

# **FCC/IC - TEST REPORT**

Report Number	: 68.950.19.0062.01 Date of Issue: March 14, 2019			
Model / HVIN	: TEMI S1			
Product Type	: Temi Personal Computer Robot			
Applicant	: Roboteam Home Technology (Shenzhen) Co., Ltd			
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD,			
	FUTIAN DISTRICT, SHENZHEN, CHINA			
Manufacturer	: Roboteam Home Technology (Shenzhen) Co., Ltd			
Address	: 22F, CHANGFU JINMAO BUILDING NO.5 SHIHUA ROAD,			
	FUTIAN DISTRICT, SHENZHEN, CHINA			
Test Result	: ■ Positive  □ Negative			
Total pages including Appendices	: <u>50</u>			

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# 2 Details about the Test Laboratory

# **Details about the Test Laboratory**

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 6998Fax:86 755 828 5299

FCC Registration 514049 No.:

IC Registration 10320A No.:



# 3 Description of the Equipment Under Test

Product:	Temi Personal Computer Robot
Model no.:	TEMI S1
Hardware Version Identification No. (HVIN)	TEMI S1
FCC ID:	2ASJLTEMIS1
IC:	24774-TEMIS1
Options and accessories:	Charger and power Cable
Rating:	Supplied by 14.4Vdc, 15.6Ah Li-ion Battery 19Vdc, 5.0A Charged by an external adapter
Adapter information:	Adapter Model: AY120BA-ZF190500M Adapter Input: 100-240Vac, 50/60Hz; 1.8A Max Adapter Output: 19.0Vdc, 5.0A
RF Transmission Frequency:	144KHz for WPT 2402MHz-2480MHz for Bluetooth 2412MHz-2462MHz for 802.11b/g/n20 (WiFi) 5150-5350, 5470-5825MHz for 802.11a/n20/n40/ac20/ac40/ac80 (WiFi)
No. of Operated Channel:	79 for Bluetooth 11 for 802.11b/g/n20 (WiFi) 43 for for 802.11a/n20/n40/ac20/ac40/ac80 (WiFi)
Modulation:	GFSK, π/4-DQPSK, 8DPSK for Bluetooth DSSS, OFDM for WiFi
Antenna Type:	Integrated antenna
Antenna Gain:	2.0dBi Max for 2.4GHz 2.5dBi Max for 5GHz
Description of the EUT:	The Equipment Under Test (EUT) is a smart robot which support WiFi at 2.4GHz and 5GHz, Bluetooth function operated at 2.4GHz



# 4 Summary of Test Standards

Test Standards					
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES				
10-1-2018 Edition	Subpart C - Intentional Radiators				
RSS-Gen Issue 5	General Requirements for Compliance of Radio Apparatus				
April 2018					
RSS-247	Digital Transmission Systems (DTSS), Frequency Hopping Systems				
Issue 2 February 2017	(FHSS) and License-Exempt Local Area Network (LE-LAN) Devices				

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05 Measurement Guidance and ANSI C63.10 (2013).



Technical Requirements							
FCC Part 15 Subpart C/ RSS-247 Issue 2/RSS-Gen Issue 4							
Test Condition	Pages	Test Result					
§15.207& RSS-Gen 8.8	Conducted emission AC power port	10	Pass				
§15.247(b)(1) & RSS-247 5.4(b)	Conducted peak output power	13	Pass				
§15.247(e) & RSS-247 5.2(b)	Power spectral density		N/A				
§15.247(a)(2) & RSS-247 5.2(a) & RSS-Gen 6.7	6dB bandwidth and 99% Occupied Bandwidth		N/A				
§15.247(a)(1) & RSS-247 5.1(a) & RSS-Gen 6.7	20dB bandwidth and 99% Occupied Bandwidth	15	Pass				
§15.247(a)(1) & RSS-247 5.1(b)	Min. of Hopping Channel Carrier Frequency Separation	21	Pass				
§15.247(a)(1)(iii) & RSS- 247 5.1(d)	Min number of hopping frequencies	24	Pass				
§15.247(a)(1)(iii) & RSS- 247 5.1(d)	Dwell Time - Average Time of Occupancy	26	Pass				
§15.247(d) & RSS-247 5.5	Spurious RF conducted emissions	29	Pass				
§15.247(d) & RSS-247 5.5	Band edge	33	Pass				
§15.247(d) & §15.209 & RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	38	Pass				
§15.203 & RSS-Gen 6.8	Antenna requirement	See note 1	Pass				

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an Integrated antenna, which gain is 2.0dBi. In accordance to §15.203 & RSS-Gen 6.8, 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: 2ASJLTEMIS1, IC: 24774-TEMIS1, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules and RSS-247, RSS-GEN.

# SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed
- □ Not Performed
- The Equipment Under Test
- - Fulfills the general approval requirements.
- □ **Does not** fulfill the general approval requirements.

Sample Received Date: February 25, 2019

Testing Start Date: February 27, 2019

Testing End Date: March 6, 2019

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

Prepared by:

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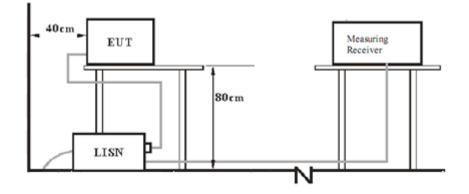
Alan Xiong Project Engineer

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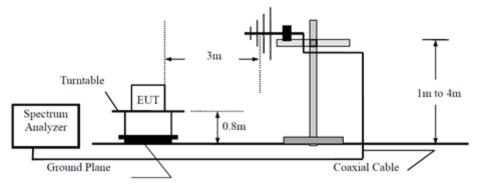


# 7 Test Setups

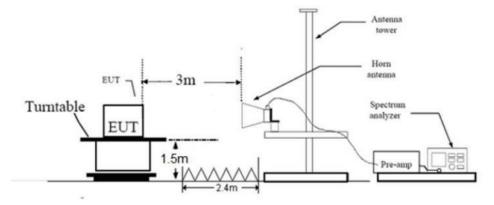
# 7.1 AC Power Line Conducted Emission test setups



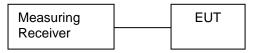
# 7.2 Radiated test setups Below 1GHz



# Above 1GHz



# 7.3 Conducted RF test setups



# 8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Notebook	Lenovo	X240	

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

Hopping mode: typical working mode (normal hopping status)

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



# 9 Technical Requirement

# 9.1 Conducted Emission

# **Test Method**

- 1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- 2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- 3. All the support units are connecting to the other LISN.
- 4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- 5. Both sides of AC line were checked for maximum conducted interference.
- 6. The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

# Limit

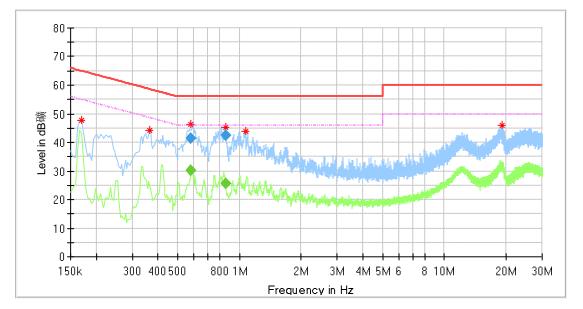
Frequency	QP Limit	AV Limit
MHz	dBµV	dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.



# **Conducted Emission**

Product Type	:	Temi Personal Computer Robot
M/N	:	TEMI S1
Operating Condition	:	Charging Mode
Test Specification	:	Line
Comment	:	AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Read Level (dBµV)	Corr. (dB)
0.170000	47.78		64.96	17.18	L1	37.58	10.2
0.366000	44.25		58.59	14.34	L1	33.95	10.3
0.581500	46.25		56.00	9.75	L1	35.95	10.3
0.581500		30.23	46.00	15.77	L1	19.93	10.3
0.581500	41.47		56.00	14.53	L1	31.17	10.3
0.857500		25.67	46.00	20.33	L1	15.37	10.3
1.070000	43.76		56.00	12.24	L1	33.46	10.3
19.074000	46.11		60.00	13.89	L1	35.11	11.0

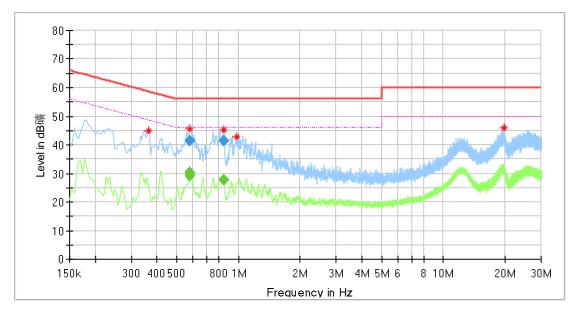
#### Remark:

Max Peak= Read level + Corrector factor Correct factor=cable loss + LISN factor



### **Conducted Emission**

Product Type:Temi Personal Computer RobotM/N:TEMI S1Operating Condition:Charging ModeTest Specification:NeutralComment:AC 120V/60Hz



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Read Level (dBµV)	Corr. (dB)
0.366000	44.75		58.59	13.84	Ν	34.45	10.3
0.577500		29.13	46.00	16.87	Ν	18.83	10.3
0.577500	41.56		56.00	14.44	Ν	31.26	10.3
0.581500		30.33	46.00	15.67	Ν	20.03	10.3
0.581500	41.25		56.00	14.75	Ν	30.95	10.3
0.849500		27.67	46.00	18.33	Ν	17.37	10.3
0.849500	41.28		56.00	14.72	Ν	30.98	10.3
0.982000	42.88		56.00	13.12	Ν	32.58	10.3
19.690000	46.11		60.00	13.89	Ν	34.91	11.2

#### Remark:

Max Peak= Read level + Corrector factor Correct factor=cable loss + LISN factor

# 9.2 Conducted peak output power

# **Test Method**

- 1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- Use the following test receiver 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
- 4. 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 and record the results in the test report.
- 5. Repeat above procedures until all frequencies measured were complete.

# Limits

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





Bluetooth Mode GFSK modulation Test Result Conducted Peak						
Frequency	<b>Output Power</b>	Result				
MHz	dBm					
Low channel 2402MHz	4.82	Pass				
Middle channel 2441MHz	6.47	Pass				
High channel 2480MHz	5.94	Pass				

.

. . . .

### Bluetooth Mode $\pi$ /4-DQPSK modulation Test Result Conducted Peak

Frequency MHz	Output Power dBm	Result
Low channel 2402MHz	3.16	Pass
Middle channel 2441MHz	4.81	Pass
High channel 2480MHz	4.89	Pass

# Bluetooth Mode 8DPSK modulation Test Result

Frequency MHz	Output Power dBm	Result
Low channel 2402MHz	4.25	Pass
Middle channel 2441MHz	4.98	Pass
High channel 2480MHz	5.26	Pass





# 9.3 20 dB bandwidth and 99% Occupied Bandwidth

# **Test Method**

- 1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- Use the following test receiver 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
- 4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
- 5. Repeat above procedures until all frequencies measured were complete.

# Limit

Limit [kHz]

N/A



# 20 dB bandwidth and 99% Occupied Bandwidth

	Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
	MHz	kHz	kHz	kHz	
-	2402	1146	905		Pass
	2441	1149	905		Pass
	2480	1152	905		Pass

### Bluetooth Mode GFSK Modulation test result

	LOW	channel 240	2MHZ		
Spectrum					₩
Ref Level 30.00 dB					
● Att 40 c	iB SWT 94.8 μs 👄	VBW 100 kHz Mode	Auto FFT		
Count 100/100					
TEK VION		м	1[1]		1.82 dBm
			-1-1	2.40	213190 GH
20 dBm		0	cc Bw	905.094	905095 kHz
10 dBm					-
		M1			
0 dBm		ANTA			-
-10 dBm	T1 _/	Net Mar	N . T2		
	X		M <sup>T2</sup>		
-20 dBm	- Nº		W C		
	M		l Vm		
-30 dBm				~	-
A mail				h m.	
-40 dBm				1-1-1-1	
				-	
NSO dBarrow				- L.	mm
					1
-60 dBm					1
CF 2.402 GHz	•	1001 pts	• •	Spi	an 3.0 MHz
		Mea	suring		03.03.2019

#### Low channel 2402MHz

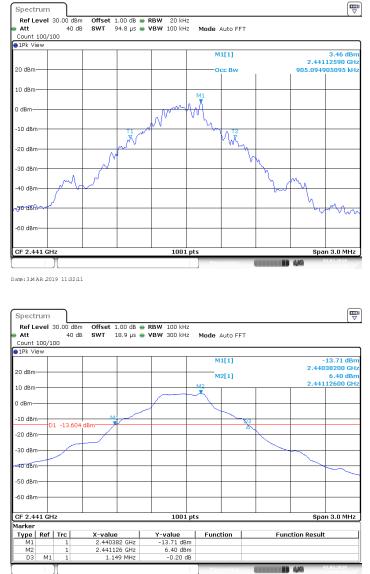
Date:3MAR.2019 11:30:17

Att Count		40 c		RBW 100 kHz	Mode Auto F	FT		
	100/10		10 0 0 10.9 ps	<b>1011</b> 300 KHZ	Mode Autor	r I		
∎1Pk Vi	ew							
					M1[1]			-15.29 dB
20 dBm·	_						2.40	139100 GI
					M2[1]		9.40	4.72 dB 213200 GF
10 dBm					M2		2.40	213200 Gr
					~~			
0 dBm—								
-10 dBm				-				
-10 asm		1 -15.28	E dD m			<b>∼</b> Q3		
-20 dBm		1 -15.20				4		
20 000	.							
-30 dBm		_						
-40 dBn	-						- <u> </u>	-
-50 dBm								
-60 dBm								
-00 ubii	'							
CF 2.4		_		1001			0	an 3.0 MH:
derker	JZ GH	2		1001 p	us		sp	an 3.0 MH
Type	Ref	Trc	X-value	Y-value	Function	l Fu	nction Resu	t
M1		1	2.401391 GHz	-15.29 dBm				
M2		1	2.402132 GHz	4.72 dBm				
D3	M1	1	1.146 MHz	-0.15 dB				

Date:3MAR.2019 11:30:05

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#### Middle channel 2441MHz

Date: 3 M AR 2019 11:31:59

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Date: 3 MAR 2019 12:49:14

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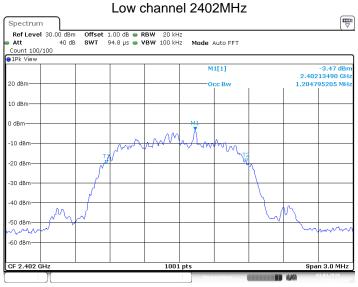
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### 20 dB bandwidth and 99% Occupied Bandwidth

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

	Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
	MHz	kHz	kHz	kHz	
-	2402	1422	1205		Pass
	2441	1425	1208		Pass
	2480	1422	1205		Pass



Date: 3 M AR 2019 12:52:07

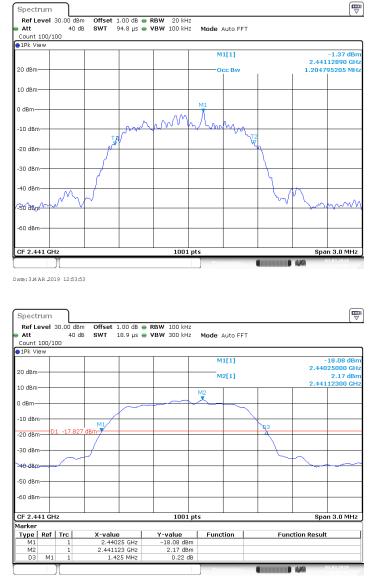
Att		30.00 dB 40 d	-		Mode Auto FFT		
Count 1Pk Vi		00					
					M1[1]		-20.05 dB
20 dBm-	_						2.40125900 GF 0.07 dB
					M2[1]		0.07 dB 2.40213200 GI
10 dBm·							2.1.0210200 0
0 dBm—					M2		
				P			
-10 dBm						$\rightarrow$	
-20 dBm		1 -19.92	M1			<b>R</b> 3	
-20 000	٣	1 -19.92				4	
-30 dBm						$\rightarrow$	
		$\sim$					$\sim$
-40 dBm		2					
-50 dBm							
-60 dBm	-						
CF 2.4	J2 GH	z		1001 pt:	5		Span 3.0 MH
Marker Type	Ref	Trc	X-value	Y-value	Function	Eupo	tion Result
M1	Kel	1	2.401259 GHz	-20.05 dBm	rancton	Func	cion Result
M2		1	2.402132 GHz	0.07 dBm			
D3	M1	1	1.422 MHz	-0.02 dB			

Date: 3 M AR 2019 12:51:55

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Middle channel 2441MHz

Date: 3 M AR 2019 12:53:42

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Date: 3 M AR 2019 12:55:22

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# 20 dB bandwidth and 99% Occupied Bandwidth

Frequency	20 dB Bandwidth	99% Bandwidth	Limit	Result
MHz	kHz	kHz	kHz	
2402	1413	1205		Pass
2441	1416	1208		Pass
2480	1413	1208		Pass

### Bluetooth Mode 8DPSK Modulation test result

Ref Level 30.00 dB		L.OO dB 😑 R						
● Att 40 d	B SWT 9	94.8 µs 👄 🖌	'BW 100 kH	z Mode	Auto FFT			
Count 100/100								
TEK VIEW					11[1]			-2.73 dBr
					11[1]		2,402	213490 GH
20 dBm-					Occ Bw			95205 MH
10 dBm								
0 dBm				<u>M1</u>				
			. M	Ā				
-10 dBm		m	$\mathcal{N}^{\mathcal{N}}$	and long	A.			
	T1	N			T2			
-20 dBm	N	r			19			
	/					Ν		
-30 dBm	+ /							
-40 dBm	+ {					$ \rightarrow $		
							M	
-50 dBm	$\sim$					~v	<u>\</u>	
month								mm
-60 dBm								
CF 2.402 GHz			1001					an 3.0 MHz

#### Low channel 2402MHz

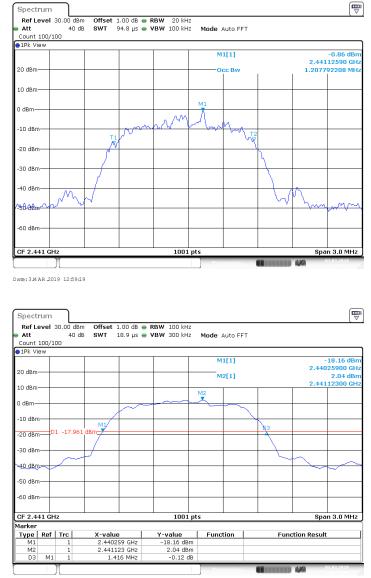
Date:3MAR.2019 12:57:26

Ref Lo Att Count		30.00 dBi 40 d		<ul> <li>RBW 100 kHz</li> <li>VBW 300 kHz</li> </ul>	Mode	Auto FFT			
∋1Pk Vi									
					N	11[1]			-19.93 dBi 26800 GF
20 dBm	-				N	42[1]		2.401	0.19 dBi
10 dBm								2.402	13200 GH
20 0011					M2				
0 dBm-	-				~~_	-			
-10 dBm									
-10 000	'		MI				63		
-20 dBn	ס+-י	1 -19.81	0 dBm	_			Å		
-30 dBm									
-30 401	·	_							
-40 dBr							-		-
-50 dBm	$\square$								
00 000	.								
-60 dBr	<u>۱</u>								
CF 2.4 Marker	D2 GH	z		1001 p	ts			Spa	in 3.0 MH;
Type	Ref	Tro	X-value	Y-value	Eun	ction	Fun	tion Result	
M1		1	2.401268 GHz	-19.93 dBm	- i an				-
M2 D3	M1	1	2.402132 GHz 1.413 MHz	0.19 dBm -0.13 dB					

Date: 3 M AR 2019 12:57:15

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Middle channel 2441MHz

Date: 3 MAR .2019 12:59:07

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Spectrum

😑 1Pk Vi

20 dBm

10 dBm 0 dB

-10 dBr

-20 dBm -30 dBr 40 dBm

-50 dBm -60 dBm M

#### RefLevel 30.00 dBm Att 40 dB Offset 1.00 dB ● RBW 20 kHz SWT 94.8 µs ● VBW 100 kHz Mode Auto FFT Count 100/100 M1[1] -0.47 dB 2.48011990 GF 1.207792208 M c Bw

M Λ

Т1 Ж

High channel 2480MHz

Span 3.0 MHz 1001 pi CF 2.48 G 1.1/7 Date: 3 M AR .2019 13:00:55 Spectrum Ref Level 30.00 dBm Att 40 dB Count 100/100 
 Offset
 1.00 dB
 RBW
 100 kHz

 SWT
 18.9 μs
 VBW
 300 kHz
 Mode Auto FFT ⊖1Pk View M1[1] 17.60 2.4792 20 dBr M2[1] 2.44 d 2.48011700 GH 10 dBm M2 0 dBm -10 dBm M1 -20 dBm -30 dBr -40 dBn -50 dBm -60 dBm CF 2.48 G 1001 pts Span 3.0 MHz /larker Type Ref Trc X-value 2.479253 GHz 2.480117 GHz 1.413 MHz 1 Function Result M2 D3 M1 ..... Date: 3 M AR .2019 13:00:44

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m

m



# 9.4 Carrier Frequency Separation

# **Test Method**

- 1. The RF output of EUT was connected to the test receiver by RF cable The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
- 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
- 4. By using the Max-Hold function record the separation of two adjacent channels.
- 5. Measure the frequency difference of these two adjacent channels by spectrum analyzer marker function. Record the results.
- 6. Repeat above procedures until all frequencies measured were complete.

# Limit

Limit
kHz
$\geqslant$ 25KHz or 2/3 of the 20 dB bandwidth which is greater

Limit

Frequency	2/3 of 20 dB Bandwidth
MHz	kHz
2402	768
2441	950
2480	944



# **Carrier Frequency Separation**

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

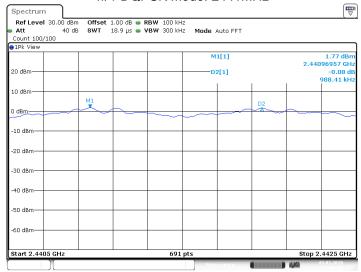
# GFSK Modulation test result

Modulation	Frequency	Carrier Frequency Separation	Result
	MHz	kHz	
GFSK	2441	997	Pass
π/4-DQPSK	2441	998	Pass
8DPSK	2441	1000	Pass

Att 40 dB SWT Count 100/100	1.00 dB 👄 RBW 100 kF 18.9 μs 👄 VBW 300 kF			
20 dBm		M1[1]	2.44	6.32 dBm 112609 GHz 0.01 dB 997.10 kHz
L0 dBm	<u>*</u>		02	
D dBm				
10 dBm	<u> </u>			
20 dBm				
30 dBm				
40 dBm				
50 dBm				
60 dBm				
Start 2.4405 GHz	691	pts	Stop 2	2.4425 GHz

Date:3MAR.2019 13:05:37

### **Carrier Frequency Separation**



Date: 3 M AR .2019 13:07:35

Ref Level 30.00           Att         4           Count 100/100           IPk View	HO dB SWT	1.00 dB 👄 RB 18.9 µs 👄 VB		Mode Auto FFT		
20 dBm				M1[1] D2[1]	2.4	2.28 dBr 4112609 GH 0.12 d 1.00000 MH
.0 dBm		M1			D2	
) dBm			$ \rightarrow                                   $	~+~~+	~~~~~~	+
10 dBm						
20 dBm						
30 dBm						
40 dBm						
50 dBm						
60 dBm						

Date: 3 M AR 2019 13:19:16

# π/4-DQPSK Mode: 2441MHz

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# 9.5 Number of hopping frequencies

# **Test Method**

- 1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
- 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
- 4. Set the spectrum analyzer on Max-Hold Mode,
- 5. Record all the signals from each channel until each one has been recorded.
- 6. Repeat above procedures until all frequencies measured were complete.

# Limit

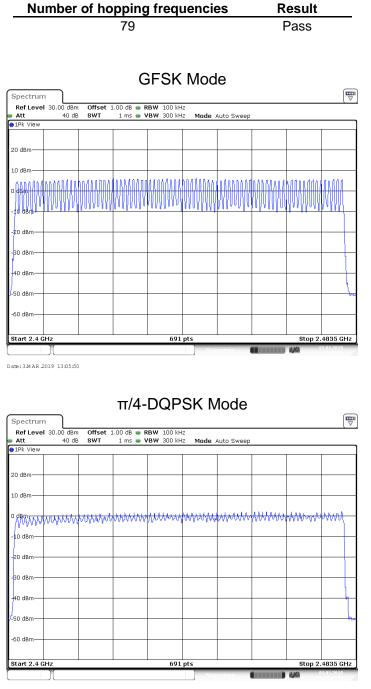
Limit <u>number</u> ≥ 15





# 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.



Date: 3 M AR 2019 13:07:57

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### 8DPSK Mode

Ref Level 3			1.00 dB 👄								
Att 1Pk View	40 dB	SWT	1 ms 👄	VBW	300 kH;	Mode .	Auto Sweep			-	
1PK VIEW				-							
20 dBm											
LO dBm											_
den mart	JAMA	ылалла	AMAMAN	und	Arial	AAAAAAA	wwww	MANN	ANALA	Hylry	-
laddonada	∧418		0								١.
10 dBm											Ļ
20 dBm				_							Ļ
											L
30 dBm											+
											Ļ
40 dBm				_							
50 dBm											
60 dBm				_							
Start 2.4 GH	7				691	nts			Ston 2	.4835 G	н

Date: 3 MAR 2019 13:19:50

# 9.6 Dwell Time

# **Test Method**

- 1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit to hopping mode.
- 3. Use the following spectrum analyzer settings: RBW: 1MHz; VBW: 1MHz; SPAN: Zero Span Set the spectrum analyzer on Max-Hold Mode,
- 4. Adjust the center frequency of spectrum analyzer on any frequency be measured.
- 5. Measure the Dwell Time by spectrum analyzer Marker function. Record the results. Dwell Time = Burst Width \* Total Hops
- 6. 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 I	Result
--------	--------

Modulation	Mode	Reading (ms)	Total Hops	Test Result (ms)	Limit (ms)	Result
GFSK	DH5	2.87	106.67	306.14	< 400	Pass
π/4-DQPSK	2DH5	2.87	106.67	306.14	< 400	Pass
8-DPSK	3DH5	2.87	106.67	306.14	< 400	Pass

# **GFSK Modulation**

			MI	1[1]			4.74 dBn 250 n
10 dBm	M1	D2	D2	2[1]			0.48 di 2.86786 m
0 dBm	RG 2.300 dBm	20					-
-10 dBm							
-20 dBm							
-30 dBm							
-40 dBm							
-50 dBm			L. I.L	Larte t	الله بال	a shatt	
unh din barari	Kapphaka		wate has been	de a l'Anamadican	MML MARKUM	olatilik unik ka	and de la

Date:3MAR.2019 13:06:03

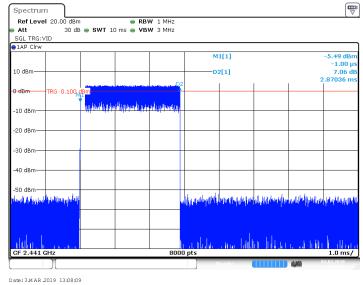
DH5

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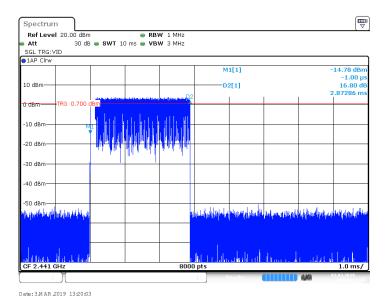
# **Dwell Time**

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





# 8-DPSK Modulation



3DH5

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# 9.7 Spurious RF conducted emissions

### **Test Method**

- 1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 4. Measure and record the results in the test report.
- 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency

### Limit

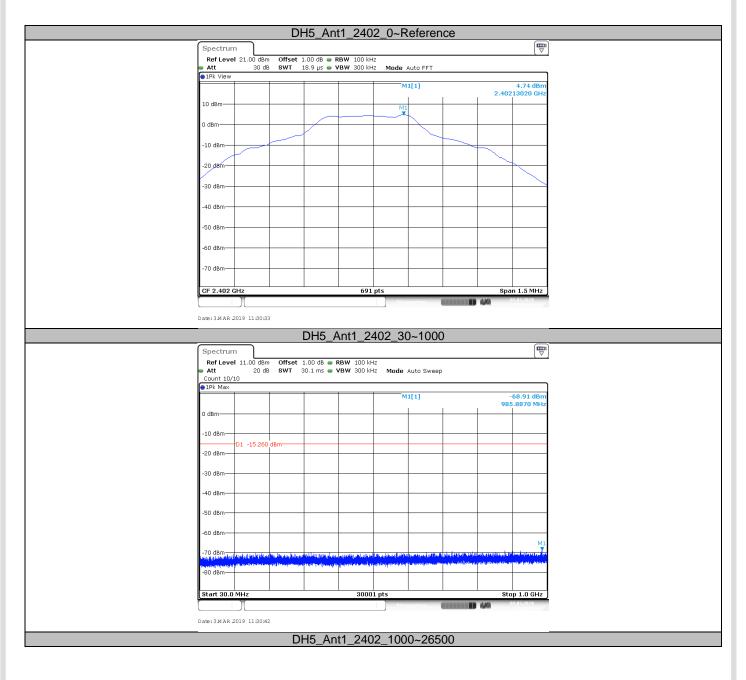
Frequency Range MHz	Limit (dBc)
30-25000	-20



# **Spurious RF conducted emissions**

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

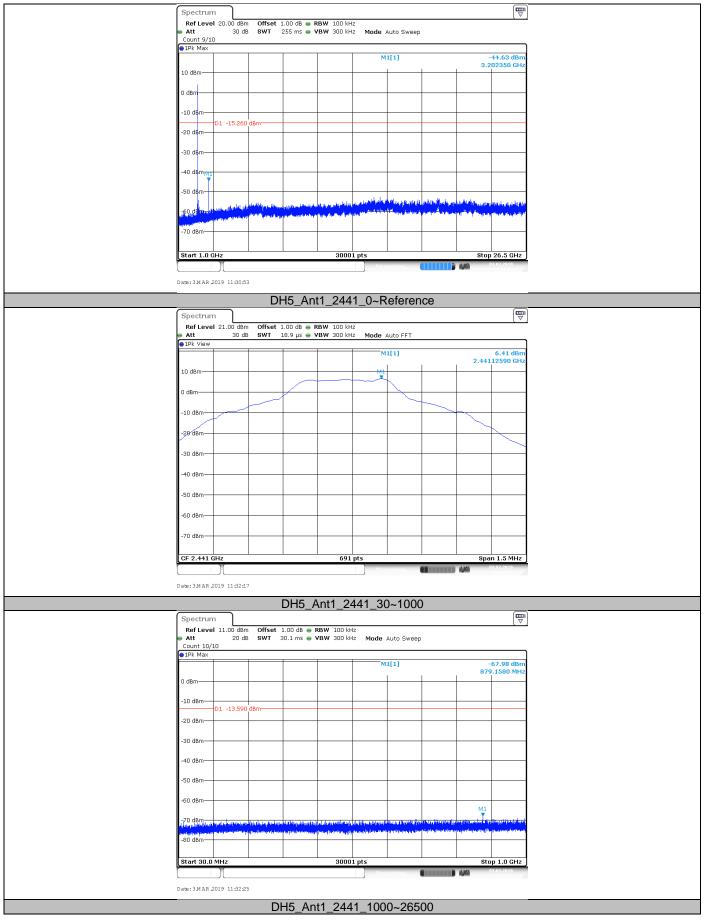
Test Mode	Antenna	Channel	Frequency Range	Ref Level	Result	Limit	Verdict
		2402	Reference	4.74	4.74		PASS
	2402	30~1000	4.74	-68.91	-15.26	PASS	
	2402	1000~26500	4.74	-44.63	-15.26	PASS	
	2441	Reference	6.41	6.41		PASS	
DH5	Ant1	2441	30~1000	6.41	-67.98	-13.59	PASS
		2441	1000~26500	6.41	-46.89	-13.59	PASS
		2480	Reference	5.80	5.80		PASS
		2480	30~1000	5.80	-68.39	-14.2	PASS
		2480	1000~26500	5.80	-49.02	-14.2	PASS



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#### Report Number: 68.950.19.0062.01



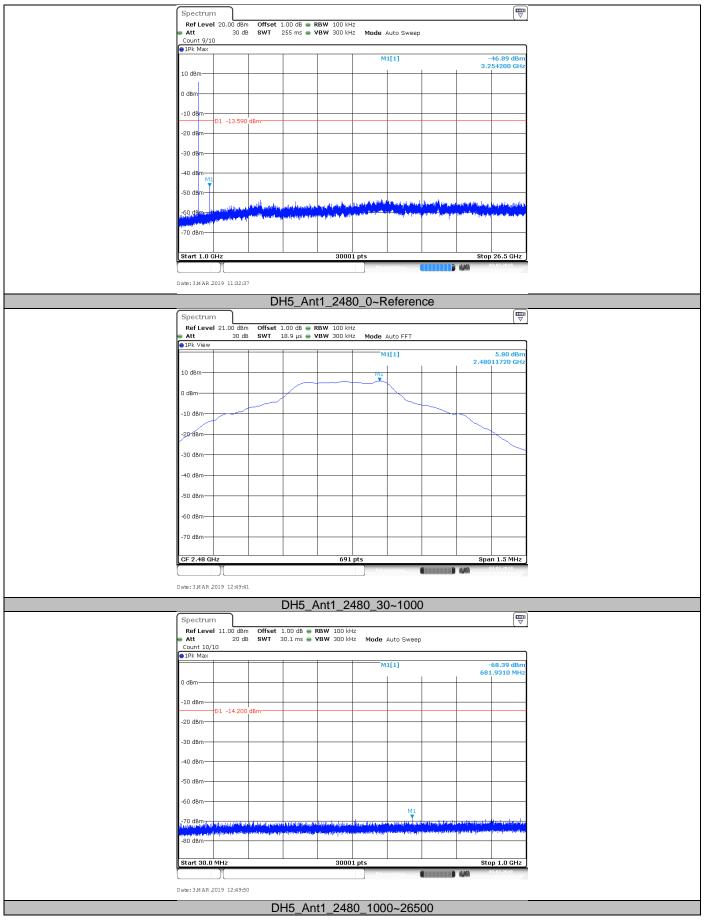


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#### Report Number: 68.950.19.0062.01



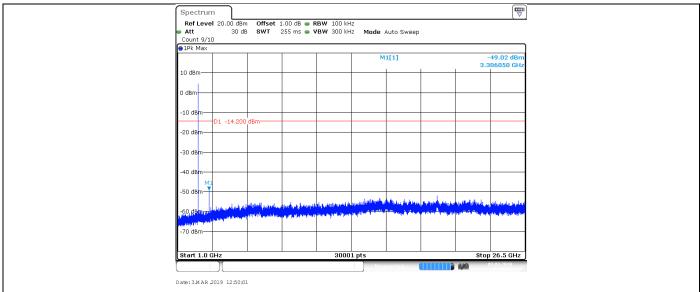


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# 9.8 Band edge testing

## **Test Method**

- 1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 4. Measure and record the results in the test report.
- 5. The RF fundamental frequency should be excluded against the limit line in the operating frequency
- 6. Set to the maximum power setting and enable the EUT hopping mode, repeat the test.

## Limit:

In any 100kHz 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 Level	20.00 dBi	m Offset :	L.00 dB 📢	• RBW 100 k	Hz						
Att	30 d	B SWT 24	46.5 μs	<b>VBW</b> 300 k	Hz	Mode /	Auto F	FT			
Count 300/3	300										
1Pk View											
						M1	[1]				4.75 dB
10 dBm					<u> </u>						402190 G
						M2	[1]				-56.18 de 400000 d
0 dBm								1		Z.	400000 0
-10 dBm											
	01 -15.25	0 d0m									
-20 dBm	1 -13.23	o ubin									
-30 dBm					<u> </u>						
-40 dBm											
-50 dBm					M4						
oo abiii					Χ.						M2
-60 dBm		www.www.	Mit in a	100 Martine	J.,				a de c	M3	month
	10 mg care	andreament	and war	· · · · · · ·	*1	r waard	Ch hair	mandagen	and find	pur viim	~~~~U
-70 dBm											
Start 2.3 GF	lz			691	pts					Stop	2.405 GH
1arker											
Type Ref		X-value		Y-value		Functi	ion		Fund	ction Resu	t
M1	1	2.4021		4.75 dE							
M2 M3	1		4 GHz	-56.18 dB							
M3 M4	1	2.3	9 GHz	-62.27 dB -53.92 dB							

Date:3MAR.2019 11:30:26

Ref Level	20.00 dB	m Offset 1.00 dB 🖷	RBW 100 kHz			
Att	30 d	dB SWT 1.1 ms 🖷	<b>VBW</b> 300 kHz	Mode Auto Sw	/eep	
Count 300/3	100					
∋1Pk View						
				M1[1]		5.76 dB
10 dBm	M1					2.480130 GF -57.73 dB
	1			M2[1]		-57.73 aB 2.483500 GF
0 dBm	1				1 1	2.465300 Gr
-10 dBm	Π					
	1 -14.24	0 dBm				
-20 dBm	<u> </u>					
	11					
-30 dBm	μ					
-40 dBm						
-50 dBm						
-50 ubiii	NY24					
-60-d8m		Martineton	3	Land and the second second		and a second
-70 dBm						
Start 2.47 G	Hz		691 pts	5	- 1 - 1	Stop 2.55 GH
4arker						
Type Ref	Trc	X-value	Y-value	Function	Func	tion Result
M1	1	2.48013 GHz	5.76 dBm			
M2	1	2.4835 GHz	-57.73 dBm			
MЗ	1	2.5 GHz	-61.42 dBm			
M4	1	2.484029 GHz	-57.16 dBm			

Date:3MAR.2019 12:49:34

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GFSK mode: Hopping on

Ref Le	vel 2	0.00 dBr	n Offset	1.00 dB (	RBW 100 k	Hz						
Att		30 d	B SWT	246.5 µs (	VBW 300 k	Hz	Mode /	Auto FF	т			
Count 3		0										
∎1Pk Vie	W											
							M1	[1]				3.67 dE
10 dBm-												04010 G
							M2	[1]				60.89 dE
) dBm—											2.4	00000 q
												1
-10 dBm				-		-						ſ
	D1	-16.330	) dBm									
-20 dBm												
-30 dBm												
-50 abin												
-40 dBm												
-50 dBm				-								
						M4					M3	M2
-60 dBm	Annu	Mucha	yun here	moundar	Manufaration	worky	penter	hypert	mouth	White	helphouse	warden
-70 dBm	•   ·					·				·		
-70 ubili												
Start 2.	3 GHz	2			691	pts					Stop :	2.405 GH
larker												
	Ref	Trc	X-valu		Y-value		Functi	ion		Funct	ion Result	
M1		1		401 GHz	3.67 di							
M2 M3		1		2.4 GHz .39 GHz	-60.89 d -61.96 d							
M3 M4		1		.39 GHZ 387 GHZ	-61.96 di -59.03 di							

Date:3MAR.2019 13:04:32

Spectrum Ref Louol	1 20.00 dBr	n Offset 1.00 dB (	DDW 100 kuz					Ę
Att	20.00 UBr 30 d		VBW 300 kHz		to Sween			
Count 300/	300			noue no				
1Pk View								
				M1[	1]			5.55 dB
10 dBm —	1							478160 G
0.0.0.0.0.0	n d			M2[	1]			-60.67 dE
q dem HAHA	U .		-			I.	2.4	483500 G
WWW	W							
10 dBm	D1 -14.450	dem-						
-20 dBm	01 -14.430	ubiii						
20 00111								
-30 dBm								
-40 dBm								
-50 dBm								
SO UDIN	L <sub>M2</sub>	M	13					
-60 dBm	L. Dates	Anoral Marine Ma Marine Marine Ma	Thyraspress	Mahaaqa	adadda	المدور معالياتهم	ورار المراجع	, and the second second
-70 dBm								-
Start 2.47	GHz		691 p	ots			Sto	p 2.55 GH
1arker								
	Trc	X-value	Y-value	Functio	<u>n  </u>	Fund	ction Resul	t
M1	1	2.47816 GHz	5.55 dBn					
M2 M3	1	2.4835 GHz	-60.67 dBn					
M3 M4	1	2.5 GHz 2.498986 GHz	-57.27 dBn -56.24 dBn					
out	1 1	2.450500 GHz	55.24 UBI	0.1				

Date: 3 M AR 2019 13:06:21

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## $\pi$ /4-DQPSK mode: Hopping off

Rei Levei	20.00 dB	m Offset 1.00 dB	RBW 100 kHz				
Att	30 d		🖷 VBW 300 kHz	Mode Auto F	FT		
Count 300/	300						
∋1Pk View							
				M1[1]		-0.09	
10 dBm						2.40204	
				M2[1]		-58.1	
0 dBm						2.40000	o qi
							- 0
-10 dBm							-11
20 d8m	D1 -20.09	0.40					
20 0011	01 -20.09	U UBIII					П
-30 dBm							
-40 dBm							+
-50 dBm			M4			P	12
60. d0m							7
millen	runderhaa	un normanit	manner	Marken Marken and	mytheathath	martune	e.
-70 dBm							
Start 2.3 G	Hz		691 pt	s		Stop 2.405	GH:
Aarker							
Type   Re	Trc	X-value	Y-value	Function	Euni	tion Result	
M1	1	2.40204 GHz	-0.09 dBm				
M2	1	2.4 GHz	-58.11 dBm				
M3	1	2.39 GHz	-62.75 dBm				
M4	1	2.349457 GHz	-59.19 dBm				

Date:3MAR.2019 12:52:16

Reflevel	20.00 dBm	Offset 1.00 d	3 🖷 RE	W 100 kHz				Ę
Att	30 dB			3W 300 kHz	Mode Au	ito Swi	eep	
Count 300/	300							
1Pk View								
					M1	1]		2.17 dB
10 dBm						-		2.480010 GF
TO UBIII	M1				M2	1]		-59.33 dB
0 dBm	X							2.483500 GF
	0 1							
-10 dBm								
-20 dBm	D1 -17.830	ивни						
-30 dBm								
-40 dBm	յլ							
-40 ubiii								
-50 dBm								
~	(M2	M	мз					
⊧60°dBm~ <sup>J</sup>	N.	arann <del>a wola fanna</del>	without	and and a second se	monanda	(Burndard	mator "unonamo	water a second s
-70 dBm								
Start 2.47	GHz			691 pt	s			Stop 2.55 GH
4arker								
	Trc	X-value		Y-value	Functi	on	Fund	ction Result
M1	1	2.48001 GH:		2.17 dBm				
M2	1	2.4835 GH		-59.33 dBm				
M3	1	2.5 GH:		-60.54 dBm				
M4	1	2.493768 GH	Z	-57.98 dBm				

Date: 3 M AR 2019 12:55:43

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## $\pi$ /4-DQPSK mode: Hopping on

Ref Level	20.00 dB	m Offset 1.00 dB	RBW 100 kH	7		[
Att	30 d		VBW 300 kH		FT	
Count 300/	300					
∋1Pk View						
				M1[1]		-0.28 dB
10 dBm						2.403100 G
10 0.0111				M2[1]		-60.93 dB
0 dBm						2.400000 Gi
						I   <u>M</u>
-10 dBm						
20 dBm	D1 -20.28	0 dBm				
-30 dBm						
-30 asm						
-40 dBm						
-50 dBm						
			M4			M2
-60 dBm	alahan Aha	Newsmannewskill	with mary and	mound	a hardbarre har a low	MR MR
-70 dBm						
Start 2.3 G	Hz		691	ots		Stop 2.405 GH
Marker						
Type Ref	Trc	X-value	Y-value	Function	Fun	ction Result
M1	1	2.4031 GHz	-0.28 dBr			
M2	1	2.4 GHz 2.39 GHz	-60.93 dBr -63.33 dBr			
M3	1					

Date:3MAR.2019 13:07:01

Spectrum										[ <sup>1</sup>
Ret Level	20.00 dBm 30 dB			RBW 100 kHz VBW 300 kHz		Auto Ci				
Count 300/		3001 1.1	1115	Y D YY 300 KH2	Moue	AULU SI	veep			
1Pk View	000									
					M	1[1]				1.87 dB
10 dBm									2	.470980 GI
10 uBili					M	2[1]				-60.09 dB
A MARA AND									2	.483500 GI
NAM AND	JVI					1				
-10 dBm						-				
		10-								
-20 dBm	D1 -18.130 d	JBM								
-30 dBm										-
-40 dBm-										
10 abiii	4									
-50 dBm										
	M2	M4	Ma							
-60 dBm	Warner	-une-aperation	and the state		antho and	further	<del>,luk</del> ov	<del>and as felled</del>	-roldo arran	monter
-70 dBm										
-70 aBm										
Start 2.47	CUIS			691	nt <i>c</i>				Ct.	op 2.55 GH
Marker				091	513				30	ip 2.00 dri
	f   Trc	X-value	1	Y-value	Fund	tion		Eupo	tion Resu	.1+
M1	1	2.47098	GHz	1.87 dBr				1 and		
M2	1	2.4835		-60.09 dBr						
MЗ	1	2.5		-58.44 dBr						
M4	1	2.491333	GHz	-58.95 dBr	n					
	)(					_			4.347	03.03.2010

Date: 3 M AR 2019 13:09:30

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8DPSK mode: Hopping off

Refle	vel 2	20.00 dBi	m Offset	1.00 dB	RBW 100 k	'Hz						(
Att		30 d			VBW 300 k		Mode	Auto P	FT			
Count	300/30	00										
1Pk Vi	зw											
					1		M	1[1]				0.28 dB
10 dBm·											2.4	102190 GF
TO UBIII							M	2[1]				-57.73 dB
) dBm—											2.4	100000 🙀
5 GDIII												1 N
10 dBm	-		+			-						
-20 dBm	D1	l -19.72	0 dBm			-						
-30 dBm	-		-			-					-	
40 dBm												1 1
-40 UBIT												
-50 dBm												
00 000	·											M
60 dBm					and the second second second	And I					M3	
		anora	monum	worther w	when around the	r	han	www	runn	manya	m but the	10 July
-70 dBm	-					+						
Start 2	.3 GH	z	1		691	pts					Stop	2.405 GH
1arker											•	
Type	Ref	Trc	X-value	.	Y-value	1	Func	tion	1	Fun	ction Resul	ŀ
M1		1		19 GHz	0.28 d	3m						
M2		1		.4 GHz	-57.73 di							
MЗ		1		39 GHz	-63.83 di							
M4		1	2.3999		-57.85 di							

Date:3MAR.2019 12:57:36

Spectrum Ref Level		Offset 1.00 dB	- PRIV 400 kits					[
Att	20.00 asm 30 dB		KBW 100 KHZ VBW 300 kHz	Mode A	uto Swa	on		
Count 300/3		<b>GW1</b> 1.1 m3 (	<b>10</b> 77 300 KHZ	Moue A	uto 5#e	eb		
1Pk View								
				M1	[1]			2.32 dB
10 dBm							2	.480130 G
TO UBIII	M1			M2	[1]			-59.65 dE
) dBm	X						2	.483500 G
	11							
-10 dBm								
	/ L 01 -17.680	dBm						
20 dBm	17.000	dom.						
30 dBm								
SU UBIII	$\Lambda$							
-40 dBm						_		
50 dBm	- t					-		-
60.d8m	M2M4	N	43			A	1.	
en asw	and the state of t	a Contraction of the Contraction	Martha Balanter	- 100 H C- 100 H C- 100 H	,	and the second	Marine Marine	- martine and a second
70 dBm								
/0 00/11								
Start 2.47 (	GHz		691 p	ts			Sto	pp 2.55 GH
1arker								
Type   Ref	Trc	X-value	Y-value	Functi	ion	Fur	nction Resu	lt
M1	1	2.48013 GHz	2.32 dBn	1				
M2	1	2.4835 GHz	-59.65 dBm					
MЗ	1	2.5 GHz	-60.42 dBm					
M4	1	2.485188 GHz	-58.79 dBm	1				

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8DPSK mode: Hopping on

Ref Level	20.00 dBr	n Offset 1.00 dB	RBW 100 kHz			
Att	30 d	в <b>SWT</b> 246.5 µs	🔵 VBW 300 kHz	Mode Auto I	FT	
Count 300/3	00					
1Pk View						
				M1[1]		-2.66 dB 2.401880 G
10 dBm				M2[1]		-62.37 dB
0 dBm						2.400000101
U dBm						
-10 dBm						
-20 dBm	1 -22.660	1 dBm				
-30 dBm						
-30 ubiii						
-40 dBm						
-50 dBm			M4			
-60 dBm						M3 M2
montal	northere	auturnerstrand	mound	Manal John	magniture	mulphing files
-70 dBm						
Start 2.3 GH	z	1 1	691 pt	s	1	Stop 2.405 GH
1arker						
	Trc	X-value	Y-value	Function	Fun	ction Result
M1	1	2.40188 GHz	-2.66 dBm			
M2 M3	1	2.4 GHz 2.39 GHz	-62.37 dBm -62.39 dBm			
M3 M4	1	2.39 GHz 2.351283 GHz	-62.39 dBm -59.61 dBm			

Date:3MAR.2019 13:09:53

Ref Level	20.00 dBr 30 d		RBW 100 kHz	Mode Auto S	w000	[[
Count 300/		5 3WI 1.1115	<b>VBW</b> 300 KH2	MOUE AULO 5	weep	
1Pk View						
				M1[1]		1.47 dE 2.471910 G
10 dBm				M2[1]		-60.55 dE
REAMIN						2.483500 G
walkalla	w)					
-10 dBm	-					
	D1 -18.530	D dBm				
20 dBm-	51 -10.550					
-30 dBm	_					
	- <u>h</u> .					
40 dBm	- 4					
50 dBm						
00 00.00	M2	N N	4			
60 dBm	howar	En and the second of the second	Far Marine Martin and the	And Menor during)	Waana waa waa waa waa waa waa waa waa waa	hand when when when when the
70 40						
-70 dBm						
Start 2.47	GHz		691 pt	s		Stop 2.55 GF
1arker						
Type   Ref	Trc	X-value	Y-value	Function	Fu	nction Result
M1	1	2.47191 GHz	1.47 dBm			
M2	1	2.4835 GHz	-60.55 dBm			
M3 M4	1	2.5 GHz 2.499913 GHz	-60.82 dBm -57.56 dBm			

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# 9.9 Spurious radiated emissions for transmitter

### **Test Method**

- 1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. Set to the maximum power setting and enable the EUT transmit continuously
- 3. The EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. 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.
- 5. 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.
- 6. Use the following spectrum analyzer settings According to C63.10:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for f < 1 GHz; VBW RBW; Sweep = auto; Detector function = peak; Trace = max hold;</p>
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \ge 1$  GHz for peak measurement.
  - For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.

VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum

power control level for the tested mode of operation.

7. Repeat above procedures until all frequencies measured were complete.

#### 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.



## Spurious radiated emissions for transmitter

#### Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency	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, 2402MHz) test result is listed in the report.

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

Frequency Band	Frequency	Emissio n Level	Read level	Polarizat ion	Limit	Detector	Margin	Correct factor	Result
Danu	MHz	dBuV/m	dBuV/m		dBµV/m		dBuV/m	(dB)	
	335.77	39.60	64.70	Н	46	QP	6.40	-25.1	Pass
	480.08	42.73	65.03	Н	46	QP	3.27	-22.3	Pass
	528.04	43.64	64.94	Н	46	QP	2.36	-21.3	Pass
30-	Other frequency			Н		QP			Pass
1000MHz	83.99	32.15	62.95	V	40	QP	7.85	-30.8	Pass
	111.48	31.51	59.41	V	43.5	QP	11.99	-27.9	Pass
	432.07	35.71	59.11	V	46	QP	10.29	-23.4	Pass
	Other frequency			V		QP			Pass
	1224.06	43.96	56.16	Н	74	PK	30.04	-12.2	Pass
	2040.06	43.68	52.58	Н	74	PK	30.32	-8.9	Pass
	*2855.38	40.06	44.46	Н	74	PK	33.94	-4.4	Pass
	Other			Н	74	PK			Pass
1000-	frequency								
25000MHz	1224.06	45.96	58.16	V	74	PK	32.04	-12.2	Pass
	2039.75	45.25	54.15	V	74	PK	28.75	-8.9	Pass
	*2880.063	42.44	46.84	V	74	PK	31.56	-4.4	Pass
	Other frequency			V	74	PK			Pass

#### GFSK Modulation 2402MHz Test Result

#### 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 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Corrected Amplitude = Read level + Corrector factor Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain Below 1GHz: Corrector factor = Antenna Factor + Cable Loss



# **10 Test Equipment List**

#### Radiated Emission Test

## List of Test Instruments

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
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	2019-7-6
LISN	Rohde & Schwarz	ENV4200	100249	2019-7-6
Attenuator	Shanghai Huaxiang	TS2-26-3	080928189	2019-7-6
Test software	Rohde & Schwarz	EMC32	Version9.15.00	N/A

#### Conducted RF Test System

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE	
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2019-7-6	
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2019-7-6	
Power Splitter	Weinschel	1580	SC319	2019-7-5	
Test software	Tonscend	System for BT/WIFI	Version 2.6	N/A	



# **11 System Measurement Uncertainty**

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

System Measurement Uncertainty				
Test Items	Extended Uncertainty			
Uncertainty for Conducted Emission 150kHz-30MHz (for test using AMN ENV432 or ENV4200)	3.21dB			
Uncertainty for Radiated Spurious Emission 25MHz- 3000MHz	Horizontal: 4.91dB; Vertical: 4.89dB;			
Uncertainty for Radiated Spurious Emission 3000MHz- 18000MHz	Horizontal: 4.80dB; Vertical: 4.79dB;			
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;			
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10 <sup>-7</sup> or 1%			