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**16740 Peters Road**  
**Middlefield, Ohio 44062**  
**United States of America**  
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## **CERTIFICATION TEST REPORT**

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**Manufacturer:** Structured Monitoring Products, Inc.  
151 Innovation Drive, Suite 320  
Elyria, Ohio 44035

**Applicant:** Same as Above

**Product Name:** Heart Monitor

**Product Description:** Heart rate and Respiratory rate measurement device for animals.

**Operating Voltage/Frequency:** DC from AC Power Supply

**Model:** VetGuardian

**FCC ID:** 2ARN8-SMPVG01

**Testing Commenced:** Oct. 1, 2018

**Testing Ended:** Jan. 21, 2019

**Summary of Test Results:** **In Compliance, with Modifications**

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**
- ❖ **FCC15.207 - Conducted Limits**
- ❖ **FCC Part 15 Subpart A, Section 15.31(e) – Measurement Standards**



Order Number: F2P18718B

Applicant: Structured Monitoring Products, Inc.

Model: VetGuardian

**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 DXT 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.



Order Number: F2P18718B

Applicant: Structured Monitoring Products, Inc.

Model: VetGuardian

**1.4 Document History:**

Document Number	Description	Issue Date	Approved By
F2P18718B-01E	First Issue	Jan. 21, 2019	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
Conducted Emissions	CFR 47 Part 15.207(a)	Complies
Variation of the Input Power	CFR 47 Part 15.31(e)	Complies

### Modifications Made to the Equipment

The following modifications were made to the EUT to meet Radiated Emissions requirements:  
One ferrite core (Fair-Rite #0431164281) was placed on DC power wire at the EUT.





### 3 TABLE OF MEASURED RESULTS

Test	5800 MHz	
Average Field Strength of Fundamental	10.8 millivolts/meter (80.7 dB $\mu$ V/m)	
Average Limit for Fundamental	50 millivolts/meter (93.97 dB $\mu$ V/m)	
-20dB Occupied Bandwidth (kHz)	8.012	
Voltage Variations (dB $\mu$ V/m)	-15% V	69.93
	-15% H	80.11
	+15% V	10.45
	+15% H	80.93

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 Structured Monitoring Products, Inc., 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: Heart Monitor

Model: VetGuardian

Serial No.: Test 4

FCC ID: **2ARN8-SMPVG01**

### **5.2 Trade Name:**

Structured Monitoring Products, Inc.

### **5.3 Power Supply:**

DC from AC Power Supply

### **5.4 Applicable Rules:**

CFR 47, Part 15.249

### **5.5 Equipment Category:**

Radio Transmitter-DXT

### **5.6 Antenna:**

0dBi Gain Integral Antenna

### **5.7 Accessories:**

AC Adapter, CUI model ESTA120100VDC-P5P-SZ

### **5.8 Test Item Condition:**

The equipment to be tested was received in good condition.

### **5.9 Testing Algorithm:**

EUT was placed in a continuous transmit mode on the single intended frequency of 5.8 GHz.

**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
Temp/Hum. Recorder	CL234	Extech	445814	03	Mar. 22, 2019
Spectrum Analyzer	CL147	Agilent Technologies	E7402A	MY45101241	Nov. 16, 2018
Receiver	CL151	Rohde & Schwarz	ESU40	100319	Oct. 25, 2019
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	Oct.11, 2019
Horn Antenna	CL098	Emco	3115	9809-5580	Dec. 28, 2018
Antenna, Horn	CL114	A. H. Systems, Inc.	SAS-572	237	Nov. 17, 2018
Horn Antenna	CL188	Com-Power	AH-640	091065	June 16, 2019
Pre-amplifier	0197	Hewlett Packard	8447D	1726A01006	Nov. 17, 2018
Pre-amplifier	CL153	Agilent	83006-69007	MY39500791	Aug. 24, 2019
Pre-amplifier	CL189	Com-Power	PAM-840A	461303	June 14, 2019
Loop Antenna	CL163-Loop	AH Systems, Inc.	EHA-52B	100	June 4, 2019
Transient Limiter	0202	Hewlett Packard	11947A	3107A00729	June 19, 2019
Spectrum Analyzer	CL147	Agilent	E7402A	MY45101241	Nov. 16, 2018
LISN	CL181	Com-Power	LI-125A	191226	July 3, 2021
LISN	CL182	Com-Power	LI-125A	191225	July 3, 2021
Software:	Tile Version 3.4.B.3		Software Verified: Oct. 1, 2018		
Software:	EMC 32, Version 5.20.2		Software Verified: Oct. 1, 2018		



## **7 FCC PART 15.215(e), OCCUPIED BANDWIDTH**

### **7.1 Requirements:**

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. 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.

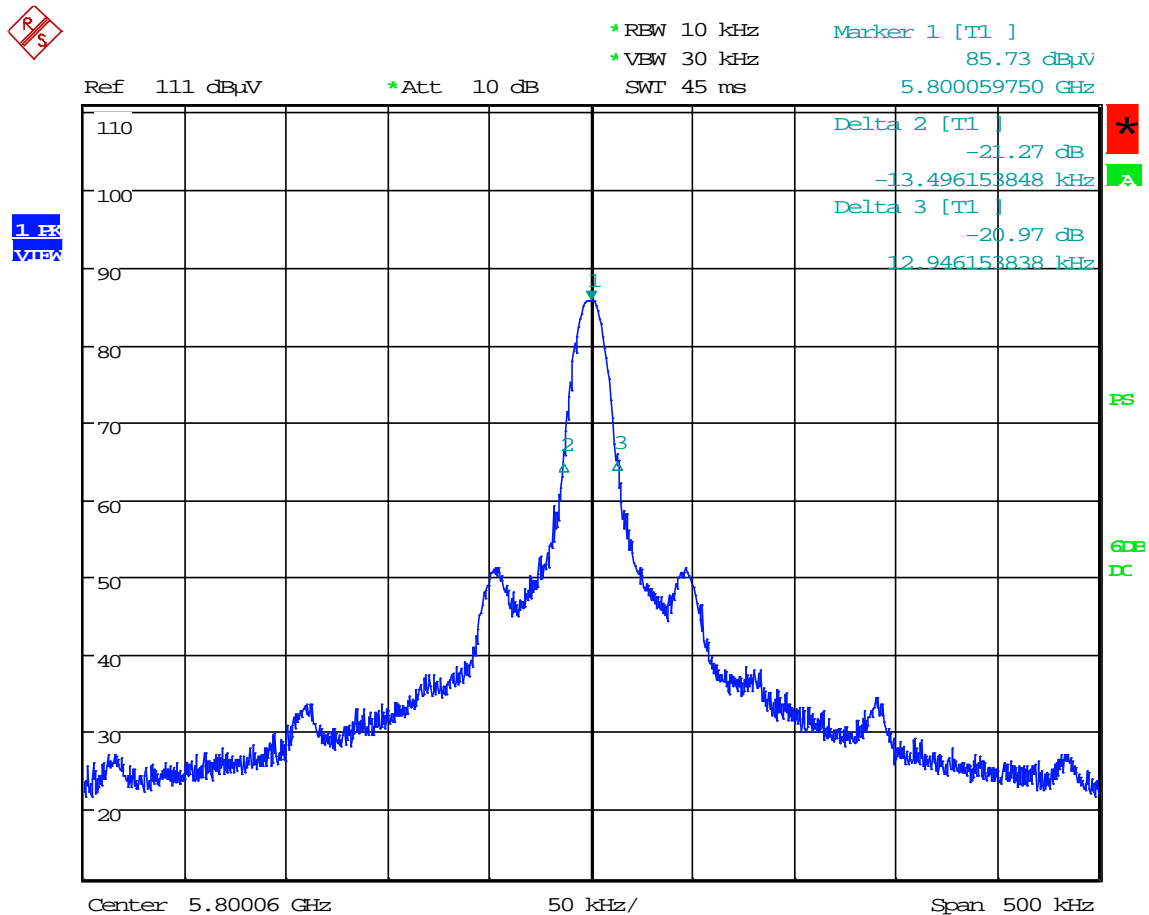
Deviations: Measured at multiple resolution bandwidths in an attempt to get the RBW to be 1-5% of the OBW. This was not obtainable.



## 7.2 Occupied Bandwidth Test Data

Test Date(s):	Oct. 4, 2018; Jan. 21, 2019	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.215(c)	Air Temperature:	20.3°C
		Relative Humidity:	37%

## 20dB, 10kHz RBW





Order Number: F2P18718B

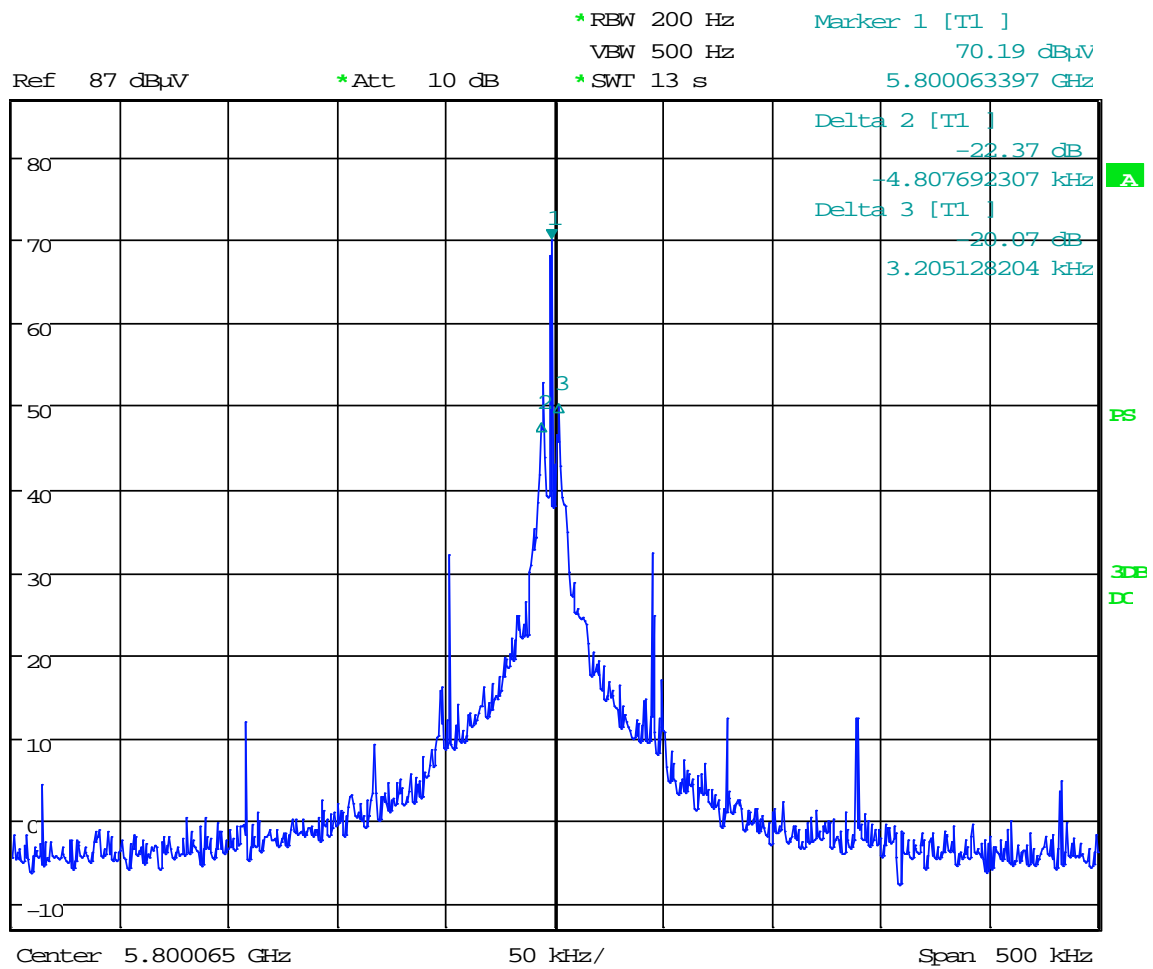
Applicant: Structured Monitoring Products, Inc.

Model: VetGuardian

20dB, 200 Hz RBW



1 PK  
VIEW



Date: 21.JAN.2019 11:54:30

**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:

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

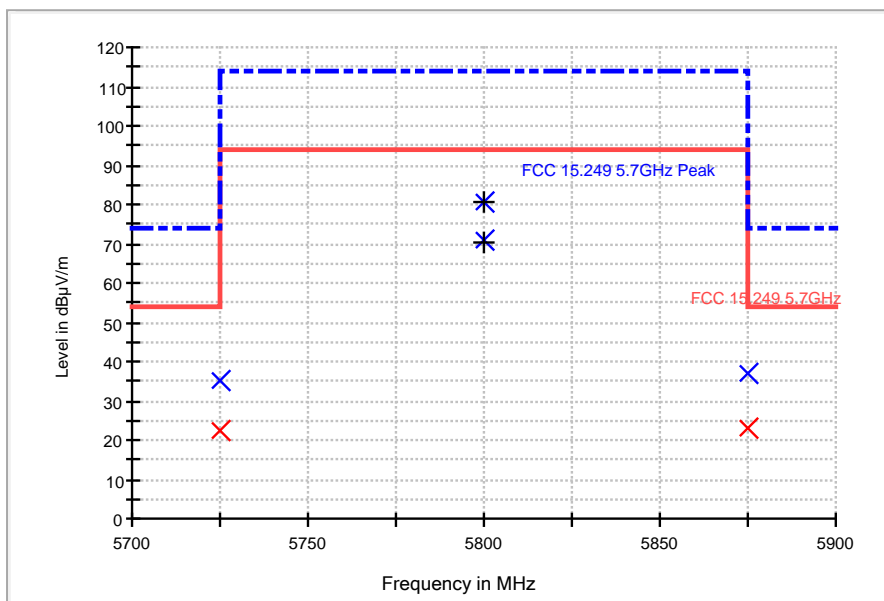
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

NOTE: During the pre-scan evaluation, the EUT was rotated in all possible directions 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):	Oct. 1, 2018	Test Engineer(s):	J. Chiller
Standards:	CFR 47 Part 15.249(a)	Air Temperature:	19.8°C
		Relative Humidity:	58%



## In Band Levels

Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dBµV)	Cable Loss & Antenna Factor (dB)	Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
5725.000000	V	175.00	25.00	27.0	-4.3	22.70	54.0	-31.3
5725.000000	H	175.00	25.00	25.9	-4.3	21.60	54.0	-32.4
5800.000000	V	175.00	25.00	75.0	-4.6	70.40	94.0	-23.6
5800.000000	H	190.00	0.00	85.3	-4.6	80.70	94.0	-13.3
5875.000000	V	175.00	25.00	27.0	-4.1	22.90	54.0	-31.1
5875.000000	H	175.00	25.00	27.5	-4.1	23.40	54.0	-30.6





## 8.2 Test Data – Spurious Emissions

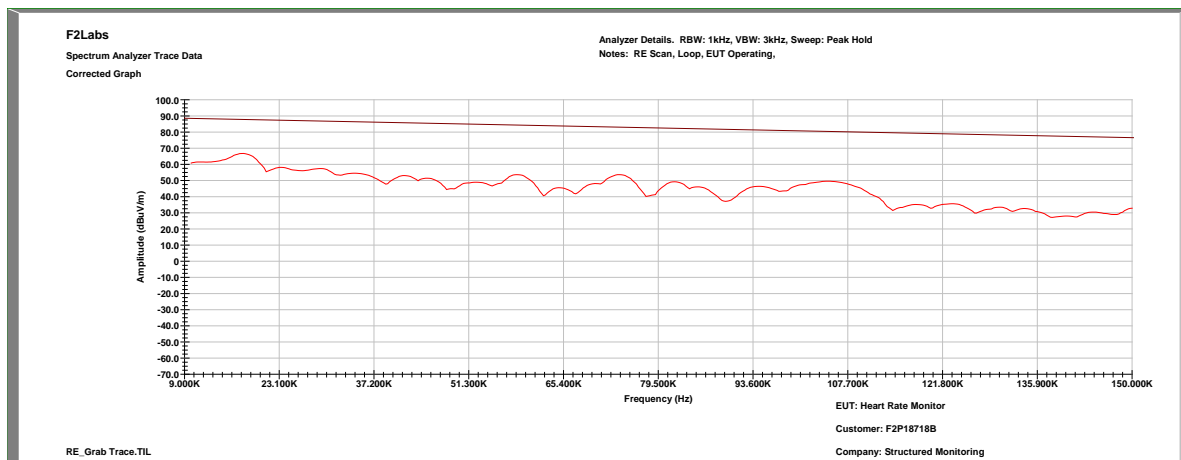
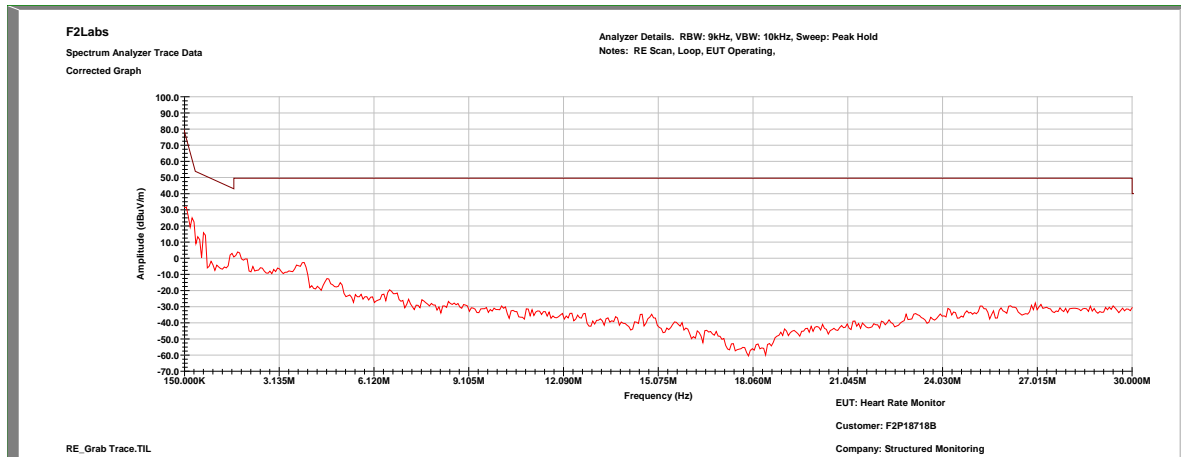
Notes: Plots are peak, max hold pre-scan data included only to determine what frequencies to investigate and measure. During the pre-scan evaluation, the EUT was rotated in all possible directions to find the maximum emissions. The orthogonal position that showed the highest emissions was used. At some 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 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 40 GHz and the highest emissions are listed below.

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.



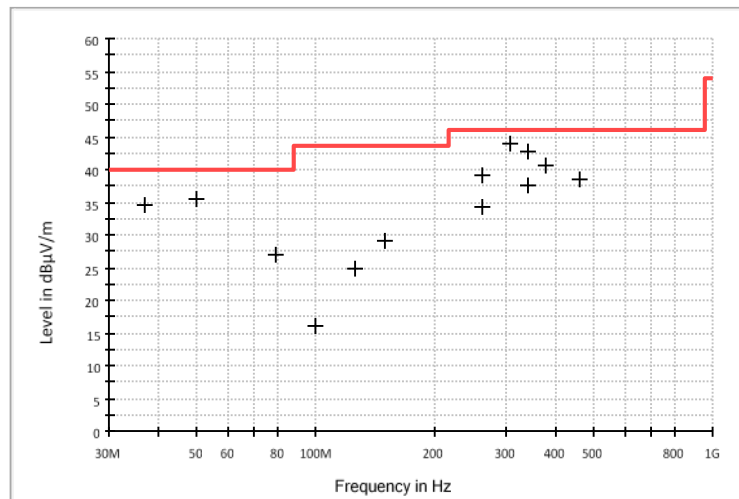
<b>Test Date(s):</b>	Oct. 1, 2018	<b>Test Engineer(s):</b>	J. Chiller
<b>Standards:</b>	CFR 47 Part 15.249(d) / Part 15.209	<b>Air Temperature:</b>	20.7°C
		<b>Relative Humidity:</b>	55%

**Characterization Scan: 0.009 MHz to 0.15 MHz****Characterization Scan: 0.15 MHz to 30 MHz**



## 30 MHz to 1000 MHz

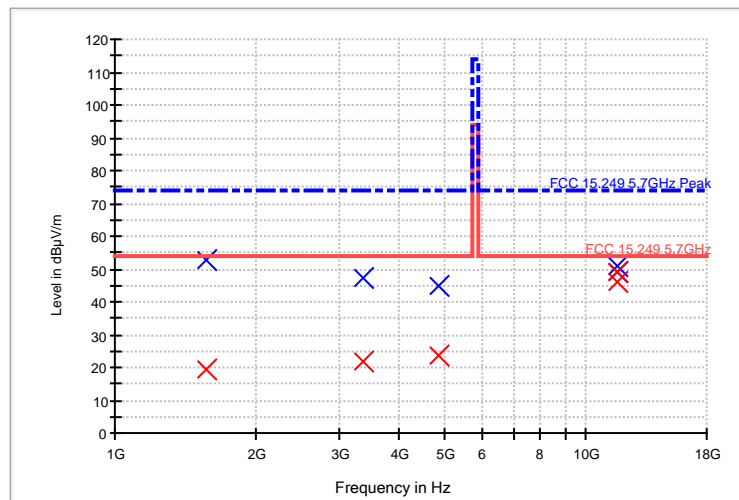
Frequency (MHz)	Antenna Polarization	Antenna Height (cm)	Azimuth (degrees)	Reading (dB $\mu$ V)	Correction Factors (dB)	Emission (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
37.000000	H	100.00	121.00	34.4	0.0	34.40	40.0	-5.6
50.000000	H	100.00	80.00	42.9	-7.6	35.30	40.0	-4.7
78.880000	H	100.00	355.00	34.6	-7.7	26.90	40.0	-13.1
99.840000	V	100.00	0.00	21.2	-5.2	16.00	43.5	-27.5
124.880000	V	100.00	352.00	26.0	-1.2	24.80	43.5	-18.7
149.880000	H	100.00	129.00	31.3	-2.3	29.00	43.5	-14.5
261.840000	H	100.00	27.00	40.2	-1.2	39.00	46.0	-7.0
263.000000	V	100.00	0.00	35.3	-1.1	34.20	46.0	-11.8
309.760000	H	100.00	306.00	43.8	0.2	44.00	46.0	-2.0
342.520000	V	100.00	185.00	36.8	0.8	37.60	46.0	-8.4
343.120000	H	100.00	7.00	42.1	0.8	42.90	46.0	-3.1
378.240000	V	100.00	3.00	39.0	1.7	40.70	46.0	-5.3
460.880000	H	100.00	298.00	34.7	3.8	38.50	46.0	-7.5





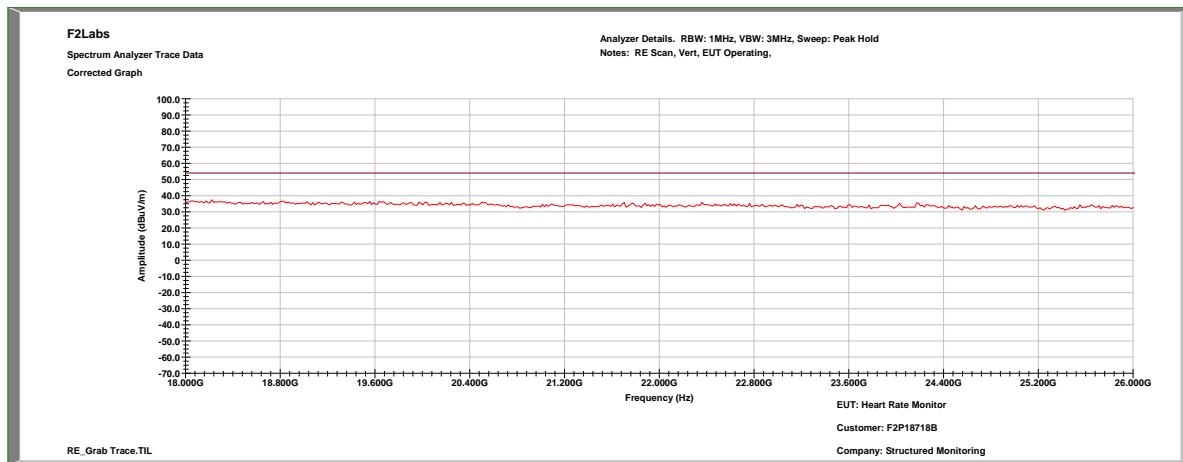
## 1 GHz to 18 GHz

Frequency (MHz)	Antenna Polarization	Azimuth (degrees)	Reading (dB $\mu$ V)	Cable Loss & Antenna Factor (dB)	Emission (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1558.000000	H	244.00	40.9	-6.2	34.7	54.0	-19.3
3355.000000	V	161.00	36.0	-3.6	32.4	54.0	-21.6
4864.000000	V	25.00	33.7	-3.6	30.1	54.0	-23.9
11600.000000	V	22.00	11.9	-3.9	8.0	54.0	-46.0
11600.000000	H	0.00	9.1	-3.9	5.2	54.0	-48.8

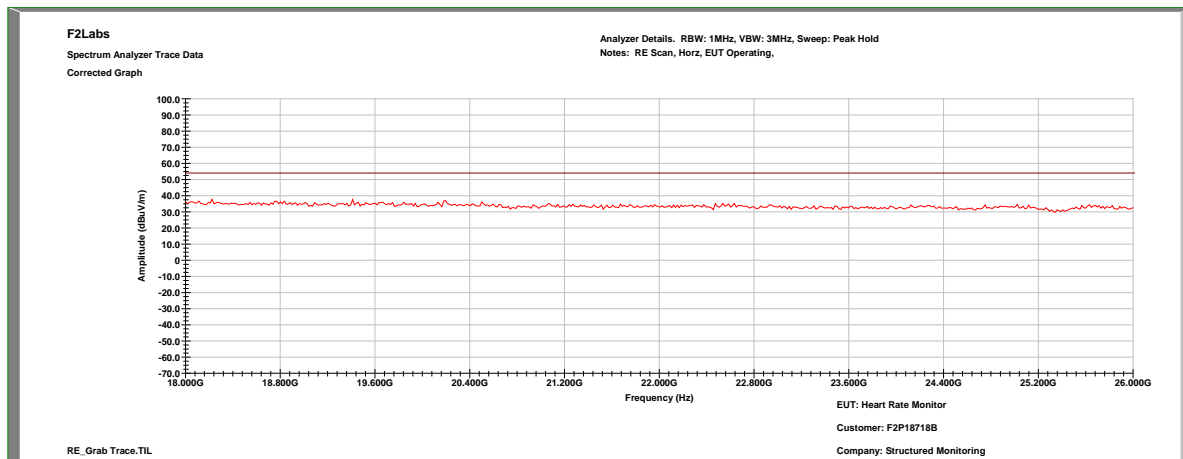




### Characterization Scan: 18 GHz to 26 GHz, Vertical

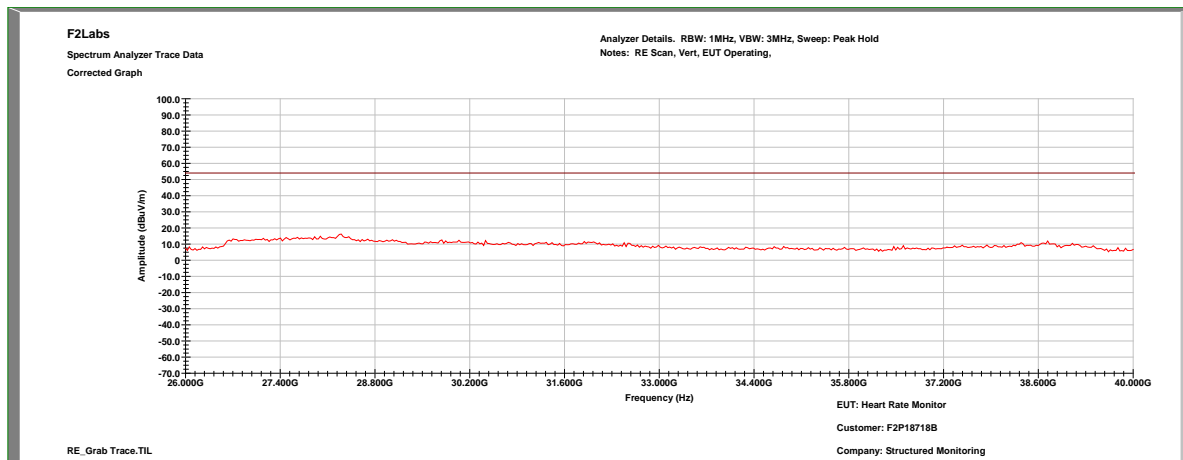


### Characterization Scan: 18 GHz to 26 GHz, Horizontal

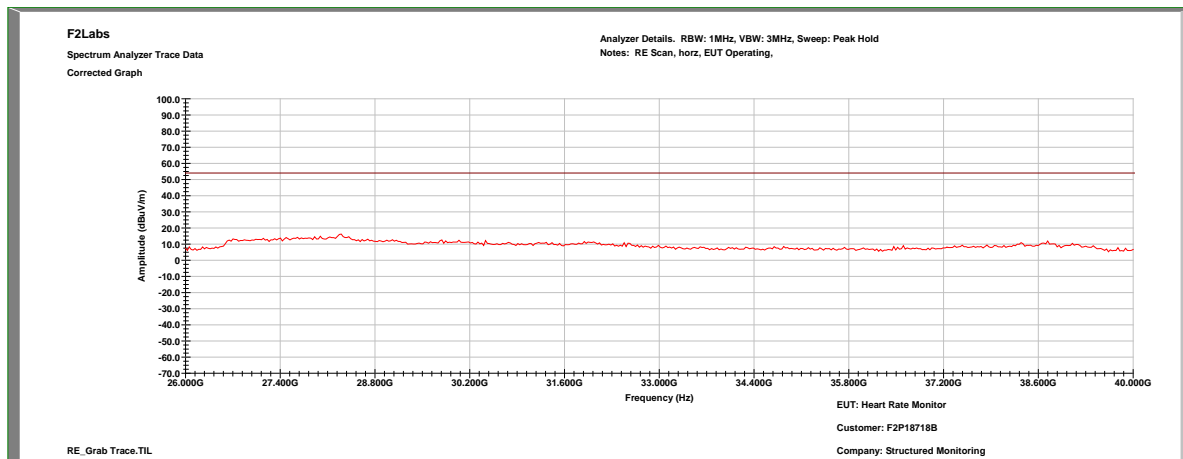




### Characterization Scan: 26 GHz to 40 GHz, Vertical



### Characterization Scan: 26 GHz to 40 GHz, Horizontal





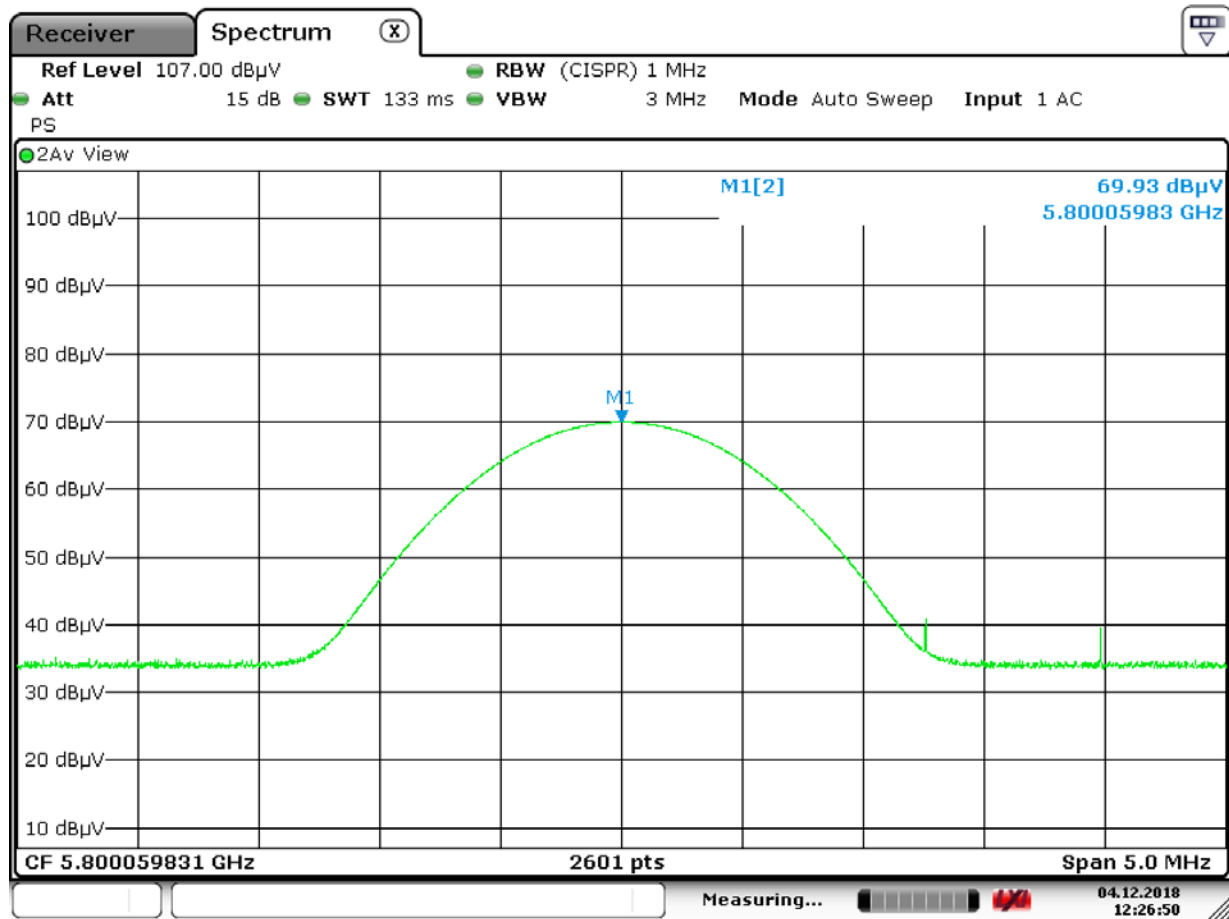
## 9 VOLTAGE VARIATIONS, 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery. A nominal voltage of 120VAC was used and then 100VAC and 138VAC were used as the 85% and 115% variations.

**RESULTS:** The results showed that the fundamental frequency did not move outside the frequency band and the field strength did not increase above the limit during the variations.



Vertical -15%

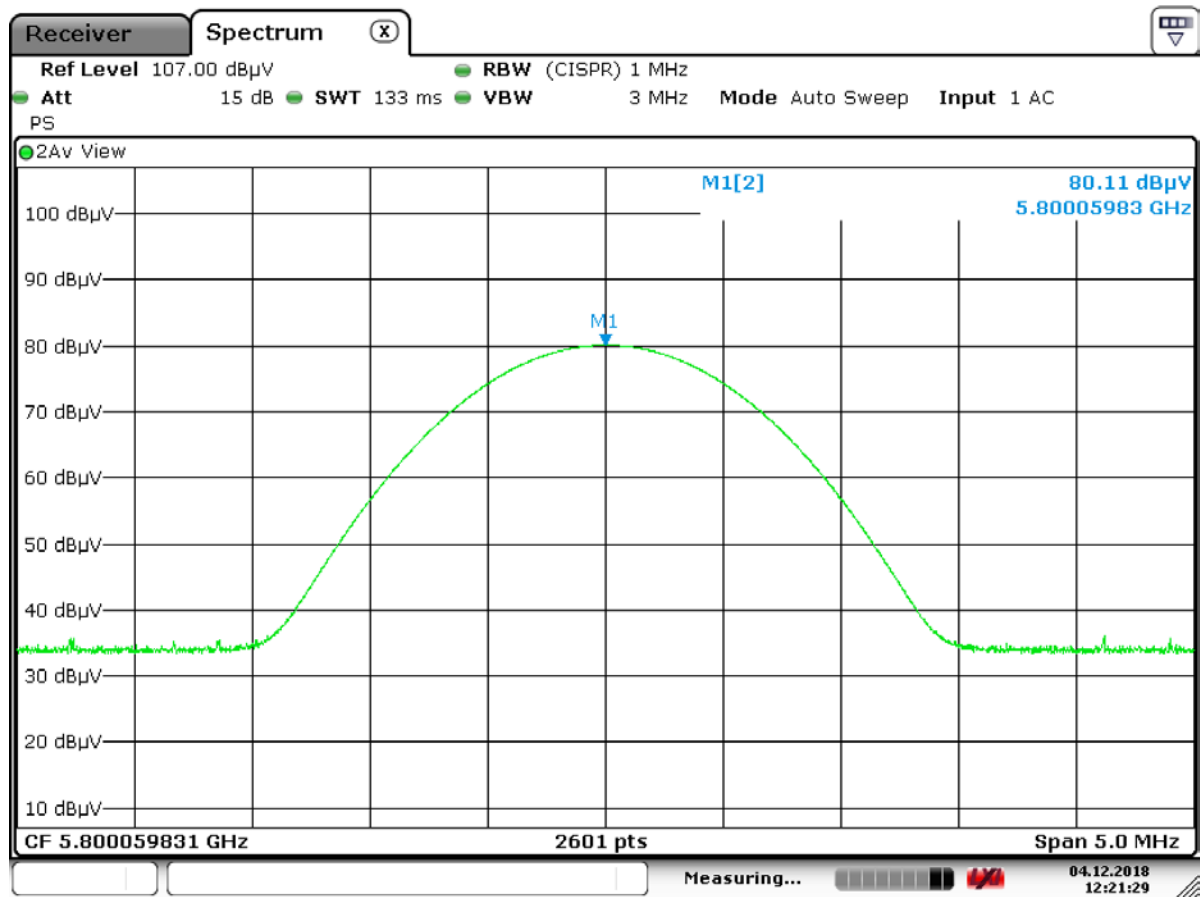


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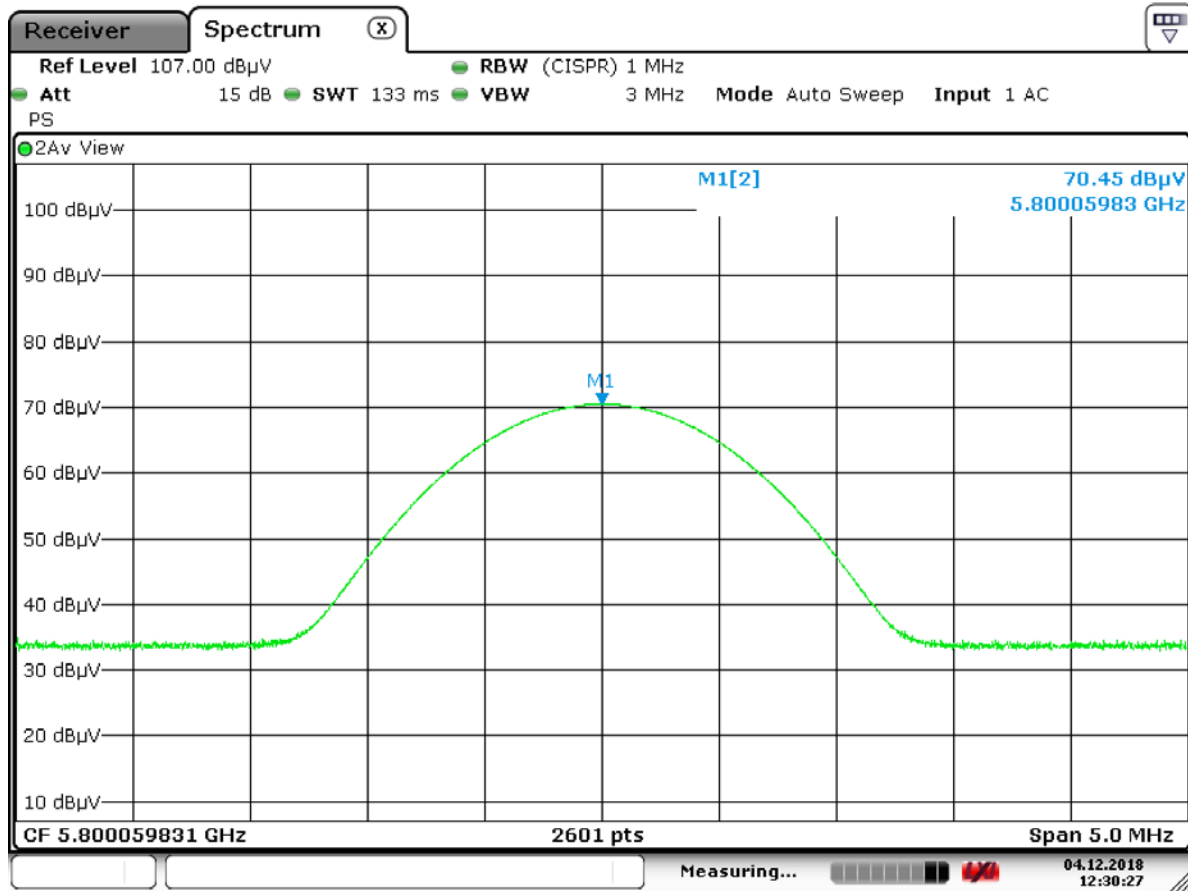
## Horizontal -15%



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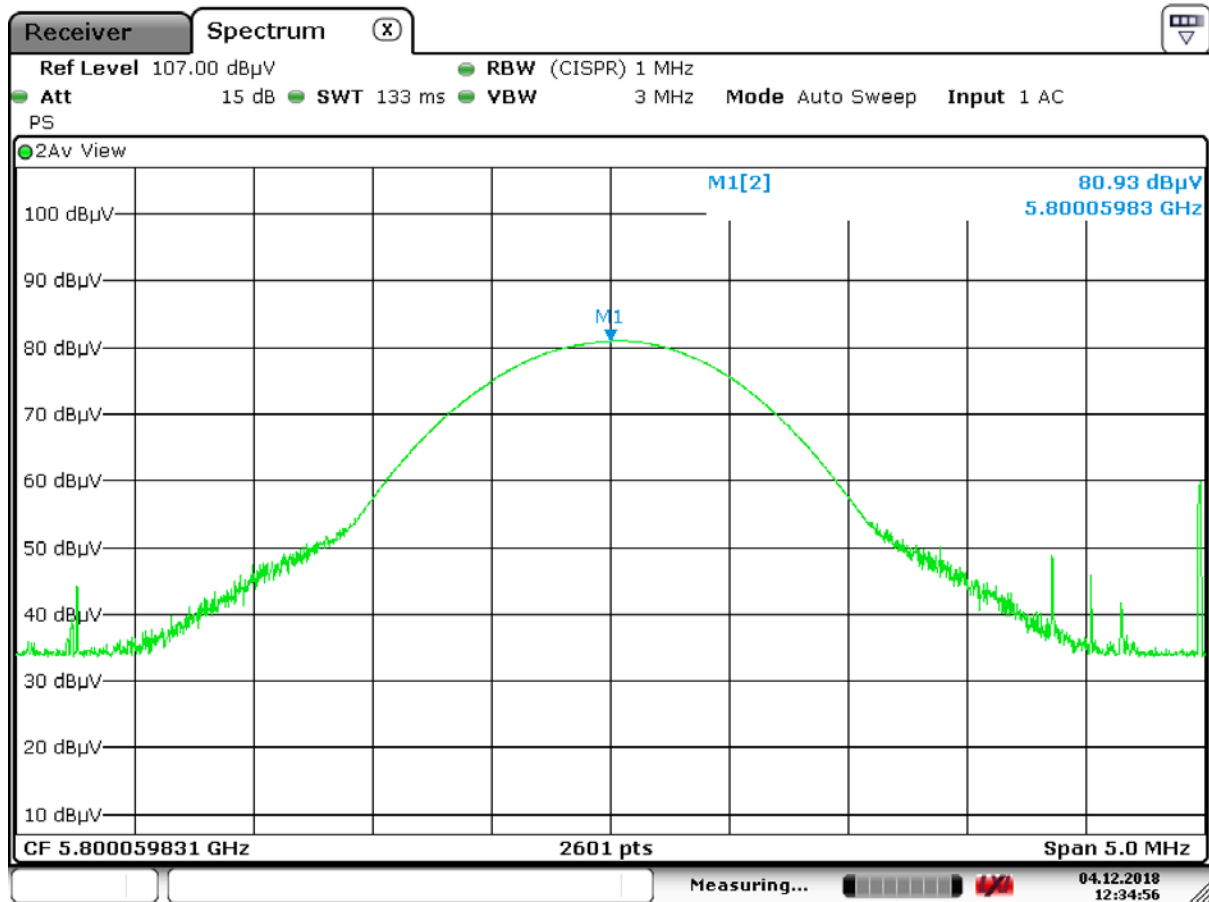
Vertical +15%



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Horizontal +15%



Date: 4.DEC.2018 12:34:57



## 10 CONDUCTED EMISSIONS

### 10.1 Requirements

In accordance with FCC CFR 47 Part 15.207(a), "Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### 10.2 Procedure

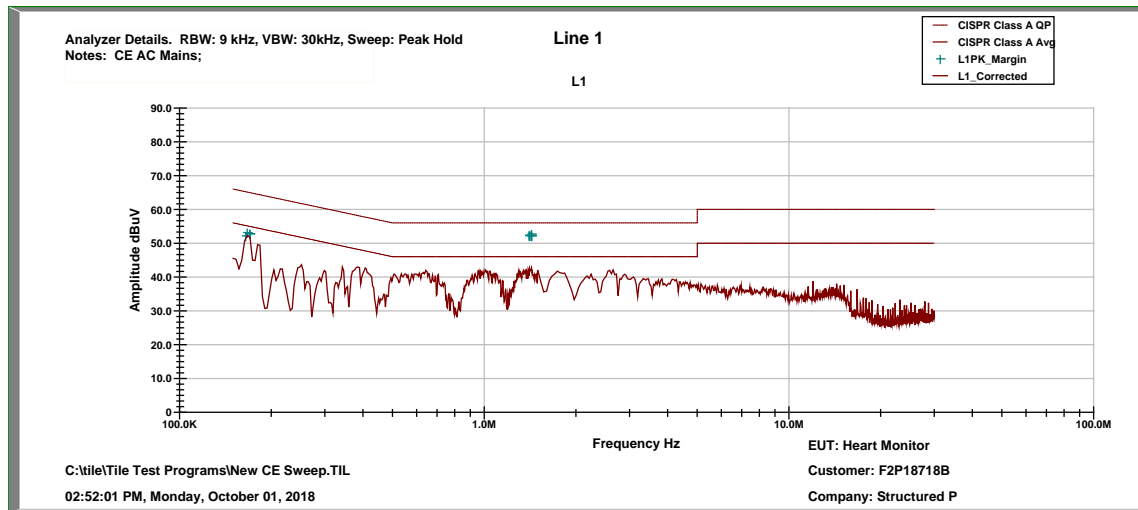
The EUT was placed on a 1.0 x 1.5 meter non-conductive table, 0.8 meter above a horizontal ground plane and 0.4 meter from a vertical ground plane. Power was provided to the EUT through a LISN bonded to a 3 x 2 meter ground plane. The LISN and peripherals were supplied power through a filtered AC power source. The output of the LISN was connected to the input of the receiver via a transient limiter, and emissions in the range 150 kHz to 30 MHz were measured. The measurements were recorded using the quasi-peak and average detectors as directed by the standard, and the resolution bandwidth during testing was 9 kHz. The raw measurements were corrected to allow for attenuation from the LISN, transient limiter and cables.



## 10.3 Conducted Emissions Test Data

Test Date(s):	Oct. 1, 2018	Test Engineer:	J. Chiller
Rule:	15.207	Air Temperature:	21.2° C
Test Results:	Complies	Relative Humidity:	46%

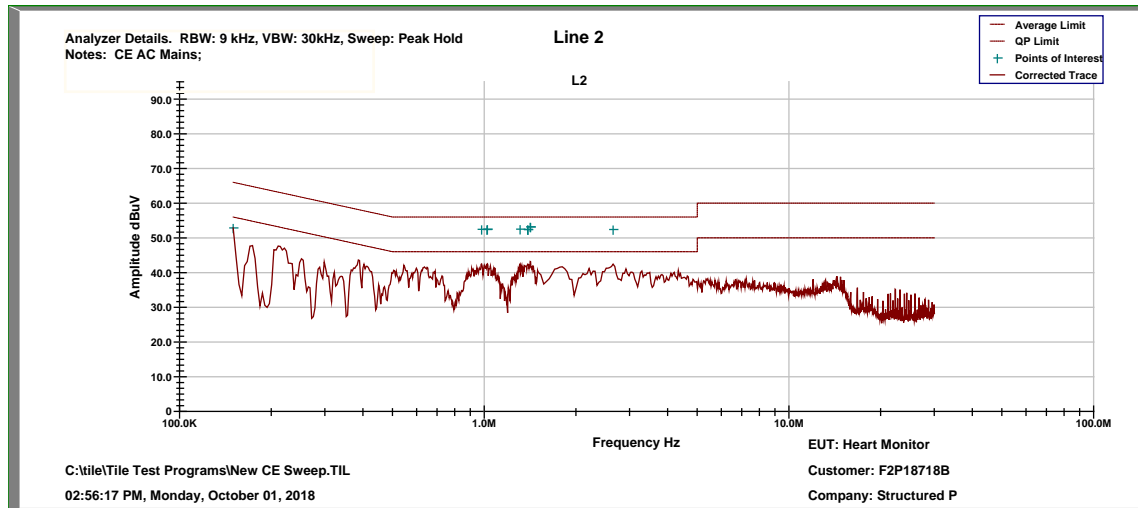
## Conducted Test – Line 1: 0.15 MHz to 30 MHz



Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBμV)	Adjustment (dB)	Results (dBμV)	Limit (dBμV)	Margin (dB)
1	Line 1	0.165	Quasi-Peak	38.928	11.346	50.274	65.208	-14.934
		0.165	Average	27.358	11.346	38.704	55.208	-16.504
2	Line 1	0.166875	Quasi-Peak	38.914	11.325	50.239	65.115	-14.876
		0.166875	Average	26.771	11.325	38.096	55.115	-17.019
3	Line 1	0.17	Quasi-Peak	38.752	11.290	50.042	64.961	-14.919
		0.17	Average	25.759	11.290	37.049	54.961	-17.912
4	Line 1	0.17025	Quasi-Peak	38.410	11.287	49.697	64.949	-15.252
		0.17025	Average	24.015	11.287	35.302	54.9	-19.647
5	Line 1	1.40213	Quasi-Peak	29.757	10.341	40.098	56.0	-15.90
		1.40213	Average	19.816	10.341	30.157	46.0	-15.843
6	Line 1	1.40887	Quasi-Peak	29.535	10.343	39.878	56.0	-16.122
		1.40887	Average	19.848	10.343	30.191	46.0	-15.809
7	Line 1	1.41	Quasi-Peak	29.429	10.343	39.772	56.0	-16.228
		1.41	Average	20.361	10.343	30.704	46.0	-15.296
8	Line 1	1.42575	Quasi-Peak	28.992	10.338	39.330	56.0	-16.670
		1.42575	Average	19.309	10.338	29.647	46.0	-16.353
9	Line 1	1.42912	Quasi-Peak	28.751	10.337	39.088	56.0	-16.912
		1.42912	Average	19.053	10.337	29.390	46.0	-16.610
10	Line 1	1.4325	Quasi-Peak	28.744	10.336	39.080	56.0	-16.920
		1.4325	Average	19.887	10.336	30.223	46.0	-15.777



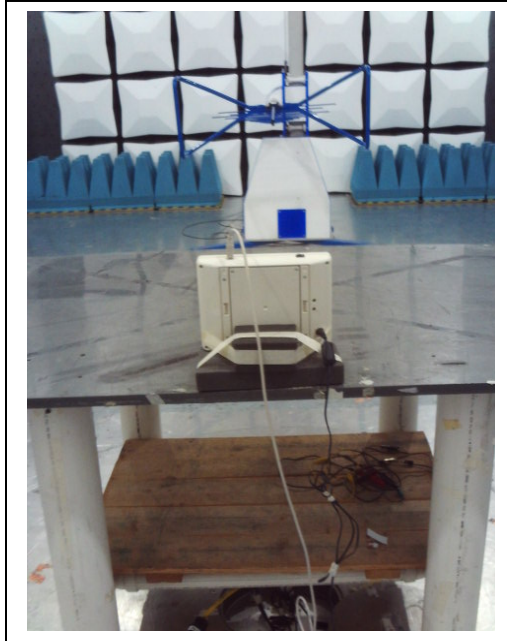
## Conducted Test – Line 2: 0.15 MHz to 30 MHz



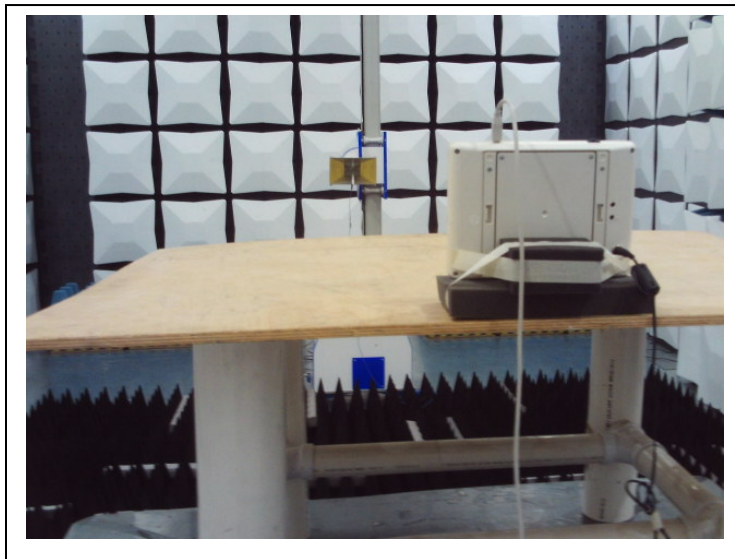
Top Discrete Measurements								
No.	Conductor	Frequency (MHz)	Detector	Level (dBuV)	Adjustment (dB)	Results (dBuV)	Limit (dBuV)	Margin (dB)
1	Line 2	0.15	Quasi-Peak	34.413	11.555	45.968	66.0	-20.032
		0.15	Average	22.647	11.555	34.202	56.0	-21.798
2	Line 2	0.98025	Quasi-Peak	29.964	10.292	40.256	56.0	-15.744
		0.98025	Average	21.002	10.292	31.294	46.0	-14.706
3	Line 2	1.02075	Quasi-Peak	30.218	10.305	40.523	56.0	-15.477
		1.02075	Average	22.716	10.305	33.021	46.0	-12.979
4	Line 2	1.02412	Quasi-Peak	30.248	10.306	40.554	56.0	-15.446
		1.02412	Average	21.167	10.306	31.473	46.0	-14.527
5	Line 2	1.311	Quasi-Peak	28.784	10.319	39.103	56.0	-16.90
		1.311	Average	19.128	10.319	29.447	46.0	-16.553
6	Line 2	1.38863	Quasi-Peak	29.873	10.338	40.211	56.0	-15.789
		1.38863	Average	20.333	10.338	30.671	46.0	-15.329
7	Line 2	1.392	Quasi-Peak	29.855	10.339	40.194	56.0	-15.806
		1.392	Average	20.923	10.339	31.262	46.0	-14.738
8	Line 2	1.41562	Quasi-Peak	29.748	10.341	40.089	56.0	-15.911
		1.41562	Average	22.054	10.341	32.395	46.0	-13.605
9	Line 2	1.419	Quasi-Peak	29.812	10.340	40.152	56.0	-15.848
		1.419	Average	21.421	10.340	31.761	46.0	-14.239
10	Line 2	2.6475	Quasi-Peak	28.552	10.291	38.843	56.0	-17.157
		2.6475	Average	19.410	10.291	29.701	46.0	-16.299

## 11 PHOTOGRAPHS

### Radiated Spurious Emissions, Less Than 1 GHz

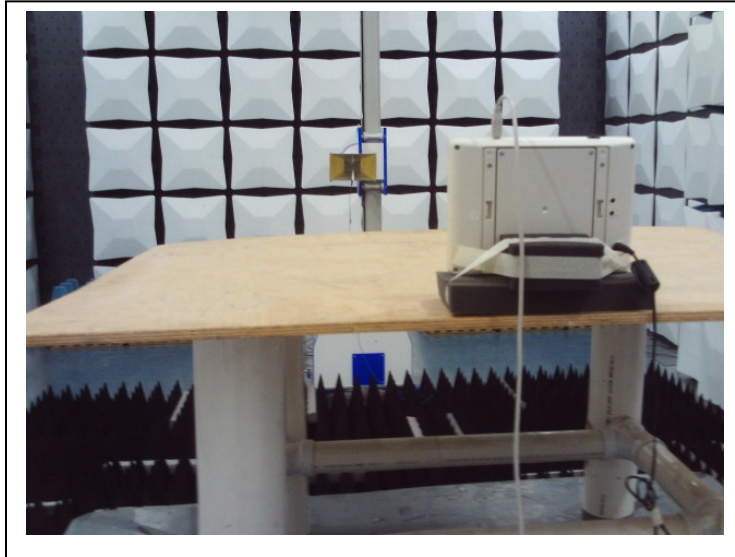


### Radiated Spurious Emissions, Greater than 1 GHz

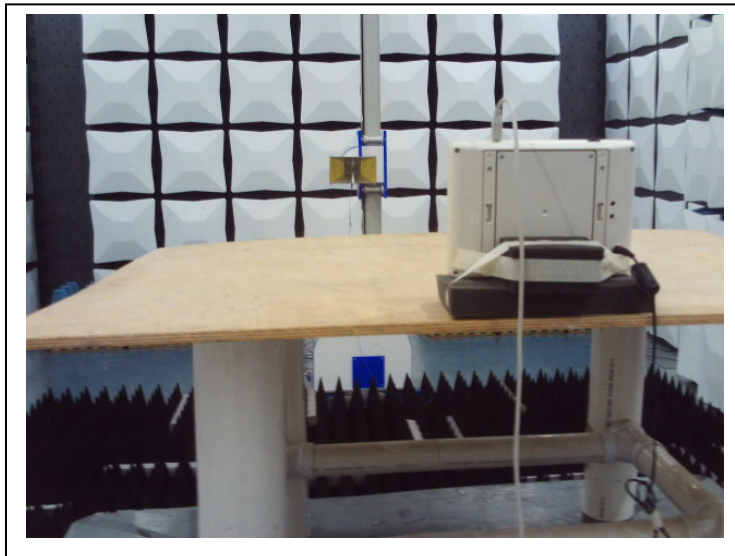




### Field Strength of Emissions, Occupied Bandwidth



### Voltage Variations







### Conducted Emissions

