

Honeywell

FCC / IC Test Report

For

5800FLOOD

Report #: 20290-A

FCC ID: CFS8DL5800FLOOD

IC ID: 573F-5800

Report Completion Date: 2017-08-10

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/IC Test Report for Honeywell products. It demonstrates the data required to be analyzed to certify a product according to the requirements of the FCC & IC.

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	2017-08-10
A	M. Antola	A. Roussin	Added Peak data to Unintentional radiated emission above 1GHz section	2017-12-12

Report Authorization

Report Prepared By:



Michael Antola
Hardware Engineer II
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	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
20dB Occupied Bandwidth	9
99% Bandwidth	11
Radiated Emissions (Unintentional Radiator)	13
Radiated Emissions (Intentional Radiator)	17
Setup Photos	23
Test Setup Photos – Antenna Port Tests	23
Test Setup Photos – Radiated Emissions below 1GHz - Front	24
Test Setup Photos – Radiated Emissions below 1GHz - Rear	25
Test Setup Photos – Radiated Emissions above 1GHz - Front	26
Test Setup Photos – Radiated Emissions above 1GHz - Rear	27
END OF REPORT	27

Applicable Test Standards

Test Standard	Result	Dates Tested
ANSI C63.4: 2014	Compliant	5/3/17-7/24/17
ANSI C63.10: 2013	Compliant	5/3/17-7/24/17
RSS-210, Issue 9	Compliant	5/3/17-7/24/17
RSS-GEN, Issue 4	Compliant	5/3/17-7/24/17
CFR 47 Part 15 Subpart C, Section 15.231	Compliant	5/3/17-7/24/17
CFR 47 Part 15 Subpart B	Compliant	5/3/17-7/24/17
ICES-003, Issue 6	Compliant	5/3/17-7/24/17

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 5800FLOOD is a water leak detector and ambient temperature monitor device, based on 5800 RF Protocol. The EUT is a periodic operator, which transmits at 344.94MHz.

Worse-Case Configuration & Mode

Radiated emissions was performed with the EUT set to transmit at the highest output power as worst-case scenario. The EUT was tested in the two orthogonal planes by which it can be installed in order to determine the worst-case emissions. It was determined that the orientation standing upright was the worst-case orientation. Therefore, all final radiated test was performed with the EUT standing upright.

Test Sample Identification

Sample ID Number	Sample Serial Number	Date Received
MEL-182	Non-serialized production unit	2/13/17
MEL-183	Non-serialized production unit	2/13/17

Calibration & Measurement Uncertainty

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

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

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

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

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

Opinions / Interpretations

None

Test Summary

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

#	Test Description	Status
1	20 dB Occupied Bandwidth	PASS
2	99% Bandwidth	PASS
3	Radiated Emissions (Intentional)	PASS
4	Radiated Emissions (Unintentional)	PASS

20dB Occupied 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 15.231 (c)	< 0.25% of the Center Frequency

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	7/24/17	28.5	52.5	1006	P

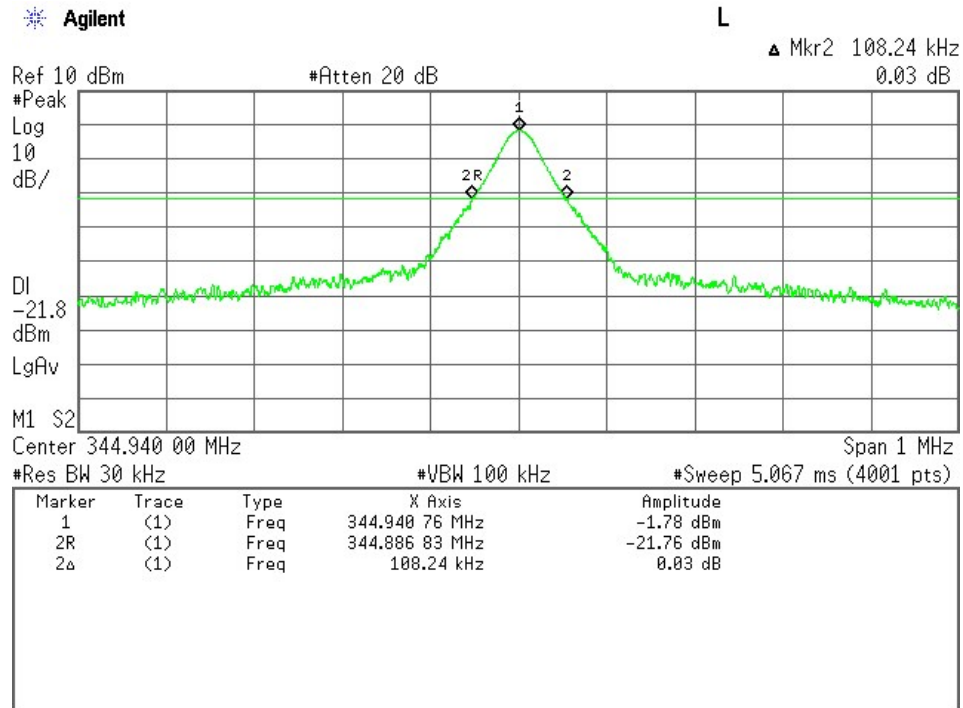
Equipment List

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	11549	A078188	Extech Instruments	SD700	04/24/17	04/24/18

Test Results

Frequency (MHz)	20dB Bandwidth (in kHz)
344.94	108.24

Plots



99% 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	N/A

Test Information

Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL	RF Lab	07/24/17	28.5	52.5	1006	P

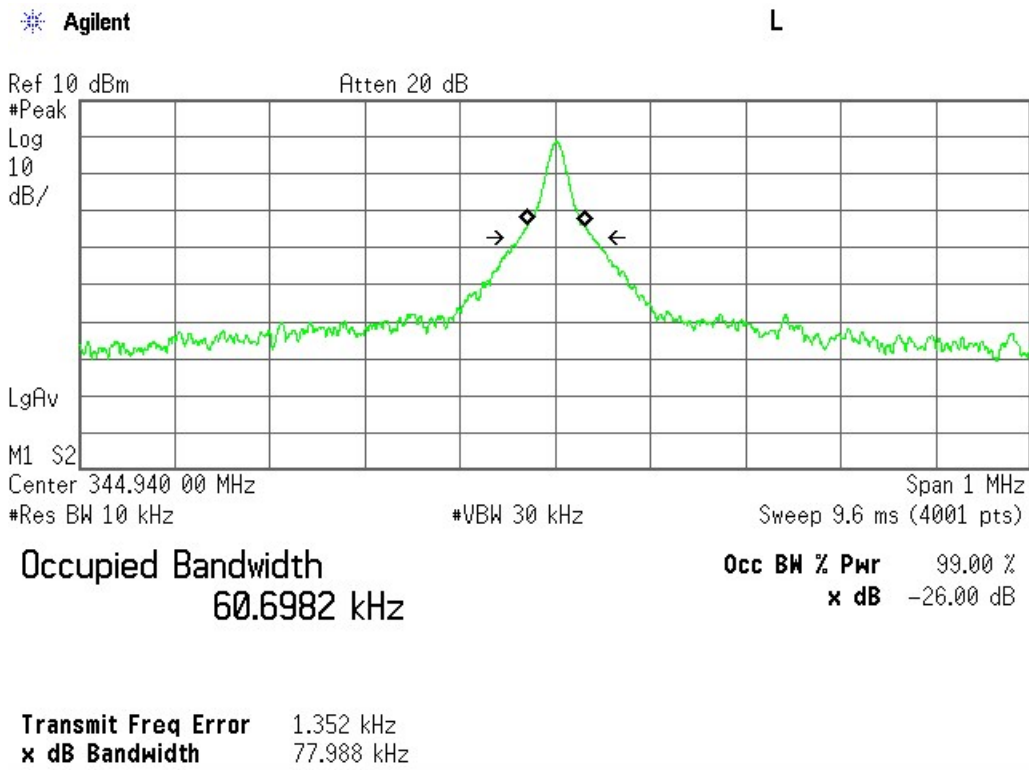
Equipment List

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	11549	A078188	Extech Instruments	SD700	04/24/17	04/24/18

Test Results

Frequency (MHz)	99% Bandwidth (in MHz)
344.94	60.698

Plots



Radiated Emissions (Unintentional Radiator)

Test Description

The Radiated Emissions (Unintentional Radiator) measurement is a test of the whole UUT during normal operation. It is a Radiated Emissions measurement done on the UUT from 30 MHz to 1 GHz, typically done in a 3 meter anechoic chamber. The UUT 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 UUT dressed appropriately. A scan is taken, and checked if it passes over the limits as shown in FCC Part 15.109 / ICES-003.

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

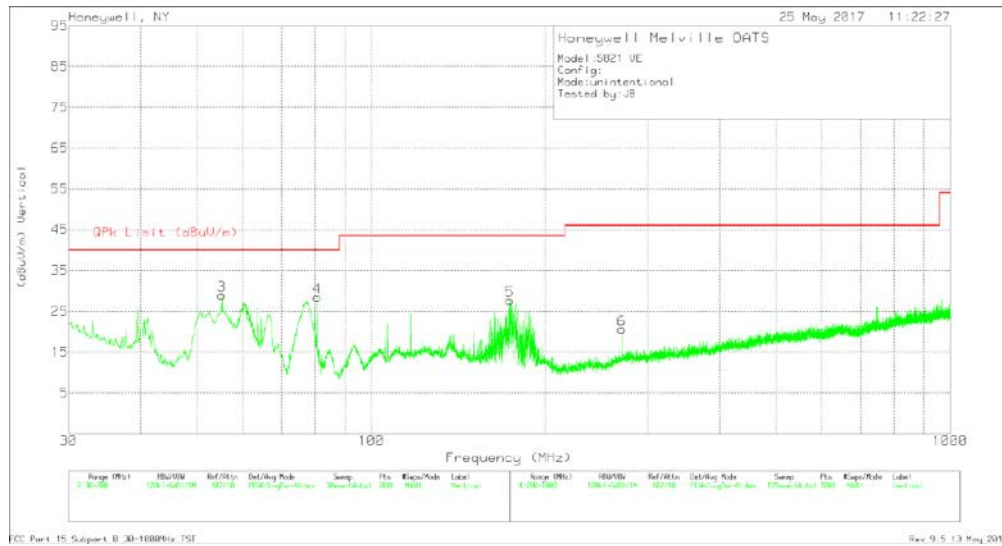
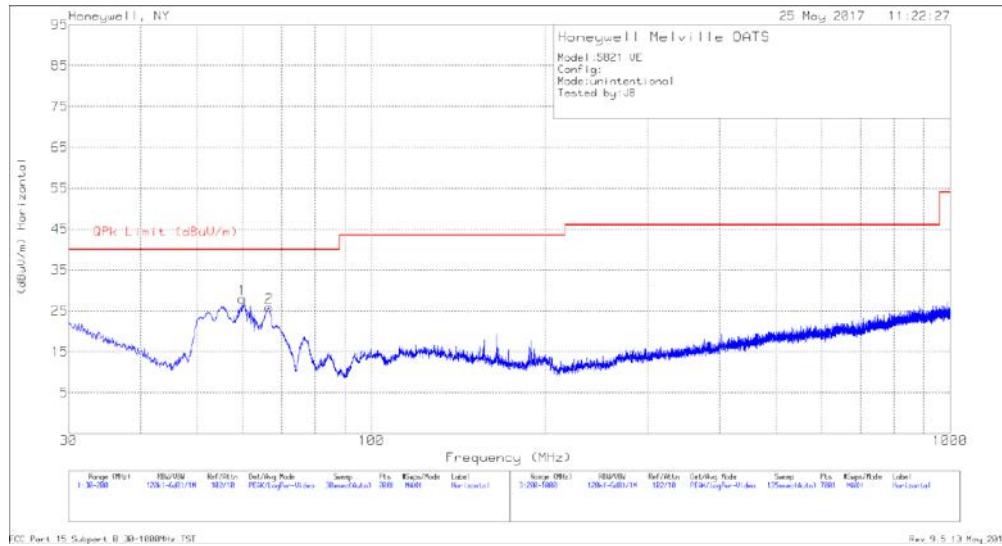
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL/JB	RF Chamber/OATS	05/25/17-06/02/17	54.0	55.0	1014	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11496	100303	Rohde & Schwarz	FSU26	04/10/17	04/10/18
Spectrum Analyzer	11545	103125	Rohde & Schwarz	FSW26	02/14/17	02/14/18
Bilog Antenna (30MHz-6GHz)	11534	A012816	Sunol	JB6	03/09/17	03/09/18
Bilog Antenna (30MHz-5GHz)	11311	A022406	Sunol	JB5	01/30/17	01/30/18
Horn Antenna (1-18GHz)	2973	3127	EMCO	RGA-60	02/03/17	02/03/18
Horn Antenna (1-18GHz)	2319	2317	EMCO	3115	02/03/17	02/03/18
Preamp (10-4200MHz)	11537	1603006	Mini Circuits	TVA-11-422	N/A	N/A
Preamp (100kHz-1.3GHz)	11540	2443AUF555	HP	8447D	N/A	N/A
Preamp (800MHz-21GHz)	11538	233701631	Mini Circuits	ZVA-213-S+	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	11549	A078188	Extech Instruments	SD700	04/24/17	04/24/18

Test Results

Below 1GHz

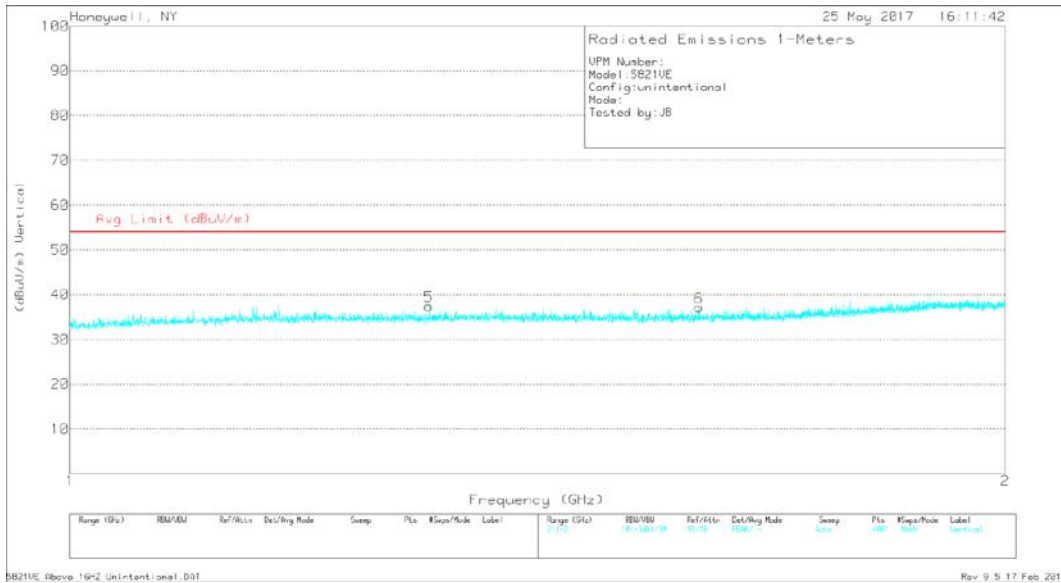
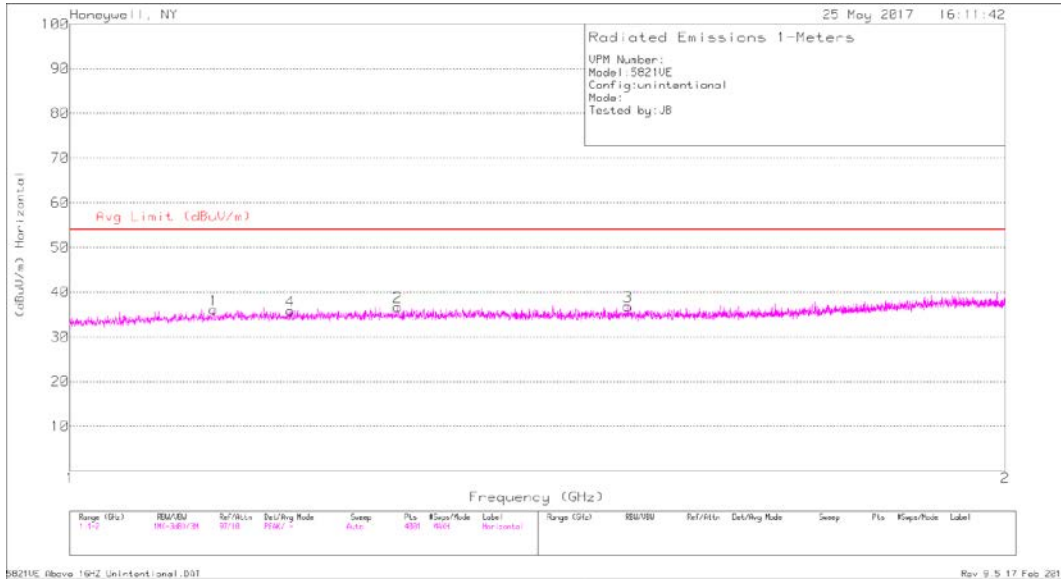


Frequency (MHz)	Meter Reading (dBuV)	Det	AF [dB/m] JB6 w/4dB pad	Pre Amp #1	RDE #1	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
60.3141	25.43	Qp	11.9	-29	1.1	9.43	40	-30.57	329	390	H
66.6129	32.02	Qp	12.2	-29	1.2	16.42	40	-23.58	307	326	H
55.0368	46.25	Qp	11.9	-29	1.1	30.25	40	-9.75	56	225	V
80.7301	42.85	Qp	11.8	-28.9	1.3	27.05	40	-12.95	103	180	V
173.0856	30.13	Qp	16.2	-28.5	1.9	19.73	43.52	-23.79	240	308	V
271.0541	29.47	Qp	17.8	-27.9	2.5	21.87	46.02	-24.15	301	181	V

Qp - Quasi-Peak detector

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

Above 1GHz



Frequency (GHz)	Meter Reading (dBuV)	Det	3115 Antenna [dB/m]	SMA5	Above1G Preamp (40dB)	Distance Corr Factor [dB]	SMA3	10dB Pad	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Polarity
1.113	47.89	Pk	25.2	1.6	-39.3	-9.5	.2	10	36.09	74	-37.91	0-360	H
1.275	48.52	Pk	25.6	1.8	-39.9	-9.5	.2	10	36.72	74	-37.28	0-360	H
1.512	49.02	Pk	25.5	2	-40.4	-9.5	.2	10	36.82	74	-37.18	0-360	H
1.178	47.6	Pk	25.4	1.7	-39.6	-9.5	.2	10	35.8	74	-38.2	0-360	H
1.305	49.4	Pk	25.6	1.8	-40	-9.5	.2	10	37.5	74	-36.5	0-360	V
1.594	49.44	Pk	25.6	2	-40.6	-9.5	.3	10	37.24	74	-36.76	0-360	V

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m] Horn#1	Above 1G Preamp(miniC)	SMA7 CF	SMA6 CF	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.114	26.25	Av	24.5	-26.6	1.8	.8	26.75	54	-27.25	83	164	H
1.276	23.51	Av	25	-26.7	1.9	.9	24.61	54	-29.39	210	167	H
1.512	44.06	Av	25.3	-26.8	2.1	.9	45.56	54	-8.44	49	131	H
1.179	23.29	Av	24.9	-26.7	1.9	.8	24.19	54	-29.81	169	201	H
1.305	23.78	Av	25.1	-26.7	1.9	.9	24.98	54	-29.02	143	263	V
1.594	24.04	Av	25.5	-26.7	2.1	.9	25.84	54	-28.16	200	334	V

Av - Average detection

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

Radiated Emissions (Intentional Radiator)

Test Description

Intentional Radiator Radiated Emissions are a test of the emissions, and harmonics on the UUT. The UUT 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	Field Strength Limit (uV/m) at 3M	Field Strength Limit (dBuV/m) at 3M
CFR 47 Subpart C, 15.205 CFR 47 Subpart C, 15.209 RSS-GEN	30-88	100	40
	88-216	150	43.5
	216-960	200	46
	Above 960	500	54

Reference	Limit		
	Fundamental Frequency (MHz)	Field Strength of Fundamental (uV/m)	Field Strength of Spurious Emissions (uV/m)
CFR 47 Subpart C, 15.231 (b) RSS-210 (a)	40.66-40.70	2250	225
	70-130	1250	125
	130-174	1250 to 3750	125 to 375
	174-260	3750	375
	260-470	3750 to 12500	375 to 1250
	Above 470	12500	1250

Message Timing & Duty Cycle

Per Exhibit 3, the declared worse-case duty cycle that the EUT will be limited to will be 10%. Hence, a duty-cycle (DC) correction factor as described in FCC Part 15, Section 15.35(c) and RSS-GEN 6.10 was used to calculate an average value as follows:

$$\text{Average value [dBuV/m]} = \text{Peak value [dBuV/m]} + 20 \cdot \log(\text{DC}/100)$$

$$\text{Average value [dBuV/m]} = \text{Peak value [dBuV/m]} + 20 \cdot \log(10/100)$$

$$\text{Average value [dBuV/m]} = \text{Peak value [dBuV/m]} - 20\text{dB}$$

Test Information

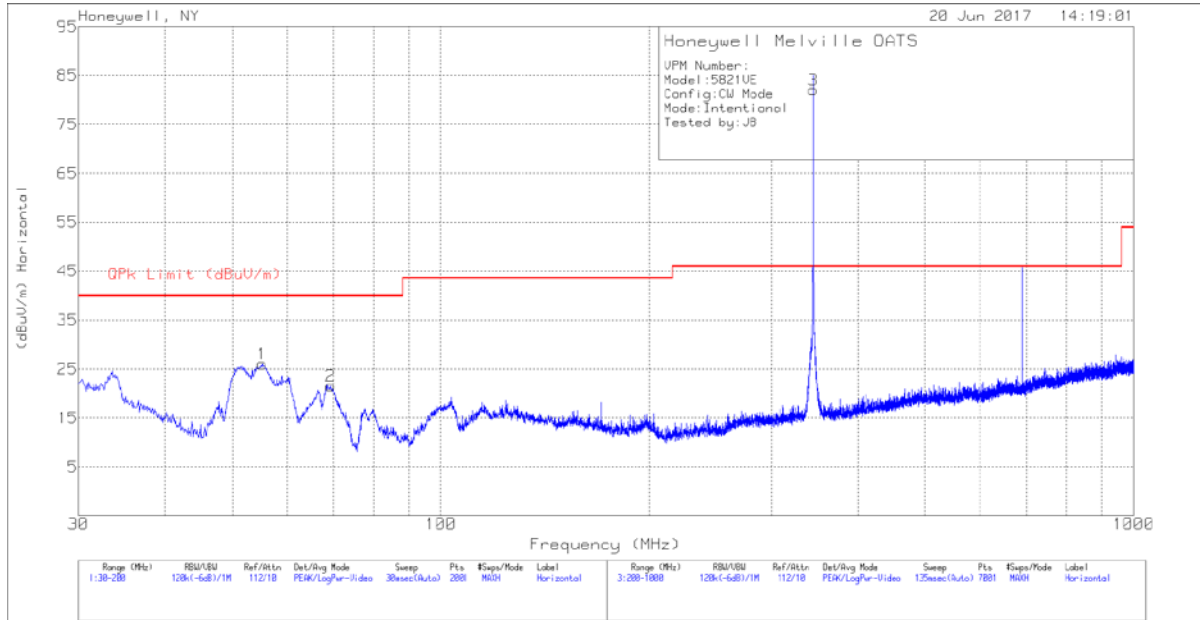
Tester	Test Location	Date	Temperature (°C)	Humidity (%RH)	Pressure (mbar)	Results (P/F)
CL/JB	RF Chamber/OATS	06/20/17-06/23/17	54.0	55.0	1014	P

Equipment List

Instrument Type	ID #	Serial #	Manufacturer	Model	Cal Date	Cal Due Date
Spectrum Analyzer	11496	100303	Rohde & Schwarz	FSU26	04/10/17	04/10/18
Spectrum Analyzer	11545	103125	Rohde & Schwarz	FSW26	02/14/17	02/14/18
Bilog Antenna (30MHz-6GHz)	11534	A012816	Sunol	JB6	03/09/17	03/09/18
Bilog Antenna (30MHz-5GHz)	11311	A022406	Sunol	JB5	01/30/17	01/30/18
Horn Antenna (1-18GHz)	2973	3127	EMCO	RGA-60	02/03/17	02/03/18
Horn Antenna (1-18GHz)	2319	2317	EMCO	3115	02/03/17	02/03/18
Preamp (10-4200MHz)	11537	1603006	Mini Circuits	TVA-11-422	N/A	N/A
Preamp (100kHz-1.3GHz)	11540	2443AUF555	HP	8447D	N/A	N/A
Preamp (800MHz-21GHz)	11538	233701631	Mini Circuits	ZVA-213-S+	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	11549	A078188	Extech Instruments	SD700	04/24/17	04/24/18

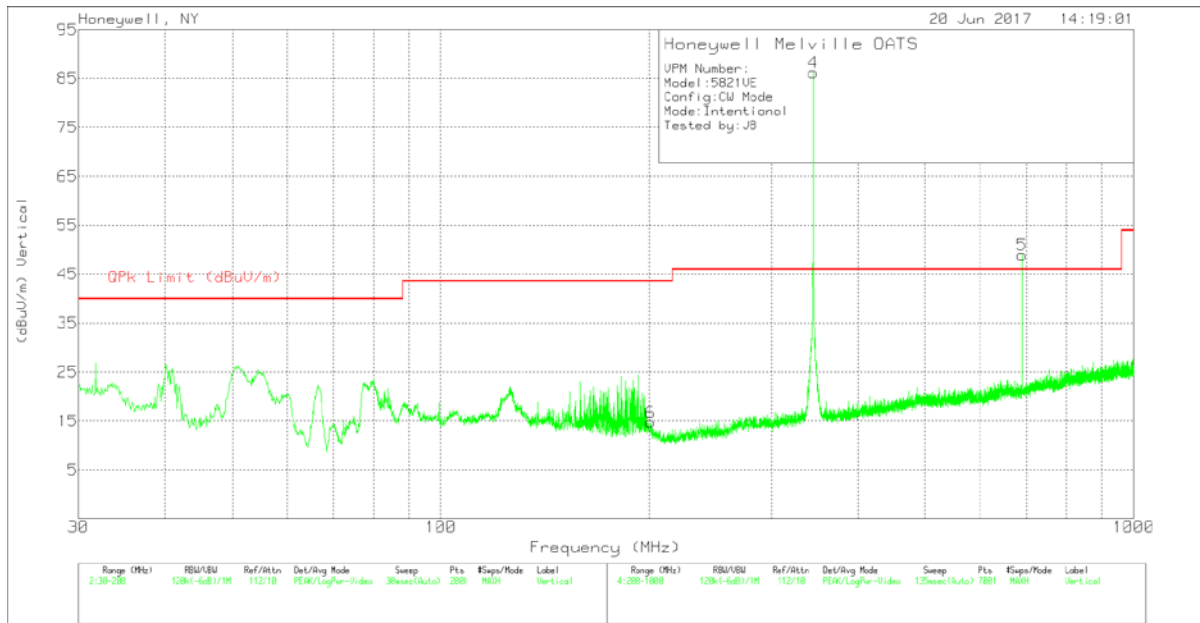
Test Results

Below 1GHz - Plots



FCC Part 15 Subpart C 30-1000MHz, TST

Rev. 9.5.13 May 2016



FCC Part 15 Subpart C 30-1000MHz, TST

Rev. 9.5.13 May 2016

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

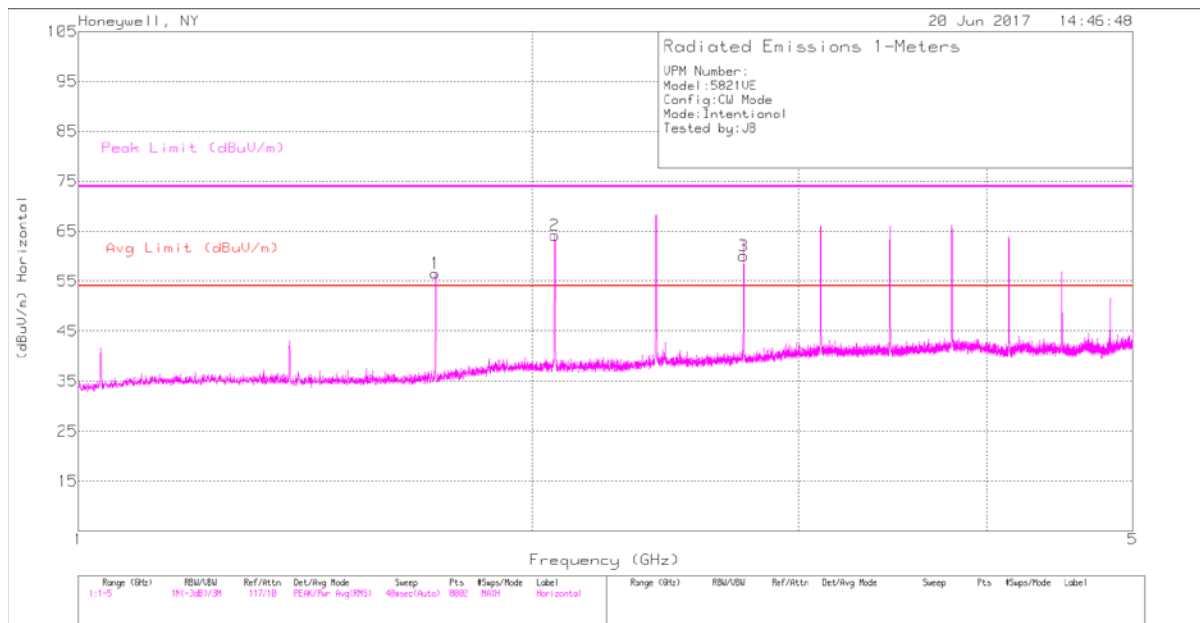
Below 1GHz - Data

Frequency (MHz)	Meter Reading (dBuV)	Det	AF [dB/m]	Preamp [dB]	Cable [dB]	Corrected Peak Reading (dBuV/m)	DCF [dB]	Corrected Av Reading (dBuV/m)	Pk Limit (dBuV/m)	Margin (dB)	Av Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
344.934	88.6	Pk	19.2	-24	4.4	88.2	-20	68.2	97.3	-9.1	77.3	-9.1	216	101	H
689.871	42.62	Pk	24.8	-25.1	8.0	50.32	-20	30.32	77.3	-26.98	57.3	-26.98	216	172	H
344.934	96.16	Pk	19.2	-24	4.4	95.76	-20	75.76	97.3	-1.54	77.3	-1.54	276	144	V
689.87	49.37	Pk	24.8	-25.1	8.0	57.07	-20	37.07	77.3	-20.23	57.3	-20.23	114	158	V

Pk - Peak detector

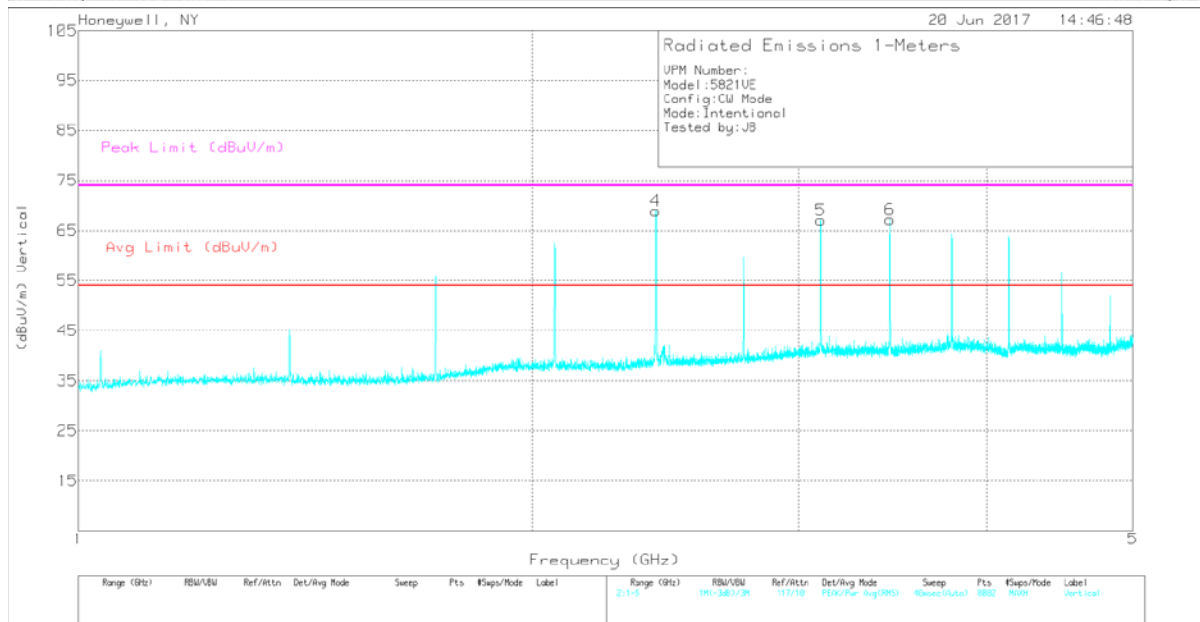
NOTE: Average field strength computed as follows for the above fundamental & harmonics:
Pk + DCF, where DCF is the duty-cycle correction factor based on the declared duty cycle

Above 1GHz - Plots



FCC Pt15 Subpart C 1-5GHz Prescan.TST

Rev. 9.5.13 May 2016



FCC Pt15 Subpart C 1-5GHz Prescan.TST

Rev. 9.5.13 May 2016

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

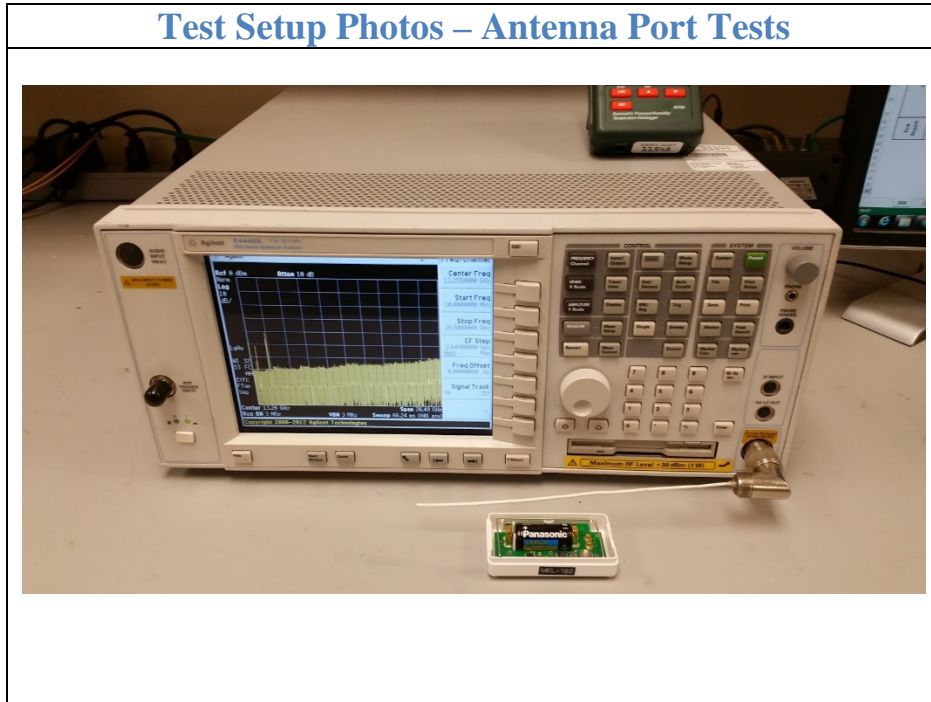
Above 1GHz - Data

Frequency (GHz)	Meter Reading (dBuV)	Det	AF [dB/m]	Preamp [dB]	Cable [dB]	Peak Reading (dBuV/m)	DCF [dB]	Corrected Avg Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.033	58.35	Pk	24.1	-26.7	2.5	58.25	-20	38.25	54	-15.75	74	-15.75	0	301	H
* 1.38	45.95	Pk	25.2	-26.7	2.9	47.35	-20	27.35	54	-26.65	74	-26.65	179	110	H
1.725	52.1	Pk	26.5	-26.8	3.2	55	-20	35	54	-19	74	-19	133	131	H
2.07	57.79	Pk	28	-27	3.5	62.29	-20	42.29	54	-11.71	74	-11.71	42	239	H
2.415	63.01	Pk	28.6	-27	3.7	68.31	-20	48.31	54	-5.69	74	-5.69	346	360	H
* 2.759	52.73	Pk	29.4	-27	4	59.13	-20	39.13	54	-14.87	74	-14.87	123	232	H
3.104	61.98	Pk	30.7	-27	4.3	69.98	-20	49.98	54	-4.02	74	-4.02	148	135	H
3.449	58.91	Pk	31.2	-27	4.5	67.61	-20	47.61	54	-6.39	74	-6.39	44	126	H
* 1.032	58.11	Pk	24	-26.7	2.5	57.91	-20	37.91	54	-16.09	74	-16.09	120	228	V
* 1.38	43.76	Pk	25.2	-26.7	2.9	45.16	-20	25.16	54	-28.84	74	-28.84	62	125	V
1.724	54.35	Pk	26.5	-26.8	3.2	57.25	-20	37.25	54	-16.75	74	-16.75	48	266	V
2.07	61.21	Pk	28	-27	3.5	65.71	-20	45.71	54	-8.29	74	-8.29	34	158	V
2.414	67.47	Pk	28.6	-27	3.7	72.77	-20	52.77	54	-1.23	74	-1.23	6	322	V
* 2.759	54.75	Pk	29.4	-27	4	61.15	-20	41.15	54	-12.85	74	-12.85	215	392	V
3.104	59.18	Pk	30.7	-27	4.3	67.18	-20	47.18	54	-6.82	74	-6.82	349	371	V
3.449	56.56	Pk	31.2	-27	4.5	65.26	-20	45.26	54	-8.74	74	-8.74	276	227	V

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

NOTE: Average field strength computed as follows for the above fundamental & harmonics:
 Pk + DCF, where DCF is the duty-cycle correction factor based on the declared duty cycle

Setup Photos

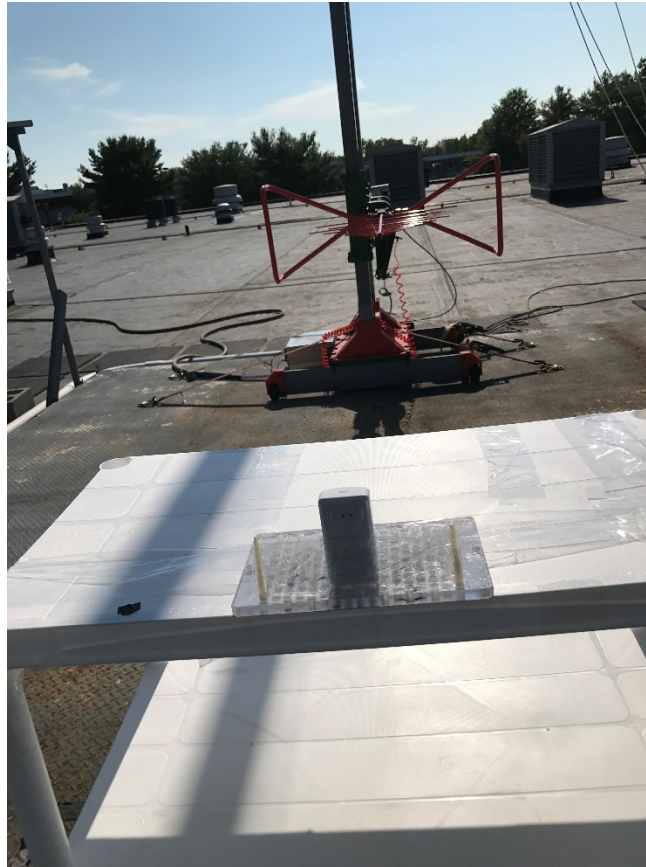


Test Setup Photos – Radiated Emissions below 1GHz - Front



Front View

Test Setup Photos – Radiated Emissions below 1GHz - Rear



Rear View

Test Setup Photos – Radiated Emissions above 1GHz - Front



Front View

Test Setup Photos – Radiated Emissions above 1GHz - Rear



Rear View

END OF REPORT