

Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC179884

Page: 1 of 66

FCC Radio Test Report FCC ID: 2AXWO-M303

Original Grant

Report No. : TB-FCC179884

Applicant : Doors Korea Co., Ltd

Equipment Under Test (EUT)

EUT Name : Miracle,m M303 Pro Wireless portable speaker

Model No. : M303

Series Model No. : M320 , M330, M300

Brand Name : Miracle,m

Sample ID : TBBJ-20210409-31-1#& TBBJ-20210409-31-2#

Receipt Date : 2020-04-19

Test Date : 2020-04-19 to 2021-06-03

Issue Date : 2021-06-03

Standards : FCC Part 15, Subpart C 15.247

Test Method : ANSI C63.10: 2013

Conclusions : PASS

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

The EUT technically complies with the FCC requirements

Test/Witness Engineer

Engineer Supervisor

Engineer Manager

Seven Wu

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in

the report.

TB-RF-074-1.0



Contents

COL	NTENTS	2
1.	GENERAL INFORMATION ABOUT EUT	5
	1.1 Client Information	5
	1.2 General Description of EUT (Equipment Under Test)	5
	1.3 Block Diagram Showing the Configuration of System Tested	
	1.4 Description of Support Units	7
	1.5 Description of Test Mode	8
	1.6 Description of Test Software Setting	9
	1.7 Measurement Uncertainty	9
	1.8 Test Facility	10
2.	TEST SUMMARY	11
3.	TEST SOFTWARE	11
4.	TEST EQUIPMENT	12
5.	CONDUCTED EMISSION TEST	13
	5.1 Test Standard and Limit	13
	5.2 Test Setup	
	5.3 Test Procedure	
	5.4 Deviation From Test Standard	14
	5.5 EUT Operating Mode	14
	5.6 Test Data	14
6.	RADIATED EMISSION TEST	15
	6.1 Test Standard and Limit	15
	6.2 Test Setup	16
	6.3 Test Procedure	
	6.4 Deviation From Test Standard	17
	6.4 EUT Operating Condition	17
	6.5 Test Data	
7.	RESTRICTED BANDS REQUIREMENT	18
	7.1 Test Standard and Limit	18
	7.2 Test Setup	18
	7.3 Test Procedure	19
	7.4 Deviation From Test Standard	19
	7.5 EUT Operating Condition	
	7.6 Test Data	
8.	NUMBER OF HOPPING CHANNEL	20
	8.1 Test Standard and Limit	20
	8.2 Test Setup	
	8.3 Test Procedure	
	8.4 Deviation From Test Standard	
	8.5 EUT Operating Condition	20

Report No.: TB-FCC179884 Page: 3 of 66

	8.6 Test Data	20
9.	AVERAGE TIME OF OCCUPANCY	21
	9.1 Test Standard and Limit	21
	9.2 Test Setup	21
	9.3 Test Procedure	21
	9.4 EUT Operating Condition	21
	9.4 Deviation From Test Standard	
	9.5 EUT Operating Condition	
	9.6 Test Data	
10.	CHANNEL SEPARATION AND BANDWIDTH TEST	23
	10.1 Test Standard and Limit	23
	10.2 Test Setup	
	10.3 Test Procedure	
	10.4 Deviation From Test Standard	24
	10.5 EUT Operating Condition	24
	10.6 Test Data	24
11.	PEAK OUTPUT POWER TEST	25
	11.1 Test Standard and Limit	25
	11.2 Test Setup	
	11.3 Test Procedure	
	11.4 Deviation From Test Standard	25
	11.5 EUT Operating Condition	25
	11.6 Test Data	25
12.	ANTENNA REQUIREMENT	26
	12.1 Standard Requirement	26
	12.2 Deviation From Test Standard	
	12.3 Antenna Connected Construction	
	12.4 Result	26
ATT	ACHMENT A CONDUCTED EMISSION TEST DATA	27
	ACHMENT B RADIATED EMISSION TEST DATA	
ATT	ACHMENT C RESTRICTED BANDS REQUIREMENT AND BAND EDGE TES	T DATA
	ACHMENT D NUMBER OF HOPPING CHANNEL TEST DATA	
	ACHMENT E AVERAGE TIME OF OCCUPANCY TEST DATA	
ATT	ACHMENT C. DEAK OUTDUT DOWED TEST DATA	62



Report No.: TB-FCC179884 Page: 4 of 66

Revision History

Report No.	Version	Description	Issued Date
TB-FCC179884	Rev.01	Initial issue of report	2021-06-03
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Page: 5 of 66

1. General Information about EUT

1.1 Client Information

Applicant : Doors Korea Co., Ltd		Doors Korea Co., Ltd	
Address : 1F, 27, Mangu-ro 81-gil, Jungnang-gu, Seoul, South Korea			
Manufacturer : DONGGUAN TUCCI ELECTRONIC TECHNOLOGY C		DONGGUAN TUCCI ELECTRONIC TECHNOLOGY CO., LTD	
Address	1	4th FL, A BLD, No 7, Longtian Road, Qinghutou Community, Tangxia	
		Town, Dongguan City	

1.2 General Description of EUT (Equipment Under Test)

EUT Name	:	Miracle,m M303 Pro Wireless portable speaker			
Models No.		M303, M320, M330, M300			
Model Difference	•	All these models are the same in the same PCB, layout and control only difference is the model name.			
WORK WITH		Operation Frequency:	Bluetooth V4.2(BT): 2402~2480 MHz FM receive: 88-108MHz		
		Number of Channel:	Bluetooth: 79 Channels see Note 2		
Product Description		Max Peak Output Power:	er: Bluetooth: -0.271dBm (π/4-DQPSK)		
Description		Antenna Gain:	-0.58dBi PCB Antenna		
		Modulation Type:	GFSK π/4-DQPSK		
Power Supply	15	Input: DC 5V/2A DC7.4V by 2000mAh Li-ion battery			
Software Version	•	V1.3			
Hardware Version	1	: V1.0			
Connecting I/O Port(S)		Please refer to the User's Manual			

Note:

(1) This Test Report is FCC Part 15.247 for Bluetooth, the test procedure follows the FCC KDB 558074 D01 DTS Means Guidance v05.



Page: 6 of 66

(2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.Channel List:

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

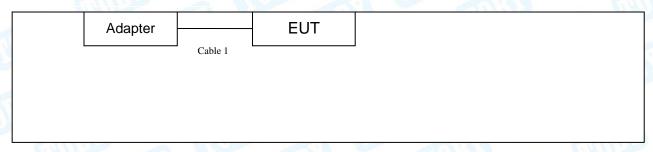
(3) The Antenna information about the equipment is provided by the applicant.



Page: 7 of 66

1.3 Block Diagram Showing the Configuration of System Tested

Charging + TX Mode



TX Mode

	FUT		
	EUT		

1.4 Description of Support Units

	Equipment Information								
Name	Model	FCC ID/VOC	Manufacturer	Used "√"					
Adapter			HUAWEI	√					
	Cable Information								
Number	Shielded Type	Ferrite Core	Length	Note					
		M (43)	JUP						



Page: 8 of 66

1.5 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test				
Final Test Mode	Description			
Mode 1	Charging + TX Mode Channel 00			
	For Radiated Test			
Final Test Mode	Description			
Mode 1	TX GFSK Mode Channel 00			
Mode 2	TX Mode(GFSK) Channel 00/39/78			
Mode 3	TX Mode(17 /4-DQPSK) Channel 00/39/78			
Mode 4	Hopping Mode(GFSK)			
Mode 5	Hopping Mode(π /4-DQPSK)			

Note: (1) The adapter and antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.

(2) All test with left and right earphone, and only show the worst case(left earphone)

Note:

(1) For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate. We have pretested all the test modes above.

According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels, and the worst case data rate as follows:

TX Mode: GFSK (1 Mbps)

TX Mode: π /4-DQPSK (2 Mbps)

(2) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane as the normal use. Therefore only the test data of this X-plane was used for radiated emission measurement test.



Page: 9 of 66

1.6 Description of Test Software Setting

During testing channel power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of Bluetooth mode.

Test Software Version	GU.	FCC_assist	COURT OF THE PARTY
Frequency	2402 MHz	2441MHz	2480 MHz
GFSK	DEF	DEF	DEF
π /4-DQPSK	DEF	DEF	DEF

1.7 Measurement Uncertainty

The reported uncertainty of measurement $y \pm U$, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

Test Item	Parameters	Expanded Uncertainty (U _{Lab})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	$\pm 3.50~\mathrm{dB}$ $\pm 3.10~\mathrm{dB}$
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.50 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.20 dB



Page: 10 of 66

1.8 Test Facility

The testing report were performed by the Shenzhen Toby Technology Co., Ltd., in their facilities located at 1/F.,Building 6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an, Shenzhen, Guangdong, China. At the time of testing, the following bodies accredited the Laboratory:

CNAS (L5813)

The Laboratory has been accredited by CNAS to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the competence in the field of testing. And the Registration No.: CNAS L5813.

A2LA Certificate No.: 4750.01

The laboratory has been accredited by American Association for Laboratory Accreditation(A2LA) to ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories for the technical competence in the field of Electrical Testing. And the A2LA Certificate No.: 4750.01. FCC Accredited Test Site Number: 854351.

IC Registration No.: (11950A)

The Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing. The site registration: Site# 11950A.



Page: 11 of 66

2. Test Summary

	FCC Part 15 Subpart C(15.247)/ RSS 247 Issue 2						
Standard Se	ction	To ad Maria	To al Camarda(a)				
FCC	IC	Test Item	Test Sample(s)	Judgment	Remark		
15.203	3	Antenna Requirement	TBBJ-20210409-31-1#	PASS	N/A		
15.207	RSS-GEN 7.2.2	Conducted Emission	TBBJ-20210409-31-2#	PASS	N/A		
15.205	RSS-Gen 7.2.3	Restricted Bands	TBBJ-20210409-31-1#	PASS	N/A		
15.247(a)(1)	RSS 247	Hopping Channel	TBBJ-20210409-31-1#	PASS	N/A		
13.247 (a)(1)	5.1 (2)	Separation	1000-20210409-31-1#				
15.247(a)(1)	RSS 247	Dwell Time	TBBJ-20210409-31-1#	PASS	N/A		
13.247 (a)(1)	5.1 (4)		1003-20210403-31-1#	1 400			
15.247(b)(1)	RSS 247	Peak Output Power	TBBJ-20210409-31-1#	PASS	N/A		
13.247 (b)(1)	5.4 (2)	I eak Output I ower					
15.247(b)(1)	RSS 247	Number of Hopping	TBBJ-20210409-31-1#	PASS	N/A		
15.247 (b)(1)	5.1 (4)	Frequency					
15.247(d)	RSS 247	Pand Edga	TDD 1 20240400 24 4#	PASS	N/A		
15.247 (u)	5.5	Band Edge	TBBJ-20210409-31-1#				
15.247(c)&	RSS 247	Radiated Spurious	TBBJ-20210409-31-1#	TIV TIV	VI.		
15.209	5.5	Emission	TBBJ-20210409-31-2#	PASS	N/A		
15.247(a)	RSS 247 5.1 (1)	99% Occupied Bandwidth & 20dB Bandwidth	TBBJ-20210409-31-1#	PASS	N/A		

Note: N/A is an abbreviation for Not Applicable.

3. Test Software

- Aller	Test Item	Test Software	Manufacturer	Version No.
	Conducted Emission	EZ-EMC	EZ	CDI-03A2
	Radiation Emission	EZ-EMC	EZ	FA-03A2RE
	RF Conducted	MTS-8310	MWRFtest	V2.0.0.0
f	Measurement	W170 0010	WWWITH LEST	v 2.0.0.0



Report No.: TB-FCC179884 Page: 12 of 66

4. Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 06, 2020	Jul. 05, 2021
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 06, 2020	Jul. 05, 2021
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 06, 2020	Jul. 05, 2021
LISN	Rohde & Schwarz	ENV216	101131	Jul. 06, 2020	Jul. 05, 2021
Radiation Emission T	est				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 06, 2020	Jul. 05, 2021
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 06, 2020	Jul. 05, 2021
Spectrum Analyzer	Rohde & Schwarz	FSV40-N	102197	Jul. 06, 2020	Jul. 05, 2021
Bilog Antenna	ETS-LINDGREN	3142E	00117537	Mar.01, 2020	Feb. 28, 2022
Horn Antenna	ETS-LINDGREN	3117	00143207	Mar.01, 2020	Feb. 28, 2022
Horn Antenna	ETS-LINDGREN	BBHA 9170	BBHA9170582	Mar.01, 2020	Feb. 28, 2022
Loop Antenna	SCHWARZBECK	FMZB 1519 B	1519B-059	Jul. 07, 2020	Jul. 06, 2021
Pre-amplifier	Sonoma	310N	185903	Feb. 25, 2021	Feb. 24, 2022
Pre-amplifier	HP	8449B	3008A00849	Feb. 25, 2021	Feb. 24, 2022
Pre-amplifier	SKET	LNPA_1840G-50	SK201904032	Feb. 25, 2021	Feb. 24, 2022
Cable	HUBER+SUHNER	100	SUCOFLEX	Feb. 25, 2021	Feb. 24, 2022
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A
Antenna Conducted I	Emission				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 06, 2020	Jul. 05, 2021
Spectrum Analyzer	Rohde & Schwarz	ESPI	100010/007	Jul. 06, 2020	Jul. 05, 2021
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 11, 2020	Sep. 10, 2021
Vector Signal Generator	Agilent	N5182A	MY50141294	Sep. 11, 2020	Sep. 10, 2021
Analog Signal Generator	Agilent	N5181A	MY50141953	Sep. 11, 2020	Sep. 10, 2021
Till	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO26	Sep. 11, 2020	Sep. 10, 2021
	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO29	Sep. 11, 2020	Sep. 10, 2021
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO31	Sep. 11, 2020	Sep. 10, 2021
The state of the s	DARE!! Instruments	RadiPowerRPR3006W	17I00015SNO33	Sep. 11, 2020	Sep. 10, 2021



Page: 13 of 66

5. Conducted Emission Test

5.1 Test Standard and Limit

5.1.1Test Standard FCC Part 15.207

5.1.2 Test Limit

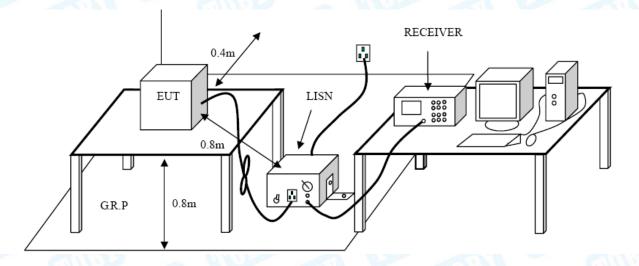
Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)			
	Quasi-peak Level	Average Level		
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *		
500kHz~5MHz	56	46		
5MHz~30MHz	60	50		

Notes:

- (1) *Decreasing linearly with logarithm of the frequency.
- (2) The lower limit shall apply at the transition frequencies.
- (3) The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.2 Test Setup





Page: 14 of 66

5.3 Test Procedure

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

LISN at least 80 cm from nearest part of EUT chassis

The bandwidth of EMI test receiver is set at 9kHz, and the test frequency band is from 0.15MHz to 30MHz.

5.4 Deviation From Test Standard

No deviation

5.5 EUT Operating Mode

Please refer to the description of test mode.

5.6 Test Data

Please refer to the Attachment A.



Page: 15 of 66

6. Radiated Emission Test

6.1 Test Standard and Limit

6.1.1 Test Standard FCC Part 15.209

6.1.2 Test Limit

Radiated Emission Limit (9 kHz~1000MHz)

Frequency (MHz	Field Strength (microvolt/meter)	Measurement Distance (meters)		
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		

Radiated Emission Limit (Above 1000MHz)

Frequency	Distance of 3m	(dBuV/m)
(MHz)	Peak	Average
Above 1000	74	54

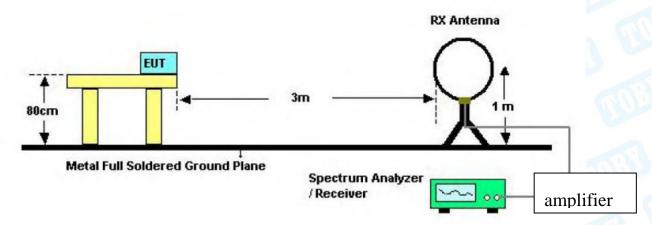
Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission Level (dBuV/m)=20log Emission Level (uV/m)

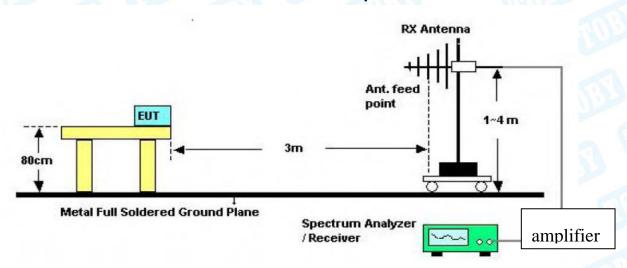


Page: 16 of 66

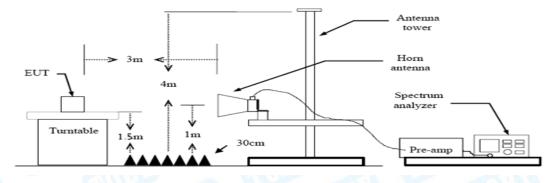
6.2 Test Setup



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup



Page: 17 of 66

6.3 Test Procedure

(1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

6.4 Deviation From Test Standard

No deviation

6.4 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power in TX mode.

6.5 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

Please refer to the Attachment B.



Page: 18 of 66

7. Restricted Bands Requirement

7.1 Test Standard and Limit

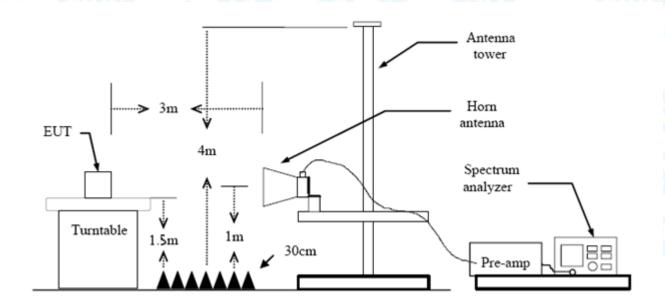
7.1.1 Test Standard FCC Part 15.209 FCC Part 15.205

7.1.2 Test Limit

Restricted Frequency Band (MHz)	Distance of 3m (dBuV/m)		
	Peak	Average	
310 ~2390	74	54	
483.5 ~2500	74	54	

Note: All restriction bands have been tested, only the worst case is reported.

7.2 Test Setup





Page: 19 of 66

7.3 Test Procedure

(1) The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1 GHz. The EUT was placed on a rotating 0.8m high above ground, the table was rotated 360 degrees to determine the position of the highest radiation.

- (2) Measurements at frequency above 1GHz. The EUT was placed on a rotating 1.5m high above the ground. RF absorbers covered the ground plane with a minimum area of 3.0m by 3.0m between the EUT and measurement receiver antenna. The RF absorber shall not exceed 30cm in high above the conducting floor. The table was rotated 360 degrees to determine the position of the highest radiation.
- (3) The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set to make measurement.
- (4) The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- (5) If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit Bellow 1 GHz, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed. But the Peak Value and average value both need to comply with applicable limit above 1 GHz.
- (6) Testing frequency range below 1GHz the measuring instrument use VBW=120 kHz with Quasi-peak detection.
- (7) Testing frequency range above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with AVG Detector for Average Values.
- (8) For the actual test configuration, please see the test setup photo.

7.4 Deviation From Test Standard

No deviation

7.5 EUT Operating Condition

The Equipment Under Test was set to Continual Transmitting in maximum power.

7.6 Test Data

Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values.

All restriction bands have been tested, only the worst case is reported.

Please refer to the Attachment C.



Page: 20 of 66

8. Number of Hopping Channel

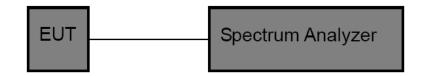
8.1 Test Standard and Limit

8.1.1 Test Standard FCC Part 15.247 (a)(1)

8.1.2 Test Limit

Section	Test Item	Limit
15.247	Number of Hopping Channel	>15

8.2 Test Setup



8.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=100 KHz, VBW=100 KHz, Sweep time= Auto.

8.4 Deviation From Test Standard

No deviation

8.5 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

8.6 Test Data

Please refer to the Attachment D.

Page: 21 of 66

9. Average Time of Occupancy

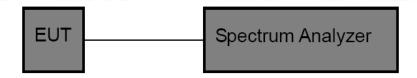
9.1 Test Standard and Limit

9.1.1 Test Standard FCC Part 15.247 (a)(1)

9.1.2 Test Limit

Section	Test Item	Limit
15.247(a)(1)	Average Time of	0.4 sec
13.247 (a)(1)	Occupancy	0.4 Sec

9.2 Test Setup



9.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting: RBW=1MHz, VBW=1MHz.
- (3) Use video trigger with the trigger level set to enable triggering only on full pulses.
- (4) Sweep Time is more than once pulse time.
- (5) Set the centre frequency on any frequency would be measure and set the frequency span to zero.
- (6) Measure the maximum time duration of one single pulse.
- (7) Set the EUT for packet transmitting.
- (8) Measure the maximum time duration of one single pulse.

9.4 EUT Operating Condition

The average time of occupancy on any channel within the Period can be calculated with formulas:

{Total of Dwell} = {Pulse Time} * (1600 / X) / {Number of Hopping Frequency} * {Period} {Period} = 0.4s * {Number of Hopping Frequency}

Note: X=2 or 4 or 6 (1DH1=2, 1DH3=4, 1DH5=6. 2DH1=2, 2DH3=4, 2DH5=6. 3DH1=2, 3DH3=4, 3DH5=6)

The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.



Page: 22 of 66

9.4 Deviation From Test Standard

No deviation

9.5 EUT Operating Condition

The EUT was set to the Hopping Mode by the Customer.

9.6 Test Data

Please refer to the Attachment E.



Page: 23 of 66

10. Channel Separation and Bandwidth Test

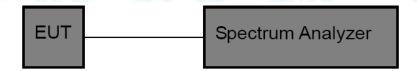
10.1 Test Standard and Limit

10.1.1 Test Standard FCC Part 15.247

10.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Bandwidth	Limit <=1 MHz (20dB bandwidth) >25KHz or >two-thirds of the 20 dB bandwidth Which is greater	2400~2483.5
Channel Separation	the 20 dB bandwidth	2400~2483.5

10.2 Test Setup



10.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Channel Separation: RBW=100 kHz, VBW=100 kHz.

Bandwidth: RBW=30 kHz, VBW=100 kHz.

- (3) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst –case (i.e the widest) bandwidth.
 - (4) Measure the channel separation the spectrum analyzer was set to Resolution Bandwidth:30 kHz, and Video Bandwidth:100 kHz. Sweep Time set auto.



Page: 24 of 66

10.4 Deviation From Test Standard

No deviation

10.5 EUT Operating Condition

The EUT was set to the Hopping Mode for Channel Separation Test and continuously transmitting for the Bandwidth Test.

10.6 Test Data

Please refer to the Attachment F.



Page: 25 of 66

11. Peak Output Power Test

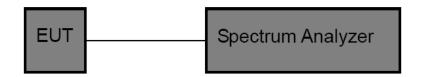
11.1 Test Standard and Limit

11.1.1 Test Standard FCC Part 15.247 (b) (1)

11.1.2 Test Limit

Test Item	Limit	Frequency Range(MHz)
Peak Output Power	Hopping Channels>75 Power<1W(30dBm)	2400~2483.5
	Other <125 mW(21dBm)	

11.2 Test Setup



11.3 Test Procedure

- (1) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above.
- (2) Spectrum Setting:

Peak Detector: RBW=1 MHz, VBW=3 MHz for bandwidth less than 1MHz.

RBW=3 MHz, VBW ≥ RBW for bandwidth more than 1MHz.

11.4 Deviation From Test Standard

No deviation

11.5 EUT Operating Condition

The EUT was set to continuously transmitting in the max power during the test.

11.6 Test Data

Please refer to the Attachment G.



Page: 26 of 66

12. Antenna Requirement

12.1 Standard Requirement

12.1.1 Standard FCC Part 15.203

12.1.2 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 shall be considered sufficient to comply with the provisions of this Section. 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.

12.2 Deviation From Test Standard

No deviation

12.3 Antenna Connected Construction

The gains of the antenna used for transmitting is -0.58dBi, and the antenna connector is de-signed with permanent attachment and no consideration of replacement. Please see the EUT photo for details.

12.4 Result

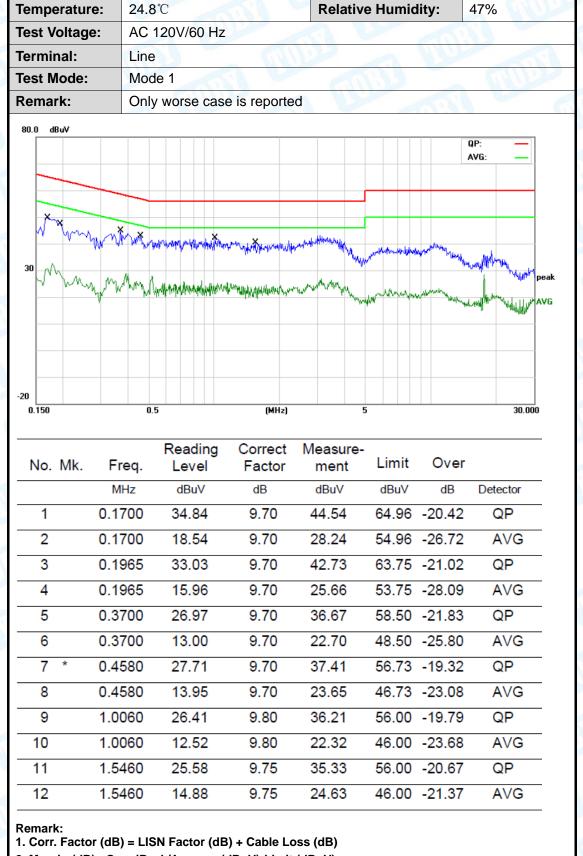
The EUT antenna is a PCB Antenna. It complies with the standard requirement.

Antenna Type				
	⊠Permanent attached antenna	MORE		
400	☐Unique connector antenna			
	☐Professional installation antenna	W. 1		

TOBY

27 of 66

Attachment A-- Conducted Emission Test Data



2. Margin (dB) =QuasiPeak/Average (dBuV)-Limit (dBuV)

Report No.: TB-FCC179884 Page: 28 of 66

TOBY

emperature:	24.8°C		- MA	Relative H	umidity	: 47%	ó
est Voltage:	AC 12	20V/60 Hz					Alin
Terminal:	Neutra	al				MAS.	
Test Mode:	Mode	1	THU!		3 /		
Remark:	Only	vorse case i	s reported		13		MARK
80.0 dBuV						QP:	_
30	MANA MA	ware out the shape of the	Majapanjaninanan Majapan	A A A A A A A A A A A A A A A A A A A	alternististuda produ	AVG:	peal
-20 0.150 No. Mk.	Freq.	Reading Level	(MHz) Correct Factor	Measure- ment	Limit	Over	30.000
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1 (0.1700	35.04	9.80	44.84	64.96	-20.12	QP
2 (0.1700	18.90	9.80	28.70	54 96	-26.26	AVG
	0.2340	30.41	9.80	40.21		-22.09	QP
	0.2340	15.05	9.80	24.85		-27.45	AVG
5 * (0.3997	29.19	9.80	38.99	57.86	-18.87	QP
6 (0.3997	15.84	9.80	25.64	47.86	-22.22	AVG
7 ′	1.0060	25.96	9.80	35.76	56.00	-20.24	QP
8 1	1.0060	12.48	9.80	22.28	46.00	-23.72	AVG
9 2	2.2060	24.30	9.80	34.10	56.00	-21.90	QP
10 2	2.2060	11.35	9.80	21.15	46.00	-24.85	AVG
	3.0860	26.82	9.80	36.62		-19.38	QP
	3.0860	12.65	9.80	22.45		-23.55	AVG
Remark: . Corr. Factor (d . Margin (dB) =	dB) = LISN	Factor (dB) -	⊦ Cable Loss	(dB)	40.00	-20.00	7,0

Page:

29 of 66



Attachment B-- Radiated Emission Test Data

9KHz~30MHz

From 9KHz to 30MHz: Conclusion: PASS

Note: The amplitude of spurious emissions which are attenuated by more than 20dB

below the permissible value has no need to be reported.

30MHz~1GHz

em	nper	atu	re:		23	3.5°	C			- Val		Rel	ativ	e H	umi	idity	/ :	439	%		
est Voltage: Ant. Pol.					A	2 12	20V	60	HZ	ARI	A. S.			1	Vi				T	M	9
nt	. Po	ıl.			Н	oriz	onta	al	13			W.T.	TO THE	150				MI	N. A.		
es	t Mc	ode:	:		M	ode	12	240	2MH	z		1			M	S.					1
Ren	nark	(:			Oı	nly	wor	se	case	is repo	orted		1	1				M			V
80.0	O dB	luV/m																			_
											2 X			4 ¥ 5	(FI	FJFCC			diation		
30	MW	Why.	halvy	hapla	MVm	Appara	AN MA	ng ng	l	1 (w/w/	,T **			* 5 * X	alfreka	yarm	, who was a second	Mu			
20	M. 000	40		50	₩V _µ	~//v····	80	~~~	:	(www	Hz)			300	alfrahm 4	00	500	600	700	10	000.00
20 30	D. 000	40	0	50	60	70		ead	ding	(www		Mea		300						10	000.00
20 30		40	0	50 Fi	60 req.	70	Re	_ev	ding vel	(MI	ect	me	sure ent	300	Lin	nit		Ove	er		
20 30	D. 000	40	o k.	50 Fi	60 req.	70	Re	_ev dBu	ding rel	Corr Fac	ect tor	me	sure	300	Lin				er	100	
20 30	0.000 No.	40	o k.	50 Fi	60 req.	70	Re	_ev	ding rel	Corr	ect tor	dBu	sure ent	300	Lin	nit	1	Ove	er	Det	ecto
20 30 —	0.000 No.	40	o k.	50 Fi	60 req.	70	Re	_ev dBu	ding rel	Corr Fac	ect tor n	dBu 21	sure ent	300	Lin dBr	nit uV/m	1 -	Ove	er 34	Det	ecto eak
30	No.	40	0 k.	FI M 20	60 req. IHz 276	70	Re L	dBu	ding vel uV 33	Corr Fac dB/r -22.	ect tor n 17	те dВu 21 33	sure ent uV/m	300	Lin dBr 43	nit uV/m	1 -	Ove dB	34 38	Dete	ecto eak
20 30 -	No.	4(k. 1	Fr M 20 75 51	req. IHz 276	70	Re L	dBu 43.3	ding vel uV 33 90	Corr Fac dB/r -22.1	ect tor n 17 28	21 33 39	sure ent uV/m .16	300	Lin dBr 43 43	nit uV/m 3.50	-	Ove dB -22.	34 38 40	Dete pe pe	eak eak
1 2	No.	4(1 1 2	50 Fr M 20 75 51	60 req. IHz 276 651	70 66 66 94	Re L	dBu 43.5 53.9	ding vel uV 33 90 80 24	Corr Fac dB/r -22.1	ect tor 17 28 20	21 33 39 28	sure ent 	300	Lin dBr 43 43 46 46	nit uV/m 3.50 3.50	-	Ove dB -22. -9.8	34 38 40 64	Dete	ecto eak eak

^{*:}Maximum data x:Over limit !:over margin

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. QuasiPeak (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = QuasiPeak (dB μ V/m)-Limit QPK(dB μ V/m)



Report No.: TB-FCC179884 Page: 30 of 66

empera	ature:		23.5	i°C			a W	Relative I	lumidity	': ⁴	43%	1
est Vol	tage:		AC	120	V60	HZ					2	AATT
nt. Pol			Vert	ical		AHUE		a v		T	13	
est Mo	de:		Mod	le 1	240	2MHz	CATT.		1 1/1			
Remark			Only	/ wc	orse	case is	s reported		9			
80.0 dBu	V/m											
									(RF)FCC 1	ISC 3M	Radiation	n
				-							Margin -6	i dB
			+		<u> </u>							
30 K		2				3	4 🕺	×				
30	MANANY	WW.	ıΜ			Λ			Makerine	M~√W	month	Mark .
			M	MAN	Wayne	MAN	Mg/	m. Vaning				
					-							
			+									
			_									
20												
			60	70			(MHz)	300	400 5	500 6	500 700	1000.000
30.000	40	50										
						ading	Correct	Measure-	Limit	0)ver	
30.000 No.		Fı	req.		Le	evel	Correct Factor	ment	Limit		ver	
No.	Mk.	Fı	lHz		Le	evel BuV	Factor dB/m	ment dBuV/m	dBuV/m		dB	Detecto
No.	Mk.	Fı		;	Le	evel	Factor	ment				
No.	Mk.	Fr M 30.8	lHz		di 43	evel BuV	Factor dB/m	ment dBuV/m	dBuV/m	-1	dB	peak
No.	Mk.	Fr M 30.8 48.3	Hz 3535	3	43 49	BuV 3.00	Factor dB/m -13.58	ment dBuV/m 29.42	dBuV/m	-1 -1	dB 10.58	peak peak
No.	Mk. *	Fi M 30.8 48.3	Hz 3535 3318 2766	6	43 49 51	BuV 3.00 9.54	Factor dB/m -13.58 -22.50 -22.17	ment dBuV/m 29.42 27.04	dBuV/m 40.00 40.00 43.50	-1 -1 -1	dB 10.58 12.96	peak peak peak
No.	Mk.	Fr M 30.8 48.3 120.1	3535 3318 2766 3348	3 6 8	43 49 51	BuV 3.00 9.54 1.45 3.49	Factor dB/m -13.58 -22.50 -22.17 -21.93	ment dBuV/m 29.42 27.04 29.28 26.56	dBuV/m 40.00 40.00 43.50 43.50	-1 -1 -1	dB 10.58 12.96 14.22 16.94	peak peak peak peak
No.	Mk.	Fi M 30.8 48.3 120.1 144.1	Hz 3535 3318 2766	6 8	43 49 51 48	BuV 3.00 9.54 1.45	Factor dB/m -13.58 -22.50 -22.17	ment dBuV/m 29.42 27.04 29.28	dBuV/m 40.00 40.00 43.50	-1 -1 -1 -1	dB 10.58 12.96 14.22	peak peak peak peak peak



Page: 31 of 66

Above 1GHz(Only worse case is reported)

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	www.	AMILIA
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz		

1	No.	Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4803.712	34.33	13.01	47.34	54.00	-6.66	AVG
2			4803.974	47.64	13.01	60.65	74.00	-13.35	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	The state of the s	
Ant. Pol.	Vertical	MUDO	
Test Mode:	TX GFSK Mode 2402MHz		4000

No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4803.780	47.41	13.01	60.42	74.00	-13.58	peak
2	*	4803.780	34.00	13.01	47.01	54.00	-6.99	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.





Page: 32 of 66

	Temperature:	23.3℃	Relative Humidity:	43%
V	Test Voltage:	DC 5V	ann p	A PIUL
	Ant. Pol.	Horizontal		
	Test Mode:	TX GFSK Mode 2441MHz		

No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.756	48.08	13.59	61.67	74.00	-12.33	peak
2	*	4881.756	34.52	13.59	48.11	54.00	-5.89	AVG

Remark

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3°C	Relative Humidity:	43%
Test Voltage:	DC 5V	URA	THU .
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2441MHz		

No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.858	47.86	13.59	61.45	74.00	-12.55	peak
2	*	4882.284	35.02	13.59	48.61	54.00	-5.39	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.



Page: 33 of 66



Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	WW TO THE	A AMOUNT
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2480MHz		

N	o. MI	k. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.652	48.23	14.15	62.38	74.00	-11.62	peak
2	*	4959.682	34.71	14.15	48.86	54.00	-5.14	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V		
Ant. Pol.	Vertical	.nii	
Test Mode:	TX GFSK Mode 2480MHz	300	

No	. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.596	47.72	14.15	61.87	74.00	-12.13	peak
2	*	4960.338	35.00	14.16	49.16	54.00	-4.84	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.





Page: 34 of 66

Temperature:	23.3°C	Relative Humidity:	43%			
Test Voltage:	DC 5V	COUNTY OF	A VIVE			
Ant. Pol.	Horizontal	Horizontal				
Test Mode:	TX π /4-DQPSK Mode 2402N	lHz				

No. Mk.		Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4804.294	47.95	13.02	60.97	74.00	-13.03	peak
2	*	4804.294	33.95	13.02	46.97	54.00	-7.03	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3℃	Relative Humidity:	43%				
Test Voltage:	DC 5V	OC 5V					
Ant. Pol.	Vertical	WOOD S					
Test Mode:	TX π /4-DQPSK Mode 240	2MHz					

No. Mk.		Mk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4803.880	34.34	13.01	47.35	54.00	-6.65	AVG
2			4804.054	47.98	13.01	60.99	74.00	-13.01	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated 1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.





Page: 35 of 66

Ę	Temperature:	23.3℃	Relative Humidity:	43%				
1	Test Voltage:	DC 5V						
	Ant. Pol.	Horizontal	Horizontal					
	Test Mode:	TX π /4-DQPSK Mode 2441	MHz					

No	Mk	Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4881.930	48.10	13.59	61.69	74.00	-12.31	peak
2	*	4882.122	34.79	13.59	48.38	54.00	-5.62	AVG

Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V		
Ant. Pol.	Vertical	TILLE	MAC
Test Mode:	TX π /4-DQPSK Mode 2441	MHz	CALLED .

	No.	Mk.	Freq.	_	Correct Factor	Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		*	4882.384	34.91	13.59	48.50	54.00	-5.50	AVG
2	2		4882.392	48.05	13.59	61.64	74.00	-12.36	peak

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.



Page: 36 of 66



Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V		AMOUNT
Ant. Pol.	Horizontal		
Test Mode:	TX π /4-DQPSK Mode 24	480MHz	

N	o. N	Иk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		•	4960.110	48.73	14.15	62.88	74.00	-11.12	peak
2	*	•	4960.110	34.30	14.15	48.45	54.00	-5.55	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V		MIN'S
Ant. Pol.	Vertical		
Test Mode:	TX π /4-DQPSK Mo	de 2480MHz	

No	o. Mk	. Freq.	Reading Level		Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4959.556	47.95	14.15	62.10	74.00	-11.90	peak
2	*	4959.968	34.89	14.15	49.04	54.00	-4.96	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)
- 4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.
- 5. No report for the emission which more than 20dB below the prescribed limit.



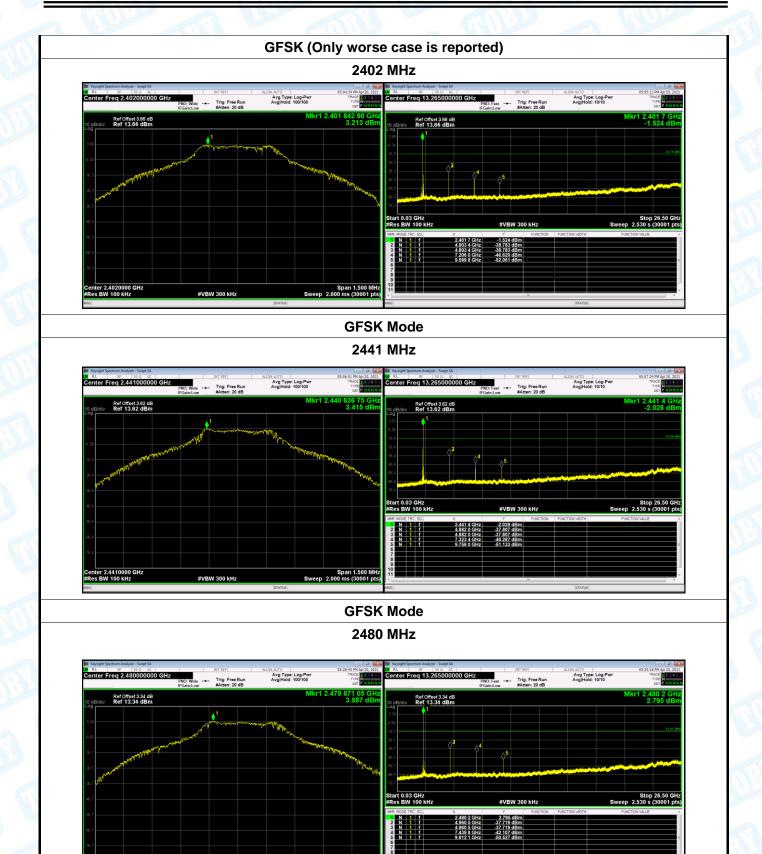
Page: 37 of 66

---Conducted Unwanted Emissions

Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	-41.99	-20	Pass
NVNT	1-DH1	2441	Ant1	-41.22	-20	Pass
NVNT	1-DH1	2480	Ant1	-41.3	-20	Pass
NVNT	2-DH1	2402	Ant1	-43.2	-20	Pass
NVNT	2-DH1	2441	Ant1	-44.58	-20	Pass
NVNT	2-DH1	2480	Ant1	-42.97	-20	Pass

Page: 38 of 66







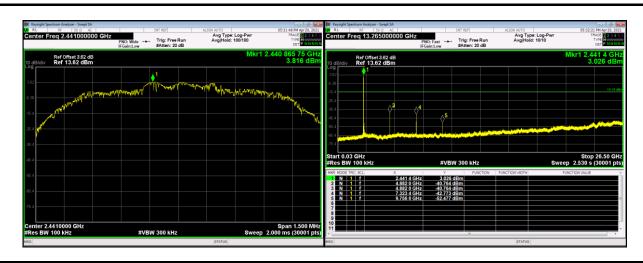
Page: 39 of 66

π/4-DQPSK (Only worse case is reported)

2402 MHz



2441 MHz



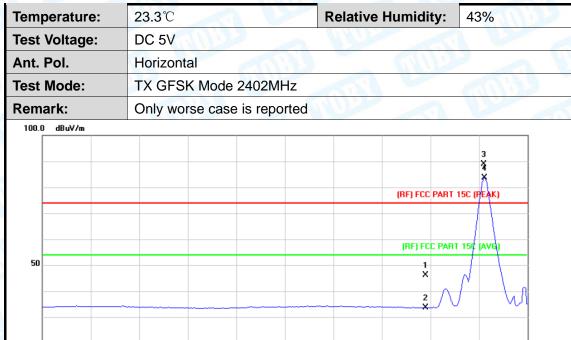


Report No.: TB-FCC179884 Page: 40 of 66



Attachment C-- Restricted Bands Requirement and Band **Edge Test Data**

(1) Radiation Test



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.87	1.28	46.15	74.00	-27.85	peak
2		2390.000	32.31	1.28	33.59	54.00	-20.41	AVG
3	X	2402.000	87.53	1.33	88.86	Fundamental I	Frequency	peak
4	*	2402.200	82.34	1.33	83.67	Fundamental I	Frequency	AVG

2361.00

2371.00

2381.00

2391.00

2411.00 MHz

0.0

2311.000 2321.00

2331.00

2341.00

2351.00

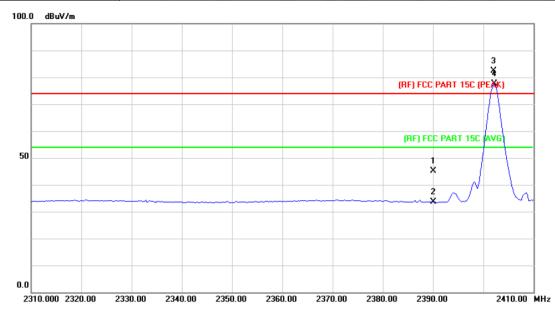
- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
- 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Page: 41 of 66

Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	CHULL	
Ant. Pol.	Vertical	and the same	100
Test Mode:	TX GFSK Mode 2402MHz		
Remark:	Only worse case is reported	MUD	A A A A



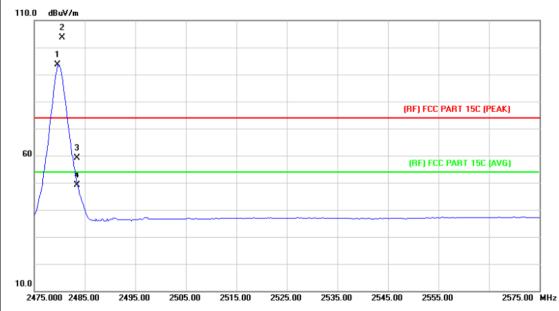
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	43.77	1.28	45.05	Fundamental F	requency	peak
2		2390.000	32.42	1.28	33.70	Fundamental I	requency	AVG
3	Χ	2402.000	81.02	1.33	82.35	74.00	8.35	peak
4	*	2402.200	76.30	1.33	77.63	54.00	23.63	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	CHILL	7
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2480 MHz		
Remark:	Only worse case is reported		A Property



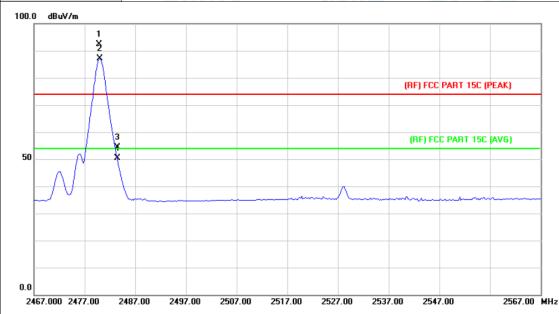
No. Mk.		. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	2479.600	91.70	1.85	93.55	Fundamental	Frequency	AVG
2	Χ	2480.600	101.71	1.85	103.56	Fundamental	Frequency	peak
3		2483.500	57.35	1.88	59.23	74.00	-14.77	peak
4		2483.500	47.26	1.88	49.14	54.00	-4.86	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V		A WILLIAM
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2480 MHz		
Remark:	Only worse case is reported		DAIL S



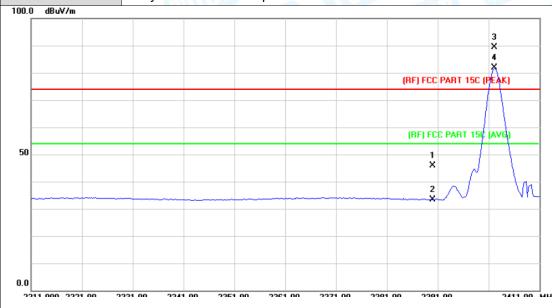
No. Mk.		. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.800	90.49	1.85	92.34	Fundamental	Frequency	peak
2	*	2480.000	85.16	1.85	87.01	Fundamental	Frequency	AVG
3		2483.500	52.50	1.88	54.38	74.00	-19.62	peak
4		2483.500	48.41	1.88	50.29	54.00	-3.71	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)





Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	O WILLIAM	
Ant. Pol.	Horizontal		
Test Mode:	TX π /4-DQPSK Mode 2402	MHz	
Remark:	Only worse case is reported		3 130
100.0 dBuV/m			



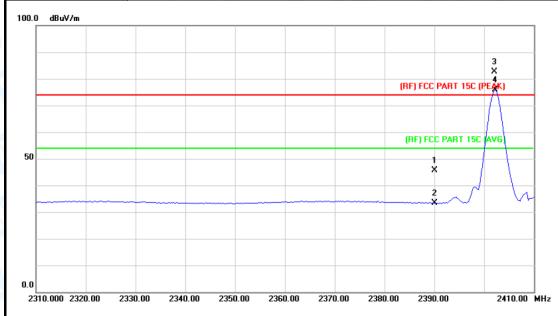
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.55	1.28	45.83	74.00	-28.17	peak
2		2390.000	32.03	1.28	33.31	54.00	-20.69	AVG
3	X	2402.200	87.99	1.33	89.32	Fundamenta	Frequency	peak
4	*	2402.200	80.61	1.33	81.94	Fundamenta	Frequency	AVG

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Temperature:	23.3℃	Relative Humidity:	43%
Test Voltage:	DC 5V	CHO.	7
Ant. Pol.	Vertical		
Test Mode:	TX π /4-DQPSK Mode 2402M	Hz	
Remark:	Only worse case is reported	MUD	A Alice



No.	Mk.	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	44.42	1.28	45.70	74.00	-28.30	peak
2		2390.000	32.15	1.28	33.43	54.00	-20.57	AVG
3	X	2402.000	81.35	1.33	82.68	Fundamental	Frequency	peak
4	*	2402.200	74.46	1.33	75.79	Fundamental	Frequency	AVG

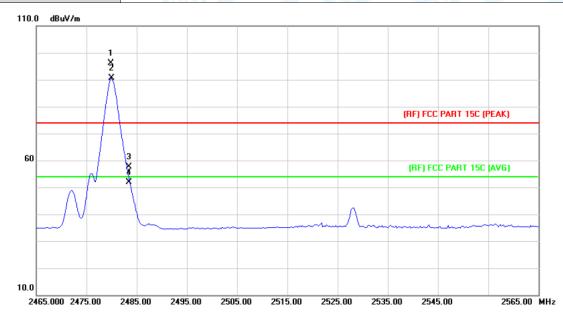
- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Page: 46 of 66

		N 1 40 10 10 10 10 10 10 10 10 10 10 10 10 10					
Temperature:	23.3℃	Relative Humidity:	43%				
Test Voltage:	DC 5V	THUE TO SERVICE THE PARTY OF TH	3				
Ant. Pol.	Horizontal	Horizontal					
Test Mode:	TX π /4-DQPSK Mode 2480	TX π /4-DQPSK Mode 2480MHz					
Remark:	Only worse case is reported	WINDS.	J. Hilliam				



No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Χ	2479.800	94.37	1.85	96.22	Fundamenta	I Frequency	peak
2	*	2480.000	88.74	1.85	90.59	Fundamenta	l Frequency	AVG
3		2483.500	55.81	1.88	57.69	74.00	-16.31	peak
4		2483.500	49.97	1.88	51.85	54.00	-2.15	AVG

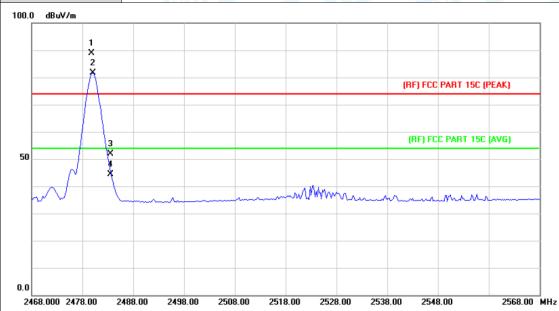
- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)





Page: 47 of 66

Temperature:	23.3°C	Relative Humidity:	43%				
Test Voltage:	DC 5V						
Ant. Pol.	Vertical	Vertical					
Test Mode:	TX π /4-DQPSK Mode 2480MHz						
Remark:	Only worse case is reported	MUDE	3 110				



No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	X	2479.800	87.03	1.85	88.88	Fundamental	Frequency	peak
2	*	2480.000	79.87	1.85	81.72	Fundamental	Frequency	AVG
3		2483.500	50.11	1.88	51.99	74.00	-22.01	peak
4		2483.500	42.51	1.88	44.39	54.00	-9.61	AVG

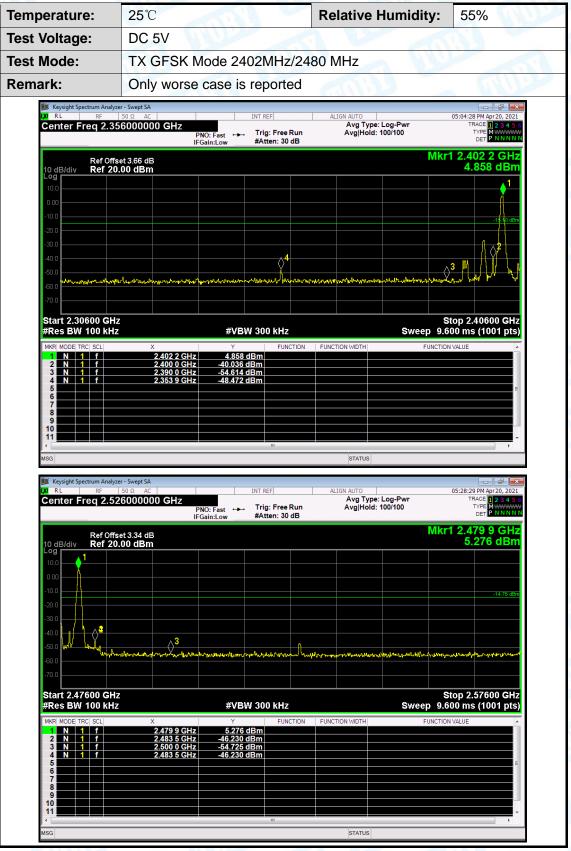
Remark:

- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)
 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dB μ V/m)-Limit PK/AVG(dB μ V/m)



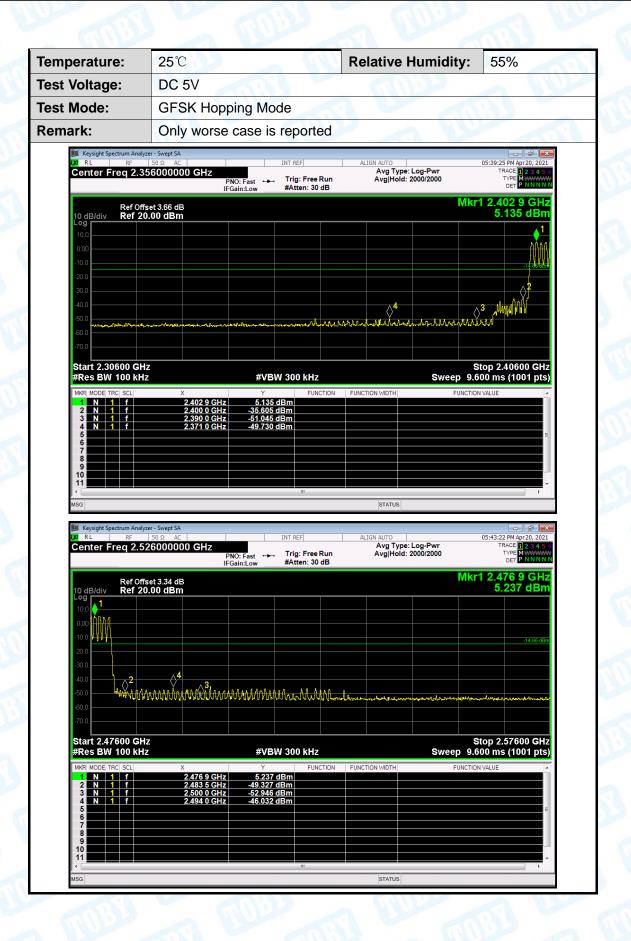
Report No.: TB-FCC179884 Page: 48 of 66

(2) Conducted Test



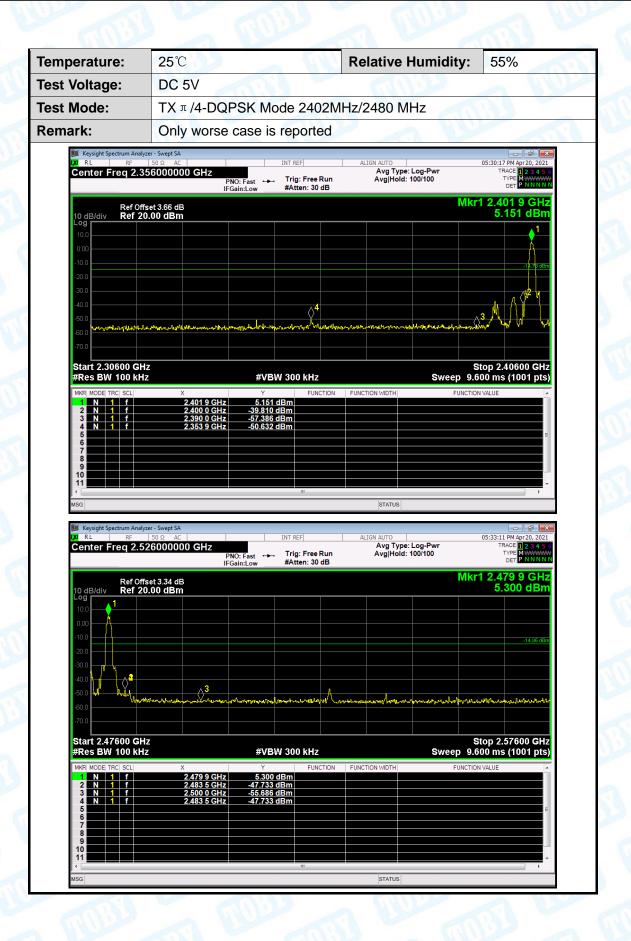


Page: 49 of 66



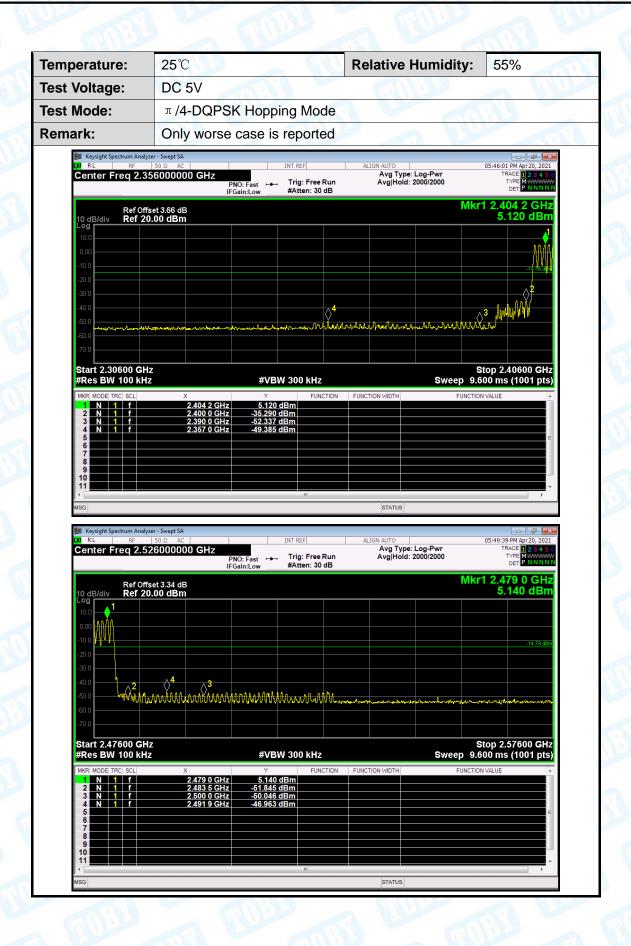


Page: 50 of 66





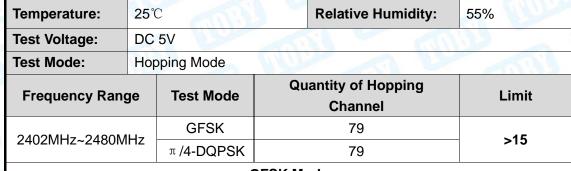
Page: 51 of 66



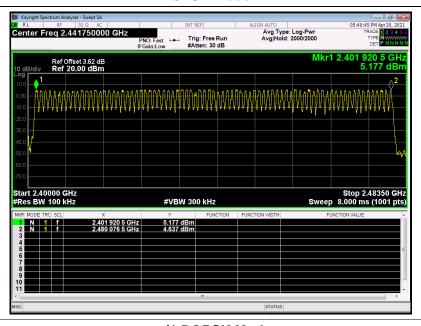




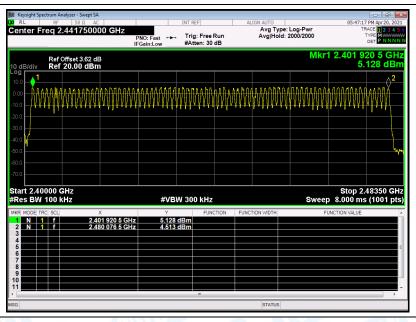
Attachment D-- Number of Hopping Channel Test Data



GFSK Mode



π /4-DQPSK Mode





Report No.: TB-FCC179884 53 of 66



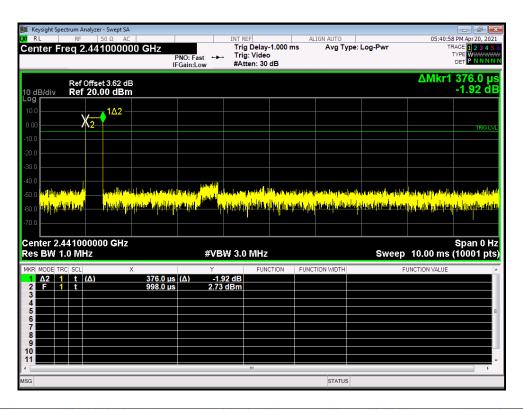
Attachment E-- Average Time of Occupancy Test Data

Temper	ature:	25°	25 ℃ Relative Humidity: 55%					
Test Vo	Itage:	: DC 5V						
Test Mo	Test Mode: Hopping Mode (GFSK)							
Test	Channel		Pulse	Total of Dwel	Period Time	Limit	Result	
Mode	(MHz)		Time (ms)	(ms)	(s)	(ms)	Result	
1DH1	244	1	0.376	120.32	31.60	400	PASS	
1DH3	244	1	1.632	261.12	31.60	400	PASS	
1DH5	244	1	2.880	307.20	31.60	400	PASS	
1DH1 Tota	l of Dwell–	Pulse	Time*(1600/2)*31 f	3/79		•	•	

1DH3 Total of Dwell= Pulse Time*(1600/4)*31.6/79

1DH5 Total of Dwell= Pulse Time*(1600/6)*31.6/79

GFSK Hopping Mode 1DH1







GFSK Hopping Mode 1DH3 2441 MHz PNO: Fast FGain:Low PNO: Fast #Atten: 30 dB Center Freq 2.441000000 GHz Avg Type: Log-Pwr ΔMkr1 1.632 ms -0.23 dB Ref Offset 3.62 dB Ref 20.00 dBm X_{2}^{-} -kinish bergalam ing ing tan-ng et ing persentah sang ang ang ang ang ang pendalah sang pang bandalah sang man Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (10001 pts) #VBW 3.0 MHz **GFSK Hopping Mode 1DH5** 2441 MHz Trig Delay-1.000 ms Trig: Video #Atten: 30 dB Center Freq 2.441000000 GHz Avg Type: Log-Pwr PNO: Fast ↔→ IFGain:Low ΔMkr1 2.880 ms 1.40 dE χ_2^-





Page: 55 of 66

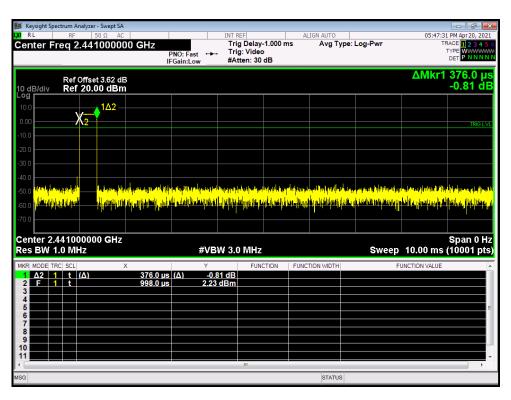
Temper	ature:	25°C Relative Humidity:					
Test Vo	tage:	DC 5V					
Test Mo	de:	Hopping Mode (π /4-DQPSK)					
Test	Channel		Pulse	Total of Dwell	Period Time	Limit	Popult
Mode	(MH	z)	Time (ms)	(ms)	(s)	(ms)	Result
2DH1	244	1	0.376	120.32	31.60	400	PASS
2DH3	244	1	1.639	262.24	31.60	400	PASS
2DH5	244	1	2.879	307.093	31.60	400	PASS

2DH1 Total of Dwell= Pulse Time*(1600/2)*31.6/79

2DH3 Total of Dwell= Pulse Time*(1600/4)*31.6/79

2DH5 Total of Dwell= Pulse Time*(1600/6)*31.6/79

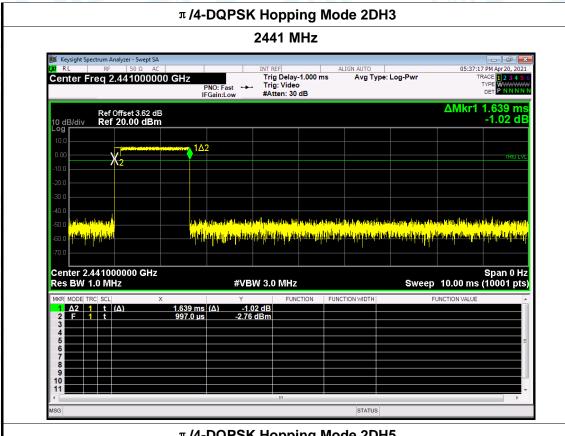
π /4-DQPSK Hopping Mode 2DH1



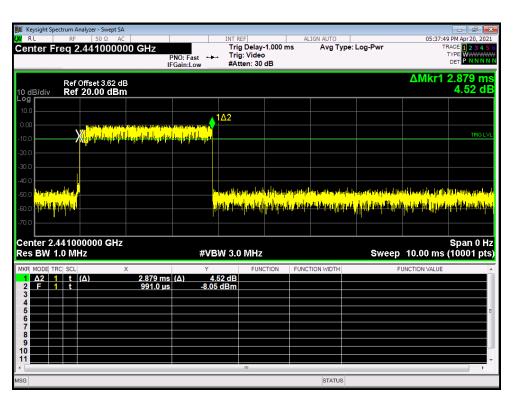




Page: 56 of 66



π /4-DQPSK Hopping Mode 2DH5





Page: 57 of 66

Attachment F-- Channel Separation and Bandwidth Test

Data

Temperature:	25℃ Relative Humidity: 55%			55%			
Test Voltage:	DC 5V						
Test Mode:	TXI	TX Mode (GFSK)					
Channel frequency (MHz)		99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)			
2402		814.54	873.8	582.53			
2441		835.31	878.6	585.73			
2480		832.87 876.2		584.13			
	GFSK TX Mode						
	2/02 MHz						



Report No.: TB-FCC179884 Page: 58 of 66



GFSK TX Mode 2441 MHz Center Freq: 2.441000000 GHz
Trig: Free Run
#Atten: 30 dB Center Freq 2.441000000 GHz Radio Device: BTS #IFGain:Low Center 2.441 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.333 ms **#VBW 100 kHz** 11.0 dBm **Total Power** Occupied Bandwidth 835.31 kHz -8.589 kHz % of OBW Power **Transmit Freq Error** 99.00 % x dB Bandwidth 878.6 kHz x dB -20.00 dB STATUS **GFSK TX Mode**





Page: 59 of 66

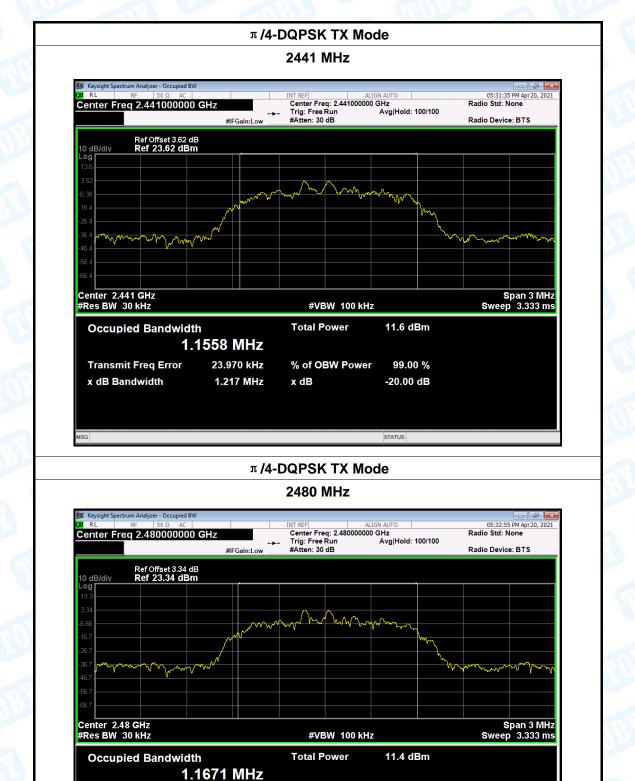
Temperature:	25℃		Relative Humidity:	55%			
Test Voltage:	DC	5V	WW TO THE	ALC:			
Test Mode:	TX	Mode (π/4-DQPSK)	A CONTRACTOR				
Channel frequency (MHz)		99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)			
2402		1142.6	1212.0	808.00			
2441		2441 1155.8		811.33			
2480	2480 1167.1			811.33			
# // DODSK TV Mode							

π/4-DQPSK TX Mode



Report No.: TB-FCC179884 Page: 60 of 66





18.461 kHz

1.217 MHz

Transmit Freq Error x dB Bandwidth

% of OBW Power

x dB

99.00 %

-20.00 dB

STATUS





25℃ Temperature: **Relative Humidity:** 55% DC 5V **Test Voltage: Test Mode:** Hopping Mode (GFSK) **Separation Read Value Separation Limit Channel frequency** (MHz) (kHz) (kHz) 2441 1104 585.73 **GFSK Hopping Mode** 2441 MHz Avg Type: Log-Pwi Avg|Hold:>100/100 Trig: Free Run #Atten: 30 dB PNO: Wide IFGain:Low





Page: 62 of 66





Report No.: TB-FCC179884 Page: 63 of 66 TOBY

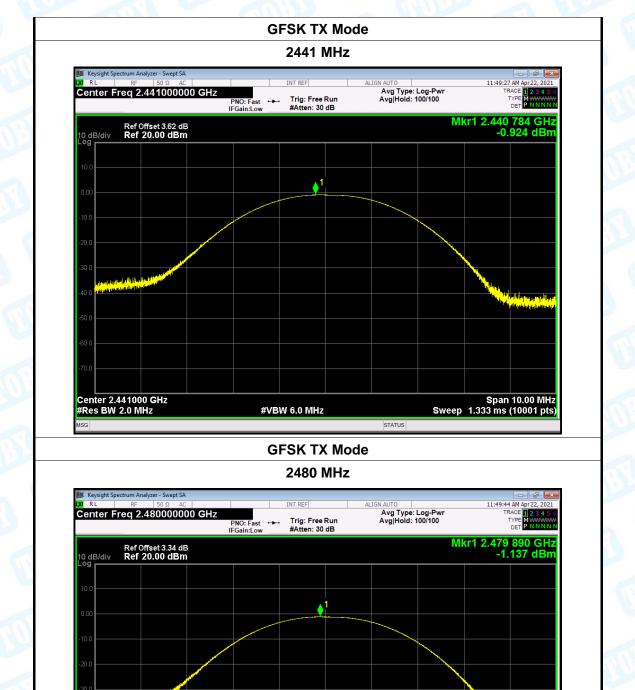
Attachment G-- Peak Output Power Test Data

t Voltage:	DC 5V						
t Mode:	TX Mode	(GFSK)				J. F.	
annel frequenc	cy (MHz)	Test Res	sult (dBn	n)	L	imit (dBm)	
2402		-1.186					
2441		-0	.924			21	
2480		-1.	.137				
		GFSK	TX Mode)			
		2402	2 MHz				
Keysight Spectrum Analyzer		***					
Center Freq 2.402	50 Ω AC 2000000 GHz	INT REF	ree Run	ALIGN AUTO Avg Type: Avg Hold:		11:48:59 AM Apr 22, 2021 TRACE 1 2 3 4 5	
			: 30 dB	Avginoid.		TYPE M WWWW.	
Ref Offsei 10 dB/div Ref 20.0	t 3.66 dB				Mkr'	l 2.401 853 GH; -1.186 dBn	
10 dB/div Ref 20.0	, u.z						
10.0							
			<u></u>				
0.00			<u> </u>				
-10.0							
-20.0							
-20.0	AND THE PROPERTY OF THE PARTY O						
-20.0						The second second	
-20.0						and the second	
-20 0 -30 0 -40 0						The state of the s	
-20 0 -30 0							
-20 0 -30 0 -40 0							
-20 0 -30 0 -40 0							
-20 0 -30 0 -40 0	Hz	#VBW 6.0 M				Span 10.00 MH: 333 ms (10001 pts	

Report No.: TB-FCC179884 Page: 64 of 66



Center 2.480000 GHz #Res BW 2.0 MHz



#VBW 6.0 MHz

Span 10.00 MHz Sweep 1.333 ms (10001 pts)

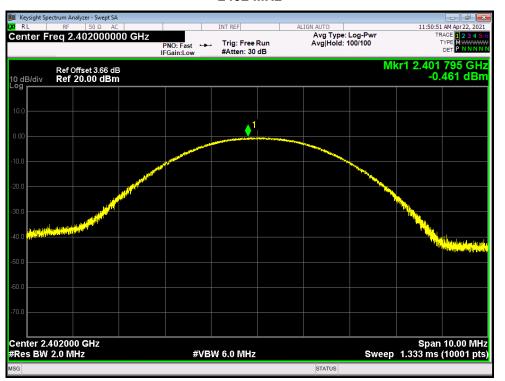




Page: 65 of 66

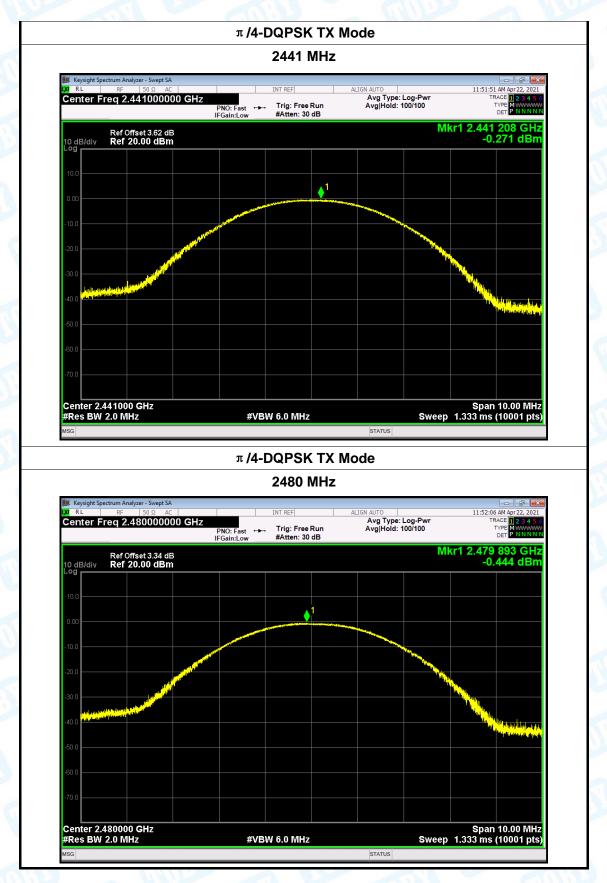
Temperature:	25℃		Relative Humi	dity:	55%		
Test Voltage:	DC 5V						
Test Mode:	TX Mode (π /4-DQPSK)						
Channel frequenc	y (MHz)	Test Result (dBm)		Limit (dBm)			
2402		-0.461					
2441		-0.271			21		
2480		-0.444					
π /4-DOPSK TX Mode							

π/4-DQPSK TX Mode



Page: 66 of 66





----END OF REPORT----