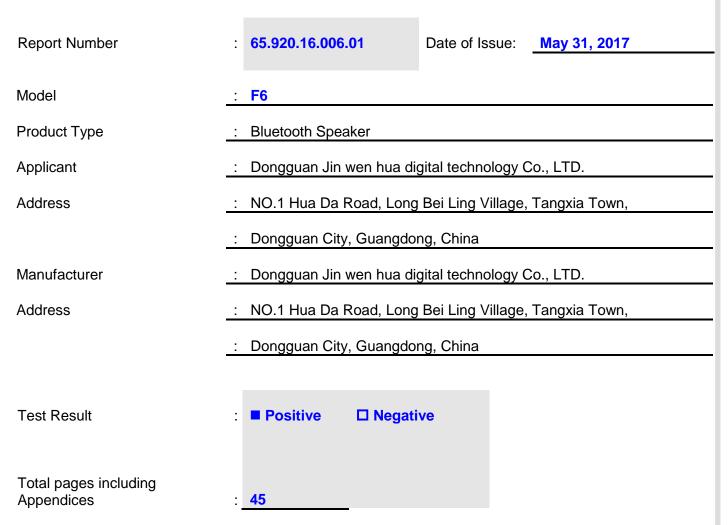


FCC - TEST REPORT



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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 Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	502708
Telephone: Fax:	86 755 8828 6998 86 755 8828 5299
Site 2 Company name:	Dongguan Yaxu (AiT) Technology Limited. No.22, Jinqianling Third Street, Jitigang, Huangjiang, Dongguan, Guangdong,523753 China
FCC Registration Number:	248337
Telephone: Fax:	86-769-82020499 86-769-82020495



3 Description of the Equipment Under Test

Product:	Bluetooth Speaker
Model no.:	F6
FCC ID:	2AFSGF6
Options and accessories:	Nil
Rating:	3.7VDC (Supplied by rechargeable battery) 5VDC, 1000mA(Charged by the mini-USB port)
RF Transmission	2402MHz-2480MHz
Frequency: No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	Internal Antenna
Antenna Gain:	1.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is Bluetooth Speaker operated at 2.4GHz



4 Summary of Test Standards

Test Standards					
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES				
10-1-2016 Edition	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 (2014).

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	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	21	Site 2	Pass			
§15.247(a)(1)	Carrier frequency separation	26	Site 2	Pass			
§15.247(a)(1)(iii)	(iii) Number of hopping frequencies		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	36	Site 2	Pass			
§15.247(d) & §15.209 Spurious radiated emissions for transmitter and receiver		41	Site 2	Pass			
§15.203	Antenna requirement	See note 2 Pass		Pass			

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an integral antenna, which gain is 1.0dBi. 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: 2AFSGF6 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:

Testing Start Date: October 27, 2016

Testing End Date:

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

Reviewed by:

an

Phoebe Hu EMC Section Manager

Prepared by:

October 27, 2016

May 17, 2017

Mark chen

Mark Chen EMC Project Engineer

Tested by:

Cal-Chen

Seal Chen EMC Test Engineer

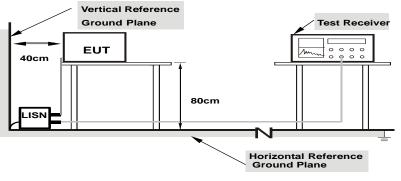
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7 Test Setups

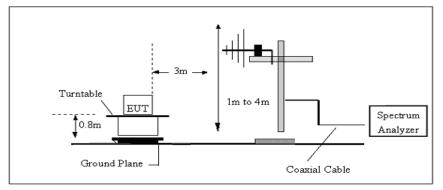
7.1 Radiated test setups

Conducted emission(150KHz-30MHz)

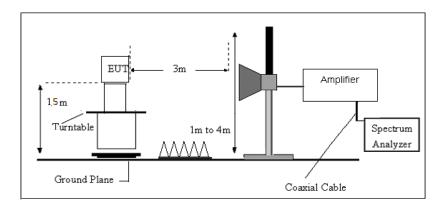


Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

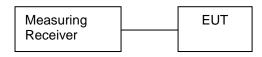
Below 1GHz



Above 1GHz



7.2 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

Name	Model	Manufacturer	S/N	Cal Due Date
Personal computer	HP	500-320cx	4CV428DQYN	
Mobile phone	huawei			
Adapter				

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

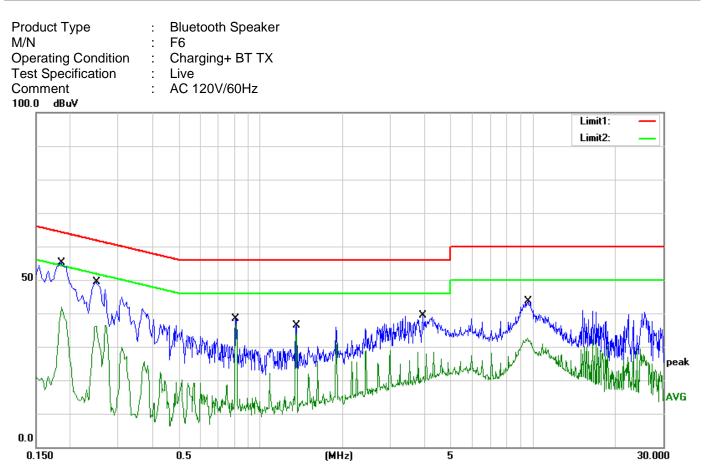
- 1. The EUT was placed on a table, which is 0.8m above ground plane
- 2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3. Maximum procedure was performed to ensure EUT compliance
- 4. A EMI test receiver is used to test the emissions from both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

Limit

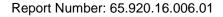
Frequency		QP Limit	AV Limit		
	MHz	dBµV	dBµV		
	0.150-0.500	66-56*	56-46*		
	0.500-5	56	46		
	5-30	60	50		
Decreasing linearly with logarithm of the frequency					



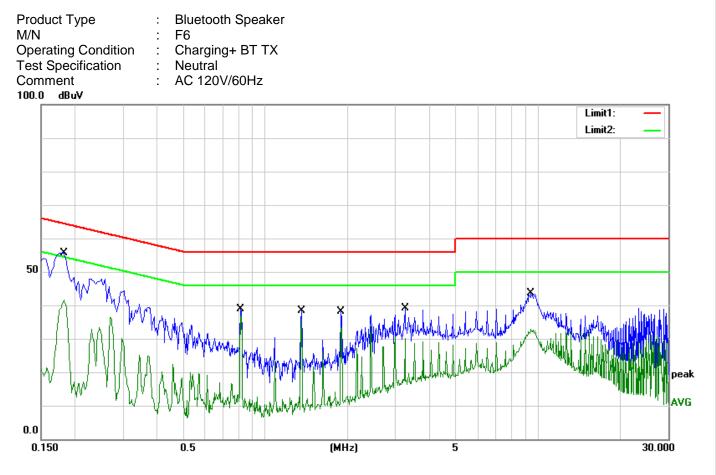
Conducted Emission



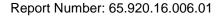
No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	(cm)	(deg.)	
1	0.1860	45.83	9.23	55.06	64.21	-9.15			QP
2	0.1860	31.63	9.23	40.86	54.21	-13.35			AVG
3	0.2500	40.08	9.18	49.26	61.76	-12.50			QP
4	0.2500	26.02	9.18	35.20	51.76	-16.56			AVG
5	0.8100	29.18	9.21	38.39	56.00	-17.61			QP
6	0.8100	26.77	9.21	35.98	46.00	-10.02			AVG
7	1.3540	27.26	9.19	36.45	56.00	-19.55			QP
8	1.3540	24.98	9.19	34.17	46.00	-11.83			AVG
9	3.9540	30.11	9.26	39.37	56.00	-16.63			QP
10	3.9540	11.62	9.26	20.88	46.00	-25.12			AVG
11	9.5900	34.14	9.47	43.61	60.00	-16.39			QP
12	9.5900	22.22	9.47	31.69	50.00	-18.31			AVG





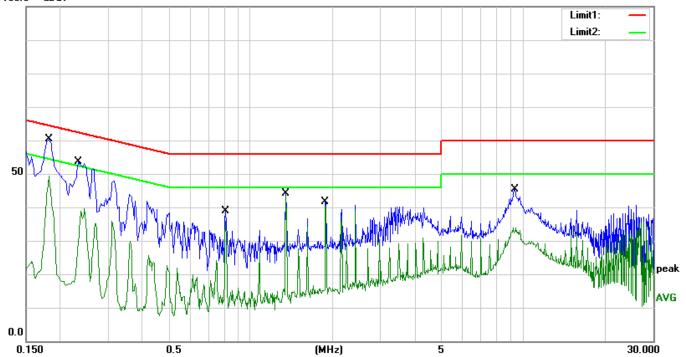


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	(cm)	(deg.)	
1	0.1820	46.45	9.23	55.68	64.39	-8.71			QP
2	0.1820	32.09	9.23	41.32	54.39	-13.07			AVG
3	0.8100	29.70	9.25	38.95	56.00	-17.05			QP
4	0.8100	27.70	9.25	36.95	46.00	-9.05			AVG
5	1.3540	29.17	9.25	38.42	56.00	-17.58			QP
6	1.3540	26.62	9.25	35.87	46.00	-10.13			AVG
7	1.8940	28.82	9.25	38.07	56.00	-17.93			QP
8	1.8940	23.81	9.25	33.06	46.00	-12.94			AVG
9	3.2500	29.92	9.26	39.18	56.00	-16.82			QP
10	3.2500	8.11	9.26	17.37	46.00	-28.63			AVG
11	9.4300	34.34	9.38	43.72	60.00	-16.28			QP
12	9.4300	23.38	9.38	32.76	50.00	-17.24			AVG

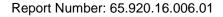




Product Type **Bluetooth Speaker** : M/N F6 2 **Operating Condition** Charging+ AUX IN Playing : Test Specification Live : Comment AC 120V/60Hz : 100.0 dBuV

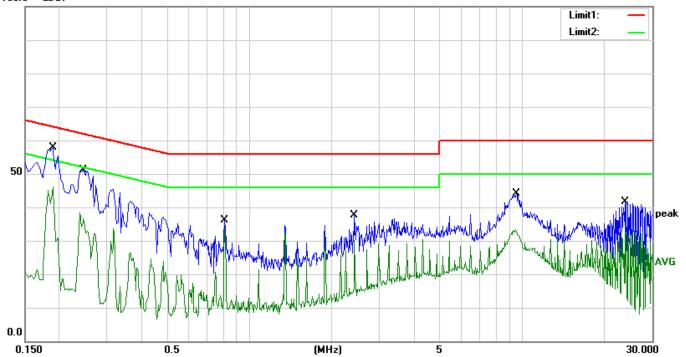


No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	(cm)	(deg.)	
1	0.1820	51.19	9.23	60.42	64.39	-3.97			QP
2	0.1820	39.28	9.23	48.51	54.39	-5.88			AVG
3	0.2340	44.38	9.20	53.58	62.31	-8.73			QP
4	0.2340	21.41	9.20	30.61	52.31	-21.70			AVG
5	0.8100	29.67	9.21	38.88	56.00	-17.12			QP
6	0.8100	26.66	9.21	35.87	46.00	-10.13			AVG
7	1.3473	22.31	9.18	31.49	56.00	-24.51			QP
8	1.3473	21.07	9.18	30.25	46.00	-15.75			AVG
9	1.8860	32.46	9.24	41.70	56.00	-14.30			QP
10	1.8860	31.45	9.24	40.69	46.00	-5.31			AVG
11	9.3260	35.93	9.46	45.39	60.00	-14.61			QP
12	9.3260	23.58	9.46	33.04	50.00	-16.96			AVG





Product Type **Bluetooth Speaker** : M/N F6 2 **Operating Condition** Charging+ AUX IN Playing : Test Specification Neutral : Comment AC 120V/60Hz : 100.0 dBuV



No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	(cm)	(deg.)	
1	0.1900	48.70	9.23	57.93	64.04	-6.11			QP
2	0.1900	35.31	9.23	44.54	54.04	-9.50			AVG
3	0.2460	41.99	9.18	51.17	61.89	-10.72			QP
4	0.2460	27.33	9.18	36.51	51.89	-15.38			AVG
5	0.8100	26.83	9.25	36.08	56.00	-19.92			QP
6	0.8100	24.12	9.25	33.37	46.00	-12.63			AVG
7	2.4300	28.48	9.26	37.74	56.00	-18.26			QP
8	2.4300	20.77	9.26	30.03	46.00	-15.97			AVG
9	9.5020	34.81	9.38	44.19	60.00	-15.81			QP
10	9.5020	23.46	9.38	32.84	50.00	-17.16			AVG
11	23.7820	31.84	9.87	41.71	60.00	-18.29			QP
12	23.7820	3.10	9.87	12.97	50.00	-37.03			AVG



9.2 Conducted peak output power

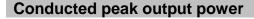
Test Method

- 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

According to §15.247 (b) (1), conducted peak output power limit as below:

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



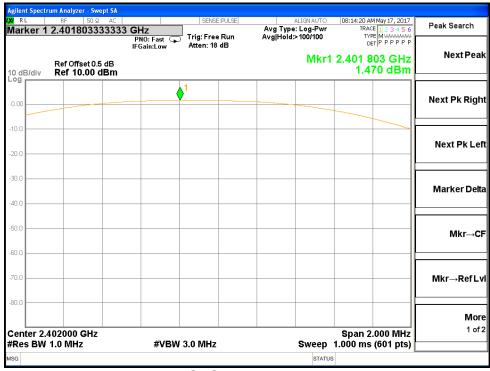
Bluetooth Mode GFSK modulation Test Result					
	Conducted Peak				
Frequency	Output Power	Result			
MHz	dBm				
Low channel 2402MHz	1.470	Pass			
Middle channel 2441MHz	2.544	Pass			
High channel 2480MHz	3.566	Pass			

Bluetooth Mode π/4-DQPSK modulation Test Result Conducted Peak

Frequency	Output Power	Result
MHz	dBm	
Low channel 2402MHz	1.694	Pass
Middle channel 2441MHz	2.560	Pass
High channel 2480MHz	3.370	Pass

Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	1.674	Pass
Middle channel 2441MHz	2.638	Pass
High channel 2480MHz	3.630	Pass



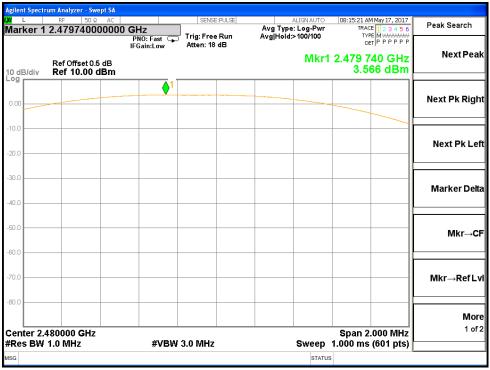
GFSK: 2402MHz

EMC_SZ_FR_21.00 FCC Release 2014-03-20



ent Spectrum Analyzer - Swep					
L RF 50 Ω		SENSE:PULSE	ALIGNAUTO Avg Type: Log-Pwr	08:14:53 AM May 17, 2017 TRACE 1 2 3 4 5 6	Peak Search
IIKEI 1 2.44072000	PNO: Fast G IFGain:Low	Trig: Free Run Atten: 18 dB	Avg Hold:>100/100		NextPea
Ref Offset 0.5 d B/div Ref 10.00 d			IVIKE	2.440 727 GHz 2.544 dBm	
	1				Next Pk Rig
0					nextrang
0					Next Pk L
0					NCALL K L
0					Marker De
0					warker De
0					Mkr⊸
0					IVIKI →
					Mire Defi
0					Mkr→Refl
0					Ма
nter 2.441000 GHz es BW 1.0 MHz	#\(D)A	3.0 MHz	Swoon	Span 2.000 MHz 1.000 ms (601 pts)	1 0
	#VDV	5.0 19172	Sweep		

GFSK: 2441MHz



GFSK: 2480MHz

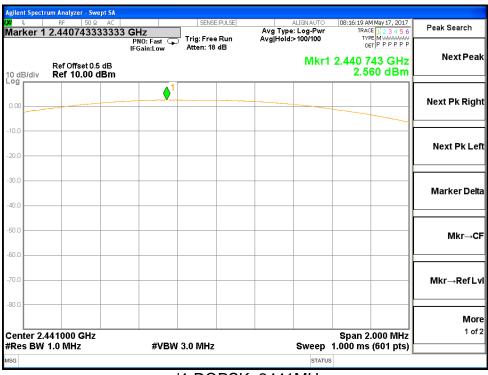
EMC_SZ_FR_21.00 FCC Release 2014-03-20 TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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Peak Search	08:16:47 AM May 17, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100	ree Run	GH ₇	RF 50 Ω AC 4018066666667	larker 1 2
Next Pea	2.401 807 GHz 1.694 dBm	Mkr1		IFGain:Luw Austr	tef Offset 0.5 dB tef 10.00 dBm	
Next Pk Rig		****		1).00
Next Pk Le						0.0
Marker De						o.o
Mkr→C						0.0
Mkr→RefL						0.0
Mo 1 of	Span 2.000 MHz 1.000 ms (601 pts)	Sweep	Hz	#VBW 3.0 MH		enter 2.40 Res BW 1

π/4-DQPSK: 2402MHz



π/4-DQPSK: 2441MHz

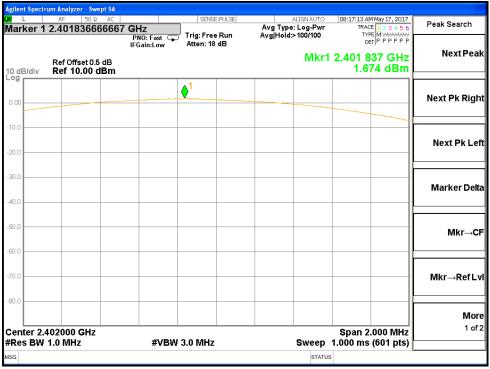
EMC_SZ_FR_21.00 FCC Release 2014-03-20 TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China Tel. +86 755 8828 6998, Fax: +86 755 8828 5299

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Peak Search	08:15:50 AM May 17, 2017 TRACE 1 2 3 4 5 6	ALIGNAUTO /g Type: Log-Pwr	SENSE:PULSE	' GHz	RF 50 Ω AC 2.4797366666667	∟ larker 1
NextPea	2.479 737 GHz 3.370 dBm	g Hold:>100/100 Mkr1	Trig: Free Run Atten: 18 dB	PNO: Fast 😱 IFGain:Low	Ref Offset 0.5 dB Ref 10.00 dBm) dB/div
Next Pk Rig				1		.00
Next Pk Le						.0
Marker De						.0
Mkr→C						.0
Mkr→RefL						.0
Mo 1 o	Span 2.000 MHz				80000 GHz	no

π/4-DQPSK: 2480MHz



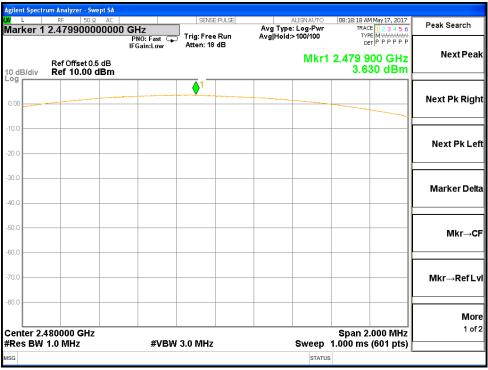
8-DPSK: 2402MHz

EMC_SZ_FR_21.00 FCC Release 2014-03-20



L RF 50Ω AC		SENSE:PULSE	ALIGN AUTO	08:17:46 AM May 17, 2017	Peak Search
larker 1 2.4407966666667	GHz PNO: Fast IFGain:Low	Trig: Free Run Atten: 18 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P	Peak Search
Ref Offset 0.5 dB 0 dB/div Ref 10.00 dBm			Mkr1	2.440 797 GHz 2.638 dBm	Next Pea
0.00		1			Next Pk Righ
20.0					Next Pk Le
10.0					Marker Delt
0.0					Mkr→C
0.0					Mkr→RefL
30.0					Mor 1 of
enter 2.441000 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep	Span 2.000 MHz 1.000 ms (601 pts)	1.01

8-DPSK: 2441MHz



8-DPSK: 2480MHz

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9.3 20 dB 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

Bluetooth Mode GFSK Modulation test result

Frequency	20 dB Bandwidth	Limit	Result
MHz	kHz	kHz	
2402	865.6		Pass
2441	863.4		Pass
2480	866.1		Pass

	ım Analyzer - Occupied BW	1			
	RF 50 Q AC	GHz	SENSE:INT Center Freq: 2.40200		01:48:36 PM May 17, 2017 Radio Std: None
]	#IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold:>10/10	Radio Device: BTS
10 dB/div	Ref Offset 0.5 dB Ref 15.00 dBm				
Log		İ.			
5.00					
-5.00			m		
-15.0				\sim	
-25.0	~	~~~			
-35.0					
-45.0					
-55.0					
-65.0					
-75.0					
Center 2.4 #Res BW			#VBW 100	kHz	Span 2 MHz Sweep 2.733 ms
-		_			-
Occup	ied Bandwidth				
	8	19.94 kHz			
Transm	nit Freq Error	-3.819 kHz	OBW Power	99.00 %	
x dB Ba	andwidth	865.6 kHz	x dB	-20.00 dB	
MSG				STATUS	

Report Number: 65.920.16.006.01



RL	RF 50 Ω AC		SENSE:INT	ALIGNAUTO	01:47:14 PM May 17,2
enter F	Freq 2.441000000		Center Freq: 2.441000		Radio Std: None
		#IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold:>10/10	Radio Device: BTS
0 dB/div	Ref Offset 0.5 dB Ref 15.00 dBm				
og 5.00					
5.0			$/ \sim \sim$		
5.0			-		
5.0		~			\wedge
5.0					
5.0					
5.0					
5.0					
enter 3	2.441 GHz				Span 2 M
	V 30 kHz		#VBW 100 k	Hz	Sweep 2.733
Occu	ipied Bandwidtl	า			
		20.61 kHz			
Trans	mit Freq Error	-4.847 kHz	OBW Power	99.00 %	
x dB l	Bandwidth	863.4 kHz	x dB	-20.00 dB	



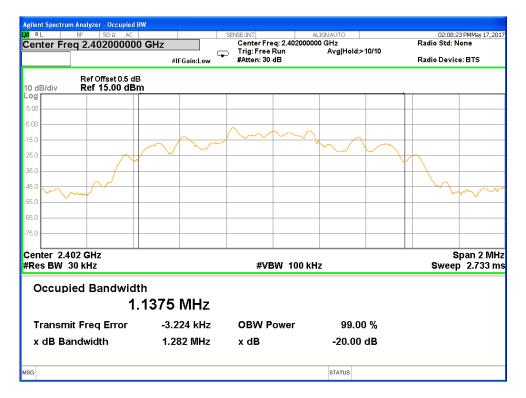
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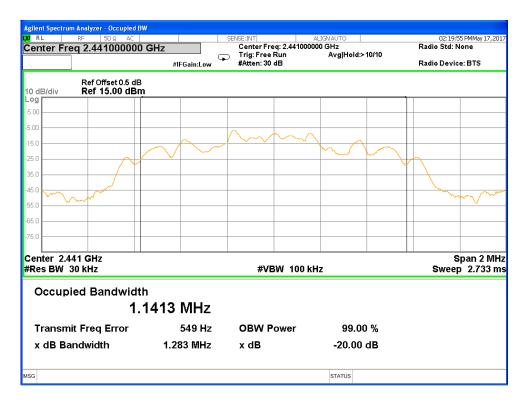
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Bluetooth Mode π /4-DQPSK Modulation test result

Frequency	20 dB Bandwidth	Limit	Result
MHz	kHz	kHz	
2402	1282		Pass
2441	1283		Pass
2480	1284		Pass





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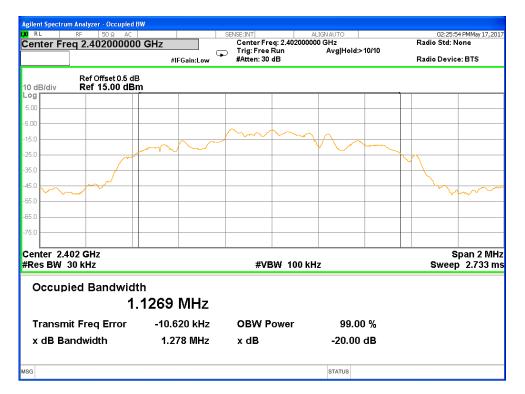
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Bluetooth Mode 8DPSK Modulation test result

Frequency MHz	20 dB Bandwidth kHz	Limit kHz	Result
2402	1278		Pass
2441	1276		Pass
2480	1277		Pass

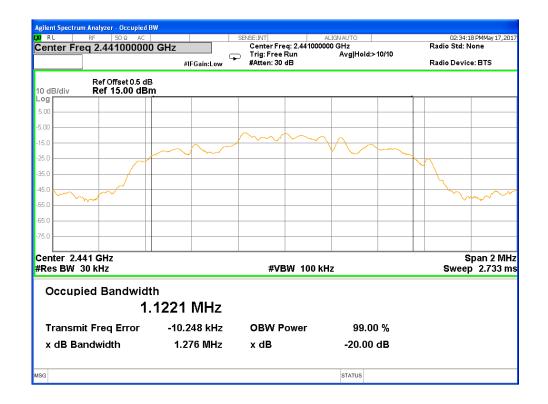


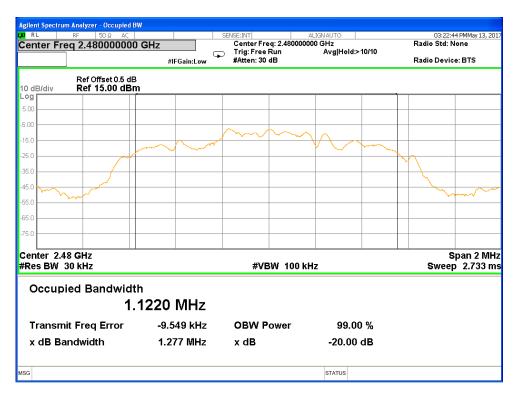
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Report Number: 65.920.16.006.01

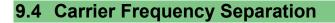






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Test Method

- 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

8DPSK Modulation Limit

Frequency	2/3 of 20 dB Bandwidth
MHz	kHz
2402	852
2441	850.7
2480	851.3



Carrier Frequency Separation

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

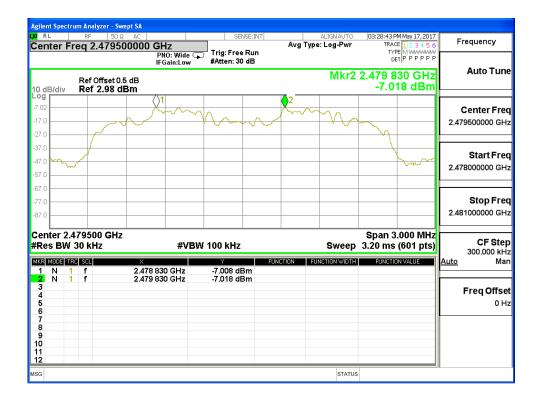


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(L	RF	50Ω AC		SENSE:		ALIGNAUTO		M May 17,2017	Frequency
nter F	req 2.44		FHZ PNO: Wide 🕞 FGain:Low	Trig: Free Ru #Atten: 30 dB		l Type: Log-Pwr	TYF	E P P P P P P	
dB/div		et0.5 dB 7 5 dBm				Mkr2		30 GHz 55 dBm	Auto Tu
3		~~~)1 ~~~~~		2 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m			Center F 2.441500000 0
3 3 <mark>~~~~</mark> 3 —								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Start F 2.440000000 (
3									Stop F 2.443000000 (
	441500 30 kHz	GHz	#VBV	/ 100 kHz		Sweep		.000 MHz (601 pts)	CF S 300.000
MODE TI N 1 N 1	f		330 GHz 330 GHz	-8.021 dBm -7.955 dBm	FUNCTION	FUNCTION WIDTH	FUNCTIO	ON VALUE	<u>Auto</u>
		2		1.000 42.00					Freq Off 0





Test Method

- 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.

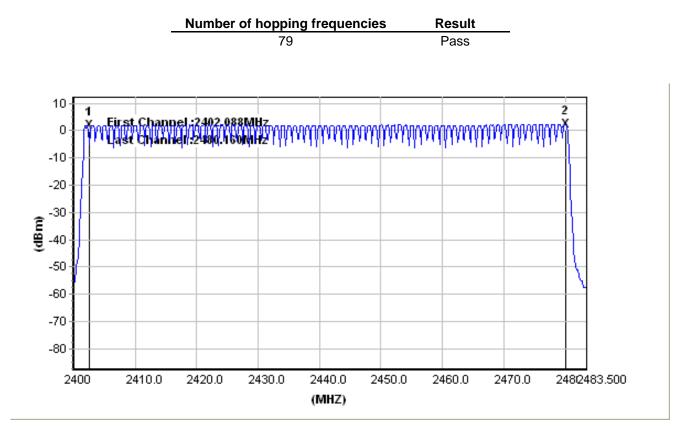
Limit

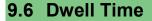
Limit number ≥ 15



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.





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

According to §15.247(a)(1)(iii). 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.

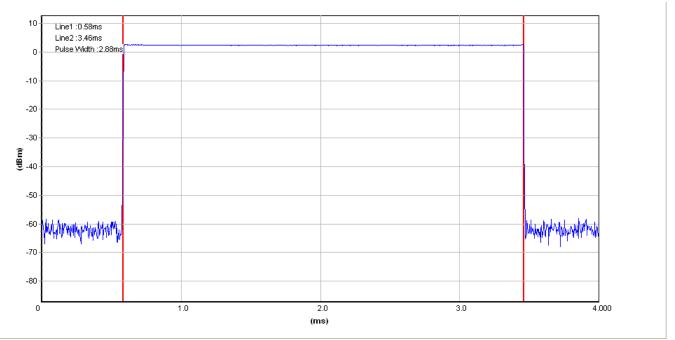
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

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.

Test Result

Modulation Reading Test Result Limit Mode **Total Hops** Result (μs) (ms) (ms) GFSK DH5 106.67 2.88 307.21 < 400 Pass π/4-DQPSK 106.67 307.21 2DH5 2.88 < 400 Pass 8-DPSK 3DH5 2.89 106.67 308.28 < 400 Pass

GFSK Modulation

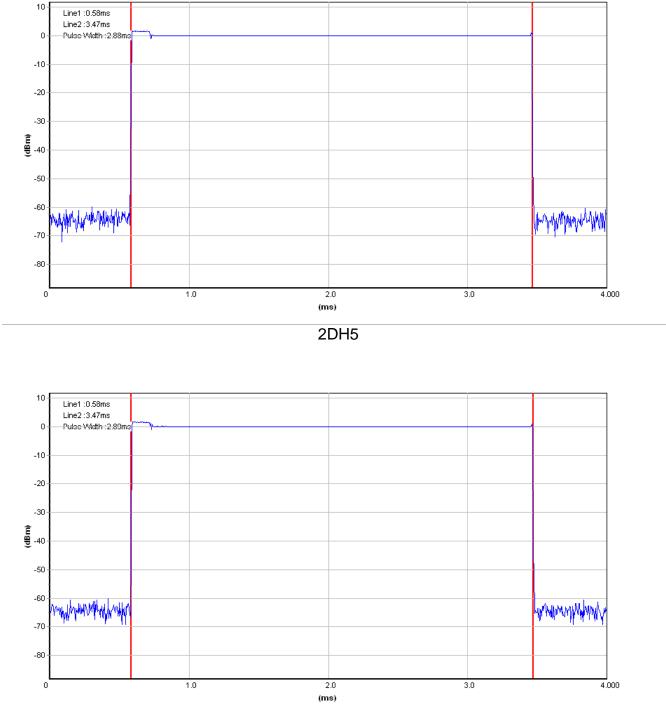


DH5

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Test Method

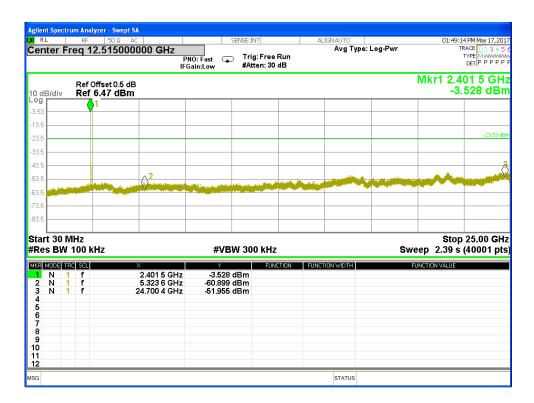
- 1. Use the following spectrum analyzer settings:
 - Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire 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

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

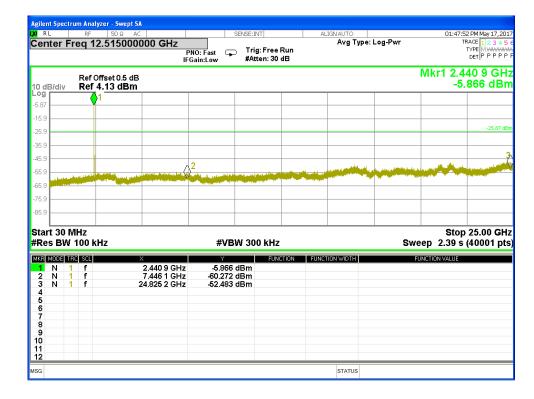
2402MHz



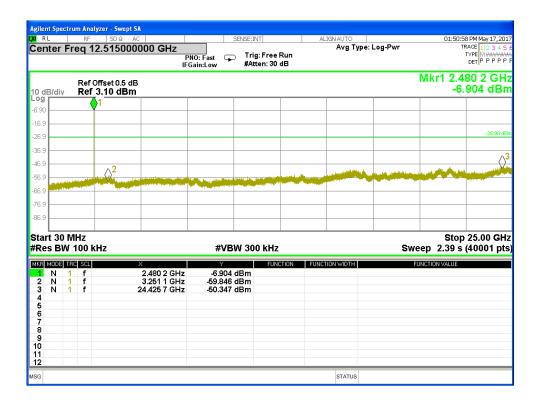
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2441MHz



2480MHz



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Test Method

- 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:

According to §15.247(d) and RSS-210 A8.5, 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) and RSS-Gen7.2.2, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.



GFSK Modulation Test Result: Hopping on mode:

	RF 50	Ω AC	SEN	ISE:INT	ALI	GN AUTO		02:08:28	3 PM May 17, 2
enter F	req 2.3515			Trig: Free Run #Atten: 30 dB	I	Avg Type:	Log-Pwr	1	ACE 1 2 3 4 TYPE MWWW DET P P P P
0 dB/div	Ref Offset 0 Ref 6.46 (MI	(r1 2.402 -3.:	794 GI 542 dB
.54									
3.5									
3.5									-23.54
.5									
.5									
.5								() ²	(
.5	Van Marken Canton	www.www.www.www.	work warman	analan yana ana ya ga aya	will all the second states	uhennenne	and and a state of the second s	mes-mailut	mun
.5									
.5									
									40300 G
art 2.3									
	/ 100 kHz		#VBW	300 kHz			Swee	ep 9.87 ms	(1001 p
Res BW	/ 100 kHz	× 2.402 794 GHz	#VBW	FUNCTION	N FUNCTI	ON WIDTH		ep 9.87 ms	(1001 p
Res BW R MODE N 2 N	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	FUNCT	ON WIDTH			(1001 p
Res BW R Mode N N N N N	/ 100 kHz 166 SCL	2.402 794 GHz	Y -3.542 dE	FUNCTION 3m 3m	N FUNCTI	ON WIDTH			(1001 p
Res BW MODE N 2 N 3 N 4 5 5	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	FUNCTI	ON WIDTH			(1001 p
Res BW R MODE 1 N 2 N	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	N FUNCTI	ION WIDTH			(1001 p
Res BW R MODE N 2 N 3 N 4 5 5 7 8 9	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	N FUNCT	ION WIDTH			(1001 p
Res BW NODE N N N N N N N N S S N N N N N N N N N	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	FUNCTI	DN WIDTH			(1001 p
Res BW R MODE N 2 N 3 N 4 5 5 7 3	/ 100 kHz IRC SCL 1 f 1 f	2.402 794 GHz 2.390 022 GHz	-3.542 dE -57.543 dE	FUNCTION 3m 3m	N FUNCTI	STATUS			(1001

RL	RF			SEP	NSE:INT	ALIGN AUTO			3 PM May 17,3
enter	r Freq 2	2.4895000	PI	NO: Fast 😱 Gain:Low	Trig: Free Run #Atten: 30 dB	Avg Ty	/pe: Log-Pwr	т	TYPE MWWW DET P P P F
) dB/di		Offset 0.5 dE 6.09 dBm					N	/kr1 2.479 -3.	819 G 914 dl
og	1								L
3.9	\square								
3.9	/ <u>\</u>								-23.9
3.9									
3.9)	h.							-
3.9		- Mr.							$\langle \rangle^3$
.9		4 tentember	worthmannon	and a state of the second s	un and the management	www.combles.combles.com	mounanan	vyproses white Vh-	- Andrew
.9									
3.9									
	47000	CH2						Stop 2	50000 (
	.47900 3W 100			#VBW	300 kHz		Sw	Stop 2. eep 2.07 m	
art 2. Res B	SW 100	kHz	×	Y	FUNCTION	FUNCTION WIDTH	Sw		
tart 2. Res B	SW 100	kHz 2	× 2.479 819 GHz 2.483 515 GHz	#VBW -3.914 dE -59.717 dE	FUNCTION	FUNCTION WIDTH	Sw	eep 2.07 m	.50000 G s (1001 j
art 2. Res B B MOD B N C N B N B N	SW 100 E TRC SCL 1 f	kHz 2	2.479 819 GHz	Y -3.914 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	
art 2. Res B MODE N N N N N S N	SW 100 E TRC SCI 1 f 1 f	kHz 2	2.479 819 GHz 2.483 515 GHz	-3.914 dE -59.717 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	
cart 2. Res B (1 N 2 N 3 N 4 5 5 7	SW 100 E TRC SCI 1 f 1 f	kHz 2	2.479 819 GHz 2.483 515 GHz	-3.914 dE -59.717 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	
cart 2. Res B (1 N 2 N 3 N 4 5 5	SW 100 E TRC SCI 1 f 1 f	kHz 2	2.479 819 GHz 2.483 515 GHz	-3.914 dE -59.717 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	
art 2. Res B MODE N 2 N 3 N 4 5 5 5 5 7 8 9 0	SW 100 E TRC SCI 1 f 1 f	kHz 2	2.479 819 GHz 2.483 515 GHz	-3.914 dE -59.717 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	
art 2. Res B MODE N N N N N N N N N N	SW 100 E TRC SCI 1 f 1 f	kHz 2	2.479 819 GHz 2.483 515 GHz	-3.914 dE -59.717 dE	FUNCTION 3m 3m	FUNCTION WIDTH	Sw	eep 2.07 m	

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Hopping off mode:

RL R	F 50Ω A	c I I	SENS	E:INT	ALIGN AUTO		01:49:4	9 PM May 17, 2
enter Freq	2.3515000	00 GHz	NO: East	Trig: Free Run #Atten: 30 dB	Avg Typ	e: Log-Pwr	TI	RACE 1 2 3 4 TYPE MWWW DET P P P P
	ef Offset 0.5 dE ef 6.55 dBm					M	kr1 2.401 -3.	867 GI 447 dB
15								
5								
5								-23.45
5								
5								
5							<mark>∕2</mark>	
5 merlementer	manne	of the manufacture of the	-log-selectory	mormoniclement	weight and a start of the second start of the	photom with the manufacture	en marine	endershammed
5								
5								
art 2.30000 es BW 100			#VBW :	300 kHz		Swe	Stop 2. ep 9.87 ms	40300 G s (1001 p
1 MODE 1176 30 N 1 f N 1 f N 1 f	2	× 2.401 867 GHz 2.390 022 GHz 2.400 013 GHz	-3.447 dB -60.659 dB -60.758 dB	n	FUNCTION WIDTH	F	UNCTION VALUE	



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8DPSK Modulation Test Result: Hopping on mode:

RL	RF 50	Ω AC	SENSE:PUL	SE	ALIGNAUTO		04:04:05 PM May 17,20
enter F	req 2.351			g: Free Run ten: 30 dB	Avg Type: L	og-Pwr	TRACE 1 2 3 4 1 TYPE M WWWW DET P P P P 1
dB/div	Ref Offset Ref 3.84					Mkr1	2.401 867 GH -6.156 dB
16							
.2							
							-26.16 c
2							
2							
2							<u>^2</u>
2 ليتقسي	housellaworn	Am Maken and por more	and the second	man ganger and the	-	mentermenter	where we wanted and a start of the start of
2							
2							
2							
)000 GHz 100 kHz		#VBW 30	0 kHz			Stop 2.40300 GF .867 ms (1001 pt
R MODE TH		X	Y	FUNCTION	FUNCTION WIDTH	FUNCTI	ON VALUE
N 1 N 1 N 1	l f l f	2.401 867 GHz 2.390 022 GHz	-6.156 dBm -59.076 dBm				
N 1	l f	2.400 013 GHz	-60.156 dBm				
							>



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Hopping off mode:

RL	RF	50 Ω AC		SEF	NSE:PULSE		AL	IGNAUTO		10:52:2	1 AM May 17, 201
enter	Freq 2.3	35150000	P	NO: Fast 😱 Gain:Low	Trig: Free #Atten: 30			Avg Type	: Log-Pwr	т	RACE 1 2 3 4 5 TYPE M WWW DET P P P P F
dB/div		fset 0.5 dB . 12 dBm							N	lkr1 2.401 -5.	867 GH 877 dBi
38											
.9											
9											-25.88 c
9											
9											A
<u> </u>										$\langle \rangle^2$	
9	mannen	not an against the second	Annana lolvan	manneralisee		at a ballastingen	washlan	mandunus	upper partitions	mound	May marker
9											
.9											
	80000 GI V 100 kH			#VB	W 300 kH:	z			Swe	Stop 2. ep 9.867 m	40300 GH s (1001 pt
	TRC SCL	>		Y		NCTION	FUNCT	ION WIDTH		FUNCTION VALUE	
N N N	1 f 1 f		401 867 GHz 390 022 GHz	-5.877 -58.513							
N	1 f		400 013 GHz	-59.472							
											>



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9.9 Spurious radiated emissions for transmitter and receiver

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 3meter 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
- 5. Use the following spectrum analyzer settings According to C63.10: For 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 and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold. 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, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).

4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.



Limit

According to part 15.247(d), 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 section 15.205, 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:

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
895.99	41.69	Horizontal	46.00	QP	4.31	Pass
956.46	38.52	Vertical	46.00	QP	7.48	Pass
*4804		Horizontal	74.00	PK		Pass
7206		Horizontal	74.00	PK		Pass
*4804		Vertical	74.00	PK		Pass
7206		Vertical	74.00	PK		Pass

Bluetooth Mode GFSK Modulation 2402MHz Test Result

Bluetooth Mode GFSK Modulation 2441MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
895.99	39.51	Horizontal	46.00	QP	6.49	Pass
866.96	38.58	Vertical	46.00	QP	7.42	Pass
*4882		Horizontal	74.00	PK		Pass
*7323		Horizontal	74.00	PK		Pass
*4882		Vertical	74.00	PK		Pass
*7323		Vertical	74.00	PK		Pass

Bluetooth Mode GFSK Modulation 2480MHz Test Result

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBuV/m	
895.99	40.69	Horizontal	46.00	QP	5.31	Pass
155.79	29.83	Vertical	43.5	QP	13.67	Pass
*4960		Horizontal	74.00	PK		Pass
*7440		Horizontal	74.00	PK		Pass
*4960		Vertical	74.00	PK		Pass
*7440		Vertical	74.00	PK		Pass

Remark:

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

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10 Test Equipment List

List of Test Instruments

Test Equipment	Manufacturer	Model No	Serial No	Cal. Date	Cal. Due Date
SIGNAL ANALYZER	R&S	FSV40	101470	2016.06.29	2017.06.28
EMI Measuring Receiver	R&S	ESR	101660	2016.06.29	2017.06.28
Low Noise Pre Amplifier	Tsj	MLA-10K01- B01-27	1205323	2016.06.29	2017.06.28
Low Noise Pre Amplifier	Tsj	MLA-0120-A02- 34	2648A04738	2016.06.29	2017.06.28
TRILOG Super Broadband test Antenna	SCHWARZBECK	VULB9160	9160-3206	2016.06.29	2017.06.28
Broadband Horn Antenna	SCHWARZBECK	BBHA9120D	452	2017.01.29	2018.01.28
SHF-EHF Horn	SCHWARZBECK	BBHA9170	BBHA91703 67	2016.06.29	2017.06.28
50Ω Coaxial Switch	Anritsu	MP59B	6200264416	2016.06.29	2017.06.28
EMI Test Receiver	R&S	ESCI	100124	2016.06.29	2017.06.28
LISN	Kyoritsu	KNW-242	8-837-4	2016.06.29	2017.06.28
LISN	Kyoritsu	KNW-407	8-1789-3	2016.06.29	2017.06.28
Loop Antenna	ETS	6512	00165355	2016.06.29	2017.06.28

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Signal Analyzer	Agilent	N9020A	MY49100060	2016.10.23	2017.10.22



11 System Measurement Uncertainty

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.70dB
4	Spurious emissions, conducted	±1.19dB
5	All emissions,radiated(<30M) (9KHz-30MHz)	±2.45dB
6	All emissions,radiated(<1G) 30MHz-200MHz	±2.83dB
7	All emissions,radiated(<1G) 200MHz-1000MHz	±2.94dB
8	All emissions,radiated(>1G)	±3.03dB
9	Temperature	±0.5°C
10	Humidity	±2%