FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Bluetooth device

Model: JL06

Trade Name: JAWBONE

Issued to

Aliph com
99 Rhode Island Street, 3rd Floor, San Francisco, CA 94103, United States

Issued by

Compliance Certification Services Inc.
No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township,
Taoyuan County 33841,Taiwan, R.O.C.
TEL: 886-3-324-0332
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Testing Laboratory
0363

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		September 16, 2014		Initial Issue	ALL	Landy Huang

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1 TEST RESULT CERTIFICATION

Applicant:	**Aliph com** 99 Rhode Island Street, 3rd Floor, San Francisco, CA 94103, United States
Manufacturer:	**FUGANG ELECTRIC (KUNSHAN) CO., LTD.** No 6, ZHENG WEI WEST ROAD, JIN XI TOWN, KUN SHAN CITY, JIANG SU PROVINCE, CHINA
Equipment Under Test:	Bluetooth device
Trade Name:	JAWBONE
Model:	JL06
Date of Test:	September 1 ~ 11, 2014

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Bill Cheng
Section Manager

Reviewed by:

Angel Hu
Section Manager

2 EUT DESCRIPTION

Product	Bluetooth device
Trade Name	JAWBONE
Model Number	JL06
Model Name Discrepancy	N/A
EUT Power Rating	3VDC From Battery
Operating Frequency Range	2402 ~ 2480 MHz
Transmit Power	0.12dBm (0.0010W)
Modulation Technique	GFSK (1Mbps)
Number of Channels	40 Channels
Antenna Specification	PIFA Antenna / Gain: -1.57dBi

Remark:

1. *The sample selected for test was production product and was provided by manufacturer.*
2. *This submittal(s) (test report) is intended for FCC ID: **V3J-JL06** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*
3. *This EUT use Bluetooth 4.0 technique and does not include Bluetooth 2.1 + EDR technique.*

3 TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 (2009), KDB558074 and FCC CFR 47 15.207, 15.209 and 15.247.

3.1. EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

3.2. EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

3.3. GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4 (2009) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4.

3.4. FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) 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 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

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

[2] Above 38.6

(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.

3.5. DESCRIPTION OF TEST MODES

The EUT (model: JL06) had been tested under operating condition and had been reported as worst case on this test report.

Test program used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

Channel Low (2402MHz), Mid (2440MHz) and High (2480MHz) with 1Mbps data rate was chosen for full testing.

The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

4.1. MEASUREMENT EQUIPMENT USED

Equipment Used for Emissions Measurement

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/01/2015
Spectrum Analyzer	Agilent	N9010A	MY52220817	03/20/2015
Spectrum Analyzer	R&S	FSL	100837	11/11/2014
Power meter	Anritsu	ML2495A	1033009	09/29/2014
Power Sensor	Anritsu	MA2411B	0917221	09/29/2014

3M Semi Anechoic Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY48250064	01/01/2015
Spectrum Analyzer	R&S	FSL	100837	11/11/2014
Pre-Amplifier	HP	8447D	2944A06530	05/02/2015
Pre-Amplifier	EMEC	EM01M26G	060570	07/28/2015
Pre-Amplifier	MITEQ	AMF-6F-26040 0-40-8P	985646	06/12/2015
Pre-Amplifier	Agilent	8449B	3008A01738	08/11/2015
EMI Test Receiver	SCHAFFNER	SCR 3501	430	03/30/2015
Loop Antenna	EMCO	6502	8905-2356	08/20/2015
Bilog Antenna	TESEQ	CBL 6112D	35378	08/21/2015
Horn Antenna	EMCO	3115	00022250	08/05/2015
Horn Antenna	EMCO	3116	00026370	12/29/2014
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R
Test S/W	EZ-EMC			

NOTE: *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.*
2. N.C.R = No Calibration Request.

4.2. MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Powerline Conducted Emission	N/A
3M Semi Anechoic Chamber / 30MHz ~ 200MHz	±3.5921
3M Semi Anechoic Chamber / 200MHz ~ 1GHz	±3.5657
3M Semi Anechoic Chamber / 1 ~ 8GHz	±2.5873
3M Semi Anechoic Chamber / 8 ~ 18GHz	±2.6646
3M Semi Anechoic Chamber / 18 ~ 26GHz	±2.9617
3M Semi Anechoic Chamber / 26 ~ 40GHz	±3.4250

Remark: *This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.*

5 FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at

☐ No.199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.
Tel: 886-2-2217-0894 / Fax: 886-2-2217-1029

☐ No.11, Wugong 6th Rd., Wugu Industrial Park, Taipei Hsien 248, Taiwan
Tel: 886-2-2299-9720 / Fax: 886-2-2298-4045

☒ No.81-1, Lane 210, Bade 2nd Rd., Lujhu Township, Taoyuan County 33841,Taiwan, R.O.C.
Tel: 886-3-324-0332 / Fax: 886-3-324-5235

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2. EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	CFR 47, FCC Part15/18, CISPR 22, EN 55022, ICES-003, AS/NZS CISPR 22, VCCI V-3, EN 55011, CISPR 11, IEC/EN 61000-4-2/3/4/5/6/8/11, EN 61000-6-1/2/3/4, EN 55024, CISPR 24, AS/NZS CISPR 24, AS/NZS 61000.6.2, EN 55014-1/-2, ETSI EN 300 386 v1.3.2/v1.3.3, IEC/EN 61000-3-2, AS/NZS 61000.3.2, IEC/EN 61000-3-3, AS/NZS 61000.3.3	A2LA ACCREDITED TESTING CERT #0824.01
USA	FCC MRA	3 meter Open Area Test Sites to perform FCC Part 15/18 measurements	FC TW1026
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-2882/2541/2798/725/1868 C-402/747/912 T-1930/1646
Taiwan	TAF	EN 55014-1, CISPR 14, CNS 13781-1, EN 55013, CISPR 13, CNS 13439, EN 55011, CISPR 11, CNS 13803, PLMN09, IS2045-0, LP0002 FCC Part 27/90, Part 15B/C/D/E, RSS-192/193/210/310 ETSI EN 300 328/ 300 220-1/ 300 220-2/ 301 893/ 301 489-01/ 301 489-03/ 301 489-07 / 301 489-17/ 300 440-1/ 300 440-2 AS/NZS 4268, AS/NZS 4771 CISPR 22, EN 55022, CNS 13438, AS/NZS CISPR 22, VCCI, IEC/EN 61000-4-2/3/4/5/6/8/11, CNS 14676-2/3/4/5/6/8, CNS 14934-2/3, CNS 13783-1, CNS 13439, CNS 13803	ilac-MRA TAF Testing Laboratory 0363
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13439, CNS 14115	SL2-IS-E-0014 / IN-E-0014 /A1-E-0014 /R1-E-0014 /R2-E-0014 /L1-E-0014
Canada	Industry Canada	RSS-Gen Issue 3	Canada IC 2324C-5

Note: *No part of this report may be used to claim or imply product endorsement by A2LA, TAF or other government agency.*

6 SETUP OF EQUIPMENT UNDER TEST

6.1. SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2. SUPPORT EQUIPMENT

For Radiated Emission (Below 1GHz) and Power Line Conducted Emission measurement							
No.	**Equipment**	**Model No.**	**Serial No.**	**FCC ID**	**Trade Name**	**Data Cable**	**Power Cord**
	N/A						

****No any support equipment during the test.**

For Conducted & Radiated Emission measurement (Above 1GHz):							
No.	**Equipment**	**Model No.**	**Serial No.**	**FCC ID**	**Trade Name**	**Data Cable**	**Power Cord**
1	Test Jig	N/A	N/A	N/A	N/A	Unshielded, 0.1m	N/A
2	Notebook PC	1706-A78	LV-L1870 06/09	FCC DOC	IBM	USB 2.0 Cable: Shielded, 1.8m	AC I/P: Unshielded, 1.8m DC O/P: Shielded, 1.8m
3	Notebook PC	ThinkPad T430u	PB-VZLGG 12/09	FCC DOC	LENOVO	Serial to USB Cable: Shielded, 1.8m	AC I/P: Unshielded, 1.8m DC O/P: Shielded, 1.8m

Remark: *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

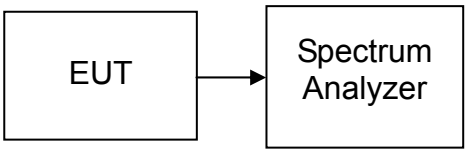
7 FCC PART 15.247 REQUIREMENTS

7.1. 6dB bandwidth

LIMIT

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100kHz, VBW = 300kHz, Span = 3MHz, Sweep = auto.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

TEST RESULTS

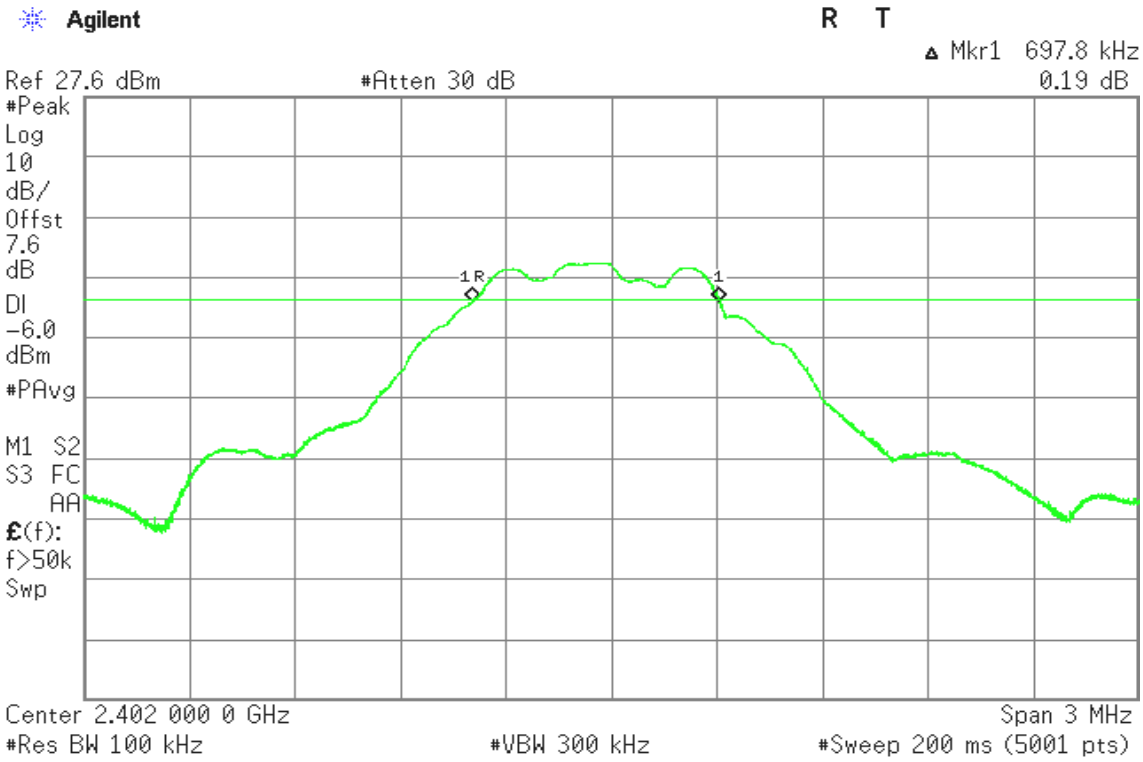
No non-compliance noted

Test Data

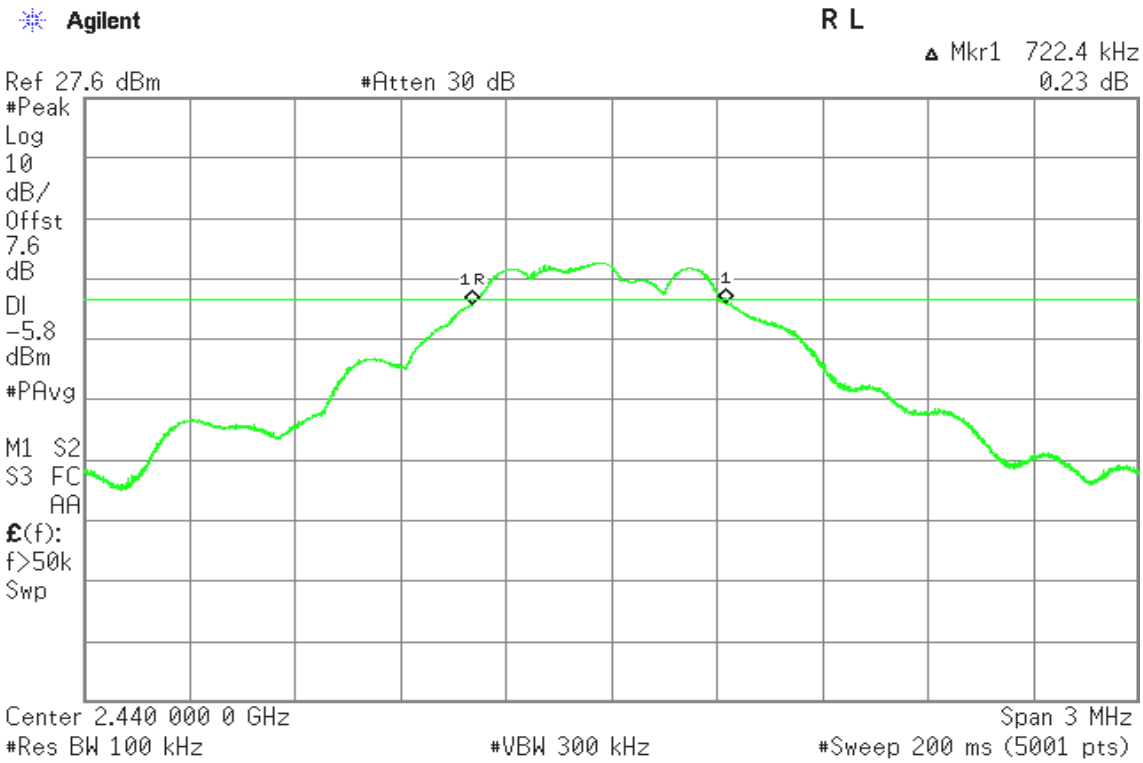
Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2402	697.8	>500	PASS
Mid	2440	722.4		PASS
High	2480	693.0		PASS

Test Plot

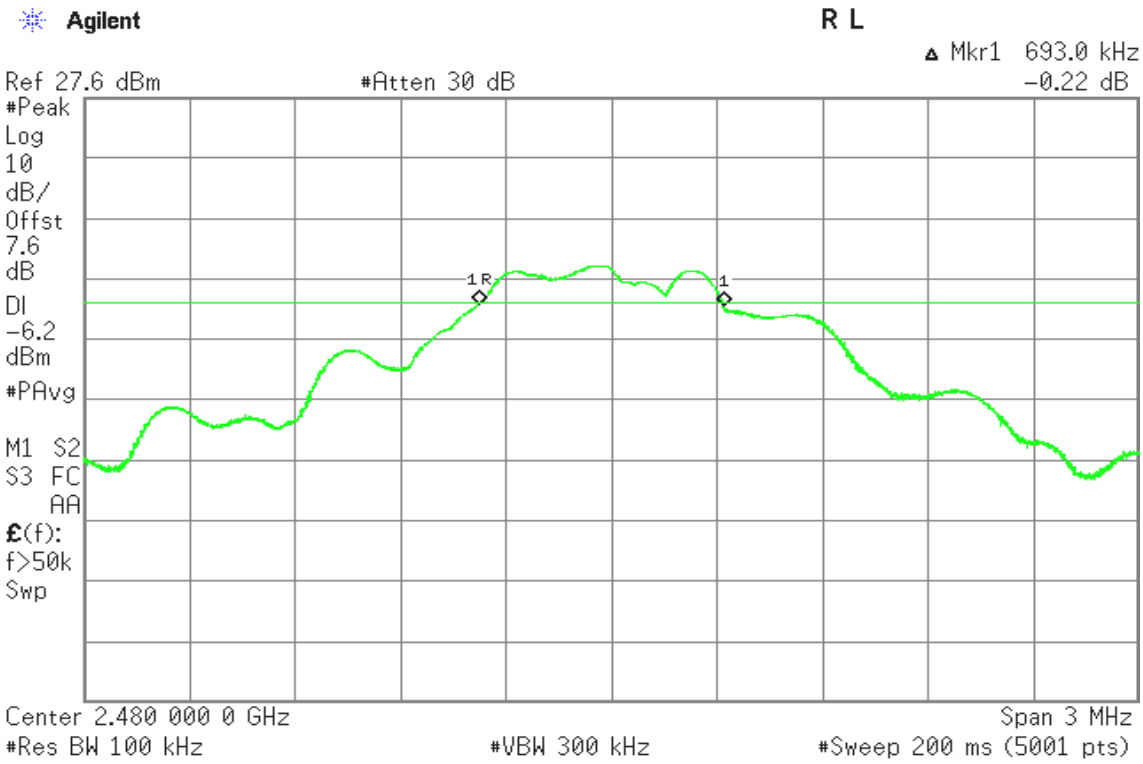
CH Low



CH Mid



CH High



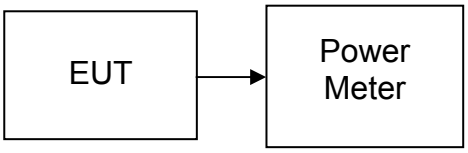
7.2. PEAK POWER

LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(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.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 v03r02

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

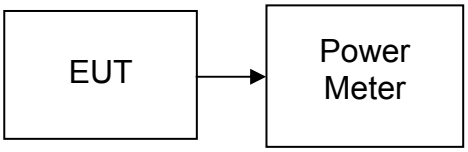
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Test Result
Low	2402	0.04	0.0010	1	PASS
Mid	2440	0.12	0.0010		PASS
High	2480	-0.21	0.0010		PASS

7.3. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 v03r02

The transmitter output is connected to the Power Meter. The Power Meter is set to the peak power detection.

TEST RESULTS

No non-compliance noted

TEST DATA

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	2402	-0.83	0.0008
Mid	2440	-1.29	0.0007
High	2480	-0.97	0.0008

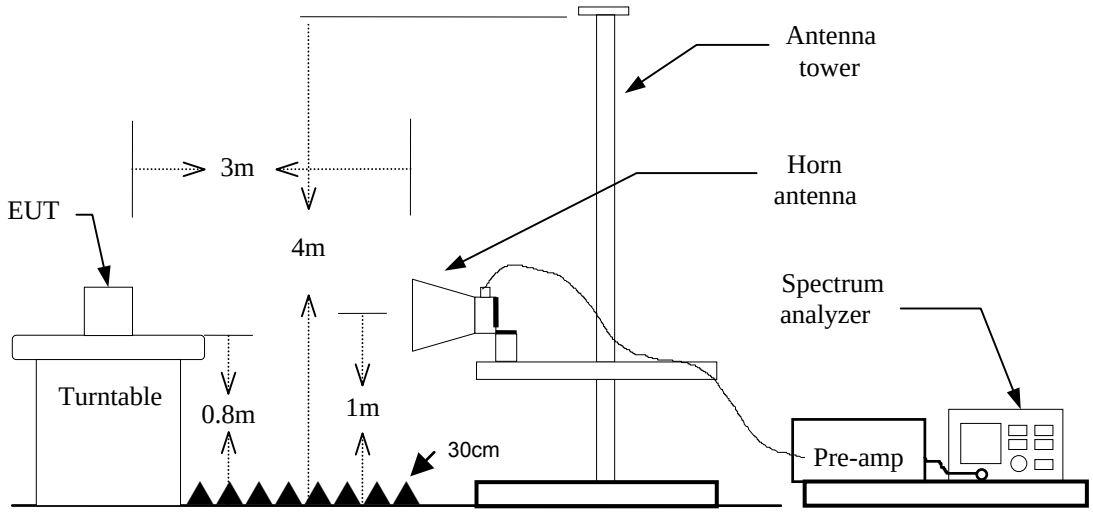
7.4. BAND EDGES MEASUREMENT

LIMIT

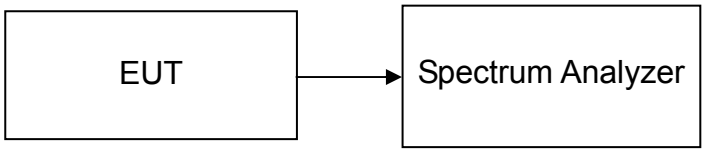
According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains 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. 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 Section 15.205(c)).

Test Configuration

For Radiated



For Conducted



TEST PROCEDURE

For Radiated

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=2.7kHz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

For Conducted

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

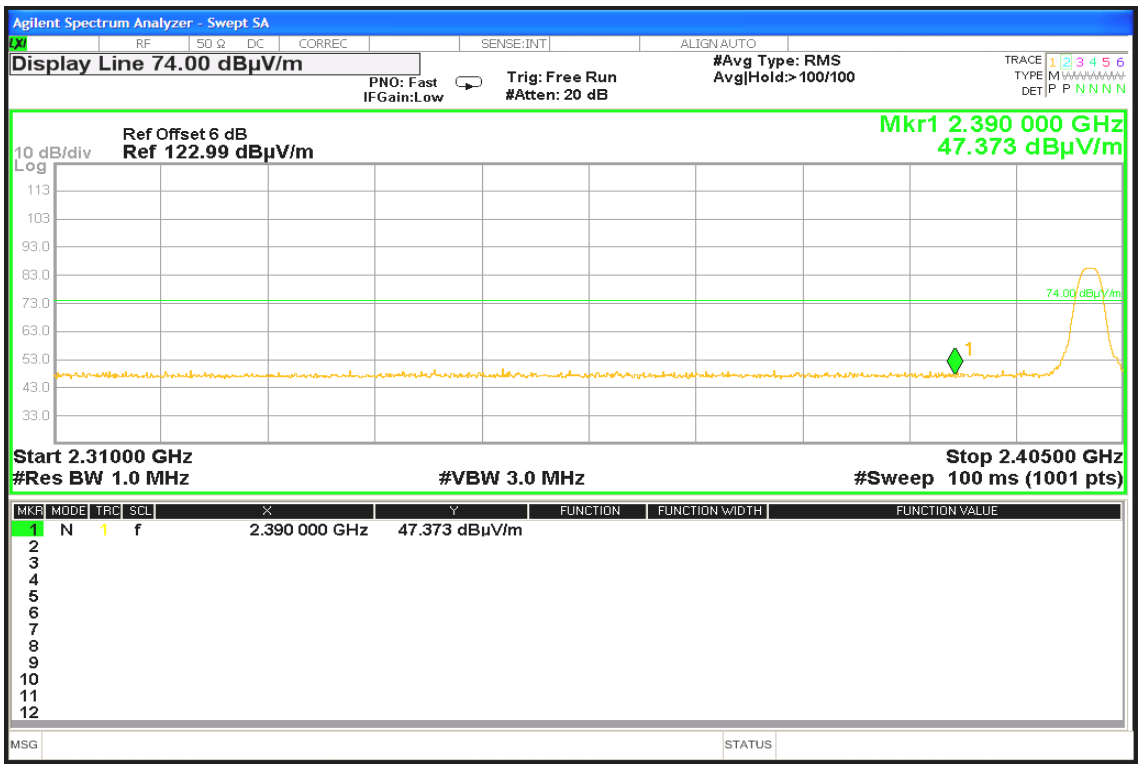
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

TEST RESULTS

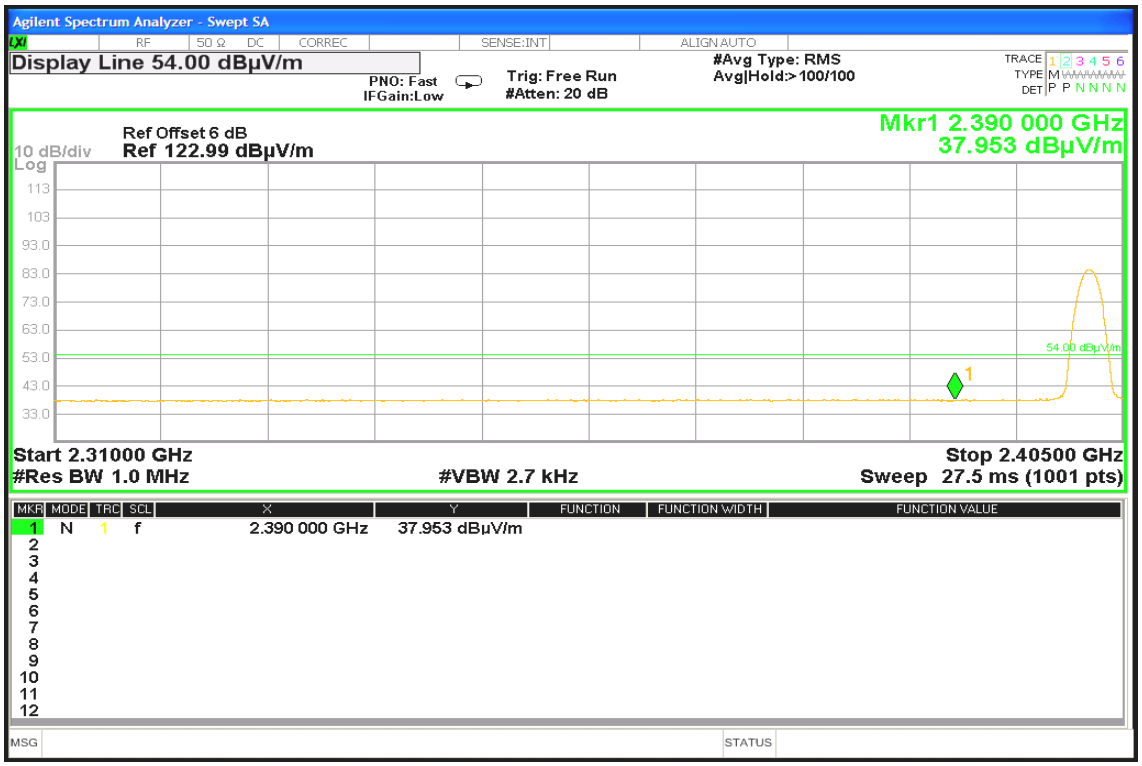
Refer to attach spectrum analyzer data chart.

CH Low

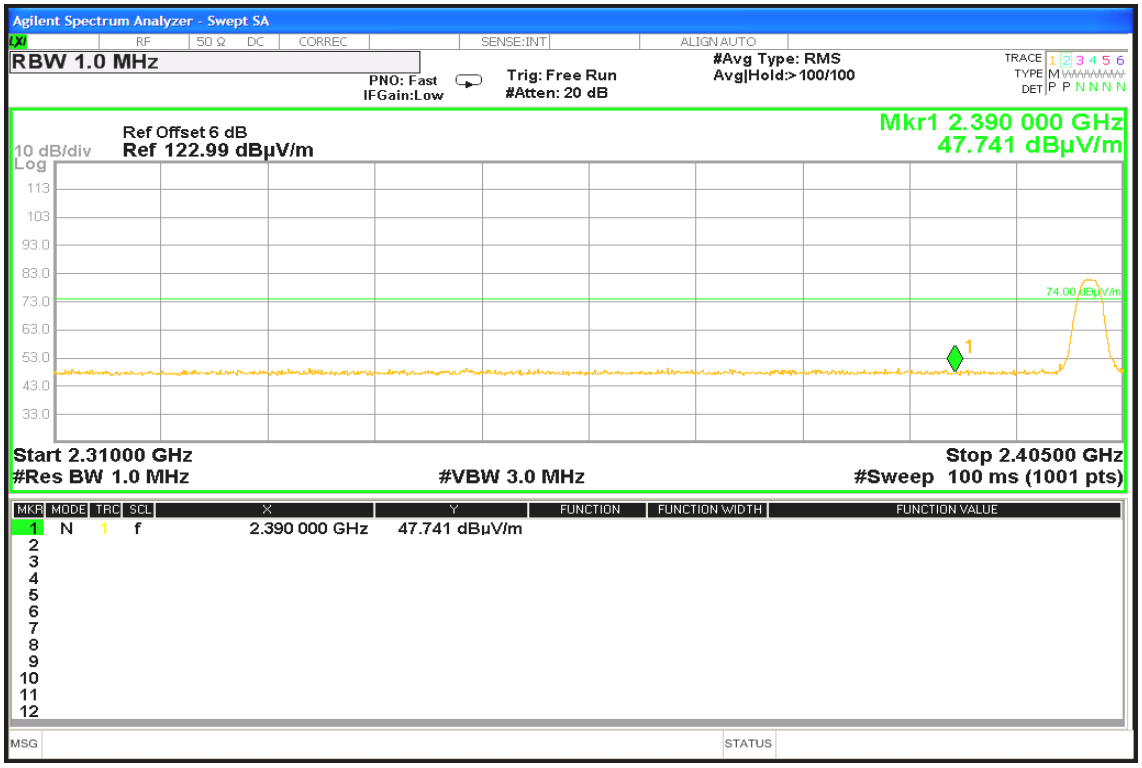
Detector mode: Peak Polarity: Vertical



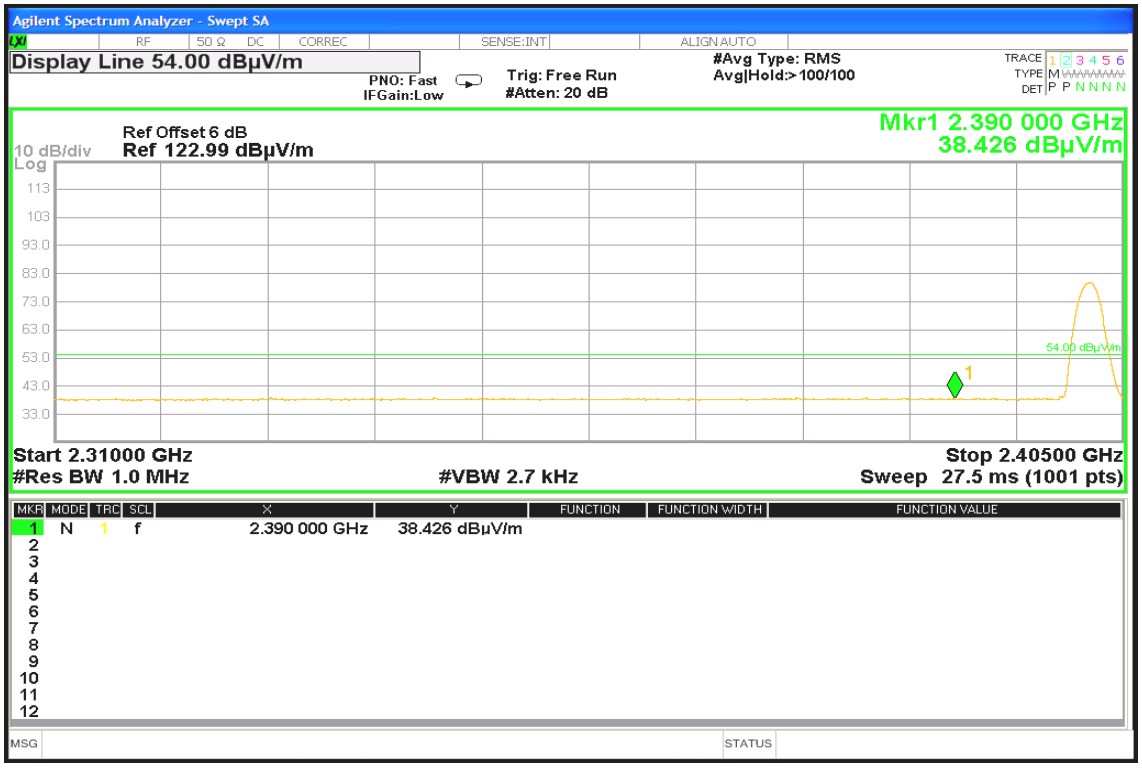
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

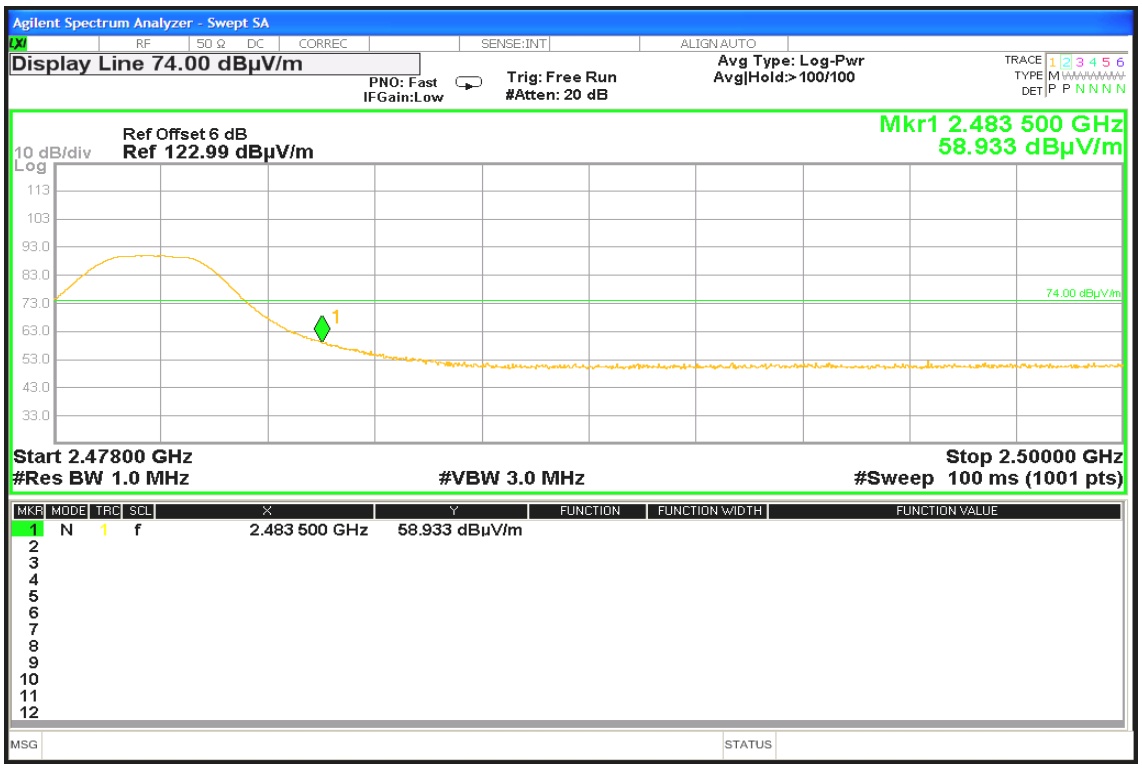


Detector mode: Average Polarity: Horizontal

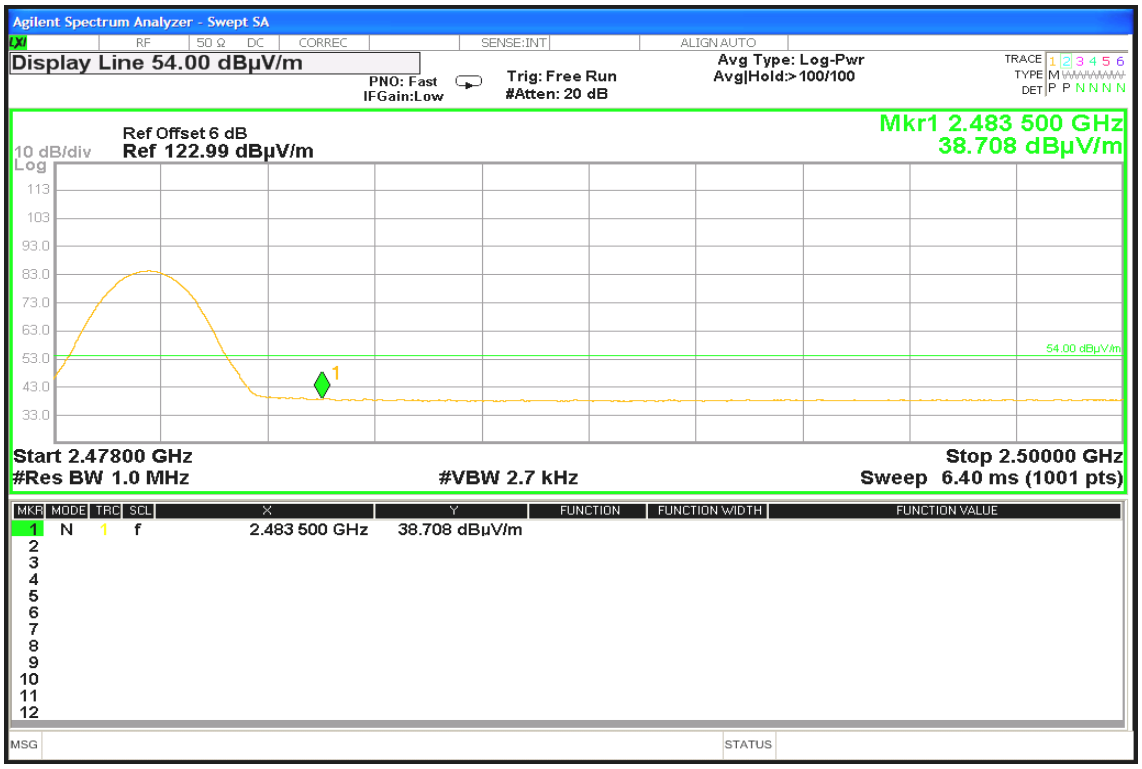


CH High

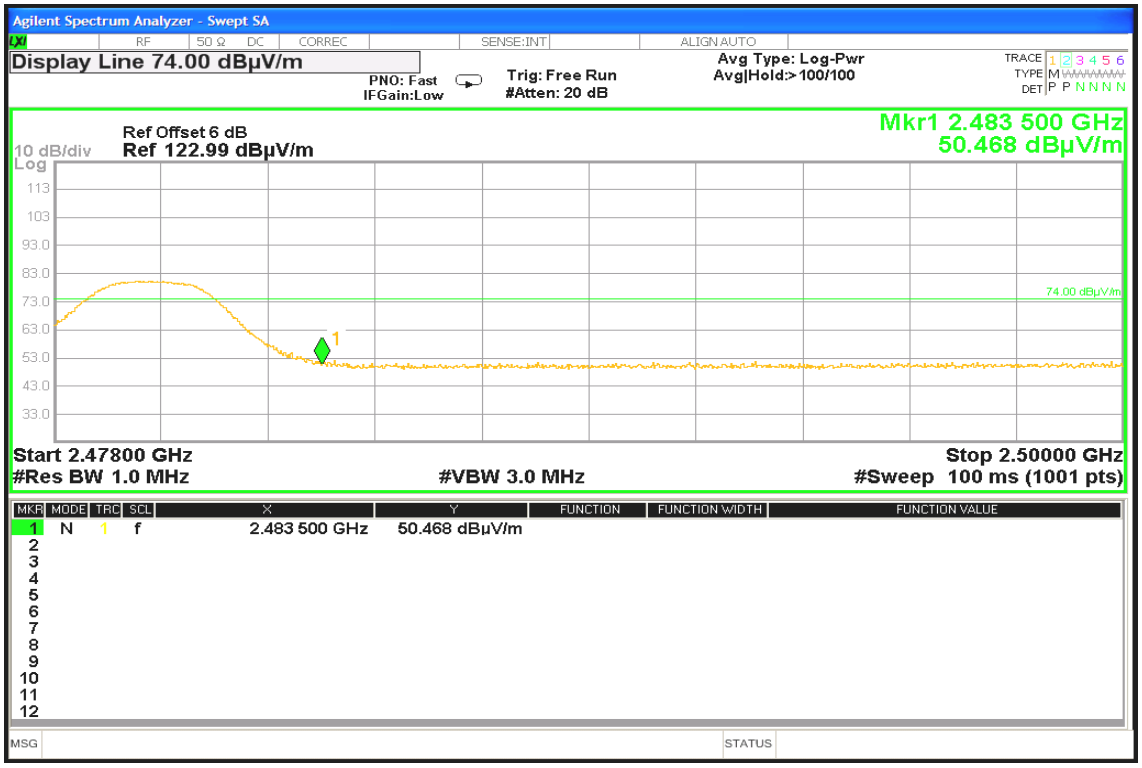
Detector mode: Peak Polarity: Vertical



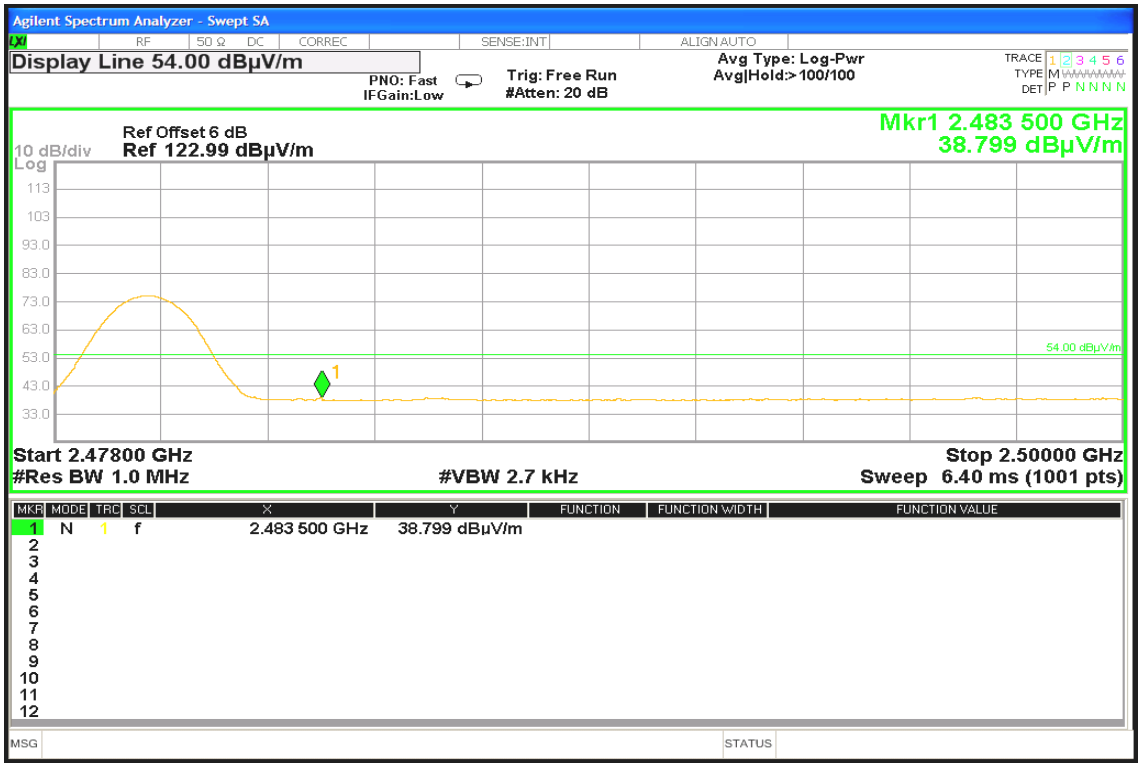
Detector mode: Average Polarity: Vertical



Detector mode: Peak Polarity: Horizontal

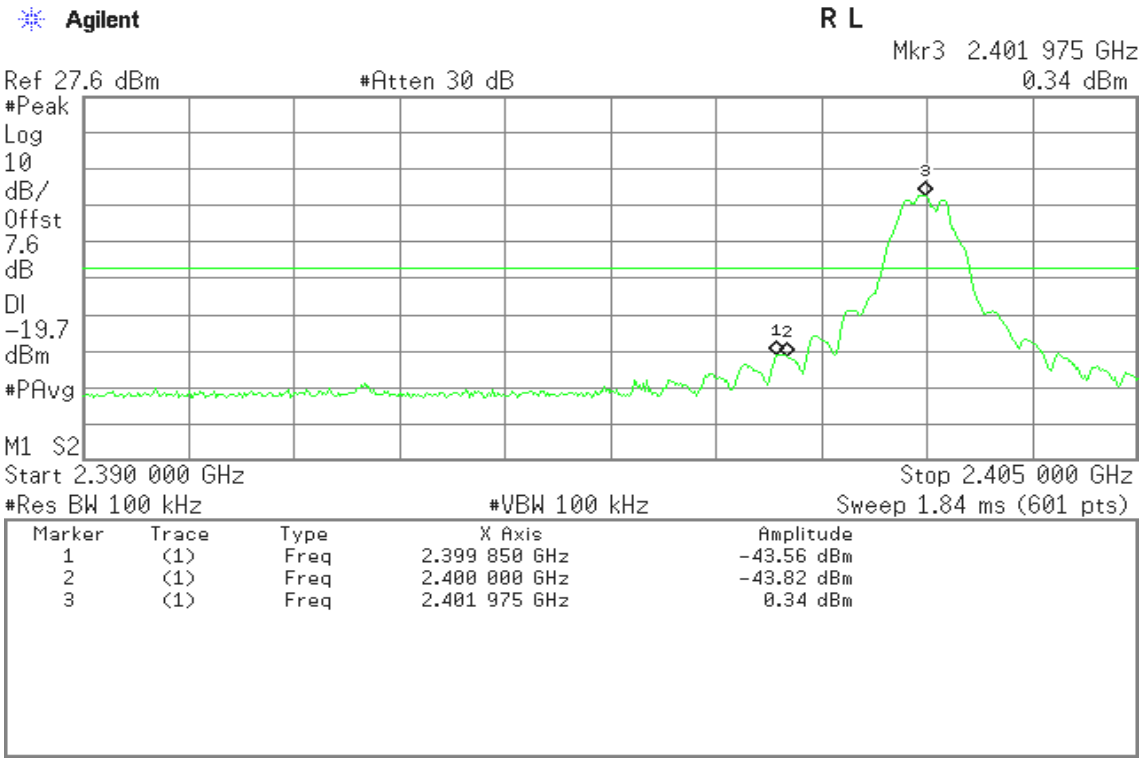


Detector mode: Average Polarity: Horizontal



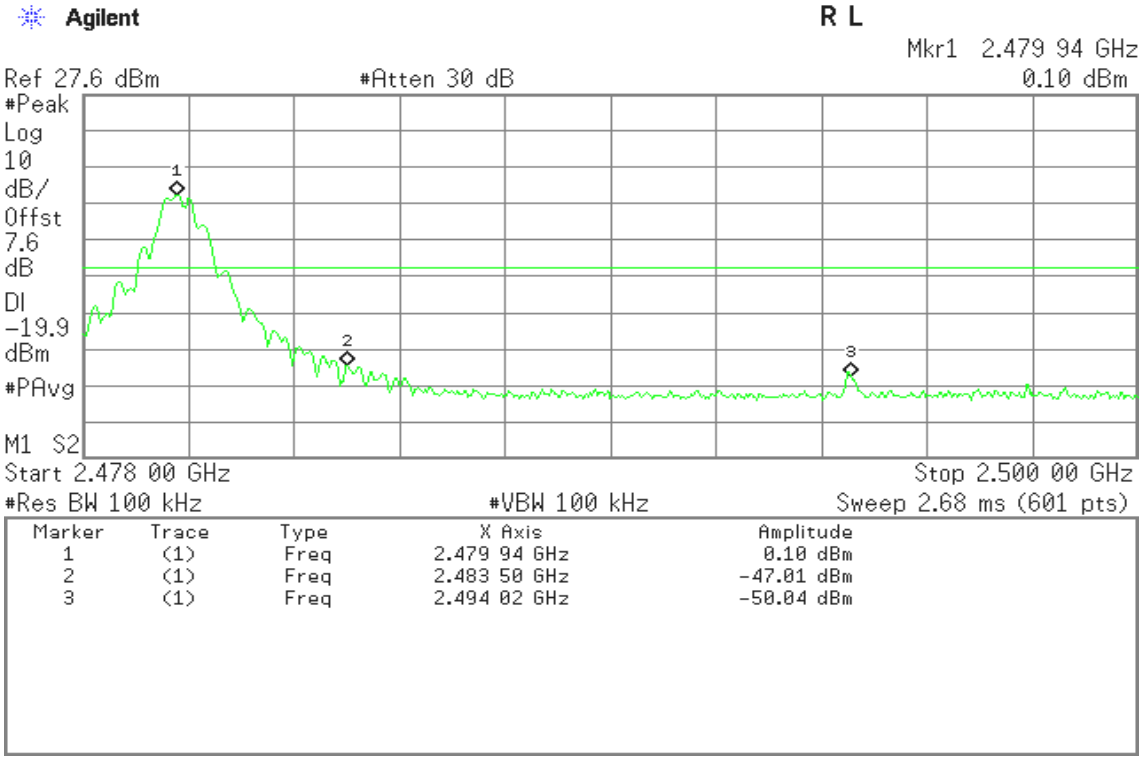
Conducted band-edge

CH Low



Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.399 850 GHz	-43.56 dBm
2	(1)	Freq	2.400 000 GHz	-43.82 dBm
3	(1)	Freq	2.401 975 GHz	0.34 dBm

CH High



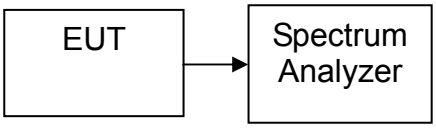
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.479 94 GHz	0.10 dBm
2	(1)	Freq	2.483 50 GHz	-47.01 dBm
3	(1)	Freq	2.494 02 GHz	-50.04 dBm

7.5. PEAK POWER SPECTRAL DENSITY

LIMIT

1. According to §15.247(e), for digitally modulated systems, the 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.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

TEST CONFIGURATION



TEST PROCEDURE

Per KDB 558074 v03r02

This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.

Use the peak marker function to determine the maximum amplitude level.
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

TEST RESULTS

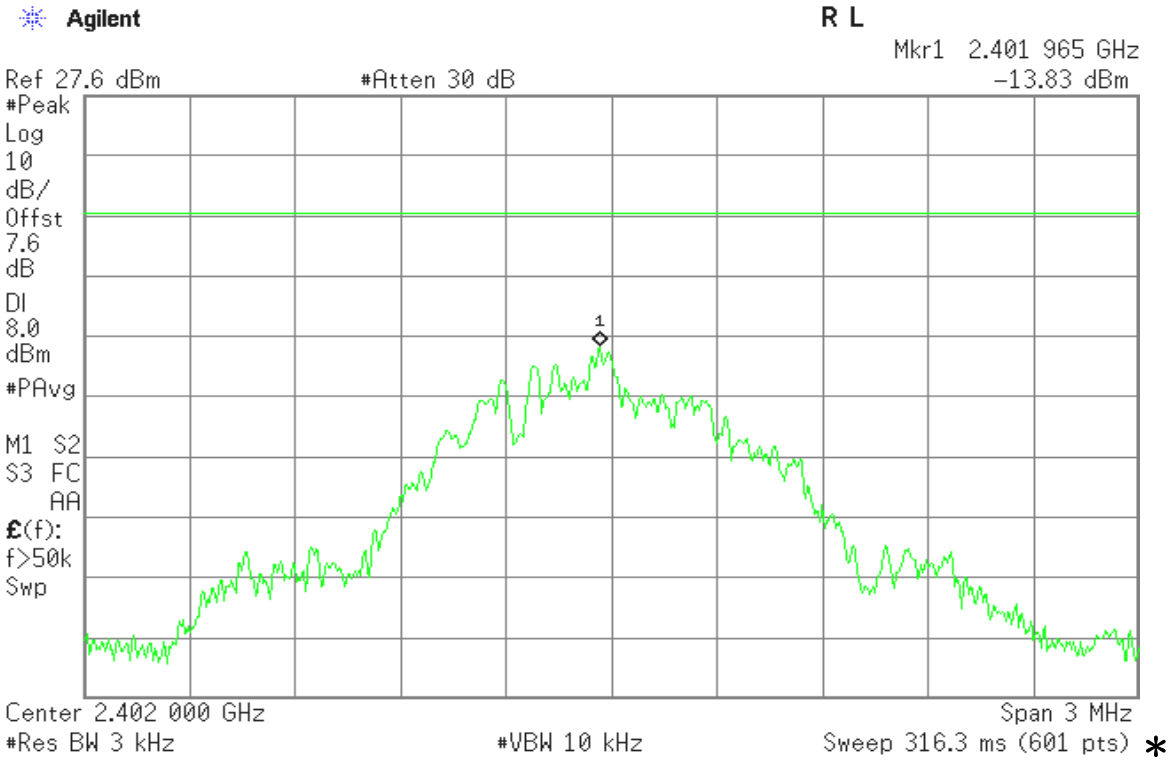
No non-compliance noted

TEST DATA

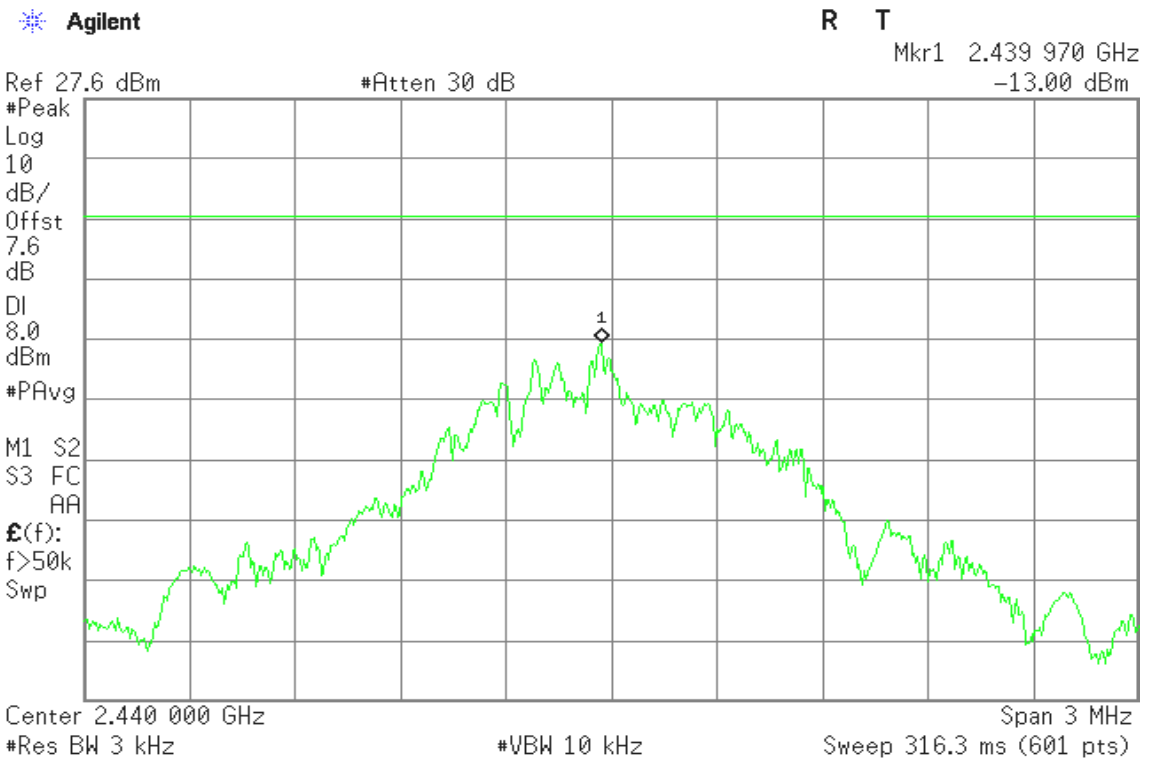
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2402	-13.83	8.00	PASS
Mid	2440	-13.00		PASS
High	2480	-13.37		PASS

Test Plot

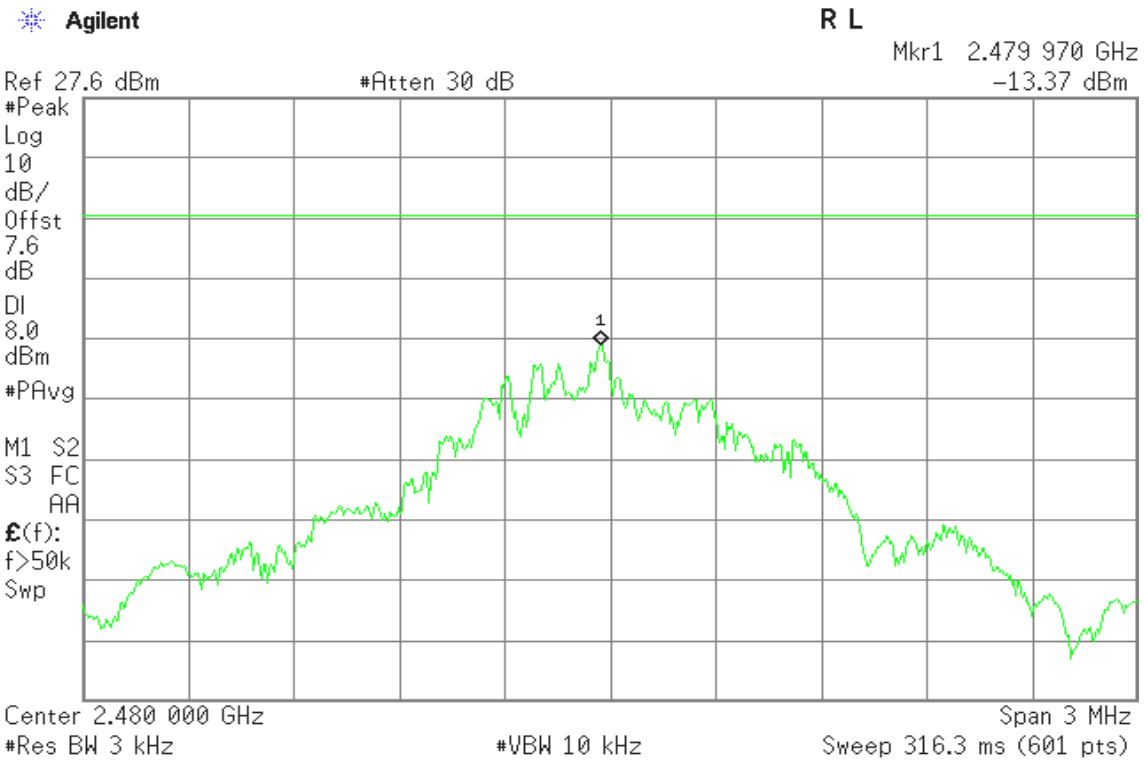
CH Low



CH Mid



CH High



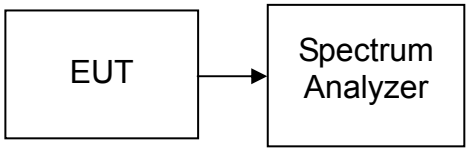
7.6. SPURIOUS EMISSIONS

7.6.1. Conducted Measurement

LIMIT

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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. Set the spectrum analyzer in the following setting as:

RBW=100kHz / VBW=100kHz

Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.

TEST RESULTS

No non-compliance noted

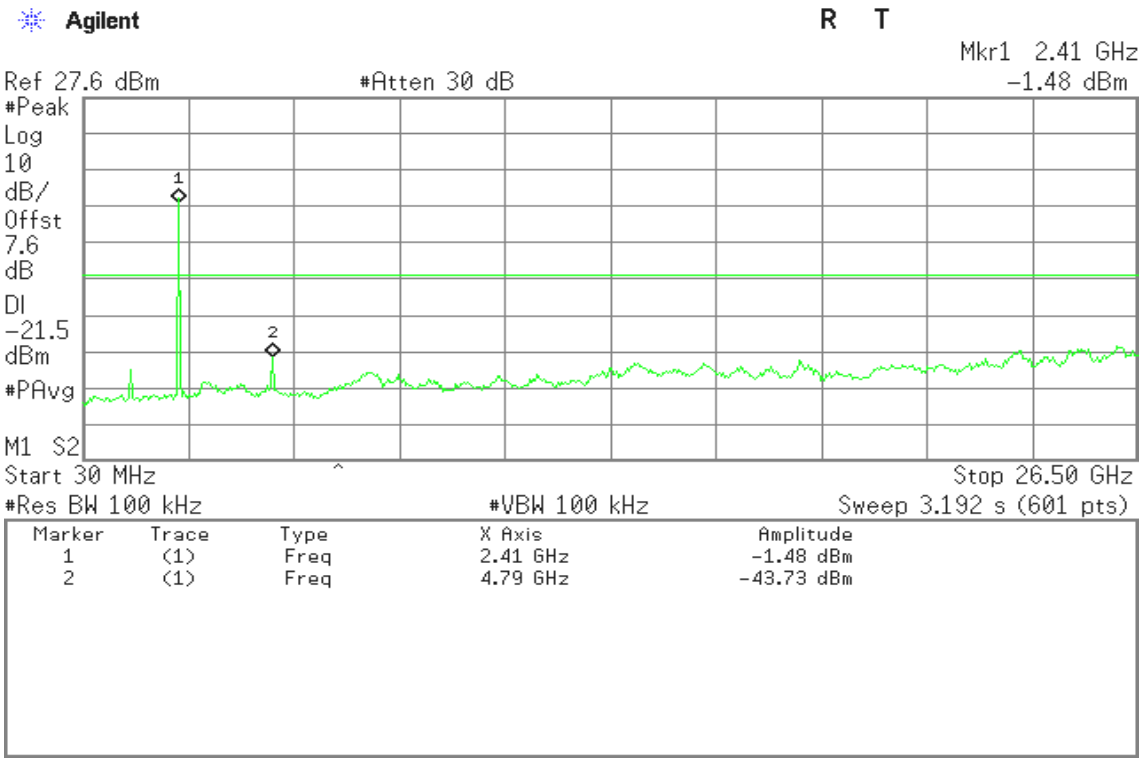
TEST DATA

Refer to attach spectrum analyzer data chart.

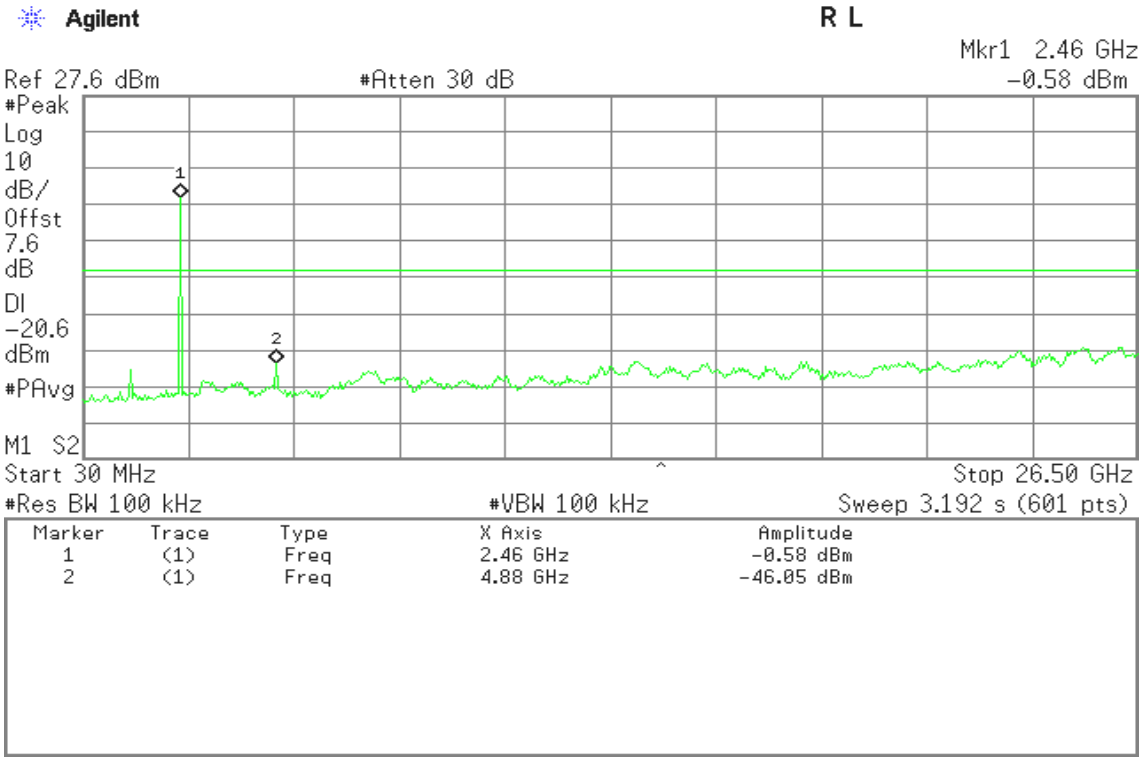
Test Plot

Spurious Emissions

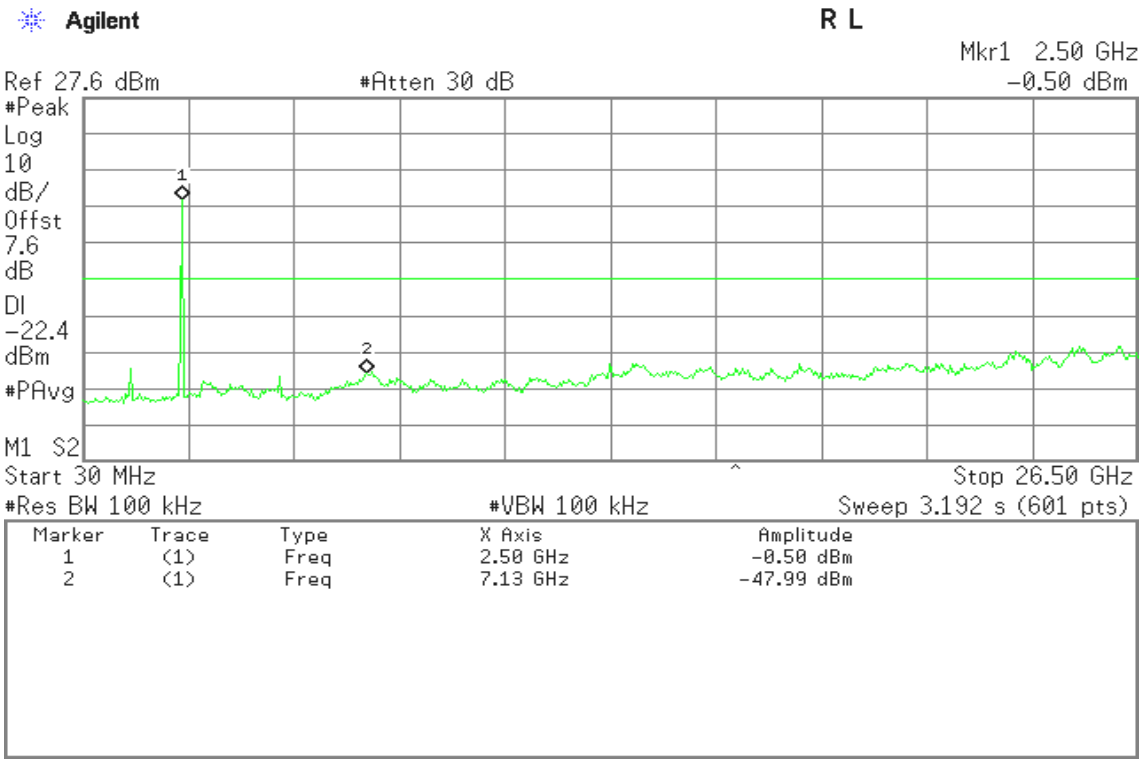
CH Low



CH Mid



CH High



7.6.2. RADIATED EMISSIONS

LIMIT

1. According to §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 (µV/m)	Measurement Distance (m)
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

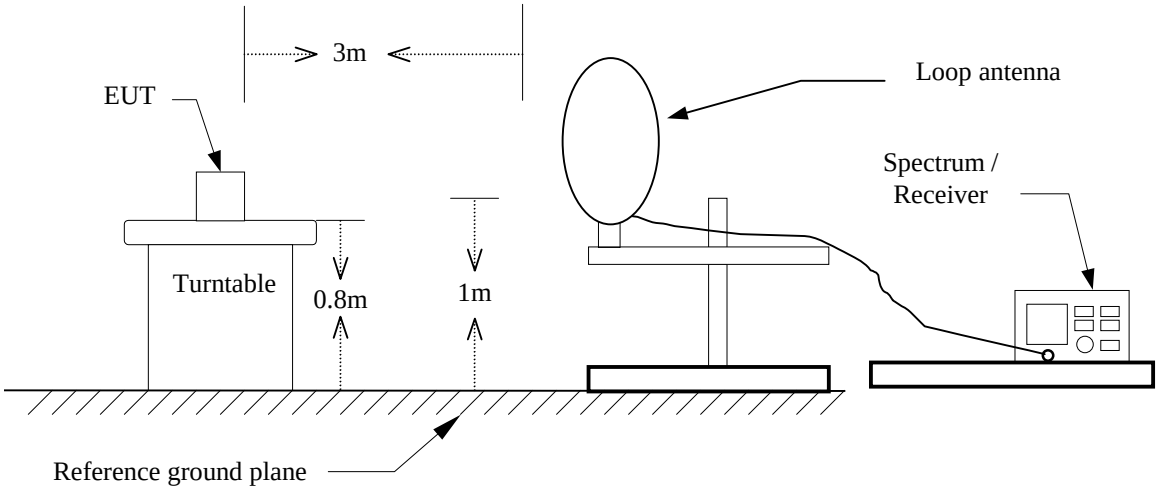
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

2. In the above emission table, the tighter limit applies at the band edges.

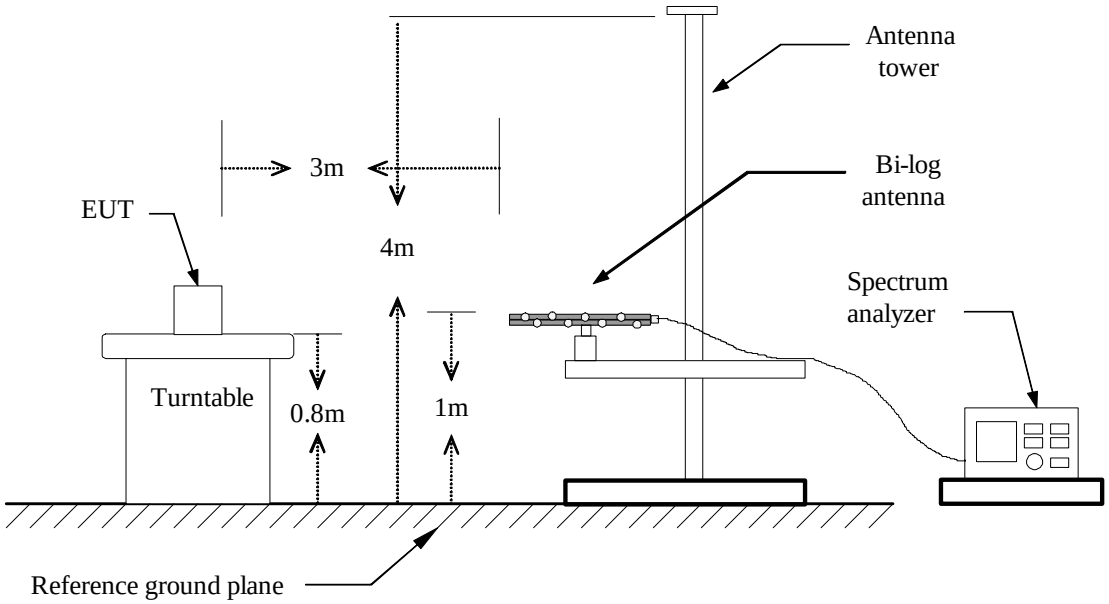
Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
0.009 - 0.490	2400/F(kHz) +80	20LOG((2400/F(kHz))+80)
0.490 - 1.705	24000/F(kHz) +40	20LOG((24000/F(kHz))+40)
1.705 – 30.0	30	69.54
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

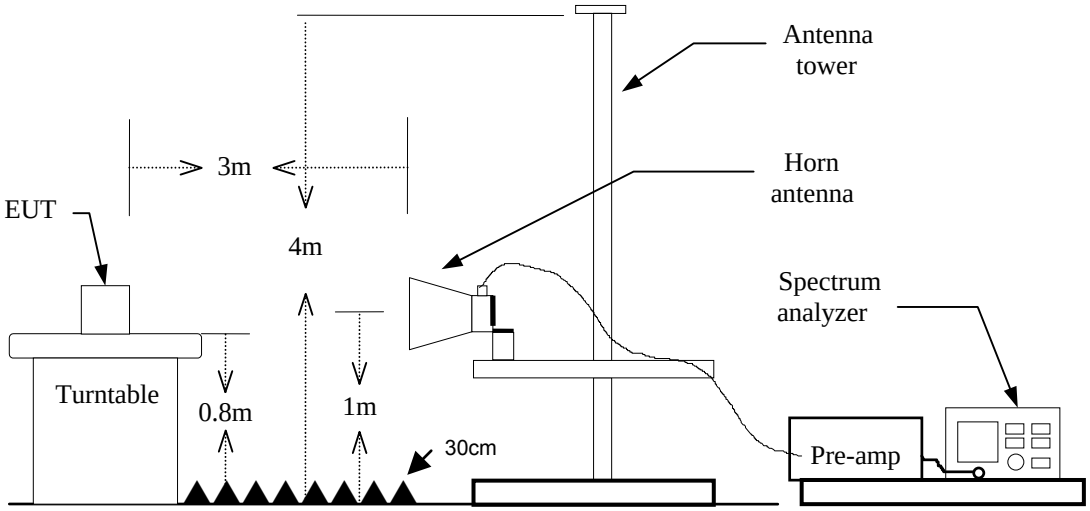
9kHz ~ 30MHz



30MHz ~ 1GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 30MHz

   RBW=10kHz / VBW=30kHz / Sweep=AUTO

   30 ~ 1000MHz:

   RBW=100kHz / VBW=300KHz / Sweep=AUTO

   Above 1GHz:

   a) PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

   b) AVERAGE: RBW=1MHz / VBW=2.7kHz / Sweep=AUTO

7. Repeat above procedures until the measurements for all frequencies are complete.

DATA SAMPLE

Below 1 GHz

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol. (H/V)	Remark
x.xx	43.20	-20.71	22.49	40.00	-17.51	V	QP

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor – Amplifier gain + Cable loss
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)
Q.P. = Quasi-Peak

Above 1 GHz

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
x.xx	45.25	6.91	52.16	74.00	-21.84	H	peak
x.xx	32.33	6.91	39.24	54.00	-14.76	H	AVG

Frequency (MHz) = Emission frequency in MHz
Reading (dBuV) = Uncorrected Analyzer / Receiver reading
Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
Result (dBuV/m) = Reading (dBuV) + Corr. Factor (dB/m)
Limit (dBuV/m) = Limit stated in standard
Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)

TEST RESULTS

No non-compliance noted.

TEST DATA

Below 1 GHz

Operation Mode:	Normal Link	**Test Date:**	2014/9/11
Temperature:	26℃	**Tested by:**	Francis Lee
Humidity:	56 % RH	**Polarity:**	Ver. / Hor.

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol. (H/V)	Remark
31.9400	27.61	-9.94	17.67	40.00	-22.33	V	QP
51.3400	28.64	-19.62	9.02	40.00	-30.98	V	QP
117.2998	26.19	-15.35	10.84	43.50	-32.66	V	QP
149.3100	28.16	-16.15	12.01	43.50	-31.49	V	QP
564.4699	25.76	-8.19	17.57	46.00	-28.43	V	QP
939.8600	22.68	-3.40	19.28	46.00	-26.72	V	QP
34.8500	24.62	-11.63	12.99	40.00	-27.01	H	QP
119.2400	26.81	-15.22	11.59	43.50	-31.91	H	QP
358.8299	23.17	-11.00	12.17	46.00	-33.83	H	QP
524.7000	25.16	-8.78	16.38	46.00	-29.62	H	QP
829.2800	24.68	-4.98	19.70	46.00	-26.30	H	QP
953.4400	24.39	-3.23	21.16	46.00	-24.84	H	QP

Remark:

1. *No emission found between lowest internal used / generated frequency to 30 MHz. (9kHz ~ 30MHz)*
2. *Measuring frequencies from 30 MHz to the 1GHz.*
3. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

Above 1 GHz

Operation Mode:	TX / CH Low	**Test Date:**	2014/9/1
Temperature:	26℃	**Tested by:**	Francis Lee
Humidity:	56% RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1256.000	55.26	-8.54	46.72	74.00	-27.28	V	peak
2002.000	51.80	-1.35	50.45	74.00	-23.55	V	peak
2884.000	50.65	-0.89	49.76	74.00	-24.24	V	peak
3755.000	41.63	3.14	44.77	74.00	-29.23	V	peak
5375.000	41.31	6.10	47.41	74.00	-26.59	V	peak
6655.000	41.41	7.26	48.67	74.00	-25.33	V	peak
1402.000	53.31	-6.94	46.37	74.00	-27.63	H	peak
2118.000	51.57	-3.74	47.83	74.00	-26.17	H	peak
2830.000	50.49	-2.25	48.24	74.00	-25.76	H	peak
3825.000	42.24	5.13	47.37	74.00	-26.63	H	peak
4805.000	43.66	5.54	49.20	74.00	-24.80	H	peak
6060.000	42.01	8.74	50.75	74.00	-23.25	H	peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / CH Mid	**Test Date:**	2014/9/1
Temperature:	26℃	**Tested by:**	Francis Lee
Humidity:	56% RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1318.000	54.40	-8.26	46.14	74.00	-27.86	V	peak
2020.000	52.24	-1.75	50.49	74.00	-23.51	V	peak
2222.000	52.04	-1.38	50.66	74.00	-23.34	V	peak
2962.000	51.08	-1.05	50.03	74.00	-23.97	V	peak
3800.000	41.12	3.69	44.81	74.00	-29.19	V	peak
5545.000	40.55	6.09	46.64	74.00	-27.36	V	peak
6735.000	40.95	7.45	48.40	74.00	-25.60	V	peak
1396.000	52.27	-7.00	45.27	74.00	-28.73	H	peak
2114.000	52.08	-3.75	48.33	74.00	-25.67	H	peak
2884.000	51.33	-1.85	49.48	74.00	-24.52	H	peak
3850.000	41.85	5.16	47.01	74.00	-26.99	H	peak
4880.000	41.93	6.81	48.74	74.00	-25.26	H	peak
6040.000	43.36	8.77	52.13	74.00	-21.87	H	peak
6040.000	29.44	8.77	38.21	54.00	-15.79	H	AVG

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

Operation Mode:	TX / CH High	**Test Date:**	2014/9/1
Temperature:	26℃	**Tested by:**	Francis Lee
Humidity:	56% RH	**Polarity:**	Ver. / Hor.

Freq. (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Ant. Pol H/V	Remark
1514.000	52.98	-5.19	47.79	74.00	-26.21	V	peak
2020.000	52.41	-1.75	50.66	74.00	-23.34	V	peak
2398.000	53.49	-1.67	51.82	74.00	-22.18	V	peak
2920.000	50.61	-0.79	49.82	74.00	-24.18	V	peak
3770.000	42.12	3.32	45.44	74.00	-28.56	V	peak
5410.000	40.95	6.37	47.32	74.00	-26.68	V	peak
6695.000	40.42	7.54	47.96	74.00	-26.04	V	peak
1394.000	52.94	-7.05	45.89	74.00	-28.11	H	peak
2140.000	51.13	-3.69	47.44	74.00	-26.56	H	peak
2816.000	50.99	-2.36	48.63	74.00	-25.37	H	peak
4315.000	41.90	7.55	49.45	74.00	-24.55	H	peak
4960.000	43.57	7.41	50.98	74.00	-23.02	H	peak
5900.000	41.22	9.22	50.44	74.00	-23.56	H	peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.*
3. *Average test would be performed if the peak result were greater than the average limit or as required by the applicant.*
4. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
5. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
6. *Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).*

7.7. POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

TEST RESULTS

Not applicable, because the EUT is not connected to AC Main Source directly