

# Radio Test Report FCC ID: 2AF2R-HB88TX

# **Original Grant**

Report No.	-	TB-FCC174731
Applicant		Shenzhen Videotimes Technology Co.,Ltd
Equipment Under	Test	(EUT)
EUT Name		2.4GHz Digital Wireless Video Baby Camera
Model No.	-	HB88TX
Series Model No.	:5	N/A
Brand Name	:	HelloBaby
Sample ID	11	TBBJ-20200714-15-02#
Receipt Date	-	2020-08-11
Test Date		2020-08-11 to 2020-08-31
Issue Date		2020-08-31
Standards		FCC Part 15, Subpart C 15.247
Test Method	1	ANSI C63.10: 2013
Conclusions	:	PASS
		In the configuration tested, the ELIT complied with the standards specified a

: Jack : WAN SU : fugto.

In the configuration tested, the EUT complied with the standards specified above, The EUT technically complies with the FCC requirements

ena

**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.



# Contents

CON	NTENTS	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	
	1.4 Description of Support Units	7
	1.5 Description of Test Mode	7
	1.6 Description of Test Software Setting	8
	1.7 Measurement Uncertainty	8
	1.8 Test Facility	
2.	TEST SUMMARY	
3.	TEST SOFTWARE	10
4.	TEST EQUIPMENT	11
5.	CONDUCTED EMISSION TEST	
	5.1 Test Standard and Limit	
	5.2 Test Setup	
	5.3 Test Procedure	
	5.4 Deviation From Test Standard	
	5.5 EUT Operating Mode	
	5.6 Test Data	13
6.	RADIATED EMISSION TEST	14
	6.1 Test Standard and Limit	
	6.2 Test Setup	15
	6.3 Test Procedure	
	6.4 Deviation From Test Standard	
	6.5 EUT Operating Condition	17
	6.6 Test Data	17
7.	RESTRICTED BANDS AND BAND-EDGE TEST	
	7.1 Test Standard and Limit	
	7.2 Test Setup	
	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	20
	8.3 Test Procedure	
	8.4 Deviation From Test Standard	20
	8.5 EUT Operating Condition	



	8.6 Test Data	20
9.	AVERAGE TIME OF OCCUPANCY	
	9.1 Test Standard and Limit	
	9.2 Test Setup	
	9.3 Test Procedure	
	9.4 EUT Operating Condition	21
	9.4 Deviation From Test Standard	21
	9.5 Test Data	21
10.	CHANNEL SEPARATION AND BANDWIDTH TEST	22
	10.1 Test Standard and Limit	22
	10.2 Test Setup	
	10.3 Test Procedure	22
	10.4 Deviation From Test Standard	
	10.5 EUT Operating Condition	
	10.6 Test Data	
11.	PEAK OUTPUT POWER TEST	
	11.1 Test Standard and Limit	23
	11.2 Test Setup	
	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	24
	12.2 Deviation From Test Standard	24
	12.3 Antenna Connected Construction	
	12.4 Result	
ATT	ACHMENT A CONDUCTED EMISSION TEST DATA	
ATT	ACHMENT B RADIATED EMISSION TEST DATA	
ATT	ACHMENT C RESTRICTED BANDS REQUIREMENT TEST DATA	
ATT	ACHMENT D NUMBER OF HOPPING CHANNEL TEST DATA	44
ATT	ACHMENT E AVERAGE TIME OF OCCUPANCY TEST DATA	
ATT	ACHMENT F CHANNEL SEPARATION AND BANDWIDTH TEST DATA	
	ACHMENT G PEAK OUTPUT POWER TEST DATA	



# **Revision History**

Report No.	Version	Description	Issued Date
TB-FCC174731	Rev.01	Initial issue of report	2020-08-31
and s	601		I ConB
No C		The second second	(D)
TUDD		TOBI TOBI	TO TO DE
	608		
THE TOP		Dis and a second	
DBJ -	0081	a lung	MOBI
0033			
	Non al		6000

# 1. General Information about EUT

# **1.1 Client Information**

TOBY

Applicant	:	Shenzhen Videotimes Technology Co.,Ltd
Address	-	Room 601, Building B, Union Financial Building Fubao Street, Futian Free Trade Zone, Shenzhen, China
Manufacturer	<	Shenzhen Videotimes Technology Co.,Ltd
Address		Room 601, Building B, Union Financial Building Fubao Street, Futian Free Trade Zone, Shenzhen, China

# 1.2 General Description of EUT (Equipment Under Test)

EUT Name		2.4GHz Digital Wireless Video Baby Camera				
Models No.		HB88TX				
Model Difference	:	N/A				
Sample ID	:	TBBJ-20200714-15-02#	TBBJ-20200714-15-02#			
AND A		Operation Frequency:	2410MHz~2473MHz			
	5	Number of Channel:	19 Channels See Note 2			
Product Description	:	Max Peak Output Power:	6.619dBm			
Description	1	Antenna Gain:	2dBi Diople Antenna			
		Modulation Type:	GFSK (4Mbps)			
Power Supply	X	DC Voltage Supply from A	DC Voltage Supply from AC/DC Adapter			
Power Rating			Adapter (Model:K05V050120U) Input: AC 100-240V~50/60Hz, 0.2A Output: DC 5.0V.1.2A			
Software Version	•••	V1.0	V1.0			
Hardware Version		HB88T_V02				
Remark	:	The adapter and antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.				

#### Note:

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



## (2) Channel List:

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)		
00	2410	15	2462.5	OR OF			
01	2413.5	16	2466		6000		
02	2417	17	2469.5				
03	2420.5	18	2473	60000			
04	2424						
05	2427.5	22	- COMPE		2		
06	2431				1170		
07	2434.5		2				
08	2438		111		12		
09	2441.5						
10	2445	6 M 2					
11	2448.5				3		
12	2452		NUC -		10		
13	2455.5				0100		
14	2459						

Note: Test frequencies are lowest channel: 2410MHz, middle channel: 2441.5MHz and highest channel: 2473MHz.

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

# 1.3 Block Diagram Showing the Configuration of System Tested

# Adapter & TX Mode

Adapter

EUT



### 1.4 Description of Support Units

The EUT has been tested as an independent unit.

#### 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	Adapter+ TX Mode

	For Radiated Test
Final Test Mode	Description
Mode 1	TX GFSK Mode
Mode 2	TX Mode(GFSK) Channel 00/09/18

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 (4Mbps)

(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	Switch channels and modes by pressing buttons			
Frequency	2410 MHz	2441.5 MHz	2473 MHz	
GFSK	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 <sub>Lab</sub> )	
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	±3.60 dB ±3.10 dB	
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	±4.60 dB	
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±4.20 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 1A/F., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, 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: 2005 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: 2005 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.

TOBY

# 2. Test Summary

FCC Part 15 Subpart C(15.247)/ RSS 247 Issue 2						
Standard S	ection	Test Item	Tast Osmula(s)		Dements	
FCC	IC	rest item	Test Sample(s)	Judgment	Remark	
15.203	4020	Antenna Requirement	TBBJ-20200714-15-02#	PASS	N/A	
15.207	RSS-GEN 8.8	Conducted Emission	TBBJ-20200714-15-02#	PASS	N/A	
15.205	RSS-Gen 8.10	Restricted Bands	TBBJ-20200714-15-02#	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (b)	Hopping Channel Separation	TBBJ-20200714-15-02#	PASS	N/A	
15.247(a)(1)	RSS 247 5.1 (d)	Dwell Time	TBBJ-20200714-15-02#	PASS	N/A	
15.247(b)(1)	RSS 247 5.4 (b)	Peak Output Power	TBBJ-20200714-15-02#	PASS	N/A	
15.247(b)(1)	RSS 247 5.1 (d)	Number of Hopping Frequency	TBBJ-20200714-15-02#	PASS	N/A	
15.247(d)	RSS 247 5.5	Band Edge	TBBJ-20200714-15-02#	PASS	N/A	
15.247(c)& 15.209	RSS 247 5.5 &RSS-GEN 8.9	Radiated Spurious Emission	TBBJ-20200714-15-02#	PASS	N/A	
15.247(a)	RSS 247 5.1 (a)	99% Occupied Bandwidth & 20dB Bandwidth	TBBJ-20200714-15-02#	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

<b>Conducted Emissi</b>	ion Test				
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100321	Jul. 12, 2020	Jul. 11, 2021
RF Switching Unit	Compliance Direction Systems Inc	RSU-A4	34403	Jul. 12, 2020	Jul. 11, 2021
AMN	SCHWARZBECK	NNBL 8226-2	8226-2/164	Jul. 12, 2020	Jul. 11, 2021
LISN	Rohde & Schwarz	ENV216	101131	Jul. 12, 2020	Jul. 11, 2021
Radiation Emissio	on Test	-		-	-
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 12, 2020	Jul. 11, 2021
EMI Test Receiver	Rohde & Schwarz	ESPI	100010/007	Jul. 12, 2020	Jul. 11, 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	00143209	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	Mar.01, 2020	Feb. 28, 2021
Pre-amplifier	HP	8449B	3008A00849	Mar.01, 2020	Feb. 28, 2021
Pre-amplifier	SKET	LNPA_1840G-50	SK201904032	Jul. 27, 2020	Jul. 26, 2021
Cable	HUBER+SUHNER	100	SUCOFLEX	Mar. 07, 2020	Mar. 06, 2021
Positioning Controller	ETS-LINDGREN	2090	N/A	N/A	N/A

# Antenna Conducted Emission

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Due Date
Spectrum Analyzer	Agilent	E4407B	MY45106456	Jul. 12, 2020	Jul. 11, 2021
Spectrum Analyzer	Rohde & Schwarz	ESCI	100010/007	Jul. 12, 2020	Jul. 11, 2021
MXA Signal Analyzer	Agilent	N9020A	MY49100060	Sep. 16, 2019	Sep. 15, 2020
Vector Signal Generator	Agilent	N5182A	MY50141294	Sep. 16, 2019	Sep. 15, 2020
Analog Signal Generator	Agilent	N5181A	MY50141953	Sep. 16, 2019	Sep. 15, 2020
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO26	Sep. 16, 2019	Sep. 15, 2020
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO29	Sep. 16, 2019	Sep. 15, 2020
RF Power Sensor	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO31	Sep. 16, 2019	Sep. 15, 2020
	DARE!! Instruments	RadiPowerRPR3006W	17100015SNO33	Sep. 16, 2019	Sep. 15, 2020



# 5. Conducted Emission Test

- 5.1 Test Standard and Limit
  - 5.1.1Test Standard FCC Part 15.207/RSS-GEN 8.8
  - 5.1.2 Test Limit

Conde	ucted Emission Test Limit		
Contraction of the second	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	

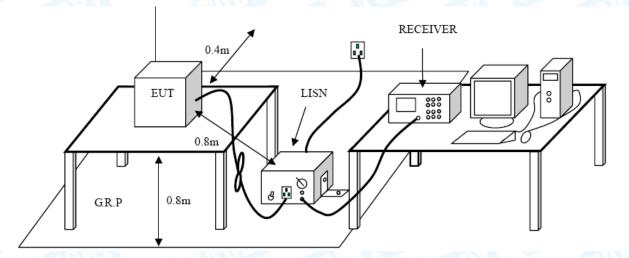
## Notes:

(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.



# 6. Radiated Emission Test

- 6.1 Test Standard and Limit
  - 6.1.1 Test Standard
    - FCC Part 15.209/RSS-GEN 8.9
  - 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

Frequency	Distance Meters(at 3m)		
(MHz)	Peak	Average	
Above 1000	74	54	

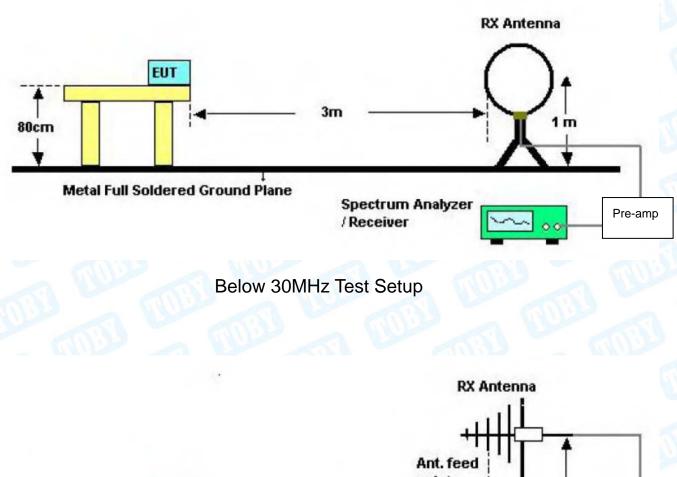
#### Note:

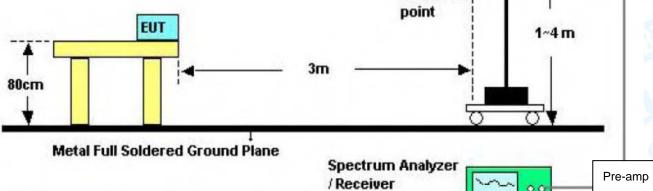
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m)



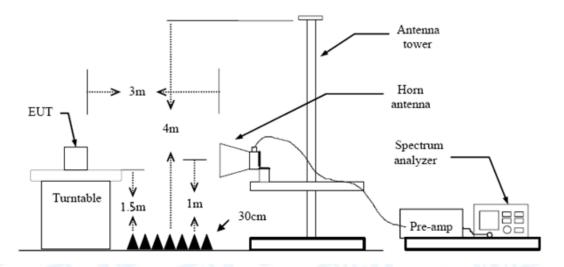
6.2 Test Setup





Below 1000MHz Test Setup





Above 1GHz Test Setup

### 6.3 Test Procedure

- (1) 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.
- (2) Measurements at frequency Below 1GHz. The EUT was placed on a rotating 0.8m 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

6.5 EUT Operating Condition

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

# 6.6 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. Please refer to the Attachment B.

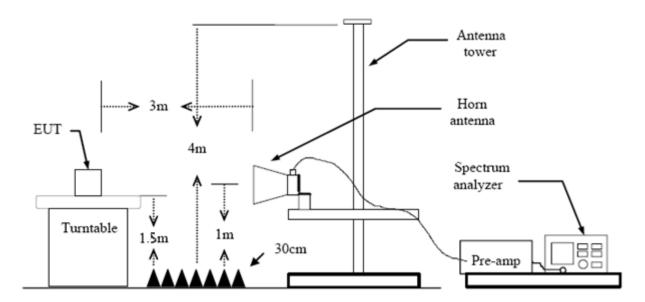


# 7. Restricted Bands and Band-edge test

- 7.1 Test Standard and Limit
  - 7.1.1 Test Standard FCC Part 15.209&15.205 RSS-GEN 8.9&8.10
  - 7.1.2 Test Limit

Restricted Frequency	Distance N	leters(at 3m)
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.

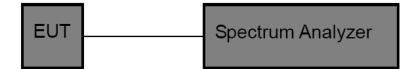


# 8. Number of Hopping Channel

- 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.

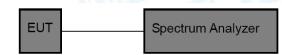


# 9. Average Time of Occupancy

- 9.1 Test Standard and Limit
  - 9.1.1 Test Standard
    - FCC Part 15.247 (a)(1) / RSS 247 5.1(d)
  - 9.1.2 Test Limit

Test Item	Limit
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=100KHz, VBW=300KHz.
- (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 center 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:

The Dwell Time = Burst Width \* Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] \* hopping number = 0.4 [s] \* 20 [ch] = 8.0 [s\*ch]; The burst width, which is directly measured, refers to the duration on one channel hop.

The maximum number of hopping channels in  $8.0s = 3^{*}(8.0/0.24) = 100$ 

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.

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

#### 9.4 Deviation From Test Standard

No deviation

## 9.5 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/RSS 247 5.1(b)
- 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.

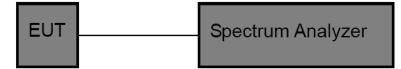


# 11. Peak Output Power Test

- 11.1 Test Standard and Limit
  - 11.1.1 Test Standard
    - FCC Part 15.247 (b) (1)/RSS 247 5.4(b)
  - 11.1.2 Test Limit

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

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=3 MHz 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 2dBi, 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 Diople Antenna. It complies with the standard requirement.

	Antenna Type
	Permanent attached antenna
100	Unique connector antenna
1	Professional installation antenna

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

Temperature:	<b>25</b> ℃	Relative Humic	lity: 55%
Test Voltage:	AC 120V/60Hz		
Terminal:	Line	all's a	
Test Mode:	TX GFSK Mode 2	410MHz	AUL -
Remark:	All channels have	been tested and Shows only	the worst channels.
90.0 dBu¥			
			QP: AVG:
			Ava
40	A A A A A A A A A A A A A A A A A A A	× ×	
mont	on. NA Markada da Marka	mander and the second of the second of the second	Mumarha martine
more	Mun m	~ ~ ^ ^ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	be an
		A. A. A. A. A. A. A. M. Martin Martin	A share many many marked
-10			
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		0.4740	28.20	9.70	37.90	56.44	-18.54	QP
2	*	0.4740	22.29	9.70	31.99	46.44	-14.45	AVG
3		0.9460	19.64	9.78	29.42	56.00	-26.58	QP
4		0.9460	10.88	9.78	20.66	46.00	-25.34	AVG
5		1.9100	16.88	9.71	26.59	56.00	-29.41	QP
6		1.9100	10.39	9.71	20.10	46.00	-25.90	AVG
7		3.2940	16.04	9.90	25.94	56.00	-30.06	QP
8		3.2940	9.31	9.90	19.21	46.00	-26.79	AVG
9		5.7780	13.44	9.86	23.30	60.00	-36.70	QP
10		5.7780	7.19	9.86	17.05	50.00	-32.95	AVG
11		27.0860	12.11	10.10	22.21	60.00	-37.79	QP
12		27.0860	5.78	10.10	15.88	50.00	-34.12	AVG





Temperature:	<b>25</b> ℃	Re	elative Humidity:	55%
Test Voltage:	AC 120V/60Hz	and a		
Terminal:	Neutral	00	Call De	A RUE
Fest Mode:	TX GFSK Mode	e 2410MHz		22
Remark:	All channels ha	ve been tested ar	nd Shows only the w	orst channels.
90.0 dBuV				
				QP: AVG:
40				
mm	N hanne all	1 MANAM	mound	
may	North	Va Ann	mound	and the state of t
		V V V V V V V	A CALLER CONTRACTOR	Auronauron
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	0.3940	23.30	9.70	33.00	57.98	-24.98	QP
2	0.3940	18.44	9.70	28.14	47.98	-19.84	AVG
3	0.4780	33.82	9.70	43.52	56.37	-12.85	QP
4 *	0.4780	29.20	9.70	38.90	46.37	-7.47	AVG
5	0.7380	23.58	9.71	33.29	56.00	-22.71	QP
6	0.7380	18.95	9.71	28.66	46.00	-17.34	AVG
7	1.0220	22.48	9.80	32.28	56.00	-23.72	QP
8	1.0220	17.46	9.80	27.26	46.00	-18.74	AVG
9	1.8300	19.83	9.72	29.55	56.00	-26.45	QP
10	1.8300	14.22	9.72	23.94	46.00	-22.06	AVG
11	3.0579	19.98	9.90	29.88	56.00	-26.12	QP
12	3.0579	14.79	9.90	24.69	46.00	-21.31	AVG



# **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

VIHZ~1GHZ						1
Temperature:	<b>25</b> ℃	(AL)	Relative H	umidity:	55%	2
Test Voltage:	AC 120V/60H	z	- CA	Contraction of the second seco	-	18
Ant. Pol.	Horizontal		TUDE	-	130	
Test Mode:	TX GFSK Mod	de 2410MHz		UPP)		260
Remark:	Only worse ca	se is reported			100	
80.0 dBuV/m 30 1 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		3 MMM MMM		(RF)FCC 15C	3M Radiation Margin -6	
-20 30.000 40 50	60 70 80 Readin	-	300 Measure-	400 500		1000.000
	req. Level	Factor	ment	Limit	Over	
	Hz dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1 33.7	986 39.69	-16.08	23.61	40.00	-16.39	QP
2 43.5	6057 43.27	-20.98	22.29	40.00	-17.71	QP
3 160.3	3456 45.21	-21.03	24.18	43.50	-19.32	QP
4 * 216.	7828 61.18	-19.36	41.82	46.00	-4.18	QP
5 ! 263.8	8190 57.31	-17.30	40.01	46.00	-5.99	QP
6 379.9	9141 44.34	-13.46	30.88	46.00	-15.12	QP

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



-9.55

-6.34

-21.31

-13.17

-13.71

-14.57

QP

QP

QP

QP

QP

QP

40.00

40.00

43.50

46.00

46.00

46.00

Temperature:	<b>25°</b> ℃			Relative Humic	lity: 559	%
Test Voltage:	AC 12	0V/60Hz		60052		MUL
Ant. Pol.	Vertica	al				
Test Mode:	TX GF	SK Mode 24	10MHz			
Remark:	Only v	vorse case is	reported	COLUMN ST		AUR
80.0 dBuV/m						
				IBE	FCC 15C 3M Ra	diation
						rgin -6 dB
						<sup>1</sup>
2						
1 2				4 5	6	
30 X				XX		1 elman
1 X	۱.	3	uNe	XX		1 Mm uh
1 X	Y.	3 X	www.W.M.M.W.W.W.	1 5 My Murch with		Andanah
1 X	Min	3 Martine Ma	wmw.W.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.M.	XX		Andread
1 X	Y.		wmwNMMMMM	XX		Andhunmh
1 X	Y.	3 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	www.NMutuutu	XX		Awedan ak
30 × ×	Y.	A A A A A A A A A A A A A A A A A A A	wmwMMMMMM	XX		Andanah
30 × ×	0 60 70		WHz)	XX	Monu	700 1000.00
30 × ×	0 60 70		(MHz)	300 400	Monu	700 1000.00
30 X X X X X X X X X X X X X X X X X X X	0 60 70 Freq.			Multur	× 4 500 600	

-16.44

-22.25

-22.07

-18.93

-17.30

-10.95

30.45

33.66

22.19

32.83

32.29

31.43

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

34.2760

46.6664

98.8326

224.5193

263.8190

485.6093

1

3

4

5

6

46.89

55.91

44.26

51.76

49.59

42.38

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

Tempe	eratu	re:	<b>25°</b> ℃	32	10	Relative H	lumidity:	55%	200
Test V	oltag	je:	AC 1	20V/60Hz		110	10	2	NO.
Ant. P	ol.	Horizontal							
Test N	Test Mode: TX GFSK Mode 2410MHz								
Remai	rk:			eport for the cribed limit.	emission w	hich more that	an 10 dB b	elow the	
No.	. Mk	. Fr	eq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		M	Ηz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	*	4821	.344	33.22	12.00	45.22	54.00	-8.78	AVG
2		4821	.416	47.70	12.00	59.70	74.00	-14.30	peak



Tempe	eratu	re:	<b>25℃</b>	2	- 5	<b>Relative Hur</b>	nidity:	55%	
Test V	oltag	ge:	AC	120V/60Hz		100	52	-	Sec.
Ant. P	ol.		Vert	ical			-0	22.0	-
Test N	lode	:	TX GFSK Mode 2410MHz						
Rema	rk:			eport for the cribed limit.	emission v	vhich more th	an 10 dB	below the	
No.	Mk	Fre	eq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MH	Z	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		4818.	854	46.98	11.98	58.96	74.00	-15.04	peak
2	*	4818.	954	33.12	11.98	45.10	54.00	-8.90	AVG



: 25°C		<u> </u>	Relative Hun	nidity:	55%	
AC 1	20V/60Hz		1100	523	-	Con 2
Horiz	zontal			6	28	
Test Mode: TX GFSK Mode 2441.5MHz						51
		emission w	hich more that	an 10 dB l	below the	
Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
883.368	48.58	12.34	60.92	74.00	-13.08	peak
883.368	33.64	12.34	45.98	54.00	-8.02	AVG
	AC 1 Horiz TX G No re preso Freq. MHz 883.368	AC 120V/60Hz Horizontal TX GFSK Mode 2 No report for the prescribed limit. Freq. Level MHz dBuV 883.368 48.58	AC 120V/60Hz Horizontal TX GFSK Mode 2441.5MHz No report for the emission w prescribed limit. Reading Correct Freq. Level Factor MHz dBuV dB/m 883.368 48.58 12.34	AC 120V/60Hz       Horizontal       TX GFSK Mode 2441.5MHz       No report for the emission which more that prescribed limit.       Reading     Correct     Measure-ment       Freq.     Level     Factor     ment       MHz     dBuV     dB/m     dBuV/m       883.368     48.58     12.34     60.92	AC 120V/60Hz       Horizontal       TX GFSK Mode 2441.5MHz       No report for the emission which more than 10 dB l       prescribed limit.       Reading     Correct       MHz     dBuV       dB/m     dBuV/m       883.368     48.58	AC 120V/60Hz       Horizontal       TX GFSK Mode 2441.5MHz       No report for the emission which more than 10 dB below the prescribed limit.       Freq.     Reading Correct Measurement Limit Over       MHz     dBuV     dB/m     dBuV/m     dB       883.368     48.58     12.34     60.92     74.00     -13.08



Temperature	e: 2	25℃			Relative H	lumidity:	55%	
Test Voltage	: /	AC 12	0V/60Hz		(DO)		-	SO &
Ant. Pol.	١	Vertica	al		4	-0		
Test Mode:	1	TX GF	SK Mode	2441.5MHz				<u></u>
Remark:			oort for the ibed limit.	emission w	hich more tha	an 10 dB b	elow the	
No. Mk.	Free		Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	:	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1 * 4	4880.5	00	33.67	12.32	45.99	54.00	-8.01	AVG
2 4	4883.0	50	48.58	12.33	60.91	74.00	-13.09	peak



Temperature:	<b>25</b> ℃		Relative H	lumidity:	55%		
Test Voltage:	AC 120V/60Hz		100	50		NUS	
Ant. Pol.	Horizontal		1	-0	2.9		
Test Mode:	TX GFSK Mode 2	X GFSK Mode 2473MHz					
Remark:	No report for the prescribed limit.	emission w	hich more tha	an 10 dB b	elow the	and the second	
No. Mk. Fr	Reading eq. Level	Correct Factor	Measure- ment	Limit	Over		
M	Hz dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	
1 * 4946	.714 33.61	12.69	46.30	54.00	-7.70	AVG	
2 4946	.816 49.09	12.69	61.78	74.00	-12.22	peak	



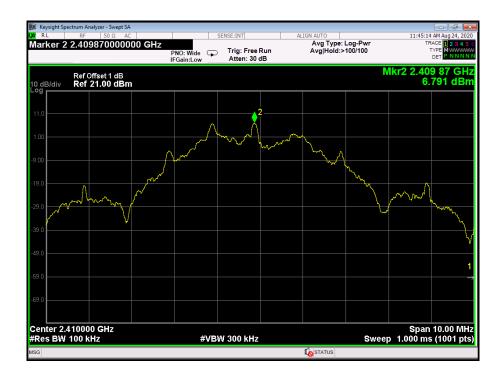
Temperature:	<b>25</b> ℃		AD N	<b>Relative Hu</b>	midity:	55%	
Test Voltage:	AC 12	0V/60Hz		1100		-	Con 2
Ant. Pol.	Vertica	al			-0	2.2	-
Test Mode:	TX GFSK Mode 2473MHz						571
Remark:		oort for the ibed limit.	emission w	hich more tha	an 10 dB b	elow the	
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1 49	46.048	48.71	12.69	61.40	74.00	-12.60	peak
2 * 49	46.048	33.57	12.69	46.26	54.00	-7.74	AVG



#### **Conducted Emission Test Data**

Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz	Con Dist	A DIVE
Test Mode:	TX GFSK Mode		BU -
Remark:	This report only shal	I the worst case mode.	
	2	2410 MHz	

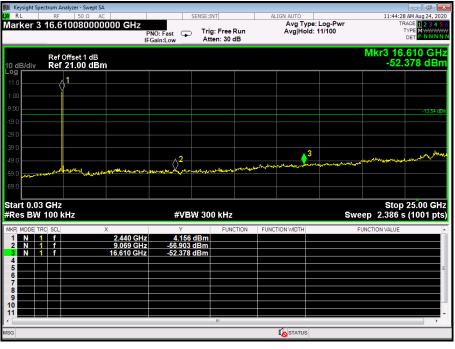
#### 0.03GHz-26.5GHz



		nalyzer - Swept SA								
RL	RF	50 Ω AC		SEN	SE:INT	AL	IGN AUTO			23 AM Aug 24, 21
arker 3	3 14.1	130800000	PN		Trig: Free Run Atten: 30 dB		Avg Type: Avg Hold:		1	TYPE DET P N N N
) dB/div		Offset 1 dB 21.00 dBm								.113 GI .522 dB
<sup>og</sup>	/	1								
1.0										
.00										
.00										-13.21 (
9.0										
9.0										
9.0										
9.0					A 2	▲3				- m
		thorn make	M. Martin Browner	وسعادهم والمساوية	Sur Sur Mar	and the start	and the second second	and	and the second s	
9.0	and a second	and a starter								
9.0										
	າດນີ້າ								Stor	25.00.01
				#VBW	300 kHz			Sw	Stop eep 2.386	
Res BW	100			Y	FUNCTION	FUNCT	ION WIDTH			
	100	<b>kHz</b>	2.402 GHz	۲ 6.736 dB	FUNCTION	FUNCT	ION WIDTH		eep 2.386	o 25.00 Gł s (1001 pi
	TRC SCL	<b>kHz</b>	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	
Res BW	TRC SCL	<b>kHz</b> ×	2.402 GHz	۲ 6.736 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	
Res BW KR MODE T 1 N 2 N 3 N	TRC SCL	<b>kHz</b> ×	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	
Res BW KR MODE T 1 N 2 N 3 N 4 5 5 6 5 7 5	TRC SCL	<b>kHz</b> ×	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	
Res BW KR MODE T 1 N 2 N 3 N 4 5 5 6 5 7 5 8 5 8 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	TRC SCL	<b>kHz</b> ×	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WDTH		eep 2.386	
Res BW KR MODE T 1 N 2 N 3 N 4 5 6 7 7 8 9 0 0	TRC SCL	<b>kHz</b> ×	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	
2 N 3 N 4 5 6 7	TRC SCL	<b>kHz</b> ×	2.402 GHz 11.866 GHz	, 6.736 dB -54.370 dB	FUNCTION m	FUNCT	ION WIDTH		eep 2.386	

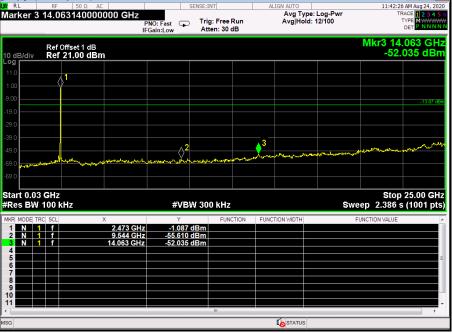












## **Attachment C-- Restricted Bands Requirement Test Data**

Temperature:	: 25℃			Relative H	lumidity:	55%
Test Voltage:	AC 12	0V/60Hz	dam	2	010	
Ant. Pol.	Horizo	ontal		600		
Test Mode:	TX GF	SK Mode 2	.410MHz			
Remark:	Only v	vorse case i	s reported		aus	
110.0 dBu¥/m						
						3 X
						X
						$\uparrow$
					(RF) FCC PAF	RT 15C (PEAK)
						$\square$
60		_			(BE) ECC/P/	ART 15C (AVG)
				1 X		
				2	~	
				×		
10.0						
2323.000 2333.00	0 2343.00 2	2353.00 2363.0	00 2373.00	2383.00 239	93.00 2403.00	24
		Reading		Measure-		
NI NAL	Freq.	Level	Factor	ment	Limit	Over
No. Mk.						
NO. MK.	MHz	dBu∨	dB/m	dBuV/m	dBuV/m	dB
		dBu∨ 46.40	dB/m 1.08	dBuV/m 47.48	dBuV/m 74.00	dB -26.52
1 2	MHz					

Emission Level= Read Level+ Correct Factor

2409.200

4

93.83

1.17

95.00

**Fundamental Frequency** 

AVG

TOBY

Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz	CULL -	AV
Ant. Pol.	Vertical		32
Test Mode:	TX GFSK Mode 2410MHz		100
Remark:	Only worse case is reported	RULL	
110.0 dBuV/m			
60			X 4 RT 15C (PEAK) ART 15C (AVG)
		1 2 X	
10.0			

No	. Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1		2390.000	43.91	1.08	44.99	74.00	-29.01	peak
2		2390.000	34.68	1.08	35.76	54.00	-18.24	AVG
3	Х	2409.000	96.73	1.16	97.89	Fundamental	Frequency	peak
4	*	2409.200	90.20	1.17	91.37	Fundamental	Frequency	AVG

Emission Level= Read Level+ Correct Factor



Temperature:	<b>25</b> ℃	Relative Humidity:	55%
Test Voltage:	AC 120V/60Hz	THUR I	
Ant. Pol.	Horizontal		
Test Mode:	TX GFSK Mode 2473 MHz		
Remark:	Only worse case is reported	CU P	
110.0 dBuV/m			
60 ×	3		ART 15C (PEAK)
10.0	3 × \ 4 X		

No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1	Х	2471.800	96.46	1.58	98.04	Fundamental	Frequency	peak
2	*	2472.000	91.71	1.58	93.29	Fundamental	Frequency	AVG
3		2483.500	51.69	1.65	53.34	74.00	-20.66	peak
4		2483.500	41.95	1.65	43.60	54.00	-10.40	AVG

Emission Level= Read Level+ Correct Factor



Temperature:	<b>25</b> ℃			Relative	Humidity:	55%	
Test Voltage:	AC 12	0V/60Hz		200	100	2	NU.S
Ant. Pol.	Vertica	al			-		-
Test Mode:	TX GF	SK Mode	2473 MHz		a		1
Remark:	Only w	orse case	is reported	anti		10	1120
110.0 dBuV/m							
<b>50</b>	3 * *					ART 15C (PEAK	
10.0 2462.000 2472.00	2482.00	2492.00 2502	2.00 2512.00	2522.00 2	532.00 2542.00	) 2	562.00 MH:
No. Mk. F	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector
1 X 247	1.800	97.09	1.58	98.67	Fundamental	Frequency	peak
			4.50	94.76	Fundamental	Frequency	AVG
2 * 247	2.000	93.18	1.58	94.70	rundumentur	roquoney	/
	2.000 33.500	93.18 52.60	1.58	94.76 54.25	74.00	-19.75	peak

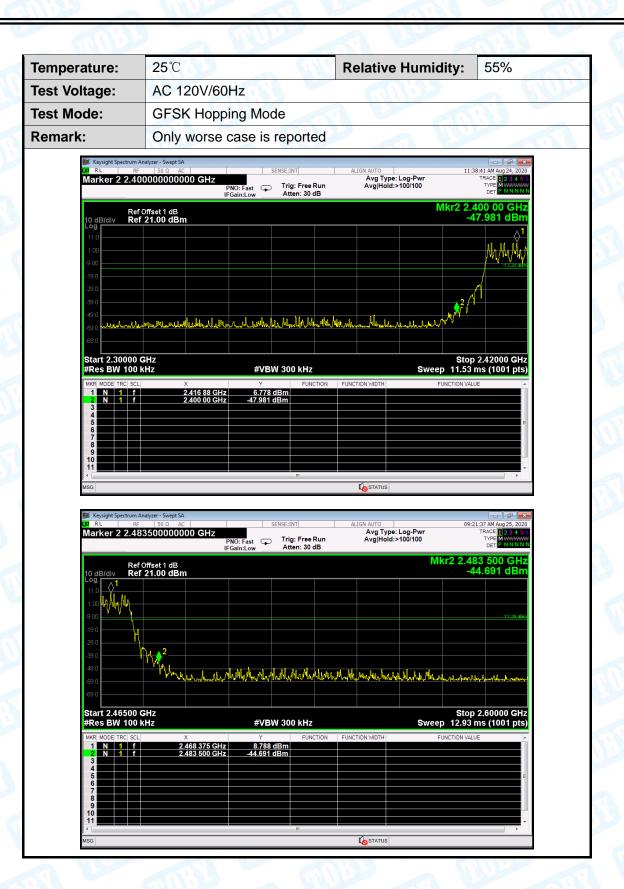
Emission Level= Read Level+ Correct Factor



### (2) Conducted Band Edge Test

emperature:	<b>25</b> ℃		Relative Humidity:	55%
est Voltage:	AC 120V/6	0Hz		
est Mode:	TX GFSK N	Mode 2410MHz/2	2473 MHz	111
emark:	Only worse	e case is reported	t l	
	m Analyzer - Swept SA	SENSE:INT	ALIGN AUTO 11	39:45 AM Aug 24, 2020
	4000000000000 GHz	PNO: Fast Trig: Free Ru IFGain:Low Atten: 30 dB	Avg Type: Log-Pwr In Avg Hold:>100/100	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N N
R	ef Offset 1 dB	IFGain:Low Atten: 00 dB	Mkr2 2	400 00 GHz 38.073 dBm
10 dB/div R Log	ef 21.00 dBm			
1.00 -9.00				-13.40 dBm
-19.0				
-39.0				Y Y
-49.0 -59.0 <del>***********</del>		amount Marine marine	wind man have been and the second	
-69.0				- 2 42020 011-
#Res BW 10	0 kHz	#VBW 300 kHz	Sweep 11.53	o 2.42000 GHz ms (1001 pts)
	CL X f 2.408 84 GH f 2.400 00 GH	Y       FUNCTI         1z       6.659 dBm         1z       -38.073 dBm	ON FUNCTION WIDTH FUNCTION VA	LUE
3 4 5				
6 7 8				
9 10 11				
MSG			STATUS	
👿 Keysight Spectrur	n Analyzer - Swept SA			
LXI RL I	RF 50 Ω AC 4835000000000 GHz	PNO: Fast C Trig: Free Ru	Avg Type: Log-Pwr	37:19 AM Aug 24, 2020 TRACE 1 2 3 4 5 6 TYPE M WWWWW
Marker 2 2.4		IFGain:Low Atten: 30 dB		DET PNNNN
	ef Offset 1 dB			483 50 GHz
	ef Offset 1 dB ef 21.00 dBm			483 50 GHz 50.439 dBm
10 dB/div R	ef Offset 1 dB ef 21.00 dBm			
10 dB/div R 11 0 dJ /div R	ef Offset 1 dB ef 21.00 dBm			
10 dB/div R Log 110 4 1.00 1 .9.00	ef Offset 1 dB ef 21.00 dBm			50.439 dBm
10 dB/div R 110 d1 100 - -900 - -990 - -390 - -490 -	A 2	Wanter Alex Alex Alex Alex Alex Alex Alex Alex		50.439 dBm
10 dB/div R 110 d1 100	A 2	ما السريقي المراجع الم		50.439 dBm
10 dB/div R 110 dB/div R 110 100 -900	A 2 A A A 2 A		-	50.439 dBm
10 dB/div R 10 dB/div R 11.0 1.00	A 2 A 2 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4	#VBW 300 kHz	-	50.439 dBm
10 dB/div R 10 dB/div R 10 dB/div R 10 d 10	0 GHz 0 kHz CL X f 2.472.86 GH	#VBW 300 kHz	-	50.439 dBm
10     dB/div     R       11.0     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       100     1       110	A 2 A 2 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4	#VBW 300 kHz	-	50.439 dBm
10     dB/div     R       10     1     1       100     1     1       100     1     1       100     1     1       100     1     1       100     1     1       100     1     1       100     1     1       120     1     1       130     1     1       490     1     1       490     1     1       400     1     1       100     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1       110     1     1	A 2 A 2 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4	#VBW 300 kHz	-	50.439 dBm







# Attachment D-- Number of Hopping Channel Test Data

Temperature:	Temperature: 25°C		Relative Humidity:	55%
Test Voltage:	AC 1	20V/60Hz	3.9	
Test Mode:	Норр	oing Mode		
Frequency Ran	Frequency Range		Quantity of Hopping Channel	Limit
2410MHz~2473MHz		GFSK	19	>15

### **GFSK Mode**

Keysight Spectrum Analyzer - Swept SA							
RL RF 50 Ω AC		SENSE:INT	A	LIGN AUTO			AM Aug 24, 2020
arker 2 2.47289550000	0 GHz PNO: Fast IFGain:Low	Trig: Fre		Avg Type Avg Hold:			ACE 1 2 3 4 5 6 YPE MWWWWW DET P N N N N N
Ref Offset 1 dB dB/div Ref 21.00 dBm					Mkr2	2 2.472 89 5.1	95 5 GHz 736 dBm
	NMMMM		WWW	MAN	MrAhab		
M .							M
0							1 
art 2.40000 GHz es BW 100 kHz	ŧ	VBW 300 kH	z		Sweep	Stop 2.4 8.000 ms	18350 GHz (1001 pts)
MODE TRC SCL X		Y FL	INCTION   FUNC	TION WIDTH	FL	INCTION VALUE	~
	851 0 GHz 6 895 5 GHz 5	.413 dBm .736 dBm					
							E
N 1 f 2.472							

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

Temper	ature:	25℃ Relative Humidity:					MU P	
Test Vo	Itage:	AC	AC 120V/60Hz					
Test Mo	de:	Нор	Hopping Mode (GFSK)					
Remark	:	The	e number of to	tal hopping frequ	encies up to 19.		0.00	
Test	Chan	nel	Reading	Total hops	Test Result	Limit	Result	
Mode	(MH:	z)	Time (ms)	Total hops	(ms)	(ms)	Result	
GFSK	241	0	0.880	81	71.28	400	PASS	

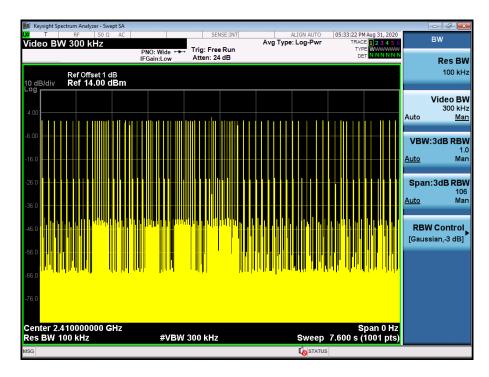
The Dwell Time = Burst Width \* Total Hops. The detailed calculations are showed as follows: The duration for dwell time calculation: 0.4 [s] \* hopping number = 0.4 [s] \* 19 [ch] =7.60[s\*ch];

The burst width, which is directly measured, refers to the duration on one channel hop.

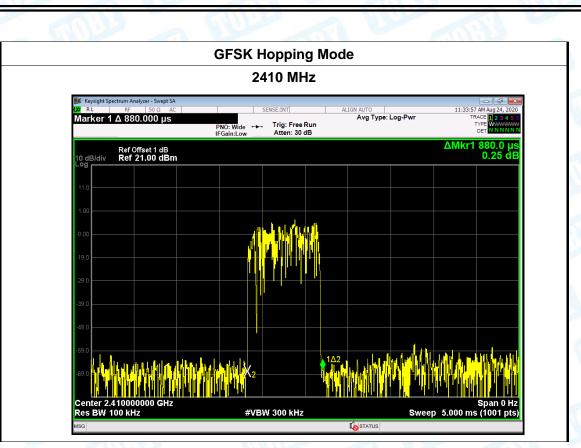
The maximum number of hopping channels in 7.6s is 81.

Reading Time=0.880ms

### **GFSK Hopping Mode**







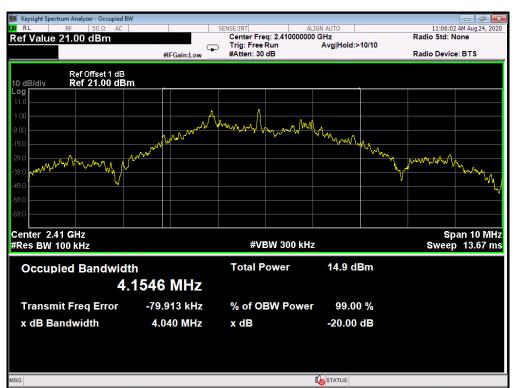


## **Attachment F-- Channel Separation and Bandwidth Test**

### Data

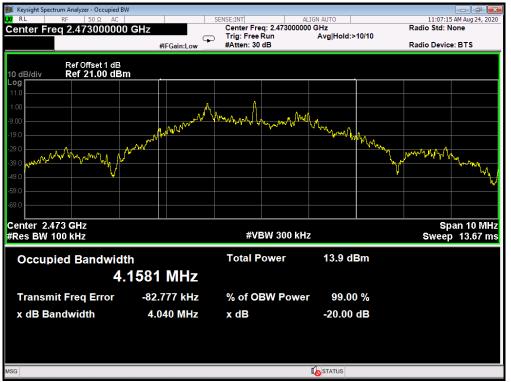
### Bandwidth Test Data:

Temperature:	25°	C	Relative Humidity:	55%			
Test Voltage:	AC	120V/60Hz	The second secon				
Test Mode:	ТΧ	Mode (GFSK)					
Channel frequency (MHz)		99% OBW (kHz)	20dB Bandwidth (kHz)	20dB Bandwidth *2/3 (kHz)			
2410	2410 4.0906		4.025	2.6833			
2441.5	2441.5 4.0829		4.031	2.6873			
2473.0	2473.0 4.1569		4.030	2.6867			
GFSK TX Mode							











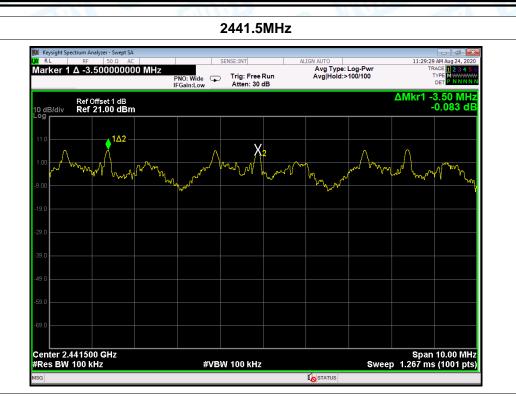
#### **Channel Separation Test data:**

Temperature:	: 55%						
Test Voltage:	AC 120V/	AC 120V/60Hz					
Test Mode:	Hopping I	Hopping Mode (GFSK)					
Remark:	We test a	We test all channel and worse case recorded in the report.					
Channel frequ	lency	Separation Re	ad Value S	eparation Limit			
(MHz)		(kHz)		(kHz)			
2410		3500.0	)	2.6833			
2441.5		3500.0		2.6873			
2473.0		3510.0		2.6867			

### **GFSK Hopping Mode**







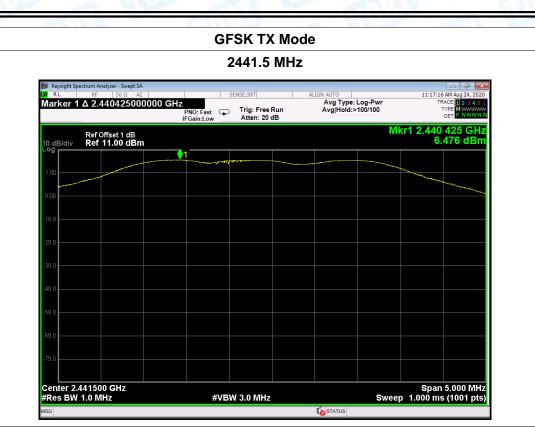


# Attachment G-- Peak Output Power Test Data

Temperature:	<b>25</b> ℃		Relative Humidity:	55%	
Test Voltage:	AC 120V/60Hz				
Test Mode:	TX Mode	(GFSK)			
Channel frequen	cy (MHz)	Test Result	(dBm) l	₋imit (dBm)	
2410.0		6.619			
2441.5		6.476		21	
2473.0		5.794			
		GFSK TX I	lode		

Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω AC	SENSE:INT	ALIGN AUTO	11:16:08 AM Aug 24, 202
larker 1 Δ 2.408890000000 G		Avg Type: Log-Pwr Avg Hold:>100/100	TRACE 1 2 3 4 5 TYPE MWWWW DET P NNNN
Ref Offset 1 dB 0 dB/div Ref 11.00 dBm	<u>,                                     </u>	Mkr	1 2.408 890 GH: 6.619 dBn
9.0			
9.0			
3.0			
3.0			
3.0			
9.0			
3.0			
enter 2.410000 GHz			Spap 5 000 MH
Res BW 1.0 MHz	#VBW 3.0 MHz		Span 5.000 MH 1.000 ms (1001 pts
G		<b>K</b> ostatus	





GFSK TX Mode

2473.0 MHz



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