# FCC TEST REPORT
# FCC ID:2AUPKDUOWOBNDT

| | | |
|---|---|---|
| Product Name | | bluetooth speaker |
| Model Name | | BBH-929s<br>BBH-929, BBH-930, BBH-930s, BBH-939, BBH-939s, HWS-990, HWS-990s,BBH-919s, HWS-918，T19, T20, T30 |
| Brand Name | | N/A |
| Report No. | | PTC19071605201E-FC01 |

**Prepared for**

**Shenzhen Duowo Technology Co., Ltd.**

**Rm.722,Floor7,Global Logistics Centre, China South City, No.1 China South Ave., Pinghu Longgang dist.,Shenzhen,China**

**Prepared by**

Dongguan Precise Testing & Certification Corp., Ltd.

Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, China

| 1TEST RESULT CERTIFICATION | | |
|---|---|---|
| Applicant's name | : | Shenzhen Duowo Technology Co., Ltd. |
| Address | : | Rm.722,Floor7,Global Logistics Centre, China South City, No.1 China South Ave., Pinghu Longgang dist.,Shenzhen,China |
| Manufacture's name | : | Shenzhen Duowo Technology Co., Ltd. |
| Address | : | Rm.722,Floor7,Global Logistics Centre, China South City, No.1 China South Ave., Pinghu Longgang dist.,Shenzhen,China |
| Product name | : | bluetooth speaker |
| Model name | : | BBH-929s,<br>BBH-929, BBH-930, BBH-930s, BBH-939, BBH-939s, HWS-990, HWS-990s,BBH-919s, HWS-918,T19, T20, T30 |
| Standards | : | FCC CFR47 Part 15 Section 15.247 |
| Test procedure | : | ANSI C63.10:2013 |
| Test Date | : | Sept. 08, 2019 to Sept. 29, 2019 |
| Date of Issue | : | Sept. 30, 2019 |
| Test Result | : | Pass |
| This device described above has been tested by PTC, and 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.<br>This report shall not be reproduced except in full, without the written approval of PTC, this document may be altered or revised by PTC, personal only, and shall be noted in the revision of the document. | | |

Test Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager

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# 1. Summary of test results

| Description of Test Item | Standard | Results |
|---|---|---|
| Maximum Peak Output Power | FCC Part 15: 15.247(b)(1)<br>ANSI C63.10 :2013 | PASS |
| 20dB Bandwidth | FCC Part 15: 15.215<br>ANSI C63.10 :2013 | PASS |
| Carrier Frequency Separation | FCC Part 15: 15.247(a)(1)<br>ANSI C63.10 :2013 | PASS |
| Number Of Hopping Channel | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 :2013 | PASS |
| Dwell Time | FCC Part 15: 15.247(a)(1)(iii)<br>ANSI C63.10 :2013 | PASS |
| Radiated Emission | FCC Part 15: 15.209<br>FCC Part 15: 15.247(d)<br>ANSI C63.10 :2013 | PASS |
| Band Edge Compliance | FCC Part 15: 15.247(d)<br>ANSI C63.10 :2013 | PASS |
| Spurious RF conducted emissions | FCC Part 15: 15.247(d)<br>ANSI C63.10 :2013 | PASS |
| Power Line Conducted Emissions | FCC Part 15: 15.207<br>ANSI C63.10 :2013 | PASS |
| Antenna requirement | FCC Part 15: 15.203 | PASS |

# 2. General test information

## 2.1. Description of EUT

| | | |
|---|---|---|
| EUT* Name | : | bluetooth speaker |
| Model Number | : | BBH-929s ,<br>BBH-929, BBH-930, BBH-930s, BBH-939, BBH-939s, HWS-990, HWS-990s,BBH-919s, HWS-918,T19, T20, T30 |
| Trade Mark | : | N/A |
| EUT function description | : | Please reference user manual of this device |
| Power supply | : | DC 3.7V from battery or DC 5V from adapter |
| Radio Specification | : | Bluetooth V5.0 |
| Operation frequency | : | 2402MHz -2480MHz |
| Modulation | : | GFSK, π/4-DQPSK, 8-DPSK |
| Data rate | : | 1Mpbs, 2Mbps, 3Mbps |
| Antenna Type | : | Integrated antenna, maximum PK gain:0dBi |
| Date of Receipt | : | Sept. 30, 2019 |
| Sample Type | : | Series models |

Note: EUT is the abbr.of equipment under test.

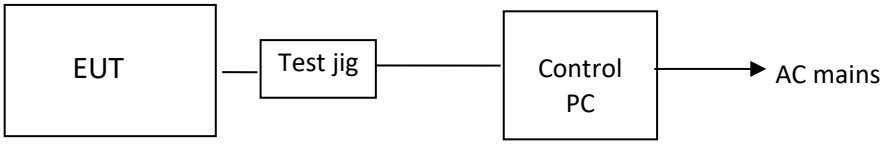
## 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number or Type | Other |
|---|---|---|---|
| Power adapter | Shenzhen Zhongling Electronic Technology Co.,Ltd. | ZAU-B050050A-04 | / |

## 2.3. Assistant equipment used for test

| Description of Assistant | Manufacturer | Model number or Type | EMC Compliance | SN |
|---|---|---|---|---|
| Notebook | DELL | Latitude D610 | FCC DOC | 00045-534-136-300 |

## 2.4. Block diagram of EUT configuration for test




EUT's Bluetooth module was connected to a special test jig provided by manufacturer which has a

standard RSS-232 connector to connect to control PC, and the control PC will run a special test software "RF Control Kit v1.0.exe" provided by manufacturer to control EUT work in test mode as blow table.

| Tested mode, channel, information | | |
|---|---|---|
| Mode | Channel | Frequency (MHz) |
| GFSK hopping on Tx Mode | CH0 to CH78 | 2402 to 2480 |
| 8-DPSK hopping on Tx Mode | CH0 to CH78 | 2402 to 2480 |
| GFSK hopping off Tx Mode | CH0 | 2402 |
| | CH39 | 2441 |
| | CH78 | 2480 |
| π /4-DQPSK hopping off Tx Mode | CH0 | 2402 |
| | CH39 | 2441 |
| | CH78 | 2480 |
| 8-DPSK hopping off Tx Mode | CH0 | 2402 |
| | CH39 | 2441 |
| | CH78 | 2480 |

Note1: Some modes not apply for all the test items.
Note2: For π π /4-DQPSK its same modulation type with 8-DPSK, and based exploratory test, there is no significant difference of that two types test result, so except output power, all other items final test were only performed with 8-DPSK and GFSK.

## 2.5. Test environment conditions

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

| | |
|---|---|
| Temperature range: | 21-25℃ |
| Humidity range: | 40-75% |
| Pressure range: | 86-106kPa |

## 2.6. Test Facility

| | |
|---|---|
| Test Location | Dongguan Precise Testing & Certification Corp., Ltd. |
| Address | Building D, Baoding Technology Park, Guangming Road2, Dongcheng District, Dongguan, Guangdong, China |
| Accreditation Certificate | FCC Registration Number: 790290<br>A2LA Certificate No.: 4408.01<br>IC Registration Number: 12191A-1 |

## 2.7. Euipments List

RF Conducted Test

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Due |
|---|---|---|---|---|---|
| MXG Signal Analyzer | Agilent | N9020A | MY56070279 | 10Hz-30GHz | Sep.18, 2020 |
| Coaxial Cable | CDS | 79254 | 46107086 | 10Hz-30GHz | Sep.18, 2020 |
| Antenna Connector | Florida RF Labs | N/A | RF01# | N/A | Sep.18, 2020 |
| Power Meter | Anritsu | ML2495A | 0949003 | N/A | Sep.18, 2020 |
| Power Sensor | Anritsu | MA2411B | 0917017 | N/A | Sep.18, 2020 |

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Due |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101417 | 9KHz-3GHz | Sep.18, 2020 |
| Loop Antenna | Schwarzbeck | FMZB 1519 | 012 | 9 KHz -30MHz | Sep.18, 2020 |
| Bilog Antenna | SCHWARZBECK | VULB9160 | 9160-3355 | 25MHz-2GHz | Sep.18, 2020 |
| Preamplifier (low frequency) | SCHWARZBECK | BBV 9475 | 9745-0013 | 1MHz-1GHz | Sep.18, 2020 |
| Cable | Schwarzbeck | PLF-100 | 549489 | 9KHz-3GHz | Sep.18, 2020 |
| Spectrum Analyzer | Agilent | E4407B | MY45109572 | 9KHz-40GHz | Sep.18, 2020 |
| Horn Antenna | SCHWARZBECK | 9120D | 9120D-1246 | 1GHz-18GHz | Sep.18, 2020 |
| Power Amplifier | LUNAR EM | LNA1G18-40 | J10100000081 | 1GHz-26.5GHz | Sep.18, 2020 |
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 9170-181 | 14GHz-40GHz | Sep.25, 2019 |
| Amplifier | SCHWARZBECK | BBV 9721 | 9721-205 | 18GHz-40GHz | Sep.18, 2020 |
| Cable | H+S | CBL-26 | N/A | 1GHz-26.5GHz | Sep.18, 2020 |
| RF Cable | R&S | R204 | R21X | 1GHz-40GHz | Sep.18, 2020 |

Conducted Emissions

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Due |
|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101417 | 9KHz-3GHz | Sep.18, 2020 |
| Artificial Mains Network | Rohde&Schwarz | L2-16B | 000WX31025 | 9KHz-300MHz | Sep.18, 2020 |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101342 | 9KHz-300MHz | Sep.18, 2020 |

## 2.8. Measurement uncertainty

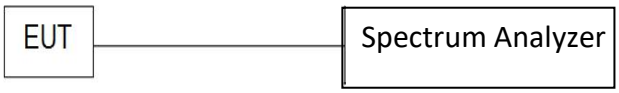
| Parameter | Uncertainty |
|---|---|
| RF output power, conducted | ±1.0dB |
| Power Spectral Density, conducted | ±2.2dB |
| Radio Frequency | ± 1 x $10^{-6}$ |
| Bandwidth | ± 1.5 x $10^{-6}$ |
| Time | ±2% |
| Duty Cycle | ±2% |
| Temperature | ±1°C |
| Humidity | ±5% |
| DC and low frequency voltages | ±3% |
| Conducted Emissions (150kHz~30MHz) | ±3.64dB |
| Radiated Emission(30MHz~1GHz) | ±5.03dB |
| Radiated Emission(1GHz~25GHz) | ±4.74dB |
| Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95% | |

# 3. Maximum Peak Output Power

## 3.1. Test Requirement

| | | |
|---|---|---|
| Test Requirement | : | FCC CFR47 Part 15 Section 15.247 |
| Test Method | : | ANSI C63.10:2013 |
| Test Limit | : | Regulation 15.247 (b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band eploying at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt (30dBm). For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.<br>Refer to the result “Number of Hopping Frequency” of this document. The 0.125watts (20.97 dBm) limit applies. |

## 3.2. Block diagram of test setup



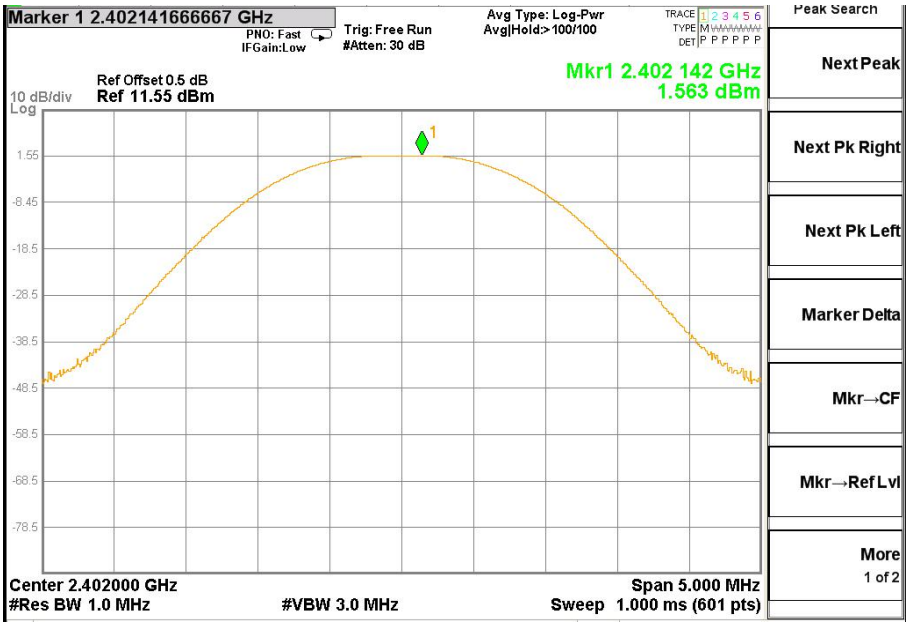

## 3.3. Test Procedure

(1) The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

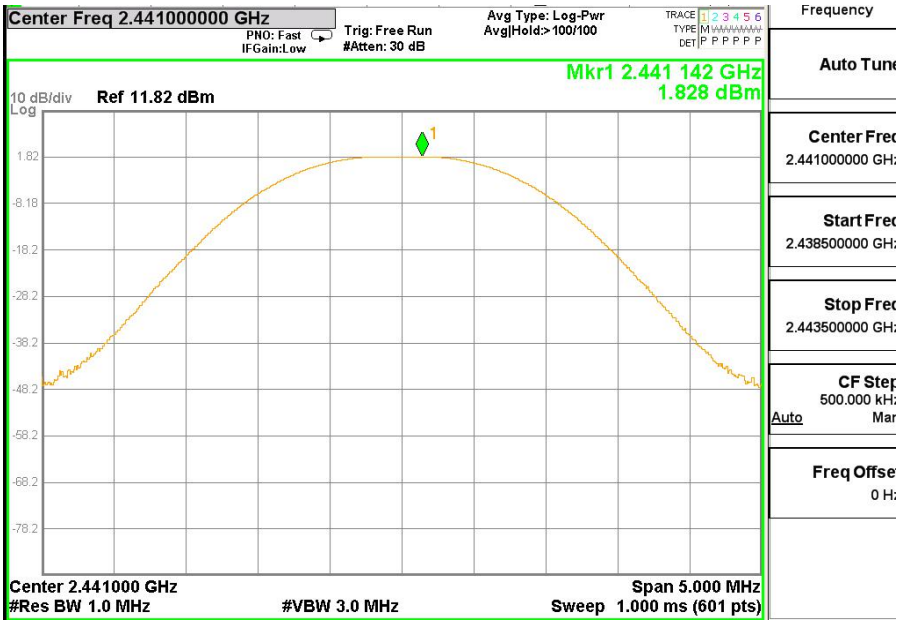
## 3.4. Test Result

| EUT: bluetooth speaker M/N: BBH-929s | | | | |
|---|---|---|---|---|
| Mode | Freq (MHz) | Result (dBm) | Limit (dBm) | Conclusion |
| GFSK | 2402 | 1.563 | 30 | PASS |
| | 2441 | 1.828 | 30 | PASS |
| | 2480 | 2.752 | 30 | PASS |
| π /4-DQPSK | 2402 | 1.253 | 21 | PASS |
| | 2441 | 1.118 | 21 | PASS |
| | 2480 | 2.349 | 21 | PASS |
| 8-DPSK | 2402 | -6.006 | 21 | PASS |
| | 2441 | -5.314 | 21 | PASS |
| | 2480 | -5.834 | 21 | PASS |

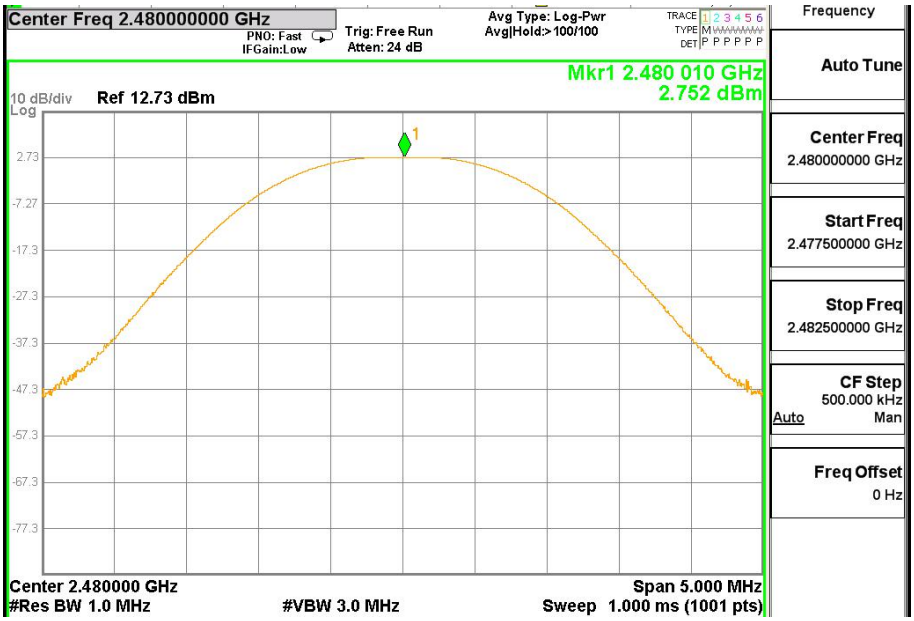
## GFSK mode-CH00



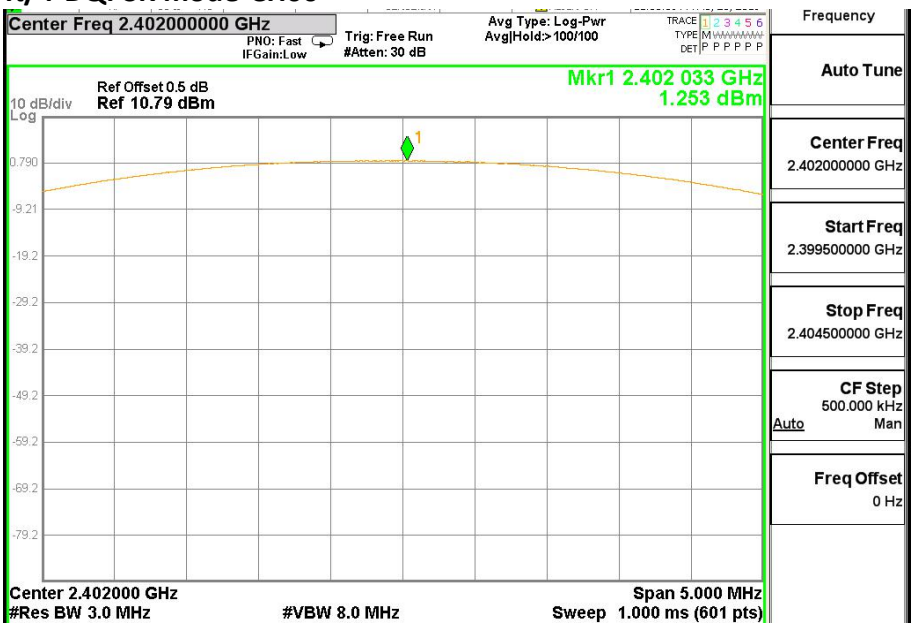

GFSK mode-CH39



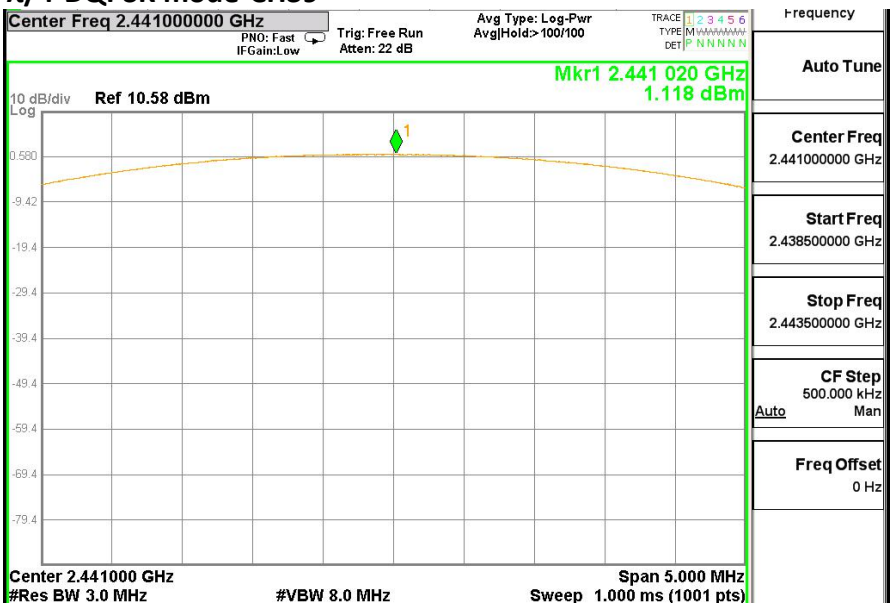
GFSK mode-CH78




π/4-DQPSK mode-CH00

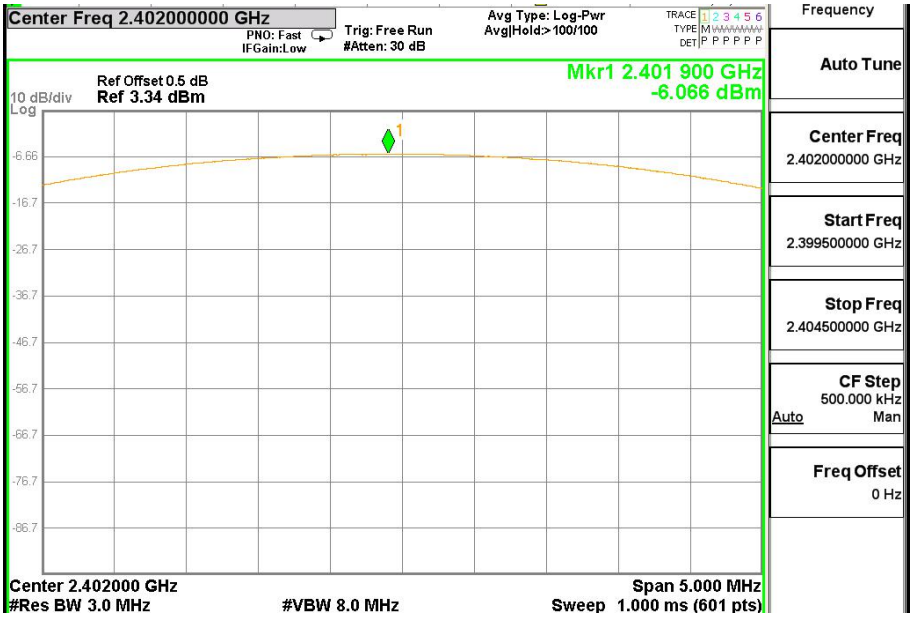


## π/4-DQPSK mode-CH39

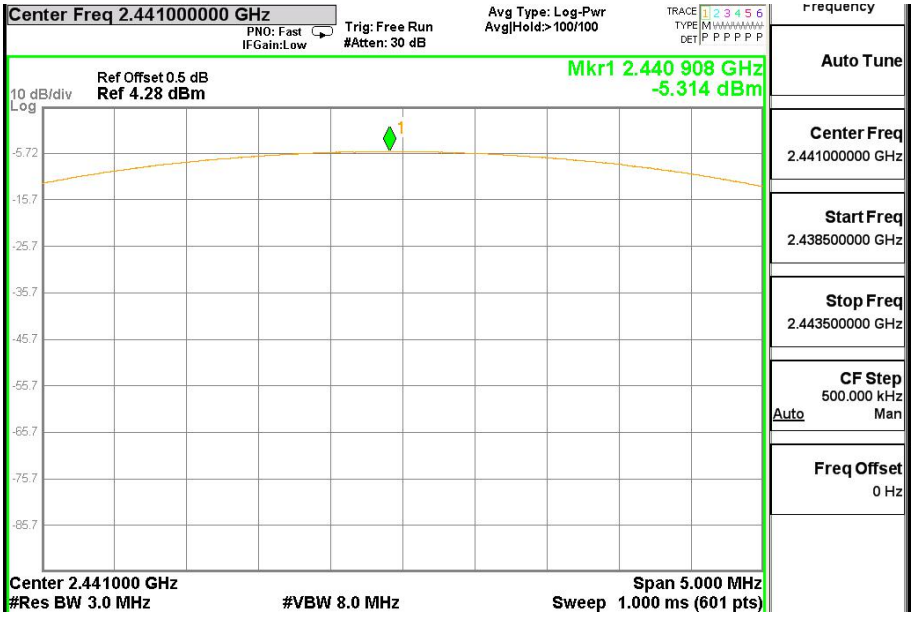



## π/4-DQPSK mode-CH78

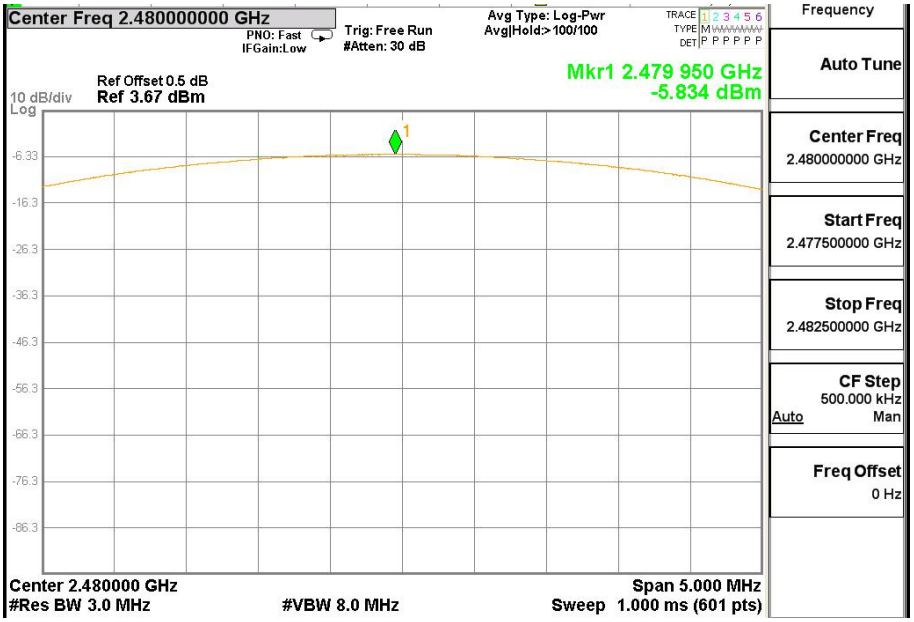
## 8DPSK mode-CH00




## 8DPSK mode-39



**8DPSK mode-CH78**



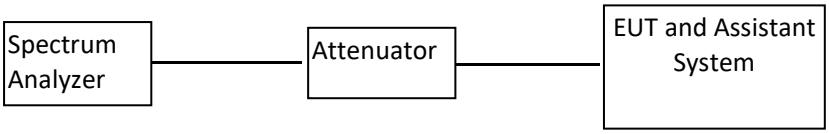

# 4. 20dB Bandwidth

## 4.1. Test Requirement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

## 4.2. Block diagram of test setup




## 4.3. Limits

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

## 4.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.4 and 4.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.

(3) Configure EUT work in test mode as stated in clause 2.4.

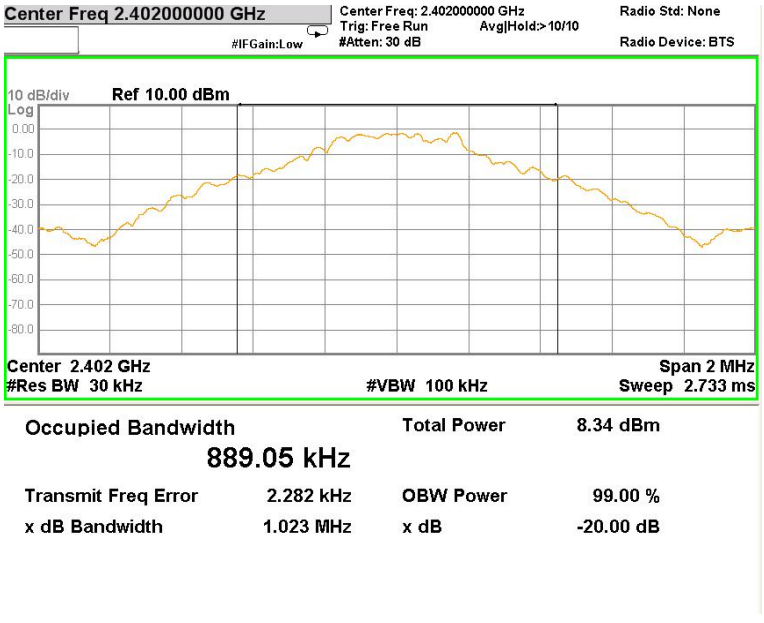
(4) The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

## 4.5. Test Result

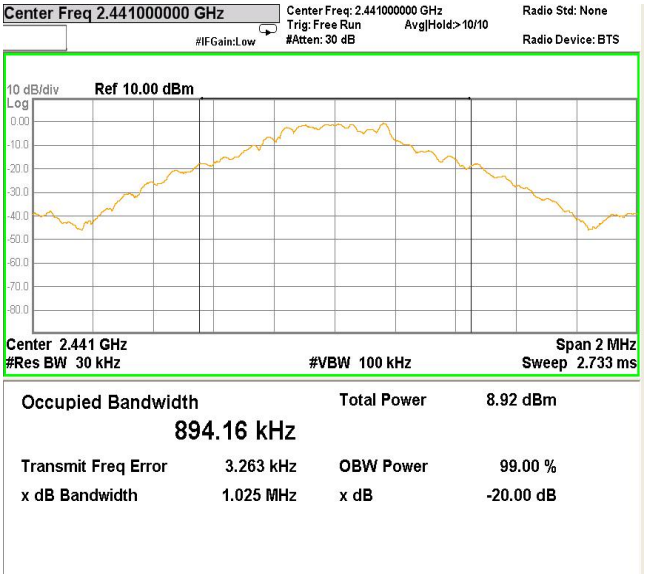
| Mode | Frequency (MHz) | 20dB Bandwidth (MHz) | Limit (kHz) | Result |
|---|---|---|---|---|
| GFSK | 2402 | 1.023 | N/A | Pass |
| | 2441 | 1.025 | N/A | Pass |
| | 2480 | 0.9703 | N/A | Pass |
| π/4-DQPSK | 2402 | 1.307 | N/A | Pass |
| | 2441 | 1.289 | N/A | Pass |
| | 2480 | 1.285 | N/A | Pass |
| 8DPSK | 2402 | 1.297 | N/A | Pass |
| | 2441 | 1.296 | N/A | Pass |
| | 2480 | 1.292 | N/A | Pass |

## 4.6. Original test data

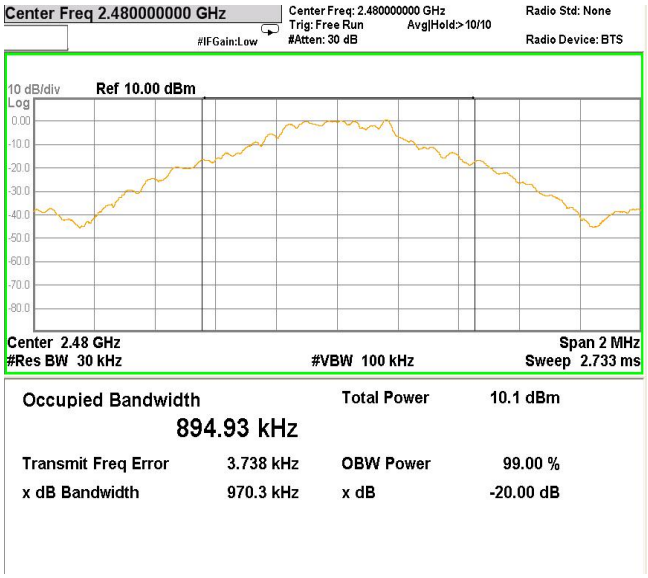
GFSK Mode TX CH00



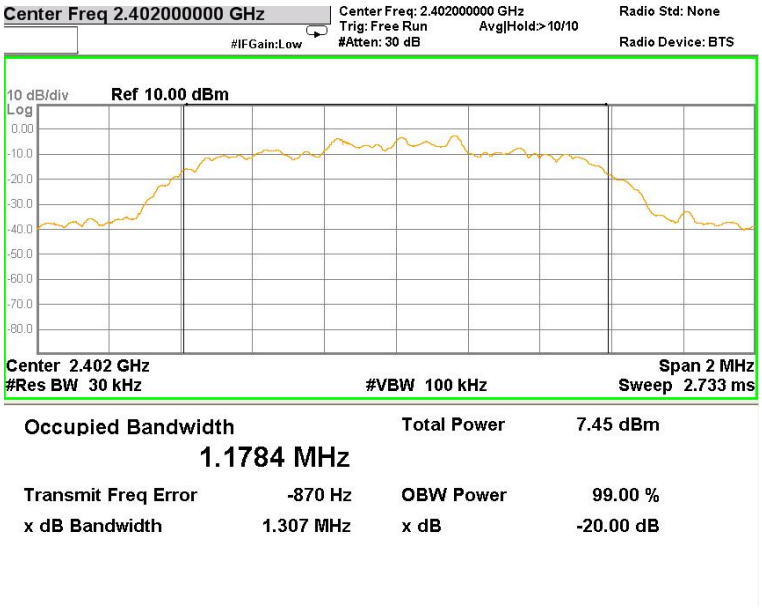
GFSK Mode TX CH39



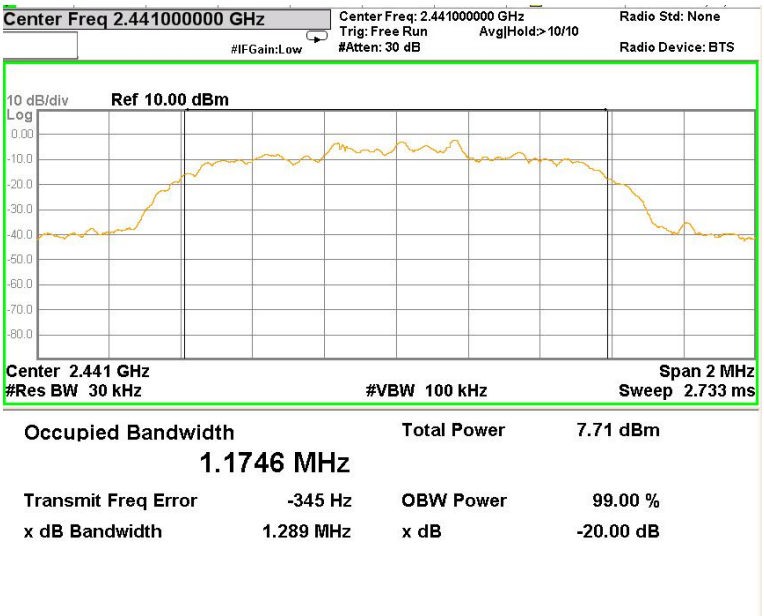

GFSK Mode TX CH78



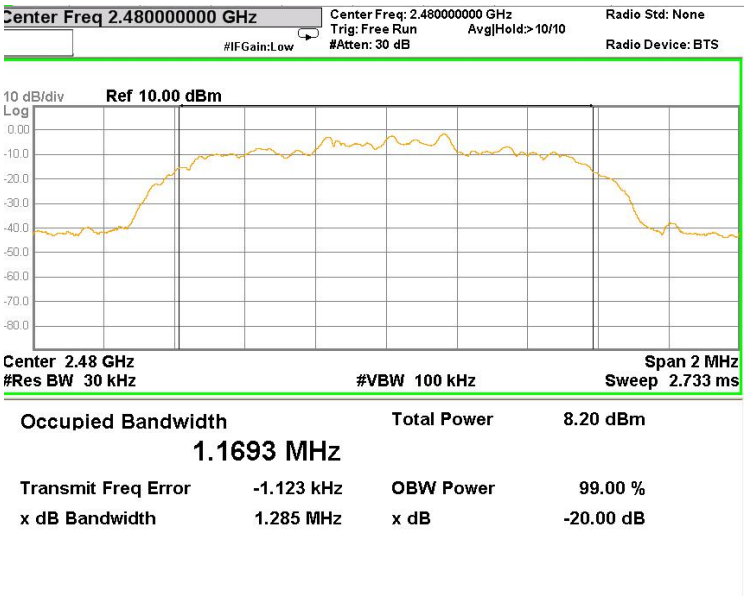
π/4-DQPSK CH00



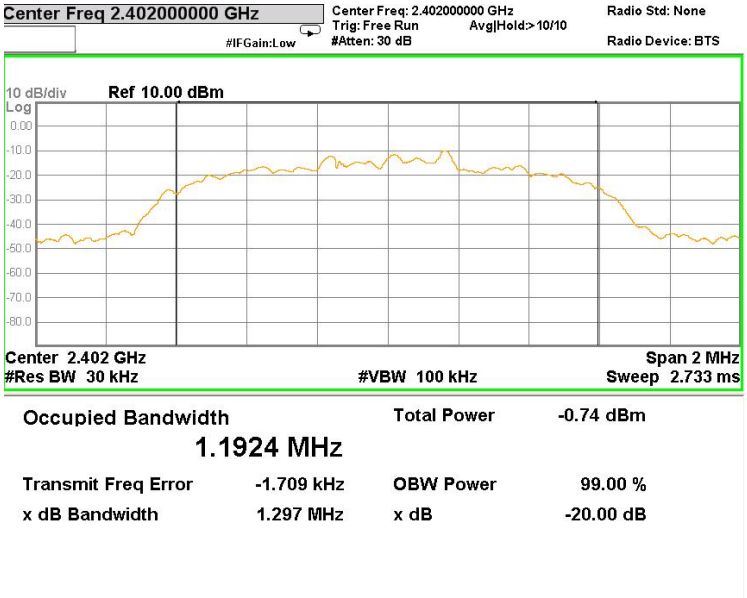

π/4-DQPSK CH39



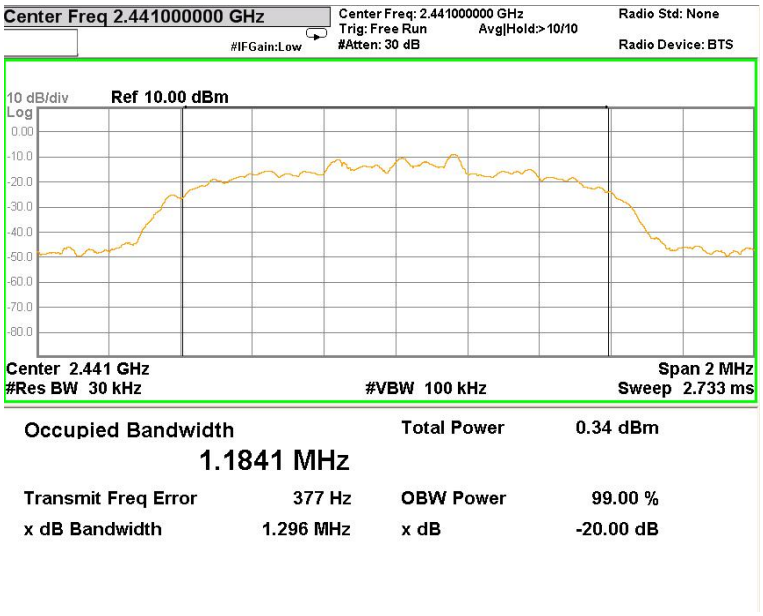
π/4-DQPSK CH78



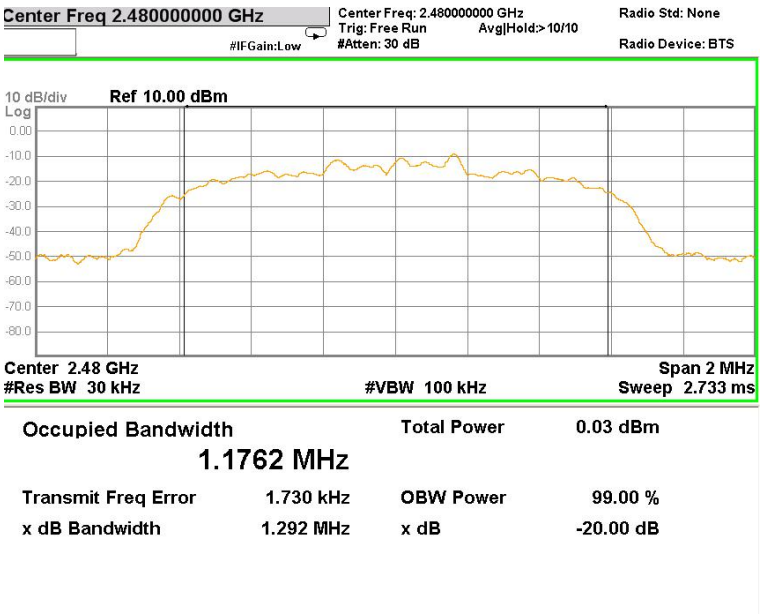

8-DPSK Mode CH00



8-DPSK Mode CH39

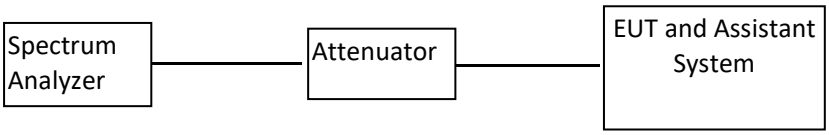



8-DPSK Mode CH78



# 5. Carrier Frequency Separation

## 5.1. Block diagram of test setup




## 5.2. Limits

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.

## 5.3. Test Procedure

(1) Configure EUT and assistant system according clause 2.4 and 5.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.

(3) Configure EUT work in test mode as stated in clause 2.4.

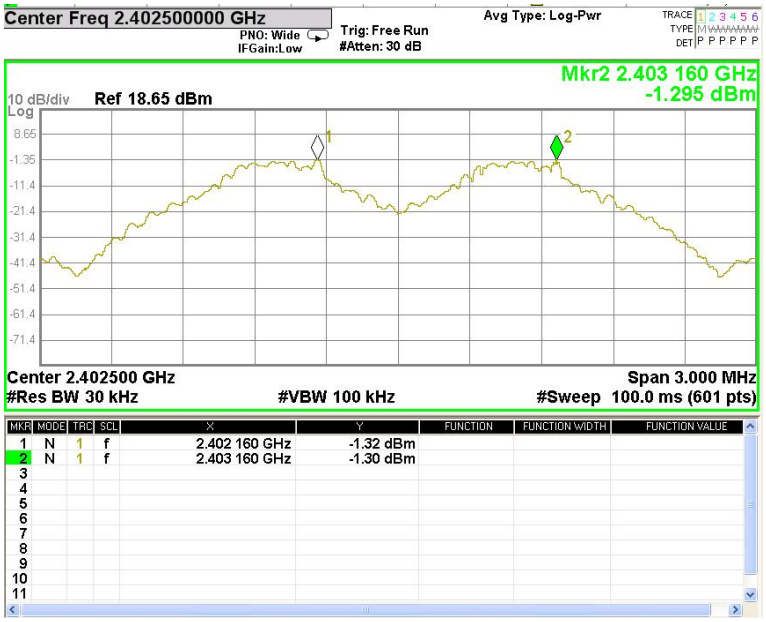
(4) The carrier frequency was measured by spectrum analyzer with 30kHz RBW and 100kHz VBW.

## 5.4. Test Result

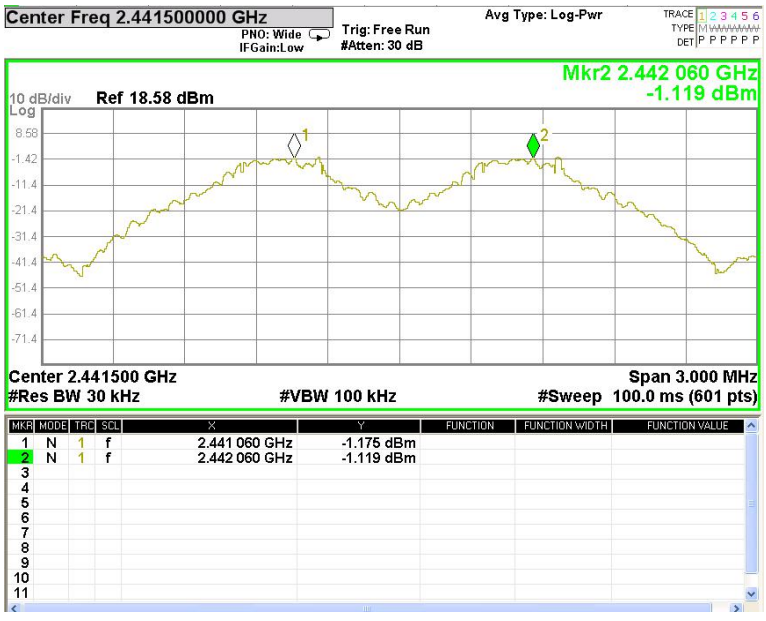
| Mode | Channel | Frequency (MHz) | Test Result (kHz) | Limit (kHz) | | Result |
|---|---|---|---|---|---|---|
| GFSK | Low | 2402 | 1000 | 682.000 | 2/3 of 20dB BW | Pass |
| | Middle | 2441 | 1000 | 683.333 | 2/3 of 20dB BW | Pass |
| | High | 2480 | 1005 | 646.867 | 2/3 of 20dB BW | Pass |
| π/4-DQPSK | Low | 2402 | 1005 | 871.333 | 2/3 of 20dB BW | Pass |
| | Middle | 2441 | 1000 | 859.333 | 2/3 of 20dB BW | Pass |
| | High | 2480 | 1000 | 856.667 | 2/3 of 20dB BW | Pass |
| 8DPSK | Low | 2402 | 1005 | 864.667 | 2/3 of 20dB BW | Pass |
| | Middle | 2441 | 995 | 864.000 | 2/3 of 20dB BW | Pass |
| | High | 2480 | 1005 | 861.333 | 2/3 of 20dB BW | Pass |

## 5.5. Original test data

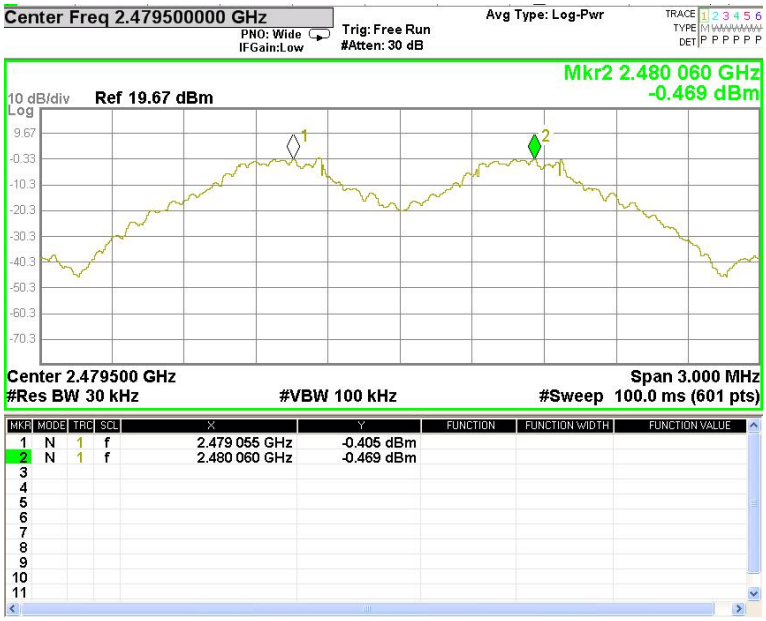
GFSK CH00



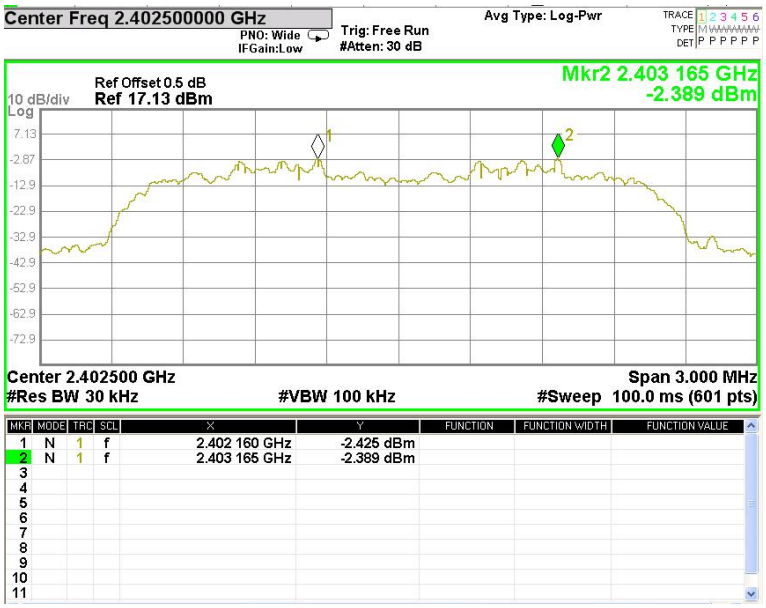

GFSK CH39



GFSK CH78

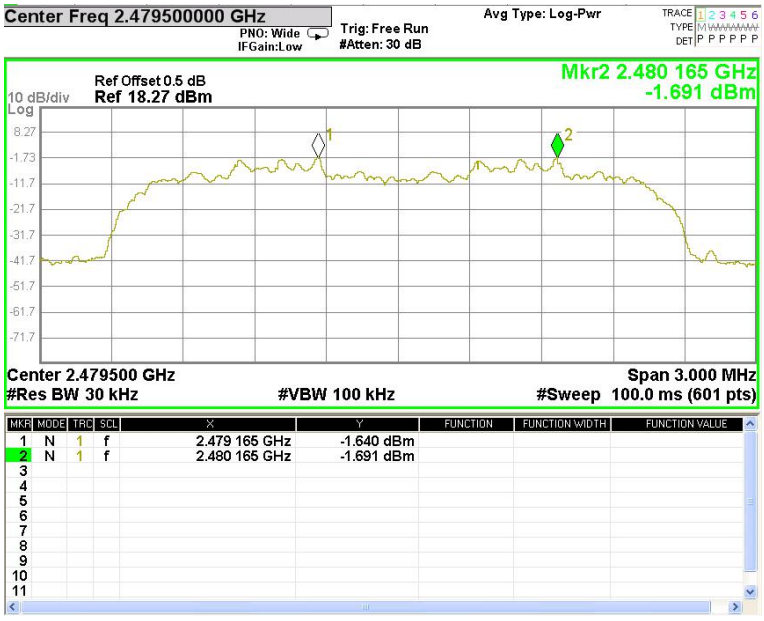



П/4-DQPSK CH00

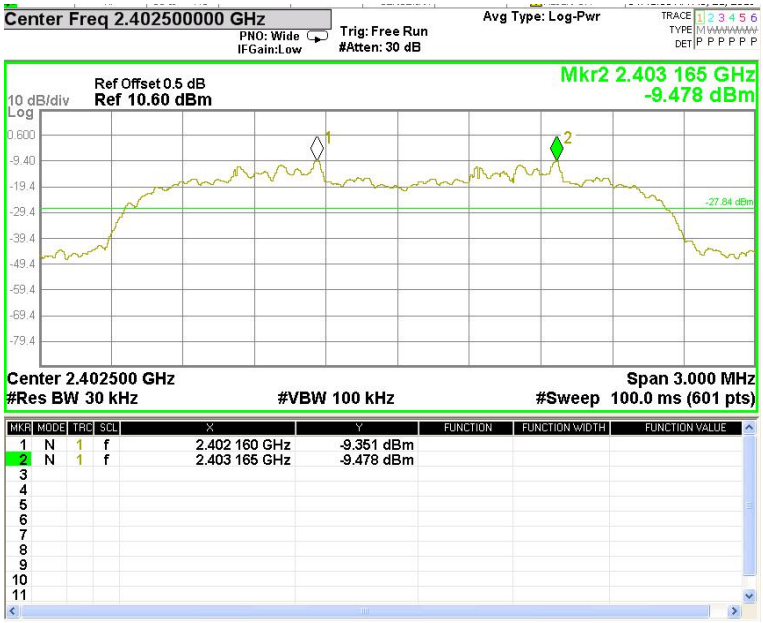


П/4-DQPSK CH39

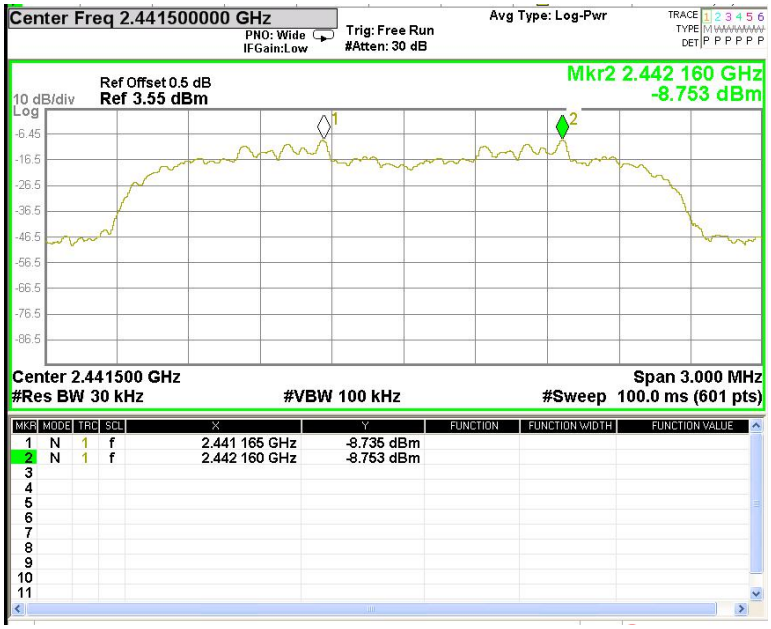

П/4-DQPSK CH78



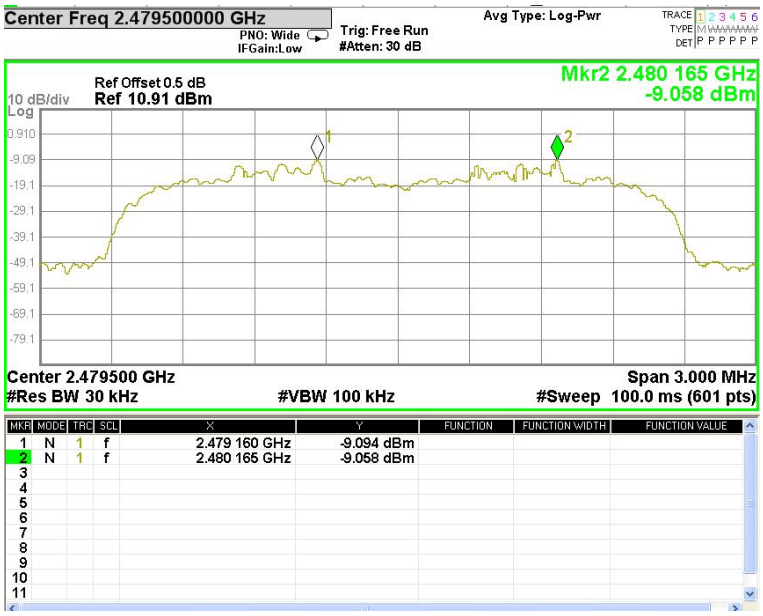
8-DPSK CH00




8-DPSK CH39



8-DPSK CH78

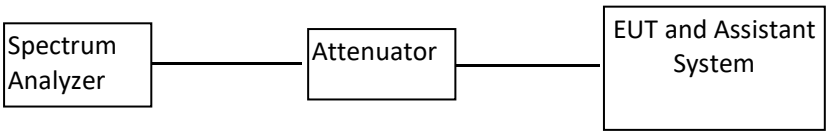

Center Freq 2.479500000 GHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
TRACE 1 2 3 4 5 6
TYPE M
DET P P P P P
Ref Offset 0.5 dB
10 dB/div
Log
Ref 10.91 dBm
Mkr2 2.480 165 GHz
-9.058 dBm
0.910
-9.09
-19.1
-29.1
-39.1
-49.1
-59.1
-69.1
-79.1
Center 2.479500 GHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3.000 MHz
#Sweep 100.0 ms (601 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 f 2.479 160 GHz -9.094 dBm
2 N 1 f 2.480 165 GHz -9.058 dBm
3
4
5
6
7
8
9
10
11

# 6. Number Of Hopping Channel

## 6.1. Test Requirement

| | | |
|---|---|---|
| Test Requirement | : | FCC CFR47 Part 15 Section 15.247 |
| Test Method | : | ANSI C63.10:2013 |
| Test Limit | : | Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. |
| Test Mode | : | Hopping |

## 6.2. Block diagram of test setup




## 6.3. Limits

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

## 6.4. Test Procedure

(1) Configure EUT and assistant system according clause 2.4 and 6.2

(2) Connect EUT's antenna output to spectrum analyzer by RF cable and though a 10dB attenuator.

(3) Configure EUT work in test mode as stated in clause 2.4.

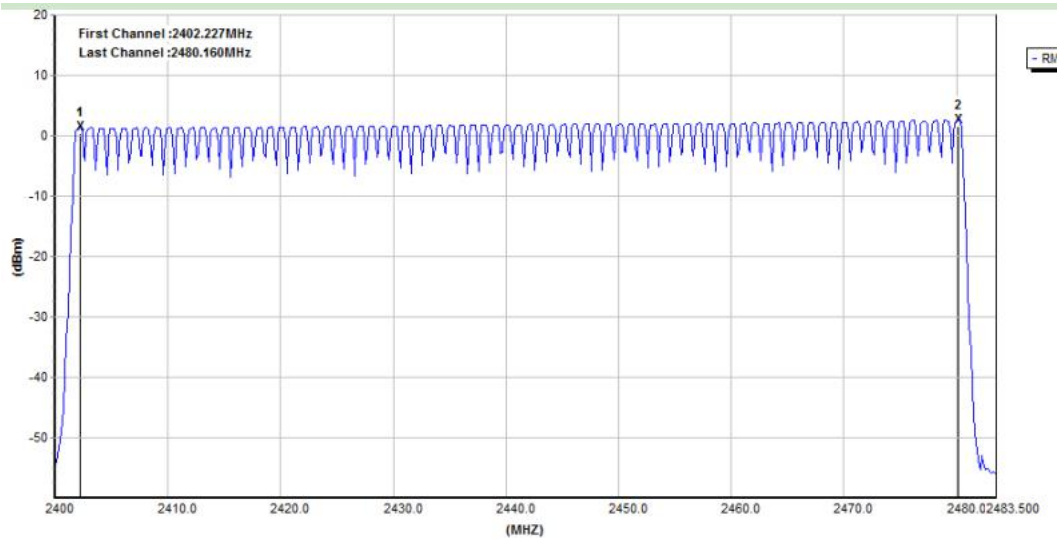
(4) The number of hopping channel was measured by spectrum analyzer with 300 kHz RBW and 1MHz VBW.

## 6.5. Test Result

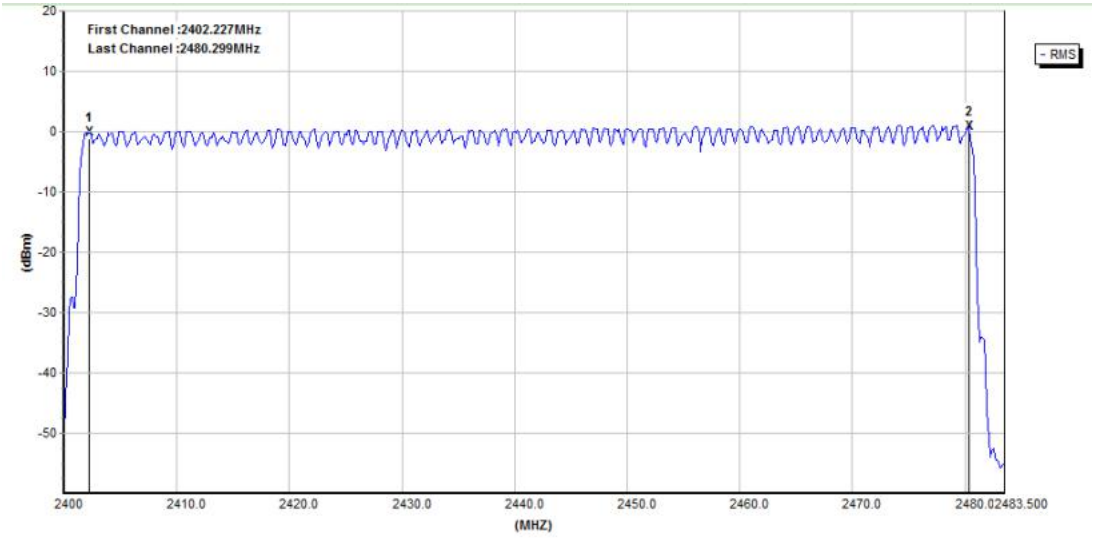
| EUT: bluetooth speaker M/N: BBH-929s | | | |
|---|---|---|---|
| Mode | Number of hopping channel | Limit | Conclusion |
| GFSK, π/4-DQPSK, 8DPSK | 79 | >15 | PASS |

## 6.6. Original test data

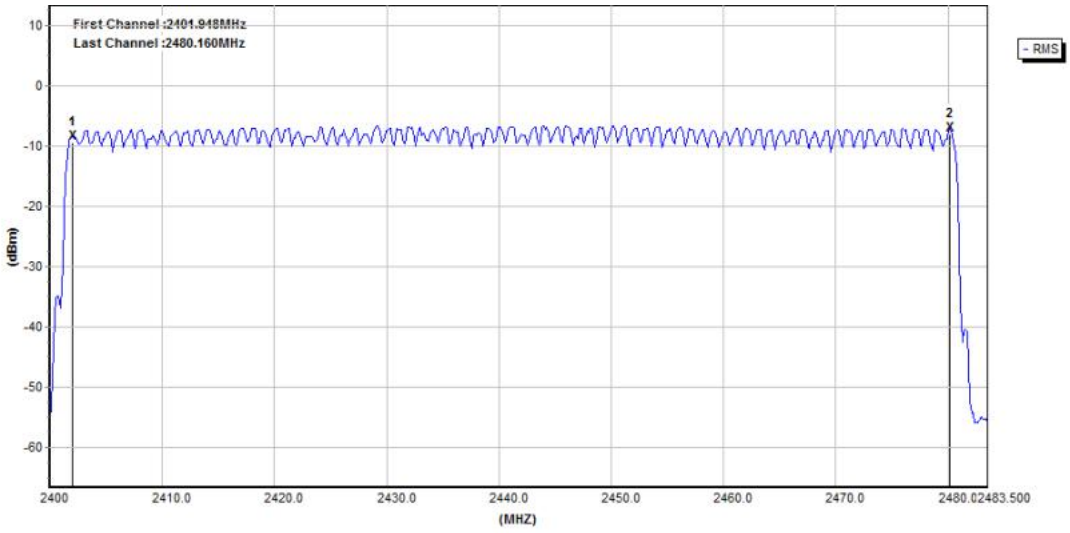
GFSK:




π/4-DQPSK



8-DPSK:

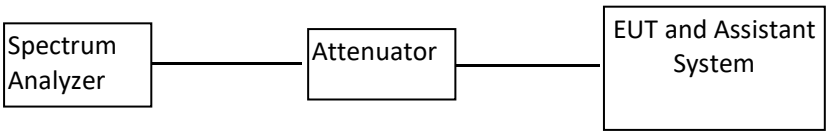

First Channel :2401.948MHz
Last Channel :2480.160MHz
RMS
10
0
-10
-20
-30
-40
-50
-60
(dBm)
1
2
2400
2410.0
2420.0
2430.0
2440.0
2450.0
2460.0
2470.0
2480.02483.500
(MHZ)

# 7. Dwell Time

## 7.1. Test Requirement

| | | |
|---|---|---|
| Test Requirement | : | FCC CFR47 Part 15 Section 15.247 |
| Test Method | : | ANSI C63.10:2013 |
| Test Limit | : | Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. |
| Test Mode | : | The test data was recorded |

## 7.2. Block diagram of test setup




## 7.3. Limits

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

## 7.4. Test Procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

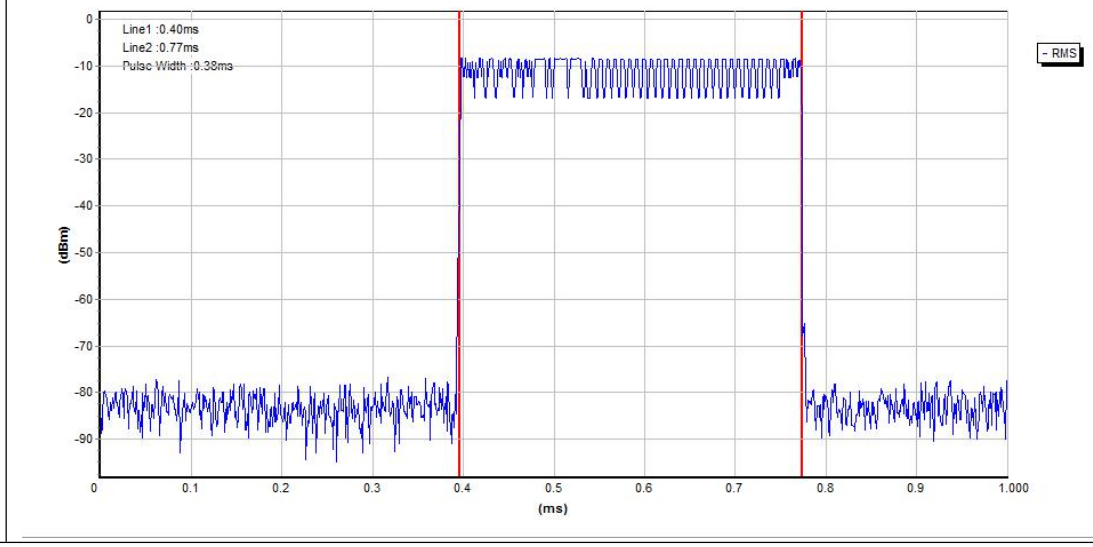
(2) Measure the hopping number and on time of each pulse with spectrum analyzer in zero span set, and calculate dwell time with formula Dwell time = total hops *pulse's on time.

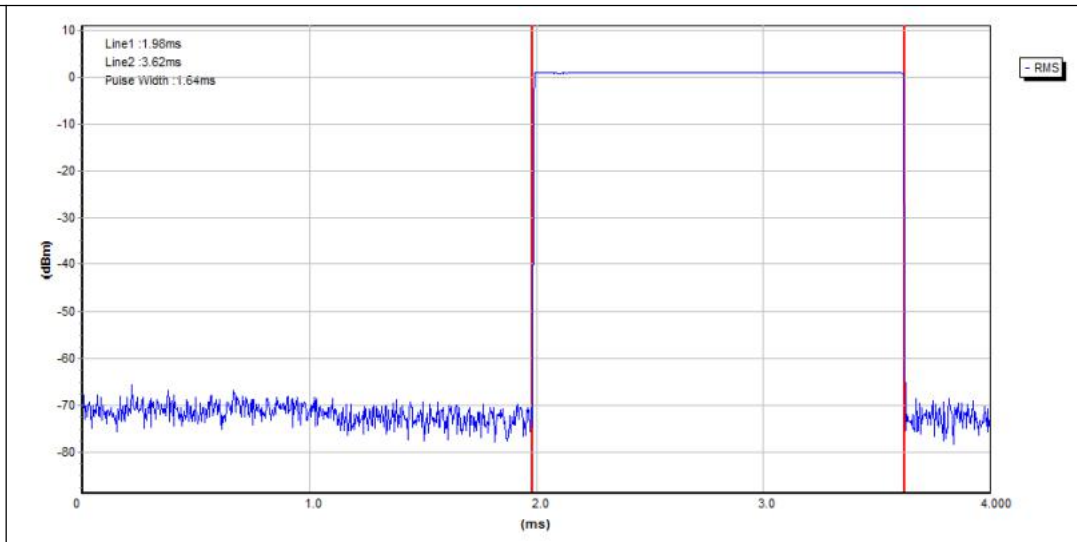
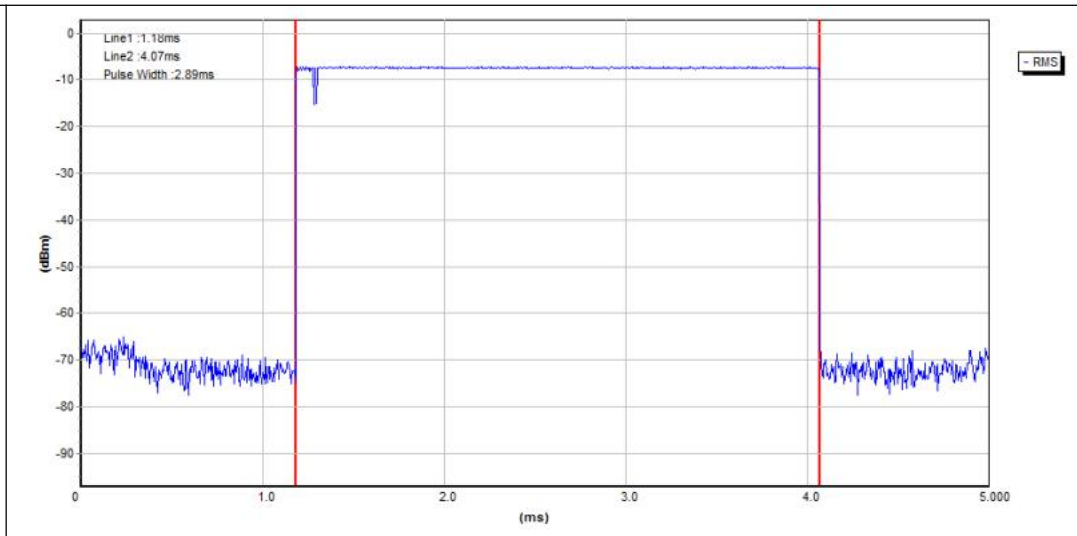
## 7.5. Test Result

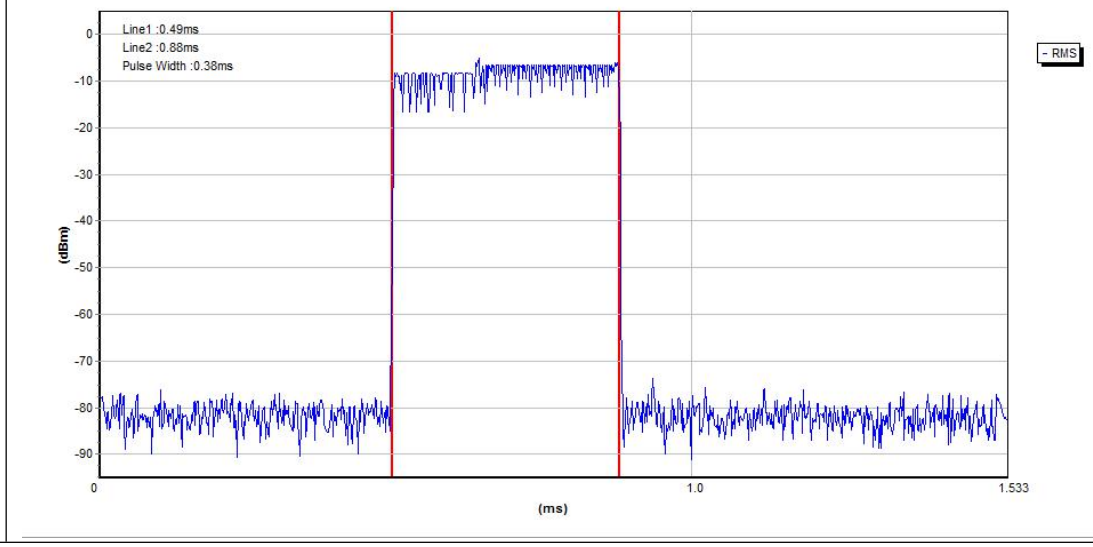
| Mode | Data Packet | Frequency (MHz) | Pulse Duration (ms) | Dwell Time (ms) | Limit(s) | Conclusion |
|---|---|---|---|---|---|---|
| GFSK | DH1 | 2441 | 0.38 | 121.60 | <0.4 | Pass |
| | DH3 | 2441 | 1.64 | 262.40 | <0.4 | Pass |
| | DH5 | 2441 | 2.89 | 308.27 | <0.4 | Pass |
| π/4 DQPSK | 2DH1 | 2441 | 0.38 | 121.60 | <0.4 | Pass |
| | 2DH3 | 2441 | 1.64 | 262.40 | <0.4 | Pass |
| | 2DH5 | 2441 | 2.89 | 308.27 | <0.4 | Pass |
| 8DPSK | 3DH1 | 2441 | 0.39 | 124.80 | <0.4 | Pass |
| | 3DH3 | 2441 | 1.64 | 262.40 | <0.4 | Pass |
| | 3DH5 | 2441 | 2.83 | 301.87 | <0.4 | Pass |

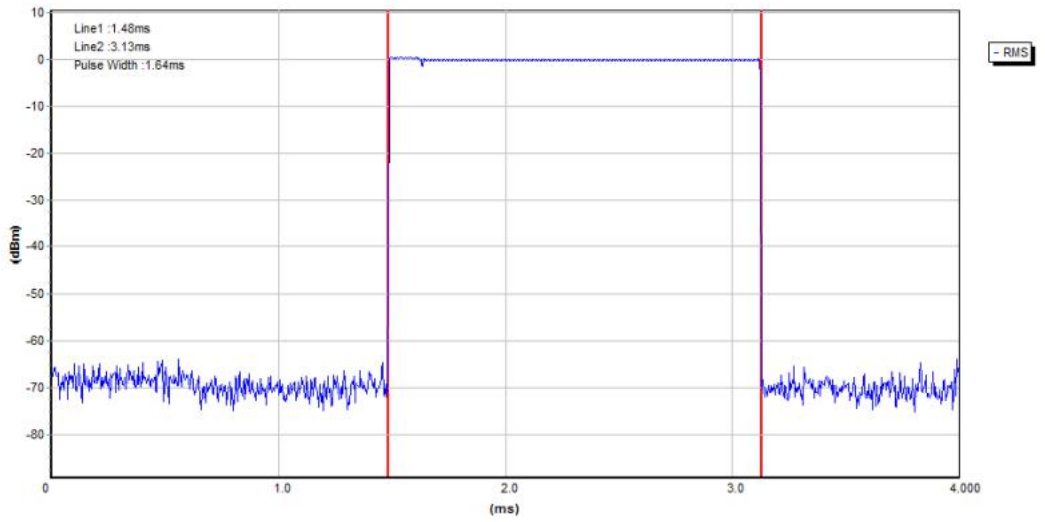
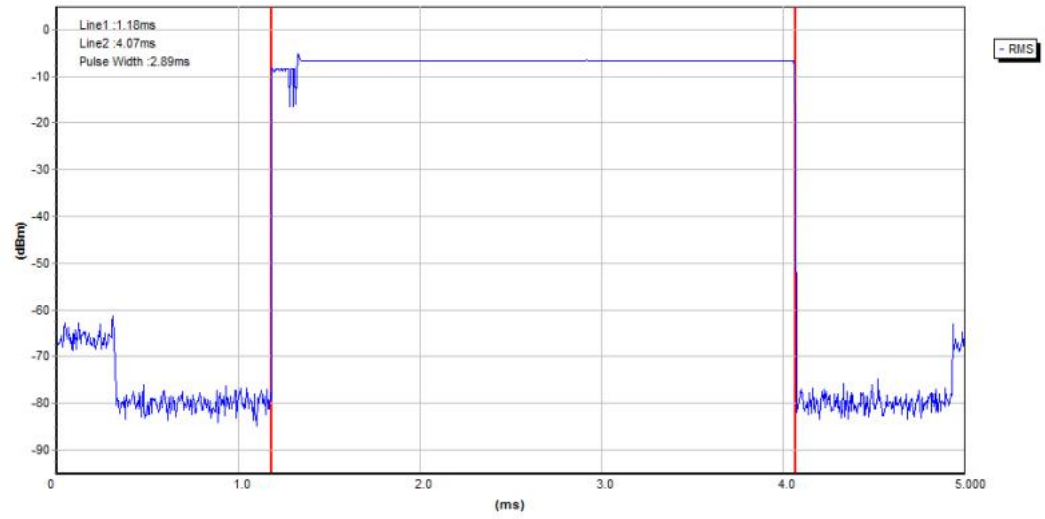
*Note1: A period time = 0.4 (s) * 79 =31.6(s)*
*Note2:*
*DH1 time slot = Pulse Duration * (1600/(2*79)) *A period time*
*DH3 time slot = Pulse Duration * (1600/(4*79)) * A period time*
*DH5 time slot = Pulse Duration * (1600/(6*79)) * A period time*
*Note3: For GFSK, π/4-DQPSK and 8DPSK: The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s*

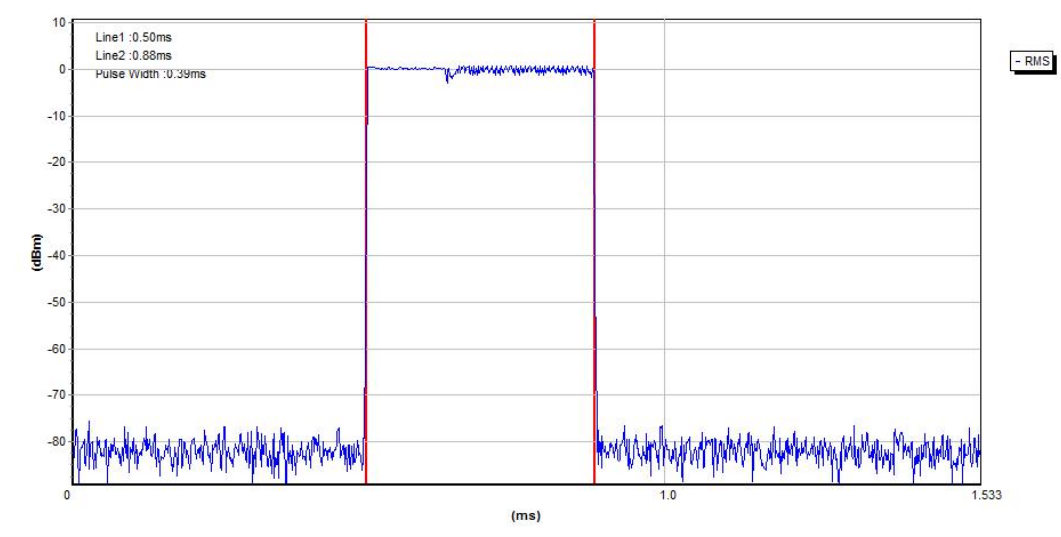
## 7.6. Original test data

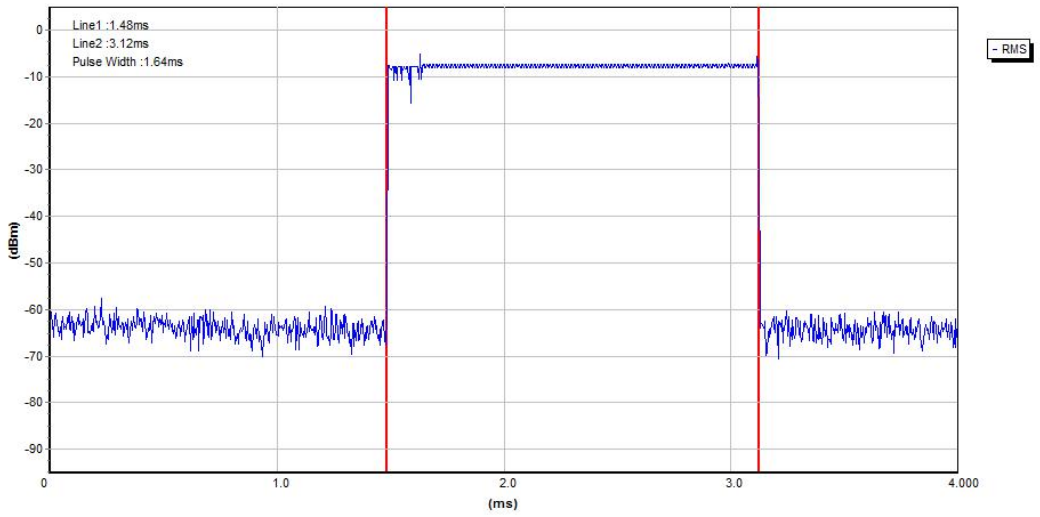
| Modulation mode | GFSK mode |
|---|---|
| DH1 |  |

| | |
|---|---|
| DH3 |  |
| DH5 |  |

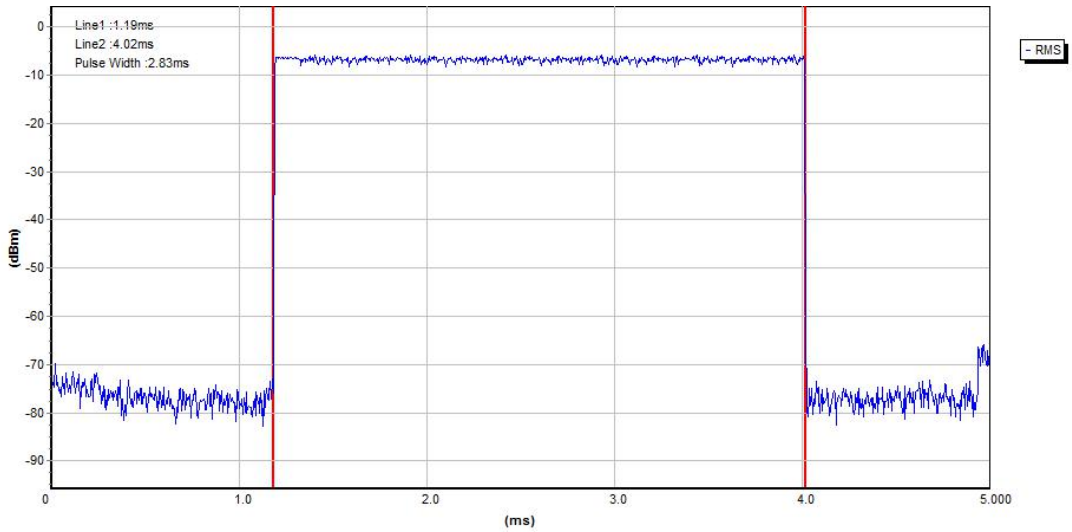
| Modulation mode | π/4-DQPSK mode |
|---|---|
| 2-DH1 |  |

| | |
|---|---|
| 2-DH3 |  |
| 2-DH5 |  |

| Modulation mode | 8DPSK mode |
|---|---|
| 3-DH1 |  |

| | |
|---|---|
| 3-DH3 |  |

Line1 :1.48ms
Line2 :3.12ms
Pulse Width :1.64ms
- RMS
(dBm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
1.0
2.0
3.0
4.000
(ms)

| | |
|---|---|
| 3-DH5 |  |

Line1 :1.19ms
Line2 :4.02ms
Pulse Width :2.83ms
- RMS
(dBm)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
0
1.0
2.0
3.0
4.0
5.000
(ms)

# 8. Radiated emission

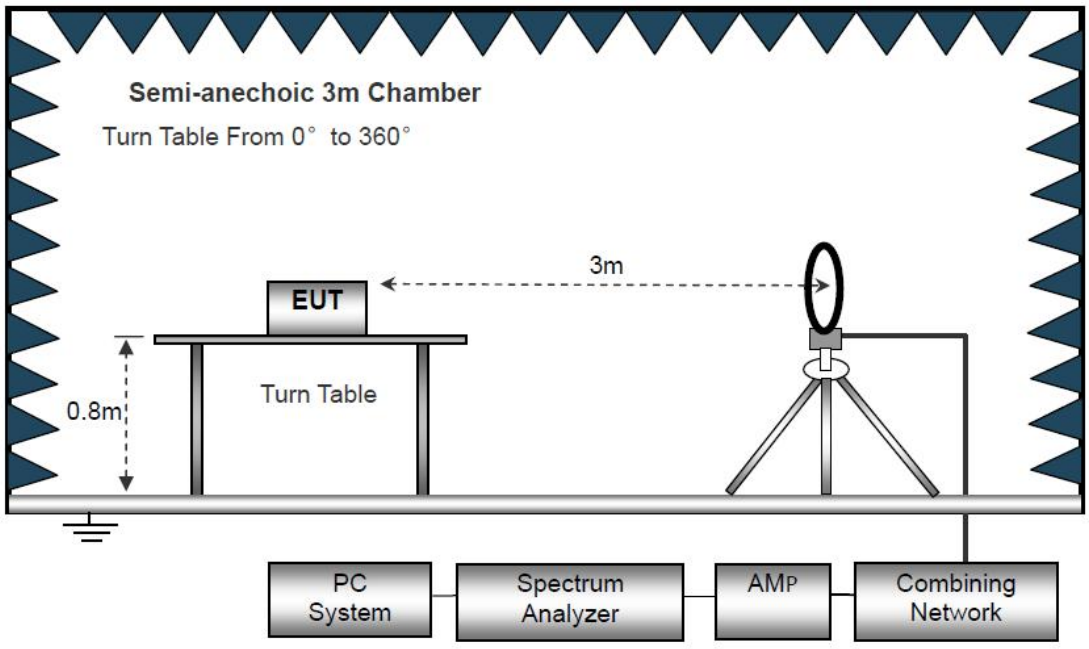
## 8.1. Test Requirement

| | | |
|---|---|---|
| Test Requirement | : | FCC CFR47 Part 15 Section 15.209 & 15.247 |
| Test Method | : | ANSI C63.10:2013 |
| Test Result | : | PASS |
| Measurement Distance | : | 3m |
| Limit | : | See the follow table |

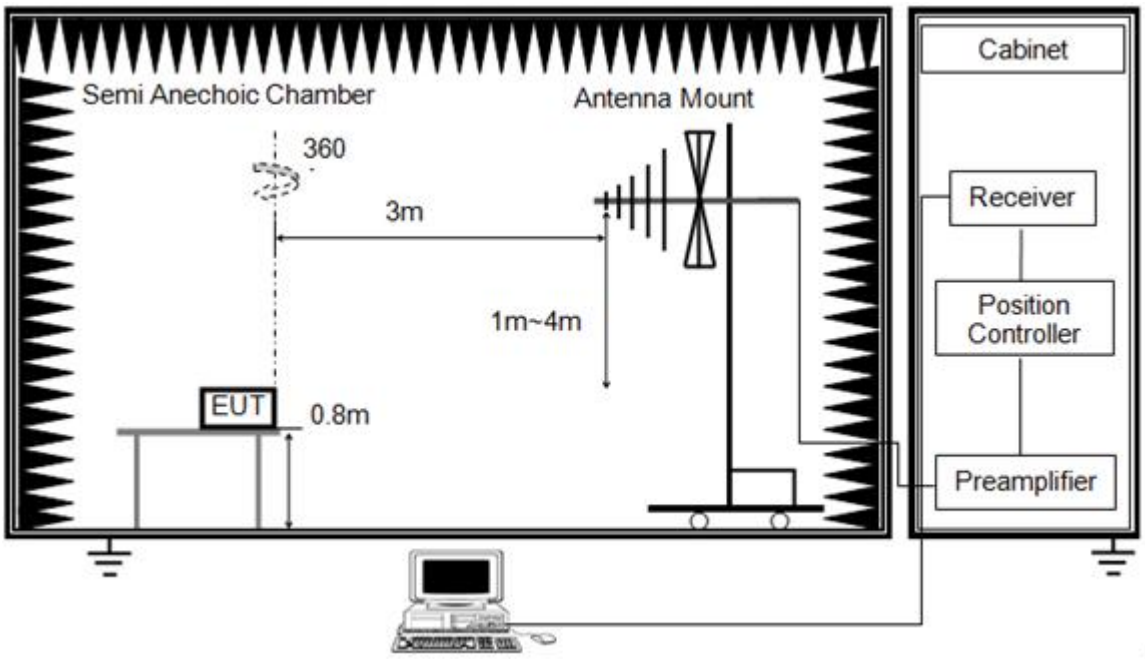
| Frequency (MHz) | Field Strength | | Field Strength Limit at 3m Measurement Dist | |
|---|---|---|---|---|
| | uV/m | Distance (m) | uV/m | dBuV/m |
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 | 10000 * 2400/F(kHz) | $20\log^{(2400/F(kHz))}$ + 80 |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 | 100 * 24000/F(kHz) | $20\log^{(24000/F(kHz))}$ + 40 |
| 1.705 ~ 30 | 30 | 30 | 100 * 30 | $20\log^{(30)}$ + 40 |
| 30 ~ 88 | 100 | 3 | 100 | $20\log^{(100)}$ |
| 88 ~ 216 | 150 | 3 | 150 | $20\log^{(150)}$ |
| 216 ~ 960 | 200 | 3 | 200 | $20\log^{(200)}$ |
| Above 960 | 500 | 3 | 500 | $20\log^{(500)}$ |

## 8.2. Test setup and procedure

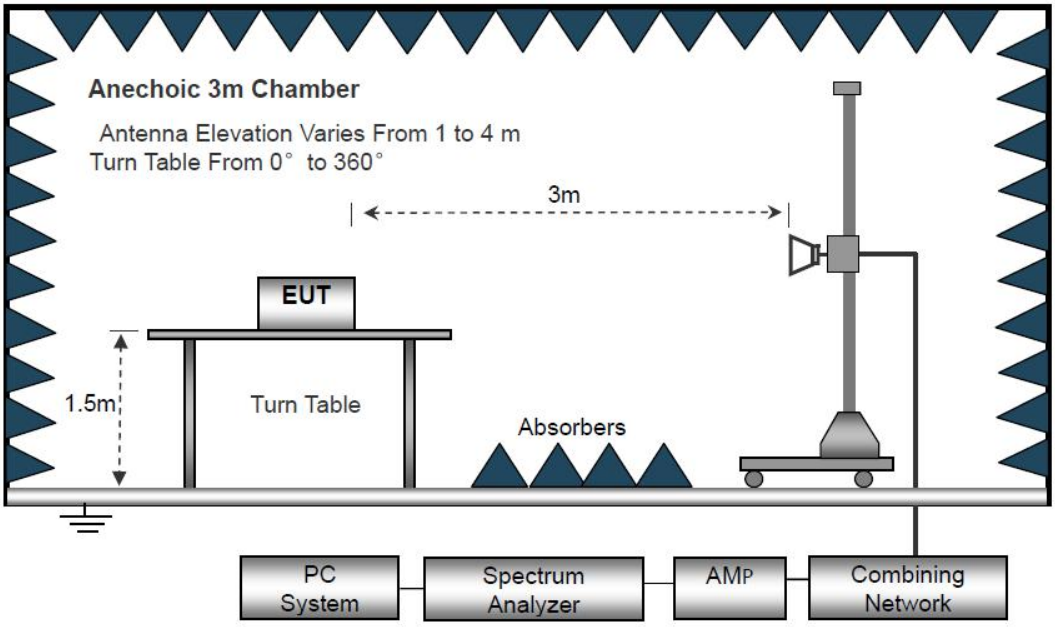
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.




The test setup for emission measurement above 1 GHz.




The setting of the spectrum analyser

| Spectrum Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RB / VB (emission in restricted band) | 1 MHz / 1 MHz for Peak, 1 MHz / *10Hz* for Average |

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 120kHz for QP |

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

6. For measurement below 1GHz, 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 then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

7. For the actual test configuration, please refer to the related Item in this test report (Photographs of the Test Configuration)

8 For emissions below 1GHz, according explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1GHz, the final test was only performed with EUT working in GFSK, Tx 2441MHz mode.

ABOVE 1G

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

6. For measurement above 1GHz, the emission measurement will be measured by the peak detector and the AV detector.

7. For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure.

8. According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

## 8.3. Limit

8.3.1 Please refer to FCC §15.205 and §15.209
Please refer to FCC §15.247 (a)(d)(e)

| The field strength of emissions from intentional radiators operated within these frequency bands | | | |
|---|---|---|---|
| Frequency (MHz) | Field strength of Fundamental | Field strength of Harmonics | Distance (m) |
| 902 - 928 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |
| 2400 – 2483.5 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |
| 5725 – 5875 | 50 mV/m (94dBuV/m) | 500 uV/m (54dBuV/m) | 3 |

| Emissions radiated outside of the specified frequency bands | | | |
|---|---|---|---|
| Frequency Range (MHz) 30 - 88 | Field Strength Limit (uV/m) at 3 m 100 | Field Strength Limit (dBuV/m) at 3 m | |
| | | Quasi-Peak | |
| 30 - 88 | 100 | 40 | |
| 88 - 216 | 150 | 43.5 | |
| 216 - 960 | 200 | 46 | |
| Above 960 | 500 | 54 | |
| Above 1000 | 500 | Peak | Average |
| | | 74 | 54 |

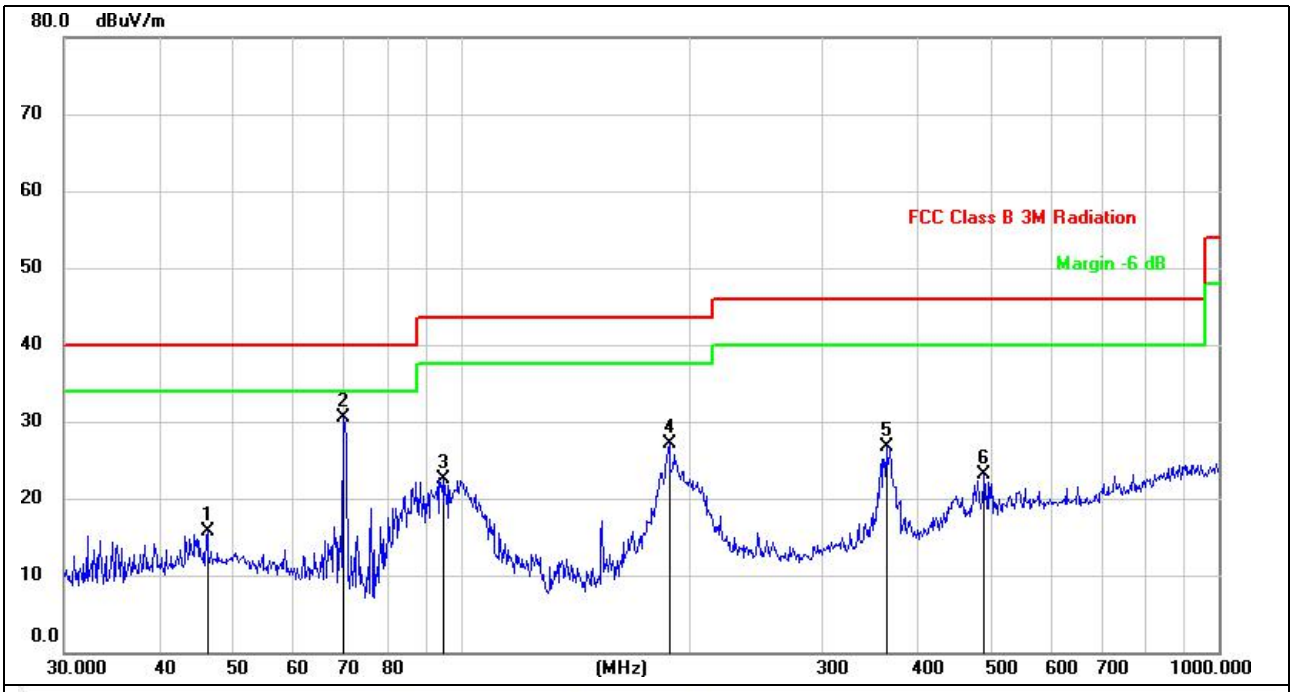
## 8.4. Test Data

*Environmental Conditions*

| | |
|---|---|
| **Temperature:** | 26 ℃ |
| **Relative Humidity:** | 55 % |
| **ATM Pressure:** | 101.0 kPa |

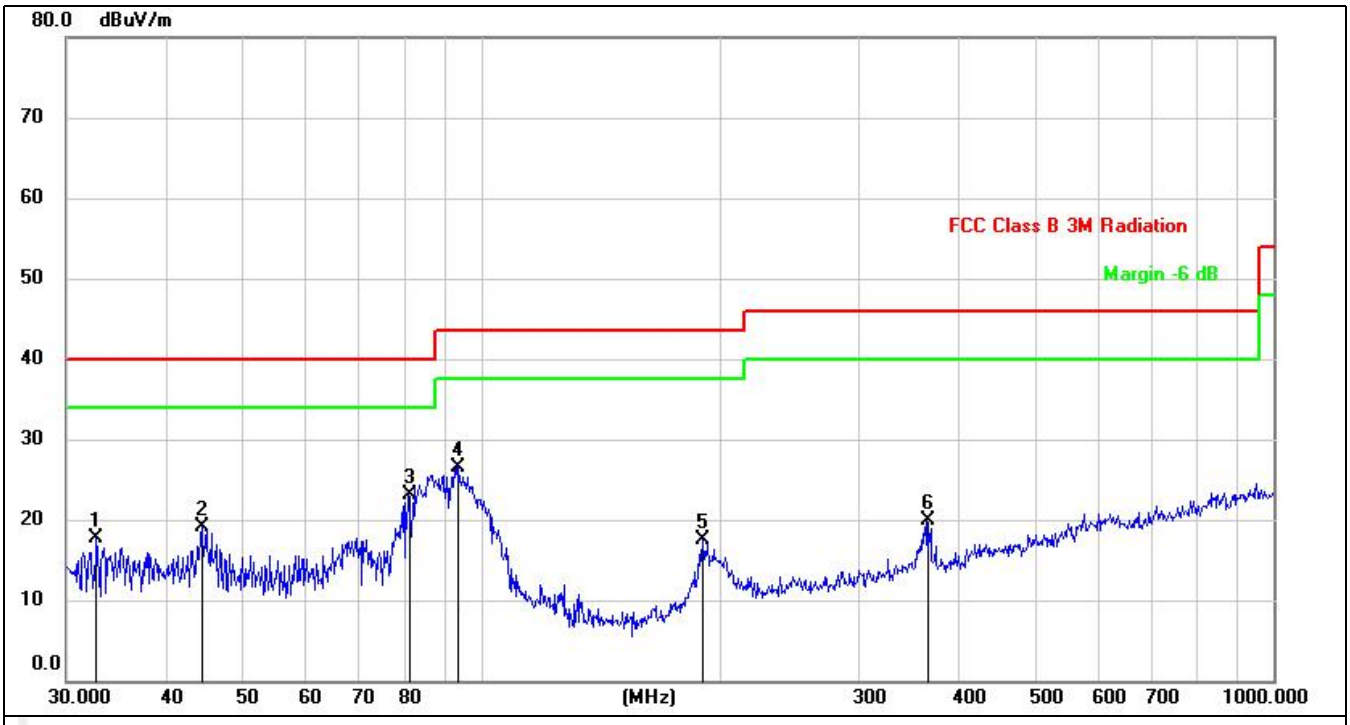
*Test Result: Compliant.*

*SPURIOUS EMISSIONS BELOW 1 GHz*
**(TX mode, HORIZONTAL)**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 46.3402 | 28.27 | -12.57 | 15.70 | 40.00 | -24.30 | QP |
| 2 | * | 70.0903 | 46.26 | -15.78 | 30.48 | 40.00 | -9.52 | QP |
| 3 | | 94.7601 | 37.40 | -14.85 | 22.55 | 43.50 | -20.95 | QP |
| 4 | | 188.4125 | 41.18 | -13.98 | 27.20 | 43.50 | -16.30 | QP |
| 5 | | 364.2595 | 36.53 | -9.83 | 26.70 | 46.00 | -19.30 | QP |
| 6 | | 490.7447 | 31.70 | -8.69 | 23.01 | 46.00 | -22.99 | QP |

(TX mode, VERTICAL)




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dBuV/m | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 32.7486 | 32.49 | -14.77 | 17.72 | 40.00 | -22.28 | QP |
| 2 | | 44.4308 | 31.76 | -12.70 | 19.06 | 40.00 | -20.94 | QP |
| 3 | * | 80.9275 | 40.77 | -17.64 | 23.13 | 40.00 | -16.87 | QP |
| 4 | | 93.1132 | 41.70 | -15.17 | 26.53 | 43.50 | -16.97 | QP |
| 5 | | 190.4050 | 31.23 | -13.73 | 17.50 | 43.50 | -26.00 | QP |
| 6 | | 365.5391 | 29.78 | -9.84 | 19.94 | 46.00 | -26.06 | QP |

Note1: Emission Level = Meter Reading + Factor, Margin= Emission Level- Limit, Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Note2: The three modulated high, medium and low channels have been tested. The report only shows the worst mode. The worst mode is GFSK CH78

*SPURIOUS EMISSIONS (1~25GHz)*

All the modulation modes have been tested, and the worst result was report as below:

| Frequency (MHz) | Read Level (dBμV) | Cable loss (dB) | Antenna Factor dB/m | Preamp Factor (dB) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Low Channel (2402 MHz)(GFSK)--Above 1G | | | | | | | | | |
| 4804.03 | 63.95 | 5.21 | 35.59 | 44.30 | 60.45 | 74.00 | -13.55 | Pk | Vertical |
| 4804.03 | 41.66 | 5.21 | 35.59 | 44.30 | 38.16 | 54.00 | -15.84 | AV | Vertical |
| 7206.27 | 61.54 | 6.48 | 36.27 | 44.60 | 59.69 | 74.00 | -14.31 | Pk | Vertical |
| 7206.27 | 44.81 | 6.48 | 36.27 | 44.60 | 42.96 | 54.00 | -11.04 | AV | Vertical |
| 4804.11 | 61.94 | 5.21 | 35.55 | 44.30 | 58.40 | 74.00 | -15.60 | Pk | Horizontal |
| 4804.11 | 42.85 | 5.21 | 35.55 | 44.30 | 39.31 | 54.00 | -14.69 | AV | Horizontal |
| 7206.22 | 63.58 | 6.48 | 36.27 | 44.52 | 61.81 | 74.00 | -12.19 | Pk | Horizontal |
| 7206.22 | 47.75 | 6.48 | 36.27 | 44.52 | 45.98 | 54.00 | -8.02 | AV | Horizontal |
| Mid Channel (2441 MHz)(GFSK)--Above 1G | | | | | | | | | |
| 4882.4 | 63.06 | 5.21 | 35.66 | 44.20 | 59.73 | 74.00 | -14.27 | Pk | Vertical |
| 4882.4 | 42.28 | 5.21 | 35.66 | 44.20 | 38.95 | 54.00 | -15.05 | AV | Vertical |
| 7323.24 | 60.39 | 7.10 | 36.50 | 44.43 | 59.56 | 74.00 | -14.44 | Pk | Vertical |
| 7323.24 | 48.48 | 7.10 | 36.50 | 44.43 | 47.65 | 54.00 | -6.35 | AV | Vertical |
| 4882.11 | 61.21 | 5.21 | 35.66 | 44.20 | 57.88 | 74.00 | -16.12 | Pk | Horizontal |
| 4882.11 | 47.80 | 5.21 | 35.66 | 44.20 | 44.47 | 54.00 | -9.53 | AV | Horizontal |
| 7323.13 | 59.86 | 7.10 | 36.50 | 44.43 | 59.03 | 74.00 | -14.97 | Pk | Horizontal |
| 7323.13 | 42.05 | 7.10 | 36.50 | 44.43 | 41.22 | 54.00 | -12.78 | AV | Horizontal |
| High Channel (2480 MHz)(GFSK)-- Above 1G | | | | | | | | | |
| 4960.4 | 66.15 | 5.21 | 35.52 | 44.21 | 62.67 | 74.00 | -11.33 | Pk | Vertical |
| 4960.4 | 42.49 | 5.21 | 35.52 | 44.21 | 39.01 | 54.00 | -14.99 | AV | Vertical |
| 7440.2 | 62.44 | 7.10 | 36.53 | 44.60 | 61.47 | 74.00 | -12.53 | Pk | Vertical |
| 7440.2 | 45.48 | 7.10 | 36.53 | 44.60 | 44.51 | 54.00 | -9.49 | AV | Vertical |
| 4960.23 | 67.30 | 5.21 | 35.52 | 44.21 | 63.82 | 74.00 | -10.18 | Pk | Horizontal |
| 4960.23 | 47.23 | 5.21 | 35.52 | 44.21 | 43.75 | 54.00 | -10.25 | AV | Horizontal |
| 7440.3 | 61.31 | 7.10 | 36.53 | 44.60 | 60.34 | 74.00 | -13.66 | Pk | Horizontal |
| 7440.3 | 45.65 | 7.10 | 36.53 | 44.60 | 44.68 | 54.00 | -9.32 | AV | Horizontal |

Note:

(1) All Readings are Peak Value (VBW=3MHz) and AV Value (VBW=10Hz).

(2) Emission Level= Antenna Factor + Cable Loss + Read Level - Preamp Factor

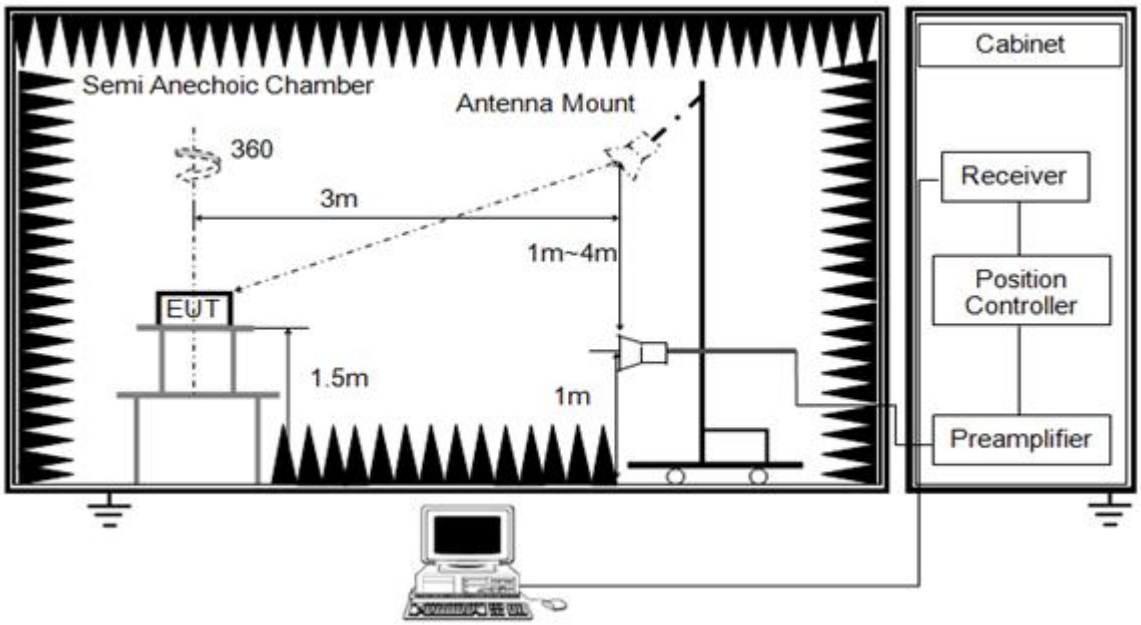
(3) All other emissions more than 20dB below the limit.

# 9. Band Edge Compliance

## 9.1. Test Requirement

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.

## 9.2. Block diagram of test setup




## 9.3. Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

## 9.4. Test Procedure

Same with clause 8.4 except change investigated frequency range from 2310MHz to 2415MHz and 2475MHz to 2500MHz.

| 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 – 2403 MHz<br>Upper Band Edge: 2479 – 2500 MHz |
| RB / VB (emission in restricted band) | 100 KHz/300 KHz |
| Trace-Mode: | Max hold |

## 9.5. Test Result and Data

All the modulation modes have been tested, and the worst result was report as below:

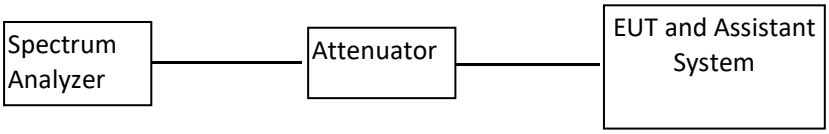
| Frequency | Meter Reading | Cable Loss | Antenna Factor | Preamp Factor | Emission Level | Limits | Margin | Detector | Comment |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dBμV) | (dB) | dB/m | (dB) | (dBμV/m) | (dBμV/m) | (dB) | Type | |
| 1Mbps (GFSK)-hopping | | | | | | | | | |
| 2310.00 | 56.36 | 2.97 | 27.80 | 43.80 | 43.33 | 74 | -30.67 | Pk | Horizontal |
| 2310.00 | 44.48 | 2.97 | 27.80 | 43.80 | 31.45 | 54 | -22.55 | AV | Horizontal |
| 2310.00 | 59.23 | 2.97 | 27.80 | 43.80 | 46.20 | 74 | -27.80 | Pk | Vertical |
| 2310.00 | 42.78 | 2.97 | 27.80 | 43.80 | 29.75 | 54 | -24.25 | AV | Vertical |
| 2390.00 | 59.61 | 3.14 | 27.21 | 43.80 | 46.16 | 74 | -27.84 | Pk | Vertical |
| 2390.00 | 43.40 | 3.14 | 27.21 | 43.80 | 29.95 | 54 | -24.05 | AV | Vertical |
| 2390.00 | 57.62 | 3.14 | 27.21 | 43.80 | 44.17 | 74 | -29.83 | Pk | Horizontal |
| 2390.00 | 42.34 | 3.14 | 27.21 | 43.80 | 28.89 | 54 | -25.11 | AV | Horizontal |
| 2483.50 | 58.14 | 3.58 | 27.70 | 44.00 | 45.42 | 74 | -28.58 | Pk | Vertical |
| 2483.50 | 42.58 | 3.58 | 27.70 | 44.00 | 29.86 | 54 | -24.14 | AV | Vertical |
| 2483.50 | 60.42 | 3.58 | 27.70 | 44.00 | 47.70 | 74 | -26.30 | Pk | Horizontal |
| 2483.50 | 43.52 | 3.58 | 27.70 | 44.00 | 30.80 | 54 | -23.20 | AV | Horizontal |
| 1Mbps(GFSK)- Non-hopping | | | | | | | | | |
| 2310.00 | 56.36 | 2.97 | 27.80 | 43.80 | 43.33 | 74 | -30.67 | Pk | Horizontal |
| 2310.00 | 43.74 | 2.97 | 27.80 | 43.80 | 30.71 | 54 | -23.29 | AV | Horizontal |
| 2310.00 | 58.26 | 2.97 | 27.80 | 43.80 | 45.23 | 74 | -28.77 | Pk | Vertical |
| 2310.00 | 42.65 | 2.97 | 27.80 | 43.80 | 29.62 | 54 | -24.38 | AV | Vertical |
| 2390.00 | 58.96 | 3.14 | 27.21 | 43.80 | 45.51 | 74 | -28.49 | Pk | Vertical |
| 2390.00 | 42.29 | 3.14 | 27.21 | 43.80 | 28.84 | 54 | -25.16 | AV | Vertical |
| 2390.00 | 57.29 | 3.14 | 27.21 | 43.80 | 43.84 | 74 | -30.16 | Pk | Horizontal |
| 2390.00 | 42.45 | 3.14 | 27.21 | 43.80 | 29.00 | 54 | -25.00 | AV | Horizontal |
| 2483.50 | 58.67 | 3.58 | 27.70 | 44.00 | 45.95 | 74 | -28.05 | Pk | Vertical |
| 2483.50 | 43.94 | 3.58 | 27.70 | 44.00 | 31.22 | 54 | -22.78 | AV | Vertical |
| 2483.50 | 59.18 | 3.58 | 27.70 | 44.00 | 46.46 | 74 | -27.54 | Pk | Horizontal |
| 2483.50 | 42.51 | 3.58 | 27.70 | 44.00 | 29.79 | 54 | -24.21 | AV | Horizontal |

# 10. Band Edge Compliance (conducted method)

## 10.1. Test Requirement

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

## 10.2. Block diagram of test setup




1.The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
2.The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.
3.The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

## 10.3. Limit

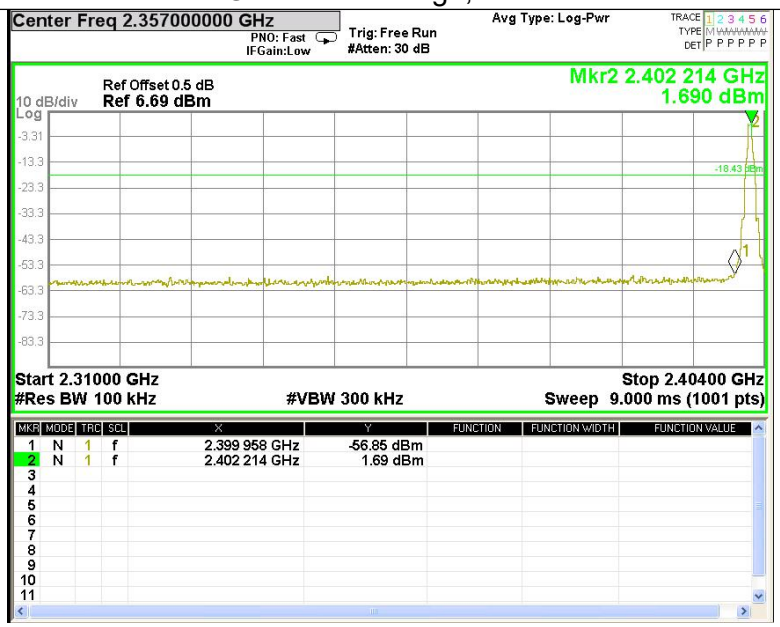
All restriction band should comply with 15.209, other emission should be at least 20dB blow the fundamental.

## 10.4. Test result

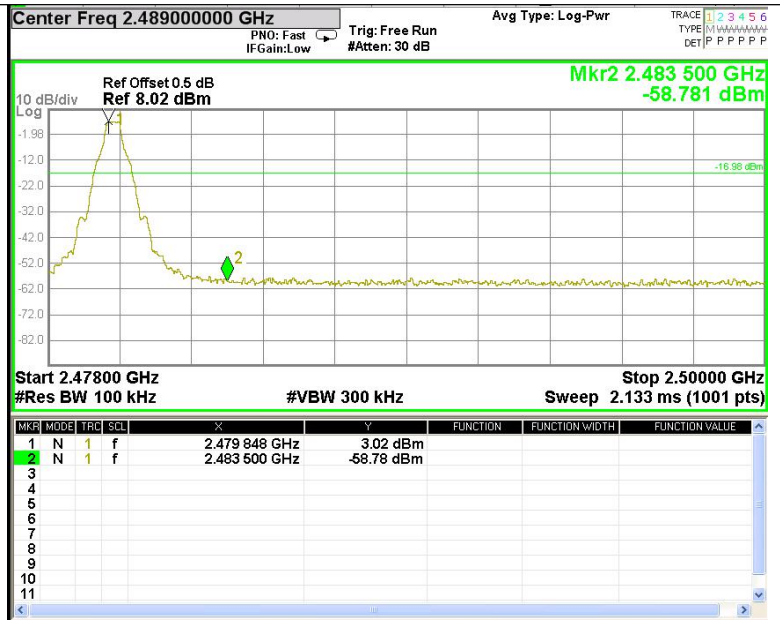
| Mode | Freq (MHz) | Conclusion |
|---|---|---|
| GFSK | Hopping off 2402 | PASS |
| | Hopping off 2480 | PASS |
| | Hopping on | PASS |
| 8-DPSK | Hopping off 2402 | PASS |
| | Hopping off 2480 | PASS |
| | Hopping on | PASS |

## 10.5. Original test data

GFSK: Band Edge, Left Side

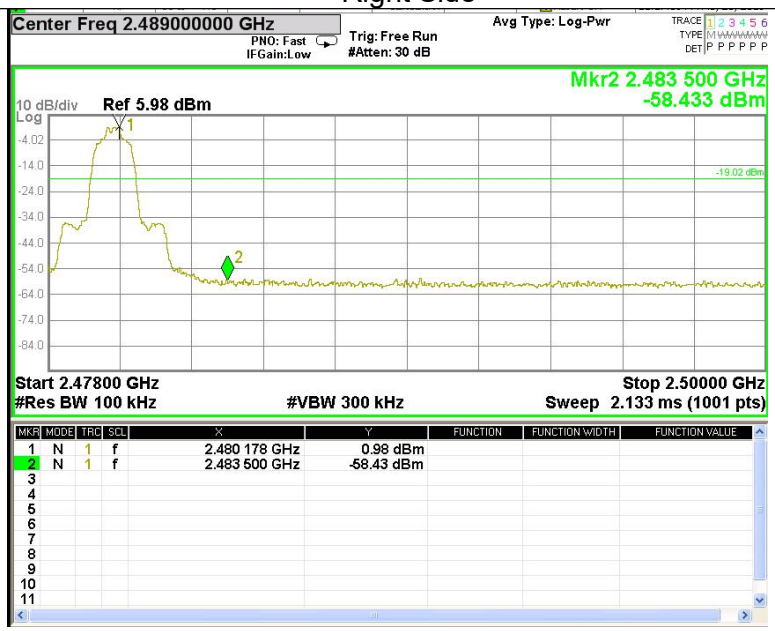



GFSK: Band Edge, Right Side



π/4-DQPSK: Band Edge,
Left Side

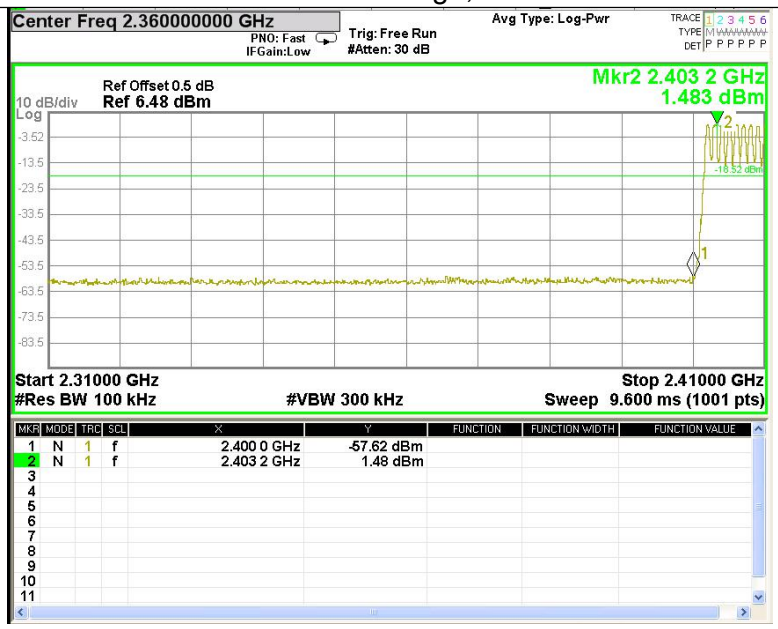
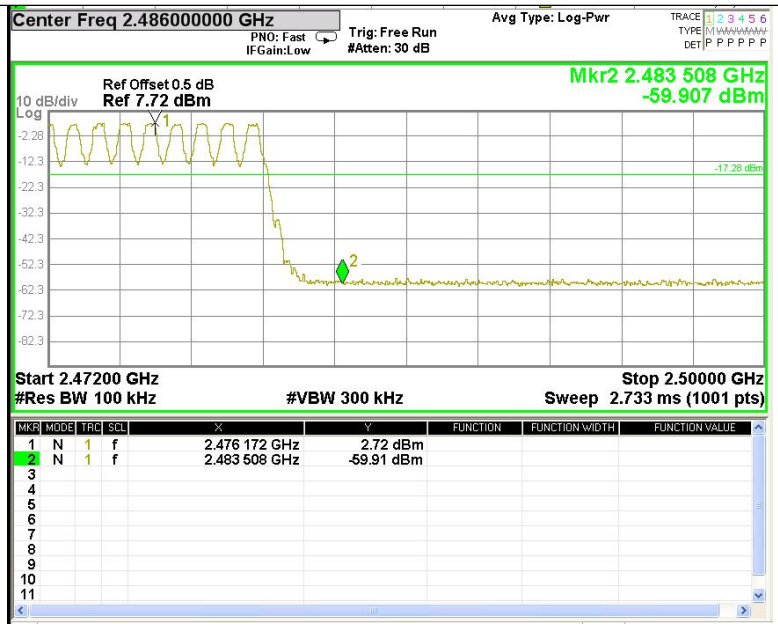

π/4-DQPSK: Band Edge,
Right Side



8DPSK: Band Edge, Left Side


8DPSK: Band Edge, Right Side

HOPPING MODE

| GFSK: Band Edge, Left Side |
| --- |
|  |
| GFSK: Band Edge, Right Side |
|  |

π/4-DQPSK: Band Edge,
Left Side


π/4-DQPSK Band Edge,
Right Side

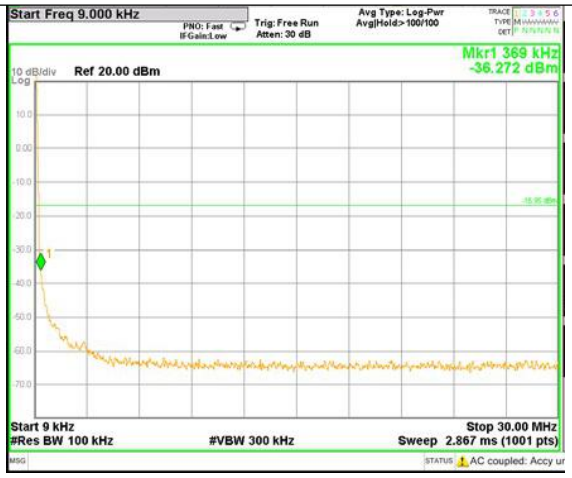
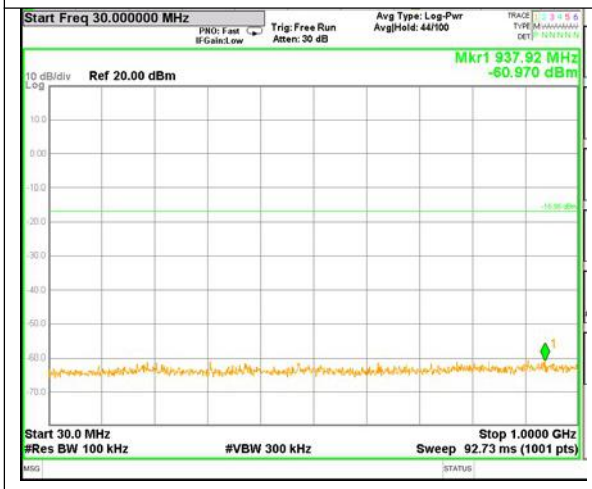
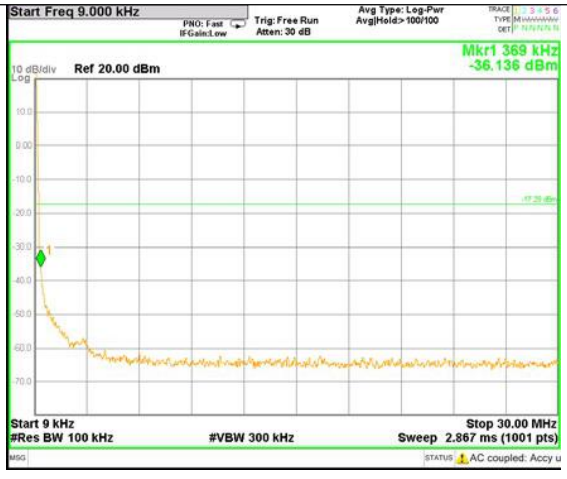
8DPSK: Band Edge, Left Side

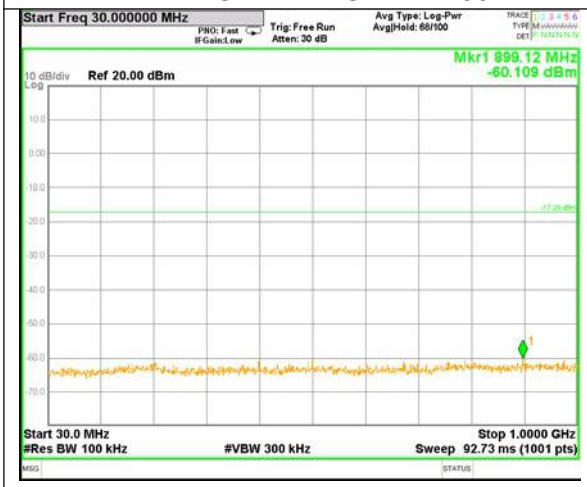
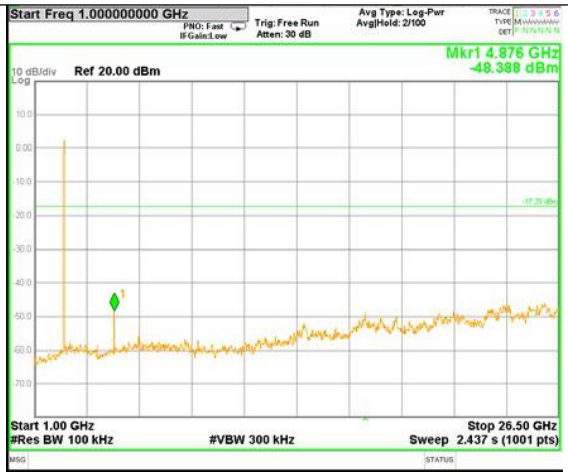
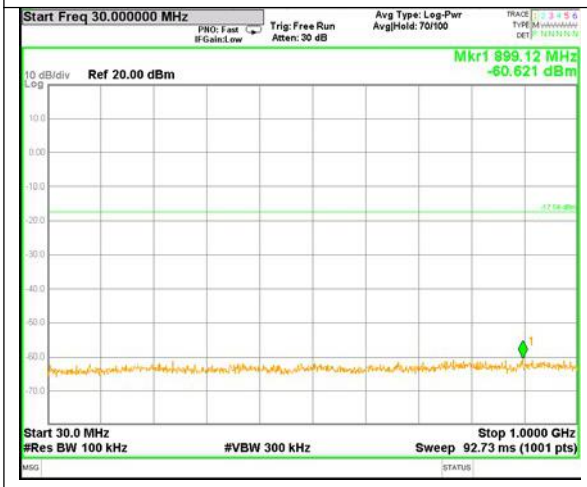

8DPSK Band Edge, Right Side

## 11. Spurious RF Conducted emissions

1.Use the following spectrum analyzer settings:
2.Span = wide enough to captu rethepeak level of the in-band emission and all spurious emissions (eg, harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
3.RBW = 100 kHz, VBW>RBW, Sweep = auto, Detector function = peak, Trace = max hold
Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
4.The level displayed must comply with the limit specified in this Section. Submit these plots.
5.Repeat above procedures until all frequencies measured were complete.
6. limited : -20db.
7. all model is tested. The worse case is GFSK(CH0, CH39, CH78)

**Test result**

| GFSK on Channel 00 | GFSK on Channel 00 |
|---|---|
|  |  |
| **GFSK on Channel 00** | **GFSK on Channel 00** |
|  |  |
| **GFSK on Channel 39** | **GFSK on Channel 39** |
|  |  |

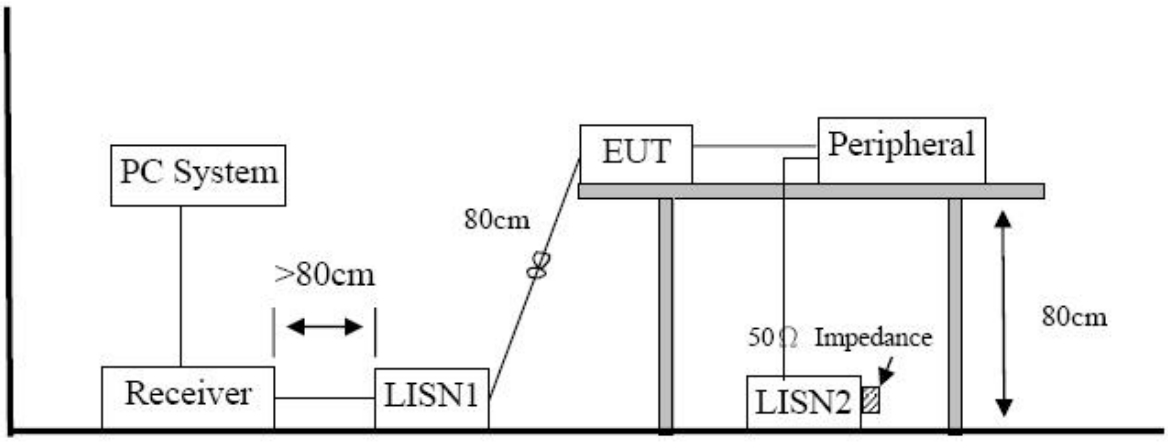
| | |
|---|---|
| GFSK on Channel 39 | GFSK on Channel 39 |
|  |  |
| GFSK on Channel 79 | GFSK on Channel 79 |
|  |  |
| GFSK on Channel 79 | GFSK on Channel 79 |
|  |  |

# 12. Power Line Conducted Emission

## 12.1. Test equipment

| | | |
|---|---|---|
| Test Requirement: | : | FCC CFR 47 Part 15 Section 15.207 |
| Test Method: | : | ANSI C63.10:2013 |
| Test Result: | : | PASS |
| Frequency Range: | : | 150kHz to 30MHz |
| Class/Severity: | : | Class B |
| Detector: | : | Peak for pre-scan (9kHz Resolution Bandwidth) |

## 12.2. Test setup and procedure




1. The EUT was placed on a table, which is 0.8m above ground plane.

2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

3. Repeat above procedures until all frequency measured was complete.

## 12.3. Power Line Conducted Emission Limits(Class B)

| Frequency | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
|---|---|---|
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

## 12.4. Test Data

*Test Result: Compliant..*

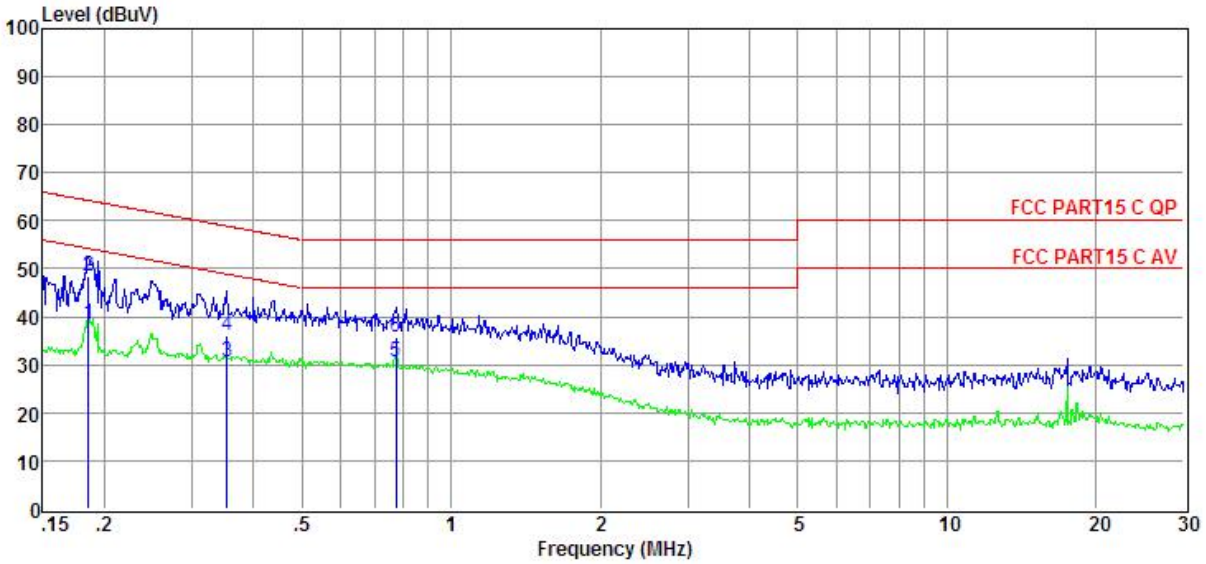
Note1: All emissions not reported below are too low against the prescribed limits.

Note2: "-----" means average detection; "-----" mans peak detection

Note3: The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

# Conducted Emission Test Result

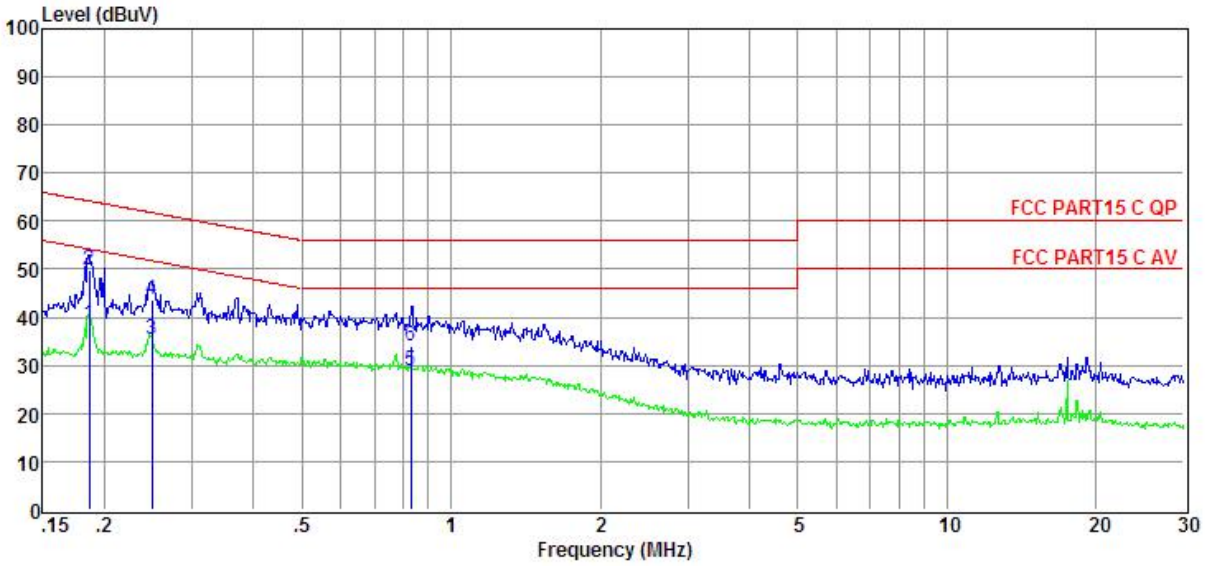
LINE




| Item<br>(Mark) | Freq<br>(MHz) | Read Level<br>(dBµV) | LISN Factor<br>(dB) | Cable Loss<br>(dB) | Result Level<br>(dBµV) | Limit Line<br>(dBµV) | Over Limit<br>(dB) | Detector | Phase |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.19 | 28.90 | 9.59 | 0.10 | 38.59 | 54.24 | -15.65 | Average | LINE |
| 2 | 0.19 | 38.88 | 9.59 | 0.10 | 48.57 | 64.24 | -15.67 | QP | LINE |
| 3 | 0.35 | 20.97 | 9.61 | 0.10 | 30.68 | 48.87 | -18.19 | Average | LINE |
| 4 | 0.35 | 26.30 | 9.61 | 0.10 | 36.01 | 58.87 | -22.86 | QP | LINE |
| 5 | 0.78 | 20.66 | 9.62 | 0.20 | 30.48 | 46.00 | -15.52 | Average | LINE |
| 6 | 0.78 | 25.86 | 9.62 | 0.20 | 35.68 | 56.00 | -20.32 | QP | LINE |

# Conducted Emission Test Result

NEUTRAL




| Item<br>(Mark) | Freq<br>(MHz) | Read Level<br>(dBμV) | LISN Factor<br>(dB) | Cable Loss<br>(dB) | Result Level<br>(dBμV) | Limit Line<br>(dBμV) | Over Limit<br>(dB) | Detector | Phase |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.19 | 28.86 | 9.66 | 0.10 | 38.62 | 54.20 | -15.58 | Average | NEUTRAL |
| 2 | 0.19 | 40.09 | 9.66 | 0.10 | 49.85 | 64.20 | -14.35 | QP | NEUTRAL |
| 3 | 0.25 | 25.68 | 9.66 | 0.10 | 35.44 | 51.78 | -16.34 | Average | NEUTRAL |
| 4 | 0.25 | 33.73 | 9.66 | 0.10 | 43.49 | 61.78 | -18.29 | QP | NEUTRAL |
| 5 | 0.83 | 19.01 | 9.64 | 0.20 | 28.85 | 46.00 | -17.15 | Average | NEUTRAL |
| 6 | 0.83 | 24.28 | 9.64 | 0.20 | 34.12 | 56.00 | -21.88 | QP | NEUTRAL |

# 13. Antenna Requirements

## 13.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 13.2. Result

The antenna used for this product is Integrated antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 0dBi.

**END OF REPORT**