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CERTIFICATION TEST REPORT

Manufacturer: Brain Sentinel, Inc.
8023 Vantage Drive, Suite 216
San Antonio, Texas 78230 USA

Applicant: Same as Above

Product Name: SeizureLink

Product Description: The SeizureLink product is a wearable sEMG seizure alerting system. When a generalized tonic clonic seizure is recognized, the device alarms and sends out a real-time alert to the monitoring app on a mobile device. This alert goes out to your caregivers so that you can get help as soon as possible. The recognized event gets logged into a seizure diary on your phone so that you can add details about it later and share with your caregivers or your physician if needed.

Operating Voltage/Frequency: Battery-operated

Model: SLU01-90001

FCC ID: 2AG2I-SLU01-90001

Testing Commenced: July 10, 2018

Testing Ended: July 11, 2018

Summary of Test Results: In Compliance

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications and/or manufacturer's statement. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- ❖ **FCC Part 15 Subpart C, Section 15.249**
- ❖ **FCC Part 15 Subpart C, Section 15.215(c) – Additional provisions to the general radiated emission limitations**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**



Order Number: F2P18823B

Applicant: Brain Sentinel

Model: SLU01-90001

Evaluation Conducted by:

Julius Chiller, EMC/Wireless Engineer

Report Reviewed by:

Ken Littell, Director of EMC & Wireless Operations

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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 2013 version of ANSI C63.10 and recommended FCC procedure of measurement of DTS operating under Section 15.249. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

The uncertainty in EMC measurements arises from several factors which affect the results, some associated with environmental conditions in the measurement room, the test equipment being used, and the measurement techniques adopted.

The measurement uncertainty budgets detailed below are calculated from the test and calibration data and are expressed with a 95% confidence factor using a coverage factor of $k=2$. The Uncertainty for a laboratory are referred to as U_{lab} . For Radiated and Conducted Emissions, the Expanded Uncertainty is compared to the U_{cispr} values to determine if a specific margin is required to deem compliance.

U_{lab}

Measurement Range	Combined Uncertainty	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	2.54	5.07dB
Radiated Emissions <1 GHz @ 10m	2.55	5.09dB
Radiated Emissions 1 GHz to 2.7 GHz	1.81	3.62dB
Radiated Emissions 2.7 GHz to 18 GHz	1.55	3.10dB
AC Power Line Conducted Emissions, 150kHz to 30 MHz	1.38	2.76dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	1.66	3.32dB

U_{cispr}

Measurement Range	Expanded Uncertainty
Radiated Emissions <1 GHz @ 3m	5.2dB
Radiated Emissions <1 GHz @ 10m	5.2dB
Radiated Emissions 1 GHz to 2.7 GHz	Under Consideration
Radiated Emissions 2.7 GHz to 18 GHz	Under Consideration
AC Power Line Conducted Emissions, 150kHz to 30 MHz	3.6dB
AC Power Line Conducted Emissions, 9kHz to 150kHz	4.0dB

If U_{lab} is less than or equal to U_{cispr} , then:

- compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cispr} in table 1, then:

- compliance is deemed to occur if no measured disturbance, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Note: Only measurements listed in the tables above that relate to tests included in this Test Report are applicable.



1.4 Document History:

Document Number	Description	Issue Date	Approved By
F2P18823B-01E	First Issue	July 19, 2018	K. Littell
F2P18823B-01E Rev. 1	Change in product description at client request.	Aug. 24, 2018	K. Littell



2 SUMMARY OF TEST RESULTS

Test Name	Standard(s)	Results
-20dB Occupied Bandwidth	CFR 47 Part 15.215(c)	Complies
Field Strength of Emissions	CFR 47 Part 15.249(a)(d)	Complies
Variation of the Input Power	CFR 47 Part 15.31(e)	Complies*

**Requirements of 15.31 were met by using new batteries.*

Note: EUT cannot connect to the Charger. Batteries are removed from the EUT and placed into charger separately. Charger does not transmit, only charges; hence, 15.207 is not applicable.

Modifications Made to the Equipment
None



3 TABLES OF MEASURED RESULTS

Test	Low Channel 2402 MHz	Mid Channel 2440 MHz	High Channel 2480 MHz
Max Field Strength of Fundamental	67.2 dB μ V/m (2.3mV/m)	64.6 dB μ V/m (1.7 mV/m)	61.5 dB μ V/m (1.2 mV/m)
Limit for Fundamental	(93.97 dB μ V/m) 50 millivolts/meter	(93.97 dB μ V/m) 50 millivolts/meter	(93.97 dB μ V/m) 50 millivolts/meter
-20dB Occupied Bandwidth (MHz)	1.227	1.212	1.210

The -20dB bandwidth of the emission shall be contained within the frequency band designated in the rule section under which the equipment is operated.



4 ENGINEERING STATEMENT

This report has been prepared on behalf of Brain Sentinel to provide documentation for the testing described herein. This equipment has been tested and found to comply with part 15.249 of the FCC Rules using ANSI C63.10 2013 standard. 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: SeizureLink

Model: SLU01-90001

Serial No.: None Specified

FCC ID: 2AG2I-SLU01-90001

5.2 Trade Name:

Brain Sentinel

5.3 Power Supply:

Battery-operated

5.4 Applicable Rules:

CFR 47, Part 15.249

5.5 Equipment Category:

Radio Transmitter-DTS

5.6 Antenna:

Integral, 3dBi Gain

5.7 Accessories:

None

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. EUT was placed on an 80cm and 1.5m high table on the turntable of a semi-anechoic chamber, 3m from the measuring antenna. Radiated emissions were measured of the fundamental (2402-2480 MHz) and out-of-band spectrums. Measurements were made on three different channels (low, mid and high).

**6 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	Jan. 9, 2019
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Nov. 17, 2018
JB Combination Antenna	CL175	Sunol Sciences	JB3	A030315	Oct. 11, 2019
Active 18" Loop Antenna	CL163-Loop	AH Systems, Inc.	EHA0-52B	100	June 4, 2019
Antenna, Horn (18 GHz-26.5 GHz)	CL114	AH Systems, Inc.	SAS-572	237	Nov. 17, 2018
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 28, 2018
Pre-Amplifier	CL153	Keysight Tech.	83006A	MY39500791	Sept. 20, 2018
Pre-Amplifier	CL136	Hewlett Packard	8447D	1726A01006	Nov. 17, 2018
Temp/Hum. Recorder	CL233	Extech	445814	02	Mar. 22, 2019
Software:	EMC 32, Version 8.53.0		Software Verified: July 10, 2018		



7 FCC PART 15.215(c), OCCUPIED BANDWIDTH

7.1 Requirements:

§15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

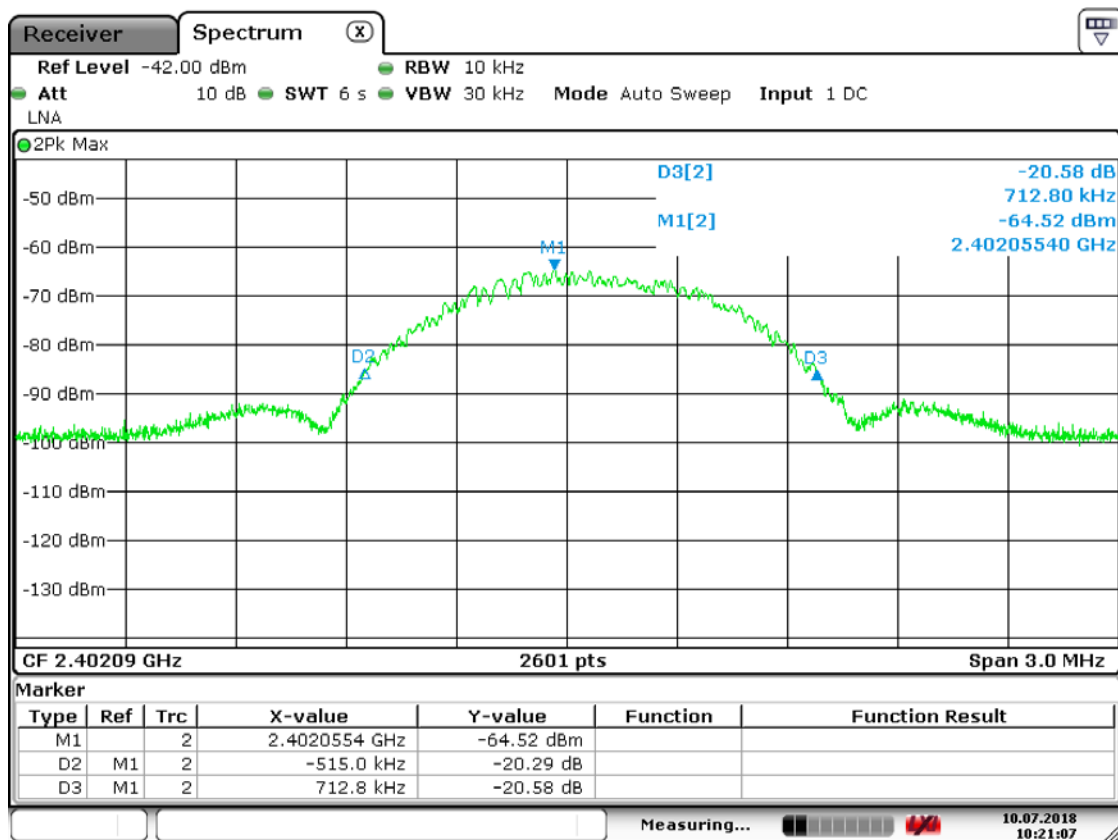
Bandwidth measurements were made at the low (2402), mid (2440) and upper (2480) MHz frequencies. The bandwidth was measured using the analyzer's marker function.



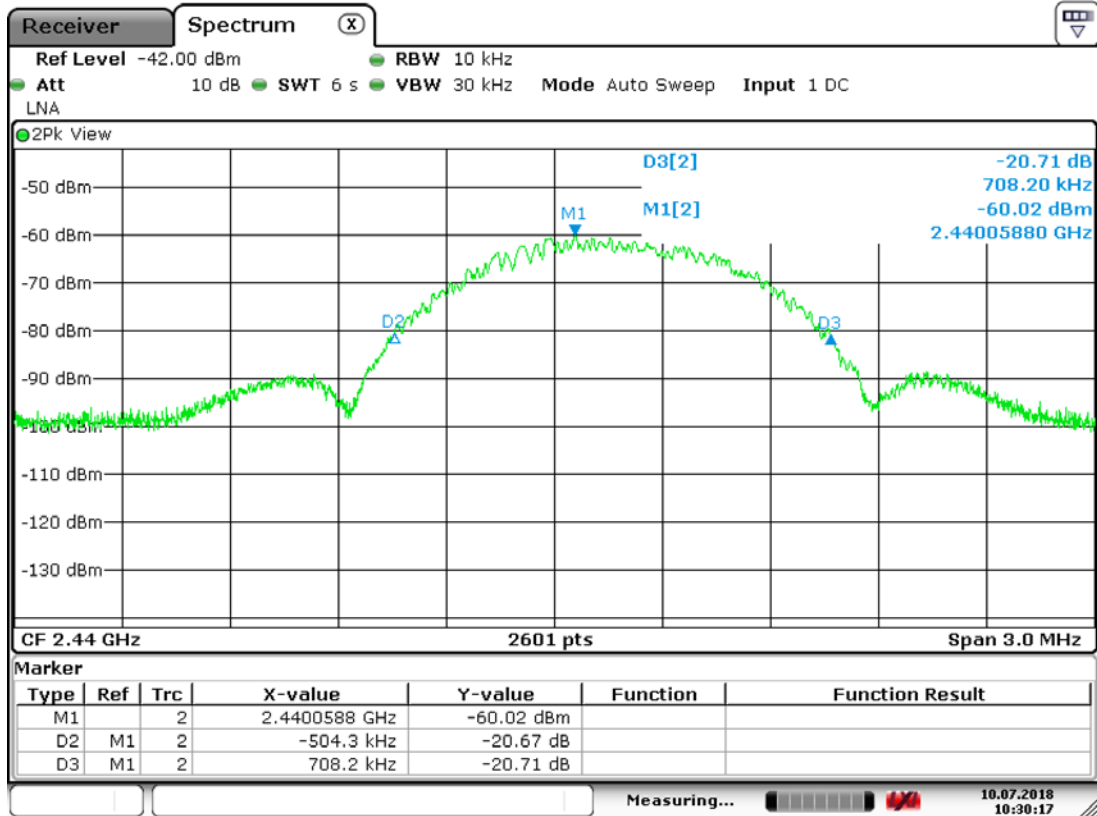
7.2 Occupied Bandwidth Test Data

Test Date(s):	July 10, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.215(c)	Air Temperature:	22.1°C
		Relative Humidity:	45%

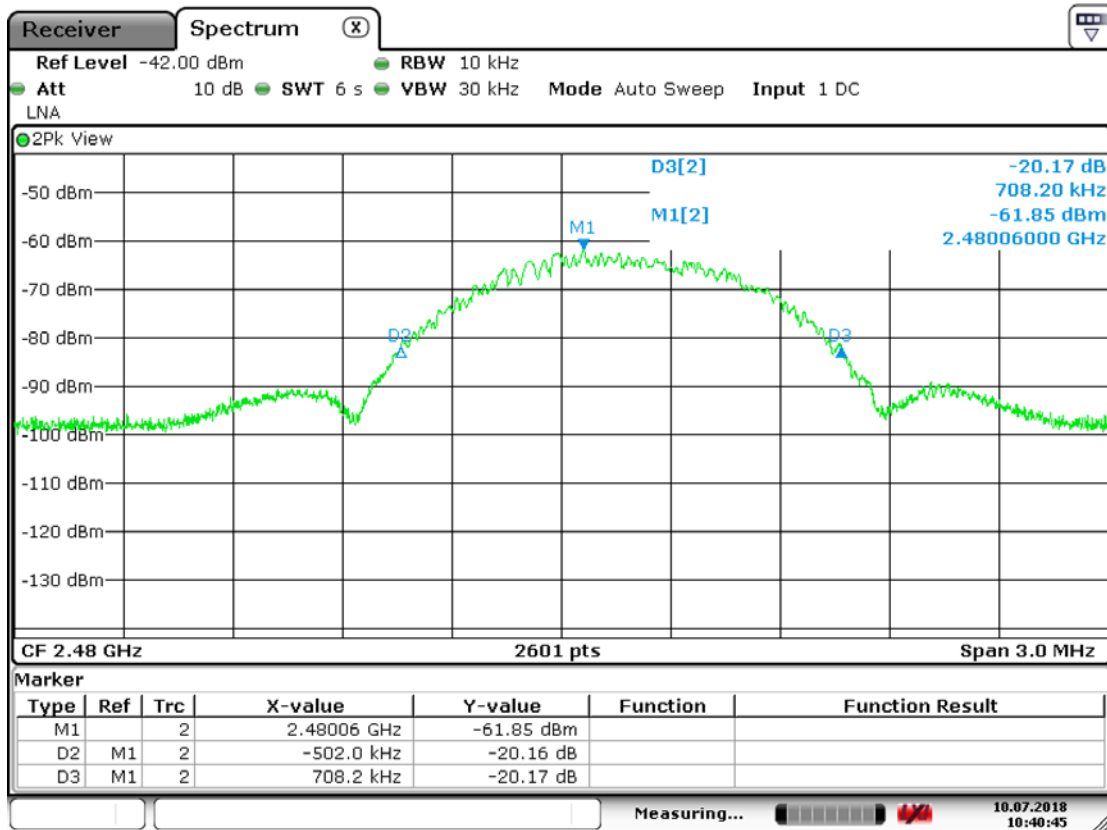
-20dB, Low Channel



Date: 10.JUL.2018 10:21:07

**-20dB, Mid Channel**

Date: 10.JUL.2018 10:30:17

**-20dB, High Channel**

Date: 10.JUL.2018 10:40:45

**8 FCC PART 15.249(a)(d) – FIELD STRENGTH OF EMISSIONS FROM INTENTIONAL RADIATORS**

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

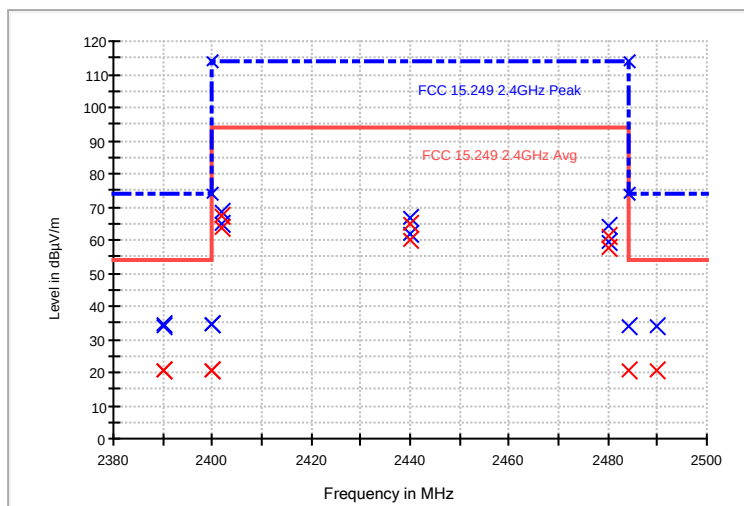
NOTE: During the pre-scan evaluation, the EUT was rotated in all three orthogonal positions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. The antenna was raised between 1 and 4 meters and the EUT turntable was rotated 360 degrees to maximize the emissions.



8.1 Test Data - Field Strength of Emissions from Intentional Radiators

Test Date(s):	July 10, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(a)	Air Temperature:	22.1°C
		Relative Humidity:	46%

In Band



Frequency (MHz)	Polarity	Antenna Height (cm)	Azimuth (deg)	Corr. (dB)	MaxPeak (dBµV/m)	MaxPeak (dBµV/m) Limit	MaxPeak Margin	Average (dBµV/m)	Average (dBµV/m) Limit	Average Margin
2402.000000	H	112.0	0.0	-4.70	64.9	114	-49.1	63.4	94	-30.6
2402.000000	V	100.0	60.0	-4.70	68.6	114	-45.4	67.2	94	-26.8
2440.000000	H	100.0	348.0	-4.30	62	114	-52.0	60.1	94	-33.9
2440.000000	V	100.0	85.0	-4.30	66.4	114	-47.6	64.6	94	-29.4
2480.000000	H	305.0	193.0	-4.30	59.6	114	-54.4	57.9	94	-36.1
2480.000000	V	137.0	73.0	-4.30	64.3	114	-49.7	61.5	94	-32.5



8.2 Test Data – Spurious Emissions

Test Date(s):	June 11, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(a) / Part 15.209	Air Temperature:	20.9°C
		Relative Humidity:	47%

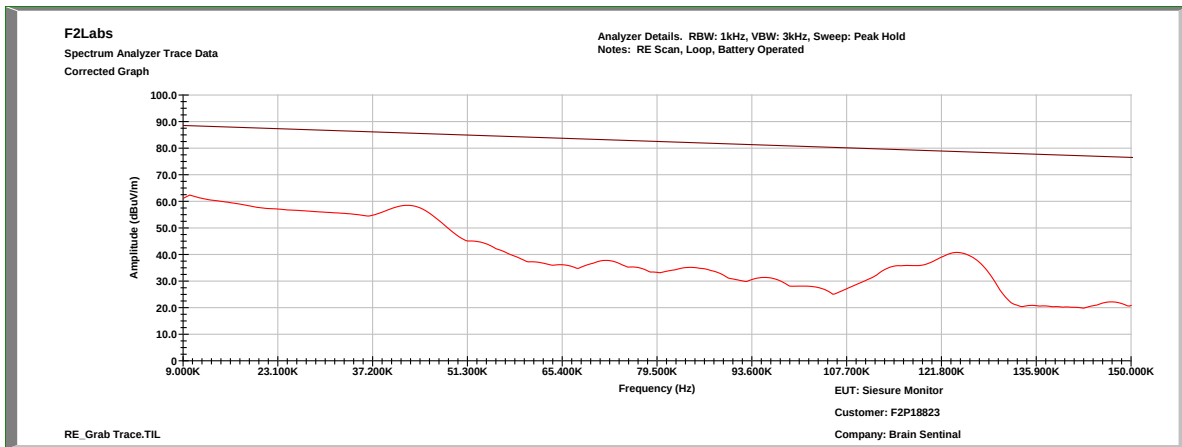
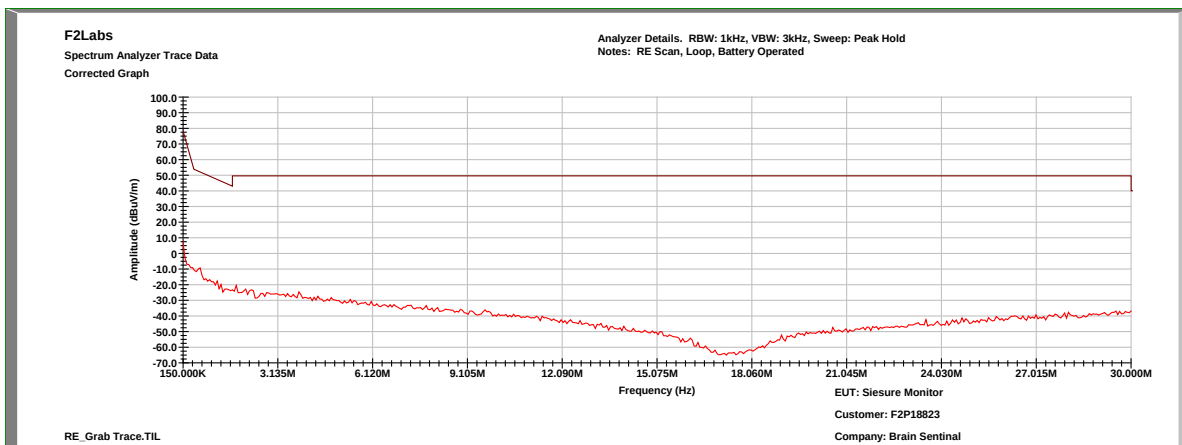
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all three orthogonal positions to find the maximum emissions. The orthogonal position that showed the highest emissions was used.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

Where emissions from the EUT were visible within 20dB of the limit, at least 6 of the highest frequencies were measured per ANSI 63.4 in a 3-meter anechoic chamber. 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. Frequencies were scanned from 9kHz to 26 GHz and the highest emissions are listed below.

Note: Spurious emissions in these EUTs were tested for all three channels. The results that follow are from the one that was deemed worst-case: 2402 MHz (Low Channel).

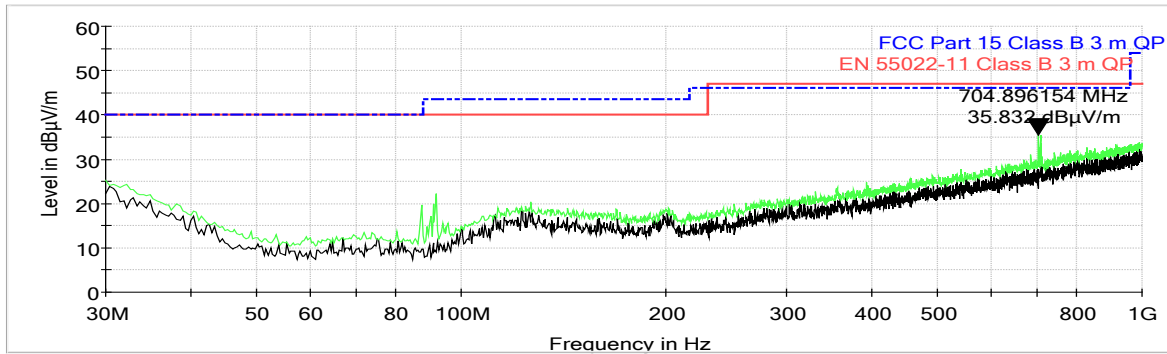


Test Date(s):	July 10, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(d) / Part 15.209	Air Temperature:	22.1°C
Results:	Complies	Relative Humidity:	40%

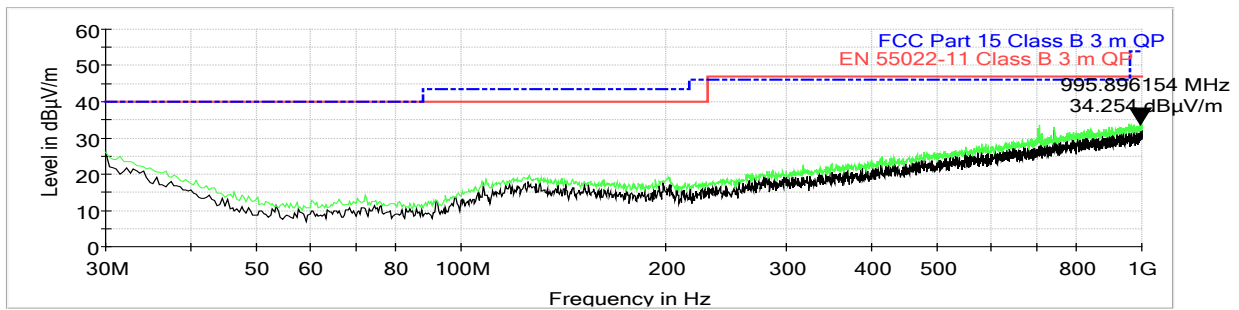
0.009 MHz to 0.15 MHz, Low Channel**0.15 MHz to 30.0 MHz, Low Channel**



30.0 MHz to 1000 MHz, Low Channel, Vertical



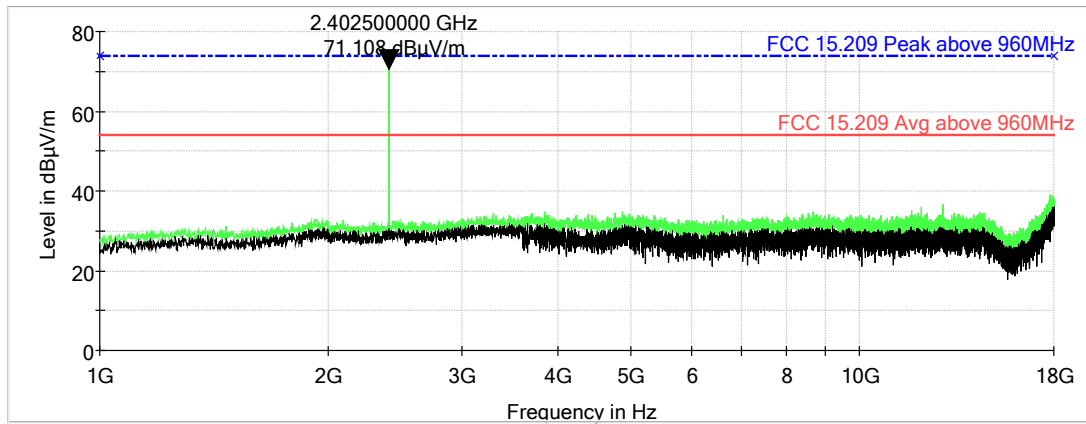
30.0 MHz to 1000 MHz, Low Channel, Horizontal



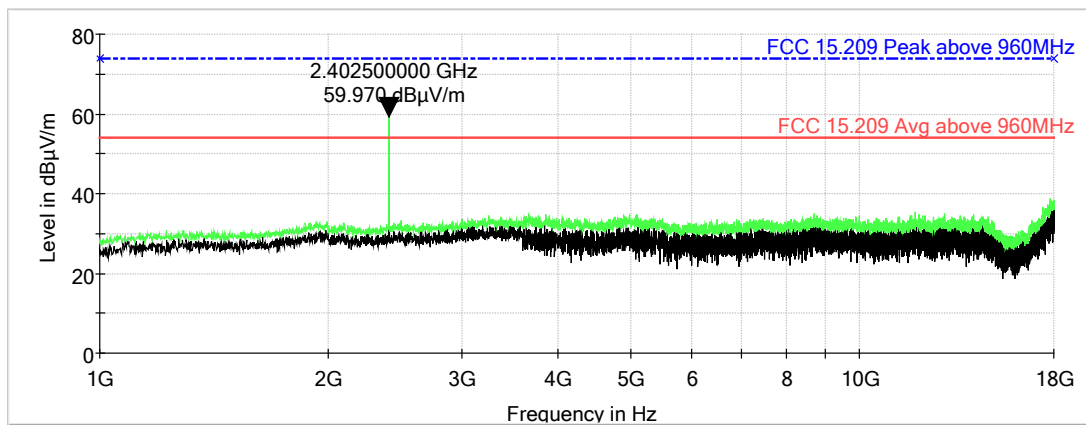
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dB μ V)	Correction Factos (dB)	Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
31.480000	H	100.00	0.00	14.0	4.1	18.10	40.0	-21.9
31.480000	V	100.00	2.00	14.1	4.1	18.20	40.0	-21.8
87.440000	V	100.00	8.00	13.8	-8.1	5.70	40.0	-34.3
91.920000	V	100.00	350.00	13.8	-7.6	6.20	43.5	-37.3
108.720000	H	100.00	0.00	13.8	-3.0	10.80	43.5	-32.7
126.640000	V	100.00	357.00	13.8	-1.1	12.70	43.5	-30.8
200.880000	H	100.00	0.00	13.9	-1.4	12.50	43.5	-31.0
432.920000	H	100.00	0.00	14.3	3.2	17.50	46.0	-28.5
548.560000	V	100.00	357.00	14.5	5.5	20.00	46.0	-26.0
704.880000	V	100.00	136.00	22.7	8.4	31.10	46.0	-14.9
707.880000	H	100.00	1.00	26.2	8.4	34.60	46.0	-11.4



1 GHz to 18 GHz, Low Channel, Vertical

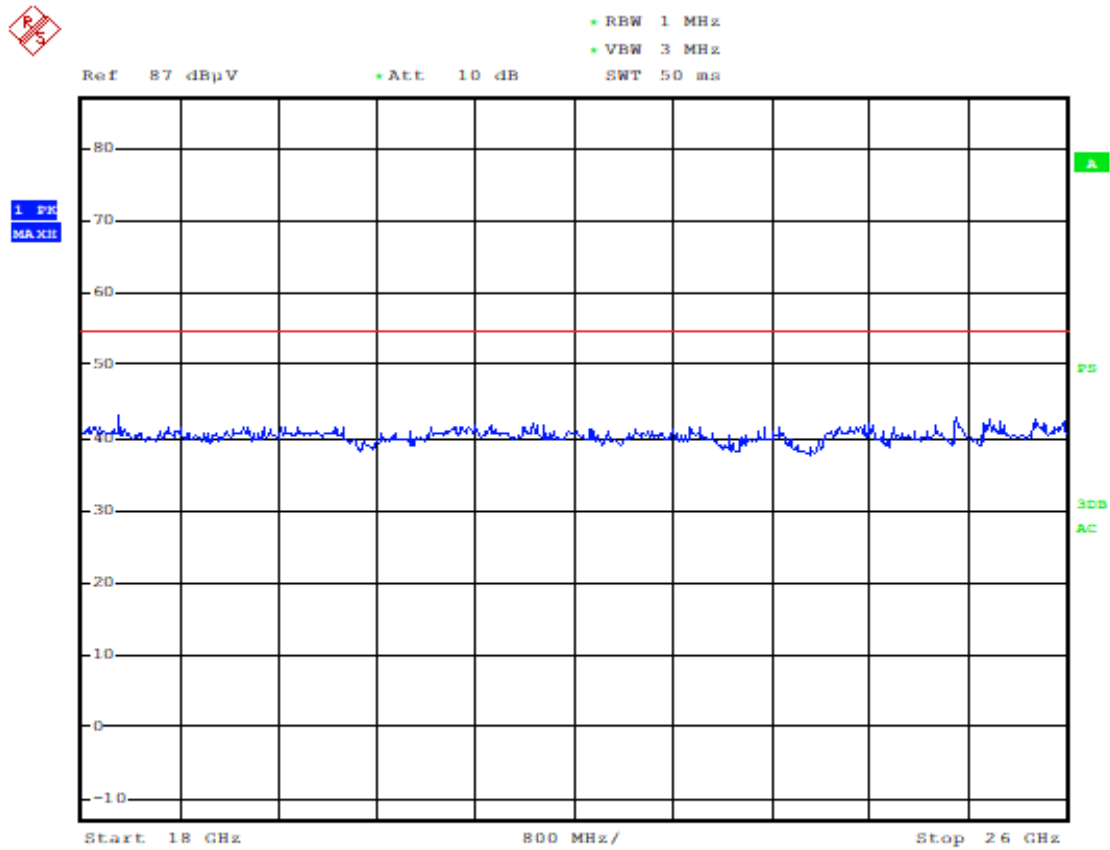


1 GHz to 18 GHz, Low Channel, Horizontal





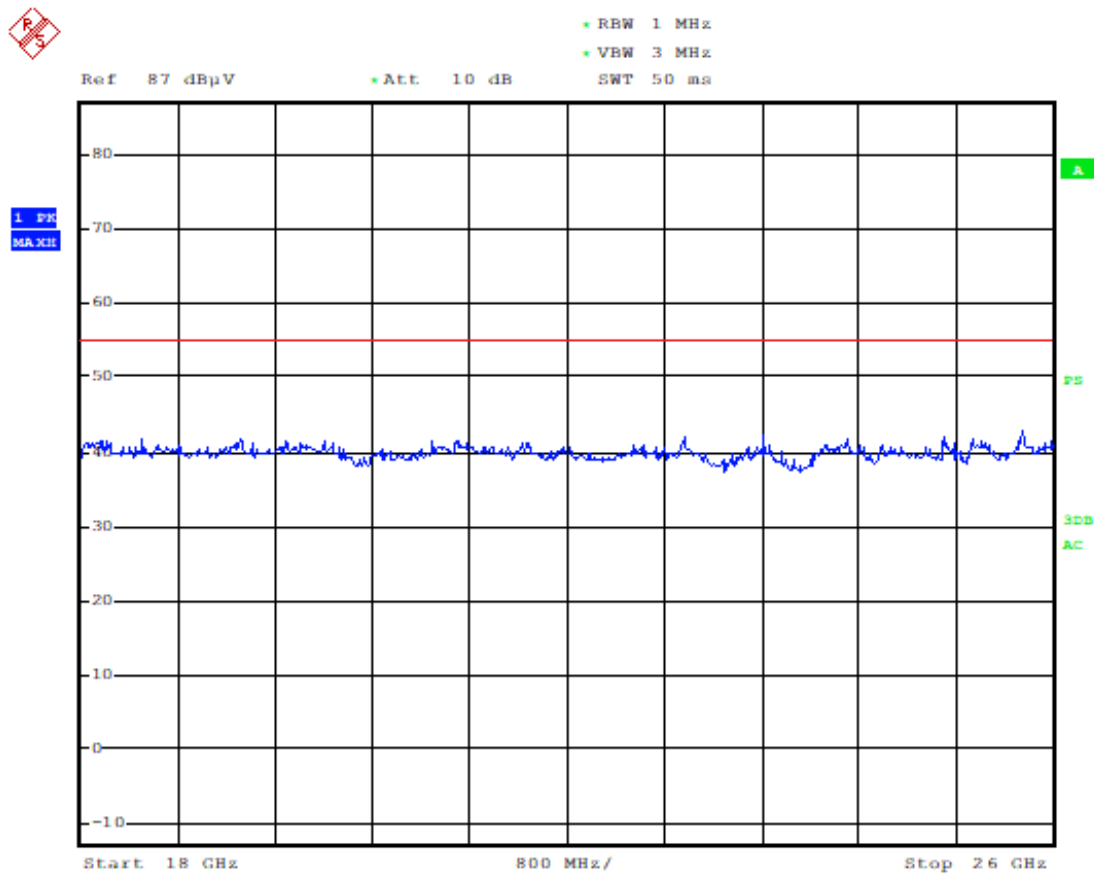
18 GHz to 26 GHz, Low Channel, Vertical



Date: 10. JUL. 2018 12:28:29



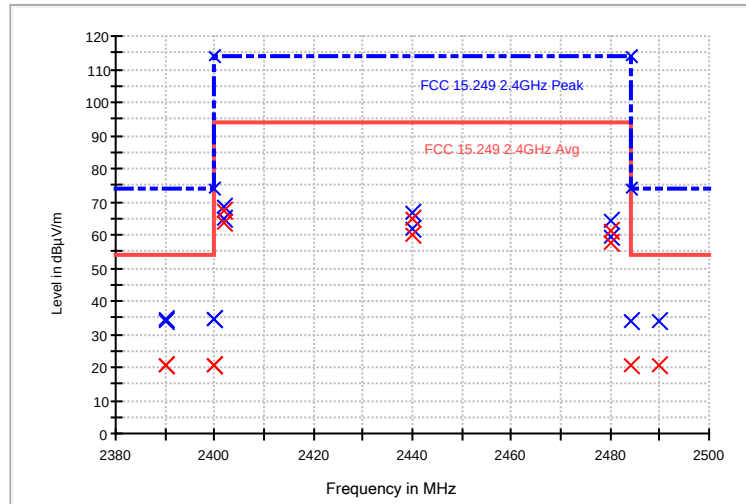
18 GHz to 26 GHz, Low Channel, Horizontal



Date: 10.JUL.2018 12:34:04



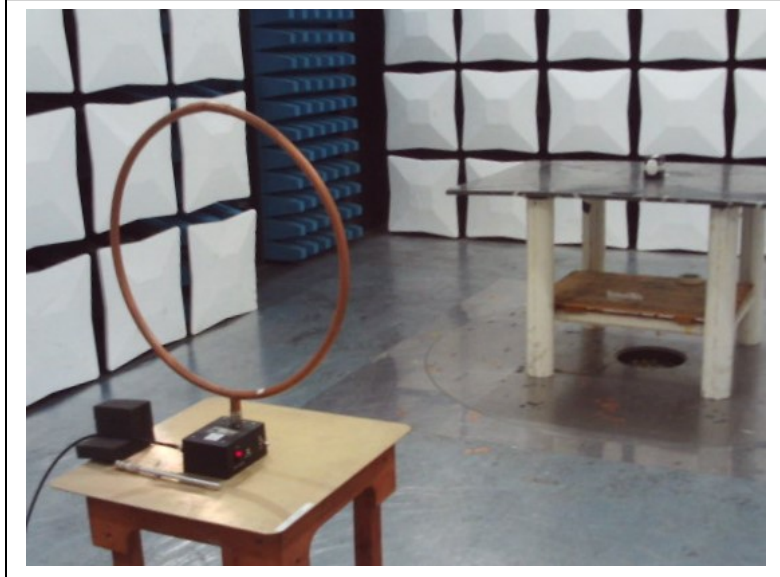
Band Edges



Frequency (MHz)	Polarity	Antenna Height (cm)	Azimuth (deg)	Corr. (dB)	MaxPeak (dBµV/m)	MaxPeak (dBµV/m) Limit	MaxPeak Margin	Average (dBµV/m)	Average (dBµV/m) Limit	Average Margin
2390.000000	V	100.0	60.0	-4.40	34	74	-40.0	20.5	54	-33.5
2390.000000	H	100.0	0.0	-4.40	34.6	74	-39.4	20.5	54	-33.5
2400.000000	H	100.0	0.0	-4.70	34.3	74	-39.7	20.4	54	-33.6
2400.000000	V	100.0	60.0	-4.70	34.3	74	-39.7	20.8	54	-33.2
2484.000000	H	305.0	193.0	-4.20	34.2	74	-39.8	20.9	54	-33.1
2484.000000	V	305.0	193.0	-4.20	38.6	74	-35.4	21.1	54	-32.9
2490.000000	H	305.0	193.0	-4.20	34.1	74	-39.9	20.9	54	-33.1
2490.000000	V	305.0	193.0	-4.20	38.3	74	-35.7	21	54	-33.0

9 PHOTOGRAPHS

Radiated Emissions: Loop Antenna, 0.009 MHz to 30 MHz



Radiated Emissions: 30 MHz to 1000 MHz





Radiated Emissions above 1GHz

