# FCC Test Report

**Test report**
**On Behalf of**
**Shenzhen Guli Tech Co., Ltd**
**For**
**Gulikit KK3**
**Model No.: NS37**

**FCC ID: 2BLVF-NS37**

| | |
|---|---|
| **Prepared For :** | **Shenzhen Guli Tech Co., Ltd**<br>**No. A603, G4 building, TCL International E-city, Nanshan District, Shenzhen, 518052 China** |
| **Prepared By :** | **Shenzhen HUAK Testing Technology Co., Ltd.**<br>**1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China** |
| **Date of Test:** | **Sept. 25, 2024 ~ Oct. 17, 2024** |
| **Date of Report:** | **Oct. 17, 2024** |
| **Report Number:** | **HK2409255610-2E** |

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# Test Result Certification

| | | |
|---|---|---|
| **Applicant's name** | : | Shenzhen Guli Tech Co., Ltd |
| Address | : | No. A603, G4 building, TCL International E-city, Nanshan District, Shenzhen, 518052 China |
| **Manufacturer's Name** | : | Shenzhen Guli Tech Co., Ltd |
| Address | : | No. A603, G4 building, TCL International E-city, Nanshan District, Shenzhen, 518052 China |
| **Product description** | | |
| Trade Mark | : | GuliKit |
| Product name | : | Gulikit KK3 |
| Model and/or type reference | : | NS37 |
| **Standards** | : | **47 CFR FCC Part 15 Subpart C 15.247** |

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| | | |
|---|---|---|
| **Date of Test** | : | |
| Date (s) of performance of tests | : | **Sept. 25, 2024 ~ Oct. 17, 2024** |
| Date of Issue | : | **Oct. 17, 2024** |
| Test Result | : | **Pass** |

Testing Engineer : Len Liao

(Len Liao)

Technical Manager : Sliver Wan

(Sliver Wan)

Authorized Signatory : Jason Zhou

(Jason Zhou)

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**** Modified History ****

| Revision | Description | Issued Data | Remark |
|---|---|---|---|
| Revision 1.0 | Initial Test Report Release | Oct. 17, 2024 | Jason Zhou |
| | | | |
| | | | |

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# 1. Summary

## 1.1. Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

ANSI C63.10:2013: American National Standard for Testing Unlicensed Wireless Devices.

## 1.2. Test Description

| FCC PART 15.247 | | |
|---|---|---|
| FCC Part 15.207 | AC Power Conducted Emission | PASS |
| FCC Part 15.215 | 20dB Bandwidth & 99% Bandwidth | PASS |
| FCC Part 15.247(d) | Spurious RF Conducted Emission | PASS |
| FCC Part 15.247(b) | Maximum Peak Output Power | PASS |
| FCC Part 15.247(a)(1) | Pseudorandom Frequency Hopping Sequence | PASS |
| FCC Part 15.247(a)(1)(iii) | Number of hopping frequency & Time of Occupancy | PASS |
| FCC Part 15.247(a)(1) | Frequency Separation | PASS |
| FCC Part 15.205/15.209 | Radiated Emissions | PASS |
| FCC Part 15.247(d) | Band Edge Compliance of RF Emission | PASS |

***Note:***

*1. PASS: Test item meets the requirement.*

*2. Fail: Test item does not meet the requirement.*

*3. N/A: Test case does not apply to the test object.*

*4. The test result judgment is decided by the limit of test standard.*

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## 1.3. Information of the Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.
Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization：

A2LA Accreditation Code is 4781.01.
FCC Designation Number is CN1229.
Canada IC CAB identifier is CN0045.
CNAS Registration Number is L9589.

## 1.4. Statement of the 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 %.

| Test | Measurement Uncertainty | Notes |
|---|---|---|
| Transmitter power conducted | ±0.37dB | (1) |
| Transmitter power Radiated | ±3.35dB | (1) |
| Conducted spurious emission 9KHz-40 GHz | ±2.20dB | (1) |
| Occupied Bandwidth | ±3.68% | (1) |
| Radiated Emission 30~1000MHz | ±3.90dB | (1) |
| Radiated Emission Above 1GHz | ±4.28dB | (1) |
| Conducted Disturbance0.15~30MHz | ±2.71dB | (1) |

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# 2. General Information

## 2.1. Environmental Conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Normal Temperature: | 25°C |
| Relative Humidity: | 55 % |
| Air Pressure: | 101 kPa |

## 2.2. General Description of EUT

| | |
|---|---|
| Product Name: | Gulikit KK3 |
| Model/Type reference: | NS37 |
| Series Model: | N /A |
| Model Difference: | N /A |
| Power supply: | DC 5V from Type-C or DC 3.7V from battery |
| Version: | Supported EDR |
| Modulation: | GFSK, π/4DQPSK, 8DPSK |
| Operation frequency: | 2402MHz~2480MHz |
| Channel number: | 79CH |
| Channel separation: | 1MHz |
| Antenna type: | PCB Antenna |
| Antenna gain: | -0.61dBi |
| Hardware Version: | V10 |
| Software Version: | V10 |

Note:
1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Antenna gain Refer to the antenna specifications.
3. The cable loss data is obtained from the supplier.
4. The test results in the report only apply to the tested sample.

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## 2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing.
There are 79 channels provided to the EUT and Channel 00/39/78 was selected for testing.

**Operation Frequency :**

| Channel | Frequency (MHz) |
|---|---|
| 00 | 2402 |
| 01 | 2403 |
| ⋮ | ⋮ |
| 38 | 2440 |
| 39 | 2441 |
| 40 | 2442 |
| ⋮ | ⋮ |
| 77 | 2479 |
| 78 | 2480 |

Note: The line display in grey were the channel selected for testing.

Preliminary tests were performed in each mode and packet length of BT, and found worst case as bellow, finally test were conducted at those mode and recorded in this report.

| Test Items | Worst case |
|---|---|
| Conducted Emissions | Charge mode |
| Radiated Emissions and Band Edge | DH5 Low channel |
| Maximum Conducted Output Power | DH5/2DH5/3DH5 |
| 20dB Bandwidth & 99% Bandwidth | DH5/2DH5/3DH5 |
| Frequency Separation | DH5/2DH5/3DH5 Middle channel |
| Number of hopping frequency | DH5/2DH5/3DH5 |
| Time of Occupancy (Dwell Time) | DH1/DH3/DH5 Middle channel<br>2DH1/2DH3/2DH5 Middle channel<br>3DH1/3DH3/3DH5 Middle channel |
| Out-of-band Emissions | DH5/2DH5/3DH5 |

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## 2.4. Equipments Used During the Test

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | L.I.S.N. | R&S | ENV216 | HKE-002 | Feb. 20, 2024 | 1 Year |
| 2 | L.I.S.N. | R&S | ENV216 | HKE-059 | Feb. 20, 2024 | 1 Year |
| 3 | EMI Test Receiver | R&S | ESR | HKE-005 | Feb. 20, 2024 | 1 Year |
| 4 | Spectrum analyzer | Agilent | N9020A | HKE-025 | Feb. 20, 2024 | 1 Year |
| 5 | Spectrum analyzer | R&S | FSV3044 | HKE-126 | Feb. 20, 2024 | 1 Year |
| 6 | Preamplifier | EMCI | EMC051845 S | HKE-006 | Feb. 20, 2024 | 1 Year |
| 7 | Preamplifier | Schwarzbeck | BBV 9743 | HKE-016 | Feb. 20, 2024 | 1 Year |
| 8 | Preamplifier | A.H. Systems | SAS-574 | HKE-182 | Feb. 20, 2024 | 1 Year |
| 9 | 6d Attenuator | Pasternack | 6db | HKE-184 | Feb. 20, 2024 | 1 Year |
| 10 | EMI Test Receiver | Rohde & Schwarz | ESR-7 | HKE-010 | Feb. 20, 2024 | 1 Year |
| 11 | Broadband Antenna | Schwarzbeck | VULB9168 | HKE-167 | Feb. 21, 2024 | 2 Year |
| 12 | Loop Antenna | COM-POWER | AL-130R | HKE-014 | Feb. 21, 2024 | 2 Year |
| 13 | Horn Antenna | Schwarzbeck | 9120D | HKE-013 | Feb. 21, 2024 | 2 Year |
| 14 | EMI Test Software | Tonscend | JS32-CE 2.5.0.6 | HKE-081 | / | / |
| 15 | EMI Test Software | Tonscend | JS32-RE 5.0.0 | HKE-082 | / | / |
| 16 | RF Automatic control unit | Tonscend | JS0806-2 | HKE-060 | Feb. 20, 2024 | 1 Year |
| 17 | High pass filter unit | Tonscend | JS0806-F | HKE-055 | Feb. 20, 2024 | 1 Year |
| 18 | Wireless Communication Test Set | R&S | CMU200 | HKE-026 | Feb. 20, 2024 | 1 Year |
| 19 | Wireless Communication Test Set | R&S | CMW500 | HKE-027 | Feb. 20, 2024 | 1 Year |
| 20 | High-low temperature chamber | Guangke | HT-80L | HKE-118 | Jun. 10, 2024 | 1 Year |
| 21 | Temperature and humidity meter | Boyang | HTC-1 | HKE-075 | Jun. 10, 2024 | 1 Year |
| 22 | RF Test Software | Tonscend | JS1120-3 Version 3.3.23 | HKE-083 | / | / |
| 23 | 10dB Attenuator | Schwarzbeck | VTSD9561F | HKE-153 | Feb. 20, 2024 | 1 Year |
| 24 | RSE Test Software | Tonscend | JS36-RSE 5.0.0 | HKE-184 | / | / |

The calibration interval was one year.

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## 2.5. Related Submittal(S) / Grant (S)

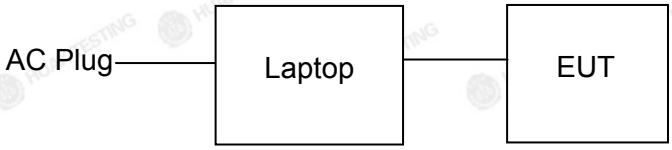
This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.6. Modifications

No modifications were implemented to meet testing criteria.

## 2.7. Description of Test Setup

Operation of EUT during Conducted and below 1GHz Radiation testing:




Operation of EUT during Radiation Above 1GHz testing:

The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position.

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## 2.8. Description of 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 | Trade Mark | Model/Type No. | Specification | Remark |
|---|---|---|---|---|---|
| 1 | Gulikit KK3 | GuliKit | NS37 | N/A | EUT |
| 2 | Laptop | Lenovo | Thinkpad E450 | Input: 20V 2.25A/3.25A | Peripheral |
| | | | | | |

***Note:***

*1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
*2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*
*3. For conducted measurements (Output Power, 20db Bandwidth, Frequency Separation, Number of Hopping Frequency, Time of Occupancy (Dwell Time), Out-of-Band Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.*

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# 3. Test Conditions and Results

## 3.1. Conducted Emissions Test

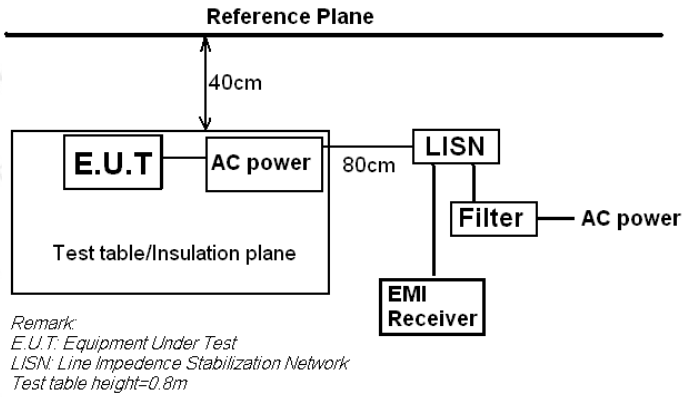
**LIMIT**

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for License-Exempt Radio Apparatus as below:

| Frequency range (MHz) | Limit (dBuV) | |
|---|---|---|
| | 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.

**TEST CONFIGURATION**




*Remark:*
*E.U.T: Equipment Under Test*
*LISN: Line Impedence Stabilization Network*
*Test table height=0.8m*

**TEST PROCEDURE**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

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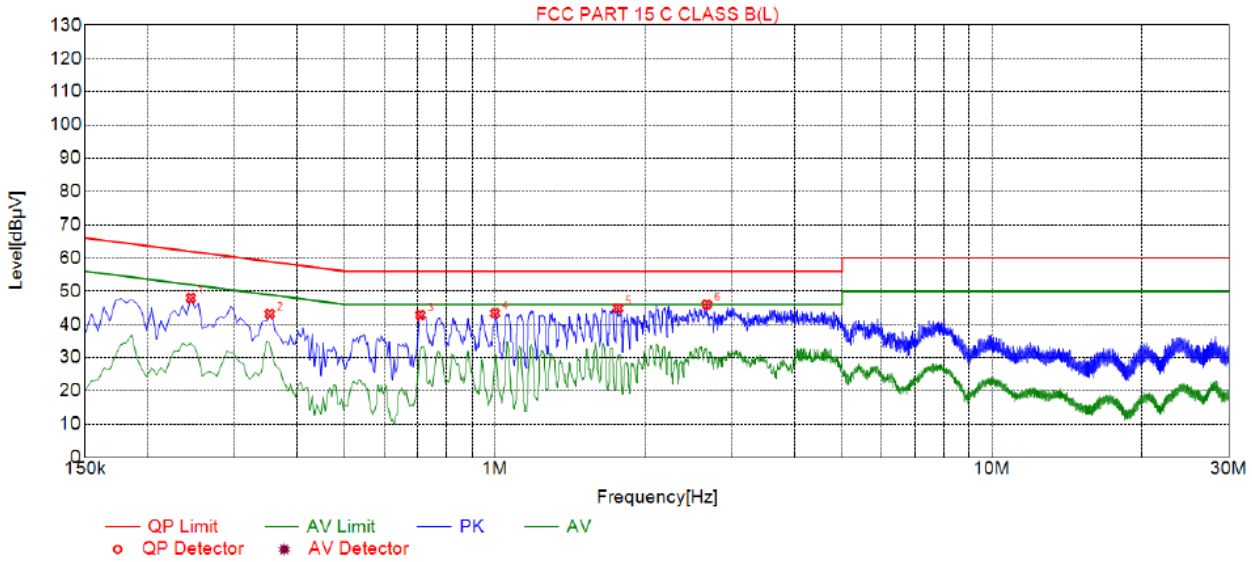
## TEST RESULTS

All modes have been tested, only the worst result was reported as below:

Test Specification: Line




| Suspected List | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Level [dBµV] | Factor [dB] | Limit [dBµV] | Margin [dB] | Reading [dBµV] | Detector | Type |
| 1 | 0.2445 | 47.96 | 19.84 | 61.94 | 13.98 | 28.12 | PK | L |
| 2 | 0.3525 | 43.14 | 19.83 | 58.90 | 15.76 | 23.31 | PK | L |
| 3 | 0.7080 | 42.85 | 19.86 | 56.00 | 13.15 | 22.99 | PK | L |
| 4 | 1.0005 | 43.33 | 19.87 | 56.00 | 12.67 | 23.46 | PK | L |
| 5 | 1.7700 | 44.87 | 19.96 | 56.00 | 11.13 | 24.91 | PK | L |
| 6 | 2.6700 | 45.99 | 20.04 | 56.00 | 10.01 | 25.95 | PK | L |

Remark: Margin = Limit – Level
Correction factor = Cable lose + ISN insertion loss
Level=Test receiver reading + correction factor

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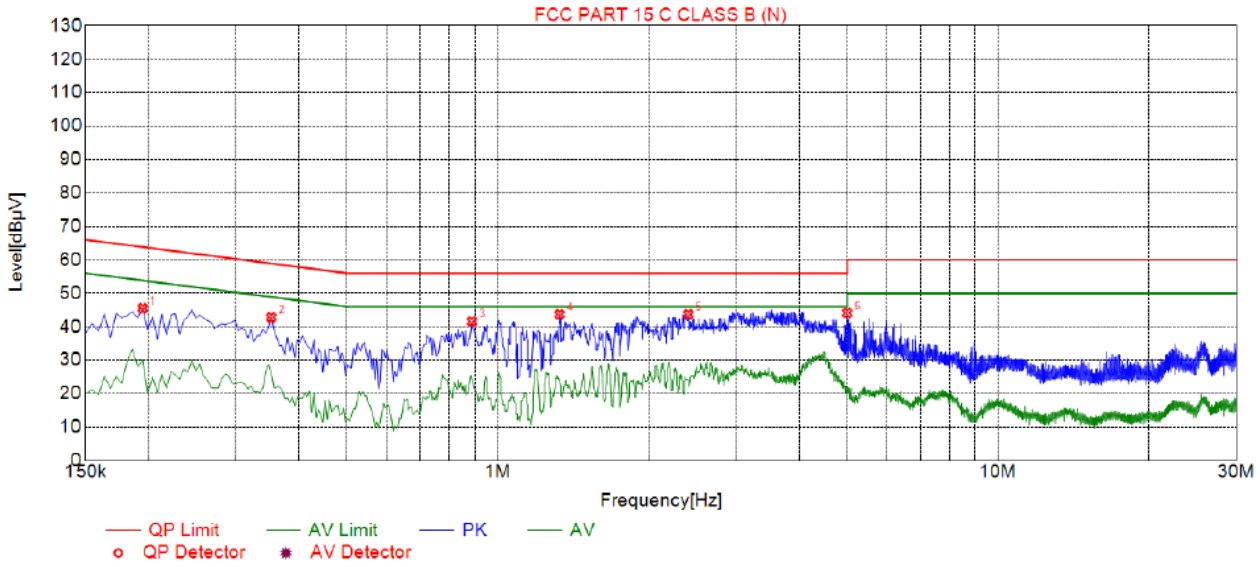
Test Specification: Neutral




## Suspected List

| NO. | Freq. [MHz] | Level [dBµV] | Factor [dB] | Limit [dBµV] | Margin [dB] | Reading [dBµV] | Detector | Type |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1950 | 45.52 | 19.73 | 63.82 | 18.30 | 25.79 | PK | N |
| 2 | 0.3525 | 42.80 | 19.72 | 58.90 | 16.10 | 23.08 | PK | N |
| 3 | 0.8880 | 41.58 | 19.74 | 56.00 | 14.42 | 21.84 | PK | N |
| 4 | 1.3290 | 43.68 | 19.79 | 56.00 | 12.32 | 23.89 | PK | N |
| 5 | 2.4045 | 43.69 | 19.88 | 56.00 | 12.31 | 23.81 | PK | N |
| 6 | 4.9965 | 44.13 | 20.00 | 56.00 | 11.87 | 24.13 | PK | N |

Remark: Margin = Limit – Level
Correction factor = Cable lose + ISN insertion loss
Level=Test receiver reading + correction factor

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## 3.2. Radiated Emissions and Band Edge

**Limit**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

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).

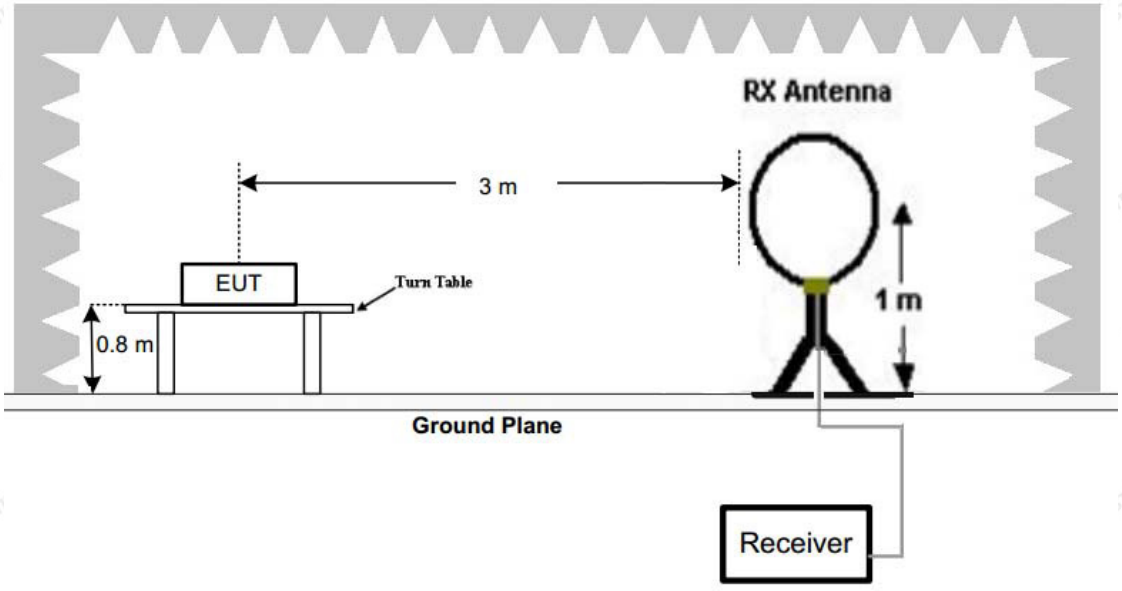
Except when the requirements applicable to a given device state otherwise, emissions from license-exempt transmitters shall comply with the field strength limits shown in table below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Radiated emission limits

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 3 | 20log(2400/F(KHz))+40log(300/3) | 2400/F(KHz) |
| 0.49-1.705 | 3 | 20log(24000/F(KHz))+ 40log(30/3) | 24000/F(KHz) |
| 1.705-30 | 3 | 20log(30)+ 40log(30/3) | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST CONFIGURATION**

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

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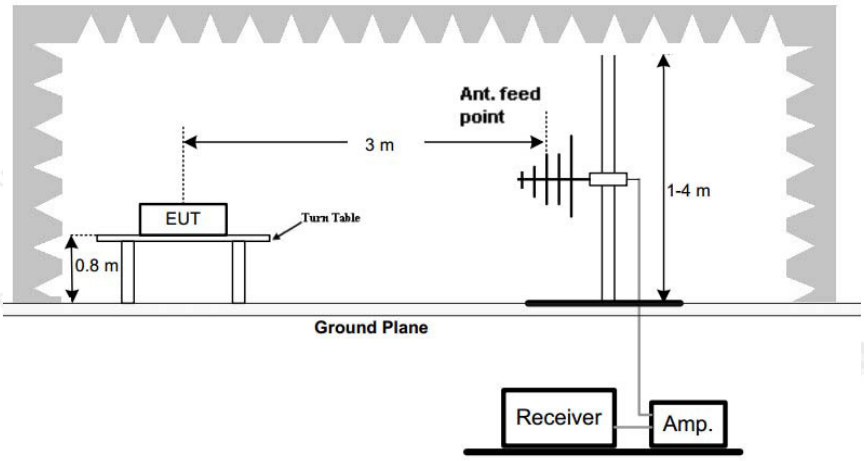
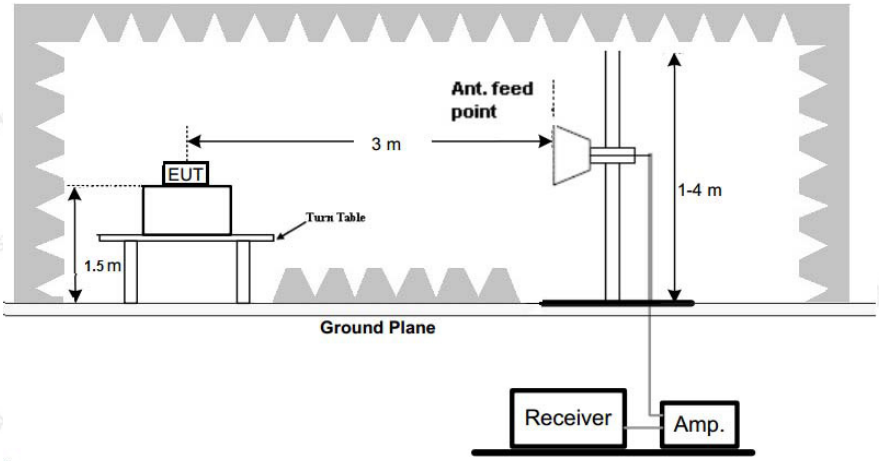
(B) Radiated Emission Test Set-Up, Frequency below 1000MHz.




(C) Radiated Emission Test Set-Up, Frequency above 1000MHz.




## Test Procedure

1. The EUT was placed on turn table which is 0.8m above ground plane for below 1GHz test, and on a low permittivity and low loss tangent turn table which is 1.5m above ground plane for above 1GHz test.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

## TEST RESULTS

Remark:
1. Radiated Emission measured at GFSK, π/4 DQPSK and 8DPSK mode from 9 KHz to 10th harmonic of fundamental and recorded worst case at GFSK DH5 mode.
2. There is no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.
3. For below 1GHz testing recorded worst at GFSK DH5 low channel.

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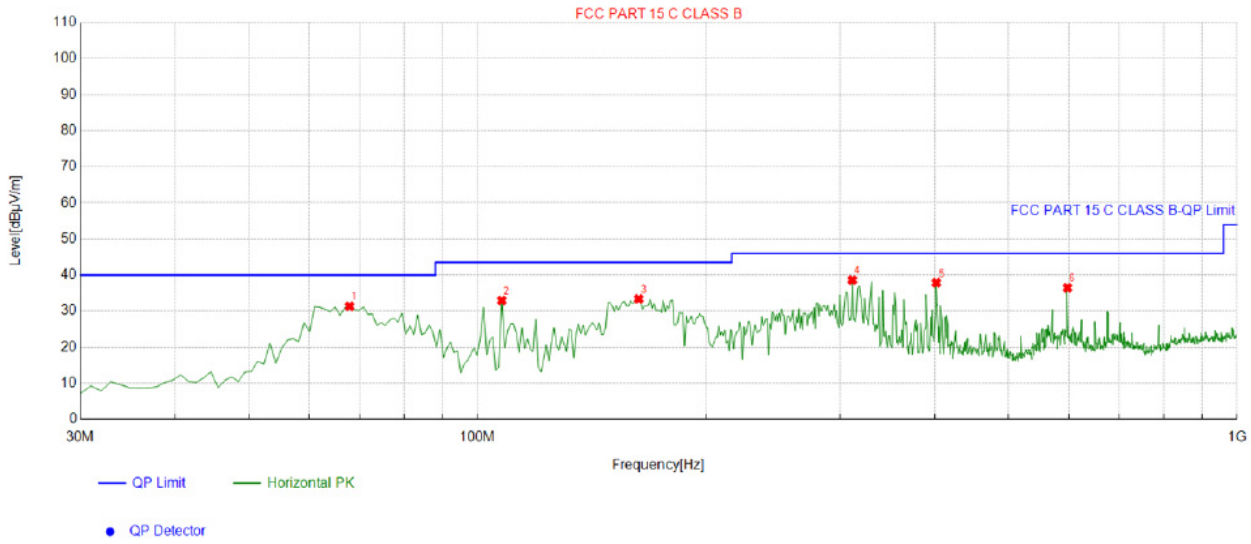
Below 1GHz Test Results:

Antenna polarity: H




| Suspected List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 67.867868 | -16.02 | 47.37 | 31.35 | 40.00 | 8.65 | 100 | 336 | Horizontal |
| 2 | 107.67767 | -14.18 | 47.14 | 32.96 | 43.50 | 10.54 | 100 | 354 | Horizontal |
| 3 | 163.02302 | -17.59 | 50.97 | 33.38 | 43.50 | 10.12 | 100 | 37 | Horizontal |
| 4 | 311.58158 | -11.70 | 50.31 | 38.61 | 46.00 | 7.39 | 100 | 93 | Horizontal |
| 5 | 401.88188 | -9.84 | 47.69 | 37.85 | 46.00 | 8.15 | 100 | 30 | Horizontal |
| 6 | 598.01801 | -5.11 | 41.57 | 36.46 | 46.00 | 9.54 | 100 | 173 | Horizontal |

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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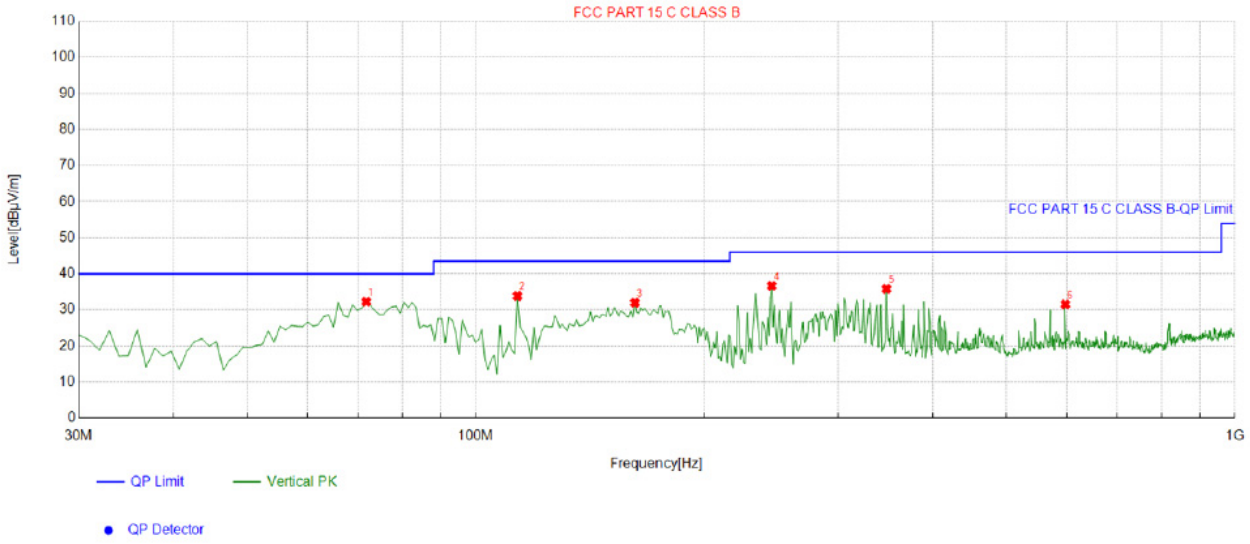
Antenna polarity: V




| Suspected List | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | Factor [dB] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity |
| 1 | 71.751752 | -17.38 | 49.64 | 32.26 | 40.00 | 7.74 | 100 | 5 | Vertical |
| 2 | 113.50350 | -15.09 | 48.92 | 33.83 | 43.50 | 9.67 | 100 | 359 | Vertical |
| 3 | 162.05205 | -17.59 | 49.55 | 31.96 | 43.50 | 11.54 | 100 | 205 | Vertical |
| 4 | 245.55555 | -13.20 | 49.85 | 36.65 | 46.00 | 9.35 | 100 | 44 | Vertical |
| 5 | 347.50750 | -10.08 | 45.89 | 35.81 | 46.00 | 10.19 | 100 | 246 | Vertical |
| 6 | 598.01801 | -5.11 | 36.64 | 31.53 | 46.00 | 14.47 | 100 | 233 | Vertical |

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

## Harmonics and Spurious Emissions

### Frequency Range (9kHz-30MHz)

| Frequency (MHz) | Level@3m (dBµV/m) | Limit@3m (dBµV/m) |
|---|---|---|
| -- | -- | -- |
| -- | -- | -- |
| -- | -- | -- |
| -- | -- | -- |

***Note:****1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor.*
*2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.*

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***For 1GHz to 25GHz***

CH Low (2402MHz)

Horizontal:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4804.00 | 56.00 | -3.65 | 52.35 | 74.00 | -21.65 | peak |
| 4804.00 | 41.17 | -3.65 | 37.52 | 54.00 | -16.48 | AVG |
| 7206.00 | 54.11 | -0.95 | 53.16 | 74.00 | -20.84 | peak |
| 7206.00 | 38.95 | -0.95 | 38.00 | 54.00 | -16.00 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4804.00 | 56.51 | -3.65 | 52.86 | 74.00 | -21.14 | peak |
| 4804.00 | 42.29 | -3.65 | 38.64 | 54.00 | -15.36 | AVG |
| 7206.00 | 54.32 | -0.95 | 53.37 | 74.00 | -20.63 | peak |
| 7206.00 | 39.91 | -0.95 | 38.96 | 54.00 | -15.04 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

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CH Middle (2441MHz)

Horizontal:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4882.00 | 54.87 | -3.54 | 51.33 | 74.00 | -22.67 | peak |
| 4882.00 | 41.04 | -3.54 | 37.50 | 54.00 | -16.50 | AVG |
| 7323.00 | 54.06 | -0.81 | 53.25 | 74.00 | -20.75 | peak |
| 7323.00 | 39.37 | -0.81 | 38.56 | 54.00 | -15.44 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4882.00 | 57.06 | -3.54 | 53.52 | 74.00 | -20.48 | peak |
| 4882.00 | 40.87 | -3.54 | 37.33 | 54.00 | -16.67 | AVG |
| 7323.00 | 55.47 | -0.81 | 54.66 | 74.00 | -19.34 | peak |
| 7323.00 | 38.39 | -0.81 | 37.58 | 54.00 | -16.42 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

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CH High (2480MHz)

Horizontal:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4960.00 | 54.41 | -3.43 | 50.98 | 74.00 | -23.02 | peak |
| 4960.00 | 39.94 | -3.44 | 36.50 | 54.00 | -17.50 | AVG |
| 7440.00 | 55.46 | -0.77 | 54.69 | 74.00 | -19.31 | peak |
| 7440.00 | 39.99 | -0.77 | 39.22 | 54.00 | -14.78 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 4960.00 | 56.07 | -3.43 | 52.64 | 74.00 | -21.36 | peak |
| 4960.00 | 40.68 | -3.44 | 37.24 | 54.00 | -16.76 | AVG |
| 7440.00 | 54.60 | -0.77 | 53.83 | 74.00 | -20.17 | peak |
| 7440.00 | 39.64 | -0.77 | 38.87 | 54.00 | -15.13 | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level - Limit. | | | | | | |

Remark :
(1) Measuring frequencies from 1 GHz to the 25 GHz.
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency; “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
(7) All modes of operation were investigated and the worst-case emissions are reported.

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Radiated Band Edge Test:

Hopping

Horizontal (Worst case)

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2310.00 | 56.06 | -5.81 | 50.25 | 74 | -23.75 | peak |
| 2310.00 | / | -5.81 | / | 54 | / | AVG |
| 2390.00 | 56.99 | -5.84 | 51.15 | 74 | -22.85 | peak |
| 2390.00 | / | -5.84 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2310.00 | 55.18 | -5.81 | 49.37 | 74 | -24.63 | peak |
| 2310.00 | / | -5.81 | / | 54 | / | AVG |
| 2390.00 | 56.04 | -5.84 | 50.2 | 74 | -23.8 | peak |
| 2390.00 | / | -5.84 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

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Horizontal (Worst case)

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 55.37 | -5.81 | 49.56 | 74 | -24.44 | peak |
| 2483.50 | / | -5.81 | / | 54 | / | AVG |
| 2500.00 | 54.92 | -6.06 | 48.86 | 74 | -25.14 | peak |
| 2500.00 | / | -6.06 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 56.58 | -5.81 | 50.77 | 74 | -23.23 | peak |
| 2483.50 | / | -5.81 | / | 54 | / | AVG |
| 2500.00 | 54.44 | -6.06 | 48.38 | 74 | -25.62 | peak |
| 2500.00 | / | -6.06 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |
| Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit. | | | | | | |

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NO hopping

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case)

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2310.00 | 56.9 | -5.81 | 51.09 | 74 | -22.91 | peak |
| 2310.00 | / | -5.81 | / | 54 | / | AVG |
| 2390.00 | 55.02 | -5.84 | 49.18 | 74 | -24.82 | peak |
| 2390.00 | / | -5.84 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2310.00 | 56.31 | -5.81 | 50.5 | 74 | -23.5 | peak |
| 2310.00 | / | -5.81 | / | 54 | / | AVG |
| 2390.00 | 54.87 | -5.84 | 49.03 | 74 | -24.97 | peak |
| 2390.00 | / | -5.84 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

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Operation Mode: TX CH High (2480MHz)

Horizontal (Worst case)

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 55.13 | -5.81 | 49.32 | 74 | -24.68 | peak |
| 2483.50 | / | -5.81 | / | 54 | / | AVG |
| 2500.00 | 56.39 | -6.06 | 50.33 | 74 | -23.67 | peak |
| 2500.00 | / | -6.06 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |

Vertical:

| Frequency | Meter Reading | Factor | Emission Level | Limits | Margin | Detector Type |
|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | (dBμV/m) | (dBμV/m) | (dB) | |
| 2483.50 | 54.25 | -5.81 | 48.44 | 74 | -25.56 | peak |
| 2483.50 | / | -5.81 | / | 54 | / | AVG |
| 2500.00 | 54.62 | -6.06 | 48.56 | 74 | -25.44 | peak |
| 2500.00 | / | -6.06 | / | 54 | / | AVG |
| Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Level-Limit. | | | | | | |
| Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit. | | | | | | |

Remark:
1. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.
2. In restricted bands of operation, the spurious emissions below the permissible value more than 20dB.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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## 3.3. Maximum Peak Conducted Output Power

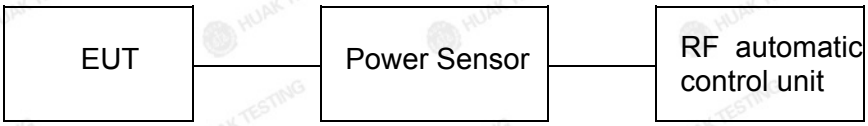
**Limit**

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. 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.

**Test Procedure**

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the RF automatic control unit.

**Test Configuration**




**Test Results**

| Type | Channel | Maximum Peak Conducted Output Power (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|
| GFSK | 00 | -2.23 | 21.00 | Pass |
| | 39 | -2.71 | | |
| | 78 | -3.4 | | |
| π/4DQPSK | 00 | 0.19 | 21.00 | Pass |
| | 39 | 0 | | |
| | 78 | -0.95 | | |
| 8DPSK | 00 | 1.43 | 21.00 | Pass |
| | 39 | 0.62 | | |
| | 78 | -0.04 | | |

Note: 1.The test results including the cable lose.

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## 3.4. 20db Bandwidth

**Limit**

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

**Test Procedure**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

RBW=1% to 5% of the OBW
VBW=approximately 3 X RBW
Detector=Peak
Trace Mode: Max Hold

Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recoded.

**Test Configuration**

**Test Results**

| Modulation | Channel | 20dB bandwidth (MHz) | Result |
|---|---|---|---|
| GFSK | CH00 | 0.942 | Pass |
| | CH39 | 0.942 | |
| | CH78 | 0.942 | |
| π/4DQPSK | CH00 | 1.284 | |
| | CH39 | 1.326 | |
| | CH78 | 1.338 | |
| 8DPSK | CH00 | 1.308 | |
| | CH39 | 1.299 | |
| | CH78 | 1.308 | |

**Test plot as follows:**

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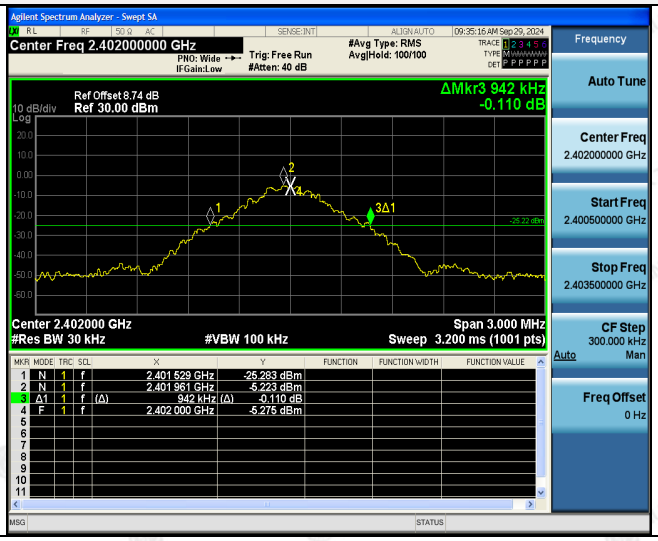
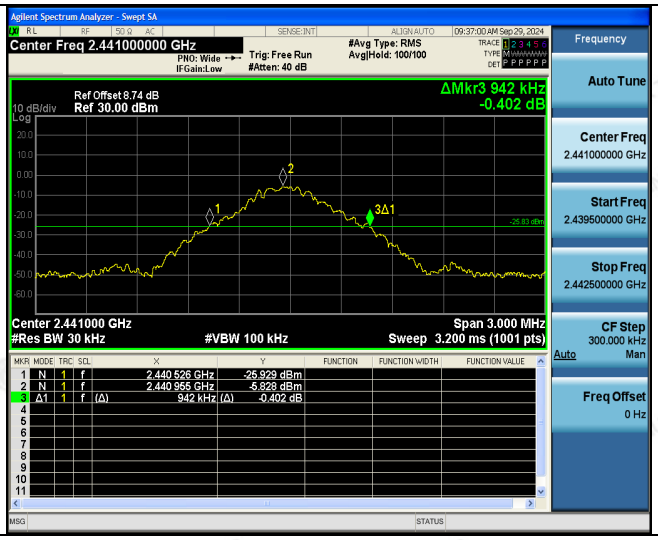
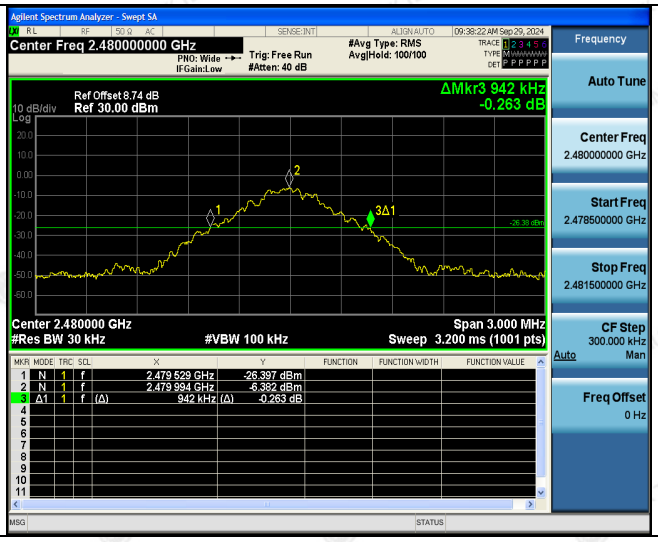
20dB bandwidth

| GFSK Modulation |
| --- |
|  |
| CH00 |
|  |
| CH39 |
|  |
| CH78 |

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