

Honeywell

THE POWER OF **CONNECTED**

Ademco Inc
251 Little Falls Drive
Wilmington, DE 19808

FCC / ISED Test Report

For

SIXREPEATER

Report #: 47216

FCC ID: CFS8DL6RPT

IC ID: 573F-6RPT

Report Completion Date: 2018-07-26

Prepared by and for:

Ademco Inc.

2 Corporate Center Dr.

Suite 100 PO Box 9040

Melville, NY 11747



Testing

NVLAP Lab Code: 600110

Document Introduction

Ademco Inc. tested the above equipment in accordance with the requirements set forth in the listed standards. All indications of Pass/Fail in the report are opinions expressed by Ademco Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

This document is a record of the FCC/ISED Test Report for Ademco Inc. products. It demonstrates the data required to be analyzed to certify a product according to the requirements of the FCC & ISED.

The results in the report reflect only the model of the items under test unless noted otherwise. This document may not be altered or revised in any way unless done so by Ademco Inc. and all revisions are duly noted in the revisions section. Any alterations of this document not carried out by Ademco Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Test Report Revision History				
Revision	Prepared By	Reviewed By	Revision Detail	Release Date
---	M. Antola	A. Roussin	Original Release	2018-07-26
A	M. Antola	A. Roussin	Updated Average spurious emissions results.	2018-07-31

Report Authorization

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Applicable Test Standards/Limits		
Test Standards/Limits	Result	Dates Tested
ANSI C63.4: 2014	Compliant	6/1/18 – 7/17/18
ANSI C63.10: 2013	Compliant	6/1/18 – 7/17/18
ICES-003 Issue 6: 2016	Compliant	6/1/18 – 7/17/18
RSS-247, Issue 2, Section 5	Compliant	6/1/18 – 7/17/18
RSS-GEN, Issue 4	Compliant	6/1/18 – 7/17/18
CFR 47 Pt 15 Subpart B, Section 15.107/109	Compliant	6/1/18 – 7/17/18
CFR 47 Pt 15 Subpart C, Section 15.207/209	Compliant	6/1/18 – 7/17/18
CFR 47 Pt 15 Subpart C, Section 15.247	Compliant	6/1/18 – 7/17/18

Deviations from Test Methods	
#	Deviation Description
0	None

Facilities and Accreditation
The test site and measurement facility used to collect data are located at 2 Corporate Center Dr., Melville, NY 11747, USA. Ademco Inc. International is accredited by NVLAP, Laboratory Code 600110-0. The full scope of accreditation can be viewed at the NVLAP website.

Test Item Description
The EUT serves as a range extended for SiX access points and devices by retransmitting any message it detects from a SiX series transmitter. It is AC powered, with battery backup, and utilizes a 2.4GHz IEEE 802.15.4-compliant transceiver. The EUT contains two integral PCB trace antennas with gains of 3.0 & 2.9 dBi.

Worse-Case Configuration & Mode

Radiated emissions was performed with the EUT set to transmit at the low/mid/high channels with the highest output power as worst-case scenario. The EUT was tested in all three orthogonal planes in order to determine the worst-case emissions. It was determined that the X axis orientation was the worst-case orientation. Therefore, all final radiated test was performed with the EUT in the X axis orientation. See setup photos for details.

Test Sample Identification

Sample ID Number	Sample Serial Number	Date Received
MEL-482	Non-serialized production unit	5/30/18
MEL-483	Non-serialized production unit	5/30/18

Calibration & Measurement Uncertainty

- Measuring Instrument Calibration – The measuring equipment utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer’s recommendations and is traceable to recognized national standards.
- Sample Calculation – Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

[i.e.] $37 \text{ dBuV/m} = 30 \text{ dBuV} + 18.5 \text{ dB/m} + 0.5 \text{ dB} - 12 \text{ dB}$

- Uncertainty - Figures are valid to a confidence level of 95%.

Test	Standard Uncertainty
Radiated Emissions (30-200MHz Horizontal)	+/- 5.05 dB
Radiated Emissions (30-200MHz Vertical)	+/- 5.28 dB
Radiated Emissions (200-1000MHz Horizontal)	+/- 10.21 dB
Radiated Emissions (200-1000MHz Vertical)	+/- 10.36 dB
Radiated Emissions (Above 1GHz)	+/- 9.70 dB
Conducted Emissions (150KHz-30MHz)	+/- 4.36 dB

Opinions / Interpretations

None

Test Summary

All tests described below are required, unless otherwise noted. Notes should be described in detail in the "Additional notes" section.

#	Test Description	Status
2	99% Occupied Bandwidth	PASS
3	6 dB Emission Bandwidth	PASS
4	Maximum Conducted Output Power	PASS
5	Maximum Power Spectral Density	PASS
6	Band Edge / Conducted Spurious Emissions	PASS
7	Radiated Emissions (Unintentional)	PASS
8	Radiated Emissions (Intentional)	PASS
9	Conducted Emissions (Mains)	PASS

On Time and Duty Cycle

Test Description

Refer to KDB 558074 Zero-Span Analyzer Method.

Test Criteria

Reference	Limit
KDB 558074, Section 6	None, for reporting only

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

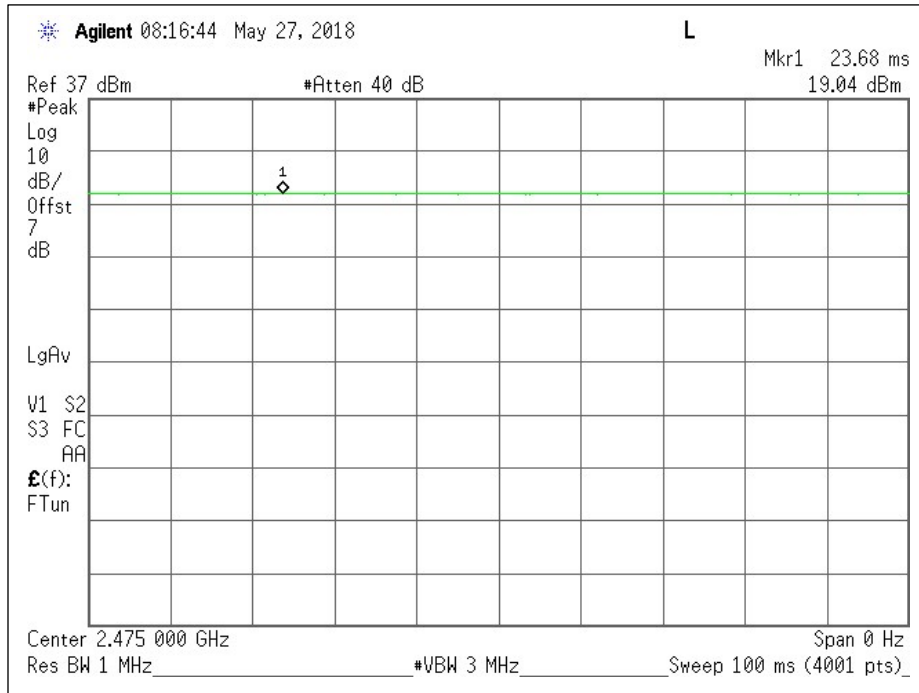
*-Passive devices are characterized in-house, not calibrated.

Test Results

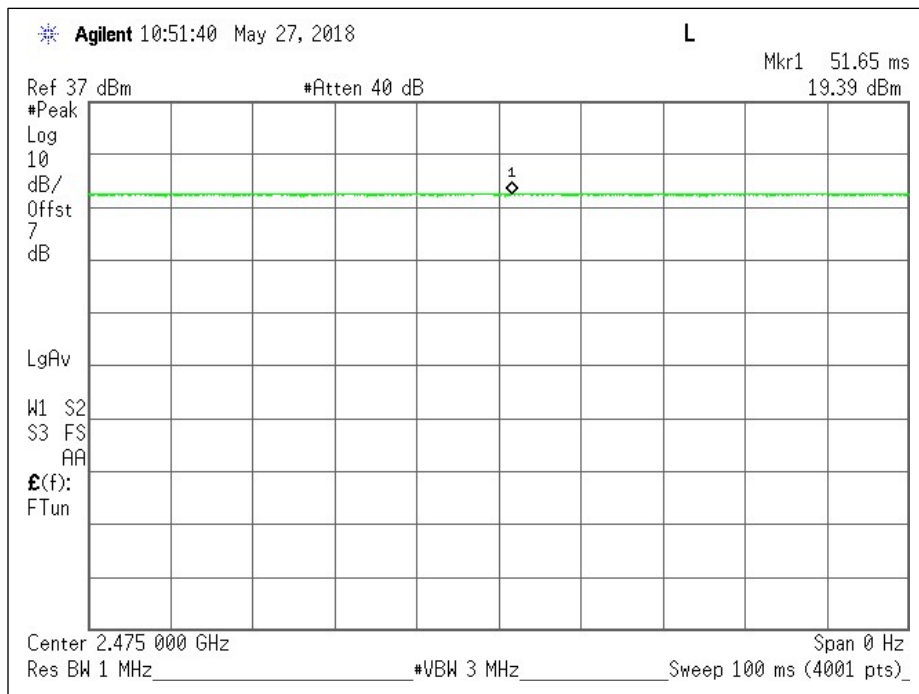
Antenna	On Time (msec)	Period (msec)	Duty Cycle	Duty Cycle (%)
1	23.68	23.68	1	100
2	51.65	51.65	1	100

Note: The duty cycle used for testing was 100%. In normal operation, the device is limited by the protocol to a maximum operational duty factor of 18.656% (refer to additional exhibits in this filing) and this value is used to determine the average level of radiated spurious emissions related to the fundamental from the measured peak level of the spurious emission using the 20log(d) factor allowed under section 12.5.2.2 (4) of KDB 558074.

Duty Cycle Plots



Antenna 1 - Plot



Antenna 2 - Plot

6dB Emission Bandwidth (DTS Bandwidth)

Test Description

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Refer to KDB 558074 D01 DTS Meas Guidance v04.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (a)(2) RSS-247 Section 5.2 (a)	≥ 500kHz

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

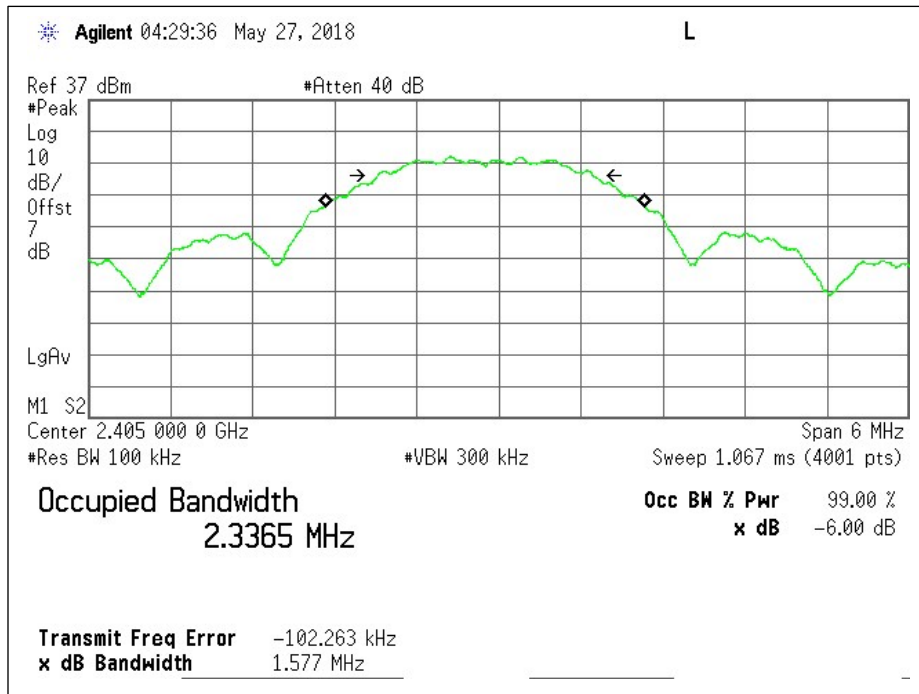
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

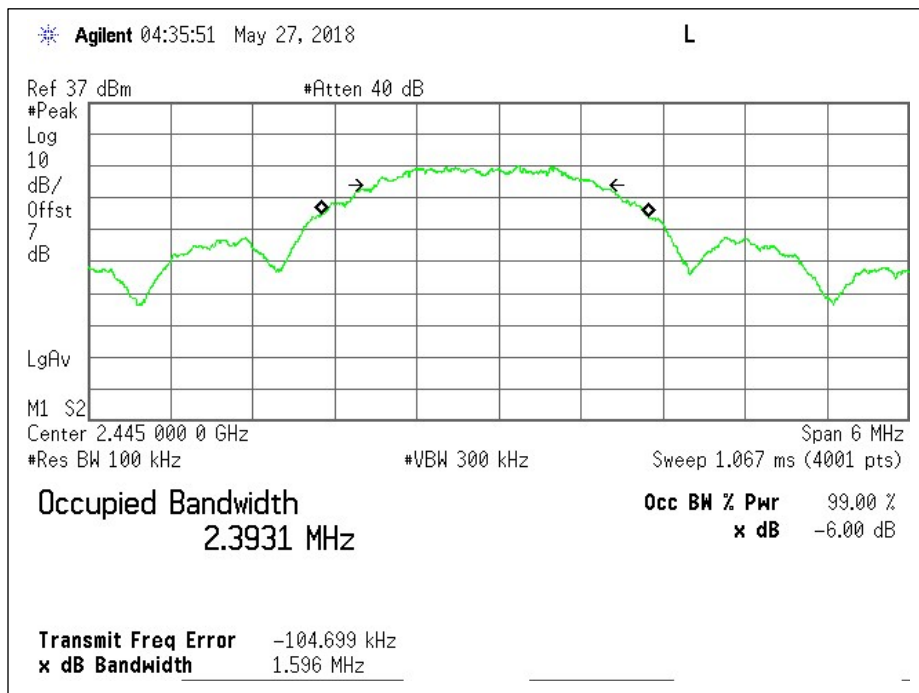
Test Results

Channel	Frequency (GHz)	6dB Bandwidth (in MHz)	
		Antenna 1	Antenna 2
Low	2.405	1.577	1.556
Mid	2.445	1.596	1.604
High	2.475	1.594	1.589

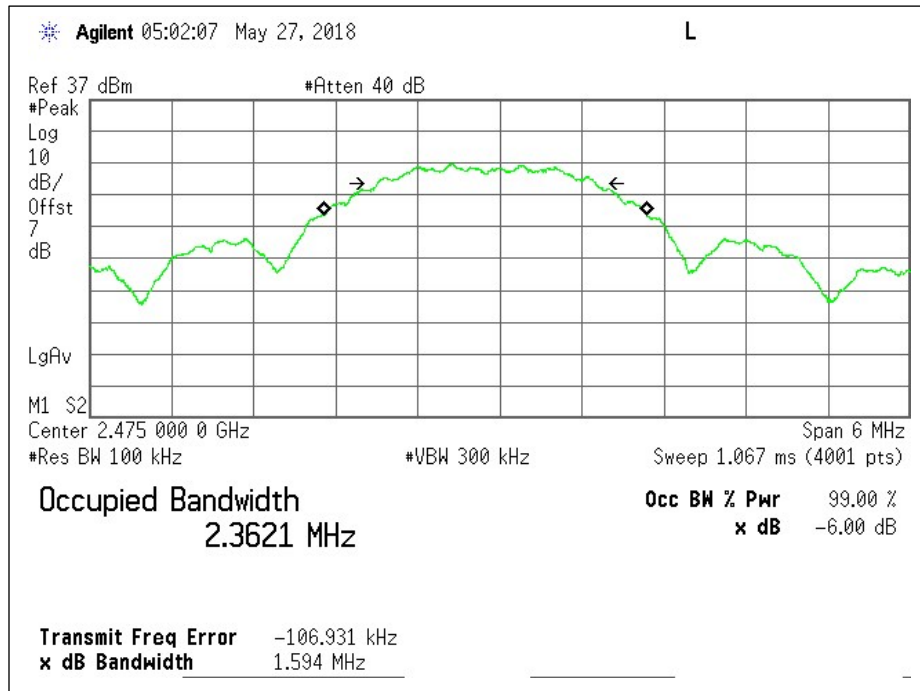
6dB Bandwidth



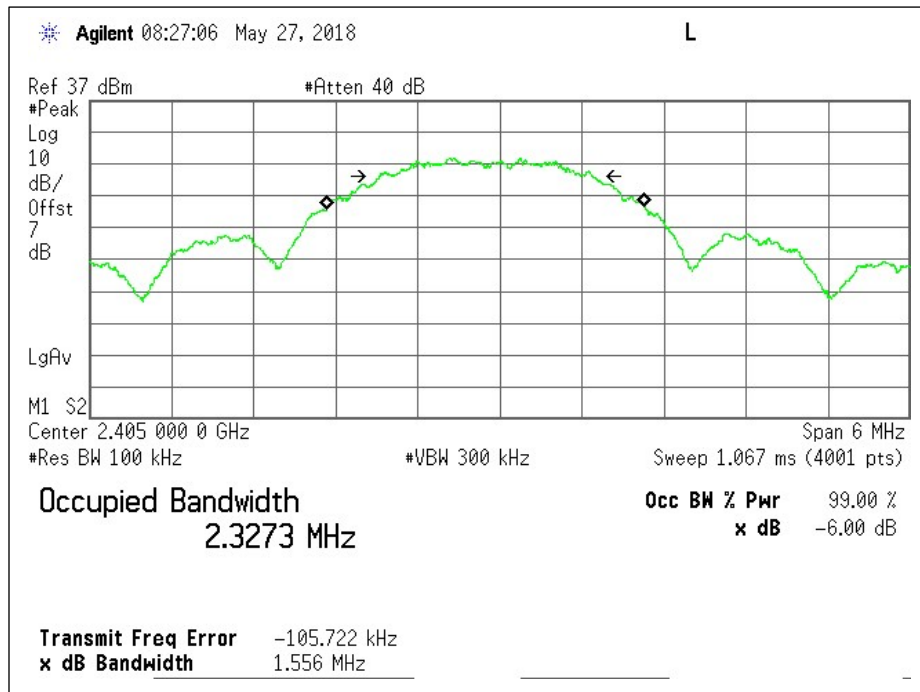
Antenna 1: Low Channel - Plot



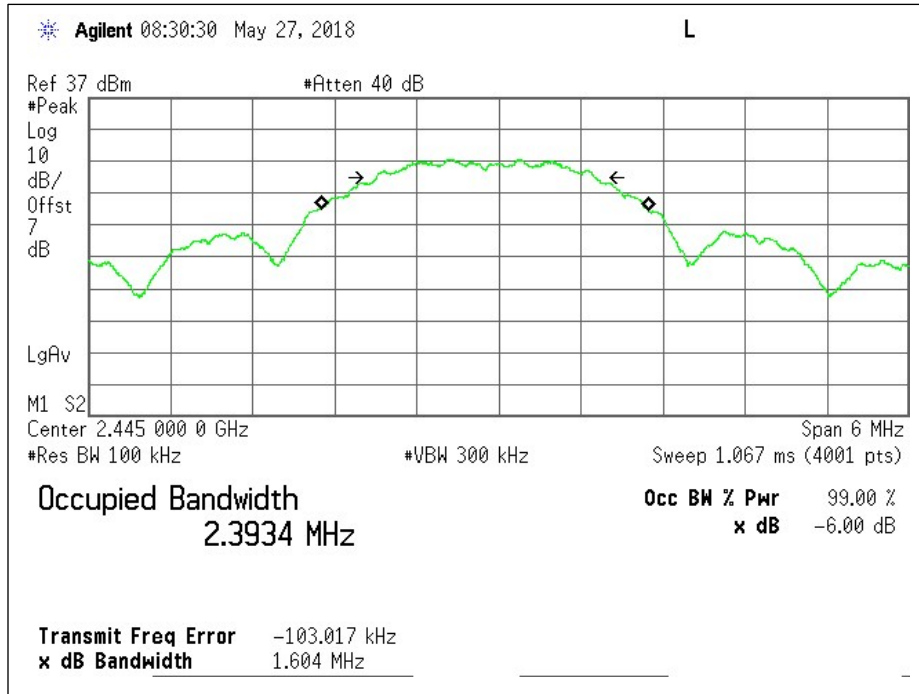
Antenna 1: Mid Channel - Plot



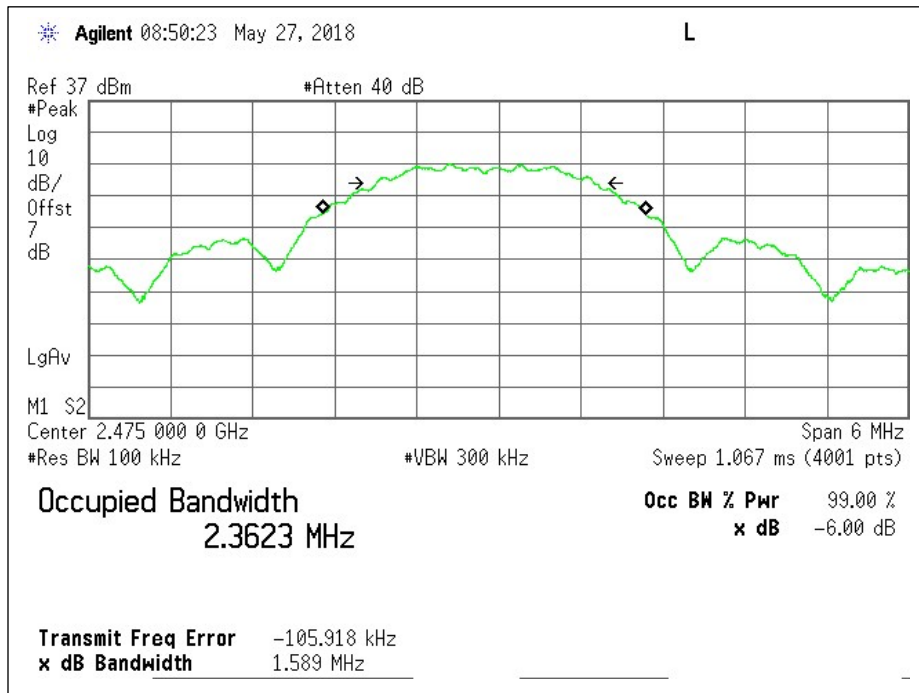
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

99% Occupied Bandwidth

Test Description

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

Test Criteria

Reference	Limit
RSS-GEN, Section 6.6	N/A

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

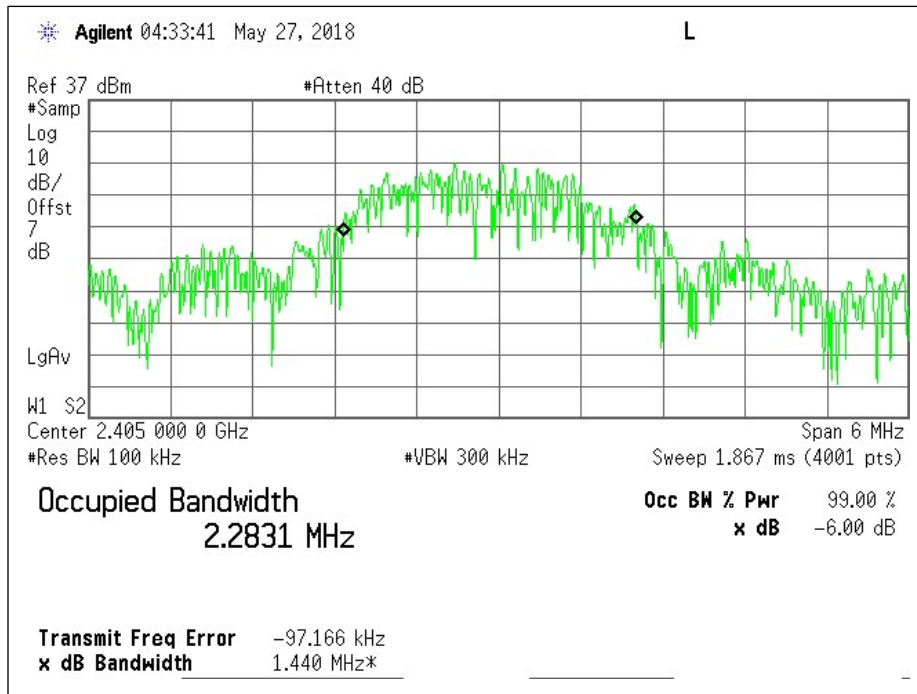
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

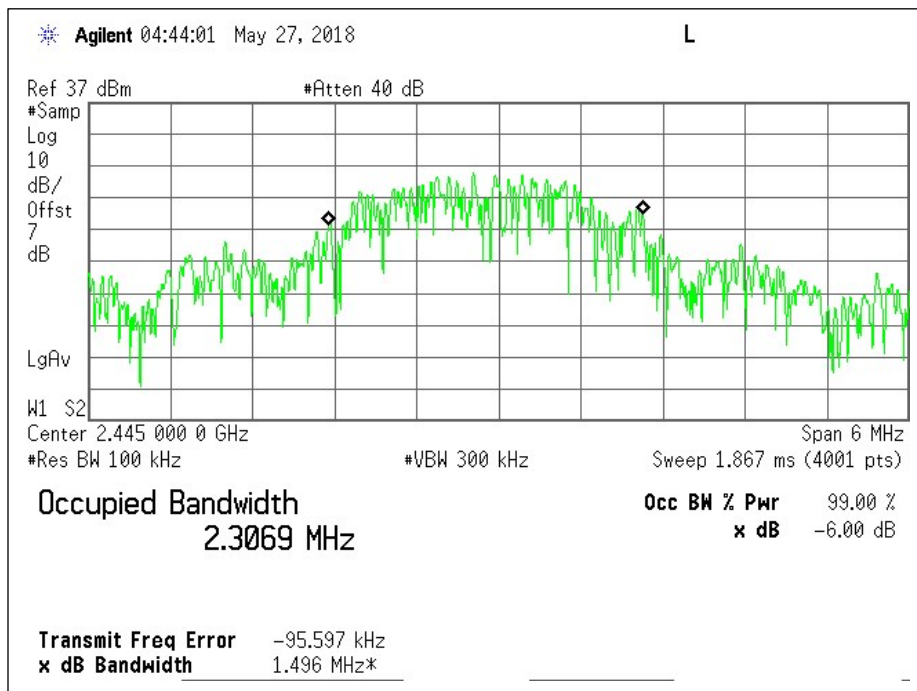
Test Results

Channel	Frequency (GHz)	99% Bandwidth (in MHz)	
		Antenna 1	Antenna 2
Low	2.405	2.2831	2.2845
Mid	2.445	2.3069	2.3350
High	2.475	2.3068	2.3077

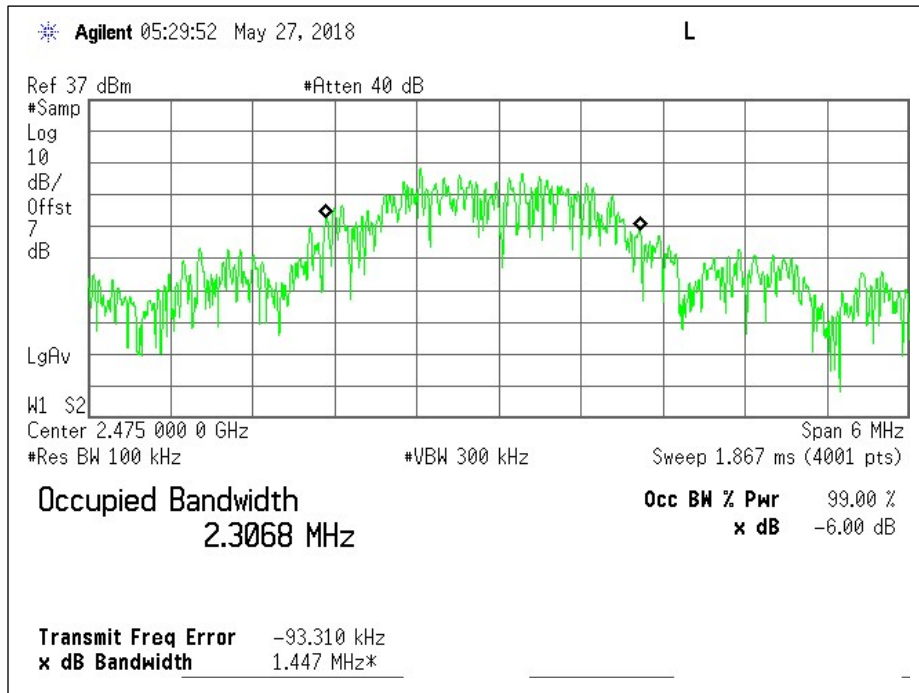
99% Occupied Bandwidth



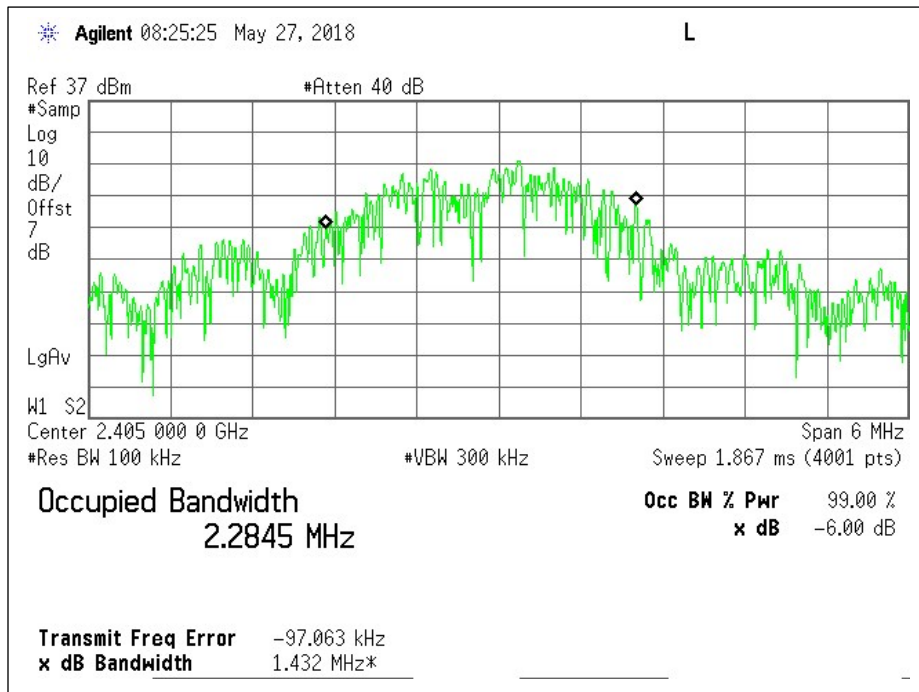
Antenna 1: Low Channel - Plot



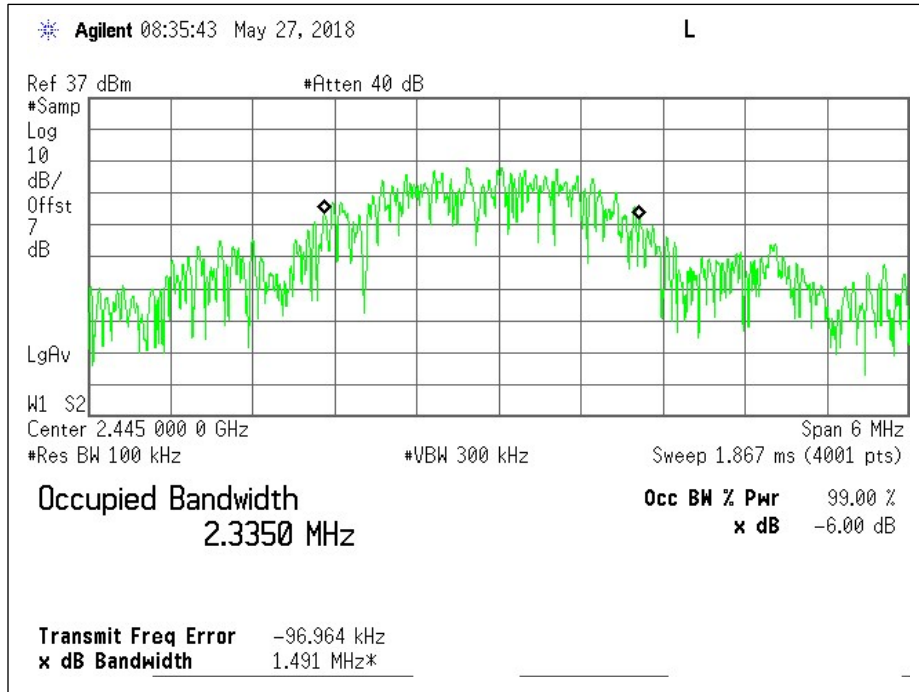
Antenna 1: Mid Channel - Plot



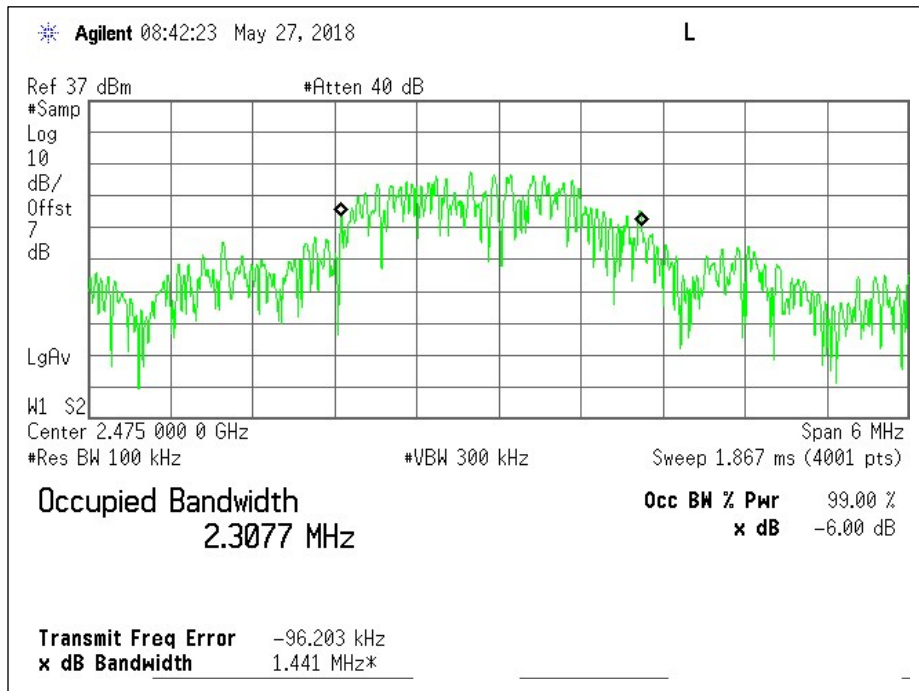
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Maximum Conducted Output Power

Test Description

For systems using digital modulation in the 902-928MHz, 2400-2483,5MHz and 5725-5850MHz bands, the conducted output power limit (specified below) is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Maximum conducted (average) output power was the method employed to determine fundamental emission output power.

Method AVGSA-1 per C63.10 and KDB 558074 was utilized for this test program.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (b)(3) RSS-247 Section 5.4 (d)	1W (30dBm)

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

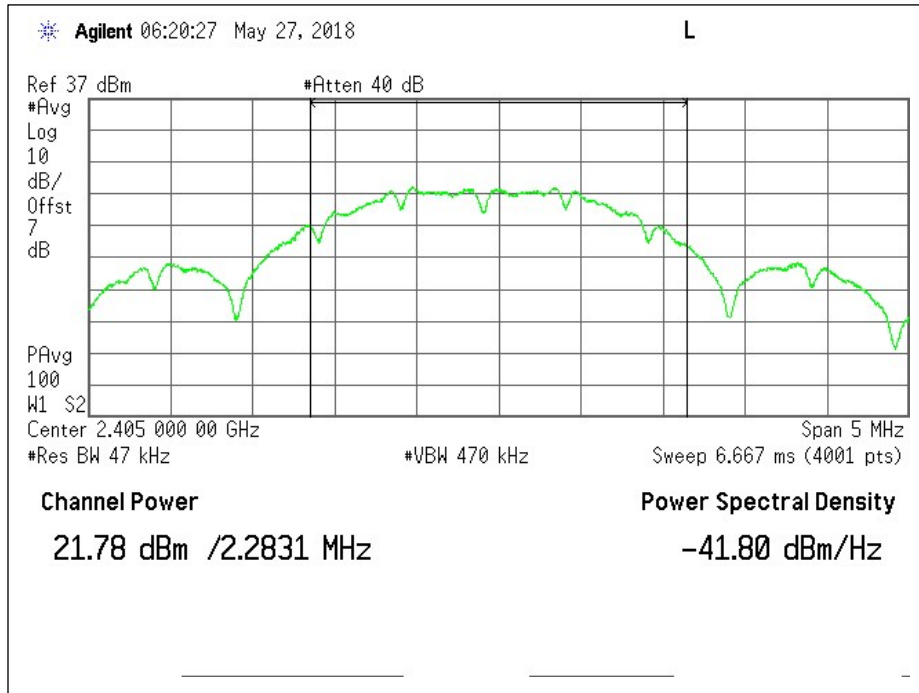
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

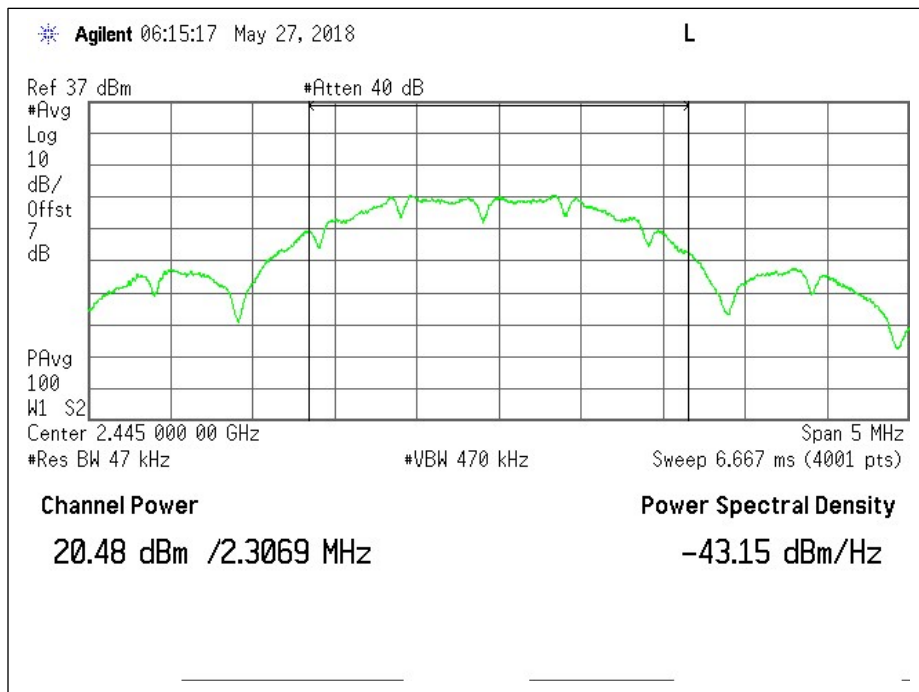
Test Results

Channel	Frequency (GHz)	Tx Channel BW Power (dBm)	
		Antenna 1	Antenna 2
Low	2.405	21.78	21.75
Mid	2.445	20.48	20.79
High	2.475	19.46	19.91

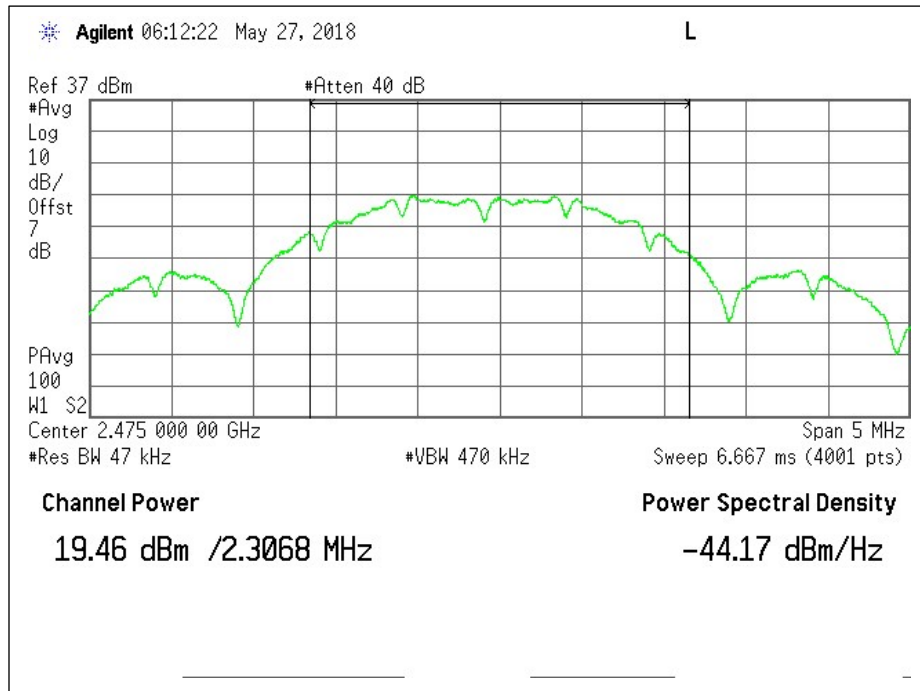
Output Power



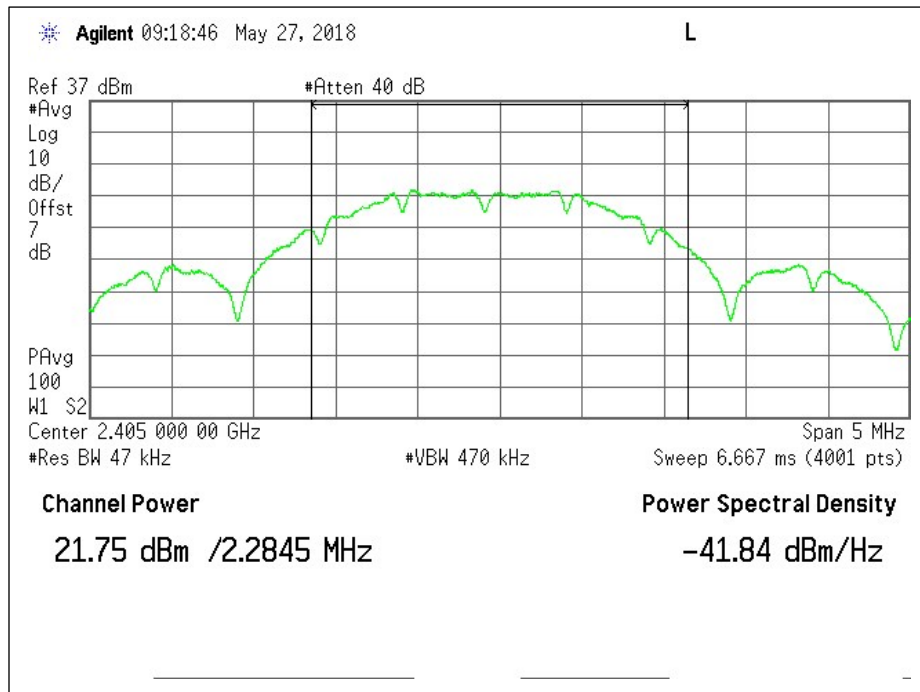
Antenna 1: Low Channel - Plot



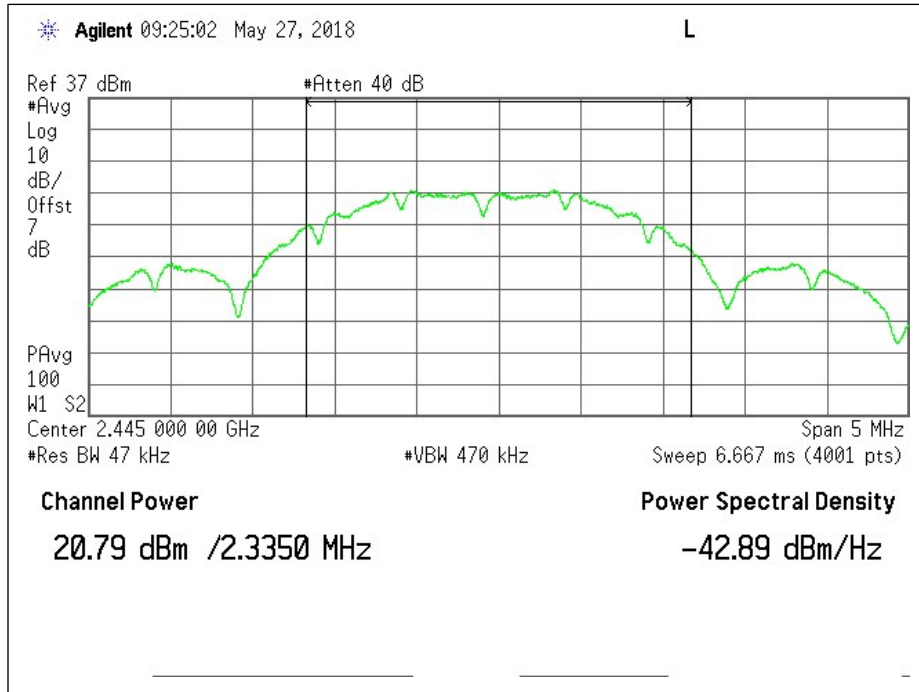
Antenna 1: Mid Channel - Plot



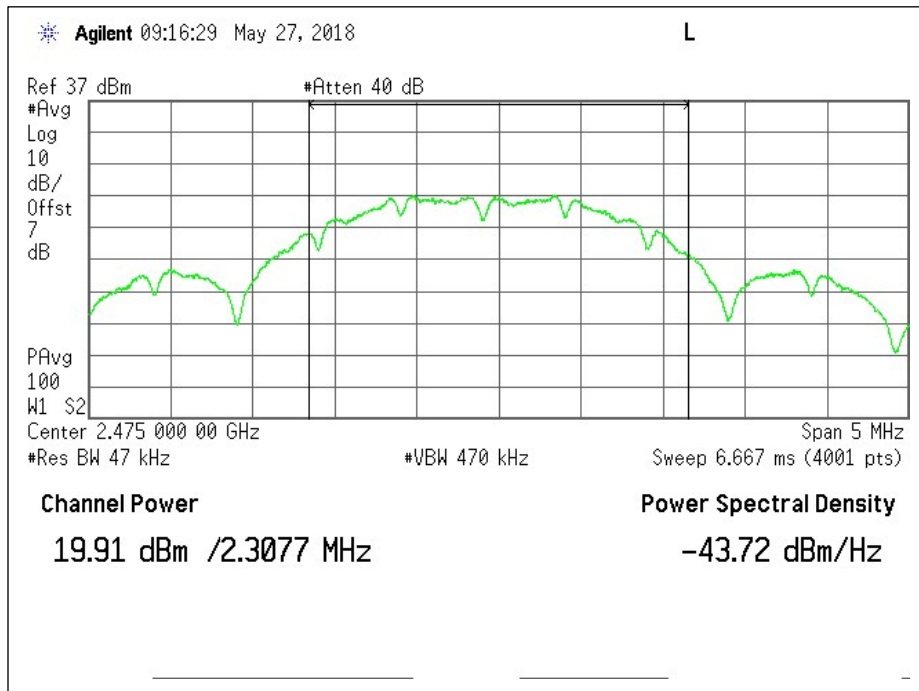
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Maximum Power Spectral Density

Test Description

The DTS rules specify a conducted PSD limit within the *DTS bandwidth* during any time interval of continuous transmission. Such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. Therefore, if maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used.

Since maximum conducted (average) output power was the method employed to determine fundamental emission output power, then the average power spectral density method was utilized.

Method AVGPS-1 per C63.10 and KDB 558074 was utilized for this test program.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (e) RSS-247 Section 5.2 (b)	< 8 dBm in any 3 kHz Band

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

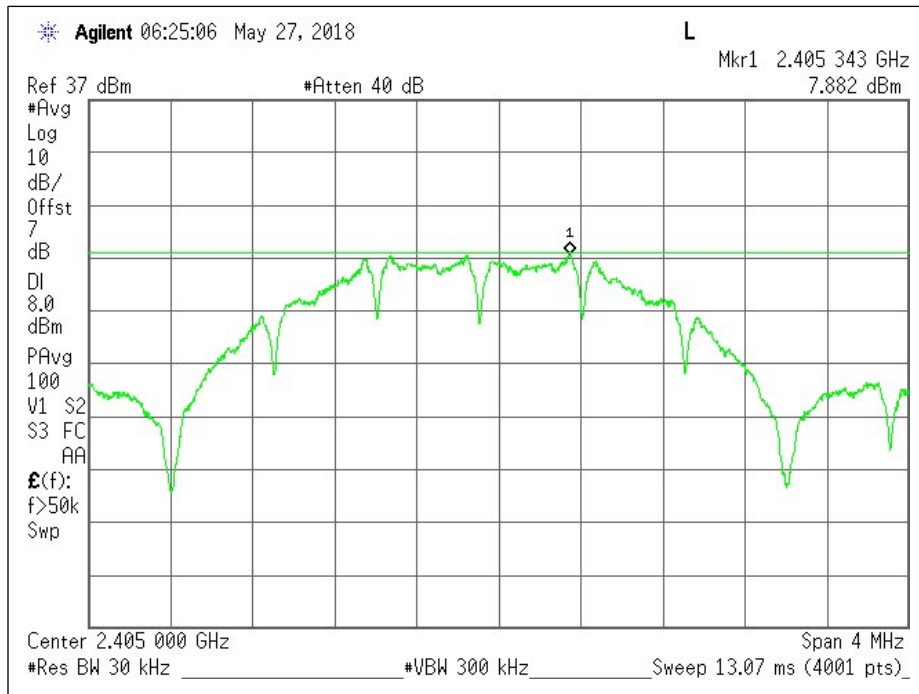
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

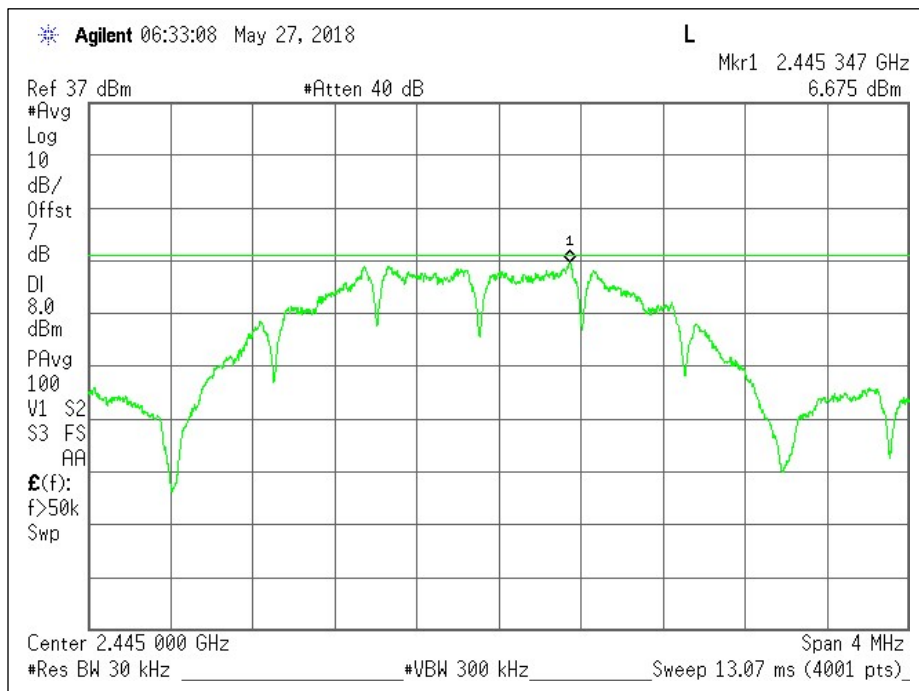
Test Results

Channel	Frequency (GHz)	Max Power (dBm)	
		Antenna 1	Antenna 2
Low	2.405	7.882	7.951
Mid	2.445	6.675	6.732
High	2.475	5.749	5.858

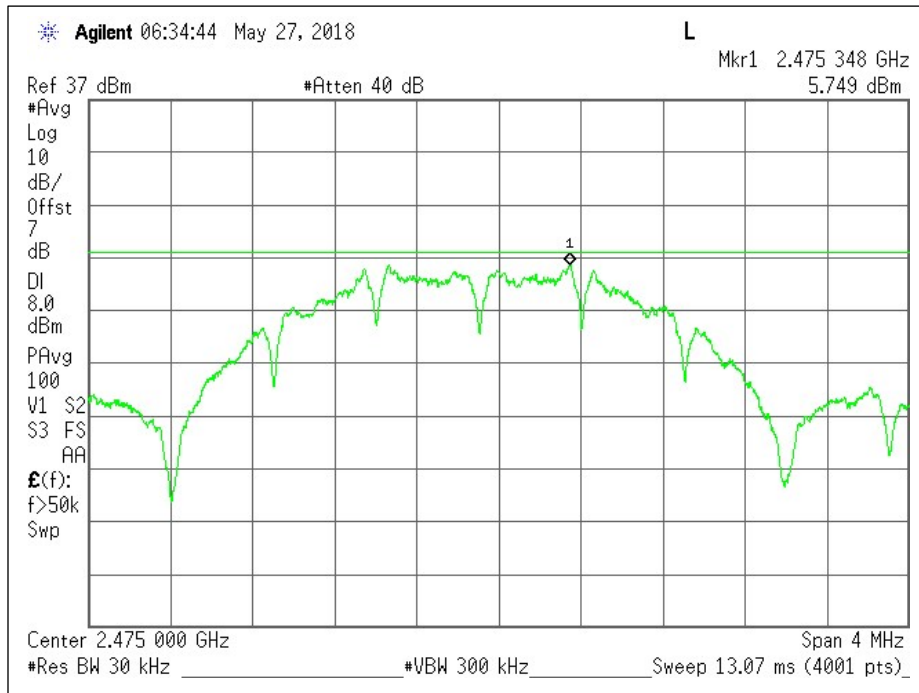
PSD



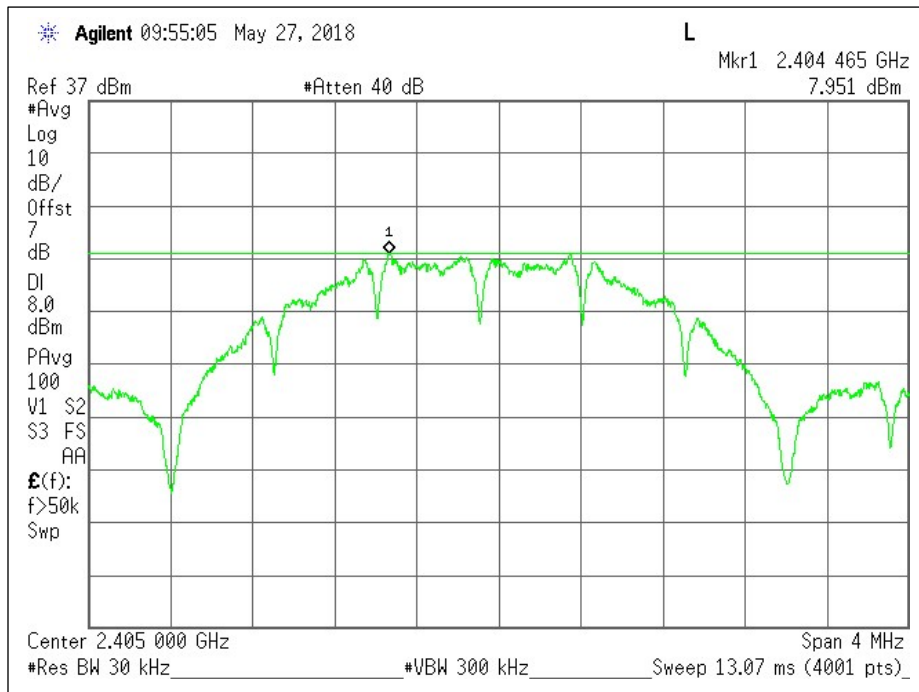
Antenna 1: Low Channel - Plot



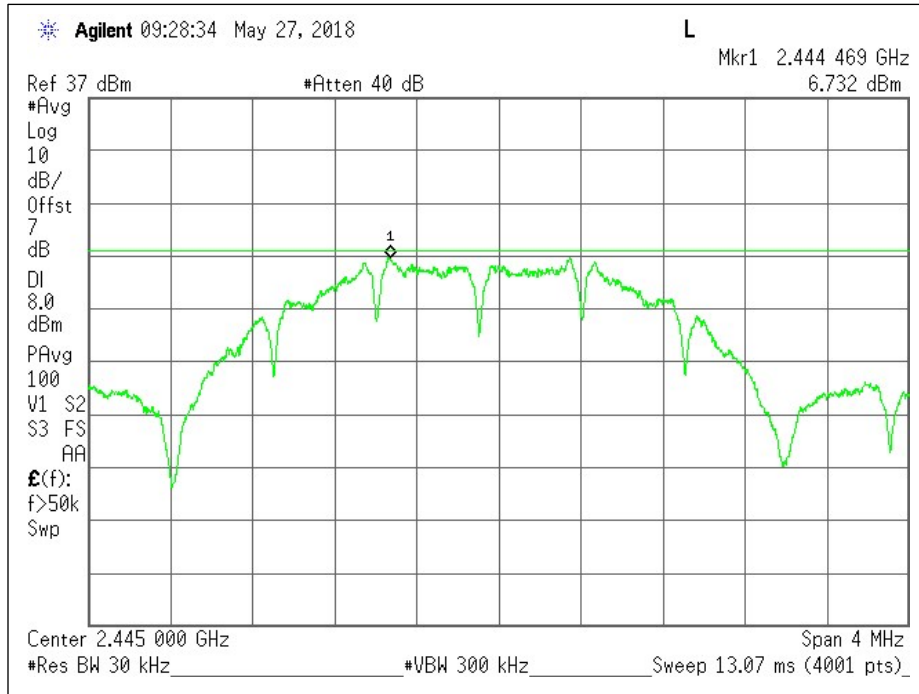
Antenna 1: Mid Channel - Plot



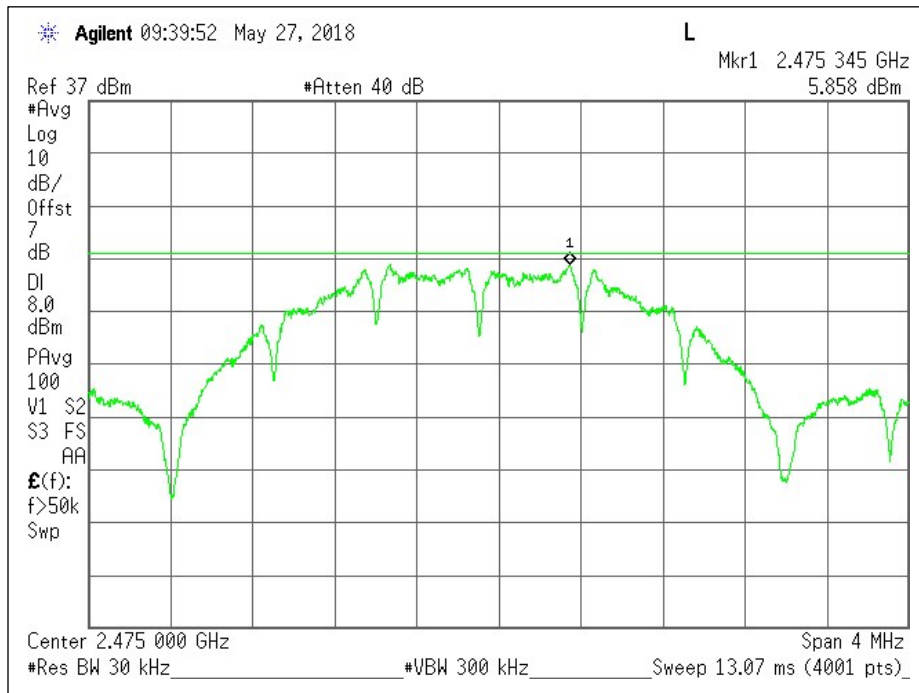
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Authorized Band Edge / Conducted Spurious Emissions

Test Description

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (d) RSS-247, Section 5.5	30dB Below the Fundamental

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	06/01/18	23.0	62.6	1004	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Attenuator	-	1624	Pasternack	PE7087-6	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

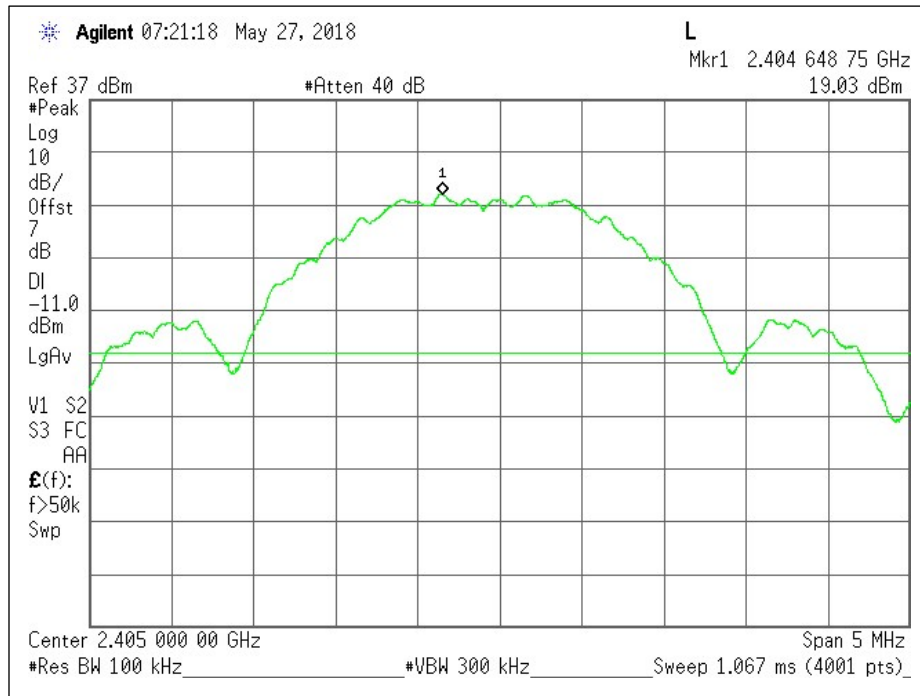
*-Passive devices are characterized in-house, not calibrated.

Test Results

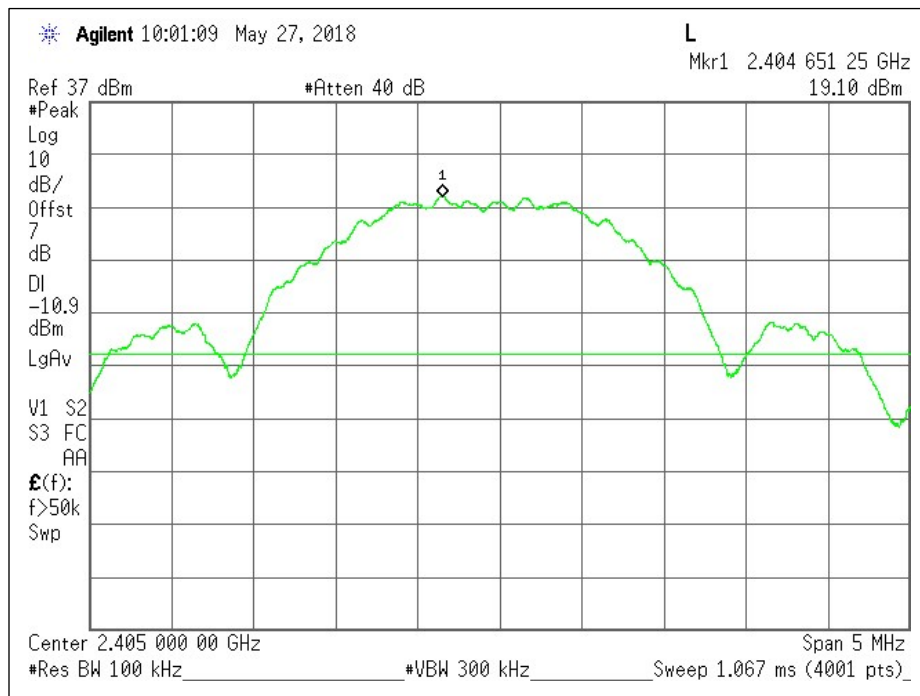
Authorized Band Edge					
Antenna	Channel	Frequency (GHz)	Delta from Peak to Bandedge (dB)	Limit (dB)	Margin (dB)
1	Low	2.405	42.92	30	-12.92
	High	2.475	60.83	30	-30.83
2	Low	2.405	42.71	30	-12.71
	High	2.475	60.32	30	-30.32

Conducted Spurious			
Channel	Frequency (GHz)	Highest Spurious Emission Delta from the -30dB down Limit (dB)	
		Antenna 1	Antenna 2
Low	2.405	-34.88	-36.98
Mid	2.445	-36.17	-37.85
High	2.475	-36.06	-36.91

Reference Measurement

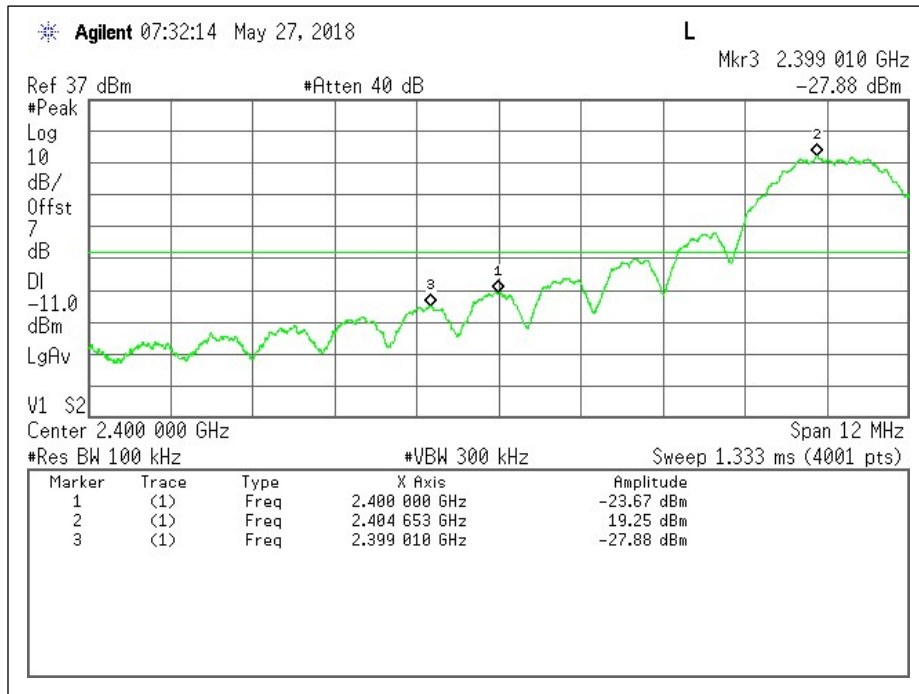


Antenna 1: Low Channel - Plot

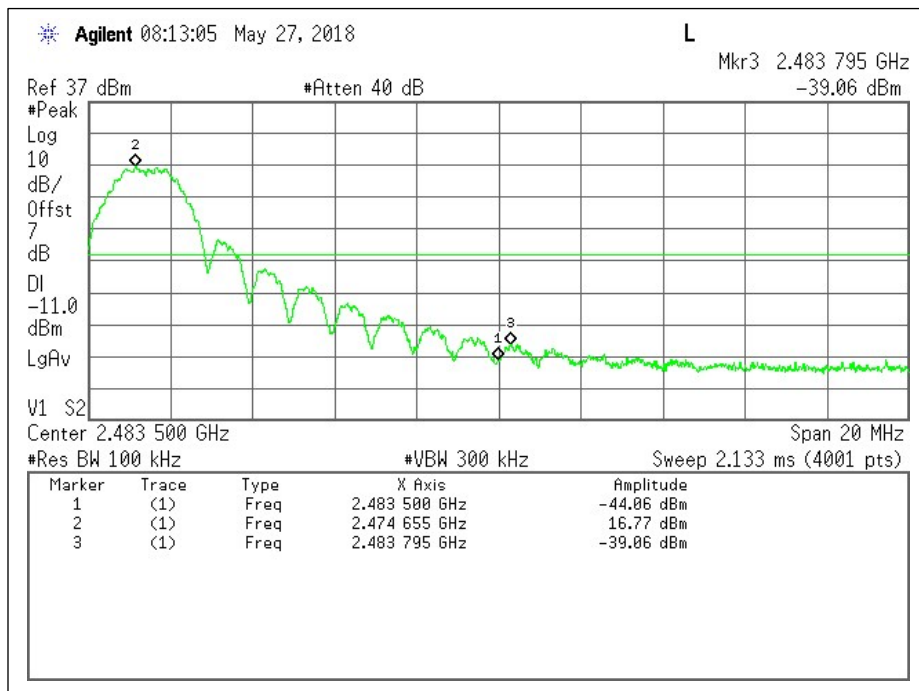


Antenna 2: Low Channel - Plot

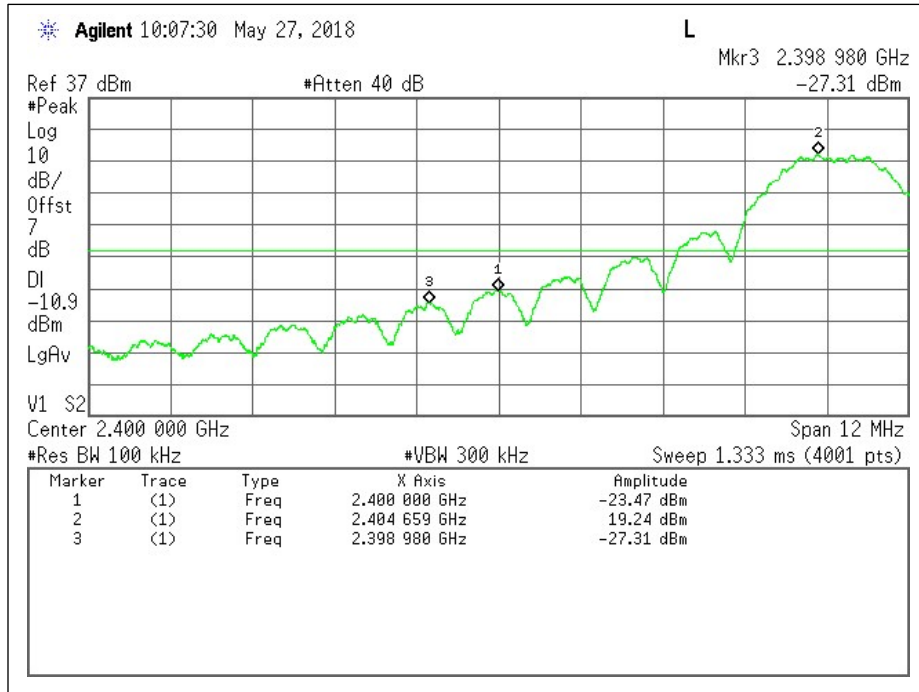
Band Edge



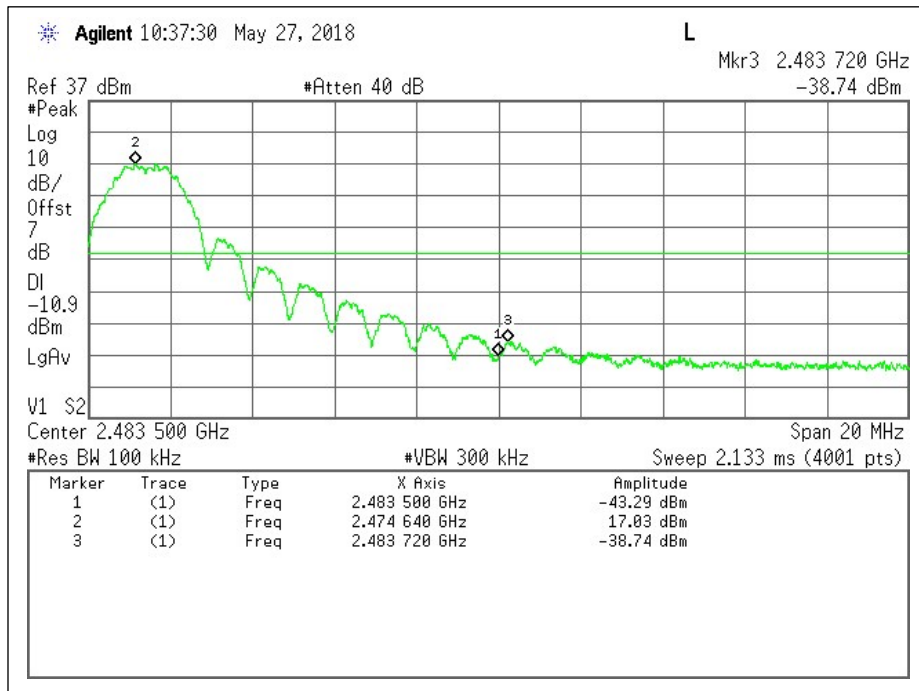
Antenna 1: Low Channel - Plot



Antenna 1: High Channel - Plot

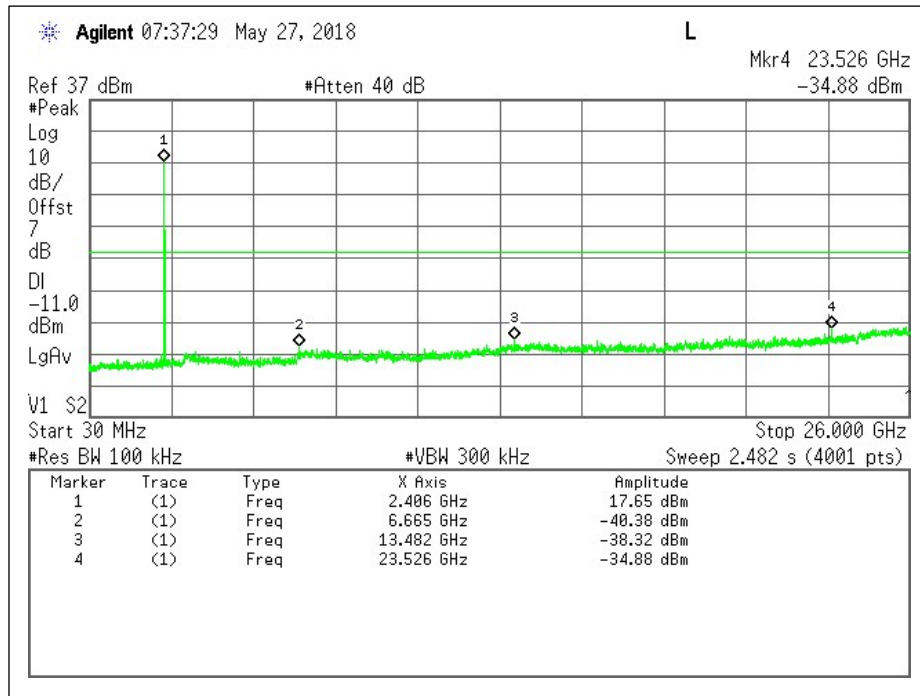


Antenna 2: Low Channel - Plot

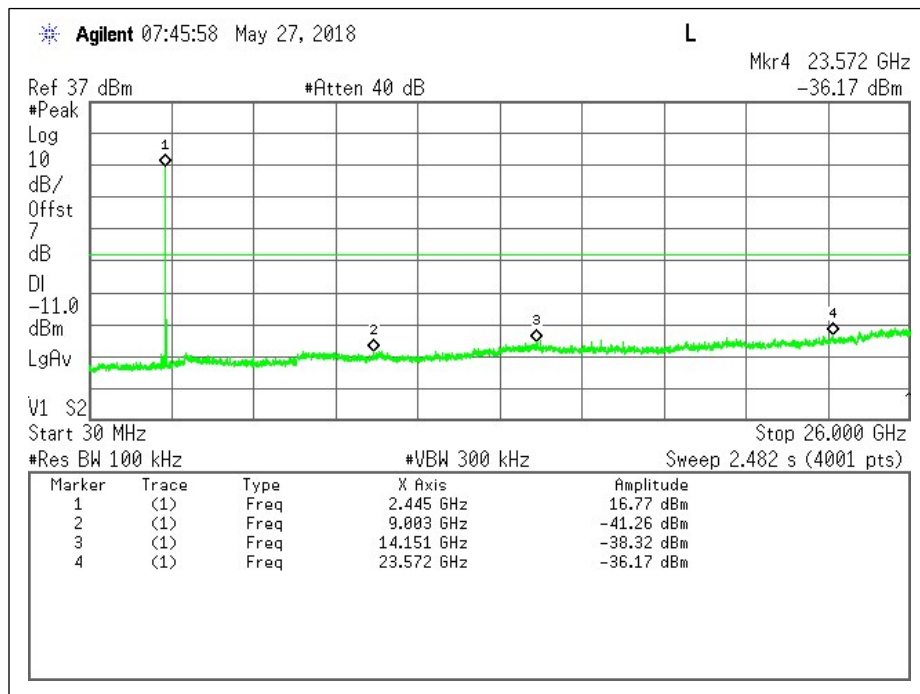


Antenna 2: High Channel - Plot

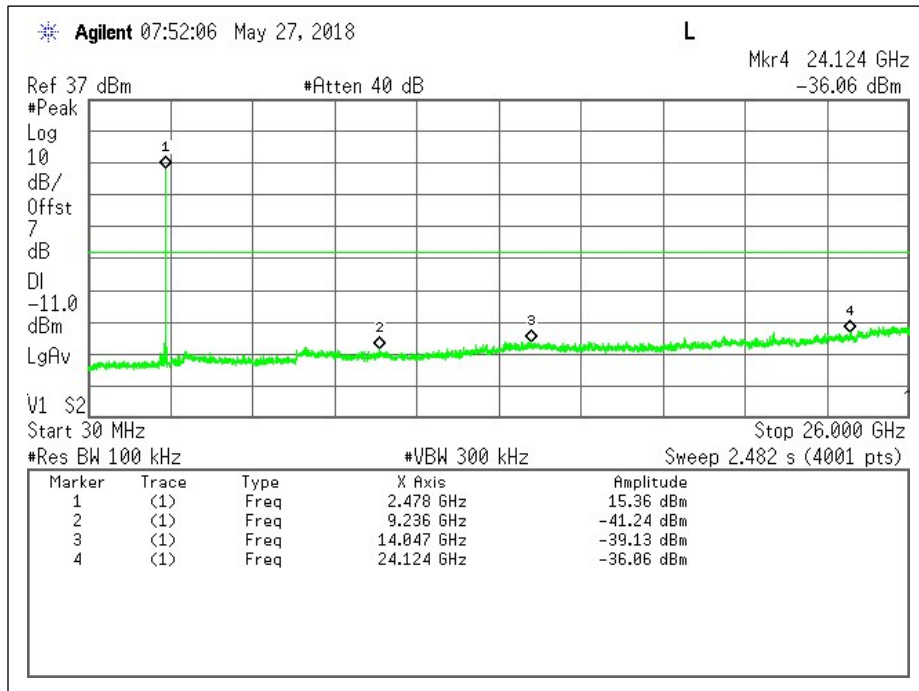
Conducted Spurious



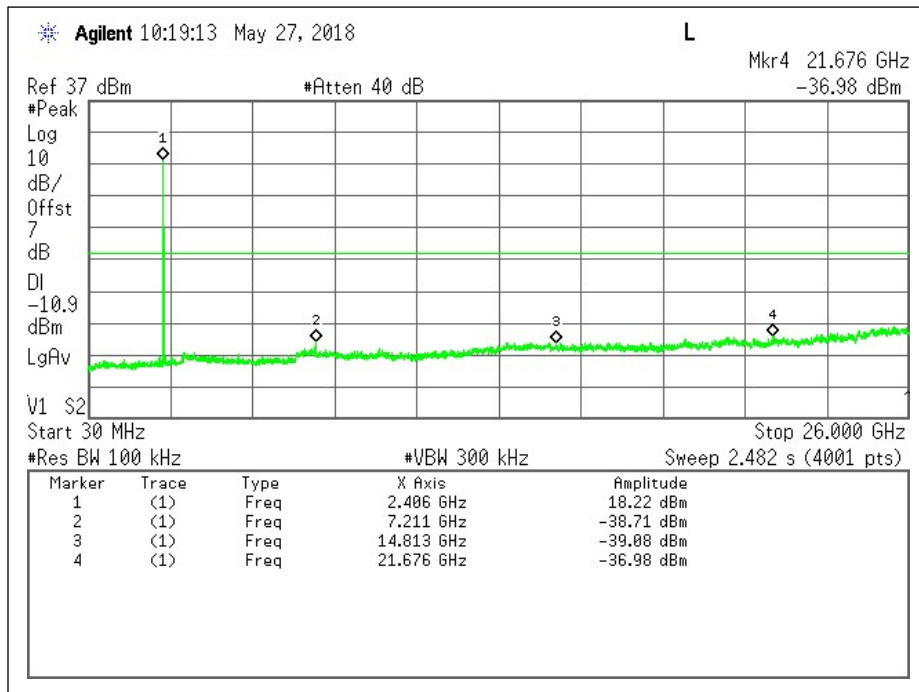
Antenna 1: Low Channel - Plot



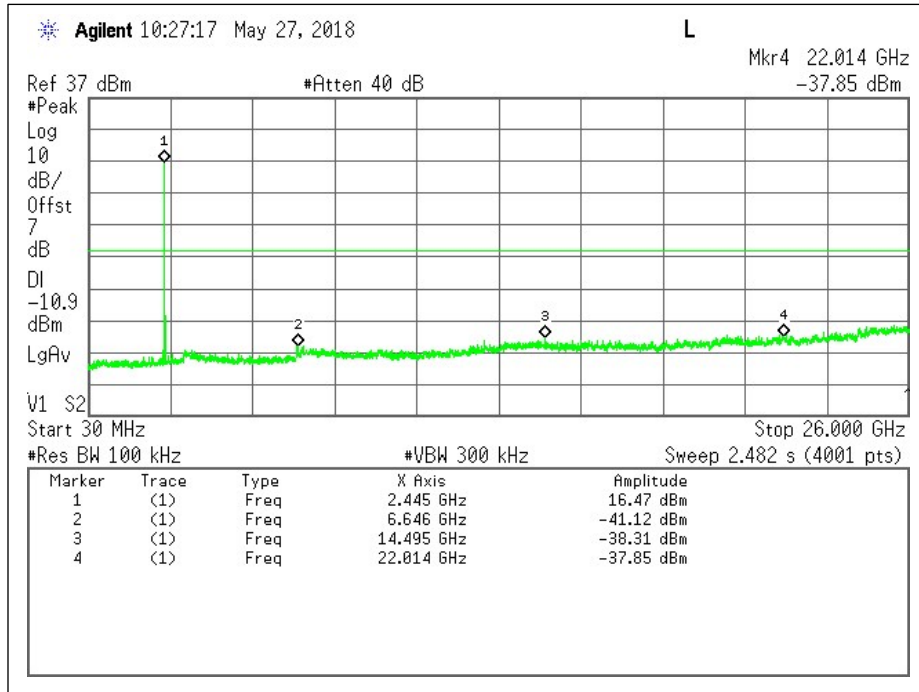
Antenna 1: Mid Channel - Plot



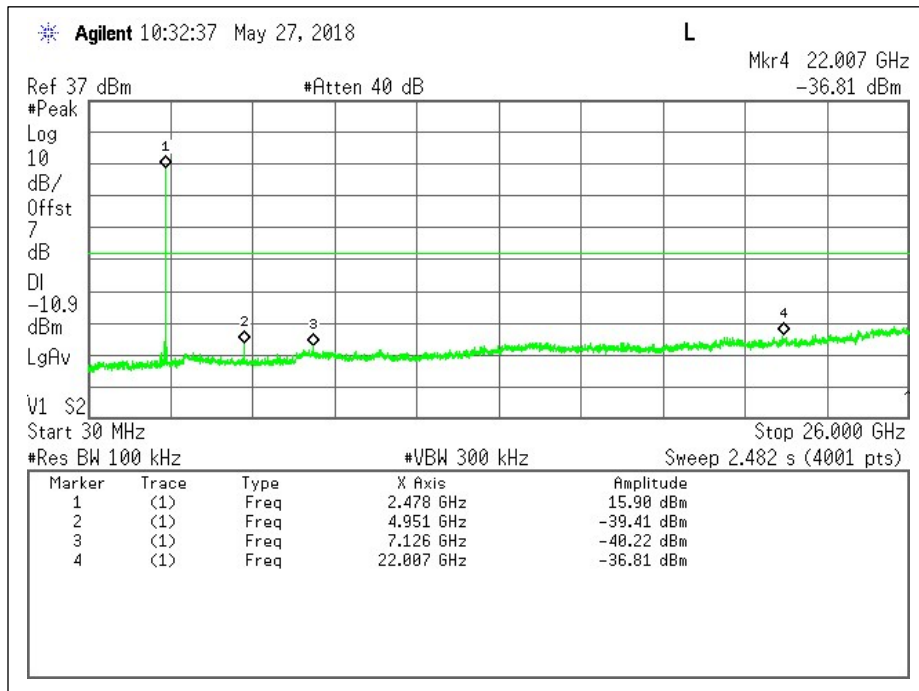
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Radiated Emissions (Unintentional)

Test Description

The Radiated Emissions (Unintentional) measurement is a test of the whole EUT during normal operation. It is a Radiated Emissions measurement performed from 30 MHz to 5x the highest operating frequency of the device. Prescans are done in a 3 meter anechoic chamber, while final measurements are made on the OATS. The EUT is positioned on a turntable in the manner for which the device will be normally used, with all peripherals connected in idle, with all cables typically used with the EUT dressed appropriately.

Test Criteria

Reference	Limit		
	Frequency Range	Field Strength Limit (uV/m) at 3M	Field Strength Limit (dBuV/m) at 3M
CFR 47 Subpart B, 15.109 ICES-003	30-88	100	40
	88-216	150	43.5
	216-960	200	46
	Above 960	500	54

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL/JB	RF Chamber/OATS	06/02/18-07/17/18	22.2	85.0	1004	P

Equipment List

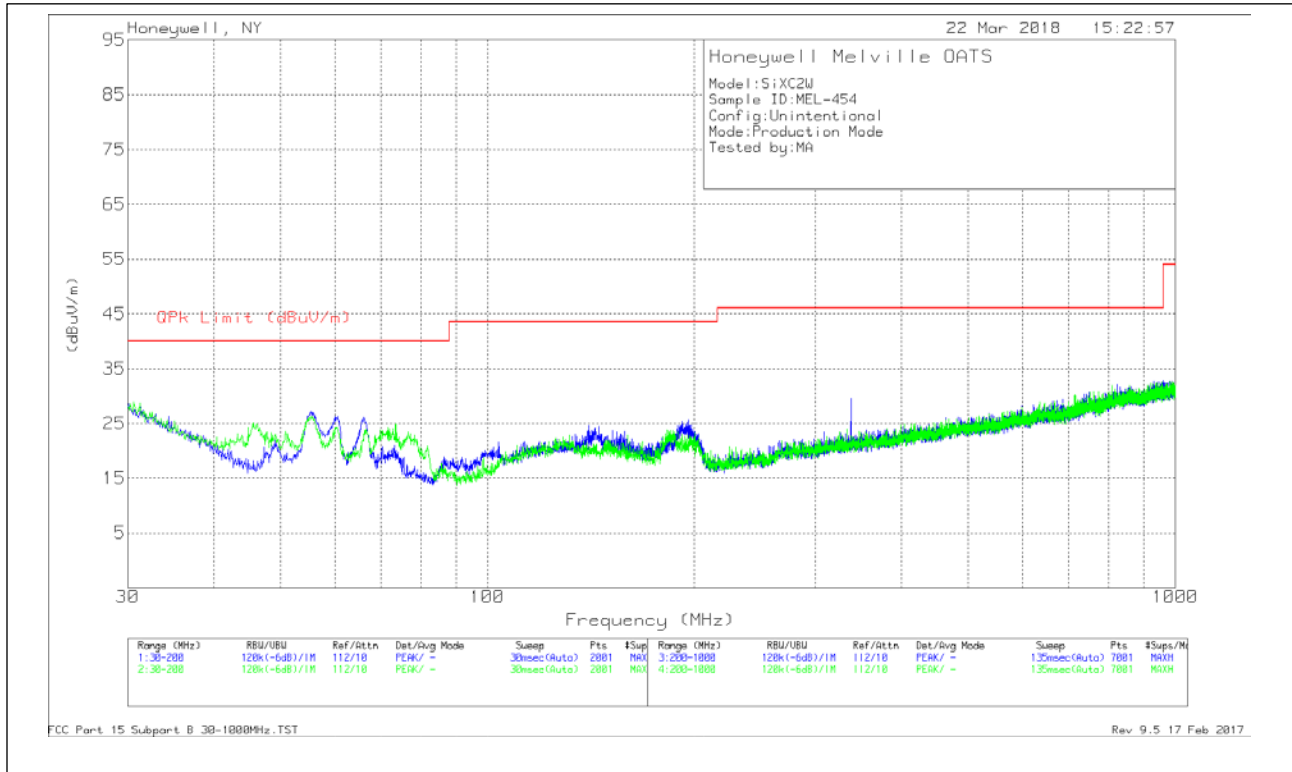
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
RF Chamber						
Spectrum Analyzer	11496	100303	Rohde & Schwarz	FSU26	04/11/18	04/11/19
Bilog Antenna (30MHz-5GHz)	11311	A0022406	Sunol	JB5	02/01/18	02/01/19
Horn Antenna (1-18GHz)	2319	2317	EMCO	3115	01/10/18	01/10/19
Preamp (30-1000MHz)	11537	1603006	Mini Circuits	TVA-11-422	N/A	N/A
Preamp (1-18GHz)	11539	160362	Amplicial	AMP1G18-35	N/A	N/A
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
RF Cable	-	-	Mini-Circuits	RDE#2	06/06/17*	12/31/18*
RF Cable	-	-	Insulated Wire	SMA#8	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20
OATS						
Spectrum Analyzer	11545	103125	Rohde & Schwarz	FSW26	02/21/18	02/21/19
Bilog Antenna (30MHz-5GHz)	11311	A0022406	Sunol	JB5	02/01/18	02/01/19

Horn Antenna (1-18GHz)	2973	3127	EMCO	RGA-60	01/22/18	01/22/19
Preamp (1-18GHz)	11539	160362	Amplical	AMP1G18-35	N/A	N/A
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
RF Cable	-	-	Pasternack	RDE#1	06/06/17*	12/31/18*
RF Cable	-	-	MegaPhase	EMC2-S1S1- 360	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

Test Results

Below 1GHz



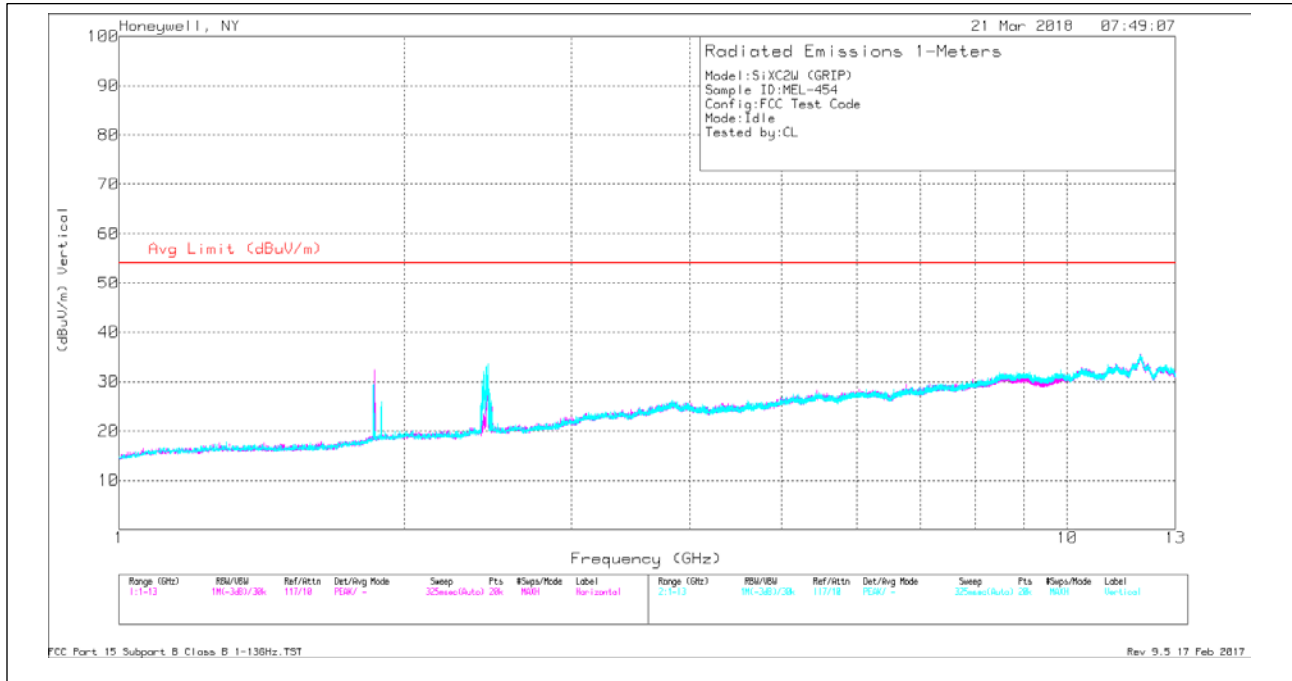
Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
30.1561	11.08	Qp	24.7	.9	36.68	40	-3.32	318	115	H
55.1056	15.33	Qp	12.1	1.1	28.53	40	-11.47	343	386	H
32.0048	11.67	Qp	23.4	.9	35.97	40	-4.03	255	104	V
55.54	18.71	Qp	12	1.1	31.81	40	-8.19	40	146	V
956.9722	4.22	Qp	27.7	9.2	41.12	46.02	-4.9	306	320	H
950.4111	4.18	Qp	27.7	9.2	41.08	46.02	-4.94	192	145	V

Qp - Quasi-Peak detector

Data

Above 1GHz



Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3.654	28.12	Av	31.9	-41.9	3.2	3.1	24.42	54	-29.58	198	240	H
6.637	26.37	Av	35.1	-39.9	4.5	4.2	30.27	54	-23.73	8	302	H
11.953	23.92	Av	39.5	-38.1	6.8	5.8	37.92	54	-16.08	358	105	H
3.382	30.8	Av	31.4	-42.7	3.1	3	25.6	54	-28.4	332	266	V
5.515	27.41	Av	34.4	-41.1	4	3.9	28.61	54	-25.39	175	387	V
9.705	24.74	Av	38	-39.8	5.6	5.2	33.74	54	-20.26	178	278	V

Av - Average detection

Data

Radiated Emissions (Intentional)

Test Description

Intentional Radiator Radiated Emissions are a test of the emissions, and harmonics on the EUT. The EUT is positioned to get the maximum emissions after a series of prescan measurements. The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1 GHz measurements and 1.5 m above the ground plane for above 1 GHz measurements. The antenna to EUT distance is 3 meters. For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 1 MHz for peak measurements and as applicable for average measurements. The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Test Criteria

Reference	Limit		
	Frequency Range (MHz)	Field Strength Limit (uV/m)	Measurement distance (meters)
CFR 47 Subpart C, 15.205 CFR 47 Subpart C, 15.209 RSS-GEN	0.009-0.490	2400/F(kHz)	300
	0.490-1.705	24000/F(kHz)	30
	1.705-30.0	30	30
	30-88	100**	3
	88-216	150**	3
	216-960	200**	3
	Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL/JB	RF Chamber/OATS	06/02/18-07/17/18	22.2	85.0	1004	P

NOTE: Below 30MHz, pretesting showed that no emissions as a product of the EUT were detected within 20dB of the regulatory limit. Worse-case plot/data reported from 30MHz - 1GHz & above 18GHz. All plots/data are provided for each channel/antenna from 1-18GHz. Prescans performed in an anechoic chamber, final measurements performed on an OATS.

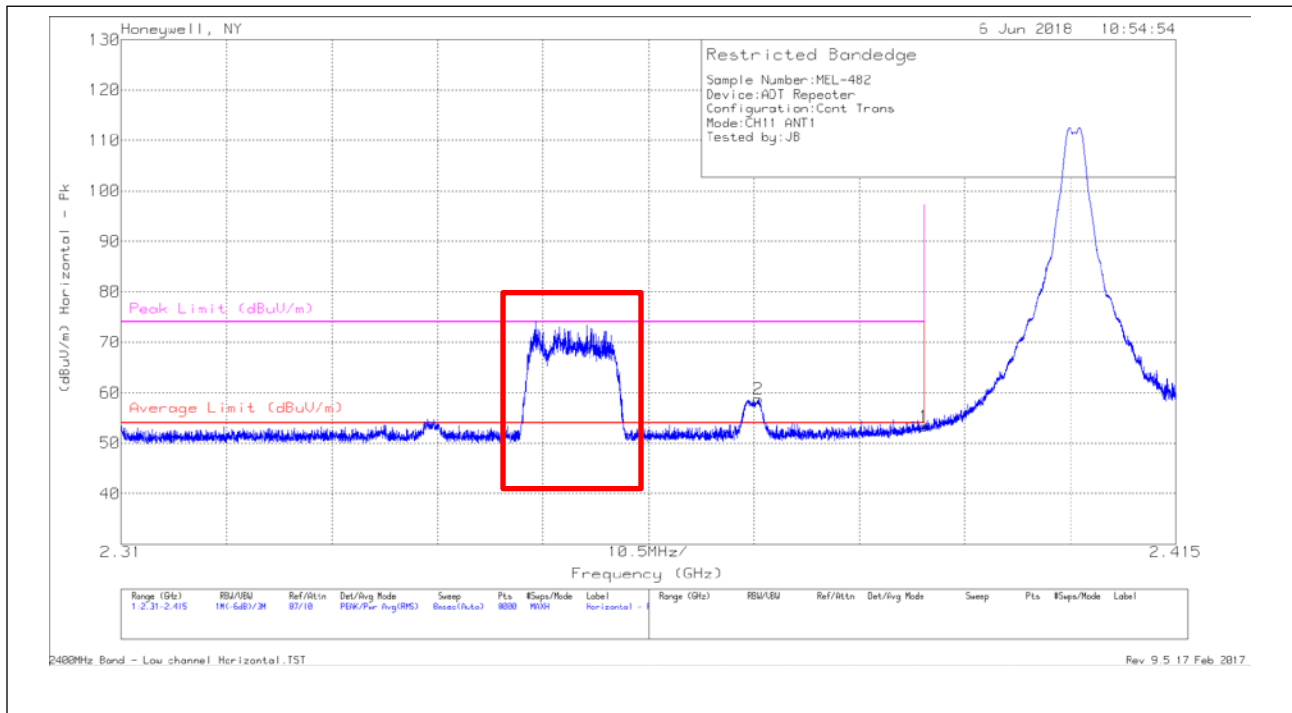
Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
RF Chamber						
Spectrum Analyzer	11496	100303	Rohde & Schwarz	FSU26	04/11/18	04/11/19
Loop Antenna (9kHz-30MHz)	11535	121080	Com-Power	AL-130R	10/17/17	10/17/18
Bilog Antenna (30MHz-5GHz)	11311	A0022406	Sunol	JB5	02/01/18	02/01/19
Horn Antenna (1-18GHz)	2319	2317	EMCO	3115	01/10/18	01/10/19
Horn Antenna (18-40GHz)	11472	151	EMCO	EM-6963	02/14/18	02/14/19
Preamp (30-1000MHz)	11537	1603006	Mini Circuits	TVA-11-422	N/A	N/A
Preamp (1-18GHz)	11539	160362	Amplicial	AMP1G18-35	N/A	N/A
Preamp (18-40GHz)	11541	160911	Amplicial	AMP18G40-35	N/A	N/A
Band Reject Filter	11553	G041	Micro-tronics	BRM50702-01	06/06/17*	12/31/18*
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
RF Cable	-	-	Mini-Circuits	RDE#2	06/06/17*	12/31/18*
RF Cable	-	-	Insulated Wire	SMA#8	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20
OATS						
Spectrum Analyzer	11545	103125	Rohde & Schwarz	FSW26	02/21/18	02/21/19
Bilog Antenna (30MHz-5GHz)	11311	A0022406	Sunol	JB5	02/01/18	02/01/19
Horn Antenna (1-18GHz)	2973	3127	EMCO	RGA-60	01/22/18	01/22/19
Preamp (1-18GHz)	11539	160362	Amplicial	AMP1G18-35	N/A	N/A
High Pass Filter	11552	G018	Micro-tronics	HPM50111-01	06/06/17*	12/31/18*
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
RF Cable	-	-	Pasternack	RDE#1	06/06/17*	12/31/18*
RF Cable	-	-	MegaPhase	EMC2-S1S1-360	06/06/17*	12/31/18*
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

*-Passive devices are characterized in-house, not calibrated.

Test Results

Restricted Band Edge



Antenna 1: Low Channel Horizontal - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	19.06	Pk	28.5	.7	2.6	2.5	-	53.36	74	-20.64	224	118	H
2	* 2.373	24.55	Pk	28.4	.7	2.6	2.5	-	58.75	74	-15.25	224	118	H
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	19.06	Av	28.5	.7	2.6	2.5	-14.58	38.78	54	-15.22	224	118	H
2	* 2.373	24.55	Av	28.4	.7	2.6	2.5	-14.58	44.17	54	-9.83	224	118	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

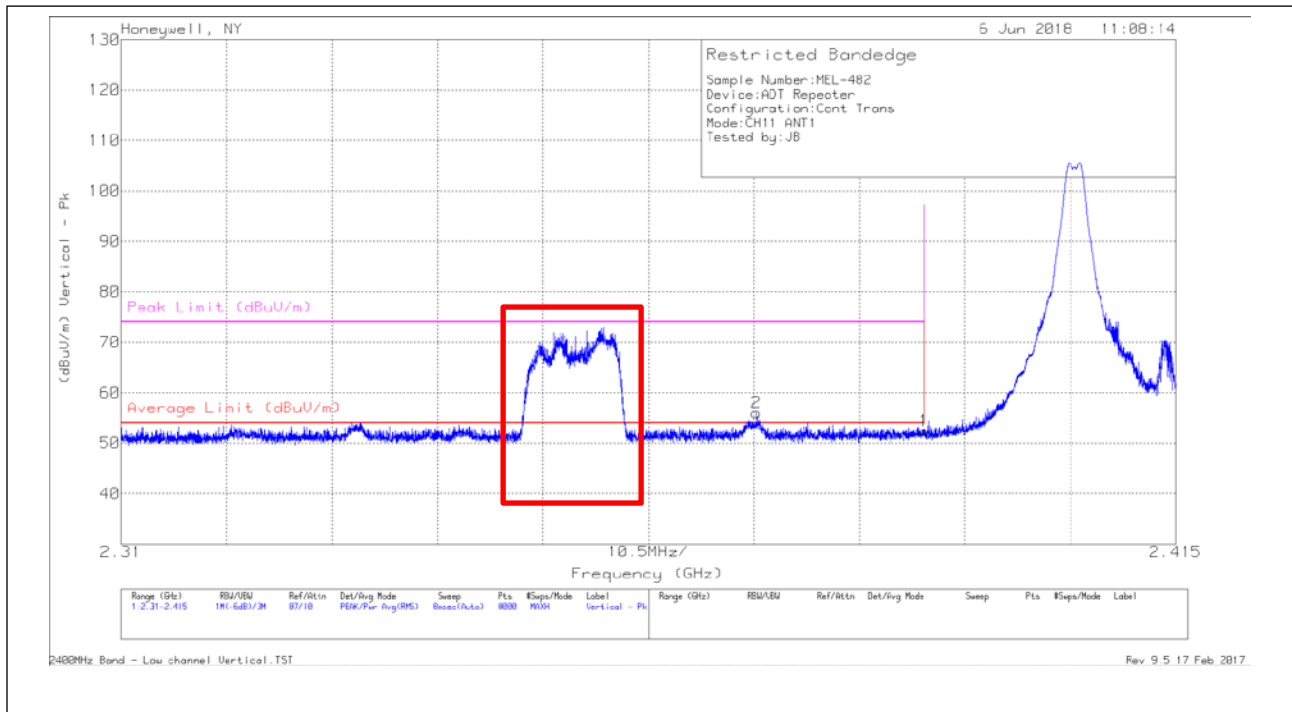
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: Low Channel Vertical - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	18.19	Pk	28.5	.7	2.6	2.5	-	52.49	74	-21.51	335	170	V
2	* 2.373	21.78	Pk	28.4	.7	2.6	2.5	-	55.98	74	-18.02	335	170	V
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	18.19	Av	28.5	.7	2.6	2.5	-14.58	37.91	54	-16.09	335	170	V
2	* 2.373	21.78	Av	28.4	.7	2.6	2.5	-14.58	41.4	54	-12.6	335	170	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

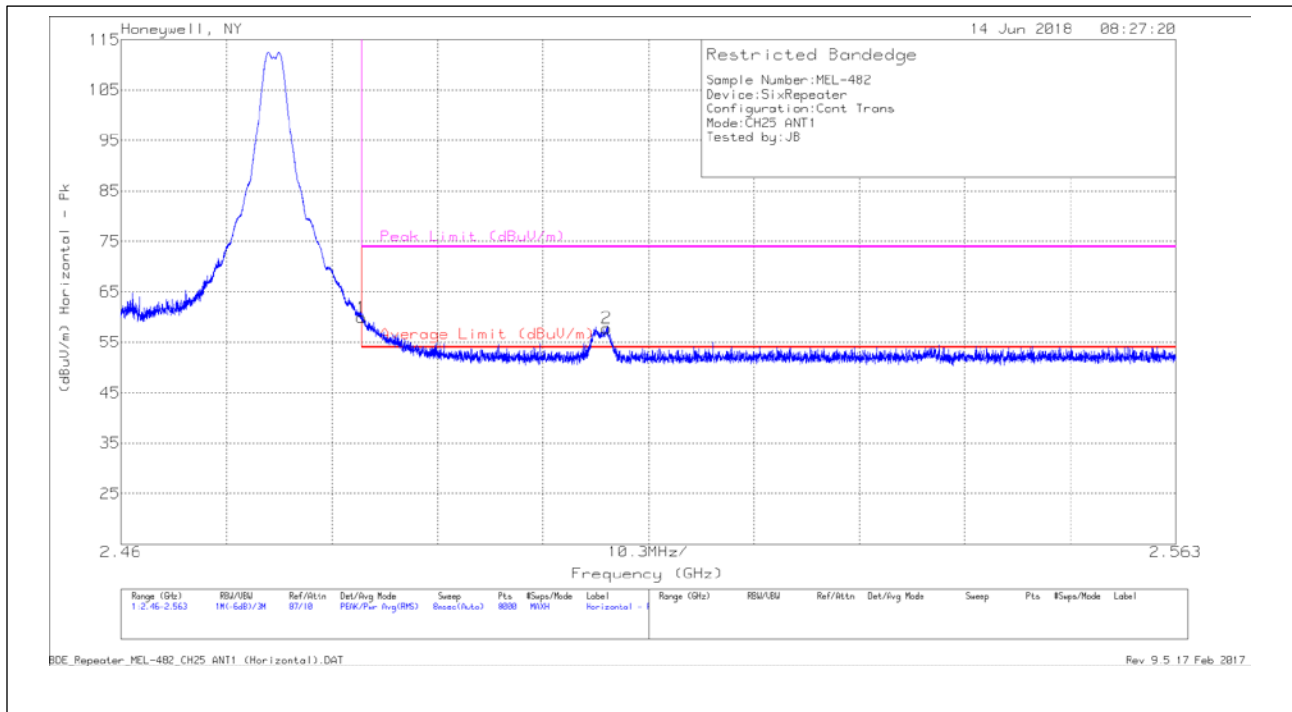
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: High Channel Horizontal - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	25.34	Pk	28.7	.7	2.6	2.6	-	59.94	74	-14.06	33	114	H
2	2.507	23.05	Pk	28.8	.7	2.7	2.6	-	57.85	74	-16.15	33	114	H
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	25.34	Av	28.7	.7	2.6	2.6	-14.58	45.36	54	-8.64	33	114	H
2	2.507	23.05	Av	28.8	.7	2.7	2.6	-14.58	43.27	54	-10.73	33	114	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

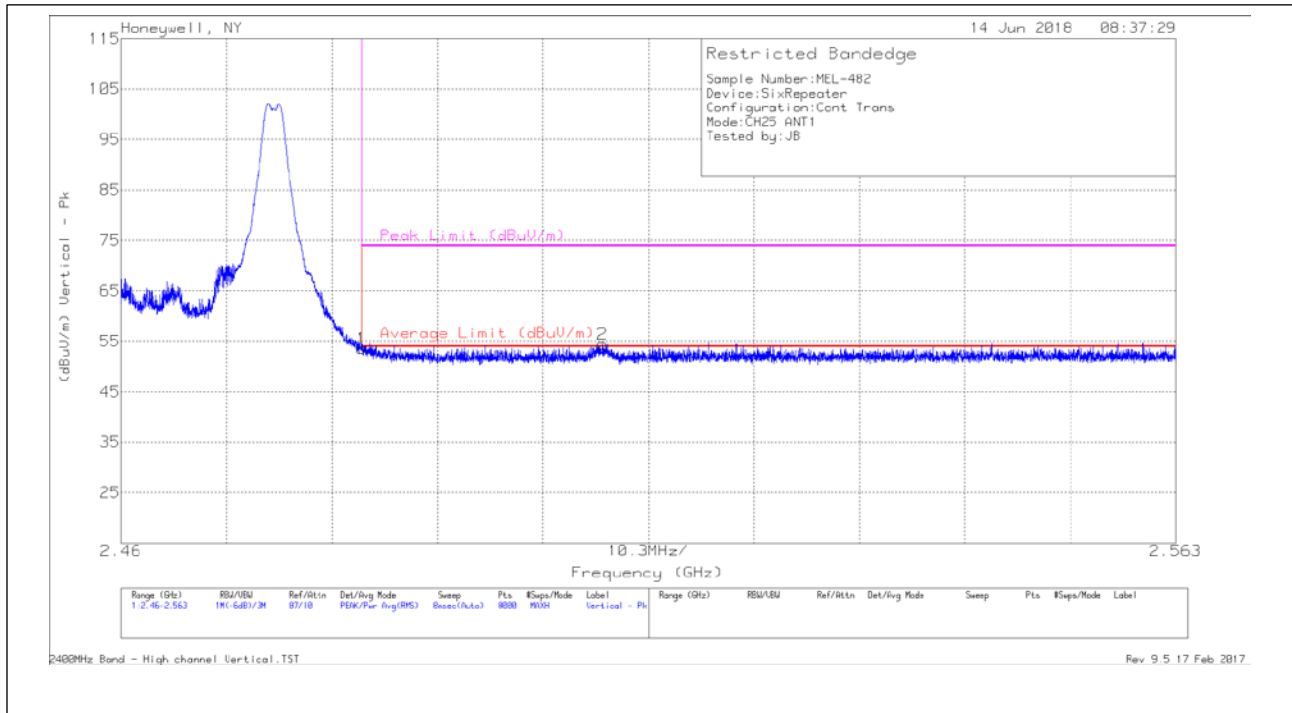
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 1: High Channel Vertical - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	18.95	Pk	28.7	.7	2.6	2.6	-	53.55	74	-20.45	318	368	V
2	2.507	19.65	Pk	28.8	.7	2.7	2.6	-	54.45	74	-19.55	318	368	V
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	18.95	Av	28.7	.7	2.6	2.6	-14.58	38.97	54	-15.03	318	368	V
2	2.507	19.65	Av	28.8	.7	2.7	2.6	-14.58	39.87	54	-14.13	318	368	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

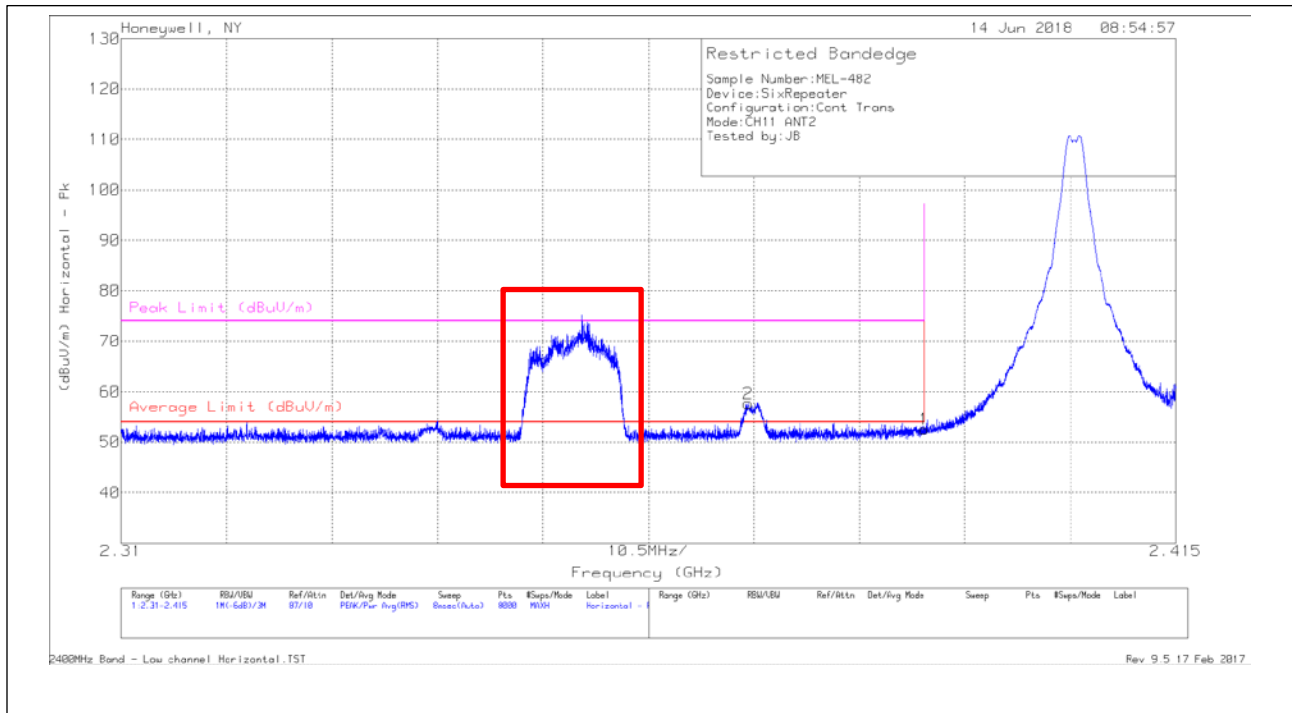
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: Low Channel Horizontal - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	18.23	Pk	28.5	.7	2.6	2.5	-	52.53	74	-21.47	273	103	H
2	* 2.372	23.43	Pk	28.4	.7	2.6	2.5	-	57.63	74	-16.37	273	103	H
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	18.23	Av	28.5	.7	2.6	2.5	-14.58	37.95	54	-16.05	273	103	H
2	* 2.372	23.43	Av	28.4	.7	2.6	2.5	-14.58	43.05	54	-10.95	273	103	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

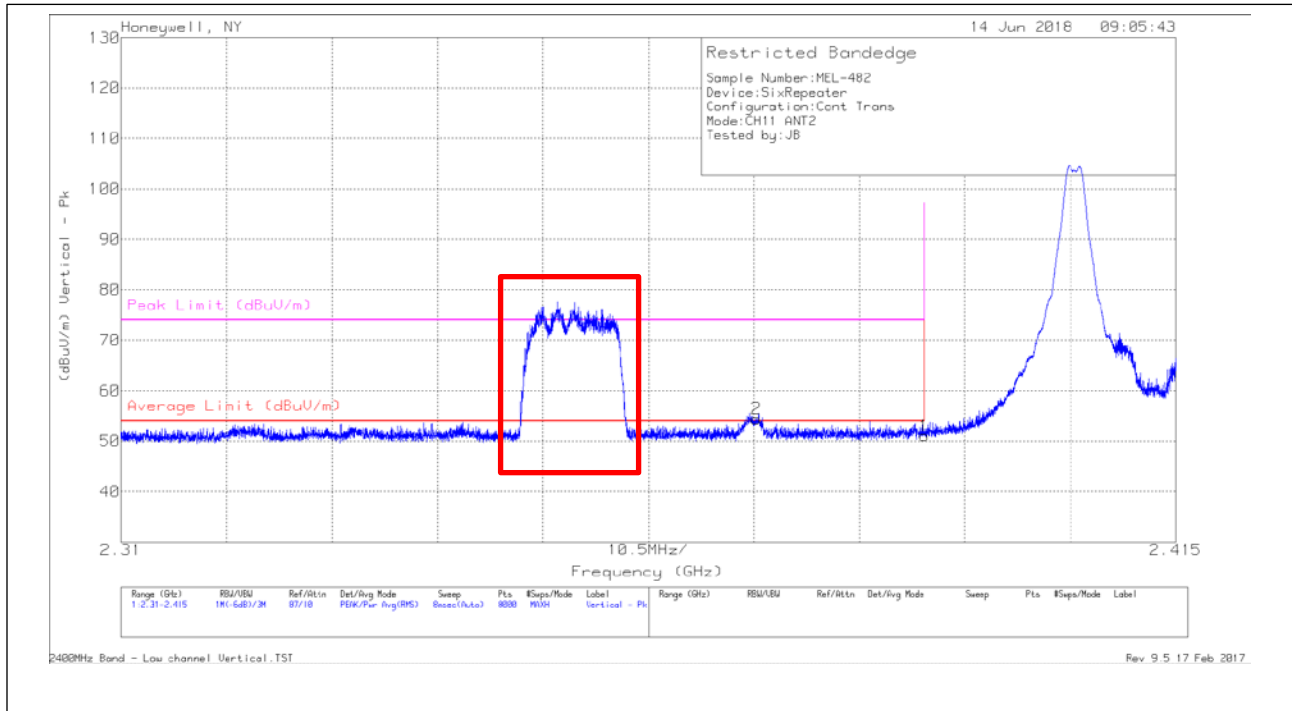
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: Low Channel Vertical - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	16.75	Pk	28.5	.7	2.6	2.5	-	51.05	74	-22.95	97	310	V
2	* 2.373	20.24	Pk	28.4	.7	2.6	2.5	-	54.44	74	-19.56	97	310	V
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	16.75	Av	28.5	.7	2.6	2.5	-14.58	36.47	54	-17.53	97	310	V
2	* 2.373	20.24	Av	28.4	.7	2.6	2.5	-14.58	39.86	54	-14.14	97	310	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

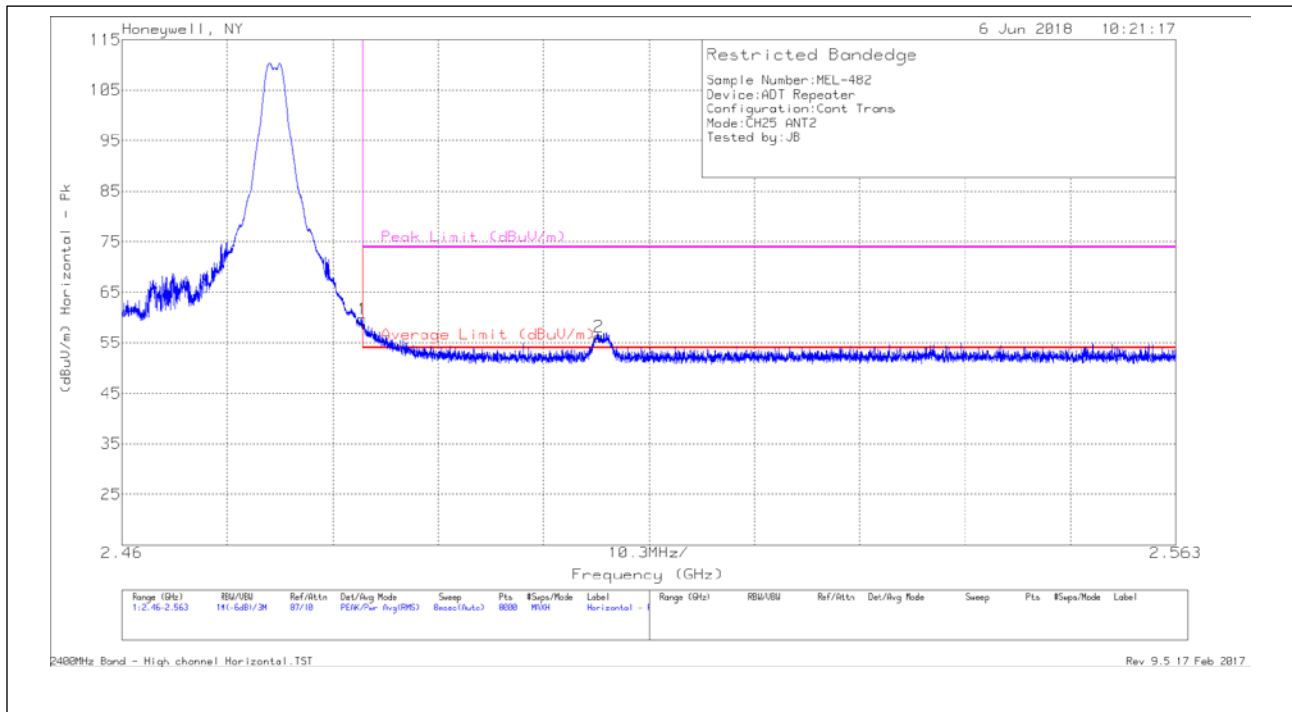
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter. Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: High Channel Horizontal - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	25.04	Pk	28.7	.7	2.6	2.6	-	59.64	74	-14.36	337	115	H
2	2.507	21.36	Pk	28.8	.7	2.7	2.6	-	56.16	74	-17.84	337	115	H
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	25.04	Av	28.7	.7	2.6	2.6	-14.58	45.06	54	-8.94	337	115	H
2	2.507	21.36	Av	28.8	.7	2.7	2.6	-14.58	41.58	54	-12.42	337	115	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

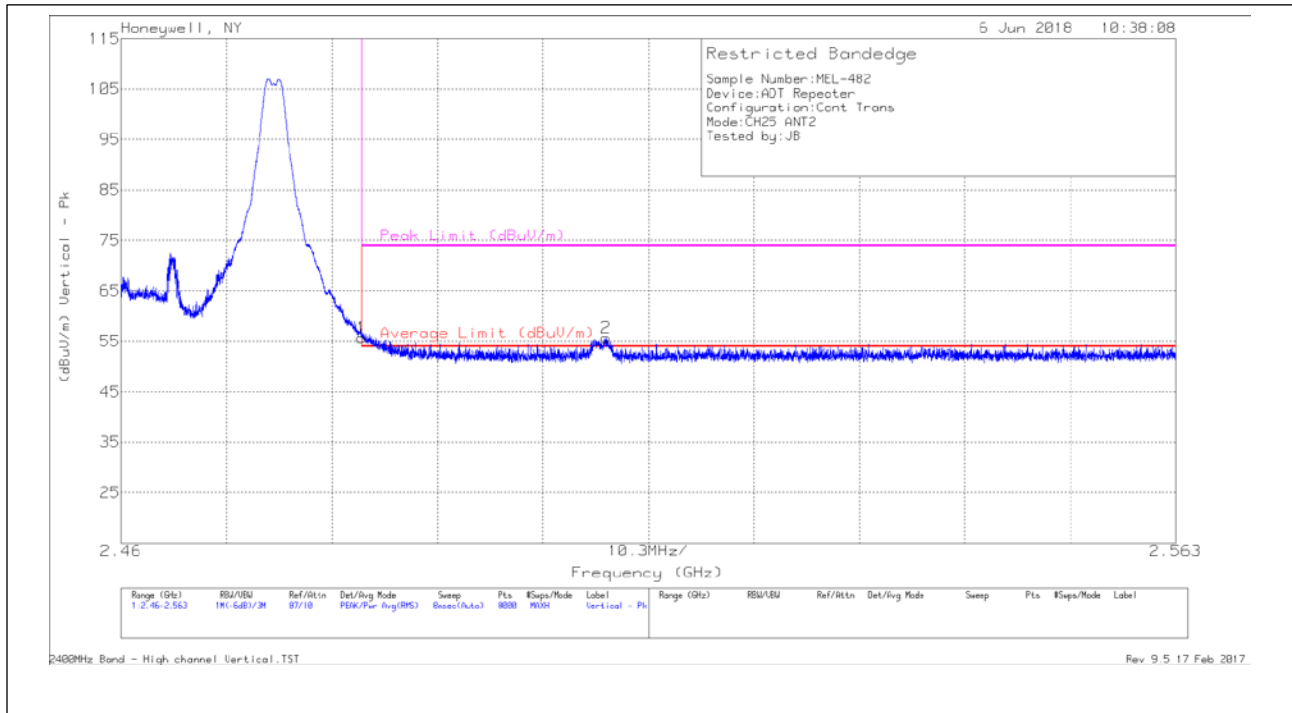
Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data



Antenna 2: High Channel Vertical - Plot

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	21.07	Pk	28.7	.7	2.6	2.6	-	55.67	74	-18.33	126	399	V
2	2.507	20.94	Pk	28.8	.7	2.7	2.6	-	55.74	74	-18.26	126	399	V
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	21.07	Av	28.7	.7	2.6	2.6	-14.58	41.09	54	-12.91	126	399	V
2	2.507	20.94	Av	28.8	.7	2.7	2.6	-14.58	41.16	54	-12.84	126	399	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Av - Peak + DC Corr (Duty Cycle Correction Factor)

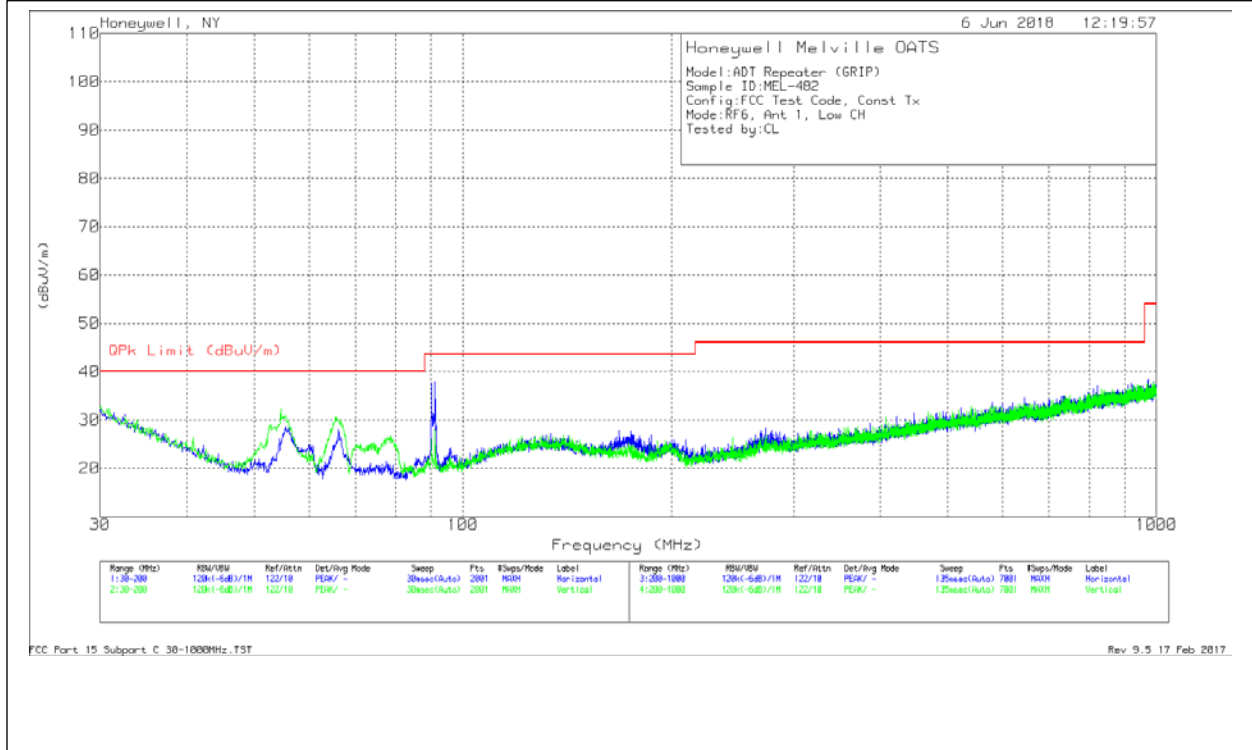
Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

NOTE: Worse-case emissions are report and all other peak emissions, once corrected by the DC Corr, would be below the average limit.

Data

Spurious Emissions

Below 1GHz (Worse-case)



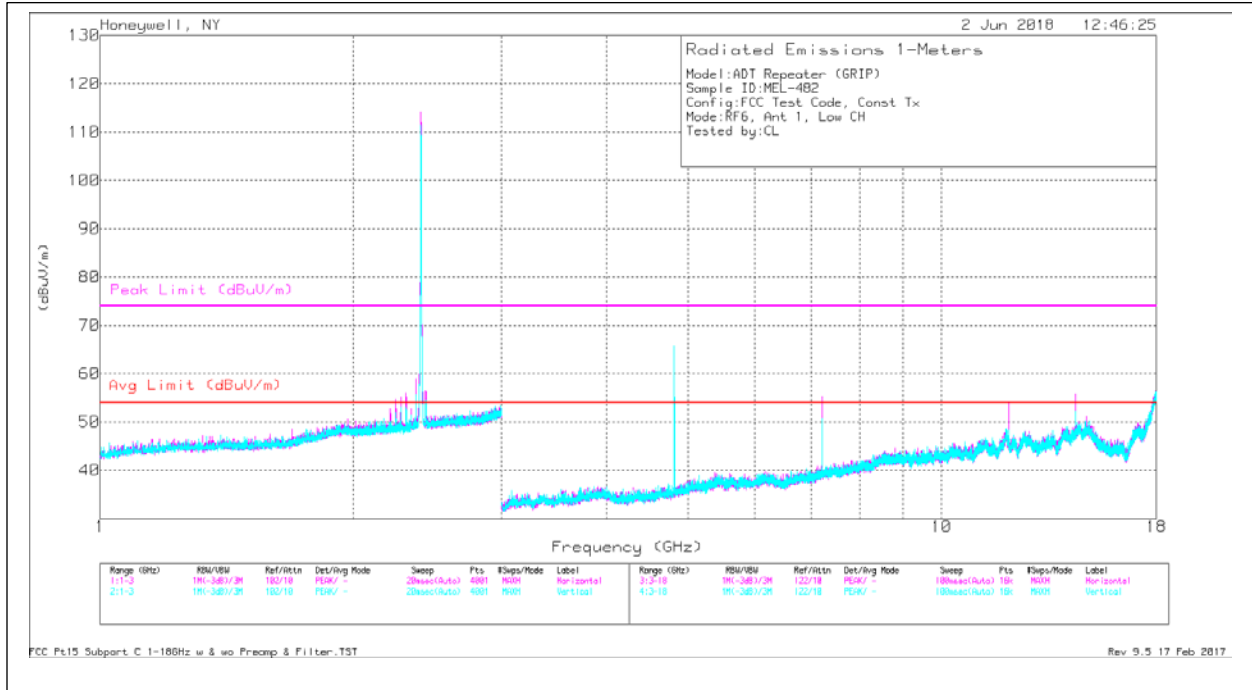
Antenna 1: Low Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
31.6926	11.32	Qp	23.6	.9	35.82	40	-4.18	240	131	H
54.8929	14.32	Qp	12.1	1.1	27.52	40	-12.48	153	370	H
91.0233	23.77	Qp	12.2	1.5	37.47	43.52	-6.05	347	339	H
30.2661	10.99	Qp	24.7	.9	36.59	40	-3.41	222	300	V
54.744	19.86	Qp	12.1	1.1	33.06	40	-6.94	306	237	V
66.2265	13.17	Qp	12	1.3	26.47	40	-13.53	48	221	V

Qp - Quasi-Peak detector

Antenna 1: Low Channel - Data

1-18GHz



Antenna 1: Low Channel - Plot

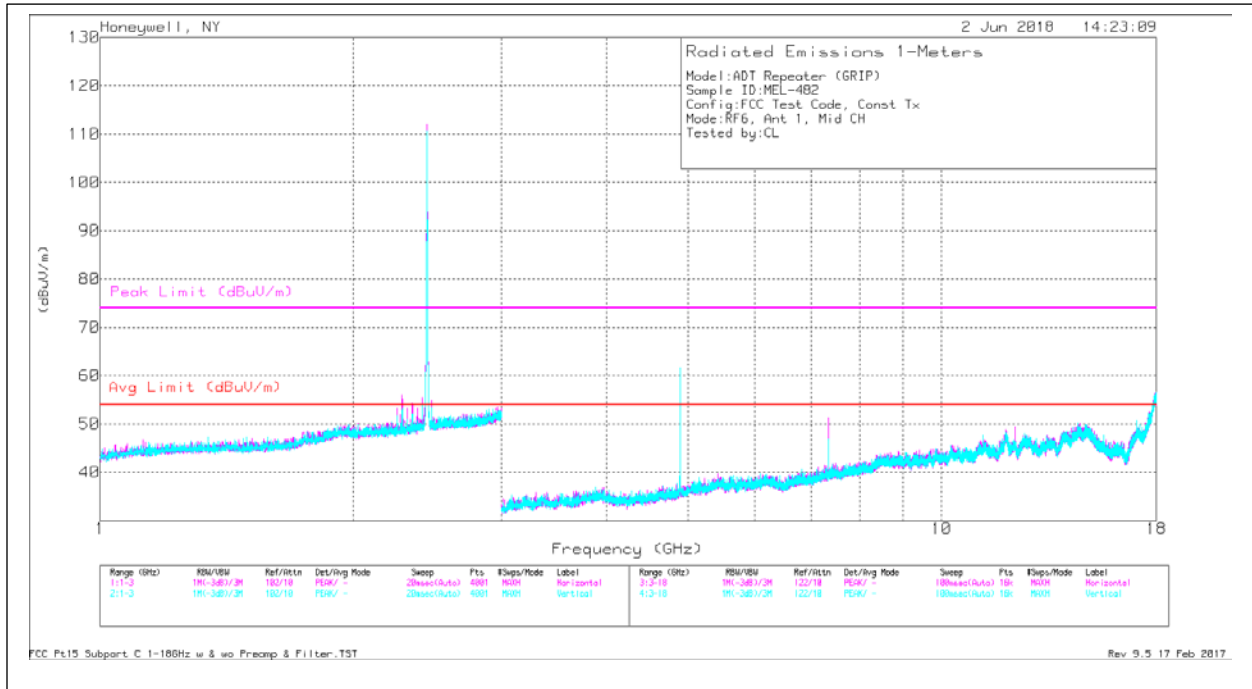
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.809	61.26	PK	33.1	-41.2	3.7	3.7	60.56	74	-13.44	86	113	H
7.213	47.1	PK	36.2	-39.5	4.7	4.5	53	74	-21	296	130	H
* 12.027	38.01	PK	39.4	-37.3	6.5	5.6	52.21	74	-21.79	53	131	H
14.428	39.35	PK	42.1	-36.9	6.8	6.4	57.75	74	-16.25	276	323	H
* 4.811	61.93	PK	33.1	-41.2	3.7	3.7	61.23	74	-12.77	3	324	V
7.216	50.11	PK	36.2	-39.5	4.7	4.5	56.01	74	-17.99	58	238	V
14.432	40.3	PK	42.1	-36.9	6.8	6.4	58.7	74	-15.3	334	231	V
* 12.028	38.8	PK	39.4	-37.3	6.5	5.6	53	74	-21	105	203	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.809	61.26	Av	33.1	-41.2	3.7	3.7	-14.58	45.98	54	-8.02	86	113	H
7.213	47.1	Av	36.2	-39.5	4.7	4.5	-14.58	38.42	54	-15.58	296	130	H
* 12.027	38.01	Av	39.4	-37.3	6.5	5.6	-14.58	37.63	54	-16.37	53	131	H
14.428	39.35	Av	42.1	-36.9	6.8	6.4	-14.58	43.17	54	-10.83	276	323	H
* 4.811	61.93	Av	33.1	-41.2	3.7	3.7	-14.58	46.65	54	-7.35	3	324	V
7.216	50.11	Av	36.2	-39.5	4.7	4.5	-14.58	41.43	54	-12.57	58	238	V
14.432	40.3	Av	42.1	-36.9	6.8	6.4	-14.58	44.12	54	-9.88	334	231	V
* 12.028	38.8	Av	39.4	-37.3	6.5	5.6	-14.58	38.42	54	-15.58	105	203	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: Low Channel - Data



Antenna 1: Mid Channel - Plot

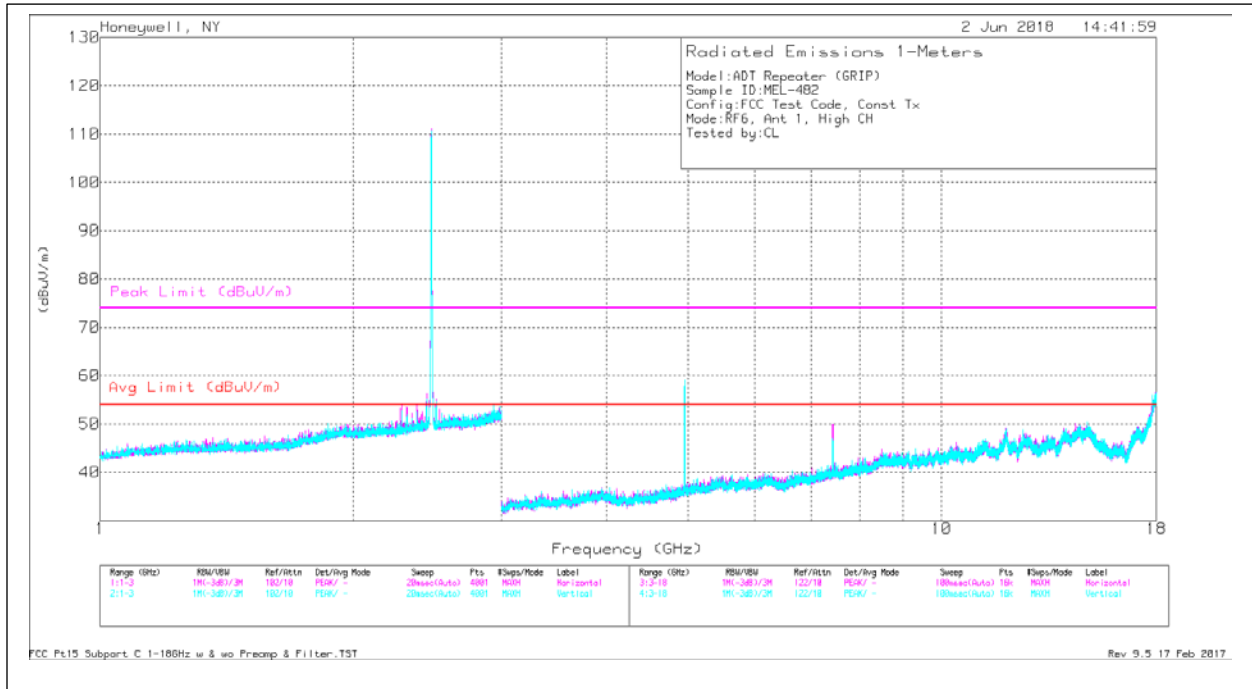
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.889	54.92	PK	33.2	-41.4	3.7	3.6	54.02	74	-19.98	78	223	H
* 7.336	44.01	PK	36.6	-39.7	4.6	4.5	50.01	74	-23.99	297	116	H
* 12.221	38.54	PK	39.2	-37.2	6.5	5.9	52.94	74	-21.06	43	207	H
* 4.889	60.39	PK	33.2	-41.4	3.7	3.6	59.49	74	-14.51	40	151	V
* 7.333	47.25	PK	36.6	-39.7	4.6	4.5	53.25	74	-20.75	37	294	V
* 12.227	38.45	PK	39.2	-37.2	6.5	5.9	52.85	74	-21.15	352	382	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.889	54.92	Av	33.2	-41.4	3.7	3.6	-14.58	39.44	54	-14.56	78	223	H
* 7.336	44.01	Av	36.6	-39.7	4.6	4.5	-14.58	35.43	54	-18.57	297	116	H
* 12.221	38.54	Av	39.2	-37.2	6.5	5.9	-14.58	38.36	54	-15.64	43	207	H
* 4.889	60.39	Av	33.2	-41.4	3.7	3.6	-14.58	44.91	54	-9.09	40	151	V
* 7.333	47.25	Av	36.6	-39.7	4.6	4.5	-14.58	38.67	54	-15.33	37	294	V
* 12.227	38.45	Av	39.2	-37.2	6.5	5.9	-14.58	38.27	54	-15.73	352	382	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: Mid Channel - Data



Antenna 1: High Channel - Plot

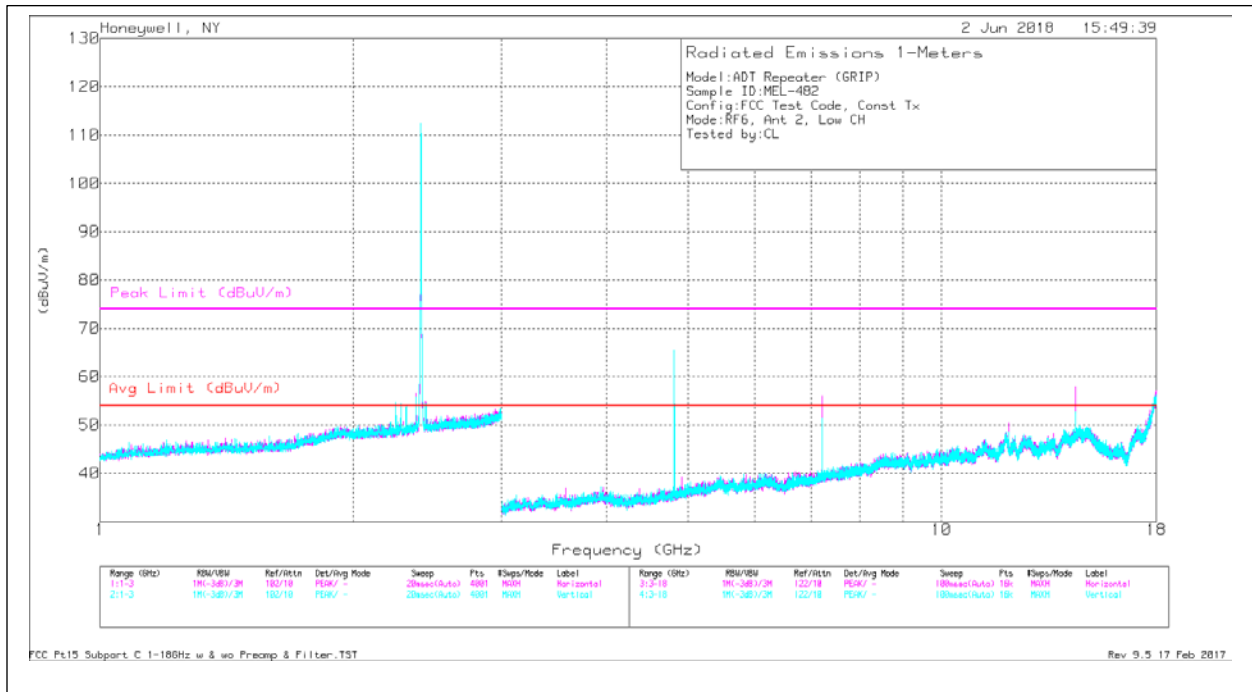
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.949	47.86	PK	33.2	-41.5	3.8	3.7	47.06	74	-26.94	312	100	H
* 7.333	40.24	PK	36.6	-39.7	4.6	4.5	46.24	74	-27.76	62	141	H
14.426	38.81	PK	42.1	-36.9	6.8	6.4	57.21	74	-16.79	47	107	H
* 4.951	57.88	PK	33.2	-41.5	3.8	3.7	57.08	74	-16.92	181	196	V
* 7.337	40.43	PK	36.6	-39.7	4.6	4.5	46.43	74	-27.57	168	235	V
14.673	39.06	PK	42.6	-36.9	6.6	6.4	57.76	74	-16.24	3	281	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.949	47.86	Av	33.2	-41.5	3.8	3.7	-14.58	32.48	54	-21.52	312	100	H
* 7.333	40.24	Av	36.6	-39.7	4.6	4.5	-14.58	31.66	54	-22.34	62	141	H
14.426	38.81	Av	42.1	-36.9	6.8	6.4	-14.58	42.63	54	-11.37	47	107	H
* 4.951	57.88	Av	33.2	-41.5	3.8	3.7	-14.58	42.5	54	-11.5	181	196	V
* 7.337	40.43	Av	36.6	-39.7	4.6	4.5	-14.58	31.85	54	-22.15	168	235	V
14.673	39.06	Av	42.6	-36.9	6.6	6.4	-14.58	43.18	54	-10.82	3	281	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

Antenna 1: High Channel – Data



Antenna 2: Low Channel - Plot

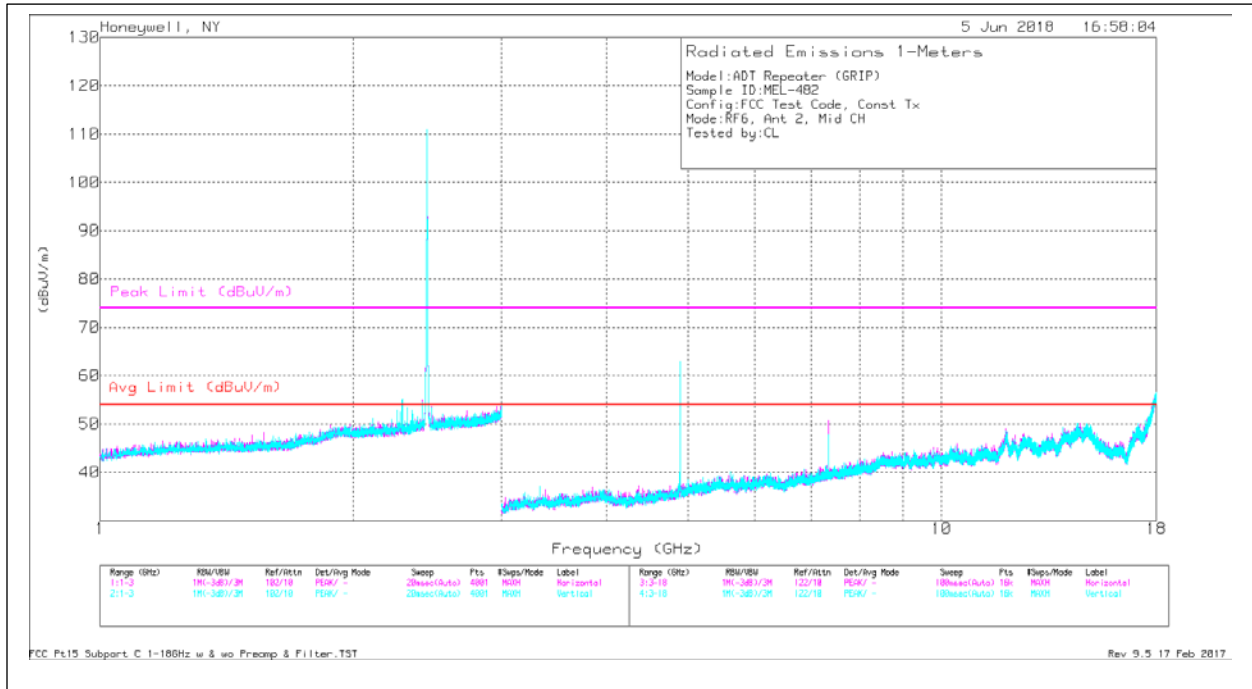
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.811	62.21	PK	33.1	-41.2	3.7	3.7	61.51	74	-12.49	81	128	H
7.213	48.26	PK	36.2	-39.5	4.7	4.5	54.16	74	-19.84	60	104	H
14.426	40.57	PK	42.1	-36.9	6.8	6.4	58.97	74	-15.03	52	378	H
* 4.809	62.22	PK	33.1	-41.2	3.7	3.7	61.52	74	-12.48	48	307	V
7.216	53.83	PK	36.2	-39.5	4.7	4.5	59.73	74	-14.27	42	304	V
14.432	41.1	PK	42.1	-36.9	6.8	6.4	59.5	74	-14.5	275	322	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.811	62.21	Av	33.1	-41.2	3.7	3.7	-14.58	46.93	54	-7.07	81	128	H
7.213	48.26	Av	36.2	-39.5	4.7	4.5	-14.58	39.58	54	-14.42	60	104	H
14.426	40.57	Av	42.1	-36.9	6.8	6.4	-14.58	44.39	54	-9.61	52	378	H
* 4.809	62.22	Av	33.1	-41.2	3.7	3.7	-14.58	46.94	54	-7.06	48	307	V
7.216	53.83	Av	36.2	-39.5	4.7	4.5	-14.58	45.15	54	-8.85	42	304	V
14.432	41.1	Av	42.1	-36.9	6.8	6.4	-14.58	44.92	54	-9.08	275	322	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

Antenna 2: Low Channel - Data



Antenna 2: Mid Channel - Plot

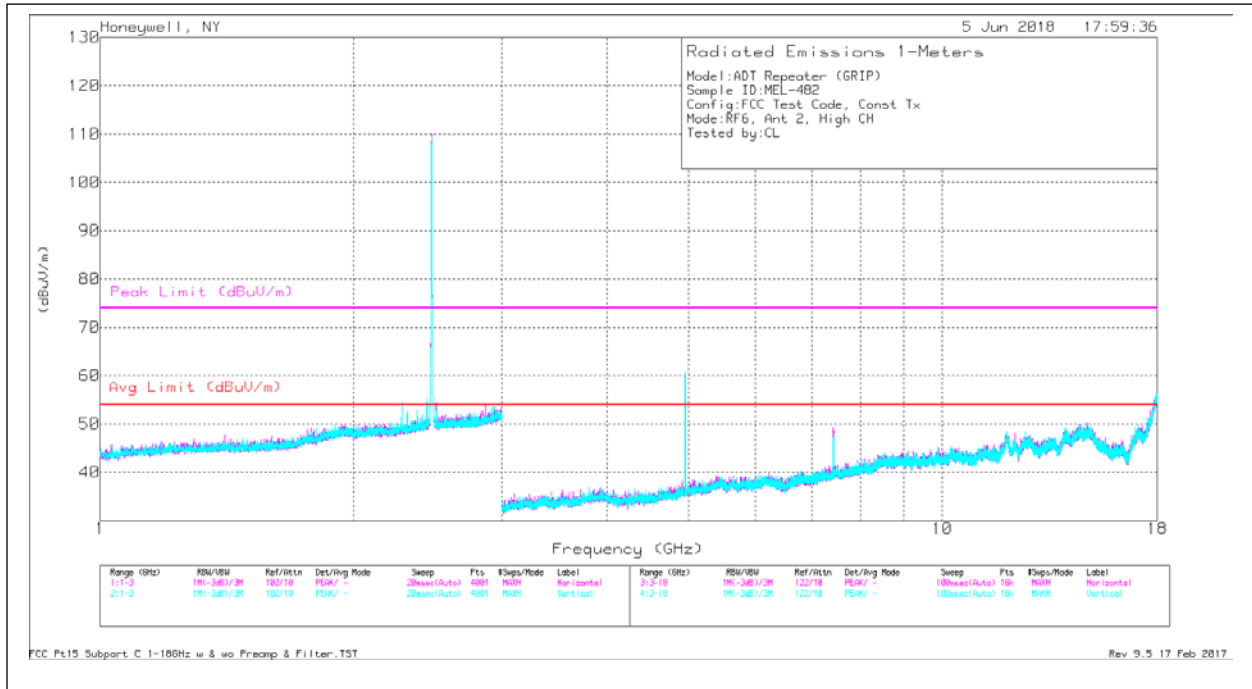
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.889	57.05	PK	33.2	-41.4	3.7	3.6	56.15	74	-17.85	277	394	H
* 7.333	44.33	PK	36.6	-39.7	4.6	4.5	50.33	74	-23.67	124	396	H
9.777	38.11	PK	38.1	-39.1	5.5	5.3	47.91	74	-26.09	123	178	H
* 12.228	38.8	PK	39.2	-37.2	6.5	5.9	53.2	74	-20.8	167	371	H
14.675	38.94	PK	42.6	-36.9	6.6	6.4	57.64	74	-16.36	116	279	H
17.11	39.42	PK	41	-38.1	7.5	7	56.82	74	-17.18	136	105	H
* 4.891	60.53	PK	33.2	-41.4	3.7	3.6	59.63	74	-14.37	180	186	V
* 7.333	47.45	PK	36.6	-39.7	4.6	4.5	53.45	74	-20.55	87	312	V
9.781	39.01	PK	38.1	-39.1	5.5	5.3	48.81	74	-25.19	13	242	V
* 12.227	38.53	PK	39.2	-37.2	6.5	5.9	52.93	74	-21.07	198	227	V
14.67	39.08	PK	42.6	-36.9	6.7	6.4	57.88	74	-16.12	285	120	V
17.118	39.04	PK	41.1	-38.1	7.5	7	56.54	74	-17.46	304	210	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.889	57.05	Av	33.2	-41.4	3.7	3.6	-14.58	41.57	54	-12.43	277	394	H
* 7.333	44.33	Av	36.6	-39.7	4.6	4.5	-14.58	35.75	54	-18.25	124	396	H
9.777	38.11	Av	38.1	-39.1	5.5	5.3	-14.58	33.33	54	-20.67	123	178	H
* 12.228	38.8	Av	39.2	-37.2	6.5	5.9	-14.58	38.62	54	-15.38	167	371	H
14.675	38.94	Av	42.6	-36.9	6.6	6.4	-14.58	43.06	54	-10.94	116	279	H
17.11	39.42	Av	41	-38.1	7.5	7	-14.58	42.24	54	-11.76	136	105	H
* 4.891	60.53	Av	33.2	-41.4	3.7	3.6	-14.58	45.05	54	-8.95	180	186	V
* 7.333	47.45	Av	36.6	-39.7	4.6	4.5	-14.58	38.87	54	-15.13	87	312	V
9.781	39.01	Av	38.1	-39.1	5.5	5.3	-14.58	34.23	54	-19.77	13	242	V
* 12.227	38.53	Av	39.2	-37.2	6.5	5.9	-14.58	38.35	54	-15.65	198	227	V
14.67	39.08	Av	42.6	-36.9	6.7	6.4	-14.58	43.3	54	-10.7	285	120	V
17.118	39.04	Av	41.1	-38.1	7.5	7	-14.58	41.96	54	-12.04	304	210	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = 20log(0.18656) = -14.58dB

Antenna 2: Mid Channel - Data



Antenna 2: High Channel - Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.949	57.32	PK	33.2	-41.5	3.8	3.7	56.52	74	-17.48	120	102	H
* 7.426	45.9	PK	36.7	-39.7	4.7	4.6	52.2	74	-21.8	66	105	H
* 12.189	38.57	PK	39.2	-37.2	6.4	6	52.97	74	-21.03	305	298	H
14.846	38.44	PK	42	-36.9	6.8	6.5	56.84	74	-17.16	113	339	H
* 4.951	57.5	PK	33.2	-41.5	3.8	3.7	56.7	74	-17.3	189	135	V
* 7.423	47.78	PK	36.7	-39.7	4.7	4.6	54.08	74	-19.92	62	237	V
* 12.191	38.65	PK	39.2	-37.2	6.4	6	53.05	74	-20.95	150	210	V
14.559	40.35	PK	42.5	-36.9	7	6.4	59.35	74	-14.65	300	185	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DCF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Avg Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.949	57.32	Av	33.2	-41.5	3.8	3.7	-14.58	41.94	54	-12.06	120	102	H
* 7.426	45.9	Av	36.7	-39.7	4.7	4.6	-14.58	37.62	54	-16.38	66	105	H
* 12.189	38.57	Av	39.2	-37.2	6.4	6	-14.58	38.39	54	-15.61	305	298	H
14.846	38.44	Av	42	-36.9	6.8	6.5	-14.58	42.26	54	-11.74	113	339	H
* 4.951	57.5	Av	33.2	-41.5	3.8	3.7	-14.58	42.12	54	-11.88	189	135	V
* 7.423	47.78	Av	36.7	-39.7	4.7	4.6	-14.58	39.5	54	-14.5	62	237	V
* 12.191	38.65	Av	39.2	-37.2	6.4	6	-14.58	38.47	54	-15.53	150	210	V
14.559	40.35	Av	42.5	-36.9	7	6.4	-14.58	44.77	54	-9.23	300	185	V

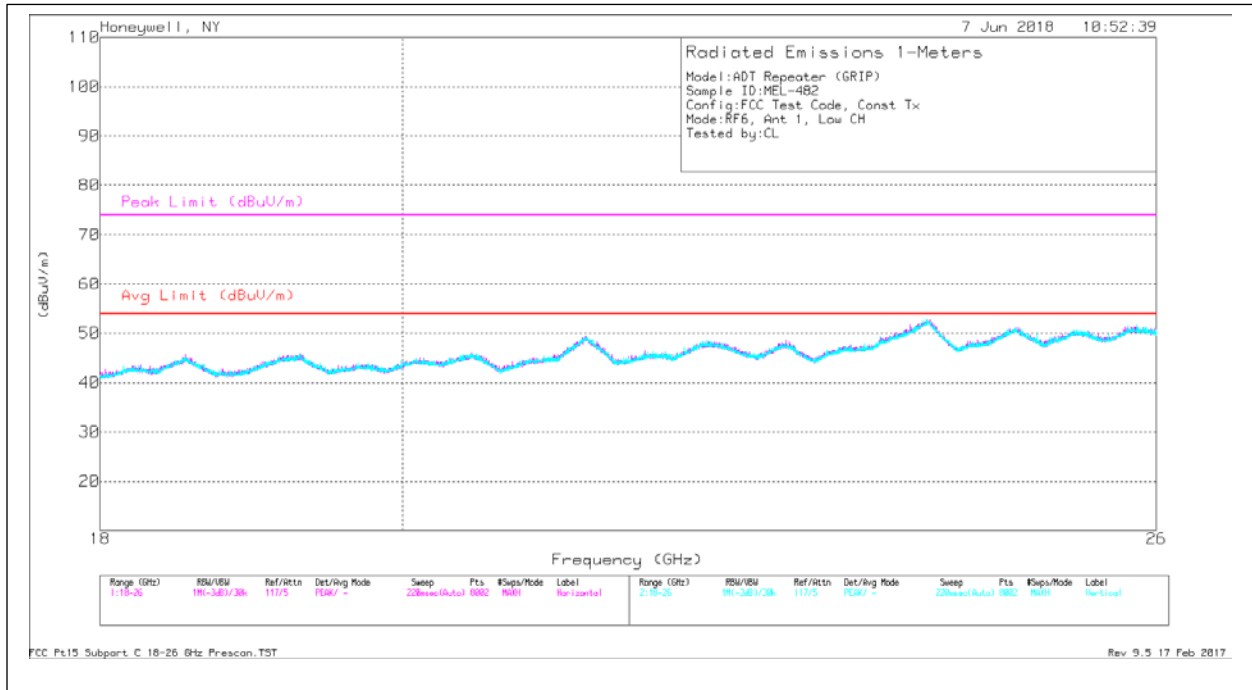
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 PK - KDB558074 Method: Maximum Peak
 Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 18.656%, thus DC Corr = $20\log(0.18656) = -14.58\text{dB}$

Antenna 2: High Channel – Data

18-26GHz

Note: No emissions detected above the system noise floor



Antenna 1: Low Channel - Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF EM-6963 [dB/m]	Preamp [dB]	SMA7 [dB]	SMA5 [dB]	Dist Corr [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 19.274	28.65	PK2	44.1	-34.5	7.9	8	-9.5	44.65	-	-	74	-29.35	0	100	H
* 19.276	20.91	MAv1	44.1	-34.5	7.9	8	-9.5	36.91	54	-17.09	-	-	0	100	H
* 21.319	33.99	PK2	44.5	-31.9	8.3	8.1	-9.5	53.49	-	-	74	-20.51	0	100	H
* 21.319	20.79	MAv1	44.5	-31.9	8.3	8.1	-9.5	40.29	54	-13.71	-	-	0	100	H
* 21.318	31.03	PK2	44.5	-31.9	8.3	8.1	-9.5	50.53	-	-	74	-23.47	193	166	H
* 21.318	20.71	MAv1	44.5	-31.9	8.3	8.1	-9.5	40.21	54	-13.79	-	-	193	166	H
24.027	30.98	PK2	46.4	-30.4	8.9	8.4	-9.5	54.78	-	-	74	-19.22	140	354	H
24.026	20.24	MAv1	46.4	-30.4	8.9	8.4	-9.5	44.04	54	-9.96	-	-	140	354	H
* 19.29	31	PK2	44.2	-34.3	7.9	8	-9.5	47.3	-	-	74	-26.7	277	321	V
* 19.29	21.1	MAv1	44.2	-34.3	7.9	8	-9.5	37.4	54	-16.6	-	-	277	321	V
* 21.323	31.14	PK2	44.5	-32	8.3	8.1	-9.5	50.54	-	-	74	-23.46	139	366	V
* 21.324	20.5	MAv1	44.5	-32	8.3	8.1	-9.5	39.9	54	-14.1	-	-	139	366	V
24.018	30.41	PK2	46.4	-30.3	8.9	8.4	-9.5	54.31	-	-	74	-19.69	272	380	V
24.019	20.61	MAv1	46.4	-30.3	8.9	8.4	-9.5	44.51	54	-9.49	-	-	272	380	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

Antenna 1: Low Channel - Data

Conducted Emissions (Mains)

Test Description

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10 / C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorder for both NEUTRAL and HOT lines.

Test Criteria

Reference	Limit (dBuV)		
	Frequency Range (MHz)	Quasi-Peak	Average
CFR 47 Subpart C, 15.207 RSS-GEN	0.15-0.5	66 to 56	56 to 46
CFR 47 Subpart B, 15.107 ICES-003	0.5-5	56	46
	5-30	60	50

Test Information

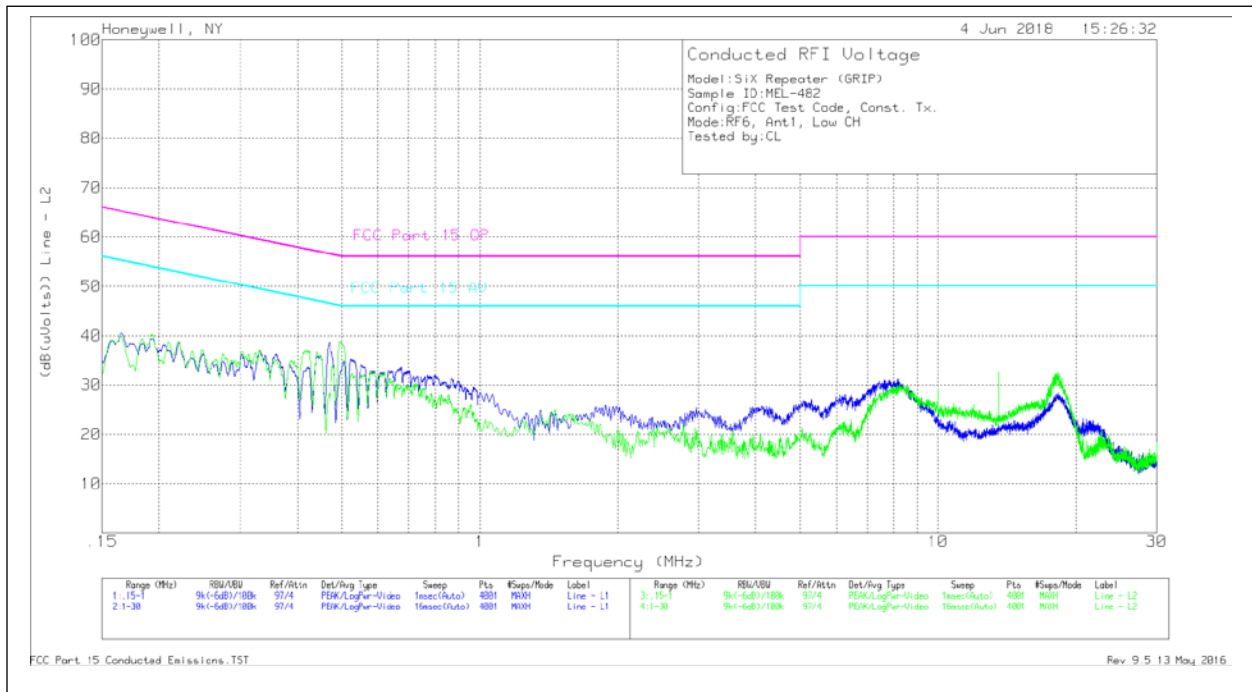
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	Shield Room	06/04/18	21.2	60.9	1005	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11536	MY49431596	Keysight	N9030A (PXA)	12/19/17	12/19/18
LISN	11527	241259	Com-Power	LIN-120A	01/10/18	01/10/19
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

Test Results

Unintentional Mode



Plot

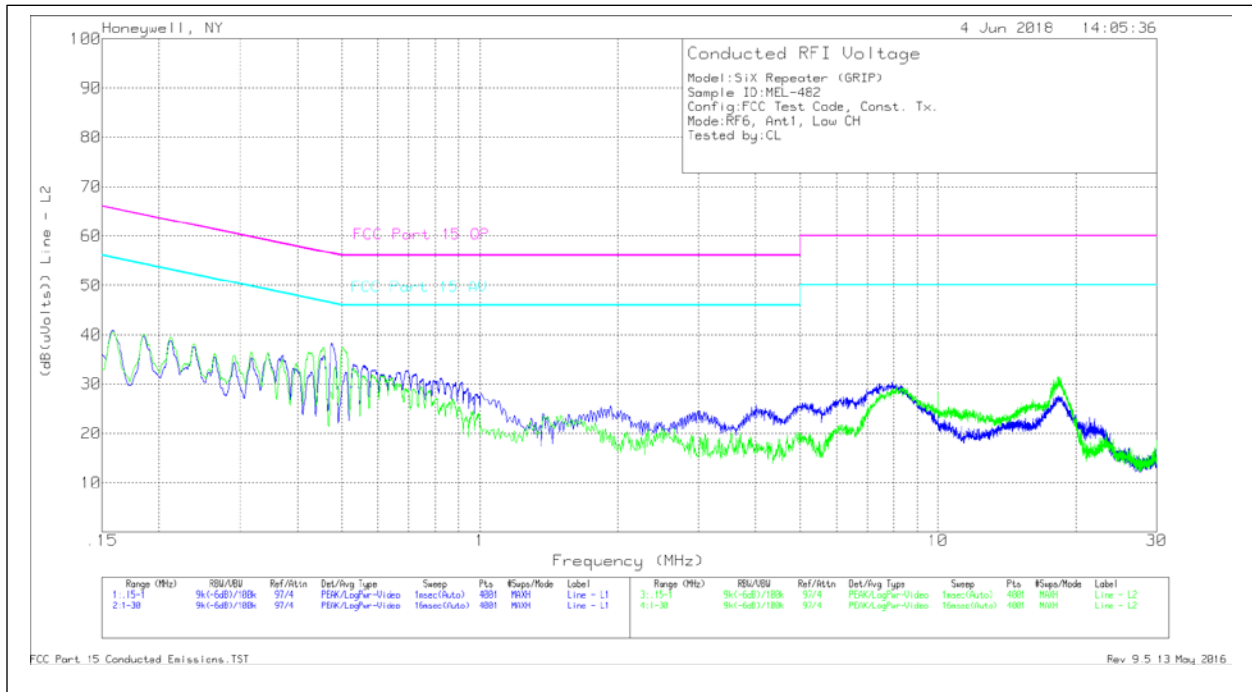
Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L1 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.16566	29.89	Pk	10.5	.1	40.49	65.18	-24.69	55.18	-14.69
.46844	27.98	Pk	10	0	37.98	56.54	-18.56	46.54	-8.56
.67387	23.8	Pk	9.9	0	33.7	56	-22.3	46	-12.3
1.8845	15.98	Pk	9.9	0	25.88	56	-30.12	46	-20.12
8.163	20.99	Pk	10	.2	31.19	60	-28.81	50	-18.81
18.1825	17.71	Pk	10.2	.3	28.21	60	-31.79	50	-21.79

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L2 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.19313	29.74	Pk	10.4	.1	40.24	63.9	-23.66	53.9	-13.66
.49644	28.7	Pk	10	0	38.7	56.06	-17.36	46.06	-7.36
.72819	20.1	Pk	10	0	30.1	56	-25.9	46	-15.9
1.45675	14.98	Pk	9.9	0	24.88	56	-31.12	46	-21.12
8.41675	19.98	Pk	10	.2	30.18	60	-29.82	50	-19.82
13.557	22.39	Pk	10.1	.2	32.69	60	-27.31	50	-17.31

Pk - Peak detector

Data

Intentional Mode



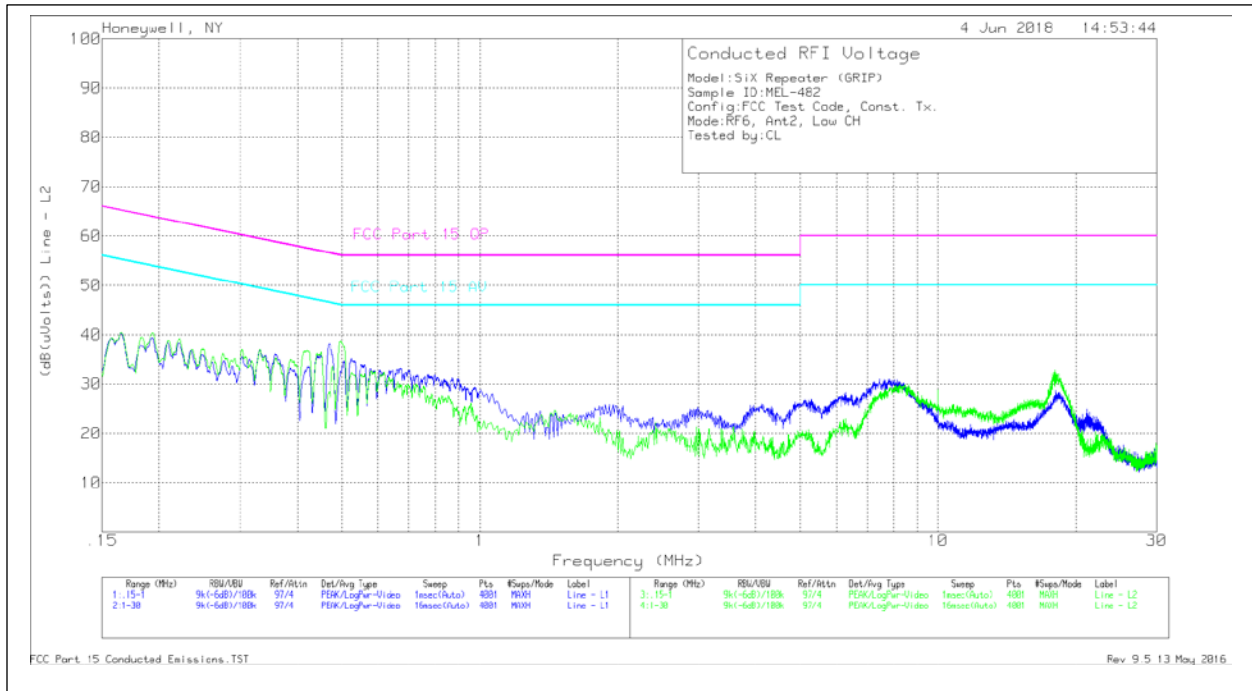
Antenna 1 - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L1 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.18461	29.22	Pk	10.4	.1	39.72	64.28	-24.56	54.28	-14.56
.4761	28.19	Pk	10	0	38.19	56.41	-18.22	46.41	-8.22
.91414	20.46	Pk	9.9	0	30.36	56	-25.64	46	-15.64
1.93525	15.66	Pk	9.9	0	25.56	56	-30.44	46	-20.44
7.931	20.16	Pk	10	.2	30.36	60	-29.64	50	-19.64
18.30575	17.14	Pk	10.2	.3	27.64	60	-32.36	50	-22.36

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L2 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.15863	29.97	Pk	10.6	0	40.57	65.54	-24.97	55.54	-14.97
.45576	27.37	Pk	10	0	37.37	56.77	-19.4	46.77	-9.4
.74629	19.57	Pk	10	0	29.57	56	-26.43	46	-16.43
1.50025	13.69	Pk	9.9	0	23.59	56	-32.41	46	-22.41
8.1195	19.45	Pk	10	.2	29.65	60	-30.35	50	-20.35
18.27675	20.98	Pk	10.2	.3	31.48	60	-28.52	50	-18.52

Pk - Peak detector

Antenna 1 - Data



Antenna 2 - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L1 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.19292	29.02	Pk	10.3	.1	39.42	63.91	-24.49	53.91	-14.49
.47184	27.72	Pk	10	0	37.72	56.48	-18.76	46.48	-8.76
.87271	21.29	Pk	9.9	0	31.19	56	-24.81	46	-14.81
1.957	15.9	Pk	9.9	0	25.8	56	-30.2	46	-20.2
7.8295	20.82	Pk	10	.2	31.02	60	-28.98	50	-18.98
18.3855	17.75	Pk	10.3	.3	28.35	60	-31.65	50	-21.65

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L2 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.16534	29.85	Pk	10.5	.1	40.45	65.19	-24.74	55.19	-14.74
.49815	28.58	Pk	10	0	38.58	56.03	-17.45	46.03	-7.45
.75897	19.32	Pk	10	0	29.32	56	-26.68	46	-16.68
1.45675	14.69	Pk	9.9	0	24.59	56	-31.41	46	-21.41
8.25	19.79	Pk	10	.2	29.99	60	-30.01	50	-20.01
18.03025	22.41	Pk	10.2	.3	32.91	60	-27.09	50	-17.09

Pk - Peak detector

Antenna 2 - Data

END OF REPORT