

Test Report

FCC ID: 2ALVE-PMO

Date of issue: Apr. 24, 2017

| | |
|---------------------|---|
| Sample Description: | BLUETOOTH HEADSET |
| Model(s): | PMO SOUNDBAND, PMO SOUNDBAND BK, PMO SOUNDBAND RE, PMO SOUNDBAND WH, PMO SOUNDBAND GL, PMO SOUNDBAND SV, PMO SOUNDBAND RG |
| Applicant: | TRI-A Technology and Consulting Co.,Ltd. |
| Address: | Room 802, No.1009, Yishan Road, Xuhui District, Shanghai, 200233 China |
| Date of Test: | Apr. 18, 2017 to Apr. 24, 2017 |

Shenzhen Microtest Co., Ltd.
<http://www.mtitest.com>



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| Test Result Certification | |
|----------------------------|---|
| | |
| Applicant's name: | TRI-A Technology and Consulting Co.,Ltd. |
| Address: | Room 802, No.1009, Yishan Road, Xuhui District, Shanghai, 200233 China |
| Manufacture's Name: | Dongguan Sambon Electronics Co., Ltd. |
| Address: | No.2-52, Xihu Industry Area, Lincun Village, Tangxia Town, Dongguan City, Guangdong Province, China |
| | |
| Product name: | BLUETOOTH HEADSET |
| Trademark: | N/A |
| Model name: | PMO SOUNDBAND, PMO SOUNDBAND BK, PMO SOUNDBAND RE, PMO SOUNDBAND WH, PMO SOUNDBAND GL, PMO SOUNDBAND SV, PMO SOUNDBAND RG |
| Standards: | FCC Part 15.247 |
| Test Procedure: | ANSI C63.10-2013 558074 D01 DTS Meas Guidance v03r05 |

This device described above has been tested by Shenzhen Toby Technology Co., Ltd. and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

Tested by:

Sang di Huang

Sangdi Huang

Apr. 24, 2017

Reviewed by:

Leon Chen

Leon Chen

Apr. 24, 2017

Approved by:

Tom Xue

Tom Xue

Apr. 24, 2017

Summary of Test Result

| Item | FCC Part No. | Description of Test | Result |
|------|---------------------------|----------------------------------|--------|
| 1 | 15.203 | Antenna requirement | Pass |
| 2 | 15.207 | AC power line conducted emission | Pass |
| 3 | 15.247(b)(3) | Maximum peak output power | Pass |
| 4 | 15.247(a)(2) | 6dB emission bandwidth | Pass |
| 5 | 15.247(e) | Power spectral density (PSD) | Pass |
| 8 | 15.247(d) | Band edge spurious emission | Pass |
| 9 | 15.247(d), 15.205, 15.209 | Radiated emission | Pass |

1 General description

1.1 Feature of equipment under test (EUT)

| | |
|----------------------------|---|
| Product name: | BLUETOOTH HEADSET |
| Model name: | PMO SOUNDBAND, PMO SOUNDBAND BK, PMO SOUNDBAND RE, PMO SOUNDBAND WH, PMO SOUNDBAND GL, PMO SOUNDBAND SV, PMO SOUNDBAND RG |
| Operating frequency range: | Tx/Rx: 2402MHz~2480MHz |
| Bluetooth version: | V4.1 Dual mode |
| Modulation type: | GFSK |
| Power source: | DC 3.7V by battery |
| Antenna designation: | Chip antenna (Antenna Gain: 1.25dBi) |

1.2 Operation channel list

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|---------|-----------|
| 0 | 2402MHz | 10 | 2422MHz | 20 | 2442MHz |
| 1 | 2404MHz | 11 | 2424MHz | 21 | 2444MHz |
| --- | --- | --- | --- | --- | --- |
| --- | --- | --- | --- | --- | --- |
| 8 | 2418MHz | 18 | 2438MHz | 38 | 2478MHz |
| 9 | 2420MHz | 19 | 2440MHz | 39 | 2480MHz |

1.3 Test frequency channel

| | |
|--------|---------|
| Low | 2402MHz |
| Middle | 2442MHz |
| High | 2480MHz |

1.4 EUT operation mode

During testing, RF test program provided by the manufacture to control the Tx operation followed the test requirement. The EUT is configured to transmit continuously (duty cycle > 98 %) at the maximum power control level.

1.5 Test conditions

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

- Temperature: 20°C~30°C
- Humidity: 30%~70%
- Atmospheric pressure: 98kPa~101kPa

1.6 Ancillary equipment list

| Equipment | Model Name | S/N | Manufacturer | Certificate type |
|-----------|--------------|-----|--------------|------------------|
| Adapter | HW-050200U01 | / | HUAWEI | FCC VOC |

1.7 Measurement uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, $U=2 \times U_c(y)$

| | |
|----------------------------------|--------------------|
| RF frequency | 1×10^{-7} |
| RF power, conducted | ± 1 dB |
| Conducted emission(150kHz~30MHz) | ± 2.5 dB |
| Radiated emission(30MHz~1GHz) | ± 4.2 dB |
| Radiated emission (above 1GHz) | ± 4.3 dB |
| Temperature | ± 1 degree |
| Humidity | ± 5 % |

2 Testing site

| | |
|------------------------|--|
| Test Site | Shenzhen Toby Technology Co., Ltd. |
| Test Site Location | 1 A/F., Bldg.6, Yusheng Industrial Zone The National Road No.107 Xixiang Section 467, Shenzhen, Guangdong, China |
| FCC Registration No.: | 811562 |
| CNAS Registration No.: | CNAS L5813 |

3 List of test equipment

For AC power line conducted emission:

| Equipment | Manufacturer | Model | Serial No. | Calibration Due |
|-------------------|--------------|------------|------------|-----------------|
| LISN | R&S | ENV216 | 101313 | 2017.12.06 |
| LISN | SCHWARZBECK | NNLK 8129 | 8129245 | 2017.12.25 |
| Pulse Limiter | SCHWARZBECK | VTSD 9561F | 9716 | 2017.12.25 |
| Test Cable | N/A | N/A | C01 | 2017.12.06 |
| EMI Test Receiver | R&S | ESCI | 101160 | 2017.12.06 |

For Radiated emission:

| Equipment | Manufacturer | Model | Serial No. | Calibration Due |
|-------------------------|------------------|-------------|------------|-----------------|
| Log-Bicon Antenna | MESS-ELEKTRONIK | VULB 9160 | 3058 | 2017.12.11 |
| Horn Antenna | Schwarzbeck | BBHA 9120D | 631 | 2017.12.05 |
| Horn Antenna | Schwarzbeck | BBHA 9170 | 373 | 2017.12.05 |
| Test Cable | United Microwave | 57793 | 1m | 2017.12.05 |
| Test Cable | United Microwave | A30A30-5006 | 10m | 2017.12.05 |
| Microwave Pre-amplifier | Agilent | 8449B | 3008A01714 | 2017.12.05 |
| Pre-Amplifier | Anritsu | MH648A | M09961 | 2017.12.05 |
| EMI Test Receiver | R&S | ESPI-7 | 101318 | 2017.12.05 |
| Spectrum analyzer | Agilent | E4470B | MY41441082 | 2017.06.01 |
| Spectrum analyzer | Agilent | N9020A | MY49100060 | 2018.03.03 |

For RF conducted emission:

| Equipment | Manufacturer | Model | Serial No. | Calibration Due |
|-------------------|--------------|-------|------------|-----------------|
| EMI Test Receiver | R&S | ESCI | 101160 | 2017.12.06 |

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

4 Test Result

4.1 Conducted emission

4.1.1 Limit

| Frequency (MHz) | Limit | |
|--------------------|------------|----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 | 56 to 46 |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

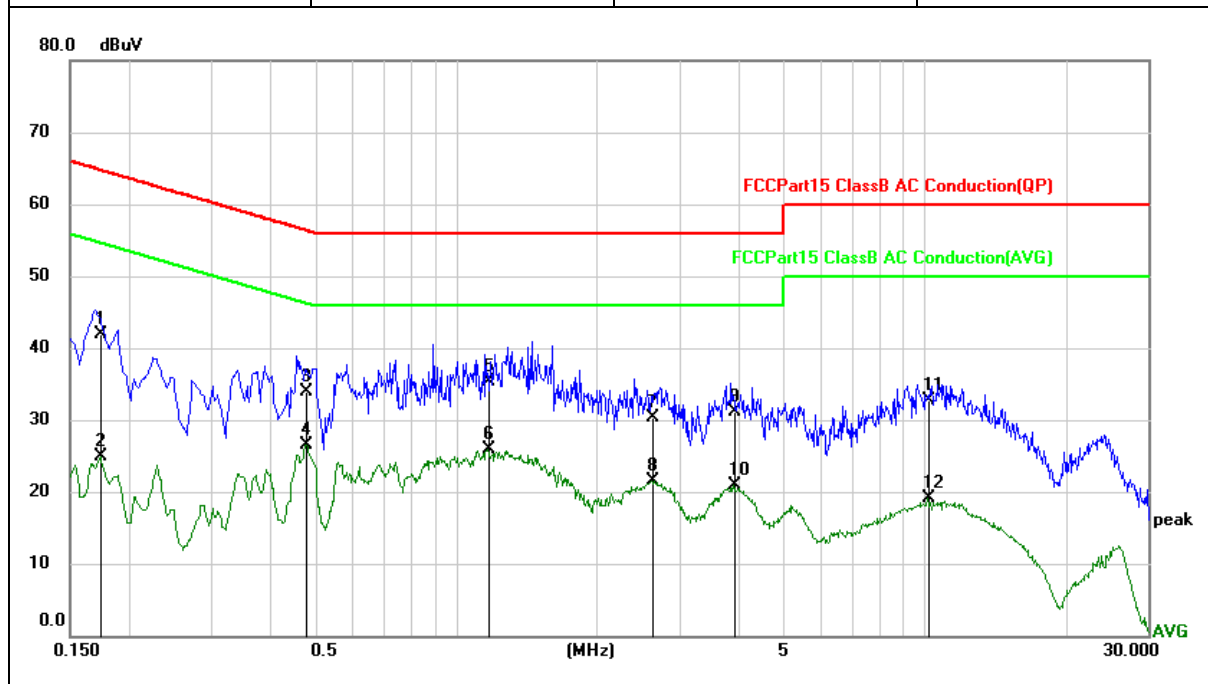
Note: Decreases with the logarithm of the frequency from 0.15MHz to 0.5MHz.

4.1.2 Test method

1. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN at least 80 cm from nearest part of EUT chassis.
5. The resolution bandwidth of EMI test receiver is set at 9kHz.

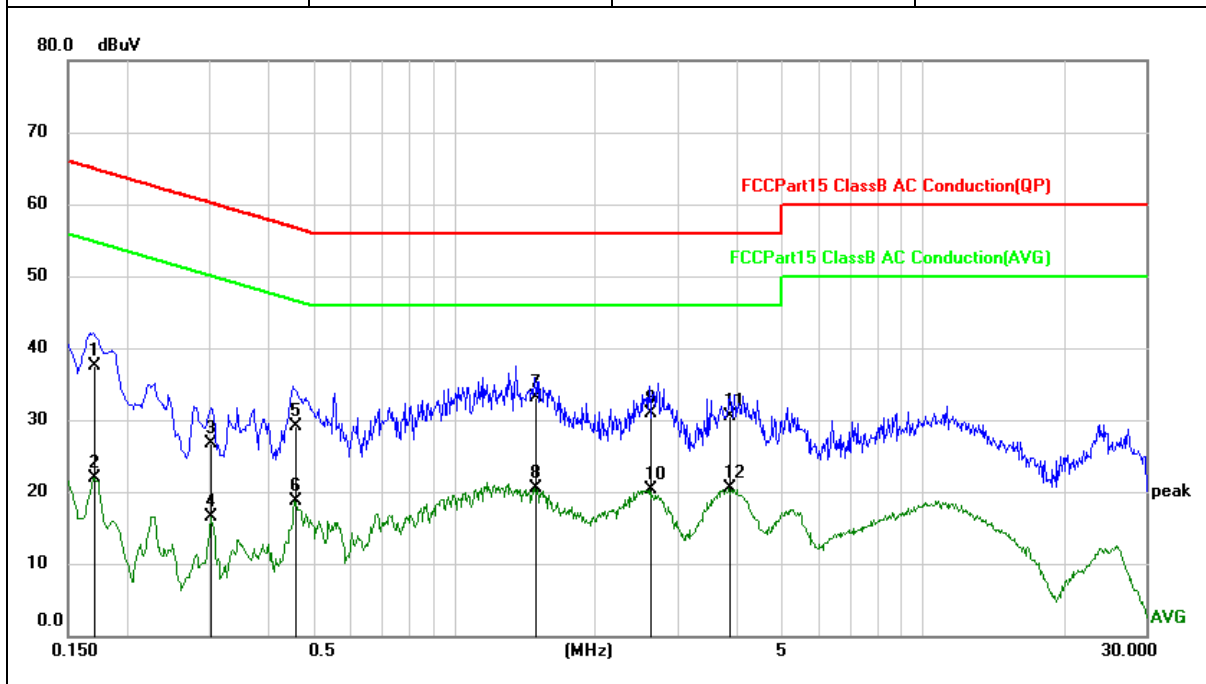
4.1.3 Test Result

| | | | |
|---------------|--------------|--------------------|--------------|
| Temperature: | 26℃ | Relative Humidity: | 47% |
| Pressure: | 101kPa | Polarization: | L |
| Test voltage: | AC 120V/60Hz | Test mode: | Transmitting |



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Over dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1 | | 0.1737 | 41.98 | -0.03 | 41.95 | 64.78 | -22.83 | QP | |
| 2 | | 0.1737 | 24.85 | -0.03 | 24.82 | 54.78 | -29.96 | AVG | |
| 3 | | 0.4778 | 33.84 | -0.03 | 33.81 | 56.38 | -22.57 | QP | |
| 4 | * | 0.4778 | 26.47 | -0.03 | 26.44 | 46.38 | -19.94 | AVG | |
| 5 | | 1.1700 | 35.26 | -0.04 | 35.22 | 56.00 | -20.78 | QP | |
| 6 | | 1.1700 | 25.98 | -0.04 | 25.94 | 46.00 | -20.06 | AVG | |
| 7 | | 2.6099 | 30.36 | -0.05 | 30.31 | 56.00 | -25.69 | QP | |
| 8 | | 2.6099 | 21.64 | -0.05 | 21.59 | 46.00 | -24.41 | AVG | |
| 9 | | 3.9180 | 31.12 | -0.05 | 31.07 | 56.00 | -24.93 | QP | |
| 10 | | 3.9180 | 20.97 | -0.05 | 20.92 | 46.00 | -25.08 | AVG | |
| 11 | | 10.1700 | 32.78 | -0.09 | 32.69 | 60.00 | -27.31 | QP | |
| 12 | | 10.1700 | 19.10 | -0.09 | 19.01 | 50.00 | -30.99 | AVG | |

| | | | |
|---------------|--------------|--------------------|--------------|
| Temperature: | 26℃ | Relative Humidity: | 47% |
| Pressure: | 101kPa | Polarization: | N |
| Test voltage: | AC 120V/60Hz | Test mode: | Transmitting |



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dBuV | Over dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|---------------|------------|----------|---------|
| 1 | | 0.1700 | 37.58 | -0.03 | 37.55 | 64.96 | -27.41 | QP | |
| 2 | | 0.1700 | 21.96 | -0.03 | 21.93 | 54.96 | -33.03 | AVG | |
| 3 | | 0.3019 | 26.77 | -0.03 | 26.74 | 60.19 | -33.45 | QP | |
| 4 | | 0.3019 | 16.44 | -0.03 | 16.41 | 50.19 | -33.78 | AVG | |
| 5 | | 0.4580 | 29.18 | -0.03 | 29.15 | 56.73 | -27.58 | QP | |
| 6 | | 0.4580 | 18.77 | -0.03 | 18.74 | 46.73 | -27.99 | AVG | |
| 7 | * | 1.4900 | 33.14 | -0.04 | 33.10 | 56.00 | -22.90 | QP | |
| 8 | | 1.4900 | 20.57 | -0.04 | 20.53 | 46.00 | -25.47 | AVG | |
| 9 | | 2.6139 | 30.93 | -0.05 | 30.88 | 56.00 | -25.12 | QP | |
| 10 | | 2.6139 | 20.29 | -0.05 | 20.24 | 46.00 | -25.76 | AVG | |
| 11 | | 3.8660 | 30.49 | -0.05 | 30.44 | 56.00 | -25.56 | QP | |
| 12 | | 3.8660 | 20.63 | -0.05 | 20.58 | 46.00 | -25.42 | AVG | |

4.2 Antenna requirement

4.2.1 Requirement defined in FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.2.2 EUT antenna description

The antenna of EUT is a permanently attached Chip antenna; the maximum gain of the antenna is 1.25dBi. So the antenna meets the requirement of this part.

4.3 Maximum peak output power

4.3.1 Limits

Conducted peak output power limit is 1W (30dBm).

4.3.2 Test Method

Use the following spectrum analyzer settings:

RBW = 1MHz(≥ 6 dB bandwidth, see section 4.4)

VBW ≥ 3 RBW

Detector = peak

Trace mode = max hold

Sweep time = auto couple

Allow trace to fully stabilize.

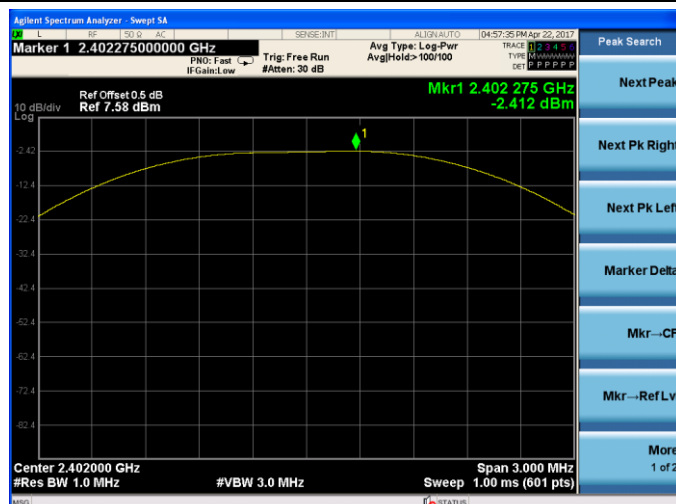
Use peak marker function to determine the peak amplitude level.

4.3.3 Test Result

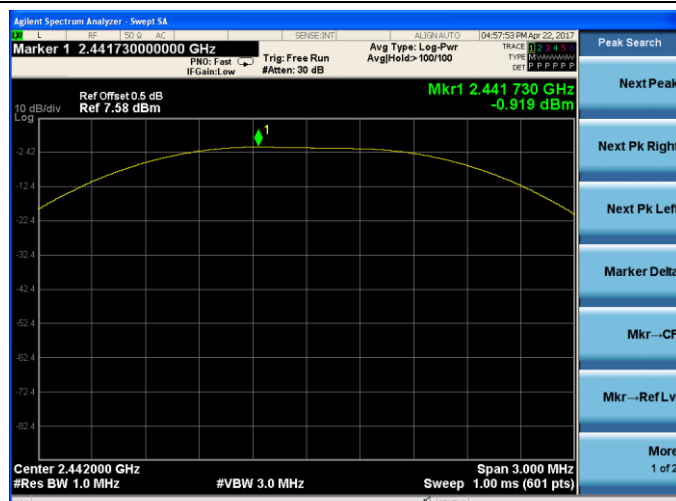
| Frequency (MHz) | Peak output power (dBm) | Limit (dBm) |
|-----------------|-------------------------|-------------|
| 2402 | -2.412 | 30 |
| 2442 | -0.919 | 30 |
| 2480 | -2.217 | 30 |

Test plots as below:

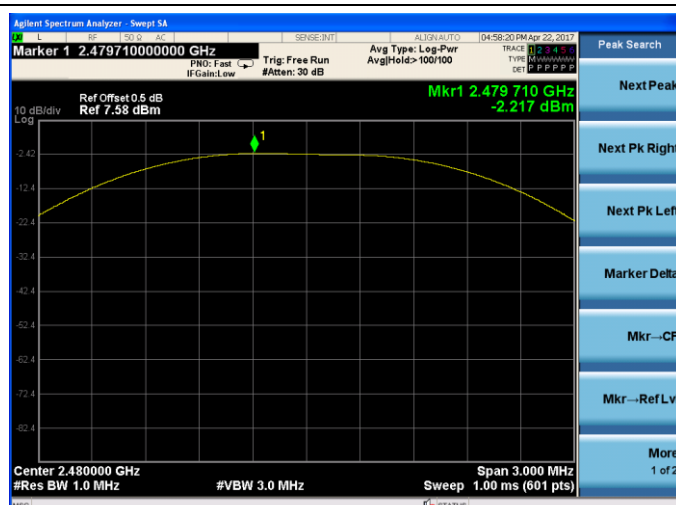
2402MHz



2442MHz



2480MHz



4.4 6dB emission bandwidth

4.4.1 Limits

The minimum 6 dB bandwidth shall be at least 500 kHz.

4.4.2 Test method

Use the following spectrum analyzer settings:

RBW = 100kHz

VBW \geq 3RBW

Detector = peak

Trace mode = max hold

Sweep time = auto couple

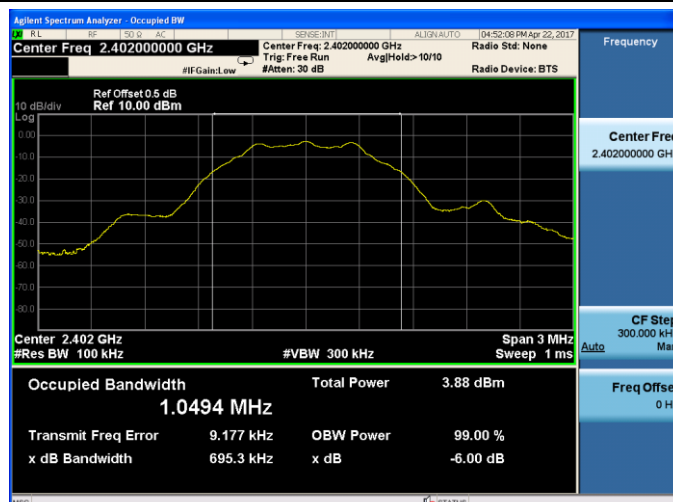
Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4.3 Test result

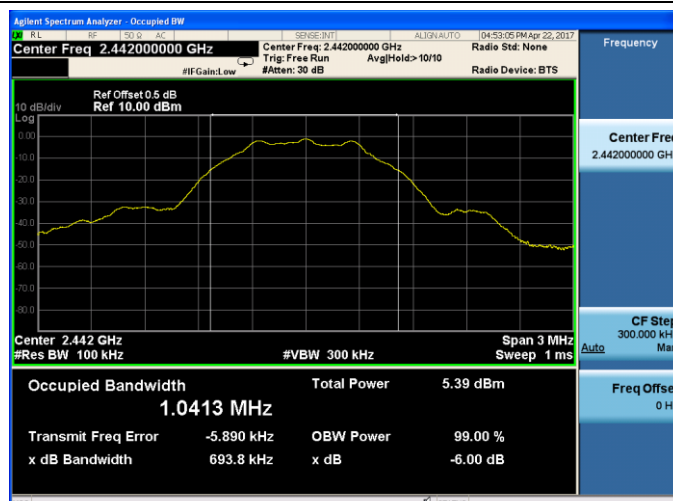
| Frequency (MHz) | 6dB emission bandwidth (MHz) | Limit |
|-----------------|------------------------------|--------|
| 2402 | 0.695 | 500kHz |
| 2442 | 0.694 | |
| 2480 | 0.695 | |

Test plots as below:

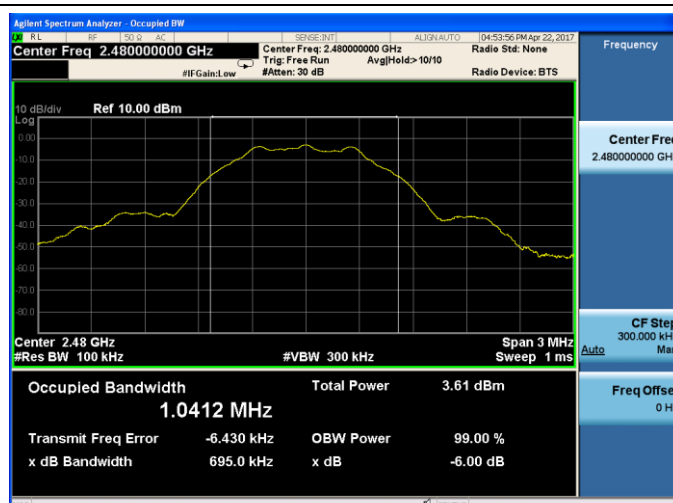
2402MHz



2442MHz



2480MHz



4.5 Power spectral density

4.5.1 Limits

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

4.5.2 Test method

Span = 1.5 times DTS bandwidth (6dB emission bandwidth, see section 4.4)

RBW = 3kHz to 100kHz

VBW \geq 3RBW

Detector = peak

Sweep time = auto

Trace mode = max hold

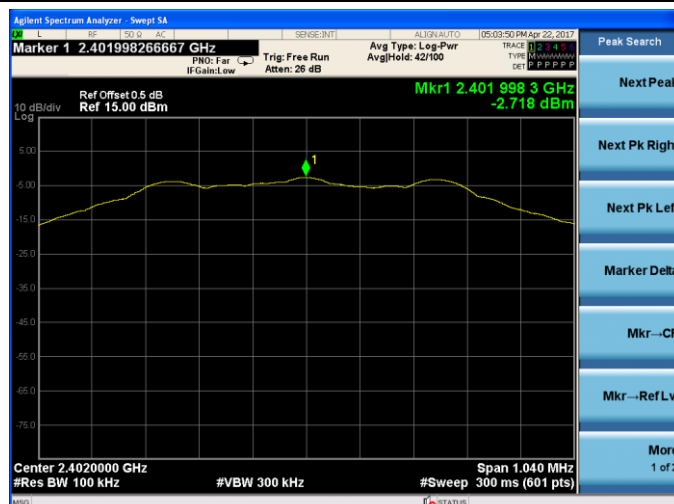
Allow the trace to stabilize. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.3 Test result

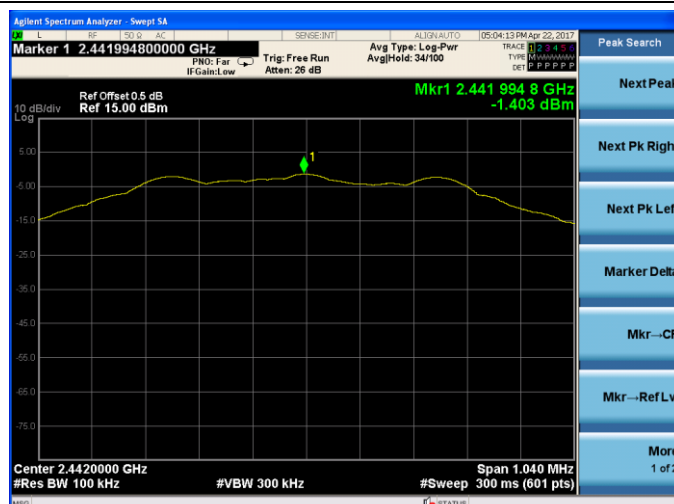
| Frequency (MHz) | PSD (dBm/100kHz) | Limit (dBm/3kHz) |
|-----------------|------------------|------------------|
| 2402 | -2.718 | 8 |
| 2442 | -1.403 | |
| 2480 | -2.506 | |

Test plots as below:

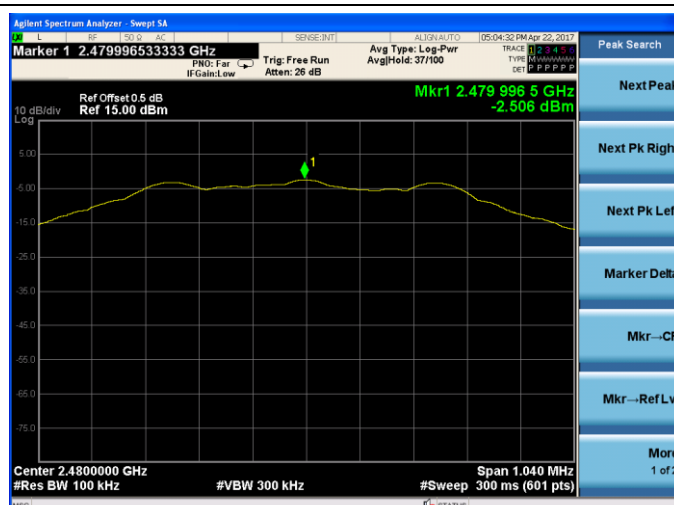
2402MHz



2442MHz



2480MHz



4.6 Band edge spurious emission

4.6.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

4.6.2 Test method

Use the following spectrum analyser settings:

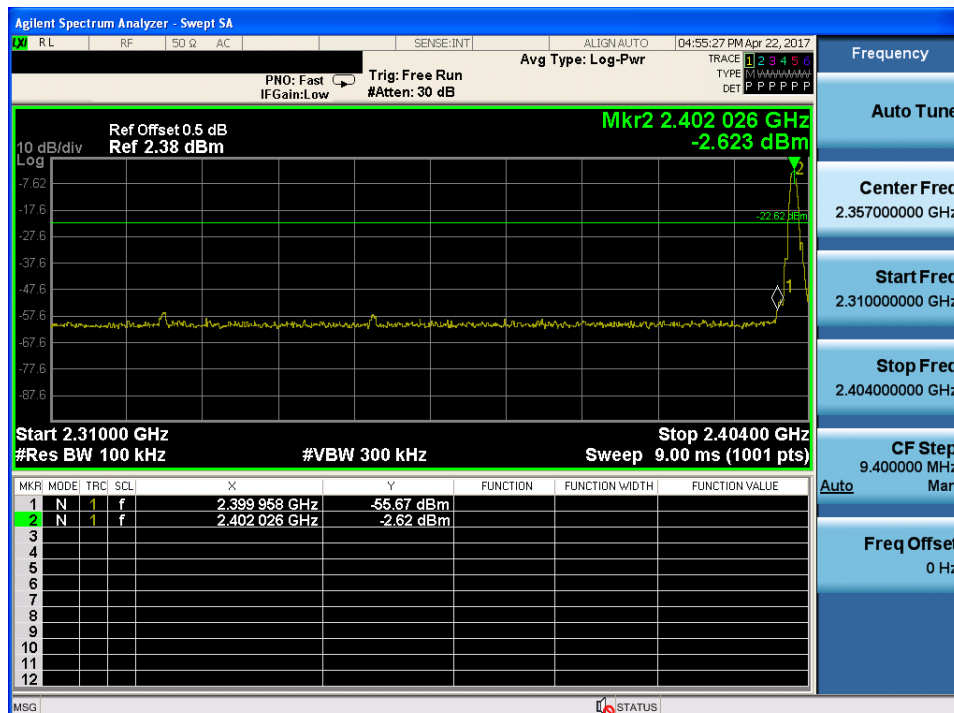
Set RBW=100 kHz. VBW \geq 3RBW. Detector = peak, Sweep time = auto couple, Trace mode = max hold.

4.6.3 Test Result

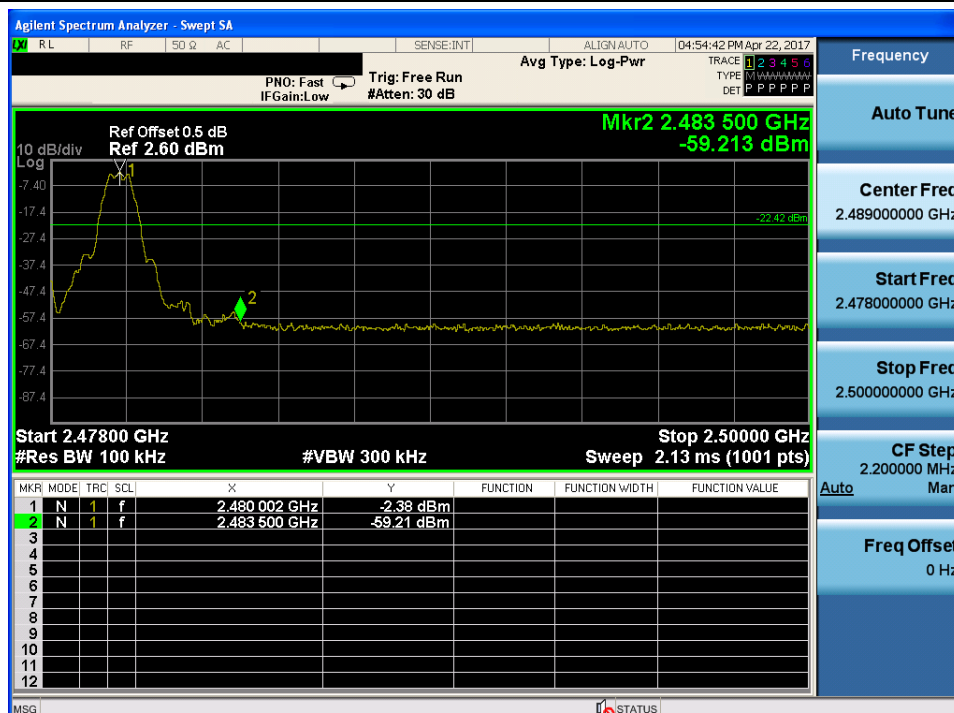
Test plots as below:

Band edge

Low edge



Up edge



4.7 Radiated emission

4.7.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. Attenuation below the general limits defined in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits defined in §15.209(a).

Radiated emission limits defined in FCC 15.209:

| Frequency (MHz) | Field strength $\mu\text{V/m}$ | Field strength $\text{dB}\mu\text{V/m}$ | Detector | Measurement distance |
|-----------------|--------------------------------|---|----------|----------------------|
| 30-88 | 100 | 40 | QP | 3m |
| 88-216 | 150 | 43.5 | QP | |
| 216-960 | 200 | 46 | QP | |
| 960-1000 | 500 | 46 | QP | |
| Above 1000 | 500 | 54 | AV | |
| Above 1000 | 5000 | 74 | PK | |

Restricted bands defined in FCC 15.205:

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-335.4 | 3600-4400 | Above 38.6 |
| 13.36-13.41 | | | |

4.7.2 Test method

1. The EUT is placed on a turntable, which is 0.8m above ground plane for test frequency range below 1GHz, and 1.5m above ground plane for test frequency range above 1GHz.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{GHz}$, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. The peak level, once corrected, must comply with the limit specified in Section 15.209. Set the RBW = 1MHz, VBW = 3MHz, Detector = RMS for AV value, while maintaining all of the other instrument settings.
6. The three orthogonal axis (x, y, z) are pre-tested, only the worst emission were reported

4.7.3 Test Result

| Transmitter channel: 2402MHz | | | | | |
|------------------------------|-------------------|----------------|--------|----------|--------|
| Frequency | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz) | H / V | dBμV/m | dBμV/m | | |
| 159.78 | V | 32.2 | 43.5 | QP | Pass |
| 159.78 | H | 34.3 | 43.5 | QP | |
| 2390 | V | 46.73 | 74 | PK | |
| 2390 | H | 48.34 | 74 | PK | |
| 4804 | V | 50.12 | 74 | PK | |
| 4804 | H | 50.74 | 74 | PK | |
| Transmitter channel: 2442MHz | | | | | |
| Frequency | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz) | H / V | dBμV/m | dBμV/m | | |
| 159.78 | V | 31.6 | 43.5 | QP | Pass |
| 159.78 | H | 33.1 | 43.5 | QP | |
| 4884 | V | 50.59 | 74 | PK | |
| 4884 | H | 51.24 | 74 | PK | |
| Transmitter channel: 2480MHz | | | | | |
| Frequency | Ant. Polarization | Emission level | Limits | Detector | Result |
| (MHz) | H / V | dBμV/m | dBμV/m | | |
| 159.78 | V | 32.2 | 43.5 | QP | Pass |
| 159.78 | H | 34.4 | 43.5 | QP | |
| 2483.5 | V | 46.91 | 74 | PK | |
| 2483.5 | H | 48.76 | 74 | PK | |
| 4960 | V | 50.23 | 74 | PK | |
| 4960 | H | 50.86 | 74 | PK | |

Note: If the PK measured values lower than average mode limit, the EUT shall be deemed to meet average limits and then no additional average mode measurement performed.

----END OF REPORT----