FCC - TEST REPORT

Report Number	:	**64.790.19.03268.01**	Date of Issue:	2019-09-26

Model	:	BE-X7, BE-818, BE-36, BE-32
Product Type	:	Bluetooth earphones
Trade Mark	:	MINISO
Applicant	:	DONGGUAN HAOYE ELECTRONIC CO.,LTD
License holder	:	DONGGUAN HAOYE ELECTRONIC CO.,LTD
Address	:	No.1 Getian Road, Zengtian Industrial Park, Chang'an, Dongguan, Guangdong , China.

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	52

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch is a subcontractor to TÜV SÜD Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch issued reports.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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 Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	514049
IC Registration Number:	10320A
Telephone:	86 755 8828 6998
Fax:	86 755 828 5299

3 Description of the Equipment Under Test

Product: Bluetooth earphones

Model no.: BE-X7, BE-818, BE-36, BE-32

FCC ID: 2ATQN-BE08

Rating: DC 3.7V (Battery), DC 5V (For USB Charging)

RF Transmission Frequency: 2402MHz to 2480MHz

Modulation: GFSK, π/4-DQPSK, 8DPSK

Antenna Type: PCB Antenna

Channel No:79

Antenna Gain: 1dBi

Description of the EUT: The EUT is a Wireless Earphones which can play music by connecting Bluetooth.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2018 Edition	PART 15 - RADIO FREQUENCY DEVICES 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) and KDB558074 D01 v05r02 DTS Measurement Guidance.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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	10-11	Site 1	Not Applicable
§15.247(b)(1)	Conducted peak output power	12-17	Site 1	Pass
§15.247(a)(2)	6dB bandwidth	---	---	N/A
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	18-27	Site 1	Pass
§15.247(a)(1)	Carrier frequency separation	28-30	Site 1	Pass
§15.247(a)(1)(iii)	Number of hopping frequencies	31-32	Site 1	Pass
§15.247(a)(1)(iii)	Dwell Time	33-35	Site 1	Pass
§15.247(e)	Power spectral density*	---	---	N/A
§15.247(d)	Spurious RF conducted emissions	36-39	Site 1	Pass
§15.247(d)	Band edge	40-46	Site 1	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter	47-48	Site 1	Pass
§15.203	Antenna requirement	See note 2		Pass

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ATQN-BE08, complies with Section 15.209, 15.247 of the FCC Part 15, Subpart C Rules.
All models use the same circuit diagram and PCB layout, different in appearance. Considering the differences, BE-X7 was selected for final tests only.

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: 2019-07-22

Testing Start Date: 2019-07-24

Testing End Date: 2019-08-02

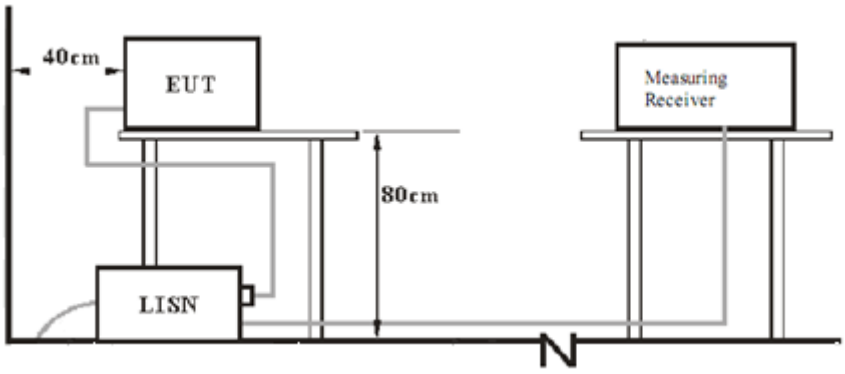
- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

Reviewed by:	Prepared by:	Tested by:
Reviewer: Tony Liu	Project engineer: Lance Lin	Test engineer: Louise Liu

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

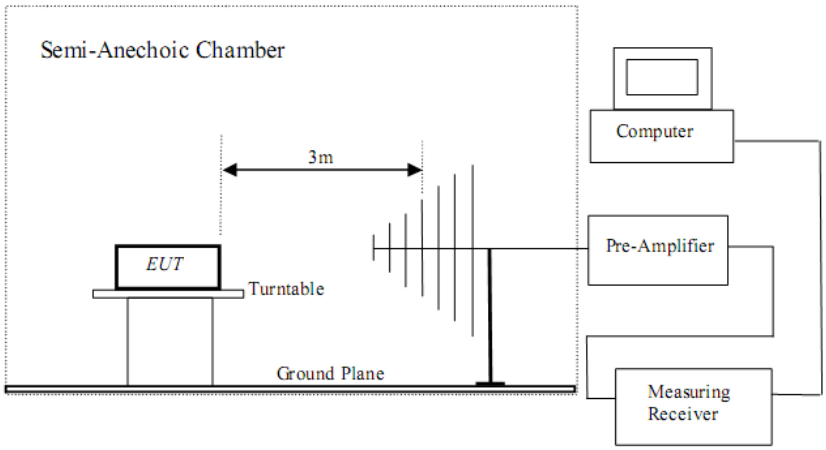
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

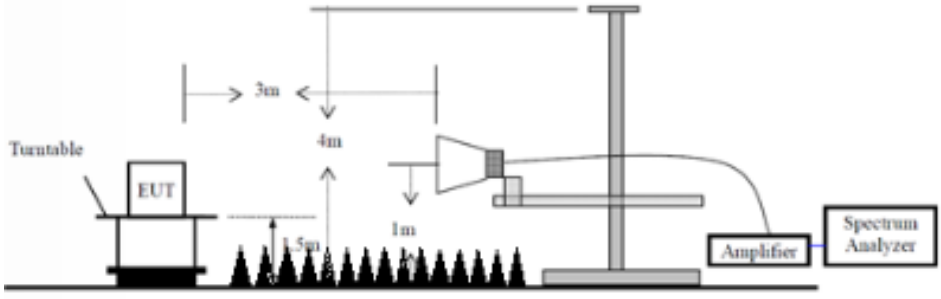


7.2 Radiated test setups

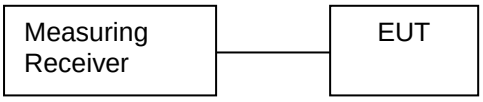
Below 1GHz



Above 1GHz



7.3 Conducted RF test setups



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
N/A	N/A	N/A	---

Test software: BK32XX RF Test V1.5, which used to control the EUT in continues transmitting mode

The system was configured to hopping mode.

Hopping mode: typical working mode (normal hopping status)

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Conducted Emission

Not Applicable

Remark: In charging mode, EUT will disconnect Bluetooth function.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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 MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

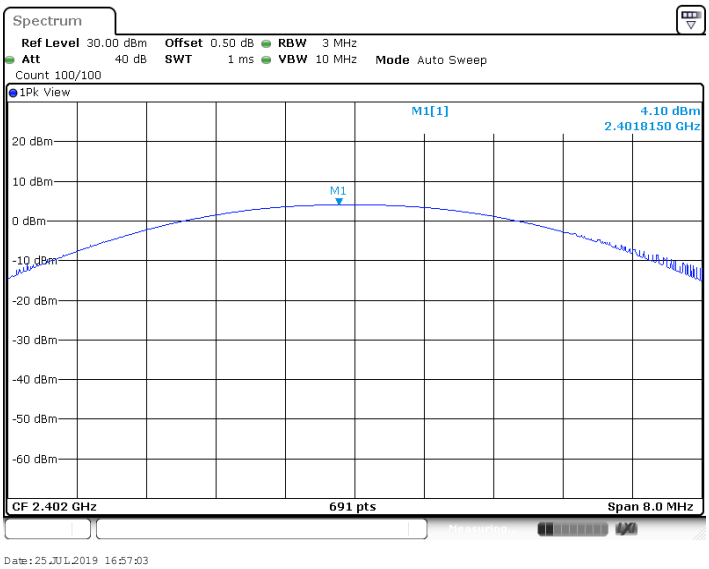
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Conducted peak output power

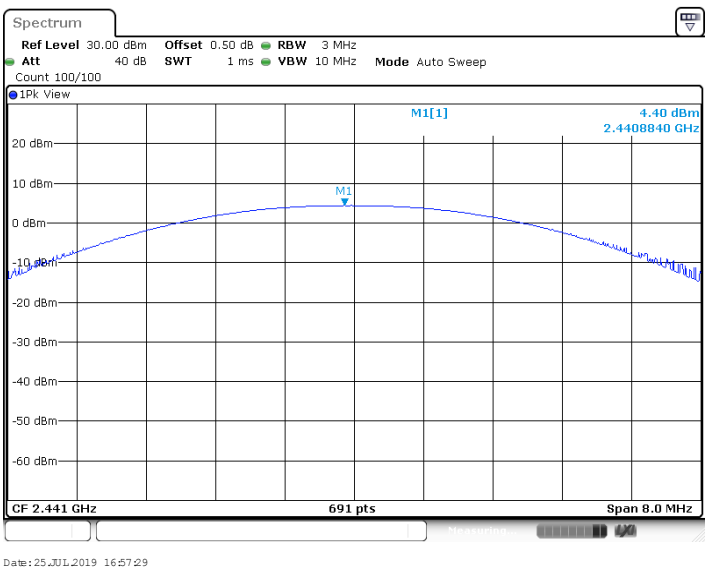
Bluetooth Mode GFSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	4.10	Pass
Middle channel 2441MHz	4.40	Pass
High channel 2480MHz	4.16	Pass

2402MHz

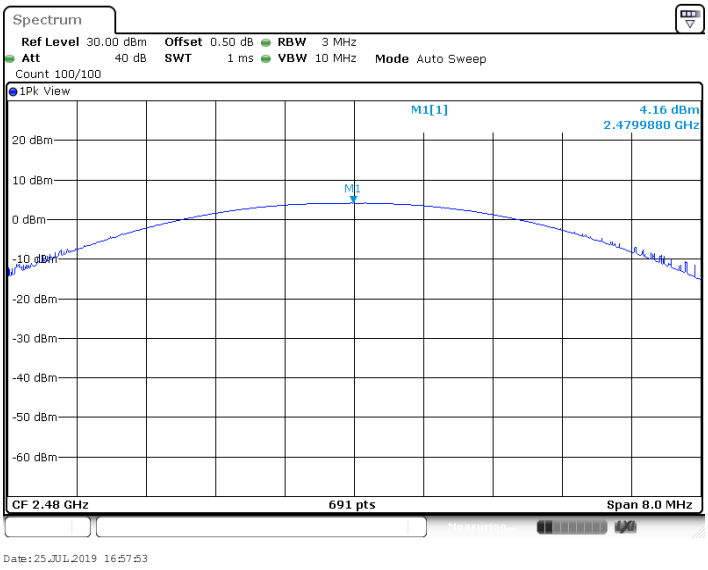


2441MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

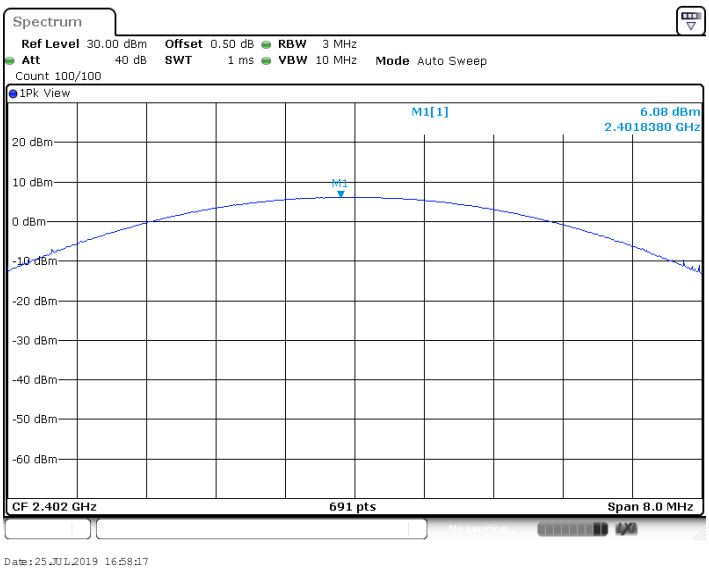
2480MHz



Bluetooth Mode π/4-DQPSK modulation Test Result

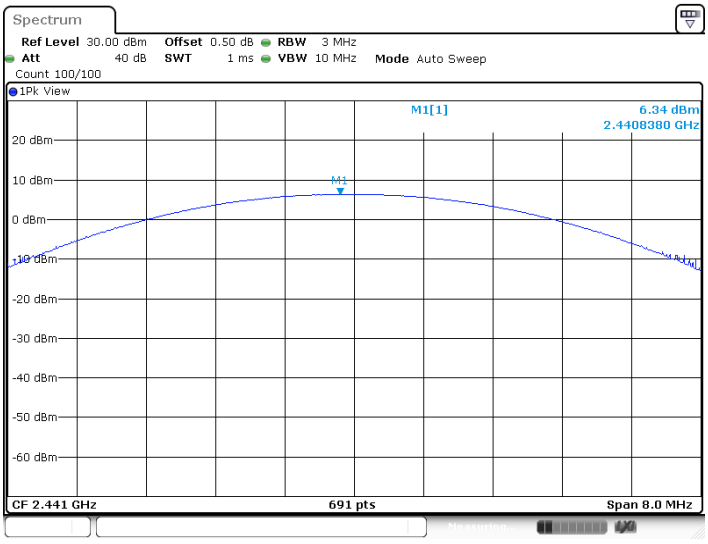
Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	6.08	Pass
Middle channel 2441MHz	6.34	Pass
High channel 2480MHz	6.13	Pass

2402MHz



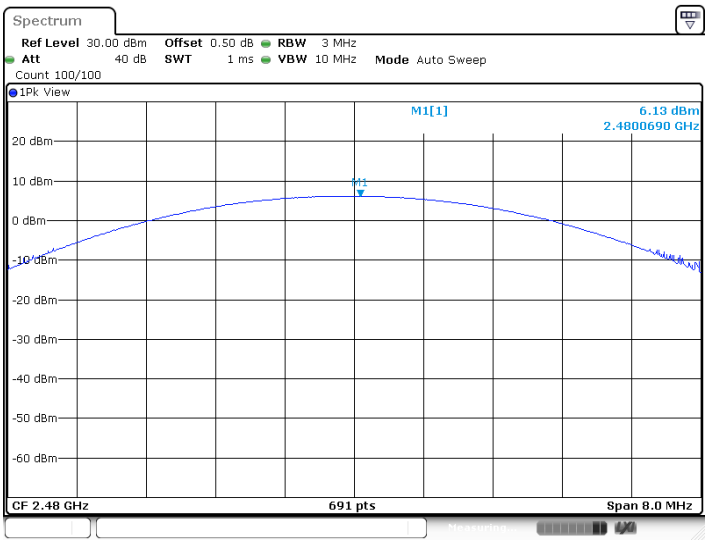
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2441MHz



Date:25.JUL.2019 16:58:37

2480MHz



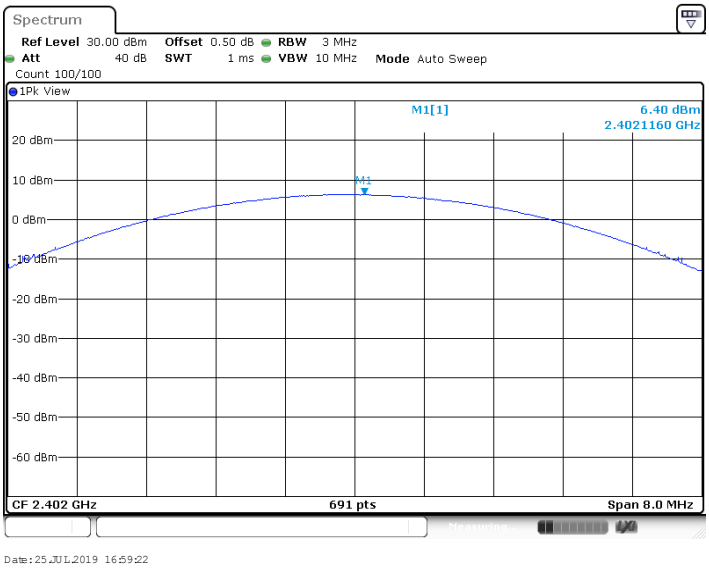
Date:25.JUL.2019 16:58:57

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

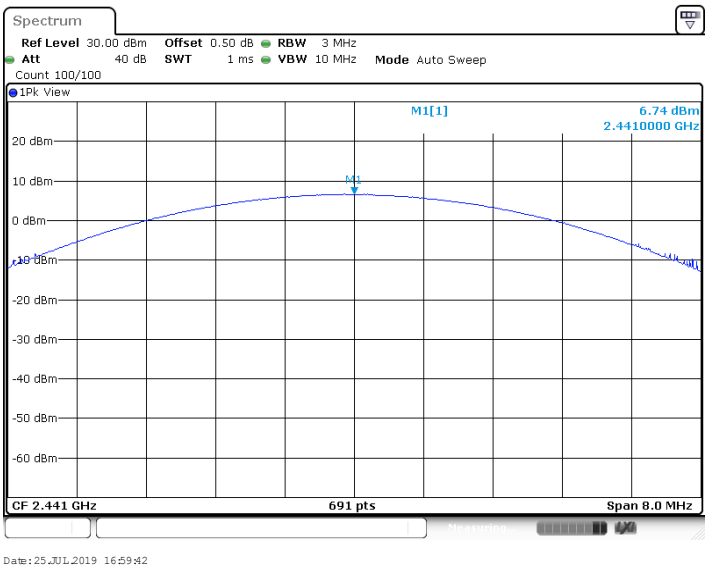
Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	6.4	Pass
Middle channel 2441MHz	6.74	Pass
High channel 2480MHz	6.49	Pass

2402MHz

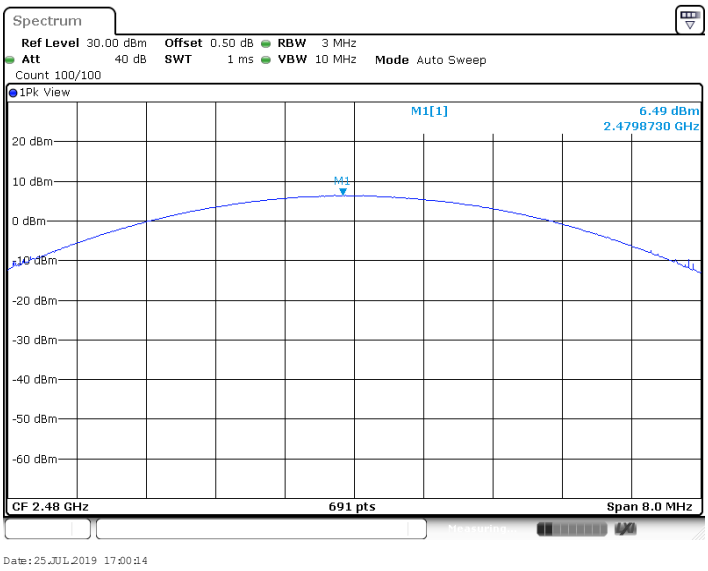


2441MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2480MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

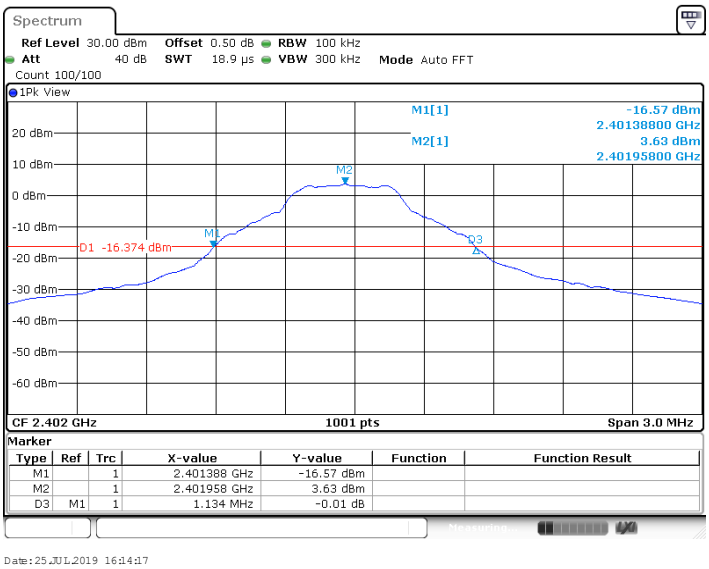
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

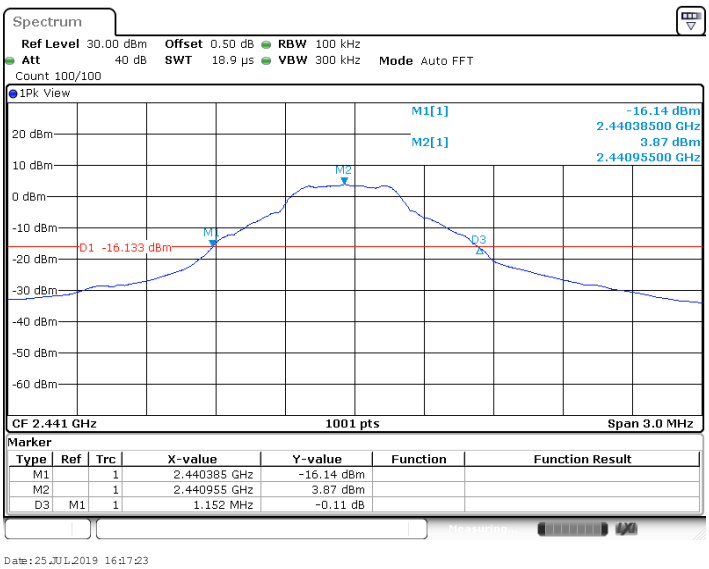
Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
2402	1134	914	--	Pass
2441	1152	911	--	Pass
2480	1140	914	--	Pass

20db Bandwidth

2402MHz

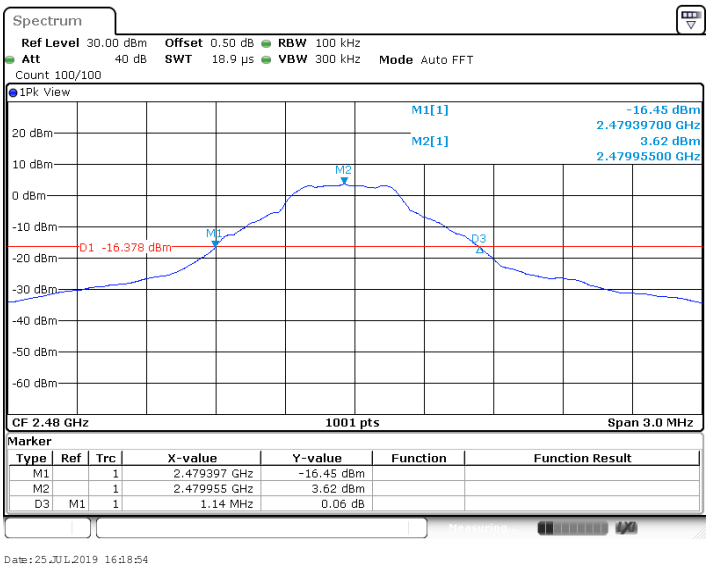


2441MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

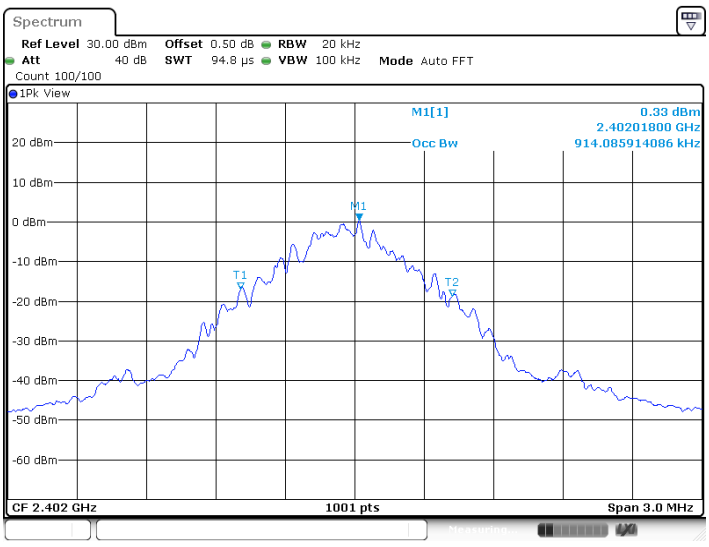
2480MHz



Date:25.JUL.2019 16:18:54

99% Bandwidth

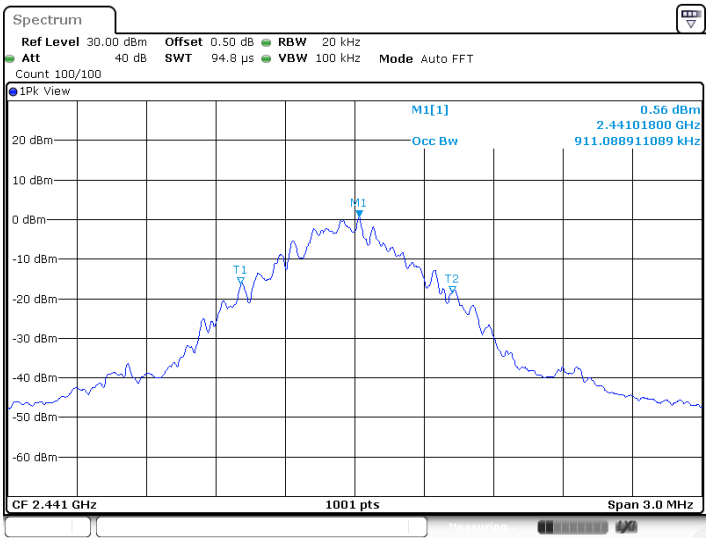
2402MHz



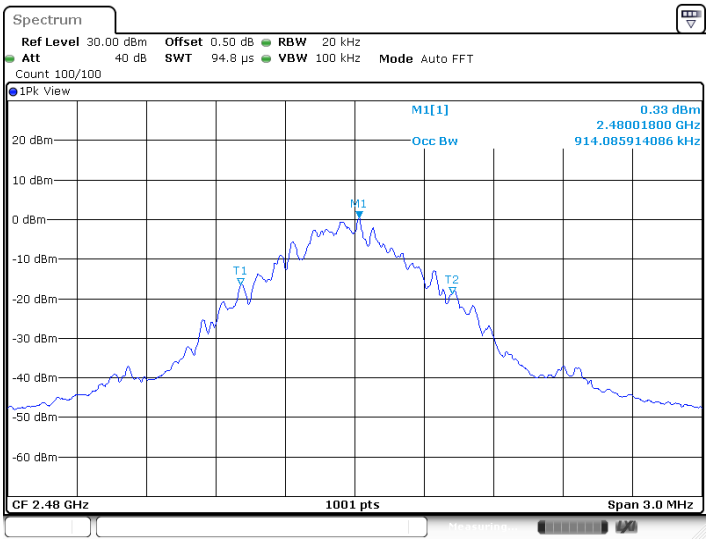
Date:25.JUL.2019 16:14:28

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2441MHz



2480MHz



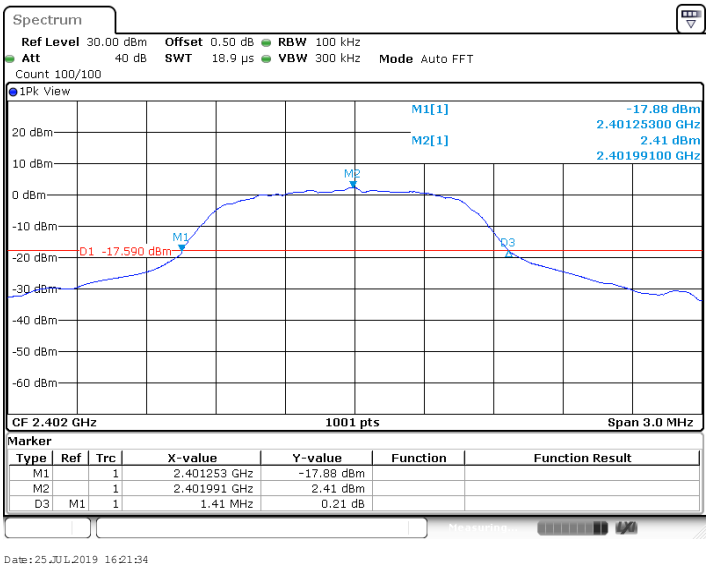
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Bluetooth Mode π/4-DQPSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	1410	1208	--	Pass
2441	1413	1208	--	Pass
2480	1413	1211	--	Pass

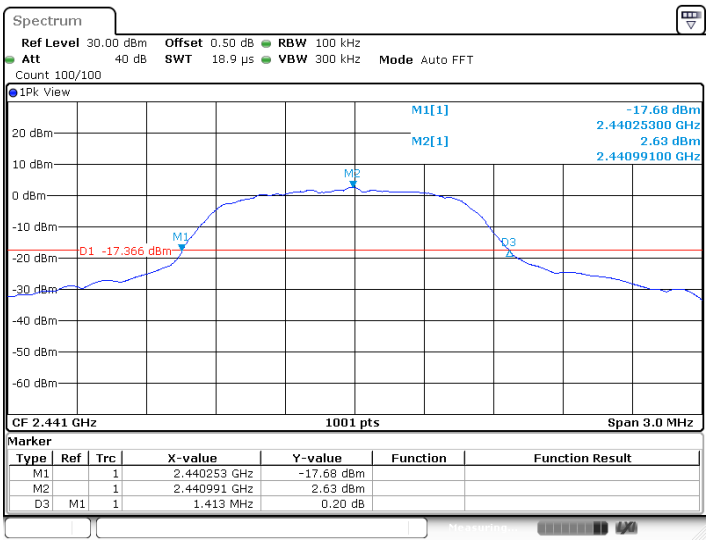
20db Bandwidth

2402MHz



Date: 25.JUL.2019 16:21:34

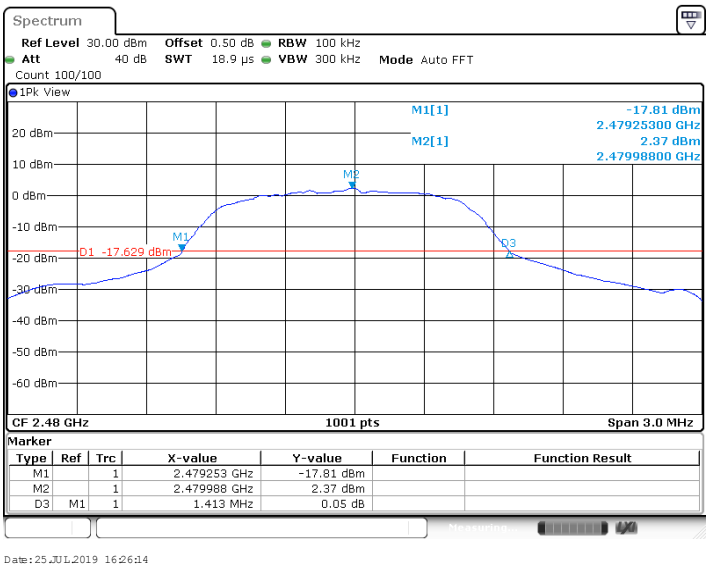
2441MHz



Date: 25.JUL.2019 16:24:30

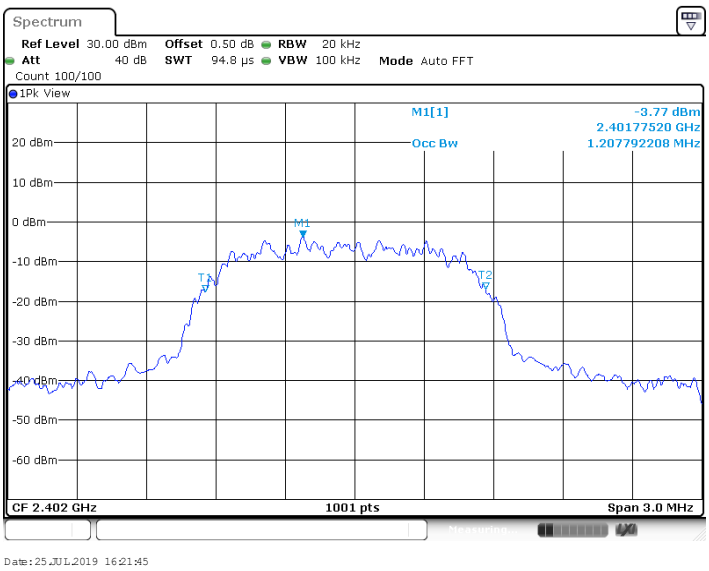
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2480MHz



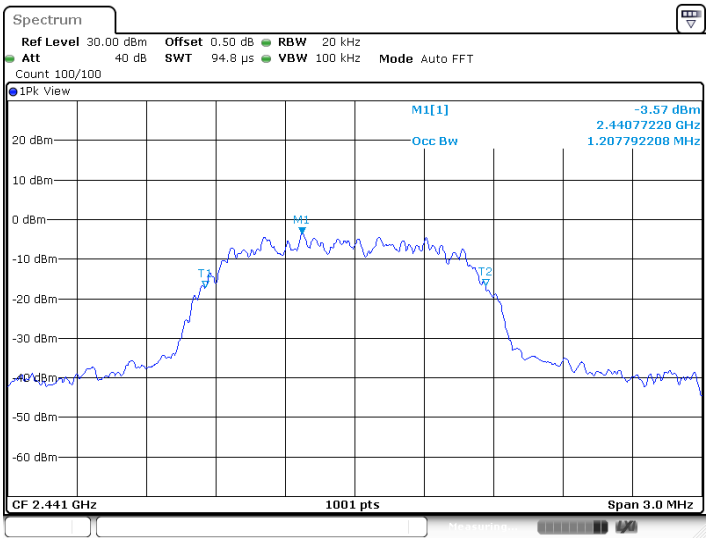
99% Bandwidth

2402MHz

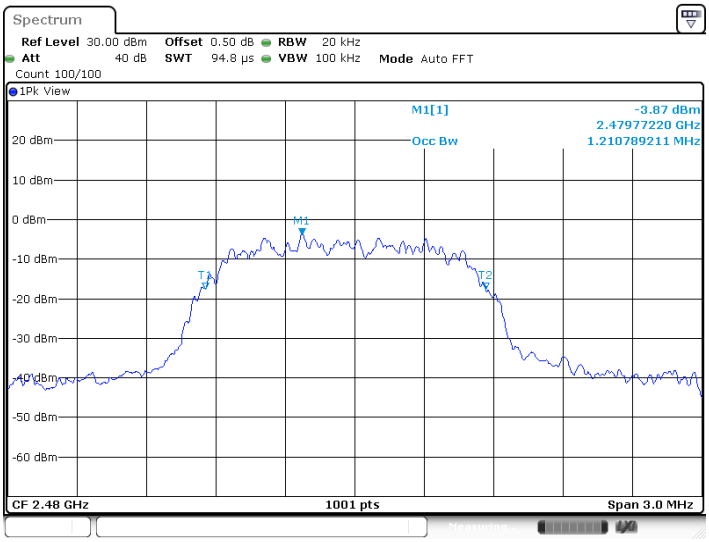


TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2441MHz



2480MHz



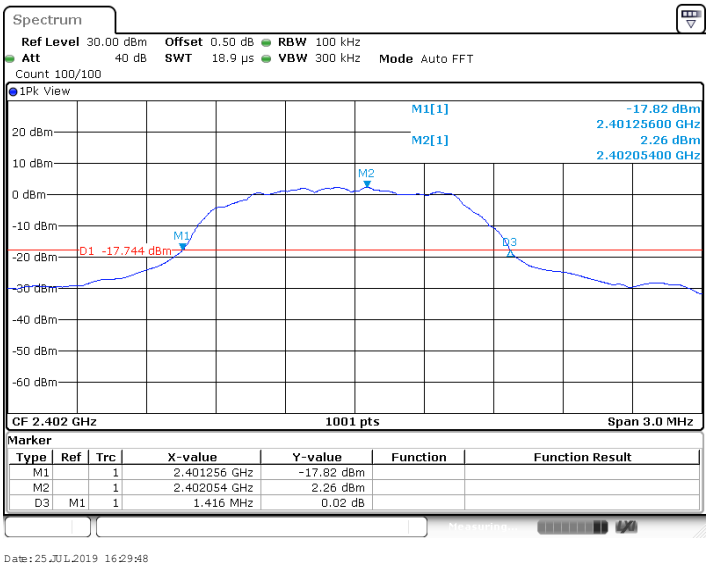
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Bluetooth Mode 8DPSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	1416	1211	--	Pass
2441	1422	1208	--	Pass
2480	1431	1214	--	Pass

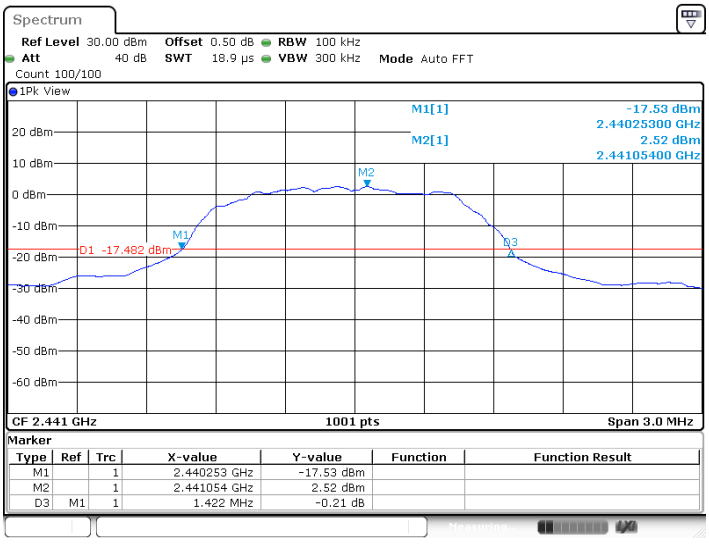
20db Bandwidth

2402MHz



Date: 25.JUL.2019 16:29:48

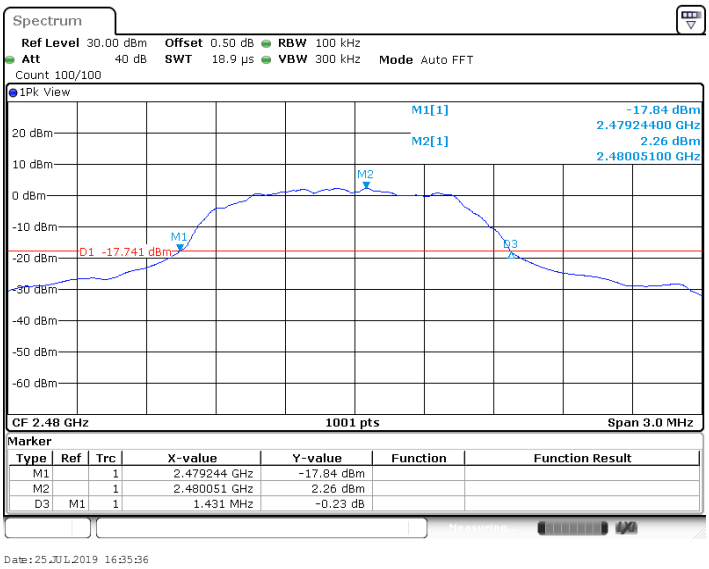
2441MHz



Date: 25.JUL.2019 16:32:32

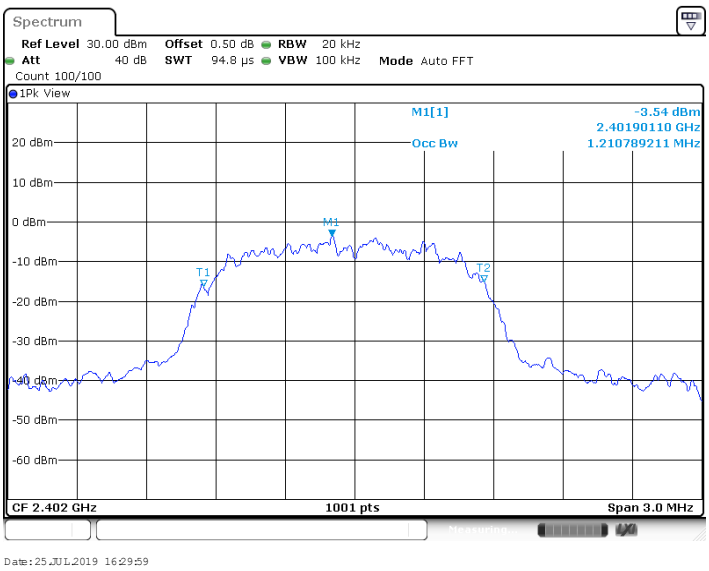
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2480MHz



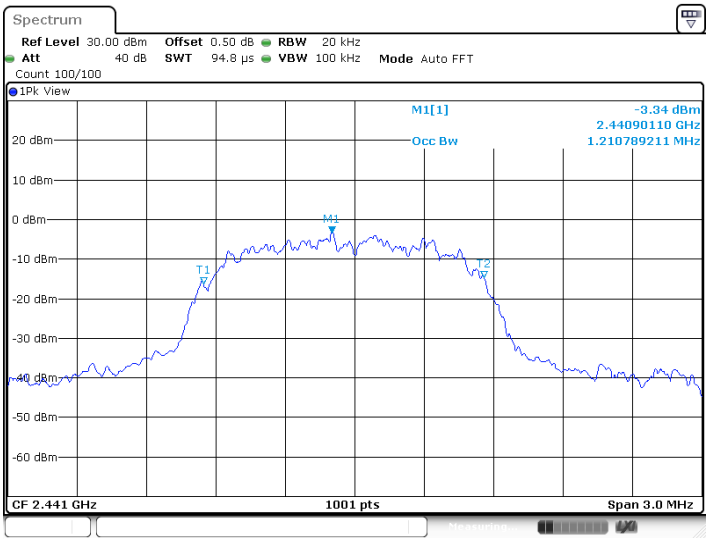
99% Bandwidth

2402MHz

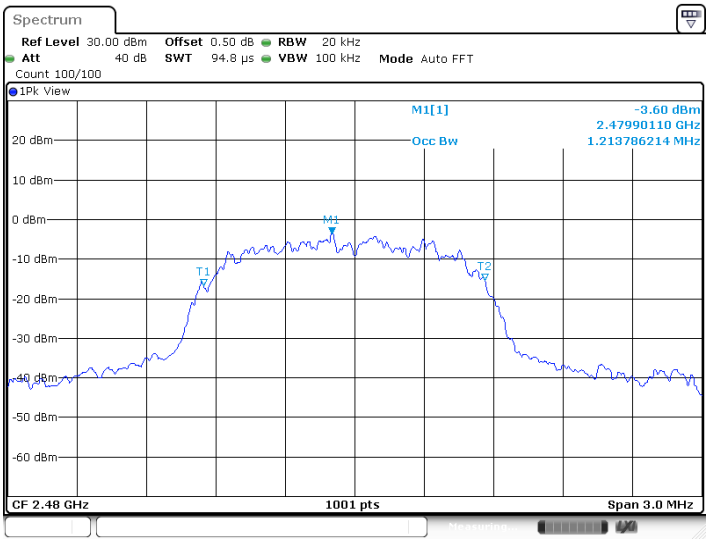


TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2441MHz



2480MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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 kHz
⩾25KHz or 2/3 of the 20 dB bandwidth which is greater

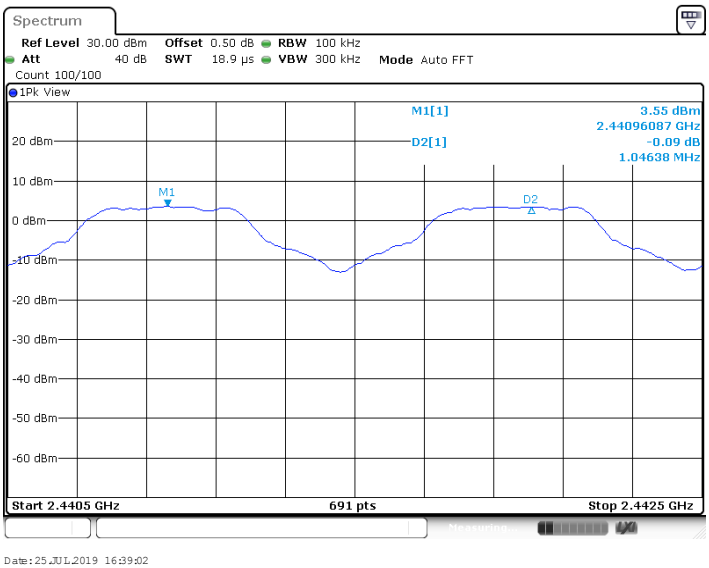
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Carrier Frequency Separation

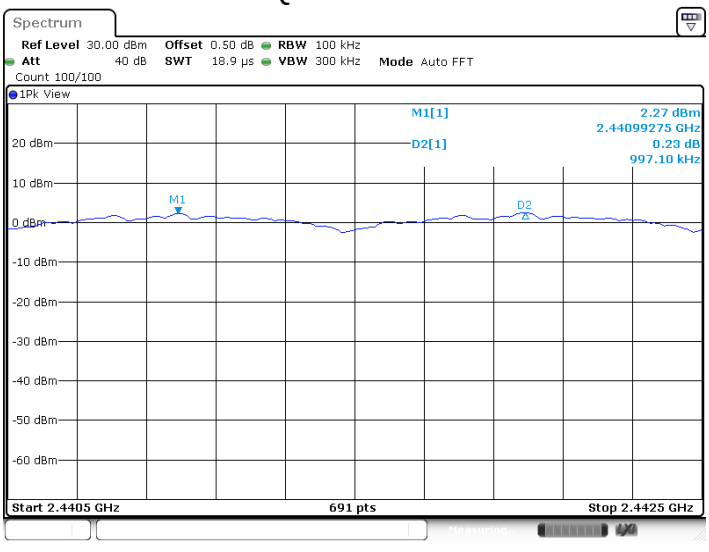
Test result: The measurement was performed with the typical configuration (normal hopping status).

Modulation	Carrier Frequency Separation kHz	Result
GFSK	1046	Pass
π/4-DQPSK	997	Pass
8DPSK	1000	Pass

GFSK Modulation

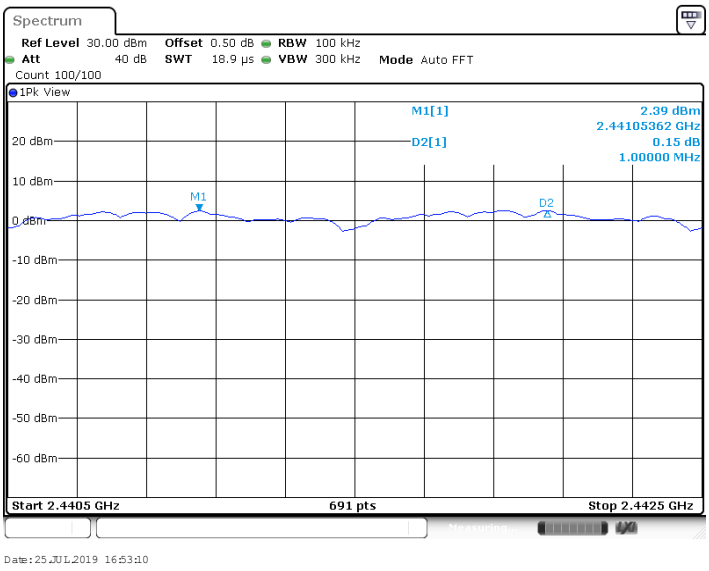


π/4-DQPSK Modulation



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

8DPSK Modulation



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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

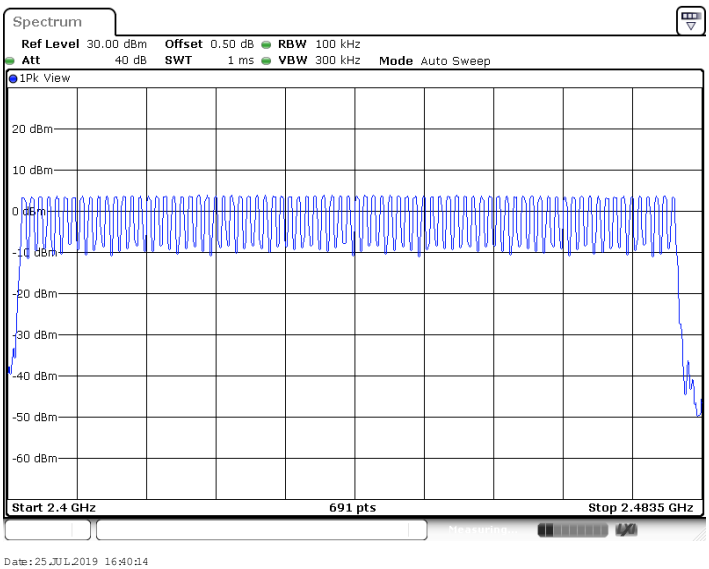
Limit number
⩾ 15

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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];

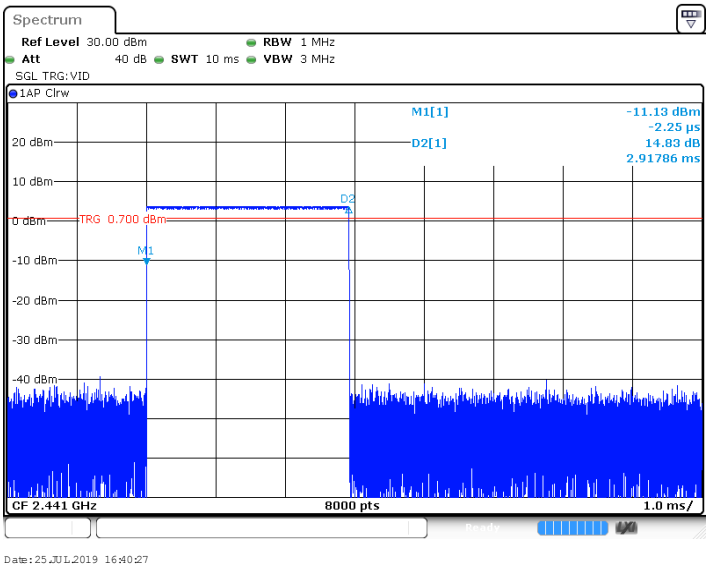
The burst width, which is directly measured, refers to the duration on one channel hop.

Test Result

Modulation	Mode	Reading (ms)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	2.92	110	321	< 400	Pass
π/4-DQPSK	2DH5	2.92	110	321	< 400	Pass
8DPSK	3DH5	2.91	110	320	< 400	Pass

GFSK Modulation

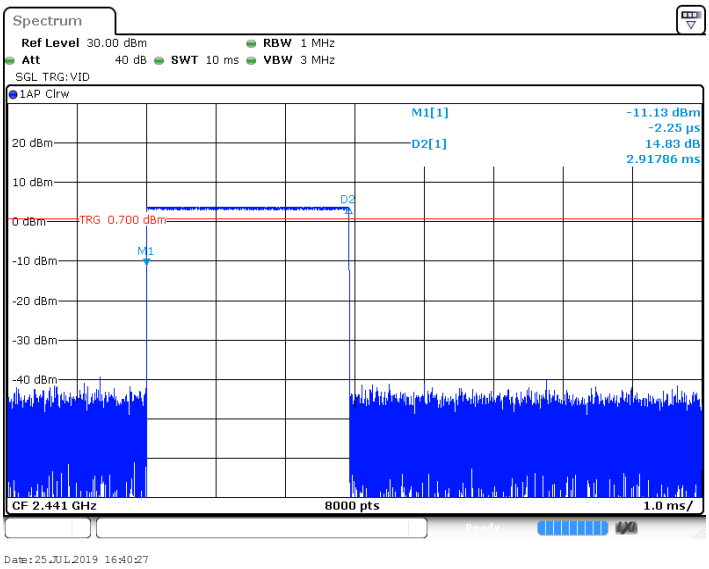
DH5



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

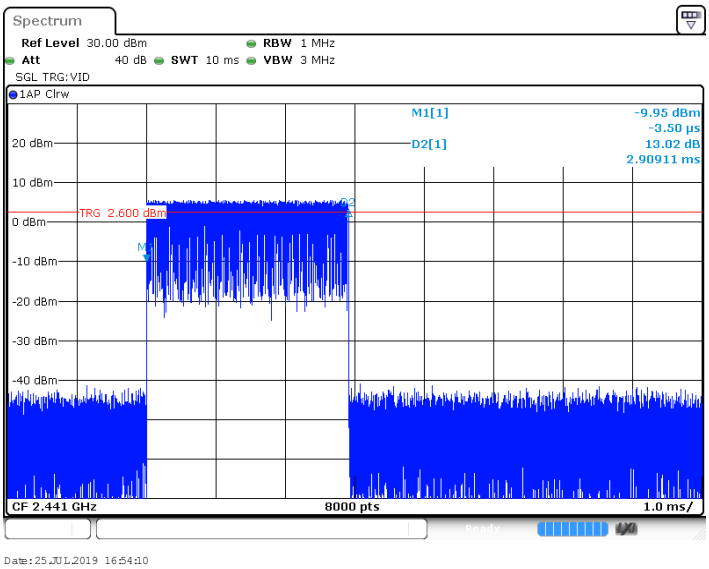
π/4-DQPSK Modulation

2DH5



8DPSK Modulation

3DH5



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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 10th 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

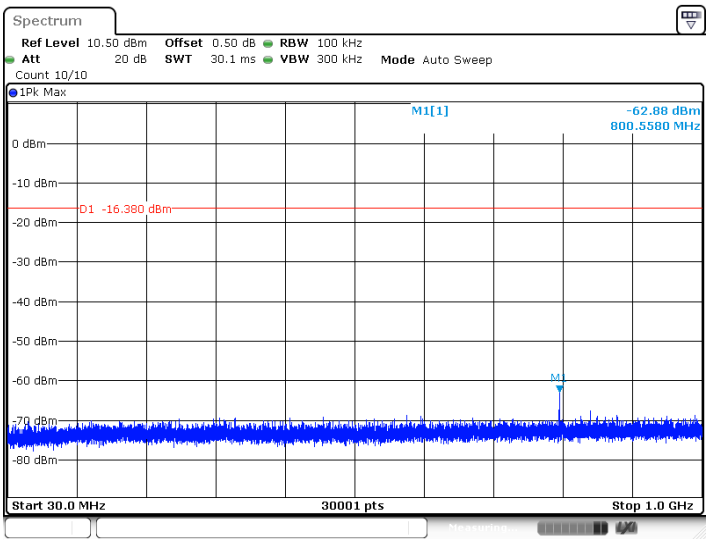
In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the 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) (see Section 15.205(c)).

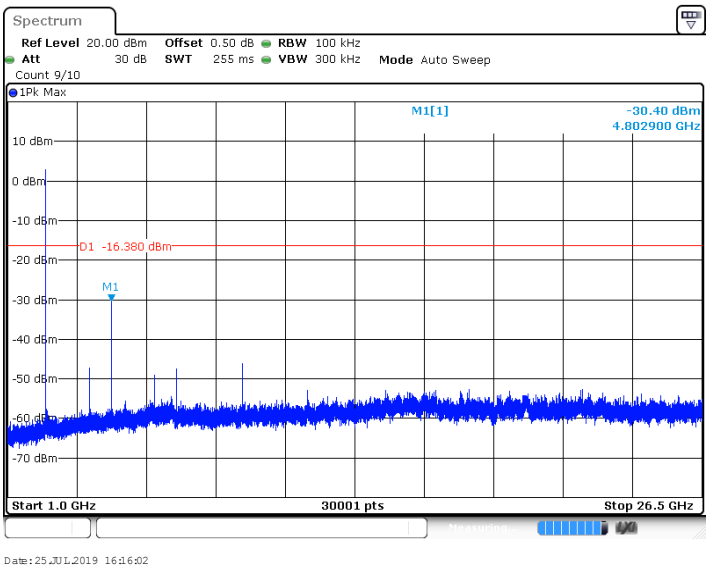
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Spurious RF conducted emissions

Only the worse case (which is subject to the maximum EIRP, 8DPSK mode) test result is listed in the report.

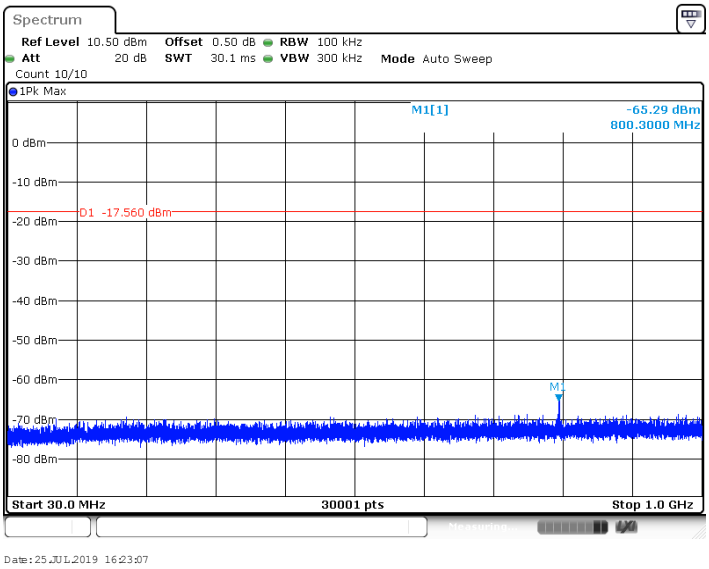
2402MHz

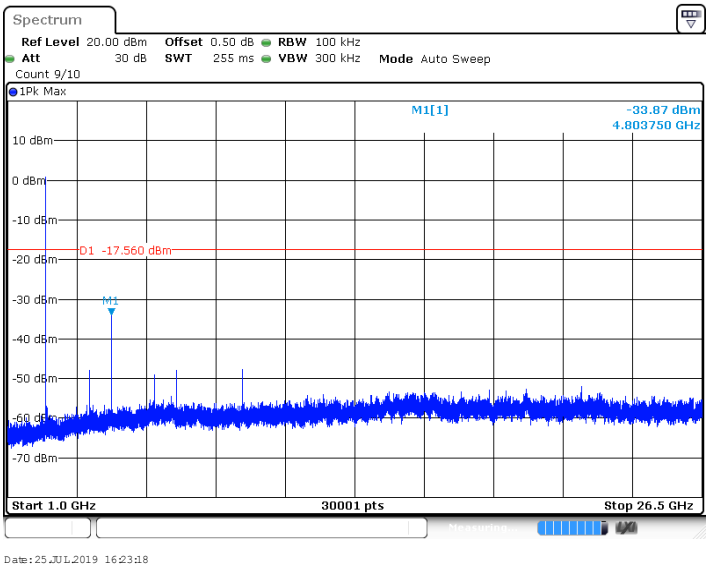




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

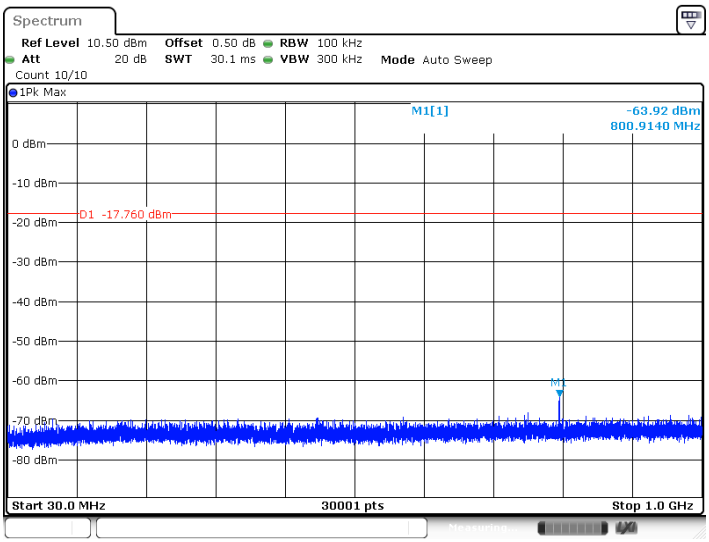
2441MHz

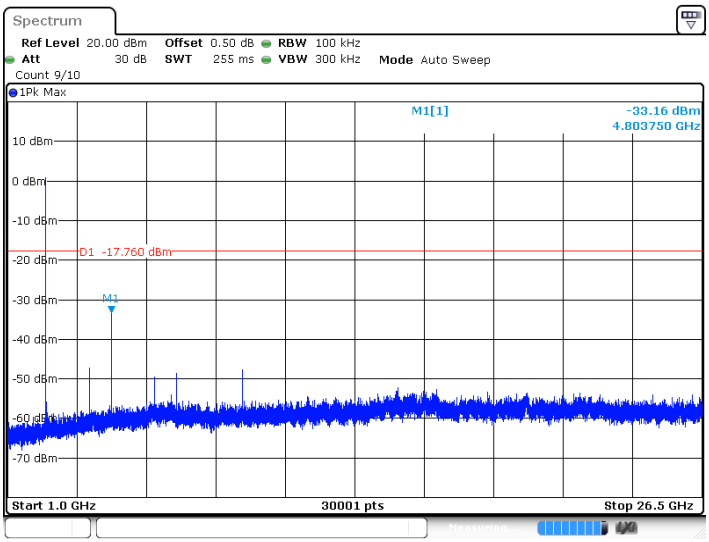




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2480MHz





TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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.

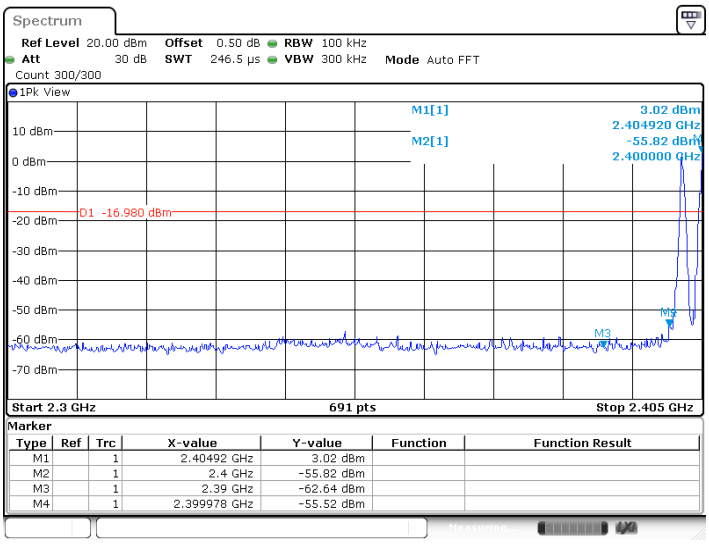
Limit:

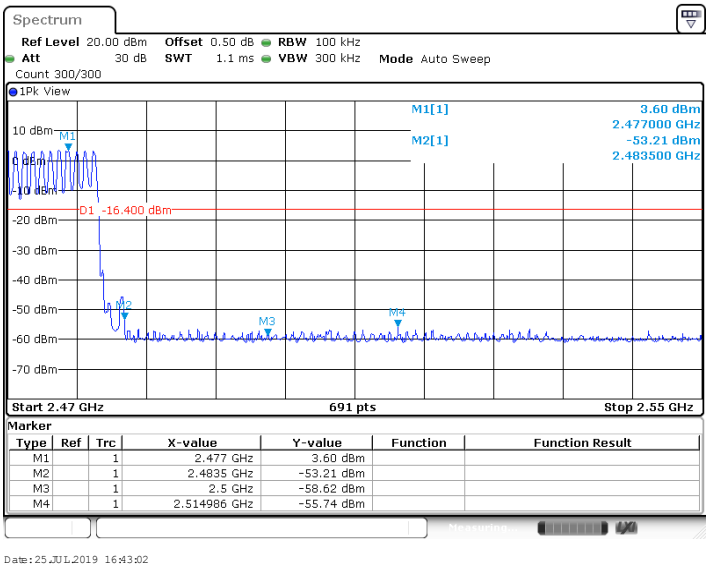
In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the 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) (see Section 15.205(c)).

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Band edge testing

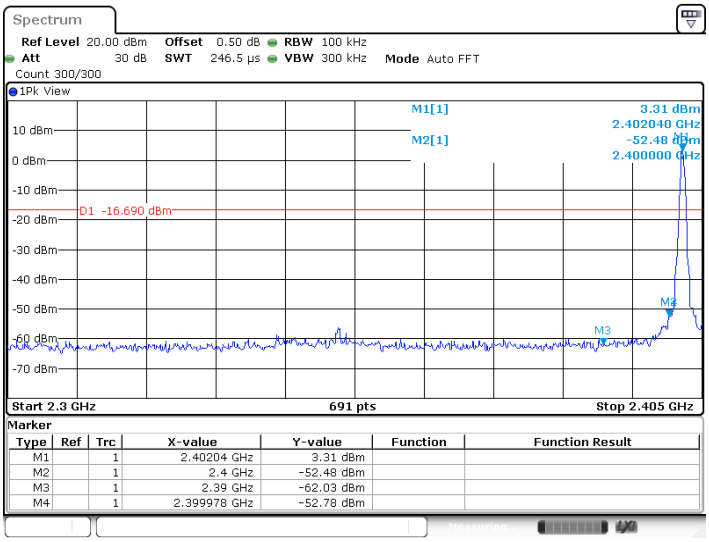
GFSK Modulation Test Result:
Hopping on mode:

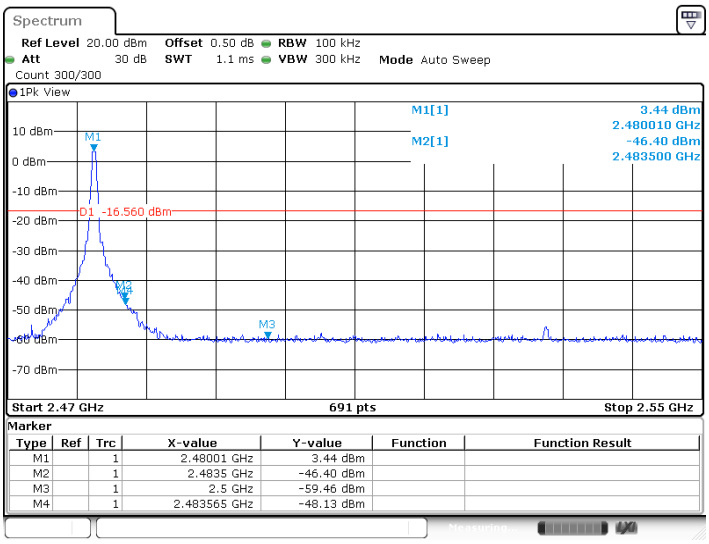




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

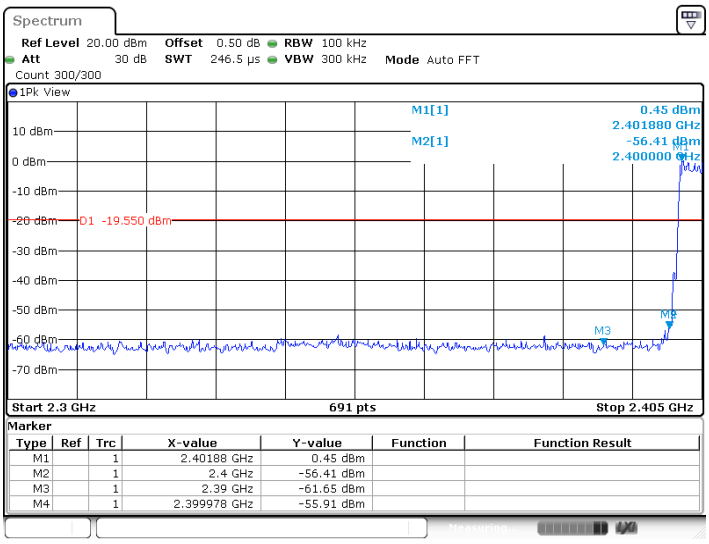
Hopping off mode:

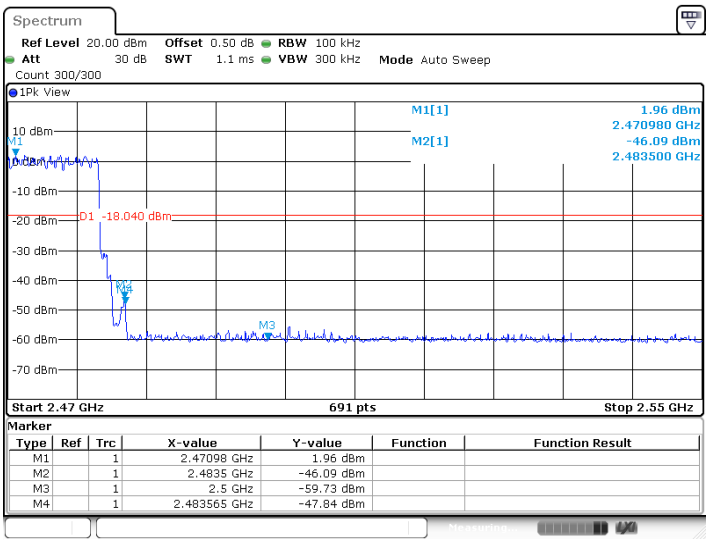




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

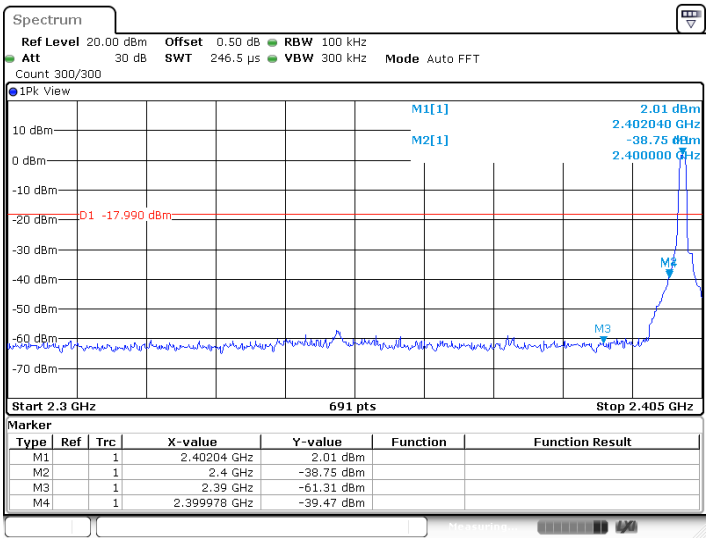
π/4-DQPSK Modulation Test Result:
Hopping on mode:

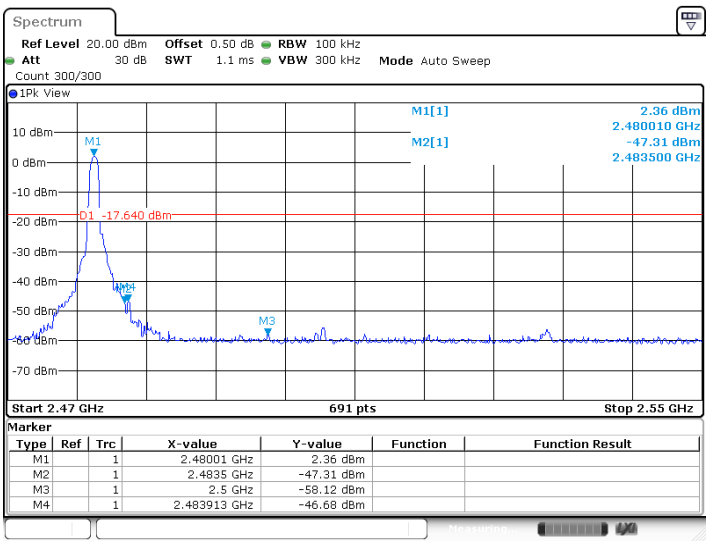




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

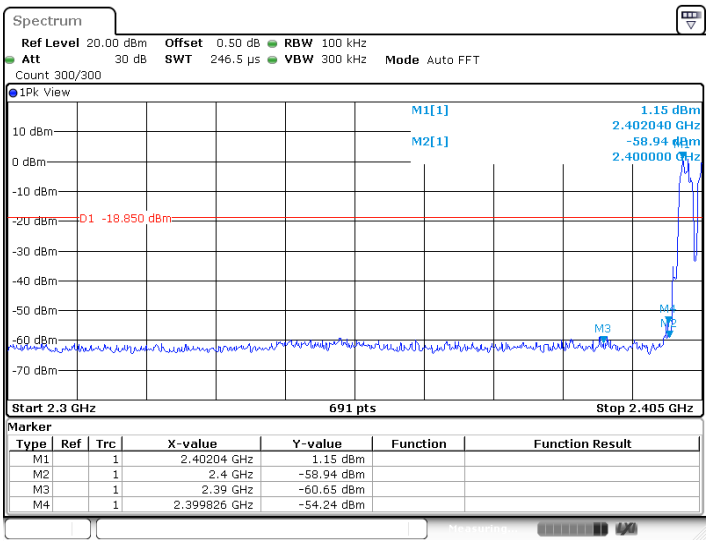
Hopping off mode:

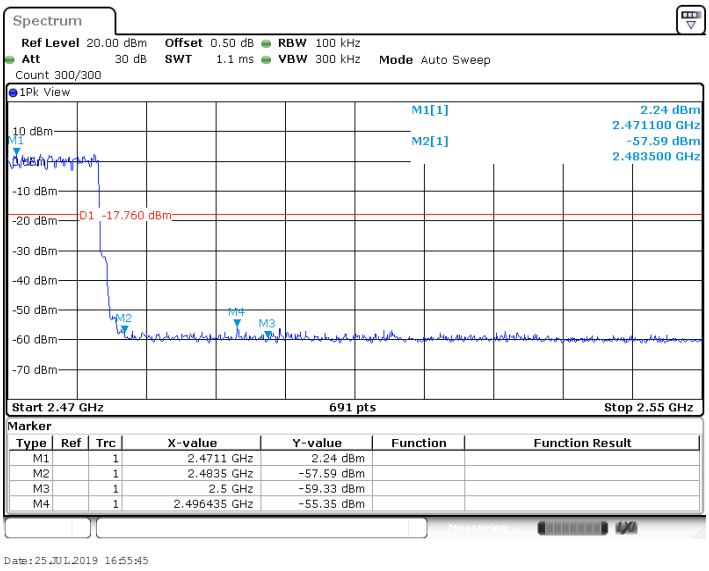




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

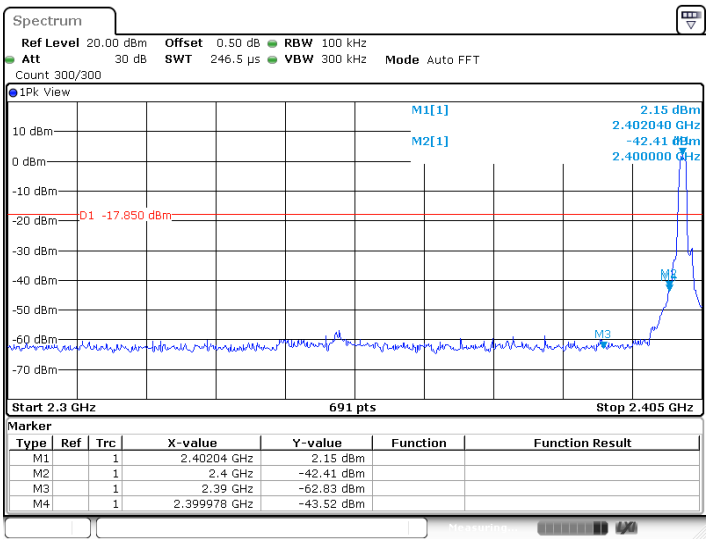
8DPSK Modulation Test Result:
Hopping on mode:

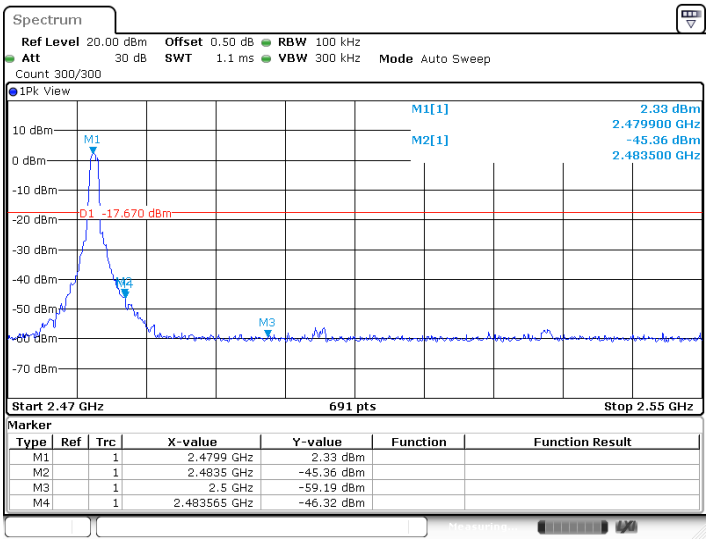




TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Hopping off mode:





TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.9 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.

3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

5: Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

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 to 120KHz, VBW≥RBW for peak measurement, Sweep = auto,
Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement ,Sweep = auto,
Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW=10Hz, Sweep = auto, Detector function = peak, Trace = max hold.
If the dwell time 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(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correct factor, derived from the appropriate the duty cycle calculation.

The setting method can refer to DA00-705.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Spurious radiated emissions for transmitter

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, 8DPSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Below 1GHz

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dB	(dB)	
30-1000MHz	101.187222	19.69	H	43.50	QP	23.81	-27.5	Pass
	232.137222	21.85	H	46.00	QP	24.15	-23.9	Pass
	878.211111	32.56	H	46.00	QP	13.44	-15.9	Pass
	107.546111	17.81	V	43.50	QP	25.69	-27.6	Pass
	230.682222	22.17	V	46.00	QP	23.83	-23.7	Pass
	943.147222	34.22	V	46.00	QP	11.78	-15.3	Pass

Above 1GHZ

Low channel 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dB	(dB)	
1000-25000MHz	7008.437500	37.46	H	74	PK	36.54	5.4	Pass
	9415.531250	40.54	H	74	PK	33.46	8.8	Pass
	7445.656250	37.91	V	74	PK	36.09	6.0	Pass
	10140.156250	39.65	V	74	PK	34.35	8.6	Pass

Middle channel 2441MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBµV/m		dB	(dB)	
1000-25000MHz	5248.406250	37.06	H	74	PK	36.94	3.9	Pass
	7493.468750	38.06	H	74	PK	35.94	6.1	Pass
	2290.937500	30.21	V	74	PK	43.79	-6.9	Pass
	7003.125000	38.06	V	74	PK	35.94	5.3	Pass

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

High channel 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Correct factor	Result
	MHz	dBuV/m		dBμV/m		dB	(dB)	
1000-25000MHz	1244.906250	31.79	H	74	PK	42.21	-12.1	Pass
	4959.937500	38.51	H	74	PK	35.49	3.3	Pass
	5033.250000	37.71	V	74	PK	36.29	3.7	Pass
	9379.937500	40.52	V	74	PK	33.48	8.6	Pass

Remark:

(1) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

(2) Data of measurement within this frequency range shown "--" in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.

(3) Level=Reading Level + Correction Factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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	2020-6-28
	LISN	Rohde & Schwarz	ENV4200	100249	2020-6-28
	LISN	Rohde & Schwarz	ENV216	100326	2020-6-28
	ISN	Rohde & Schwarz	ENY81	100177	2020-6-28
	ISN	Rohde & Schwarz	ENY81-CAT6	101664	2020-6-28
	High Voltage Proble	Rohde & Schwarz	TK9420(VT9420)	9420-584	2020-6-24
	RF Current probe	Rohde & Schwarz	EZ-17	100816	2020-7-2
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2020-6-28
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2020-6-28
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2020-6-28
	RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2020-6-28
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2020-6-28
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2020-6-28
	Horn Antenna	Rohde & Schwarz	HF907	102294	2020-6-22
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2020-6-28
	3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7

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
- Spurious RF conducted emissions
- Band edge

RE - Radiated RF tests

- Spurious radiated emissions for transmitter

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

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**
Radiated Spurious Emission 25MHz-3000MHz	**Horizontal: 4.80dB; Vertical: 4.87dB;**
Radiated Spurious Emission 3000MHz-18000MHz	**Horizontal: 4.59dB; Vertical: 4.58dB;**
Radiated Spurious Emission 18000MHz-40000MHz	**Horizontal: 5.05dB; Vertical: 5.04dB;**
Conducted RF test with TS 8997	**RF Power Conducted: 1.16dB Frequency test involved: 0.6×10^{-7} or 1%**

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F, Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478