FCC Radio Test Report

For

Product Name: Smart Radio Transmitter
Brand Name: YUNEEC
Model No.: ST24******
(The "*" can be 0 to 9, a to z, A to Z, blank or any symbol, for marketing purpose.)**
Series Model: N/A
FCC ID: 2ACS5-ST24
**Test Report Number:
C150227R01-RPW**

Issued for

Yuneec Technology Co., Limited
2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun Tong

Issued by

Compliance Certification Services Inc.
Kun shan Laboratory
**No.10 Weiye Rd., Innovation park, Eco&Tec,
Development Zone, Kunshan City, Jiangsu, China**
TEL: 86-512-57355888
FAX: 86-512-57370818

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	April 20, 2015	C150407R01-RPW	ALL	N/A

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

Product Name:	Smart Radio Transmitter
Trade Name:	YUNEEC
Model Name.:	ST24******** (The "*" can be 0 to 9, a to z, A to Z, blank or any symbol, for marketing purpose.)
Series Model:	N/A
Applicant Discrepancy:	Initial
Device Category:	Mobile unit
Date of Test:	April 10, 2015 - April 15, 2015
Applicant:	**Yuneec Technology Co., Limited** 2/F Man Shung Industrial Building, 7 Lai Yip Street, Kwun Tong
Manufacturer:	**Good Power Technology Co., Ltd.** No.388 East Zhengwei Road, Jinxi Town, Kunshan, Jiangsu 215324, China
Application Type:	Certification

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

We hereby certify that:

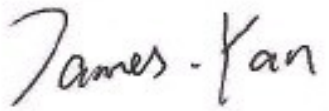
The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample EUT tested as described 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:

Jeff.Fang
RF Manager
Compliance Certification Service Inc.

Tested by:



James.Yan
Test Engineer
Compliance Certification Service Inc.

2. EUT DESCRIPTION

Product Name:	Smart Radio Transmitter
Brand Name:	YUNEEC
Model Name:	ST24******** (The "*" can be 0 to 9, a to z, A to Z, blank or any symbol, for marketing purpose.)
Series Model:	N/A
Model Discrepancy:	N/A
Hardware Version	N/A
Software Version	N/A
Power Adapter Power Rating :	Power supply and ADP(rating): Model No: CYSK05-050100 Brand Name: N/A Input: AC100-240V，50/60Hz，0.15A Output: DC5V 1000mA Battery(rating): Model No.: YP-2 Brand Name: YUNEEC Capacitance: 8700mAh Rated Voltage: 3.6v
Frequency Range:	2405 ~ 2480MHz
Transmit Power:	Channel 2440: 17.65 dBm
Modulation Technique:	DSSS（O-QPSK）
Number of Channels:	16 Channels
Antenna Specification:	Dipole Antenna for 2.4GHz Gain 0 dBi

Remark:

1.The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2.This submittal(s) (test report) is intended for ***FCC ID: 2ACS5-ST24*** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 2009and 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 2009.

3.4.FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

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	2655 - 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	([2])
13.36 - 13.41			

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

[2] Above 38.6

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

Software used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Both chain1 and chain2 could be used as transmit/receiving antenna, but only one of them could transmit/receive at the same time. After the preliminary san chains and the worst mode chain1 was recorded.

The worst-case data are determined to be as follows for each mode based on investigation by measuring the average power, peak power and PPSD across all channel, bandwidths, and modulations.

3.6.ANTENNA DESCRIPTION

According to FCC 47 CFR 15.203

“an intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached or an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section”

* the antenna of this EUT is a unique(Dipole Antenna for zigbee).
* the EUT complies with the requirement of 15.203.

4. INSTRUMENT CALIBRATION

4.1.MEASURING 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.

Equipment Used for Emissions Measurement

Conducted Emissions Test Site				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY44020154	2016-4-7
DETECTOR NEGATIVE	Agilent	8473B	MY42240176	2015-5-11
OSCILLOSCOPE	Agilent	DSO6104A	MY44002585	2016-3-15
MIMO Power Measurement Test Set	Aglient	U2021XA	MY53120005	2015-7-3
Power SPLITTER	Mini-Circuits	ZN2PD-9G	SF078500430	N.C.R
DC Power Supply	AGILENT	E3632A	MY50340053	N.C.R
Temp. / Humidity Chamber	TERCHY	MHK-120AK	X30109	2016-1-21
Test Software	EZ-EMC			

977 Chamber				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	E4446A	MY44020154	2016-4-7
EMI Test Receiver	R&S	ESCI	101378	2016-1-11
Pre-Amplfier	MINI	ZFL-1000VH2	d041703	2016-1-11
Pre-Amplfier	Miteq	JS41-00101800-32-10P	1675713	2016-1-11
Bilog Antenna	Sunol	JB1	A062604	2016-3-5
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	2016-3-6
Turn Table	CT	CT123	4165	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R
Controller	CT	CT1OO	95637	N.C.R
Test Software	EZ-EMC			

Conducted Emission				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
EMI TEST RECEIVER	R&S	ESCI	100781	2016-3-15
V (V-LISN)	SCHWARZBECK	NNLK 8129	8129-143	N.C.R
LISN (EUT)	FCC	FCC-LISN-50/250-50-2-02	05012	2016-3-15
Pulse LIMITER	R&S	ESH3-Z2	100524	2015-9-24
Test Software	EZ-EMC			

Remark: *The measurement uncertainty is less than +/- 2.81dB, which is evaluated as per the NAMAS NIS 81 and CISPR/A/291/CDV.*

Expanded Uncertainty (95% CONFIDENCE INTERVAL): K=2

5. FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at
CCS China Kunshan Lab at 10#Weiye Rd, Innovation Park Eco. & Tec. Development Zone

Kunshan city JiangSu, (215300), CHINA.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 2009 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. LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by American Association for Laboratory Accreditation Program for the specific scope accreditation under Lab Code: 200581-0 to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22 requirements. In addition, the test facilities are listed with Industry Canada, Certification and Engineering Bureau, IC5743 for 10m chamber 10m, IC5743 for 10m chamber 3m.

5.4.TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	A2LA	47 CFR FCC Part 15/18 (using ANSI C63.4 :2009); VCCI V3; CNS 13438; CNS 13439; CNS 13803; CISPR 11; EN 55011; CISPR 13; EN 55013; CISPR 22:2005; CISPR 22:1997 +A1 :2000+A2 :2002; EN 55022:2006; EN55022 :1998 +A1 :2001+A2 :2003; EN 61000-6-3 (excluding discontinuous interference); EN 61000-6-4; AS/NZS CISPR 22; CAN/CSA-CEI/IEC CISPR 22; EN 61000-3-2; EN 61000-3-3; EN550024; EN 61000-4-2; EN 61000-4-3; EN61000-4-4; EN 61000-4-5; EN 61000-4-6; IEC 61000-4-8; EN 61000-4-11; IEC61000-3-2; IEC61000-3-3; IEC 61000-4-2; IEC 61000-4-3; IEC 61000-4-4; IEC 61000-4-5; IEC 61000-4-6; IEC 61000-4-8; IEC 61000-4-11; EN 300 220-3; EN 300 328; EN 300 330-2; EN 300 440-1; EN 300-440-2; EN 300 893; EN 301 489-01; EN 301 489-3; EN 301 489-07; EN 301 489-17; 47 CFR FCC Part 15, 22, 24	ACCREDITED TESTING CERT #2541.01
USA	FCC	3/10 meter Sites to perform FCC Part 15/18 measurements	93105, 90471
Japan	VCCI	3/10 meter Sites and conducted test sites to perform radiated/conducted measurements	VCCI R-1600 C-1707 G-216

** No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.*

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

No.	Device Type	Brand	Model	Series No.	FCC DOC
1.	N/A				

Remark:

2. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
3. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

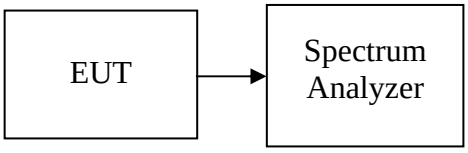
7. FCC PART 15.247 REQUIREMENTS

7.1. 6DB BANDWIDTH MEASUREMENT

LIMIT

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

Test Configuration



TEST PROCEDURE

1. The transmitter output is connected to the spectrum analyzer. Set RBW = 100 kHz. Set the video bandwidth (VBW) ≥ 3 × RBW, Sweep = auto couple.

.

TEST RESULTS

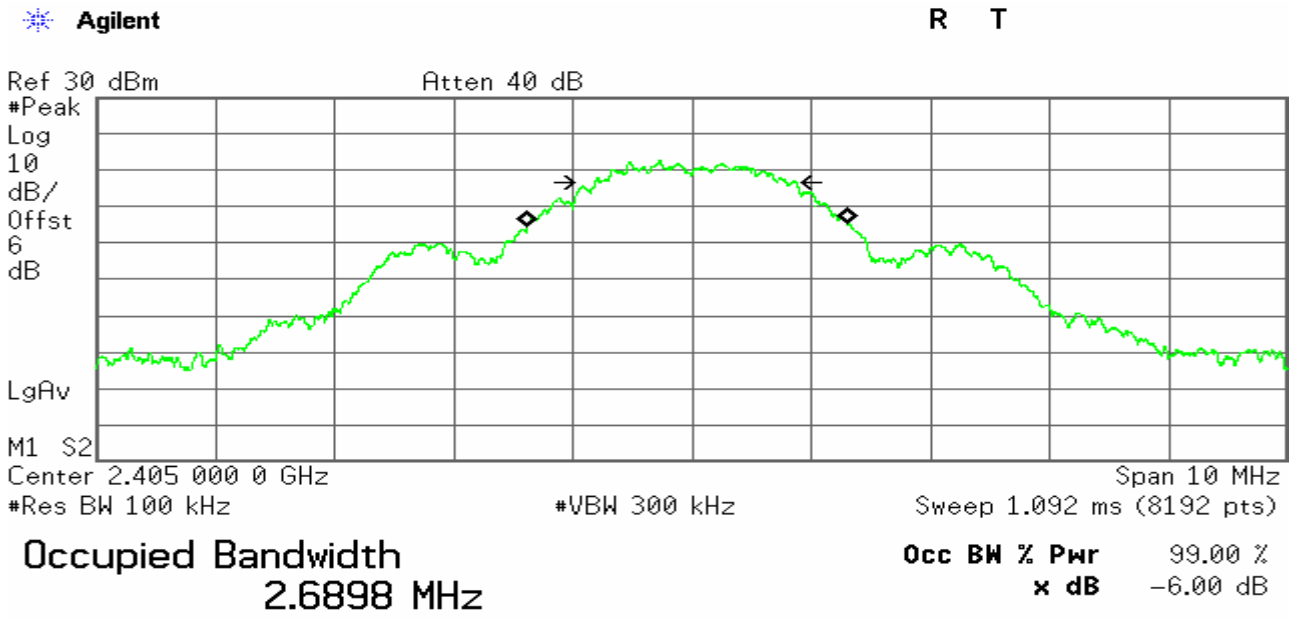
No non-compliance noted

Test Data

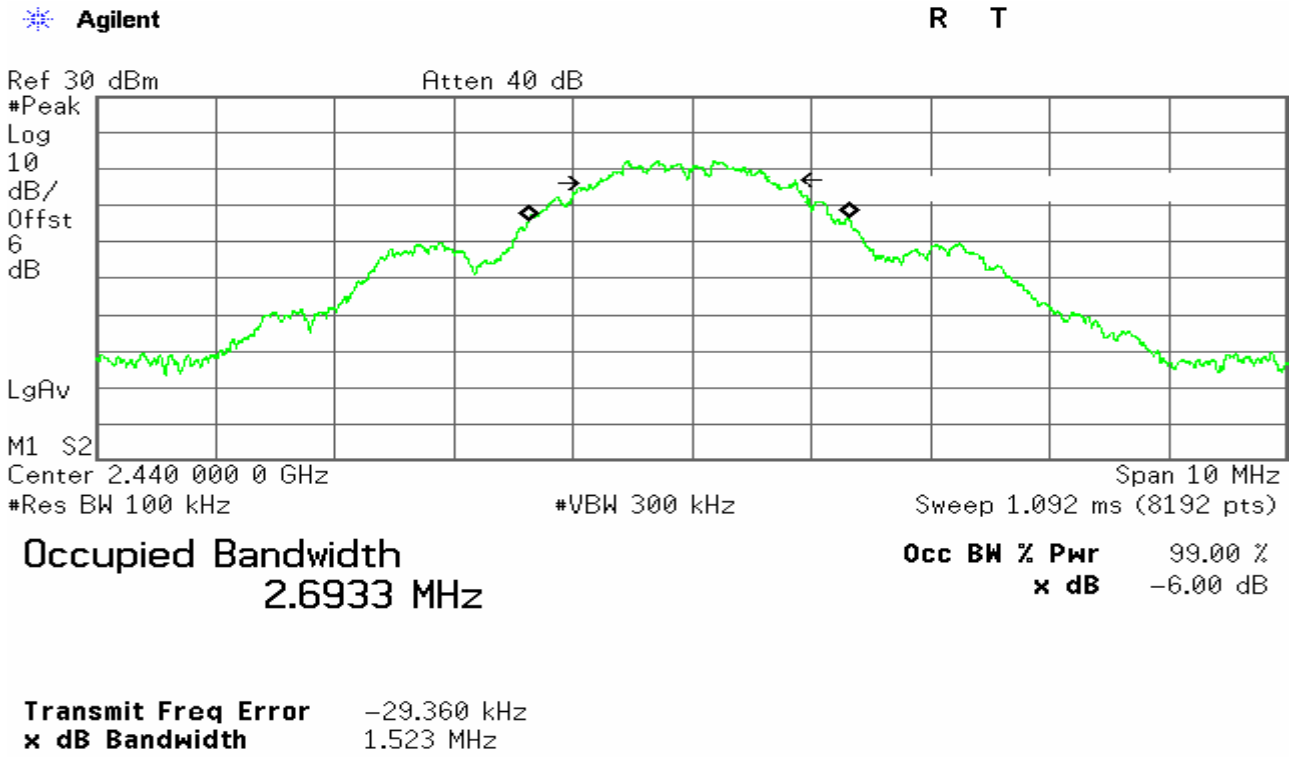
Channel	Frequency (MHz)	Bandwidth(B) (MHz)	6dB Bandwidth Min. Limit(MHz)
Low	2405	1.623	0.5
Mid	2440	1.523	0.5
High	2480	1.500	0.5

Test Plot

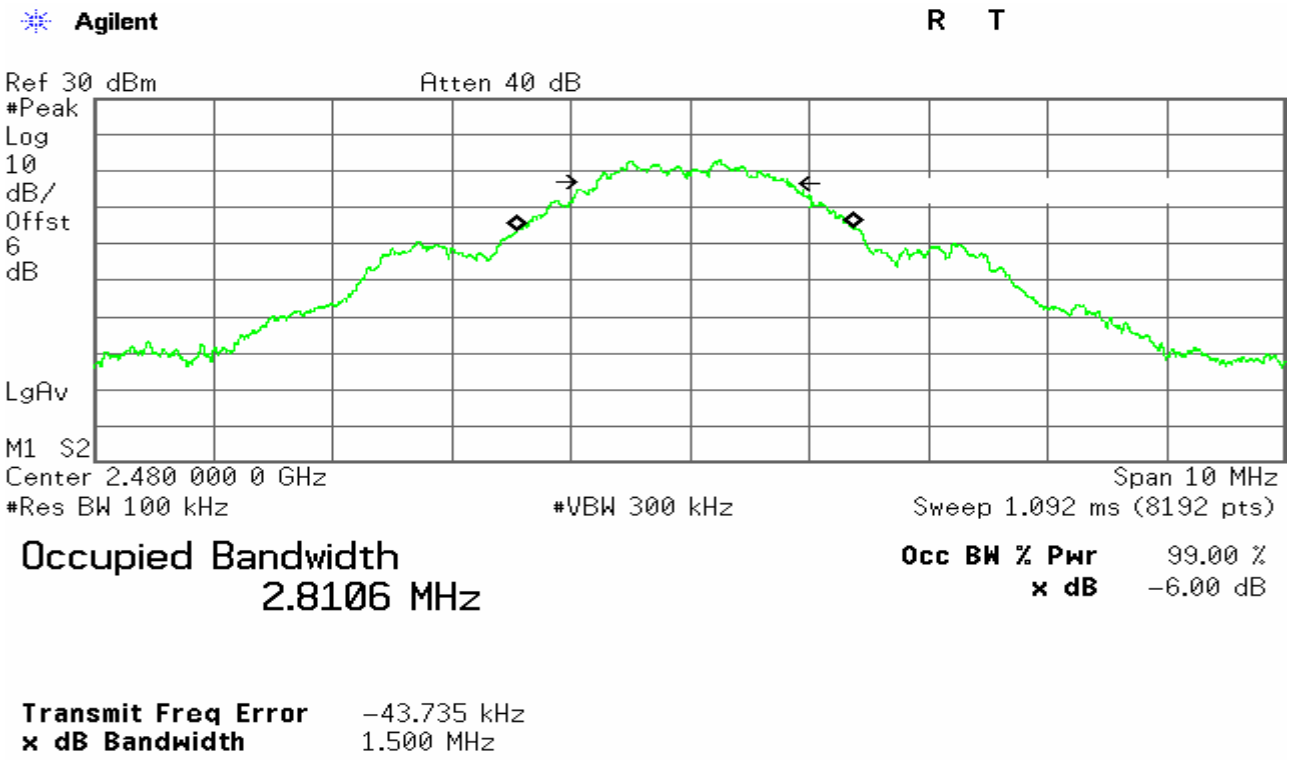
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)

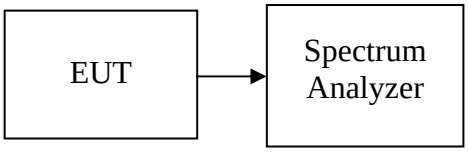


7.2.99% BANDWIDTH MEASUREMENT

LIMIT

None; for reporting purposes only
RSS-Gen 4.6.1

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to close to 1% of the selected span as is possible without being below 1%.The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

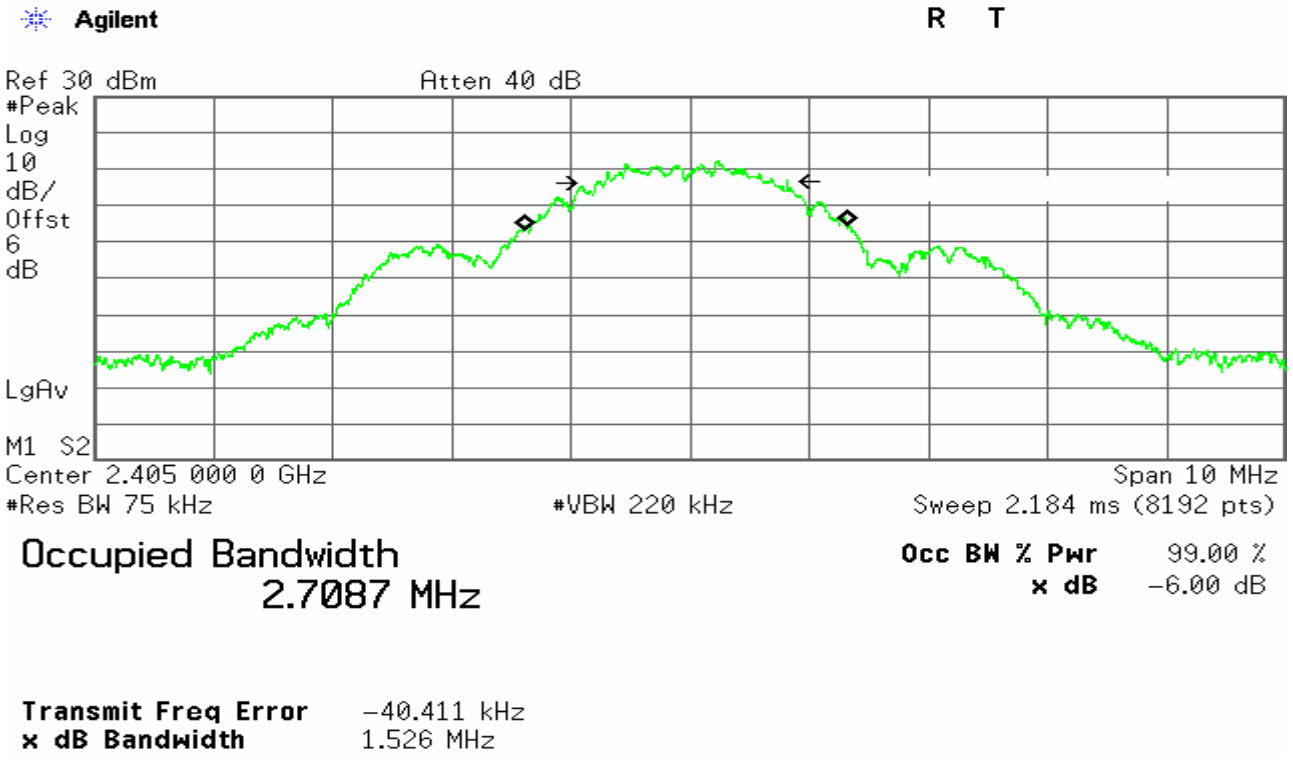
test results

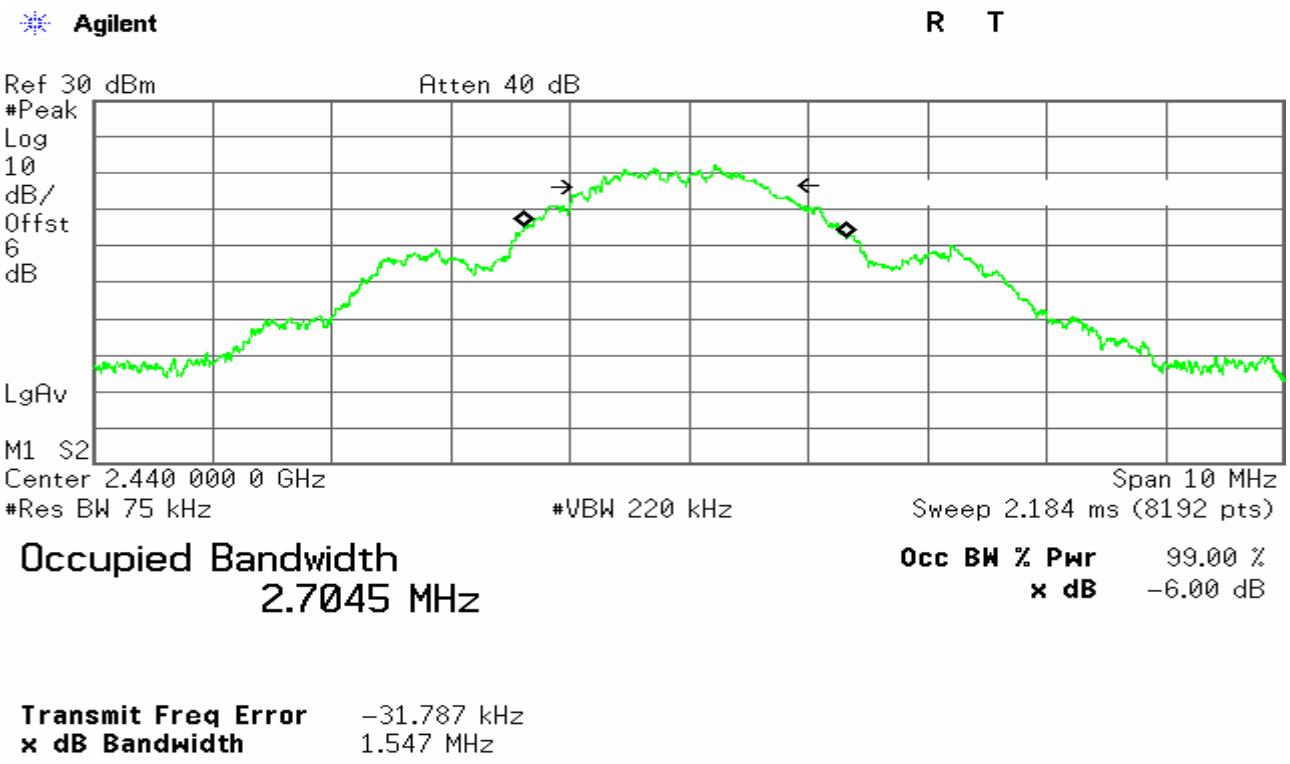
No non-compliance noted

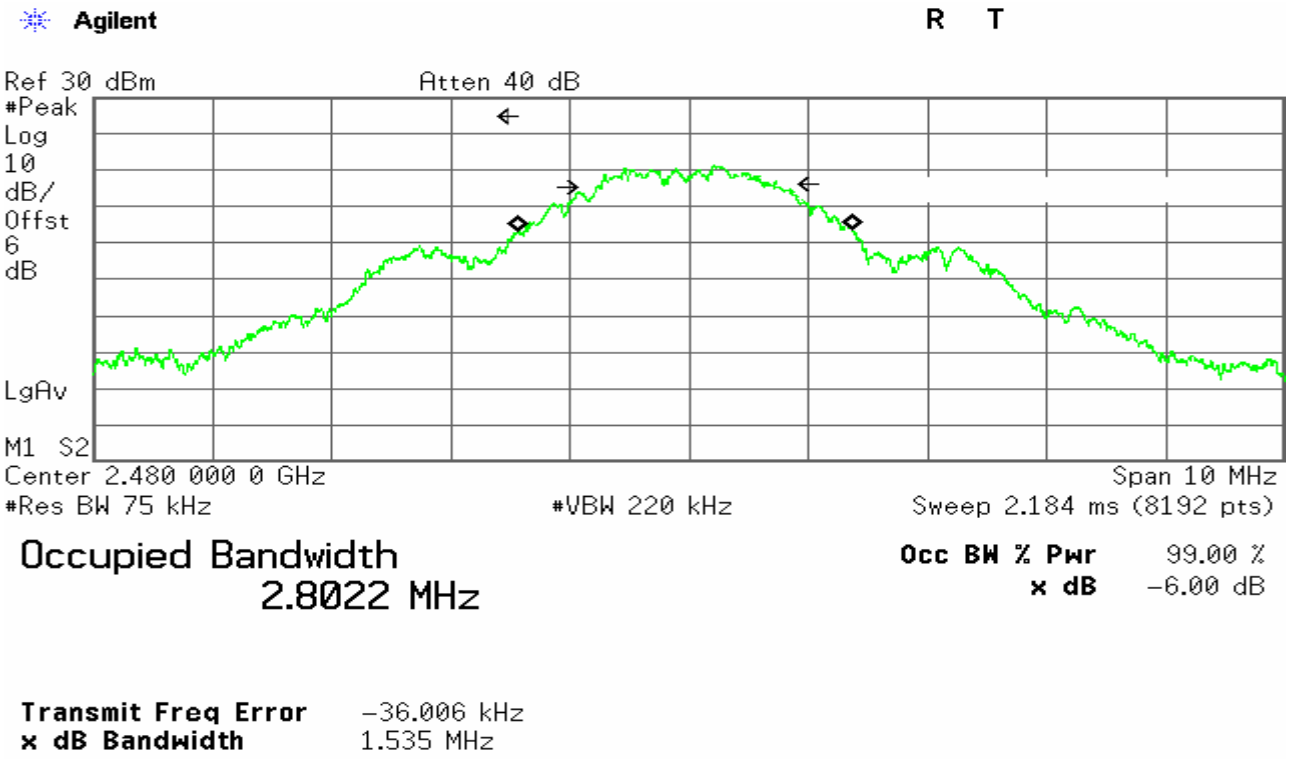
Test Data

Channel	Frequency (MHz)	Bandwidth(B) (MHz)	99% Bandwidth Min. Limit(MHz)
Low	2405	2.709	0.5
Mid	2440	2.705	0.5
High	2480	2.802	0.5

Test Plot




Agilent
R T
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
LgAv
M1 S2
Center 2.440 000 0 GHz
Span 10 MHz
#Res BW 75 kHz
#VBW 220 kHz
Sweep 2.184 ms (8192 pts)
Occupied Bandwidth
2.7045 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -31.787 kHz
x dB Bandwidth 1.547 MHz


Agilent
R T
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
LgAv
M1 S2
Center 2.480 000 0 GHz
Span 10 MHz
#Res BW 75 kHz
#VBW 220 kHz
Sweep 2.184 ms (8192 pts)
Occupied Bandwidth
2.8022 MHz
Occ BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error -36.006 kHz
x dB Bandwidth 1.535 MHz

7.3.PEAK POWER

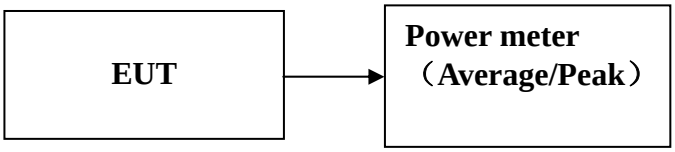
LIMIT

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, and 2400-2483.5 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

1. The EUT transmitter output is connected to the Power meter.
   The Power meter is set to the peak power detection.
2. The testing follows the Measurement Procedure FCC KDB No. 558074 D01 DTS Meas. Guidance v03r02. 9.1.2 PKPM1 Peak power meter method.

TEST RESULTS

No non-compliance noted

Test Data

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Low	2405	17.32	30
Mid	2440	17.65	30
High	2480	17.13	30

Average Power Test Data

Channel	Frequency (MHz)	Conducted Average Power (dBm)	Limit (dBm)
Low	2405	15.82	N/A
Mid	2440	16.15	N/A
High	2480	15.97	N/A

Note: The duty cycle of the EUT is 4.95%

7.4.PEAK POWER SPECTRAL DENSITY

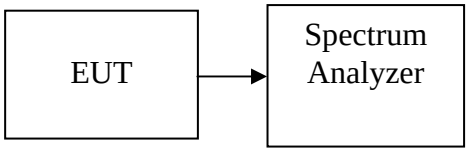
LIMIT

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 (18

d) of this section.

Test Configuration



TEST PROCEDURE

1.Place the EUT on the table and set it in transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

2.Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 1.5 times the DTS bandwidth, Sweep = auto

3.Record the max reading.

4.Repeat the above procedure until the measurements for all frequencies are completed.

TEST RESULTS

No non-compliance noted

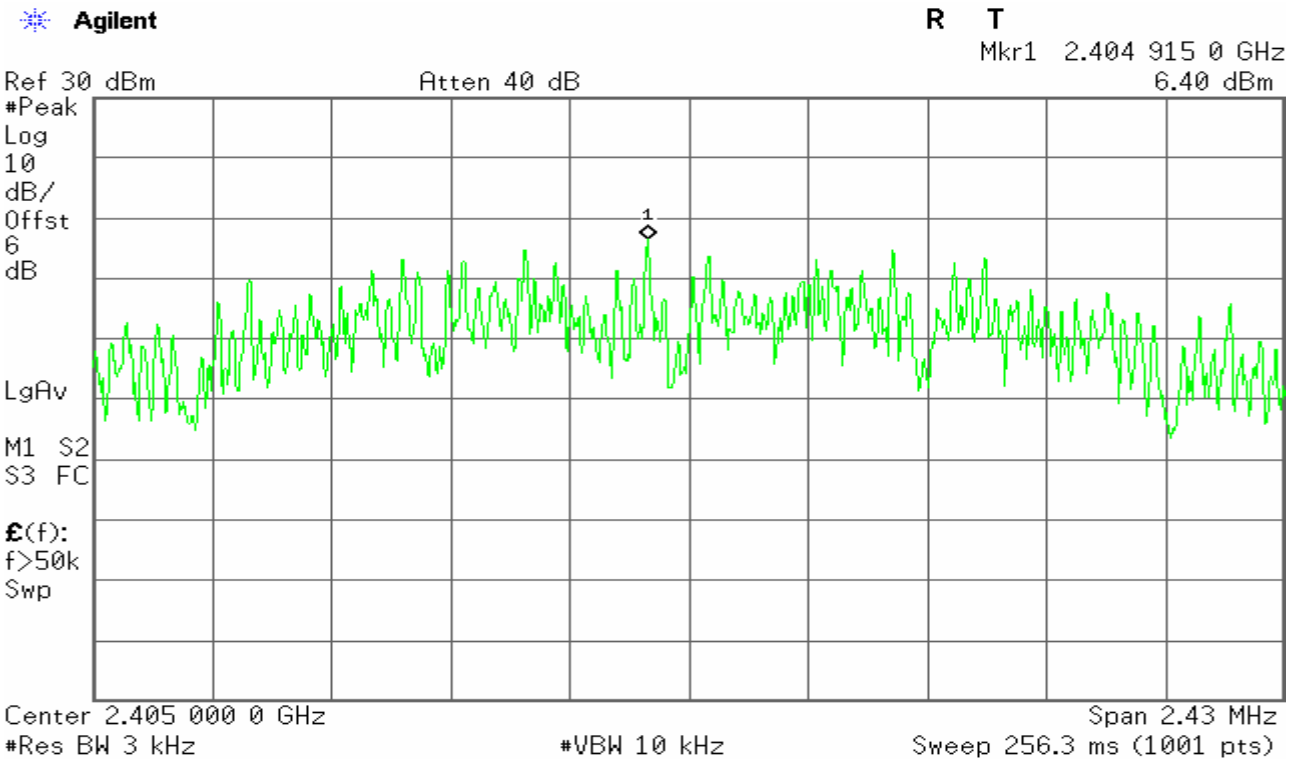
Test Data

Test mode:

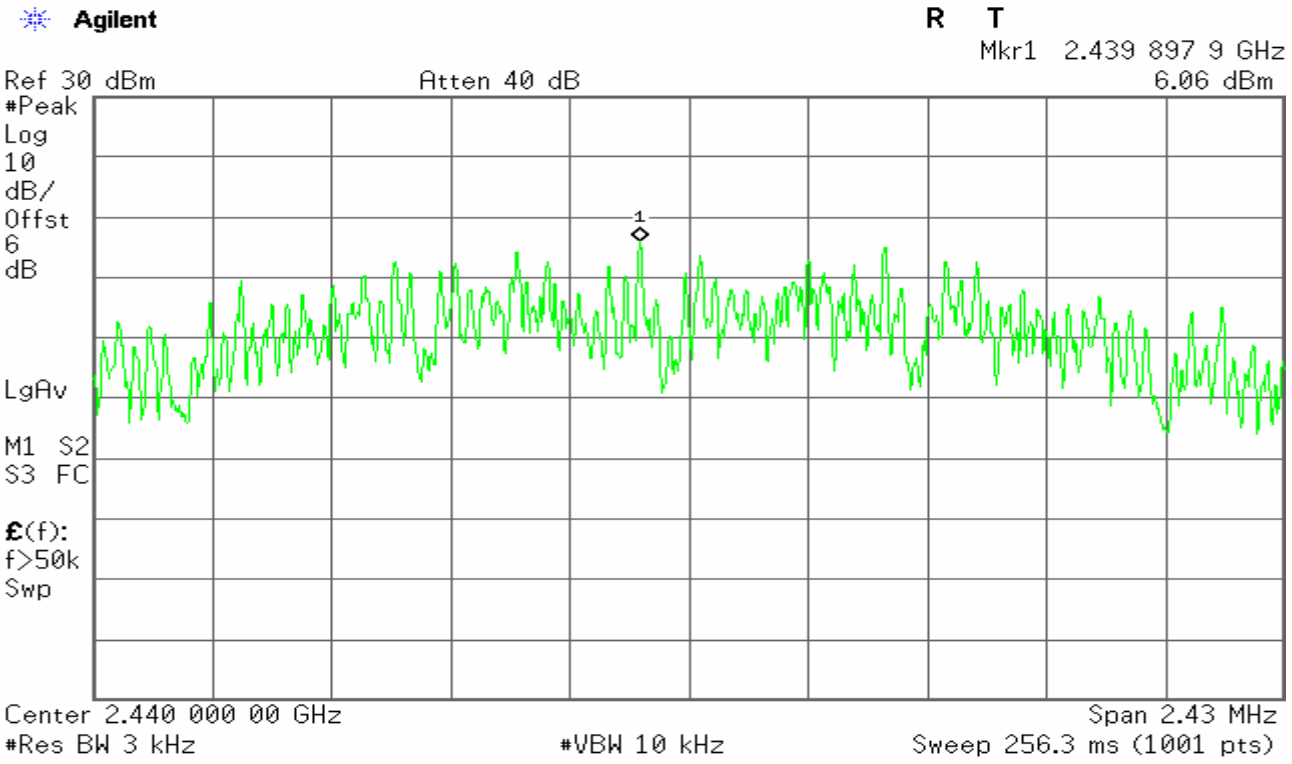
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Result
Low	2405	6.40	8.00	PASS
Mid	2440	6.06	8.00	PASS
High	2480	5.97	8.00	PASS

Test Plot

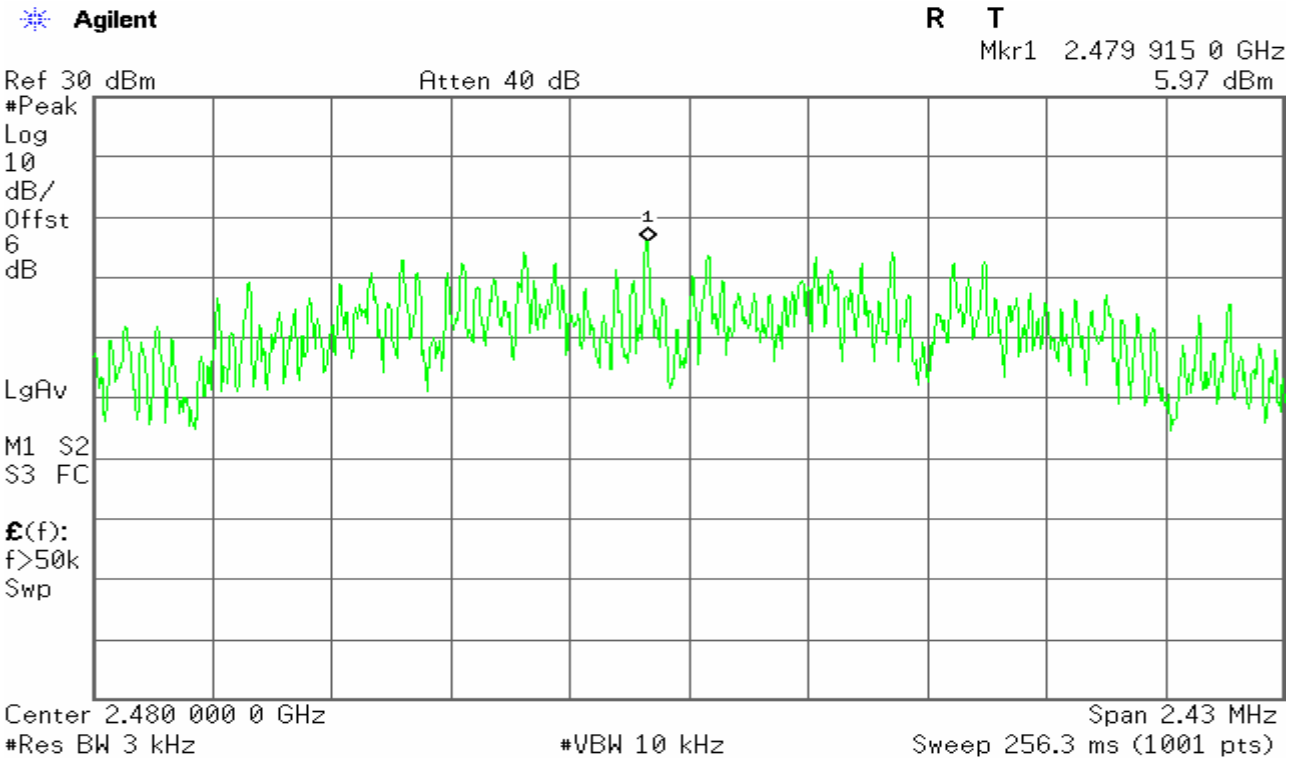
PPSD (CH Low)



PPSD (CH Mid)



PPSD (CH High)


Agilent
R T
Mkr1 2.479 915 0 GHz
5.97 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Center 2.480 000 0 GHz
Span 2.43 MHz
#Res BW 3 kHz
#VBW 10 kHz
Sweep 256.3 ms (1001 pts)

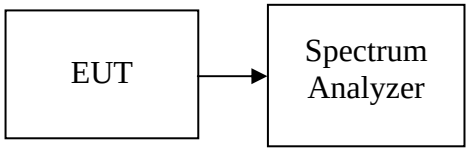
7.5.SPURIOUS EMISSIONS

Conducted 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



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. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

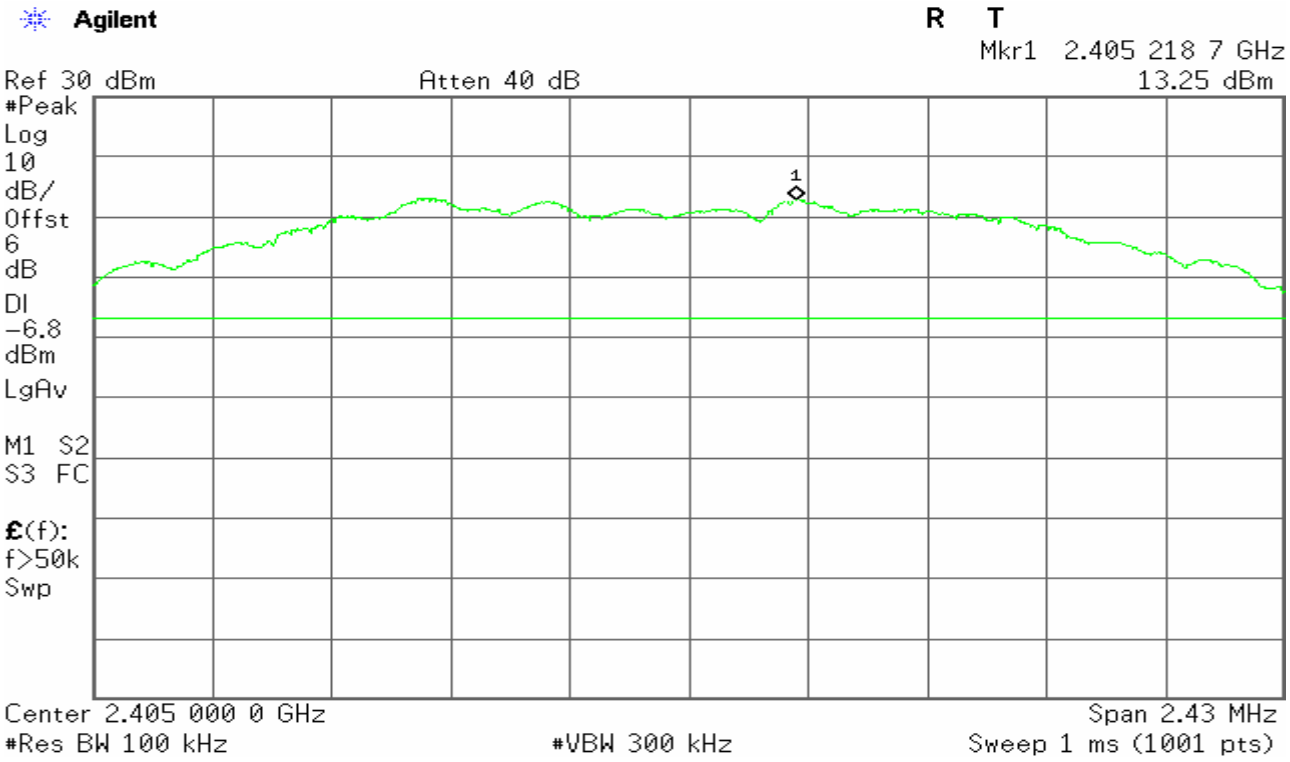
Measurements are made over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

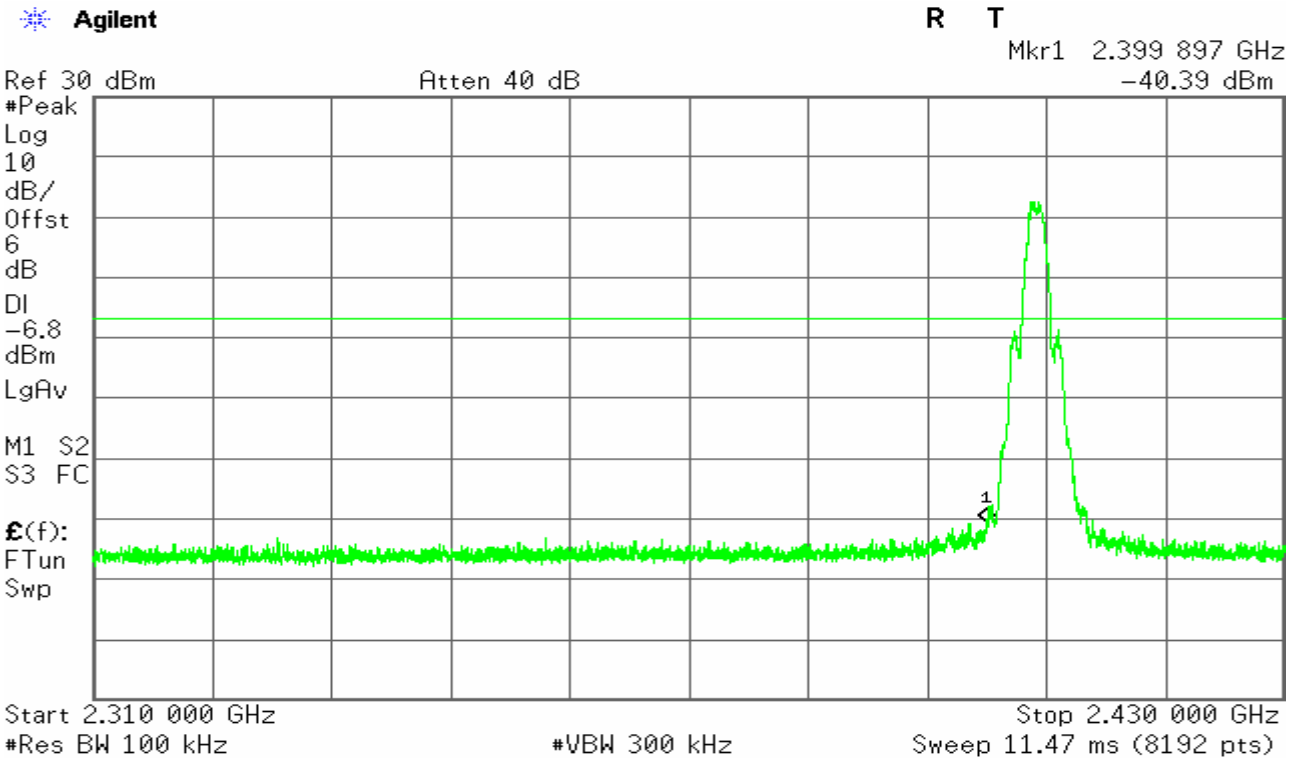
TEST RESULTS

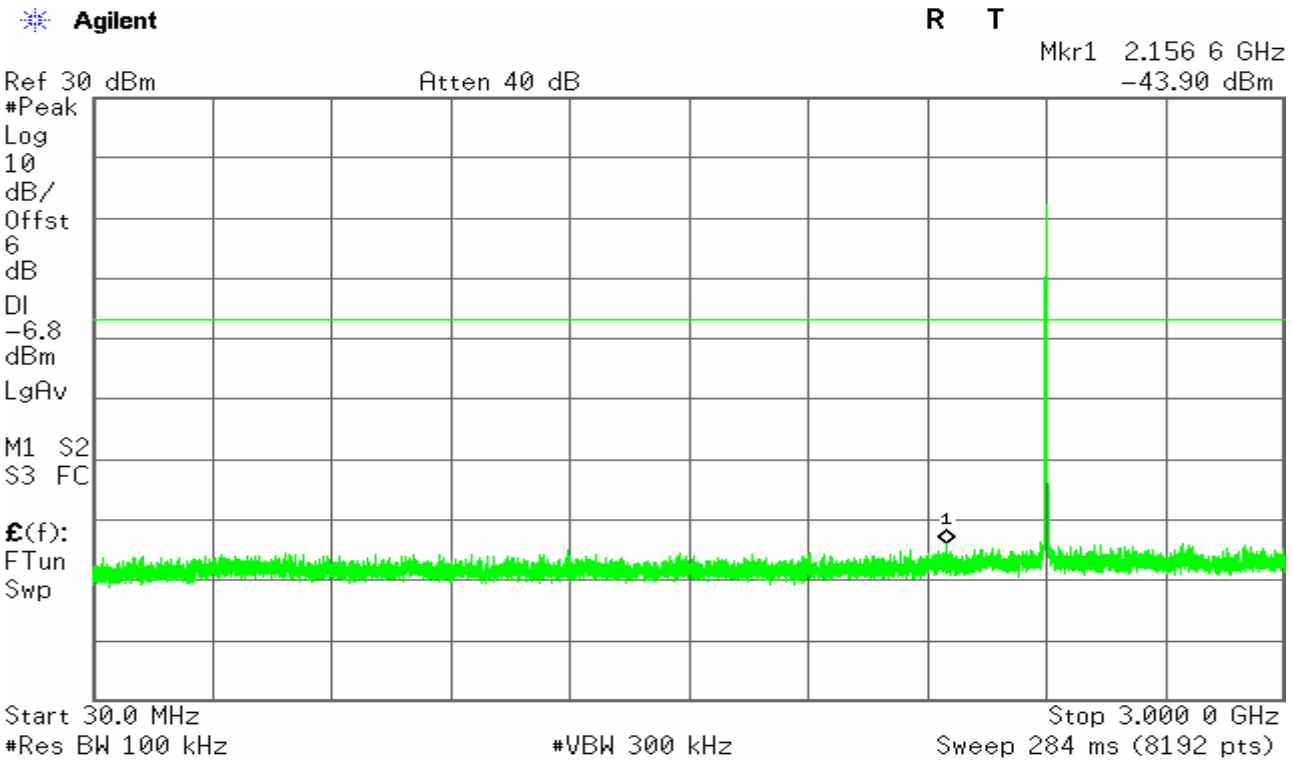
No non-compliance noted

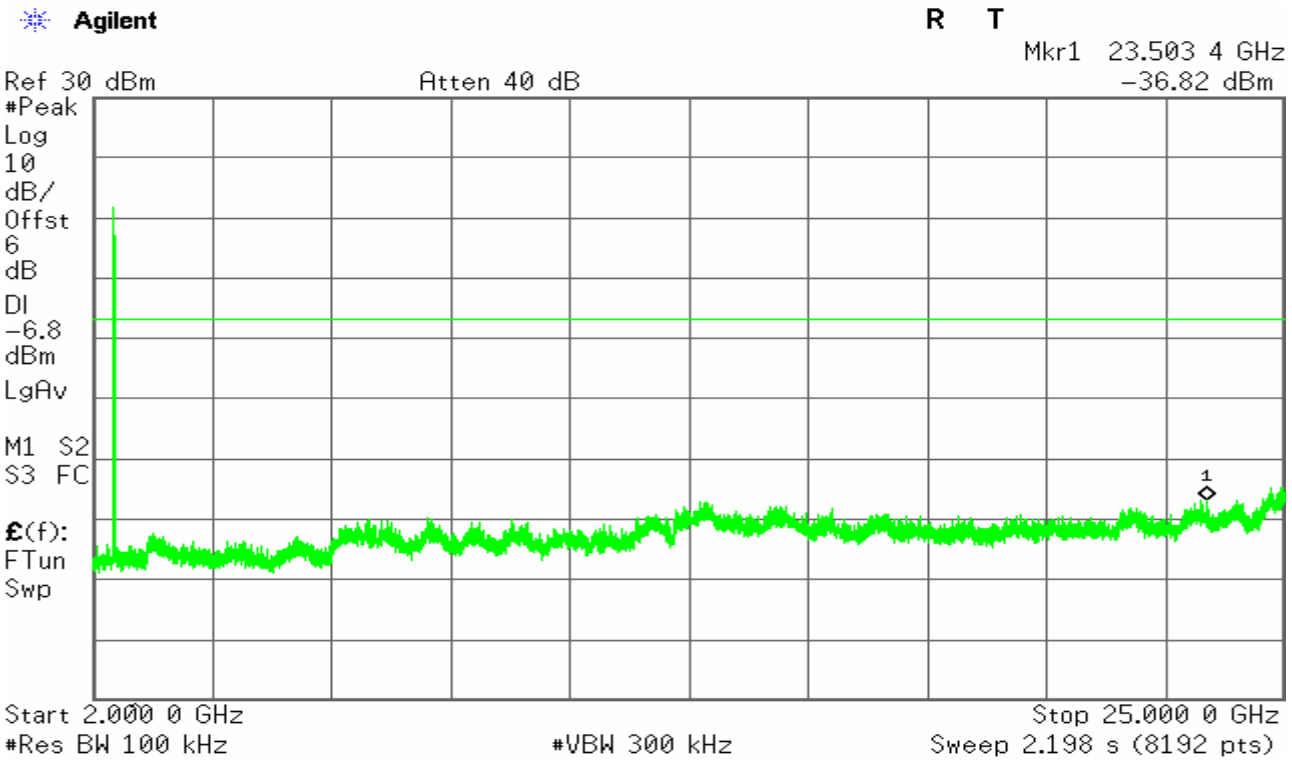
Test Plot
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

CH Low

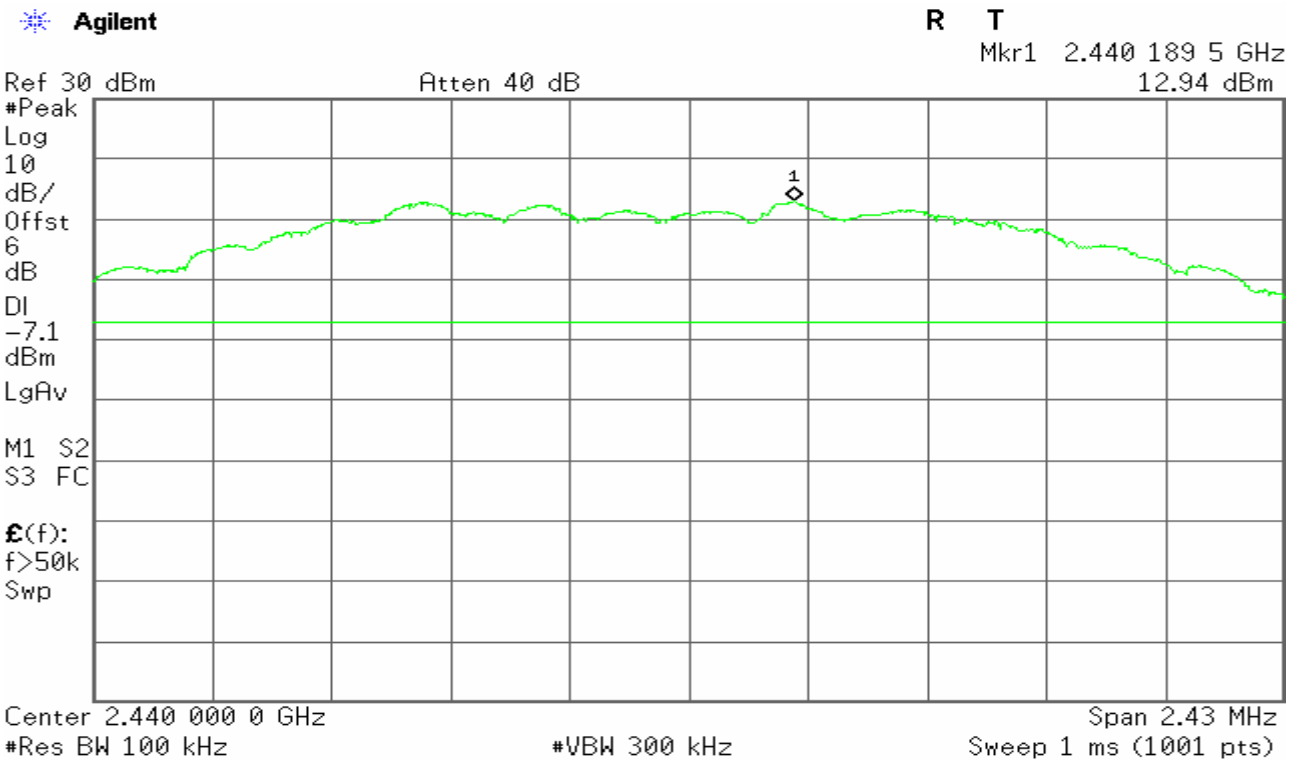


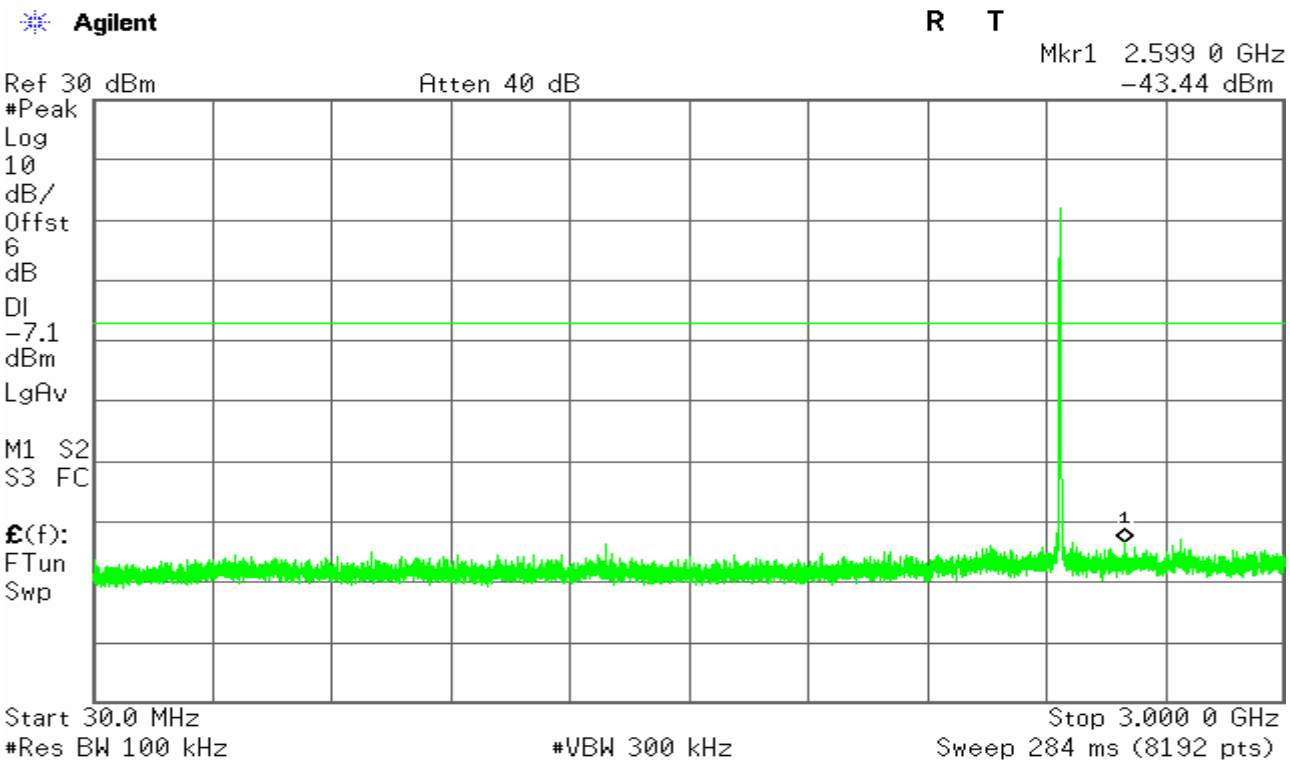


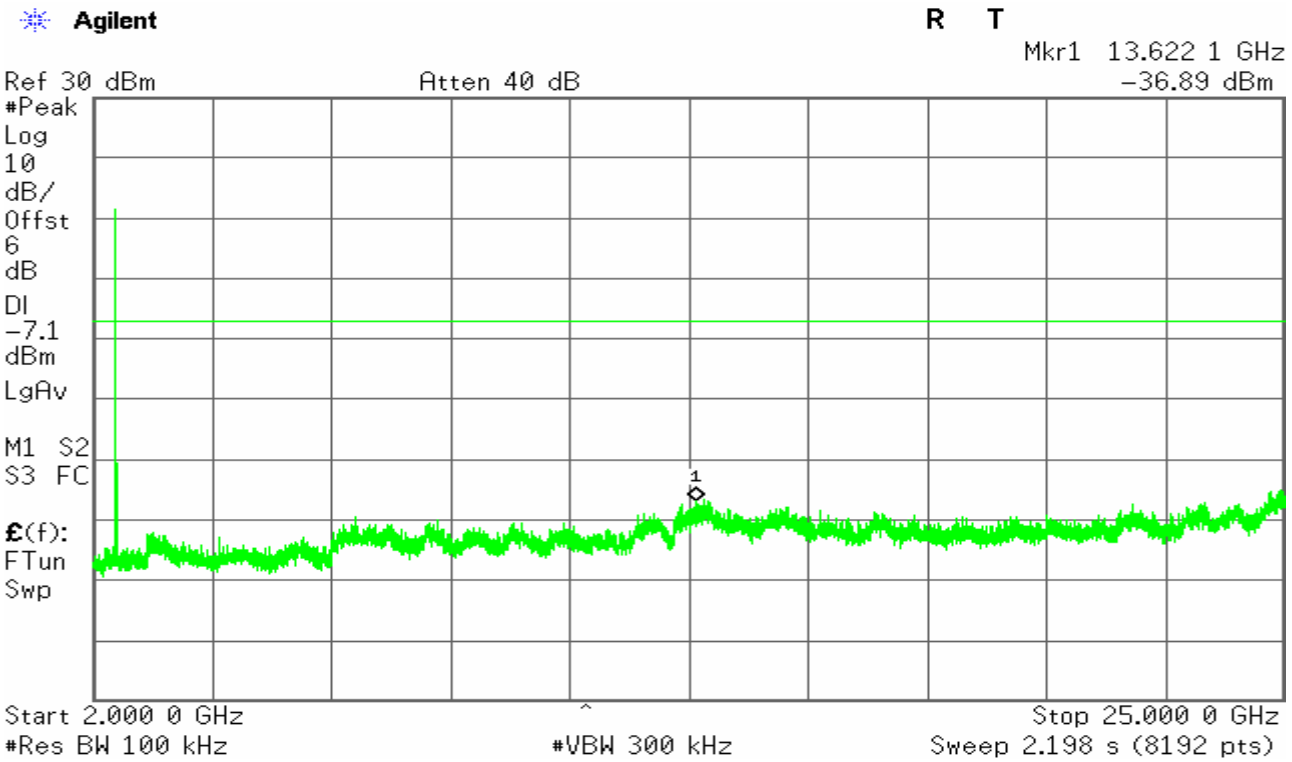

Agilent
R T
Mkr1 2.156 6 GHz
-43.90 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-6.8
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 0 GHz
Sweep 284 ms (8192 pts)


Agilent
R T
Mkr1 23.503 4 GHz
-36.82 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-6.8
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 2.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 0 GHz
Sweep 2.198 s (8192 pts)

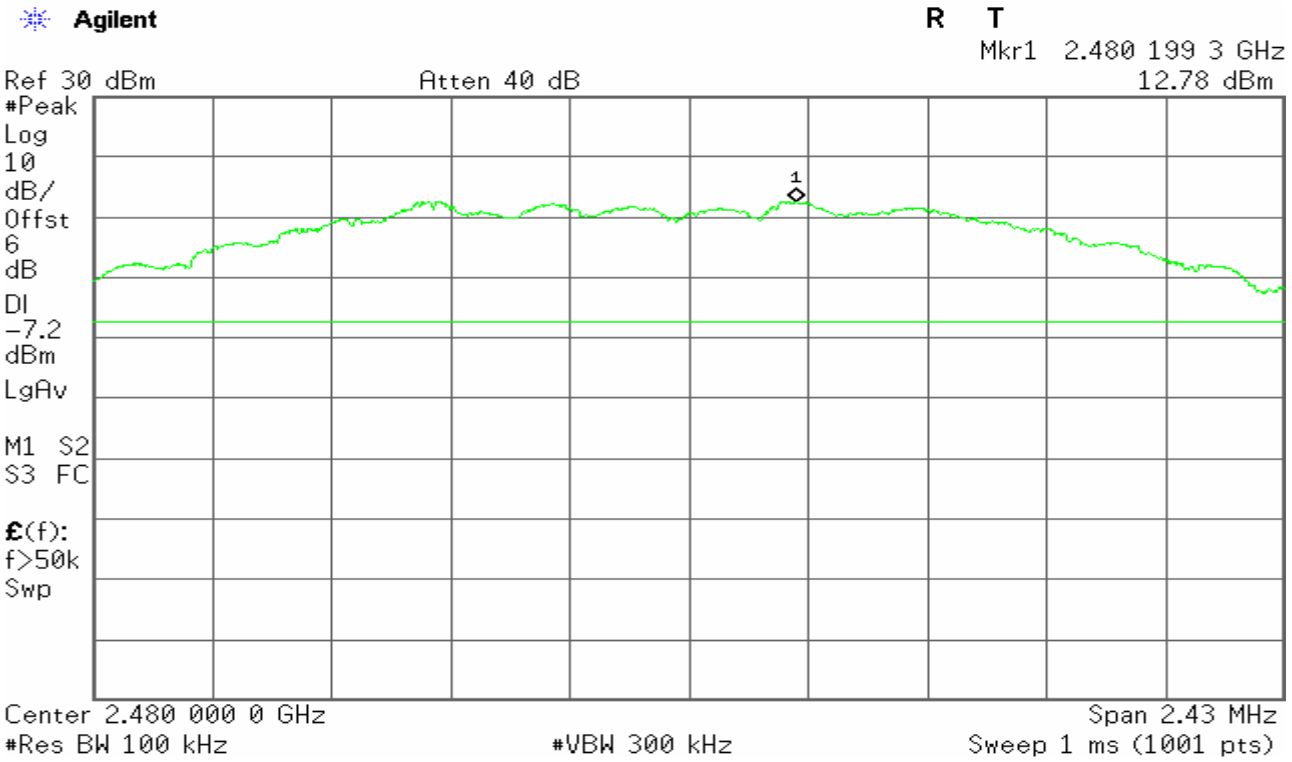
CH Mid

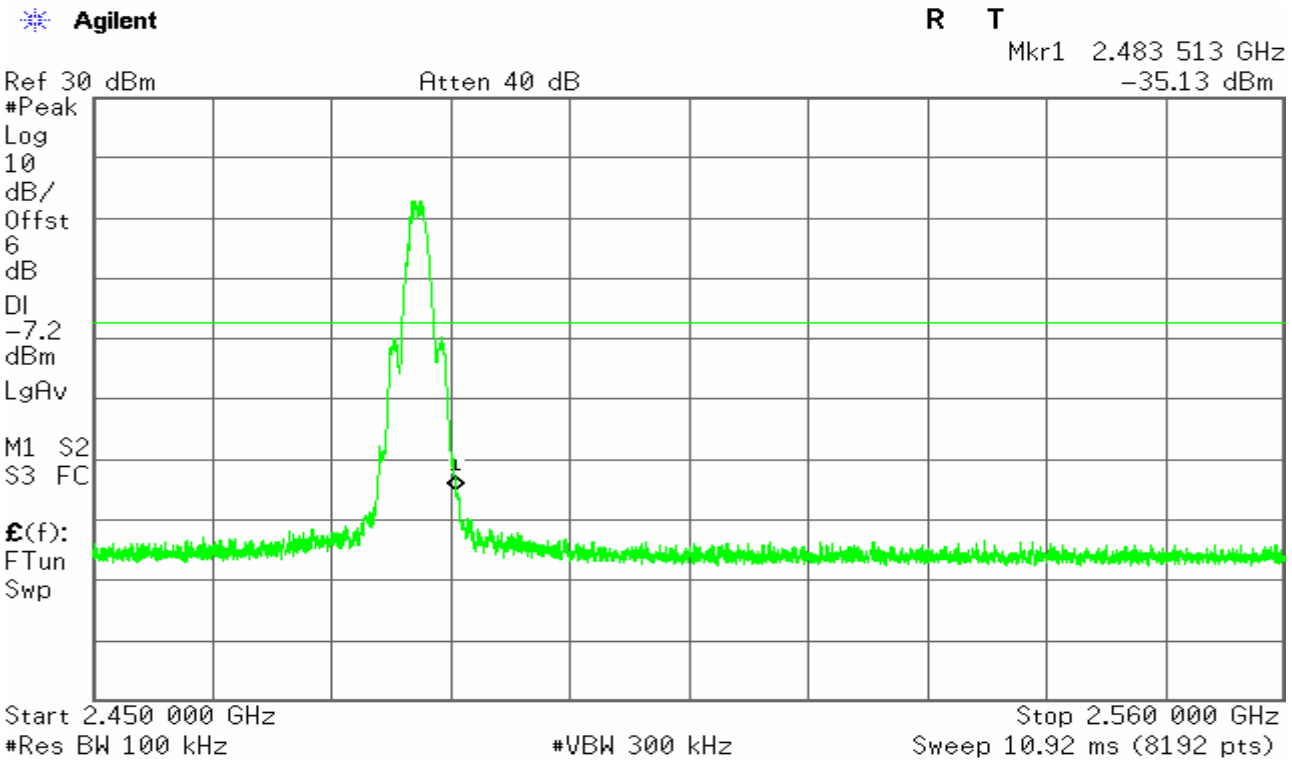

Agilent
R T
Mkr1 2.440 189 5 GHz
12.94 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.1
dBm
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Center 2.440 000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2.43 MHz
Sweep 1 ms (1001 pts)

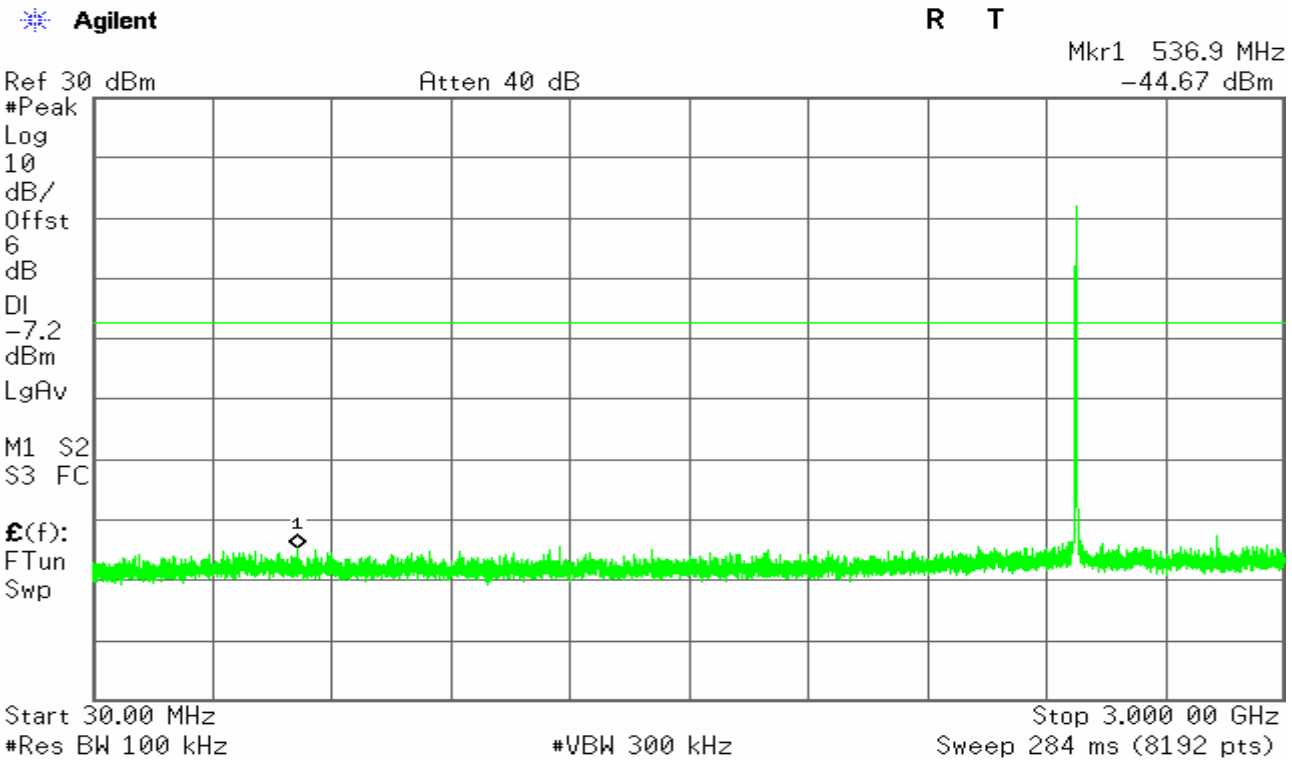

Agilent
R T
Mkr1 2.599 0 GHz
-43.44 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.1
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 30.0 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 0 GHz
Sweep 284 ms (8192 pts)

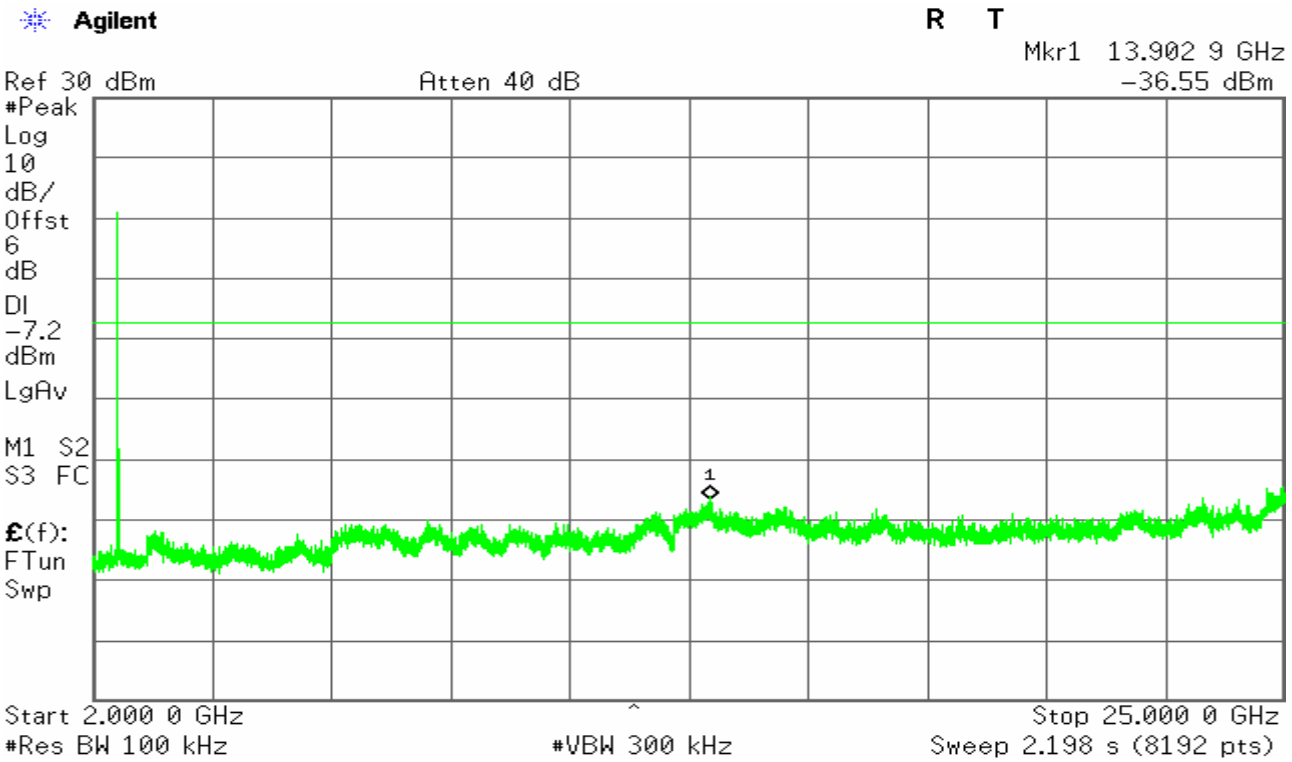

Agilent
R T
Mkr1 13.622 1 GHz
-36.89 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.1
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 2.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 0 GHz
Sweep 2.198 s (8192 pts)

CH High


Agilent
R T
Mkr1 2.480 199 3 GHz
12.78 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.2
dBm
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Center 2.480 000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 2.43 MHz
Sweep 1 ms (1001 pts)


Agilent
R T
Mkr1 2.483 513 GHz
-35.13 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.2
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 2.450 000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 2.560 000 GHz
Sweep 10.92 ms (8192 pts)


Agilent
R T
Mkr1 536.9 MHz
-44.67 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.2
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Start 30.00 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3.000 00 GHz
Sweep 284 ms (8192 pts)


Agilent
R T
Mkr1 13.902 9 GHz
-36.55 dBm
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
6
dB
Dl
-7.2
dBm
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
1
Start 2.000 0 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.000 0 GHz
Sweep 2.198 s (8192 pts)

7.6.RADIATED EMISSIONS

LIMIT

Radiated emissions from 9 kHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2009. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

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:

FREQUENCIES(MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE(meters)
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

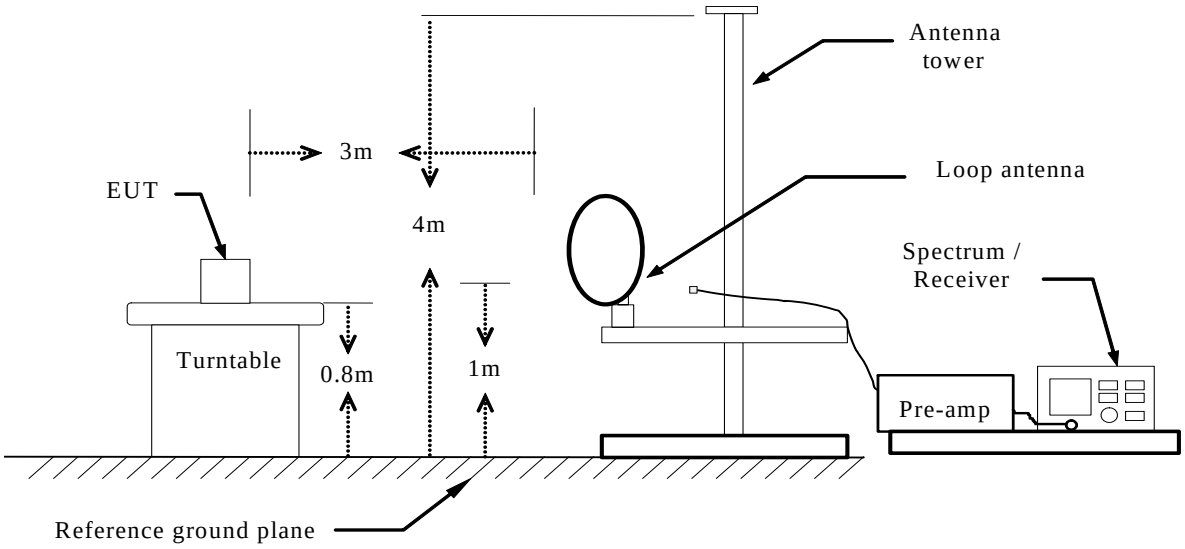
Remark: *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of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

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

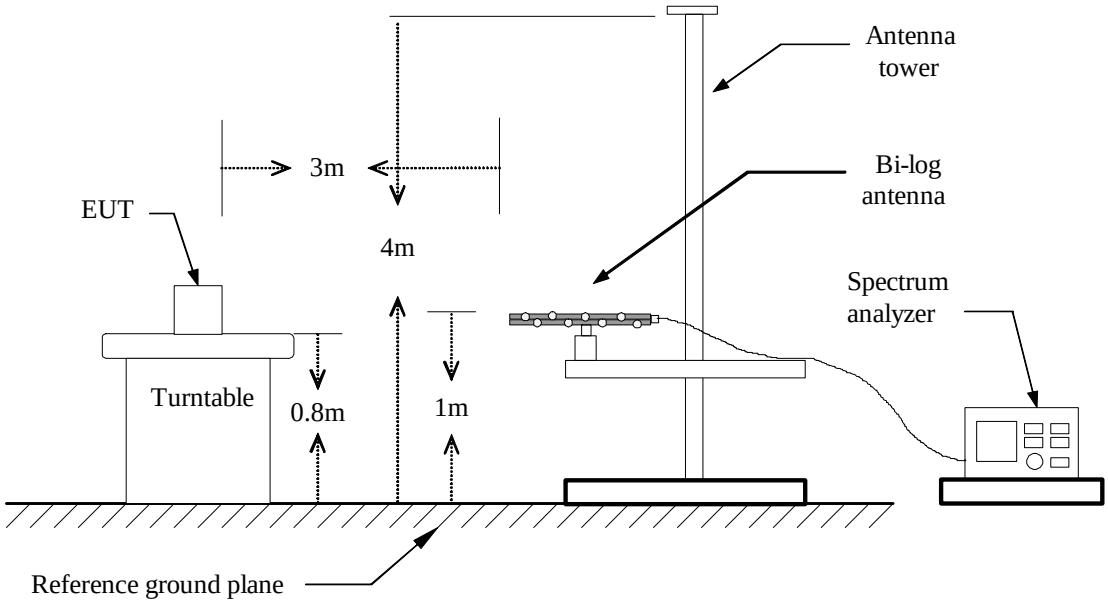
Frequency (MHz)	Field Strength (μV/m at 3-meter)	Field Strength (dBμV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Configuration

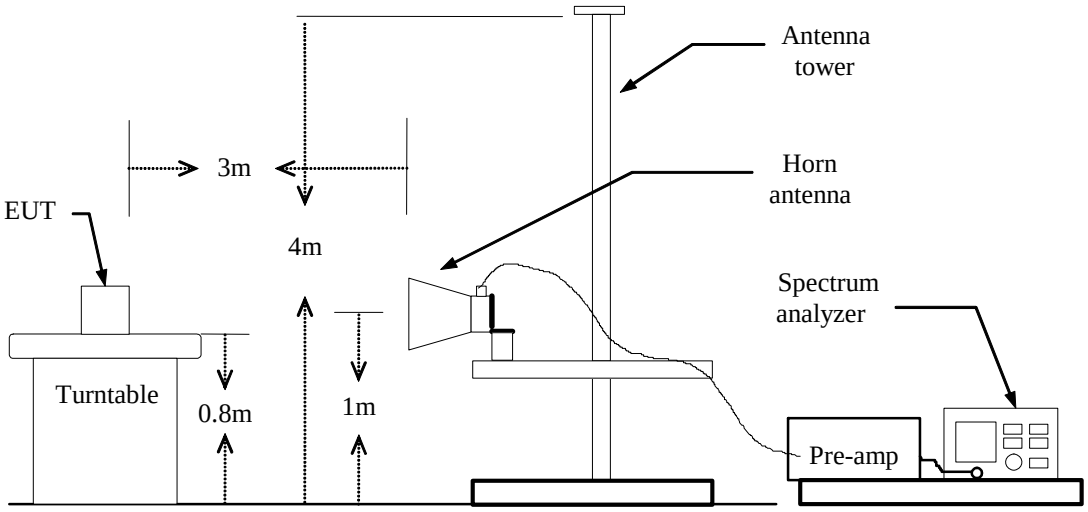
Below 30MHz



Below 1 GHz



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 1GHz:

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

   Above 1GHz:

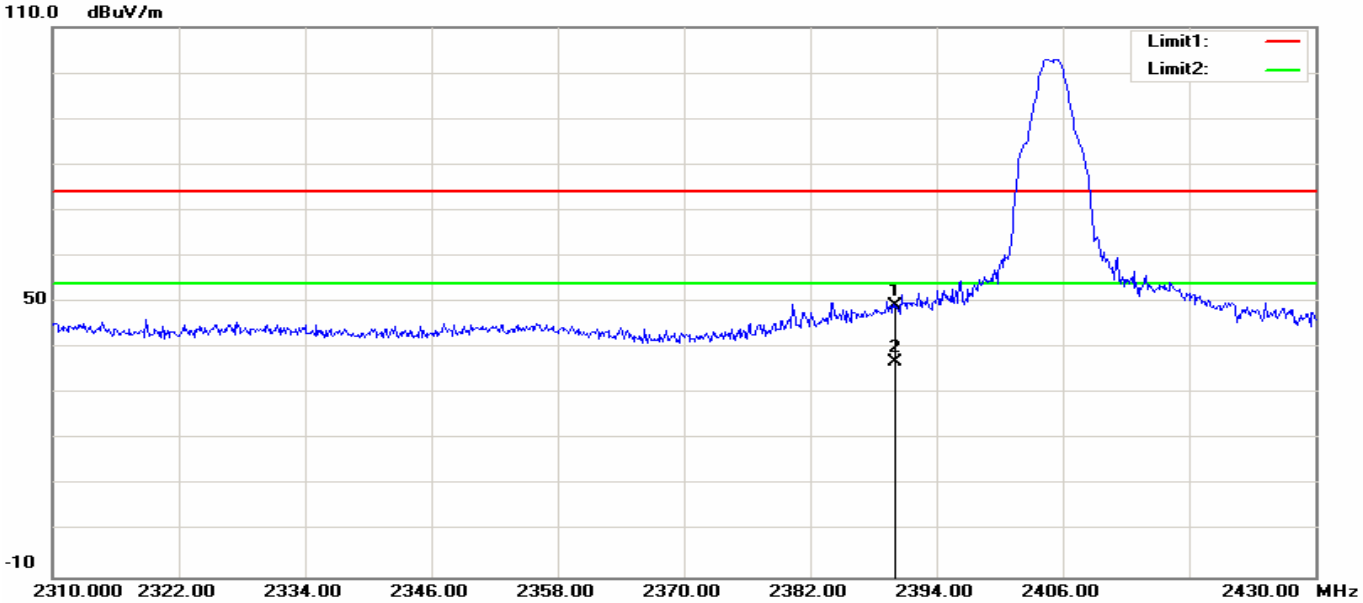
   PEAK: RBW=VBW=1MHz / Sweep=AUTO, PEAK DETECTOR

   AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO, PEAK DETECTOR

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

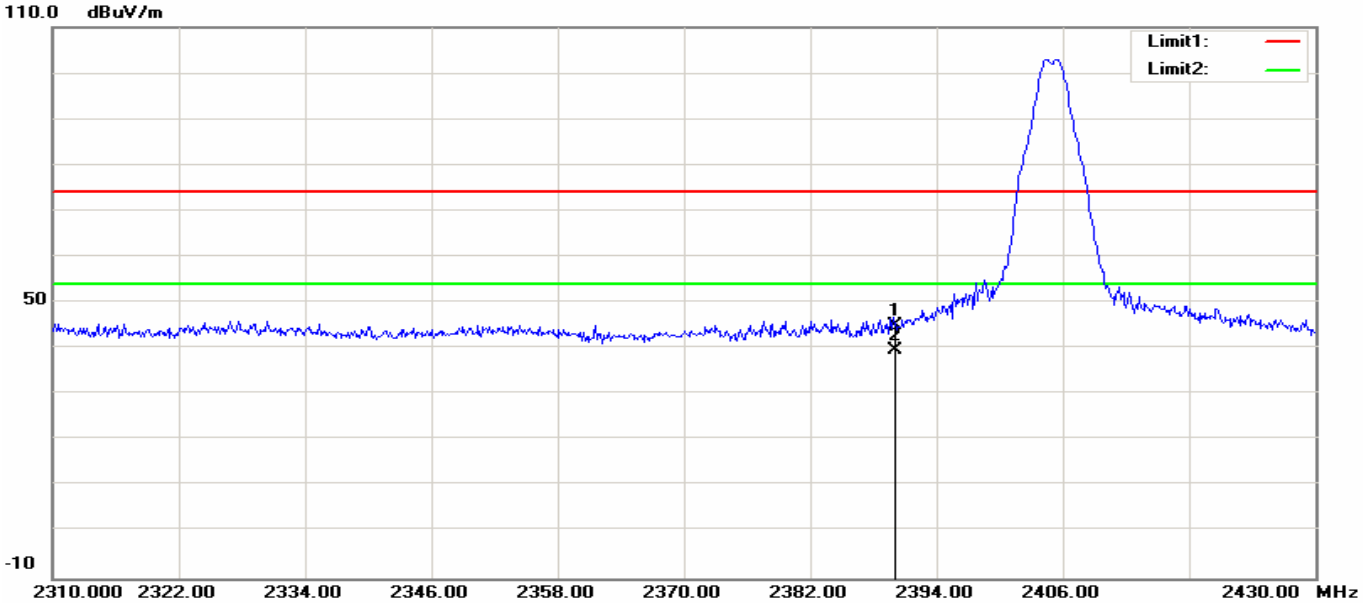
TEST RESULTS

RESTRICTED BANDEDGE (Low Channel, Horizontal)



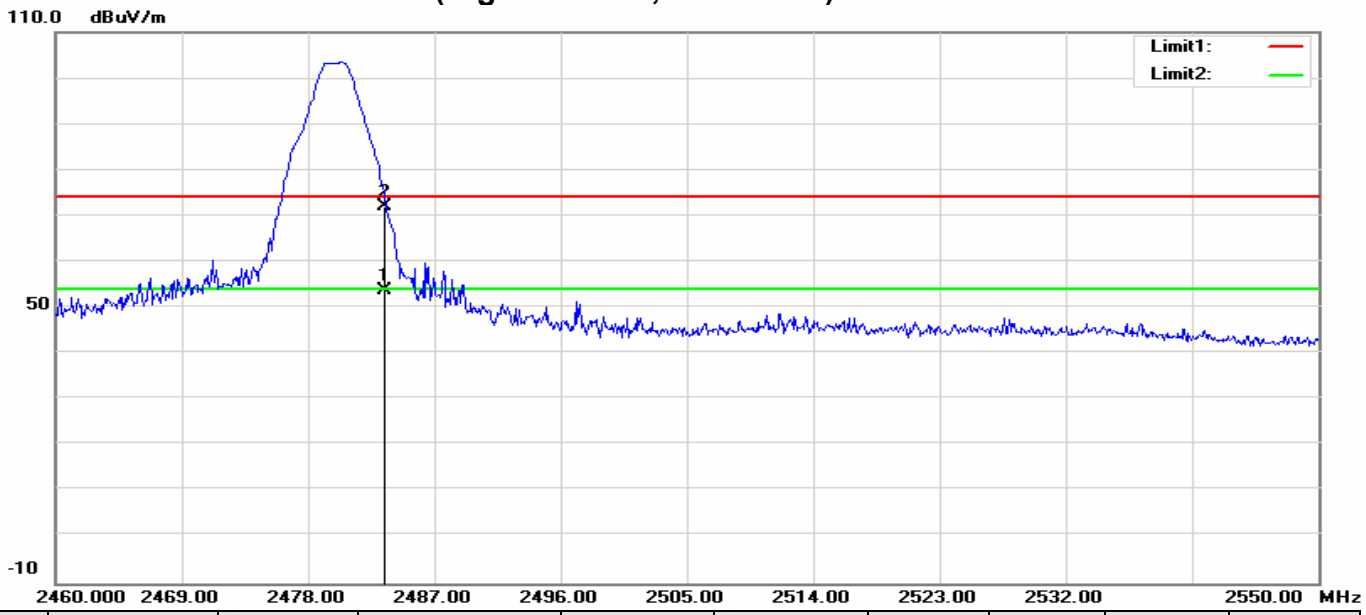
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2390.000	57.79	-8.42	49.37	74.00	-24.63	100	173	peak
2	2390.000	45.52	-8.42	37.10	54.00	-16.90	100	173	AVG

RESTRICTED BANDEDGE (Low Channel, Vertical)



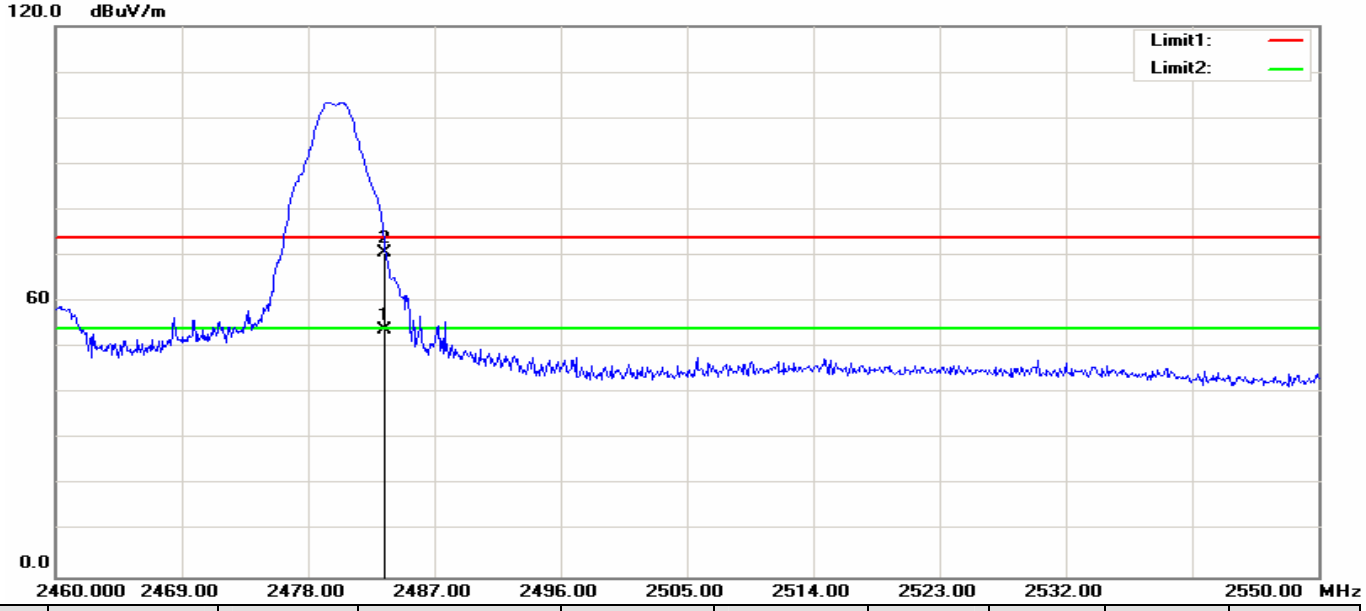
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2390.000	53.47	-8.42	45.05	74.00	-28.95	100	358	peak
2	2390.000	47.93	-8.42	39.51	54.00	-14.49	100	315	AVG

RESTRICTED BANDEDGE (High Channel, Horizontal)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.458	61.83	-8.10	53.73	54.00	-0.27	100	0	AVG
2	2483.500	80.09	-8.10	71.99	74.00	-2.01	100	185	peak

RESTRICTED BANDEDGE (High Channel, Vertical)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.455	61.84	-8.10	53.74	54.00	-0.26	100	191	peak
2	2483.500	78.86	-8.10	70.76	74.00	-3.24	100	192	AVG

Below 1GHz

Operation Mode: Keeping TX **Test Date:** 2015-4-13

Temperature: 24°C **Tested by:** James.Yan

Humidity: 48% RH **Polarity:** Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
84.6360	V	29.74	9.19	38.93	40.00	-1.07	Peak
143.9600	V	19.57	14.75	34.32	43.50	-9.18	Peak
236.6100	V	21.49	12.00	33.49	46.00	-12.51	Peak
466.9500	V	21.85	19.15	41.00	46.00	-5.00	Peak
540.2200	V	16.52	20.52	37.04	46.00	-8.96	Peak
794.3600	V	15.00	23.35	38.35	46.00	-7.65	Peak
50.8370	H	21.62	8.38	30.00	40.00	-10.00	Peak
148.3400	H	19.23	14.64	33.87	43.50	-9.63	Peak
340.4000	H	20.59	15.39	35.98	46.00	-10.02	Peak
447.9600	H	26.03	18.97	45.00	46.00	-1.00	Peak
842.8600	H	15.01	23.29	38.30	46.00	-7.70	Peak
946.6500	H	15.44	25.17	40.61	46.00	-5.39	Peak

Remark:

1. *Measuring frequencies from 30 MHz to the 1GHz (No emission found between lowest internal used/generated frequency to 30 MH).*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using peak/quasi-peak detector mode.*
3. *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.*
4. *Margin (dB) = Result (dBuV/m) – Limit (dBuV/m).*

Above 1 GHz

Operation Mode: TX / CH Low **Test Date:** 2015-4-13

Temperature: 24°C **Tested by:** James.Yan

Humidity: 48 % RH **Polarity:** Ver. / Hor.

Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4808.000	49.18	1.41	50.59	74.00	-23.41	100	127	peak
2	4808.000	39.18	1.41	40.59	54.00	-13.41	100	127	AVG
3	7222.000	40.50	8.01	48.51	54.00	-5.49	100	0	AVG
4	7222.000	53.91	8.06	61.97	74.00	-12.03	100	207	peak
N/A									

Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4808.000	59.58	1.41	60.99	74.00	-13.01	100	26	peak
2	4808.000	46.92	1.41	48.33	54.00	-5.67	100	256	AVG
3	7215.000	53.00	8.02	61.02	74.00	-12.98	100	165	peak
4	7215.000	40.08	8.02	48.10	54.00	-5.90	100	231	AVG
N/A									

Operation Mode: TX /CH Mid **Test Date:** 2015-4-13

Temperature: 24°C **Tested by:** James.Yan

Humidity: 48 % RH **Polarity:** Ver. / Hor.

Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4876.000	52.23	1.21	53.44	74.00	-20.56	100	207	peak
2	4876.000	38.92	1.21	40.13	54.00	-13.87	100	256	AVG
3	7324.000	50.52	8.78	59.30	74.00	-14.70	100	230	peak
4	7324.000	38.46	8.78	47.24	54.00	-6.76	100	118	AVG
5	9755.000	46.66	14.86	61.52	74.00	-12.48	100	184	peak
6	9755.000	34.53	14.86	49.39	54.00	-4.61	100	48	AVG

Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4876.000	50.66	1.21	51.87	74.00	-22.13	100	175	peak
2	4876.000	38.47	1.21	39.68	54.00	-14.32	100	251	AVG
3	7324.000	46.37	8.78	55.15	74.00	-18.85	100	209	peak
4	7324.000	35.11	8.78	43.89	54.00	-10.11	100	185	AVG
5	9755.000	42.91	14.86	57.77	74.00	-16.23	100	129	peak
6	9755.000	31.17	14.86	46.03	54.00	-7.97	100	63	AVG

Operation Mode: TX /CH High **Test Date:** 2015-4-13

Temperature: 24°C **Tested by:** James.Yan

Humidity: 48 % RH **Polarity:** Ver. / Hor.

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	4961.000	46.89	0.96	47.85	74.00	-26.15	100	162	peak
2	4961.000	34.19	0.96	35.15	54.00	-18.85	100	147	AVG
3	7443.000	51.02	9.61	60.63	74.00	-13.37	100	70	peak
4	7443.000	37.19	9.61	46.80	54.00	-7.20	100	84	AVG
5	9925.000	45.18	15.45	60.63	74.00	-13.37	100	162	peak
6	9925.000	32.63	15.45	48.08	54.00	-5.92	100	275	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	4961.000	50.69	0.96	51.65	74.00	-22.35	100	72	peak
2	4961.000	37.99	0.96	38.95	54.00	-15.05	100	257	AVG
3	7443.000	50.96	9.61	60.57	74.00	-13.43	100	186	peak
4	7443.000	38.21	9.61	47.82	54.00	-6.18	100	63	AVG
5	9925.000	48.84	15.45	64.29	74.00	-9.71	100	209	peak
6	9925.000	35.23	15.45	50.68	54.00	-3.32	100	75	AVG

7.7.POWERLINE CONDUCTED EMISSIONS

LIMIT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

** Decreases with the logarithm of the frequency.*

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.

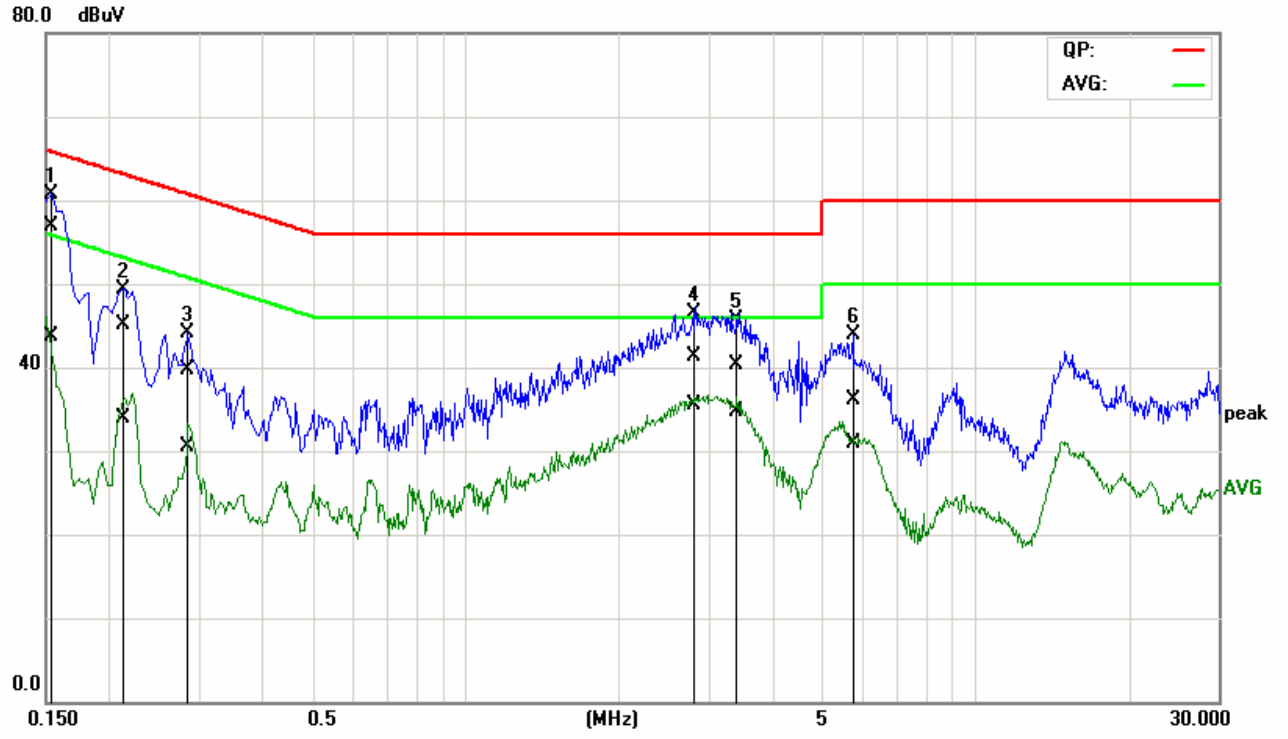
TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Test Data

Job No.:	C150407R01-RPW	Date:	2015-4-11
Model:	ST24********	Time:	10:32:29
Standard:	FCC Class B	Temp.(C)/Hum.(%):	22(C)/48%
Test item:	Conduction test	Test By:	James.Yan
Line:	L1	Test Voltage:	AC 120V/60Hz
Model:		Description:	

L1

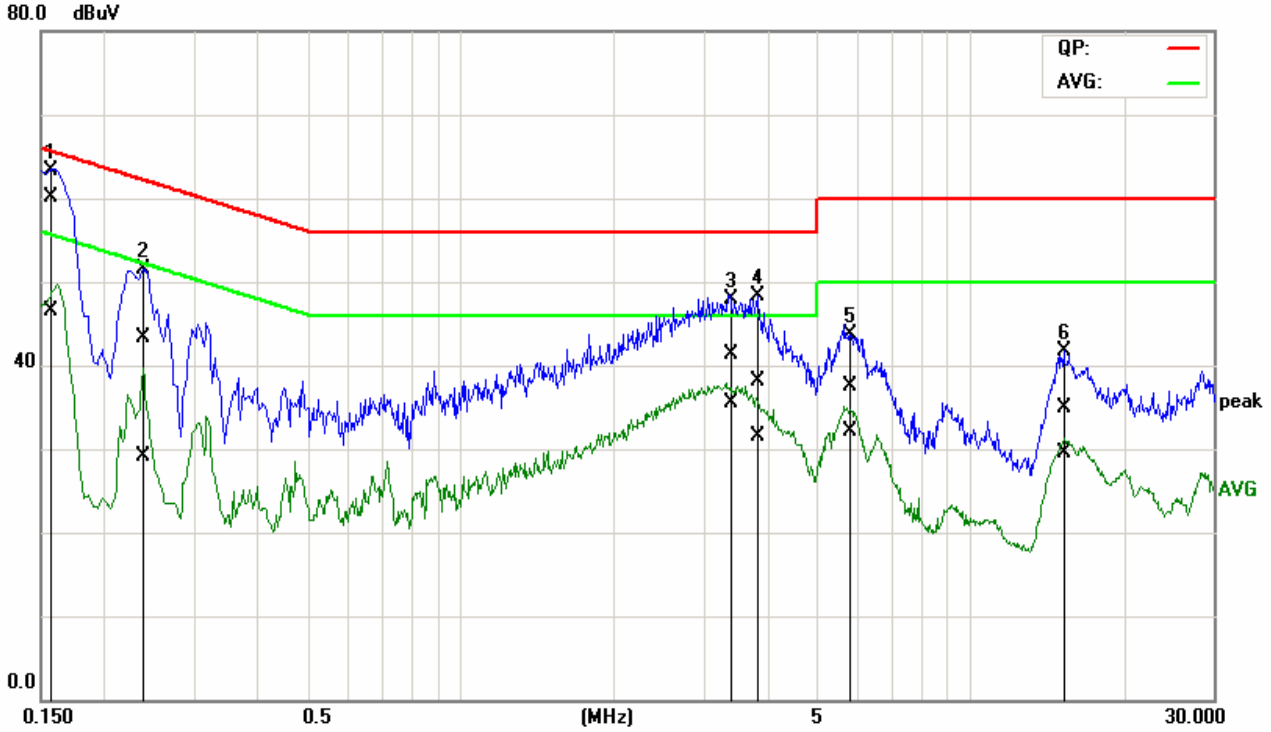


No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1507	37.22	23.95	19.73	56.95	43.68	65.96	55.96	-9.01	-12.28	Pass
2	0.2104	25.51	14.34	19.65	45.16	33.99	63.19	53.19	-18.03	-19.20	Pass
3*	0.2844	20.00	10.83	19.70	39.70	30.53	60.69	50.69	-20.99	-20.16	Pass
4	2.7753	21.18	15.49	20.06	41.24	35.55	56.00	46.00	-14.76	-10.45	Pass
5	3.3790	20.17	14.61	20.12	40.29	34.73	56.00	46.00	-15.71	-11.27	Pass
6	5.7861	15.65	10.61	20.38	36.03	30.99	60.00	50.00	-23.97	-19.01	Pass

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).

Job No.:	C150407R01-RPW	Date:	2015-4-11
Model:	ST24********	Time:	10:36:59
Standard:	FCC Class B	Temp.(C)/Hum.(%):	22(C)/48%
Test item:	Conduction test	Test By:	James.Yan
Line:	L2	Test Voltage:	AC 120V/60Hz
Model:		Description:	

L2



No.	Frequency	QuasiPeak reading	Average reading	Correction factor	QuasiPeak result	Average result	QuasiPeak limit	Average limit	QuasiPeak margin	Average margin	Remark
	(MHz)	(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)	
1	0.1550	40.23	26.75	19.79	60.02	46.54	65.73	55.73	-5.71	-9.19	Pass
2	0.2358	23.69	9.44	19.63	43.32	29.07	62.24	52.24	-18.92	-23.17	Pass
3	3.4140	21.13	15.42	20.10	41.23	35.52	56.00	46.00	-14.77	-10.48	Pass
4	3.8439	18.00	11.40	20.16	38.16	31.56	56.00	46.00	-17.84	-14.44	Pass
5*	5.7261	17.21	11.65	20.37	37.58	32.02	60.00	50.00	-22.42	-17.98	Pass
6	15.3203	14.04	8.63	20.86	34.90	29.49	60.00	50.00	-25.10	-20.51	Pass

Note: 1. L1 = Line One (Live Line) / L2 = Line Two (Neutral Line).