



# FCC RADIO TEST REPORT

Applicant : MtM+ Technology Corporation  
Address : 8F, 178, MinQuan East Road, Section 3,  
Taipei 10542, Taiwan  
Equipment : M905  
Model No. : nRF52832  
Trade Name : MtM+ Technology  
FCC ID. : 2AJ9P-M905

**I HEREBY CERTIFY THAT :**

The sample was received on Oct. 30, 2017 and the testing was carried out on Nov. 03, 2017 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Assistant Manager

Tested by:

Spree Yei / Engineer

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





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# 1. Summary of Test Procedure and Test Results

## 1.1 Applicable Standards

**ANSI C63.4:2014**

**ANSI C63.10:2013**

**FCC Rules and Regulations Part 15 Subpart C §15.247**

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	Pass
15.207	. AC Power Line Conducted Emission	Pass
15.209 15.205	. Radiated Spurious Emission	Pass
15.247(d)	. Conducted Spurious Emission	Pass
15.247(a)(2)	. 6dB Bandwidth	Pass
15.247(b)	. Maximum Peak Output Power	Pass
15.247(e)	. Power Spectral Density	Pass

This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report.



## 2. Test Configuration of Equipment under Test

### 2.1 Feature of Equipment under Test

Modulation Type	BLE:GFSK
Frequency Range	BLE: 2402-2480MHz NFC: 13.56MHz
Data Rate	BLE:1Mbps
Antenna Type	BLE: Trace Antenna NFC: Coil Antenna
Antenna Gain	BLE E1: -3.2 dBi E3: -5.9 dBi

\*NFC is passive mode.

### 2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<b>*00</b>	<b>2402</b>	14	2430	28	2458
01	2404	15	2432	29	2460
02	2406	16	2434	30	2462
03	2408	17	2436	31	2464
04	2410	18	2438	32	2466
05	2412	<b>*19</b>	<b>2440</b>	33	2468
06	2414	20	2442	34	2470
07	2416	21	2444	35	2472
08	2418	22	2446	36	2474
09	2420	23	2448	37	2476
10	2422	24	2450	38	2478
11	2424	25	2452	<b>*39</b>	<b>2480</b>
12	2426	26	2454	--	--
13	2428	27	2456	--	--

Note: Channels remarked \* are selected to perform test.

### 2.3 Test Mode and Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- An executive program, "Nrfghostudio:1.21.2" under WIN 7 was executed to transmit and receive data via Bluetooth.
- The following test mode was performed for the test:

Test Mode	Operating Description
1	E1, GFSK (1Mbps)
2	E3, GFSK (1Mbps)

### 2.4 Description of Test System

The EUT was tested alone. No support devices is needed for testing.



### 2.5 General Information of Test

Test Site	<b>Cerpass Technology Corporation Test Laboratory</b> Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881 Address: No.68-1, Shihbachongsi, Shihding Township, New Taipei City 223, Taiwan, R.O.C. Tel: +886-2-2663-8582	
	FCC	TW1079, TW1061, 390316, 228391, 641184
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication Test C-4663 for Conducted emission test R-4218, R-4399 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	



### 3. Test Equipment and Ancillaries Used for Tests

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI3	100443	2017/03/07	2018/03/06
LISN	Schwarzbeck	NSLK 8127	8127-568	2017/02/15	2018/02/14
Pulse Limiter	R&S	ESH3-Z2	101934	2017/02/14	2018/02/13
Bilog Antenna	Schwarzbeck	VULB9168	369	2017/03/15	2018/03/14
Active Loop Antenna	EMCO	6507	40855	2017/05/15	2018/05/14
Horn Antenna	EMCO	3115	31589	2017/02/18	2018/02/17
Horn Antenna	EMCO	3116	31970	2017/03/29	2018/03/28
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2017/03/17	2018/03/16
Preamplifier	EM	EM330	60660	2017/02/25	2018/02/24
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2017/09/20	2018/09/19
Preamplifier	Agilent	8449B	3008A01954	2017/02/09	2018/02/08
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2017/11/06	2018/11/05
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2017/03/17	2018/03/16
Spectrum Analyzer	R&S	FSP40	100219	2017/07/01	2018/06/30
BLUETOOTH TESTER	R&S	CBT	101133	2017/03/10	2018/03/09
Attenuator	KEYSIGHT	8491B	MY39250703	2017/03/07	2018/03/06
Rotary Attenuator	Agilent	8495B	MY42146680	2017/03/13	2018/03/12
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2017/09/04	2018/09/03
Series Power Meter	Anritsu	ML2495A	1224005	2017/03/01	2018/02/28
Power Sensor	Anritsu	MA2411B	1207295	2017/03/01	2018/02/28
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2017/02/25	2018/02/24
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2017/02/25	2018/02/24
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	V8.2014-8-6	N/A	N/A
Software	Keysight	N7607B Signal Studio	v2.0.0.1	N/A	N/A
Software	Keysight	Inservice MonitorUtility	N/A	N/A	N/A





## 4. Antenna Requirements

### 4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 4.2 Antenna Construction and Directional Gain

Antenna Type	Trace Antenna
Antenna Gain	E1: -3.2 dBi E3: -5.9 dBi



## 5. Test of AC Power Line Conducted Emission

The EUT was powered by Battery, this test item is not applicable for the EUT.



## 6. Test of Spurious Emission (Radiated)

### 6.1 Test Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

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

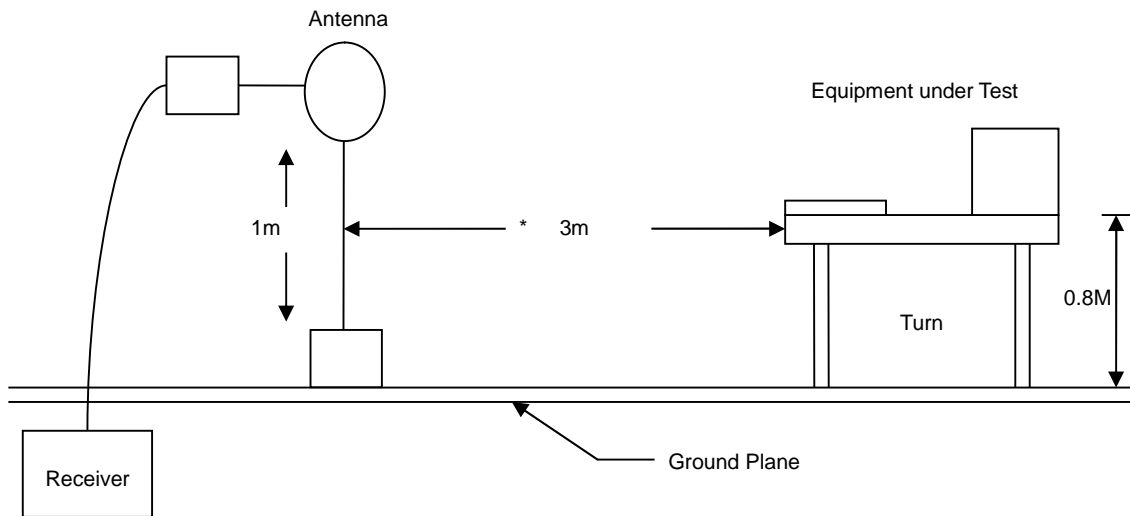
### 6.2 Test Procedures

- The EUT was placed on a rotatable table top 0.8 meter above ground.
- The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- The table was rotated 360 degrees to determine the position of the highest radiation.
- The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

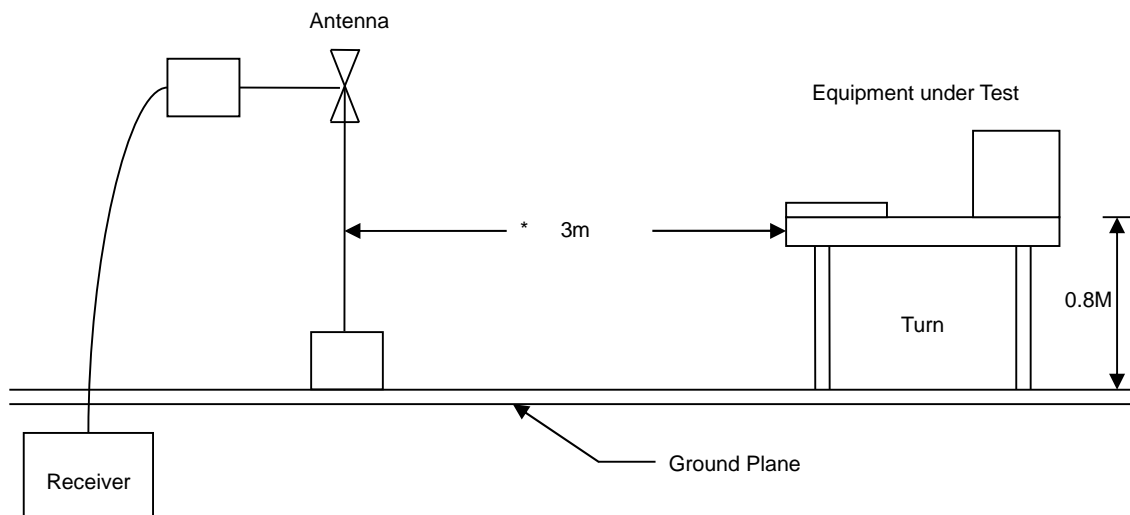


### 6.3 Typical Test Setup

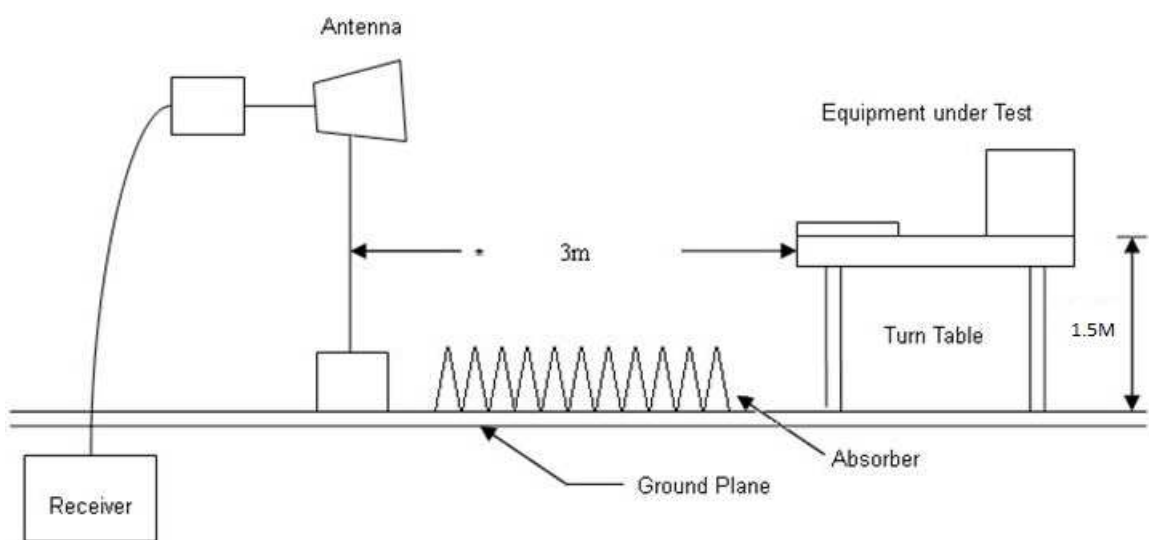
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



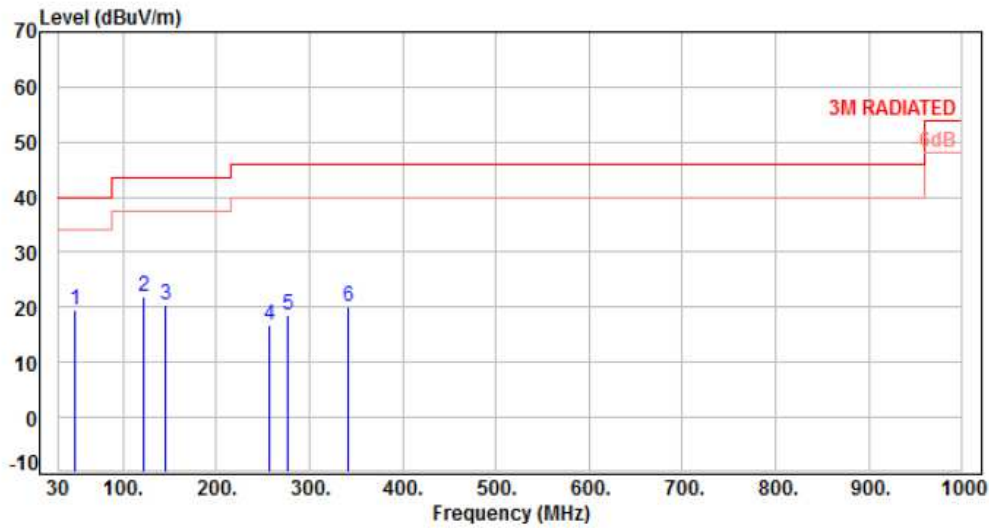


### 6.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

### 6.5 Test Result and Data (30MHz ~ 1GHz)

Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

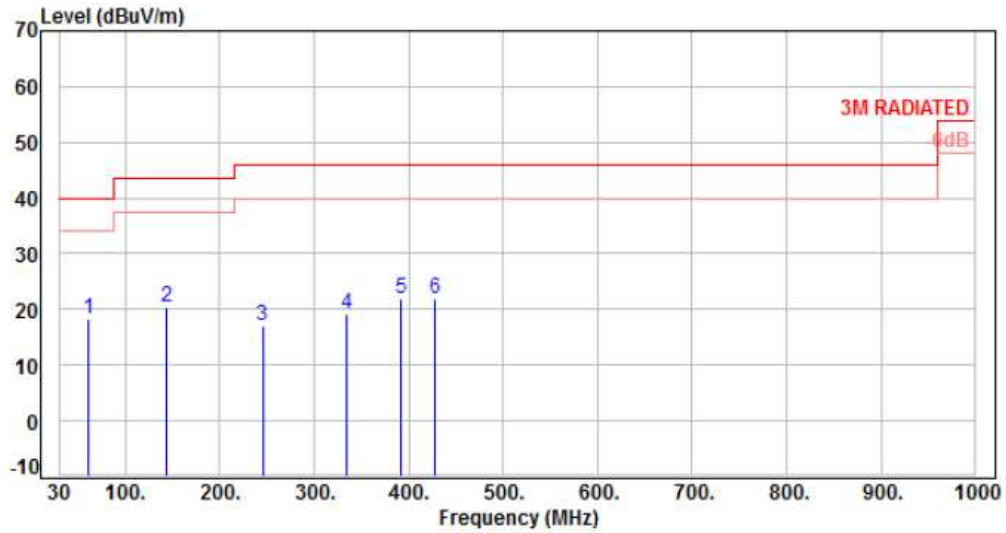


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	48.66	-9.75	29.22	19.47	40.00	-20.53	Peak	400	0	P
2	121.77	-12.26	34.05	21.79	43.50	-21.71	Peak	400	0	P
3	144.85	-10.20	30.56	20.36	43.50	-23.14	Peak	400	0	P
4	256.98	-10.45	27.28	16.83	46.00	-29.17	Peak	400	0	P
5	277.58	-9.47	28.12	18.65	46.00	-27.35	Peak	400	0	P
6	341.37	-7.72	27.77	20.05	46.00	-25.95	Peak	400	0	P

Note: Level=Reading+Factor  
Margin=Level-Limit  
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

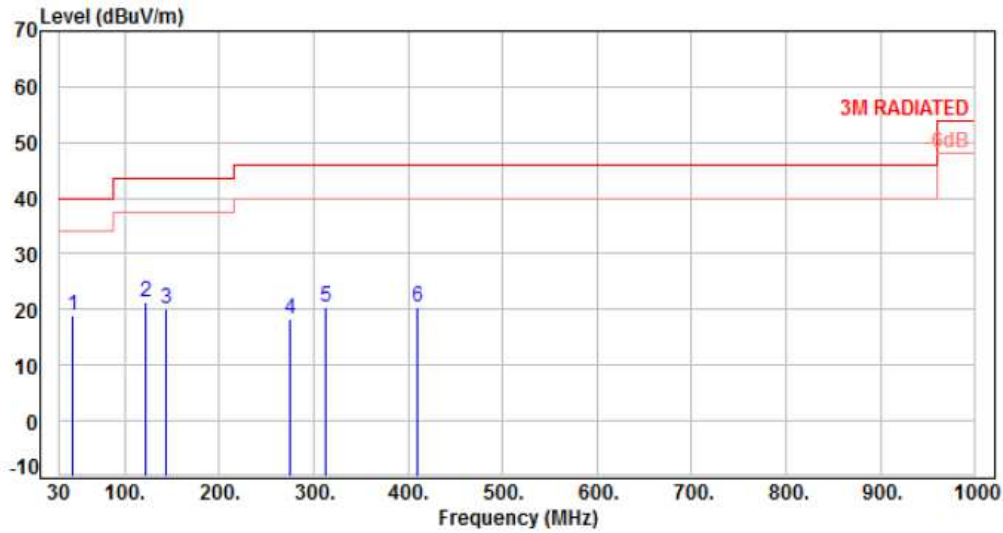


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	60.25	-10.29	28.63	18.34	40.00	-21.66	Peak	100	0	P
2	144.33	-10.21	30.53	20.32	43.50	-23.18	Peak	100	0	P
3	245.34	-10.69	27.70	17.01	46.00	-28.99	Peak	100	0	P
4	334.58	-7.90	27.11	19.21	46.00	-26.79	Peak	100	0	P
5	391.81	-6.23	28.31	22.08	46.00	-23.92	Peak	100	0	P
6	428.67	-5.29	27.32	22.03	46.00	-23.97	Peak	100	0	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 2	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

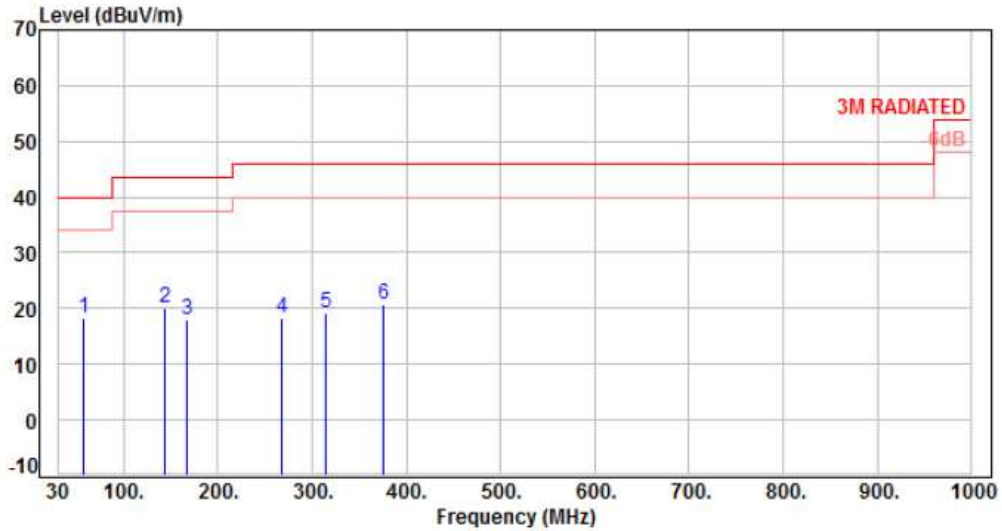


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	45.52	-9.89	28.72	18.83	40.00	-21.17	Peak	400	0	P
2	122.15	-12.23	33.66	21.43	43.50	-22.07	Peak	400	0	P
3	143.49	-10.24	30.41	20.17	43.50	-23.33	Peak	400	0	P
4	275.41	-9.55	27.91	18.36	46.00	-27.64	Peak	400	0	P
5	312.27	-8.48	28.89	20.41	46.00	-25.59	Peak	400	0	P
6	410.24	-5.74	26.30	20.56	46.00	-25.44	Peak	400	0	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	58.13	-10.15	28.48	18.33	40.00	-21.67	Peak	100	0	P
2	143.49	-10.24	30.32	20.08	43.50	-23.42	Peak	100	0	P
3	166.77	-10.00	27.99	17.99	43.50	-25.51	Peak	100	0	P
4	267.65	-9.89	28.06	18.17	46.00	-27.83	Peak	100	0	P
5	315.18	-8.40	27.59	19.19	46.00	-26.81	Peak	100	0	P
6	375.32	-6.73	27.58	20.85	46.00	-25.15	Peak	100	0	P

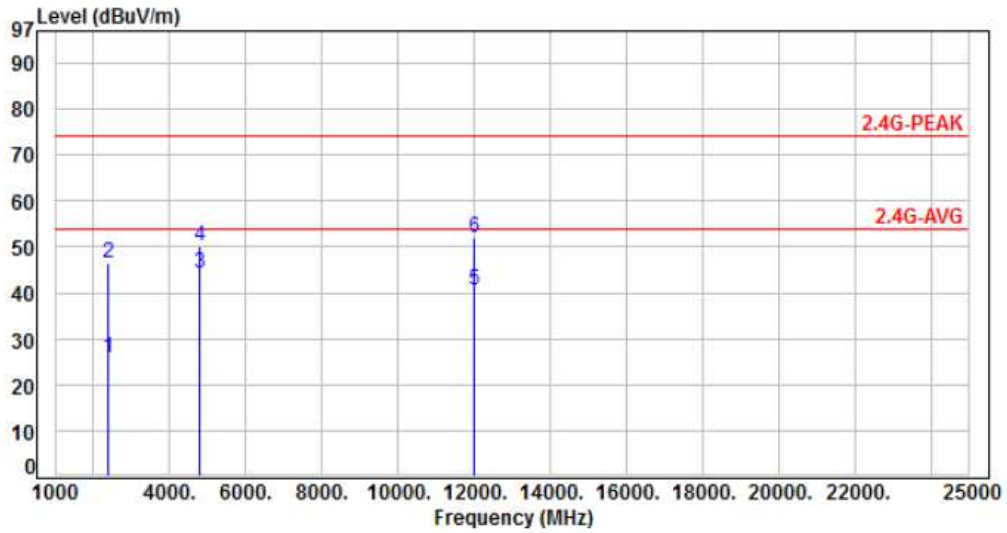
Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor





6.6 Test Result and Data (1GHz ~ 25GHz)

Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH00	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

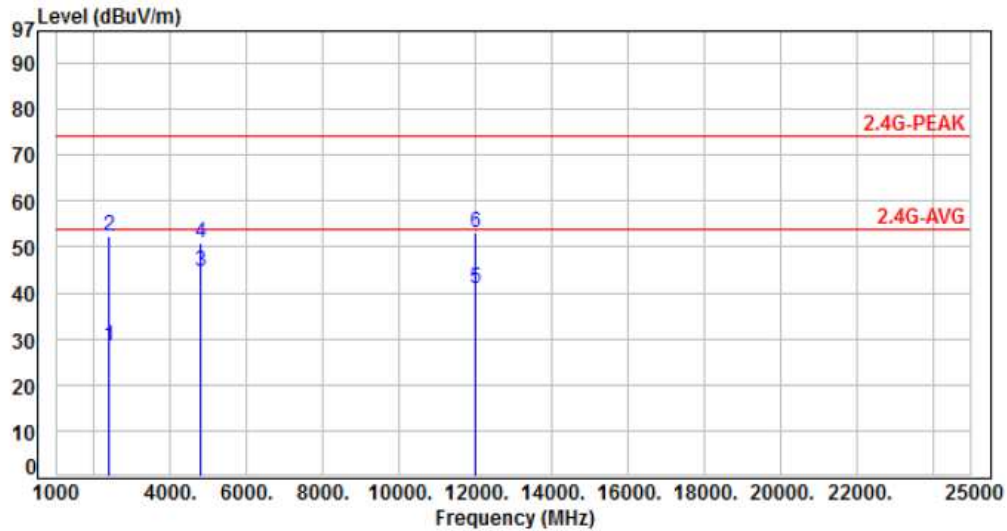


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	44.74	25.79	54.00	-28.21	Average	377	162	P
2	2390.00	-18.95	65.50	46.55	74.00	-27.45	Peak	377	162	P
3	4804.00	-13.28	57.40	44.12	54.00	-9.88	Average	384	327	P
4	4804.00	-13.28	63.30	50.02	74.00	-23.98	Peak	384	327	P
5	12010.00	-5.98	46.66	40.68	54.00	-13.32	Average	103	227	P
6	12010.00	-5.98	58.00	52.02	74.00	-21.98	Peak	103	227	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH00	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

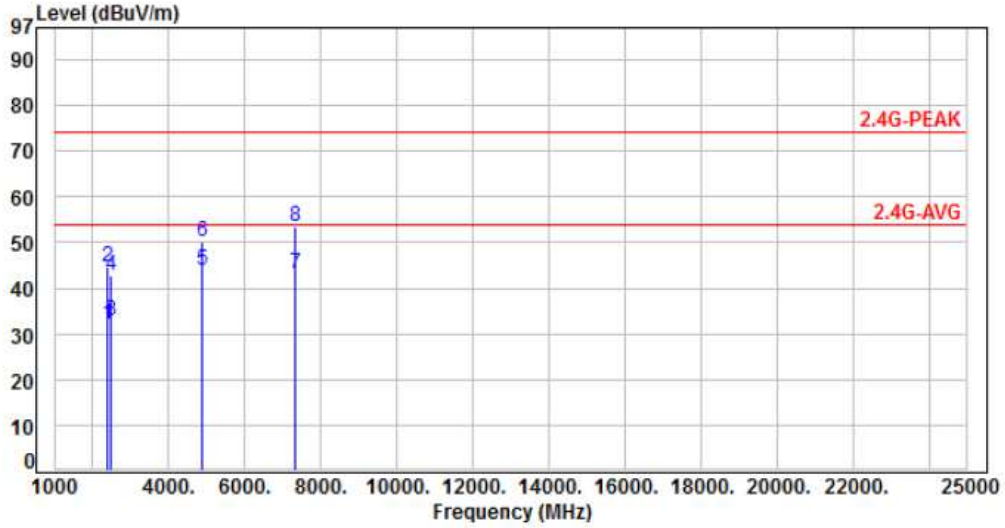


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	47.20	28.25	54.00	-25.75	Average	100	248	P
2	2390.00	-18.95	71.40	52.45	74.00	-21.55	Peak	100	248	P
3	4804.00	-13.28	57.87	44.59	54.00	-9.41	Average	130	124	P
4	4804.00	-13.28	64.30	51.02	74.00	-22.98	Peak	130	124	P
5	12010.00	-5.98	46.88	40.90	54.00	-13.10	Average	144	251	P
6	12010.00	-5.98	58.97	52.99	74.00	-21.01	Peak	144	251	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH19	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

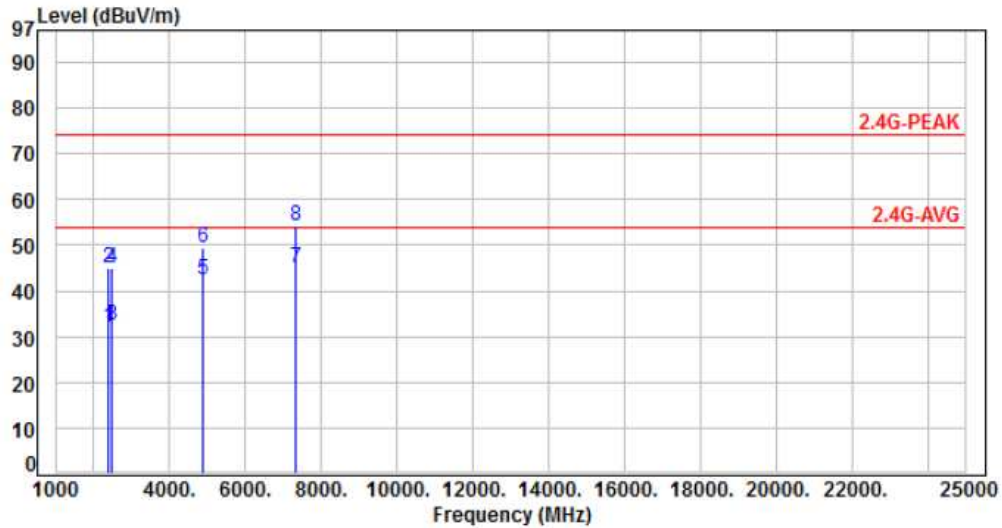


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	51.10	32.15	54.00	-21.85	Average	363	105	P
2	2390.00	-18.95	63.40	44.45	74.00	-29.55	Peak	363	105	P
3	2483.50	-18.71	51.66	32.95	54.00	-21.05	Average	363	105	P
4	2483.50	-18.71	61.50	42.79	74.00	-31.21	Peak	363	105	P
5	4880.00	-13.09	57.15	44.06	54.00	-9.94	Average	357	240	P
6	4880.00	-13.09	63.20	50.11	74.00	-23.89	Peak	357	240	P
7	7320.00	-10.17	53.49	43.32	54.00	-10.68	Average	100	209	P
8	7320.00	-10.17	63.80	53.63	74.00	-20.37	Peak	100	209	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH19	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

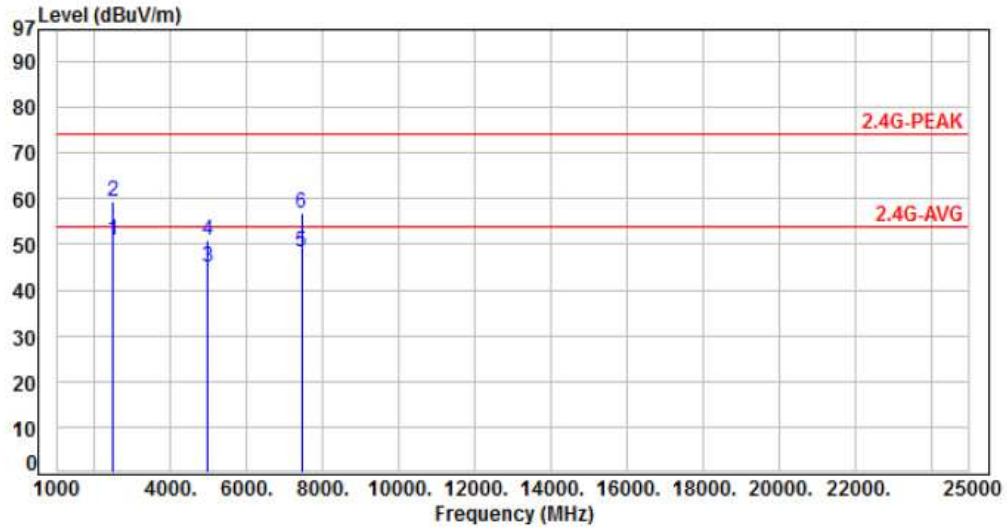


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	50.99	32.04	54.00	-21.96	Average	292	55	P
2	2390.00	-18.95	63.91	44.96	74.00	-29.04	Peak	292	55	P
3	2483.50	-18.71	51.20	32.49	54.00	-21.51	Average	292	55	P
4	2483.50	-18.71	63.88	45.17	74.00	-28.83	Peak	292	55	P
5	4880.00	-13.09	55.67	42.58	54.00	-11.42	Average	389	193	P
6	4880.00	-13.09	62.54	49.45	74.00	-24.55	Peak	389	193	P
7	7320.00	-10.17	55.10	44.93	54.00	-9.07	Average	100	296	P
8	7320.00	-10.17	64.50	54.33	74.00	-19.67	Peak	100	296	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH39	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

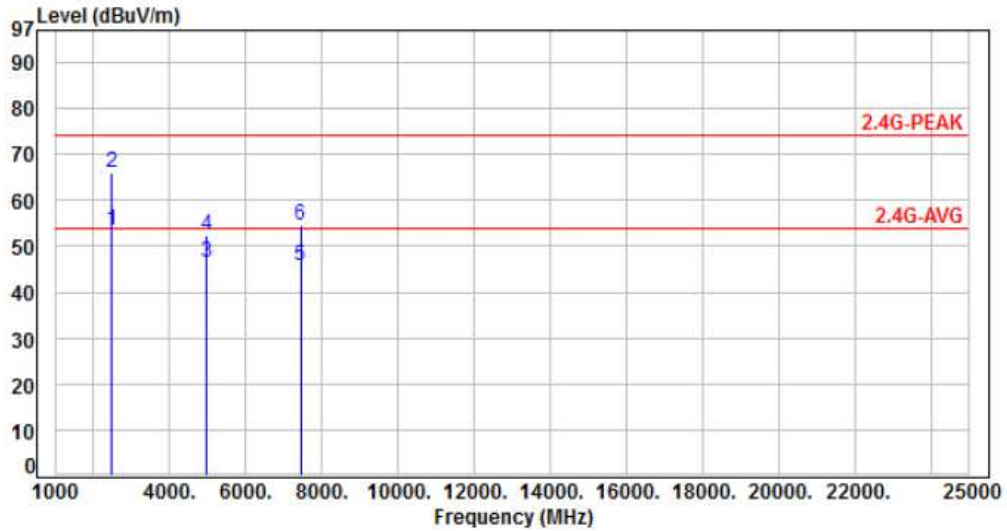


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	69.45	50.74	54.00	-3.26	Average	400	342	P
2	2483.50	-18.71	78.20	59.49	74.00	-14.51	Peak	400	342	P
3	4960.00	-12.89	57.89	45.00	54.00	-9.00	Average	362	323	P
4	4960.00	-12.89	63.83	50.94	74.00	-23.06	Peak	362	323	P
5	7440.00	-9.88	58.30	48.42	54.00	-5.58	Average	100	213	P
6	7440.00	-9.88	66.50	56.62	74.00	-17.38	Peak	100	213	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH39	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

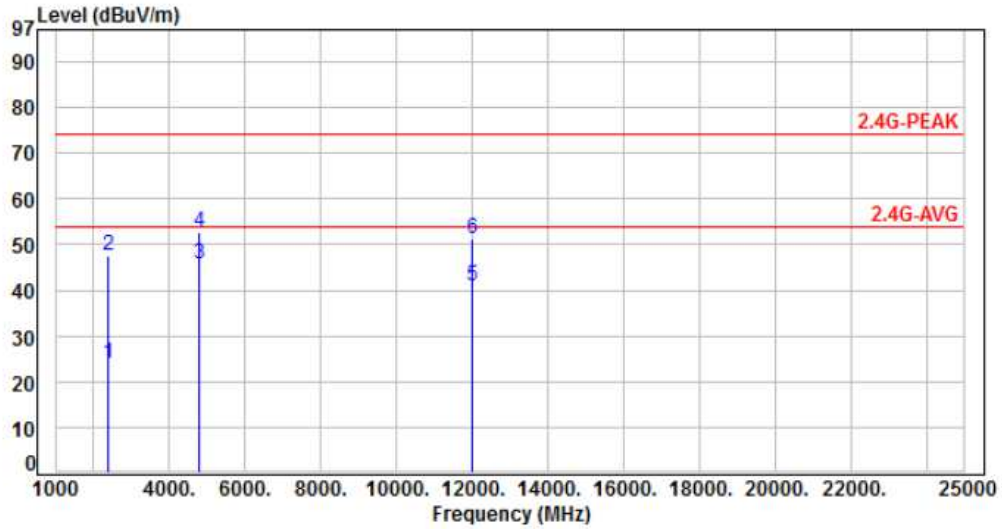


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	72.02	53.31	54.00	-0.69	Average	113	245	P
2	2483.50	-18.71	84.86	66.15	74.00	-7.85	Peak	113	245	P
3	4960.00	-12.89	59.20	46.31	54.00	-7.69	Average	160	249	P
4	4960.00	-12.89	65.20	52.31	74.00	-21.69	Peak	160	249	P
5	7440.00	-9.88	55.65	45.77	54.00	-8.23	Average	100	189	P
6	7440.00	-9.88	64.57	54.69	74.00	-19.31	Peak	100	189	P

Note: Level=Reading+Factor  
Margin=Level-Limit  
Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH00	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

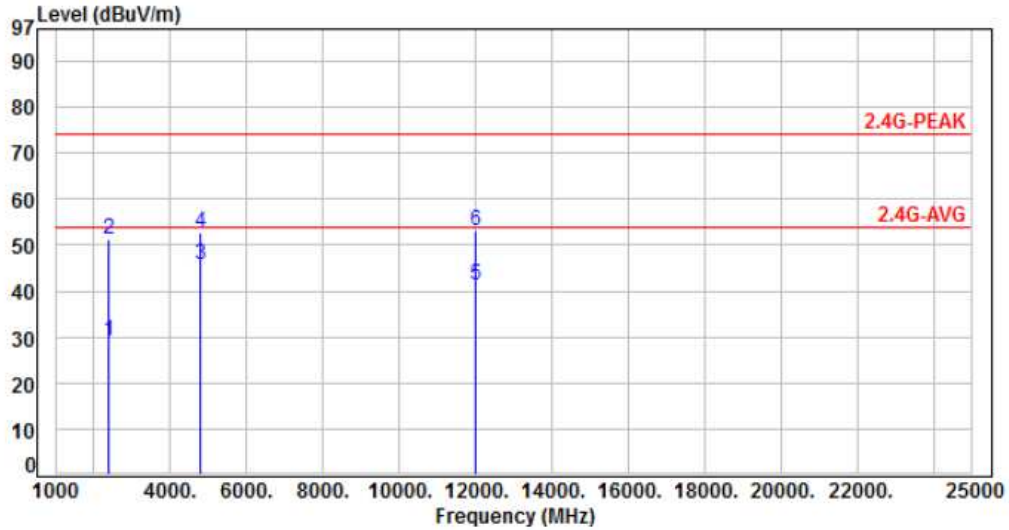


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	42.86	23.91	54.00	-30.09	Average	352	157	P
2	2390.00	-18.95	66.47	47.52	74.00	-26.48	Peak	352	157	P
3	4804.00	-13.28	58.85	45.57	54.00	-8.43	Average	338	301	P
4	4804.00	-13.28	66.10	52.82	74.00	-21.18	Peak	338	301	P
5	12010.00	-5.98	46.89	40.91	54.00	-13.09	Average	100	265	P
6	12010.00	-5.98	57.37	51.39	74.00	-22.61	Peak	100	265	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH00	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %



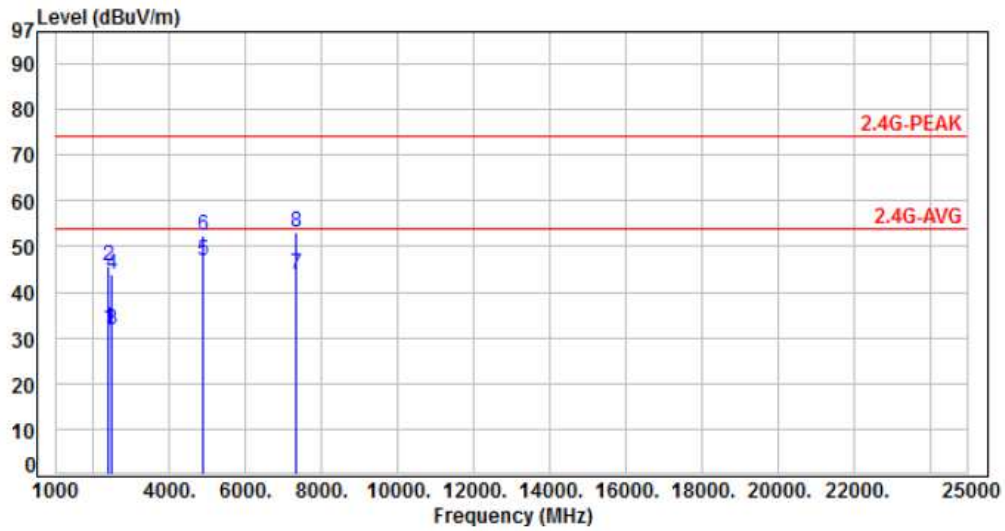
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	48.06	29.11	54.00	-24.89	Average	105	227	P
2	2390.00	-18.95	70.31	51.36	74.00	-22.64	Peak	105	227	P
3	4804.00	-13.28	58.99	45.71	54.00	-8.29	Average	182	110	P
4	4804.00	-13.28	66.06	52.78	74.00	-21.22	Peak	182	110	P
5	12010.00	-5.98	47.12	41.14	54.00	-12.86	Average	133	296	P
6	12010.00	-5.98	59.05	53.07	74.00	-20.93	Peak	133	296	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor





Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH19	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

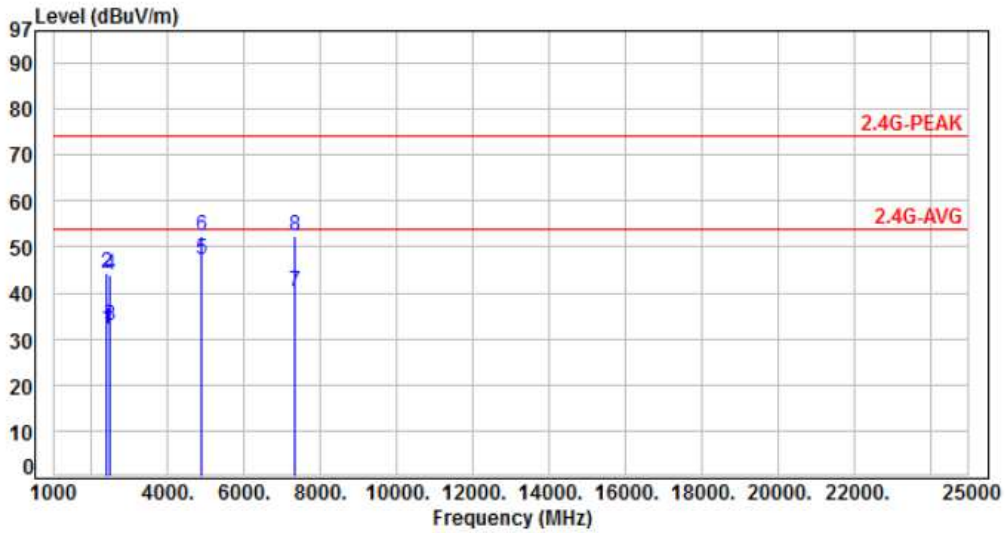


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	50.98	32.03	54.00	-21.97	Average	347	63	P
2	2390.00	-18.95	64.70	45.75	74.00	-28.25	Peak	347	63	P
3	2483.50	-18.71	50.35	31.64	54.00	-22.36	Average	347	63	P
4	2483.50	-18.71	62.42	43.71	74.00	-30.29	Peak	347	63	P
5	4880.00	-13.09	59.96	46.87	54.00	-7.13	Average	378	157	P
6	4880.00	-13.09	65.33	52.24	74.00	-21.76	Peak	378	157	P
7	7320.00	-10.17	54.20	44.03	54.00	-9.97	Average	400	339	P
8	7320.00	-10.17	63.40	53.23	74.00	-20.77	Peak	400	339	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH19	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

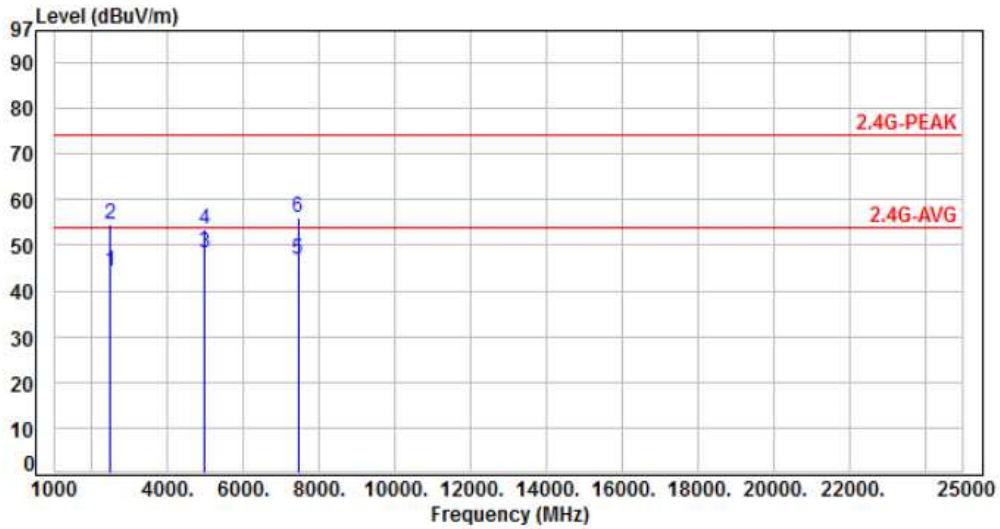


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV)	Limit (dBUV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-18.95	50.92	31.97	54.00	-22.03	Average	110	170	P
2	2390.00	-18.95	63.34	44.39	74.00	-29.61	Peak	110	170	P
3	2483.50	-18.71	51.36	32.65	54.00	-21.35	Average	110	170	P
4	2483.50	-18.71	62.55	43.84	74.00	-30.16	Peak	110	170	P
5	4880.00	-13.09	60.26	47.17	54.00	-6.83	Average	120	217	P
6	4880.00	-13.09	65.54	52.45	74.00	-21.55	Peak	120	217	P
7	7320.00	-10.17	50.30	40.13	54.00	-13.87	Average	105	172	P
8	7320.00	-10.17	62.70	52.53	74.00	-21.47	Peak	105	172	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH39	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %

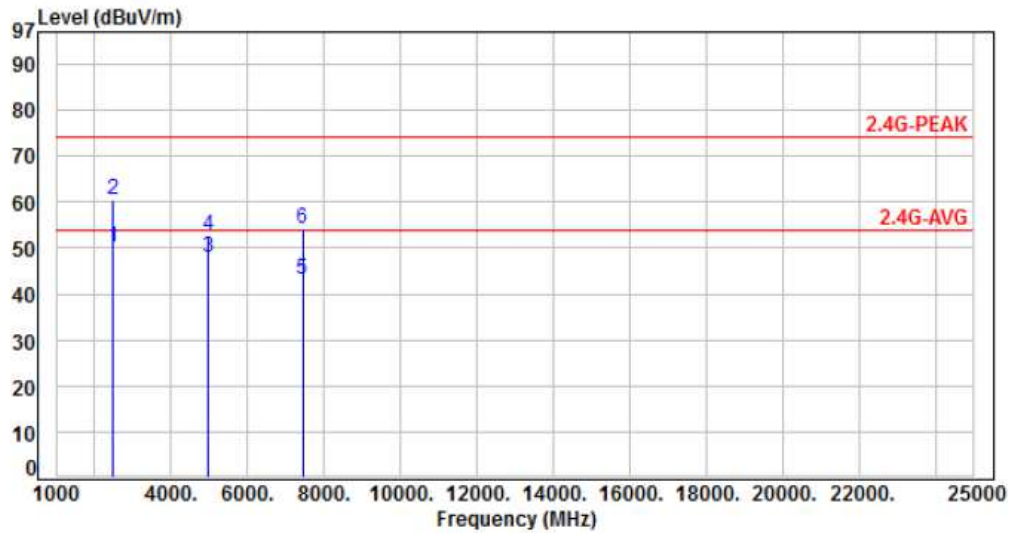


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	63.02	44.31	54.00	-9.69	Average	100	360	P
2	2483.50	-18.71	73.33	54.62	74.00	-19.38	Peak	100	360	P
3	4960.00	-12.89	61.34	48.45	54.00	-5.55	Average	364	151	P
4	4960.00	-12.89	66.26	53.37	74.00	-20.63	Peak	364	151	P
5	7440.00	-9.88	56.88	47.00	54.00	-7.00	Average	100	150	P
6	7440.00	-9.88	65.82	55.94	74.00	-18.06	Peak	100	150	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: From Battery	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH39	Temperature	: 24 °C
Test Date	: Oct. 30, 2017	Humidity	: 68 %



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-18.71	68.82	50.11	54.00	-3.89	Average	100	188	P
2	2483.50	-18.71	79.36	60.65	74.00	-13.35	Peak	100	188	P
3	4960.00	-12.89	61.02	48.13	54.00	-5.87	Average	121	181	P
4	4960.00	-12.89	65.80	52.91	74.00	-21.09	Peak	121	181	P
5	7440.00	-9.88	53.10	43.22	54.00	-10.78	Average	100	180	P
6	7440.00	-9.88	64.20	54.32	74.00	-19.68	Peak	100	180	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



### 6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

\*\* : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz



### 6.8 Test Photographs (30MHz ~ 1GHz)

Front View



Rear View





### 6.9 Test Photographs (1GHz ~ 25GHz)

Front View



Rear View





## 7. Test of Spurious Emission (Conducted)

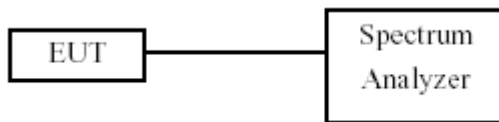
### 7.1 Test Limit

Below -20dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

### 7.2 Test Procedure

- a. The transmitter output was connected to the spectrum analyzer via a low lose cable.
- b. Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- c. Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20dB relative to the maximum measured in-band peak PSD level.
- d. The band edges was measured and recorded.

### 7.3 Test Setup Layout



### 7.4 Test Result and Data

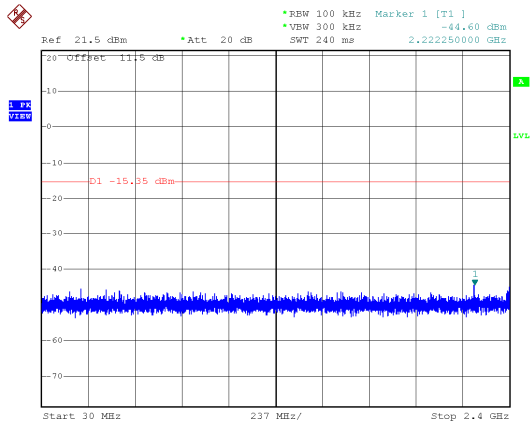
Test Result	: PASS	Temperature	: 24°C
Test Date	: Nov. 03, 2017	Humidity	: 68%

Note: Test plots refer to the following pages.

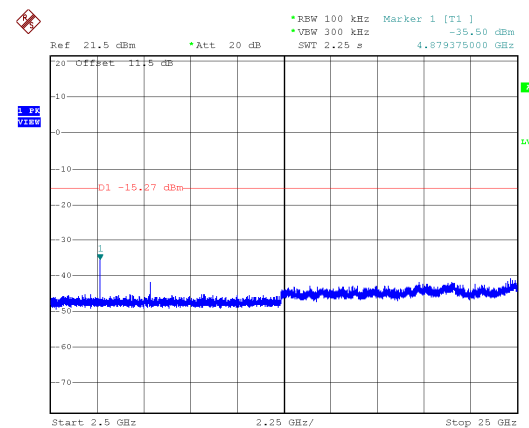
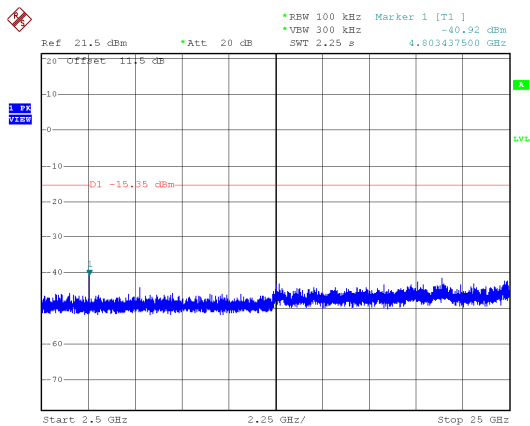
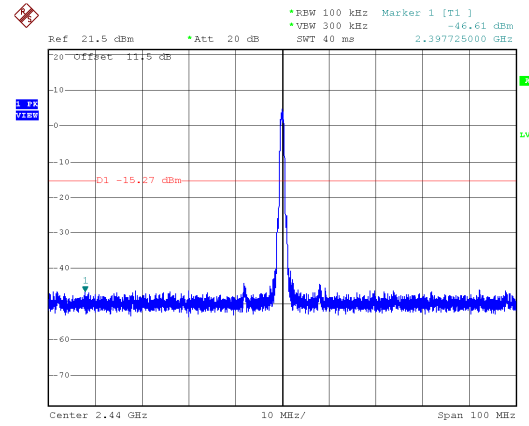
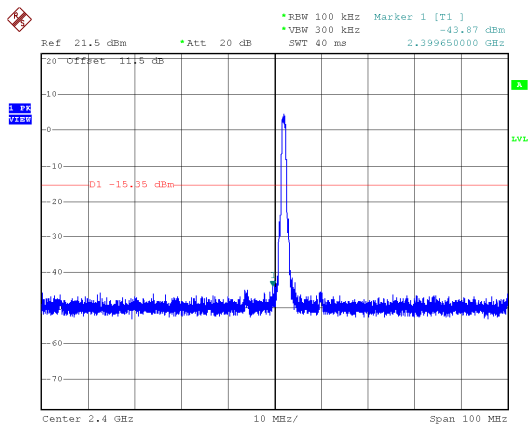
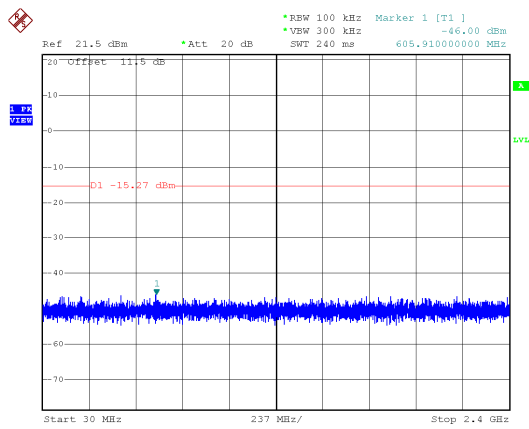




Modulation Type: GFSK  
CH00

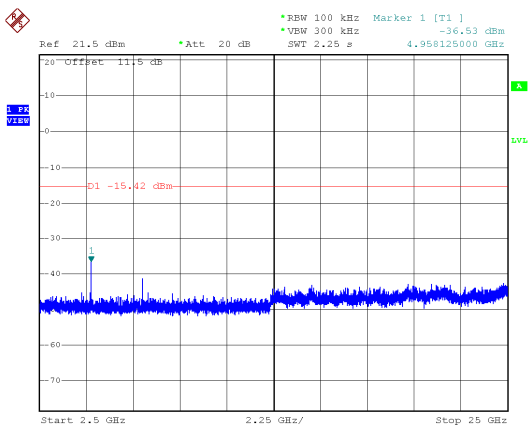
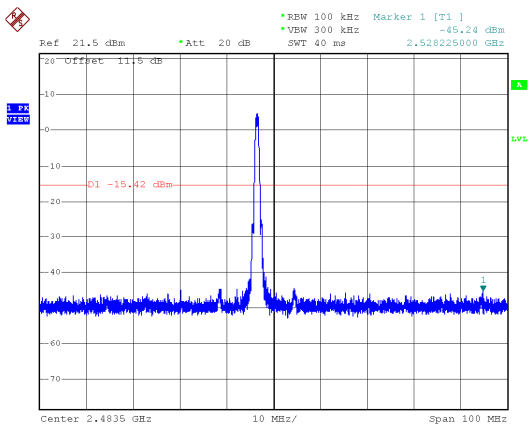
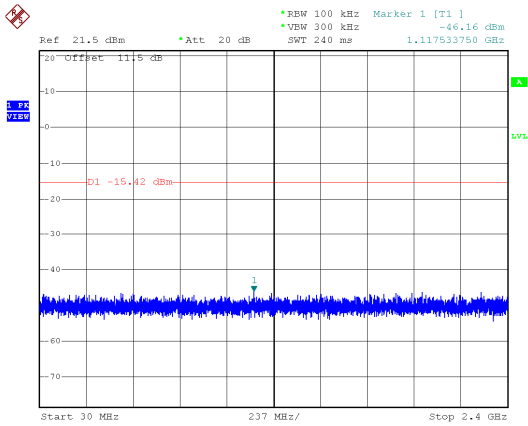


Modulation Type: GFSK  
CH19





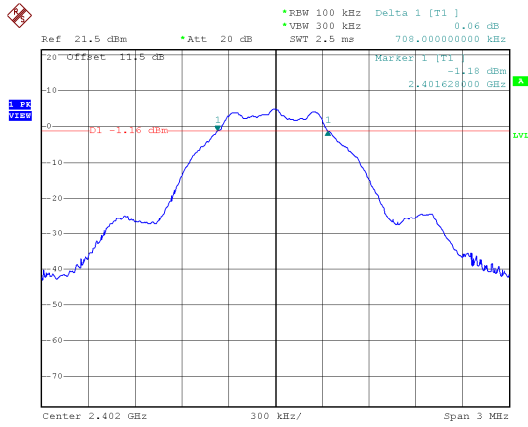
Modulation Type: GFSK  
CH39



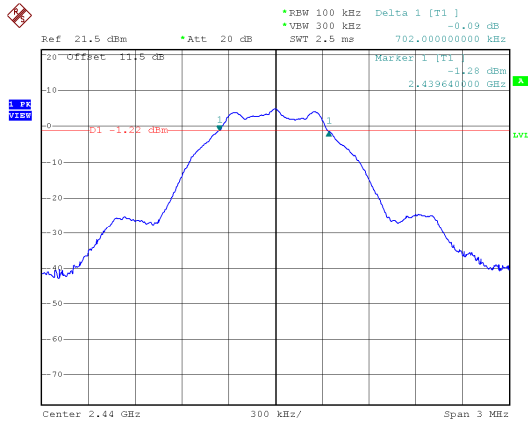




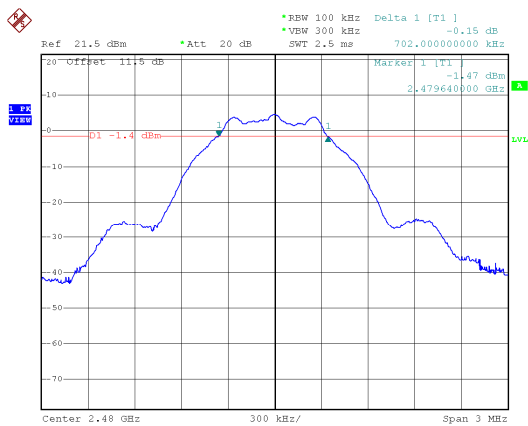
Modulation Type: GFSK  
CH00



CH19



CH39





## 9. Maximum Peak and Average Output Power

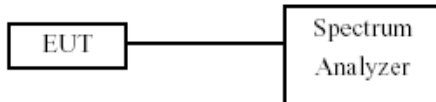
### 9.1 Test Limit

The Maximum Peak Output Power Measurement is 30dBm.

### 9.2 Test Procedures

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

### 9.3 Test Setup Layout



### 9.4 Test Result and Data

Test Result : PASS

Temperature : 24°C

Test Date : Nov. 03, 2017

Humidity : 68%

Modulation Standard	Channel	Frequency (MHz)	Power Output (dBm)		Peak Power Output (mW)	
			Peak	Average	Peak	Average
GFSK	00	2402	5.03	4.89	3.184	3.083
	19	2440	4.98	4.82	3.148	3.034
	39	2480	4.89	4.73	3.083	2.972



### 10. Power Spectral Density

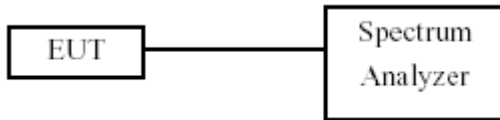
#### 10.1 Test Limit

The Maximum of Power Spectral Density Measurement is 8dBm.

#### 10.2 Test Procedures

- a. The transmitter output was connected to spectrum analyzer.
- b. The spectrum analyzer’s resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=auto couple.
- c. The power spectral density was measured and recorded.

#### 10.3 Test Setup Layout



#### 10.4 Test Result and Data

Test Result : PASS

Temperature : 24°C

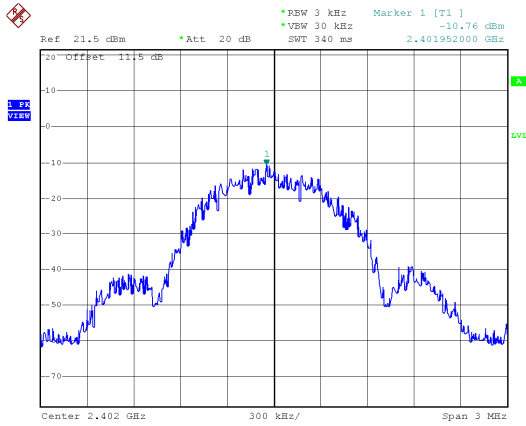
Test Date : Nov. 03, 2017

Humidity : 68%

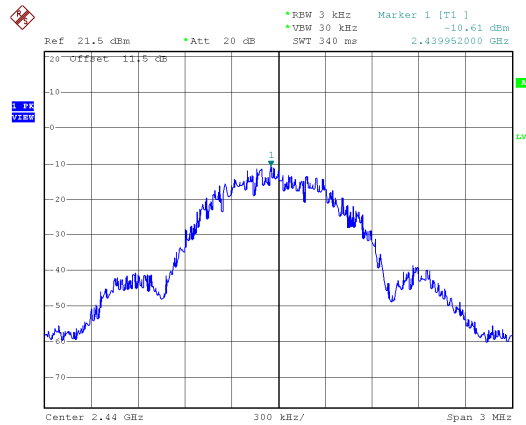
Modulation Standard	Channel	Frequency (MHz)	Maximum Power Density of 3 kHz Bandwidth (dBm)	Limit
GFSK	00	2402	-10.76	8.00
	19	2440	-10.61	8.00
	39	2480	-10.89	8.00



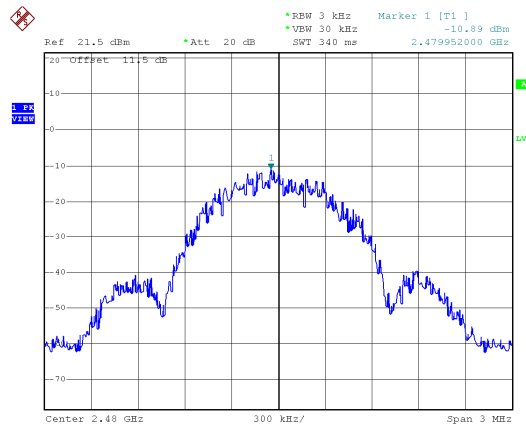
Modulation Type: GFSK  
CH00



CH19



CH39





### 11. Radio Frequency Exposure

#### 11.1 Applicable Standards

The measurements shown in this test report were made in accordance with the procedures given in FCC Part 2 (Section 2.1091)

#### 11.2 EUT Specification

<b>Frequency band (Operating)</b>	<input type="checkbox"/> WLAN: 2412MHz ~ 2462MHz <input type="checkbox"/> WLAN: 5150MHz ~ 5250MHz <input type="checkbox"/> WLAN: 5250MHz ~ 5350MHz <input type="checkbox"/> WLAN: 5470MHz ~ 5725MHz <input type="checkbox"/> WLAN: 5725MHz ~ 5850MHz <input checked="" type="checkbox"/> Bluetooth: 2402MHz ~ 2480MHz
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A
<b>Remark:</b>	
<ol style="list-style-type: none"> <li>The maximum output power is <u>5.03dBm (0.0003mW)</u> at <u>GFSK</u> (with <u>numeric 1.1 antenna gain.</u>)</li> <li>DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.</li> <li>For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.</li> </ol>	





### 11.3 Test Results

No non-compliance noted.

### 11.4 Calculation

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm<sup>2</sup>

### 11.5 Maximum Permissible Exposure

Max. output power	E1: GFSK: 5.03 dBm (0.0003 mW) E3: GFSK: 5.03 dBm (0.0002 mW)
Antenna gain (Max)	E1: -3.2 dBi E3: -5.9 dBi

Modulation Mode	Frequency band (MHz)	Max. Conducted output power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
GFSK	2402-2480	5.03	-3.2	20	0.0003	1
GFSK	2402-2480	5.03	-5.9	20	0.0002	1