



FCC / ISED Test Report

For

GRIP 7" AIO Panel

Report #: 50346-A3

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IC ID: 573F-GRIPAIO7

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Prepared by and for:
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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	2018-06-21
A	M. Antola	A. Roussin	Updated configuration information; Updated above 1GHz spurious data; Added data (radiated and conducted) to support simultaneous operation conditions	2018-06-29

Report Authorization

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Applicable Test Standards/Limits

Test Standards/Limits	Result	Dates Tested
ANSI C63.10: 2013	Compliant	05/14/2018 – 06/29/2018
RSS-247, Issue 2, Section 5	Compliant	05/14/2018 – 06/29/2018
RSS-GEN, Issue 4	Compliant	05/14/2018 – 06/29/2018
CFR 47 Pt 15 Subpart C, Section 15.207/209	Compliant	05/14/2018 – 06/29/2018
CFR 47 Pt 15 Subpart C, Section 15.247	Compliant	05/14/2018 – 06/29/2018

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 Global Residential Intrusion Platform (GRIP) 7" All-In-One (AIO) solution consists of a panel with a built-in touch screen display. The panel consists of a main PCB board that contains components (Display, camera, microphones, speaker) to support features such as video and audio, interfaces to external devices/sensors (sensors, devices, and cameras) and wireless communicators. The EUT is AC powered with a battery back-up.

There are three (3) on-board radios - Bluetooth (LE), RF6 and Wiselink. Plug-in modules can support WiFi, Z-Wave and cellular communications. This report will cover the Bluetooth (LE) portion of the EUT.

The Bluetooth LE circuitry contains a single integral PCB antenna with a gain of 6dBi.

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 has a typical installation orientation of vertical (i.e. wall-mounted or standing upright on desktop). Therefore, all final radiated test was performed with the EUT in the vertical orientation. See setup photos for details. The AC powered configuration proved to be the worse-case configuration and was tested as such.

Test Sample Identification

Sample ID Number	Sample Serial Number	Date Received
MEL-461	Non-serialized production unit	04/02/2018
MEL-473	Non-serialized production unit	04/19/2018

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
1	99% Occupied Bandwidth	PASS
2	6 dB Emission Bandwidth	PASS
3	Maximum Conducted Output Power	PASS
4	Maximum Power Spectral Density	PASS
5	Out of Band Emissions	PASS
6	Radiated Emissions (Intentional)	PASS
7	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	05/11/2018	22.6	37.2	1014	P

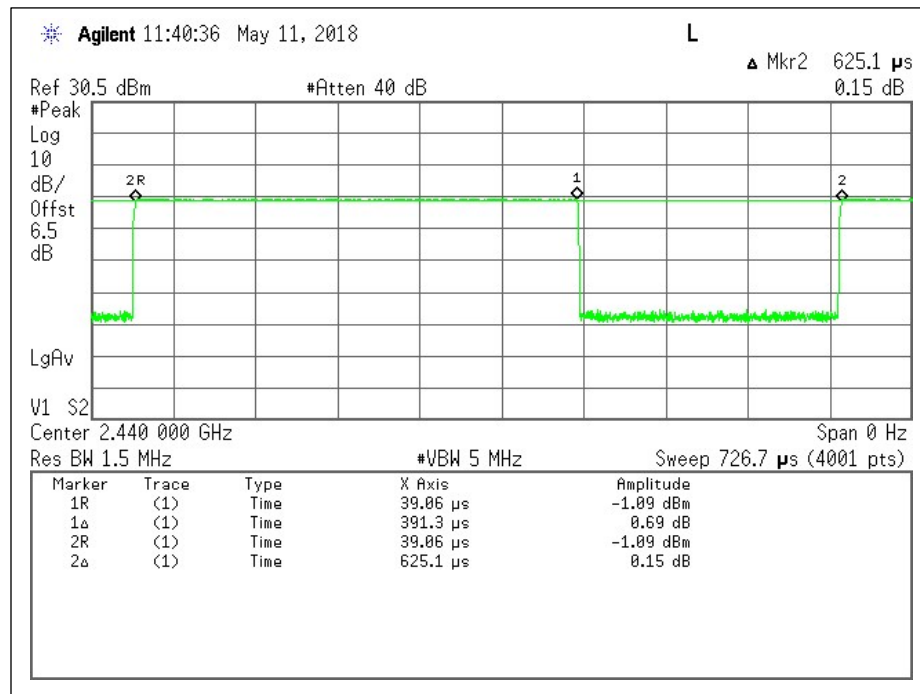
Equipment List

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	11548	A078188	Extech Instruments	SD700	04/24/17	04/24/18

Test Results

On Time (usec)	Period (usec)	Duty Cycle	Duty Cycle (%)	Correction Factor [10log(1/D)]
391.3	625.1	0.626	62.6	2.03

Duty Cycle 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)
CL	RF Lab	05/11/2018	22.6	37.2	1014	P

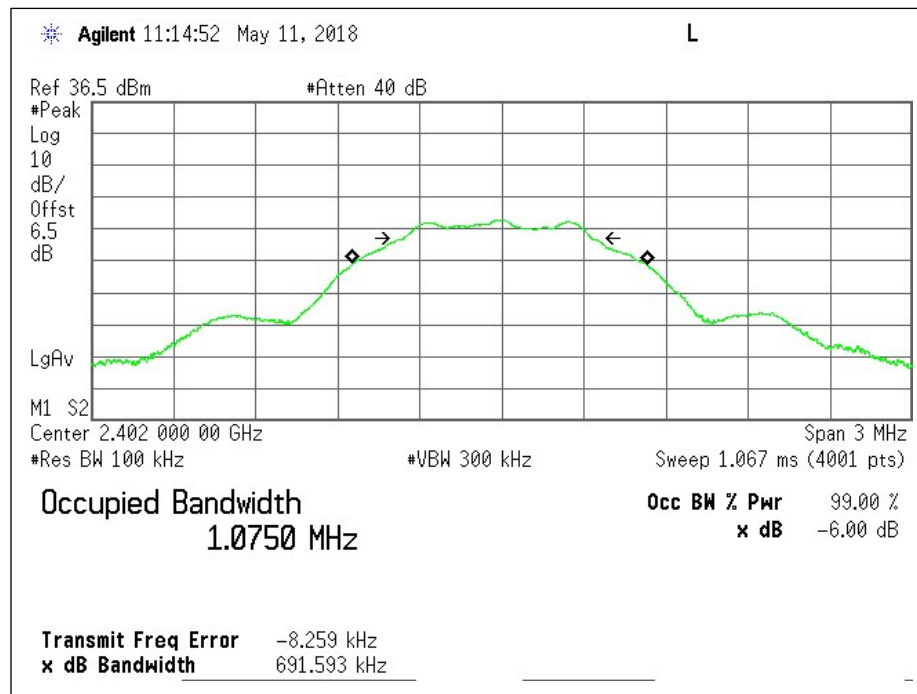
Equipment List

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

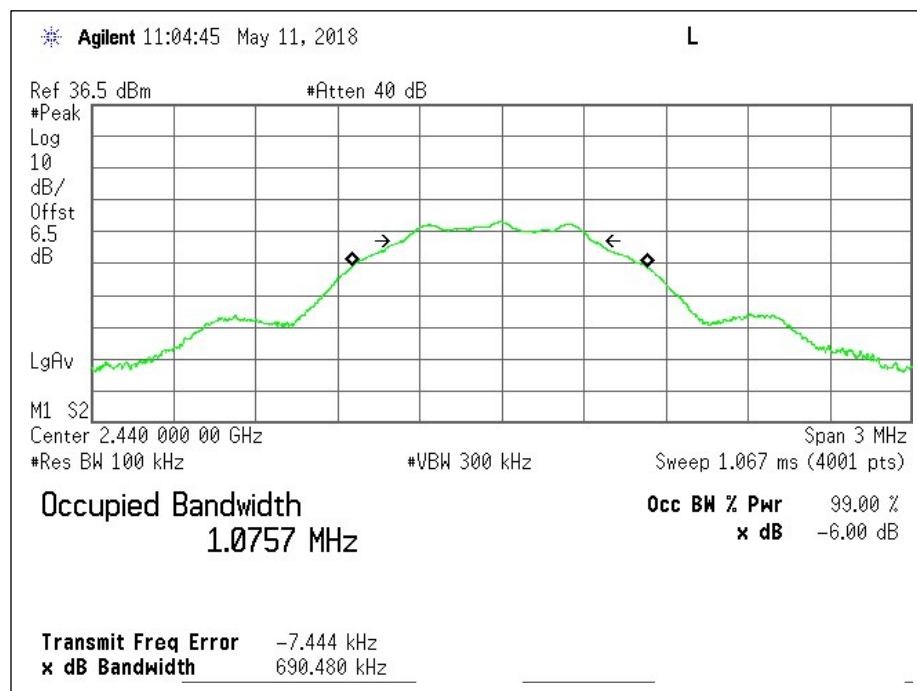
Test Results

Channel	Frequency (GHz)	6dB Bandwidth (in kHz)
Low	2.402	692
Mid	2.440	690
High	2.480	695

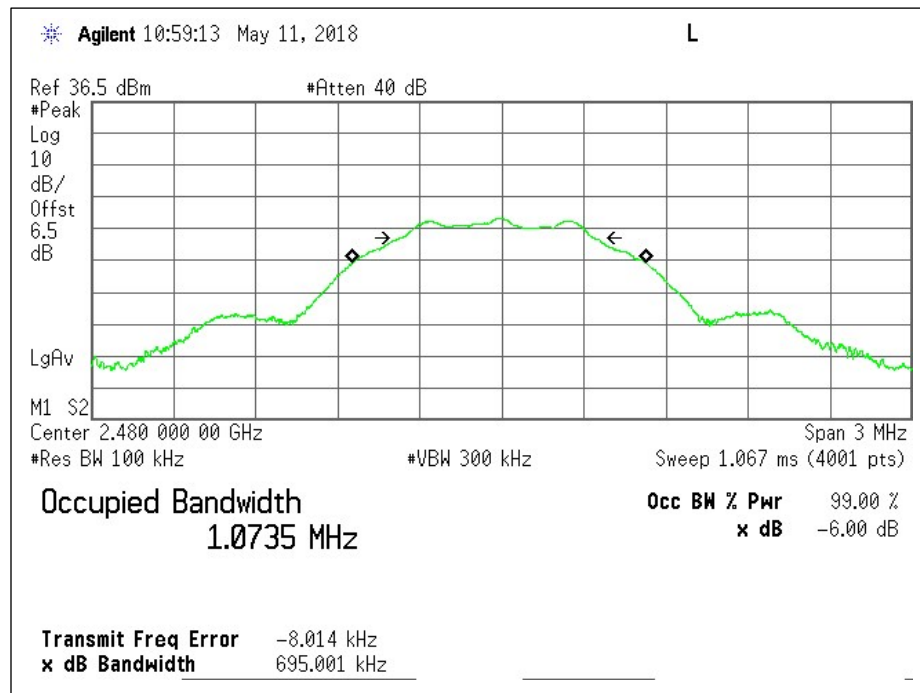
6dB Bandwidth



Low Channel - Plot



Mid Channel - Plot



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	05/11/2018	22.6	37.2	1014	P

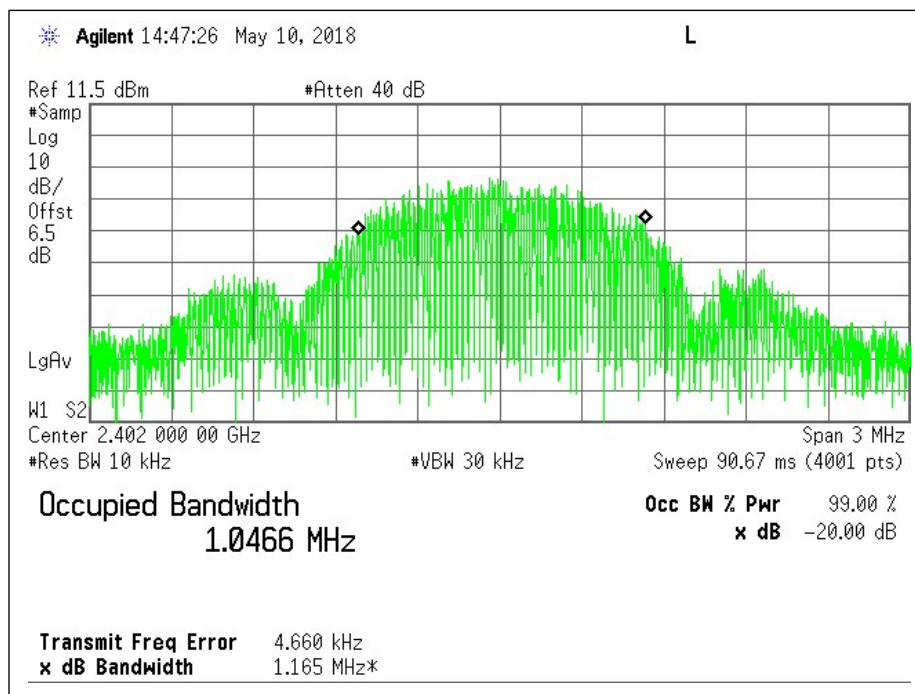
Equipment List

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

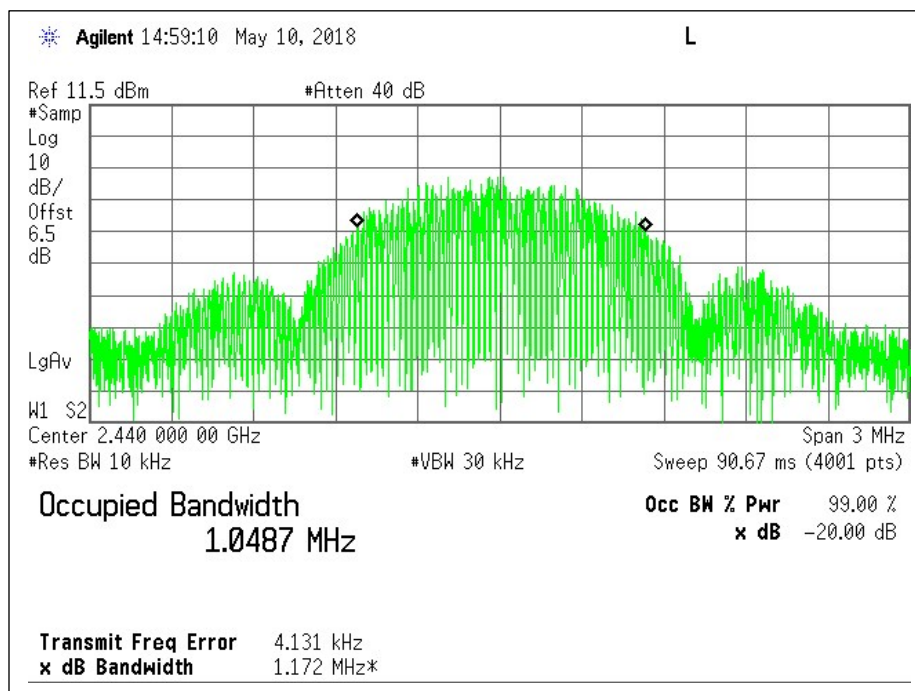
Test Results

Channel	Frequency (GHz)	99% Bandwidth (in MHz)
Low	2.402	1.0466
Mid	2.440	1.0487
High	2.480	1.0495

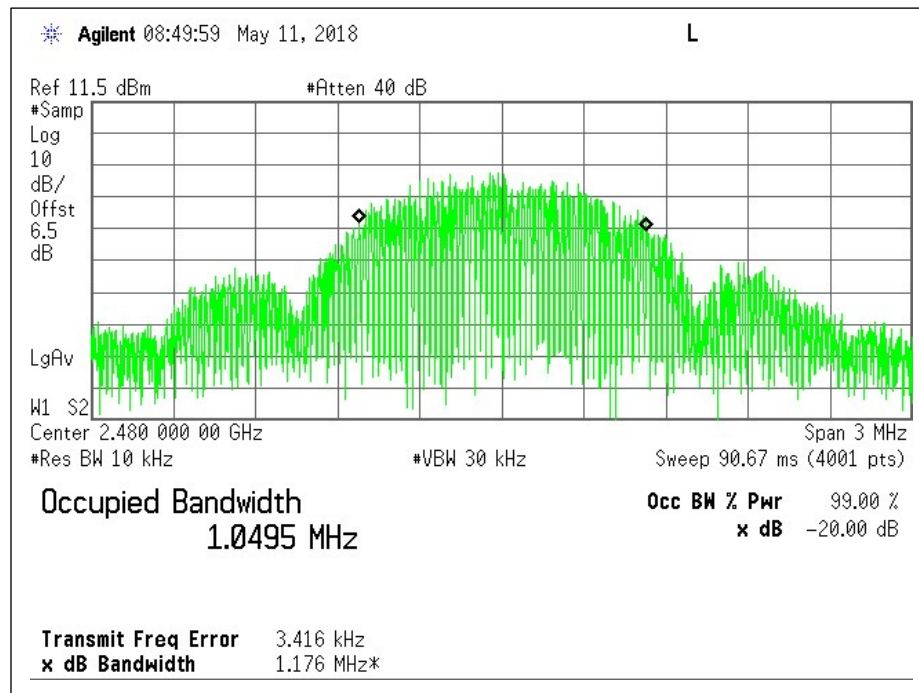
99% Occupied Bandwidth



Low Channel - Plot



Mid Channel - Plot



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 peak conducted output power was the method employed to determine fundamental emission output power.

Method RBW $\geq$ DTS Bandwidth 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	05/11/218	22.6	37.2	1014	P

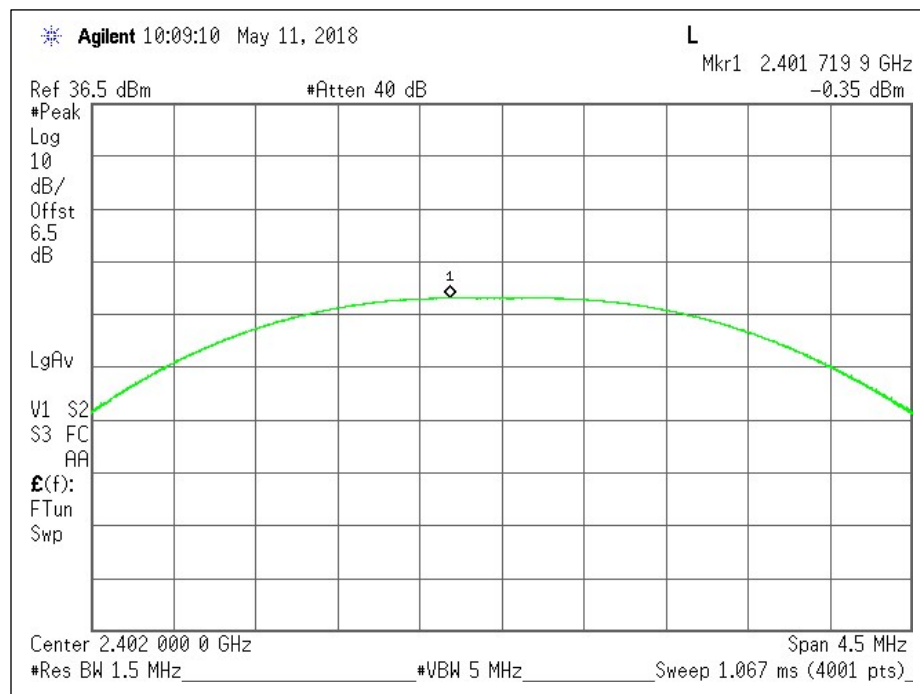
Equipment List

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

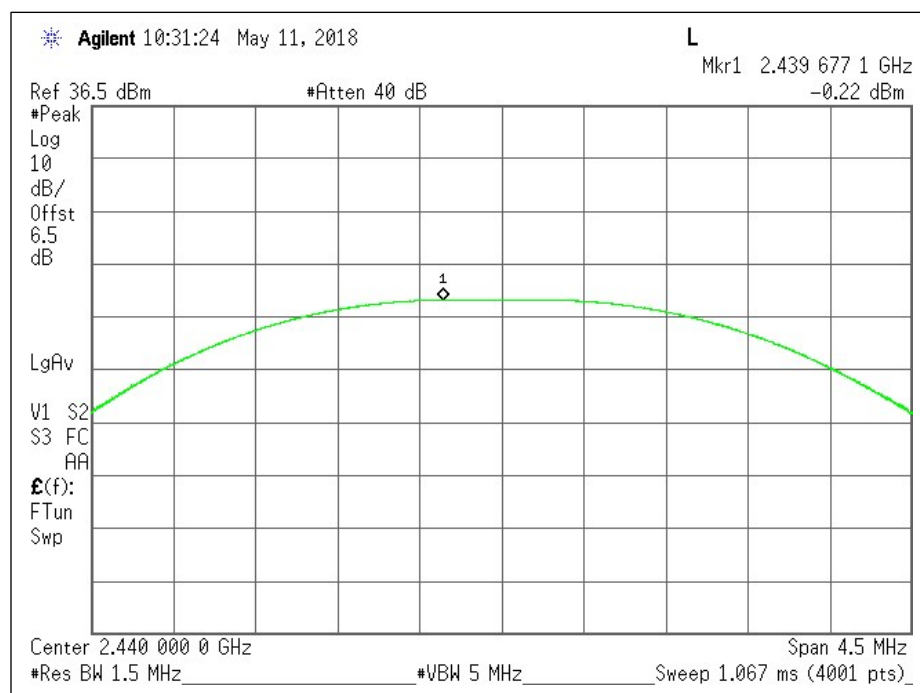
Test Results

Channel	Frequency (GHz)	Tx Channel BW Power (dBm)
Low	2.402	-0.35
Mid	2.440	-0.22
High	2.480	-0.08

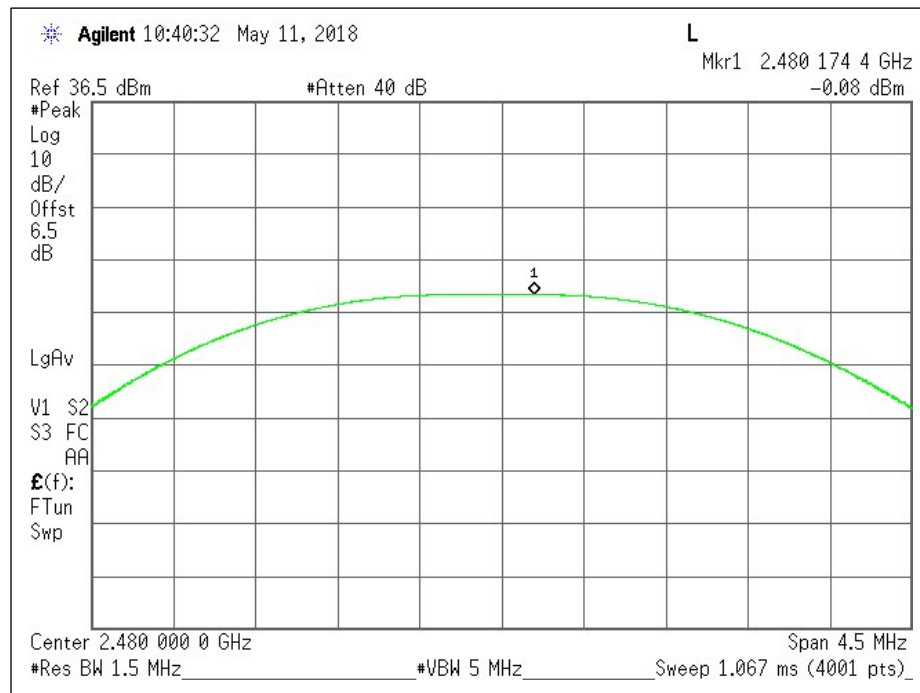
Output Power



Low Channel - Plot



Mid Channel - Plot



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 (peak) output power was the method employed to determine fundamental emission output power, then the peak power spectral density method was utilized.

Method PKPSD 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	05/11/2018	22.6	37.2	1014	P

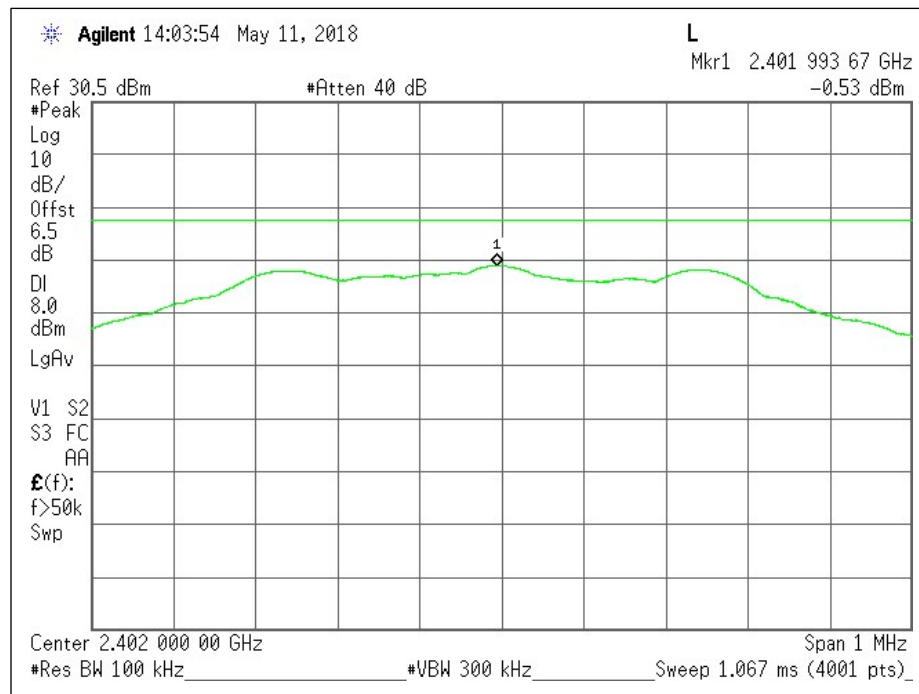
Equipment List

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

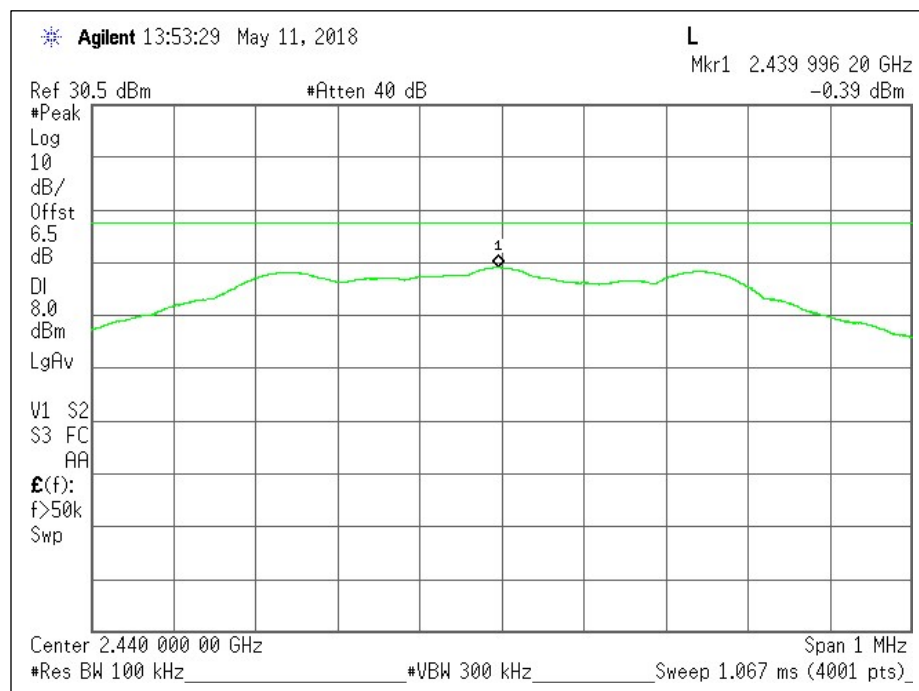
Test Results

Channel	Frequency (GHz)	Max PSD (dBm)
Low	2.402	-0.53
Mid	2.440	-0.39
High	2.480	-0.23

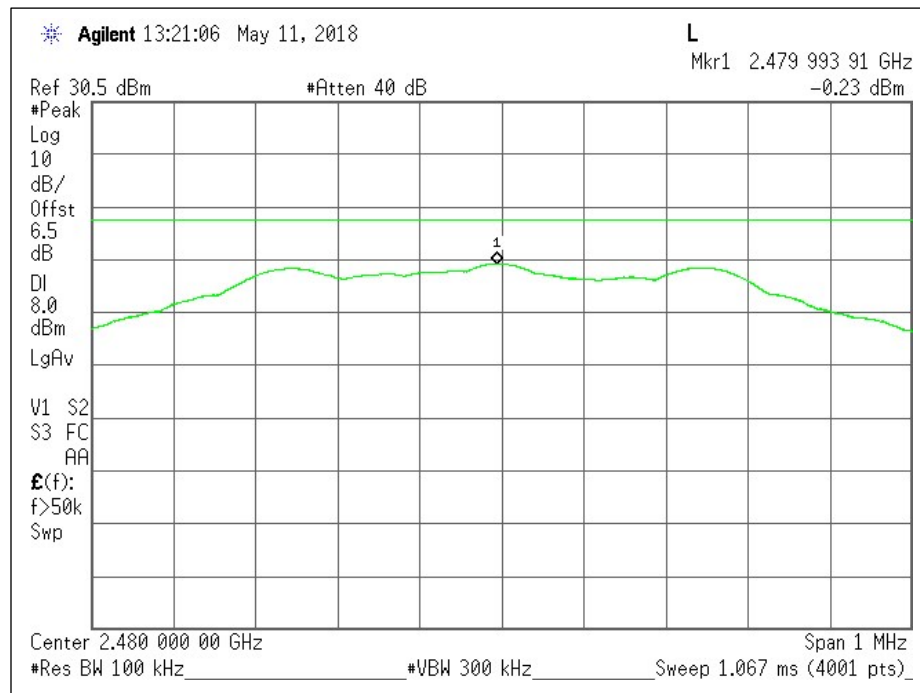
PSD



Low Channel - Plot



Mid Channel - Plot



High Channel – Plot

Out of Band 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	20dB Below the Fundamental

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	05/11/2018	22.6	37.2	1014	P

Equipment List

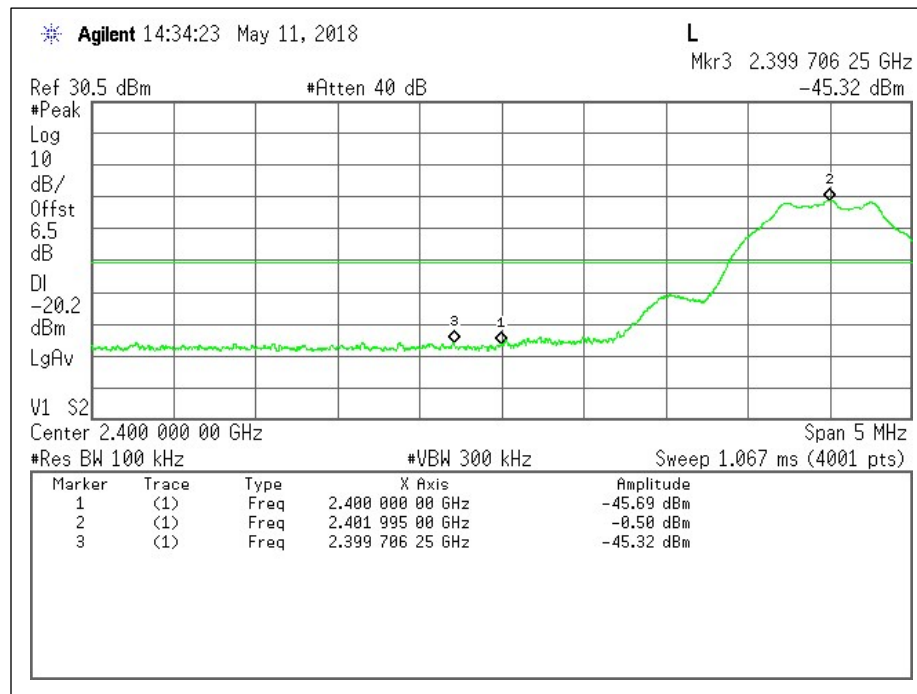
Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11549	MY46187211	Agilent	E4440A	06/06/17	06/06/19
Environmental Meter	11533	A070144	Extech Instruments	SD700	08/21/17	08/21/20

Test Results

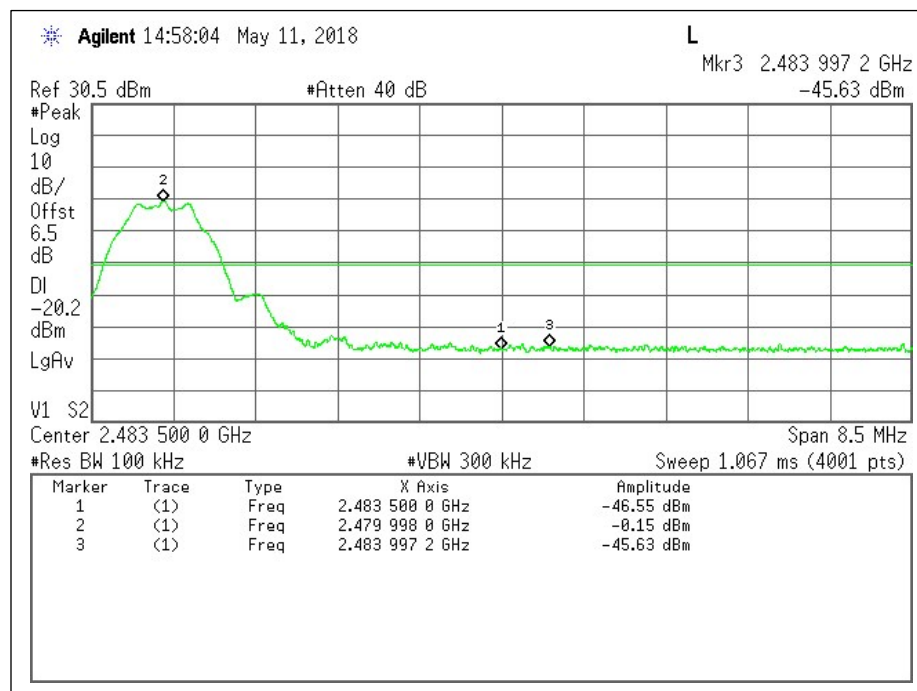
Authorized Band Edge				
Channel	Frequency (GHz)	Delta from Peak to Bandedge (dB)	Limit (dB)	Margin (dB)
Low	2.402	45.19	20	-25.19
High	2.480	46.4	20	-26.4

Conducted Spurious		
Channel	Frequency (GHz)	Highest Spurious Emission from -20dB down point (dB)
Low	2.402	-39.44
Mid	2.440	-38.78
High	2.480	-38.4

Band Edge

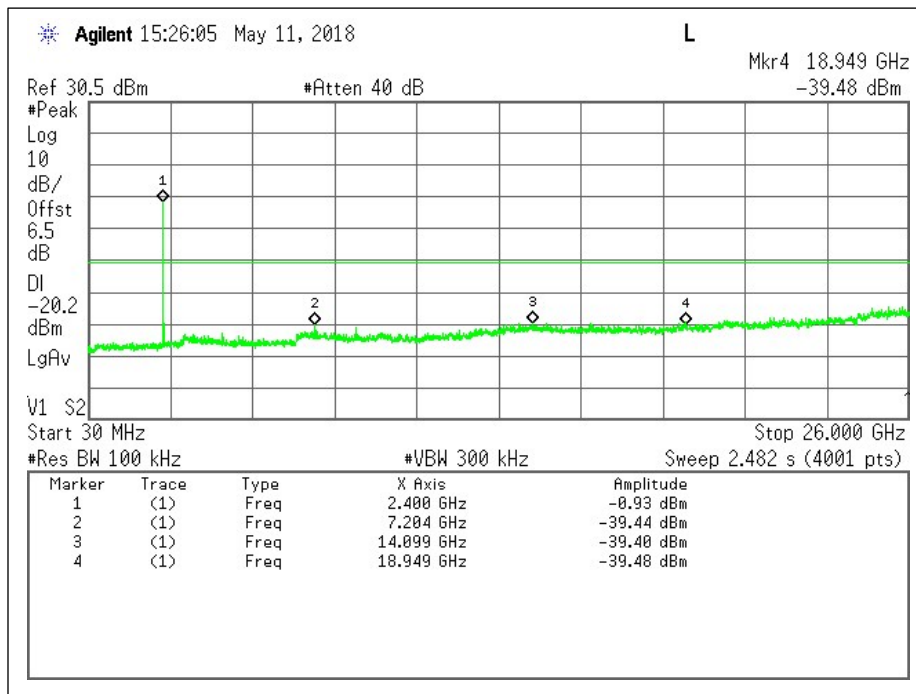


Low Channel - Plot

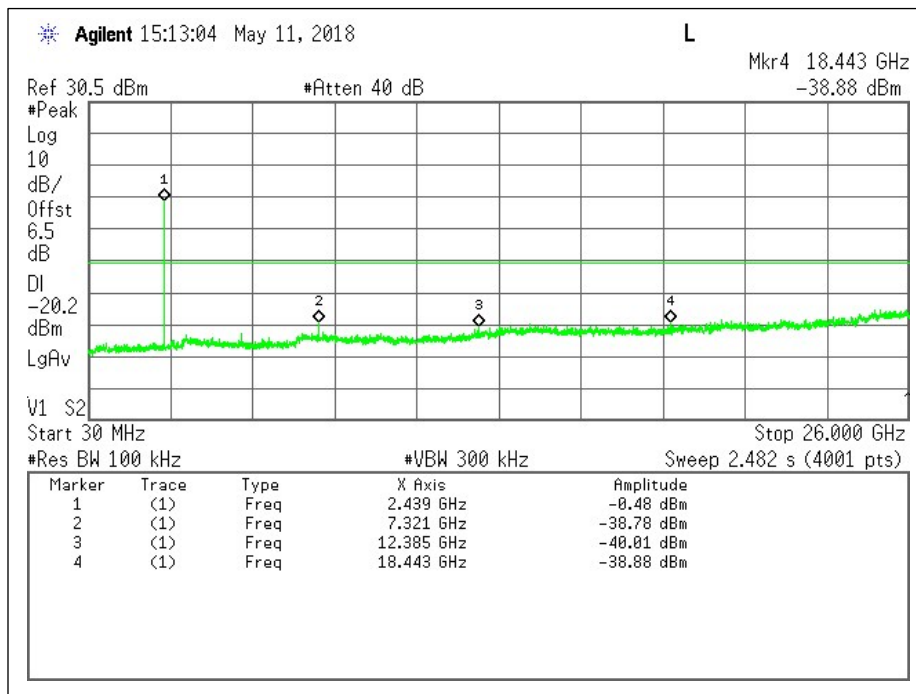


High Channel - Plot

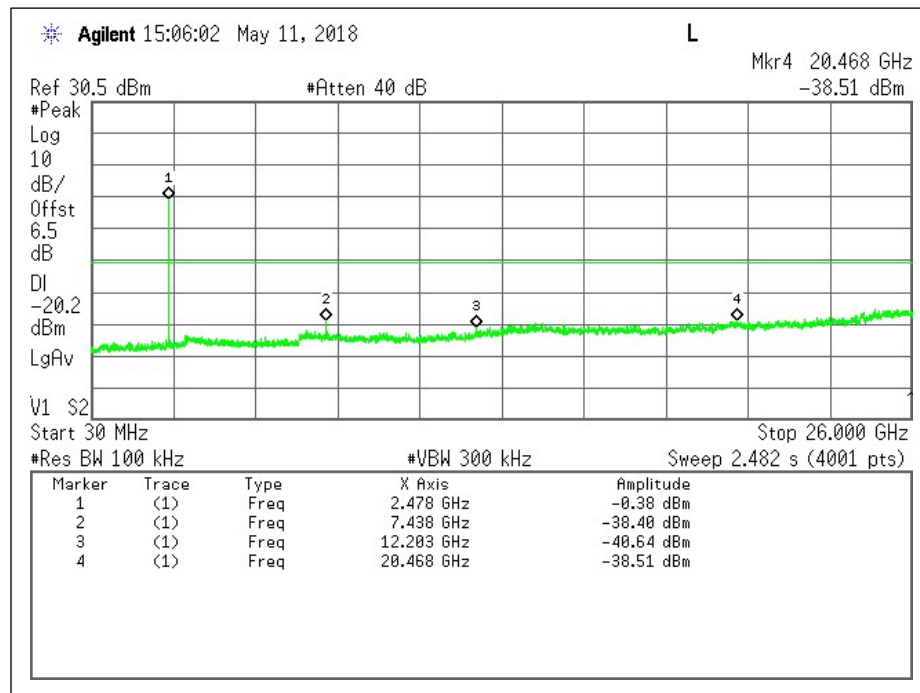
Conducted Spurious



Low Channel - Plot



Mid Channel - Plot



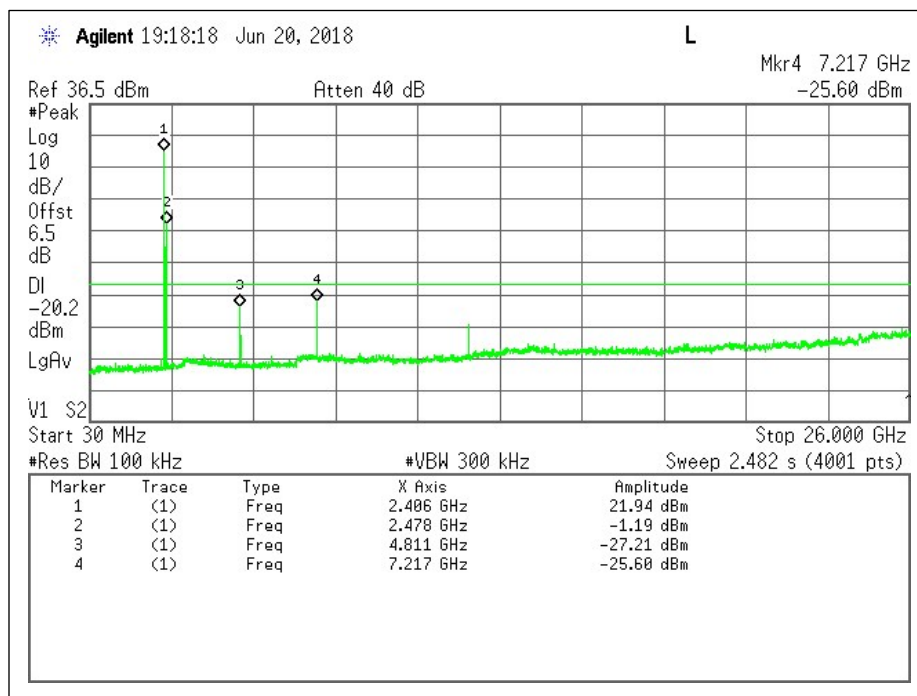
High Channel - Plot

Conducted Spurious – Simultaneous Transmission, Shared Antenna, with RF6 Radio

Configuration (Worse-case):

RF6 – Low Channel

Bluetooth (LE) – High Channel



Note: Display line shows the limit used for Bluetooth testing as this is the worse-case limit.

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	05/15/18-05/24/18	28.3	54	1002	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 and above 18GHz. Prescans performed in an anechoic chamber, final measurements performed on an OATS.

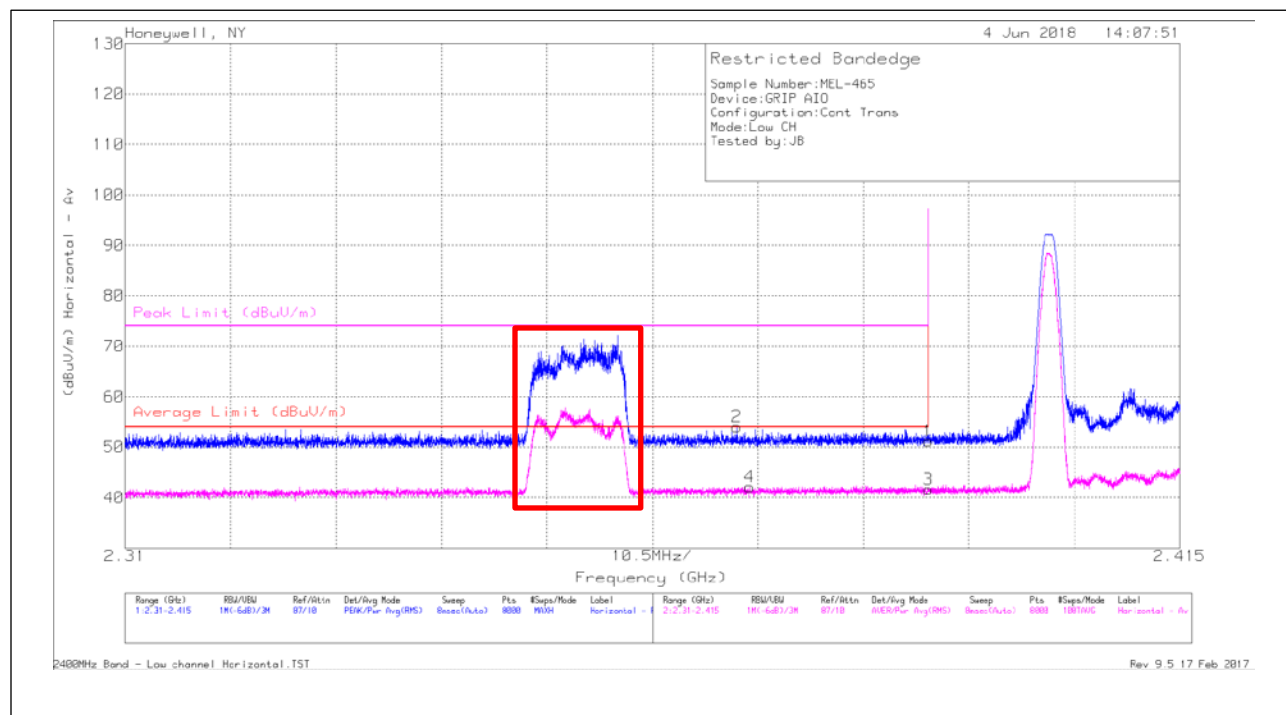
Since Wiselink/RF6/Bluetooth radios can transmit simultaneously, additional spurious scans are provided with all radios on and transmitting in their worse-case state.

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	10/17/18	10/17/19
Bilog Antenna (30MHz-5GHz)	11311	A022406	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 (10-4200MHz)	11537	1603006	Mini Circuits	TVA-11-422	N/A	N/A
Preamp (1-18GHz)	11557	18040034	Com-Power	PAM-118A	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-6GHz)	11534	A012816	Sunol	JB6	03/27/18	03/27/19
Horn Antenna (1-18GHz)	2973	3127	EMCO	RGA-60	01/22/18	01/22/19
Horn Antenna (18-40GHz)	11472	151	EMCO	EM-6963	02/14/18	02/14/19
Preamp (800MHz-21GHz)	11538	233701631	Mini Circuits	ZVA-213-S+	N/A	N/A
Preamp (18-40GHz)	11541	160911	Amplical	AMP18G40-35	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

Test Results

Restricted Band Edge



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	16.93	Pk	28.5	.7	2.6	2.5	-	51.23	74	-22.77	193	134	H
2	* 2.371	19.95	Pk	28.3	.7	2.6	2.5	-	54.05	74	-19.95	193	134	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
3	* 2.39	7.36	RMS	28.5	.7	2.6	2.5	2.03	43.69	54	-10.31	193	134	H
4	* 2.372	8.03	RMS	28.3	.7	2.6	2.5	2.03	44.16	54	-9.84	193	134	H

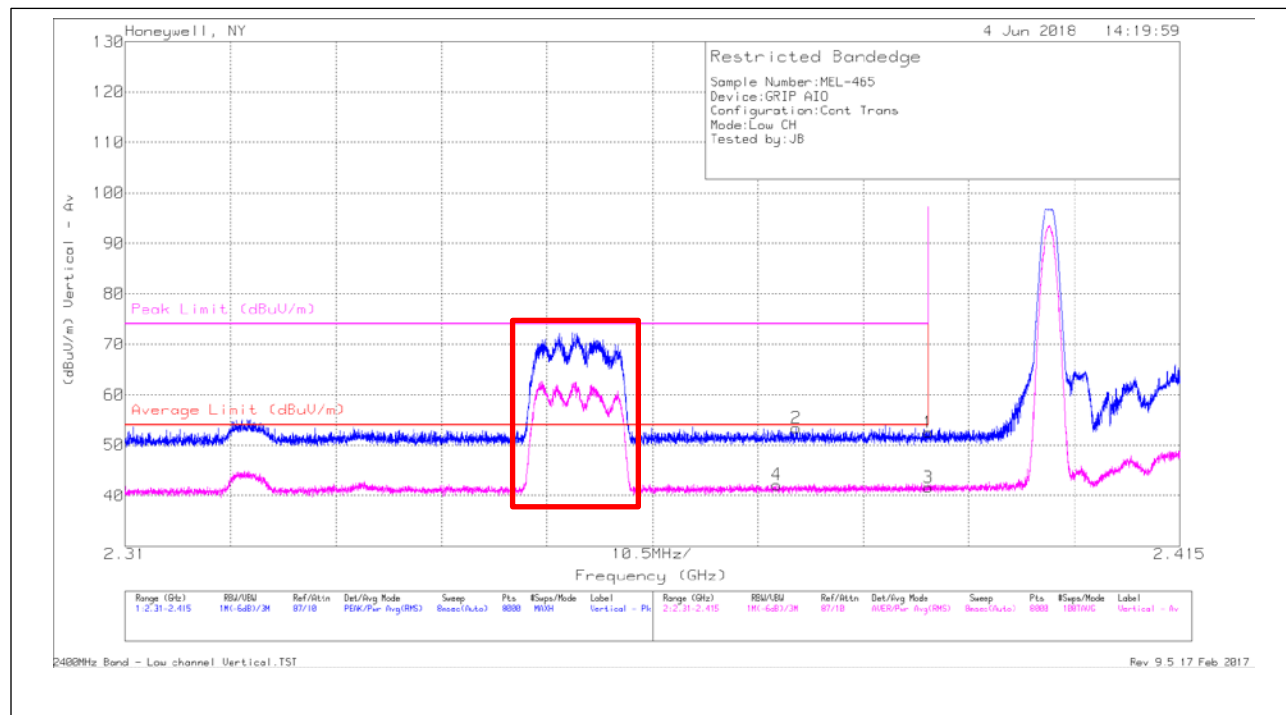
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter.

Low Channel Horizontal - Data



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	18.27	Pk	28.5	.7	2.6	2.5	-	52.57	74	-21.43	267	214	V
2	* 2.377	19.18	Pk	28.4	.7	2.6	2.5	-	53.38	74	-20.62	267	214	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
3	* 2.39	7.29	RMS	28.5	.7	2.6	2.5	2.03	43.62	54	-10.38	267	214	V
4	* 2.375	7.99	RMS	28.4	.7	2.6	2.5	2.03	44.22	54	-9.78	267	214	V

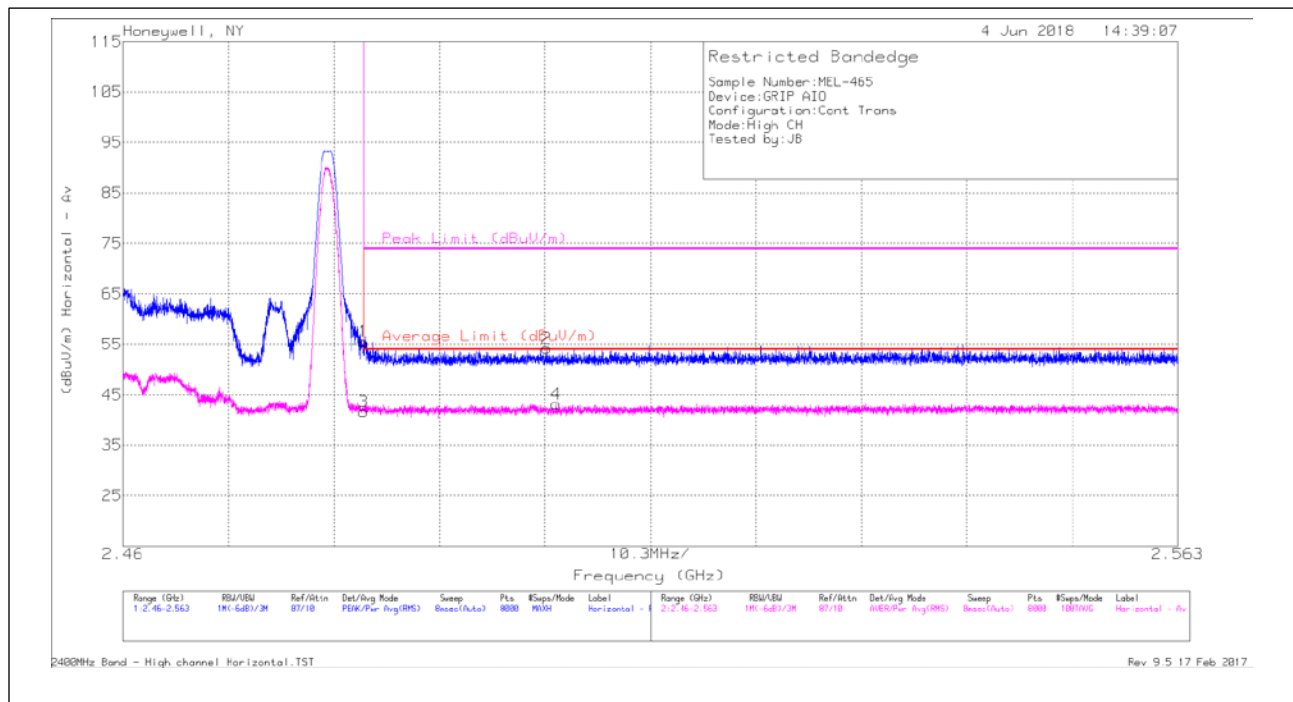
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

NOTE: Emissions highlighted in the plot above is OATS ambient and not a product of the transmitter.

Low Channel Vertical - Data



High Channel Horizontal – Plot

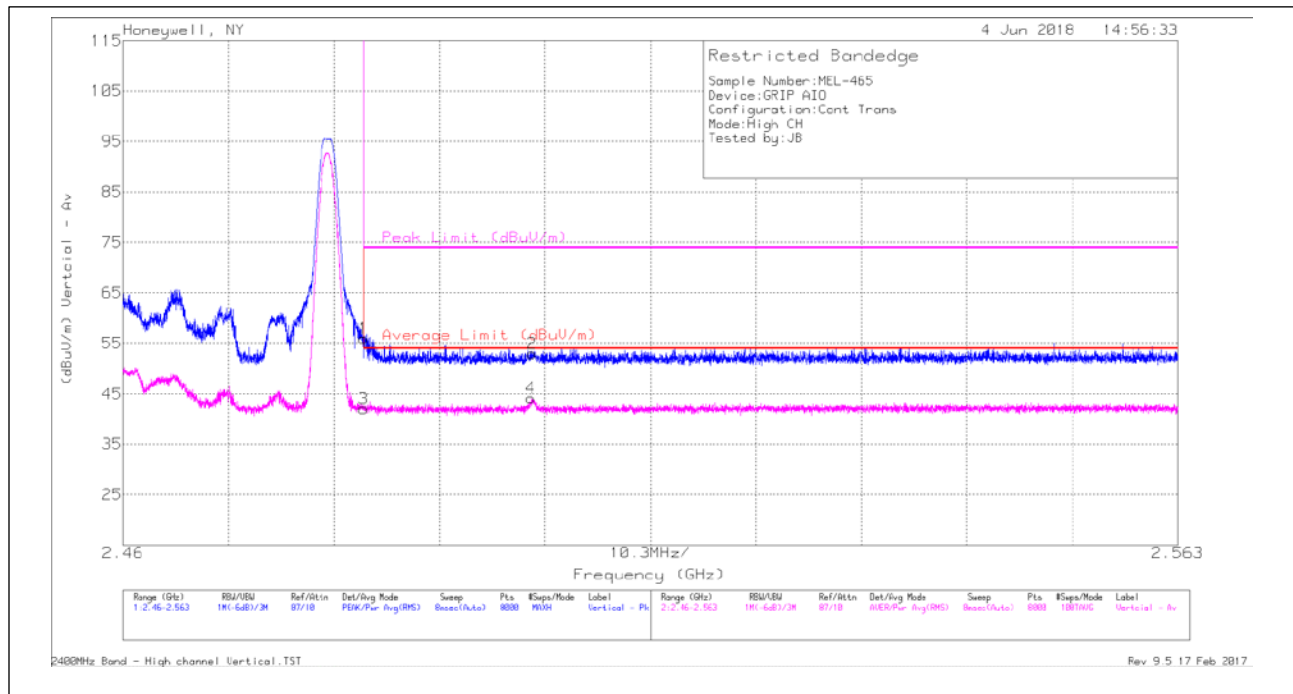
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	20.94	Pk	28.7	.7	2.6	2.6	-	55.54	74	-18.46	330	270	H
2	2.501	19.52	Pk	28.7	.7	2.7	2.6	-	54.22	74	-19.78	330	270	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
3	* 2.484	7.1	RMS	28.7	.7	2.6	2.6	2.03	43.73	54	-10.27	330	270	H
4	2.502	8.5	RMS	28.7	.7	2.7	2.6	2.03	45.23	54	-8.77	330	270	H

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

Pk - Peak detector

RMS - RMS detection

High Channel Horizontal - Data



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	21.35	Pk	28.7	.7	2.6	2.6	-	55.95	74	-18.05	284	223	V
2	* 2.5	18.21	Pk	28.7	.7	2.7	2.6	-	52.91	74	-21.09	284	223	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
3	* 2.484	7.4	RMS	28.7	.7	2.6	2.6	2.03	44.03	54	-9.97	284	223	V
4	* 2.5	9.45	RMS	28.7	.7	2.7	2.6	2.03	46.18	54	-7.82	284	223	V

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

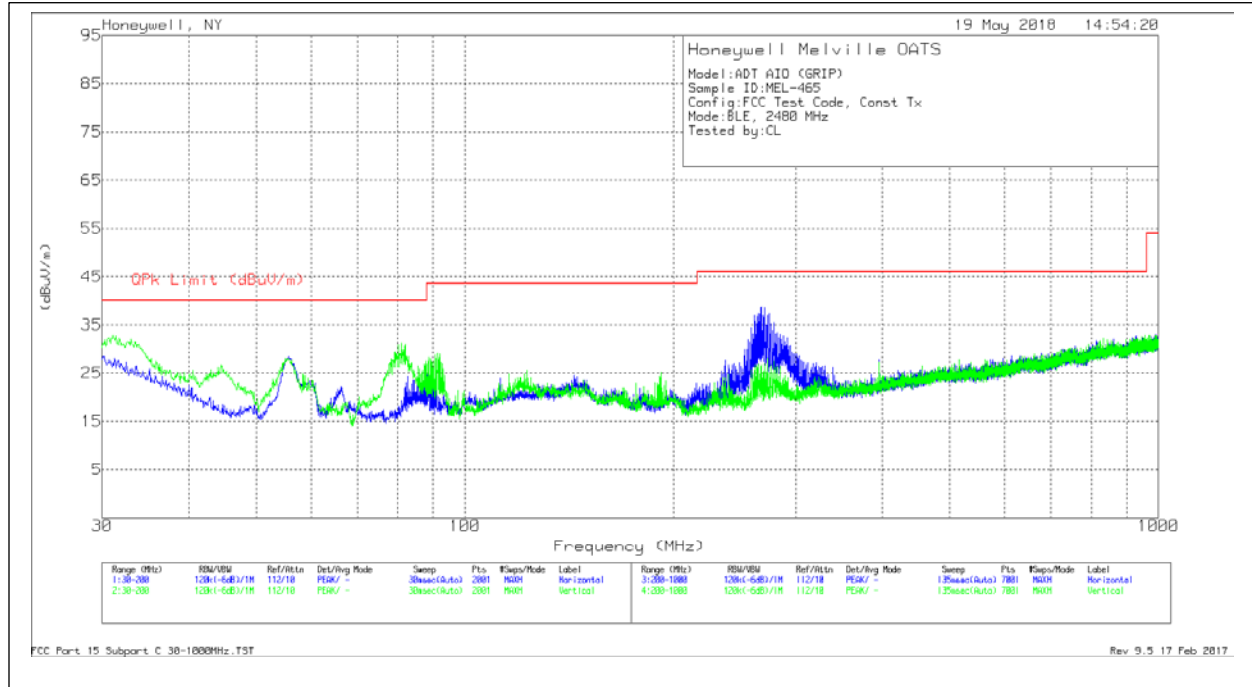
Pk - Peak detector

RMS - RMS detection

High Channel Vertical - Data

Spurious Emissions

Below 1GHz (Worse-case)



High Channel - Plot

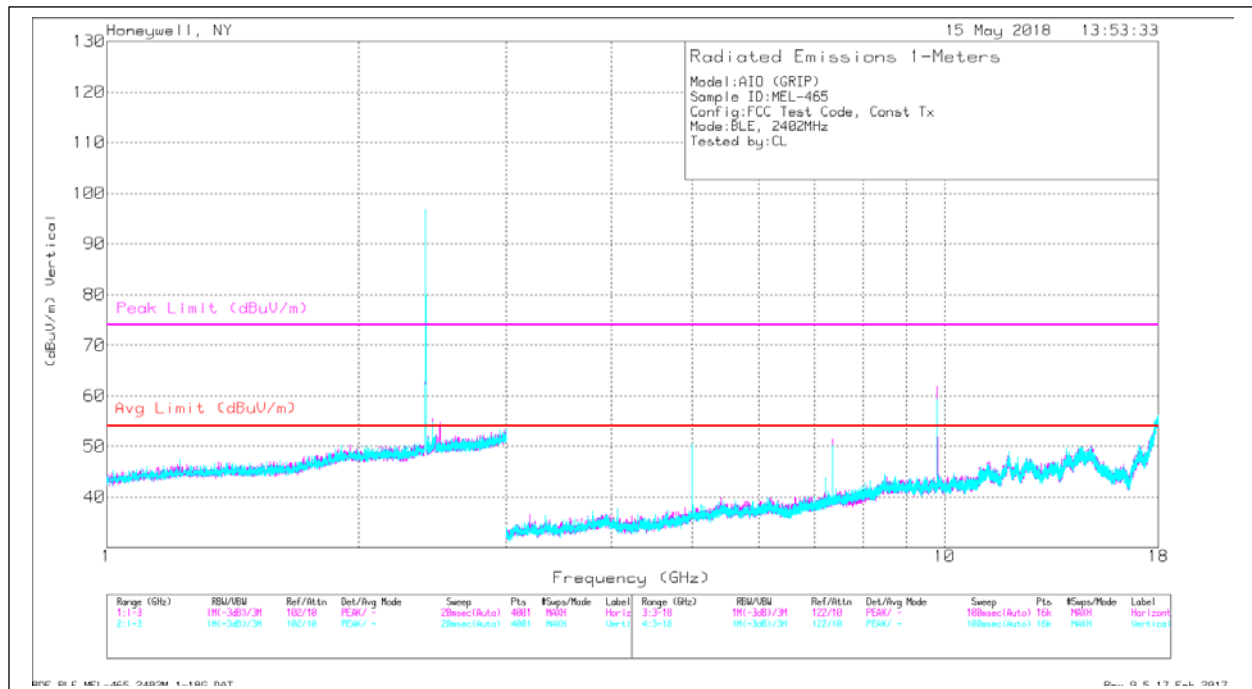
Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
31.7263	10.86	Qp	23.6	.9	35.36	40	-4.64	278	280	H
55.9512	16.9	Qp	12	1.1	30	40	-10	347	377	H
31.0564	11.08	Qp	24.1	.9	36.08	40	-3.92	173	167	V
55.1623	19.14	Qp	12	1.1	32.24	40	-7.76	308	122	V
80.953	13.86	Qp	11.7	1.4	26.96	40	-13.04	240	141	V
* 267.0425	5.45	Qp	17.1	3.1	25.65	46.02	-20.37	76	234	H

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

Qp - Quasi-Peak detector

High Channel - Data

1-18GHz



Low Channel - Plot

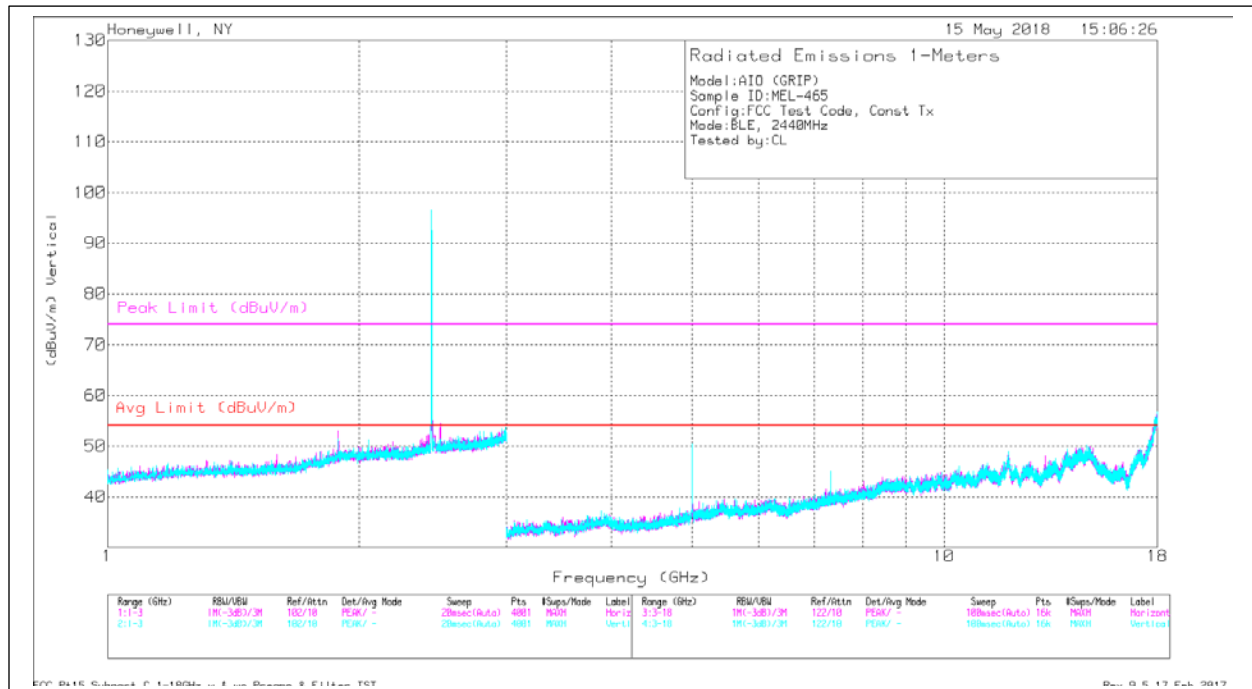
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 5	50.55	PK2	33.3	-41.6	3.8	3.7	-	49.75	-	-	74	-24.25	285	106	H
* 5	45.98	MAv1	33.3	-41.6	3.8	3.7	2.03	47.21	54	-6.79	-	-	285	106	H
* 7.348	40.66	PK2	36.6	-39.7	4.6	4.5	-	46.66	-	-	74	-27.34	284	318	H
* 7.352	28.87	MAv1	36.6	-39.7	4.6	4.5	2.03	36.9	54	-17.1	-	-	284	318	H
9.806	38.99	PK2	38.1	-39.1	5.6	5.2	-	48.79	-	-	74	-25.21	253	206	H
9.804	27.06	MAv1	38.1	-39.1	5.6	5.2	2.03	38.89	54	-15.11	-	-	253	206	H
* 18	38.95	PK2	47.9	-38.4	7.7	7.3	-	63.45	-	-	74	-10.55	174	106	H
* 18	24.64	MAv1	47.9	-38.4	7.7	7.3	2.03	51.17	54	-2.83	-	-	174	106	H
* 5	52.86	PK2	33.3	-41.6	3.8	3.7	-	52.06	-	-	74	-21.94	30	104	V
* 5	49.56	MAv1	33.3	-41.6	3.8	3.7	2.03	50.79	54	-3.21	-	-	30	104	V
* 7.347	40.89	PK2	36.6	-39.7	4.6	4.5	-	46.89	-	-	74	-27.11	108	195	V
* 7.356	28.9	MAv1	36.6	-39.7	4.6	4.5	2.03	36.93	54	-17.07	-	-	108	195	V
9.803	38.2	PK2	38.1	-39.1	5.6	5.2	-	48	-	-	74	-26	229	306	V
9.805	26.9	MAv1	38.1	-39.1	5.6	5.2	2.03	38.73	54	-15.27	-	-	229	306	V
* 17.998	38.92	PK2	47.9	-38.4	7.7	7.3	-	63.42	-	-	74	-10.58	242	220	V
* 17.997	24.72	MAv1	47.9	-38.4	7.7	7.3	2.03	51.25	54	-2.75	-	-	242	220	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

Low Channel - Data



Mid Channel - Plot

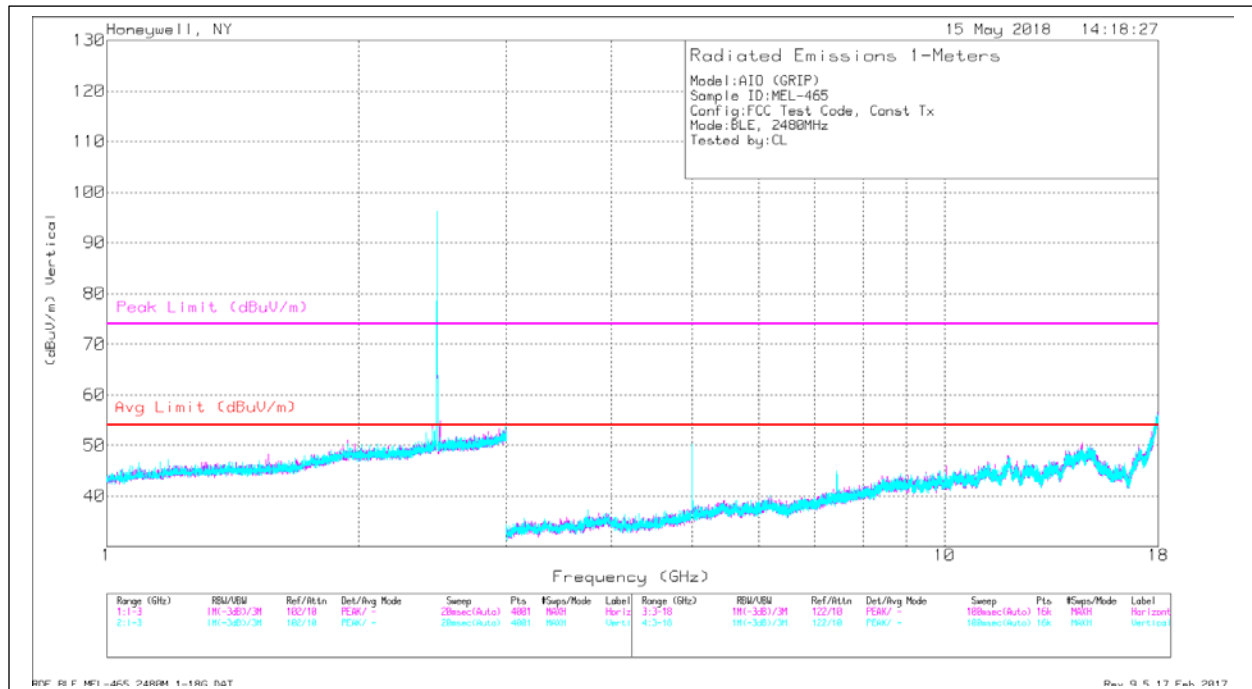
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 5	52.37	PK2	33.3	-41.6	3.8	3.7	-	51.57	-	-	74	-22.43	74	301	H
* 5	48.62	MAv1	33.3	-41.6	3.8	3.7	2.03	49.85	54	-4.15	-	-	74	301	H
* 7.316	40.19	PK2	36.6	-39.6	4.6	4.5	-	46.29	-	-	74	-27.71	269	134	H
* 7.319	28.78	MAv1	36.6	-39.7	4.6	4.5	2.03	36.81	54	-17.19	-	-	269	134	H
* 11.942	38.03	PK2	39.5	-37.4	6.8	5.8	-	52.73	-	-	74	-21.27	240	376	H
* 11.943	26.8	MAv1	39.5	-37.4	6.8	5.8	2.03	43.53	54	-10.47	-	-	240	376	H
* 18	38.95	PK2	47.9	-38.4	7.7	7.3	-	63.45	-	-	74	-10.55	174	106	H
* 18	24.64	MAv1	47.9	-38.4	7.7	7.3	2.03	51.17	54	-2.83	-	-	174	106	H
* 5	54.98	PK2	33.3	-41.6	3.8	3.7	-	54.18	-	-	74	-19.82	352	170	V
* 5	52.01	MAv1	33.3	-41.6	3.8	3.7	2.03	53.24	54	-0.76	-	-	352	170	V
* 7.316	41.05	PK2	36.6	-39.6	4.6	4.5	-	47.15	-	-	74	-26.85	330	334	V
* 7.322	28.77	MAv1	36.6	-39.7	4.6	4.5	2.03	36.8	54	-17.2	-	-	330	334	V
* 11.936	38.04	PK2	39.5	-37.4	6.8	5.8	-	52.74	-	-	74	-21.26	204	238	V
* 11.934	26.76	MAv1	39.5	-37.4	6.9	5.8	2.03	43.59	54	-10.41	-	-	204	238	V
* 17.998	38.92	PK2	47.9	-38.4	7.7	7.3	-	63.42	-	-	74	-10.58	242	220	V
* 17.997	24.72	MAv1	47.9	-38.4	7.7	7.3	2.03	51.25	54	-2.75	-	-	242	220	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

Mid Channel - Data



High Channel - Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX2 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 5	51.12	PK2	33.3	-41.6	3.8	3.7	-	50.32	-	-	74	-23.68	246	242	H
* 5	46.91	MAv1	33.3	-41.6	3.8	3.7	2.03	48.14	54	-5.86	-	-	246	242	H
* 7.439	43.28	PK2	36.7	-39.7	4.7	4.6	-	49.58	-	-	74	-24.42	343	231	H
* 7.439	33.69	MAv1	36.7	-39.7	4.7	4.6	2.03	42.02	54	-11.98	-	-	343	231	H
14.587	40.02	PK2	42.5	-36.9	6.9	6.4	-	58.92	-	-	74	-15.08	94	130	H
14.586	28.61	MAv1	42.5	-36.9	6.9	6.4	2.03	49.54	54	-4.46	-	-	94	130	H
* 18	38.95	PK2	47.9	-38.4	7.7	7.3	-	63.45	-	-	74	-10.55	174	106	H
* 18	24.64	MAv1	47.9	-38.4	7.7	7.3	2.03	51.17	54	-2.83	-	-	174	106	H
* 5	53.88	PK2	33.3	-41.6	3.8	3.7	-	53.08	-	-	74	-20.92	13	220	V
* 5	50.82	MAv1	33.3	-41.6	3.8	3.7	2.03	52.05	54	-1.95	-	-	13	220	V
* 7.439	44.02	PK2	36.7	-39.7	4.7	4.6	-	50.32	-	-	74	-23.68	204	244	V
* 7.439	34.04	MAv1	36.7	-39.7	4.7	4.6	2.03	42.37	54	-11.63	-	-	204	244	V
14.767	38.87	PK2	42.3	-36.9	6.7	6.4	-	57.37	-	-	74	-16.63	246	368	V
14.769	27.38	MAv1	42.3	-36.9	6.7	6.4	2.03	47.91	54	-6.09	-	-	246	368	V
* 17.998	38.92	PK2	47.9	-38.4	7.7	7.3	-	63.42	-	-	74	-10.58	242	220	V
* 17.997	24.72	MAv1	47.9	-38.4	7.7	7.3	2.03	51.25	54	-2.75	-	-	242	220	V

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

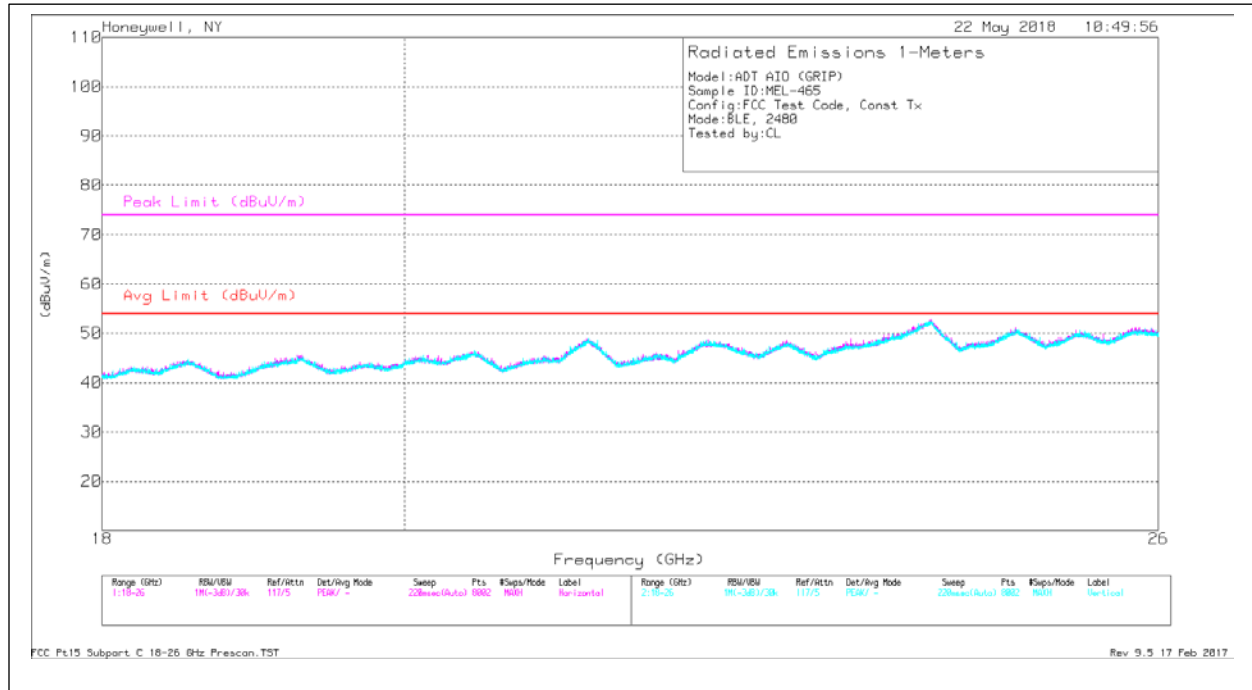
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

High Channel - Data

18-26GHz

Note: No emissions detected above the system noise floor



High 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

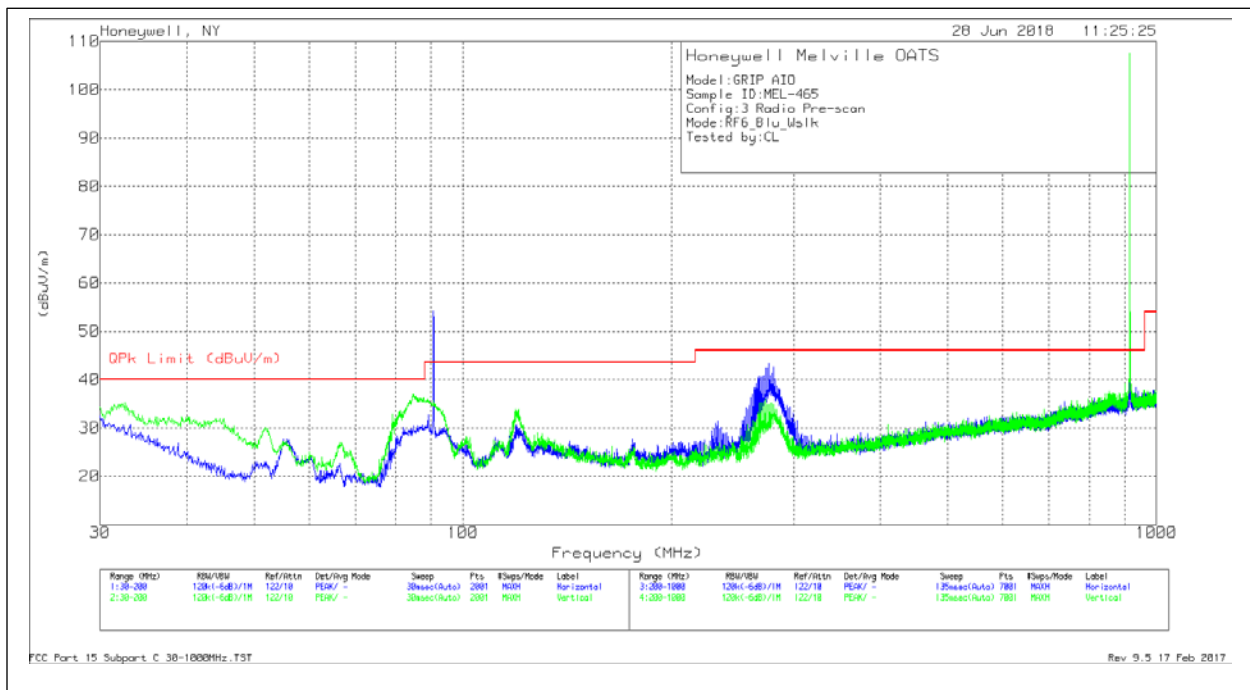
MAv1 - KDB558074 Option 1 Maximum RMS Average

High Channel - Data

Simultaneous Transmission

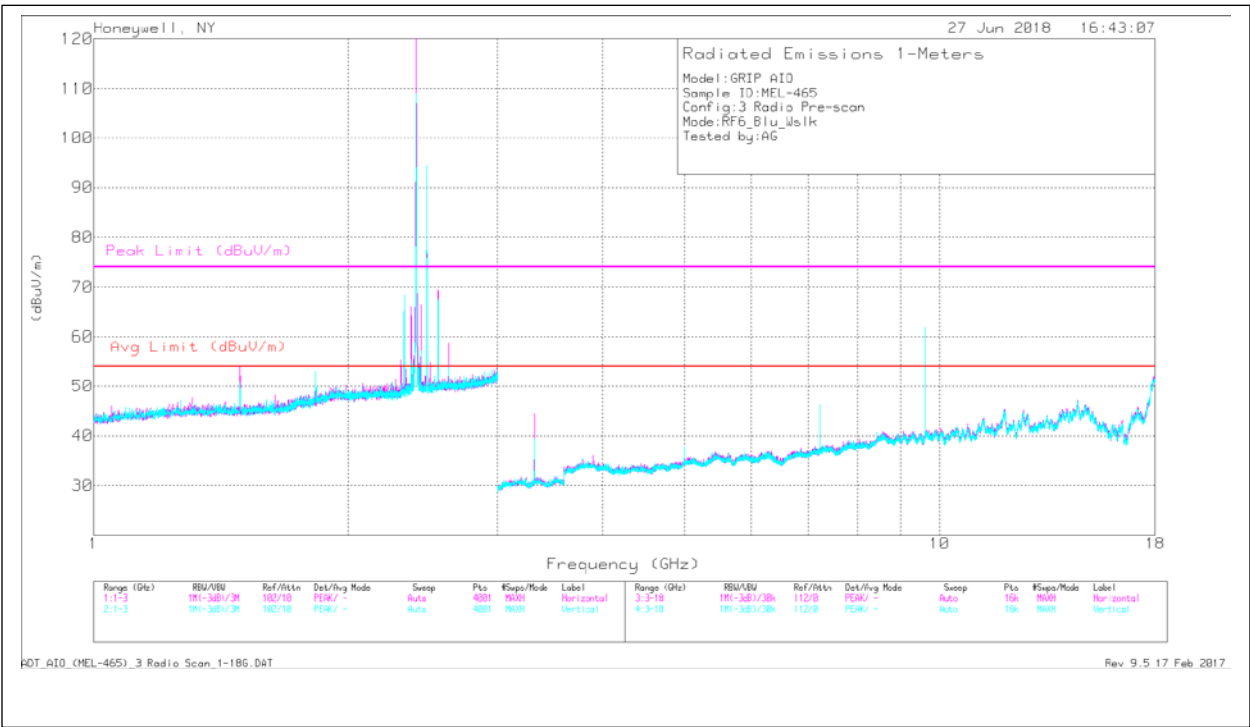
Configuration (Worse-case):

RF6 – Antenna 1, Low Channel
Wiselink – Low Channel
Bluetooth (LE) – High Channel



30-1000MHz – Plot

Note: No additional emissions generated by simultaneous transmission



1-18GHz – Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX3 [dB]	SMA7 [dB]	SMA5 [dB]	DC Corr [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.479	22.87	Pk	25.4	.6	2.1	1.9	-	52.87	-	-	74	-21.13	165	102	H
* 1.479	18.89	MAv1	25.4	.6	2.1	1.9	-	48.89	54	-5.11	-	-	165	102	H
* 2.33	32.3	Pk	28.1	.7	2.6	2.5	-	66.2	-	-	74	-7.8	226	204	H
* 2.33	27.36	Av	28.1	.7	2.6	2.5	-23.4	37.86	54	-16.14	-	-	226	204	H
* 1.479	25.69	Pk	25.4	.6	2.1	1.9	-	55.69	-	-	74	-18.31	358	181	V
* 1.479	19.68	MAv1	25.4	.6	2.1	1.9	-	49.68	54	-4.32	-	-	358	181	V
* 2.33	28.34	Pk	28.1	.7	2.6	2.5	-	62.24	-	-	74	-11.76	193	108	V
* 2.33	22.15	Av	28.1	.7	2.6	2.5	-23.4	32.65	54	-21.35	-	-	193	108	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SMA 8 [dB]	CP Preamp	Distance Corr Factor [dB]	24G Notch Filter	Pad [dB]	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.555	47.56	Pk	28.9	2.5	-	-9.5	-	-	69.46	74	-4.54	0-360	100	H
2.631	36.62	Pk	29	2.5	-	-9.5	-	-	58.62	74	-15.38	0-360	100	H
1.831	32.76	Pk	27.1	2.1	-	-9.5	-	-	52.46	74	-21.54	0-360	100	V
3.32	49.43	Pk	31.4	3	-40.6	-9.5	.8	20	54.53	74	-19.47	0-360	100	H
7.215	43.08	Pk	36.2	4.4	-39.6	-9.5	.1	20	54.68	74	-19.32	0-360	100	H
9.619	56.21	Pk	38	5.2	-39.8	-9.5	.8	20	70.91	74	-3.09	0-360	100	H
14.573	35.82	Pk	42.5	6.6	-39.8	-9.5	1	20	56.62	74	-17.38	0-360	100	H
17.171	36.14	Pk	41.4	6.9	-39.7	-9.5	.4	20	55.64	74	-18.36	0-360	100	H
7.214	44.67	Pk	36.2	4.4	-39.6	-9.5	.1	20	56.27	74	-17.73	0-360	100	V
9.619	57.22	Pk	38	5.2	-39.8	-9.5	.8	20	71.92	74	-2.08	0-360	100	V
14.584	36.31	Pk	42.5	6.6	-39.7	-9.5	.9	20	57.11	74	-16.89	0-360	100	V
17.185	35.61	Pk	41.5	6.9	-39.8	-9.5	.4	20	55.11	74	-18.89	0-360	100	V

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

Pk - Peak Detector

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

MAv1 - KDB558074 Option 1 Maximum RMS Average

Duty Cycle (RF6) = 6.75%, thus DC Corr = $20\log(0.0675) = -23.4\text{dB}$

2.33GHz was found to be a product of the RF6 transmitter, thus Average measurement was derived by applying a duty cycle correction factor to the Peak measurement.

1-18GHz – 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 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

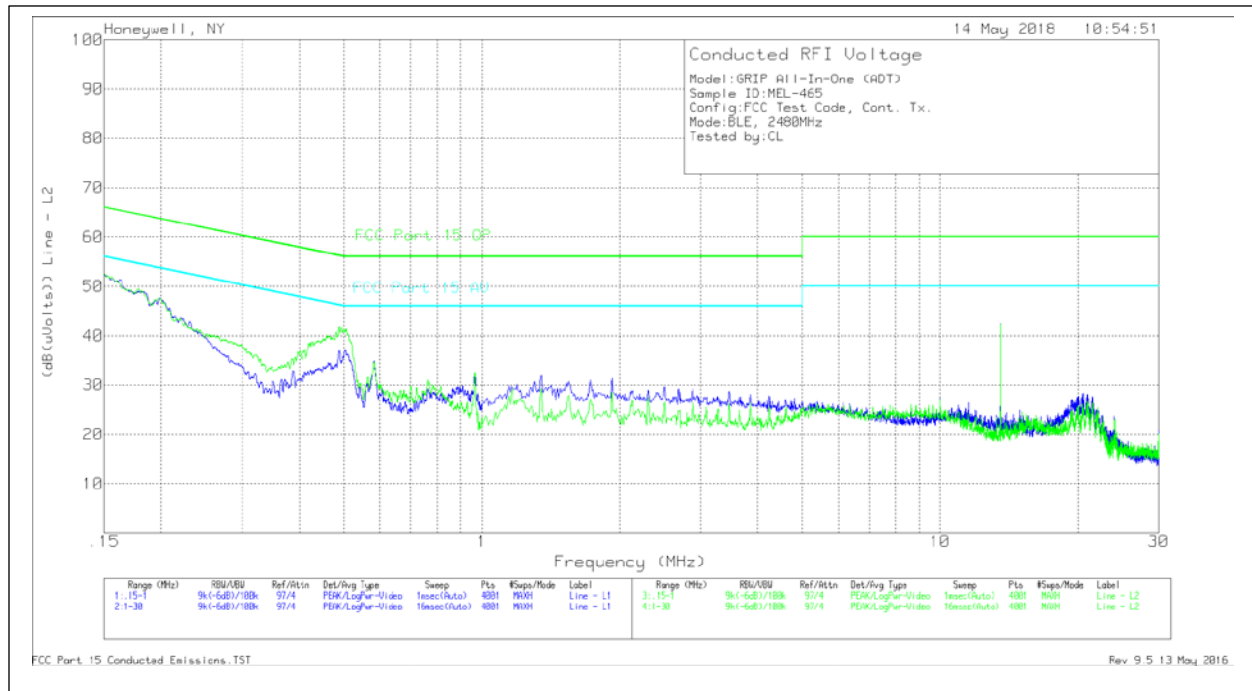
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	5/10/18	22.6	8.8	1014	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11556	MY49430802	Keysight	N9030A (PXA)	12/19/2017	12/19/2018
LISN	11527	241259	Com-Power	LIN-120A	01/10/2018	01/10/2019
Measurement Software	11543	Version 9.5	UL	UL EMC	N/A	N/A
Environmental Meter	11533	A078144	Extech Instruments	SD700	08/21/2017	08/21/2020

Test Results (Worse-case)



High Channel – Plot

Line - L1									
Frequency (MHz)	Meter Reading (dBuV)	Det	Gain/Loss [dB] LISN1	CDE Cable #1	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.15948	40.47	Pk	10.6	0	51.07	65.49	-14.42	55.49	-4.42
.50337	27.06	Pk	10	0	37.06	56	-18.94	46	-8.94
.96877	21.48	Pk	9.9	0	31.38	56	-24.62	46	-14.62
1.348	22.02	Pk	9.9	0	31.92	56	-24.08	46	-14.08
13.557	32.12	Pk	10.1	.2	42.42	60	-17.58	50	-7.58
20.4735	17.68	Pk	10.4	.3	28.38	60	-31.62	50	-21.62

Line - Neutral									
Frequency (MHz)	Meter Reading (dBuV)	Det	Gain/Loss [dB] LISN1	CDE Cable #1	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.15021	41.96	Pk	10.6	0	52.56	65.99	-13.43	55.99	-3.43
.48867	31.79	Pk	10	0	41.79	56.19	-14.4	46.19	-4.4
.96526	22.45	Pk	9.9	0	32.35	56	-23.65	46	-13.65
1.16675	19.45	Pk	9.9	0	29.35	56	-26.65	46	-16.65
13.557	31.98	Pk	10.1	.2	42.28	60	-17.72	50	-7.72
21.039	16.23	Pk	10.4	.3	26.93	60	-33.07	50	-23.07

Pk - Peak detector

High Channel – Data

END OF REPORT