

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND RSS 247 REQUIREMENT

OF

FCC Applicant: Huawei Technologies Co., Ltd.
Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, China

IC Applicant: Huawei Technologies Co., Ltd.
Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, China (Peoples Republic Of)

Product Name: Notebook Computer

Brand Name: HUAWEI, HONOR

FCC Model No.: KPR-W19, KPR-W29, KPR-WXXXXX (X Can be 0-9, A-Z, a-z, blank or symbol "-")

IC Model No.: KPR-W19, KPR-W29

Model Difference: For the marketing purpose, only different model designations on the marking plate for different markets. No RF concern.

Report Number: T190305W03-RP3

FCC ID: QISKPR-WX9

IC: 6369A-KPRWX9

FCC Rule Part: §15.247, Cat: DSS

IC Rule Part: RSS-247 issue 2 Feb 2017

Issue Date: Mar. 21, 2019

Date of Test: Mar. 07, 2019 ~ Mar. 14, 2019

Date of EUT Received: Mar. 07, 2019

Issued by Compliance Certification Services Inc. Wugu Lab.
No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
service@ccsrf.com

Note: The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.

The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory).

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Henry Chiang

Tested By:

Henry Chiang / Engineer

Kevin Tsai

Approved By:

Kevin Tsai / Deputy Manager



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Revision History

| Report Number | Revision | Description | Effected Page | Issue Date | Revised By |
|----------------|----------|------------------------------|---------------|---------------|---------------|
| T190305W03-RP3 | Rev.00 | Initial creation of document | All | Mar. 21, 2019 | Violetta Tang |

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1 GENERAL INFORMATION

1.1 Product description

| | | |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Product Name: | Notebook Computer | |
| Brand Name: | HUAWEI, HONOR | |
| FCC Model No.: | KPR-W19, KPR-W29, KPR-WXXXXX (X Can be 0-9, A-Z, a-z, blank or symbol "-") | |
| IC Model No.: | KPR-W19, KPR-W29 | |
| Model Difference: | For the marketing purpose, only different model designations on the marking plate for different markets. No RF concern. | |
| Product SW/HW version: | 1809 (OS Build 17763.194) / B3A | |
| Radio SW/HW version: | Wi-Fi Component: 20 / Wi-Fi Component: 8265 | |
| Test SW Version: | N/A | |
| RF power setting in TEST SW: | N/A | |
| Power Supply: | 7.6Vdc from Rechargeable Li-ion Battery or 5Vdc / 9Vdc / 12Vdc / 15Vdc / 20Vdc from AC/DC Adapter. | |
| | Battery: | Model No.: HB4593R1ECW, Supplier: HUAWEI |
| | Adapter: | Model No.: HW-200325YYY (Y=0-9, A-Z or blank) Supplier: HUAWEI |

Bluetooth_BR+EDR:

| | |
|----------------------|-------------------------------------|
| Bluetooth Version: | V4.0 Dual Mode |
| Channel number: | 79 channels |
| Modulation type: | GFSK + $\pi/4$ DQPSK + 8DPSK |
| Transmit Power: | 11.60 dBm |
| Frequency Range: | 2.402GHz – 2.480GHz |
| Dwell Time: | $\leq 0.4s$ |
| Antenna Designation: | PIFA Antenna, Antenna Gain: 0.65dBi |

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1.2 Test Methodology of Applied Standards

Canada RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

FCC Part 15, Subpart C §15.247

KDB 558074 D01 v05r01 DSS Meas. Guidance

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

Compliance Certification Services Inc. Wugu Lab. No.11, Wugong 6th Rd.,

Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.) (TAF code 1309)

FCC Designation number: TW1309

Canada Registration number: 2324G

1.4 Special Accessories

There is no special accessory used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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2.5 Configuration of Tested System

Fig. 2-1 Radiated & Conducted Emission Configuration



Fig.2-2 AC power line Configuration

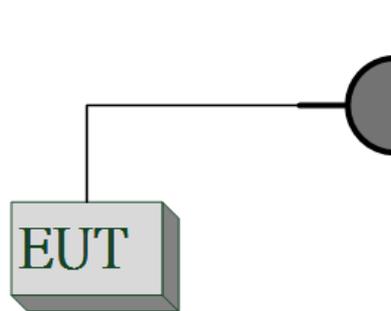


Table 2-1 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/Type No. | Series No. | Data Cable | Power Cord |
|------|-------------------------|-----------|----------------|------------|------------|------------|
| 1. | Bluetooth Test Software | N/A | N/A | N/A | N/A | N/A |

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3 SUMMARY OF TEST RESULTS

| FCC Rules | IC Rules | Description Of Test | Result |
|-----------------------|-----------------------------------------------|----------------------------------------------|-----------|
| §15.207(a) | RSS-Gen §8.8 | AC Power Line Conducted Emission | Compliant |
| §15.247(b)(1) | RSS-247 §5.4 (2) | Peak Output Power | Compliant |
| §15.247(a)(1) | RSS-247 §5.1 (1) RSS-Gen §6.7 | 20dB & 99% Bandwidth | Compliant |
| §15.247(d) | RSS-247 §5.5 | Conducted Band Edge and Spurious Emission | Compliant |
| §15.247(d) | RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10 | Radiated Band Edge and Spurious Emission | Compliant |
| §15.247(a)(1) | RSS-247 §5.1 (2) | Frequency Separation | Compliant |
| §15.247(a)(1)(iii) | RSS-247 §5.1 (4) | Number of hopping frequency | Compliant |
| §15.247(a)(1)(iii) | RSS-247 §5.1 (4) | Time of Occupancy | Compliant |
| §15.203 §15.247(b) | RSS- Gen §6.8 | Antenna Requirement | Compliant |

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

79 channels are provided for Bluetooth

| ITEM | FREQUENCY | ITEM | FREQUENCY | ITEM | FREQUENCY | ITEM | FREQUENCY |
|------|-----------|------|-----------|------|-----------|------|-----------|
| 1 | 2402 MHz | 21 | 2422 MHz | 41 | 2442 MHz | 71 | 2462 MHz |
| 2 | 2403 MHz | 22 | 2423 MHz | 42 | 2443 MHz | 72 | 2463 MHz |
| 3 | 2404 MHz | 23 | 2424 MHz | 43 | 2444 MHz | 73 | 2464 MHz |
| 4 | 2405 MHz | 24 | 2425 MHz | 44 | 2445 MHz | 74 | 2465 MHz |
| 5 | 2406 MHz | 25 | 2426 MHz | 45 | 2446 MHz | 75 | 2466 MHz |
| 6 | 2407 MHz | 26 | 2427 MHz | 46 | 2447 MHz | 76 | 2467 MHz |
| 7 | 2408 MHz | 27 | 2428 MHz | 47 | 2448 MHz | 77 | 2468 MHz |
| 8 | 2409 MHz | 28 | 2429 MHz | 48 | 2449 MHz | 78 | 2469 MHz |
| 9 | 2410 MHz | 29 | 2430 MHz | 49 | 2450 MHz | 79 | 2470 MHz |
| 10 | 2411 MHz | 30 | 2431 MHz | 50 | 2451 MHz | 70 | 2471 MHz |
| 11 | 2412 MHz | 31 | 2432 MHz | 51 | 2452 MHz | 71 | 2472 MHz |
| 12 | 2413 MHz | 32 | 2433 MHz | 52 | 2453 MHz | 72 | 2473 MHz |
| 13 | 2414 MHz | 33 | 2434 MHz | 53 | 2454 MHz | 73 | 2474 MHz |
| 14 | 2415 MHz | 34 | 2435 MHz | 54 | 2455 MHz | 74 | 2475 MHz |
| 15 | 2416 MHz | 35 | 2436 MHz | 55 | 2456 MHz | 75 | 2476 MHz |
| 16 | 2417 MHz | 36 | 2437 MHz | 56 | 2457 MHz | 76 | 2477 MHz |
| 17 | 2418 MHz | 37 | 2438 MHz | 57 | 2458 MHz | 77 | 2478 MHz |
| 18 | 2419 MHz | 38 | 2439 MHz | 58 | 2459 MHz | 78 | 2479 MHz |
| 19 | 2420 MHz | 39 | 2440 MHz | 59 | 2460 MHz | 79 | 2480 MHz |
| 20 | 2421 MHz | 40 | 2441 MHz | 60 | 2461 MHz | | |

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4.2 The Worst Test Modes and Channel Details

- 1 The EUT has been tested under operating condition.
- 2 Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

AC POWER LINE CONDUCTED EMISSION TEST:

| | |
|-----------------------|-------------------------------------------------------|
| Test Condition | AC Power line conducted emission for line and neutral |
| Worst Case | Operation in normal mode |

RADIATED EMISSION TEST:

| RADIATED EMISSION TEST (BELOW 1 GHz) | | | | |
|--------------------------------------|---------------------------|------------------------|------------|-------------|
| MODE | AVAILABLE FREQUENCY (MHz) | TESTED FREQUENCY (MHz) | MODULATION | PACKET TYPE |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK | DH5 |
| RADIATED EMISSION TEST (ABOVE 1 GHz) | | | | |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK | DH5 |

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for Bluetooth BR+EDR Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

| CONDUCTED TEST | | | | |
|------------------------------------|---------------------------|------------------------|------------------------------|-------------|
| Peak Output Power, 20dB Band Width | | | | |
| MODE | AVAILABLE FREQUENCY (MHz) | TESTED FREQUENCY (MHz) | MODULATION | PACKET TYPE |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK, $\pi/4$ -DQPSK, 8-DPSK | DH5 |
| Band Edge | | | | |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK | DH5 |
| Frequency Separation | | | | |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK | DH5 |
| Number of hopping frequency | | | | |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK | DH5 |
| Time of Occupancy (Dwell time) | | | | |
| Bluetooth | 2402 to 2480 | 2402, 2441, 2480 | GFSK, $\pi/4$ -DQPSK, 8-DPSK | DH1/DH3/DH5 |

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5 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|-------------------------------------------|----------------|
| AC Powerline Conducted Emission | +/- 1.2575 dB |
| Peak Output Power | +/- 1.924 dB |
| 20dB Bandwidth | +/- 147.256 Hz |
| 100 kHz Bandwidth of Frequency Band Edges | +/- 1.924 dB |
| Frequency Separation | +/- 147.256 Hz |
| Number of hopping frequency | +/- 147.256 Hz |
| Time of Occupancy | +/- 147.256 Hz |
| 3M Semi Anechoic Chamber / 30M~200M | +/- 4.12 dB |
| 3M Semi Anechoic Chamber / 200M~1000M | +/- 4.68 dB |
| 3M Semi Anechoic Chamber / 1G~8G | +/- 5.18 dB |
| 3M Semi Anechoic Chamber / 8G~18G | +/- 5.47 dB |
| 3M Semi Anechoic Chamber / 18G~26G | +/- 3.81 dB |
| 3M Semi Anechoic Chamber / 26G~40G | +/- 3.87 dB |

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.
3. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

| Frequency range MHz | Limits dB(uV) | |
|------------------------|------------------|----------|
| | 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
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

6.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|--------------------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| CABLE | EMCI | CFD300-NL | CERF | 2018/06/29 | 2019/06/28 |
| EMI Test Receiver | R&S | ESCI | 100064 | 2018/07/24 | 2019/07/23 |
| LISN | SCHWARZ-BECK | NSLK 8127 | 8127-541 | 2019/01/31 | 2020/01/30 |
| LISN | SCHAFFNER | NNB 41 | 03/10013 | 2019/02/13 | 2020/02/12 |
| Software | EZ-EMC(CCS-3A1-CE) | | | | |

6.3 EUT Setup

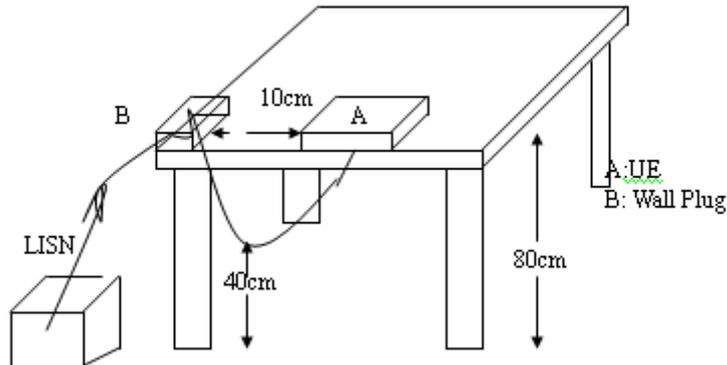
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plan.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit.

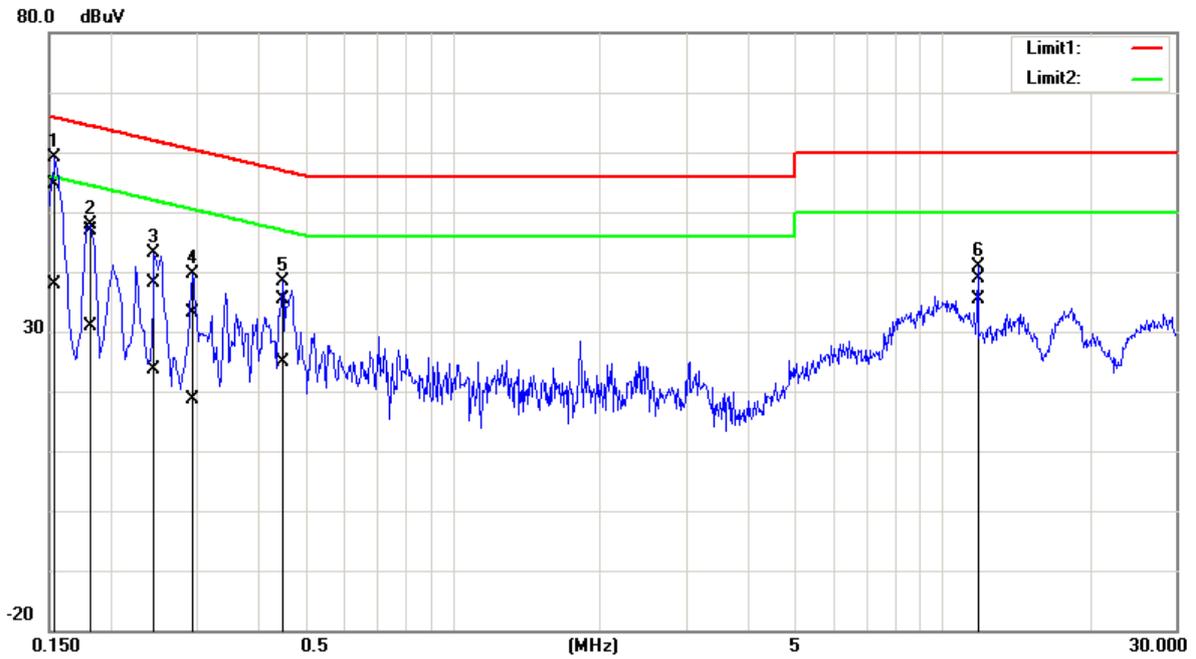
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AC POWER LINE CONDUCTED EMISSION TEST DATA

| | | | |
|------------------------|-------------------------------|--------------------|--------------|
| Job No.: | T190305W03-RP3 | Date: | 2019/3/12 |
| Company: | Huawei Technologies Co., Ltd. | Time: | 05:48:49 PM |
| Standard: | FCC/IC QP | Temp.(°C)/Hum.(%): | 25(°C)/60% |
| Test item: | Conduction test | Test By: | Henry |
| Line: | L1 | Test Voltage: | AC 120V/60Hz |
| Model: | KPR-W19, KPR-WXXXXX, KPR-W19 | | |
| Description: Operation | | | |



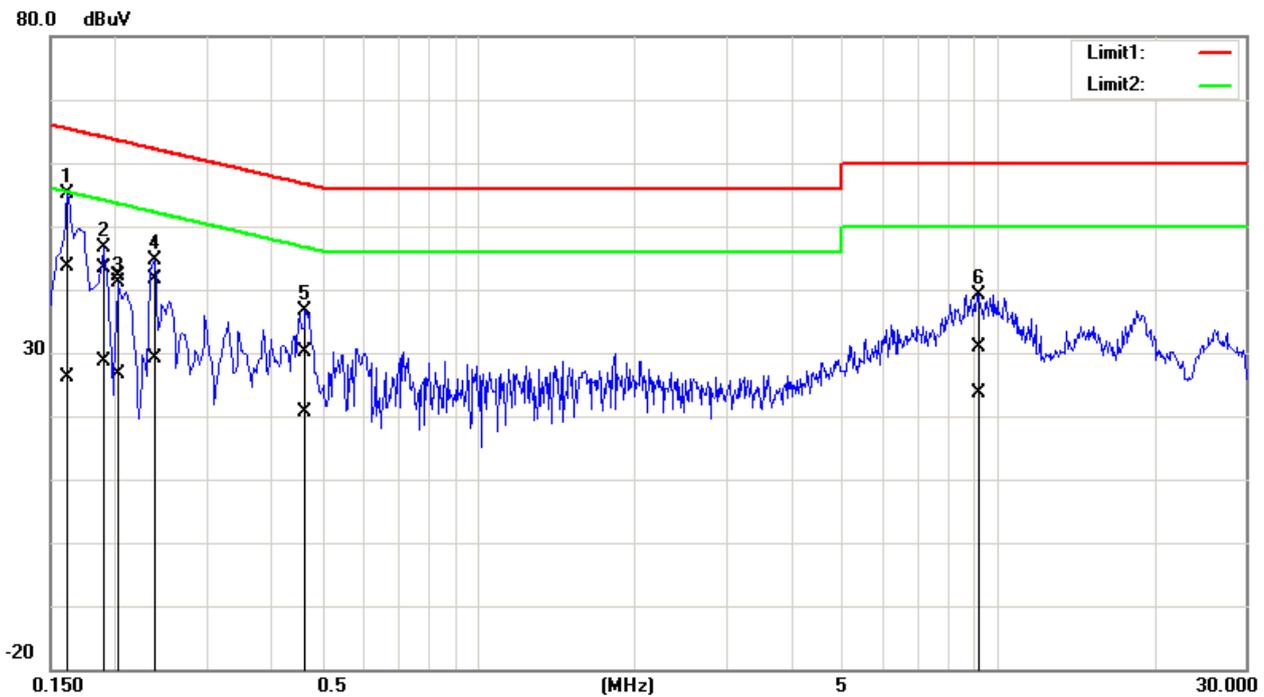
| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|-----|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------|
| 1* | 0.1539 | 54.59 | 37.70 | 0.16 | 54.75 | 37.86 | 65.78 | 55.79 | -11.03 | -17.93 | Pass |
| 2 | 0.1819 | 46.70 | 30.79 | 0.15 | 46.85 | 30.94 | 64.39 | 54.40 | -17.54 | -23.46 | Pass |
| 3 | 0.2460 | 37.95 | 23.42 | 0.15 | 38.10 | 23.57 | 61.89 | 51.89 | -23.79 | -28.32 | Pass |
| 4 | 0.2940 | 32.89 | 18.59 | 0.15 | 33.04 | 18.74 | 60.41 | 50.41 | -27.37 | -31.67 | Pass |
| 5 | 0.4500 | 35.17 | 24.61 | 0.16 | 35.33 | 24.77 | 56.87 | 46.88 | -21.54 | -22.11 | Pass |
| 6 | 11.8139 | 38.48 | 34.98 | 0.51 | 38.99 | 35.49 | 60.00 | 50.00 | -21.01 | -14.51 | Pass |

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| | | | |
|------------------------|-------------------------------|--------------------|--------------|
| Job No.: | T190305W03-RP3 | Date: | 2019/3/12 |
| Company: | Huawei Technologies Co., Ltd. | Time: | 05:53:29 PM |
| Standard: | FCC/IC QP | Temp.(°C)/Hum.(%): | 24(°C)/50% |
| Test item: | Conduction test | Test By: | Henry |
| Line: | N | Test Voltage: | AC 120V/60Hz |
| Model: | KPR-W19, KPR-WXXXXX, KPR-W19 | | |
| Description: Operation | | | |



| No. | Frequency (MHz) | QuasiPeak reading (dBuV) | Average reading (dBuV) | Correction factor (dB) | QuasiPeak result (dBuV) | Average result (dBuV) | QuasiPeak limit (dBuV) | Average limit (dBuV) | QuasiPeak margin (dB) | Average margin (dB) | Remark |
|-----|-----------------|--------------------------|------------------------|------------------------|-------------------------|-----------------------|------------------------|----------------------|-----------------------|---------------------|--------|
| 1 | 0.1620 | 43.60 | 26.09 | 0.10 | 43.70 | 26.19 | 65.36 | 55.36 | -21.66 | -29.17 | Pass |
| 2 | 0.1900 | 43.34 | 28.43 | 0.10 | 43.44 | 28.53 | 64.03 | 54.04 | -20.59 | -25.51 | Pass |
| 3 | 0.2020 | 41.94 | 26.42 | 0.10 | 42.04 | 26.52 | 63.52 | 53.53 | -21.48 | -27.01 | Pass |
| 4* | 0.2380 | 41.58 | 28.99 | 0.10 | 41.68 | 29.09 | 62.16 | 52.17 | -20.48 | -23.08 | Pass |
| 5 | 0.4660 | 30.13 | 20.60 | 0.11 | 30.24 | 20.71 | 56.58 | 46.58 | -26.34 | -25.87 | Pass |
| 6 | 9.1899 | 30.54 | 23.39 | 0.36 | 30.90 | 23.75 | 60.00 | 50.00 | -29.10 | -26.25 | Pass |

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7 PEAK OUTPUT POWER MEASUREMENT

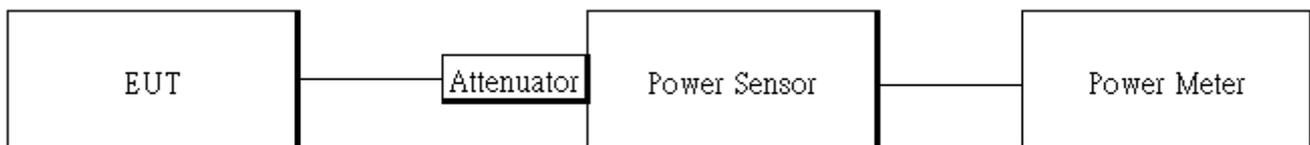
7.1 Standard Applicable

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, The Limit: 1Watt. For all other frequency hopping systems in the 2400 – 2483.5MHz band: The Limit: 0.125 Watts. The power limit for 1Mbps is 1watt, and 2Mbps, 3Mbps and AFH mode are 0.125 watts and the e.i.r.p. shall not exceed 0.5 W if the hop set uses less than 75 hopping channels.

7.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Power Meter | Anritsu | ML2496A | 1242004 | 2018/10/23 | 2019/10/22 |
| Power Sensor | Anritsu | MA2411B | 1207365 | 2018/10/23 | 2019/10/22 |
| Power Sensor | Anritsu | MA2411B | 1207368 | 2018/10/24 | 2019/10/23 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A185 C | RF229 | 2019/02/26 | 2020/02/25 |

7.3 Test Set-up:



7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
4. Record the max. reading.
5. Repeat above procedures until all default test channel is completed.

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7.5 Measurement Result

1M BR mode (Peak):

| CH | Freq. (MHz) | Peak Output Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|-------------------------|-------------------|------------|
| 0 | 2402 | 11.36 | 13.677 | 1000 |
| 39 | 2441 | 11.55 | 14.289 | 1000 |
| 78 | 2480 | 11.60 | 14.454 | 1000 |

1M BR mode (Average):

| CH | Freq. (MHz) | Max. Output include tune up tolerance Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|---------------------------------------------------|-------------------|------------|
| 0 | 2402 | 11.09 | 12.838 | 1000 |
| 39 | 2441 | 11.29 | 13.443 | 1000 |
| 78 | 2480 | 11.34 | 13.599 | 1000 |

2M EDR mode (Peak):

| CH | Freq. (MHz) | Peak Output Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|-------------------------|-------------------|------------|
| 0 | 2402 | 10.06 | 10.139 | 125 |
| 39 | 2441 | 9.76 | 9.462 | 125 |
| 78 | 2480 | 9.78 | 9.506 | 125 |

2M EDR mode (Average):

| CH | Freq. (MHz) | Max. Avg. Output include tune up tolerance Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|--------------------------------------------------------|-------------------|------------|
| 0 | 2402 | 7.87 | 6.117 | 125 |
| 39 | 2441 | 7.81 | 6.033 | 125 |
| 78 | 2480 | 7.85 | 6.088 | 125 |

3M EDR mode (Peak):

| CH | Freq. (MHz) | Peak Output Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|-------------------------|-------------------|------------|
| 0 | 2402 | 9.44 | 8.790 | 125 |
| 39 | 2441 | 9.45 | 8.810 | 125 |
| 78 | 2480 | 9.28 | 8.472 | 125 |

3M EDR mode (Average):

| CH | Freq. (MHz) | Max. Avg. Output include tune up tolerance Power (dBm) | Output Power (mW) | Limit (mW) |
|----|-------------|--------------------------------------------------------|-------------------|------------|
| 0 | 2402 | 6.98 | 4.983 | 125 |
| 39 | 2441 | 6.98 | 4.983 | 125 |
| 78 | 2480 | 6.88 | 4.870 | 125 |

NOTE: cable loss as 10.8dB that offsets in the s₁

**Note: Max. Output include tune up tolerance Power measured by using average detector.*

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1M BR mode EIRP

| Channel | Frequency (MHz) | Max. Output include tune up tolerance Power (dBm) | Antenna Gain (dBi) | EIRP (mW) | Limit (mW) |
|---------|-----------------|---------------------------------------------------|--------------------|-----------|------------|
| 0 | 2402 | 11.09 | 0.65 | 14.911 | 4000 |
| 39 | 2441 | 11.29 | 0.65 | 15.614 | 4000 |
| 78 | 2480 | 11.34 | 0.65 | 15.795 | 4000 |

2M EDR mode EIRP

| Channel | Frequency (MHz) | Max. Avg. Output include tune up tolerance | Antenna Gain (dBi) | EIRP (mW) | Limit (mW) |
|---------|-----------------|--------------------------------------------|--------------------|-----------|------------|
| 0 | 2402 | 7.87 | 0.65 | 7.104 | 4000 |
| 39 | 2441 | 7.81 | 0.65 | 7.007 | 4000 |
| 78 | 2480 | 7.85 | 0.65 | 7.071 | 4000 |

3M EDR mode EIRP

| Channel | Frequency (MHz) | Max. Avg. Output include tune up tolerance | Antenna Gain (dBi) | EIRP (mW) | Limit (mW) |
|---------|-----------------|--------------------------------------------|--------------------|-----------|------------|
| 0 | 2402 | 6.98 | 0.65 | 5.788 | 4000 |
| 39 | 2441 | 6.98 | 0.65 | 5.788 | 4000 |
| 78 | 2480 | 6.88 | 0.65 | 5.656 | 4000 |

* **Note:** EIRP = Average Power + Gain

NOTE: cable loss as 1.1dB that offsets in the spectrum

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8 20dB & 99% BANDWIDTH MEASUREMENT

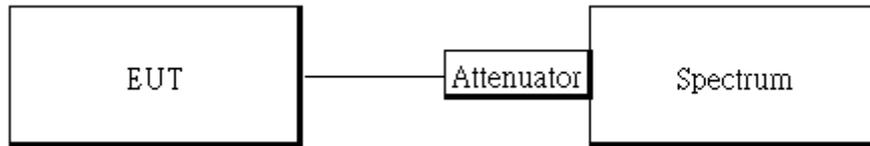
8.1 Standard Applicable

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

8.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|----------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Spectrum Analyzer | Agilent | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| DC Block | PASTERNAK | PE8210 | RF81 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A185C | RF229 | 2019/02/26 | 2020/02/25 |

8.3 Test Set-up



8.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set the spectrum analyzer as RBW=10 kHz (1 % of 20 dB Bandwidth.), VBW = 30 kHz, Span= 3MHz, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
5. Mark the peak frequency and -20dB (upper and lower) frequency
6. Turn on the 99% bandwidth function, max reading.
7. Repeat above procedures until all test default channel is completed

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8.5 Measurement Result

GFSK

| CH | 20 dB BW (MHz) | 2/3 BW (MHz) |
|------|----------------|--------------|
| Low | 0.923 | 0.62 |
| Mid | 0.925 | 0.62 |
| High | 0.923 | 0.62 |

$\pi/4$ -DQPSK

| CH | 20 dB BW (MHz) | 2/3 BW (MHz) |
|------|----------------|--------------|
| Low | 1.517 | 1.01 |
| Mid | 1.518 | 1.01 |
| High | 1.515 | 1.01 |

8-DPSK

| CH | 20 dB BW (MHz) | 2/3 BW (MHz) |
|------|----------------|--------------|
| Low | 1.390 | 0.93 |
| Mid | 1.389 | 0.93 |
| High | 1.389 | 0.93 |

GFSK

| CH | 99% Bandwidth (MHz) |
|------|---------------------|
| Low | 0.8635 |
| Mid | 0.8684 |
| High | 0.8663 |

$\pi/4$ -DQPSK

| CH | 99% Bandwidth (MHz) |
|------|---------------------|
| Low | 1.3468 |
| Mid | 1.3457 |
| High | 1.3472 |

8-DPSK

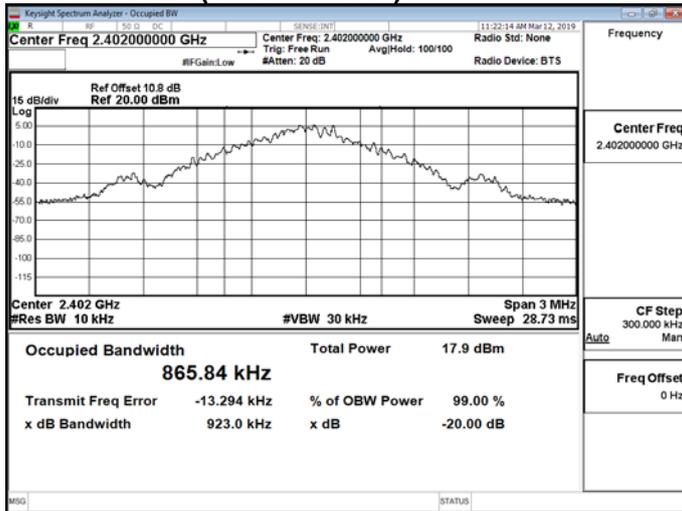
| CH | 99% Bandwidth (MHz) |
|------|---------------------|
| Low | 1.3427 |
| Mid | 1.3412 |
| High | 1.3413 |

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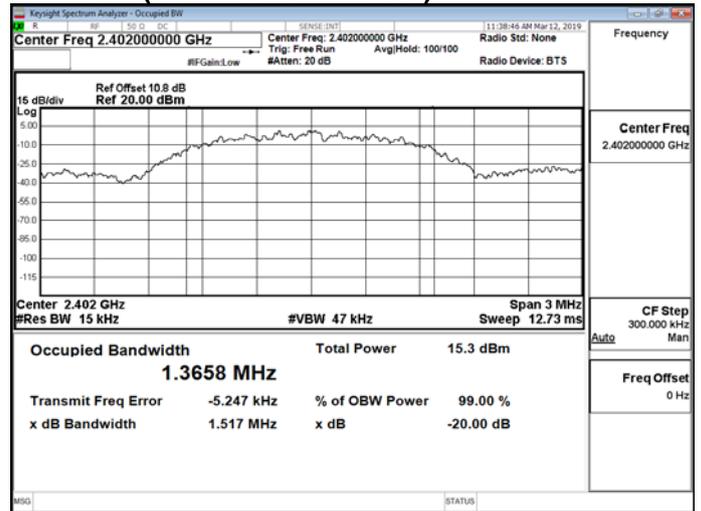
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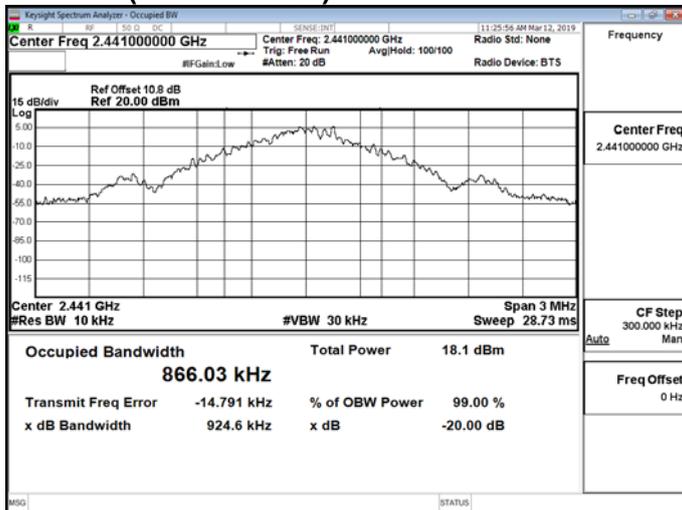
BW CH-Low (GFSK mode)



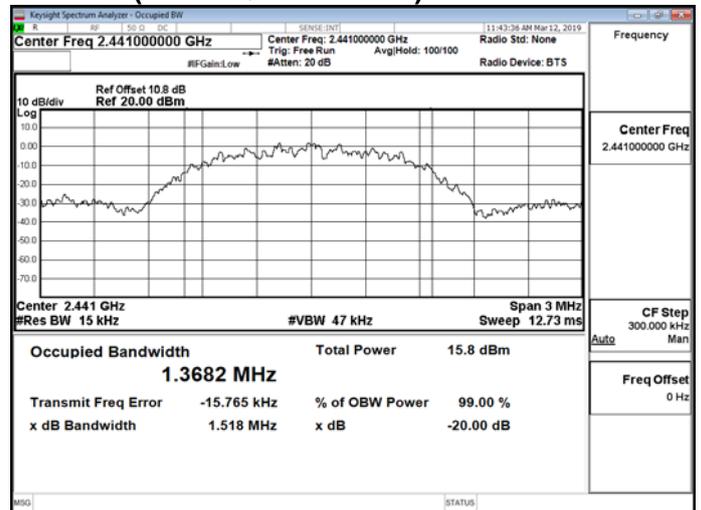
CH-Low ($\pi/4$ -DQPSK mode)



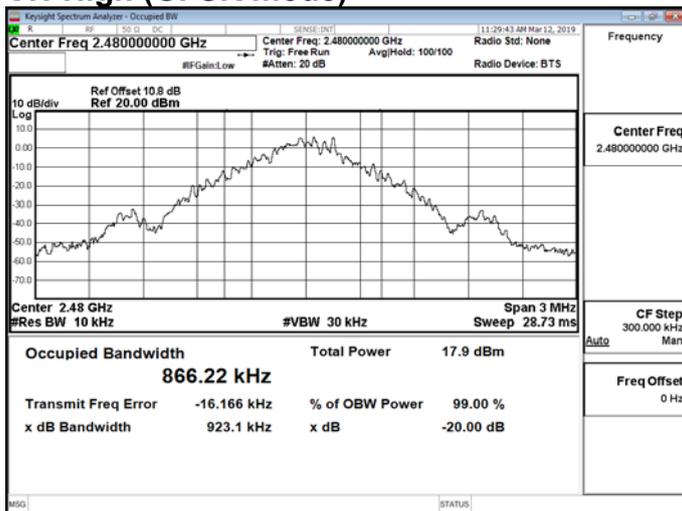
CH-Mid (GFSK mode)



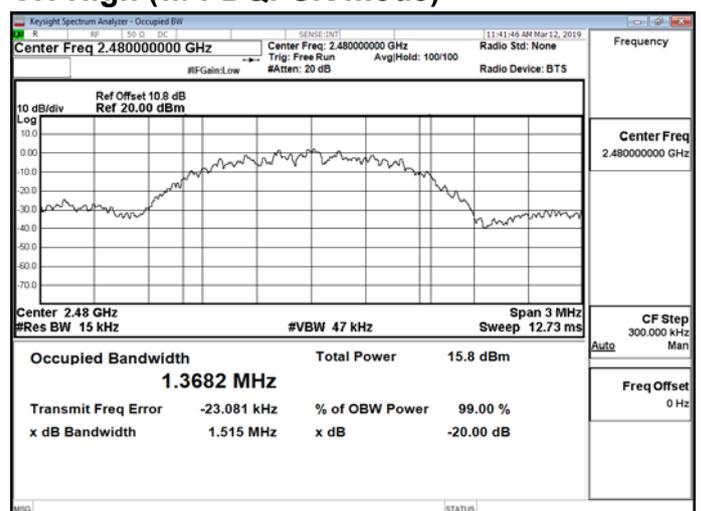
CH-Mid ($\pi/4$ -DQPSK mode)



CH-High (GFSK mode)



CH-High ($\pi/4$ -DQPSK mode)

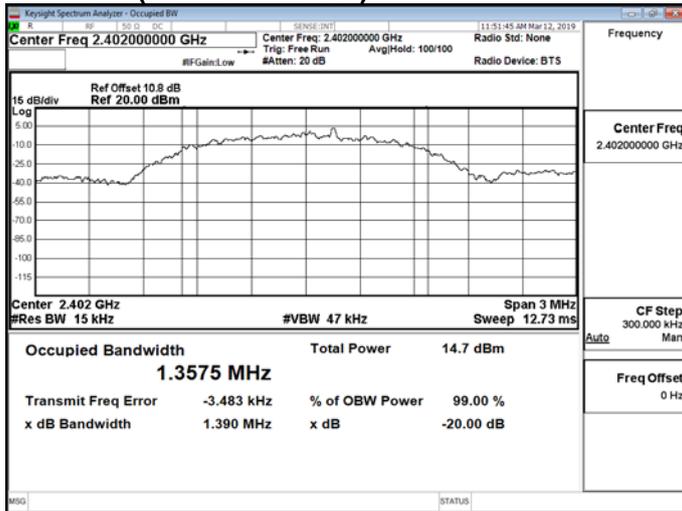


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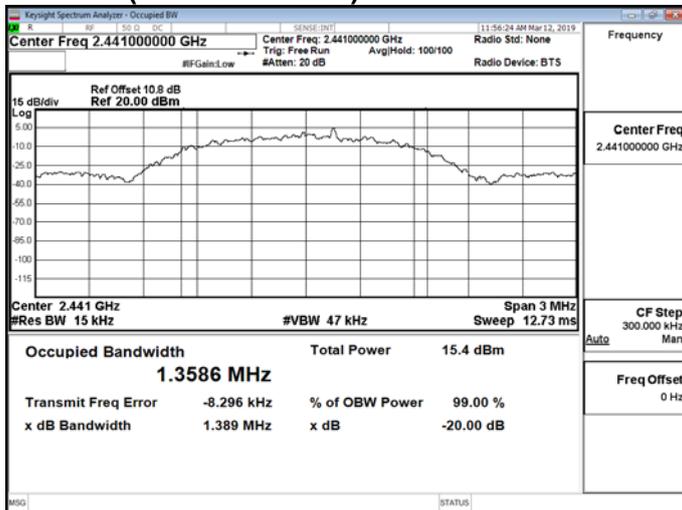
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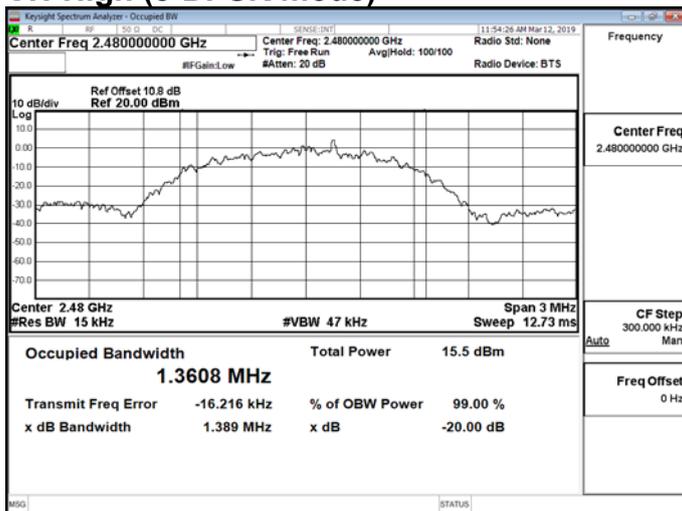
CH-Low (8-DPSK mode)



CH-Mid (8-DPSK mode)



CH-High (8-DPSK mode)

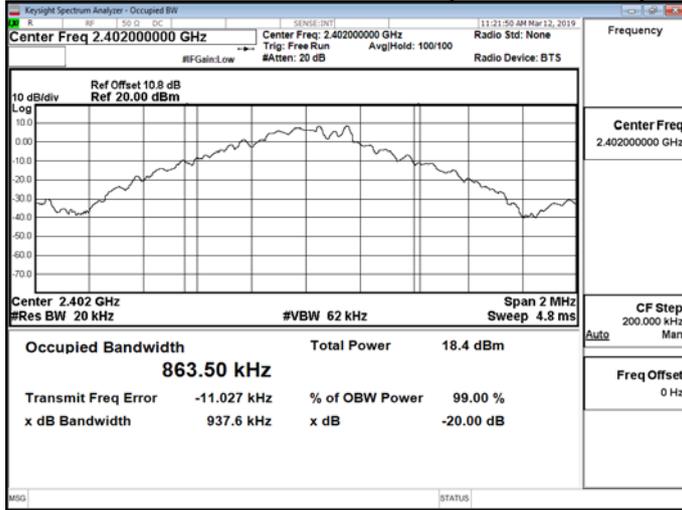


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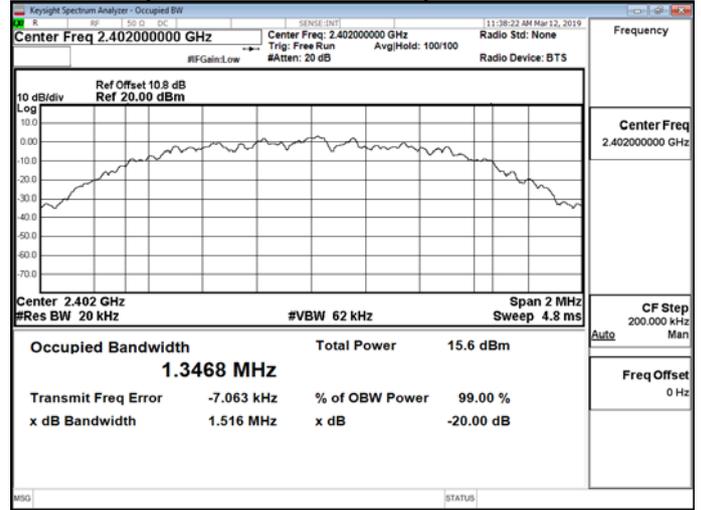
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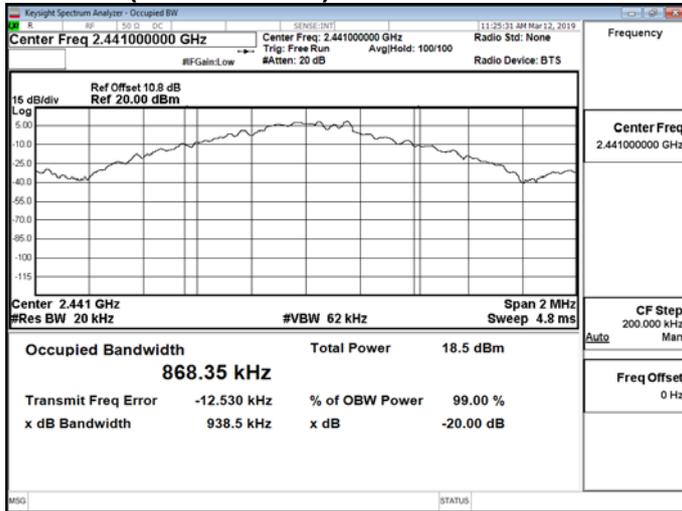
99% Bandwidth BW CH-Low (GFSK mode)



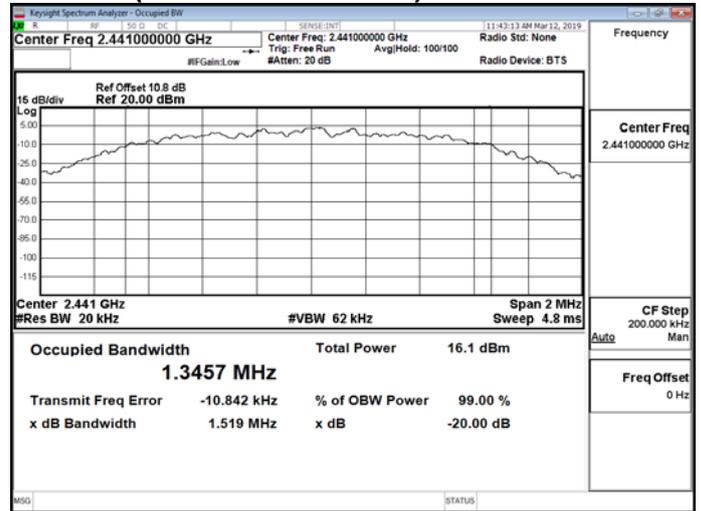
CH-Low ($\pi/4$ -DQPSK mode)



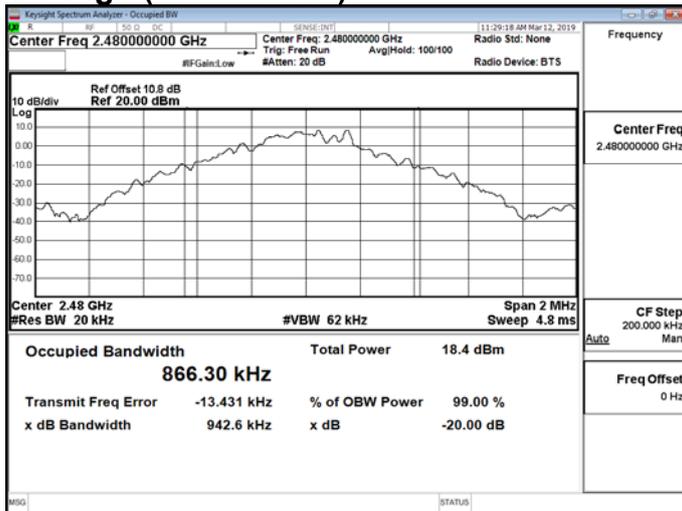
CH-Mid (GFSK mode)



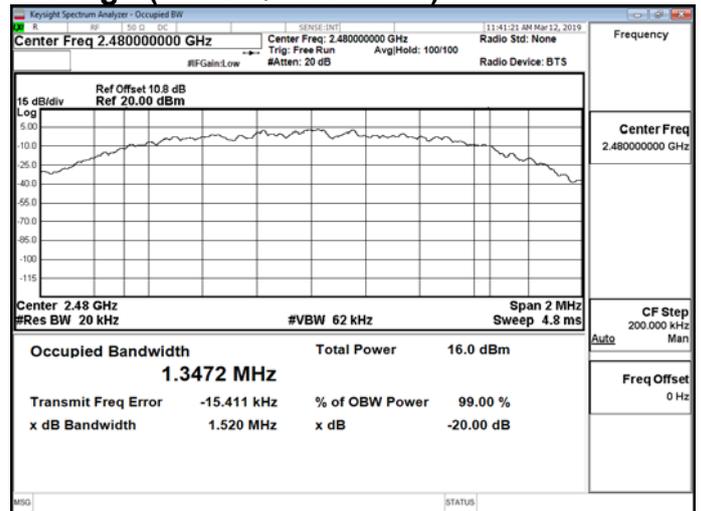
CH-Mid ($\pi/4$ -DQPSK mode)



CH-High (GFSK mode)



CH-High ($\pi/4$ -DQPSK mode)

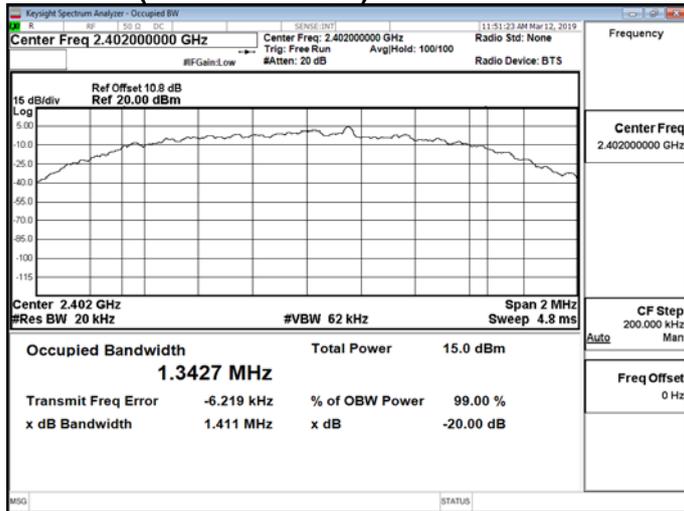


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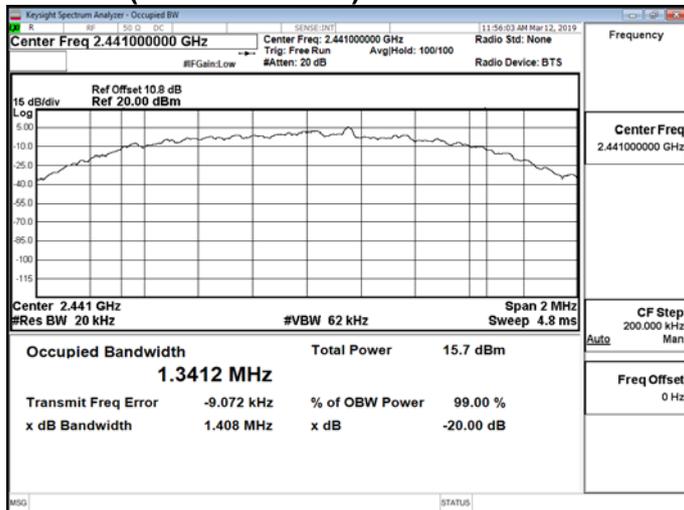
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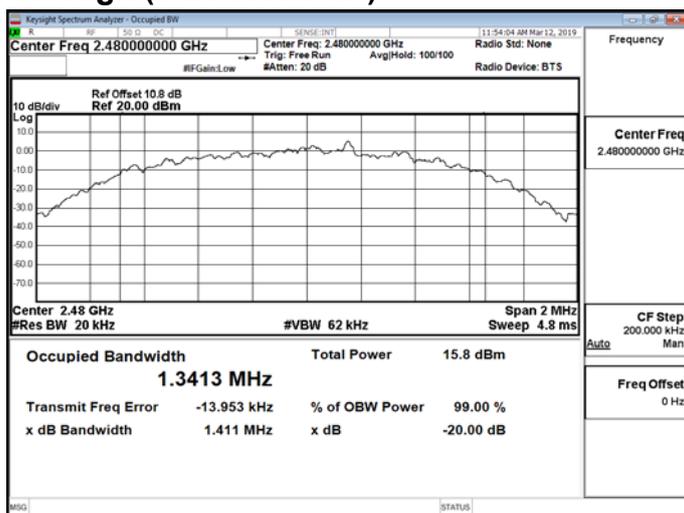
CH-Low (8-DPSK mode)



CH-Mid (8-DPSK mode)



CH-High (8-DPSK mode)



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9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

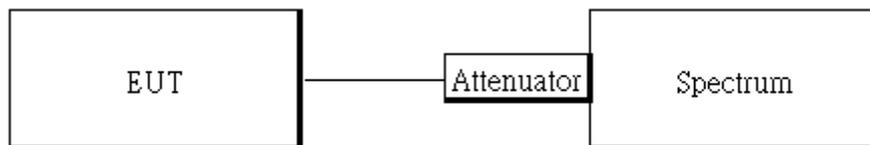
9.1 Standard Applicable

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. 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) & RSS-Gen §8.9 limit.

9.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|----------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Spectrum Analyzer | Agilent | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| DC Block | PASTERNAK | PE8210 | RF81 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A185C | RF229 | 2019/02/26 | 2020/02/25 |

9.3 Test SET-UP



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9.4 Measurement Procedure

Conducted Band Edge:

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
6. Mark Peak, 2.3999GHz and 2.4836GHz and record the max. level.
7. Repeat above procedures until all frequency measured were complete.

Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Set RBW = 100 kHz & VBW = 300 kHz, Detector =Peak, Sweep = Auto
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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

$$FS = RA + AF + CL - AG$$

| | | |
|-------|------------------------|--------------------------------------------|
| Where | FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| | RA = Reading Amplitude | AG = Amplifier Gain |
| | AF = Antenna Factor | |

9.5 Measurement Result

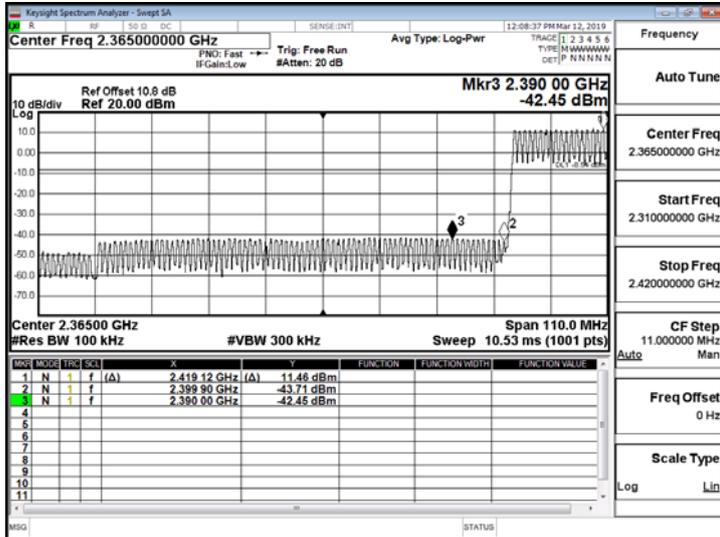
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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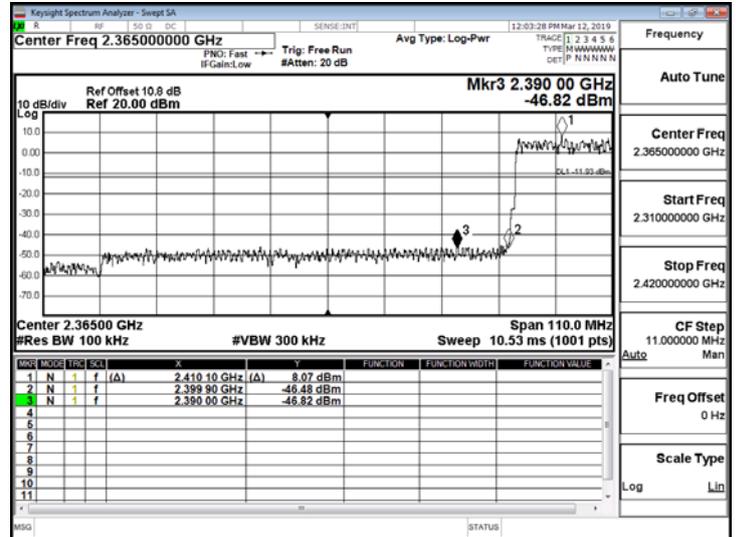
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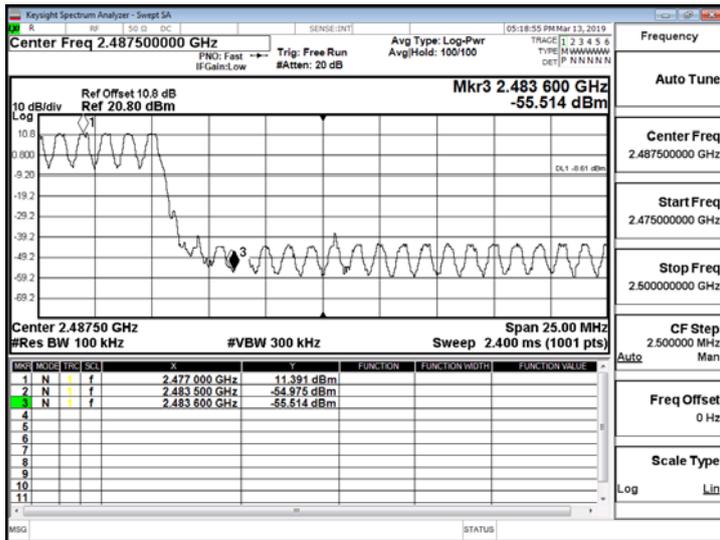
Hopping mode BR Band Edge CH-Low



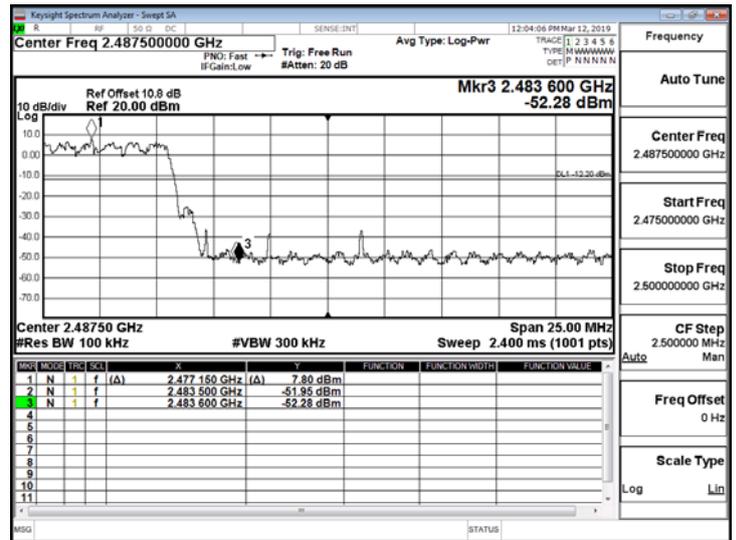
EDR Band Edge CH-Low



BR Band Edge CH-High



EDR Band Edge CH-High

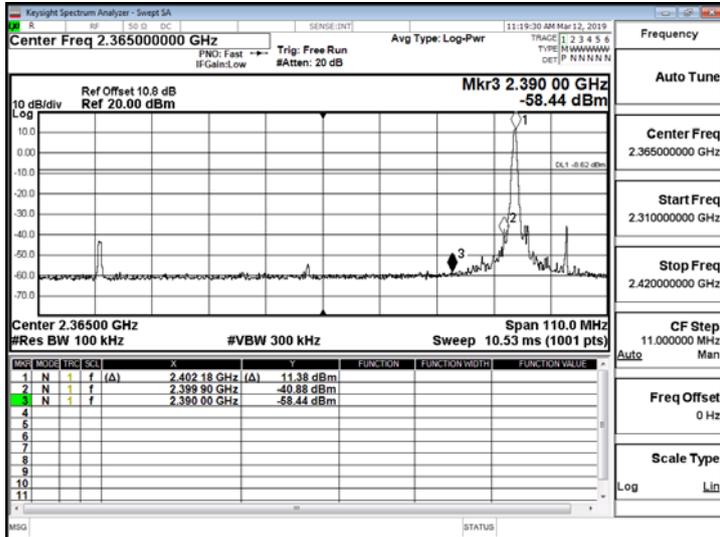


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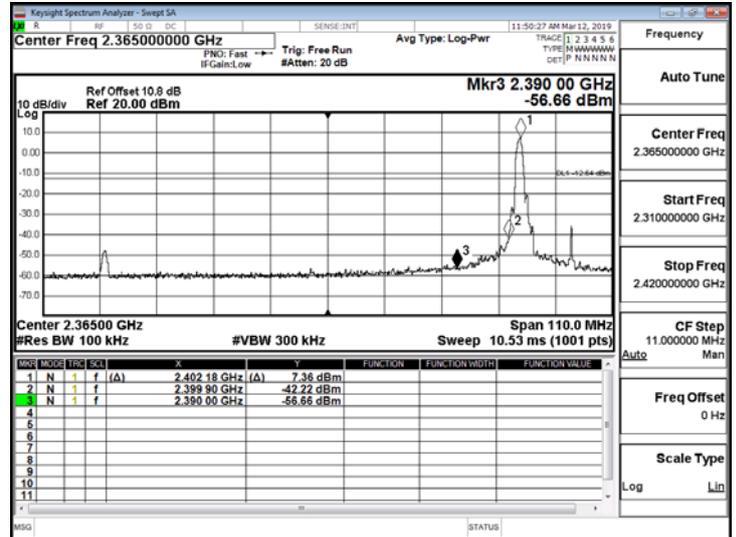
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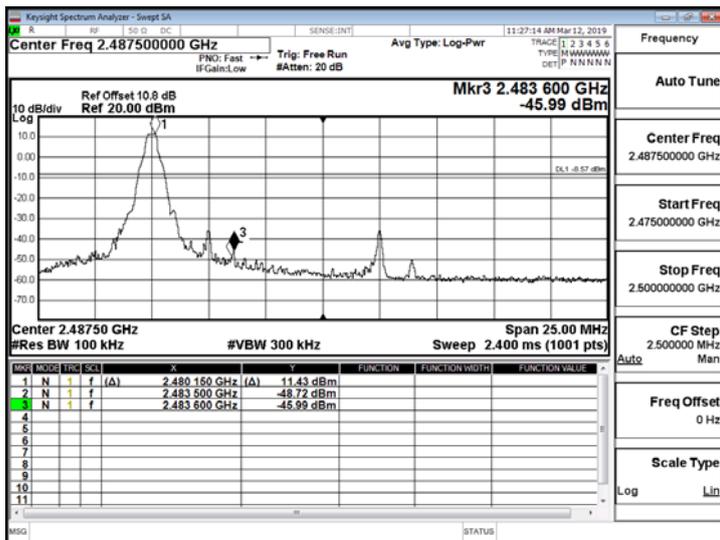
Non-Hopping BR Band Edge CH-Low



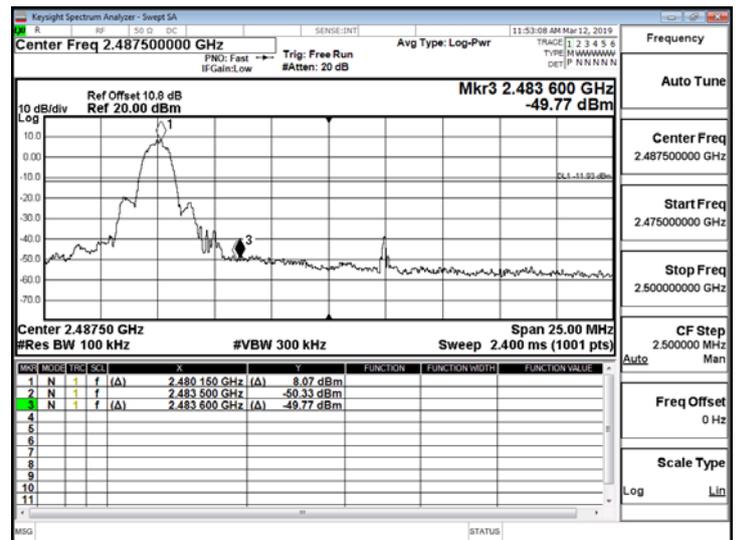
EDR Band Edge CH-Low



BR Band Edge CH-High



EDR Band Edge CH-High

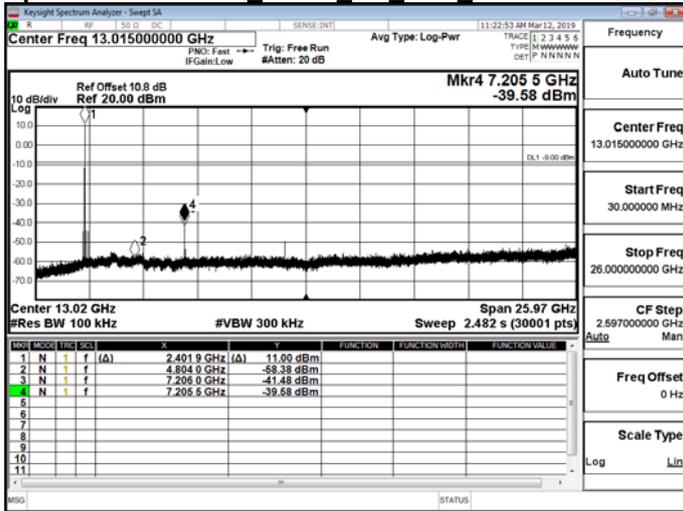


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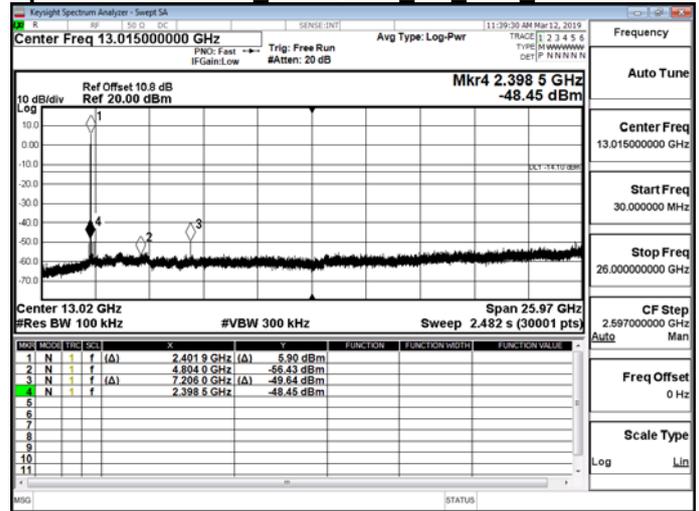
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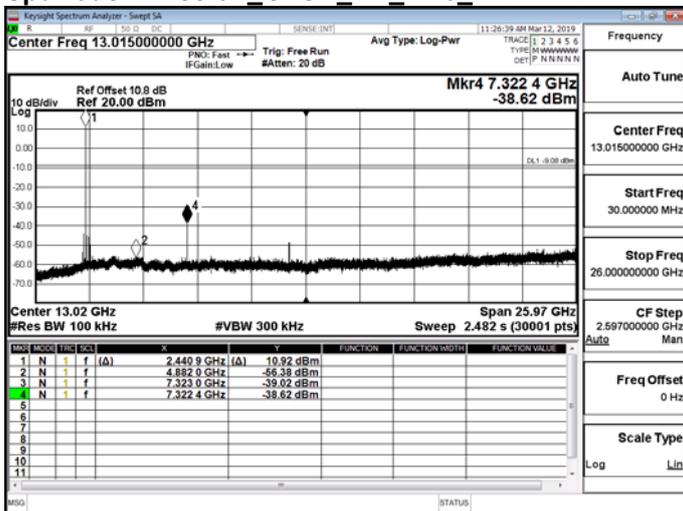
Spurious Emission GFSK 1M DH5 2402MHz



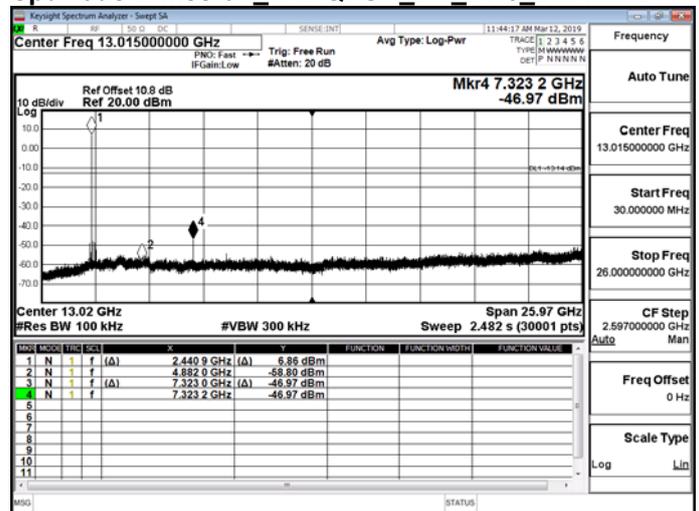
Spurious Emission π 4DQPSK 2M DH5 2402MHz



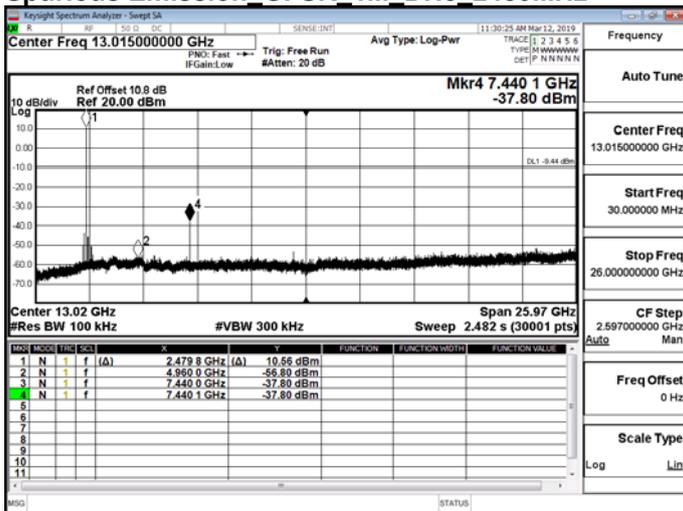
Spurious Emission GFSK 1M DH5 2441MHz



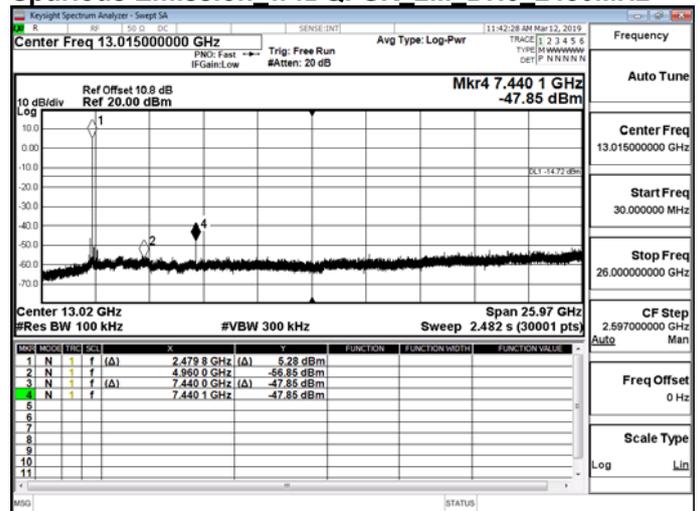
Spurious Emission π 4DQPSK 2M DH5 2441MHz



Spurious Emission GFSK 1M DH5 2480MHz



Spurious Emission π 4DQPSK 2M DH5 2480MHz

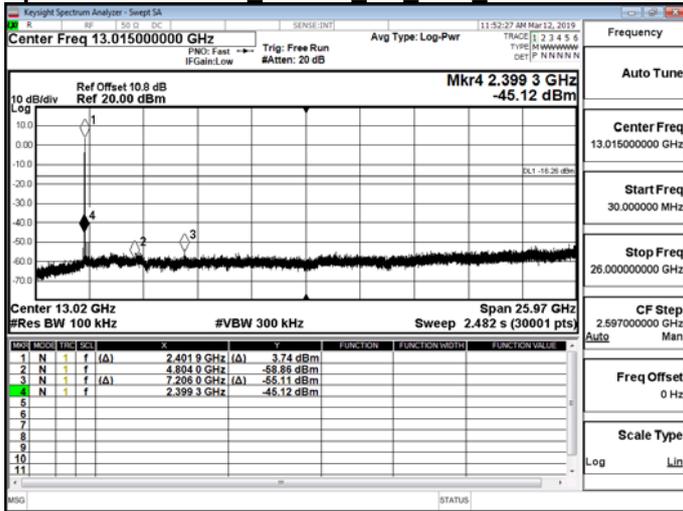


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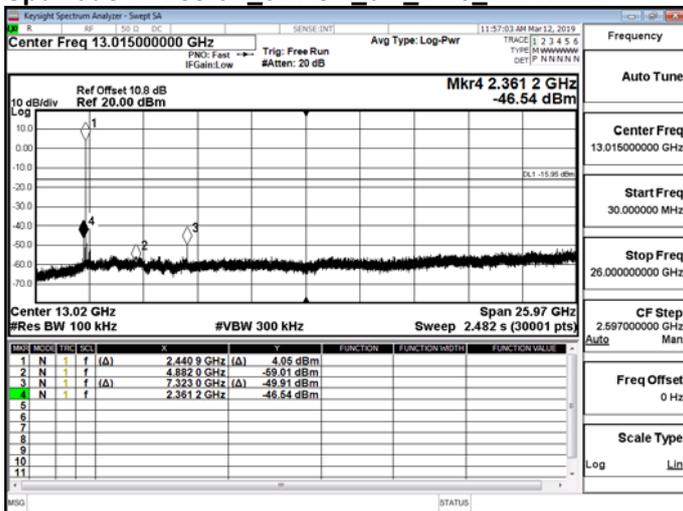
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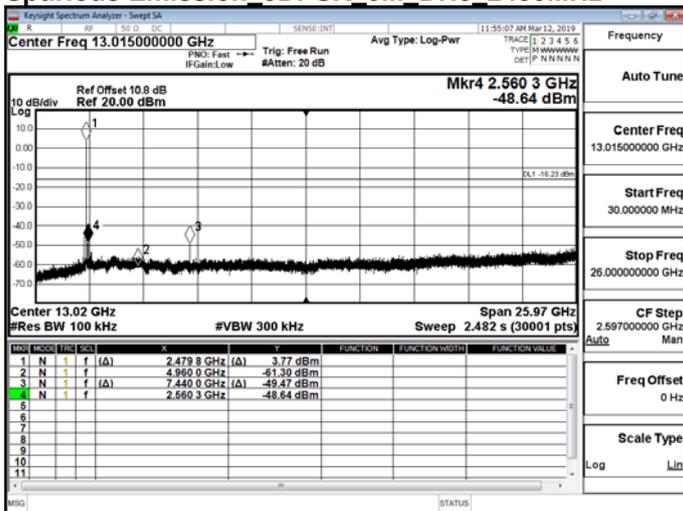
Spurious Emission 8DPSK 3M DH5 2402MHz



Spurious Emission 8DPSK 3M DH5 2441MHz



Spurious Emission 8DPSK 3M DH5 2480MHz



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10 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands, must also comply with the §15.209 & RSS-Gen §8.10 Table 6 limit.

And according to §15.33(a) (1) & RSS-Gen §8.9 Table 4 & 5, for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBµV/m) = 20 log Emission level (dBµV/m)

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10.2 Measurement Equipment Used

| 966A Chamber | | | | | |
|----------------------------------|-------------------|-----------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Band Reject Filters | MICRO TRONICS | BRM 50702 | 120 | 2019/02/26 | 2020/02/25 |
| Bilog Antenna | Sunol Sciences | JB3 | A030105 | 2018/07/13 | 2019/07/12 |
| Cable | HUBER SUHNER | SUCOFLEX 104PEA | 25157 | 2019/02/26 | 2020/02/25 |
| Cable | HUBER SUHNER | SUCOFLEX 104PEA | 20995 | 2019/02/26 | 2020/02/25 |
| Digital Thermo-Hygro Meter | WISEWIND | 1206 | D07 | 2019/01/30 | 2020/01/29 |
| double Ridged Guide Horn Antenna | ETC | MCTD 1209 | DRH13M02003 | 2018/08/20 | 2019/08/19 |
| Loop Ant | ETS.LINDGREN | 6502 | 148045 | 2018/10/08 | 2019/10/07 |
| Pre-Amplifier | EMEC | EM330 | 060609 | 2019/02/26 | 2020/02/25 |
| Pre-Amplifier | HP | 8449B | 3008A00965 | 2019/02/26 | 2020/02/25 |
| PSA Series Spectrum Analyzer | Agilent | E4446A | MY46180323 | 2018/05/31 | 2019/05/30 |
| Antenna Tower | CCS | CC-A-1F | N/A | N.C.R | N.C.R |
| Controller | CCS | CC-C-1F | N/A | N.C.R | N.C.R |
| Turn Table | CCS | CC-T-1F | N/A | N.C.R | N.C.R |
| Software | e3 V6.11-20180413 | | | | |

NOTE: N.C.R refers to Not Calibrated Required.

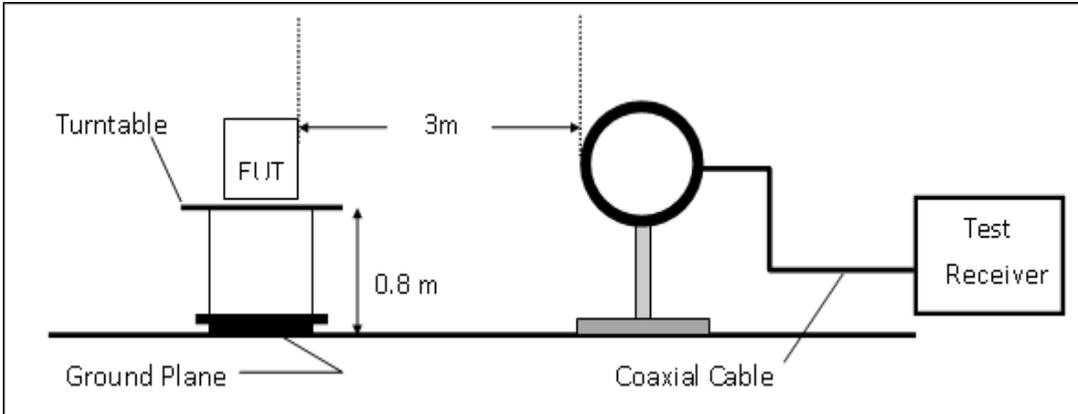
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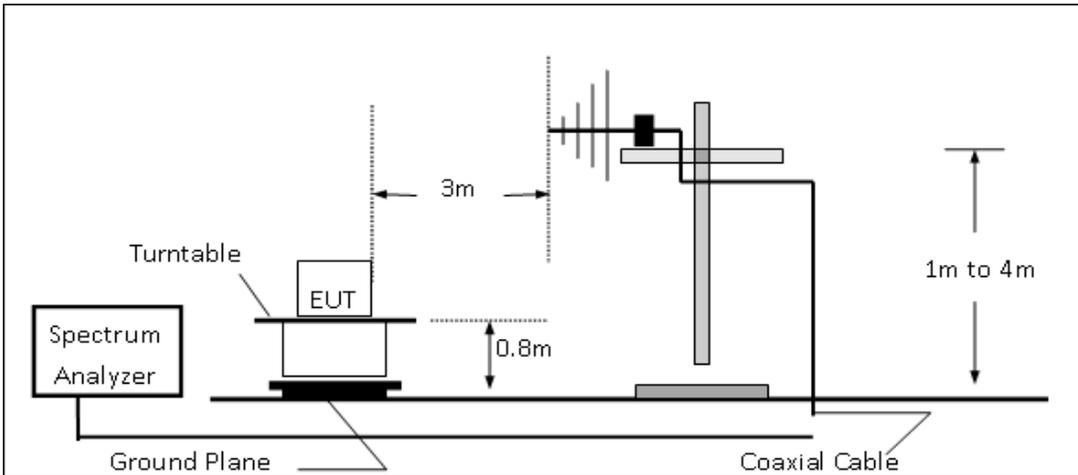
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10.3 Test SET-UP

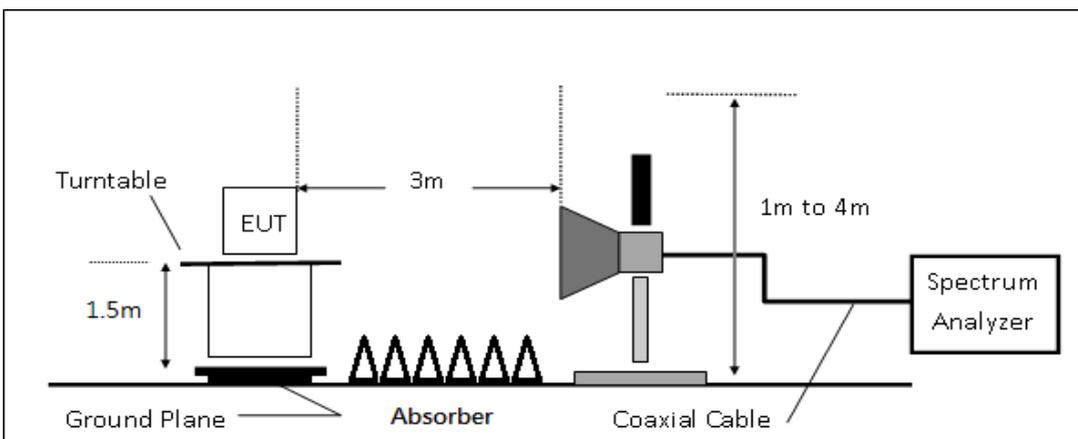
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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10.4 Measurement Procedure

Radiated Emission

1. The testing follows ANSI C63.10:2013. Measurement Guidelines.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 0.8m for frequency > 1GHz above ground plan.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
8. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
11. Repeat above procedures until all frequency of the interest measured were complete.

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10.5 Field Strength Calculation

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

$$FS = RA + AF + CL - AG$$

| | |
|---------------------------|--------------------------------------------|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

The limit of the emission level is expressed in dBuV/m, which converts $20 \cdot \log(\mu\text{V}/\text{m})$

Actual FS(dBuV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBuV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

10.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

10.7 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

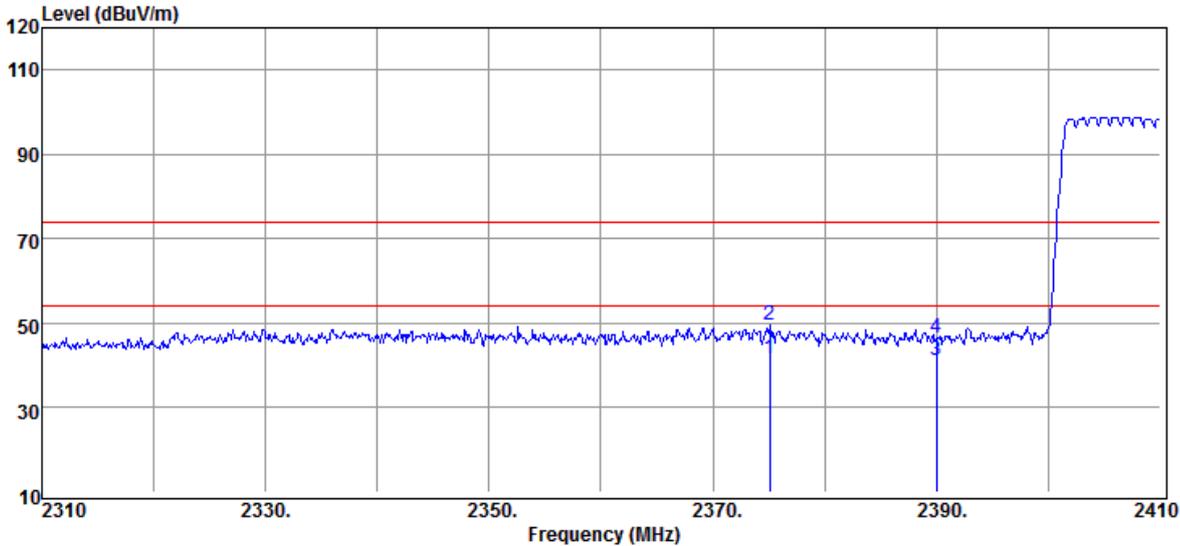
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Radiated Band Edge Measurement Result: (Hopping Mode)

| | | | |
|----------------|----------------|--------------|-------------|
| Operation Mode | :BT BR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



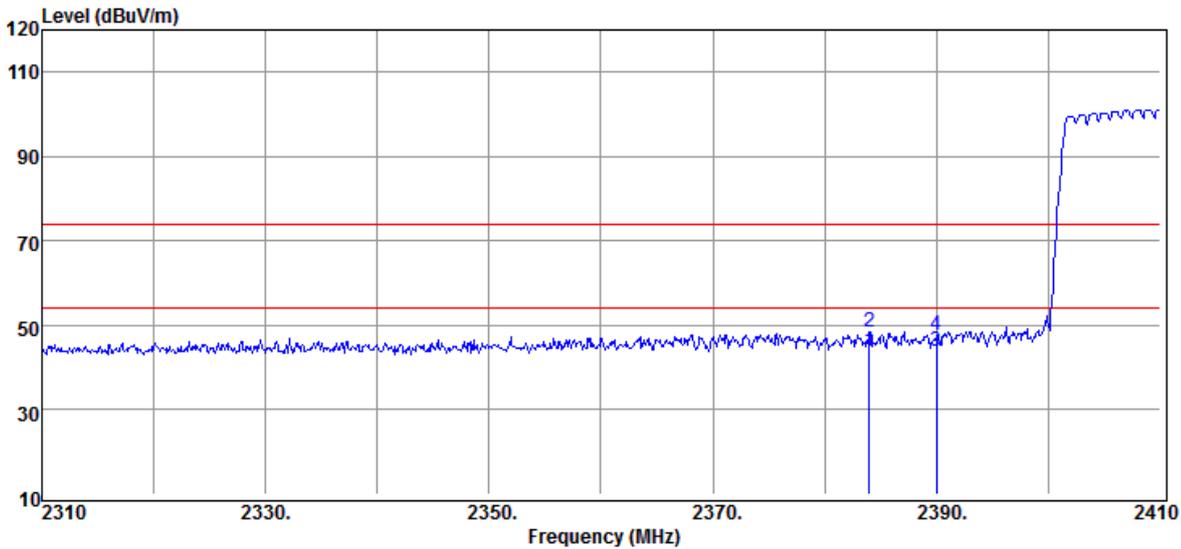
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBuV | Factor dB | Actual FS dBuV/m | Limit @3m dBuV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 2375.10 | Average | 44.86 | -3.33 | 41.53 | 54.00 | -12.47 |
| 2375.10 | Peak | 52.78 | -3.33 | 49.45 | 74.00 | -24.55 |
| 2390.00 | Average | 44.68 | -3.33 | 41.35 | 54.00 | -12.65 |
| 2390.00 | Peak | 49.78 | -3.33 | 46.45 | 74.00 | -27.55 |

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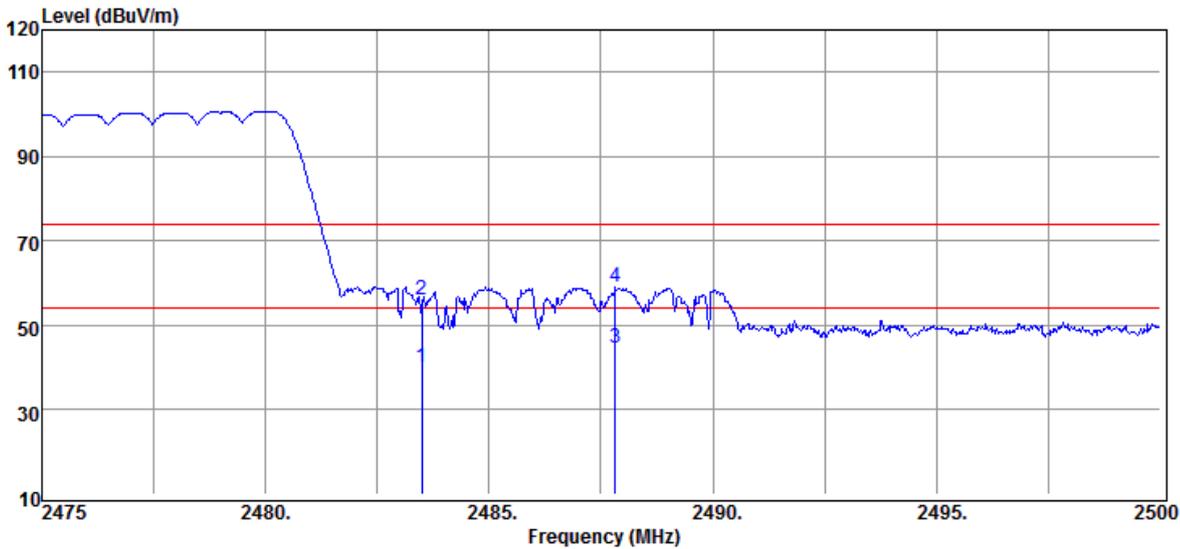
| | | | |
|----------------|----------------|--------------|-------------|
| Operation Mode | :BT BR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2384.00 | Average | 47.08 | -3.33 | 43.75 | 54.00 | -10.25 |
| 2384.00 | Peak | 51.92 | -3.33 | 48.59 | 74.00 | -25.41 |
| 2390.00 | Average | 47.15 | -3.33 | 43.82 | 54.00 | -10.18 |
| 2390.00 | Peak | 51.17 | -3.33 | 47.84 | 74.00 | -26.16 |

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| | | | |
|----------------|----------------|--------------|-------------|
| Operation Mode | :BT BR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



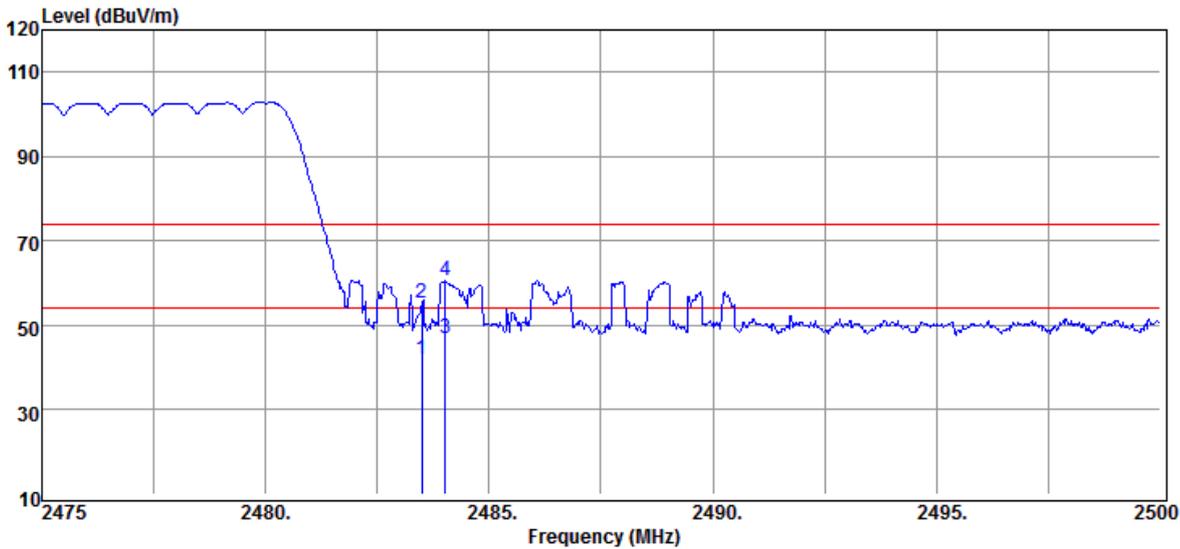
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 42.84 | -2.72 | 40.12 | 54.00 | -13.88 |
| 2483.50 | Peak | 58.90 | -2.72 | 56.18 | 74.00 | -17.82 |
| 2487.83 | Average | 47.13 | -2.68 | 44.45 | 54.00 | -9.55 |
| 2487.83 | Peak | 61.83 | -2.68 | 59.15 | 74.00 | -14.85 |

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| | | | |
|----------------|----------------|--------------|-------------|
| Operation Mode | :BT BR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



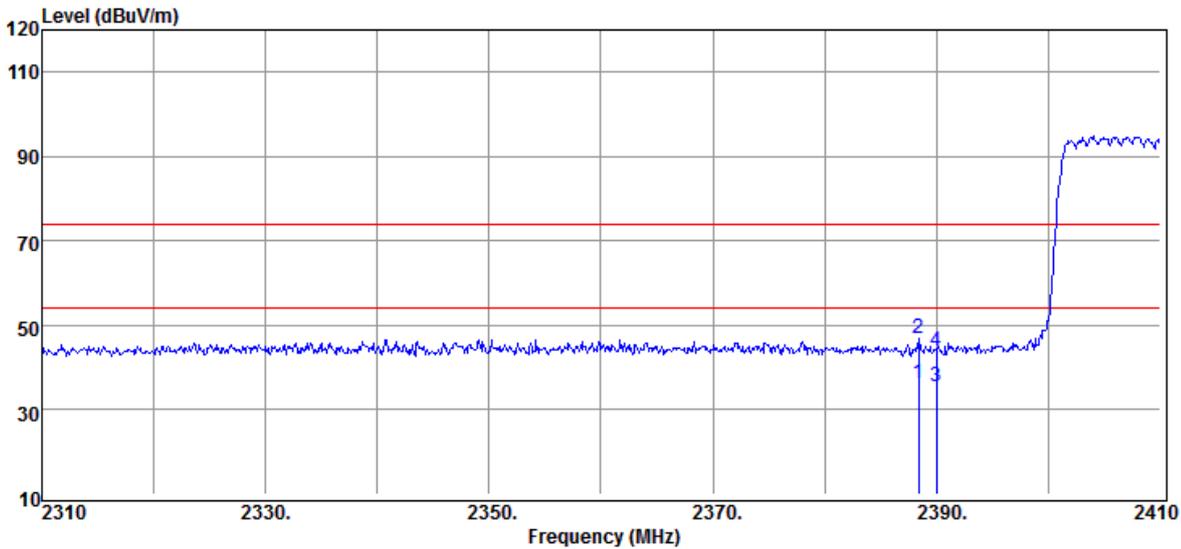
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 44.55 | -2.72 | 41.83 | 54.00 | -12.17 |
| 2483.50 | Peak | 58.02 | -2.72 | 55.30 | 74.00 | -18.70 |
| 2484.03 | Average | 49.47 | -2.71 | 46.76 | 54.00 | -7.24 |
| 2484.03 | Peak | 63.33 | -2.71 | 60.62 | 74.00 | -13.38 |

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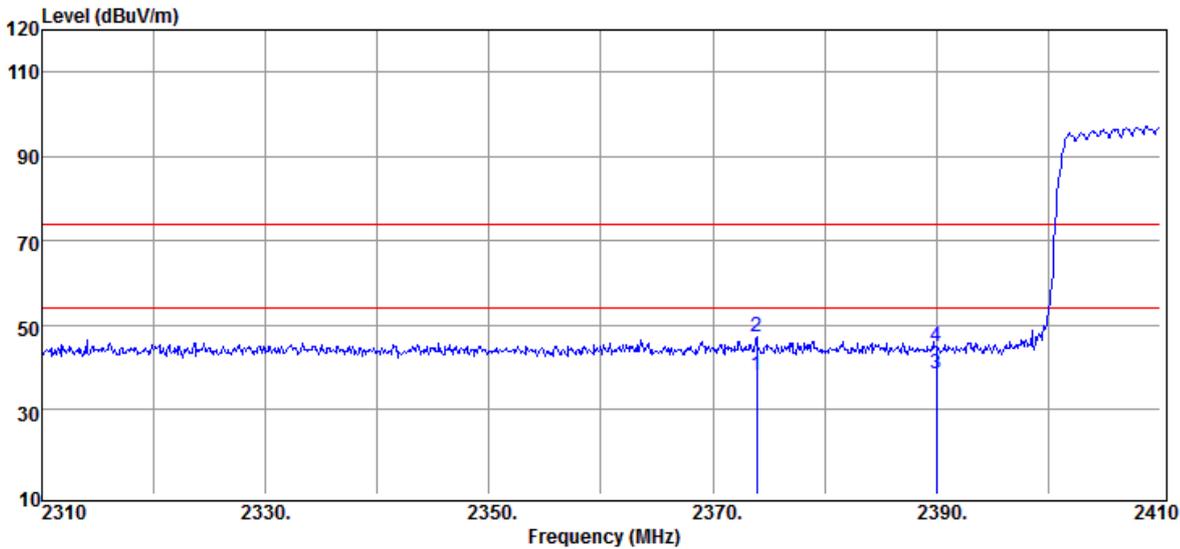
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|----------------|-----------------|--------------|-------------|
| Operation Mode | :BT EDR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2388.40 | Average | 39.43 | -3.33 | 36.10 | 54.00 | -17.90 |
| 2388.40 | Peak | 50.26 | -3.33 | 46.93 | 74.00 | -27.07 |
| 2390.00 | Average | 39.02 | -3.33 | 35.69 | 54.00 | -18.31 |
| 2390.00 | Peak | 47.20 | -3.33 | 43.87 | 74.00 | -30.13 |

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| | | | |
|----------------|-----------------|--------------|-------------|
| Operation Mode | :BT EDR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



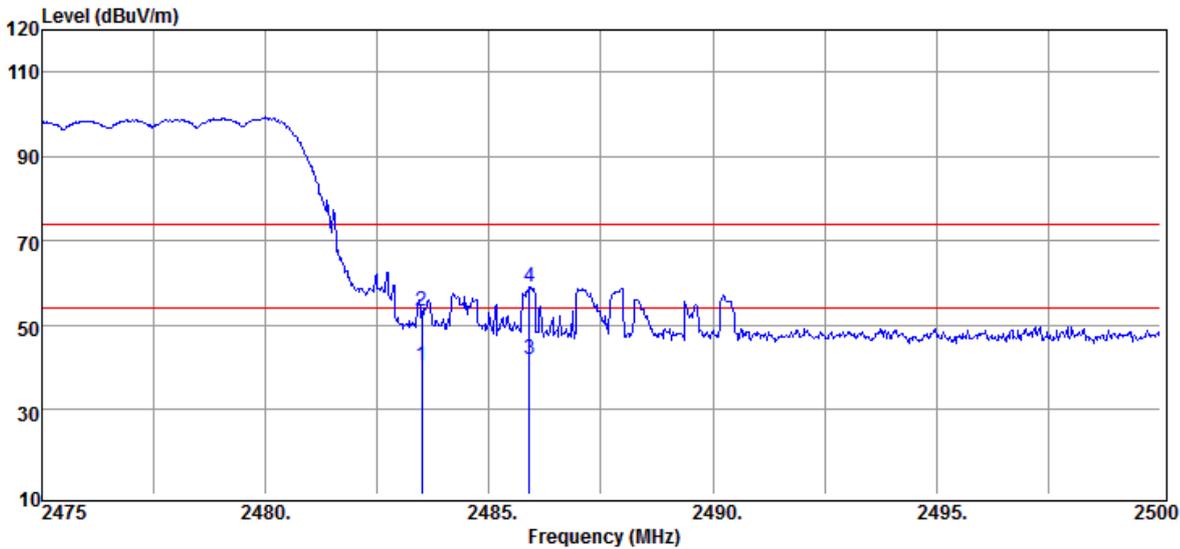
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2373.90 | Average | 41.34 | -3.34 | 38.00 | 54.00 | -16.00 |
| 2373.90 | Peak | 50.45 | -3.34 | 47.11 | 74.00 | -26.89 |
| 2390.00 | Average | 41.84 | -3.33 | 38.51 | 54.00 | -15.49 |
| 2390.00 | Peak | 48.53 | -3.33 | 45.20 | 74.00 | -28.80 |

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| | | | |
|----------------|-----------------|--------------|-------------|
| Operation Mode | :BT EDR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



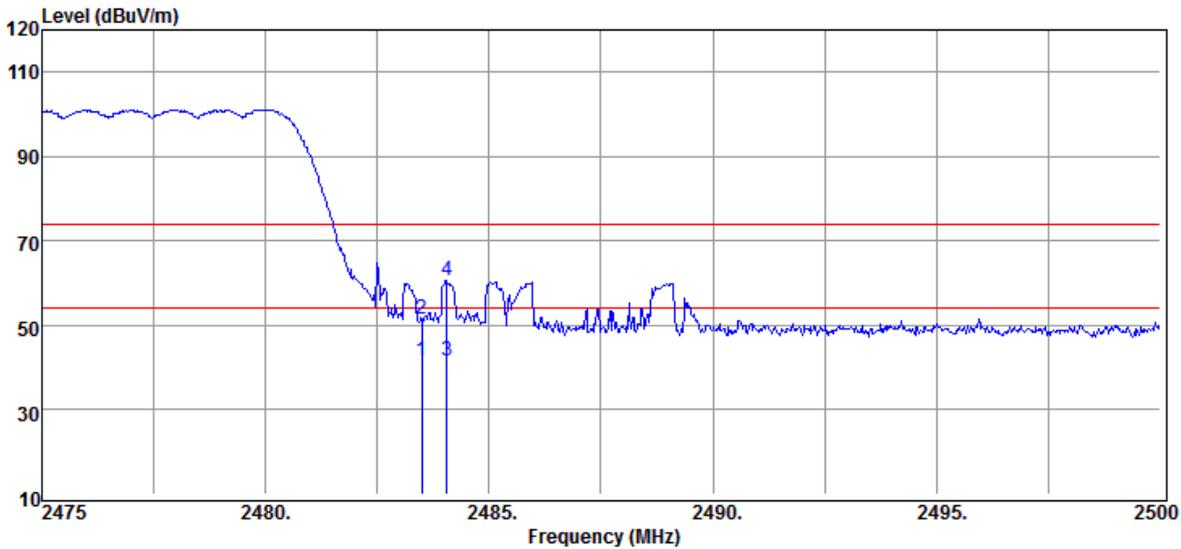
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 43.18 | -2.72 | 40.46 | 54.00 | -13.54 |
| 2483.50 | Peak | 55.92 | -2.72 | 53.20 | 74.00 | -20.80 |
| 2485.90 | Average | 44.76 | -2.71 | 42.05 | 54.00 | -11.95 |
| 2485.90 | Peak | 61.99 | -2.71 | 59.28 | 74.00 | -14.72 |

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| | | | |
|----------------|-----------------|--------------|-------------|
| Operation Mode | :BT EDR Hopping | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |

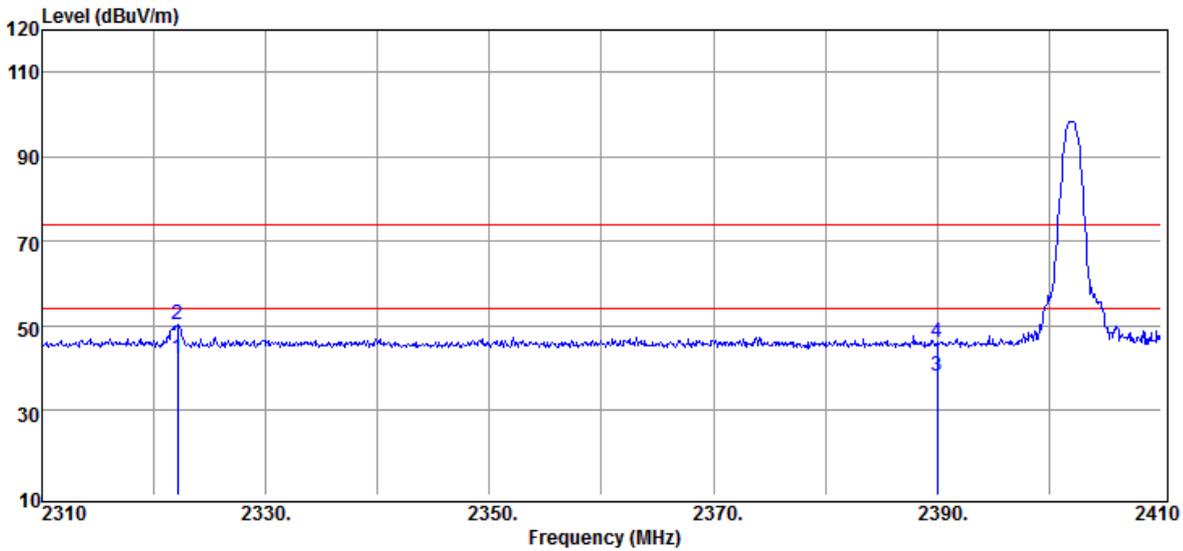


| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBuV | Factor dB | Actual FS dBuV/m | Limit @3m dBuV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 2483.50 | Average | 44.18 | -2.72 | 41.46 | 54.00 | -12.54 |
| 2483.50 | Peak | 54.19 | -2.72 | 51.47 | 74.00 | -22.53 |
| 2484.05 | Average | 44.27 | -2.71 | 41.56 | 54.00 | -12.44 |
| 2484.05 | Peak | 63.22 | -2.71 | 60.51 | 74.00 | -13.49 |

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Radiated Emission – Band Edge (Non-Hopping Mode):

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



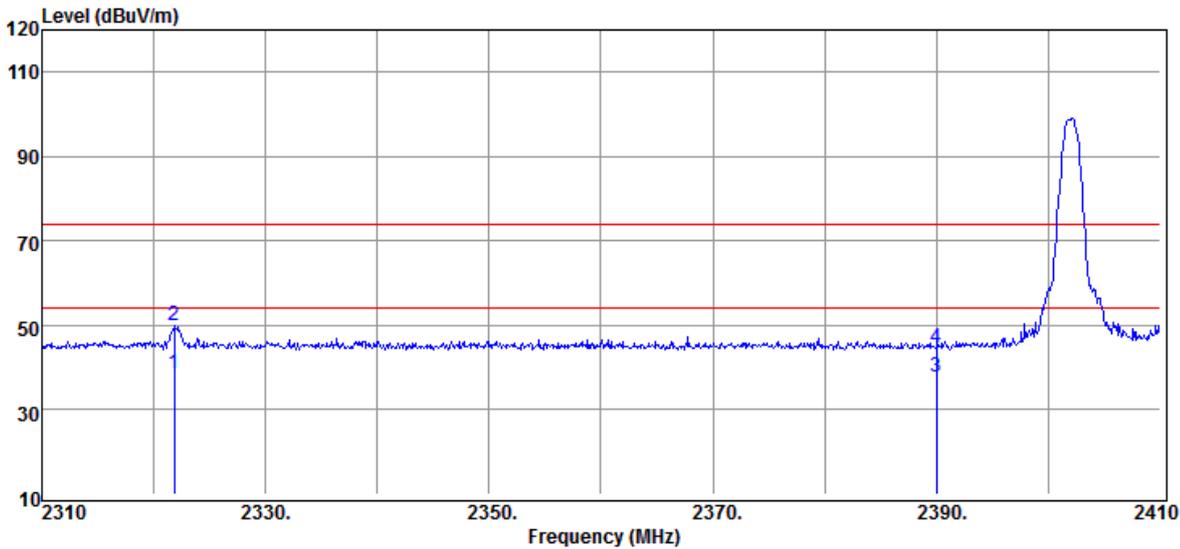
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2322.10 | Average | 45.67 | -3.25 | 42.42 | 54.00 | -11.58 |
| 2322.10 | Peak | 53.48 | -3.25 | 50.23 | 74.00 | -23.77 |
| 2390.00 | Average | 41.45 | -3.33 | 38.12 | 54.00 | -15.88 |
| 2390.00 | Peak | 49.53 | -3.33 | 46.20 | 74.00 | -27.80 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



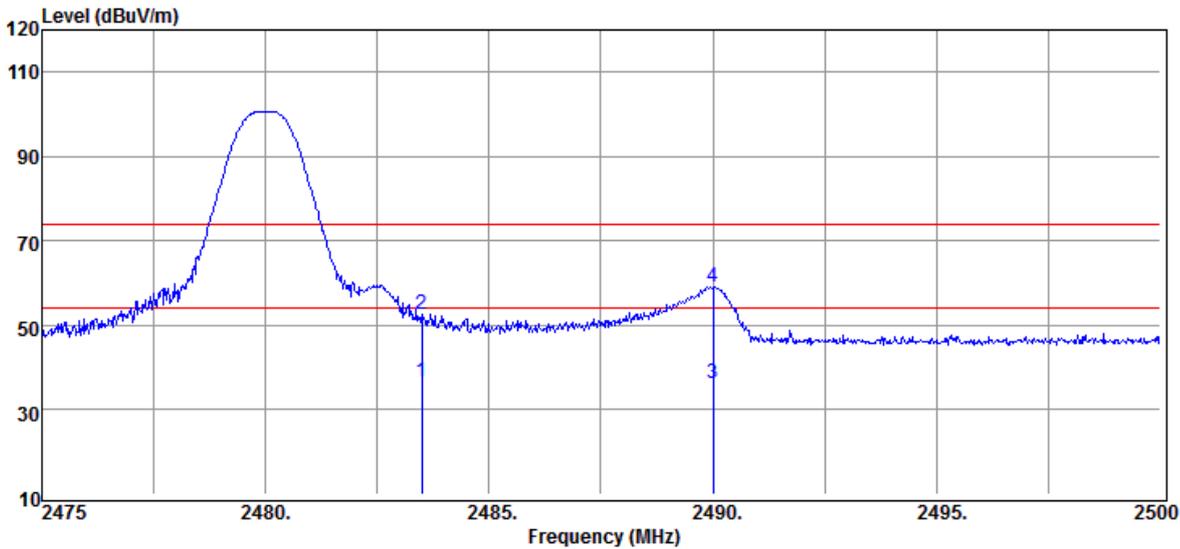
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2321.80 | Average | 41.77 | -3.25 | 38.52 | 54.00 | -15.48 |
| 2321.80 | Peak | 53.21 | -3.25 | 49.96 | 74.00 | -24.04 |
| 2390.00 | Average | 41.05 | -3.33 | 37.72 | 54.00 | -16.28 |
| 2390.00 | Peak | 47.98 | -3.33 | 44.65 | 74.00 | -29.35 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



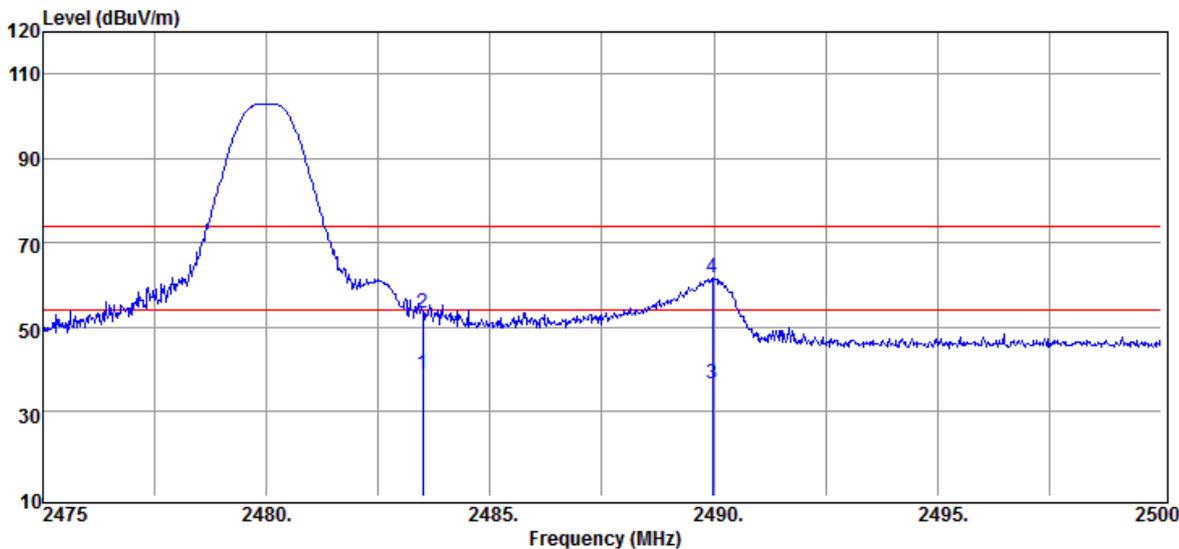
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 39.19 | -2.72 | 36.47 | 54.00 | -17.53 |
| 2483.50 | Peak | 55.29 | -2.72 | 52.57 | 74.00 | -21.43 |
| 2490.00 | Average | 38.78 | -2.67 | 36.11 | 54.00 | -17.89 |
| 2490.00 | Peak | 61.96 | -2.67 | 59.29 | 74.00 | -14.71 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



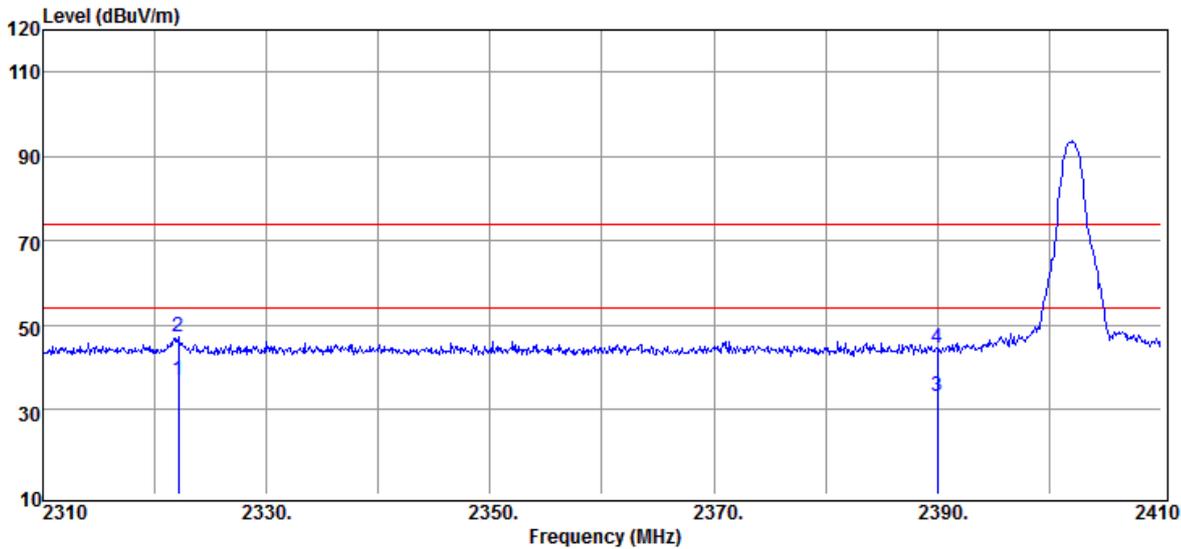
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 41.52 | -2.72 | 38.80 | 54.00 | -15.20 |
| 2483.50 | Peak | 56.14 | -2.72 | 53.42 | 74.00 | -20.58 |
| 2489.98 | Average | 39.36 | -2.67 | 36.69 | 54.00 | -17.31 |
| 2489.98 | Peak | 64.38 | -2.67 | 61.71 | 74.00 | -12.29 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT EDR | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



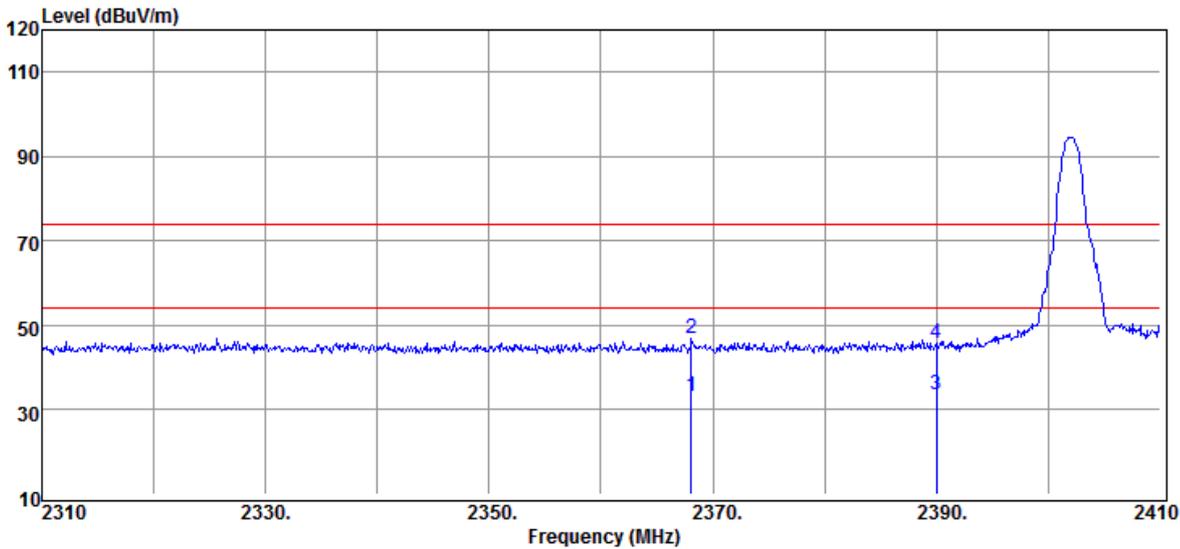
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2322.10 | Average | 40.37 | -3.25 | 37.12 | 54.00 | -16.88 |
| 2322.10 | Peak | 50.68 | -3.25 | 47.43 | 74.00 | -26.57 |
| 2390.00 | Average | 36.42 | -3.33 | 33.09 | 54.00 | -20.91 |
| 2390.00 | Peak | 47.97 | -3.33 | 44.64 | 74.00 | -29.36 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT EDR | Test Date | :2019-03-12 |
| Test Mode | :BE CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



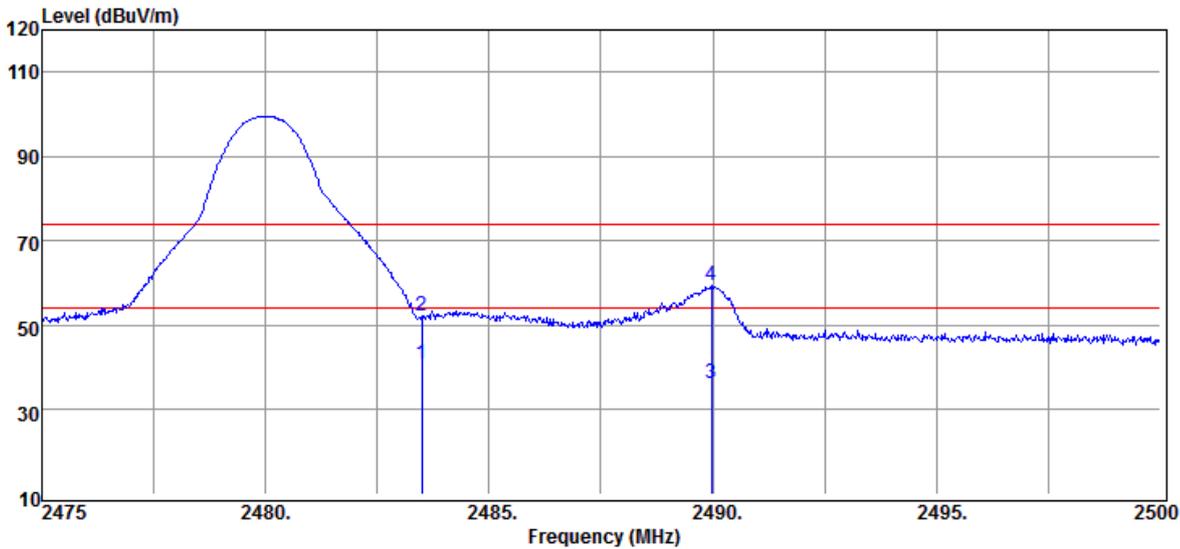
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2368.10 | Average | 36.45 | -3.36 | 33.09 | 54.00 | -20.91 |
| 2368.10 | Peak | 50.36 | -3.36 | 47.00 | 74.00 | -27.00 |
| 2390.00 | Average | 36.90 | -3.33 | 33.57 | 54.00 | -20.43 |
| 2390.00 | Peak | 49.09 | -3.33 | 45.76 | 74.00 | -28.24 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT EDR | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



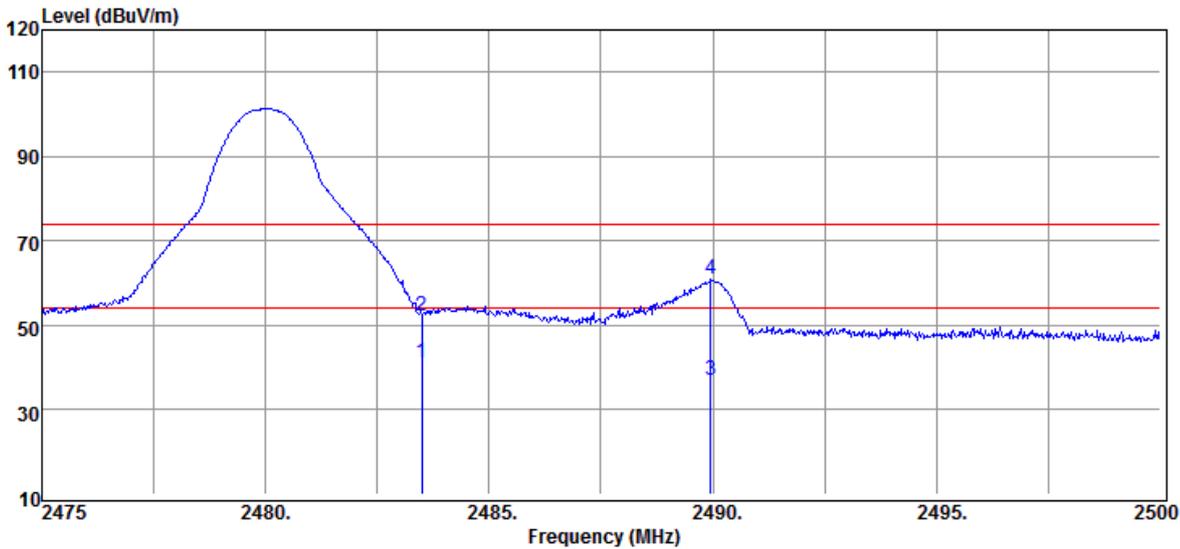
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 43.51 | -2.72 | 40.79 | 54.00 | -13.21 |
| 2483.50 | Peak | 55.01 | -2.72 | 52.29 | 74.00 | -21.71 |
| 2489.98 | Average | 38.84 | -2.67 | 36.17 | 54.00 | -17.83 |
| 2489.98 | Peak | 62.07 | -2.67 | 59.40 | 74.00 | -14.60 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT EDR | Test Date | :2019-03-12 |
| Test Mode | :BE CH HIGH | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 2483.50 | Average | 43.93 | -2.72 | 41.21 | 54.00 | -12.79 |
| 2483.50 | Peak | 55.07 | -2.72 | 52.35 | 74.00 | -21.65 |
| 2489.95 | Average | 39.83 | -2.67 | 37.16 | 54.00 | -16.84 |
| 2489.95 | Peak | 63.58 | -2.67 | 60.91 | 74.00 | -13.09 |

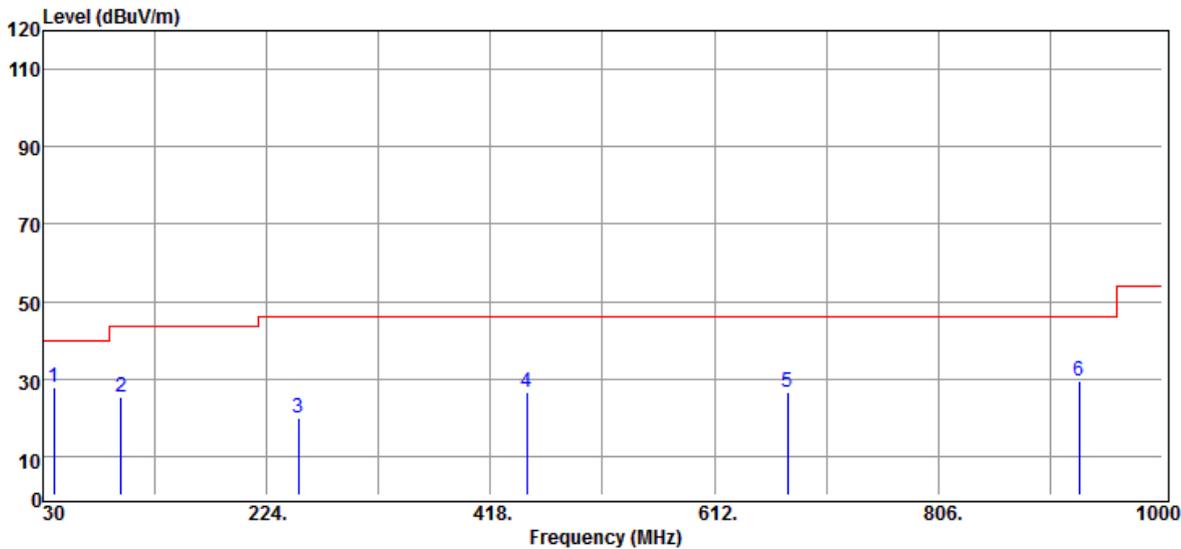
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Radiated Spurious Emission Measurement Result:
Frequency form 30MHz to 1000MHz

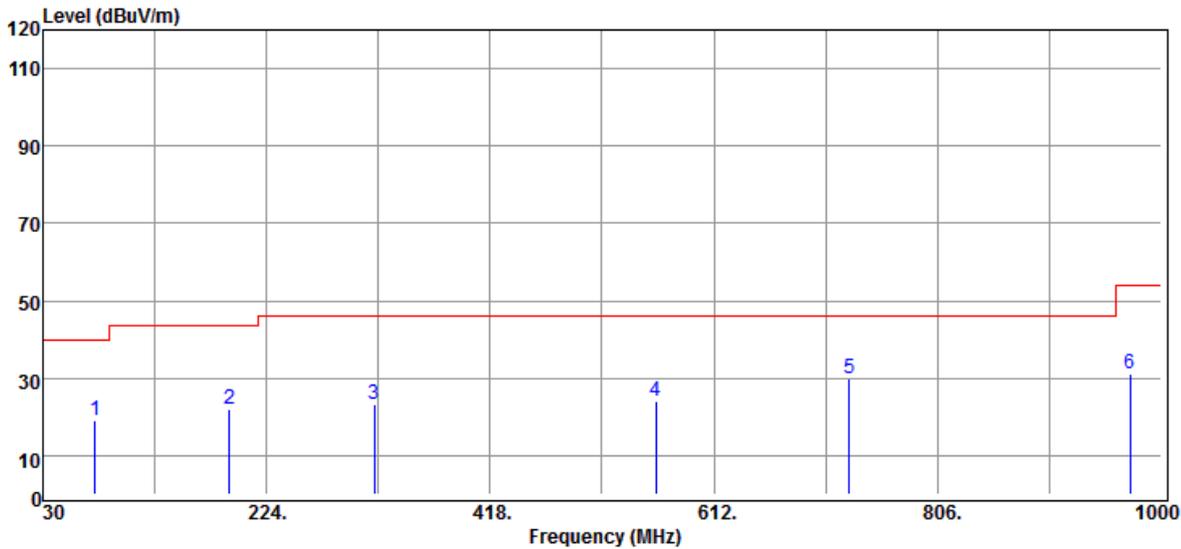
| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH LOW | Temp./Humi. | :22/55 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBµV | Factor dB | Actual FS dBµV/m | Limit @3m dBµV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 39.70 | Peak | 36.32 | -8.62 | 27.70 | 40.00 | -12.30 |
| 97.90 | Peak | 37.96 | -12.68 | 25.28 | 43.50 | -18.22 |
| 251.16 | Peak | 29.61 | -9.79 | 19.82 | 46.00 | -26.18 |
| 449.04 | Peak | 29.85 | -3.07 | 26.78 | 46.00 | -19.22 |
| 675.05 | Peak | 25.80 | 0.96 | 26.76 | 46.00 | -19.24 |
| 928.22 | Peak | 24.62 | 4.97 | 29.59 | 46.00 | -16.41 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH LOW | Temp./Humi. | :22/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



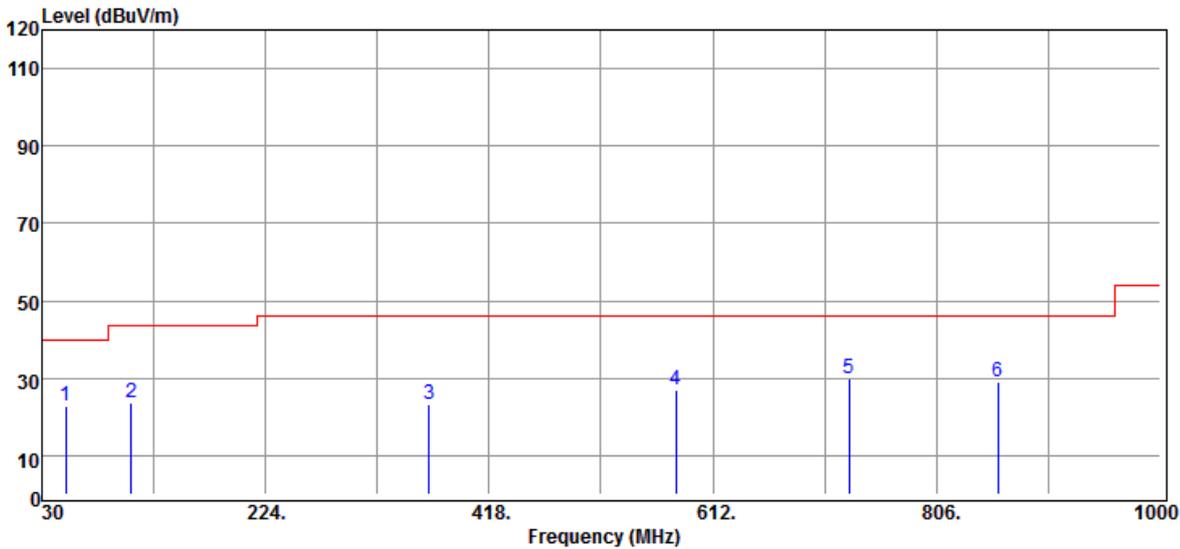
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 75.59 | Peak | 33.36 | -14.31 | 19.05 | 40.00 | -20.95 |
| 191.99 | Peak | 32.03 | -9.93 | 22.10 | 43.50 | -21.40 |
| 317.12 | Peak | 29.95 | -6.84 | 23.11 | 46.00 | -22.89 |
| 561.56 | Peak | 25.38 | -1.50 | 23.88 | 46.00 | -22.12 |
| 729.37 | Peak | 28.30 | 1.51 | 29.81 | 46.00 | -16.19 |
| 972.84 | Peak | 24.65 | 6.65 | 31.30 | 54.00 | -22.70 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH MID | Temp./Humi. | :21/55 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2441 MHz | Engineer | :Jerry |



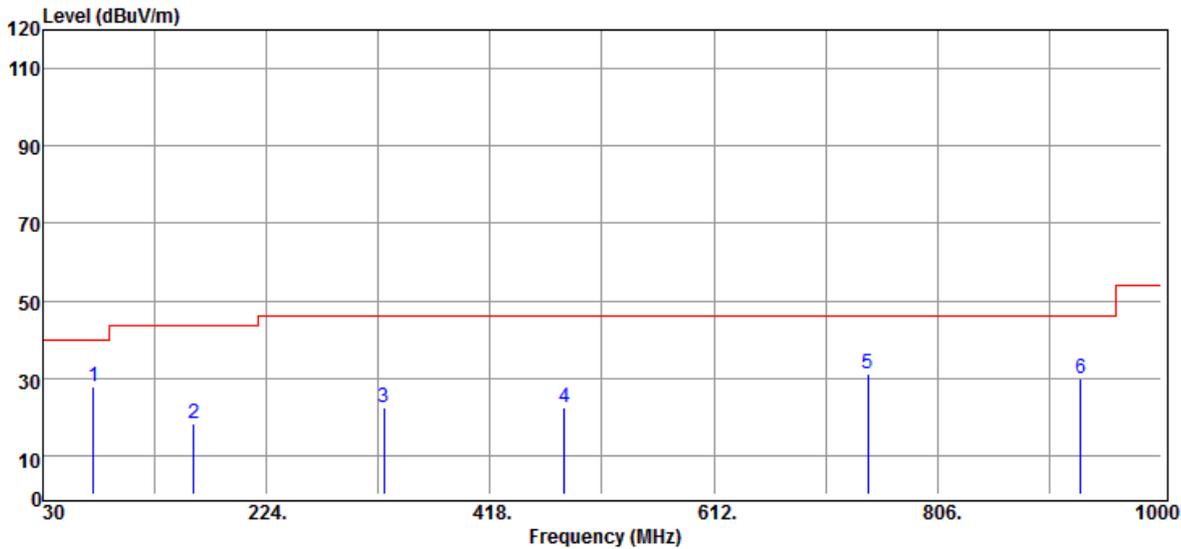
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 50.37 | Peak | 37.61 | -14.62 | 22.99 | 40.00 | -17.01 |
| 107.60 | Peak | 33.59 | -10.12 | 23.47 | 43.50 | -20.03 |
| 365.62 | Peak | 29.19 | -5.73 | 23.46 | 46.00 | -22.54 |
| 579.99 | Peak | 28.42 | -1.51 | 26.91 | 46.00 | -19.09 |
| 730.34 | Peak | 28.33 | 1.53 | 29.86 | 46.00 | -16.14 |
| 859.35 | Peak | 24.95 | 4.19 | 29.14 | 46.00 | -16.86 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH MID | Temp./Humi. | :21/56 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2441 MHz | Engineer | :Jerry |



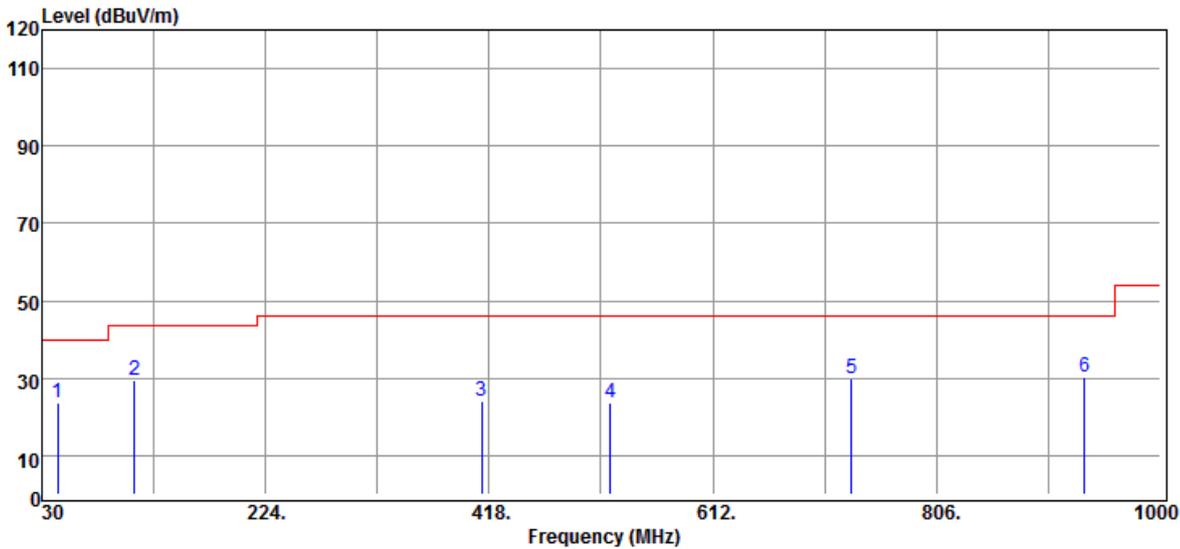
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBuV | Factor dB | Actual FS dBuV/m | Limit @3m dBuV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 73.65 | Peak | 42.27 | -14.45 | 27.82 | 40.00 | -12.18 |
| 160.95 | Peak | 27.80 | -9.55 | 18.25 | 43.50 | -25.25 |
| 325.85 | Peak | 28.89 | -6.51 | 22.38 | 46.00 | -23.62 |
| 482.02 | Peak | 24.35 | -2.03 | 22.32 | 46.00 | -23.68 |
| 745.86 | Peak | 29.00 | 2.32 | 31.32 | 46.00 | -14.68 |
| 930.16 | Peak | 24.73 | 4.98 | 29.71 | 46.00 | -16.29 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH HIGH | Temp./Humi. | :22/54 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



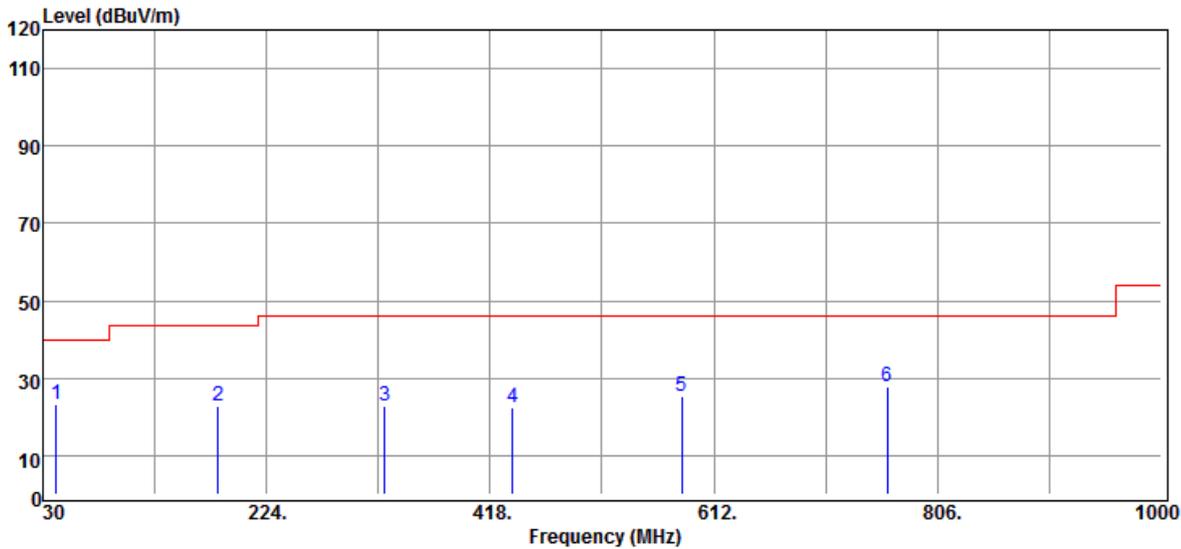
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 43.58 | Peak | 34.94 | -11.40 | 23.54 | 40.00 | -16.46 |
| 110.51 | Peak | 38.84 | -9.48 | 29.36 | 43.50 | -14.14 |
| 411.21 | Peak | 28.62 | -4.45 | 24.17 | 46.00 | -21.83 |
| 522.76 | Peak | 24.98 | -1.34 | 23.64 | 46.00 | -22.36 |
| 732.28 | Peak | 28.23 | 1.63 | 29.86 | 46.00 | -16.14 |
| 934.04 | Peak | 25.23 | 5.04 | 30.27 | 46.00 | -15.73 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-12 |
| Test Mode | :TX CH HIGH | Temp./Humi. | :22/55 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 41.64 | Peak | 33.21 | -10.03 | 23.18 | 40.00 | -16.82 |
| 182.29 | Peak | 33.67 | -10.64 | 23.03 | 43.50 | -20.47 |
| 326.82 | Peak | 29.42 | -6.46 | 22.96 | 46.00 | -23.04 |
| 437.40 | Peak | 25.71 | -3.48 | 22.23 | 46.00 | -23.77 |
| 583.87 | Peak | 26.78 | -1.44 | 25.34 | 46.00 | -20.66 |
| 762.35 | Peak | 25.22 | 2.78 | 28.00 | 46.00 | -18.00 |

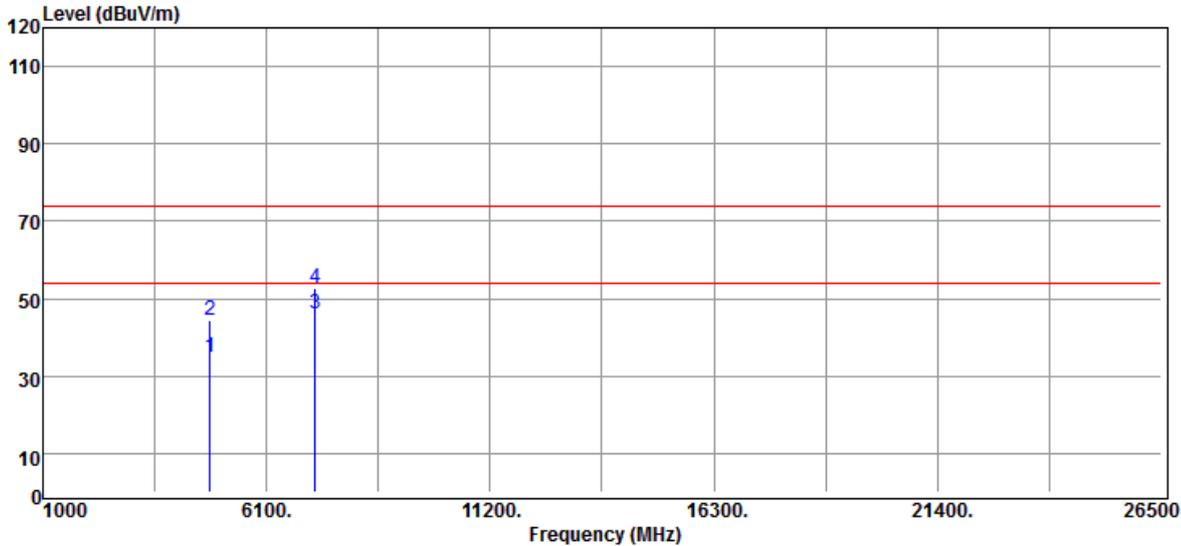
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Frequency above 1 GHz

| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH LOW | Temp./Humi. | :21/55 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



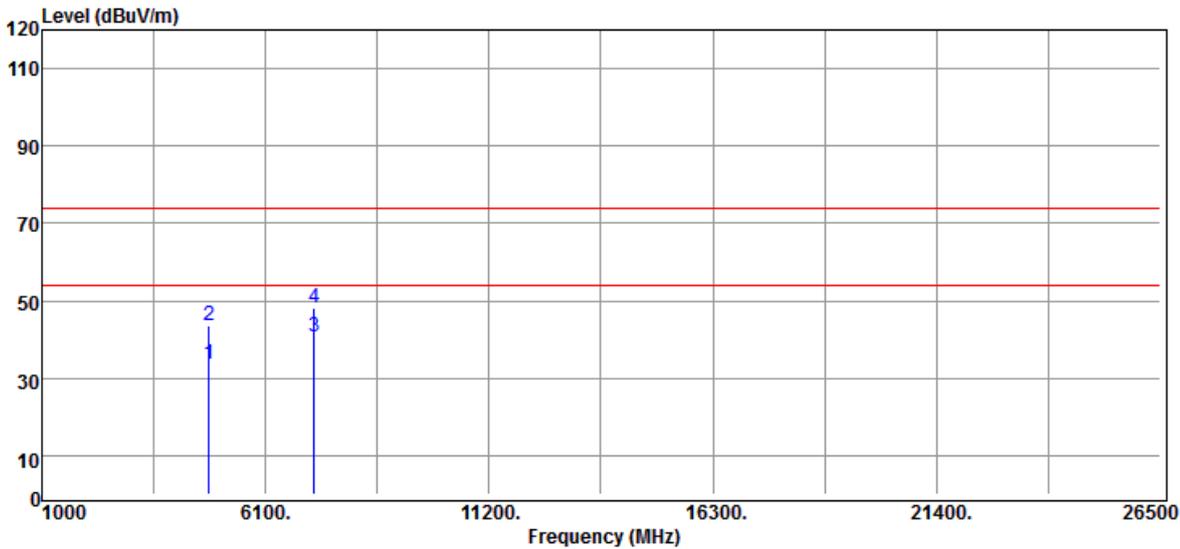
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dBuV | Factor dB | Actual FS dBuV/m | Limit @3m dBuV/m | Margin dB |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|
| 4804.00 | Average | 31.67 | 3.11 | 34.78 | 54.00 | -19.22 |
| 4804.00 | Peak | 41.43 | 3.11 | 44.54 | 74.00 | -29.46 |
| 7206.00 | Average | 34.73 | 11.31 | 46.04 | 54.00 | -7.96 |
| 7206.00 | Peak | 41.63 | 11.31 | 52.94 | 74.00 | -21.06 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH LOW | Temp./Humi. | :21/55 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2402 MHz | Engineer | :Jerry |



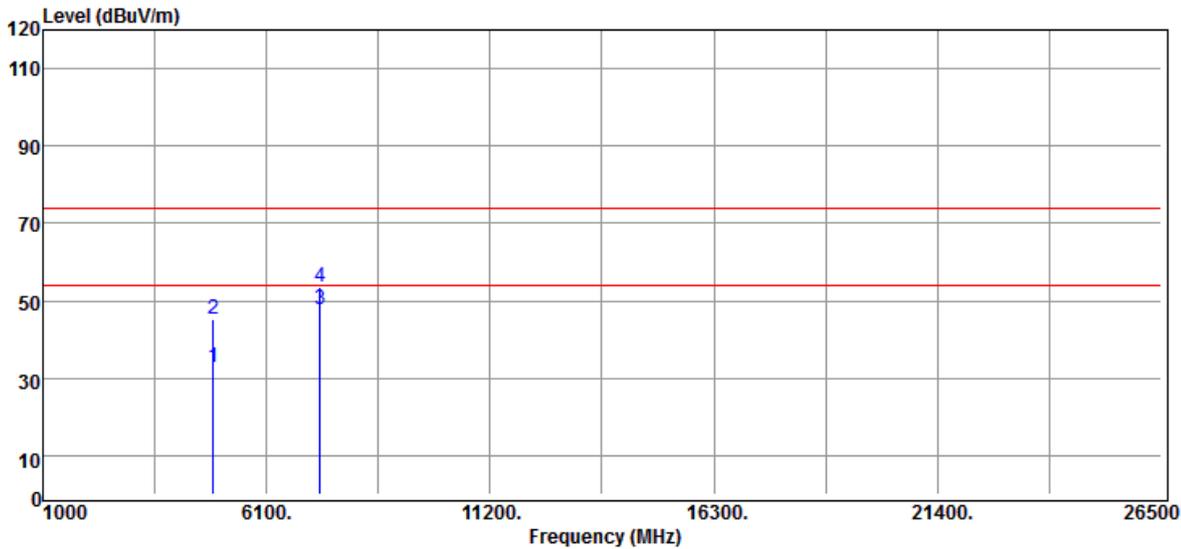
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 4804.00 | Average | 30.50 | 3.11 | 33.61 | 54.00 | -20.39 |
| 4804.00 | Peak | 40.34 | 3.11 | 43.45 | 74.00 | -30.55 |
| 7206.00 | Average | 29.49 | 11.31 | 40.80 | 54.00 | -13.20 |
| 7206.00 | Peak | 36.90 | 11.31 | 48.21 | 74.00 | -25.79 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH MID | Temp./Humi. | :21/54 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2441 MHz | Engineer | :Jerry |



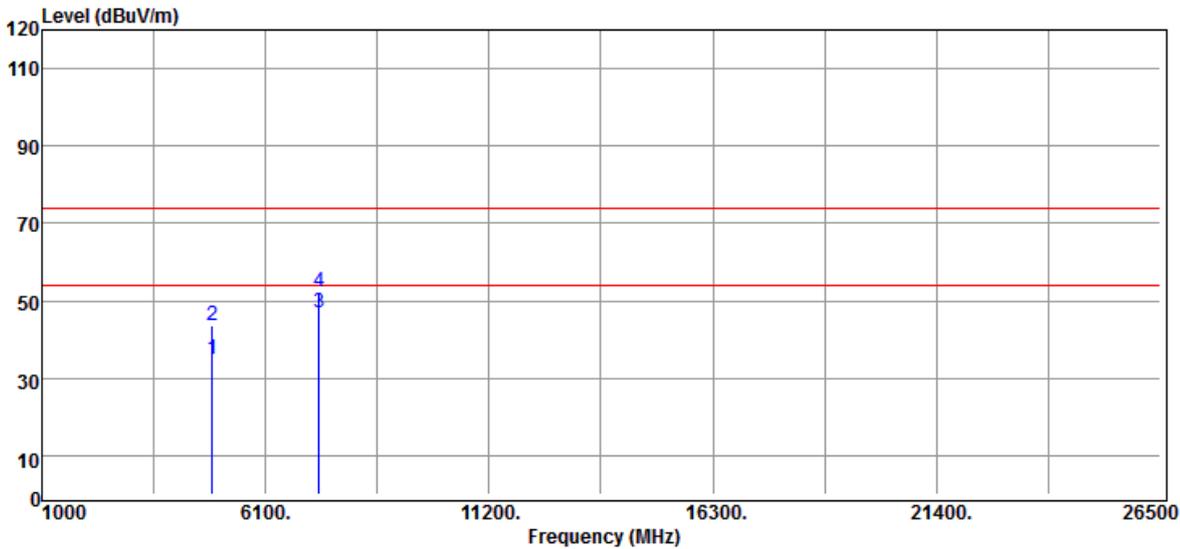
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 4882.00 | Average | 29.30 | 3.46 | 32.76 | 54.00 | -21.24 |
| 4882.00 | Peak | 41.70 | 3.46 | 45.16 | 74.00 | -28.84 |
| 7323.00 | Average | 36.89 | 10.95 | 47.84 | 54.00 | -6.16 |
| 7323.00 | Peak | 42.65 | 10.95 | 53.60 | 74.00 | -20.40 |

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| | | | |
|----------------|------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH MID | Temp./Humi. | :21/54 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2441 MHz | Engineer | :Jerry |



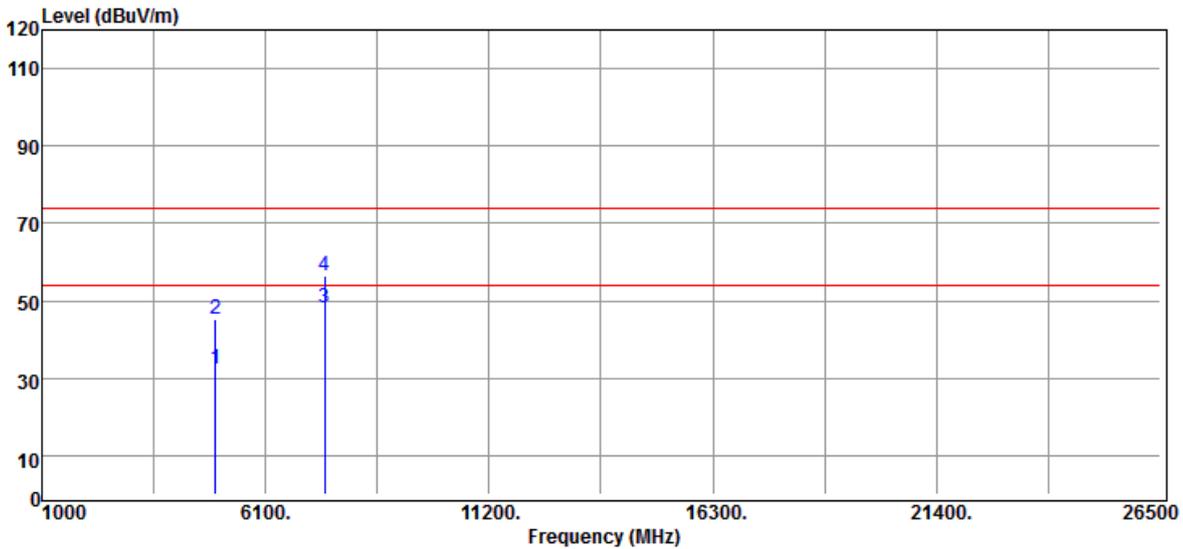
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 4882.00 | Average | 31.23 | 3.46 | 34.69 | 54.00 | -19.31 |
| 4882.00 | Peak | 40.29 | 3.46 | 43.75 | 74.00 | -30.25 |
| 7323.00 | Average | 36.02 | 10.95 | 46.97 | 54.00 | -7.03 |
| 7323.00 | Peak | 41.40 | 10.95 | 52.35 | 74.00 | -21.65 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH HIGH | Temp./Humi. | :21/53 |
| EUT Pol | :H Plan | Antenna Pol. | :VERTICAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



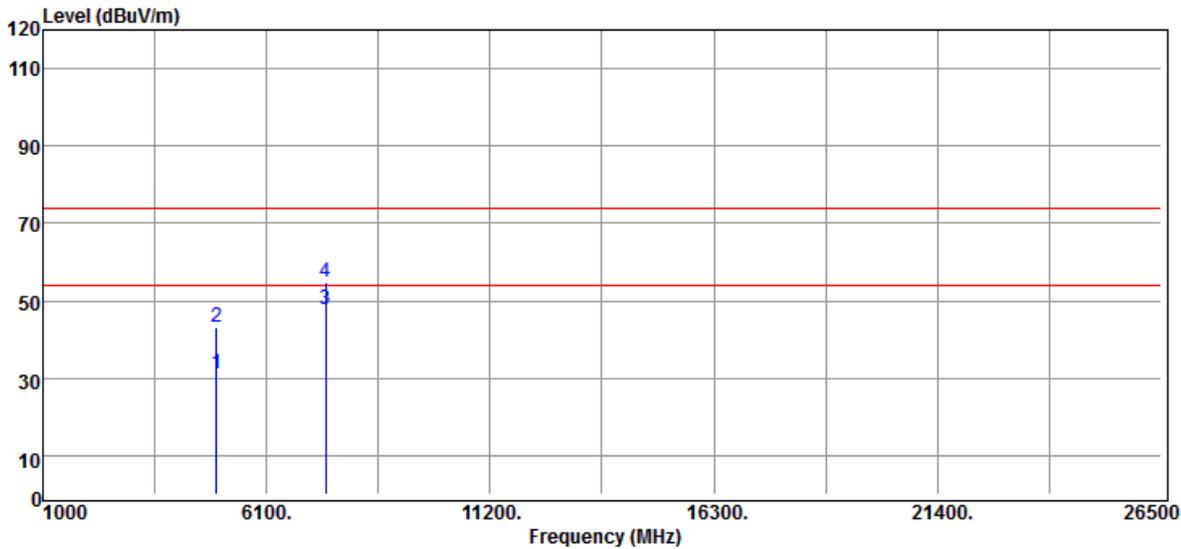
| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 4960.00 | Average | 27.87 | 4.48 | 32.35 | 54.00 | -21.65 |
| 4960.00 | Peak | 40.87 | 4.48 | 45.35 | 74.00 | -28.65 |
| 7440.00 | Average | 37.07 | 10.93 | 48.00 | 54.00 | -6.00 |
| 7440.00 | Peak | 45.55 | 10.93 | 56.48 | 74.00 | -17.52 |

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| | | | |
|----------------|-------------|--------------|-------------|
| Operation Mode | :BT BR | Test Date | :2019-03-08 |
| Test Mode | :TX CH HIGH | Temp./Humi. | :21/53 |
| EUT Pol | :H Plan | Antenna Pol. | :HORIZONTAL |
| Test Channel | :2480 MHz | Engineer | :Jerry |



| Freq. MHz | Detector Mode PK/QP/AV | Spectrum Reading Level dB μ V | Factor dB | Actual FS dB μ V/m | Limit @3m dB μ V/m | Margin dB |
|--------------|------------------------------|-----------------------------------------|--------------|------------------------------|------------------------------|--------------|
| 4960.00 | Average | 26.55 | 4.48 | 31.03 | 54.00 | -22.97 |
| 4960.00 | Peak | 38.51 | 4.48 | 42.99 | 74.00 | -31.01 |
| 7440.00 | Average | 37.02 | 10.93 | 47.95 | 54.00 | -6.05 |
| 7440.00 | Peak | 43.89 | 10.93 | 54.82 | 74.00 | -19.18 |

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11 FREQUENCY SEPARATION

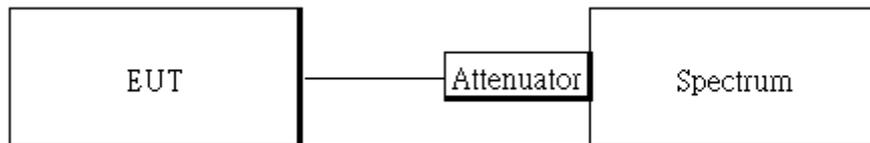
11.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

11.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|--------------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Spectrum Analyzer | Agilent | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| DC Block | PASTERNAK | PE8210 | RF81 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A18 5C | RF229 | 2019/02/26 | 2020/02/25 |

11.3 Test Set-up



11.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = middle of hopping channel.
5. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 5MHz, Sweep = auto.
6. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

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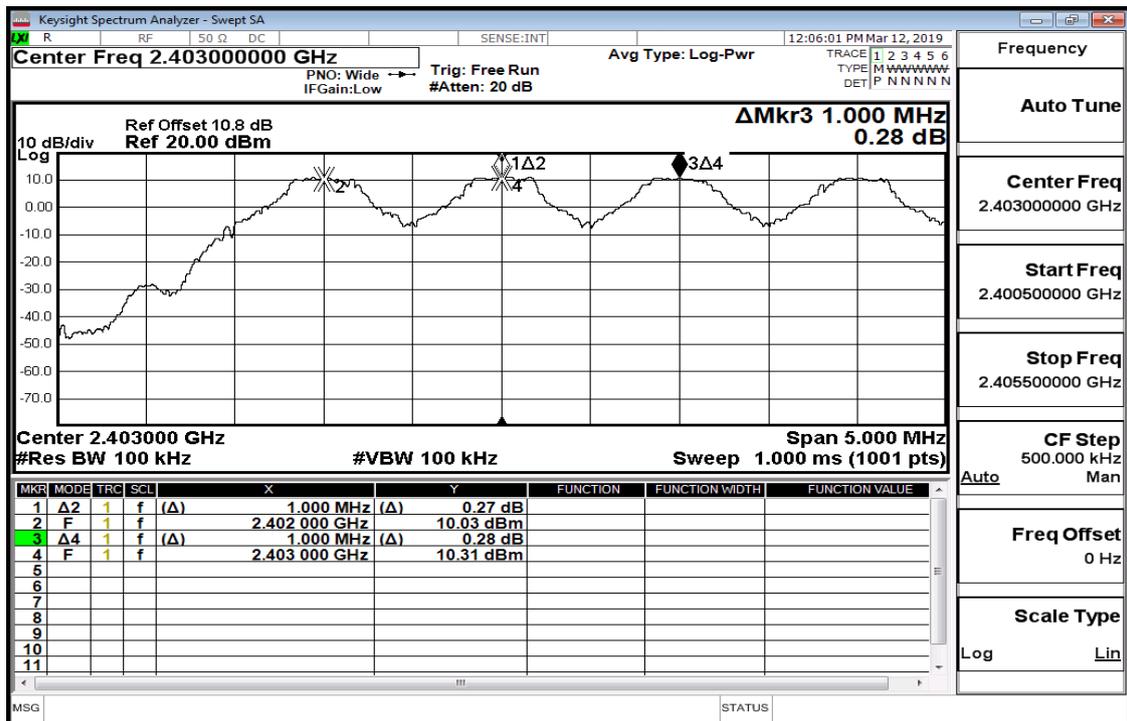
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11.5 Measurement Result

| Channel separation (MHz) | Limit | Result |
|--------------------------|----------------------------------------------|--------|
| 1 | ≥ 25 kHz or 2/3 times 20dB bandwidth | PASS |

Frequency Separation Test Data



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12 NUMBER OF HOPPING FREQUENCY

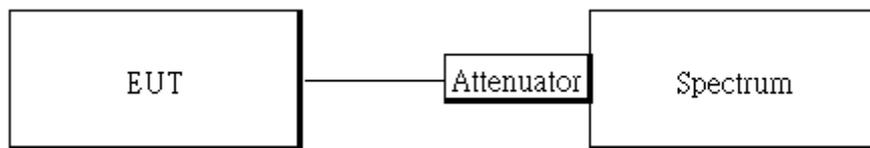
12.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

12.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|----------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Spectrum Analyzer | Agilent | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| DC Block | PASTERNAK | PE8210 | RF81 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A185C | RF229 | 2019/02/26 | 2020/02/25 |

12.3 Test Set-up



12.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set spectrum analyzer Start=2400MHz, Stop = 2483.5MHz, Sweep = auto.
5. Set the spectrum analyzer as RBW=430 kHz, VBW=1.5MHz., Detector = Peak
6. Max hold, view and count how many channel in the band.

12.5 Measurement Result

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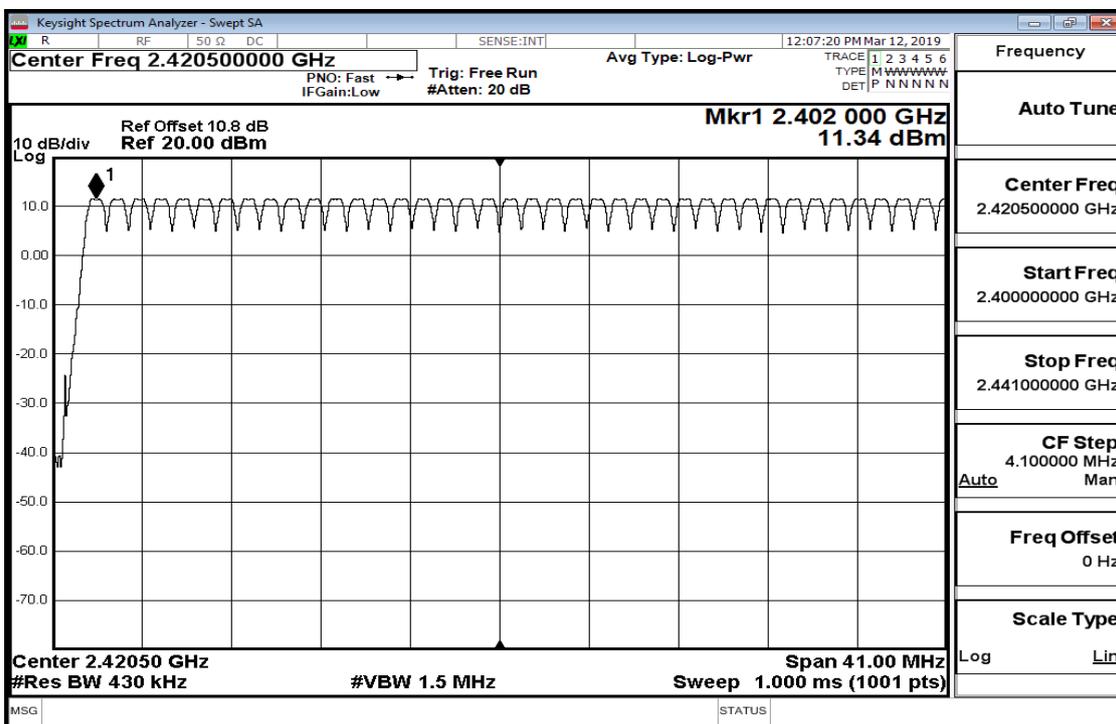
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Tabular Data of Total Channel Number

| | Channel Number | Limit |
|------------------------------|-----------------------|---------------|
| 2.4 GHz – 2.441GHz | 40 | >15 |
| 2.441 GHz – 2.4835GHz | 39 | |
| 2.4GHz ~2.4835GHz | (40+39) = 79 | |

Channel Number

2.402GHz – 2.441GHz

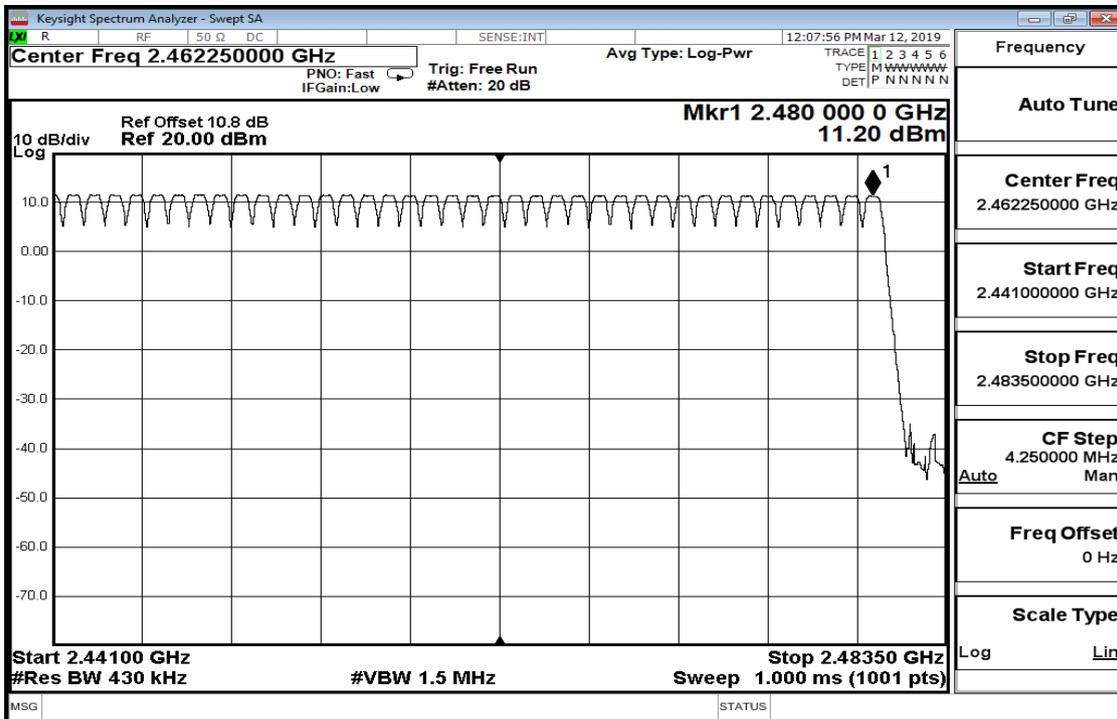


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2.441GHz – 2.4835GHz



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13 TIME OF OCCUPANCY (DWELL TIME)

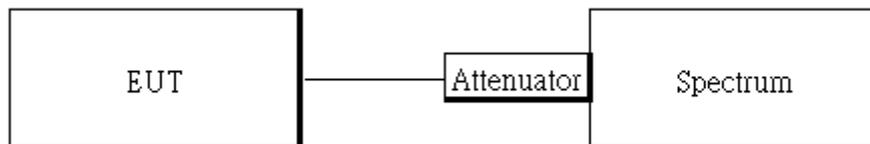
13.1 Standard Applicable

Frequency hopping systems operating in the 2400MHz-2483.5MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within period of 0.4 seconds multiplied by the number of hopping channel employed.

13.2 Measurement Equipment Used

| Conducted Emission Test Site | | | | | |
|------------------------------|-----------|----------------|---------------|------------|------------|
| EQUIPMENT TYPE | MFR | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| Spectrum Analyzer | Agilent | N9010A | MY51440113 | 2018/06/20 | 2019/06/19 |
| Attenuator | Marvelous | MVE2213-10 | RF31 | 2019/02/26 | 2020/02/25 |
| DC Block | PASTERNAK | PE8210 | RF81 | 2019/02/26 | 2020/02/25 |
| Coaxial Cables | Woken | 00100A1F1A185C | RF229 | 2019/02/26 | 2020/02/25 |

13.3 Test Set-up



13.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows ANSI C63.10:2013. Measurement Guidelines.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set center frequency of spectrum analyzer = operating frequency.
5. Set the spectrum analyzer as RBW, VBW=1MHz, 3MHz, Span = 0Hz , Detector = Peak, Adjust Sweep = 2~8ms.
6. Repeat above procedures until all frequency of the interest measured were complete.

Formula Deduced: time occupancy of one time slot X Hopping rate / total slot in one channel / total channel that hops X period of working channels.

Where, standard hopping rate is 1600 hops/s, slot in one channel for DH1, DH3, and DH5 is 2, 4, and 6, respectively.

DH1 consists of single time slot of the uplink, and one slot of the downlink Total Slot: 2

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DH3 consists of three time slot of the uplink, and one slot of the downlink. Total Slot: 4
DH5 consists of five time slot of the uplink, and one slot of the downlink. Total Slot: 6

In AFH mode, hopping rate is 800 hop/s with 6 slots in 20 hopping channels with channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 * 20) (S), Hop Over Occupancy Time comes to (800 / 6 / 20)*(0.4 *20) =53.33

Note: the result of the complete test default channel at 1Mbps is recorded on the test report, 2Mbps, and 3Mbps only records the measurement result at middle channel that reveals no much deviation.

13.5 Tabular Result of the Measurement

GFSK (1Mbps)

| Channel | PACKET TYPE | Measurement Result (ms) | Limit (ms) | 1/T (kHz) | VBW setting (kHz) |
|---------|-------------|-------------------------|------------|-----------|-------------------|
| 0 | DH1 | 121.60 | 400ms | 2.63 | 3.00 |
| | DH3 | 262.40 | 400ms | 0.61 | 1.00 |
| | DH5 | 308.80 | 400ms | 0.35 | 1.00 |
| 39 | DH1 | 121.60 | 400ms | 2.63 | 3.00 |
| | DH3 | 262.40 | 400ms | 0.61 | 1.00 |
| | DH5 | 308.80 | 400ms | 0.35 | 1.00 |
| 78 | DH1 | 121.60 | 400ms | 2.63 | 3.00 |
| | DH3 | 262.40 | 400ms | 0.61 | 1.00 |
| | DH5 | 307.20 | 400ms | 0.00 | 1.00 |

$\pi/4$ DQPSK (2Mbps)

| Channel | PACKET TYPE | Measurement Result (ms) | Limit (ms) | 1/T (kHz) | VBW setting (kHz) |
|---------|-------------|-------------------------|------------|-----------|-------------------|
| 39 | 2DH1 | 123.20 | 400ms | 2.60 | 3.00 |
| | 2DH3 | 262.40 | 400ms | 0.61 | 1.00 |
| | 2DH5 | 307.20 | 400ms | 0.35 | 1.00 |

8-DPSK (3Mbps)

| Channel | PACKET TYPE | Measurement Result (ms) | Limit (ms) | 1/T (kHz) | VBW setting (kHz) |
|---------|-------------|-------------------------|------------|-----------|-------------------|
| 39 | 3DH1 | 124.80 | 400ms | 2.56 | 3.00 |
| | 3DH3 | 262.40 | 400ms | 0.61 | 1.00 |
| | 3DH5 | 308.80 | 400ms | 0.35 | 1.00 |

A period time = 0.4 (s) * 79 = 31.6 (s)

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GFSK (1Mbps):

| | | | | | |
|---------|-----------------|---------|---------------|--------|-------------|
| CH Low | DH1 time slot = | 0.380 * | (1600/2/79) * | 31.6 = | 121.60 (ms) |
| | DH3 time slot = | 1.640 * | (1600/4/79) * | 31.6 = | 262.40 (ms) |
| | DH5 time slot = | 2.895 * | (1600/6/79) * | 31.6 = | 308.80 (ms) |
| CH Mid | DH1 time slot = | 0.380 * | (1600/2/79) * | 31.6 = | 121.60 (ms) |
| | DH3 time slot = | 1.640 * | (1600/4/79) * | 31.6 = | 262.40 (ms) |
| | DH5 time slot = | 2.895 * | (1600/6/79) * | 31.6 = | 308.80 (ms) |
| CH High | DH1 time slot = | 0.380 * | (1600/2/79) * | 31.6 = | 121.60 (ms) |
| | DH3 time slot = | 1.640 * | (1600/4/79) * | 31.6 = | 262.40 (ms) |
| | DH5 time slot = | 2.880 * | (1600/6/79) * | 31.6 = | 307.20 (ms) |

$\pi/4$ -DQPSK (2Mbps):

| | | | | | |
|--------|------------------|---------|---------------|--------|-------------|
| CH Mid | 2DH1 time slot = | 0.385 * | (1600/2/79) * | 31.6 = | 123.20 (ms) |
| | 2DH3 time slot = | 1.640 * | (1600/4/79) * | 31.6 = | 262.40 (ms) |
| | 2DH5 time slot = | 2.880 * | (1600/6/79) * | 31.6 = | 307.20 (ms) |

8-DPSK (3Mbps):

| | | | | | |
|--------|------------------|---------|---------------|--------|-------------|
| CH Mid | 3DH1 time slot = | 0.390 * | (1600/2/79) * | 31.6 = | 124.80 (ms) |
| | 3DH3 time slot = | 1.640 * | (1600/4/79) * | 31.6 = | 262.40 (ms) |
| | 3DH5 time slot = | 2.895 * | (1600/6/79) * | 31.6 = | 308.80 (ms) |

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| GFSK (1Mbps) for AFH Mode | | | |
|------------------------------------------------------|-------------|-------------------------|------------|
| Hopping Channel Number | PACKET TYPE | Measurement Result (ms) | Limit (ms) |
| 20 | DH5 | 153.60 | 400ms |
| $\pi/4$ DQPSK (2Mbps) for AFH Mode | | | |
| Hopping Channel Number | PACKET TYPE | Measurement Result (ms) | Limit (ms) |
| 20 | 2DH5 | 153.60 | 400ms |
| 8-DPSK (3Mbps) for AFH Mode | | | |
| Hopping Channel Number | PACKET TYPE | Measurement Result (ms) | Limit (ms) |
| 20 | 3DH5 | 154.40 | 400ms |

GFSK (1Mbps):

$$\text{DH5 time sl} = 2.880 \text{ (ms)} * (800/6/20)^* 8 = 153.60 \text{ (ms)}$$

$\pi/4$ -DQPSK (2Mbps)

$$\text{2DH5 time :=} 2.880 \text{ (ms)} * (800/6/20)^* 8 = 153.60 \text{ (ms)}$$

8-DPSK (3Mbps):

$$\text{3DH5 time :=} 2.895 \text{ (ms)} * (800/6/20)^* 8 = 154.40 \text{ (ms)}$$

13.6 Measurement Result

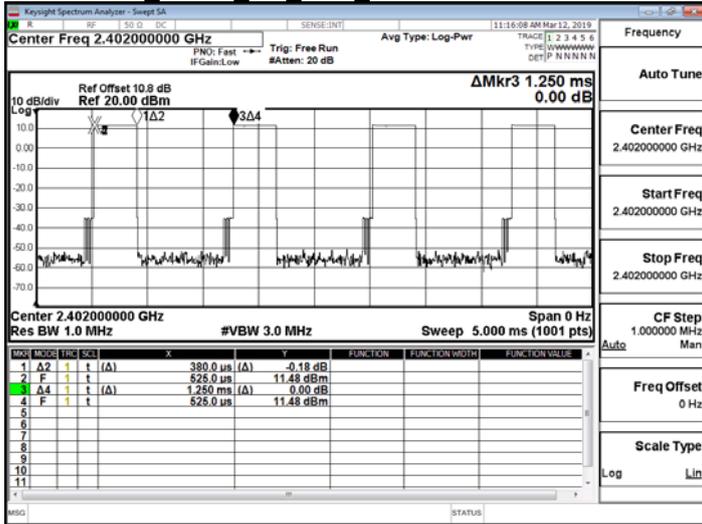
Note: Refer to next page for plots.

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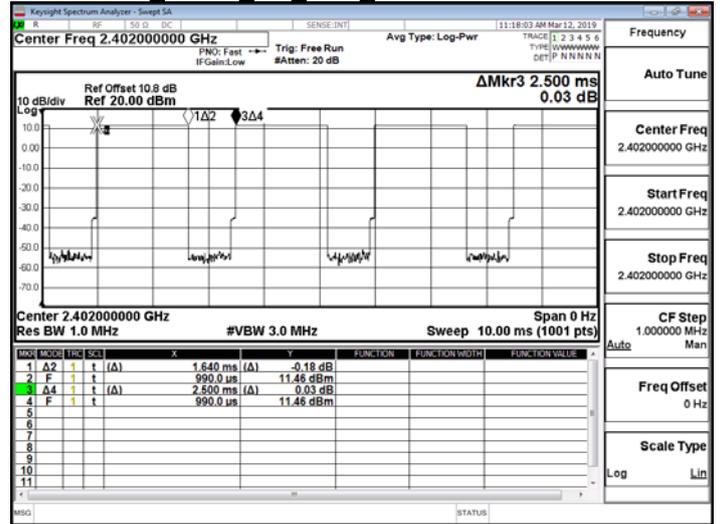
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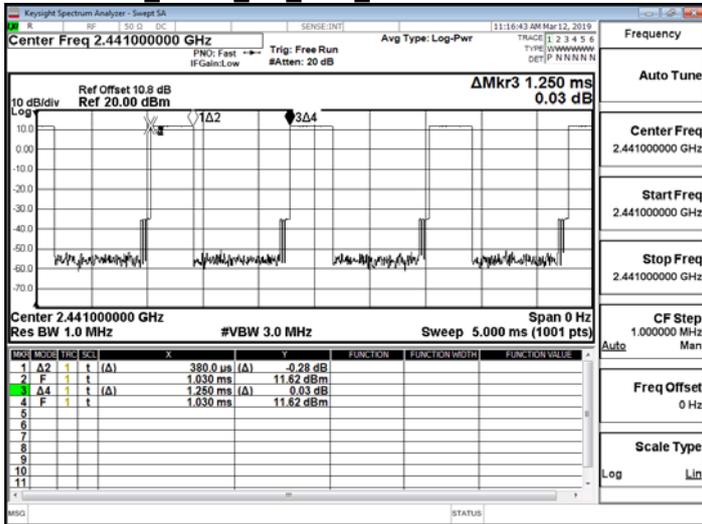
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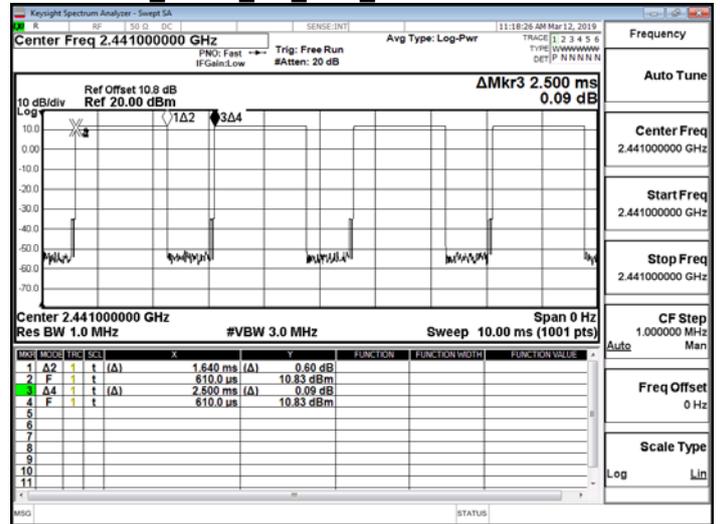
Dwell Time_GFSK_1M_DH3_2402MHz



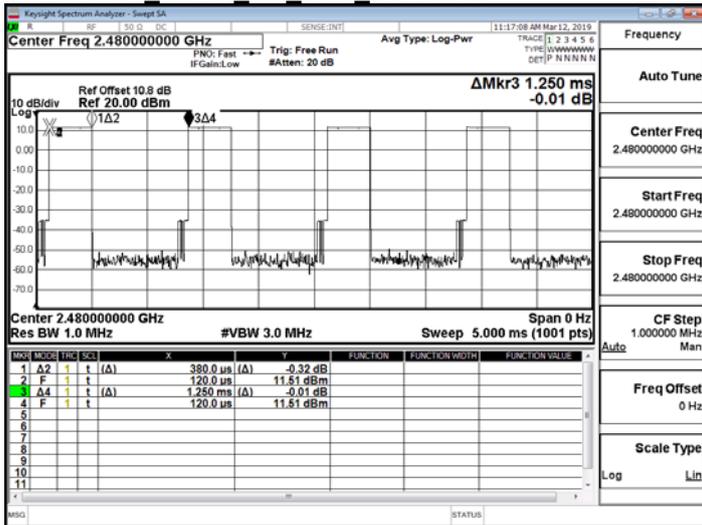
Dwell Time_GFSK_1M_DH1_2441MHz



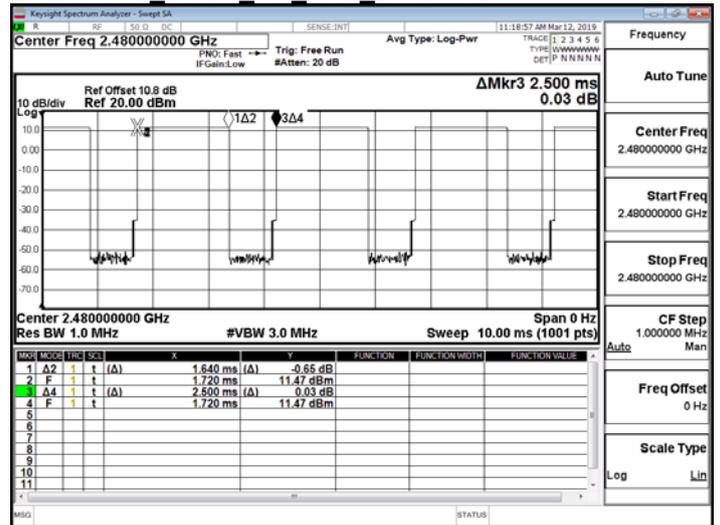
Dwell Time_GFSK_1M_DH3_2441MHz



Dwell Time_GFSK_1M_DH1_2480MHz



Dwell Time_GFSK_1M_DH3_2480MHz

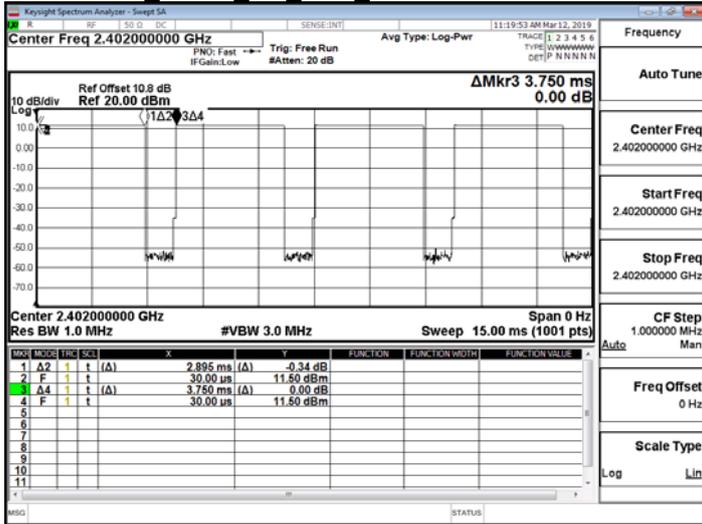


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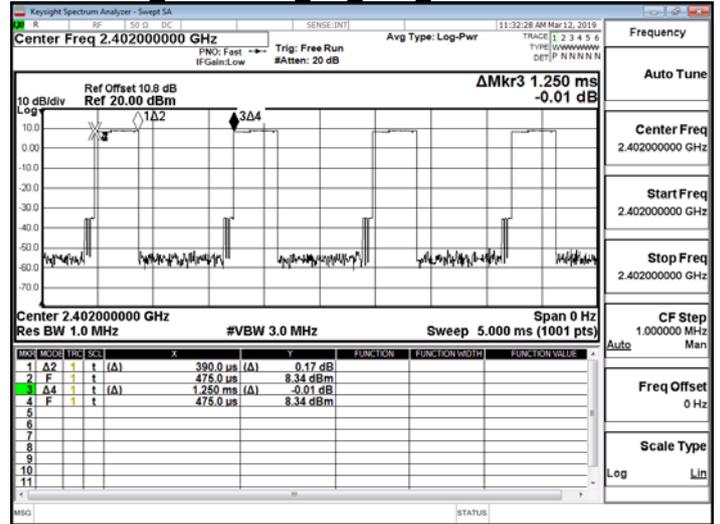
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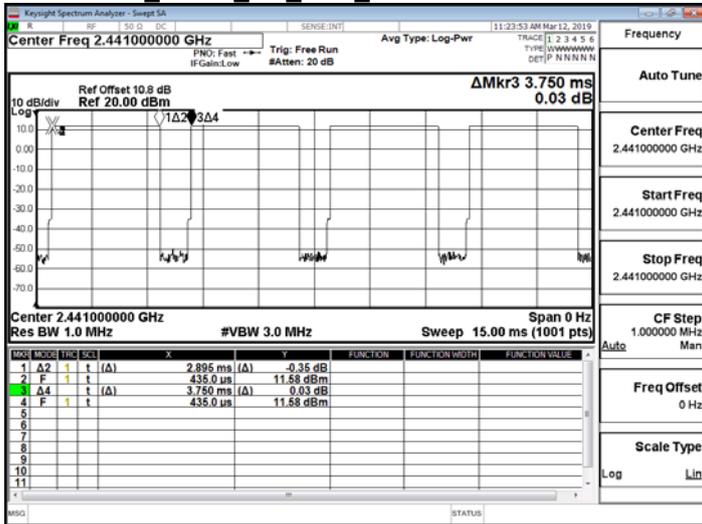
Dwell Time GFSK 1M DH5 2402MHz



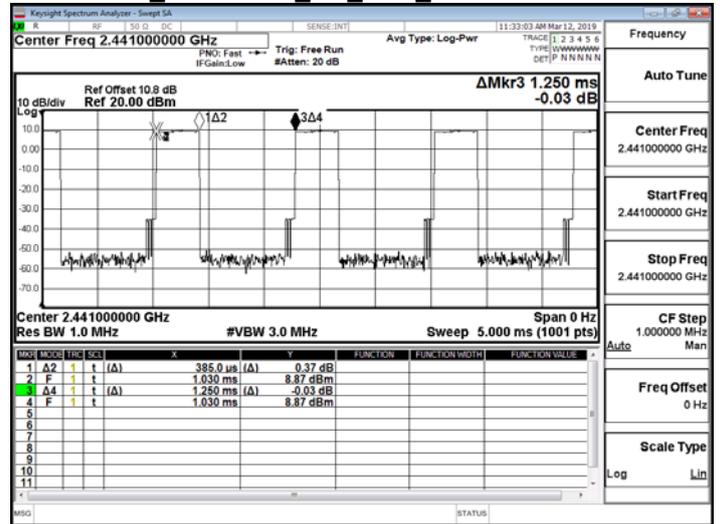
Dwell Time π4DQPSK 2M DH1 2402MHz



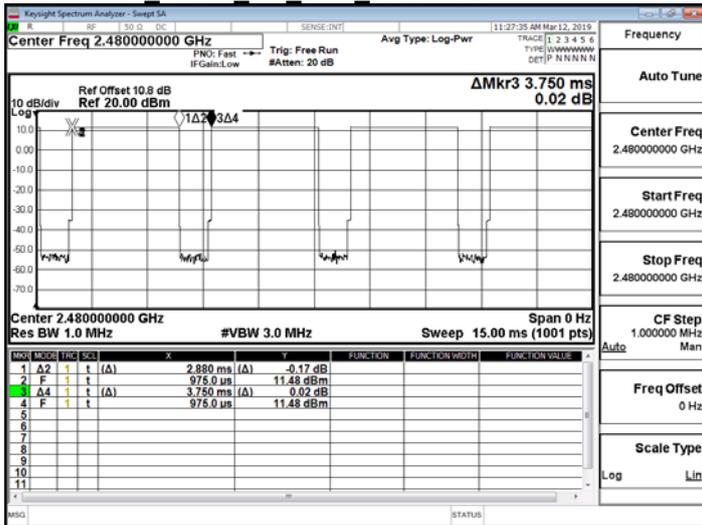
Dwell Time GFSK 1M DH5 2441MHz



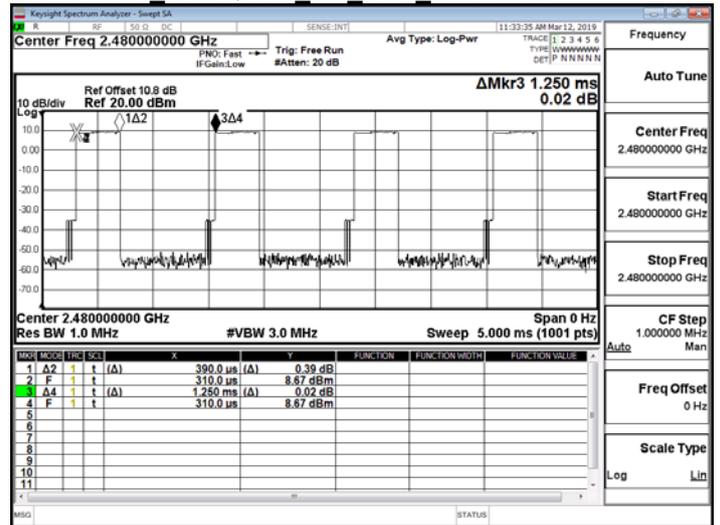
Dwell Time π4DQPSK 2M DH1 2441MHz



Dwell Time GFSK 1M DH5 2480MHz



Dwell Time π4DQPSK 2M DH1 2480MHz

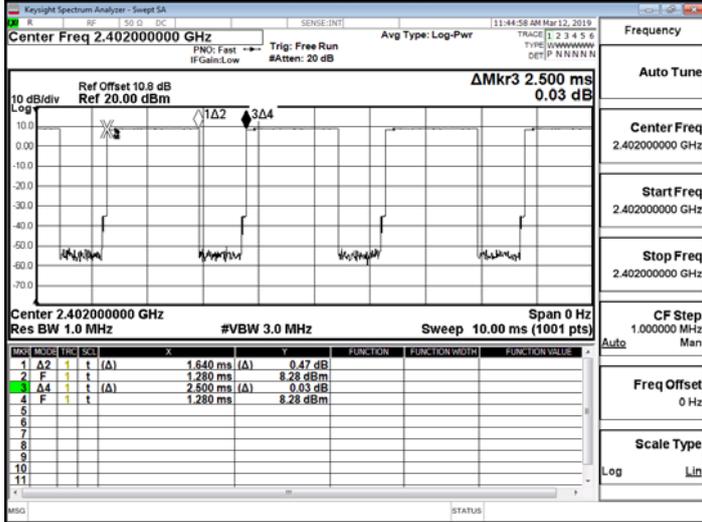


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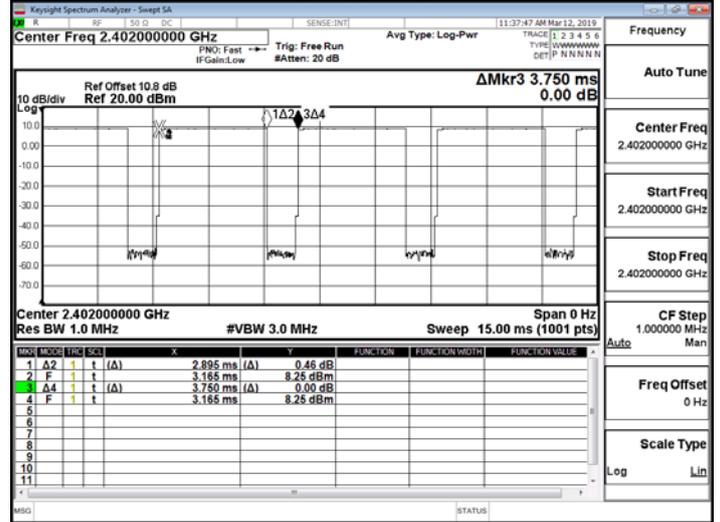
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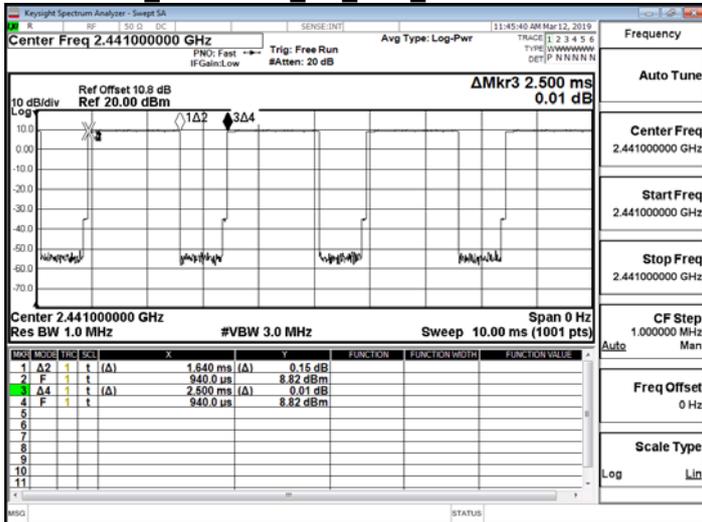
Dwell Time π 4DQPSK 2M DH3 2402MHz



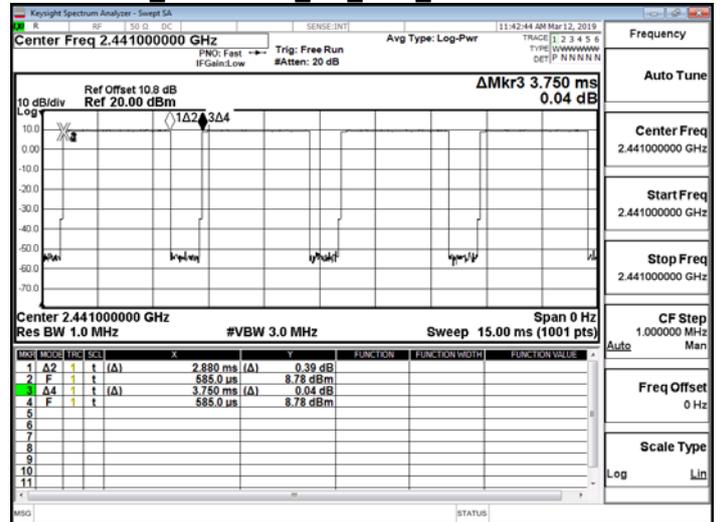
Dwell Time π 4DQPSK 2M DH5 2402MHz



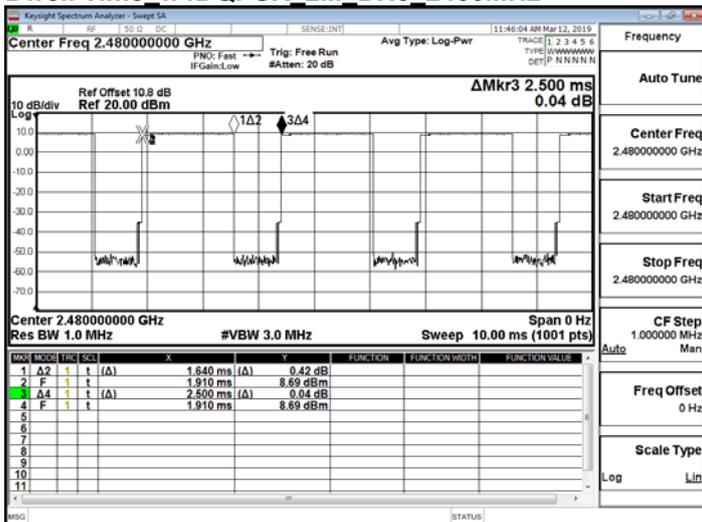
Dwell Time π 4DQPSK 2M DH3 2441MHz



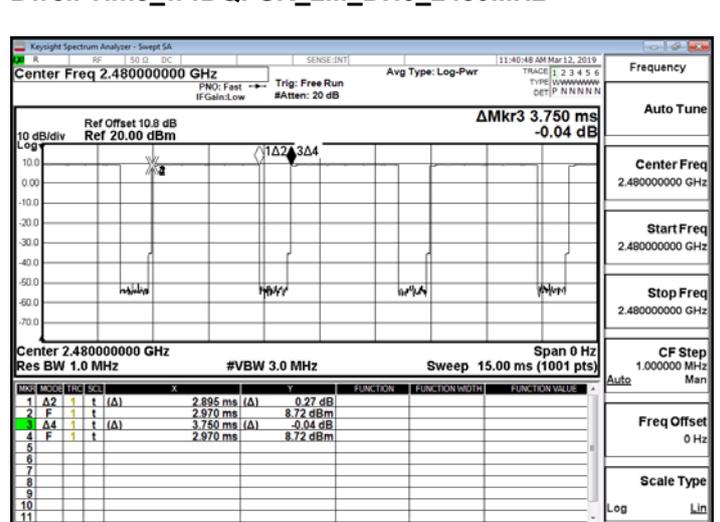
Dwell Time π 4DQPSK 2M DH5 2441MHz



Dwell Time π 4DQPSK 2M DH3 2480MHz



Dwell Time π 4DQPSK 2M DH5 2480MHz

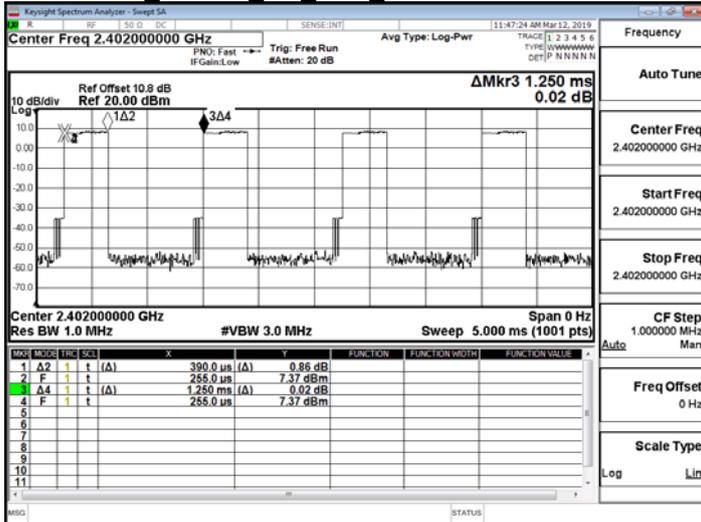


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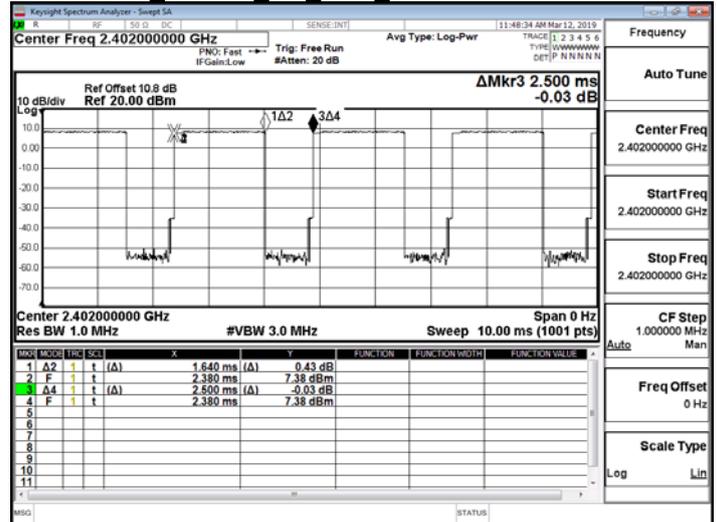
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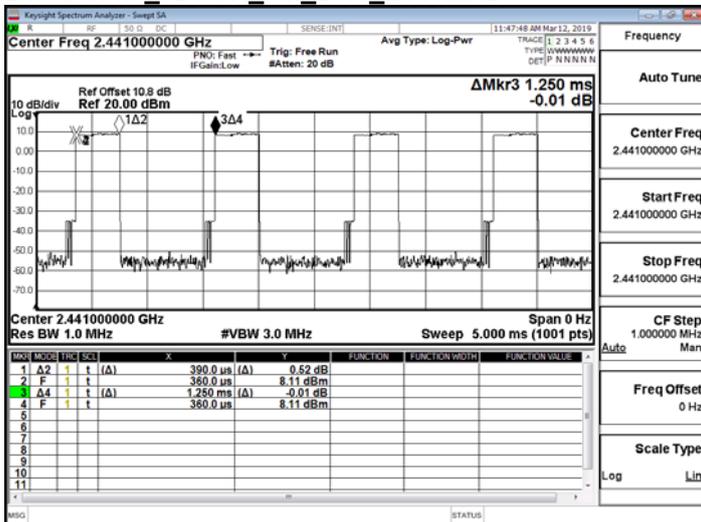
Dwell Time 8DPSK 3M DH1 2402MHz



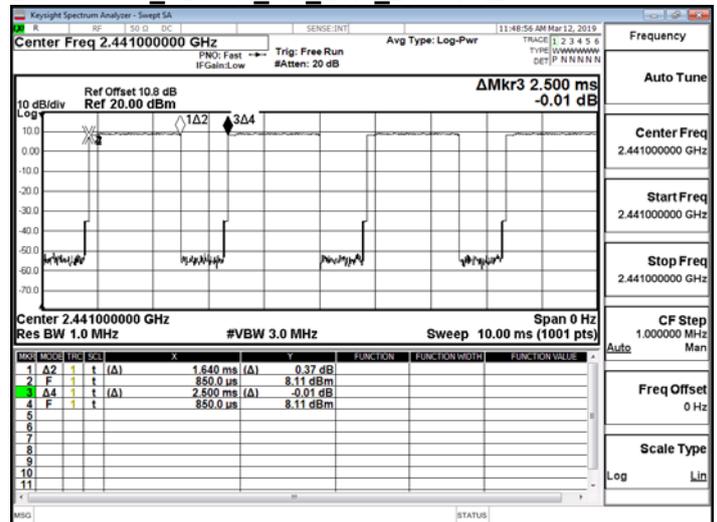
Dwell Time 8DPSK 3M DH3 2402MHz



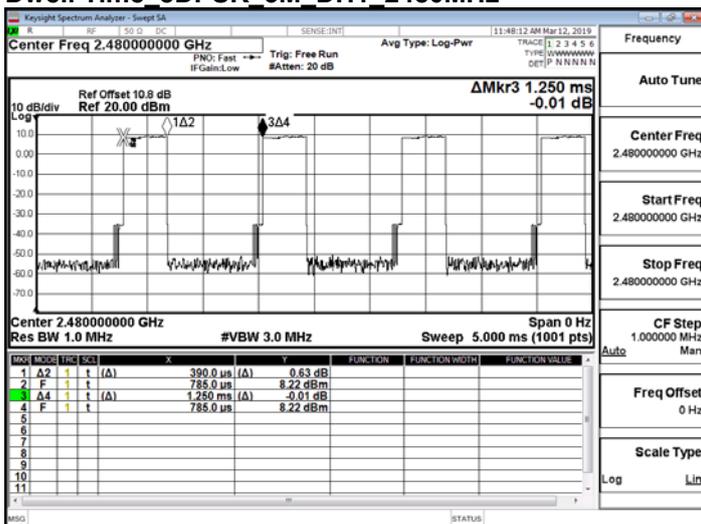
Dwell Time 8DPSK 3M DH1 2441MHz



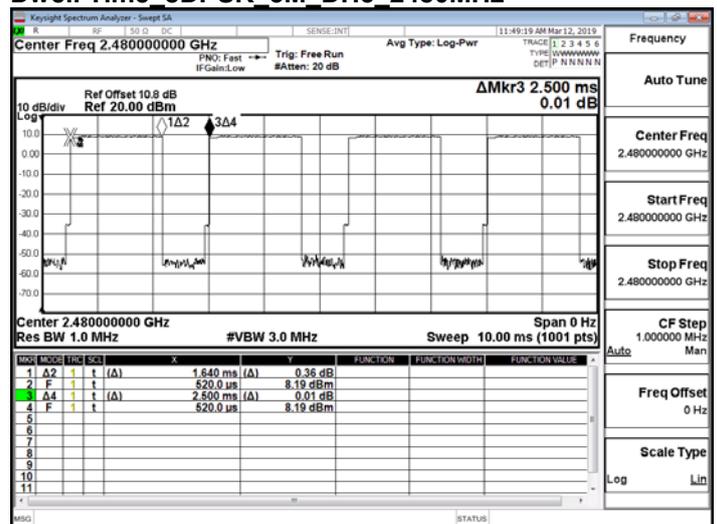
Dwell Time 8DPSK 3M DH3 2441MHz



Dwell Time 8DPSK 3M DH1 2480MHz



Dwell Time 8DPSK 3M DH3 2480MHz

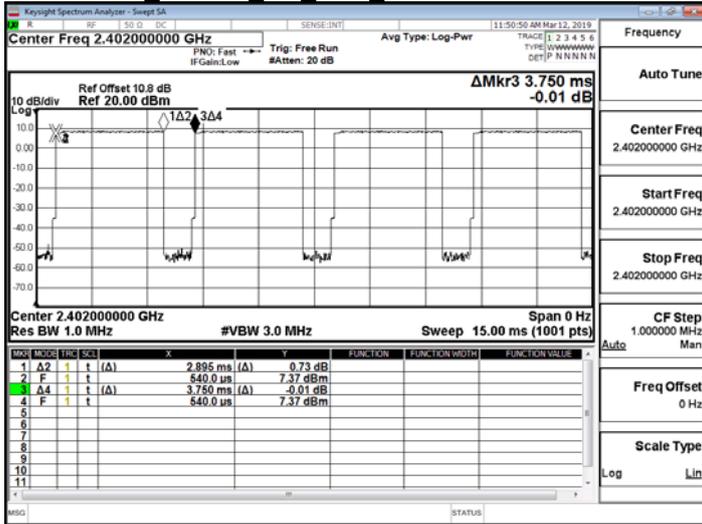


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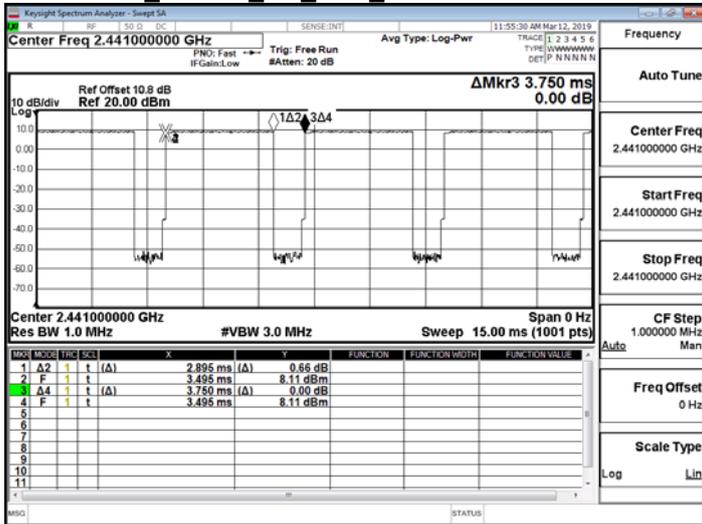
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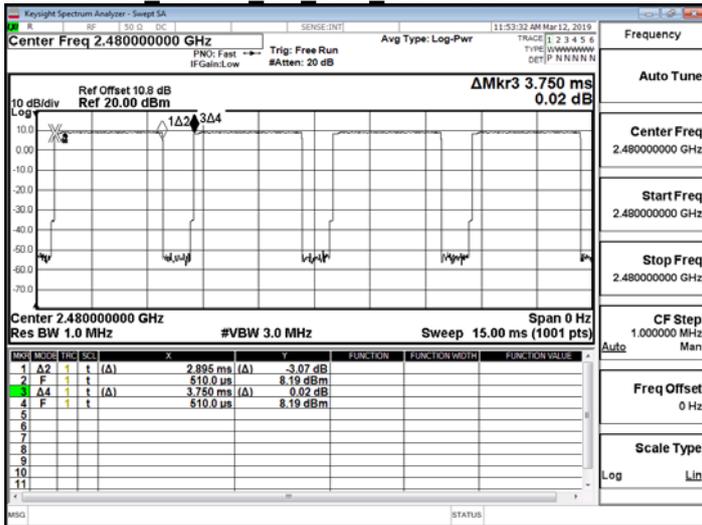
Dwell Time 8DPSK 3M DH5 2402MHz



Dwell Time 8DPSK 3M DH5 2441MHz



Dwell Time 8DPSK 3M DH5 2480MHz



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14 ANTENNA REQUIREMENT

14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

14.2 Antenna Connected Construction

The antenna is designed as permanently attached and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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