# FCC - TEST REPORT

| | | | | |
|---|---|---|---|---|
| Report Number | : | **64.790.18.00378.01** | Date of Issue: | January 24, 2018 |

| | | |
|---|---|---|
| Model | : | HTR-B1623-B |
| Product Type | : | Shoe Beatz |
| Applicant | : | Terry Electronics Technology Company Limited |
| Manufacturer | : | Terry Electronics Technology Company Limited |
| Address | : | 2/F, Building D, Dingfeng Technology Park, Changcheng Road, Shuitian Community, Shiyan,Baoan,Shenzhen,China |

| | | |
|---|---|---|
| Test Result | : | ■ **Positive** ☐ **Negative** |
| Total pages including Appendices | : | 43 |

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## 2 Details about the Test Laboratory

**Details about the Test Laboratory**
Test Site 1

| | |
|---|---|
| Company name: | TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch<br>Building 12&13, Zhiheng Wisdomland Business Park,<br>Nantou Checkpoint Road 2, Nanshan District,<br>Shenzhen City, 518052,<br>P. R. China |
| FCC Registration Number: | 502708 |
| IC Registration Number: | 10320A-1 |
| Telephone: | 86 755 8828 6998 |
| Fax: | 86 755 828 5299 |

# 3 Description of the Equipment Under Test

Product: Shoe Beatz

Model no.: HTR-B1623-B

FCC ID: 2AOPFTERRY201802

Rating: DC 3.7V

RF Transmission Frequency: 2402MHz to 2480MHz

Modulation: GFSK, π/4-DQPSK

Antenna Type: PIFA

Antenna Gain: 3.3dBi

Description of the EUT: The EUT is a Shoe which can play music by connecting Bluetooth

# 4 Summary of Test Standards

| Test Standards | |
|---|---|
| FCC Part 15 Subpart C<br>10-1-2016 Edition | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators |

All the test methods were according to Public Notice DA 00-705 -Frequency Hopper Spread Spectrum Test Procedure released by FCC on March 30, 2000 and C63.10 (2013).

# 5 Summary of Test Results

| Technical Requirements | | | | |
|---|---|---|---|---|
| **FCC Part 15 Subpart C** | | | | |
| Test Condition | | Pages | Test Site | Test Result |
| §15.207 | Conducted emission AC power port | | Site 1 | Pass |
| §15.247(b)(1) | Conducted peak output power | | Site 1 | Pass |
| §15.247(a)(2) | 6dB bandwidth | --- | --- | N/A |
| §15.247(a)(1) | 20dB bandwidth and 99% Occupied Bandwidth | | Site 1 | Pass |
| §15.247(a)(1) | Carrier frequency separation | | Site 1 | Pass |
| §15.247(a)(1)(iii) | Number of hopping frequencies | | Site 1 | Pass |
| §15.247(a)(1)(iii) | Dwell Time | | Site 1 | Pass |
| §15.247(e) | Power spectral density* | --- | --- | N/A |
| §15.247(d) | Spurious RF conducted emissions | | Site 1 | Pass |
| §15.247(d) | Band edge | | Site 1 | Pass |
| §15.247(d) & §15.209 & | Spurious radiated emissions for transmitter and receiver | | Site 1 | Pass |
| §15.203 | Antenna requirement | See note 2 | | Pass |

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a PIFA antenna, which gain is 3.3dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

## 6 General Remarks

**Remarks**

This submittal(s) (test report) is intended for FCC ID: 2AOPFTERRY201802, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

**SUMMARY:**

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: January 16, 2018

Testing Start Date: November 17, 2014

Testing End Date: December 23, 2014

- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by:

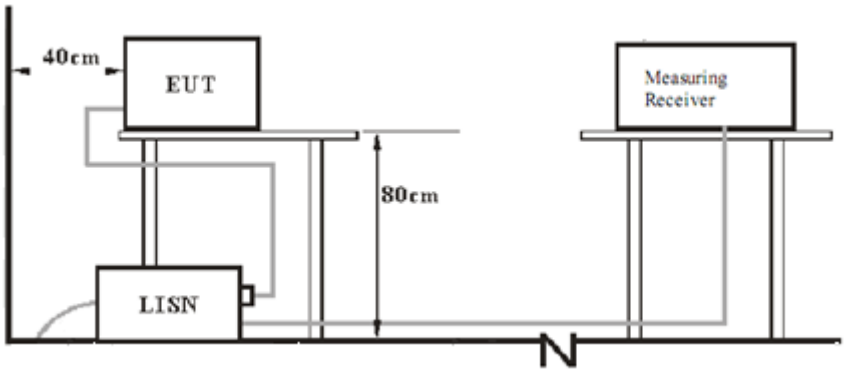
Peter Jia

Prepared by:

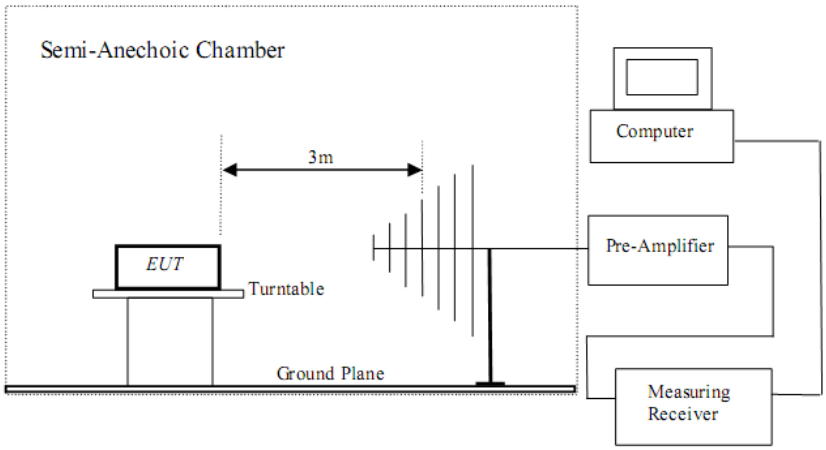
Matt Zhang

# 7 Test Setups

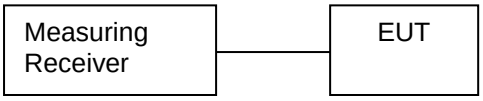
## 7.1 AC Power Line Conducted Emission test setups




## 7.2 Radiated test setups




## 7.3 Conducted RF test setups



# 8 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|---|---|---|---|
| Adaptor | Apple | A1357 | --- |

Test software: FCCAssist_1.5.exe, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode and non-hopping mode.

Hopping mode: typical working mode (normal hopping status)

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power

# 9 Technical Requirement

## 9.1 Conducted Emission

**Test Method**

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

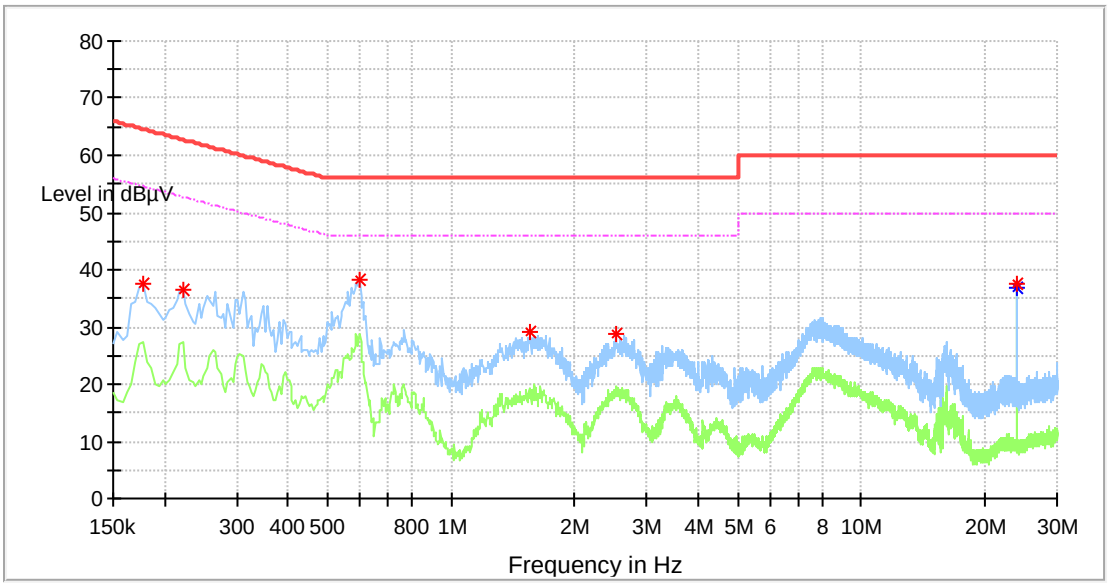
**Limit**

| Frequency MHz | QP Limit dBµV | AV Limit dBµV |
|---|---|---|
| 0.150-0.500 | 66-56* | 56-46* |
| 0.500-5 | 56 | 46 |
| 5-30 | 60 | 50 |

Decreasing linearly with logarithm of the frequency

## Conducted Emission

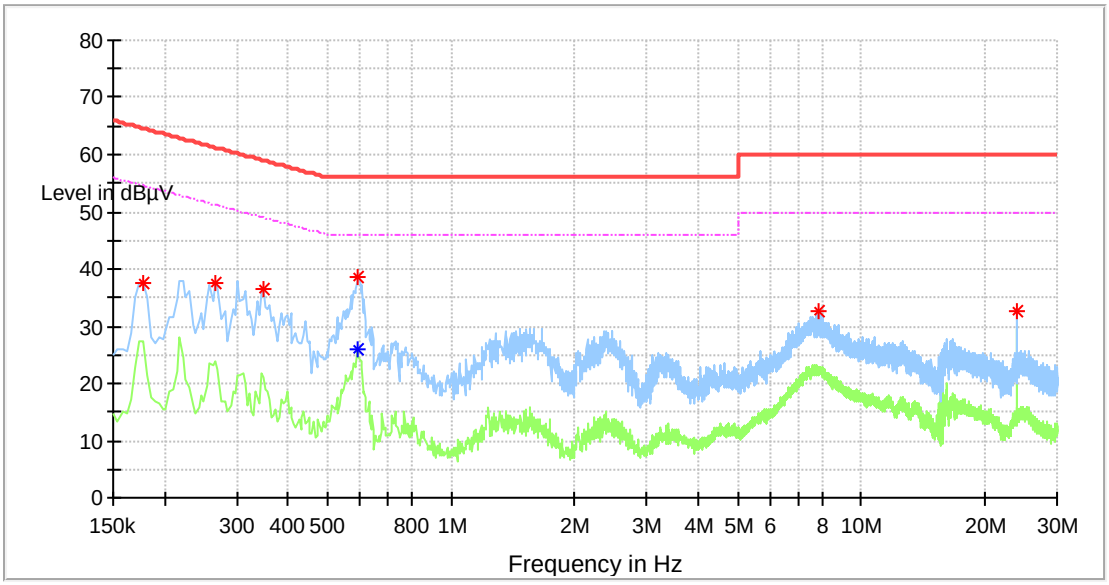
Product Type : Shoe Beatz
M/N : HTR-B1623-B
Operating Condition : Charging
Conduct Line : L




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line |
|---|---|---|---|---|---|
| 0.178000 | 37.41 | --- | 64.58 | 27.17 | L1 |
| 0.222000 | 36.50 | --- | 62.74 | 26.25 | L1 |
| 0.598000 | 38.34 | --- | 56.00 | 17.66 | L1 |
| 1.558000 | 29.01 | --- | 56.00 | 26.99 | L1 |
| 2.514000 | 28.64 | --- | 56.00 | 27.36 | L1 |
| 23.998000 | 37.57 | --- | 60.00 | 22.43 | L1 |
| 23.998000 | --- | 36.74 | 50.00 | 13.26 | L1 |

Product Type : Shoe Beatz
M/N : HTR-B1623-B
Operating Condition : Charging
Conduct Line : N




## Critical_Freqs

| Frequency (MHz) | MaxPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Line |
|---|---|---|---|---|---|
| 0.178000 | 37.64 | --- | 64.58 | 26.94 | N |
| 0.266000 | 37.68 | --- | 61.24 | 23.56 | N |
| 0.350000 | 36.34 | --- | 58.96 | 22.62 | N |
| 0.590000 | --- | 25.85 | 46.00 | 20.15 | N |
| 0.594000 | 38.48 | --- | 56.00 | 17.52 | N |
| 7.834000 | 32.78 | --- | 60.00 | 27.22 | N |
| 23.998000 | 32.66 | --- | 60.00 | 27.34 | N |

## 9.2 Conducted peak output power

**Test Method**

1. Use the following spectrum analyzer settings:
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   RBW > the 20 dB bandwidth of the emission being measured, VBW≥RBW,
   Sweep = auto, Detector function = peak, Trace = max hold
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power

**Limits**

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|---|---|---|
| 2400-2483.5 | ≤1 | ≤30 |

## Conducted peak output power

Bluetooth Mode GFSK modulation Test Result

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|---|---|---|
| Low channel 2402MHz | -4.50 | Pass |
| Middle channel 2441MHz | -4.41 | Pass |
| High channel 2480MHz | -5.74 | Pass |

2402MHz

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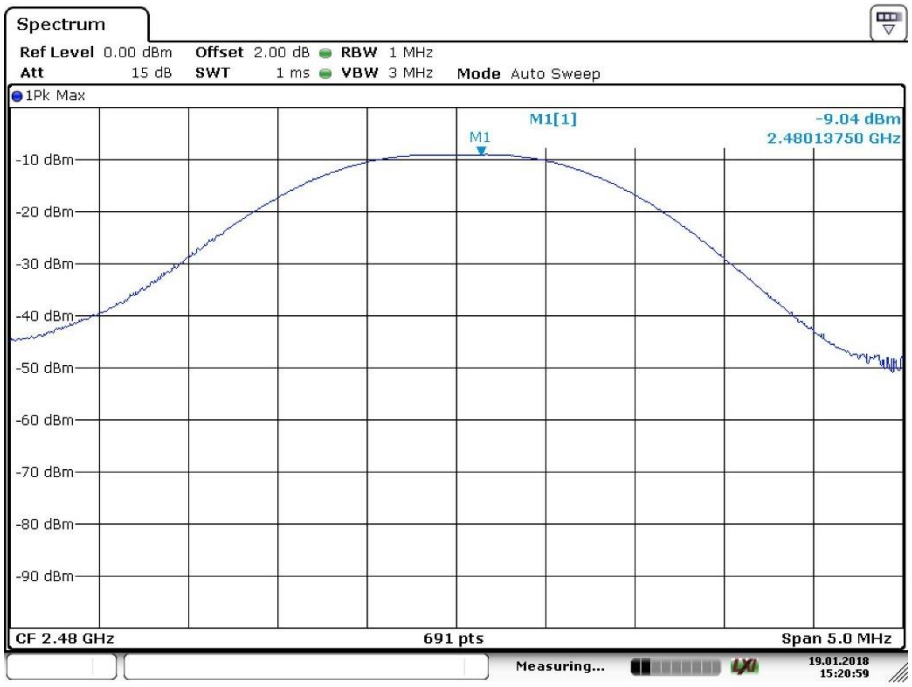
2441MHz

Date: 19.JAN.2018 15:19:48

2480MHz

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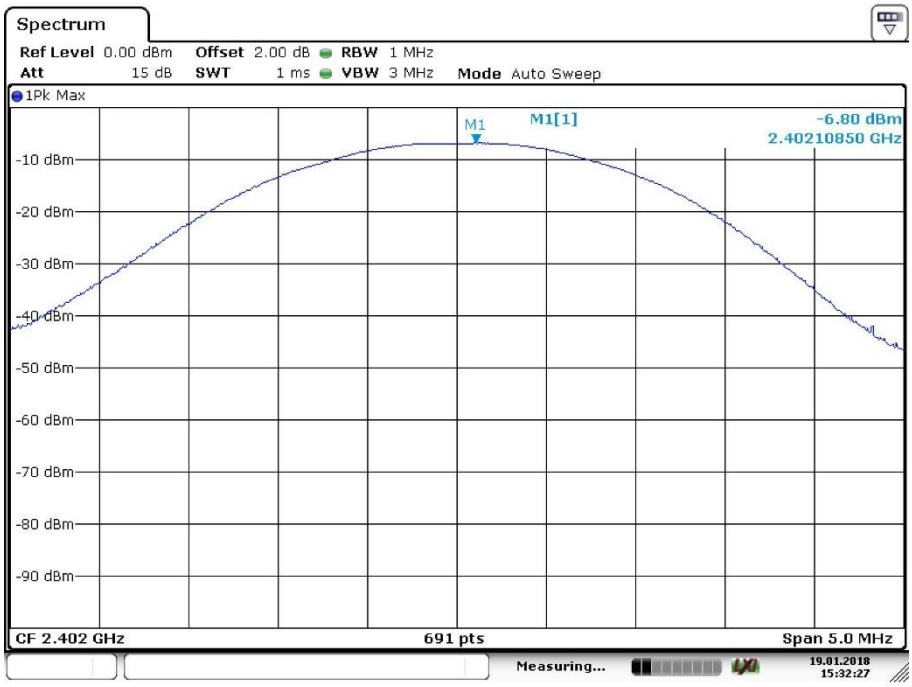
## Bluetooth Mode π/4-DQPSK modulation Test Result

| Frequency MHz | Conducted Peak Output Power dBm | Result |
|---|---|---|
| Low channel 2402MHz | -3.50 | Pass |
| Middle channel 2441MHz | -3.62 | Pass |
| High channel 2480MHz | -4.79 | Pass |

2402MHz

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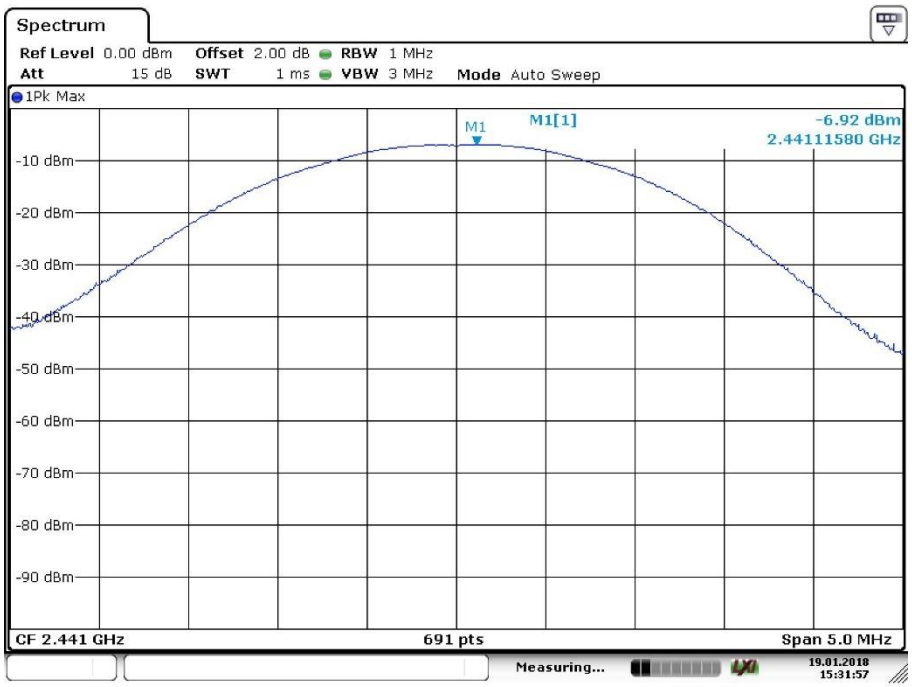
2441MHz

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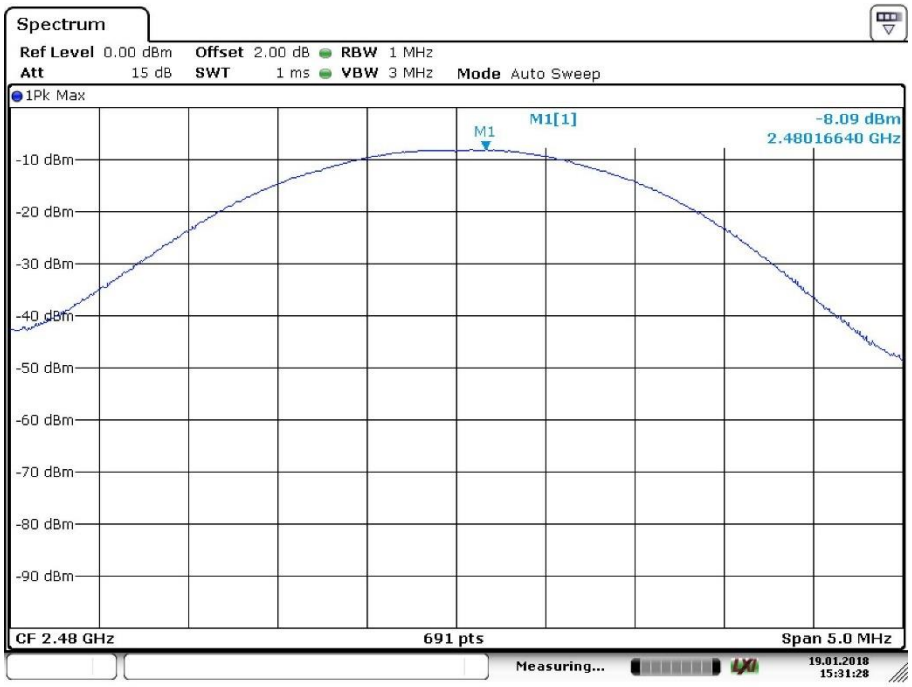
2480MHz

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Note：Test result=Power spectrum + antenna gain, Antenna gain=3.3dBi

## 9.3 20 dB bandwidth and 99% Occupied Bandwidth

**Test Method**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

**Limit**

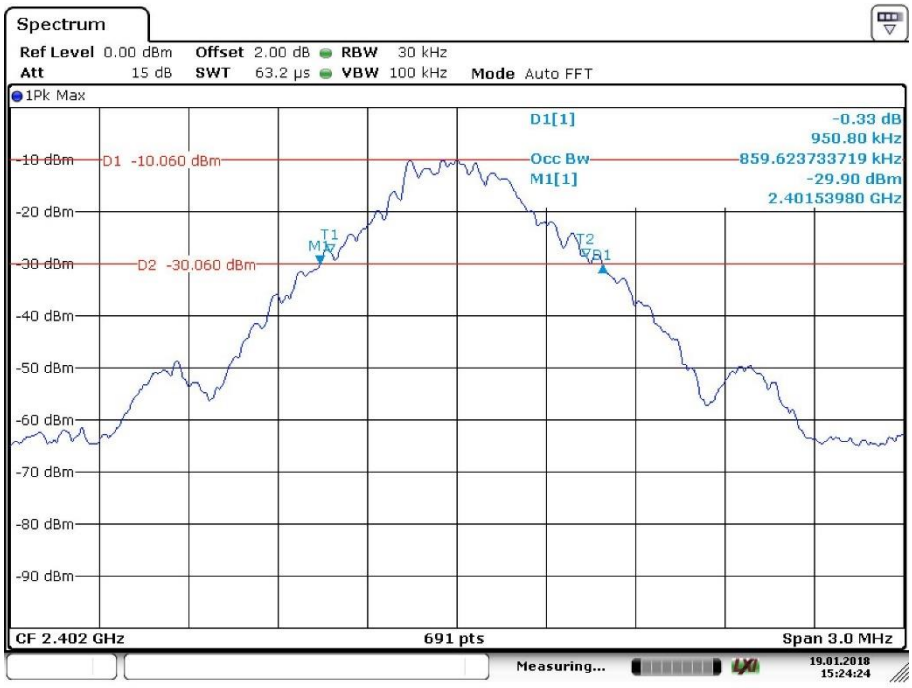
| Limit [kHz] |
|---|
| N/A |

## 20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

| Frequency MHz | 20 dB Bandwidth kHz | 99% Bandwidth kHz | Limit kHz | Result |
|---|---|---|---|---|
| 2402 | 950.8 | 859.6 | -- | Pass |
| 2441 | 950.8 | 859.6 | -- | Pass |
| 2480 | 950.8 | 859.6 | -- | Pass |

2402MHz

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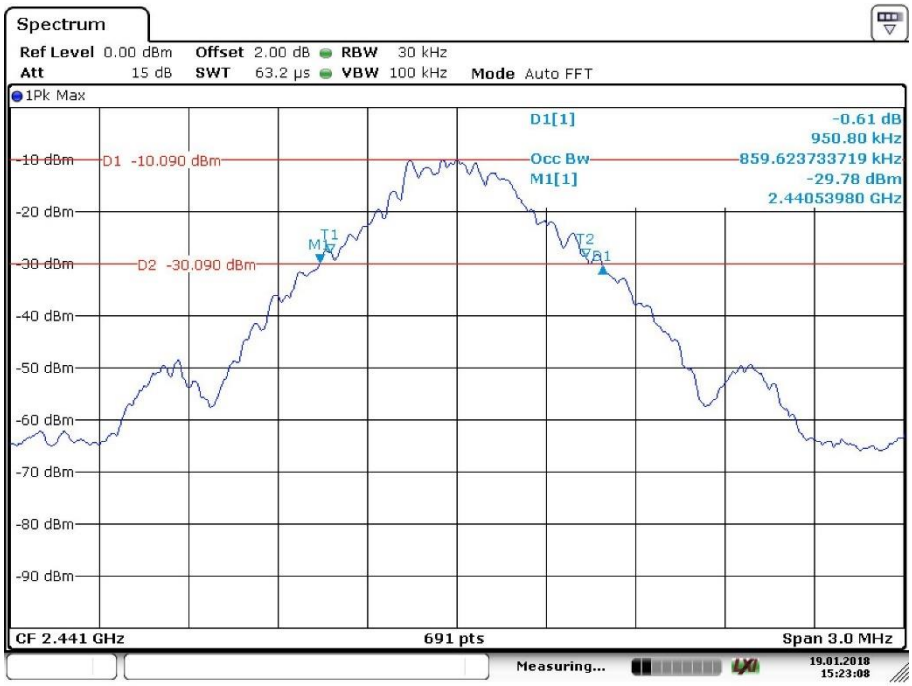
2441MHz

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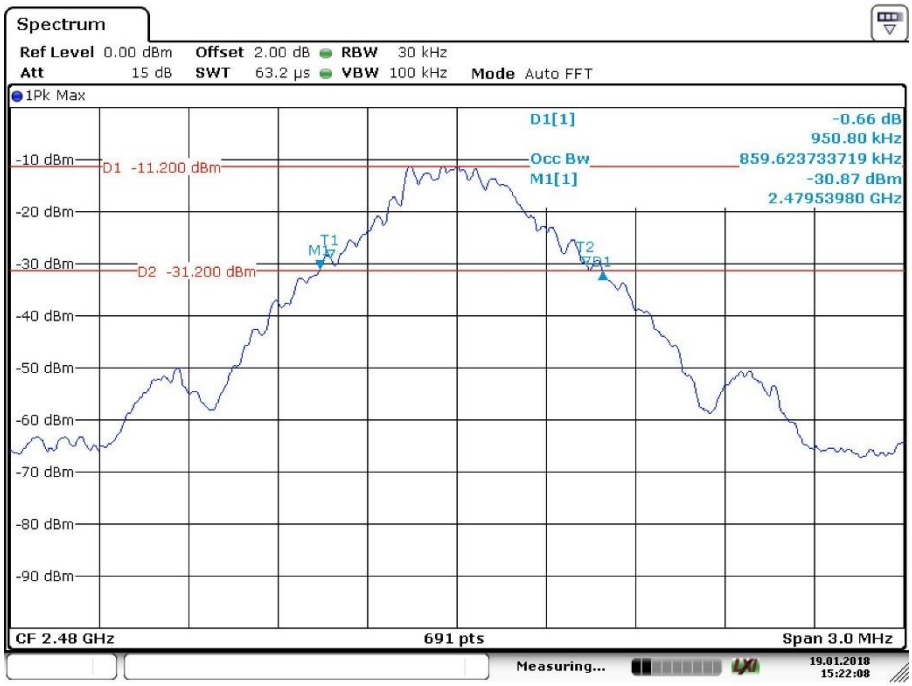
2480MHz

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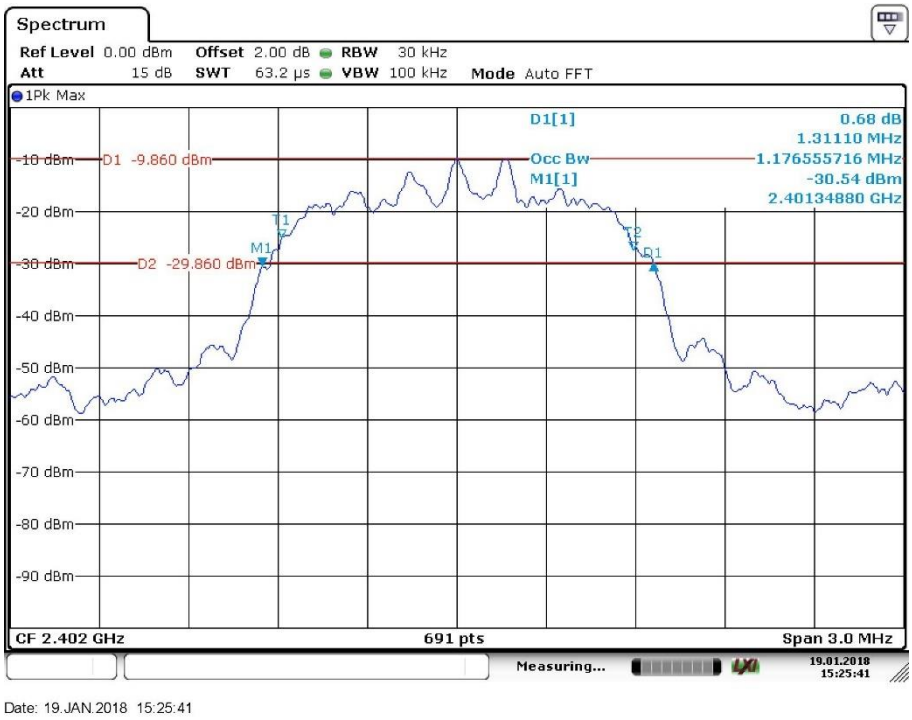
## 20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode π/4-DQPSK Modulation test result

| Frequency MHz | 20 dB Bandwidth kHz | 99% Bandwidth kHz | Limit kHz | Result |
|---|---|---|---|---|
| 2402 | 1311.1 | 1176.6 | -- | Pass |
| 2441 | 1285.1 | 1176.6 | -- | Pass |
| 2480 | 1285.1 | 1172.2 | -- | Pass |

2402MHz

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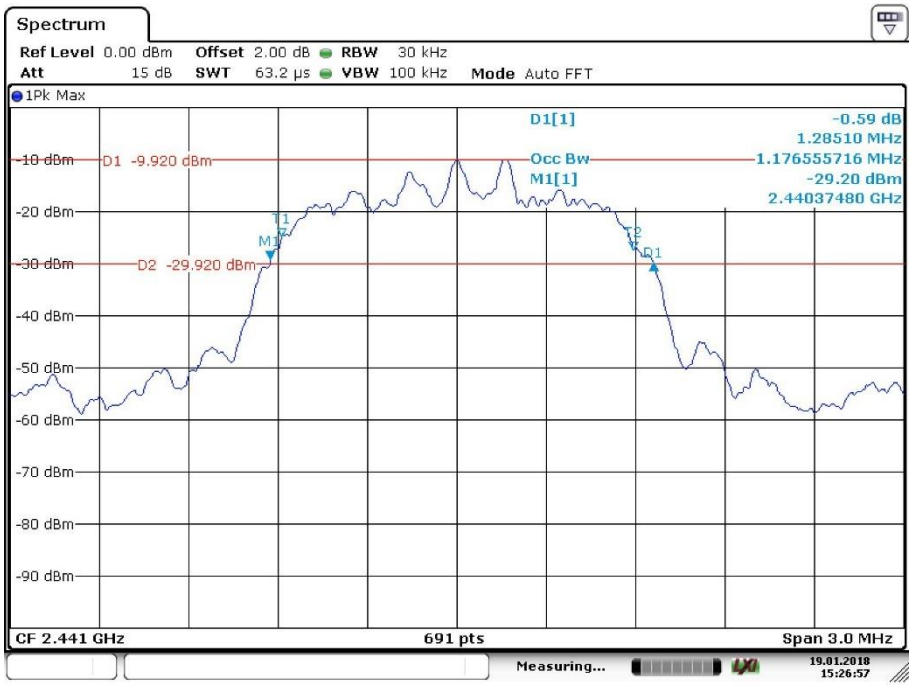
2441MHz

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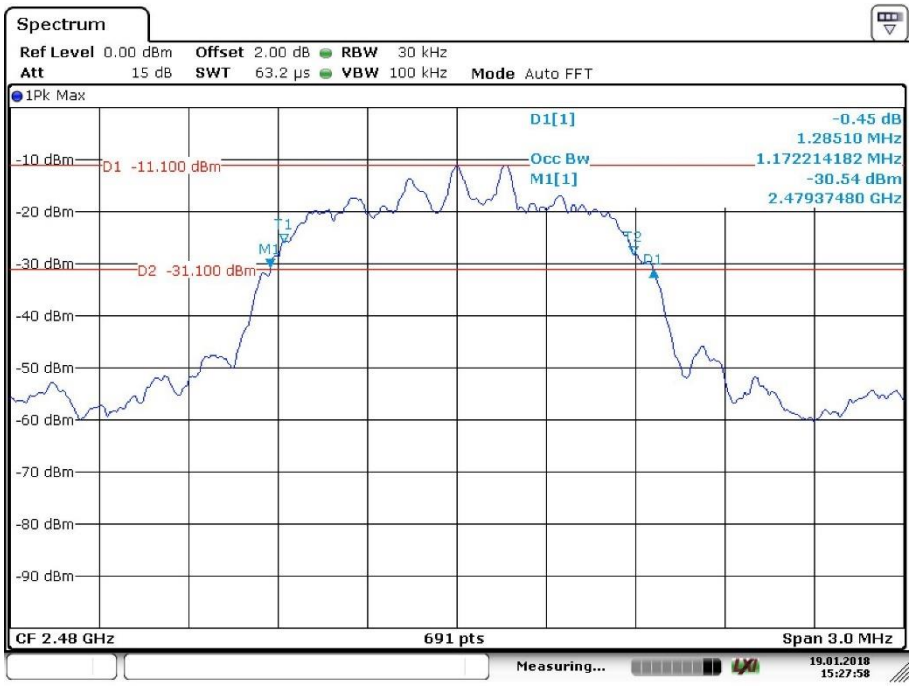
2480MHz

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## 9.4 Carrier Frequency Separation

**Test Method**

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function.
4. Repeat above procedures until all frequencies measured were complete.

**Limit**

| Limit<br>kHz |
|---|
| ⩾25KHz or 2/3 of the 20 dB bandwidth which is greater |

GFSK Modulation Limit

| Frequency<br>MHz | 2/3 of 20 dB Bandwidth<br>kHz |
|---|---|
| 2402 | 633.87 |
| 2441 | 633.87 |
| 2480 | 633.87 |

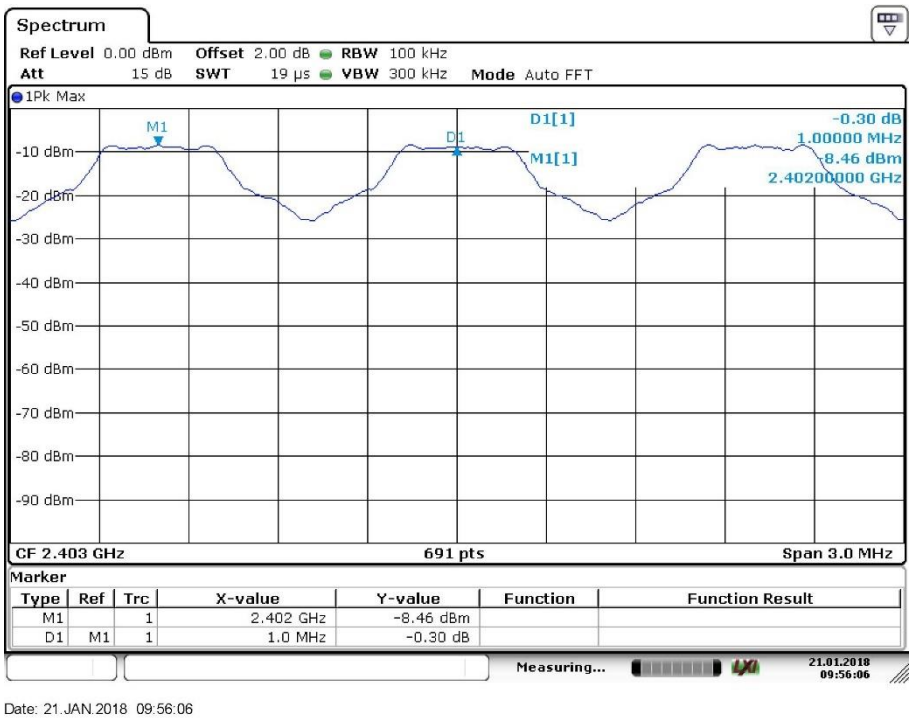
## Carrier Frequency Separation

Test result: The measurement was performed with the typical configuration (normal hopping status), here GFSK modulation mode was used to show compliance.

GFSK Modulation test result

| Frequency MHz | Carrier Frequency Separation kHz | Result |
|---|---|---|
| 2402 | 1000 | Pass |
| 2441 | 1000 | Pass |
| 2480 | 1000 | Pass |

2402MHz

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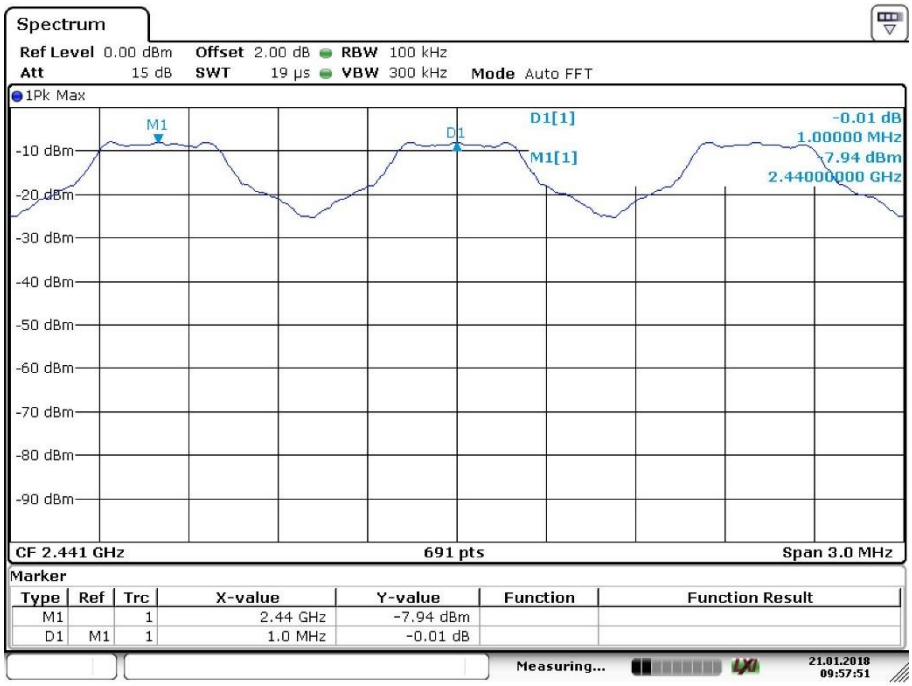
2441MHz

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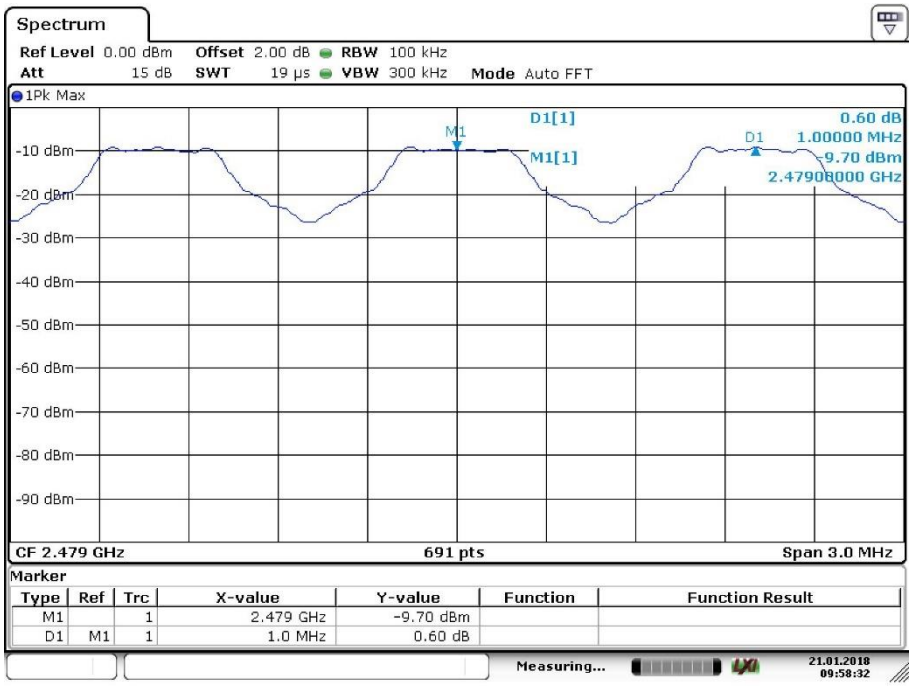
2480MHz

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## 9.5 Number of hopping frequencies

**Test Method**

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels, RBW ≥ 1% of the span, VBW) ≥RBW, Sweep = auto, Detector function = peak
2. Set the spectrum analyzer on Max-Hold Mode, and then keep the EUT in hopping mode.
3. Record all the signals from each channel until each one has been recorded.
4. Repeat above procedures until all frequencies measured were complete.

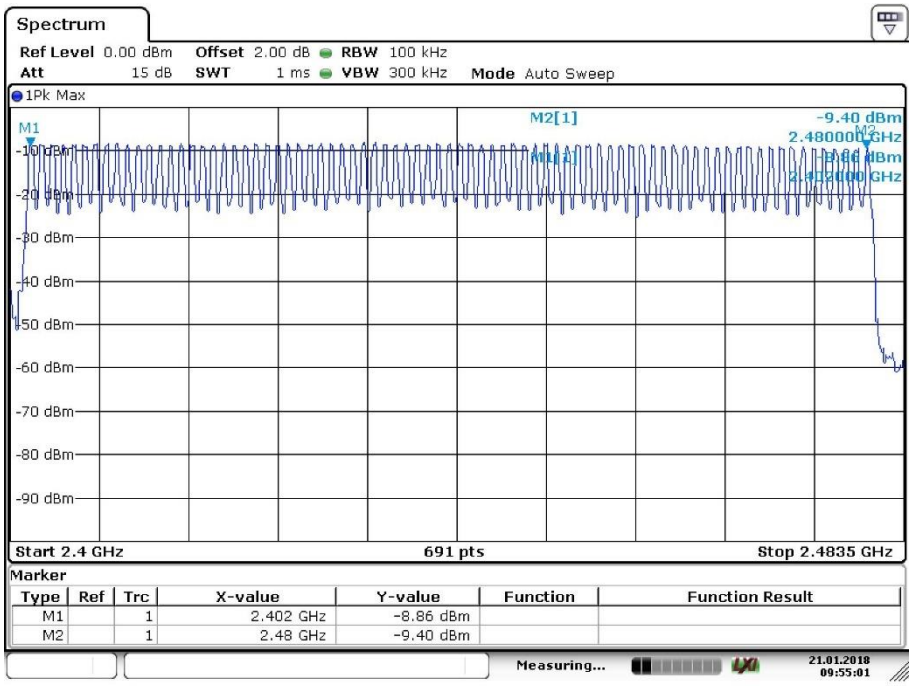
**Limit**

| Limit number |
|---|
| ⩾ 15 |

## Number of hopping frequencies

Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification. Here GFSK modulation mode was used to show compliance.

| Number of hopping frequencies | Result |
|---|---|
| 79 | Pass |

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## 9.6 Dwell Time

**Test Method**

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable. Equipment mode: Spectrum analyzer
2. RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span
3. Adjust the center frequency of spectrum analyzer on any frequency be measured.
4. Measure the Dwell Time by spectrum analyzer Marker function.
5. Repeat above procedures until all frequencies measured were complete.

**Limit**

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

## Dwell Time

**Dwell time**

The maximum dwell time shall be 0,4 s.
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows:
The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];

The burst width, which is directly measured, refers to the duration on one channel hop.

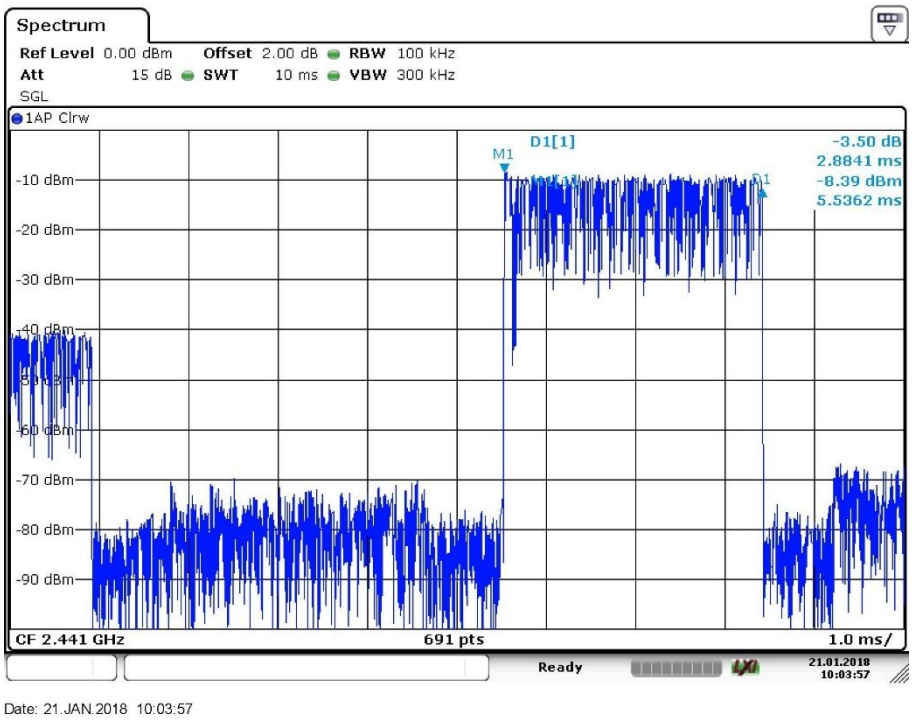
The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

| Modulation | Mode | Reading (μs) | Total Hops | Test Result (ms) | Limit (ms) | Result |
|---|---|---|---|---|---|---|
| GFSK | DH5 | 2884.1 | 106.7 | 307.7 | < 400 | Pass |
| π/4-DQPSK | 2DH5 | 2898.6 | 106.7 | 309.3 | < 400 | Pass |

GFSK Modulation

DH5

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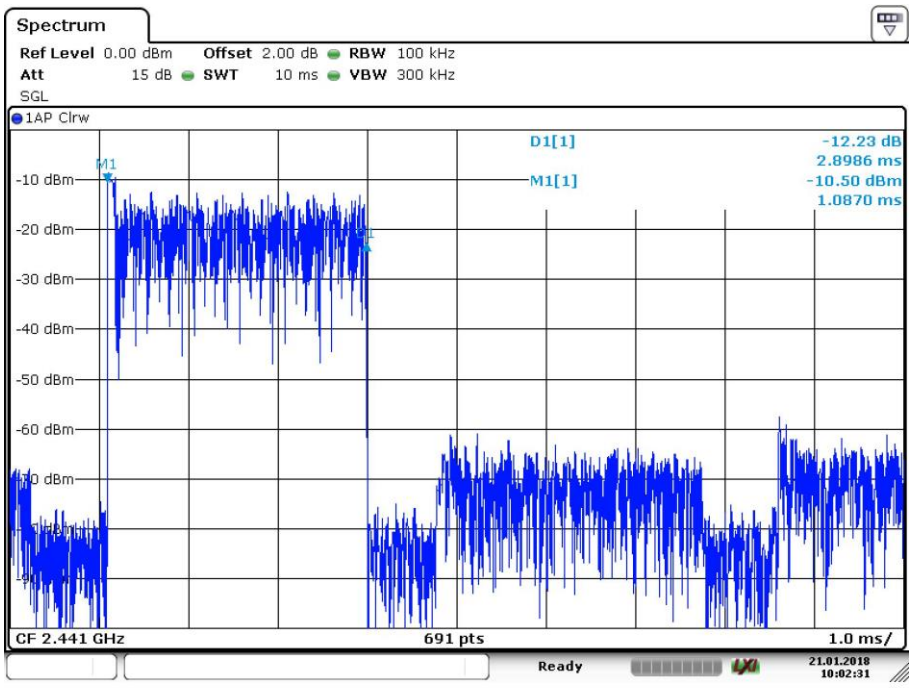
π/4-DQPSK Modulation

2DH5

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## 9.7 Spurious RF conducted emissions

**Test Method**

1. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10$^{th}$ harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
3. The level displayed must comply with the limit specified in this Section. Submit these plots.
4. Repeat above procedures until all frequencies measured were complete.

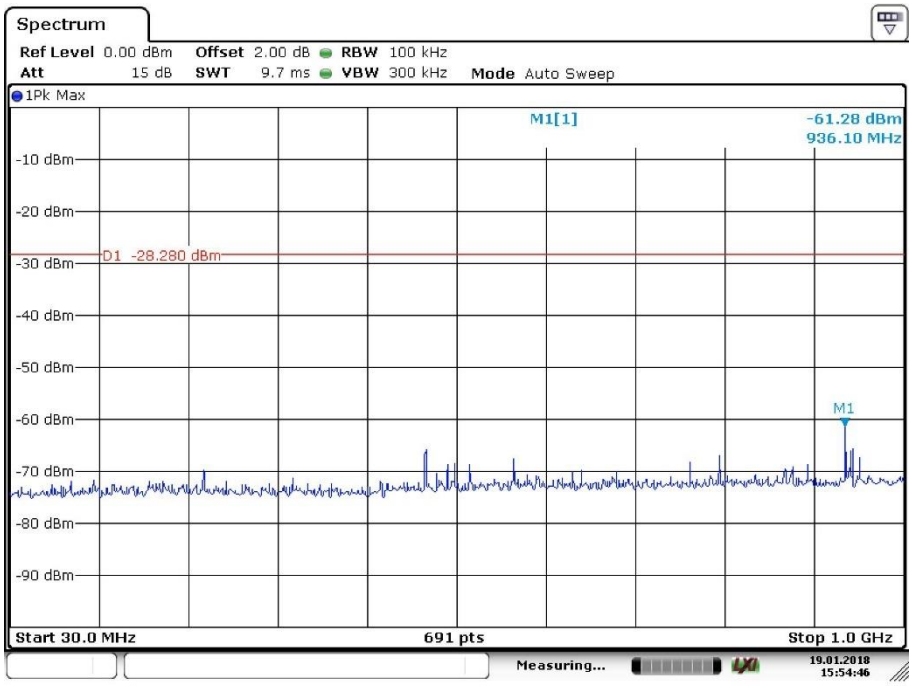
**Limit**

| Frequency Range MHz | Limit (dBc) |
|---|---|
| 30-25000 | -20 |

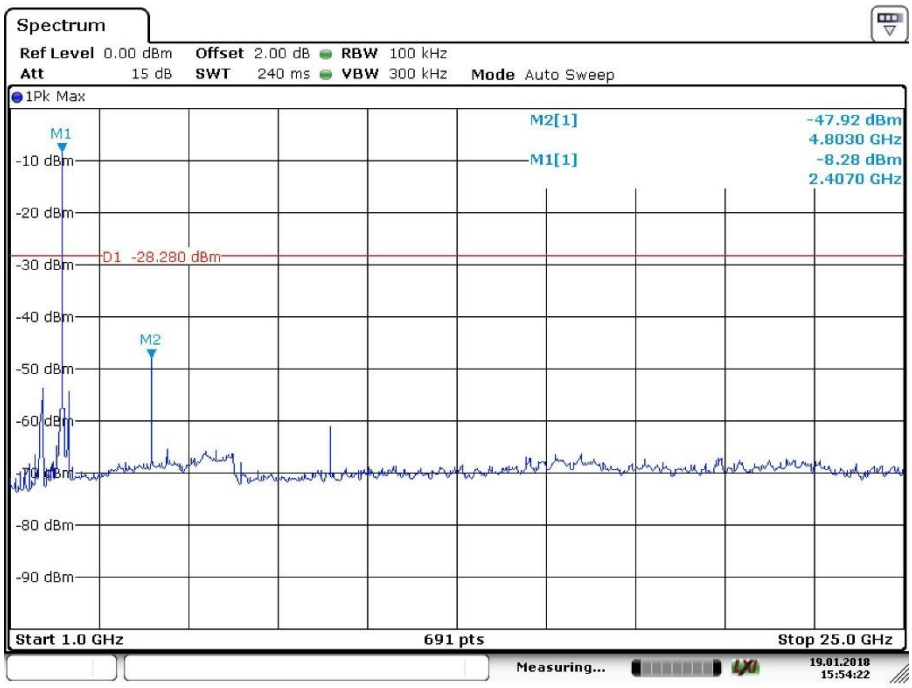
## Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

2402MHz

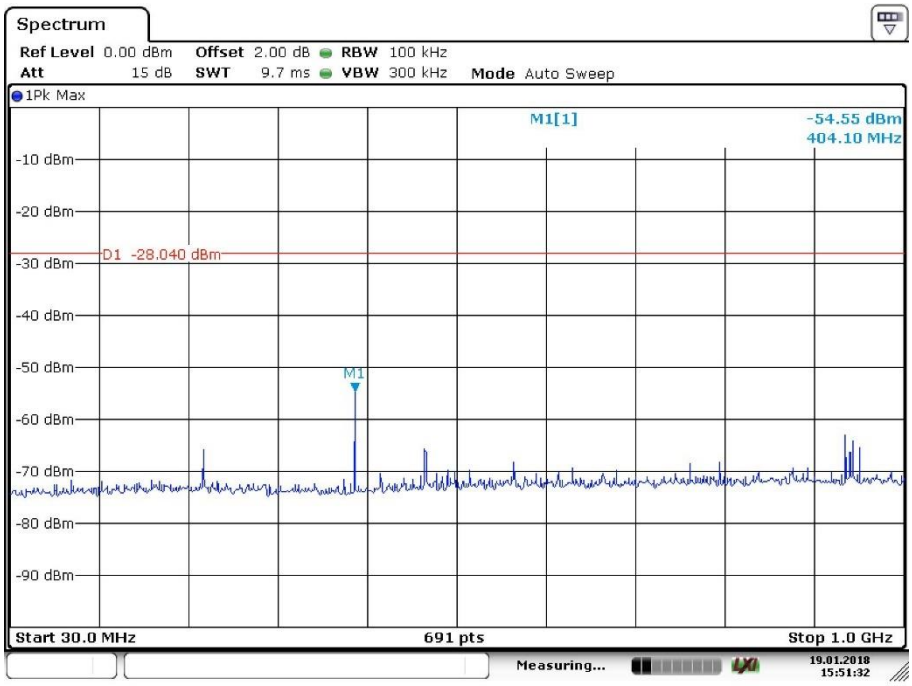



Date: 19.JAN.2018 15:54:47

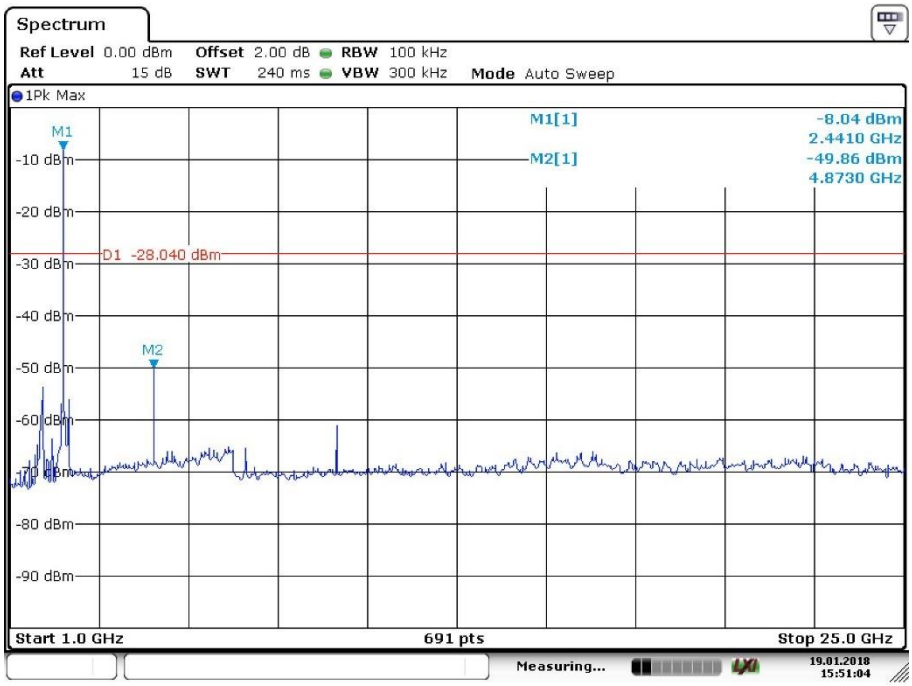



Date: 19.JAN.2018 15:54:23

2441MHz

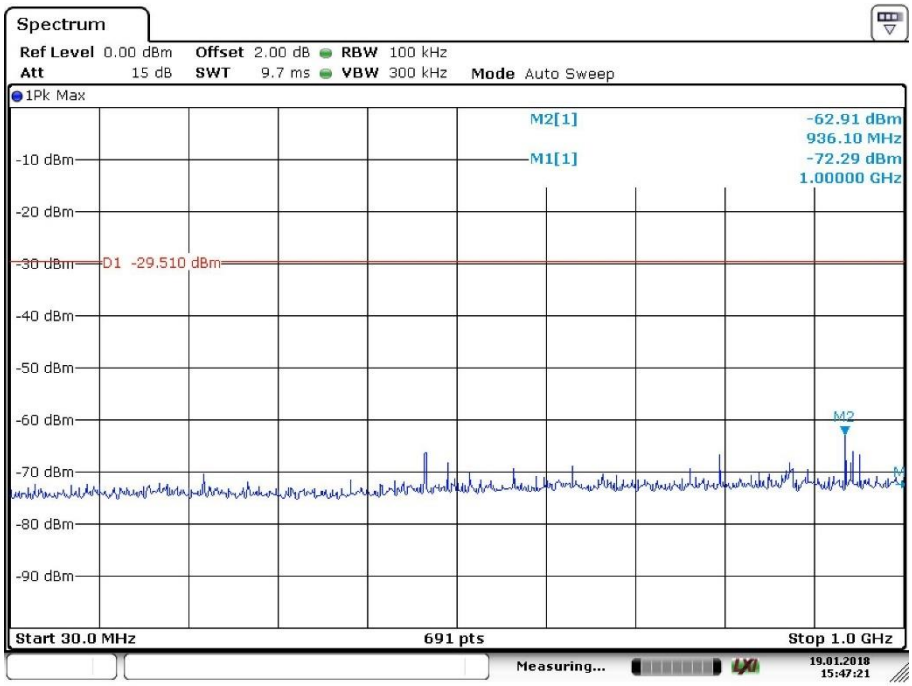



Date: 19.JAN.2018 15:51:32

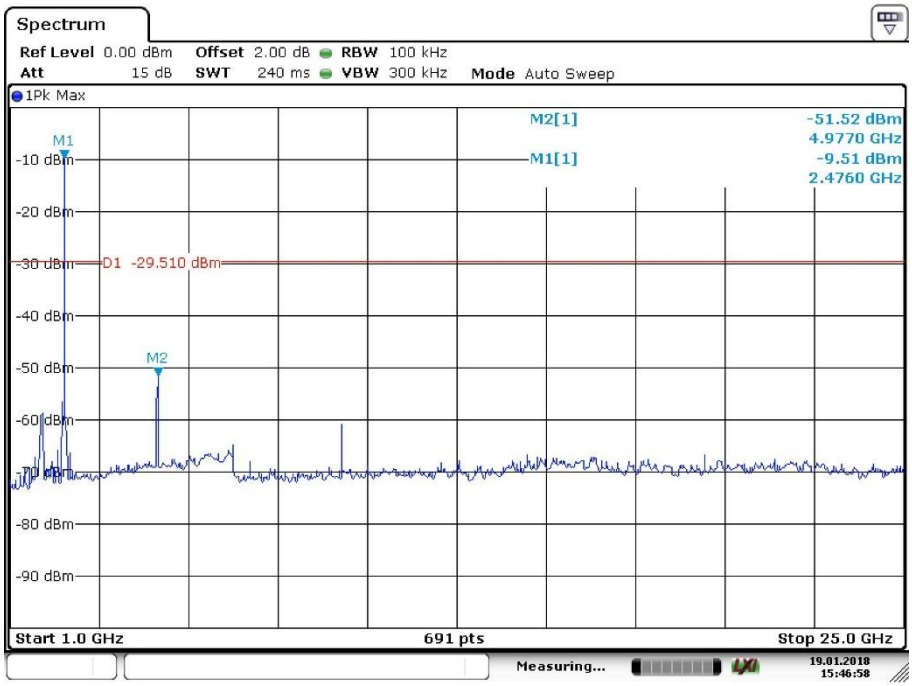



Date: 19.JAN.2018 15:51:05

2480MHz




Date: 19.JAN.2018 15:47:22




Date: 19.JAN.2018 15:46:58

## 9.8 Band edge testing

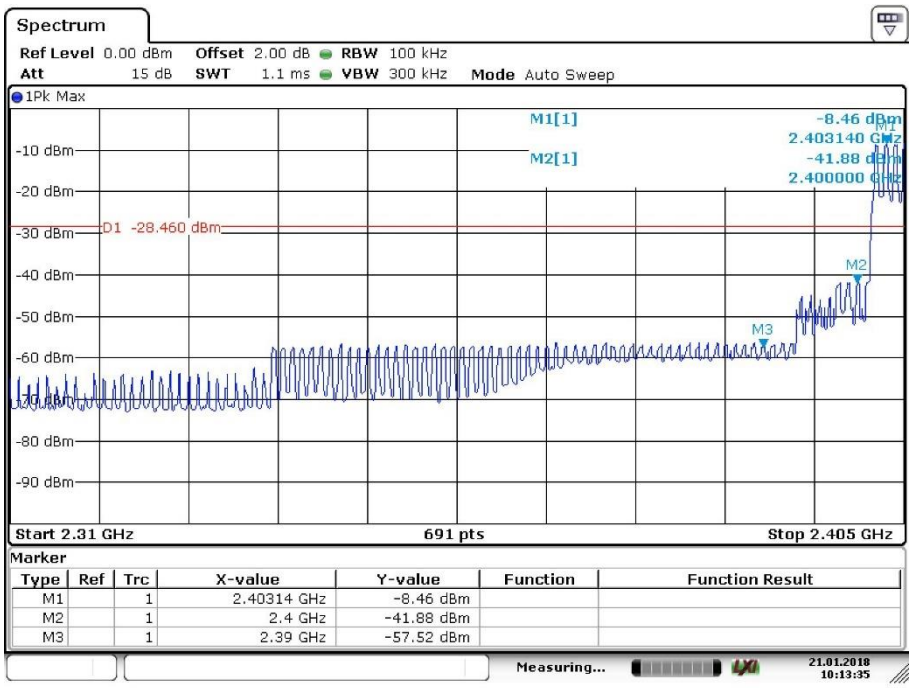
**Test Method**

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section. .
4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

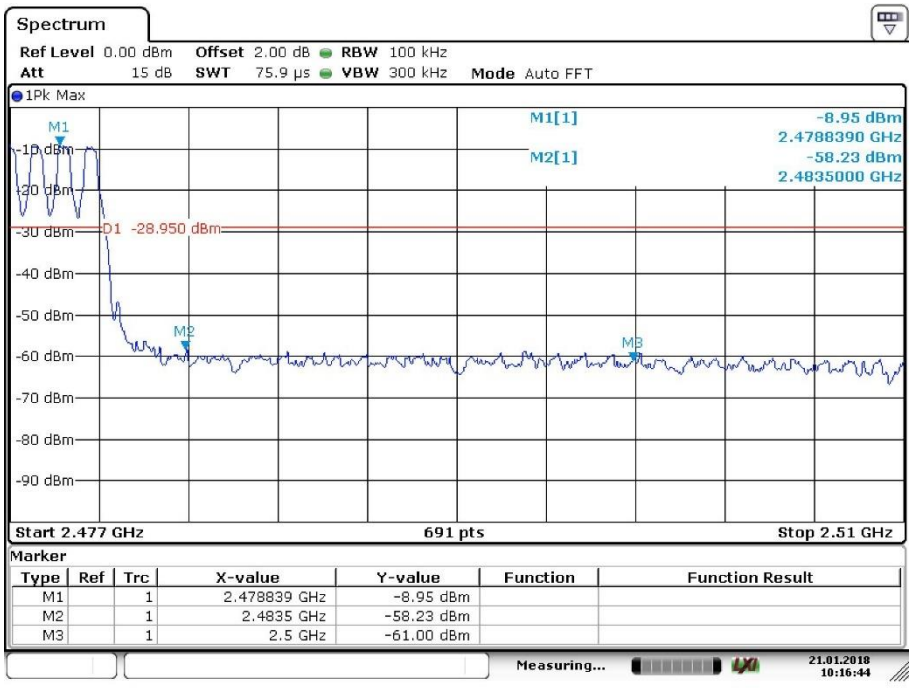
**Limit:**

## Band edge testing

GFSK Modulation Test Result:
Hopping on mode:

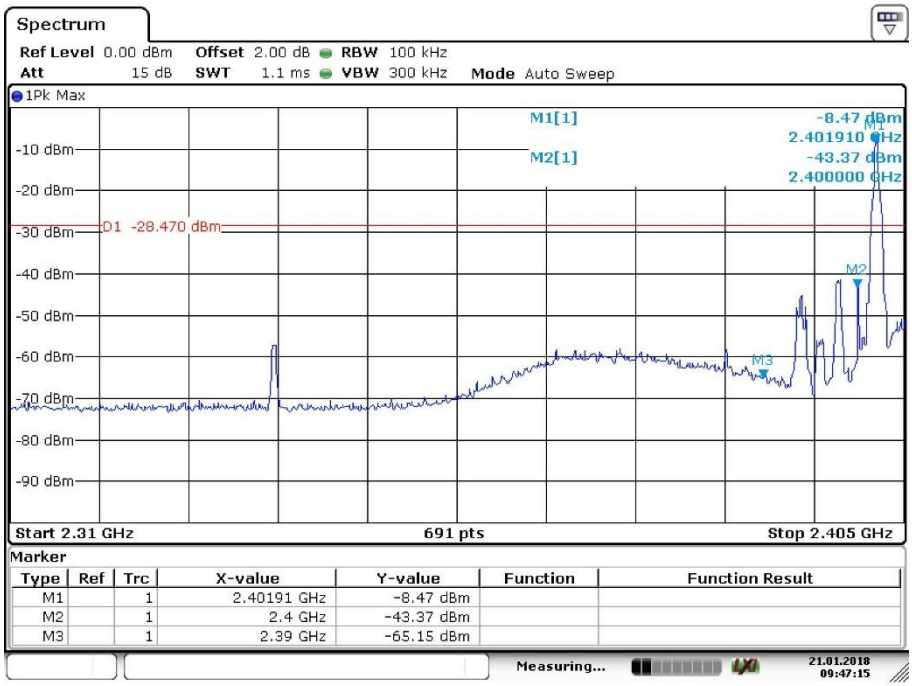



Date: 21.JAN.2018 10:13:35

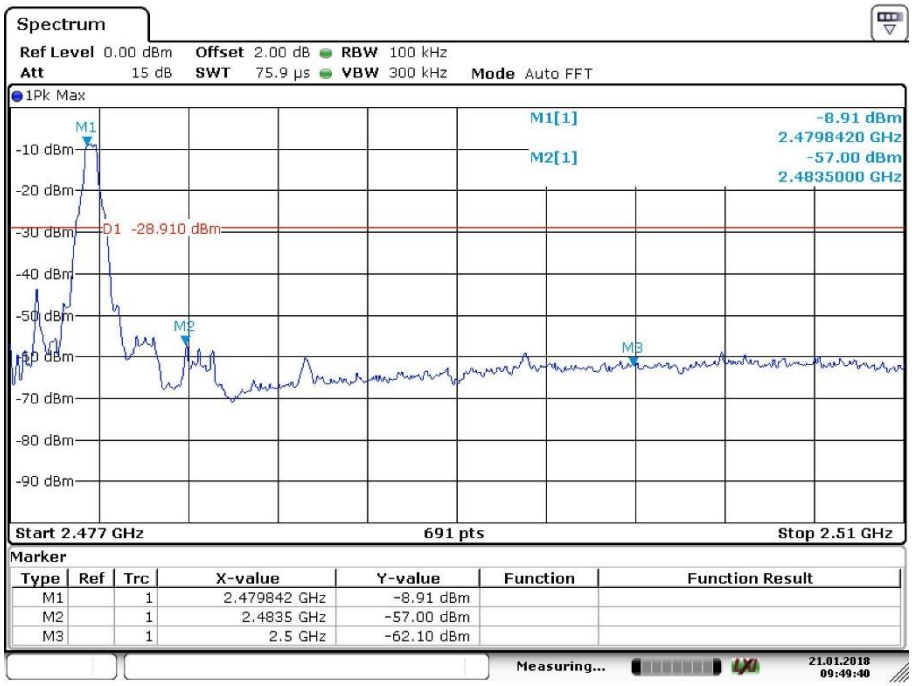



Date: 21.JAN.2018 10:16:45

Hopping off mode:

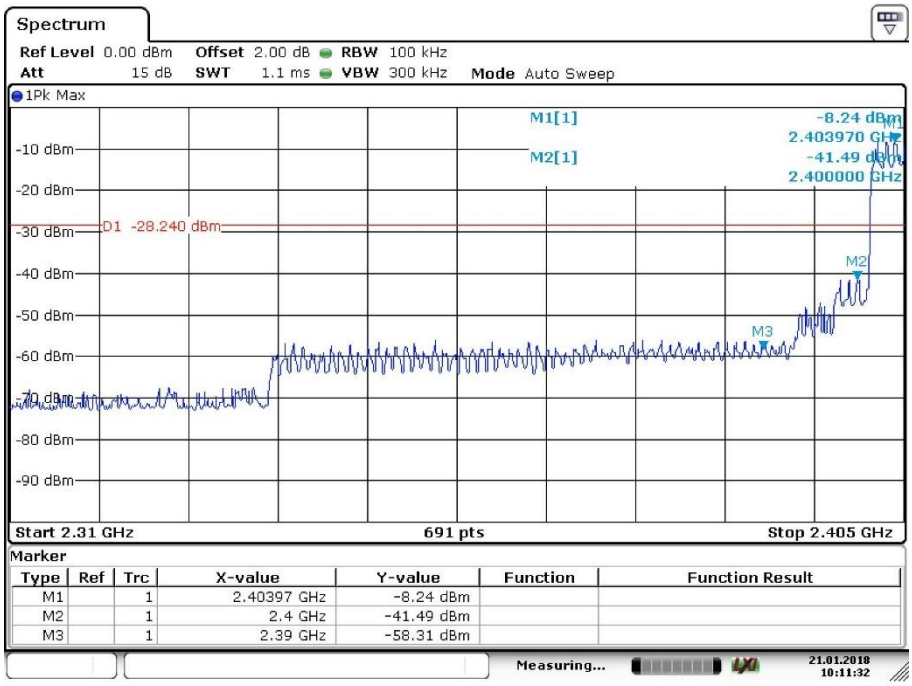



Date: 21.JAN.2018 09:47:15

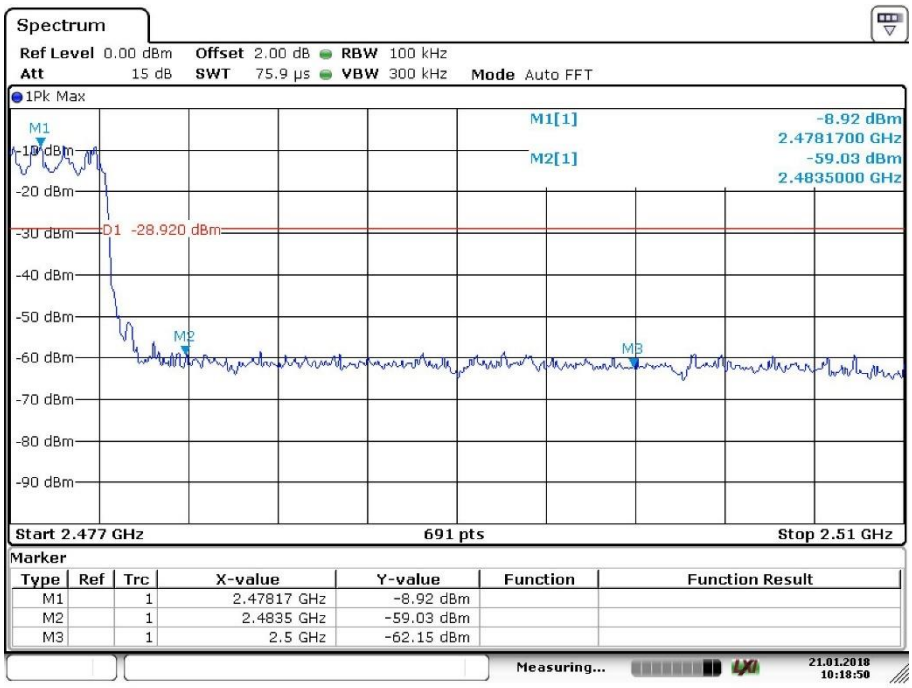



Date: 21.JAN.2018 09:49:40

π/4-DQPSK Modulation Test Result:
Hopping on mode:

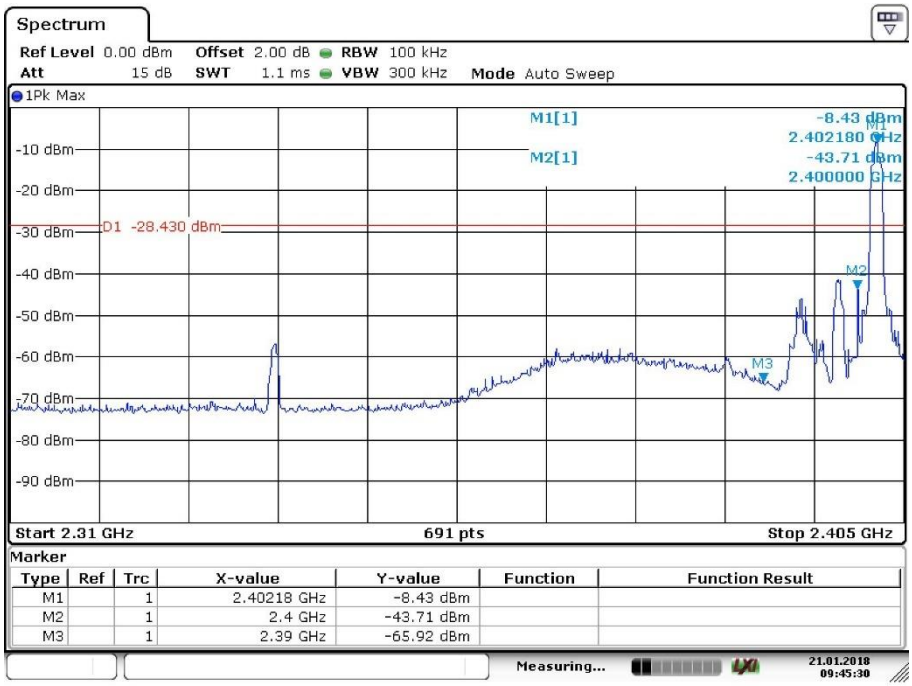



Date: 21.JAN.2018 10:11:32

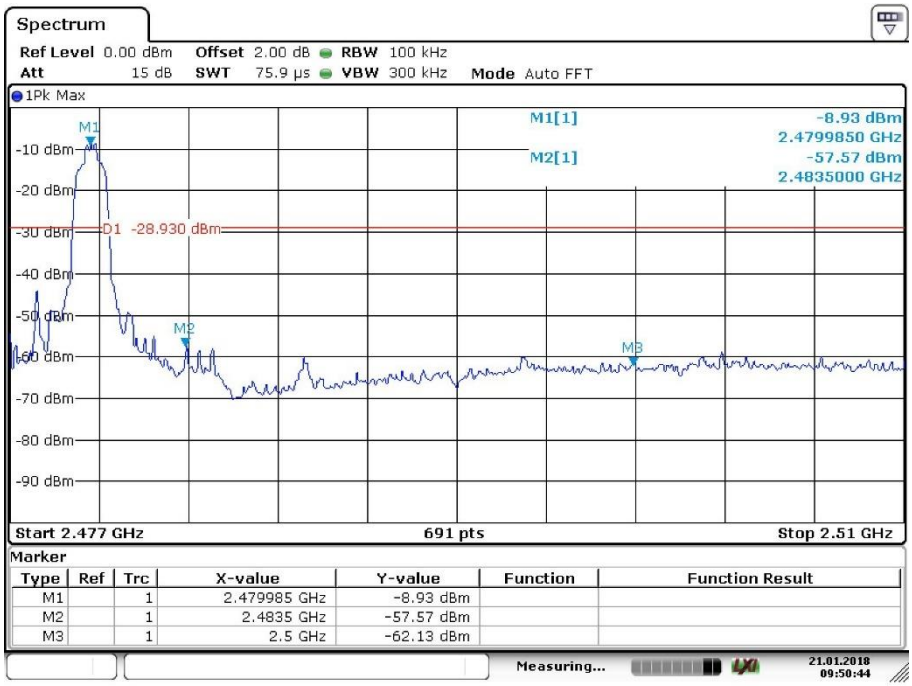



Date: 21.JAN.2018 10:18:50

Hopping off mode:




Date: 21.JAN.2018 09:45:30




Date: 21.JAN.2018 09:50:44

## 9.9 Spurious radiated emissions for transmitter and receiver

**Test Method**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
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 ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ 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. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

**Limit**

The radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

| Frequency MHz | Field Strength uV/m | Field Strength dBµV/m | Detector |
|---|---|---|---|
| 30-88 | 100 | 40 | QP |
| 88-216 | 150 | 43.5 | QP |
| 216-960 | 200 | 46 | QP |
| 960-1000 | 500 | 54 | QP |
| Above 1000 | 500 | 54 | AV |
| Above 1000 | 5000 | 74 | PK |

## Spurious radiated emissions for transmitter and receiver

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

**Transmitting spurious emission test result as below:**

Bluetooth Mode GFSK Modulation 2402MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| 767.97 | 43.68 | H | 46.00 | PK | 2.32 | Pass |
| 4800.00 | 45.25 | V | 74.00 | PK | 28.75 | Pass |

Bluetooth Mode GFSK Modulation 2441MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| 4877.81 | 48.65 | H | 74.00 | PK | 25.35 | Pass |
| 4877.81 | 45.14 | V | 74.00 | PK | 28.86 | Pass |

Bluetooth Mode GFSK Modulation 2480MHz Test Result

| Frequency | Emission Level | Polarization | Limit | Detector | Margin | Result |
|---|---|---|---|---|---|---|
| MHz | dBuV/m | | dBµV/m | | dBuV/m | |
| 4955.65 | 45.79 | H | 74.00 | PK | 28.21 | Pass |
| 4955.62 | 44.48 | V | 74.00 | PK | 29.52 | Pass |

Remark:

(1) AV Emission Level= PK Emission Level+20log(dutycycle)
(2) Data of measurement within this frequency range shown "-" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

# 10 Test Equipment List

**List of Test Instruments**

| | DESCRIPTION | MANUFACTURER | MODEL NO. | SERIAL NO. | CAL. DUE DATE |
|---|---|---|---|---|---|
| CE | EMI Test Receiver | Rohde & Schwarz | ESR 3 | 101782 | 2018-7-14 |
| | LISN | Rohde & Schwarz | ENV4200 | 100249 | 2018-7-17 |
| | LISN | Rohde & Schwarz | ENV216 | 100326 | 2018-7-14 |
| | ISN | Rohde & Schwarz | ENY81 | 100177 | 2018-7-14 |
| | ISN | Rohde & Schwarz | ENY81-CAT6 | 101664 | 2018-7-14 |
| | High Voltage Proble | Rohde & Schwarz | TK9420(VT9420) | 9420-58 | 2018-7-14 |
| | RF Current probe | Rohde & Schwarz | EZ-17 | 100816 | 2018-7-14 |
| C | Signal Generator | Rohde & Schwarz | SMB100A | 108272 | 2018-7-7 |
| | Signal Analyzer | Rohde & Schwarz | FSV40 | 101030 | 2018-7-7 |
| | Vector Signal Generator | Rohde & Schwarz | SMU 200A | 105324 | 2018-7-7 |
| | RF Switch Module | Rohde & Schwarz | OSP120/OSP-B157 | 101226/100851 | 2018-7-7 |
| RE | EMI Test Receiver | Rohde & Schwarz | ESR 26 | 101269 | 2018-7-14 |
| | Trilog Super Broadband Test Antenna | Schwarzbeck | VULB 9163 | 707 | 2018-7-14 |
| | Horn Antenna | Rohde & Schwarz | HF907 | 102294 | 2018-7-14 |
| | Pre-amplifier | Rohde & Schwarz | SCU 18 | 102230 | 2018-7-14 |
| | 3m Semi-anechoic chamber | TDK | 9X6X6 | ---- | 2019-5-29 |

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth
- 20dB bandwidth and 99% Occupied Bandwidth
- Carrier frequency separation
- Number of hopping frequencies
- Dwell Time
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

# 11 System Measurement Uncertainty

**For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:**

| System Measurement Uncertainty | |
|---|---|
| Test Items | Extended Uncertainty |
| Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz | Horizontal: 4.83dB;<br>Vertical: 4.91dB; |
| Uncertainty for Radiated Emission in 3m chamber 1000MHz-25000MHz | Horizontal: 4.89dB;<br>Vertical: 4.88dB; |
| Uncertainty for Conducted Emission 9kHz-150KHz | 3.88dB |