**SGS-CSTC Standards Technical Services Co., Ltd.**
**Guangzhou Branch**

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# *TEST REPORT*

| | |
|---|---|
| **Application No.**: | GZEM1805002734CR |
| **Applicant:** | Berlin Brands Group Inc |
| **Address of Applicant:** | 101 Montgomery Street, Suite 2050 in San Francisco, CA 94104 |
| **Manufacturer:** | Guangdong Shunde Detlone Electrical Appliance Co., Ltd |
| **Address of Manufacturer:** | 9 Zhian North Road, Junan, Shunde, Foshan, Guangdong, China |
| **Factory:** | Guangdong Shunde Detlone Electrical Appliance Co., Ltd |
| **Address of Factory:** | 9 Zhian North Road, Junan, Shunde, Foshan, Guangdong, China |
| **Equipment Under Test (EUT):** | |
| **FCC ID: 2AMNHHA-04A-S** | |
| **EUT Name:** | Roaster |
| **Model No.:** | HA-04A-S |
| **Standard(s) :** | 47 CFR Part 15, Subpart C 15.247 |
| **Date of Receipt:** | 2018-05-28 |
| **Date of Test:** | 2018-06-22 to 2018-07-20 |
| **Date of Issue:** | 2018-07-25 |
| **Test Result:** | **Pass*** |

* In the configuration tested, the EUT complied with the standards specified above.

Kobe Jian
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| 01 | | 2018-07-25 | | Original |
| | | | | |
| | | | | |
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| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| **Tested By** | | Lily Kuang<br>**Lily_Kuang /Project Engineer** | | 2018-06-22 to 2018-07-20<br>**Date** |
| **Checked By** | | Riday Liu<br>**Ricky_Liu /Reviewer** | | 2018-07-25<br>**Date** |

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# 2 Test Summary

| Radio Spectrum Technical Requirement | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Antenna Requirement | 47 CFR Part 15, Subpart C 15.247 | N/A | 47 CFR Part 15, Subpart C 15.203 & 15.247(c) | Pass |

| Radio Spectrum Matter Part | | | | |
|---|---|---|---|---|
| **Item** | **Standard** | **Method** | **Requirement** | **Result** |
| Conducted Emissions at AC Power Line (150kHz-30MHz) | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.2 | 47 CFR Part 15, Subpart C 15.207 | Pass |
| Minimum 6dB Bandwidth | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.8.1 | 47 CFR Part 15, Subpart C 15.247a(2) | Pass |
| Conducted Peak Output Power | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.9.1 | 47 CFR Part 15, Subpart C 15.247(b)(3) | Pass |
| Power Spectrum Density | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.10.2 | 47 CFR Part 15, Subpart C 15.247(e) | Pass |
| Conducted Band Edges Measurement | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.13.3.2 | 47 CFR Part 15, Subpart C 15.247(d) | Pass |
| Conducted Spurious Emissions | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 11.11 | 47 CFR Part 15, Subpart C 15.247(d) | Pass |
| Radiated Emissions which fall in the restricted bands | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.10.5 | 47 CFR Part 15, Subpart C 15.209 & 15.247(d) | Pass |
| Radiated Spurious Emissions | 47 CFR Part 15, Subpart C 15.247 | ANSI C63.10 (2013) Section 6.4,6.5,6.6 | 47 CFR Part 15, Subpart C 15.209 & 15.247(d) | Pass |

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# 4 General Information

## 4.1 Details of E.U.T.

| | |
|---|---|
| Antenna Type | integrated |
| Channel Spacing | 5MHz |
| Modulation Type | 802.11b: DSSS (CCK, DQPSK, DBPSK) |
| | 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Number of Channels | 802.11b/g/n(HT20):11 |
| Operation Frequency | 802.11b/g/n(HT20): 2412MHz to 2462MHz |
| Antenna Gain | 0 dBi |
| Power Supply: | AC 100-120V,60Hz |

## 4.2 Description of Support Units

The EUT has been tested as an independent unit.

## 4.3 Measurement Uncertainty

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Radio Frequency | ±5.5 x 10-8 |
| 2 | Duty cycle | ±0.57% |
| 3 | Occupied Bandwidth | ±3% |
| 4 | RF Conducted power | ±0.68dB |
| 5 | RF Power Density | ±1.50dB |
| 6 | Conducted Spurious Emissions | ±1.04dB |
| 7 | RF Radiated Power | ±4.5dB (below 1GHz) |
| 8 | RF Radiated Power | ±4.8dB (above 1GHz) |
| | Radiated Spurious Emission Test | ±4.5dB (30MHz-1GHz) |
| 9 | Radiated Spurious Emission Test | ±4.8dB (1GHz-18GHz) |
| | Temperature | ±0.4°C |
| 10 | Humidity | ±1.3% |
| 11 | Supply Voltages | ±1.5% |
| 12 | Time | ±3% |

## 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

198 Kezhu Road, Scientech Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

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## 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our NVLAP accreditation.

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2006 accreditation criteria for testing laboratories (identical to

ISO/IEC 17025:2005 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized 2.948 Listed Test Firm(Registration No.: 282399)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 282399, May 31, 2002.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818, Jul 13, 2017.

- **Industry Canada (Registration No.: 4620B-1)**

The 3m/10m Alternate Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Certification and Engineering of Industry Canada for radio equipment testing with Registration No. 4620B-1.

- **VCCI (Registration No.: R-2460, C-2584, G-449 and T-1179)**

The 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2460, C-2584，G-449 and T-1179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2005, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.

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## 4.6 Deviation from Standards

None

## 4.7 Abnormalities from Standard Conditions

None

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# 5 Equipment List

| Conducted Emissions at at AC Power Line | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| Shielding Room | Zhong Yu | 8m x 3m x 3.8m | EMC0306 | N/A | N/A |
| Two-Line V-Netwok | R&S | ENV216 | EMC0118 | 2018-01-19 | 2019-01-18 |
| LISN | SCHAFFNER CHASE | MN2050D/1 | EMC0102 | 2017-09-20 | 2018-09-19 |
| EMI Test Receiver | Rohde & Schwarz | ESCS30 | EMC0506 | 2017-11-27 | 2018-11-26 |
| Coaxial Cable | HangTianXing | 2m | EMC0107 | 2017-07-23 | 2019-07-22 |
| Voltage Probe | SGS | N/A | EMC0106 | 2018-04-04 | 2020-04-03 |
| Conical Metal Housing | SGS-EMC | N/A | EMC0167 | 2018-04-19 | 2020-04-18 |
| Test Software E3c | Audix | Ver. 5.4.1221b | GZE100-62 | N/A | N/A |

| Minimum 6dB Bandwidth | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer | AgilentTechnologies | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2018-04-04 | 2020-04-03 |
| Test Software JS1120-3 | HangTianXing | V2.6 | GZE100-69 | N/A | N/A |

| Conducted Peak Output Power | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer | AgilentTechnologies | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2018-04-04 | 2020-04-03 |
| Test Software JS1120-3 | HangTianXing | V2.6 | GZE100-69 | N/A | N/A |

| Power Spectrum Density | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer | AgilentTechnologies | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2018-04-04 | 2020-04-03 |
| Test Software JS1120-3 | HangTianXing | V2.6 | GZE100-69 | N/A | N/A |

| Conducted Band Edges Measurement | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| MXA Signal Analyzer | AgilentTechnologies | N9020A | SEM004-10 | 2018-03-10 | 2019-03-09 |
| ESG Vector Signal Generator | Keysight | E4438C | SEM006-03 | 2018-04-10 | 2019-04-10 |

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| | | | | | |
|---|---|---|---|---|---|
| EXG Analog Signal Generator | AgilentTechnologies | N5171B | SEM006-04 | 2017-07-26 | 2020-07-25 |
| Power Meter | AgilentTechnologies | U2021XA_Ch2 | SEM009-02 | 2017-09-19 | 2018-09-18 |
| Power Meter | AgilentTechnologies | U2021XA_Ch3 | SEM009-03 | 2017-09-19 | 2018-09-18 |
| EXA Signal Analzer | AgilentTechnologies | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2018-04-04 | 2020-04-03 |
| Test Software JS1120-3 | HangTianXing | V2.6 | GZE100-69 | N/A | N/A |

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| Conducted Spurious Emissions | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EXA Signal Analzer | AgilentTechnologies | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| 6dB Attenuator | HP | 8491A | EMC2062 | 2018-04-04 | 2020-04-03 |
| Test Software JS1120-3 | HangTianXing | V2.6 | GZE100-69 | N/A | N/A |

| Radiated Emissions which fall in the restricted bands | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EMI Test Receiver | Rohde & Schwarz | ESIB26 | EMC0522 | 2018-01-19 | 2019-01-18 |
| EMI Test Receiver | Rohde & Schwarz | ESCI | EMC0056 | 2018-01-19 | 2019-01-18 |
| Chamber cable | HangTianXing | N/A | EMC0542 | 2017-06-30 | 2019-06-30 |
| Trilog Broadband Antenna 30MHz-1GHz | SCHWARZBECKMESS-ELEKTRONIK | VULB 9160 | EMC2025 | 2016-09-08 | 2019-09-07 |
| Bi-log Type Antenna | Schaffner -Chase | CBL6112B | EMC0524 | 2016-09-08 | 2019-09-07 |
| Bi-log Type Antenna | Schaffner -Chase | CBL6143 | EMC0519 | 2017-05-04 | 2020-05-03 |
| Horn Antenna 1GHz-18GHz | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | EMC2026 | 2016-09-09 | 2019-09-08 |
| 1GHz-26.5 GHz Pre-Amplifier | Agilent | 8449B | EMC0521 | 2018-01-08 | 2019-01-07 |
| Amplifier | HP | 8447F | EMC2065 | 2018-06-01 | 2019-05-31 |
| Pre-Amplifier MH648A | ANRITSU CORP | MH648A | EMC2086 | 2017-11-20 | 2018-11-19 |
| Active Loop Antenna | EMCO | 6502 | EMC0523 | 2018-02-24 | 2019-02-23 |
| High Pass Filter(915MHz) | FSY MICROWAVE | HM1465-9SS | EMC2079 | 2018-01-19 | 2019-01-18 |
| 2.4GHz Filter | Micro-Tronics | BRM 50702 | EMC2069 | 2018-01-08 | 2019-01-07 |
| 10m Semi-Anechoic Chamber | ETS | N/A | EMC0530 | 2017-06-18 | 2019-06-18 |
| 966 Anechoic Chamber | C.R.T | 9m x 6m x 6m | EMC2142 | 2017-11-29 | 2018-11-28 |
| MXE EMI Receiver | Keysight | N9038A | EMC2139 | 2017-11-15 | 2018-11-14 |
| EXA Signal Analyzer | Keysight | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| Test Software E3 | Audix | Ver.6.120110a | GZE100-61 | N/A | N/A |

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| Radiated Spurious Emissions | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| EMI Test Receiver | Rohde & Schwarz | ESIB26 | EMC0522 | 2018-01-19 | 2019-01-18 |
| EMI Test Receiver | Rohde & Schwarz | ESCI | EMC0056 | 2018-01-19 | 2019-01-18 |
| Chamber cable | HangTianXing | N/A | EMC0542 | 2017-06-30 | 2019-06-30 |
| Trilog Broadband Antenna 30MHz-1GHz | SCHWARZBECKMESS-ELEKTRONIK | VULB 9160 | EMC2025 | 2016-09-08 | 2019-09-07 |
| Bi-log Type Antenna | Schaffner -Chase | CBL6112B | EMC0524 | 2016-09-08 | 2019-09-07 |
| Bi-log Type Antenna | Schaffner -Chase | CBL6143 | EMC0519 | 2017-05-04 | 2020-05-03 |
| Horn Antenna 1GHz-18GHz | SCHWARZBECK MESS-ELEKTRONIK | BBHA 9120D | EMC2026 | 2016-09-09 | 2019-09-08 |
| 1GHz-26.5 GHz Pre-Amplifier | Agilent | 8449B | EMC0521 | 2018-01-08 | 2019-01-07 |
| Amplifier | HP | 8447F | EMC2065 | 2018-06-01 | 2019-05-31 |
| Pre-Amplifier MH648A | ANRITSU CORP | MH648A | EMC2086 | 2017-11-20 | 2018-11-19 |
| Active Loop Antenna | EMCO | 6502 | EMC0523 | 2018-02-24 | 2019-02-23 |
| High Pass Filter(915MHz) | FSY MICROWAVE | HM1465-9SS | EMC2079 | 2018-01-19 | 2019-01-18 |
| 2.4GHz Filter | Micro-Tronics | BRM 50702 | EMC2069 | 2018-01-08 | 2019-01-07 |
| 10m Semi-Anechoic Chamber | ETS | N/A | EMC0530 | 2017-06-18 | 2019-06-18 |
| 966 Anechoic Chamber | C.R.T | 9m x 6m x 6m | EMC2142 | 2017-11-29 | 2018-11-28 |
| MXE EMI Receiver | Keysight | N9038A | EMC2139 | 2017-11-15 | 2018-11-14 |
| EXA Signal Analyzer | Keysight | N9010A | EMC2138 | 2017-11-15 | 2018-11-14 |
| Test Software E3 | Audix | Ver.6.120110a | GZE100-61 | N/A | N/A |

| General used equipment | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model No** | **Inventory No** | **Cal Date** | **Cal Due Date** |
| DMM | Fluke | 73 | EMC0006 | 2017-07-26 | 2018-07-25 |
| DMM | Fluke | 73 | EMC0007 | 2017-07-26 | 2018-07-25 |

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# 6 Radio Spectrum Technical Requirement

## 6.1 Antenna Requirement

### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(c)

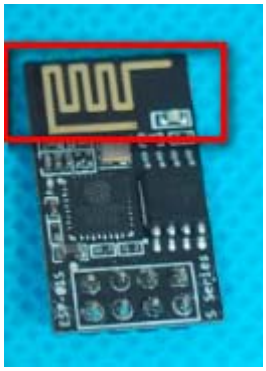
### 6.1.2 Conclusion

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

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.



EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

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# 7 Radio Spectrum Matter Test Results

## 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207
Test Method: ANSI C63.10 (2013) Section 6.2
Limit:

| Frequency of emission(MHz) | Conducted limit(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| *Decreases with the logarithm of the frequency. | | |

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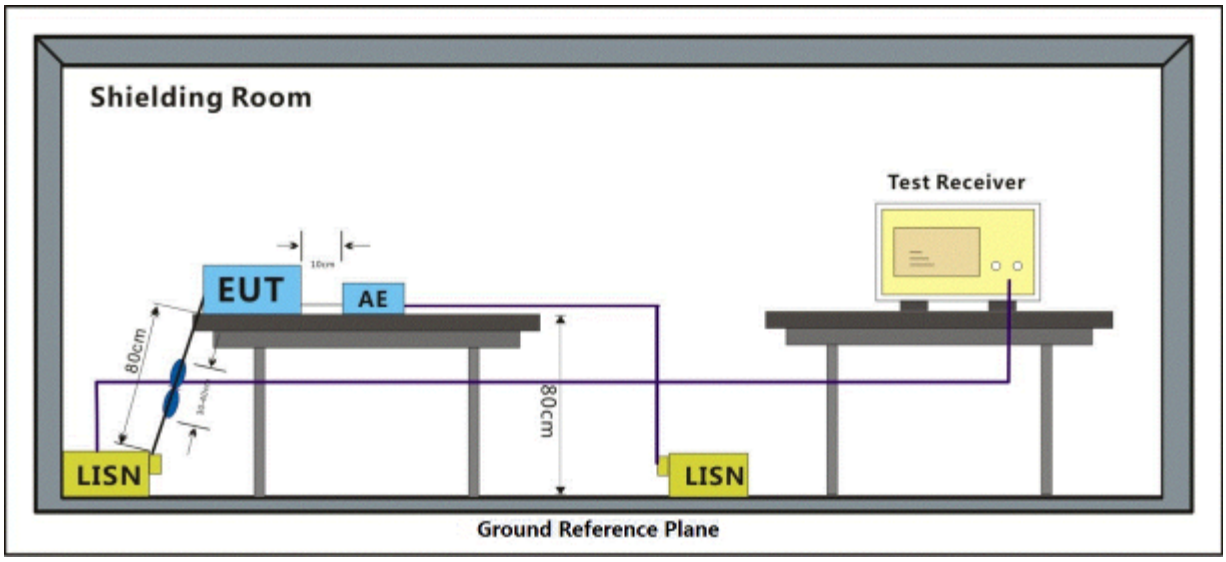
### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 24.5 °C Humidity: 52.9 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.1.2 Test Setup Diagram




### 7.1.3 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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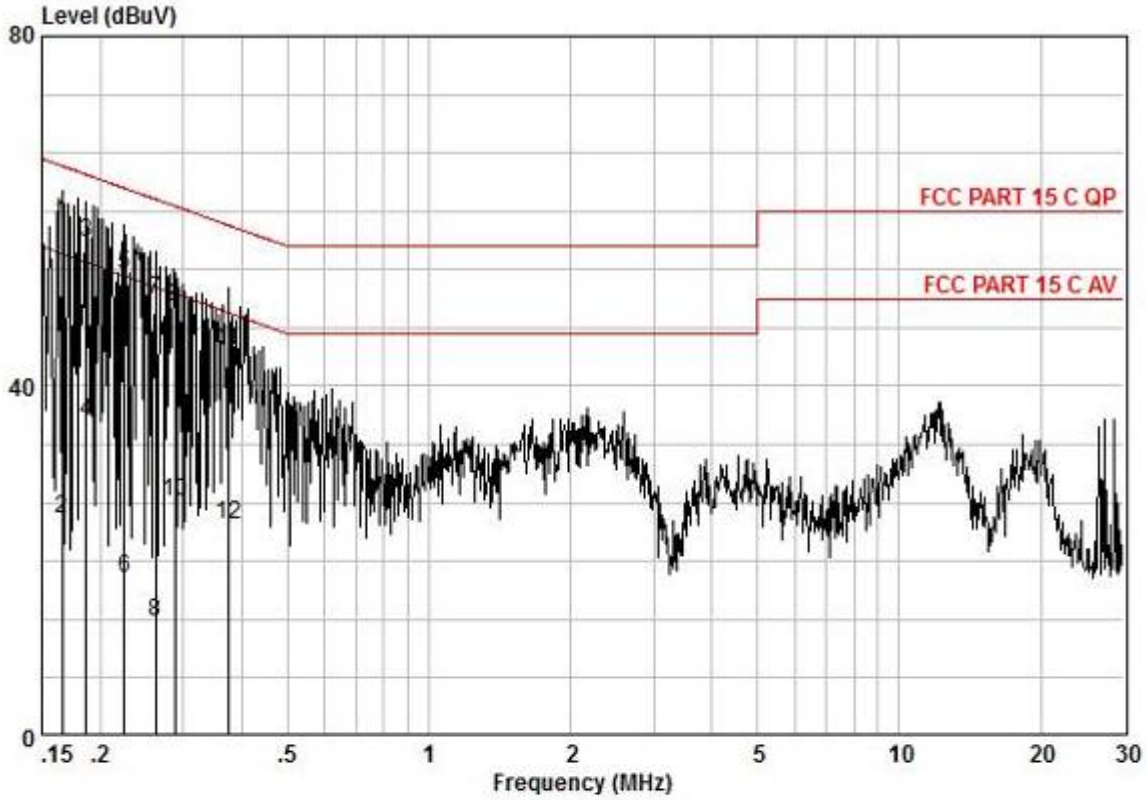
Mode:a; Line:Live Line




Pol :LIVE
No :
Model :

| Frequency MHz | read level dBuV | Cable Loss dB | LISN Factor dB | Measured level dBuV | Limit Line dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.17 | 48.94 | 0.10 | 9.51 | 58.55 | 65.16 | -6.61 | QP |
| 0.17 | 15.16 | 0.10 | 9.51 | 24.77 | 55.16 | -30.39 | AVERAGE |
| 0.19 | 46.82 | 0.10 | 9.58 | 56.50 | 64.20 | -7.69 | QP |
| 0.19 | 26.32 | 0.10 | 9.58 | 36.00 | 54.20 | -18.19 | AVERAGE |
| 0.22 | 43.08 | 0.11 | 9.62 | 52.82 | 62.66 | -9.84 | QP |
| 0.22 | 8.42 | 0.11 | 9.62 | 18.16 | 52.66 | -34.50 | AVERAGE |
| 0.26 | 40.16 | 0.13 | 9.63 | 49.92 | 61.38 | -11.46 | QP |
| 0.26 | 3.41 | 0.13 | 9.63 | 13.17 | 51.38 | -38.21 | AVERAGE |
| 0.29 | 39.34 | 0.14 | 9.63 | 49.11 | 60.59 | -11.48 | QP |
| 0.29 | 17.13 | 0.14 | 9.63 | 26.90 | 50.59 | -23.69 | AVERAGE |
| 0.37 | 34.24 | 0.17 | 9.64 | 44.05 | 58.43 | -14.38 | QP |
| 0.37 | 14.39 | 0.17 | 9.64 | 24.20 | 48.43 | -24.23 | AVERAGE |

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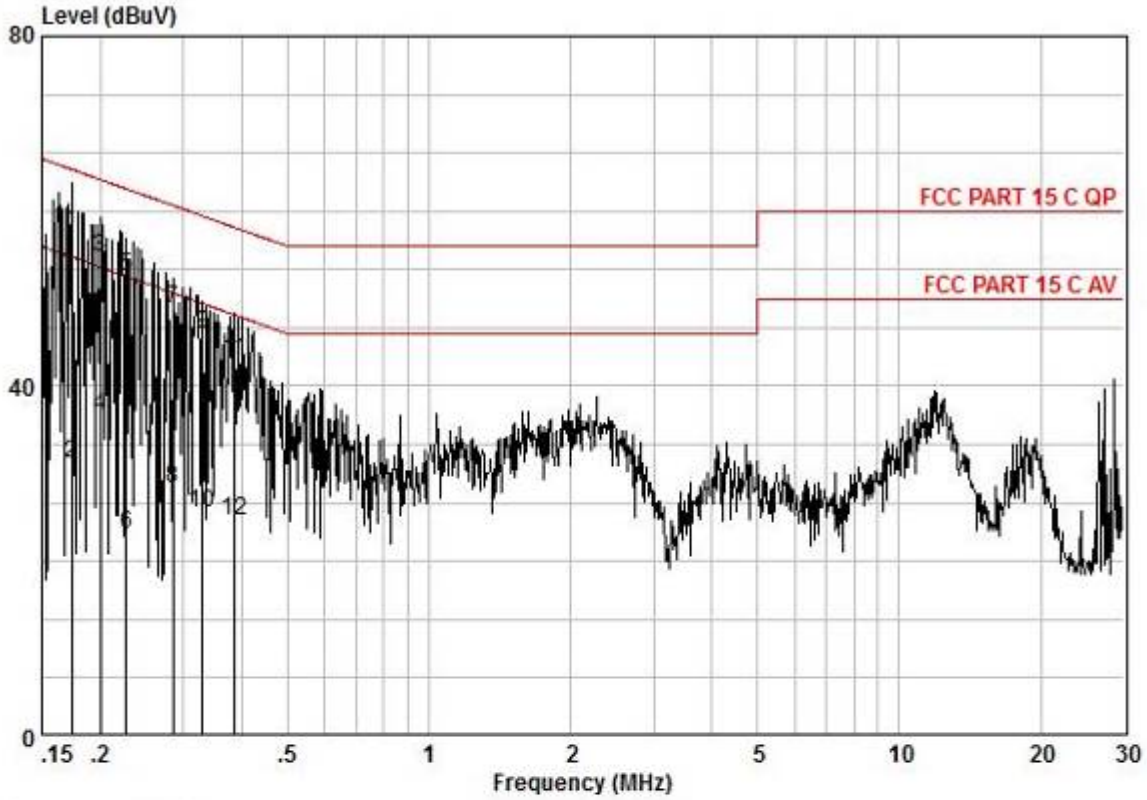
Mode:a; Line:Neutral Line




Pol :NEUTRAL
No :
Model :

| Frequency MHz | read level dBuV | Cable Loss dB | LISN Factor dB | Measured level dBuV | Limit Line dBuV | Over limit dB | Remark |
|---|---|---|---|---|---|---|---|
| 0.17 | 48.02 | 0.10 | 9.49 | 57.61 | 64.77 | -7.16 | QP |
| 0.17 | 21.52 | 0.10 | 9.49 | 31.11 | 54.77 | -23.66 | AVERAGE |
| 0.20 | 44.96 | 0.10 | 9.59 | 54.65 | 63.62 | -8.97 | QP |
| 0.20 | 26.85 | 0.10 | 9.59 | 36.54 | 53.62 | -17.08 | AVERAGE |
| 0.23 | 42.86 | 0.11 | 9.58 | 52.56 | 62.57 | -10.01 | QP |
| 0.23 | 13.49 | 0.11 | 9.58 | 23.19 | 52.57 | -29.38 | AVERAGE |
| 0.28 | 39.12 | 0.14 | 9.57 | 48.83 | 60.68 | -11.84 | QP |
| 0.28 | 18.57 | 0.14 | 9.57 | 28.28 | 50.68 | -22.39 | AVERAGE |
| 0.33 | 36.24 | 0.15 | 9.57 | 45.96 | 59.44 | -13.48 | QP |
| 0.33 | 15.82 | 0.15 | 9.57 | 25.54 | 49.44 | -23.90 | AVERAGE |
| 0.39 | 33.14 | 0.17 | 9.56 | 42.87 | 58.12 | -15.25 | QP |
| 0.39 | 14.86 | 0.17 | 9.56 | 24.59 | 48.12 | -23.53 | AVERAGE |

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## 7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ≥500 kHz

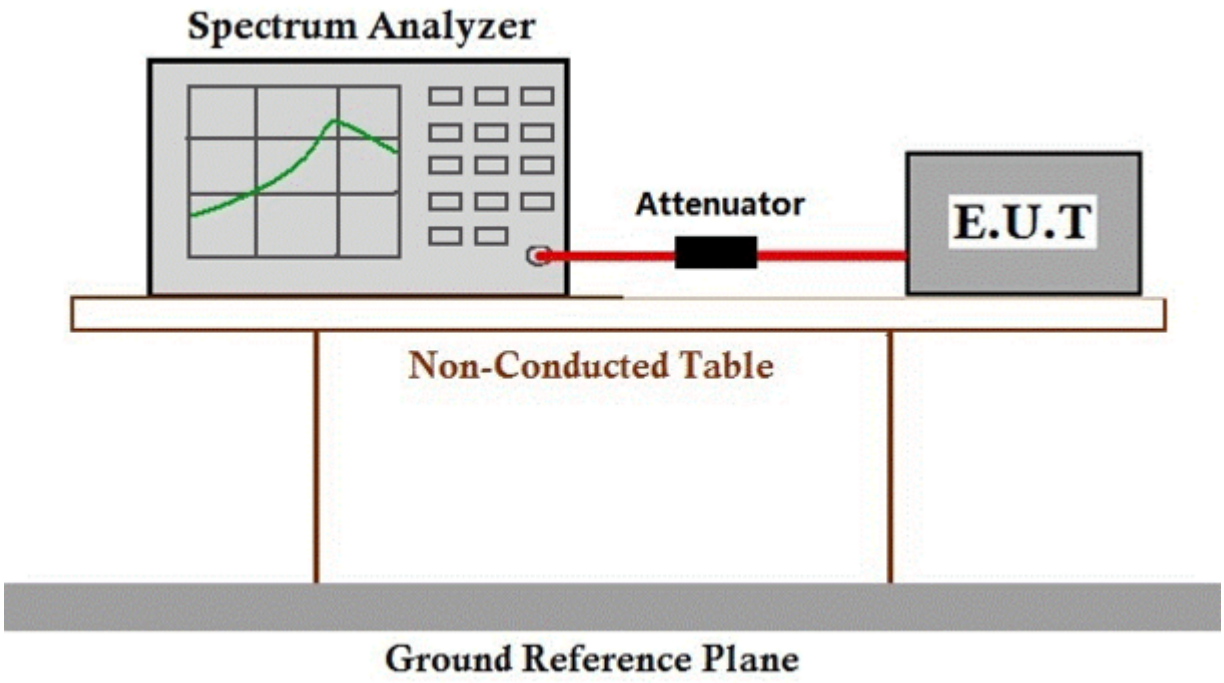
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C Humidity: 61.3 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.2.2 Test Setup Diagram




### 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.3 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

| Frequency range(MHz) | Output power of the intentional radiator(watt) |
|---|---|
| 902-928 | 1 for ≥50 hopping channels |
| | 0.25 for 25≤ hopping channels <50 |
| | 1 for digital modulation |
| 2400-2483.5 | 1 for ≥75 non-overlapping hopping channels |
| | 0.125 for all other frequency hopping systems |
| | 1 for digital modulation |
| 5725-5850 | 1 for frequency hopping systems and digital modulation |

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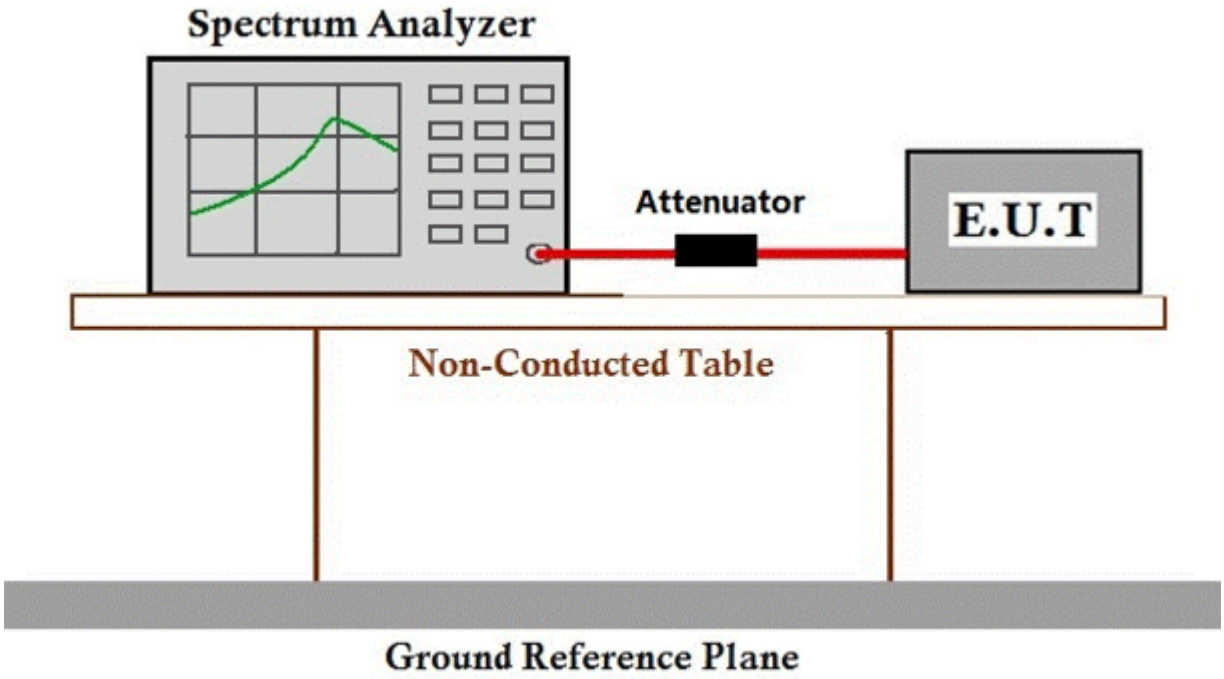
### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C Humidity: 61.4 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.3.2 Test Setup Diagram




### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.4 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)

Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit: ≤8dBm in any 3 kHz band during any time interval of continuous transmission

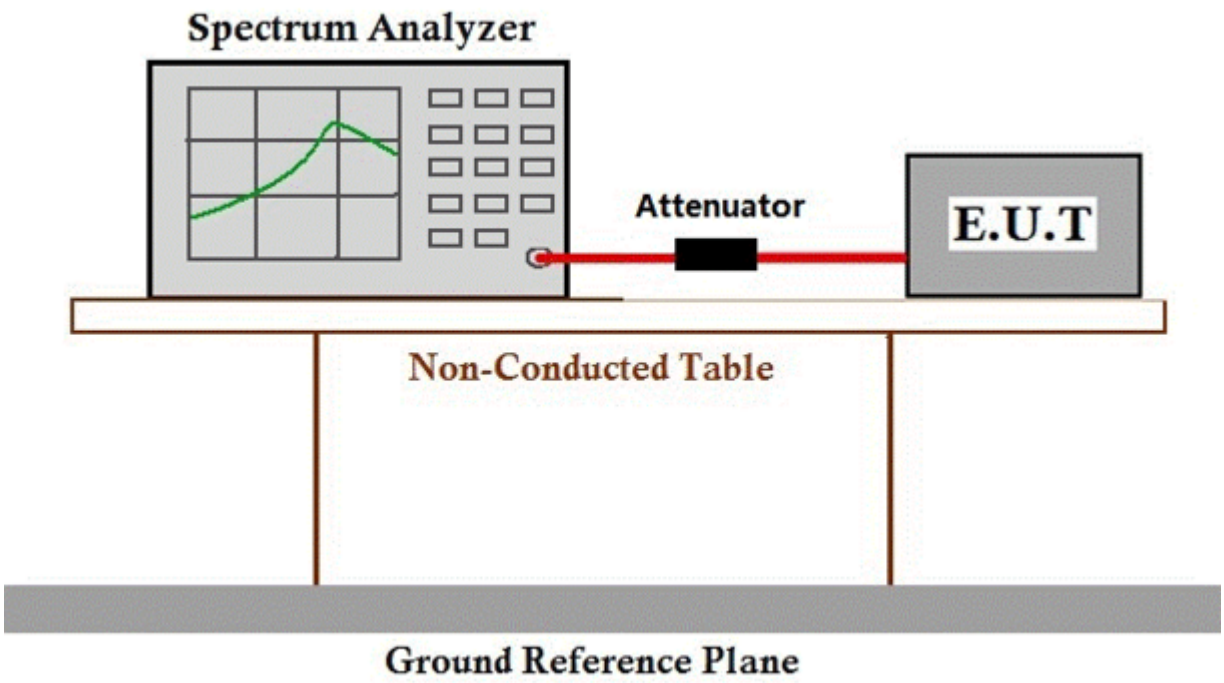
### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C Humidity: 61.3 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.4.2 Test Setup Diagram




### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.5 Conducted Band Edges Measurement

| | |
|---|---|
| Test Requirement | 47 CFR Part 15, Subpart C 15.247(d) |
| Test Method: | ANSI C63.10 (2013) Section 11.13.3.2 |
| 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) |

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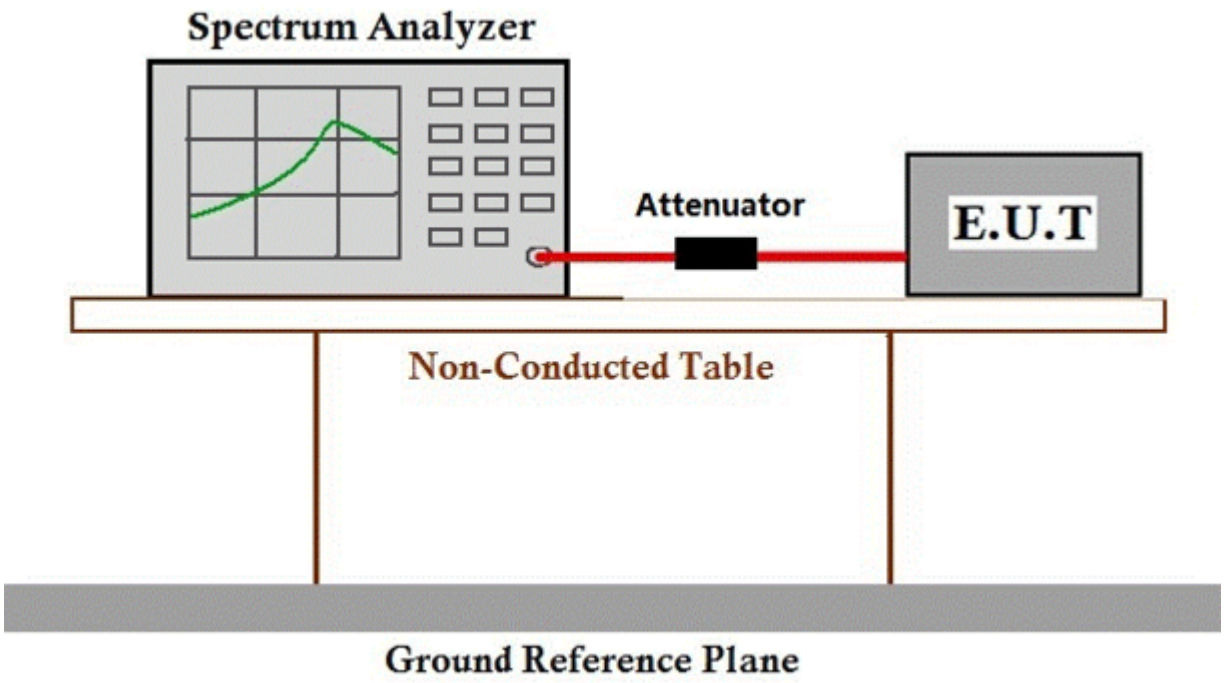
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C Humidity: 61.3 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.5.2 Test Setup Diagram




### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.6 Conducted Spurious Emissions

| | |
|---|---|
| Test Requirement | 47 CFR Part 15, Subpart C 15.247(d) |
| Test Method: | ANSI C63.10 (2013) Section 11.11 |
| 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) |

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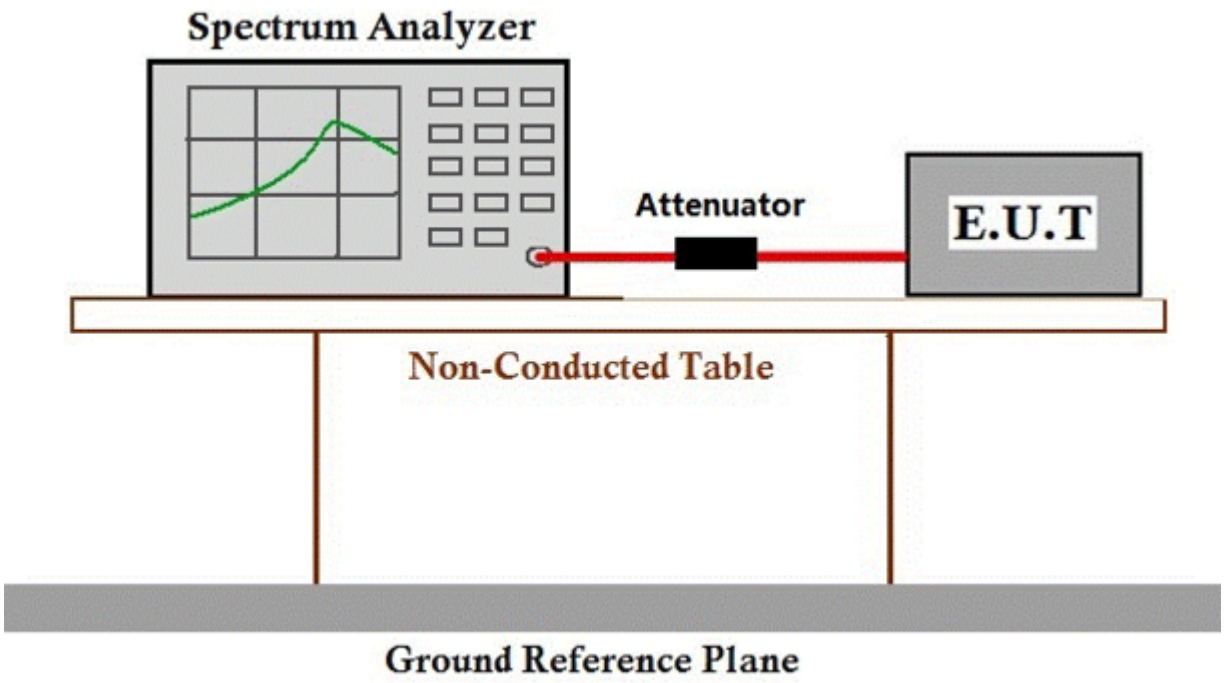
### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.7 °C Humidity: 61.3 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.6.2 Test Setup Diagram




### 7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

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## 7.7 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
Limit:

| Frequency(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: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. | | |

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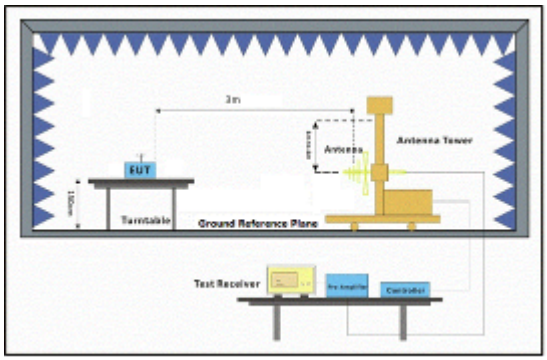
### 7.7.1 E.U.T. Operation

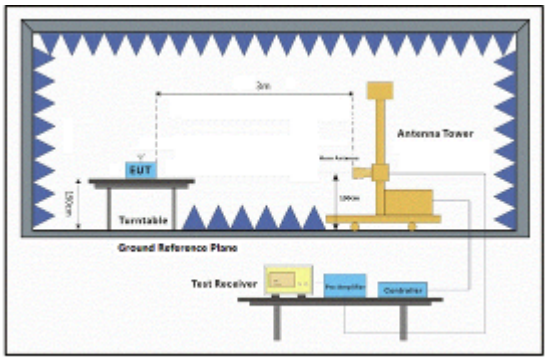
Operating Environment:

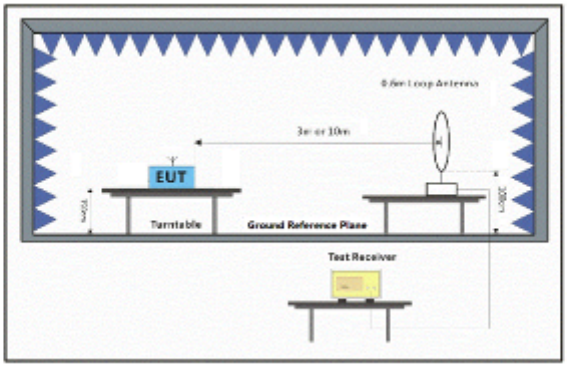
Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.7.2 Test Setup Diagram

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### 7.7.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Level=Read Level + Antenna Factor + Cable Loss - Preamp Factor

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Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 36.38 | 26.25 | 5.03 | 37.44 | 30.22 | 54.00 | -23.78 | HORIZONTAL | Average |
| 2 | 2310.000 | 46.29 | 26.25 | 5.03 | 37.44 | 40.13 | 74.00 | -33.87 | HORIZONTAL | Peak |
| 3 | 2390.000 | 34.69 | 26.43 | 4.88 | 37.42 | 28.58 | 54.00 | -25.42 | HORIZONTAL | Average |
| 4 | 2390.000 | 48.52 | 26.43 | 4.88 | 37.42 | 42.41 | 74.00 | -31.59 | HORIZONTAL | Peak |
| 5 | 2483.500 | 36.45 | 26.58 | 5.23 | 37.40 | 30.86 | 54.00 | -23.14 | HORIZONTAL | Average |
| 6 | 2483.500 | 47.51 | 26.58 | 5.23 | 37.40 | 41.92 | 74.00 | -32.08 | HORIZONTAL | Peak |
| 7 | 2500.000 | 36.30 | 26.60 | 4.95 | 37.39 | 30.46 | 54.00 | -23.54 | HORIZONTAL | Average |
| 8 | 2500.000 | 47.78 | 26.60 | 4.95 | 37.39 | 41.94 | 74.00 | -32.06 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 33.31 | 26.25 | 5.03 | 37.44 | 27.15 | 54.00 | -26.85 | VERTICAL | Average |
| 2 | 2310.000 | 45.47 | 26.25 | 5.03 | 37.44 | 39.31 | 74.00 | -34.69 | VERTICAL | Peak |
| 3 | 2390.000 | 36.77 | 26.43 | 4.88 | 37.42 | 30.66 | 54.00 | -23.34 | VERTICAL | Average |
| 4 | 2390.000 | 46.25 | 26.43 | 4.88 | 37.42 | 40.14 | 74.00 | -33.86 | VERTICAL | Peak |
| 5 | 2483.500 | 33.83 | 26.58 | 5.23 | 37.40 | 28.24 | 54.00 | -25.76 | VERTICAL | Average |
| 6 | 2483.500 | 45.81 | 26.58 | 5.23 | 37.40 | 40.22 | 74.00 | -33.78 | VERTICAL | Peak |
| 7 | 2500.000 | 33.04 | 26.60 | 4.95 | 37.39 | 27.20 | 54.00 | -26.80 | VERTICAL | Average |
| 8 | 2500.000 | 46.84 | 26.60 | 4.95 | 37.39 | 41.00 | 74.00 | -33.00 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 33.17 | 26.25 | 5.03 | 37.44 | 27.01 | 54.00 | -26.99 | HORIZONTAL | Average |
| 2 | 2310.000 | 45.88 | 26.25 | 5.03 | 37.44 | 39.72 | 74.00 | -34.28 | HORIZONTAL | Peak |
| 3 | 2390.000 | 33.25 | 26.43 | 4.88 | 37.42 | 27.14 | 54.00 | -26.86 | HORIZONTAL | Average |
| 4 | 2390.000 | 45.75 | 26.43 | 4.88 | 37.42 | 39.64 | 74.00 | -34.36 | HORIZONTAL | Peak |
| 5 | 2483.500 | 34.64 | 26.58 | 5.23 | 37.40 | 29.05 | 54.00 | -24.95 | HORIZONTAL | Average |
| 6 | 2483.500 | 47.57 | 26.58 | 5.23 | 37.40 | 41.98 | 74.00 | -32.02 | HORIZONTAL | Peak |
| 7 | 2500.000 | 33.51 | 26.60 | 4.95 | 37.39 | 27.67 | 54.00 | -26.33 | HORIZONTAL | Average |
| 8 | 2500.000 | 47.19 | 26.60 | 4.95 | 37.39 | 41.35 | 74.00 | -32.65 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 34.19 | 26.25 | 5.03 | 37.44 | 28.03 | 54.00 | -25.97 | VERTICAL | Average |
| 2 | 2310.000 | 45.55 | 26.25 | 5.03 | 37.44 | 39.39 | 74.00 | -34.61 | VERTICAL | Peak |
| 3 | 2390.000 | 32.61 | 26.43 | 4.88 | 37.42 | 26.50 | 54.00 | -27.50 | VERTICAL | Average |
| 4 | 2390.000 | 46.01 | 26.43 | 4.88 | 37.42 | 39.90 | 74.00 | -34.10 | VERTICAL | Peak |
| 5 | 2483.500 | 32.93 | 26.58 | 5.23 | 37.40 | 27.34 | 54.00 | -26.66 | VERTICAL | Average |
| 6 | 2483.500 | 46.22 | 26.58 | 5.23 | 37.40 | 40.63 | 74.00 | -33.37 | VERTICAL | Peak |
| 7 | 2500.000 | 34.31 | 26.60 | 4.95 | 37.39 | 28.47 | 54.00 | -25.53 | VERTICAL | Average |
| 8 | 2500.000 | 45.72 | 26.60 | 4.95 | 37.39 | 39.88 | 74.00 | -34.12 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 38.65 | 26.25 | 5.03 | 37.44 | 32.49 | 54.00 | -21.51 | HORIZONTAL | Average |
| 2 | 2310.000 | 52.42 | 26.25 | 5.03 | 37.44 | 46.26 | 74.00 | -27.74 | HORIZONTAL | Peak |
| 3 | 2390.000 | 47.29 | 26.43 | 4.88 | 37.42 | 41.18 | 54.00 | -12.82 | HORIZONTAL | Average |
| 4 | 2390.000 | 60.86 | 26.43 | 4.88 | 37.42 | 54.75 | 74.00 | -19.25 | HORIZONTAL | Peak |
| 5 | 2483.500 | 44.20 | 26.58 | 5.23 | 37.40 | 38.61 | 54.00 | -15.39 | HORIZONTAL | Average |
| 6 | 2483.500 | 58.33 | 26.58 | 5.23 | 37.40 | 52.74 | 74.00 | -21.26 | HORIZONTAL | Peak |
| 7 | 2500.000 | 44.38 | 26.60 | 4.95 | 37.39 | 38.54 | 54.00 | -15.46 | HORIZONTAL | Average |
| 8 | 2500.000 | 55.22 | 26.60 | 4.95 | 37.39 | 49.38 | 74.00 | -24.62 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 36.30 | 26.25 | 5.03 | 37.44 | 30.14 | 54.00 | -23.86 | VERTICAL | Average |
| 2 | 2310.000 | 49.31 | 26.25 | 5.03 | 37.44 | 43.15 | 74.00 | -30.85 | VERTICAL | Peak |
| 3 | 2390.000 | 44.61 | 26.43 | 4.88 | 37.42 | 38.50 | 54.00 | -15.50 | VERTICAL | Average |
| 4 | 2390.000 | 57.55 | 26.43 | 4.88 | 37.42 | 51.44 | 74.00 | -22.56 | VERTICAL | Peak |
| 5 | 2483.500 | 41.54 | 26.58 | 5.23 | 37.40 | 35.95 | 54.00 | -18.05 | VERTICAL | Average |
| 6 | 2483.500 | 55.69 | 26.58 | 5.23 | 37.40 | 50.10 | 74.00 | -23.90 | VERTICAL | Peak |
| 7 | 2500.000 | 40.59 | 26.60 | 4.95 | 37.39 | 34.75 | 54.00 | -19.25 | VERTICAL | Average |
| 8 | 2500.000 | 52.74 | 26.60 | 4.95 | 37.39 | 46.90 | 74.00 | -27.10 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:g; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 36.72 | 26.25 | 5.03 | 37.44 | 30.56 | 54.00 | -23.44 | HORIZONTAL | Average |
| 2 | 2310.000 | 51.16 | 26.25 | 5.03 | 37.44 | 45.00 | 74.00 | -29.00 | HORIZONTAL | Peak |
| 3 | 2390.000 | 41.69 | 26.43 | 4.88 | 37.42 | 35.58 | 54.00 | -18.42 | HORIZONTAL | Average |
| 4 | 2390.000 | 54.37 | 26.43 | 4.88 | 37.42 | 48.26 | 74.00 | -25.74 | HORIZONTAL | Peak |
| 5 | 2483.500 | 51.31 | 26.58 | 5.23 | 37.40 | 45.72 | 54.00 | -8.28 | HORIZONTAL | Average |
| 6 | 2483.500 | 63.23 | 26.58 | 5.23 | 37.40 | 57.64 | 74.00 | -16.36 | HORIZONTAL | Peak |
| 7 | 2500.000 | 46.36 | 26.60 | 4.95 | 37.39 | 40.52 | 54.00 | -13.48 | HORIZONTAL | Average |
| 8 | 2500.000 | 59.47 | 26.60 | 4.95 | 37.39 | 53.63 | 74.00 | -20.37 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:g; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 33.88 | 26.25 | 5.03 | 37.44 | 27.72 | 54.00 | -26.28 | VERTICAL | Average |
| 2 | 2310.000 | 45.78 | 26.25 | 5.03 | 37.44 | 39.62 | 74.00 | -34.38 | VERTICAL | Peak |
| 3 | 2390.000 | 37.26 | 26.43 | 4.88 | 37.42 | 31.15 | 54.00 | -22.85 | VERTICAL | Average |
| 4 | 2390.000 | 53.15 | 26.43 | 4.88 | 37.42 | 47.04 | 74.00 | -26.96 | VERTICAL | Peak |
| 5 | 2483.500 | 47.40 | 26.58 | 5.23 | 37.40 | 41.81 | 54.00 | -12.19 | VERTICAL | Average |
| 6 | 2483.500 | 61.29 | 26.58 | 5.23 | 37.40 | 55.70 | 74.00 | -18.30 | VERTICAL | Peak |
| 7 | 2500.000 | 46.19 | 26.60 | 4.95 | 37.39 | 40.35 | 54.00 | -13.65 | VERTICAL | Average |
| 8 | 2500.000 | 58.89 | 26.60 | 4.95 | 37.39 | 53.05 | 74.00 | -20.95 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 39.11 | 26.25 | 5.03 | 37.44 | 32.95 | 54.00 | -21.05 | HORIZONTAL | Average |
| 2 | 2310.000 | 53.31 | 26.25 | 5.03 | 37.44 | 47.15 | 74.00 | -26.85 | HORIZONTAL | Peak |
| 3 | 2390.000 | 46.76 | 26.43 | 4.88 | 37.42 | 40.65 | 54.00 | -13.35 | HORIZONTAL | Average |
| 4 | 2390.000 | 61.88 | 26.43 | 4.88 | 37.42 | 55.77 | 74.00 | -18.23 | HORIZONTAL | Peak |
| 5 | 2483.500 | 43.41 | 26.58 | 5.23 | 37.40 | 37.82 | 54.00 | -16.18 | HORIZONTAL | Average |
| 6 | 2483.500 | 58.96 | 26.58 | 5.23 | 37.40 | 53.37 | 74.00 | -20.63 | HORIZONTAL | Peak |
| 7 | 2500.000 | 45.93 | 26.60 | 4.95 | 37.39 | 40.09 | 54.00 | -13.91 | HORIZONTAL | Average |
| 8 | 2500.000 | 56.80 | 26.60 | 4.95 | 37.39 | 50.96 | 74.00 | -23.04 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 39.59 | 26.25 | 5.03 | 37.44 | 33.43 | 54.00 | -20.57 | VERTICAL | Average |
| 2 | 2310.000 | 49.92 | 26.25 | 5.03 | 37.44 | 43.76 | 74.00 | -30.24 | VERTICAL | Peak |
| 3 | 2390.000 | 47.19 | 26.43 | 4.88 | 37.42 | 41.08 | 54.00 | -12.92 | VERTICAL | Average |
| 4 | 2390.000 | 60.79 | 26.43 | 4.88 | 37.42 | 54.68 | 74.00 | -19.32 | VERTICAL | Peak |
| 5 | 2483.500 | 41.54 | 26.58 | 5.23 | 37.40 | 35.95 | 54.00 | -18.05 | VERTICAL | Average |
| 6 | 2483.500 | 53.97 | 26.58 | 5.23 | 37.40 | 48.38 | 74.00 | -25.62 | VERTICAL | Peak |
| 7 | 2500.000 | 40.97 | 26.60 | 4.95 | 37.39 | 35.13 | 54.00 | -18.87 | VERTICAL | Average |
| 8 | 2500.000 | 53.68 | 26.60 | 4.95 | 37.39 | 47.84 | 74.00 | -26.16 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:n; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 36.99 | 26.25 | 5.03 | 37.44 | 30.83 | 54.00 | -23.17 | HORIZONTAL | Average |
| 2 | 2310.000 | 49.38 | 26.25 | 5.03 | 37.44 | 43.22 | 74.00 | -30.78 | HORIZONTAL | Peak |
| 3 | 2390.000 | 42.31 | 26.43 | 4.88 | 37.42 | 36.20 | 54.00 | -17.80 | HORIZONTAL | Average |
| 4 | 2390.000 | 53.78 | 26.43 | 4.88 | 37.42 | 47.67 | 74.00 | -26.33 | HORIZONTAL | Peak |
| 5 | 2483.500 | 53.17 | 26.58 | 5.23 | 37.40 | 47.58 | 54.00 | -6.42 | HORIZONTAL | Average |
| 6 | 2483.500 | 62.22 | 26.58 | 5.23 | 37.40 | 56.63 | 74.00 | -17.37 | HORIZONTAL | Peak |
| 7 | 2500.000 | 51.39 | 26.60 | 4.95 | 37.39 | 45.55 | 54.00 | -8.45 | HORIZONTAL | Average |
| 8 | 2500.000 | 63.52 | 26.60 | 4.95 | 37.39 | 57.68 | 74.00 | -16.32 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:n; bandwidth:20MHz; Channel:High

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 2310.000 | 30.88 | 26.25 | 5.03 | 37.44 | 24.72 | 54.00 | -29.28 | VERTICAL | Average |
| 2 | 2310.000 | 43.93 | 26.25 | 5.03 | 37.44 | 37.77 | 74.00 | -36.23 | VERTICAL | Peak |
| 3 | 2390.000 | 38.69 | 26.43 | 4.88 | 37.42 | 32.58 | 54.00 | -21.42 | VERTICAL | Average |
| 4 | 2390.000 | 47.65 | 26.43 | 4.88 | 37.42 | 41.54 | 74.00 | -32.46 | VERTICAL | Peak |
| 5 | 2483.500 | 41.67 | 26.58 | 5.23 | 37.40 | 36.08 | 54.00 | -17.92 | VERTICAL | Average |
| 6 | 2483.500 | 54.48 | 26.58 | 5.23 | 37.40 | 48.89 | 74.00 | -25.11 | VERTICAL | Peak |
| 7 | 2500.000 | 40.90 | 26.60 | 4.95 | 37.39 | 35.06 | 54.00 | -18.94 | VERTICAL | Average |
| 8 | 2500.000 | 49.98 | 26.60 | 4.95 | 37.39 | 44.14 | 74.00 | -29.86 | VERTICAL | Peak |

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## 7.8 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6
Measurement Distance: 3m
Limit:

| Frequency(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: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. | | |

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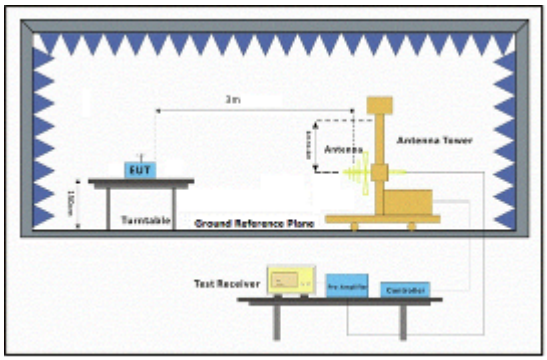
### 7.8.1 E.U.T. Operation

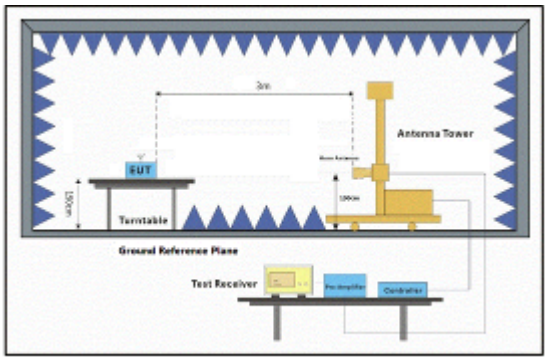
Operating Environment:

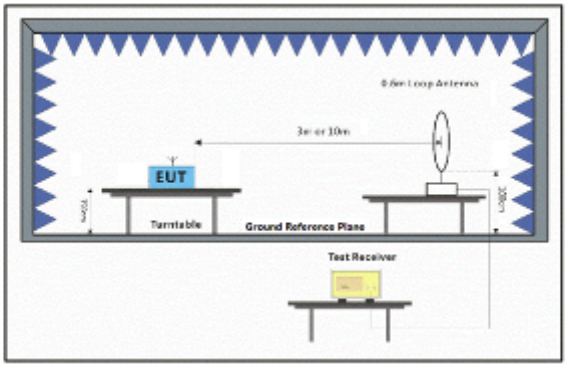
Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1020 mbar

Test mode: a:TX mode_Keep the EUT in continuously transmitting mode with all modulation types. All data rates for each modulation type have been tested and found the data rate @ 1Mbps is the worst case of IEEE 802.11b; data rate @ 6Mbps is the worst case of IEEE 802.11g; data rate @ 6.5Mbps is the worst case of IEEE 802.11n(HT20).

### 7.8.2 Test Setup Diagram

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### 7.8.3 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown

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Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 36.766 | 21.80 | 12.52 | 0.34 | 23.01 | 11.65 | 40.00 | -28.35 | HORIZONTAL | QP |
| 2 | 54.261 | 21.78 | 12.68 | 0.59 | 25.01 | 10.04 | 40.00 | -29.96 | HORIZONTAL | QP |
| 3 | 107.510 | 29.84 | 10.25 | 0.87 | 27.49 | 13.47 | 43.50 | -30.03 | HORIZONTAL | QP |
| 4 | 140.342 | 25.51 | 13.10 | 1.04 | 28.16 | 11.49 | 43.50 | -32.01 | HORIZONTAL | QP |
| 5 | 189.739 | 29.00 | 11.95 | 1.28 | 28.19 | 14.04 | 43.50 | -29.46 | HORIZONTAL | QP |
| 6 | 787.851 | 28.07 | 22.61 | 2.79 | 28.77 | 24.70 | 46.00 | -21.30 | HORIZONTAL | QP |

Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 3834.438 | 34.34 | 29.12 | 7.80 | 36.91 | 34.35 | 54.00 | -19.65 | HORIZONTAL | Average |
| 2 | 3834.438 | 45.34 | 29.12 | 7.80 | 36.91 | 45.35 | 74.00 | -28.65 | HORIZONTAL | Peak |
| 3 | 4831.962 | 40.52 | 30.85 | 6.15 | 36.94 | 40.58 | 54.00 | -13.42 | HORIZONTAL | Average |
| 4 | 4831.962 | 52.55 | 30.85 | 6.15 | 36.94 | 52.61 | 74.00 | -21.39 | HORIZONTAL | Peak |
| 5 | 6195.508 | 31.18 | 33.00 | 6.92 | 36.99 | 34.11 | 54.00 | -19.89 | HORIZONTAL | Average |
| 6 | 6195.508 | 43.88 | 33.00 | 6.92 | 36.99 | 46.81 | 74.00 | -27.19 | HORIZONTAL | Peak |
| 7 | 7236.309 | 30.33 | 35.55 | 7.35 | 36.93 | 36.30 | 54.00 | -17.70 | HORIZONTAL | Average |
| 8 | 7236.309 | 43.96 | 35.55 | 7.35 | 36.93 | 49.93 | 74.00 | -24.07 | HORIZONTAL | Peak |
| 9 | 9047.272 | 31.85 | 36.57 | 8.29 | 37.02 | 39.69 | 54.00 | -14.31 | HORIZONTAL | Average |
| 10 | 9047.272 | 45.06 | 36.57 | 8.29 | 37.02 | 52.90 | 74.00 | -21.10 | HORIZONTAL | Peak |
| 11 | 12060.070 | 28.57 | 39.46 | 10.71 | 37.17 | 41.57 | 54.00 | -12.43 | HORIZONTAL | Average |
| 12 | 12060.070 | 43.31 | 39.46 | 10.71 | 37.17 | 56.31 | 74.00 | -17.69 | HORIZONTAL | Peak |

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Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 32.293 | 21.93 | 12.27 | 0.13 | 22.03 | 12.30 | 40.00 | -27.70 | VERTICAL | QP |
| 2 | 48.672 | 21.00 | 12.97 | 0.62 | 24.79 | 9.80 | 40.00 | -30.20 | VERTICAL | QP |
| 3 | 120.277 | 29.13 | 11.52 | 0.92 | 28.19 | 13.38 | 43.50 | -30.12 | VERTICAL | QP |
| 4 | 199.986 | 31.85 | 11.20 | 1.16 | 28.42 | 15.79 | 43.50 | -27.71 | VERTICAL | QP |
| 5 | 485.609 | 28.48 | 18.07 | 2.11 | 29.49 | 19.17 | 46.00 | -26.83 | VERTICAL | QP |
| 6 | 744.866 | 29.56 | 21.99 | 3.12 | 29.18 | 25.49 | 46.00 | -20.51 | VERTICAL | QP |

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:Low

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 3214.623 | 39.39 | 27.90 | 5.91 | 37.01 | 36.19 | 54.00 | -17.81 | VERTICAL | Average |
| 2 | 3214.623 | 49.91 | 27.90 | 5.91 | 37.01 | 46.71 | 74.00 | -27.29 | VERTICAL | Peak |
| 3 | 4824.962 | 48.16 | 30.82 | 6.01 | 36.94 | 48.05 | 54.00 | -5.95 | VERTICAL | Average |
| 4 | 4824.962 | 56.89 | 30.82 | 6.01 | 36.94 | 56.78 | 74.00 | -17.22 | VERTICAL | Peak |
| 5 | 6451.353 | 31.38 | 34.15 | 7.03 | 36.98 | 35.58 | 54.00 | -18.42 | VERTICAL | Average |
| 6 | 6451.353 | 44.31 | 34.15 | 7.03 | 36.98 | 48.51 | 74.00 | -25.49 | VERTICAL | Peak |
| 7 | 7236.795 | 33.31 | 35.55 | 7.35 | 36.93 | 39.28 | 54.00 | -14.72 | VERTICAL | Average |
| 8 | 7236.795 | 45.86 | 35.55 | 7.35 | 36.93 | 51.83 | 74.00 | -22.17 | VERTICAL | Peak |
| 9 | 9648.250 | 31.91 | 37.54 | 8.18 | 37.08 | 40.55 | 54.00 | -13.45 | VERTICAL | Average |
| 10 | 9648.250 | 44.40 | 37.54 | 8.18 | 37.08 | 53.04 | 74.00 | -20.96 | VERTICAL | Peak |
| 11 | 12060.280 | 30.01 | 39.46 | 10.71 | 37.17 | 43.01 | 54.00 | -10.99 | VERTICAL | Average |
| 12 | 12060.280 | 42.00 | 39.46 | 10.71 | 37.17 | 55.00 | 74.00 | -19.00 | VERTICAL | Peak |

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Mode:a; Polarization:Horizontal; Modulation:b; bandwidth:20MHz; Channel:middle

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 3790.361 | 35.73 | 28.97 | 7.83 | 36.92 | 35.61 | 54.00 | -18.39 | HORIZONTAL | Average |
| 2 | 3790.361 | 45.20 | 28.97 | 7.83 | 36.92 | 45.08 | 74.00 | -28.92 | HORIZONTAL | Peak |
| 3 | 4884.043 | 42.03 | 30.95 | 6.86 | 36.95 | 42.89 | 54.00 | -11.11 | HORIZONTAL | Average |
| 4 | 4884.043 | 54.89 | 30.95 | 6.86 | 36.95 | 55.75 | 74.00 | -18.25 | HORIZONTAL | Peak |
| 5 | 5797.032 | 34.13 | 32.16 | 7.47 | 37.00 | 36.76 | 54.00 | -17.24 | HORIZONTAL | Average |
| 6 | 5797.032 | 45.27 | 32.16 | 7.47 | 37.00 | 47.90 | 74.00 | -26.10 | HORIZONTAL | Peak |
| 7 | 7326.092 | 32.27 | 35.74 | 7.39 | 36.92 | 38.48 | 54.00 | -15.52 | HORIZONTAL | Average |
| 8 | 7326.092 | 42.88 | 35.74 | 7.39 | 36.92 | 49.09 | 74.00 | -24.91 | HORIZONTAL | Peak |
| 9 | 9768.852 | 31.29 | 37.74 | 8.37 | 37.09 | 40.31 | 54.00 | -13.69 | HORIZONTAL | Average |
| 10 | 9768.852 | 44.69 | 37.74 | 8.37 | 37.09 | 53.71 | 74.00 | -20.29 | HORIZONTAL | Peak |
| 11 | 12210.480 | 26.28 | 39.21 | 10.98 | 37.06 | 39.41 | 54.00 | -14.59 | HORIZONTAL | Average |
| 12 | 12210.480 | 38.77 | 39.21 | 10.98 | 37.06 | 51.90 | 74.00 | -22.10 | HORIZONTAL | Peak |

Mode:a; Polarization:Vertical; Modulation:b; bandwidth:20MHz; Channel:middle

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Pol/Phase | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | | |
| 1 | 4039.212 | 32.53 | 29.53 | 7.13 | 36.90 | 32.29 | 54.00 | -21.71 | VERTICAL | Average |
| 2 | 4039.212 | 44.84 | 29.53 | 7.13 | 36.90 | 44.60 | 74.00 | -29.40 | VERTICAL | Peak |
| 3 | 4884.151 | 45.48 | 30.95 | 6.86 | 36.95 | 46.34 | 54.00 | -7.66 | VERTICAL | Average |
| 4 | 4884.151 | 54.44 | 30.95 | 6.86 | 36.95 | 55.30 | 74.00 | -18.70 | VERTICAL | Peak |
| 5 | 6451.353 | 31.69 | 34.15 | 7.03 | 36.98 | 35.89 | 54.00 | -18.11 | VERTICAL | Average |
| 6 | 6451.353 | 43.64 | 34.15 | 7.03 | 36.98 | 47.84 | 74.00 | -26.16 | VERTICAL | Peak |
| 7 | 7326.838 | 31.56 | 35.74 | 7.39 | 36.92 | 37.77 | 54.00 | -16.23 | VERTICAL | Average |
| 8 | 7326.838 | 44.34 | 35.74 | 7.39 | 36.92 | 50.55 | 74.00 | -23.45 | VERTICAL | Peak |
| 9 | 9768.916 | 31.13 | 37.74 | 8.37 | 37.09 | 40.15 | 54.00 | -13.85 | VERTICAL | Average |
| 10 | 9768.916 | 45.84 | 37.74 | 8.37 | 37.09 | 54.86 | 74.00 | -19.14 | VERTICAL | Peak |
| 11 | 12210.210 | 28.97 | 39.21 | 10.98 | 37.06 | 42.10 | 54.00 | -11.90 | VERTICAL | Average |
| 12 | 12210.210 | 42.08 | 39.21 | 10.98 | 37.06 | 55.21 | 74.00 | -18.79 | VERTICAL | Peak |

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