test is to ensure that the RF energy intentionally transmitted, in terms of power density emitted from the EUT at a stated operating distance does not exceed the limits listed below as defined in the applicable test standard, as calculated based upon readings obtained during testing. This helps protect human exposure to excessive RF fields.

Limit(s) and Method

The limits, as defined in FCC 15.247(i) and FCC 1.1310 Table 1 (B) limits for residential / uncontrolled exposure was applied. The limit for the frequency range of < 1500 MHz to 100,000 MHz is 1.0 mW/cm^2. The distance used for calculations was 20.0 cm, as this is the minimum distance an operator will be from the EUT during normal operation.

Measurement Uncertainty

Measurement uncertainty does not apply to this requirement, as this is a calculated result based upon readings obtained. The measurement uncertainty of this calculation can be approximated by the measurement uncertainty of the peak power, combined with the measurement uncertainty of the antenna gain, which was not available at the time of evaluation.

Results

The EUT passed the requirements. The worst case calculated power density was 0.018 mW/cm^2 this is under the 1.0 mW/cm^2 requirement.

Calculations

Method 1 (conducted power)

$P_d = (P_t * G) / (4 * pi * R^2)$
Where Pt = 15.45 dBm or 35.5 mW as per Peak power conducted output
Where G = 4.0 dBi, or numerically 2.51
Where R = 20.0 cm

$P_d = (35.5\ mW * 2.51) / (4 * pi * 20.0cm^2)$
$P_d = 89.1\ mW / 78.53\ cm^2$
$P_d = 0.018\ mW/cm^2$

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	2006-08-09	2008-12-09	GEMC 6
Quasi Peak Adapter	85650A	HP	2006-08-07	2008-012-07	GEMC 7
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Pre-Amplifier	PA-2.5-26	Vican	2006-09-12	2008-09-12	GEMC 9
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.

General EUT Description

Manufacturer	Sonavox Canada Inc. 10 Konrad Crescent, Markham, Ontario, Canada L3R 8T7
EUT Name	770102
Equipment Category (Commercial / Residential / Medical)	Residential audio frequency wireless transmitter
Input Voltage and Frequency	120V 60Hz
Intentional RF (If yes describe)	Yes – 2404 – 2475 MHz FHSS
Table Top / Wall mount / Floor standing (choose table top if unsure)	Table top
I/O Connectors available on EUT	RCA audio connectors
Peripherals required for test	No peripherals are needed to exercise the EUT.
Minimum Separation distance from operator	20.0 cm

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

EUT Functional Description

EUT Configuration

The unit is mains operated and communicates with a receiver in the vicinity. During all testing a link was established between the transmitter and the receiver. Both units were placed in the chamber at the same time such that data was transferred between the units. The receiver sends an acknowledgment to the transmitter during the communication process. The peak output power from the receiver is the same and this was verified during the spurious emission plots. The only difference between the two is the duty cycle of operation with the receiver having an on time of only 80 uS compared to 1.2 ms of transmitter. Because of this all testing was performed on the transmitter with spurious and channel occupancy time verified on the receiver.

Operational Setup

For medium, low and high channel measurements software was available such that the transmitter could to be tuned to those frequencies.

For spurious emissions, number of channels occupied, frequency allocation radiated tests were performed. For all other tests an SMA connector was provided by the manufacturer on the output of the antenna port and all other tests were carried out using conducted measurements.

Test Signals Required For Test

The following patterns or signals were generated during test by the peripherals as described above to exercise the EUT during testing.

None required.

Modifications Required for Compliance

No modifications were required.

Appendix B – EUT and Test Setup Photographs

Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

Figure 1: EUT conducted emissions

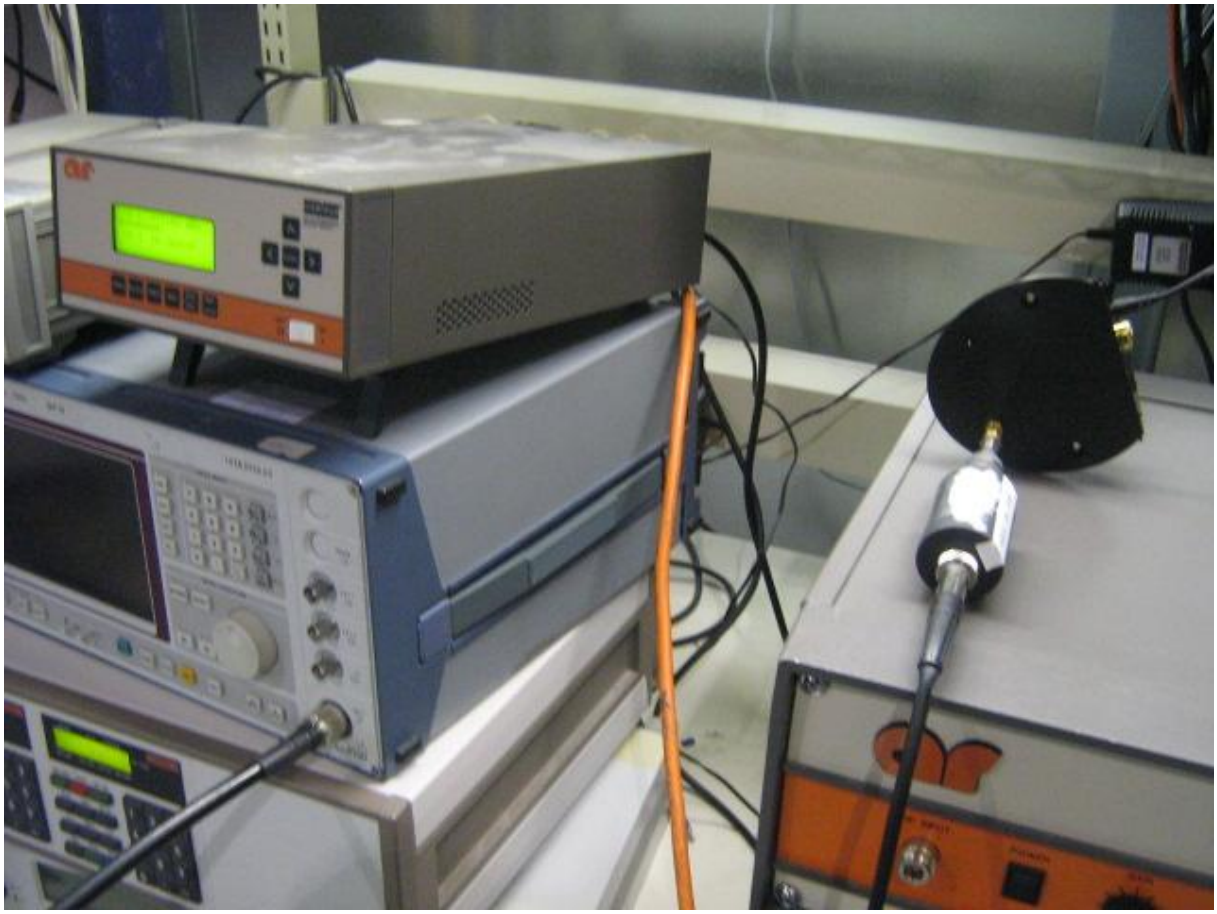


Figure 2: Conducted test setup

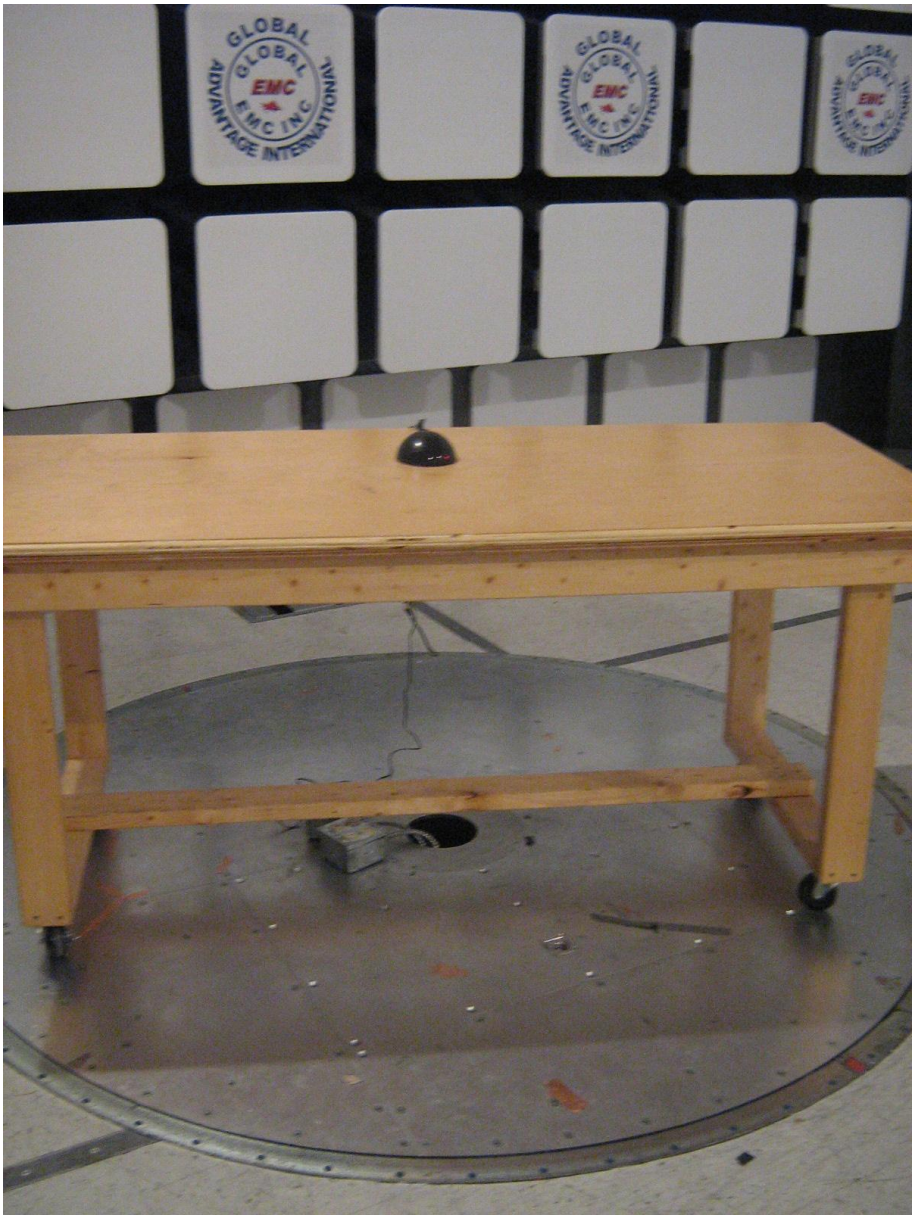


Figure 3: Radiated emissions