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CERTIFICATION TEST REPORT

Manufacturer: Structured Mining Systems, Inc.
d.b.a. Cervis Inc.
170 Thorn Hill Road
Warrendale, Pennsylvania 15086
United States of America

Applicant: Same As Above

Product: Radio Module, DSSS, 2.4GHz, 100mW

Model: SRF305

FCC ID: LOBSRF305

Testing Commenced: May 2, 2014

Testing Ended: June 30, 2014

Summary of Test Results: Page 5

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.247**
- ❖ **FCC Part 15, Subpart C, Section 15.209**



Evaluation Conducted by:

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to the 2009 version of ANSI C63.4 and recommended FCC procedure of measurement of DTS operating under Section 15.247 and in KDB558074. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

Radiated Emission

- Combined Uncertainty (+ or -) 2.67 dB
- Expanded Uncertainty (+ or -) 5.35 dB

Conducted Emissions

- Combined Uncertainty (+ or -) 1.88 dB
- Expanded Uncertainty (+ or -) 3.75 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2LQ5898A-03E	First Issue	July 1, 2014	W. Fuster



2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
Conducted Output Power	CFR 47 Part 15.247(b)(3) / KDB558074	Complies
Radiated Spurious Emission	CFR 47 Part 15.247(d) / Part 15.209 / KDB558074	Complies

Modifications Made to the Equipment
None



3 TABLE OF MEASURED RESULTS

Test	High Channel 2.480GHz	Mid Channel 2.440GHz	Low Channel 2.405GHz
Conducted Output Power	97.05mW (19.87dBm)	97.72mW (19.90dBm)	97.05mW (19.87dBm)
Conducted Output Power Limit	1 Watt, (30dBm)	1 Watt, (30dBm)	1 Watt, (30dBm)
E.I.R.P. with 9dBi Whip Antenna	770.90mW (28.87dBm)	776.25mW (28.90dBm)	770.90mW (28.87dBm)
E.I.R.P. Limit	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)	4 Watts, (36.02dBm)



4 ENGINEERING STATEMENT

This report has been prepared on behalf of Cervis Inc. to provide documentation for the testing described herein to be used as evidence that the Class II changes made to radio module SRF305 have not increased the output power or radiated spurs to exceed the limits allowed. This equipment has been tested and found to comply with parts 15.247 and 15.209 of the FCC Rules using ANSI C63.4 2009 and KDB558074 standards. The test results found in this test report relate only to the items tested.



5 EUT INFORMATION AND DATA

5.1 Equipment Under Test:

Product: Radio Module, DSSS, 2.4GHz

Model: SRF305

Serial No.: None

FCC ID: LOBSRF305

5.2 Trade Name:

Structured Mining Systems, Inc. d.b.a. Cervis Inc.

5.3 Power Supply:

Non-rechargeable AAA Batteries

5.4 Applicable Rules:

CFR 47, Part 15.247, subpart C

CFR 47, Part 15.209

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

9dBi gain Whip Antenna

5.7 Accessories:

N/A

5.8 Test Item Condition:

The equipment to be tested was received in good condition.

5.9 Testing Algorithm:

EUT was set up in a normal operating mode, with device transmitting in three different channels (low, mid, high).

**7 FCC PART 15.247(b)(3) – CONDUCTED OUTPUT POWER**

The EUT antenna port was fitted with an SMA connector and directly connected to the input of the receiver. The peak power output was measured.

7.1 Requirements:

The peak power output shall be 1 watt (30 dBm) or less when using an antenna with a gain of less than 6dBi. For antennas having a gain of more than 6dBi, the limit is reduced by 1dB for every dB the antenna gain is over 6dBi.

7.2 Equipment Used:

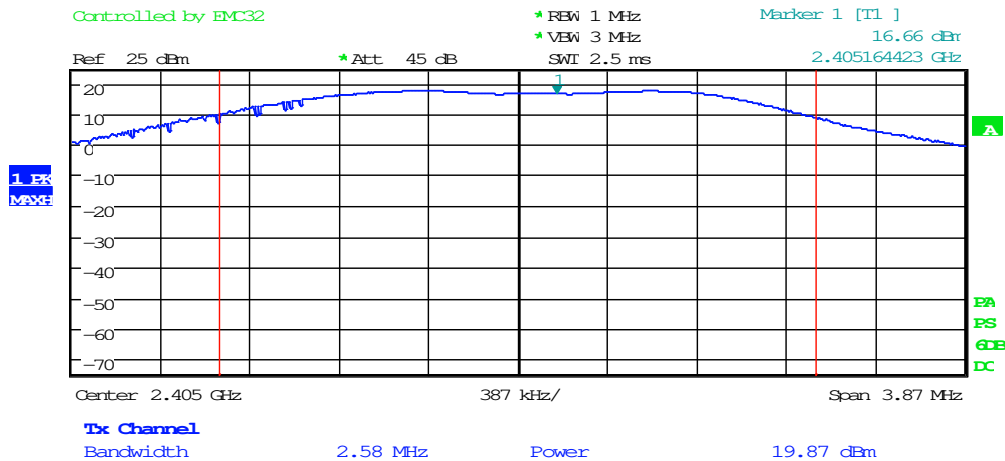
Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Temp/Hum. Recorder	CL119	Extech	RH520	H005869	Jan. 8, 2015
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 31, 2014
Cable: 0.3m Low Loss	CL116	A.H. Systems, Inc.	SAC-26G-0.3	206	Apr. 29, 2015



7.3 Conducted Output Power Test Data

Test Date:	May 2, 2014	Test Engineers:	J. Knepper, K. Littell
Standards:	CFR 47 Part 15.247(b)(3); KDB558074	Air Temperature:	21.3°C
		Relative Humidity:	48%

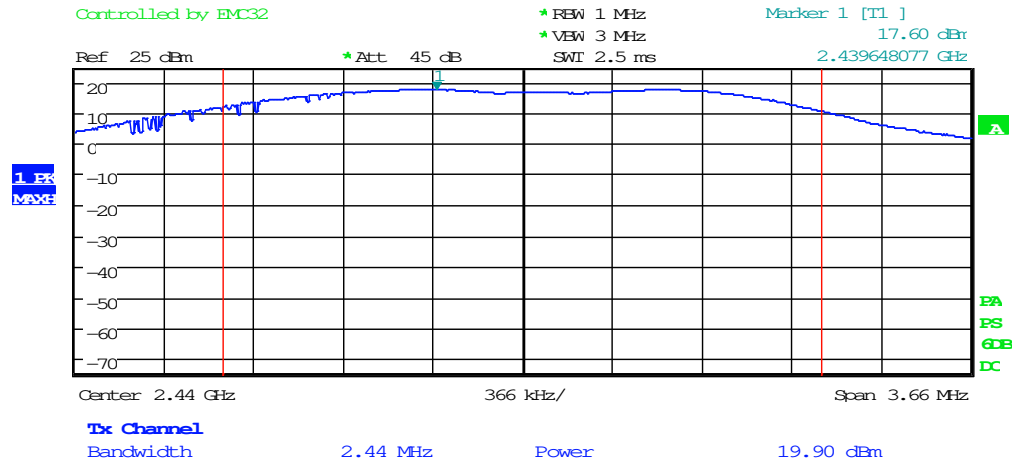
Low Channel



Date: 2.MAY.2014 15:31:57



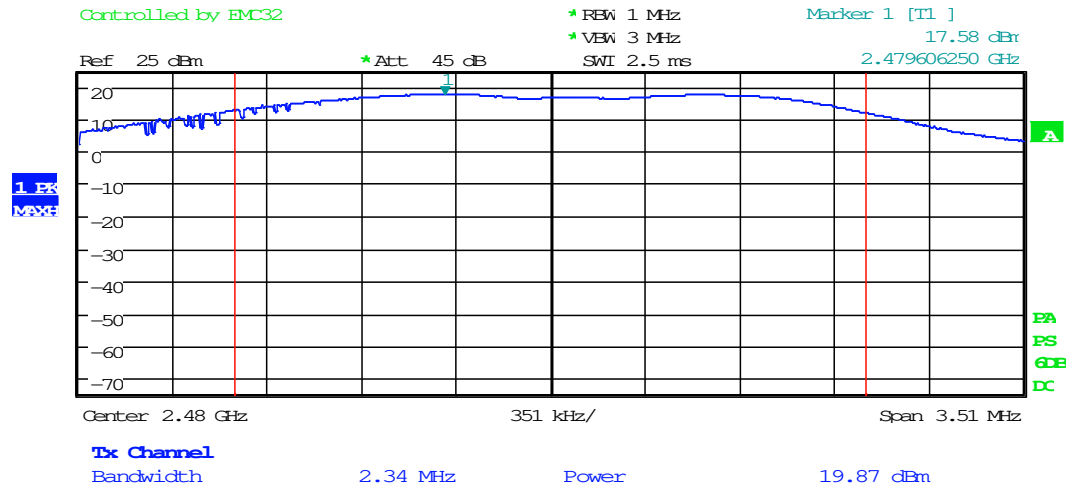
Mid Channel



Date: 2.MAY.2014 15:35:03



High Channel



Date: 2.MAY.2014 15:38:30



9 RADIATED SPURIOUS EMISSION

The EUT antenna port was fitted with its 9dBi whip antenna. Radiated emissions were measured on the Open Area Test Site (OATS). All emissions generated that fall in the restricted bands per FCC Part 15.205 were examined.

9.1 Requirements:

All emissions that fall in the restricted bands defined in FCC Part 15.205 shall not exceed the maximum field strength listed in FCC Part 15.209(a).

9.2 Equipment Used:

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shield Room	0175	Ray Proof	N/A	11645	Verified
Digital Thermometer with Humidity	CL075	ACU-Rite	00891	None Specified	Verified
OATS-3m	CL017	Compliance Labs	N/A	001	Dec. 12, 2014
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 30, 2014
Antenna 1-Chamber	0142	ETS/EMCO	3142B	9811-1330	Verified
Antenna 2-OATS	0105	Sunol Sciences	JB1	A101101	May 7, 2015
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500900	Jan. 9, 2015
Active 18" Loop Antenna	CL082	A.H. Systems, Inc.	SAS-562B	241	Sept. 6, 2014
Antenna, Horn	CL098	Emco	3115	9809-5580	Dec. 3, 2015
Cable: 0.3m Low Loss	CL117	A.H. Systems, Inc.	SAC-26G-3	207	Jan. 16, 2015
High Frequency Cable	CL154	Pasternack	p/n PE350-240	N/A	Jan. 16, 2015



9.3 Radiated Spurious Emission Test Data

Test Dates:	May 2, June 11 & 30, 2014	Test Engineers:	J. Knepper; K. Littell
Standards:	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	Air Temperature:	17.3°C
		Relative Humidity:	60%

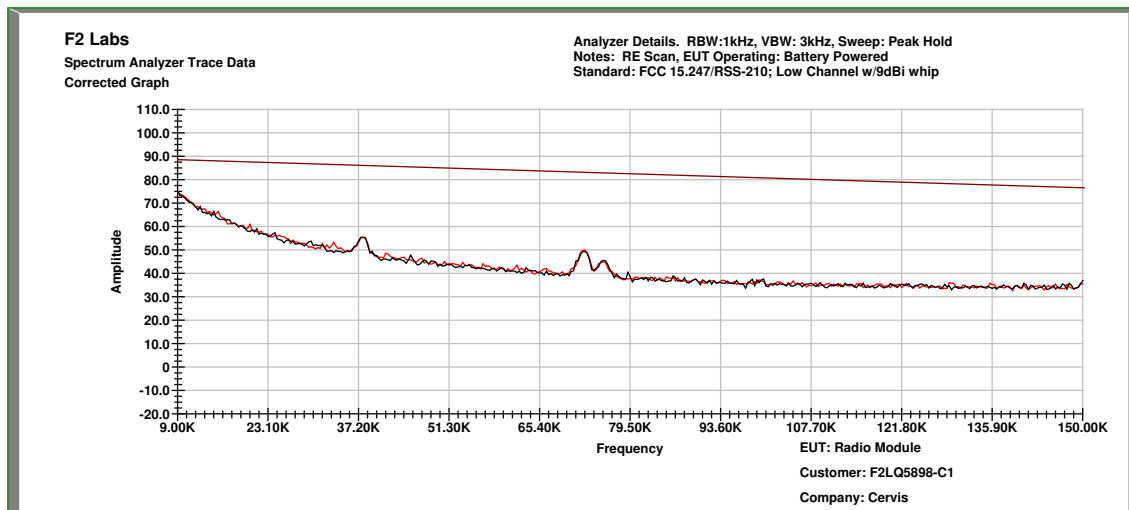
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some frequencies, no emissions from the EUT were measurable over the ambient noise floor. The readings did not change with EUT on and EUT off.

At least 6 of the highest frequencies were measured per ANSI 63.4 on the Open Area Test Site. Frequencies below 1GHz were measured using a quasi-peak detector. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions. Some of the frequencies did not change with the EUT on or off. At those frequencies, the test distance was shortened to 1 meter and still no emissions from the EUT were visible or over the ambient or limit.

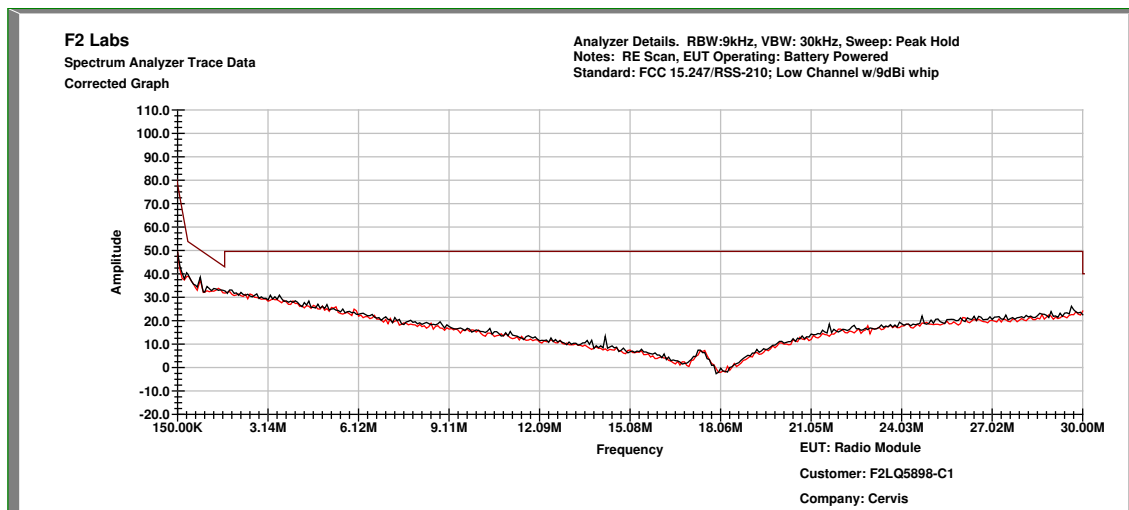
In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.



Characterization Scan - Low Channel: .009 MHz to .015 MHz

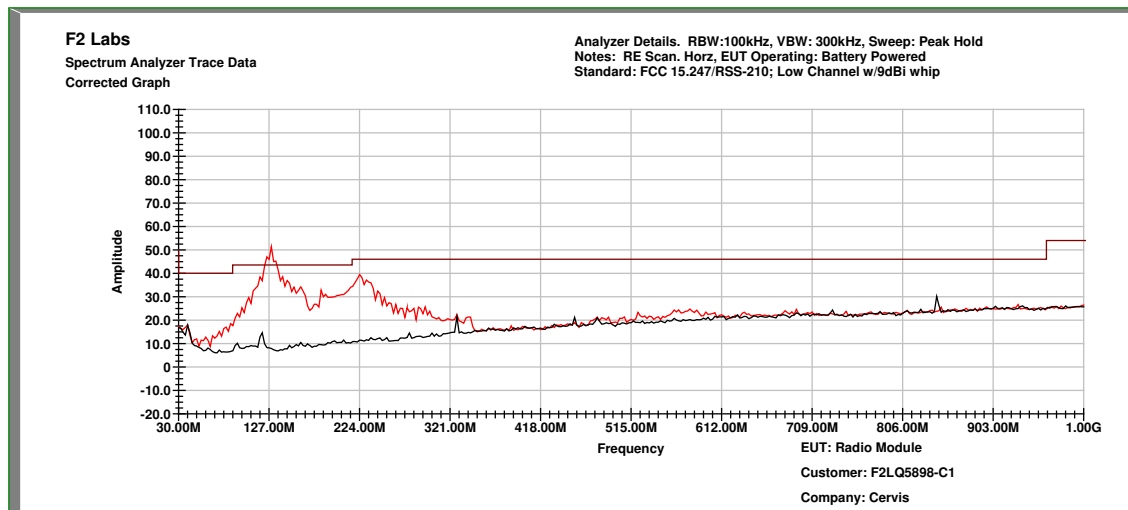


Characterization Scan - Low Channel: .15 MHz to 30 MHz

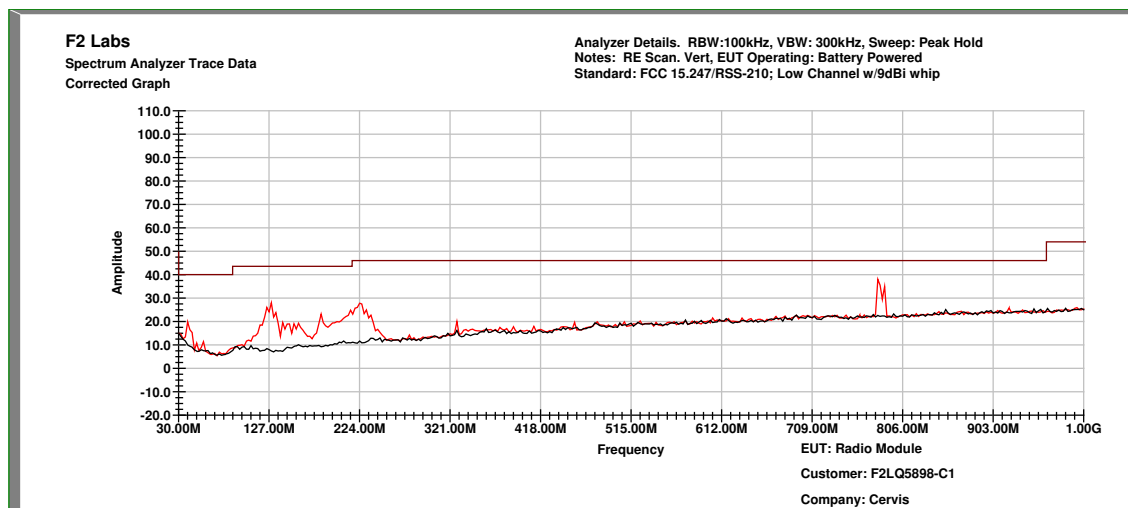




Characterization Scan - Low Channel: 30 MHz to 1 GHz, Horizontal

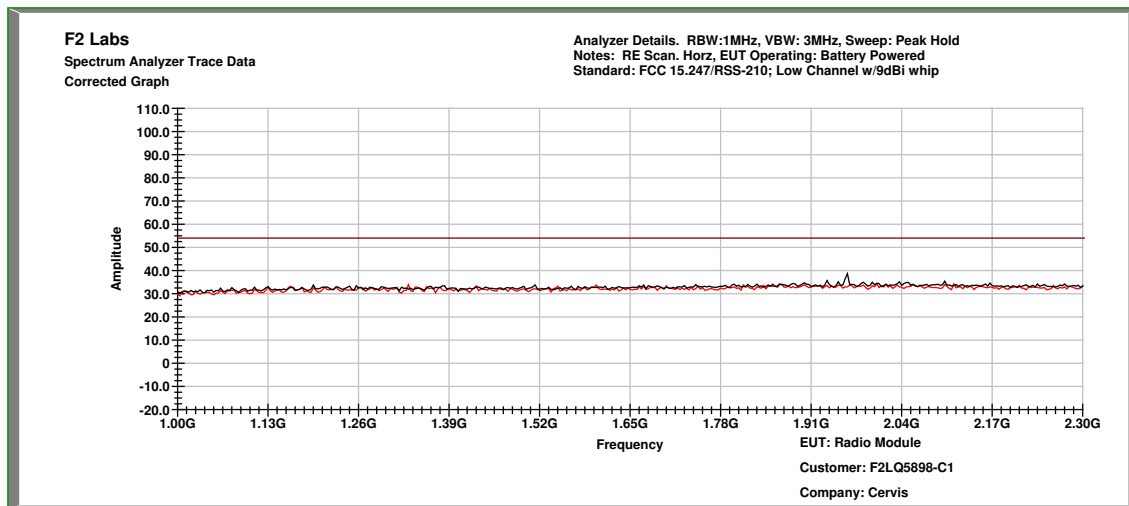


Characterization Scan - Low Channel: 30 MHz to 1 GHz, Vertical

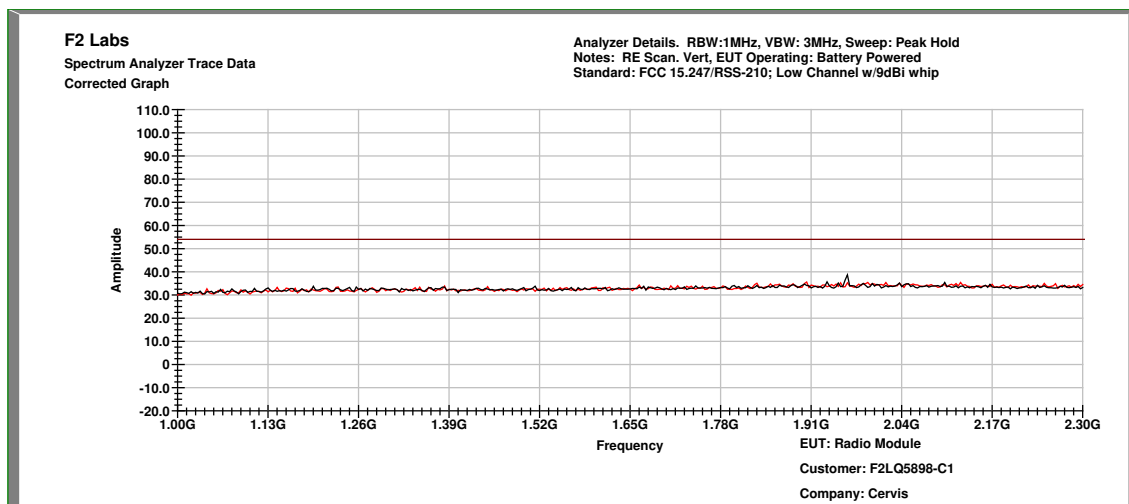




Characterization Scan - Low Channel: 1 GHz to 2.3 GHz, Horizontal

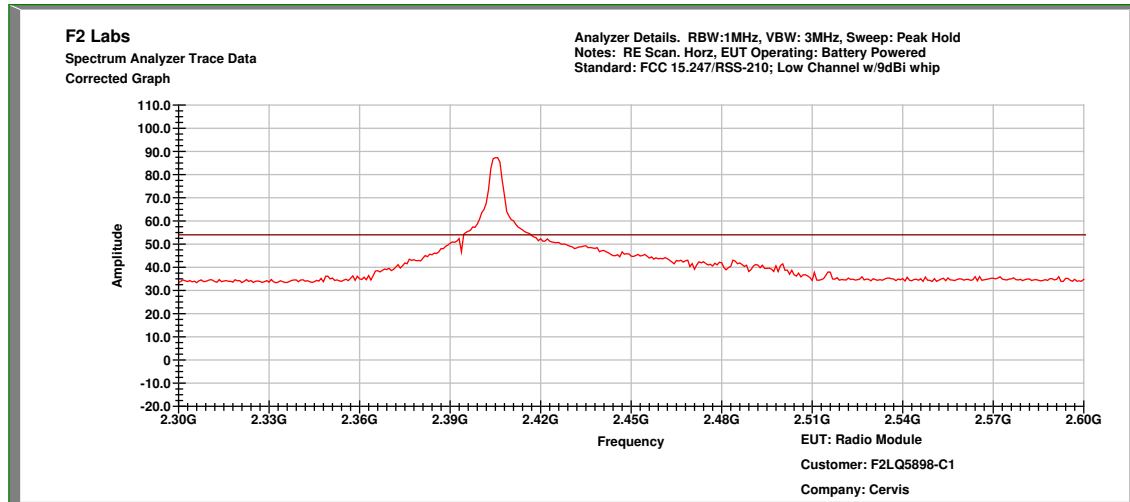


Characterization Scan - Low Channel: 1 GHz to 2.3 GHz, Vertical

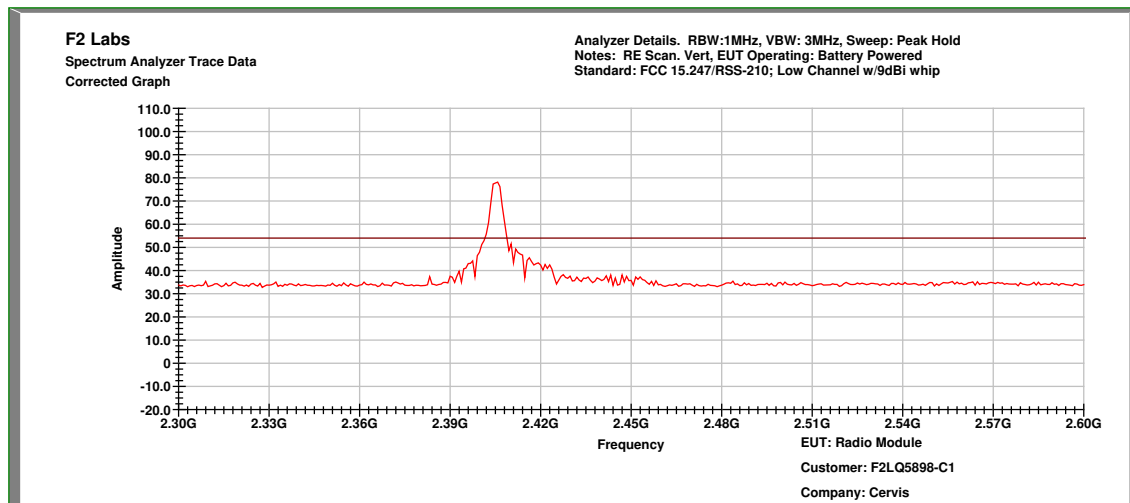




Characterization Scan - Low Channel, 2.3 GHz to 2.6 GHz, Horizontal

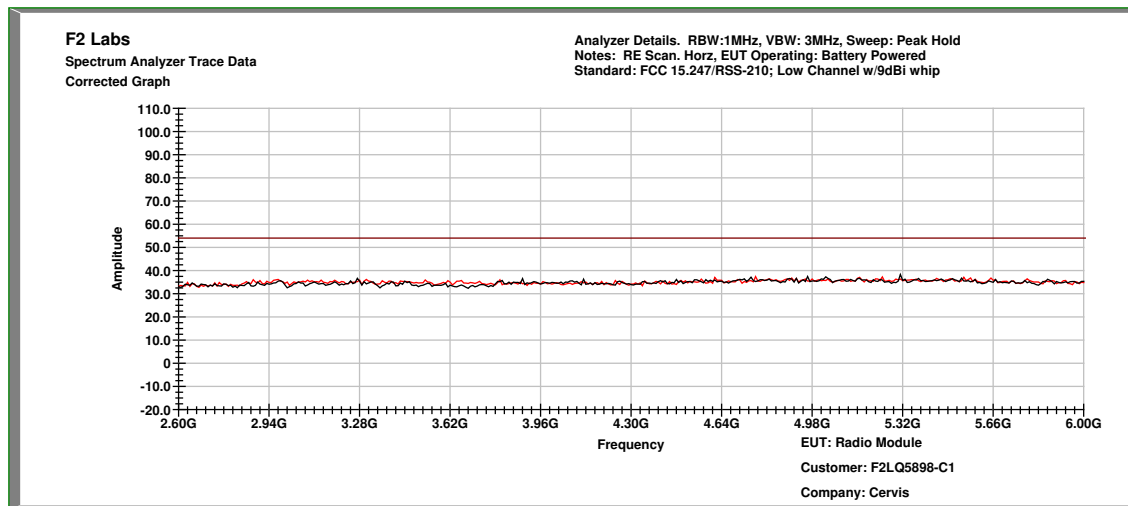


Characterization Scan - Low Channel, 2.3 GHz to 2.6 GHz, Vertical

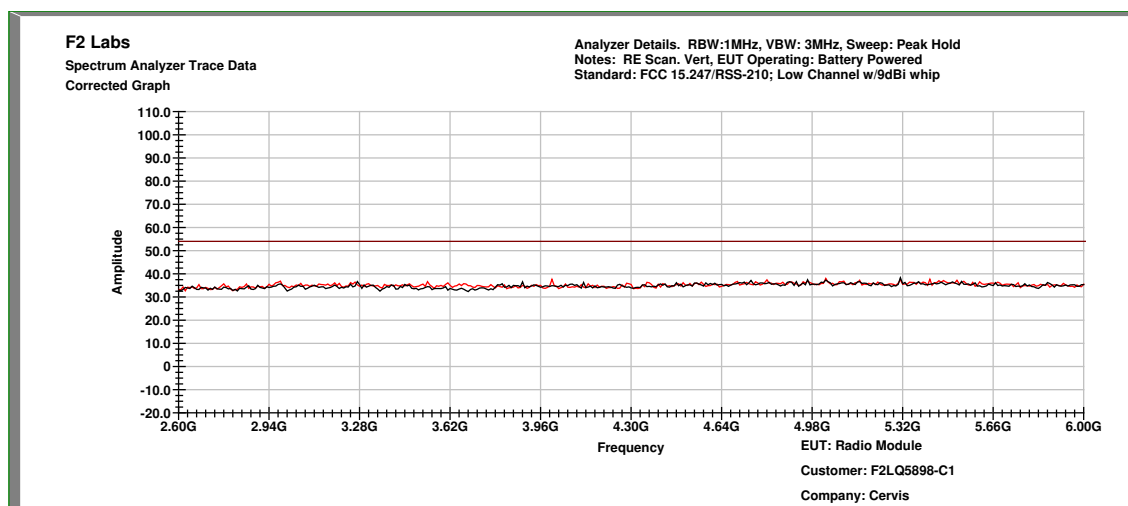




Characterization Scan - Low Channel, 2.6 GHz to 6 GHz, Horizontal

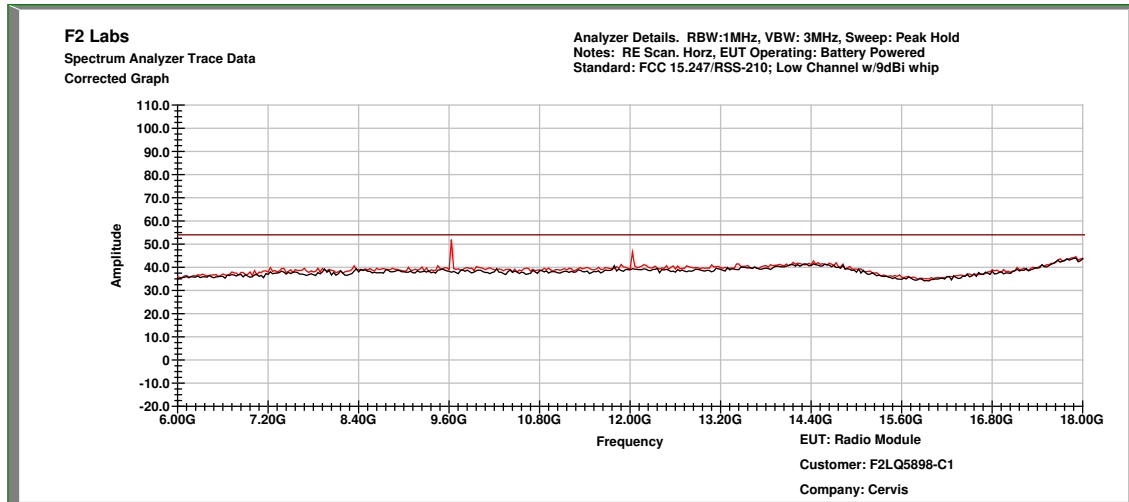


Characterization Scan - Low Channel, 2.6 GHz to 6 GHz, Vertical

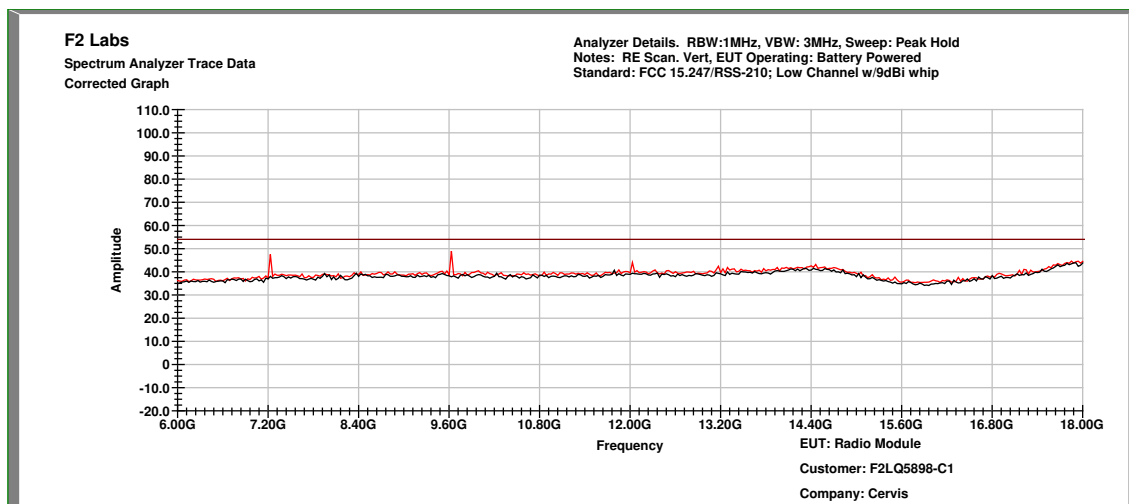




Characterization Scan - Low Channel, 6 GHz to 18 GHz, Horizontal

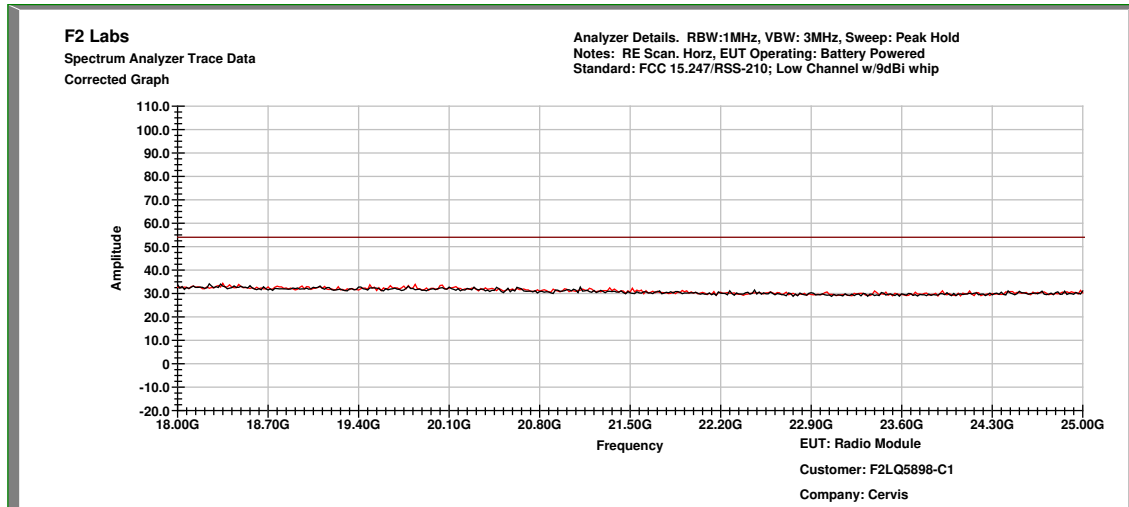


Characterization Scan - Low Channel, 6 GHz to 18 GHz, Vertical

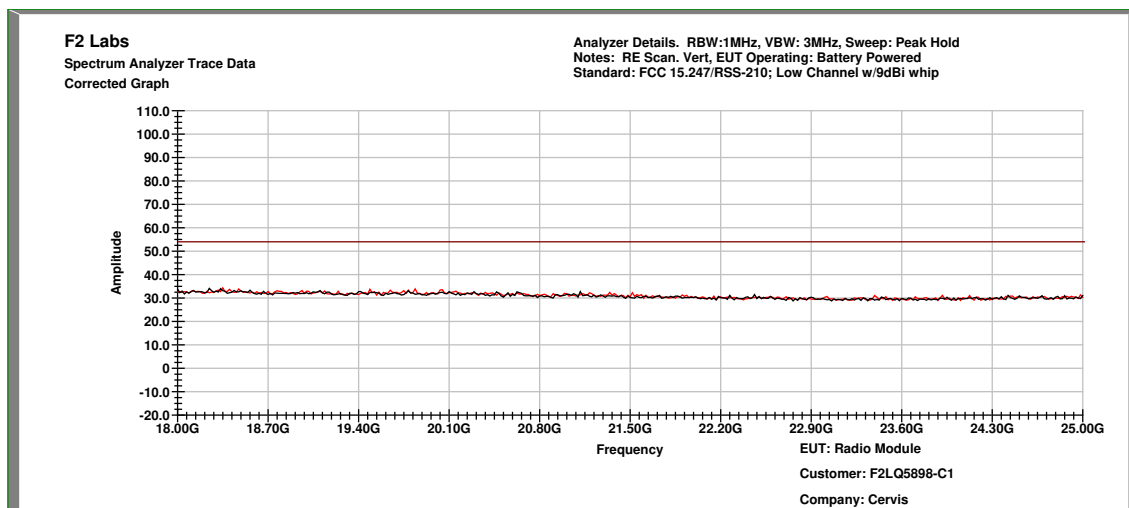




Characterization Scan - Low Channel, 18 GHz to 25 GHz, Horizontal

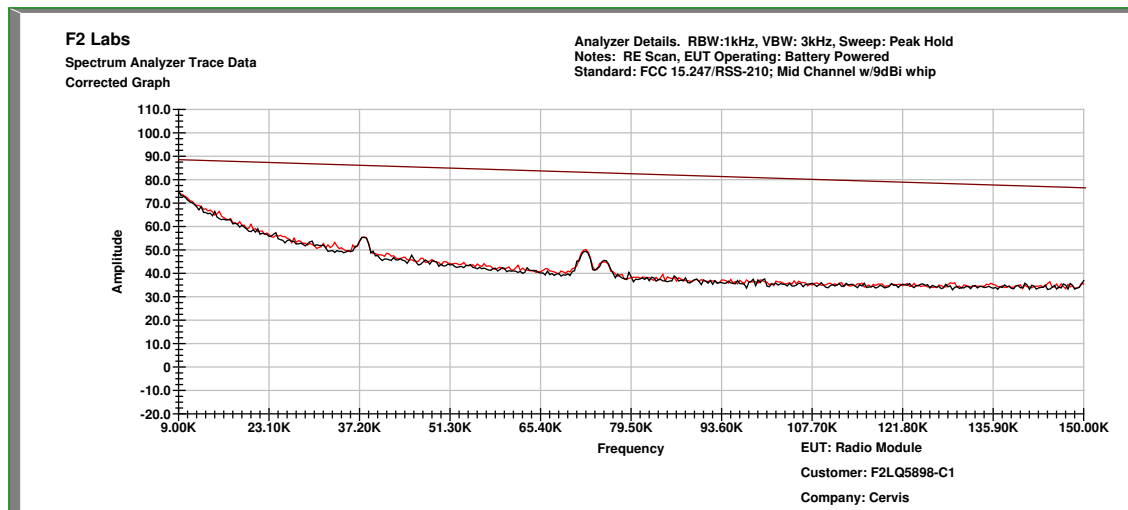


Characterization Scan - Low Channel, 18 GHz to 25 GHz, Vertical

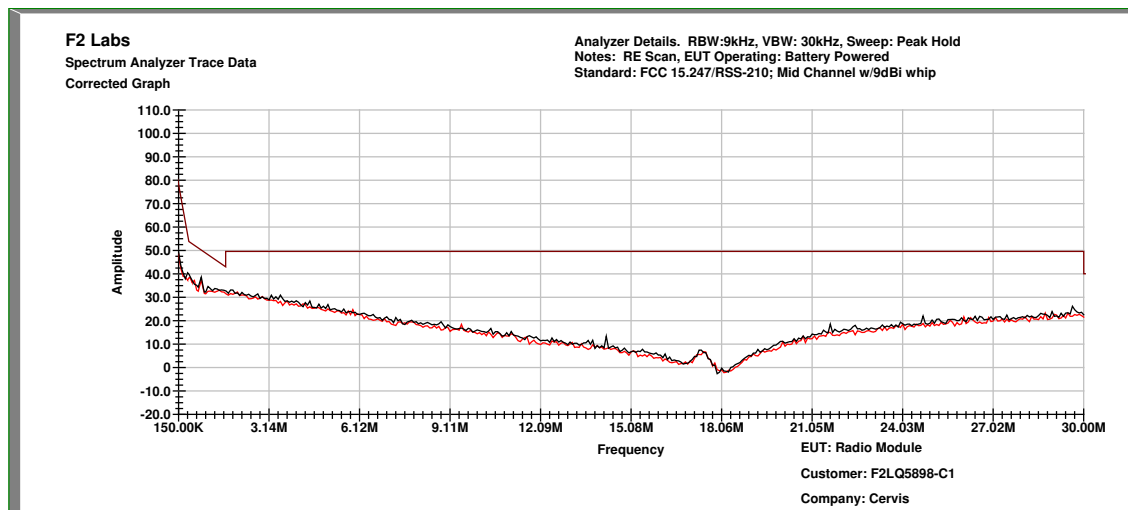




Characterization Scan - Mid Channel: .009 MHz to .015 MHz

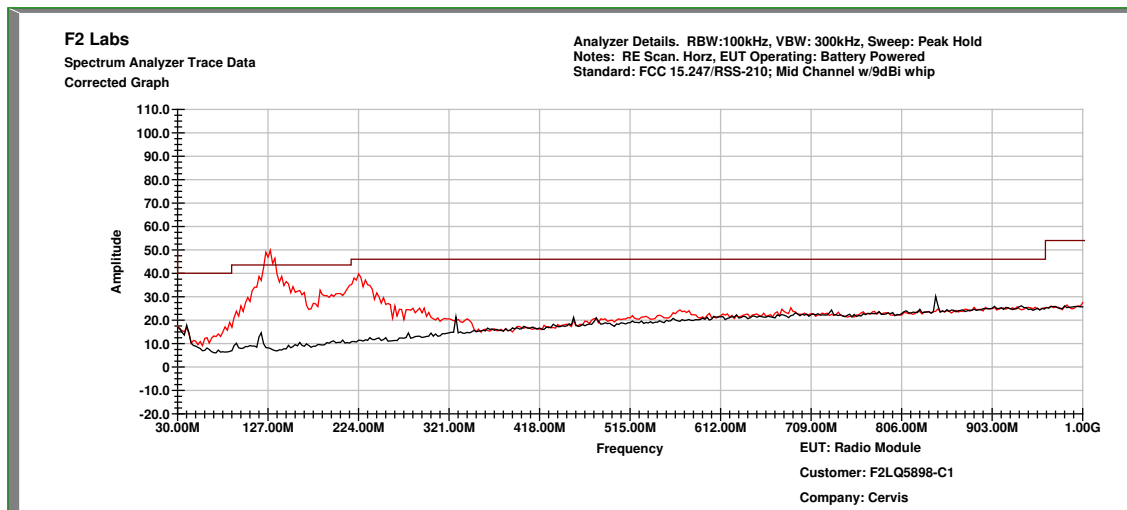


Characterization Scan - Mid Channel: .15 MHz to 30 MHz

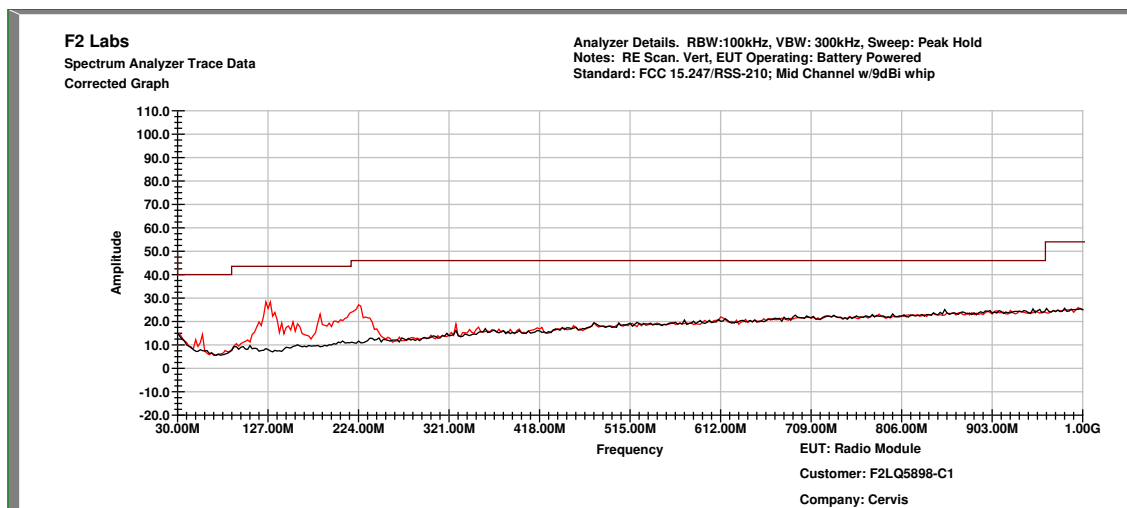




Characterization Scan - Mid Channel: 30 MHz to 1 GHz, Horizontal

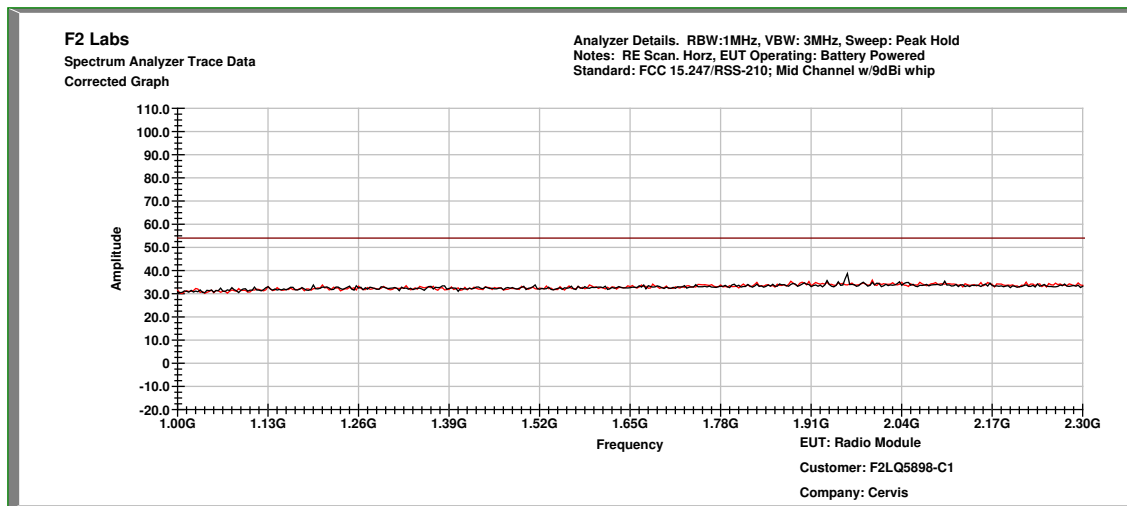


Characterization Scan - Mid Channel: 30 MHz to 1 GHz, Vertical

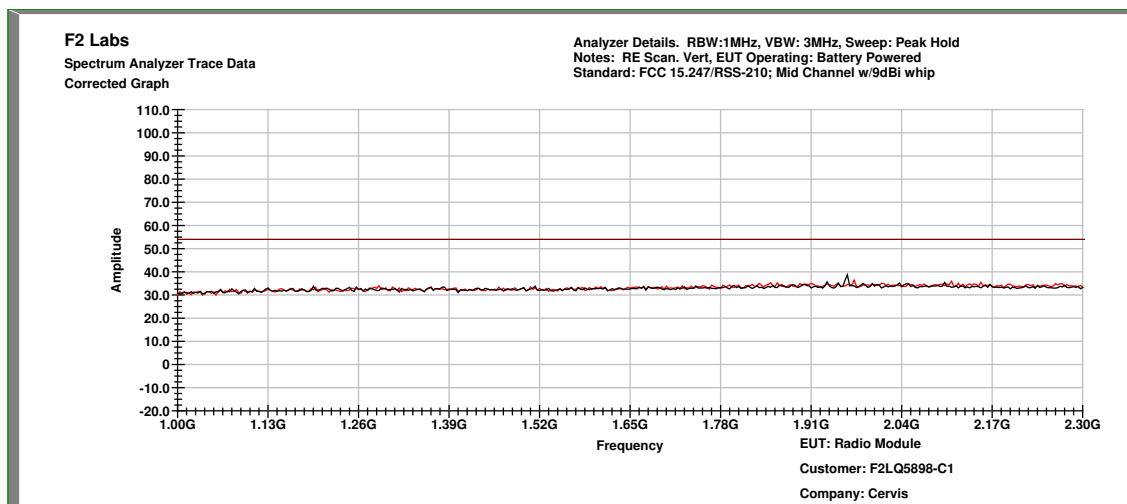




Characterization Scan - Mid Channel: 1 GHz to 2.3 GHz, Horizontal

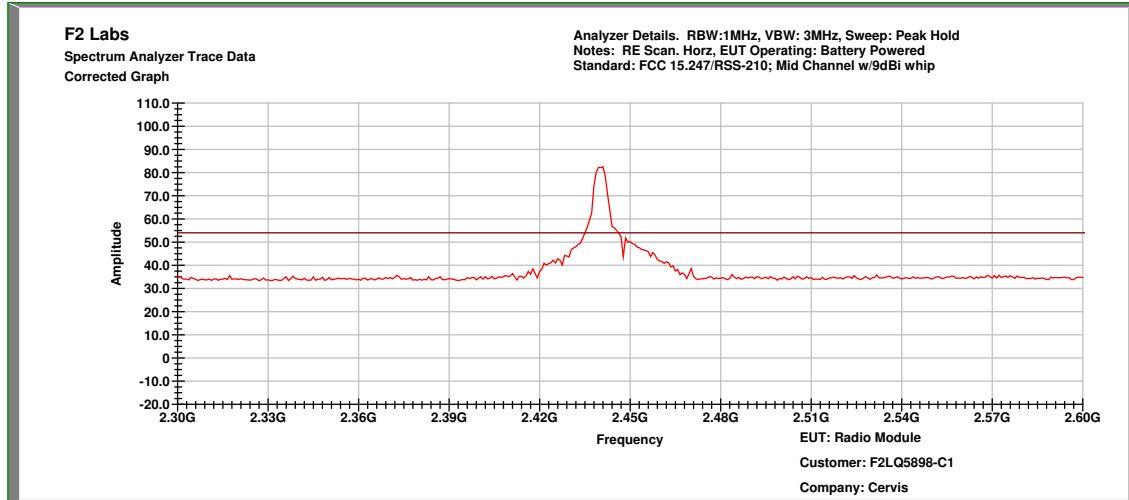


Characterization Scan - Mid Channel: 1 GHz to 2.3 GHz, Vertical

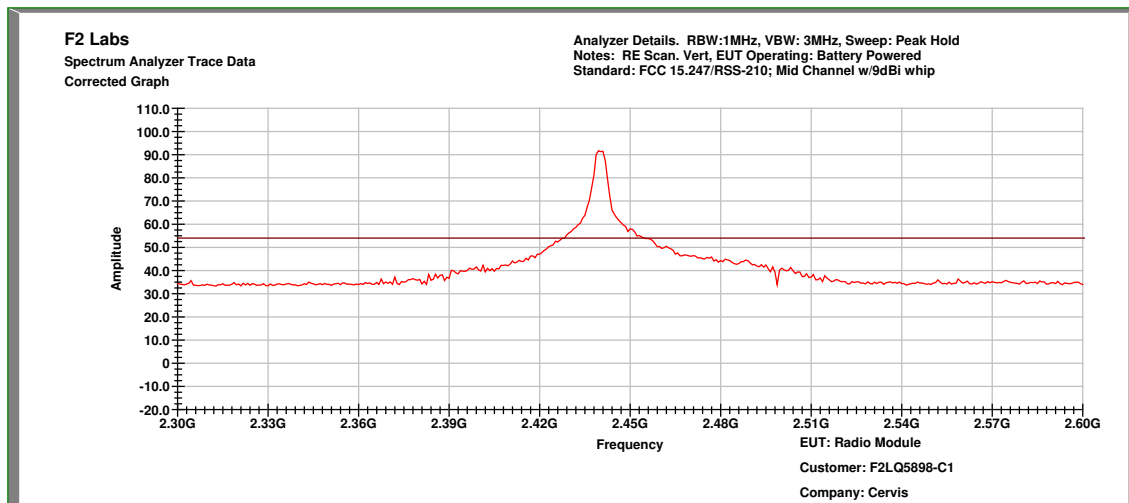




Characterization Scan - Mid Channel, 2.3 GHz to 2.6 GHz, Horizontal

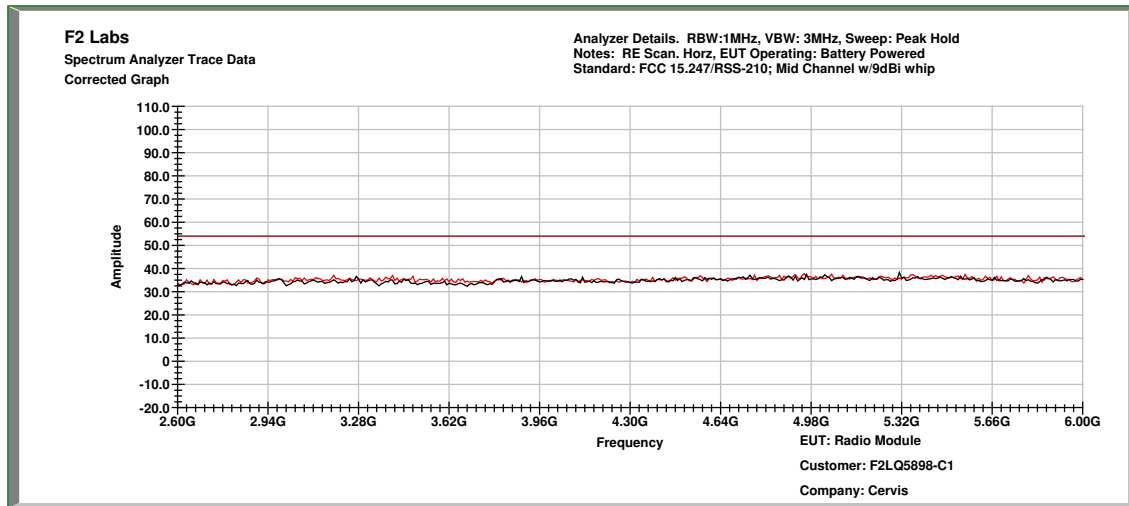


Characterization Scan - Mid Channel, 2.3 GHz to 2.6 GHz, Vertical

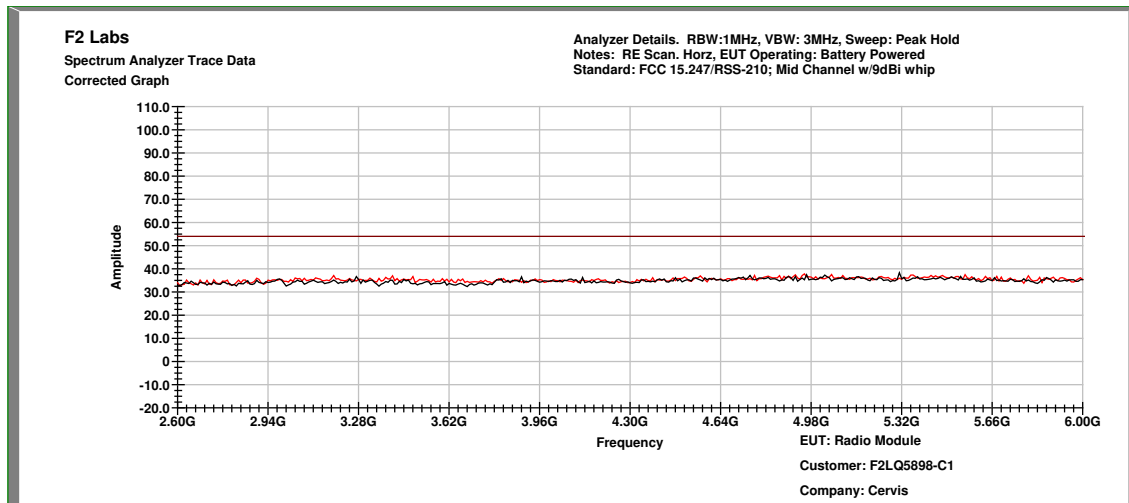




Characterization Scan - Mid Channel, 2.6 GHz to 6 GHz, Horizontal

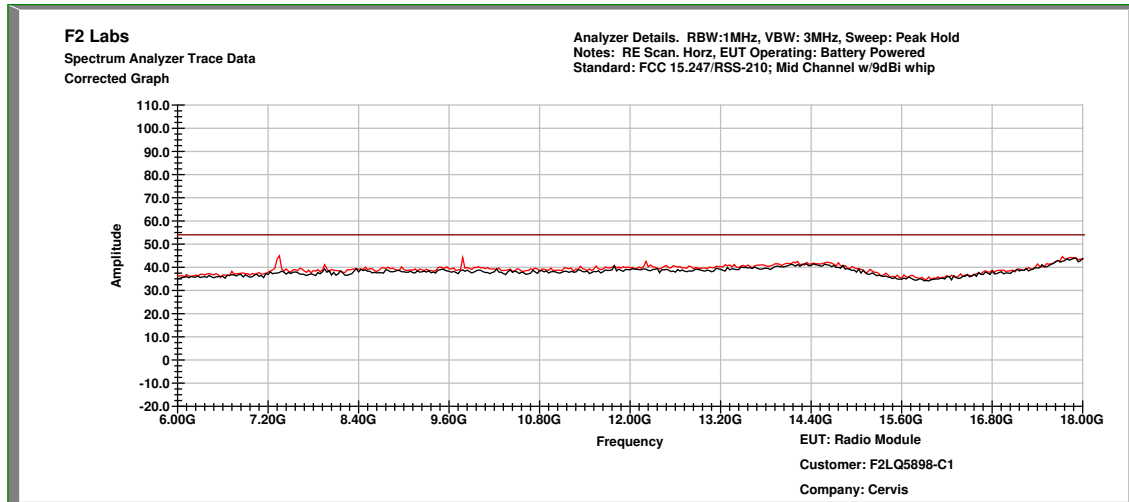


Characterization Scan - Mid Channel, 2.6 GHz to 6 GHz, Vertical

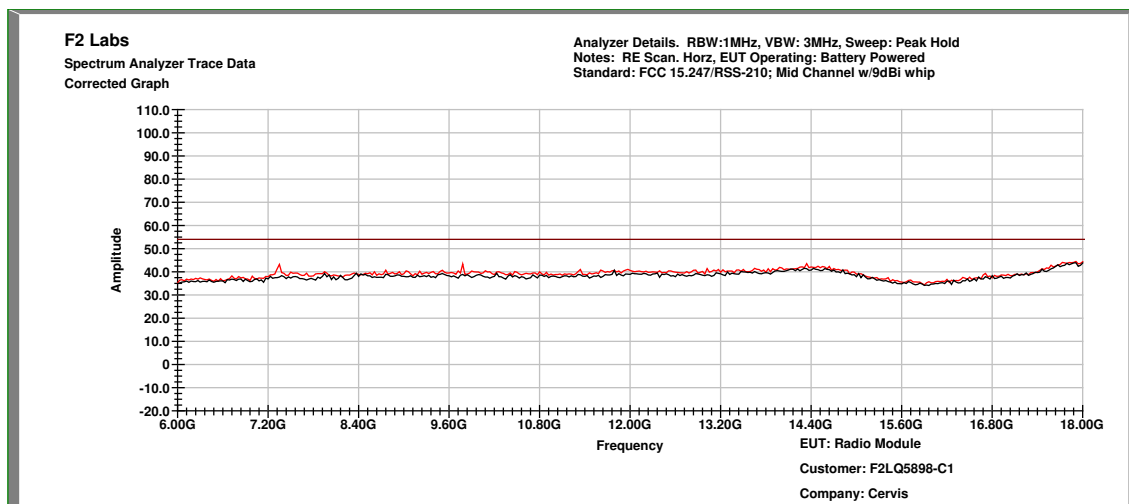




Characterization Scan - Mid Channel, 6 GHz to 18 GHz, Horizontal

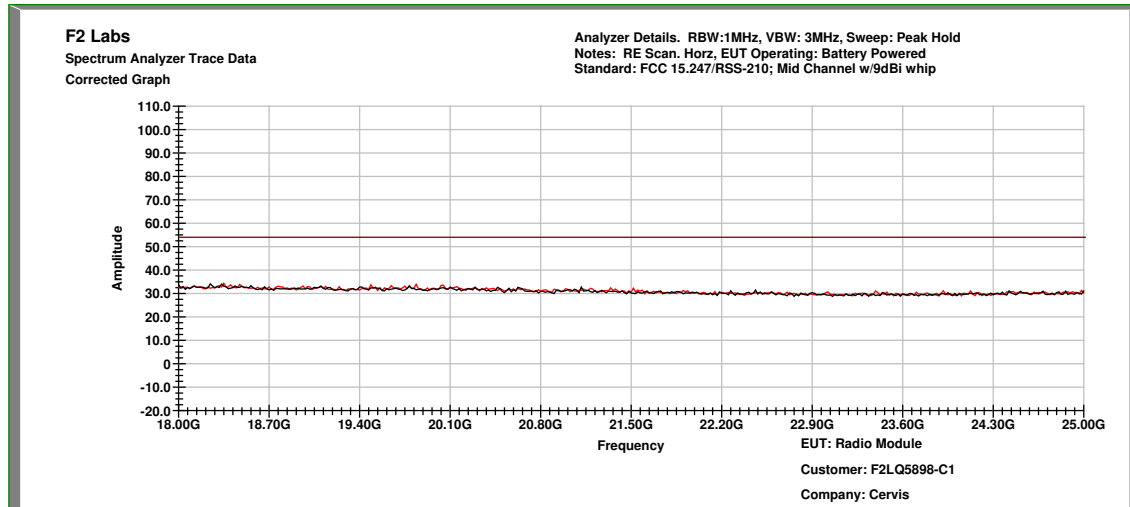


Characterization Scan - Mid Channel, 6 GHz to 18 GHz, Vertical

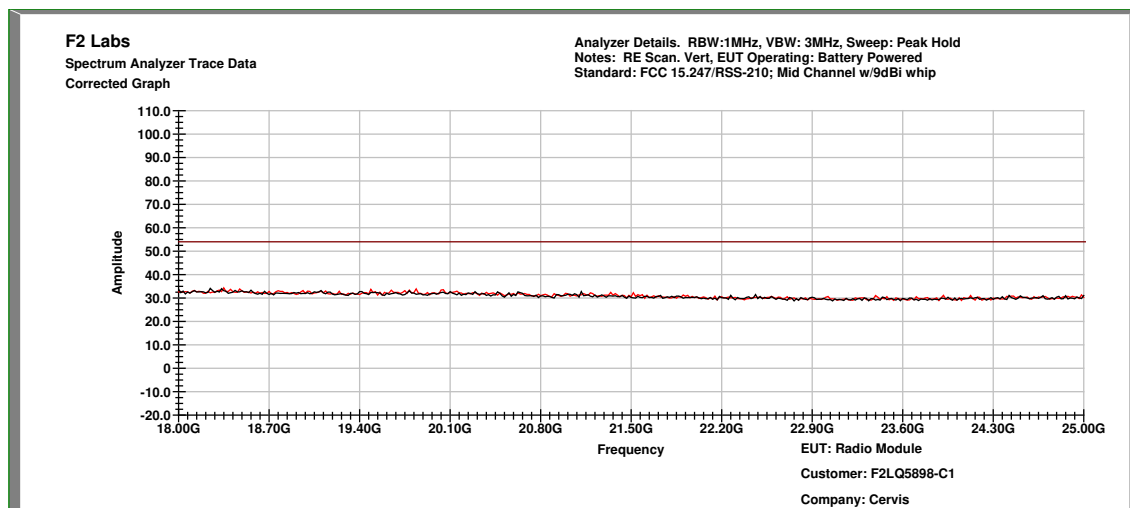




Characterization Scan - Mid Channel, 18 GHz to 25 GHz, Horizontal

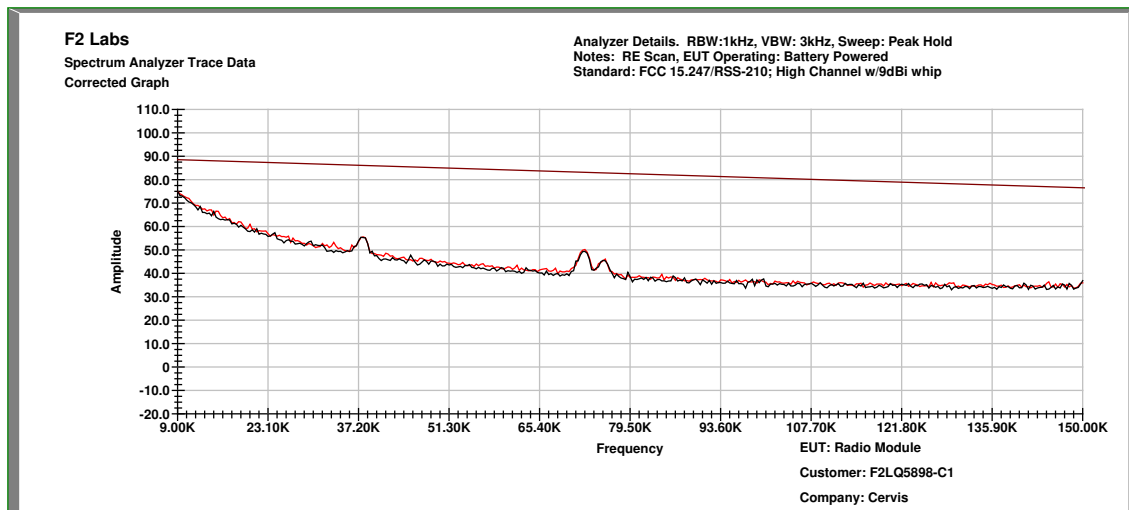


Characterization Scan - Mid Channel, 18 GHz to 25 GHz, Vertical

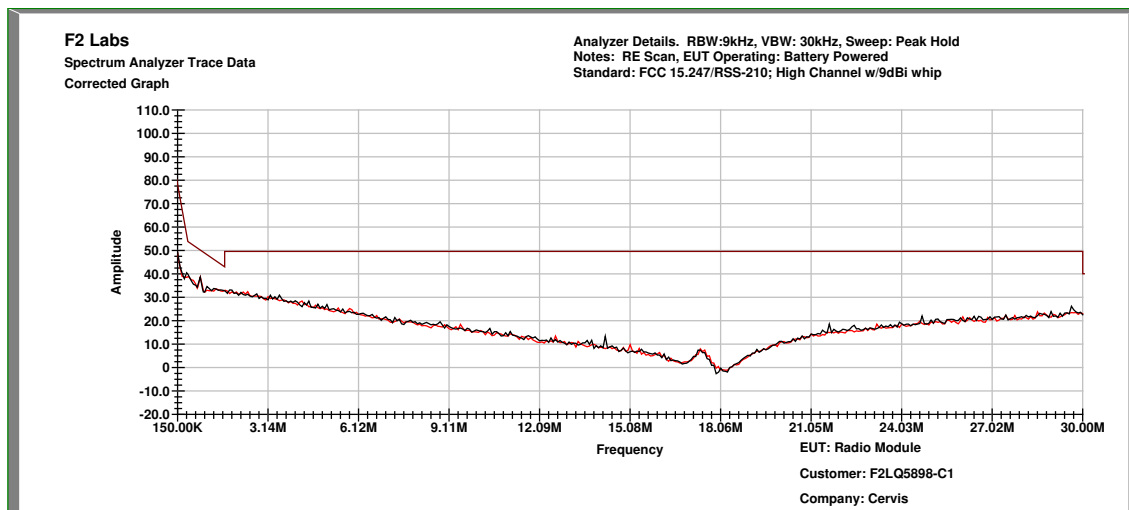




Characterization Scan - High Channel: .009 MHz to .015 MHz

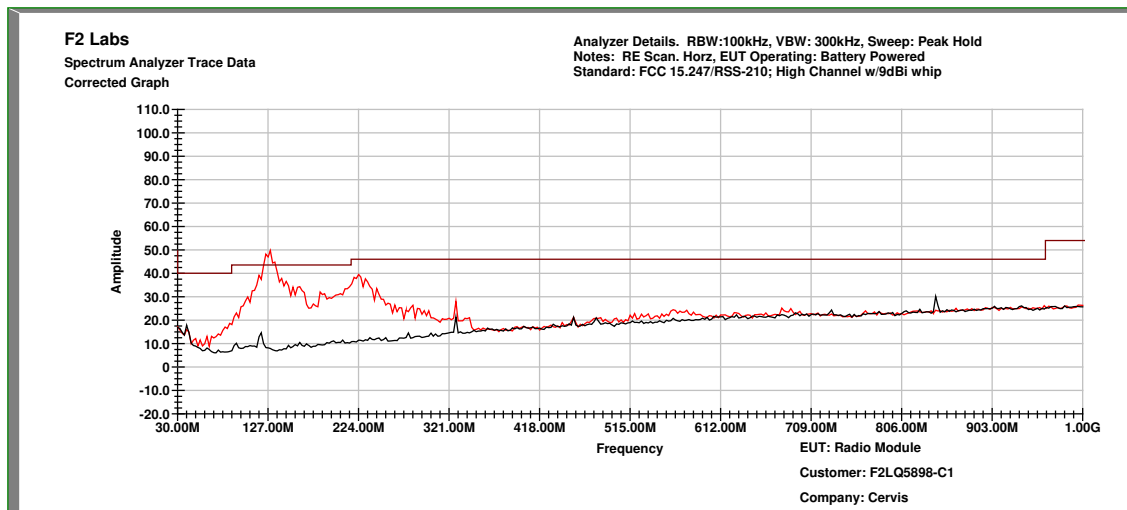


Characterization Scan - High Channel: .15 MHz to 30 MHz

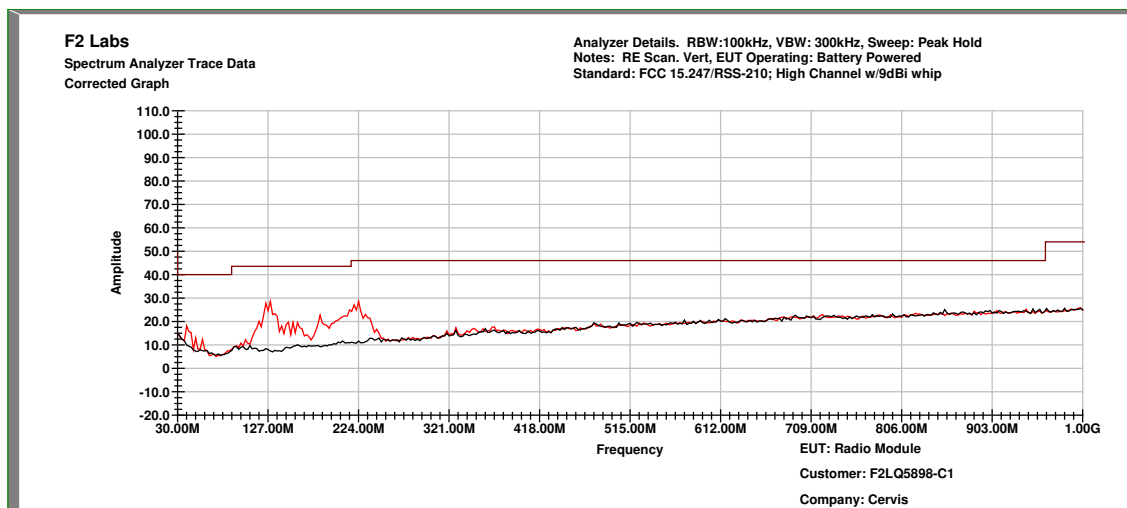




Characterization Scan - High Channel: 30 MHz to 1 GHz, Horizontal

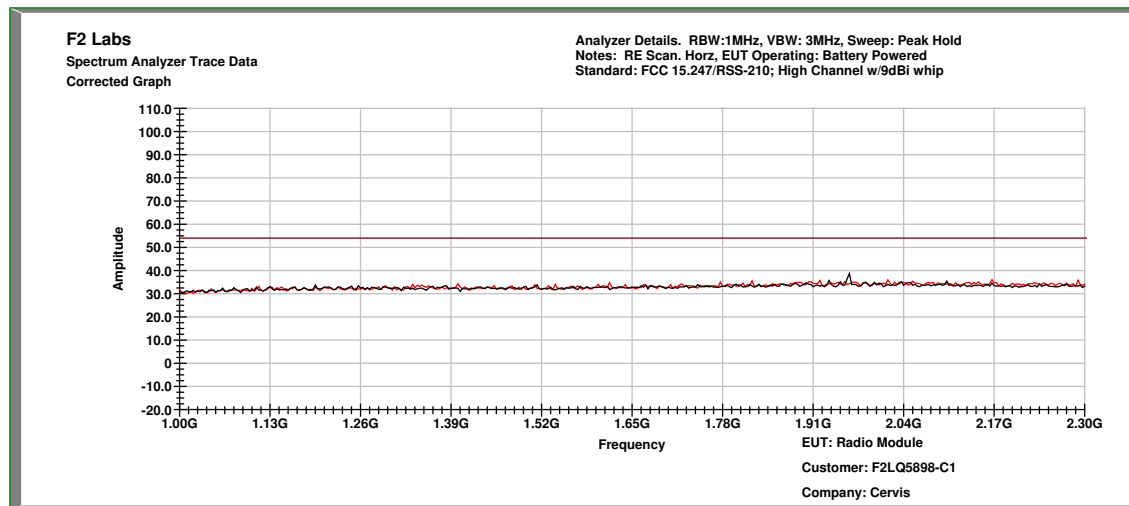


Characterization Scan - High Channel: 30 MHz to 1 GHz, Vertical

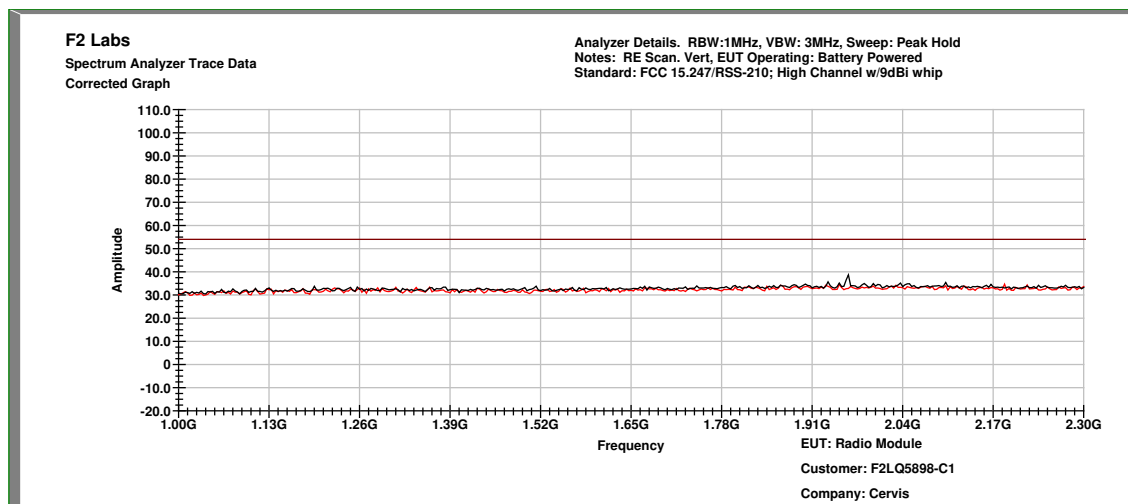




Characterization Scan - High Channel: 1 GHz to 2.3 GHz, Horizontal

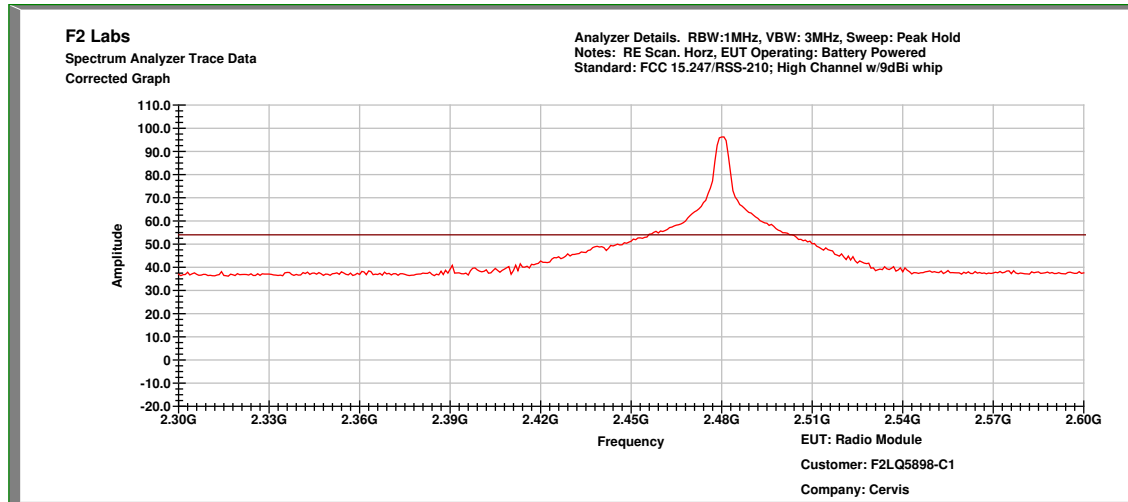


Characterization Scan - High Channel: 1 GHz to 2.3 GHz, Vertical

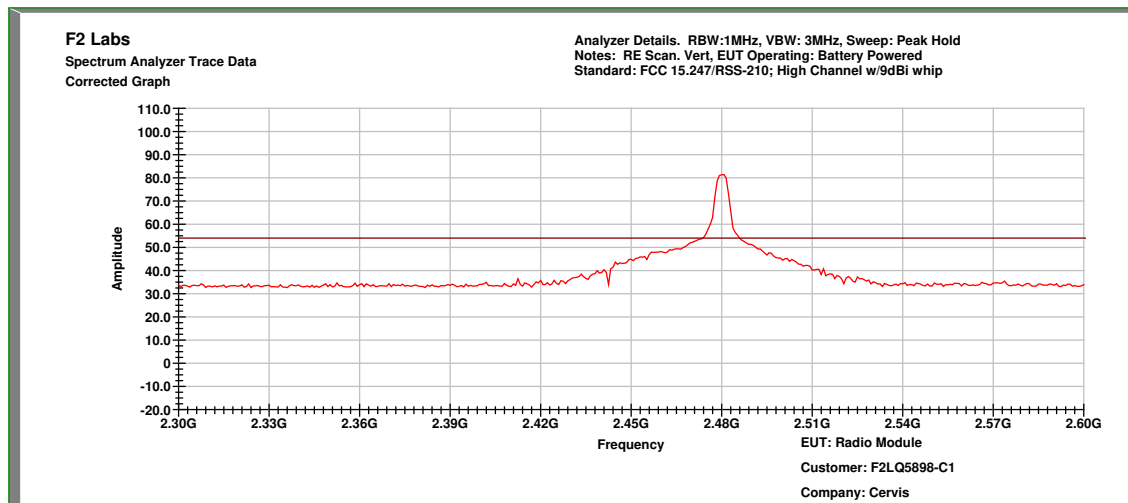




Characterization Scan - High Channel, 2.3 GHz to 2.6 GHz, Horizontal

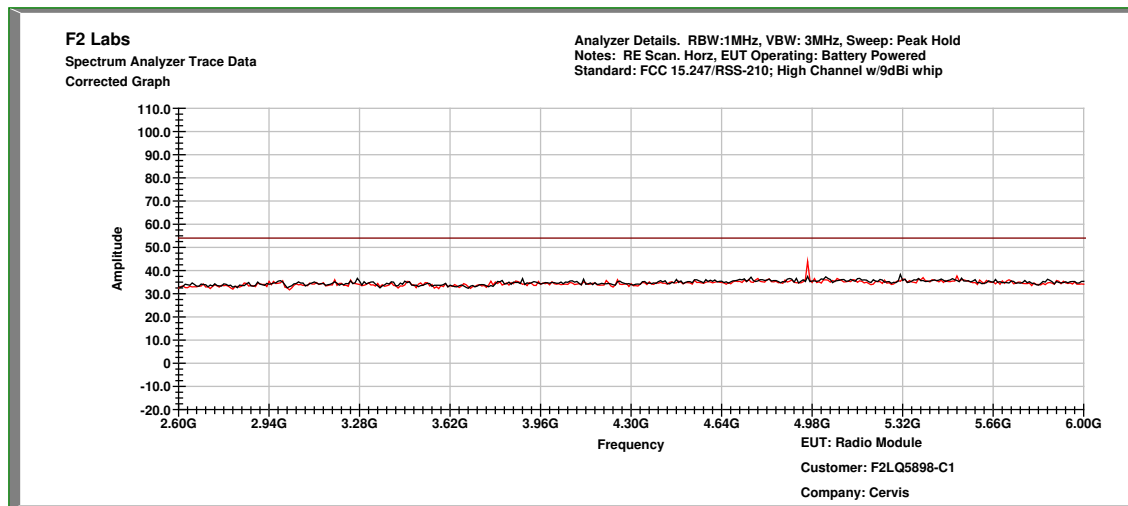


Characterization Scan - High Channel, 2.3 GHz to 2.6 GHz, Vertical

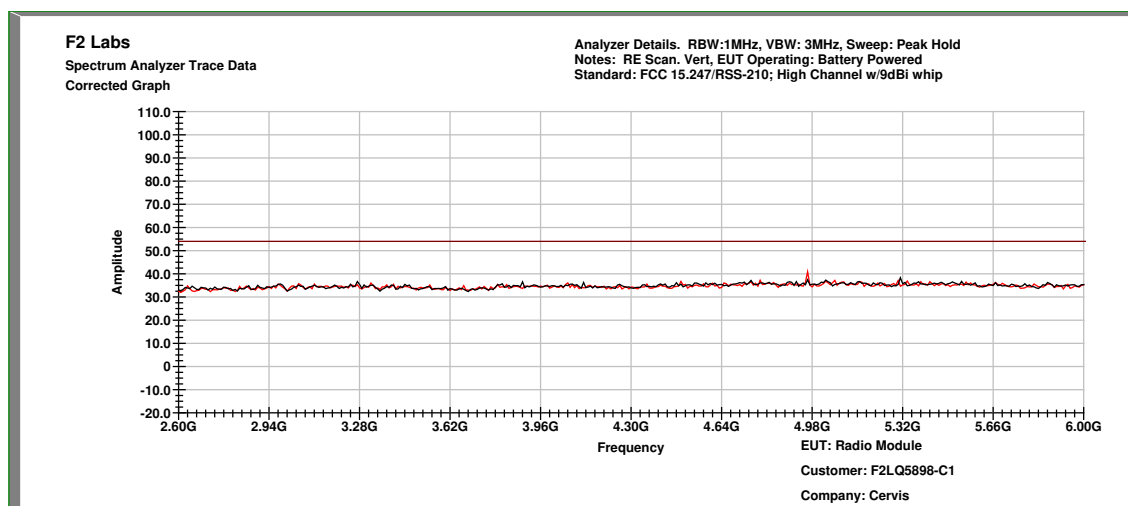




Characterization Scan - High Channel, 2.6 GHz to 6 GHz, Horizontal

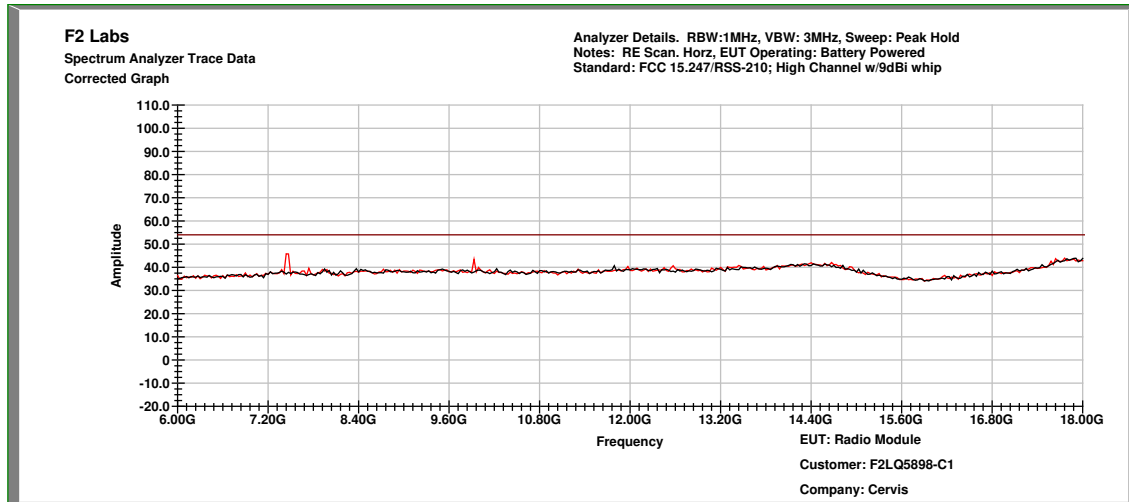


Characterization Scan - High Channel, 2.6 GHz to 6 GHz, Vertical

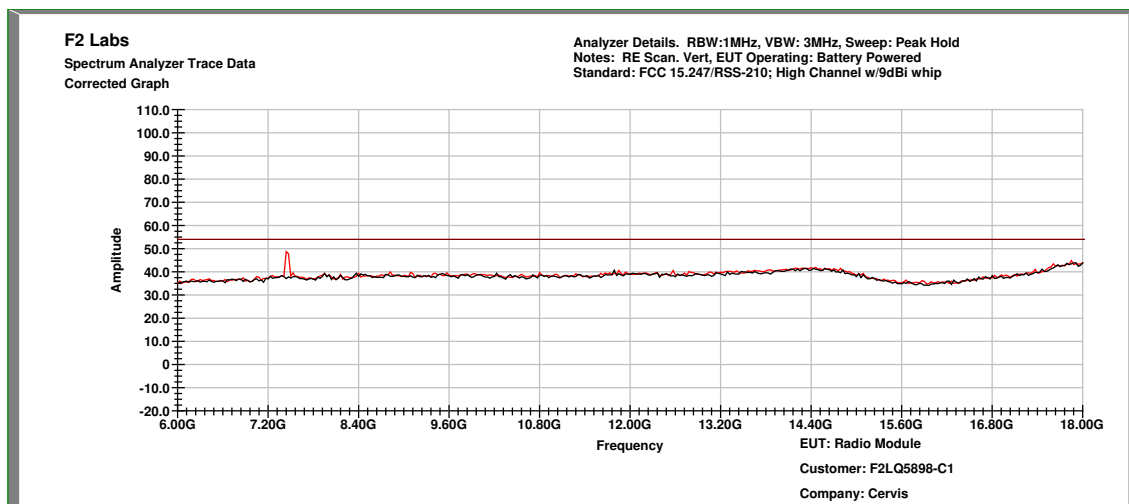




Characterization Scan - High Channel, 6 GHz to 18 GHz, Horizontal

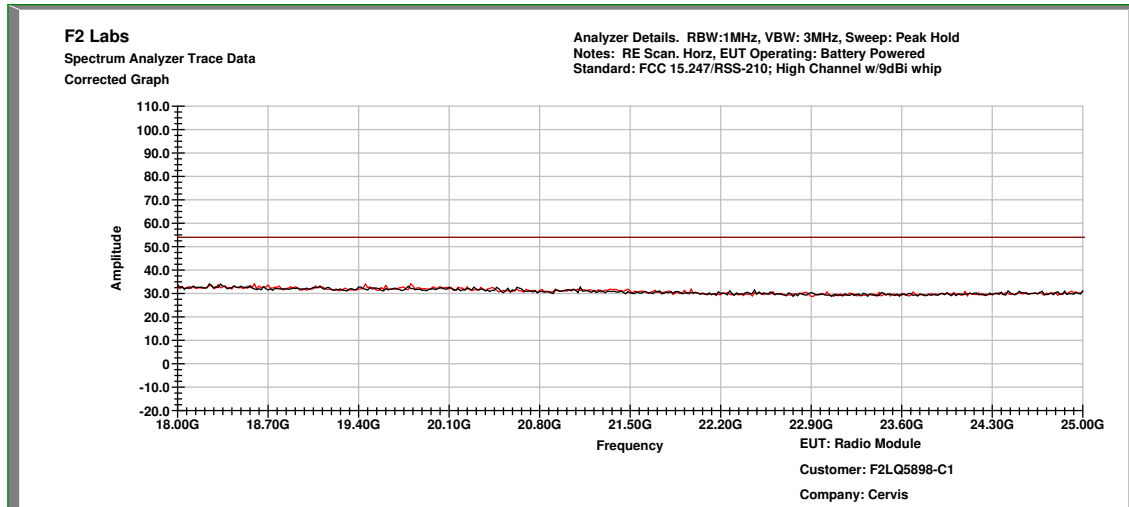


Characterization Scan - High Channel, 6 GHz to 18 GHz, Vertical

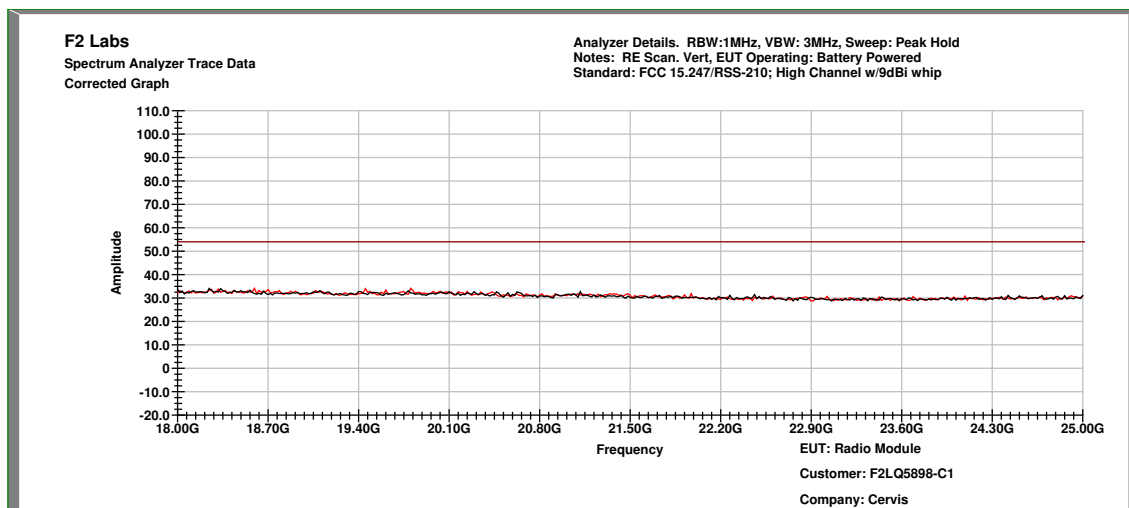




Characterization Scan - High Channel, 18 GHz to 25 GHz, Horizontal



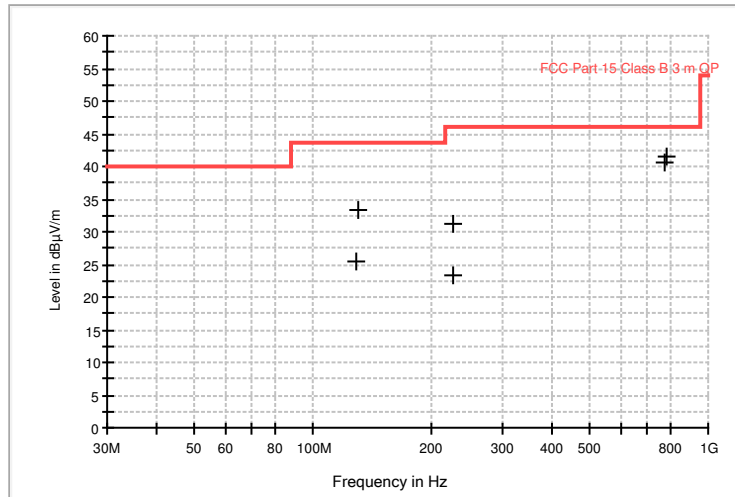
Characterization Scan - High Channel, 18 GHz to 25 GHz, Vertical





Measurements

Low Channel

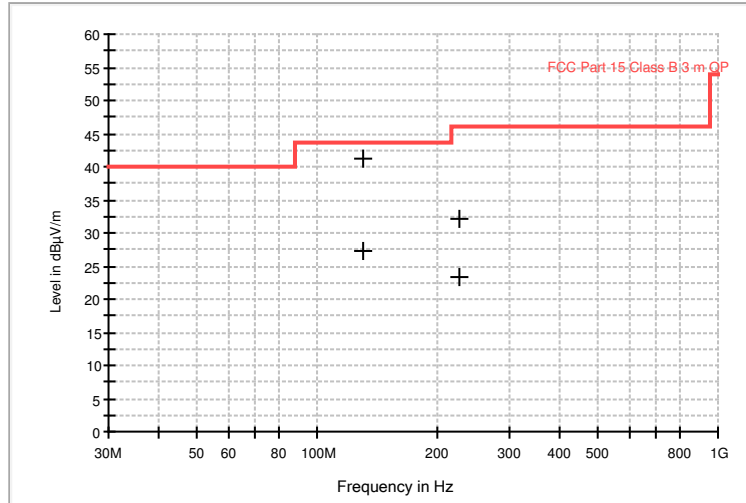


Frequency (MHz)	Bandwidth	Antenna Polarization	QuasiPeak (dB μ V/m)	Cable Loss & Antenna Factor (dB)	Emission (dB μ V/m)	QP Limit (dB μ V/m)	QP Margin (dB)
128.770000	120.000	V	7.4	18.0	25.4	43.5	-18.1
129.100000	120.000	H	15.7	17.7	33.4	43.5	-10.1
225.860000	120.000	V	6.5	16.7	23.2	46.0	-22.8
226.520000	120.000	H	14.5	16.7	31.2	46.0	-14.8
779.010000	120.000	V	7.7	32.8	40.5	46.0	-5.5
785.620000	120.000	V	8.5	33.0	41.5	46.0	-4.5

Frequency (MHz)	MaxPeak (dB μ V/m)	Limits (dB μ V/m)	Average (dB μ V/m)	Limits (dB μ V/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
4811.280000	62.7	74.0	49.3	54.0	1000.000	H	32.9
4819.000000	62.6	74.0	49.1	54.0	1000.000	V	33.5
7200.000000	55.1	74.0	43.3	54.0	1000.000	V	33.7
9600.000000	57.8	74.0	40.8	54.0	1000.000	H	33.53
9600.000000	56.9	74.0	39.6	54.0	1000.000	V	34.9
12000.000000	43.2	74.0	38.6	54.0	1000.000	H	35.4



Mid Channel

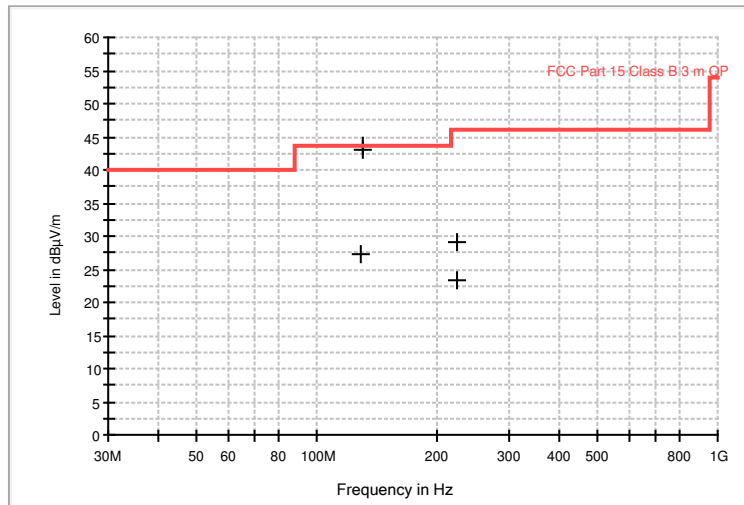


Frequency (MHz)	Bandwidth	Antenna Polarization	QuasiPeak (dBμV/m)	Cable Loss & Antenna Factor (dB)	Emission (dBμV/m)	QP Limit (dBμV/m)	QP Margin (dB)
129.080000	120.000	V	9.5	17.9	27.4	43.5	-16.1
129.100000	120.000	H	23.6	17.7	41.3	43.5	-2.2
225.340000	120.000	V	6.7	16.6	23.3	46.0	-22.7
226.490000	120.000	H	15.6	16.4	32.0	46.0	-14.0

Frequency (MHz)	MaxPeak (dBμV/m)	Limits (dBμV/m)	Average (dBμV/m)	Limits (dBμV/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
7320.00000	42.1	74.0	37.4	54.0	1000.000	V	33.7
7320.00000	44.5	74.0	38.0	54.0	1000.000	H	34.2
9760.00000	46.2	74.0	41.2	54.0	1000.000	H	33.5
9760.00000	45.9	74.0	40.7	54.0	1000.000	V	34.9



High Channel



Frequency (MHz)	Bandwidth	Antenna Polarization	QuasiPeak (dBµV/m)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	QP Limit (dBµV/m)	QP Margin (dB)
128.480000	120.000	V	9.3	18.0	27.3	43.5	-16.2
129.170000	120.000	H	22.3	17.7	40.0	43.5	-3.5
223.300000	120.000	V	6.7	16.6	23.3	46.0	-22.7
224.240000	120.000	H	12.9	16.3	29.2	46.0	-16.8

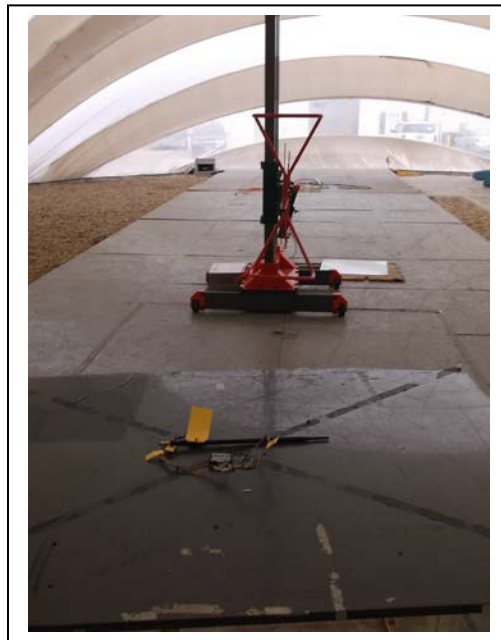
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Bandwidth (kHz)	Polarity	Corr. (dB)
4960.00000	41.6	74.0	35.7	54.0	1000.000	V	33.7
4960.00000	44.2	74.0	36.4	54.0	1000.000	H	33.1
7440.00000	53.6	74.0	46.1	54.0	1000.000	V	33.9
7440.00000	49.8	74.0	42.7	54.0	1000.000	H	34.4

12 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Radiated Spurious Emission: Prescan



Radiated Spurious Emission: OATS





Conducted Output Power

