



TEST REPORT

APPLICANT	:	Shenzhen Chainway Information Technology Co., Ltd.
PRODUCT NAME	:	Mobile Data Terminal
MODEL NAME	:	C6000
BRAND NAME	:	CHAINWAY
FCC ID	:	2AC6AC6000B
STANDARD(S)	:	47 CFR Part 15 Subpart C
RECEIPT DATE	:	2020-11-20
TEST DATE	•	2020-12-05 to 2020-12-31
ISSUE DATE	:	2021-01-15

Edited by:

Pong Mi Peng Mi (Rapporteur)

Approved by:

Peng Huarui (Supervisor)

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DIRECTORY

1. Technical Information 3
1.1. Applicant and Manufacturer Information 3
1.2. Equipment Under Test (EUT) Description
1.3. The Channel Number and Frequency 4
1.4. Test Standards and Results 5
1.5. Environmental Conditions 6
2. 47 CFR Part 15C Requirements 7
2.1. Antenna Requirement ······ 7
2.2. Hopping Mechanism 7
2.3. Number of Hopping Frequency 8
2.4. Duty Cycle of Test Signal ······11
2.5. Maximum Peak Conducted Output Power ······12
2.6. Maximum Average Conducted Output Power ······19
2.7. 20dB Bandwidth ······21
2.8. Carried Frequency Separation28
2.9. Time of Occupancy (Dwell time)
2.10. Conducted Spurious Emissions
2.11. Conducted Emission 51
2.12. Restricted Frequency Bands55
2.13. Radiated Emission ······65
Annex A Test Uncertainty78
Annex B Testing Laboratory Information79

Change History										
Version	Version Date Reason for change									
1.0	2021-01-15	First edition								





1. Technical Information

Note: Provide by applicant.

1.1.Applicant and Manufacturer Information

Applicant:	Shenzhen Chainway Information Technology Co., Ltd.			
	9F Building 2, Daqian Industrial Park, District 67, XingDong			
Applicant Address:	Community, Xin'an Street, Bao'an District, Shenzhen,			
	Guangdong, China			
Manufacturer:	Shenzhen Chainway Information Technology Co., Ltd.			
	9F Building 2, Daqian Industrial Park, District 67, XingDong			
Manufacturer Address:	Community, Xin'an Street, Bao'an District, Shenzhen,			
	Guangdong, China			

1.2.Equipment Under Test (EUT) Description

Product Name:	Mobile Data Term	ninal					
Serial No.:	(N/A, marked #1	N/A, marked #1 by test site)					
Hardware Version:	PCBA-C6000M-6	CBA-C6000M-62MB-V20					
Software Version:	H205XOA.C6000 1.20200921.ATA	E3AX.A3.AD10.WVGA.CN.FTM.MV3224.P					
Equipment Type:	Bluetooth classic						
Bluetooth Version:	5.0						
Modulation Type:	FHSS (GFSK(1N	lbps), π/4-DQPSK(EDR 2Mbps),					
	8-DPSK(EDR 3Mbps))						
Operating Frequency Range:	2402MHz-2480MHz						
Antenna Type:	PIFA Antenna						
Antenna Gain:	0.90dBi						
	Battery						
	Brand Name:	Hixon					
	Model No.:	J314					
Accessory Information	Serial No.:	(N/A, marked #1 by test site)					
Accessory Information:	Capacity:	4200mAh					
	Rated Voltage:	3.80V					
	Charge Limit:	4.35V					
	Manufacturer:	Hixon(Shenzhen) Technology Limited					



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Page 3 of 81



	AC Adapter					
	Brand Name:	ULPOWER®				
	Model No.:	NA010050020				
Accessory Information:	Serial No.:	(N/A, marked #1 by test site)				
	Rated Output:	5V=2A				
	Rated Input:	100-240V~50/60Hz, 0.5A				
	Manufacturer:	Shenzhen Shi Ying Yuan Electronics Co.,				
		Ltd.				

Note 1: We use the dedicated software to control the EUT continuous transmission.

Note 2: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

1.3.The Channel Number and Frequency

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

Note 1: The black bold channels were selected for test.



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1.4.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	Document Title				
1	47 CFR Part 15	Radio Frequency Devices				
Test	Test detailed items/section required by FCC rules and results are as below:					

No.	Section	Description	Test Date	Test Engineer	Result	Method determination /Remark
1	15.203	Antenna Requirement	N/A	N/A	PASS	No deviation
2	15.247(a) 15.247(h)	Hopping Mechanism	N/A	N/A	PASS	No deviation
3	15.247(a)	Number of Hopping Frequency	Dec 15, 2020	Ouyang Feng	PASS	No deviation
4	ANSI C63.10	Duty Cycle	Dec 15, 2020	Ouyang Feng	PASS	No deviation
5	15.247(b)	Maximum Peak Conducted Output Power	Dec 11, 2020	Ouyang Feng	PASS	No deviation
6	15.247(b)	Maximum Average Conducted Output Power	Dec 11, 2020	Ouyang Feng	PASS	No deviation
7	15.247(a)	20dB Bandwidth	Dec 31, 2020	Ouyang Feng	PASS	No deviation
8	15.247(a)	Carrier Frequency Separation	Dec 15, 2020	Ouyang Feng	PASS	No deviation
9	15.247(a)	Time of Occupancy (Dwell time)	Dec 15, 2020	Ouyang Feng	PASS	No deviation
10	15.247(d)	Conducted Spurious Emission	Dec 11, 2020	Ouyang Feng	PASS	No deviation
11	15.207	Conducted Emission	Dec 19, 2020	Huang Zhiye	PASS	No deviation
12	15.247(d)	Restricted Frequency Bands	Dec 05, 2020	Peng Xuewei	PASS	No deviation
13	15.209, 15.247(d)	Radiated Emission	Dec 05, 2020	Peng Xuewei	PASS	No deviation



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Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.10-2013 and KDB558074 D01 v05r02.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The Ref offset 2.0dB means the cable loss is 2.0dB.

Note 3: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 4: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.

1.5.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.Test Result: Compliant

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

2.2.Hopping Mechanism

2.2.1.Requirement

According to FCC §15.247(a)(1), a frequency hopping spread spectrum system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

According to FCC §15.247(h), the incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

2.2.2.Result: Compliant

The hopping mechanism of the EUT is in compliance with the document "*Bluetooth core specification v5.1*".





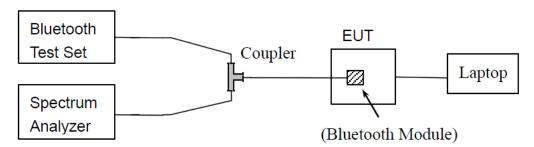
2.3.Number of Hopping Frequency

2.3.1.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.

2.3.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

2.3.3.Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings: Span = the frequency band of operation

RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.

VBW ≥ RBW

Sweep = auto Detector function = peak Trace = max hold

Allow the trace to stabilize

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2.3.4.Test Result

A.Test Verdict:

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

B.Test Plots:



(GFSK)

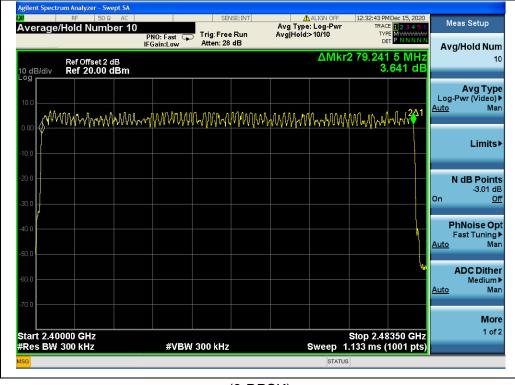


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verage	ନ ୍ୟାର Mold Numb	oer 10	PNO: Fast 😱	.		ALIGN OFF : Log-Pwr > 10/10	TRAC TYP	IDec 15, 2020 E 1 2 3 4 5 6 E M UMANAN FT P N N N N N		as Setup /Hold Num
10 dB/div Log	Ref Offset 2 (Ref 20.00 (ΔMkr	2 79.074 0.	5 MHz 310 dB		1
10.0	hnynn	ANTAINAN	MMMMM	ሌላሌላ	$\mathcal{W}\mathcal{W}\mathcal{W}$	MMM W	mulau	////2∕≏1	Log-I <u>Auto</u>	Avg Typ Pwr (Video) Ma
-10.0										Limits
-20.0									N On	l d B Point -3.01 di <u>O</u> i
-40.0										hNoise Op Fast Tuning I Mai
-60.0									Auto	ADC Dithe Medium Ma
Start 2.40	0000 GHz		#VBM	300 kHz		Sween 1	Stop 2.48	350 GHz 1001 pts)		Mor 1 of:

(π/4-DQPSK)



(8-DPSK)



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2.4. Duty Cycle of Test Signal

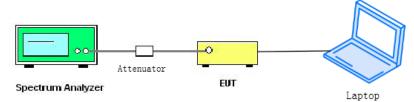
2.4.1.Requirement

Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%).When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be used to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data are being acquired (i.e., no transmitter OFF-time is to be considered).

When continuous transmission cannot be achieved and sweep triggering/signal gating cannot be implemented, alternative procedures are provided that can be used to measure the average power; however, they will require an additional measurement of the transmitter duty cycle (D). Within this sub clause, the duty cycle refers to the fraction of time over which the transmitter is ON and is transmitting at its maximum power control level. The duty cycle is considered to be constant if variations are less than ±2%; otherwise, the duty cycle is considered to be nonconstant.

2.4.2.Test Description

Test Setup:



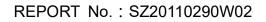
ANSI C63.10 2013 Clause 11.6 was used in order to prove compliance.

2.4.3.Test Result

Test Mode	Duty Cycle (%) (D)	Duty Factor (10*lg[1/D])
GFSK	76.80	1.15
π/4-DQPSK	76.80	1.15
8-DPSK	77.33	1.12



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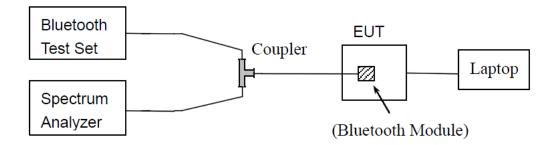
2.5.Maximum Peak Conducted Output Power

2.5.1.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.

2.5.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.





2.5.3.Test Result

GFSK Mode

A.Test Verdict:

Channel	Frequency	Measured Output Peak Power Limit		Verdict		
Channel	(MHz)	dBm	W	dBm	W	verdict
0	2402	9.53	0.009			PASS
39	2441	8.64	0.007	20.96	0.125	PASS
78	2480	9.20	0.008	Ī		PASS

B.Test Plot:



(Channel 0, GFSK)



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Agilent Spectrum Analyzer - Swept SA 02 RF 50 Ω AC Marker 1 2.4409450000000	PNO: East 🕞 Trig: Free Run	ALIGN OFF Avg Type: Log-Pwr Avg Hold:>10/10	03:37:22 PMDec 11, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N	Peak Search
Ref Offset 2 dB 10 dB/div Ref 20.00 dBm	IFGain:Low Atten: 28 dB	Mkr1	2.440 945 GHz 8.639 dBm	NextPeal
10.0	<u> </u>			Next Pk Righ
-10.0				Next Pk Let
-20.0				Marker Delt
-40.0				Mkr→C
-60.0				Mkr→RefL
Center 2.441000 GHz #Res BW 1.5 MHz	#VBW 5.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	Mor 1 of
MSG		STATUS	1	

(Channel 39, GFSK)



(Channel 78, GFSK)

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$\pi/4$ -DQPSK Mode

A.Test Verdict:

Channel	Frequency	Measured Outp	ut Peak Power	Limit		Verdict
Channel	(MHz)	dBm	W	dBm	W	verdict
0	2402	8.92	0.008			PASS
39	2441	8.26	0.007	20.96	0.125	PASS
78	2480	8.53	0.007			PASS

B.Test Plot:

Agilent Spectrum Analyzer - Swept SA				
022 RF 50 Ω AC Marker 1 2.401900000000 GHz PN0: Fa IFGain:Lt	st C Trig: Free Run Mw Atten: 28 dB	Avg Type: Log-Pwr Avg Hold:>10/10	03:38:04 PM Dec 11, 2020 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N	Peak Search
Ref Offset 2 dB		Mkr1	2.401 900 GHz 8.920 dBm	Next Peak
	<u> </u>	7		Next Pk Right
-10.0				Next Pk Lef
-20.0				Marker Delta
-40.0				Mkr→Cl
-50.0				Mkr→RefLv
-70.0				Mon 1 of:
	VBW 5.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	

(Channel 0, π/4-DQPSK)



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(Channel 39, π/4-DQPSK)



(Channel 78, π/4-DQPSK)

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8-DPSK Mode

A.Test Verdict:

Channel	Frequency	Measured Outp	ut Peak Power	r Limit		Verdict
Channel	(MHz)	dBm	W	dBm	W	verdict
0	2402	8.90	0.008			PASS
39	2441	8.23	0.007	20.96	0.125	PASS
78	2480	8.49	0.007			PASS

B.Test Plot:

Agilent Spectrum Analyzer - Swept SA			
Marker 1 2.401905000000	PNO: Fast IFGain:Low Atten: 28 dB	Avg Type: Log-Pwr TRACE Avg/Hold:>10/10 TYP	Dec 11, 2020 Peak Search 1 2 3 4 5 6 Peak Search MWWWWW PNNNNN
Ref Offset 2 dB 10 dB/div Ref 20.00 dBm	I Gaille W	Mkr1 2.401 9 8.90	05 GHz Next Peak 12 dBm
10.0	Î Î		Next Pk Right
-10.0			Next Pk Lef
-20.0			Marker Delta
-40.0			Mkr→Cl
-50.0			Mkr→RefLv
-70.0			More
Center 2.402000 GHz #Res BW 1.5 MHz	#VBW 5.0 MHz	Span 5. Sweep 1.000 ms (′	000 MHz 1 of 2 1001 pts)
MSG		STATUS	

(Channel 0, 8-DPSK)

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(Channel 39, 8-DPSK)



(Channel 39, 8-DPSK)

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2.6.Maximum Average Conducted Output Power

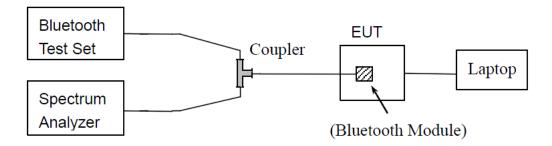
2.6.1.Requirement

According to FCC §15.247(b), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum average 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.

2.6.2.Test Description

The measured output power was calculated by the reading of the USB Wideband Power Sensor and calibration.

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.



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2.6.3.Test Result

GFSK Mode

	Frequency	Moourod		Average Power		Limit		
Channel	Frequency (MHz)	Measured	Duty	Duty factor	Calculated	Limit		Verdict
	(IVITZ)	dBm	Factor	dBm	W	dBm	W	
0	2402	7.79		8.94	0.008			PASS
39	2441	7.22	1.15	8.37	0.007	20.96	0.125	PASS
78	2480	7.64		8.79	0.008			PASS

$\pi/4$ -DQPSK Mode

	Frequency	Measured		Average Power Limit		Limit		
Channel	Frequency (MHz)	Measureu	Duty	Duty factor	Calculated			Verdict
	(IVITZ)	dBm	Factor	dBm	W	dBm	W	
0	2402	4.76		5.91	0.004			PASS
39	2441	3.96	1.15	5.11	0.003	20.96	0.125	PASS
78	2480	4.10		5.25	0.003			PASS

8-DPSK Mode

	Frequency	Measured		Average Pov	wer	Limit			
Channel	Frequency (MHz)	Measureu	Duty	Duty factor	Calculated			Verdict	
	(10112)	dBm	Factor	dBm	W	dBm	W		
0	2402	4.77		5.89	0.004			PASS	
39	2441	3.87	1.12	4.99	0.003	20.96	0.125	PASS	
78	2480	4.06		5.18	0.003			PASS	



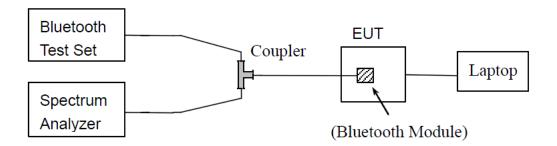


2.7.1.Definition

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.

2.7.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

2.7.3.Test Procedure

Use the following spectrum analyzer settings: Span = between 2 to 5 times the OBW, centered on the test channel RBW= 1% to 5% of the OBW VBW \ge 3 x RBW Sweep = auto Detector function = peak Trace = max hold





2.7.4.Test Result

GFSK Mode

A.Test Verdict:

Channel	Frequency (MHz) 20dB Bandwidth (MHz)		Result
0	2402	0.841	PASS
39	2441	0.812	PASS
78	2480	0.814	PASS

B.Test Plot:



(Channel 0, GFSK)



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(Channel 39, GFSK)



(Channel 78, GFSK)



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$\pi/4$ -DQPSK Mode

A.Test Verdict:

Channel	Frequency (MHz) 20dB Bandwidth (MHz)		Result
0	2402	1.268	PASS
39	2441	1.264	PASS
78	2480	1.270	PASS

B.Test Plot:

Agilent Spectrum Analyzer - Occupied BV Date RF 50 ລ AC Center Freq 2.402000000	GHz Cente Trig: F	NSE:PULSE SOURCE OFF FFreq: 2.402000000 GHz ree Run Avg Hol : 28 dB	Ra d:>10/10	5:47:03 PMDec 31, 2020 dio Std: None dio Device: BTS	Avg	as Setup I /Hold Num 10
10 dB/div Ref 15.00 dBm			•		<u>On</u>	Off
Log 5.00 -5.00 -15.0	- M	man			Exp	Avg Mode Repeat
-25.0	/					
-35.0			m	h		
-55.0						DWDower
-75.0						99.00 %
Center 2.402 GHz #Res BW 30 kHz	#	VBW 100 kHz	Sv	Span 3 MHz veep 4.133 ms		
Occupied Bandwidth	1	Total Power	13.9 di	3m		
1.1	1588 MHz					x dB
Transmit Freq Error	-1.376 kHz	OBW Power	99.00)%		-20.00 dB
x dB Bandwidth	1.268 MHz	x dB	-20.00	dB		
						More 1 of 2
MSG			STATUS			

(Channel 0, π/4-DQPSK)

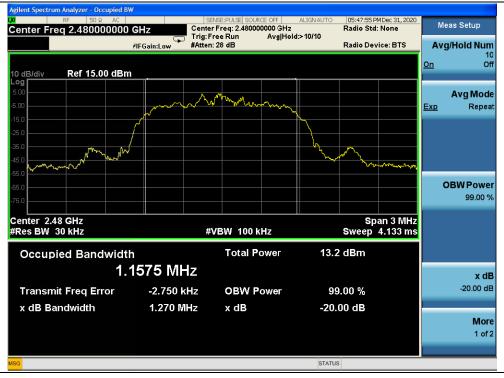


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(Channel 39, π/4-DQPSK)



(Channel 78, π/4-DQPSK)

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8-DPSK Mode

A.Test Verdict:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
0	2402	1.262	PASS
39	2441	1.256	PASS
78	2480	1.260	PASS

B.Test Plot:

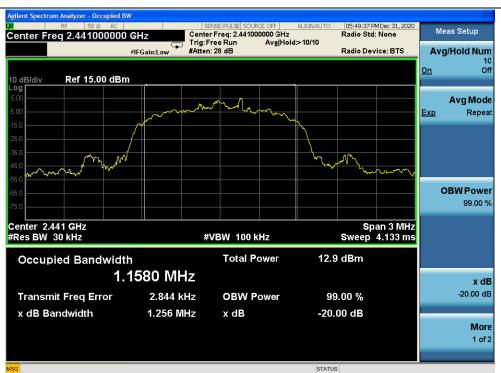
Agilent Spectrum Analyzer - Occupied BW Od RF 50 Ω AC Center Freq 2.402000000	GHz Center Trig: F	nse:PULse source off r Freq: 2.402000000 GHz ree Run Avg Hol : 28 dB	ALIGNAUTO	05:49:25 P Radio Std: Radio Dev			eas Setup g/Hold Num 10
10 dB/div Ref 15.00 dBm						<u> 0n</u>	Off
Log 5.00 -5.00		man				Exp	Avg Mode Repeat
-25.0							
-35.0 m			m	* Um	~~~v		
-65.0						(DBW Power 99.00 %
Center 2.402 GHz #Res BW 30 kHz	#	VBW 100 kHz		Sp Sweep	an 3 MHz 4.133 ms		
Occupied Bandwidth		Total Power	13.9	dBm			
1.1	588 MHz						x dB
Transmit Freq Error	2.592 kHz	OBW Power	99.	00 %			-20.00 dB
x dB Bandwidth	1.262 MHz	x dB	-20.0	0 dB			More 1 of 2
							. 012
MSG			STATUS				

(Channel 0, 8-DPSK)



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(Channel 39, 8-DPSK)



(Channel 78, 8-DPSK)



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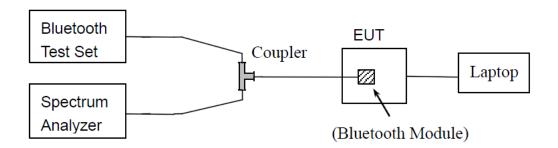
2.8. Carried Frequency Separation

2.8.1.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.

2.8.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

2.8.3.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

RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.

VBW ≥ 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.





2.8.4.Test Result

A.Test Verdict:

	Measured	Carried Frequency	20dBband		
Test Mode	Channel	Separation	width	Min. Limit	Verdict
	Numbers	(MHz)	(MHz)		
GFSK	39 and 40	1.158	0.841	two-thirds of the	PASS
π/4-DQPSK	39 and 40	1.005	1.280	20dBbandwidth	PASS
8-DPSK	39 and 40	1.011	1.262		PASS

B.Test Plot:



(GFSK)



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(m/4-DQPSK)







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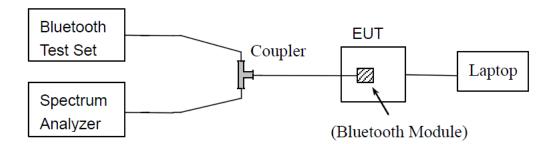
2.9. Time of Occupancy (Dwell time)

2.9.1.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.

2.9.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

2.9.3.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

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.





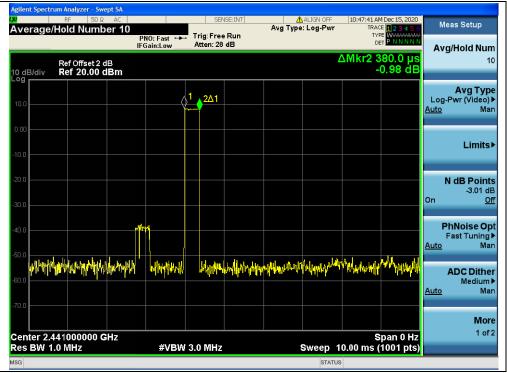
2.9.4.Test Result

GFSK Mode

A.Test Verdict:

DH Pulse Width		Dwell T	Limit (sec)	Verdict	
Packet	(ms)	Normal Mode	AFH Mode		Verdict
DH1	0.38	121.60	60.80		PASS
DH3	1.64	262.40	131.20	0.4	PASS
DH5	2.88	307.20	153.60		PASS

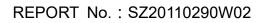
B.Test Plot:



(DH1, GFSK)



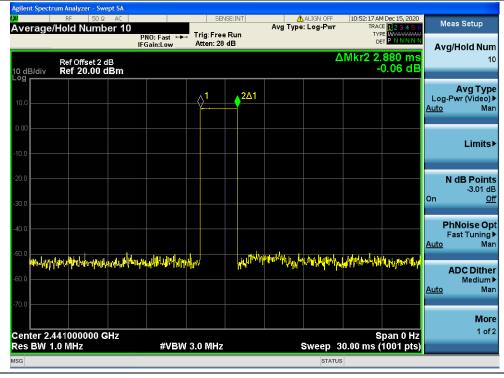
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(DH3, GFSK)



(DH5, GFSK)



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$\pi/4$ -DQPSK Mode

A.Test Verdict:

DH Pulse Width		Dwell T	Limit (sec)	Verdict	
Packet	(ms)	Normal Mode	AFH Mode		vertici
DH1	0.38	121.60	60.80		PASS
DH3	1.64	262.40	131.20	0.4	PASS
DH5	2.88	307.20	153.60		PASS

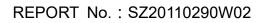
B.Test Plot:

Agilent Spectrum Analyzer - Swept SA XI RF 50 Ω AC	SEM		ALIGN OFF	10:53:16 AM Dec 15, 2020 TRACE 1 2 3 4 5 6	Meas Setup
Average/Hold Number 10	PNO: Fast ↔ Trig: Free IFGain:Low Atten: 28	∋Run - ···	-	DET PNNNN	Avg/Hold Num
Ref Offset 2 dB 10 dB/div Ref 20.00 dBm			Δ	Mkr2 380.0 µs. -1.33 dB-	10
10.0			¹ / _{v→} 2Δ [·]		Avg Type Log-Pwr (Video) ▶ <u>Auto</u> Man
-10.0					Limits►
-20.0					N dB Points -3.01 dB On <u>Off</u>
-40.0					PhNoise Op Fast Tuning Auto Mar
-60.0	-yaliyk-aliyuvey ^k aluyk-aulukuale	the production of the state of	WY Arm	punku kirilipi nyinyinyinyi	ADC Dither Medium ▶ Auto Man
-70.0 Center 2.441000000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz		Sween -10	Span 0 Hz 9.00 ms (1001 pts)	More 1 of 2
NGS DW TO MITZ	#4544 3.0 MHZ		STATUS	alo na (1001 praj	

(DH1, π/4-DQPSK)



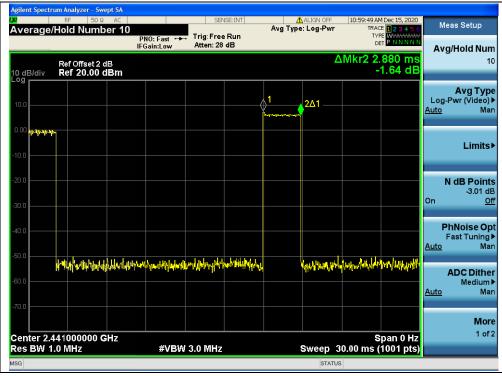
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Agilent Spectrum Analyzer - Swept SA								
KM RF 50 Ω AC		SENSE:INT	Avg Type:	ALIGN OFF		1 Dec 15, 2020 E 1 2 3 4 5 6	Meas Setu	p
Average/Hold Number 10		rig: Free Run	Avg type.	Log-Pwr	TYF	E W MMMMM		
	IFGain:Low	Atten: 28 dB				T P N N N N N	Avg/Hold N	Num
Ref Offset 2 dB				<i>L</i>	\Mkr2 1.		-	10
10 dB/div Ref 20.00 dBm						1.96 dB		
Log							Avg T	Type
10.0				.∧1	<u></u> 2∆1		Log-Pwr (Vid	
10.0				- <u>X</u>			Auto	Man
0.00								
10.0							Lim	nits►
-10.0								
-20.0							N dB Po	Dints 01 dB
							-3.0 On	Off
-30.0								_
							PhNoise	Ont
-40.0							Fast Tun	
50.0							<u>Auto</u>	Man
-50.0	Landra Line Million	Martin Martin Barthouter	or when her large		the in the	MAN		
	an and a state of the state of	and a shake of a shake of a start	dament dildi	MIN.	J A.W	T OPPY	ADC Di	
-60.0							Medi Auto	ium▶ Man
							Auto	Wall
-70.0								
								Nore
Center 2.441000000 GHz					S	pan 0 Hz	1	1 of 2
Res BW 1.0 MHz	#VBW 3.	0 MHz	S	weep 2	20.00 ms (1001 pts)		
MSG				STATU	s			

(DH3, π/4-DQPSK)



(DH5, π/4-DQPSK)

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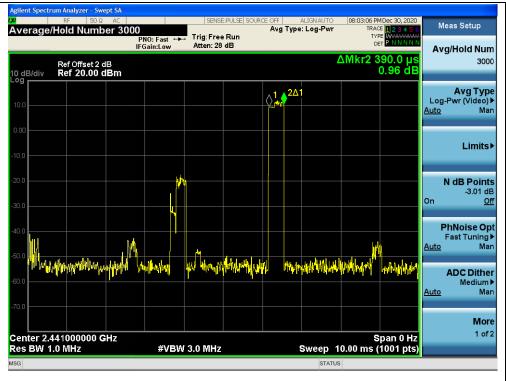


8-DPSK mode

A.Test Verdict:

DH Pulse Width		Dwell T	Limit (sec)	Verdict	
Packet	(ms)	Normal Mode	AFH Mode		vertici
DH1	0.39	124.80	62.40		PASS
DH3	1.64	262.40	131.20	0.4	PASS
DH5	2.88	307.20	153.60		PASS

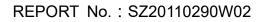
B.Test Plot:



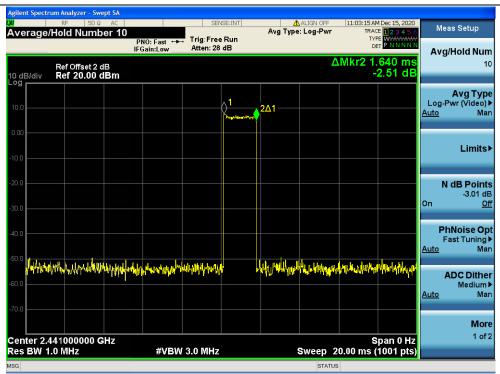
(DH1, 8-DPSK)



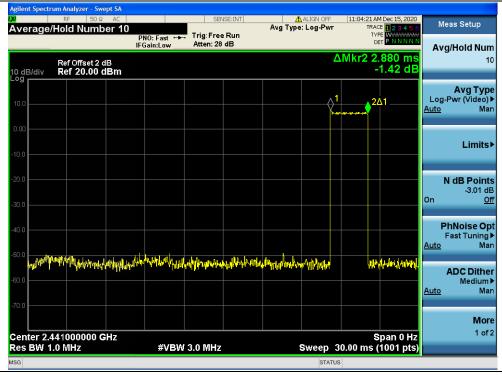
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(DH3, 8-DPSK)



(DH5, 8-DPSK)



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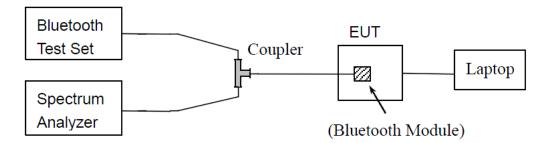
2.10.Conducted Spurious Emissions

2.10.1.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 20 dB 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.

2.10.2.Test Description

Test Setup:



The Bluetooth Module of the EUT is coupled to the Spectrum Analyzer (SA) and the Bluetooth Test Set through the coupler; the RF load attached to the EUT antenna terminal is 500hm; the path loss as the factor is calibrated to correct the reading.

2.10.3.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 \geq RBW Sweep = auto Detector function = peak Trace = max hold Allow the trace to stabilize.

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2.10.4.Test Result

GFSK Mode

A.Test Verdict:

Frequence	Froqueney	Measured Max. Out of Band	Limit (
Channel	. ,	Emission (dBm)	Carrier Level	Calculated	Verdict	
	(MHz) Emission (Carrier Lever	-20dBc Limit		
0	2402	-44.72	9.22	-10.78	PASS	
39	2441	-43.46	8.08	-11.92	PASS	
78	2480	-44.71	8.70	-11.30	PASS	

B.Test Plot:



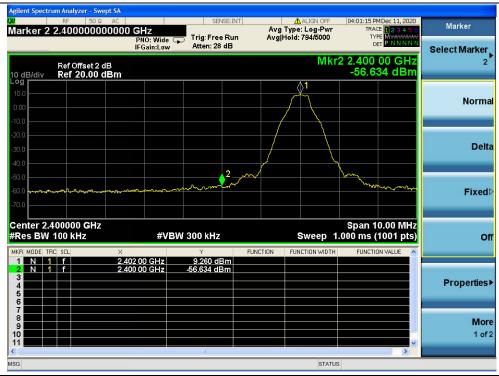
(30MHz to 25GHz, Channel 0, GFSK)



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(Band edge, Channel 0, GFSK)



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



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Agilent Spectrum Analyzer - Swept SA				
₩ RF 50 Ω AC Marker 2 24.043649000000 GHz	SENSE:INT	ALIGN OFF	04:11:34 PMDec 11, 2020 TRACE 12 3 4 5 6	Peak Search
PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 28 dB	Avg Hold:>10/10	DET PNNNN	
Ref Offset 2 dB		Mkr	2 24.043 6 GHz	Next Peak
10 dB/div Ref 20.00 dBm			-43.457 dBm	
Log				
0.00				Next Pk Right
-10.0				
-20.0				
-30.0				Next Pk Left
-40,0				
-50.0		وإرافا المقاولة المساجرة المساحلية	A Marine Ma Marine Marine Mari	
-60.0	and the second design of the			Marker Delta
-70.0				
Start 30 MHz	^		Stop 25.00 GHz	
#Res BW 100 kHz #VBW	300 kHz	Sweep 2	2.387 s (10001 pts)	Mkr→CF
MKR MODE TRC SCL X 1 N 1 f 2.4421GHz	Y FUNCTI 8.084 dBm	ON FUNCTION WIDTH	FUNCTION VALUE	
2 N 1 f 24.043 6 GHz	-43.457 dBm			
3				Mkr→RefLvl
5			=	
7				
9				More 1 of 2
11			v	1012
KSG	m	STATUS		
MSG		STATUS		

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



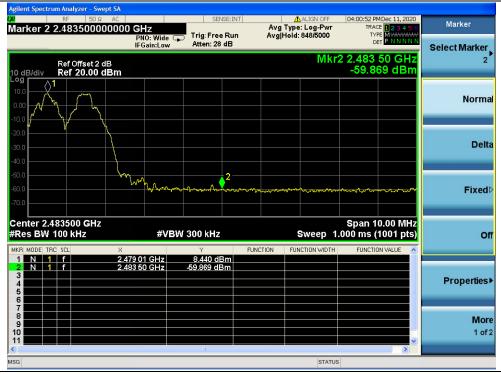
(30MHz to 25GHz, Channel 78, GFSK)





Agilent Spectrum Analyzer - Swept SA				
	SENSE:IN	ALIGN OFF	04:01:34 PMDec 11, 2020 TRACE 1 2 3 4 5 6	Marker
Marker 2 2.483500000000 GHz PNO: IFGain	Wide Trig: Free Run Atten: 28 dB		TYPE MWWWW DET PNNNN	Select Marker
Ref Offset 2 dB 10 dB/div Ref 20.00 dBm		Mkr	2 2.483 50 GHz -57.597 dBm	2
Log 10.0 0.00 -10.0				Normal
-20.0				Delta
-50.0	2- www	Mandana Awarana	Amana	Fixed⊳
Center 2.483500 GHz #Res BW 100 kHz	#VBW 300 kHz	Sweep 1	Span 10.00 MHz .000 ms (1001 pts) FUNCTION VALUE	Off
1 N 1 f 2.480 00 G 2 N 1 f 2.483 50 G 3 - - - - 4 - - - - 5 - - - - - 7 -	8.894 dBm Hz -57.597 dBm			Properties▶
7 8 9 10 11			>	More 1 of 2
MSG		STATUS	3	

(Band edge, Channel 78, GFSK)



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



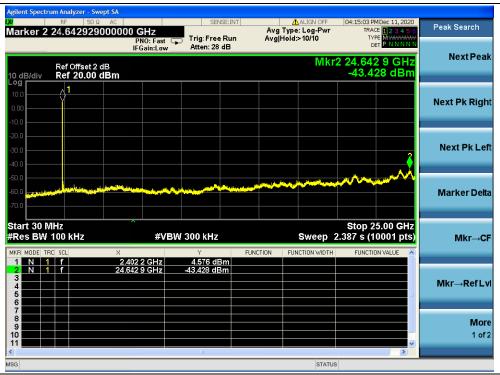


$\pi/4$ -DQPSK Mode

A.Test Verdict:

	Fraguanay	requency Measured Max. Out of Band		Limit (dBm)			
Channel	Channel ' '	Emission (dBm)	Carrier	Calculated	Verdict		
(MHz)		Level	-20dBc Limit				
0	2402	-43.43	4.58	-15.42	PASS		
39	2441	-57.89	6.69	-13.31	PASS		
78	2480	-45.30	1.89	-18.11	PASS		

B.Test Plot:



(30MHz to 25GHz, Channel 0, π /4-DQPSK)



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

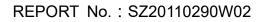


(Band edge with hopping on, Channel 0, π /4-DQPSK)

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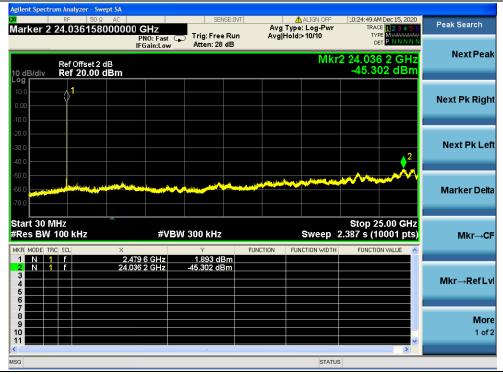
 Http://www.morlab.cn
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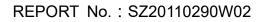


(30MHz to 25GHz, Channel 39, π/4-DQPSK)

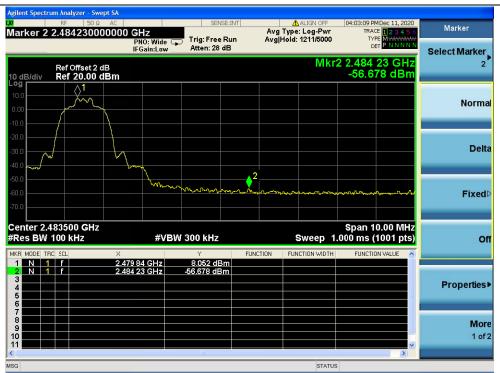


(30MHz to 25GHz, Channel 78, π/4-DQPSK)









(Band edge, Channel 78, π/4-DQPSK)



(Band edge with hopping on, Channel 78, π /4-DQPSK)





8-DPSK Mode

A.Test Verdict:

	Frequency	Measured Max. Out of Band	Limi	t (dBm)	
Channel	Channel ' '	Emission (dBm)	Carrier	Calculated	Verdict
(MHz)	Emission (dBm)	Level	-20dBc Limit		
0	2402	-44.33	5.30	-14.70	PASS
39	2441	-44.56	1.91	-18.09	PASS
78	2480	-44.45	2.58	-17.42	PASS

B.Test Plot:



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



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(Band edge, Channel 0, 8-DPSK)



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

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Agilent Spectru	um Analyzer - Swej	pt SA							
Marker 2	RF 50 Ω 23.9937090	00000 GHz	Z Fast 😱 Trig:F	ree Run		ALIGN OFF e: Log-Pwr d:>10/10	TYPE	2 3 4 5 6	Peak Search
10 dB/div	Ref Offset 2 d Ref 20.00 d	в	LUW Atten.	20 40		Mkr	2 23.993 7 -44.563		Next Peak
10.0 0.00	1								Next Pk Right
-20.0 -30.0 -40.0								2	Next Pk Left
-50.0 -60.0 -70.0	ر الي _{رين ا} ينو (الله اليرين					un and a start a		<u>~~~</u>	Marker Delta
Start 30 M #Res BW	100 kHz	× 2.442 1 G	#VBW 300 kH	FU	NCTION FL	Sweep 2	Stop 25.0 2.387 s (100 FUNCTION V	01 pts)	Mkr→CF
1 N 1 2 N 1 3 4 5 6	f	23.993 7 G							Mkr→RefLvl
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9								~	More 1 of 2
MSG						STATUS			

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



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





Agilent Spectrum Analyzer - Swept SA						
Marker 2 2.483570000000 GHz	SENSE:IN		ALIGN OFF	04:05:35 PMDec 11, TRACE 1 2 3		Marker
PNO: Wide IFGain:Low	Trig: Free Run Atten: 28 dB		Hold: 1310/5000	TYPE MUM	MMM 	Select Marker
Ref Offset 2 dB 10 dB/div Ref 20.00 dBm			Mkr	2 2.483 57 G -57.503 di		2
Log 10.0 0.00 -10.0						Normal
-20.0						Delta
-50.0 -60.0 -70.0	2-	m.m.m.	<u><u></u></u>		~~~~	Fixed⊳
Center 2.483500 GHz #Res BW 100 kHz #VBV	V 300 kHz	FUNCTION	Sweep 1	Span 10.00 M .000 ms (1001) FUNCTION VALUE		Off
1 N 1 f 2.480 16 GHz 2 N 1 f 2.483 67 GHz 3 4 4 4 4 6 6 6 6 1 1	8.157 dBm -57.503 dBm					Properties▶
7 8 9 10 11					~	More 1 of 2
MSG			STATUS			

(Band edge, Channel 78, 8-DPSK)



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





2.11.Conducted Emission

2.11.1.Requirement

According to FCC section 15.207, 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/ 50Ω 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			

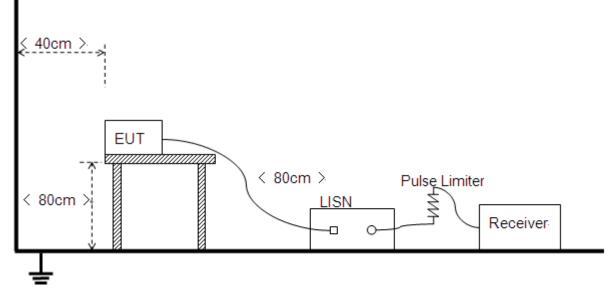
NOTE:

(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.

2.11.2.Test Description

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.





2.11.3.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. Set RBW=9kHz, VBW=30kHz. Refer to recorded points and plots below.

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

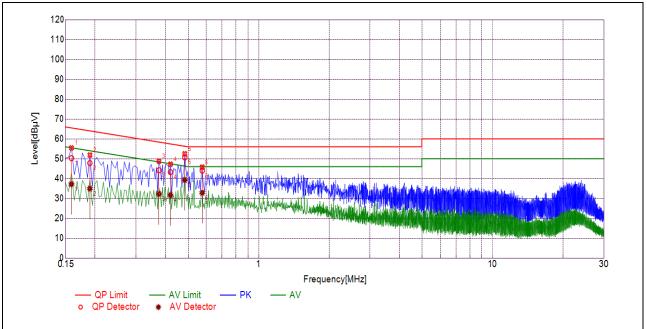
A.Test Setup:

Test Mode: <u>EUT+ ADAPTER+BT TX</u> Test Voltage: <u>AC 120V/60Hz</u> The measurement results are obtained as below: E [dB μ V] =U_R + L_{Cable loss} [dB] + A_{Factor} U_R: Receiver Reading A_{Factor}: Voltage division factor of LISN





B.Test Plot:



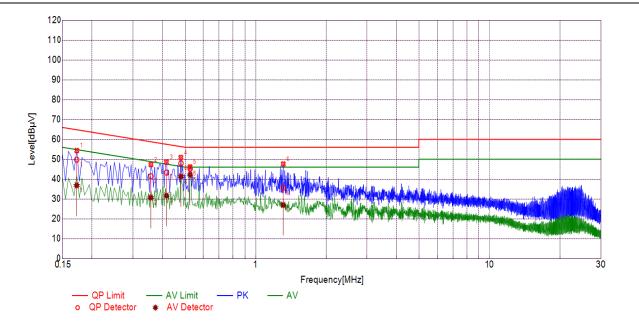
(L Phase)

No.	No		Emission Level (dBµV)		dBµV)	Power-line	Verdict
	(MHz)	^{z)} Quai-peak Average Quai-peak Average			. e. alot		
1	0.1590	50.31	37.22	65.51	55.51		PASS
2	0.1904	47.81	34.96	64.02	54.02		PASS
3	0.3753	44.21	32.29	58.38	48.38	Line	PASS
4	0.4197	43.27	31.71	57.45	47.45	Line	PASS
5	0.4829	50.65	39.36	56.29	46.29		PASS
6	0.5730	44.00	32.88	56.00	46.00		PASS



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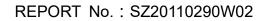
(N	Phase)	
----	--------	--

No.	No.		Emission Level (dBµV)		dBµV)	Power-line	Verdict
	(MHz)	^I Z) Quai-peak Average Quai-peak Average		Average			
1	0.1724	49.77	36.82	64.85	54.85		PASS
2	0.3568	41.45	30.69	58.80	48.80		PASS
3	0.4157	43.27	31.67	57.53	47.53	Neutral	PASS
4	0.4790	47.98	41.30	56.36	46.36	Neutral	PASS
5	0.5239	45.23	42.17	56.00	46.00		PASS
6	1.3150	35.67	26.99	56.00	46.00		PASS



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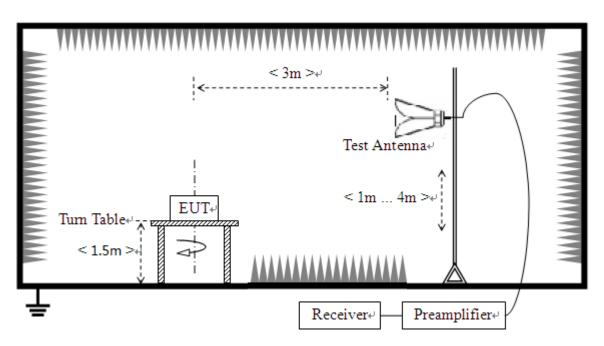
2.12.Restricted Frequency Bands

2.12.1.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).

2.12.2.Test Description

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.

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.





2.12.3.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 MHzSweep = auto Detector function = peak/average Trace = max hold Allow the trace to stabilize

2.12.4.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

G_{preamp}: Preamplifier Gain

A_{Factor}: 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.

GFSK Mode

A.Test Verdict:

Channel	Frequency (MHz)	Detector	Receiver Reading U _R	A⊤ (dB)	A _{Factor} (dB@3m)	Max. Emission E	Limit (dBµV/m)	Verdict
		PK/ AV	(dBµV)			(dBµV/m)		
0	2376.75	PK	25.69	6.74	27.20	59.63	74	PASS
0	2387.15	AV	13.16	6.74	27.20	47.10	54	PASS
78	2485.46	PK	24.93	6.74	27.20	58.87	74	PASS
78	2483.65	AV	12.93	6.74	27.20	46.87	54	PASS





B.Test Plot:

Keysight Spectrum Analyzer - Swept				- F -
RL RF PRESEL 50 Ω arker 1 2.376752000	DC SENSE:INT	ALIGN OFF Avg Type: Voltage	06:56:51 AM Dec 05, 2020 TRACE 1 2 3 4 5 6	Marker
PREAMP	PNO: Fast Frig: Free Run IFGain:Low Atten: 10 dB	Avg Hold:>100/100	TYPE MWWWW DET P P N N N N	Select Marker
O dB/div Ref 86.99 dE	ЗμV	MIKI'I	2.376 752 GHz 25.692 dBμV	1
7.0				Norm
7.0			Δ	
7.0		1	2	Del
7.0	۹۵٬۵۵۹۹۹۹۹۹۰۹۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰۰	neretako segeren Augenteko n- Angerta panan -		
99				Fixe
art 2.30000 GHz tes BW (CISPR) 1 MH	Iz #VBW 3.0 MHz	Sweep 1	Stop 2.40400 GHz .000 ms (1001 pts)	c
R MODE TRC SCL	X Y F	UNCTION FUNCTION WIDTH	FUNCTION VALUE	
	2.376 752 GHz 25.692 dBµV 2.390 000 GHz 23.882 dBµV			Properties
			E	Toperae
7 B				Mo
				1 0
<u>.</u>		STATUS	3	

(PEAK, Channel 0, GFSK)



(AVERAGE, Channel 0, GFSK)



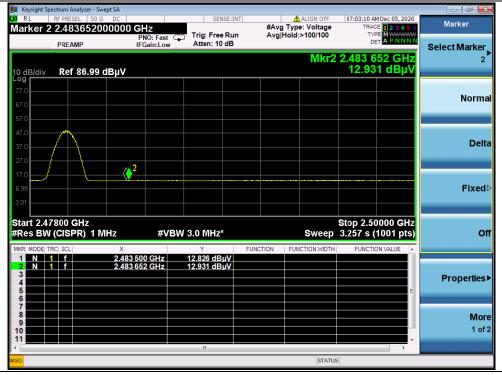
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Marker	M Dec 05, 2020 E 1 2 3 4 5 6		ALIGN OFF	#Avg -	ISE:INT	SEI	7	DC	ESEL 50 Ω	RL RFPF
Select Marker	56 GHz 4 dBµV	2.485 4	:>100/100			Trig: Free Atten: 10	NO: Fast G Gain:Low	P IF	AMP	PRE
Normal		24.00						вµи	ef 86.99 (
Delta	NAME OF TANK OF	Design sector da 6		when Amalle Ansara	********	o days i se set fida	¢ ²			
Fixed⊳										9 1
Off	0000 GHz 1001 pts)	.000 ms (Sweep 1	CTION		3.0 MHz Y		x	SPR) 1 M	es BW (CIS
Properties►	=					24.388 dB 24.934 dB	0 GHz 6 GHz	2.483 50 2.485 45		N 1 f N 1 f
More 1 of 2	-					11				
		;	STATUS			11				

(PEAK, Channel 78, GFSK)



(AVERAGE, Channel 78, GFSK)



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$\pi/4$ -DQPSK Mode

A.Test Verdict:

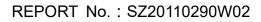
Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Verdict
Chlamiter	(MHz)	PK/ AV	U _R (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	Veraiet
0	2380.70	PK	25.77	6.74	27.20	59.71	74	PASS
0	2386.42	AV	13.17	6.74	27.20	47.11	54	PASS
78	2484.07	PK	24.73	6.74	27.20	58.67	74	PASS
78	2483.74	AV	12.87	6.74	27.20	46.81	54	PASS

B.Test Plot:

U RL	Pectrum Analyzer - Si RF PRESEL 50 9 1 2.3807040 PREAMP	DC 000000 GH PN	Z 0: Fast ⊊ ain:Low				ALIGN OFF e: Voltage :>100/100	TRACE	Dec 05, 2020 1 2 3 4 5 6 MWWWWW P P N N N N	Marker Select Marker
I0 dB/div	Ref 86.99	dBµV					Mkr1	2.380 7 25.77	04 GHz I dBµV	1
77.0 67.0										Norm
57.0 47.0 37.0 27.0	المراجع	Vyljena filoda je stanova se		Mahr presention	1 may and the second	80.000-00-00-00-00-00-00-00-00-00-00-00-0	1	2 merchucian		Delt
17.0 6.99 3.01										Fixed
Res BV	0000 GHz V (CISPR) 1 I		#VBV	N 3.0 MHz			Sweep 1.	Stop 2.40 .000 ms (1	001 pts)	o
	TRC SCL 1 f 1 f	× 2.380 704 2.390 000		Y 25.771 dB 24.101 dB		ION FUN	ICTION WIDTH	FUNCTIO	N VALUE	Properties
7 8 9 10 11										Moi 1 of
SG				m			STATUS		•	

(PEAK, Channel 0,π/4-DQPSK)

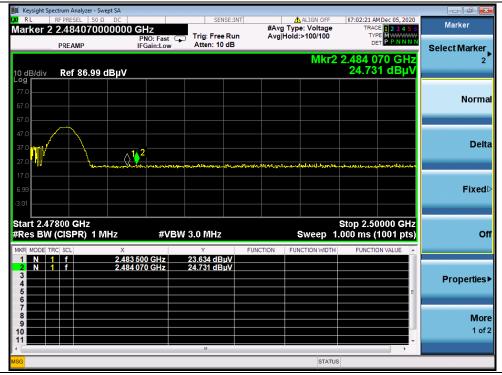






										Analyzer - S		
Marker	5 6	E 1 2 3 4	06:58:19 A	ALIGN OFF e: Voltage	#Avg T	SENSE			0 Ω DC	SEL 50		rt Rter 1
Select Marker	IN N		DI	:>100/100	Avg Ho	rig: Free R Atten: 10 d		PNO: Fas IFGain:Lo		AMP	PREA	
1		24 Gł 2 dBµ	2.386 4 13.17	Mkr1					9 dBµV	f 86.99	Rei	dB/div
Norma												
Delta	Λ											
			<mark>≜</mark> 1 ∆2									
Fixed	t)	_ ▼_∨_									0 9
										~		
Of	Hz ts)	1400 GI 1001 pi	Stop 2.40 15.40 s (Sweep) MHz*	/BW 3	#\	MHz	GHz PR) 1	:0000 V (CIS	
	ĥ	ON VALUE	FUNCTI	ICTION WIDTH	CTION I	Ƴ 172 dBµ\	1	424 GHz	× 2.386		TRC SCL	MODE
Properties						145 dBµ\	1	000 GHz	2.390		1 f	N
Mon 1 of:												
	Ŧ	•				II.						
				STATUS								

(AVERAGE, Channel 0, π/4-DQPSK)



(PEAK, Channel 78, π/4-DQPSK)

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6 Marker M	7 AM Dec 05, 2020 RACE 1 2 3 4 5 6 TYPE MWWWW DET A P N N N N	TRA T)	ALIGN OFF pe: Voltage d:>100/100		SEN Trig: Free Atten: 10	IZ IO:Fast ⊊ Gain:Low	DC 00000 GI P		RF PRI	LXI RL
2	740 GHz 373 dBµV		Mkr2				lBµV	f 86.99 (div Re	10 dE Log j
Normal										77.0 67.0 57.0
Delta							. 12	\ \ \	/	47.0 37.0 27.0
Fixed⊳					······································		¹²			17.0 6.99 -3.01
Off	50000 ĜHz 6 (1001 pts)	3.257 s	Sweep	FL	3.0 MHz*	#VBW	Hz	PR) 1 IV	2.47800 BW (CIS	#Res
Properties►					12.849 dBj 12.873 dBj) GHz) GHz	2.483 50 2.483 74			1 2 3 4 5 6
More 1 of 2										7 8 9 10 11
		s	STATUS							MSG

(AVERAGE, Channel 78, π/4-DQPSK)





8-DPSK Mode

A.Test Verdict:

Channel	Frequency	Detector	Receiver Reading	A _T	A _{Factor}	Max. Emission	Limit	Verdict
	(MHz)	PK/ AV	U _R (dBµV)	(dB)	(dB@3m)	E (dBµV/m)	(dBµV/m)	
0	2388.40	PK	26.44	6.74	27.20	60.38	74	PASS
0	2388.82	AV	13.17	6.74	27.20	47.11	54	PASS
78	2484.84	PK	25.18	6.74	27.20	59.12	74	PASS
78	2483.76	AV	12.96	6.74	27.20	46.90	54	PASS

B.Test Plot:

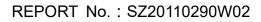
Marker 1 2	um Analyzer - Swept S PRESEL 50 Ω D .3884000000	С	Trig: Free F Atten: 10 d	#Av Run Avg	ALIGN OFF g Type: Voltage Hold:>100/100	06:59:13 AM Dec 05, 2020 TRACE 1 2 3 4 5 TYPE M WWWWW DET P P N N N	Marker
10 dB/div	Ref 86.99 dBj	٧u			Mkr1	2.388 400 GHz 26.444 dBµV	1
77.0 67.0							Normal
57.0 47.0						Λ	
37.0		- Luo Arto Arto ann Martin		had desired to collection the			Delta
17.0 6.99		alaa Aserbala aseraa ahaana	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	- 9 k. ykon 4 9 d., 7 k. er y Ray K. y K.	and a second	in the floor of the SL Name and Player (physics)	Fixed⊳
-3.01							
	SISPR) 1 MHz		SW 3.0 MHz		Sweep 1	Stop 2.40400 GHz .000 ms (1001 pts)	Off
MKR MODE TRC 1 N 1 2 N 1 3 4 5	f 2	X 2.388 400 GHz 2.390 000 GHz	Υ <u>26.444 dBμ\</u> 23.474 dBμ\	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Properties►
6 7 8 9 10							More 1 of 2
11 ∢ MSG			IΠ		STATUS	•	

(PEAK, Channel 0, 8-DPSK)



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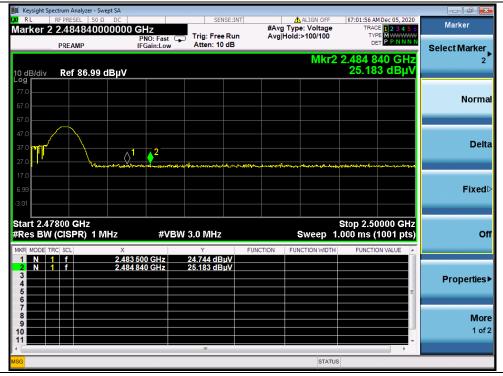
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									n Analyzer - S		
Marker	Dec 05, 2020	TRAC	ALIGN OFF ype: Voltage old:>100/100		NSE:IN			000000	RESEL 50		<mark>xı</mark> ri Mark
Select Marker	APNNNN	DE	5ia:>100/100	Avg		Atten: 10	PNO: Fast G FGain:Low		EAMP	PR	
1	16 GHz 1 dBµV	2.388 8 13.17	Mkr1					dBμV	ef 86.99	/div R	10 dE Log i
Norma											77.0
											67.0 57.0
Delta	Λ										47.0 37.0
		1 2									27.0
Fixed											17.0 6.99
											-3.01
Of	400 GHz 1001 pts)	Stop 2.40 15.40 s (Sweep		*	/ 3.0 MHz	#VBV	MHz) GHz SPR) 1	2.3000 BW (CI	
·	N VALUE	FUNCTIO	FUNCTION WIDTH	UNCTION	RuV	۲ 13.171 dB	16 GHz	X 2 388 8	CL		MKR N
Properties						13.102 dB	00 GHz	2.390 0		N 1	2 3 4
	=										5 6 7
More 1 of 2											8
1012	-										10 11 ∢
		\$	STATUS								MSG

(AVERAGE, Channel 0, 8-DPSK)



(PEAK, Channel 78, 8-DPSK)

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Marker	Dec 05, 2020	TRAC	ALIGN OFF De: Voltage I:>100/100	SE:INT		IZ NO: Fast ⊂	DC 0000 GI	ESEL 50 Ω	vsight Spectrum RF PR ker 2 2.4
Select Marker	APNNNN 2 GHz dBµV	2.483 7	Mkr2	dB	Atten: 10	Gain:Low	IFO	амр f 86.99 (
Normal									
Delta									
Fixed⊳							¹²		
Off	001 pts)	Stop 2.50 3.257 s (FUNCTIO	Sweep		' 3.0 MHz* Y		х	PR) 1 M	t 2.47800 s BW (CIS
Properties►					12.803 dB 12.963 dB		2.483 50 2.483 76		N 1 f N 1 f
More 1 of 2									
		6	STATUS						

(AVERAGE, Channel 78, 8-DPSK)





2.13.Radiated Emission

2.13.1.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

Note1: 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. **Note2:**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).

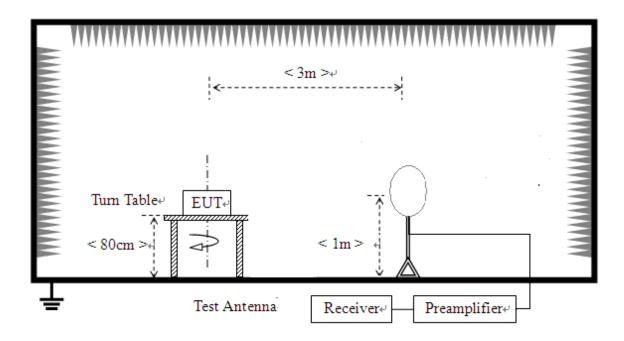




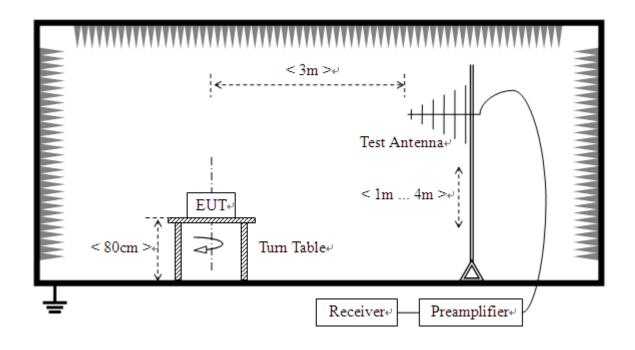
2.13.2.Test Description

Test Setup:

1) For radiated emissions from 9kHz to 30MHz



2) For radiated emissions from 30MHz to1GHz



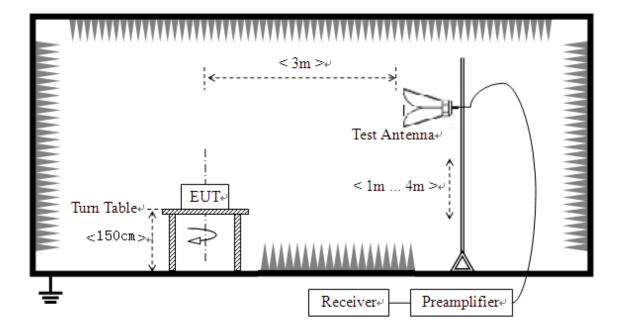


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3) For radiated emissions above 1GHz



The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz.The antenna to EUT distance is 3meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 30MHz, the emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9kHz-90 kHz, 110kHz-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

For measurements below 1GHz the resolution bandwidth is set to 100kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video band width is set to 3MHz for peak measurements and as applicable for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.





2.13.3.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 (or average) limit, it is unnecessary to perform an quasi-peak measurement (or average).

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.

Note 1: 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.

Note 2: For the frequency, which started from 9kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.

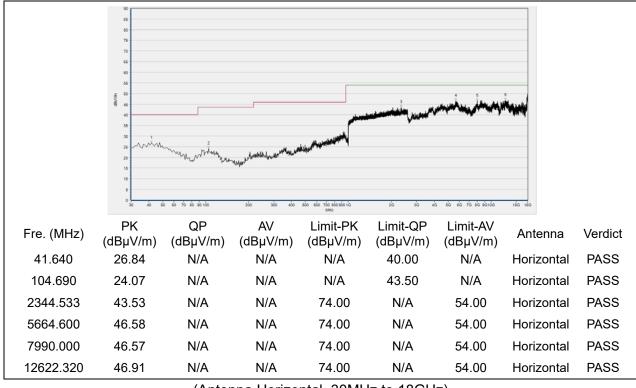
Note 3: For the frequency, which started from 18GHz to 40GHz, was pre-scanned and the result which was 20dB lower than the limit was not recorded.



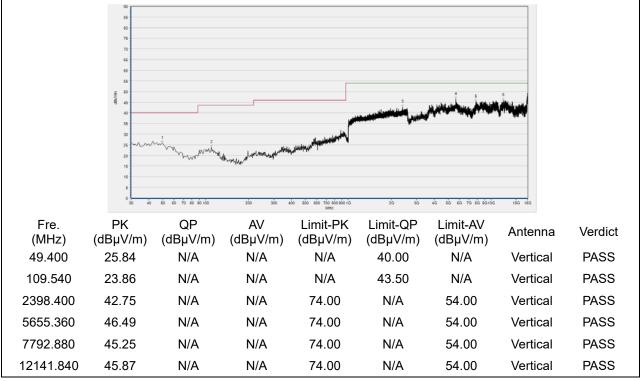


GFSK Mode

Plots for Channel 0



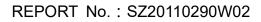
(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

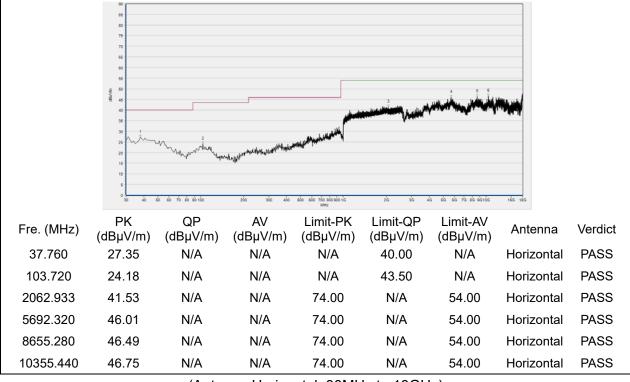


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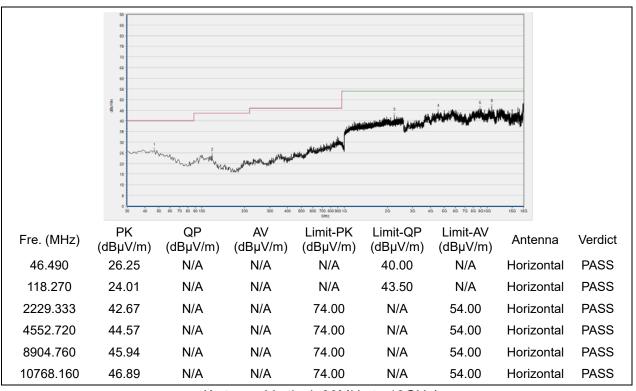




Plot for Channel 39



(Antenna Horizontal, 30MHz to 18GHz)



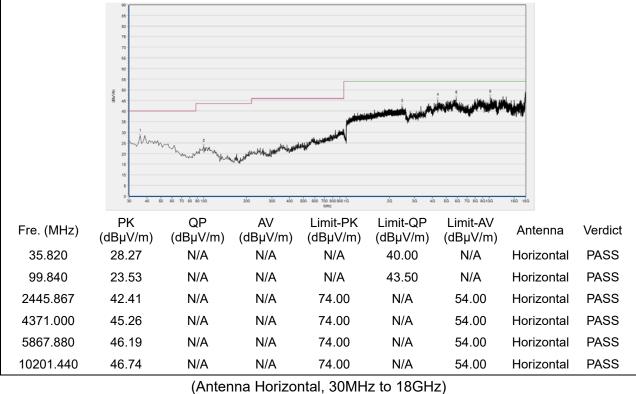
(Antenna Vertical, 30MHz to 18GHz)

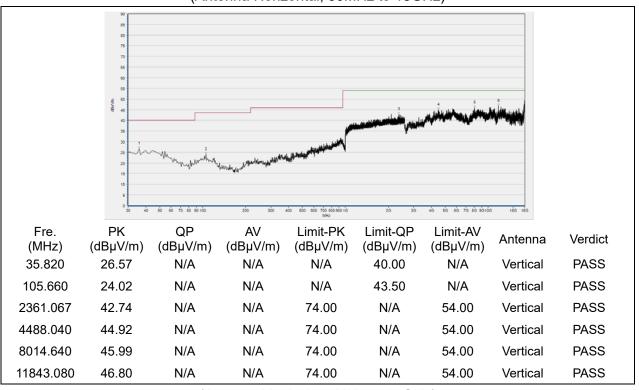


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Plot for Channel 78

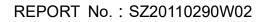




(Antenna Vertical, 30MHz to 18GHz)



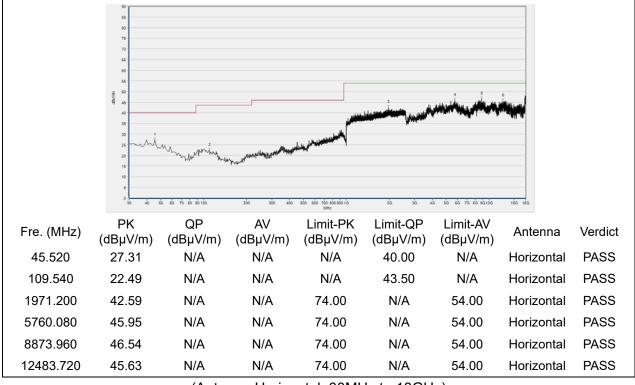
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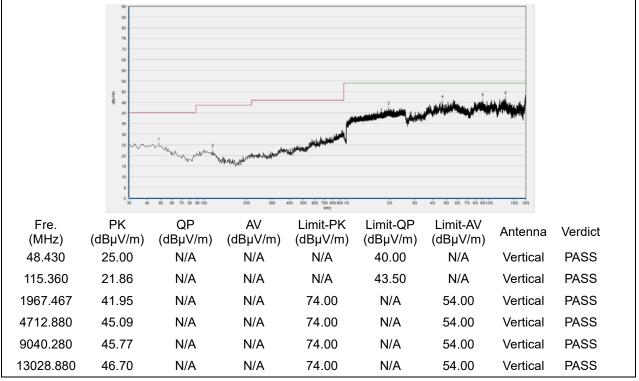


π/4-DQPSK Mode

Plots for Channel 0



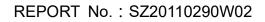
(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

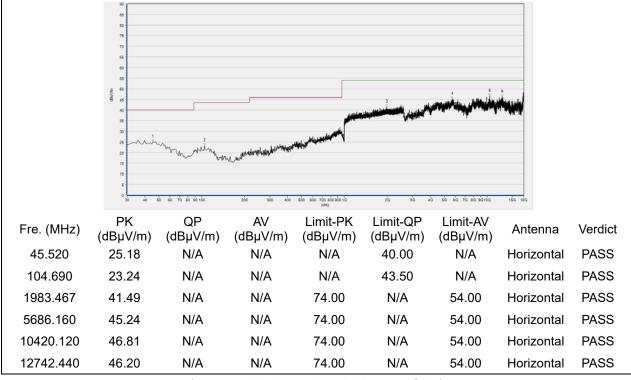


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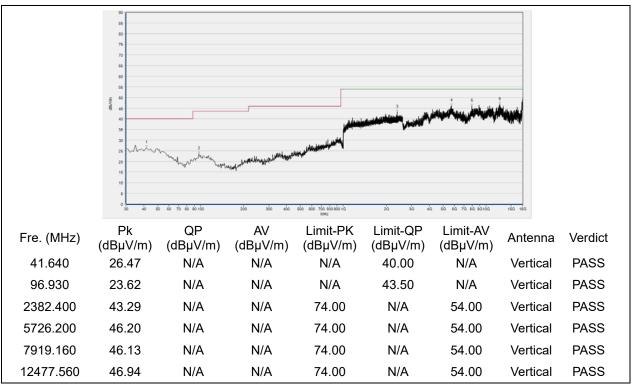




Plot for Channel 39



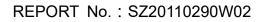
(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

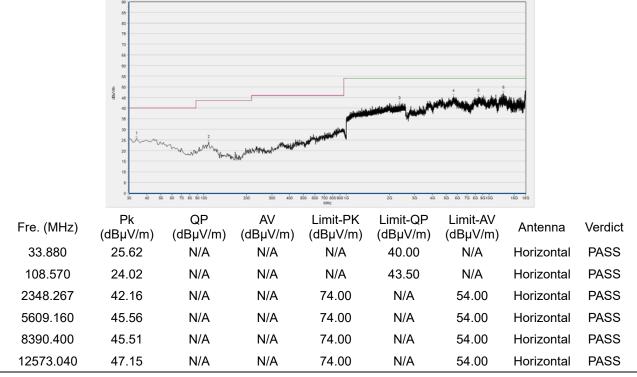


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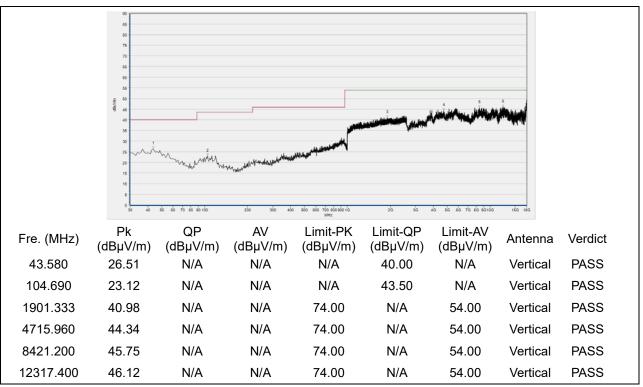




Plot for Channel 78



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

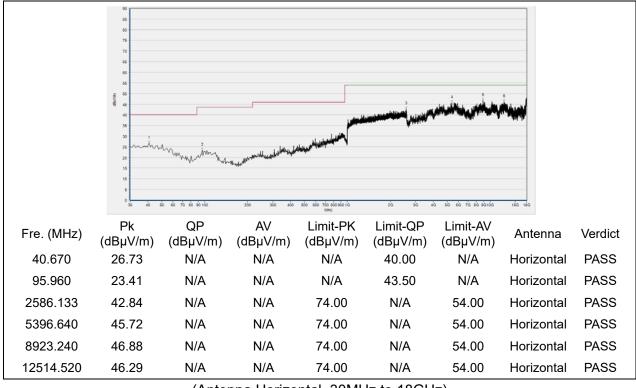


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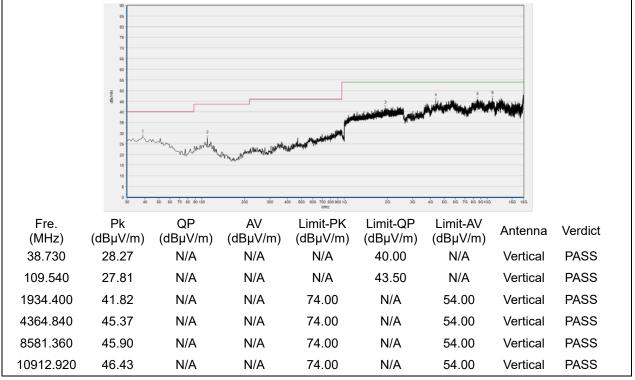


8-DPSK Mode

Plots for Channel 0



(Antenna Horizontal, 30MHz to 18GHz)



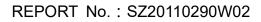
(Antenna Vertical, 30MHz to 18GHz)



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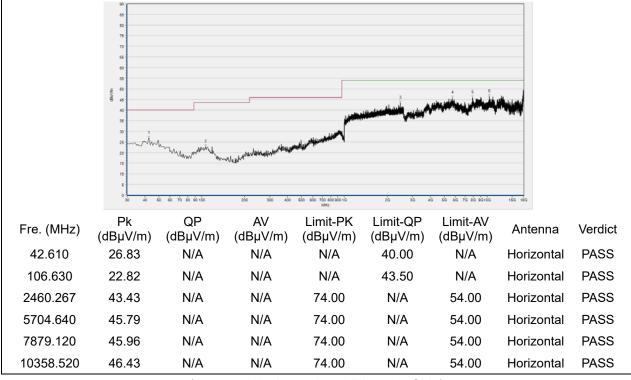
Fax: 86-755-36698525

cn E-mail: service@morlab.cn

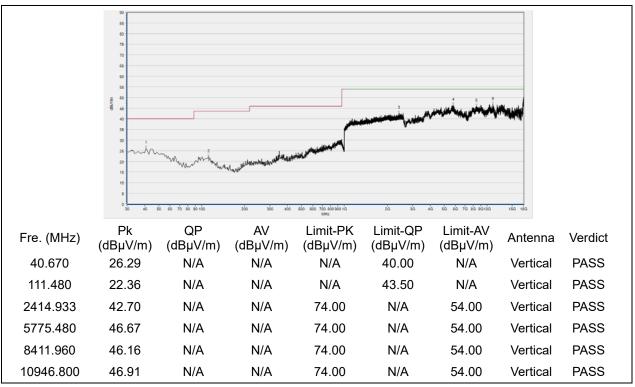




Plot for Channel 39



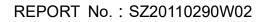
(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)

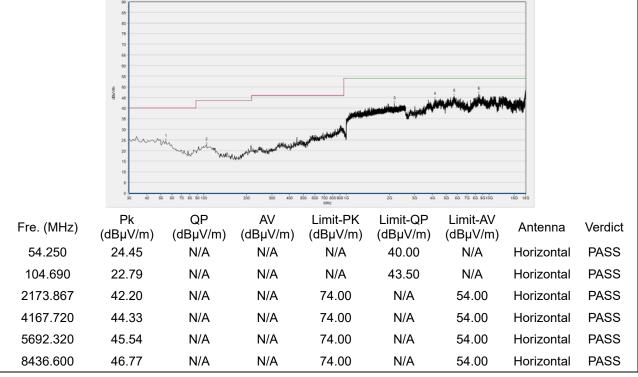


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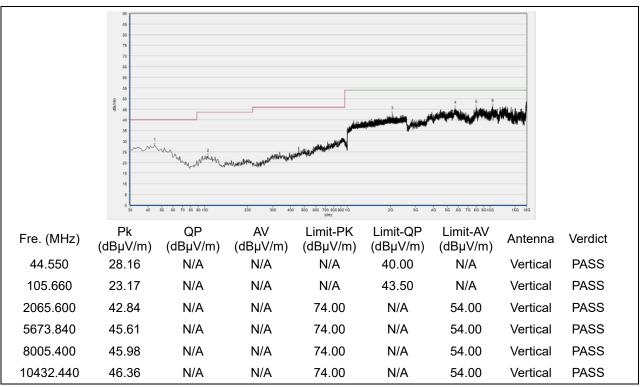




Plot for Channel 78



(Antenna Horizontal, 30MHz to 18GHz)



(Antenna Vertical, 30MHz to 18GHz)



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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%
±2.77dB
±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

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

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.		
	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 C63.10-2013and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.





4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Due Date
Bluetooth Base Station	6K00006210	MT8852B	Anritsu	2020.04.01	2021.03.31
Directional coupler	17041703	DTO-5-30	ShangHaiHuaxiang	N/A	N/A
EXA Signal Analzyer	MY53470836	N9010A	Agilent	2020.04.01	2021.03.31
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	Due Date
Receiver	MY56400093	N9038A	KEYSIGHT	2020.03.26	2021.03.25
LISN	812744	NSLK	Schwarzbeck	2020.03.26	2021.03.25
LIGIN		8127			
Pulse Limiter	VTSD 9561	VTSD	Schwarzbeck	2020.07.24	2021.07.23
(10dB)	F-B #206	9561-F	Schwarzbeck		
Coaxial					
cable(BNC)	CB01	EMC01	Morlab	N/A	N/A
(30MHz-26GHz)					
Computer	DF2DR A01	VOSTRO	DELL	N/A	N/A
	DPC	5370			
PC Adapter	N/A	LA45NM1	LITEON	N/A	N/A
		40			

4.3 List of Software Used

Description	Manufacturer	Software Version
Test System	Tonscend	V2.6
Power Panel	Agilent	V3.8
MORLAB EMCR V1.2	MORLAB	V1.0
TS+ -[JS32-CE]	Tonscend	V2.5.0.0





4.4 Radiated Test Equipments

Equipment Name	Serial No.	Туре	Manufacturer	Cal. Date	Due Date
Receiver	MY54130016	N9038A	Agilent	2020.07.21	2021.07.20
Test Antenna - Bi-Log	9163-519	VULB 9163	Schwarzbeck	2019.05.24	2022.05.23
Test Antenna - Loop	1519-022	FMZB1519	Schwarzbeck	2019.02.14	2022.02.13
Test Antenna – Horn	01774	BBHA 9120D	Schwarzbeck	2019.07.26	2022.07.25
Test Antenna – Horn	BBHA9170 #774	BBHA9170	Schwarzbeck	2019.07.26	2022.07.25
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
Coaxial cable (N male) (30MHz-40GHz)	CB05	EMC05	Morlab	N/A	N/A
1-18GHz pre-Amplifier	61171/61172	S020180L32 03	Tonscend	2020.07.21	2021.07.20
18-26.5GHz pre-Amplifier	46732	S10M100L38 02	Tonscend	2020.07.21	2021.07.20
26-40GHz pre-Amplifier	56774	S40M400L40 02	Tonscend	2020.07.21	2021.07.20
Notch Filter	N/A	WRCG-2400- 2483.5-60SS	Wainwright	2020.07.21	2021.07.20
Anechoic Chamber	N/A	9m*6m*6m	CRT	2020.01.06	2023.01.05

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