



FCC / ISED Test Report

For

WLTP100

Report #: 50346-W1

FCC ID: CFS8DLWLTP100

IC ID: 573F-WLTP100

Report Completion Date: 2018-07-20

Prepared by and for:
Honeywell International Inc.
2 Corporate Center Dr.
Suite 100 PO Box 9040
Melville, NY 11747



Testing
NVLAP Lab Code: 600110

Document Introduction

Honeywell 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 Honeywell 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 Honeywell 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 Honeywell and all revisions are duly noted in the revisions section. Any alterations of this document not carried out by Honeywell 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	2018-07-18
A	M. Antola	A. Roussin	Updated radiated test data (removed non-restricted band data)	2018-07-20

Report Authorization

Report Prepared By:



Michael Antola
Hardware Engineer
HBT RF & EMC Design
Honeywell International Inc.

Reviewed & Approved By:



Andrew Roussin
Hardware Engineer II
HBT RF & EMC Design
Honeywell International Inc.

Contents

Applicable Test Standards/Limits.....	5
Deviations from Test Methods	5
Facilities and Accreditation	5
Test Item Description	5
Worse-Case Configuration & Mode.....	6
Calibration & Measurement Uncertainty.....	7
Opinions / Interpretations	7
Test Summary.....	8
On Time and Duty Cycle.....	9
6dB Emission Bandwidth (DTS Bandwidth)	11
99% Occupied Bandwidth.....	15
Maximum Conducted Output Power	19
Maximum Power Spectral Density	23
Authorized Band Edge / Conducted Spurious Emissions.....	27
Radiated Emissions (Unintentional).....	34
Radiated Emissions (Intentional)	38
Conducted Emissions (Mains).....	62
END OF REPORT.....	65

Applicable Test Standards/Limits

Test Standards/Limits	Result	Dates Tested
ANSI C63.4: 2014	Compliant	06/29/18 – 07/18/18
ANSI C63.10: 2013	Compliant	06/29/18 – 07/18/18
ICES-003 Issue 6: 2016	Compliant	06/29/18 – 07/18/18
RSS-247, Issue 2, Section 5	Compliant	06/29/18 – 07/18/18
RSS-GEN, Issue 4	Compliant	06/29/18 – 07/18/18
CFR 47 Pt 15 Subpart B, Section 15.107/109	Compliant	06/29/18 – 07/18/18
CFR 47 Pt 15 Subpart C, Section 15.207/209	Compliant	06/29/18 – 07/18/18
CFR 47 Pt 15 Subpart C, Section 15.247	Compliant	06/29/18 – 07/18/18

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. Honeywell 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 WLTP100 is a wireless alpha touchpad that is used in conjunction with the ADTHYWL and ADT7AIO control panels. It utilizes a 2.4GHz Zigbee-based transmitter and contain two (2) integral antennas with gains of 4.49dBi (Antenna 1) and 5.33dBi (Antenna 2). The EUT is AC power from an external power adapter with battery backup.

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. AC powered proved to be the worse-case configuration and was tested as such.

Test Sample Identification

Sample ID Number	Sample Serial Number	Date Received
MEL-504	Non-serialized production unit	06/22/18
MEL-505	Non-serialized production unit	07/03/18

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

[i.e.] 37 dBuV/m = 30 dBuV + 18.5 dB/m + 0.5 dB – 12 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	07/03/18	21.2	60.9	1005	P

Equipment List

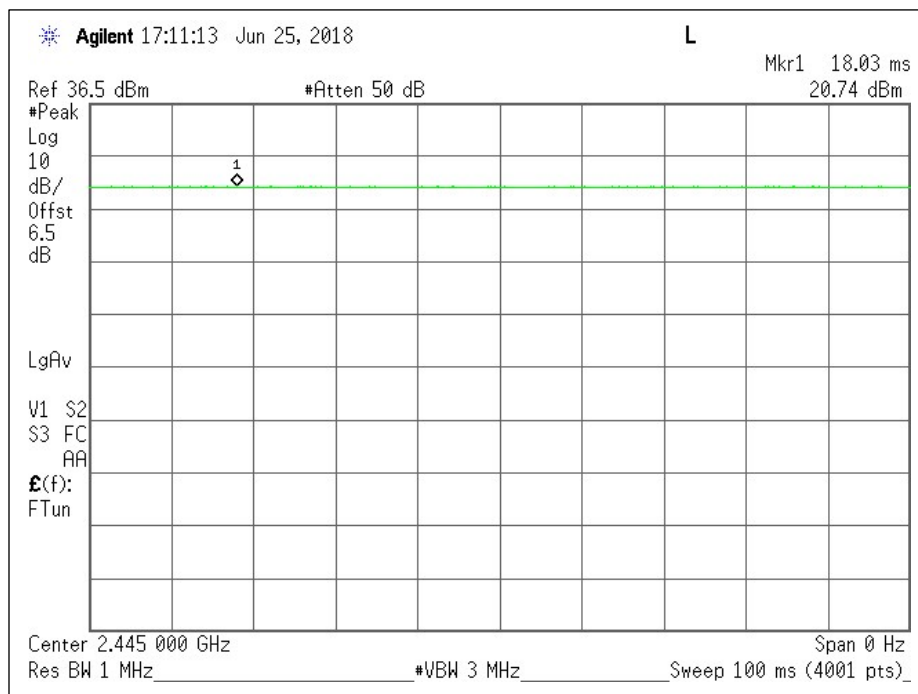
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

Test Results

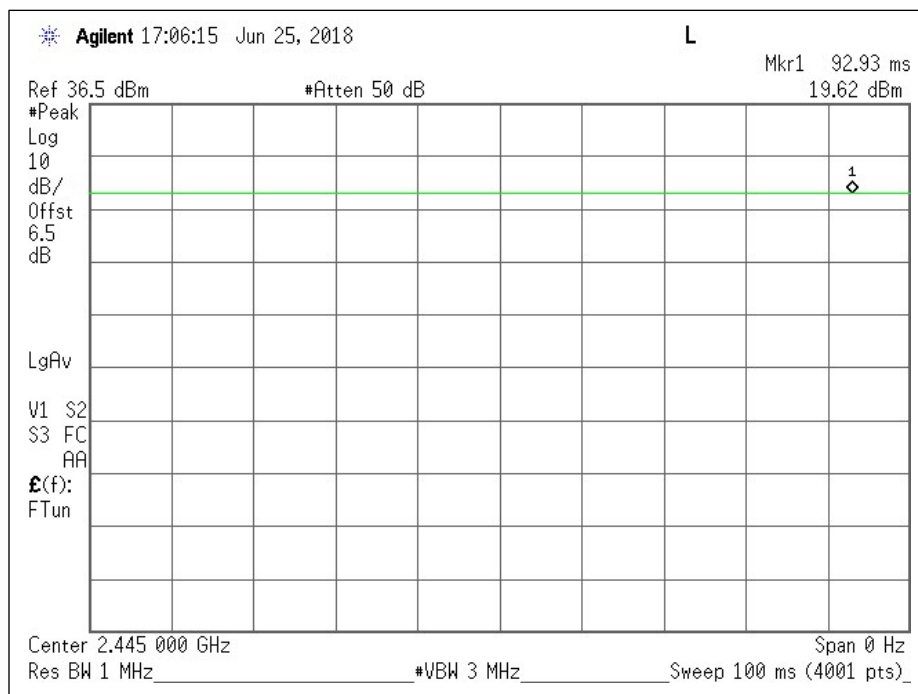
Antenna	On Time (msec)	Period (msec)	Duty Cycle	Duty Cycle (%)
1	18.03	18.03	1	100
2	92.93	92.93	1	100

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 7.136% (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)	$\geq 500\text{kHz}$

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
MA	RF Lab	06/29/18	21.2	60.9	1005	P

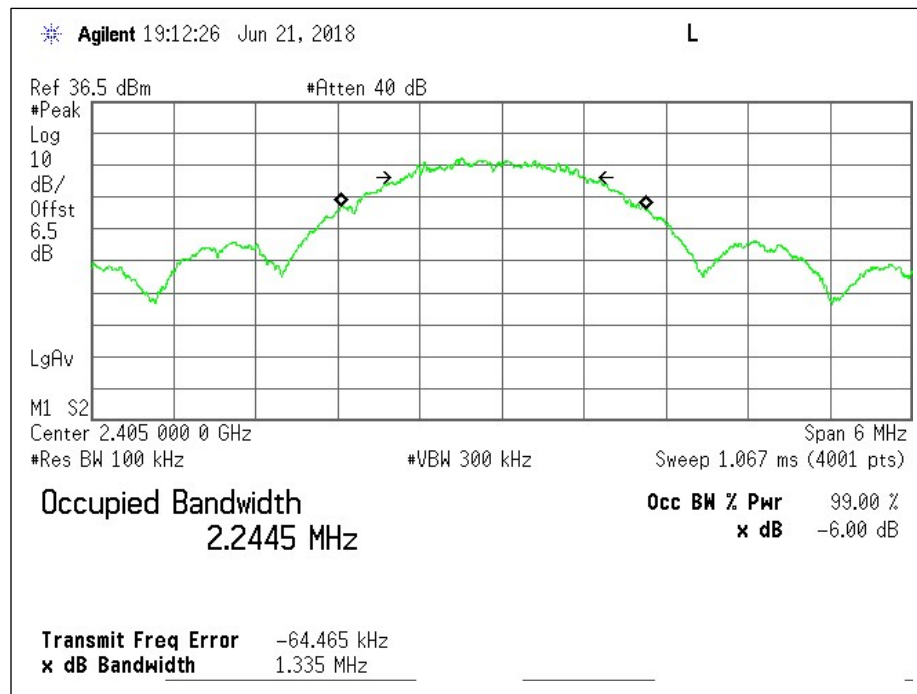
Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

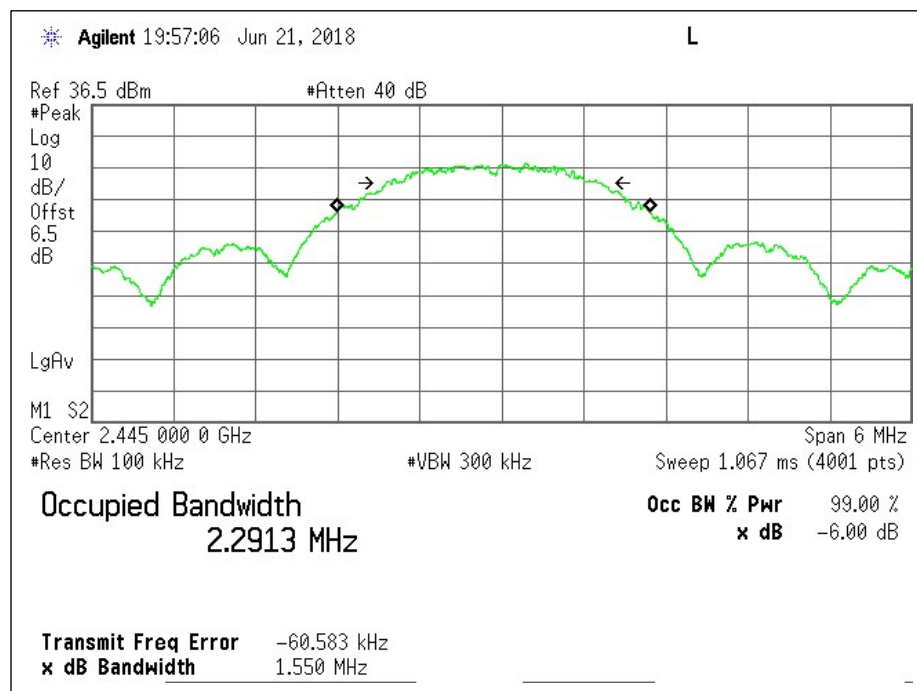
Test Results

Channel	Frequency (GHz)	6dB Bandwidth (in MHz)	
		Antenna 1	Antenna 2
Low	2.405	1.335	1.410
Mid	2.445	1.550	1.551
High	2.475	1.571	1.579

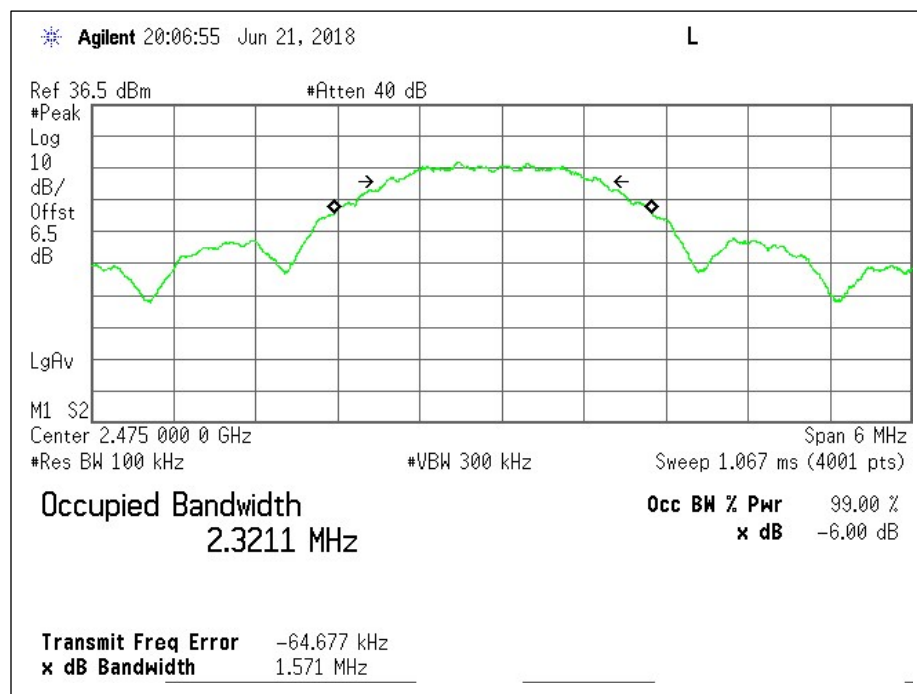
6dB Bandwidth



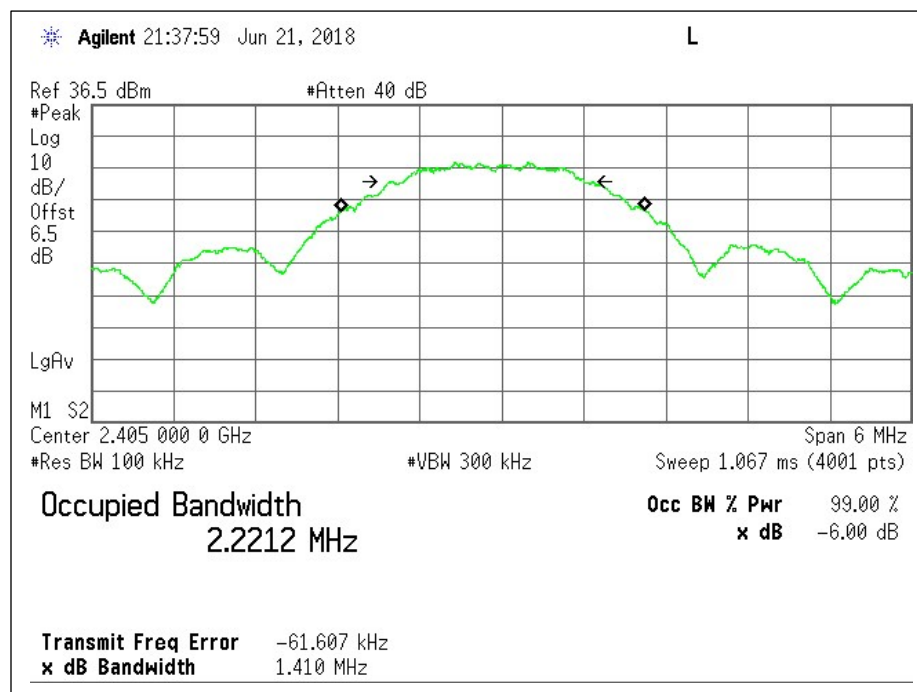
Antenna 1: Low Channel - Plot



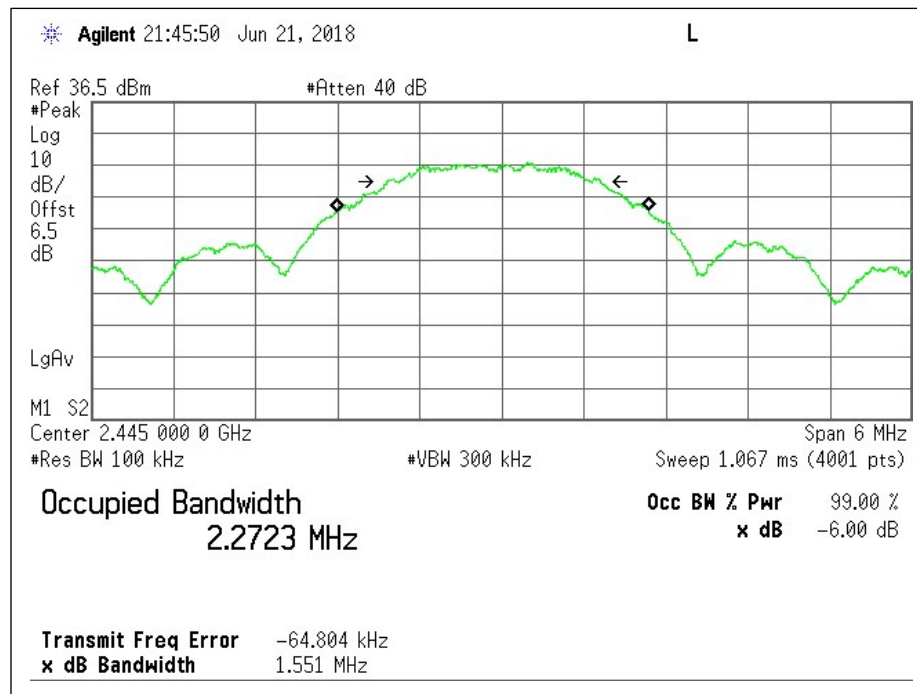
Antenna 1: Mid Channel - Plot



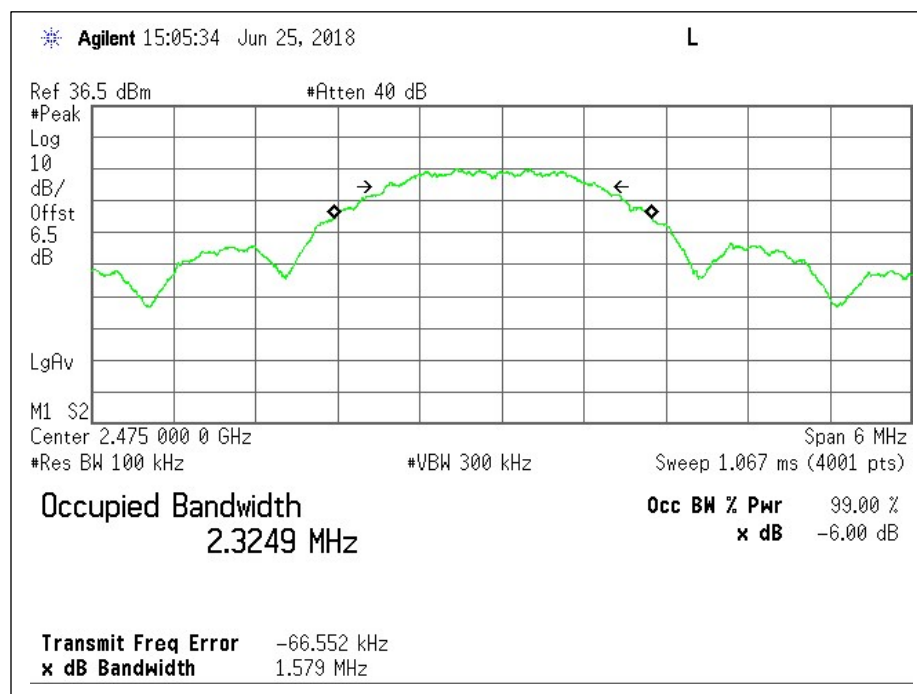
Antenna 1: High Channel – Plot



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)
MA	RF Lab	06/29/18	21.2	60.9	1005	P

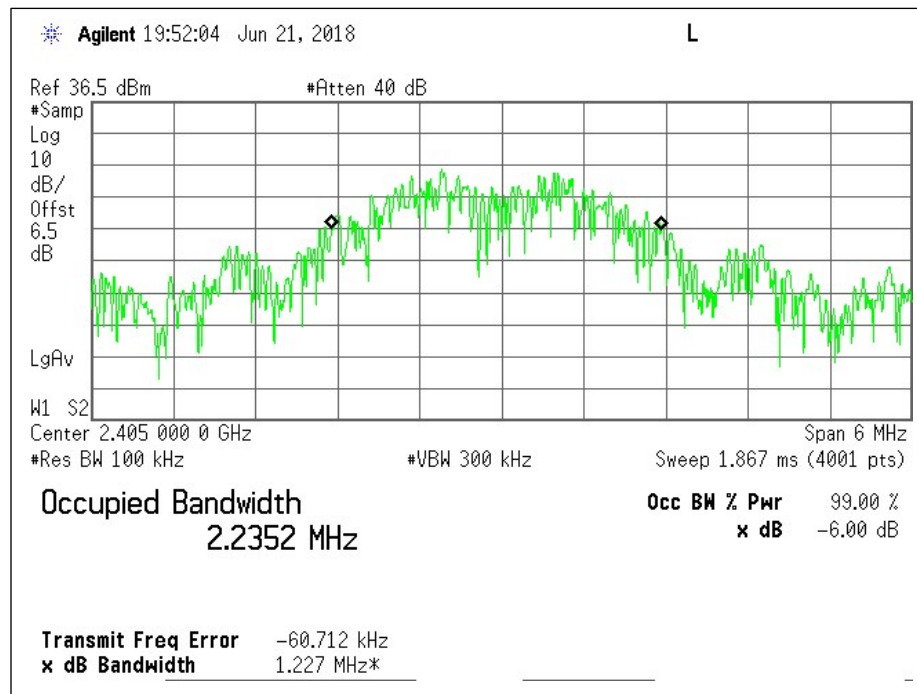
Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

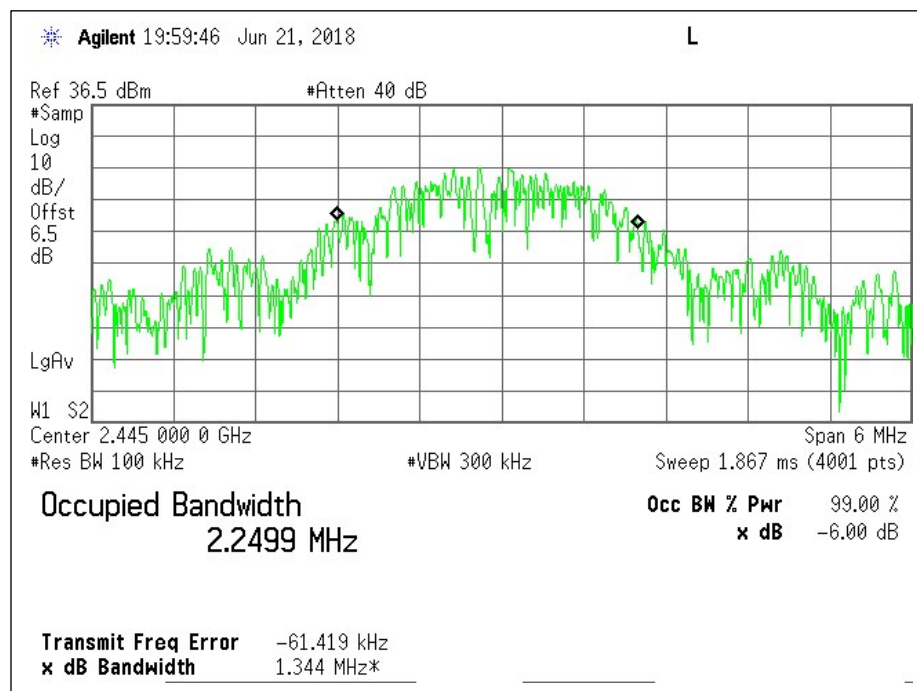
Test Results

Channel	Frequency (GHz)	99% Bandwidth (in MHz)	
		Antenna 1	Antenna 2
Low	2.405	2.2352	2.2301
Mid	2.445	2.2499	2.2599
High	2.475	2.2735	2.2852

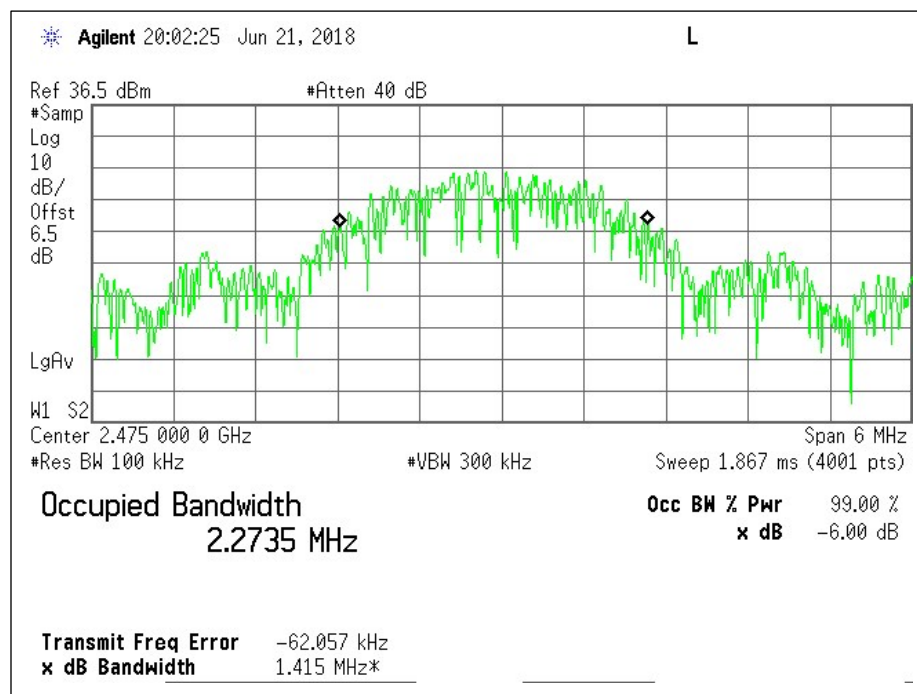
99% Occupied Bandwidth



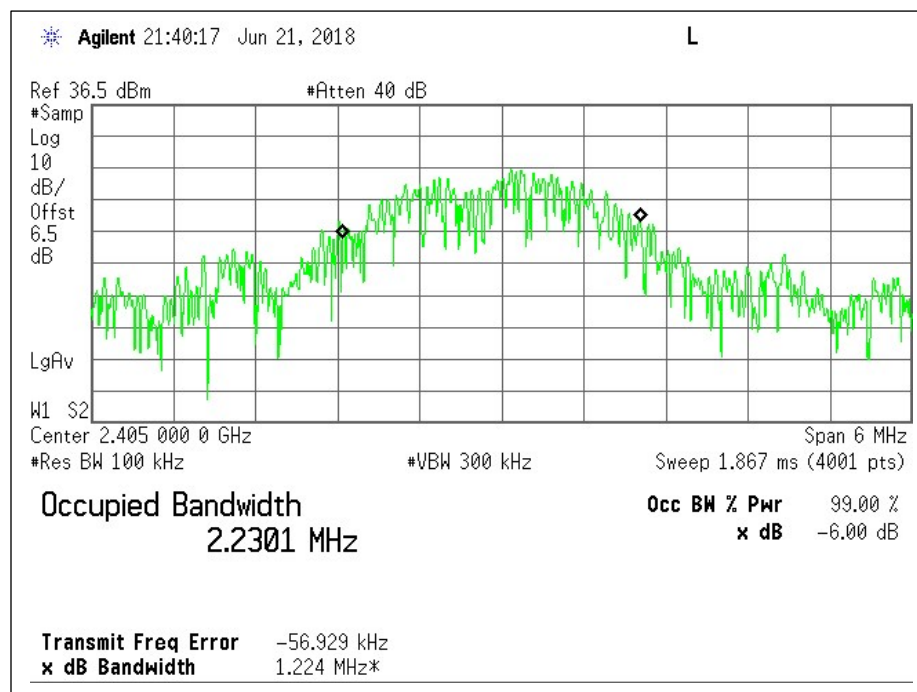
Antenna 1: Low Channel - Plot



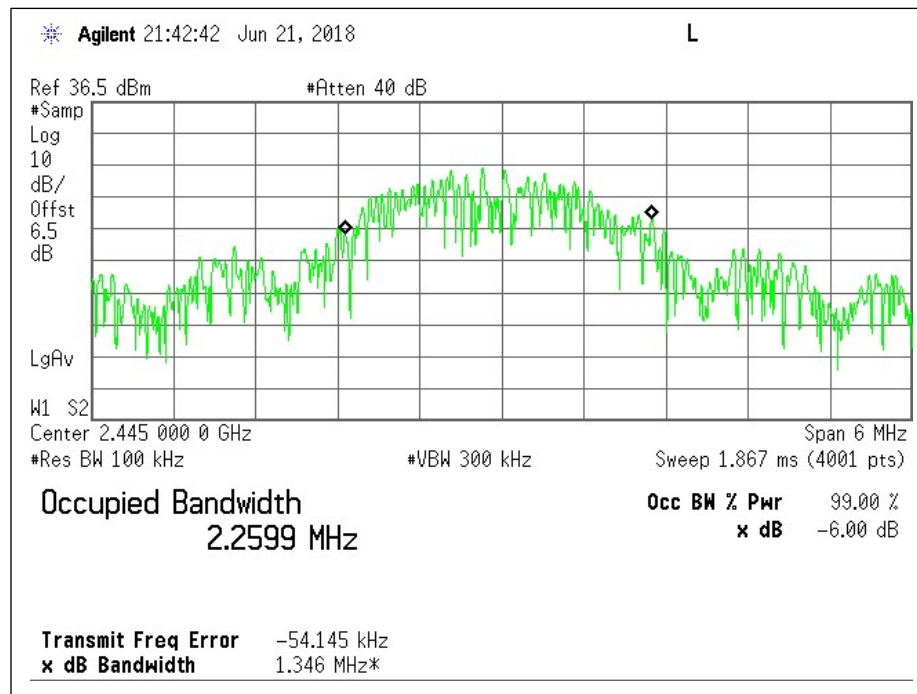
Antenna 1: Mid Channel - Plot



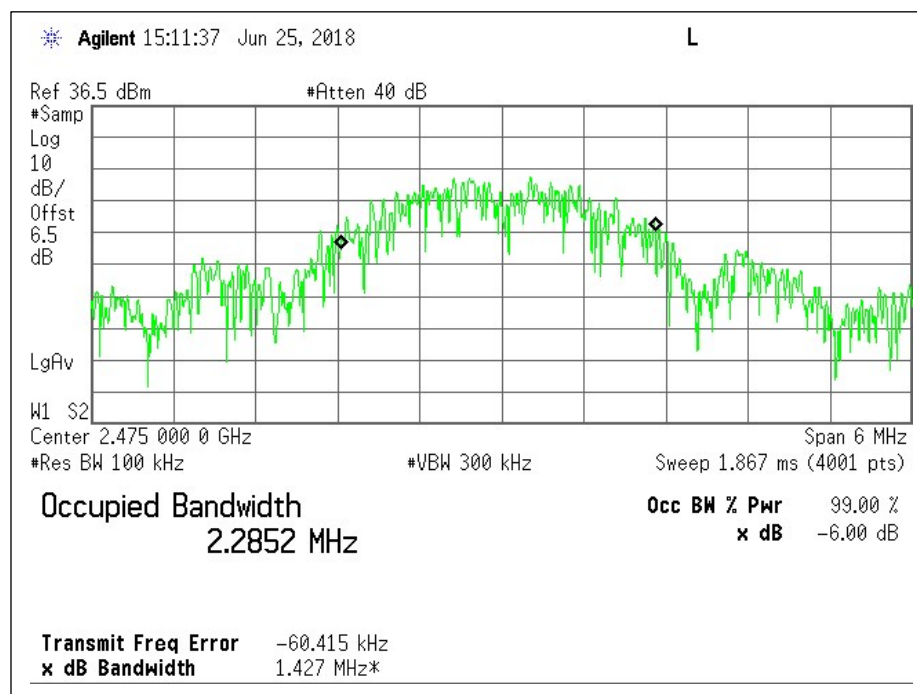
Antenna 1: High Channel – Plot



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)
MA	RF Lab	06/29/18	21.2	60.9	1005	P

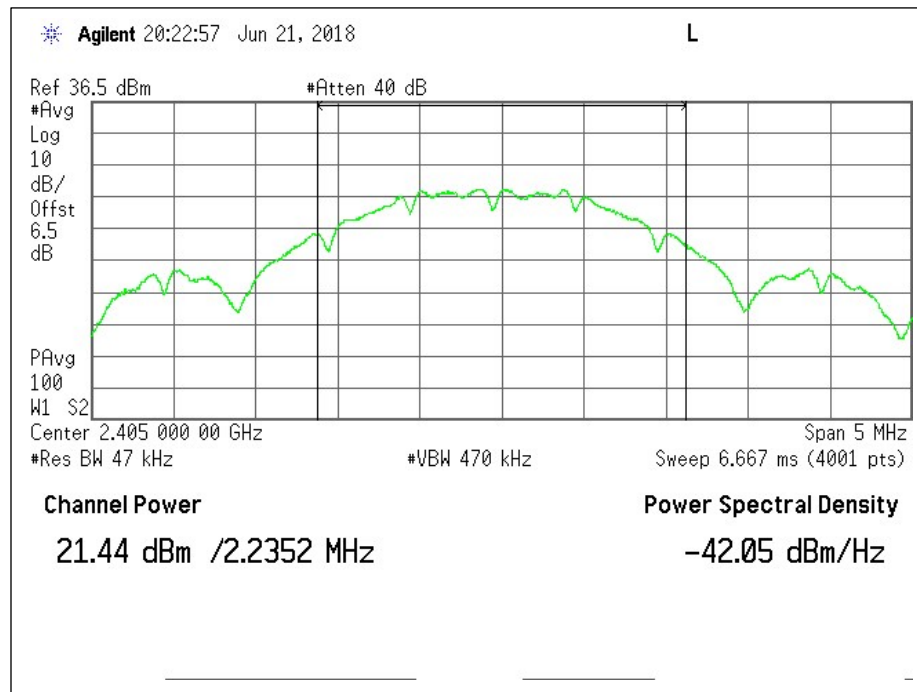
Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

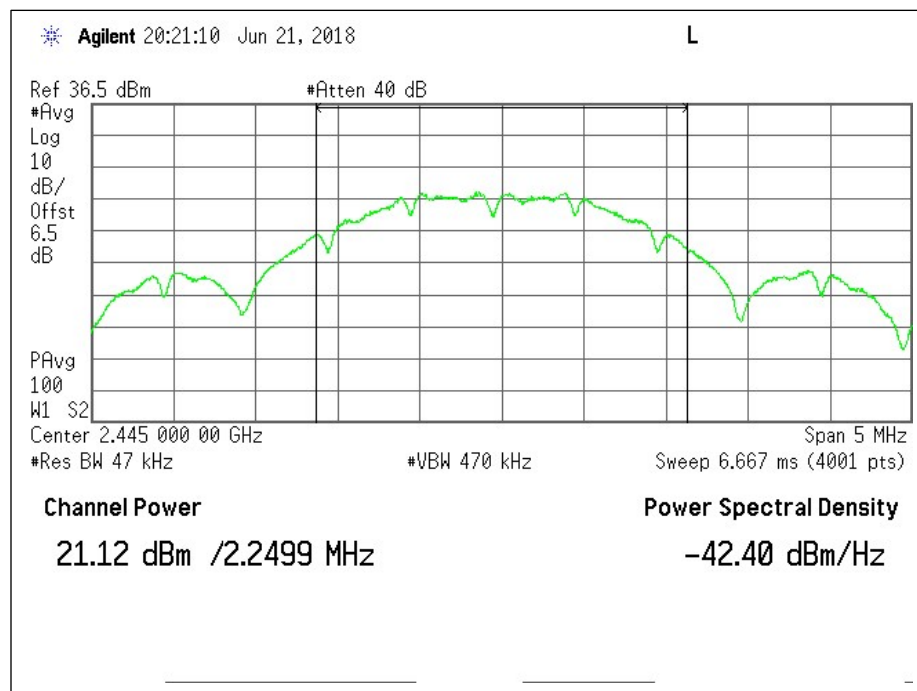
Test Results

Channel	Frequency (GHz)	Tx Channel BW Power (dBm)	
		Antenna 1	Antenna 2
Low	2.405	21.44	20.75
Mid	2.445	21.12	19.82
High	2.475	20.79	19.49

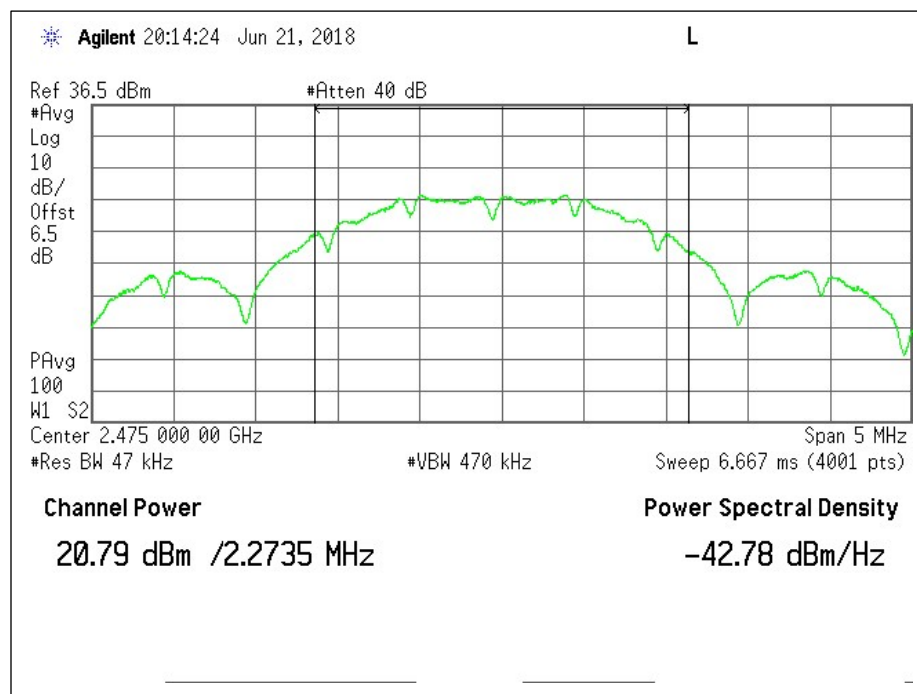
Output Power



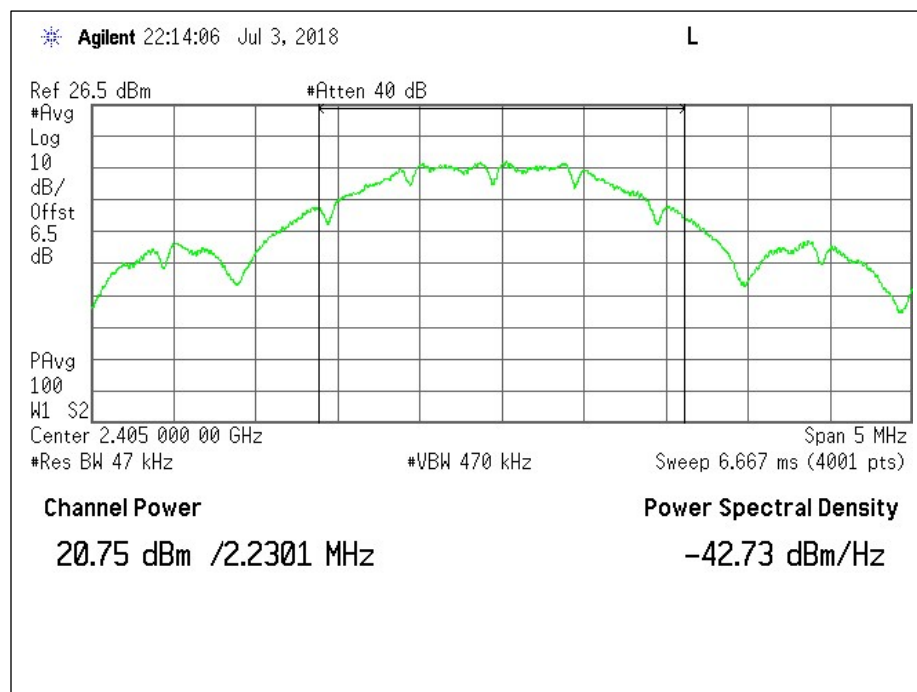
Antenna 1: Low Channel - Plot



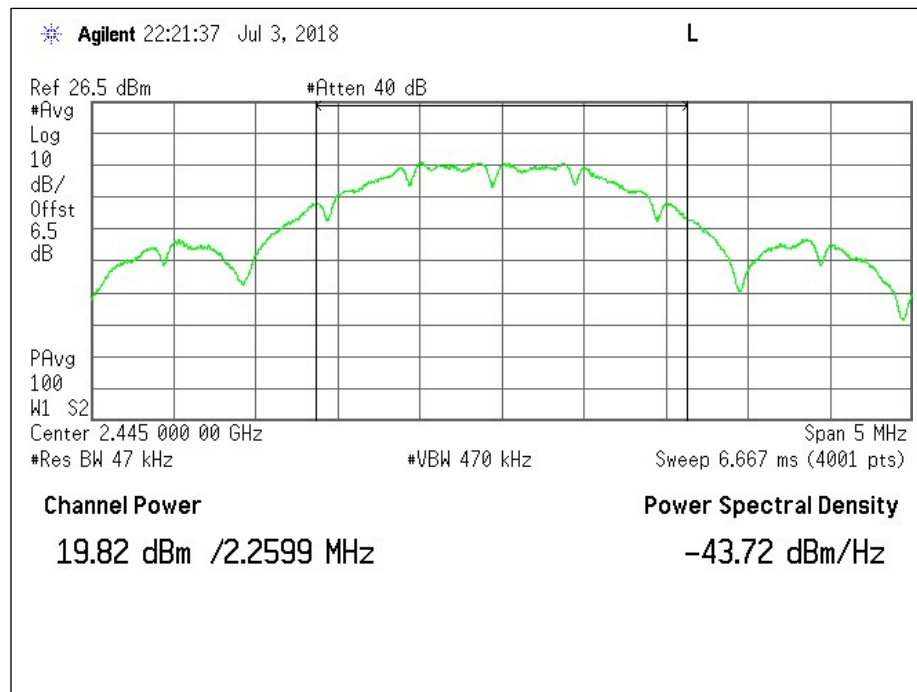
Antenna 1: Mid Channel - Plot



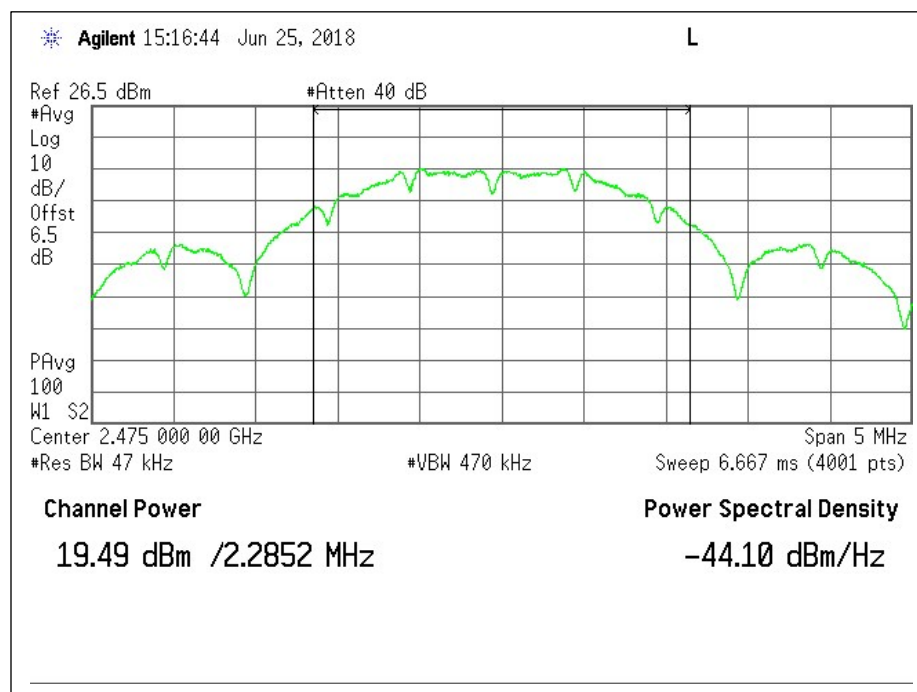
Antenna 1: High Channel – Plot



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 AVGPSD-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	06/29/18	21.2	60.9	1005	P

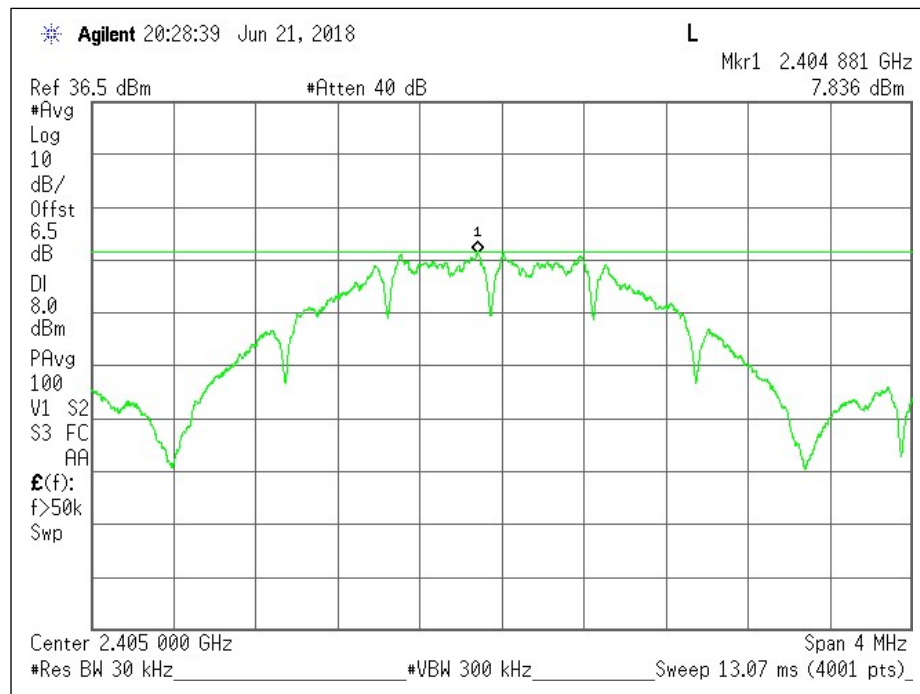
Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

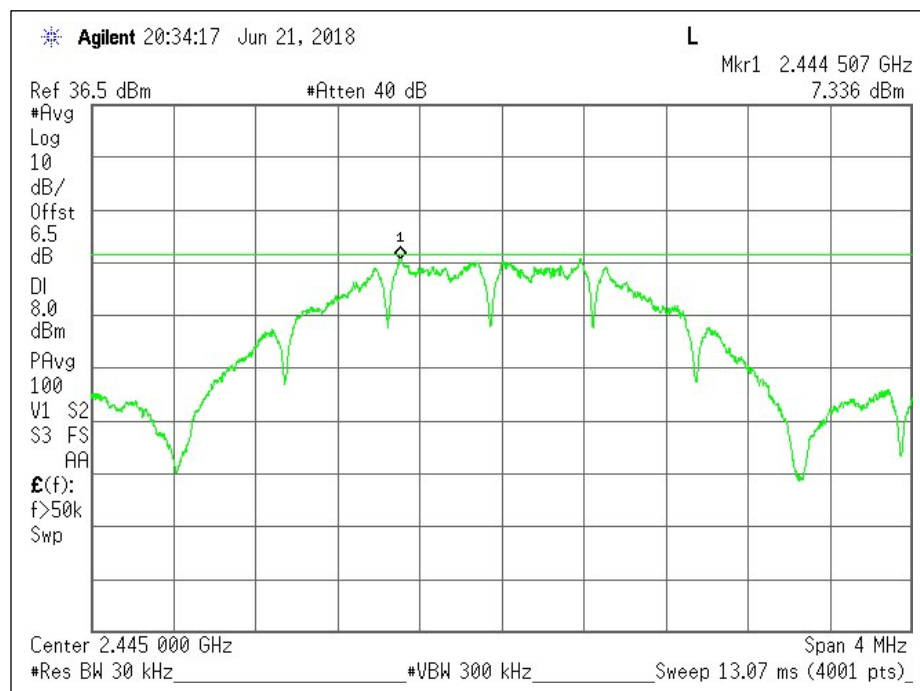
Test Results

Channel	Frequency (GHz)	Max Power (dBm)	
		Antenna 1	Antenna 2
Low	2.405	7.836	7.006
Mid	2.445	7.336	6.081
High	2.475	7.322	5.739

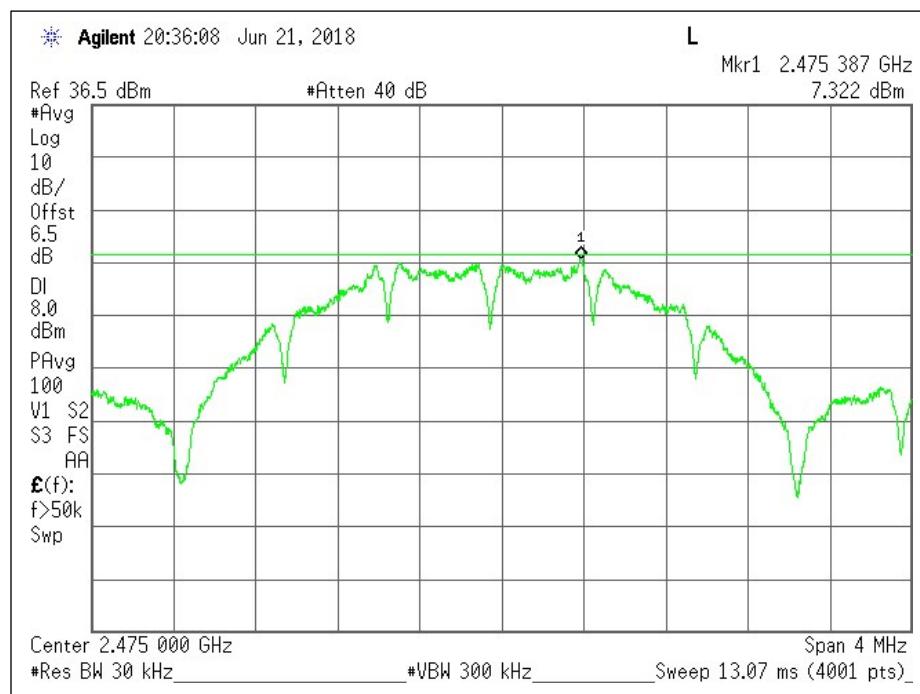
PSD



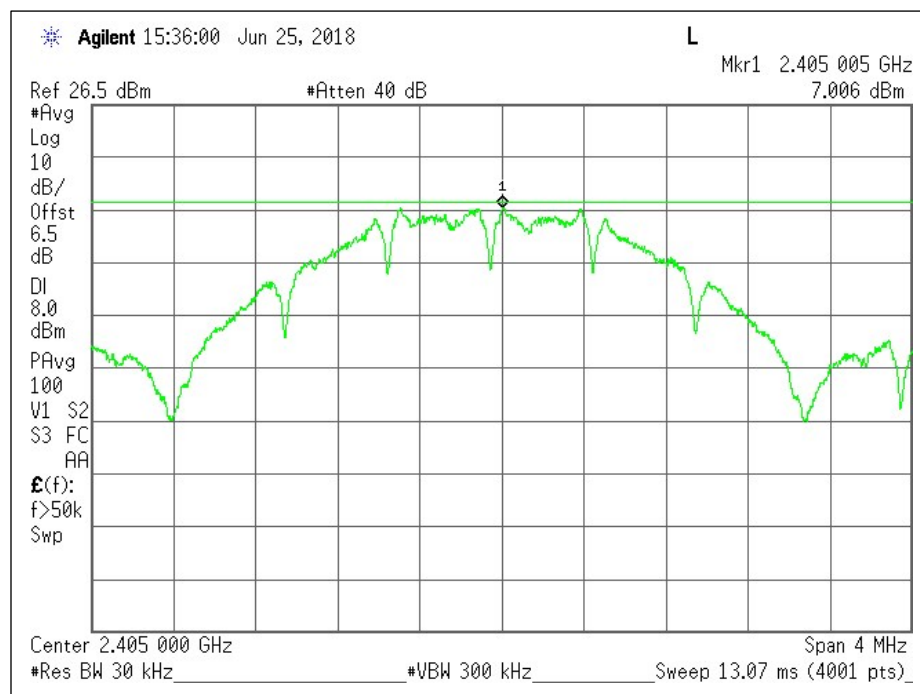
Antenna 1: Low Channel - Plot



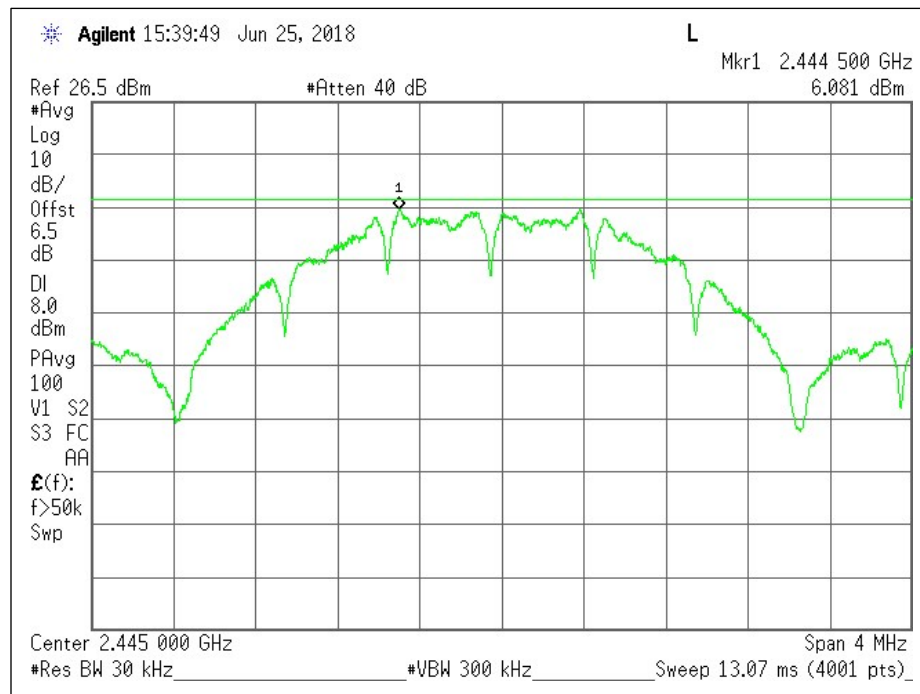
Antenna 1: Mid Channel - Plot



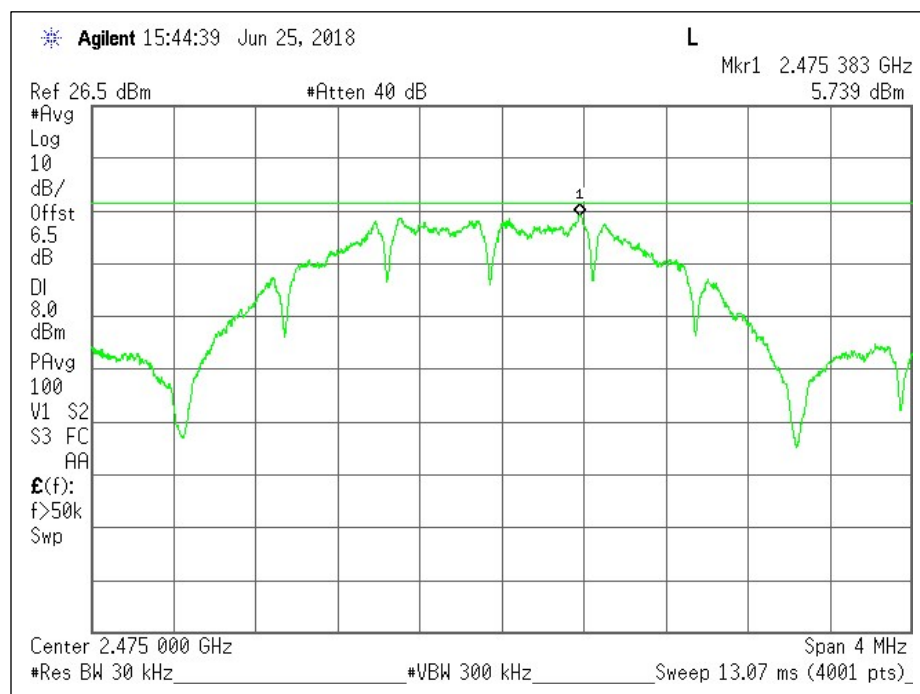
Antenna 1: High Channel – Plot



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	06/29/18	21.2	60.9	1005	P

Equipment List

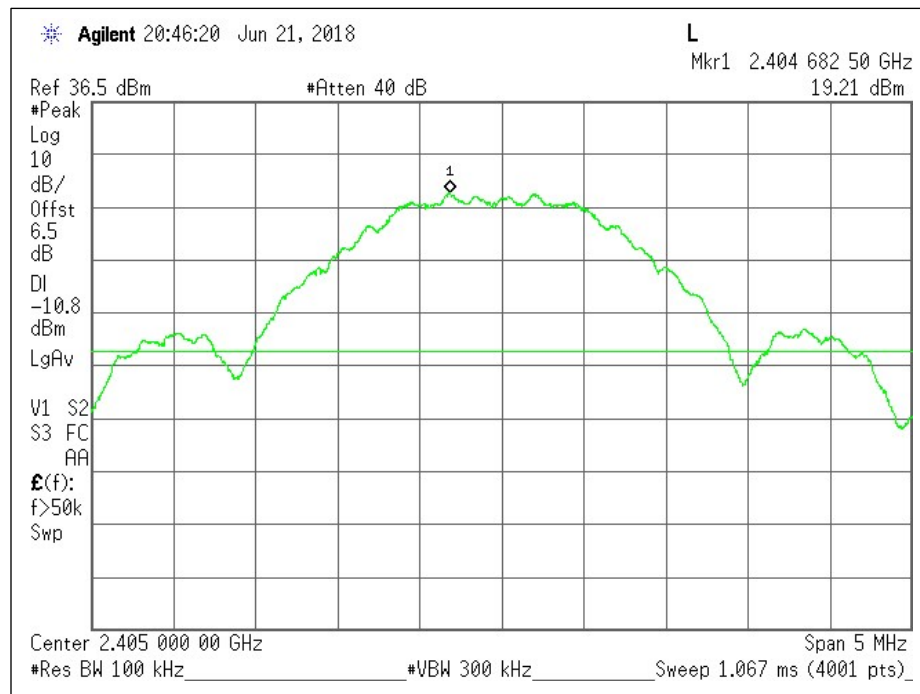
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

Test Results

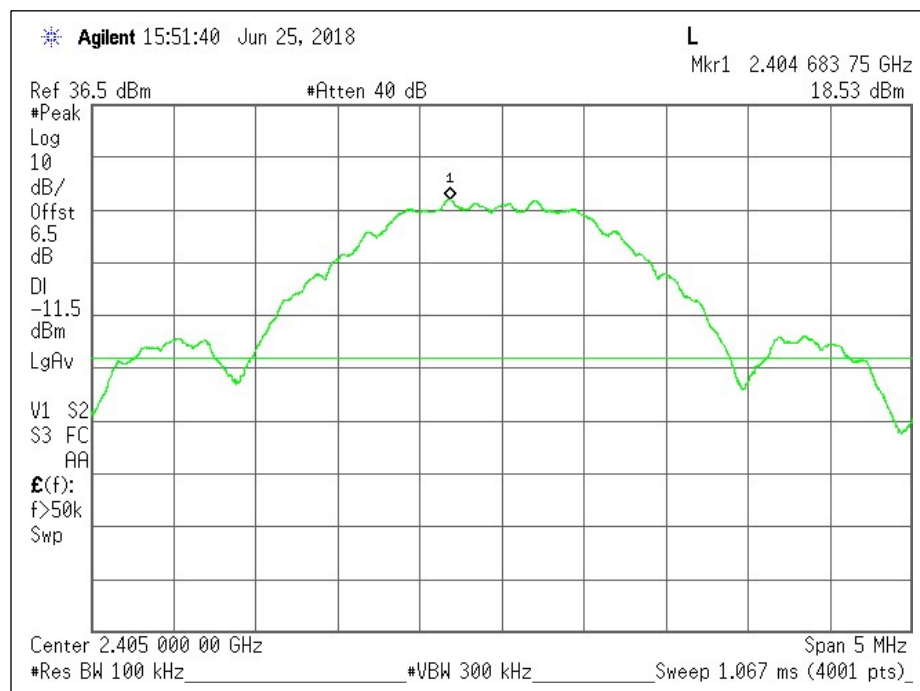
Authorized Band Edge					
Antenna	Channel	Frequency (GHz)	Delta from Peak to Bandedge (dB)	Limit (dB)	Margin (dB)
1	Low	2.405	44.28	30	-14.28
	High	2.475	61.43	30	-31.43
2	Low	2.405	43.15	30	-13.15
	High	2.475	60.79	30	-30.79

Conducted Spurious			
Channel	Frequency (GHz)	Highest Spurious Emission Delta from the -30dB down Limit (dB)	
		Antenna 1	Antenna 2
Low	2.405	-37.6	-31.22
Mid	2.445	-40.61	-34.6
High	2.475	-43.74	-36.32

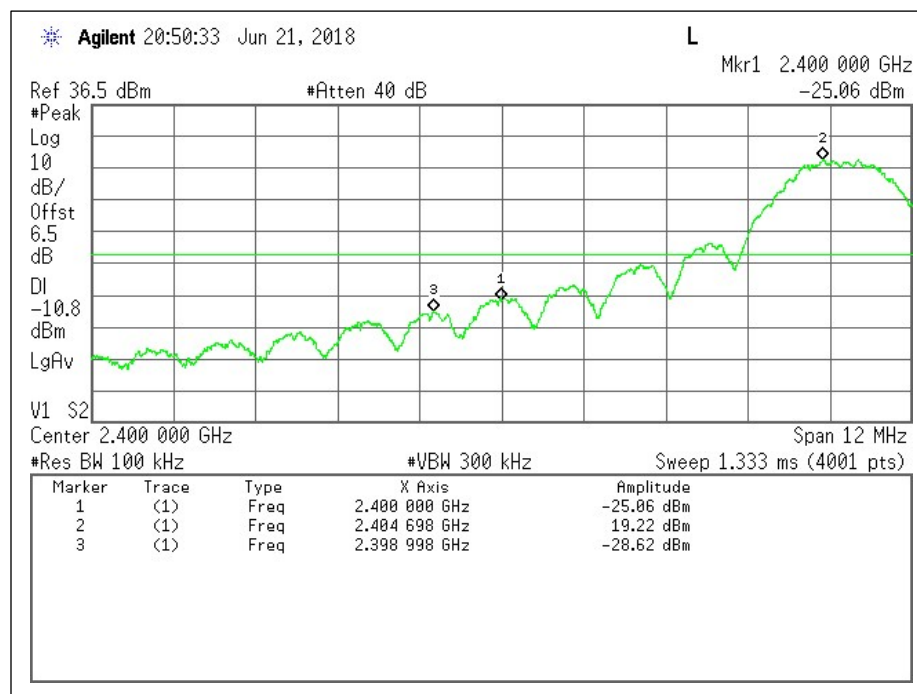
Band Edge



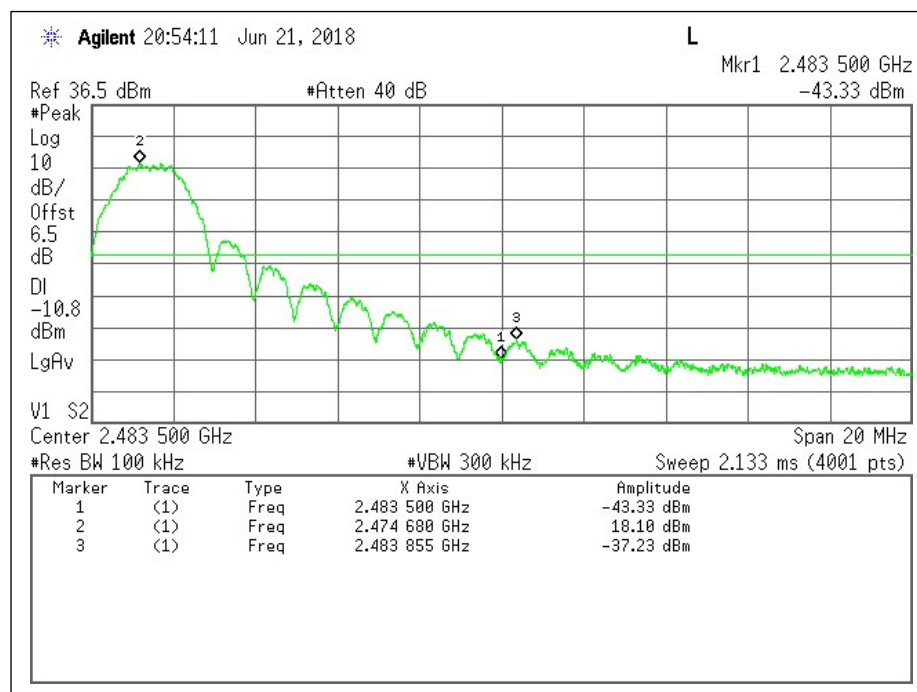
Antenna 1: Reference Channel - Plot



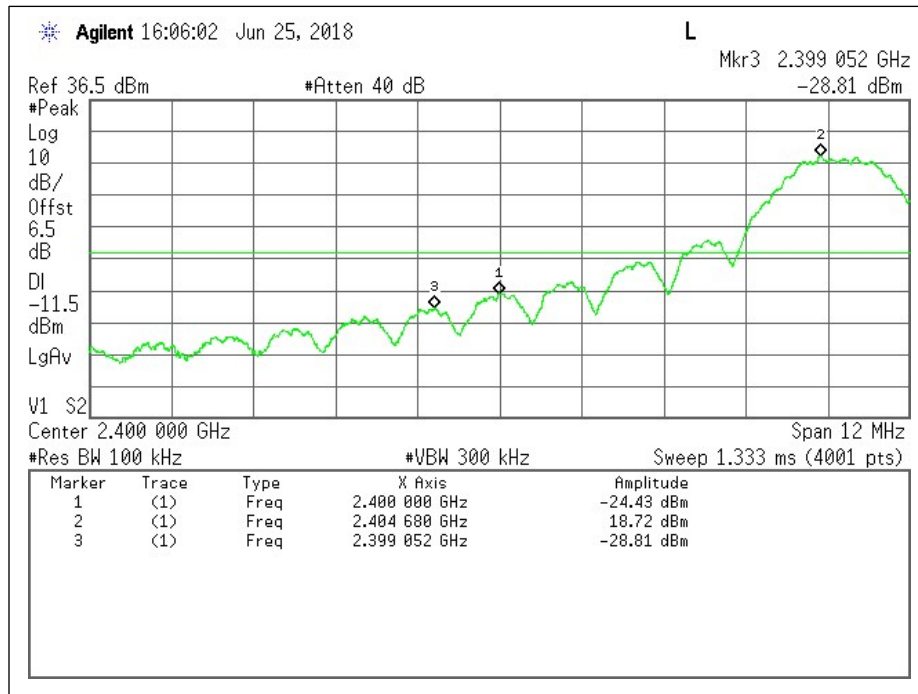
Antenna 2: Reference Channel – Plot



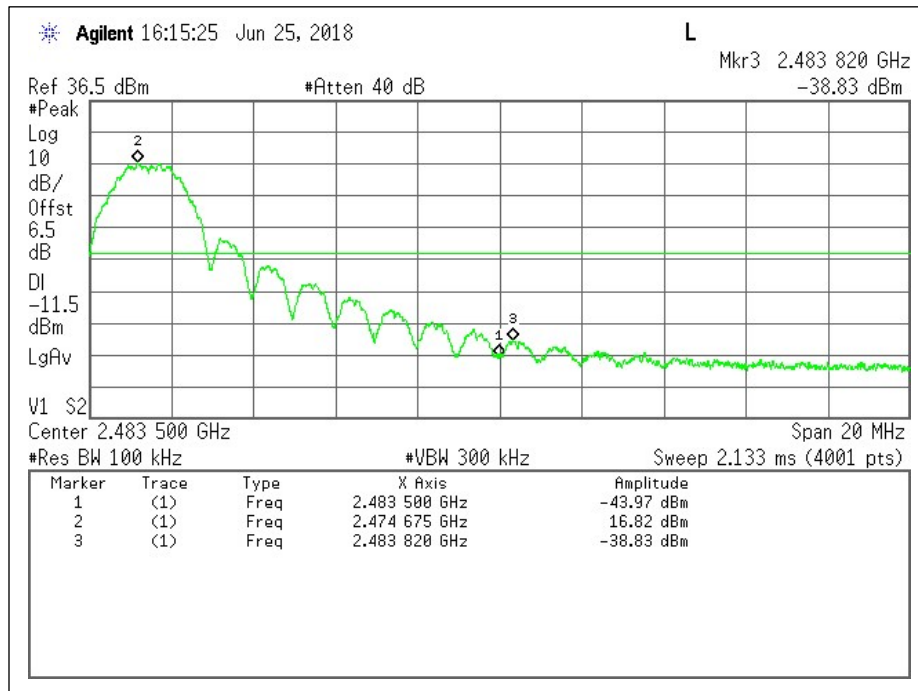
Antenna 1: Low Channel - Plot



Antenna 1: High Channel – Plot

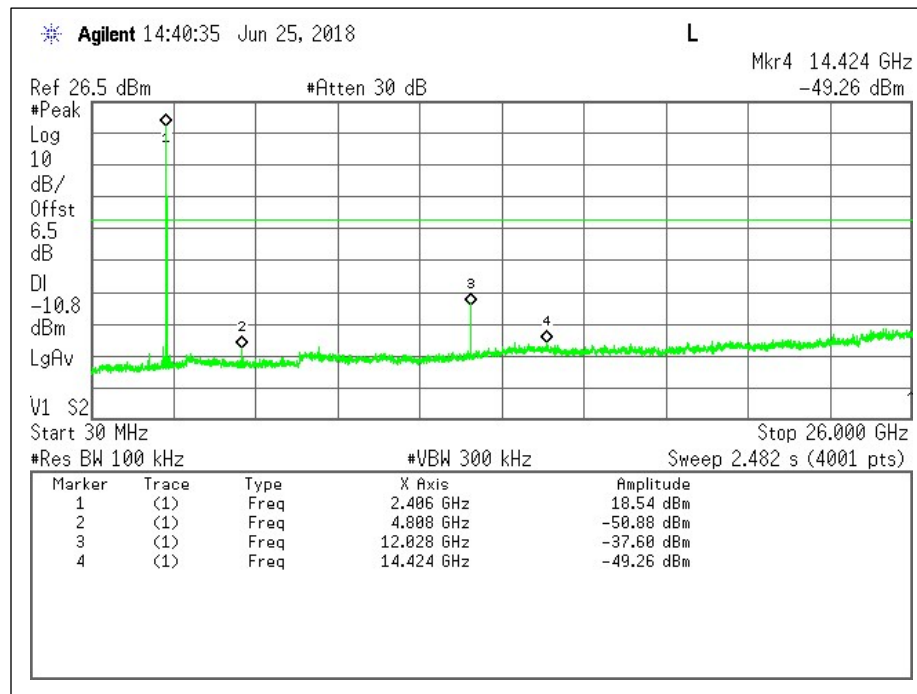


Antenna 2: Low Channel - Plot

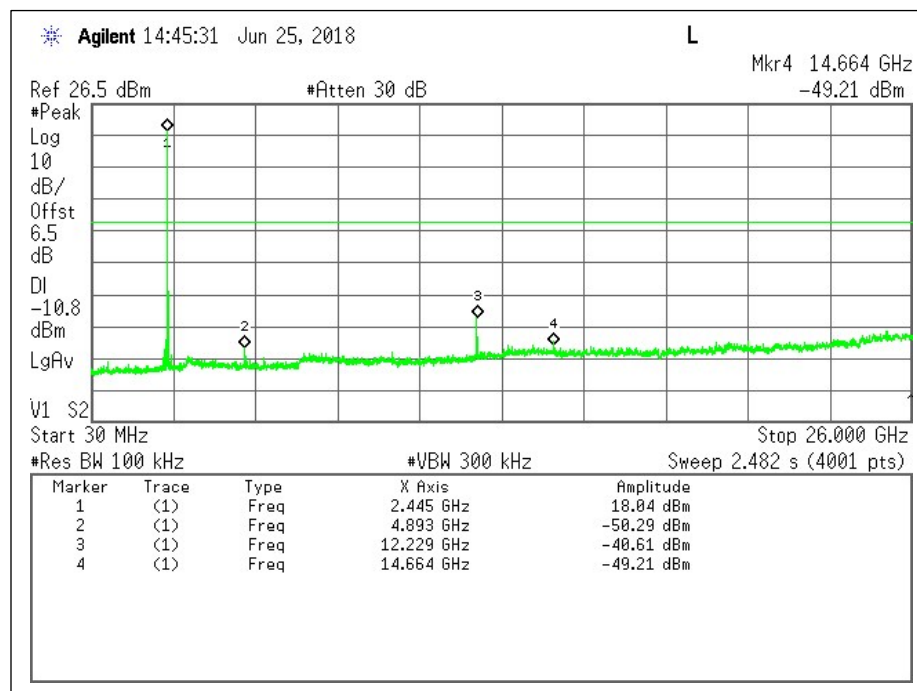


Antenna 2: High Channel - Plot

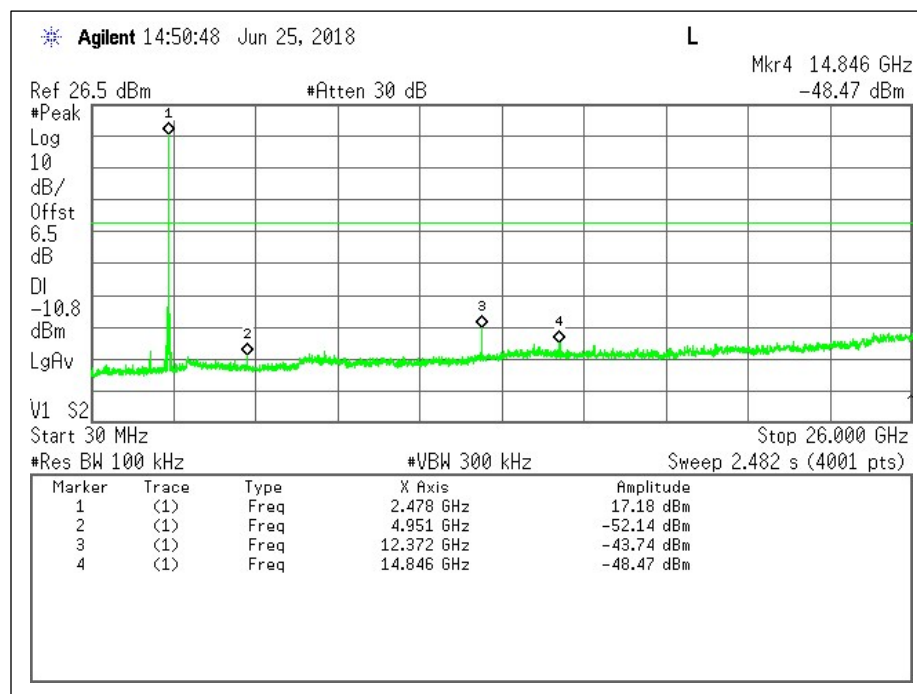
Conducted Spurious



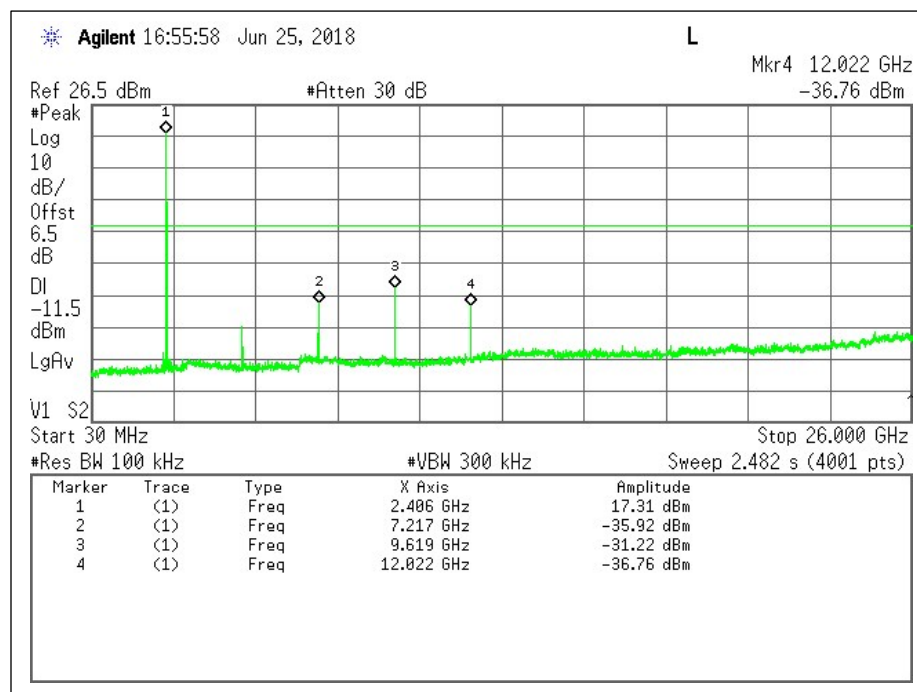
Antenna 1: Low Channel - Plot



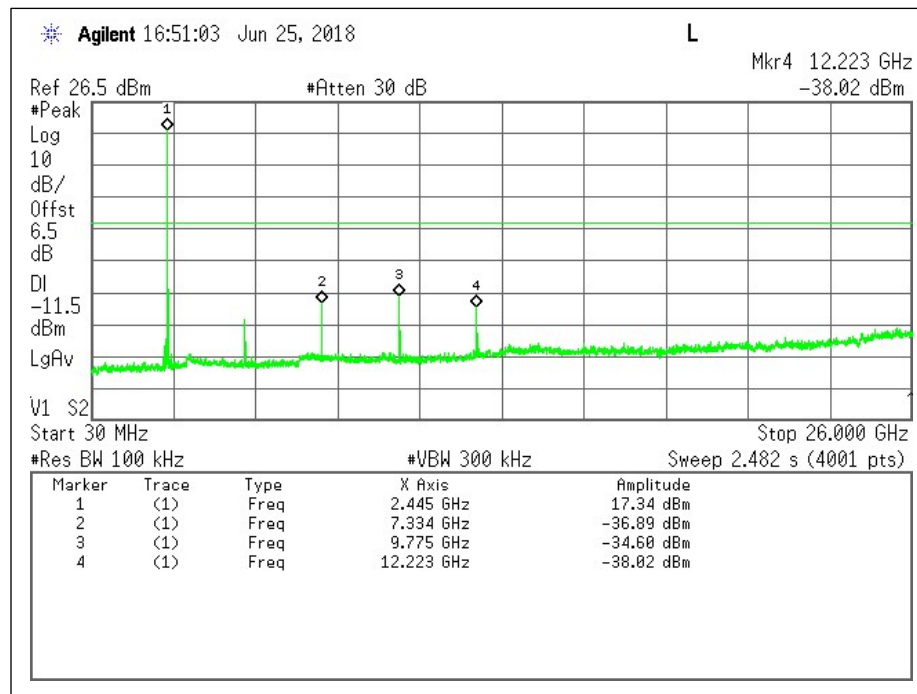
Antenna 1: Mid Channel - Plot



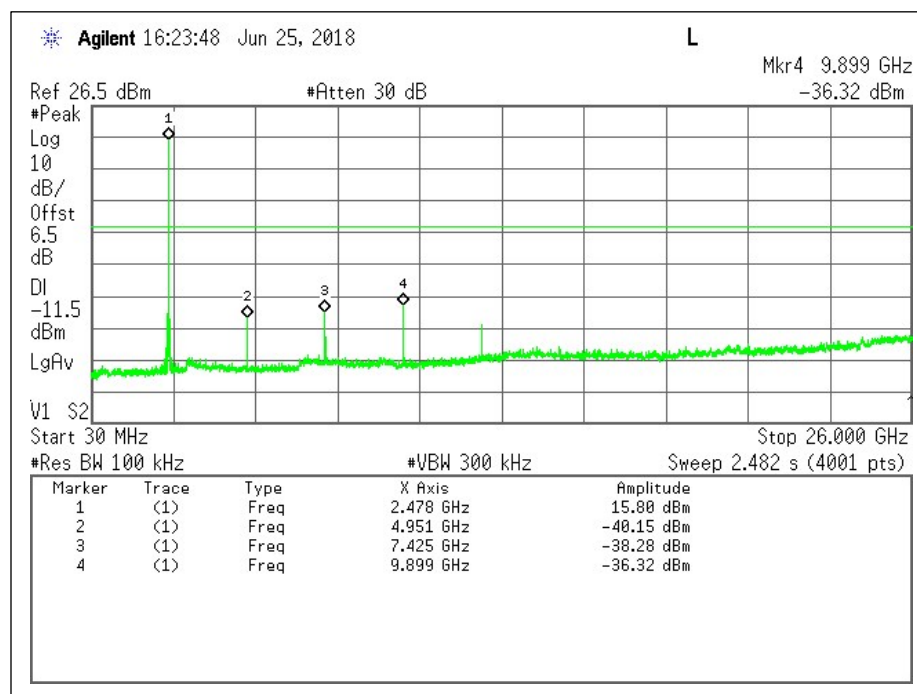
Antenna 1: High Channel – Plot



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	07/10/18-07/13/18	29.4	65	1009	P

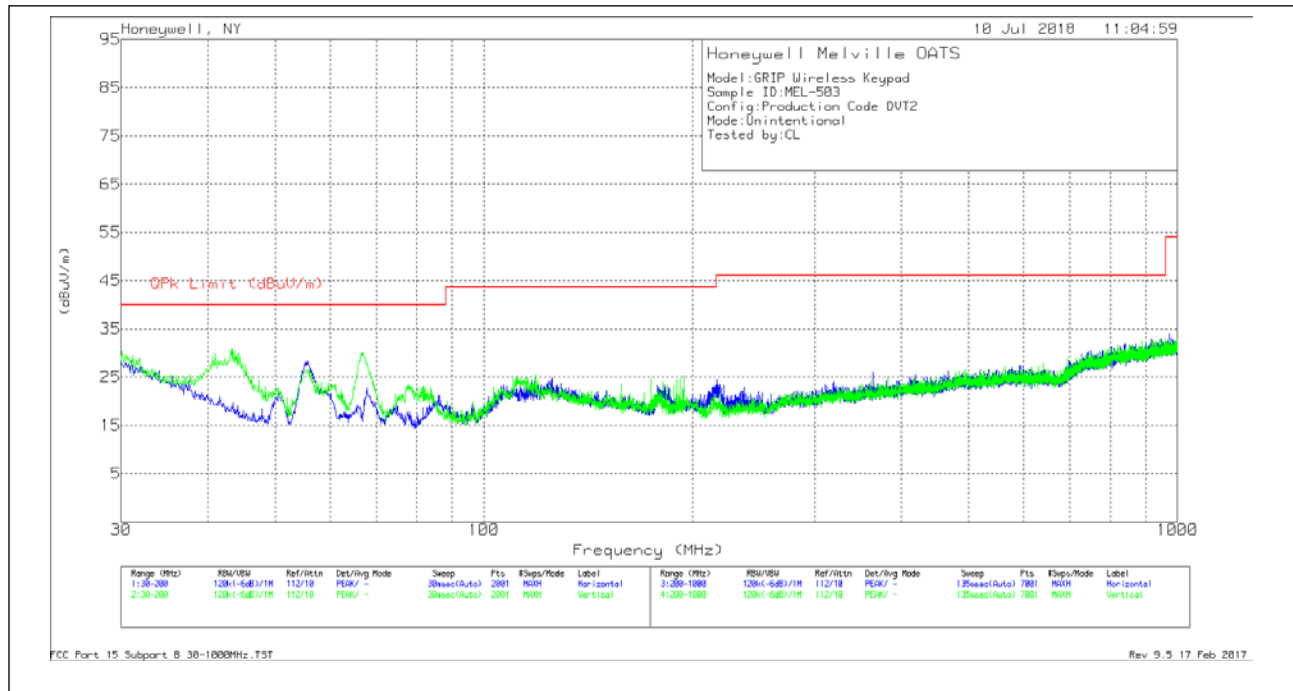
NOTE: Prescans performed in an anechoic chamber, final measurements performed on an OATS.

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
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	Amplical	AMP1G18-35	N/A	N/A
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
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
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

Test Results

Below 1GHz



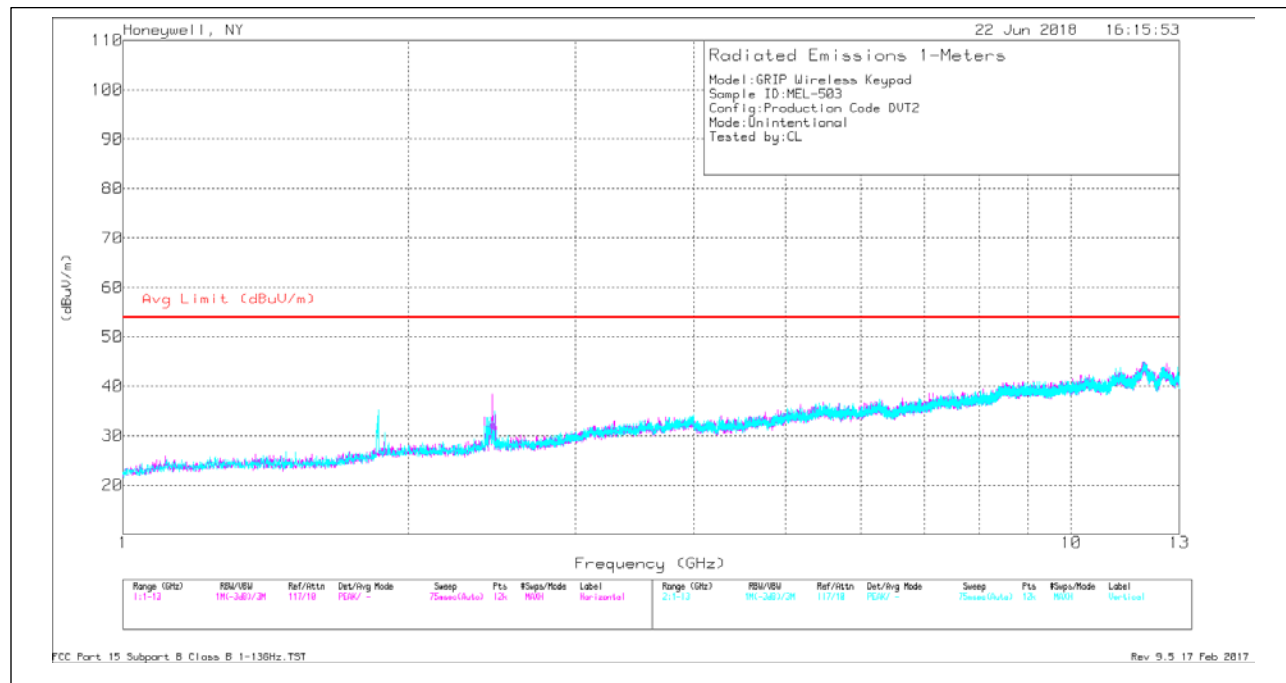
Plot

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
31.3125	12.61	Qp	23.9	.9	37.41	40	-2.59	80	207	H
55.2355	15.66	Qp	12	1.1	28.76	40	-11.24	202	396	H
67.2449	14.6	Qp	12	1.3	27.9	40	-12.1	132	399	H
30.3811	11.08	Qp	24.6	.9	36.58	40	-3.42	150	245	V
43.0104	12.77	Qp	16.1	1	29.87	40	-10.13	22	382	V
66.8272	25.92	Qp	12	1.3	39.22	40	-.78	28	344	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
1.267	39	Av	25.5	-41.1	2	1.8	27.2	54	-26.8	201	133	H
4.001	28.1	Av	32.8	-41	3.4	3.3	26.6	54	-27.4	359	150	H
11.987	23.65	Av	39.5	-38.1	6.6	5.7	37.35	54	-16.65	337	237	H
6.279	24.23	Av	34.9	-39.8	4.3	4.2	27.83	54	-26.17	241	357	V
11.139	23.17	Av	38.6	-38.6	6	5.8	34.97	54	-19.03	16	324	V
2	32.06	Av	27.9	-42.6	2.4	2.3	22.06	54	-31.94	130	332	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.

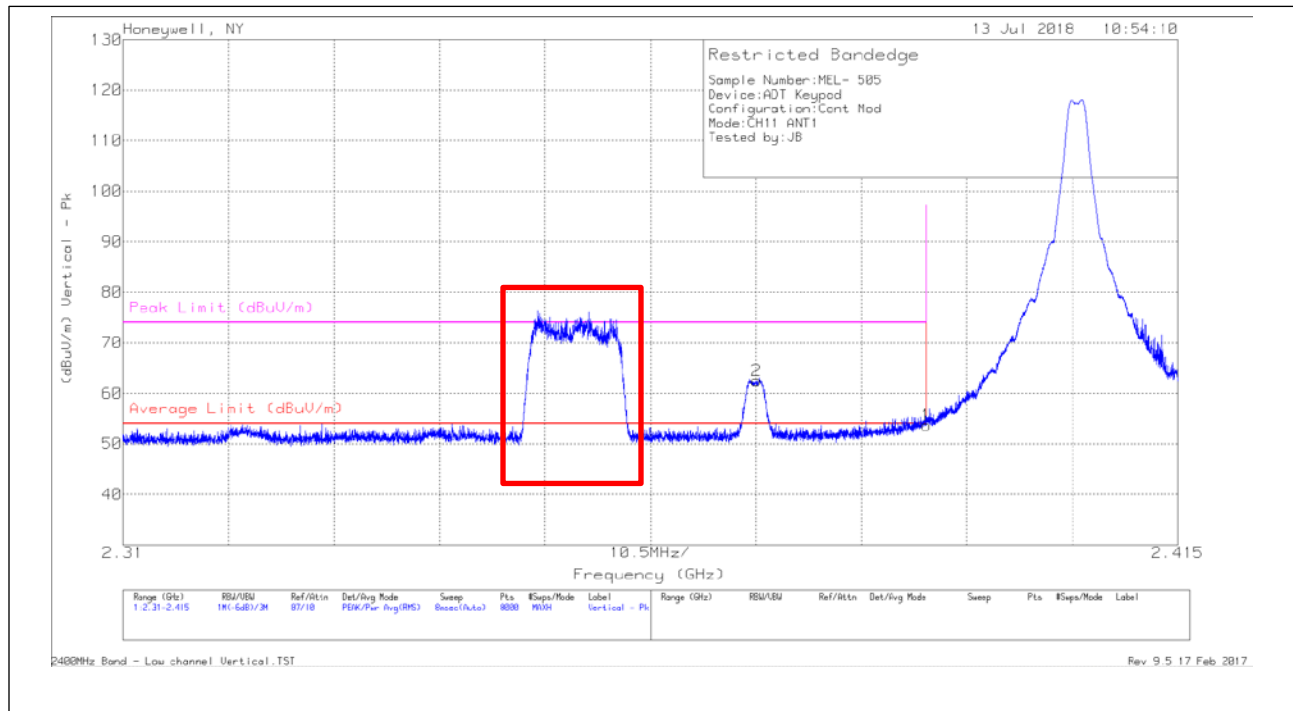
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL/JB/MA	RF Chamber/OATS	07/03/18-07/17/18	29.4	65	1009	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 reported 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	Amplical	AMP1G18-35	N/A	N/A
Preamp (18-40GHz)	11541	160911	Amplical	AMP18G40-35	N/A	N/A
Band Reject Filter	11553	G041	Micro-tronics	BRM50702-01	N/A	N/A
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
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
High Pass Filter	11552	G018	Micro-tronics	HPM50111-01	N/A	N/A
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



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	19.43	Pk	28.5	.7	2.6	2.5	-	53.73	74	-20.27	256	330	V
2	* 2.373	28.24	Pk	28.4	.7	2.6	2.5	-	62.44	74	-11.56	256	330	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	19.43	Av	28.5	.7	2.6	2.5	-22.9	30.83	54	-23.17	256	330	V
2	* 2.373	28.24	Av	28.4	.7	2.6	2.5	-22.9	39.54	54	-14.46	256	330	V

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

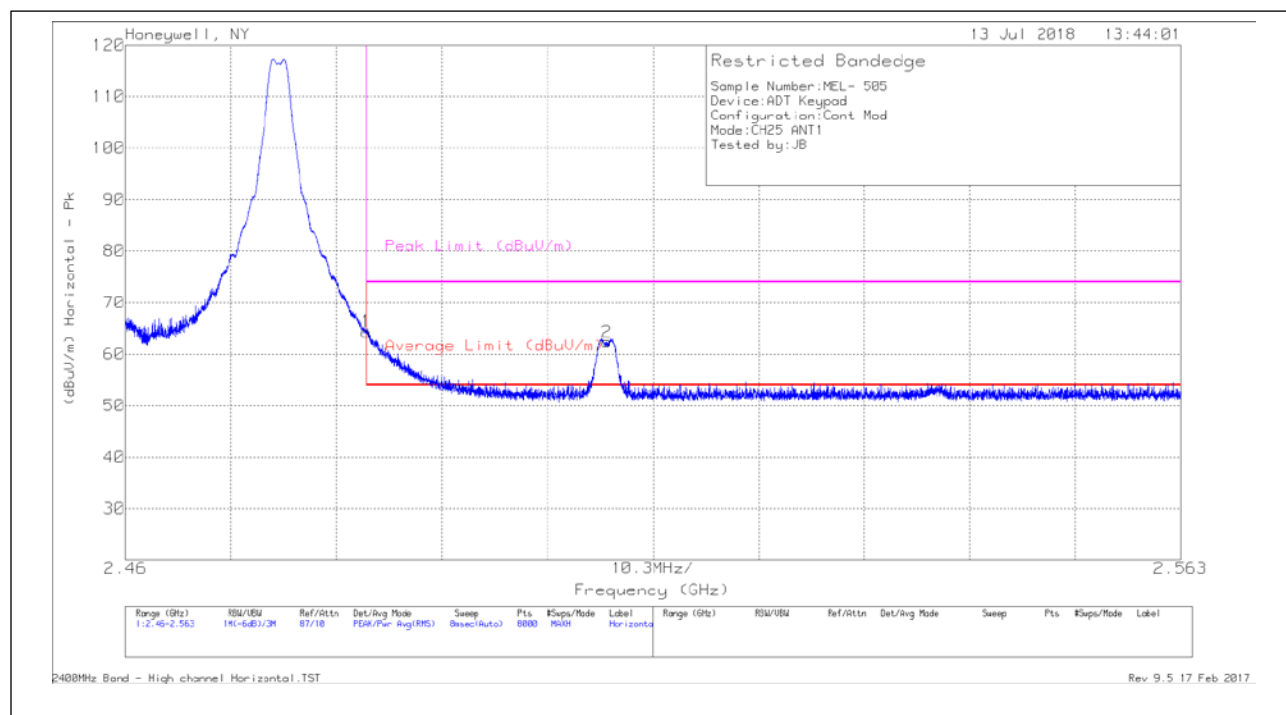
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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.

Antenna 1: Low Channel Vertical - 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	29.75	Pk	28.7	.7	2.6	2.6	-	64.35	74	-9.65	319	314	H
2	2.507	27.54	Pk	28.8	.7	2.7	2.6	-	62.34	74	-11.66	319	314	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	29.75	Av	28.7	.7	2.6	2.6	-22.9	41.45	54	-12.55	319	314	H
2	2.507	27.54	Av	28.8	.7	2.7	2.6	-22.9	39.44	54	-14.56	319	314	H

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

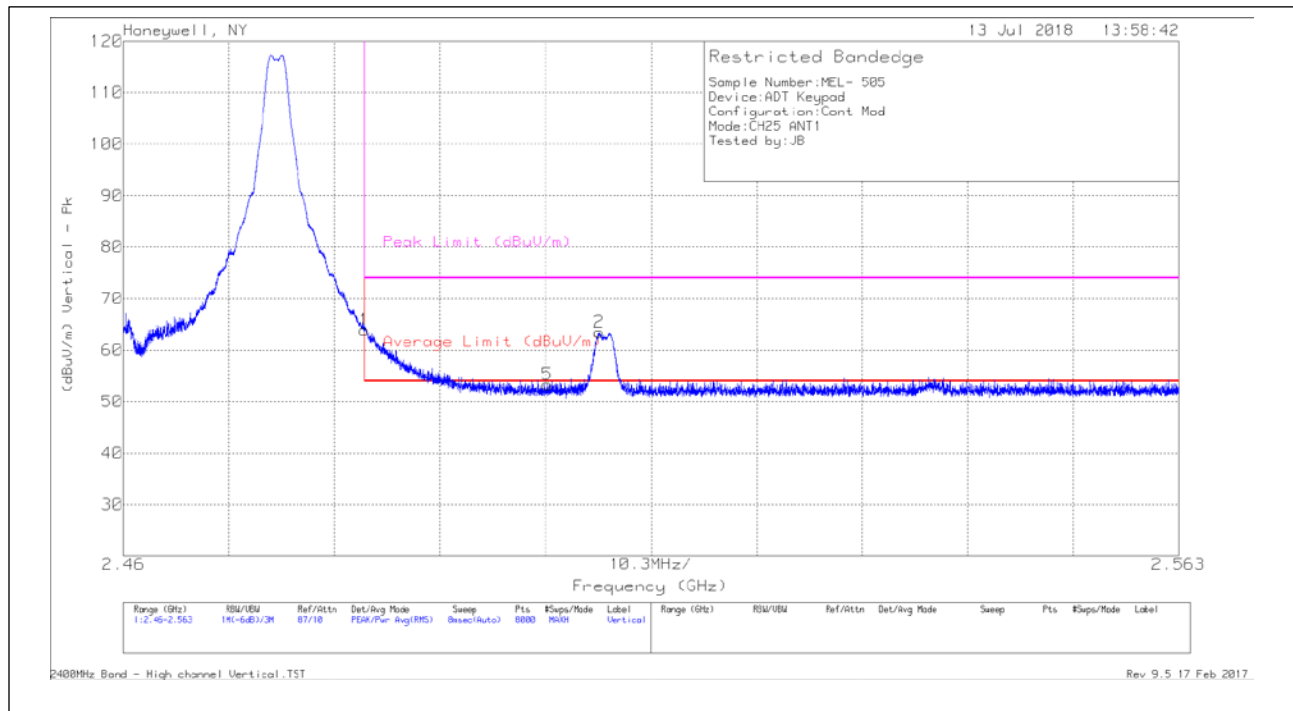
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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

Antenna 1: High Channel Horizontal - 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	29.3	Pk	28.7	.7	2.6	2.6	-	63.9	74	-10.1	271	277	V
2	2.506	28.71	Pk	28.8	.7	2.7	2.6	-	63.51	74	-10.49	271	277	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	29.3	Av	28.7	.7	2.6	2.6	-22.9	41	54	-13	271	277	V
2	2.506	28.71	Av	28.8	.7	2.7	2.6	-22.9	40.61	54	-13.39	271	277	V

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

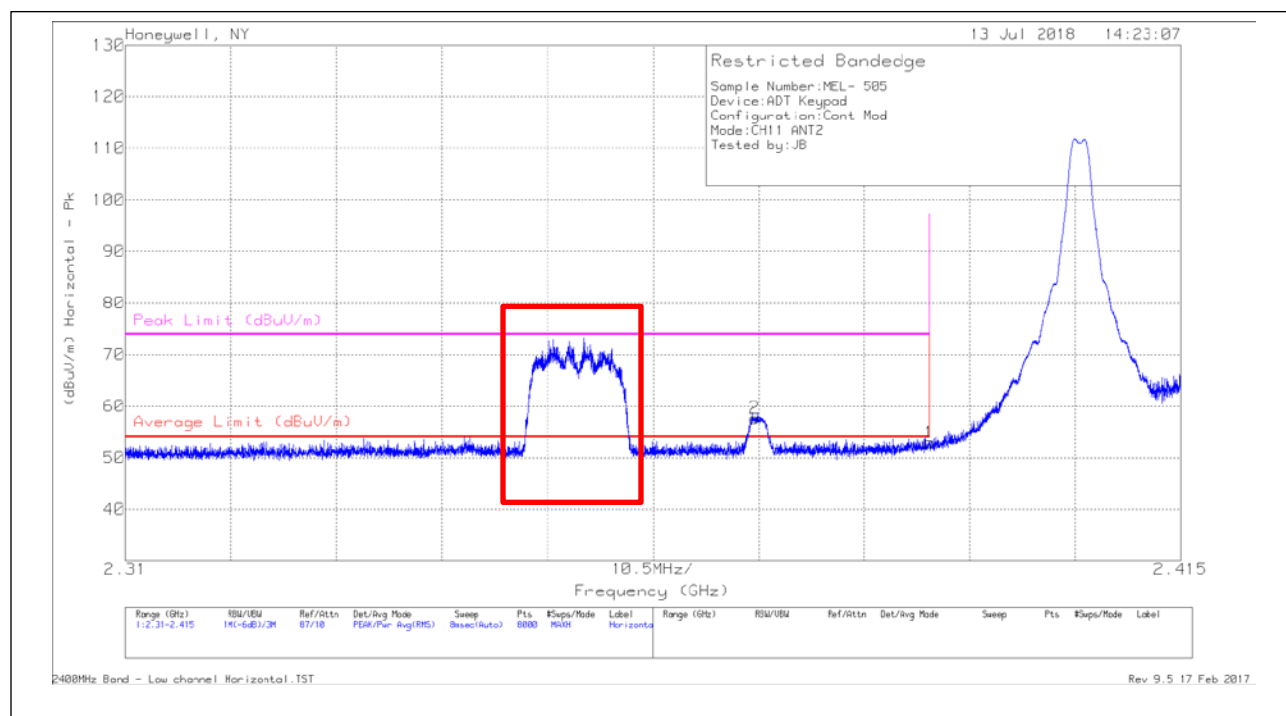
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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

Antenna 1: High Channel Vertical - 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	18.67	Pk	28.5	.7	2.6	2.5	-	52.97	74	-21.03	130	236	H
2	* 2.373	23.48	Pk	28.4	.7	2.6	2.5	-	57.68	74	-16.32	130	236	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	18.67	Av	28.5	.7	2.6	2.5	-22.9	30.07	54	-23.93	130	236	H
2	* 2.373	23.48	Av	28.4	.7	2.6	2.5	-22.9	34.78	54	-19.22	130	236	H

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

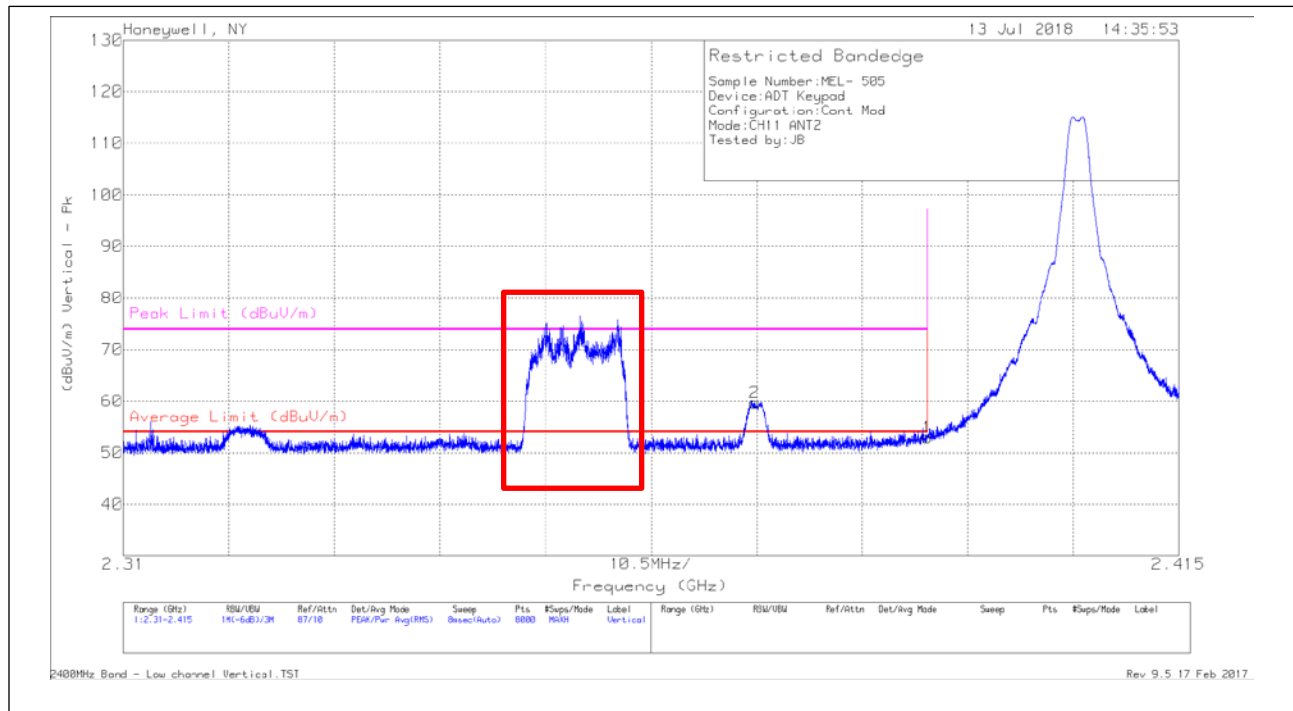
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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.

Antenna 2: Low Channel Horizontal - 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	18.67	Pk	28.5	.7	2.6	2.5	-	52.97	74	-21.03	107	249	V
2	* 2.373	25.47	Pk	28.4	.7	2.6	2.5	-	59.67	74	-14.33	107	249	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	18.67	Av	28.5	.7	2.6	2.5	-22.9	30.07	54	-23.93	107	249	V
2	* 2.373	25.47	Av	28.4	.7	2.6	2.5	-22.9	36.77	54	-17.23	107	249	V

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

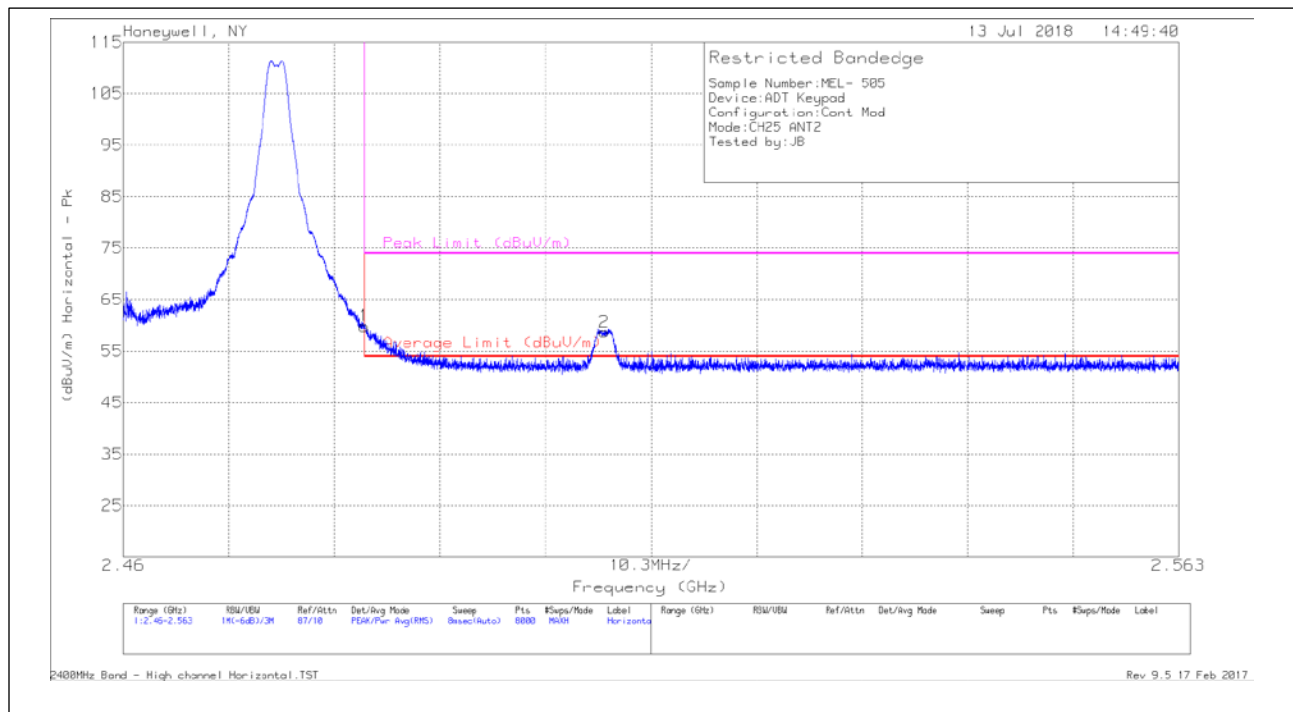
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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.

Antenna 2: Low Channel Vertical - 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	25.26	Pk	28.7	.7	2.6	2.6	-	59.86	74	-14.14	125	198	H
2	2.507	23.88	Pk	28.8	.7	2.7	2.6	-	58.68	74	-15.32	125	198	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	25.26	Av	28.7	.7	2.6	2.6	-22.9	36.96	54	-17.04	125	198	H
2	2.507	23.88	Av	28.8	.7	2.7	2.6	-22.9	35.58	54	-18.42	125	198	H

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

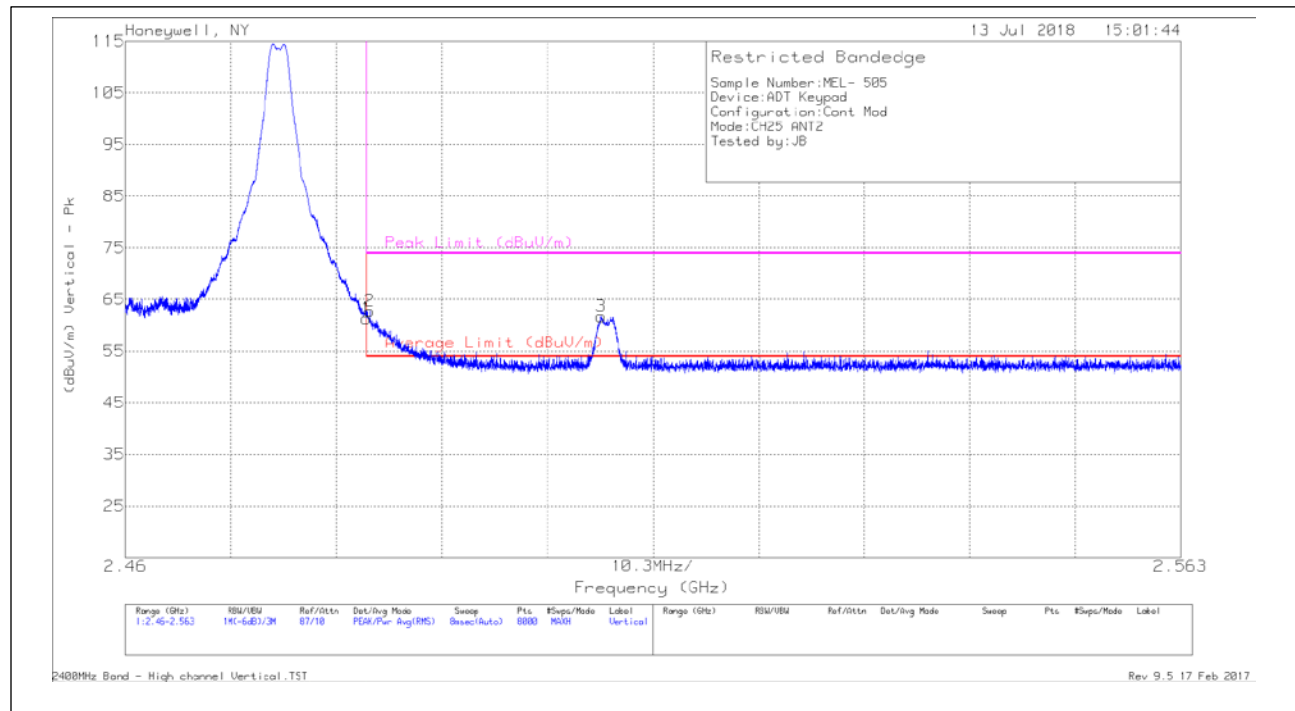
Pk - Peak detector

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

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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

Antenna 2: High Channel Horizontal - 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
2	* 2.484	28.17	Pk	28.7	.7	2.6	2.6	-	62.77	74	-11.23	258	208	V
3	2.506	26.92	Pk	28.8	.7	2.7	2.6	-	61.72	74	-12.28	258	208	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
2	* 2.484	28.17	Av	28.7	.7	2.6	2.6	-22.9	39.87	54	-14.13	258	208	V
3	2.506	26.92	Av	28.8	.7	2.7	2.6	-22.9	38.82	54	-15.18	258	208	V

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

Pk - Peak detector

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

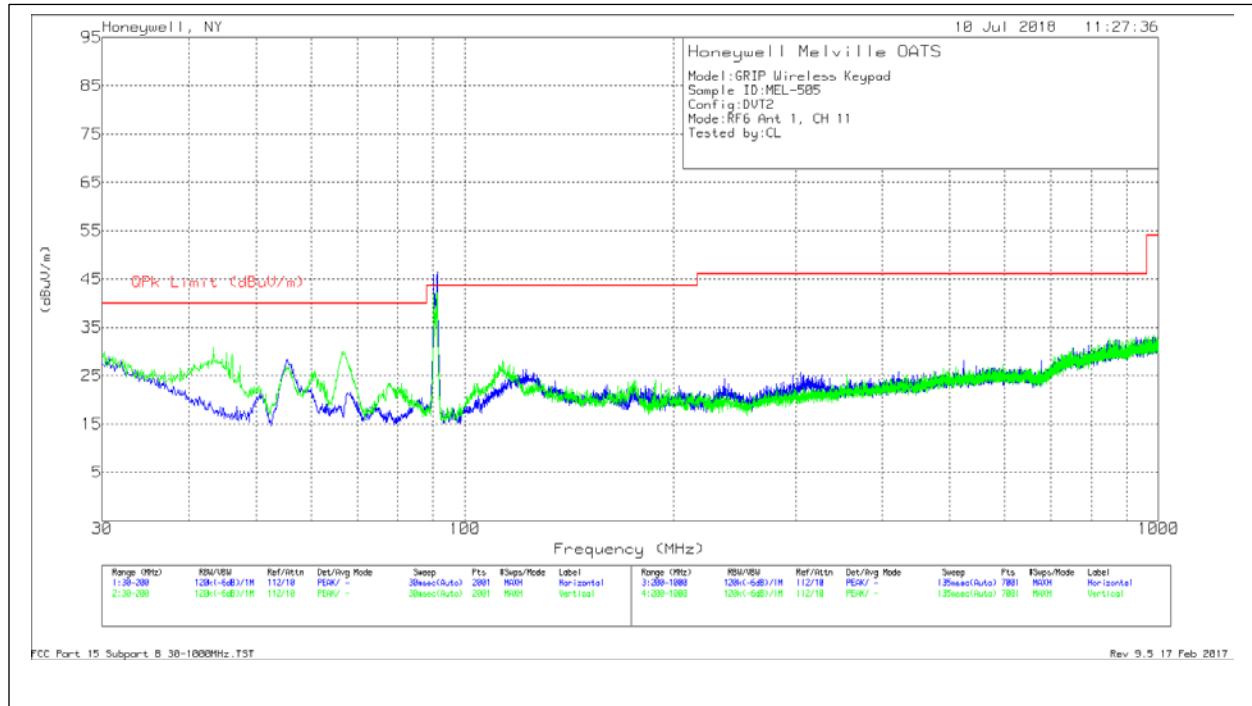
Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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

Antenna 2: High Channel Vertical - Data

Spurious Emissions

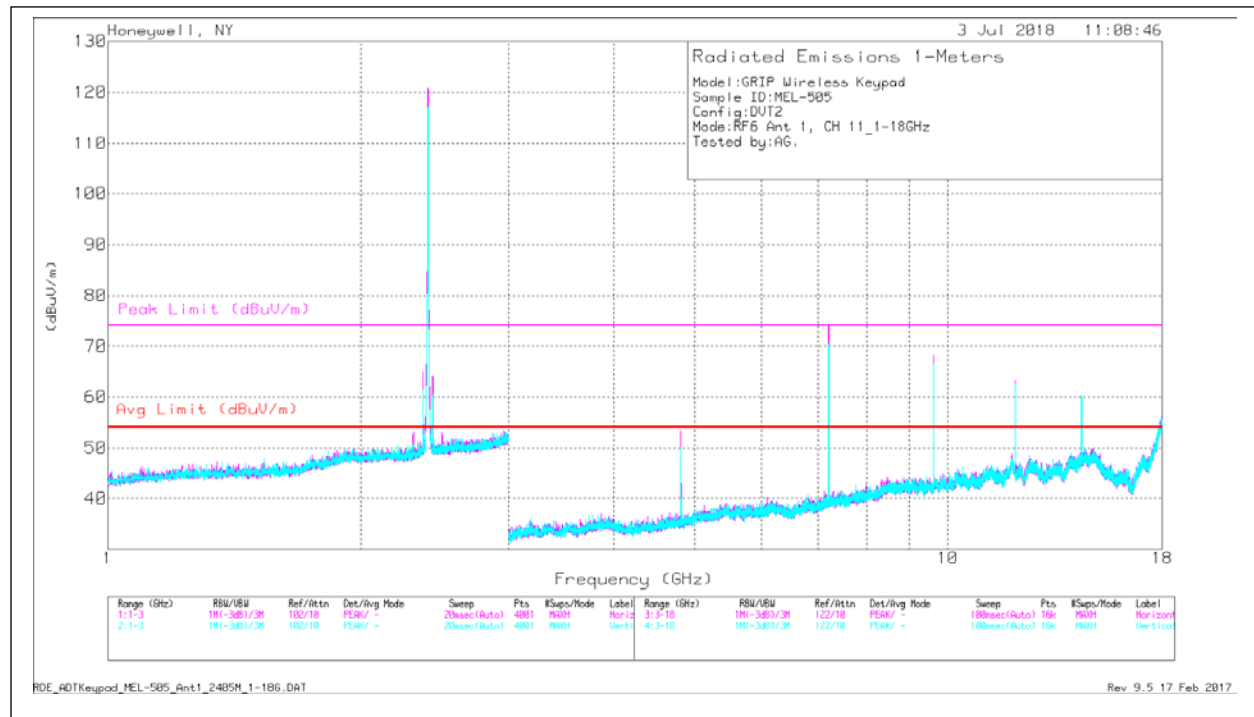
Below 1GHz (ANT1 Worst-case, Low Channel)



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
30.9353	1.57	Qp	24.2	.9	26.67	40	-13.33	270	199	H
55.476	14.08	Qp	12	1.1	27.18	40	-12.82	12	398	H
* 122.4233	6.1	Qp	17.6	1.8	25.5	43.52	-18.02	170	370	H
91.8946	25.3	Qp	12.4	1.5	39.2	43.52	-4.32	187	372	H
43.2071	12.71	Qp	16	1	29.71	40	-10.29	59	231	V
55.252	21.17	Qp	12	1.1	34.27	40	-5.73	347	134	V
66.8969	24.95	Qp	12	1.3	38.25	40	-1.75	77	385	V
91.9065	24.95	Qp	12.4	1.5	38.85	43.52	-4.67	233	107	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Qp - Quasi-Peak detector

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	50.17	PK	33.1	-41.2	3.7	3.7	49.47	74	-24.53	178	371	H
7.216	65.13	PK	36.2	-39.5	4.7	4.5	71.03	74	-2.97	244	289	H
9.622	52.24	PK	38	-39	5.6	5.2	62.04	74	-11.96	322	261	H
* 12.027	48.18	PK	39.4	-37.3	6.5	5.6	62.38	74	-11.62	255	272	H
14.432	39.21	PK	42.1	-36.9	6.8	6.4	57.61	74	-16.39	169	235	H
* 17.946	38.53	PK	47.9	-37.8	7.7	7.3	63.63	74	-10.37	105	325	H
* 4.811	49.02	PK	33.1	-41.2	3.7	3.7	48.32	74	-25.68	232	318	V
7.213	62.08	PK	36.2	-39.5	4.7	4.5	67.98	74	-6.02	235	325	V
9.622	50.69	PK	38	-39	5.6	5.2	60.49	74	-13.51	197	339	V
* 12.027	49.92	PK	39.4	-37.3	6.5	5.6	64.12	74	-9.88	198	163	V
14.432	42.51	PK	42.1	-36.9	6.8	6.4	60.91	74	-13.09	147	253	V
16.837	40.35	PK	39.6	-38.1	7.5	7.1	56.45	74	-17.55	193	240	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.809	50.17	Av	33.1	-41.2	3.7	3.7	-22.9	26.57	54	-27.43	178	371	H
7.216	65.13	Av	36.2	-39.5	4.7	4.5	-22.9	48.13	54	-5.87	244	289	H
9.622	52.24	Av	38	-39	5.6	5.2	-22.9	39.14	54	-14.86	322	261	H
* 12.027	48.18	Av	39.4	-37.3	6.5	5.6	-22.9	39.48	54	-14.52	255	272	H
14.432	39.21	Av	42.1	-36.9	6.8	6.4	-22.9	34.71	54	-19.29	169	235	H
* 17.946	38.53	Av	47.9	-37.8	7.7	7.3	-22.9	40.73	54	-13.27	105	325	H
* 4.811	49.02	Av	33.1	-41.2	3.7	3.7	-22.9	25.42	54	-28.58	232	318	V
7.213	62.08	Av	36.2	-39.5	4.7	4.5	-22.9	45.08	54	-8.92	235	325	V
9.622	50.69	Av	38	-39	5.6	5.2	-22.9	37.59	54	-16.41	197	339	V
* 12.027	49.92	Av	39.4	-37.3	6.5	5.6	-22.9	41.22	54	-12.78	198	163	V
14.432	42.51	Av	42.1	-36.9	6.8	6.4	-22.9	38.01	54	-15.99	147	253	V
16.837	40.35	Av	39.6	-38.1	7.5	7.1	-22.9	33.55	54	-20.45	193	240	V

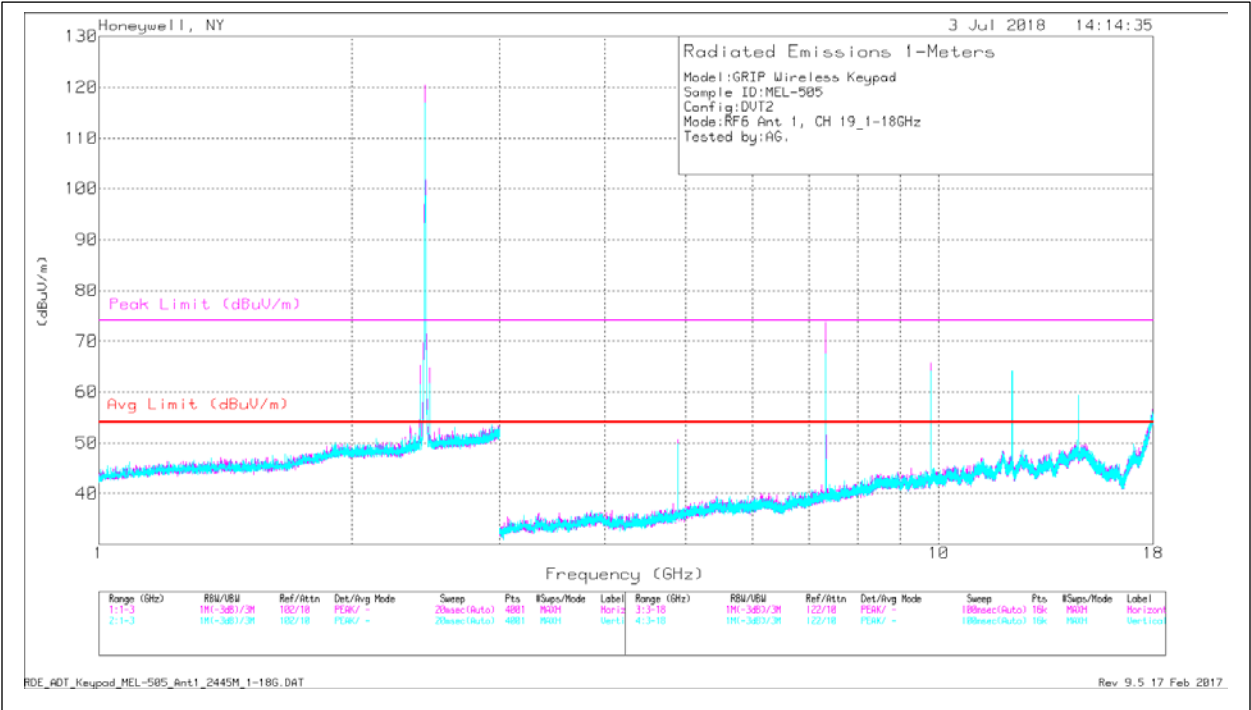
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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
* 4.89	42.5	PK	33.2	-41.4	3.7	3.6	41.6	74	-32.4	64	238	H
* 7.336	64.62	PK	36.6	-39.7	4.6	4.5	70.62	74	-3.38	257	311	H
9.782	50.6	PK	38.1	-39.1	5.5	5.3	60.4	74	-13.6	67	304	H
* 12.227	47.59	PK	39.2	-37.2	6.5	5.9	61.99	74	-12.01	209	289	H
14.673	41.02	PK	42.6	-36.9	6.6	6.4	59.72	74	-14.28	211	362	H
17.112	39.1	PK	41.1	-38.1	7.5	7	56.6	74	-17.4	87	284	H
* 4.891	48.85	PK	33.2	-41.4	3.7	3.6	47.95	74	-26.05	109	177	V
* 7.333	65.64	PK	36.6	-39.7	4.6	4.5	71.64	74	-2.36	0	170	V
9.778	51.67	PK	38.1	-39.1	5.5	5.3	61.47	74	-12.53	45	164	V
* 12.227	49.7	PK	39.2	-37.2	6.5	5.9	64.1	74	-9.9	202	191	V
14.666	42.87	PK	42.6	-36.9	6.7	6.4	61.67	74	-12.33	147	205	V
17.12	39.35	PK	41.1	-38.1	7.5	7	56.85	74	-17.15	214	332	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.89	42.5	Av	33.2	-41.4	3.7	3.6	-22.9	18.7	54	-35.3	64	238	H
* 7.336	64.62	Av	36.6	-39.7	4.6	4.5	-22.9	47.72	54	-6.28	257	311	H
9.782	50.6	Av	38.1	-39.1	5.5	5.3	-22.9	37.5	54	-16.5	67	304	H
* 12.227	47.59	Av	39.2	-37.2	6.5	5.9	-22.9	39.09	54	-14.91	209	289	H
14.673	41.02	Av	42.6	-36.9	6.6	6.4	-22.9	36.82	54	-17.18	211	362	H
17.112	39.1	Av	41.1	-38.1	7.5	7	-22.9	33.7	54	-20.3	87	284	H
* 4.891	48.85	Av	33.2	-41.4	3.7	3.6	-22.9	25.05	54	-28.95	109	177	V
* 7.333	65.64	Av	36.6	-39.7	4.6	4.5	-22.9	48.74	54	-5.26	0	170	V
9.778	51.67	Av	38.1	-39.1	5.5	5.3	-22.9	38.57	54	-15.43	45	164	V
* 12.227	49.7	Av	39.2	-37.2	6.5	5.9	-22.9	41.2	54	-12.8	202	191	V
14.666	42.87	Av	42.6	-36.9	6.7	6.4	-22.9	38.77	54	-15.23	147	205	V
17.12	39.35	Av	41.1	-38.1	7.5	7	-22.9	33.95	54	-20.05	214	332	V

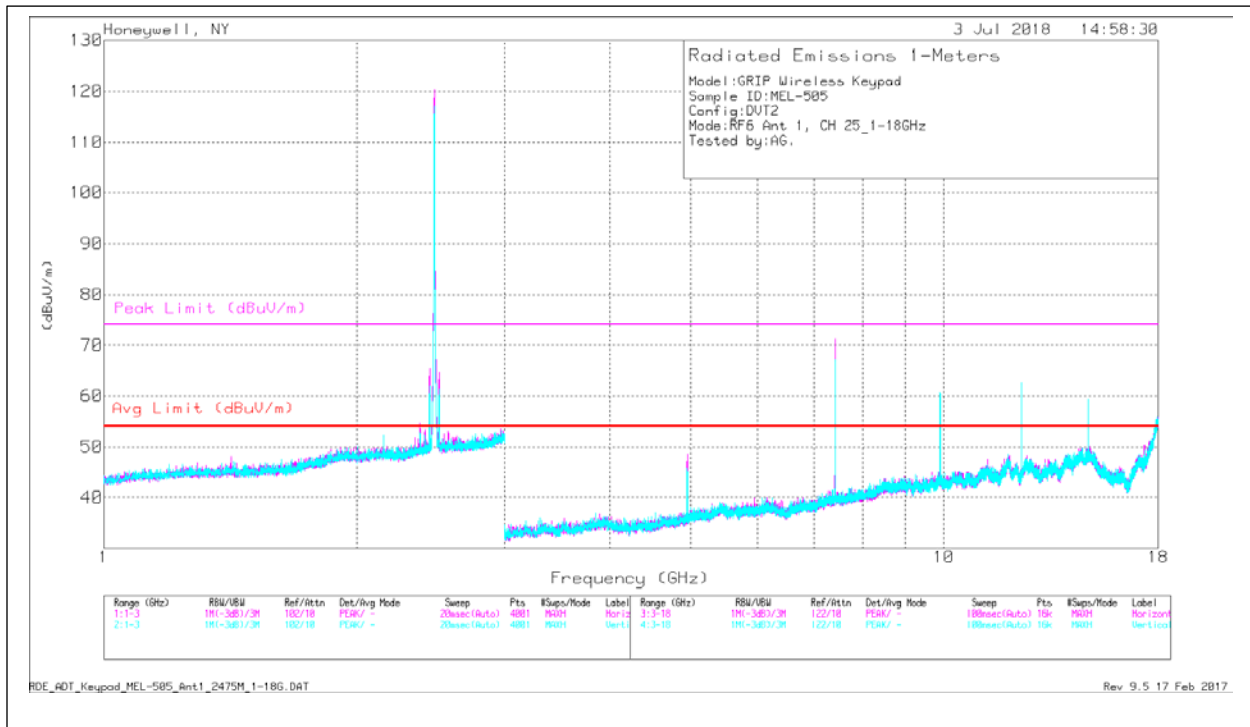
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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
* 4.951	51.09	PK	33.2	-41.5	3.8	3.7	50.29	74	-23.71	244	272	H
* 7.423	63.82	PK	36.7	-39.7	4.7	4.6	70.12	74	-3.88	247	281	H
9.902	49.33	PK	38.2	-39.2	5.5	5.3	59.13	74	-14.87	315	333	H
* 12.377	43.2	PK	38.9	-37.1	6.5	5.9	57.4	74	-16.6	315	333	H
14.853	40.1	PK	42	-36.9	6.8	6.5	58.5	74	-15.5	207	391	H
17.327	39.23	PK	42.4	-38.2	7.5	7.1	58.03	74	-15.97	254	320	H
* 4.951	47.97	PK	33.2	-41.5	3.8	3.7	47.17	74	-26.83	126	290	V
* 7.423	62.38	PK	36.7	-39.7	4.7	4.6	68.68	74	-5.32	155	332	V
9.902	47.19	PK	38.2	-39.2	5.5	5.3	56.99	74	-17.01	196	315	V
* 12.377	48.55	PK	38.9	-37.1	6.5	5.9	62.75	74	-11.25	193	146	V
14.853	42.78	PK	42	-36.9	6.8	6.5	61.18	74	-12.82	149	207	V
17.324	39.75	PK	42.4	-38.2	7.5	7.1	58.55	74	-15.45	149	207	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.951	51.09	Av	33.2	-41.5	3.8	3.7	-22.9	27.39	54	-26.61	244	272	H
* 7.423	63.82	Av	36.7	-39.7	4.7	4.6	-22.9	47.22	54	-6.78	247	281	H
9.902	49.33	Av	38.2	-39.2	5.5	5.3	-22.9	36.23	54	-17.77	315	333	H
* 12.377	43.2	Av	38.9	-37.1	6.5	5.9	-22.9	34.5	54	-19.5	315	333	H
14.853	40.1	Av	42	-36.9	6.8	6.5	-22.9	35.6	54	-18.4	207	391	H
17.327	39.23	Av	42.4	-38.2	7.5	7.1	-22.9	35.13	54	-18.87	254	320	H
* 4.951	47.97	Av	33.2	-41.5	3.8	3.7	-22.9	24.27	54	-29.73	126	290	V
* 7.423	62.38	Av	36.7	-39.7	4.7	4.6	-22.9	45.78	54	-8.22	155	332	V
9.902	47.19	Av	38.2	-39.2	5.5	5.3	-22.9	34.09	54	-19.91	196	315	V
* 12.377	48.55	Av	38.9	-37.1	6.5	5.9	-22.9	39.85	54	-14.15	193	146	V
14.853	42.78	Av	42	-36.9	6.8	6.5	-22.9	38.28	54	-15.72	149	207	V
17.324	39.75	Av	42.4	-38.2	7.5	7.1	-22.9	35.65	54	-18.35	149	207	V

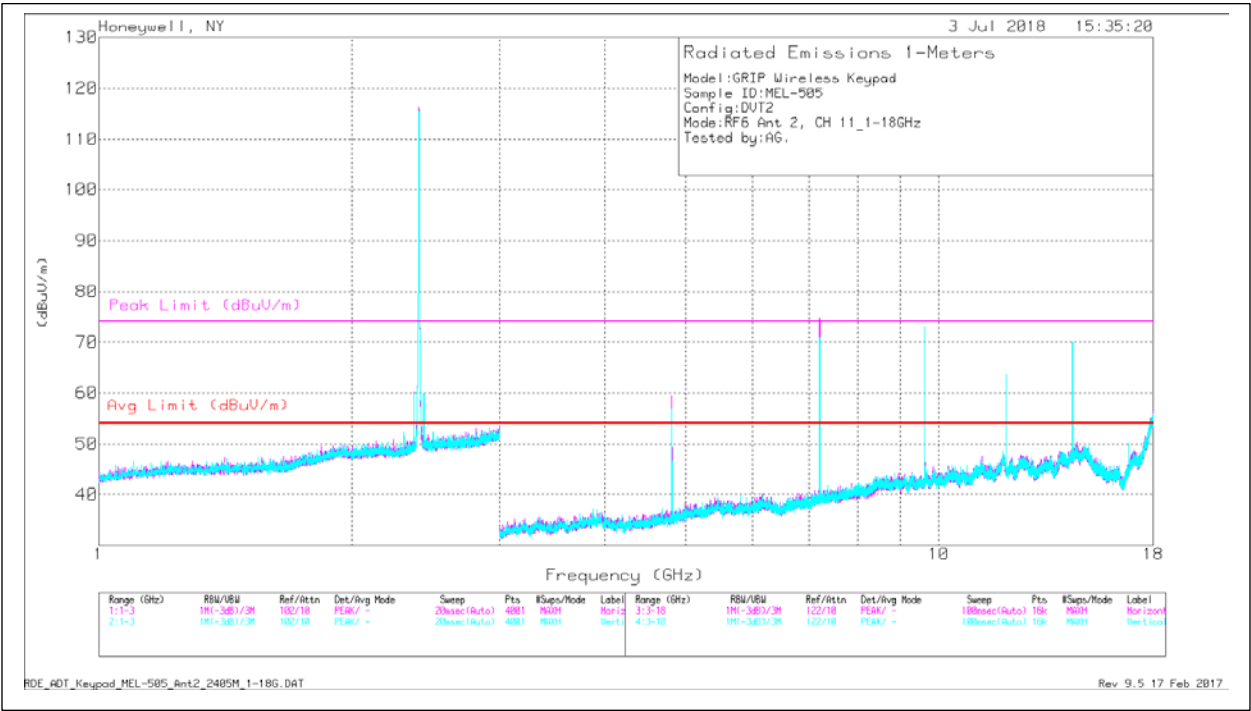
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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	59.24	PK	33.1	-41.2	3.7	3.7	58.54	74	-15.46	171	152	H
* 12.022	49.73	PK	39.4	-37.3	6.5	5.6	63.93	74	-10.07	40	283	H
* 17.986	38.72	PK	47.9	-37.8	7.7	7.3	63.82	74	-10.18	133	108	H
* 4.811	56.4	PK	33.1	-41.2	3.7	3.7	55.7	74	-18.3	240	154	V
* 12.027	50.63	PK	39.4	-37.3	6.5	5.6	64.83	74	-9.17	197	157	V
* 17.997	36.33	PK	47.9	-37.8	7.7	7.3	61.43	74	-12.57	9	184	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.811	59.24	Av	33.1	-41.2	3.7	3.7	-22.9	35.64	54	-18.36	171	152	H
7.216	67.34	Av	36.2	-39.5	4.7	4.5	-22.9	50.34	54	-3.66	247	277	H
9.622	63.24	Av	38	-39	5.6	5.2	-22.9	50.14	54	-3.86	320	277	H
* 12.022	49.73	Av	39.4	-37.3	6.5	5.6	-22.9	41.03	54	-12.97	40	283	H
14.433	44.46	Av	42.1	-36.9	6.8	6.4	-22.9	39.96	54	-14.04	204	263	H
16.831	41.65	Av	39.6	-38.1	7.4	7.1	-22.9	34.75	54	-19.25	191	202	H
* 17.986	38.72	Av	47.9	-37.8	7.7	7.3	-22.9	40.92	54	-13.08	133	108	H
* 4.811	56.4	Av	33.1	-41.2	3.7	3.7	-22.9	32.8	54	-21.2	240	154	V
7.216	68.49	Av	36.2	-39.5	4.7	4.5	-22.9	51.49	54	-2.51	6	173	V
9.622	63.24	Av	38	-39	5.6	5.2	-22.9	50.14	54	-3.86	48	165	V
* 12.027	50.63	Av	39.4	-37.3	6.5	5.6	-22.9	41.93	54	-12.07	197	157	V
14.432	48.94	Av	42.1	-36.9	6.8	6.4	-22.9	44.44	54	-9.56	150	218	V
16.831	44.9	Av	39.6	-38.1	7.4	7.1	-22.9	38	54	-16	192	213	V
* 17.997	36.33	Av	47.9	-37.8	7.7	7.3	-22.9	38.53	54	-15.47	9	184	V

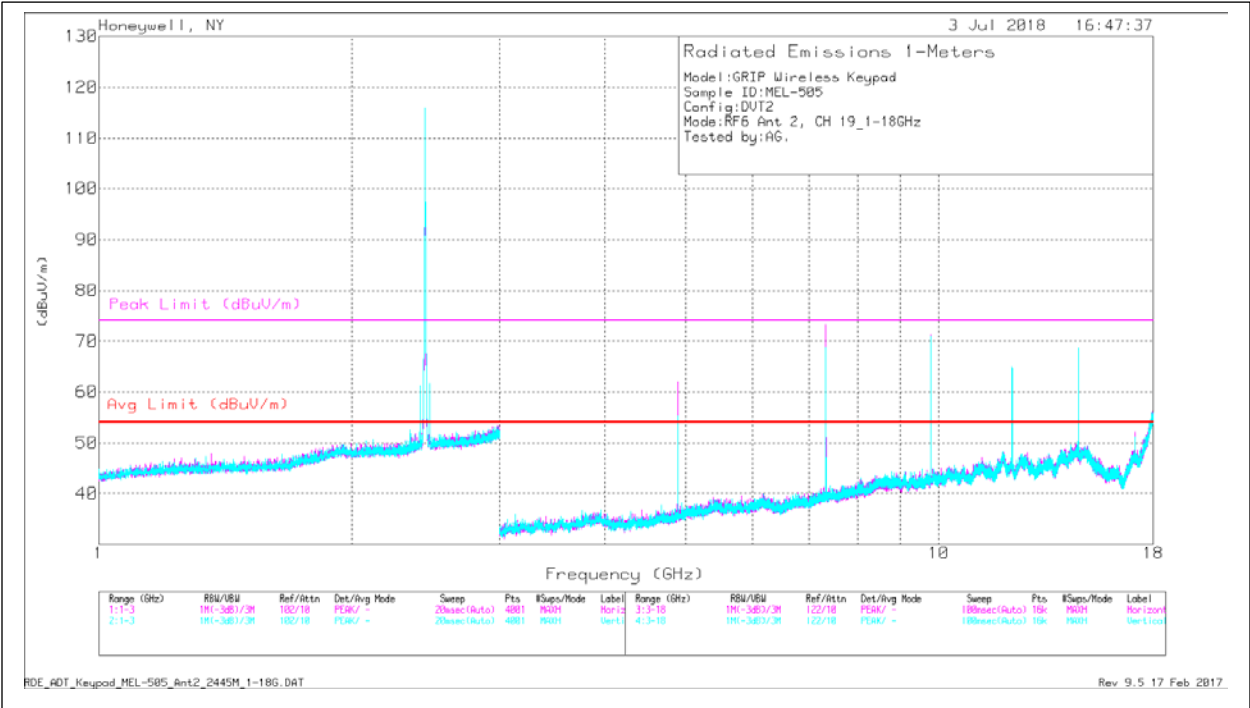
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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
* 4.891	58.64	PK	33.2	-41.4	3.7	3.6	57.74	74	-16.26	134	279	H
* 7.333	66.26	PK	36.6	-39.7	4.6	4.5	72.26	74	-1.74	244	278	H
9.782	62.81	PK	38.1	-39.1	5.5	5.3	72.61	74	-1.39	321	271	H
* 12.227	48.9	PK	39.2	-37.2	6.5	5.9	63.3	74	-10.7	82	271	H
14.673	42.44	PK	42.6	-36.9	6.6	6.4	61.14	74	-12.86	202	316	H
17.111	41.18	PK	41.1	-38.1	7.5	7	58.68	74	-15.32	62	376	H
* 4.891	54.7	PK	33.2	-41.4	3.7	3.6	53.8	74	-20.2	294	379	V
* 7.333	65.42	PK	36.6	-39.7	4.6	4.5	71.42	74	-2.58	162	332	V
9.782	60.18	PK	38.1	-39.1	5.5	5.3	69.98	74	-4.02	195	300	V
* 12.227	49.49	PK	39.2	-37.2	6.5	5.9	63.89	74	-10.11	156	393	V
14.673	46.94	PK	42.6	-36.9	6.6	6.4	65.64	74	-8.36	139	322	V
* 17.922	38.78	PK	47.8	-37.9	7.8	7.3	63.78	74	-10.22	39	379	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.891	58.64	Av	33.2	-41.4	3.7	3.6	-22.9	34.84	54	-19.16	134	279	H
* 7.333	66.26	Av	36.6	-39.7	4.6	4.5	-22.9	49.36	54	-4.64	244	278	H
9.782	62.81	Av	38.1	-39.1	5.5	5.3	-22.9	49.71	54	-4.29	321	271	H
* 12.227	48.9	Av	39.2	-37.2	6.5	5.9	-22.9	40.4	54	-13.6	82	271	H
14.673	42.44	Av	42.6	-36.9	6.6	6.4	-22.9	38.24	54	-15.76	202	316	H
17.111	41.18	Av	41.1	-38.1	7.5	7	-22.9	35.78	54	-18.22	62	376	H
* 4.891	54.7	Av	33.2	-41.4	3.7	3.6	-22.9	30.9	54	-23.1	294	379	V
* 7.333	65.42	Av	36.6	-39.7	4.6	4.5	-22.9	48.52	54	-5.48	162	332	V
9.782	60.18	Av	38.1	-39.1	5.5	5.3	-22.9	47.08	54	-6.92	195	300	V
* 12.227	49.49	Av	39.2	-37.2	6.5	5.9	-22.9	40.99	54	-13.01	156	393	V
14.673	46.94	Av	42.6	-36.9	6.6	6.4	-22.9	42.74	54	-11.26	139	322	V
* 17.922	38.78	Av	47.8	-37.9	7.8	7.3	-22.9	40.88	54	-13.12	39	379	V

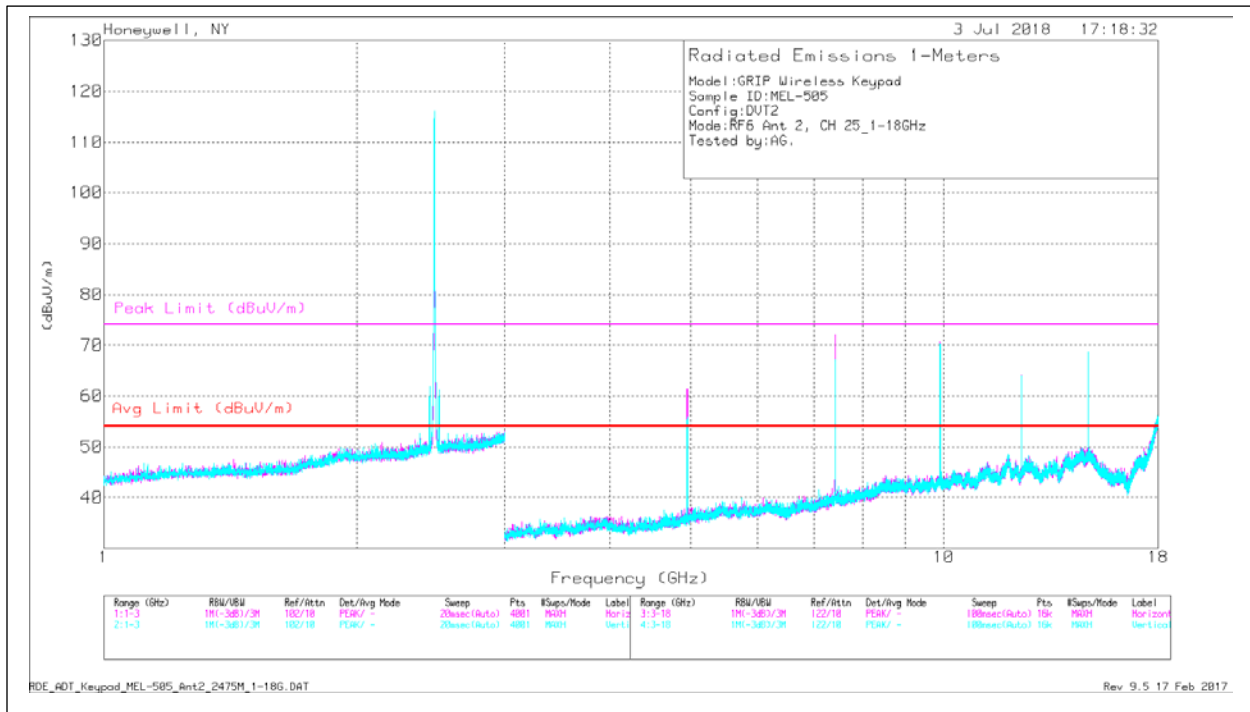
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK - KDB558074 Method: Maximum Peak

Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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
* 4.951	59.45	PK	33.2	-41.5	3.8	3.7	58.65	74	-15.35	183	182	H
* 7.426	66.34	PK	36.7	-39.7	4.7	4.6	72.64	74	-1.36	252	319	H
9.902	59.01	PK	38.2	-39.2	5.5	5.3	68.81	74	-5.19	326	275	H
* 12.377	48.14	PK	38.9	-37.1	6.5	5.9	62.34	74	-11.66	157	223	H
14.853	43.68	PK	42	-36.9	6.8	6.5	62.08	74	-11.92	38	221	H
17.326	39.8	PK	42.4	-38.2	7.5	7.1	58.6	74	-15.4	288	346	H
* 4.949	55.97	PK	33.2	-41.5	3.8	3.7	55.17	74	-18.83	231	113	V
* 7.426	59.4	PK	36.7	-39.7	4.7	4.6	65.7	74	-8.3	207	398	V
9.902	56.46	PK	38.2	-39.2	5.5	5.3	66.26	74	-7.74	78	114	V
* 12.377	52.31	PK	38.9	-37.1	6.5	5.9	66.51	74	-7.49	189	126	V
14.853	47.58	PK	42	-36.9	6.8	6.5	65.98	74	-8.02	183	284	V
17.328	39.29	PK	42.4	-38.2	7.5	7.1	58.09	74	-15.91	105	240	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Av Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.951	59.45	Av	33.2	-41.5	3.8	3.7	-22.9	35.75	54	-18.25	183	182	H
* 7.426	66.34	Av	36.7	-39.7	4.7	4.6	-22.9	49.74	54	-4.26	252	319	H
9.902	59.01	Av	38.2	-39.2	5.5	5.3	-22.9	45.91	54	-8.09	326	275	H
* 12.377	48.14	Av	38.9	-37.1	6.5	5.9	-22.9	39.44	54	-14.56	157	223	H
14.853	43.68	Av	42	-36.9	6.8	6.5	-22.9	39.18	54	-14.82	38	221	H
17.326	39.8	Av	42.4	-38.2	7.5	7.1	-22.9	35.7	54	-18.3	288	346	H
* 4.949	55.97	Av	33.2	-41.5	3.8	3.7	-22.9	32.27	54	-21.73	231	113	V
* 7.426	59.4	Av	36.7	-39.7	4.7	4.6	-22.9	42.8	54	-11.2	207	398	V
9.902	56.46	Av	38.2	-39.2	5.5	5.3	-22.9	43.36	54	-10.64	78	114	V
* 12.377	52.31	Av	38.9	-37.1	6.5	5.9	-22.9	43.61	54	-10.39	189	126	V
14.853	47.58	Av	42	-36.9	6.8	6.5	-22.9	43.08	54	-10.92	183	284	V
17.328	39.29	Av	42.4	-38.2	7.5	7.1	-22.9	35.19	54	-18.81	105	240	V

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

PK - KDB558074 Method: Maximum Peak

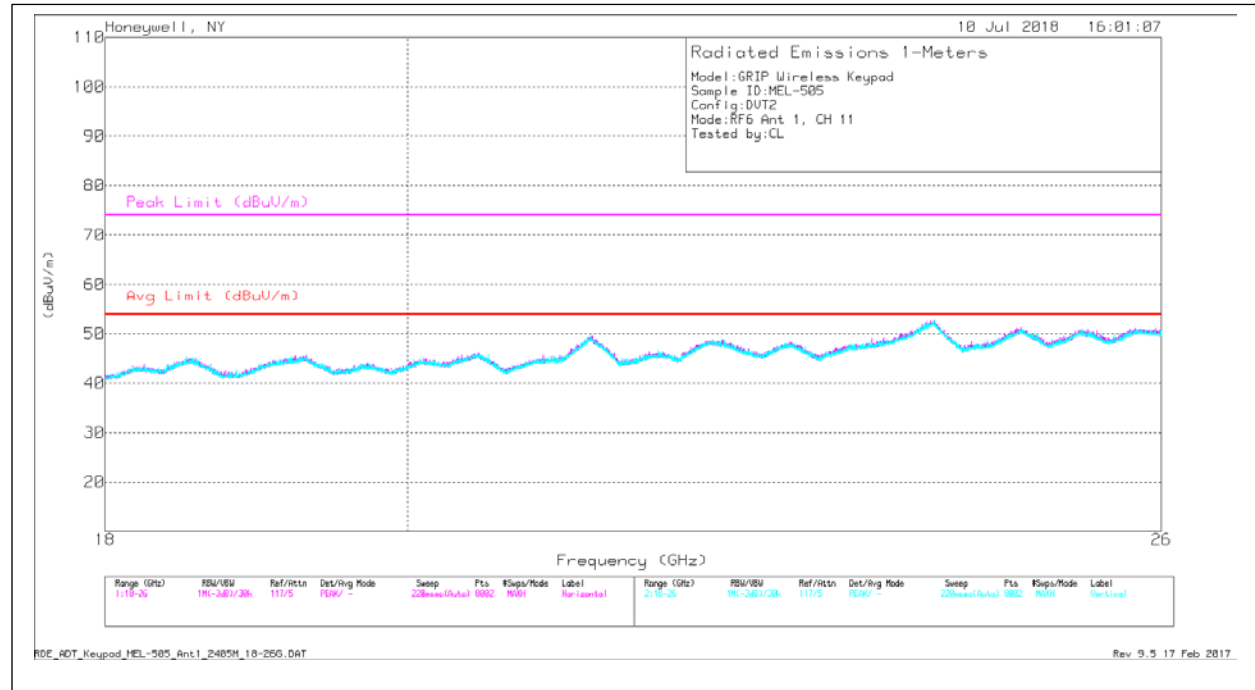
Av - KDB558074 Method: PK + DC Corr (Duty Cycle Correction Factor)

Duty Cycle = 7.136%, thus DC Corr = $20\log(0.07316) = -22.9\text{dB}$

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 (dBm)	Preamplifier [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. Both Unintentional and Intentional (worse-case) data is reported.

Test Criteria

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

Test Information

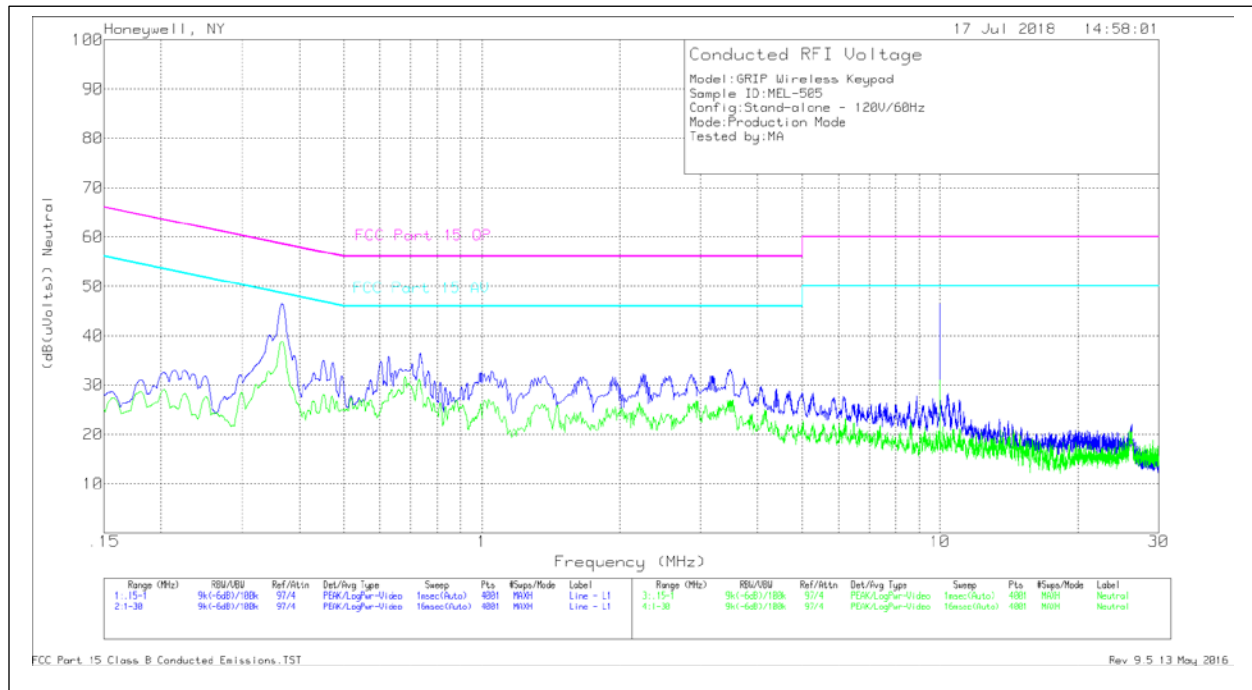
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
AG/MA	RF Lab	07/09/18, 07/17/18	21.2	60.9	1005	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11556	MY49430802	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

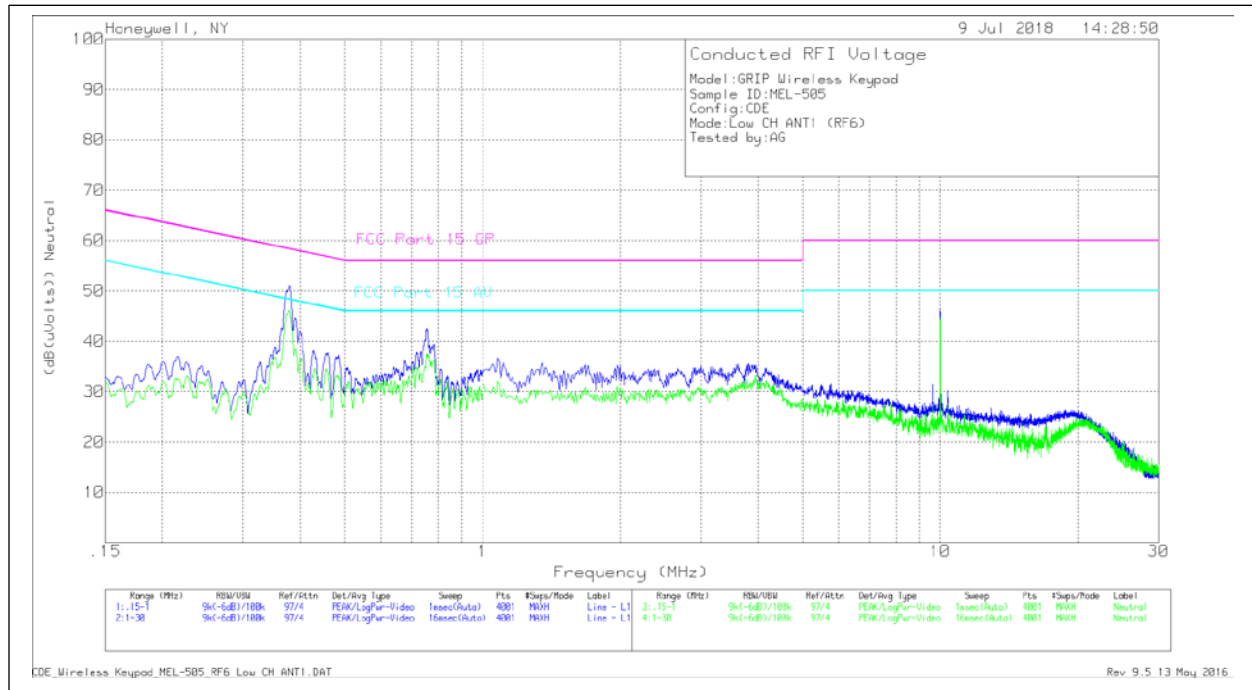
Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L1 [dB]	CDE Cable [dB]	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.36737	36.5	Pk	10	0	46.5	58.56	-12.06	48.56	-2.06
.7366	25.57	Pk	9.9	0	35.47	56	-20.53	46	-10.53
.62329	24.89	Pk	9.9	0	34.79	56	-21.21	46	-11.21
9.99725	36.31	Pk	10	.2	46.51	60	-13.49	50	-3.49
1.05075	22.87	Pk	9.9	0	32.77	56	-23.23	46	-13.23
2.247	22.31	Pk	9.9	0	32.21	56	-23.79	46	-13.79

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)
.36918	28.33	Pk	10.1	0	38.43	58.52	-20.09	48.52	-10.09
.68069	21.67	Pk	10	0	31.67	56	-24.33	46	-14.33
.72723	20.94	Pk	10	0	30.94	56	-25.06	46	-15.06
9.99725	20.78	Pk	10	.2	30.98	60	-29.02	50	-19.02
3.44325	16.86	Pk	10	.1	26.96	56	-29.04	46	-19.04
1.03625	17.23	Pk	10	0	27.23	56	-28.77	46	-18.77

Pk - Peak detector

Data

Intentional Mode (Worse-case)



Antenna 1, Low Channel - 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)
.37866	41.09	Pk	10	0	51.09	58.31	-7.22	48.31	2.78
.37824	33.31	Av	10	0	43.31	58.32	-15.01	48.32	-5.01
.74842	30.33	Pk	9.9	0	40.23	56	-15.77	46	-5.77
9.99725	36.27	Pk	10	.2	46.47	60	-13.53	50	-3.53
.48569	27.18	Pk	10	0	37.18	56.24	-19.06	46.24	-9.06
.75716	32.63	Pk	9.9	0	42.53	56	-13.47	46	-3.47
1.07975	26.86	Pk	9.9	0	36.76	56	-19.24	46	-9.24

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)
.3778	35.99	Pk	10.1	0	46.09	58.33	-12.24	48.33	-2.24
.75694	27.57	Pk	10	0	37.57	56	-18.43	46	-8.43
9.99725	34.66	Pk	10	.2	44.86	60	-15.14	50	-5.14
.7841	26.46	Pk	10	0	36.46	56	-19.54	46	-9.54
.7136	22.72	Pk	10	0	32.72	56	-23.28	46	-13.28
1.07975	22.12	Pk	10	0	32.12	56	-23.88	46	-13.88

Pk - Peak detector

Av - Average detector

Antenna 1, Low Channel – Data

END OF REPORT