

TEST REPORT

Product Name	 9" Double Sided Portable Vanity Mirror with
Model Number	Bluetooth Mono Speaker iCVBT80, iCVBT80SN, iCVBT80XX
FCC ID	(XX denote different cabinet color) EMOICVBT80A
Prepared for	SDI Technologies Inc.
Address	1299, Main Street, Rahway, NJ 07065, U.S.A.
Prepared by Address	EMTEK (SHENZHEN) CO., LTD. Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China
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Report Number	:	ES201209006W
Date(s) of Tests	:	December 09, 2020 to December 18, 2020
Date of issue	:	December 18, 2020

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VERIFICATION OF COMPLIANCE

Applicant:	SDI Technologies Inc 1299, Main Street, Rahway, NJ 07065, U.S.A.	
Manufacturer:	SDI Technologies Inc 1299, Main Street, Rahway, NJ 07065, U.S.A.	
Factory:	ARTS ELECTRONICS CO. LTD. NO.1 SHANG XING LU, SHANG JIAO COMMUNITY, CHANG AN ZHEN, DONGGUAN CITY, GUANGDONG PROVINCE, CHINA	
Product Description:	9" Double Sided Portable Vanity Mirror with Bluetooth Mono Speake	
Trade Mark:	iHome	
Model Number:	iCVBT80, iCVBT80SN, iCVBT80XX (Note: XX denote different cabinet color, here we prepare iCVBT80 for the all test)	

We hereby certify that:

The above equipment was tested by EMTEK(SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247(2018).

Date of Test	December 09, 2020 to December 18, 2020
Prepared by :	kaimin Guo /Editor
Reviewer :	Jersie Hu
	Jessie Hu /Supervisor ^{NZHEN}
Approved & Authorized Signer :	Lisa Wang /Manager

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Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	1	ES201209006W
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Table of Contents

1. GENERAL INFORMATION	
1.1 PRODUCT DESCRIPTION	6
1.2 TEST METHODOLOGY	
1.3 TEST FACILITY	7
2. SYSTEM TEST CONFIGURATION	
2.1 EUT CONFIGURATION	
2.2 EUT Exercise	8
2.3 TEST PROCEDURE	8
2.4 CONFIGURATION OF TESTED SYSTEM	9
3. SUMMARY OF TEST RESULTS	
4. DESCRIPTION OF TEST MODES	
5. TEST SYSTEM UNCERTAINTY	
6. CONDUCTED EMISSIONS TEST	
6.1 Measurement Procedure:	
6.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
6.3 MEASUREMENT EQUIPMENT USED:	
6.4 MEASUREMENT RESULT:	
6.5 Conducted Measurement Photos:	
7. RADIATED EMISSION TEST	
7.1 Measurement Procedure	18
7.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
7.3 MEASUREMENT EQUIPMENT USED:	
7.4 RADIATED EMISSION LIMIT	
7.5 Measurement Result	
7.5 RADIATED MEASUREMENT PHOTOS:	
8. CHANNEL SEPARATION TEST	29
8.1 Measurement Procedure	
8.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
8.3 MEASUREMENT EQUIPMENT USED:	
8.4 MEASUREMENT RESULTS:	
9. 20DB BANDWIDTH TEST	
9.1 Measurement Procedure	
9.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
9.3 MEASUREMENT EQUIPMENT USED:	
9.4 MEASUREMENT RESULTS:	

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10. QUANTITY OF HOPPING CHANNEL TEST	
10.1 Measurement Procedure	
10.2TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
10.3Measurement Equipment Used:	
10.4 Measurement Results:	43
11. TIME OF OCCUPANCY (DWELL TIME) TEST	44
11.1 Test Description	
11.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
11.3 MEASUREMENT EQUIPMENT USED:	44
11.4 TEST REQUIREMENTS / LIMITS	44
11.5 TEST RESULT	
12. MAXIMUM PEAK OUTPUT POWER TEST	
12.1 Measurement Procedure	
12.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
12.3 MEASUREMENT EQUIPMENT USED:	47
12.4Measurement Results:	
13. BAND EDGE TEST	52
13.1Measurement Procedure	
13.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	
13.3 MEASUREMENT EQUIPMENT USED:	
13.4 MEASUREMENT RESULTS:	
14. ANTENNA APPLICATION	
14.1 ANTENNA REQUIREMENT.	
14.2 RESULT	72
15. PHOTOS OF EUT	

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1. GENERAL INFORMATION

1.1 Product Description

Characteristics	Description	
Product Name	9" Double Sided Portable Vanity Mirror with Bluetooth Mono Speaker	
Model number	iCVBT80, iCVBT80SN, iCVBT80XX (Note: XX denote different cabinet color, here we prepare iCVBT80 for the all test)	
Power Supply	AC 120V 60Hz, DC 7.4V from battery	
Kind of Device	Bluetooth Ver.4.2	
Modulation	GFSK, π/4-DQPSK, 8DPSK	
Operating Frequency Range	2402-2480MHz	
Number of Channels	79	
Transmit Power Max(PK)	2.3dBm(0.001698W)	
Antenna Type	Internal PCB antenna	
Antenna Gain	OdBi	

1.2Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10-2013. Radiated testing was performed at an antenna to EUT distance 3 meters.

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1.3Test Facility

Site Description		
EMC Lab.	:	Accredited by CNAS, 2018.07.06 The certificate is valid until 2022.10.28 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2018 (identical to ISO/IEC 17025:2017) The Certificate Registration Number is L2291.
		Accredited by FCC Designation Number: CN1204 Test Firm Registration Number: 882943
		Accredited by A2LA, August 25, 2020 The Certificate Number is 4321.01.
		Accredited by Industry Canada, November 09, 2018 The Conformity Assessment Body Identifier is CN0008
	:	EMTEK(SHENZHEN) CO., LTD. Building 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China.

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2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of EUT was fixed in a particular direction according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013.

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2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested Sys	stem
--	------

Item	Equipment	Trademark	Model No.	FCC ID	Note
1.	9" Double Sided Portable Vanity Mirror with Bluetooth Mono Speaker	iHome	iCVBT80	EMOICVBT80A	EUT
2	Adapter	N/A	M/N: BQ30A-0902500-U Input: AC 100-240V 50/60Hz Max. 800mA Output: DC 9.0V 2500mA	N/A	Support Equipment

Note:

(1) Unless otherwise denoted as EUT in [Remark] column , device(s) used in tested system is a support equipment.

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FCC Rules	Description Of Test	Result
§15.207	AC Power Conducted Emission	Compliant
§15.247(d),§15.209	Radiated Emission	Compliant
§15.247(a)(1)	Channel Separation test	Compliant
§15.247(a)(1)	20dB Bandwidth	Compliant
§15.247(a)(1)(iii)	Quantity of Hopping Channel	Compliant
§15.247(a)(1)(iii)	Time of Occupancy(Dwell Time)	Compliant
§15.247(b)	Max Peak output Power test	Compliant
§15.247(d)	Band edge test	Compliant
§15.203	Antenna Requirement	Compliant

3. Summary of Test Results

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4. Description of test modes

The EUT has been tested under its typical operating condition and fully-charged battery for EUT tested alone. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonics of the highest fundamental frequency or to 40 GHz, whichever is lower).

The EUT has been tested under TX operating condition.

This EUT is a FHSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK, $\Pi/4$ -DQPSK, 8DPSK have been tested. 79 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Channel List:

<u></u>
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Test Frequency and channe

Channel	Frequency(MHz)
1	2402
40	2441
79	2480

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5. TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Radio Frequency	±1x10^-5
Maximum Peak Output Power Test	±1.0dB
Conducted Emissions Test	±2.0dB
Radiated Emission Test	±2.0dB
Power Density	±2.0dB
Occupied Bandwidth Test	±1.0dB
Band Edge Test	±3dB
All emission, radiated	±3dB
Antenna Port Emission	±3dB
Temperature	±0.5 ℃
Humidity	±3%

Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%

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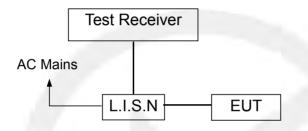


6. Conducted Emissions Test

6.1 Measurement Procedure:

- 1. The EUT was placed on a table, which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured was complete.

6.2 Test SET-UP (Block Diagram of Configuration)



6.3 Measurement Equipment Used:

	Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Characteristics	Last Cal.	Due date
Test Receiver	Rohde & Schwarz	ESCS30	100018	9kHz~3GHz	05/22/2020	05/21/2021
L.I.S.N	Rohde & Schwarz	ENV216	100017	9KHz-300MHz	05/22/2020	05/21/2021
RF Switching Unit	CDS	RSU-M2	38401	9KHz-300MHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	9kHz~3GHz	05/22/2020	05/21/2021

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6.4 Measurement Result:

Operation Mode:	ТХ	Test Date :	December 11, 2020
Frequency Range:	0.15MHz~30MHz	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Test By:	Loren		

Pass.

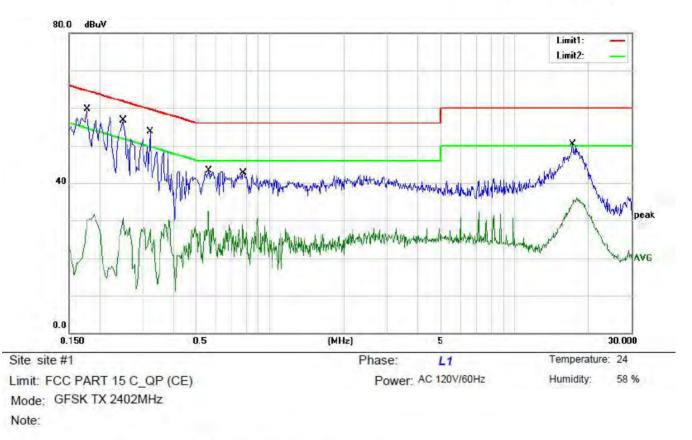
Conducted emission at both 120V & 240V, and emission at 120V represents the worst case. All the modulation modes were tested the data of the worst mode (GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Please refer to the following data.

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Report No.ES201209006W





No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	l.	
	-	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1780	43.76	10.94	54.70	64.58	-9.88	QP	
2	1	0.1780	20.83	10.94	31.77	54.58	-22.81	AVG	
3		0.2500	40.65	10.95	51.60	61.76	-10.16	QP	
4		0.2500	19.73	10.95	30.68	51.76	-21.08	AVG	
5		0.3220	37.65	10.95	48.60	59.66	-11.06	QP	
6		0.3220	19.44	10.95	30.39	49.66	-19.27	AVG	
7		0.5620	28.34	10.96	39.30	56.00	-16.70	QP	
8		0.5620	21.74	10.96	32.70	46.00	-13.30	AVG	
9	-	0.7780	27.84	10.96	38.80	56.00	-17.20	QP	
10	0.0	0.7780	19.78	10.96	30.74	46.00	-15.26	AVG	
11		17.2580	34.46	10.94	45.40	60.00	-14.60	QP	
12		17.2580	25.11	10.94	36.05	50.00	-13.95	AVG	

*:Maximum data x:0

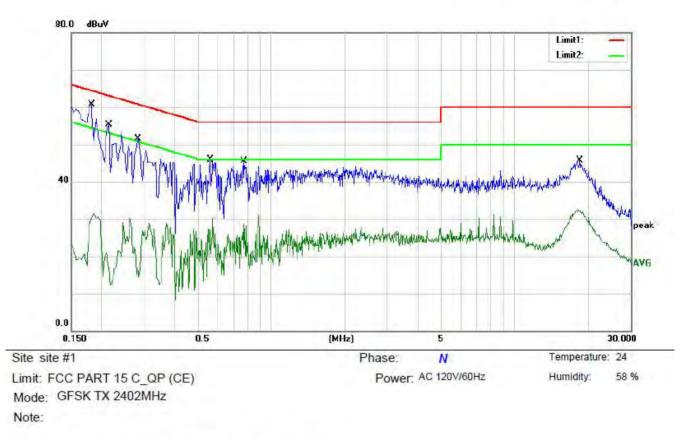
x:Over limit I:over margin

Comment: Factor build in receiver. Operato

Operator: Ccyf

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No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	6.1.2	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1820	44.66	10.94	55.60	64.39	-8.79	QP	
2	-	0.1820	20.58	10.94	31.52	54.39	-22.87	AVG	
3		0.2140	39.36	10.94	50.30	63.05	-12.75	QP	
4		0.2140	19.52	10.94	30.46	53.05	-22.59	AVG	
5		0.2820	36.65	10.95	47.60	60.76	-13.16	QP	
6	100	0.2820	18.04	10.95	28.99	50.76	-21.77	AVG	
7		0.5620	30.34	10.96	41.30	56.00	-14.70	QP	
8		0.5620	19.29	10.96	30.25	46.00	-15.75	AVG	
9	r 7	0.7740	30.54	10.96	41.50	56.00	-14.50	QP	
10		0.7740	19.92	10.96	30.88	46.00	-15.12	AVG	
11	17	18.5820	29.97	10.93	40.90	60.00	-19.10	QP	
12	1	18.5820	21.59	10.93	32.52	50.00	-17.48	AVG	

*:Maximum data

x:Over limit I:over margin

Comment: Factor build in receiver.

Operator: Ccyf

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6.5 Conducted Measurement Photos:

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7. Radiated Emission Test

7.1 Measurement Procedure

- 1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
- 2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
- 3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
- 5. Set to the maximum power setting and enable the EUT transmit continuously.
- 6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
- 7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

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Use the following spectrum analyzer settings:

When spectrum scanned from 30MHz to 1GHz setting resolution bandwidth 120KHz and video bandwidth 300KHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	120KHz
VB	300KHz
Detector	QP
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	3MHz
Detector	Peak
Trace	Max hold

When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 10Hz:

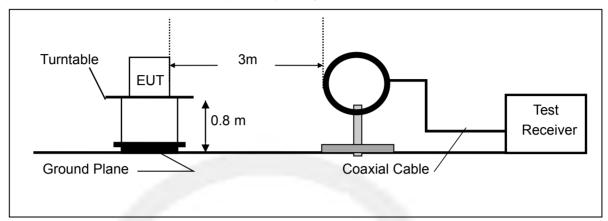
EMI Test Receiver	Setting
Attenuation	Auto
RB	1MHz
VB	10Hz
Detector	Average
Trace	Max hold

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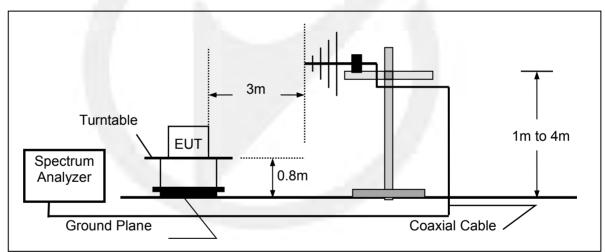


7.2 Test SET-UP (Block Diagram of Configuration)

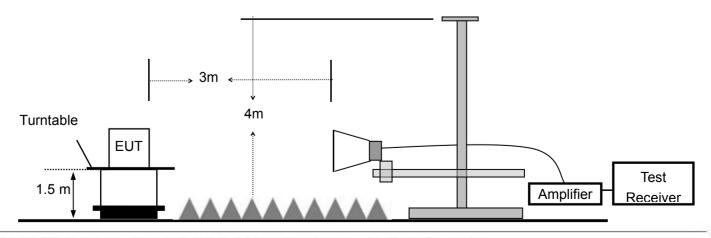
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



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7.3 Measurement Equipment Used:

Item	Equipment	Manufacturer	Model No.	Serial No.	Characteristics	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	1166.5950.0 3	9KHz-3GHz	05/22/2020	1 Year
2.	Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	05/22/2020	1 Year
3.	Bilog Antenna	Schwarzbeck	VULB9163	000141	25MHz-2GHz	05/22/2020	1 Year
4.	Power Amplifier	CDS	RSU-M352	818	1MHz-1GHz	05/22/2020	1 Year
5.	Power Amplifier	HP	8447F	OPT H64	1GHz-26.5GHz	05/22/2020	1 Year
6.	Color Monitor	SUNSPO	SP-140A	N/A		05/22/2020	1 Year
7.	Single Line Filter	JIANLI	XL-3	N/A		05/22/2020	1 Year
8.	Single Phase Power Line Filter	JIANLI	DL-2X100B	N/A		05/22/2020	1 Year
9.	3 Phase Power Line Filter	JIANLI	DL-4X100B	N/A		05/22/2020	1 Year
10.	DC Power Filter	JIANLI	DL-2X50B	N/A		05/22/2020	1 Year
11.	Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	05/22/2020	1 Year
12.	Cable	Rosenberger	CIL02	A0783566	9KHz-3GHz	05/22/2020	1 Year
13.	Cable	Rosenberger	RG 233/U	525178	9KHz-3GHz	05/22/2020	1 Year
14.	Signal Analyzer	Rohde & Schwarz	FSV30	103040	9KHz-40GHz	05/22/2020	1 Year
15.	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1272	1GHz-18GHz	05/22/2020	1 Year
16.	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA91703 99	14GHz -26.5GHz	05/22/2020	1 Year
17.	Power Amplifier	LUNAR EM	LNA1G18-4 0	J101000000 81	1GHz-26.5GHz	05/22/2020	1 Year
18.	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year
19.	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year
20.	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year

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7.4 Radiated Emission Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 15.209(a):

Frequencies	Field Strength	Measurement Distance
(MHz)	(micorvolts/meter)	(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

15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)

Remark: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

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7.5 Measurement Result

Operation Mode:	ТХ	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	28 ℃
Test Result:	PASS	Humidity :	65 %
Measured Distance:	3m		

Below 30MHz:

Freq.	Ant.Pol.	Emission	Limit 3m	Over
		Level		
(MHz)	H/V	(dBuV/m)	(dBuV/m)	(dB)

Note: The low frequency, which started from 9KHz-30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Below 1000MHz:

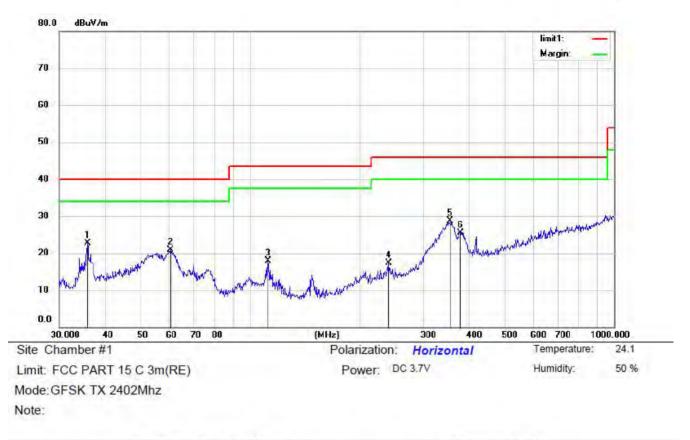
Pass.

All modulation modes have been tested, the worst mode is (GFSK TX 2402MHz), the data is recorded on the following page, other modulation modes do not exceed this limit.

Please refer to the following data.

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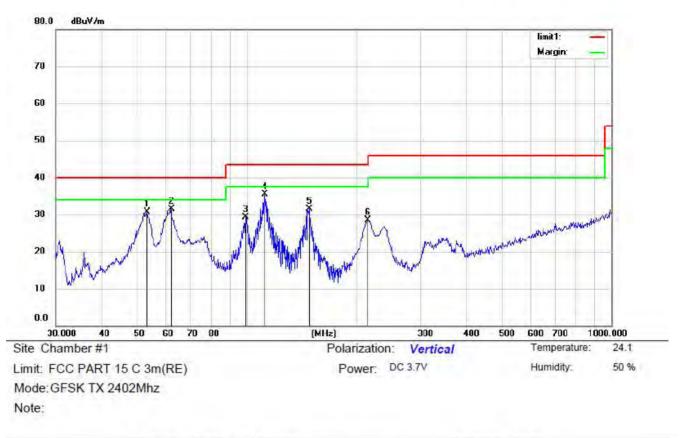
Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
2.1	35.8746	40.94	-18.24	22.70	40.00	-17.30	QP			
	60.4918	37.96	-17.14	20.82	40.00	-19.18	QP			
1	111.7380	36.50	-18.65	17.85	43.50	-25.65	QP			
2	240.8303	33.08	-15.72	17.36	46.00	-28.64	QP			
* 3	354.1831	40.91	-12.19	28.72	46.00	-17.28	QP			
3	378.5842	36.87	-11.39	25.48	46.00	-20.52	QP			
	*	MHz 35.8746 60.4918 111.7380 240.8303	MHz dBuV 35.8746 40.94 60.4918 37.96 111.7380 36.50 240.8303 33.08 * 354.1831 40.91	MHz dBuV dB 35.8746 40.94 -18.24 60.4918 37.96 -17.14 111.7380 36.50 -18.65 240.8303 33.08 -15.72 * 354.1831 40.91 -12.19	MHz dBuV dB dBuV/m 35.8746 40.94 -18.24 22.70 60.4918 37.96 -17.14 20.82 111.7380 36.50 -18.65 17.85 240.8303 33.08 -15.72 17.36 * 354.1831 40.91 -12.19 28.72	MHz dBuV dB dBuV/m dBuV/m 35.8746 40.94 -18.24 22.70 40.00 60.4918 37.96 -17.14 20.82 40.00 111.7380 36.50 -18.65 17.85 43.50 240.8303 33.08 -15.72 17.36 46.00 * 354.1831 40.91 -12.19 28.72 46.00	MHz dBuV dB dBuV/m dBuV/m dB 35.8746 40.94 -18.24 22.70 40.00 -17.30 60.4918 37.96 -17.14 20.82 40.00 -19.18 111.7380 36.50 -18.65 17.85 43.50 -25.65 240.8303 33.08 -15.72 17.36 46.00 -28.64 * 354.1831 40.91 -12.19 28.72 46.00 -17.28	MHz dBuV dB dBuV/m dBuV/m dB Detector 35.8746 40.94 -18.24 22.70 40.00 -17.30 QP 60.4918 37.96 -17.14 20.82 40.00 -19.18 QP 111.7380 36.50 -18.65 17.85 43.50 -25.65 QP 240.8303 33.08 -15.72 17.36 46.00 -28.64 QP * 354.1831 40.91 -12.19 28.72 46.00 -17.28 QP	MHz dBuV dB dBuV/m dBuV/m dB Detector cm 35.8746 40.94 -18.24 22.70 40.00 -17.30 QP 60.4918 37.96 -17.14 20.82 40.00 -19.18 QP 111.7380 36.50 -18.65 17.85 43.50 -25.65 QP 240.8303 33.08 -15.72 17.36 46.00 -28.64 QP * 354.1831 40.91 -12.19 28.72 46.00 -17.28 QP	MHz dBuV dB dBuV/m dBuV/m dB Detector cm degree 35.8746 40.94 -18.24 22.70 40.00 -17.30 QP 60.4918 37.96 -17.14 20.82 40.00 -19.18 QP 111.7380 36.50 -18.65 17.85 43.50 -25.65 QP 240.8303 33.08 -15.72 17.36 46.00 -28.64 QP * 354.1831 40.91 -12.19 28.72 46.00 -17.28 QP

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

Operator: Jason

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Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
	53.5052	46.44	-15.76	30.68	40.00	-9.32	QP			
	61.9951	48.75	-17.34	31.41	40.00	-8.59	QP			
1	99.5281	47.90	-18.68	29.22	43.50	-14.28	QP			
*	111.7380	54.22	-18.65	35.57	43.50	-7.93	QP			
- 1	148.4410	53.01	-21.60	31.41	43.50	-12.09	QP			
2	215.2678	45.72	-17.17	28.55	43.50	-14.95	QP			
	*	MHz 53.5052 61.9951 99.5281 * 111.7380	Mk. Freq. Level MHz dBuV 53.5052 46.44 61.9951 48.75 99.5281 47.90 * 111.7380 54.22 148.4410 53.01	Mk. Freq. Level Factor MHz dBuV dB 53.5052 46.44 -15.76 61.9951 48.75 -17.34 99.5281 47.90 -18.68 * 111.7380 54.22 -18.65 148.4410 53.01 -21.60	Mk. Freq. Level Factor ment MHz dBuV dB dBuV/m 53.5052 46.44 -15.76 30.68 61.9951 48.75 -17.34 31.41 99.5281 47.90 -18.68 29.22 * 111.7380 54.22 -18.65 35.57 148.4410 53.01 -21.60 31.41	Mk. Freq. Level Factor ment Limit MHz dBuV dB dBuV/m dBuV/m 53.5052 46.44 -15.76 30.68 40.00 61.9951 48.75 -17.34 31.41 40.00 99.5281 47.90 -18.68 29.22 43.50 * 111.7380 54.22 -18.65 35.57 43.50 148.4410 53.01 -21.60 31.41 43.50	Mk. Freq. Level Factor ment Limit Over MHz dBuV dB dBuV/m dBuV/m dB 53.5052 46.44 -15.76 30.68 40.00 -9.32 61.9951 48.75 -17.34 31.41 40.00 -8.59 99.5281 47.90 -18.68 29.22 43.50 -14.28 * 111.7380 54.22 -18.65 35.57 43.50 -7.93 148.4410 53.01 -21.60 31.41 43.50 -12.09	Mk. Freq. Level Factor ment Limit Over MHz dBuV dB dBuV/m dBuV/m dB Detector 53.5052 46.44 -15.76 30.68 40.00 -9.32 QP 61.9951 48.75 -17.34 31.41 40.00 -8.59 QP 99.5281 47.90 -18.68 29.22 43.50 -14.28 QP * 111.7380 54.22 -18.65 35.57 43.50 -7.93 QP 148.4410 53.01 -21.60 31.41 43.50 -12.09 QP	Mk. Freq. Level Factor ment Limit Over Height MHz dBuV dB dBuV/m dB Detector cm 53.5052 46.44 -15.76 30.68 40.00 -9.32 QP 61.9951 48.75 -17.34 31.41 40.00 -8.59 QP 99.5281 47.90 -18.68 29.22 43.50 -14.28 QP * 111.7380 54.22 -18.65 35.57 43.50 -7.93 QP 148.4410 53.01 -21.60 31.41 43.50 -12.09 QP	Mk. Freq. Level Factor ment Limit Over Height Degree MHz dBuV dB dBuV/m dB dBuV/m dB Detector cm degree 53.5052 46.44 -15.76 30.68 40.00 -9.32 QP 61.9951 48.75 -17.34 31.41 40.00 -8.59 QP 99.5281 47.90 -18.68 29.22 43.50 -14.28 QP * 111.7380 54.22 -18.65 35.57 43.50 -7.93 QP 148.4410 53.01 -21.60 31.41 43.50 -12.09 QP

*:Maximum data x:Over limit 1:over margin

Operator: Jason

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December 11, 2020

Above 1000MHz~10th Harmonics:

Operation Mode: GFSK (CH40: 2441MHz)

All modulation modes have been tested, the worst mode is (GFSK), the data is recorded on the following page, other modulation modes do not exceed this limit.Please refer to the following data.

Freq.	Ant.	Rea	ding	Correct	Emis	sion	Lim	nit	Margin(d	D)
Fieq.	Pol.	Level(d	BuV/m)	Factor	Level(d	BuV/m)	3m(dB	uV/m	iviargin(u	5)
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4804	V	94.06	76.41	-32.3	61.76	44.11	74	54	-12.24	-9.89
7206	V	97.68	70.07	-37.2	60.48	32.87	74	54	-13.52	-21.13
9608	>	95.23	71.82	-39.8	55.43	32.02	74	54	-18.57	-21.98
12010	>	96.00	75.63	-40.5	55.50	35.13	74	54	-18.50	-18.87
14412	<	92.61	73.05	-41.7	50.91	31.35	74	54	-23.09	-22.65
16814	<	91.04	71.22	-40.0	51.04	31.22	74	54	-22.96	-22.78
4804	H	98.16	72.90	-31.6	66.56	41.30	74	54	-7.44	-12.70
7206	Н	96.05	73.13	-35.5	60.55	37.63	74	54	-13.45	-16.37
9608	Н	94.83	70.69	-38.3	56.53	32.39	74	54	-17.47	-21.61
12010	Н	93.74	73.20	-39.0	54.74	34.20	74	54	-19.26	-19.80
14412	Н	97.52	70.68	-42.0	55.52	28.68	74	54	-18.48	-25.32
16814	Н	93.43	71.22	-39.3	54.13	31.92	74	54	-19.87	-22.08

Operation Mode: GFSK (CH1: 2402MHz) Test Date :

Test Date : December 11, 2020

Freq.	Ant.	Rea	ding	Correct	Emis	sion	Li	mit	Marg	in(dB)
	Pol.	Level(d	BuV/m)	Factor	Level(d	BuV/m)	3m(dE	3uV/m)		
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4882		92.82	76.56	-32.3	60.52	44.26	74	54	-13.48	-9.74
7323		91.62	74.07	-37.2	54.42	36.87	74	54	-19.58	-17.13
9764		97.19	72.12	-39.8	57.39	32.32	74	54	-16.61	-21.68
12205	V	93.08	71.15	-40.5	52.58	30.65	74	54	-21.42	-23.35
14646		92.71	72.91	-41.0	51.71	31.91	74	54	-22.29	-22.09
17087	>	93.49	70.73	-41.1	52.39	29.63	74	54	-21.61	-24.37
4882	Н	95.41	73.97	-31.6	63.81	42.37	74	54	-10.19	-11.63
7323	н	97.67	73.77	-35.5	62.17	38.27	74	54	-11.83	-15.73
9764	Н	92.64	76.04	-38.3	54.34	37.74	74	54	-19.66	-16.26
12205	Н	95.98	72.65	-39.0	56.98	33.65	74	54	-17.02	-20.35
14646	Н	93.92	75.29	-42.0	51.92	33.29	74	54	-22.08	-20.71
17087	Н	98.91	74.38	-41.5	57.41	32.88	74	54	-16.59	-21.12

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Freq.	Ant.	Rea	ding	Correct	Emis	sion	Lii	nit	Margin(dB)	
	Pol.	Level(d	BuV/m)	Factor	Level(d	BuV/m)	3m(dBuV/m)			
(MHz)	H/V	PK	AV	dB	PK	AV	PK	AV	PK	AV
4960	V	97.42	75.87	-32.3	65.12	43.57	74	54	-8.88	-10.43
7440	V	96.99	70.81	-37.2	59.79	33.61	74	54	-14.21	-20.39
9920	V	92.48	76.83	-39.8	52.68	37.03	74	54	-21.32	-16.97
12400	V	92.15	70.08	-40.5	51.65	29.58	74	54	-22.35	-24.42
14880	V	91.31	75.68	-41	50.31	34.68	74	54	-23.69	-19.32
17360	V	95.30	70.56	-41.1	54.2	29.46	74	54	-19.8	-24.54
4960	Н	94.51	76.28	-31.6	62.91	44.68	74	54	-11.09	-9.32
7440	Н	93.11	71.08	-35.5	57.61	35.58	74	54	-16.39	-18.42
9920	Н	95.95	75.71	-38.3	57.65	37.41	74	54	-16.35	-16.59
12400	Н	93.60	70.92	-39	54.6	31.92	74	54	-19.4	-22.08
14880	Н	93.57	75.51	-42	51.57	33.51	74	54	-22.43	-20.49
17360	Н	91.22	73.94	-41.5	49.72	32.44	74	54	-24.28	-21.56

Operation Mode: GFSK (CH79: 2480MHz)

Test Date : December 11, 2020

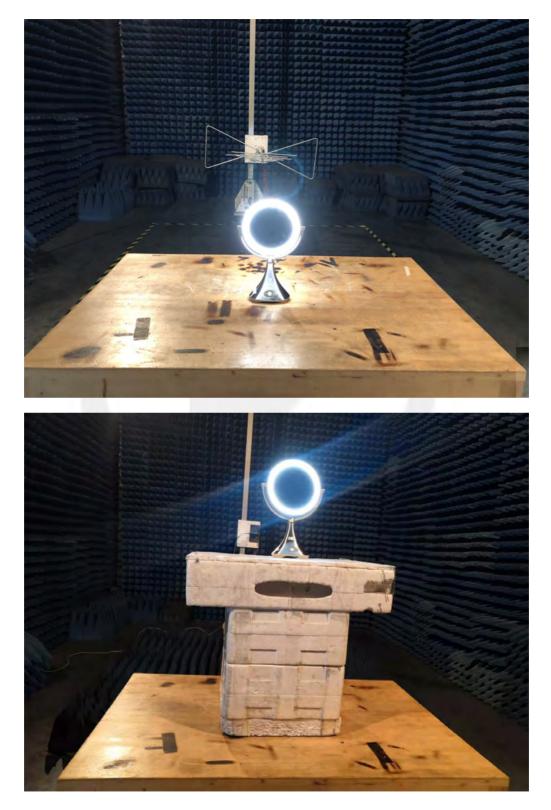
Other harmonics emissions are lower than 20dB below the allowable limit.

- **Note:** (1) All Readings are Peak Value and AV.
 - (2) Emission Level= Reading Level+ Probe Factor +Cable Loss.
 - (3) The average measurement was not performed when the peak measured data under the limit of average detection.
 - (4) Measuring frequencies from 1GHz to 25GHz.

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7.5 Radiated Measurement Photos:



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8. Channel Separation test

8.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

8.2 Test SET-UP (Block Diagram of Configuration)

EUT Spectrum Analyzer

8.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Characteristics	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	10Hz-30GHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

8.4 Measurement Results:

Refer to attached data chart.

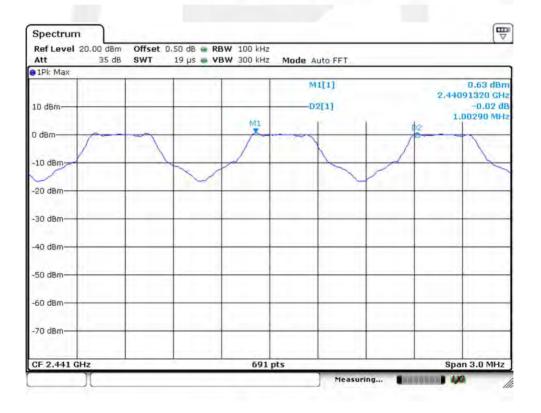
Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK	-	

Channel number	Channel	Separation Read	Separation Limit
Channel number	frequency (MHz)	Value (kHz)	2/3 20dB Down BW(kHz)
1	2402	1003	>634
40	2441	1003	>634
79	2480	1003	>634

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₽ Spectrum Ref Level 20.00 dBm Offset 0.50 dB 🖷 RBW 100 kHz Att 35 dB SWT 19 µs 🖷 VBW 300 kHz Mode Auto FFT 01Pk Max D2[1] 0.02 de 1.00290 MHz M1[1] 0.22 dBm 10 dBm-2.40191320 GHz MI 0 dBm -10 dBm -20 dBm -30 dBm 40 dBm -50 dBm--60 dBm -70 dBm Span 3.0 MHz CF 2.402 GHz 691 pts Sussessit 40 Measuring...



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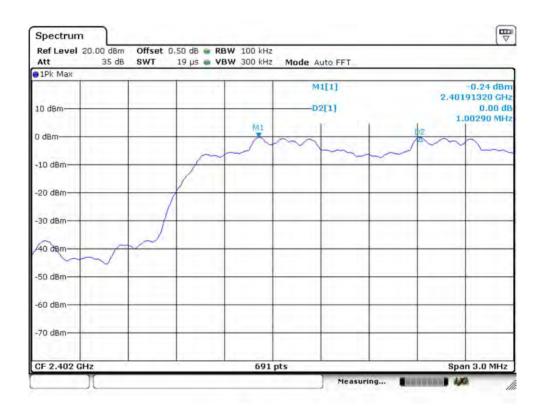
Ref Level 20.00 dB Att 35 d		.50 dB 🖷 RE 19 µs 🖷 VE		Mode Auto FFT	_	
10 dBmM1			02	D2[1] M1[1]	1.00	-0.02 de 290 MH: .10 dBn 900 GH:
-10 dBm	1			1		
-30 dBm					~	
-50 dBm	-					~~~
-60 dBm						-
-70 dBm					T	
CF 2.48 GHz		A	691 pt	5	Span 3	.0 MHz

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Modulation:	П/4-DQPSK	Soparation Poad	Soporation Limit
Test Result:	PASS	Humidity :	53 %
Test By:	Loren	Temperature :	24 ℃
Spectrum Detector:	PK	Test Date :	December 11, 2020

Channel number	Channel frequency (MHz)	Separation Read Value (kHz)	Separation Limit 2/3 20dB Down BW(kHz)
1	2402	1003	>833
40	2441	1003	>831
79	2480	1003	>831



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Ref Level 20.00 dB Att 35 d		 RBW 100 kHz VBW 300 kHz 	Mode Auto FFT	
1Pk Max	<u>í</u> 1			
10 dBm		M1	D2[1] M1[1]	0.00 de 1.00290 MH: 0.67 dBm 2.44091750 GH: b2
0 dBm	m	~~~~	~	-m-
-20 dBm		_		
-30 dBm	-			
-40 dBm				
-50 dBm				
-60 dBm				
-70 dBm				
CF 2.441 GHz	4	691 pts		Span 3.0 MHz

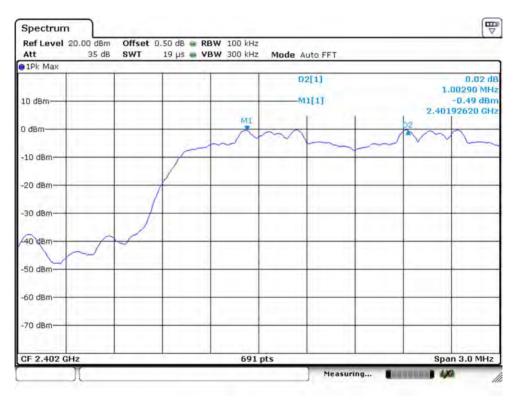


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Spectrum Detector: Test By: Test Result: Modulation:	PK Loren PASS 8DPSK	Test Date : Temperature : Humidity :	December 11, 2020 24℃ 53 %
Channel number	Channel	Separation Read	Separation Limit
	frequency (MHz)	Value (kHz)	2/3 20dB Down BW(kH

Channel number	frequency (MHz)	Value (kHz)	2/3 20dB Down BW(kHz)
1	2402	1003	>857
40	2441	1003	>857
79	2480	1003	>857



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Ref Level 20.00 dBm Att 35 dB			Auto FFT	
1Pk Max	í í	1 1		
10 dBm			M1[1] -D2[1]	0.58 dBn 2.44092190 GH: -0.35 dE 1.00290 MH:
0 dBm	M_	M1 X		12
-10 dBm-				
-20 dBm				
-30 dBm				
-40 dBm				
-50 dBm				
-60 dBm				
-70 dBm				
CF 2.441 GHz		691 pts		Span 3.0 MHz



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9. 20dB Bandwidth test

9.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

9.2 Test SET-UP (Block Diagram of Configuration)

EUT Spectrum Analyzer

9.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Characteristics	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	10Hz-30GHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

9.4 Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	24 °C
Test Result:	PASS	Humidity :	53 %
Modulation:	GFSK		

Channel number	Channel frequency (MHz)	20dB Down BW(kHz)
1	2402	951
40	2441	951
79	2480	951

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Spectrum Ref Level 20.00 dBm Offset 0.50 dB RBW 30 kHz 63.2 µs 🖝 VBW 100 kHz Att 35 dB SWT Mode Auto FFT • 1Pk Max -2.42 dBm M1[1] 2.40191320 GH 10 dBmndB 20.00 dF 950.800000000 kHz BW 0 dBm 2526.2 O factor -10 dBm -20 dBm -30 dBmdBm 50 dBm -60 dBm--70 dBm-CF 2.402 GHz 691 pts Span 3.0 MHz Marker Type | Ref | Trc X-value Y-value Function **Function Result** M1 2.4019132 GHz -2.42 dBm ndB down 950.8 kHz 1 Τ1 2.4016093 GHz -22.13 dBm ndB 20.00 dB Q factor T2 2.4025601 GHz -22.79 dBm 2526.2 1 Measuring... CONTRACTOR AND **B** Spectrum Offset 0.50 dB a RBW 30 kHz Ref Level 20.00 dBm 63.2 µs 🖷 VBW 100 kHz Att 35 dB SWT Mode Auto FFT 1Pk Max M1[1] 1.54 dBn 2.44091320 GHz 10 dBmndB 20.00 dF 950.800000000 kHz MI BW 0 dBm-Q factor 2567.3 S -10 dBm



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Ref Level 1 Att	20.00 dBn 35 dB			Mode Auto FFT		
1Pk Max	_					
10 dBm			M1	M1[1] ndB Bw Q factor		-1.28 dBn 2.47991320 GH 20.00 df 950.800000000 kH 2608.1
-10 dBm		T	- MA	m	72	
-20 dBm	8 - 10	and and		Y I	The	
-10 dBm	~	w			~	~
-60 dBm						
CF 2.48 GH	z		691 pts			Span 3.0 MHz
Marker	Trc	X-value	Y-value	Function	Fund	tion Result
Type Ref M1	1	2.4799132 GHz	-1.28 dBm	ndB down	Func	950.8 kHz
T1 T2	1	2.4796093 GHz 2.4805601 GHz	-21.32 dBm -21.23 dBm	Q factor		20.00 dB 2608.2

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ΡK Test Date : Spectrum Detector: December 11, 2020 Test By: Loren **24**℃ Temperature : Test Result: 53 % PASS Humidity : Modulation: Π/4-DQPSK Channel frequency 20dB Down Channel number (MHz) BW(kHz) 2402 1250 1 40 2441 1246 79 2480 1246 **B** Spectrum Ref Level 20.00 dBm Offset 0.50 dB 🖷 RBW 30 kHz 63.2 µs 🕳 VBW 100 kHz 35 dB Att SWT Mode Auto FFT • 1Pk Max M1[1] -1.85 dBm 2.40191320 GHz 10 dBm 20.00 dB ndB 1.250400000 MHz BW M 0 dBm 1921.0 O factor -10 dBm--20 dBm -30 dBm dBm 50 dBm -60 dBm--70 dBm-Span 3.0 MHz CF 2.402 GHz 691 pts Marker Type | Ref | Trc X-value Y-value Function **Function Result** 2.4019132 GHz 1.2504 MHz M1 -1.85 dBm ndB down 1 2.4014443 GHz -22.21 dBm 20.00 dB T1 ï ndB 2.4026946 GHz Q factor -21.91 dBm 1921.0 T2 1 Measuring... **CO** IN COLUMN 14 LIG

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5 Spectrum Ref Level 20.00 dBm Offset 0.50 dB 🖷 RBW 30 kHz Att 35 dB SWT 63.2 µs 🕳 VBW 100 kHz Mode Auto FFT 1Pk Max M1[1] -0.99 dBn 2.44091320 GH 10 dBm ndB 20,00 de MI BW 1.246000000 MHz 0 dBm-Q factor 1959.0 -10 dBm 11 -20 dBm--30 dBmdBm 50 -60 dBm--70 dBm-CF 2.441 GHz Span 3.0 MHz 691 pts Marker Type | Ref | Trc Function **Function Result** X-value Y-value 2.4409132 GHz -0.99 dBm 1.246 MHz M1 1 ndB down Τ1 2.4404486 GHz -20.41 dBm 20.00 dB ndB 1 2.4416946 GHz -20.85 dBm Q factor 1959.0 T2 1 40 Measuring..

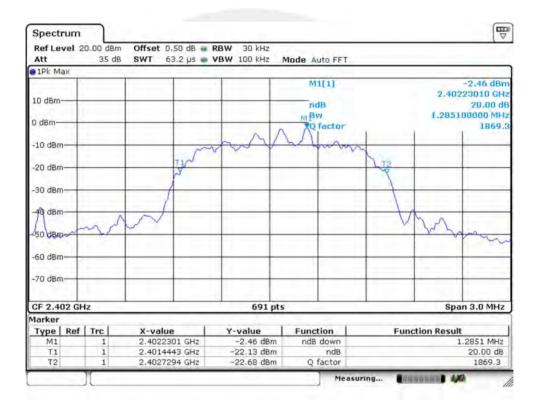


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Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	24℃
Test Result: Modulation:	PASS 8DPSK	Humidity :	53 %

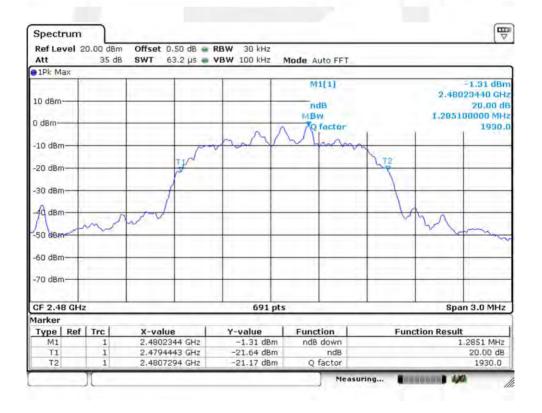
Channel number	Channel frequency	20dB Down
Channel number	(MHz)	BW(kHz)
1	2402	1285
40	2441	1285
79	2480	1285



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5 Spectrum Ref Level 20.00 dBm Offset 0.50 dB 🖷 RBW 30 kHz Att 35 dB SWT 63.2 µs 🕳 VBW 100 kHz Mode Auto FFT 1Pk Max M1[1] 1.57 dBm 2.44123010 GH 10 dBm ndB 20,00 de MBW 1.285100000 MHz 0 dBm Q factor 1899.7 -10 dBm-Τ2 -20 dBm--30 dBmdBm-50 dBr -60 dBm--70 dBm-CF 2.441 GHz Span 3.0 MHz 691 pts Marker Type | Ref | Trc Function **Function Result** X-value Y-value 2.4412301 GHz -1.57 dBm 1.2851 MHz M1 1 ndB down Τ1 2.4404443 GHz -21.50 dBm 20.00 dB ndB 2.4417294 GHz -21.66 dBm Q factor 1899.7 T2 1 Measuring... Energence 400



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Report No.ES201209006W



10. Quantity of Hopping Channel Test

10.1 Measurement Procedure

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

10.2Test SET-UP (Block Diagram of Configuration)

EUT		Spectrum Analyzer
-----	--	-------------------

10.3Measurement Equipment Used:

EQUIPMENT	MFR	MODEL	SERIAL	Characteristics	LAST	CAL DUE.
TYPE		NUMBER	NUMBER		CAL.	
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	10Hz-30GHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

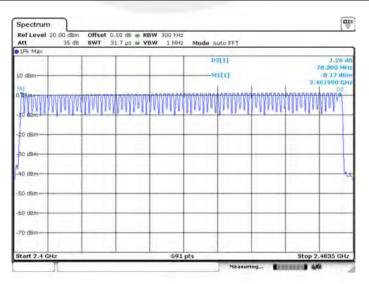
10.4 Measurement Results:

Refer to attached data chart. Vorst Test Mode GESK

vvorst lest wode	GESK
Test By:	Loren
Test Result:	PASS

Test Date : Temperature : Humidity : December 11, 2020 25 ℃ 50 %

Hopping Channel	Quantity of Hopping	Quantity of Hopping
Frequency Range	Channel	Channel
2402-2480	79	>15



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11. Time of Occupancy (Dwell Time) test

11.1 Test Description

The Equipment Under Test (EUT) was set up to perform the dwell time measurements. The EUT was connected to the spectrum analyzer via a short coax cable. The dwell time is calculated by:

Dwell time = time slot length * hop rate / number of hopping channels * 31.6s

with:

- hop rate = $1600 \times 1/s$ for DH1 packets = 1600 s^{-1}
- hop rate = 1600/3 * 1/s for DH3 packets = 533.33 s⁻¹
- number of hopping channels = 79
- 31.6 s = 0.4 seconds multiplied by the number of hopping channels = 0.4 s * 79

The highest value of the dwell time is reported.

11.2 Test SET-UP (Block Diagram of Configuration)

EUT

Spectrum Analyzer

11.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	Characteristics	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	10Hz-30GHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

11.4 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (a) (1) (iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6seconds. Refer to attached data chart

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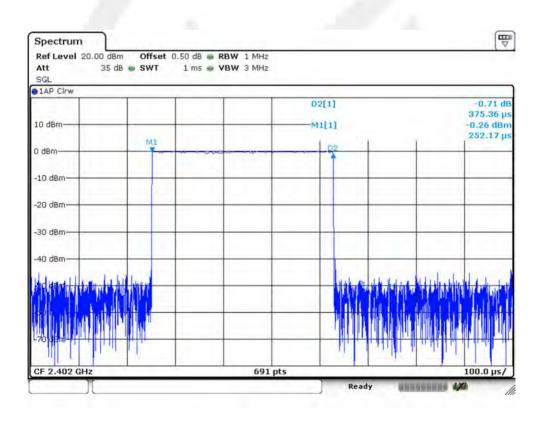
Modulation:	GFSK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

11.5 Test result

Mode	Number of transmission in a 31.6(79 Hopping*0.4)	Length of transmissions time(msec)	Result (msec)	Limit (msec)
DH1	1600/(2*79) x 31.6 = 320	0.375	120	400
DH3	1600/(4*79) x 31.6 =160	1.635	261.6	400
DH5	1600/(6*79) x 31.6 =106.67	2.877	306.89	400

Remark: The results of worst cased was recorded.

DH1:

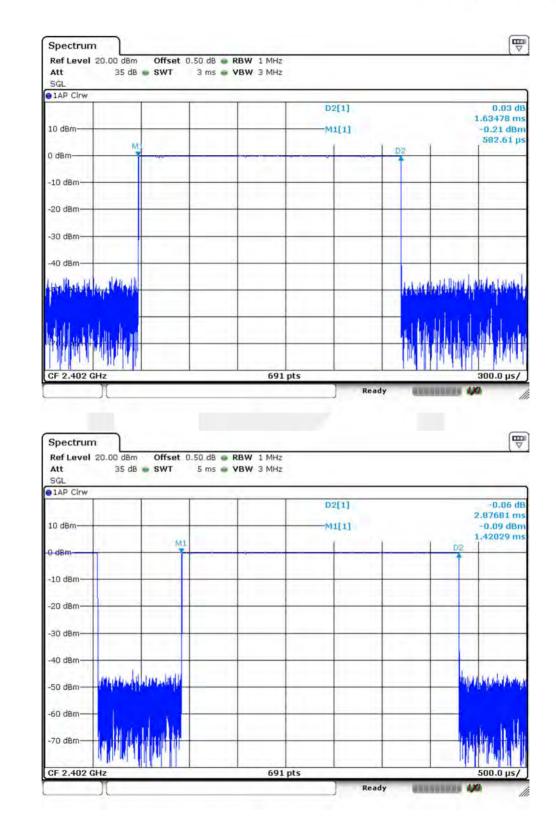


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DH3:

DH5:



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12. MAXIMUM PEAK OUTPUT POWER TEST

12.1 Measurement Procedure

a. Check the calibration of the measuring instrument(SA) using either an internal calibrator or a known signal from an external generator.

b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using proper RBW and VBW setting.

d. Measure the captured power within the band and recording the plot.

e. Repeat above procedures until all frequencies required were complete.

12.2 Test SET-UP (Block Diagram of Configuration)



12.3 Measurement Equipment Used:

EQUIPMENT	MFR	MODEL	SERIAL	Characteristics	LAST	CAL DUE.
TYPE		NUMBER	NUMBER		CAL.	
Spectrum Analyzer	Rohde & Schwarz	FSV30	1321.3008K	10Hz-30GHz	05/22/2020	05/21/2021
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

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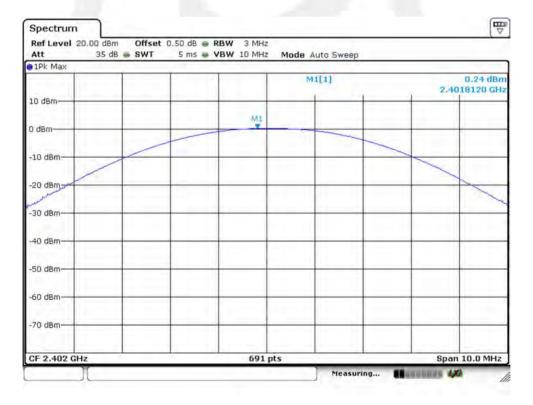


12.4Measurement Results:

Refer to attached data chart.

Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %
Modulation:	GFSK	-	

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
01	2402	0.24	1.057	1000	PASS
40	2441	1.07	1.279	1000	PASS
79	2480	1.36	1.368	1000	PASS



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Spectrum Ref Level 20.00 dBm Offset 0.50 dB . RBW 3 MHz 35 dB . SWT 5 ms 👄 VBW 10 MHz Mode Auto Sweep Att 01Pk Max 1.07 dBm 2.4409860 GHz M1[1] 10 dBm-×. 0 dBm--10 dBm--20 dBm -30 dBm-40 dBm--50 dBm--60 dBm--70 dBm Span 10.0 MHz CF 2.441 GHz 691 pts Measuring...

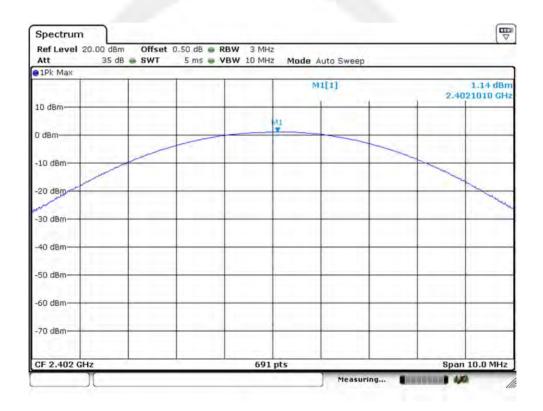
1Pk Max			
		M1[1]	1.36 dBm 2.4800290 GH
10 dBm-			
		1	
) dBm-			
10 dBm-			
20 dBm	1		
30 dBm-	1 mm 11 1 mm		
26.1 I I I I I I I I I	1.1.1.1.1		
40 dBm			
50 dBm-			
A 11 1 2 2 2 2 2			
-60 dBm			
-70 dBm			
CF 2.48 GHz	601	pts	Span 10.0 MHz

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Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	25 ℃
Test Result: Modulation:	PASS ∏/4-DQPSK	Humidity :	50 %

Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
01	2402	1.14	1.300	125	PASS
40	2441	1.99	1.581	125	PASS
79	2480	2.26	1.683	125	PASS



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1Pk Max	Contraction of the second	5 ms 👼	VBW 10 MI	12 MOUE	Áuto Sweep	_	
				,	M1[1]	2.4	1.99 dBr 413040 GH
0 dBm-				MI			
dBm		-					-
10 dBm-							-
20 dBm		-					-
30 dBm	-	-				-	
40 dBm	-	-				 	
50 dBm	-						-
60 dBm			-				-
70 dBm			_				-

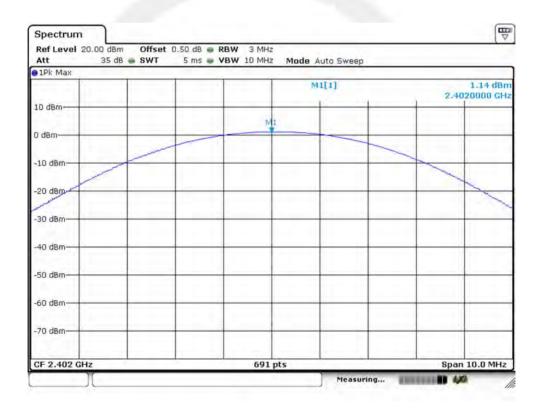
Att 35 dB 🖷	SWT 5 ms	5 - VBW 10 M	Hz Mode	Auto Sweep		
1Pk Max			M	11[1]	2.4802	26 dBr 460 GH
10 dBm-			141			
0 dBm			MI			_
	1					
-10 dBm						
					1	
-20 dBpr						M
-30 dBm					 	_
		1.	0.0		 	
-40 dBm					 	
-50 dBm-					 	_
-60 dBm			-		 	
-70 dBm-						
-70 UBII						
CF 2.48 GHz			1 pts		 Span 10	

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Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	25 ℃
Test Result: Modulation:	PASS 8DPSK	Humidity :	50 %

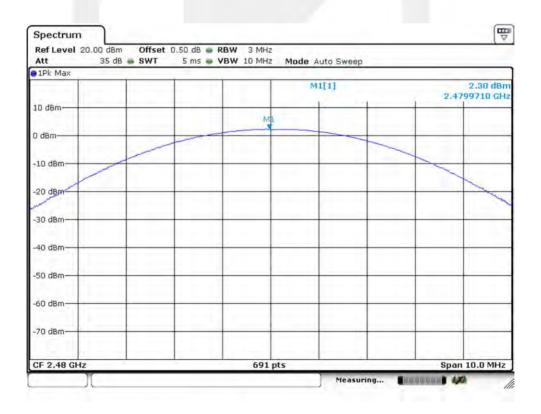
Channel number	Channel Frequency (MHz)	Peak Power output(dBm)	Peak Power output(mW)	Peak Power Limit(mW)	Pass/Fail
01	2402	1.14	1.300	125	PASS
40	2441	1.99	1.581	125	PASS
79	2480	2.30	1.698	125	PASS



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	ms 🖶 VBW 10 MHz Mod	le Auto Sweep	
1Pk Max	1 1	NoTe1	1.99 dBr
		M1[1]	2.4409860 GH
10 dBm-			1 1
	MI		
0 dBm-			
-10 dBm			
10 dBm			
-20 dBm			
manufacture and a second s			
-30 dBm			
	b 4 1 1 1 10 10	1101-010-01	
-40 dBm			
-50 dBm-			
-60 dBm-			
-70 dBm			
CF 2.441 GHz	691 pts		Span 10.0 MHz
T		Measuring	



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13. Band EDGE test

13.1 Measurement Procedure

For Conducted Test

- 1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100KHz. The video bandwidth is set to 300KHz.
- 2. The spectrum from 30MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

middle, and mighteet chamiele.		
EMI Test Receiver	Setting	
Attenuation	Auto	
RBW	100KHz	
VBW	300KHz	
Detector	Peak	
Trace	Max hold	

For Radiated emission Test

The EUT was placed on a styrofoam table which is 1.5m above ground plane.

The measurement procedure at the ban edges was simplified by performing the measurement in just one plot. Both, the in-band-emission and the unwanted emission were be encompassed by the span. After trace stabilization, the maximum peak was be determined by a peak detector and the value was marked by an appropriate limit line. The second limit line, which is 20dB below the first, marks the limit for the emissions in the unrestricted band. A maximum-peak-detector marks the highest emission in the unrestricted band next to the band edge.

The measurements were performed at the lower end of the 2.4GHz band. Use the following spectrum analyzer settings:

For Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 1MHz, video bandwidth 3MHz:

EMI Test Receiver	Setting
Attenuation	Auto
RBW	1MHz
VBW	3MHz
Detector	Peak
Trace	Max hold

For Non-Restricted Band, When spectrum scanned above 1GHz setting resolution bandwidth 100KHz, video bandwidth 300KHz:

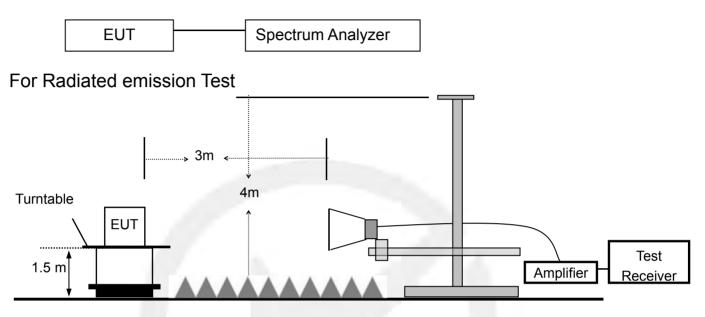
EMI Test Receiver	Setting
Attenuation	Auto
RBW	100KHz
VBW	300KHz
Detector	Peak
Trace	Max hold

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13.2 Test SET-UP (Block Diagram of Configuration)

For Conducted Test



13.3 Measurement Equipment Used:

For Conducted Test

ſ	EQUIPMENT	MFR	MODEL	SERIAL	Characteristics	LAST	CAL DUE.
$\left \right $	TYPE Spectrum Analvzer	Rohde & Schwarz	NUMBER FSV30	NUMBER 1321.3008K	10Hz-30GHz	CAL. 05/22/2020	05/21/2021
t	Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	05/22/2020	05/21/2021
	Antenna Connector	ARTHUR-YANG	2244-N1TG1	N/A	10Hz-30GHz	05/22/2020	05/21/2021

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

For	Radiated	emission	Test
	i ta alato a	01111001011	

Item	Equipment	Manufacturer	Model No.	Serial No.	Characteristics	Last Cal.	Cal. Interval
1	Signal Analyzer	Rohde & Schwarz	FSV30	103040	9KHz-40GHz	05/22/2020	1 Year
2	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-12 72	1GHz-18GHz	05/22/2020	1 Year
3	Power Amplifier	LUNAR EM	LNA1G18-40	J1010000 0081	1GHz-26.5GHz	05/22/2020	1 Year
4	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year
5	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year
6	Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	05/22/2020	1 Year

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13.4 Measurement Results:

Refer to attached data chart.

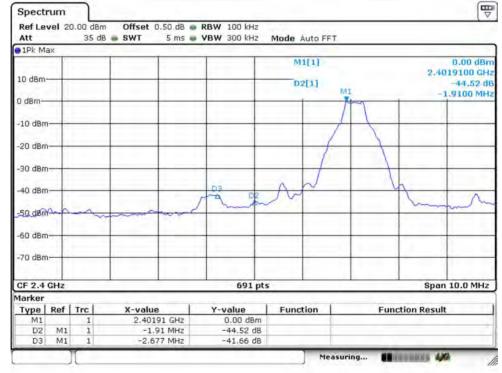
Spectrum Detector:	PK	Test Date :	December 11, 2020
Test By:	Loren	Temperature :	25 ℃
Test Result:	PASS	Humidity :	50 %

1. Conducted Test

For Non-Hopping Mode:

Frequency (MHz)	Modulation	Peak Power Output(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
2401.91	GFSK	0.00	44.52	>20dBc
2401.91	pi/4-DQPSK	0.02	41.72	>20dBc
2402.23	8DPSK	0.12	42.67	>20dBc
2479.91	GFSK	1.29	41.98	>20dBc
2479.91	pi/4-DQPSK	1.31	43.19	>20dBc
2480.23	8DPSK	1.22	41.91	>20dBc

Test plots of GFSK



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5 Spectrum Ref Level 20.00 dBm Offset 0.50 dB @ RBW 100 kHz Att 35 dB 🕳 SWT 5 ms 🔳 VBW 300 kHz Mode Auto FFT • 1Pk Max D3[1] 41,98 dB 3.6470 MHz 10 dBm M1[1] 1.29 dBm M1 2.4799110 GHz 0 dBm -10 dBm -20 dBm--30 dBm--40 dBm--50 dBm--60 dBm--70 dBm-CF 2.4835 GHz 691 pts Span 10.0 MHz Marker Type | Ref | Trc Function **Function Result** X-value Y-value 2.479911 GHz 1.29 dBm M1 1 D2 M1 44.19 dB 3.589 MHz M1 3.647 MHz 41.98 dB D3 1 III 100 Measuring..

Test plots of pi/4-DQPSK



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B Spectrum Ref Level 20.00 dBm Offset 0.50 dB 🖷 RBW 100 kHz Att 35 dB 🕳 SWT 5 ms 🖝 VBW 300 kHz Mode Auto FFT 0 1Pk Max D3[1] 43.19 dB 3.6470 MHz 10 dBm M1[1] 1.31 dBm M1 2.4799110 GHz 0 dBm -10 dBm -20 dBm -30 dBm 40 Br -50 dBm -60 dBm--70 dBm-Span 10.0 MHz CF 2.4835 GHz 691 pts Marker Type Ref Trc Function Function Result X-value Y-value 2.479911 GHz 1.31 dBm M1 1 D2 M1 44.47 dB 3.589 MHz 1 D3 M1 3.647 MHz 43.19 dB 1 BB 440 Measuring...

Test plots of 8DPSK



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Att	/el 20	0.00 dBm 35 dB			RBW 100 kHz VBW 300 kHz	Mode	Auto FF	т		
• 1Pk Ma	ж									
10 dBm-		MI					3[1]		2.4	-41.91 d 3.3290 MH 1.22 dBr 802290 GH
O OBW-	~	Jave								
-10 dBm	1			-					-	
-20 dBm	+	_		-	+ +					-
-30 dBm	4		1		-				_	-
Loc			4		1. 102	-				
-40 dBm	111		h	m	min					
-50 dBm	-	_		-	1.00	my	no	mmm	m	mo
-60 dBm		_		_						
								10 1 10		
-70 dBm						-				
CF 2.48	35 G	Hz		_	691 p	ts			Spa	n 10.0 MHz
larker										
	Ref		X-value		Y-value	Func	tion	Fu	nction Resu	lt
M1		1	2.480229		1.22 dBm		-			
D2	M1	1	3.2706	MHz MHz	-44.16 dB -41.91 dB					

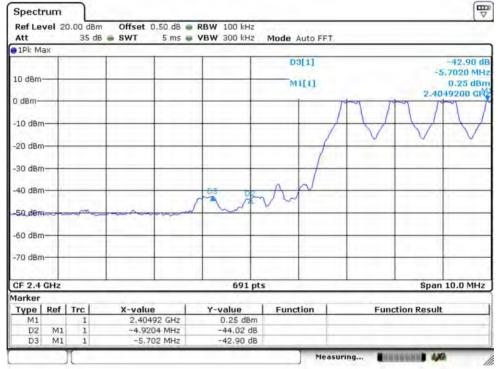
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For Hopping Mode:

Frequency (MHz)	Modulation	Peak Power Output(dBm)	Result of Band edge(dBc)	Band edge Limit(dBc)
2404.92	GFSK	0.25	42.90	>20dBc
2404.92	pi/4-DQPSK	0.26	42.47	>20dBc
2404.24	8DPSK	0.20	43.76	>20dBc
2479.91	GFSK	1.24	43.21	>20dBc
2478.91	pi/4-DQPSK	1.26	44.00	>20dBc
2479.23	8DPSK	1.25	45.04	>20dBc

Test plots of GFSK



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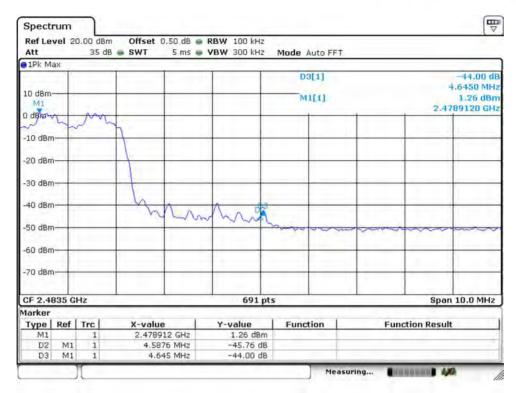
₽ Spectrum Ref Level 20.00 dBm Offset 0.50 dB @ RBW 100 kHz Att 35 dB 🕳 SWT 5 ms 🛢 VBW 300 kHz Mode Auto FFT 0 1Pk Max D3[1] 43.21 dB 3.6610 MHz 10 dBm M1[1] 1.24 dBm M1 2.4799118 GHz 0 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm -70 dBm-CF 2.4835 GHz 691 pts Span 10.0 MHz Marker Type | Ref | Trc Y-value Function **Function Result** X-value 2.479911 GHz 1.24 dBm M1 1 M1 45.13 dB D2 3.589 MHz 1 M1 3.661 MHz -43.21 dB D3 1 CONCERNENT AND Measuring...

Test plots of pi/4-DQPSK



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Test plots of 8DPSK

Att	vel 20	0.00 dBm 35 dB			RBW 100 kHz VBW 300 kHz	Mode A	uto FF	r.		
1Pk Ma	ax									
10 dBm-							(1) ((1)			-43.76 d -4.9930 MH 0.20 dBr
0 dBm—	-			_				MAN	2.4	1042400 GH
-10 dBm		_		1			- [~~~		
-20 dBm	-			-					-	
-30 dBm	-	_					_	_		
-40 dBm	-			_	03 00	M	2		-	-
-59-d8m					manne		_	_	-	-
-60 dBm		-		-			-			
-70 dBm	÷				-		-		-	-
CF 2.4	GHz				691 pt	ts	_		Spa	in 10.0 MHz
larker										
	Ref		X-value		Y-value	Funct	ion	F	unction Resu	lt
M1	24.2	1	2.4042		0.20 dBm					
D2 D3	M1 M1	1	-4.240	3 MHz	-45.62 dB -43.76 dB					

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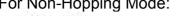


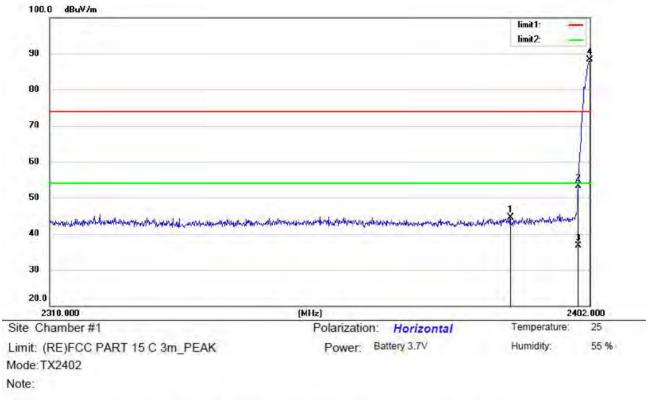
Ref Lev Att	/el 20	0.00 dBm 35 dB			RBW 100 kHz VBW 300 kHz	Mode Au	to FFT			
9 1Pk Ma	x		-							
10 dBm-						M1[5			1.25 dBr 92310 GH -45.04 d 1.2692 MH
0 dBm	L	wa								
-10 dBm	-		1	-	+ +		-	-		-
-20 dBm		_	1	-			_			
-30 dBm	+			-	-		_	-		
-40 dBm	+	_	h	ha	hand	-	-			
-50 dBm	-	_	-	1-2	1 minse	Same	~~~~			
-60 dBm		_	-	-				-		
-70 dBm	+	_	-	-	-		_	-		
CF 2.48	35 G	Hz			691 p	ts			Span	10.0 MHz
larker										
	Ref	Trc	X-valu		Y-value	Functio	m	Fun	ction Result	
M1		1		231 GHz	1.25 dBm					
D2 D3	M1 M1	1		92 MHz	-45.04 dB -42.71 dB					_

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2. Radiated emission Test Worst test modulation 8DPSK For Non-Hopping Mode:



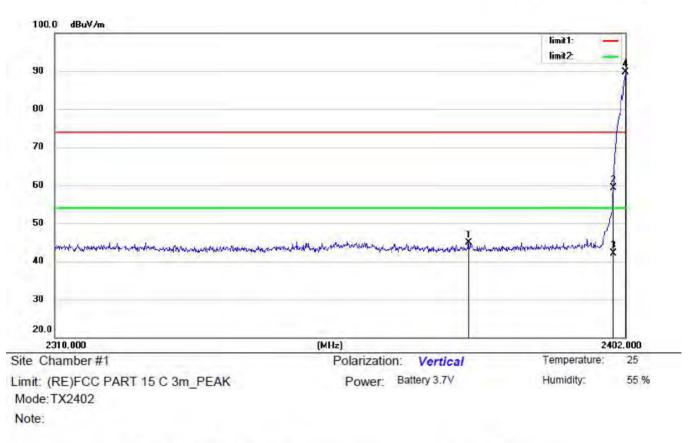


No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	$\sim k$	Antenna Height	Table Degree	
	-	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	- 12	2388.292	56.20	-11.66	44.54	74.00	-29.46	peak			
2		2400.000	64.89	-11.63	53.26	74.00	-20.74	peak			
3	113	2400.000	48.25	-11.63	36.62	54.00	-17.38	AVG			
4	*	2402.000	99.99	-11.63	88.36	74.00	14.36	peak			

*:Maximum data x:Over limit I:over margin Operator: huang

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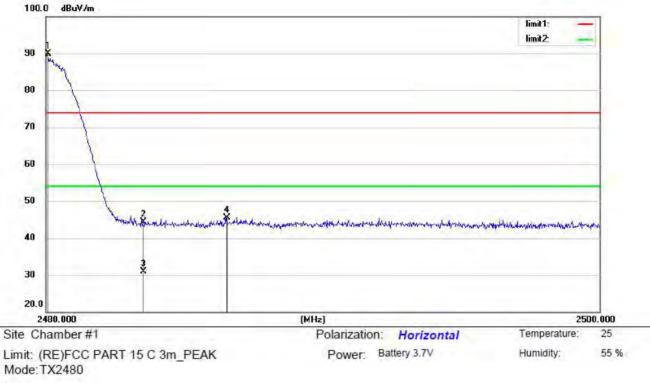
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
-		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2376.424	56.63	-11.68	44.95	74.00	-29.05	peak	(
2	3	2400.000	70.98	-11.63	59.35	74.00	-14.65	peak			
3		2400.000	53.65	-11.63	42.02	54.00	-11.98	AVG			
4	*	2402.000	101.41	-11.63	89.78	74.00	15.78	peak			

*:Maximum data x:Over limit 1:over margin

Operator: huang

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Note:

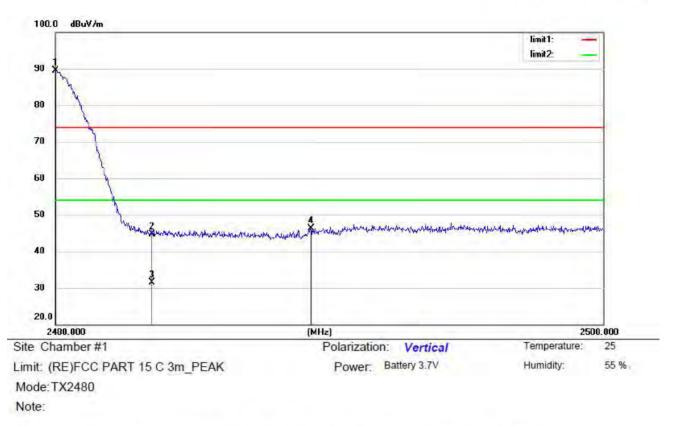
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	- 2	Antenna Height	Table Degree	
-		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.080	101.35	-11.45	89.90	74.00	15.90	peak			
2		2483.500	55.84	-11.46	44.38	74.00	-29.62	peak			
3	5.1	2483.500	42.42	-11.46	30.96	54.00	-23.04	AVG			
4		2486.520	56.88	-11.44	45.44	74.00	-28.56	peak			
_											

*:Maximum data x:Over limit 1:over margin

Operator: huang

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No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.000	99.59	-10.02	89.57	74.00	15.57	peak	1		
2		2483.500	54.74	-10.01	44.73	74.00	-29.27	peak			
3		2483.500	41.50	-10.01	31.49	54.00	-22.51	AVG			
4		2489.320	56.28	-9.98	46.30	74.00	-27.70	peak	_		

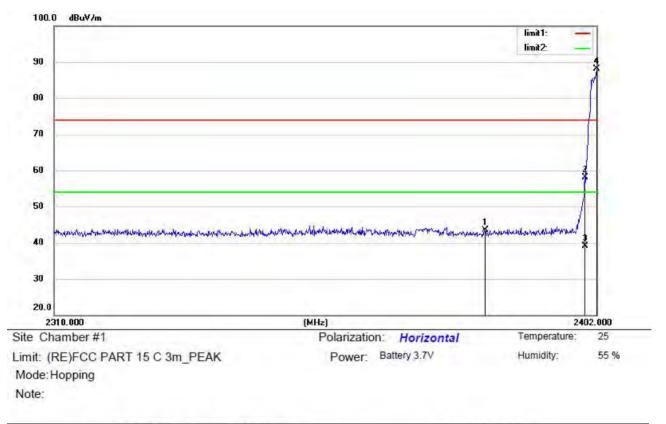
*:Maximum data x:Over limit I:over margin

Operator: huang

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For Hopping Mode:



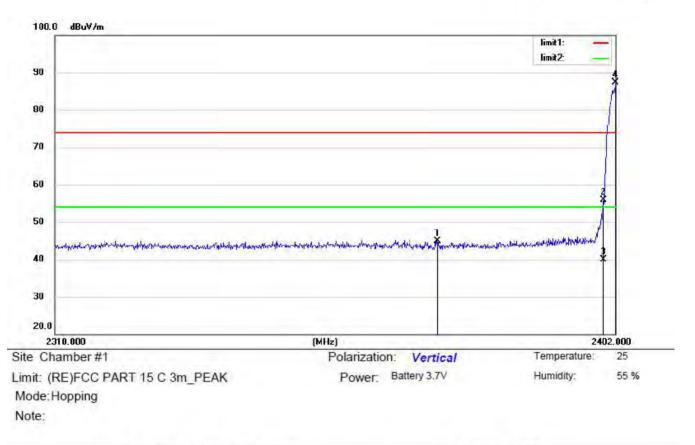
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		2382.772	55.19	-11.67	43.52	74.00	-30.48	peak	P		
2		2400.000	69.72	-11.63	58.09	74.00	-15.91	peak			
3		2400.000	50.80	-11.63	39.17	54.00	-14.83	AVG	1		
4	*	2402.000	99.73	-11.63	88.10	74.00	14.10	peak			

*:Maximum data x:Over limit 1:over margin

Operator: huang

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No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	2.1	2372.376	55.54	-10.61	44.93	74.00	-29.07	peak			
2		2400.000	66.45	-10.47	55.98	74.00	-18.02	peak			
3		2400.000	50.36	-10.47	39.89	54.00	-14.11	AVG			
4	*	2402.000	97.72	-10.46	87.26	74.00	13.26	peak			

*:Maximum data x:Over limit I:over margin

Operator: huang

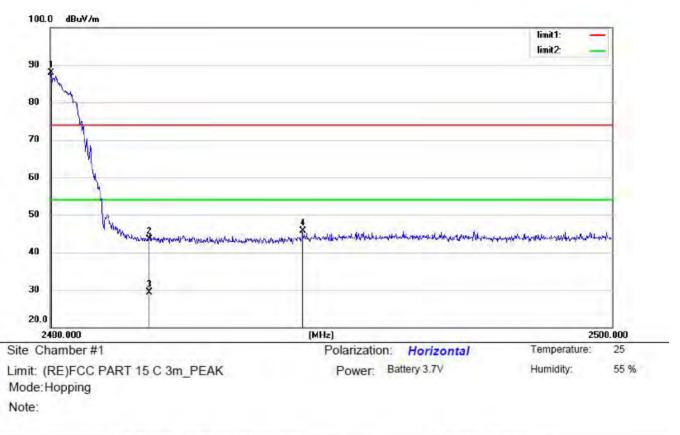
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Report No.ES201209006W

Page 69 of 73

Ver.1.0





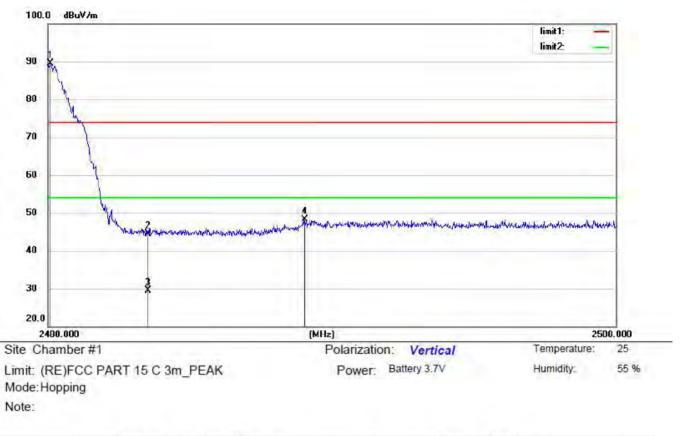
No.	Mk	. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
	1	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.020	99.36	-11.45	87.91	74.00	13.91	peak			
2		2483.500	54.89	-11.46	43.43	74.00	-30.57	peak			
3		2483.500	40.80	-11.46	29.34	54.00	-24.66	AVG			
4	-	2488.980	57.11	-11.44	45.67	74.00	-28.33	peak			

*:Maximum data x:Over limit 1:over margin

Operator: huang

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No.	M	k. Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over		Antenna Height	Table Degree	
-		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	*	2480.080	99.49	-10.02	89.47	74.00	15.47	peak	1		
2		2483.500	54.49	-10.01	44.48	74.00	-29.52	peak			
3	1	2483.500	39.60	-10.01	29.59	54.00	-24.41	AVG			
4	100	2489.020	58.24	-9.98	48.26	74.00	-25.74	peak			
	_										

*:Maximum data x:Over limit I:over margin

Operator: huang

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14. Antenna Application

14.1 Antenna requirement

The EUT'S antenna is met the requirement of FCC part 15C section 15.203 and 15.247.

FCC part 15C section 15.247 requirements:

Systems operating in the 2402-2480MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

14.2 Result

The EUT's antenna, permanent attached antenna, used a PCB antenna and integrated on PCB, The antenna's gain is 0 Bi and meets the requirement.

15. Photos of EUT

Please refer to external photos and internal photos.

*** End of Report ***

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声明

Statement

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3. 本报告的检测结果仅对送测样品有效,委托方对样品的代表性和资料的真实性负责;

The test results or observations are applicable only to tested sample. Client shall be responsible for representativeness of the sample and authenticity of the material.

 本检测报告中检测项目标注有特殊符号则该项目不在资质认定范围内,仅作为客户委托、科研、教学或内部质量 控制等目的使用;

The observations or tests with special mark fall outside the scope of accreditation, and are only used for purpose of commission, research, training, internal quality control etc.

5. 本检测报告以实测值进行符合性判定,未考虑不确定度所带来的风险,本实验室不承担相关责任,特别约定、标 准或规范中有明确规定的除外;

The test results or observations are provided in accordance with measured value, without taking risks caused by uncertainty into account. Without explicit stipulation in special agreements, standards or regulations, EMTEK shall not assume any responsibility.

6. 对本检测报告若有异议,请于收到报告之日起20日内提出;

Objections shall be raised within 20 days from the date receiving the report.

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