MOTOROLA SOLUTIONS

CERTIFICATE 2518.08

MS ISO/IEC 17025
TESTING
SAMM NO. 0825

**MOTOROLA PENANG ADV. COMM. LABORATORY**
**Motorola Solutions Malaysia Sdn. Bhd.**
**Plot 2A Medan Bayan Lepas,**
**Mukim 12, S.W.D. 11900 Bayan Lepas,**
**Penang, Malaysia.**

**FCC / ISED TEST REPORT**
**Report Revision : Rev.A**

| | | |
|---|---|---|
| **Date/s Tested** | : | 24-Nov-2021 - 09-Dec-2021 |
| **Report Issue Date** | : | 15-Dec-2021 |
| **Manufacturer/Location** | : | Motorola Solutions Malaysia Sdn Bhd<br>Plot 2A, Medan Bayan Lepas, Mukim 12 SWD,<br>11900 Bayan Lepas, Penang, Malaysia |
| **Requestor** | : | LIM POH CHIN |
| **Product Type** | : | Hand-held |
| **Product Version (PMN)** | : | APX 8000XE |
| **Model Number (HVIN)** | : | H91TGD9PW7AN (IC model: 8000XE3) |
| **Frequency Band** | : | 2.402 - 2.480 GHz |
| **Max RF Output Power** | : | 10 mWatts |
| **Applicant Name** | : | Motorola Solutions Inc |
| **Applicant Address** | : | 8000 West Sunrise Boulevard,<br>Fort Lauderdale, Florida 33322 |
| **FCC Registrations** | : | 461337 |
| **IC Registrations** | : | MY0001 |
| **Firmware Version (FVIN)** | : | L10212256 |

**The equipment was tested accordance to the requirement listed below:**

| | |
|---|---|
| **(2.4GHz BT)**<br>**FCC 47CFR Part 15C**<br>**ISED RSS 247 Issue 2** | **PASS** |



Prepared By:

**GAN BOON TEONG**
**Test Personnel**

Approved Signatory:

**VINCENT FOONG CHUEN KIT**
**Responsible Engineer**

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REVISION HISTORY

| Revision History | Description | Date | Originator |
|---|---|---|---|
| Rev. A | Initial Report | **15-Dec-2021** | **Gan Boon Teong** |

## 1.0. General Information

### EUT Description:

| | |
|---|---|
| **Technologies** | 2.4GHz BT |
| **TX Frequency range** | 2402MHz – 2480MHz |
| **Modulation Type** | GFSK, Pi/4 DQPSK,8DPSK |
| **Connector type** | PROGRAMMING, TEST & ALIGNMENT CABLE |
| **Antenna type** | INTERNAL BT/WLAN ANTENNA |

The EUT contains following accessory devices and data cable:

| Item | Brand | Model or P/N |
|---|---|---|
| BATT IMPRES 2 LIION R IP68 5100T | MOTOROLA | PMNN4494A |
| Programming, Test & Alignment Cable | MOTOROLA | PMKN4013C |
| ANTENNA, WHIP,ANTENNA, WHIP,700-800MHZ 762-870MHZ | MOTOROLA | PMAF4040A |

Channel number and frequency information:

79 channels are provided to this EUT:

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|---|---|---|
| 0 | 2402 | 20 | 2422 | 40 | 2442 | 60 | 2462 |
| 1 | 2403 | 21 | 2423 | 41 | 2443 | 61 | 2463 |
| 2 | 2404 | 22 | 2424 | 42 | 2444 | 62 | 2464 |
| 3 | 2405 | 23 | 2425 | 43 | 2445 | 63 | 2465 |
| 4 | 2406 | 24 | 2426 | 44 | 2446 | 64 | 2466 |
| 5 | 2407 | 25 | 2427 | 45 | 2447 | 65 | 2467 |
| 6 | 2408 | 26 | 2428 | 46 | 2448 | 66 | 2468 |
| 7 | 2409 | 27 | 2429 | 47 | 2449 | 67 | 2469 |
| 8 | 2410 | 28 | 2430 | 48 | 2450 | 68 | 2470 |
| 9 | 2411 | 29 | 2431 | 49 | 2451 | 69 | 2471 |
| 10 | 2412 | 30 | 2432 | 50 | 2452 | 70 | 2472 |
| 11 | 2413 | 31 | 2433 | 51 | 2453 | 71 | 2473 |
| 12 | 2414 | 32 | 2434 | 52 | 2454 | 72 | 2474 |
| 13 | 2415 | 33 | 2435 | 53 | 2455 | 73 | 2475 |
| 14 | 2416 | 34 | 2436 | 54 | 2456 | 74 | 2476 |
| 15 | 2417 | 35 | 2437 | 55 | 2457 | 75 | 2477 |
| 16 | 2418 | 36 | 2438 | 56 | 2458 | 76 | 2478 |
| 17 | 2419 | 37 | 2439 | 57 | 2459 | 77 | 2479 |
| 18 | 2420 | 38 | 2440 | 58 | 2460 | 78 | 2480 |
| 19 | 2421 | 39 | 2441 | 59 | 2461 | | |

**General Description of Applied Standards**

The EUT is a RF Product. According to the specifications of the manufacturer, the EUT is to comply with the requirements of the following standards:

**FCC 47 CFR Part 15 Subpart C**
**KDB 558074 D01 15.247 Meas Guidance v05**
**ANSI C63.10-2013**

**Deviation from standard**

Not applicable as no deviation from standard test method

**Modifications to EUT**

For RF conducted measurements a pigtail was soldered out of the board while for radiated measurements there were no modifications to the device

**Test configuration of EUT**

All relevant configurations involving radio models and accessories (including chargers, batteries, antennas) were assessed. Only worst case configurations will be included in this report.

## 2.0. Summary of Test Results

| FCC Clause | ISED Clause | Test Item | Result | Remark | Serial number tested | Tested by |
|---|---|---|---|---|---|---|
| 15.247 (b)(1) | RSS-247 5.4(b) | Conducted RF Output Power (Peak) | Pass | Highest output power: 9.376 dBm (8.66 mW) | 579TXV0069 | Gan |
| 15.247 (a)(1) | RSS-247 5.1(a) RSS-247 5.1(b) | (1) 20dB Channel Bandwidth (2) Channel Separation | Pass | GFSK – 0.858 MHz 858KF1D Pi/4 DQPSK – 1.145 MHz 1M15G1D 8DPSK – 1.188 MHz 1M19G1D | 579TXV0069 | Gan |
| 15.247(a)(1)(iii) | RSS-247 5.1(d) | Number of hopping Frequency used | Pass | Meet the limit requirement. | 579TXV0069 | Gan |
| 15.247(a)(1)(iii) | RSS-247 5.1(d) | Dwell time on each channel | Pass | Meet the limit requirement. | 579TXV0069 | Gan |
| 15.247 (d) | RSS-247 5.5 | Band Edge Conducted Spurious Emission | Pass | Worst case emission: -49.45 dB | 579TXV0069 | Gan |
| 15.247 (d) | RSS-247 5.5 | Conducted Spurious Emission | Pass | Worst case emission: -45.03 dBm | 579TXV0069 | Gan |
| 15.205, 15.209, 15.247 (d) | RSS-247 5.5 | Radiated Emission within Restricted Bands | Pass | Worst case emission: RSE: 61.1031 dBuV/m, Margin 12.9 dB, Noise Floor. RBE: 45.4336 dBuV/m, Margin, 8.5664 dB. | 579TXV0057 | Qawiman & Nazrin |
| 15.207 | RSS-Gen 8.8 | AC Powerline Conducted Emission | NA | Testing is not required, radio shall turn off during charging mode | NA | NA |
| 15.203 | - | Antenna Requirement | NA | Internal antenna is not accessible to the end-user | NA | NA |

## 3.0. Measurement Uncertainty

| Measurement | Frequency | Expended Uncertainty (k=1.96) (±) |
|---|---|---|
| Radiated Emissions up to 1 GHz (Field Strength) | 30MHz ~ 1000MHz | 5.88 dB |
| Radiated Emissions above 1 GHz (Field Strength) | 1GHz ~ 18GHz | 5.84 dB |
| | 18GHz ~ 40GHz | 6.02 dB |
| Conducted Spurious Emissions | 9kHz ~ 12.75GHz | 2.82 dB |

## 4.0. Equipment List

### Bluetooth ATE # 1 (SW Version: Ate Main_3.1.11)

| Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| POWER SUPPLY | 6652A | 3640A02941 | 22-Jan-21 | 22-Jan-22 |
| ANALYZER SPECTRUM | E4440A | US45303111 | 14-Jul-21 | 14-Jul-22 |
| CHAMBER | SH-641 | 92003820 | 14-Jul-21 | 14-Jul-22 |
| N to N RF Cable # 1 | SF126/11N/11N | NA | NA | NA |

### Radiated Emission Station (SW Version: EMC FCC RE v1.6.2)

| Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| DRG HORN FREQ. | SAS-571 | 720 | 06-Apr-21 | 06-Apr-23 |
| DRG HORN FREQ. | SAS-571 | 719 | 13-Sep-21 | 13-Sep-22 |
| POWER SUPPLY | N7976A | MY53410110 | 24-May-21 | 24-May-22 |
| SIGNAL GENERATOR | SMB 100A | 182511 | 4-Jun-21 | 4-Jun-24 |
| EMI TEST RECEIVER | ESW44 | 101750 | 15-Jan-21 | 15-Jan-22 |
| EMI TEST RECEIVER | ESIB26 | 827769/009 | 11-Mar-21 | 11-Mar-22 |
| 5m SEMI-ANECHOIC CHAMBER | S800-HX | J2308 | Not Required | Not Required |
| BILOG ANTENNA | CBL6112D | 55546 | 06-Jun-21 | 06-Jun-22 |
| BILOG ANTENNA | CBL6112B | 2964 | 4-May-21 | 4-May-22 |
| HYGRO-THERMOMETER | SDL500 | A.016800 | 18-May-21 | 18-May-22 |
| SYSTEM CONTROLLER | SC104V | 050806-1 | Not Required | Not Required |
| TURNTABLE FLUSH MOUNT 2M | FM2011 | NA | Not Required | Not Required |
| ANTENNA POSITIONING TOWER | TLT2 | NA | Not Required | Not Required |
| BROAD-BAND HORN ANTENNA | BBHA9170 | BBHA9170255 | 4-Feb-21 | 4-Feb-22 |
| PREAMPLIFIER 18-40GHz | BBV9721 | 9721-007 | Not Required | Not Required |
| PREAMPLIFIER | PAM-0118P | 361 | 11-Sep-20 | 11-Sep-23 |
| LOOP ANTENNA | 6502 | 00203479 | 5-Feb-21 | 5-Feb-22 |

## 4.1. Test Mode Applicability and Test Channel Detail

**Radiated Emission Test (Above 1GHz)**

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Environmental Conditions |
|---|---|---|---|---|---|
| Test Mode | 0 to 78 | 0,39,78 | FHSS | GFSK, Pi/4 DQPSK,8DPSK | 23.2°C, 70.3%RH |

**Radiated Emission Test (Below 1GHz)**

☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Environmental Conditions |
|---|---|---|---|---|---|
| Test Mode | 0 to 78 | 0,39,78 | FHSS | GFSK, Pi/4 DQPSK,8DPSK | 23.2°C, 70.3%RH |

**Power Line Conducted Emission Test**

☐Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☐Following channel(s) was (were) selected for the final test as listed below.

| NAEUT Configure Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Environmental Conditions |
|---|---|---|---|---|---|
| Application Mode | 0 to 78 | AUTO | FHSS | AUTO | NA |

**Antenna Port Conducted Measurement:**

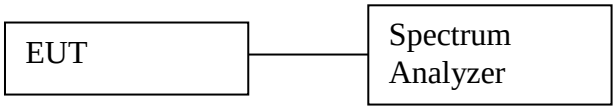
☒This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
☒Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
☒Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Environmental Conditions |
|---|---|---|---|---|---|
| Test Mode | 0 to 78 | 0,39,78 | FHSS | GFSK, Pi/4 DQPSK,8DPSK | 25°C, 54.8%RH |

## 5.0. Transmitter Test Parameters

## 5.1. Conducted RF Output Power (Peak)

### 5.1.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = > 20 dB bandwidth
   b. VBW = RBW
   c. Detector mode = Peak
   d. AMPLITUDE → Scale/Div = 10 dB
   e. Trace = Max hold
   f. Sweep = auto
e) Measure the captured power within the band and recording the plot.
f) Repeat above procedure with other different mode of operation.

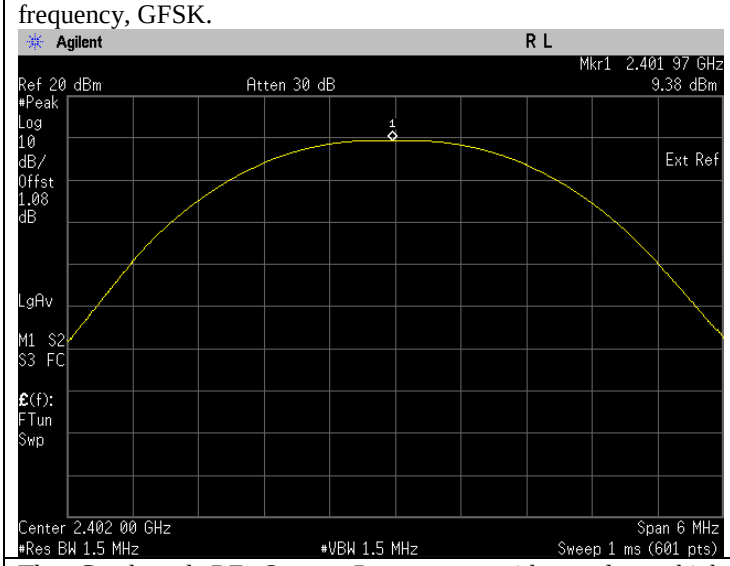
### 5.1.2. Test Limits:

| **Normal Condition (25 ° C)** |
|---|
| **≤ 125mW ( or 20.9dBm)** |

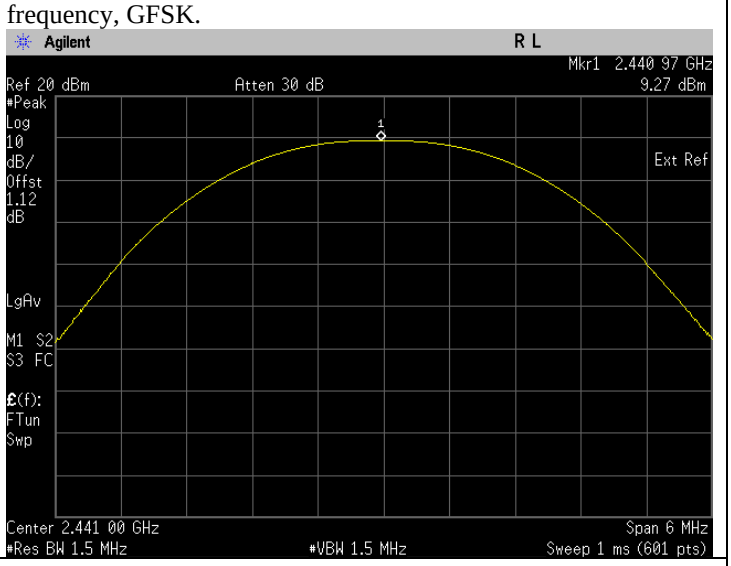
### 5.1.3. Test Data:

| Test Conditions | | Test Frequency (GHz) | Results | |
|---|---|---|---|---|
| Modulation | Voltage(V) | | dBm | Status |
| GFSK | 7.50 | 2.4020 | 9.376 | Pass |
| | | 2.4410 | 9.268 | Pass |
| | | 2.4800 | 9.053 | Pass |
| Pi/4DQPSK | 7.50 | 2.4020 | 7.077 | Pass |
| | | 2.4410 | 7.020 | Pass |
| | | 2.4800 | 6.848 | Pass |
| 8DPSK | 7.50 | 2.4020 | 7.393 | Pass |
| | | 2.4410 | 7.335 | Pass |
| | | 2.4800 | 7.121 | Pass |

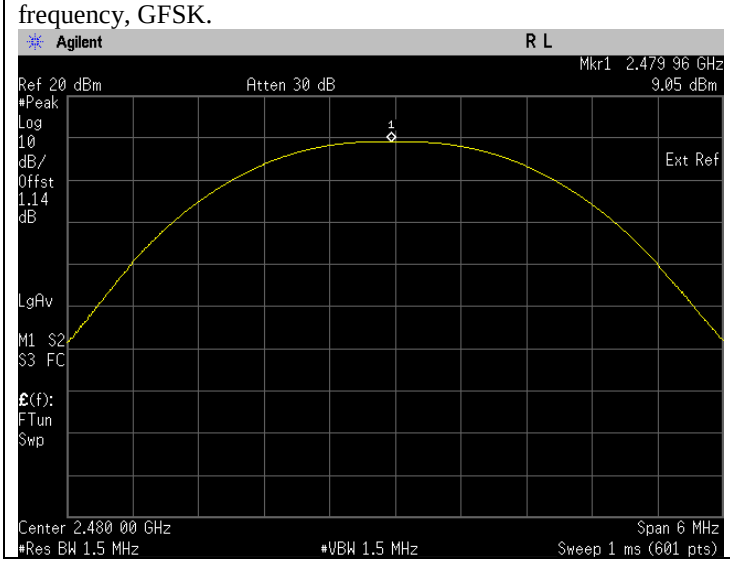
The Conducted RF Output Power test with result at low frequency, GFSK.



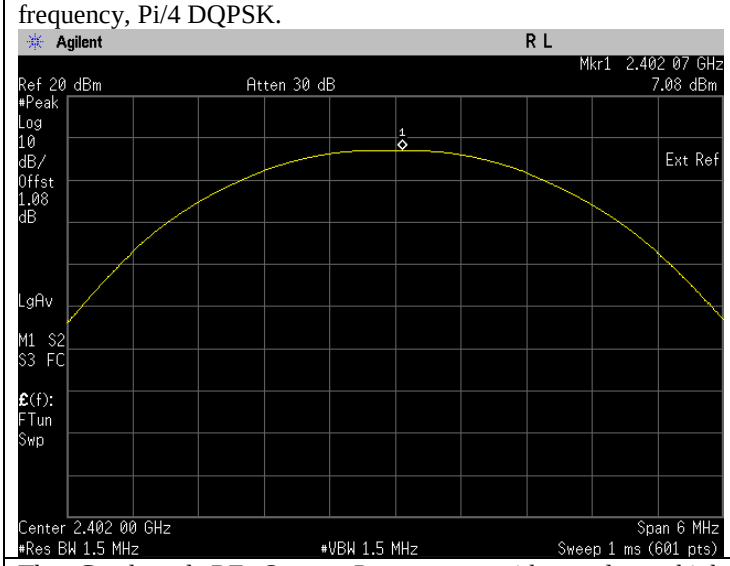

The Conducted RF Output Power test with result at mid frequency, GFSK.



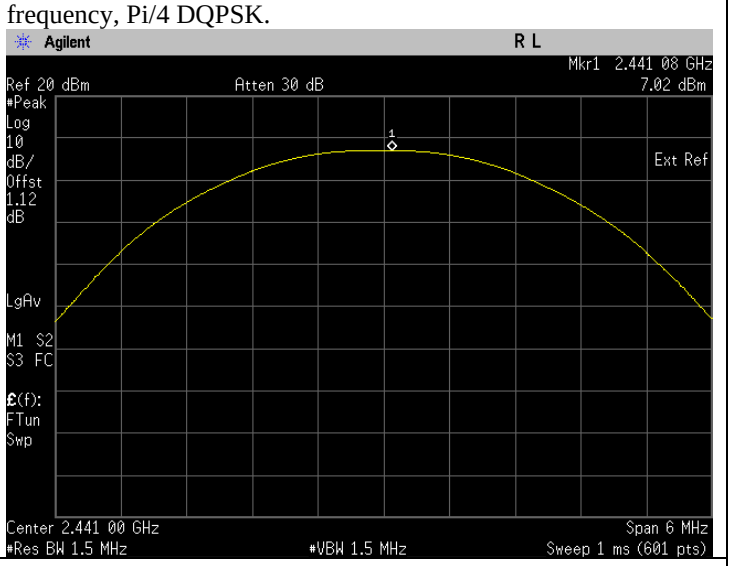

The Conducted RF Output Power test with result at high frequency, GFSK.



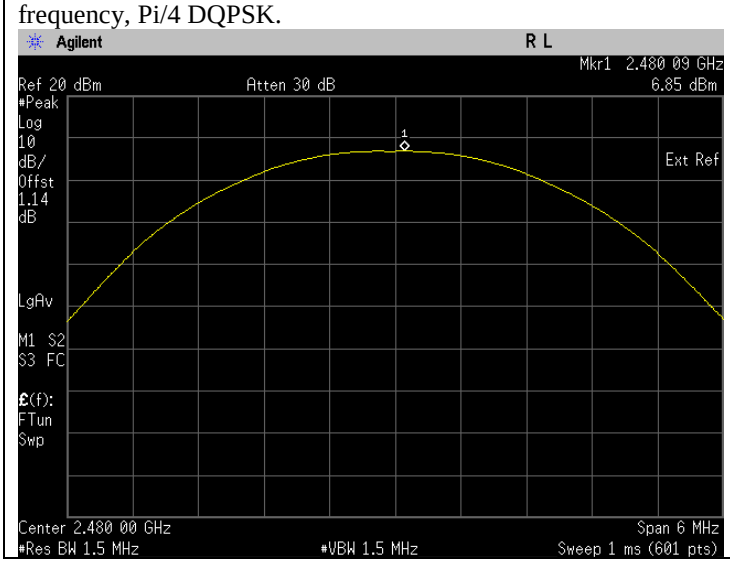
The Conducted RF Output Power test with result at low frequency, Pi/4 DQPSK.



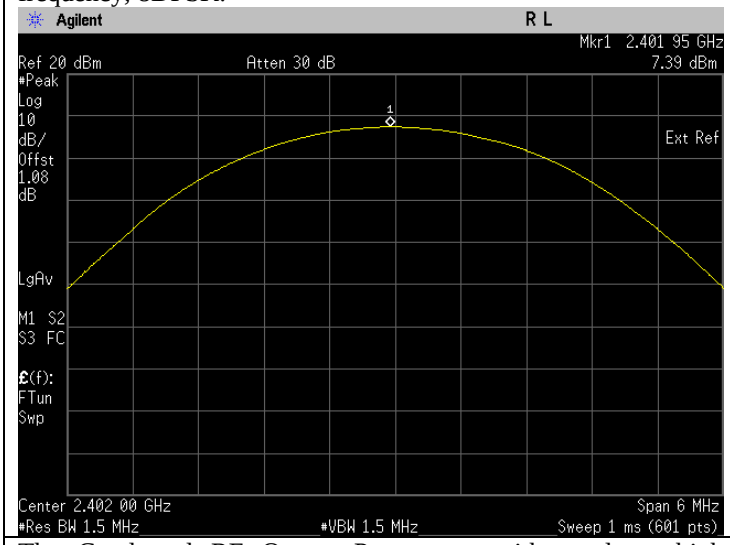

The Conducted RF Output Power test with result at mid frequency, Pi/4 DQPSK.



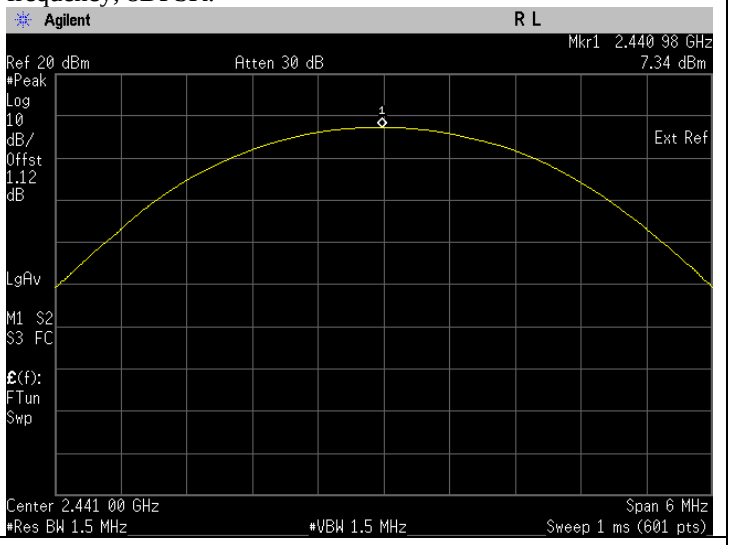

The Conducted RF Output Power test with result at high frequency, Pi/4 DQPSK.



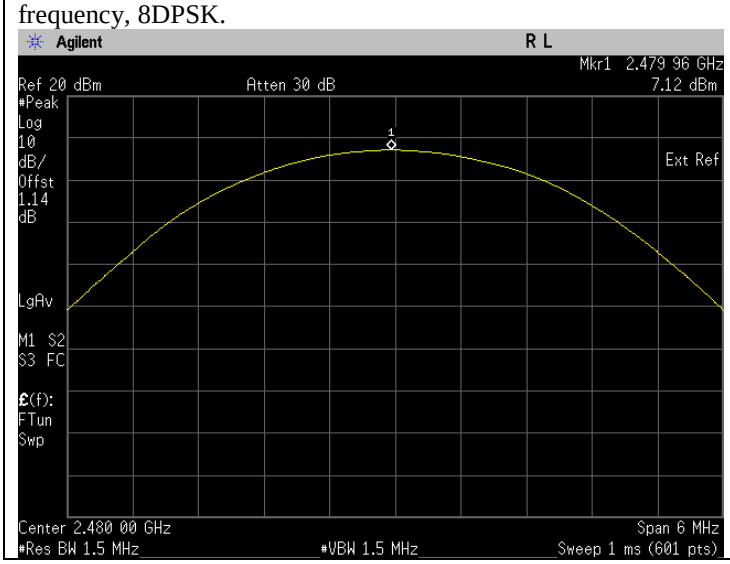
The Conducted RF Output Power test with result at low frequency, 8DPSK.




The Conducted RF Output Power test with result at mid frequency, 8DPSK.

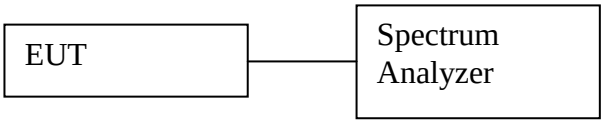



The Conducted RF Output Power test with result at high frequency, 8DPSK.



## 5.2. 20dB Channel Bandwidth

### 5.2.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = 30 kHz
   b. VBW = 100 kHz
   c. SPAN = 3 MHz, center on test frequency
   d. AMPLITUDE → Scale/Div = 10 dB
   e. Detector mode = Peak
   f. Trace = Max hold
   g. Sweep = auto
e) Measure the freq different of two frequencies that were attenuated 20dB from peak of the emission & record the frequency difference as the emission bandwidth.
f) Save the plot result from spectrum analyzer screen.
g) Repeat above procedure with other different mode of operation.

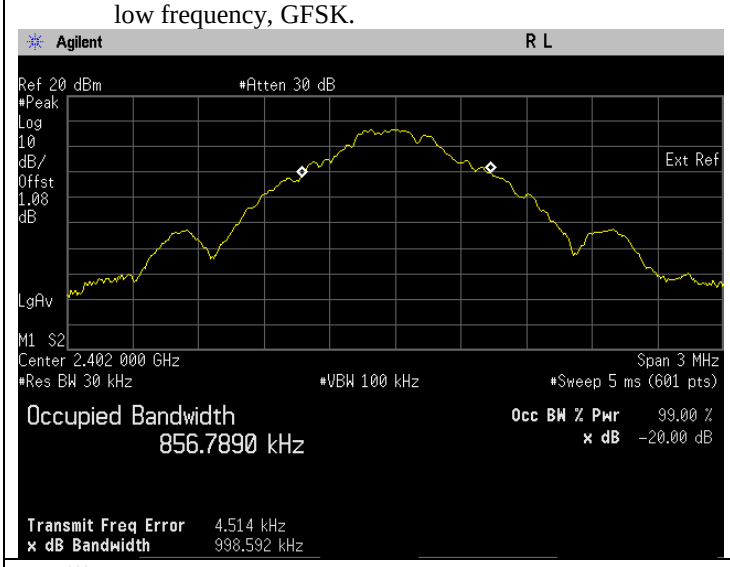
### 5.2.2. Test Limits:

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.

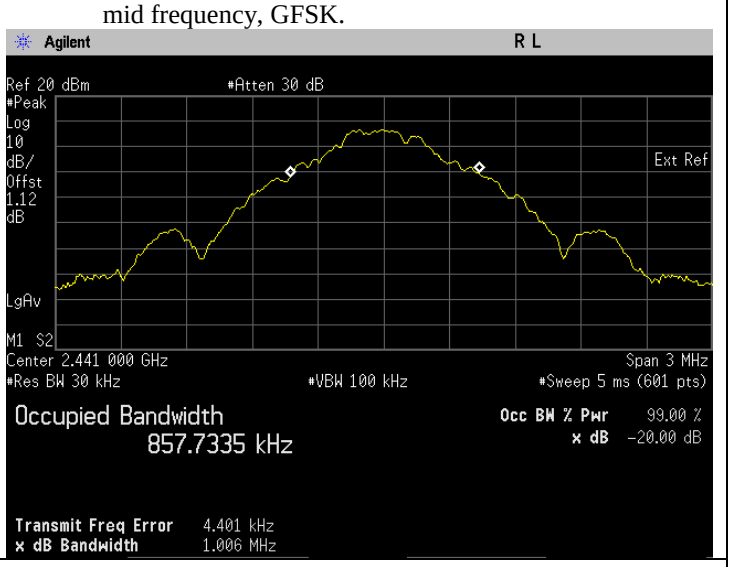
### 5.2.3. est Data:

| Test Conditions | | Test Frequency TX (GHz) | Results (MHz) | | |
|---|---|---|---|---|---|
| Modulation Type | Voltage(V) | | 20dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) | Status |
| GFSK | 7.50 | 2.4020 | 0.999 | 0.857 | Pass |
| | | 2.4410 | 1.006 | 0.858 | Pass |
| | | 2.4800 | 1.003 | 0.858 | Pass |
| Pi/4 DQPSK | 7.50 | 2.4020 | 1.278 | 1.144 | Pass |
| | | 2.4410 | 1.278 | 1.144 | Pass |
| | | 2.4800 | 1.278 | 1.145 | Pass |
| 8DPSK | 7.50 | 2.4020 | 1.269 | 1.188 | Pass |
| | | 2.4410 | 1.269 | 1.188 | Pass |
| | | 2.4800 | 1.269 | 1.188 | Pass |

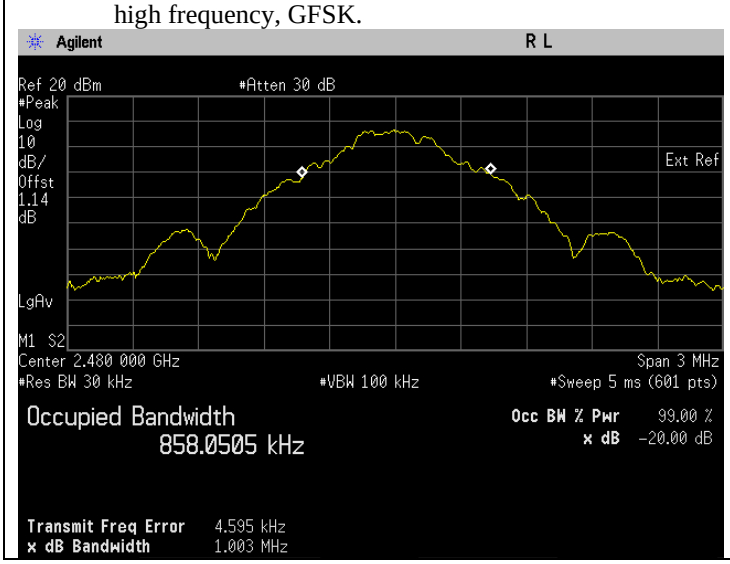
i. The 20 dB BW & occupied bandwidth test with result at low frequency, GFSK.



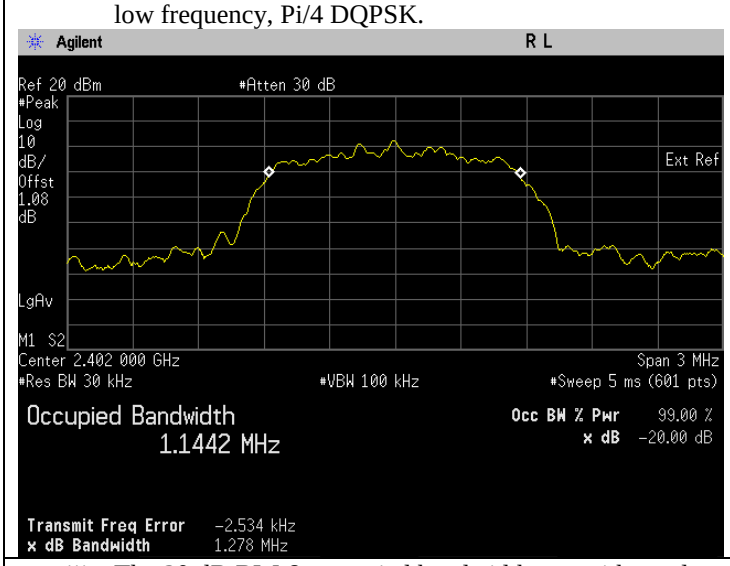

ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, GFSK.



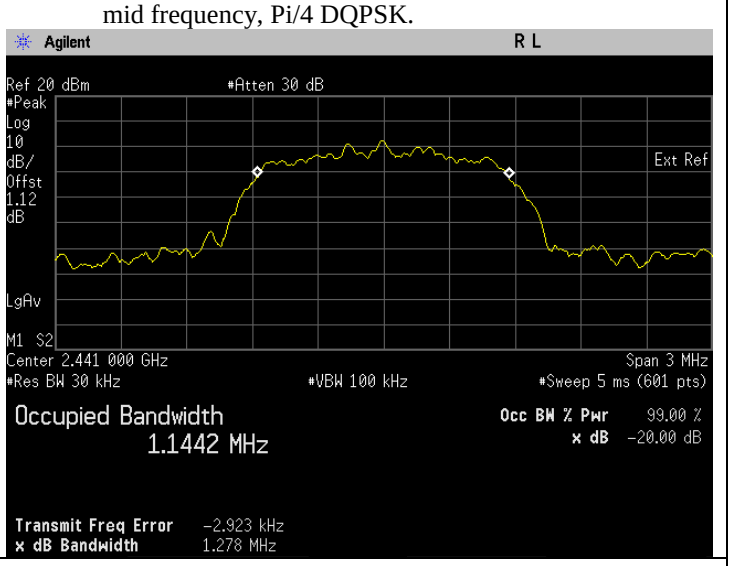

iii. The 20 dB BW & occupied bandwidth test with result at high frequency, GFSK.



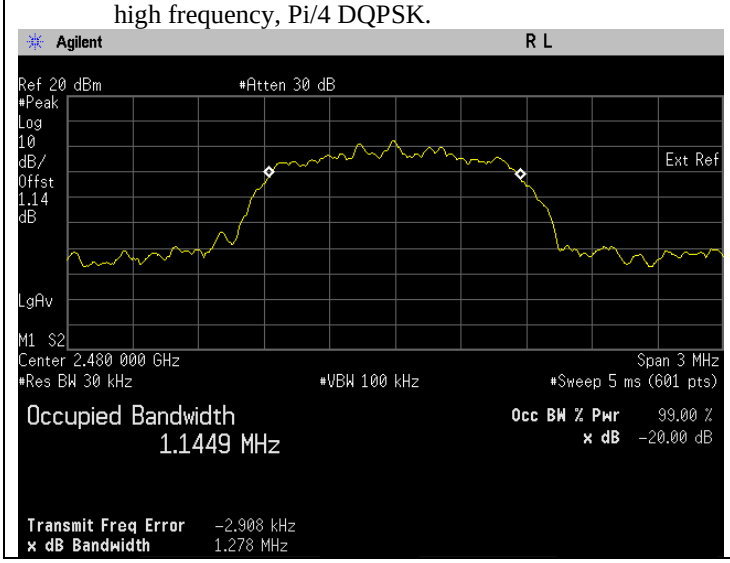
i. The 20 dB BW & occupied bandwidth test with result at low frequency, Pi/4 DQPSK.



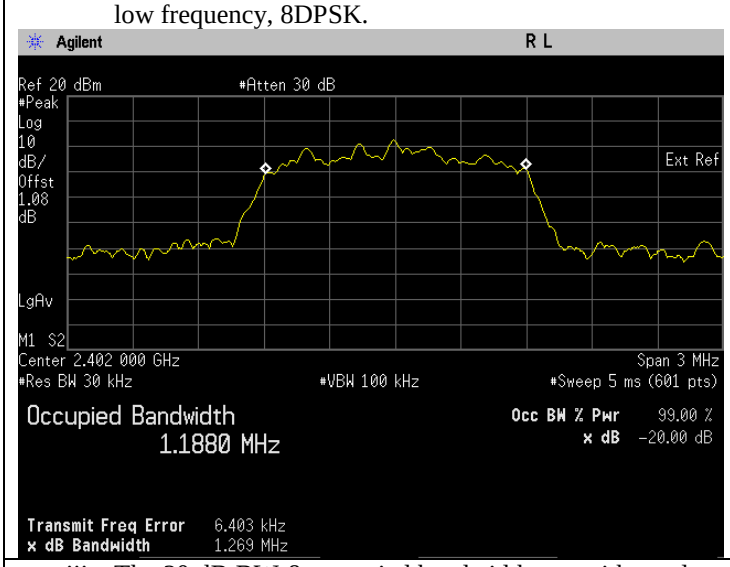

ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, Pi/4 DQPSK.



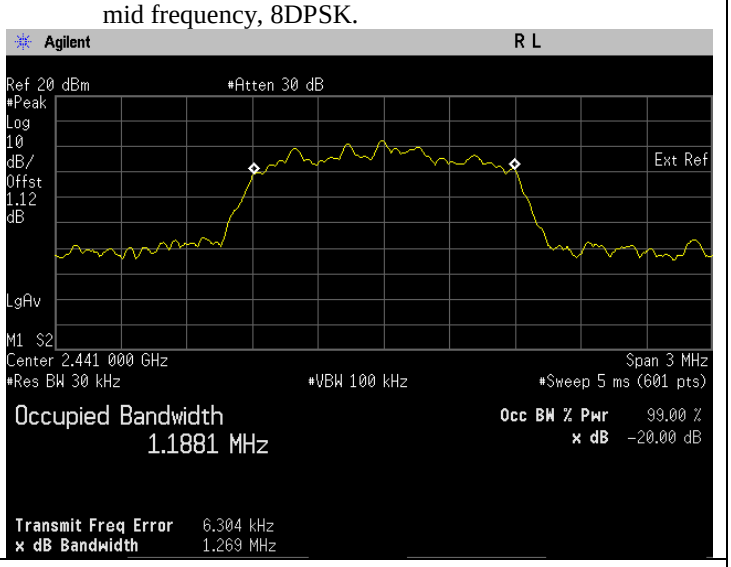

iii. The 20 dB BW & occupied bandwidth test with result at high frequency, Pi/4 DQPSK.



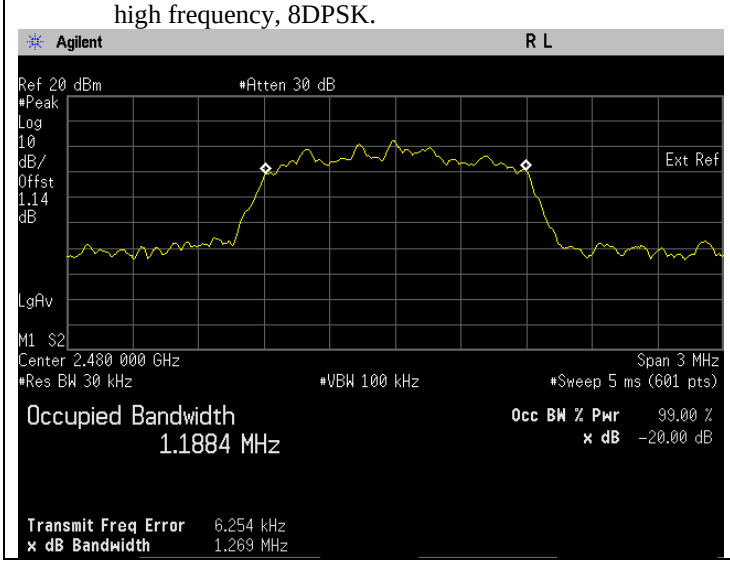
i. The 20 dB BW & occupied bandwidth test with result at low frequency, 8DPSK.




ii. The 20 dB BW & occupied bandwidth test with result at mid frequency, 8DPSK.

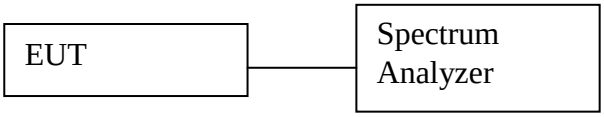



iii. The 20 dB BW & occupied bandwidth test with result at high frequency, 8DPSK.



## 5.3. Band-edge Conducted Spurious Emission

### 5.3.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and keep the EUT in hopping mode.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = 100 kHz
   b. VBW = 300 kHz
   c. SPAN = 4 MHz (Low channel) or 6MHz(High Channel)
   d. Detector mode = Peak
   e. AMPLITUDE → Scale/Div = 10 dB
   f. Trace = Max hold
   g. Sweep = auto
e) Measure the captured band edge emission result and recording the plot.
f) Repeat above on EUT with hopping disable.
g) Repeat above procedure with other different test frequency.

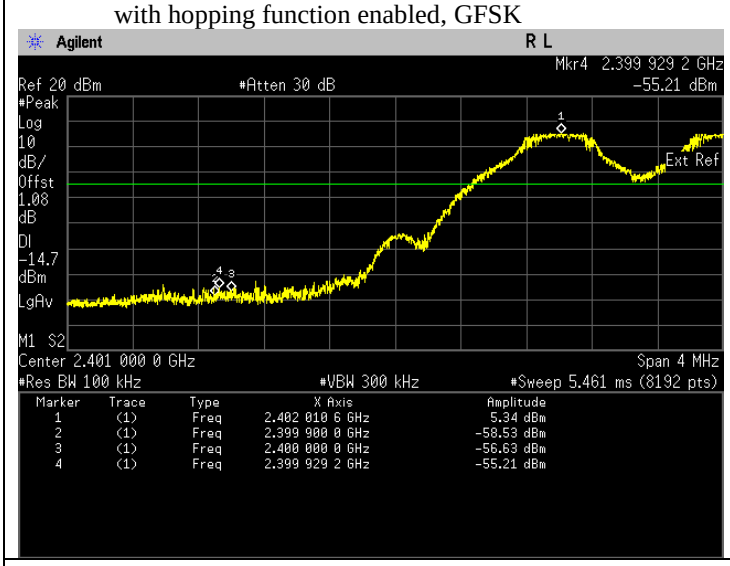
### 5.3.2. Test Limits

| **Normal Condition (25 º C)** |
|---|
| **Shall be at least 20 dB below the peak power.** |

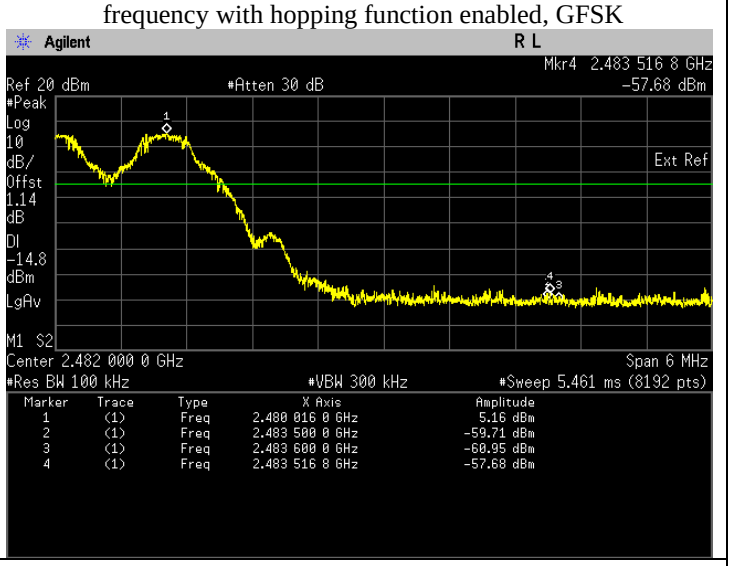
### 5.3.3. Test Result

| Test Conditions | | Hopping Method | Test Frequency(GHz) | Results | |
|---|---|---|---|---|---|
| Modulation | Voltage(V) | | | dB | Status |
| GFSK | 7.50 | Enabled (continuously) | 2.4020 | -55.20 | Pass |
| | | | 2.4800 | -57.68 | Pass |
| | | Disabled (constantly) | 2.4020 | -51.25 | Pass |
| | | | 2.4800 | -56.36 | Pass |
| Pi/4 DQPSK | 7.50 | Enabled (continuously) | 2.4020 | -52.59 | Pass |
| | | | 2.4800 | -58.89 | Pass |
| | | Disabled (constantly) | 2.4020 | -50.83 | Pass |
| | | | 2.4800 | -57.33 | Pass |
| 8DPSK | 7.50 | Enabled (continuously) | 2.4020 | -50.97 | Pass |
| | | | 2.4800 | -59.49 | Pass |
| | | Disabled (constantly) | 2.4020 | -49.45 | Pass |
| | | | 2.4800 | -56.36 | Pass |

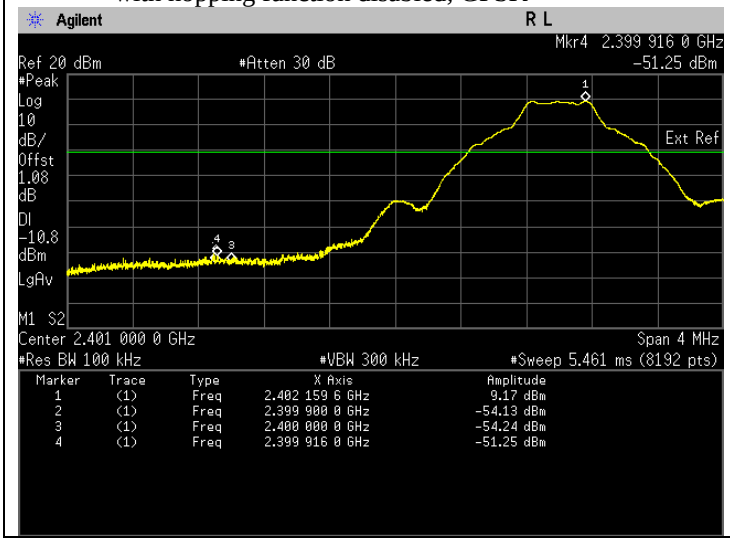
i. The highest band edge emission at low carrier frequency with hopping function enabled, GFSK



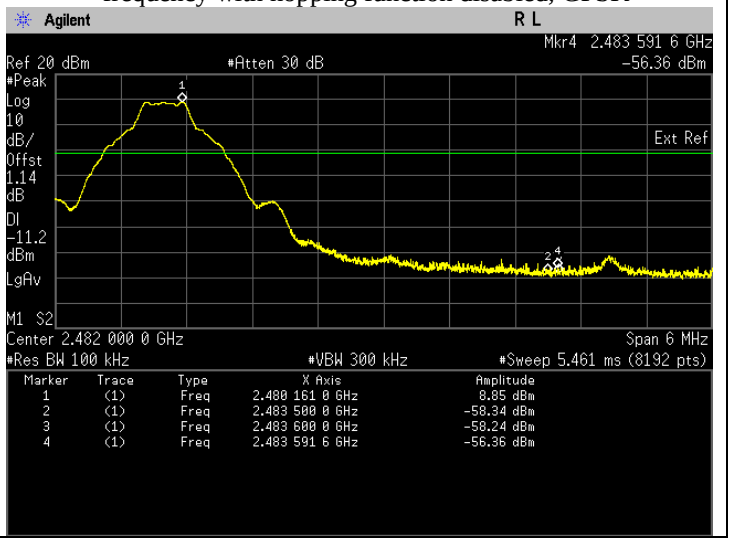

ii. The highest band edge emission at high carrier frequency with hopping function enabled, GFSK



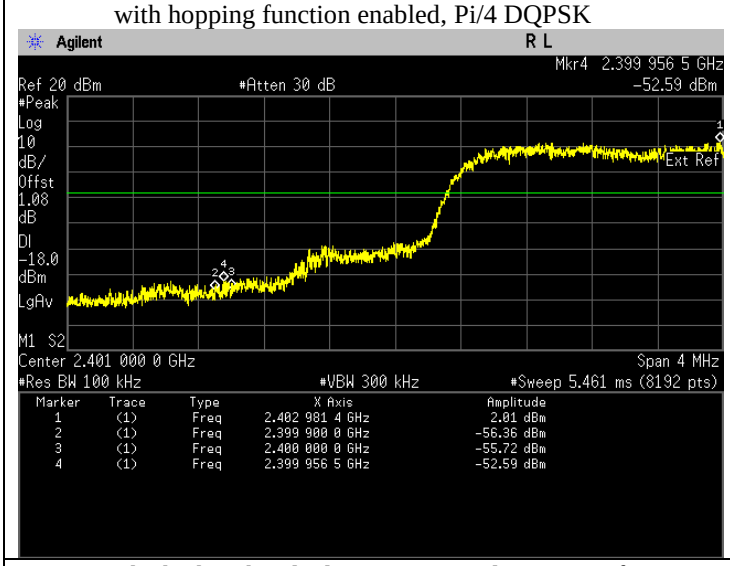

iii. The highest band edge emission at low carrier frequency with hopping function disabled, GFSK



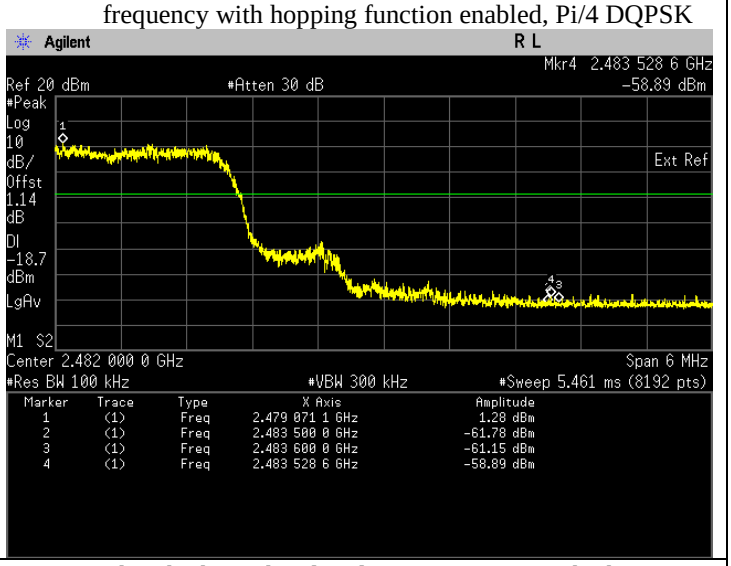

iv. The highest band edge emission at high carrier frequency with hopping function disabled, GFSK



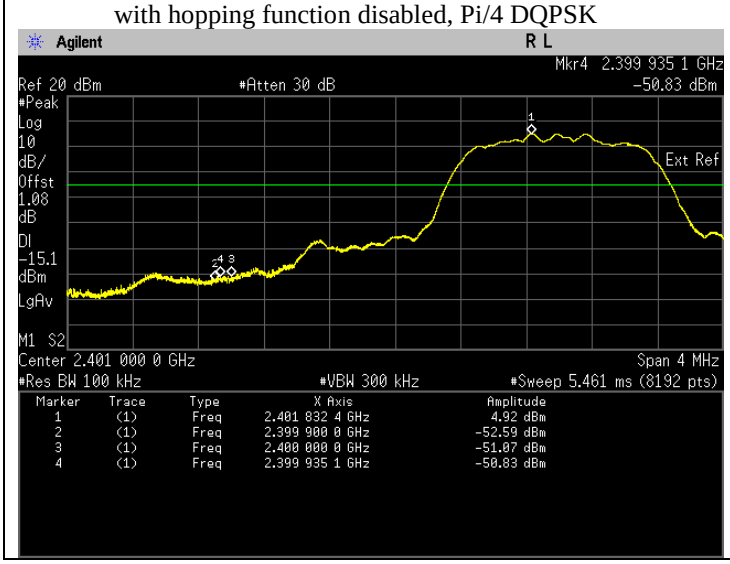
i. The highest band edge emission at low carrier frequency with hopping function enabled, Pi/4 DQPSK



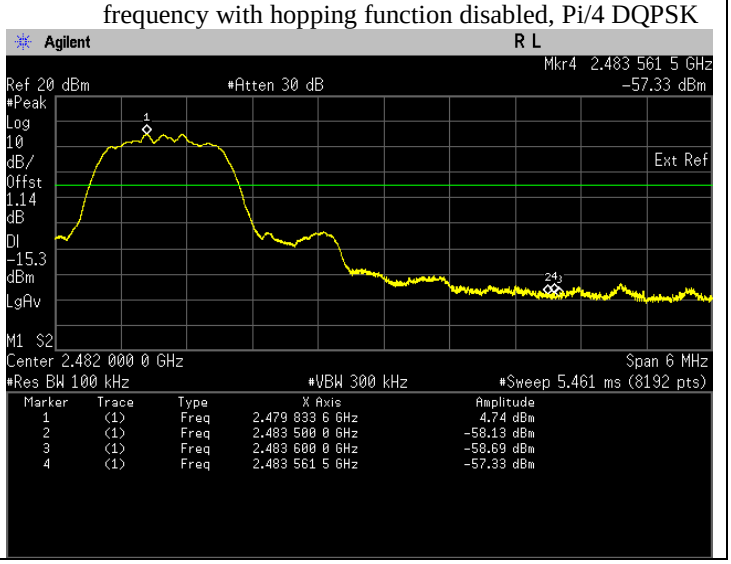

ii. The highest band edge emission at high carrier frequency with hopping function enabled, Pi/4 DQPSK



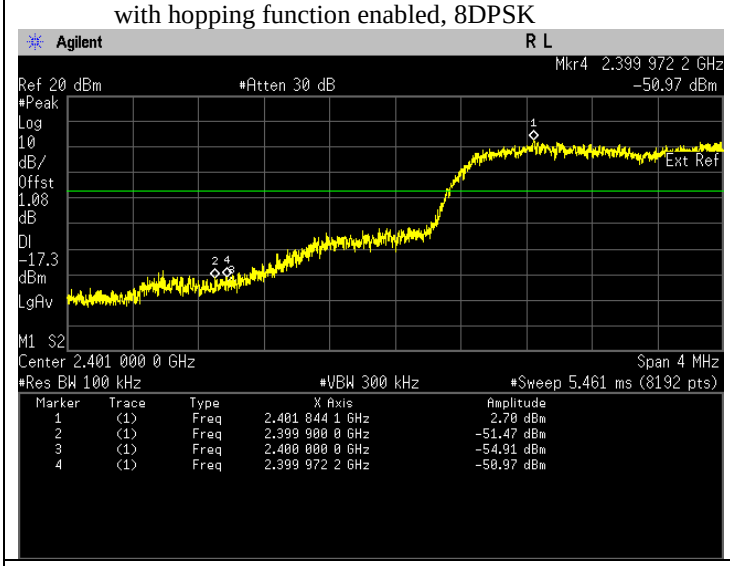

iii. The highest band edge emission at low carrier frequency with hopping function disabled, Pi/4 DQPSK



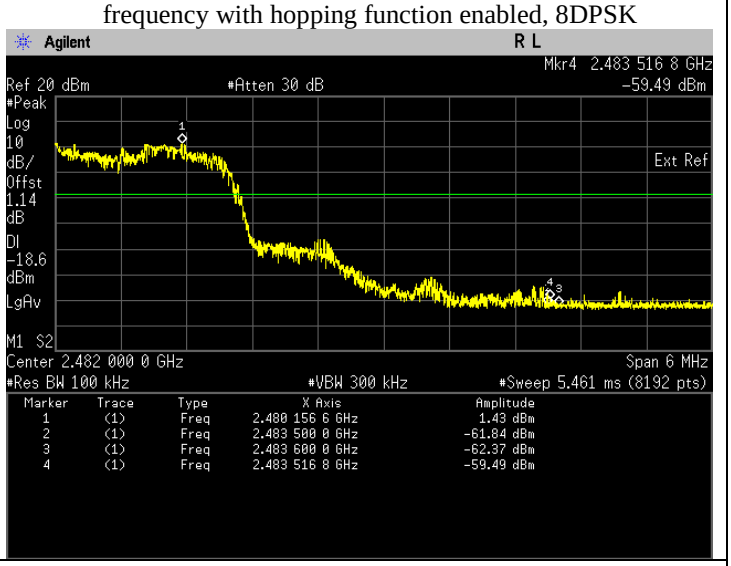

iv. The highest band edge emission at high carrier frequency with hopping function disabled, Pi/4 DQPSK



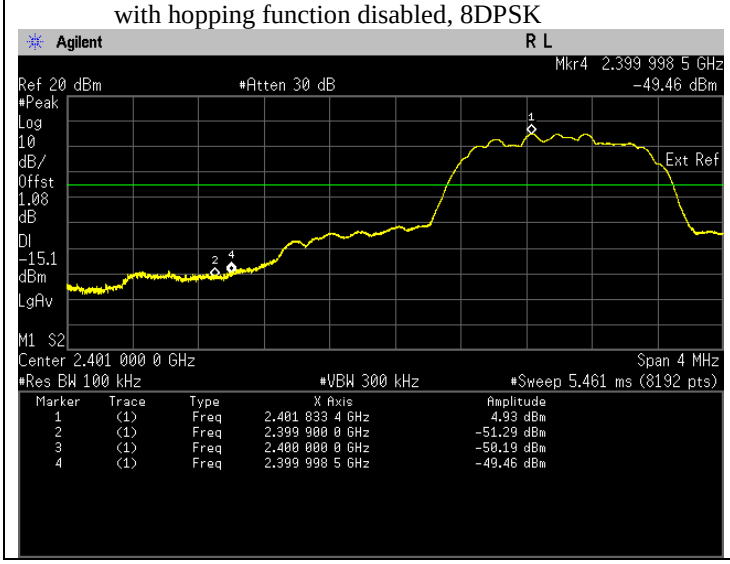
i. The highest band edge emission at low carrier frequency with hopping function enabled, 8DPSK



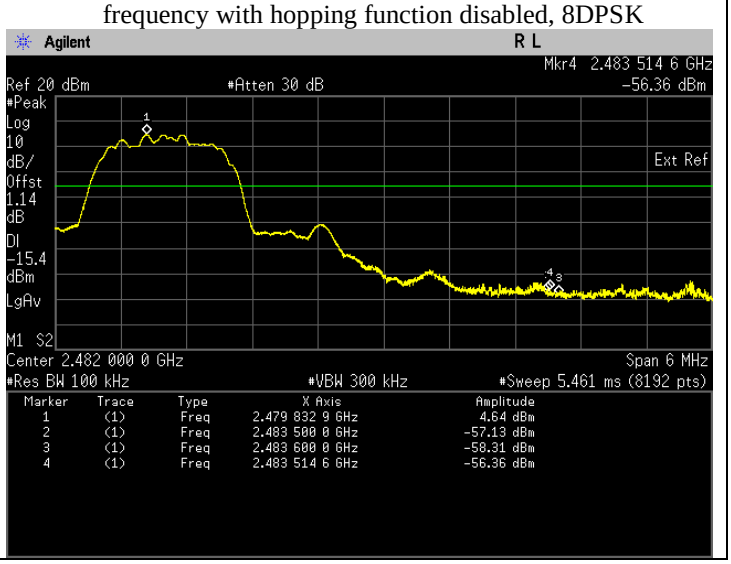

ii. The highest band edge emission at high carrier frequency with hopping function enabled, 8DPSK




iii. The highest band edge emission at low carrier frequency with hopping function disabled, 8DPSK

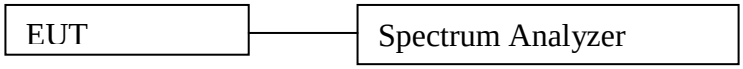



iv. The highest band edge emission at high carrier frequency with hopping function disabled, 8DPSK



## 5.4. Dwell time on each channel

### 5.4.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and keep the EUT in hopping mode.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
    a. RBW = 100 kHz
    b. VBW = 300 kHz
    c. SPAN = Zero SPAN, center on hopping frequency
    d. Detector mode = Peak
    e. Trace = Max hold
    f. Sweep time = 5second
    g. Sweep = Single
e) Measure total numbers of transmissions occur in 5 second and save the plot.
f) Change the setting of spectrum analyzer :
    a. RBW = 100 kHz
    b. VBW = 300 kHz
    c. Sweep time = sufficient to capture dwell time for 1 transmission
    d. Sweep = Single
g) Measure dwell time for 1 transmission and save the plot.
h) Calculate accumulate dwell time in a given period equal to number of hopping frequencies x 0.4
i) Repeat above procedure with other different mode of operation.

### 5.4.2. Test Limits:

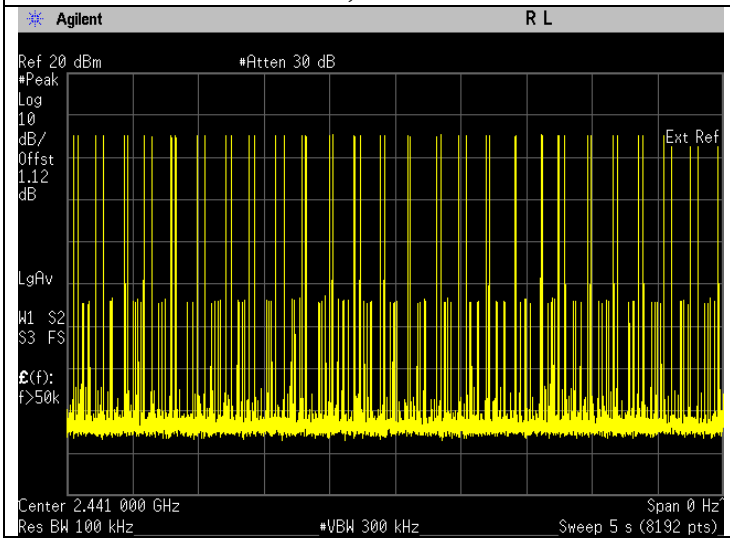
| Normal Condition (25 ° C) |
|---|
| **≤ 400ms** |

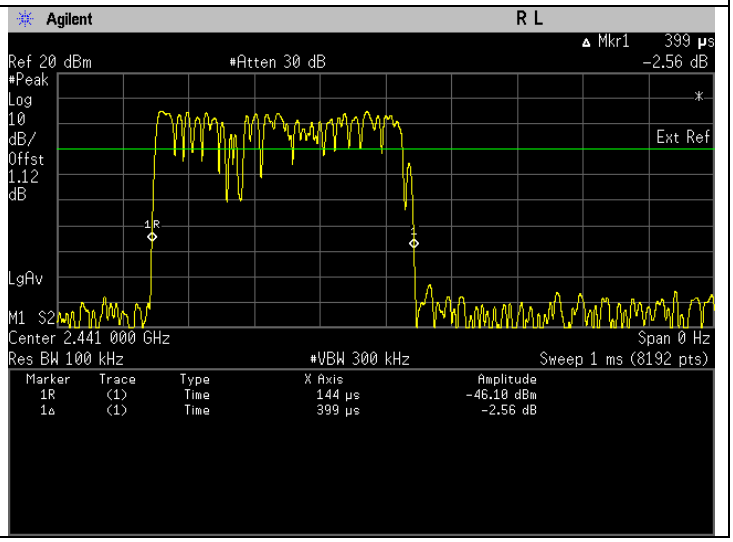
### 5.4.3. Test Result

| Test Conditions | | | Data Package | Results | | | |
|---|---|---|---|---|---|---|---|
| Modulation | Voltage (V) | Test Frequency (GHz) | | No. of transmission in 5s **(a)** | Dwell time in one transmission **(b) (msec)** | Total accumulate dwell time in 31.6s. **(c ) (msec)** | Status |
| GFSK | 7.50 | 2.4410 | DH1 | 52 | 0.399 | 131.127360 | Pass |
| | | | DH3 | 24 | 1.654 | 250.878720 | Pass |
| | | | DH5 | 17 | 2.902 | 311.790880 | Pass |
| Pi/4 DQPSK | 7.50 | | DH1 | 51 | 0.401 | 129.250320 | Pass |
| | | | DH3 | 25 | 1.653 | 261.174000 | Pass |
| | | | DH5 | 18 | 2.902 | 330.131520 | Pass |
| 8 DPSK | 7.50 | | DH1 | 51 | 0.401 | 129.250320 | Pass |
| | | | DH3 | 27 | 1.652 | 281.897280 | Pass |
| | | | DH5 | 14 | 2.902 | 256.768960 | Pass |

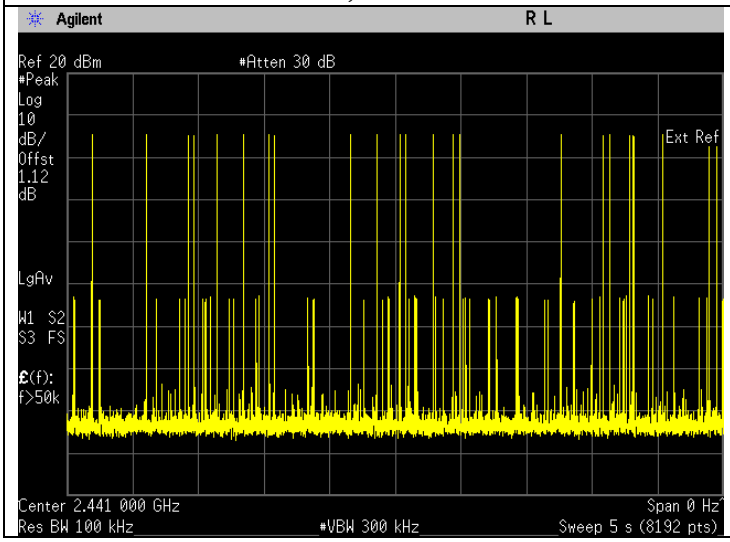
****Note:** Total dwell time 31.6s (79Hopping*0.4), (c ) = (a) x 6.32 x (b)

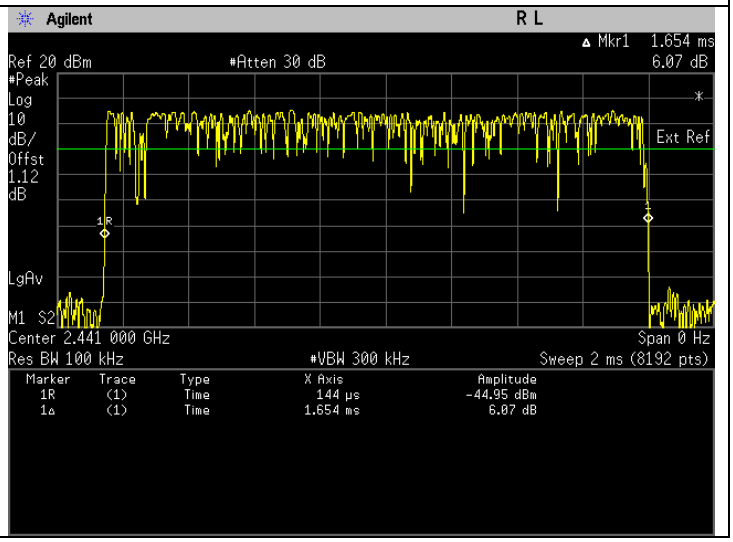
i. Dwell Time at DH1, GFSK



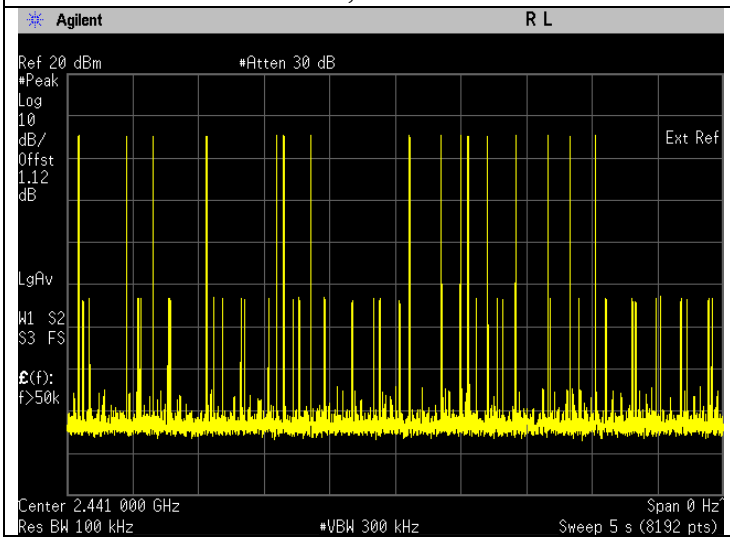



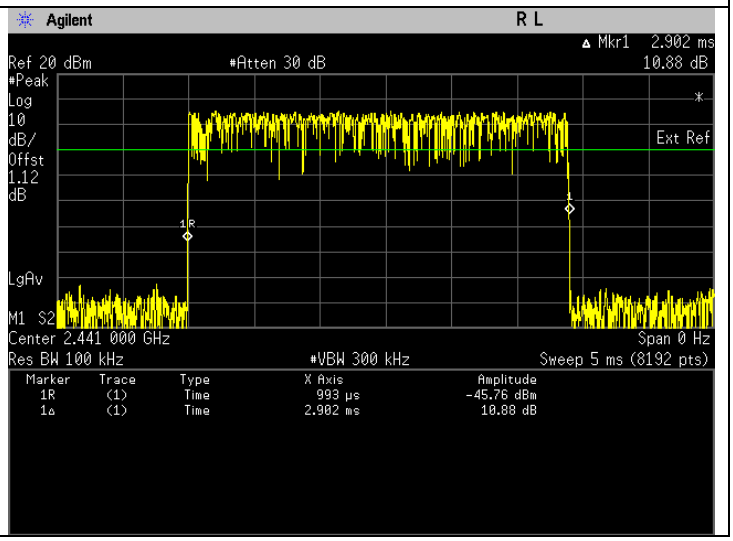

ii. Dwell Time at DH3, GFSK



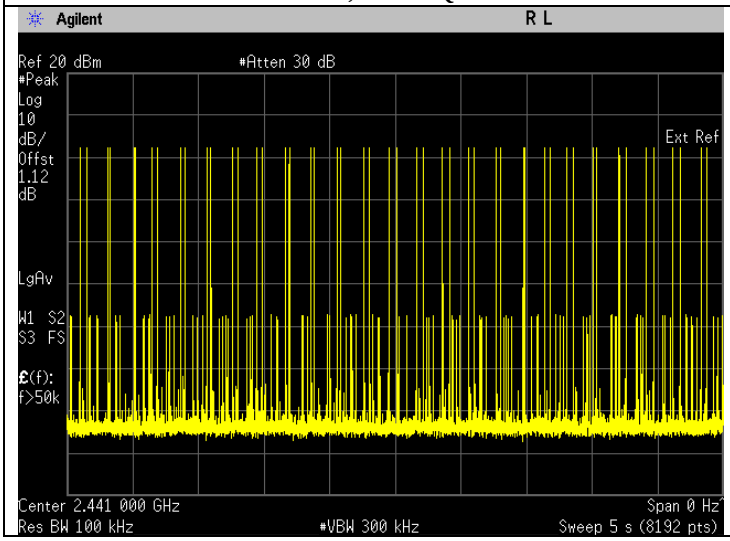



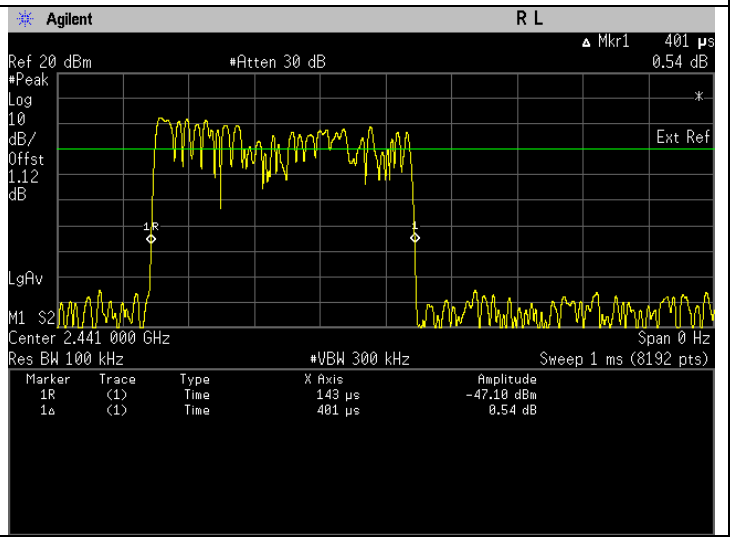
iii. Dwell Time at DH5, GFSK



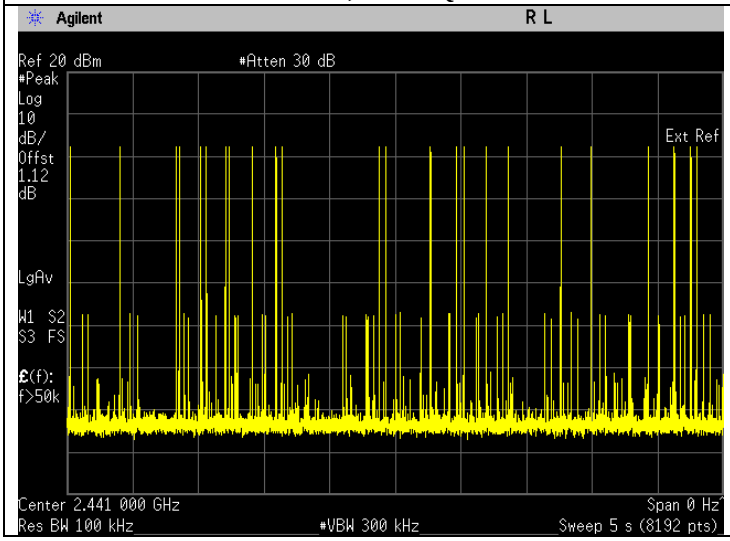



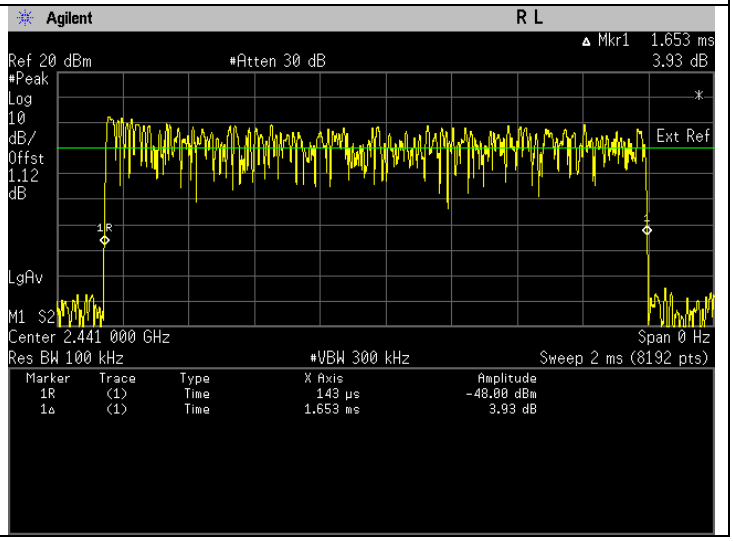

iv. Dwell Time at DH1, PI/4DQPSK



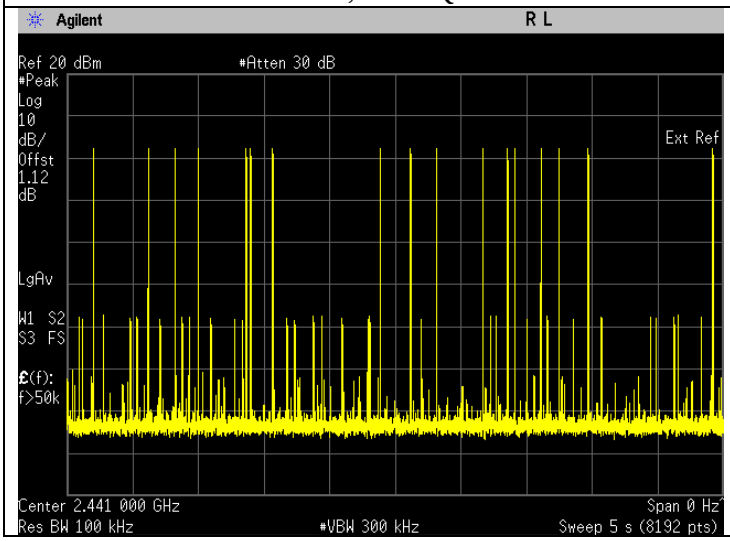



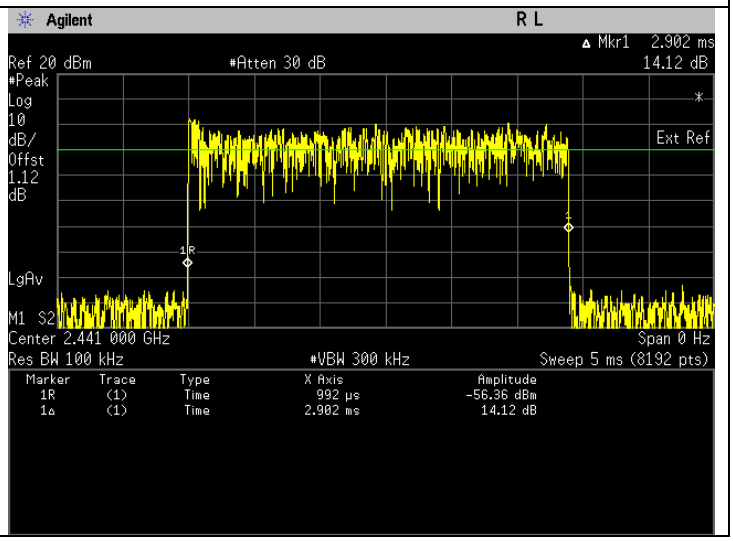

v. Dwell Time at DH3, PI/4DQPSK



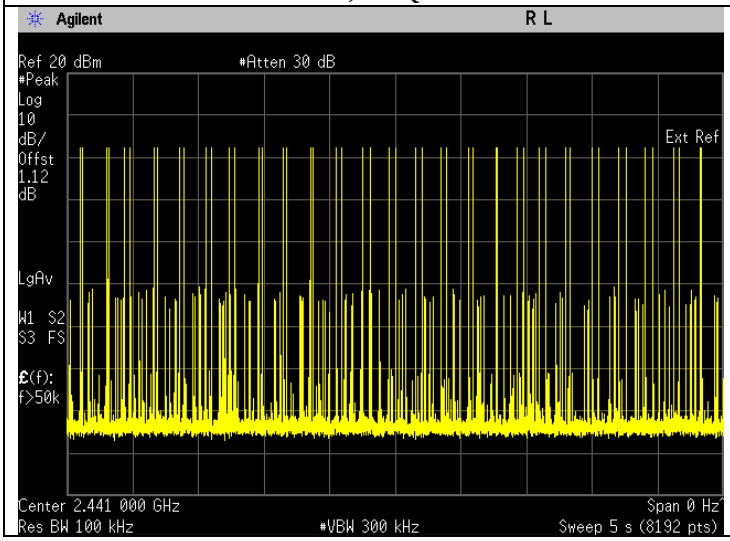



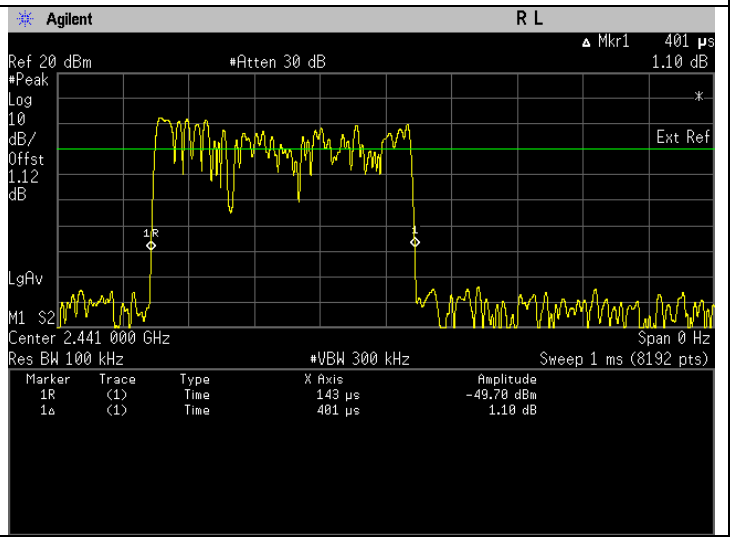
vi. Dwell Time at DH5, PI/4DQPSK



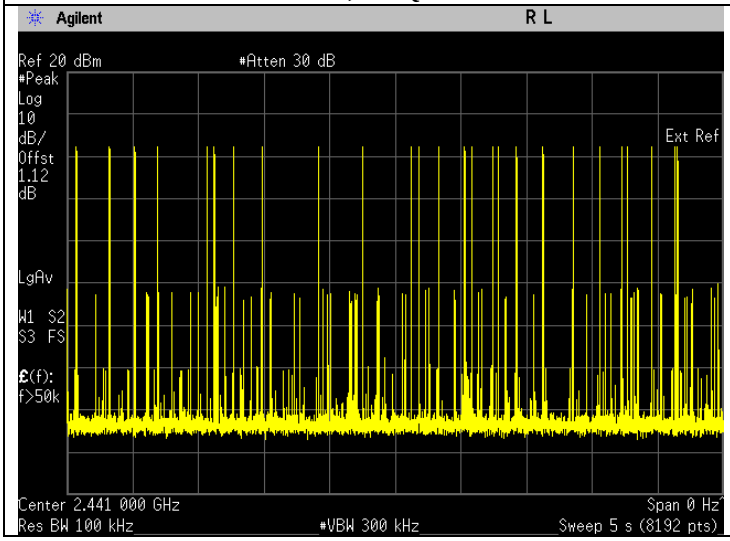



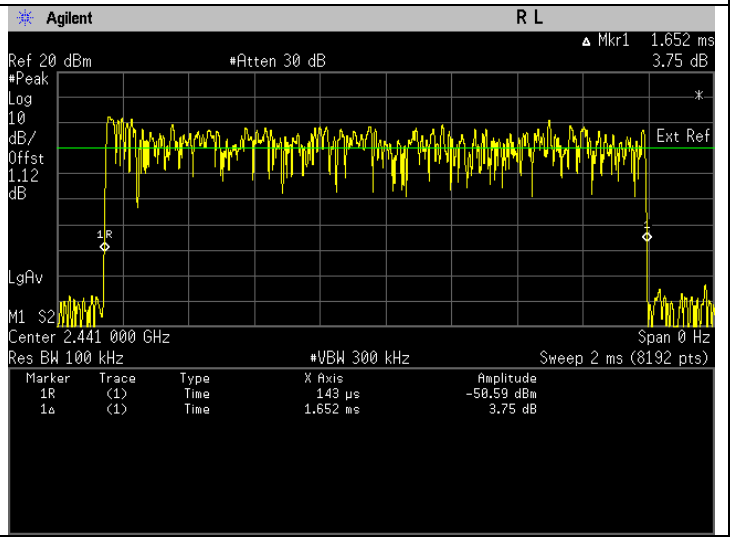

vii. Dwell Time at DH1, 8DQPSK



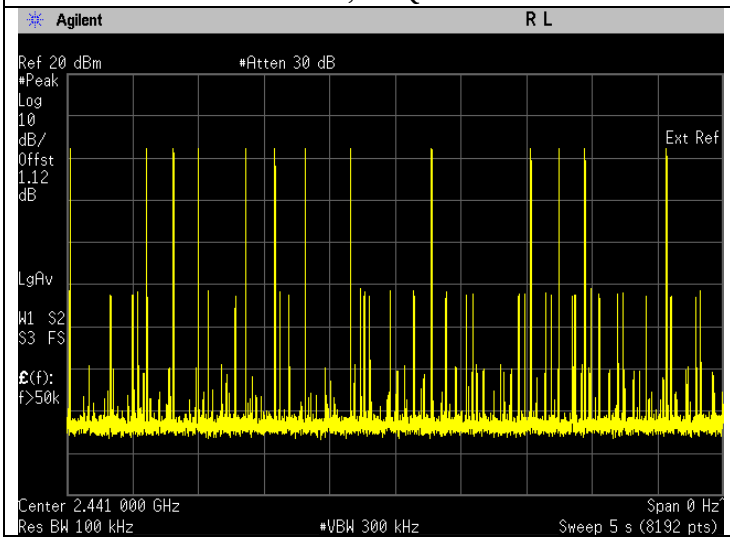



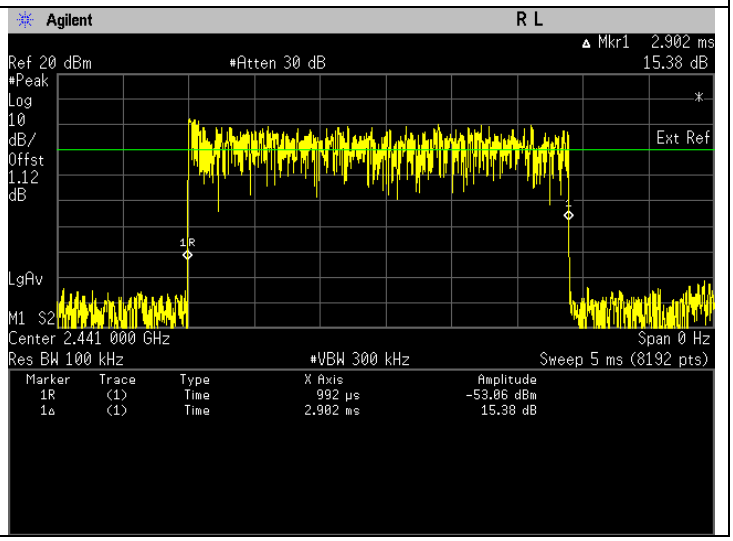

viii. Dwell Time at DH3, 8DQPSK



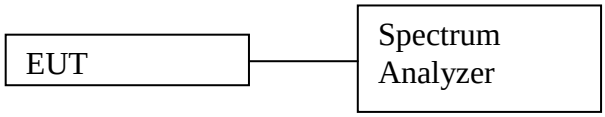
ix. Dwell Time at DH5, 8DQPSK



## 5.5. Number of hopping Frequency

### 5.5.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and keep the EUT in hopping mode.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = 300 kHz
   b. VBW = 300 kHz
   c. Detector mode = Peak
   d. Trace = Max hold
e) Allow the trace to stabilized & save the plot result from spectrum analyzer screen.
f) Count number of channel frequency in the operating.
g) Repeat above procedure for other test frequency.

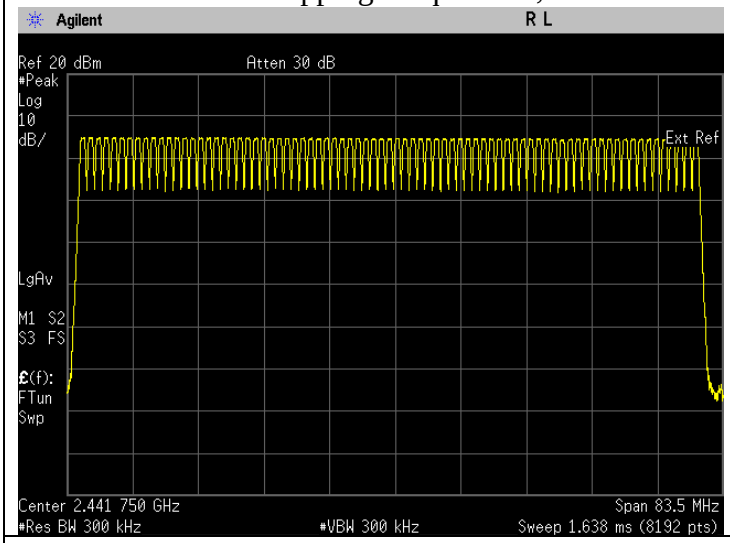
### 5.5.2. Test Limits:

| **Normal Condition (25 ° C)** |
|---|
| **≥ 15** |

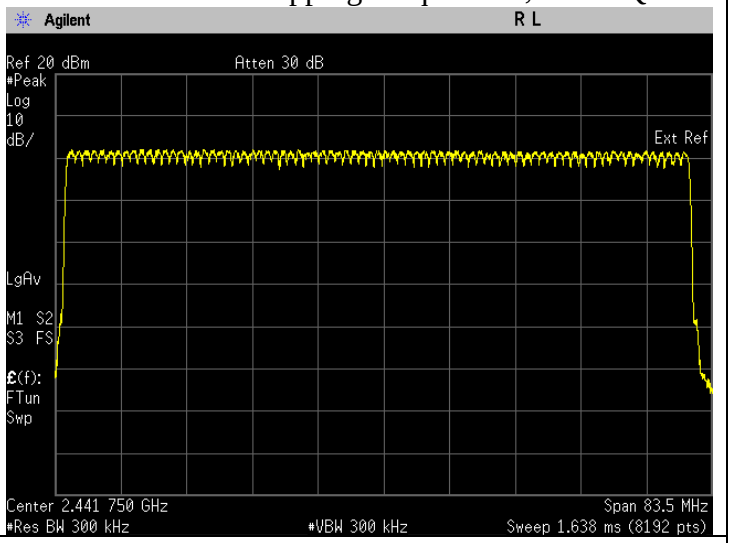
### 5.5.3. Test Result

| Test Conditions | | Sweep Range (GHz) | Results | |
|---|---|---|---|---|
| Modulation | Voltage(V) | | No. of Hopping Frequencies | Status |
| GFSK | 7.50 | 2.4000-2.4835 | 79 | Pass |
| Pi/4DQPSK | 7.50 | 2.4000-2.4835 | 79 | Pass |
| 8DPSK | 7.50 | 2.4000-2.4835 | 79 | Pass |

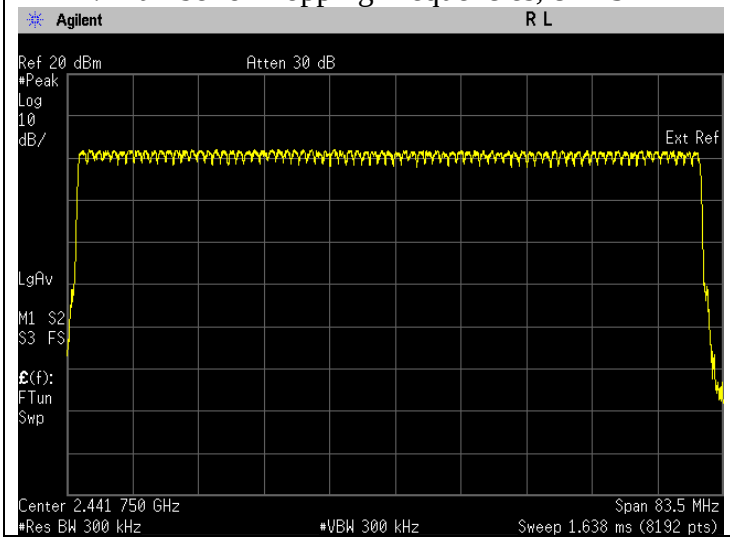
i. Number of Hopping Frequencies, GFSK




ii. Number of Hopping Frequencies, Pi/4 DQPSK

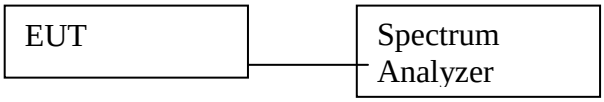



iii. Number of Hopping Frequencies, 8DPSK



## 5.6. Channel Separation

### 5.6.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and keep the EUT in hopping mode.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = 300 kHz
   b. VBW = 300 kHz
   c. SPAN = 3 MHz, center on test frequency
   d. AMPLITUDE → Scale/Div = 5 dB
   e. Detector mode = Peak
   f. Trace = Max hold
   g. Sweep = auto
e) Measure the frequency different of these two adjacent channels with marker delta function & record the measurement results.
f) Repeat above procedure with other different mode of operation.

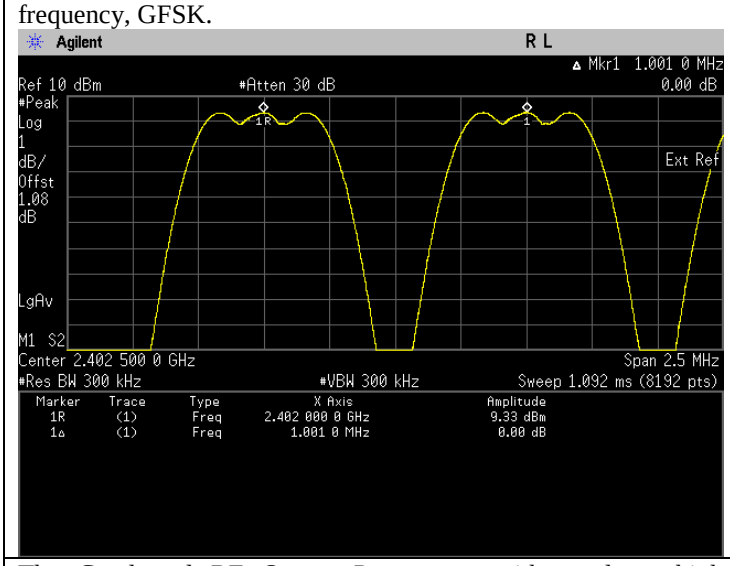
### 5.6.2. Test Limits:

| **Normal Condition (25 º C)** |
|---|
| **≥ 2/3 of 20dB Bandwidth** |

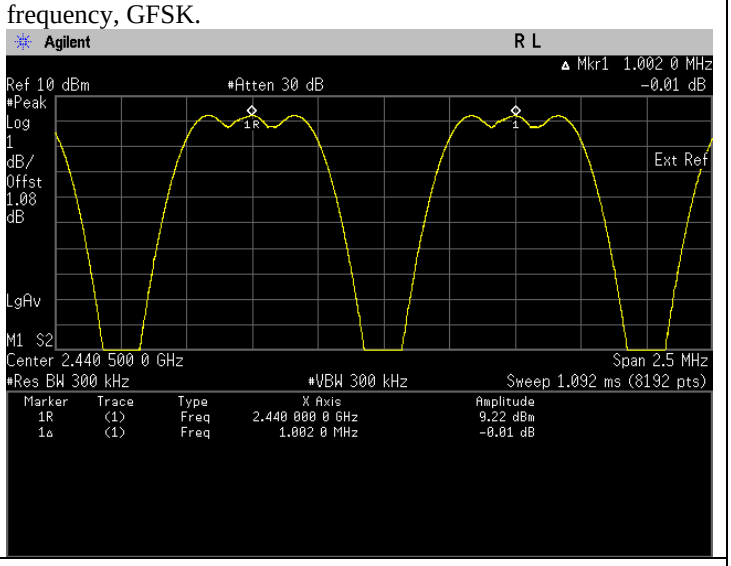
### 5.6.3. Test Result

| Test Conditions | | Test Frequency (GHz) | Results | | | |
|---|---|---|---|---|---|---|
| Modulation | Voltage(V) | | Test Data<br>Adjacent Channel Separation (MHz) | 20dB Bandwidth (MHz) | Min Limit<br>= 2/3 of 20dB Bandwidth (kHz) | Status |
| GFSK | 7.50 | 2.4020 | 1.001 | 0.999 | 665.728 | Pass |
| | | 2.4410 | 1.002 | 1.006 | 670.683 | Pass |
| | | 2.4800 | 0.993 | 1.003 | 668.503 | Pass |
| Pi/4DQPSK | 7.50 | 2.4020 | 1.001 | 1.278 | 852.113 | Pass |
| | | 2.4410 | 1.007 | 1.278 | 851.811 | Pass |
| | | 2.4800 | 0.997 | 1.278 | 851.811 | Pass |
| 8DPSK | 7.50 | 2.4020 | 0.995 | 1.269 | 845.943 | Pass |
| | | 2.4410 | 1.001 | 1.269 | 845.963 | Pass |
| | | 2.4800 | 0.994 | 1.269 | 846.205 | Pass |

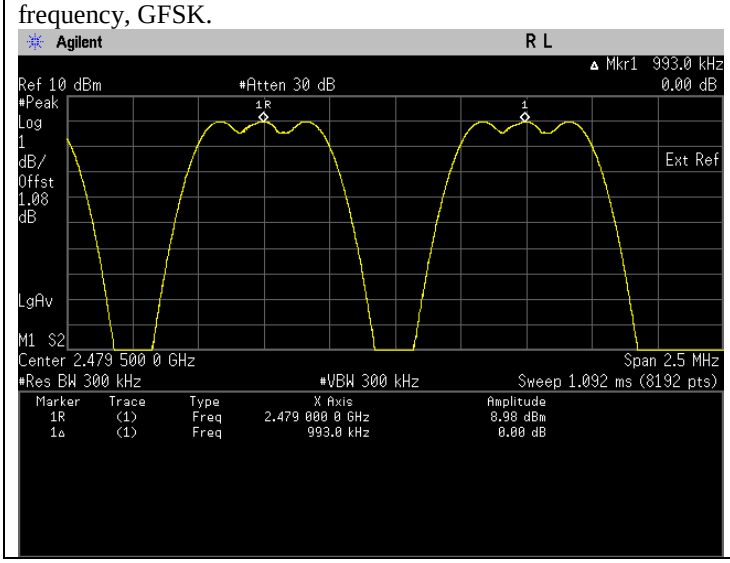
The Conducted RF Output Power test with result at low frequency, GFSK.



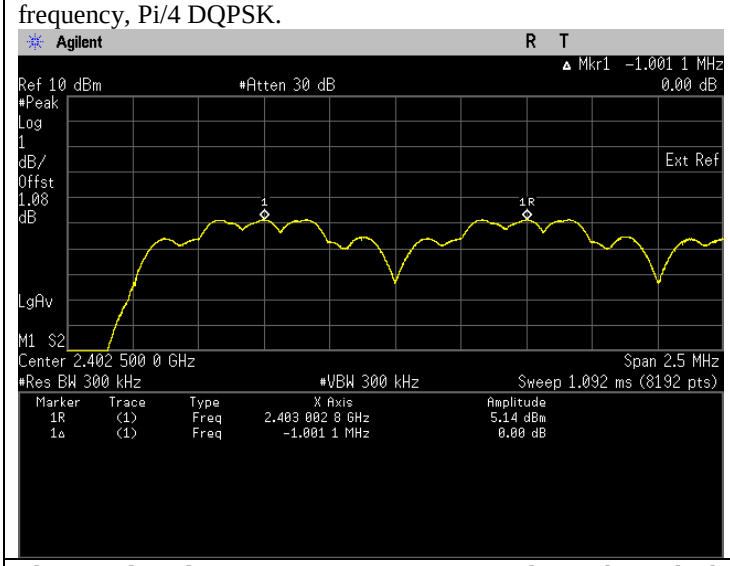

The Conducted RF Output Power test with result at mid frequency, GFSK.



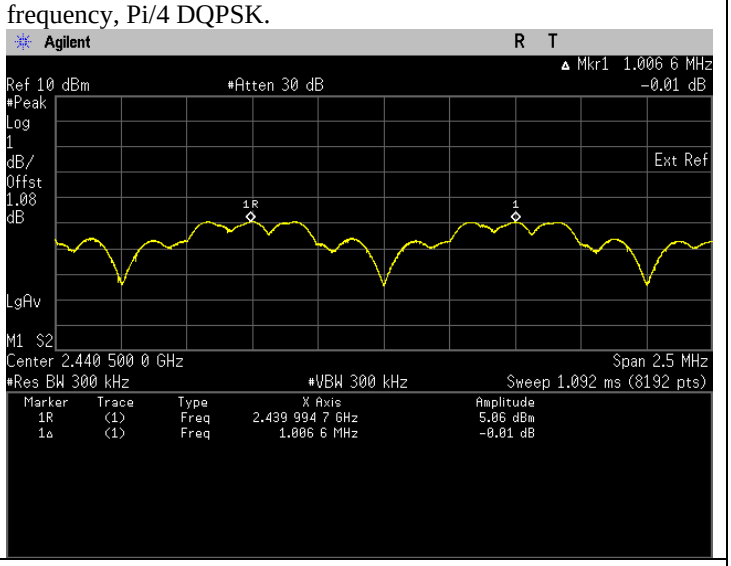

The Conducted RF Output Power test with result at high frequency, GFSK.



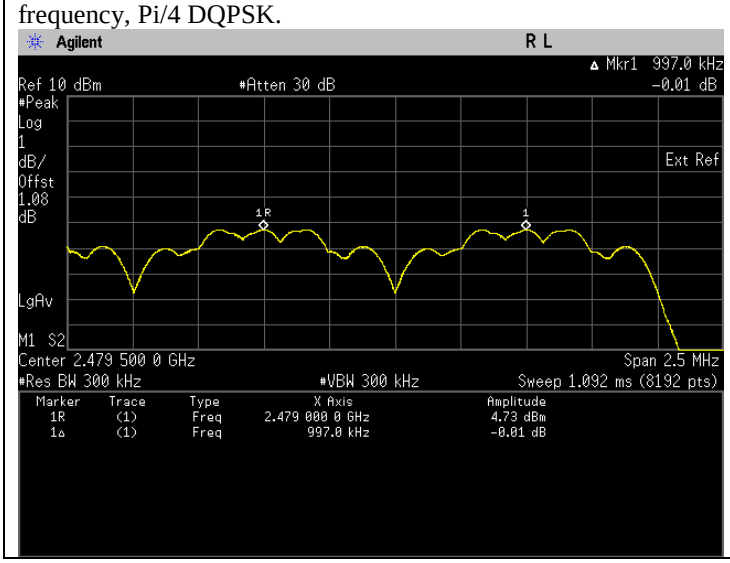
The Conducted RF Output Power test with result at low frequency, Pi/4 DQPSK.



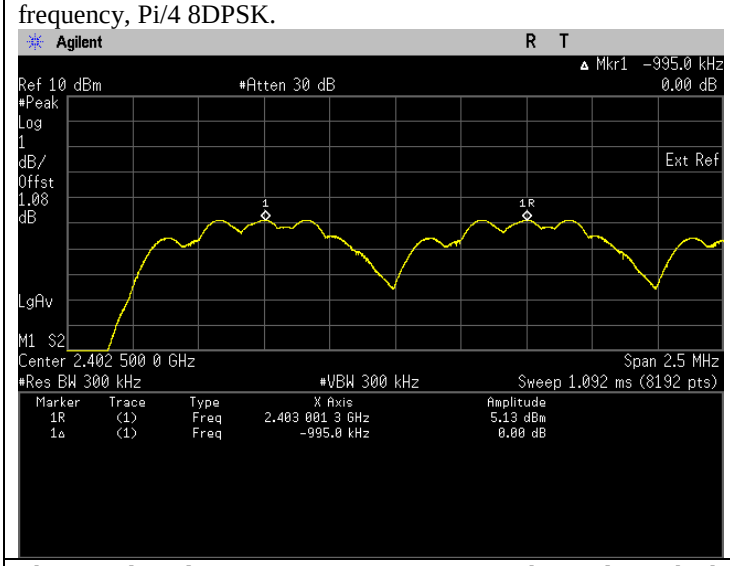

The Conducted RF Output Power test with result at mid frequency, Pi/4 DQPSK.



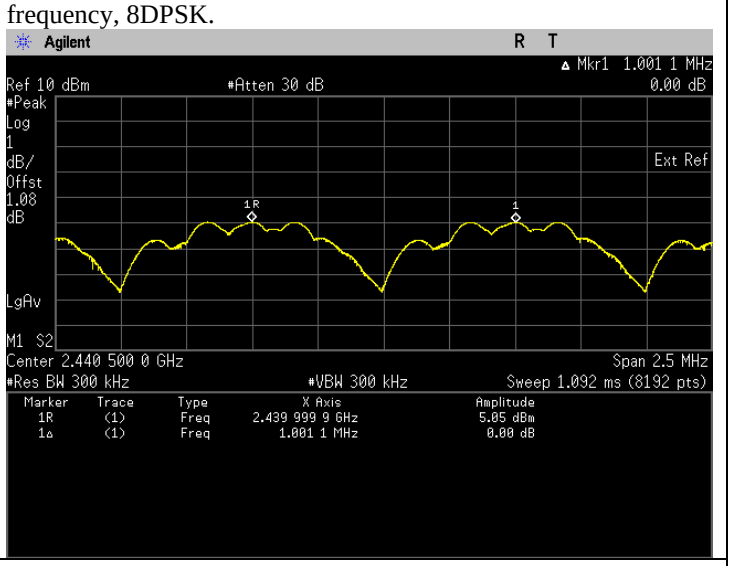

The Conducted RF Output Power test with result at high frequency, Pi/4 DQPSK.



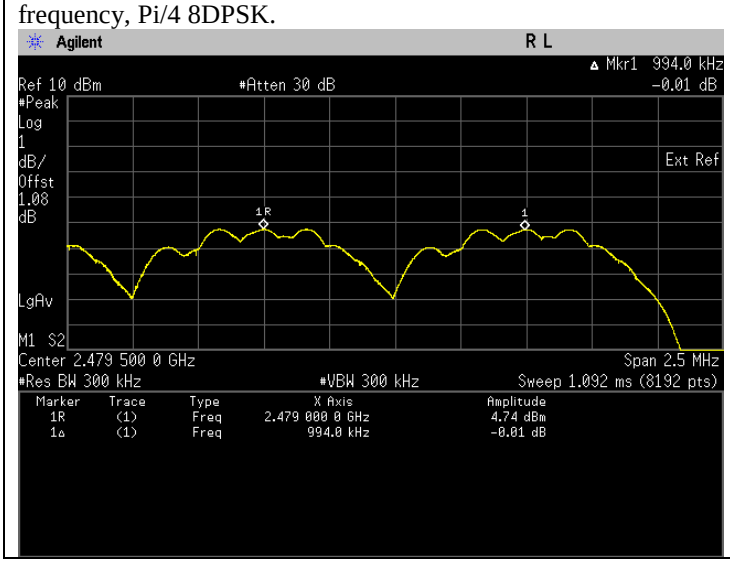
The Conducted RF Output Power test with result at low frequency, Pi/4 8DPSK.




The Conducted RF Output Power test with result at mid frequency, 8DPSK.

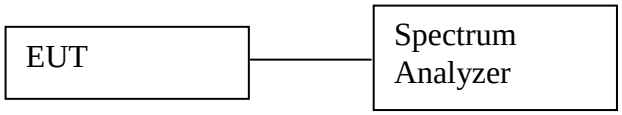



The Conducted RF Output Power test with result at high frequency, Pi/4 8DPSK.



## 5.7. Conducted Spurious Emission

### 5.7.1. Test Setup




a) Check and ensure the spectrum analyzer well calibrate.
b) Turn on the EUT and set EUT to transmit maximum data rate with hopping disable.
c) Connect EUT's antenna terminal to spectrum analyzer with a low loss cable.
d) Setting of Spectrum analyzer :
   a. RBW = 100 kHz
   b. VBW = 300 kHz
   c. SPAN = Cover until $10^{th}$ harmonic
   d. Detector mode = Peak
   e. AMPLITUDE → Scale/Div = 10 dB
   f. Trace = Max hold
   g. Sweep = auto
e) Measure the captured spurious emission result and recording the plot.
f) Repeat above procedure with other different mode of operation.

### 5.7.2. Test Limits:

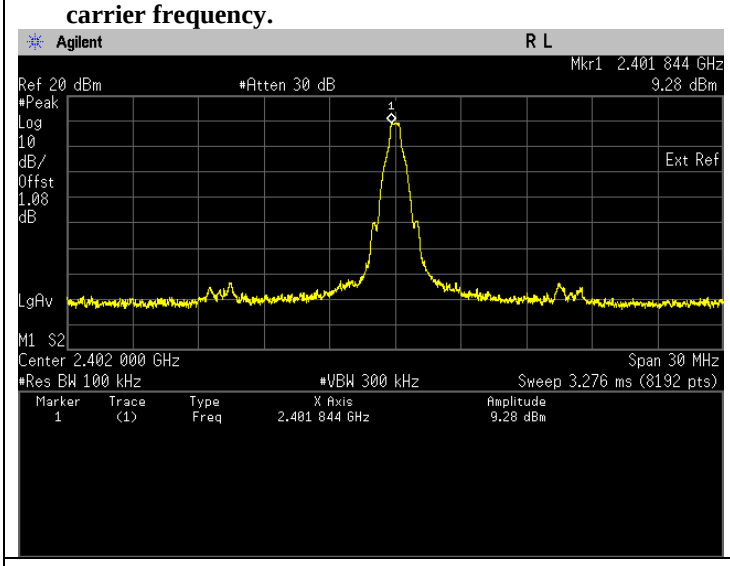
| **Normal Condition (25 ° C)** |
|---|
| **Shall be at least 20 dB below for peak power.** |

### 5.7.3. Test Data:

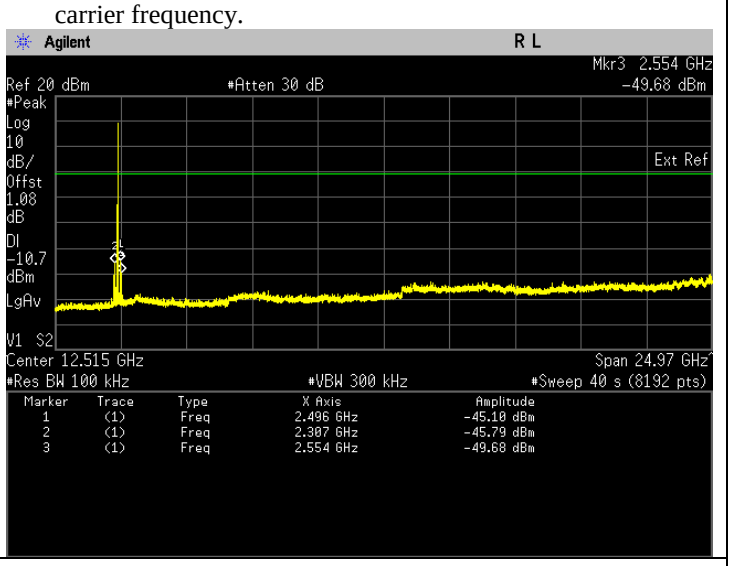
| Test Conditions | | | Results | | |
|---|---|---|---|---|---|
| Modulation | Voltage(V) | Test Frequency (GHz) | Spurs (MHz) | Level (dBm) | Status |
| GFSK | 7.50 | 2.4020 | 2496.000 | -45.102 | Pass |
| | | 2.4410 | 2341.000 | -45.465 | Pass |
| | | 2.4800 | 2380.000 | -45.032 | Pass |
| Pi/4 DQPSK | 7.50 | 2.4020 | 24796.000 | -50.607 | Pass |
| | | 2.4410 | 24896.000 | -50.681 | Pass |
| | | 2.4800 | 2383.000 | -50.385 | Pass |
| 8DPSK | 7.50 | 2.4020 | 24201.000 | -50.677 | Pass |
| | | 2.4410 | 24869.000 | -50.010 | Pass |
| | | 2.4800 | 24918.000 | -49.713 | Pass |

GFSK Modulation:

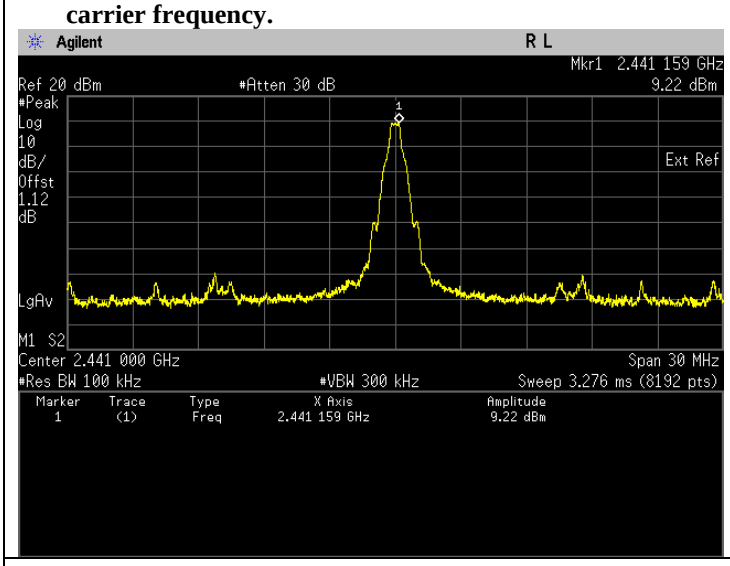
- **The high emission level within the assigned band at low carrier frequency.**



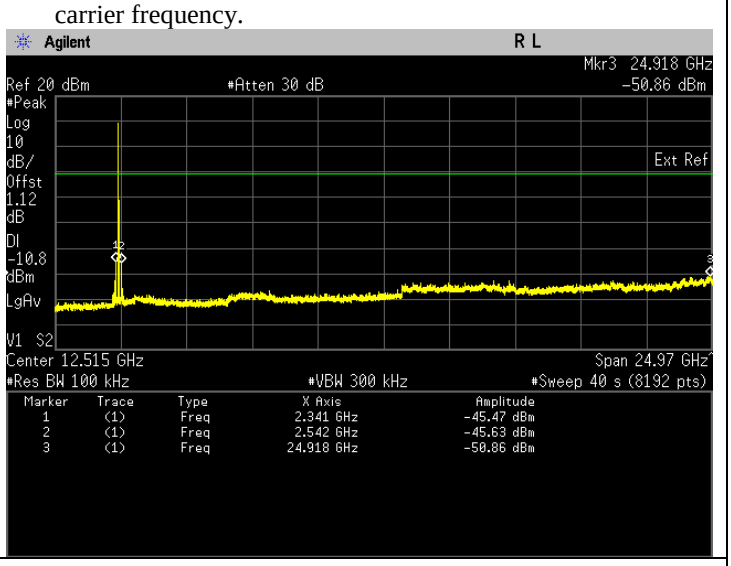

- Spurious emission measurement in **30MHz – 25GHz** at low carrier frequency.



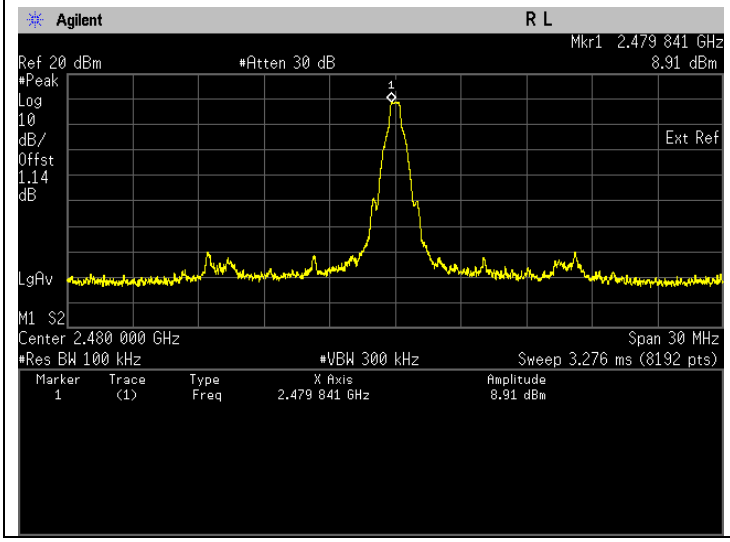

- **The high emission level within the assigned band at mid carrier frequency.**



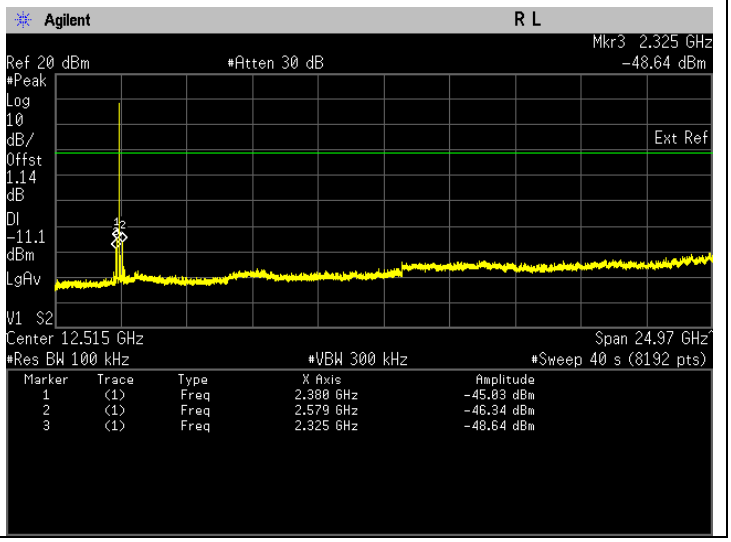

- Spurious emission measurement in **30MHz – 25GHz** at mid carrier frequency.




- **The high emission level within the assigned band at high carrier frequency.**

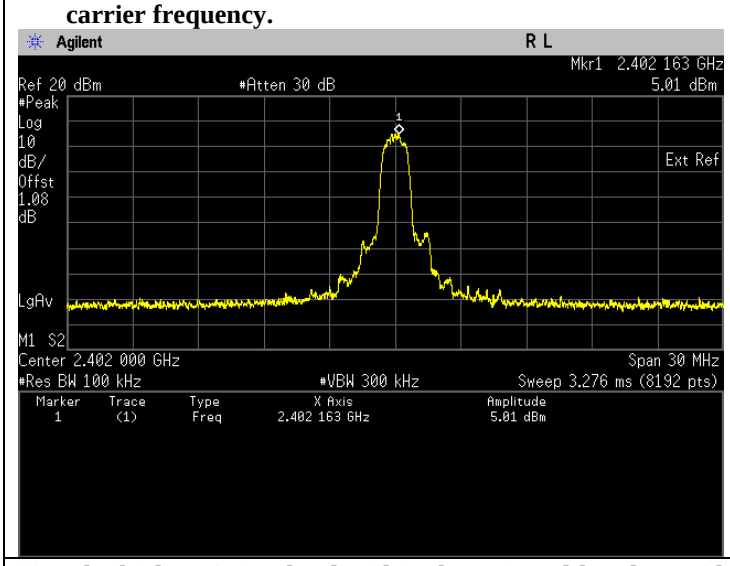



- Spurious emission measurement in 30MHz – 25GHz at high carrier frequency.

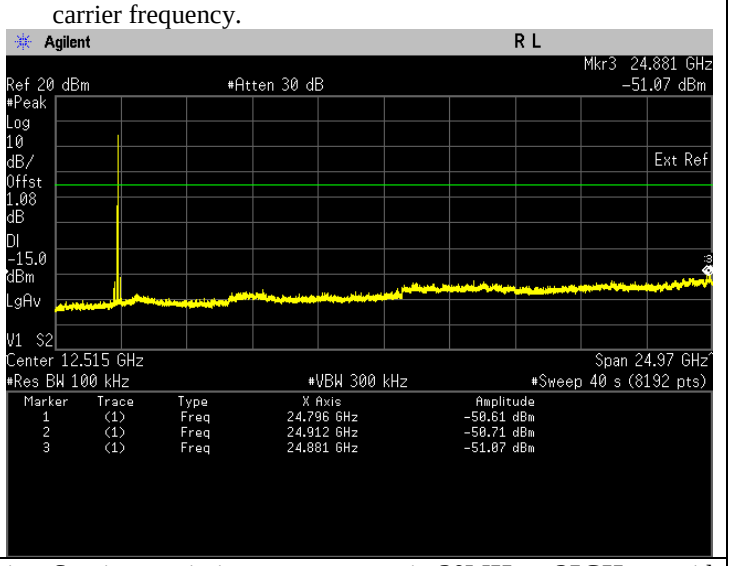


Pi/4 DQPSK Modulation:

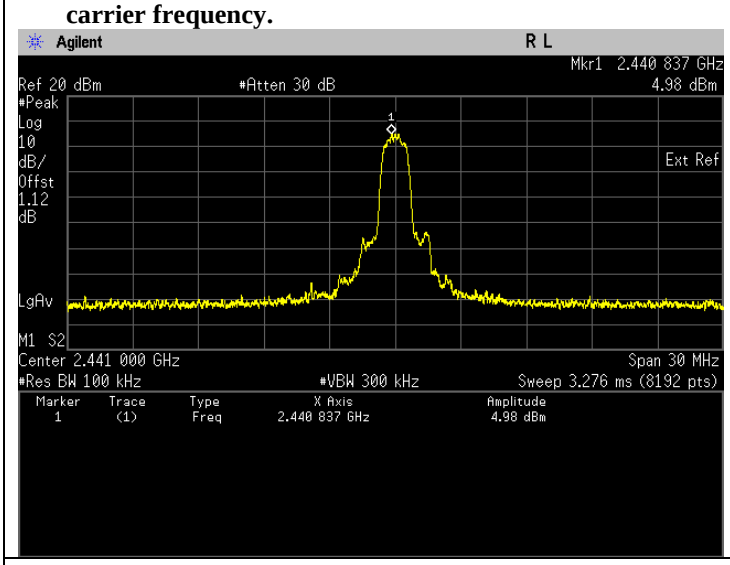
**i. The high emission level within the assigned band at low carrier frequency.**



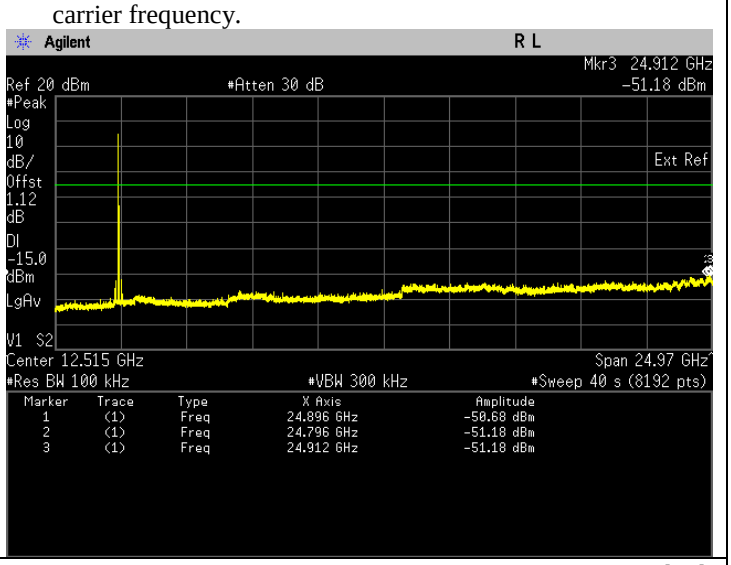

ii. Spurious emission measurement in **30MHz – 25GHz** at low carrier frequency.



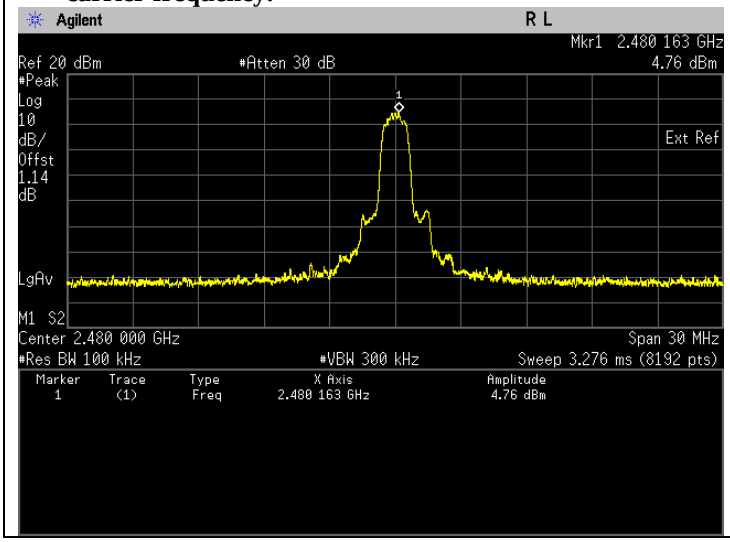

**iii. The high emission level within the assigned band at mid carrier frequency.**



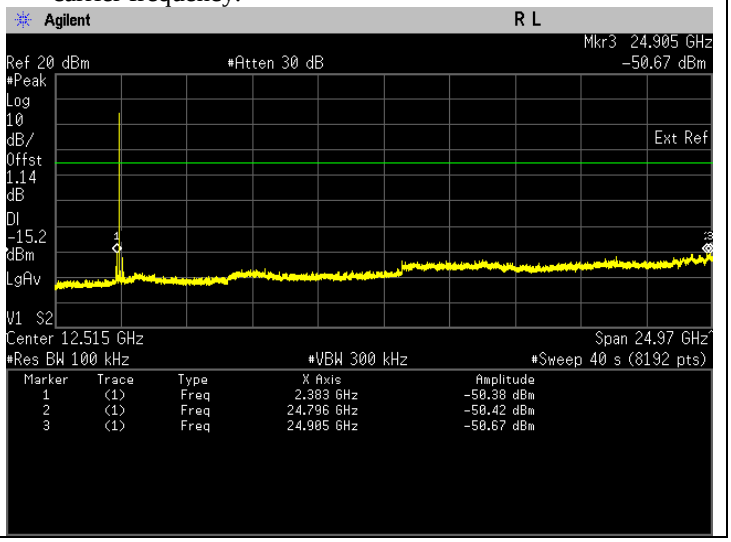

iv. Spurious emission measurement in **30MHz – 25GHz** at mid carrier frequency.




**v. The high emission level within the assigned band at high carrier frequency.**

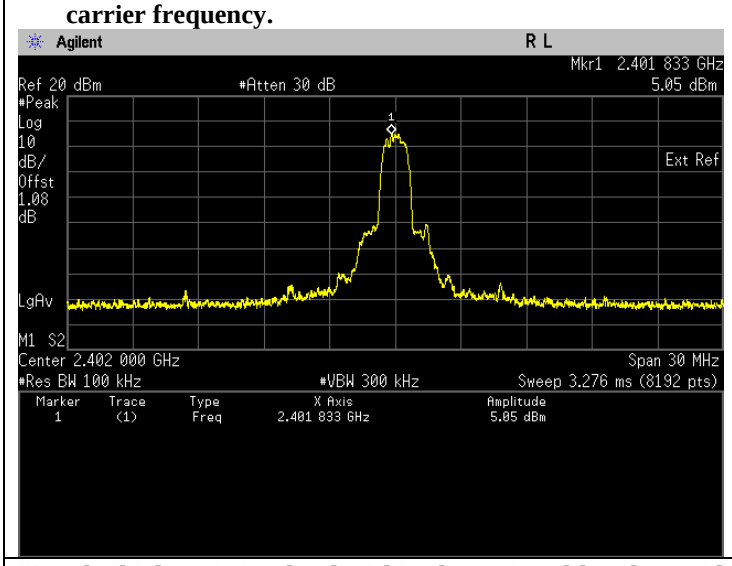



vi. Spurious emission measurement in **30MHz – 25GHz** at high carrier frequency.

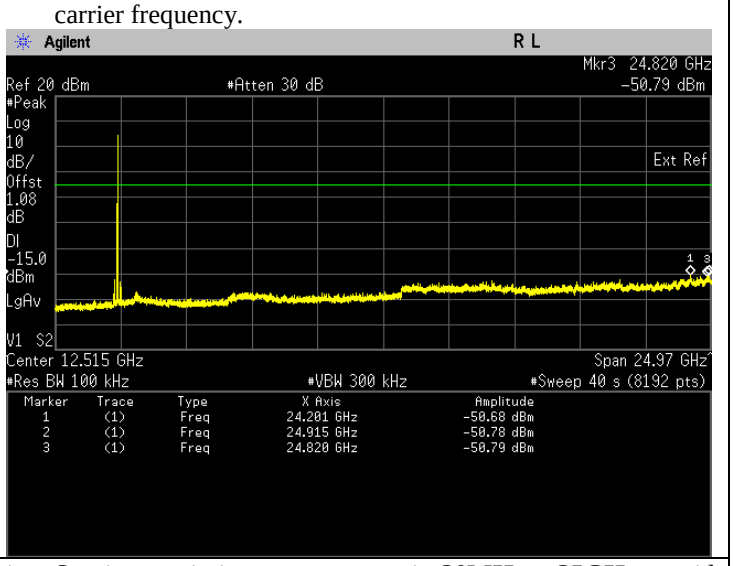


8DPSK Modulation:

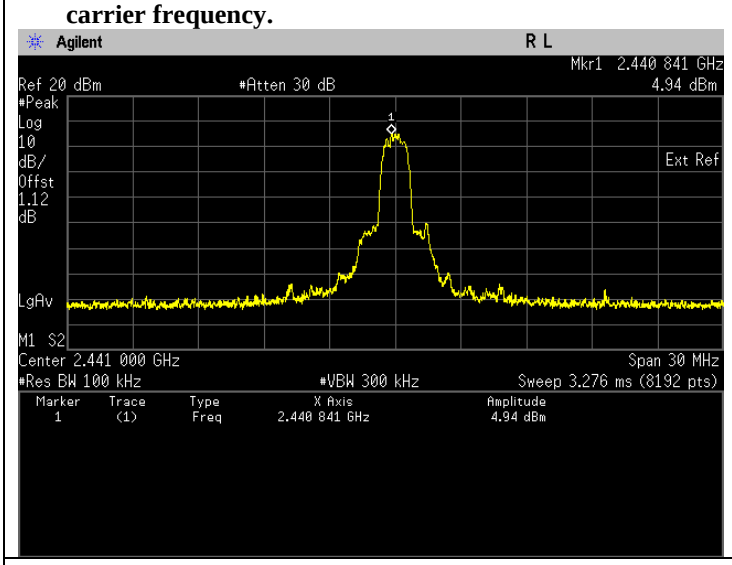
**i. The high emission level within the assigned band at low carrier frequency.**



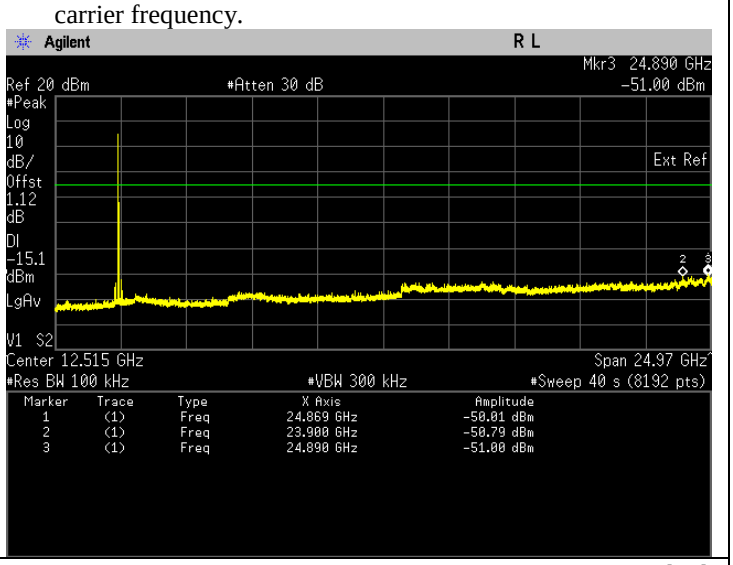

ii. Spurious emission measurement in **30MHz – 25GHz** at low carrier frequency.



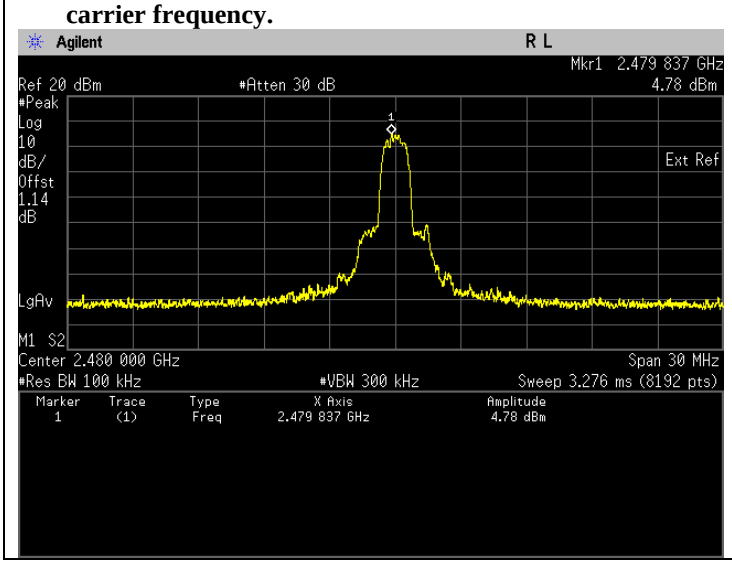

**iii. The high emission level within the assigned band at mid carrier frequency.**



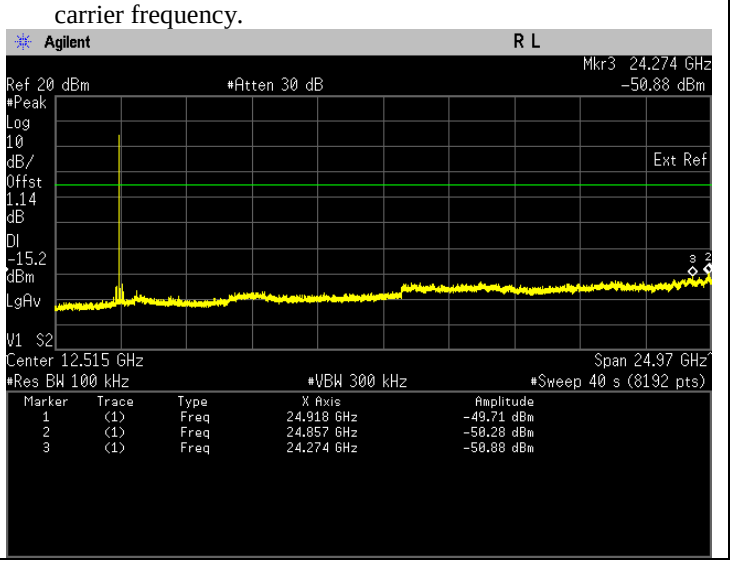

iv. Spurious emission measurement in **30MHz – 25GHz** at mid carrier frequency.




**v. The high emission level within the assigned band at high carrier frequency.**

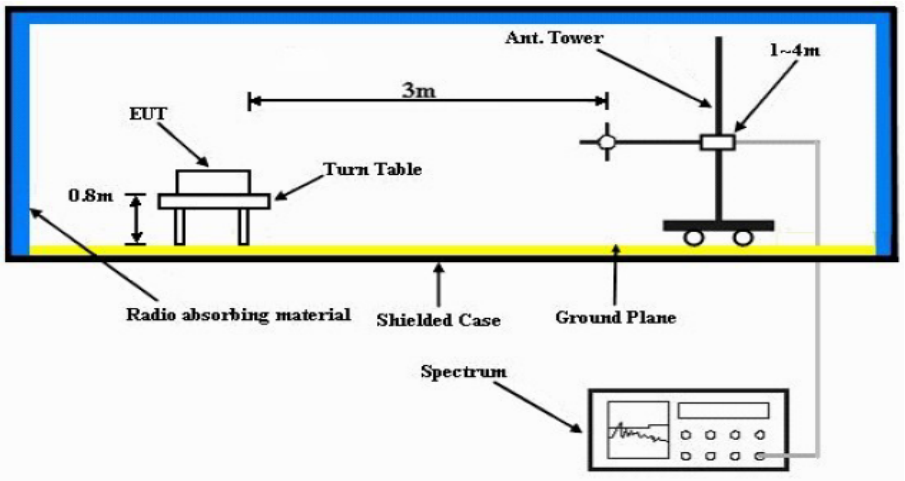



vi. Spurious emission measurement in **30MHz – 25GHz** at high carrier frequency.



## 5.8. Radiated Emission within restricted Bands

### 5.8.1. Test Setup




a. The EUT is placed on the top of a rotating table 0.8m (<1GHz) or 1.5m (>1GHz) above the ground at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
b. The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
c. The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

**NOTE:**

a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection at frequency below 1GHz.
b. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3 MHz for Peak detection at frequency above 1 GHz.
c. All modes of operation were investigated and the worst-case emissions are reported.

### 5.8.2. Test Limits:

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power.

| Frequency (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|---|---|---|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100** | 3 |
| 88-216 | 150** | 3 |
| 216-960 | 200** | 3 |
| Above 960 | 500 | 3 |

**NOTE:**

a. The lower limit shall apply at the transition frequencies.
b. Emission level (dBuV/m) = 20 log Emission level (uV/m).
c. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

### 5.8.3. Test Data:

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (GFSK)**

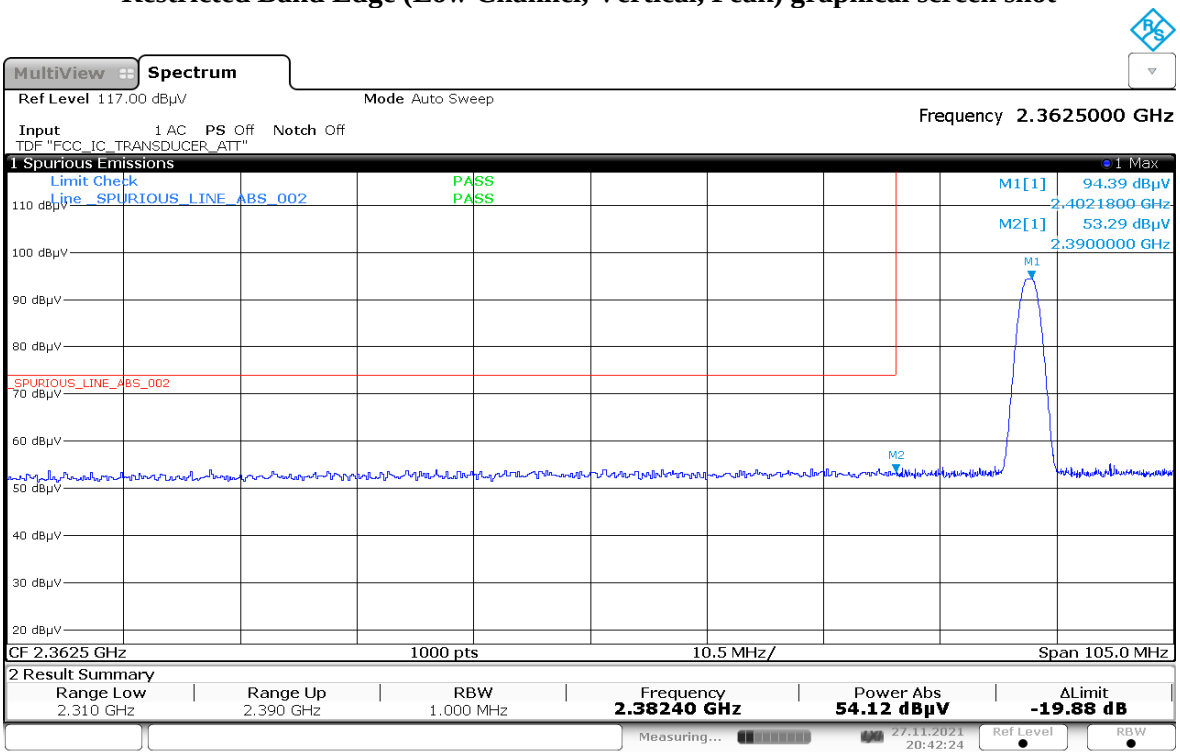
**Restricted Band Edge (Low Channel) tabular data**

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2390.0000 | - | 53.2888 | 42.8388 | - | 74.0000 | 54.0000 | - | -20.7112 | -11.1612 | - |
| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2390.0000 | - | 53.6548 | 43.2249 | - | 74.0000 | 54.0000 | - | -20.3452 | -10.7751 | - |

| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

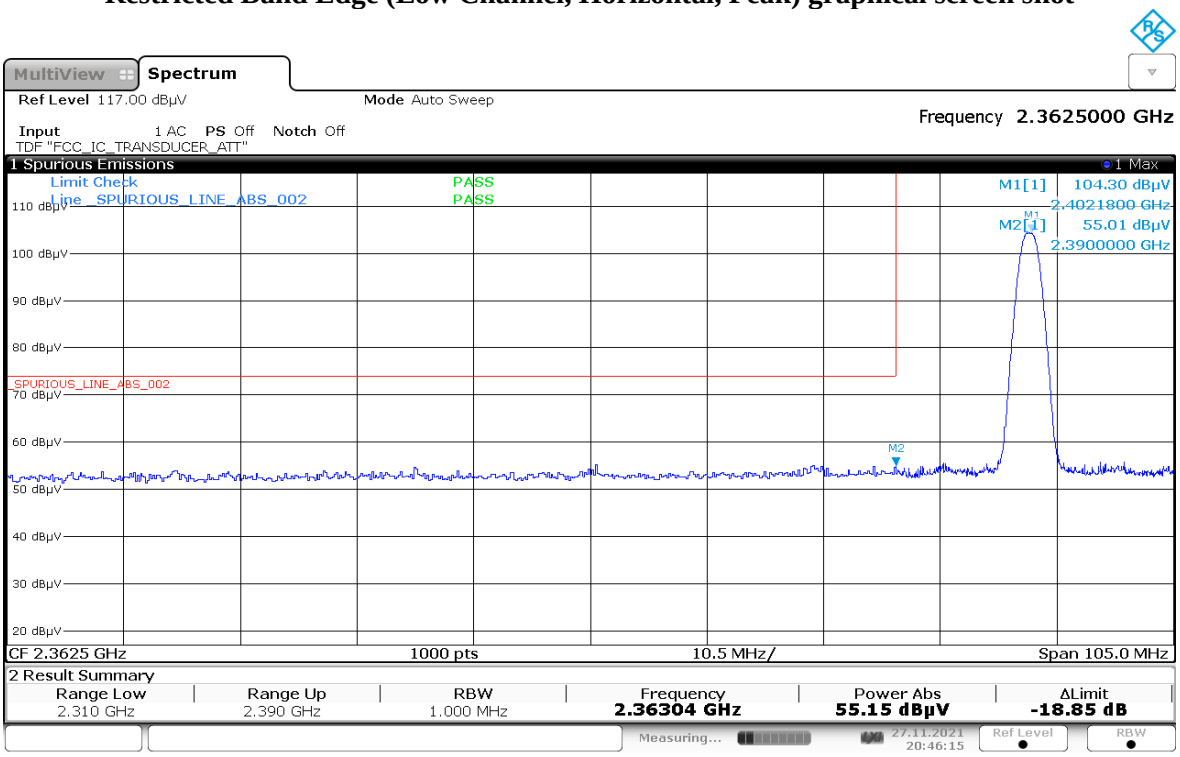
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



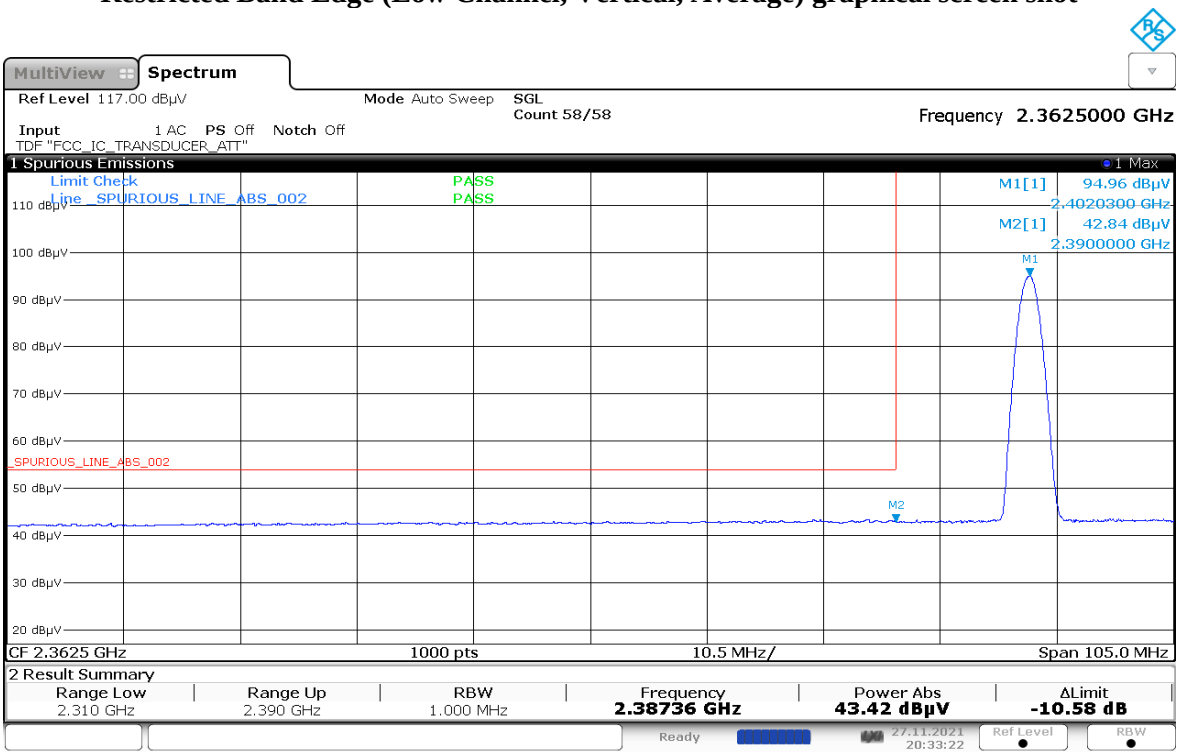

**20:42:24 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



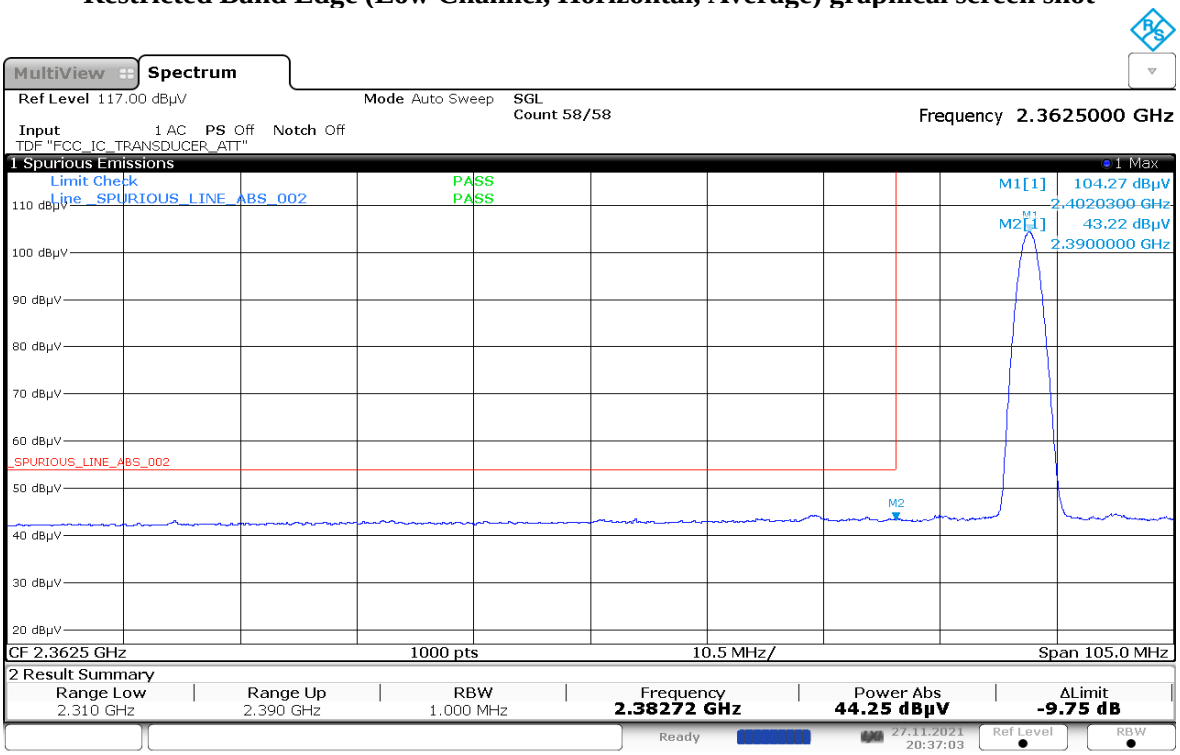

**20:46:16 27.11.2021**

## Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot




**20:33:23 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot




**20:37:04 27.11.2021**

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (GFSK)**

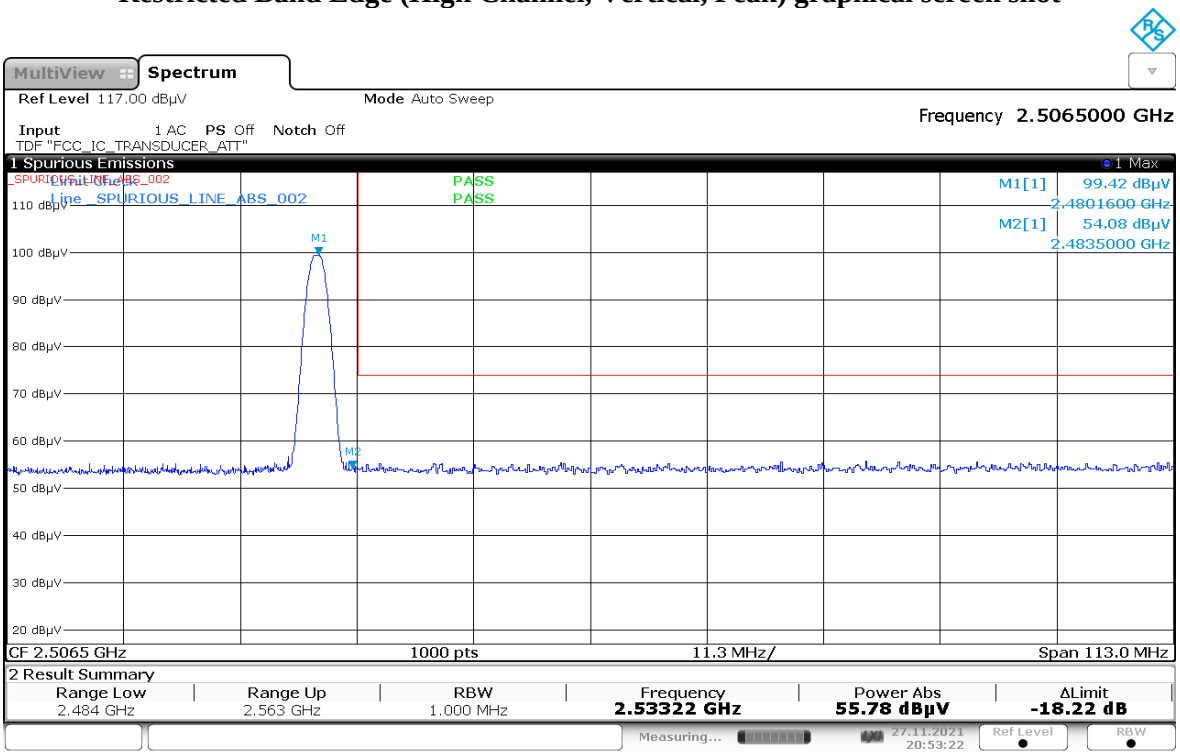
## Restricted Band Edge (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2483.5000 | - | 53.6968 | 44.2109 | - | 74.0000 | 54.0000 | - | -20.3032 | -9.7891 | - |
| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2483.5000 | - | 56.3213 | 45.4336 | - | 74.0000 | 54.0000 | - | -17.6787 | -8.5664 | - |

| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

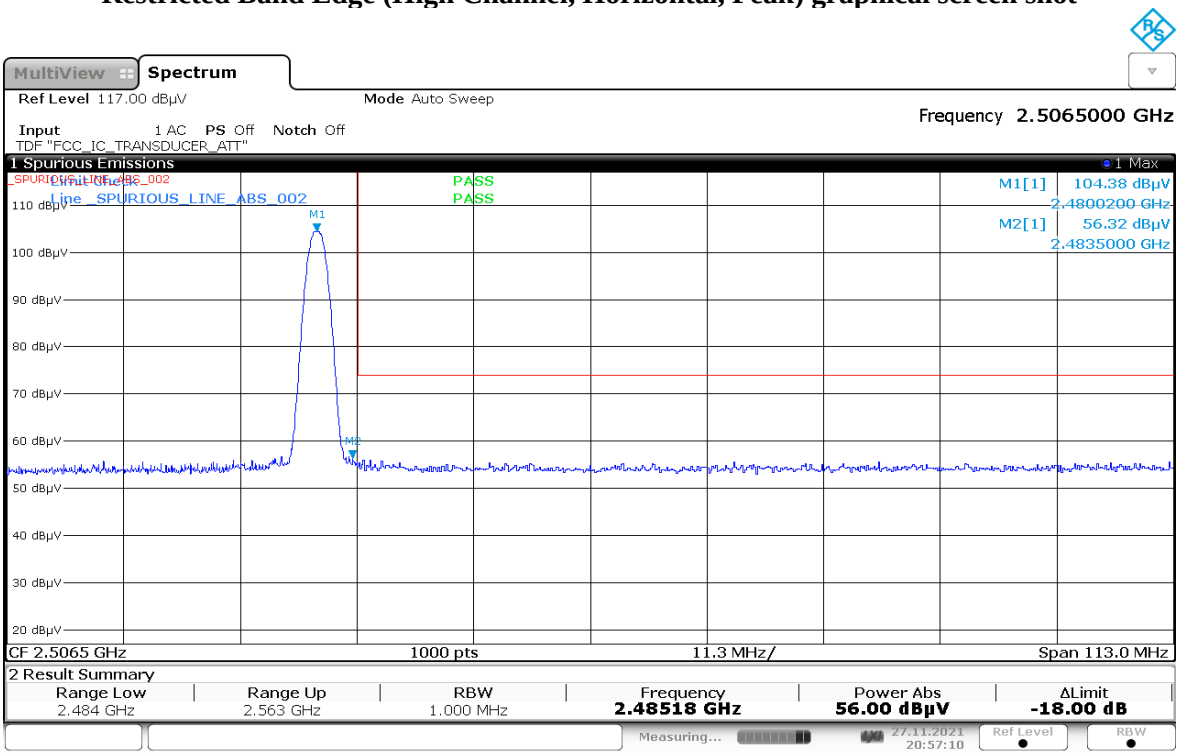
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



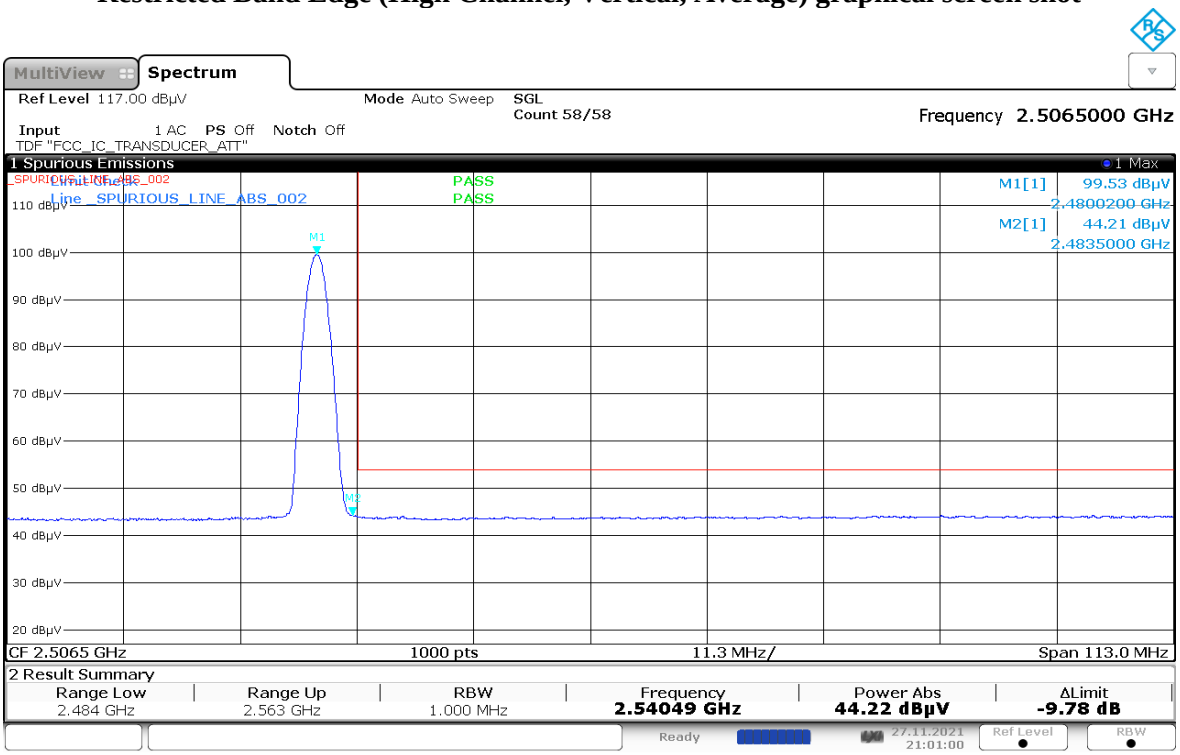

**20:53:22 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



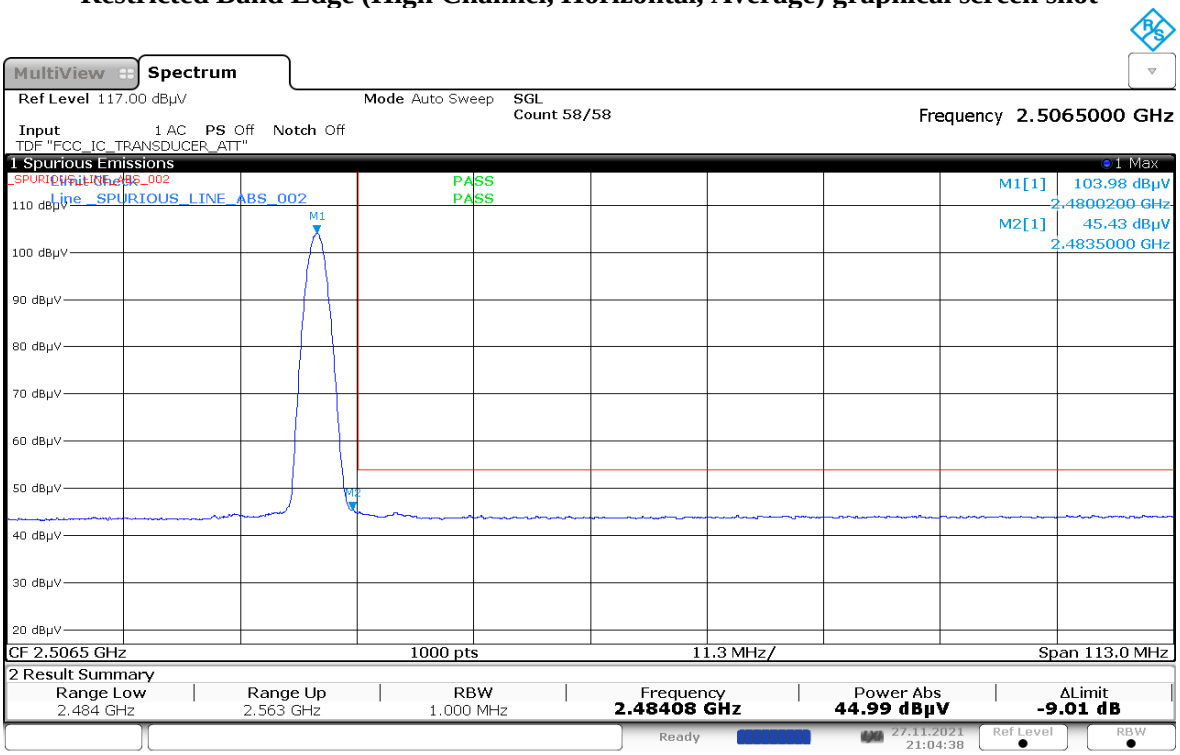

**20:57:11 27.11.2021**

## Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot




**21:01:00 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot




**21:04:38 27.11.2021**

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (DQPSK)**

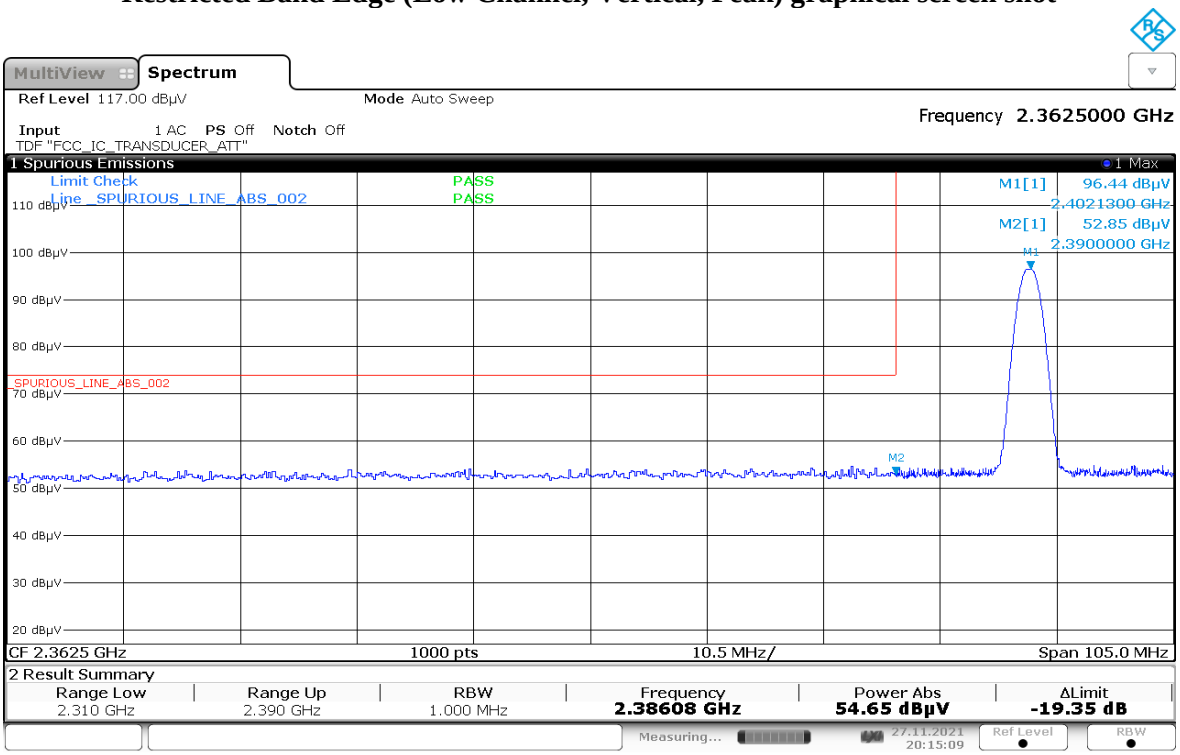
## Restricted Band Edge (Low Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2390.0000 | - | 52.8489 | 42.8388 | - | 74.0000 | 54.0000 | - | -21.1511 | -11.1612 | - |
| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2390.0000 | - | 53.3018 | 42.9694 | - | 74.0000 | 54.0000 | - | -20.6982 | -11.0306 | - |

| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

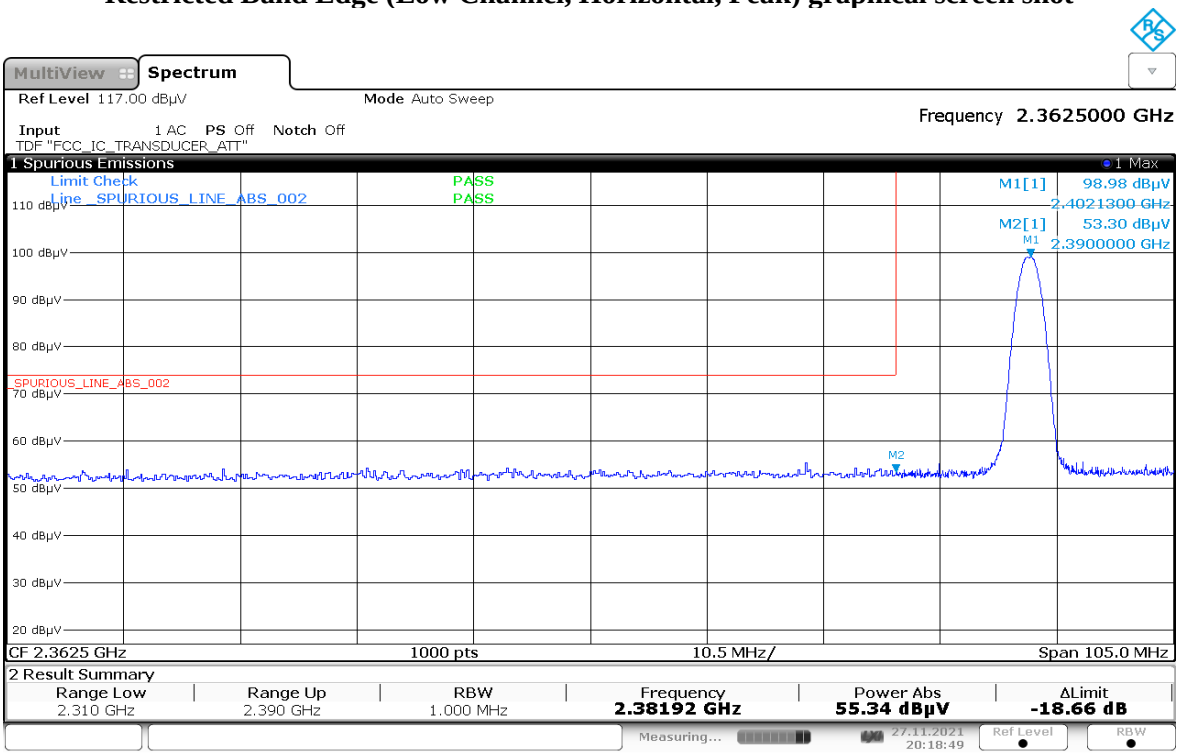
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



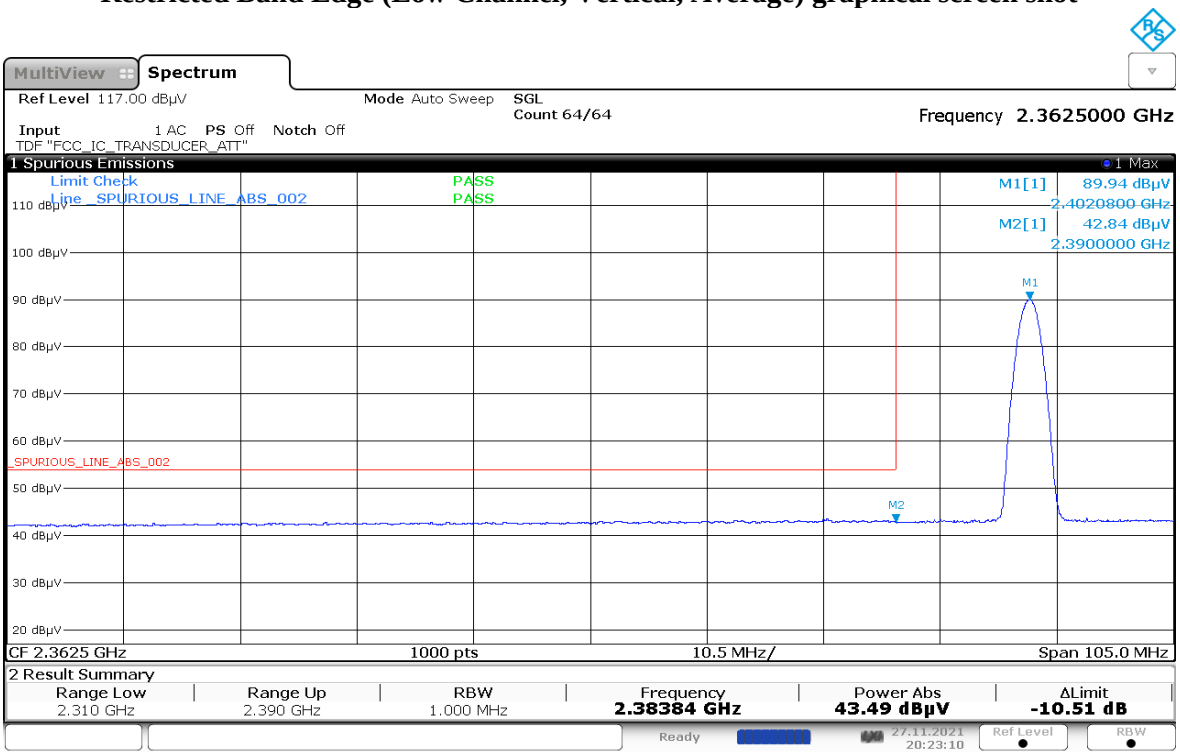

**20:15:10 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



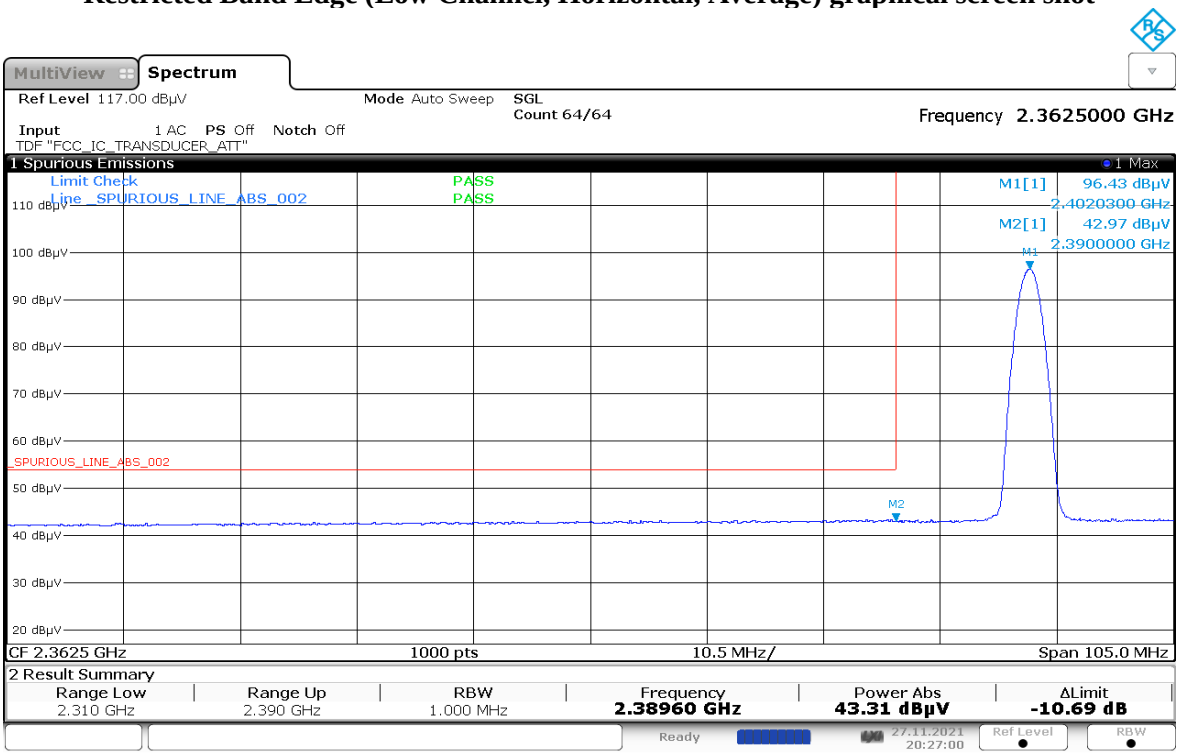

**20:18:50 27.11.2021**

## Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot




**20:23:10 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot




**20:27:01 27.11.2021**

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (DQPSK)**

## Restricted Band Edge (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2483.5000 | - | 53.1718 | 43.7972 | - | 74.0000 | 54.0000 | - | -20.8282 | -10.2028 | - |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2483.5000 | - | 53.8759 | 44.2109 | - | 74.0000 | 54.0000 | - | -20.1241 | -9.7891 | - |
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| Remarks: Pass Result | Marginal Result | Fail Result |
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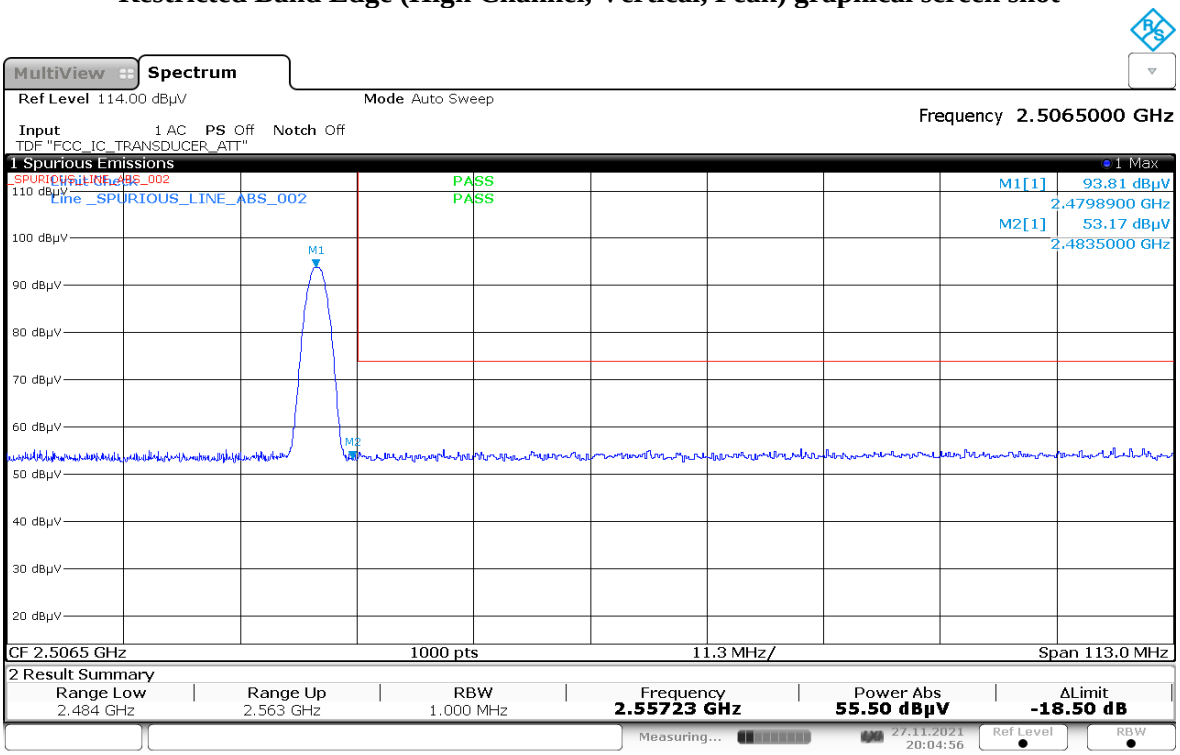
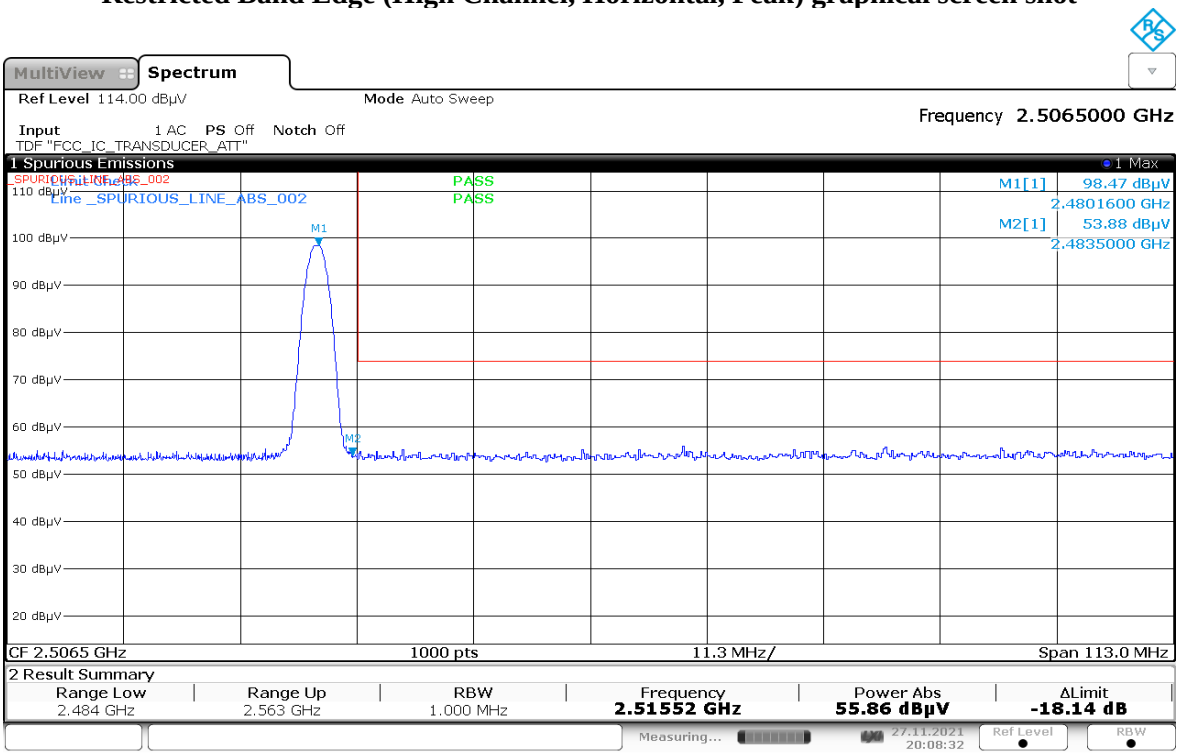
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



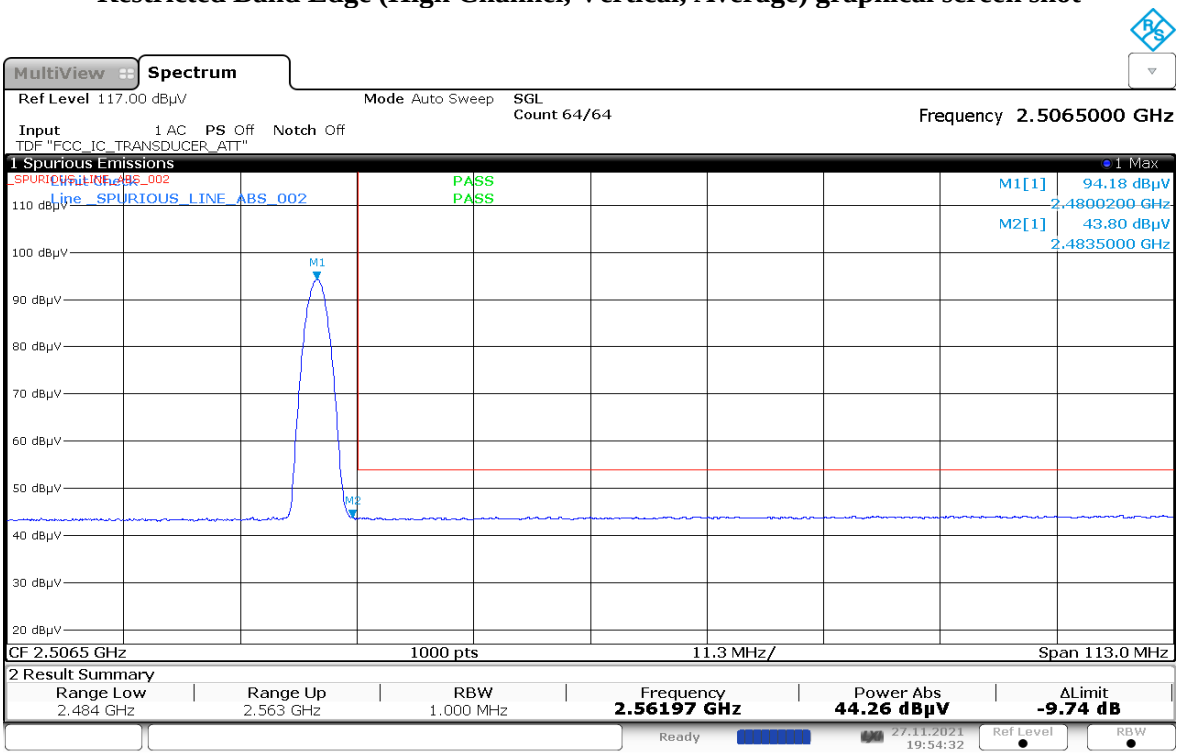

**20:04:56 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



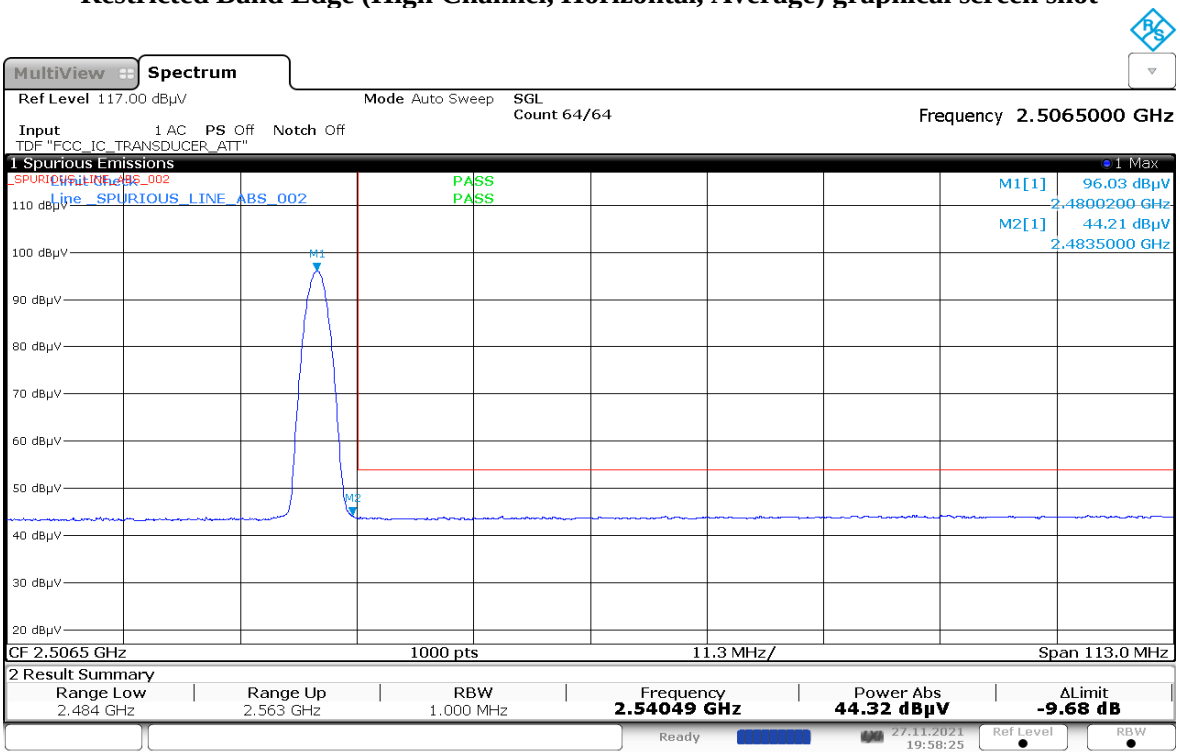

**20:08:32 27.11.2021**

## Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot




**19:54:33 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot




**19:58:26 27.11.2021**

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (8DPSK)**

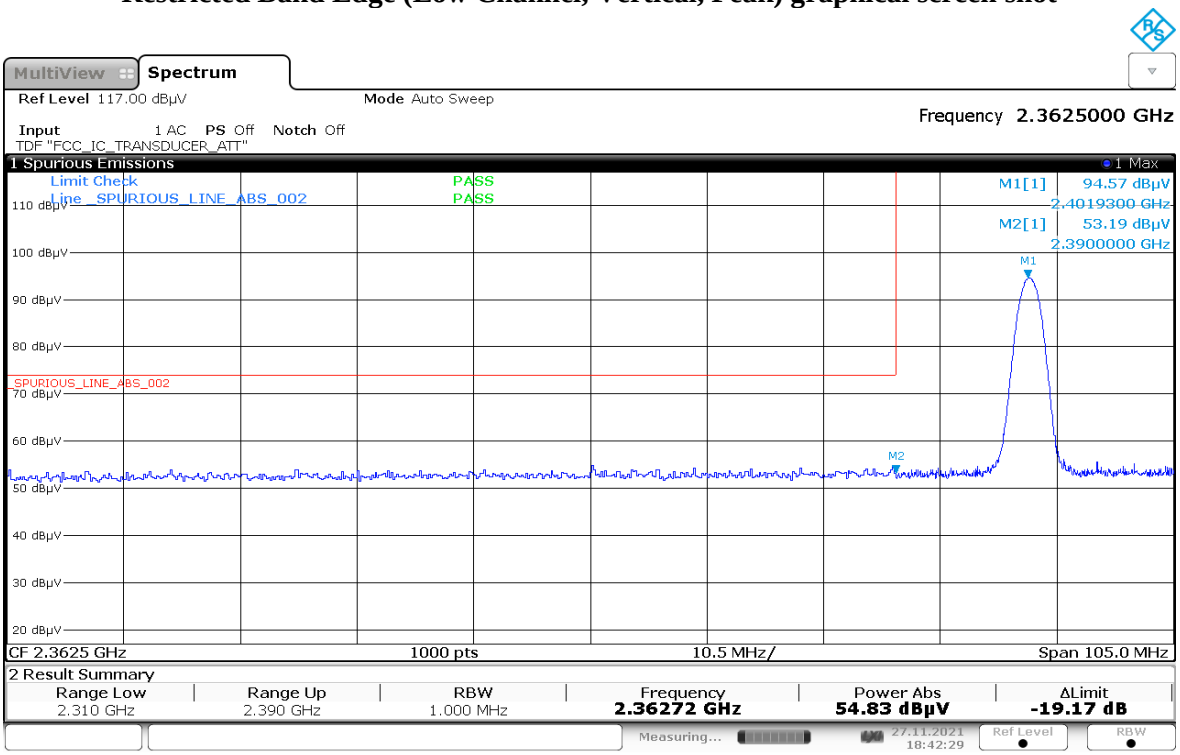
## Restricted Band Edge (Low Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2390.0000 | - | 53.1890 | 42.9694 | - | 74.0000 | 54.0000 | - | -20.8110 | -11.0306 | - |
| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2390.0000 | - | 52.6171 | 43.0981 | - | 74.0000 | 54.0000 | - | -21.3829 | -10.9019 | - |

| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

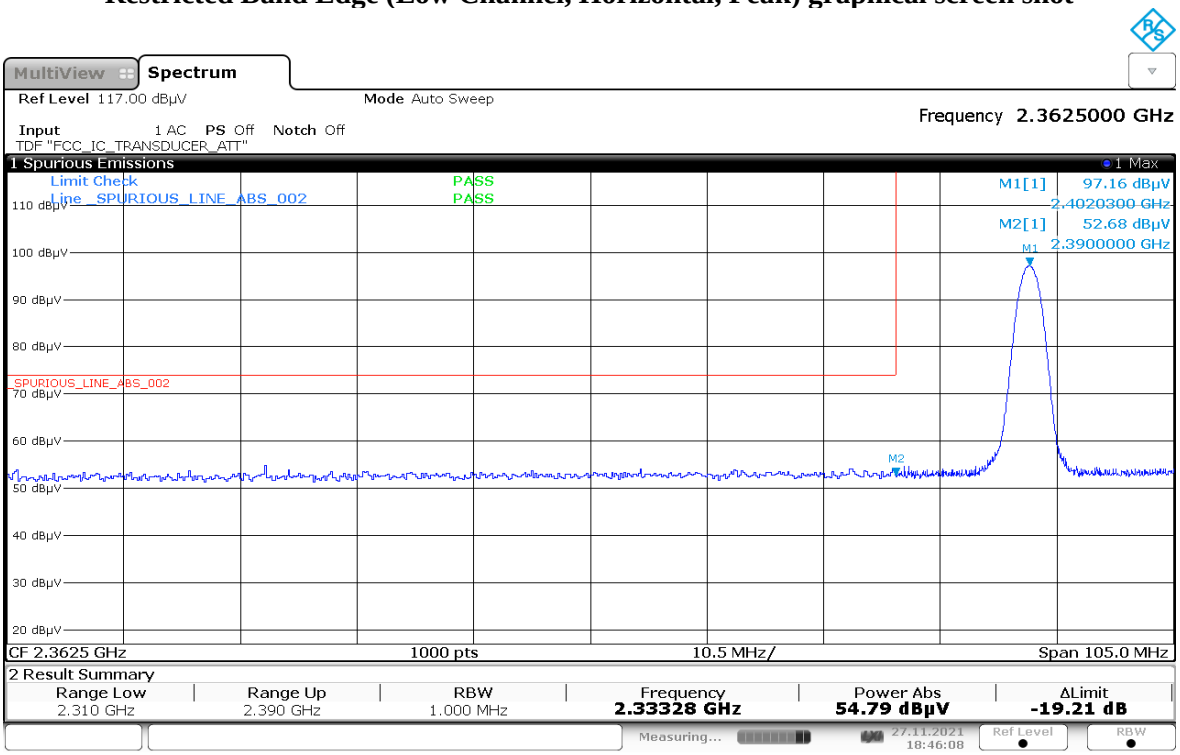
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (Low Channel, Vertical, Peak) graphical screen shot



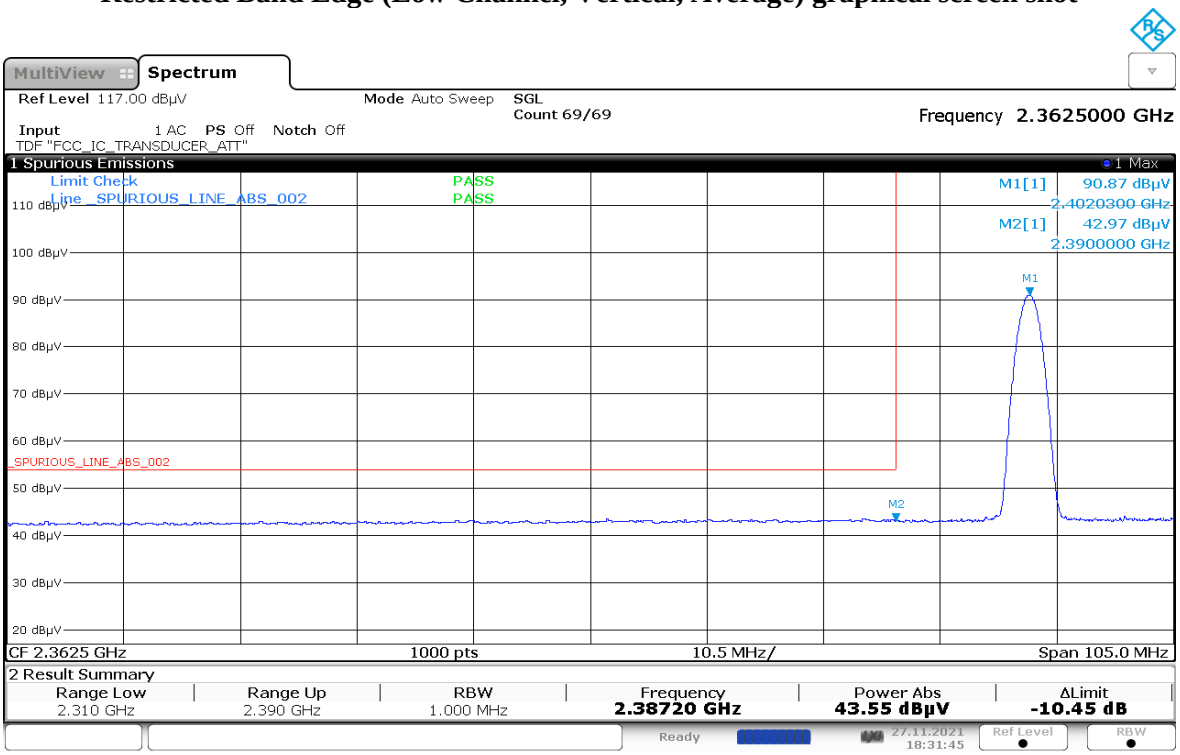

**18:42:30 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Peak) graphical screen shot



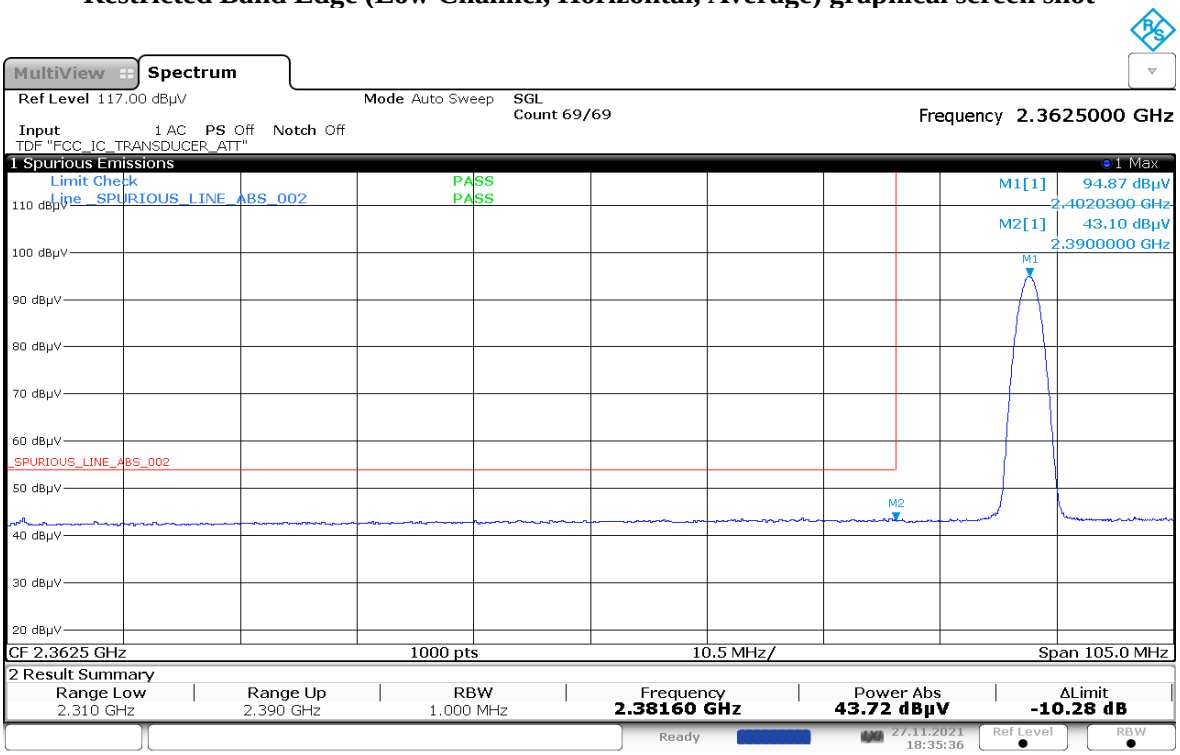

**18:46:09 27.11.2021**

## Restricted Band Edge (Low Channel, Vertical, Average) graphical screen shot




**18:31:46 27.11.2021**

## Restricted Band Edge (Low Channel, Horizontal, Average) graphical screen shot




**18:35:36 27.11.2021**

**Test: Bluetooth SAC Restricted Band Edge**
**Model Number: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (8DPSK)**

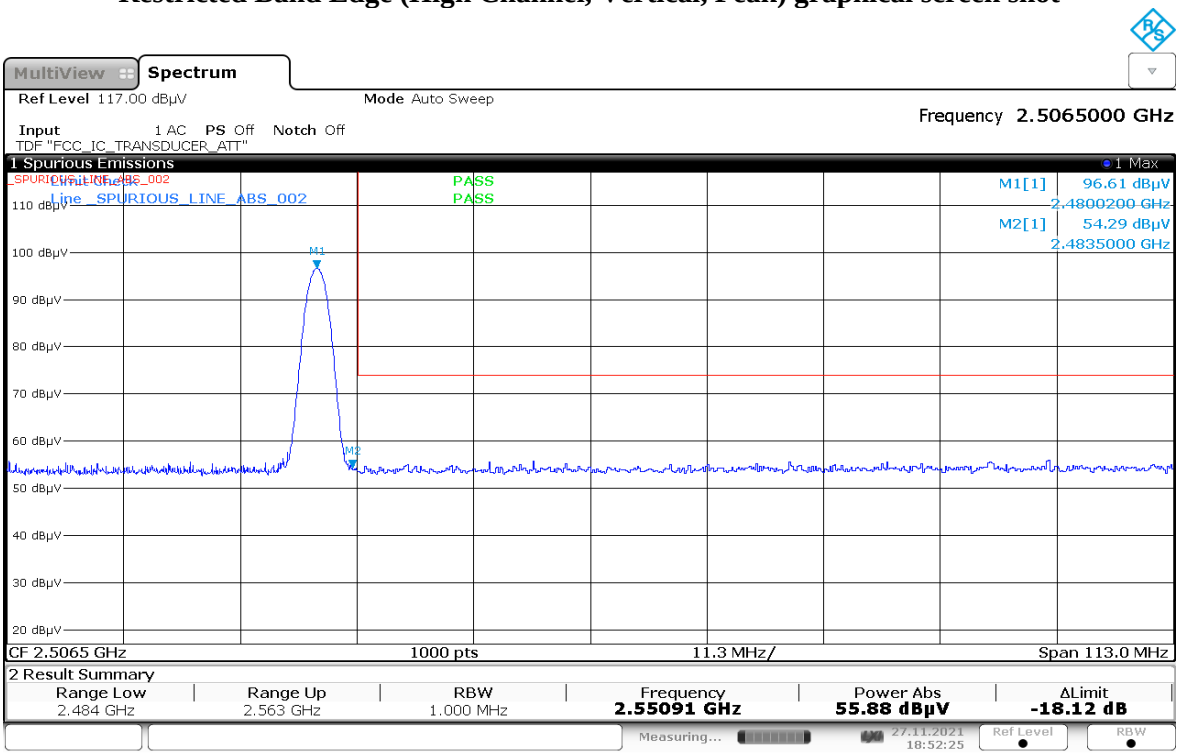
## Restricted Band Edge (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 2483.5000 | - | 54.2883 | 43.6906 | - | 74.0000 | 54.0000 | - | -19.7117 | -10.3094 | - |
| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 2483.5000 | - | 55.3794 | 43.9025 | - | 74.0000 | 54.0000 | - | -18.6206 | -10.0975 | - |

| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

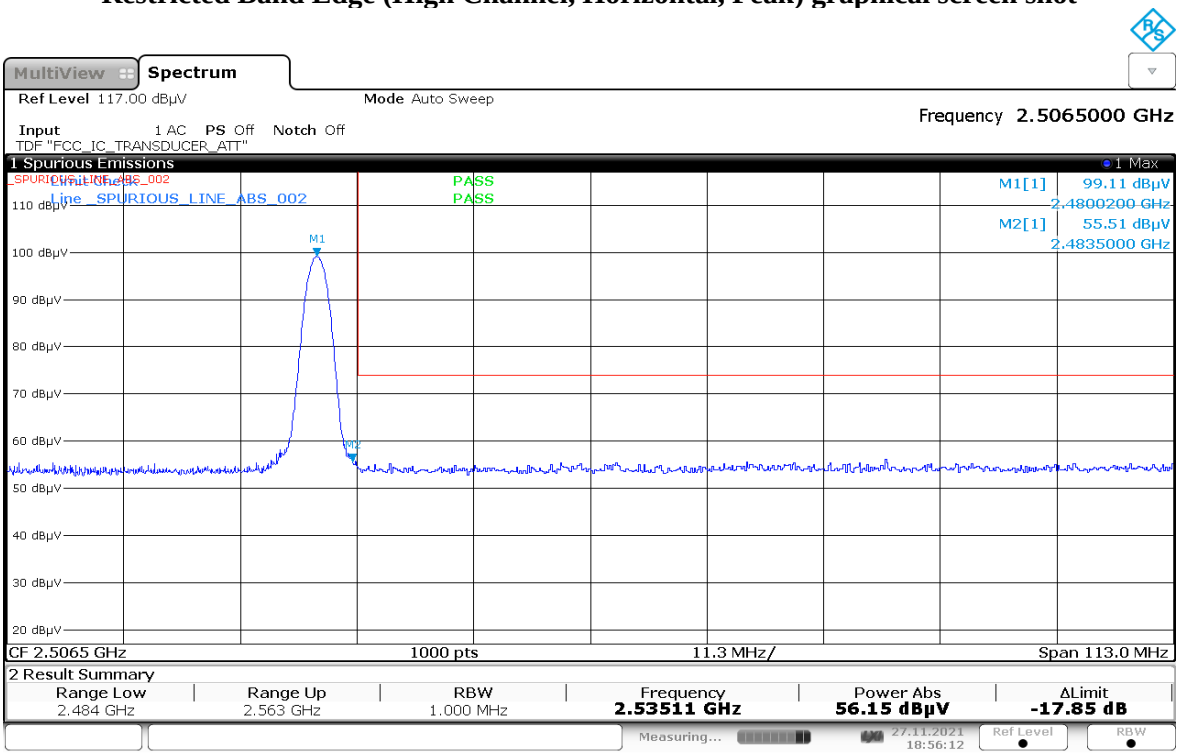
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sat, 27 Nov, 2021**
**System MU: 5.84dB**

## Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



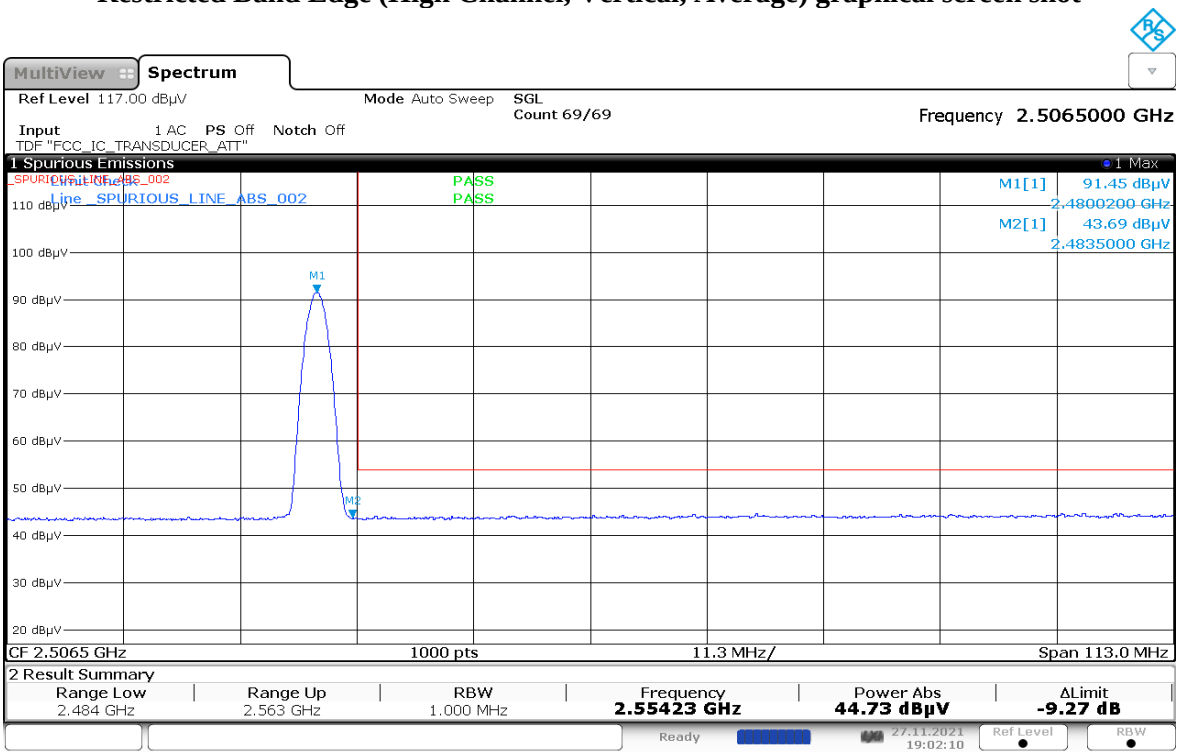

**18:52:26 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



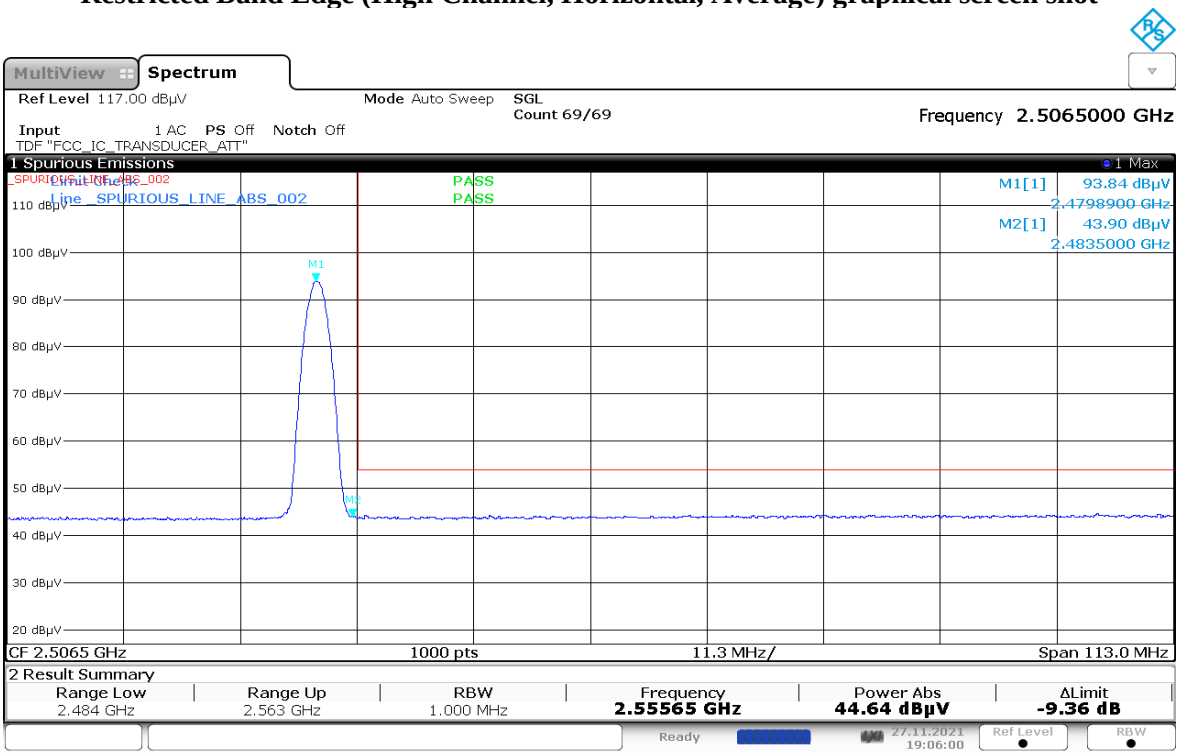

**18:56:13 27.11.2021**

## Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot




**19:02:11 27.11.2021**

## Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot




**19:06:00 27.11.2021**

**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (GFSK)**

## Radiated Emission (Low Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4804 | - | 48.2001** | - | - | 74.0 | - | - | 25.7999 | - | - |
| 7206 | - | 52.8542** | - | - | 86.3528 | - | - | 33.4986 | - | 106.3528 |
| 9608 | - | 56.0747** | - | - | 86.3528 | - | - | 30.2781 | - | 106.3528 |
| 12010 | - | 59.6260** | 37.1260** | - | 74.0 | 54.0 | - | 14.3740 | - | - |
| 14412 | - | 61.2645** | - | - | 86.3528 | - | - | 25.0883 | - | 106.3528 |
| 16814 | - | 63.3906** | - | - | 86.3528 | - | - | 22.9622 | - | 106.3528 |
| 19216 | - | 36.1468** | - | - | 74.0 | - | - | 37.8532 | - | - |
| 21618 | - | 36.5466** | - | - | 86.3528 | - | - | 49.8062 | - | 106.3528 |
| 24020 | - | 37.3462** | - | - | 86.3528 | - | - | 49.0066 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4804 | - | 49.7692** | - | - | 74.0 | - | - | 24.2308 | - | - |
| 7206 | - | 53.7467** | - | - | 86.3528 | - | - | 32.6061 | - | 106.3528 |
| 9608 | - | 56.3701** | - | - | 86.3528 | - | - | 29.9827 | - | 106.3528 |
| 12010 | - | 60.1742** | 37.6742** | - | 74.0 | 54.0 | - | 13.8258 | - | - |
| 14412 | - | 61.9916** | - | - | 86.3528 | - | - | 24.3612 | - | 106.3528 |
| 16814 | - | 63.6710** | - | - | 86.3528 | - | - | 22.6818 | - | 106.3528 |
| 19216 | - | 33.7715** | - | - | 74.0 | - | - | 40.2285 | - | - |
| 21618 | - | 36.8516** | - | - | 86.3528 | - | - | 49.5012 | - | 106.3528 |
| 24020 | - | 36.7914** | - | - | 86.3528 | - | - | 49.5614 | - | 106.3528 |
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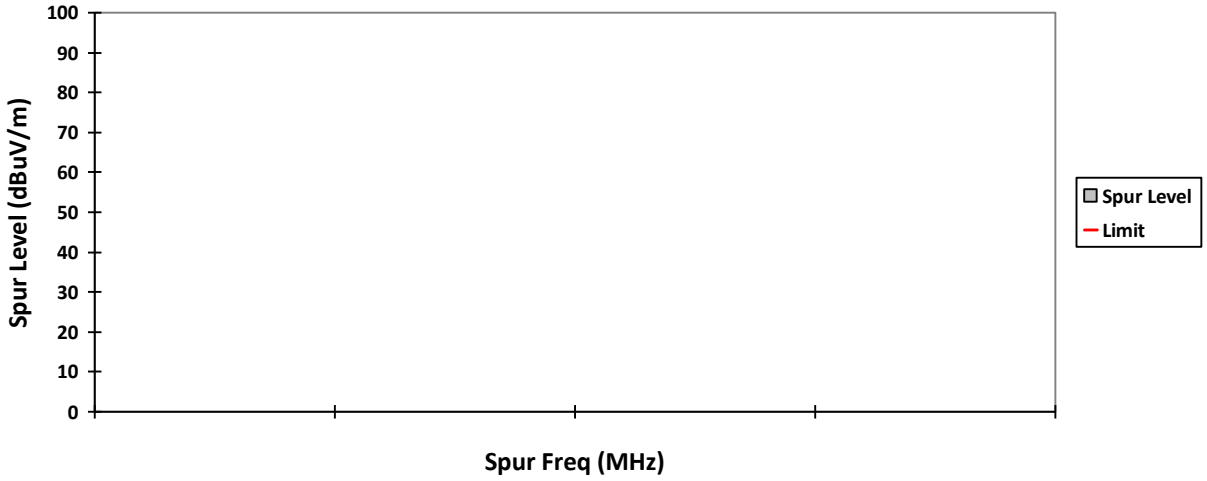
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

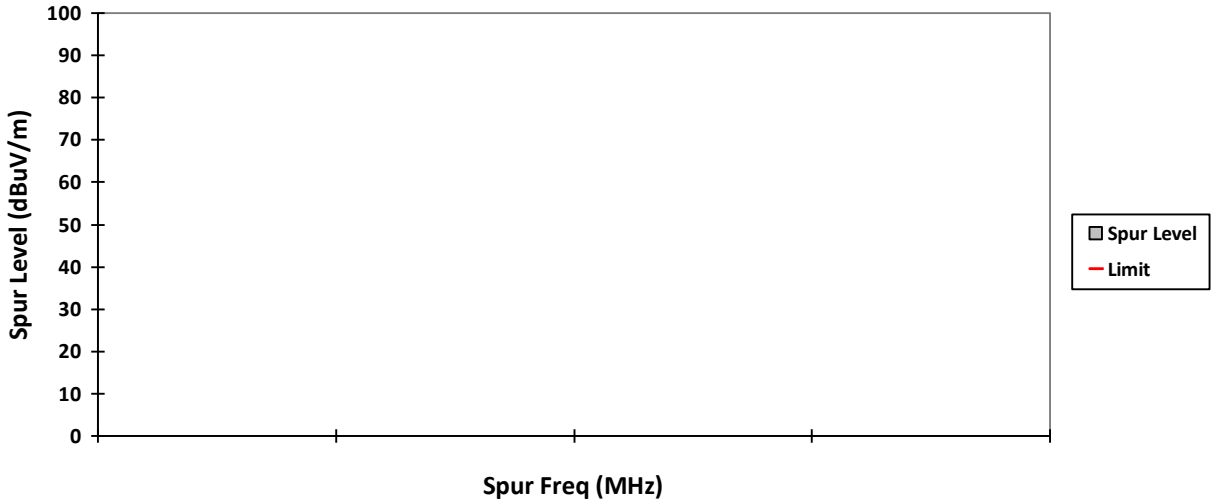
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

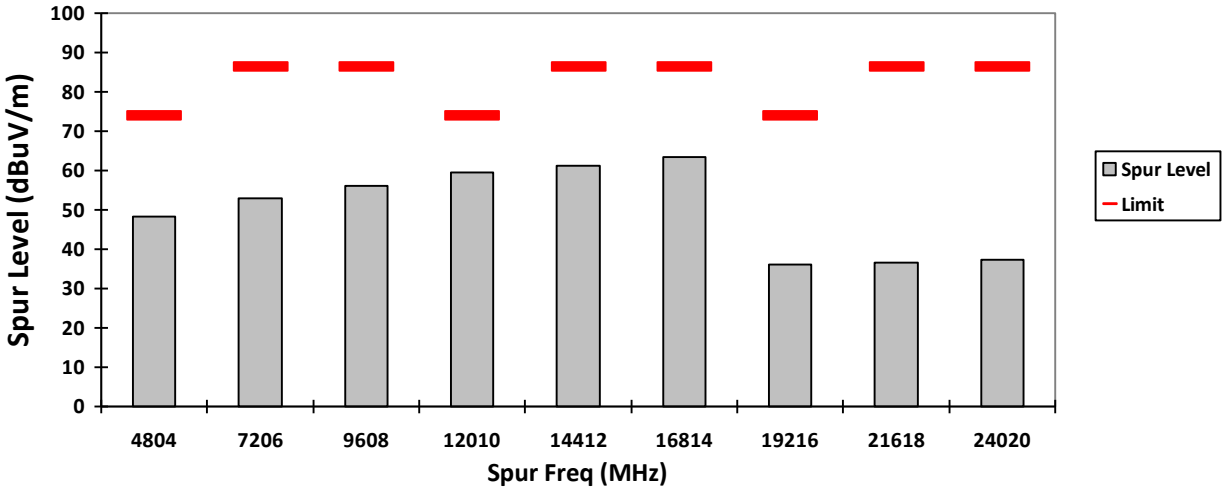
**VERTICAL, QPK**



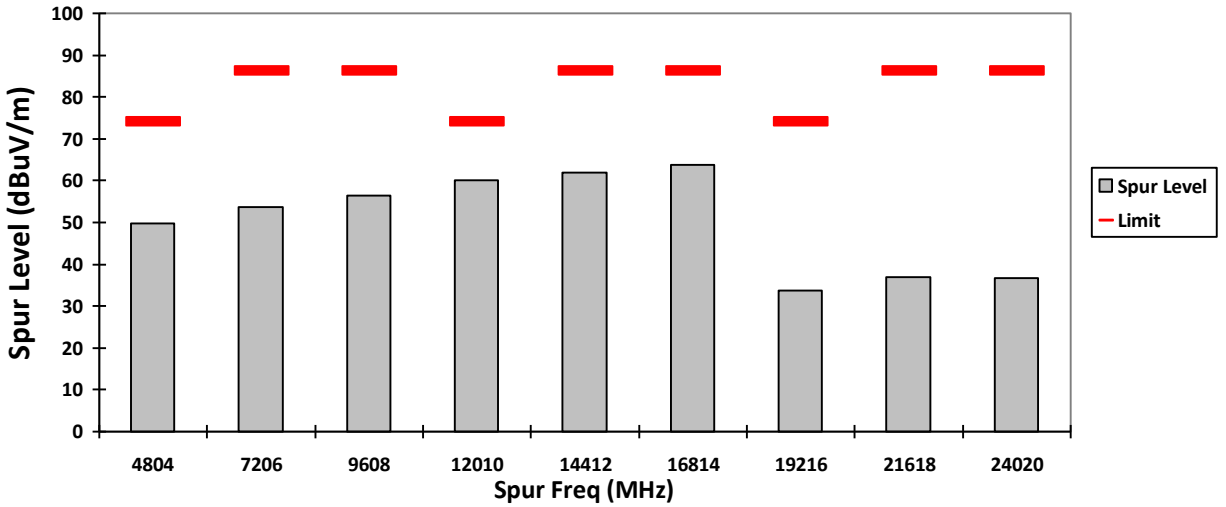

**HORIZONTAL, QPK**



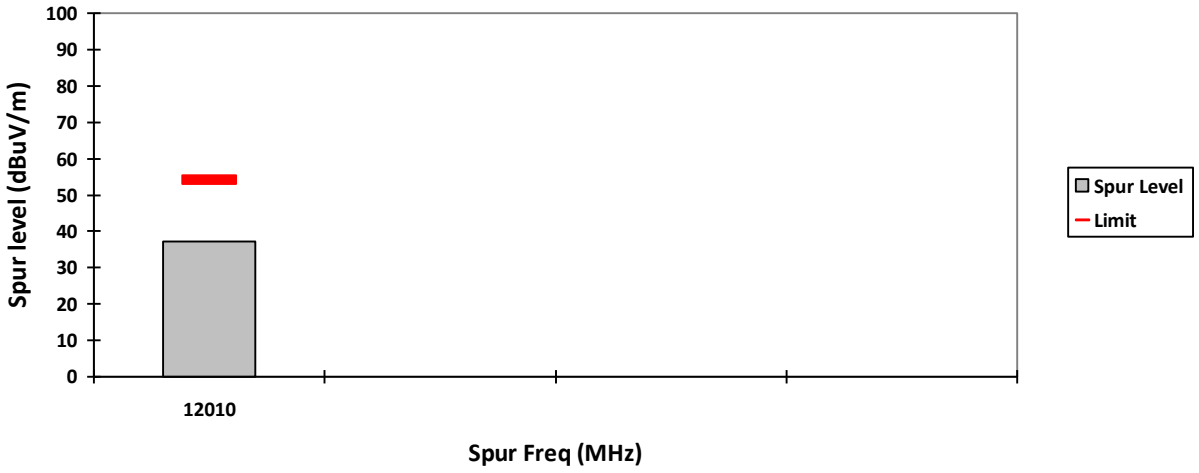
**VERTICAL, PK**



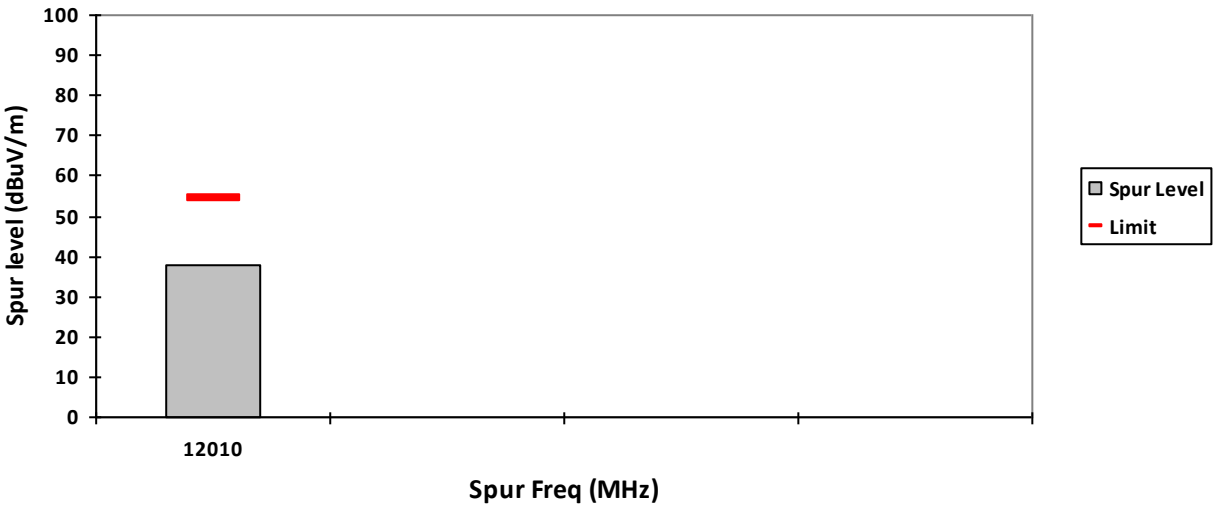

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Mid Test Frequency: 2441.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (GFSK)**

## Radiated Emission (Mid Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4882 | - | 48.8045** | - | - | 74.0 | - | - | 25.1955 | - | - |
| 7323 | - | 52.5041** | - | - | 74.0 | - | - | 21.4959 | - | - |
| 9764 | - | 57.1049** | - | - | 86.3528 | - | - | 29.2479 | - | 106.3528 |
| 12205 | - | 60.6340** | 38.1340** | - | 74.0 | 54.0 | - | 13.3660 | 15.8660 | - |
| 14646 | - | 61.7104** | - | - | 86.3528 | - | - | 24.6424 | - | 106.3528 |
| 17087 | - | 63.7262** | - | - | 86.3528 | - | - | 22.6266 | - | 106.3528 |
| 19528 | - | 33.1420** | - | - | 74.0 | - | - | 40.8580 | - | - |
| 21969 | - | 40.3089** | - | - | 86.3528 | - | - | 46.0439 | - | 106.3528 |
| 24410 | - | 38.2548** | - | - | 86.3528 | - | - | 48.0980 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4882 | - | 49.1674** | - | - | 74.0 | - | - | 24.8326 | - | - |
| 7323 | - | 52.9982** | - | - | 74.0 | - | - | 21.0018 | - | - |
| 9764 | - | 57.5044** | - | - | 86.3528 | - | - | 28.8484 | - | 106.3528 |
| 12205 | - | 59.1269** | 36.6269** | - | 74.0 | 54.0 | - | 14.8731 | 17.3731 | - |
| 14646 | - | 61.9358** | - | - | 86.3528 | - | - | 24.4170 | - | 106.3528 |
| 17087 | - | 64.3705** | - | - | 86.3528 | - | - | 21.9823 | - | 106.3528 |
| 19528 | - | 32.4498** | - | - | 74.0 | - | - | 41.5502 | - | - |
| 21969 | - | 38.5114** | - | - | 86.3528 | - | - | 47.8414 | - | 106.3528 |
| 24410 | - | 38.0078** | - | - | 86.3528 | - | - | 48.3450 | - | 106.3528 |
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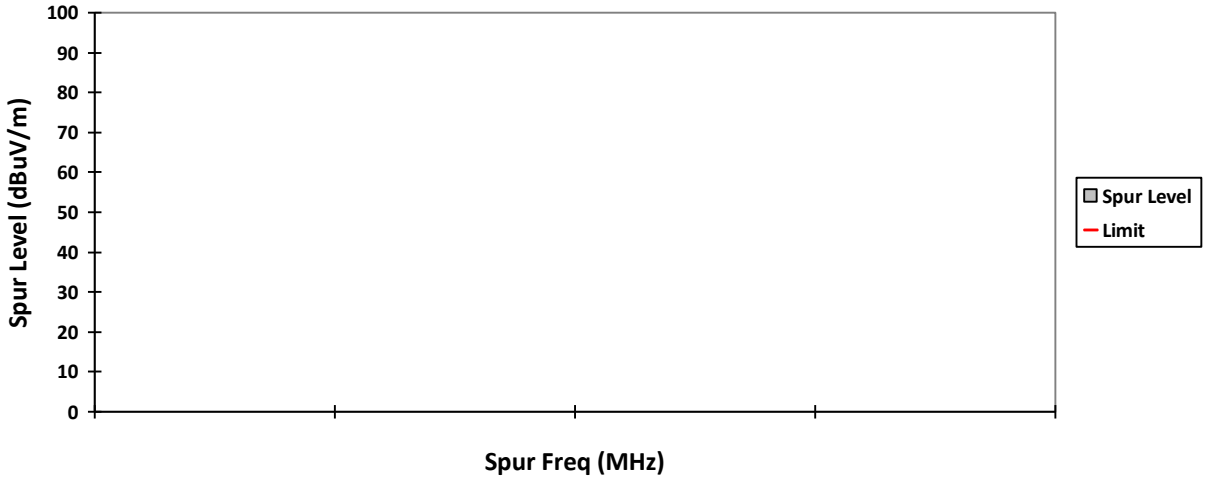
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

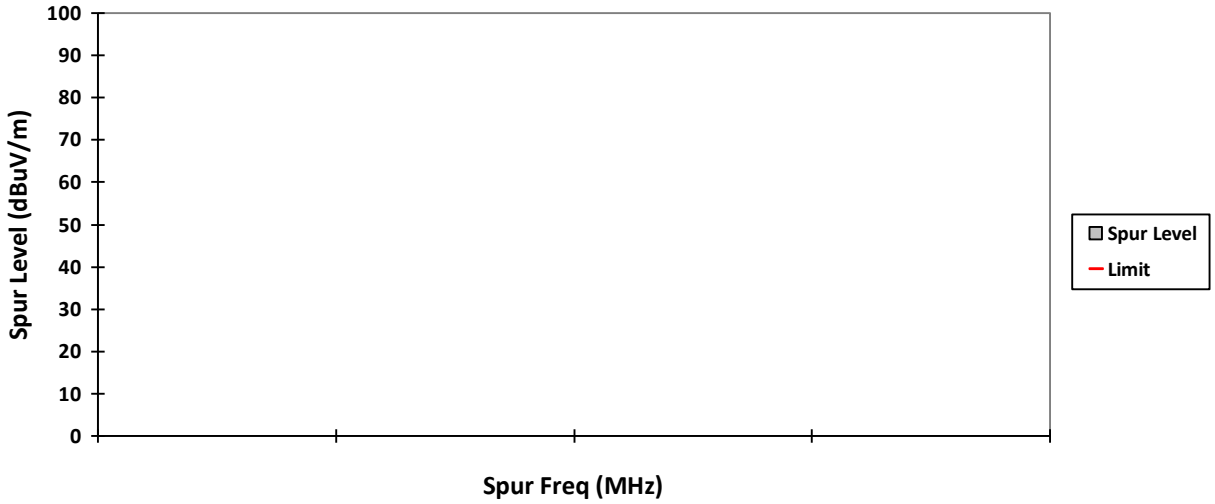
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

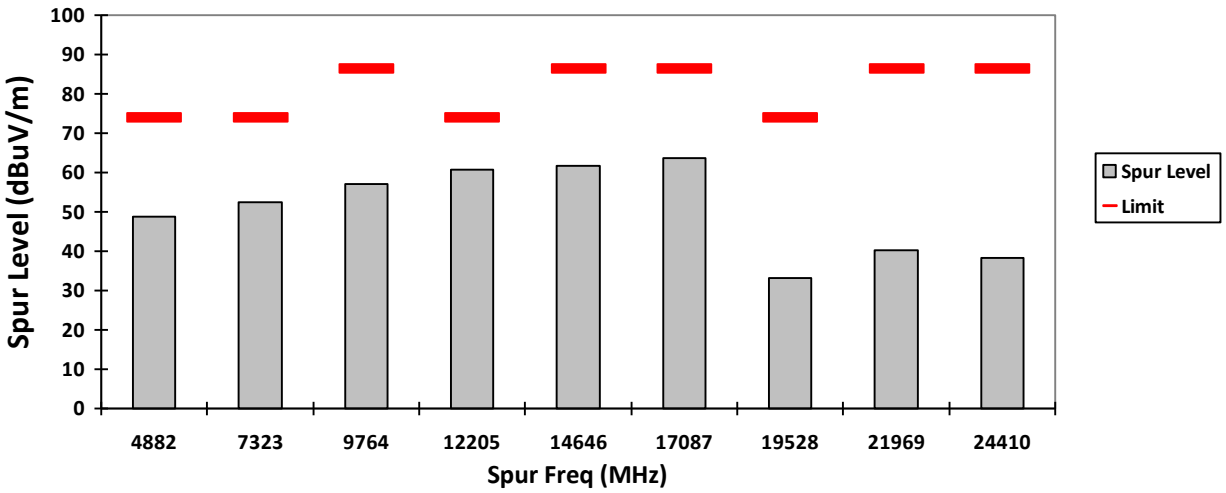
**VERTICAL, QPK**



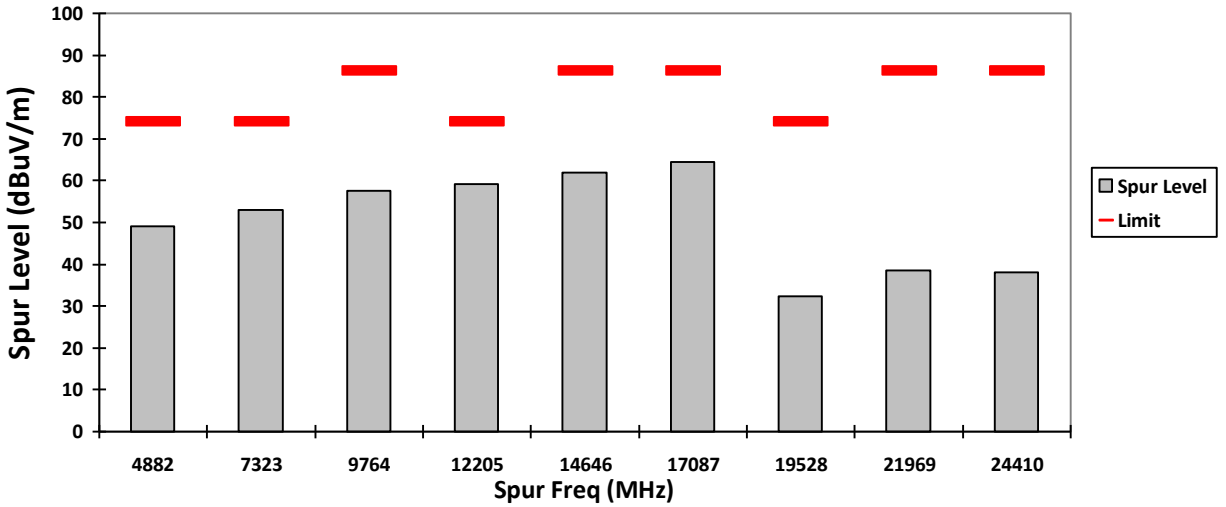

**HORIZONTAL, QPK**



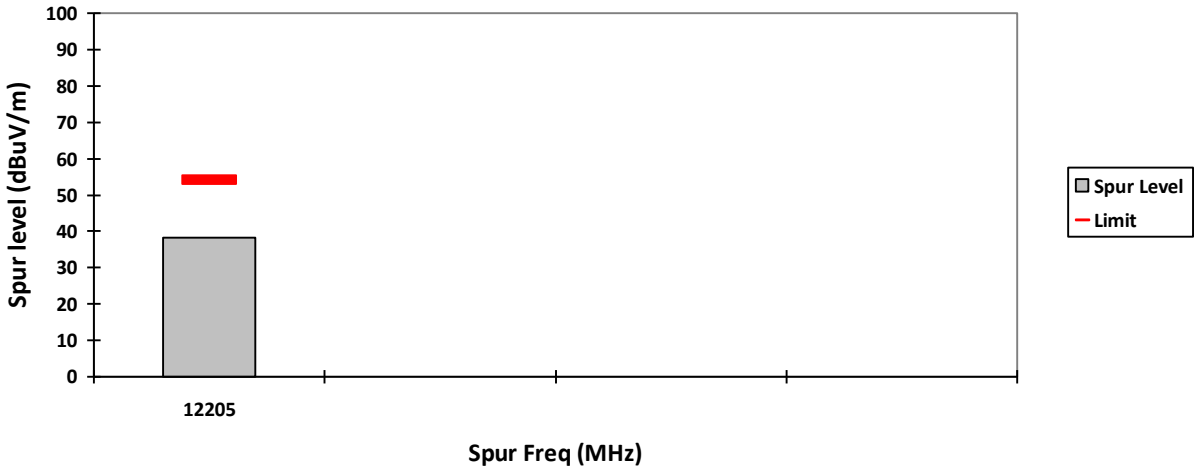
**VERTICAL, PK**



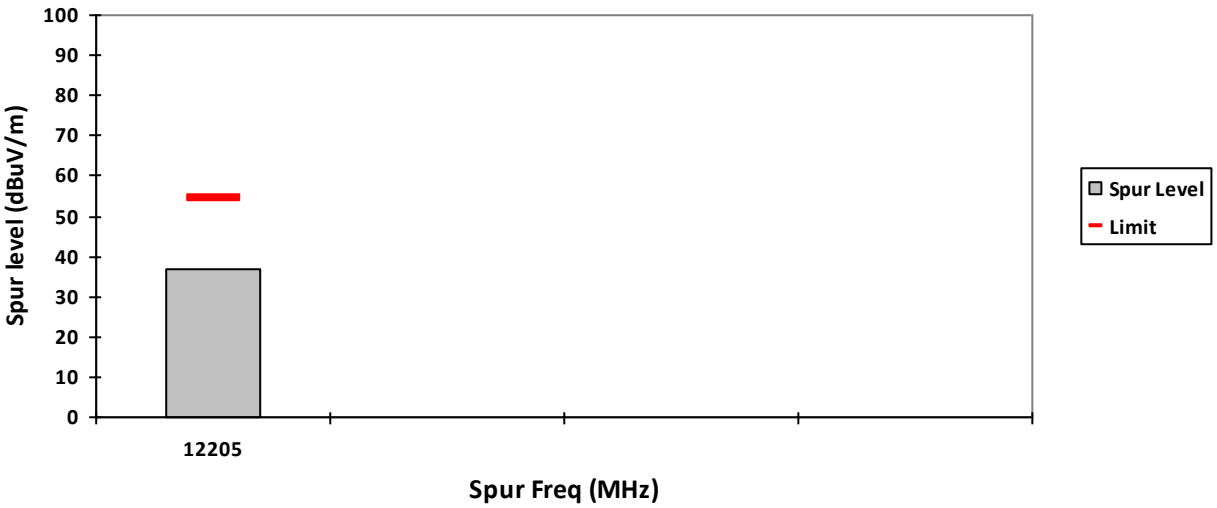

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (GFSK)**

## Radiated Emission (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4960 | - | 48.2007** | - | - | 74.0 | - | - | 25.7993 | - | - |
| 7440 | - | 53.9847** | - | - | 74.0 | - | - | 20.0153 | - | - |
| 9920 | - | 57.7693** | - | - | 86.3528 | - | - | 28.5835 | - | 106.3528 |
| 12400 | - | 58.7881** | 36.2881** | - | 74.0 | 54.0 | - | 15.2119 | 17.7119 | - |
| 14880 | - | 60.4765** | - | - | 86.3528 | - | - | 25.8763 | - | 106.3528 |
| 17360 | - | 64.9794** | - | - | 86.3528 | - | - | 21.3734 | - | 106.3528 |
| 19840 | - | 33.1837** | - | - | 74.0 | - | - | 40.8163 | - | - |
| 22320 | - | 36.8170** | - | - | 74.0 | - | - | 37.1830 | - | - |
| 24800 | - | 38.7425** | - | - | 86.3528 | - | - | 47.6103 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4960 | - | 48.2828** | - | - | 74.0 | - | - | 25.7172 | - | - |
| 7440 | - | 52.7887** | - | - | 74.0 | - | - | 21.2113 | - | - |
| 9920 | - | 57.4968** | - | - | 86.3528 | - | - | 28.8560 | - | 106.3528 |
| 12400 | - | 57.7561** | 35.2561** | - | 74.0 | 54.0 | - | 16.2439 | 18.7439 | - |
| 14880 | - | 61.5526** | - | - | 86.3528 | - | - | 24.8002 | - | 106.3528 |
| 17360 | - | 64.2653** | - | - | 86.3528 | - | - | 22.0875 | - | 106.3528 |
| 19840 | - | 33.3035** | - | - | 74.0 | - | - | 40.6965 | - | - |
| 22320 | - | 36.6489** | - | - | 74.0 | - | - | 37.3511 | - | - |
| 24800 | - | 37.2865** | - | - | 86.3528 | - | - | 49.0663 | - | 106.3528 |
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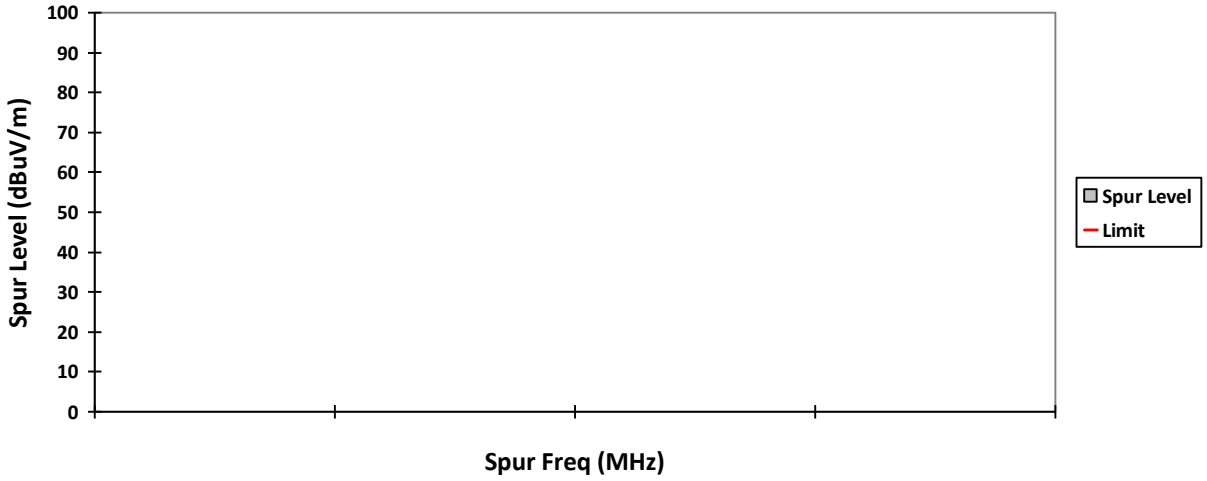
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

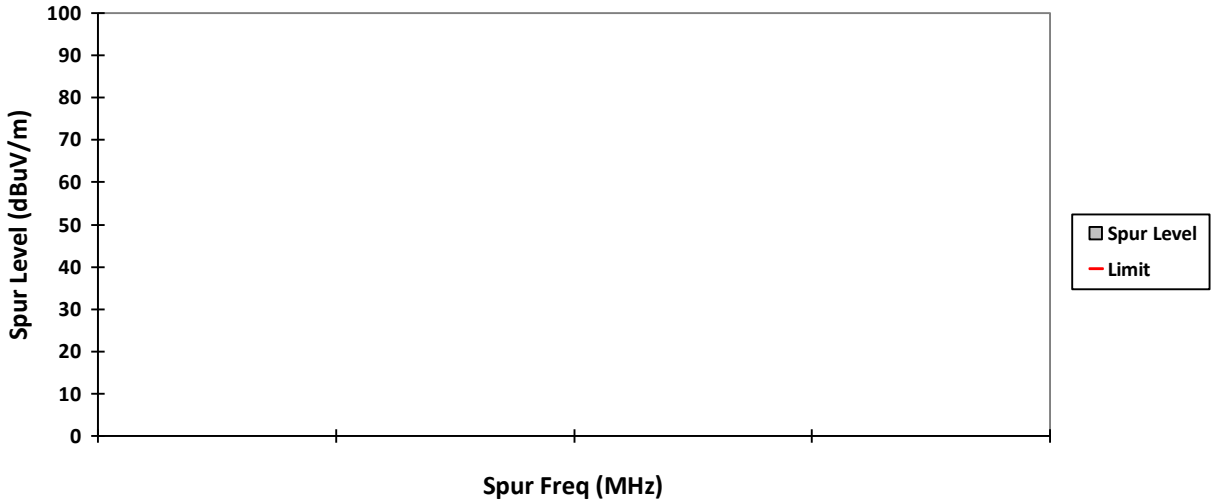
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

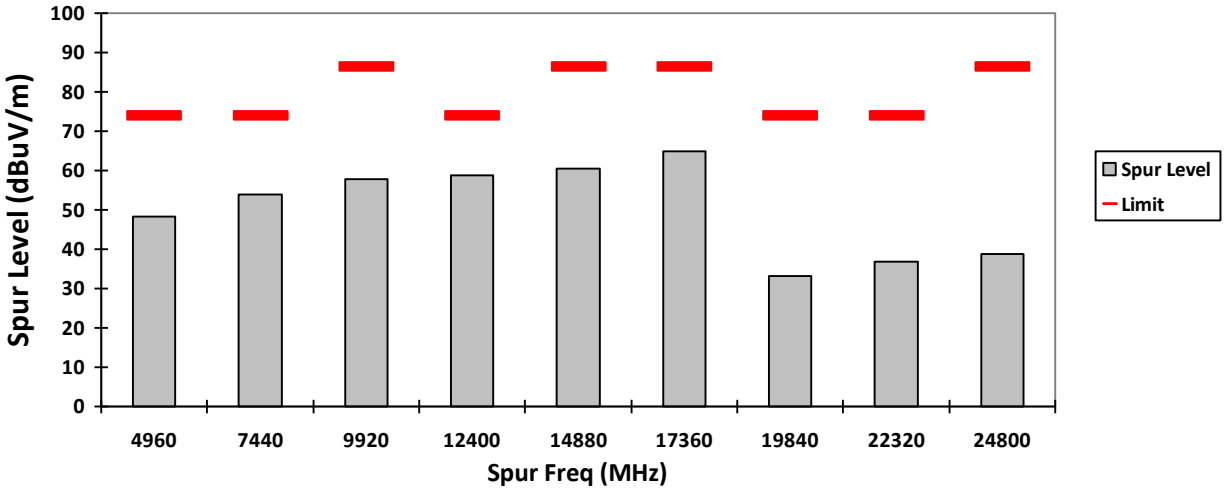
**VERTICAL, QPK**



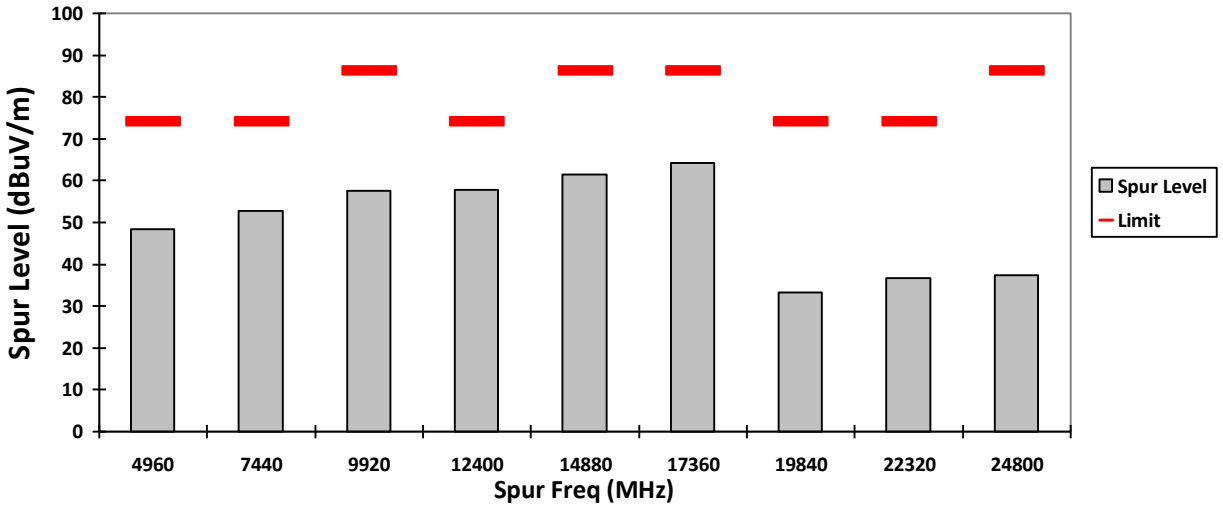

**HORIZONTAL, QPK**



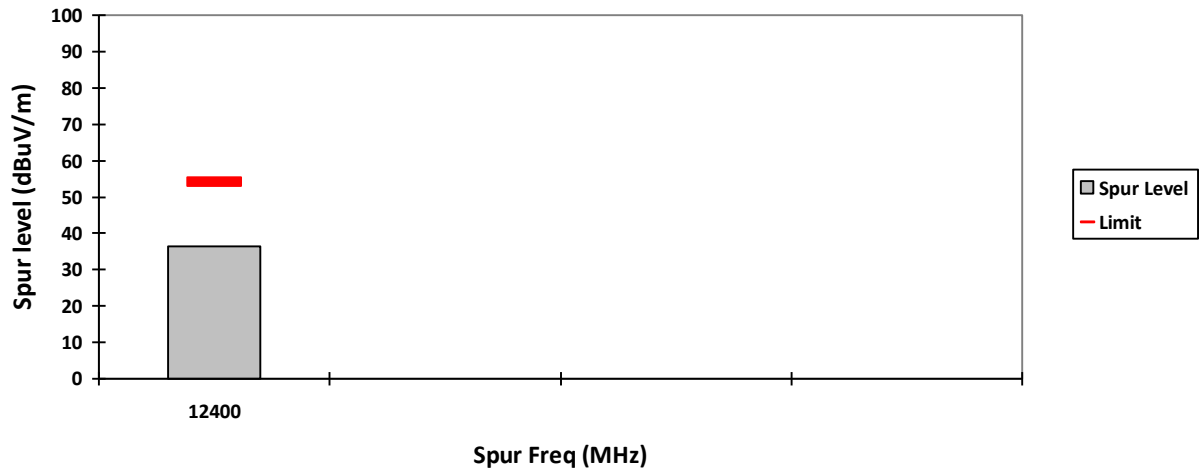
**VERTICAL, PK**



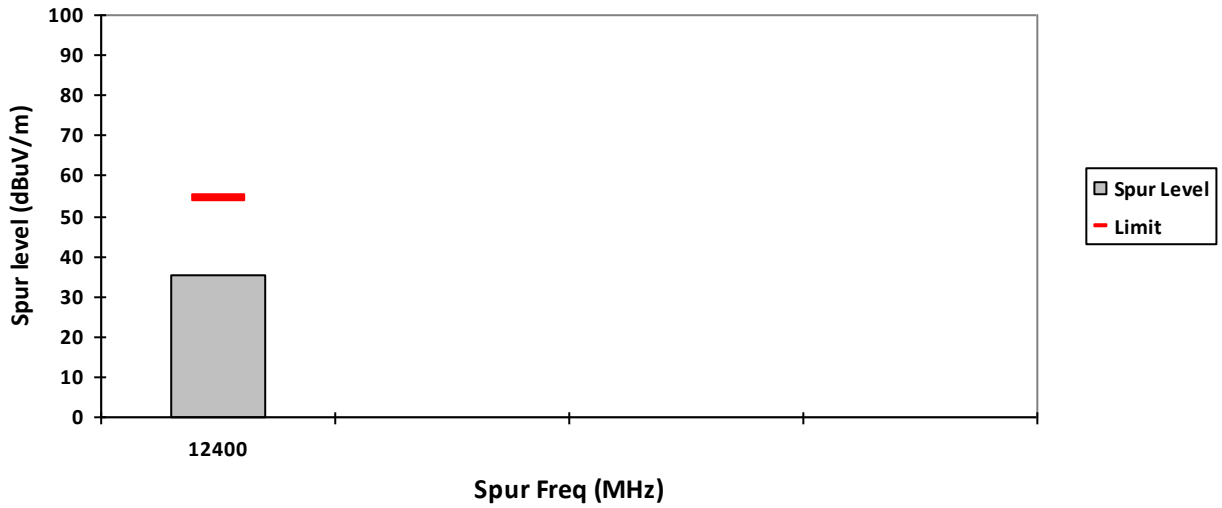

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**




**NOTE:**
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)
Adjusted channel hop rate for DH5 mode = 133.33 hops/second
Time per channel hop = 1 / 133.33 hops/second = 7.5 ms
Time to cycle through all channels = 7.5 x 20 channels = 150 ms
Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
Worst case dwell time = 7.5 ms
Duty cycle connection factor = $20\log_{10}$ (7.5ms / 100ms) = **-22.5 dB**

**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (DQPSK)**

## Radiated Emission (Low Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4804 | - | 48.5050** | - | - | 74.0 | - | - | 25.4950 | - | - |
| 7206 | - | 54.0293** | - | - | 86.3528 | - | - | 32.3235 | - | 106.3528 |
| 9608 | - | 55.5371** | - | - | 86.3528 | - | - | 30.8157 | - | 106.3528 |
| 12010 | - | 60.7349** | 38.2349** | - | 74.0 | 54.0 | - | 13.2651 | - | - |
| 14412 | - | 61.8593** | - | - | 86.3528 | - | - | 24.4935 | - | 106.3528 |
| 16814 | - | 64.3863** | - | - | 86.3528 | - | - | 21.9665 | - | 106.3528 |
| 19216 | - | 34.2574** | - | - | 74.0 | - | - | 39.7426 | - | - |
| 21618 | - | 35.5028** | - | - | 86.3528 | - | - | 50.8500 | - | 106.3528 |
| 24020 | - | 37.7445** | - | - | 86.3528 | - | - | 48.6083 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4804 | - | 49.6697** | - | - | 74.0 | - | - | 24.3303 | - | - |
| 7206 | - | 53.0689** | - | - | 86.3528 | - | - | 33.2839 | - | 106.3528 |
| 9608 | - | 55.6318** | - | - | 86.3528 | - | - | 30.7210 | - | 106.3528 |
| 12010 | - | 59.7243** | 37.2243** | - | 74.0 | 54.0 | - | 14.2757 | - | - |
| 14412 | - | 61.9569** | - | - | 86.3528 | - | - | 24.3959 | - | 106.3528 |
| 16814 | - | 65.2824** | - | - | 86.3528 | - | - | 21.0704 | - | 106.3528 |
| 19216 | - | 33.4029** | - | - | 74.0 | - | - | 40.5971 | - | - |
| 21618 | - | 36.5546** | - | - | 86.3528 | - | - | 49.7982 | - | 106.3528 |
| 24020 | - | 36.1802** | - | - | 86.3528 | - | - | 50.1726 | - | 106.3528 |
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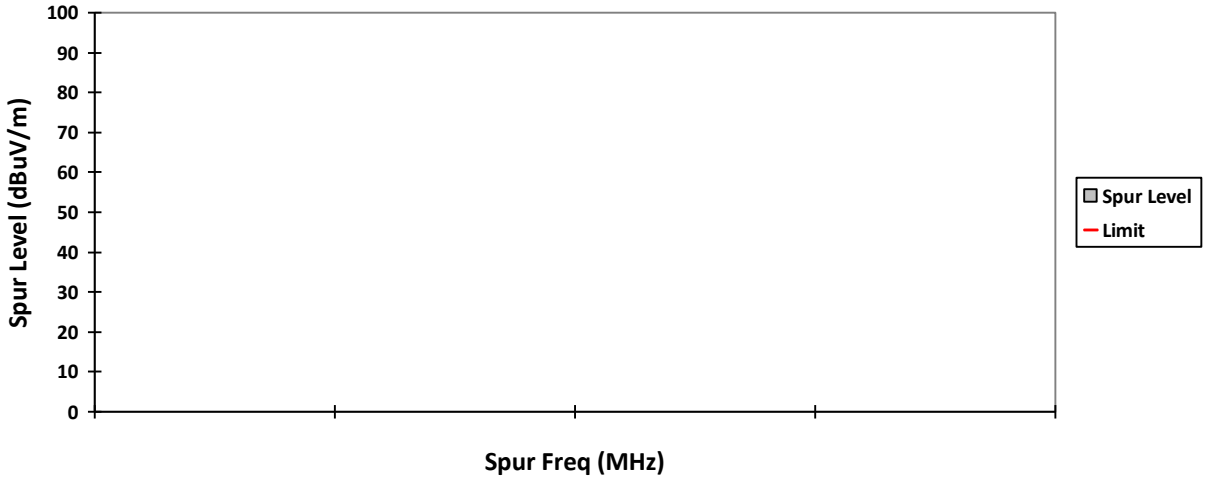
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

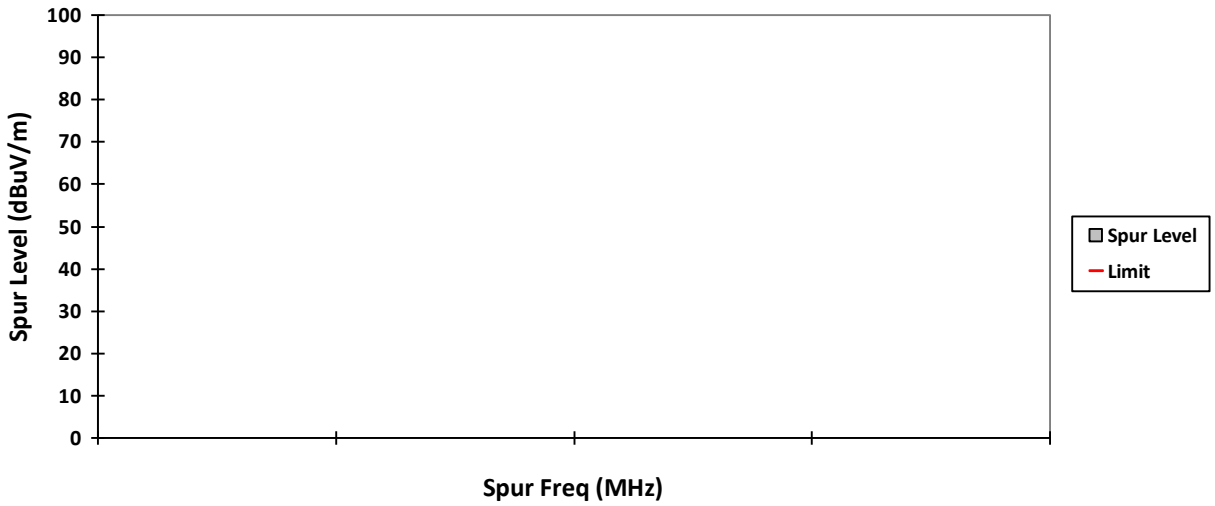
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

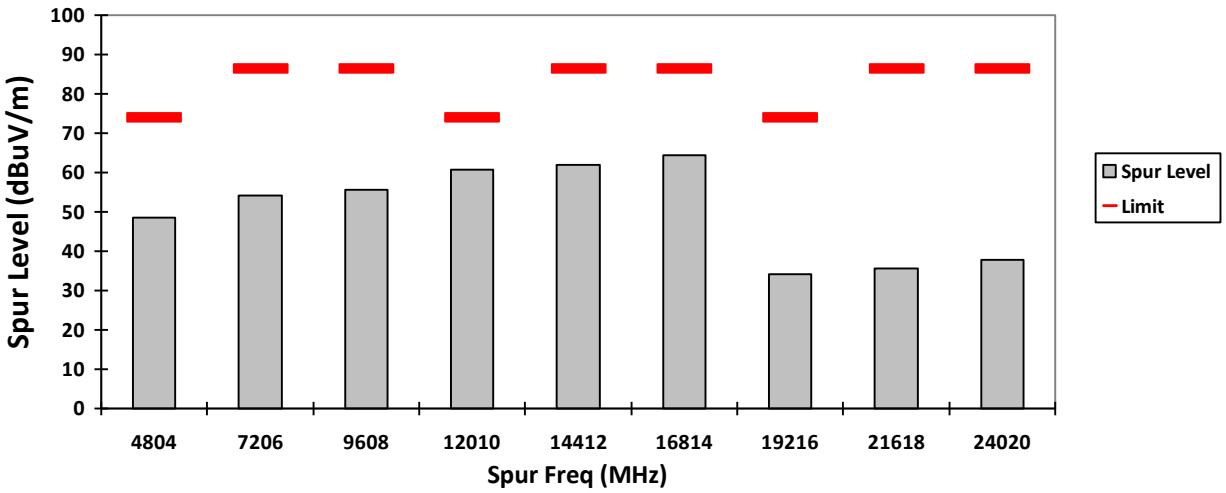
**VERTICAL, QPK**



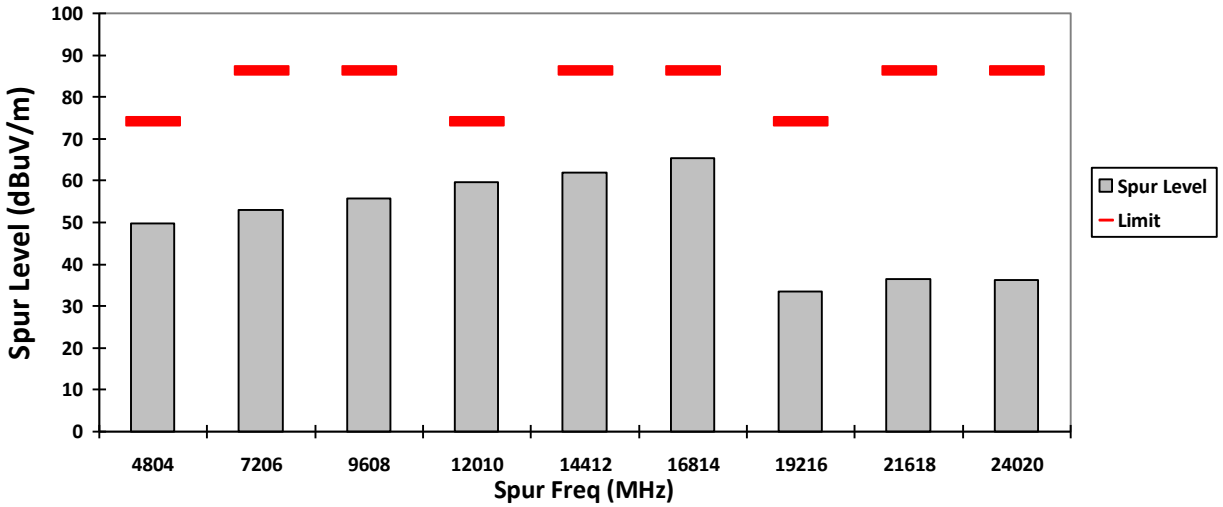

**HORIZONTAL, QPK**



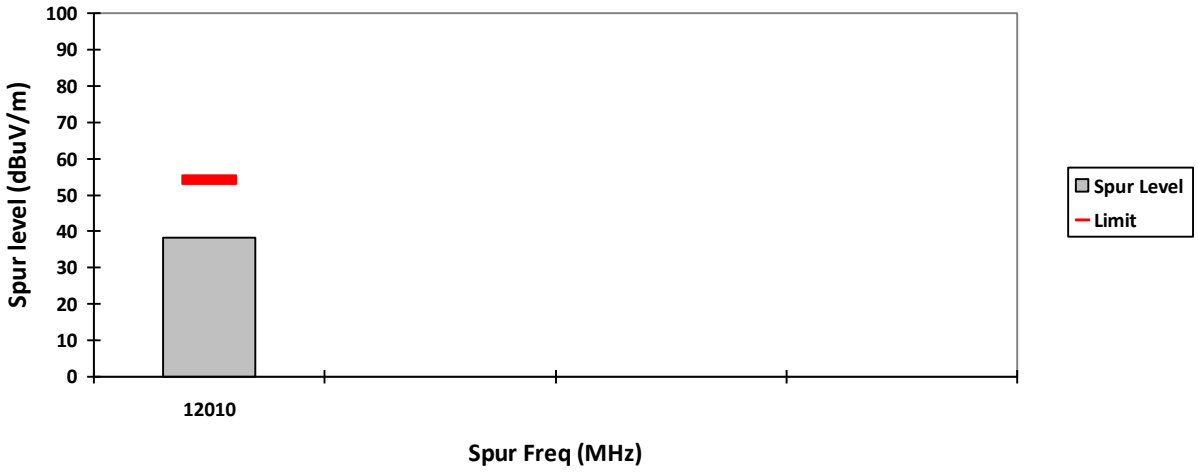
**VERTICAL, PK**



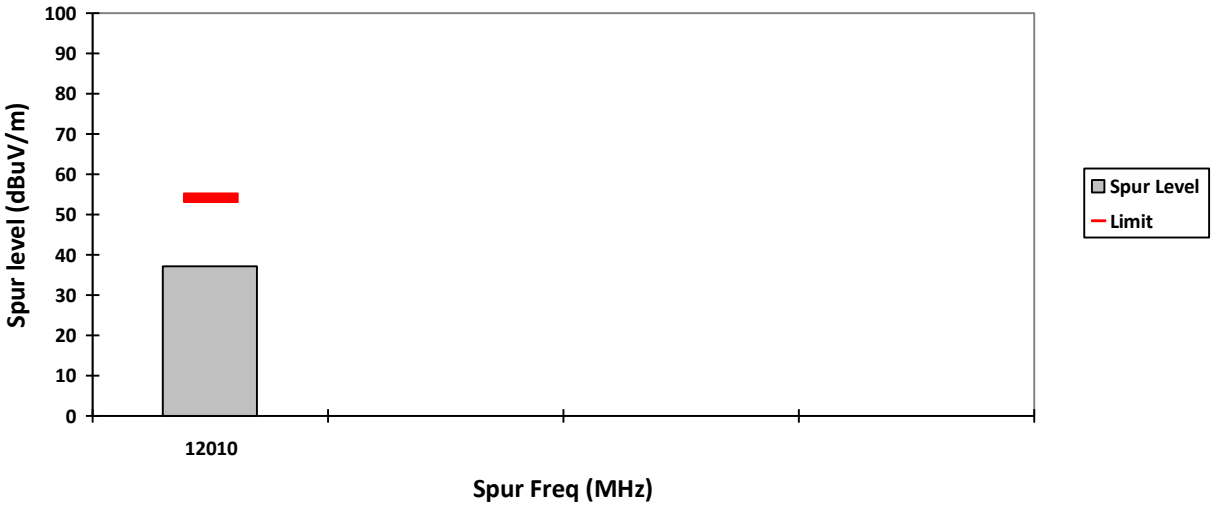

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Mid Test Frequency: 2441.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (DQPSK)**

## Radiated Emission (Mid Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4882 | - | 48.3428** | - | - | 74.0 | - | - | 25.6572 | - | - |
| 7323 | - | 54.4072** | - | - | 74.0 | - | - | 19.5928 | - | - |
| 9764 | - | 57.2178** | - | - | 86.3528 | - | - | 29.1350 | - | 106.3528 |
| 12205 | - | 59.4862** | 36.9862** | - | 74.0 | 54.0 | - | 14.5138 | 17.0138 | - |
| 14646 | - | 60.8230** | - | - | 86.3528 | - | - | 25.5298 | - | 106.3528 |
| 17087 | - | 65.0034** | - | - | 86.3528 | - | - | 21.3494 | - | 106.3528 |
| 19528 | - | 33.1960** | - | - | 74.0 | - | - | 40.8040 | - | - |
| 21969 | - | 40.0927** | - | - | 86.3528 | - | - | 46.2601 | - | 106.3528 |
| 24410 | - | 38.6580** | - | - | 86.3528 | - | - | 47.6948 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4882 | - | 49.4165** | - | - | 74.0 | - | - | 24.5835 | - | - |
| 7323 | - | 54.1496** | - | - | 74.0 | - | - | 19.8504 | - | - |
| 9764 | - | 56.7368** | - | - | 86.3528 | - | - | 29.6160 | - | 106.3528 |
| 12205 | - | 58.4408** | 35.9408** | - | 74.0 | 54.0 | - | 15.5592 | 18.0592 | - |
| 14646 | - | 62.4295** | - | - | 86.3528 | - | - | 23.9233 | - | 106.3528 |
| 17087 | - | 64.0086** | - | - | 86.3528 | - | - | 22.3442 | - | 106.3528 |
| 19528 | - | 33.9491** | - | - | 74.0 | - | - | 40.0509 | - | - |
| 21969 | - | 38.3935** | - | - | 86.3528 | - | - | 47.9593 | - | 106.3528 |
| 24410 | - | 38.3431** | - | - | 86.3528 | - | - | 48.0097 | - | 106.3528 |
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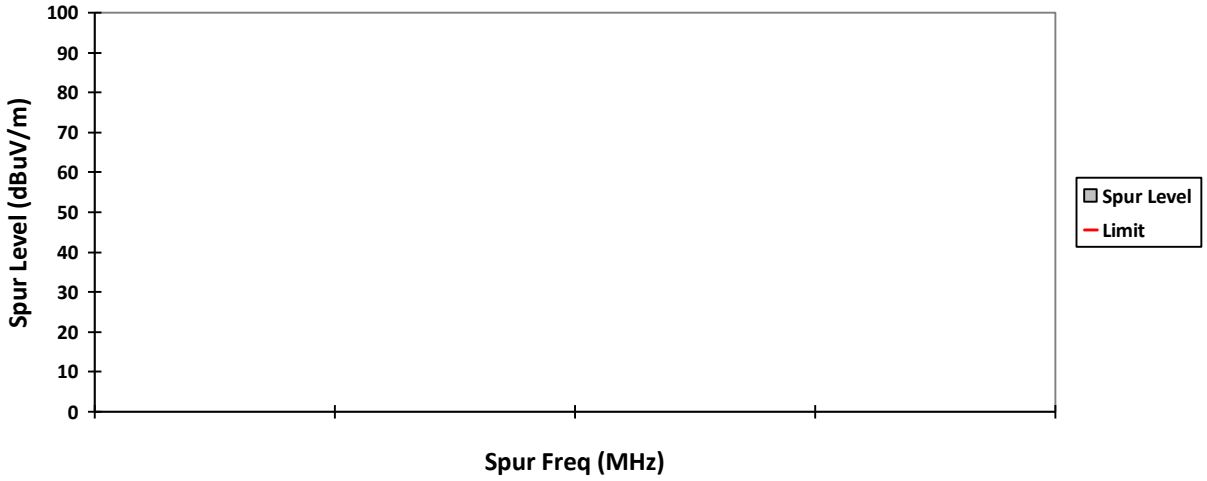
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

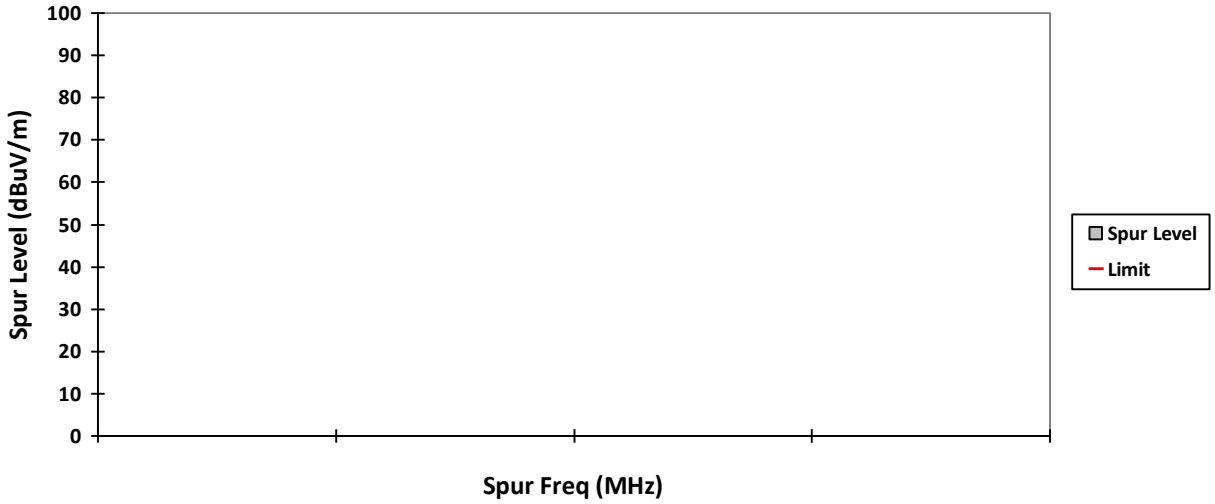
**Temperature (degC): 23.2 Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

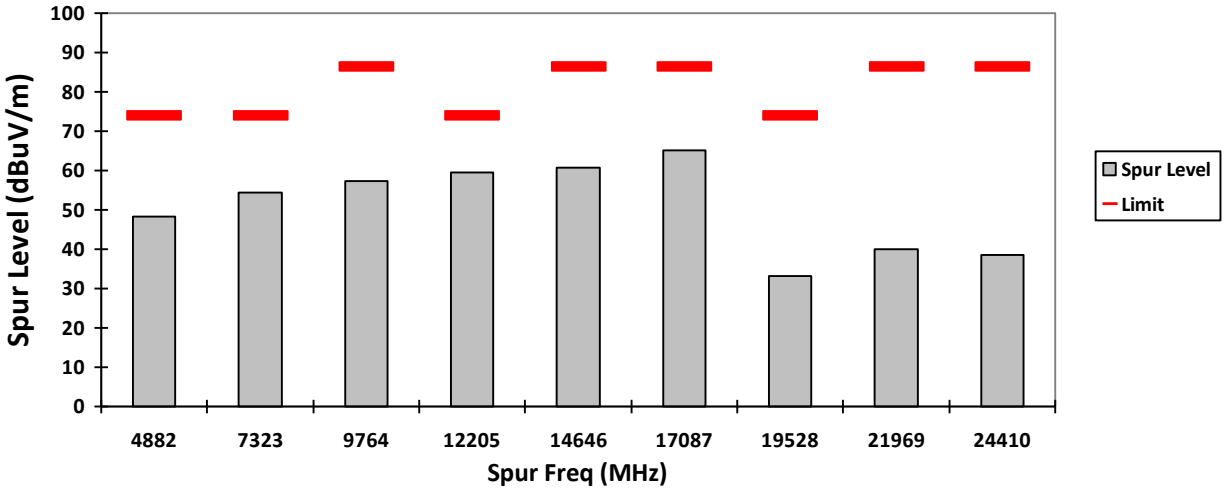
**VERTICAL, QPK**



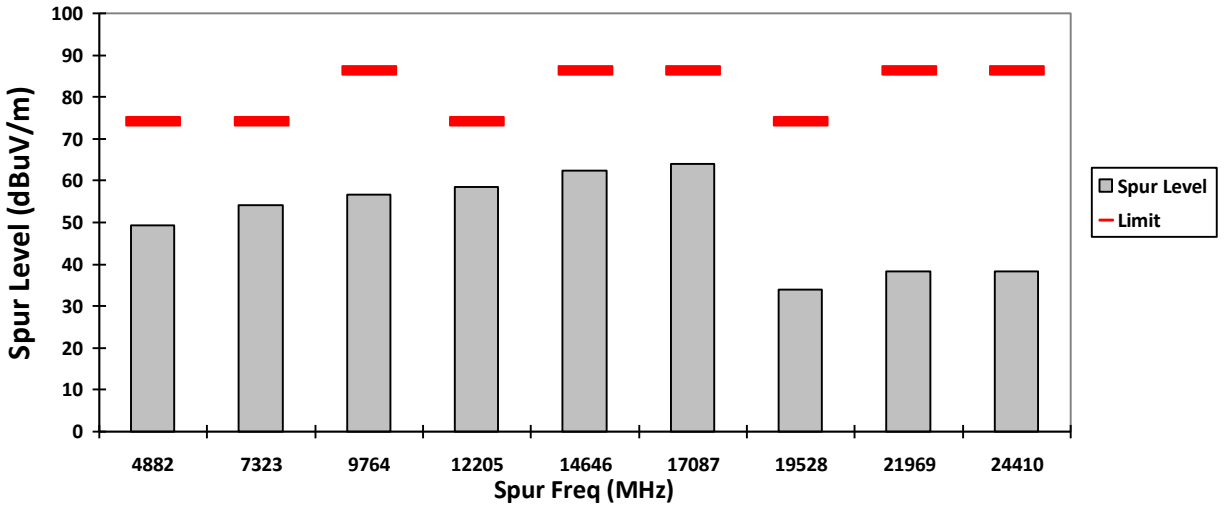

**HORIZONTAL, QPK**



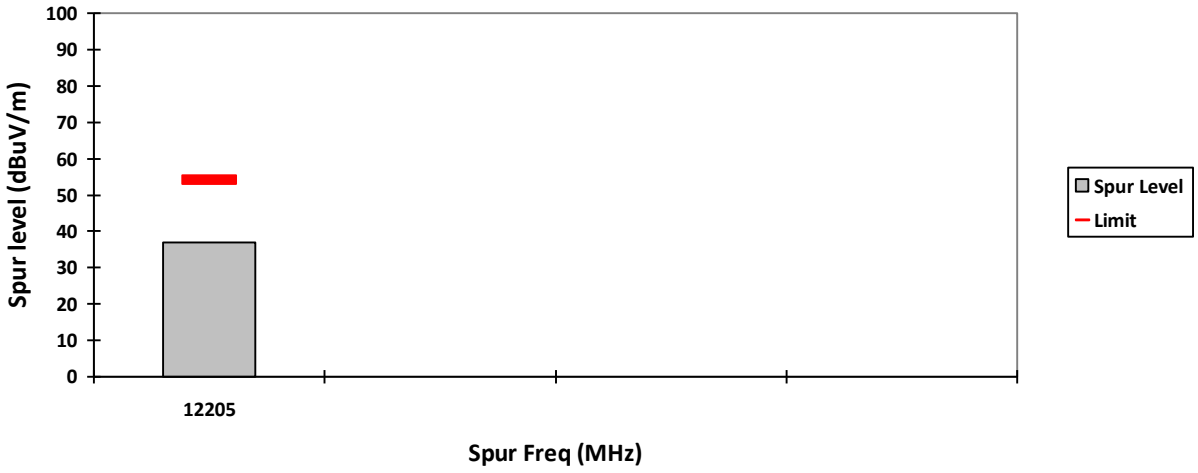
**VERTICAL, PK**



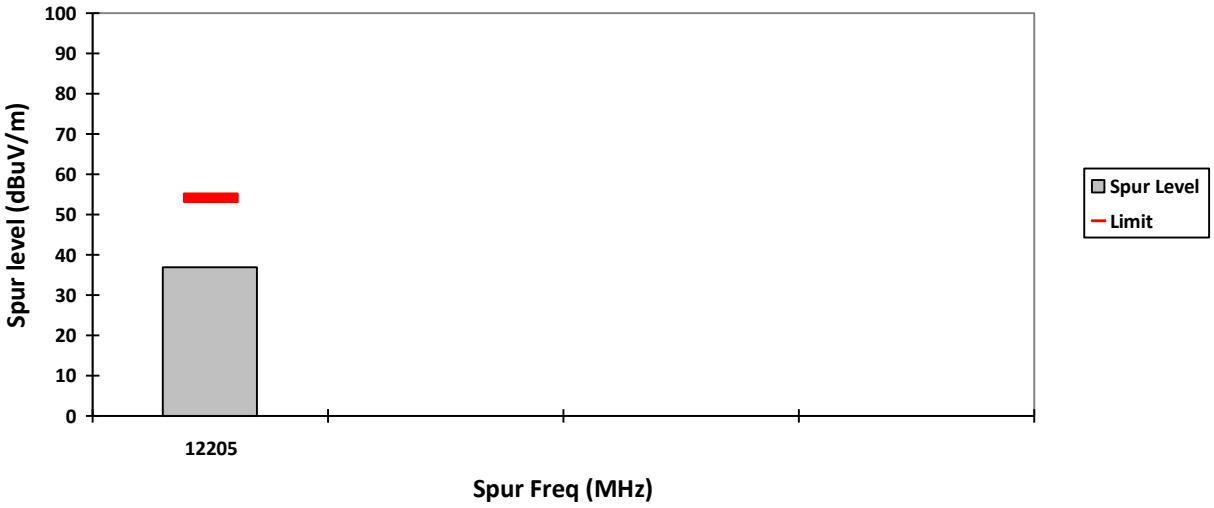

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (DQPSK)**

## Radiated Emission (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4960 | - | 48.7477** | - | - | 74.0 | - | - | 25.2523 | - | - |
| 7440 | - | 54.4313** | - | - | 74.0 | - | - | 19.5687 | - | - |
| 9920 | - | 57.4295** | - | - | 86.3528 | - | - | 28.9233 | - | 106.3528 |
| 12400 | - | 58.5936** | 36.0936** | - | 74.0 | 54.0 | - | 15.4064 | 17.9064 | - |
| 14880 | - | 60.8682** | - | - | 86.3528 | - | - | 25.4846 | - | 106.3528 |
| 17360 | - | 63.5266** | - | - | 86.3528 | - | - | 22.8262 | - | 106.3528 |
| 19840 | - | 33.9336** | - | - | 74.0 | - | - | 40.0664 | - | - |
| 22320 | - | 36.9435** | - | - | 74.0 | - | - | 37.0565 | - | - |
| 24800 | - | 38.1192** | - | - | 86.3528 | - | - | 48.2336 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4960 | - | 48.6546** | - | - | 74.0 | - | - | 25.3454 | - | - |
| 7440 | - | 53.2311** | - | - | 74.0 | - | - | 20.7689 | - | - |
| 9920 | - | 58.5719** | - | - | 86.3528 | - | - | 27.7809 | - | 106.3528 |
| 12400 | - | 60.4863** | 37.9863** | - | 74.0 | 54.0 | - | 13.5137 | 16.0137 | - |
| 14880 | - | 60.7856** | - | - | 86.3528 | - | - | 25.5672 | - | 106.3528 |
| 17360 | - | 65.5704** | - | - | 86.3528 | - | - | 20.7824 | - | 106.3528 |
| 19840 | - | 33.6984** | - | - | 74.0 | - | - | 40.3016 | - | - |
| 22320 | - | 36.8216** | - | - | 74.0 | - | - | 37.1784 | - | - |
| 24800 | - | 39.1008** | - | - | 86.3528 | - | - | 47.2520 | - | 106.3528 |
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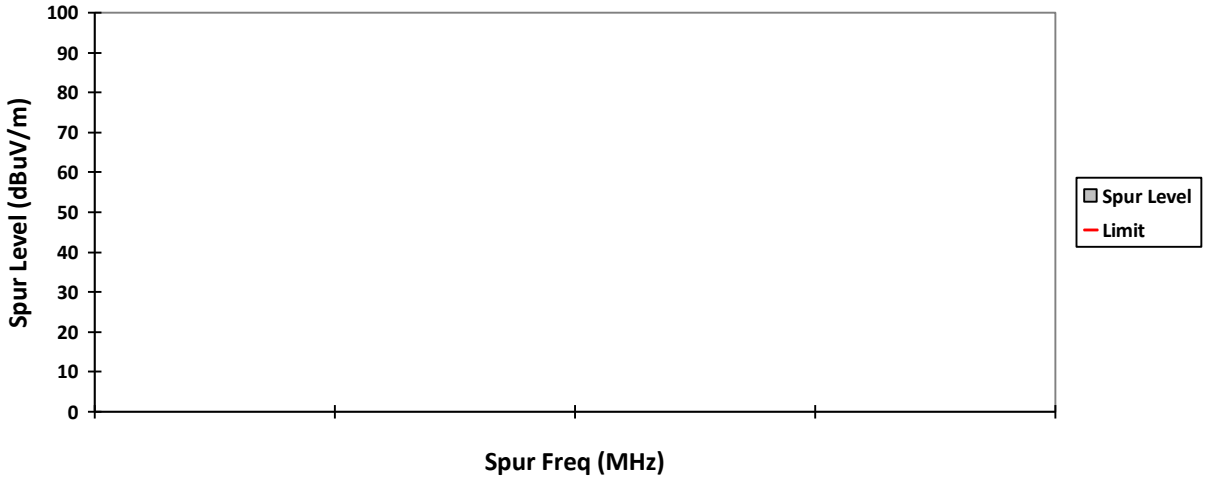
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

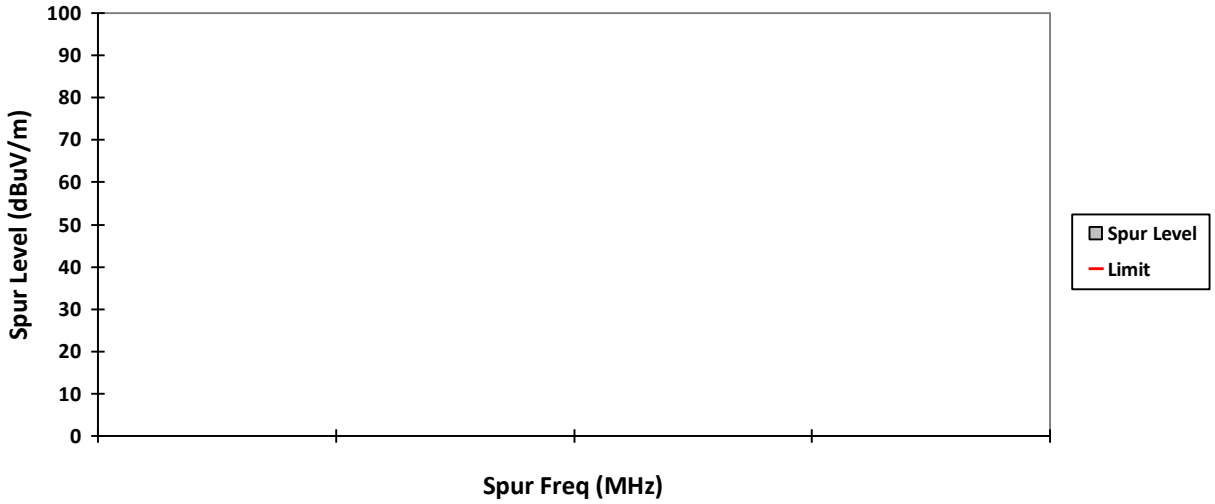
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

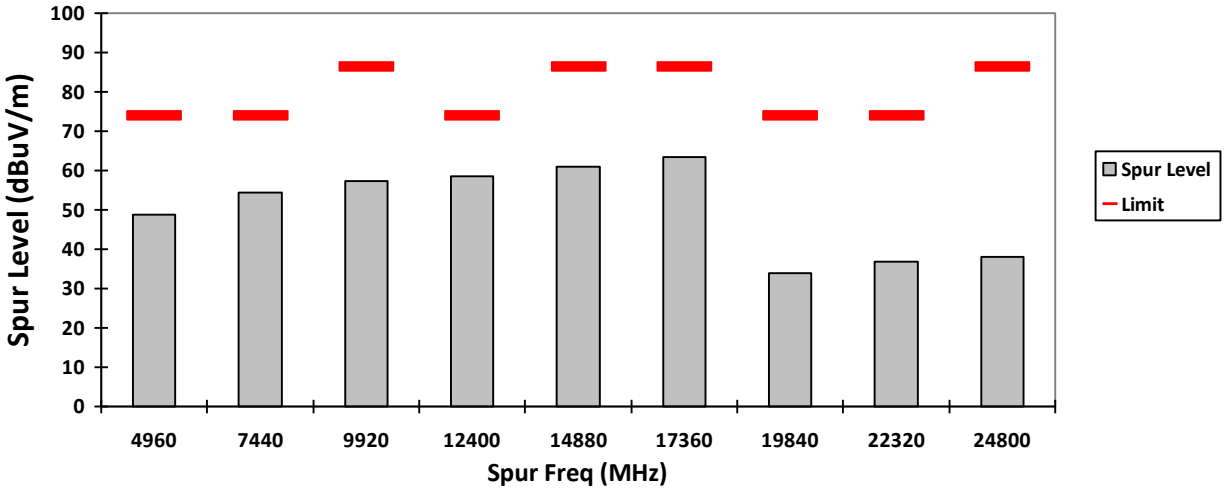
**VERTICAL, QPK**



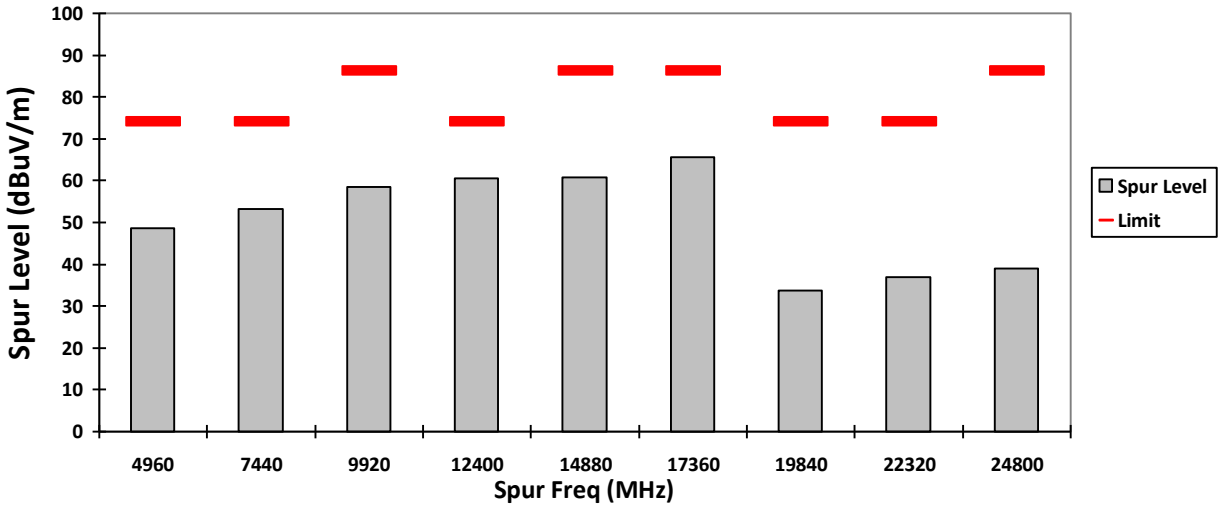

**HORIZONTAL, QPK**



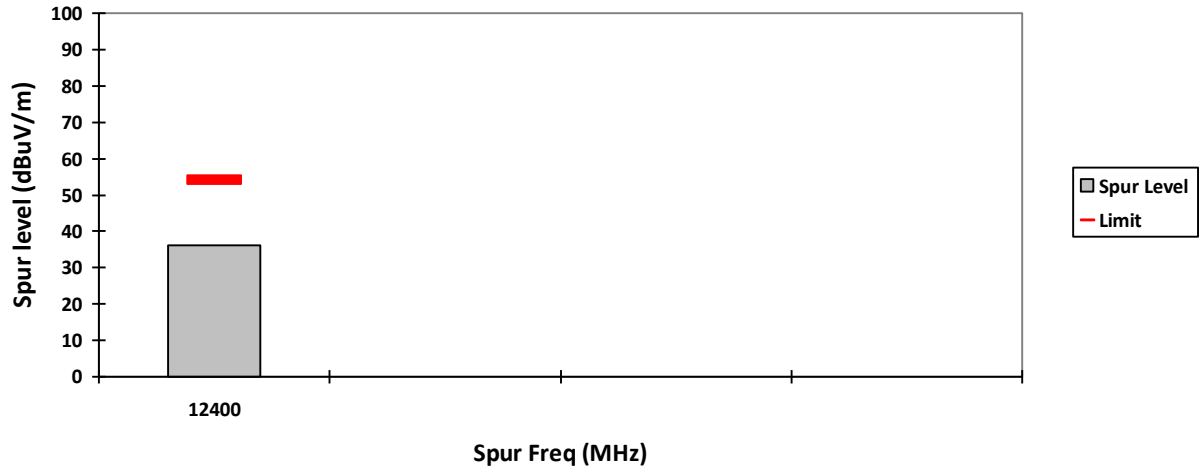
**VERTICAL, PK**



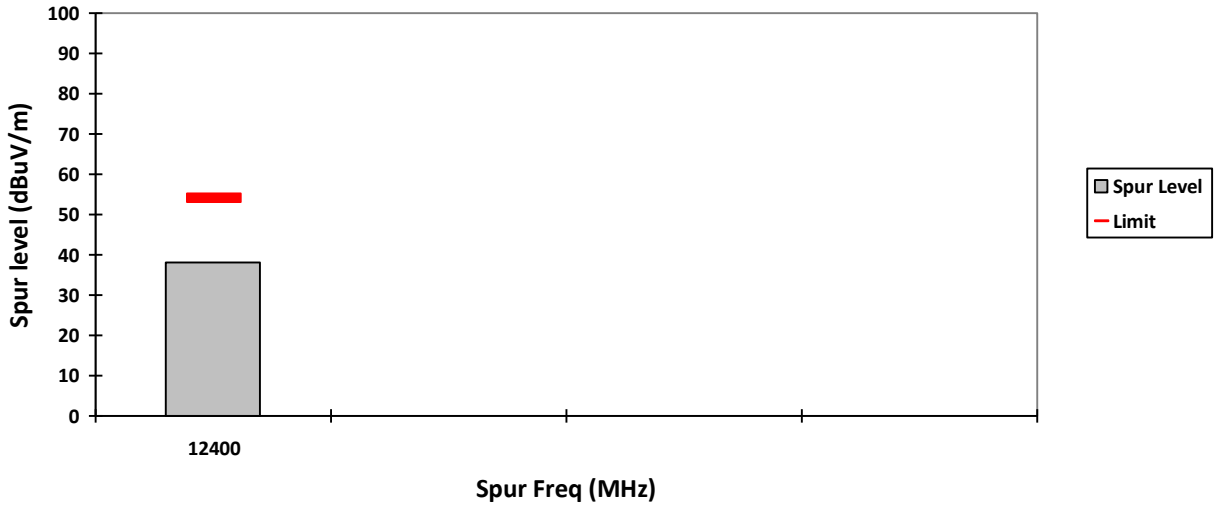

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**




**NOTE:**
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)
Adjusted channel hop rate for DH5 mode = 133.33 hops/second
Time per channel hop = 1 / 133.33 hops/second = 7.5 ms
Time to cycle through all channels = 7.5 x 20 channels = 150 ms
Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
Worst case dwell time = 7.5 ms
Duty cycle connection factor = $20\log_{10}$ (7.5ms / 100ms) = **-22.5 dB**

**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Low Test Frequency: 2402.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (8DPSK)**

## Radiated Emission (Low Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4804 | - | 49.3990** | - | - | 74.0 | - | - | 24.60 | - | - |
| 7206 | - | 53.7623** | - | - | 86.3528 | - | - | 32.59 | - | 106.3528 |
| 9608 | - | 53.9986** | - | - | 86.3528 | - | - | 32.35 | - | 106.3528 |
| 12010 | - | 61.1031** | 38.6031** | - | 74.0 | 54.0 | - | 12.90 | 15.40 | - |
| 14412 | - | 61.7306** | - | - | 86.3528 | - | - | 24.62 | - | 106.3528 |
| 16814 | - | 62.8072** | - | - | 86.3528 | - | - | 23.55 | - | 106.3528 |
| 19216 | - | 33.6615** | - | - | 74.0 | - | - | 40.34 | - | - |
| 21618 | - | 36.5849** | - | - | 86.3528 | - | - | 49.77 | - | 106.3528 |
| 24020 | - | 36.0399** | - | - | 86.3528 | - | - | 50.31 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4804 | - | 48.1531** | - | - | 74.0 | - | - | 25.85 | - | - |
| 7206 | - | 53.3613** | - | - | 86.3528 | - | - | 32.99 | - | 106.3528 |
| 9608 | - | 55.6269** | - | - | 86.3528 | - | - | 30.72 | - | 106.3528 |
| 12010 | - | 59.9356** | 37.4356** | - | 74.0 | 54.0 | - | 14.06 | 16.56 | - |
| 14412 | - | 61.7736** | - | - | 86.3528 | - | - | 24.58 | - | 106.3528 |
| 16814 | - | 63.2508** | - | - | 86.3528 | - | - | 23.10 | - | 106.3528 |
| 19216 | - | 34.2461** | - | - | 74.0 | - | - | 39.75 | - | - |
| 21618 | - | 36.3889** | - | - | 86.3528 | - | - | 49.96 | - | 106.3528 |
| 24020 | - | 37.1193** | - | - | 86.3528 | - | - | 49.23 | - | 106.3528 |
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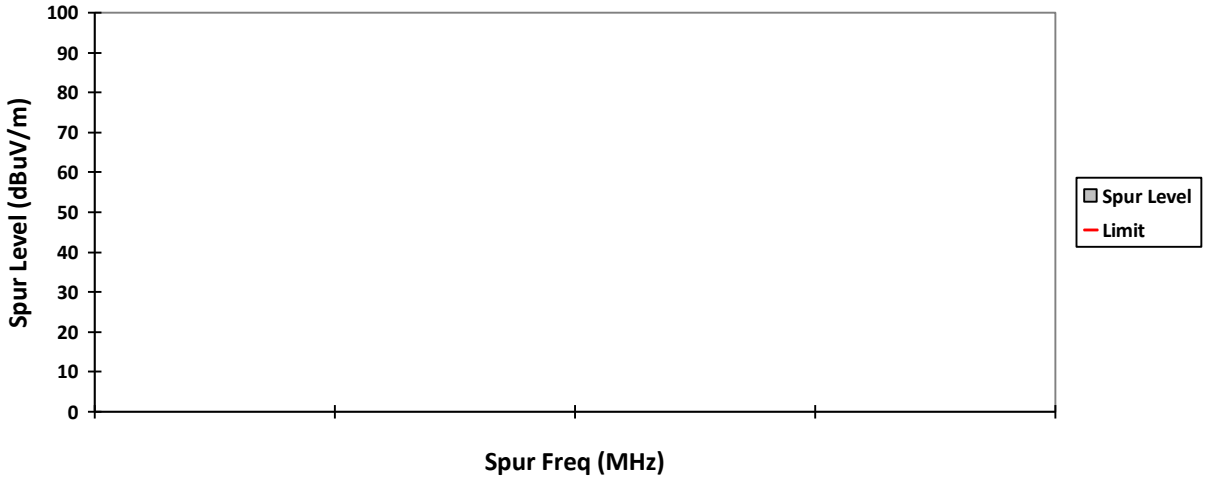
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

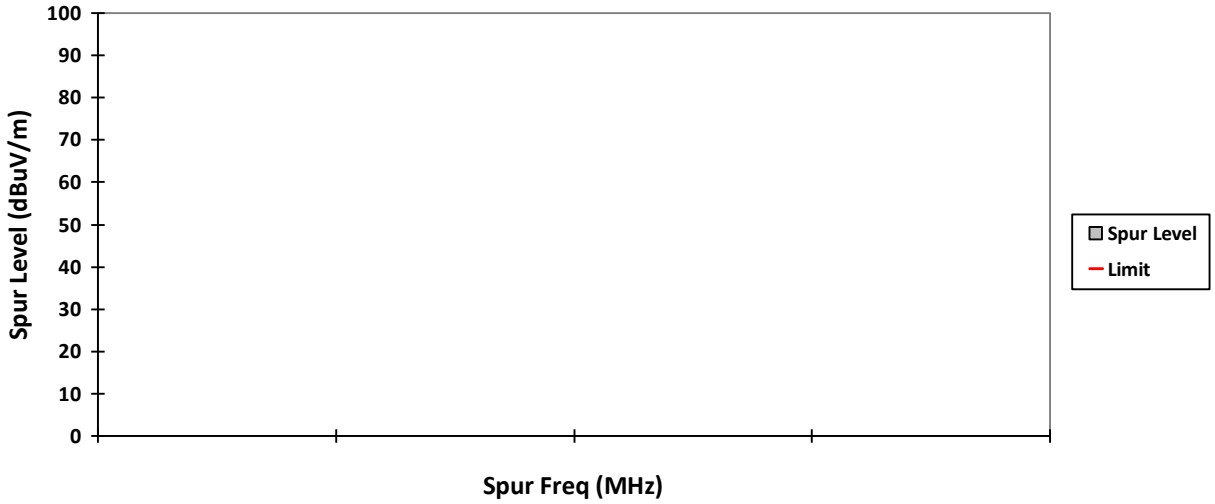
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

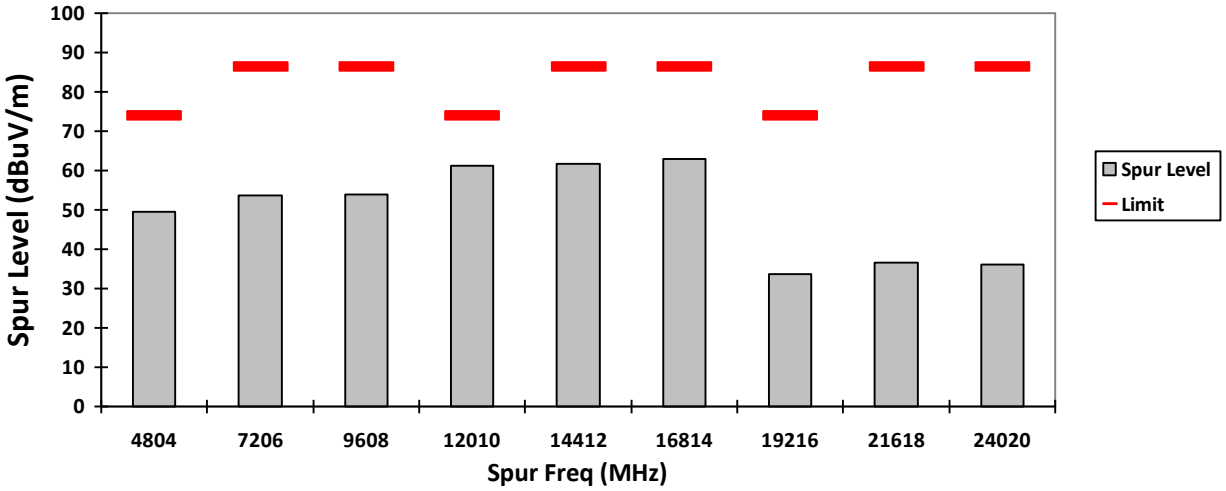
**VERTICAL, QPK**



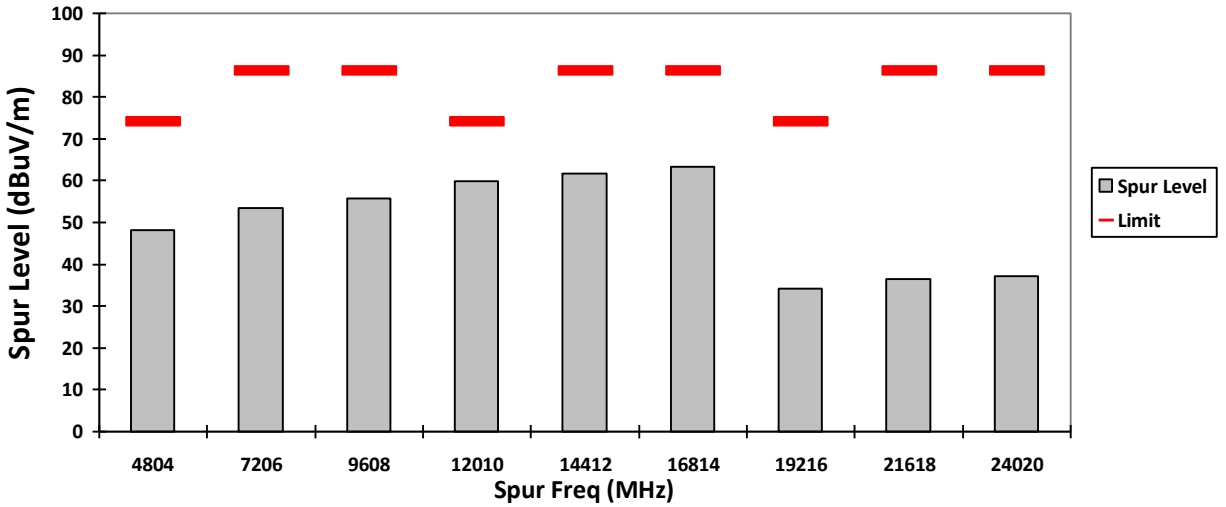

**HORIZONTAL, QPK**



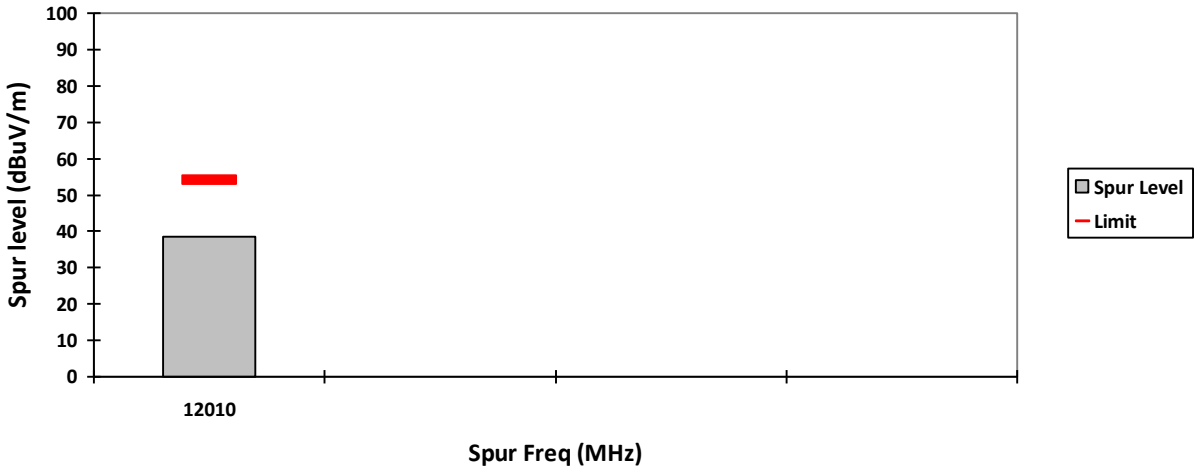
**VERTICAL, PK**



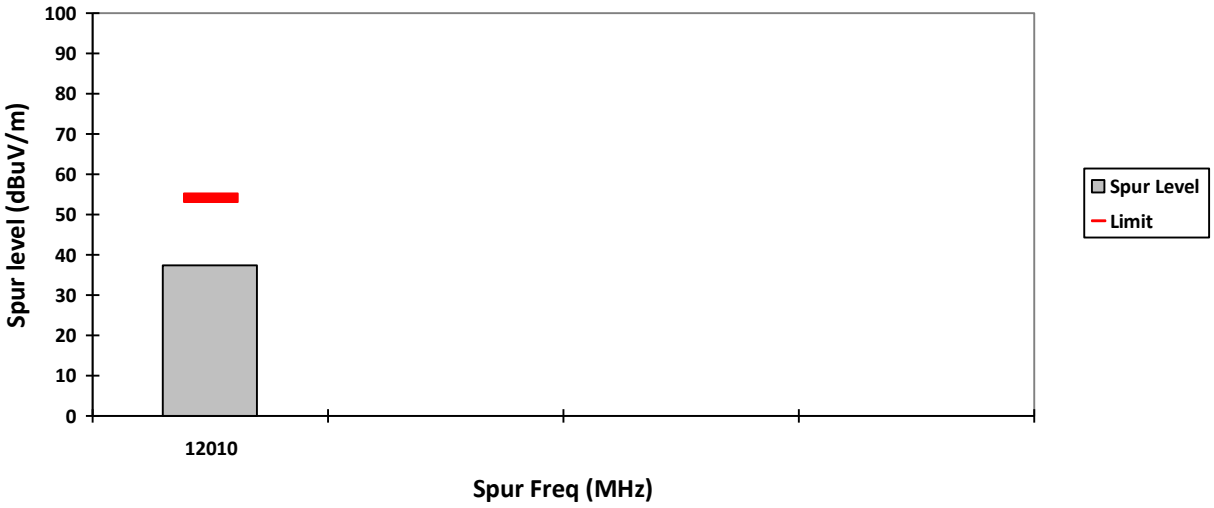

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: Mid Test Frequency: 2441.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (8DPSK)**

## Radiated Emission (Mid Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4882 | - | 51.5440** | - | - | 74.0 | - | - | 22.46 | - | - |
| 7323 | - | 53.9460** | - | - | 74.0 | - | - | 20.05 | - | - |
| 9764 | - | 55.9967** | - | - | 86.3528 | - | - | 30.36 | - | 106.3528 |
| 12205 | - | 59.2918** | 36.7918** | - | 74.0 | 54.0 | - | 14.71 | 17.21 | - |
| 14646 | - | 61.5559** | - | - | 86.3528 | - | - | 24.80 | - | 106.3528 |
| 17087 | - | 64.5415** | - | - | 86.3528 | - | - | 21.81 | - | 106.3528 |
| 19528 | - | 32.2522** | - | - | 74.0 | - | - | 41.75 | - | - |
| 21969 | - | 38.3940** | - | - | 86.3528 | - | - | 47.96 | - | 106.3528 |
| 24410 | - | 37.3969** | - | - | 86.3528 | - | - | 48.96 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4882 | - | 49.3060** | - | - | 74.0 | - | - | 24.69 | - | - |
| 7323 | - | 52.9930** | - | - | 74.0 | - | - | 21.01 | - | - |
| 9764 | - | 55.7798** | - | - | 86.3528 | - | - | 30.57 | - | 106.3528 |
| 12205 | - | 59.9810** | 37.4810** | - | 74.0 | 54.0 | - | 14.02 | 16.52 | - |
| 14646 | - | 60.7776** | - | - | 86.3528 | - | - | 25.58 | - | 106.3528 |
| 17087 | - | 64.5470** | - | - | 86.3528 | - | - | 21.81 | - | 106.3528 |
| 19528 | - | 32.5610** | - | - | 74.0 | - | - | 41.44 | - | - |
| 21969 | - | 38.4037** | - | - | 86.3528 | - | - | 47.95 | - | 106.3528 |
| 24410 | - | 37.9003** | - | - | 86.3528 | - | - | 48.45 | - | 106.3528 |
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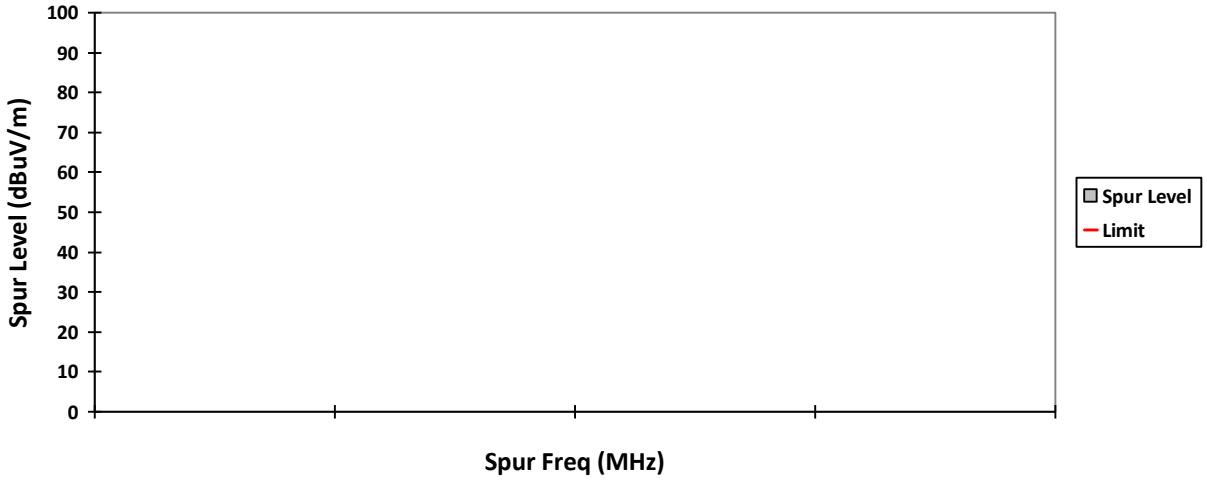
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

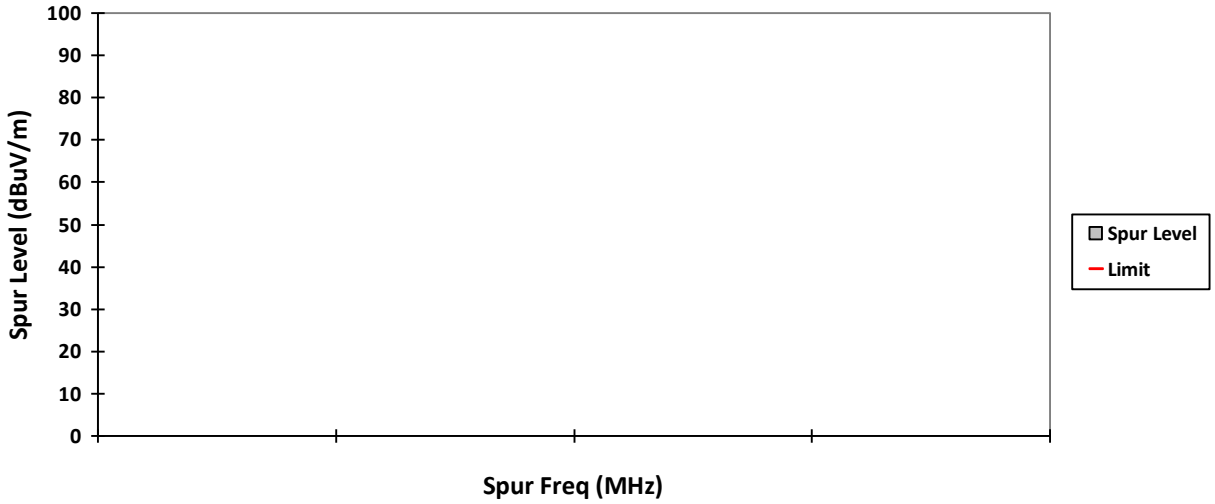
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

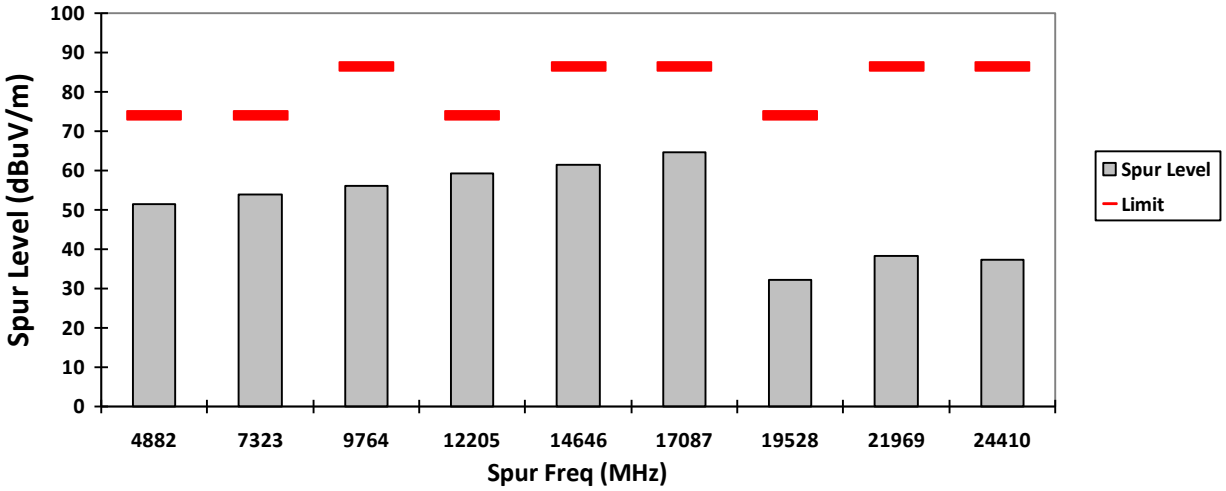
**VERTICAL, QPK**



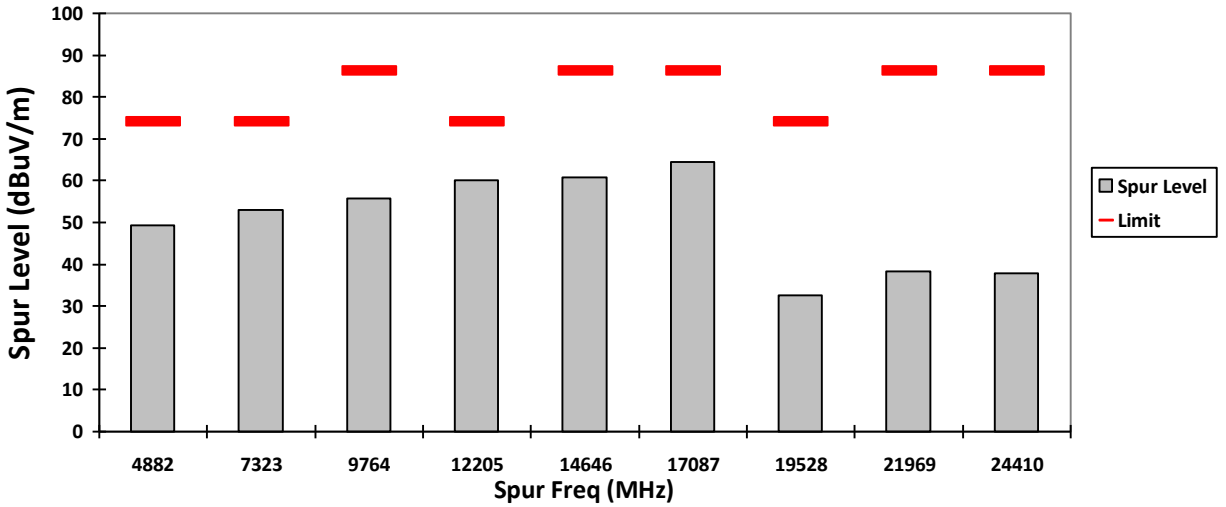

**HORIZONTAL, QPK**



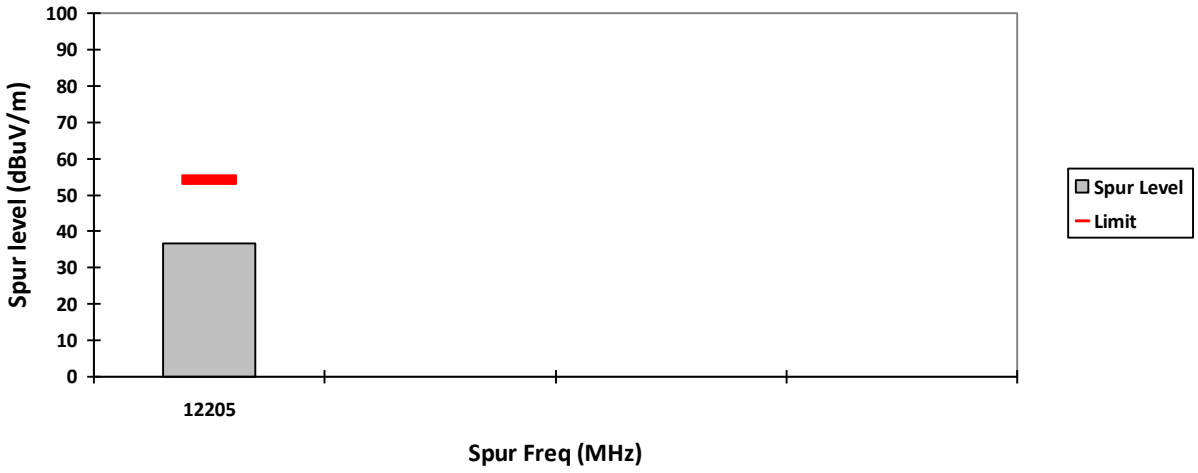
**VERTICAL, PK**



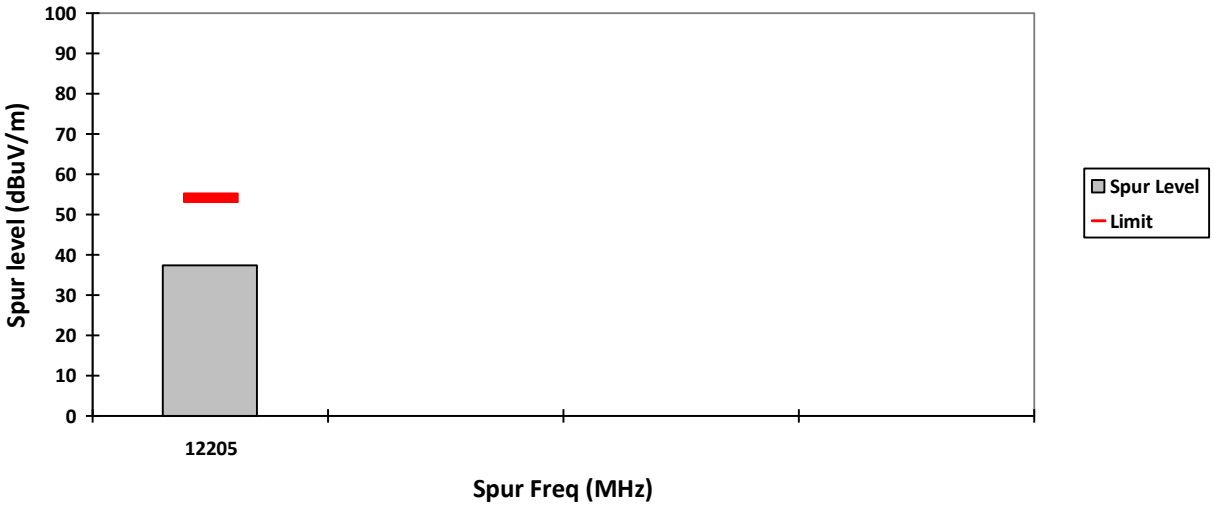

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



**Test: Bluetooth SAC Transmitter Radiated Emission**
**Model#: H91TGD9PW7AN S/N: 579TXV0057 EMC SR ID#: 09154-EMC-00046**
**Battery: PMNN4494A Accessory: PMAF4040A**
**Test Channel: High Test Frequency: 2480.0000 MHz Test Standard: ANSI C63.10-2013**
**Worst Case Plane: X-Plane (8DPSK)**

## Radiated Emission (High Channel) tabular data

| Vertical Radiated Emission Result | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spur Freq (MHz) | Spur level QPK (dBµV/m) | Spur level PK (dBµV/m) | Spur level AV (dBµV/m) | Limit QPK (dBµV/m) | Limit PK (dBµV/m) | Limit AV (dBµV/m) | Margin QPK (dBµV/m) | Margin PK (dBµV/m) | Margin AV (dBµV/m) | Carrier PK Power (dBµV/m) |
| 4960 | - | 48.5240** | - | - | 74.0 | - | - | 25.48 | - | - |
| 7440 | - | 53.9856** | - | - | 74.0 | - | - | 20.01 | - | - |
| 9920 | - | 57.3195** | - | - | 86.3528 | - | - | 29.03 | - | 106.3528 |
| 12400 | - | 59.0276** | 36.5276** | - | 74.0 | 54.0 | - | 14.97 | 17.47 | - |
| 14880 | - | 61.3851** | - | - | 86.3528 | - | - | 24.97 | - | 106.3528 |
| 17360 | - | 64.1521** | - | - | 86.3528 | - | - | 22.20 | - | 106.3528 |
| 19840 | - | 33.2937** | - | - | 74.0 | - | - | 40.71 | - | - |
| 22320 | - | 36.4710** | - | - | 74.0 | - | - | 37.53 | - | - |
| 24800 | - | 38.0917** | - | - | 86.3528 | - | - | 48.26 | - | 106.3528 |
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| **Horizontal Radiated Emission Result** | | | | | | | | | | |
| 4960 | - | 48.9784** | - | - | 74.0 | - | - | 25.02 | - | - |
| 7440 | - | 53.9606** | - | - | 74.0 | - | - | 20.04 | - | - |
| 9920 | - | 56.5973** | - | - | 86.3528 | - | - | 29.76 | - | 106.3528 |
| 12400 | - | 59.3915** | 36.8915** | - | 74.0 | 54.0 | - | 14.61 | 17.11 | - |
| 14880 | - | 61.2934** | - | - | 86.3528 | - | - | 25.06 | - | 106.3528 |
| 17360 | - | 63.4997** | - | - | 86.3528 | - | - | 22.85 | - | 106.3528 |
| 19840 | - | 34.4935** | - | - | 74.0 | - | - | 39.51 | - | - |
| 22320 | - | 36.2954** | - | - | 74.0 | - | - | 37.70 | - | - |
| 24800 | - | 39.5960** | - | - | 86.3528 | - | - | 46.76 | - | 106.3528 |
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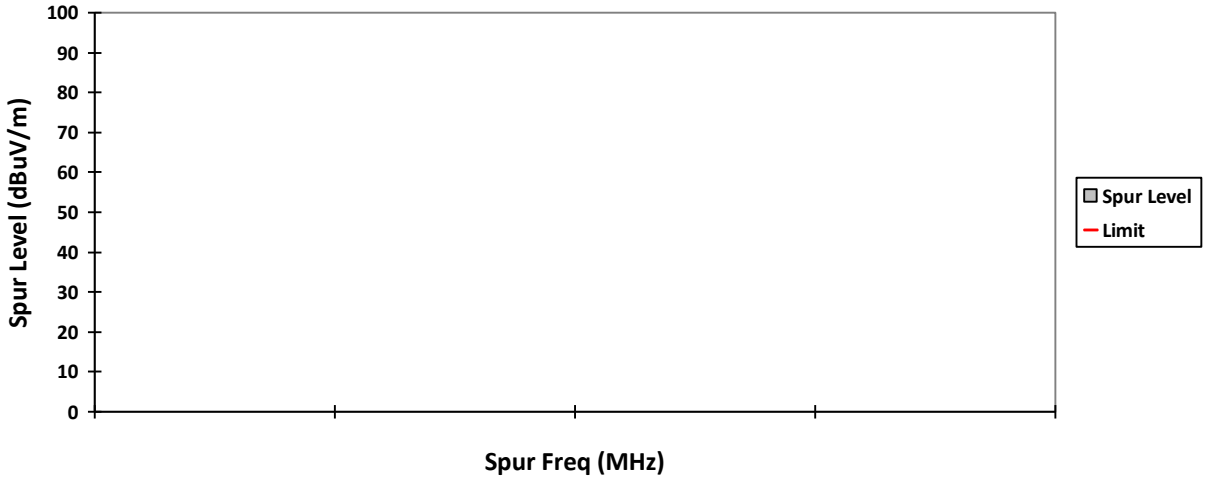
| Remarks: Pass Result | Marginal Result | Fail Result |
|---|---|---|

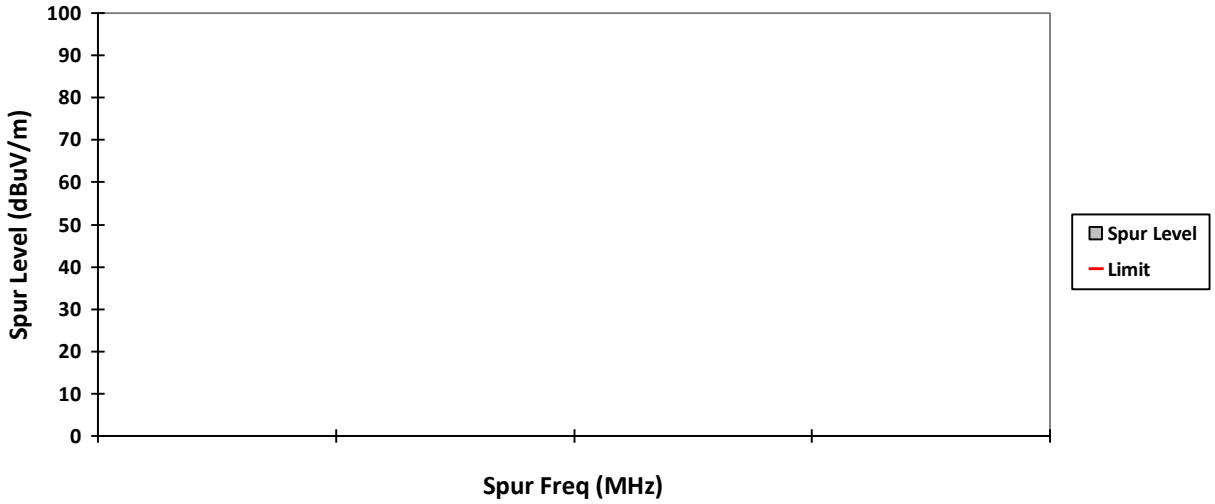
**Temperature (degC): 23.2** **Humidity (%): 70.3**
**Test Performed by: Qawiman&Nazrin** **Test Date: Sun, 28 Nov, 2021**
**System MU: 5.88 dB (30-1000MHz), 5.84 dB (1000-18000MHz), 6.02 dB (18000MHz-40000MHz)**

**Remarks: ** Indicates the spurious emission could not be detected due to noise limitations or ambient.**
***Pursuant to CFR 47 Part 2.1057 ( c ), emissions attenuated more than 20 dB below the permissible limit are not reported.**

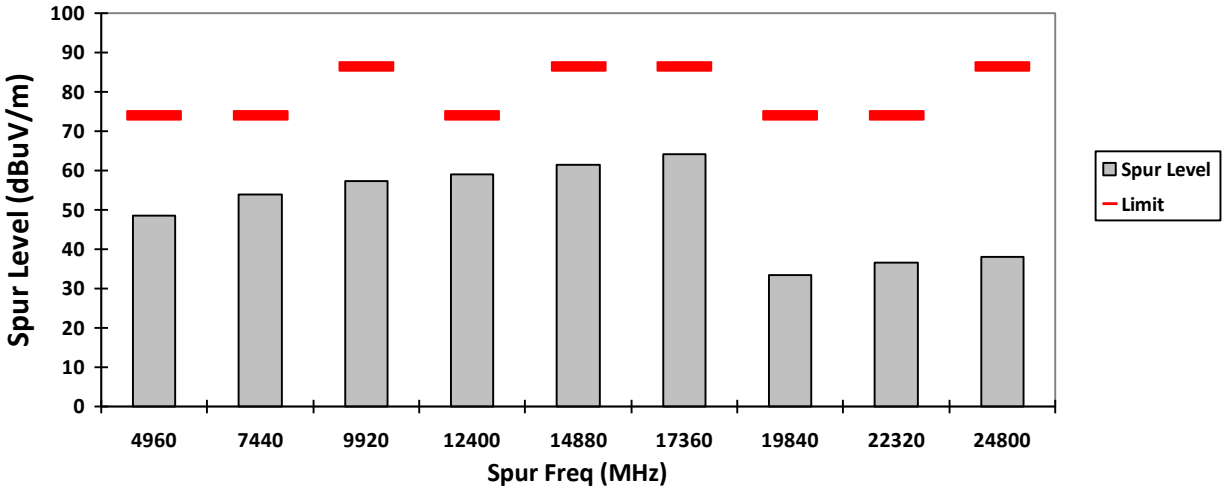
**VERTICAL, QPK**



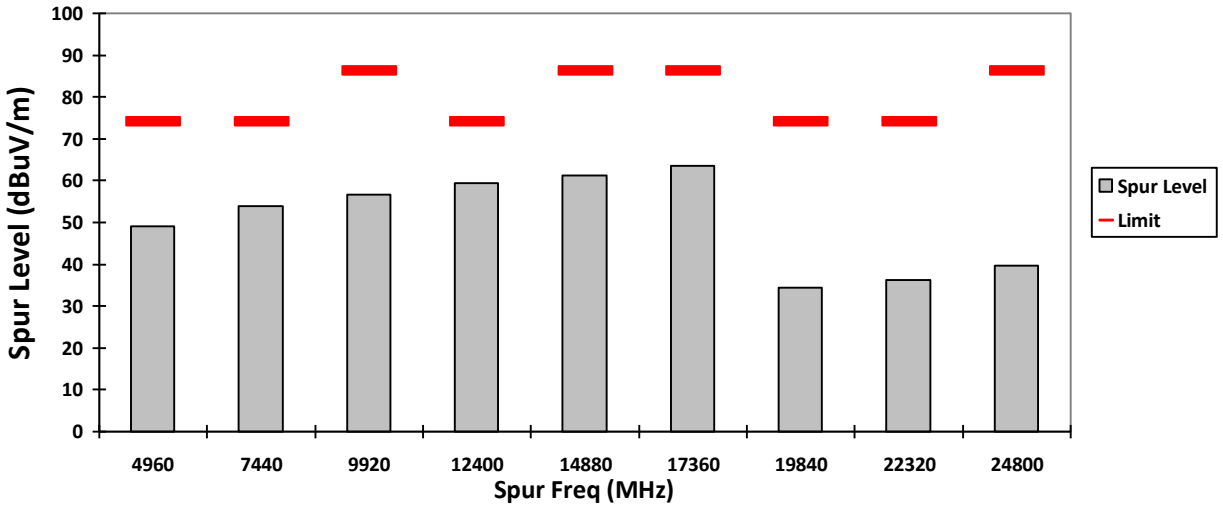

**HORIZONTAL, QPK**



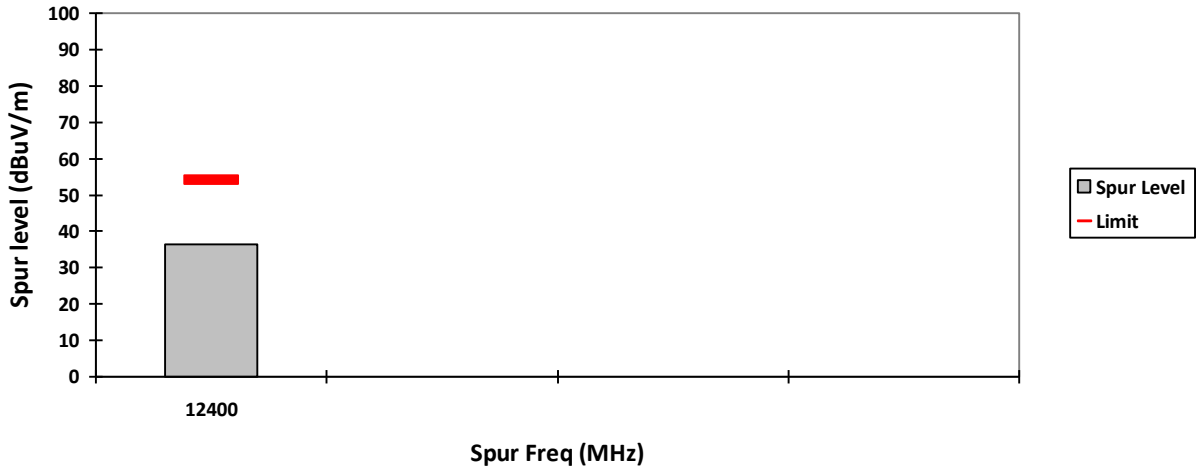
**VERTICAL, PK**



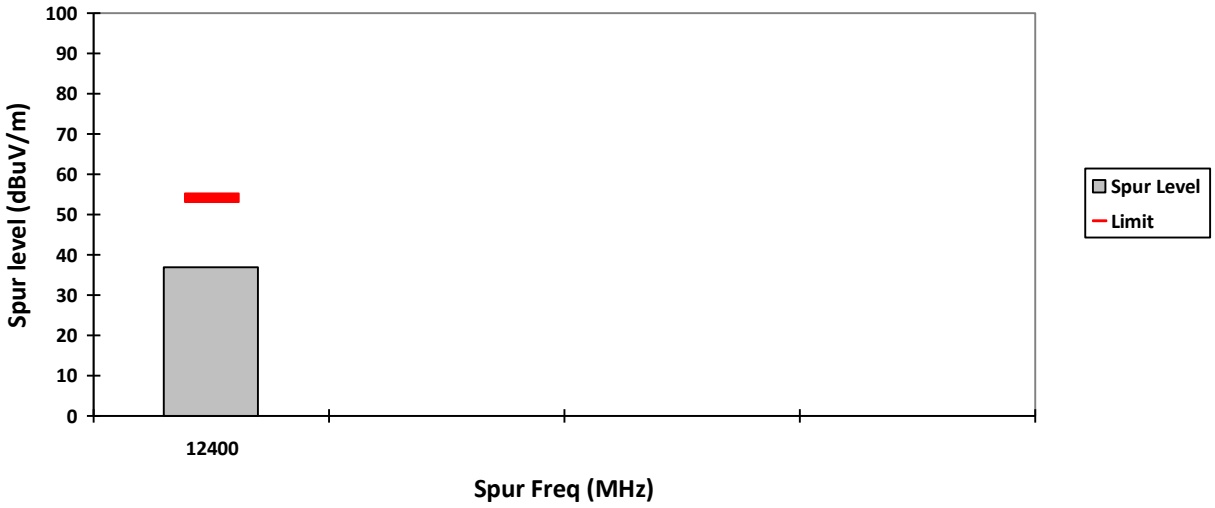

**HORIZONTAL, PK**



**VERTICAL, AV**




**HORIZONTAL, AV**



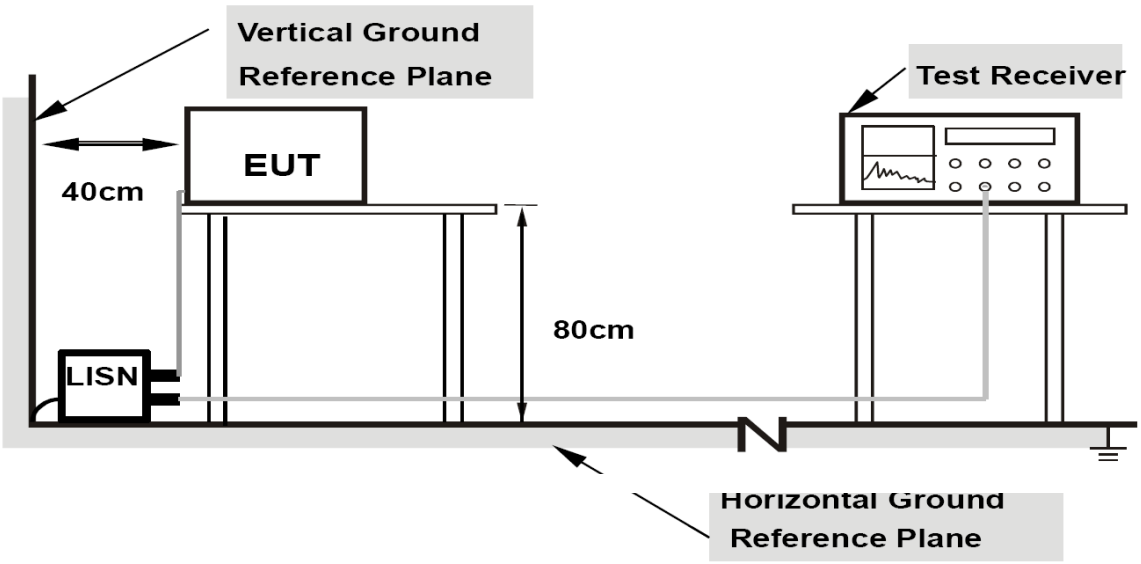

**NOTE:**
Transmitter Duty Cycle Calculation, FCC Rule 15.35 (b,c)

Based on the Bluetooth Specification Version 2.1+EDR, and worst case AFH mode, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length, the AFH mode Duty cycle connection factor as below:

Channel hop rate = 800 hops/second (AFH Mode)
Adjusted channel hop rate for DH5 mode = 133.33 hops/second
Time per channel hop = 1 / 133.33 hops/second = 7.5 ms
Time to cycle through all channels = 7.5 x 20 channels = 150 ms
Number of times transmitter hits on one channel = 100 ms / 150 ms = 1 time(s)
Worst case dwell time = 7.5 ms
Duty cycle connection factor = $20\log_{10}$ (7.5ms / 100ms) = **-22.5 dB**

## 5.9. AC Powerline Conducted Emission

### 5.9.1. Test Setup




1) Tests were conducted for both Receive and Transmit Mode of the EUT.
2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
4) The frequency range from 150 kHz to 30MHz was measured.

### 5.9.2. Test Limits:

**For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.**

**Limits for conducted disturbance at the mains ports of class A ITE**

| Frequency range MHz | Limits dB(µV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0,15 to 0,50 | 79 | 66 |
| 0,50 to 30 | 73 | 60 |
| NOTE The lower limit shall apply at the transition frequency. | | |

**Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.**

**Limits for conducted disturbance at the mains ports of class B ITE**

| Frequency range MHz | Limits dB(µV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0,15 to 0,50 | 66 to 56 | 56 to 46 |
| 0,50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |
| NOTE 1 The lower limit shall apply at the transition frequencies.<br>NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. | | |

**Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE**

### 5.9.3. Test Result

**Not Applicable. Testing is not required, radio shall turn off during charging mode**

# END OF TEST REPORT