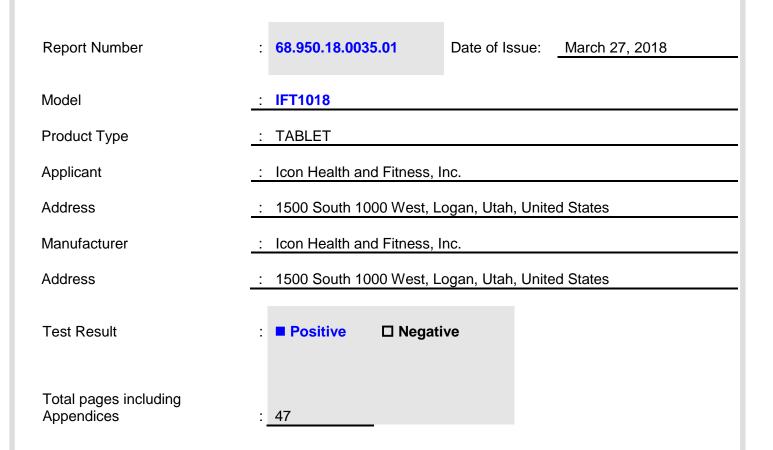


FCC/IC - TEST REPORT



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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 518052				
	P.R. China				
Telephone:	86 755 8828 6998				
Fax:	86 755 828 5299				
FCC Registration Number:	514049				
IC Registration Number:	10320A-1				



3 Description of the Equipment Under Test

Product:	TABLET
Model no.:	IFT1018
IC:	3673A-IFT1018
FCC ID:	OMCIFT1018
Options and accessories:	Nil
Rating:	3.8VDC, 6000mAh (supplied by an internal rechargable battery pack) or 5VDC, 2000mA (charging by an external adapter) Model: SAW12-050-2000UB Input: 100 – 240VAC, 50/60Hz, 0.3A Output: 5VDC, 2000mA
RF Transmission	2402MHz-2480MHz
Frequency: No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	Integrated antenna
Antenna Gain:	2.23dBi
Description of the EUT:	The Equipment Under Test (EUT) is a TABLET operated at 2.4GHz



4 Summary of Test Standards

Test Standards				
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES			
10-1-2015 Edition	Subpart C - Intentional Radiators			
RSS-Gen Issue 4	General Requirements for the Certification of Radio Apparatus.			
November 2014				
RSS-247 Issue 2 2017 Digital Transmission Systems (DTS), Frequency Hoppin				
	(FHSS) and License-Exempt Local Area Network (LE-LAN) Devices			

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 ANSI C63.10-2013.



5 Summary of Test Results

	Technical Requirements					
FCC Part 15 Sub	part C/RSS-247	Issue 2/RSS-Gen Issue 4				
Test Condition		Pages	Test Result	Test Site		
§15.207	RSS-GEN 8.8	Conducted emission AC power port	10	Pass	Site 1	
§15.247(b)(1)	RSS-247 Clause 5.4(2)	Conducted peak output power	13	Pass	Site 1	
§15.247(e)	RSS-247 Clause 5.2(2)	Power spectral density*		N/A		
§15.247(a)(2)	RSS-247 Clause 5.2(1)	6dB bandwidth		N/A		
§15.247(a)(1)	RSS-247 Clause 5.1(1)	20dB bandwidth and 99% Occupied Bandwidth	20	Pass	Site 1	
§15.247(a)(1)	RSS-247 Clause 5.1(2)	Carrier frequency separation	27	Pass	Site 1	
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(4)	Number of hopping frequencies	30	Pass	Site 1	
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(4)	Dwell Time	32	Pass	Site 1	
§15.247(d)	RSS-247 Clause 5.5	Spurious RF conducted emissions	35	Pass	Site 1	
§15.247(d)	RSS-247 Clause 5.5	Band edge	39	Pass	Site 1	
§15.247(d) & §15.209 &	RSS-247 Clause 5.5 & RSS-GEN 6.13	Spurious radiated emissions for transmitter and receiver	42	Pass	Site 1	
§15.203	RSS-GEN 8.3	Antenna requirement	See note 1	Pass		

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an Integrated antenna, which gain is 2.23dBi. 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: OMCIFT1018, IC: 3673A-IFT1018, complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C and RSS 247 and RSS-Gen rules.

This report is for the BT 3.0 part.

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.
- - **Fulfills** the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date:January 25, 2018Testing Start Date:January 25, 2018Testing End Date:March 22, 2018

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

Reviewed by: JULANS

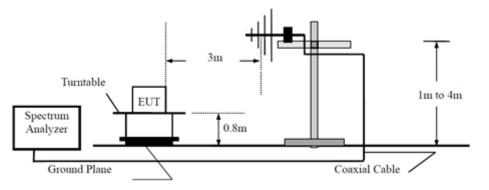
Laurent Yuan EMC Project Manager Prepared by:

Aaron Lai EMC Project Engineer

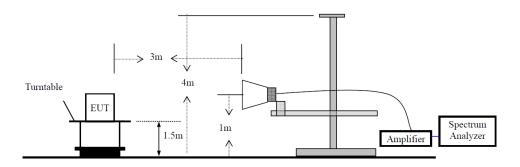
7 Test Setups

7.1 Radiated test setups

Below 1GHz



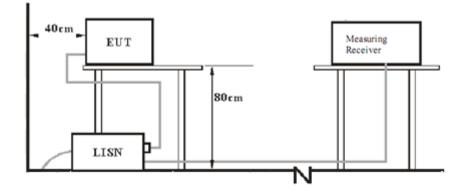
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups







8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
PC	lenovo	X220	

Test software: RF test tool, which used to control the EUT in continues transmitting mode

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

Hopping mode: typical working mode (normal hopping status)

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



9.1 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

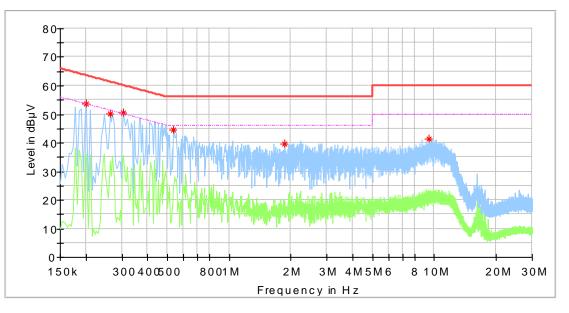
Decreasing linea





Conducted Emission

Product Type M/N Operating Condition Test Specification	:	TABLET IFT1018 TX
Test Specification Comment	-	Live AC 120V/60Hz



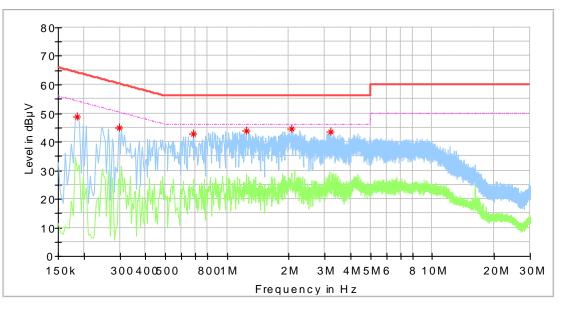
Frequency	MaxPeak	Average	Limit	Margin	Line	Corr.
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)		(dB)
0.202000	53.69		63.53	9.84	L1	10.2
0.262000	50.21		61.37	11.16	L1	10.2
0.306000	50.65		60.08	9.43	L1	10.2
0.534000	44.40		56.00	11.60	L1	10.2
1.858000	39.72		56.00	16.28	L1	10.3
9.398000	41.23		60.00	18.77	L1	10.6

Remark : "*" Correct factor=cable loss + LISN factor



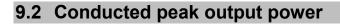
Conducted Emission

Product Type	•	TABLET
M/N	:	IFT1018
Operating Condition	:	ТХ
Test Specification	:	Neutral
Comment	:	AC 120V/60Hz



Frequency	MaxPeak	Average	Limit	Margin	Line	Corr.
(MHz)	(dBµV)	(dBµV)	(dBµV)	(dB)		(dB)
0.186000	48.61		64.21	15.61	Ν	10.3
0.298000	44.87		60.30	15.43	N	10.3
0.682000	42.79		56.00	13.21	Ν	10.4
1.238000	43.90		56.00	12.10	Ν	10.4
2.062000	44.61		56.00	11.39	N	10.4
3.210000	43.45		56.00	12.55	Ν	10.5

Remark : "*" Correct factor=cable loss + LISN factor



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

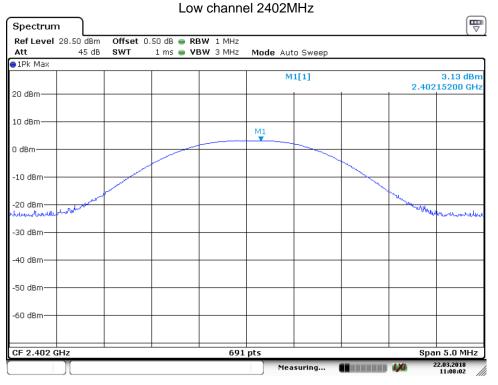
Limits

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





Bluetooth Mode GFS	K modulation Tes Conducted Peak	t Result
Frequency	Output Power	Result
MHz	dBm	
Low channel 2402MHz	3.13	Pass
Middle channel 2441MHz	3.29	Pass
High channel 2480MHz	2.63	Pass



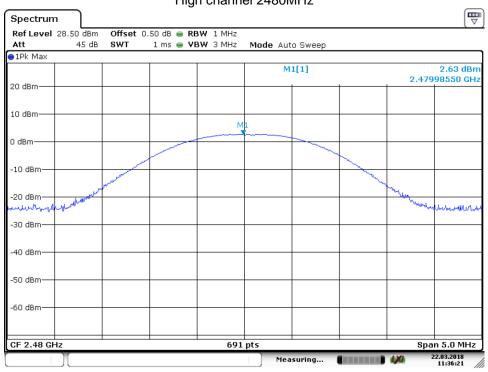
Date: 22.MAR.2018 11:08:02





Middle channel 2441MHz Spectrum Offset 0.50 dB 👄 RBW 1 MHz Ref Level 28.50 dBm 45 dB 1 ms 👄 VBW 3 MHz Att SWT Mode Auto Sweep ⊖1Pk Max M1[1] 3.28 dBn 2.44116640 GHz 20 dBm-10 dBm-M1 0 dBm -10 dBm -20 dBm-. n. Johnstein ω. mente -30 dBm -40 dBm -50 dBm--60 dBm 691 pts CF 2.441 GHz Span 5.0 MHz 22.03.2018 11:35:31 Measuring...

Date: 22.MAR.2018 11:35:31



High channel 2480MHz

Date: 22.MAR.2018 11:36:22

-



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

Frequency	Output Power	Result
MHz	dBm	
Low channel 2402MHz	2.27	Pass
Middle channel 2441MHz	2.34	Pass
High channel 2480MHz	1.78	Pass

			L0			VII 12			_
Spectrun	Γ								
Ref Level	28.50 dBm	Offset	0.50 dB 🔵 R	BW 1 MHz					
Att	45 dB	SWT		BW 3 MHz	Mode Au	to Sweep			
∋1Pk Max						F			
					M	1[1]		2 401	2.27 dBm 97830 GHz
20 dBm			+			1		2.401	97630 GHZ
10 dBm									
				м	1				
0 dBm			www						
-10 dBm		www.					margare		
	and the second							willing	
-20 dBm	. John Wald							"Wold w	dt
northerent	J.C.								Muunun
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
CF 2.402 C	Hz			691	pts		1	 Spa	n 5.0 MHz
					Mea	asuring		100	22.03.2018 11:37:36
									11.57.50 //

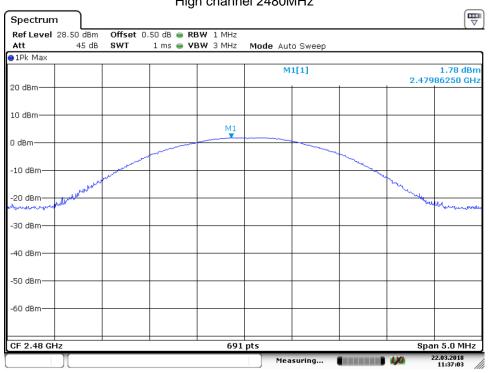
Low channel 2402MHz

Date: 22.MAR.2018 11:37:37



Middle channel 2441MHz Spectrum Offset 0.50 dB 👄 RBW 1 MHz Ref Level 28.50 dBm 45 dB 1 ms 👄 VBW 3 MHz Att SWT Mode Auto Sweep ⊖1Pk Max M1[1] 2.34 dBn 2.44114470 GHz 20 dBm-10 dBm-M1 0 dBm an T -10 dBm MIN -20 dBmun l allermater -30 dBm -40 dBm -50 dBm--60 dBm 691 pts Span 5.0 MHz CF 2.441 GHz 22.03.2018 11:38:03 Measuring... ······

Date: 22.MAR.2018 11:38:03



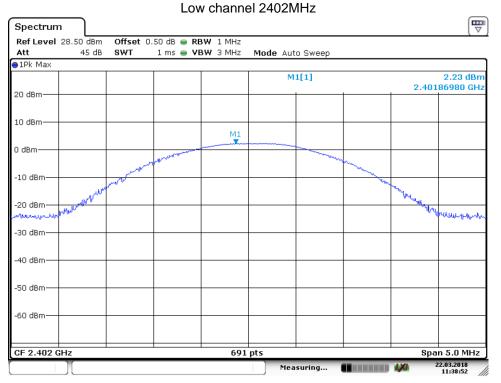
High channel 2480MHz

Date: 22.MAR.2018 11:37:04



Bluetooth Mode 8DPSK modulation Test Result Conducted Peak Frequency Output Power Result

riequency	Output Fower	Nesun
MHz	dBm	
Low channel 2402MHz	2.23	Pass
Middle channel 2441MHz	2.42	Pass
High channel 2480MHz	1.76	Pass



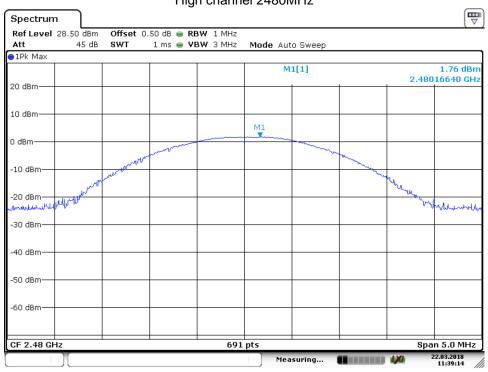
Date: 22.MAR.2018 11:38:53

EMC_SZ_FR_23.01 FCC Release 2017-06-20



Middle channel 2441MHz Spectrum Offset 0.50 dB 👄 RBW 1 MHz Ref Level 28.50 dBm 45 dB 1 ms 👄 VBW 3 MHz Att SWT Mode Auto Sweep ⊖1Pk Max 2.42 dBm 2.44104340 GHa M1[1] 20 dBm-10 dBm-0 dBm -10 dBm -20 dBmъđ Mahan -30 dBm -40 dBm -50 dBm--60 dBm 691 pts CF 2.441 GHz Span 5.0 MHz 22.03.2018 11:38:25 Measuring...

Date: 22.MAR.2018 11:38:26



High channel 2480MHz

Date: 22.MAR.2018 11:39:14



9.3 20 dB bandwidth and 99% Occupied Bandwidth

Test Method

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

Limit

Limit [kHz]

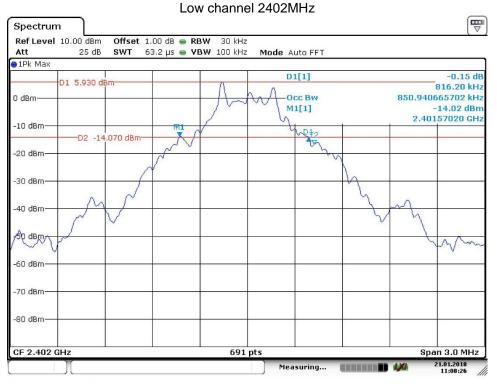
N/A



20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode GFSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	816.20	850.94		Pass
2441	816.20	850.94		Pass
2480	816.20	850.94		Pass

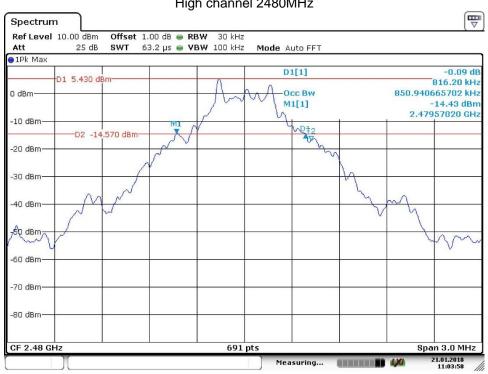


Date: 21.JAN.2018 11:08:26



Middle channel 2441MHz ₽ Spectrum Offset 1.00 dB 👄 RBW 30 kHz Ref Level 10.00 dBm 25 dB SWT 63.2 µs 👄 VBW 100 kHz Att Mode Auto FFT ⊖1Pk Max D1[1] -0.10 dB D1 5.840 dBm 816.20 kHz Occ Bw 850.940665702 kHz 0 dBm -13.99 dBm M1[1] 2.44057020 GHz -10 dBm--D2 -14.160 dBm 4 -20 dBm -30 dBm 40 dBm-50 dBm N -60 dBm -70 dBm -80 dBm 691 pts Span 3.0 MHz CF 2.441 GHz 21.01.2018 11:07:29 Measuring...

Date: 21.JAN.2018 11:07:30



High channel 2480MHz

Date: 21.JAN.2018 11:03:58



20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode $\pi/4$ -DQPSK Modulation test result Frequency 20 dB Bandwidth 99% Bandwidth Limit Result MHz kHz kHz kHz 1072.35 Pass 2402 1124.50 --1072.35 2441 1120.10 Pass --1072.35 2480 1120.10 Pass --



Low channel 2402MHz

Date: 21.JAN.2018 10:56:06

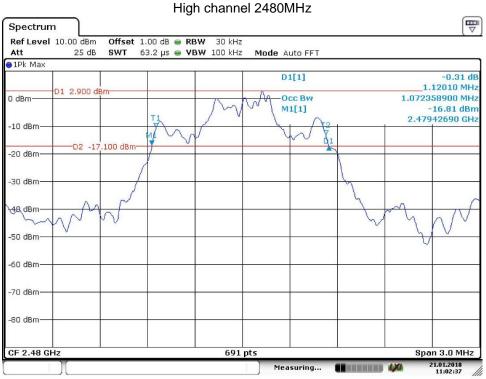
EMC_SZ_FR_23.01 FCC Release 2017-06-20



Middle channel 2441MHz ₽ Spectrum
 Offset
 1.00 dB
 ■
 RBW
 30 kHz

 SWT
 63.2 μs
 ■
 VBW
 100 kHz
 Ref Level 10.00 dBm Att 25 dB Mode Auto FFT ●1Pk Max M1[1] 3.34 dBn M1 2.44112590 GHz D1 3.340 dBm 0 dBm-Occ Bw 1.072358900 MHz -10 dBm 0 -D2 -16.660 dBm -20 dBm -30 dBm 40\dBm -50 dBm--60 dBm 70 dBm -80 dBm CF 2.441 GHz 691 pts Span 3.0 MHz 21.01.2018 10:59:42 Measuring...

Date: 21.JAN.2018 10:59:42



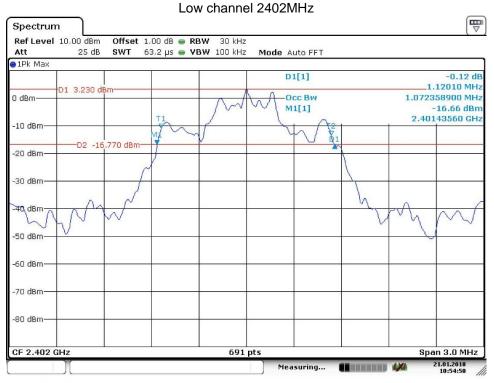
Date: 21.JAN.2018 11:02:37



20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode 8DPSK Modulation test result

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
 MHz	kHz	kHz	kHz	
 2402	1120.10	1072.35		Pass
2441	1120.10	1072.35		Pass
2480	1120.10	1072.35		Pass



Date: 21.JAN.2018 10:54:50

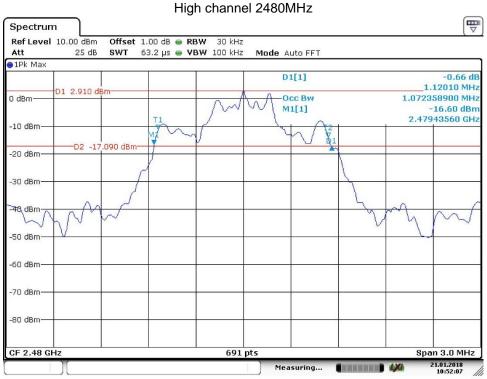
EMC_SZ_FR_23.01 FCC Release 2017-06-20



Middle channel 2441MHz ₽ Spectrum
 Offset
 1.00 dB
 ■
 RBW
 30 kHz

 SWT
 63.2 μs
 ■
 VBW
 100 kHz
 Ref Level 10.00 dBm Att 25 dB Mode Auto FFT ●1Pk Max D1[1] -0.25 dP 1.12010 MHz D1 3.350 dBm 0 dBm-Occ Bw 1.072358900 MHz M1[1] -16.44 dBm 2.44043560 GHz -10 dBm -D2 -16.650 dBm -20 dBm--30 dBm -40 dBm -50 dBm--60 dBm 70 dBm -80 dBm CF 2.441 GHz 691 pts Span 3.0 MHz 21.01.2018 10:52:58 Measuring...

Date: 21. JAN. 2018 10:52:58



Date: 21.JAN.2018 10:52:06

EMC_SZ_FR_23.01 FCC Release 2017-06-20

9.4 Carrier Frequency Separation

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

GFSK Modulation Limit

Frequency	2/3 of 20 dB Bandwidth
MHz	kHz
2402	544.1333
2441	544.1333
2480	544.1333



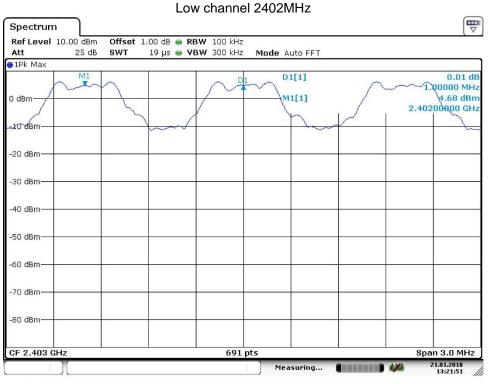


Carrier Frequency Separation

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

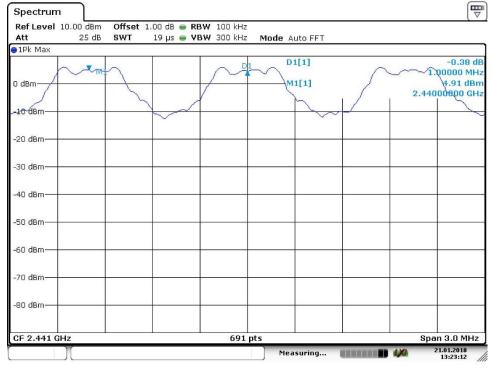
Frequency MHz	Carrier Frequency Separation kHz	Result	
2402	1000.00	Pass	
2441	1000.00	Pass	
2480	1000.00	Pass	



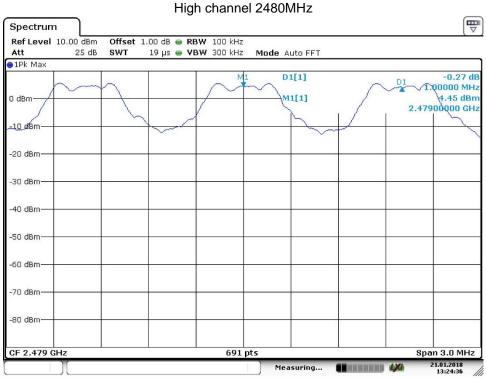
Date: 21.JAN.2018 13:21:51



Middle channel 2441MHz



Date: 21.JAN.2018 13:23:13



Date: 21.JAN.2018 13:24:37



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

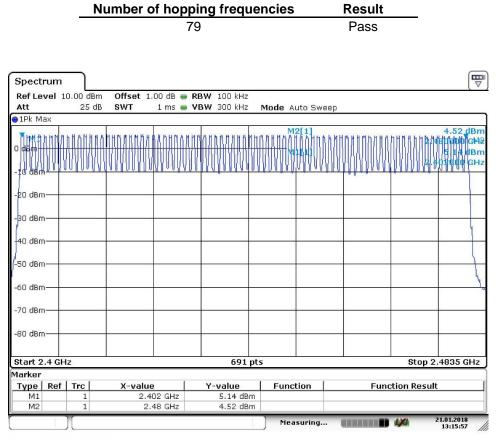
Limit number ≥ 15





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.



Date: 21.JAN.2018 13:15:57



Test Method

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

Limit

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





Dwell Time

Dwell time

The maximum dwell time shall be 0.4 s.

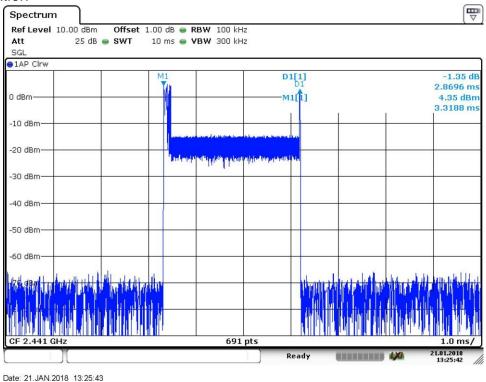
According to the Bluetooth Core Specification, the worse result (DH5 mode) was reported to show compliance.

The Dwell Time = Burst Width * Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] * hopping number = 0.4 [s] * 79 [ch] = 31.6 [s*ch];The burst width, which is directly measured, refers to the duration on one channel hop. The maximum number of hopping channels in 31.6s for DH5=1600 / 6 / 79 *31.6=106.67

Test Result

Modulation	Mada	Reading	Tatalliana	Test Result	Limit	Desult
	Mode	(us)	Total Hops	(ms)	(ms)	Result
GFSK	DH5	2869.6	106.67	306.10	< 400	Pass
π/4-DQPSK	2DH5	2869.6	106.67	306.10	< 400	Pass
8-DPSK	3DH5	2869.6	106.67	306.10	< 400	Pass

GFSK Modulation

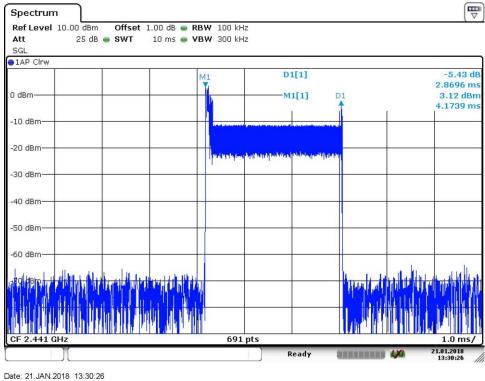


DH5

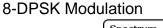
EMC_SZ_FR_23.01 FCC Release 2017-06-20 TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12 & 13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District Shenzhen 518052, P.R. China Page 33 of 47



$\pi/4$ -DQPSK Modulation







Spectrum Ref Level 10.00 dBm Offset 1.00 dB 👄 RBW 100 kHz Att 25 dB 👄 SWT 10 ms 👄 **VBW** 300 kHz SGL ●1AP Clrw D1[1] 0.20 dB М D1 2.8696 ms 3.13 dBm 0 dBm-M1[1] 1.9710 m -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm 691 pts CF 2,441 GHz 1.0 ms/ 21.01.2018 13:31:31 Ready unnunnun 🎶 Date: 21.JAN.2018 13:31:30

3DH5

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9.7 Spurious RF conducted emissions

Test Method

- 1. Use the following spectrum analyzer settings:
- Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 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



Spurious RF conducted emissions

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

BT3.0 GFSK Modulation:

			LUV	v channe					G
Spectrun Ref Level	n 10.00 dBm	Offset	1.00 dB 👄 RE	3W 100 kHz					[9
Att	25 dB	SWT	9.7 ms 👄 VE	3W 300 kHz	Mode A	uto Sweep			
1Pk Max	1	1				1[1]			-61.35 dB
						1[1]			936.10 MI
) dBm				· · · · · · · · · · · · · · · · · · ·					-
10 dBm									
	D1 -14.350	dBm					2 C.		
20 dBm									
30 dBm									
40 dBm—									
50 dBm									
									M1
60 dBm	Hulden and and on	Mulpah ine	lum market with	a million the	ulun when	hunderstructure	muturally	mendedgement	munimum
70 dBm-			db o control through						
80 dBm									
oo abiii				1					
		1							
	MHz 2018 11:29:0	8		691	1	suring			cop 1.0 GH 21.01.2018 11:29:07
te: 21. JAN. Spectrun Ref Level	2018 11:29:0 n 10.00 dBm	Offset	1.00 dB 🖷 RE	3W 100 kHz	Mea				21.01.2018 11:29:07
te: 21.JAN. Spectrun Ref Level Att	2018 11:29:0 n		1.00 dB 👄 RE 240 ms 🖷 VE	3W 100 kHz	Mea	uto Sweep			21.01.2018 11:29:07
ate: 21.JAN. Spectrum Ref Level Att 1Pk Max	2018 11:29:0 n 10.00 dBm 25 dB	Offset		3W 100 kHz	Mea Mode A				21.01.2018 11:29:07
tte: 21.JAN. Spectrum Ref Level Att 1Pk Max	2018 11:29:0 n 10.00 dBm 25 dB	Offset		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
tte: 21.JAN. Spectrum Ref Level Att 1Pk Max	2018 11:29:0 n 10.00 dBm 25 dB	Offset		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 11Pk Max 0 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 11Pk Max 0 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 11Pk Max 0 dBm 10 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 11Pk Max 0 dBm 10 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 10 dBm 10 dBm 20 dBm 20 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att 10 dBm 10 dBm 20 dBm 20 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrun Ref Level Att 10 dBm 10 dBm 20 dBm 30 dBm 30 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
Spectrun Ref Level Att 1Pk Max	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrun Ref Level Att 110 dBm 20 dBm 30 dBm 40 dBm 40 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrun Ref Level Att 10 dBm 20 dBm 20 dBm 30 dBm 40 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mea Mode A	uto Sweep			21.01.2018 11:29:07
te: 21.JAN. Spectrum Ref Level Att) 1Pk Max () dBm 20 dBm 20 dBm 30 dBm 50 dBm 60 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT	240 ms • VE	3W 100 kHz 3W 300 kHz	Mode A Mode A	uto Sweep			21.01.2018 11:29:07
tte: 21.JAN. Spectrun Ref Level Att 110 dBm 20 dBm 30 dBm 30 dBm	2018 11:29:0 n 10.00 dBm 25 dB	Offset SWT		3W 100 kHz	Mode A Mode A	uto Sweep			21.01.2018

Date: 21.JAN.2018 11:28:35

-80 dBm-

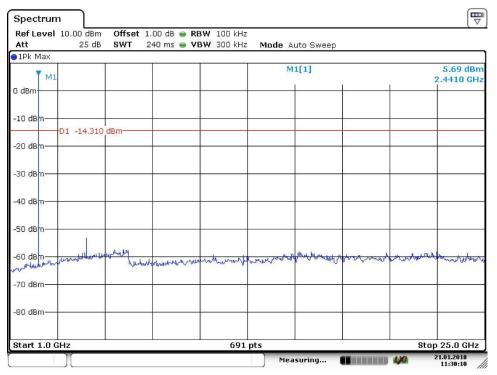
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Middle channel 2441MHz

Spectrun	n]									
Ref Level	10.00 dBm	Offset	1.00 dB	👄 RB	₩ 100 kHz					
Att	25 dB	SWT	9.7 ms	👄 УВ	W 300 kHz	Mode	Auto Sweep			
●1Pk Max						-				
							M1[1]			-60.99 dBm
							1	1	1	835.10 MHz
0 dBm										
84451 - 111W375										
-10 dBm	-									-
	D1 -14.310	dBm								
-20 dBm										
-30 dBm										
-40 dBm										
io dom										
-50 dBm										
-50 UBIII					0					
									M1	
-60 dBm				100			PRIS	a determinent war	all retenued	untromound
aludownoon	hadden mark	Contraction and	bellentur	anarcher	whether where the second	Charles and a second	a don an lha - Mu			
-70 dBm										-
-80 dBm			-							-
Start 30.0	541 I-	4			601	nta		6. 67	,	ton 1.0.0Un
Start 30.0	MHZ				691					21.01.2018
						M	easuring			11:30:41

Date: 21.JAN.2018 11:30:41



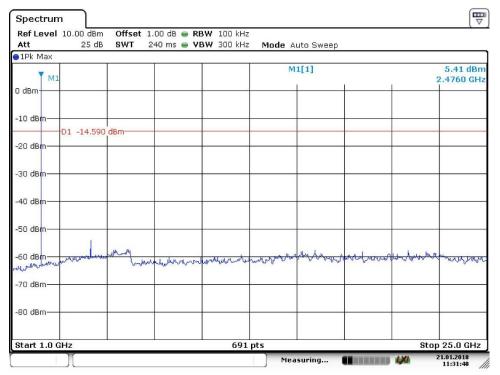
Date: 21.JAN.2018 11:30:11



High channel 2480MHz

Spectrun	n]								
	10.00 dBm		CARLEN STREET	RBW 100 kHz		the set of the			
Att	25 dB	SWT	9.7 ms 🥃	VBW 300 kHz	Mode	Auto Sweep			
⊖1Pk Max	1								
						M1[1]			-60.98 dBm 986.70 MHz
0 dBm						+			900.70 MHz
-10 dBm—	-								
	D1 -14.590	dBm						-	
-20 dBm									
-30 dBm—									
-40 dBm									
-50 dBm—									
-60 dBm									M1
manuluhar	andelimetrale	unno	unqualities	amahnunamana	number	reparation	analuth	nahanaanahaa	murmunuh
-70 dBm				-					
-80 dBm						-			
Start 30.0	MHz			691	pts			Sto	p 1.0 GHz
)(M	easuring		4/0	21.01.2018 11:32:36

Date: 21.JAN.2018 11:32:36



Date: 21.JAN.2018 11:31:47



9.8 Band edge testing

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:

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.



Hopping on mode:

Spectrur	n]				[
	10.00 dBm				×
Att	25 dB	SWT 1.1 ms 👄	VBW 300 kHz	Mode Auto Swe	ep
∋1Pk Max					
				M1[1]	5.85 dB
0 dBm				110111	2.404930
				M2[1]	-52.19 d 2.400000 d
-10 dBm—				1	2.40000 4
	D1 -14.150) dBm			
-20 dBm—					
-30 dBm—			-		
-40 dBm—					
					Ma
-50 dBm					The second secon
-60 dBm					МЗ
your work	manum	polosimon haber have som	in the second second second	Maharahhadahm	- manually an re- charles with
-70 dBm					
-70 0011					
-80 dBm					
Start 2.31			691 pt		Stop 2.405 GH
Marker	GHZ		091 ht	3	atop 2.403 GH
	ef Trc	X-value	Y-value	Function	Function Result
M1	1	2,40493 GHz	5.85 dBm	runction	T unction Result
M2	1	2.4 GHz	-52.19 dBm		
M3	1	2.39 GHz	-62.12 dBm		
)[Measuring	21.01.2018 13:13:16

Date: 21.JAN.2018 13:13:16

Spect	rum								₽
Ref Le	vel 1	0.00 dBr	n Offset 1.00 dB 📢	• RBW 100 kHz					
Att		25 d	B SWT 75.9 μs 🖲	🕨 VBW 300 kHz	Mode	Auto FFT			
⊖1Pk M	ах								
	N				P	41[1]		5.48 2.4778360	
-10 dBn	Ш				P	42[1]		-64.37 2.4835000	
20 dBn	V p	1 -14.52	20 dBm						_
" -30 dBn	n						2126		
-40 dBn	0-1	4							
-50 dBn	n	۱. M							
-60 dBn	n	Yun	MP Manuhan	menshering	muner	mutur	Manunh	mannun	M
-70 dBn	n+								
-80 dBn	n						~		
Start 2	2.477	GHz		691	pts			Stop 2.51 (GHz
Marker									
Туре	Ref	Trc	X-value	Y-value		ction	Fun	ction Result	
M1		1	2.477836 GHz	5.48 dB					
M2 M3		1	2.4835 GHz 2.5 GHz	-64.37 dB -64.64 dB					
)[asuring		21.01.201 11:35:5	

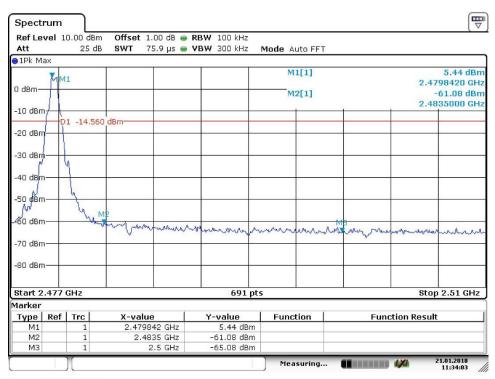
Date: 21.JAN.2018 11:35:57



Hopping off mode:

Spectrur	n				E ▼
Ref Level Att	10.00 dBm 25 dB		RBW 100 kHz VBW 300 kHz	Mode Auto Swee	en
●1Pk Max				Hodd Hato Shot	4
0 dBm				M1[1] M2[1]	5.86 den 2.401910 GH -51.92 dBn
-10 dBm—					2.400000 GH
-20 dBm—	-D1 -14.140	Jabm			
-30 dBm					
-40 dBm—					
-50 dBm—					MZ
-60 dBm-	-	munullition	mandutundership	angerter to the second starter the start	M3 M3
-70 dBm—					
-80 dBm—					
Start 2.31	GHz		691 pt	ts	Stop 2.405 GHz
Marker	<u>(</u>	× 1 1		1 1	
Type Re M1	ef Trc	2.40191 GHz	Y-value 5.86 dBm	Function	Function Result
M2	1	2.40191 GHz	-51.92 dBm		
M3	1	2.39 GHz	-62.01 dBm		
)[Measuring	21.01.2018 13:10:42

Date: 21.JAN.2018 13:10:42



Date: 21.JAN.2018 11:34:03



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 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 from 0 degrees to 360 degrees to find the maximum reading.

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 \geq 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

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.

	Field Strength	Field Strength	Detector
0-88	100	40	QP
3-216	150	43.5	QP
6-960	200	46	QP
0-1000	500	54	QP
ve 1000	500	54	AV
ve 1000	5000	74	PK
	quency MHz 00-88 8-216 6-960 0-1000 ve 1000 ve 1000	WHz uV/m 50-88 100 8-216 150 6-960 200 0-1000 500 ve 1000 500	WHzuV/mdBµV/m00-88100408-21615043.56-960200460-100050054ve 100050054



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, GFSK mode) test result is listed in the report.

Transmitting spurious emission test result as below:

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Corr.	Result
Danu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-	873.36	27.72	Н	46.00	QP	18.28	-25.80	Pass
1000MHz	863.66	31.83	V	46.00	QP	14.17	-16.00	Pass
	*4803.75	38.02	Н	74.00	PK	35.98	2.5	Pass
1000-			Н	54.00	AV			
25000MHz	*4803.75	44.20	V	74.00	PK	29.80	2.6	Pass
			V	54.00	AV			

BT3.0 GFSK Modulation 2402MHz Test Result

BT3.0 GFSK Modulation 2441MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Corr.	Result
Dallu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-			Н	43.5	QP			
1000MHz			Н	46	QP			
	8697.65	40.32	Н	74	PK	33.68	8.5	Pass
1000-			Н	54	AV			
25000MHz	*4881.56	43.66	V	74	PK	30.34	2.6	Pass
			V	54	AV			



BT3.0 GFSK Modulation 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Corr.	Result
Danu	MHz	dBuV/m		dBµV/m		dBuV/m	(dB)	
30-			Н	43.5	QP			
1000MHz			Н	46	QP			
	8760.46	40.57	Н	74	PK	33.43	8.8	Pass
1000-			Н	54	AV			
25000MHz	8758.59	41.30	V	74	PK	32.70	8.9	Pass
			V	54	AV			

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.



10 Test Equipment List

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2018-7-14	
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2018-7-14	
Horn Antenna	Rohde & Schwarz	HF907	102294	2018-7-14	
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2018-7-14	
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2018-7-7	
Attenuator	Agilent	8491A	MY39264334	2018-7-7	
3m Semi-anechoic chamber	TDK	9X6X6		2020-7-7	
Test software	Rohde & Schwarz	EMC32	Version 9.15.00	N/A	

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2018-7-14
LISN	Rohde & Schwarz	ENV4200	100249	2018-7-14
LISN	Rohde & Schwarz	ENV432	101318	2018-7-14
LISN	Rohde & Schwarz	ENV216	100326	2018-7-14
ISN	Rohde & Schwarz	ENY81	100177	2018-7-14
ISN	Rohde & Schwarz	ENY81-CA6	101664	2018-7-14
High Voltage Probe	Rohde & Schwarz	TK9420(VT94 20)	9420-584	2018-7-14
RF Current Probe	Rohde & Schwarz	EZ-17	100816	2018-7-14
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2018-7-7
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

C - Conducted RF tests

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



11 System Measurement Uncertainty

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

System Measurement Uncertainty						
Items	Extended Uncertainty					
Uncertainty for Radiated Emission in 3m chamber	Horizontal: 4.83dB;					
30MHz-1000MHz	Vertical: 4.91dB;					
Uncertainty for Radiated Emission in 3m chamber	Horizontal: 4.89dB;					
1000MHz-18000MHz	Vertical: 4.88dB;					
Uncertainty for Conducted RF test	2.04dB					
Uncertainty for Conducted Emission 9kHz-150KHz	3.46dB					