

TEST REPORT

Applicant: SHENZHEN ALEX TECHNOLOGY CO., LTD.

Address of Applicant: 7th Floor, Building B, Tangxi Zhigu, Xijing Road, Xixiang, Baoan, Shenzhen, China

Manufacturer/Factory: SHENZHEN ALEX TECHNOLOGY CO., LTD.

Address of Manufacturer/Factory: 7th Floor, Building B, Tangxi Zhigu, Xijing Road, Xixiang, Baoan, Shenzhen, China

Equipment Under Test (EUT)

Product Name: Open Ear Headphones

Model No.: OPENEAR Air F3, OPENEAR Air F3A, OPENEAR Bone F1, OPENEAR Bone F4, BoneHearing S1, BoneHearing F2, BoneHearing F2C, BoneHearing F2H, BoneHearing F2A, BoneHearing F2B, HearBoost F11, HearBoost F12, 3304460, OPENEAR F8A, OPENEAR F8B, OPENEAR F8C

Trade Mark: ALOVA

FCC ID: 2AP4P-OPENEAR-F3

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

Date of sample receipt: Apr. 17, 2025

Date of Test: Apr. 17, 2025 to Apr. 21, 2025

Date of report issued: Apr. 22, 2025

Test Result : PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

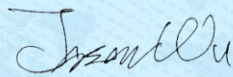
Robinson Luo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	Apr. 22, 2025	Original

Prepared By:

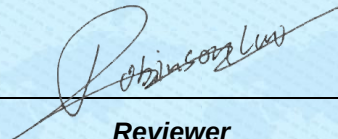


Date:

2025-04-22

Project Engineer

Check By:



Date:

2025-04-22

Reviewer

3 Contents

	Page
1 COVER PAGE.....	1
2 VERSION	2
3 CONTENTS	3
4 TEST SUMMARY	4
4.1 MEASUREMENT UNCERTAINTY	4
5 GENERAL INFORMATION	5
5.1 GENERAL DESCRIPTION OF EUT	5
5.2 TEST MODE	7
5.3 DESCRIPTION OF SUPPORT UNITS	7
5.4 DEVIATION FROM STANDARDS.....	7
5.5 ABNORMALITIES FROM STANDARD CONDITIONS	7
5.6 TEST FACILITY.....	7
5.7 TEST LOCATION	7
5.8 ADDITIONAL INSTRUCTIONS.....	7
6 TEST INSTRUMENTS LIST	8
7 TEST RESULTS AND MEASUREMENT DATA.....	10
7.1 ANTENNA REQUIREMENT	10
7.2 CONDUCTED EMISSIONS	11
7.3 RADIATED EMISSION METHOD	14
7.3.1 Field Strength of The Fundamental Signal	16
7.3.2 Spurious emissions.....	17
7.3.3 Bandedge emissions.....	28
7.4 20dB OCCUPY BANDWIDTH	30
8 TEST SETUP PHOTO	37
9 EUT CONSTRUCTIONAL DETAILS	37

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Remarks:

1. Pass: The EUT complies with the essential requirements in the standard.
2. N/A: Not applicable.
3. Test according to ANSI C63.10:2013

4.1 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	RF conducted power	$\pm 0.75\text{dB}$
5	RF power density	$\pm 3\text{dB}$
6	Conducted Spurious emissions	$\pm 2.58\text{dB}$
7	AC Power Line Conducted Emission	$\pm 3.44\text{dB}$ (0.15MHz ~ 30MHz)
8	Radiated Spurious emission test	$\pm 3.1\text{dB}$ (9kHz-30MHz)
		$\pm 3.8039\text{dB}$ (30MHz-200MHz)
		$\pm 3.9679\text{dB}$ (200MHz-1GHz)
		$\pm 4.29\text{dB}$ (1GHz-18GHz)
		$\pm 3.30\text{dB}$ (18GHz-40GHz)
9	Temperature test	$\pm 1^\circ\text{C}$
10	Humidity test	$\pm 3\%$
11	Time	$\pm 3\%$

5 General Information

5.1 General Description of EUT

Product Name:	Open Ear Headphones
Model No.:	OPENEAR Air F3, OPENEAR Air F3A, OPENEAR Bone F1, OPENEAR Bone F4, BoneHearing S1, BoneHearing F2, BoneHearing F2C, BoneHearing F2H, BoneHearing F2A, BoneHearing F2B, HearBoost F11, HearBoost F12, 3304460, OPENEAR F8A, OPENEAR F8B, OPENEAR F8C
Test Model No.:	OPENEAR Air F3
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits. The only difference is model name for commercial purpose.	
Serial No.:	OPENEAR Air F3A, OPENEAR Bone F1, OPENEAR Bone F4, BoneHearing S1, BoneHearing F2, BoneHearing F2C, BoneHearing F2H, BoneHearing F2A, BoneHearing F2B, HearBoost F11, HearBoost F12, 3304460, OPENEAR F8A, OPENEAR F8B, OPENEAR F8C
Test sample(s) ID:	GTSL2025040446-1
Sample(s) Status	Engineered sample
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Modulation type:	GFSK, $\pi/4$ DQPSK, 8DPSK
Antenna Type:	Chip Antenna
Antenna gain:	0.26 dBi(declare by applicant)
Power supply:	DC 5.0V from adapter or DC 3.7V from Li-battery

Remark:

1. Antenna gain information provided by the customer
2. The relevant information of the sample is provided by the entrusting company, and the laboratory is not responsible for its authenticity.

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402	21	2423	42	2444	63	2465
01	2403	22	2424	43	2445	64	2466
02	2404	23	2425	44	2446	65	2467
03	2405	24	2426	45	2447	66	2468
04	2406	25	2427	46	2448	67	2469
05	2407	26	2428	47	2449	68	2470
06	2408	27	2429	48	2450	69	2471
07	2409	28	2430	49	2451	70	2472
08	2410	29	2431	50	2452	71	2473
09	2411	30	2432	51	2453	72	2474
10	2412	31	2433	52	2454	73	2475
11	2413	32	2434	53	2455	74	2476
12	2414	33	2435	54	2456	75	2477
13	2415	34	2436	55	2457	76	2478
14	2416	35	2437	56	2458	77	2479
15	2417	36	2438	57	2459	78	2480
16	2418	37	2439	58	2460		
17	2419	38	2440	59	2461		
18	2420	39	2441	60	2462		
19	2421	40	2442	61	2463		
20	2422	41	2443	62	2464		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2441MHz
The highest channel	2480MHz

5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
Remark: New battery is used during all test.	

5.3 Description of Support Units

None.

5.4 Deviation from Standards

None.

5.5 Abnormalities from Standard Conditions

None.

5.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations: ● FCC—Registration No.: 381383 Designation Number: CN5029 Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. ● ISED —Registration No.: 9079A CAB identifier: CN0091 The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of ISED for radio equipment testing ● NVLAP (LAB CODE:600179-0) Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

5.7 Test Location

All tests were performed at:
Global United Technology Services Co., Ltd. Address: No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102 Tel: 0755-27798480 Fax: 0755-27798960

5.8 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default

6 Test Instruments list

Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Apr. 11, 2025	Apr. 10, 2026
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Apr. 12, 2025	Apr. 11, 2026
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	Apr. 12, 2025	Apr. 11, 2026
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	Apr. 11, 2025	Apr. 10, 2026
6	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	Jul. 02, 2024	Jul. 01, 2025
7	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov.16, 2024	Nov.15, 2025
8	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	Apr. 11, 2025	Apr. 10, 2026
9	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	Apr. 11, 2025	Apr. 10, 2026
10	Horn Antenna (18GH-40GHz)	Schwarzbeck	BBHA 9170	GTS691	Apr. 11, 2025	Apr. 10, 2026
11	FSV·Signal Analyzer (10Hz-40GHz)	Keysight	FSV-40-N	GTS666	Mar. 11, 2025	Mar. 10, 2026
12	Amplifier	/	LNA-1000-30S	GTS650	Apr. 11, 2025	Apr. 10, 2026
13	CDNE M2+M3-16A	HCT	30MHz-300MHz	GTS692	Nov. 13, 2024	Nov. 12, 2025
14	Wideband Amplifier	/	WDA-01004000-15P35	GTS602	Apr. 11, 2025	Apr. 10, 2026
15	Thermo meter	JINCHUANG	GSP-8A	GTS643	Apr. 15, 2025	Apr. 14, 2026
16	RE cable 1	GTS	N/A	GTS675	Jul. 02, 2024	Jul. 01, 2025
17	RE cable 2	GTS	N/A	GTS676	Jul. 02, 2024	Jul. 01, 2025
18	RE cable 3	GTS	N/A	GTS677	Jul. 02, 2024	Jul. 01, 2025
19	RE cable 4	GTS	N/A	GTS678	Jul. 02, 2024	Jul. 01, 2025
20	RE cable 5	GTS	N/A	GTS679	Jul. 02, 2024	Jul. 01, 2025
21	RE cable 6	GTS	N/A	GTS680	Jul. 02, 2024	Jul. 01, 2025
22	RE cable 7	GTS	N/A	GTS681	Jul. 05, 2024	Jul. 04, 2025
23	RE cable 8	GTS	N/A	GTS682	Jul. 05, 2024	Jul. 04, 2025
24	EMI Test Software	AUDIX	E3-6.100614a	GTS725	N/A	N/A

Conducted Emission						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	Jul. 12, 2022	Jul. 11, 2027
2	EMI Test Receiver	R&S	ESCI 7	GTS552	Apr. 12, 2025	Apr. 11, 2026
3	LISN	ROHDE & SCHWARZ	ENV216	GTS226	Apr. 11, 2025	Apr. 10, 2026
4	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A
5	Thermo meter	JINCHUANG	GSP-8A	GTS642	Apr. 15, 2025	Apr. 14, 2026
6	Absorbing clamp	Elektronik-Feinmechanik	MDS21	GTS229	Apr. 12, 2025	Apr. 11, 2026
7	ISN	SCHWARZBECK	NTFM 8158	GTS565	Apr. 11, 2025	Apr. 10, 2026
8	High voltage probe	SCHWARZBECK	TK9420	GTS537	Apr. 11, 2025	Apr. 10, 2026
9	Antenna end assembly	Weinschel	1870A	GTS560	Apr. 11, 2025	Apr. 10, 2026
10	EMI Test Software	AUDIX	E3-6.100622	GTS726	N/A	N/A
11	Current probe	CYBERTEK	EM5011	GTS698	Jan. 13, 2025	Jan. 12, 2026

RF Conducted Test:						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	Apr. 11, 2025	Apr. 10, 2026
2	EMI Test Receiver	R&S	ESCI 7	GTS552	Apr. 12, 2025	Apr. 11, 2026
3	PSA Series Spectrum Analyzer	Agilent	E4440A	GTS536	Apr. 11, 2025	Apr. 10, 2026
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	Apr. 11, 2025	Apr. 10, 2026
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	Apr. 11, 2025	Apr. 10, 2026
6	Wideband Power Meter	Keysight	N1924A	GTS673	Apr. 11, 2025	Apr. 10, 2026
7	USB RF Power Sensor	DARE	RPR3006W	GTS569	Apr. 11, 2025	Apr. 10, 2026
8	RF Switch Box	Shongyi	RFSW3003328	GTS571	Apr. 11, 2025	Apr. 10, 2026
9	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	Apr. 11, 2025	Apr. 10, 2026
10	Thermo meter	JINCHUANG	GSP-8A	GTS641	Apr. 15, 2025	Apr. 14, 2026

General used equipment:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Barometer	KUMAO	SF132	GTS647	Aug. 17, 2024	Aug. 16, 2025

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.	
EUT Antenna:	
The antenna is chip antenna, reference to the appendix II for details.	

7.2 Conducted Emissions

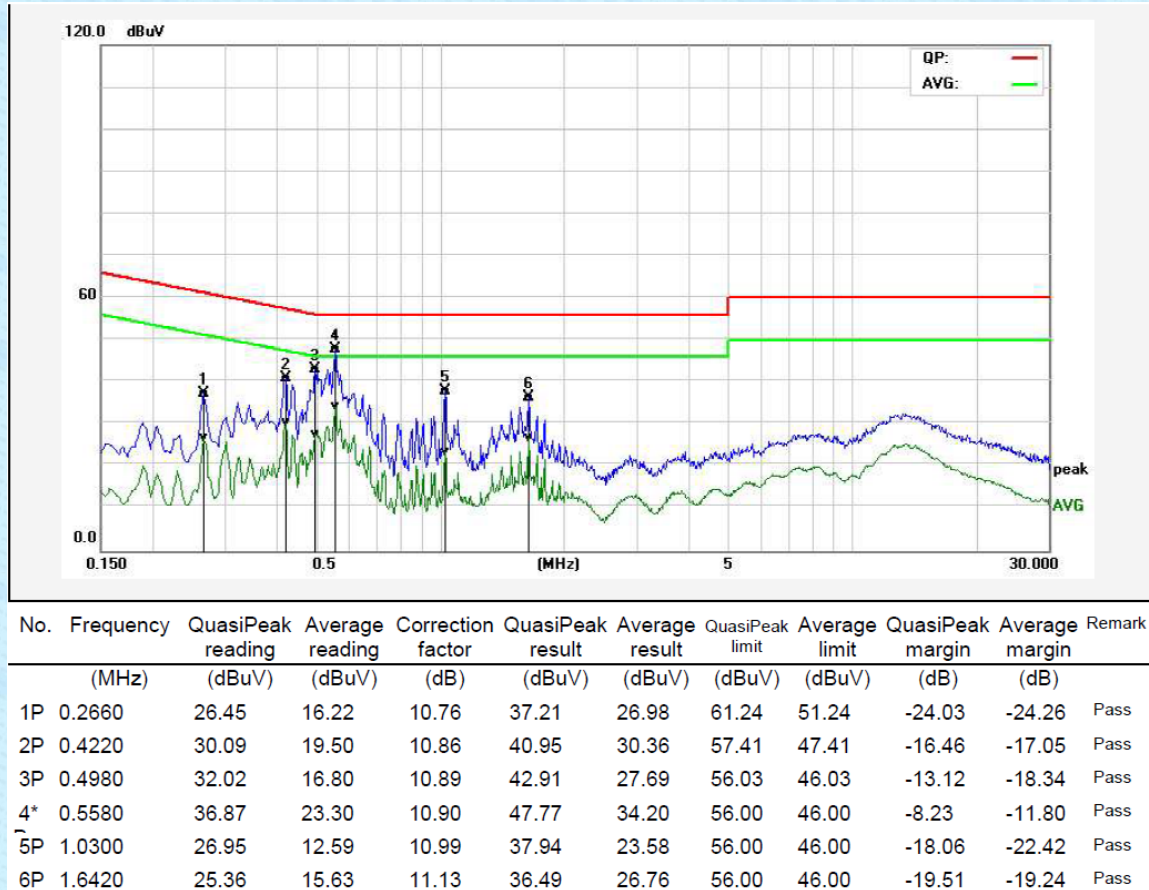
Test Requirement:	FCC Part15 C Section 15.207						
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	150KHz to 30MHz						
Class / Severity:	Class B						
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto						
Limit:	Frequency range (MHz)		Limit (dBuV)				
			Quasi-peak		Average		
	0.15-0.5		66 to 56*		56 to 46*		
	0.5-5		56		46		
	5-30		60		50		
* Decreases with the logarithm of the frequency.							
Test setup:	Reference Plane 40cm LISN 40cm AUX Equipment E.U.T Test table/Insulation plane 80cm 40cm LISN Filter AC power EMI Receiver Remark E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m						
Test procedure:	1. The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.						
Test Instruments:	Refer to section 6.0 for details						
Test mode:	Refer to section 5.2 for details						
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar	
Test voltage:	AC 120V, 60Hz						
Test results:	Pass						

Remark:

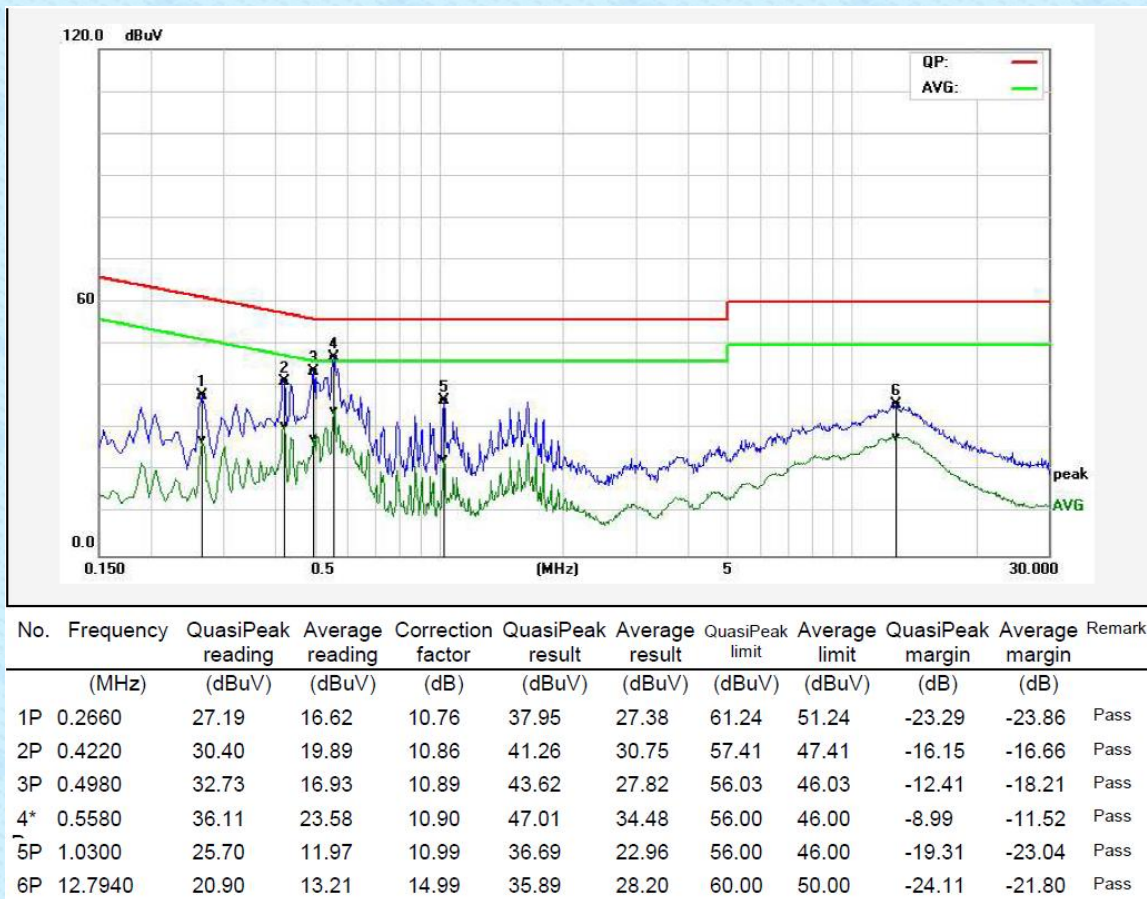
1. All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
2. All modes were test at Low, Middle, and High channel, only the worst result of 8DPSK High Channel was reported.

Measurement data

Line:



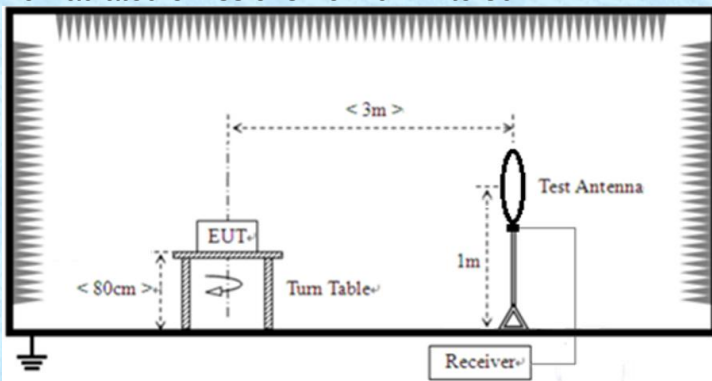
Neutral:

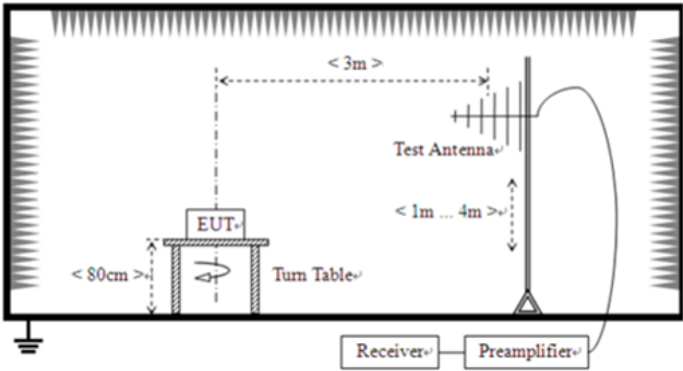
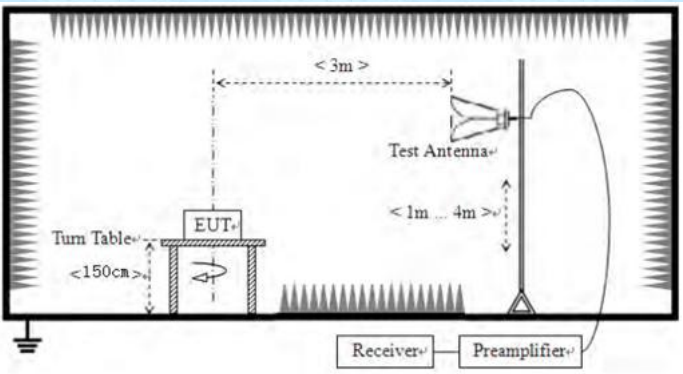


Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss
4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

7.3 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209																																	
Test Method:	ANSI C63.10:2013																																	
Test Frequency Range:	9kHz to 25GHz																																	
Test site:	Measurement Distance: 3m																																	
Receiver setup:	<table><tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr><tr><td>9kHz-150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>300Hz</td><td>Quasi-peak Value</td></tr><tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>10kHz</td><td>Quasi-peak Value</td></tr><tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr><tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr></table> Note: For Duty cycle $\geq 98\%$, average detector set as above, For Duty cycle $< 98\%$, average detector set as below: $VBW \geq 1 / T$					Frequency	Detector	RBW	VBW	Remark	9kHz-150kHz	Quasi-peak	200Hz	300Hz	Quasi-peak Value	150kHz-30MHz	Quasi-peak	9kHz	10kHz	Quasi-peak Value	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value	Above 1GHz	Peak	1MHz	3MHz	Peak Value	Peak	1MHz	10Hz	Average Value
Frequency	Detector	RBW	VBW	Remark																														
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Above 1GHz	Peak	1MHz	3MHz	Peak Value																														
	Peak	1MHz	10Hz	Average Value																														
Limit: (Field strength of the fundamental signal)	<table><tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr><tr><td rowspan="2">2400 Hz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr><tr><td>114.00</td><td>Peak Value</td></tr></table>		Frequency	Limit (dBuV/m @3m)	Remark	2400 Hz-2483.5MHz	94.00	Average Value	114.00	Peak Value																								
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Limit: (Spurious Emissions)	<table><tr><td>Frequency</td><td>Limit (dBuV/m)</td><td>Remark</td></tr><tr><td>0.009MHz -0.490MHz</td><td>2400 / F(kHz) @30m</td><td>Quasi-peak Value</td></tr><tr><td>0.490MHz-1.705MHz</td><td>24000/F(kHz) @30m</td><td>Quasi-peak Value</td></tr><tr><td>1.705MHz-30.0MHz</td><td>30 @30m</td><td>Quasi-peak Value</td></tr><tr><td>30MHz-88MHz</td><td>100 @3m</td><td>Quasi-peak Value</td></tr><tr><td>88MHz-216MHz</td><td>150 @3m</td><td>Quasi-peak Value</td></tr><tr><td>216MHz-960MHz</td><td>200 @3m</td><td>Quasi-peak Value</td></tr><tr><td>960MHz-1GHz</td><td>500 @3m</td><td>Quasi-peak Value</td></tr><tr><td rowspan="2">Above 1GHz</td><td>500 @3m</td><td>Average Value</td></tr><tr><td>5000 @3m</td><td>Peak Value</td></tr></table>		Frequency	Limit (dBuV/m)	Remark	0.009MHz -0.490MHz	2400 / F(kHz) @30m	Quasi-peak Value	0.490MHz-1.705MHz	24000/F(kHz) @30m	Quasi-peak Value	1.705MHz-30.0MHz	30 @30m	Quasi-peak Value	30MHz-88MHz	100 @3m	Quasi-peak Value	88MHz-216MHz	150 @3m	Quasi-peak Value	216MHz-960MHz	200 @3m	Quasi-peak Value	960MHz-1GHz	500 @3m	Quasi-peak Value	Above 1GHz	500 @3m	Average Value	5000 @3m	Peak Value			
Frequency	Limit (dBuV/m)	Remark																																
0.009MHz -0.490MHz	2400 / F(kHz) @30m	Quasi-peak Value																																
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Above 1GHz	500 @3m	Average Value																																
	5000 @3m	Peak Value																																
Limit: (band edge)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.																																	
Test setup:	For radiated emissions from 9kHz to 30MHz 																																	

	Report No.: CPCELL200401101-01 For radiated emissions from 30MHz to1GHz  For radiated emissions above 1GHz 					
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.					
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
Test voltage:	AC 120V, 60Hz					
Test results:	Pass					

Measurement data:

7.3.1 Field Strength of The Fundamental Signal

GFSK:

Test frequency (MHz)	Fundamental Frequency (MHz)	Field strength of fundamental level (dB μ V/m)		Limit (dBuV)		Result	Antenna Pole (H/V)
		AVG	Peak	AVG	Peak		
2402	2401.762	77.48	98.00	94	114	Pass	H
	2401.858	77.21	97.56	94	114	Pass	V
2441	2440.935	77.57	98.10	94	114	Pass	H
	2440.879	77.40	97.83	94	114	Pass	V
2480	2479.822	78.13	98.66	94	114	Pass	H
	2479.918	77.96	98.33	94	114	Pass	V

$\pi/4$ DQPSK:

Test frequency (MHz)	Fundamental Frequency (MHz)	Field strength of fundamental level (dB μ V/m)		Limit (dBuV)		Result	Antenna Pole (H/V)
		AVG	Peak	AVG	Peak		
2402	2401.851	75.56	95.88	94	114	Pass	H
	2402.924	75.39	95.63	94	114	Pass	V
2441	2440.819	78.67	99.08	94	114	Pass	H
	2440.787	78.43	98.67	94	114	Pass	V
2480	2480.059	79.04	99.56	94	114	Pass	H
	2480.033	78.80	99.16	94	114	Pass	V

8DPSK:

Test frequency (MHz)	Fundamental Frequency (MHz)	Field strength of fundamental level (dB μ V/m)		Limit (dBuV)		Result	Antenna Pole (H/V)
		AVG	Peak	AVG	Peak		
2402	2401.869	78.93	99.23	94	114	Pass	H
	2401.774	78.65	99.09	94	114	Pass	V
2441	2440.958	78.97	99.35	94	114	Pass	H
	2440.911	78.86	99.14	94	114	Pass	V
2480	2479.883	79.54	99.81	94	114	Pass	H
	2479.891	79.28	99.63	94	114	Pass	V

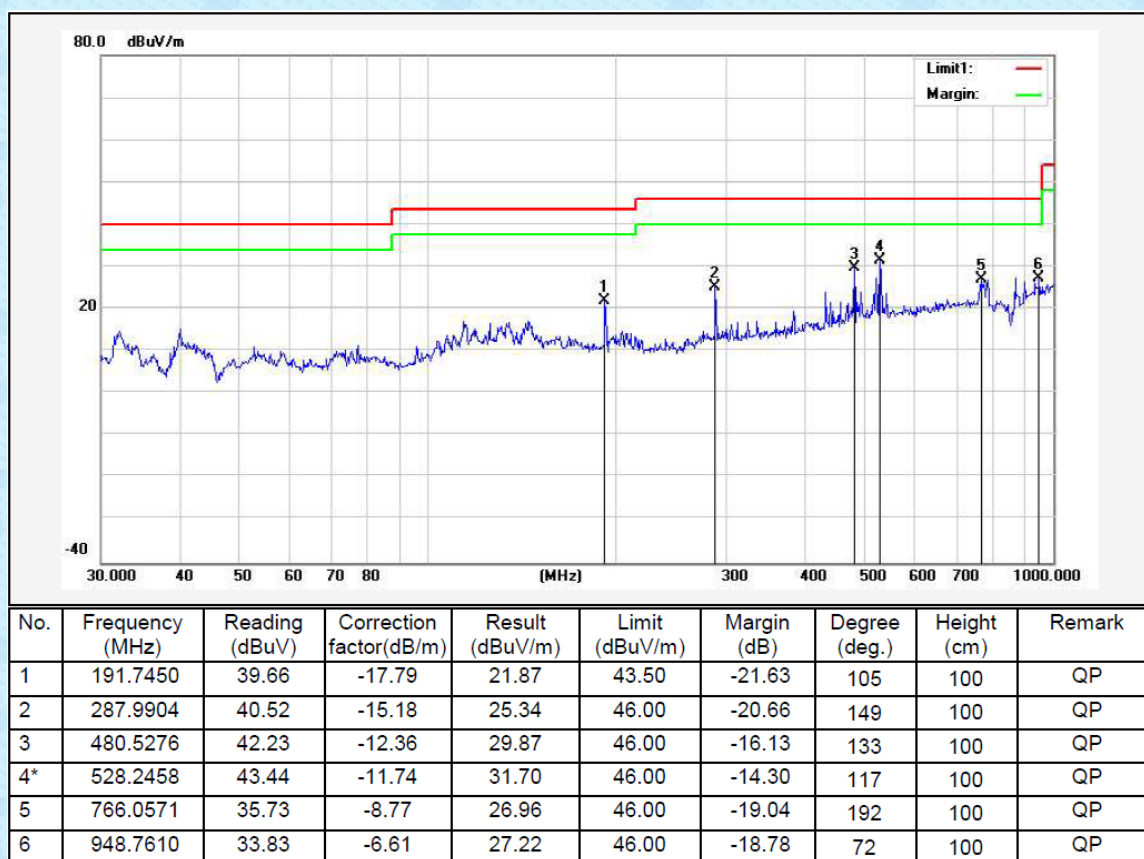
7.3.2 Spurious emissions

■ Below 30MHz

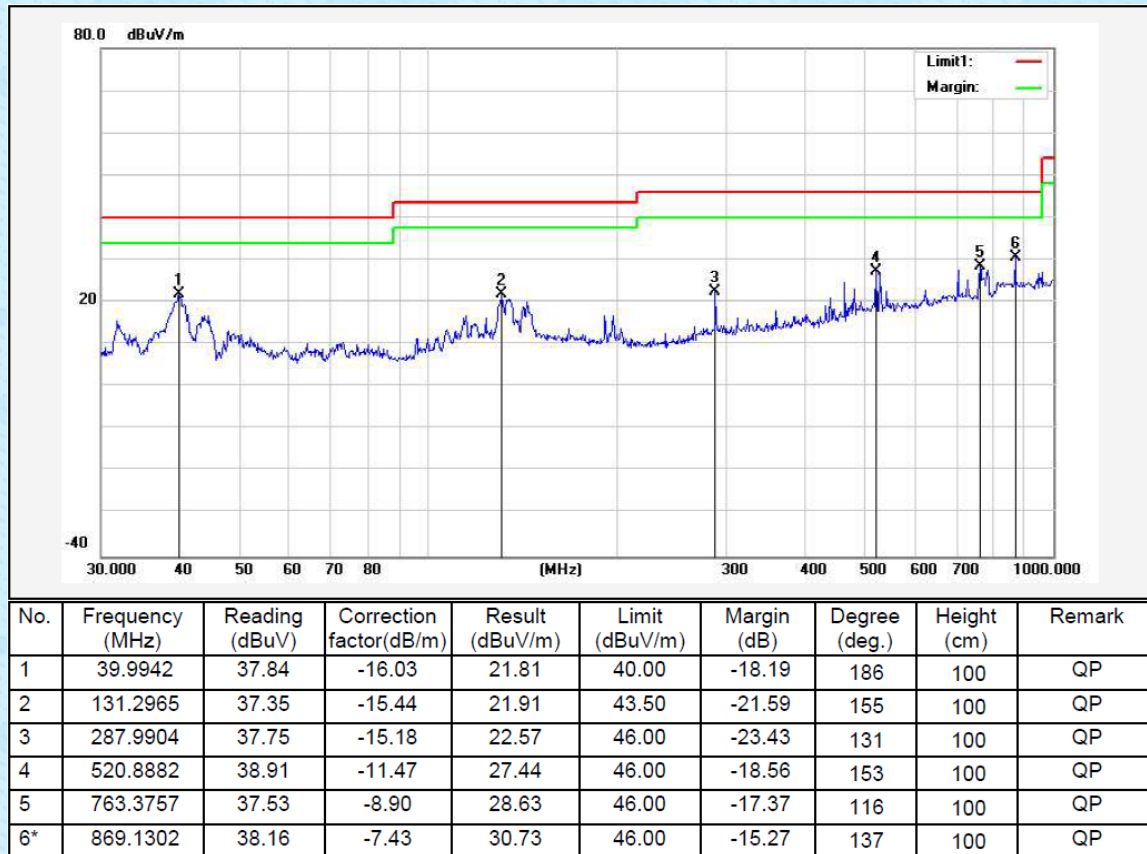
The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o), the test result no need to reported.

■ Below 1GHz

Horizontal:



Vertical:



Remark:

All modes were test at Low, Middle, and High channel, only the worst result of 8DPSK High Channel was reported for below 1GHz test.

Above 1GHz
GFSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402	103.84	-5.84	98	114	-16	PK
2402	83.32	-5.84	77.48	94	-16.52	AV
4804	60.47	-3.64	56.83	74	-17.17	PK
4804	40.38	-3.64	36.74	54	-17.26	AV
7206	57.36	-0.95	56.41	74	-17.59	PK
7206	37.08	-0.95	36.13	54	-17.87	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402	103.4	-5.84	97.56	114	-16.44	PK
2402	83.05	-5.84	77.21	94	-16.79	AV
4804	60.36	-3.64	56.72	74	-17.28	PK
4804	40.21	-3.64	36.57	54	-17.43	AV
7206	57.03	-0.95	56.08	74	-17.92	PK
7206	36.56	-0.95	35.61	54	-18.39	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	103.81	-5.71	98.1	114	-15.9	PK
2441	83.28	-5.71	77.57	94	-16.43	AV
4882	60.45	-3.51	56.94	74	-17.06	PK
4882	40.4	-3.51	36.89	54	-17.11	AV
7323	57.37	-0.82	56.55	74	-17.45	PK
7323	37.04	-0.82	36.22	54	-17.78	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	103.54	-5.71	97.83	114	-16.17	PK
2441	83.11	-5.71	77.4	94	-16.6	AV
4882	60.39	-3.51	56.88	74	-17.12	PK
4882	40.2	-3.51	36.69	54	-17.31	AV
7323	57.12	-0.82	56.3	74	-17.7	PK
7323	36.59	-0.82	35.77	54	-18.23	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	104.31	-5.65	98.66	114	-15.34	PK
2480	83.78	-5.65	78.13	94	-15.87	AV
4960	61.11	-3.43	57.68	74	-16.32	PK
4960	41.04	-3.43	37.61	54	-16.39	AV
7440	57.99	-0.75	57.24	74	-16.76	PK
7440	37.67	-0.75	36.92	54	-17.08	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	103.96	-5.63	98.33	114	-15.67	PK
2480	83.61	-5.65	77.96	94	-16.04	AV
4960	60.97	-3.43	57.54	74	-16.46	PK
4960	40.72	-3.43	37.29	54	-16.71	AV
7440	57.65	-0.75	56.9	74	-17.1	PK
7440	37.12	-0.75	36.37	54	-17.63	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

$\pi/4$ DQPSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2402	101.72	-5.84	95.88	114	-18.12	PK
2402	81.4	-5.84	75.56	94	-18.44	AV
4804	58.56	-3.64	54.92	74	-19.08	PK
4804	38.47	-3.64	34.83	54	-19.17	AV
7206	55.43	-0.95	54.48	74	-19.52	PK
7206	35.17	-0.95	34.22	54	-19.78	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2402	101.47	-5.84	95.63	114	-18.37	PK
2402	81.23	-5.84	75.39	94	-18.61	AV
4804	58.57	-3.64	54.93	74	-19.07	PK
4804	38.4	-3.64	34.76	54	-19.24	AV
7206	55.28	-0.95	54.33	74	-19.67	PK
7206	35.03	-0.95	34.08	54	-19.92	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	104.79	-5.71	99.08	114	-14.92	PK
2441	84.38	-5.71	78.67	94	-15.33	AV
4882	61.6	-3.51	58.09	74	-15.91	PK
4882	41.49	-3.51	37.98	54	-16.02	AV
7323	58.44	-0.82	57.62	74	-16.38	PK
7323	38.17	-0.82	37.35	54	-16.65	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	104.38	-5.71	98.67	114	-15.33	PK
2441	84.14	-5.71	78.43	94	-15.57	AV
4882	61.43	-3.51	57.92	74	-16.08	PK
4882	41.19	-3.51	37.68	54	-16.32	AV
7323	58.15	-0.82	57.33	74	-16.67	PK
7323	37.59	-0.82	36.77	54	-17.23	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	105.21	-5.65	99.56	114	-14.44	PK
2480	84.69	-5.65	79.04	94	-14.96	AV
4960	61.99	-3.43	58.56	74	-15.44	PK
4960	41.88	-3.43	38.45	54	-15.55	AV
7440	58.91	-0.75	58.16	74	-15.84	PK
7440	38.56	-0.75	37.81	54	-16.19	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	104.79	-5.63	99.16	114	-14.84	PK
2480	84.45	-5.65	78.8	94	-15.2	AV
4960	61.81	-3.43	58.38	74	-15.62	PK
4960	41.49	-3.43	38.06	54	-15.94	AV
7440	58.46	-0.75	57.71	74	-16.29	PK
7440	37.97	-0.75	37.22	54	-16.78	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

8DPSK Modulation:
CH00 (2402MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402	105.07	-5.84	99.23	114	-14.77	PK
2402	84.77	-5.84	78.93	94	-15.07	AV
4804	61.92	-3.64	58.28	74	-15.72	PK
4804	41.82	-3.64	38.18	54	-15.82	AV
7206	58.8	-0.95	57.85	74	-16.15	PK
7206	38.55	-0.95	37.6	54	-16.4	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402	104.93	-5.84	99.09	114	-14.91	PK
2402	84.49	-5.84	78.65	94	-15.35	AV
4804	61.87	-3.64	58.23	74	-15.77	PK
4804	41.7	-3.64	38.06	54	-15.94	AV
7206	58.58	-0.95	57.63	74	-16.37	PK
7206	38.13	-0.95	37.18	54	-16.82	AV

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit

CH39 (2441MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	105.06	-5.71	99.35	114	-14.65	PK
2441	84.68	-5.71	78.97	94	-15.03	AV
4882	61.94	-3.51	58.43	74	-15.57	PK
4882	41.67	-3.51	38.16	54	-15.84	AV
7323	58.81	-0.82	57.99	74	-16.01	PK
7323	38.53	-0.82	37.71	54	-16.29	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441	104.85	-5.71	99.14	114	-14.86	PK
2441	84.57	-5.71	78.86	94	-15.14	AV
4882	61.91	-3.51	58.4	74	-15.6	PK
4882	41.69	-3.51	38.18	54	-15.82	AV
7323	58.54	-0.82	57.72	74	-16.28	PK
7323	38.08	-0.82	37.26	54	-16.74	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

CH78 (2480MHz)

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	105.46	-5.65	99.81	114	-14.19	PK
2480	85.19	-5.65	79.54	94	-14.46	AV
4960	62.65	-3.43	59.22	74	-14.78	PK
4960	42.53	-3.43	39.1	54	-14.9	AV
7440	59.52	-0.75	58.77	74	-15.23	PK
7440	39.28	-0.75	38.53	54	-15.47	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2480	105.26	-5.63	99.63	114	-14.37	PK
2480	84.93	-5.65	79.28	94	-14.72	AV
4960	62.26	-3.43	58.83	74	-15.17	PK
4960	42.08	-3.43	38.65	54	-15.35	AV
7440	58.96	-0.75	58.21	74	-15.79	PK
7440	38.44	-0.75	37.69	54	-16.31	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Emission Level – Limit						

Remark:

- Measuring frequencies from 1 GHz to the 25 GHz.
- “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
- * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120kHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10kHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
- For fundamental frequency, RBW >20dB BW, VBW>=3XRBW, PK detector for PK value, AV detector for AV value.

7.3.3 Bandedge emissions

All of the restriction bands were tested, and only the data of worst case 8DPSK was exhibited.

Test channel:	Lowest channel
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Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	56.53	-5.81	50.72	74	-23.28	PK
2310	/	-5.81	/	54	/	AV
2390	56.58	-5.84	50.74	74	-23.26	PK
2390	/	-5.84	/	54	/	AV
2400	56.5	-5.84	50.66	74	-23.34	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	56.29	-5.81	50.48	74	-23.52	PK
2310	/	-5.81	/	54	/	AV
2390	56.42	-5.84	50.58	74	-23.42	PK
2390	/	-5.84	/	54	/	AV
2400	56.57	-5.84	50.73	74	-23.27	PK
2400	/	-5.84	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Test channel:	Highest channel
---------------	-----------------

Horizontal:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	55.3	-5.65	49.65	74	-24.35	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.38	-5.72	50.66	74	-23.34	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

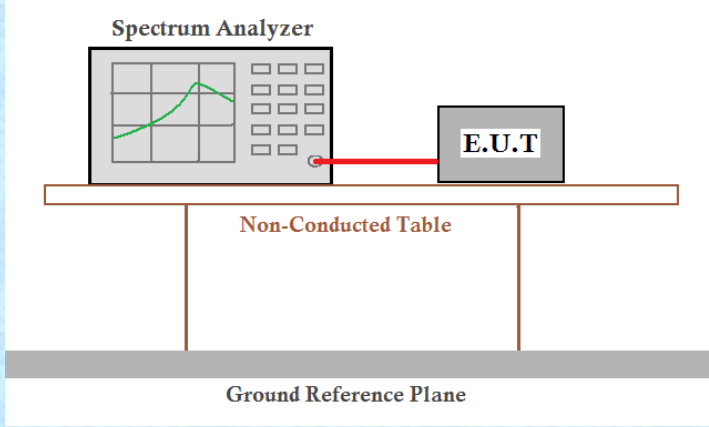
Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.5	56.87	-5.65	51.22	74	-22.78	PK
2483.5	/	-5.65	/	54	/	AV
2500	56.39	-5.72	50.67	74	-23.33	PK
2500	/	-5.72	/	54	/	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Note:

1. Since the peak value is less than the average limit, the average value does not reflected in the report.

7.4 20dB Occupy Bandwidth

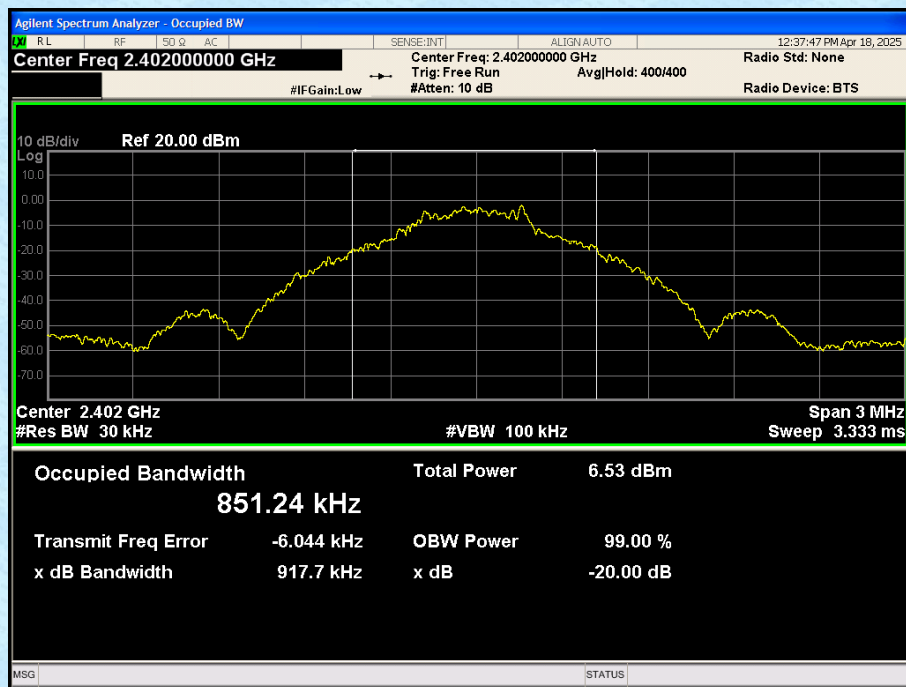
Test Requirement:	FCC Part15 C Section 15.249/15.215
Test Method:	ANSI C63.10:2013
Limit:	Operation Frequency range 2400MHz~2483.5MHz
Test setup:	 The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

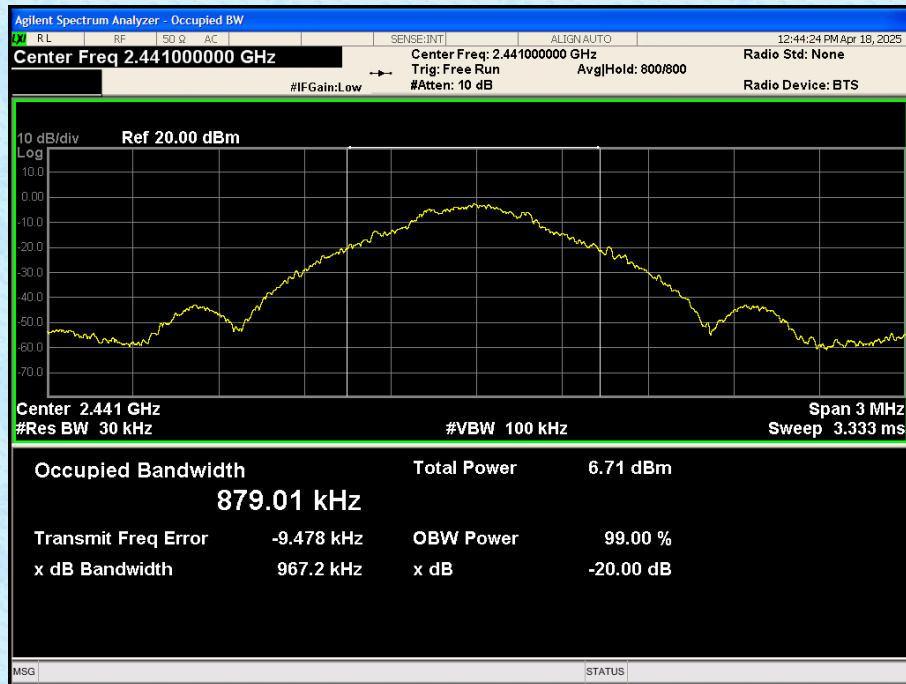
GFSK Modulation:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
CH00	2402	0.9177	PASS
CH39	2441	0.9672	PASS
CH78	2480	0.9787	PASS

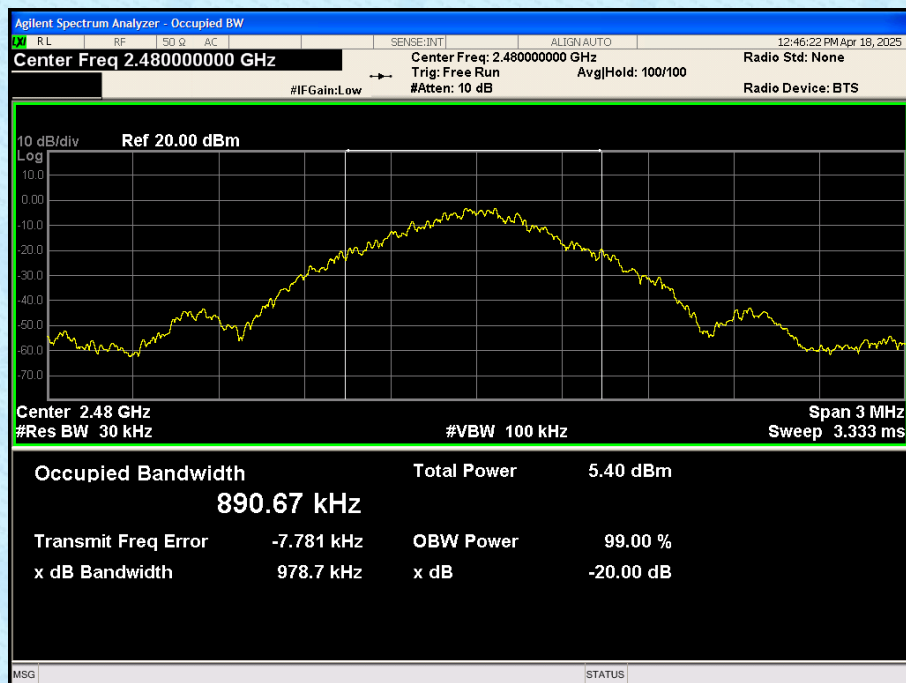
CH00: 2402MHz



CH39: 2441MHz



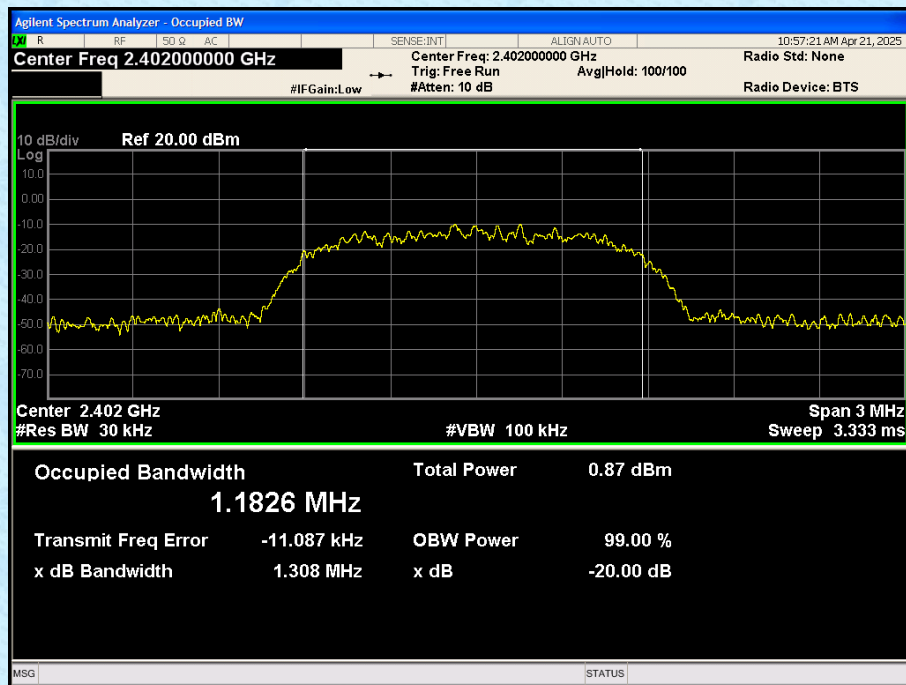
CH78: 2480MHz



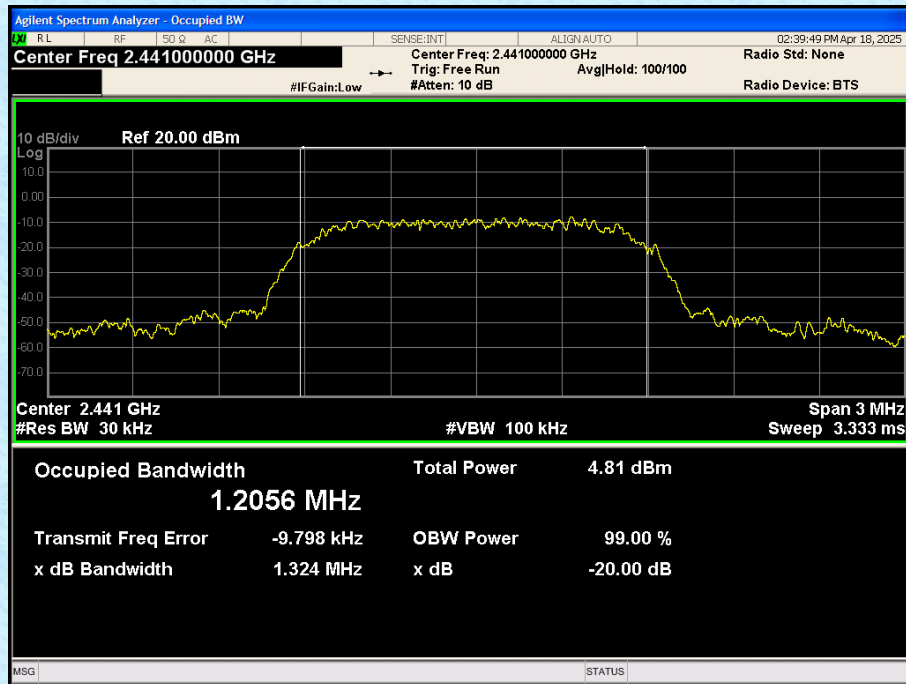
$\pi/4$ DQPSK Modulation:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
CH00	2402	1.308	PASS
CH39	2441	1.324	PASS
CH78	2480	1.286	PASS

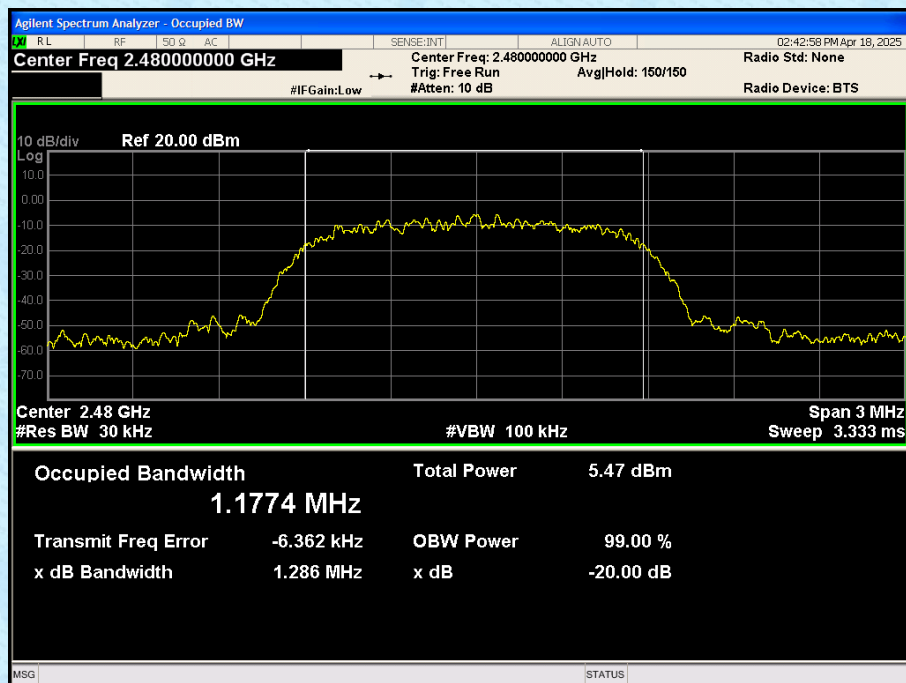
CH00: 2402MHz



CH39: 2441MHz



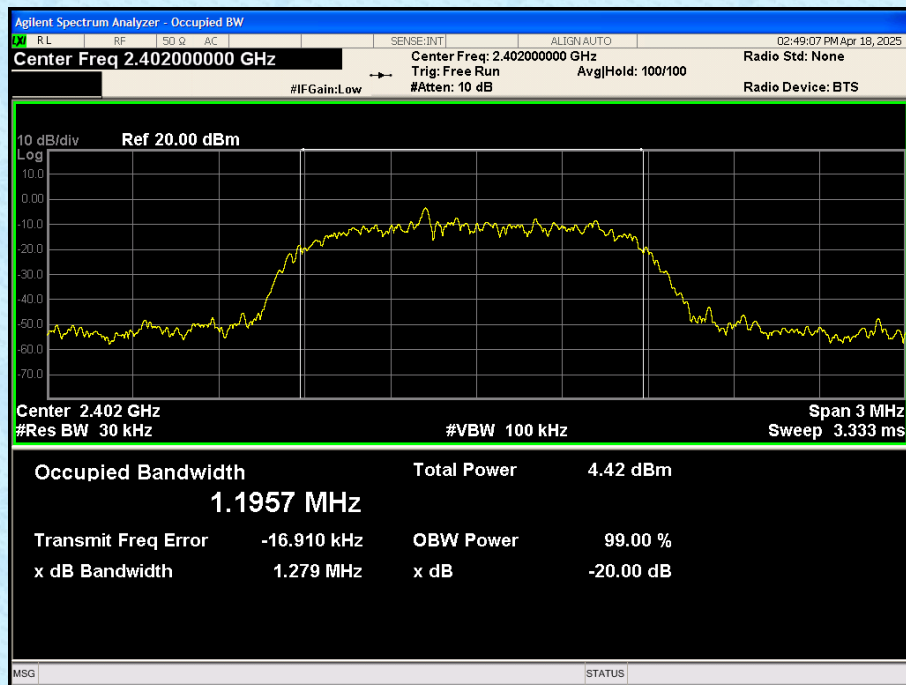
CH78: 2480MHz



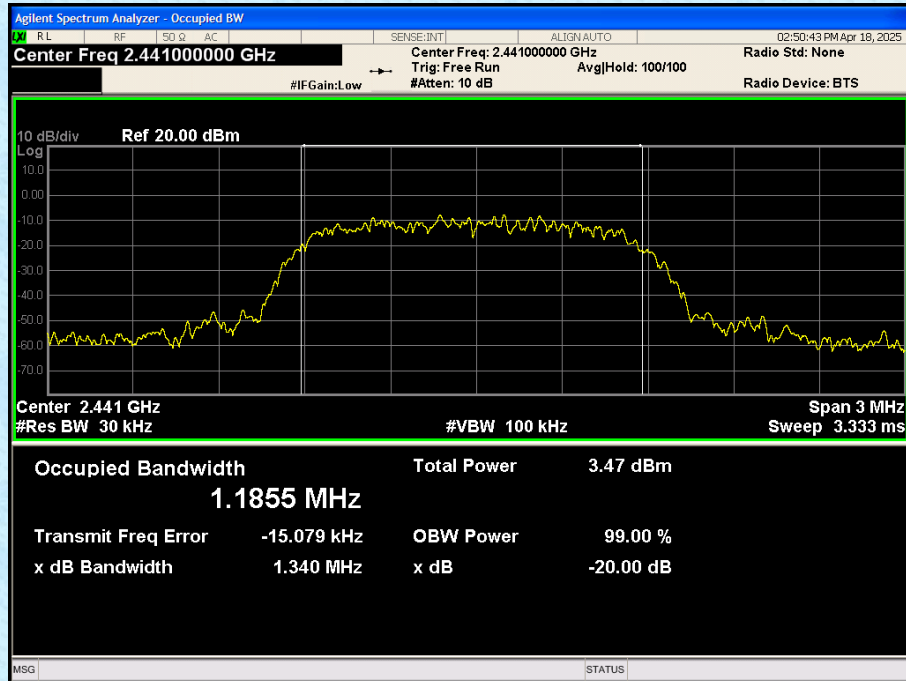
8DPSK Modulation:

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Result
CH00	2402	1.279	PASS
CH39	2441	1.340	PASS
CH78	2480	1.270	PASS

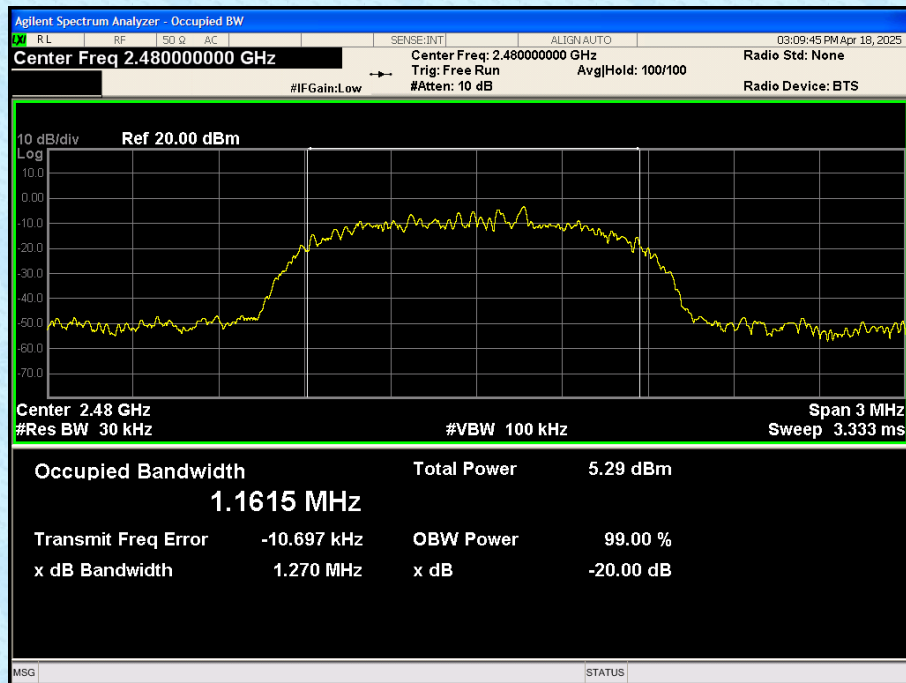
CH00: 2402MHz



CH39: 2441MHz



CH78: 2480MHz



8 Test Setup Photo

Reference to the **appendix I** for details.

9 EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----