

Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC179884 Page: 1 of 66

# FCC Radio Test Report FCC ID: 2AXWO-M303

## **Original Grant**

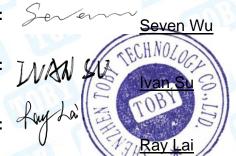
Report No.	27:	TB-FCC179884
Applicant	:	Doors Korea Co., Ltd
Equipment Under Te	est (El	JT)
EUT Name	:	Miracle,m M303 Pro Wireless portable speaker
Model No.	1:0	M303
Series Model No.	-	M320 , M330, M300
Brand Name	1:no	Miracle,m
Sample ID		TBBJ-20210409-31-1#& TBBJ-20210409-31-2#
Receipt Date	1:00	2020-04-19
Test Date		2020-04-19 to 2021-06-03
Issue Date	- : \	2021-06-03
Standards	<u>)</u> :	FCC Part 15, Subpart C 15.247
Test Method	- CA	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** 



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

CON	ITENTS	2
1.	GENERAL INFORMATION ABOUT EUT	5
	1.1 Client Information	5
	1.2 General Description of EUT (Equipment Under Test)	
	1.3 Block Diagram Showing the Configuration of System Tested	7
	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	
2.	TEST SUMMARY	11
3.	TEST SOFTWARE	
4.	TEST EQUIPMENT	12
5.	CONDUCTED EMISSION TEST	
	5.1 Test Standard and Limit	
	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	
	6.3 Test Procedure	17
	6.4 Deviation From Test Standard	17
	6.4 EUT Operating Condition	
	6.5 Test Data	17
7.	RESTRICTED BANDS REQUIREMENT	
	7.1 Test Standard and Limit	
	7.2 Test Setup	18
	7.3 Test Procedure	
	7.4 Deviation From Test Standard	
	7.5 EUT Operating Condition	
	7.6 Test Data	
8.	NUMBER OF HOPPING CHANNEL	20
	8.1 Test Standard and Limit	
	8.2 Test Setup	
	8.3 Test Procedure	
	8.4 Deviation From Test Standard	
	8.5 EUT Operating Condition	20

8.6 Test Data	20
9. AVERAGE TIME OF OCCUPANCY	21
9.1 Test Standard and Limit	21
9.2 Test Setup	
9.3 Test Procedure	21
9.4 EUT Operating Condition	21
9.4 Deviation From Test Standard	22
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	23
10.3 Test Procedure	
10.4 Deviation From Test Standard	
10.5 EUT Operating Condition	
10.6 Test Data	
11. PEAK OUTPUT POWER TEST	25
11.1 Test Standard and Limit	25
11.2 Test Setup	25
11.3 Test Procedure	
11.4 Deviation From Test Standard	
11.5 EUT Operating Condition	
11.6 Test Data	
12. ANTENNA REQUIREMENT	
12.1 Standard Requirement	26
12.2 Deviation From Test Standard	26
12.3 Antenna Connected Construction	26
12.4 Result	26
ATTACHMENT A CONDUCTED EMISSION TEST DATA	27
ATTACHMENT B RADIATED EMISSION TEST DATA	
ATTACHMENT C RESTRICTED BANDS REQUIREMENT AND BAND EDGE TES	T DATA
	40
ATTACHMENT D NUMBER OF HOPPING CHANNEL TEST DATA	
ATTACHMENT E AVERAGE TIME OF OCCUPANCY TEST DATA	
ATTACHMENT G PEAK OUTPUT POWER TEST DATA	63



# **Revision History**

Report No.	Version	Description	Issued Date
TB-FCC179884	Rev.01	Initial issue of report	2021-06-03
ang)		DEL TURA	anB
A C	BD T	The second	and the
mBJ	00		MABL
		E BAR	
and the	005		FORM
TOB		THE STATE	
and i	0000	A LUMAN D	TOBY
TOBL		A REAL PROPERTY OF	B mol
	000		COBU -
a mous		TOBY TOBY	TUDE
TOP		TOBI DOBI	The second

# 1. General Information about EUT

## **1.1 Client Information**

TOBY

Applicant	:	Doors Korea Co., Ltd		
Address	:	27, Mangu-ro 81-gil, Jungnang-gu, Seoul, South Korea		
Manufacturer	1	DONGGUAN TUCCI ELECTRONIC TECHNOLOGY CO., LTD		
Address		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 circuit, the only difference is the model name.		
AND AND		Operation Frequency:	Bluetooth V4.2(BT): 2402~2480 MHz FM receive: 88-108MHz	
and the		Number of Channel: Bluetooth: 79 Channels See Note 2		
Product Description		Max Peak Output Power: Bluetooth: -0.271dBm ( 1/4-DQPSK)		
Description		Antenna Gain: -0.58dBi PCB Antenna		
		Modulation Type:	GFSK π/4-DQPSK	
Power Supply	1.0	Input: DC 5V/2A DC7.4V by 2000mAh Li-io	n battery	
Software Version	~	V1.3		
Hardware Version		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.



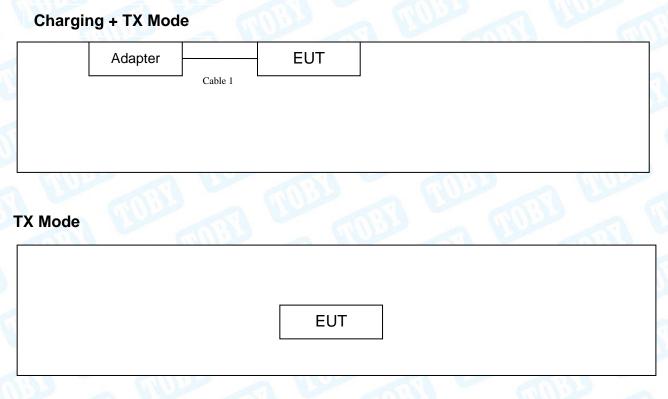
(2) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.Channel List:

		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.



## 1.3 Block Diagram Showing the Configuration of System Tested



1.4 Description of Support Units

	Equipment Information						
Name	Model	FCC ID/VOC	Manufacturer	Used "√"			
Adapter			HUAWEI	$\checkmark$			
	Cable Information						
Number	Shielded Type	Ferrite Core	Length	Note			



### 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( π/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.



### 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	CUUC A	FCC_assist	
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  $y \pm U_{2}$ , 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 <sub>Lab</sub> )
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.50 dB ±3.10 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



#### 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.

# 2. Test Summary

FCC Part 15 Subpart C(15.247)/ RSS 247 Issue 2						
Standard Se	ction	- Test Item	Test Sample(s)	Judgment	Remark	
FCC	IC	Test item		Judyment	Kemark	
15.203		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 5.1 (2)	Hopping Channel Separation	TBBJ-20210409-31-1#	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (4)	Dwell Time	TBBJ-20210409-31-1#	PASS	N/A	
15.247(b)(1)	RSS 247 5.4 (2)	Peak Output Power	TBBJ-20210409-31-1#	PASS	N/A	
15.247(b)(1)	RSS 247 5.1 (4)	Number of Hopping Frequency	TBBJ-20210409-31-1#	PASS	N/A	
15.247(d)	RSS 247 5.5	Band Edge	TBBJ-20210409-31-1#	PASS	N/A	
15.247(c)& 15.209	RSS 247 5.5	Radiated Spurious Emission	TBBJ-20210409-31-1# 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	

# 3. Test Software

Test Item	Test Software	Manufacturer	Version No.	
Conducted Emission	EZ-EMC	EZ	CDI-03A2	
Radiation Emission	EZ-EMC	EZ	FA-03A2RE	
RF Conducted Measurement	MTS-8310	MWRFtest	V2.0.0.0	

# 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
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Sep. 11, 2020	Sep. 10, 2021
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Sep. 11, 2020	Sep. 10, 2021
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO31	Sep. 11, 2020	Sep. 10, 2021
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO33	Sep. 11, 2020	Sep. 10, 2021

## 5. Conducted Emission Test

- 5.1 Test Standard and Limit
  - 5.1.1Test Standard FCC Part 15.207
  - 5.1.2 Test Limit

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

#### **Conducted Emission Test Limit**

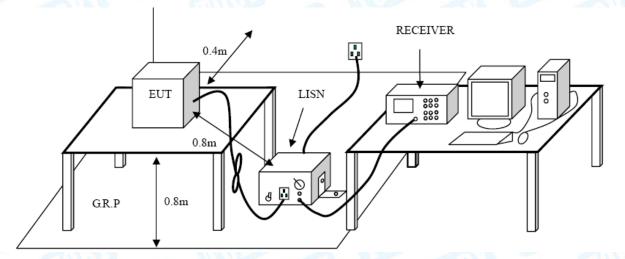
Notes:

(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





#### 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.

#### Report No.: TB-FCC179884 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)

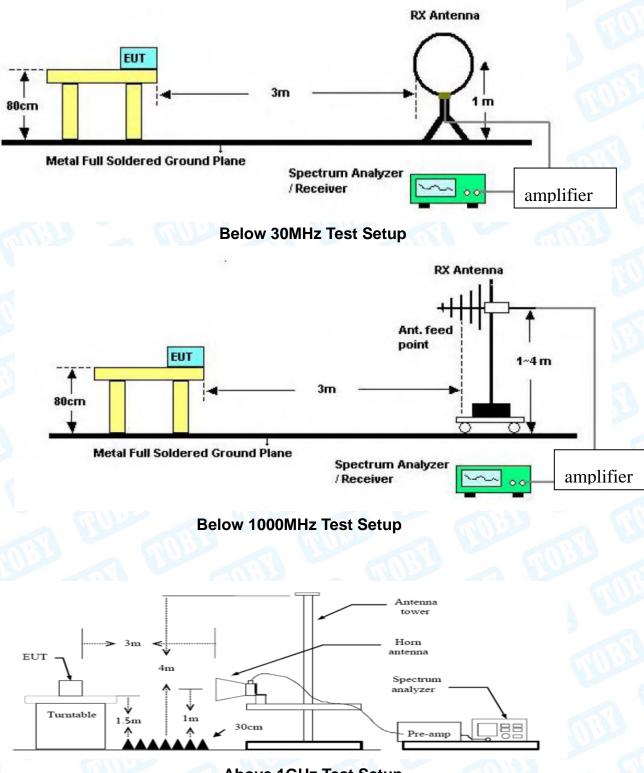
Frequency	Distance of 3m (dBuV/m)			
(MHz)	Peak	Average		
Above 1000	74	54		

#### Note:

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



6.2 Test Setup



Above 1GHz Test Setup

## 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

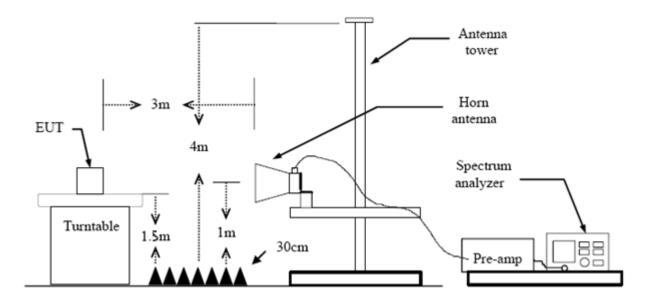
Remark: During testing above 1GHz the measuring instrument use RBW=1 MHz and VBW=3 MHz with Peak Detector for Peak Values, and use RBW=1 MHz and VBW=10 Hz with Peak Detector for Average Values. Please refer to the Attachment B.

# 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	Distance of 3m (dBuV/m)			
Band (MHz)	Peak	Average		
2310 ~2390	74	54		
2483.5 ~2500	74	54		

## 7.2 Test Setup



## 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.

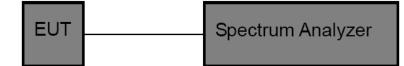
All restriction bands have been tested, only the worst case is reported. Please refer to the Attachment C.

# 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.

## 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 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.



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.



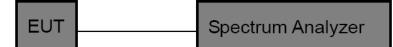
## **10. Channel Separation and Bandwidth Test**

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	<=1 MHz (20dB bandwidth)	2400~2483.5		
Channel Separation	>25KHz or >two-thirds of the 20 dB bandwidth Which is greater	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.



#### 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

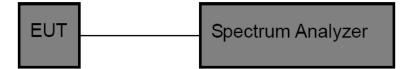
Please refer to the Attachment F.

## **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

Limit	Frequency Range(MHz)
Hopping Channels>75 Power<1W(30dBm)	2400~2483.5
	Hopping Channels>75

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  $\geq$  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.



## 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
Unique connector antenna
Professional installation antenna

# **Attachment A-- Conducted Emission Test Data**

Test Mode: Mode 1								
Terminal:      Line        Test Mode:      Mode 1        Remark:      Only worse case is reported        80.0      dBuV        0      0.0        0      0.0        0      0.0        0      0.0        0      0.0        0      0.0        0      0.0        0      0.0        0      0.5        0      0.5        0      0.5        0      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150      0.5        0.150	Temperatur	<b>e:</b> 24.8	3°C	EN I	Relative	e Humidity	/:	47%
Test Mode:      Mode 1        Remark:      Only worse case is reported        80.0      dBuV        0      0        0      dBuV        0      0	Test Voltage	e: AC	120V/60 Hz			200	602	
Remark: Only worse case is reported      80.0    dBuV      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0      0    0.5      0    0.5      0    0.5      0    0.5      0    0.5      0    0.5      0.150    0.5      0.5    0.5      0.1700    34.84      9.70    44.54      64.96    -20.42	Terminal:	Line		ET!	100		Ne	
80.0      dBuV        0 </th <th>Test Mode:</th> <th>Mod</th> <th>le 1</th> <th></th> <th>-</th> <th></th> <th></th> <th>MUL</th>	Test Mode:	Mod	le 1		-			MUL
No. Mk.      Freq.      Reading Level      Correct Factor      Measure- ment      Limit      Over        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	Remark:	Only	worse case	e is reporte	d		12	
No. Mk.      Freq.      Reading Level      Correct Factor      Measure- ment      Limit      Over        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	80.0 dBuV							
No. Mk.      Freq.      Reading Level      Correct Factor      Measure- ment      Limit      Over        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	00.0 0001						(	P:
30    4								
30    4								
30    4		_						
30    4								
30    4	×							
30    4	W Yumu	×						
30    4	. ol. M	W MM	white the second states	Mar New York and the	a happet the many line		dan.	
30    Main and			and a stable state attabilities	a solden her he an ortho	11 Marin	with the with shall be	They are and a second second	udan
No. Mk.    Freq.    Reading Level    Correct Factor    Measure- ment    Limit    Over      MHz    dBuV    dB    dBuV    dB    Detector      1    0.1700    34.84    9.70    44.54    64.96    -20.42    QP	30							WHAT THE WALLAND
-20    -	- N'M	MAM	ليعمينا المعملاتهما	Ins	much days			<sup>77</sup> 4 <sup>1</sup> pea
-20		Y W W W	Alexandra and the second states of a	e	Mar and	wall marganet	with which is	- Martine
0.150      0.5      (МНz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measure- ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP						***	and and	AND THE AVE
0.150      0.5      (МНz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measure-ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
0.150      0.5      (MHz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measure-ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
0.150      0.5      (MHz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measurement      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
0.150      0.5      (MHz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measurement      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
0.150      0.5      (MHz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measure-ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
0.150      0.5      (MHz)      5      30.000        No. Mk.      Freq.      Reading Level      Correct Factor      Measure-ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	.20							
No. Mk.Freq.Reading LevelCorrect FactorMeasure- mentLimitOverMHzdBuVdBdBuVdBuVdBDetector10.170034.849.7044.5464.96-20.42QP		0	5	(MH2)	5			30.000
No. Mk.      Freq.      Level      Factor      ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	0.150	0.	5	(MI12)	5	1		30.000
No. Mk.      Freq.      Level      Factor      ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP								
No. Mk.      Freq.      Level      Factor      ment      Limit      Over        MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP			Reading	Correct	Measure-			
MHz      dBuV      dB      dBuV      dBuV      dB      Detector        1      0.1700      34.84      9.70      44.54      64.96      -20.42      QP	No Mk	Fred				Limit	Over	
1 0.1700 34.84 9.70 44.54 64.96 -20.42 QP	NO. WIK.	Fley.	Level	Factor	ment	2000	0,01	
1 0.1700 34.84 9.70 44.54 64.96 -20.42 QP		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
2 0.1700 18.54 9.70 28.24 54.96 -26.72 AVG	1	0.1700	34.84	9.70	44.54	64.96 -2	20.42	QP
2 0.1700 18.54 9.70 28.24 54.96 -26.72 AVG								
	2	0.1700	18.54	9.70	28.24	54.96 -2	26.72	AVG

No.	Mk.	Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1700	34.84	9.70	44.54	64.96	-20.42	QP
2		0.1700	18.54	9.70	28.24	54.96	-26.72	AVG
3		0.1965	33.03	9.70	42.73	63.75	-21.02	QP
4		0.1965	15.96	9.70	25.66	53.75	-28.09	AVG
5		0.3700	26.97	9.70	36.67	58.50	-21.83	QP
6		0.3700	13.00	9.70	22.70	48.50	-25.80	AVG
7	*	0.4580	27.71	9.70	37.41	56.73	-19.32	QP
8		0.4580	13.95	9.70	23.65	46.73	-23.08	AVG
9		1.0060	26.41	9.80	36.21	56.00	-19.79	QP
10		1.0060	12.52	9.80	22.32	46.00	-23.68	AVG
11		1.5460	25.58	9.75	35.33	56.00	-20.67	QP
12		1.5460	14.88	9.75	24.63	46.00	-21.37	AVG

Remark:

TOBY

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

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



emperature	e: 24.8℃	: 32	A	Relative H	lumidity	47%	)
est Voltage	: AC 12	20V/60 Hz			LUD .		and a
erminal:	Neutra	al		A V	C.		
est Mode:	Mode	1	UPD .			y's	
lemark:	Only v	worse case	is reported	and '	19		NUL
80.0 dBuV						QP:	_
						AVG:	
<b></b>							
×							
V Win	n Man w		×.,	apple to the second			
	AM A. L. Make	on and the state of the state o	"napped/phases	Mary Waynes	heternoonspherios	Marine walker por	mu.
30	5 Mr. Am Au	a national showed	"Milliplay, 14/61/1444/14/14, 14-14-14-14-14	white			All pea
	No in the second	and the second sec	. MANYANA MANYA	- market	Mangalan	www.www.www.www.www.	
						-	
20							
0.150	0.5		(MHz)	5			30.000
		Reading	Correct	Measure-		-	
No. Mk.	Freq.	Level	Factor	ment	Limit	Over	
	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
3	0.2340	30.41	9.80	40.21	00.00	-22.09	QP
•		30.41	9.00	40.21	62.30	-22.03	
4	0.2340	15.05	9.80	24.85		-27.45	AVG
					52.30		AVG QP
4	0.2340	15.05	9.80	24.85	52.30 57.86	-27.45	
4 5 *	0.2340 0.3997	15.05 29.19	9.80 9.80	24.85 38.99	52.30 57.86 47.86	-27.45 -18.87	QP
4 5 * 6	0.2340 0.3997 0.3997	15.05 29.19 15.84	9.80 9.80 9.80	24.85 38.99 25.64 35.76	52.30 57.86 47.86 56.00	-27.45 -18.87 -22.22	QP AVG
4 5 * 6 7 8	0.2340 0.3997 0.3997 1.0060 1.0060	15.05 29.19 15.84 25.96 12.48	9.80 9.80 9.80 9.80 9.80 9.80	24.85 38.99 25.64 35.76 22.28	52.30 57.86 47.86 56.00 46.00	-27.45 -18.87 -22.22 -20.24 -23.72	QP AVG QP AVG
4 5 * 6 7 8 9	0.2340 0.3997 0.3997 1.0060 1.0060 2.2060	15.05 29.19 15.84 25.96 12.48 24.30	9.80 9.80 9.80 9.80 9.80 9.80 9.80	24.85 38.99 25.64 35.76 22.28 34.10	52.30 57.86 47.86 56.00 46.00 56.00	-27.45 -18.87 -22.22 -20.24 -23.72 -21.90	QP AVG QP AVG QP
4 5 * 6 7 8 9 10	0.2340 0.3997 0.3997 1.0060 1.0060 2.2060 2.2060	15.05 29.19 15.84 25.96 12.48 24.30 11.35	9.80 9.80 9.80 9.80 9.80 9.80 9.80 9.80	24.85 38.99 25.64 35.76 22.28 34.10 21.15	52.30 57.86 47.86 56.00 46.00 56.00 46.00	-27.45 -18.87 -22.22 -20.24 -23.72 -21.90 -24.85	QP AVG QP AVG QP AVG
4 5 * 6 7 8 9	0.2340 0.3997 0.3997 1.0060 1.0060 2.2060	15.05 29.19 15.84 25.96 12.48 24.30	9.80 9.80 9.80 9.80 9.80 9.80 9.80	24.85 38.99 25.64 35.76 22.28 34.10	52.30 57.86 47.86 56.00 46.00 56.00 46.00 56.00	-27.45 -18.87 -22.22 -20.24 -23.72 -21.90	QP AVG QP AVG QP

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)

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



## **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

Z~1GHZ	- 65					A. 15	
emperature:	<b>23.5</b> ℃			Relative I	lumidity:	43%	
est Voltage:	AC 120	V60HZ	1 Star				A.S
nt. Pol.	Horizon	ital		1000		N.S.	
est Mode:	Mode 1	2402MHz	122		132		
emark:	Only wo	orse case	is reported			100	
80.0 dBuV/m							
					(RE)ECC 15(	C 3M Radiati	
						Margin	- L - H - H - H
				3			
			2	- /			
30			, Å	4 . × .	;	6 X	man
Marke		1 ×	1	w with	al manum	when	~~~~
Manhamphing		Ϊ	Mrs		nation		
	WW. you showed w	man man					
20 <b>30.000 40 50</b>	60 70 8		(MHz)	300	400 500	0 600 700	) 1000.00
JU. UUU 40 JU	00 70 0	0	(MTZ)	500	400 300	000 700	1000.00
	F	Reading	Correct	Measure-			
No. Mk. Fr	eq.	Level	Factor	ment	Limit	Over	
M	Hz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detecto

No.	Mk	. Freq.	Level	Factor	ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		120.2766	43.33	-22.17	21.16	43.50	-22.34	peak
2		175.6516	53.90	-20.28	33.62	43.50	-9.88	peak
3	*	251.1804	56.80	-17.20	39.60	46.00	-6.40	QP
4		312.1794	44.24	-15.88	28.36	46.00	-17.64	peak
5		337.2155	40.93	-15.05	25.88	46.00	-20.12	peak
6		578.6699	38.82	-8.57	30.25	46.00	-15.75	peak

\*:Maximum data x:Over limit !:over margin

#### Remark:

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

- 2. QuasiPeak (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)
- 3. Margin (dB) = QuasiPeak (dB $\mu$ V/m)-Limit QPK(dB $\mu$ V/m)



emperature	: 2	<b>3.5</b> ℃	52			Relativ	e Humidit	ty:	43%	
est Voltage	: A	C 12	0V60	HZ			NOD			ann
Ant. Pol.	V	ertica	al	1 M				5		
est Mode:	N	lode	1 240	2MHz	CU P	20	0	<u>S</u>		
Remark:	C	)nly w	vorse	case is	s reported	600	35		10	N.
80.0 dBuV/m										
30	2			3			(RF)FC		3M Radiation Margin -6	dB
-20			W	n der			h da har har har har har har har har har ha			
		60 70			(MHz)	3	100 400	500	600 700	1000.000
-20	50	60 70	Rea	ading	(MHz) Correct Factor	Measure ment	00 400	500		
-20	50	60 70 eq.	Rea	ading	Correct	Measure	100 400 E- Limit	500	600 700	
-20	50 Free	60 70 eq.	Rea	ading	Correct Factor	Measure ment	200 400 e- Limit 1 dBuV/	500	600 700 Over	1000.000
-20 30.000 40 No. Mk.	50 Fre MH	60 70 eq. lz 535	Rea Le dE 43	ading evel BuV	Correct Factor dB/m	Measure ment dBuV/m	200 400 e- Limit 1 dBuV/	500 m 0	600 700 Over dB	1000.000
20 30.000 40 No. Mk. 1 * 2	50 Fre MH 30.85	60 70 eq. iz 535 318	Rea Le di 43	ading evel BuV 3.00	Correct Factor dB/m -13.58	Measure ment dBuV/m 29.42	200 400 e- Limit dBuV/r 40.00	500 m 0	600 700 Over dB -10.58	1000.000 Detecto
-20 30.000 40 No. Mk. 1 * 2 3	50 Fre MH 30.85 48.33	eq. iz 535 318 766	Rea Le 43 49 51	ading evel BuV 3.00 9.54	Correct Factor dB/m -13.58 -22.50	Measure ment dBuV/m 29.42 27.04	000 400 e- Limit dBuV/ 40.00 40.00	500 m 0 0	600 700 Over dB -10.58 -12.96	1000.000 Detecto peak
-20 30.000 40 No. Mk. 1 * 2 3 4	50 Fre MH 30.85 48.33 120.2	eq. iz 535 318 766 348	Rea Le 43 49 51 48	ading evel BuV 3.00 9.54 1.45	Correct Factor dB/m -13.58 -22.50 -22.17	Measure ment dBuV/m 29.42 27.04 29.28	e- Limit dBuV/ 40.00 40.00 43.50	500 m 0 0 0	600 700 Over dB -10.58 -12.96 -14.22	1000.00 Detecto peak peak

\*:Maximum data x:Over limit !:over margin

#### Emission Level= Read Level+ Correct Factor

#### Above 1GHz(Only worse case is reported)

Temperature:	23.3°C	Relative Humidity:	43%
Test Voltage:	DC 5V	mabe	
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2402MHz		i and

	No.	Mk	. Freq.	Reading Level	Correct Factor	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	2		4803.974	47.64	13.01	60.65	74.00	-13.35	peak

#### 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 $\mu$ V/m)-Limit PK/AVG(dB $\mu$ 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.

Relative Humidity:	43%
THUS -	
	11:33

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

#### 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz, The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

Temperature:	<b>23.3</b> ℃	Relative Humidity:	43%
Test Voltage:	DC 5V	0000	
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 24	41MHz	

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 $\mu$ V/m)-Limit PK/AVG(dB $\mu$ 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:	<b>23.3</b> ℃	Relative Humidity:	43%
Test Voltage:	DC 5V	UR1	
Ant. Pol.	Vertical	TOB!	and b
Test Mode:	TX GFSK Mode 2441MHz		

No	. Mk	. Freq.	Reading Level	Correct Factor	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

#### 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

			a contractor		100		7
Temperature:	23.3	°C		Relative H	lumidity:	43%	1
Test Voltage:	DC 5	SV V		000	52		MO.S.
Ant. Pol.	Horiz	contal		1 6	-0	RS	
Test Mode:	TX G	FSK Mode 2	480MHz				
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector

14.15

14.15

62.38

48.86

74.00

54.00

-11.62

-5.14

peak

AVG

Remark:

1

2

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

4959.652

4959.682

2. Peak/AVG (dBµV/m)= Corr. (dB/m)+ Read Level (dBµV)

48.23

34.71

3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/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:	<b>23.3</b> ℃	Relative Humidity:	43%
Test Voltage:	DC 5V		2
Ant. Pol.	Vertical		
Test Mode:	TX GFSK Mode 2480MHz		

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

#### 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.

-13.03

-7.03

peak

AVG

74.00

54.00

Temperature:	23.3	B℃	2 61	Relative Hu	midity:	43%	100
Test Voltage:	DC	5V			32	2	NUC
Ant. Pol.	Hori	zontal		100	-0		
Test Mode:	TX 1	τ /4-DQPSK I	Mode 2402	MHz			1200
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector

13.02

13.02

60.97

46.97

Remark:

1

2

1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB)

4804.294

4804.294

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

47.95

33.95

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:	<b>23.3</b> ℃	Relative Humidity:	43%				
Test Voltage:	DC 5V	DC 5V					
Ant. Pol.	Vertical						
Test Mode:	TX π /4-DQPSK I	Mode 2402MHz					

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

#### 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	<b>23.3</b> ℃	Relative Humidity:	43%
Test Voltage:	DC 5V	and by	
Ant. Pol.	Horizontal		RU
Test Mode:	TX π /4-DQPSK Mo	de 2441MHz	

N	o. Mk	. Freq.	Reading Level	Correct Factor	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 (dBµV/m)-Limit PK/AVG(dBµV/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	1	
Ant. Pol.	Vertical	TUD	
Test Mode:	TX π /4-DQPSK Mode 2441	MHz	- GUU

Ν	lo. M	lk.	Freq.	Reading Level		Measure- ment	Limit	Over	
			MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	48	382.384	34.91	13.59	48.50	54.00	-5.50	AVG
2		48	382.392	48.05	13.59	61.64	74.00	-12.36	peak

#### 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 $\mu$ V/m)-Limit PK/AVG(dB $\mu$ V/m)

4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



Temperature:	<b>23.3</b> ℃	Relative Humid	ity: 43%
Test Voltage:	DC 5V	and a	
Ant. Pol.	Horizontal		TOBLE -
Test Mode:	TX π /4-DQPSK Mod	le 2480MHz	
Test Wode.			

No	o. Mk	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

#### 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 $\mu$ V/m)-Limit PK/AVG(dB $\mu$ 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:	<b>23.3</b> ℃	Relative Humidity:	43%			
Test Voltage:	DC 5V					
Ant. Pol.	Vertical					
Test Mode:	TX π /4-DQPSK Mode 2480M	1Hz				

No	. 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

#### 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

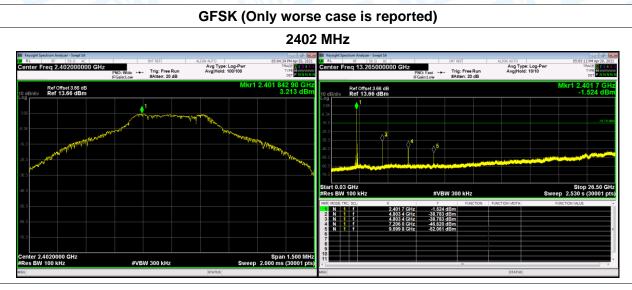
4. The tests evaluated1-26.5GHz,The testing has been conformed to the 10th harmonic of the highest fundamental frequency.



#### ---Conducted Unwanted Emissions

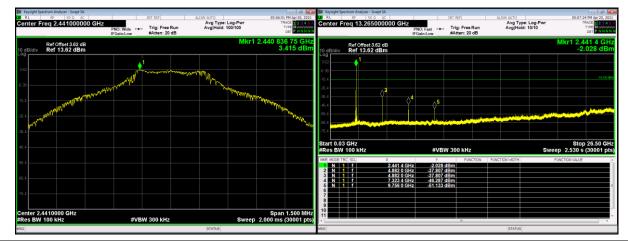
Condition	Mode	Frequency (MHz)	Antenna	Max Value (dBc)	Limit (dBc)	Verdict
NVNT	1-DH1	2402	Ant1	-41.99	-20	Pass
NVNT	1-DH1	2441	Ant1	-41.22	-20	Pass
NVNT	1-DH1	2480	Ant1	-41.3	-20	Pass
NVNT	2-DH1	2402	Ant1	-43.2	-20	Pass
NVNT	2-DH1	2441	Ant1	-44.58	-20	Pass
NVNT	2-DH1	2480	Ant1	-42.97	-20	Pass



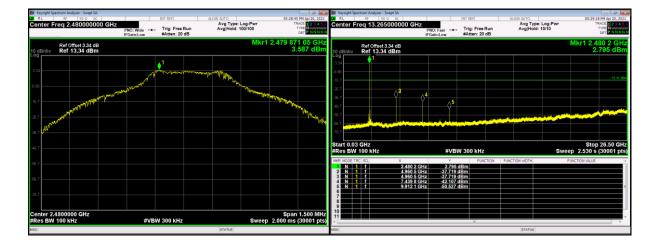


#### **GFSK Mode**

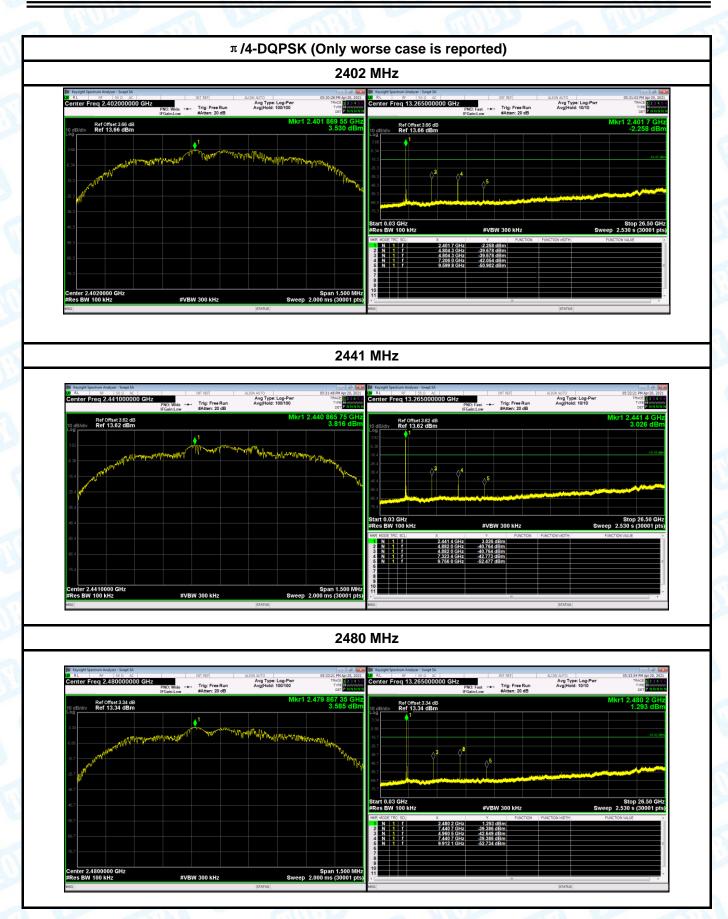
#### 2441 MHz



#### **GFSK Mode**







### Attachment C-- Restricted Bands Requirement and Band

### **Edge Test Data**

#### (1) Radiation Test

em	perature:	<b>23.3</b> ℃	Relative Humidity: 43%
est	Voltage:	DC 5V	
nt.	Pol.	Horizontal	and a and a
est	Mode:	TX GFSK Mode 240	02MHz
em	ark:	Only worse case is	reported
100.0	) dBuV/m		
			(RF) FCC PART 15C (PEAK)
			(RF) FCC PART 15¢ (AVG)
50			
0.0			

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	Х	2402.000	87.53	1.33	88.86	Fundamental	Frequency	peak
4	*	2402.200	82.34	1.33	83.67	Fundamental	Frequency	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 (dBµV/m)-Limit PK/AVG(dBµV/m)

23.3℃	<b>Relative Humidity:</b>	43%				
DC 5V	GUD -					
Vertical		3.2				
TX GFSK Mode 2402MHz						
Only worse case is reported	ed					
		3 ¥				
	(RF) FCC PA	RT 15C (PEXK)				
		$-\Lambda$				
	(BE) ECC P/	ABT 15C (AVG)				
	(					
	×					
	2	N° h				
	Vertical TX GFSK Mode 2402MHz	Vertical      TX GFSK Mode 2402MHz      Only worse case is reported      Image: Strength of the strengt of the strength of the strength of the strength of the strengt o				

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	Frequency	AVG
3	Х	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

- 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 (dBµV/m)-Limit PK/AVG(dBµV/m)

								100 M					<u>  </u>	1
Tem	nperat	ure	:	23.3°	C		21	3	Re	lative H	Humidity:	43%	-	
Tes	t Volta	ge		DC 5	V	U.	15)			CHO.	20		<u>v</u>	
Ant	. Pol.			Horiz	ontal	20		0			nn -	55		
Tes	t Mod	e:		TX G	FSK M	ode 2	2480 MH	Iz		-	10	A	53	31
Ren	nark:			Only	worse	case	is report	ed	6	(UP)			200	
110.	.0 dBuV	/m												
	2 X													
	1 ×													
	$\vdash \uparrow$	-						-						
	$ \downarrow\rangle$	_						-			(RE) ECC PA	ART 15C (PEA	<b>K</b> 1	
l	H							<u> </u>			(11)10011	uni 190 (r a	<u>,</u>	
60		3												
	'	×									(RF) FCC F	PART 15C (AV	6)	
l	$\parallel$	ž												
l	<b> </b>	-						_						
l														
l														
10.0	a													
	2475.000	2485.	00 2	495.00	2505.00	2515	5.00 252	5.00	253	5.00 25	645.00 2555.00	D	2575.00	MHz
					Rei	ading	Corre	ect	Me	asure-				—
l	No.	Mł	к. F	Freq.		evel	Fact			nent	Limit	Over		
I				MHz	dĒ	BuV	dB/m	n	dE	BuV/m	dBuV/m	dB	Detect	tor
	1	*	247	9.600	91	.70	1.85	5	9	3.55	Fundamental	Frequency	AVC	G
	2	Х	248	80.600	10	1.71	1.85	5	10	03.56	Fundamental	Frequency	pea	k
	3		248	3.500	57	.35	1.88	3	5	9.23	74.00	-14.77	pea	k
	4		248	3.500	47	.26	1.88	3	4	9.14	54.00	-4.86	AVC	G

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



		20.00		Dulut	11	100/			
	perature:	<b>23.3</b> ℃		Relativ	ve Humidity:	43%			
est	Voltage:	DC 5V	1.97		(I) DP	AW			
nt.	Pol.	Vertical	N. C.						
est	Mode:	TX GFS	K Mode 2480 MI	Hz		MOBY			
em	ark:	Only wor	rse case is repo	rted	131				
100.0	) dBuV/m	i							
	1 2								
	X								
					(RF) FCC P/	ART 15C (PEAK)			
		2							
50		3 ¥			(RF) FCC F	PART 15C (AVG)			
50		1							
	_/V					4 0.00			
	~								
0.0	67.000 2477.00	2487.00 249	97.00 2507.00 25	17.00 2527.00	2537.00 2547.0	0 2567.00 M			

No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	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)



emperature:	<b>23.3</b> ℃	Relative Humidity:	43%				
est Voltage:	DC 5V	TUP-					
nt. Pol.	Horizontal		1019				
est Mode:	e: TX π /4-DQPSK Mode 2402MHz						
emark:	Only worse case is repo	orted					
100.0 dBuV/m							
			3 X				
			ê.				
		(RF) FCC	PART 15C (PEAK)				
		(RF) FC	C PART 15¢ (AVG)				
50		1 X					
		2 					
0.0							

			Deedline	Commont	Magazina			
No.	Mk	. Freq.	Reading Level	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	Х	2402.200	87.99	1.33	89.32	Fundamenta	Frequency	peak
4	*	2402.200	80.61	1.33	81.94	Fundamental	Frequency	AVG

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

Temperature	e: 23	.3℃		<b>Relative Humidity:</b>	43%				
Test Voltage	: DC	C 5V	85	A DUL					
Ant. Pol.	Ve	rtical			3.5				
Fest Mode:	ТХ	π/4-DQPSK	Mode 2402M	Hz					
Remark:	Or	ly worse cas	e is reported	eported					
100.0 dBuV/m									
					3 ×				
				(RF) FCC PART					
				(RF) FCC PAF					
50									
				×					
				2					
0.0									

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	Х	2402.000	81.35	1.33	82.68	Fundamental	Frequency	peak
4	*	2402.200	74.46	1.33	75.79	Fundamental	Frequency	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 (dBµV/m)-Limit PK/AVG(dBµV/m)

Temperature:	<b>23.3</b> ℃	Relative Humidity:	43%
Test Voltage:	DC 5V	MUP	
Ant. Pol.	Horizontal		30
Test Mode:	TX π /4-DQPSK Mode 2480Mł	Hz	
Remark:	Only worse case is reported	CUUL .	1 Bar
110.0 dBuV/m			
60 60 10.0			ART 15C (PEAK)

No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2479.800	94.37	1.85	96.22	Fundamenta	I Frequency	peak
2	*	2480.000	88.74	1.85	90.59	Fundamenta	I 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

- 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 (dBµV/m)-Limit PK/AVG(dBµV/m)



emperature:	<b>23.3℃</b>	Relative Humidity:	43%
est Voltage:	DC 5V	A DULL	
nt. Pol.	Vertical		100
est Mode:	TX π /4-DQPSK Mode 2480	ИНz	
lemark:	Only worse case is reported	CTUDE -	2 199
100.0 dBuV/m			
			PART 15C (PEAK)
0.0			

No	o. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	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

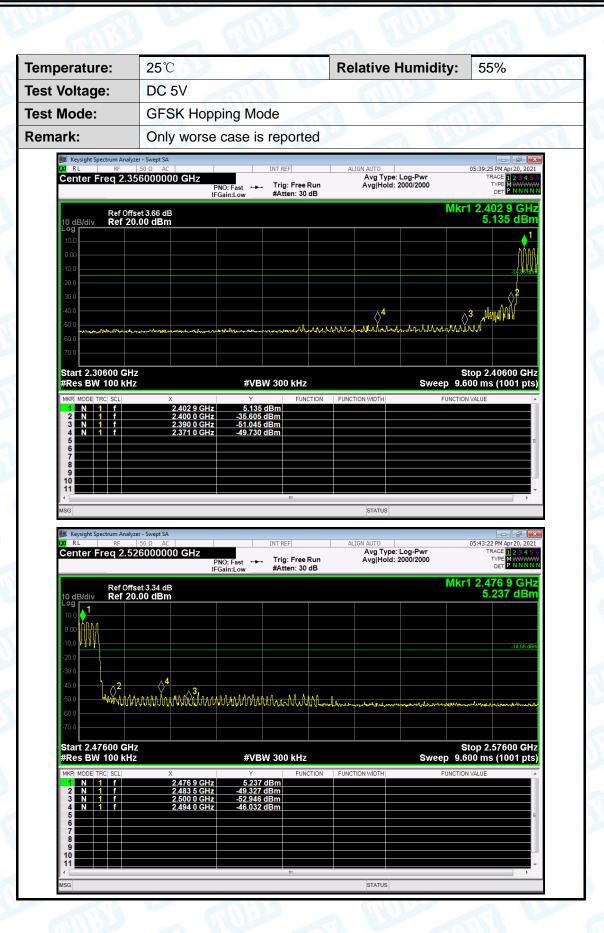
- 1. Corr. = Antenna Factor (dB/m) + Cable Loss (dB) 2. Peak/AVG (dBμV/m)= Corr. (dB/m)+ Read Level (dBμV)
- 3. Margin (dB) = Peak/AVG (dBµV/m)-Limit PK/AVG(dBµV/m)



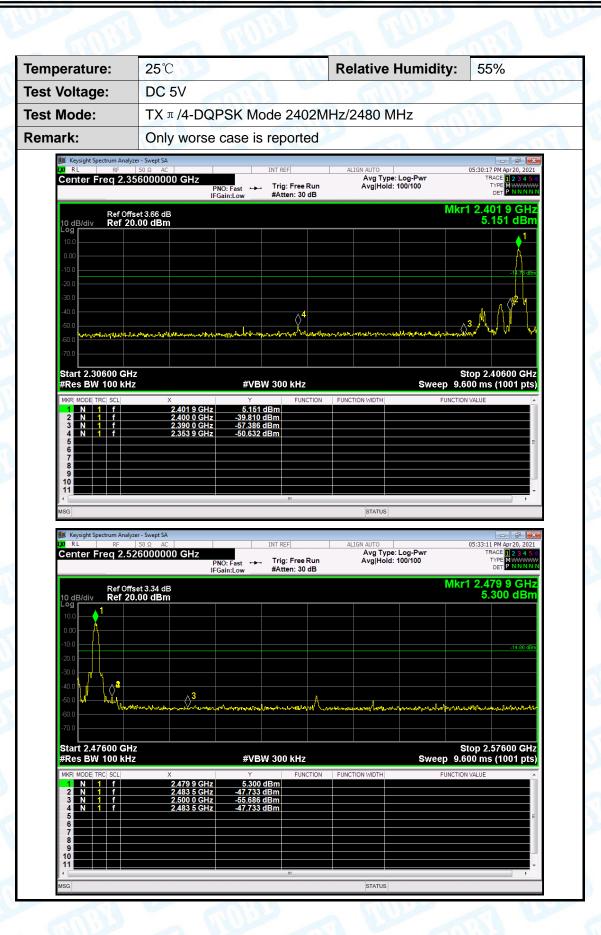
### (2) Conducted Test

perature:	<b>25</b> ℃	Relative Hu	umidity: 55%	
Voltage:	DC 5V	10		9
Mode:	TX GFSK Mode 2402N	/Hz/2480 MHz	NUL	1
nark:	Only worse case is rep	orted		111
Keysight Spectrum Anal XX RL RF	yzer - Swept SA 50 Ω AC INT RE	F ALIGN AUTO	05:04:28 PM Apr	💣 💌
	56000000 GHz	: Free Run Avg Type: Log Avg Hold: 100	a-Pwr TRACE	2 3 4 5 6 WWWWW NNNNN
Ref Of	IFGain:Low #Att	en: 30 dB	Mkr1 2.402 2	GHz
10 dB/div Ref 2	0.00 dBm		4.858	dBm 1
0.00				
-10.0				-15.10 dBm
-30.0			A /	2
-40.0		<sup>4</sup>	<u>3</u> №	[ Li p
-60.0	filled and many and a filled and the second and the second s	we wanter works and which we are we	at when provide the second field of	Ŷ
-70.0			Stop 2.4060	
Start 2.30600 GH #Res BW 100 kH		) kHz	Stop 2.4060 Sweep 9.600 ms (100	
MKR MODE TRC SCL	X Y 2.402 2 GHz 4.858 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	
	2 400 0 CUI= 40 026 dD=			
2 N 1 f 3 N 1 f 4 N 1 f	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm 2.353 9 GHz -48.472 dBm			
2 N 1 f 3 N 1 f 4 N 1 f 5 6	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm			=
2 N 1 f 3 N 1 f 4 N 1 f 5 6 7 8 9	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm			
2 N 1 f 3 N 1 f 4 N 1 f 5 6 7 7 8	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm	11		
2 N 1 f 3 N 1 f 4 N 1 f 5 6 7 8 9 9 10	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm	III III III		E F
2 N 1 f 3 N 1 f 4 N 1 f 6 5 6 7 8 9 9 9 10 7 MSG MSG M RL RF	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm ////////////////////////////////////	F ALIGN AUTO	05:28:29 PM Ap	
2 N 1 f 3 N 1 f 4 N 1 f 6 5 6 7 8 9 9 9 10 7 MSG MSG M RL RF	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC INT RE 26000000 GHz PNC: Fast ↔ Trig	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM Apr g-Pwr TRACE	
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC I INT R2 26000000 GHz Fast → Trig IFGain:Low #Att fset 3.34 dB	F ALIGN AUTO AVITO AVIT	05:28:29 PM Ap g-Pwr TRACE /100 TYPE M DET P Mkr1 2.479 9	C 20, 2021 2 3 4 5 6 0
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz -40.036 dBm 2.390 0 GHz -54.614 dBm 2.353 9 GHz -48.472 dBm yzer - Swept SA 50 Ω AC INT RE 26600000 GHz PNO: Fast → Trig IFGain:Low #Att	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM Api g-Pwr TRACE /100 TYPE M DET P	C 20, 2021 2 3 4 5 6 0
2 N 1 f 3 N 1 f 4 N 1 f 6 7 9 9 10 1 4 SC MSC MSC MSC MSC MSC MSC MSC M	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC I INT R2 26000000 GHz Fast → Trig IFGain:Low #Att fset 3.34 dB	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM Ap g-Pwr TRACE /100 TYPE M DET P Mkr1 2.479 9	C 20, 2021 2 3 4 5 6 0
2 N 1 f 3 N 1 f 4 N 1 f 6 7 9 9 9 9 10 11 4 MSG MSG MSG MSG MSG MSG MSG MSG	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC I INT R2 26000000 GHz Fast → Trig IFGain:Low #Att fset 3.34 dB	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM and 1 100 TRACE 1 1100 Type 1 Mkr1 2.479 9 5.276	C 20, 2021 2 3 4 5 6 0
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC I INT R2 26000000 GHz Fast → Trig IFGain:Low #Att fset 3.34 dB	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM and 1 100 TRACE 1 1100 Type 1 Mkr1 2.479 9 5.276	20, 2021 2 3 4 5 6 WWWWW NNNNN GHz dBm
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz    -40.036 dBm      2.350 0 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      2.353 9 GHz    -48.472 dBm      yzer - Swept SA	F ALIGN AUTO Avg Type: Loj : Free Run Avg Hold: 100	05:28:29 PM and 1 100 TRACE 1 1100 Type 1 Mkr1 2.479 9 5.276	20, 2021 2 3 4 5 6 WWWWW NNNNN GHz dBm
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz 40.036 dBm 2.390 0 GHz 54.614 dBm 2.353 9 GHz 48.472 dBm yzer - Swept SA 50 Ω AC 1 INT R2 26000000 GHz PNO: Fast → Trig IFGain:Low #Att fset 3.34 dB	F ALIGN AUTO Avg Type: Lo Avg Type: Lo Avg Hold: 100	05:28:29 PM and TRACE IT TYPE IN 00 TYPE IN	20, 2021 2 3 4 5 6 WWWWW NNNNN GHz dBm
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz    -40.036 dBm      2.350 0 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      2.353 9 GHz    -48.472 dBm      yzer - Swept SA	F ALIGN AUTO Avg Type: Lo Free Run Avg Hold: 100	05:28:29 PM and the second sec	r20, 2021 2 3 4 5 6 NNNNN GHz dBm
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz    -40.036 dBm      2.350 9 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      50 Ω    AC    INT RE      26000000 GHz    PNC: Fast    →      PRO: Fast    -    Trig      1FGain:Low    -    #Att      fset 3.34 dB    -    -      0.00 dBm    -    -      -    -    -    -      -    -    -    -      -    -    -    -      -    -    -    -    -      -    -    -    -    -      -    -    -    -    -      -    -    -    -    -      -    -    -	F ALIGN AUTO Avg Type: Lon Avg Type: Lon avg Hold: 100 Avg Hold: 100 Avg Hold: 100 Avg	05:28:29 PM or 1/100 TRACE I TYPE M 0 ET 2 Mkr1 2.479 9 5.276	r20, 2021 2 3 4 5 6 NNNN N GHz dBm -14.76 dBm
2 N 1 f 3 N 1 f 4 N 1 f 6	2.400 0 GHz    -40.036 dBm      2.350 0 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      2.353 9 GHz    -48.472 dBm      yzer - Swept SA    INT RE      50 Ω    AC      90 Ω AC    INT RE      126000000 GHz    PNO: Fast      PNO: Fast    INT RE      126000000 GHz    INT RE      126000000 GHz    INT RE      12    YWBW 300      12    YVBW 300      2.479 9 GHz    5.276 dBm	F ALIGN AUTO Avg Type: Lon Avg Type: Lon avg Hold: 100 Avg Hold: 100 Avg Hold: 100 Avg	05:28:29 PM or TRACE 1 1/100 TryPE M Mkr1 2.479 9 5.276	r20, 2021 2 3 4 5 6 NNNN N GHz dBm -14.76 dBm
2 N 1 f 3 N 1 f 4 N 1 f 6 1 f 6 1 f 6 1 f 7 8 8 9 9 9 9 10 0 11 8 F Center Freq 2.5 10 dB/div Ref 2 10 dB/div Ref	2.400 0 GHz  -40.036 dBm    2.350 9 GHz  -54.614 dBm    2.353 9 GHz  -48.472 dBm    2.353 9 GHz  -48.472 dBm    yzer - Swept SA  INT RE    50 Ω  AC  INT RE    26000000 GHz  PNO: Fast  →    126000000 GHz  PNO: Fast  →    17 Gain: Low  ***  Trig    18 0.00 dBm  -  -    19 0.00 dBm  -  -    10 0.00 dBm  -  -    12 1  ***  ***    12 1  #VBW 300	IF  ALIGN AUTO    Avg Type: Lo    Avg Type: Lo    avg Hold: 100	05:28:29 PM or TRACE 1 TYPE M 0 TYPE M 0 DET P Mkr1 2.479 9 5.276 Mkr1 2.479 9 5.276 Stop 2.5760 Sweep 9.600 ms (100	r20, 2021 2 3 4 5 6 NNNN N GHz dBm -14.76 dBm
2 N 1 f 3 N 1 f 4 N 1 f 6 1 f 6 1 f 6 1 f 7 1 f 8 9 9 9 10 11 4 MSG 11 F 6 1 f 7 1 f 8 9 9 9 10 11 4 MSG 10 0 11 F 10 0 11 F 10 0 11 F 10 0 11 F 10 0 10	2.400 0 GHz    -40.036 dBm      2.350 0 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      50 Ω    AC      526000000 GHz    INT R      PN0: Fast    →      IFGain:Low    Trig      #Att    50 Ω      fset 3.34 dB    0.00 dBm      0.00 dBm    -46.20 dBm      4z    -46.230 dBm      2.479 9 GHz    5.276 dBm      2.483 5 GHz    -46.230 dBm      2.439 5 GHz    -5.276 dBm      2.438 5 GHz    -46.230 dBm	IF  ALIGN AUTO    Avg Type: Lo    Avg Type: Lo    avg Hold: 100	05:28:29 PM or TRACE 1 TYPE M 0 TYPE M 0 DET P Mkr1 2.479 9 5.276 Mkr1 2.479 9 5.276 Stop 2.5760 Sweep 9.600 ms (100	r20, 2021 2 3 4 5 6 NNNN N GHz dBm -14.76 dBm
2 N 1 f 3 N 1 f 4 N 1 f 6 1 f 6 1 f 6 1 f 6 1 f 7 1 f 8 9 9 9 10 0 11 1 4 Keysight Spectrum Anal 6 1 f 7 Keysight Spectrum Anal 7 Key	2.400 0 GHz    -40.036 dBm      2.350 0 GHz    -54.614 dBm      2.353 9 GHz    -48.472 dBm      50 Ω    AC      526000000 GHz    INT R      PN0: Fast    →      IFGain:Low    Trig      #Att    50 Ω      fset 3.34 dB    0.00 dBm      0.00 dBm    -46.20 dBm      4z    -46.230 dBm      2.479 9 GHz    5.276 dBm      2.483 5 GHz    -46.230 dBm      2.439 5 GHz    -5.276 dBm      2.438 5 GHz    -46.230 dBm	IF  ALIGN AUTO    Avg Type: Lo    Avg Type: Lo    avg Hold: 100	05:28:29 PM or TRACE 1 TYPE M 0 TYPE M 0 DET P Mkr1 2.479 9 5.276 Mkr1 2.479 9 5.276 Stop 2.5760 Sweep 9.600 ms (100	r20, 2021 2 3 4 5 6 NNNN N GHz dBm

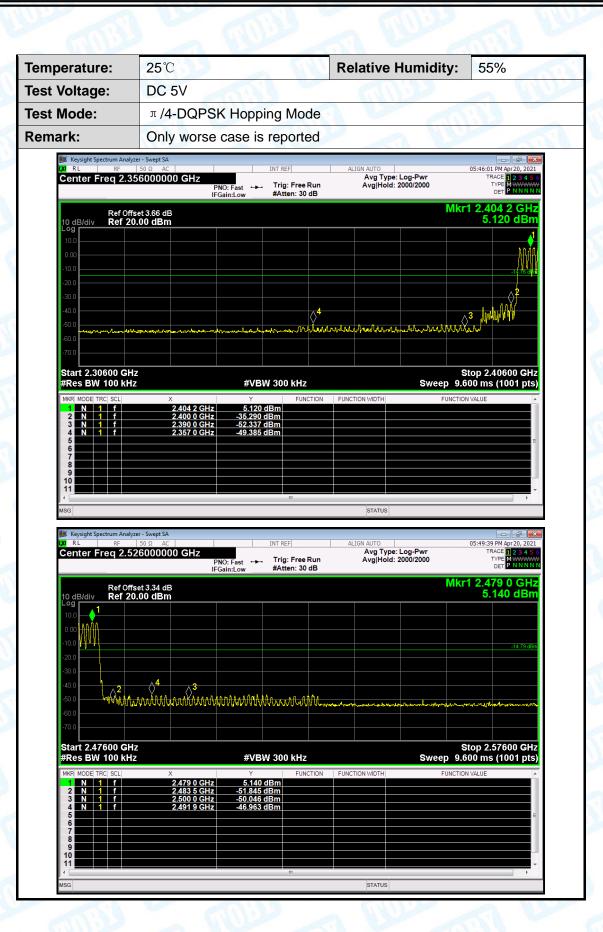












## **Attachment D-- Number of Hopping Channel Test Data**

TOBY

Temperature:	25°		5	Relative Humidity:	55%
Test Voltage:	DC	5V	-		132
Test Mode:	Нор	ping Mode	CHO.		
Frequency Rang	ge	Test Mode	Qu	antity of Hopping Channel	Limit
2402MHz~2480M	⊔,	GFSK		79	>15
2402101772~2480101	ПΖ	$\pi$ /4-DQPSK		79	>15

#### GFSK Mode

KI RL	RE	alyzer - Swept SA 50 Ω AC				INT REF	Δ	LIGN AUTO		05:40:4	5 PM Apr 20, 2021
enter F		44175000						Avg Type	: Log-Pwr		RACE 1 2 3 4 5
Seriler	Teq Z	44 17 5000		PNO: Fast	. <b></b> .	Trig: Free I		Avg Hold:			TYPE M WAAAAAAAA
				FGain:Low		#Atten: 30	dB				DET P NNNN
									Mkr	1 2 /01 0	20 5 GH
	Ref	Offset 3.62 dE	3						INIKI		177 dBn
10 dB/div Log	Ref	20.00 dBm									
10.0											2
		A DA DOS DA		*****	6 6 M M	146.8606		0.544.044.4	. Ma. 8 . 4 6 .		44444
0.00	机机机机	MANANA	MMANA	THE WAY	AAH.	JU AJU JA	YHUUUNNA	HAAAAAAAA	АНЛАНАНЦА	NAMAN	HANINA
-10.0	EY U U Y I	, , , , , , , , , , , , , , , , , , , ,	IAAAAAAAA	IVVVVV	( JA I)	A A A A A A A A A A	4444444	I Û Û Û Û Û Û Û Û Û Û Û Û Û Û Û Û Û Û Û	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	IANAAAAAA	141474
									A A . AL A .		
-20.0											
-30.0											
-40.0											
											}
-50.0											*¥
-60.0											
-70.0											
										Stop 2	48350 GH
Start 2.4	0000 G	Hz									
				#	≠VB₩	V 300 kHz			Sweep	p 8.000 m	s (1001 pts
#Res BW	/ 100 k	Hz								9 8.000 m	s (1001 pts
Start 2.4 #Res BW	I 100 k	Hz	×		Y	FUNC	TION FUNC	TION WIDTH		p 8.000 m UNCTION VALUE	s (1001 pts
#Res BN	/ 100 k	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BN	/ 100 k rrc scl 1 f	Hz 2.40		5	Y	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW MKR MODE 1 1 N 2 N 3 4 5 5 6 7 7 8 9	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WDTH		9 8.000 m	s (1001 pts
#Res BW	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC	TION FUNC	TION WIDTH		9 8.000 m	s (1001 pts
#Res BW MKR MODE 1 1 N 2 N 3 4 5 5 6 7 7 8 9	/ 100 k rrc scl 1 f	Hz 2.40	01 920 5 GHz	5	Y 11776	FUNC		TION WIDTH		9 8.000 m	s (1001 pts

#### π /4-DQPSK Mode

Filter F	req 2	.44175000		PNO:Fast ↔	L Tri	g: Free	Run				_og-Pwr 000/2000			RACE 1 2 3 4 5
				FGain:Low		tten: 30								DET PNNNN
		Offset 3.62 dB									Mkr	1 2.4		20 5 GH
dB/div	Ref	20.00 dBn											5.	128 dBn
m 🔥	A A A IV	18. LA 6. A. F. A.	ለኩስበኪብስል	አሉኪስሉሲሉሲ	ANN	ነስ ስ ክስ	n D B a A	n M M	s n 6 ለ ስ ሺ /	16A/	ANAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	ANNA.	1An AJ	14A D B Å
	WW	WWWW	44454044	N W W	18664	WW	INNIN	UW	VVVVV	WW	WWWWW	υ¥ύ∛γ	WW	VVVVI
	''Y'				i i i i	4.1.			1.001	1 81	11111	a k 1	111	$\{1,1,1\}$
.0 🖌														
														144
.0														
.0														
art 2.40	000 0	247										6	on 2	48350 GH:
les BW				#VI	BW 30	0 kHz					Swee	p 8.0	00 ms	(1001 pts
R MODE T	RCI SCLI		x	Y		FUN	CTION	FUNC	TION WIDTH	_	1	UNCTION	VALUE	
I N ·	l f	2.4	01 920 5 GHz	5.12	8 dBm									
	l i	2.48	30 076 5 GHz	4.51	3 dBm									
6														

### Attachment E-- Average Time of Occupancy Test Data

Temper	ature:	25°	С	Re	elative Humidity:	55%	010-20
Test Vo	Itage:	DC	5V			19	
Test Mo	de:	Hop	oping Mode (G	GFSK)			1200
Test	Chan	nel	Pulse	Total of Dwell	Period Time	Limit	Result
Mode	(MH	z)	Time (ms)	(ms)	(s)	(ms)	Result
	•	-/		(	(3)		
1DH1	244		0.376	120.32	31.60	400	PASS
1DH1 1DH3	•	<i>.</i> 1			. /	. ,	PASS PASS
	244	1 1	0.376	120.32	31.60	400	

1DH1 Total of Dwell= Pulse Time\*(1600/2)\*31.6/79

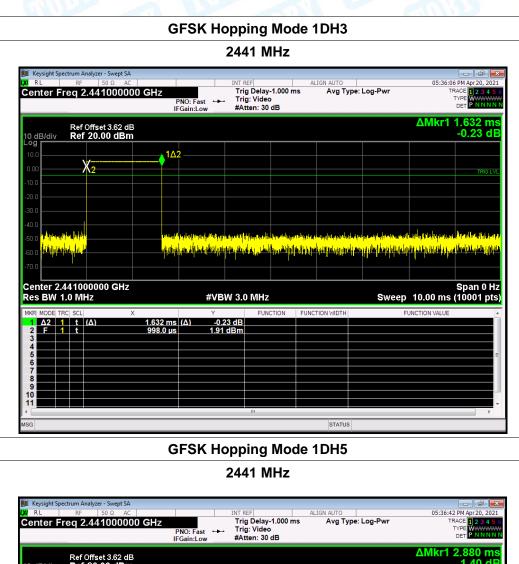
1DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79

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

#### GFSK Hopping Mode 1DH1

RL ∣ RF enter Freq 2.44	ter - Swept SA 50 Ω AC 41000000 GHz		INT REF Trig Delay-1 Trig: Video #Atten: 30 d	1.000 ms	IGN AUTO Avg Type:	Log-Pwr	т	8 PM Apr 20, 202 RACE 1 2 3 4 5 TYPE WWWWW DET PNNN
) dB/div Ref 20	set 3.62 dB <b>.00 dBm</b>						ΔMkr1	376.0 μ -1.92 d
o.0	<u>1Δ2</u>							
.00 X2								TRIG L
0.0								
0.0								
0.0								
		La techtik						
o.o <mark>kaliktaitisteinel</mark> i—	<mark>hopen is the state of the </mark>	in the light has a second show	Long to the distri		dualis lise ji sudjenilje		and a still a state	dia ata ata dalah
	lepallitettetetetetetetetetetetetetetetetete	in the light has a second show	alaanay aadad <mark>alaa Ayaalay ahalika, afti</mark>			an ar hein fin an iddin <mark>hijer dy'n ted</mark> yndyn	han na tipatan <mark>1937 - Langer Mangelan</mark>	de de en et de la de La de la d
the factor of the second se	ing partition of the second	in the light has a second show	a harren berte bilditte <mark>1 japolitza</mark> (b <mark>iolitza (</mark> bi				hadaan Afradadh (ya lagalan galahar)	1999 - 1999 - 1999 - 1999 - 1999 1996 - 1999 - 1999 - 1999 - 1999 - 1999 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 19
0.0 <mark>dala aktivitad</mark>		ng diga bertakan pertakan pert Pertakan pertakan pertak Pertakan pertakan p	i 3.0 MHz			LA LAN IL IL IL IN LEADING AND A DATA	10.00 ms	Span 0 I
0.0 <b></b>	Х	in the second part of the second s	<b>3.0 MHz</b>			Sweep		Span 0 I
α      μ	Х	₩₩₩₩₩ ₩₩ #VBW 9 μs (Δ) -1.92	I 3.0 MHz		<mark>head a bail a bail a</mark>	Sweep	10.00 ms	Span 0 I
0.0      Image: Constraint of the second sec	× 376.0	₩₩₩₩₩ ₩₩ #VBW 9 μs (Δ) -1.92	I 3.0 MHz		<mark>head a bail a bail a</mark>	Sweep	10.00 ms	Span 0 I
0.0      μ	× 376.0	₩₩₩₩₩ ₩₩ #VBW 9 μs (Δ) -1.92	I 3.0 MHz		<mark>head a bail a bail a</mark>	Sweep	10.00 ms	Span 0 I
0.0      μ	× 376.0	₩ <sup>4</sup> ₩ <sup>4</sup> ₩ #VBW 9 µs (Δ) -1.92	I 3.0 MHz		<mark>head a bail a bail a</mark>	Sweep	10.00 ms	Span 0 I
0.0      μ	× 376.0	₩ <sup>4</sup> ₩ <sup>4</sup> ₩ #VBW 9 µs (Δ) -1.92	I 3.0 MHz		<mark>head a bail a bail a</mark>	Sweep	10.00 ms	Span 0 I





RL	eq 2.4410		PNO: Fast	. Trig: \		ALIGN AUTO ns Avg Typ	e: Log-Pwr	TF	2 PM Apr 20, 202 RACE 1 2 3 4 5 TYPE W
	Ref Offset 3	8 62 dB	IFGain:Low	#Atter	n: 30 dB			ΔMkr1	2.880 m
dB/div	Ref 20.00							1	1.40 d
0.0				<u>↓</u> 1∆2					
.00	X_								TRIG L
3.0									
0.0									
0.0									
o.o. A davatada	Liter Lite			addette binan	والمراورين بعار أأسطوا	nation and an and the first state	والموراقيل وورور ألاتهم	والمتعادية المراجع	all as a middle and
0.0 <mark>1919 996</mark> 0.0 <b>1919 996</b> 0.0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					<mark>ell úl, stoán Halst, disz, bil</mark> l			ital dae generalite y det
enter 2.4 es BW 1.	41000000 .0 MHz	GHz	#\	VBW 3.0 N	ЛНz		Sweep	10.00 ms	Span 0 H (10001 pt
	C SCL	× 2.880 m		1.40 dB	FUNCTION	FUNCTION WIDTH	F	UNCTION VALUE	
2 F 1	t t	998.0 μ		.95 dBm					
4									
6									
8									
9									
1					1				•





ature:	<b>25℃ Relative Humidity:</b> 55%					
tage:	DC	5V	all -	6000		OID -
de:	Нор	oping Mode (	π /4-DQPSK)			
Chan	nel	Pulse	Total of Dwel	I Period Time	Limit	Booult
(MHz	z)	Time (ms)	(ms)	(s)	(ms)	Result
244 <sup>-</sup>	1	0.376	120.32	31.60	400	PASS
244 <sup>-</sup>	1	1.639	262.24	31.60	400	PASS
244 <sup>-</sup>	1	2.879	307.093	31.60	400	PASS
	tage: de: Chani (MHz 244 <sup>-</sup> 244 <sup>-</sup>	tage: DC	tage:  DC 5V    de:  Hopping Mode (3    Channel (MHz)  Pulse    2441  0.376    2441  1.639	tage:    DC 5V      de:    Hopping Mode ( π /4-DQPSK)      Channel (MHz)    Pulse    Total of Dwel      (MHz)    Time (ms)    (ms)      2441    0.376    120.32      2441    1.639    262.24	tage:      DC 5V        de:      Hopping Mode ( π /4-DQPSK)        Channel (MHz)      Pulse      Total of Dwell      Period Time        (MHz)      Time (ms)      (ms)      (s)        2441      0.376      120.32      31.60        2441      1.639      262.24      31.60	tage:      DC 5V        de:      Hopping Mode ( π /4-DQPSK)        Channel      Pulse      Total of Dwell      Period Time      Limit        (MHz)      Time (ms)      (ms)      (s)      (ms)        2441      0.376      120.32      31.60      400        2441      1.639      262.24      31.60      400

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

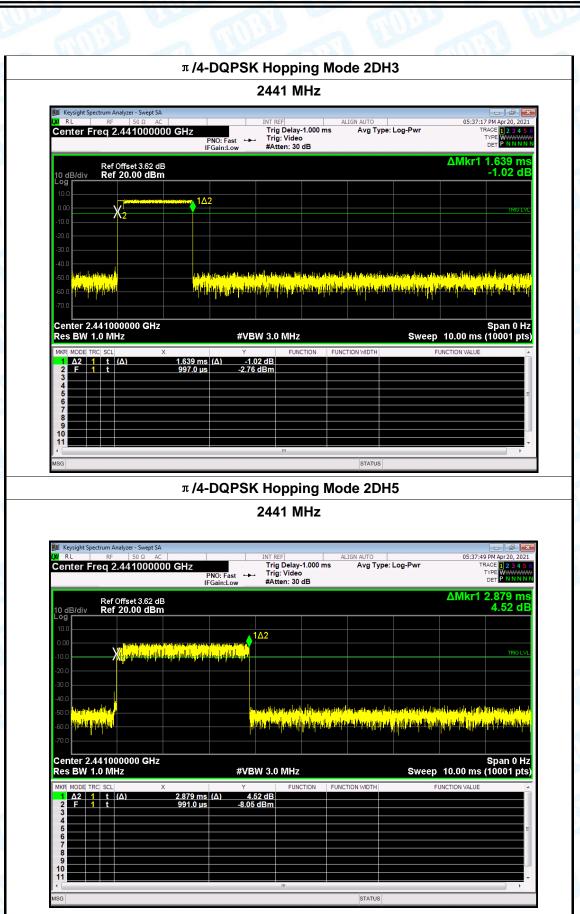
2DH3 Total of Dwell= Pulse Time\*(1600/4)\*31.6/79

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

#### $\pi$ /4-DQPSK Hopping Mode 2DH1

RL RF	alyzer - Swept SA 50 Ω AC		INT	REF	ALIG	N AUTO		05:47:3	1 PM Apr 20, 2
nter Freq 2.4			Tr ast ⊶⊶ Tr	rig Delay-1.00 rig: Video Atten: 30 dB		Avg Type:	Log-Pwr		TYPE WWW DET PNN
	ffset 3.62 dB 20.00 dBm							<b>AMkr</b> 1	376.0 -0.81
	1Δ2								
10 <b>— — — — — — —</b>	2								TRIC
.0									
o									
o									
o									
المحديقة المعريقا ال	la i complita di sui <mark>11 statisti di statisti</mark>	and the second	karlışının tirkini yaşır <mark>Alta hali den balınının</mark>	the second s				na dense gladen deli <mark>Asi dengina (anglis</mark> )	la di akawa a kat Vilani ya shekini
o <mark>jilenadajajan da kanek</mark> o	la, kasang kina dapat Aj <sub>a</sub> stadapati ( 114 siyan)	and the second	nandursta telenasia <mark>Ukushapata tilapata</mark>	the second s				in den er glednind aft <mark>Calif, en dreaf angelig d</mark>	li dan ang dan Li palan dan da
nter 2.441000		and the second		<mark>a, hal<sub>li t</sub>a ta kana kana kana kana kana kana kana </mark>			i, Laadelis ne kalkan ja ja	10.00 ms	Span 0 (10001 p
nter 2.441000 s BW 1.0 MHz	<b>z</b> X	<u>taka kia (nin pinta a</u>	<mark>Шилециал. (2014)</mark> #VBW 3. Y	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep		Span 0 (10001 j
nter 2.44100( s BW 1.0 MH; MODE TRC SCL	z χ Δ)	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 )
nter 2.441000 s BW 1.0 MH; MODE TRC SCL A2 1 t (/ F 1 t	z χ Δ)	<u>taka kia (nin pinta a</u>	<mark>Шилециал. (2014)</mark> #VBW 3. Y	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 p
nter 2.441000 s BW 1.0 MH; MODE TRC SCL A2 1 t (4 F 1 t	z χ	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 j
nter 2.441000 s BW 1.0 MH7 BW 1.0 MH7 MODE TRC SCL A2 1 t (4 F 1 t	z χ	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 p
nter 2.441000 s BW 1.0 MH; MODE TRC SCL A2 1 t (4 F 1 t	z χ	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 p
Image: constraint of the second se	z χ	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 j
	z χ	<u>алын , , , , , , , , , , , , , , , , , , ,</u>	<mark>Шилен (1), (2), (2), (2), (2), (2), (2), (2), (2</mark>	.0 MHz	il da kara ikun fika a	<mark>nişili indişi takla</mark> ı	Sweep	10.00 ms	Span 0 (10001 j





### Attachment F-- Channel Separation and Bandwidth Test

### Data

Temperature:	<b>25</b> ℃		Relative Humidity:	55%			
Test Voltage:	DC	5V		6000			
Test Mode:	ТΧ	Mode (GFSK)					
Channel frequency (MHz)		99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)			
2402	2402 814.54		873.8	582.53			
2441		2441 835.31		835.31 878.6		585.73	
2480		832.87	876.2	584.13			
GFSK TX Mode							

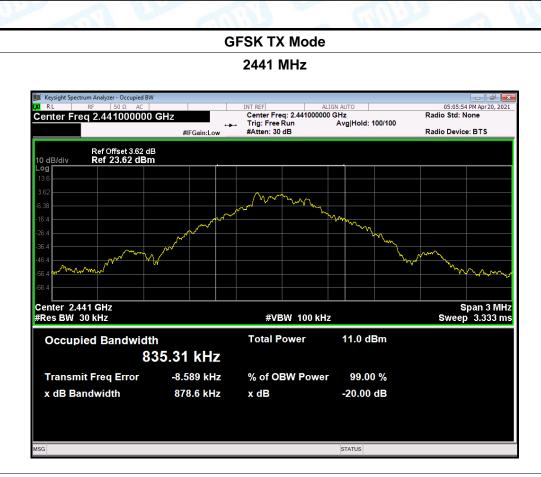
Keysight Spe RL um Analyzer - Occupied B 05:04:12 PM Apr 20, 202 Radio Std: None 
 INTIREFI
 ALIGN AUT

 Center Freq: 2.402000000 GHz

 Trig: Free Run
 Avg

 #Atten: 30 dB
Center Freq 2.402000000 GHz Avg|Hold: 100/100 Radio Device: BTS Ref Offset 3.66 dB Ref 23.66 dBm 10 dB/div Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.333 ms #VBW 100 kHz **Occupied Bandwidth Total Power** 11.2 dBm 814.54 kHz **Transmit Freq Error** -10.069 kHz % of OBW Power 99.00 % x dB Bandwidth 873.8 kHz x dB -20.00 dB STATUS





#### **GFSK TX Mode**



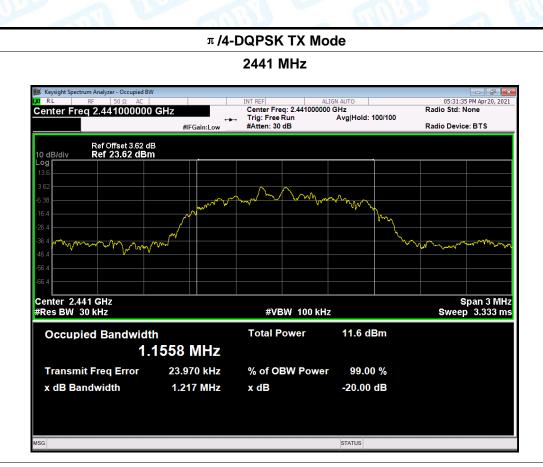


Temperature:	25°	C	Relative Humidity:	55%	
Test Voltage:	DC	5V	4000		
Test Mode:	ТΧ	Mode (π/4-DQPSK)		RU	
Channel freque (MHz)	ncy	99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)	
2402		1142.6	1212.0	808.00	
2441		2441 1155.8		811.33	
2480		1167.1	1217.0	811.33	

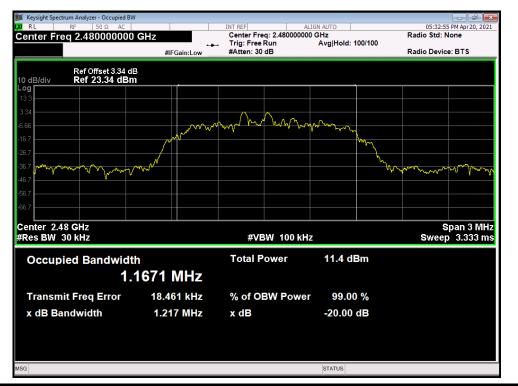
#### $\pi$ /4-DQPSK TX Mode







#### π /4-DQPSK TX Mode





		-			
perature:	<b>25</b> ℃		Relative Hu	imidity:	55%
Voltage:	DC 5V	NU:	AV		
Mode:	Hopping N	lode (GFSK)	100		
Channel freq	uency	Separation	n Read Value	Sep	aration Limi
(MHz)		()	(Hz)		(kHz)
2441		1	104		585.73
	1	GFSK Ho	pping Mode		
		244	1 MHz		
Keysight Spectrum Analy					
Center Freq 2.4	50 Ω AC 41500000 GHz		ALIGN AUTO Avg Type: Tree Run Avg Hold:> 1: 30 dB		05:40:03 PM Apr 20, 2021 TRACE 2 3 4 5 6 TYPE MWWWW DET P N N N N N
	set 3.62 dB			Mkr1	2.440 924 GHz
Log	0.00 dBm	.1			2.411 dBm
0.00		villa -		~~	^ ~ ~
10.0	mm	· · · · · · · · · · · · · · · · · · ·	Ma month .	· "~	a drawny v
-20.0	· Kongeland	v	www.	why	
-30.0					
-50.0					
-60.0					
-70.0					
Center 2.441500	GH7				Span 3.000 MHz
#Res BW 30 kHz		#VBW 100 I	٢Hz	Sweep 3	.200 ms (1001 pts)
MKR MODE TRC SCL	х	Y	FUNCTION FUNCTION WIDTH	FUNCT	ION VALUE
1 N 1 f 2 N 1 f	2.440 924 GH 2.442 028 GH				
3					
5					=
7					
8					
10					
•					4
MSG			STATUS		

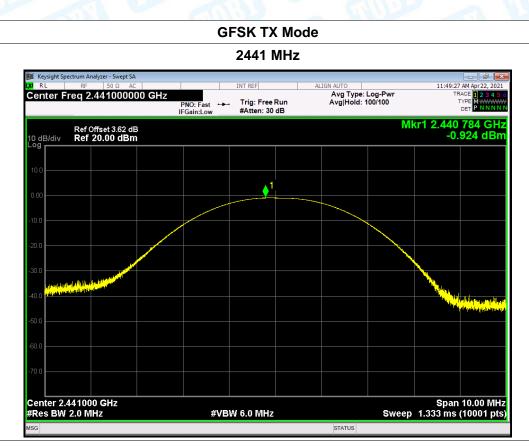


25℃ DC 5V Hopping M Hency	Separa		Relative Hu ) nd Value		55% paration Limit (kHz)
Hopping M lency	Separa	tion Rea (kHz)		Sep	
iency	Separa	tion Rea (kHz)		Sep	
	•	(kHz)	d Value	Sep	oaration Limit (kHz)
	π <b>/4-DQP</b> \$				(kHz)
	π <b>/4-DQP</b> \$	999.0			
	π <b>/4-DQP</b>				811.33
		SK Hop	oing Mode		
	2	2441 MH	z		
					e f
			ALIGN AUTO Avg Type: L	.og-Pwr	05:46:42 PM Apr 20, 2021 TRACE 1 2 3 4 5 6
			Avg Hold:>1	00/100	
t 3.62 dB				Mkr1	2.440 867 GHz
00 dBm					3.815 dBm
	<mark>}</mark> 1		<b>⊘</b> 2		
	harrow		- Marin	m	- Aver
mader		my and	vmm	Wm	a month
					~~~
					0
HZ	#VBW	100 kHz		Sweep 3	Span 3.000 MHz 3.200 ms (1001 pts)
X	Y		FUNCTION WIDTH		ION VALUE
2.440 867 GHz	z 3.815 dB	m			
2.441 866 GH2	2 3.825 dB	im			
					-
		III	STATIS		•
	et 3.62 dB 00 dBm	50 Q AC 111 1500000 GHz PNO: Wide IFGain:Low et 3.62 dB 00 dBm 1 1 1 1 1 1 1 1 1 1 1 1 1	S0 Q AC INT REF 1500000 GHZ PNO: Wide Trig: Free Run #Atten: 30 dB at 3.62 dB 00 dBm thz #VBW 100 kHz X Y FUNCTION 2.440 867 GHz 3.815 dBm	S0 Q      AC      INT REF      ALIGN AUTO        1500000 GHz      PNO: Wide IFGain:Low      Trig: Free Run #Atten: 30 dB      Avg Type: L AvgHold:>1        attack      Trig: Free Run #Atten: 30 dB      AvgHold:>1        attack      Trig: Free Run #Atten: 30 dB      AvgHold:>1        attack      Trig: Free Run #Atten: 30 dB      AvgHold:>1        attack      AvgHold:>1      AvgHold:>1        attack      Trig: Free Run #Atten: 30 dB      AvgHold:>1        attack      AvgHold:>1      AvgHold:>1        attack      Trig: Free Run #Atten: 30 dB      AvgHold:>1        attack      AvgHold:>1      AvgHold:>1        attack      Trig: Free Run #VBW 100 kHz      AvgHold:>1        X      Y      FUNCTION      FUNCTION WDTH	50 Q  AC  INT REF  ALIGN AUTO    1500000 GHz  PNO: Wide IFGain:Low  Trig: Free Run #Atten: 30 dB  Avg Type: Log-Pwr Avg Hold:>100/100    et 3.62 dB 00 dBm  Mkr1    00 dBm  0  0    100 dBm  0  0    100 dBm  0  0    100 dBm  0  0    100 dBm  0  0    110 dBm  0  0    111 dBm  0  0    111 dBm  0  0    111 dBm  0  0    111 dBm  111  0    111 dBm  111  111    111 dBm  111  1111

## Attachment G-- Peak Output Power Test Data

TOBY

mperature:	<b>25°</b> ℃		Relative H	lumidity:	55%		
st Voltage:	DC 5V	100	AV				
st Mode:	TX Mode	(GFSK)	100				
nannel frequen	cy (MHz)	Test Res	ult (dBm)	L	Limit (dBm)		
2402		-1.	186				
2441		-0.	924		21		
2480		-1.	137	_			
		GFSK 1	X Mode	1			
		2402	MHz				
Keysight Spectrum Analyze							
Center Freq 2.40	50 Ω AC 2000000 GHz	PNO: Fast +++ Trig: Fr IFGain:Low #Atten:	ee Run Avg Hol	pe: Log-Pwr d: 100/100	11:48:59 AM Apr 22, 2021 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNNN		
Ref Offse 10 dB/div Ref 20.	et 3.66 dB 00 dBm			Mkr	1 2.401 853 GHz -1.186 dBm		
10.0							
0.00							
-10.0							
-20.0							
-30.0	1 Martine Contraction						
-40.0					Mart		
-50.0							
-60.0							
-70.0							
Center 2.402000 G #Res BW 2.0 MHz	iHz	#VBW 6.0 MI	17	Sweep_1	Span 10.00 MHz .333 ms (10001 pts)		
WINCS DW 2.0 WINZ			1-	өмсср і	loco ma (noco i pis)		



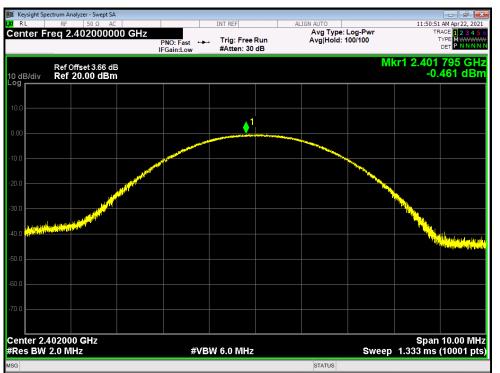
**GFSK TX Mode** 





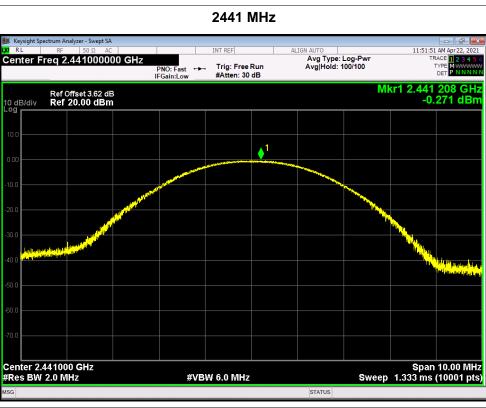
			10		
Temperature:25°C		Relative Humidity:		55%	
Test Voltage:	DC 5V		60		
Test Mode:	TX Mode	(π/4-DQPSK)		R	
Channel frequen	cy (MHz)	Test Result (dBm)	Li	imit (dBm)	
2402		-0.461			
2441		-0.271		21	
2480	-0.444				
		- /4 DODCK TV Made	I.		

#### π /4-DQPSK TX Mode



#### -----END OF REPORT-----





π/4-DQPSK TX Mode

TOBY

#### π /4-DQPSK TX Mode

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