




# FCC RADIO TEST REPORT

Applicant : ATBS TECHNOLOGY CO.,LTD  
Address : 3F, No. 49, Lane 35, Jihu Rd., Neihu Chiu,  
Taipei City 114, Taiwan  
Equipment : BLE TPMS  
Model No. : ATX3 (X=0-9, A-Z, a-z or blank, for marking  
purpose)  
Trade Name :   
FCC ID : UP5-AT63


### I HEREBY CERTIFY THAT :

The sample was received on Jun. 28, 2016 and the testing was carried out on Jun. 29, 2016 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:

  
Ray Chou / Assistant Manager

Tested by:

  
Spree Yei / Engineer

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





## Contents

<b>1. Summary of Test Procedure and Test Results.....</b>	<b>5</b>
1.1 Applicable Standards .....	5
<b>2. Test Configuration of Equipment under Test.....</b>	<b>6</b>
2.1 Feature of Equipment under Test.....	6
2.2 Carrier Frequency of Channels.....	6
2.3 Test Mode and Test Software.....	7
2.4 Description of Test System.....	7
2.5 General Information of Test.....	8
2.6 Measurement Uncertainty .....	8
<b>3. Test Equipment and Ancillaries Used for Tests.....</b>	<b>9</b>
<b>4. Antenna Requirements.....</b>	<b>10</b>
4.1 Standard Applicable .....	10
4.2 Antenna Construction and Directional Gain.....	10
<b>5. Test of AC Power Line Conducted Emission .....</b>	<b>11</b>
<b>6. Test of Spurious Emission (Radiated) .....</b>	<b>12</b>
6.1 Test Limit .....	12
6.2 Test Procedures .....	12
6.3 Typical Test Setup .....	13
6.4 Test Result and Data (9kHz ~ 30MHz).....	14
6.5 Test Result and Data (30MHz ~ 1GHz).....	14
6.6 Test Result and Data (1GHz ~ 25GHz).....	20
6.7 Restricted Bands of Operation .....	26
6.8 Restrict Band Emission Measurement Data .....	27
6.9 Test Photographs (30MHz ~ 1GHz) .....	31
6.10 Test Photographs (1GHz ~ 25GHz) .....	32
<b>7. Test of Spurious Emission (Conducted).....</b>	<b>33</b>
7.1 Test Limit .....	33
7.2 Test Procedure .....	33
7.3 Test Setup Layout .....	33
7.4 Test Result and Data .....	33
<b>8. 6dB Bandwidth Measurement Data .....</b>	<b>35</b>
8.1 Test Limit .....	35
8.2 Test Procedures .....	35
8.3 Test Setup Layout .....	35
8.4 Test Result and Data .....	35
<b>9. Maximum Peak and Average Output Power.....</b>	<b>37</b>
9.1 Test Limit .....	37
9.2 Test Procedures .....	37
9.3 Test Setup Layout .....	37
9.4 Test Result and Data .....	37
<b>10. Power Spectral Density .....</b>	<b>38</b>



10.1	Test Limit .....	38
10.2	Test Procedures .....	38
10.3	Test Setup Layout .....	38
10.4	Test Result and Data .....	38



History of this test report

Report No.	Issue Date	Description
TEFQ1603225	Jun. 30, 2016	Original



# 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 15.247(d)	. 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	GFSK (Bluetooth low energy)
Frequency Range	2400-2483.5MHz
Data Rate	1MHz
Antenna Type	PCB Antenna
Antenna Gain	0 dBi

### 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

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. The complete test system included Notebook and EUT for RF test.
- c. An executive program, "Setup\_SmartRF\_Studio\_7\_2.3.1" under WIN 7 was executed to transmit and receive data via Bluetooth.
- d. The following test mode was performed for the test:  
Test Mode 1. GFSK (1Mbps)

### 2.4 Description of Test System

Device	Manufacturer	Model No.	Description
Notebook	DELL	Vostro 3560	Power Cable, Unshielding, 1.8m



## 2.5 General Information of Test

Test Site	<b>CerpPASS 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-3428, R-4218 for Radiated emission test G-812, G-813 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.	

## 2.6 Measurement Uncertainty

Measurement Item	Measurement Frequency	Polarization	Uncertainty
Conducted Emission	9 kHz ~ 30 MHz	LINE / NEUTRAL	±2.9076 dB
Radiated Emission	9 kHz ~ 25,000 MHz	Vertical / Horizontal	±0.948 dB
Spurious Emission (Conducted)	-	-	±4.011 dB
Maximum Peak and Average Output Power	-	-	±0.322 dB
Power Spectral Density	-	-	±0.322 dB

The measurement uncertainty will be considered, when test result margin to the limit.





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

Instrument	Model No.	Manufacturer	Serial No.	Calibration Date	Valid Date
EMI Receiver	R&S	ESCI3	100443	2016/03/28	2017/03/27
LISN	Schwarzbeck	NSLK 8127	8127-516	2016/03/11	2017/03/10
LISN	Schwarzbeck	NSLK 8127	8127-740	2015/09/03	2016/09/02
Pulse Limiter	R&S	ESH3-Z2	101934	2016/03/09	2017/03/08
Bilog Antenna	Schwarzbeck	VULB9168	369	2016/03/22	2017/03/21
Active Loop Antenna	EMCO	6507	40855	2016/03/11	2017/03/10
Horn Antenna	EMCO	3115	31601	2015/09/02	2016/09/01
Horn Antenna	EMCO	3116	31589	2016/03/22	2017/03/21
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2016/03/16	2017/03/15
Preamplifier	EM	EM330	060660	2016/03/16	2017/03/15
Preamplifier	Agilent	8449B	3008A01954	2016/03/04	2017/03/03
Preamplifier	MITEQ	AMF-7D-001 0100-30-10P	1860212	2016/03/16	2017/03/15
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2015/11/04	2016/11/03
MXG MW Analog Signal Generator	KEYSIGHT	N5183A	MY50142931	2016/03/18	2017/03/17
Spectrum Analyzer	R&S	FSP40	100219	2015/09/01	2016/08/31
BLUETOOTH TESTER	R&S	CBT	101133	2016/03/18	2017/03/17
Attenuator	KEYSIGHT	8491B	MY39250703	2016/03/07	2017/03/06
Rotary Attenuator	Agilent	8494B	MY42154466	2016/03/08	2017/03/07
Rotary Attenuator	Agilent	8495B	MY42146680	2016/03/08	2017/03/07
Temp & Humi chamber	T-MACHINE	TMJ-9712	T-12-040111	2015/09/08	2016/09/07
Series Power Meter	Anritsu	ML2495A	1224005	2016/03/03	2017/03/02
Power Sensor	Anritsu	MA2411B	1207295	2016/03/03	2017/03/02
Software	Farad	Ez-EMC	ver.ct3a1	N/A	N/A
Software	AUDIX	E3	vct-3a1	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	Antenna Gain
PCB Antenna	0 dBi



## 5. Test of AC Power Line Conducted Emission

The power is DC source, so this item doesn't require testing.



## 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

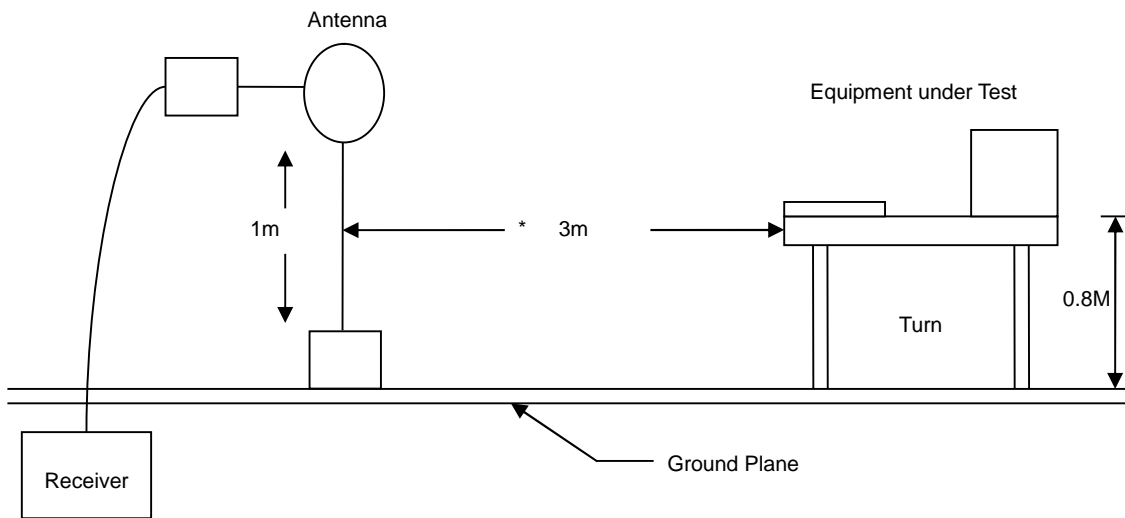
### 6.2 Test Procedures

- 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 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.

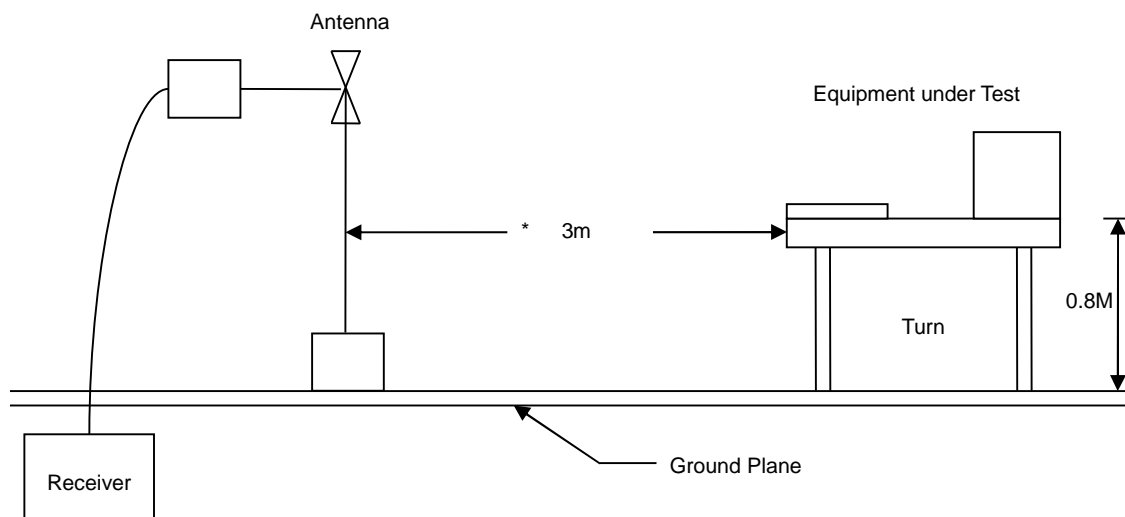


### 6.3 Typical Test Setup

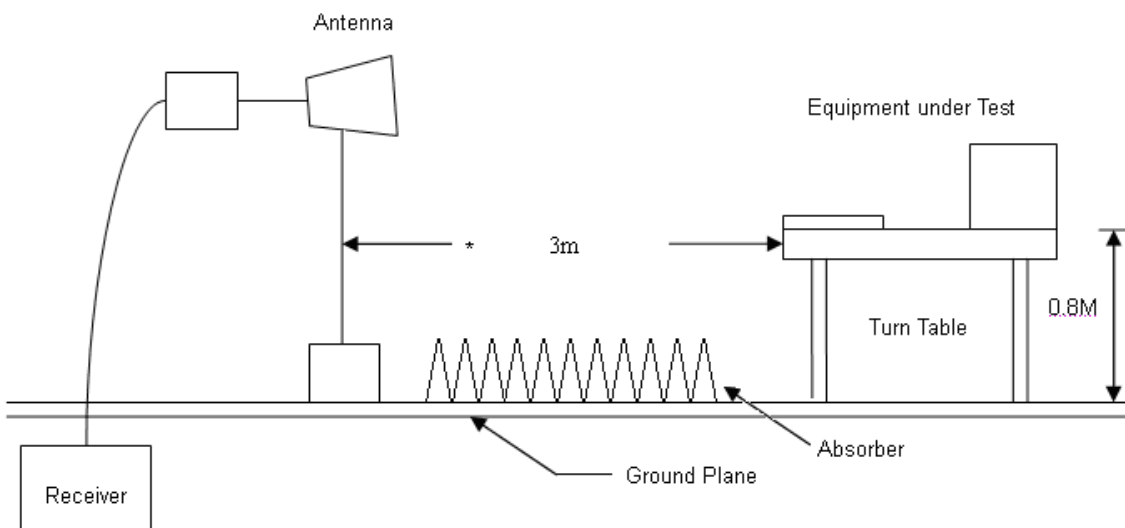
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



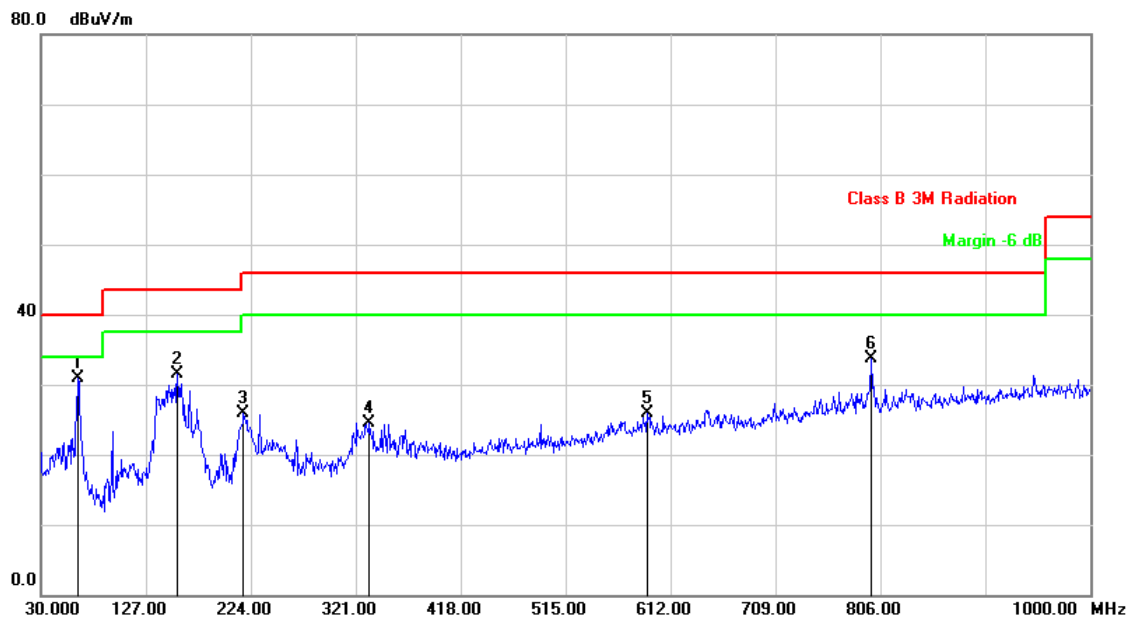


### 6.4 Test Result and Data (9kHz ~ 30MHz)

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

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

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH00	Atmospheric Pressure	: 1005 hPa

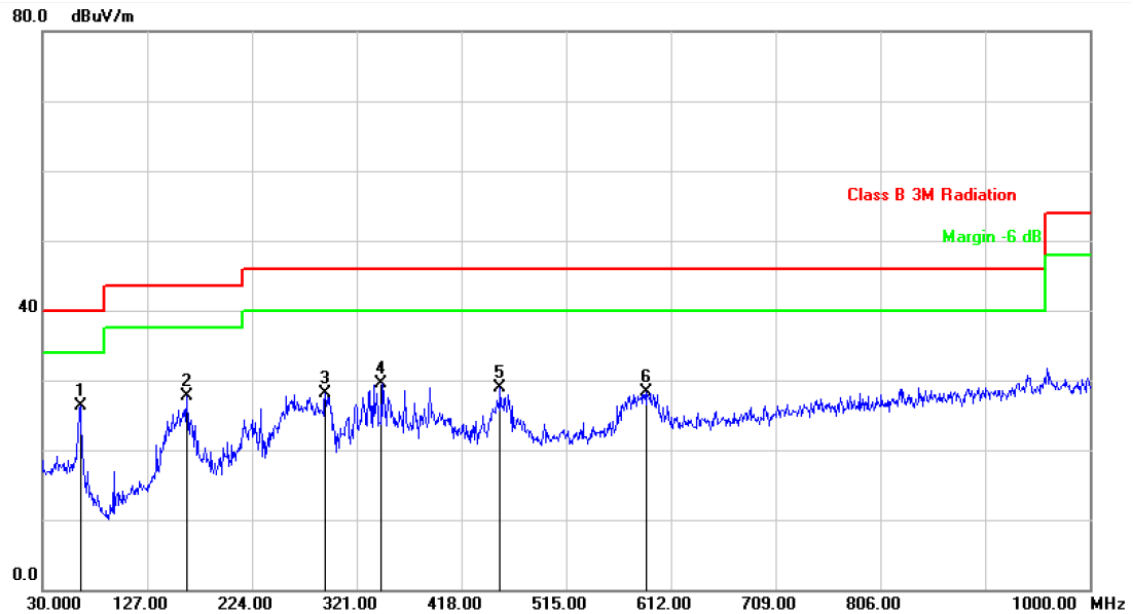


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	63.9500	-11.25	42.15	30.90	40.00	-9.10	peak	400	0	P
2	156.1000	-9.95	41.47	31.52	43.50	-11.98	peak	400	0	P
3	217.2100	-12.67	38.67	26.00	46.00	-20.00	peak	400	0	P
4	333.6099	-8.19	32.73	24.54	46.00	-21.46	peak	400	0	P
5	590.6599	-2.22	28.18	25.96	46.00	-20.04	peak	400	0	P
6	797.2700	0.78	33.00	33.78	46.00	-12.22	peak	400	0	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH00	Atmospheric Pressure	: 1005 hPa

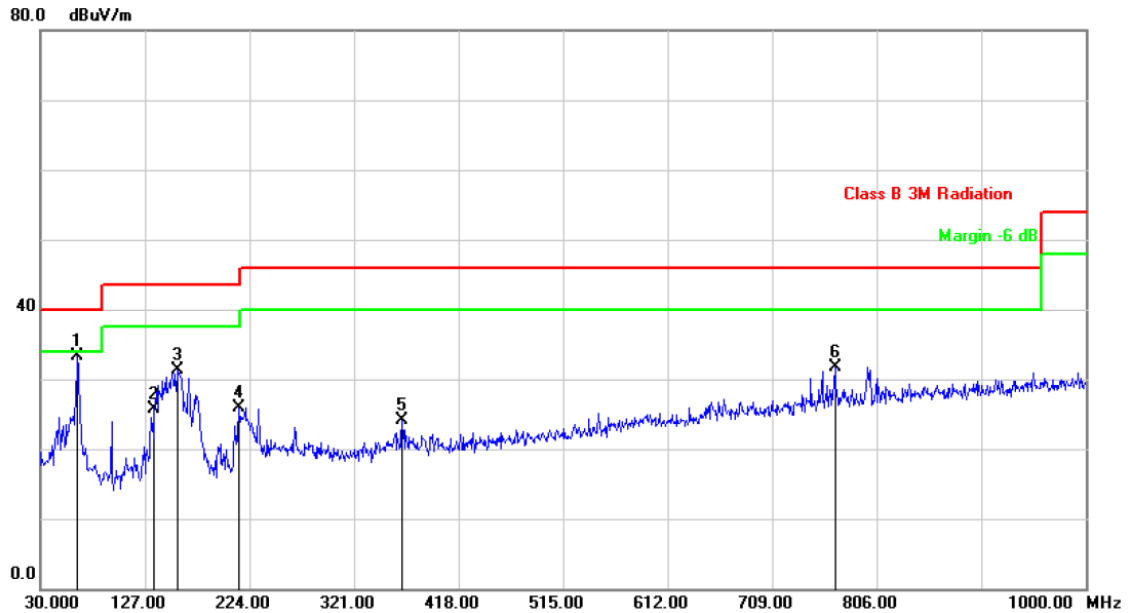


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	64.9200	-11.45	37.66	26.21	40.00	-13.79	peak	100	0	P
2	163.8600	-10.03	37.66	27.63	43.50	-15.87	peak	100	0	P
3	291.8999	-9.25	37.37	28.12	46.00	-17.88	peak	100	0	P
4	344.2799	-7.91	37.42	29.51	46.00	-16.49	peak	100	0	P
5	453.8899	-4.87	33.86	28.99	46.00	-17.01	peak	100	0	P
6	589.6900	-2.25	30.64	28.39	46.00	-17.61	peak	100	0	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH19	Atmospheric Pressure	: 1005 hPa



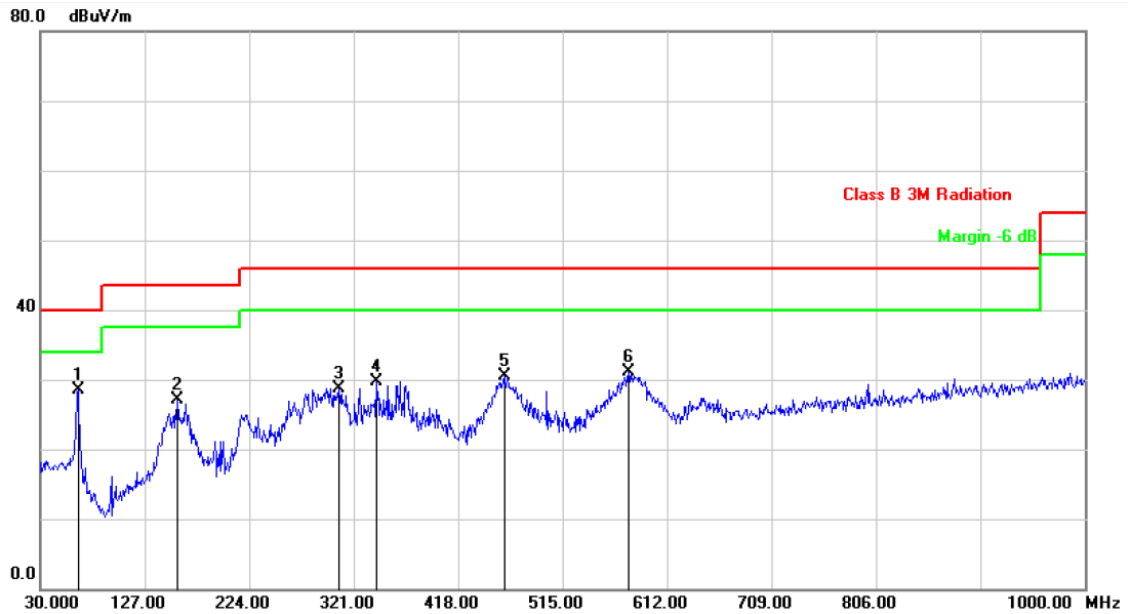
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	63.9500	-11.25	44.49	33.24	40.00	-6.76	peak	400	0	P
2	135.7298	-10.86	36.52	25.66	43.50	-17.84	peak	400	0	P
3	157.0699	-9.93	41.20	31.27	43.50	-12.23	peak	400	0	P
4	214.3000	-12.66	38.60	25.94	43.50	-17.56	peak	400	0	P
5	365.6200	-7.33	31.34	24.01	46.00	-21.99	peak	400	0	P
6	767.2000	0.53	31.08	31.61	46.00	-14.39	peak	400	0	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor





Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH19	Atmospheric Pressure	: 1005 hPa

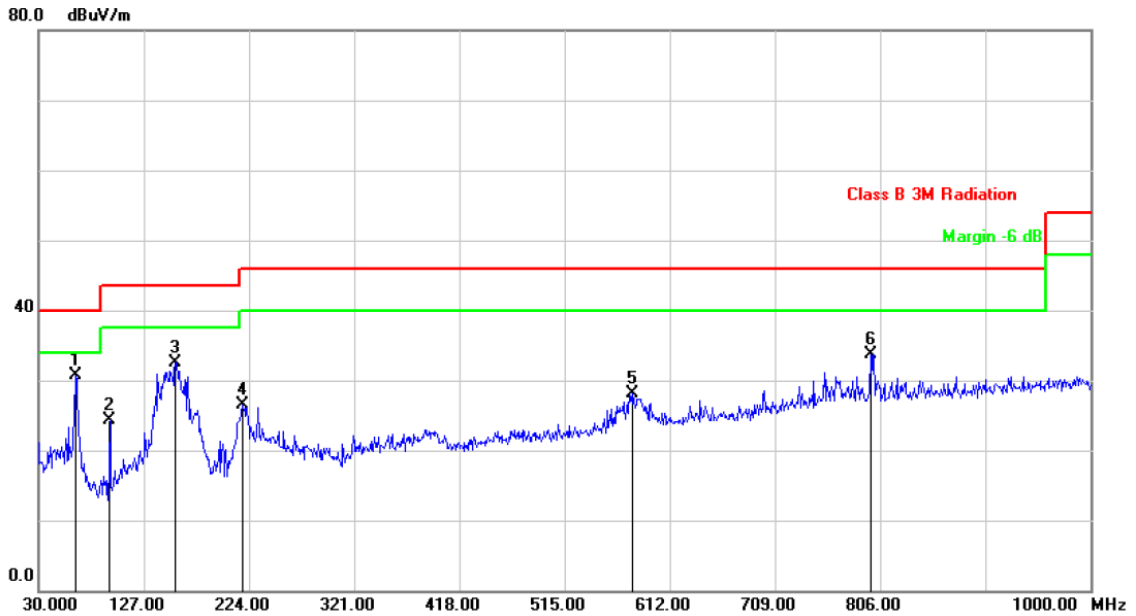


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	64.9200	-11.45	39.97	28.52	40.00	-11.48	peak	100	0	P
2	157.0699	-9.93	37.02	27.09	43.50	-16.41	peak	100	0	P
3	307.4200	-8.88	37.67	28.79	46.00	-17.21	peak	100	0	P
4	342.3399	-7.96	37.74	29.78	46.00	-16.22	peak	100	0	P
5	460.6800	-4.77	35.23	30.46	46.00	-15.54	peak	100	0	P
6	576.1100	-2.60	33.70	31.10	46.00	-14.90	peak	100	0	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH39	Atmospheric Pressure	: 1005 hPa

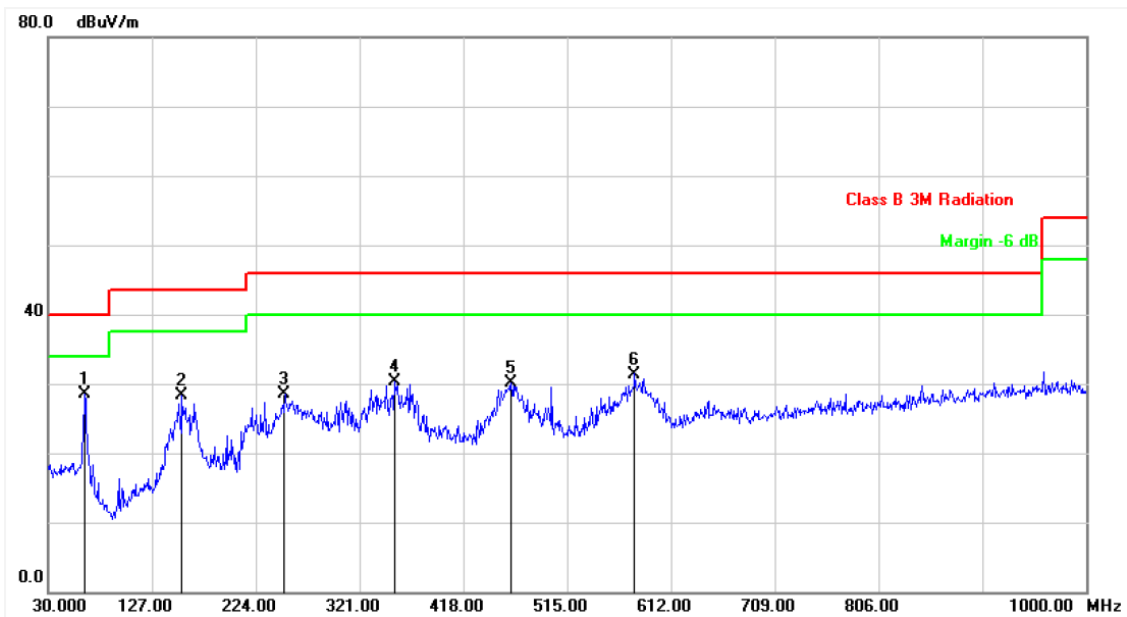


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	63.9500	-11.25	41.95	30.70	40.00	-9.30	peak	400	0	P
2	95.9599	-15.42	39.76	24.34	43.50	-19.16	peak	400	0	P
3	156.0999	-9.95	42.50	32.55	43.50	-10.95	peak	400	0	P
4	218.1800	-12.68	39.15	26.47	46.00	-19.53	peak	400	0	P
5	578.0499	-2.55	30.62	28.07	46.00	-17.93	peak	400	0	P
6	797.2698	0.78	32.92	33.70	46.00	-12.30	peak	400	0	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH39	Atmospheric Pressure	: 1005 hPa



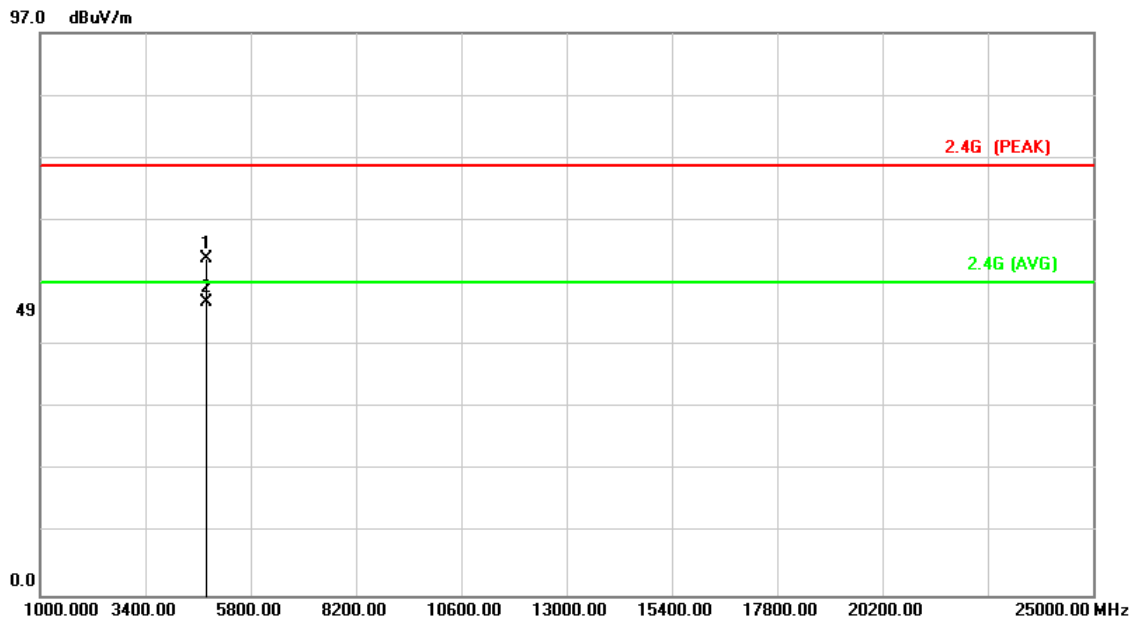
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	63.9500	-11.25	39.72	28.47	40.00	-11.53	peak	100	0	P
2	155.1299	-9.95	38.20	28.25	43.50	-15.25	peak	100	0	P
3	251.1599	-10.93	39.39	28.46	46.00	-17.54	peak	100	0	P
4	353.9800	-7.64	37.95	30.31	46.00	-15.69	peak	100	0	P
5	462.6200	-4.74	34.88	30.14	46.00	-15.86	peak	100	0	P
6	578.0499	-2.55	33.95	31.40	46.00	-14.60	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	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH00	Atmospheric Pressure	: 1005 hPa

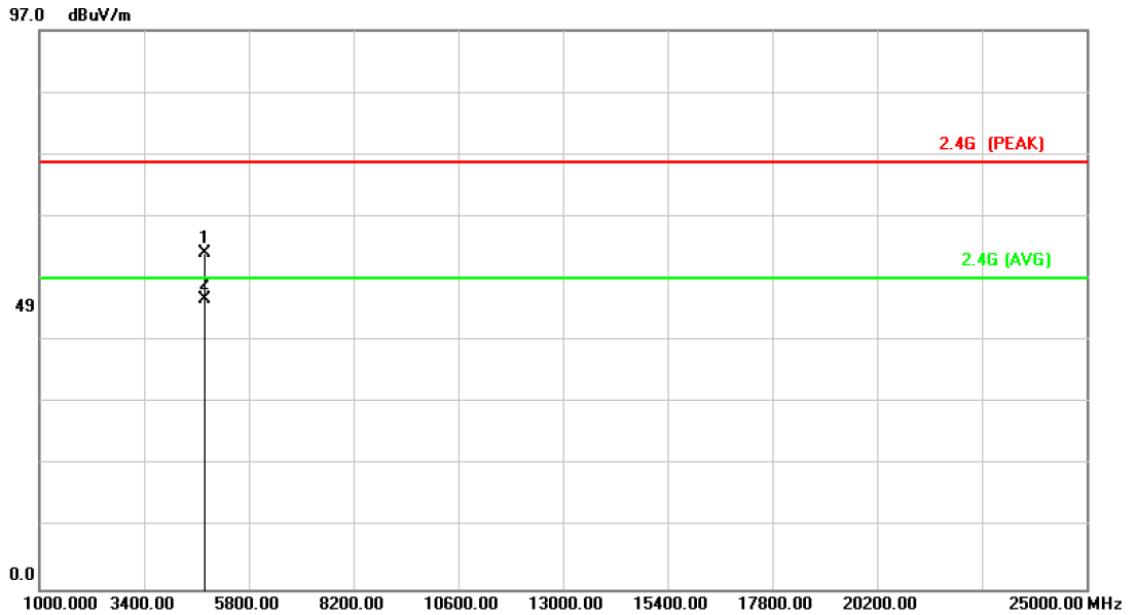


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4804.000	7.84	50.24	58.08	74.00	-15.92	peak	200	133	P
2	4804.000	7.84	42.72	50.56	54.00	-3.44	AVG	200	133	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH00	Atmospheric Pressure	: 1005 hPa

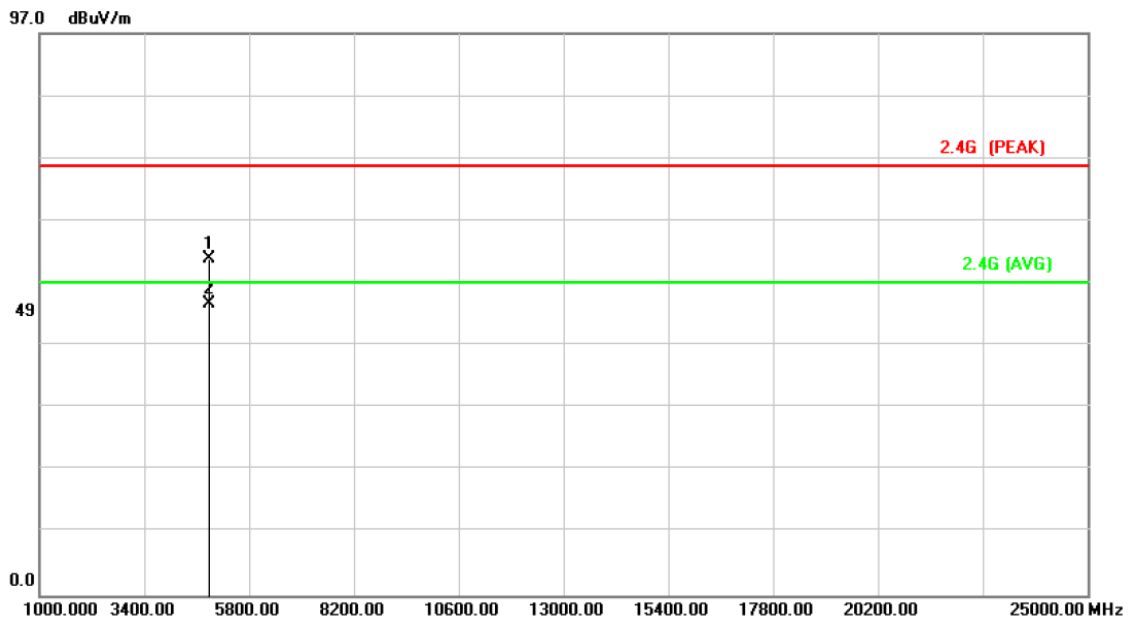


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4804.000	7.84	50.51	58.35	74.00	-15.65	peak	100	263	P
2	4804.000	7.84	42.55	50.39	54.00	-3.61	AVG	100	263	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH19	Atmospheric Pressure	: 1005 hPa

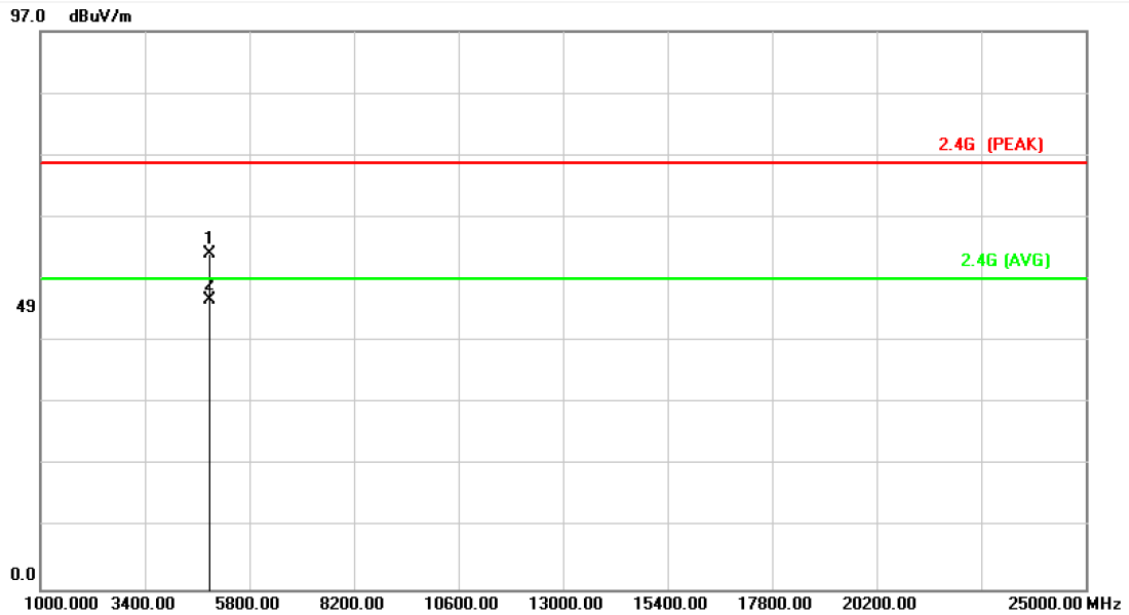


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4880.000	8.22	49.74	57.96	74.00	-16.04	peak	200	128	P
2	4880.000	8.22	42.20	50.42	54.00	-3.58	AVG	200	128	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH19	Atmospheric Pressure	: 1005 hPa

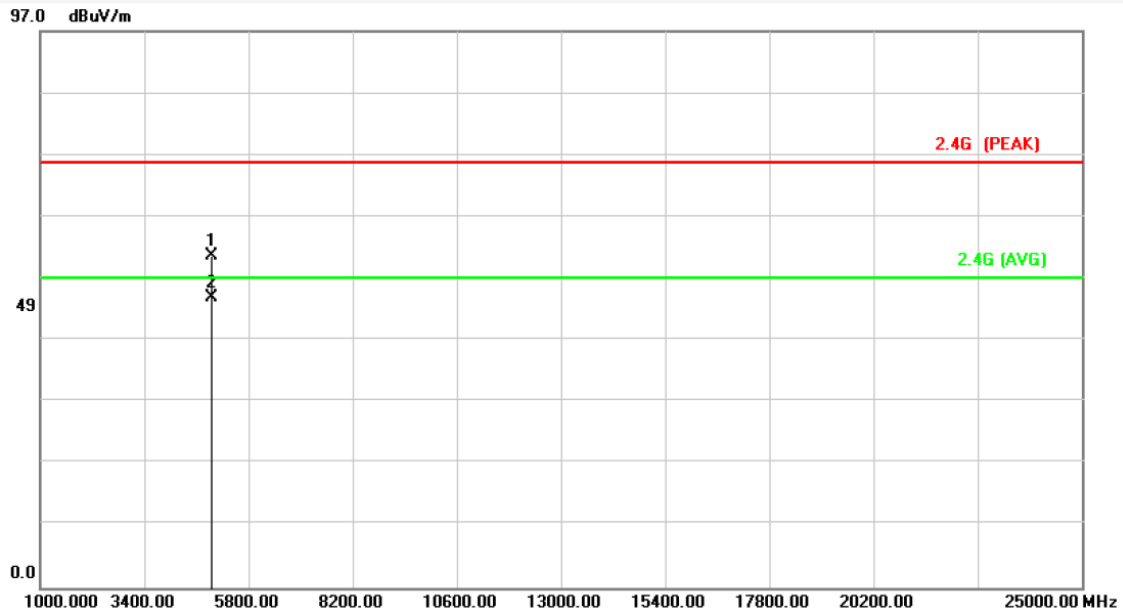


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4880.000	8.22	50.14	58.36	74.00	-15.64	peak	100	209	P
2	4880.000	8.22	42.22	50.44	54.00	-3.56	AVG	100	209	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH39	Atmospheric Pressure	: 1005 hPa



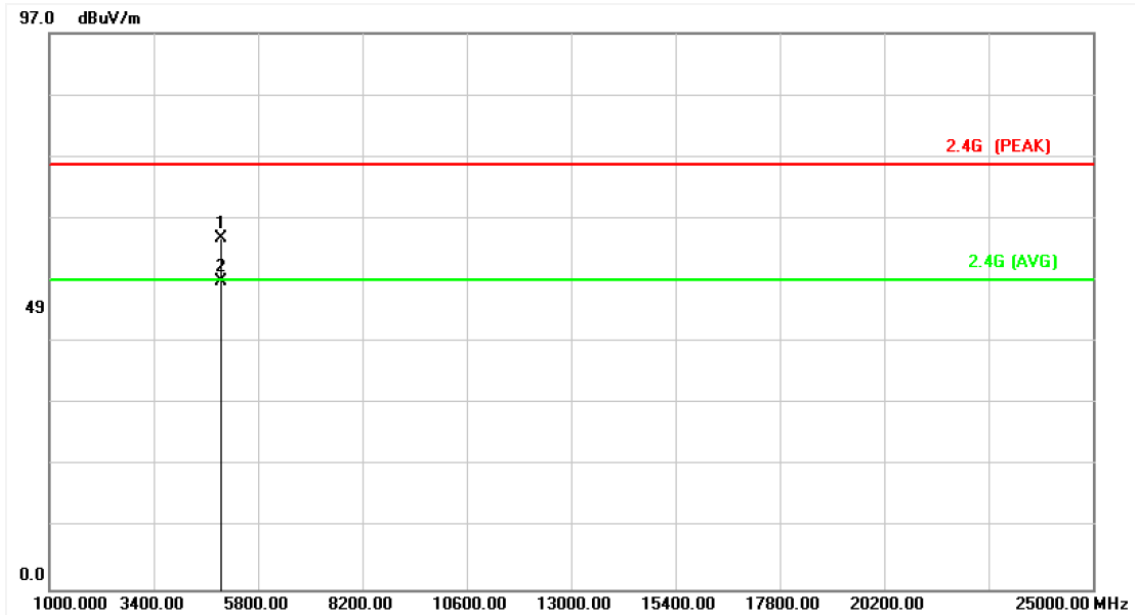
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4960.000	8.61	49.18	57.79	74.00	-16.21	peak	200	128	P
2	4960.000	8.61	42.05	50.66	54.00	-3.34	AVG	200	128	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor





Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Jun. 28, 2016	Humidity	: 46 %
Memo	: CH39	Atmospheric Pressure	: 1005 hPa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	4960.000	8.61	52.63	61.24	74.00	-12.76	peak	170	258	P
2	4960.000	8.61	45.01	53.62	54.00	-0.38	AVG	170	258	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:

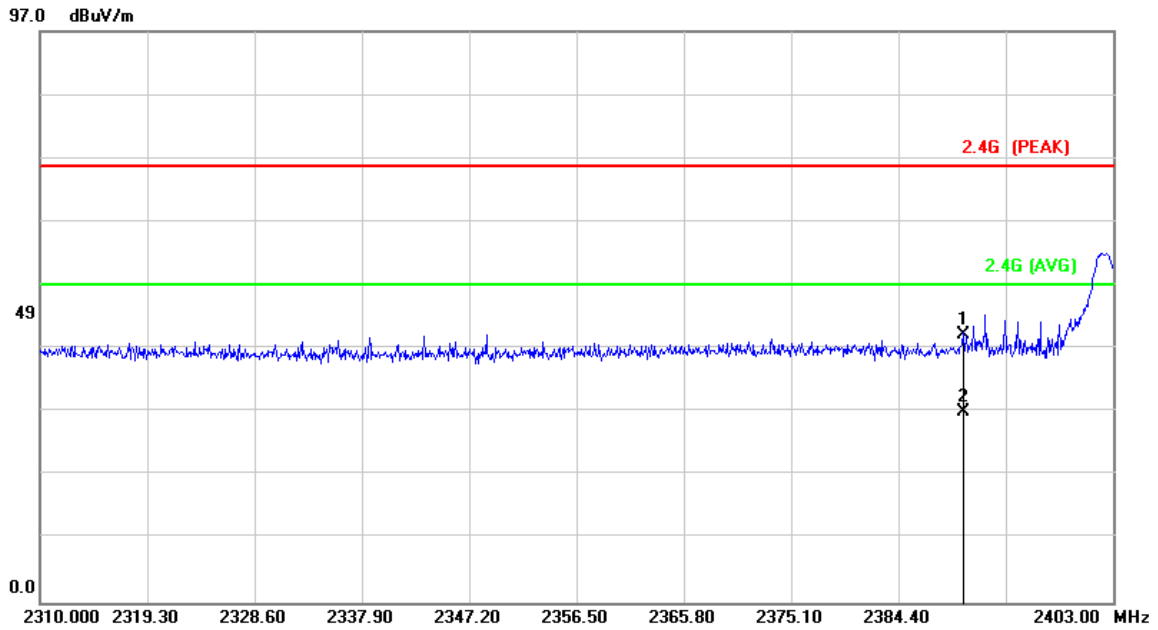
MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	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 Restrict Band Emission Measurement Data

Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Jun. 28, 2016	Humidity	: 45 %
Memo	: CH00	Atmospheric Pressure	: 1009 hPa

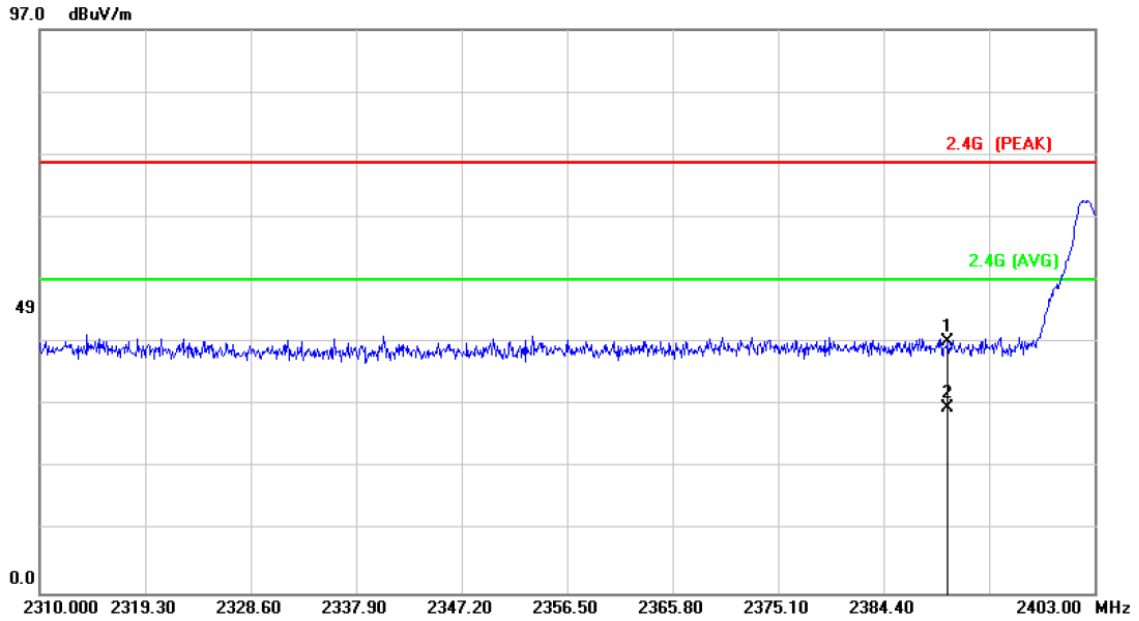


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth ( ° )	P/F
1	2390.000	-0.94	46.44	45.50	74.00	-28.50	peak	107	10	P
2	2390.000	-0.94	33.42	32.48	54.00	-21.52	AVG	107	10	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Jun. 28, 2016	Humidity	: 45 %
Memo	: CH00	Atmospheric Pressure	: 1009 hPa

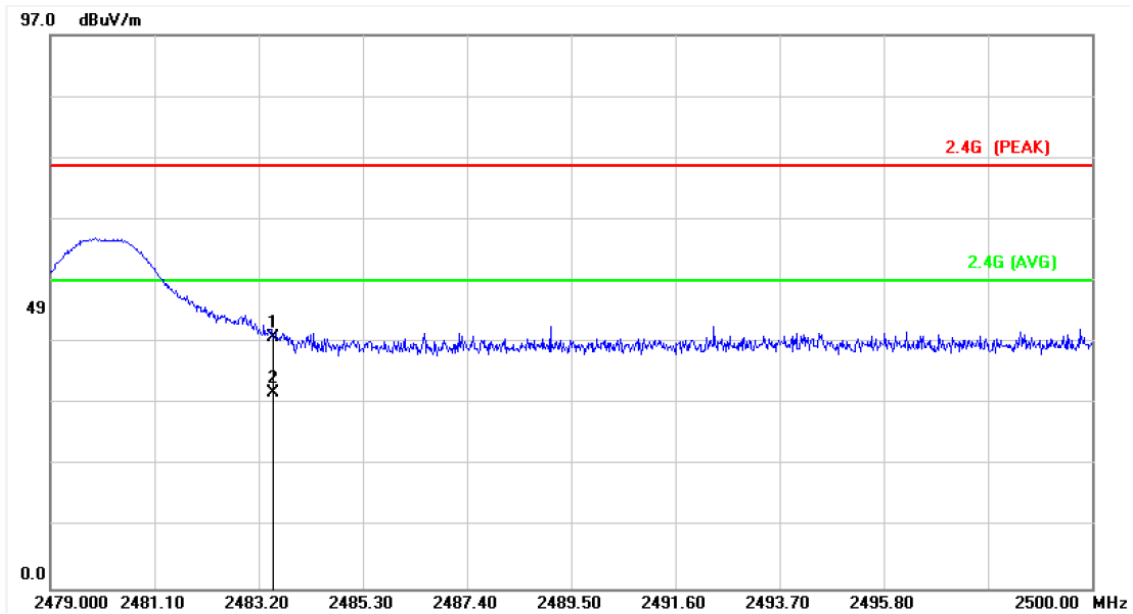


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	2390.000	-0.94	44.34	43.40	74.00	-30.60	peak	128	280	P
2	2390.000	-0.94	32.88	31.94	54.00	-22.06	AVG	128	280	P

Note: Level = Reading + Factor  
 Margin = Level – Limit  
 Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Jun. 28, 2016	Humidity	: 45 %
Memo	: CH39	Atmospheric Pressure	: 1009 hPa

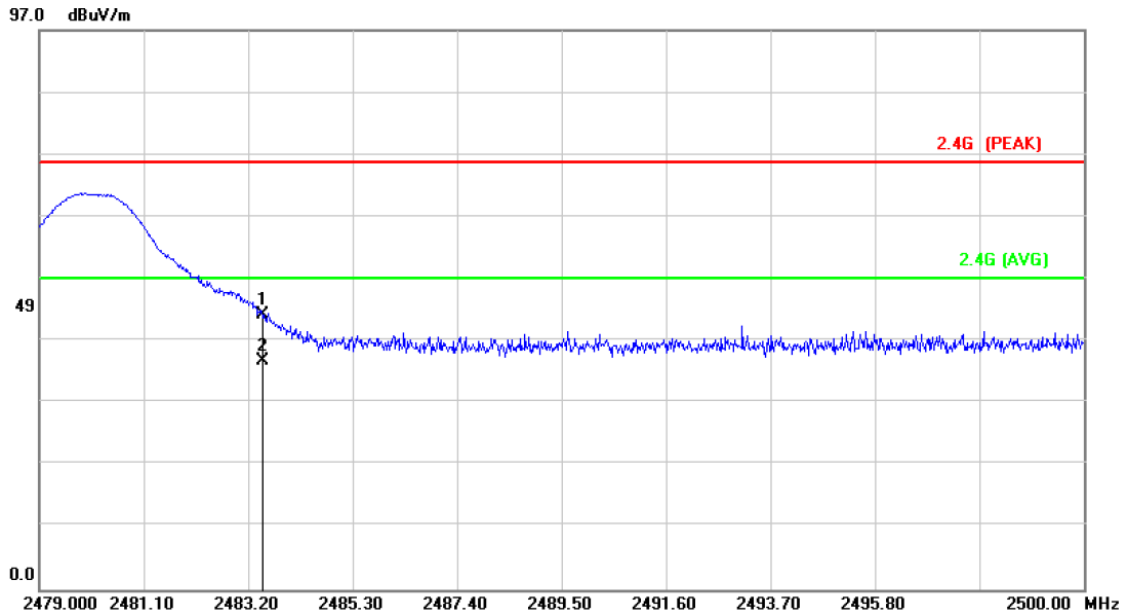


No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	2483.500	-0.64	44.74	44.10	74.00	-29.90	peak	150	294	P
2	2483.500	-0.64	34.89	34.25	54.00	-19.75	AVG	150	294	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 3V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 25 °C
Test Date	: Jun. 28, 2016	Humidity	: 45 %
Memo	: CH39	Atmospheric Pressure	: 1009 hPa



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (°)	P/F
1	2483.500	-0.64	48.32	47.68	74.00	-26.32	peak	120	283	P
2	2483.500	-0.64	40.20	39.56	54.00	-14.44	AVG	120	283	P

Note: Level = Reading + Factor  
Margin = Level – Limit  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



## 7. Test of Spurious Emission (Conducted)

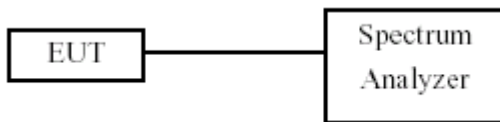
### 7.1 Test Limit

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 Date: Jun. 29, 2016

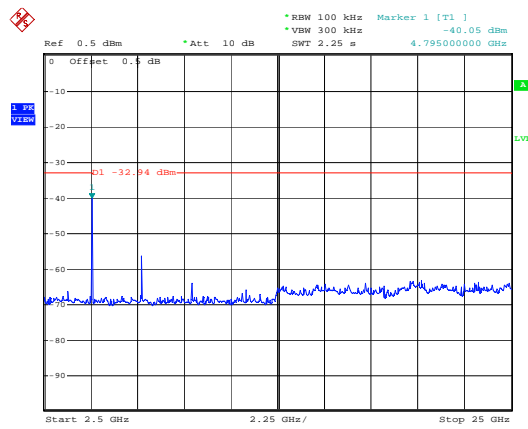
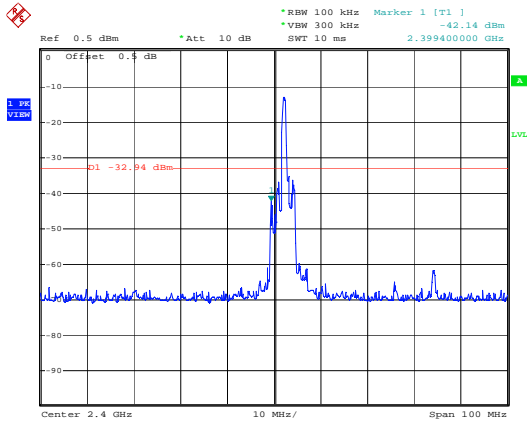
Temperature: 21°C

Humidity: 64%

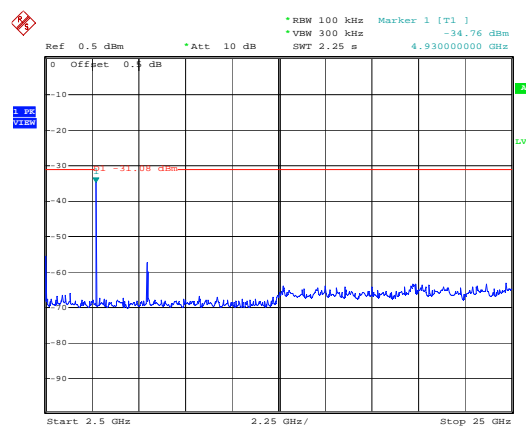
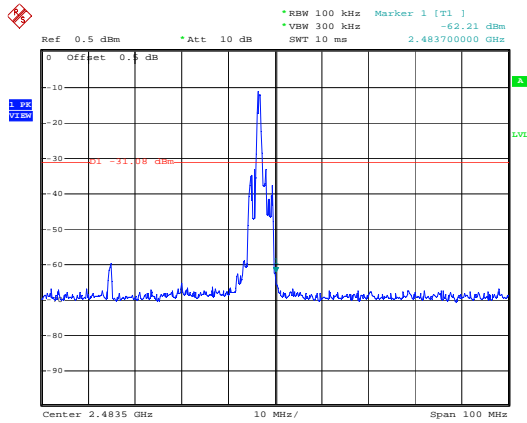
Note: Test plots refer to the following pages.



Modulation Type: GFSK(1Mbps)  
CH00



CH39







## 8. 6dB Bandwidth Measurement Data

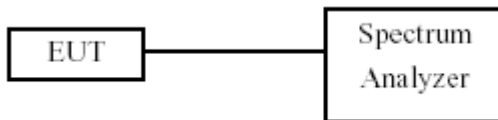
### 8.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

### 8.2 Test Procedures

- a. The transmitter output was connected to the spectrum analyzer.
- b. Set RBW of spectrum analyzer to 1~5% of the emission bandwidth and VBW  $\geq$  3x RBW.
- c. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.
- d. The 6dB Bandwidth was measured and recorded.

### 8.3 Test Setup Layout



### 8.4 Test Result and Data

Test Date: Jun. 29, 2016

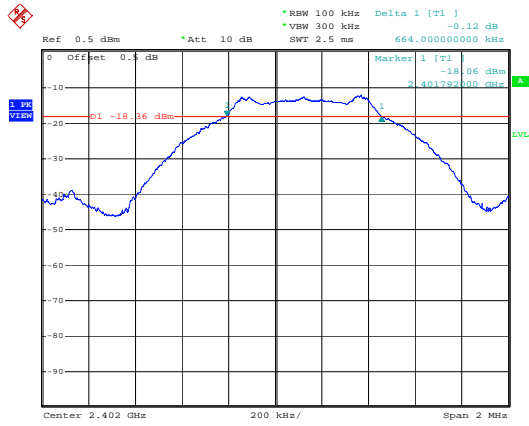
Temperature: 21 °C

Humidity: 64 %

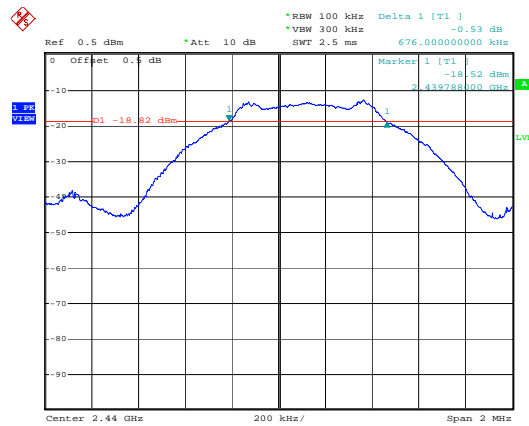
Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (KHz)
GFSK	00	2402	664.00
	19	2440	676.00
	39	2480	688.00



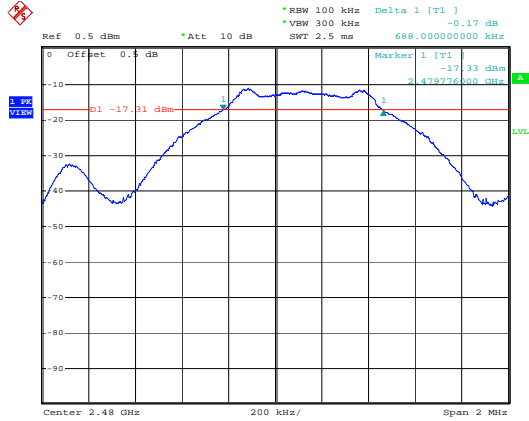
Modulation Type: GFSK(1Mbps), CH00



CH19



CH39





## 9. Maximum Peak and Average Output Power

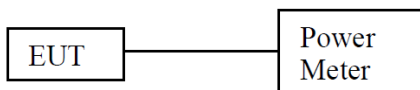
### 9.1 Test Limit

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 Date: Jun. 29, 2016

Temperature: 21 °C

Humidity: 64 %

Modulation Standard	Channel	Frequency (MHz)	Power Output (dBm)		Peak Power Output (mW)	
			Peak	Average	Peak	Average
GFSK	00	2402	-10.04	-12.33	0.099	0.058
	19	2440	-10.39	-13.02	0.091	0.050
	39	2480	-9.42	-11.39	0.114	0.073



## 10. Power Spectral Density

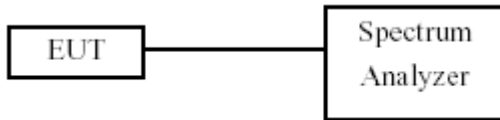
### 10.1 Test Limit

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 Date: Jun. 29, 2016

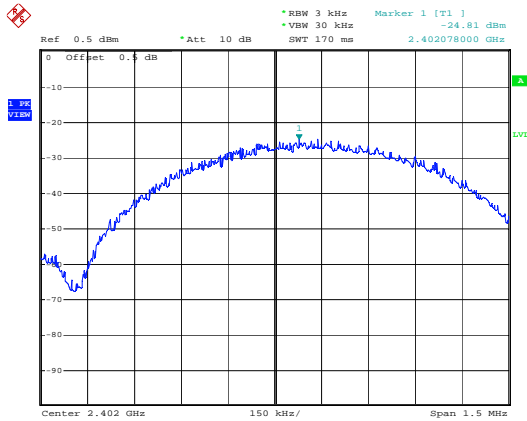
Temperature: 21 °C

Humidity: 64 %

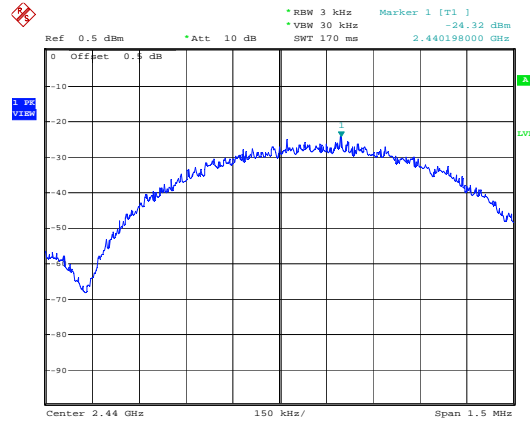
Modulation Standard	Channel	Frequency (MHz)	Maximum Power Density of 3 kHz Bandwidth (dBm)
GFSK	00	2402	-24.81
	19	2440	-24.32
	39	2480	-23.48



Modulation Type: GFSK(1Mbps), CH00



CH19



CH39

