

TEST REPORT

APPLICANT	: Hot Pepper, Inc.
PRODUCT NAME	: 4G Smart Phone
MODEL NAME	: H5
BRAND NAME	: Hot Pepper
FCC ID	: 2APD4-P26A
STANDARD(S)	: 47 CFR Part 15 Subpart C
TEST DATE	: 2018-03-14 to 2018-05-04
ISSUE DATE	: 2018-05-21

Tested by:

Tu Ya'nan

Tu Ya'nan (Test Engineer)

Approved by:

Andy Yeh (Technical Director)

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Change History				
Issue	Date	Reason for change		
1.0	2018-05-21	First edition		



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1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Hot Pepper, Inc.	
Applicant Address:	Address: 5151 California Ave., Suite 100, Irvine 92617, USA	
Manufacturer: Hot Pepper, Inc.		
Manufacturer Address:	5151 California Ave., Suite 100, Irvine 92617, USA	

1.2. Equipment Under Test (EUT) Description

Product Name:	4G Smart Phone
Serial No:	(N/A, marked #1 by test site)
Hardware Version:	T169-LK-V1.2
Software Version: HOTPEPPER_SW01_20180320	
Modulation Type:	Bluetooth: FHSS (GFSK(1Mbps), π/4-DQPSK(EDR 2Mbps),
Modulation Type.	8-DPSK(EDR 3Mbps))
	The frequency range used is 2402MHz – 2480MHz
Operating Frequency Range:	(79 channels, at intervals of 1MHz);
	The frequency block is 2400MHz to 2483.5MHz.
Bluetooth Version:	Bluetooth 4.1(BR/EDR)
Antenna Type: PIFA Antenna	
Antenna Gain:	1.39 dBi

Note 1: The EUT contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies is F(MHz)=2402+1*n (0<=n<=78). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

Note 2: The EUT connected to the serial port of the computer with a serial communication cable, we use the dedicated software to control the EUT into the test mode, and then use MT8852B base station to control the EUT continuous transmission.

Note 3: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.





1.3. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart C for the EUT FCC ID Certification:

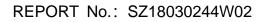
No	Identity		Docu	Document Title		
1 47 CFR Part 15 (10-1-15 Edition)		Radio Frequency Devices				
Test d	etailed items	/section required by FCC rule	es and	results are as be	elow:	
No.	Section in CFR 47	Description		Test Date	Test Engineer	Result
1	15.203	Antenna Requirement		N/A	N/A	PASS
2	15.247(a)	Number of Hopping Freque	ncy	Apr 10, 2018	Tu Ya'nan	PASS
3	15.247(b)	Peak Output Power		Apr 10, 2018	Tu Ya'nan	PASS
4	15.247(a)	20dB Bandwidth		Apr 10, 2018	Tu Ya'nan	PASS
5	15.247(a)	Carrier Frequency Separation		Apr 10, 2018	Tu Ya'nan	PASS
6	15.247(a)	Time of Occupancy (Dwell time)		Apr 10, 2018	Tu Ya'nan	PASS
7	15.247(d)	Conducted Spurious Emiss	ion	Apr 10, 2018	Tu Ya'nan	PASS
8	15.247(d)	Restricted Frequency Band	S	Mar 14, 2018	Wu Junke	PASS
9	15.209, 15.247(d)	Radiated Emission		Apr 05, 2018	Wu Junke	PASS
10	15.207	207 Conducted Emission		May 04, 2018	Wu Junke	PASS
Note	1: The tests	were performed according to	the n	nethod of measur	ements prescribed	in ANSI
C63.	10-2013.					

1.4. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 -60
Atmospheric Pressure (kPa):	86-106







2. 47 CFR Part 15C Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

2.1.2. Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

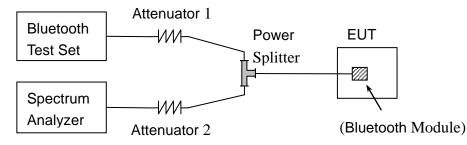
2.2. Number of Hopping Frequency

2.2.1. Requirement

According to FCC §15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

2.2.2. Test Description

A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.





B. Equipments List:

Please reference ANNEX A(1.5).

2.2.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = the frequency band of operation RBW \geq 1% of the span VBW \geq RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize

2.2.4. Test Result

The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency.

Test Mode	Frequency Block (MHz)	Measured Channel Numbers	Min. Limit	Verdict
GFSK	2400 - 2483.5	79	15	PASS
π/4-DQPSK	2400 - 2483.5	79	15	PASS
8-DPSK	2400 - 2483.5	79	15	PASS

A. Test Verdict:





B. Test Plots:

/arker 1	PNO: Fast IFGain:Low Atten: 30		TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	Marker
Ref Offset 2 dB 0 dB/div Ref 15.00 dBm	I Gaine ow Antonio		78.991 0 MHz 0.225 dB	Select Marker
		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u>142</u>	Norma
15.0				Delta
25.0				Fixed
45.0				Of
55.0				Properties
750 Start 2.40000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sween 1	Stop 2.48350 GHz 000 ms (1001 pts)	More 1 of 2

(GFSK)



 $(\pi/4-DQPSK)$ 



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XI 1 Marker 1	RF 50 Ω DC 1 Δ 79.15800000	0 MHz	SENSE(INT	ALIGN AUTO/NO RF	01:48:23 AM Apr 10, 2018 TRACE 1 2 3 4 5 6	Marker
interneor		PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Hold:>100/100	DET PNNNN	Select Marker
10 dB/div Log	Ref Offset 2 dB Ref 15.00 dBm			ΔMkr1	79.158 0 MHz 0.456 dB	1
500	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				142	Norma
-5.00	******		*****	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	wwww	
-15.0						Delta
-25.0						Fixed
-35,0						
-45.0						01
-55.0						-
-65.0						Properties
-75,0						Mor
Start 2.4 #Res BM	0000 GHz / 1.0 MHz	#VBW	3.0 MHz	Sweep 1.00	op 2.48350 GHz 00 ms (1001 pts)	1 of:
MSG				STATUS		

(8- DPSK)





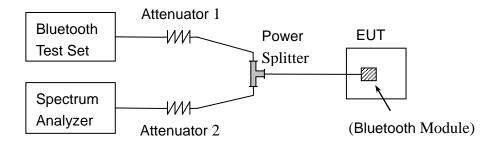
### 2.3. Peak Output Power

#### 2.3.1. Requirement

According to FCC §15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

#### 2.3.2. Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please refer ANNEX A(1.5).

#### 2.3.3. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the module. The lowest, middle and highest channel were tested by USB Wideband Power Sensor.





#### 2.3.3.1 GFSK Mode

#### A. Test Verdict:

Channel	Frequency	Measured Output Peak Power Limit		Limit		Verdict
Channel	(MHz)	dBm	W	dBm	W	verdict
0	2402	3.90	0.00245			PASS
39	2441	3.46	0.00222	20.97	0.125	PASS
78	2480	3.67	0.00233			PASS

#### B. Test Plots:



(GFSK, Channel 0, 2402MHz)



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SENSE:INT	ALIGN AUTO/NO RF 01:03:32 AM Apr 10, 2018	
CHZ PNO: Fast C IFGain:Low Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100 DET PNNNNN	Peak Search
	Mkr1 2.440 826 GHz 3.457 dBm	Next Pea
<u></u> 1		Next Pk Righ
		Next Pk Le
		Marker Deli
		Mkr→C
		Mkr→RefL
#VBW 3.0 MHz	Span 3.000 MHz Sweep 1.000 ms (1001 pts)	Mor 1 of
	GHZ PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB 1 1 1 1 1 1 1 1 1 1 1 1 1	GHz PN0: Fast If Gain:Low     Trig: Free Run Atten: 30 dB     Avg Type: Log-Pwr Arg Hold:>100/100     TRACE 12.8 46 WHY TYPE TYPE TYPE TYPE TYPE TYPE TYPE TYPE

#### (GFSK, Channel 39, 2441MHz)



#### (GFSK, Channel 78, 2480MHz)

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#### 2.3.3.2 π/4-DQPSK Mode

#### A. Test Verdict:

Channel		Measured Output Peak Power		Limit		Verdict	
Channel	(MHz)	dBm	W	dBm	W	verdici	
0	2402	2.69	0.00186			PASS	
39	2441	2.55	0.00180	20.97	0.125	PASS	
78	2480	2.70	0.00186			PASS	

#### B. Test Plots:

Agilent Spectrum Analyzer - Swept SA     L RF 50 Q DC     Marker 1 2.402135000000	GHz PNO: Fast IFGain:Low	Augn Auton Auto/NO RF  01:04:28 AM Apr 10, 2018 Avg Type: Log-Pwr TRACE 0 2:4.5 S Avg Hold:>100/100 TYPE MWAAWA Der P NN NN	Peak Search
Ref Offset 2 dB 0 dB/div Ref 17.00 dBm		Mkr1 2.402 135 GHz 2.686 dBm	Next Pea
7,00	<u> </u>		Next Pk Rigi
3.00			Next Pk Le
33.0			Marker Del
43.0			Mkr→C
53,0			Mkr→RefL
Res BW 1.0 MHz	#VBW 3.0 MHz	Span 3.000 MHz Sweep 1.000 ms (1001 pts)	Moi 1 of
#Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 1.000 ms (1001 pts)	

(π/4-DQPSK, Channel 0, 2402MHz)



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Agilent Spectrum Analyzer - Swept SA  K L R F 50 Ω DC	SENSE:INT	ALIGN AUTO/NO RF 01:04:49 AM Apr 10, 2018	
Marker 1 2.441135000000		Avg Type: Log-Pwr TRACE 12345 Avg Hold:>100/100 TYPE MWWW DET P NNNN	Peak Search
Ref Offset 2 dB		Mkr1 2.441 135 GH 2.551 dBn	NextPea
7.00	<b>↓</b> 1		Next Pk Righ
13.0			Next Pk Le
23 0			Marker Del
43.0			Mkr→C
73.0			Mkr→RefL
/30 Center 2.441000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Span 3.000 MH Sweep 1.000 ms (1001 pts	Mor 1 of
SG		STATUS	-

(π/4-DQPSK, Channel 39, 2441MHz)



(π/4-DQPSK, Channel 78, 2480MHz)

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#### 2.3.3.3 8-DPSK Mode

#### A. Test Verdict:

Channel	Frequency	Measured Output Peak Power		Limit		Verdict	
Channel	(MHz)	dBm	W	dBm	W	verdici	
0	2402	2.84	0.00192			PASS	
39	2441	2.53	0.00179	20.97	0.125	PASS	
78	2480	2.96	0.00198			PASS	

#### B. Test Plots:

t	um Analyzer - Swept SA RF 50 Ω DC		SENSE:INT		01:05:39 AM Apr 10, 2018	Peak Search
larker 1 2	2.40199400000	PNO: Fast C IFGain:Low	Trig: Free Run Atten: 30 dB	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET PNNNNN	Peak Search
	Ref Offset 2 dB Ref 17.00 dBm			Mkr1 2	2.401 994 GHz 2.842 dBm	Next Pea
7,00			1			Next Pk Rig
3,00						Next Pk Le
3.0						Marker De
3.0						Mkr→C
3.0						Mkr→RefL
	02000 GHz				Span 3.000 MHz	<b>Mo</b> 1 of
Res BW 1	.0 MHZ	#VB	N 3.0 MHz	Sweep 1.	100 ms (1001 pts)	

(8-DPSK, Channel 0, 2402MHz)



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Agnent Spe	ctrum Analyzer - Swept SA RF 50 Ω DC		SENSE:INT	ALIGN AUTO/NO RE	01:06:00 AM Apr 10, 2018	
	2.44097900000	PNO: Fast	10.00	Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Peak Search
I0 dB/div	Ref Offset 2 dB Ref 17.00 dBm			Mkr1 :	2.440 979 GHz 2.533 dBm	Next Pea
7.00			<u>1</u>			Next Pk Rigi
-3,00	And the second					Next Pk Le
23.0						Marker Del
43.0						Mkr→C
63.0						Mkr→RefL
	441000 GHz 1.0 MHz	#VBV	V 3.0 MHz	Sweep 1.	Span 3.000 MHz	Mor 1 of
Center 2. #Res BW		#VBV	V 3.0 MHz	Sweep 1.	Span 3.000 MHz 000 ms (1001 pts)	

#### (8-DPSK, Channel 39, 2441MHz)



#### (8-DPSK, Channel 78, 2480MHz)

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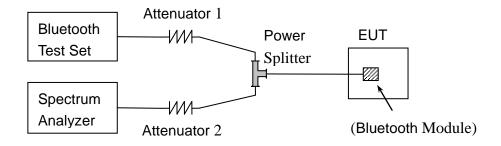


#### 2.4.1. Definition

According to FCC \$15.247(a)(1), the 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth (10*log1% = 20dB) taking the total RF output power.

#### 2.4.2. Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

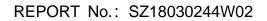
#### B. Equipments List:

Please refer ANNEX A(1.5).

#### 2.4.3. Test Procedure

Use the following spectrum analyzer settings: Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  $RBW \ge 1\%$  of the 20 dB bandwidth  $VBW \ge RBW$ Sweep = auto Detector function = peak Trace = max hold







#### 2.4.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

#### 2.4.4.1 GFSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.036	PASS
39	2441	1.035	PASS
78	2480	1.033	PASS

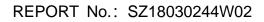
#### B. Test Plots:



(GFSK, Channel 0, 2402MHz)

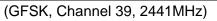


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#### (GFSK, Channel 78, 2480MHz)



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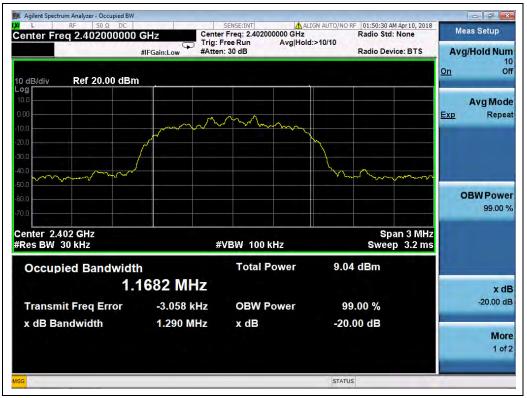


#### 2.4.4.2 π/4-DQPSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.290	PASS
39	2441	1.310	PASS
78	2480	1.309	PASS

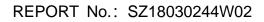
#### B. Test Plots:



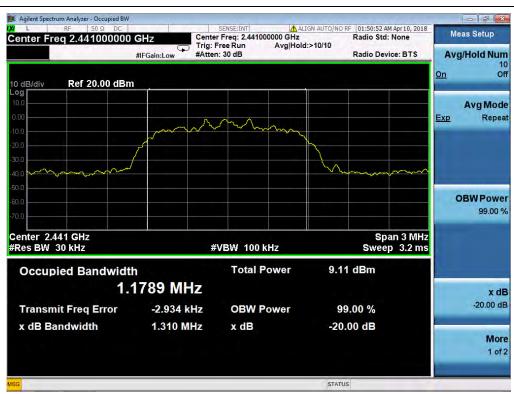
(π/4-DQPSK, Channel 0, 2402MHz)

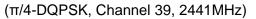


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(π/4-DQPSK, Channel 78, 2480MHz)



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#### 2.4.4.3 8-DPSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.290	PASS
39	2441	1.294	PASS
78	2480	1.291	PASS

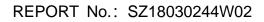
#### B. Test Plots:



(8-DPSK, Channel 0, 2402MHz)

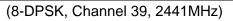


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#### (8-DPSK, Channel 78, 2480MHz)



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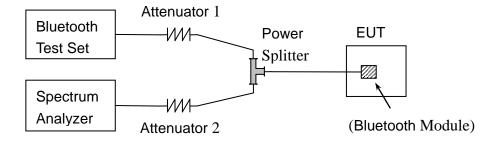
### 2.5. Carried Frequency Separation

#### 2.5.1. Definition

According to FCC §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

#### 2.5.2. Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please refer ANNEX A(1.5).

#### 2.5.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span

Video (or Average) Bandwidth (VBW)  $\geq$  RBW

Sweep = auto

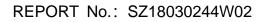
Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.



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#### 2.5.4. Test Result

The Bluetooth Module operates at hopping-on test mode. For any adjacent channels (e.g. the channel 39 and 40 as showed below), the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel (refer to section 2.4.4), whichever is greater. So, the verdict is PASSING.

Test Mode	Measured	ured Carried Frequency			
	Channel		bandwidth	Min. Limit	Verdict
	Numbers	Separation	(MHz)		
GFSK	39 and 40	1.155	1.033	two thirds of the	PASS
π/4-DQPSK	39 and 40	1.002	1.290	two-thirds of the 20dB bandwidth	PASS
8-DPSK	39 and 40	1.170	1.290		PASS



(GFSK)



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L RF 50Ω DC larker 1 Δ 1.002000000 MI		Avg Type: Log-Pwr TRACE 12 3 4 5	Marker
	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB	Avg Hold:>100/100 TYPE MWWWW DET P N N N N	Select Marker
Ref Offset 2 dB 0 dB/div Ref 15.00 dBm		ΔMkr1 1.002 MHz -0.006 dE	1
5.00	X2mmm	1 <u>Δ2</u>	Norma
15.0			Delta
36.0			Fixed
16.0			O
75.0			Properties
Center 2.441000 GHz Res BW 300 kHz	#VBW 1.0 MHz	Span 3.000 MHz Sweep 1.000 ms (1001 pts	Mon 1 of

(π/4-DQPSK)



(8-DPSK)



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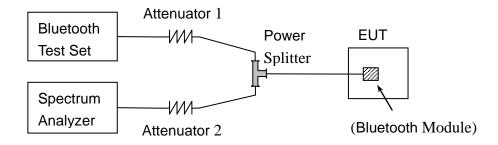
### 2.6. Time of Occupancy (Dwell time)

#### 2.6.1. Requirement

According to FCC §15.247(a) (1) (iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

#### 2.6.2. Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please refer ANNEX A(1.5).

#### 2.6.3. Test Procedure

Normal Mode:

DH1: Dwell time equal to Pulse time (ms) (1600 / 2 / 79) 31.6 Millisecond DH3: Dwell time equal to Pulse time (ms) (1600 / 4 / 79) 31.6 Millisecond DH5: Dwell time equal to Pulse Time (ms) (1600 / 6 / 79) 31.6 Millisecond



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#### AFH Mode:

DH1: Dwell time equal to Pulse time (ms) (800 / 2 / 20)(0.4 + 20) Millisecond DH3: Dwell time equal to Pulse time (ms) (800 / 4 / 20)(0.4 + 20) Millisecond DH5: Dwell time equal to Pulse Time (ms) (800 / 6 / 20)(0.4 + 20) Millisecond

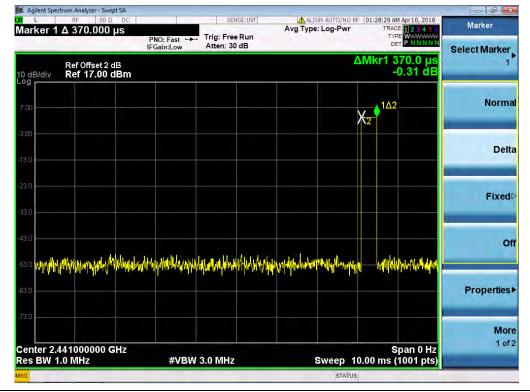
#### 2.6.4. Test Result

#### 2.4.4.4 GFSK Mode

#### A. Test Verdict:

DH	DH Pulse Width		ne (ms)	Limit (sec)	Verdict
Packet	(ms)	Normal Mode	AFH Mode		vertici
DH1	0.37	118.40	59.20		PASS
DH3	1.62	259.20	129.60	0.4	PASS
DH5	2.88	307.20	153.62		PASS

#### B. Test Plots:



#### (DH1, GFSK)

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 Tel:
 86-755-36698555
 Fax:
 86-755 

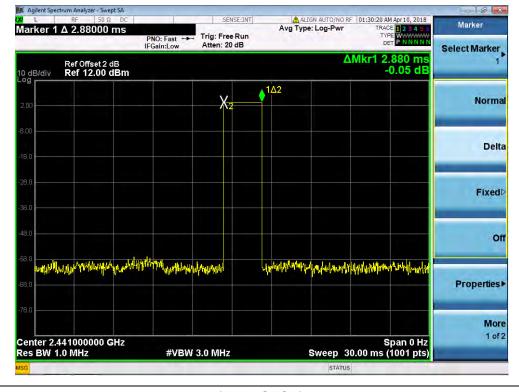
 Http://www.morlab.cn
 E-mail:
 servior

Fax: 86-755-36698525 E-mail: service@morlab.cn



l Jarker		50 Ω			SE	NSE:INT		IGN AUTO/NO R e: Log-Pwr		M Apr 10, 2018 CE 1 2 3 4 5 6	Marker
nanker		.02000	PN	NO: Fast 🔸 Gain:Low	Trig: Free Atten: 20				TY D		Select Marker
0 dB/div	Ref Re	f Offset 2 f 12.00	dB dBm					Δ	Mkr1 1	.620 ms 0.07 dB	1
.og	X ₂ -	↓ 1∆2									Norm
8,00											
18.0											Delt
28.0							an al à				Fixed
48:0											
58.0			d been t	+ hay sharrang it	a and of the			and and dates			0
68.0	WY	Lappy	ntrong the strong to	n /	ulphm when	MAN	hinin a	had a start of the		an shark an	Properties
78.0											Mo
enter tes BW		00000 C	SHz	#VBW	√ 3.0 MHz			Sweep 2	9.00 ms	Span 0 Hz (1001 pts)	1 of
SG								STATUS	-		

#### (DH3, GFSK)



(DH5, GFSK)



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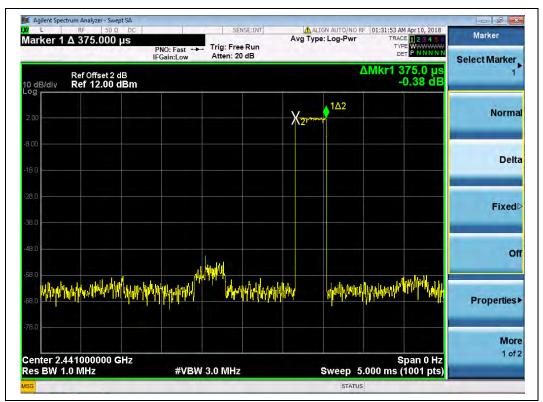


#### 2.4.4.5 π/4-DQPSK Mode

#### A. Test Verdict:

DH	Pulse Width (ms)	Dwell Tin	ne (ms)	Limit (sec)	Verdict
Packet		Normal Mode	AFH Mode		
DH1	0.38	121.60	60.8		PASS
DH3	1.62	259.20	129.6	0.4	PASS
DH5	2.85	304.00	152.02		PASS

#### B. Test Plots:



(DH1,  $\pi/4$ -DQPSK)



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#### (DH3, $\pi/4$ -DQPSK)



(DH5,  $\pi/4$ -DQPSK)



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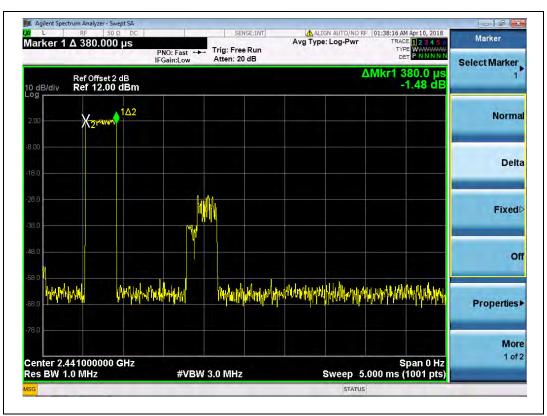


#### 2.4.4.6 8-DPSK mode

#### A. Test Verdict:

DH	Pulse Width (ms)	Dwell Tin	ne (ms)	Limit (sec)	Verdict
Packet		Normal Mode	AFH Mode		
DH1	0.38	121.60	60.8		PASS
DH3	1.62	259.20	129.6	0.4	PASS
DH5	2.85	304.00	152.02		PASS

#### B. Test Plots:

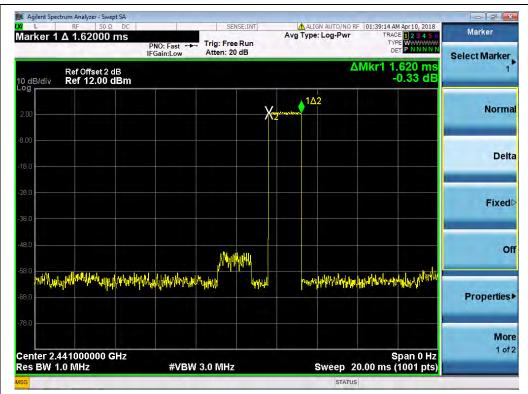


(DH1, 8-DPSK)

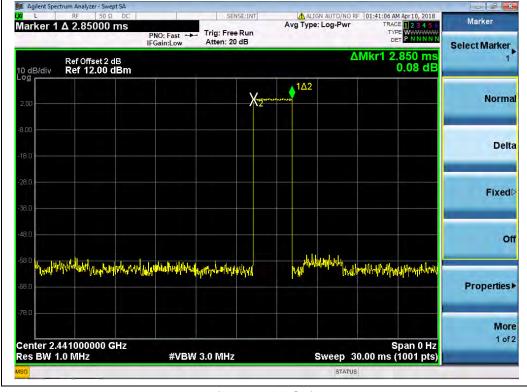


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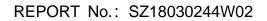
#### (DH3, 8-DPSK)



(DH5, 8-DPSK)



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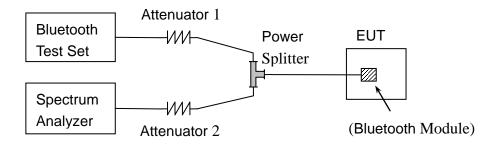
### 2.7. Conducted Spurious Emissions

#### 2.7.1. Requirement

According to FCC §15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### 2.7.2. Test Description

#### A. Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

#### B. Equipments List:

Please refer ANNEX A(1.5).

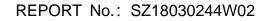
#### 2.7.3. Test Procedure

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 Allow the trace to stabilize.

#### 2.7.4. Test Result

The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

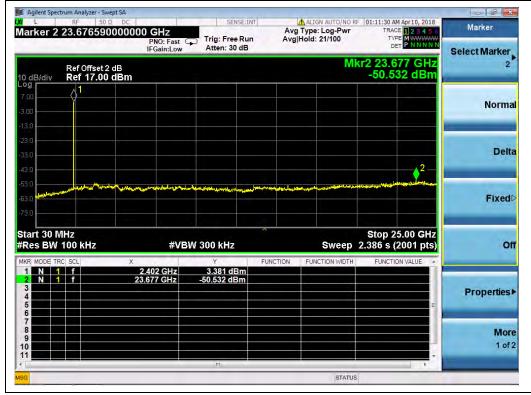
#### 2.5.4.1 GFSK Mode

#### A. Test Verdict:

Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Limit			
			Carrier Level	Calculated	Verdict	
				-20dBc Limit		
0	2402	-50.53	3.38	-16.62	PASS	
39	2441	-50.57	2.44	-17.56	PASS	
78	2480	-51.07	2.88	-17.12	PASS	

#### B. Test Plots:

Note: The power of the Module transmitting frequency should be ignored.

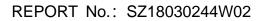


(Channel = 0, 30MHz to 25GHz, GFSK Mode)

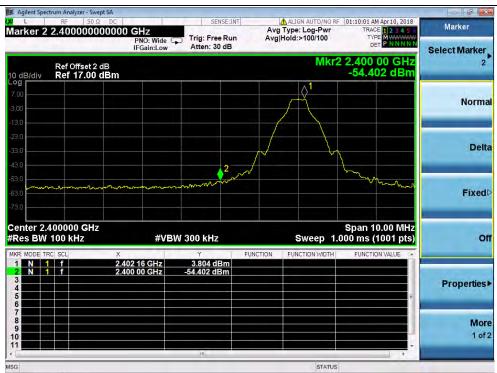


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(Channel = 0, Band edge,GFSK Mode)



(Channel = 0, Band edge with hopping on, GFSK Mode)

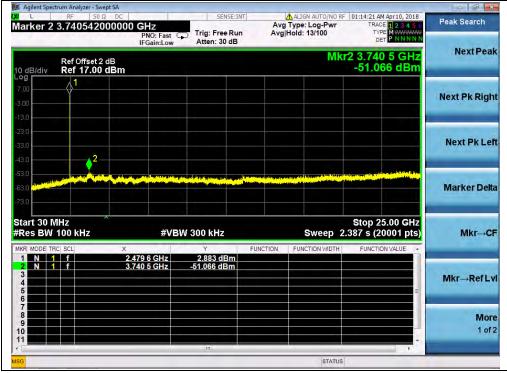


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Peak Search	01:12:59 AM Apr 10, 2018			SENSE:IN		Ω DC		R	L
Peak Search	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET PNNNNN	Type: Log-Pwr Hold: 16/100		Trig: Free Run Atten: 30 dB	GHZ PNO: Fast C Gain:Low		038655	r 2 24.	ker
Next Peak	2 24.039 GHz -50.568 dBm	M					f Offset 2 f 17.00		3/di
Next Pk Right							1	(	
Next Pk Left	2								
Marker Delta	Law alam Master and Long Marker (No.	and a second	laanna ka inminini	Ayarmay, and possible and a second	- Migranda Marine	hora and the second second	and the state	معطيرم المامعل	
Mkr→CF	Stop 25.00 GHz 2.386 s (2001 pts)	Sweep		N 300 kHz	#VB		kHz	0 MHz W 100	
	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	Ƴ 2.442 dBm -50.568 dBm	40 GHz 39 GHz			E TRC SC	MODI N N
Mkr→RefLvi	=								
More 1 of 2									
	*			III					

(Channel = 39, 30MHz to 25GHz, GFSK Mode)

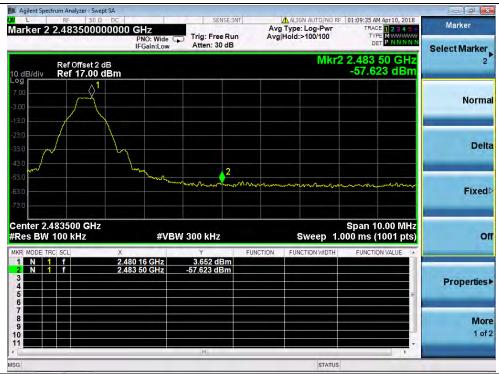


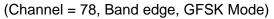
#### (Channel = 78, 30MHz to 25GHz, GFSK Mode)

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(Channel = 78, Band edge with hopping on, GFSK Mode)

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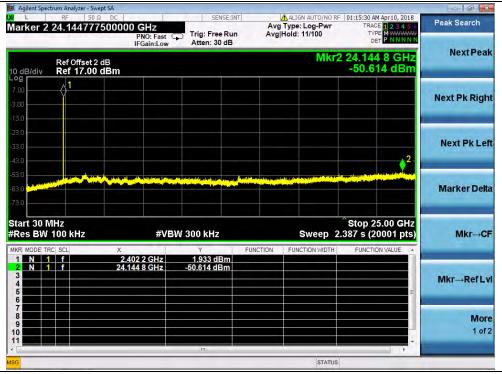
## 2.5.4.2 π/4-DQPSK Mode

#### A. Test Verdict:

	Fraguanay	Measured Max. Out of Band	Limit	(dBm)	
Channel	Frequency (MHz)	Emission (dBm)	Carrier	Calculated	Verdict
	(IVITZ)		Level	-20dBc Limit	
0	2402	-50.61	1.93	-18.07	PASS
39	2441	-52.15	-1.51	-21.51	PASS
78	2480	-51.04	-2.99	-22.99	PASS

#### B. Test Plots:

Note: the power of the Module transmitting frequency should be ignored.



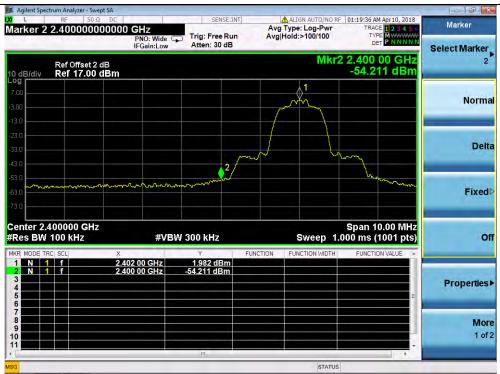
(Channel = 0, 30MHz to 25GHz,  $\pi/4$ -DQPSK)



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(Channel = 0, Band edge,  $\pi/4$ -DQPSK)



(Channel = 0, Band edge with hopping on,  $\pi/4$ -DQPSK)

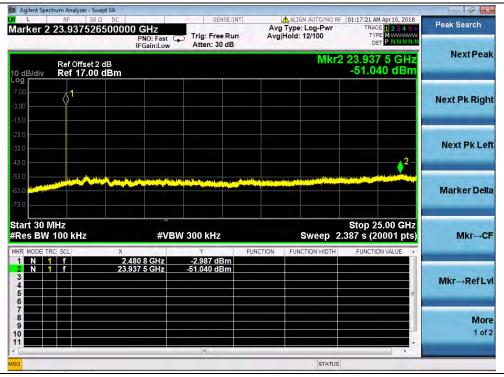
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Agilent Spect	trum Analyzer - Swept SA RF 50 Ω D		SENSE(IN	т	ALIGN ALITO/NO RE	01:16:30 AM Apr 10, 2018	- 5 💌
rker 2	3.785488000		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	Avc	Type: Log-Pwr Hold: 15/100	TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P N N N N N	Peak Search
dB/div	Ref Offset 2 dB Ref 17.00 dB	m			Mkı	2 3.785 5 GHz -52.152 dBm	Next Peak
g 10 10	¹						Next Pk Righ
0 0 0 0							Next Pk Lei
	•		and and included game and anter an applying the second s	notification and a second			Marker Delt
	100 kHz		W 300 kHz	~		Stop 25.00 GHz 387 s (20001 pts)	Mkr→C
N 1	f	X 2.440 9 GHz 3.785 5 GHz	Y -1.513 dBm -52.152 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLv
							Mon 1 of
			m		STATUS		

(Channel = 39, 30MHz to 25GHz,  $\pi/4$ -DQPSK)



(Channel = 78, 30MHz to 25GHz,  $\pi/4$ -DQPSK)





L RF 50 Ω DC		SENSE:IN			01:19:11 AM Apr 10, 2018	Marker
rker 2 2.48350000000	0 GHz PNO: Wide O IFGain:Low	Trig: Free Run Atten: 30 dB		Type: Log-Pwr Hold:>100/100	TRACE 1 2 3 4 5 TYPE MWWWW DET P N N N N	At N
Ref Offset 2 dB IB/div Ref 17.00 dBm	IFGalliteow	Atten of dB		Mkr2	2.483 50 GHz -57.206 dBn	
						Norma
	~~~					Delta
		~2 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	w.J.w.J.b.was.Pa	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Montanto	Fixed
nter 2.483500 GHz es BW 100 kHz	#VB	W 300 kHz		Sweep 1.0	Span 10.00 MH 000 ms (1001 pts	Of
MODE TRC SCL X	479 84 GHz	Y 2.125 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	
N 1 f 2.4	483 50 GHz	-57.206 dBm				Properties
						More 1 of 2

(Channel = 78, Band edge, $\pi/4$ -DQPSK)



(Channel = 78, Band edge with hopping on, $\pi/4$ -DQPSK)





2.5.4.3 8-DPSK Mode

A. Test Verdict:

	Fraguanay	Managurad Max, Out of Pand	Limi	t (dBm)	
Channel	Frequency (MHz)	Measured Max. Out of Band Emission (dBm)	Carrier	Calculated	Verdict
	(IVITZ)	Emission (dBm)	Level	-20dBc Limit	
0	2402	-52.17	-1.50	-21.50	PASS
39	2441	-50.75	-1.14	-21.14	PASS
78	2480	-50.87	-1.79	-21.79	PASS

B. Test Plots:

Note: the power of the Module transmitting frequency should be ignored.



(Channel = 0, 30MHz to 25GH, 8-DPSK)



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(Channel = 0, Band edge, 8-DPSK)



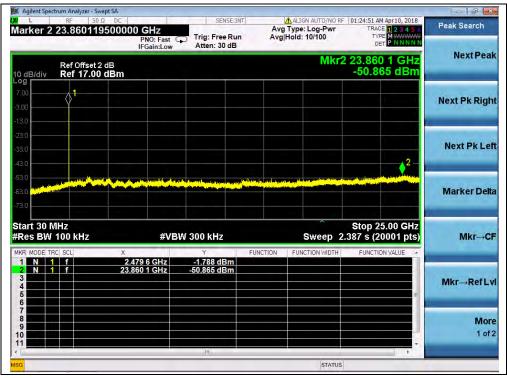
(Channel = 0, Band edge with hopping on, 8-DPSK)

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Agilent Spectrum Analyzer - Swe L RF 50 Ω	DC DC	SENSE:IN	T		01:24:05 AM Apr 10, 2018	
arker 2 24.044897		2	Avg	Type: Log-Pwr Hold: 18/100	TRACE 1 2 3 4 5 6 TYPE M WWWW DET P N N N N N	Peak Search
Ref Offset 2 dB/div Ref 17.00				Mkr2	24.044 9 GHz -50.750 dBm	Next Peal
						Next Pk Righ
0					2	Next Pk Le
						Marker Delt
art 30 MHz tes BW 100 kHz	#VB	W 300 kHz	FUNCTION	Sweep 2	Stop 25.00 GHz 387 s (20001 pts)	Mkr→C
N 1 f N 1 f	2.440 9 GHz 24.044 9 GHz	-1.136 dBm -50.750 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Mkr→RefLv
						Mor 1 of
		m	_	STATUS	1.10	

(Channel = 39, 30MHz to 25GHz, 8-DPSK)



(Channel = 78, 30MHz to 25GH, 8-DPSK)





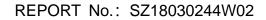
- 5	01:20:41 AM Apr 10, 2018		T	SENSE(IN	Swept SA	rtrum Analyzer -	Agilent Spec
Marker	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Type: Log-Pwr Hold:>100/100	Av		0000000 GHz PNO: Wide		rker 2
Select Marker 2	2.483 50 GHz -57.784 dBm	Mkr2		Atten: 30 db		Ref Offse Ref 17.0	dB/dív
Norm					\1	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	9 20
Del					h		
Fixed	Minthe Manager	mannana	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2			0 ; 0
c	Span 10.00 MHz 000 ms (1001 pts)	Sweep 1.0		W 300 kHz		483500 G 100 kHz	es BW
Properties	FUNCTION VALUE	FUNCTION WIDTH	FUNCTION	Y 2.567 dBm -57.784 dBm	X 2.480 16 GHz 2.483 50 GHz	RC SCL	N 1 N 1
Mo 1 o	-						
		STATUS		m			

(Channel = 78, Band edge, 8-DPSK)



(Channel = 78, Band edge with hopping on, 8-DPSK)







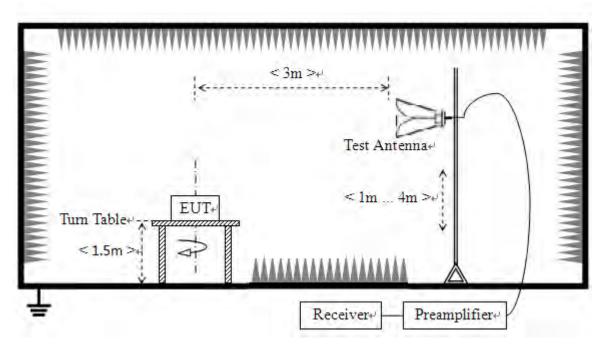
2.8. Restricted Frequency Bands

2.8.1. Requirement

According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

2.8.2. Test Description

A. Test Setup:



The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under non hopping-on test mode transmitting 339 bytes DH5, 679 bytes 2DH5 and 1021 bytes 3DH5 packages at maximum power. For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.



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B. Equipments List:

Please refer ANNEX A(1.5).

2.8.3. Test Procedure

Span = wide enough to fully capture the emission being measured RBW = 1 MHz for $f \ge 1$ GHz, 100 KHz for f < 1GHz VBW = 3 MHz for peak and 10Hz for average Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize.

2.8.4. Test Result

The lowest and highest channels are tested to verify Restricted Frequency Bands.

The measurement results are obtained as below:

 $E [dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; AT = L_{Cable loss} [dB] - G_{preamp} [dB]$

AT: Total correction Factor except Antenna

UR: Receiver Reading

Gpreamp: Preamplifier Gain

AFactor: Antenna Factor at 3m

Note: Restricted Frequency Bands were performed when antenna was at vertical and horizontal polarity, and only the worse test condition (vertical) was recorded in this test report.

2.6.4.1 GFSK Mode

A. Test Verdict:

Channel	Frequency (MHz)	Detector PK/ AV	Receiver Reading U _R	A _T (dB)	A _{Factor} (dB@3m)	Max. Emission E	Limit (dBµV/m)	Verdict
		FN/AV	(dBuV)			(dBµV/m)		
0	2386.53	PK	44.91	-33.63	32.56	43.84	74	Pass
0	2387.05	AV	32.84	-33.63	32.56	31.77	54	Pass
78	2488.60	PK	46.96	-33.18	32.50	46.28	74	Pass
78	2483.79	AV	33.10	-33.18	32.50	32.42	54	Pass



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Tel: 86-755-36698555

Fax: 86-755-36698525

Http://www.morlab.cn

E-mail: service@morlab.cn



B. Test Plots:

Keysight Spectrum Analyzer - Swept SA 07:46:57 PM Mar 14, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P N N N N DI Trace/Detector Marker 1 2.386528000000 GHz Avg Type: Voltage Avg|Hold:>100/100 TYPE Trig: Free Run Atten: 6 dB PNO: Fast Select Trace Mkr1 2.386 528 GH 44.912 dBµ\ 10 dB/div Log Ref 100.00 dBµV Detector Peak Man Auto Preset ¹
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 ² Detectors **Clear Trace** Stop 2.40400 GHz 1.000 ms (1001 pts) Start 2.30000 GHz Res BW (CISPR) 1 MHz #VBW 3.0 MHz Sweep **Clear All Traces** FUNCTION FUNCTION WIDTH /ALLIE N 1 f N 1 f 2.386 528 GHz 2.390 000 GHz 44.912 dBµV 44.051 dBµV Preset **All Traces** More 2 of 3

(Channel = 0, PEAK, GFSK)



(Channel = 0, AVERAGE, GFSK)



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Marker	M Mar 14, 2018		ALIGN AUTO		SENSE:IN		DC	Analyzer - Swej SEL 50 Ω	RF PRE	P
	DE 123456 PE MWWWW ET P P N N N N		Hold:>100/100		Trig: Free Run Atten: 6 dB	NO: Fast G Gain:Low	P	3860400	2.48	r 2 2
Select Marker 2	04 GHz 2 dBµV		Mkr2			Cull.EOW		f 100.00	Re	liv
Norm										1
Delt	or for a start of the	1-1-11-12-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	n Parka - Andrew - Labora	marit	2 where the red commendation	-	1	- ha		/
Fixed										
o	0000 GHz 1001 pts)	Stop 2.50 .000 ms (Sweep 1.		3.0 MHz	#VBV	2	GHz R)1MH		
-	ON VALUE	FUNCTION	FUNCTION WIDTH	FUNCTION	Υ 44.151 dBμV		× 2.483 50		SCL	
Properties					46.962 dBµV	4 GHZ	2.488 60			
Mo										

(Channel = 78, PEAK, GFSK)



(Channel = 78, AVERAGE, GFSK)

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2.6.4.2 π/4-DQPSK Mode

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Verdict
	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	, er allet
0	2384.76	PK	45.40	-33.63	32.56	44.33	74	Pass
0	2384.45	AV	32.84	-33.63	32.56	31.77	54	Pass
78	2491.31	PK	46.90	-33.18	32.50	46.22	74	Pass
78	2384.65	AV	33.10	-33.18	32.50	32.42	54	Pass

B. Test Plots:

RL	RF PRESE	L 50 Ω D	0	SENSE:INT	ALIGN AUTO		
arker	1 2.384	7600000	PNO: Fast	Trig: Free Run	Avg Type: Voltage Avg Hold:>100/100		₩.
_	_		IFGain:Low	Atten: 6 dB	Mice	1 2.384 760 GH	Select Marker
) dB/div	Ref	100.00 dE	βµV		WIN	45.395 dBµ\	, '
0.0							Norma
0.0							
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0.0	and in the second		wall the wall from the second	hand the surgery production and from			Delt
0.0							14
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0.0							Fixed
							1
	30000 G (CISPR	HZ)1MHZ	#VB	W 3.0 MHz	Sweep	Stop 2.40400 GH 1.000 ms (1001 pts	
KR MODE			X	Ŷ	FUNCTION FUNCTION WIDT	FH FUNCTION VALUE	
1 N 2 N	1 f 1 f		.384 760 GHz .390 000 GHz	45.395 dBµV 44.005 dBµV			
3							Properties
6							
8							Mor
9							1 of
1							+

(Channel = 0, PEAK, π /4-DQPSK)





Marker	Mar 14, 2018	07:52:55 PM	ALIGN AUTO		SENSE(IN	011		RF PRESEL	RL
	I 2 3 4 5 6 MWWWWW P P N N N N	TYPE	Hold:>100/100		Trig: Free Run Atten: 6 dB	PNO: Fast G	8000000	1 2.38444	rker 1
Select Marke	8 GHz dBµV	2.384 44 32.838	Mkr1			- Galileon	0.00 dBµV	Ref 10	dB/div
Norn	A								9 .0 .0
De		2							.0 .0 .0 .0 .0
Fixe		• · • •							0 0 0
		Stop 2.40 11.93 s (1			10 Hz	#VB\		30000 GHz (CISPR) 1	
_	VALUE	FUNCTION	FUNCTION WIDTH	FUNCTION	Y 32.838 dBµV 32.843 dBµV	448 GHz		TRC SCL	NODE T
Propertie	=				32.843 GBUV	1000 GHZ	2.390		
M c 1 c									

(Channel = 0, AVERAGE, $\pi/4$ -DQPSK)



(Channel = 78, PEAK, π /4-DQPSK)

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Marker	ar 14, 2018	08:05:41 PM	ALIGN AUTO		SENSE:IN			RESEL 50 Ω	
Select Marke		TYPE	lold:>100/100		Trig: Free Run Atten: 6 dB	NO: Fast G Gain:Low	PI	0505400	#I Z Z.4
	Mkr2 2.483 654 GHz 33.103 dBμV 33.103 dBμV								
Norm									
Del							A. 2		
Fixed									
c	00 GHz 01 pts)	Stop 2.50 2.523 s (1	Sweep		10 Hz	#VB\	Ηz) GHz SPR) 1 M	2.47800 BW (CIS
-	VALUE	FUNCTIO	FUNCTION WIDTH	FUNCTION	Υ 33.092 dBμV 33.103 dBμV		× 2.483 50 2.483 65		DE TRC SC
Properties									

(Channel = 78, AVERAGE, $\pi/4$ -DQPSK)

2.6.4.3 8-DPSK Mode

A. Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Verdict
	(MHz)	PK/ AV	U _R (dBuV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Voraiot
0	2377.48	PK	45.65	-33.63	32.56	44.58	74	Pass
0	2384.66	AV	32.87	-33.63	32.56	31.80	54	Pass
78	2489.86	PK	46.76	-33.18	32.50	46.08	74	Pass
78	2483.70	AV	33.09	-33.18	32.50	32.41	54	Pass



B. Test Plots:

Keysight Spectrum Analyzer - Swept SA 07:54:07 PM Mar 14, 2018 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P. P. N.N.N. R SENSE:INT Marker Marker 1 2.377480000000 GHz Avg Type: Voltage Avg|Hold:>100/100 Trig: Free Run Atten: 6 dB PNO: Fast C Select Marker Mkr1 2.377 480 GHz 45.650 dBµV 10 dB/div -og Ref 100.00 dBµV Normal 1 ∂2 Delta **Fixed** Stop 2.40400 GHz Sweep 1.000 ms (1001 pts) Start 2.30000 GHz Res BW (CISPR) 1 MHz #VBW 3.0 MHz Off ELINCTION 2.377 480 GHz 2.390 000 GHz 45.650 dBuV 43.750 dBuV Ν Properties . More 1 of 2

(Channel = 0, PEAK, 8-DPSK)



(Channel = 0, AVERAGE, 8-DPSK)



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Manala and	M Mar 14, 2018		ALIGN AUTO		SENSE:IN		50 Ω DC		
Marker	PE MMWWWW	Avg Type: Voltage TRACE 2 3 4 5 6 Avg Hold:>100/100 TYPE MMWWWW		Trig: Free Run Avg H		PNO: Fast	58000000	2.4898	er 2
Select Marker		DE			Atten: 6 dB	IFGain:Low			_
2	div Ref 100.00 dBμV 46.758 dBμV								/div
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									1
Delt	manapla	mannadoret		2	an and a star of	1	1		/
Fixed									
		Stop 2.50			N 3.0 MHz	#\/B		300 GH CISPR)	
0	0000 GHz		Sweep 1.						
o	1001 pts)	.000 ms (Sweep 1.	FUNCTION	Y J.V IVINZ	* V D			
o		.000 ms (Sweep 1.	FUNCTION	Υ 44.247 dBμV	3 500 GHz	× 2.483		
	1001 pts)	.000 ms (FUNCTION	Y		× 2.483		
O Properties	1001 pts)	.000 ms (FUNCTION	Υ 44.247 dBμV	3 500 GHz	× 2.483		
	1001 pts)	.000 ms (FUNCTION	Υ 44.247 dBμV	3 500 GHz	× 2.483		

(Channel = 78, PEAK, 8-DPSK)



(Channel = 78, AVERAGE, 8-DPSK)

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2.9. Conducted Emission

2.9.1. Requirement

According to RSS-GEN section 8.8, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μ H/50 Ω line impedance stabilization network (LISN).

Frequency range	Conducted Limit (dBµV)			
(MHz)	Quai-peak	Average		
0.15 - 0.50	66 to 56	56 to 46		
0.50 - 5	56	46		
5- 30	60	50		

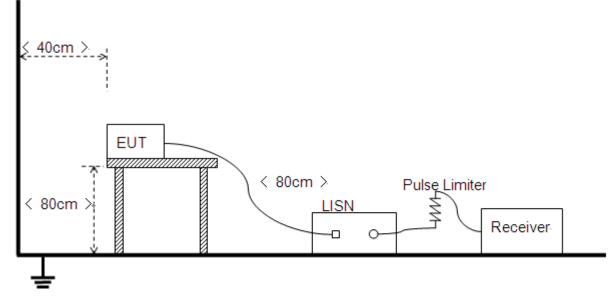
NOTE:

(a) The lower limit shall apply at the band edges.

(b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

2.9.2. Test Description

A. Test Setup:



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2013.

The factors of the site are calibrated to correct the reading. During the measurement, the Bluetooth



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EUT is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

B. Equipments List:

Please reference ANNEX A(1.5).

2.9.3. Test Result

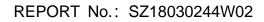
The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

Note: Both of the test voltage AC 120V/60Hz and AC 230V/50Hz were considered and tested respectively, only the results of the worst case AC 120V/60Hz were recorded in this report.

A. Test setup:

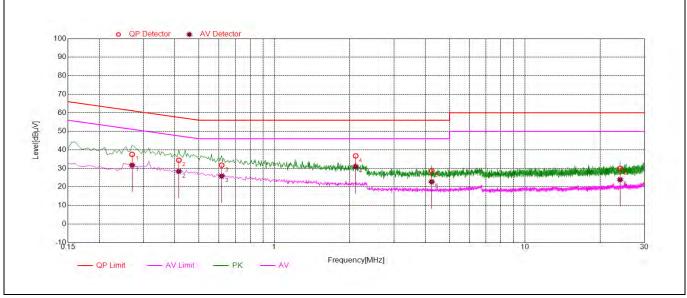
The EUT configuration of the emission tests is $\underline{\text{EUT} + \text{Link.}}$ **Note:** The test voltage is AC 120V/60Hz.







B. Test Plots:

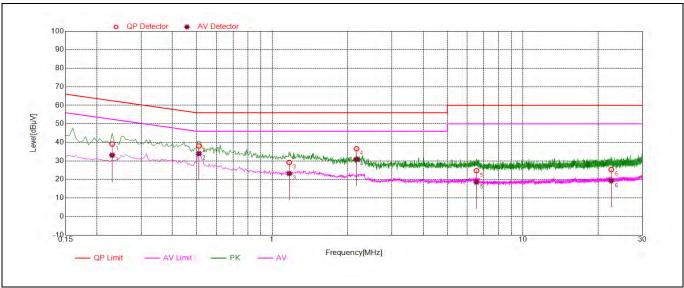


(Plot A: L Phase)

NO.	Fre.	Emission Level (dBµV)		Limit (dBµV)		Verdict	
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.27	37.58	31.72	61.12	51.12		PASS
2	0.41	34.42	28.40	57.55	47.55		PASS
3	0.62	31.75	25.83	56.00	46.00		PASS
4	2.11	36.77	30.95	56.00	46.00	Line	PASS
5	4.24	28.69	22.75	56.00	46.00		PASS
6	24.00	30.05	23.93	60.00	50.00		PASS







(Plot B: N Phase)

NO.	Fre.	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
	(MHz)	Quai-peak	Average	Quai-peak	Average		
1	0.23	39.06	33.11	62.45	52.45		PASS
2	0.51	38.02	33.95	56.00	46.00		PASS
3	1.17	29.19	23.22	56.00	46.00	Noutral	PASS
4	2.17	36.60	30.83	56.00	46.00	Neutral	PASS
5	6.53	24.77	18.58	60.00	50.00	-	PASS
6	22.54	25.35	19.27	60.00	50.00		PASS





2.10. Radiated Emission

2.10.1. Requirement

According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Note:

- For Above 1000MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- For above 1000MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK)

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

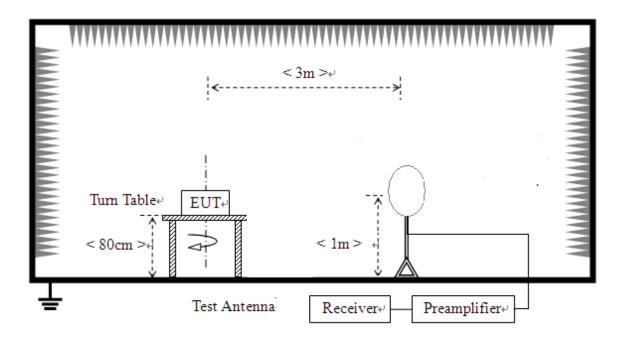




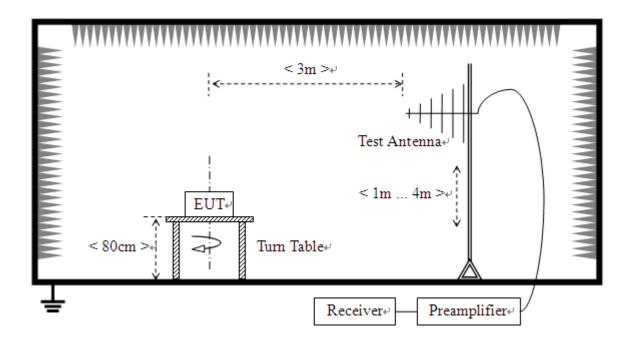
2.10.2. Test Description

A. Test Setup:

1) For radiated emissions from 9kHz to 30MHz



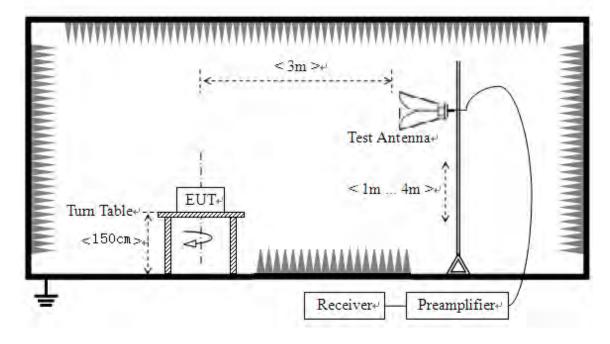
2) For radiated emissions from 30MHz to1GHz





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3) For radiated emissions above 1GHz



The RF absorbing material used on the reference ground plane and on the turntable have a maximum height (thickness) of 30 cm (12 in) and have a minimum-rated attenuation of 20 dB at all frequencies from 1 GHz to 18 GHz.

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2013). For radiated emissions below or equal to 1GHz, the EUT was set-up on insulator 80cm above the Ground Plane, For radiated emissions above 1GHz, The EUT was set-up on insulator 150cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10.

The EUT is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading.

For the Test Antenna:

(a) In the frequency range of 9kHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.

(b) In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Place the test antenna at 3m away from area of the EUT, while keeping the test antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The test antenna may have to be





higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final test antenna elevation shall be that which maximizes the emissions. The test antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. The emission levels at both horizontal and vertical polarizations should be tested.

B. Equipments List:

Please reference ANNEX A(1.5).

2.10.3. Test Procedure

Use the following spectrum analyzer settings: Span = wide enough to fully capture the emission being measured RBW = 1 MHz for $f \ge 1$ GHz, 100 kHz for f < 1 GHz VBW \ge RBW Sweep = auto Detector function = peak Trace = max hold

2.10.4. Test Result

According to ANSI C63.10, because of peak detection will yield amplitudes equal to or greater than amplitudes measured with the quasi-peak (or average) detector, the measurement data from a spectrum analyzer peak detector will represent the worst-case results, if the peak measured value complies with the quasi-peak limit, it is unnecessary to perform an quasi-peak measurement.

The measurement results are obtained as below:

E $[dB\mu V/m] = U_R + A_T + A_{Factor} [dB]; A_T = L_{Cable loss} [dB] - G_{preamp} [dB]$ A_T: Total correction Factor except Antenna U_R: Receiver Reading G_{preamp}: Preamplifier Gain A_{Factor}: Antenna Factor at 3m

During the test, the total correction Factor AT and A_{Factor} were built in test software.

Note1: All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Note2: For the frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

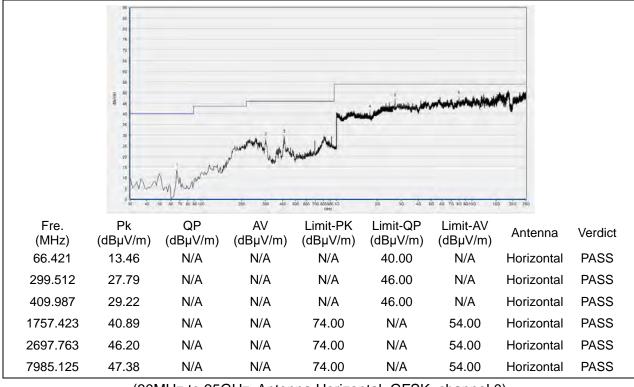
Note3: For the frequency, which started from 25GHz to 40GHz, was pre-scanned and the result which was 10dB lower than the limit was not recorded.



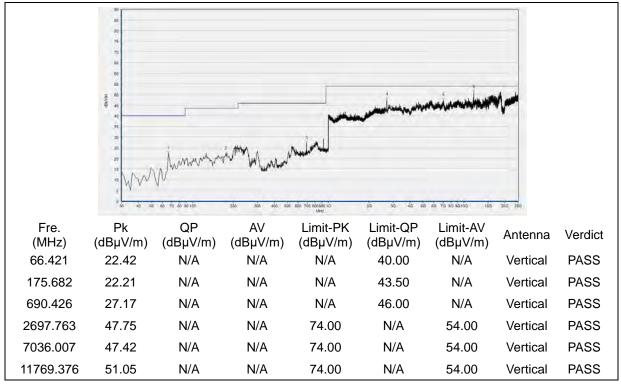


2.8.4.1 GFSK Mode:

Plots for Channel = 0



(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 0)

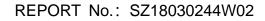


(30MHz to 25GHz, Antenna Vertical, GFSK, channel 0)



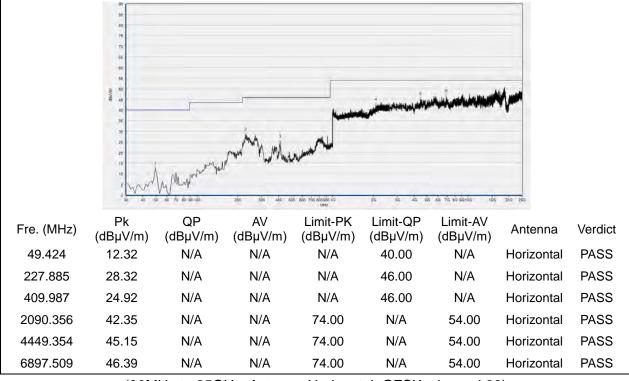
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E-mail: service@morlab.cn

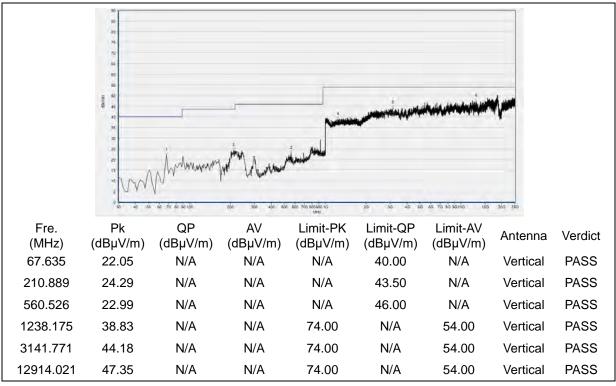




Plot for Channel = 39



(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 39)



(30MHz to 25GHz, Antenna Vertical, GFSK, channel 39)

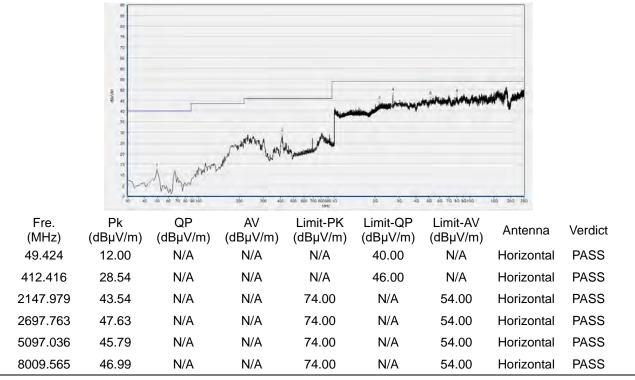
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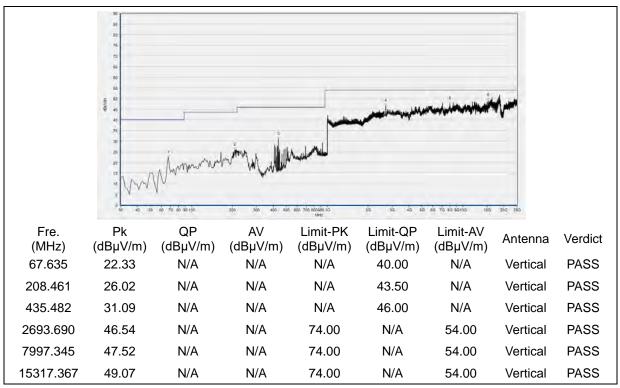
Fax: 86-755-36698525



Plot for Channel = 78



(30MHz to 25GHz, Antenna Horizontal, GFSK, channel 78)



(30MHz to 25GHz, Antenna Vertical, GFSK, channel 78)

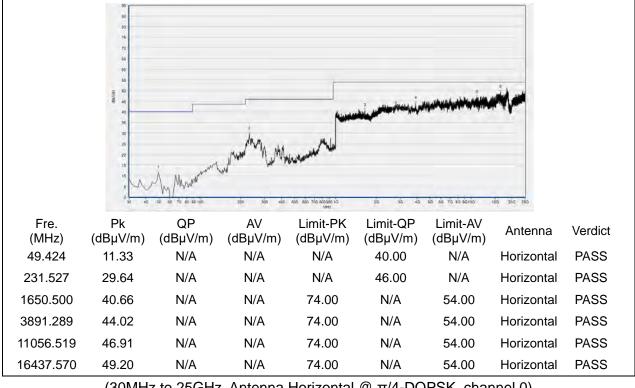


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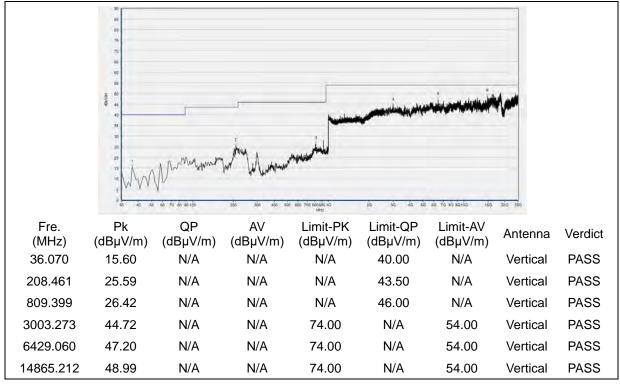


2.8.4.2 π/4-DQPSK Mode:

Plots for Channel = 0



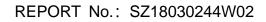
(30MHz to 25GHz, Antenna Horizontal @ π /4-DQPSK, channel 0)



(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 0)

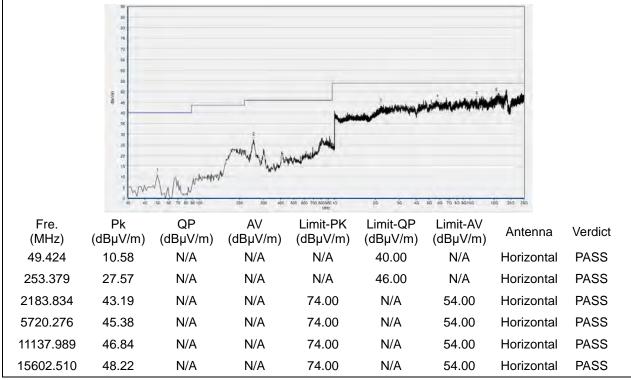


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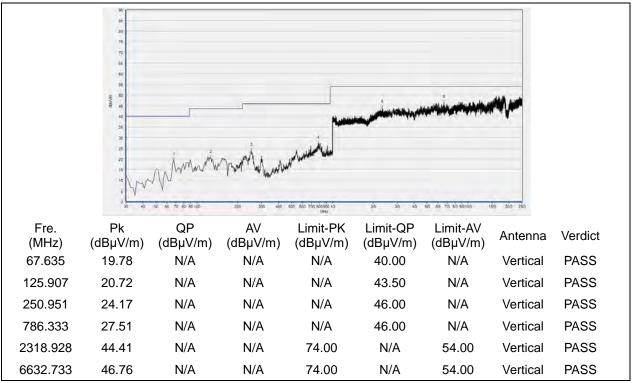




Plot for Channel = 39



(30MHz to 25GHz, Antenna Horizontal @ π/4-DQPSK, channel 39)

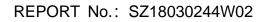


(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 39)



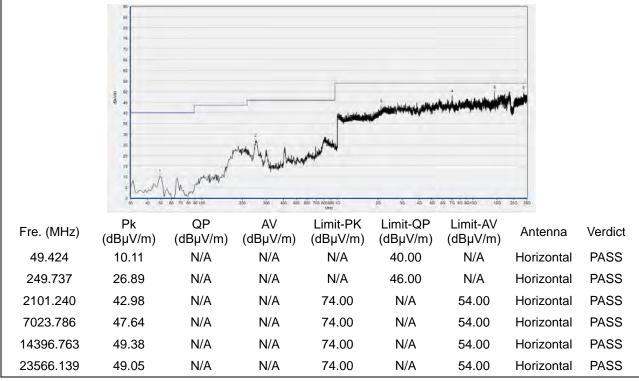
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Fax: 86-755-36698525

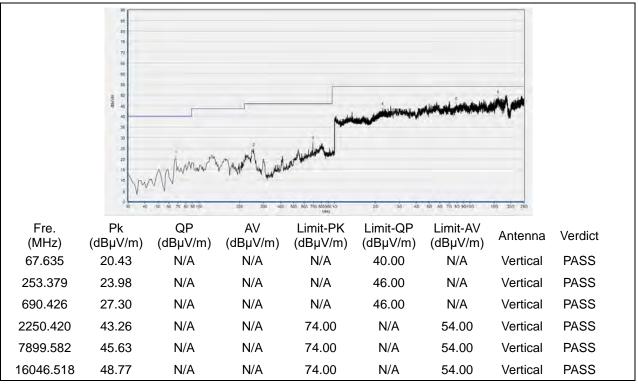




Plot for Channel = 78



(30MHz to 25GHz, Antenna Horizontal @ π /4-DQPSK, channel 78)



(30MHz to 25GHz, Antenna Vertical @ π/4-DQPSK, channel 78)



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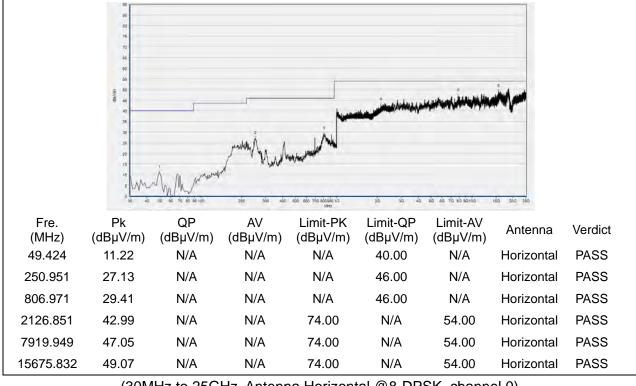
Fax: 86-755-36698525 E-mail: service@morlab.cn

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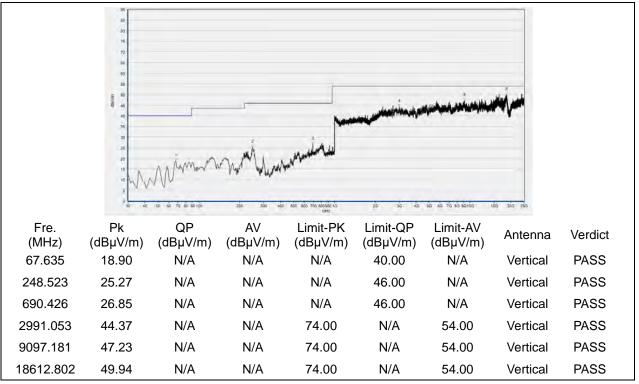


2.8.4.3 8-DPSK Mode:

Plots for Channel = 0



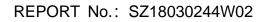
(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 0)



(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 0)

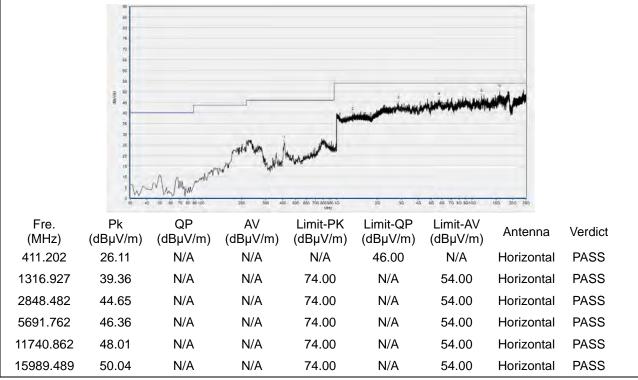
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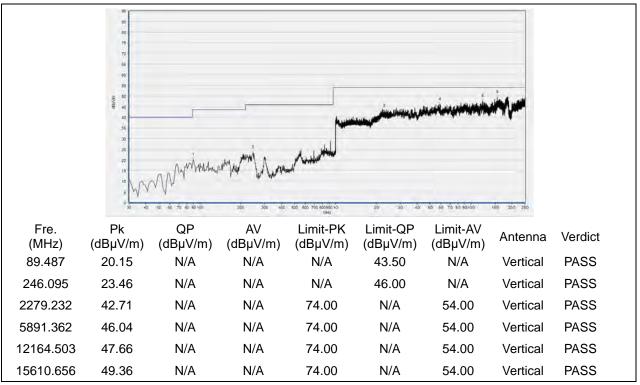




Plot for Channel = 39



(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 39)

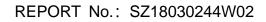


(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 39)



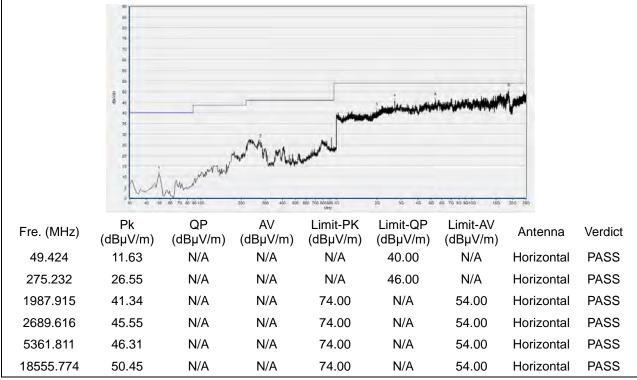
SHENZHEN MORLAB COMMUNICATIONS TECHNOLOGY Co., Ltd. FL1-3, Building A, FeiYang Science Park, No.8 LongChang Road, Block67, BaoAn District, ShenZhen , GuangDong Province, P. R. China Tel: 86-755-36698555 E-mail: service@morlab.cn Http://www.morlab.cn

Fax: 86-755-36698525

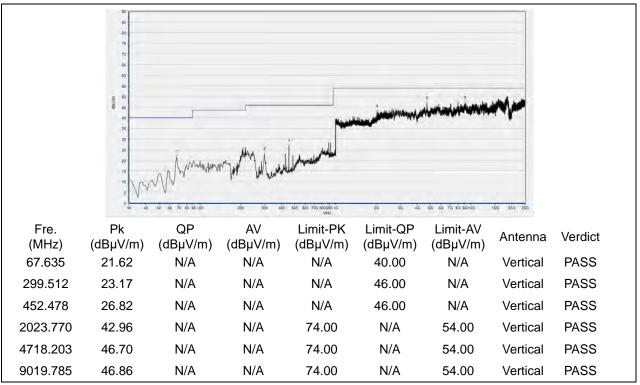




Plot for Channel = 78



(30MHz to 25GHz, Antenna Horizontal @8-DPSK, channel 78)



(30MHz to 25GHz, Antenna Vertical @8-DPSK, channel 78)



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Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Uncertainty
±5%
±2.22dB
±5%
±5%
±5%
±2.77 dB
±5%
±2.95dB
±2.44dB

This uncertainty represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2





Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.					
Department:	Morlab Laboratory					
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang					
	Road, Block 67, BaoAn District, ShenZhen, GuangDong					
	Province, P. R. China					
Responsible Test Lab	Mr. Su Feng					
Manager:						
Telephone:	+86 755 36698555					
Facsimile:	+86 755 36698525					

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Hamor	Morlab Laboratory
	FL.3, Building A, FeiYang Science Park, No.8 LongChang
Address:	Road, Block 67, BaoAn District, ShenZhen, GuangDong
	Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192.





4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Bluetooth Base Station	6K00006210	MT8852B	Anritsu	2018.04.17	2019.04.16
Power Splitter	NW521	1506A	Weinschel	2018.04.17	2019.04.16
Attenuator 1	(N/A.)	10dB	Resnet	2018.04.17	2019.04.16
Attenuator 2	(N/A.)	3dB	Resnet	2018.04.17	2019.04.16
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2017.12.03	2018.12.02
RF cable (30MHz-26GHz)	CB01	RF01	Morlab	N/A	N/A
Coaxial cable	CB02	RF02	Morlab	N/A	N/A
SMA connector	CN01	RF03	HUBER-SUHNER	N/A	N/A

4.2 Conducted Emission Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Receiver	MY56400093	N9038A	KEYSIGHT	2017.07.13	2018.07.12
LISN	812744	NSLK 8127	Schwarzbeck	2018.05.08	2019.05.07
Pulse Limiter (20dB)	9391	VTSD 9561-D	Schwarzbeck	2018.05.08	2019.05.07
Coaxial cable(BNC) (30MHz-26GHz)	CB01	EMC01	Morlab	N/A	N/A

4.3Auxiliary Test Equipment

Equipment Name	Model No.	Brand Name	Manufacturer	Cal.Date	Cal. Due
Computer	T430i	Think Pad	Lenovo	N/A	N/A

4.4 List of Software Used

Description	Manufacturer	Software Version
Test system	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V 1.0





4.5 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Cal. Due
Receiver	MY54130016	N9038A	Agilent	2018.05.08	2019.05.07
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2018.05.08	2019.05.07
Test Antenna - Horn	9170C-531	BBHA9170	Schwarzbeck	2017.09.13	2018.09.12
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2018.03.03	2019.03.02
Test Antenna - Horn	01774	BBHA 9120D	Schwarzbeck	2017.09.13	2018.09.12
Coaxial cable (N male) (9KHz-30MHz)	CB04	EMC04	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB02	EMC02	Morlab	N/A	N/A
Coaxial cable (N male) (30MHz-26GHz)	CB03	EMC03	Morlab	N/A	N/A
1-18GHz pre-Amplifier	MA02	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
18-26.5GHz pre-Amplifier	MA03	TS-PR18	Rohde& Schwarz	2018.05.08	2019.05.07
Anechoic Chamber	N/A	9m*6m*6m	CRT	2017.11.19	2020.11.18

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