Product Service

FCC - TEST REPORT

Report Number	:	**708881503689-00**	Date of Issue:	April 6, 2016

Model	:	U1
Product Type	:	BCT Bluetooth Headset
Applicant	:	Suzhou YOKO BCT Electronic Corporation
Address	:	P-48, No.666 Jianlin Road, High tech Zone, Suzhou Jiangsu, People's Republic of China
Production Facility	:	Suzhou YOKO BCT Electronic Corporation
Address	:	P-48, No.666 Jianlin Road, High tech Zone, Suzhou Jiangsu, People's Republic of China

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	51

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai 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. Shanghai 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. Shanghai Branch issued reports.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China
FCC Registration Number:	904822
Telephone:	+86 21 6037 9100
Fax:	+86 21 6037 6350

Test Site 2

Company name:	MRT Technology (Suzhou) Co., Ltd D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, P.R. China
FCC Registration Number:	809388
Telephone:	+86-512-66308358
Fax:	+86-512-66308368

Product Service

3 Description of the Equipment Under Test

Product:	BCT Bluetooth Headset
Model no.:	U1
FCC ID:	2AC8AYKU1A
Options and accessories:	
Rating:	5V, 150mA DC battery
RF Transmission Frequency:	2402~2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4DQPSK,8DPSK
Duty Cycle:	less than 100%
Antenna Type:	PCB
Antenna Gain:	0dBi
Description of the EUT:	Bluetooth Headset

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to C63.10 (2013).

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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	12	Site 2	Pass
§15.247(b)(1)	Conducted peak output power	15	Site 2	Pass
§15.247(a)(2)	6dB bandwidth	---	---	N/A
§15.247(a)(1)	20dB bandwidth and 99% Occupied Bandwidth	19	Site 2	Pass
§15.247(a)(1)	Carrier frequency separation	23	Site 2	Pass
§15.247(a)(1)(iii)	Number of hopping frequencies	27	Site 2	Pass
§15.247(a)(1)(iii)	Dwell Time	31	Site 2	Pass
§15.247(e)	Power spectral density*	---	---	N/A
§15.247(d)	Spurious RF conducted emissions	34	Site 2	Pass
§15.247(d)	Band edge	37	Site 2	Pass
§15.247(d) & §15.209 &	Spurious radiated emissions for transmitter and receiver	40	Site 2	Pass
§15.203	Antenna requirement	See note 1		Pass

Note 1: N/A=Not Applicable.
Note 2: The EUT uses a permanently PCB Antenna, which gain is 0dBi. 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. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AC8AYKU1A 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: November 18, 2015

Testing Start Date: December 19, 2015

Testing End Date: January 28, 2016

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

Reviewed by:

Hui TONG
Review Engineer

Prepared by:

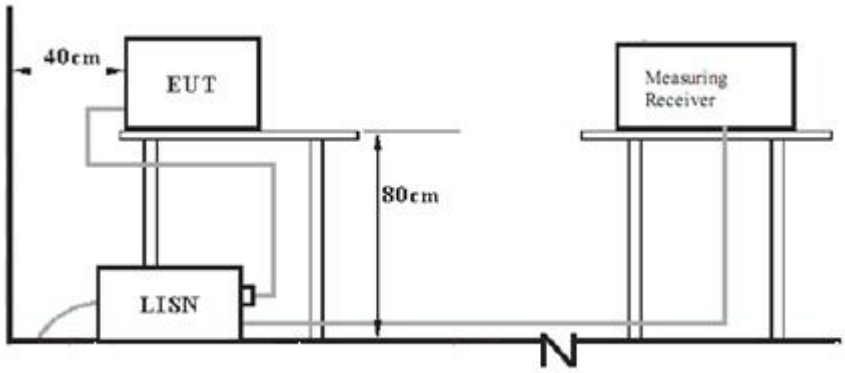
Wenwen CHEN
Project Engineer

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

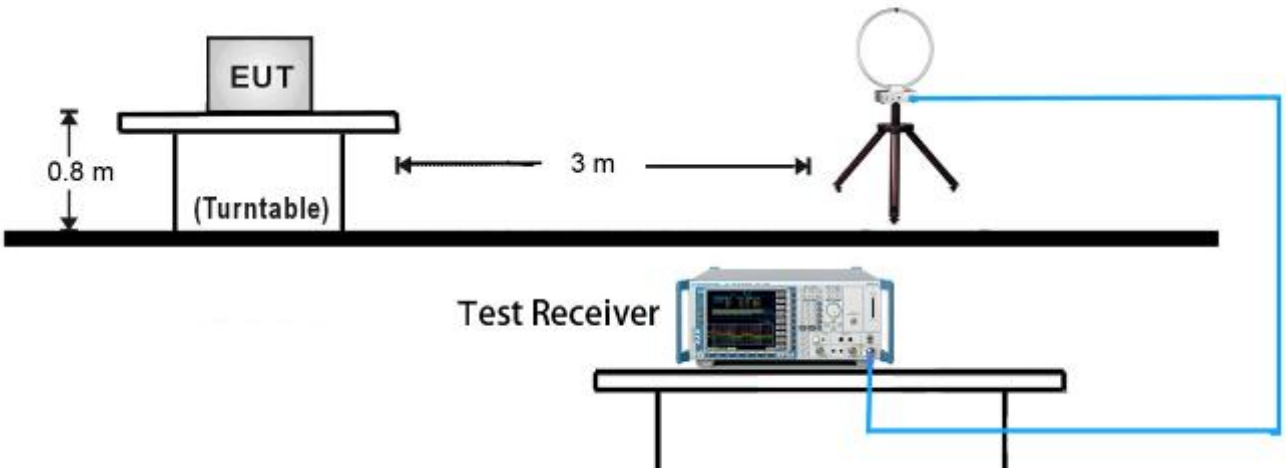
7 Test Setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

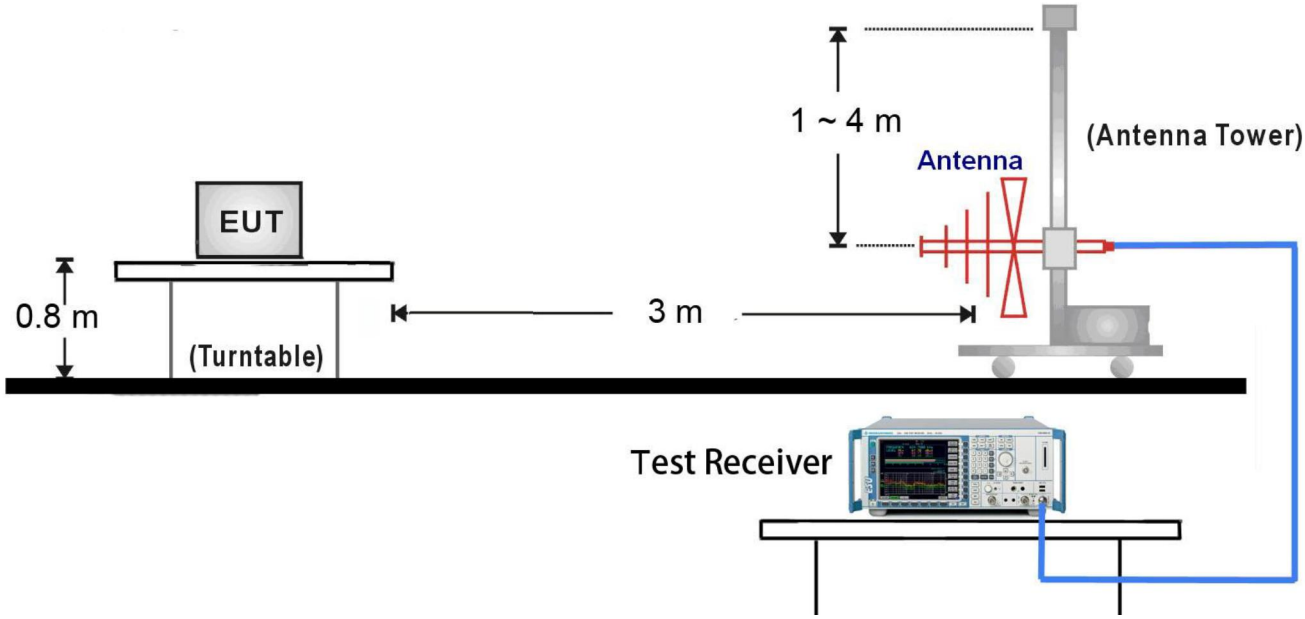
9kHz ~ 30MHz Test Setup:



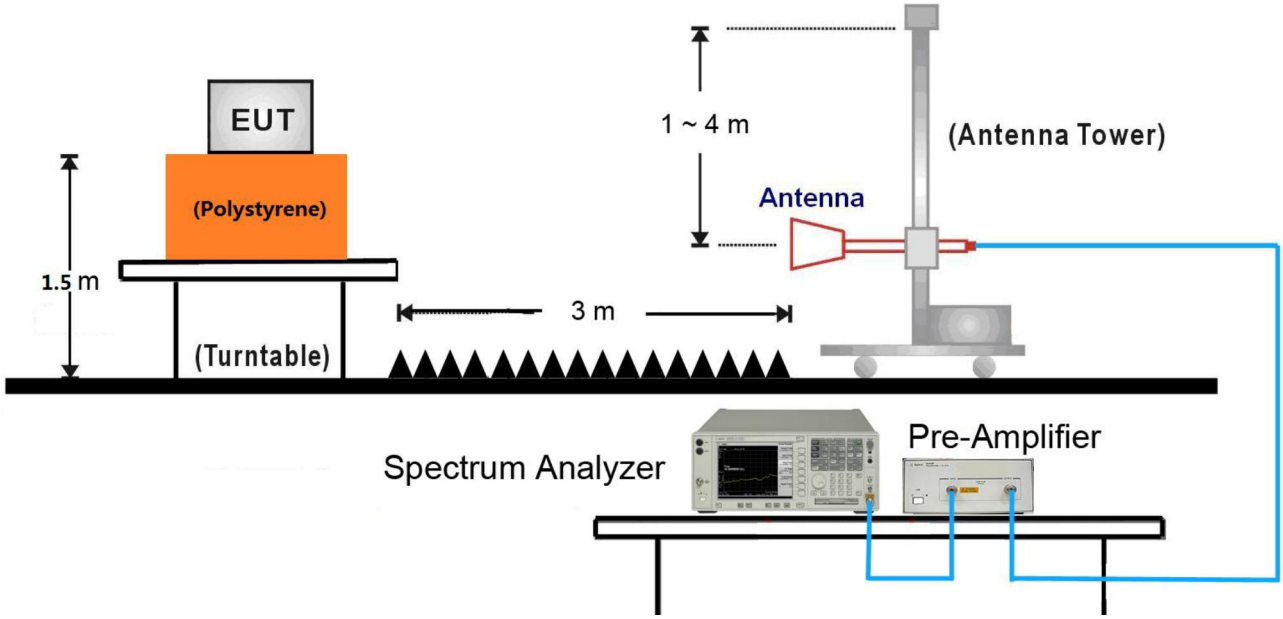
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

30MHz ~ 1GHz Test Setup:



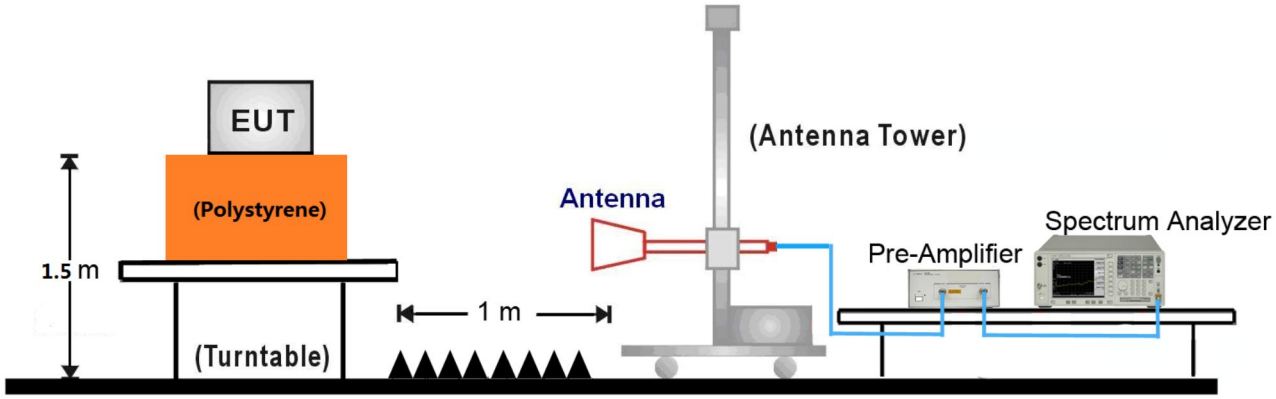
1GHz ~ 18GHz Test Setup:



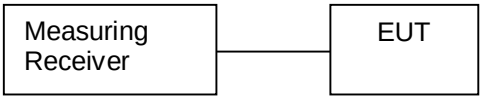
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

18GHz ~25GHz Test Setup:



7.3 Conducted RF test setups



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Laptop	Lenovo	X230	---

Test software: BlueTest 3, 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

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

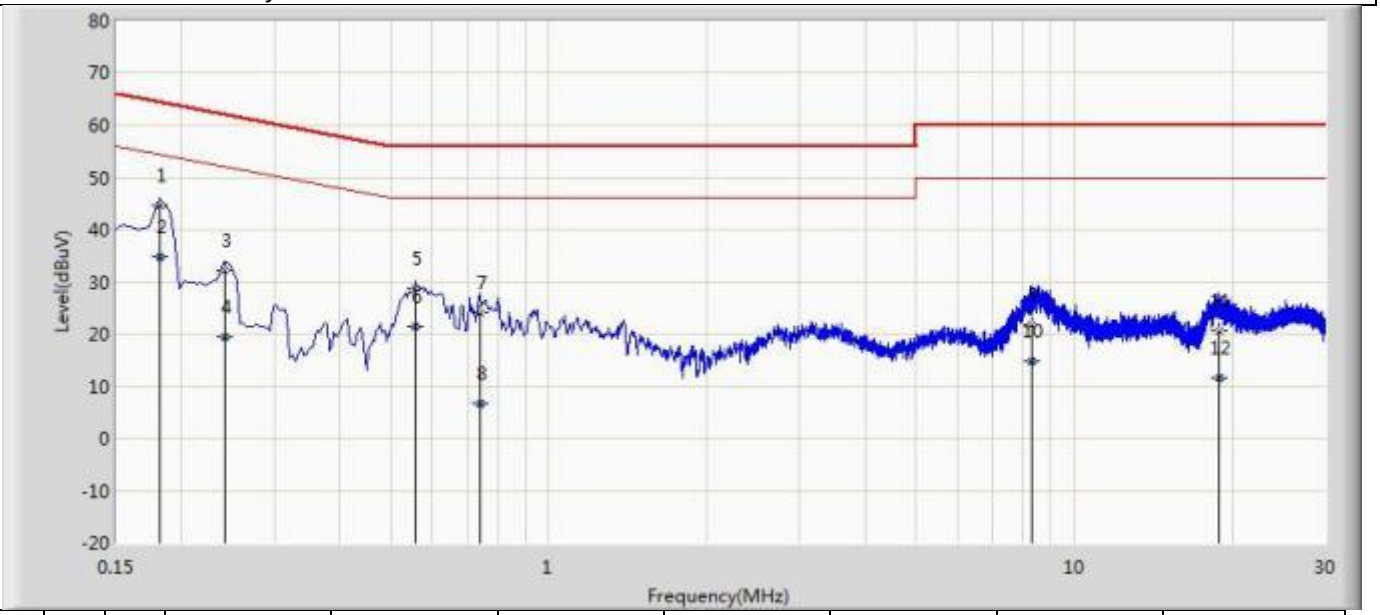
Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Conducted Emission

Engineer: Vince Yu	
Site: SR2	Time: 2015/12/25 - 19:06
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: U1	Power: AC 120V/60Hz
Test Mode: Transmit by DH5 at Channel 2402MHz	



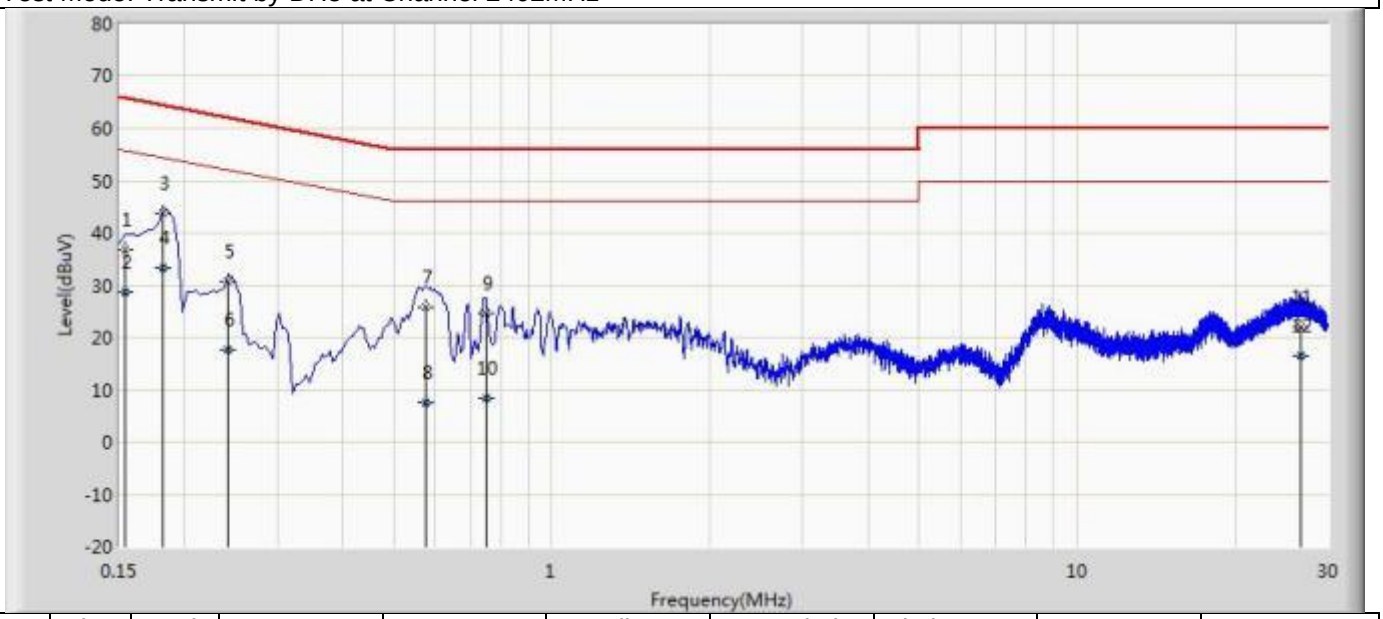
No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.182	44.658	34.609	-19.736	64.394	10.048	QP
2		*	0.182	34.671	24.622	-19.723	54.394	10.048	AV
3			0.242	32.210	22.253	-29.817	62.027	9.958	QP
4			0.242	19.284	9.327	-32.743	52.027	9.958	AV
5			0.558	28.651	18.515	-27.349	56.000	10.137	QP
6			0.558	21.346	11.209	-24.654	46.000	10.137	AV
7			0.738	23.914	13.871	-32.086	56.000	10.044	QP
8			0.738	6.622	-3.422	-39.378	46.000	10.044	AV
9			8.274	21.718	11.555	-38.282	60.000	10.163	QP
10			8.274	14.685	4.522	-35.315	50.000	10.163	AV
11			18.886	20.651	10.535	-39.349	60.000	10.116	QP
12			18.886	11.658	1.542	-38.342	50.000	10.116	AV

Note: Measure Level (dBμV) = Reading Level (dBμV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

Engineer: Vince Yu	
Site: SR2	Time: 2015/12/25 - 19:11
Limit: FCC_Part15.207_CE_AC Power	Margin: 0
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: U1	Power: AC 120V/60Hz
Test Mode: Transmit by DH5 at Channel 2402MHz	



No	Flag	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Factor (dB)	Type
1			0.154	36.708	25.992	-29.073	65.781	10.716	QP
2			0.154	28.651	17.935	-27.131	55.781	10.716	AV
3		*	0.182	43.643	33.600	-20.751	64.394	10.042	QP
4			0.182	33.298	23.255	-21.096	54.394	10.042	AV
5			0.242	30.584	20.589	-31.443	62.027	9.995	QP
6			0.242	17.549	7.554	-34.479	52.027	9.995	AV
7			0.574	25.667	15.522	-30.333	56.000	10.145	QP
8			0.574	7.447	-2.698	-38.553	46.000	10.145	AV
9			0.750	24.730	14.683	-31.270	56.000	10.047	QP
10			0.750	8.490	-1.557	-37.510	46.000	10.047	AV
11			26.618	22.100	11.741	-37.900	60.000	10.360	QP
12			26.618	16.450	6.091	-33.550	50.000	10.360	AV

Note: Measure Level (dBµV) = Reading Level (dBµV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB)

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

Conducted peak output power

Test Mode	Channel No.	Frequency (MHz)	Peak Power		
			(dBm)	(mW)	Limit (mW)
DH5	00	2402	1.56	1.43	< 1000
DH5	39	2441	3.54	2.26	< 1000
DH5	78	2480	4.07	2.55	< 1000
2DH5	00	2402	-0.44	0.90	< 1000
2DH5	39	2441	1.72	1.48	< 1000
2DH5	78	2480	2.25	1.68	< 1000
3DH5	00	2402	-0.14	0.97	< 1000
3DH5	39	2441	2.08	1.62	< 1000
3DH5	78	2480	2.54	1.80	< 1000

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

DH5 (Bluetooth Mode GFSK modulation) Test Result	
Channel 00 (2402MHz)	**Channel 39 (2441MHz)**
	
Channel 78 (2480MHz)	
	

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

2DH5 (Bluetooth Mode π/4-DQPSK modulation) Test Result	
Channel 00 (2402MHz)	**Channel 39 (2441MHz)**
	
Channel 78 (2480MHz)	
	

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

3DH5 (Bluetooth Mode 8DPSK modulation) Test Result	
Channel 00 (2402MHz)	**Channel 39 (2441MHz)**
	
Channel 78 (2480MHz)	
	

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

9.3 20 dB bandwidth 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. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

20 dB bandwidth Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	923.9	--	Pass
2441	923.8	--	Pass
2480	925.8	--	Pass

2402

2441

2480

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

20 dB bandwidth Occupied Bandwidth

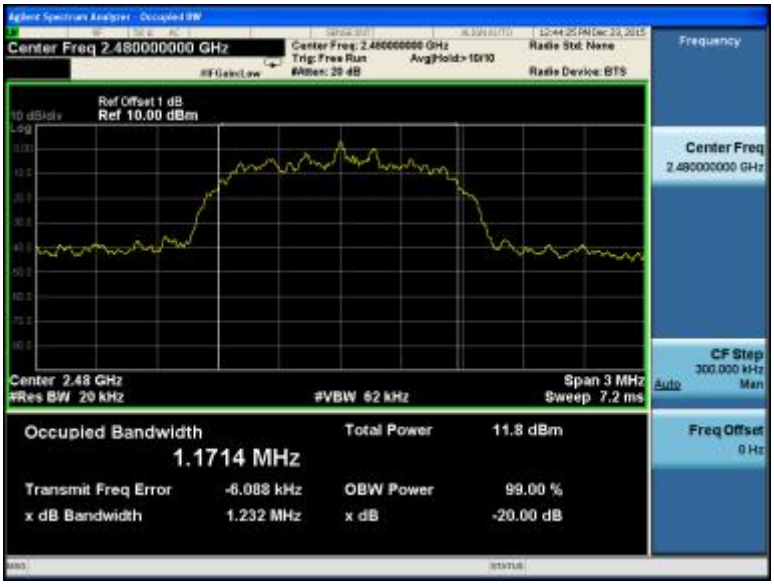
Bluetooth Mode π/4-DQPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1.230	--	Pass
2441	1.1853	--	Pass
2480	1.1714	--	Pass

2402

2441

2480



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

20 dB bandwidth Occupied Bandwidth

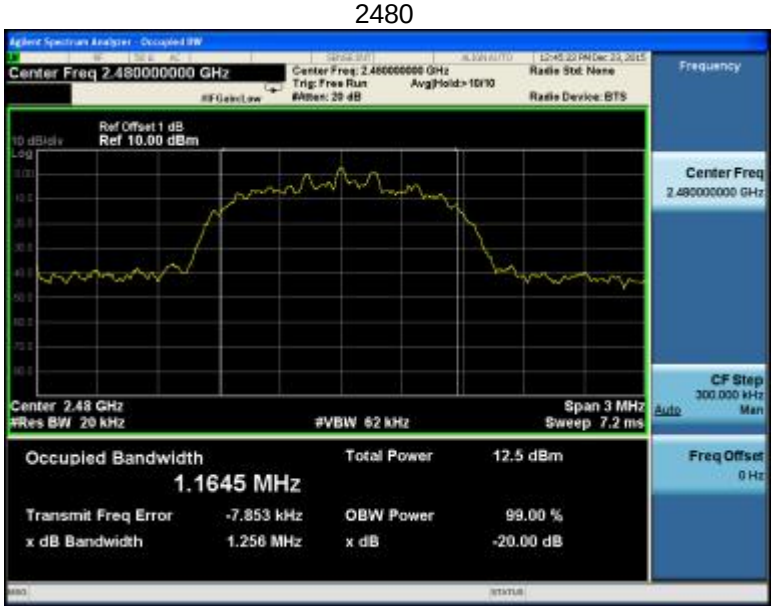
Bluetooth Mode 8DPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1.254	--	Pass
2441	1.282	--	Pass
2480	1.256	--	Pass

2402

2441

2480



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

GFSK

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	615.93
2441	615.87
2480	617.20

π/4-DQPSK

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	820.00
2441	790.20
2480	780.93

8DPSK

Frequency MHz	2/3 of 20 dB Bandwidth kHz
2402	836.00
2441	854.67
2480	837.33

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

2441MHz

2480MHz

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

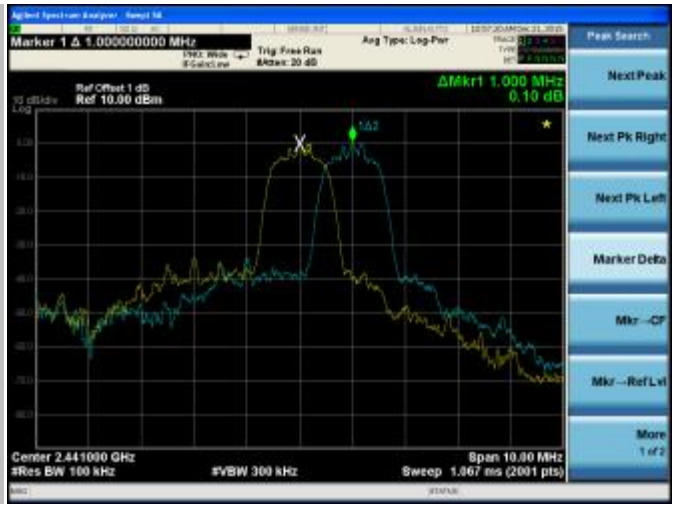
Test result: The measurement was performed with the typical configuration (normal hopping status), here π/4-DQPSK modulation mode was used to show compliance.

π/4-DQPSK Modulation test result

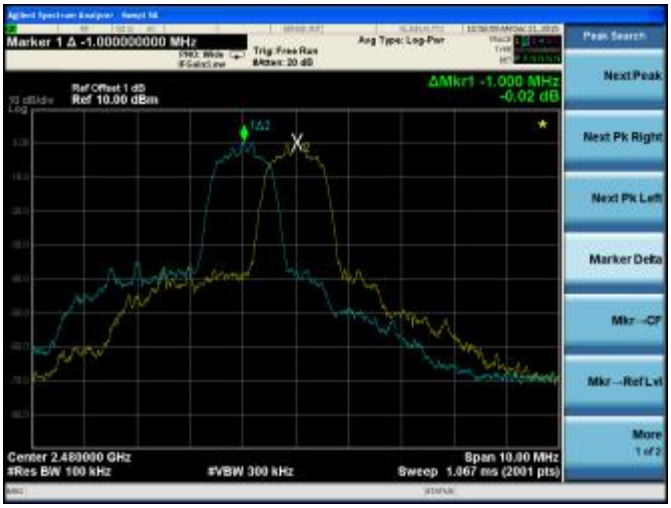
Frequency MHz	Carrier Frequency Separation kHz	Result
2402	1000	Pass
2441	1000	Pass
2480	1000	Pass

2402

2441



2480



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

Test result: The measurement was performed with the typical configuration (normal hopping status), here 8DPSK modulation mode was used to show compliance.

8DPSK Modulation test result

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

2402

2441

2480

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

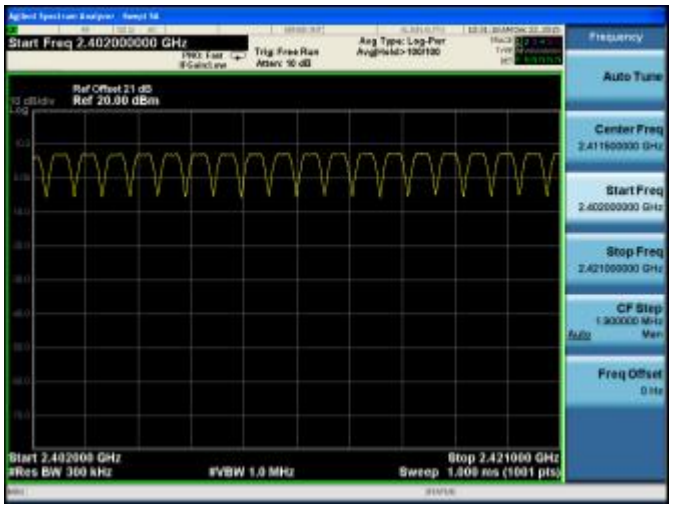
Product Service

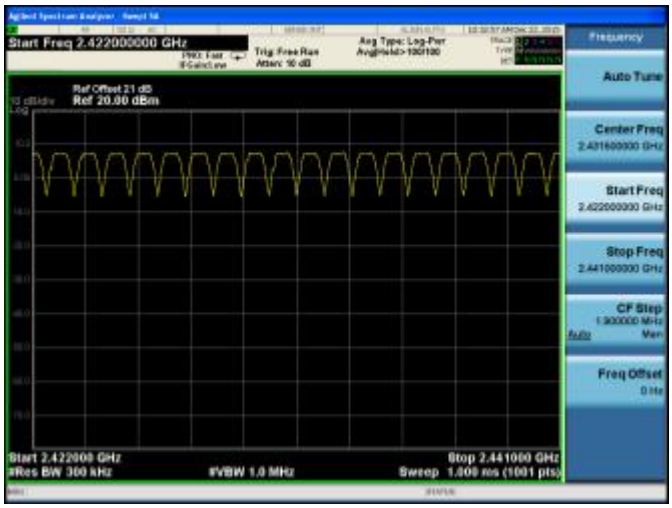
Number of hopping frequencies

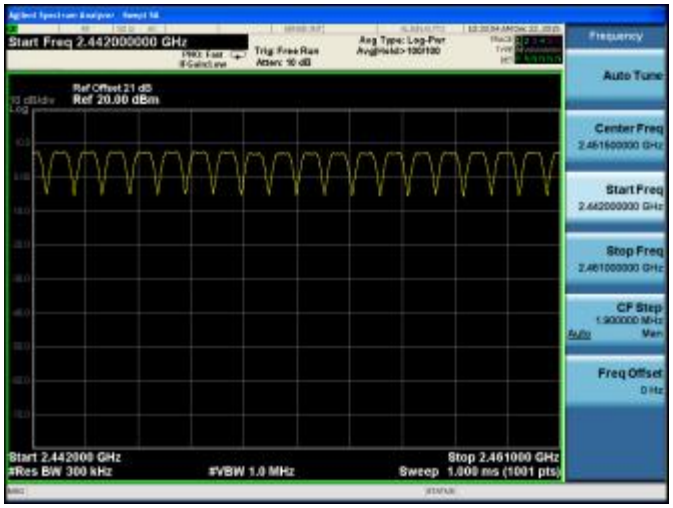
Test result: The measurement was performed with the typical configuration (normal hopping status), and the total hopping channels is constant for the all modulation mode according with the Bluetooth Core Specification.

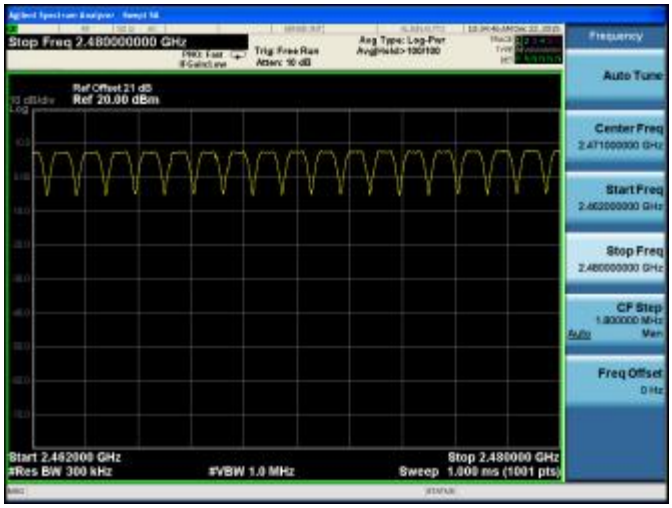
Number of hopping frequencies	Result
79	Pass

GFSK Modulation test result





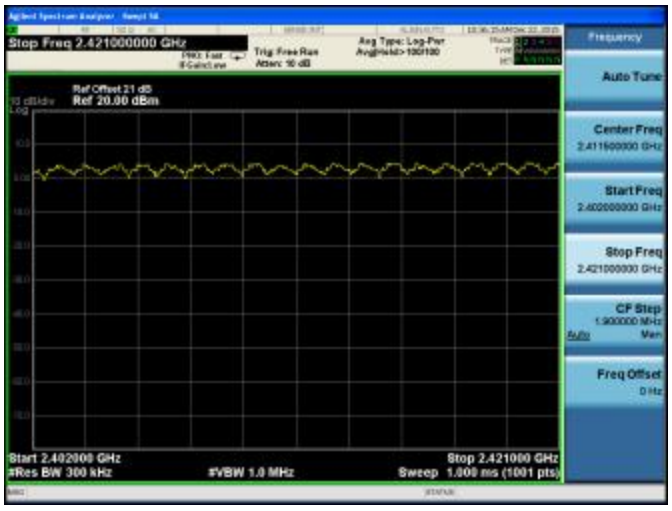


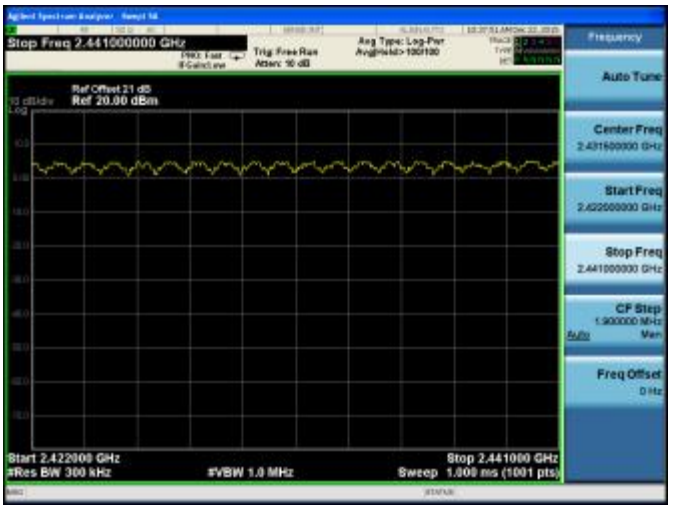


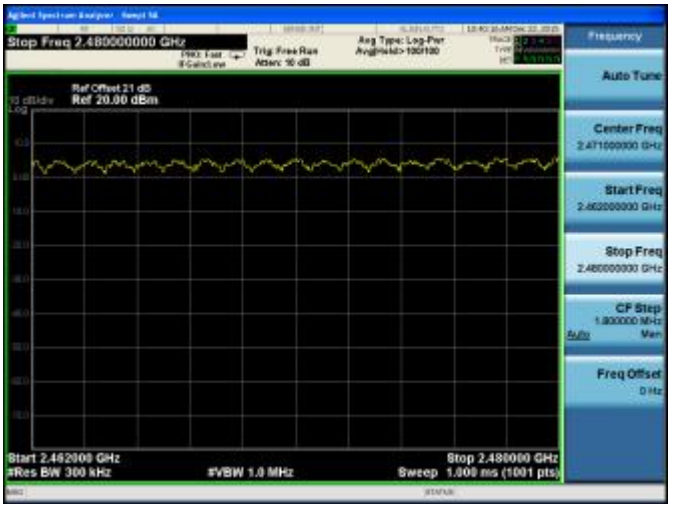
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

π/4-DQPSK Modulation test result







TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

8DPSK Modulation test result

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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.

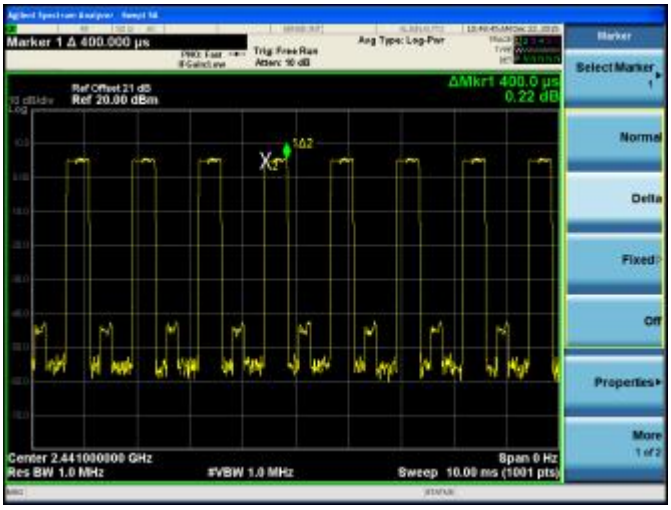
The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation	Mode	Reading (μs)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	400	106.67	42.668	< 400	Pass
π/4-DQPSK	2DH5	1650	106.67	176.01	< 400	Pass
8-DPSK	3DH5	2870	106.67	306.14	< 400	Pass

GFSK Modulation

DH5



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

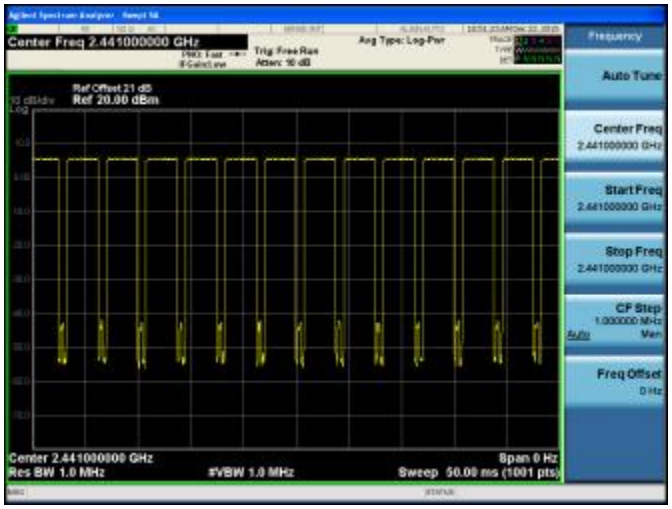
Product Service

π/4-DQPSK Modulation

2DH5

8-DPSK Modulation

3DH5



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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

2441MHz

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

2480MHz

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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.

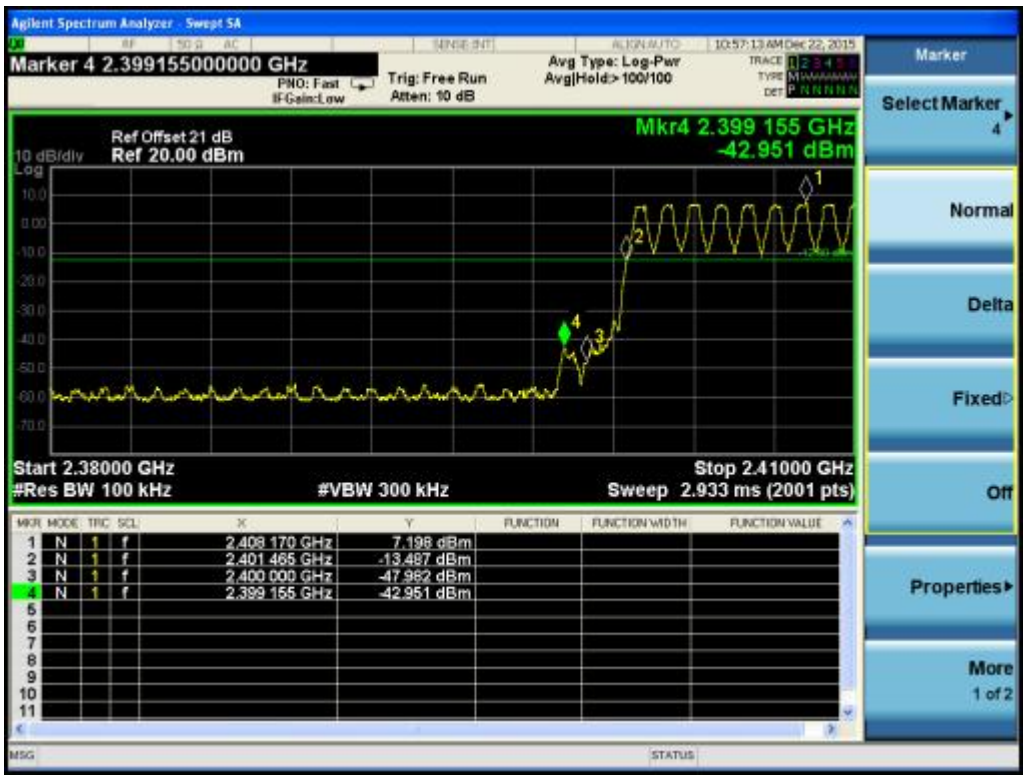
Limit: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits.

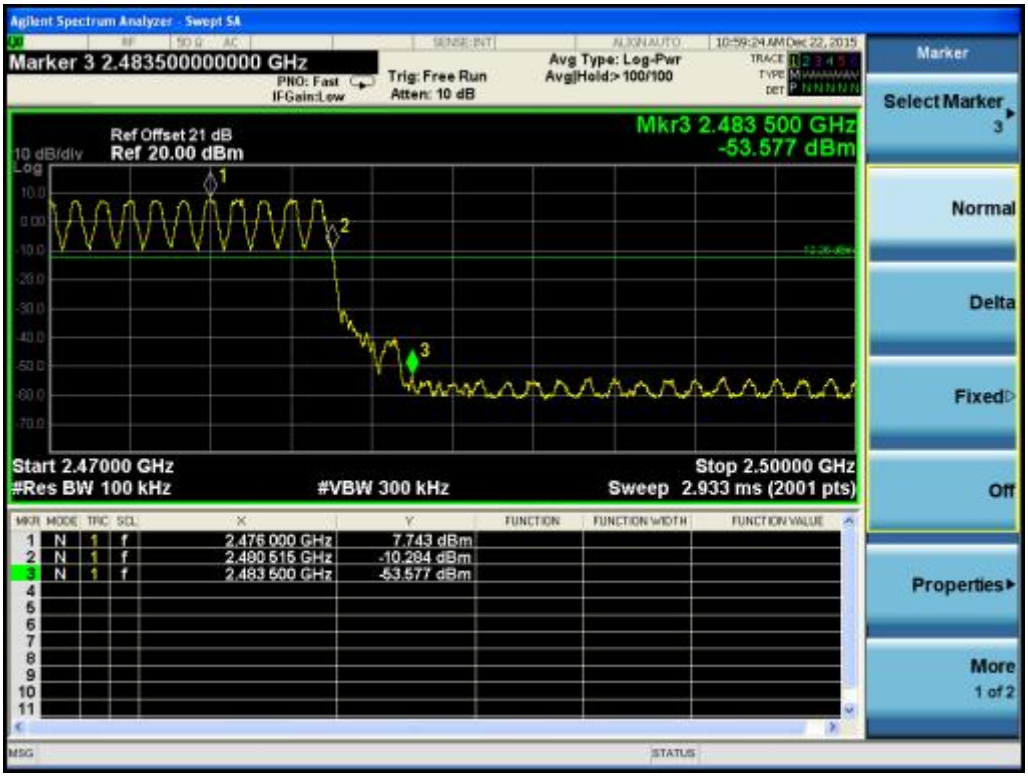
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

Band edge testing

GFSK Modulation Test Result:
Hopping on mode:





TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

Hopping off mode:

Product Service

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 C63.4-2009 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

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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	
4835.5	38.69	H	74	PK	35.31	Pass
7205.0	49.92	H	74	PK	24.08	Pass
4799.5	45.43	V	74	PK	28.57	Pass
7205.0	50.55	V	74	PK	23.45	Pass

Bluetooth Mode GFSK Modulation 2441MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
4884.5	41.93	H	74	PK	32.07	Pass
7324.0	51.55	H	74	PK	22.45	Pass
4884.5	48.06	V	74	PK	25.94	Pass
7324.0	51.68	V	74	PK	22.32	Pass

Bluetooth Mode GFSK Modulation 2480MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
4961.0	44.96	H	74	PK	29.04	Pass
7443.0	52.45	H	74	PK	21.55	Pass
4961.0	46.57	V	74	PK	27.43	Pass
7443.0	52.33	V	74	PK	21.67	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.

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

10 Test Equipment List

List of Test Instruments

Conducted Emissions

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06002	1 year	2016/11/03
Two-Line V-Network	R&S	ENV216	MRTSUE06003	1 year	2016/11/03
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06114	1 year	2016/11/20

Radiated Emission

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	E4447A	MRTSUE06028	1 year	2016/12/08
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2016/04/16
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2016/03/29
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9162	MRTSUE06022	1 year	2016/11/07
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2016/01/05
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06115	1 year	2016/11/20

Conducted Test Equipment

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2016/05/08
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2016/05/08
Temperature/Humidity Meter	Ouleinuo	N/A	MRTSUE06112	1 year	2016/11/20

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

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

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 9kHz-1000MHz	4.18dB
Uncertainty for Radiated Emission in 3m chamber 1000MHz-40000MHz	4.76dB
Uncertainty for Conducted Emission 150KHz-30MHz	3.46dB

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

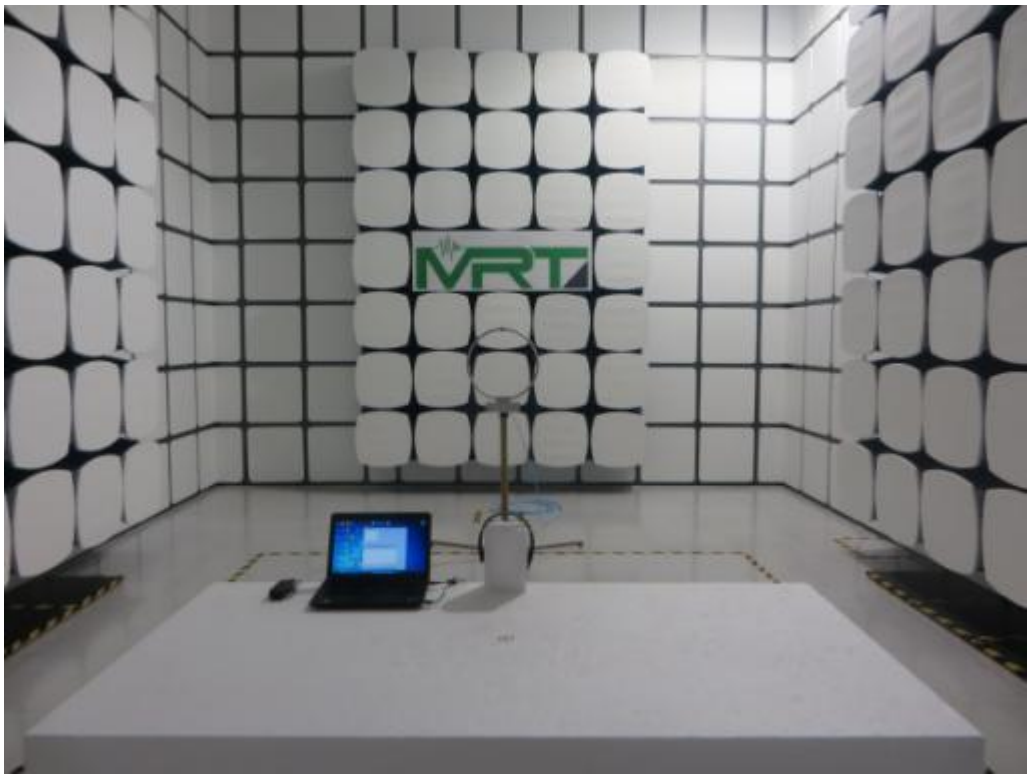
12 Photographs of Test Set-ups

Conducted Emission Setup

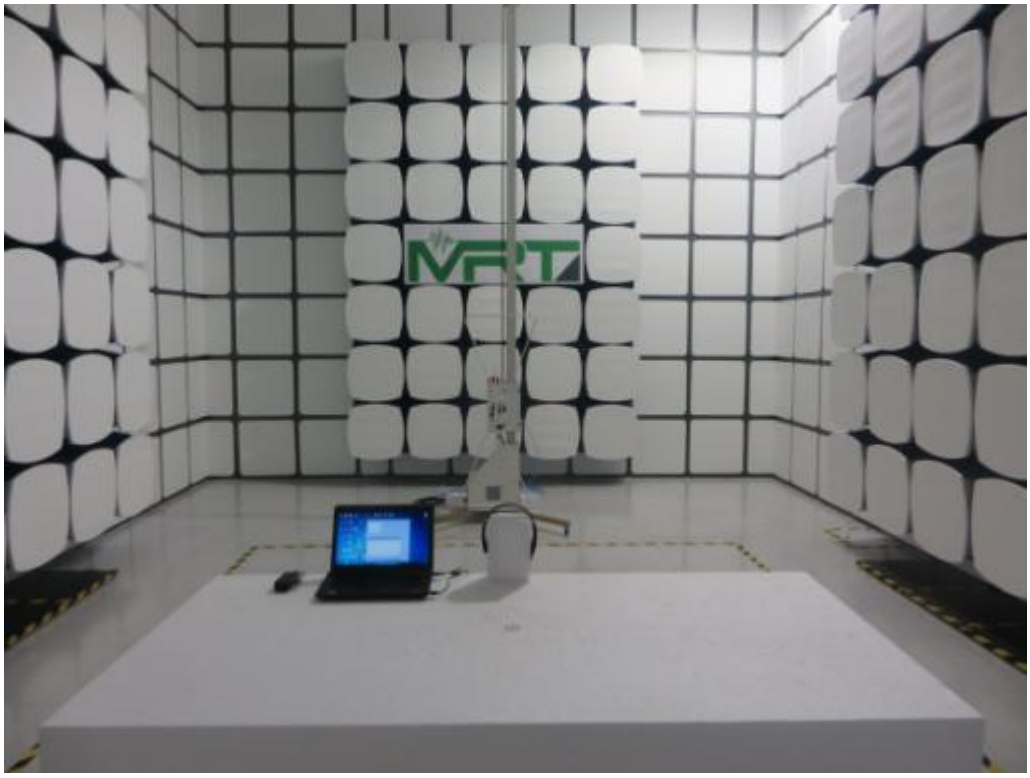
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

Radiated Emission Setup
9k~30MHz

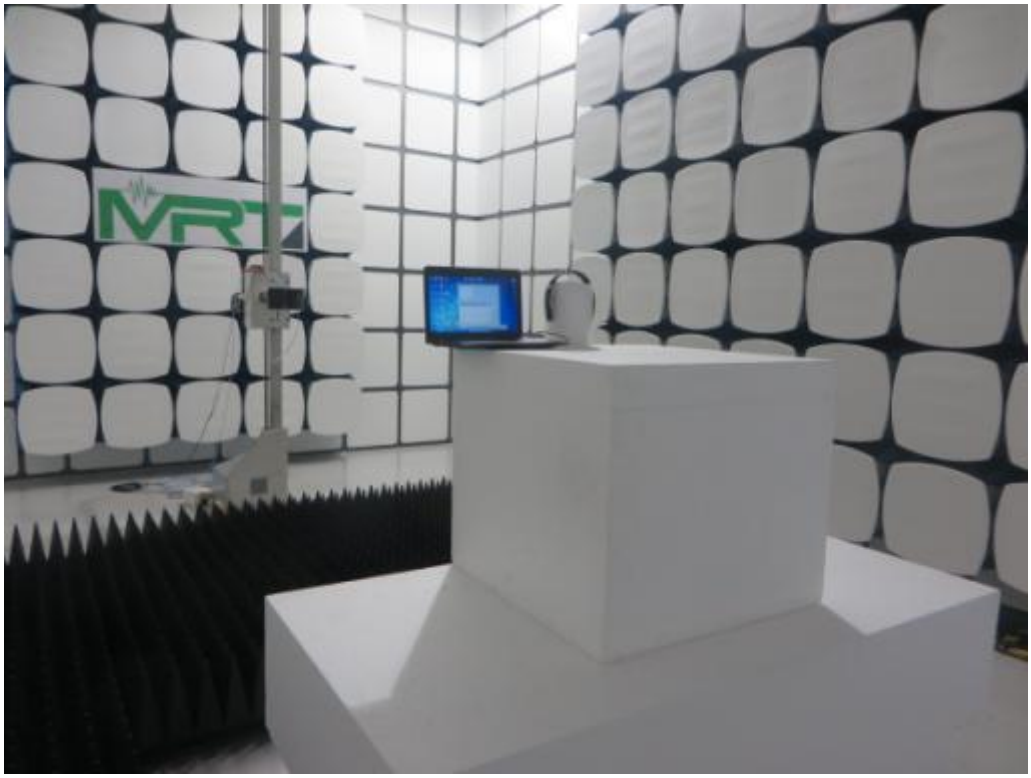


30MHz~1GHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

1GHz~18GHz



18GHz~40GHz

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

13 Photographs of EUT

External Photographs

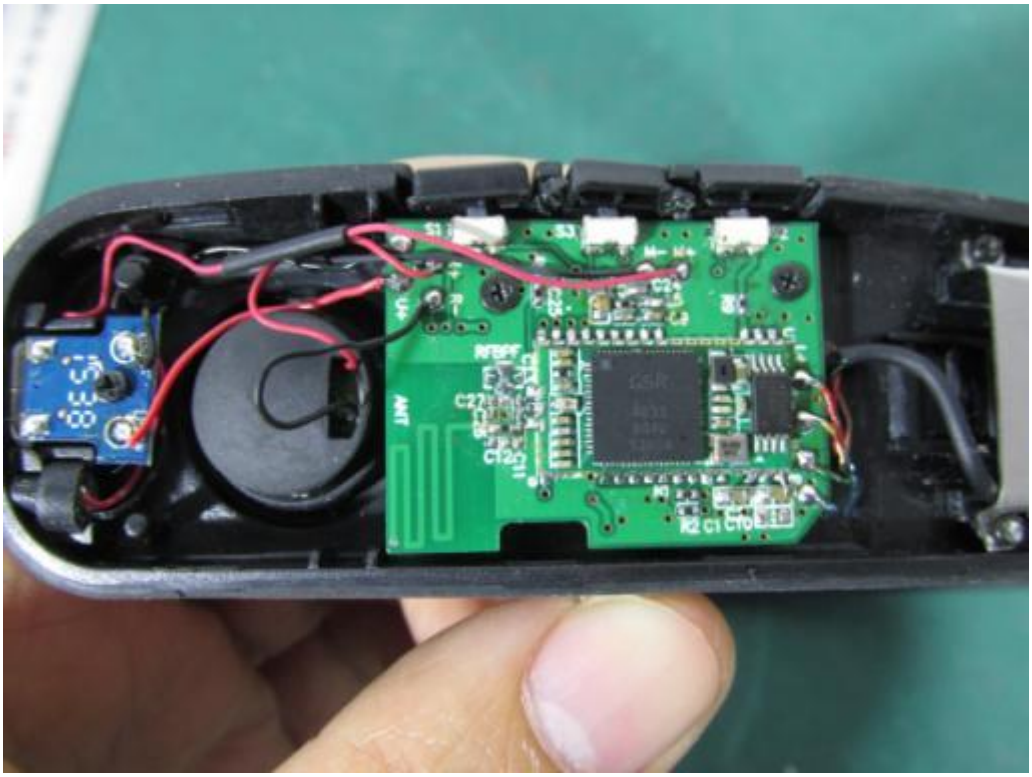
TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service

TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

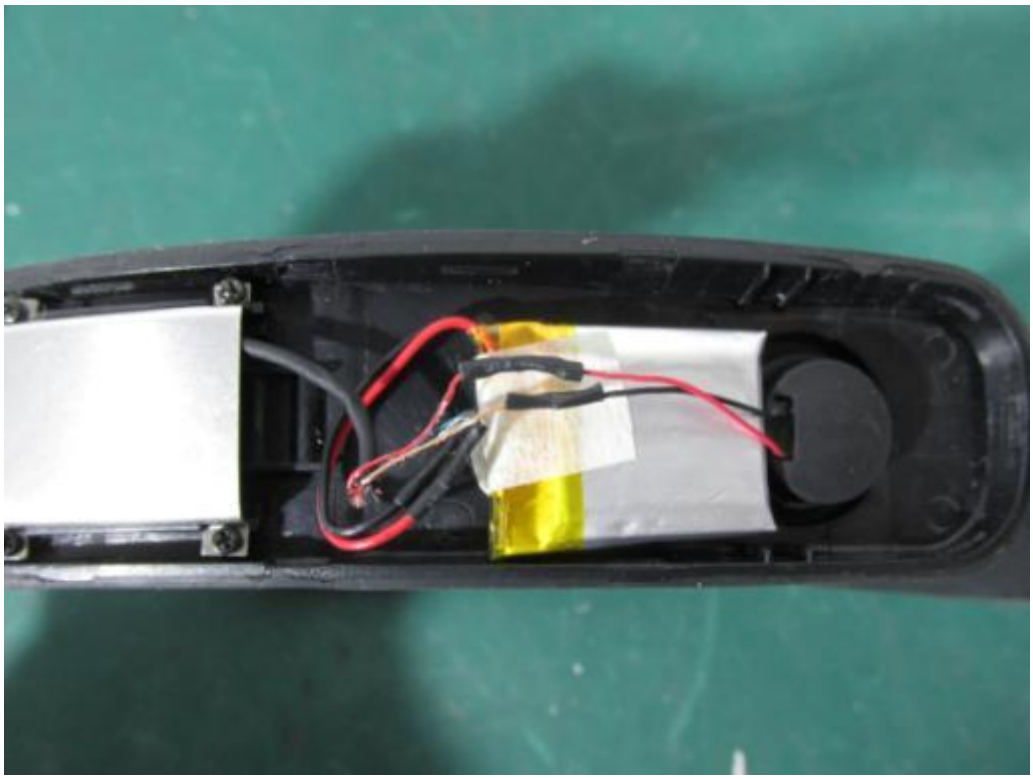
Product Service

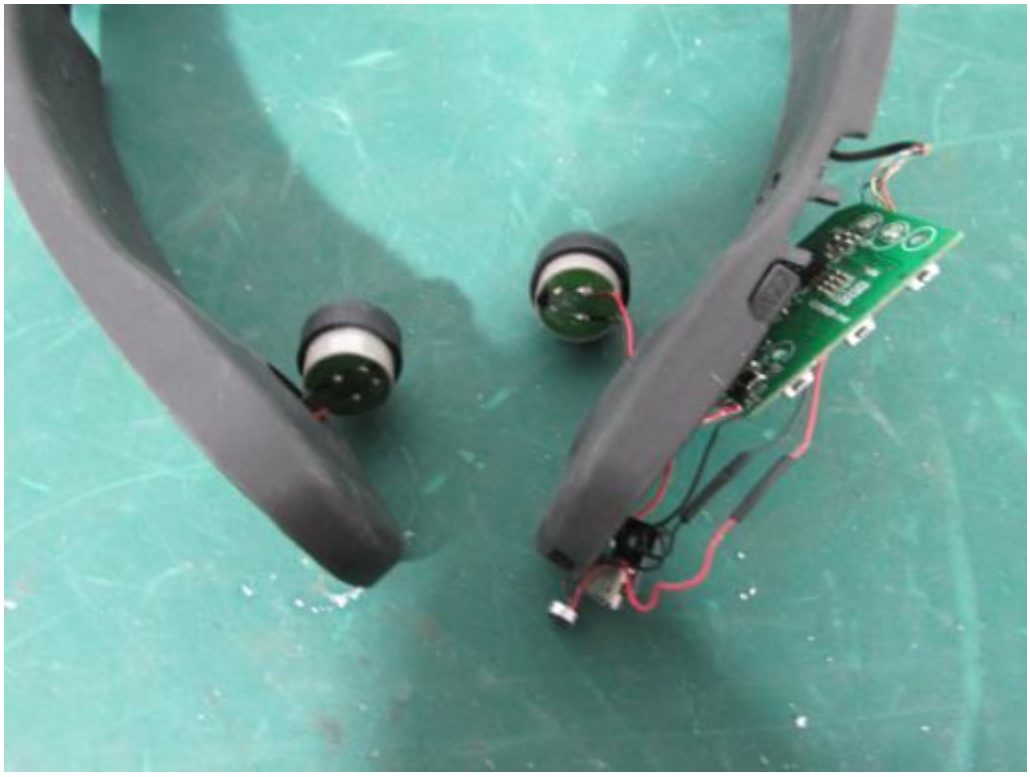
Internal Photographs



TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

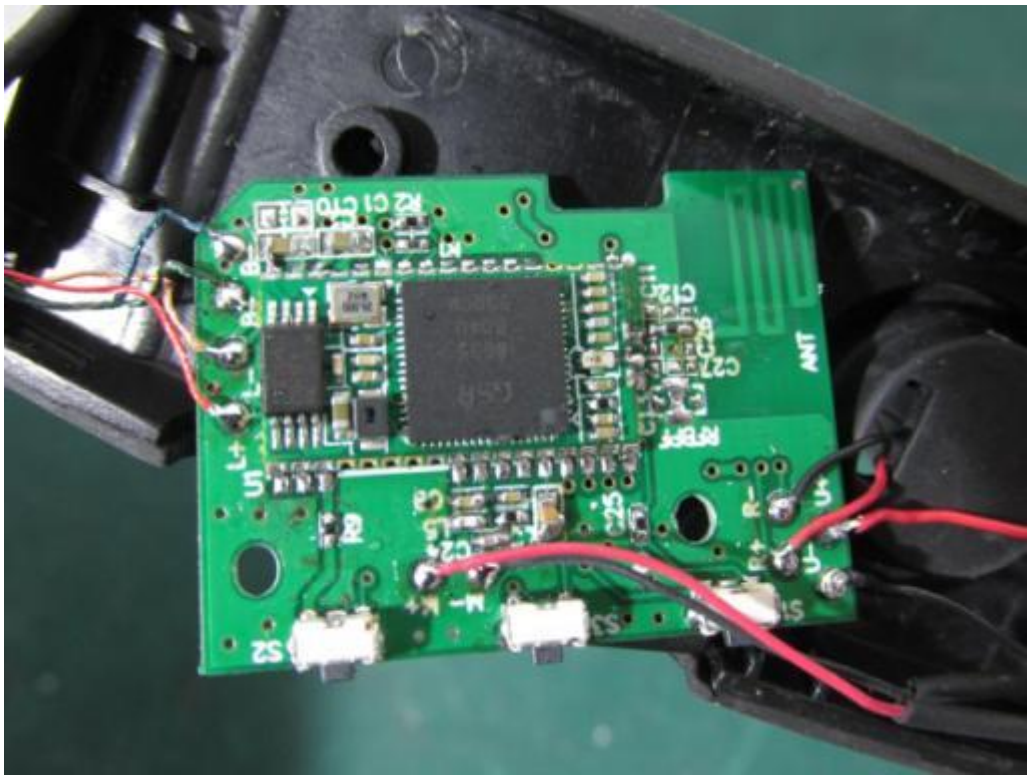
Product Service

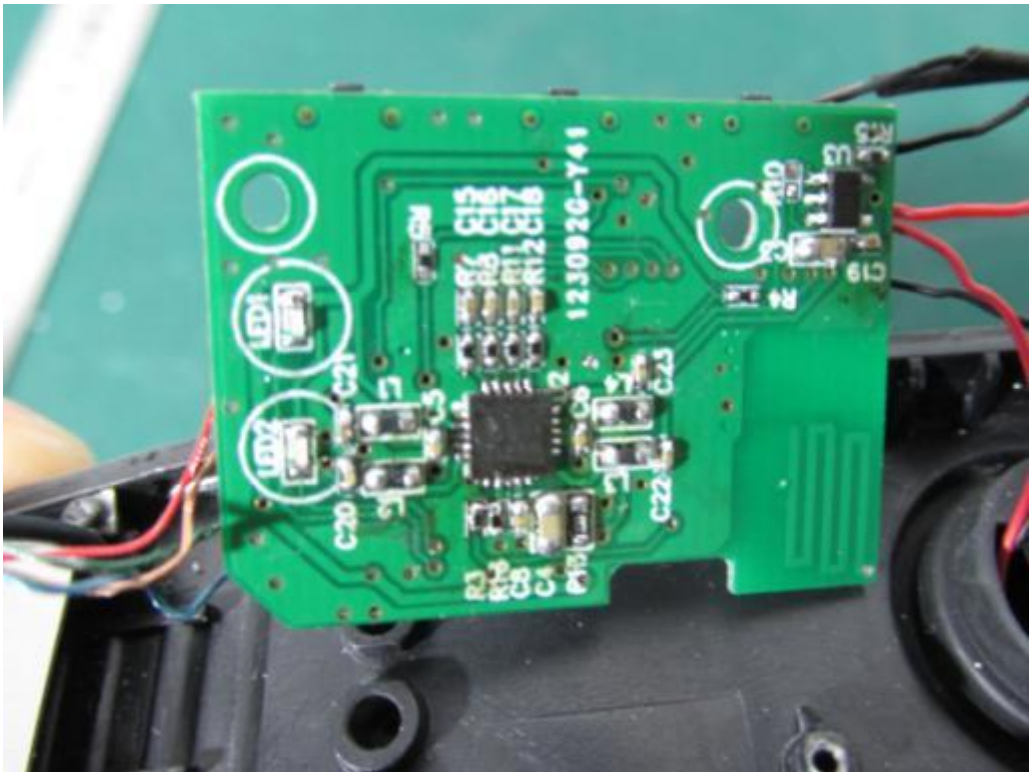




TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350

Product Service





TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch
No.16 Lane, 1951 Du Hui Road 201108, Shanghai, P.R. China
Tel. +86 21 6037 9100 , Fax: +86 21 6037 6350