

FCC/ISED - TEST REPORT

Report Number	: 68.950.20.0526.02	Date of Issue: June 13, 2022		
Model	: PI5R, Pi5 S2R			
Product Type	: In-ear True Wireless Hea	adphone		
Applicant	: B&W Group Ltd.			
Address	: Dale Road Worthing Uni	ted Kingdom BN11 2BH		
Factory	: Charter Media (Dongguan) Co., Ltd.			
Address	: Dabandi Industrial Zone, Daning District, Humen Town,			
	: 523930 Dongguan City, Guangdong Province,			
	: PEOPLE'S REPUBLC C	F CHINA		
Test Result	: n Positive o N	egative		
Total pages including Appendices	: 70			

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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: Fax:	86 755 8828 6998 86 755 8288 5299
FCC Registration	514049
ISED#:	10320A
Fax: FCC Registration No.:	Road 2, Nanshan District Shenzhen 518052 P.R. China 86 755 8828 6998 86 755 8288 5299 514049



3 Description of the Equipment Under Test

Product:	In-ear True Wireless Headphone
Model no/HVIN/PMN.:	PI5R, Pi5 S2R
FVIN:	V1.0.X
FCC ID: IC:	2ACIX-PI5R 11946B-PI5R
Options and accessories:	Type-C Cable, Charging Case
Rating:	PI5R: Earbud: 3.7VDC, 55mAh, 0.204Wh (Supplied by Built Li-ion battery)
	Pi5 S2R: Earbud: 3.85VDC, 70mAh, 0.270Wh (Supplied by Built Li-ion battery)
RF Transmission Frequency:	2402MHz-2480MHz
No. of Operated Channel:	79
Modulation:	GFSK, π/4-DQPSK, 8-DPSK
Antenna Type:	Mono pole antenna
Antenna Gain:	1.0dBi for PI5R, -3.0dBi for Pi5 S2R
Description of the EUT:	The Equipment Under Test (EUT) is an In-ear True Wireless Headphone support Bluetooth function.



4 Summary of Test Standards

Test Standards			
FCC Part 15 Subpart C 10-1-2020 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators		
RSS-Gen Issue 5, Amendment 1, March 2019	General Requirements for the Certification of Radio Apparatus		
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSS), Frequency Hopping Systems (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, KDB558074 D01 v05r02 and ANSI C63.10-2013.



5 Summary of Test Results

Technical Requirements				
FCC Part 15 Sub	oart C/ RSS-247 Issu	e 2/RSS-Gen Issue 5		
Test Condition			Test Result	Test Site
§15.207	RSS-GEN 8.8	Conducted emission AC power port	N/A	
§15.247(b)(1)	RSS-247 Clause 5.4(b)	Conducted peak output power	Pass	Site 1
§15.247(e)	RSS-247 Clause 5.2(b)	Power spectral density	N/A	
§15.247(a)(2)	RSS-247 Clause 5.2(a)	6dB bandwidth	N/A	
§15.247(a)(1)	RSS-247 Clause 5.1(a) & RSS-Gen 6.7	20dB bandwidth and 99% Occupied Bandwidth	Pass	Site 1
§15.247(a)(1)	RSS-247 Clause 5.1(b)	Carrier frequency separation	Pass	Site 1
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(d)	Number of hopping frequencies	Pass	Site 1
§15.247(a)(1)(iii)	RSS-247 Clause 5.1(d)	Dwell Time	Pass	Site 1
§15.247(d)	RSS-247 Clause 5.5	Spurious RF conducted emissions	Pass	Site 1
§15.247(d)	RSS-247 Clause 5.5	Band edge	Pass	Site 1
§15.247(d) & §15.209 & §15.205	RSS-247 Clause 5.5 & RSS-GEN 6.13 RSS-GEN 8.9 RSS-GEN 8.10	Spurious radiated emissions for transmitter and receiver	Pass	Site 1
§15.203	RSS-GEN 6.8	Antenna requirement	See note 2	Site 1

Note 1: N/A=Not Applicable.

Note 2: The EUT uses a Mono pole antenna, which gain is 1.0dBi for PI5R, -3.0dBi for Pi5 S2R. In accordance to §15.203 and RSS-GEN 6.8, it is considered sufficiently to comply with the provisions of this section.



General Remarks 6

Remarks

This submittal(s) (test report) is intended for FCC ID: 2ACIX-PI5R, IC: 11946B-PI5R complies with Section 15.205, 15.209, 15.247 of the FCC Part 15, Subpart and RSS-247 issue 2 and RSS-Gen issue 5 rules.

The report base 68.950.20.0526.01 additional a model Pi5 S2R, was identical with PI5R except for battery of earbuds, antenna of earbuds and appearance of earbuds, Additional Antenna Power tests. Other the test data in this report was referred from 68.950.20.0526.01.

Note: The report is for BDR+EDR only.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

O - Not Performed

The Equipment Under Test

n - Fulfills the general approval requirements.

• **Does not** fulfill the general approval requirements.

Sample Received Date: August 3, 2020

Testing Start Date: August 3, 2020

Testing End Date:

August 31, 2020

Updated test date:

April 18, 2022-June 10, 2022

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

Reviewed by:

John Zhi **EMC** Project Manager

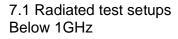
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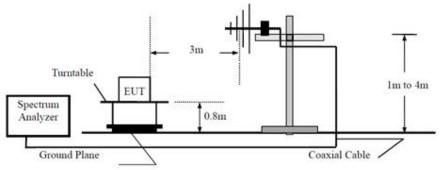
Tested by: Mark chen ΠÜΛ SUD

Mark Chen EMC Project Engineer

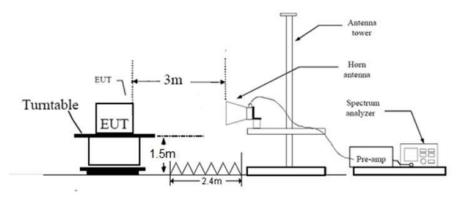
Carry Cai **EMC Test Engineer**

7 Test Setups

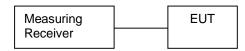




Above 1GHz



7.2 Conducted RF test setups







8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Notebook	Lenovo	X220	

Test software: Bluetooth 3 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 Technical Requirement

9.1 Conducted peak output power and e.i.r.p

Test Method

- Use the following spectrum analyzer settings: Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel RBW > the 20dB 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

Conducted Peak Output Power:

	Frequency Range	Limit	Limit
	MHz	W	dBm
For e.i.r.p	2400-2483.5	≤1	≤30
	Frequency Range	Limit	Limit
	MHz	W	dBm
	2400-2483.5	≤4	≤36



Conducted peak output power

PI5R:					
Bluetooth Mode GFSK modulation Test Result					
	Conducted				
	Peak Output		Result		
Frequency	Power	E.I.R.P			
MHz	dBm	dBm			
Low channel 2402MHz	7.5	8.5	Pass		
Middle channel 2441MHz	7.56	8.56	Pass		
High channel 2480MHz	7.7	8.7	Pass		

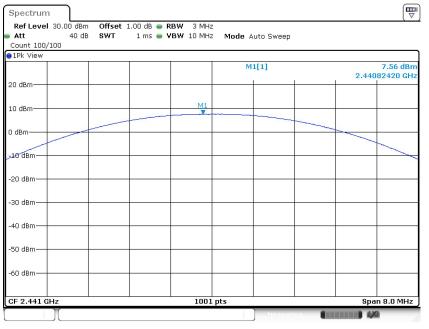
Spectrum			(Egg
Ref Level 30.00 dB	m Offset 1.00 dB 👄 RB	W 3 MHz	
Att 40 c			
Count 100/100		in to hime indue Auto Sweep	
1Pk View			
		M1[1]	7.50 dBn 2.40196800 GHz
20 dBm			
10 dBm		м	
0 dBm			
-16 dBm-			
-20 dBm			
-30 dBm			
-40 dBm			
FO do-			
-50 dBm			
-60 dBm			
CF 2.402 GHz		1001 pts	Span 8.0 MHz
		Measur	ina

Low channel 2402MHz

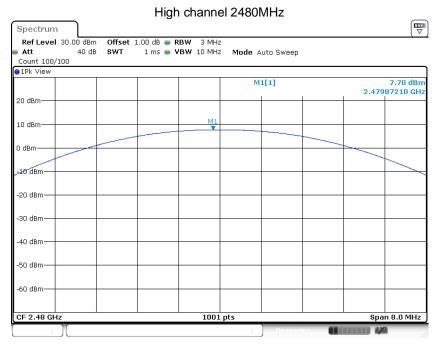
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Middle channel 2441MHz



Date: 18.AUG.2020 14:23:53



Date: 18.AUG.2020 14:24:14



Bluetooth Mode $\pi/4$ -DQPSK modulation Test Result			
Conducted			
Peak Output Resu			
Frequency	Power	E.I.R.P	

Frequency	Power	E.I.R.P	
MHz	dBm	dBm	
Low channel 2402MHz	7.52	8.52	Pass
Middle channel 2441MHz	7.54	8.54	Pass
High channel 2480MHz	7.64	8.64	Pass

Spectrum			
Ref Level 30.00 dBm Of Att 40 dB SV Count 100/100	fset 1.00 dB	Mode Auto Sweep	,
)1Pk View		M1[1]	7.52 dBn
		MILI	2.40198400 GH
20 dBm			
10 dBm	M		
) dBm			
Jasm			
10 dBm			+
-20 dBm			
30 dBm			
40 dBm			
50 dBm			
SO UDIN			
60 dBm			
CF 2.402 GHz	1991		Span 8.0 MHz
5F 2.4UZ GHZ	1001	· · · · · · · · · · · · · · · · · · ·	Span 8.0 MHz

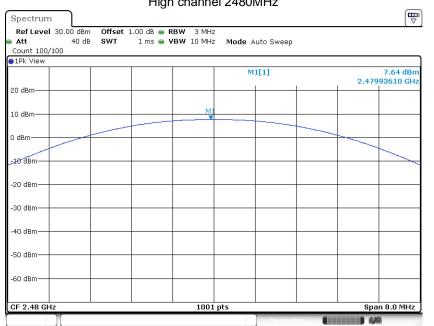
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Middle channel 2441MHz

Ref Level 30.00	dBm Offset 1) dB SWT	.00 dB 👄 RBW 1 ms 👄 VBW	3 MHz	• • • • • • • •		
Count 100/100	JUB 5WI	I MB 🛑 ABM	IU MHZ N	1ode Auto Sweep		
●1Pk View						
				M1[1]	2.440	7.54 dBi 199200 GH
20 dBm						
10 dBm			M1			
0 dBm						
-10 dBm						
-20 dBm						
-30 dBm						
-40 dBm						
-50 dBm						
-30 0011						
-60 dBm						
CF 2.441 GHz			1001 pts		Spa	in 8.0 MHz
1 I				Measuring		0

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High channel 2480MHz

Date: 18.AUG.2020 14:25:07



Bluetooth Mode 8DPSK modulation Test	Result
Conducted	
Peak Output	Result

Pass
Pass
Pass
F

	Low	/ channel	2402MHz			
Spectrum						
Ref Level 30.00 dB Att 40 c Count 100/100		RBW 3 MHz VBW 10 MHz	Mode Auto Sweep			
●1Pk View			M1[1]		7.43	dBm
20 dBm			milij	+ +	2.40196800	
10 dBm		м				
0 dBm						
-10 dBm						~
-20 dBm						
-30 dBm						
-40 dBm						
-50 dBm						
-60 dBm						
CF 2.402 GHz		1001 p	ts		Span 8.0 M	инz
			Measu	ing	4/4	111

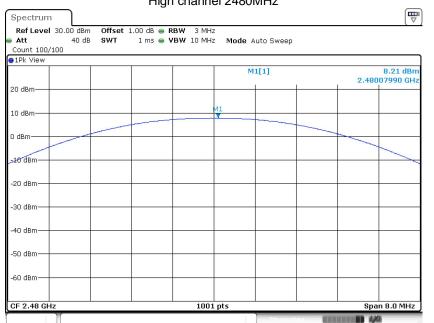
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Middle channel 2441MHz

Ref Level 30.00 dBr	m Offset 1.00 d	B 🖷 RBW 3 MHz			
Att 40 d	B SWT 1 m	s 👄 VBW 10 MHz	Mode Auto Sweep		
Count 100/100					
IFK VIEW			M1[1]	9.	7.55 dBr 14095200 GH
20 dBm				2	
10 dBm		M			
0 dBm					
=10 dBm					
-20 dBm					
-30 dBm					
-40 dBm					
-50 dBm					
-60 dBm					
CF 2.441 GHz		1001	pts		Span 8.0 MHz
			Moacurior	(Internet)	4.3/4

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High channel 2480MHz

Date: 18.AUG.2020 14:26:05

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Bluetooth Mode	Pi5 S2R: e GFSK modu	lation Test Re	esult
	Conducted		
Frequency	Peak Output Power	E.I.R.P	Result
MHz	dBm	dBm	
Low channel 2402MHz	5.28	2.28	Pass
Middle channel 2441MHz	4.98	1.98	Pass
High channel 2480MHz	5.35	2.35	Pass

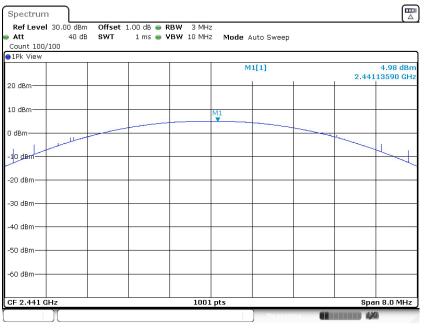
Ref Level 30.00 dBm Att 40 dB		B RBW 3 MHz B VBW 10 MHz			
Count 100/100	SWI IM:	5 5 76 7 10 MH2	Mode Auto Sweep		
1Pk View			M1[1]		5.28 dBn
			wifil	2.4	0195200 GH:
20 dBm					
LO dBm		m			
) dBm					
10 dBm					11
10 0811					A.
20 dBm					
30 dBm					
40 dBm					
50 dBm					
60 dBm					

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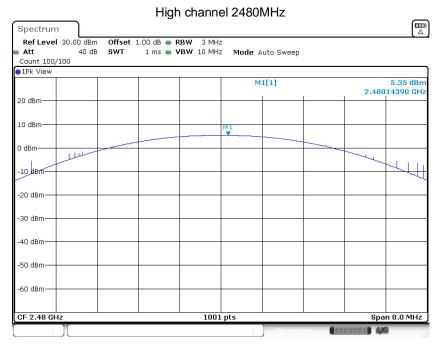
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Date: 21.MAY.2022 11:42:21



Bluetooth Mode π/4-DQPSK modulation Te	est Result
Conducted	
Peak Output	Posul

	Peak Output		Result
Frequency	Power	E.I.R.P	
MHz	dBm	dBm	
Low channel 2402MHz	5.04	2.04	Pass
Middle channel 2441MHz	4.72	1.72	Pass
High channel 2480MHz	5.20	2.20	Pass

			Low	channe	1 2402N	/Hz			
Spectrum									
Ref Level 3	21.00 dBm	Offset 1.0)0 dB 😑 R	BW 3 MHz					
Att	30 dB	SWT	1 ms 👄 🛛	BW 10 MHz	Mode A	uto Swe	ер		
⊜1Pk Max									
					M:	l[1]		2.4	5.05 dBm 019770 GHz
10 dBm				MI					
0 dBm									
o ubili	-								
-10 dBm									
-20 dBm									
-30 dBm									
-40 dBm									
-50 dBm									
-60 dBm									
-70 dBm									
CF 2.402 GH	z			691	pts			Spa	an 8.0 MHz
Marker									
Type Ref	Trc	X-value		Y-value	Funct	ion	F	unction Resul	t
M1	1	2.401977	GHz	5.05 dBr	n				
	Л					Meas	suring		a //

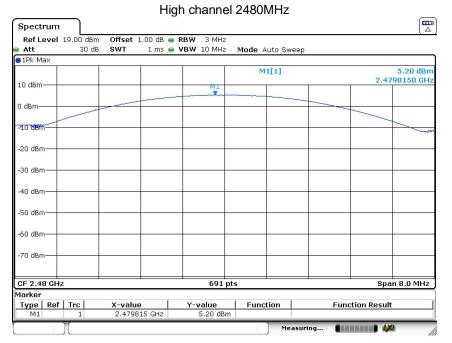
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Middle channel 2441MHz

Spectrum					
Ref Level 19.00 dBr					
 Att 30 di 1Pk Max 	B SWI IMS .	VBW 10 MHz	Mode Auto Sw	eep	
TEK Man			M1[1]		4.72 dBn
10 dBm			and the second s		2.4410000 GH
10 0800		MI			
0 dBm					
-10 dBm					
-20 dBm					
-30 dBm					
-40 dBm					
-50 dBm					
-60 dBm					
-70 dBm					
CF 2.441 GHz		691 pt	s		Span 8.0 MHz
Marker					
Type Ref Trc	X-value	Y-value	Function	Fun	ction Result
M1 1	2.441 GHz	4.72 dBm			
П			Me	asuring 🚺	· · · · · · · · · · · · · · · · · · ·

Date: 10.JUN.2022 16:07:06



Date: 10.JUN.2022 16:07:27



Bluetooth Mode 8DPSK modulation Test Result
Conducted
Peak Output Res

	Peak Output		Result
Frequency	Power	E.I.R.P	
MHz	dBm	dBm	
Low channel 2402MHz	5.25	2.25	Pass
Middle channel 2441MHz	4.98	1.98	Pass
High channel 2480MHz	5.31	2.31	Pass

	Low ch	annel 2402	MHz	
Spectrum				
Ref Level 30.00 dBr		3 MHz		
Att 40 dl Count 100/100	B SWT 1 ms 👄 VBW	10 MHz Mode A	uto Sweep	
1Pk View				
		м	1[1]	5.25 dBm 2.40196800 GHz
20 dBm				
10 dBm				
0 dBm				
-10 dBm				
-20 dBm				
-30 dBm				
-40 dBm				
-50 dBm				
-JU UBIII				
-60 dBm				
CF 2.402 GHz		1001 pts		Span 8.0 MHz
			Measuring	

Date: 21.MAY.2022 11:46:45



Middle channel 2441MHz

Count 100/100 • 1Pk View							
			M	11[1]		2.441	4.98 dBr 02400 GH
20 dBm							
10 dBm		M	1				
0 dBm	 				-		
- 0 dam						1	W.L
-20 dBm							
-30 dBm							
-40 dBm							
-50 dBm							
-60 dBm							
CF 2.441 GHz		1001	nts			Sna	in 8.0 MH
				Measuri			3

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High channel 2480MHz

Date: 21.MAY.2022 11:47:22



9.2 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]

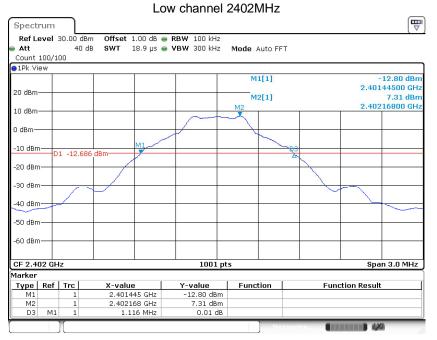
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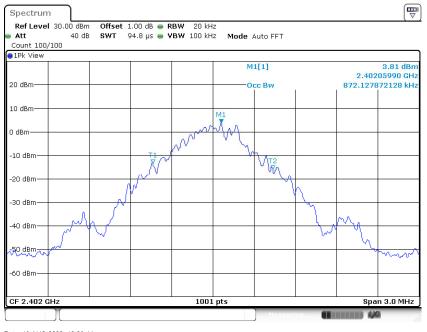
20 dB bandwidth and 99% Occupied Bandwidth

Frequency MHz	20 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz	Result
 2402	1116	872		Pass
2441	1119	869		Pass
2480	1116	863		Pass

Bluetooth Mode GFSK Modulation test result



Date: 18.AUG.2020 12:28:33



Date: 18.AUG.2020 12:28:44

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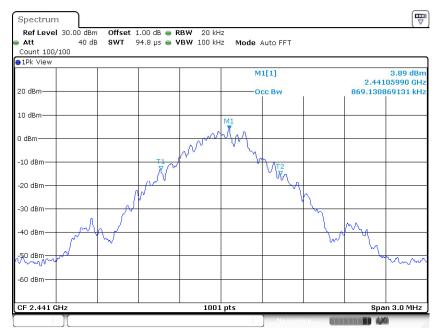
Report Number: 68.950.20.0526.02



Middle channel 2441MHz

-	ew				M	1[1]				-12.95 dBn
20 dBm-										44200 GH
20 ubiii					M	2[1]				7.34 dBr
10 dBm·					M2				2.441	16800 GH
				\sim	\sim					
0 dBm—										
-10 dBm			M1				-			
20 000	D	1 -12.658	dBm				A			
-20 dBm	1-							2		
-30 dBm	דרי							\sim		
-40 dBm	1	/								
~	~								<u> </u>	\sim
-50 dBm	+-ו					-				
-60 dBm										
-00 0811	-									
CF 2.44	41 GH	17		100	1 pts				Sna	in 3.0 MHz
Marker				100					590	
Туре	Ref	Trc	X-value	Y-value	Func	tion		Func	tion Result	t
M1		1	2.440442 GH							
M2 D3	M1	1	2.441168 GH 1.119 MH							

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Date: 18.AUG.2020 12:30:23

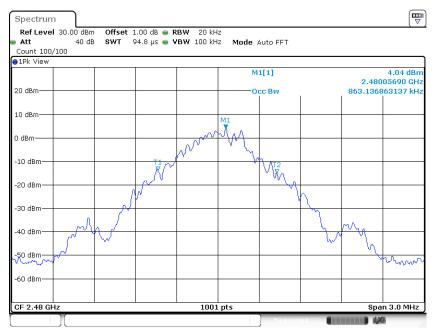
Report Number: 68.950.20.0526.02



High channel 2480MHz

Ref Leve				RBW 100 kHz				
Att		to dB SWT	18.9 µs 😑	VBW 300 kHz	Mode Auto FF	т		
Count 100	/100							
1Pk View								
					M1[1]			2.54 dBn
20 dBm								4500 GH
					M2[1]			7.50 dBn
10 dBm					M2		2.4801	6800 GH
					~			
) dBm——								
10.10			M1			000		
-10 dBm—	D1 -12	.505 dBm	Y			- N 3		
-20 dBm			1			-		
-20 ubiii—								
-30 dBm								
-50 abiii						\sim		
-40 dBm								
$\sim \sim$	Ľ.							~
-50 dBm								
-60 dBm								
CF 2.48 G	l Hz			1001 p	ts		Span	3.0 MHz
1arker								
Type Re	f Trc	X-va	lue	Y-value	Function	Func	tion Result	
M1	1		9445 GHz	-12.54 dBm				
M2	1		0168 GHz	7.50 dBm				
D3 N	11 1	1	.116 MHz	-0.26 dB				

Date: 18.AUG.2020 12:31:28



Date: 18.AUG.2020 12:31:39



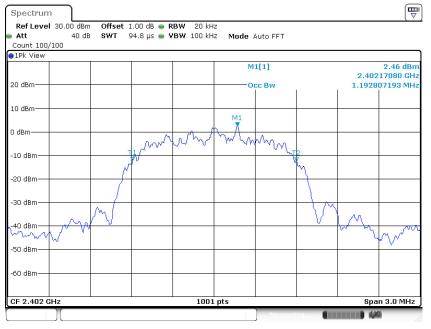
20 dB bandwidth and 99% Occupied Bandwidth

Bluetooth Mode $\pi/4$ -DQPSK Modulation test result

	Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
	MHz	kHz	kHz	kHz	
_	2402	1410	1193		Pass
	2441	1410	1193		Pass
	2480	1410	1196		Pass

Low channel 2402MHz Spectrum Ref Level 30.00 dBm Offset 1.00 dB 🖷 RBW 100 kHz SWT 18.9 μs 👄 VBW 300 kHz 40 dB Mode Auto FFT Att Count 100/100 ●1Pk View M1[1] -12.97 dBr 2.40129800 GHz 20 dBm M2[1] 7.15 dBm 2.40200600 GHz 10 dBm 0 dBm -10 dBm-D1 -12.847 dBm--20 dBm -30 dBm -40 dBm -50 dBm -60 dBm-CF 2.402 GHz 1001 pts Span 3.0 MHz 4arker 2.401298 GHz Type | Ref | Trc | Y-value | Function **Function Result** M1 M2 -12.97 dBm 7.15 dBm 2.402006 GHz M1 D3 1.41 MHz -0.22 dB **III 120**

Date: 23.AUG.2020 15:42:19



Date: 23.AUG.2020 15:42:30

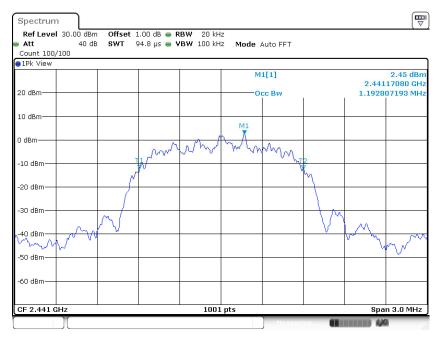
Report Number: 68.950.20.0526.02



Middle channel 2441MHz

Spectrum						ſ
Ref Level 3 Att Count 100/10	40			Mode Auto FFT		
●1Pk View						
				M1[1]		-13.22 dE
20 dBm						2.44029500 G
20 0011				M2[1]		7.12 dE
10 dBm			M2			2.44100600 G
			\rightarrow	~~~~		
0 dBm						
-10 dBm		M1				
-10 dBm	L -12.8	80 dBm 📝			4	
-20 dBm						
-30 dBm	~	A				
-40 dBm						
-50 dBm						
-60 dBm						
CF 2.441 GH	z		1001 pts	5		Span 3.0 MH
Marker						
Type Ref	Trc	X-value	Y-value	Function	Func	tion Result
M1	1	2.440295 GHz	-13.22 dBm			
M2	1	2.441006 GHz	7.12 dBm			
D3 M1	1	1.41 MHz	0.24 dB			
]				Mea	suring 🔳 🛙	4,70

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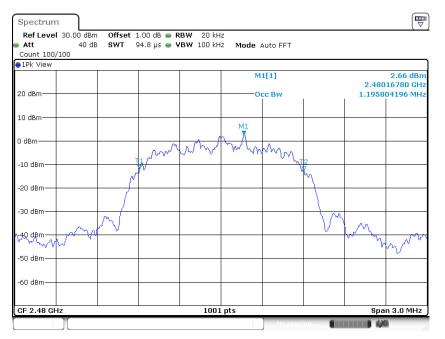
Report Number: 68.950.20.0526.02



High channel 2480MHz

Ref Level 30.00 dBm Offset 1.0) dB 😑 RBW 100 kHz			,
	9 µs 👄 VBW 300 kHz	Mode Auto FFT		
Count 100/100				
1Pk View				
		M1[1]		-12.94 dBr
20 dBm				2.47929500 GH
		M2[1]		7.32 dBr
10 dBm	M2		-	2.48000600 GH
		~~~		
D dBm				
10 dbm				
-10 dBm D1 -12,676 dBm			69	
			1	
-20 dBm				
-30 dBm				$\sim$
-40 dBm				
-50 dBm				
-60 dBm			+	
CF 2.48 GHz	1001 p	ts		Span 3.0 MHz
1arker				
Type   Ref   Trc   X-value	Y-value	Function	Functi	on Result
M1 1 2.479295	GHz -12.94 dBm			
M2 1 2.480006				
D3 M1 1 1.41	MHz 0.25 dB			

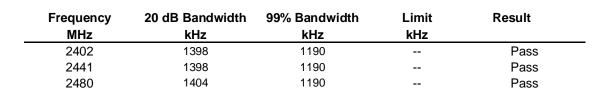
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#### Bluetooth Mode 8DPSK Modulation test result

____

-50 dBm

CF 2.402 GHz

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EMC_SZ_FR_21.00 FCC Release 2014-03-20 1001 pts

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Span 3.0 MHz

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Middle channel 2441MHz

Spectrum						
Ref Level 30 Att Count 100/100	40 d		<ul> <li>RBW 100 kHz</li> <li>VBW 300 kHz</li> </ul>	Mode Auto FFT		
●1Pk View						
				M1[1]		-13.22 dBn 2.44030700 GH
20 dBm				M2[1]		7.23 dBn 2.44116800 GH
10 dBm		~		~~~~	<	
0 dBm		MI			X	
-10 dBm	-12.769				4	
-30 dBm					5	
-40 dBm						
-50 dBm						
-60 dBm						
-oo ubiil						
CF 2.441 GHz			1001 pt	s		Span 3.0 MHz
Marker						
Type   Ref   '		X-value	Y-value	Function	Funct	ion Result
M1	1	2.440307 GHz	-13.22 dBm			
M2 D3 M1	1	2.441168 GHz 1.398 MHz	7.23 dBm 0.34 dB			
)[				Meas	suring 🔳 🛙	4,64

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High channel 2480MHz

Att	evel	30.00 c 40		B 👄 RBW 100 kH: Is 👄 VBW 300 kH:		Auto FFT			
Count	100/1	00							
1Pk Vi	ew								
					M	1[1]			13.08 dBn
20 dBm	_							2.479	30400 GH
						2[1]		0.400	7.39 dBr 16800 GH
10 dBm	_			5472-02 D	M2	1	1	2.480	10800 GH
				$\sim$	$\sim$				
0 dBm—									
-10 dBrr			MI						
-10 000	D	1 -12.6	514 dBm 🗡 👘				4		
-20 dBm	-								
30 dBm	-						-	12	~ (-
10 -10-									Ŭ
-40 dBrr									
-50 dBrr									
00 0011	'								
-60 dBm									
CF 2.4	3 GHz			1001	pts			Spa	n 3.0 MHz
1arker									
Туре	Ref	Trc	X-value	Y-value	Func	tion	Func	tion Result	
M1		1	2.479304 GH						
M2 D3	M1	1	2.480168 GH 1.404 MH						

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## 9.3 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	t		

Test Mode	2/3 of 20 dB Bandwidth kHz			
DH5	746			
2DH5	940			
3DH5	932			



## **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

Test Mode	<b>Carrier Frequency Separation</b>	Result
	kHz	
DH5	994	Pass
2DH5	997	Pass
3DH5	1017	Pass

Ref Level 30.00 d		1 00 de 👝 🛛	BW 100 kHz				
Count 100/100			'BW 300 kHz	Mode Auto FFT			
1Pk View							
				M1[1]		0.444	7.11 dBn 01304 GH
20 dBm				D2[1]		2.441	0.24 df
LO GDIII				DZ[1]		9	94.20 kH
10 dBm	M1				D2		
						$\sim$	
) dBm							
						<u> </u>	-
-10 dBm							1
20 dBm							
-30 dBm							
-40 dBm							
-50 dBm							
-60 dBm							
Start 2.4405 GHz		1	691 pt	5		Stop 2.	4425 GHz
			· · ·	Meas			_

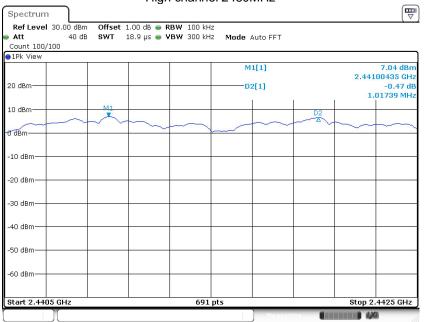
Date: 18.AUG.2020 13:18:14



Att	40 dB SWT	18.9 us 🖷 <b>VB</b>	<b>W</b> 300 kHz	Mode Auto FFT		
Count 100/100						
∋1Pk View						
				M1[1]		7.10 dBn
				0.000		2.44116667 GH
20 dBm				D2[1]		-0.03 di 997.10 kH
		M1				997.10 KH
10 dBm	-	X.			02	
	_					
0 dBm						
-10 dBm						
-20 dBm						
-30 dBm						
-40 dBm						
-50 dBm		_				
-60 dBm						
Start 2.4405 GH			691 pt			top 2.4425 GHz

#### Middle channel 2441MHz

Date: 23.AUG.2020 15:52:43



#### High channel 2480MHz

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## 9.4 Number of hopping frequencies

#### **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.

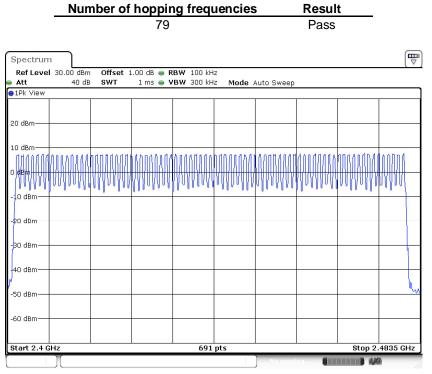
#### Limit

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.



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## 9.5 Dwell Time

### **Test Method**

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

### Limit

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



#### **Dwell Time**

#### **Dwell time**

The maximum dwell time shall be 0.4 s.

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

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

**Test Result** 

				-		
TestMode	Channel	BurstWidth	TotalHops	Result	Limit	Verdict
DH5	Нор	2.87	110	0.316	<=0.4	PASS
2DH5	Нор	2.88	110	0.317	<=0.4	PASS
3DH5	Нор	2.88	110	0.317	<=0.4	PASS

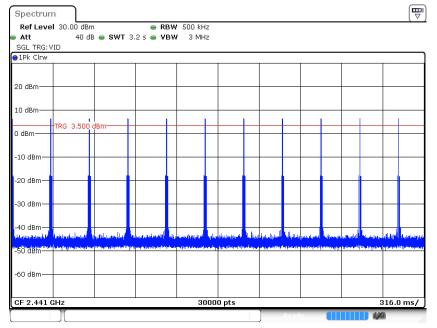
### **GFSK Modulation**

GL TRG: VID							
			М	1[1]		1	13.52 dBr
0 dBm			D	2[1]			-7.25 μ 19.12 d
						2	.87161 m
.0 dBm		D2					
	3.500 dBm	4					
dBm							
10 dBm	2.41						<u>(    )</u> ,
	Ť						
20 dBm							
30 dBm							
40 dBm							
	nlapillylv		ydaithaihaan Aastifisiligen	n pariladi kirdan	distantian	Npolo Marketta	http://
nida, dapid po	4 <mark>14 14 14 1</mark> 4		(lun Plath) (P		a HANA ANA	a shirt and a shirt and	il phi
t at is international data and	10 J 1 2 2		alas sa alsi	uthir with	արի գործ։	and a set	1.5

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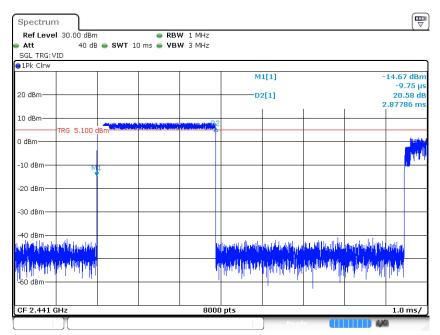




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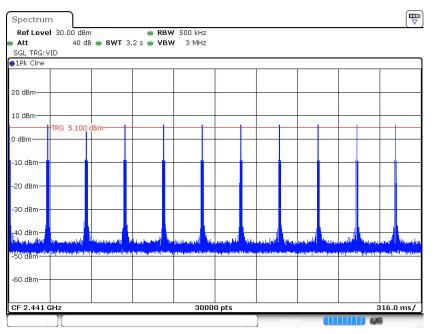


#### $\pi/4$ -DQPSK Modulation



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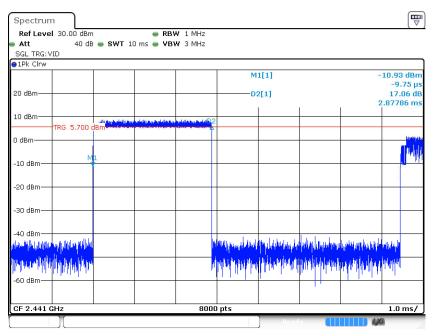
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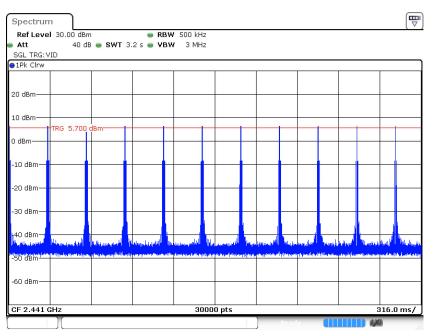
2DH5

#### 8-DPSK Modulation



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3DH5



# 9.6 Spurious RF conducted emissions

### **Test Method**

- 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

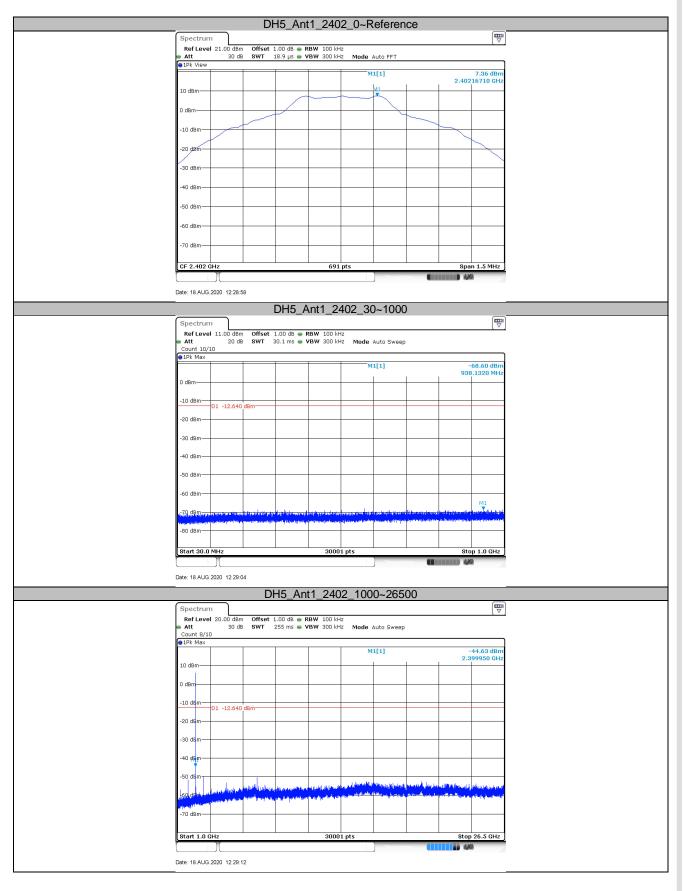
Frequency Range MHz	Limit (dBc)
30-25000	-20



## Spurious RF conducted emissions

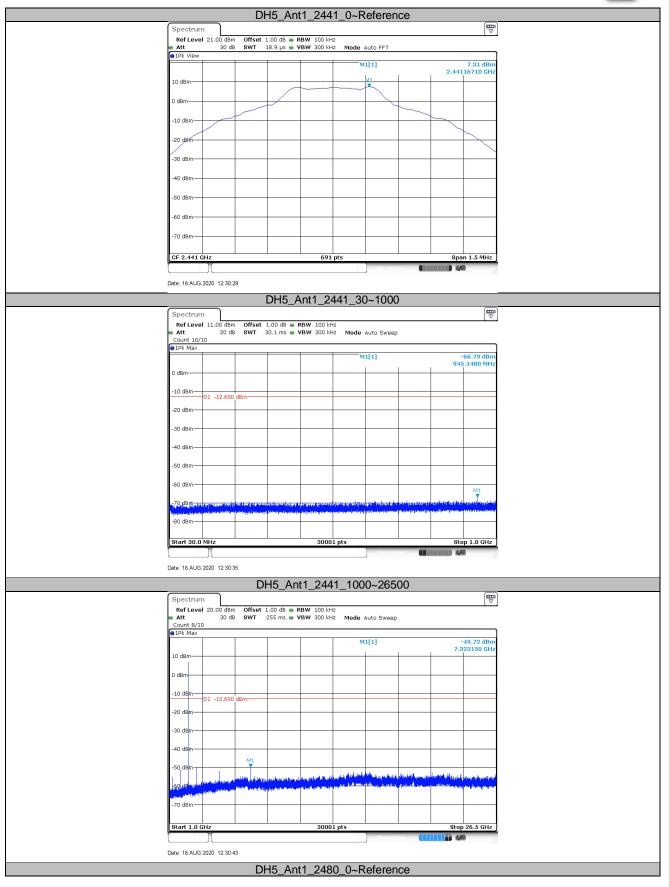
TestMode	Antenna	Channel(MHz)	FreqRange(MHz)	RefLevel(MHz)	Result(dBm)	Limit(dBm)	Verdict
			Reference	7.36	7.36		PASS
		2402	30~1000	30~1000	-68.6	<=-12.64	PASS
			1000~26500	1000~26500	-44.63	<=-12.64	PASS
			Reference	7.31	7.31		PASS
DH5	Ant1	2441	30~1000	30~1000	-66.79	<=-12.69	PASS
			1000~26500	1000~26500	-49.72	<=-12.69	PASS
			Reference	7.51	7.51		PASS
		2480	30~1000	30~1000	-68.35	<=-12.49	PASS
			1000~26500	1000~26500	-48.67	<=-12.49	PASS
			Reference	7.30	7.30		PASS
		2402	30~1000	30~1000	-68.55	<=-12.7	PASS
			1000~26500	1000~26500	-47.9	<=-12.7	PASS
			Reference	7.26	7.26		PASS
2DH5	Ant1	2441	30~1000	30~1000	-68.08	<=-12.74	PASS
			1000~26500	1000~26500	-47.5	<=-12.74	PASS
			Reference	7.49	7.49		PASS
		2480	30~1000	30~1000	-67.49	<=-12.51	PASS
			1000~26500	1000~26500	-46.31	<=-12.51	PASS
			Reference	7.38	7.38		PASS
		2402	30~1000	30~1000	-68.03	<=-12.62	PASS
			1000~26500	1000~26500	-47.24	<=-12.62	PASS
			Reference	7.41	7.41		PASS
3DH5	Ant1	2441	30~1000	30~1000	-67.59	<=-12.59	PASS
			1000~26500	1000~26500	-47.33	<=-12.59	PASS
			Reference	7.54	7.54		PASS
		2480	30~1000	30~1000	-68.28	<=-12.46	PASS
			1000~26500	1000~26500	-47.27	<=-12.46	PASS





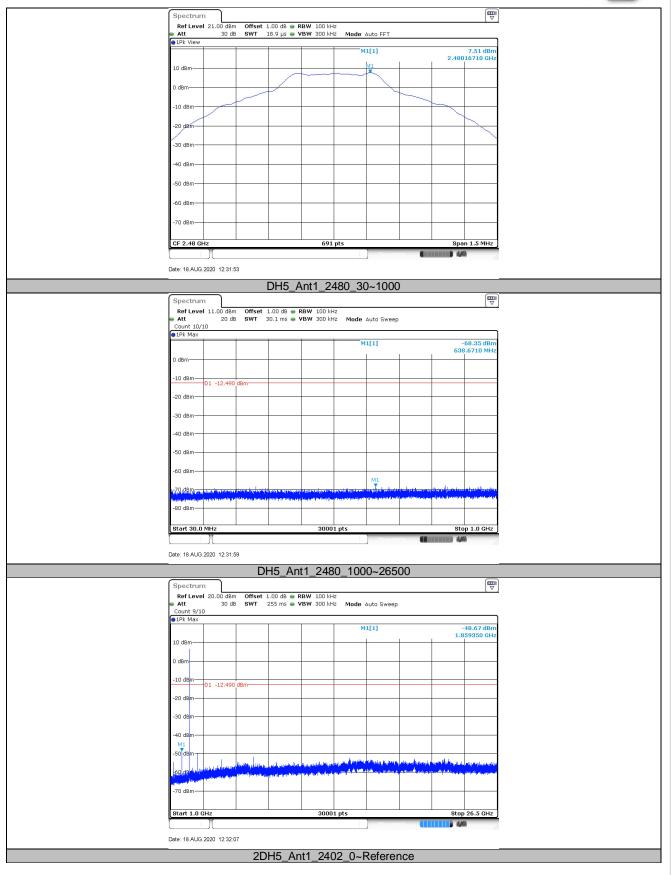
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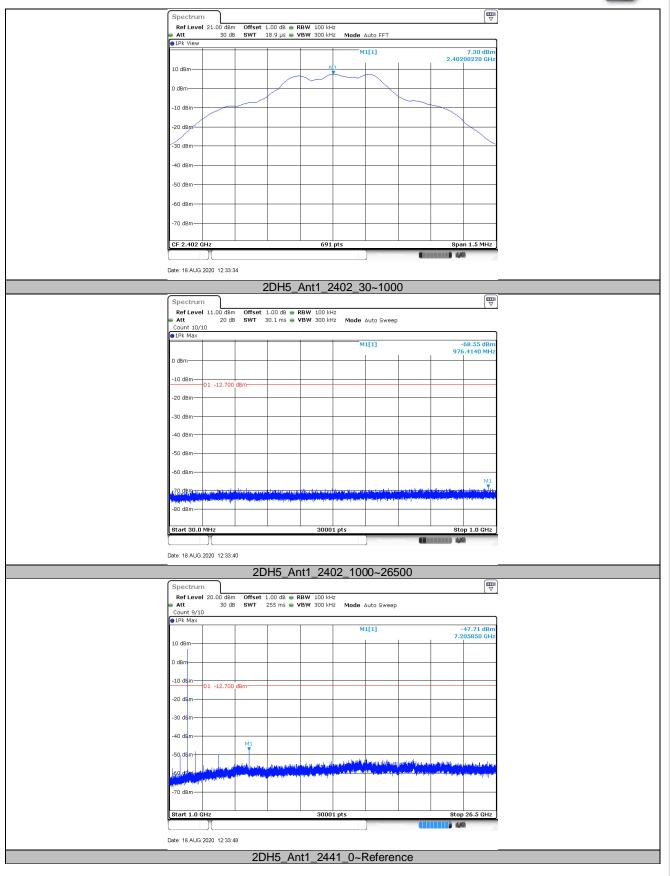
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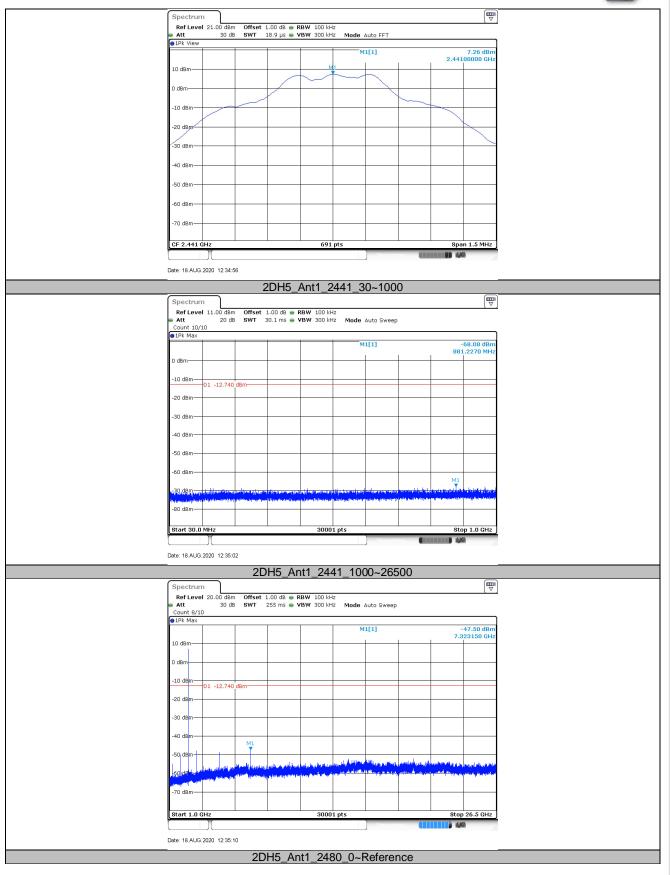
EMC_SZ_FR_21.00 FCC Release 2014-03-20





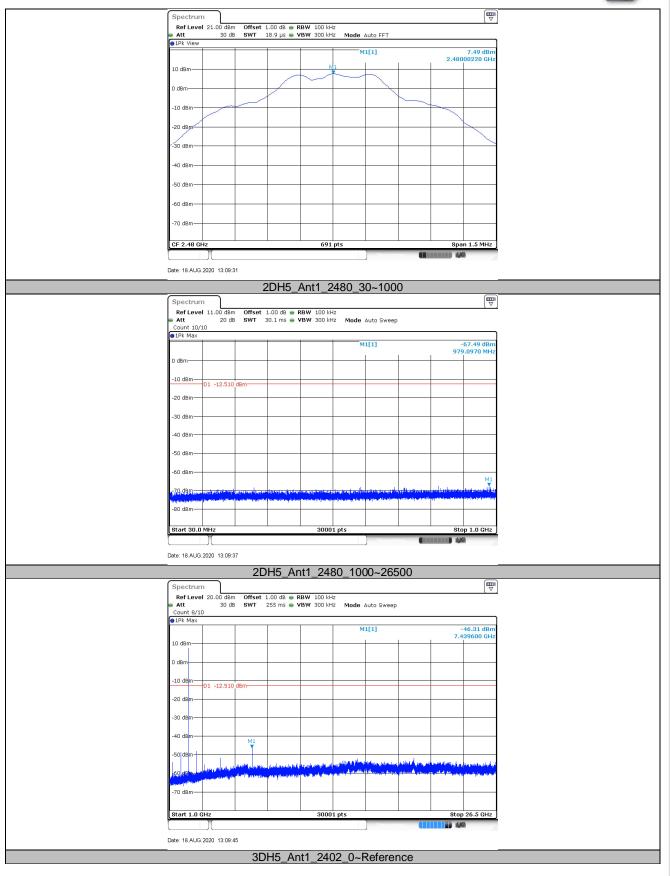
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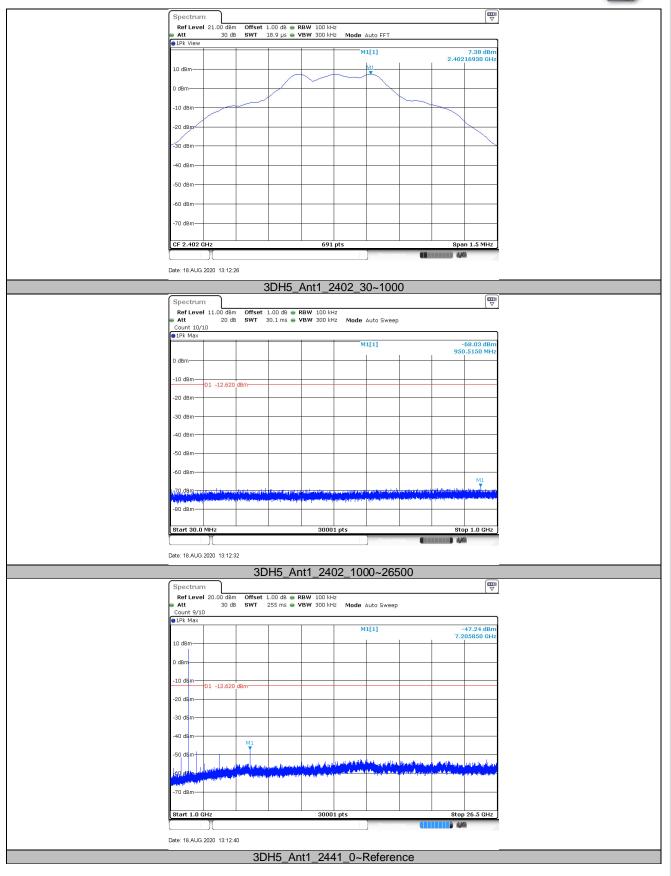
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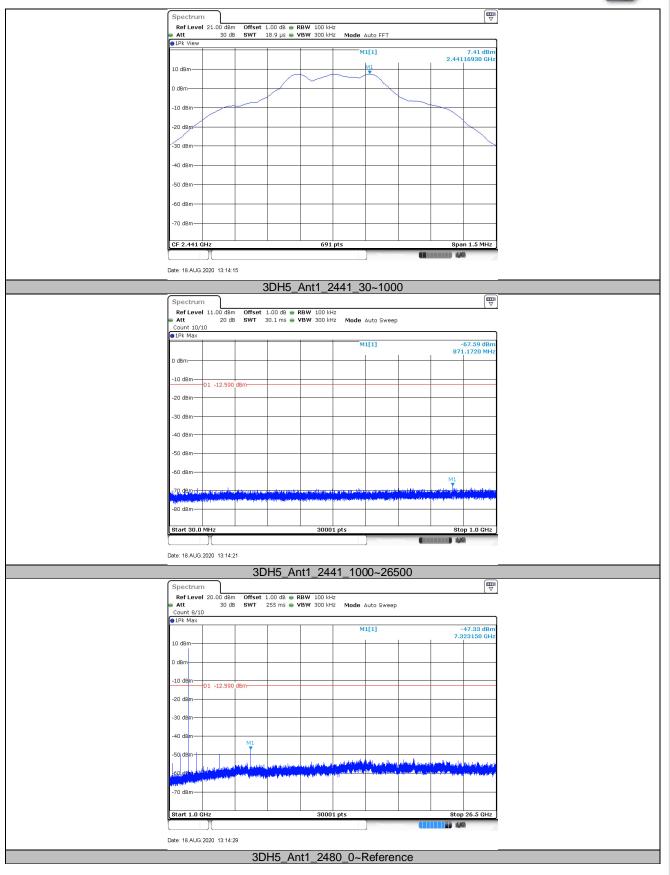
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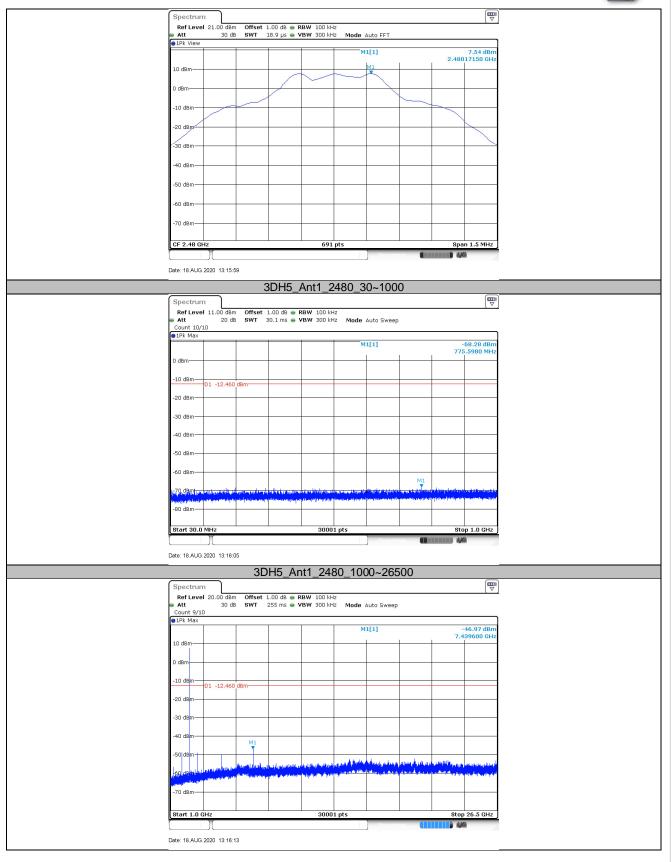
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## 9.7 Band edge testing

### **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:

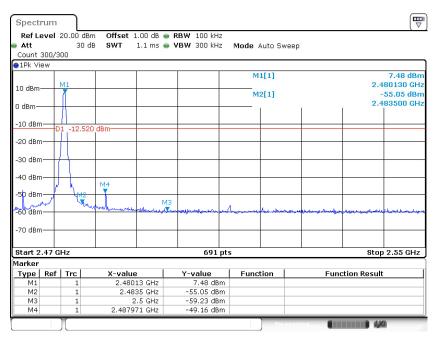
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an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



## GFSK mode: Hopping off

Ref Lo Att	evel	20.00 dB 30 d			<ul> <li>RBW 100 kHz</li> <li>VBW 300 kHz</li> </ul>	Mode	Auto F	FT			
Count 1Pk Vi		00									
TEK AI						M	1[1]				7.24 dBn
10 dBm											401880 GH
						M:	2[1]				-49.31 dan 400000 CH
) dBm—								1	T	2.	400000 GH
10 dBm											
20 001	D	1 -12.76	0 dBm								
20 dBm	<u>ا</u> ل-۱										
30 dBm											
SU UDII											
40 dBm											
50 dBrr											M≱ Y
OU UBII	' _									M3	
60 dBrr	Lade	him more	human Murene	w.l.t.	Jethoral and maker	the really	in all in	the toget	mm		webser .
-70 dBrr	די										
Start 2	3.6H	7			691 pt	5				Ston	2.405 GHz
larker					051 pt	,				0.00	2.100 0112
Type	Ref	Trc	X-value		Y-value	Funct	tion		Funct	ion Resul	t
M1		1	2.40188 G		7.24 dBm						
M2		1	2.4 G		-49.31 dBm						
M3 M4		1	2.39 G 2.399978 G		-61.49 dBm -50.61 dBm						

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### GFSK mode: Hopping on

Refle	vel	20.00 dB	m Offset	1 00 dB	RBW 1	00 kHz						[₩
Att		30 c			● VBW 3		Mode	Auto F	FT			
Count :	300/30	00		J	-							
1Pk Vi	ew .											
							M	1[1]				6.24 dBn
0 dBm-											2.4	103100 GH
o abiii							M	2[1]				-55.12 dB
dBm—										7	2.4	100000 GH
												1 01
10 dBm		1 -13.76	0 d0m									1 100
0 dBm		1 -13.70	0 uBili									
го авт												
30 dBm	_											
												1
40 dBm	-					_			_			
50 dBm						M4						₩ <b>₽</b>
50 dBm						7					M3	Jul
1-1-2-2-14	mon	harm	renteren	hours	- A Company	(	almont de	while	marin	Marina	www.	to a construction of the c
70 dBm	+		-									
tart 2	.3 GH	z				691 pts					Stop	
arker												
Гуре	Ref	Trc	X-value	e	Y-val	ue	Func	tion		Func	tion Result	:
M1		1	2.40	31 GHz	6.2	24 dBm						
M2		1		2.4 GHz		L2 dBm						
M3		1		39 GHz		09 dBm						
M4		1	2.3499	13 GHz	-58.	70 dBm						

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Ref Level 20.00 dBm         Offset 1.00 dB         RBW 100 kHz         Mode Auto Sweep           Count 300/300         9WT         1.1 ms         VBW 300 kHz         Mode Auto Sweep           Count 300/300         9PK View         7.53 dBn         2.475150 GH           10 dBm         0         M2[1]         7.53 dBn           10 dBm         0         M2[1]         2.475150 GH           0 dBm         0         M2[1]         -57.66 dBn           -10 dBm         0         -10 dBm         0           -10 dBm         0         -10 dBm         0         -10 dBm           -10 dBm         0         -10 dBm         0         -10 dBm           -20 dBm         0         0         0         0         0           -30 dBm         0         0         0         0         0         0           -50 dBm         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0 <th>Spectrum</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>₽</th>	Spectrum										₽
Count 300/300         M1[1]         7.53 dBm           10 dBM	Ref Level	20.00 dBr	n Offset 1.	00 dB 👄	<b>RBW</b> 100 kH	z					( -
1Pk View       M1[1]       7.53 dBr         10 dBM       M2[1]       -57.66 dBr         -10 dBm       01 -12.470 dBm       M2[1]       -57.66 dBr         -20 dBm       01 -12.470 dBm       -20 dBm       -20 dBm         -30 dBm       -30 dBm       -40 dBm       -40 dBm       -40 dBm         -50 dBm       -60 dBm       -60 dBm       -60 dBm       -60 dBm       -60 dBm         -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm         -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70 dBm       -70	Att	30 d	B SWT 1	.1 ms 😑	<b>VBW</b> 300 kH	z Mode	Auto Sv	veep			
M1[1]     7.53 dBn       10 dBn     2.475150 GH       10 dBn     2.475160 GH       10 dBn     2.483500 GH       10 dBn     2.483500 GH       10 dBn     2.483500 GH       10 dBn     2.483500 GH       10 dBn     1       2.0 dBn     2.483500 GH       -20 dBn     -20 dBn       -30 dBn     -20 dBn       -40 dBn     -20 dBn       -50 dBn     -20 dBn       -50 dBn     -20 dBn       -50 dBn     -20 dBn       -60 dBn     -20 dBn       -70 dBn <td< td=""><td>Count 300/</td><td>/300</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Count 300/	/300									
10 dBM	●1Pk View										
10 dBm     M2[1]     -57.66 dBm       0 dBm     01     -12.470 dBm     2.483500 GH       -20 dBm     01     -12.470 dBm     -       -30 dBm     -     -     -       -40 dBm     -     -     -       -50 dBm     -     -     -       -50 dBm     -     -     -       -60 dBm     -     -     -       -70 dBm     -     -     -       -71 dataker     -     -       -72 dataker     -     - <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>M1[1]</td><td></td><td></td><td></td><td>7.53 dBm</td></td<>							M1[1]				7.53 dBm
M2[1]    37.66 dBn       -10 dBm     2.483500 GH       -20 dBm     2.483500 GH       -20 dBm     -       -30 dBm     -       -30 dBm     -       -40 dBm     -       -50 dBm     -       -50 dBm     -       -60 dBm     -       -70 dBm	10 dBM1										
-10 dBm     01     -12.470 dBm     -12.470 dBm       -20 dBm     -20 dBm     -20 dBm     -20 dBm       -30 dBm     -20 dBm     -20 dBm     -20 dBm       -40 dBm     -20 dBm     -20 dBm     -20 dBm       -50 dBm     -20 dBm     -20 dBm     -20 dBm       -70 dBm     -20 dBm     -20 dBm     -20 dBm       Start 2.47 GHz     -50 dBm     -20 dBm     -20 dBm       M1     1     2.47515 GHz     -75.66 dBm       M2     1     2.6 GHz     -58.06 dBm	4004004	ut n				1	M2[1]				
-20 dBm     -22 dBm       -20 dBm     -20 dBm       -30 dBm     -30 dBm       -40 dBm     -40 dBm       -50 dBm     -50 dBm       -60 dBm     -60 dBm       -70 dBm     -691 pts       Start 2.47 GHz     691 pts       Start 2.47 GHz     -691 pts       Start 2.47 GHz     -53 dBm       M1     1       1     2.47515 GHz       -58.06 dBm     -58.06 dBm	¢,deb¢i <del>),,,</del>	<u>All</u>					1	1	ī	2.4	83500 GHz
-20 dBm     -22 dBm       -20 dBm     -20 dBm       -30 dBm     -30 dBm       -40 dBm     -40 dBm       -50 dBm     -50 dBm       -60 dBm     -60 dBm       -70 dBm     -691 pts       Start 2.47 GHz     691 pts       Start 2.47 GHz     -691 pts       Start 2.47 GHz     -53 dBm       M1     1       1     2.47515 GHz       -58.06 dBm     -58.06 dBm	10888844	881									
-20 dBm -30 dBm -40 dBm -50 dBm - - - - - - - - - - - - -	-10 dBm	D1 -12,470	) dBm				_				
30 dBm     A     A     A     A       40 dBm     A     A     A     A       50 dBm     M2     M3     M4     A       60 dBm     A     A     A     A       70 dBm     A     A     A     A       70 dBm     A     A     A     A       70 dBm     A     A     A     A       8tart 2.47 GHz     691 pts     Stop 2.55 GHz       Iarker     A     A     A       M1     1     2.47515 GHz     7.53 dBm       M2     1     2.4835 GHz     -57.66 dBm       M3     1     2.5 GHz     -58.06 dBm	00 40 -										
40 dBm     M2     M3     M4       -60 dBm     M2     M3     M4       -60 dBm     M3     M4       -60 dBm     M3     M4       -70 dBm     M3     M4       -70 dBm     Stop 2.55 GHz       Start 2.47 GHz     691 pts     Stop 2.55 GHz       Type     Ref     Trc     X-value     Y-value       M1     1     2.47515 GHz     -7.56 dBm       M3     1     2.5 GHz     -58.06 dBm	-20 UBIII										
40 dBm     M2     M3     M4       -50 dBm     M2     M3     M4       -60 dBm     M2     M3     M4       -70 dBm     M3     M4       -70 dBm     For the total state of the total state of total state	-30 dBm										
Stort 2.47 GHz         M3         M4           -70 dBm	oo abiii										
60 dBm         M3         M4           -60 dBm         M3         M4           -70 dBm         Get Marker         Get Marker           Start 2.47 GHz         691 pts         Stop 2.55 GHz           farker         Get Marker         Function Function Result           M1         1         2.47515 GHz         7.53 dBm           M2         1         2.4835 GHz         -55.06 dBm           M3         1         2.5 GHz         -58.06 dBm	-40 dBm										
60 dBm         M3         M4           -60 dBm         M3         M4           -70 dBm         Get Marker         Get Marker           Start 2.47 GHz         691 pts         Stop 2.55 GHz           farker         Get Marker         Function Function Result           M1         1         2.47515 GHz         7.53 dBm           M2         1         2.4835 GHz         -55.06 dBm           M3         1         2.5 GHz         -58.06 dBm											
Action of the second	-50 dBm			МЗ	M4						
Start 2.47 GHz         691 pts         Stap 2.55 GHz           Iarker         Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm         1         2.4835 GHz         -55.66 dBm         1           M2         1         2.4835 GHz         -55.06 dBm         1         -55.06 dBm         1	60 d0m	Mary North	A transmission	k dant kata A	. In Succession	Salar and sa	he contractions	Acres	at case of	and the second of the second	and the second
Start 2.47 GHz         691 pts         Stop 2.55 GHz           Iarker         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm           M2         1         2.4935 GHz         -57.66 dBm           M3         1         2.5 GHz         -58.06 dBm	-oo ubiii										
Start 2.47 GHz         691 pts         Stop 2.55 GHz           Iarker         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm           M2         1         2.4835 GHz         -57.66 dBm           M3         1         2.5 GHz         -58.06 dBm	70 dBm										
Marker         Yype         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm <td></td>											
Marker         Yype         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm <td>Pt-set 9,47</td> <td><u>eu</u>-</td> <td></td> <td></td> <td>601</td> <td>ntc</td> <td></td> <td></td> <td></td> <td>Ptor</td> <td></td>	Pt-set 9,47	<u>eu</u> -			601	ntc				Ptor	
Type         Ref         Trc         X-value         Y-value         Function         Function Result           M1         1         2.47515 GHz         7.53 dBm              M2         1         2.4835 GHz         -57.66 dBm              M3         1         2.5 GHz         -58.06 dBm		GHZ			091	prs				310	J 2.33 GH2
M1         1         2.47515 GHz         7.53 dBm           M2         1         2.4835 GHz         -57.66 dBm           M3         1         2.5 GHz         -58.06 dBm		f I Tuo I	V uslue	- 1	V uslue	1 5.00	otion	1	Eurod	tion Docul	
M2         1         2.4835 GHz         ~57.66 dBm           M3         1         2.5 GHz         ~58.06 dBm				E CH2			cuon		Func	lion Resul	L
M3 1 2.5 GHz -58.06 dBm											
	M4										
Measuring		1							<b>1</b>		<b>74</b>

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## 8DPSK mode: Hopping off

Ref L	evel :	20.00 d	Bm Offset	1.00 dB	RBW	100 kHz						
Att		30	db SWT	246.5 µs	e VBW	300 kHz	Mode	Auto F	FT			
Count	300/3	00										
1Pk Vi	ew											
							M	1[1]				7.40 dBn
LO dBm												102190 MH
							M	2[1]				-53.76 dan
) dBm—	_								7		2.4	100000 CH
10 dBrr		1 -12.6	00 dBm									
		1 -12.0	UU UBIII									
20 dBm	1-1-											
30 dBm												
зо авп												
40 dBm												
10 0.011	·											
50 dBm	∩—			_								- M <u>4</u> 2
											M3	<b>1</b>
60 dBr	hundle	Henry	morrow	Who we wash	mound	www.	histor	James	tran	mythe	un allow	p-shall "
		0.0										
70 dBm												
Start 2	.3 GH	z				691 pts					Stop	2.405 GHz
larker												
Туре	Ref	Trc	X-valı	ie	Y-va	lue	Func	tion		Fund	tion Resul	t
M1		1		219 GHz		.40 dBm						
M2		1		2.4 GHz		.76 dBm						
M3		1		2.39 GHz		22 dBm						
M4		1	2.399	065 GHz	-55.	.18 dBm						

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Spectrum									
Ref Level Att Count 300/3	30			RBW 100 kHz VBW 300 kHz		Auto Sv	/еер		,
1Pk View     10 dBm     0 dBm	M1					1[1] 2[1]			7.52 dBm #80130 GHz -56.29 dBm #83500 GHz
-10 dBm-D	1 -12.4	180 dBm							
-30 dBm	Ц	M4							
-50 dBm	L.M.	mulumouro	M	3 	America	whento we a	and we with the second	ahanan du chatangana	والمعالية والمحافظة و
-70 dBm				601				01-0	
Marker	HZ			691	315			510	2.55 GHz
Type   Ref	Trc	X-value		Y-value	Func	tion	Fu	nction Resul	t
M1 M2	1		13 GHz 35 GHz	7.52 dBr -56.29 dBr					
M3 M4	1	2 2.4879	.5 GHz 71 GHz	-59.33 dBr -48.61 dBr					
	][					) Me	asuring 🔳		0

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## 8DPSK mode: Hopping on

Ref L	evel :	20.00 dE	m Offset	1.00 dB	😑 R	BW 100 ki	Hz					
Att		30	HB SWT	246.5 µs	. e V	BW 300 ki	Hz Mode	a Auto F	FT			
Count	300/3	00										
1Pk Vi	∋w											
							1	41[1]				4.47 dBn
10 dBm				L			,					104770 GH
							r I	42[1]				48.54 dBn
0 dBm—	_		_					1	i i	T	2.4	00000 94
												10
-10 dBrr								-				
-20 dBm		1 -15.53	IO dBm									
-20 UBII												
-30 dBm	-											
00 001												
-40 dBrr	-							-				
												M2
-50 dBrr			-		M4							
											МЗ	JIH N
on anu	Jerow	ben me	www.un	ulonul	whe	and and the second	multiple	Manna	mound	mgru	No. How with the last	
-70 dBm												
, o abii												
Start 2	2.01	-				691	nto				Pton	 2.405 GHz
arker	.э сп	2				091	prs				atup	2.403 GHZ
	Ref	Trc	X-valu	-	1	Y-value	1 5	ction	1	<b>F</b>	tion Result	
Type M1	Rei	1		77 GHz		4.47 dB		ction		Func	cion Result	
M2		1		2.4 GHz		-48.54 dB						
M3		1		39 GHz		-61.91 dB						
M4		1		83 GHz		-58.89 dB						

Date: 23.AUG.2020 15:56:17

Spectrum										
Ref Level 2				RBW 100 kH:						
Att	30 0	db SWT	1.1 ms 🦷	• <b>VBW</b> 300 kH:	Z Mode	Auto S\	veep			
Count 300/30	U									
1Pk View										7.00.40
					IVI	1[1]				7.39 dBm .480130 GHz
10 aBm					M	2[1]			2	-50.18 dBm
O'dBm	4				111	2[1]			2	.483500 GHz
0 dBm							1		1	1
-10 dBm										
D1	-12.61	.0 dBm								
-20 dBm		-								
-30 dBm	+									
	1									
-40 dBm	1									
-50 dBm	1M2									
-50 0511	าเก	munican	M	з М	4					
-60 dBm		a mound by sound		and she was	ملططينية بالمعه		بسهدهم	فليتعار وسيعا		and the state of the
-70 dBm										
Start 2.47 GH	lz			691	pts				St	op 2.55 GHz
Marker										
Type   Ref	Trc	X-value		Y-value	Func	tion		Fun	ction Resu	ılt
M1	1	2.480:	L3 GHz	7.39 dB						
M2	1		35 GHz	-50.18 dB						
M3	1		.5 GHz	-59.08 dB						
M4	1	2.5	51 GHz	-57.06 dB	m	-				
						Me	asuring			LXI

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EMC_SZ_FR_21.00 FCC Release 2014-03-20



## 9.8 Spurious radiated emissions for transmitter

### **Test Method**

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

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

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

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

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

For Below 1GHz

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

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

Procedures for average unwanted emissions measurements above 1000 MHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW=10Hz, Sweep = auto, Detector function = peak, Trace = max hold. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from 20log(dwell time/100 ms), in an effort to demonstrate compliance with the 15.209 limit.

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

The setting method can refer to DA00-705.



### 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.

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 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Frequency	Field Strength	Field Strength	Detector
 MHz	uV/m	dBµV/m	
 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



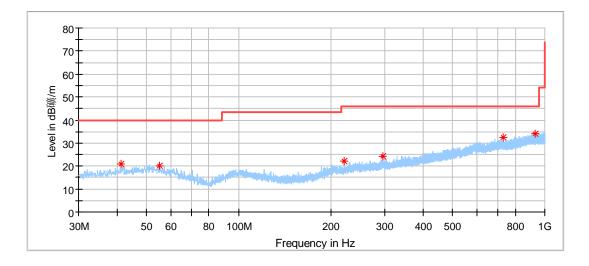
#### Spurious radiated emissions for transmitter

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.

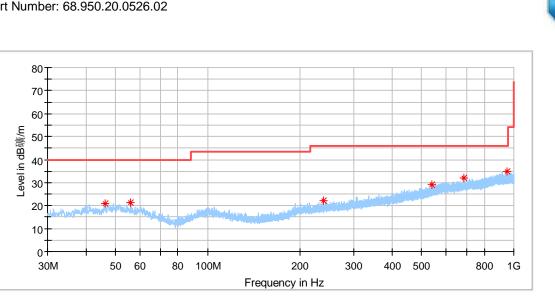
The only worse case (which is subject to the maximum EIRP, GFSK mode) test result is listed in the report.

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

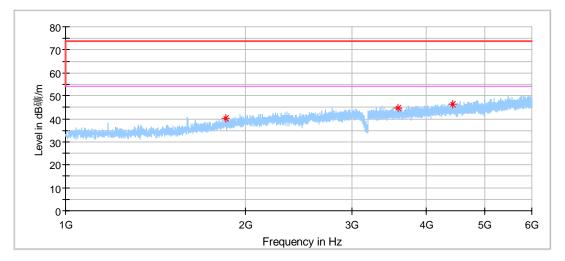
all of the modes were performed and the worst case GFSK was shown on the report.EUT:In-ear True Wireless HeadphoneM/N:PI5ROperating Condition:Tx 2402MHz, lowest Channel, Below 1GHz



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
41.262778	21.00	40.00	19.00	150.0	н	313.0	13.7
55.004444	20.13	40.00	19.87	150.0	Н	228.0	14.2
221.359444	22.30	46.00	23.70	150.0	Н	228.0	12.9
295.887778	24.13	46.00	21.87	150.0	Н	265.0	14.9
733.465556	32.28	46.00	13.72	150.0	н	126.0	22.6
934.686667	34.15	46.00	11.85	150.0	Н	194.0	25.2

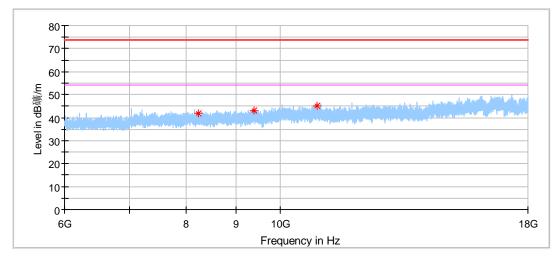


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
46.328333	21.09	40.00	18.91	150.0	v	350.0	14.4
56.136111	21.22	40.00	18.78	150.0	v	131.0	14.1
238.496111	22.30	46.00	23.70	150.0	v	247.0	13.8
538.818889	29.08	46.00	16.92	150.0	v	6.0	20.3
688.791667	31.82	46.00	14.18	150.0	v	271.0	22.1
948.643889	34.99	46.00	11.01	150.0	v	236.0	25.2

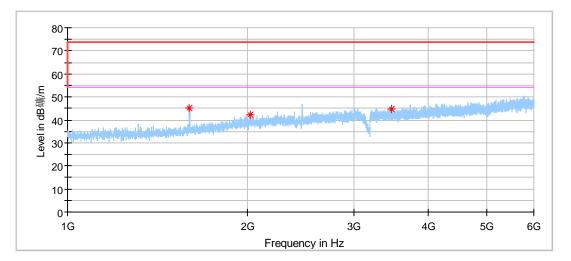


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1851.500000	40.01	74.00	33.99	150.0	Н	334.0	-5.3
3592.000000	44.52	74.00	29.48	150.0	Η	109.0	-0.1
4434.500000	46.17	74.00	27.83	150.0	H	177.0	2.2



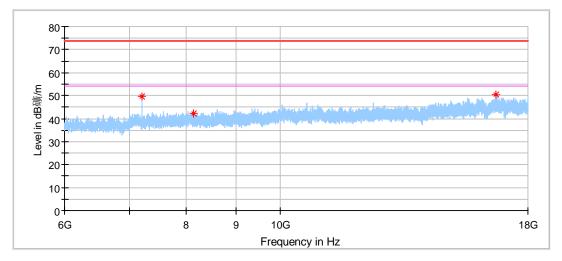


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
8237.000000	41.75	74.00	32.25	150.0	Н	140.0	6.2
9400.500000	42.93	74.00	31.07	150.0	Н	347.0	7.2
10909.500000	45.28	74.00	28.72	150.0	Н	163.0	8.5



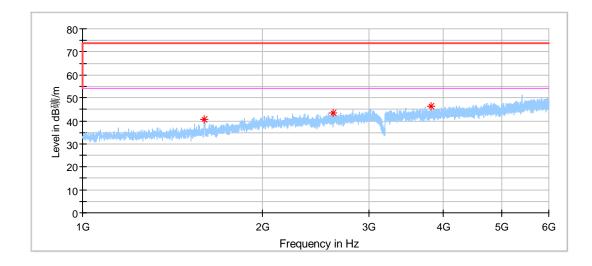
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1598.000000	45.29	74.00	28.71	150.0	v	0.0	-7.3
2019.500000	42.12	74.00	31.88	150.0	v	229.0	-4.2
3479.000000	44.90	74.00	29.10	150.0	v	206.0	-0.5





Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7205.500000	49.51	74.00	24.49	150.0	v	175.0	5.1
8138.500000	42.24	74.00	31.76	150.0	v	152.0	6.2
16683.500000	50.34	74.00	23.66	150.0	V	79.0	15.9

EUT:In-ear True Wireless HeadphoneM/N:PI5ROperating Condition: Tx 2441MHz, Middle Channel, 1GHz-18GHz

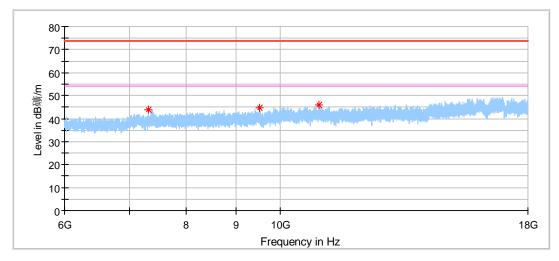


## **Critical_Freqs**

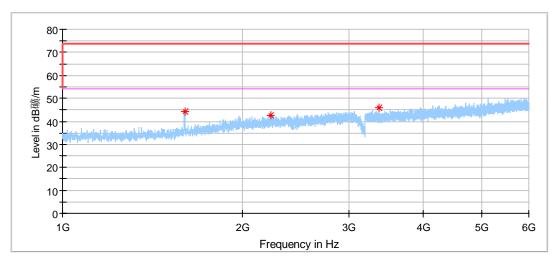
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1595.500000	40.58	74.00	33.42	150.0	Н	305.0	-7.3
2616.000000	43.51	74.00	30.49	150.0	Н	188.0	-2.5
3817.000000	46.27	74.00	27.73	150.0	Н	227.0	0.7

EMC_SZ_FR_21.00 FCC Release 2014-03-20



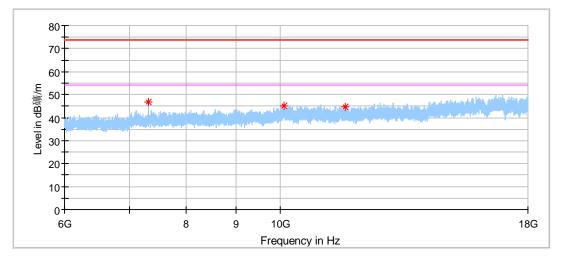


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7323.000000	44.10	74.00	29.90	150.0	Н	81.0	5.3
9528.500000	44.87	74.00	29.13	150.0	Н	105.0	7.5
10968.000000	45.91	74.00	28.09	150.0	Н	0.0	8.5



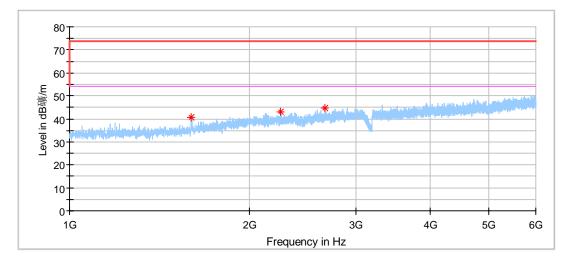
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1598.500000	44.38	74.00	29.62	150.0	v	13.0	-7.3
2224.000000	42.86	74.00	31.14	150.0	v	161.0	-3.6
3371.000000	45.77	74.00	28.23	150.0	v	21.0	-0.5





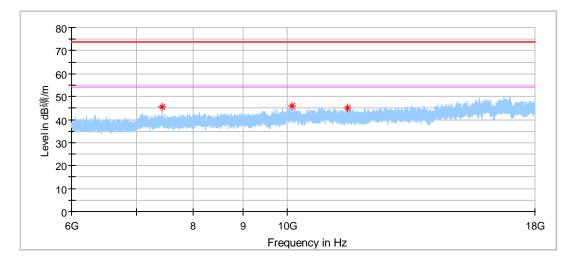
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7323.500000	46.67	74.00	27.33	150.0	v	163.0	5.3
10089.500000	44.94	74.00	29.06	150.0	v	350.0	9.2
11676.000000	44.83	74.00	29.17	150.0	V	329.0	8.5

EUT:	In-ear True Wireless Headphone
M/N:	PI5R
Operating Condition:	Tx 2480MHz, High Channel, 1GHz-18GHz

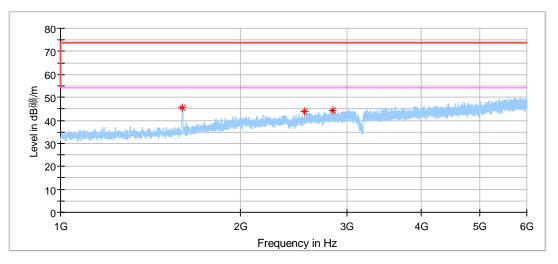


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1596.000000	40.58	74.00	33.42	150.0	н	54.0	-7.3
2253.500000	43.07	74.00	30.93	150.0	н	139.0	-3.5
2665.000000	44.60	74.00	29.40	150.0	H	100.0	-2.4



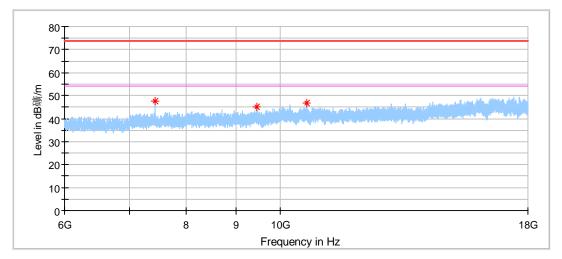


Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7440.000000	45.72	74.00	28.28	150.0	Н	71.0	5.5
10114.000000	45.78	74.00	28.22	150.0	Н	279.0	9.2
11530.000000	45.19	74.00	28.81	150.0	Н	4.0	8.2



Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1596.000000	45.42	74.00	28.58	150.0	v	30.0	-7.3
2556.000000	43.72	74.00	30.28	150.0	v	0.0	-2.7
2843.500000	44.20	74.00	29.80	150.0	v	15.0	-1.9





Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
7440.500000	47.62	74.00	26.38	150.0	v	197.0	5.5
9471.500000	45.29	74.00	28.71	150.0	v	243.0	7.7
10643.000000	46.65	74.00	27.35	150.0	v	11.0	8.4

#### Remark:

- (1) Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.
- (2) Level=Reading Level + Correction Factor Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss (The Reading Level is recorded by software which is not shown in the sheet)

# **10 Test Equipment List**

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Calibration interval (year)	cal. due date
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14- 002	101269	1	2021-6-29
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19- 003	284	1	2021-2-24
Wave Guide Antenna	ETS	3117	68-4-80-19- 001	00218954	1	2021-6-15
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19- 001	100745	1	2020-12- 14
Pre-amplifier	Rohde & Schwarz	SCU 08F2	68-4-29-19- 004	08400018	1	2020-12- 14
Sideband Horn Antenna	Q-PAR	QWH-SL- 18-40-K-SG	68-4-80-14- 008	12827	1	2021-8-5
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14- 002	100432	1	2021-7-30
3m Semi-anechoic chamber	TDK	9X6X6	68-4-90-19- 006		3	2022-12- 29
Test software	Rohde & Schwarz	EMC32	68-4-90-19- 006-A01	Version10.35. 02	N/A	N/A

#### Radiated Emission Test

### List of Test Instruments

#### **RF Conducted Test**

Description	Manufacturer	Model no.	Equipment ID	Serial no.	Calibration interval (year)	cal. due date
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14- 004	101030	1	2023-5-27





# **11 System Measurement Uncertainty**

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

System Measurement Uncertainty					
Test Items	Extended Uncertainty				
Radiated Spurious Emission 30MHz-1000MHz	Horizontal: 4.70dB; Vertical: 4.67dB;				
Radiated Spurious Emission 1000MHz-18000MHz	Horizontal: 4.65dB; Vertical: 4.63dB;				
Conducted RF test with TS 8997	RF Power Conducted: 1.31dB Frequency test involved: 0.6×10 ⁻⁷ or 1%				