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United States of America
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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, Type III

FCC ID: LOBSRF305

Testing Commenced: Aug. 27, 2014

Testing Ended: Sept. 4, 2014

Summary of Test Results: Page 5

Standards:

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



Order Number: F2LQ5898A-C2

Client: Cervis Inc.
Model: SRF305, Type III

Evaluation Conducted by:

Joe Knepper, EMC Proj. Eng.

Report Reviewed 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-05E	First Issue	Sept. 8, 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
Power on the High Channel was reduced 14 steps to meet Radiated Spurs requirements at the outer band edge.

**3 TABLE OF MEASURED RESULTS**

Test	High Channel 2.480GHz	Mid Channel 2.440GHz	Low Channel 2.405GHz
Conducted Output Power	8.851mW (9.47dBm)	82.6mW (19.17dBm)	85.7mW (19.33dBm)
Conducted Output Power Limit	1 Watt (30dBm)	1 Watt (30dBm)	1 Watt (30dBm)
E.I.R.P. with 9dBi Whip Antenna	70.3mW (18.47dBm)	656.1mW (28.17dBm)	680.8mW (28.33dBm)
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, Type III

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).

6.0 MODIFICATIONS MADE TO THE EUT

Power on the High Channel was reduced 14 steps to meet Radiated Spurs requirements at the outer band edge.

**7 TEST EQUIPMENT USED**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shield Room	0175	Ray Proof	N/A	11645	Verified
Temp/Hum. Recorder	CL137	Extech	RH520	CH16992	May 5, 2015
OATS-3m	CL017	Compliance Labs	N/A	001	Dec. 13, 2014
Spectrum Analyzer	CL138	Agilent Technologies	E4407B	US41192779	Oct. 29, 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
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 3, 2015
Horn Antenna	CL114	A.H. Systems, Inc.	SAS-572	237	Sept. 16, 2014
Pre-Amplifier	CL153	Agilent	83006-69007	MY39500900	Jan. 9, 2015
Pre-Amplifier	CL136	Hewlett Packard	8447E	1937A01894	Apr. 29, 2015
Software:	Tile Version 1.0		Software Verified: Sept. 4, 2014		
Software:	EMC 32, Version 5.20.2		Software Verified: Sept. 4, 2014		



8 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.

8.1 Requirements:

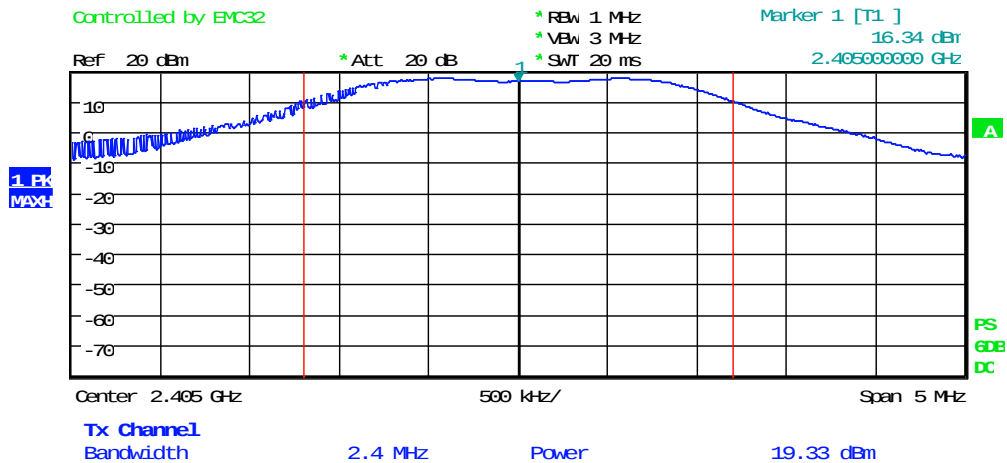
The peak power output shall be 1 watt (30 dBm) or less when using an antenna with a gain of less than 6dBi. For antennas having a gain of more than 6dBi, the limit is reduced by 1dB for every dB the antenna gain is over 6dBi.



8.2 Conducted Output Power Test Data

Test Date:	Sept. 4, 2014	Test Engineer:	J. Knepper
Standards:	CFR 47 Part 15.247(b)(3); KDB558074	Air Temperature:	22.1°C
		Relative Humidity:	50%

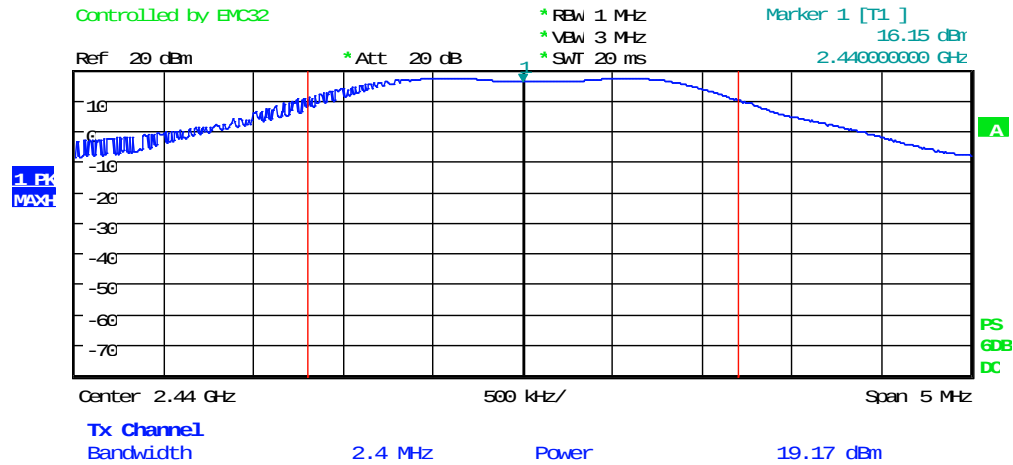
Low Channel



Date: 4.SEP.2014 08:52:49



Mid Channel



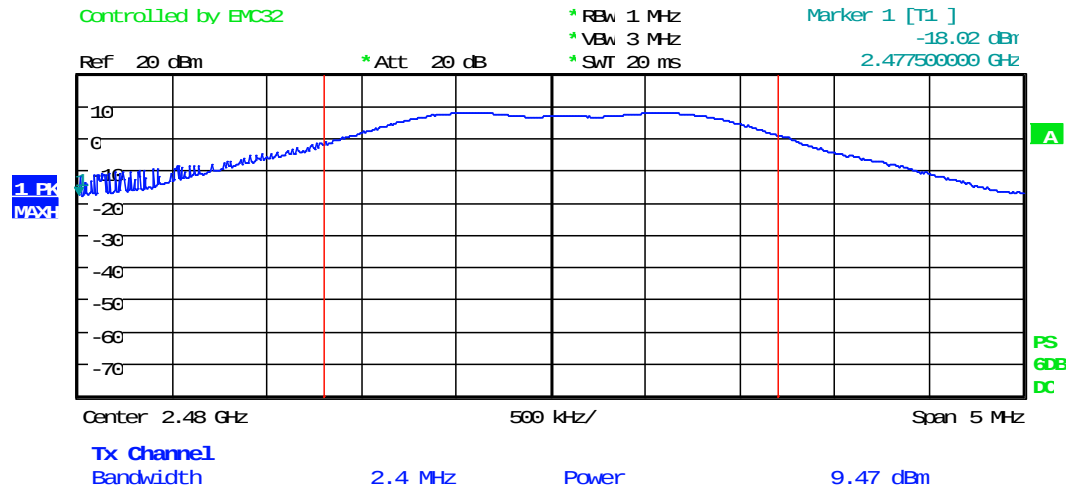
Date: 4.SEP.2014 08:54:30



Order Number: F2LQ5898A-C2

Client: Cervis Inc.
Model: SRF305, Type III

High Channel



Date: 4.SEP.2014 08:55:37



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 Radiated Spurious Emission Test Data

Test Dates:	Aug. 29, 2014-Sept. 4, 2014	Test Engineer:	J. Knepper
Standards:	CFR 47 Part 15.247(d); Part 15.209 / KDB558074	Air Temperature:	23.4°C
		Relative Humidity:	60%

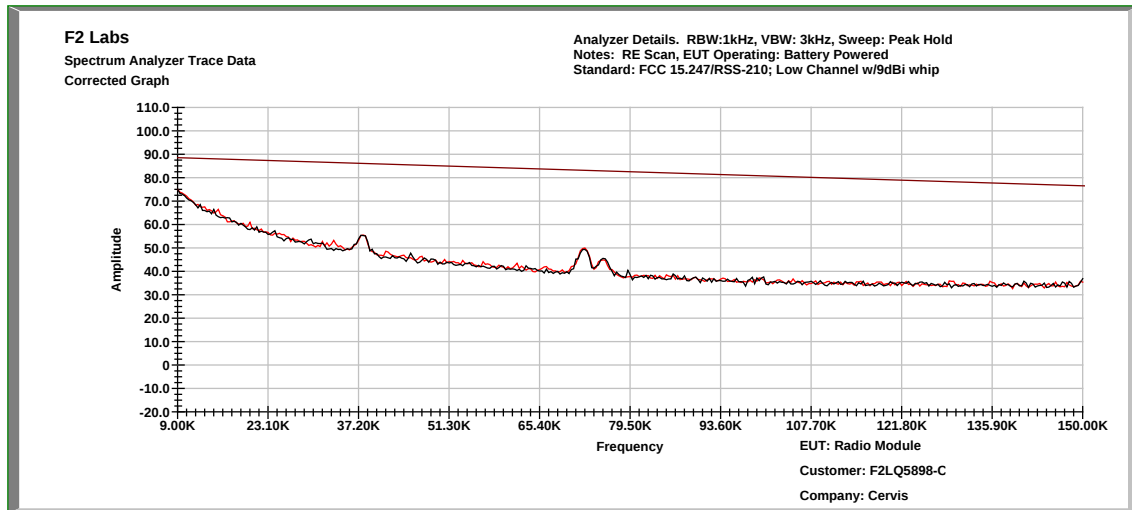
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some 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.

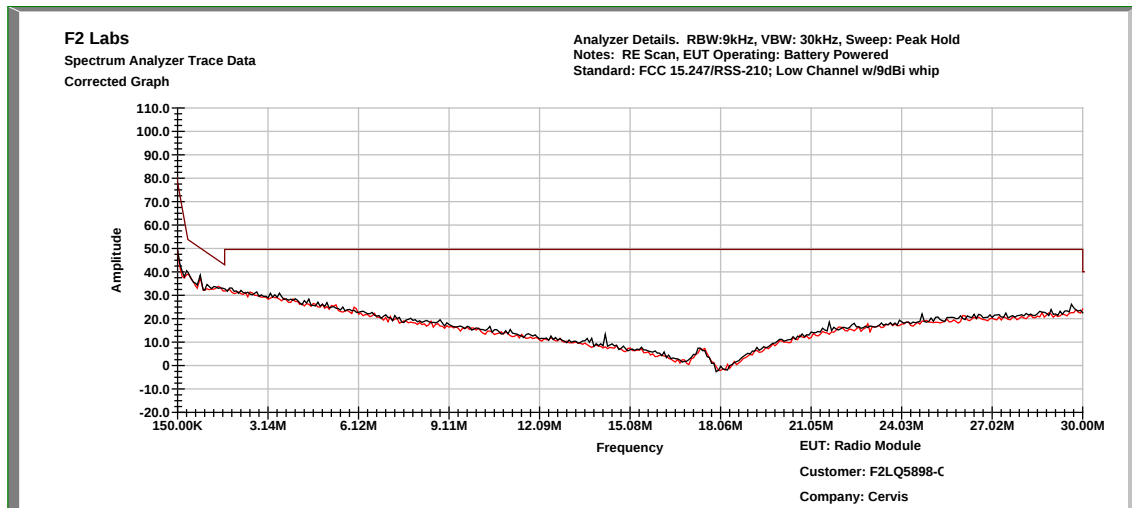
In the following plots, the black line indicates ambient noise and the red line indicates the measurement with the EUT on. Emissions to be found by the EUT were measured and listed in tables below.



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

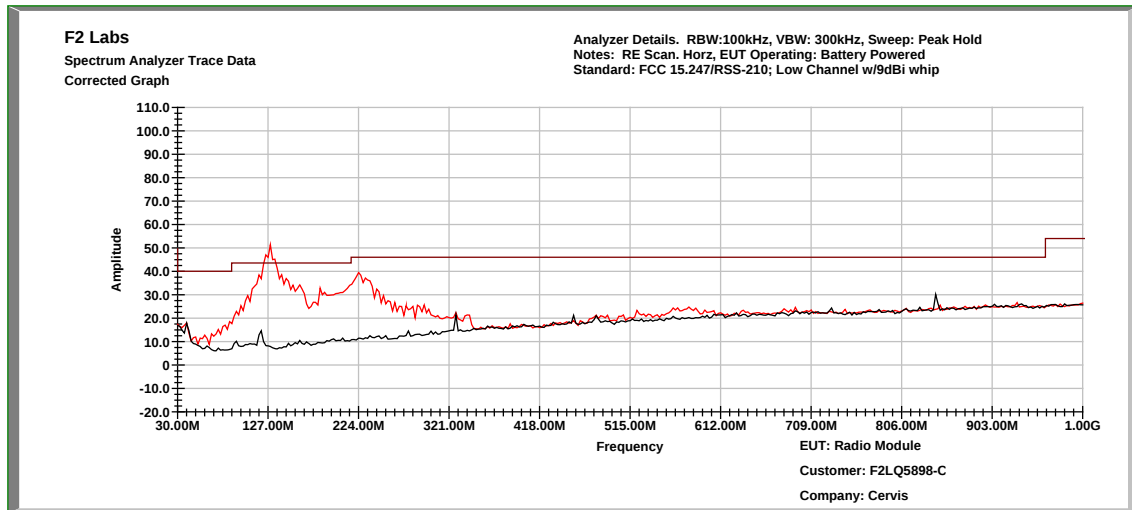


Characterization Scan - Low Channel: .15 MHz to 30 MHz

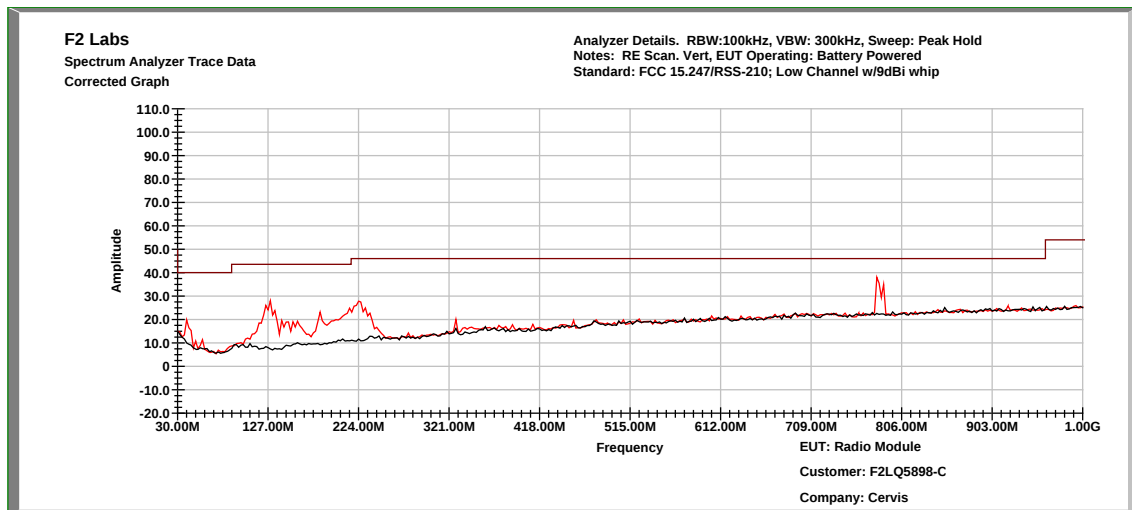




Characterization Scan - Low Channel: 30 MHz to 1 GHz, Horizontal

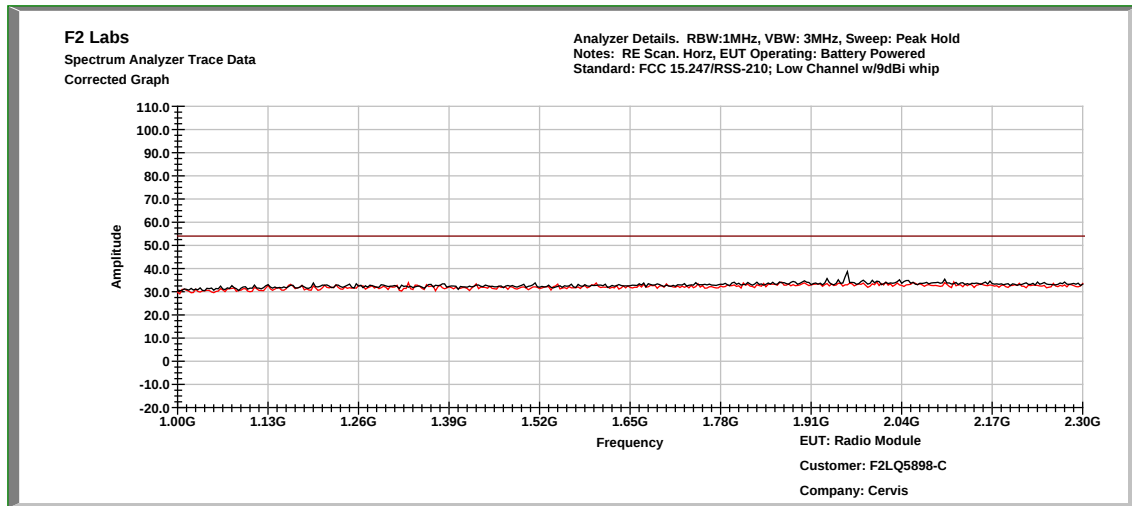


Characterization Scan - Low Channel: 30 MHz to 1 GHz, Vertical

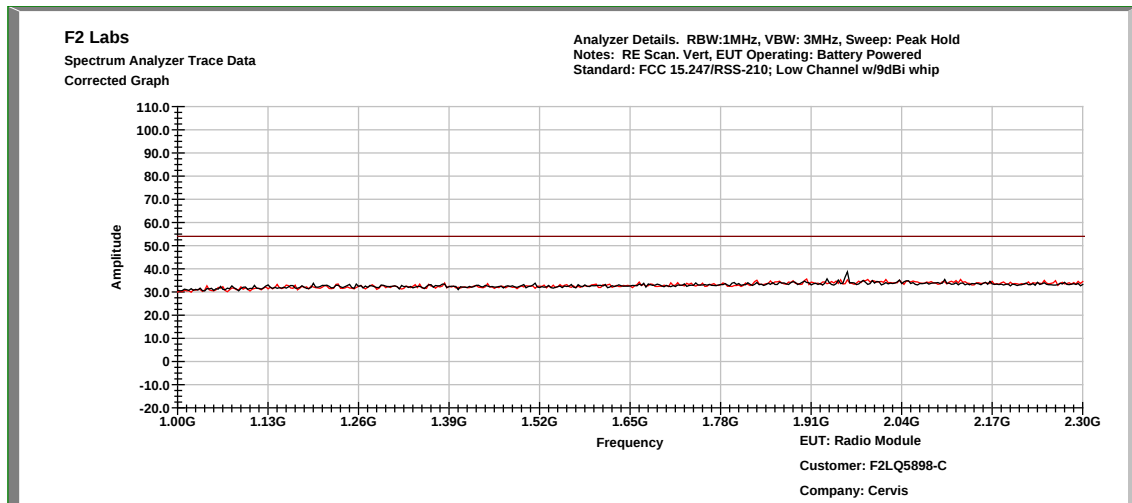




Characterization Scan - Low Channel: 1 GHz to 2.3 GHz, Horizontal

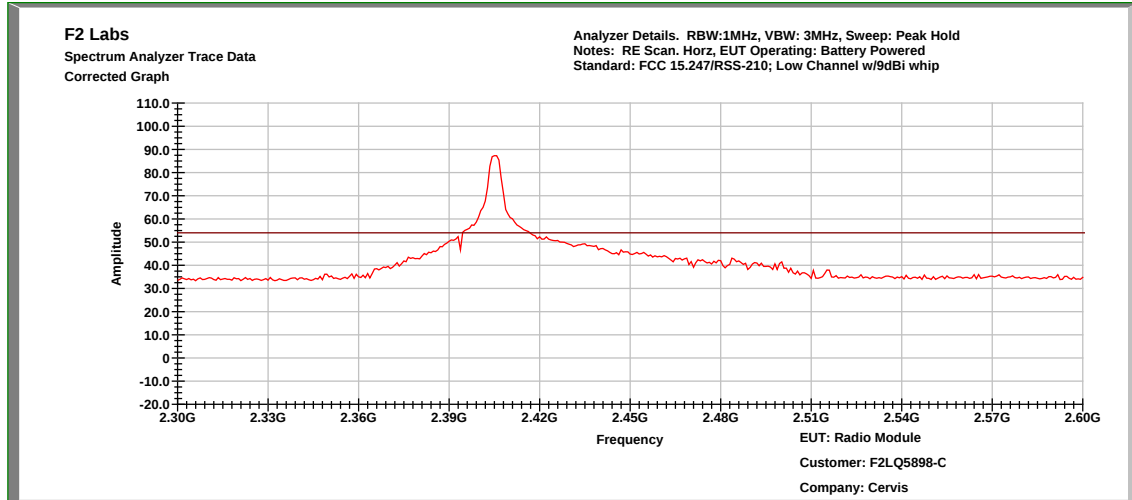


Characterization Scan - Low Channel: 1 GHz to 2.3 GHz, Vertical

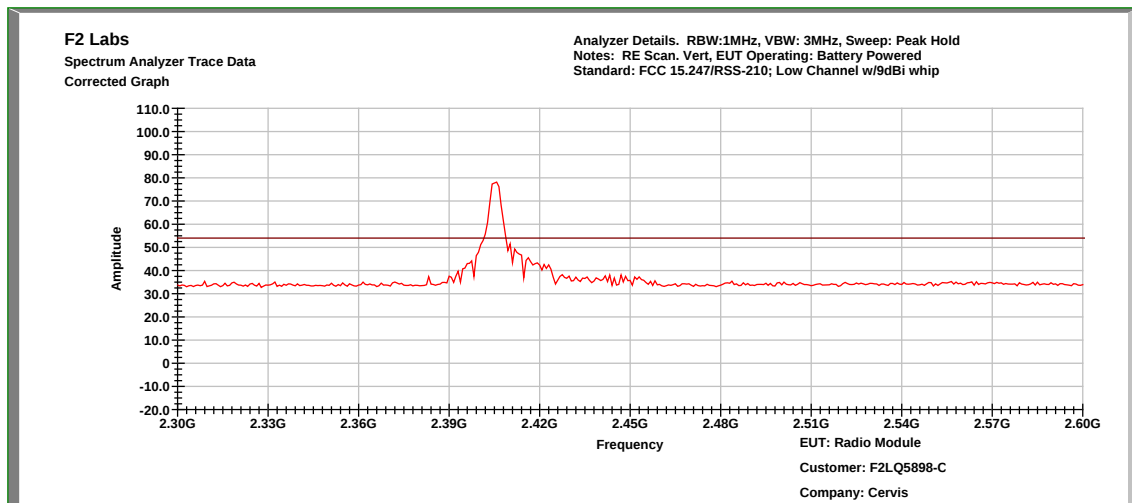




Characterization Scan - Low Channel, 2.3 GHz to 2.6 GHz, Horizontal

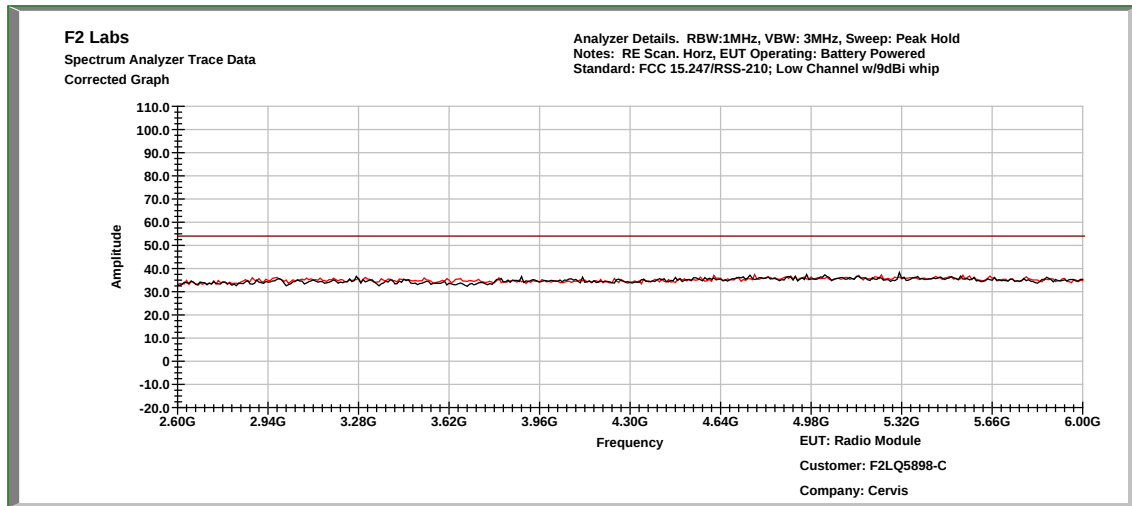


Characterization Scan - Low Channel, 2.3 GHz to 2.6 GHz, Vertical

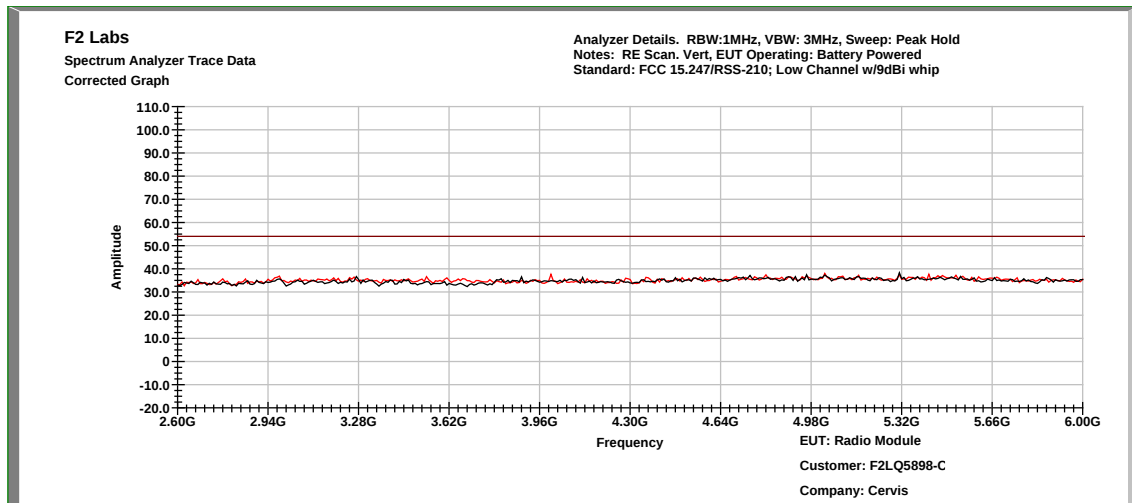




Characterization Scan - Low Channel, 2.6 GHz to 6 GHz, Horizontal

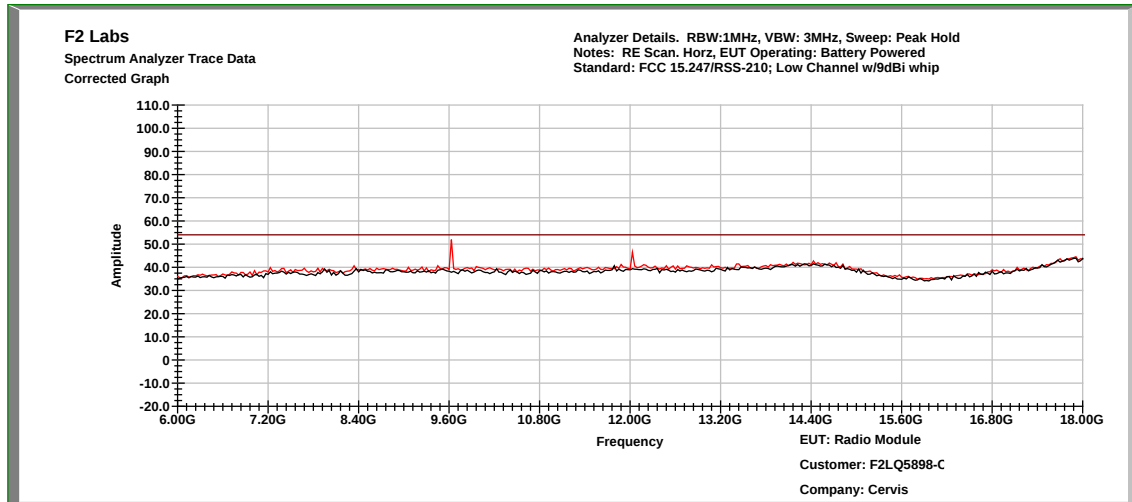


Characterization Scan - Low Channel, 2.6 GHz to 6 GHz, Vertical

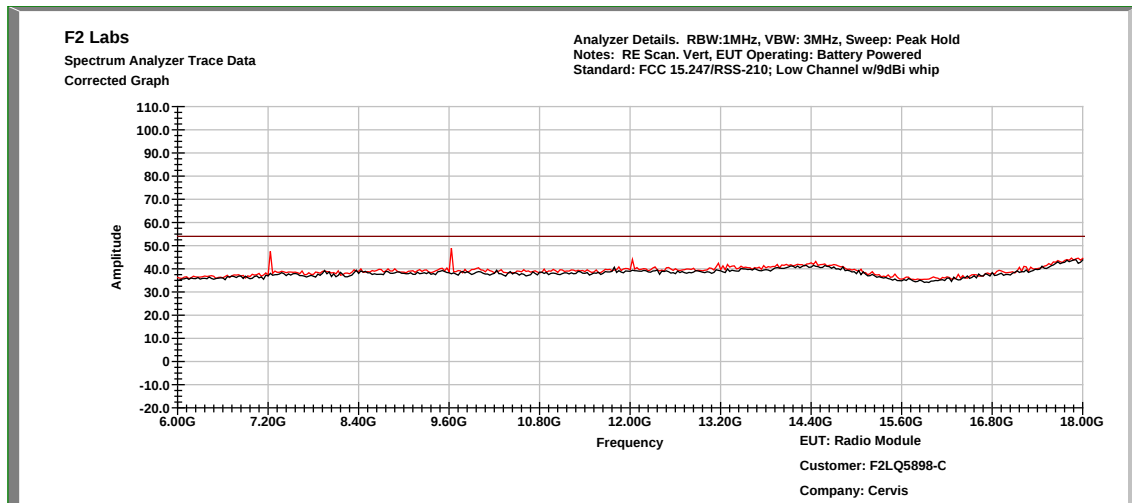




Characterization Scan - Low Channel, 6 GHz to 18 GHz, Horizontal

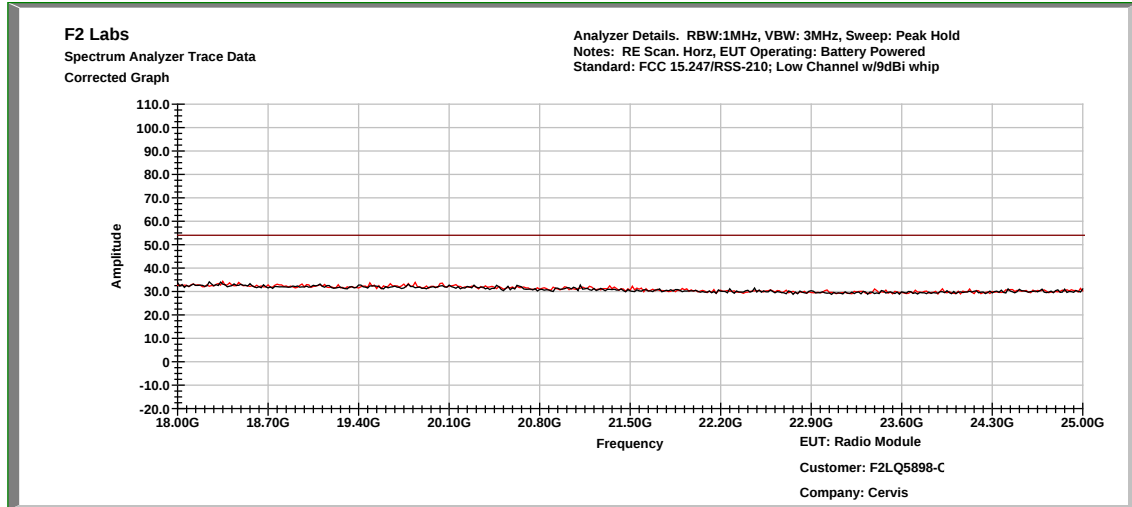


Characterization Scan - Low Channel, 6 GHz to 18 GHz, Vertical

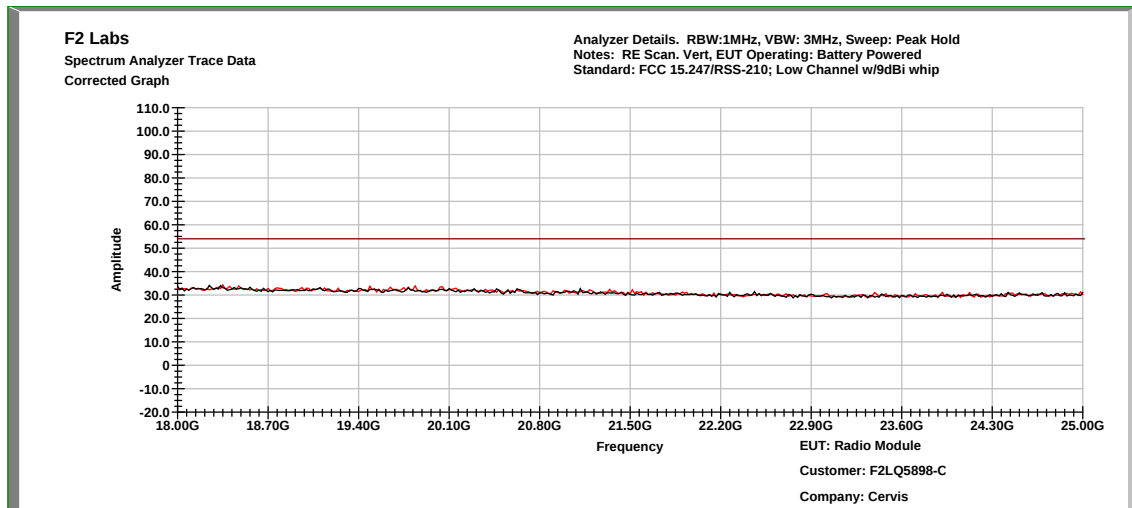




Characterization Scan - Low Channel, 18 GHz to 25 GHz, Horizontal

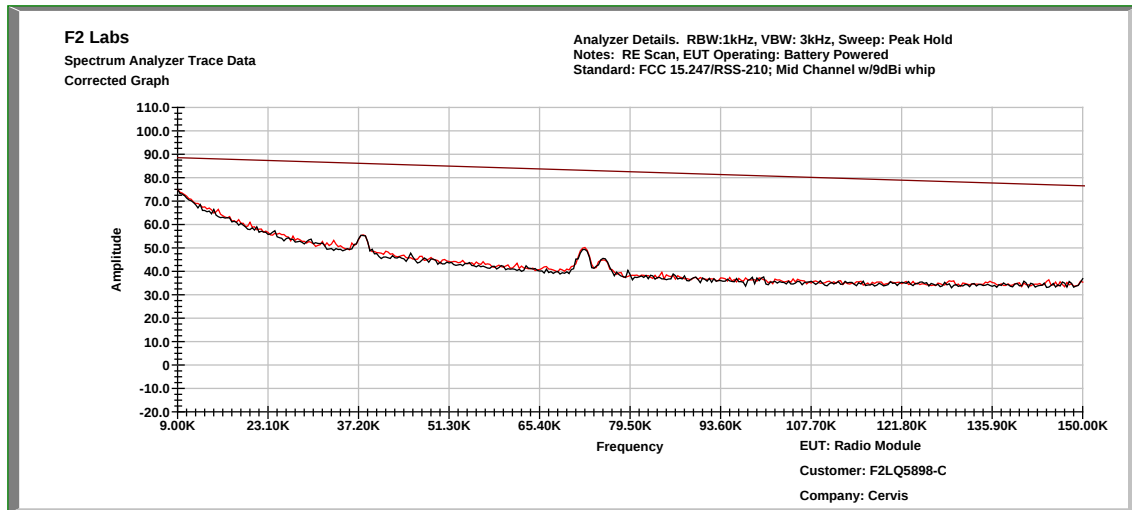


Characterization Scan - Low Channel, 18 GHz to 25 GHz, Vertical

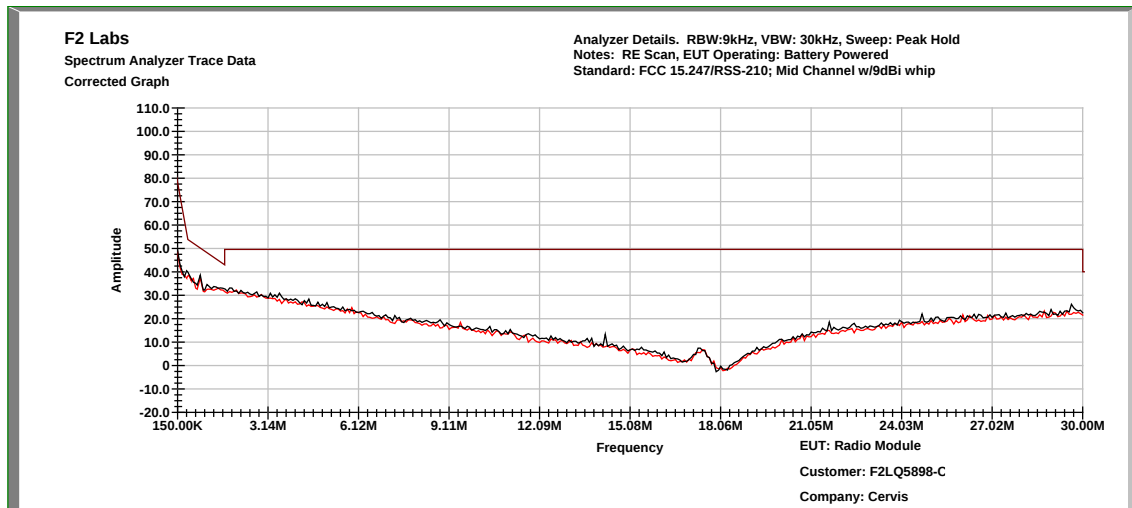




Characterization Scan - Mid Channel: .009 MHz to .015 MHz

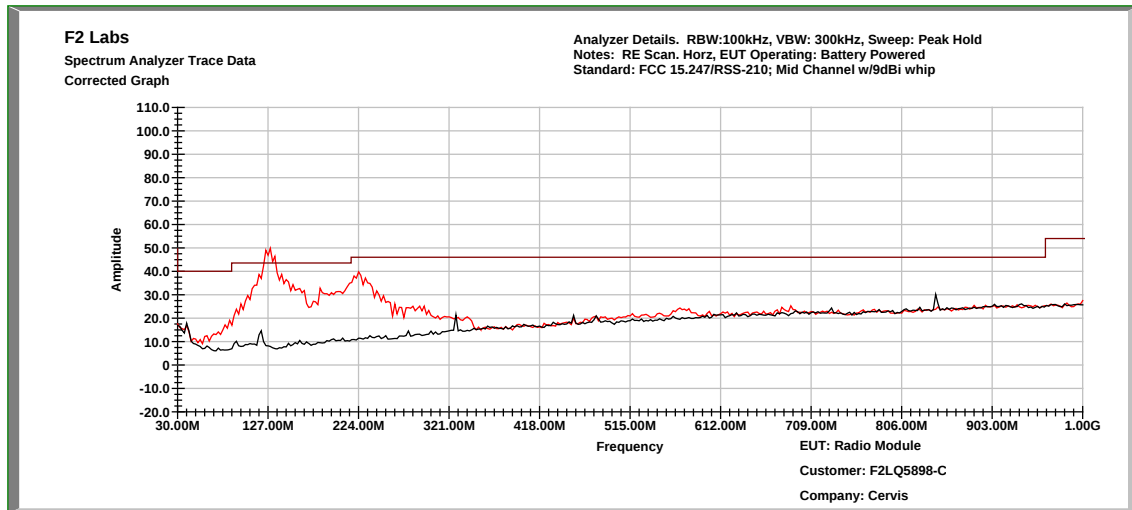


Characterization Scan - Mid Channel: .15 MHz to 30 MHz

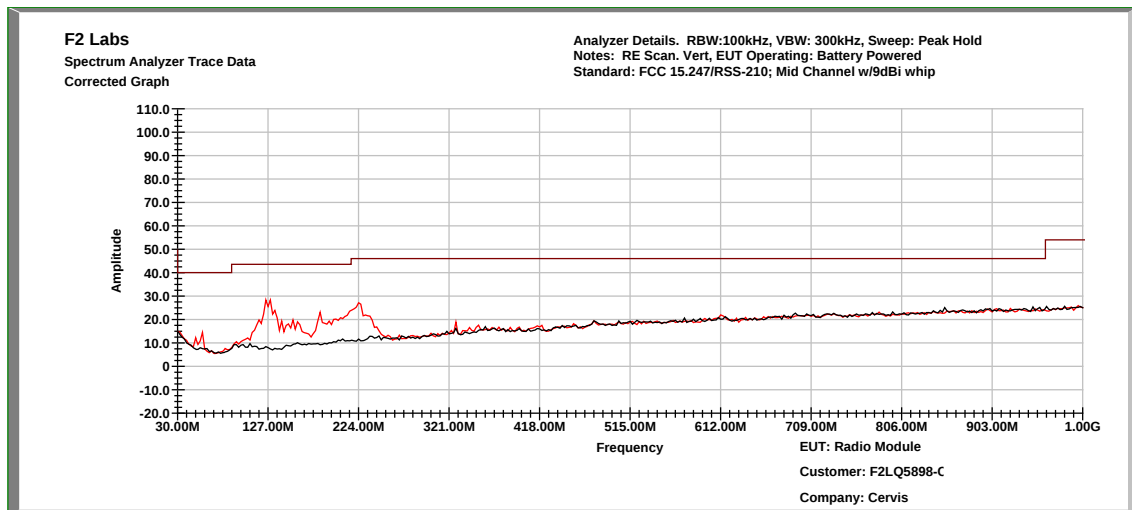




Characterization Scan - Mid Channel: 30 MHz to 1 GHz, Horizontal

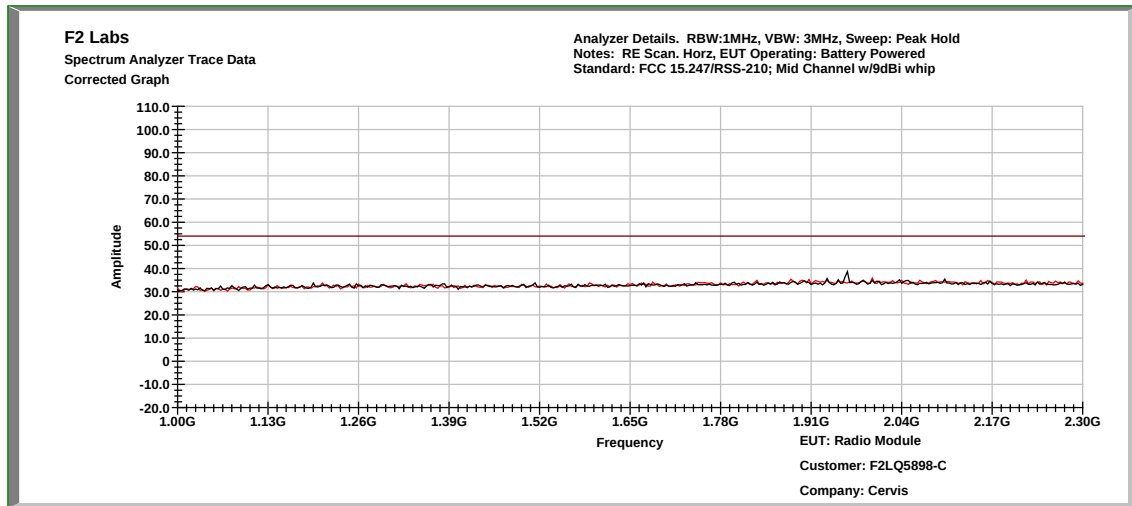


Characterization Scan - Mid Channel: 30 MHz to 1 GHz, Vertical

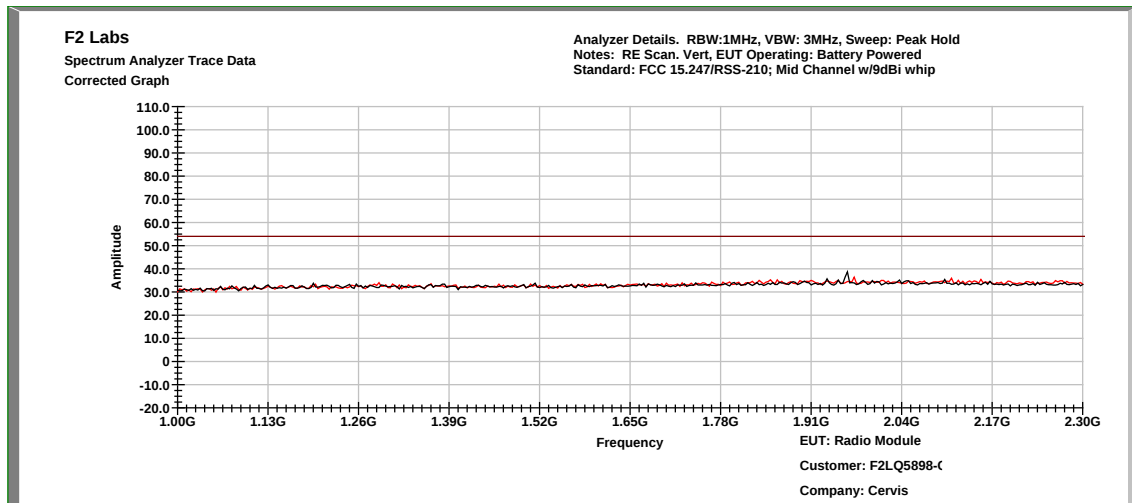




Characterization Scan - Mid Channel: 1 GHz to 2.3 GHz, Horizontal

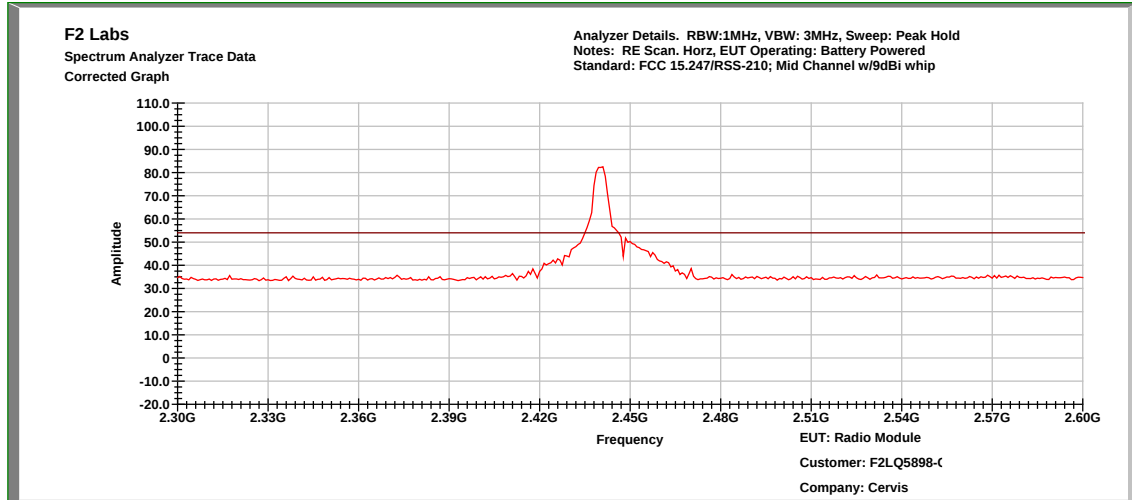


Characterization Scan - Mid Channel: 1 GHz to 2.3 GHz, Vertical

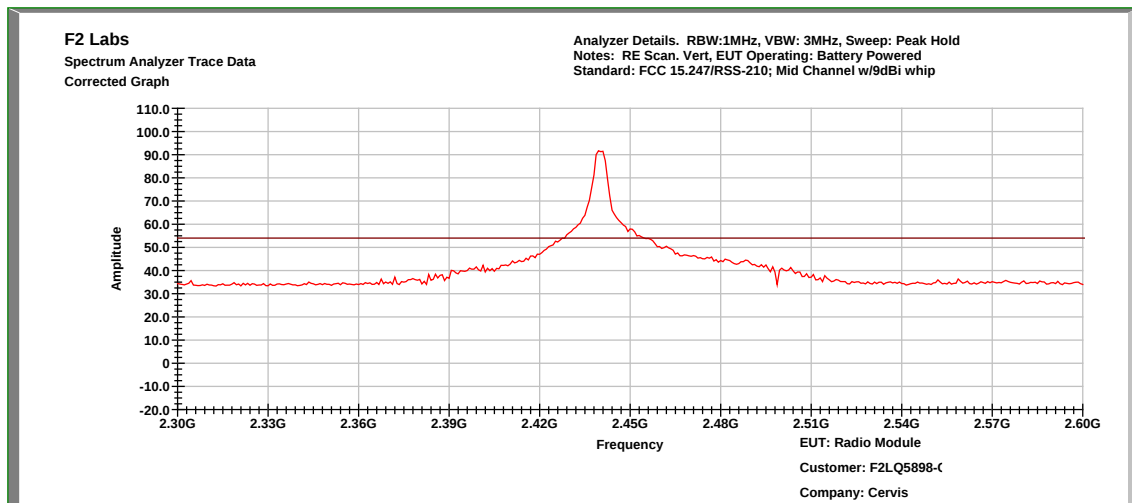




Characterization Scan - Mid Channel, 2.3 GHz to 2.6 GHz, Horizontal

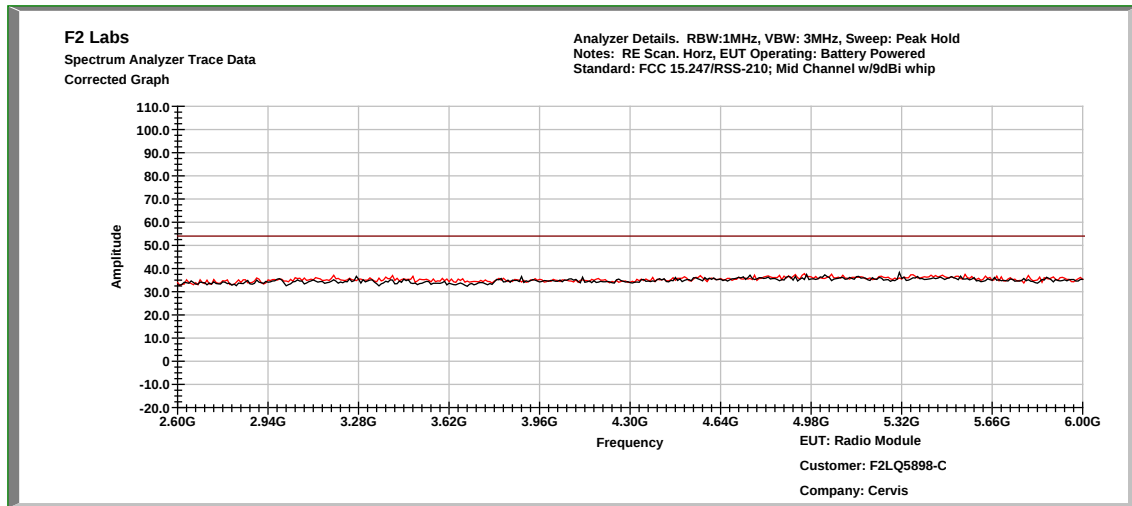


Characterization Scan - Mid Channel, 2.3 GHz to 2.6 GHz, Vertical

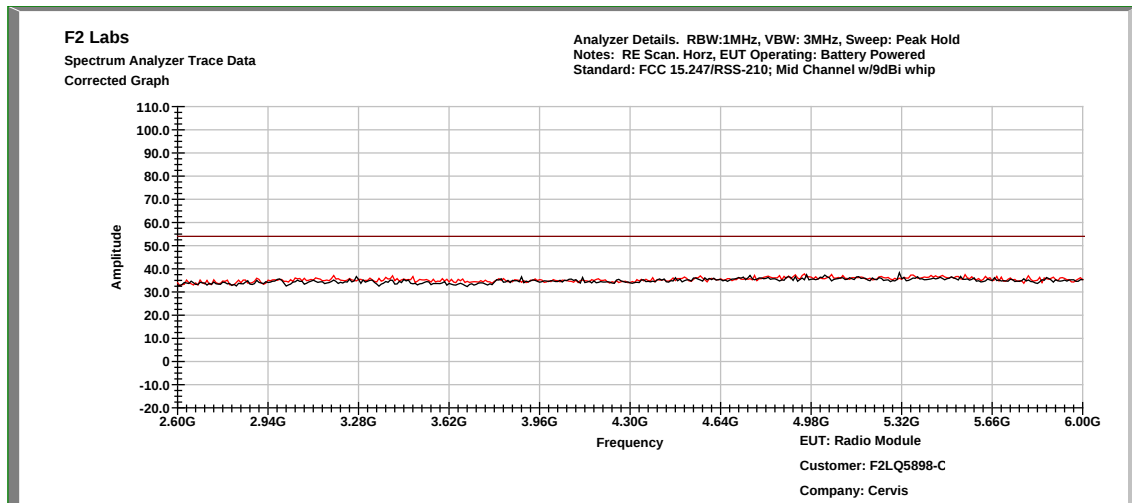




Characterization Scan - Mid Channel, 2.6 GHz to 6 GHz, Horizontal

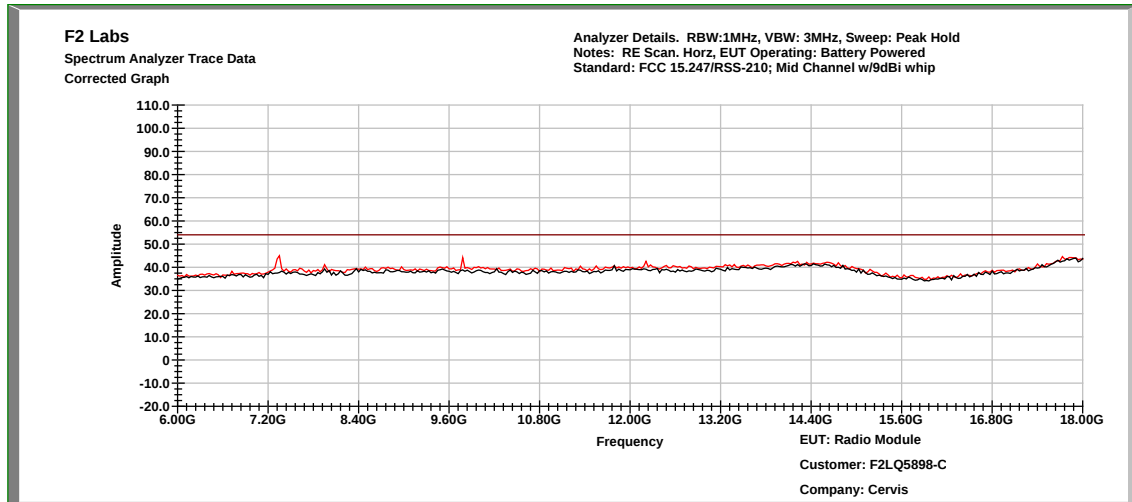


Characterization Scan - Mid Channel, 2.6 GHz to 6 GHz, Vertical

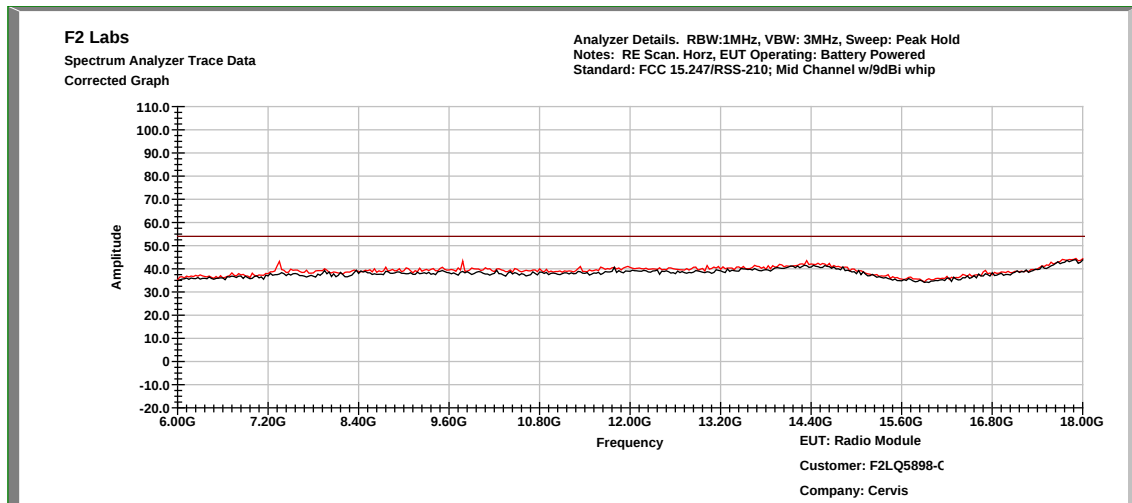




Characterization Scan - Mid Channel, 6 GHz to 18 GHz, Horizontal

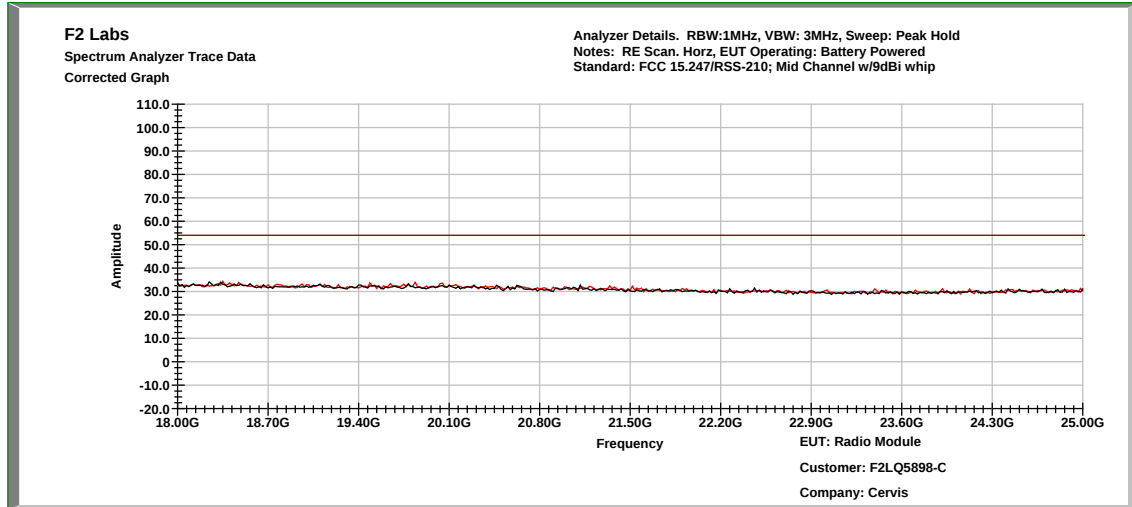


Characterization Scan - Mid Channel, 6 GHz to 18 GHz, Vertical

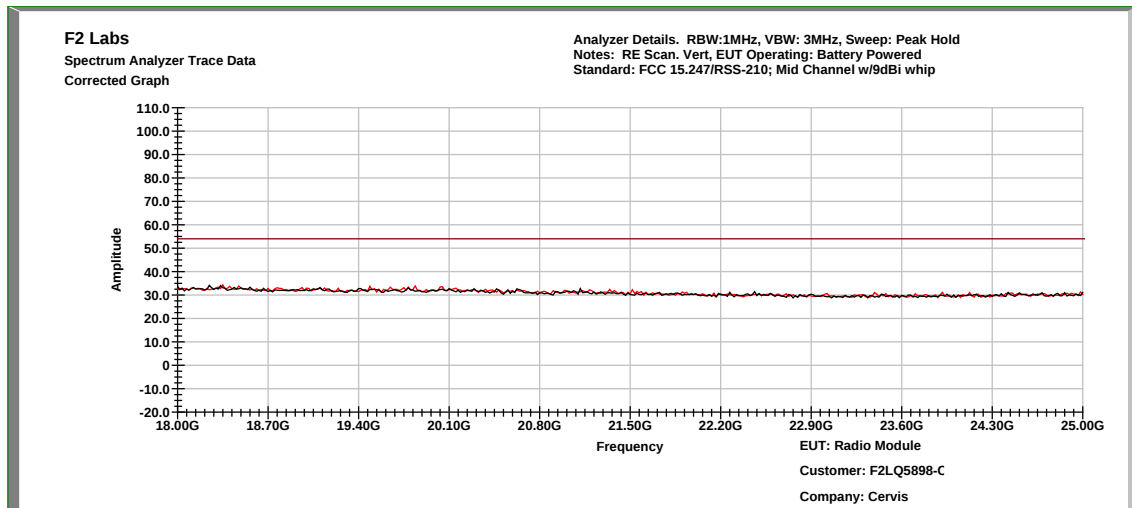




Characterization Scan - Mid Channel, 18 GHz to 25 GHz, Horizontal

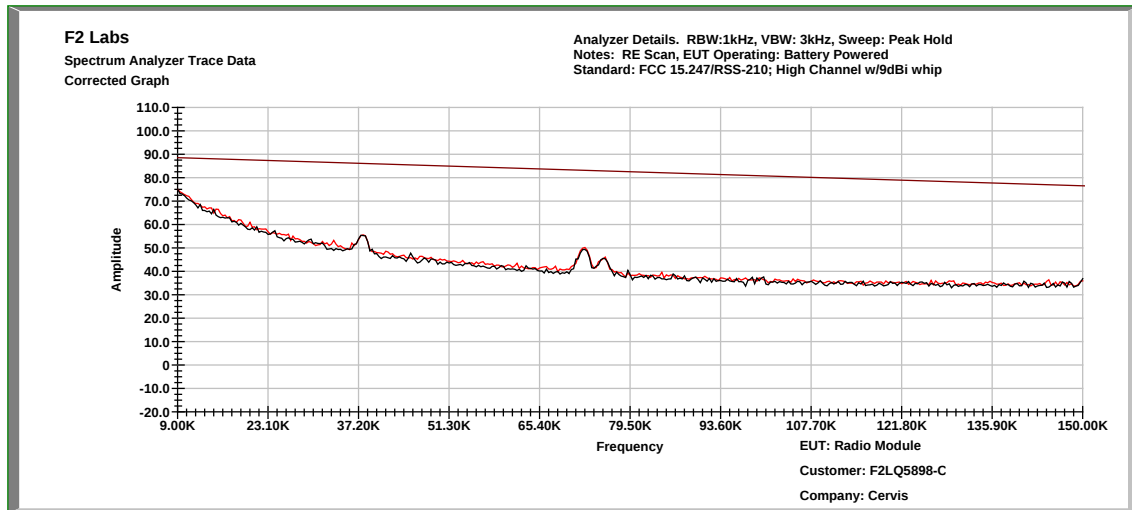


Characterization Scan - Mid Channel, 18 GHz to 25 GHz, Vertical

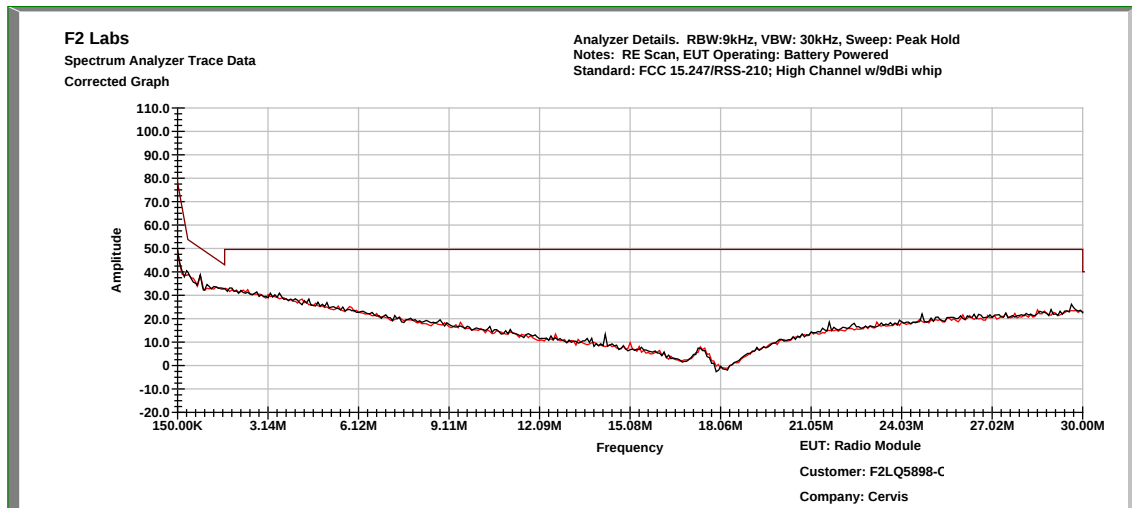




Characterization Scan - High Channel: .009 MHz to .015 MHz

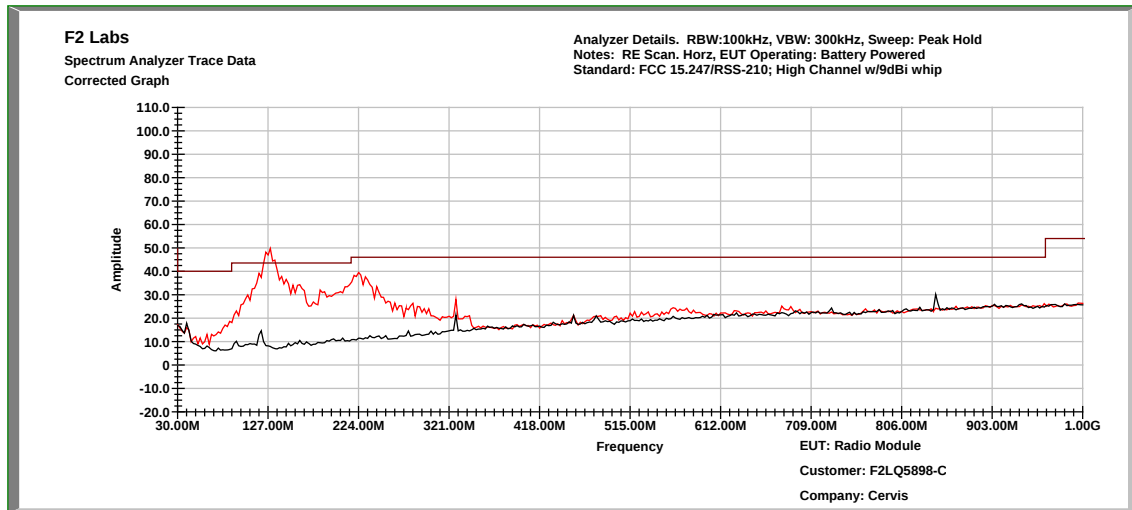


Characterization Scan - High Channel: .15 MHz to 30 MHz

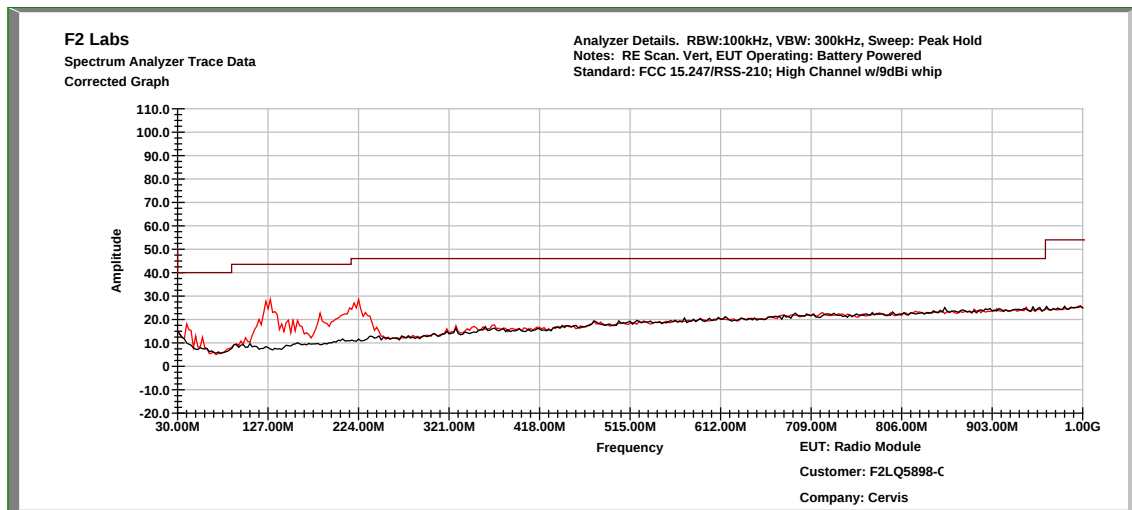




Characterization Scan - High Channel: 30 MHz to 1 GHz, Horizontal

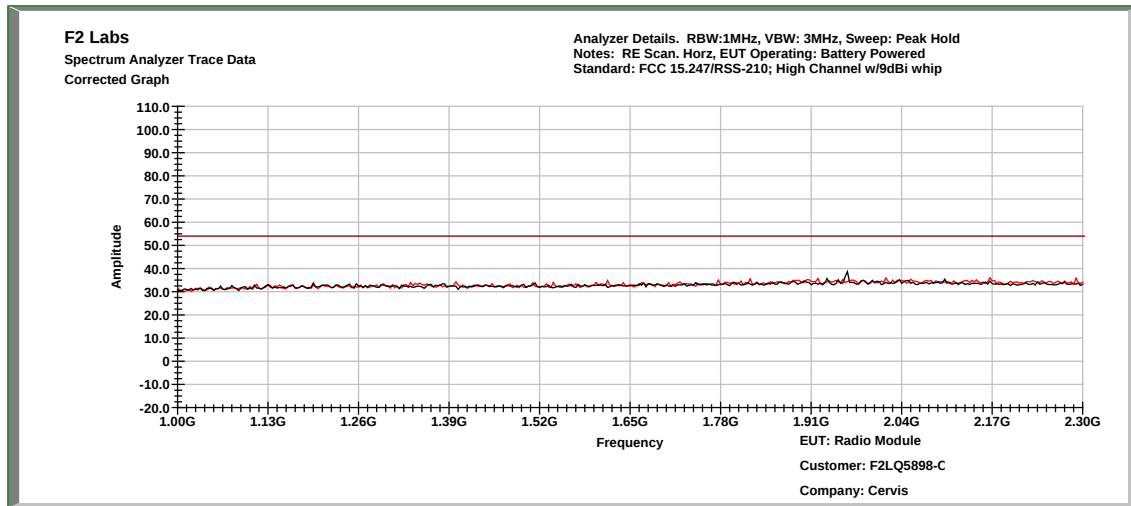


Characterization Scan - High Channel: 30 MHz to 1 GHz, Vertical

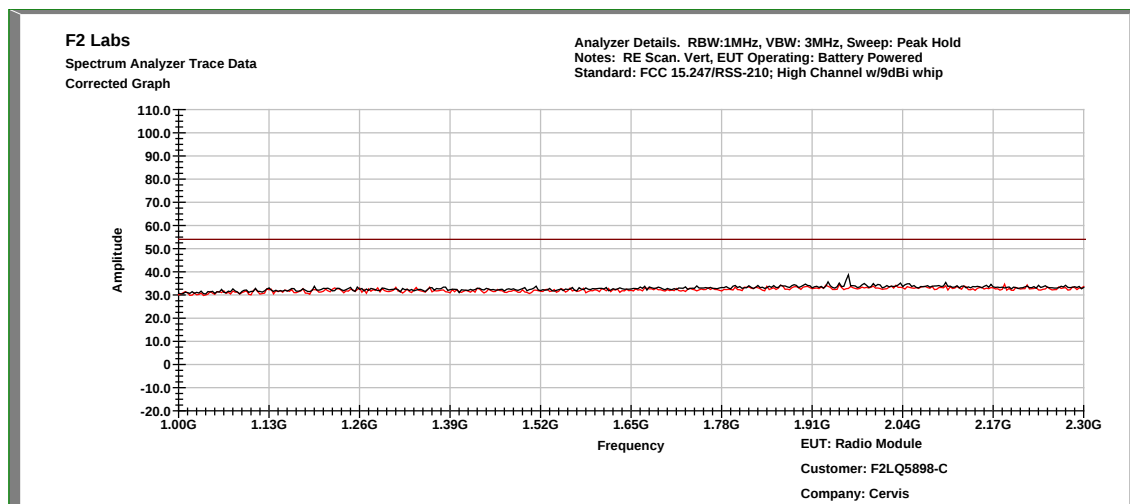




Characterization Scan - High Channel: 1 GHz to 2.3 GHz, Horizontal

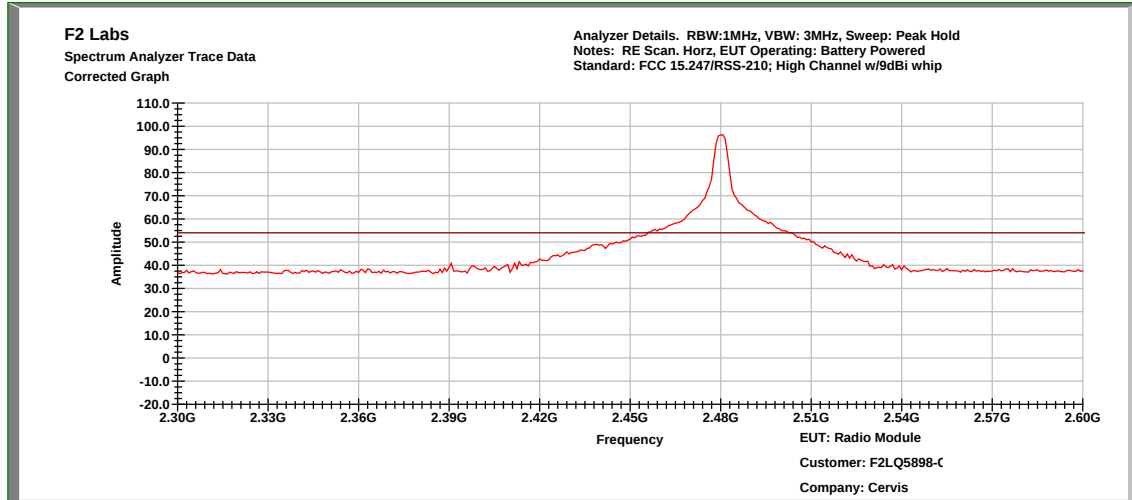


Characterization Scan - High Channel: 1 GHz to 2.3 GHz, Vertical

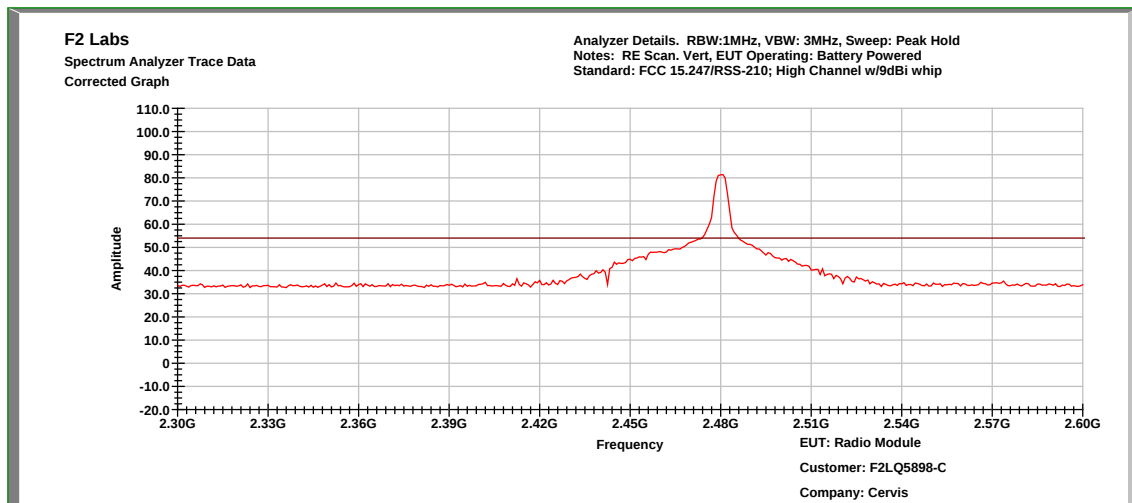




Characterization Scan - High Channel, 2.3 GHz to 2.6 GHz, Horizontal

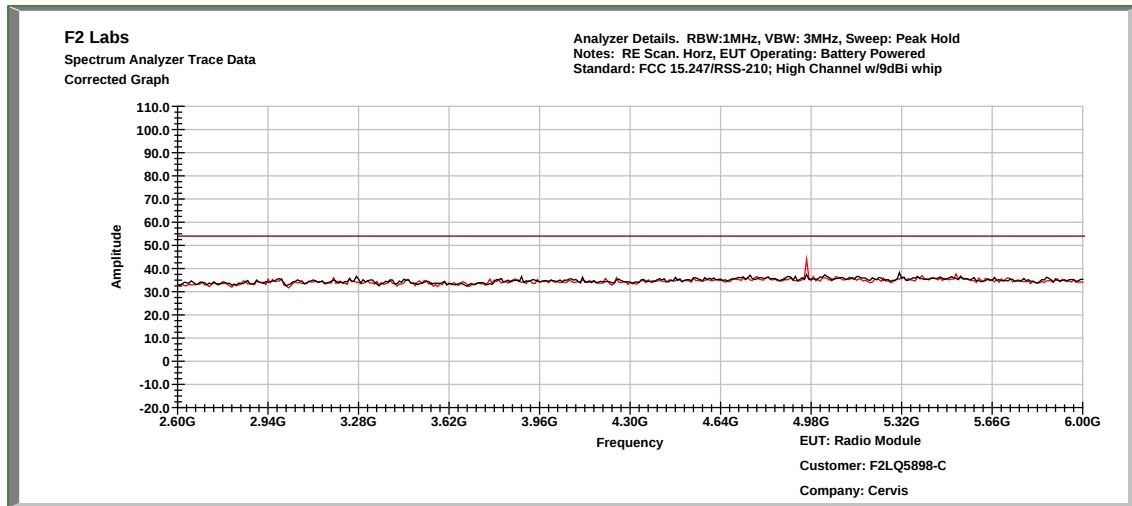


Characterization Scan - High Channel, 2.3 GHz to 2.6 GHz, Vertical

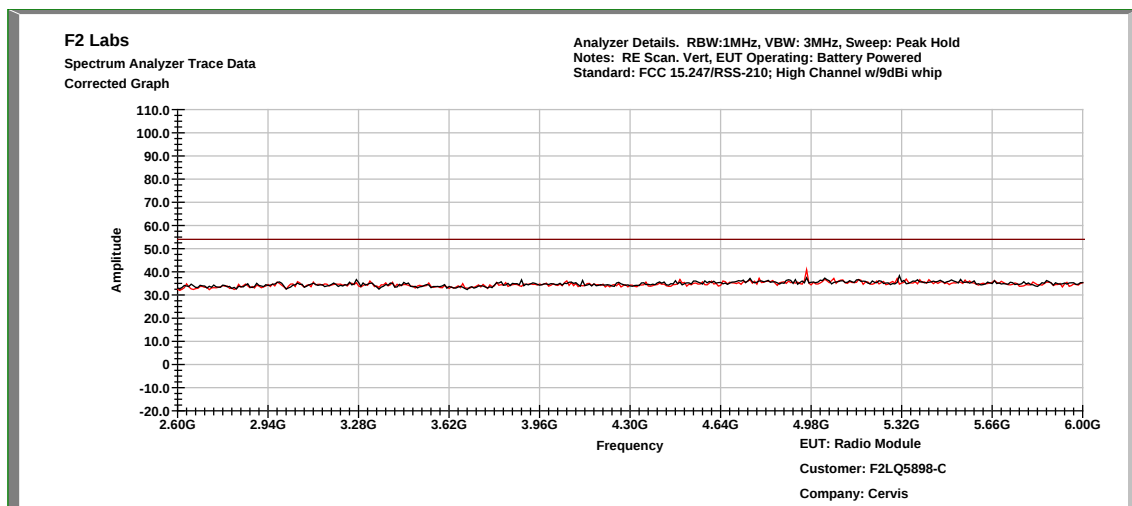




Characterization Scan - High Channel, 2.6 GHz to 6 GHz, Horizontal

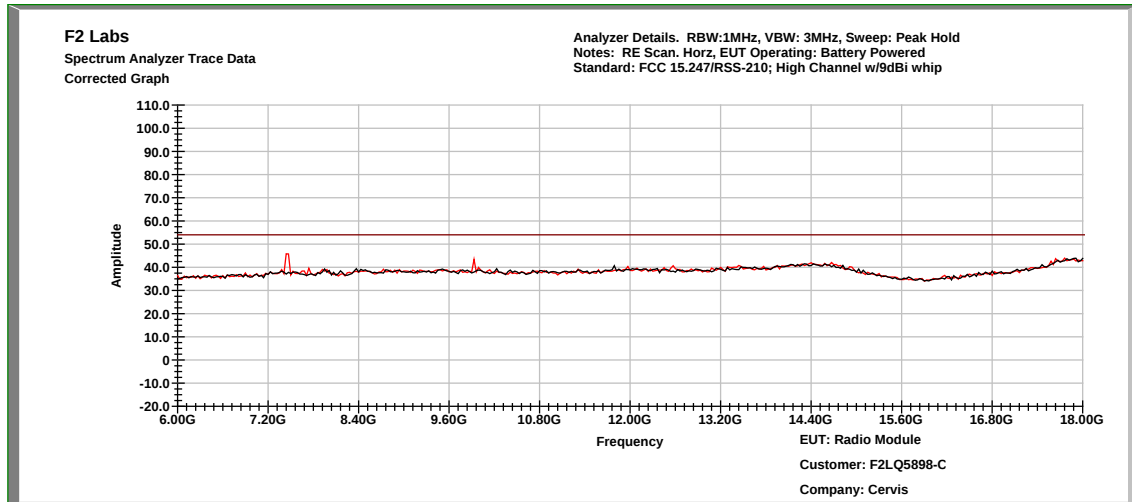


Characterization Scan - High Channel, 2.6 GHz to 6 GHz, Vertical

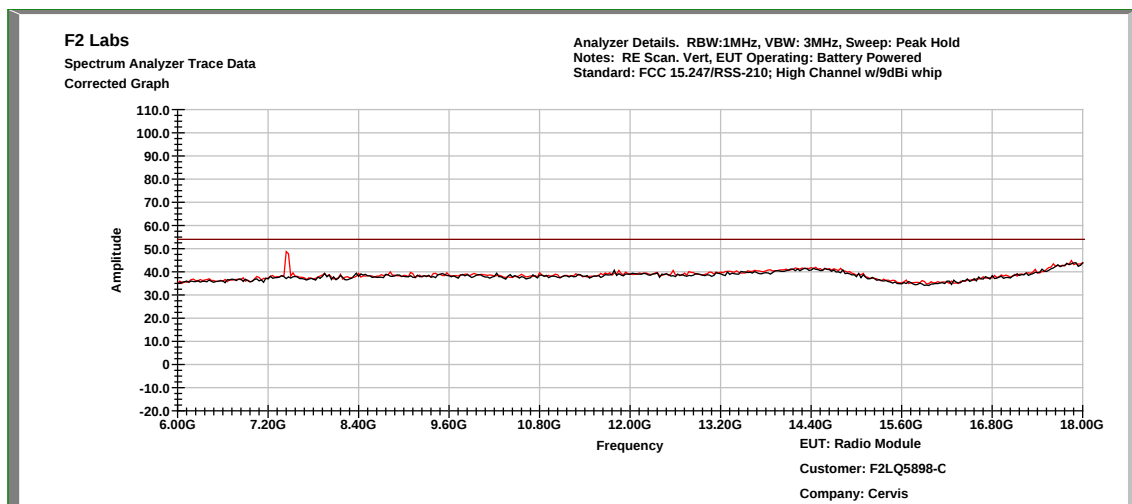




Characterization Scan - High Channel, 6 GHz to 18 GHz, Horizontal

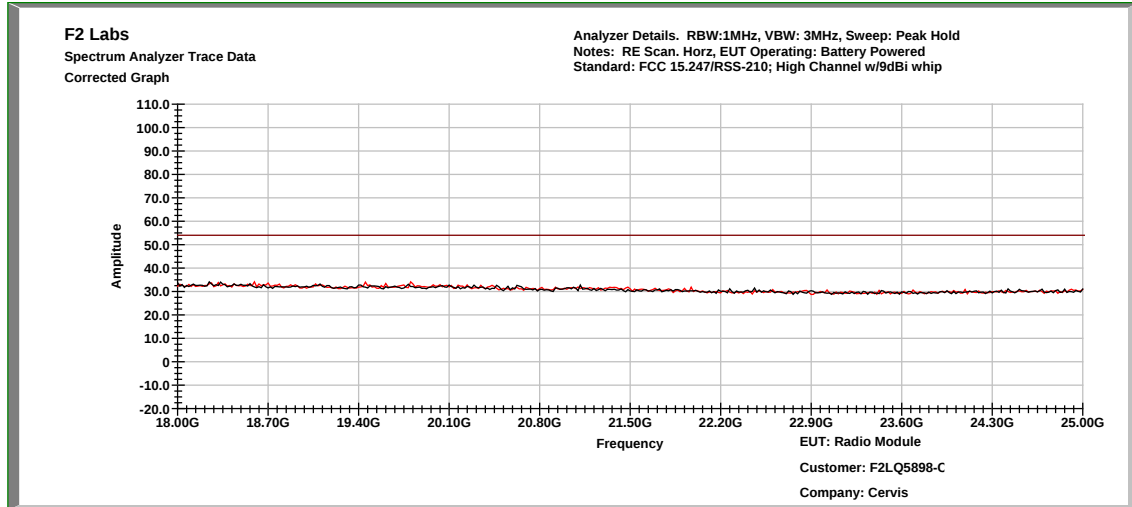


Characterization Scan - High Channel, 6 GHz to 18 GHz, Vertical

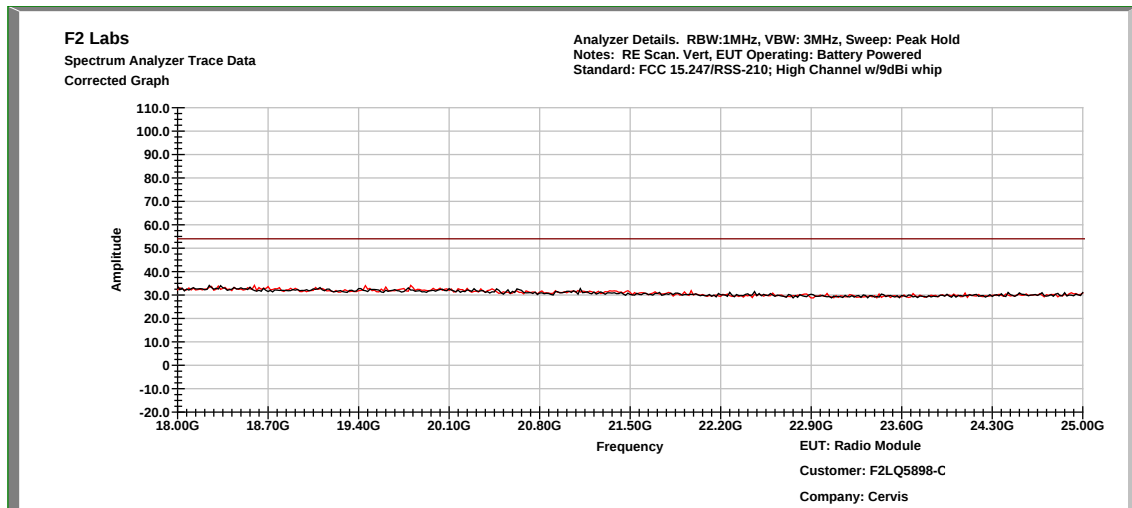




Characterization Scan - High Channel, 18 GHz to 25 GHz, Horizontal



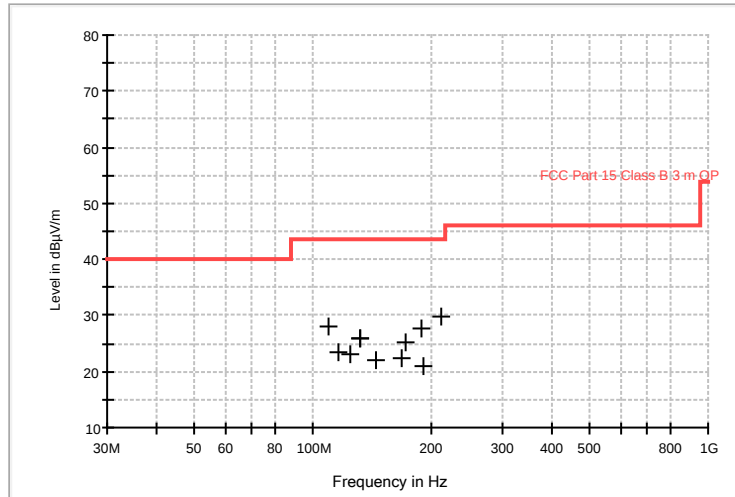
Characterization Scan - High Channel, 18 GHz to 25 GHz, Vertical





Measurements

Low Channel

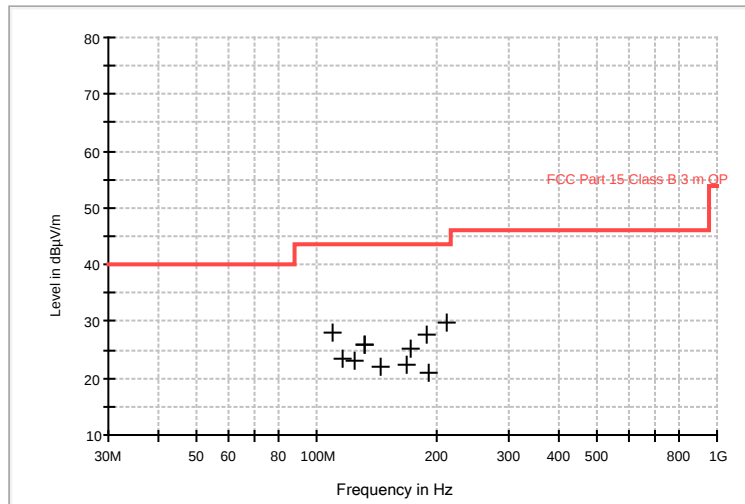


Frequency (MHz)	Bandwidth	Antenna Polarization	QuasiPeak (dBµV/m)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	QP Limit (dBµV/m)	QP Margin (dB)
109.550000	120.000	V	13.6	14.3	27.9	43.5	-15.6
116.340000	120.000	V	8.1	15.2	23.3	43.5	-20.2
124.640000	120.000	V	7.2	16.0	23.2	43.5	-20.3
131.820000	120.000	V	10.4	15.7	26.1	43.5	-17.4
131.820000	120.000	V	10.3	15.7	26.0	43.5	-17.5
144.810000	120.000	V	7.6	14.2	21.8	43.5	-21.7
167.210000	120.000	V	7.4	14.8	22.2	43.5	-21.3
171.440000	120.000	H	10.8	14.5	25.3	43.5	-18.2
187.300000	120.000	H	13.5	14.1	27.6	43.5	-15.9
189.580000	120.000	V	6.8	14.0	20.8	43.5	-22.7
211.120000	120.000	H	16.5	13.2	29.7	43.5	-13.8

Frequency (MHz)	Bandwidth	Antenna Polarization	Cable Loss & Antenna Factor (dB)	MaxPeak (dBµV/m)	MaxPeak Limits (dBµV/m)	Margin MaxPeak (dB)	Average (dBµV/m)	Average Limits (dBµV/m)	Margin AVG (dB)
2390.000000	1000.000	V	7.2	64.8	74.0	-2.0	24.8	54.0	-22.0
2390.000000	1000.000	H	7.2	53.9	74.0	-12.9	24.3	54.0	-22.5
2484.000000	1000.000	V	7.5	45.0	74.0	-21.5	24.3	54.0	-22.2
2484.000000	1000.000	H	7.5	47.2	74.0	-19.3	27.6	54.0	-18.9
4810.000000	1000.000	V	12.3	50.8	74.0	-10.9	27.8	54.0	-13.9
4810.000000	1000.000	H	12.3	51.1	74.0	-10.6	27.8	54.0	-13.9
7215.000000	1000.000	V	16.4	43.8	74.0	-13.8	27.0	54.0	-10.6
7215.000000	1000.000	H	16.4	41.1	74.0	-16.5	26.9	54.0	-10.7
9620.000000	1000.000	V	19.3	40.3	74.0	-14.4	26.8	54.0	-7.9
9620.000000	1000.000	H	19.3	40.5	74.0	-14.2	26.9	54.0	-7.8



Mid Channel

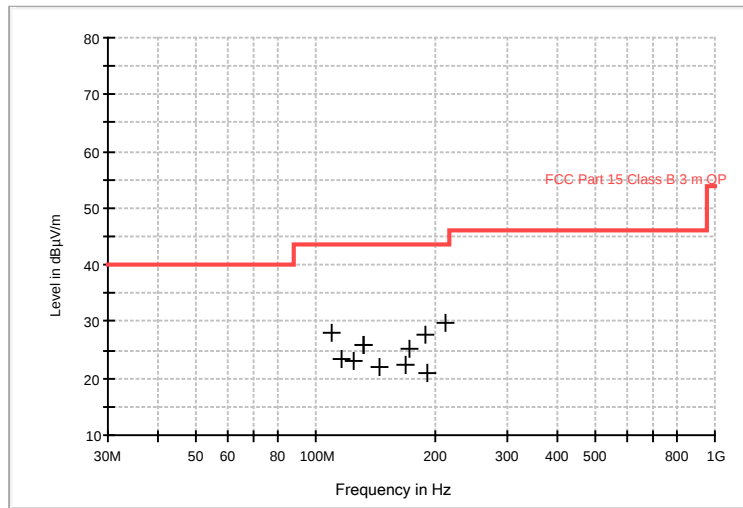


Frequency (MHz)	Bandwidth	Antenna Polarization	QuasiPeak (dBµV/m)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	QP Limit (dBµV/m)	QP Margin (dB)
109.550000	120.000	V	13.3	14.3	27.6	43.5	-15.9
116.340000	120.000	V	8.5	15.2	23.7	43.5	-19.8
124.640000	120.000	V	7.3	16.0	23.3	43.5	-20.2
131.820000	120.000	V	11.0	15.7	26.7	43.5	-16.8
131.820000	120.000	V	10.5	15.7	26.2	43.5	-17.3
144.810000	120.000	V	7.3	14.2	21.5	43.5	-22.0
167.210000	120.000	V	7.9	14.8	22.7	43.5	-20.8
171.440000	120.000	H	10.6	14.5	25.1	43.5	-18.4
187.300000	120.000	H	13.3	14.1	27.4	43.5	-16.1
189.580000	120.000	V	6.7	14.0	20.7	43.5	-22.8
211.120000	120.000	H	16.1	13.2	29.3	43.5	-14.2

Frequency (MHz)	Bandwidth	Antenna Polarization	Cable Loss & Antenna Factor (dB)	MaxPeak (dBµV/m)	MaxPeak Limits (dBµV/m)	Margin MaxPeak (dB)	Average (dBµV/m)	Average Limits (dBµV/m)	Margin AVG (dB)
2399.000000	1000.000	V	7.2	38.1	74.0	-28.7	24.1	54.0	-22.7
2399.000000	1000.000	H	7.2	54.6	74.0	-12.2	24.2	54.0	-22.6
2484.000000	1000.000	V	7.5	37.5	74.0	-29.0	24.3	54.0	-22.2
2484.000000	1000.000	H	7.5	51.1	74.0	-15.4	24.3	54.0	-22.2
4880.000000	1000.000	H	12.6	50.3	74.0	-11.1	27.6	54.0	-13.8
4880.000000	1000.000	V	12.6	40.4	74.0	-21.0	27.2	54.0	-14.2
7320.000000	1000.000	V	16.7	41.0	74.0	-16.3	27.0	54.0	-10.3
7320.000000	1000.000	H	16.7	42.9	74.0	-14.4	27.1	54.0	-10.2



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)
109.550000	120.000	V	13.2	14.3	27.5	43.5	-16.0
116.340000	120.000	V	8.1	15.2	23.3	43.5	-20.2
124.640000	120.000	V	7.8	16.0	23.8	43.5	-19.7
131.820000	120.000	V	10.8	15.7	26.5	43.5	-17.0
131.820000	120.000	V	10.7	15.7	26.4	43.5	-17.1
144.810000	120.000	V	7.7	14.2	21.9	43.5	-21.6
167.210000	120.000	V	7.7	14.8	22.5	43.5	-21.0
171.440000	120.000	H	10.8	14.5	25.3	43.5	-18.2
187.300000	120.000	H	13.5	14.1	27.6	43.5	-15.9
189.580000	120.000	V	6.7	14.0	20.7	43.5	-22.8
211.120000	120.000	H	16.3	13.2	29.5	43.5	-14.0

Frequency (MHz)	Bandwidth	Antenna Polarization	Cable Loss & Antenna Factor (dB)	MaxPeak (dBµV/m)	MaxPeak Limits (dBµV/m)	Margin MaxPeak (dB)	Average (dBµV/m)	Average Limits (dBµV/m)	Margin AVG (dB)
2399.000000	1000.000	H	7.2	52.4	74.0	-14.4	24.2	54.0	-22.6
2399.000000	1000.000	V	7.2	44.3	74.0	-22.5	24.2	54.0	-22.6
2484.000000	1000.000	H	7.5	64.9	74.0	-1.6	26.7	54.0	-19.8
2484.000000	1000.000	V	7.5	56.3	74.0	-10.2	25.2	54.0	-21.3
4880.000000	1000.000	V	12.9	47.3	74.0	-13.8	27.6	54.0	-13.5
4880.000000	1000.000	H	12.9	55.6	74.0	-5.5	28.2	54.0	-12.9
7320.000000	1000.000	H	17.1	40.9	74.0	-16.0	27.2	54.0	-9.7
7320.000000	1000.000	V	17.1	41.2	74.0	-15.7	27.1	54.0	-9.8

10 PHOTOGRAPHS/EXHIBITS – PRODUCT PHOTOS, TEST SETUPS

Radiated Spurious Emission: OATS



Conducted Output Power

