

FCC CERTIFICATION TEST REPORT

For

FCC ID: 2AAOY-278003465

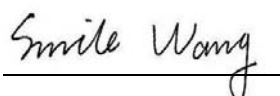
Report Reference No..... : 18EFAS10059 11
Date of issue..... : 2018-11-28
Testing Laboratory..... : DongGuan ShuoXin Electronic Technology Co., Ltd.
Address..... : Zone A, 1F, No. 6, XinGang Road YuanGang Street,
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GuangDong, China

Applicant's name..... : Mitek corp
Address..... : 1 Mitek Plaza Winslow IL 61089,United States

Manufacturer..... : Mitek corp

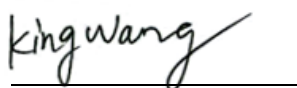
Test specification:
Test item description..... : Bluetooth controller
Trade Mark..... : MTX
Model/Type reference : 278003465
Ratings..... : I/P: DC12V

Responsible Engineer :



Smile Wang

Authorized Signatory:



King Wang

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TEST REPORT DECLARE

| | | |
|-----------------------------|---|--|
| Applicant | : | Mitek corp |
| Address | : | 1 Mitek Plaza Winslow IL 61089,United States |
| Equipment under Test | : | Bluetooth controller |
| Test Model No | : | 278003465 |
| Manufacturer | : | Mitek corp |
| Address | : | 1 Mitek Plaza Winslow IL 61089,United States |

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C (15.247)

Test procedure used: ANSI C63.10:2013, 558074 D01 15.247 Meas Guidance v05

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

| | | | |
|----------------------|--------------------------|------------------------|------------|
| Report No: | 18EFAS10059 11 | | |
| Date of Test: | 2018-11-20 To 2018-11-28 | Date of Report: | 2018-11-28 |

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of DongGuan ShuoXin Electronic Technology Co., Ltd.

1. SUMMARY OF TEST RESULTS

| The EUT have been tested according to the applicable standards as referenced below. | | |
|---|--------------------------------|---------|
| Description of Test Item | Standard | Results |
| Bandwidth | FCC Part 15: 15.247(a)(1) | PASS |
| Carrier Frequency Separation Test | FCC Part 15: 15.247(a)(1) | PASS |
| Number Of Hopping Frequency | FCC Part 15: 15.247(a)(1)(iii) | PASS |
| Dwell Time Test | FCC Part 15: 15.247(a)(1)(iii) | PASS |
| Maximum Output Power | FCC Part 15: 15.247(b)(1) | PASS |
| Band Edge Emission | FCC Part 15: 15.247(c) | N/A |
| Radiated Spurious Emissions | FCC Part 15.205 / 15.209 | PASS |
| Antenna requirement | FCC Part 15: 15.203 | PASS |
| Conducted Emission | FCC Part 15.207 | N/A |

2. GENERAL TEST INFORMATION

2.1. DESCRIPTION OF EUT

| | | |
|--------------------------|---|---|
| EUT* Name | : | Bluetooth controller |
| Model Number | : | 278003465 |
| EUT function description | : | Please reference user manual of this device |
| Power supply | : | DC12V |
| Adaptor | : | N/A |
| Radio Technology | : | BT V4.0 |
| Operation frequency | : | 2402-2480MHz |
| Modulation | : | GFSK, $\pi/4$ -DQPSK, 8DPSK |
| Antenna Type | : | Internal Antenna, maximum PK gain: 0dBi |
| Date of Receipt | : | 2018/11/20 |
| Sample Type | : | Single production |

2.2. ACCESSORIES OF EUT

| Description of Accessories | Manufacturer | Model number or Type | Output. |
|----------------------------|--------------|----------------------|---------|
| / | / | / | / |

2.3. ASSISTANT EQUIPMENT USED FOR TEST

| Description of Assistant equipment | Manufacturer | Model number or Type | EMC Compliance | SN |
|------------------------------------|--------------|----------------------|----------------|----|
| Notebook | Acer | Aspire E1-472G | FCC Doc | / |

2.4. BLOCK DIAGRAM OF EUT CONFIGURATION FOR TEST



EUT enters the engineering interface by clicking the system version ,control EUT work in Continuous TX mode, and select test channel, wireless mode and data rate.

Remark: GFSK,8DPSK, π /4DQPSK all these modulation all have been tested , GFSK is found as worst case and only reported for radiated emission.

| Tested mode, channel, and data rate information | | | |
|---|--------------------------------|--------------|--------------------|
| Mode | data rate (Mbps) (see Note) | Channel | Frequency (MHz) |
| GFSK | 1 | Low :CH0 | 2402 |
| | 1 | Middle: CH39 | 2441 |
| | 1 | High: CH78 | 2480 |
| π /4DQPSK | 2 | Low :CH0 | 2402 |
| | 2 | Middle: CH39 | 2441 |
| | 2 | High: CH78 | 2480 |
| 8DPSK | 3 | Low :CH0 | 2402 |
| | 3 | Middle: CH39 | 2441 |
| | 3 | High: CH78 | 2480 |

Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.

2.5. TEST ENVIRONMENT CONDITIONS

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

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

2.6. MEASUREMENT UNCERTAINTY

| Test Item | Uncertainty |
|---|-----------------------|
| Uncertainty for Conduction emission test (9kHz-150kHz) | 3.7 dB |
| Uncertainty for Conduction emission test (150kHz-30MHz) | 3.3 dB |
| Uncertainty for Radiation Emission test (30MHz-200MHz) | 4.60 dB (Polarize: V) |
| | 4.60 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (200MHz-1GHz) | 6.10 dB (Polarize: V) |
| | 5.08 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (1GHz-6GHz) | 5.01 dB (Polarize: V) |
| | 5.01 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (6GHz-18GHz) | 5.26 dB (Polarize: V) |
| | 5.26 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (18GHz-40GHz) | 5.06 dB (Polarize: V) |
| | 5.06 dB (Polarize: H) |
| Uncertainty for radio frequency | $\pm 0.048\text{kHz}$ |
| Uncertainty for conducted RF Power | $\pm 0.32\text{dB}$ |

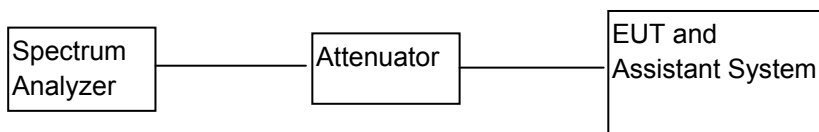
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. 20dB BANDWIDTH & 99% BANDWIDTH

3.1. TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

3.2. BLOCK DIAGRAM OF TEST SETUP



3.3. LIMITS

No limit requirement.

3.4. TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2.
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

| | |
|----------------|----------|
| RBW: | 30KHz |
| VBW: | 100KHz |
| Detector Mode: | Peak |
| Sweep time: | auto |
| Trace mode: | Max hold |

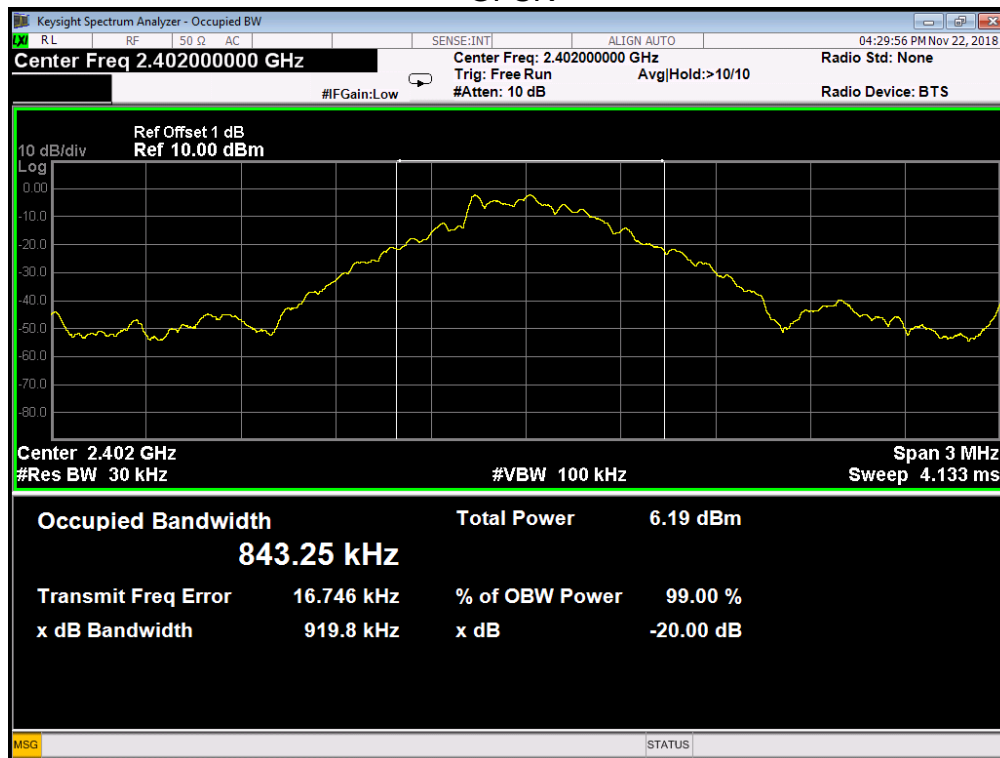
- (5) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB and 99% bandwidth relative to the maximum level measured in the fundamental emission.

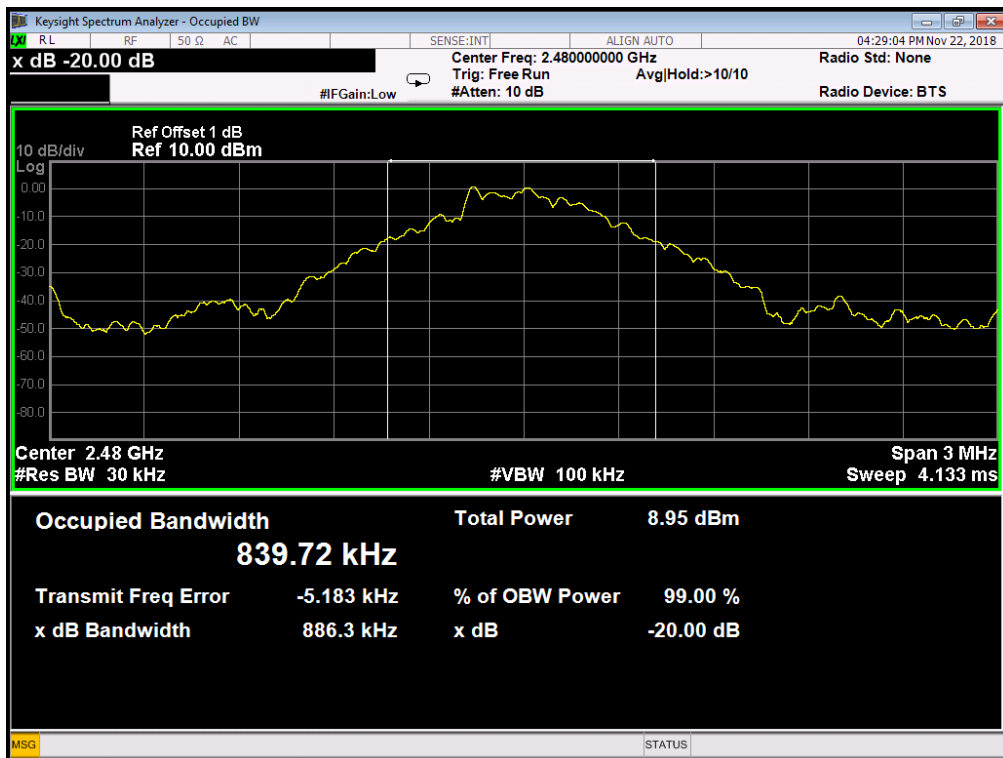
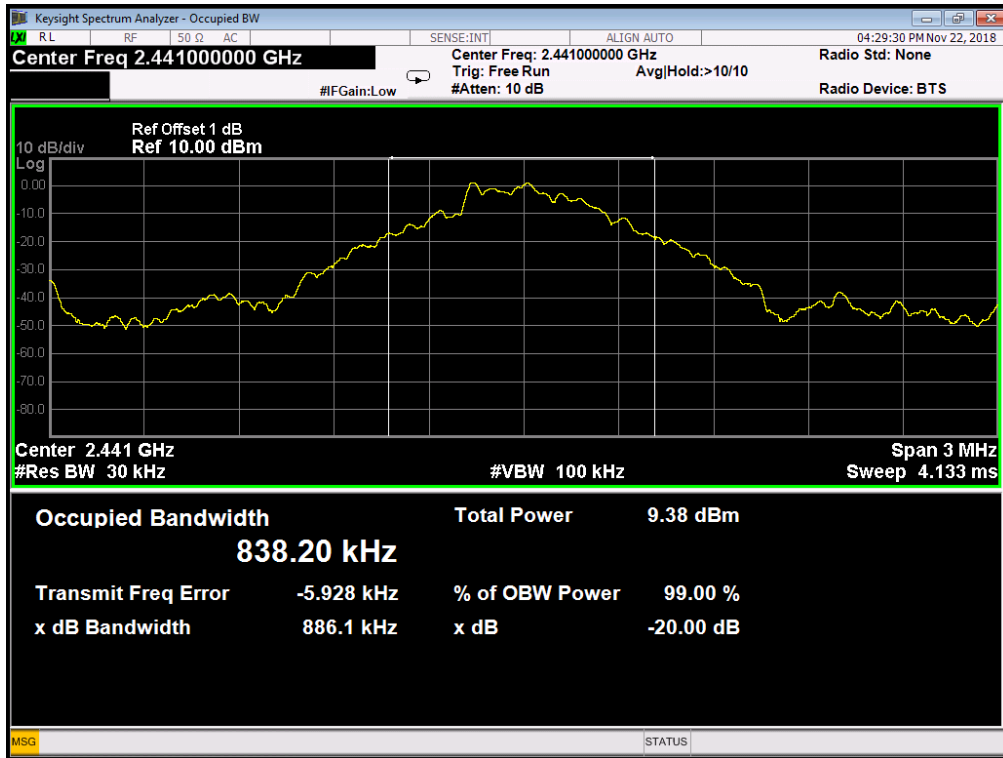
3.5. TEST RESULT

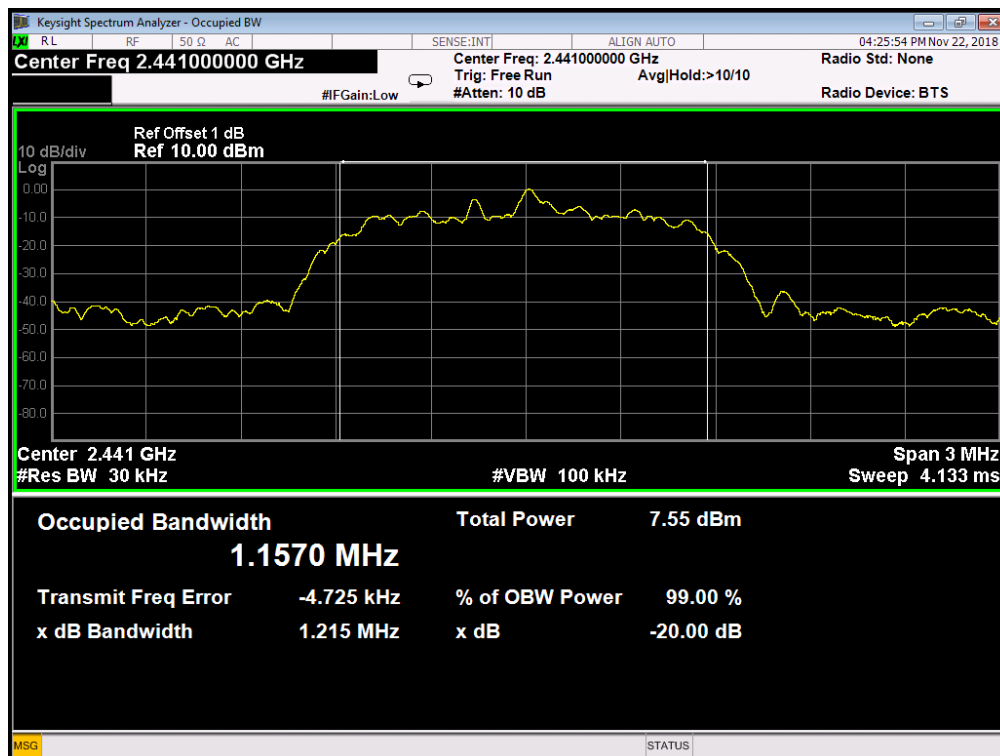
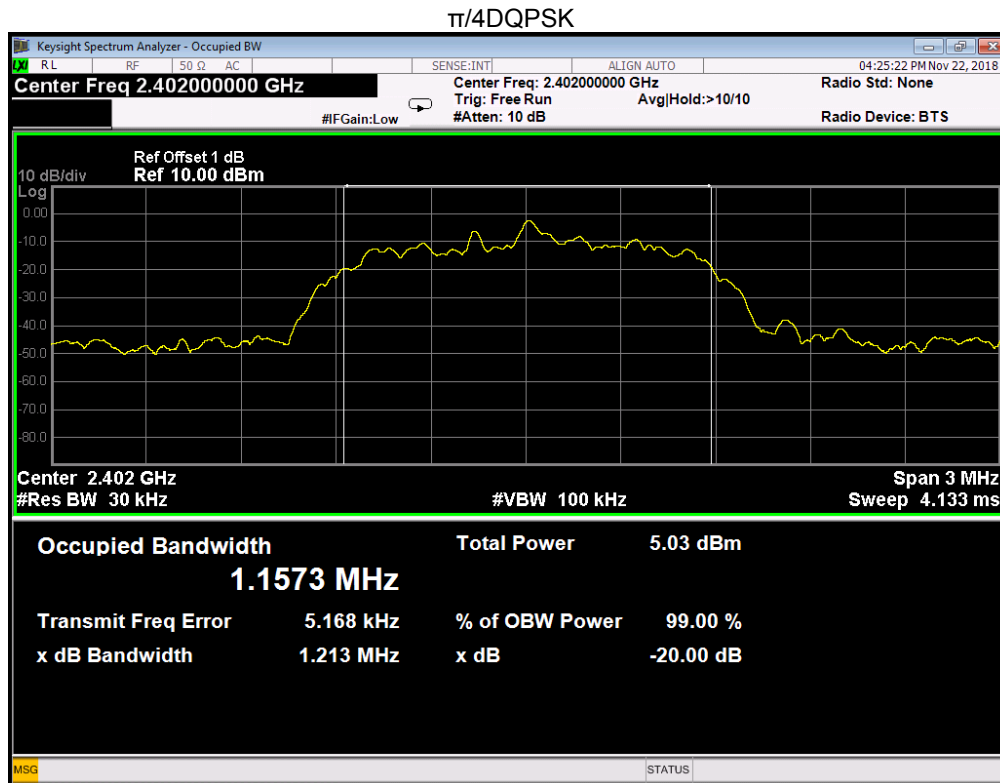
| Mode | Freq | 20dB | 99%OBW | Conclusion |
|---------------|-------|-------|--------|------------|
| | (MHz) | (MHz) | (MHz) | |
| GFSK | 2402 | 0.92 | 0.84 | PASS |
| | 2441 | 0.89 | 0.84 | PASS |
| | 2480 | 0.89 | 0.84 | PASS |
| $\pi/4$ DQPSK | 2402 | 1.21 | 1.16 | PASS |
| | 2441 | 1.22 | 1.16 | PASS |
| | 2480 | 1.22 | 1.16 | PASS |
| 8DPSK | 2402 | 1.21 | 1.14 | PASS |
| | 2441 | 1.21 | 1.13 | PASS |
| | 2480 | 1.21 | 1.13 | PASS |

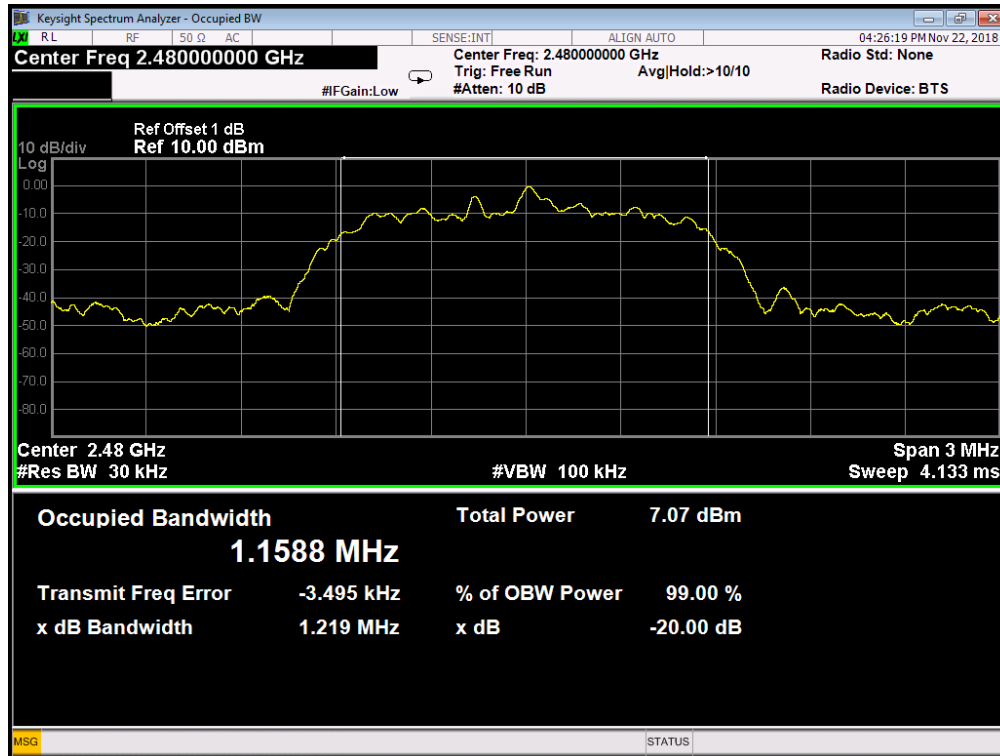
3.6. ORIGINAL TEST DATA

GFSK

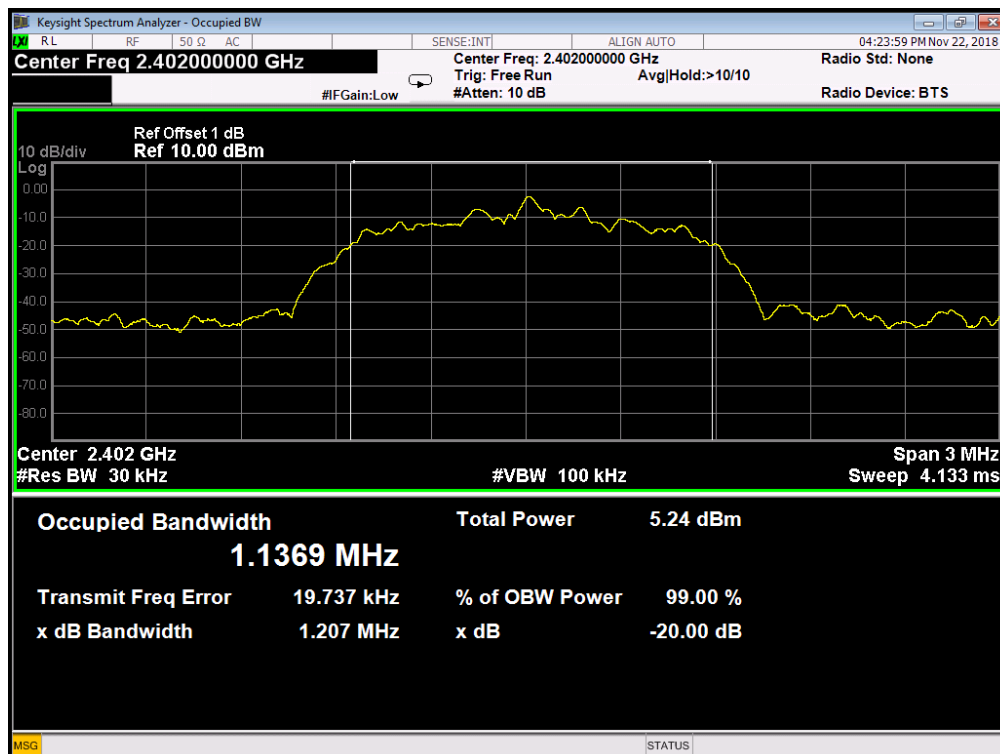


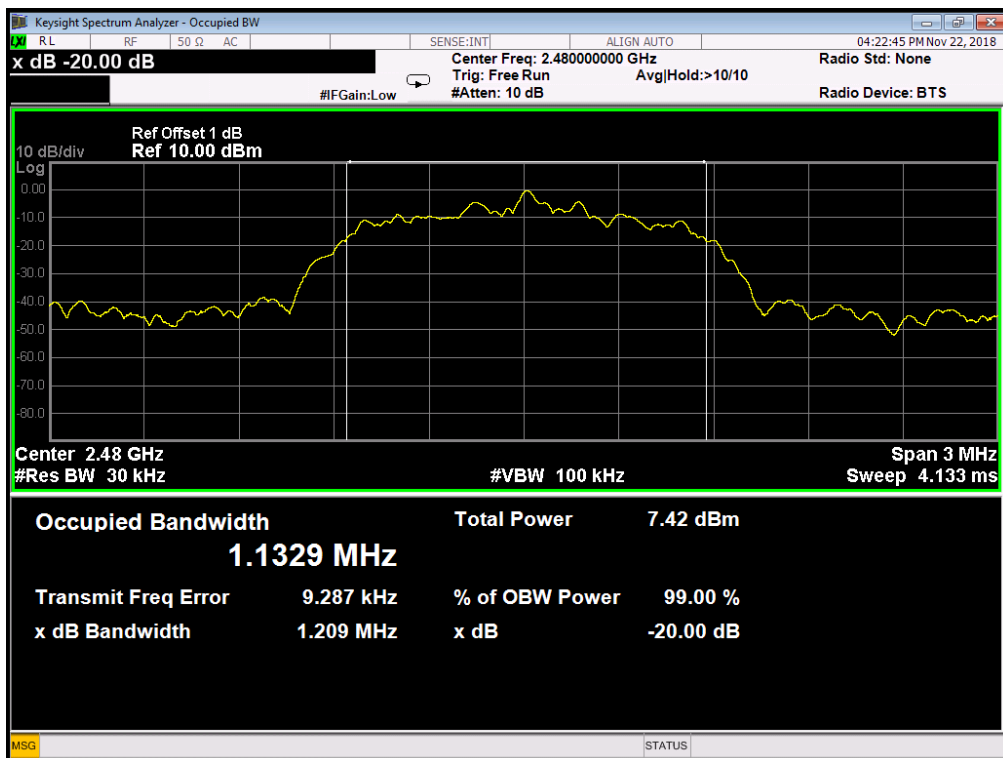
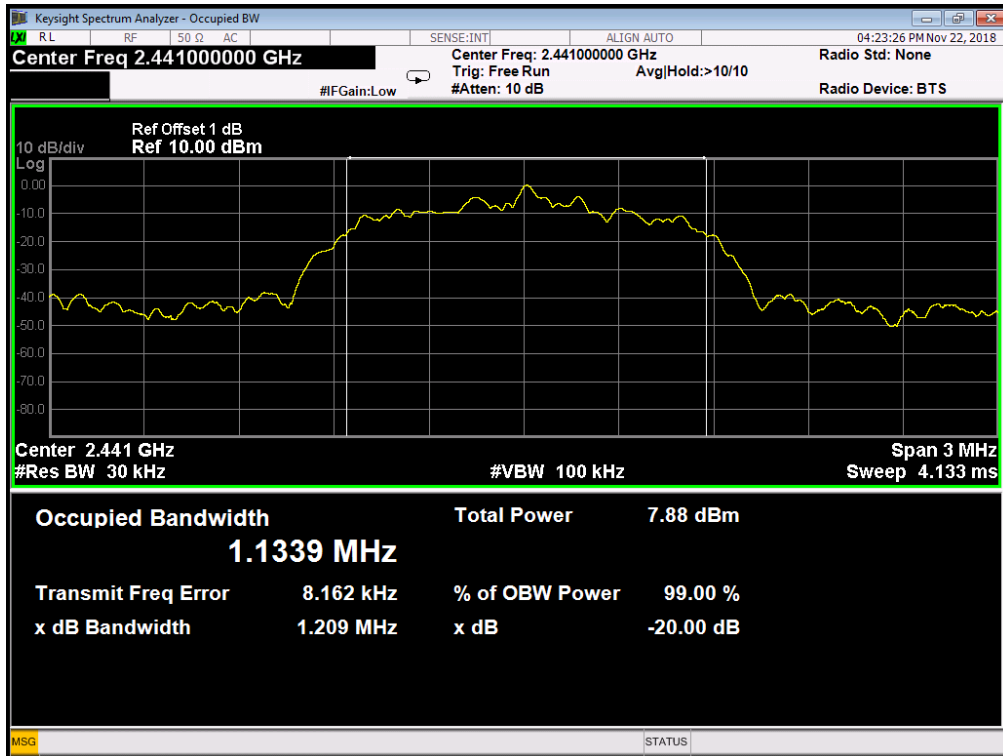






8DPSK





4. CARRIER FREQUENCY SEPARATION TEST

4.1. TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

4.2. THE REQUIREMENT FOR SECTION 15.247(A)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

4.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

4.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 6.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

4.5. TEST PROCEDURE

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) .Set RBW of spectrum analyzer to 30 kHz and VBW to 100 kHz. Adjust Span to 3 MHz.
- (3) Set the adjacent channel of the EUT maxhold another trace.
- (4) Measurement the channel separation

4.6. TEST RESULT

GFSK

| Channel | Frequency (MHz) | Channel Separation(MHz) | Limit (MHz) | Result |
|---------|-----------------|-------------------------|--------------------------------|--------|
| Low | 2402 | 1.014 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| Middle | 2441 | 1.008 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| High | 2479 | 0.996 | >(25KHz or 2/3*20dB Bandwidth) | PASS |

$\pi/4$ DQPSK

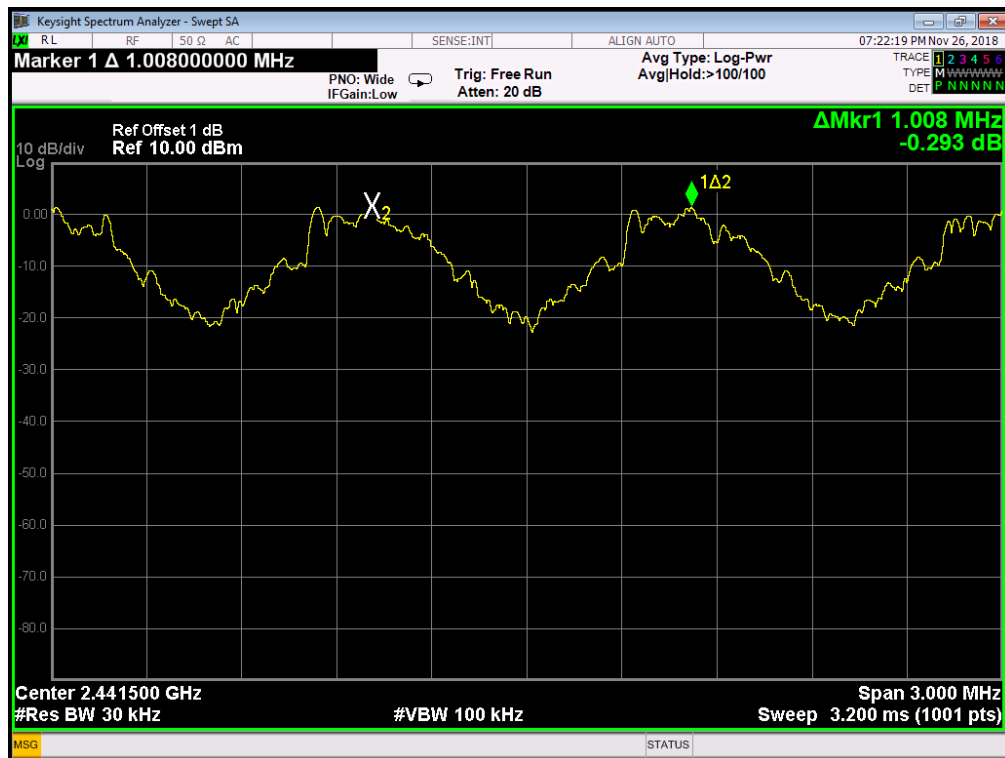
| Channel | Frequency (MHz) | Channel Separation(MHz) | Limit (MHz) | Result |
|---------|-----------------|-------------------------|--------------------------------|--------|
| Low | 2402 | 0.990 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| Middle | 2441 | 1.011 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| High | 2479 | 1.005 | >(25KHz or 2/3*20dB Bandwidth) | PASS |

8DPSK

| Channel | Frequency (MHz) | Channel Separation(MHz) | Limit (MHz) | Result |
|---------|-----------------|-------------------------|--------------------------------|--------|
| Low | 2402 | 0.993 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| Middle | 2441 | 1.002 | >(25KHz or 2/3*20dB Bandwidth) | PASS |
| High | 2480 | 0.996 | >(25KHz or 2/3*20dB Bandwidth) | PASS |

The spectrum analyzer plots are attached as below.

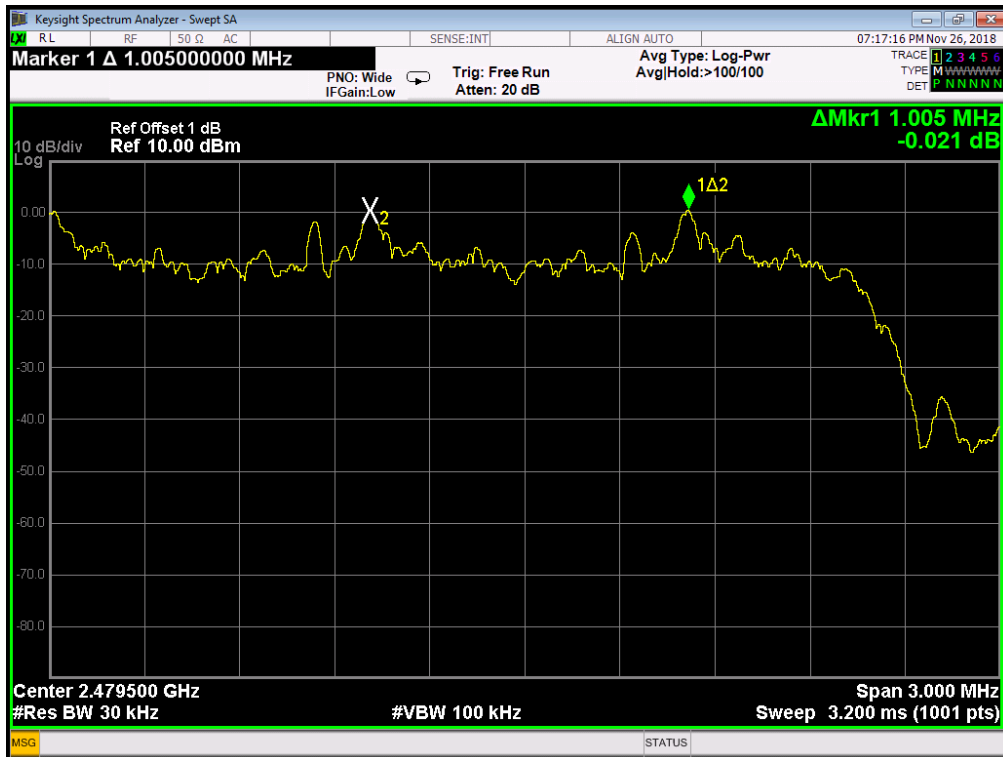
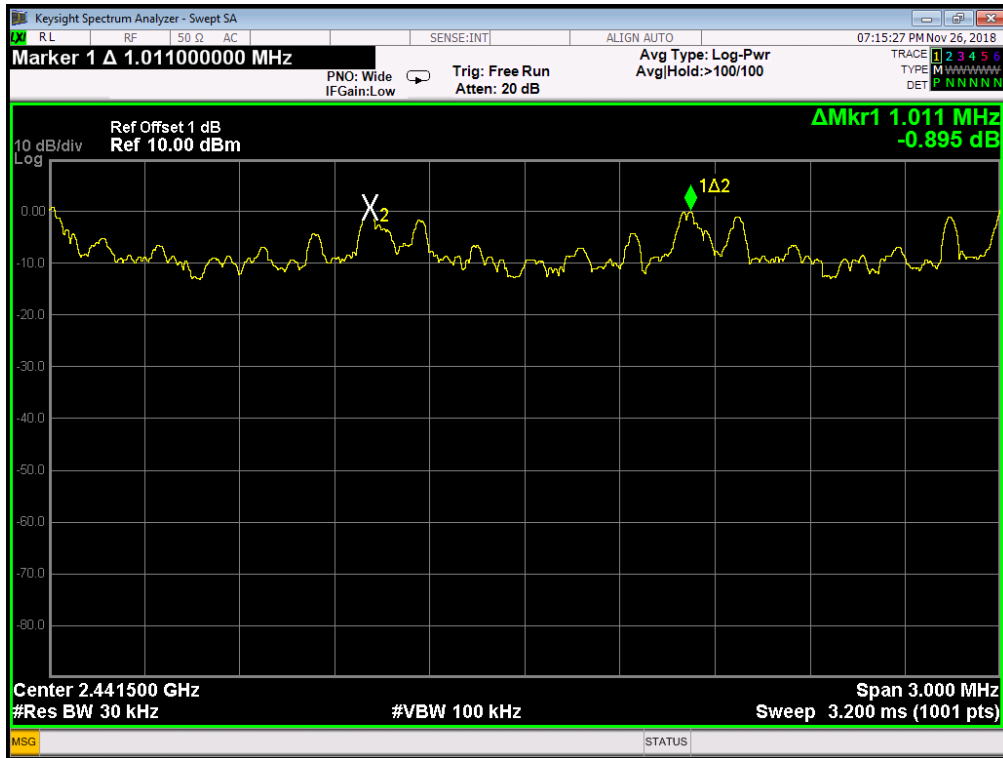
GFSK



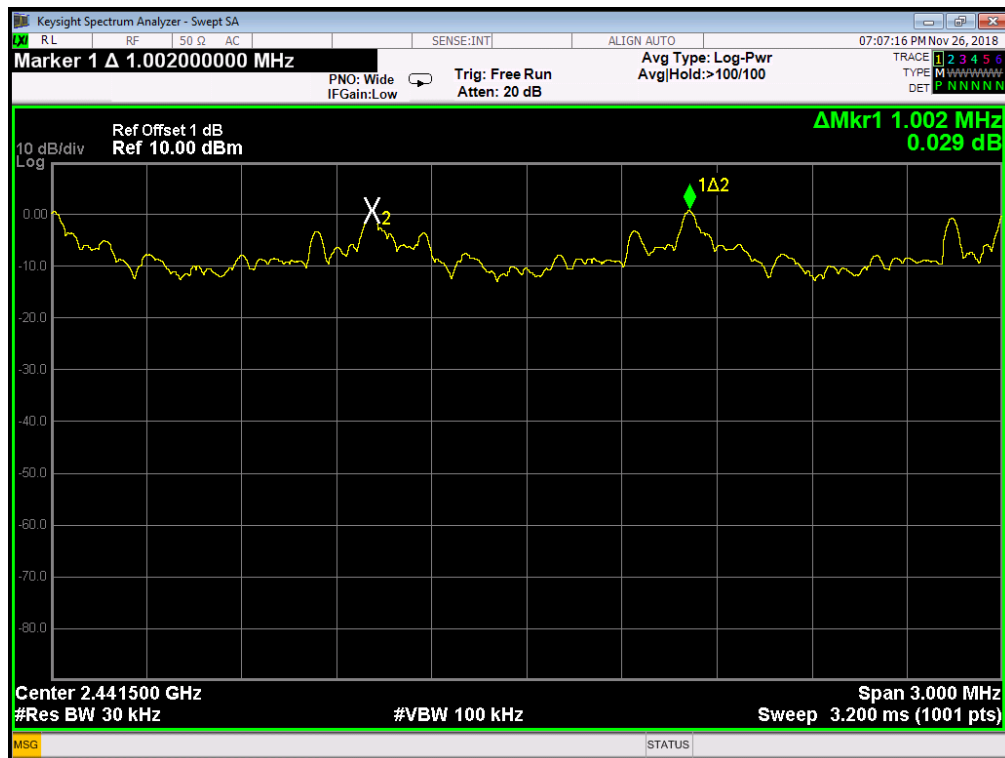


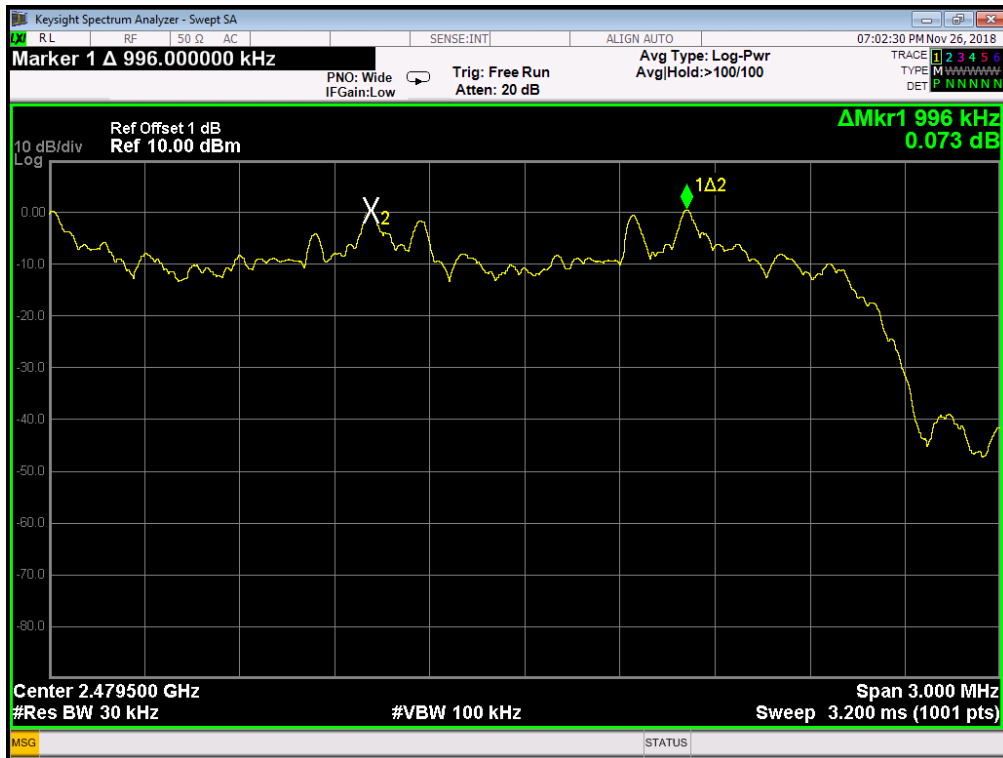
$\pi/4$ DQPSK





8DPSK





5. NUMBER OF HOPPING FREQUENCY TEST

5.1. TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

5.2. THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

5.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 7.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it.

5.5. TEST PROCEDURE

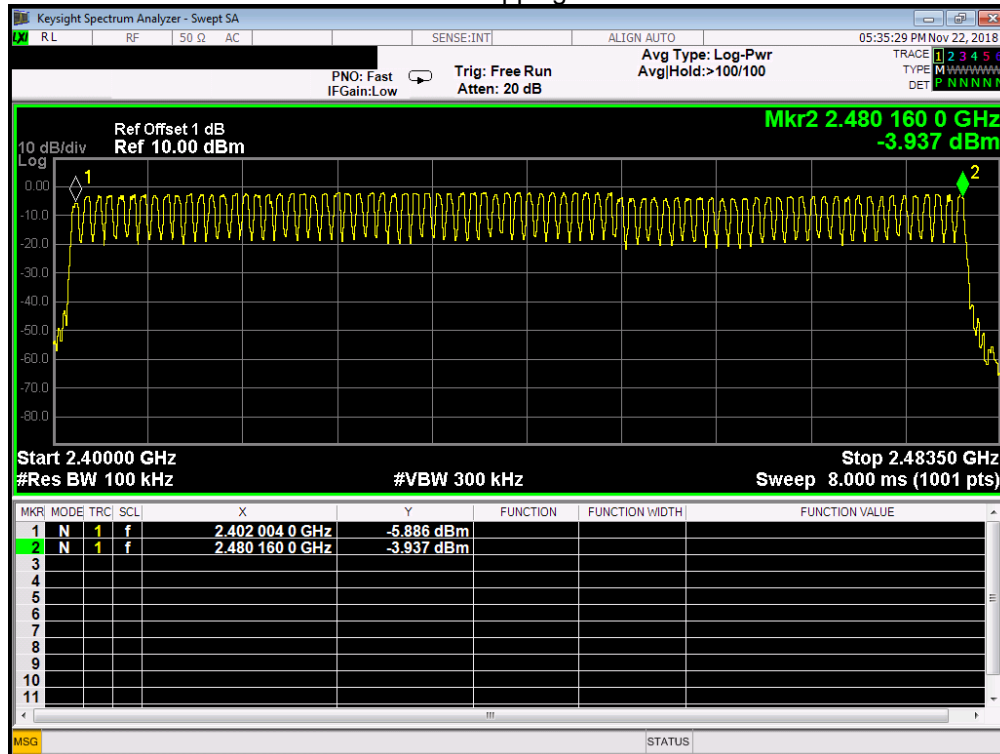
- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set the spectrum analyzer as Span=83.5MHz, RBW=100 kHz, VBW=300 kHz.
- (3) Max hold, view and count how many channel in the band.

5.6. TEST RESULT

| Total number of hopping channel | Measurement result(CH) | Limit(CH) |
|---------------------------------|------------------------|-----------|
| | | 79 |

The spectrum analyzer plots are attached as below

Number of hopping channels



Channle information

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

6. DWELL TIME TEST

6.1. TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

6.2. THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

6.3. EUT CONFIGURATION ON MEASUREMENT

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 8.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

6.5. TEST PROCEDURE

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set center frequency of spectrum analyzer = operating frequency.
- (3) Detector Mode: Peak
- (4) Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz

A Period Time = (channel number)*0.4

DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)

DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)

DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

6.6. TEST RESULT

GFSK Mode

| Mode | Channel Frequency (MHz) | Pulse Time (ms) | Dwell Time (ms) | Limit (ms) |
|------|-------------------------|-----------------|-----------------|------------|
| DH1 | 2441 | 0.43 | 128.0 | 400 |
| DH3 | 2441 | 1.68 | 262.4 | 400 |
| DH5 | 2441 | 2.94 | 350.4 | 400 |

$\pi/4$ DQPSK Mode

| Mode | Channel Frequency (MHz) | Pulse Time (ms) | Dwell Time (ms) | Limit (ms) |
|------|-------------------------|-----------------|-----------------|------------|
| DH1 | 2441 | 0.44 | 131.2 | 400 |
| DH3 | 2441 | 1.70 | 273.9 | 400 |
| DH5 | 2441 | 3.00 | 347.5 | 400 |

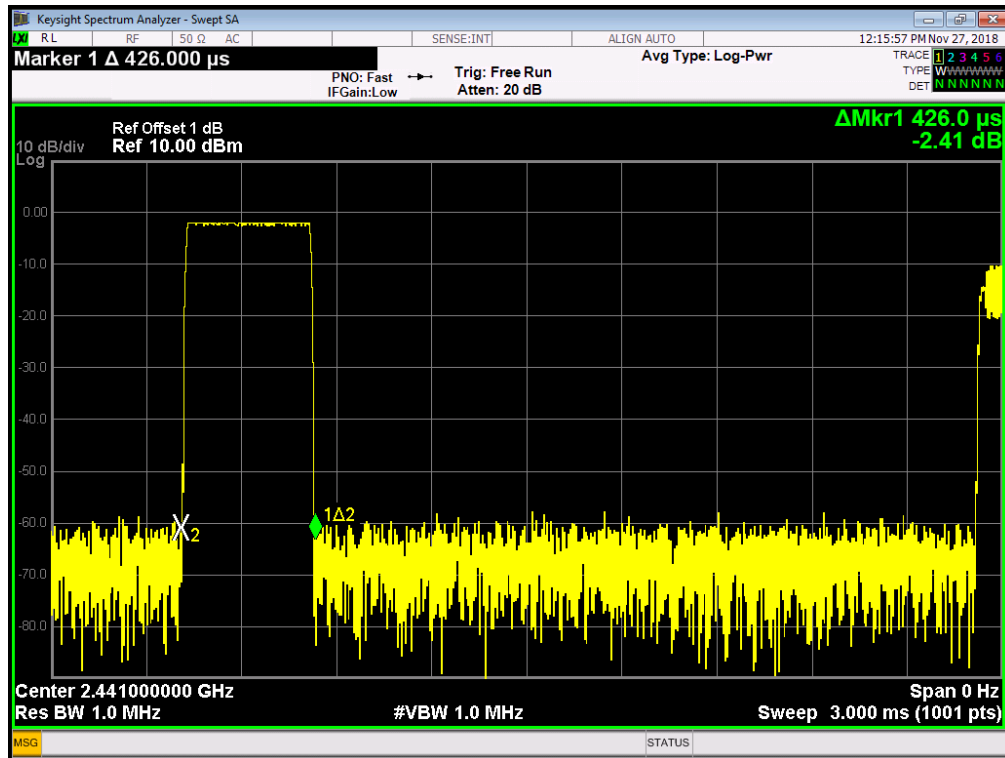
8DPSK Mode

| Mode | Channel Frequency (MHz) | Pulse Time (ms) | Dwell Time (ms) | Limit (ms) |
|------|-------------------------|-----------------|-----------------|------------|
| DH1 | 2441 | 0.44 | 131.6 | 400 |
| DH3 | 2441 | 1.70 | 265.6 | 400 |
| DH5 | 2441 | 2.96 | 364.08 | 400 |

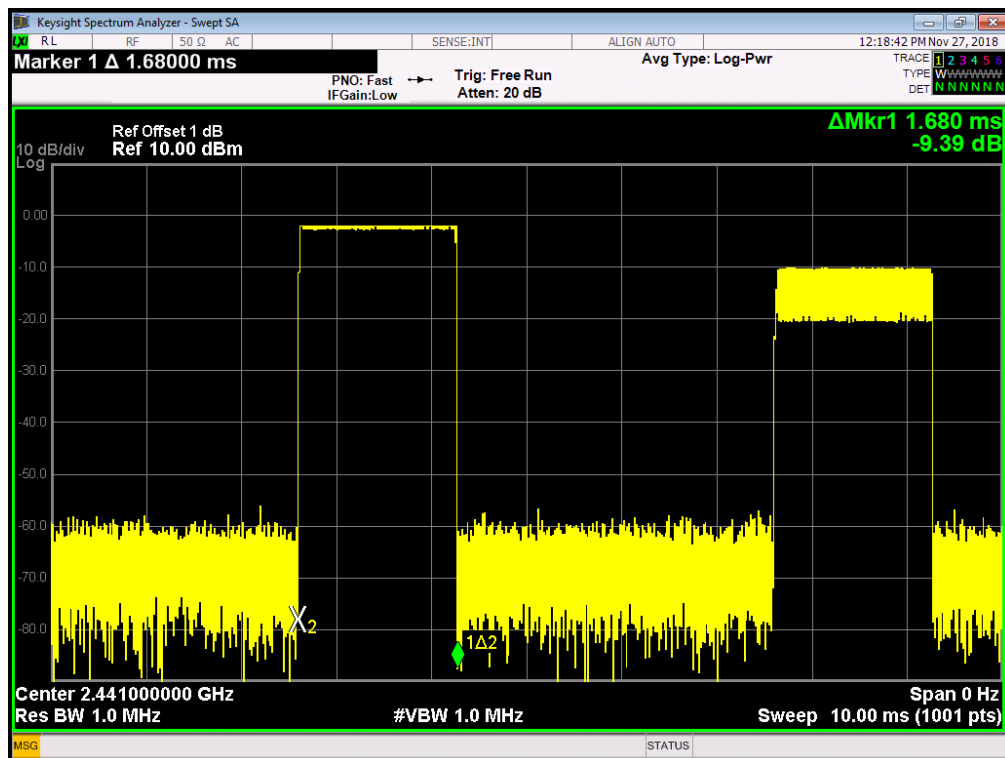
The spectrum analyzer plots are attached as below:

GFSK Mode

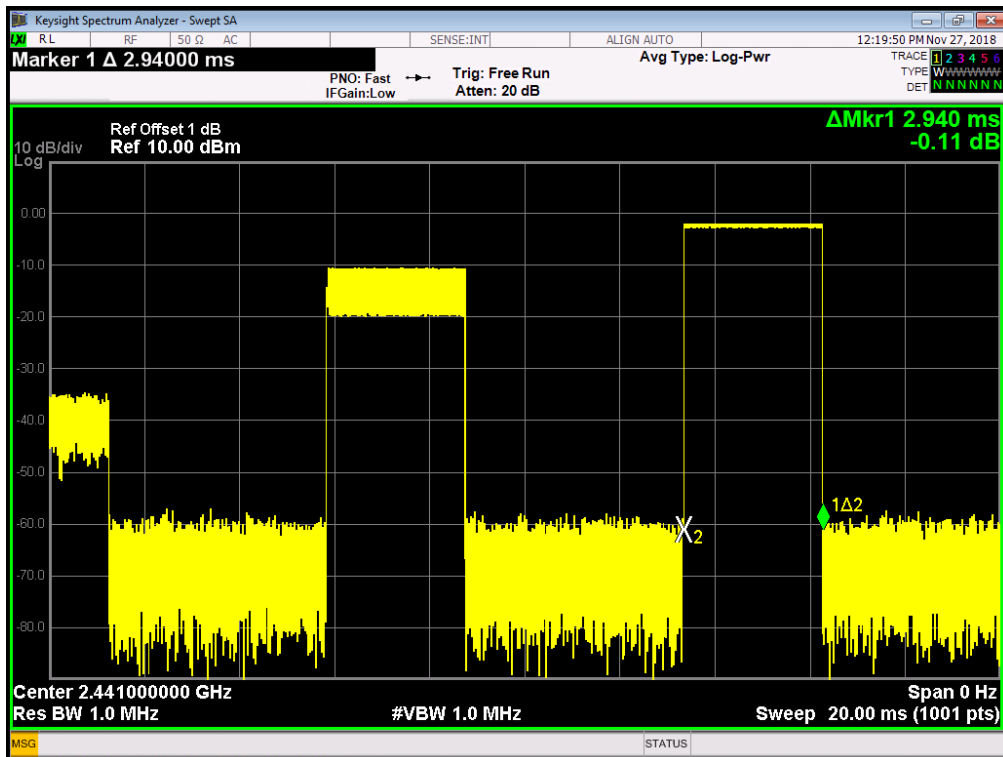
DH1



DH3

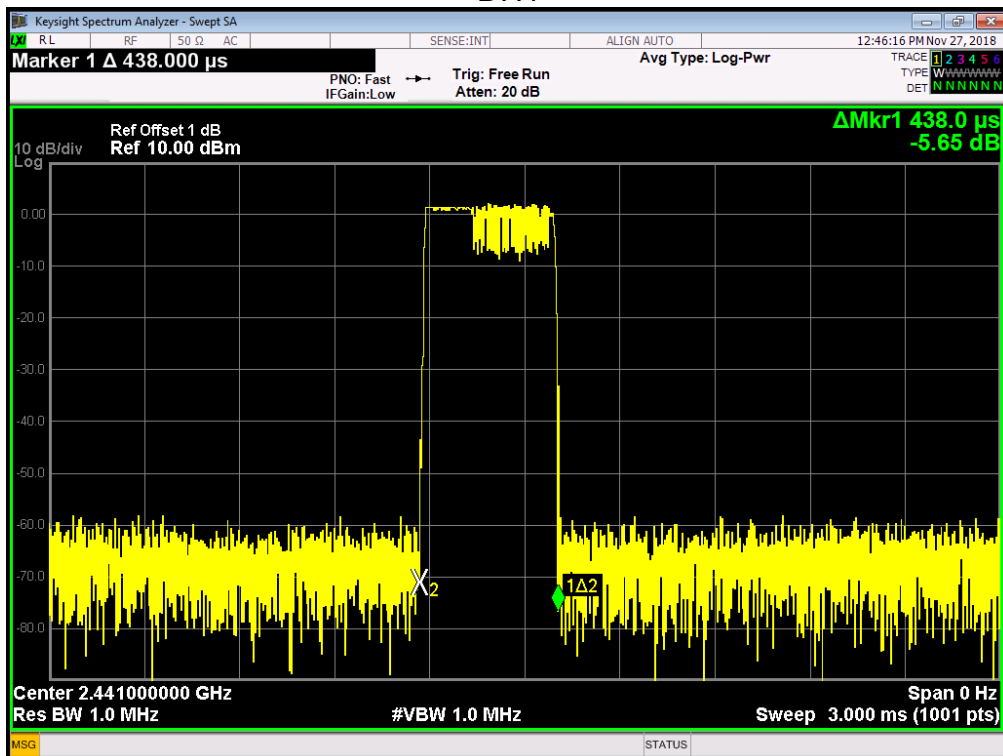


DH5



$\pi/4$ DQPSK Mode

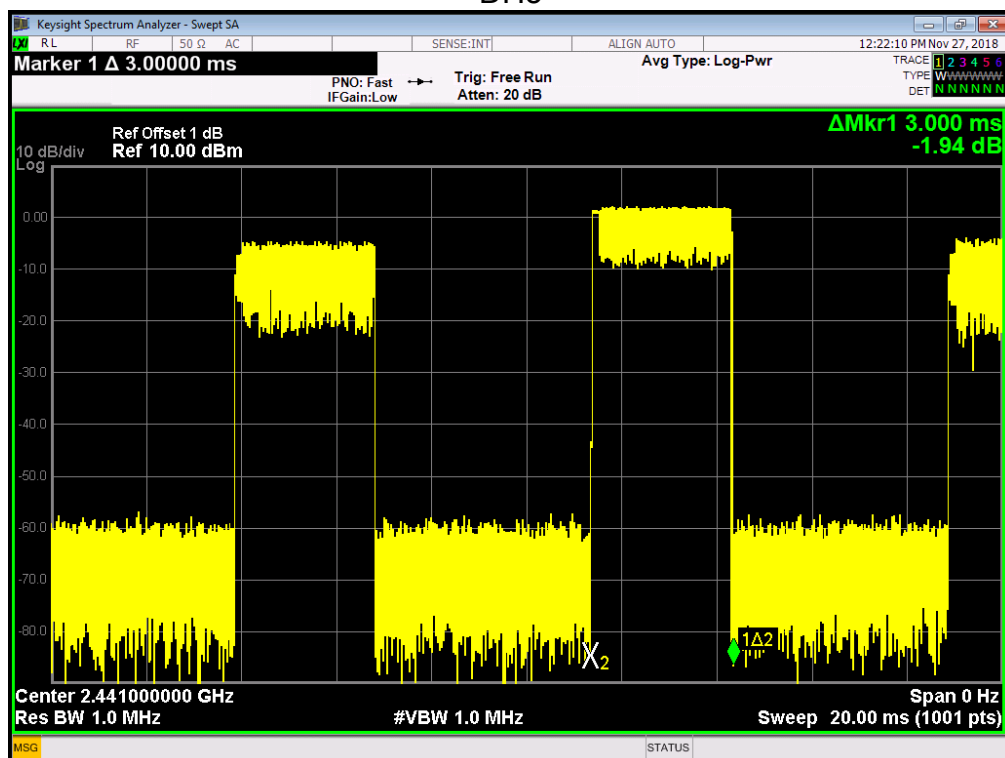
DH1



DH3

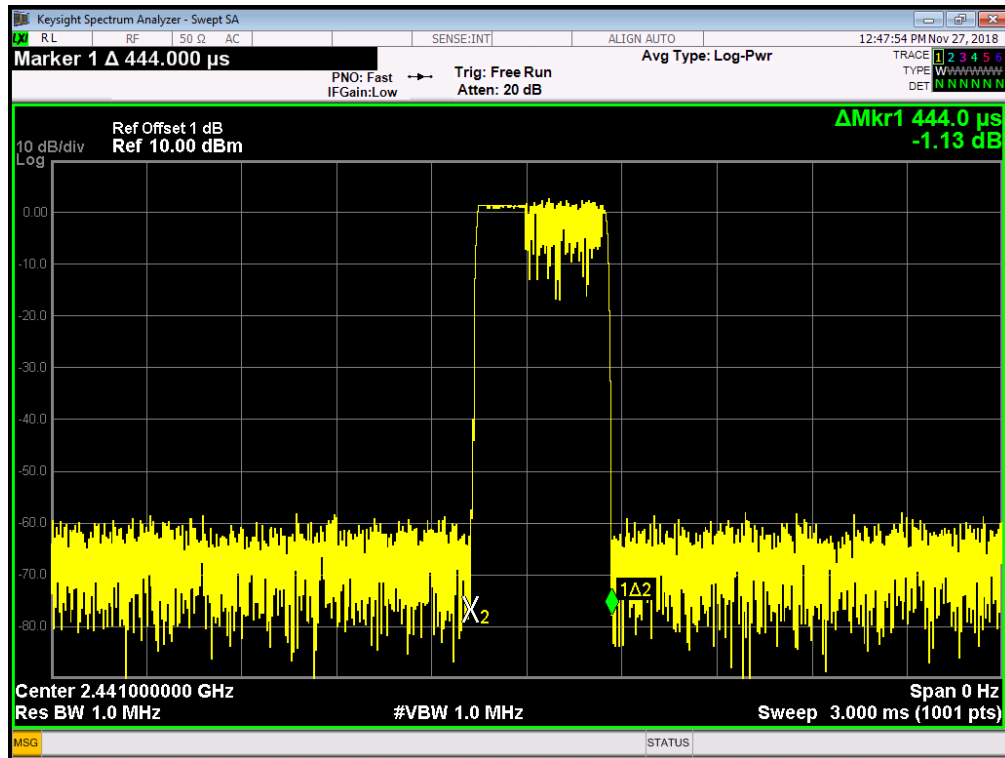


DH5

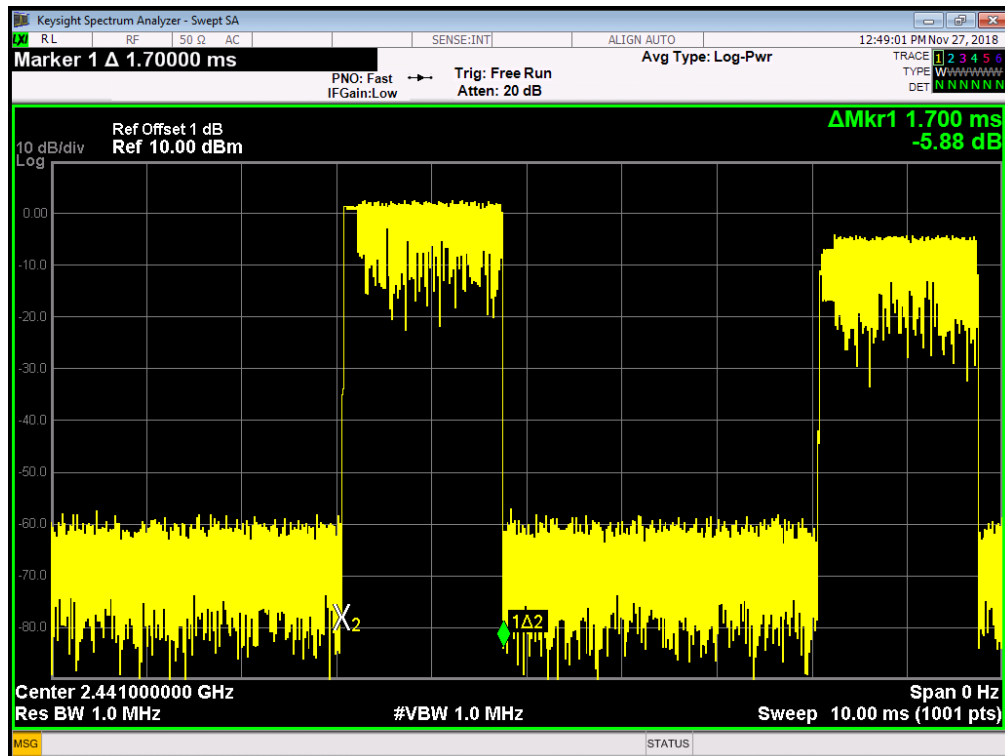


8DPSK Mode

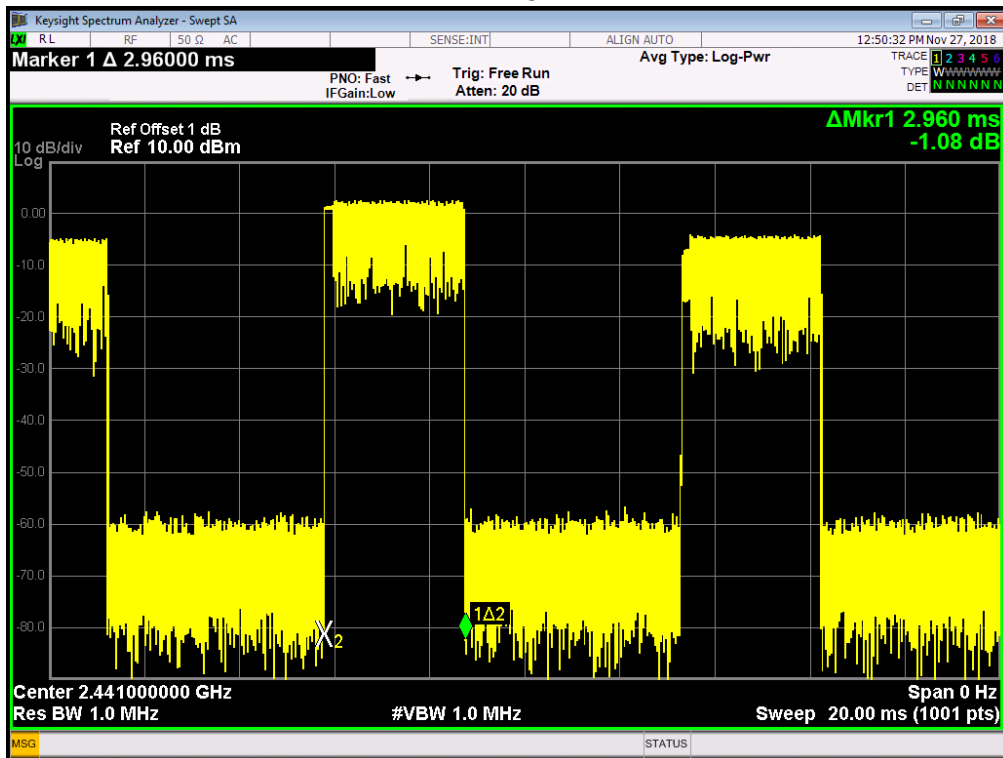
DH1



DH3



DH5



7. MAXMUM OUTPUT POWER

7.1. TEST EQUIPMENT

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

7.2. BLOCK DIAGRAM OF TEST SETUP

FCC:Same with 3.2

7.3. LIMITS

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 0.125 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.4. TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

| | | |
|----------------|------|----------------------|
| GFSK | RBW: | 1MHz |
| | VBW: | 3MHz |
| $\pi/4$ DQPSK | RBW: | 3MHz |
| | VBW: | 3MHz |
| 8DPSK | RBW: | 3MHz |
| | VBW: | 3MHz |
| Span | | >1.5x 20dB bandwidth |
| Detector Mode: | | Peak |
| Sweep time: | | auto |
| Trace mode | | Max hold |

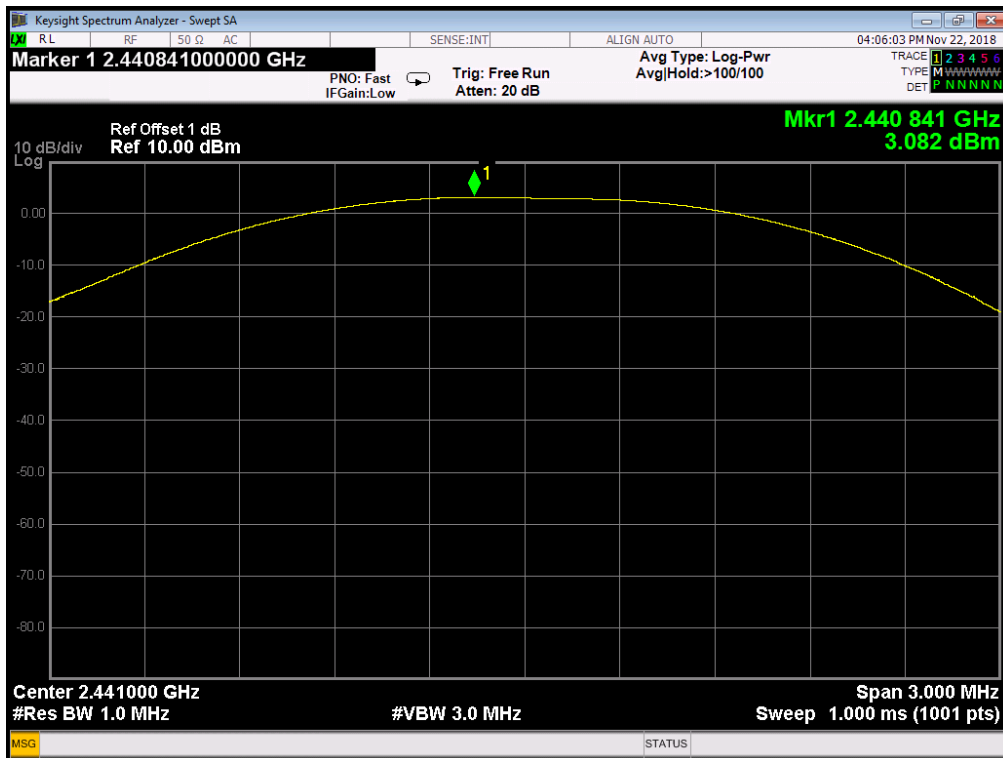
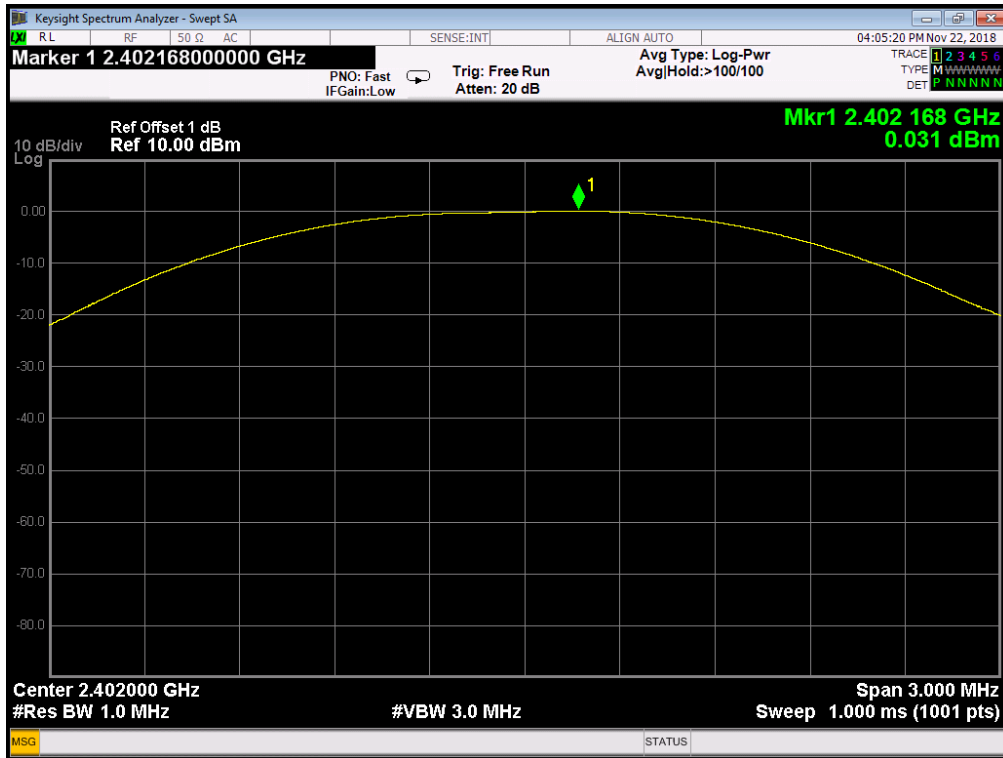
- (5) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the Average and PK output power.

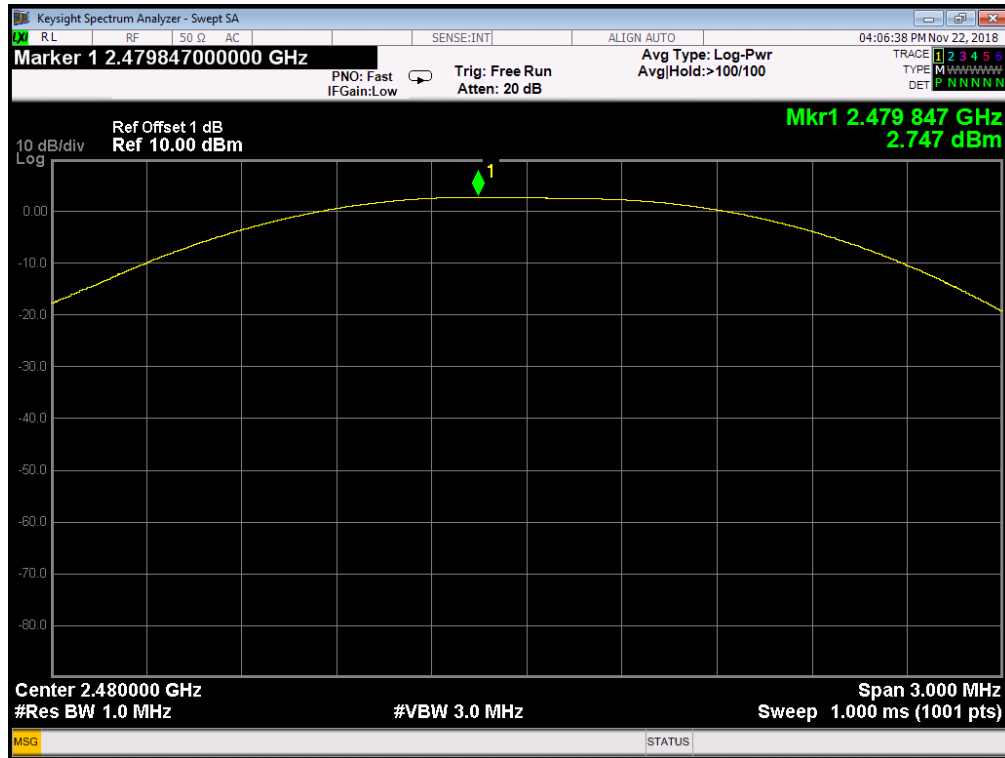
7.5. TEST RESULT

| EUT Set Mode | Data Rate (Mbps) | Frequency (MHz) | Result(dBm) |
|---------------|------------------|------------------|-------------|
| | | | Peak |
| GFSK | 1 | 2402 | 0.031 |
| | | 2441 | 3.082 |
| | | 2480 | 2.747 |
| $\pi/4$ DQPSK | 2 | 2402 | -0.027 |
| | | 2441 | 2.281 |
| | | 2480 | 2.002 |
| 8DPSK | 3 | 2402 | 0.343 |
| | | 2441 | 2.830 |
| | | 2480 | 2.572 |
| Limit: 21dBm | | Conclusion: PASS | |

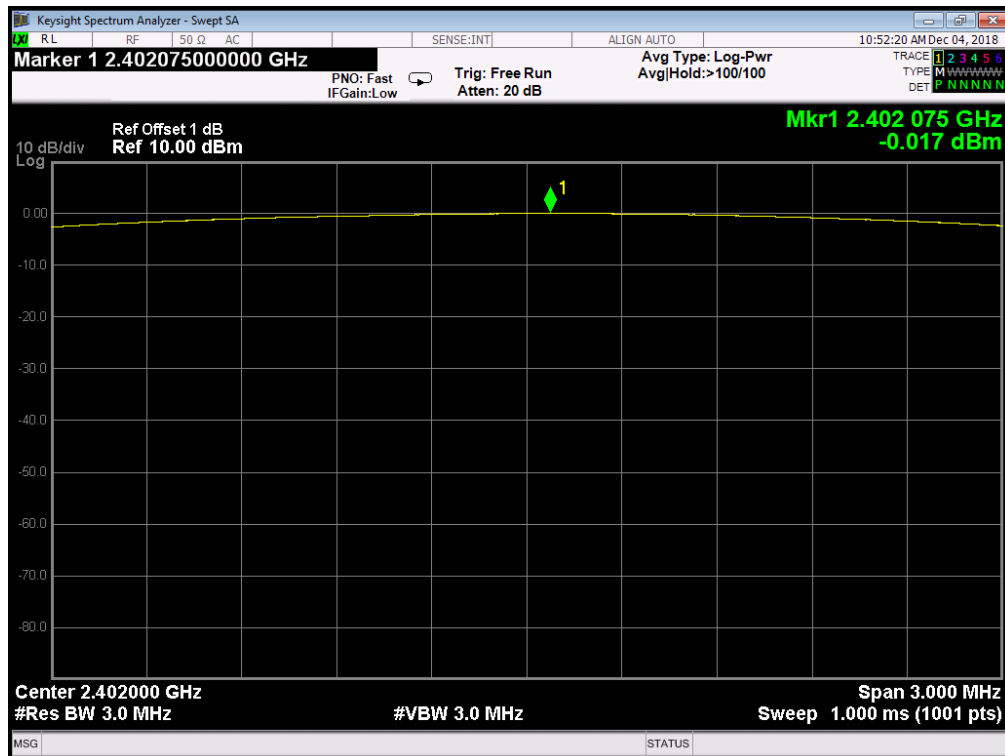
Original test data

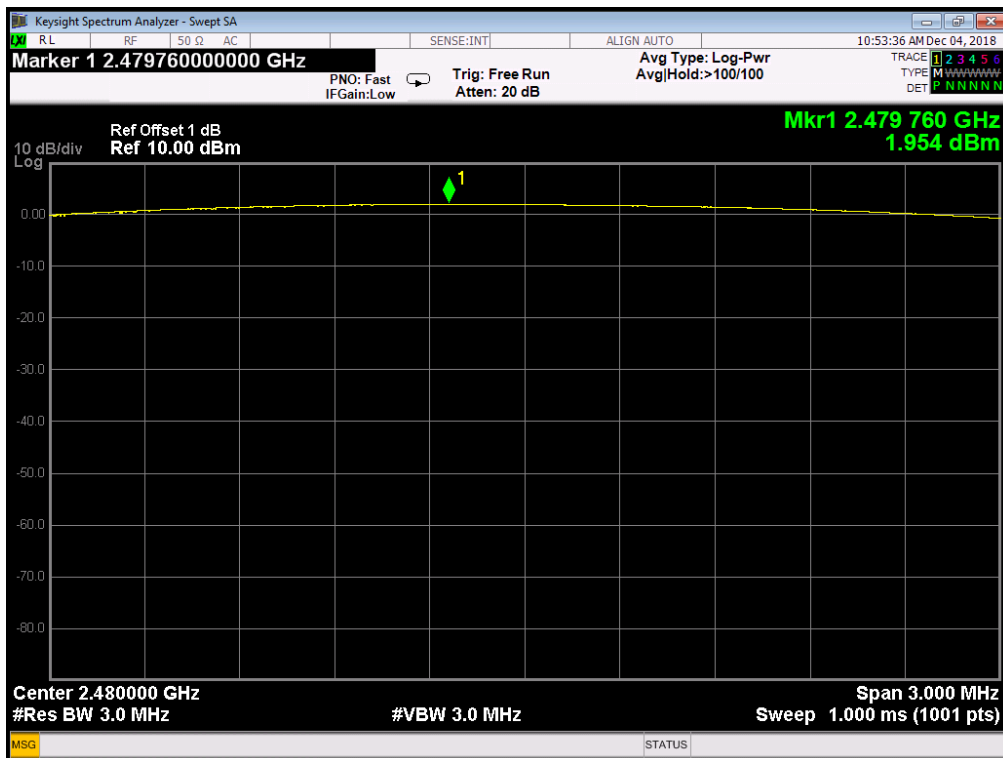
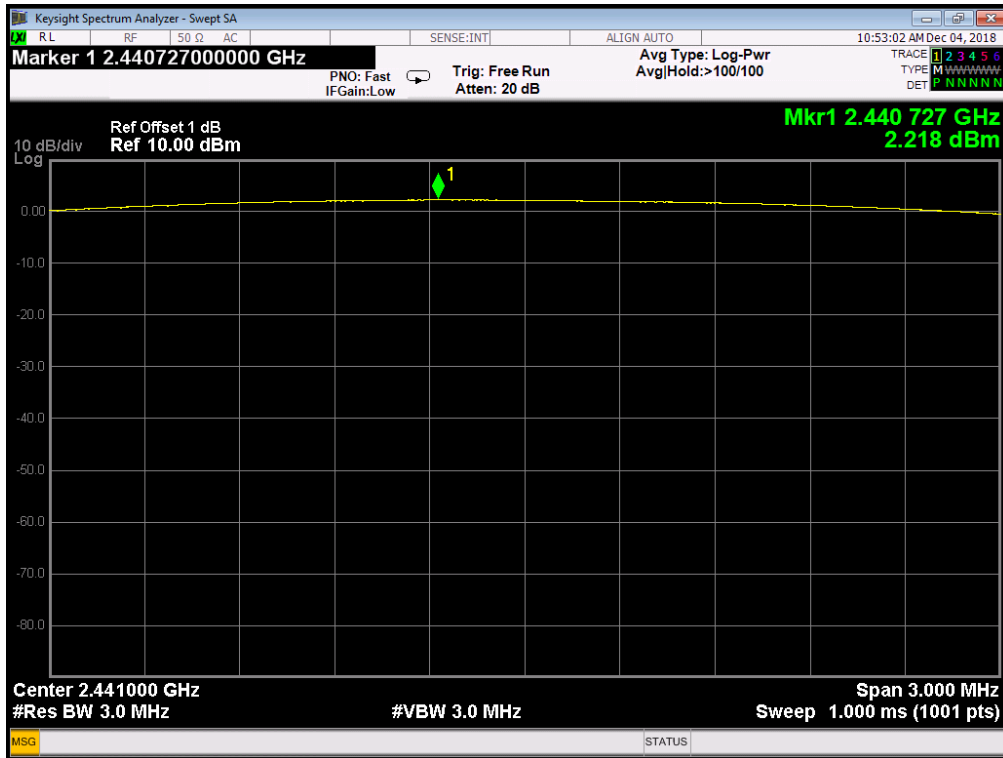
GFSK



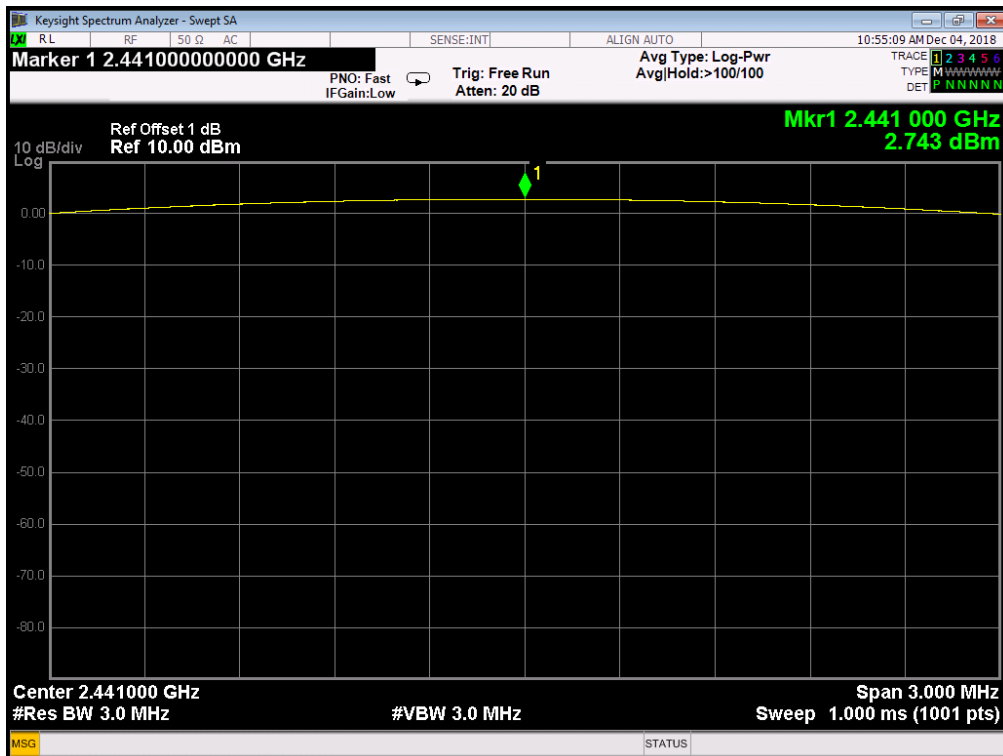
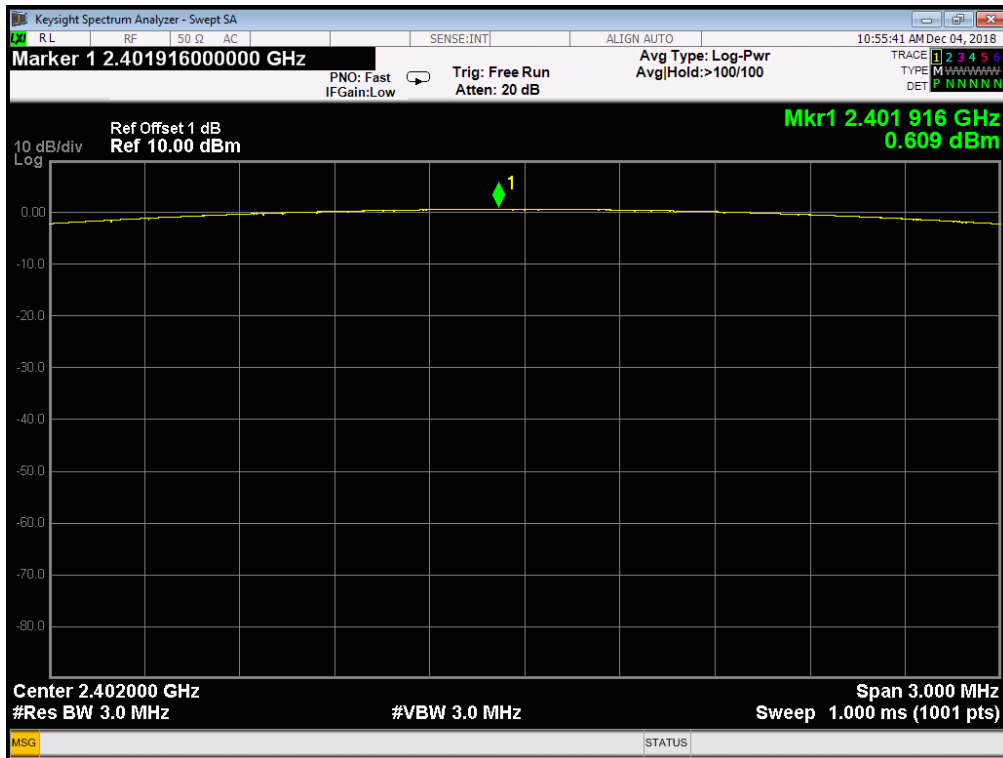


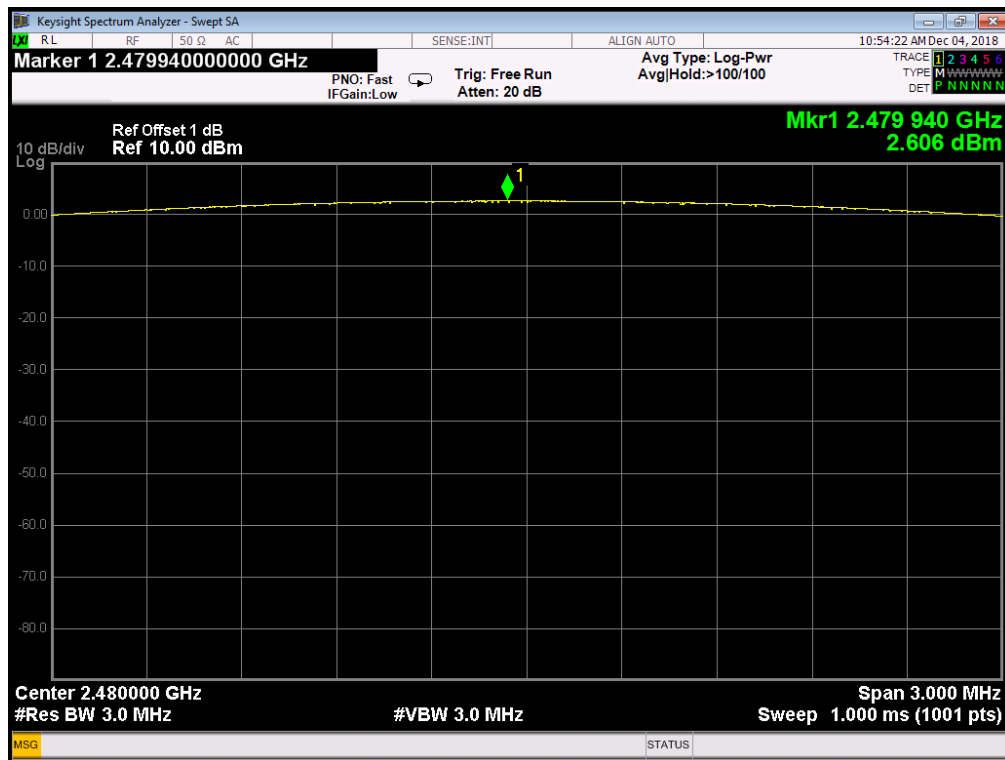
$\pi/4$ DQPSK





8DPSK





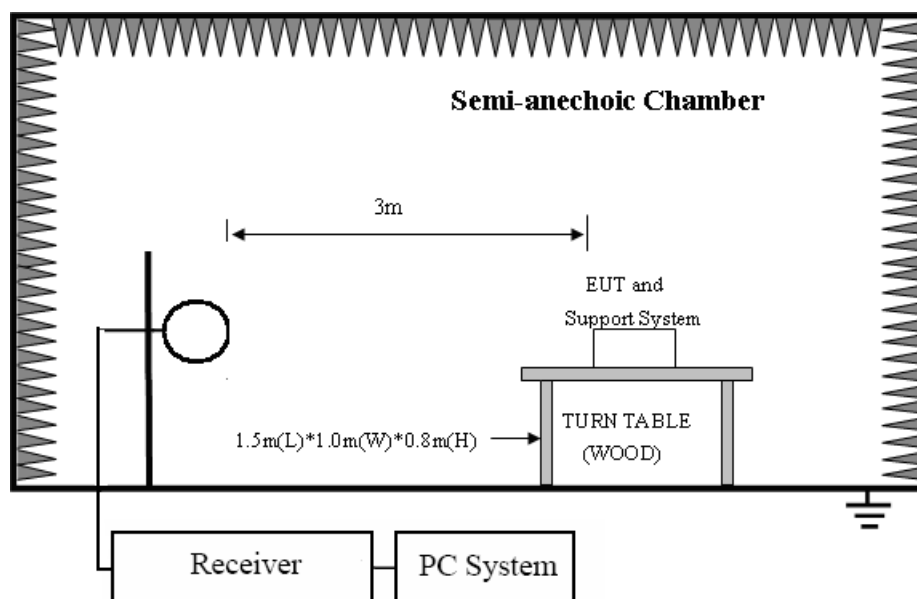
8. SPURIOUS EMISSION

8.1. Test equipment

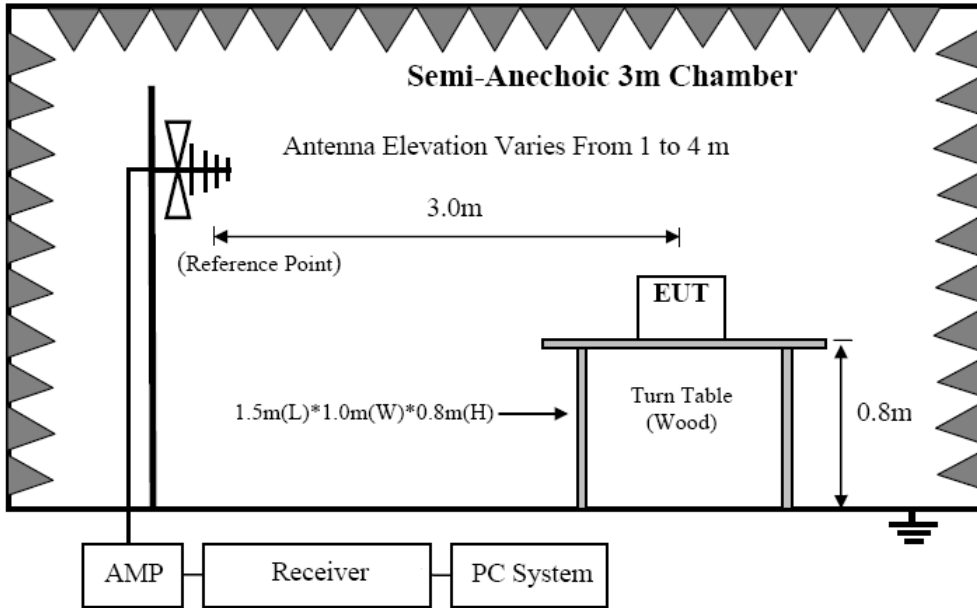
| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|----------------------------|--------------|-----------------------------|--------------|------------|---------------|
| 1 | EMI Test Receiver | R&S | ESU8 | 100316 | 2018/12/17 | 1 Year |
| 2 | Spectrum analyzer | R&S | FSU | 1166.1660.26 | 2018/12/17 | 1 Year |
| 3 | Loop antenna | TESEQ | HLA6120 | 20129 | 2018/12/17 | 1 Year |
| 4 | Trilog Broadband Antenna | Schwarzbeck | VULB9163 | 9163-462 | 2018/12/17 | 1 Year |
| 5 | Double Ridged Horn Antenna | Schwarzbeck | BBHA9120D | 9120D 1065 | 2018/12/17 | 1 Year |
| 6 | Horn Antenna | Schwarzbeck | BBHA 9170 | 9170 1248 | 2018/12/17 | 1 Year |
| 7 | Pre-amplifier | A.H. | PAM-1840VH | 562 | 2018/12/17 | 1 Year |
| 8 | Pre-amplifier | R&S | AFS33-18002 650-30-8P-44 | SEL0080 | 2018/12/17 | 1 Year |
| 9 | Pre-Amplifier | HP | 8449B | 3274A06298 | 2018/12/17 | 1 Year |
| 10 | RF Cable | R&S | R01 | 10403 | 2018/12/17 | 1 Year |
| 11 | RF Cable | R&S | R02 | 10512 | 2018/12/17 | 1 Year |

8.2. Block diagram of test setup

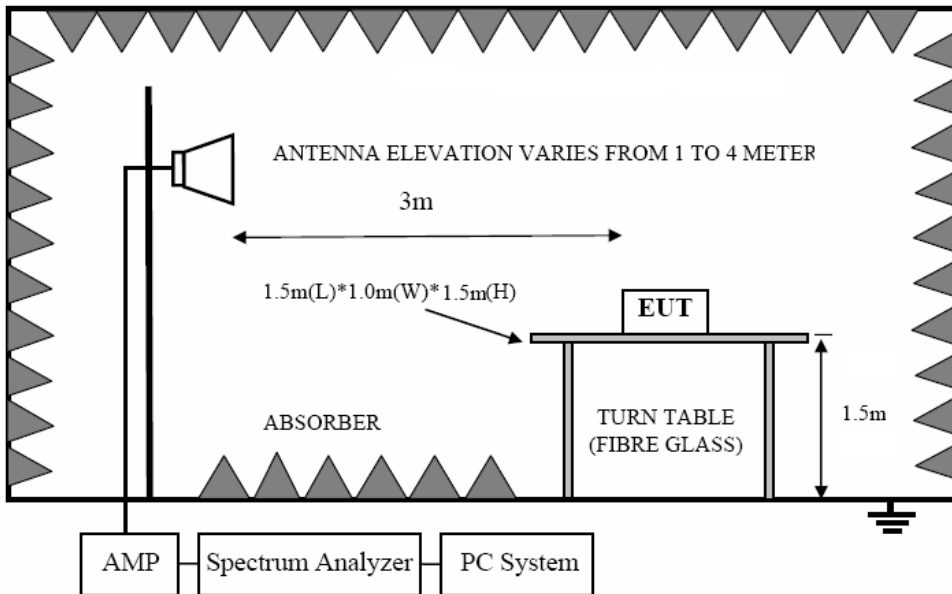
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

8.3. Limit

8.3.1 Restricted frequency band

| MHz | MHz | MHz | GHz |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (²) |

8.3.2. Limit.

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|------------------|--------------------|---|-----------------------------------|
| | | $\mu\text{V}/\text{m}$ | $\text{dB}(\mu\text{V})/\text{m}$ |
| 0.009 ~ 0.490 | 300 | 2400/F(KHz) | 67.6-20log(F) |
| 0.490 ~ 1.705 | 30 | 24000/F(KHz) | 87.6-20log(F) |
| 1.705 ~ 30.0 | 30 | 30 | 29.54 |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average) | |

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dBuV}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dBuV}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

8.3.3. Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 30dB below the fundamental emissions, or comply with 15.209 limits.

8.4. Test Procedure

- (1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 7.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

| Test frequency range | Test antenna used |
|----------------------|--|
| 9KHz-30MHz | Active Loop antenna |
| 30MHz-1GHz | Trilog Broadband Antenna |
| 1GHz-26.5GHz | Double Ridged Horn Antenna(1GHz-26.5GHz) |

According ANSI C63.10:2013 clause 6.4.4.2 and 6,5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9KHz to 25GHz:
 - (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.)
 - (b) Change work frequency or channel of device if practicable.
 - (c) Change modulation type of device if practicable.
 - (d) new battery is used during testing
 - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

- (5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz, for emissions from 9KHz-90KHz, 110KHz-490KHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.
- (7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

| Frequency band | RBW |
|----------------|--------|
| 9KHz-150KHz | 200Hz |
| 150KHz-30MHz | 9KHz |
| 30MHz-1GHz | 120KHz |

- (8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure). Peak detector is used for Peak and AV measurement both.

8.5. Test Result

Below 30M

| | | | |
|----------------------|----------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24°C | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | -- | Test Result: | Pass |
| Test Mode: | Keeping TX mode | Test By: | Smile |

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

Note:

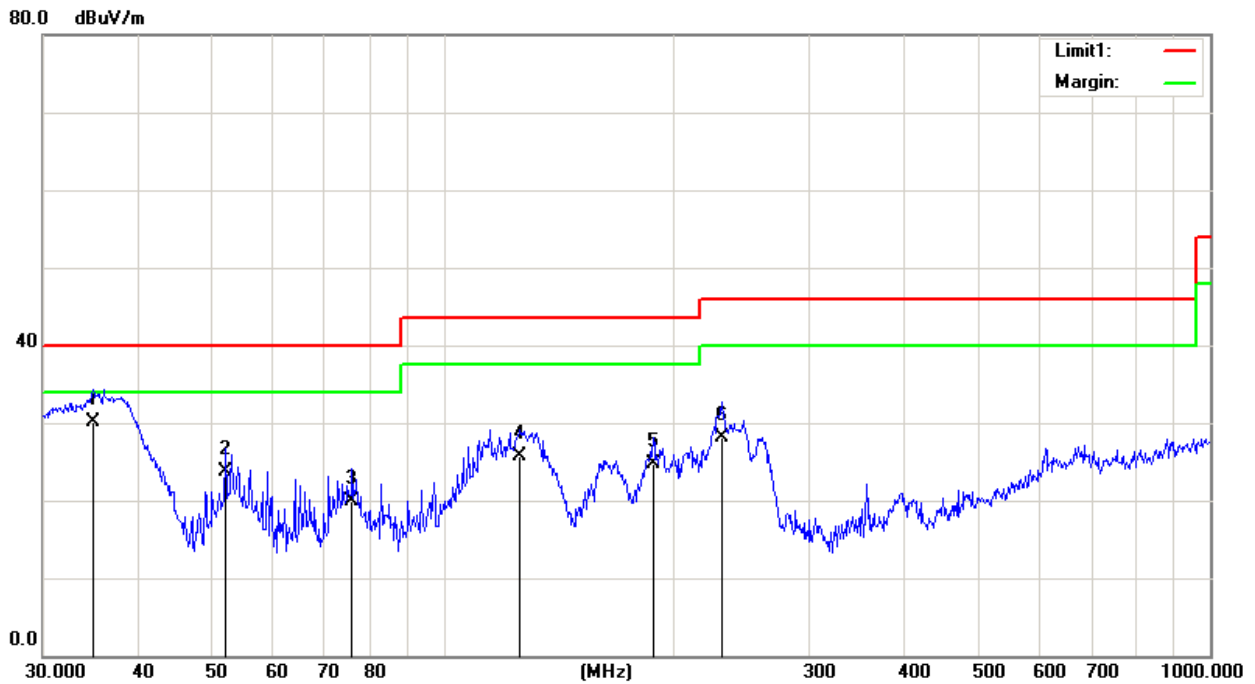
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log(\text{specific distance}/\text{test distance})$ (dB);

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

Between 30M – 1000 MHz

| | | | |
|----------------------|----------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Standard: | (RE)FCC PART 15 | Test By: | Smile |
| Test Mode: | Keeping TX mode | | |

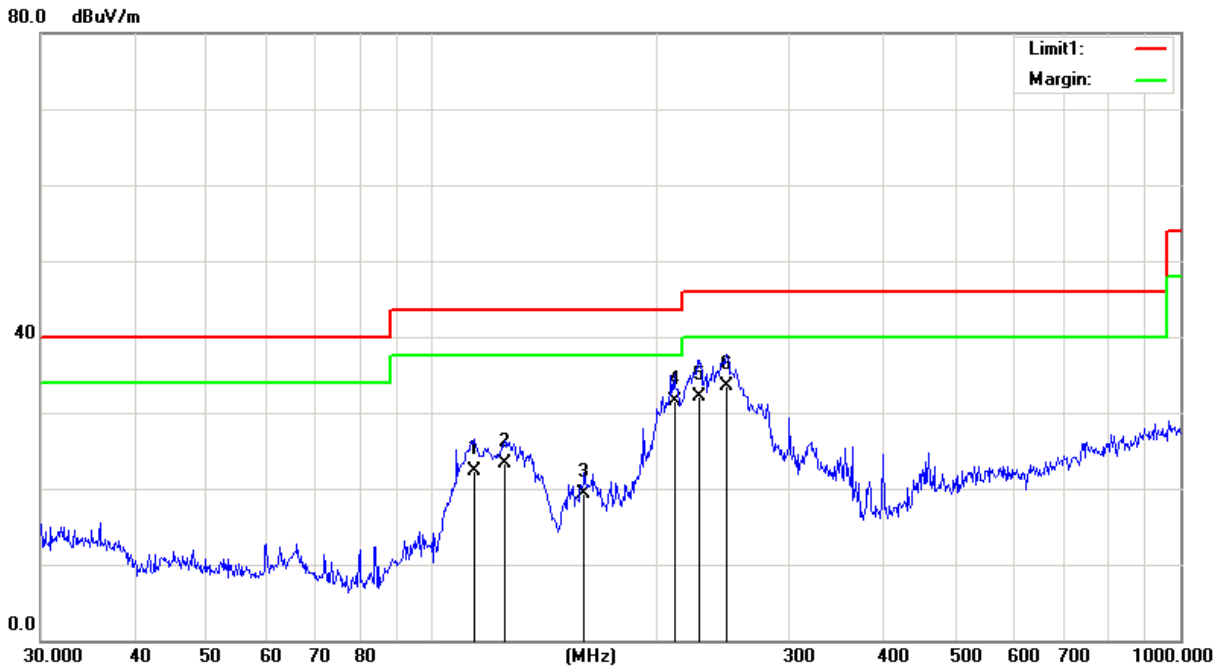


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 34.8823 | 43.87 | -13.85 | 30.02 | 40.00 | -9.98 | QP |
| 2 | 52.0251 | 36.90 | -13.28 | 23.62 | 40.00 | -16.38 | QP |
| 3 | 75.9773 | 35.45 | -15.47 | 19.98 | 40.00 | -20.02 | QP |
| 4 | 125.8864 | 38.04 | -12.43 | 25.61 | 43.50 | -17.89 | QP |
| 5 | 187.7530 | 36.65 | -11.94 | 24.71 | 43.50 | -18.79 | QP |
| 6 | 230.9068 | 36.59 | -8.54 | 28.05 | 46.00 | -17.95 | QP |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Standard: | (RE)FCC PART 15 | Test By: | Smile |
| Test Mode: | Keeping TX mode | | |



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|---------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 114.1138 | 37.52 | -15.22 | 22.30 | 43.50 | -21.20 | QP |
| 2 | 125.0066 | 36.66 | -13.30 | 23.36 | 43.50 | -20.14 | QP |
| 3 | 159.7844 | 32.71 | -13.41 | 19.30 | 43.50 | -24.20 | QP |
| 4 | 210.7860 | 40.89 | -9.47 | 31.42 | 43.50 | -12.08 | QP |
| 5 | 227.6906 | 41.00 | -8.94 | 32.06 | 46.00 | -13.94 | QP |
| 6 | 247.6819 | 40.09 | -6.62 | 33.47 | 46.00 | -12.53 | QP |

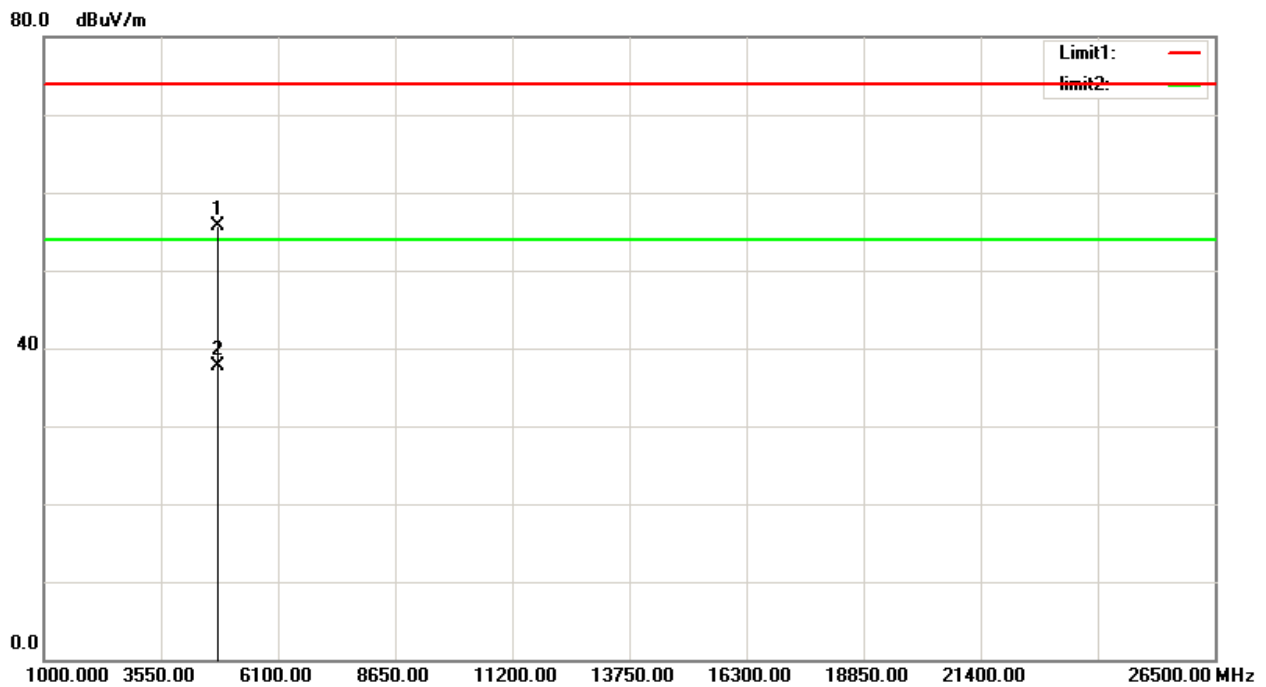
The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

Between 1000M – 25000 MHz

| | | | |
|---------------------|---|-------------------------|-------------|
| Test Site | : 3m Chamber | | |
| EUT | : Bluetooth controller | Tested By | : Smile |
| Power Supply | : DC 12V | Model Number | : 278003465 |
| Condition | : Temp:24.5'C,Humi:55%, Press:100.1kPa | Test Mode | : Tx mode |
| Memo | : GFSK (worst case) | Antenna/Distance | : |

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2402 | | |

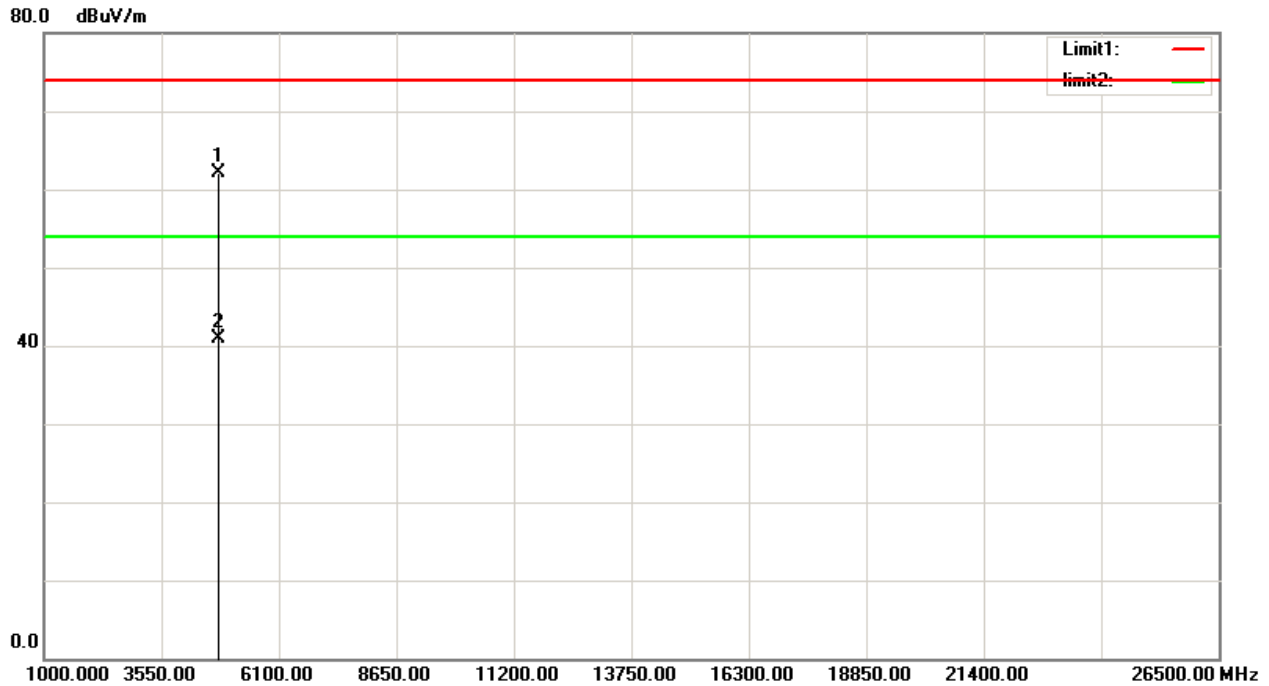


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 4804.000 | 66.41 | -10.79 | 55.62 | 74.00 | -18.38 | peak |
| 2 | 4804.000 | 48.59 | -10.79 | 37.80 | 54.00 | -16.20 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2402 | | |

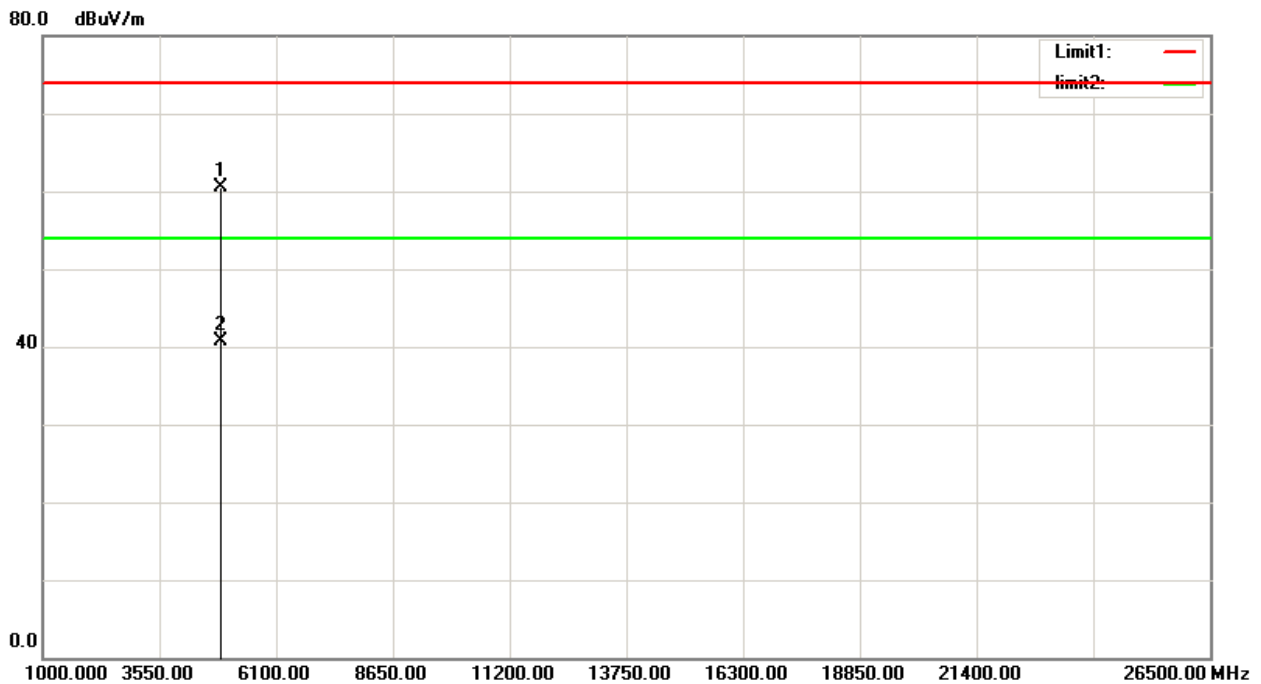


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 4804.100 | 72.85 | -10.79 | 62.06 | 74.00 | -11.94 | peak |
| 2 | 4804.100 | 51.76 | -10.79 | 40.97 | 54.00 | -13.03 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2441 | | |

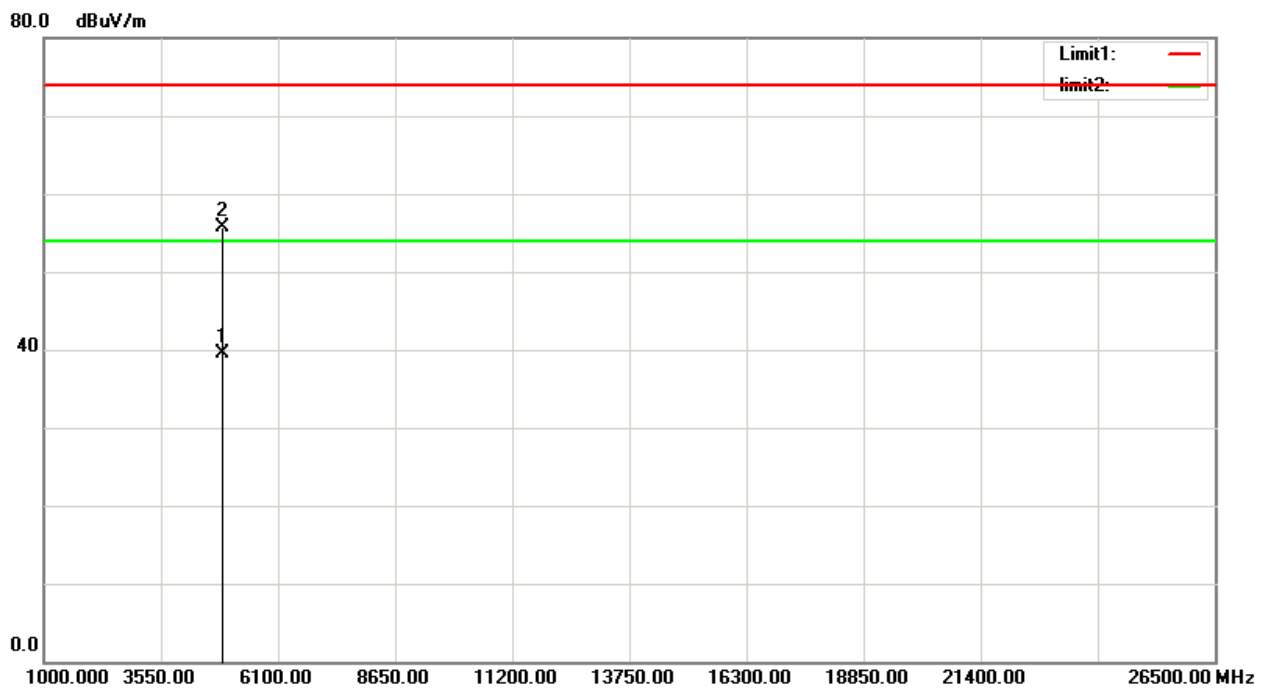


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|---------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 4882.000 | 70.95 | -10.43 | 60.52 | 74.00 | -13.48 | peak |
| 2 | 4882.000 | 51.07 | -10.43 | 40.64 | 54.00 | -13.36 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2441 | | |

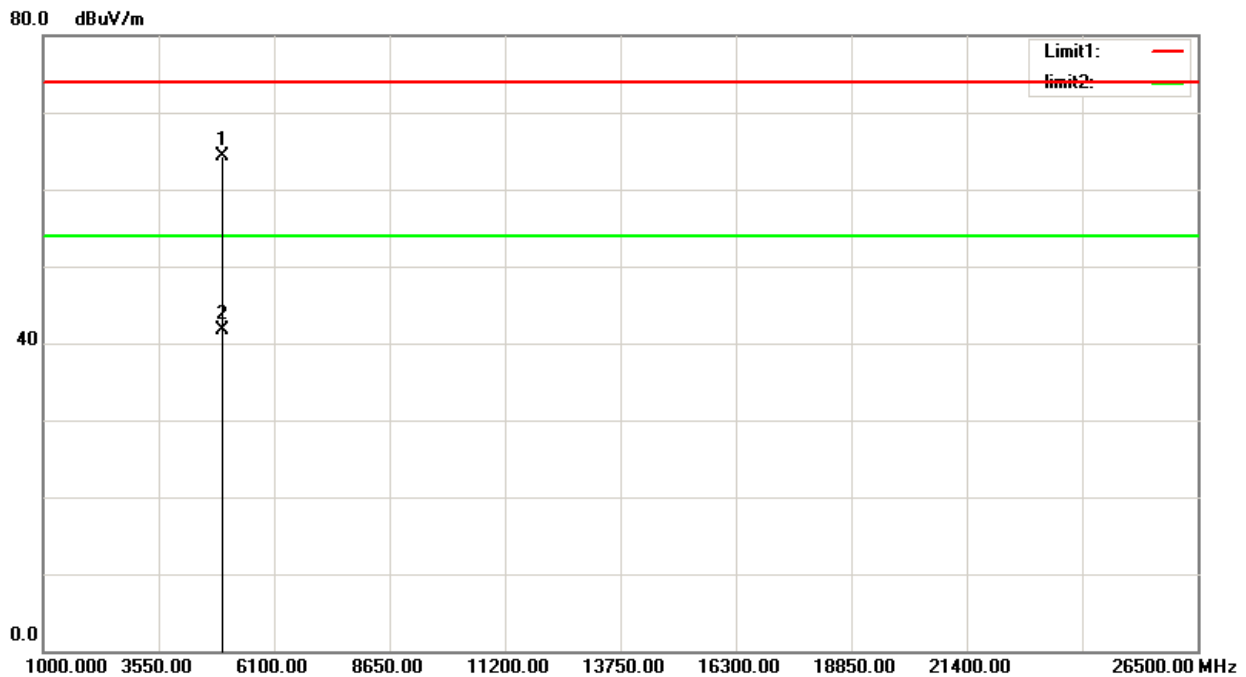


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 4881.900 | 50.01 | -10.43 | 39.58 | 54.00 | -14.42 | AVG |
| 2 | 4881.900 | 66.17 | -10.43 | 55.74 | 74.00 | -18.26 | peak |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2480 | | |

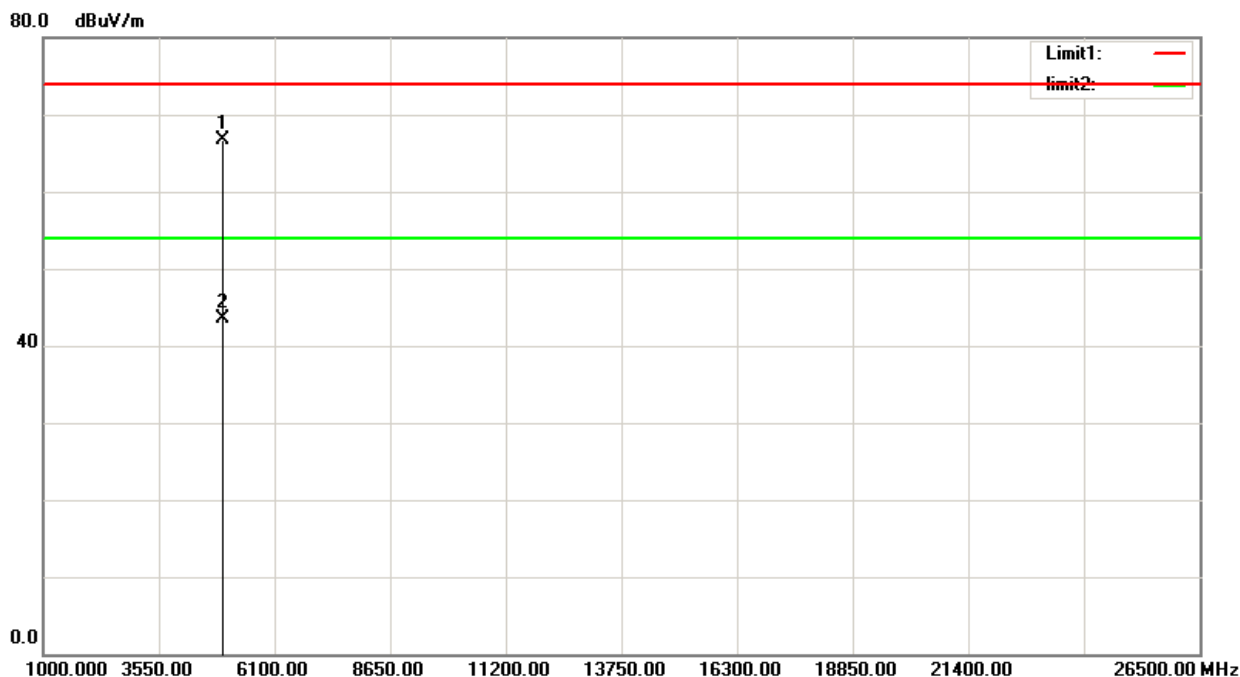


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 4960.050 | 74.47 | -10.08 | 64.39 | 74.00 | -9.61 | peak |
| 2 | 4960.050 | 51.78 | -10.08 | 41.70 | 54.00 | -12.30 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | 1M 2480 | | |



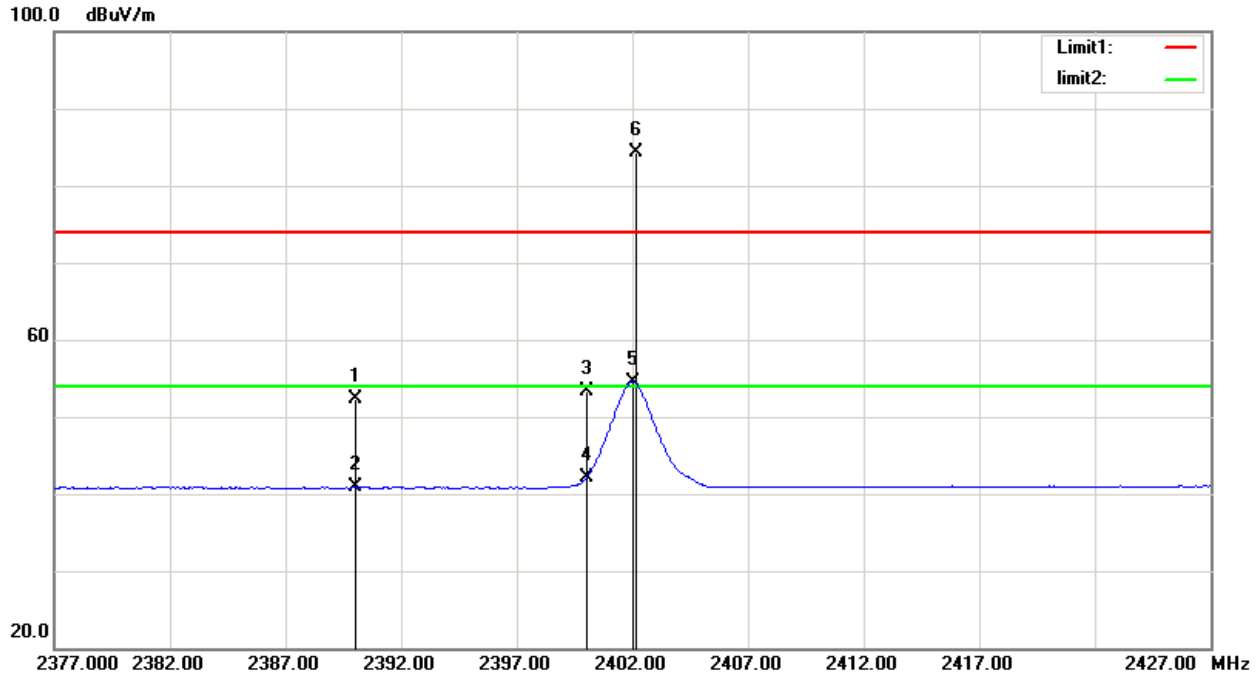
| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 4959.950 | 76.69 | -10.08 | 66.61 | 74.00 | -7.39 | peak |
| 2 | 4959.950 | 53.58 | -10.08 | 43.50 | 54.00 | -10.50 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

Radiated band edge:

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12 V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 1M 2402 | | |

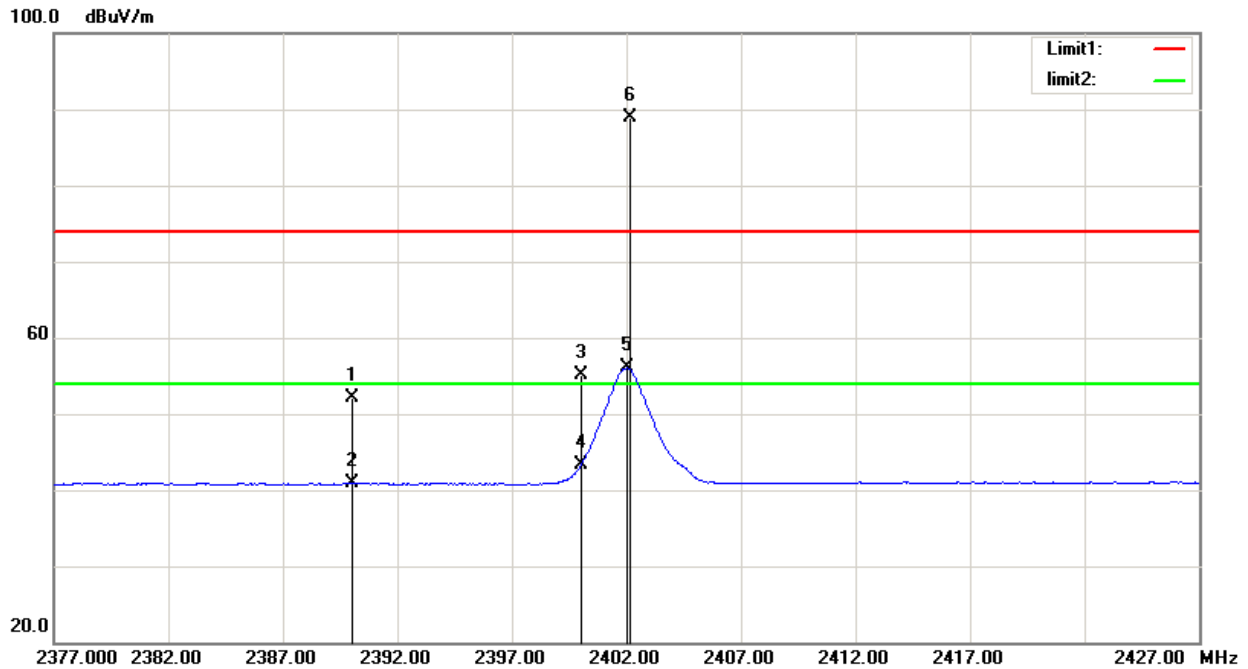


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 21.45 | 30.85 | 52.30 | 74.00 | -21.70 | peak |
| 2 | 2390.000 | 9.96 | 30.85 | 40.81 | 54.00 | -13.19 | AVG |
| 3 | 2400.000 | 22.36 | 30.87 | 53.23 | 74.00 | -20.77 | peak |
| 4 | 2400.000 | 11.20 | 30.87 | 42.07 | 54.00 | -11.93 | AVG |
| 5 | 2402.000 | 23.67 | 30.87 | 54.54 | | | AVG |
| 6 | 2402.200 | 53.43 | 30.87 | 84.30 | | | peak |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 1M 2402 | | |

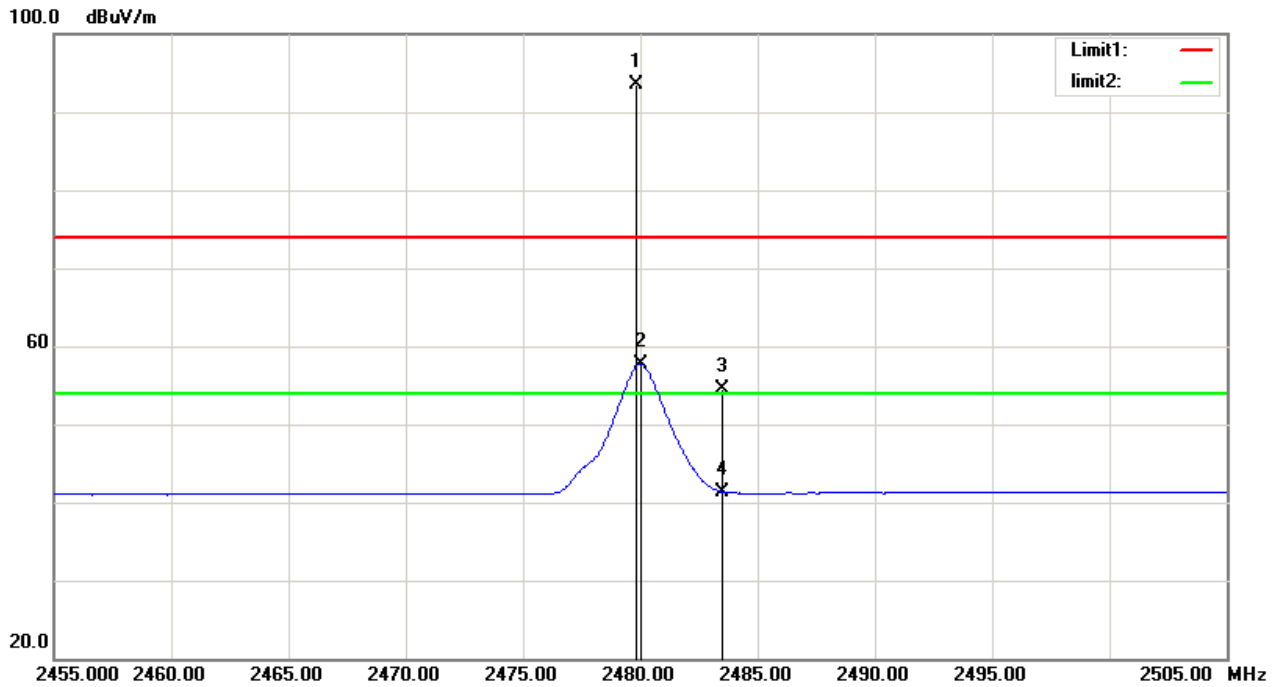


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 21.27 | 30.85 | 52.12 | 74.00 | -21.88 | peak |
| 2 | 2390.000 | 9.99 | 30.85 | 40.84 | 54.00 | -13.16 | AVG |
| 3 | 2400.000 | 24.18 | 30.87 | 55.05 | 74.00 | -18.95 | peak |
| 4 | 2400.000 | 12.36 | 30.87 | 43.23 | 54.00 | -10.77 | AVG |
| 5 | 2402.000 | 25.17 | 30.87 | 56.04 | | | AVG |
| 6 | 2402.200 | 58.08 | 30.87 | 88.95 | | | peak |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 1M 2480 | | |

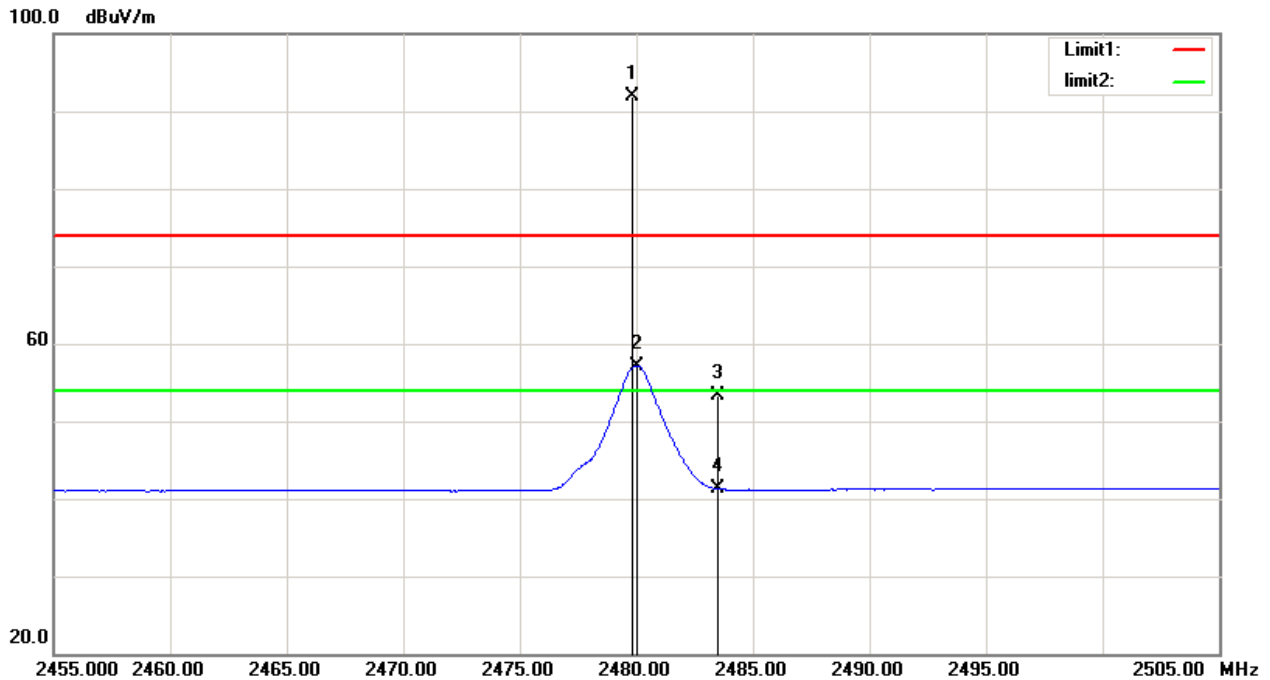


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 62.41 | 31.06 | 93.47 | | | peak |
| 2 | 2480.000 | 26.70 | 31.06 | 57.76 | | | AVG |
| 3 | 2483.500 | 23.51 | 31.07 | 54.58 | 74.00 | -19.42 | peak |
| 4 | 2483.500 | 10.31 | 31.07 | 41.38 | 54.00 | -12.62 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 1M 2480 | | |

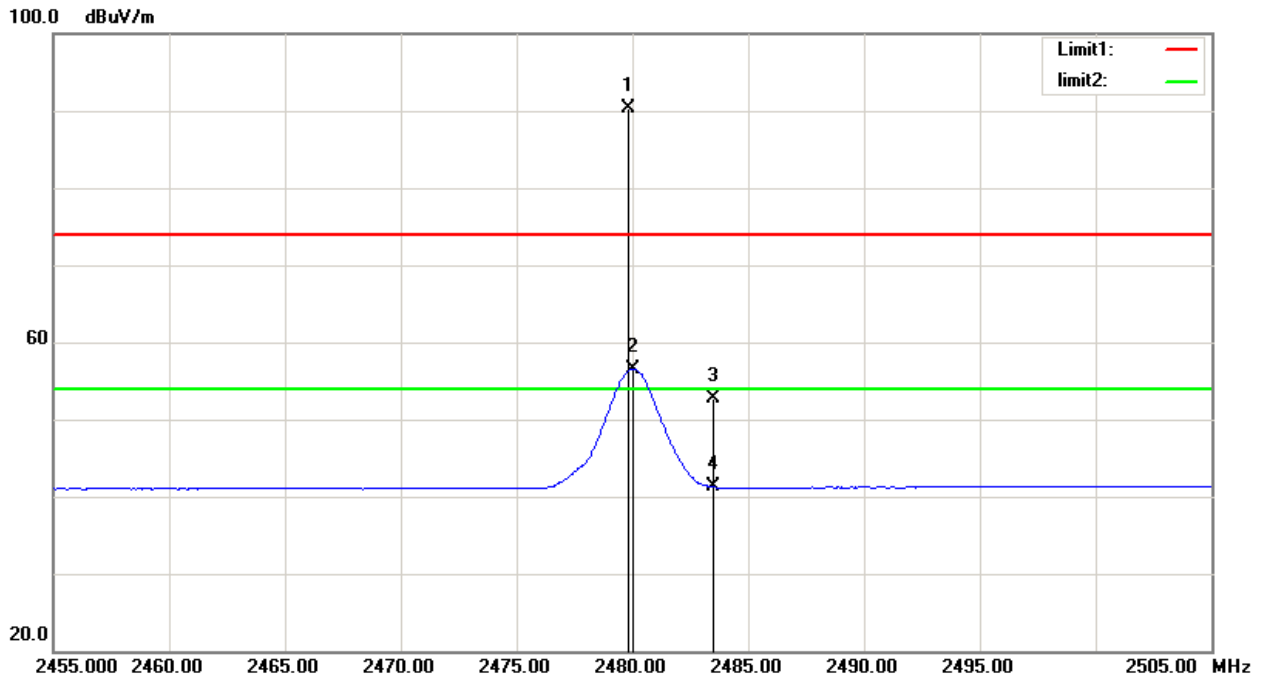


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 60.75 | 31.06 | 91.81 | | | peak |
| 2 | 2480.000 | 26.11 | 31.06 | 57.17 | | | AVG |
| 3 | 2483.500 | 22.28 | 31.07 | 53.35 | 74.00 | -20.65 | peak |
| 4 | 2483.500 | 10.23 | 31.07 | 41.30 | 54.00 | -12.70 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|---------------|----------------------------|--------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 2M 2480 | | |

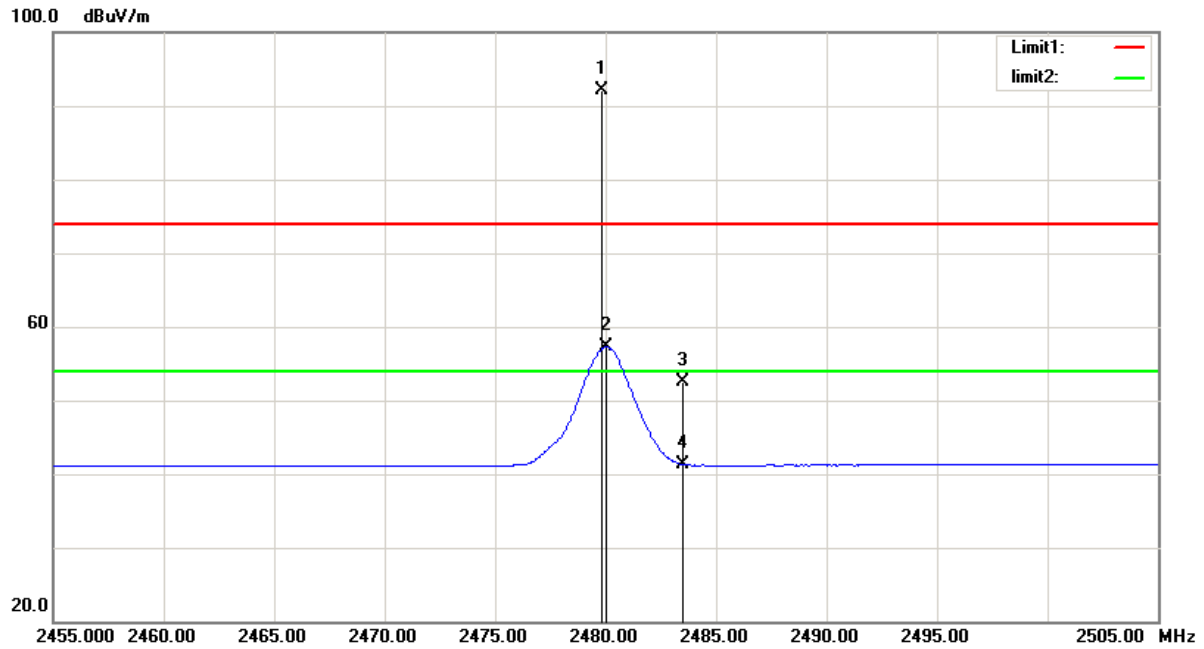


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 59.17 | 31.06 | 90.23 | | | peak |
| 2 | 2480.000 | 25.52 | 31.06 | 56.58 | | | AVG |
| 3 | 2483.500 | 21.70 | 31.07 | 52.77 | 74.00 | -21.23 | peak |
| 4 | 2483.500 | 10.14 | 31.07 | 41.21 | 54.00 | -12.79 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 2M 2480 | | |

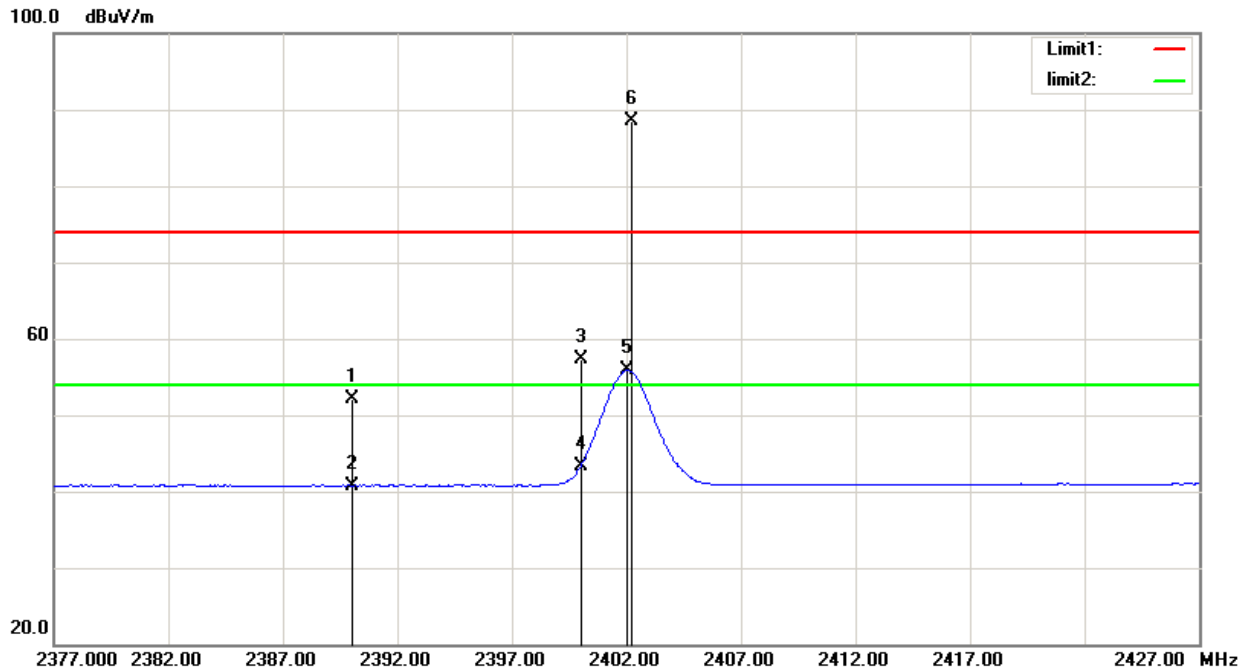


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 61.09 | 31.06 | 92.15 | | | peak |
| 2 | 2480.050 | 26.21 | 31.06 | 57.27 | | | AVG |
| 3 | 2483.500 | 21.36 | 31.07 | 52.43 | 74.00 | -21.57 | peak |
| 4 | 2483.500 | 10.23 | 31.07 | 41.30 | 54.00 | -12.70 | AVG |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 2M 2402 | | |

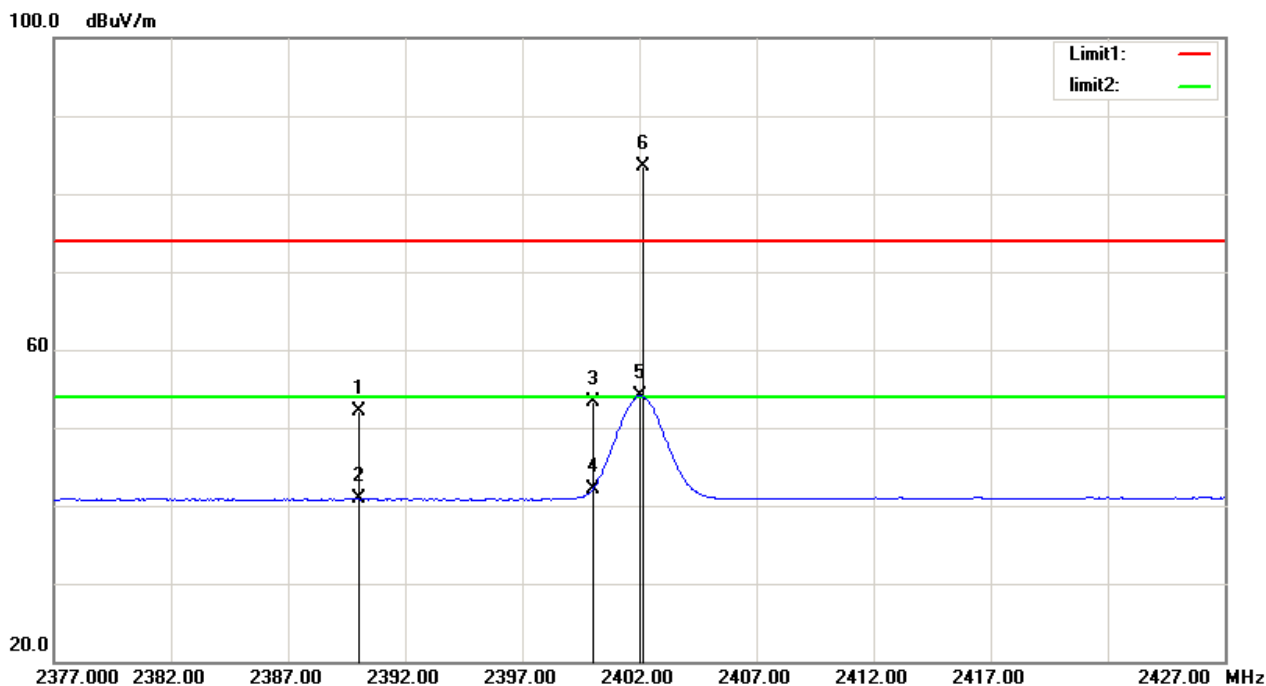


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 21.33 | 30.85 | 52.18 | 74.00 | -21.82 | peak |
| 2 | 2390.000 | 9.94 | 30.85 | 40.79 | 54.00 | -13.21 | AVG |
| 3 | 2400.000 | 26.40 | 30.87 | 57.27 | 74.00 | -16.73 | peak |
| 4 | 2400.000 | 12.37 | 30.87 | 43.24 | 54.00 | -10.76 | AVG |
| 5 | 2402.050 | 25.00 | 30.87 | 55.87 | | | AVG |
| 6 | 2402.250 | 57.69 | 30.87 | 88.56 | | | peak |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 2M 2402 | | |

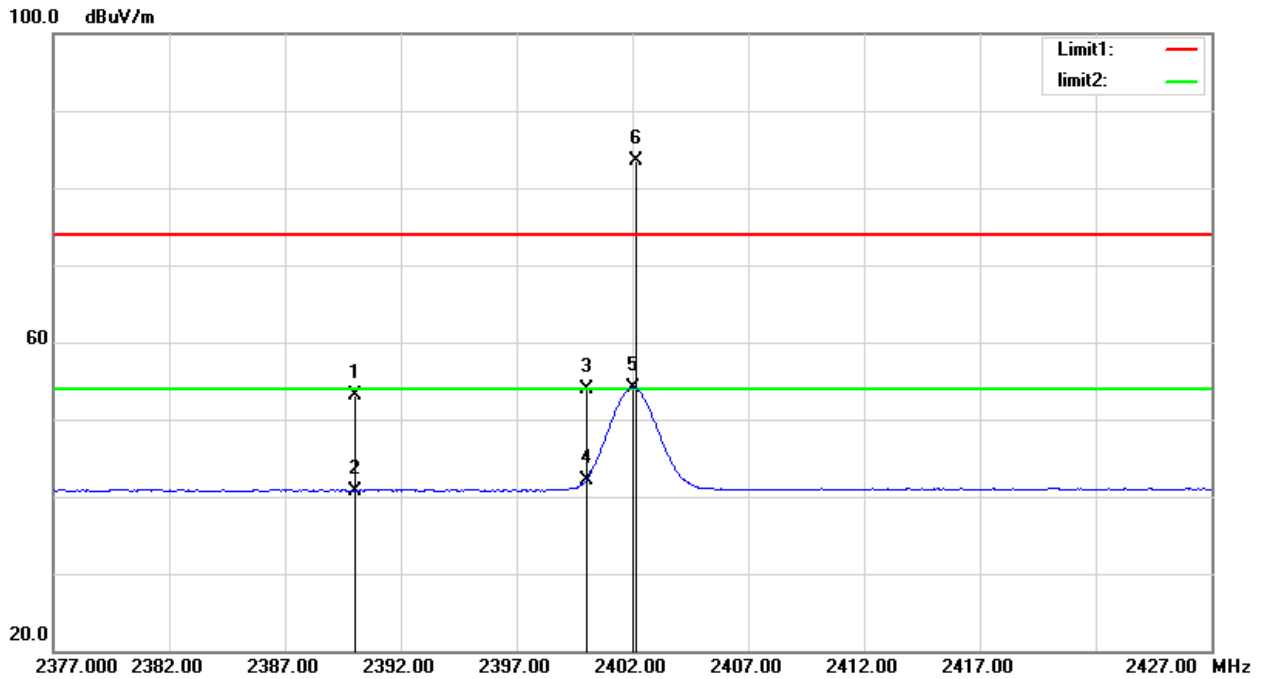


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 21.29 | 30.85 | 52.14 | 74.00 | -21.86 | peak |
| 2 | 2390.000 | 9.96 | 30.85 | 40.81 | 54.00 | -13.19 | AVG |
| 3 | 2400.000 | 22.36 | 30.87 | 53.23 | 74.00 | -20.77 | peak |
| 4 | 2400.000 | 11.16 | 30.87 | 42.03 | 54.00 | -11.97 | AVG |
| 5 | 2402.000 | 23.25 | 30.87 | 54.12 | | | AVG |
| 6 | 2402.200 | 52.61 | 30.87 | 83.48 | | | peak |

The test result is calculated as the following:

- (1) Result = Reading + Correct Factor
- (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (3) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 3M 2402 | | |

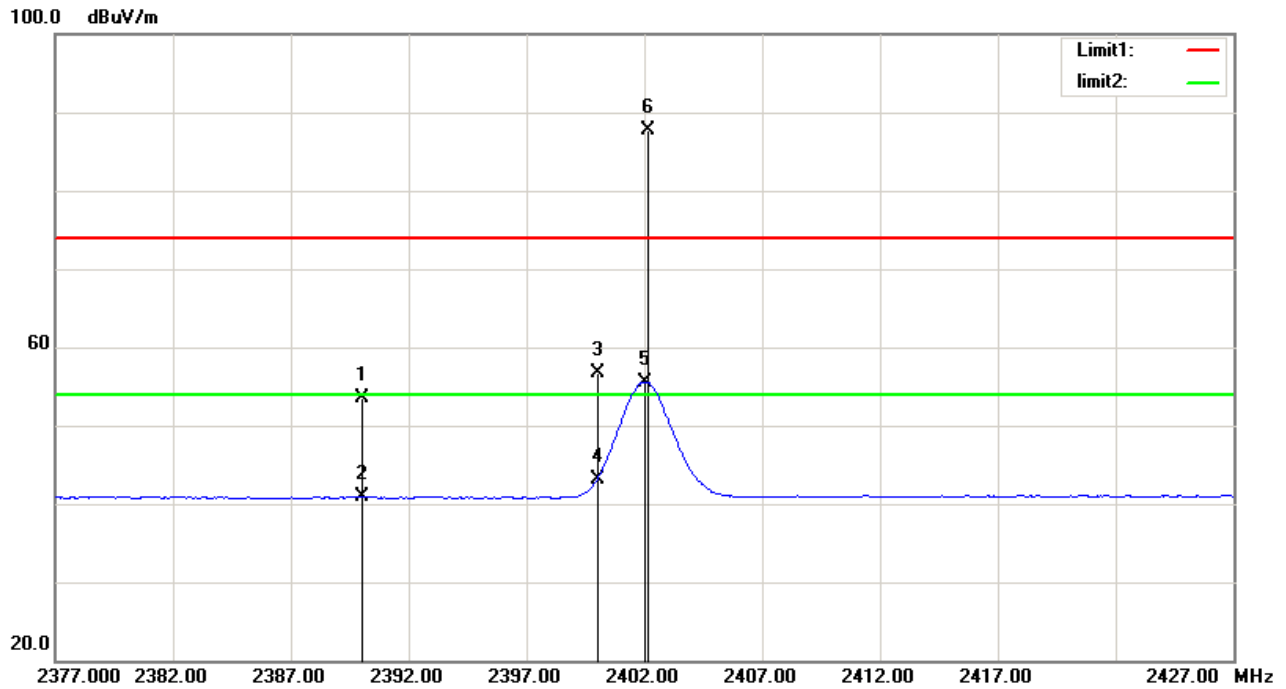


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 22.22 | 30.85 | 53.07 | 74.00 | -20.93 | peak |
| 2 | 2390.000 | 9.95 | 30.85 | 40.80 | 54.00 | -13.20 | AVG |
| 3 | 2400.000 | 23.02 | 30.87 | 53.89 | 74.00 | -20.11 | peak |
| 4 | 2400.000 | 11.20 | 30.87 | 42.07 | 54.00 | -11.93 | AVG |
| 5 | 2402.000 | 23.26 | 30.87 | 54.13 | | | AVG |
| 6 | 2402.200 | 52.63 | 30.87 | 83.50 | | | peak |

The test result is calculated as the following:

- (4) Result = Reading + Correct Factor
- (5) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (6) Margin = Result - Limit

| | | | |
|----------------------|-----------------------------------|---------------------------|------------------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 3M 2402 | | |

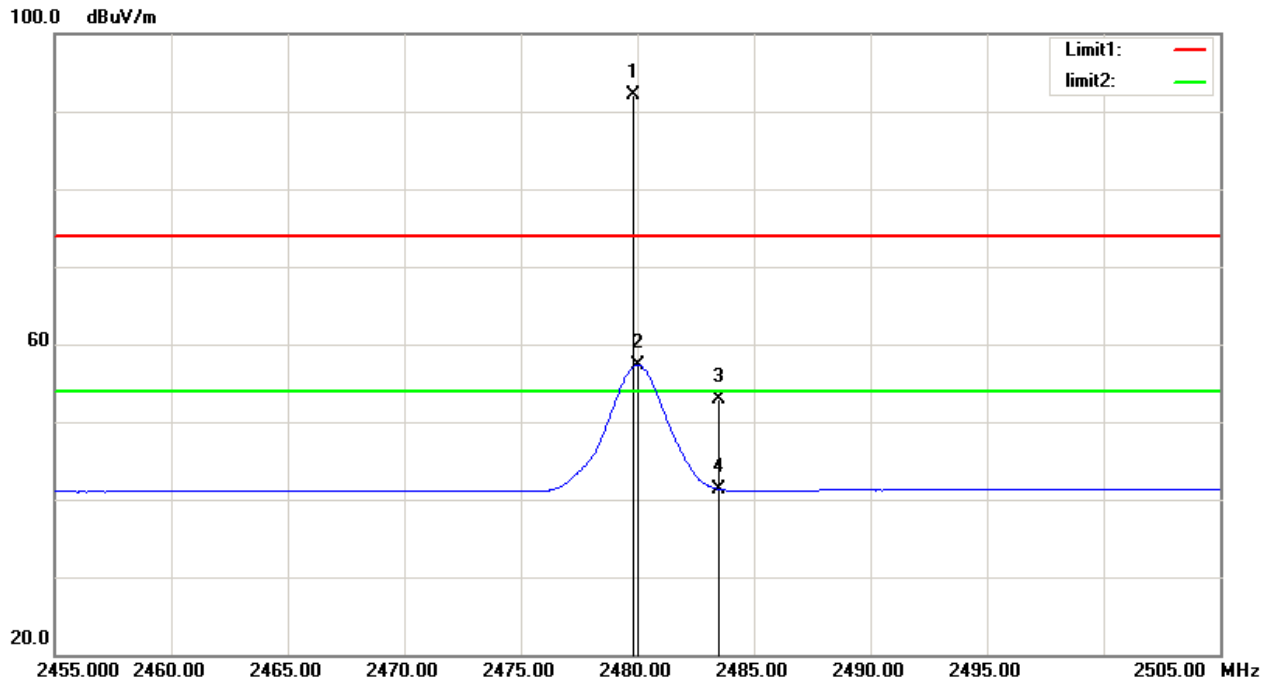


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2390.000 | 22.70 | 30.85 | 53.55 | 74.00 | -20.45 | peak |
| 2 | 2390.000 | 10.00 | 30.85 | 40.85 | 54.00 | -13.15 | AVG |
| 3 | 2400.000 | 25.87 | 30.87 | 56.74 | 74.00 | -17.26 | peak |
| 4 | 2400.000 | 12.25 | 30.87 | 43.12 | 54.00 | -10.88 | AVG |
| 5 | 2402.050 | 24.69 | 30.87 | 55.56 | | | AVG |
| 6 | 2402.200 | 56.84 | 30.87 | 87.71 | | | peak |

The test result is calculated as the following:

- (4) Result = Reading + Correct Factor
- (5) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (6) Margin = Result - Limit

| | | | |
|---------------|----------------------------|--------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Horizontal | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 3M 2480 | | |

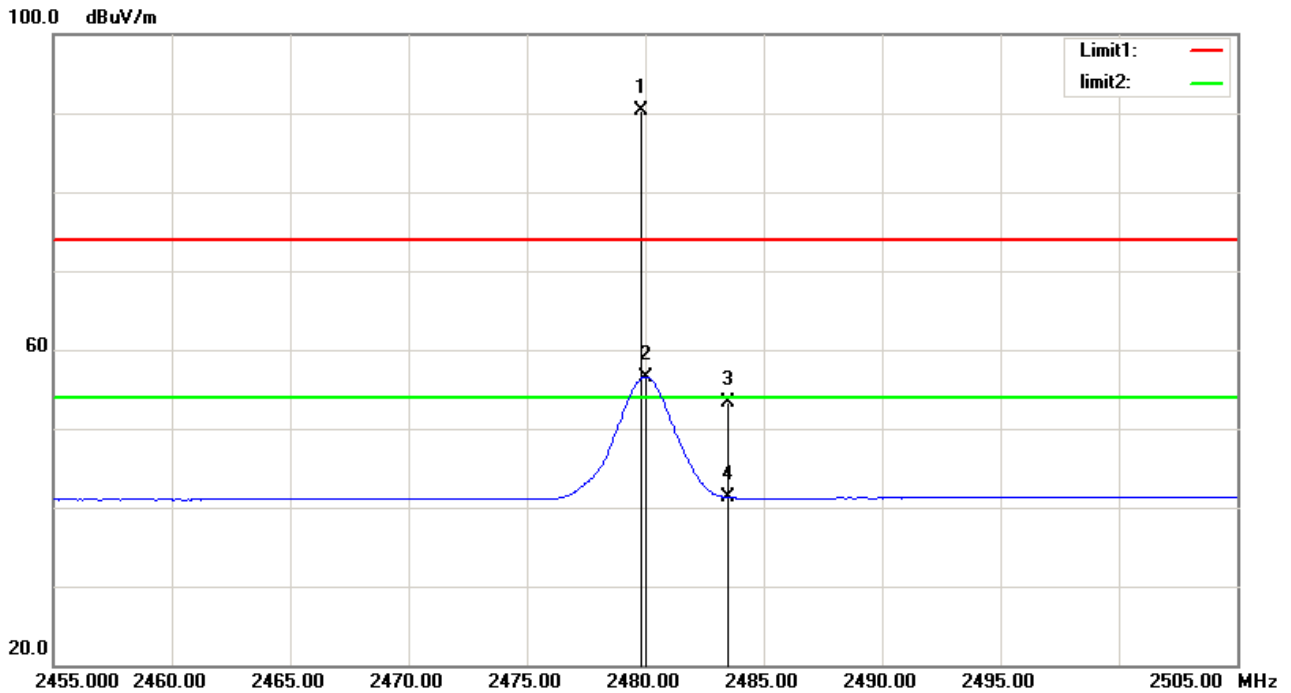


| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|-----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 61.14 | 31.06 | 92.20 | | | peak |
| 2 | 2480.000 | 26.25 | 31.06 | 57.31 | | | AVG |
| 3 | 2483.500 | 21.80 | 31.07 | 52.87 | 74.00 | -21.13 | peak |
| 4 | 2483.500 | 10.25 | 31.07 | 41.32 | 54.00 | -12.68 | AVG |

The test result is calculated as the following:

- (4) Result = Reading + Correct Factor
- (5) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (6) Margin = Result - Limit

| | | | |
|----------------------|----------------------------|---------------------------|-----------|
| EUT: | Bluetooth controller | Model No.: | 278003465 |
| Temperature: | 24 | Relative Humidity: | 55% |
| Distance: | 3m | Test Power: | DC 12V |
| Polarization: | Vertical | Test Result: | Pass |
| Test Time: | 2018-11-27 | Test By: | Smile |
| Standard: | FCC PART 15 C 1-26.5G PEAK | | |
| Test Mode: | TX | | |
| Note: | BT 3M 2480 | | |



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|-----------------|------------------|----------------------|-----------------|----------------|-------------|--------|
| 1 | 2479.850 | 59.20 | 31.06 | 90.26 | | | peak |
| 2 | 2480.050 | 25.53 | 31.06 | 56.59 | | | AVG |
| 3 | 2483.500 | 22.25 | 31.07 | 53.32 | 74.00 | -20.68 | peak |
| 4 | 2483.500 | 10.15 | 31.07 | 41.22 | 54.00 | -12.78 | AVG |

The test result is calculated as the following:

- (4) Result = Reading + Correct Factor
- (5) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
- (6) Margin = Result - Limit

9. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

9.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Cal Due. | Cal. Interval |
|------|-------------------|---------------|-------------|------------|------------|---------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2019/05/25 | 1 Year |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 2018/12/17 | 1 Year |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 2018/12/17 | 1 Year |

9.2. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

9.3. Test Procedure

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

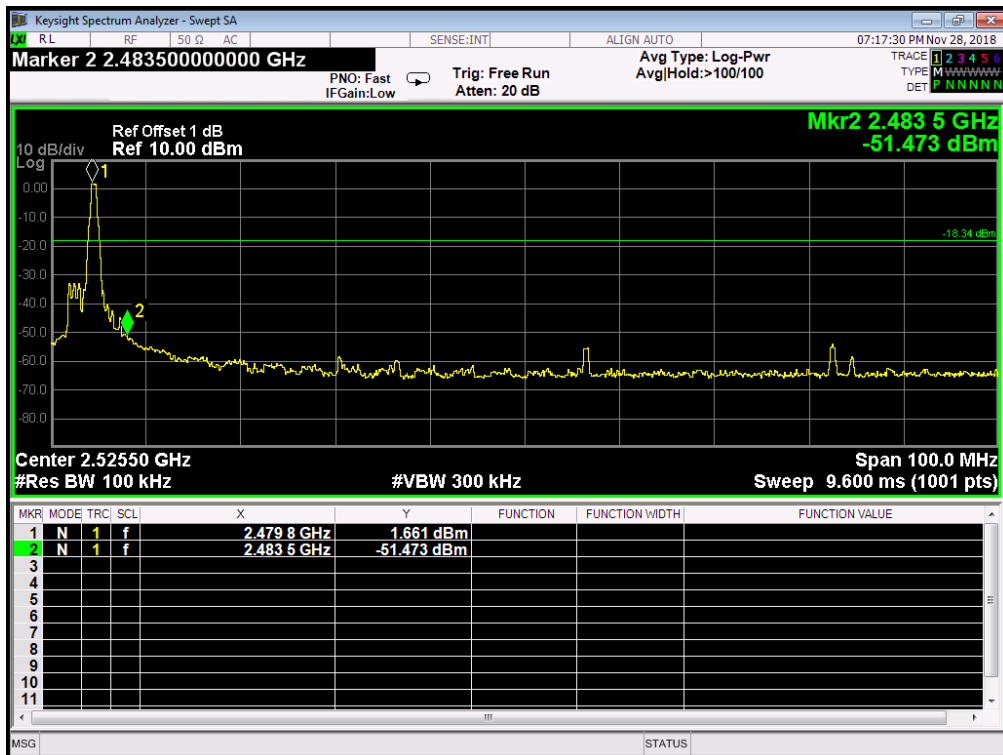
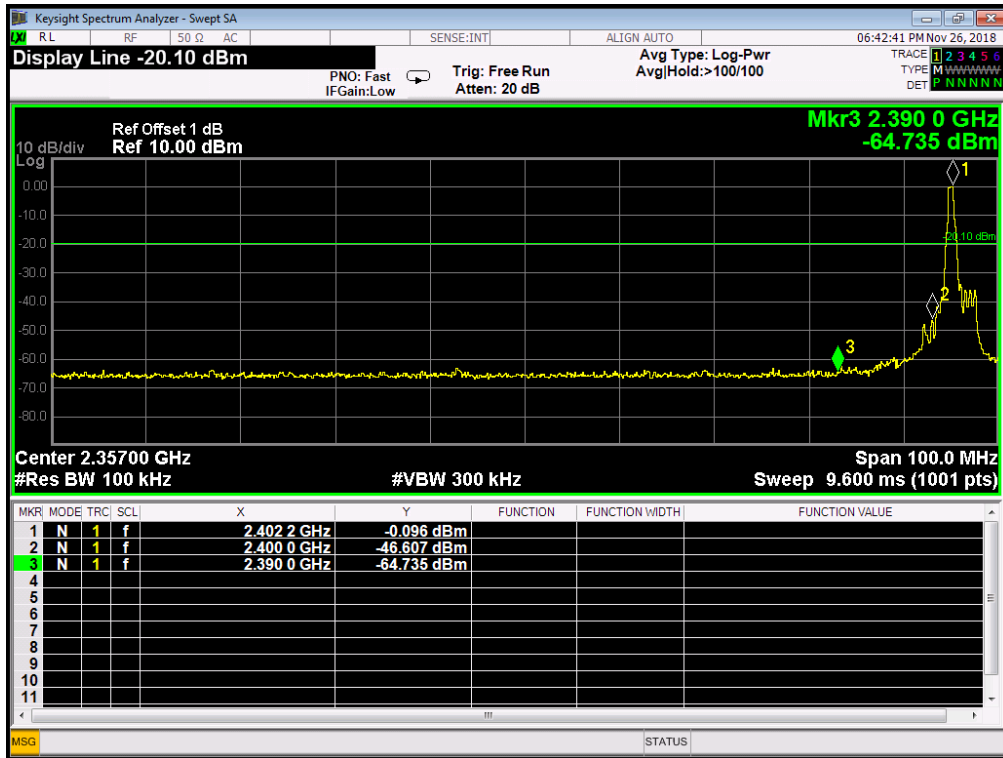
9.4. Test result

PASS (See below detailed test result.)

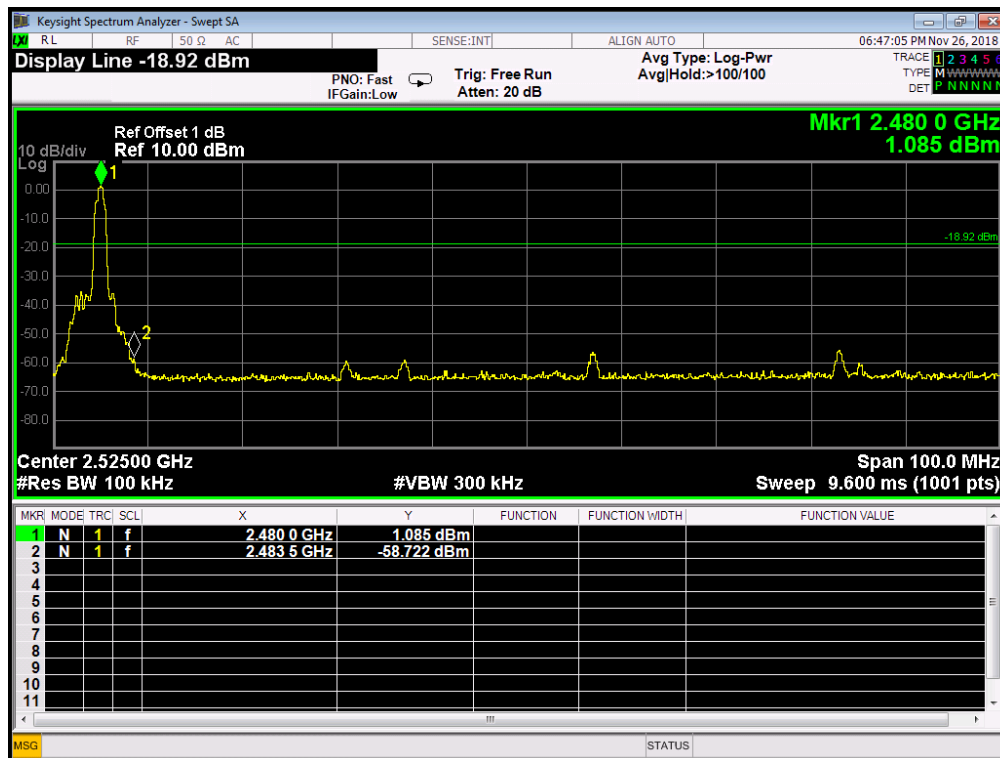
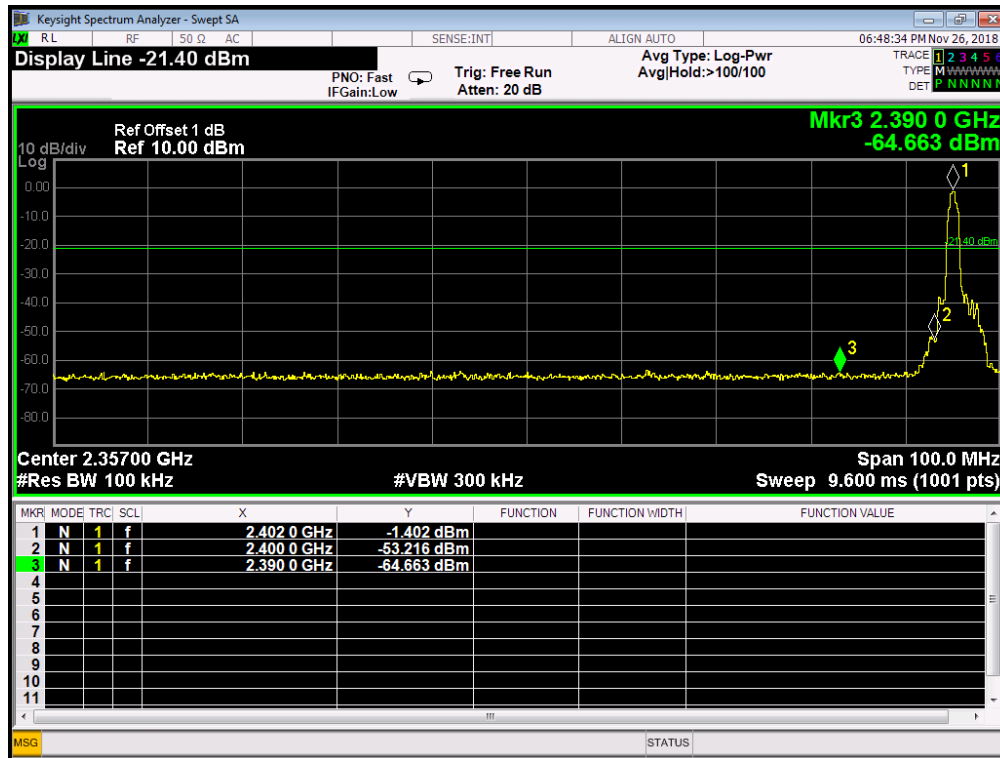
| Frequency Band | Delta Peak to band emission (dBc) | >Limit (dBc) | Result |
|-------------------|-----------------------------------|--------------|--------|
| 1Mbps Non-hopping | | | |
| 2400 | 46.51 | 20 | Pass |
| 2483.5 | 53.13 | 20 | Pass |
| 2Mbps Non-hopping | | | |
| 2400 | 51.81 | 20 | Pass |
| 2483.5 | 59.81 | 20 | Pass |
| 3Mbps Non-hopping | | | |
| 2400 | 51.58 | 20 | Pass |
| 2483.5 | 59.38 | 20 | Pass |

| Frequency Band | Delta Peak to band emission (dBc) | >Limit (dBc) | Result |
|----------------|-----------------------------------|--------------|--------|
| 1Mbps hopping | | | |
| 2400 | 55.12 | 20 | Pass |
| 2483.5 | 65.57 | 20 | Pass |
| 2Mbps hopping | | | |
| 2400 | 54.10 | 20 | Pass |
| 2483.5 | 62.66 | 20 | Pass |
| 3Mbps hopping | | | |
| 2400 | 54.66 | 20 | Pass |
| 2483.5 | 58.82 | 20 | Pass |

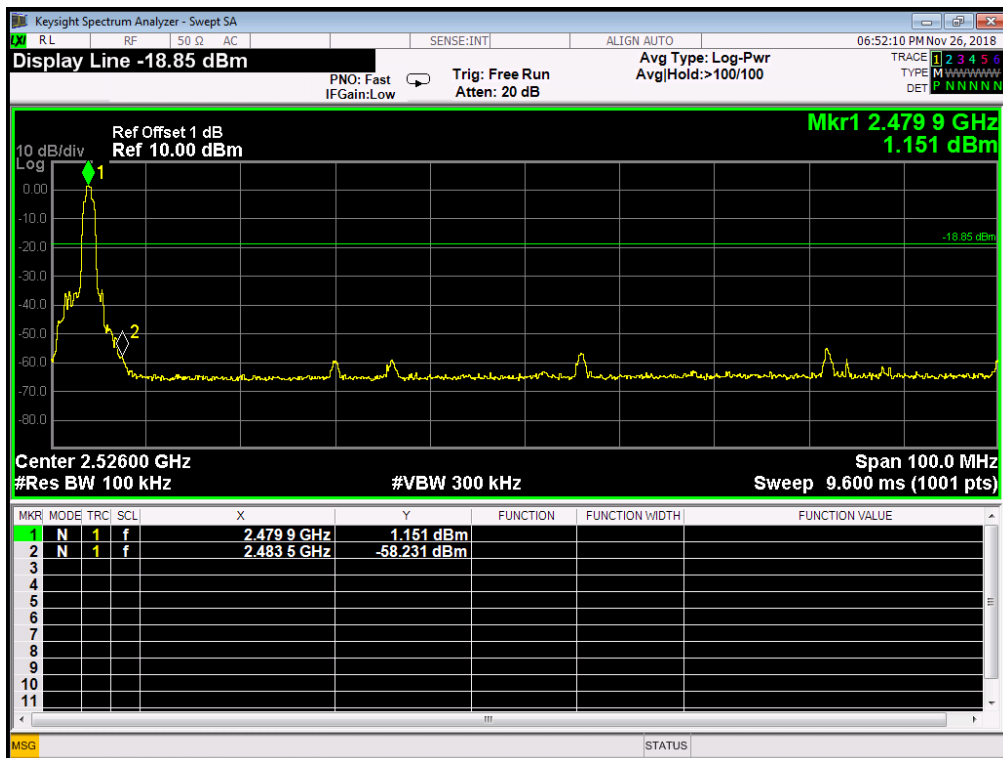
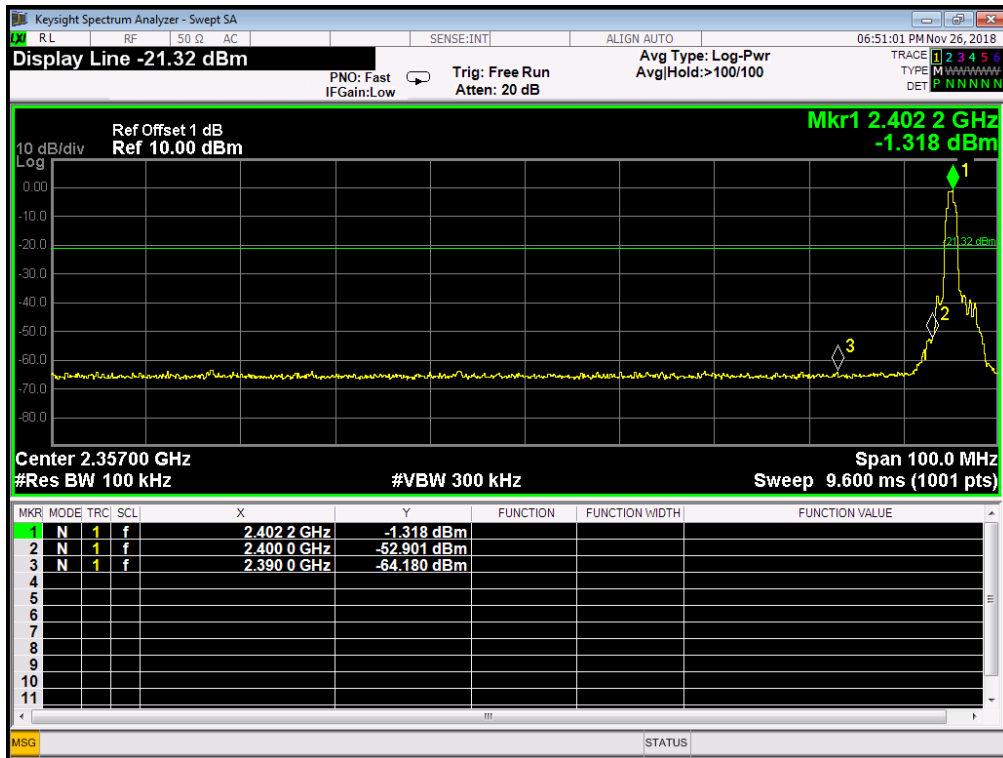
GFSK



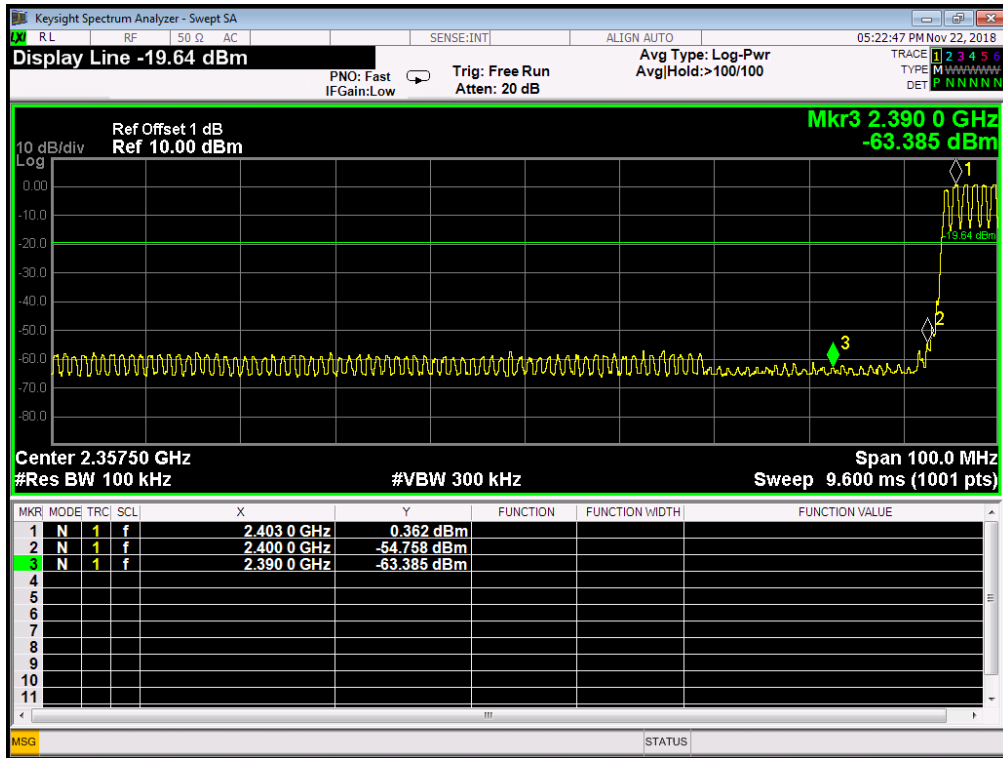
$\pi/4$ DQPSK



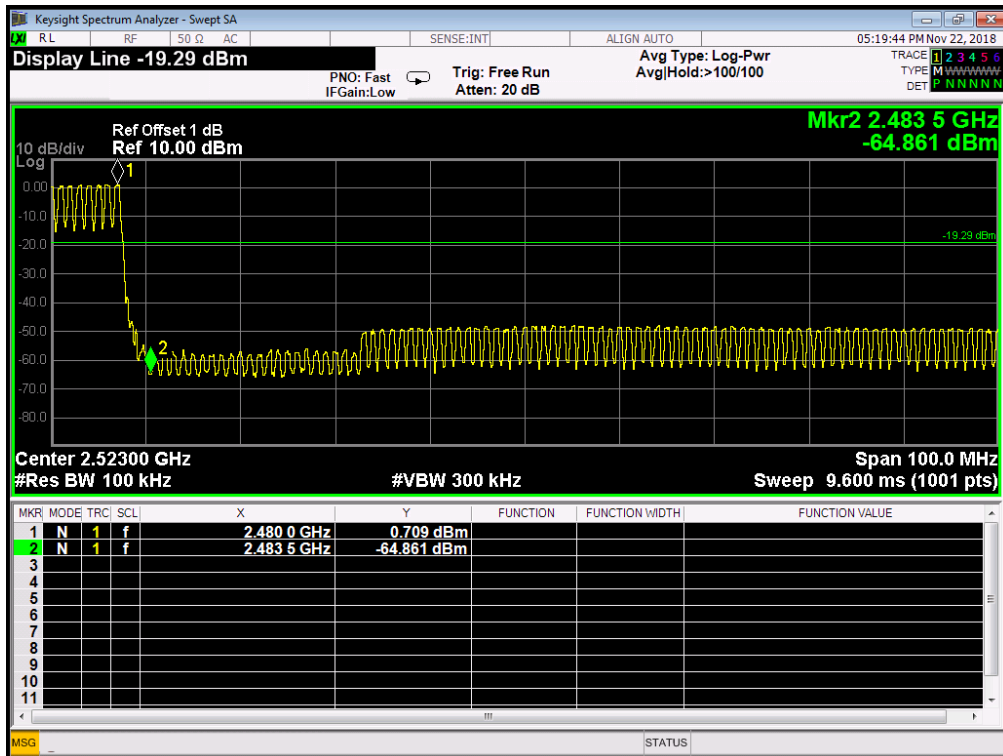
8DPSK



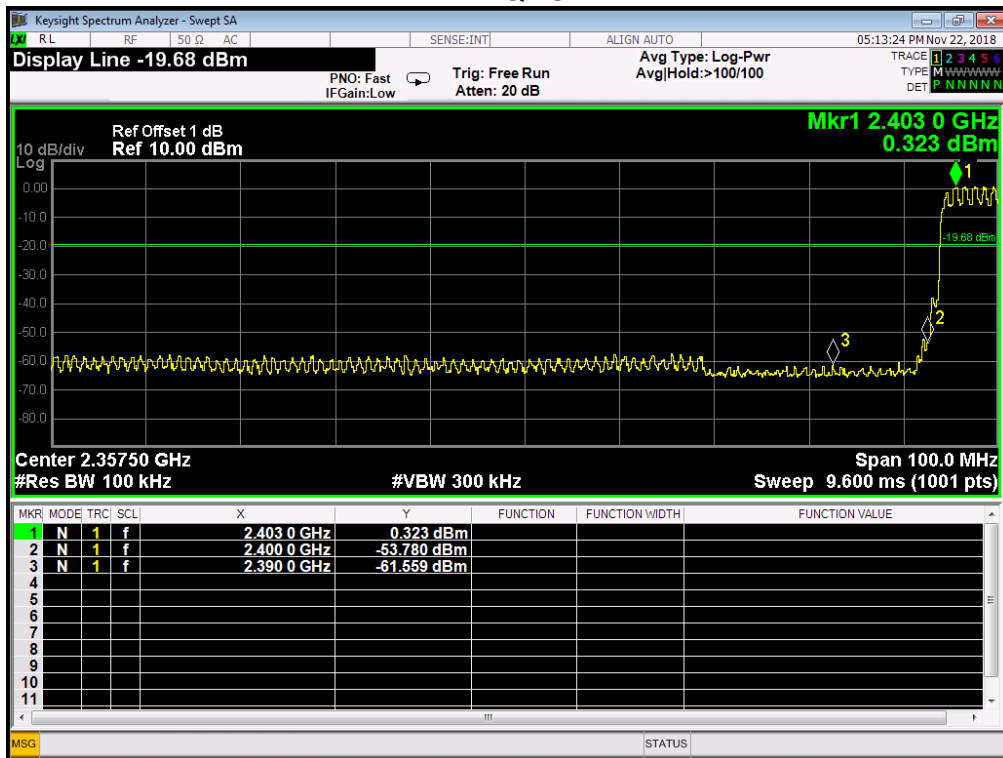
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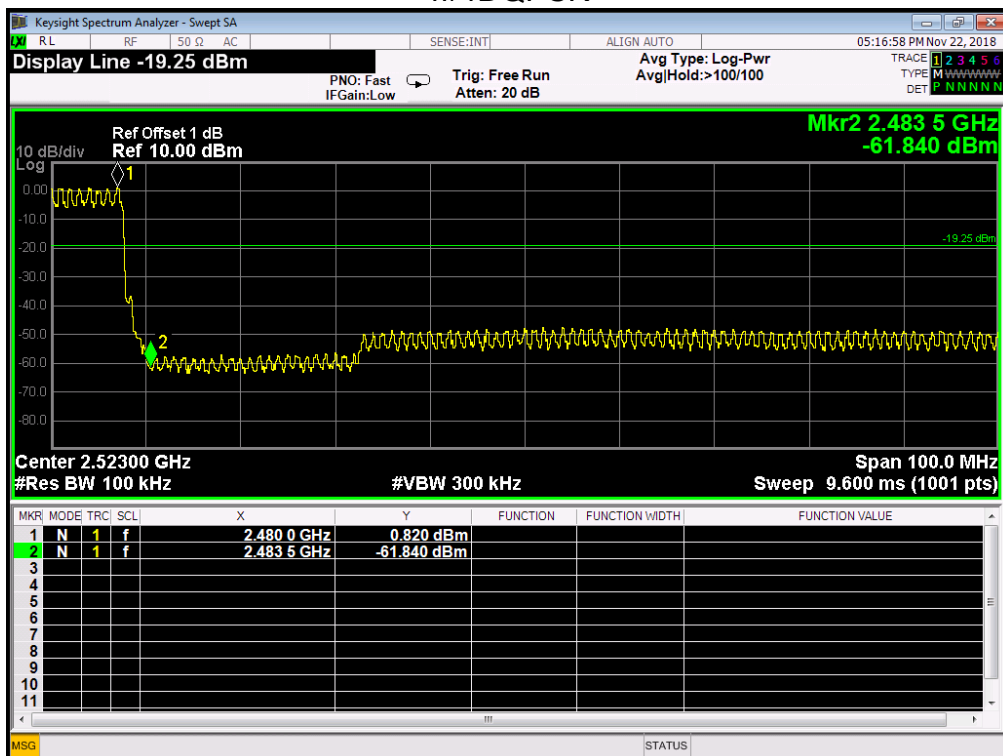
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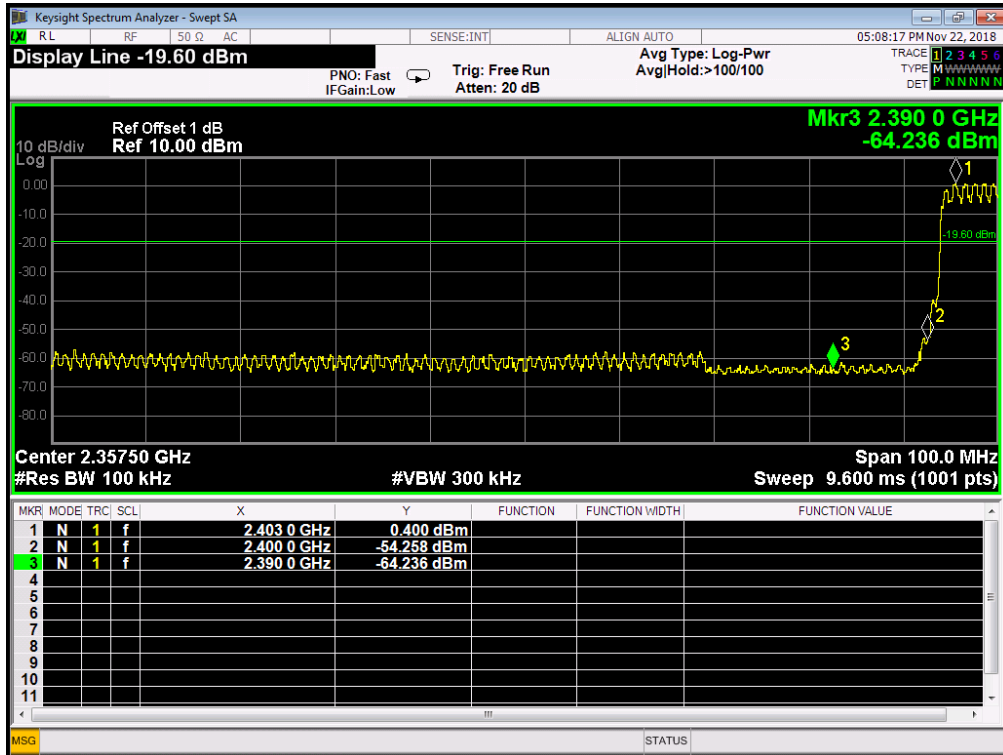
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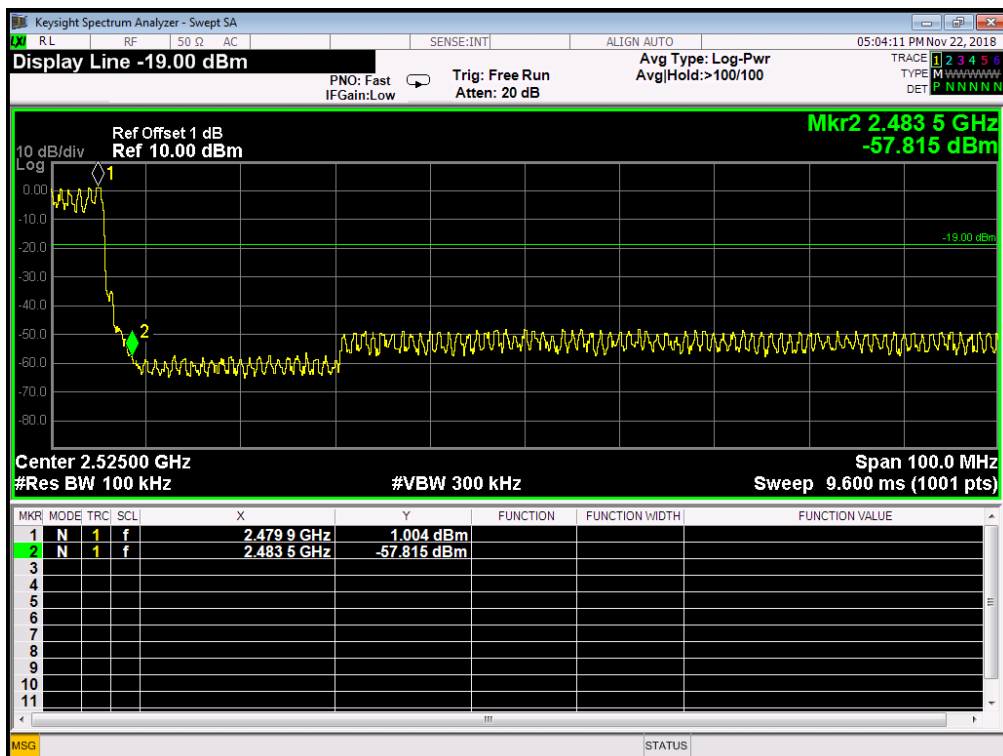
$\pi/4$ DQPSK



8DPSK

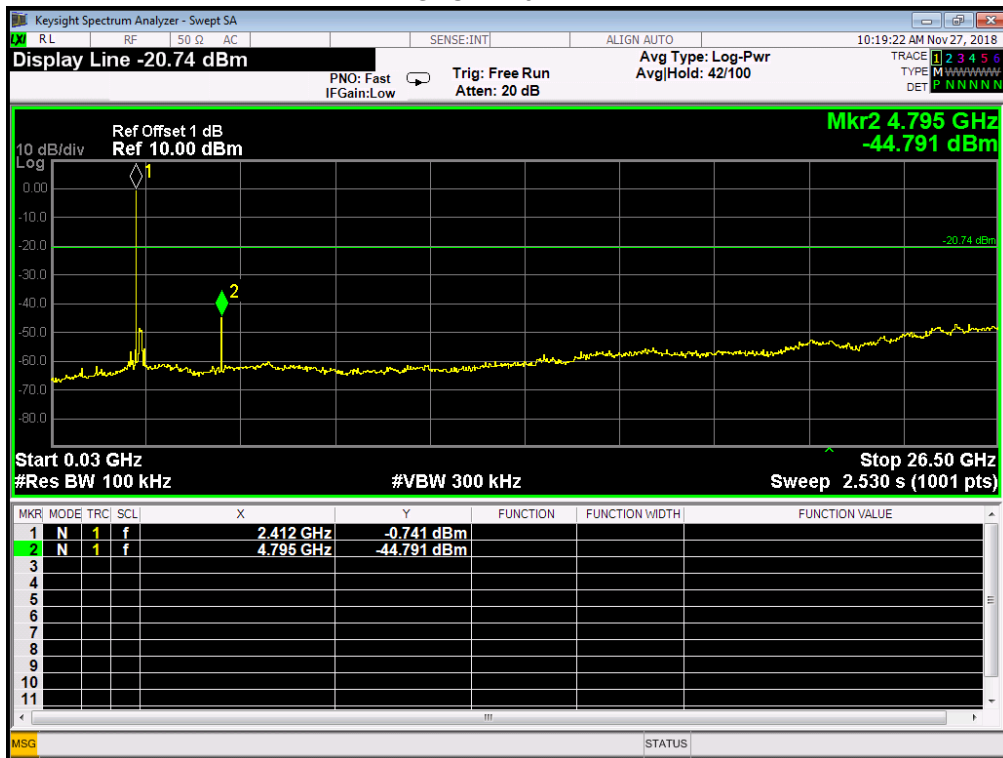


8DPSK

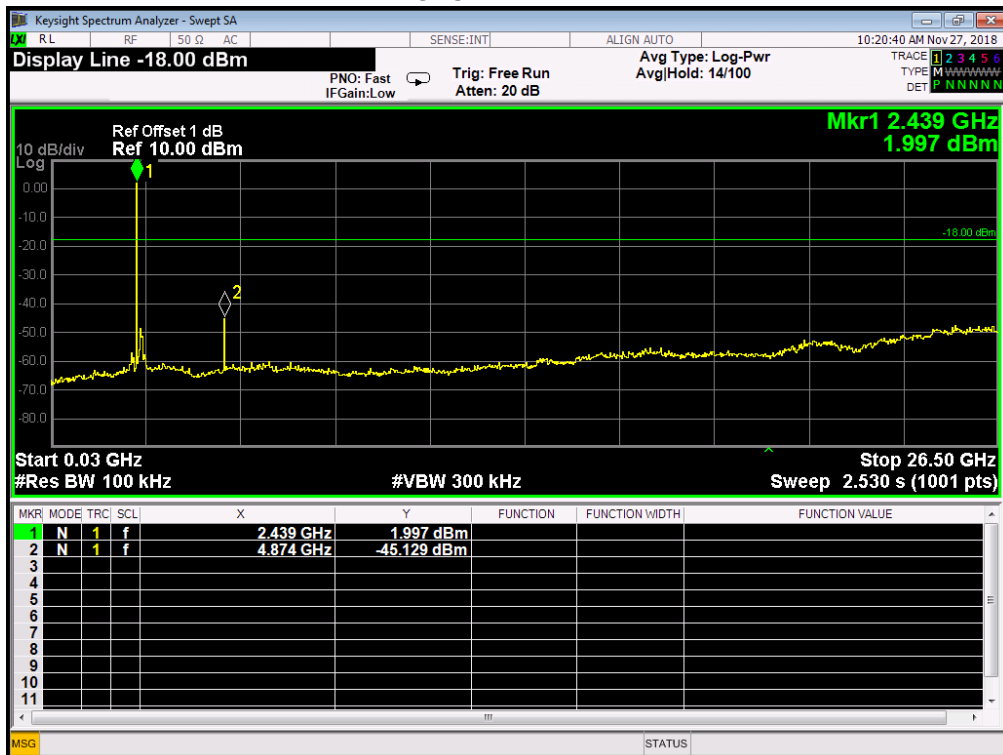


Conducted Emission

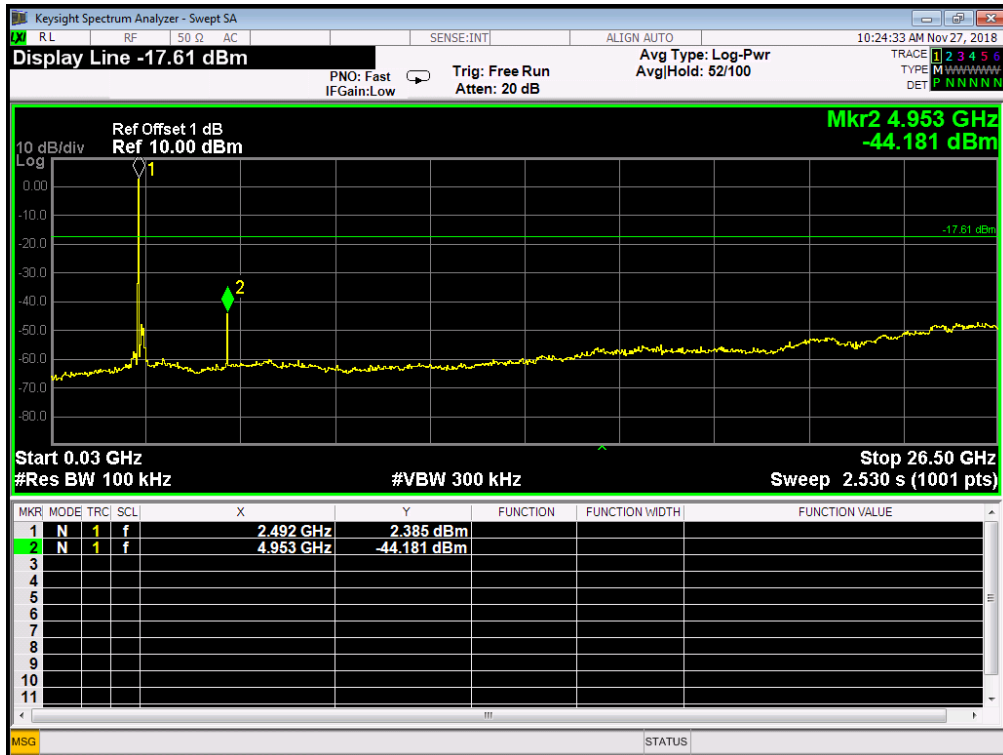
GFSK 2402MHz



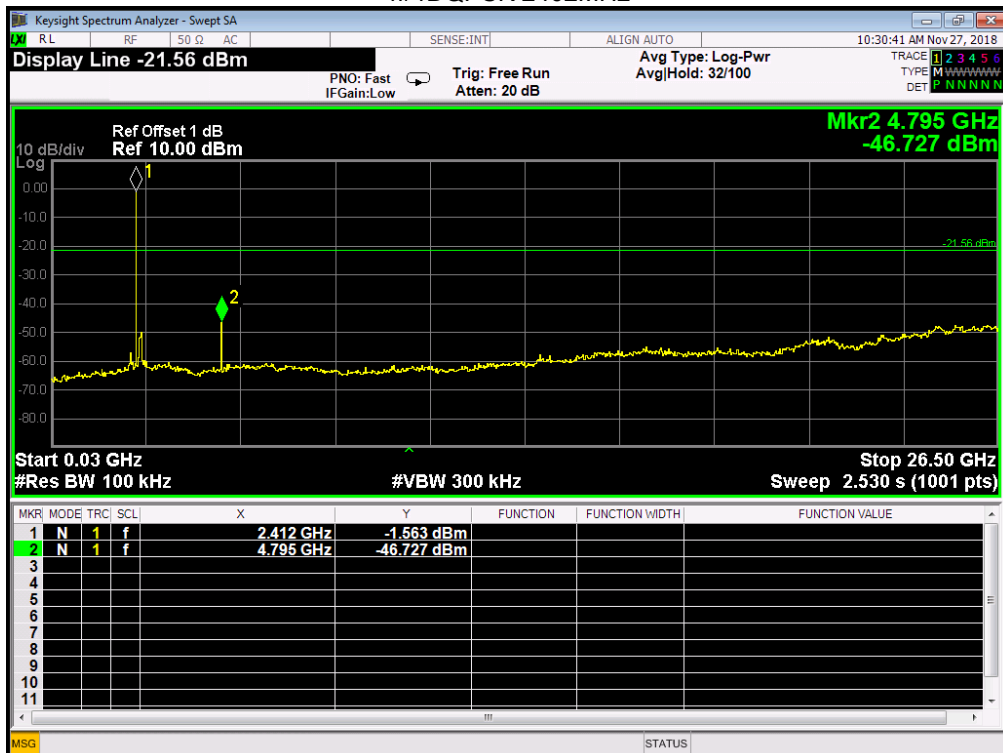
GFSK 2441MHz

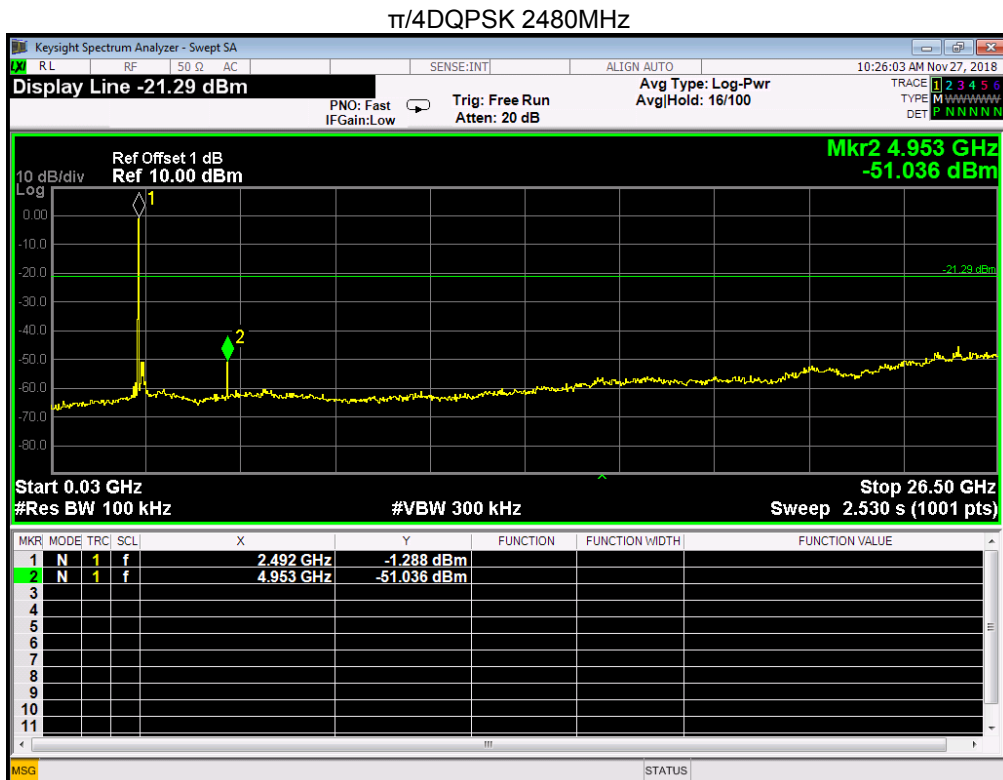
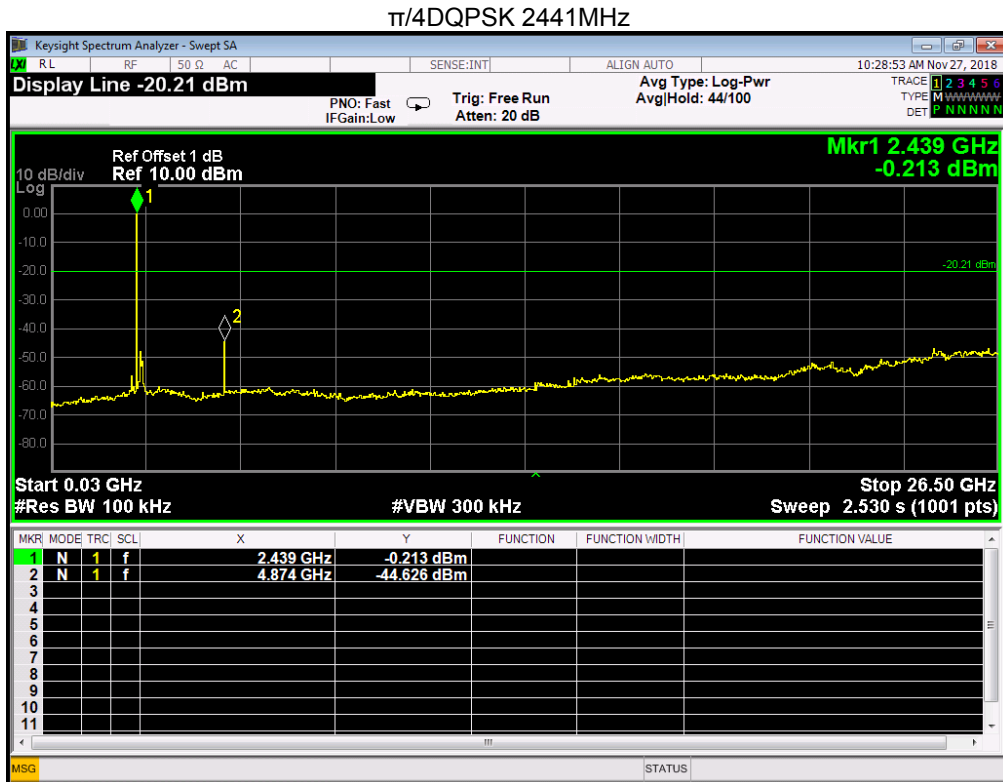


GFSK 2480MHz

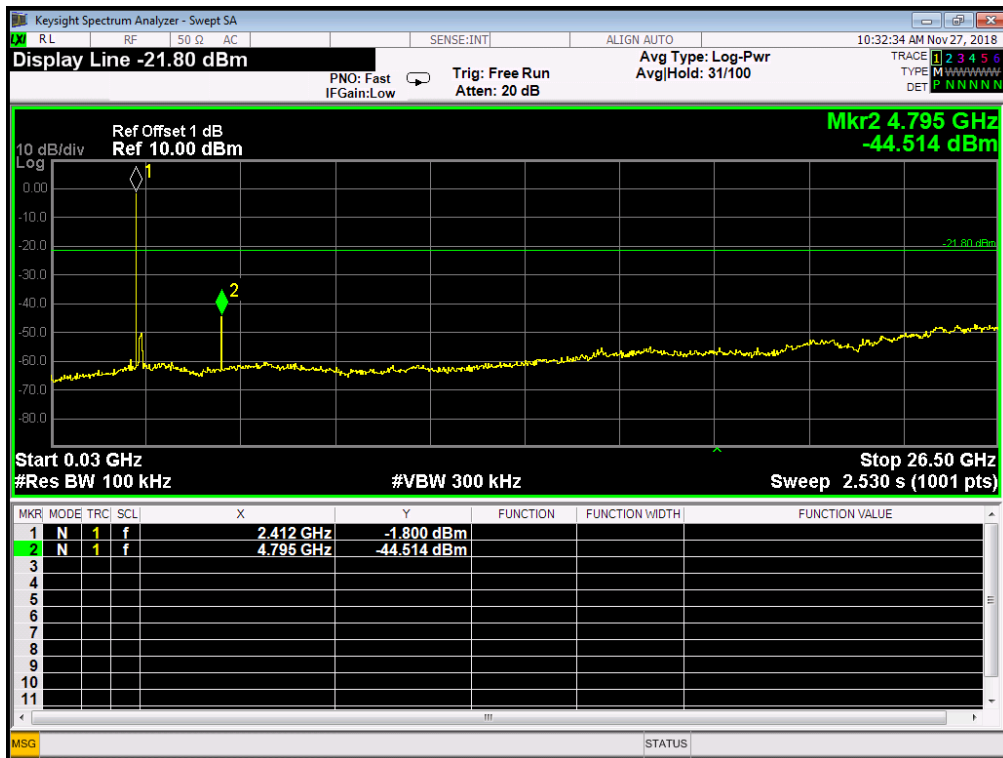


$\pi/4$ DQPSK 2402MHz

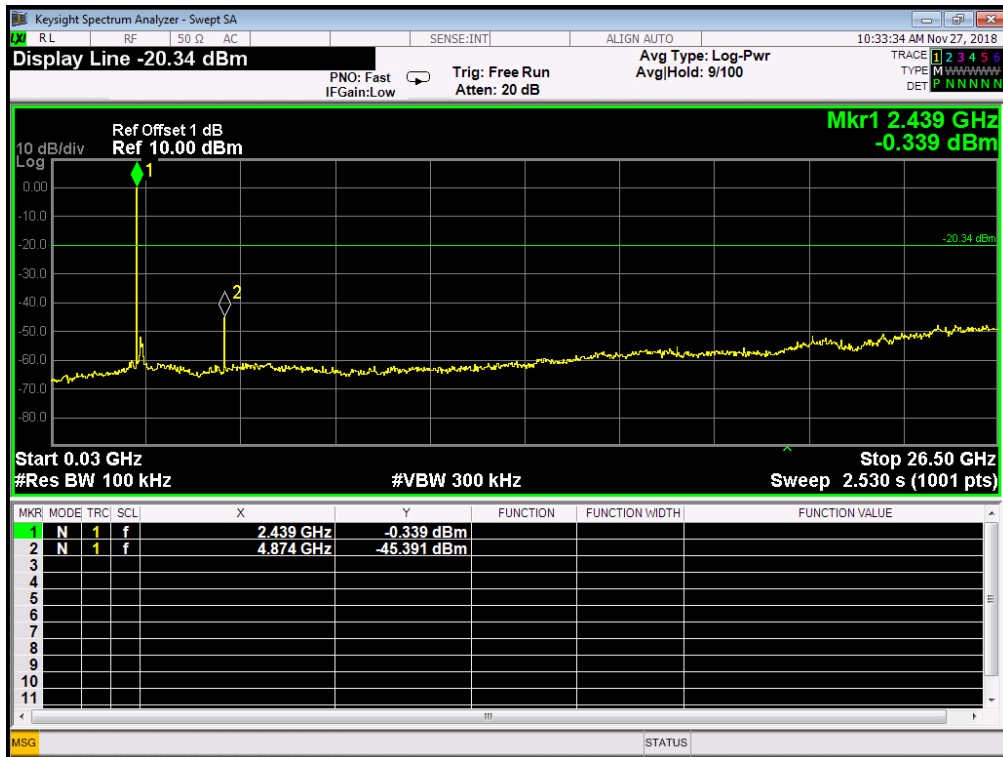




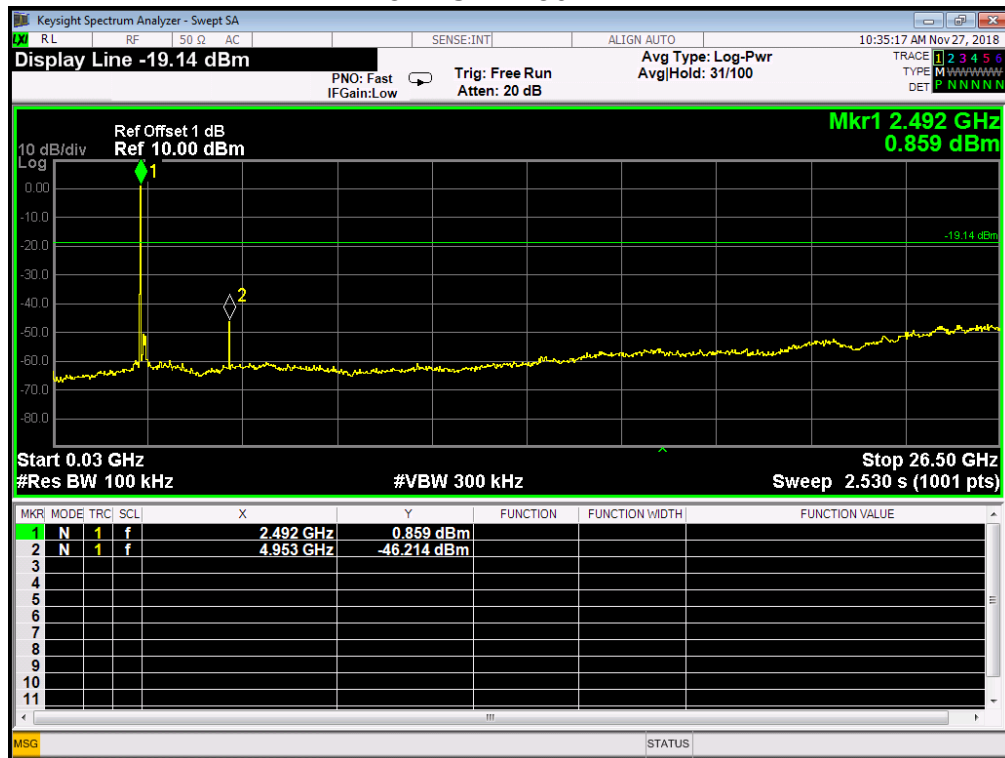
8DPSK 2402MHz



8DPSK 2441MHz



8DPSK 2480MHz



10 Antenna Requirements

10.1 Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

10.2 EUT ANTENNA

The EUT antenna is permanent attached antenna. It comply with the standard requirement.

END OF REPORT