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FCC CFR47 PART 15 SUBPART C & IC RSS-210

TEST REPORT

For

Somfy Systems, Inc.

**RF External Module 2.4GHz
Model Number: RFMOD-01**

**FCC ID: DWNRFMOD
IC: 12049A-RFMOD**

Report Number: 0048-140708-03

Prepared for
**Somfy Systems, Inc.
121 Herrod Blvd.
Dayton, NJ 08810
USA**

Prepared by
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Date: 07/21/2014

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1. TEST RESULT CERTIFICATION

COMPANY NAME: SOMFY SYSTEMS, Inc.
121 Herrod Blvd.
Dayton, NJ 08810

EUT DESCRIPTION: SWF Basic Remote Unit

MODEL: RFMOD-01

DATE TESTED: 07/08/2014 to 07/18/2014

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC Part 15.247 & IC RSS-210:Issue 8	NO NON-COMPLIANCE NOTED

Advanced Compliance Laboratory, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Advanced Compliance Laboratory, Inc. (ACL) and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by ACL, Advanced Compliance Laboratory, Inc. will constitute fraud and shall nullify the document.

Approved & Released For ACL By:

Tested By:



Wei Li

Edward Lee

Manager
Advanced Compliance Laboratory, Inc.

EMC Engineer

2. EUT DESCRIPTION

The EUT for this certification is a low power transmitter, using digital modulation & operating in the 2400-2483.5 MHz band.

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Rated Power Selection	Tested Average Power (dBm/W)*	Tested Peak Power (dBm/W)*
2400-2483.5		4.96 / 0.003	12.26 / 0.017

*Calculated from measured E field intensity
 $EIRP (dBm) = E (dBuV/m) - 95.2$

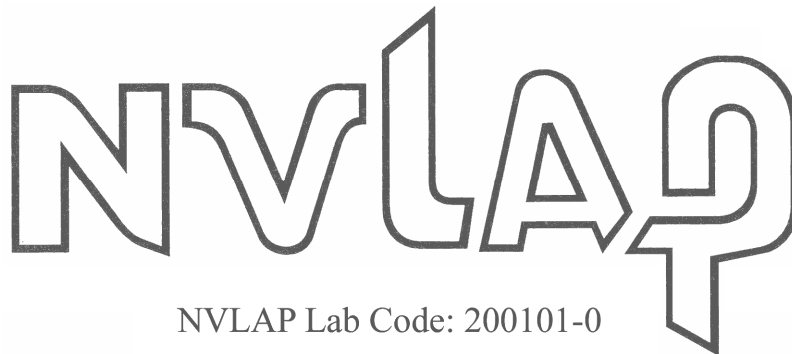
3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/C63.10, FCC CFR 47 Part 2 & 15 and IC RSS-210. Test procedure described in FCC “KDB 558074 D01 DTS Measurement Guidance” is used in this report.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at Hillsborough, New Jersey, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods”

ACL is accredited by NVLAP, Laboratory Code 200101-0. The full accreditation can be viewed at <http://www.ac-lab.com>



No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5.2. MEASUREMENT UNCERTAINTY

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty u_c	norm.	± 2.36	± 2.99	± 1.83

5.3. TEST AND MEASUREMENT EQUIPMENT

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

Manufacturer	Model	Serial No.	Description	Last Cal mm/dd/ yy	Cal Due Mm/dd/ yy
Agilent	E4440A	US40420700	3Hz-26.5GHz Spec. Analyzer	6/06/14	6/06/15
R &S	ESPI	100018	9KHz-7GHz EMI Receiver	8/25/13	8/25/14
HP	HP8546A	3448A00290	9kHz to 6.5GHz EMI Receiver	10/16/13	10/16/14
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	10/19/12	10/19/14
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	10/19/12	10/19/14
Electro-Meterics	ALR-25M/30	289	10KHz-30MHz Active Loop Antenna	8/28/13	8/28/14
EMCO	3115	4945	Double Ridge Guide Horn Antenna	10/17/12	10/17/14
R&S	SMH	8942280/010	Signal Generator		
RES-NET	RFA500NFF 30	0108	30dB in-line Power Attenuator		

All Test Equipment Used is Calibrated, Traceable to NIST Standards.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

None.

TEST SETUP

Testing Frequency/Channel/Port Selection:

- **L**(owest), **M**(iddle), **H**(ighest) Channels of 2.4 GHz Band.
- Radiated method was chosen for this EUT which has integrated on-board antenna (using EIRP=E-95.2 relation) instead of common approach (measured at EUT's antenna connector on PCB for conducted measurements).
- Channel Selection: Low Channel=2425 MHz; Middle Channel=2450 MHz; High Channel=2475 MHz
- For intentional radiator measurements, only 2.4 GHz Band transmitter was activated. The EUT powered either by 12V battery supply pack or 15V sector Power Supply. Based on pre-scan results, the reported configuration of the EUT was chosen as the worst case for final data collection.

7. APPLICABLE LIMITS AND TEST RESULTS

7.1 6dB &99% BANDWIDTH

LIMIT

§15.247 (a) (2) & RSS-210 A8.2(1): Min. 6dB DTS bandwidth should be no less than 500KHz.

TEST PROCEDURE *per FCC KDB 558074D01v03r02*

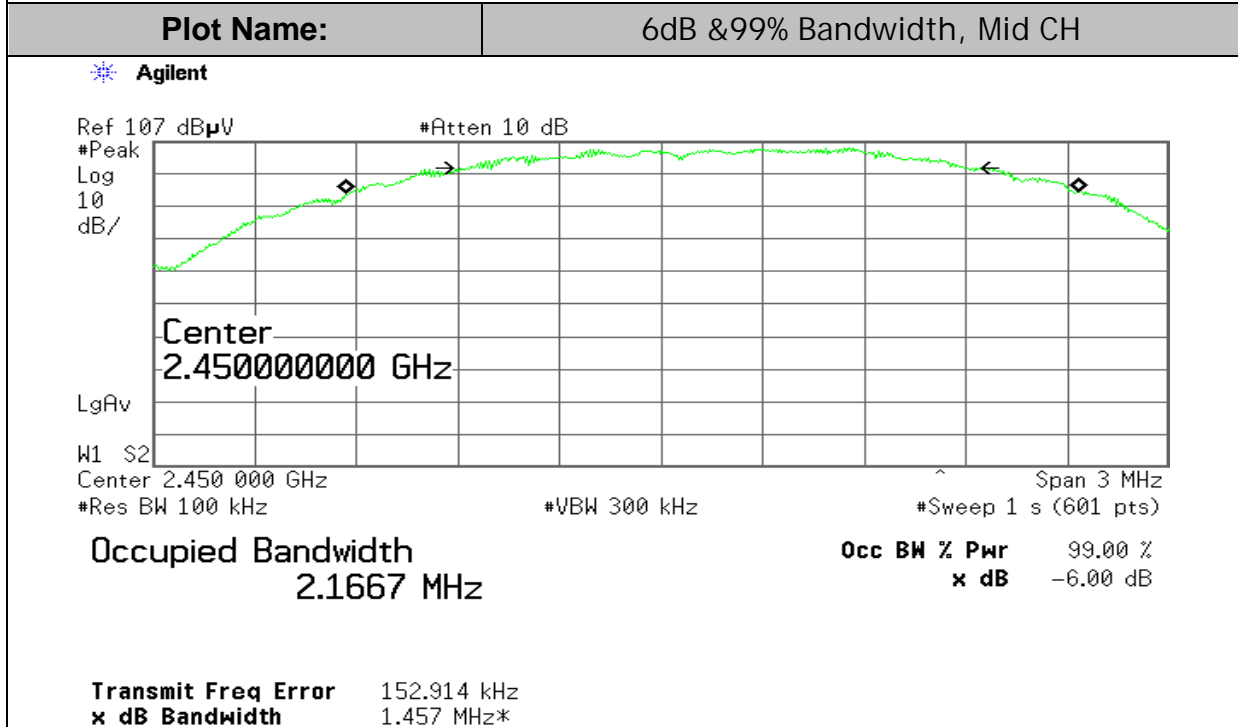
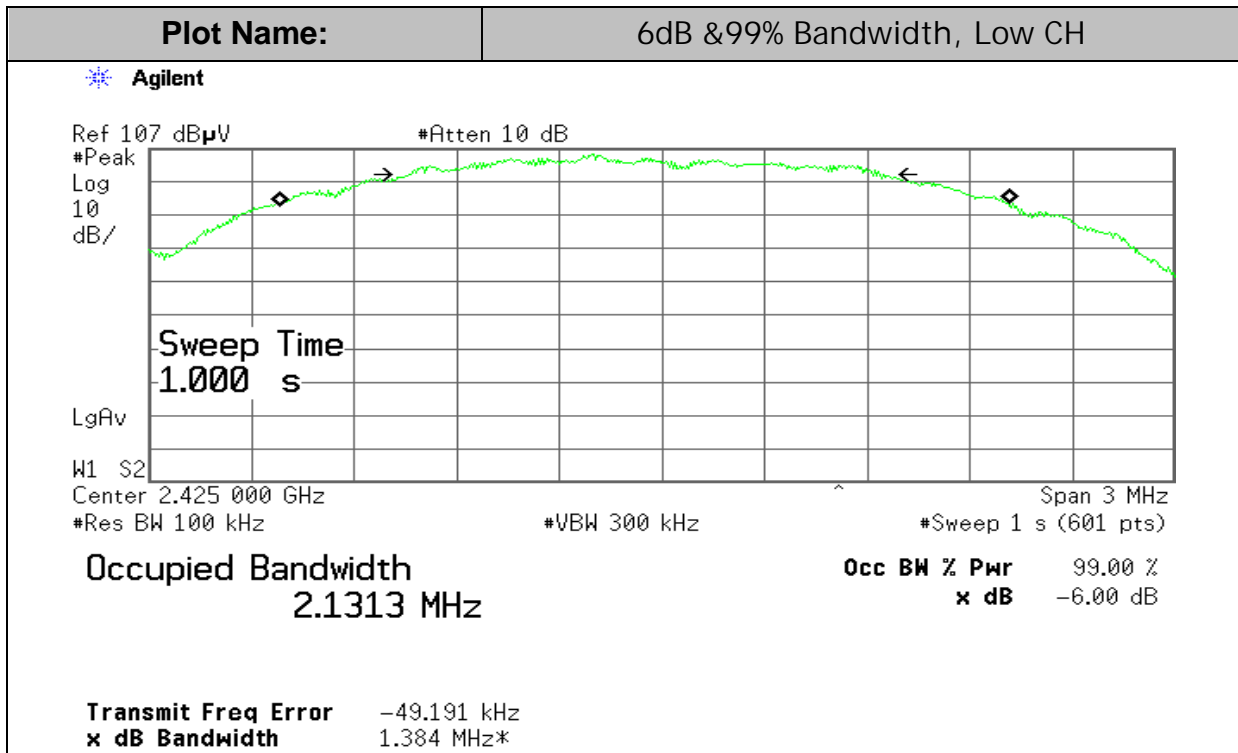
Measurement Procedure for Emission Bandwidth (DTS Bandwidth)	Applicable to this EUT
8.1 DTS BW Measurement Procedure: Option 1	<input type="checkbox"/>
8.2 DTS BW Measurement Procedure: Option 2	<input checked="" type="checkbox"/>

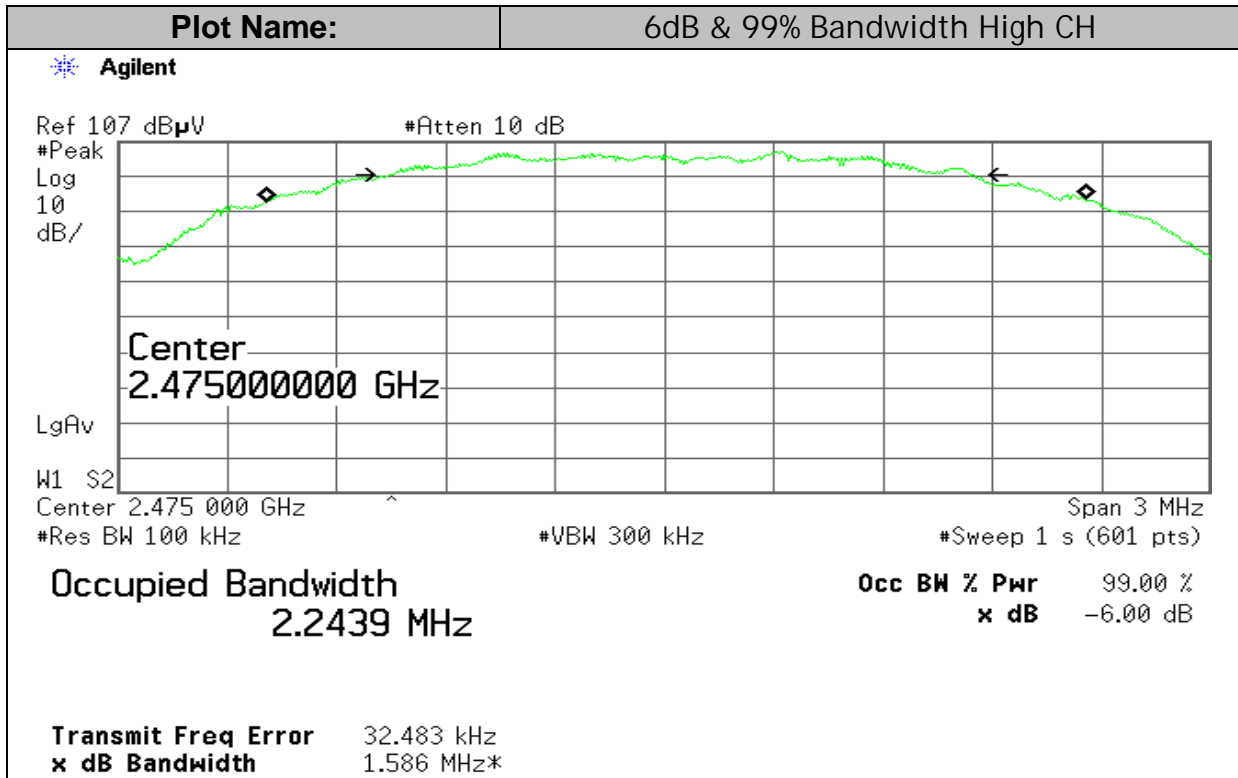
RESULTS

No non-compliance noted.

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2425	1.384	2.131
Middle	2450	1.457	2.167
High	2475	1.586	2.244

6dB & 99% BANDWIDTH





7.2 PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b)(3) & RSS-210 A8.4(4)

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
 For systems using digital modulation in the 2400-2483.5 MHz band: 1 Watt.

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

b(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Therefore, the applicable output power limit shall be calculated as follows:

$$P_{out} = 30 - (G_{tx} - 6) \text{ for antenna gain } \leq 6 \text{ dBi or}$$

$$P_{out} = 30 - \text{Floor}[(G_{tx} - 6)/3]$$

G_{Tx} = the maximum transmitting antenna directional gain in dBi.

TEST PROCEDURE *per FCC KDB 558074D01v03r02*

Measurement Procedure for Fundamental Emission Output Power	Applicable to this EUT
9.1.1 Maximum Peak Conducted Output Power Level Measurement Procedure Option 1 (RBW ≥ DTS BW)	<input checked="" type="checkbox"/> preferred
9.1.2 Maximum Peak Conducted Output Power Level Measurement Procedure Option 2 (RBW < DTS BW)	<input type="checkbox"/>
9.1.3 Maximum Peak Conducted Output Power Level Measurement Procedure Option 3 (Peak Power Meter Method)	<input type="checkbox"/>
9.2.2 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 1 (Measurement using a spectrum analyzer (SA))	<input type="checkbox"/>
9.2.3 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 2 (using a power meter (PM))	<input type="checkbox"/>

* Alternative method. EUT shall be configured to transmit continuously (min. 98% duty cycle at full power). The spectrum analyzer shall be set for bin-to-bin spacing ≤ RBW/2.

ALTERNATIVE METHOD

(Ref: 558074 D01 DTS Measurement Guidance v03r02)

The measurement procedures described herein are based on the use of an antenna-port conducted test configuration. However, if antenna-port conducted tests cannot be performed on an EUT (e.g., portable or handheld devices with integral antenna), then radiated tests are acceptable for demonstrating compliance to the conducted emission requirements. The guidance provided herein is applicable to either antenna-port conducted or radiated compliance measurements.

If a radiated test configuration is used, then the measured power or field strength levels shall be converted to equivalent conducted power levels for comparison to the applicable output power limit. This may be accomplished by first measuring the radiated field strength or power levels using a methodology for maximum peak conducted power or maximum conducted (average) power as applicable and peak or average power spectral density as applicable. The radiated field strength or power level can then be converted to EIRP (see ANSI C63.10 for guidance).

Therefore, the applicable output power limit shall be calculated as follows:

$$\text{EIRP (dBm)} = \text{E (dBuV/m)} - 95.2$$

No non-compliance noted.

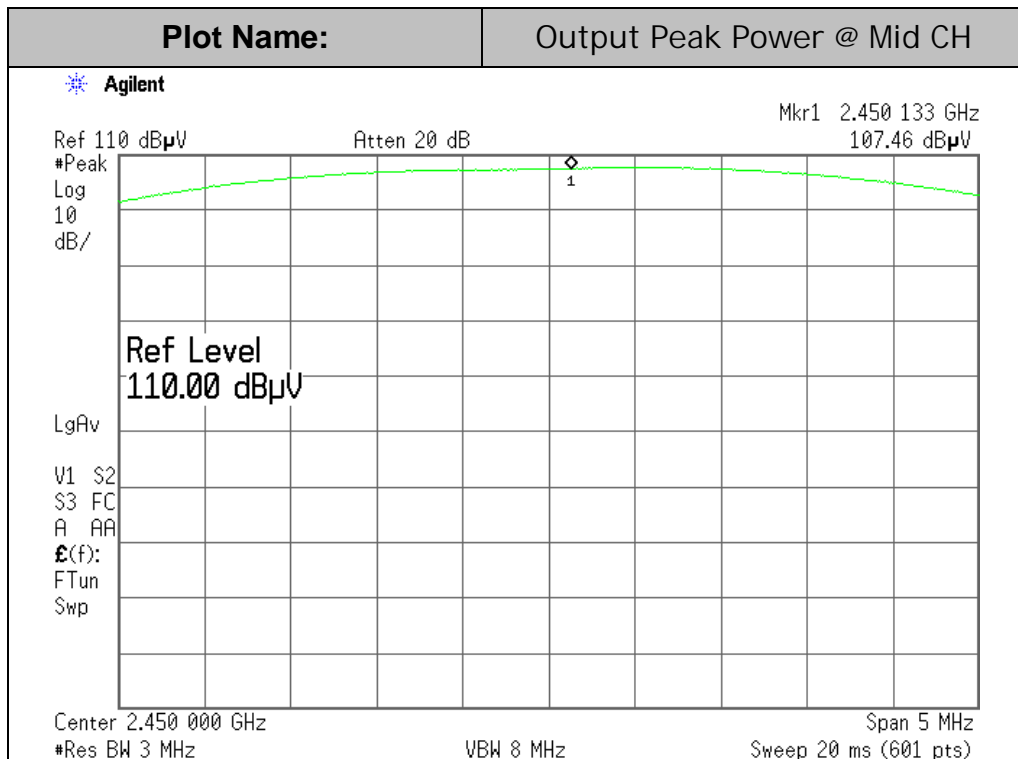
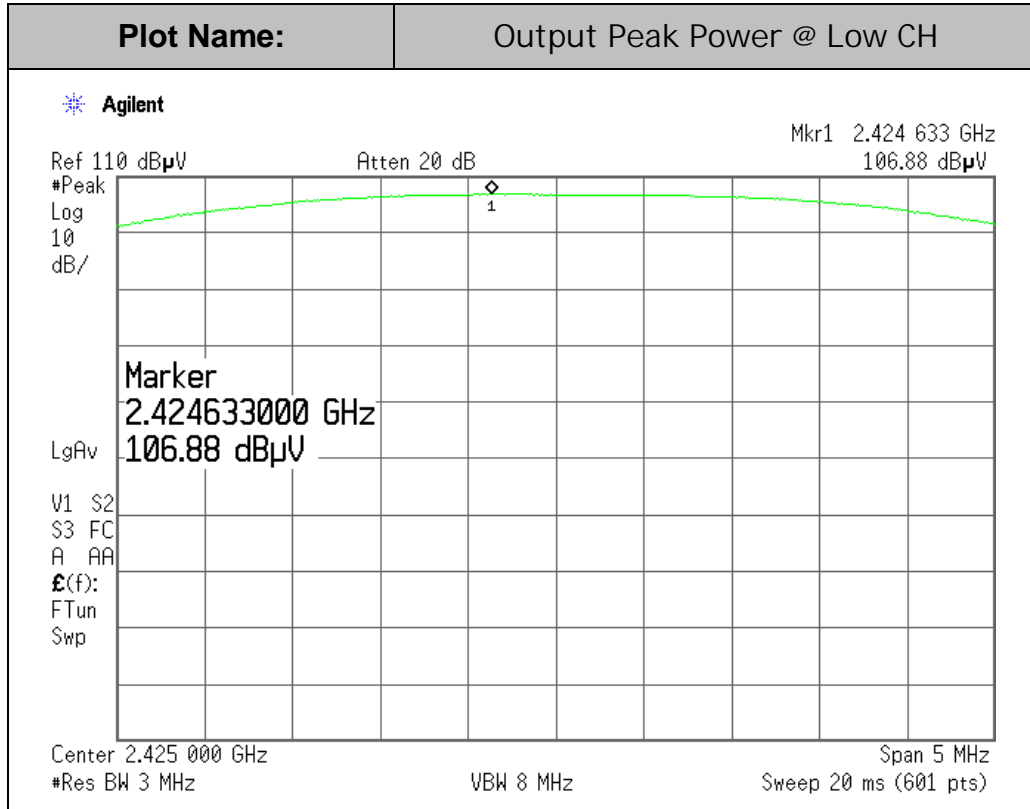
OUTPUT PEAK POWER

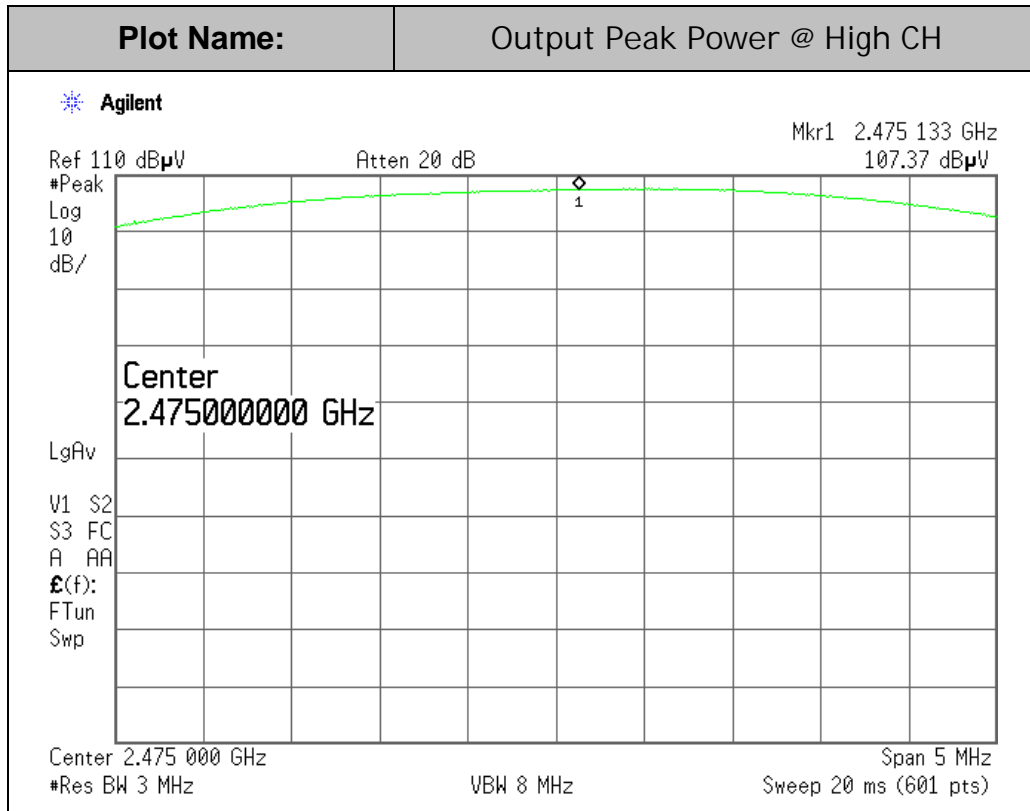
Summary of Peak Power Testing Data:

Channel	Frequency (MHz)	Peak Power* (dBm)	Limit (dBm)	Margin (dB)
Low	2425	11.68	30	-18.32
Middle	2450	12.26	30	-17.44
High	2475	12.17	30	-17.83

* Calculated from measured E field intensity.

$$\text{EIRP (dBm)} = \text{E (dBuV/m)} - 95.2$$





7.3 MAXIMUM PERMISSIBLE EXPOSURE

LIMITS & RSS-102

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of Power to mW and Distance to cm, using:

$$P(\text{mW}) = P(\text{W}) / 1000 \text{ and}$$

$$d(\text{cm}) = 100 * d(\text{m})$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

Substituting the logarithmic form of power and gain using: P

$$(mW) = 10^{(P(\text{dBm}) / 10)} \text{ and}$$

$$G(\text{numeric}) = 10^{(G(\text{dBi}) / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

Equation (1)

$$S = 0.0795 * 10^{((P + G) / 10)} / d^2$$

Equation (2)

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

Equation (2) and the measured peak power is used to calculate the Power density.

LIMITS

From §1.1310 Table 1 (B),
for Public $S = 1.0 \text{ mW/cm}^2$
for Professional, $S = 5.0 \text{ mW/cm}^2$

RESULTS

No non-compliance noted:

For this EUT, $P+G=12.26 \text{ dBm}$, and $d=20\text{cm}$

Plug all three items into equation (2), yielding,

Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
1.0/5.0	12.26	0	0.003

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.4 AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE *per FCC KDB 558074D01v01r03*

Measurement Procedure for Fundamental Emission Output Power	Applicable to this EUT
9.2.2 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 1 (Measurement using a spectrum analyzer (SA))	<input type="checkbox"/>
9.2.3 Maximum Conducted (average) Output Power Level * Measurement Procedure Option 2 (using a power meter(PM))	<input checked="" type="checkbox"/>

* Alternative method. EUT shall be configured to transmit continuously (min. 98% duty cycle at full power). The spectrum analyzer shall be set for bin-to-bin spacing \leq RBW/2.

The transmitter output is connected to a RF broadband power meter.

Note: No RF Output Connector on EUT. Radiated Emission Measurement performed.

RESULTS

No non-compliance noted:

Channel	Frequency (MHz)	Average Power* (dBm)
Low	2425	4.38
Middle	2450	4.96
High	2475	4.87

*Derived from average Field Strength, then converted to dBm.

7.5 PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (e) & RSS-210 A8.2(2)

For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST PROCEDURE *per FCC KDB 558074D01v01r03*

Measurement Procedure for Maximum Power Spectral Density in the Fundamental Emission*	Applicable to this EUT
10.2 Measurement Procedure Option 1 for Peak PSD (PKPSD)	<input checked="" type="checkbox"/> preferred
10.3-10.8 Measurement Procedure Option 2 for Average PSD** (6 methods: AVGPS-1 & Alt, AVGPS-2 & Alt, AVGPS-3 & Alt)	<input type="checkbox"/>

* Same method as used to determine fundamental power.

** EUT shall be configured to transmit continuously (min. 98% duty cycle at full power) or use video triggering/signal gating. The spectrum analyzer shall be set for bin-to-bin spacing \leq RBW/2.

RESULTS

No non-compliance noted:

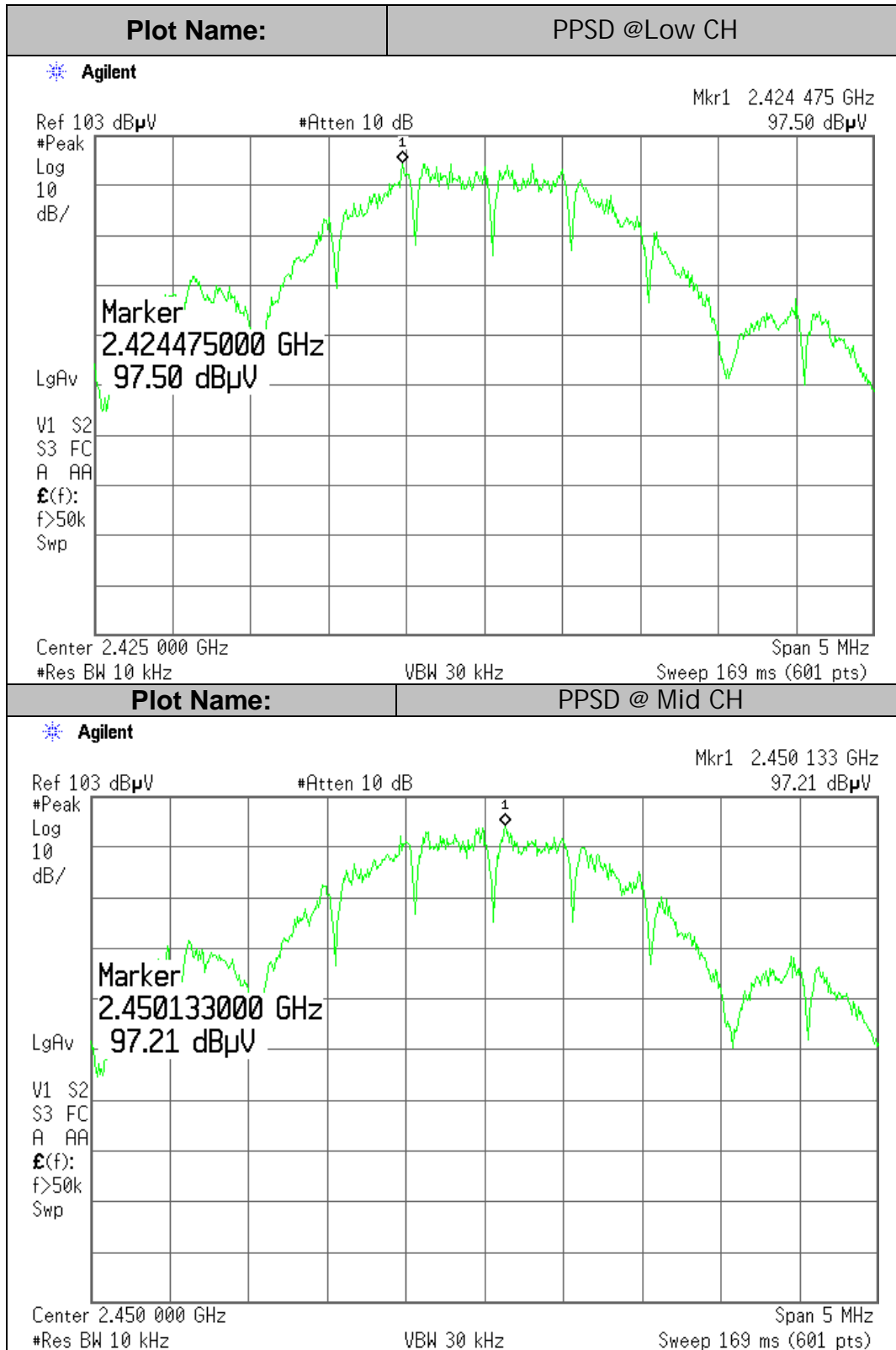
Summary of PPSD Testing Data:

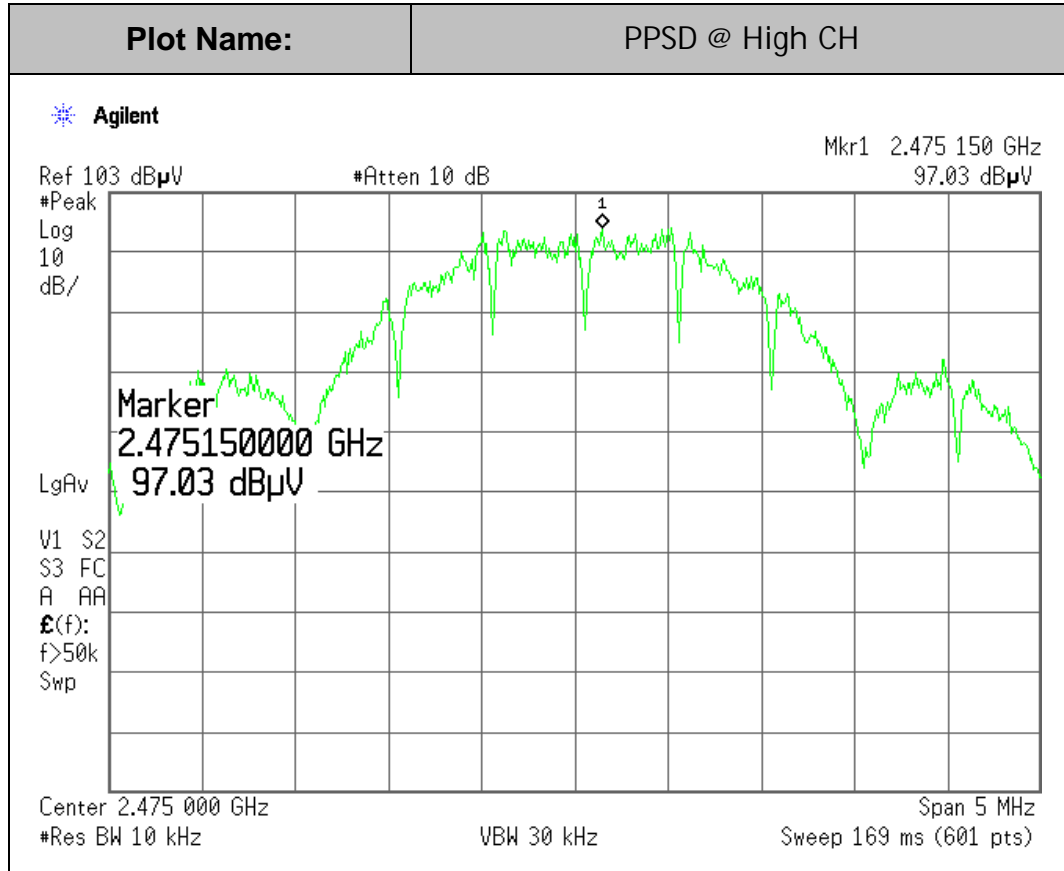
Channel	Frequency (MHz)	Field Strength (dBuV/m @10KHz RBW)	Limit (dBuV/m @3KHz RBW)	Margin (dB)
Low	2425	97.50	103.2	-5.70
Middle	2450	97.21	103.2	-5.99
High	2475	97.03	103.2	-6.17

by Calculated from measured E field intensity: $EIRP (dBm) = E (dBuV/m) - 95.2$, the same result as above

Channel	Frequency (MHz)	PPSD (dBm/10KHz)	Limit (dBm/3KHz)	Margin (dB)
Low	2425	2.3	8	-5.7
Middle	2450	2.01	8	-5.99
High	2475	1.83	8	-6.17

PEAK POWER SPECTRAL DENSITY





7.6 CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (d) & RSS- 210 A8.5

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) (see §15.205(c)).

TEST PROCEDURE *per FCC KDB 558074D01v01r03*

(Report the three highest emissions relative to the limit)

Conducted Measurement Procedure for Maximum Unwanted Emissions into Non-Restricted Frequency Bands	Applicable to this EUT	
	Peak Power limit: (-20dB)	Average Power Limit: (-30dB)
11.1-11.2 Measurement Procedure-Reference Level (RBW=100KHz, VBW=300KHz)	<input checked="" type="checkbox"/>	
11.3 Measurement Procedure-Unwanted Emissions*	<input checked="" type="checkbox"/> preferred	<input type="checkbox"/>

* Different attenuation limit shall be used based on the measurement method of fundamental emission power and PSD.

Antenna-Port Conducted Measurement Procedure for Maximum Unwanted Emissions into Restricted Frequency Bands**	Applicable to this EUT
12.2.3 CISPR Quasi-Peak Measurement (CISPR 16)	<input type="checkbox"/>
12.2.4 Peak Power Measurement (Table 1 for RBW setting)	<input type="checkbox"/>
12.2.5 Average Power Measurement (three options)***	<input type="checkbox"/>
13.2 Band-Edge Marker-Delta Method (ANSI C63.10) (within 2MHz)	<input type="checkbox"/>
13.3 Band-Edge Integration Method (peak / average) (within 2MHz)	<input type="checkbox"/>

** To use this conducted testing method, per 12.2.2-12.2.6, the followings shall be taken as consideration:

1. Proper RBW and detector, per 15.35 a/b, shall be chosen in different frequency ranges;
2. **Maximum transmitter antenna gain (no less than 2dBi), G, shall be added to the measured power level to determine the EIRP;**
3. **Appropriate factor, A, shall be added to model worst case ground reflections: 6.0dB (f≤30MHz) and 4.7dB (f≤30 to 100MHz)**
4. **Electric field strength can be obtained from the equation: E= EIRP-20log(d)+104.8+G (or 2.0) +A; Then compare to applicable limit;**
5. Unwanted emissions from EUT cabinet or casing shall be measured via radiated emission test method per C63.10 (in this case, the antenna port may be terminated properly).
6. Absolute peak power limit of -21.2dBm within the unwanted emission bandwidth shall be used for meeting 15.35(b) requirement;
7. Per 15.35(c), for pulse operation, Duty Cycle factor reduction can be applied for unwanted emissions that have the same pulse characteristics as does the fundamental emissions (such as harmonics) pulse operation

*** EUT shall be configured to transmit continuously (min. 98% duty cycle at full power). The spectrum analyzer shall be set for bin-to-bin spacing ≤RBW/2.

RESULTS

Not applicable for this EUT with internal PCB antenna.

7.7 RADIATED EMISSIONS

7.7.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) RSS-102 Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHZ	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(e)
13.36-13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts /meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode. Established procedures in C63.10 for performing radiated measurements shall be used. For cabinet emission measurements, the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. For portable devices, the EUT was tested in three orthogonal planes.

For measurements below 1 GHz the resolution bandwidth is set to 100 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, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The radio spectrum was investigated from the lowest frequency generated within the device (without going below 9 kHz) up to the 10th harmonic of the rated transmitted emission. The emissions are investigated with the transmitter set to the lowest, middle, and highest channels.

The emissions are investigated with the transmitter set to the lowest, middle, and highest channels, if applicable. The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. 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.

RESULTS

No non-compliance noted.

7.7.2. TRANSMITTER RADIATED EMISSIONS DATA

(HARMONICS & SPURIOUS falling in restricted bands listed in Sec.15.205 and non-restricted bands *)

EUT with Internal Ant.: Low Channel(2425MHz) Harmonics/Spurious

Freq. (MHz)	Worst H/V	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (dBuV/m)	QP /Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP /Avg. Mar (dBuV/m)
88.7	V	3	-	34.23			43.5		-9.27
161.6	H	3	-	33.02			43.5		-10.48
658	H	3	-	37.40			46.5		-9.1
818	V	3	-	38.26			46.5		-8.24
4849	V	3	-	53.86	46.02	74	54	-20.14	-7.98
4849	H	3	-	55.87	49.26	74	54	-18.13	-4.74
7373.5	H	3	-	62.61	52.15	74	54	-11.39	-1.85
7373.5	V	3	-	63.50	51.97	74	54	-10.5	-2.03
9698	V	3	-	48.10		74	54	-25.9	-5.9
9698	H	3	-	48.96		74	54	-25.04	-5.04

EUT with Internal Ant.: Middle Channel(2450MHz) Harmonics/Spurious

Freq. (MHz)	Worst H/V	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (dBuV/m)	QP /Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP /Avg. Mar (dBuV/m)
88.9	V	3	-	36.41			43.5		-7.09
147.3	H	3	-	33.86			43.5		-9.64
162.2	H	3	-	34.41			43.5		-9.09
660	H	3	-	38.20			46.5		-8.3
820	V	3	-	39.35			46.5		-7.15
4899	H	3	-	55.63	47.58	74	54	-18.37	-6.42
4899	V	3	-	57.09	50.01	74	54	-16.91	-3.99
7348.5	H	3	-	65.53	53.02	74	54	-8.47	-0.98
7348.5	V	3	-	64.99	52.50	74	54	-9.01	-1.50
9798	H	3	-	50.77		74	54	-23.23	-3.23
9798	V	3	-	51.07		74	54	-22.93	-2.93
12247.6	H	3	-	49.21		74	54	-24.79	-4.79
12247.6	V	3	-	49.76		74	54	-24.24	-4.24

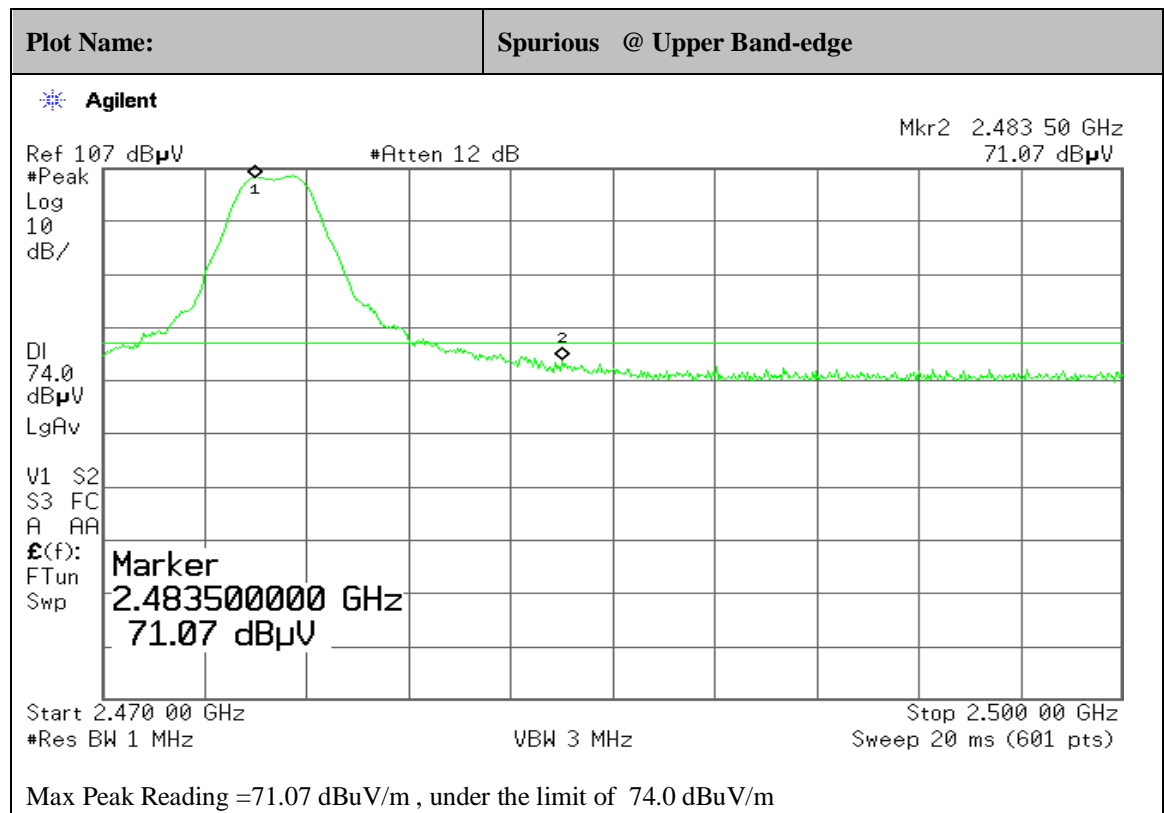
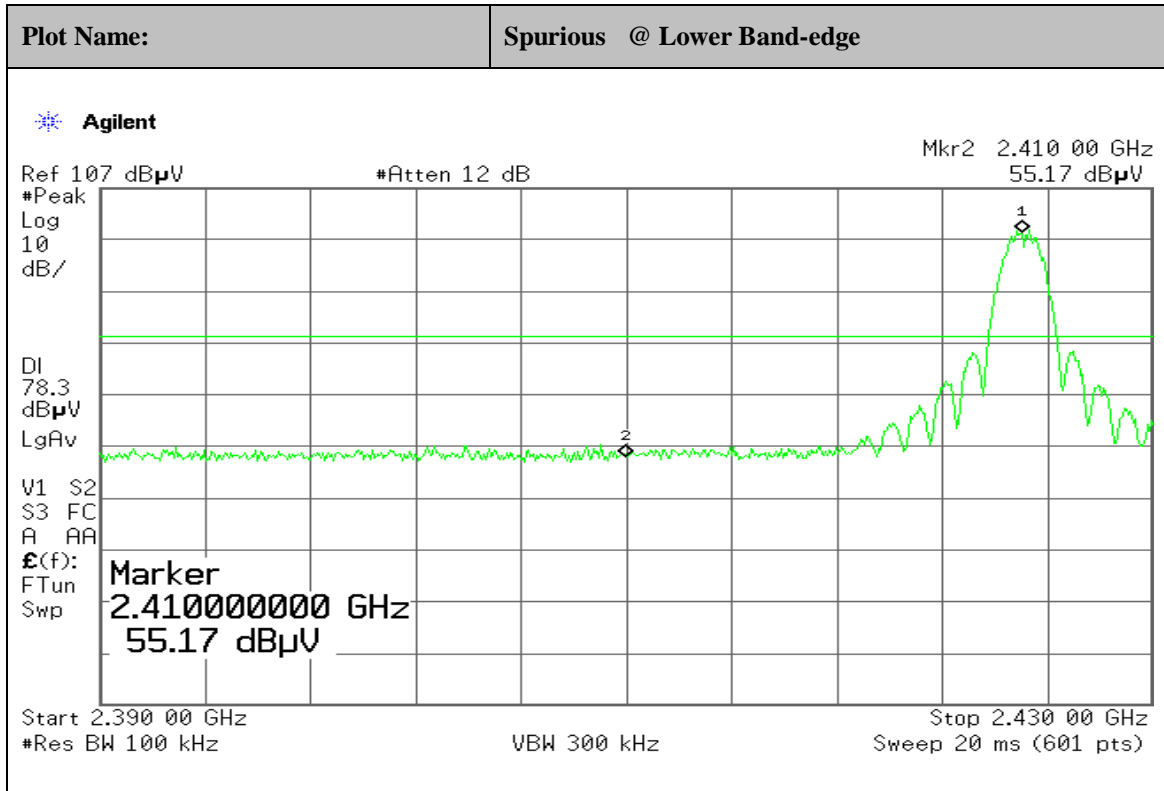
EUT with Internal Ant: High Channel(2475MHz) Harmonics/Spurious

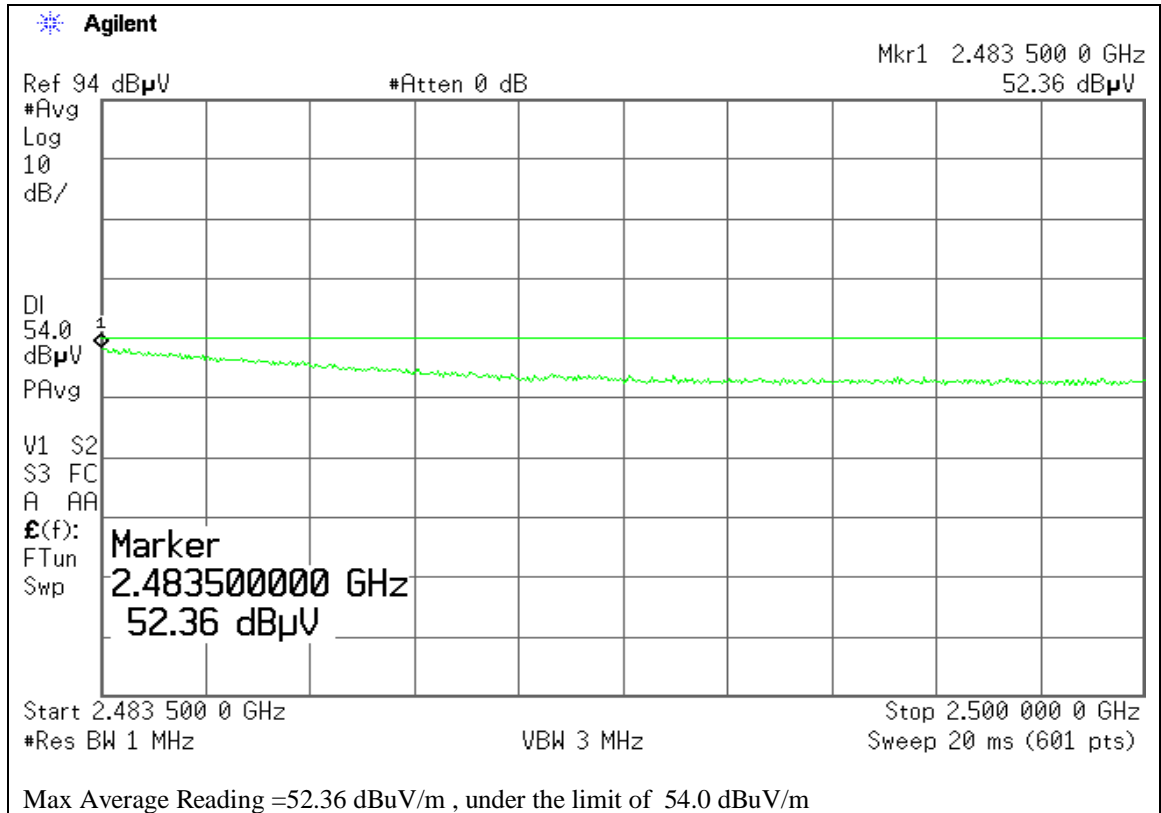
Freq. (MHz)	Worst H/V	Dist. (m)	D Corr (dB)	Peak@3m (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (dBuV/m)	QP /Avg. Lim (dBuV/m)	PK Mar (dBuV/m)	QP /Avg.Mar (dBuV/m)
89.6	V	3	-	37.11			43.5		-6.39
148.0	H	3	-	34.26			43.5		-9.24
161.8	H	3	-	34.41			43.5		-9.09
659	H	3	-	37.94			46.5		-8.56
817	V	3	-	39.35			46.5		-7.15
4949	H	3	-	56.83	48.89	74	54	-17.17	-5.11
4949	V	3	-	58.12	50.84	74	54	-15.88	-3.16
7423.5	H	3	-	65.10	52.91	74	54	-8.9	-1.09
7423.5	V	3	-	64.78	52.72	74	54	-9.22	-1.28
9898	H	3	-	51.01		74	54	-22.99	-2.99
9898	V	3	-	50.34		74	54	-23.66	-3.66
12372.5	H	3	-	49.65		74	54	-24.35	-4.35
12372.5	V	3	-	49.92		74	54	-24.08	-4.08

* Data shown above represents the worst case in all EUT orientations. No other significant emissions were found in the rest frequency range. For spurious in restricted band, the limit is per 15.209. For the others, by measuring the field strength of fundamental (peak) with 100KHz RBW, the limit is 20dB below that level.

In this case, all non-fundamental emission points are below 15.209 limit, so there is NO additional concern for non-restriction band limit compliance.

This scenario was also applied for bandedge measurement (2390-2400MHz and 2483.5-2500MHz), please see the following plots.





7.8 CONDUCTED EMISSION

7.8.1 Test Methods and Conditions

The EUT was under normal operational mode during the conducted emission test. EMI Receiver was scanned from 150KHz to 30MHz with maximum hold mode for maximum emission. Recorded data was sent to the plotter to generate output in linear format. At the input of the spectrum analyzer, a HP transient limiter is inserted for protective purpose. This limiter has a 10 dB attenuation in the range of 150KHZ to 30MHZ. That factor was automatically compensated by the receiver, so the readings are the corrected readings. The reference of the plot is the CISPR 22 Class B limit in following plots.

Conducted Emission Technical Requirements				
Frequency Range	Class A		Class B	
	Quasi-Peak dBuV	Average dBuV	Quasi-Peak DBuV	Average dBuV
150kHz -0.5MHz	79 (8912uV)	66 (1995uV)	66-56	56-46
0.5MHz-30MHz	73 (4467uV)	60 (1000uV)	---	---
0.5MHz- 5MHz	---	---	56	46 (250uV)
5MHz-30MHz	---	---	60	50

Emissions that have peak values close to the specification limit (if any) are also measured in the quasi-peak/average mode to determine compliance.

7.8.2 Test Data

The following plots show the neutral and line conducted emissions for the standard operation.

Highest Data for AC Line Conducted Emissions						
Frequency (MHz)	0.32	0.36	0.48	0.50	0.57	0.94
Peak Reading (dBuV)	44.15	45.18	45.44	50.65	44.8	42.29
Average Reading (dBuV*)				23.12		

* no need to show the average reading if the peak value is under average limit.

Test Personnel:



Tester Signature: _____

Typed/Printed Name: Edward Lee

Date: 07/21/2014

