# Radio Test Report

Report No.: STS2503152W01

Issued for

Shenzhen Guangjiale Xin Intelligent Technology Co., Ltd.

Room 1203A, Building A, Phase I, ZhuoBaozhong Times

Square, No. 15-1, Haitian Road, N23, Haibin Community,

Xin 'an Street, Bao'an District, Shenzhen, China

| | |
|---|---|
| Product Name: | AI smart voice recorder |
| Brand Name: | N/A |
| Model Name: | MRP-01 |
| Series Model(s): | X1, MRP-02 |
| FCC ID: | 2BOEZMRP-01 |
| Test Standards: | FCC Part15.247 |

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Shenzhen STS Test Services Co., Ltd.

# TEST REPORT

| | |
|---|---|
| **Applicant's Name** ..... : | Shenzhen Guangjiale Xin Intelligent Technology Co., Ltd. |
| Address ..... : | Room 1203A, Building A, Phase I, ZhuoBaozhong Times Square, No. 15-1, Haitian Road, N23, Haibin Community, Xin 'an Street, Bao'an District, Shenzhen, China |
| **Manufacturer's Name** ..... : | Shenzhen core Zhi innovation Electronics Co., LTD |
| Address ..... : | 201, Building D, D1, Yinfeng Industrial Park, Hangcheng Avenue, Sanwei Community, Hangcheng Street, Baoan District, Shenzhen, China |

**Product Description**

| | |
|---|---|
| Product Name ..... : | AI smart voice recorder |
| Brand Name ..... : | N/A |
| Model Name ..... : | MRP-01 |
| Series Model(s) ..... : | X1, MRP-02 |
| **Test Standards** ..... : | FCC Part15.247 |
| Test Procedure ..... : | ANSI C63.10-2020 |

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Shenzhen STS Test Services Co., Ltd.

**Date of Test** ..... :

| | |
|---|---|
| Date of receipt of test item ..... : | 24 Mar. 2025 |
| Date (s) of performance of tests .: | 24 Mar. 2025 ~ 26 Mar. 2025 |
| Date of Issue ..... : | 26 Mar. 2025 |
| Test Result ..... : | Pass |

Testing Engineer : Aaron Bu

(Aaron Bu)

Technical Manager : Tony Liu

(Tony Liu)

Authorized Signatory : Bovey Yang

(Bovey Yang)

SHENZHEN STS TEST SERVICES CO., LTD. TESTING APPROVAL

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## Revision History

| Rev. | Issue Date | Report No. | Effect Page | Contents |
|---|---|---|---|---|
| 00 | 26 Mar. 2025 | STS2503152W01 | ALL | Initial Issue |
| | | | | |

# 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
KDB 558074 D01 15.247 Meas Guidance v05r02.

| FCC Part 15.247,Subpart C | | | |
|---|---|---|---|
| Standard Section | Test Item | Judgment | Remark |
| 15.207 | Conducted Emission | PASS | -- |
| 15.247(a)(1) | Hopping Channel Separation | PASS | -- |
| 15.247(a)(1)&(b)(1) | Output Power | PASS | -- |
| 15.209 | Radiated Spurious Emission | PASS | -- |
| 15.247(d) | Conducted Spurious & Band Edge Emission | PASS | -- |
| 15.247(a)(1)(iii) | Number of Hopping Frequency | PASS | -- |
| 15.247(a)(1)(iii) | Dwell Time | PASS | -- |
| 15.247(a)(1) | Bandwidth | PASS | -- |
| 15.205 | Restricted bands of operation | PASS | -- |
| Part 15.247(d)/part 15.209(a) | Band Edge Emission | PASS | -- |
| 15.203 | Antenna Requirement | PASS | -- |

NOTE:

(1) 'N/A' denotes test is not applicable in this Test Report.

(2) All tests are according to ANSI C63.10-2020.

## 1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD

Add. : 101, Building B, Zhuoke Science Park, No.190 Chongqing Road, ZhanChengShequ, Fuhai Sub-District, Bao'an District, Shenzhen, Guang Dong, China

FCC test Firm Registration Number: 625569

IC test Firm Registration Number: 12108A

A2LA Certificate No.: 4338.01

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ±**U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

| No. | Item | Uncertainty |
|---|---|---|
| 1 | RF output power, conducted | ±0.755dB |
| 2 | Unwanted Emissions, conducted | ±2.874dB |
| 3 | All emissions, radiated 9K-30MHz | ±3.80dB |
| 4 | All emissions, radiated 30M-1GHz | ±4.18dB |
| 5 | All emissions, radiated 1G-6GHz | ±4.90dB |
| 6 | All emissions, radiated>6G | ±5.24dB |
| 7 | Conducted Emission (9KHz-150KHz) | ±2.19dB |
| 8 | Conducted Emission (150KHz-30MHz) | ±2.53dB |
| 9 | Occupied Channel Bandwidth | ±3.5% |
| 10 | Dwell time | ±3.2% |

# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF THE EUT

| | |
|---|---|
| Product Name | AI smart voice recorder |
| Brand Name | N/A |
| Model Name | MRP-01 |
| Series Model(s) | X1, MRP-02 |
| Model Difference | The model name is different, the rest are the same |
| Channel List | Please refer to the Note 3. |
| Bluetooth | Frequency:2402 – 2480 MHz<br>Modulation: GFSK(1Mbps), π/4-DQPSK(2Mbps), 8DPSK(3Mbps) |
| Bluetooth Configuration | BR+EDR |
| Antenna Type | Chip Antenna |
| Antenna Gain | 2.5dBi |
| Power Rating | Input: DC5V 1A |
| Adapter | N/A |
| Battery | N/A |
| Hardware version number | N/A |
| Software version number | N/A |
| Connecting I/O Port(s) | Please refer to the Note 1. |

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User Manual.
2. The antenna information refer the manufacturer provide report, applicable only to the tested sample identified in the report. Due to the incorrect antenna information, a series of problems such as the accuracy of the test results will be borne by the customer.

3.

| Channel List | | | | | |
|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 00 | 2402 | 27 | 2429 | 54 | 2456 |
| 01 | 2403 | 28 | 2430 | 55 | 2457 |
| 02 | 2404 | 29 | 2431 | 56 | 2458 |
| 03 | 2405 | 30 | 2432 | 57 | 2459 |
| 04 | 2406 | 31 | 2433 | 58 | 2460 |
| 05 | 2407 | 32 | 2434 | 59 | 2461 |
| 06 | 2408 | 33 | 2435 | 60 | 2462 |
| 07 | 2409 | 34 | 2436 | 61 | 2463 |
| 08 | 2410 | 35 | 2437 | 62 | 2464 |
| 09 | 2411 | 36 | 2438 | 63 | 2465 |
| 10 | 2412 | 37 | 2439 | 64 | 2466 |
| 11 | 2413 | 38 | 2440 | 65 | 2467 |
| 12 | 2414 | 39 | 2441 | 66 | 2468 |
| 13 | 2415 | 40 | 2442 | 67 | 2469 |
| 14 | 2416 | 41 | 2443 | 68 | 2470 |
| 15 | 2417 | 42 | 2444 | 69 | 2471 |
| 16 | 2418 | 43 | 2445 | 70 | 2472 |
| 17 | 2419 | 44 | 2446 | 71 | 2473 |
| 18 | 2420 | 45 | 2447 | 72 | 2474 |
| 19 | 2421 | 46 | 2448 | 73 | 2475 |
| 20 | 2422 | 47 | 2449 | 74 | 2476 |
| 21 | 2423 | 48 | 2450 | 75 | 2477 |
| 22 | 2424 | 49 | 2451 | 76 | 2478 |
| 23 | 2425 | 50 | 2452 | 77 | 2479 |
| 24 | 2426 | 51 | 2453 | 78 | 2480 |
| 25 | 2427 | 52 | 2454 | | |
| 26 | 2428 | 53 | 2455 | | |

## 2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Worst Mode | Description | Data Rate/Modulation |
|---|---|---|
| Mode 1 | TX CH00 | 1Mbps/GFSK |
| Mode 2 | TX CH39 | 1Mbps/GFSK |
| Mode 3 | TX CH78 | 1Mbps/GFSK |
| Mode 4 | TX CH00 | 2 Mbps/π/4-DQPSK |
| Mode 5 | TX CH39 | 2 Mbps/π/4-DQPSK |
| Mode 6 | TX CH78 | 2 Mbps/π/4-DQPSK |
| Mode7 | TX CH00 | 3 Mbps/8DPSK |
| Mode 8 | TX CH39 | 3 Mbps/8DPSK |
| Mode 9 | TX CH78 | 3 Mbps/8DPSK |
| Mode 10 | Hopping | GFSK |
| Mode 11 | Hopping | π/4-DQPSK |
| Mode 12 | Hopping | 8DPSK |

Note:

(1) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported.

(2) We tested for all available U.S. voltage and frequencies (For 120V, 50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V/ 60Hz is shown in the report.

(3) The battery is fully-charged during the radiated and RF conducted test.

For AC Conducted Emission

| Test Case | |
|---|---|
| AC Conducted Emission | Mode 13 : Keeping BT TX |

## 2.3 FREQUENCY HOPPING SYSTEM REQUIREMENTS

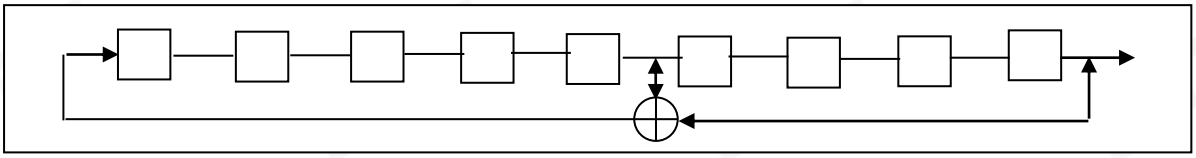
(1)Standard and Limit

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

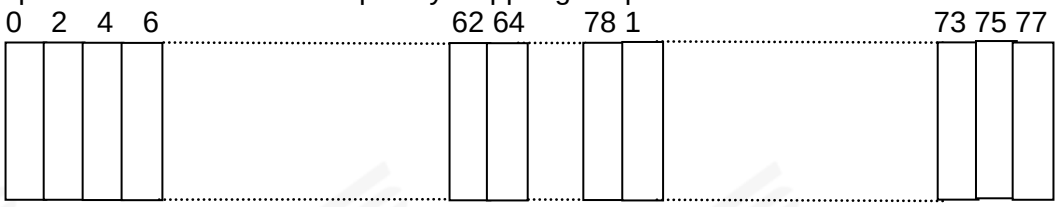
The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

(2)The Pseudorandom sequence may be generated in a nin-stage shift register whose $5^{th}$ and $9^{th}$ stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones: i.e. the shift register is initialized with nine ones.
Numver of shift register stages:9
Length of pseudo-random sequence:$2^9$-1=511bits
Longest sequence of zeros: 8(non-inverted signal)



Liner Feedback Shift Register for Generator of the PRBS sequence

An example of Pseudorandom Frequency Hoppong Sequence as follow:




Each frequency used equally on th average by each transmitter.
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies ini synchronization with the transmitted signals.

(3)Frequency Hopping System
This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

This device was tested with a bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements FCC Part 15.247 rule.

## 2.4 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

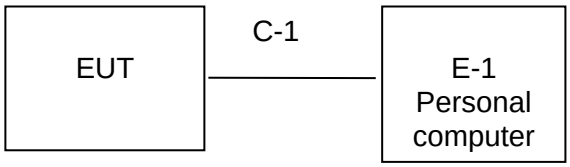
During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS.

| (Control software) Parameters(1/2/3Mbps) | Test program: Bluetooth | | |
|---|---|---|---|
| | Packet type:<br>DH1:4:27<br>2DH1:20:54<br>3DH1:24:83 | Packet type:<br>DH3:11:183<br>2DH3:26:367<br>3DH3:27:552 | Packet type:<br>DH5:15:339<br>2DH5:30:679<br>3DH5:31:1021 |

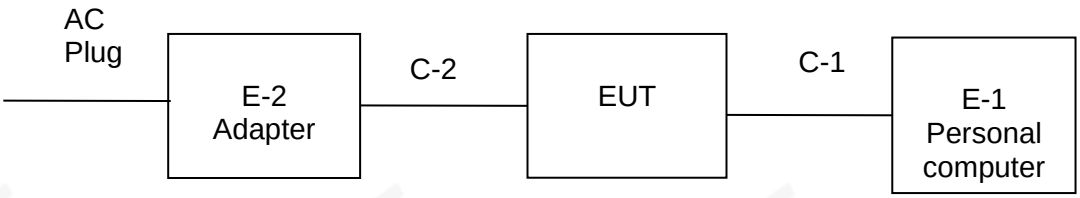
| RF Function | Type | Mode Or Modulation type | ANT Gain(dBi) | Power Class | Software For Testing |
|---|---|---|---|---|---|
| BT | BR+EDR | GFSK | 2.5 | default | FCC_assist_1.0.2.2 |
| | | π/4-DQPSK | | default | |
| | | 8DPSK | | default | |

## 2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test




Conducted Emission Test



## 2.6 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Mfr/Brand | Model/Type No. | Note |
|---|---|---|---|---|
| E-1 | Personal computer | DELL | Inspiron 3501 | N/A |
| E-2 | Adapter | ZTC | NB-A515A | N/A |
| C-1 | Serial port board | XES | WTYZK | N/A |
| C-2 | USB Cable | ZTC | NB-A515A | N/A |

| Item | Shielded Type | Ferrite Core | Length | Note |
|---|---|---|---|---|
| C-2 | Shielded | NO | 150cm | N/A |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Note:

(1) For detachable type I/O cable should be specified the length in cm in『Length』column.
(2) “YES” is means “with core”; “NO” is means “without core”.

## 2.7 EQUIPMENTS LIST

| RF Radiation Test Equipment | | | | | |
|---|---|---|---|---|---|
| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last Calibration | Calibrated Until |
| Temperature & Humidity | SW-108 | SuWei | N/A | 2025.02.24 | 2026.02.23 |
| Pre-Amplifier(0.1M-3GHz) | EM | EM330 | 060665 | 2025.02.22 | 2026.02.21 |
| Pre-Amplifier(1G-18GHz) | SKET | LNPA-01018G-45 | SK2018080901 | 2024.09.23 | 2025.09.22 |
| Pre-Amplifier(18G-40GHz) | SKET | LNPA_1840-50 | SK2018101801 | 2025.02.22 | 2026.02.21 |
| Active loop Antenna | ZHINAN | ZN30900C | 16035 | 2025.02.25 | 2026.02.24 |
| Bilog Antenna | TESEQ | CBL6111D | 34678 | 2024.09.30 | 2025.09.29 |
| Horn Antenna | SCHWARZBECK | BBHA 9120D | 02014 | 2023.09.24 | 2025.09.23 |
| Horn Antenna | A-INFOMW | LB-180400-KF | J211020657 | 2023.10.10 | 2025.10.09 |
| Positioning Controller | MF | MF-7802 | MF-780208587 | N/A | N/A |
| Signal Analyzer | R&S | FSV 40-N | 101823 | 2024.09.23 | 2025.09.22 |
| Switch Control Box | N/A | N/A | N/A | N/A | N/A |
| Filter Box | BALUN Technology | SU319E | BL-SZ1530051 | N/A | N/A |
| Antenna Mast | MF | MFA-440H | N/A | N/A | N/A |
| Turn Table | MF | SC100_1 | 60531 | N/A | N/A |
| AC Power Source | APC | KDF-11010G | F214050035 | N/A | N/A |
| DC power supply | HONGSHENGFENG | DPS-305AF | 17064939 | 2024.09.23 | 2025.09.22 |
| Test SW | EZ-EMC | Ver.STSLAB-03A1 RE | | | |
| Conduction Test equipment | | | | | |
| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
| Test Receiver | R&S | ESCI | 101427 | 2024.09.24 | 2025.09.23 |
| Limtter | CYBERTEK | EM5010 | N/A | 2024.09.24 | 2025.09.23 |
| LISN | R&S | ENV216 | 101242 | 2024.09.24 | 2025.09.23 |
| LISN | EMCO | 3810/2NM | 23625 | 2024.09.24 | 2025.09.23 |
| Temperature & Humidity | SW-108 | SuWei | N/A | 2025.02.24 | 2026.02.23 |
| Test SW | EZ-EMC | Ver.STSLAB-03A1 CE | | | |
| RF Connected Test | | | | | |
| Kind of Equipment | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
| Signal Analyzer | Agilent | N9020A | MY51510623 | 2025.02.22 | 2026.02.21 |
| Power Sensor | Keysight | U2021XA | MY56120038 | 2024.09.23 | 2025.09.22 |
| Temperature & Humidity | SW-108 | SuWei | N/A | 2025.02.24 | 2026.02.23 |
| Test SW | MW | MTS 8310_2.0.0.0 | | | |

# 3. EMC EMISSION TEST

## 3.1 CONDUCTED EMISSION MEASUREMENT

### 3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

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.

| FREQUENCY (MHz) | Conducted Emissionlimit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 -0.5 | 66 - 56 * | 56 - 46 * |
| 0.50 -5.0 | 56.00 | 46.00 |
| 5.0 -30.0 | 60.00 | 50.00 |

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

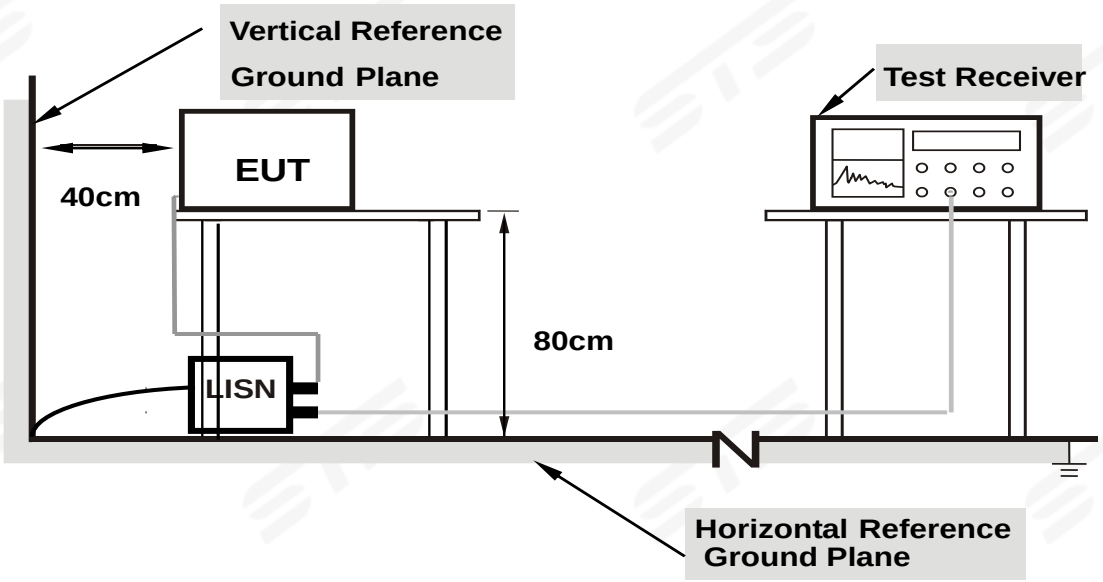
The following table is the setting of the receiver

| **Receiver Parameters** | **Setting** |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

3.1.2 TEST PROCEDURE

a. The EUT is 0.8 m from the horizontal ground plane and 0.4 m from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments are powered from additional LISN(s). The LISN provides 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN is at least 80 cm from the nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP




**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes support units.**

3.1.4 EUT OPERATING CONDITIONS

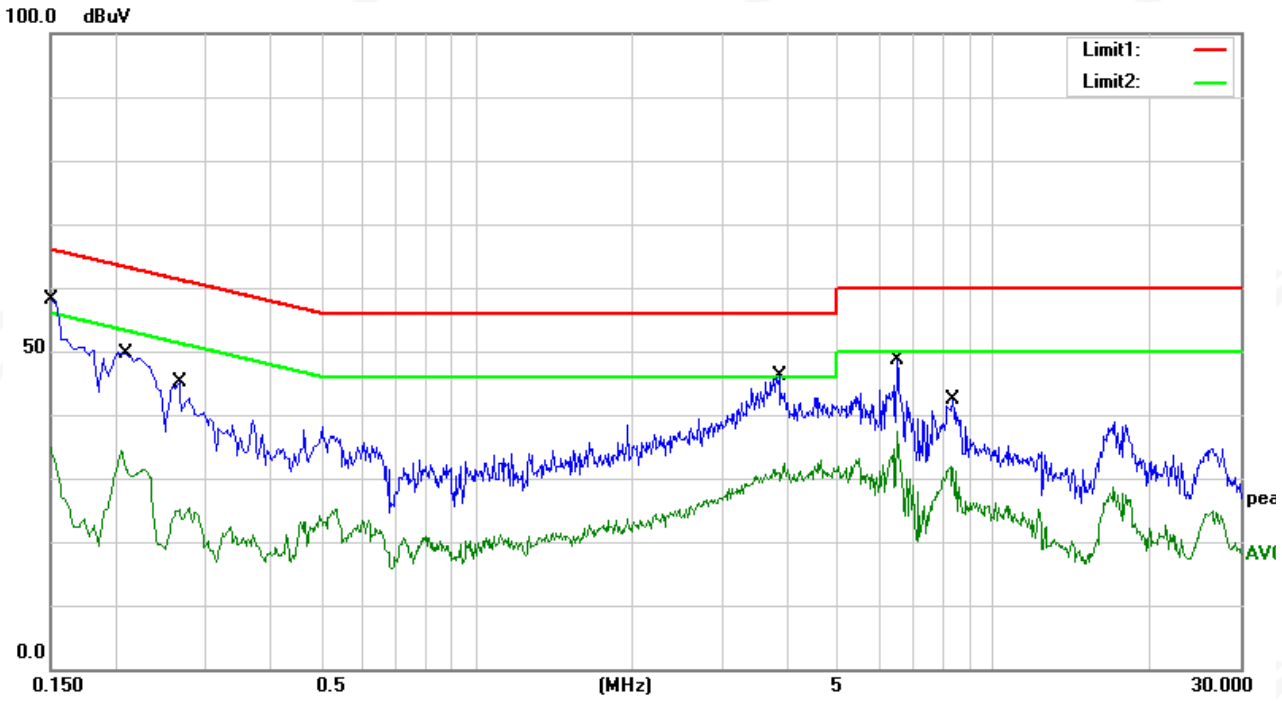
The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.5 TEST RESULT

| | | | |
|---|---|---|---|
| Temperature: | 25.1℃ | Relative Humidity: | 59%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | L |
| Test Mode: | Mode 13 | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 38.29 | 19.78 | 58.07 | 66.00 | -7.93 | QP |
| 2 | 0.1500 | 15.00 | 19.78 | 34.78 | 56.00 | -21.22 | AVG |
| 3 | 0.2100 | 29.85 | 19.81 | 49.66 | 63.21 | -13.55 | QP |
| 4 | 0.2100 | 14.46 | 19.81 | 34.27 | 53.21 | -18.94 | AVG |
| 5 | 0.2660 | 24.99 | 20.07 | 45.06 | 61.24 | -16.18 | QP |
| 6 | 0.2660 | 5.30 | 20.07 | 25.37 | 51.24 | -25.87 | AVG |
| 7 | 3.8580 | 26.28 | 19.84 | 46.12 | 56.00 | -9.88 | QP |
| 8 | 3.8580 | 12.60 | 19.84 | 32.44 | 46.00 | -13.56 | AVG |
| 9 | 6.5220 | 28.91 | 19.82 | 48.73 | 60.00 | -11.27 | QP |
| 10 | 6.5220 | 17.56 | 19.82 | 37.38 | 50.00 | -12.62 | AVG |
| 11 | 8.3580 | 22.31 | 20.05 | 42.36 | 60.00 | -17.64 | QP |
| 12 | 8.3580 | 11.94 | 20.05 | 31.99 | 50.00 | -18.01 | AVG |

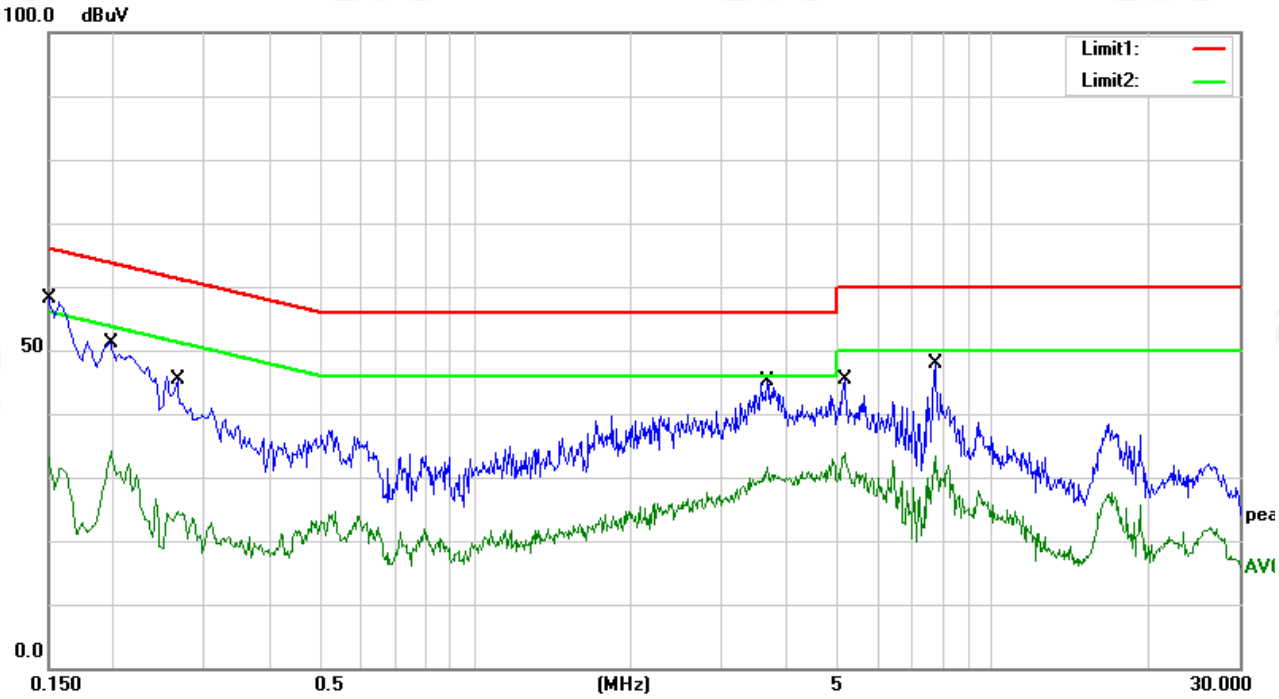
Remark:
1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result =Reading + Factor )–Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)



| | | | |
|---|---|---|---|
| Temperature: | 25.1℃ | Relative Humidity: | 59%RH |
| Test Voltage: | AC 120V/60Hz | Phase: | N |
| Test Mode: | Mode 13 | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB) | Result (dBuV) | Limit (dBuV) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 38.28 | 19.74 | 58.02 | 66.00 | -7.98 | QP |
| 2 | 0.1500 | 13.33 | 19.74 | 33.07 | 56.00 | -22.93 | AVG |
| 3 | 0.1980 | 31.30 | 19.86 | 51.16 | 63.69 | -12.53 | QP |
| 4 | 0.1980 | 14.32 | 19.86 | 34.18 | 53.69 | -19.51 | AVG |
| 5 | 0.2660 | 25.20 | 20.12 | 45.32 | 61.24 | -15.92 | QP |
| 6 | 0.2660 | 4.49 | 20.12 | 24.61 | 51.24 | -26.63 | AVG |
| 7 | 3.6620 | 25.16 | 19.94 | 45.10 | 56.00 | -10.90 | QP |
| 8 | 3.6620 | 11.60 | 19.94 | 31.54 | 46.00 | -14.46 | AVG |
| 9 | 5.1780 | 25.57 | 19.88 | 45.45 | 60.00 | -14.55 | QP |
| 10 | 5.1780 | 13.95 | 19.88 | 33.83 | 50.00 | -16.17 | AVG |
| 11 | 7.7420 | 28.05 | 19.89 | 47.94 | 60.00 | -12.06 | QP |
| 12 | 7.7420 | 13.55 | 19.89 | 33.44 | 50.00 | -16.56 | AVG |

Remark:
1. All readings are Quasi-Peak and Average values
2. Margin = Result (Result =Reading + Factor )–Limit
3. Factor=LISN factor+Cable loss+Limiter (10dB)



## 3.2 RADIATED EMISSION MEASUREMENT

### 3.2.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205 (a)&209(a) limit in the table and according to ANSI C63.10-2020 below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

| Frequencies (MHz) | Field Strength (micorvolts/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 |

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

| FREQUENCY (MHz) | (dBuV/m) (at 3M) | |
|---|---|---|
| | PEAK | AVERAGE |
| Above 1000 | 74 | 54 |

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RESTRICTED FREQUENCY BANDS

| FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (MHz) | FREQUENCY (GHz) |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

For Radiated Emission

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/QP/AV |
| Start Frequency | 9 KHz/150KHz(Peak/QP/AV) |
| Stop Frequency | 150KHz/30MHz(Peak/QP/AV) |
| RB / VB (emission in restricted band) | 200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz);<br>200Hz (From 9kHz to 0.15MHz)/<br>9KHz (From 0.15MHz to 30MHz) |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/QP |
| Start Frequency | 30 MHz(Peak/QP) |
| Stop Frequency | 1000 MHz (Peak/QP) |
| RB / VB (emission in restricted band) | 120 KHz / 300 KHz |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Detector | Peak/AV |
| Start Frequency | 1000 MHz(Peak/AV) |
| Stop Frequency | 10th carrier hamonic(Peak/AV) |
| RB / VB (emission in restricted band) | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG) |

For Restricted band

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak/AV |
| Start/Stop Frequency | Lower Band Edge: 2310 to 2410 MHz<br>Upper Band Edge: 2476 to 2500 MHz |
| RB / VB | 1 MHz / 3 MHz(Peak)<br>1 MHz/1/T MHz(AVG) |

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~90kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 90kHz~110kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 110kHz~490kHz / RB 200Hz for PK & AV |
| Start ~ Stop Frequency | 490kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

3.2.2 TEST PROCEDURE

a. The measuring distance at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz, and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 m (above 1GHz is 1.5 m) above the ground at a 3 m anechoic chamber test site. The table was rotated 360 degree to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m (above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. Horizontal and vertical polarization of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and QuasiPeak detector mode will be re-measured.
e. If the Peak Mode measured value is compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and no additional QP Mode measurement was performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

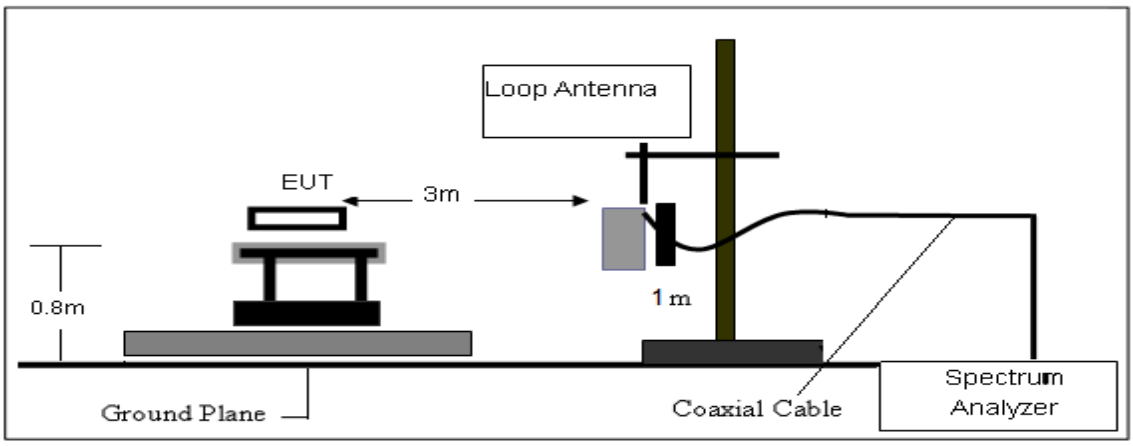
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

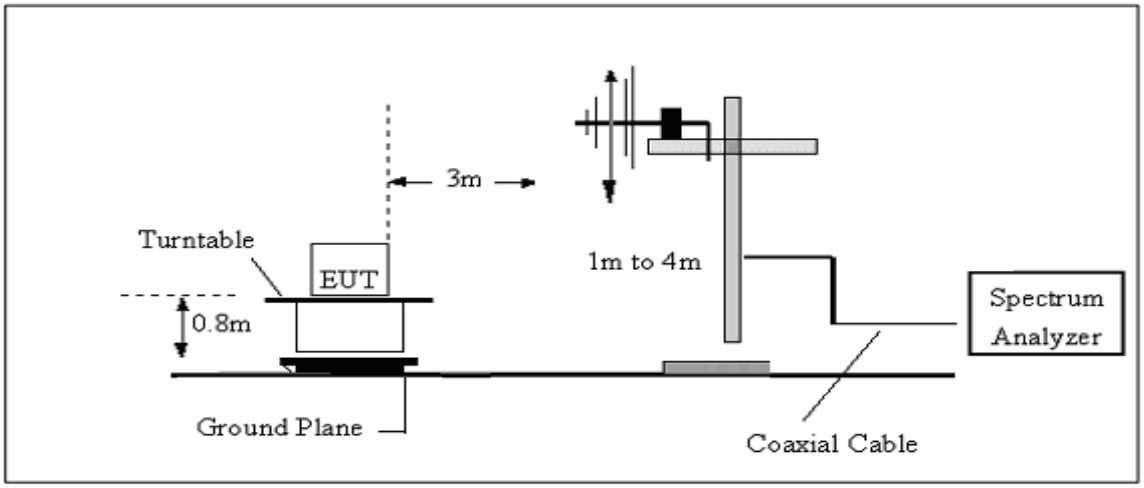
No deviation.

3.2.4 TESTSETUP

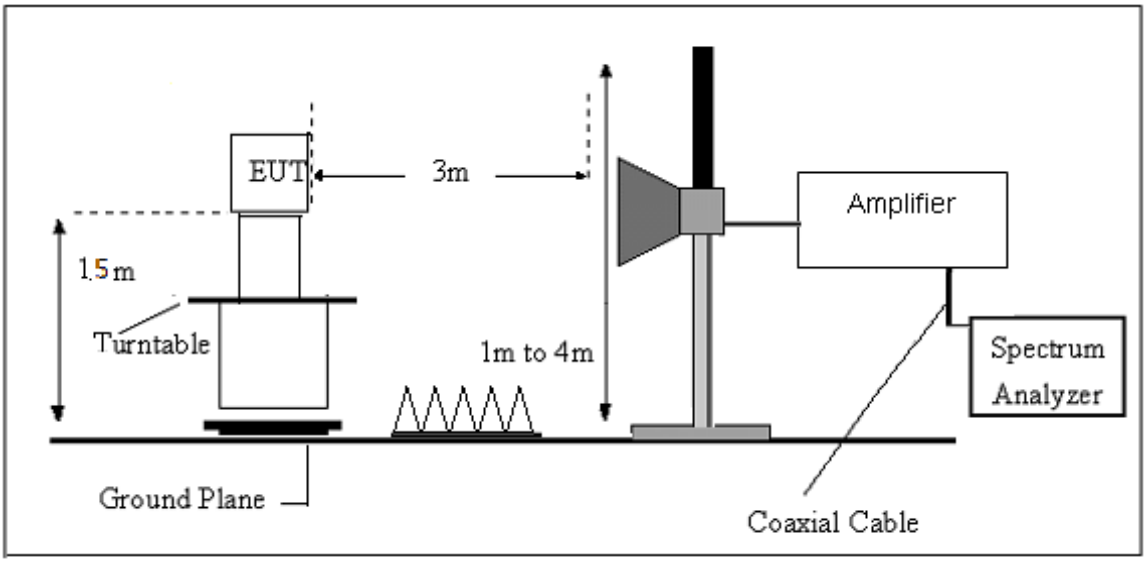
(A) Radiated Emission Test-Up Frequency Below 30MHz




(B) Radiated Emission Test-Up Frequency 30MHz~1GHz




(C) Radiated Emission Test-Up Frequency Above 1GHz




3.2.5 EUT OPERATING CONDITIONS

Please refer to section 3.1.4 of this report.

### 3.2.6 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

| Frequency | FS | RA | AF | CL | AG | Factor |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV/m) | (dBμV/m) | (dB) | (dB) | (dB) | (dB) |
| 300 | 40 | 58.1 | 12.2 | 1.6 | 31.9 | -18.1 |

Factor=AF+CL-AG

### 3.2.7 TEST RESULTS

(9KHz-30MHz)

| | | | |
|---|---|---|---|
| Temperature: | 23.4℃ | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.7V From Battery | Test Mode: | TX Mode |

| Freq. | Reading | Limit | Margin | State | Test Result |
|---|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F | |
| -- | -- | -- | -- | -- | PASS |
| -- | -- | -- | -- | -- | PASS |

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

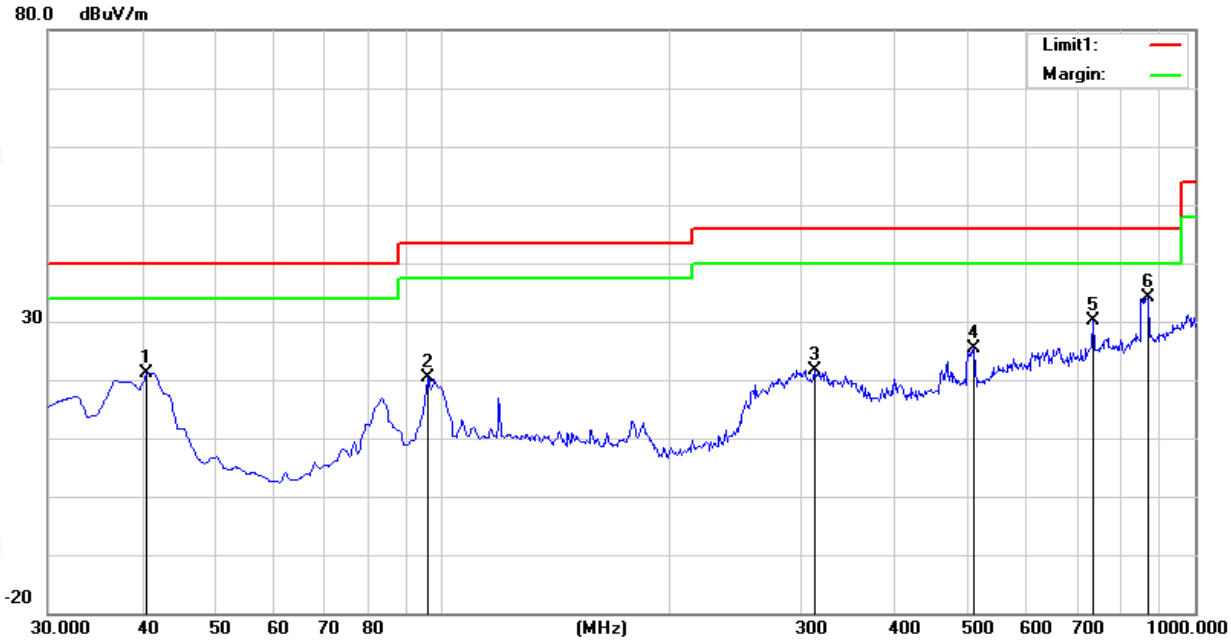
Limit line = specific limits (dBuv) + distance extrapolation factor.

(30MHz-1000MHz)

| | | | |
|---|---|---|---|
| Temperature: | 23.4℃ | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.7V From Battery | Phase: | Horizontal |
| Test Mode: | Mode 1/2/3/4/5/6/7/8/9 (Mode 7 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 40.6700 | 39.53 | -18.40 | 21.13 | 40.00 | -18.87 | peak |
| 2 | 95.9600 | 41.11 | -20.67 | 20.44 | 43.50 | -23.06 | peak |
| 3 | 312.2700 | 36.04 | -14.36 | 21.68 | 46.00 | -24.32 | peak |
| 4 | 509.1800 | 33.33 | -7.95 | 25.38 | 46.00 | -20.62 | peak |
| 5 | 733.2500 | 32.48 | -2.35 | 30.13 | 46.00 | -15.87 | peak |
| 6 | 867.1100 | 34.72 | -0.50 | 34.22 | 46.00 | -11.78 | peak |

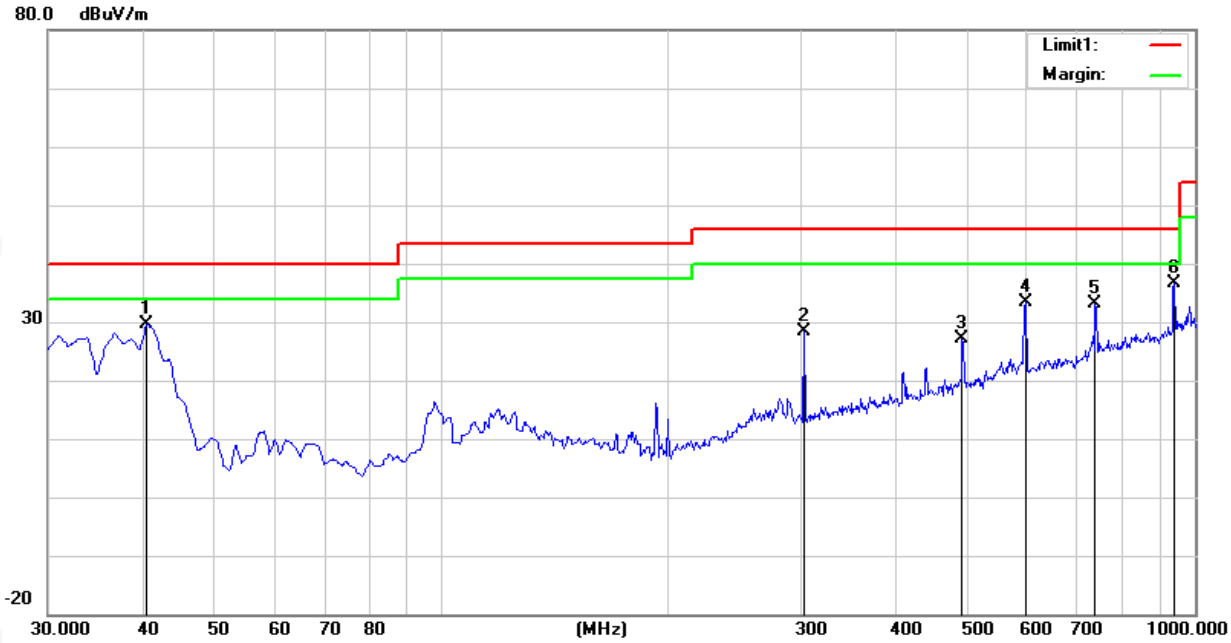
Remark:
1. Margin = Result (Result =Reading + Factor )–Limit
2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain
3. All modes have been tested,only show the worst case.



| | | | |
|---|---|---|---|
| Temperature: | 23.4℃ | Relative Humidity: | 60%RH |
| Test Voltage: | DC 3.7V From Battery | Phase: | Vertical |
| Test Mode: | Mode 1/2/3/4/5/6/7/8/9 (Mode 7 worst mode) | | |

| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 40.6700 | 48.13 | -18.40 | 29.73 | 40.00 | -10.27 | peak |
| 2 | 302.5700 | 42.99 | -14.72 | 28.27 | 46.00 | -17.73 | peak |
| 3 | 490.7500 | 35.22 | -8.20 | 27.02 | 46.00 | -18.98 | peak |
| 4 | 596.4800 | 39.31 | -5.84 | 33.47 | 46.00 | -12.53 | peak |
| 5 | 739.0700 | 35.28 | -2.15 | 33.13 | 46.00 | -12.87 | peak |
| 6 | 941.8000 | 35.26 | 1.42 | 36.68 | 46.00 | -9.32 | peak |

Remark:
1. Margin = Result (Result =Reading + Factor )–Limit
2. Factor= Antenna factor+Cable attenuation factor(cable loss)-Amplifier gain



(1GHz~25GHz) Spurious emission Requirements

| Frequency | Meter Reading | Amplifier | Loss | Antenna Factor | Corrected Factor | Emission Level | Limits | Margin | Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dB) | (dB/m) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type | |
| Low Channel (8DPSK/2402 MHz) | | | | | | | | | | |
| 3264.76 | 62.14 | 44.70 | 6.70 | 28.20 | -9.80 | 52.34 | 74.00 | -21.66 | PK | Vertical |
| 3264.76 | 50.15 | 44.70 | 6.70 | 28.20 | -9.80 | 40.35 | 54.00 | -13.65 | AV | Vertical |
| 3264.69 | 61.03 | 44.70 | 6.70 | 28.20 | -9.80 | 51.23 | 74.00 | -22.77 | PK | Horizontal |
| 3264.69 | 50.21 | 44.70 | 6.70 | 28.20 | -9.80 | 40.41 | 54.00 | -13.59 | AV | Horizontal |
| 4804.39 | 58.89 | 44.20 | 9.04 | 31.60 | -3.56 | 55.33 | 74.00 | -18.67 | PK | Vertical |
| 4804.39 | 49.36 | 44.20 | 9.04 | 31.60 | -3.56 | 45.80 | 54.00 | -8.20 | AV | Vertical |
| 4804.42 | 59.58 | 44.20 | 9.04 | 31.60 | -3.56 | 56.02 | 74.00 | -17.98 | PK | Horizontal |
| 4804.42 | 50.48 | 44.20 | 9.04 | 31.60 | -3.56 | 46.92 | 54.00 | -7.08 | AV | Horizontal |
| 5359.83 | 48.47 | 44.20 | 9.86 | 32.00 | -2.34 | 46.13 | 74.00 | -27.87 | PK | Vertical |
| 5359.83 | 40.01 | 44.20 | 9.86 | 32.00 | -2.34 | 37.67 | 54.00 | -16.33 | AV | Vertical |
| 5359.77 | 48.05 | 44.20 | 9.86 | 32.00 | -2.34 | 45.70 | 74.00 | -28.30 | PK | Horizontal |
| 5359.77 | 39.52 | 44.20 | 9.86 | 32.00 | -2.34 | 37.17 | 54.00 | -16.83 | AV | Horizontal |
| 7205.80 | 53.81 | 43.50 | 11.40 | 35.50 | 3.40 | 57.21 | 74.00 | -16.79 | PK | Vertical |
| 7205.80 | 44.60 | 43.50 | 11.40 | 35.50 | 3.40 | 48.00 | 54.00 | -6.00 | AV | Vertical |
| 7205.84 | 54.00 | 43.50 | 11.40 | 35.50 | 3.40 | 57.40 | 74.00 | -16.60 | PK | Horizontal |
| 7205.84 | 44.51 | 43.50 | 11.40 | 35.50 | 3.40 | 47.91 | 54.00 | -6.09 | AV | Horizontal |
| Middle Channel (8DPSK/2441 MHz) | | | | | | | | | | |
| 3264.61 | 60.99 | 44.70 | 6.70 | 28.20 | -9.80 | 51.19 | 74.00 | -22.81 | PK | Vertical |
| 3264.61 | 50.84 | 44.70 | 6.70 | 28.20 | -9.80 | 41.04 | 54.00 | -12.96 | AV | Vertical |
| 3264.62 | 62.24 | 44.70 | 6.70 | 28.20 | -9.80 | 52.44 | 74.00 | -21.56 | PK | Horizontal |
| 3264.62 | 50.10 | 44.70 | 6.70 | 28.20 | -9.80 | 40.30 | 54.00 | -13.70 | AV | Horizontal |
| 4882.49 | 58.15 | 44.20 | 9.04 | 31.60 | -3.56 | 54.59 | 74.00 | -19.41 | PK | Vertical |
| 4882.49 | 50.20 | 44.20 | 9.04 | 31.60 | -3.56 | 46.64 | 54.00 | -7.36 | AV | Vertical |
| 4882.58 | 59.06 | 44.20 | 9.04 | 31.60 | -3.56 | 55.50 | 74.00 | -18.50 | PK | Horizontal |
| 4882.58 | 50.46 | 44.20 | 9.04 | 31.60 | -3.56 | 46.90 | 54.00 | -7.10 | AV | Horizontal |
| 5359.89 | 48.94 | 44.20 | 9.86 | 32.00 | -2.34 | 46.59 | 74.00 | -27.41 | PK | Vertical |
| 5359.89 | 39.44 | 44.20 | 9.86 | 32.00 | -2.34 | 37.09 | 54.00 | -16.91 | AV | Vertical |
| 5359.85 | 47.22 | 44.20 | 9.86 | 32.00 | -2.34 | 44.87 | 74.00 | -29.13 | PK | Horizontal |
| 5359.85 | 38.49 | 44.20 | 9.86 | 32.00 | -2.34 | 36.15 | 54.00 | -17.85 | AV | Horizontal |
| 7323.81 | 54.29 | 43.50 | 11.40 | 35.50 | 3.40 | 57.69 | 74.00 | -16.31 | PK | Vertical |
| 7323.81 | 44.05 | 43.50 | 11.40 | 35.50 | 3.40 | 47.45 | 54.00 | -6.55 | AV | Vertical |
| 7323.67 | 53.74 | 43.50 | 11.40 | 35.50 | 3.40 | 57.14 | 74.00 | -16.86 | PK | Horizontal |
| 7323.67 | 44.48 | 43.50 | 11.40 | 35.50 | 3.40 | 47.88 | 54.00 | -6.12 | AV | Horizontal |

| High Channel (8DPSK/2480 MHz) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3264.71 | 60.90 | 44.70 | 6.70 | 28.20 | -9.80 | 51.10 | 74.00 | -22.90 | PK | Vertical |
| 3264.71 | 50.24 | 44.70 | 6.70 | 28.20 | -9.80 | 40.44 | 54.00 | -13.56 | AV | Vertical |
| 3264.61 | 61.79 | 44.70 | 6.70 | 28.20 | -9.80 | 51.99 | 74.00 | -22.01 | PK | Horizontal |
| 3264.61 | 50.20 | 44.70 | 6.70 | 28.20 | -9.80 | 40.40 | 54.00 | -13.60 | AV | Horizontal |
| 4960.43 | 59.04 | 44.20 | 9.04 | 31.60 | -3.56 | 55.48 | 74.00 | -18.52 | PK | Vertical |
| 4960.43 | 50.28 | 44.20 | 9.04 | 31.60 | -3.56 | 46.72 | 54.00 | -7.28 | AV | Vertical |
| 4960.34 | 59.18 | 44.20 | 9.04 | 31.60 | -3.56 | 55.62 | 74.00 | -18.38 | PK | Horizontal |
| 4960.34 | 50.11 | 44.20 | 9.04 | 31.60 | -3.56 | 46.55 | 54.00 | -7.45 | AV | Horizontal |
| 5359.86 | 49.31 | 44.20 | 9.86 | 32.00 | -2.34 | 46.96 | 74.00 | -27.04 | PK | Vertical |
| 5359.86 | 39.41 | 44.20 | 9.86 | 32.00 | -2.34 | 37.07 | 54.00 | -16.93 | AV | Vertical |
| 5359.63 | 47.35 | 44.20 | 9.86 | 32.00 | -2.34 | 45.01 | 74.00 | -28.99 | PK | Horizontal |
| 5359.63 | 39.20 | 44.20 | 9.86 | 32.00 | -2.34 | 36.85 | 54.00 | -17.15 | AV | Horizontal |
| 7439.91 | 54.21 | 43.50 | 11.40 | 35.50 | 3.40 | 57.61 | 74.00 | -16.39 | PK | Vertical |
| 7439.91 | 43.56 | 43.50 | 11.40 | 35.50 | 3.40 | 46.96 | 54.00 | -7.04 | AV | Vertical |
| 7439.86 | 54.04 | 43.50 | 11.40 | 35.50 | 3.40 | 57.44 | 74.00 | -16.56 | PK | Horizontal |
| 7439.86 | 44.61 | 43.50 | 11.40 | 35.50 | 3.40 | 48.01 | 54.00 | -5.99 | AV | Horizontal |

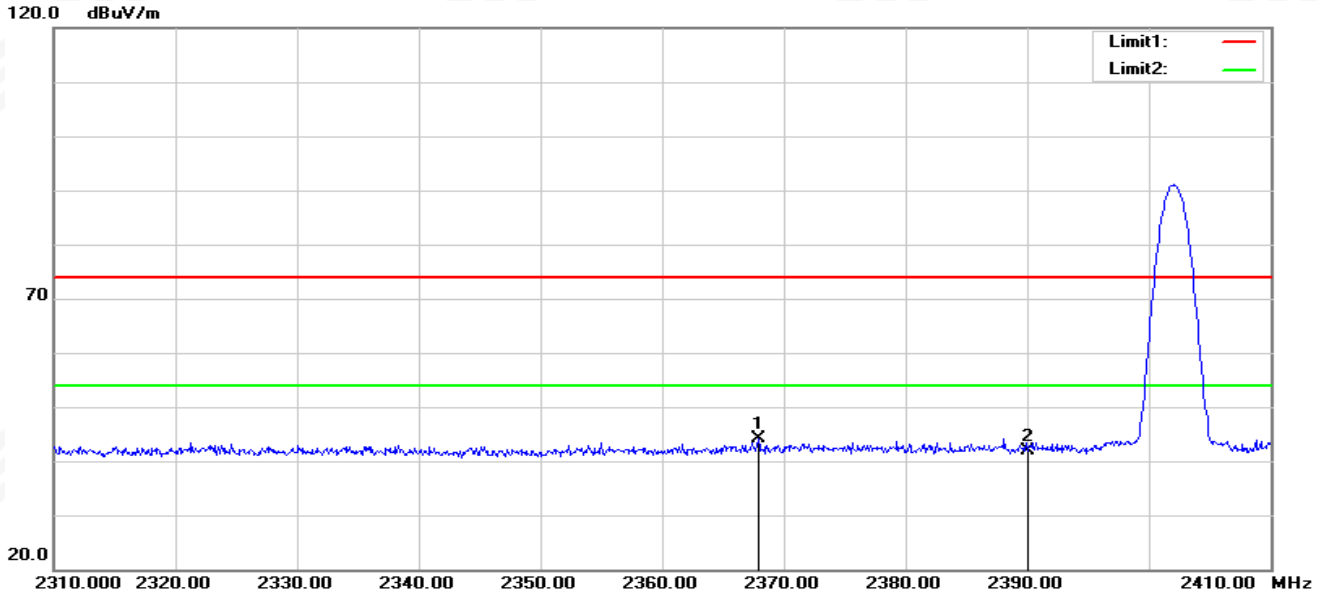
Note:

1) All modes have been measurement, only worst mode was reported.
2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor
3) The frequency emission of peak points that did not show above the forms are at least 20dB below the limit, the frequency emission is mainly from the environment noise.

Restricted band Requirements

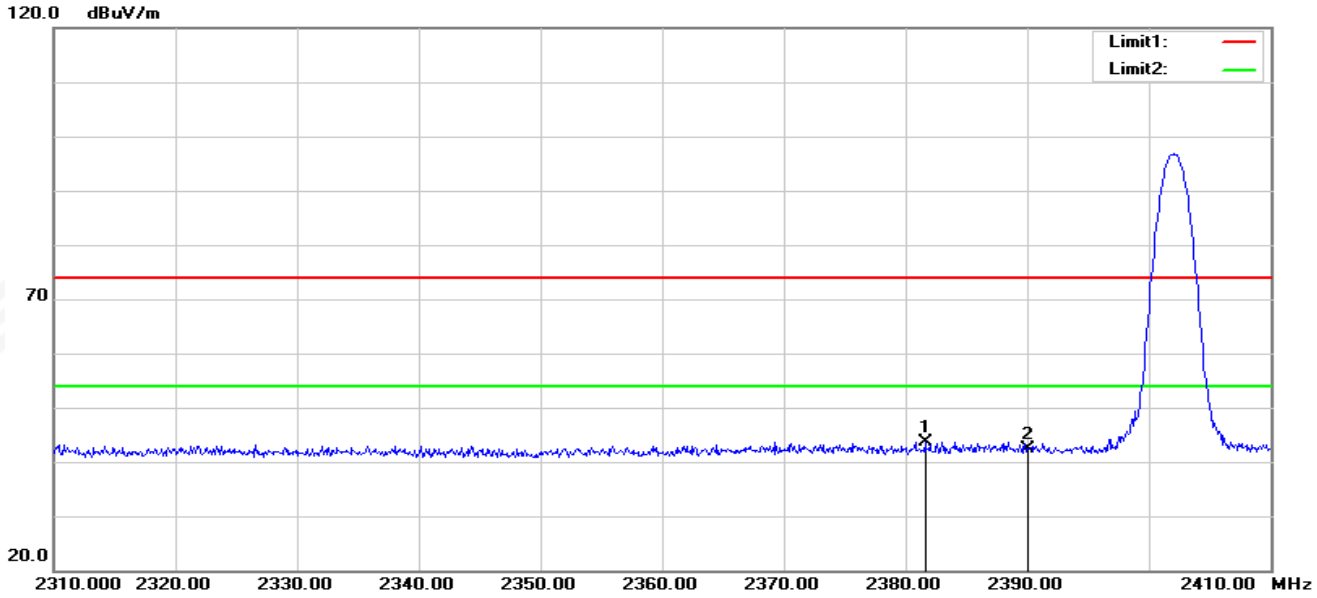
**8DPSK -Low**

Horizontal




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2367.900 | 40.05 | 4.01 | 44.06 | 74.00 | -29.94 | peak |
| 2 | 2390.000 | 37.43 | 4.34 | 41.77 | 74.00 | -32.23 | peak |

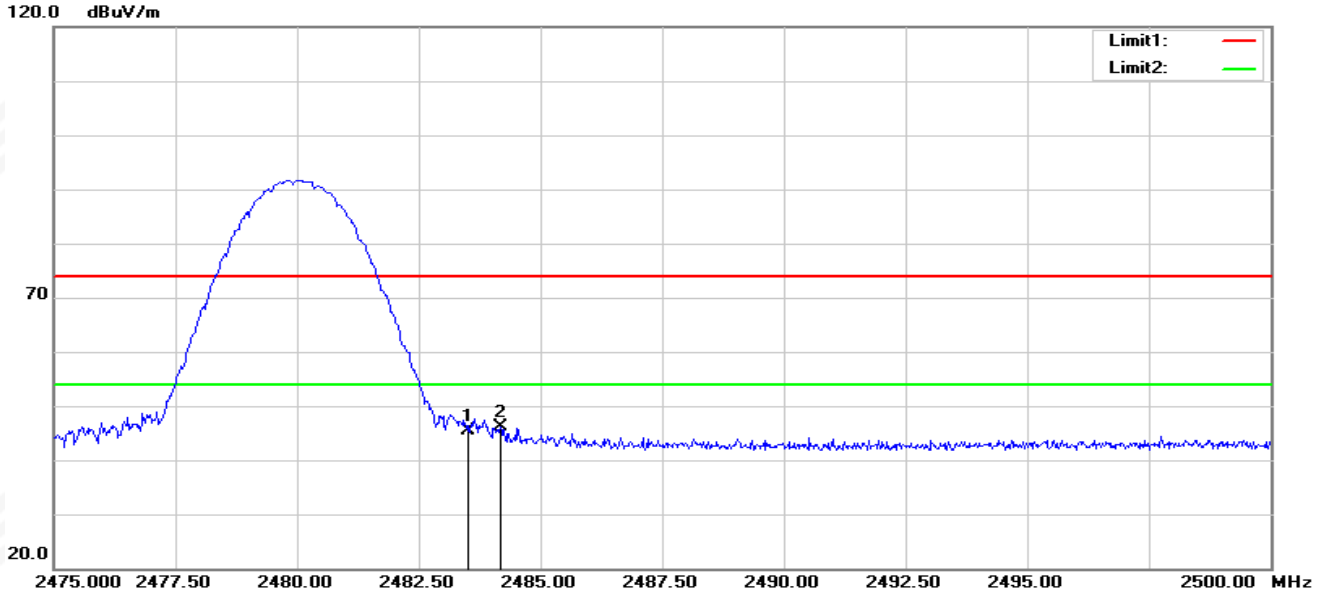
Vertical




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2381.600 | 39.38 | 4.22 | 43.60 | 74.00 | -30.40 | peak |
| 2 | 2390.000 | 38.11 | 4.34 | 42.45 | 74.00 | -31.55 | peak |

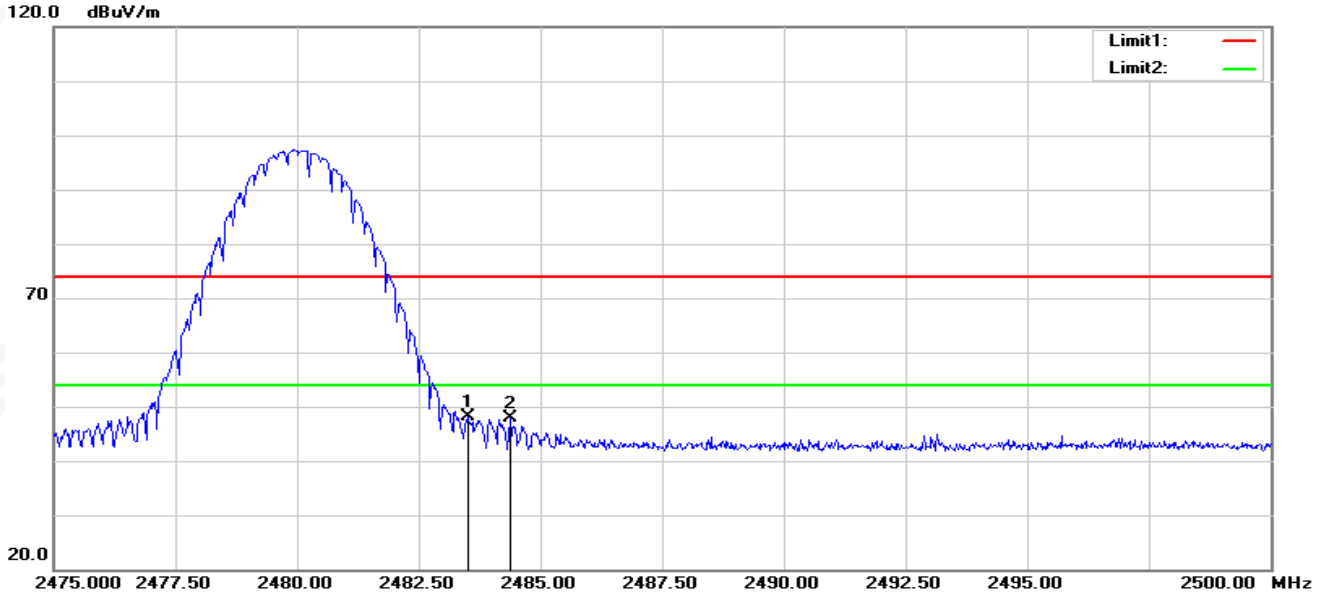
**8DPSK -High**

Horizontal




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 40.84 | 4.60 | 45.44 | 74.00 | -28.56 | peak |
| 2 | 2484.175 | 41.61 | 4.61 | 46.22 | 74.00 | -27.78 | peak |

Vertical




| No. | Frequency (MHz) | Reading (dBuV) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|
| 1 | 2483.500 | 43.58 | 4.60 | 48.18 | 74.00 | -25.82 | peak |
| 2 | 2484.375 | 43.33 | 4.61 | 47.94 | 74.00 | -26.06 | peak |

Note: All modes have been measurement, only worst mode was reported.

# 4. CONDUCTED SPURIOUS & BAND EDGE EMISSION

## 4.1 LIMIT

According to FCC section 15.247(d), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

## 4.2 TEST PROCEDURE

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Start/Stop Frequency | 30 MHz to 10th carrier harmonic |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

For Band edge

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 2300 – 2407 MHz<br>Upper Band Edge: 2475 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

For Hopping Band edge

| Spectrum Parameter | Setting |
|---|---|
| Detector | Peak |
| Start/Stop Frequency | Lower Band Edge: 2300– 2403 MHz<br>Upper Band Edge: 2479 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

4.3 TEST SETUP

The EUT is connected to the Spectrum Analyzer; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. Tune the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. In order to make an accurate measurement, the span is set to be greater than RBW.

4.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

4.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

# 5. NUMBER OF HOPPING CHANNEL

## 5.1 LIMIT

| FCC Part 15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | FrequencyRange (MHz) | Result |
| 15.247 (a)(1)(iii) | Number of Hopping Channel | ≥15 | 2400-2483.5 | PASS |

| Spectrum Parameters | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Operating FrequencyRange |
| RB | 100KHz |
| VB | 300KHz |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

## 5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

## 5.3 TEST SETUP

## 5.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

## 5.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

# 6. AVERAGE TIME OF OCCUPANCY

## 6.1 LIMIT

| FCC Part 15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | FrequencyRange (MHz) | Result |
| 15.247 (a)(1)(iii) | Average Time of Occupancy | 0.4sec | 2400-2483.5 | PASS |

## 6.2 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer.
b. Set RBW =1MHz/VBW =3MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.

The Dwell Time=Burst Width*Total Hops.The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4[s]*hopping number=0.4[s]*79[ch)=31.6[s*ch];
Dwell Time Calculate formula:
Dwell time = pulse time (ms) x pulse number in 31.6s

## 6.3 TEST SETUP

## 6.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

## 6.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

# 7. HOPPING CHANNEL SEPARATION MEASUREMEN

## 7.1 LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > 20 dB Bandwidth or Channel Separation |
| RB | 30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation) |
| VB | 100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

## 7.2 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
c. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

## 7.3 TEST SETUP

## 7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 7.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

# 8. BANDWIDTH TEST

## 8.1 LIMIT

| FCC Part15 15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | FrequencyRange (MHz) | Result |
| 15.247 (a)(1) | Bandwidth | N/A | 2400-2483.5 | PASS |

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Span Frequency | > Measurement Bandwidth or Channel Separation |
| RB | 30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation) |
| VB | 100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation) |
| Detector | Peak |
| Trace | Max Hold |
| Sweep Time | Auto |

## 8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

## 8.3 TEST SETUP

## 8.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

## 8.5 TEST RESULTS

Note: The test data please refer to APPENDIX 1.

# 9. OUTPUT POWER TEST

## 9.1 LIMIT

| FCC Part 15.247,Subpart C | | | | |
|---|---|---|---|---|
| Section | Test Item | Limit | Frequency Range (MHz) | Result |
| 15.247 (a)(1)&(b)(1) | Output Power | 1 W or 0.125W<br>if channel separation > 2/3 bandwidthprovided thesystems operatewith an output power no greater than125 mW(20.97dBm) | 2400-2483.5 | PASS |

## 9.2 TEST PROCEDURE

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.