

FCC 47 CFR PART 15 SUBPART C**TEST REPORT****For****Product Name: Wireless Node Controller****Brand Name: MOONS'****Model No.: MSDK6149****Series Model.: MSDK6137,MSDK6131,MSDK6159****FCC ID: 2ALUV-MSDK61XX****Test Report Number:****C170411E02-RPW****Issued for****Shanghai MOONS' Automation Control Co.,Ltd.****No.168 Mingjia Rd, Minhang District,Shanghai 201107****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**

TESTING CERT #2541.01

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Revision History

| Rev. | Issue Date | Report NO. | Effect Page | Contents |
|------|-------------|----------------|-------------|----------|
| 00 | May 7, 2017 | C170411E02-RPW | ALL | N/A |
| | | | | |

1. TEST RESULT CERTIFICATION

| | |
|-------------------------------|---|
| Product Name: | Wireless Node Controller |
| Trade Name: | MOONS' |
| Model Name.: | MSDK6149 |
| Series Model: | MSDK6137, MSDK6131, MSDK6159 |
| Applicant Discrepancy: | Initial |
| Device Category: | Mobile unit |
| Date of Test: | April 20~May 7, 2017 |
| Applicant: | Shanghai MOONS' Automation Control Co.,Ltd. No.168 Mingjia Rd, Minhang District,Shanghai 201107 |
| Manufacturer: | Shanghai MOONS' Automation Control Co.,Ltd. No.168 Mingjia Rd, Minhang District,Shanghai 201107 |
| Application Type: | Certification |

APPLICABLE STANDARDS

| STANDARD | TEST RESULT |
|------------------------------|-------------------------|
| FCC 47 CFR Part 15 Subpart C | No non-compliance noted |

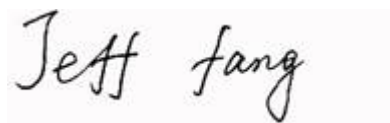
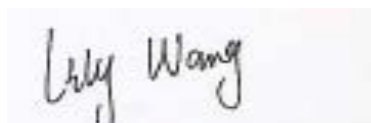
We hereby certify that:

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 C63.10: 2013 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:

Tested by:

Jeff.Fang
 RF Manager
 Compliance Certification Service Inc.

Lily.Wang
 Test Engineer
 Compliance Certification Service Inc.

2. EUT DESCRIPTION

| | |
|-------------------------------|--|
| Product Name: | Wireless Node Controller |
| Brand Name: | MOONS' |
| Model Name: | MSDK6149 |
| Series Model: | MSDK6137, MSDK6131, MSDK6159 |
| Model Discrepancy: | See table of model discrepancy |
| Power Rating: | INPUT:100-277VAC 50/60Hz OUTPUT:100-277VAC 50/60Hz 1000VA |
| Frequency Range: | 2405~2475MHz |
| Transmit Power: | Channel 2405:11.24 dBm |
| Modulation Technique: | O-QPSK |
| Number of Channels: | 15 Channels |
| Antenna Specification: | monopole antenna Gain: 2.88 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: 2ALUV-MSDK61XX** filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

Model Discrepancy:

| Model Name | Input voltage | Output current | Dimming | GPS | Light Sensor | Metering | shell color |
|------------|---------------|----------------|-----------|-----|--------------|----------|-------------|
| MSDK6149 | 100 to 277VAC | 5A | 0-10Vdc*2 | Yes | Yes | Yes | Blue |
| MSDK6137 | | | 0-10Vdc | No | Yes | | |
| MSDK6131 | | | 0-10Vdc | No | No | | |
| MSDK6159 | | | DALI | Yes | Yes | | |

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10 2013 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 C63.10 2013 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

Under 1GHz

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 C63.10:2013.

Above 1GHz

The EUT is placed on a turn table, which is 1.5 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 C63.10:2013.

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.

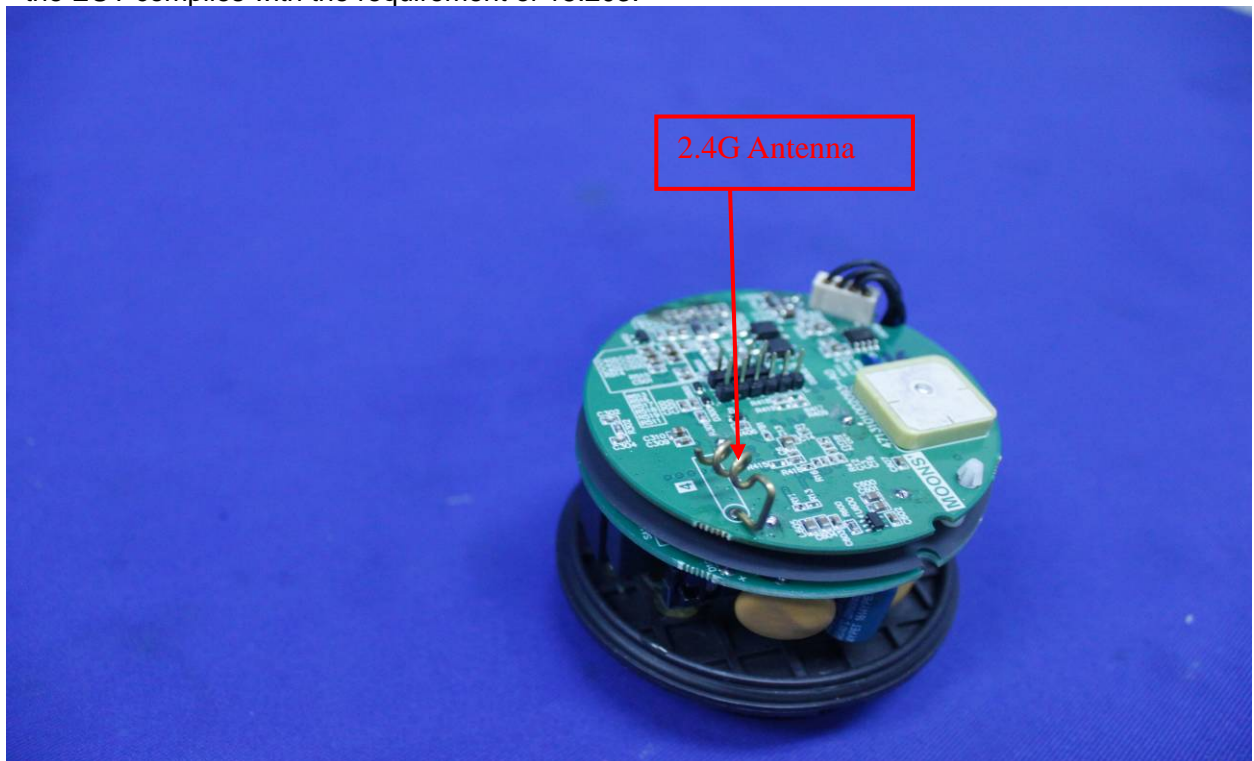
3.5.DESRIPTION OF TEST MODES

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

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(monopole Antenna).
- * 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 Date | Calibration Due |
| Spectrum Analyzer | Agilent | E4446A | MY44020154 | 2016-9-10 | 2017-9-9 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2016-7-21 | 2017-7-20 |
| Power meter | Anritsu | ML2495A | 1445010 | 2016-5-16 | 2017-5-15 |
| Power sensor | Anritsu | MA2411B | 1339220 | 2016-5-16 | 2017-5-15 |
| Power SPLITTER | Mini-Circuits | ZN2PD-9G | SF078500430 | N.C.R | N.C.R |
| DC Power Supply | AGILENT | E3632A | MY50340053 | N.C.R | N.C.R |
| Temp. / Humidity Gauge | Anymetre | TH603 | CCS007 | 2016-11-1 | 2017-10-31 |
| Test Software | | | EZ-EMC | | |

| 977 Chamber | | | | | |
|-------------------|--------------|----------------------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| Spectrum Analyzer | Agilent | E4446A | MY44020154 | 2016-9-10 | 2017-9-9 |
| Spectrum Analyzer | RS | FSU26 | 200789 | 2016-7-21 | 2017-7-20 |
| EMI Test Receiver | R&S | ESCI | 101378 | 2017-1-5 | 2018-1-4 |
| Pre-Amplifier | MINI | ZFL-1000VH2 | 070306 | 2017-1-5 | 2018-1-4 |
| Pre-Amplifier | Miteq | JS41-00101800-32-10P | 1675713 | 2016-7-21 | 2017-7-20 |
| Bilog Antenna | Sunol | JB1 | A062604 | 2016-5-29 | 2017-5-28 |
| Bilog Antenna | Sunol | JB1 | A110204-1 | 2016-5-29 | 2017-5-28 |
| Loop Antenna | SCHWARZBECK | HXYZ9170 | 9170-108 | 2017-3-4 | 2018-3-3 |
| Horn-antenna | SCHWARZBECK | 9120D | D:266 | 2017-3-5 | 2018-3-4 |
| Horn-antenna | SCHWARZBECK | 9120D | D:267 | 2016-11-10 | 2017-11-9 |
| Turn Table | CT | CT123 | 4165 | N.C.R | N.C.R |
| Antenna Tower | CT | CTERG23 | 3256 | N.C.R | N.C.R |
| Controller | CT | CT100 | 95637 | N.C.R | N.C.R |
| Test Software | | | EZ-EMC | | |

| Conducted Emission | | | | | |
|--------------------|--------------|-----------|---------------|------------------|-----------------|
| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Date | Calibration Due |
| EMI TEST RECEIVER | R&S | ESCI | 100781 | 2017-2-28 | 2018-2-27 |
| V (V-LISN) | SCHWARZBECK | NNLK 8129 | 8129-143 | 2016-11-1 | 2017-10-31 |
| TWO-LINE V-NETWORK | R&S | ENV216 | 101604 | 2016-11-1 | 2017-10-31 |
| Pulse LIMITER | R&S | ESH3-Z2 | 100524 | 2017-1-5 | 2018-1-4 |
| 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 C63.10 2013 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, 2324E-1 for 10m chamber, 2324E-2 for 3m chamber; the test facilities are listed with USA, Certification and Engineering Bureau, 424105 for 10m chamber, 238958 for 3m chamber.

5.4.TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---------|--------|---|--|
| USA | A2LA | 47 CFR FCC Part 15/18 (using ANSI C63.10 :2013); 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 |  |
| 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 ID |
|-----|-------------|-------|-------|------------|--------|
| 1. | N/A | N/A | N/A | N/A | 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.

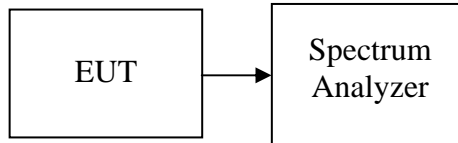
7. FCC PART 15.247 REQUIREMENTS

7.1.6DB BANDWIDTH

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

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the selected span. The VBW is set to 3 times the RBW. The sweep time is occupied.

TEST RESULTS

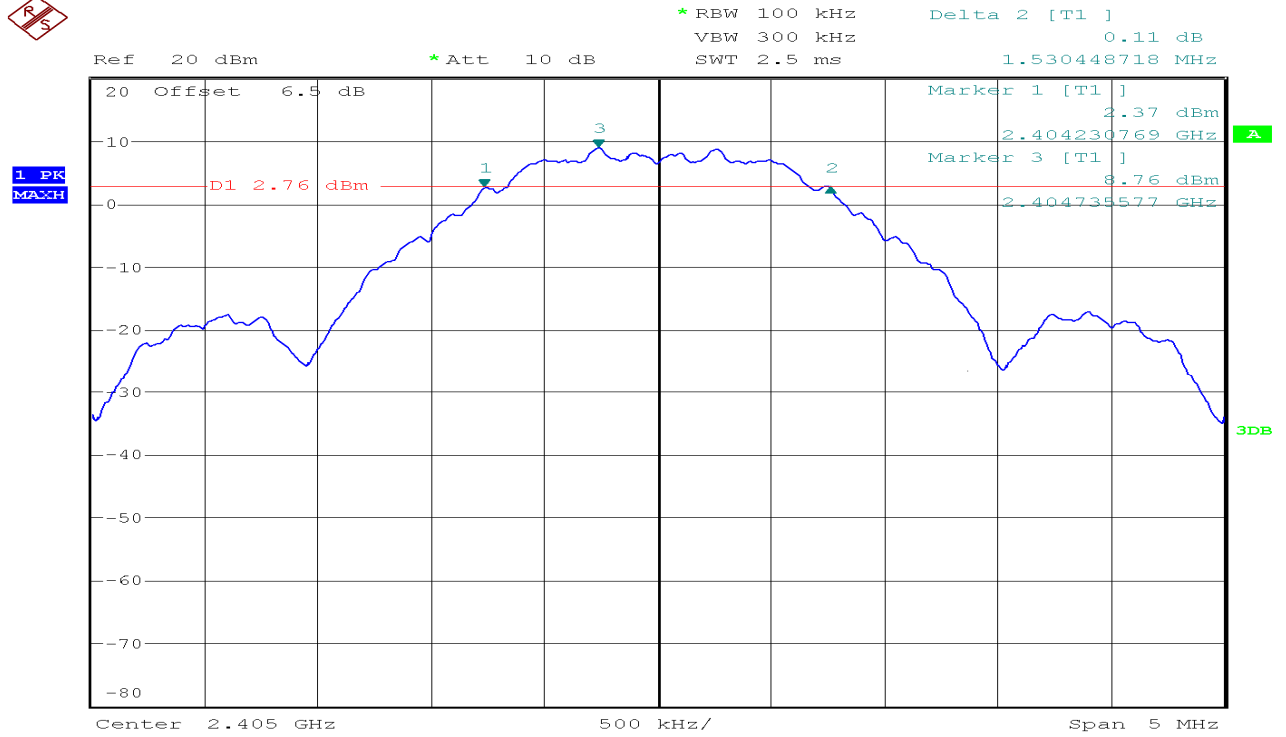
No non-compliance noted

Test Data

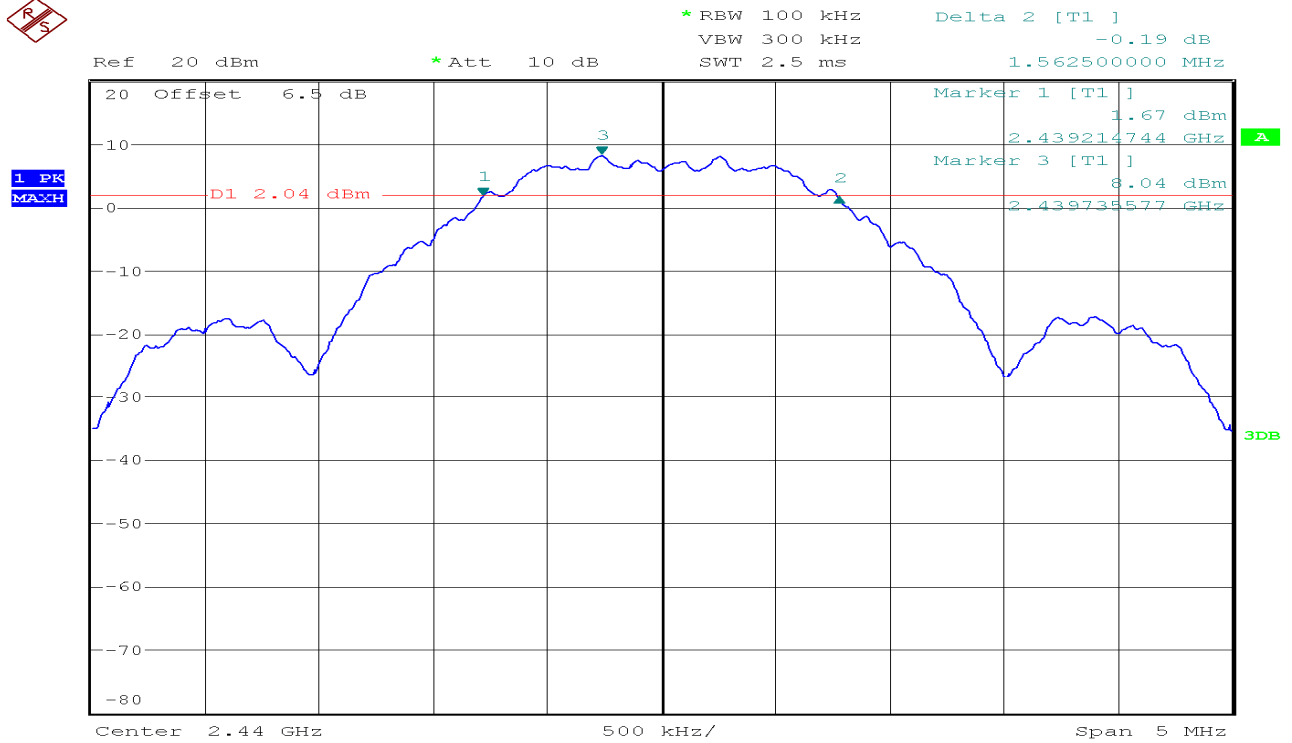
| Channel | Frequency (MHz) | Bandwidth (MHz) | Limit (kHz) | Result |
|---------|-----------------|-----------------|-------------|--------|
| Low | 2405 | 1.530 | >500 | PASS |
| Mid | 2440 | 1.563 | | PASS |
| High | 2475 | 1.571 | | PASS |

Test Plot

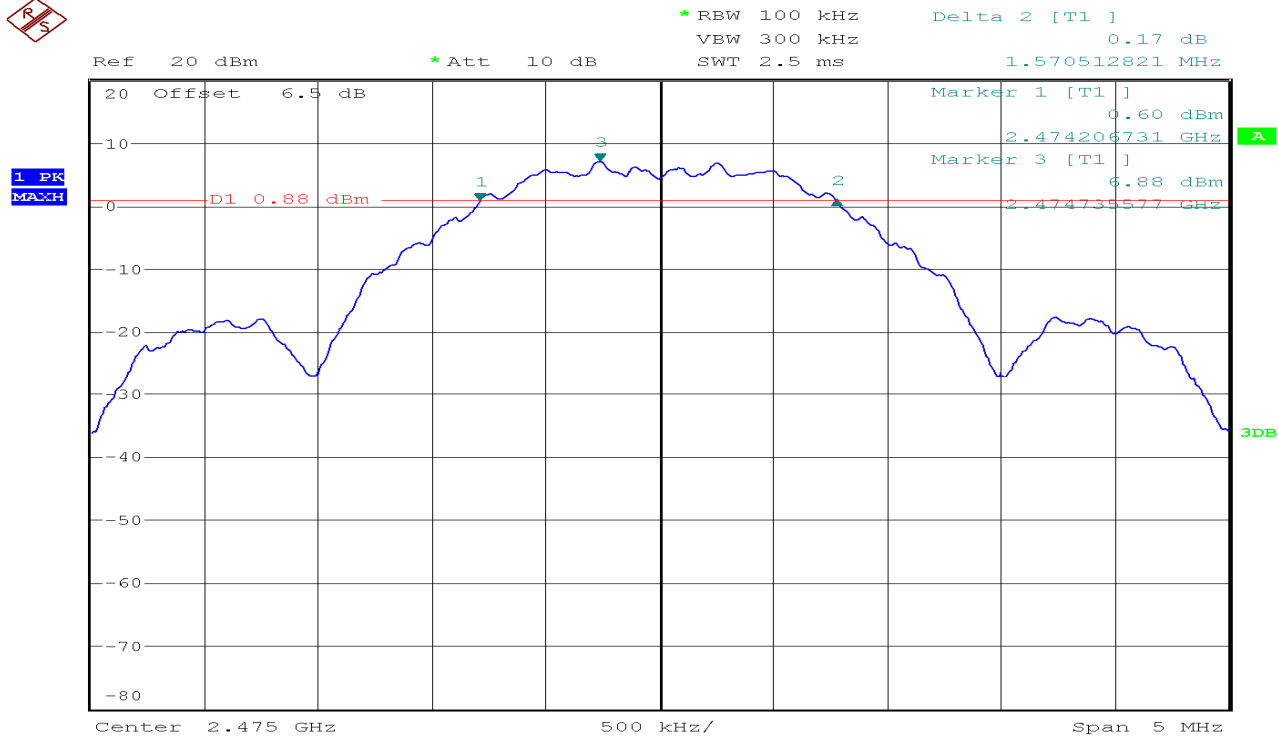
6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)



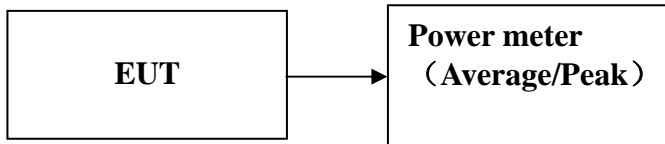
7.2. PEAK POWER

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, 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 v04. 9.1.3 PKPM1 Peak-reading power meter method.

TEST RESULTS

No non-compliance noted



Test Data

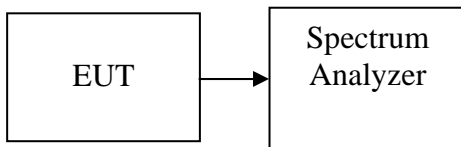
| Channel | Frequency (MHz) | Peak Output Power (dBm) | Limit (dBm) |
|----------------|------------------------|--------------------------------|--------------------|
| Low | 2405 | 11.24 | 30.00 |
| Mid | 2440 | 10.78 | 30.00 |
| High | 2475 | 9.87 | 30.00 |

7.3. 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

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

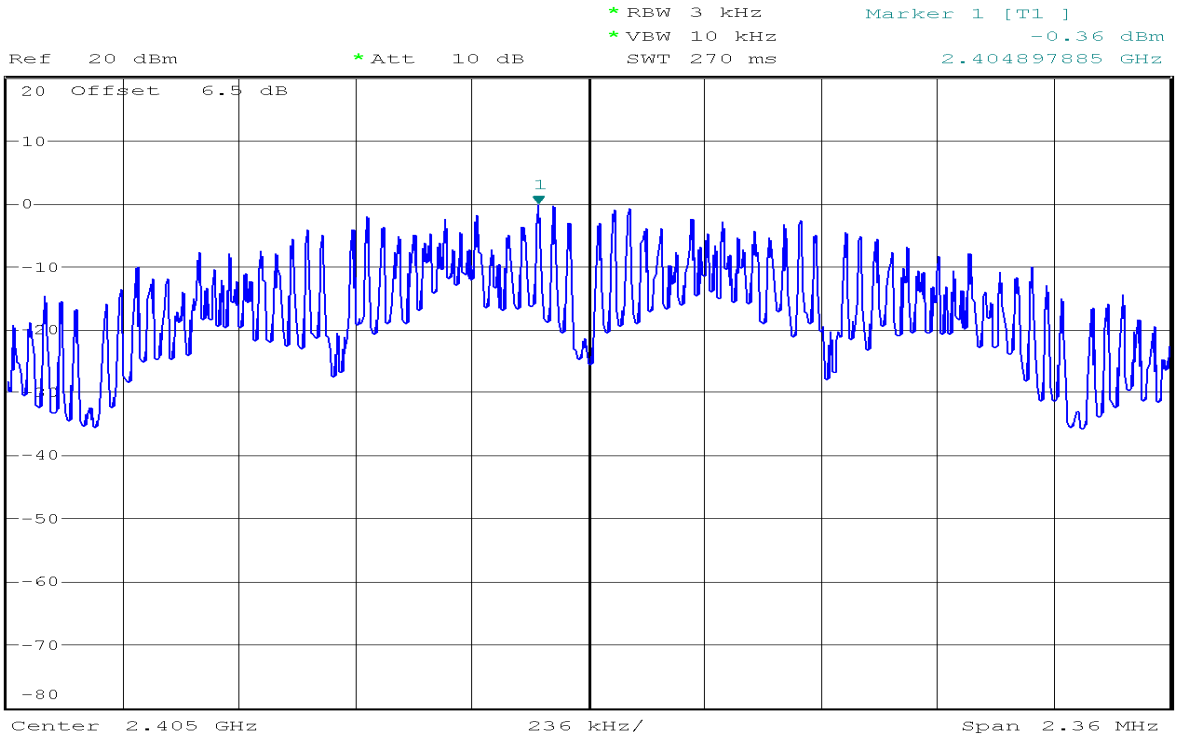


Test Data

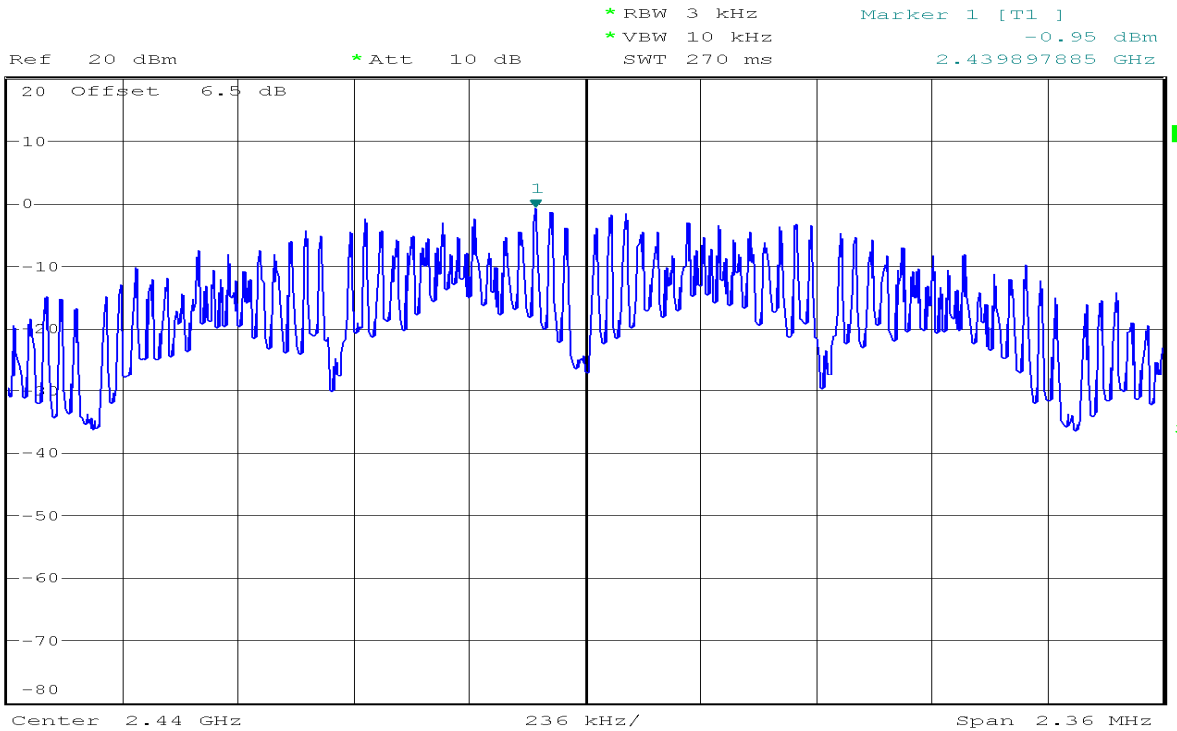
| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Result |
|----------------|------------------------|-------------------|--------------------|---------------|
| Low | 2405 | -0.36 | 8.00 | PASS |
| Mid | 2440 | -0.95 | 8.00 | PASS |
| High | 2475 | -2.35 | 8.00 | PASS |

Test Plot

PPSD (CH Low)



PPSD(CH Mid)

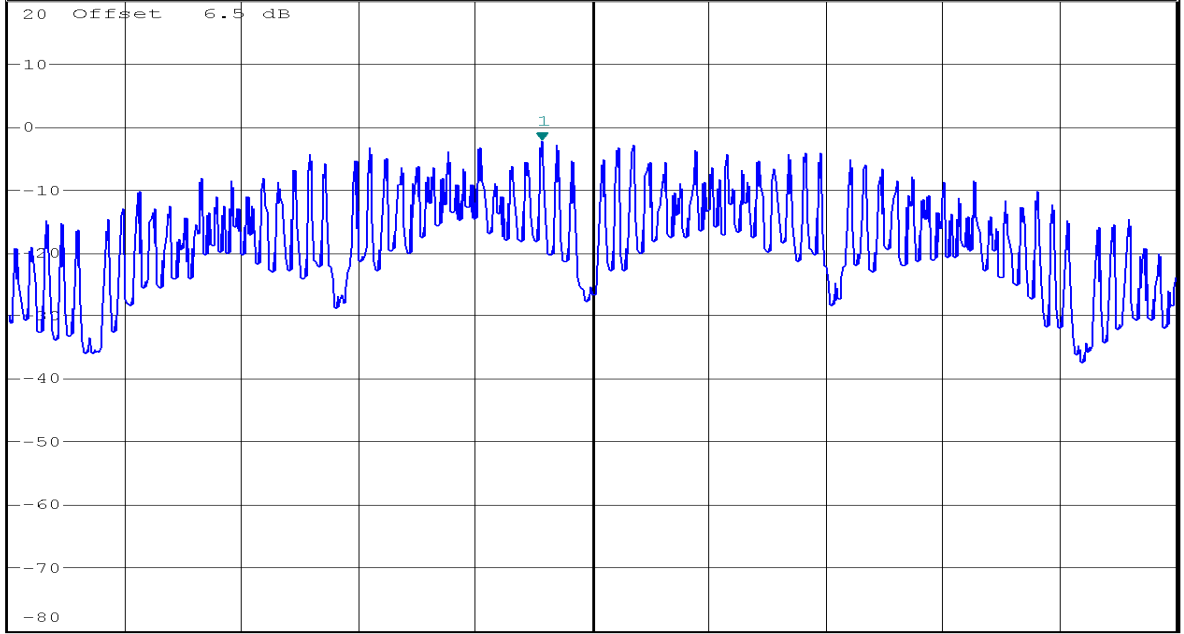


PPSD (CH High)



* RBW 3 kHz
* VBW 10 kHz
SWT 270 ms
Marker 1 [T1]
-2.35 dBm
2.474897885 GHz

Ref 20 dBm * Att 10 dB



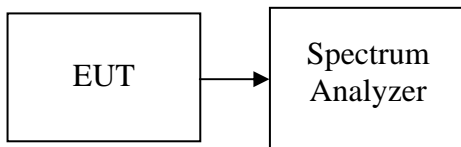
7.4.SPURIOUS EMISSIONS

Conducted Measurement

LIMIT

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator 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. 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

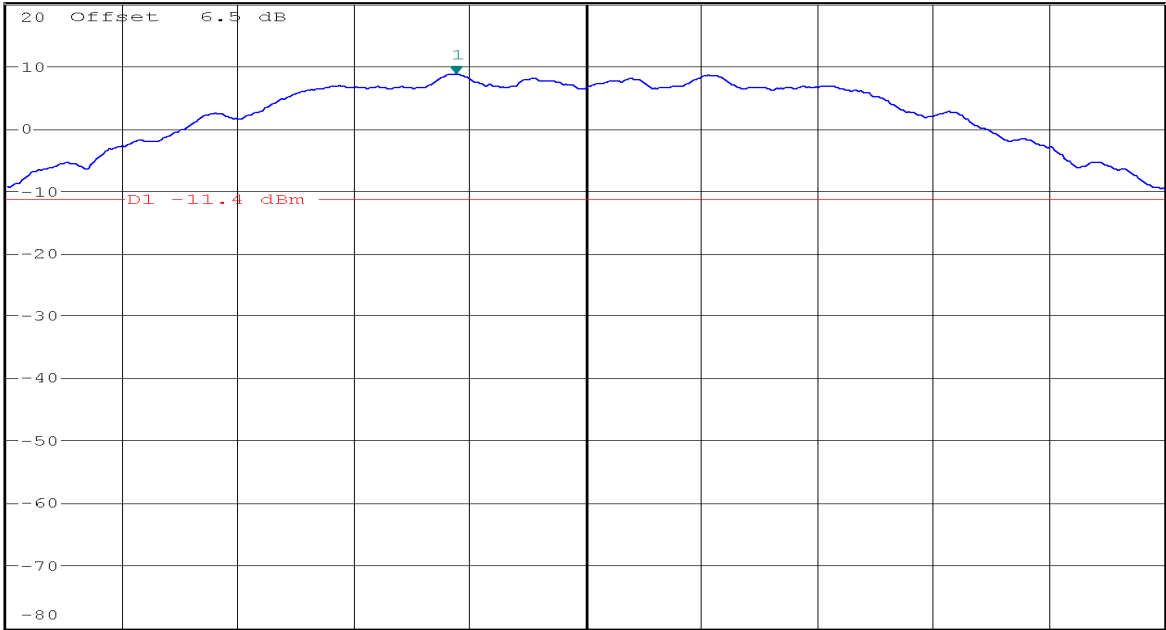
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

CH Low



Ref 20 dBm * Att 10 dB * RBW 100 kHz Marker 1 [T1]
 * VBW 300 kHz 8.60 dBm
 SWT 2.5 ms 2.404735256 GHz

1 PK
 MAXH

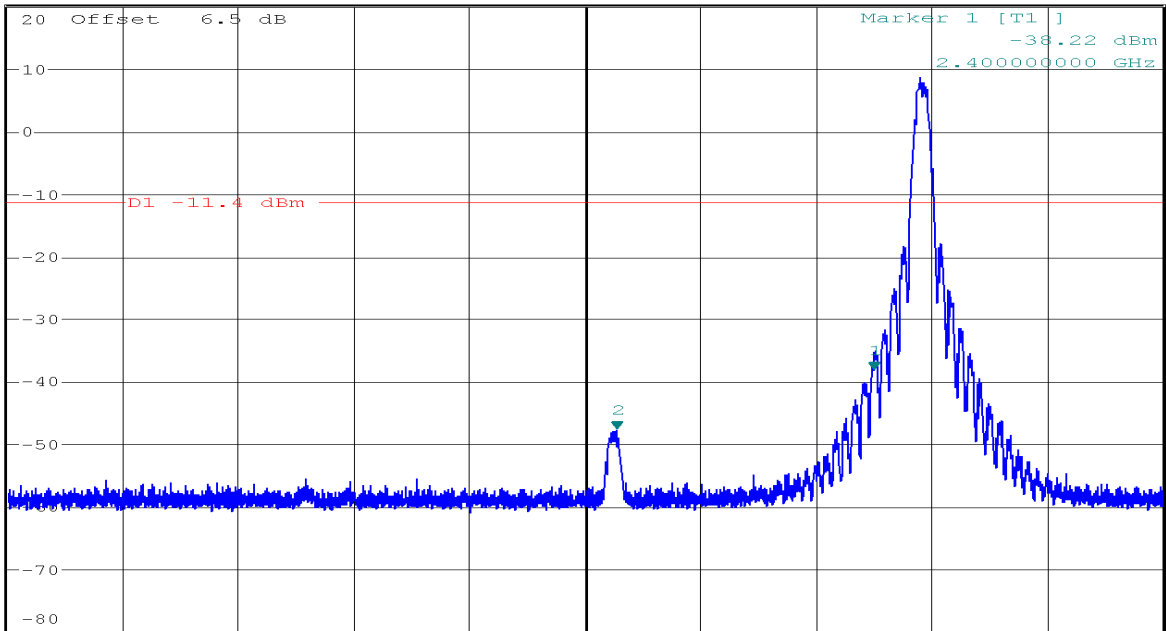


Center 2.405 GHz 236 kHz/ Span 2.36 MHz



Ref 20 dBm * Att 10 dB * RBW 100 kHz Marker 2 [T1]
 * VBW 300 kHz -47.74 dBm
 SWT 35 ms 2.373248780 GHz

1 PK
 MAXH

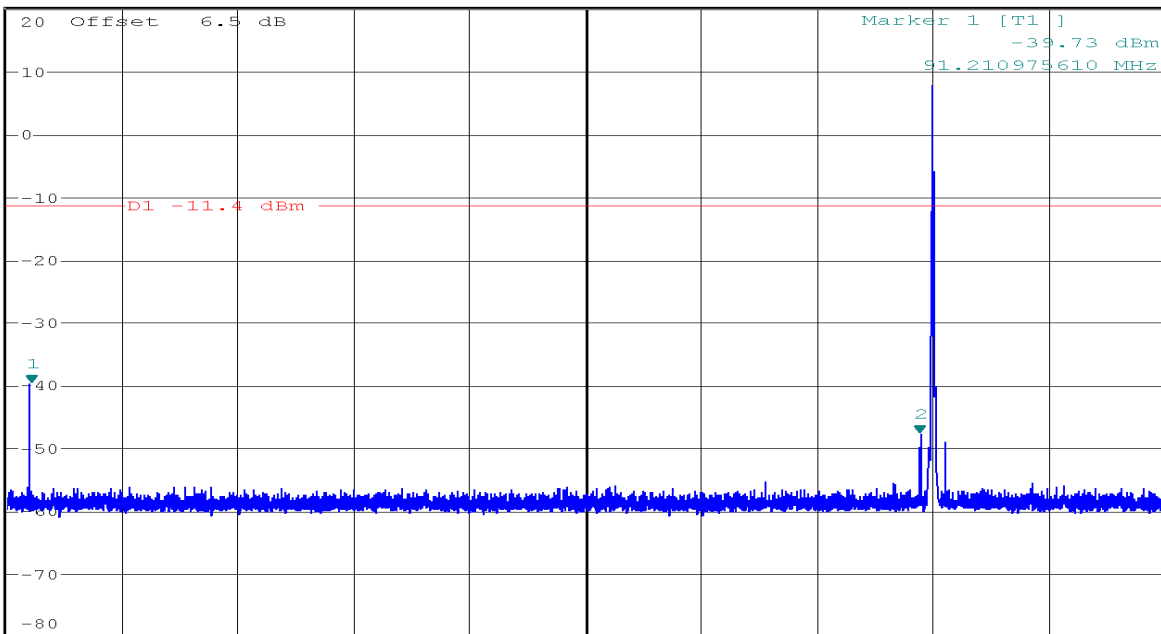


Start 2.31 GHz 12 MHz/ Stop 2.43 GHz



Ref 20 dBm * Att 10 dB * RBW 100 kHz Marker 2 [T1]
* VBW 300 kHz -47.75 dBm
SWT 300 ms 2.373402439 GHz

1 PK
MATH

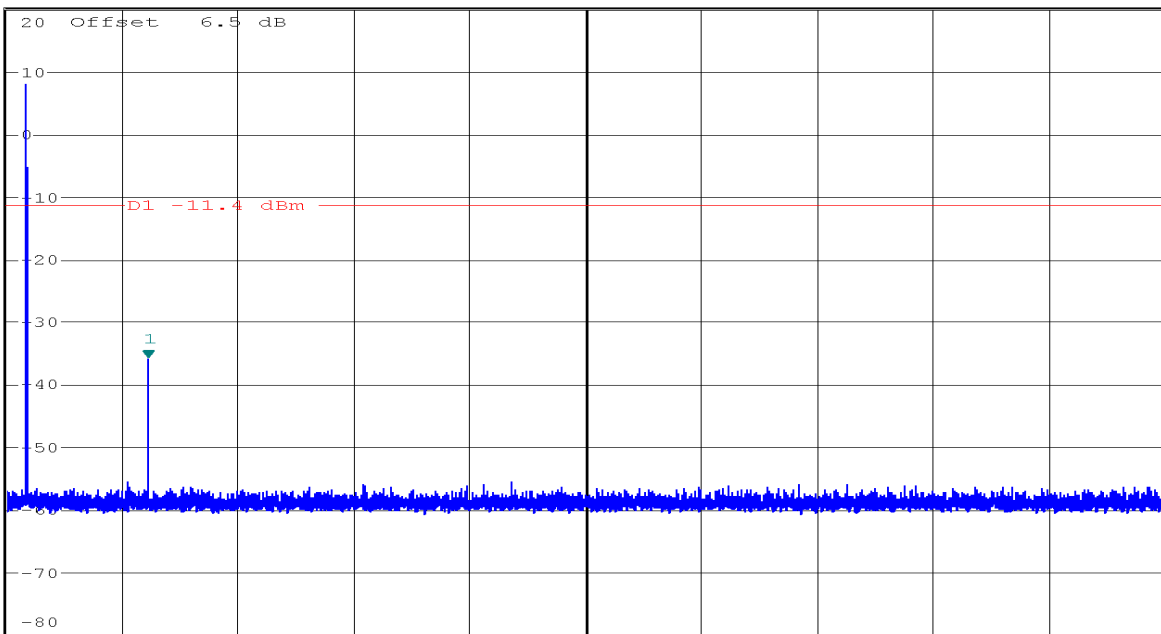


Start 30 MHz 297 MHz/ Stop 3 GHz



Ref 20 dBm * Att 10 dB * RBW 100 kHz Marker 1 [T1]
* VBW 300 kHz -36.04 dBm
SWT 2.3 s 4.807682927 GHz

1 PK
MATH



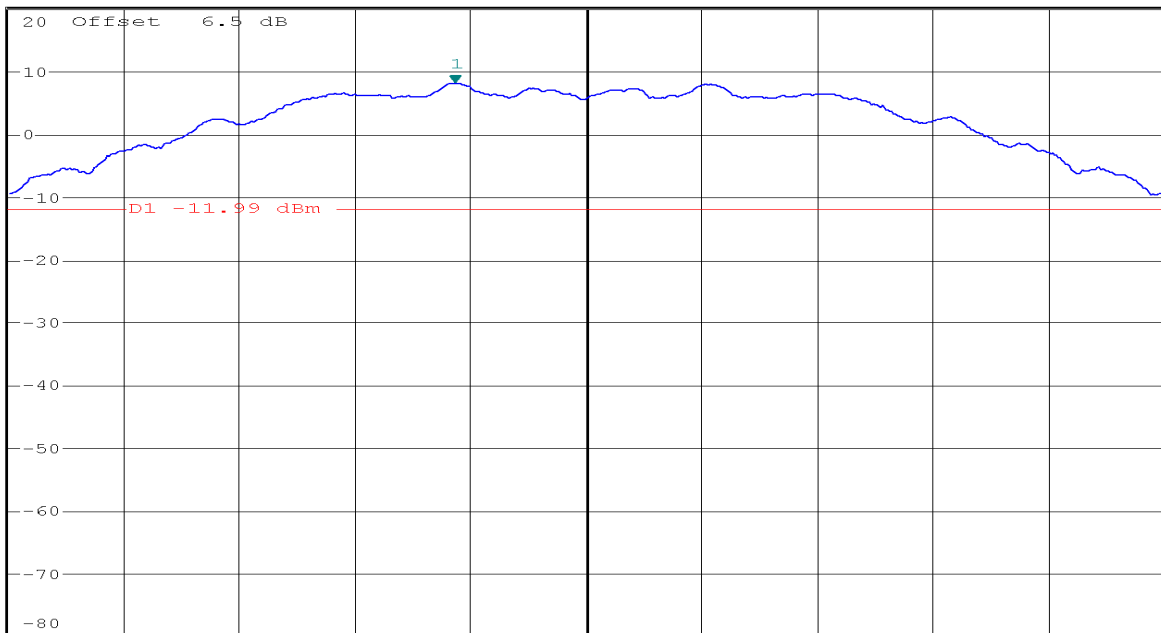
Start 2 GHz 2.3 GHz/ Stop 25 GHz

CH Mid



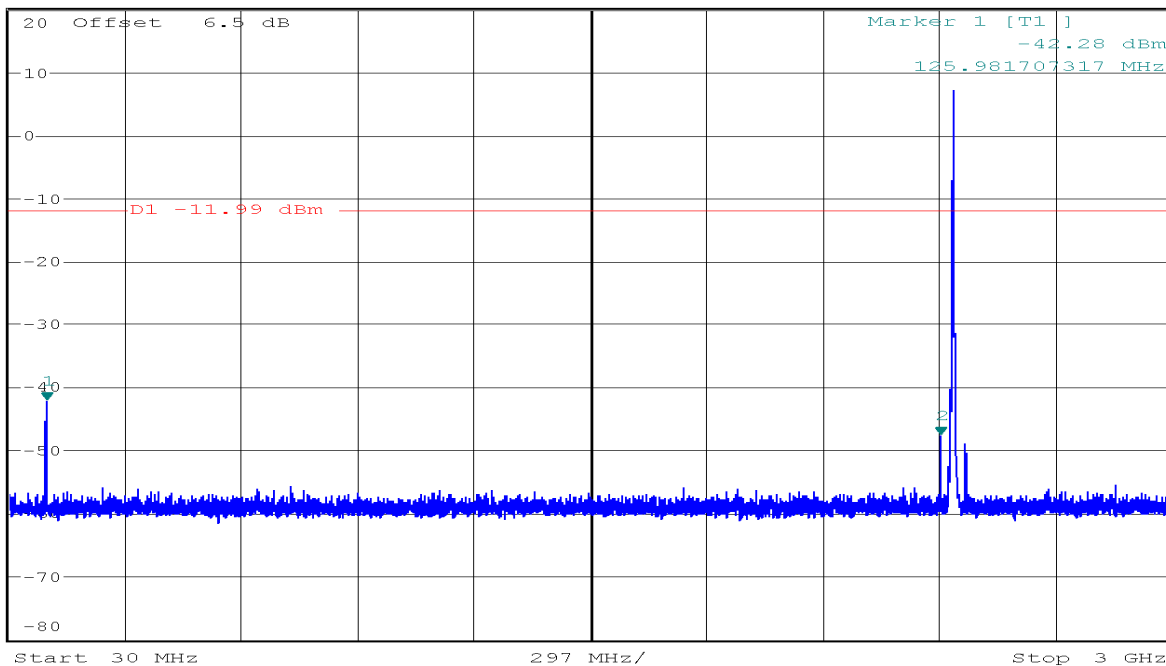
Ref 20 dBm *Att 10 dB *RBW 100 kHz Marker 1 [T1] 8.01 dBm
 *VBW 300 kHz 2.439732533 GHz
 SWT 2.5 ms

1 PK
 MATCH



Ref 20 dBm *Att 10 dB *RBW 100 kHz Marker 2 [T1] -47.71 dBm
 *VBW 300 kHz 2.408173171 GHz
 SWT 300 ms

1 PK
 MATCH



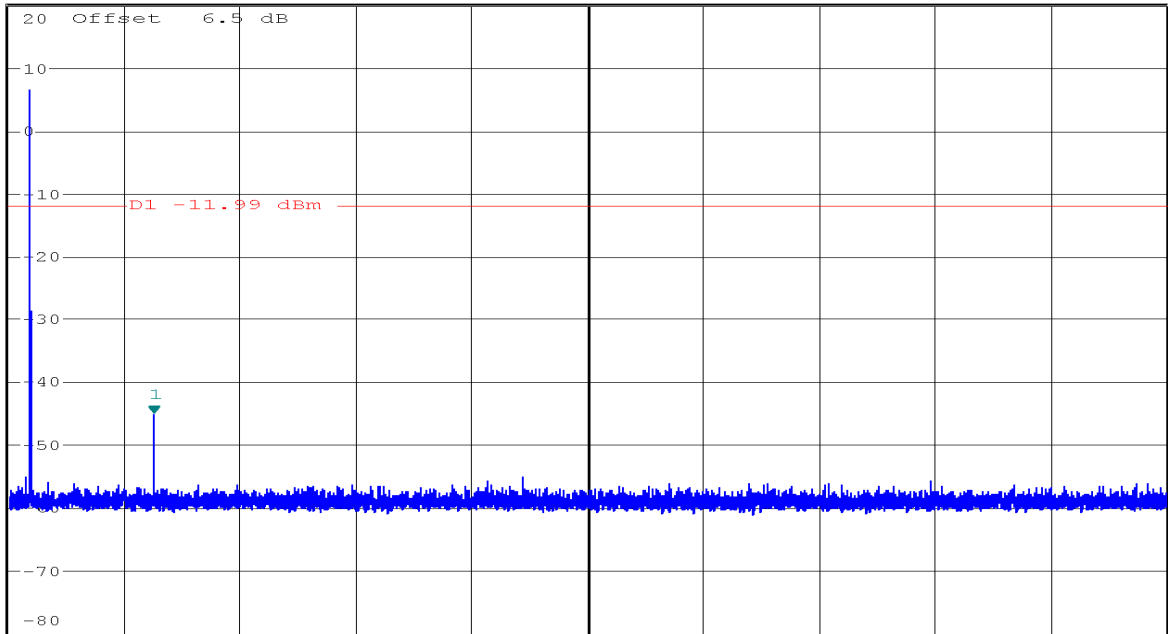


*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz -45.23 dBm
 *Att 10 dB SWT 2.3 s 4.877804878 GHz

Ref 20 dBm

*Att 10 dB

1 PK
MAGN



Start 2 GHz

2.3 GHz/

Stop 25 GHz

CH High

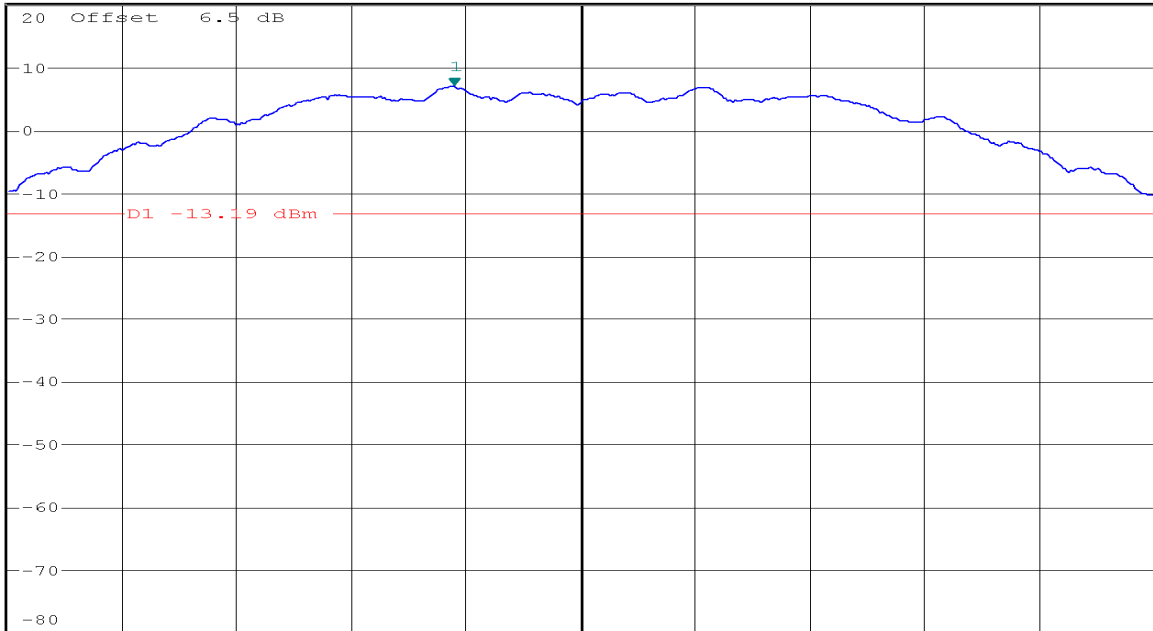


*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 6.81 dBm
 *Att 10 dB SWT 2.5 ms 2.474740400 GHz

Ref 20 dBm

*Att 10 dB

1 PK
MAGN



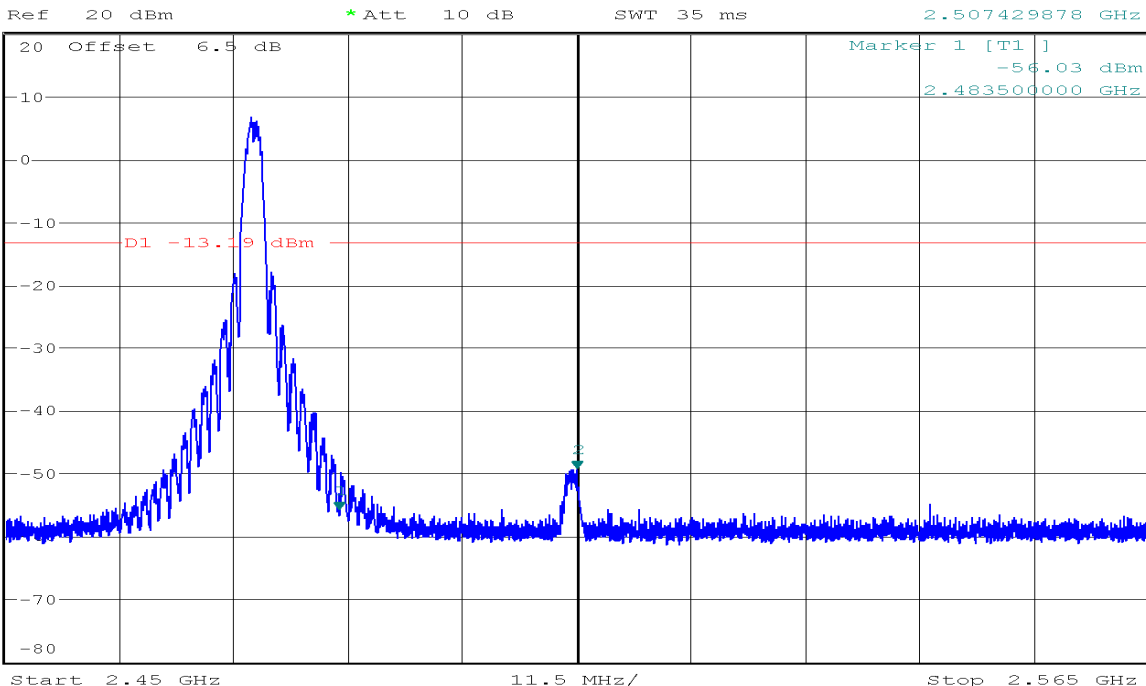
Center 2.475 GHz

236 kHz/

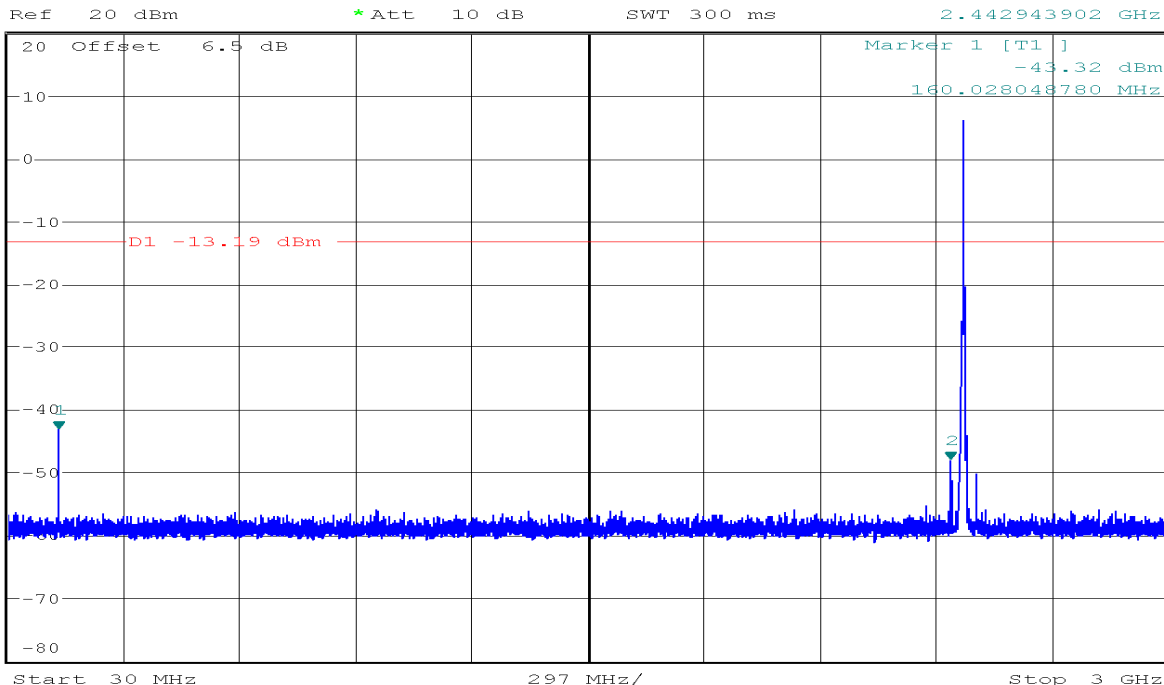
Span 2.36 MHz



* RBW 100 kHz Marker 2 [T1] -49.36 dBm
 * VBW 300 kHz 2.507429878 GHz
 * Att 10 dB SWT 35 ms



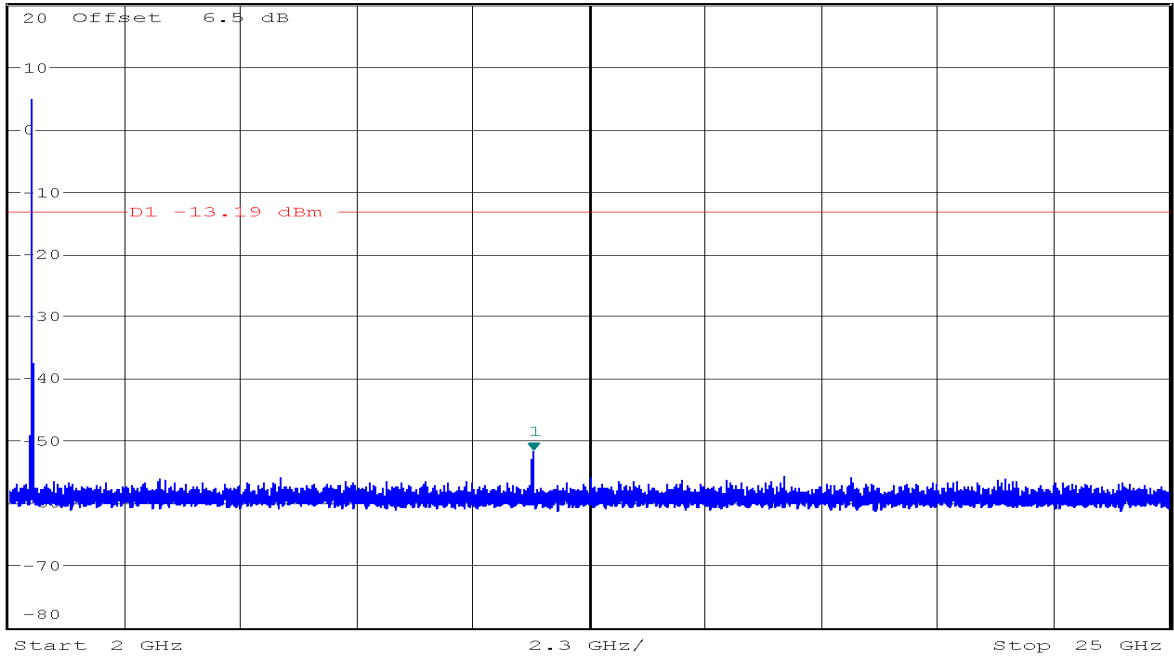
* RBW 100 kHz Marker 2 [T1] -48.16 dBm
 * VBW 300 kHz 2.442943902 GHz
 * Att 10 dB SWT 300 ms





* RBW 100 kHz Marker 1 [T1]
* VBW 300 kHz -51.77 dBm
SWT 2.3 s 12.378048780 GHz

Ref 20 dBm * Att 10 dB



7.5.RADIATED EMISSIONS

LIMIT

Radiated emissions from 9 kHz to 25 GHz were measured according to the methods defines in ANSI C63.10-2013. The EUT was placed above the ground plane, 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz. 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:

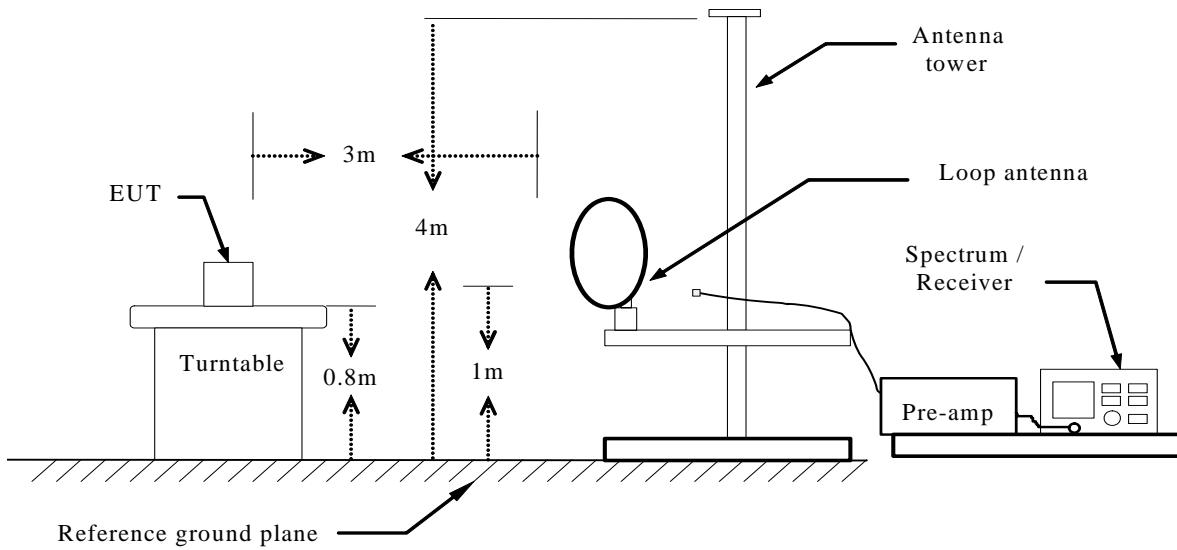
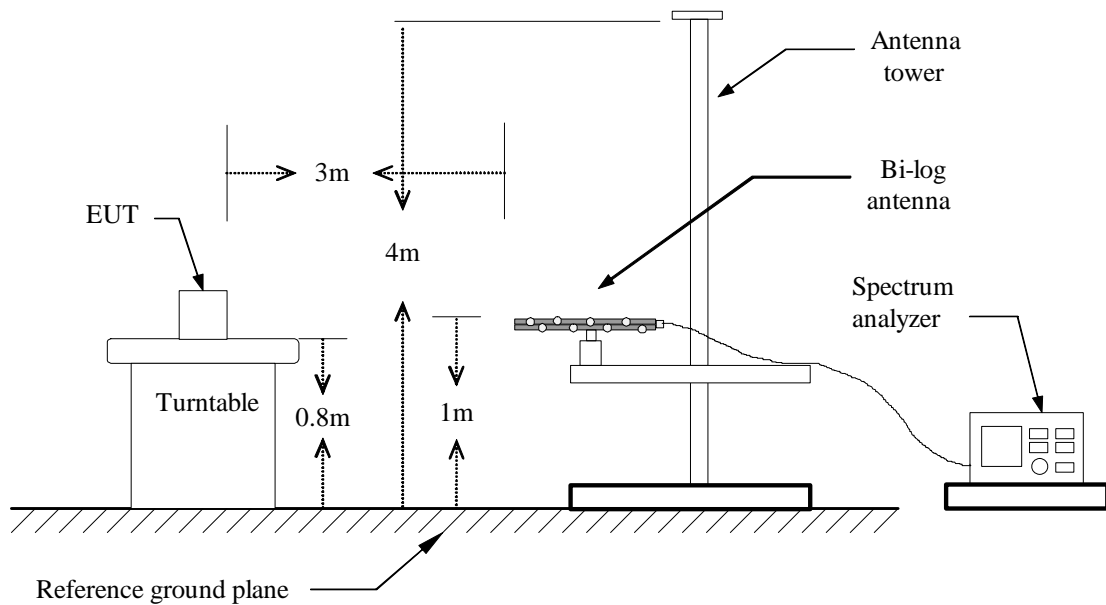
| FREQUENCIES(MHz) | FIELD STRENGTH (microvolts/meter) | MEASUREMENT DISTANCE(meters) |
|------------------|--------------------------------------|---------------------------------|
| 0.009~0.490 | 2400/F(kHz) | 300 |
| 0.490~1.705 | 24000/F(kHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

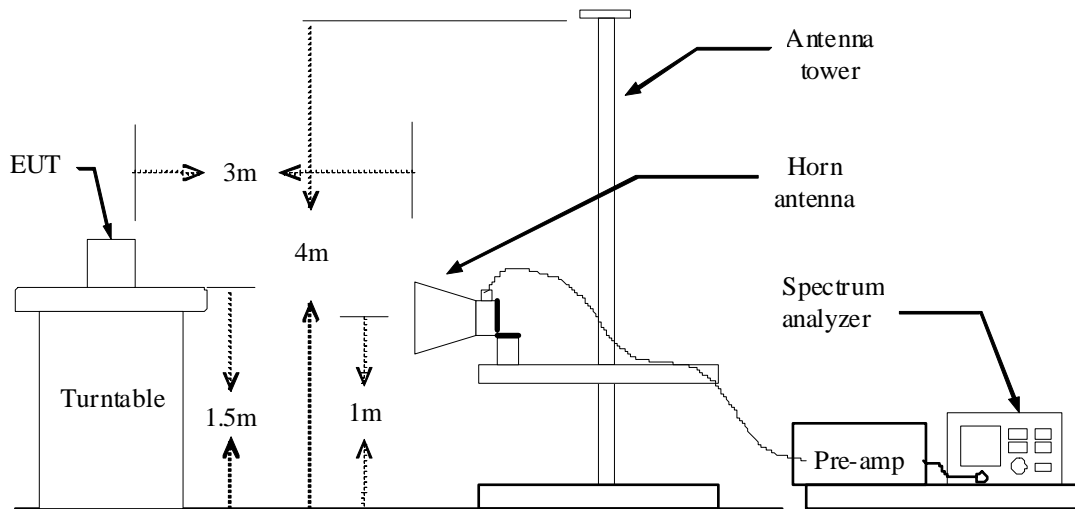
Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of 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 (μ V/m at 3-meter) | Field Strength (dB μ V/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 above ground plane, which is 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz.
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

AVERAGE: RBW=1MHz / Sweep=AUTO

VBW=10Hz,when duty cycle is no less than 98 percent.

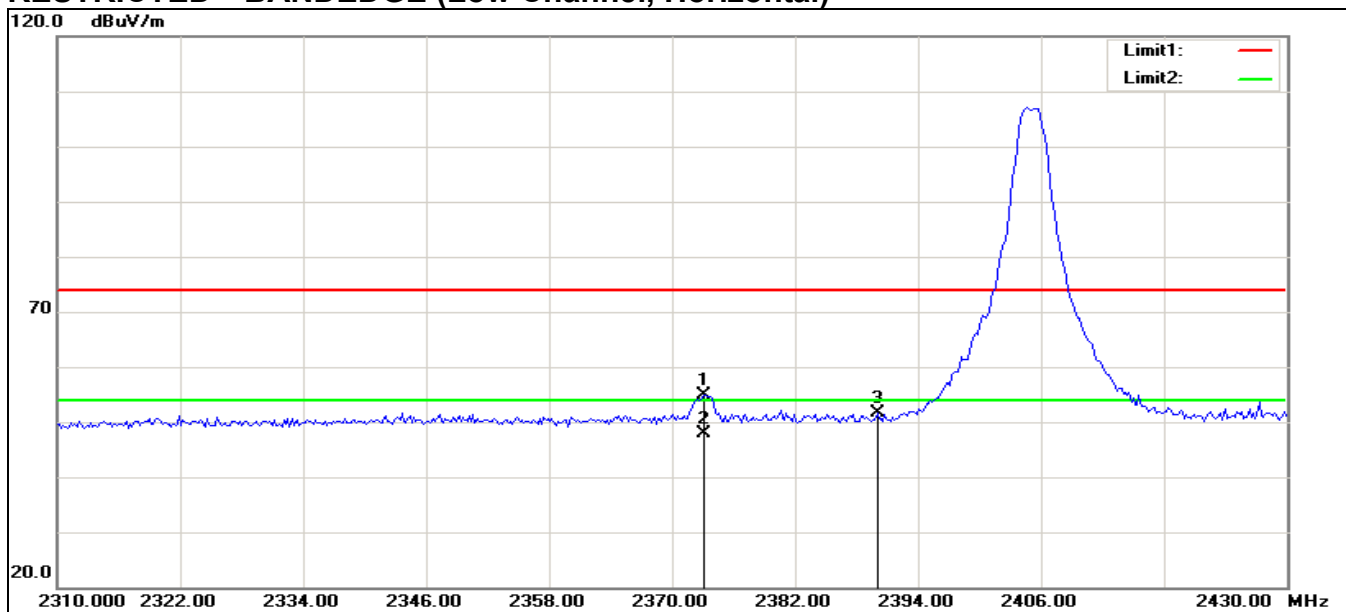
VBW ≥ 1/T,when duty cycle is less than 98 percent,where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

| Band | Duty Cycle(%) | T(ms) | 1/T(kHz) | VBW Setting |
|---------------|---------------|-------|----------|-------------|
| IEEE 802.15.4 | 100 | -- | -- | 10Hz |

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

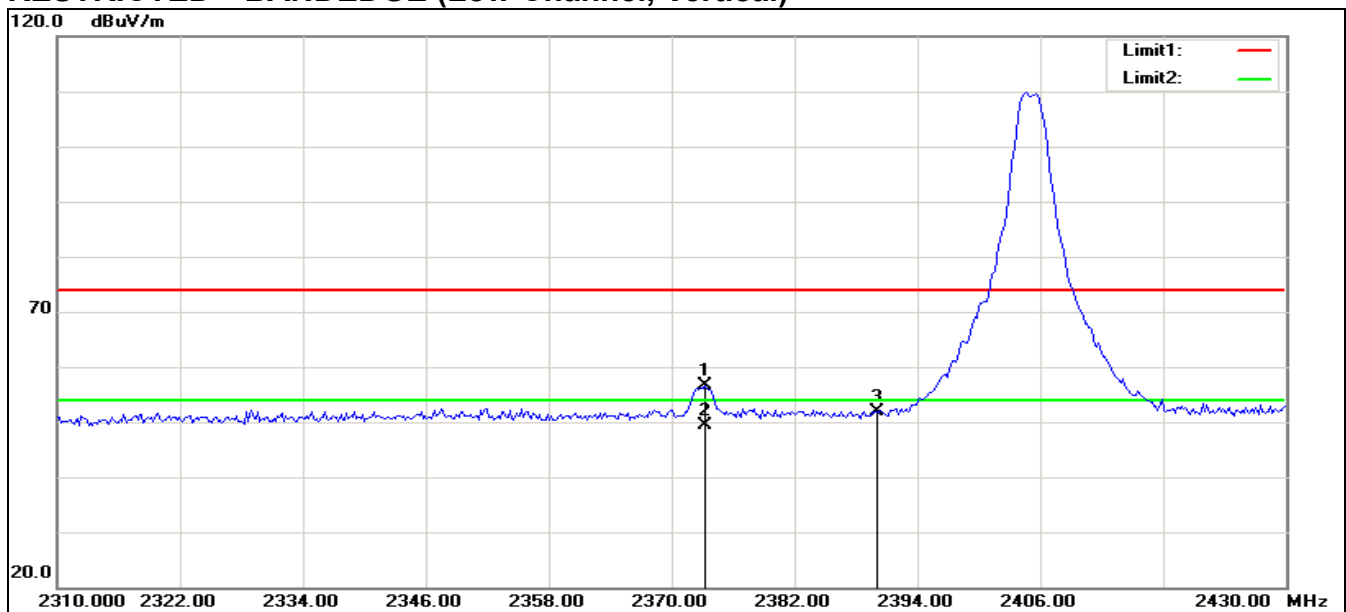
TEST RESULTS

RESTRICTED BANDEDGE (Low Channel, Horizontal)



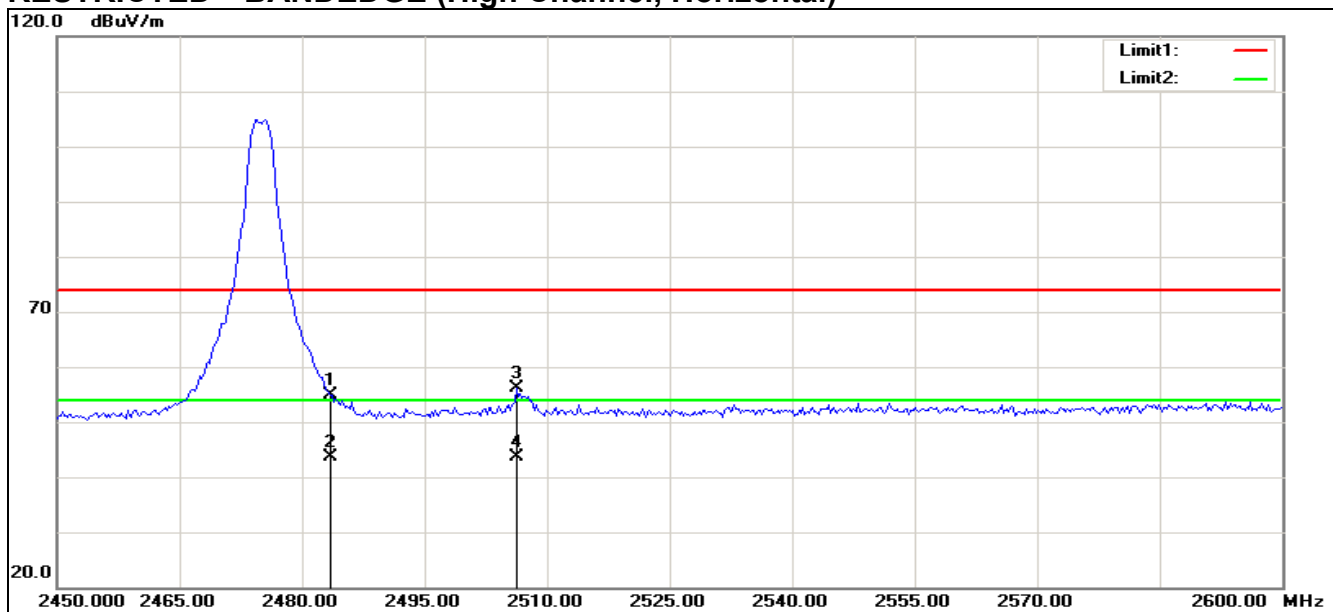
| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|-------------|---------------|--------|
| 1 | 2373.077 | 62.46 | -7.47 | 54.99 | 74.00 | -19.01 | 100 | 111 | peak |
| 2 | 2373.077 | 55.44 | -7.47 | 47.97 | 54.00 | -6.03 | 100 | 56 | AVG |
| 3 | 2390.000 | 58.96 | -7.31 | 51.65 | 74.00 | -22.35 | 100 | 236 | peak |

RESTRICTED BANDEDGE (Low Channel, Vertical)



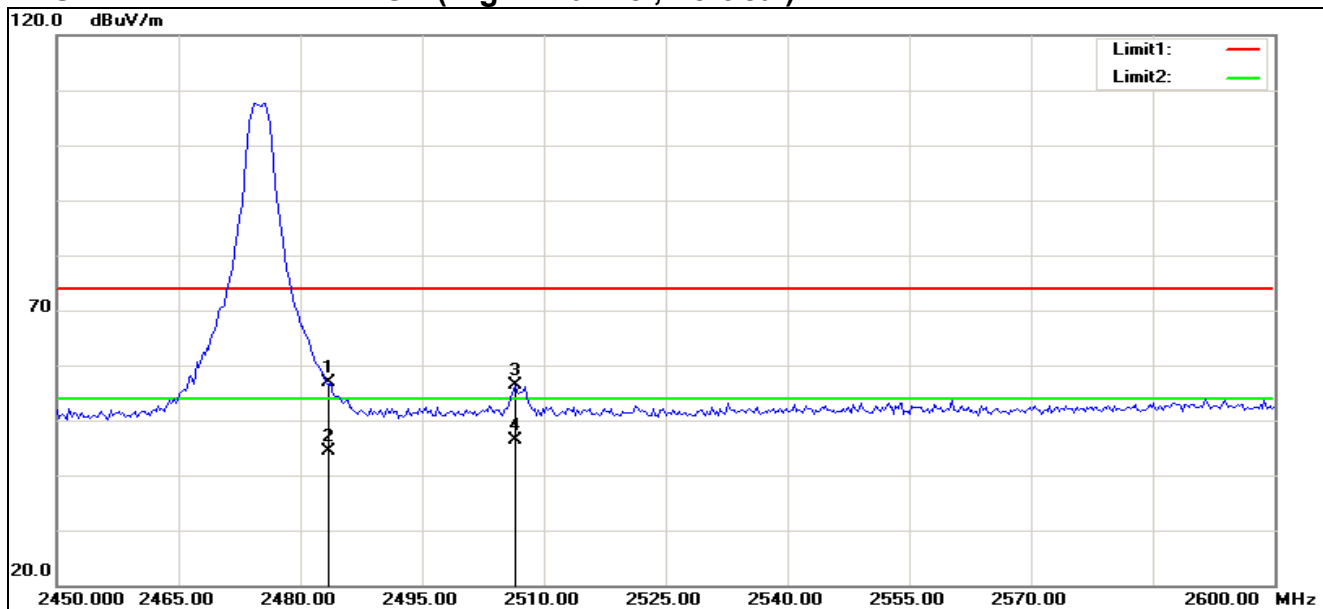
| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|-------------|---------------|--------|
| 1 | 2373.269 | 64.01 | -7.47 | 56.54 | 74.00 | -17.46 | 100 | 236 | peak |
| 2 | 2373.269 | 56.90 | -7.47 | 49.43 | 54.00 | -4.57 | 100 | 259 | AVG |
| 3 | 2390.000 | 59.25 | -7.31 | 51.94 | 74.00 | -22.06 | 100 | 251 | peak |

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 | 2483.500 | 61.34 | -6.44 | 54.90 | 74.00 | -19.10 | 100 | 167 | peak |
| 2 | 2483.500 | 49.96 | -6.44 | 43.52 | 54.00 | -10.48 | 100 | 257 | AVG |
| 3 | 2506.250 | 62.46 | -6.23 | 56.23 | 74.00 | -17.77 | 100 | 129 | peak |
| 4 | 2506.250 | 49.76 | -6.23 | 43.53 | 54.00 | -10.47 | 133 | 0 | AVG |

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 | 2483.500 | 63.34 | -6.44 | 56.90 | 74.00 | -17.10 | 200 | 195 | peak |
| 2 | 2483.500 | 50.82 | -6.44 | 44.38 | 54.00 | -9.62 | 198 | 192 | AVG |
| 3 | 2506.490 | 62.70 | -6.23 | 56.47 | 74.00 | -17.53 | 201 | 186 | peak |
| 4 | 2506.490 | 52.60 | -6.23 | 46.37 | 54.00 | -7.63 | 202 | 165 | AVG |

Test Result of Radiated Emission**Below 30MHz**

The interference of the frequency value is lower than the limit below 20 db, measured as the background noise values and will not be recorded.

30MHz-1GHz

| | | | |
|------------------------|-------------|-------------------|-------------|
| Operation Mode: | Normal Link | Test Date: | 2017-4-20 |
| Temperature: | 25°C | Tested by: | Lily.Wang |
| 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 |
|-----------------|-----------------|----------------|--------------------------|-----------------|----------------|-------------|--------|
| 141.5500 | V | 12.87 | 13.55 | 26.42 | 43.50 | -17.08 | Peak |
| 283.1700 | V | 10.48 | 16.47 | 26.95 | 46.00 | -19.05 | Peak |
| 425.7600 | V | 12.84 | 20.94 | 33.78 | 46.00 | -12.22 | Peak |
| 567.3800 | V | 11.62 | 22.66 | 34.28 | 46.00 | -11.72 | Peak |
| 709.0000 | V | 8.80 | 25.39 | 34.19 | 46.00 | -11.81 | Peak |
| 850.6200 | V | 11.24 | 25.91 | 37.15 | 46.00 | -8.85 | Peak |
| 141.5500 | H | 12.73 | 13.55 | 26.28 | 43.50 | -17.22 | Peak |
| 425.7600 | H | 6.27 | 20.94 | 27.21 | 46.00 | -18.79 | Peak |
| 567.3800 | H | 8.91 | 22.66 | 31.57 | 46.00 | -14.43 | Peak |
| 701.2400 | H | 5.47 | 25.41 | 30.88 | 46.00 | -15.12 | Peak |
| 861.2900 | H | 6.34 | 26.06 | 32.40 | 46.00 | -13.60 | Peak |
| 945.6800 | H | 5.29 | 27.37 | 32.66 | 46.00 | -13.34 | Peak |

Remark:

1. Measuring frequencies from 30 MHz to the 1GHz (No emission found between lowest internal used/generated frequency to 30 MHz).
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: 2017-5-2

Temperature: 24°C

Tested by: Lily.Wang

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 | 4813.962 | 57.71 | -5.26 | 52.45 | 54.00 | -1.55 | 198 | 211 | AVG |
| 2 | 4814.103 | 70.29 | -5.26 | 65.03 | 74.00 | -8.97 | 200 | 197 | peak |
| 3 | 7211.538 | 50.54 | 6.30 | 56.84 | 74.00 | -17.16 | 200 | 123 | peak |
| 4 | 7211.782 | 39.94 | 6.30 | 46.24 | 54.00 | -7.76 | 202 | 137 | AVG |
| 5 | 12033.654 | 43.21 | 10.42 | 53.63 | 74.00 | -20.37 | 200 | 227 | peak |
| N/A | | | | | | | | | |

Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|-------------|---------------|--------|
| 1 | 4813.866 | 54.80 | -5.26 | 49.54 | 54.00 | -4.46 | 202 | 219 | AVG |
| 2 | 4814.103 | 64.79 | -5.26 | 59.53 | 74.00 | -14.47 | 200 | 235 | peak |
| 3 | 7211.538 | 47.25 | 6.30 | 53.55 | 74.00 | -20.45 | 200 | 125 | peak |
| 4 | 9636.218 | 43.50 | 7.76 | 51.26 | 74.00 | -22.74 | 200 | 142 | peak |
| 5 | 12032.116 | 38.19 | 10.41 | 48.60 | 54.00 | -5.40 | 198 | 134 | AVG |
| 6 | 12033.654 | 46.75 | 10.42 | 57.17 | 74.00 | -16.83 | 200 | 120 | peak |

Operation Mode: TX /CH Mid

Test Date: 2017-5-2

Temperature: 24°C

Tested by: Lily.Wang

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 | 4868.590 | 67.30 | -5.22 | 62.08 | 74.00 | -11.92 | 200 | 129 | peak |
| 2 | 4868.975 | 56.51 | -5.22 | 51.29 | 54.00 | -2.71 | 198 | 234 | AVG |
| 3 | 7319.430 | 42.32 | 6.40 | 48.72 | 54.00 | -5.28 | 202 | 137 | AVG |
| 4 | 7320.513 | 51.44 | 6.40 | 57.84 | 74.00 | -16.16 | 200 | 129 | peak |
| 5 | 12197.115 | 42.44 | 11.12 | 53.56 | 74.00 | -20.44 | 200 | 239 | peak |
| N/A | | | | | | | | | |

Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|-------------|---------------|--------|
| 1 | 4868.590 | 63.95 | -5.22 | 58.73 | 74.00 | -15.27 | 200 | 12 | peak |
| 2 | 4869.975 | 53.22 | -5.22 | 48.00 | 54.00 | -6.00 | 202 | 1 | AVG |
| 3 | 7319.686 | 42.09 | 6.40 | 48.49 | 54.00 | -5.51 | 202 | 142 | AVG |
| 4 | 7320.513 | 50.94 | 6.40 | 57.34 | 74.00 | -16.66 | 200 | 126 | peak |
| 5 | 9772.436 | 45.45 | 7.93 | 53.38 | 74.00 | -20.62 | 200 | 117 | peak |
| 6 | 12197.115 | 43.32 | 11.12 | 54.44 | 74.00 | -19.56 | 200 | 90 | peak |
| 7 | 12197.115 | 35.44 | 11.12 | 46.56 | 54.00 | -7.44 | 198 | 103 | AVG |

Operation Mode: TX / CH High

Test Date: 2017-5-2

Temperature: 24°C

Tested by: Lily.Wang

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 | 4948.942 | 54.07 | -5.15 | 48.92 | 54.00 | -5.08 | 203 | 145 | AVG |
| 2 | 4950.320 | 63.92 | -5.15 | 58.77 | 74.00 | -15.23 | 200 | 150 | peak |
| 3 | 7428.750 | 42.26 | 6.50 | 48.76 | 54.00 | -5.24 | 198 | 112 | AVG |
| 4 | 7429.487 | 52.04 | 6.50 | 58.54 | 74.00 | -15.46 | 200 | 121 | peak |
| 5 | 12387.628 | 35.92 | 11.94 | 47.86 | 54.00 | -6.14 | 202 | 159 | AVG |
| 6 | 12387.820 | 42.56 | 11.95 | 54.51 | 74.00 | -19.49 | 200 | 127 | peak |

Vertical

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Height (cm) | Degree (deg.) | Remark |
|-----|-----------------|----------------|----------------------|-----------------|----------------|-------------|-------------|---------------|--------|
| 1 | 4950.320 | 58.53 | -5.15 | 53.38 | 74.00 | -20.62 | 200 | 182 | peak |
| 2 | 7429.205 | 41.12 | 6.50 | 47.62 | 54.00 | -6.38 | 147 | 217 | AVG |
| 3 | 7429.487 | 51.42 | 6.50 | 57.92 | 74.00 | -16.08 | 200 | 123 | peak |
| 4 | 9908.654 | 45.33 | 8.10 | 53.43 | 74.00 | -20.57 | 200 | 121 | peak |
| 5 | 12387.628 | 36.07 | 11.94 | 48.01 | 54.00 | -5.99 | 202 | 106 | AVG |
| 6 | 12387.820 | 44.22 | 11.95 | 56.17 | 74.00 | -17.83 | 200 | 91 | peak |

7.6.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 μ H/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 (dB μ V) | |
|--------------------------|------------------------|-----------|
| | 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.

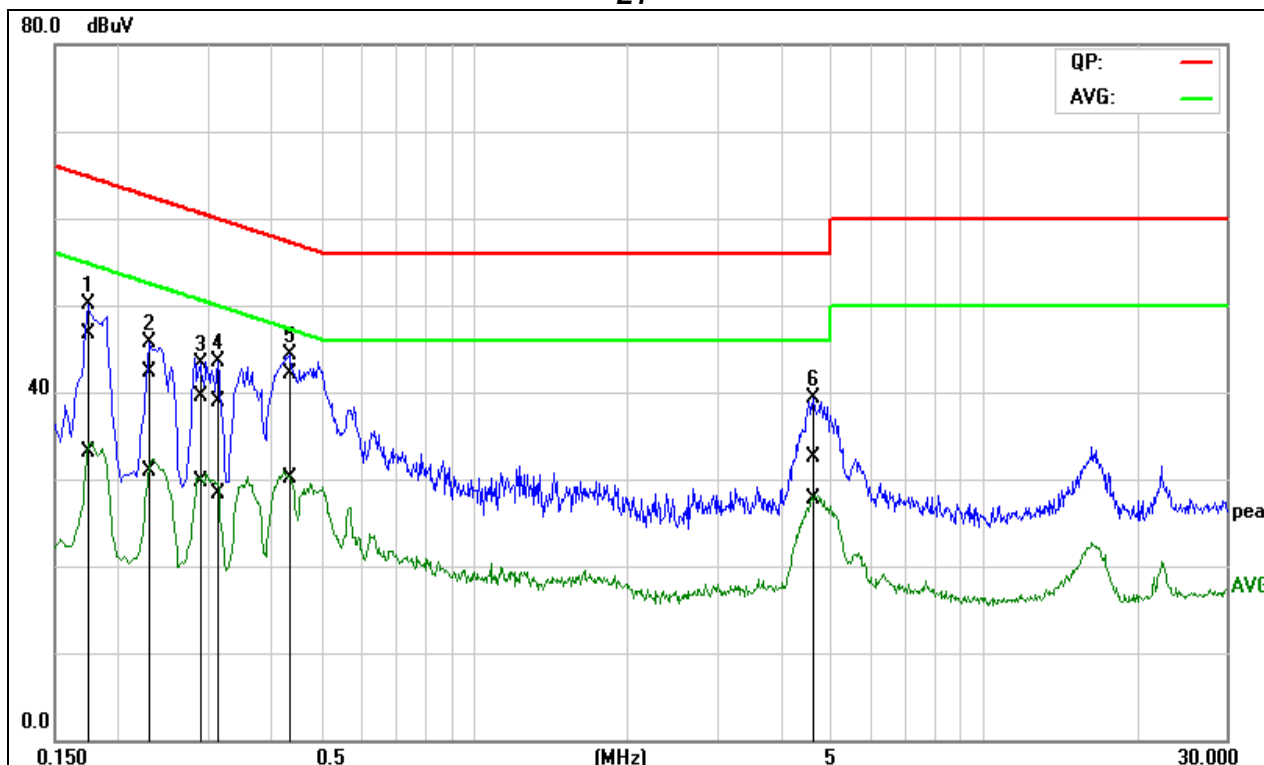
TEST RESULTS

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.: | C170411E02 | Date: | 2017-4-20 |
| Model No.: | MSDK6149 | Time: | 9:24:15 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L1 | Test Voltage: | AC 120V/60Hz |
| Model: | | Description: | |

L1

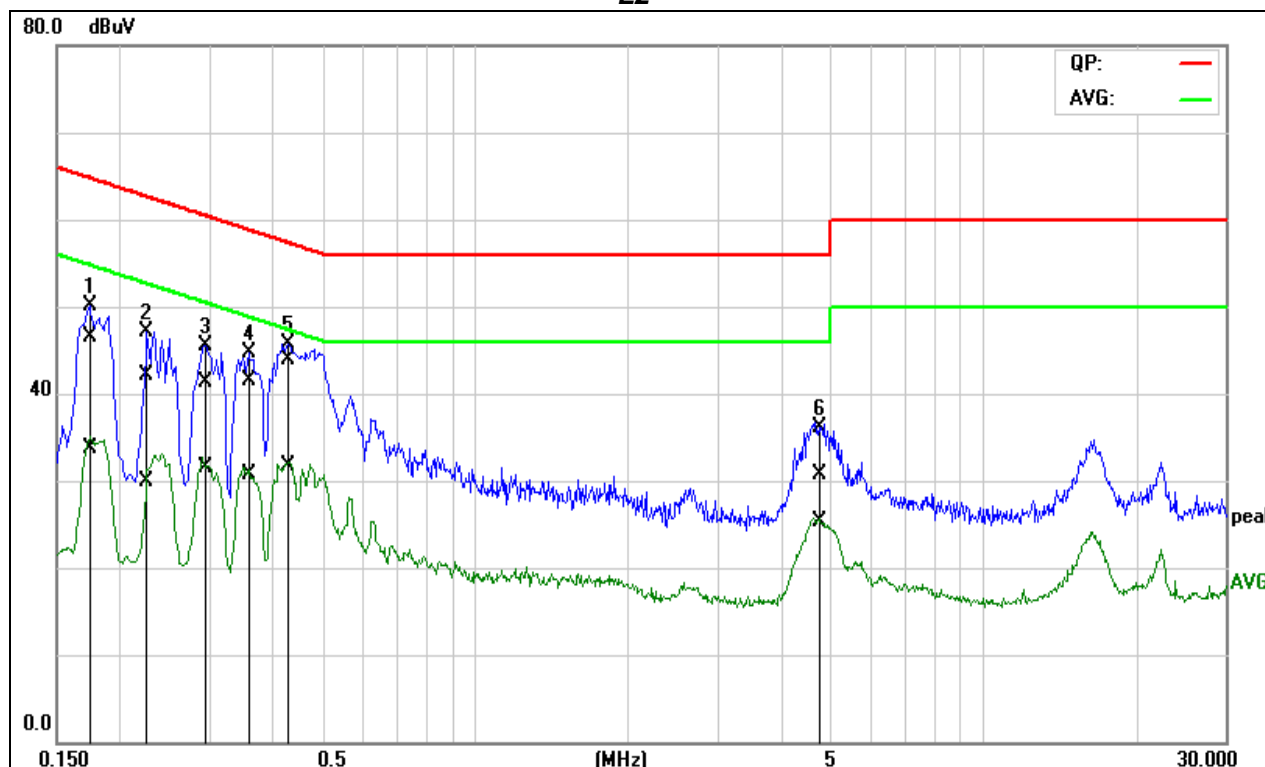


| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|-----|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------|
| 1 | 0.1751 | 26.20 | 12.54 | 20.55 | 46.75 | 33.09 | 64.71 | 54.71 | -17.96 | -21.62 | Pass |
| 2 | 0.2305 | 21.77 | 10.51 | 20.47 | 42.24 | 30.98 | 62.43 | 52.43 | -20.19 | -21.45 | Pass |
| 3 | 0.2859 | 18.96 | 9.12 | 20.50 | 39.46 | 29.62 | 60.64 | 50.64 | -21.18 | -21.02 | Pass |
| 4 | 0.3145 | 18.29 | 7.76 | 20.54 | 38.83 | 28.30 | 59.85 | 49.85 | -21.02 | -21.55 | Pass |
| 5* | 0.4302 | 21.60 | 9.61 | 20.51 | 42.11 | 30.12 | 57.25 | 47.25 | -15.14 | -17.13 | Pass |
| 6 | 4.6306 | 11.98 | 7.13 | 20.59 | 32.57 | 27.72 | 56.00 | 46.00 | -23.43 | -18.28 | Pass |

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

| | | | |
|------------|-----------------|-------------------|--------------|
| Job No.: | C170411E02 | Date: | 2017-4-20 |
| Model No.: | MSDK6149 | Time: | 9:19:12 |
| Standard: | FCC Class B | Temp.(C)/Hum.(%): | 22(C)/48% |
| Test item: | Conduction test | Test By: | Lily.Wang |
| Line: | L2 | Test Voltage: | AC 120V/60Hz |
| Model: | | Description: | |

L2



| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|-----|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------|
| 1 | 0.1729 | 26.10 | 13.39 | 20.38 | 46.48 | 33.77 | 64.82 | 54.82 | -18.34 | -21.05 | Pass |
| 2 | 0.2258 | 21.67 | 9.57 | 20.42 | 42.09 | 29.99 | 62.60 | 52.60 | -20.51 | -22.61 | Pass |
| 3 | 0.2918 | 20.87 | 11.02 | 20.45 | 41.32 | 31.47 | 60.47 | 50.47 | -19.15 | -19.00 | Pass |
| 4 | 0.3543 | 20.97 | 10.21 | 20.47 | 41.44 | 30.68 | 58.86 | 48.86 | -17.42 | -18.18 | Pass |
| 5* | 0.4277 | 23.55 | 11.24 | 20.45 | 44.00 | 31.69 | 57.30 | 47.30 | -13.30 | -15.61 | Pass |
| 6 | 4.7451 | 10.02 | 4.49 | 20.73 | 30.75 | 25.22 | 56.00 | 46.00 | -25.25 | -20.78 | Pass |

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

Remark:

1. The measuring frequencies range between 0.15 MHz and 30 MHz.
2. The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.
3. “---” denotes the emission level was or more than 2dB below the Average limit, and no re-check was made.
4. The IF bandwidth of SPA between 0.15MHz and 30MHz was 10KHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9kHz.

END OF REPORT