

Honeywell Home

FCC / ISED Test Report

For

Flycatcher Thermostat

Report #: 43868-2

FCC ID: HS9-THX321WF01

IC ID: 573R-THX321WF01

Report Completion Date: 2018-11-30

Prepared by and for:

Ademco Inc.

2 Corporate Center Dr.

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Testing

NVLAP Lab Code: 600110

Document Introduction

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

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

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

Ademco Inc. is the legal entity name for Honeywell Home / Resideo. All three names can be used synonymously within this test report.

Test Report Revision History				
Revision	Prepared By	Reviewed By	Revision Detail	Release Date
---	M. Antola	A. Roussin	Original Release	2018-11-30
A	M. Antola	A. Roussin	Updated antenna gain information	2018-12-19

Report Authorization

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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
Test & Measurement Equipment.....	9
On Time and Duty Cycle.....	11
20dB Emission Bandwidth.....	12
99% Occupied Bandwidth.....	16
Maximum Conducted Output Power.....	20
Number of Hopping Frequencies	21
Channel Separation	23
Dwell Time.....	25
Out-of-Band Emissions	27
Radiated Emissions (Intentional)	35
Conducted Emissions (Mains).....	50
END OF REPORT.....	52

Applicable Test Standards/Limits

Test Standards/Limits	Result	Dates Tested
ANSI C63.10: 2013	Compliant	11/15/18 – 11/30/18
RSS-247, Issue 2, Section 5	Compliant	11/15/18 – 11/30/18
RSS-GEN, Issue 4	Compliant	11/15/18 – 11/30/18
CFR 47 Pt 15 Subpart C, Section 15.207/209	Compliant	11/15/18 – 11/30/18
CFR 47 Pt 15 Subpart C, Section 15.247	Compliant	11/15/18 – 11/30/18

Deviations from Test Methods

#	Deviation Description
0	None

Facilities and Accreditation

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

Test Item Description

The EUT, model number RCHT9610WFW2004, is a wireless thermostat that contains two (2) unique radios – a dual-band Wi-Fi radio and a 903-926MHz frequency hopping spread spectrum (i.e. RedLINK) radio. Each radio utilizes two (2) antennas, which are used for diversity only. Antenna gains are listed below:

2.4GHz Wi-Fi Antenna 1: -0.55dBi
2.4GHz Wi-Fi Antenna 2: 0.65dBi
5GHz Wi-Fi Antenna 1: -0.10dBi
5GHz Wi-Fi Antenna 2: 0.94dBi
900MHz RedLINK Antenna 1: 0.50dBi
900MHz RedLINK Antenna 2: 1.45dBi

This report covers the 900MHz RedLINK radio only.

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 (standing upright) was the worst-case orientation. Therefore, all final radiated test was performed with the EUT in the X axis orientation. See setup photos for details.

Test Sample Identification

Sample ID Number	Sample Serial Number	Date Received
MEL-633	Non-serialized production unit	2018-11-15
MEL-634	Non-serialized production unit	2018-11-15

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	20 dB Emission Bandwidth	PASS
2	99% Occupied Bandwidth	PASS
3	Maximum Conducted Output Power	PASS
4	Number of Hopping Frequencies	PASS
5	Channel Separation	PASS
6	Dwell Time	PASS
7	Out-of-Band Emissions	PASS
8	Radiated Emissions (Intentional)	PASS
9	Conducted Emissions (Mains)	PASS

Test & Measurement Equipment

The following test and measurement equipment was utilized for the tests documented in this report:

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
RF Lab (RF Conducted & Power Tests)						
Spectrum Analyzer	11531	MY41000078	Agilent	E4440A	06/06/17	06/06/19
Power Sensor	11568	105317	Rohde & Schwarz	NRP-Z81	10/02/18	10/02/19
Attenuator	-	1624	Pasternack	PE7087-6	*	*
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	10/29/18	10/29/19
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	*	*
Preamp (500MHz-18GHz)	11557	18040034	Com-Power	PAM-118A	*	*
Preamp (18-40GHz)	11541	160911	Amplical	AMP18G40-35	*	*
Band Reject Filter	11553	G041	Micro-tronics	BRM50702-01	*	*
RF Cable	-	-	Mini-Circuits	RDE#2	*	*
RF Cable	-	-	Insulated Wire	SMA#8	*	*
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 (100kHz-1.3GHz)	11540	2443AUF555	HP	8447D	*	*
Preamp (1-18GHz)	11539	160362	Amplical	AMP1G18-35	*	*
Preamp	11541	160911	Amplical	AMP18G40-35	*	*

(18-40GHz)						
High Pass Filter	11552	G018	Micro-tronics	HPM50111-01	*	*
RF Cable	-	-	Pasternack	RDE#1	*	*
RF Cable	-	-	MegaPhase	EMC2-S1S1-360	*	*
Shield Room						
EMI Receiver	11566	102484	Rohde & Schwarz	ESR3	09/19/18	09/19/19
LISN	11527	241259	Com-Power	LIN-120A	01/10/18	01/10/19
Misc.						
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

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

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

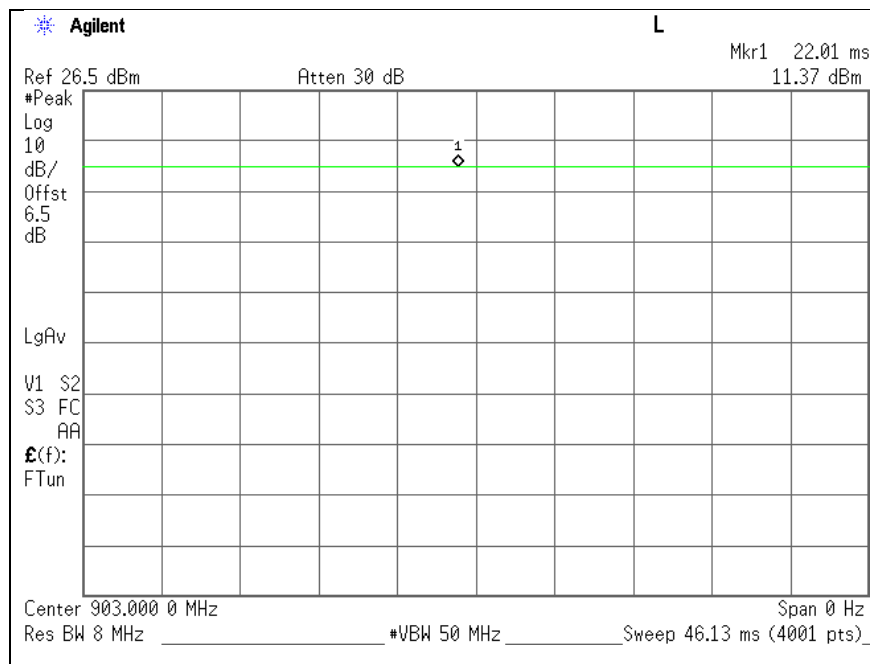
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
MA	RF Lab	12/03/18	22.6	37.2	1014	P

Test Results

EUT Mode	ON Time (ms)	Period (ms)	Duty Cycle (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/ON Time Minimum VBW (kHz)
RedLINK	22.01	22.01	1.0	100%	0.00	0.01

Duty Cycle Plot



20dB Emission 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 20 dB relative to the maximum level measured in the fundamental emission.

Test Limit

Reference	Limit
CFR 47 Subpart C 15.247 (a)(1)(i)	< 0.25% of the Center Frequency

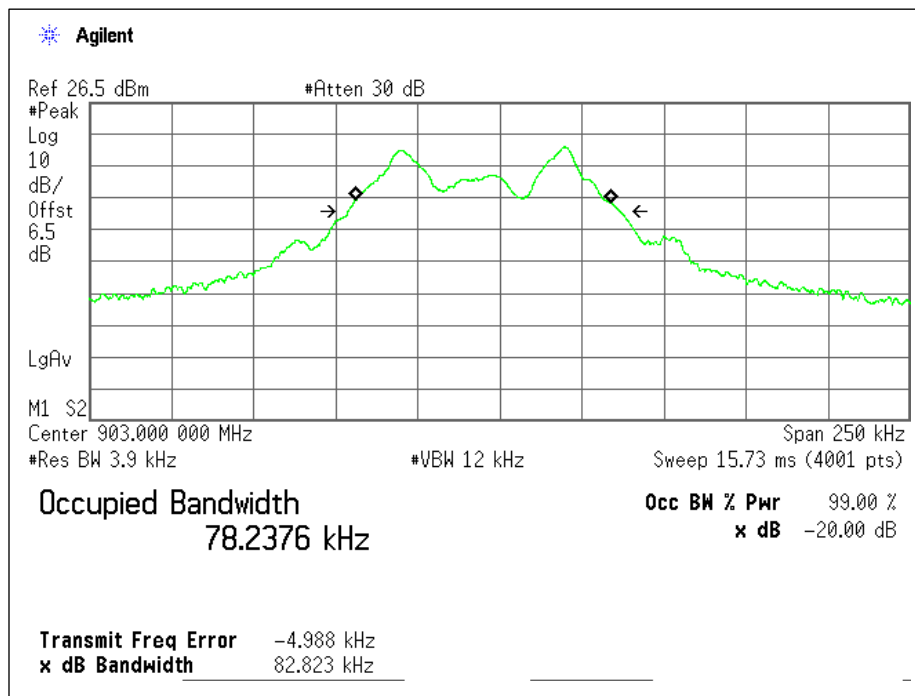
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

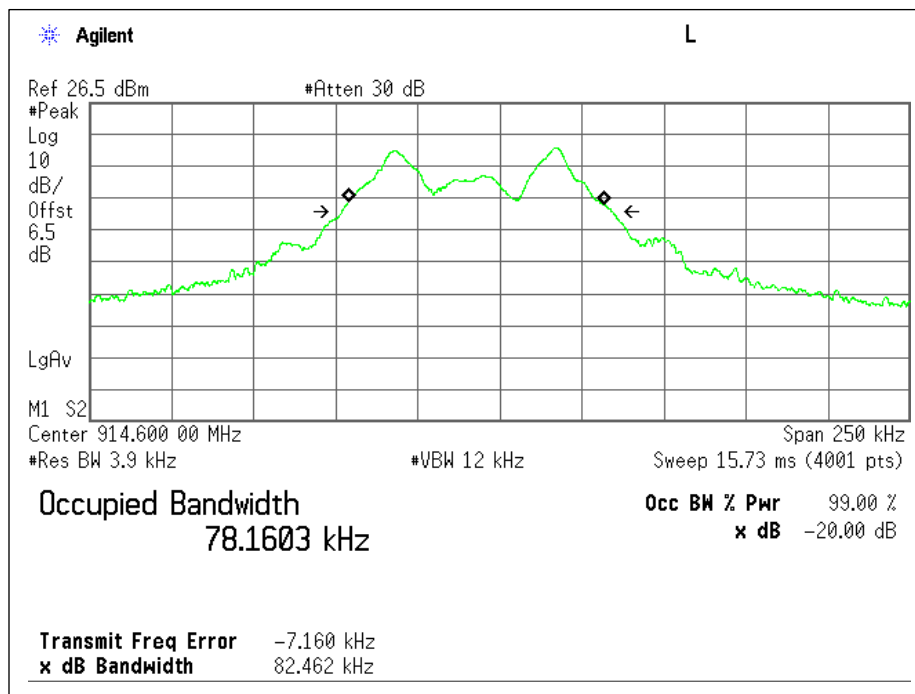
Test Results

Channel	Frequency (MHz)	20dB Bandwidth (in kHz)	
		Antenna 1	Antenna 2
Low	903	82.823	82.502
Mid	914.6	82.462	82.545
High	926.4	83.496	83.186

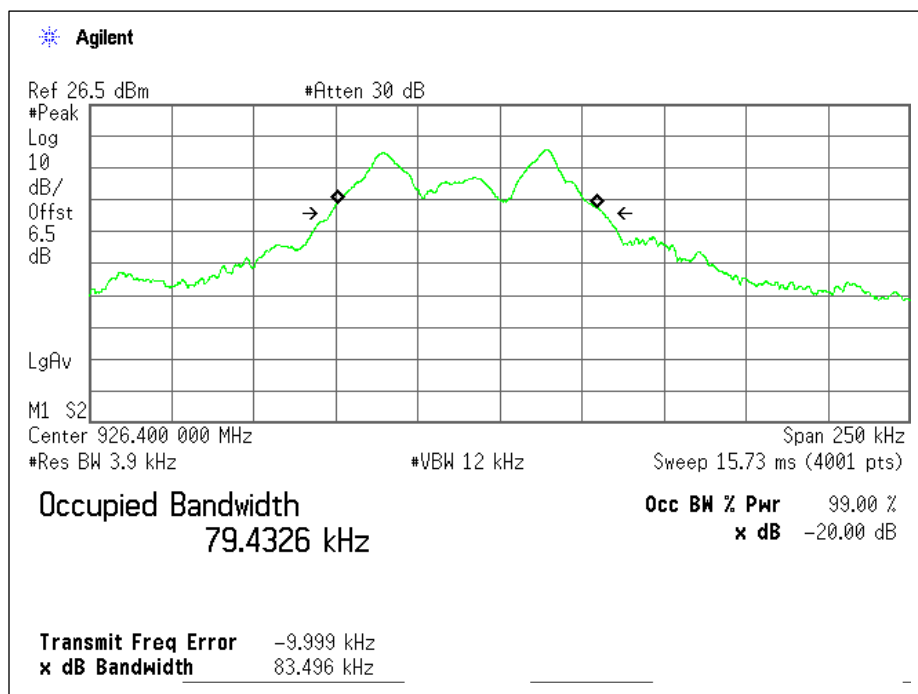
20dB Bandwidth



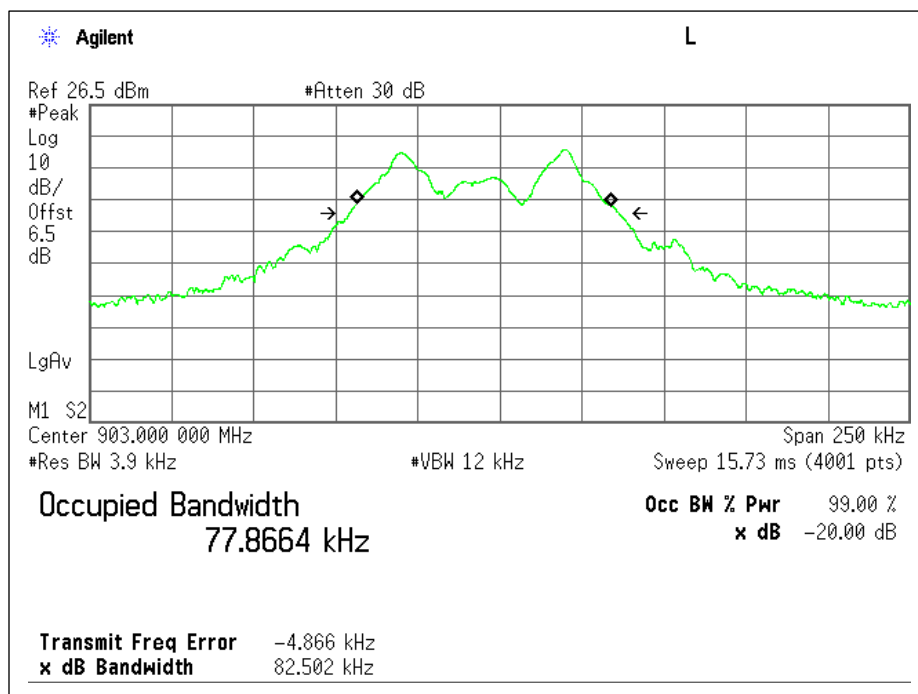
Antenna 1: Low Channel - Plot



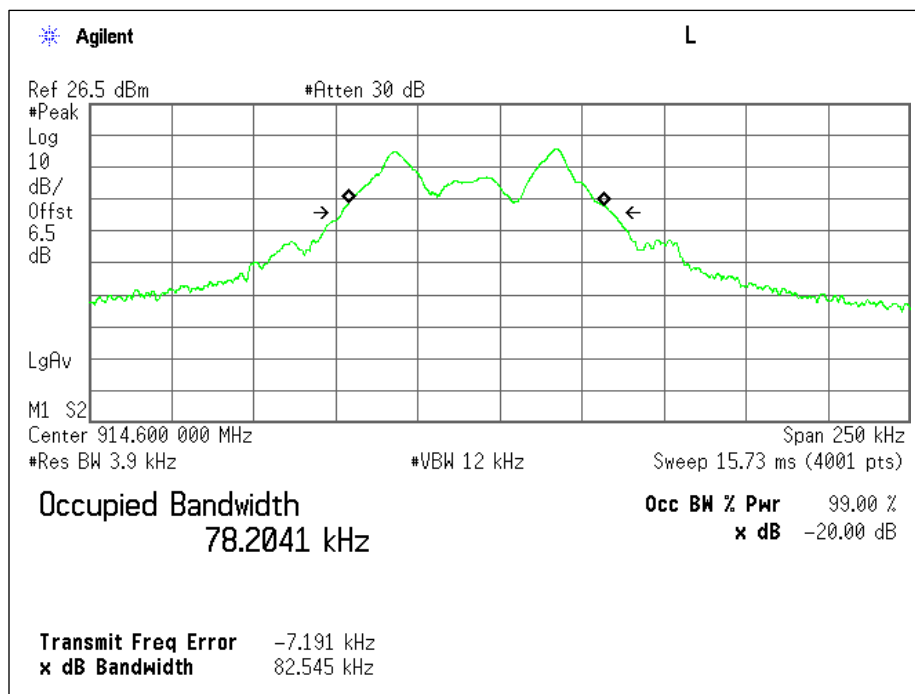
Antenna 1: Mid Channel - Plot



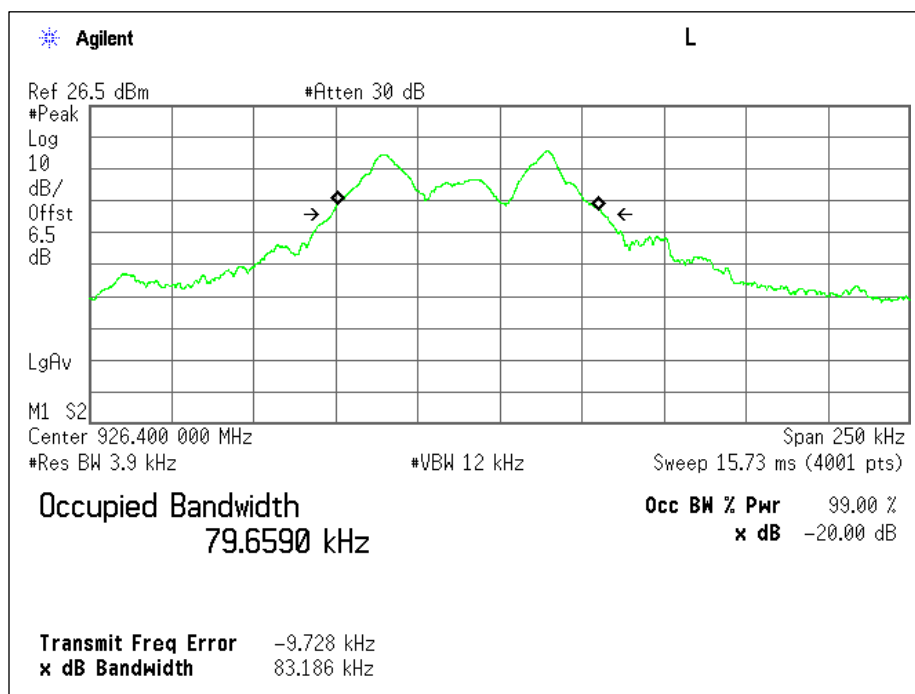
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

99% Occupied Bandwidth

Test Description

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

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

Test Criteria

Reference	Limit
RSS-GEN, Section 6.6	N/A

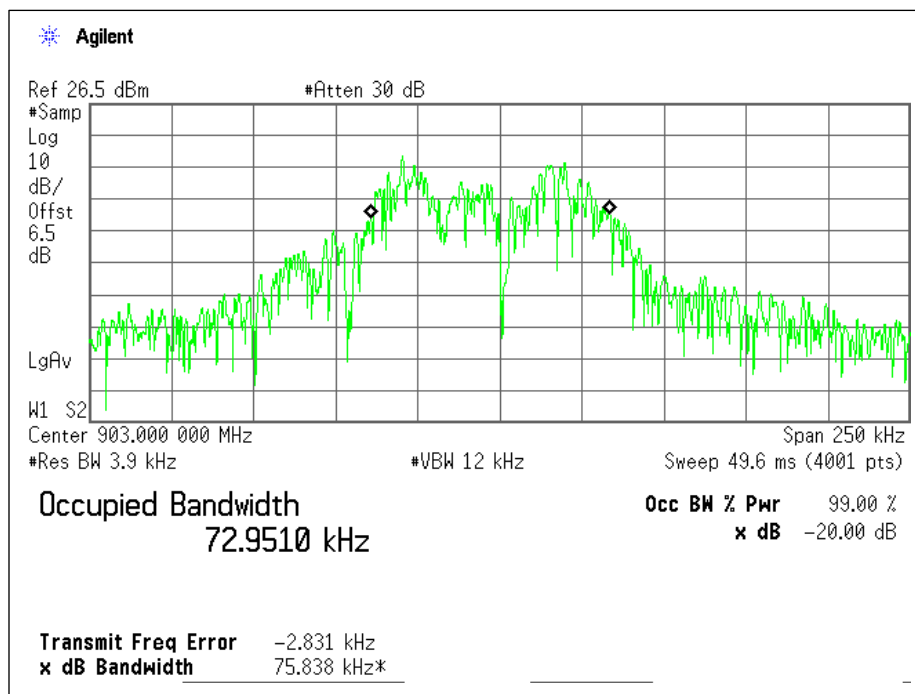
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

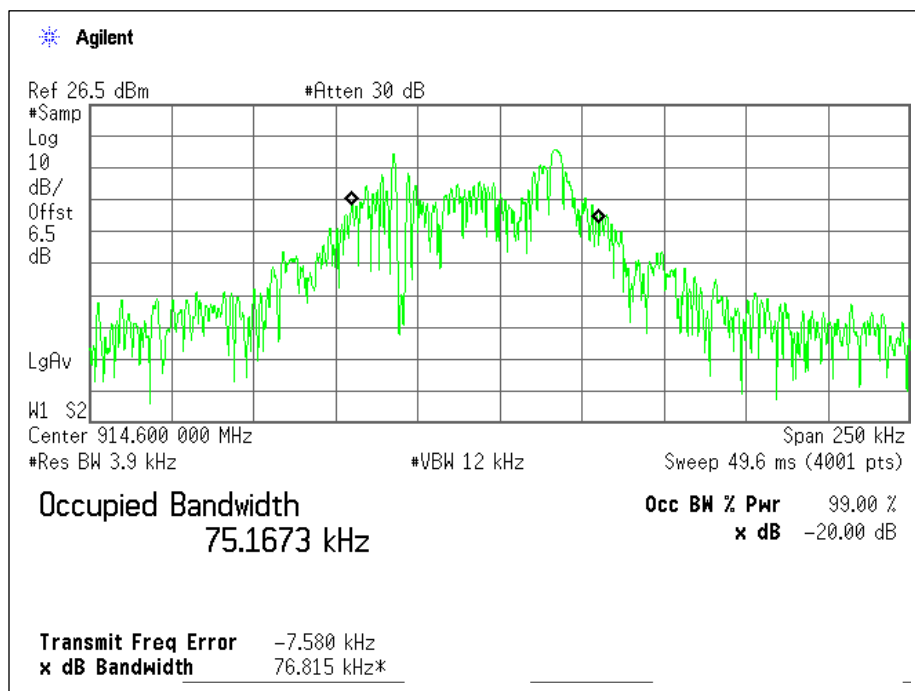
Test Results

Channel	Frequency (MHz)	99% Bandwidth (in kHz)	
		Antenna 1	Antenna 2
Low	903	72.9510	76.0347
Mid	914.6	75.1673	78.2333
High	926.4	76.6951	73.3851

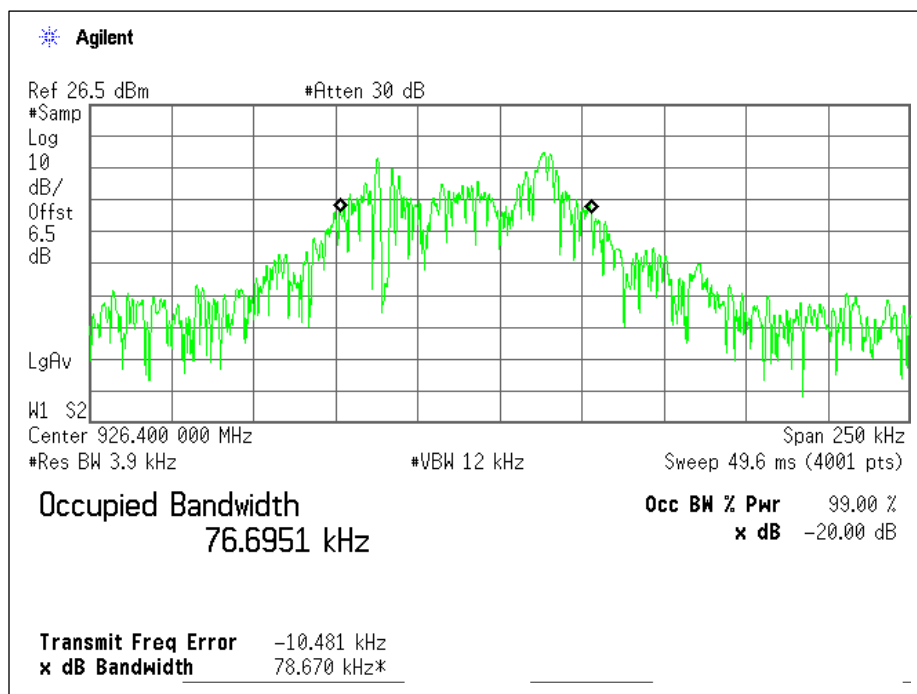
99% Occupied Bandwidth



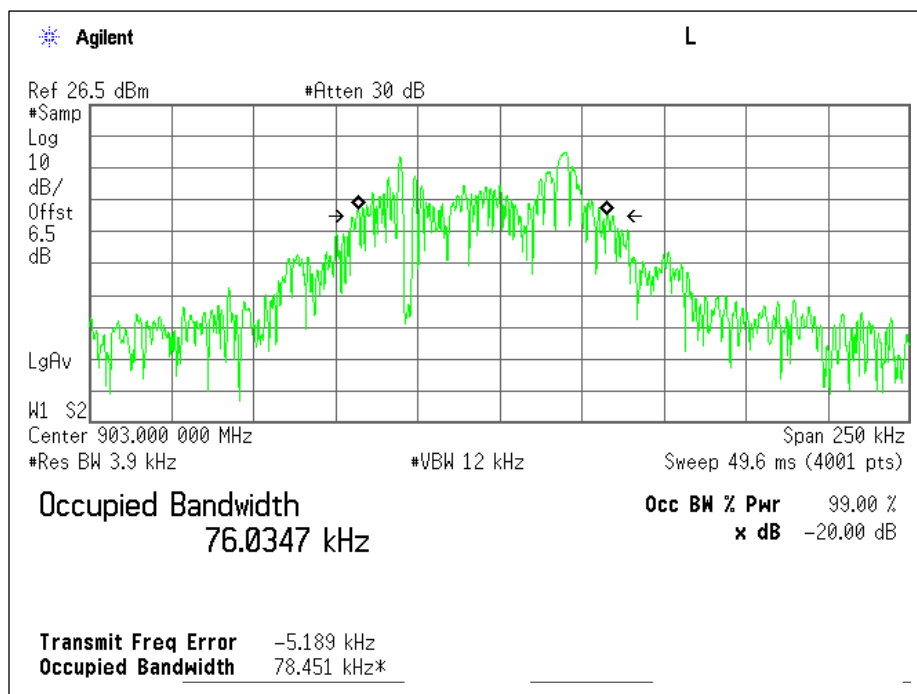
Antenna 1: Low Channel - Plot



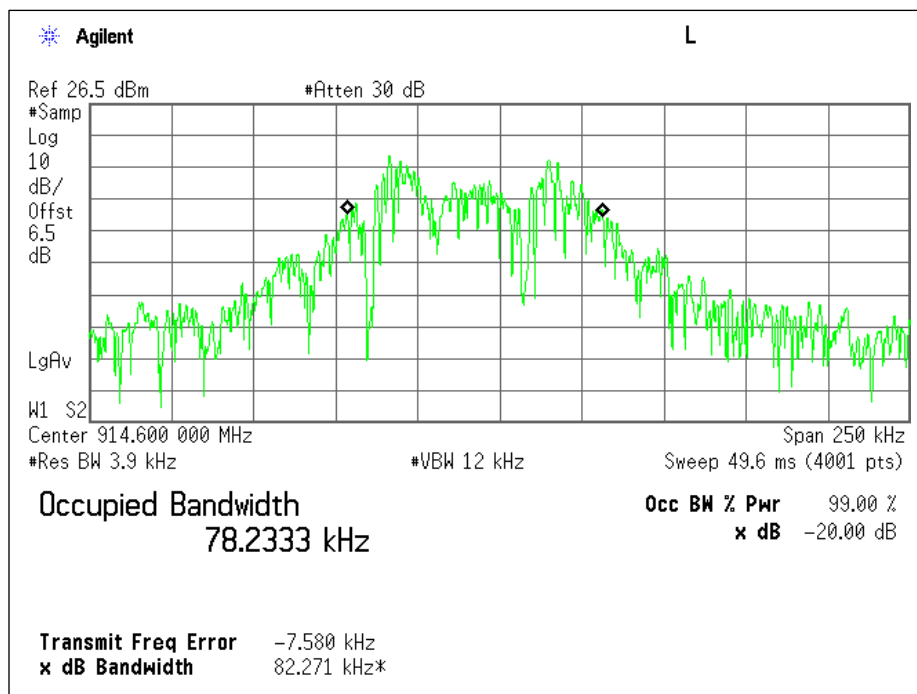
Antenna 1: Mid Channel - Plot



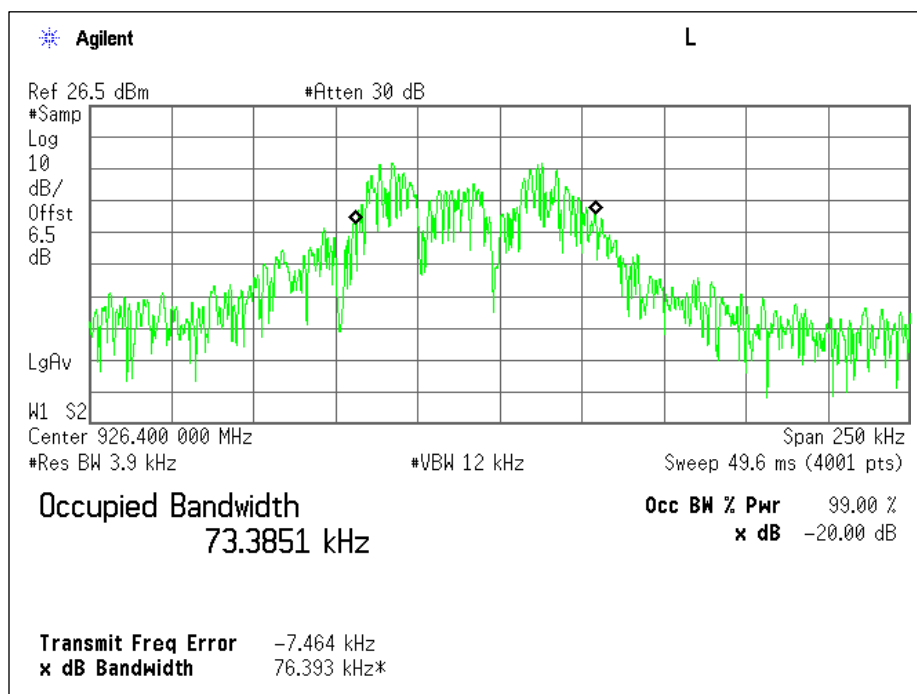
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Maximum Conducted Output Power

Test Description

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels.

Maximum peak conducted output power was the method employed to determine fundamental emission output power. As allowed per Section 7.8.5 of C63.10, a peak power sensor was utilized for the measurements contained in this section.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (b)(2) RSS-247 Section 5.4 (a)	1W (30dBm)

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

Test Results

Channel	Frequency (MHz)	Tx Channel Power (dBm)	
		Antenna 1	Antenna 2
Low	903	12.18	12.05
Mid	914.6	12.05	11.95
High	926.4	11.92	11.87

Number of Hopping Frequencies

Test Description

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (a)(1) RSS-247 Section 5.1 (c)	≥ 50 Hopping Frequencies

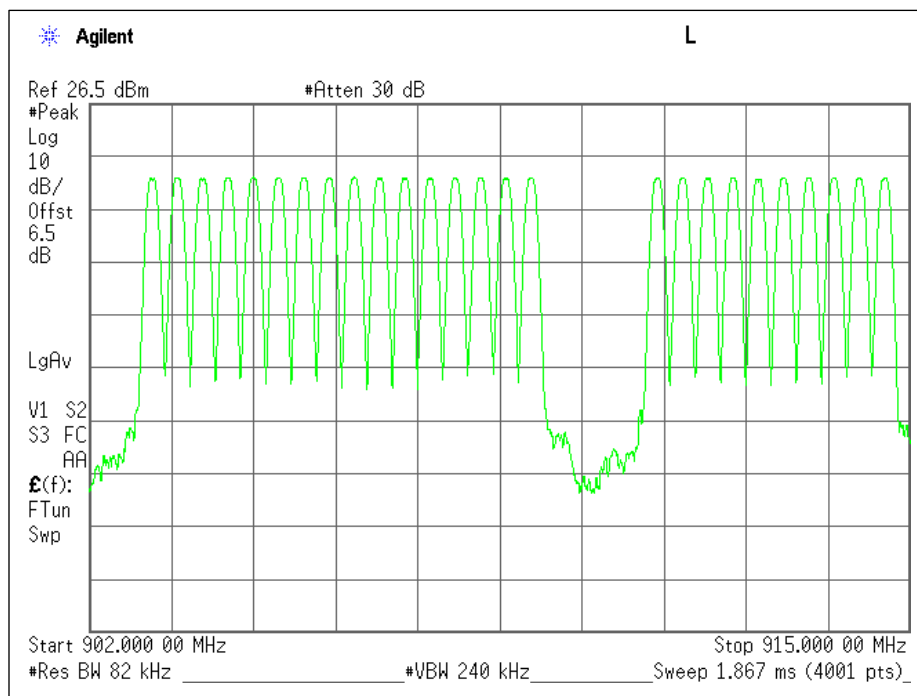
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

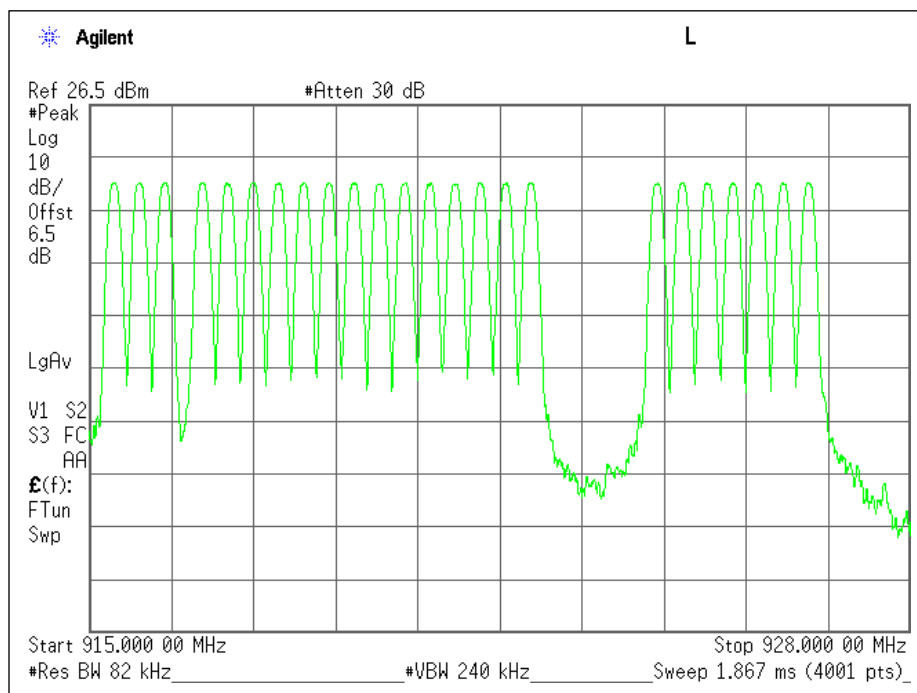
Test Results

Number of Channels
50

Number of Hopping Frequencies



Number of Channels - Plot 1



Number of Channels - Plot 2

Channel Separation

Test Description

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (a)(1) RSS-247 Section 5.1 (b)	25kHz or the 20dB Bandwidth, whichever is greater

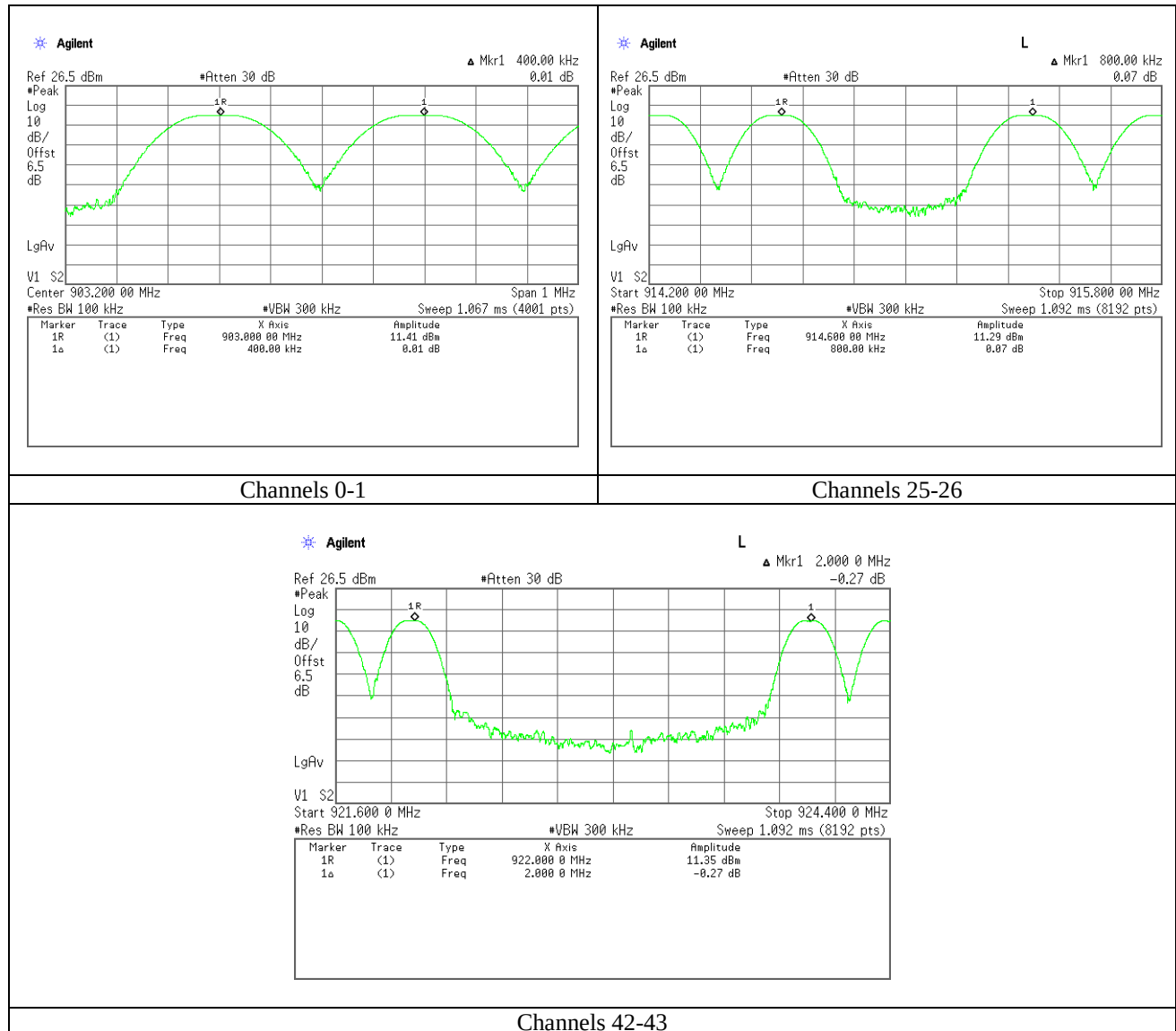
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

Test Results

Channel Separation
400kHz
800kHz
2MHz

Channel Separation



Dwell Time

Test Description

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Criteria

Reference	Limit
CFR 47 Subpart C 15.247 (a)(1) RSS-247 Section 5.1 (c/d)	< 0.4s in a 20 Second Period

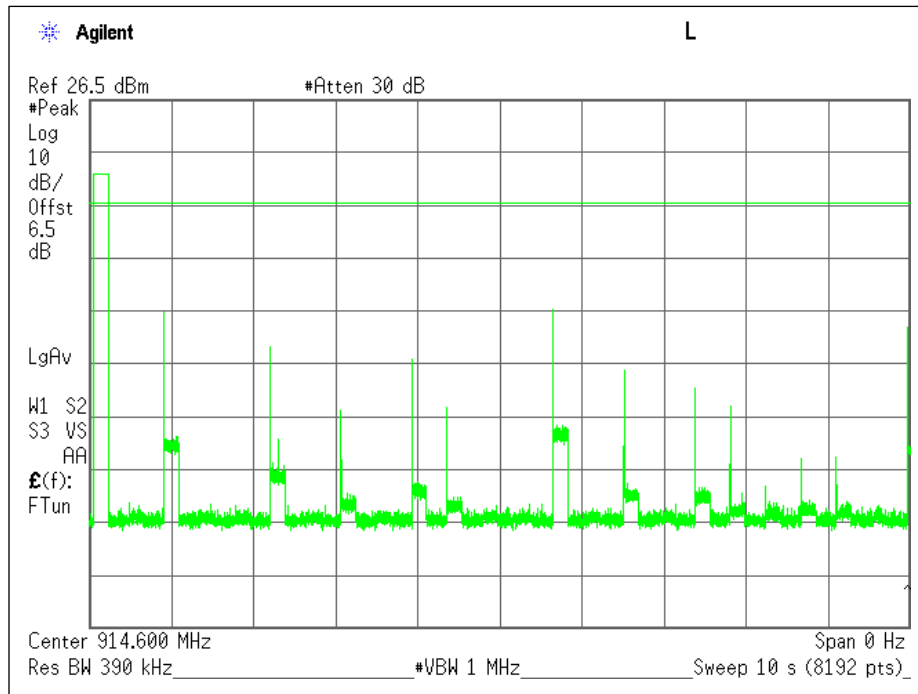
Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

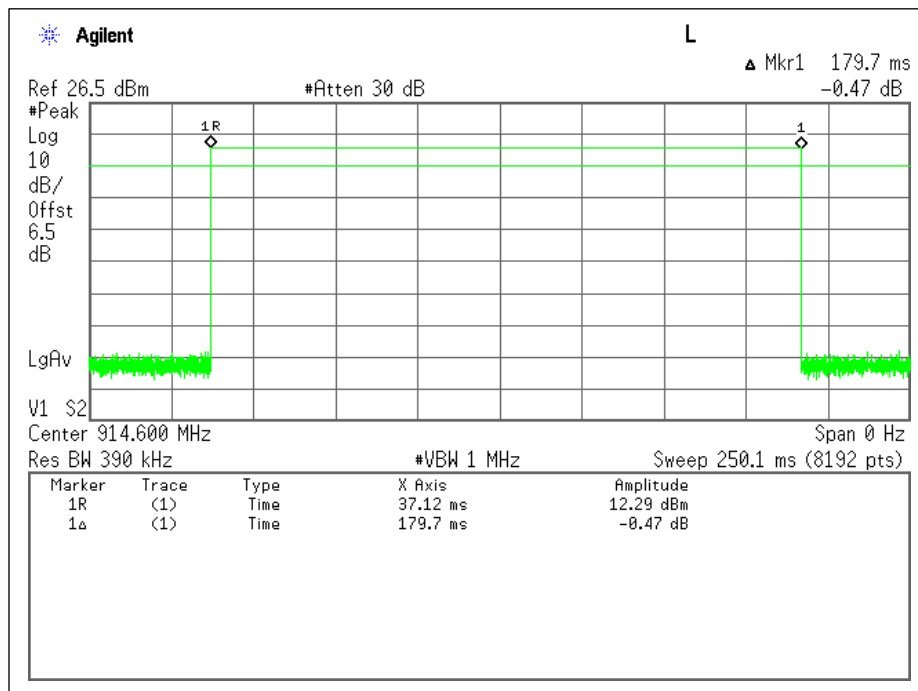
Test Results

Number of transmission in 20 seconds	Length of transmission time (msec)	Results (msec)	Limit (msec)	Margin (msec)
1 (time) * 2 = 2 times	179.7	2 * 179.7 = 359.4	400	-40.6

Dwell Time



Number of Transmissions in a 10 second window



Dwell Time per Channel

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

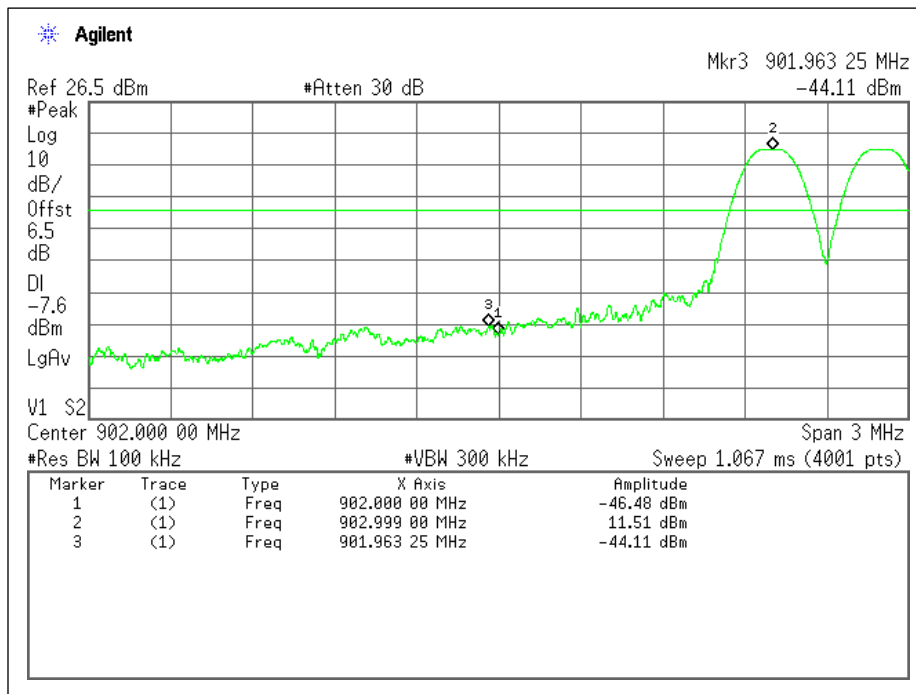
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	11/19/18	22.2	24.9	1008	P

Test Results

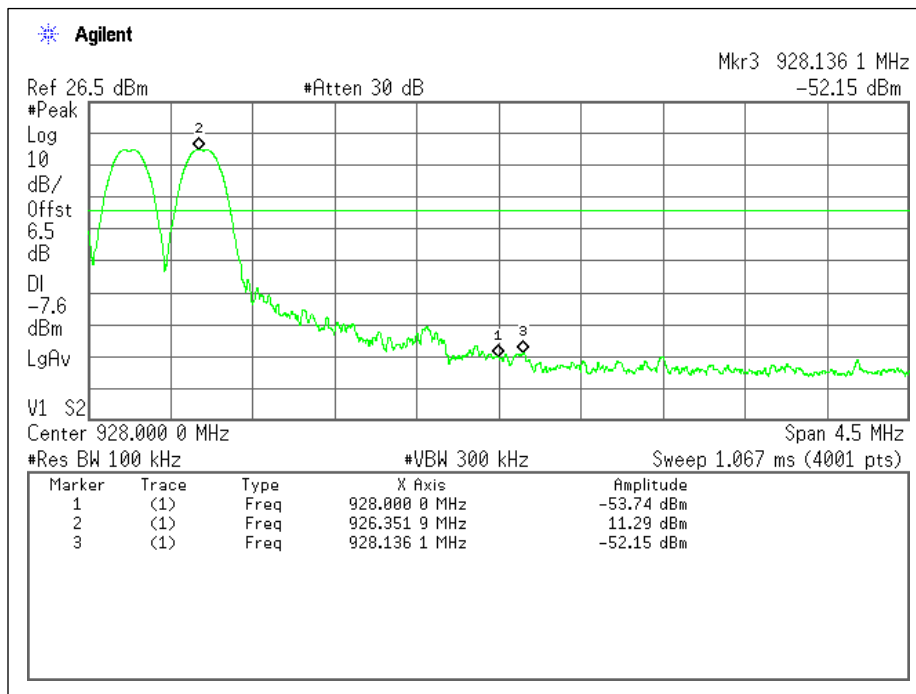
Authorized Band Edge						
Mode	Antenna	Channel	Frequency (MHz)	Delta from Peak to Bandedge (dB)	Limit (dB)	Margin (dB)
Hopping Enabled	1	Low	903	57.99	20	-37.99
		High	926.4	65.03	20	-45.03
	2	Low	903	56.54	20	-36.54
		High	926.4	62.36	20	-42.36
Hopping Disabled	1	Low	903	55.53	20	-35.53
		High	926.4	61.28	20	-41.28
	2	Low	903	54.5	20	-34.5
		High	926.4	61.51	20	-41.51

Conducted Spurious			
Channel	Frequency (MHz)	Highest Spurious Emission Delta from the -20dB down Limit (dB)	
		Antenna 1	Antenna 2
Low	903	-43.9	-46.8
Mid	914.6	-43.95	-46.59
High	926.4	-43.49	-46.99

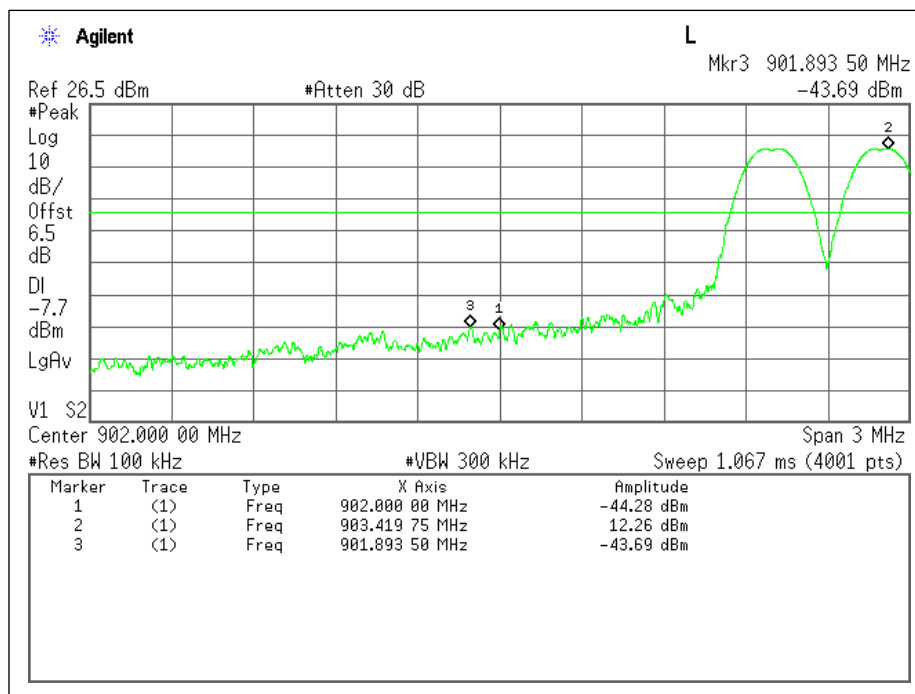
Band Edge – Hopping Enabled



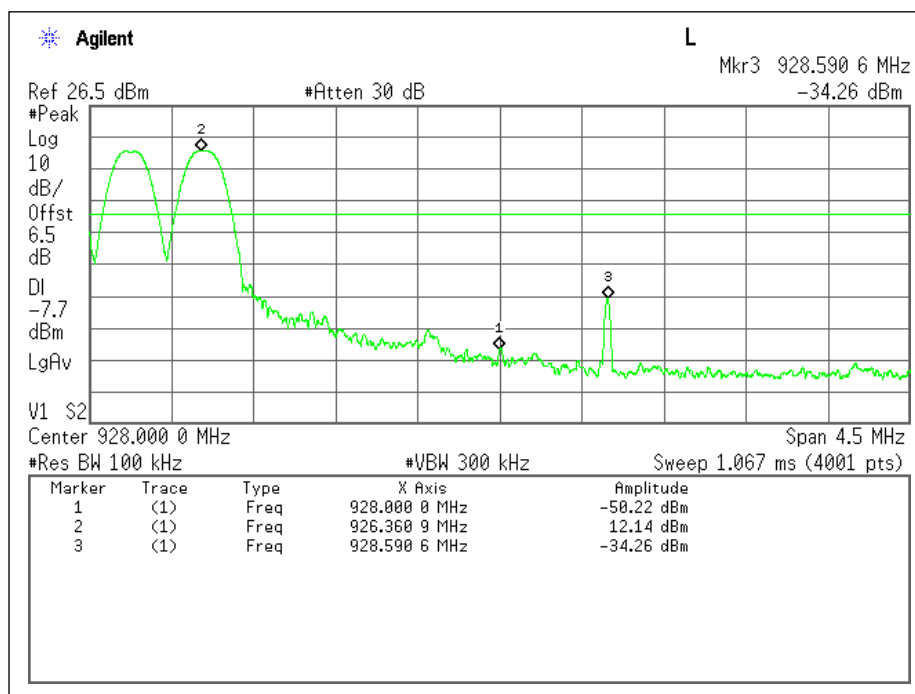
Antenna 1: Low Channel - Plot



Antenna 1: High Channel – Plot

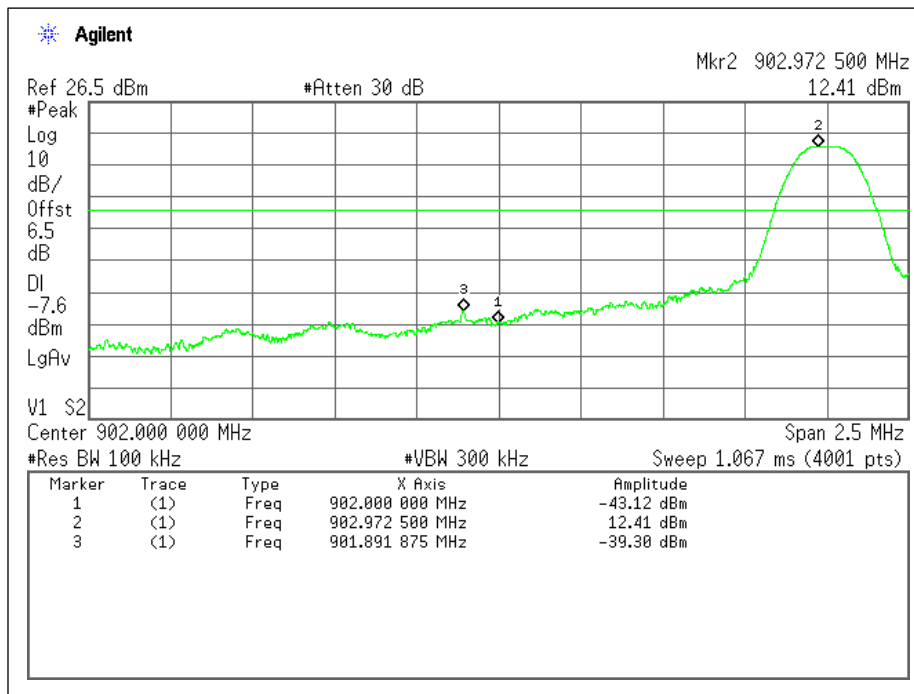


Antenna 2: Low Channel - Plot

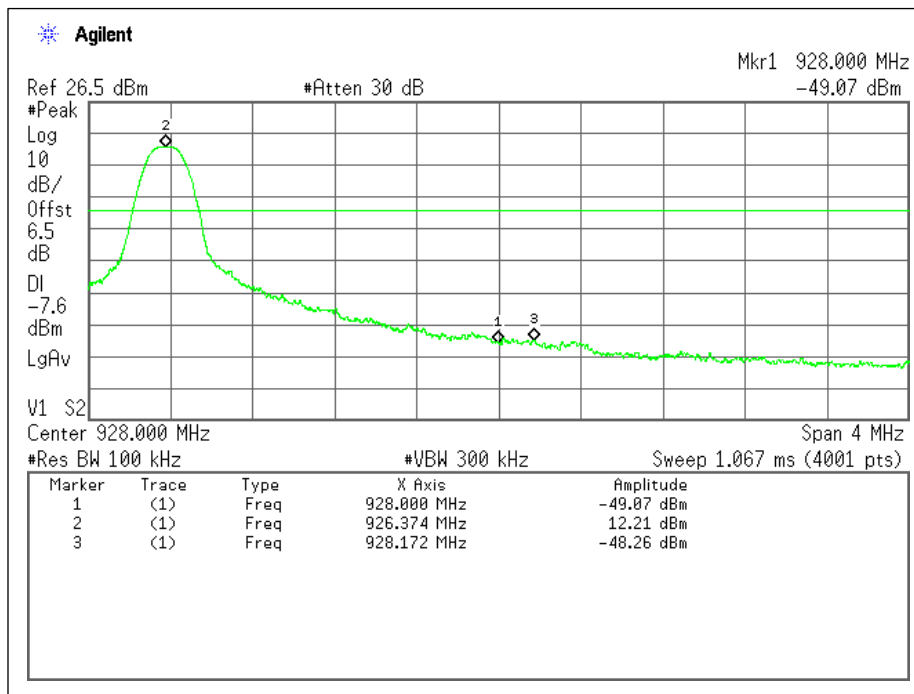


Antenna 2: High Channel – Plot

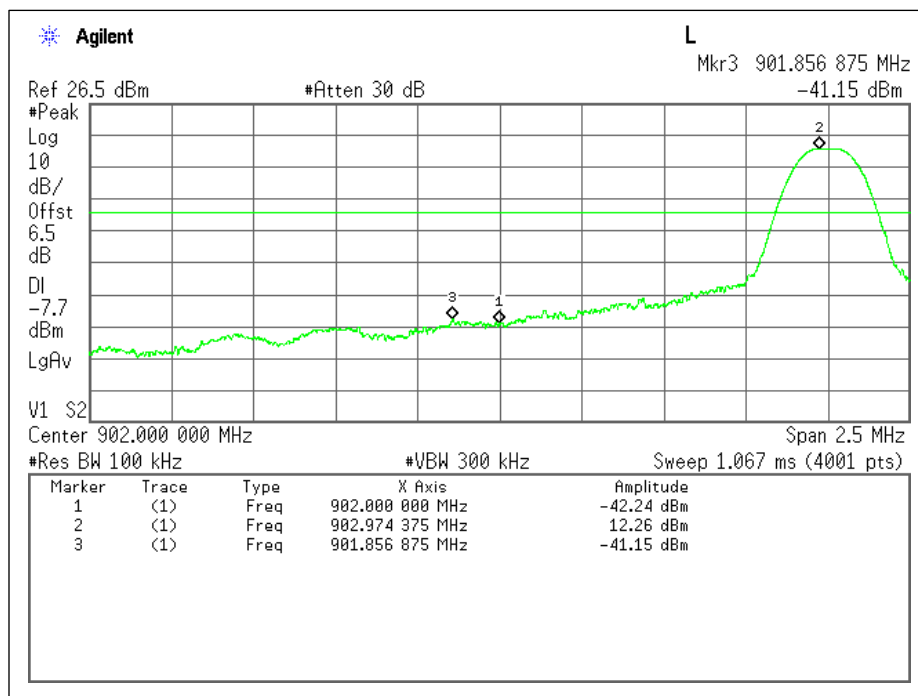
Band Edge – Hopping Disabled



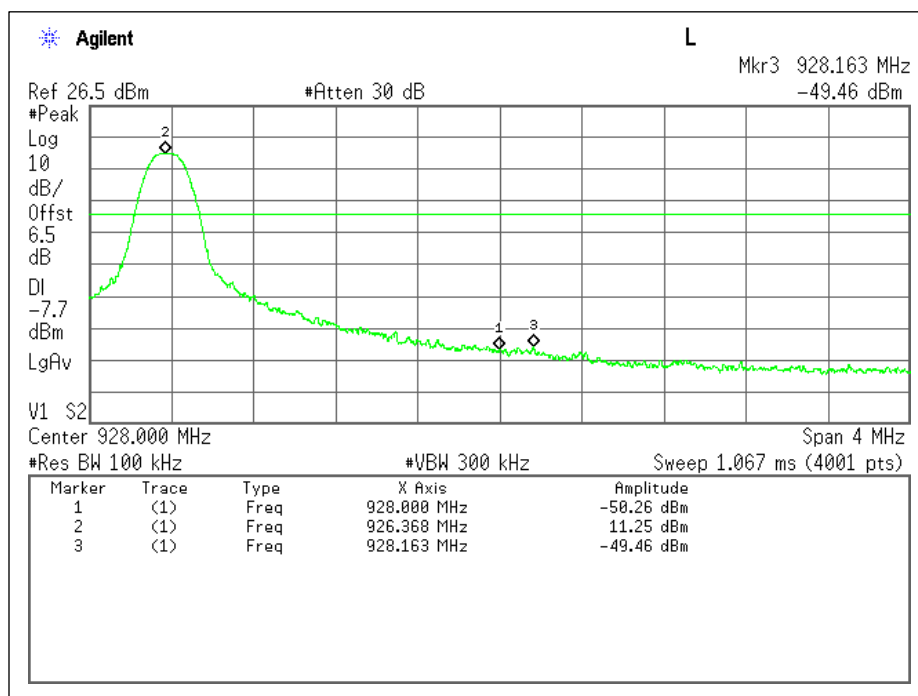
Antenna 1: Low Channel - Plot



Antenna 1: High Channel – Plot

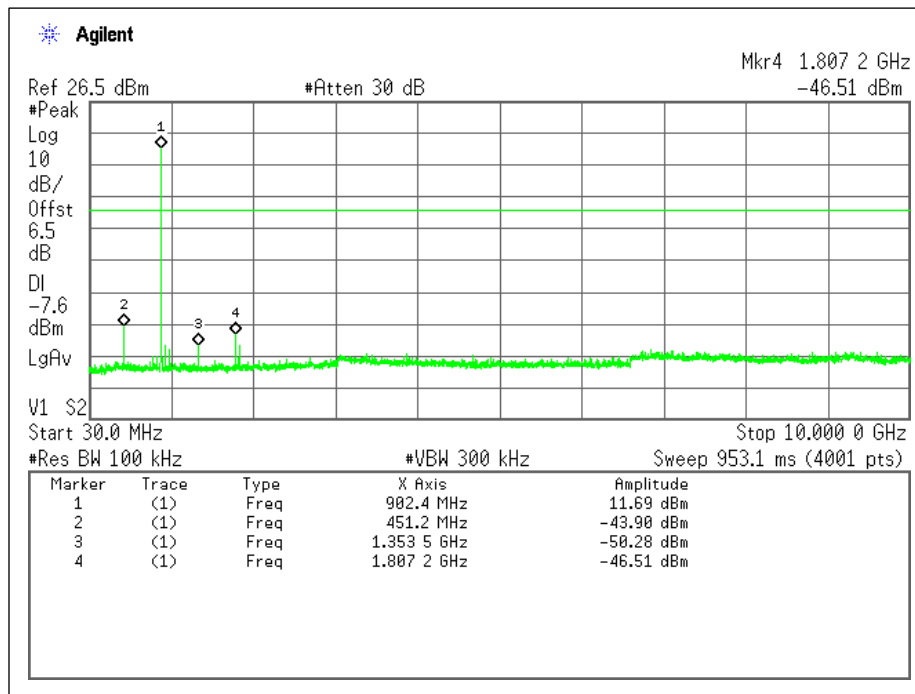


Antenna 2: Low Channel - Plot

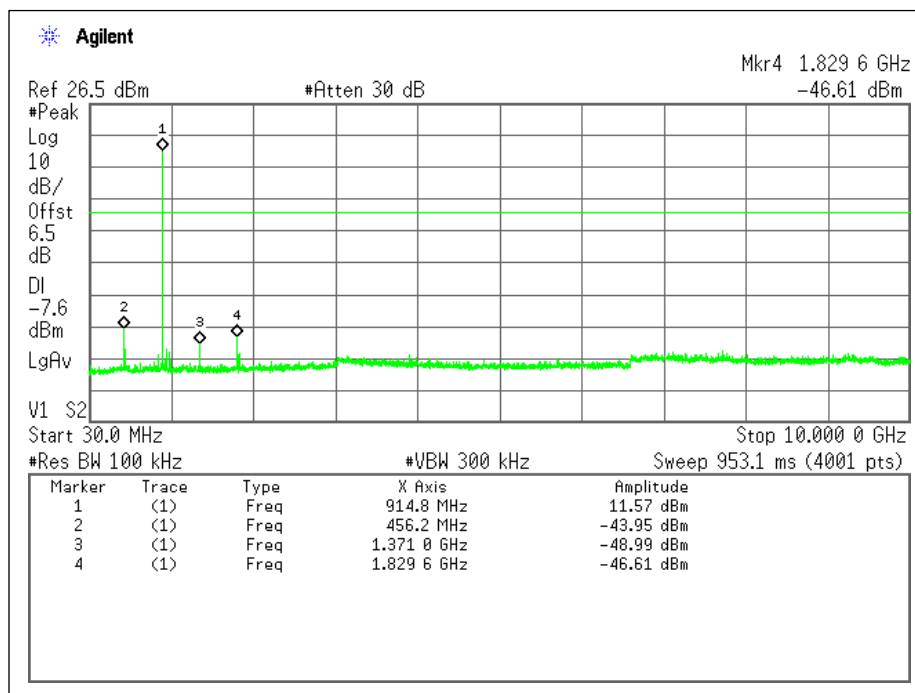


Antenna 2: High Channel - Plot

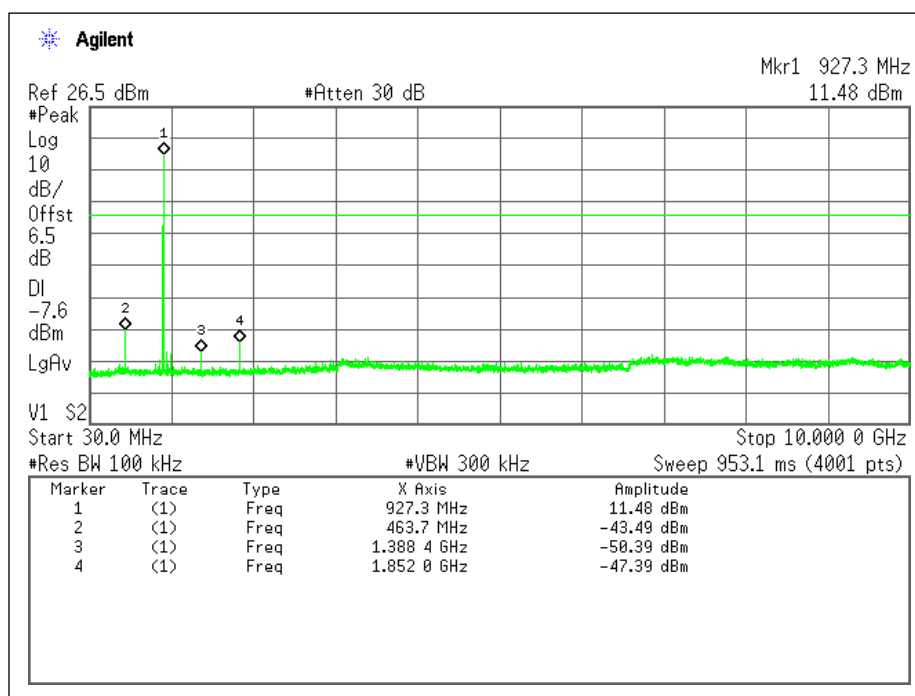
Conducted Spurious



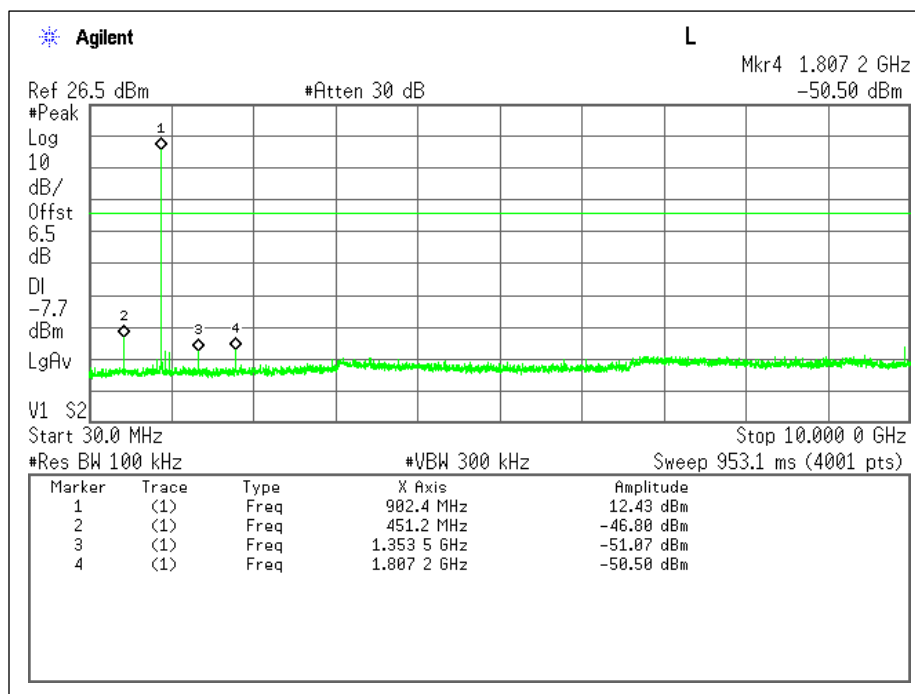
Antenna 1: Low Channel - Plot



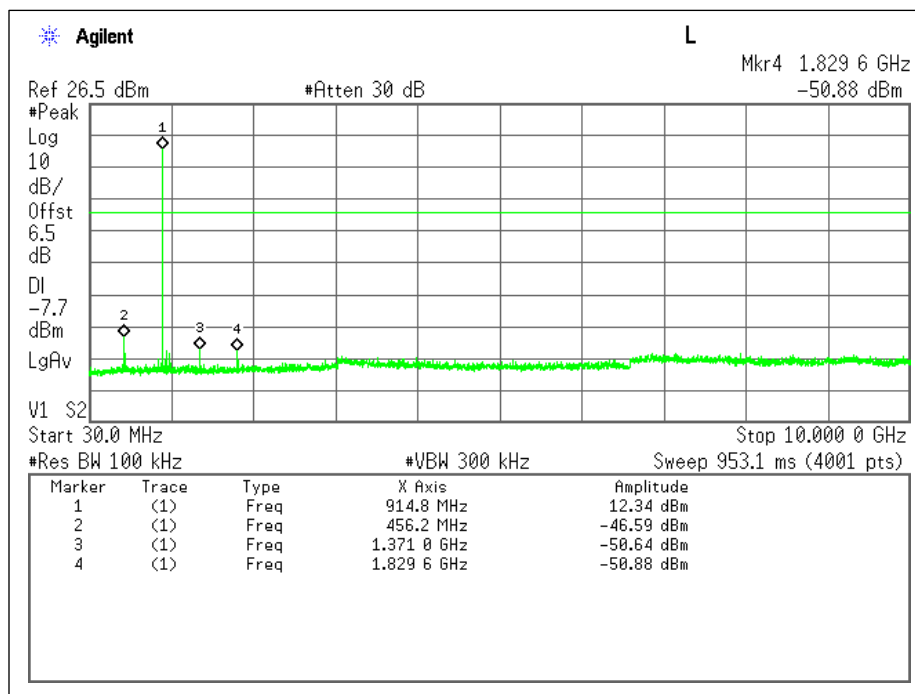
Antenna 1: Mid Channel - Plot



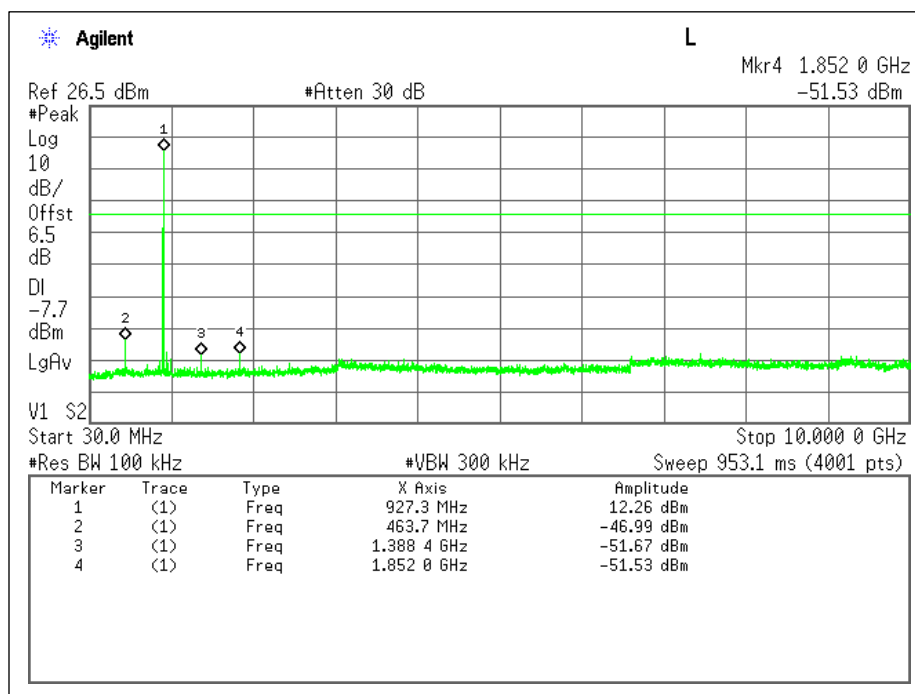
Antenna 1: High Channel – Plot



Antenna 2: Low Channel - Plot



Antenna 2: Mid Channel - Plot



Antenna 2: High Channel - Plot

Radiated Emissions (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

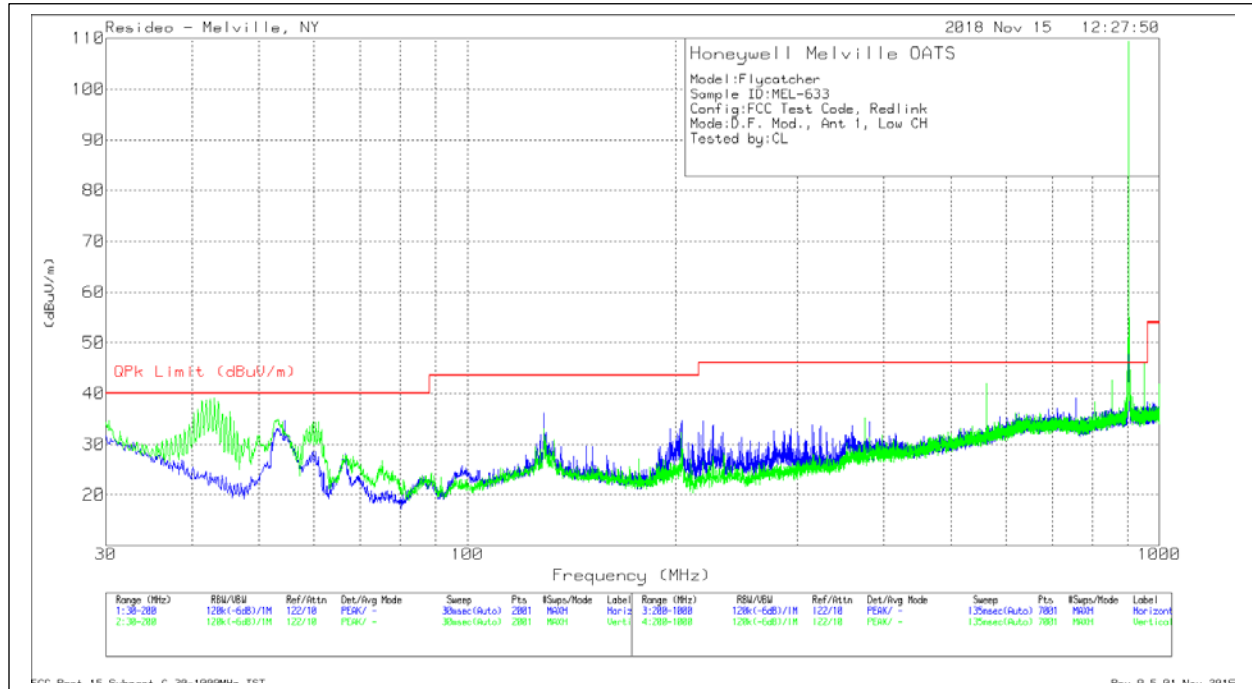
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
MA/JB	RF Chamber / OATS	11/15/18	6.7	43.0	1011	P

NOTE: Below 30MHz, pretesting showed that no emissions as a product of the EUT were detected within 20dB of the regulatory limit. Prescans performed in an anechoic chamber, final measurements performed on an OATS. Since RedLINK/Wi-Fi radios can transmit simultaneously, additional spurious scans are provided with all radios on and transmitting in their worse-case state.

Test Results

Spurious Emissions

Below 1GHz

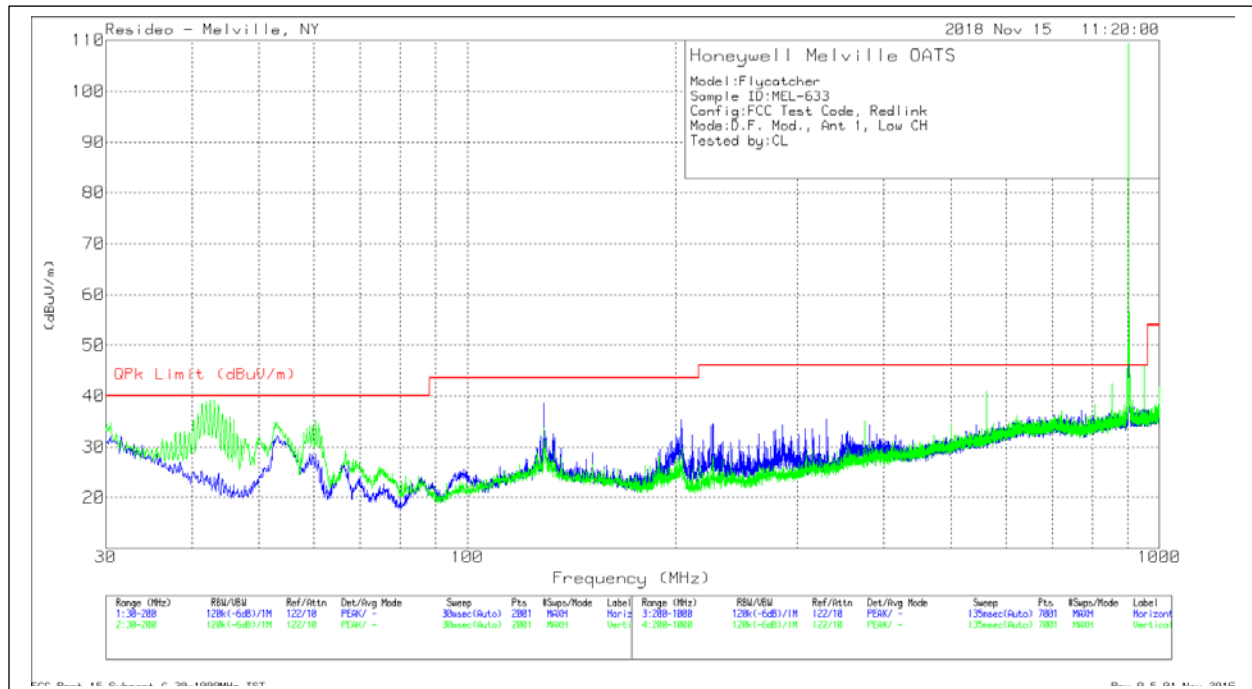


Antenna 1: Low Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	Limit [Fundamental-20dBc] (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
45.123	13.84	Pk	14.9	1	29.74	89.4	-59.66	104	190	V
53.0401	21.31	Pk	12.1	1.1	34.51	89.4	-54.89	126	109	V
60.0782	21.05	Pk	11.8	1.2	34.05	89.4	-55.35	215	146	V
560.7817	4.09	Pk	22.9	5.8	32.79	89.4	-56.61	307	292	V
854.9904	10.71	Pk	26.3	8.4	45.41	89.4	-43.99	251	124	V
951.0215	11.89	Pk	27.7	9.2	48.79	89.4	-40.61	254	110	V

Pk - Peak detector

Antenna 1: Low Channel - Data

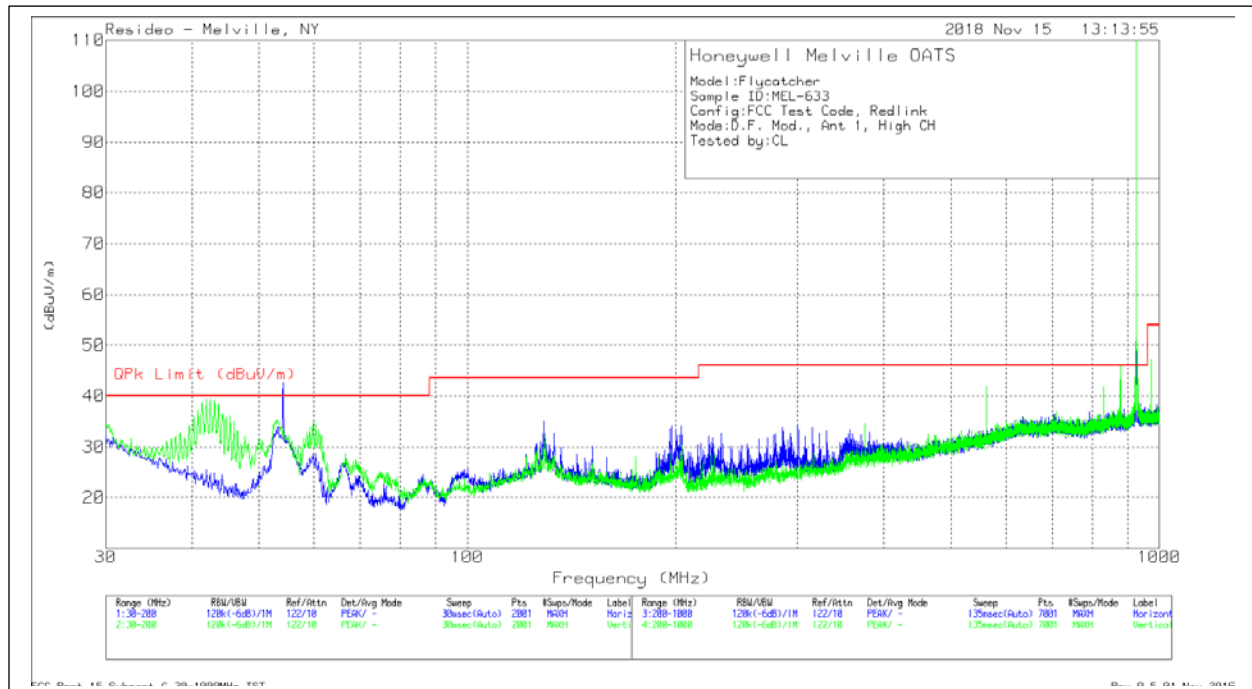


Antenna 1: Mid Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 128.4036	5.37	Qp	17.6	1.8	24.77	43.52	-18.75	149	362	H
43.8516	12.51	Qp	15.6	1	29.11	40	-10.89	325	131	V
60.1833	26.86	Qp	11.8	1.2	39.86	40	-1.14	262	153	V
561.0435	3.9	Qp	22.9	5.8	32.6	46.02	-13.42	129	197	V
854.0303	4	Qp	26.3	8.4	38.7	46.02	-7.32	295	123	V
951.6166	3.91	Qp	27.7	9.2	40.81	46.02	-5.21	297	295	V

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

Antenna 1: Mid Channel - Data



Antenna 1: High Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	Limit [Fundamenta l-20dBc] (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
54.3348	17.71	Pk	12.1	1.1	30.91	89.4	-58.49	329	389	H
42.7452	10.8	Pk	16.2	1	28	89.4	-61.4	229	383	V
561.9725	3.9	Pk	23	5.8	32.7	89.4	-56.7	309	202	V
830.3896	6.71	Pk	26.2	8.2	41.11	89.4	-48.29	163	371	V
879.0162	13.78	Pk	26.5	9	49.28	89.4	-40.12	77	313	V

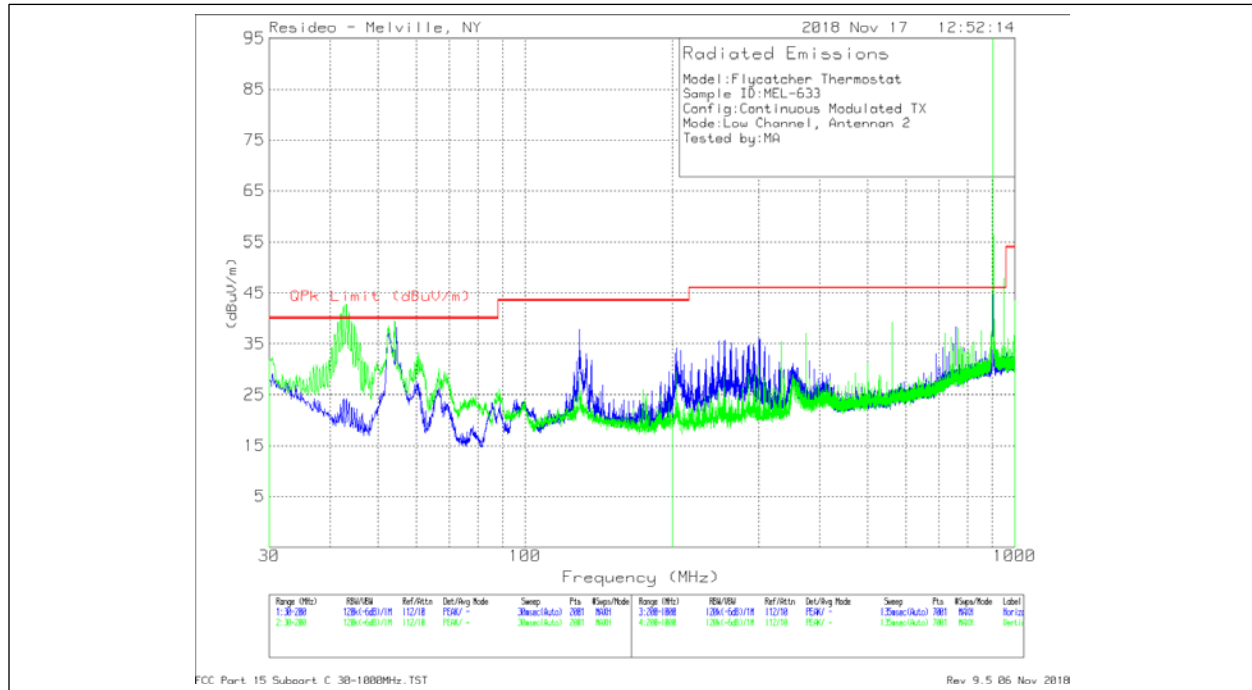
Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 974.4172	11.33	Qp	27.5	9.1	47.93	54	-6.07	215	101	V

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

Pk - Peak detector

Qp - Quasi-Peak detector

Antenna 1: High Channel – Data

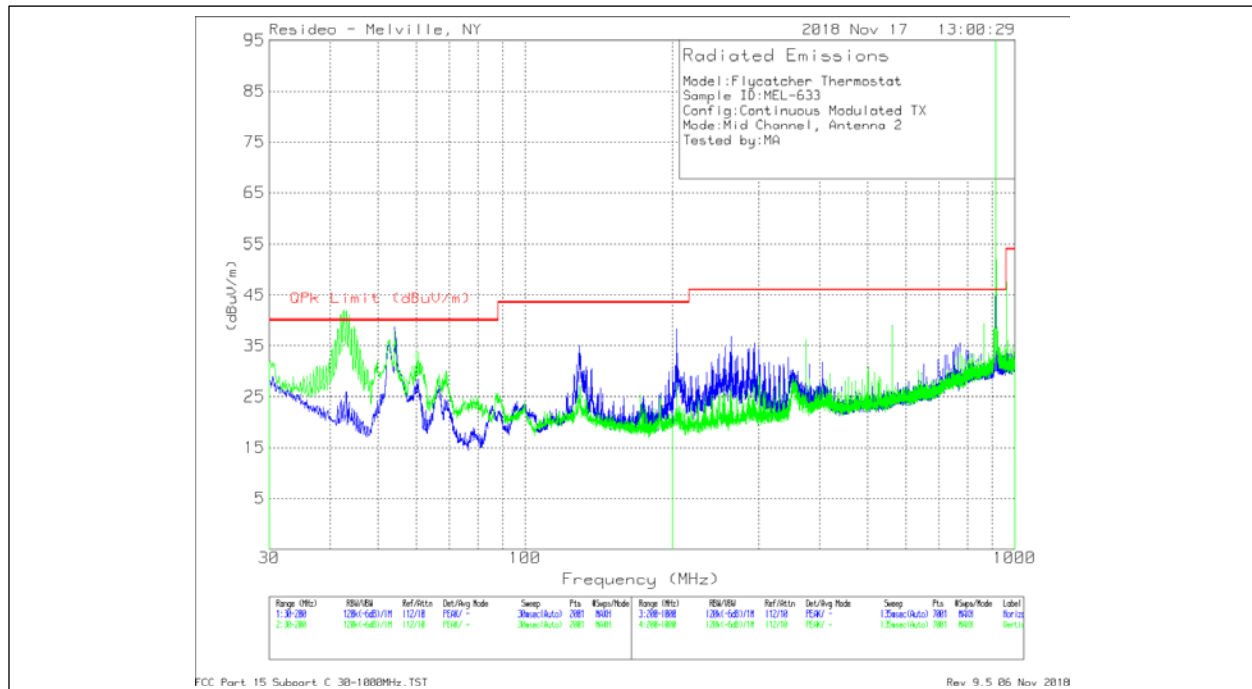


Antenna 2: Low Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	Limit [Fundamental-20dBc] (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
54.3293	17.65	Pk	12.1	1.1	30.85	86.6	-55.75	143	386	H
43.079	18.57	Pk	16	1	35.57	86.6	-51.03	256	334	V
53.5909	18.87	Pk	12.1	1.1	32.07	86.6	-54.53	163	132	V
52.9644	27.27	Pk	12.1	1.1	40.47	86.6	-46.13	18	330	V
563.498	3.94	Pk	23.1	5.9	32.94	86.6	-53.66	346	210	V
951.013	14.37	Pk	27.7	9.2	51.27	86.6	-35.33	54	116	V

Pk - Peak detector

Antenna 2: Low Channel - Data

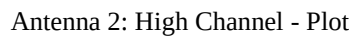


Antenna 2: Mid Channel - Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
54.3308	17.57	Qp	12.1	1.1	30.77	40	-9.23	323	397	H
* 115.8961	9.86	Qp	17.2	1.6	28.66	43.52	-14.86	69	110	V
204.0799	4.61	Qp	15.8	2.5	22.91	43.52	-20.61	346	378	H
* 263.9772	6.02	Qp	16.7	3.1	25.82	46.02	-20.2	119	140	H
374.991	8.1	Qp	19.1	3.8	31	46.02	-15.02	102	272	V
562.4329	3.94	Qp	23	5.8	32.74	46.02	-13.28	5	345	V

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

Antenna 2: Mid Channel - Data

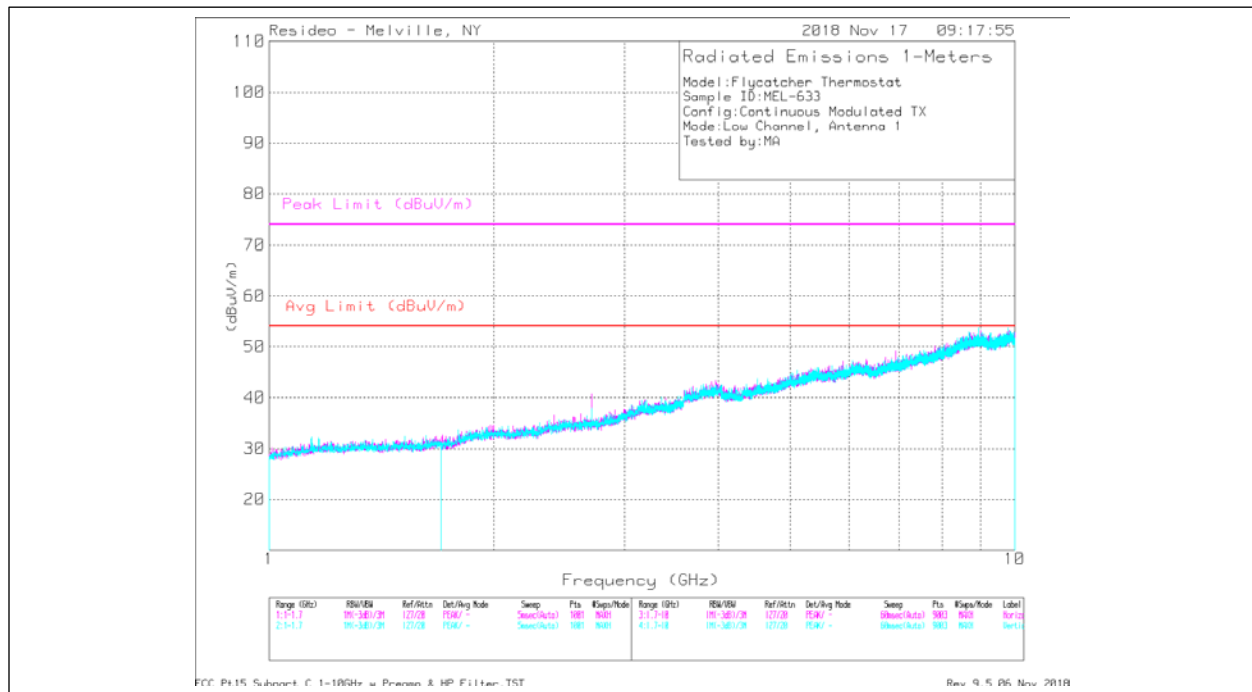


Frequency (MHz)	Meter Reading (dBuV)	Det	AF_JB6 [dB/m]	Cable 1 [dB]	Corrected Reading (dBuV/m)	15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
54.3278	16.93	Qp	12.1	1.1	30.13	40	-9.87	192	365	H
42.571	11.37	Qp	16.3	1	28.67	40	-11.33	257	132	V
54.305	19.5	Qp	12.1	1.1	32.7	40	-7.3	334	217	V
374.997	8.3	Qp	19.1	3.8	31.2	46.02	-14.82	284	140	V
562.2902	3.96	Qp	23	5.8	32.76	46.02	-13.26	90	203	V
879.0957	9.77	Qp	26.5	9	45.27	46.02	-.75	294	349	V

Qp - Quasi-Peak detector

Antenna 2: High Channel - Data

Above 1GHz



Antenna 1: Low Channel - Plot

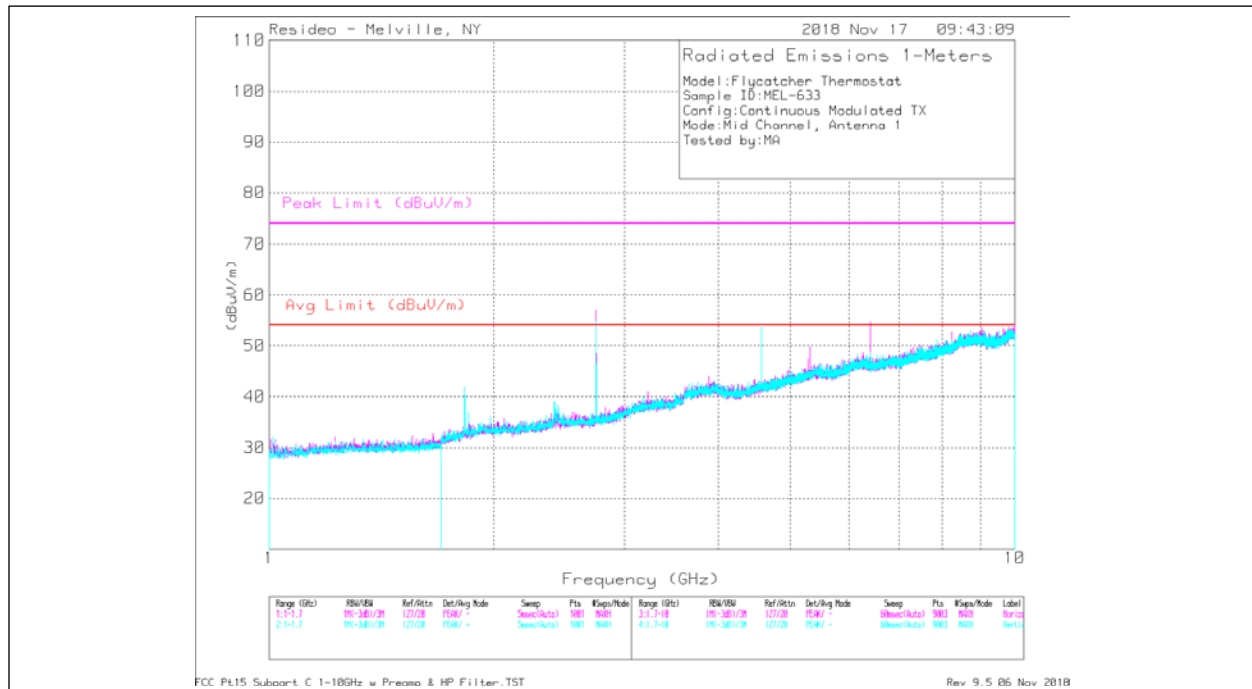
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.709	56.38	PKFH	29	-43.6	2.8	2.7	.2	47.48	-	-	74	-26.52	216	226	H
* 2.709	53.45	VA1T	29	-43.6	2.8	2.7	.2	44.55	54	-9.45	-	-	216	226	H
* 3.963	39.11	PKFH	32.8	-41.1	3.4	3.3	.1	37.61	-	-	74	-36.39	286	260	H
* 3.966	26.01	VA1T	32.8	-41.1	3.4	3.3	.1	24.51	54	-29.49	-	-	286	260	H
8.975	35.93	PKFH	37.8	-39.4	5.3	5.1	.2	44.93	-	-	74	-29.07	322	192	H
8.978	22.29	VA1T	37.8	-39.4	5.3	5.1	.2	31.29	54	-22.71	-	-	322	192	H
* 2.709	60.72	PKFH	29	-43.6	2.8	2.7	.2	51.82	-	-	74	-22.18	310	104	V
* 2.709	59.9	VA1T	29	-43.6	2.8	2.7	.2	51	54	-3	-	-	310	104	V
* 3.942	39.72	PKFH	32.9	-41.2	3.4	3.3	.1	38.22	-	-	74	-35.78	90	120	V
* 3.939	26.33	VA1T	32.9	-41.2	3.4	3.3	.1	24.83	54	-29.17	-	-	90	120	V
9.775	34.94	PKFH	38.1	-39.8	5.5	5.3	.4	44.44	-	-	74	-29.56	82	178	V
9.778	21.99	VA1T	38.1	-39.8	5.5	5.3	.4	31.49	54	-22.51	-	-	82	178	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

Antenna 1: Low Channel - Data



Antenna 1: Mid Channel - Plot

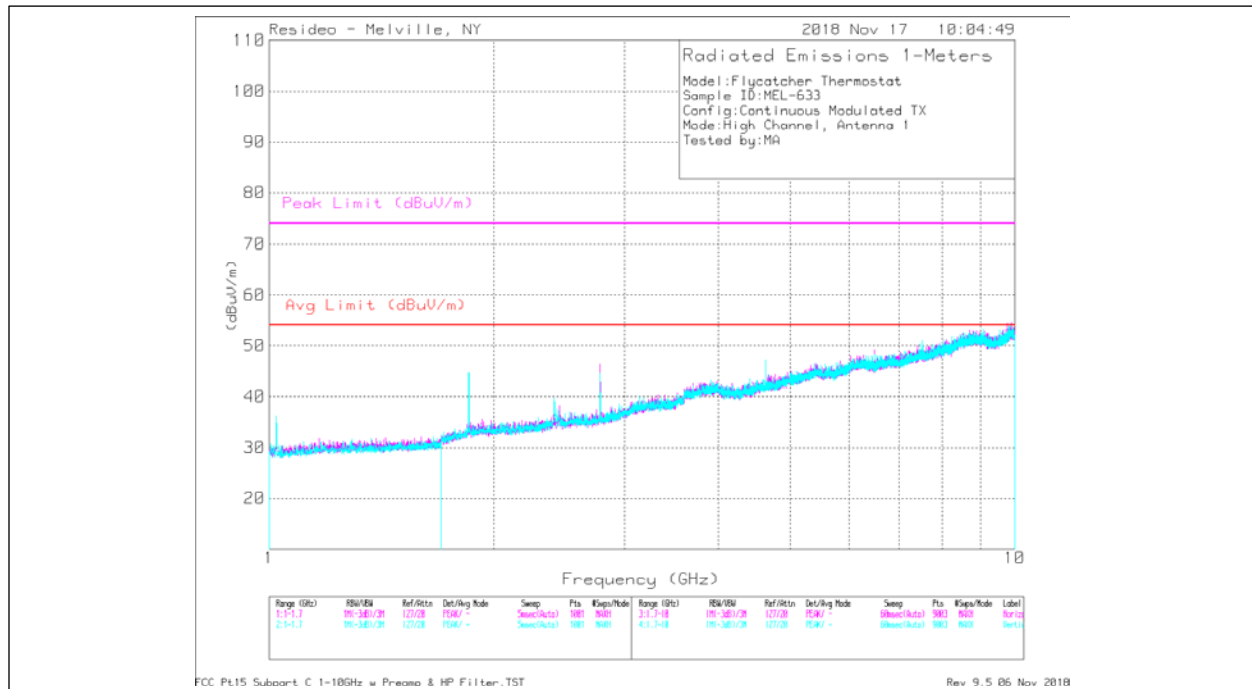
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.745	57.62	PKFH	29	-43.6	2.8	2.7	.3	48.82	-	-	74	-25.18	76	168	H
* 2.744	51.48	VA1T	29	-43.6	2.8	2.7	.3	42.68	54	-11.32	-	-	76	168	H
* 4.573	42.33	PKFH	32.6	-41.3	3.6	3.5	.3	41.03	-	-	74	-32.97	358	121	H
* 4.573	36.59	VA1T	32.6	-41.3	3.6	3.5	.3	35.29	54	-18.71	-	-	358	121	H
6.402	38.8	PKFH	34.7	-39.8	4.3	4.2	1.2	43.4	-	-	74	-30.6	161	252	H
6.402	29.82	VA1T	34.7	-39.8	4.3	4.2	1.2	34.42	54	-19.58	-	-	161	252	H
9.743	35.12	PKFH	38	-39.8	5.5	5.3	.4	44.52	-	-	74	-29.48	282	189	H
9.743	21.79	VA1T	38	-39.8	5.5	5.3	.4	31.19	54	-22.81	-	-	282	189	H
1.829	52.5	PKFH	27.1	-42.4	2.3	2.2	.5	42.2	-	-	74	-31.8	40	339	V
1.829	49.74	VA1T	27.1	-42.4	2.3	2.2	.5	39.44	54	-14.56	-	-	40	339	V
* 2.744	61.18	PKFH	29	-43.6	2.8	2.7	.3	52.38	-	-	74	-21.62	38	103	V
* 2.744	60.37	VA1T	29	-43.6	2.8	2.7	.3	51.57	54	-2.43	-	-	38	103	V
* 4.573	47.37	PKFH	32.6	-41.3	3.6	3.5	.3	46.07	-	-	74	-27.93	43	211	V
* 4.573	43.98	VA1T	32.6	-41.3	3.6	3.5	.3	42.68	54	-11.32	-	-	43	211	V
9.807	35.34	PKFH	38.1	-39.8	5.6	5.2	.5	44.94	-	-	74	-29.06	187	192	V
9.81	21.94	VA1T	38.1	-39.8	5.6	5.2	.5	31.54	54	-22.46	-	-	187	192	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

Antenna 1: Mid Channel - Data



Antenna 1: High Channel - Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.853	51.66	PKFH	27.4	-42.4	2.3	2.2	.5	41.66	-	-	74	-32.34	196	387	H
1.853	51.09	VA1T	27.4	-42.4	2.3	2.2	.5	41.09	54	-12.91	-	-	196	387	H
* 2.779	47.89	PKFH	29.1	-43.6	2.8	2.7	.3	39.19	-	-	74	-34.81	51	381	H
* 2.779	41.54	VA1T	29.1	-43.6	2.8	2.7	.3	32.84	54	-21.16	-	-	51	381	H
* 4.632	45.45	PKFH	32.8	-41.3	3.7	3.6	.3	44.55	-	-	74	-29.45	27	395	H
* 4.632	40.82	VA1T	32.8	-41.3	3.7	3.6	.3	39.92	54	-14.08	-	-	27	395	H
8.939	35.28	PKFH	37.8	-39.4	5.3	5.1	.2	44.28	-	-	74	-29.72	74	275	H
8.94	22.15	VA1T	37.8	-39.4	5.3	5.1	.2	31.15	54	-22.85	-	-	74	275	H
1.853	52.32	PKFH	27.4	-42.4	2.3	2.2	.5	42.32	-	-	74	-31.68	266	204	V
1.853	49.3	VA1T	27.4	-42.4	2.3	2.2	.5	39.3	54	-14.7	-	-	266	204	V
* 2.779	54.6	PKFH	29.1	-43.6	2.8	2.7	.3	45.9	-	-	74	-28.1	236	346	V
* 2.779	52.1	VA1T	29.1	-43.6	2.8	2.7	.3	43.4	54	-10.6	-	-	236	346	V
* 4.632	42.36	PKFH	32.8	-41.3	3.7	3.6	.3	41.46	-	-	74	-32.54	89	356	V
* 4.632	34.85	VA1T	32.8	-41.3	3.7	3.6	.3	33.95	54	-20.05	-	-	89	356	V
9.911	35.05	PKFH	38.2	-39.8	5.5	5.3	.7	44.95	-	-	74	-29.05	74	275	V
9.913	21.88	VA1T	38.2	-39.8	5.5	5.3	.7	31.78	54	-22.22	-	-	74	275	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

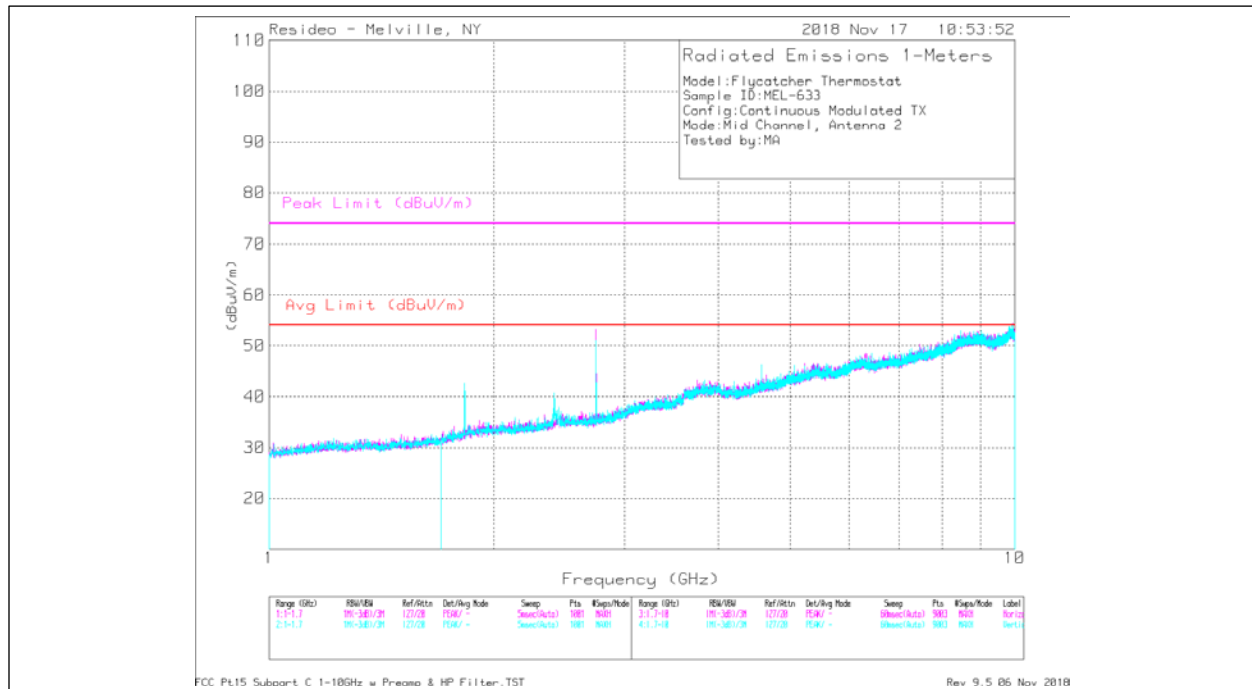
Antenna 1: High Channel - Data



Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 2.709	60.27	PKFH	29	-43.6	2.8	2.7	.2	51.37	-	-	74	-22.63	144	215	H
* 2.709	59.34	VA1T	29	-43.6	2.8	2.7	.2	50.44	54	-3.56	-	-	144	215	H
1.806	52.91	PKFH	26.8	-42.4	2.2	2.2	.6	42.31	-	-	74	-31.69	357	256	H
1.806	51.21	VA1T	26.8	-42.4	2.2	2.2	.6	40.61	54	-13.39	-	-	357	256	H
8.934	35.33	PKFH	37.8	-39.4	5.2	5.1	.2	44.23	-	-	74	-29.77	266	193	H
8.943	22.48	VA1T	37.8	-39.4	5.3	5.1	.2	31.48	54	-22.52	-	-	266	193	H
1.806	50.84	PKFH	26.8	-42.4	2.2	2.2	.6	40.24	-	-	74	-33.76	174	328	V
1.806	46.88	VA1T	26.8	-42.4	2.2	2.2	.6	36.28	54	-17.72	-	-	174	328	V
* 2.709	53.66	PKFH	29	-43.6	2.8	2.7	.2	44.76	-	-	74	-29.24	335	177	V
* 2.709	51.54	VA1T	29	-43.6	2.8	2.7	.2	42.64	54	-11.36	-	-	335	177	V
* 4.515	48.91	PKFH	32.5	-41.3	3.6	3.5	.3	47.51	-	-	74	-26.49	227	103	V
* 4.515	45.86	VA1T	32.5	-41.3	3.6	3.5	.3	44.46	54	-9.54	-	-	227	103	V
9.886	36.46	PKFH	38.2	-39.8	5.6	5.2	.6	46.26	-	-	74	-27.74	332	309	V
9.886	22.17	VA1T	38.2	-39.8	5.6	5.2	.6	31.97	54	-22.03	-	-	332	309	V

VA1T - FHSS: Linear Voltage Average $V_B = 1/T_{on}$ where: T_{on} is transmit duration

Antenna 2: Low Channel - Data



Antenna 2: Mid Channel - Plot

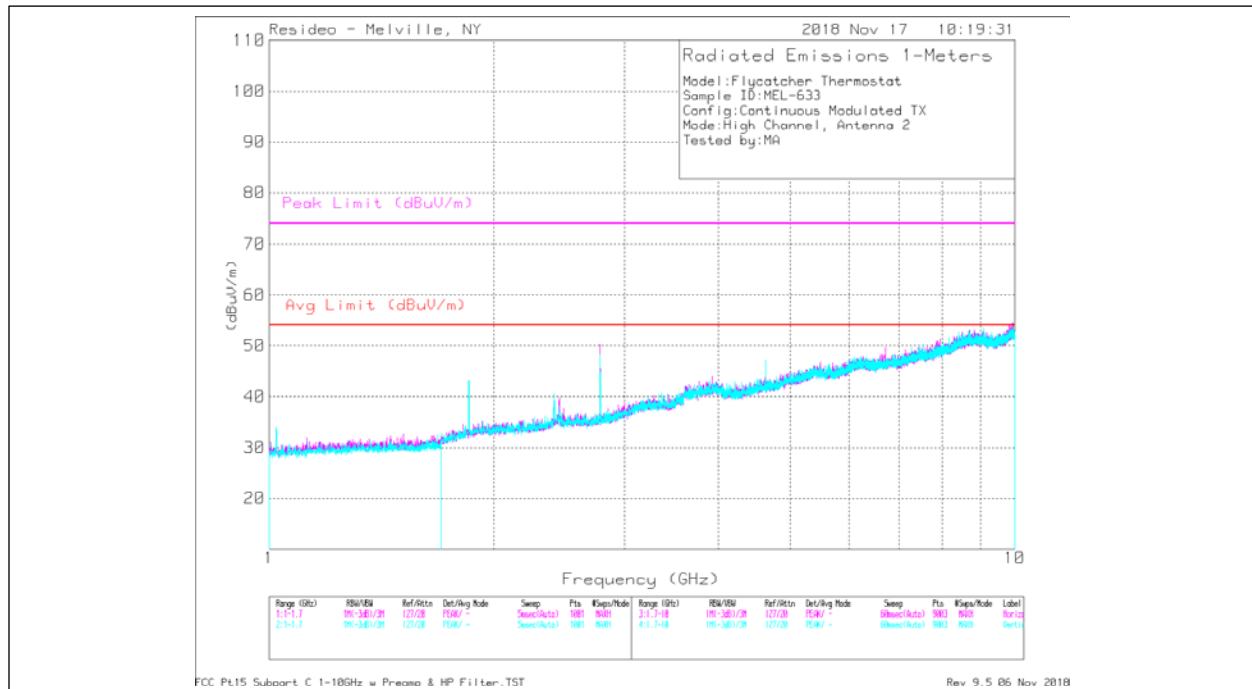
Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.829	51.59	PKFH	27.1	-42.4	2.3	2.2	.5	41.29	-	-	74	-32.71	257	180	H
1.829	48.46	VA1T	27.1	-42.4	2.3	2.2	.5	38.16	54	-15.84	-	-	257	180	H
* 2.744	61.76	PKFH	29	-43.6	2.8	2.7	.3	52.96	-	-	74	-21.04	143	117	H
* 2.744	60.69	VA1T	29	-43.6	2.8	2.7	.3	51.89	54	-2.11	-	-	143	117	H
8.949	35.75	PKFH	37.8	-39.4	5.3	5.1	.2	44.75	-	-	74	-29.25	345	396	H
8.953	22.47	VA1T	37.8	-39.4	5.3	5.1	.2	31.47	54	-22.53	-	-	345	396	H
1.829	52.08	PKFH	27.1	-42.4	2.3	2.2	.5	41.78	-	-	74	-32.22	210	100	V
1.829	48.14	VA1T	27.1	-42.4	2.3	2.2	.5	37.84	54	-16.16	-	-	210	100	V
* 2.744	61.77	PKFH	29	-43.6	2.8	2.7	.3	52.97	-	-	74	-21.03	29	104	V
* 2.744	60.85	VA1T	29	-43.6	2.8	2.7	.3	52.05	54	-1.95	-	-	29	104	V
9.843	36.13	PKFH	38.2	-39.8	5.6	5.1	.6	45.83	-	-	74	-28.17	162	156	V
9.844	22.09	VA1T	38.2	-39.8	5.6	5.1	.6	31.79	54	-22.21	-	-	162	156	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

Antenna 2: Mid Channel - Data



Antenna 2: High Channel - Plot

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	SWBOX1 [dB]	SMA7 [dB]	SMA5 [dB]	HPF [dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.852	54.79	PKFH	27.4	-42.4	2.3	2.2	.5	44.79	-	-	74	-29.21	249	102	H
1.853	50.03	VA1T	27.4	-42.4	2.3	2.2	.5	40.03	54	-13.97	-	-	249	102	H
* 2.779	60.07	PKFH	29.1	-43.6	2.8	2.7	.3	51.37	-	-	74	-22.63	312	372	H
* 2.779	59.6	VA1T	29.1	-43.6	2.8	2.7	.3	50.9	54	-3.1	-	-	312	372	H
9.889	34.92	PKFH	38.2	-39.8	5.5	5.2	.6	44.62	-	-	74	-29.38	211	338	H
9.888	21.94	VA1T	38.2	-39.8	5.5	5.2	.6	31.64	54	-22.36	-	-	211	338	H
1.853	52.97	PKFH	27.4	-42.4	2.3	2.2	.5	42.97	-	-	74	-31.03	109	327	V
1.853	47.76	VA1T	27.4	-42.4	2.3	2.2	.5	37.76	54	-16.24	-	-	109	327	V
* 2.779	62.07	PKFH	29.1	-43.6	2.8	2.7	.3	53.37	-	-	74	-20.63	52	126	V
* 2.779	61.36	VA1T	29.1	-43.6	2.8	2.7	.3	52.66	54	-1.34	-	-	52	126	V
* 4.632	51.71	PKFH	32.8	-41.3	3.7	3.6	.3	50.81	-	-	74	-23.19	136	302	V
* 4.632	49.76	VA1T	32.8	-41.3	3.7	3.6	.3	48.86	54	-5.14	-	-	136	302	V
9.878	34.94	PKFH	38.2	-39.8	5.6	5.2	.6	44.74	-	-	74	-29.26	173	132	V
9.879	21.94	VA1T	38.2	-39.8	5.6	5.2	.6	31.74	54	-22.26	-	-	173	132	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

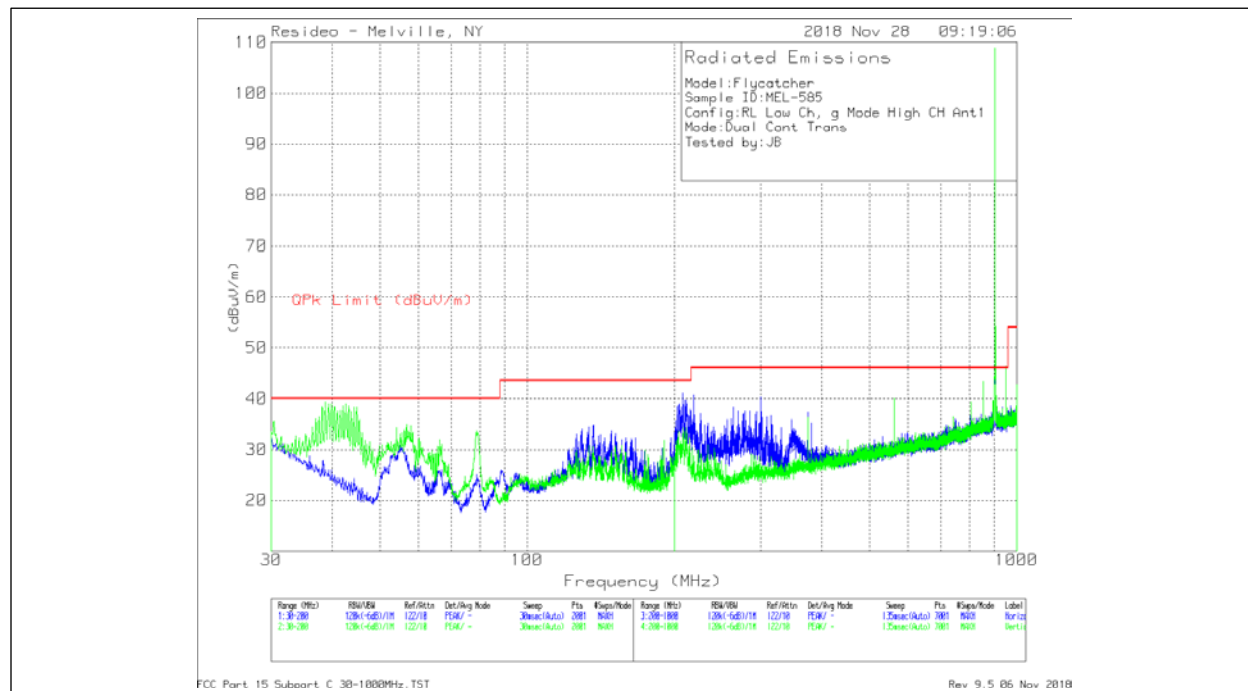
Antenna 2: High Channel – Data

Simultaneous Transmission

Configuration (Worse-case):

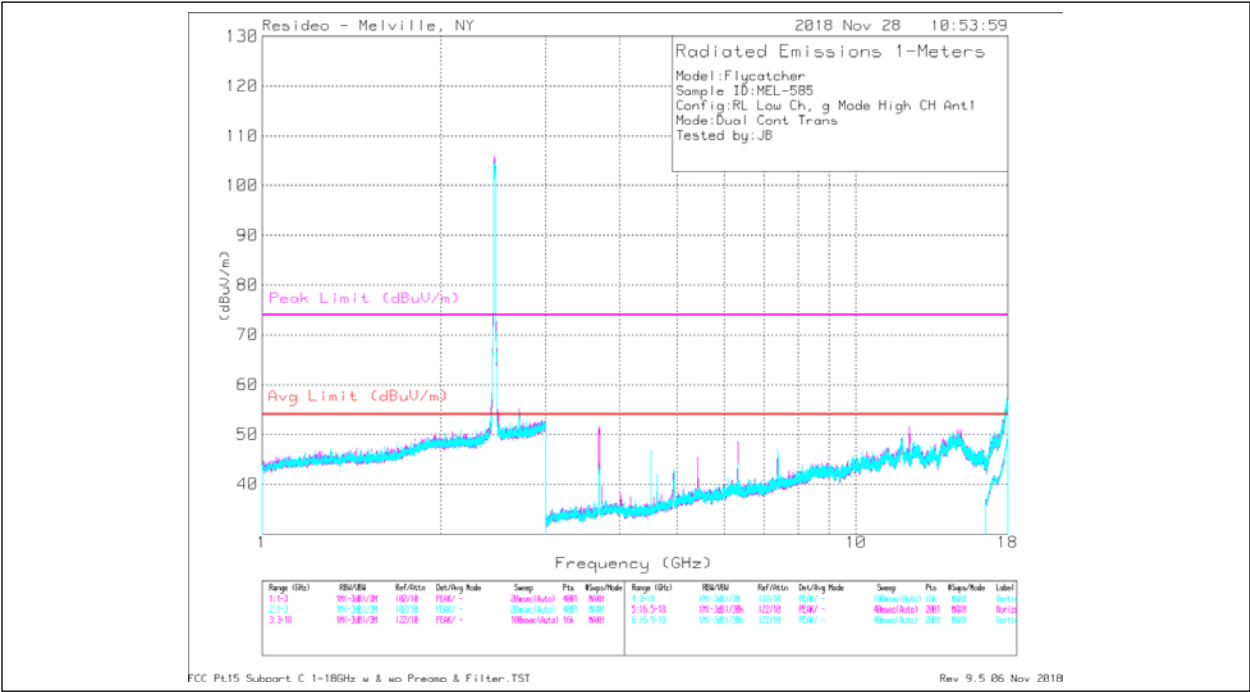
RedLINK – Low Channel, Antenna 1

Wi-Fi – 802.11g Mode, High Channel, Antenna 1



30-1000MHz – Plot

Note: No new emissions detected above the system noise floor with both radios transmitting simultaneously.



1-18GHz – Plot

Note: No new emissions detected above the system noise floor with both radios transmitting simultaneously.

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

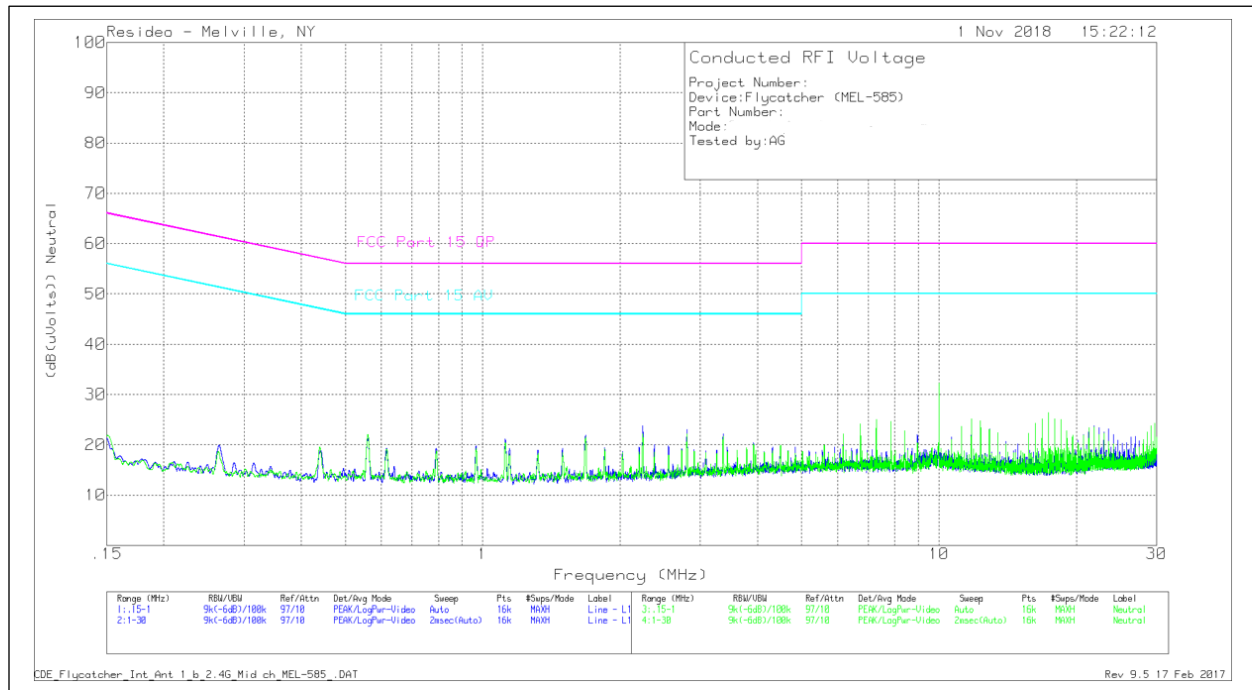
Reference	Limit (dBuV)		
	Frequency Range (MHz)	Quasi-Peak	Average
CFR 47 Subpart C, 15.207 RSS-GEN CFR 47 Subpart B, 15.107 ICES-003	0.15-0.5	66 to 56	56 to 46
	0.5-5	56	46
	5-30	60	50

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
AG	Shield Room	11/01/18	16.6	50	1001	P

Test Results

Intentional Mode



Plot

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L1 [dB]	CDE Cable	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.26445	9.69	Pk	10.2	0	19.89	61.29	-41.4	51.29	-31.4
.55977	11.4	Pk	9.9	0	21.3	56	-34.7	46	-24.7
.96686	9.82	Pk	9.9	0	19.72	56	-36.28	46	-26.28
1.68131	12.04	Pk	9.9	0	21.94	56	-34.06	46	-24.06
2.80113	13.12	Pk	9.9	0	23.02	56	-32.98	46	-22.98
9.99839	19.49	Pk	10	.1	29.59	60	-30.41	50	-20.41

Pk - Peak detector

Frequency (MHz)	Meter Reading (dBuV)	Det	LISN1 L2 [dB]	CDE Cable	Corrected Reading (dB(uVolts))	FCC Part 15 QP	Margin (dB)	FCC Part 15 AV	Margin (dB)
.15082	11.08	Pk	10.7	.1	21.88	65.95	-44.07	55.95	-34.07
.26231	8.25	Pk	10.2	0	18.45	61.36	-42.91	51.36	-32.91
.55998	12.03	Pk	10	0	22.03	56	-33.97	46	-23.97
1.11959	10.42	Pk	10	0	20.42	56	-35.58	46	-25.58
2.24122	12.29	Pk	9.9	0	22.19	56	-33.81	46	-23.81
9.99839	22.09	Pk	10	.1	32.19	60	-27.81	50	-17.81

Pk - Peak detector

Data

END OF REPORT