



# FCC RADIO TEST REPORT

Applicant : Mobile Appliance, Inc.  
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          Daerung Techno Town 15, Gwanyang-dong,  
          Anyang-si, Gyeonggi-do, 14057, South Korea  
Equipment : UTR (Universal Traffic Recorder)  
Model No. : UTR (Universal Traffic Recorder)  
Trade Name : AUDI  
FCC ID : WHBAFUTR

## I HEREBY CERTIFY THAT :

The sample was received on Oct. 07, 2016 and the testing was carried out on Oct. 12, 2016 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Ray Chou  
Assistant Manager

Tested by:

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Engineer

## Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory



NVLAP®  
NVLAP LAB CODE: 20954-0



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## History of this test report



## 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**

**KDB558074**

**KDB662911**

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	DSSS, OFDM
Frequency Range	2412MHz~2462MHz
Data Rate	802.11b: 1- 11Mbps 802.11g: 6- 54Mbps 802.11n HT20: MCS0-MCS7
Channel Spacing	5MHz
Antenna Type	Chip Antenna
Antenna Gain	3.5dBi
Power Source	DC 12V

### 2.2 Carrier Frequency of Channels

802.11b, 802.11g, 802.11n HT20 (2412MHz~2462MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
*01	<b>2412</b>	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	*11	<b>2462</b>
*06	<b>2437</b>	---	---

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 Battery and EUT for RF test.
- c. An executive program, " WiFiTestProgram V0.4" under WIN 7 was executed to transmit and receive data via WLAN.
- d. Test modes:

Mode 1: 802.11b (1Mbps)

Mode 2: 802.11g (6Mbps)

Mode 3: 802.11n HT20 (6.5Mbps)

For radiated test (below 1GHz), "Test Mode 2" generated the worst case, it was reported as the final data.

For radiated test (above 1GHz), "Test Mode 1、2、3" were reported as the final data.

\* All Data Rate Pre-Scanned RF Power, The highest powers were chosen for the test.

## 2.4 Description of Test System

Device	Manufacturer	Model No.	Description
Battery	YUASA	55B24R(S)-CMFII	N/A



## 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-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.	



### 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	8127-740	2016/08/30	2017/08/29
LISN	Schwarzbeck	NSLK 8127	8127-516	2016/09/06	2017/09/05
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	2016/05/11	2017/05/10
Horn Antenna	EMCO	3115	31601	2016/09/05	2017/09/04
Horn Anrenna	EMCO	3116	31970	2016/03/18	2017/03/17
EXA Signal Analyzer	KEYSIGHT	N9010A	MY54200207	2016/03/16	2017/03/15
Preamplifier	EM	EM330	60660	2016/03/16	2017/03/15
Preamplifier	EMC INSTRUMENTS	EMC051845SE	980333	2016/09/13	2017/09/12
Preamplifier	Agilent	8449B	3008A01954	2016/03/04	2017/03/03
Preamplifier	MITEQ	AMF-7D-001010 0-30-10P	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	2016/09/01	2017/08/31
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	2016/09/05	2017/09/04
Series Power Meter	Anritsu	ML2495A	1224005	2016/03/03	2017/03/02
Power Sensor	Anritsu	MA2411B	1207295	2016/03/03	2017/03/02
Cable	HUBER SUHNER	SUCOFLEX 102	28422/2	2016/03/15	2017/03/14
Cable	HUBER SUHNER	SUCOFLEX 102	28418/2	2016/03/16	2017/03/15
Cable	HUBER SUHNER	SUCOFLEX 102	28417/2	2016/03/04	2017/03/03
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	Antenna Gain
Chip Antenna	3.5dBi

Basic methodology with NANT transmit antennas, each with the same directional gain GANT dBi, being driven by NANT transmitter outputs of equal power. Directional gain is to be computed as follows:

(i) If any transmit signals are correlated with each other,

$$\text{Directional gain} = \text{GANT} + 10 \log(\text{NANT}) \text{ dBi}$$

(ii) If all transmit signals are completely uncorrelated with each other,

$$\text{Directional gain} = \text{GANT}$$

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi

(i) If transmit signals are correlated, then

$$\text{Directional gain} = 10 \log[(10\text{G1}/20 + 10\text{G2}/20 + \dots + 10\text{GN}/20)/2/\text{NANT}] \text{ dBi}$$

(ii) If all transmit signals are completely uncorrelated, then

$$\text{Directional gain} = 10 \log[(10\text{G1}/10 + 10\text{G2}/10 + \dots + 10\text{GN}/10)/\text{NANT}] \text{ dBi}$$



## 5. Test of AC Power Line Conducted Emission

The test item is not applicable because the power is from DC Source.



## 6. Test of Radiated Spurious Emission

### 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

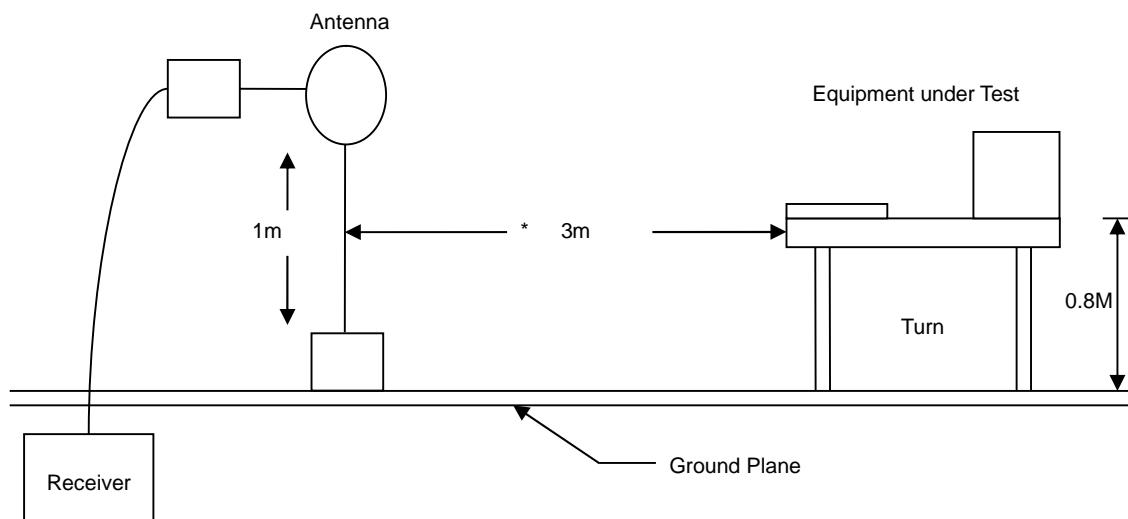
### 6.2 Test Procedures

- a. The EUT was placed on a rotatable table top below 1 GHz 0.8 meter above ground. above 1 GHz 1.5 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. 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.
- e. 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.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. 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.
- h. 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.
- i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

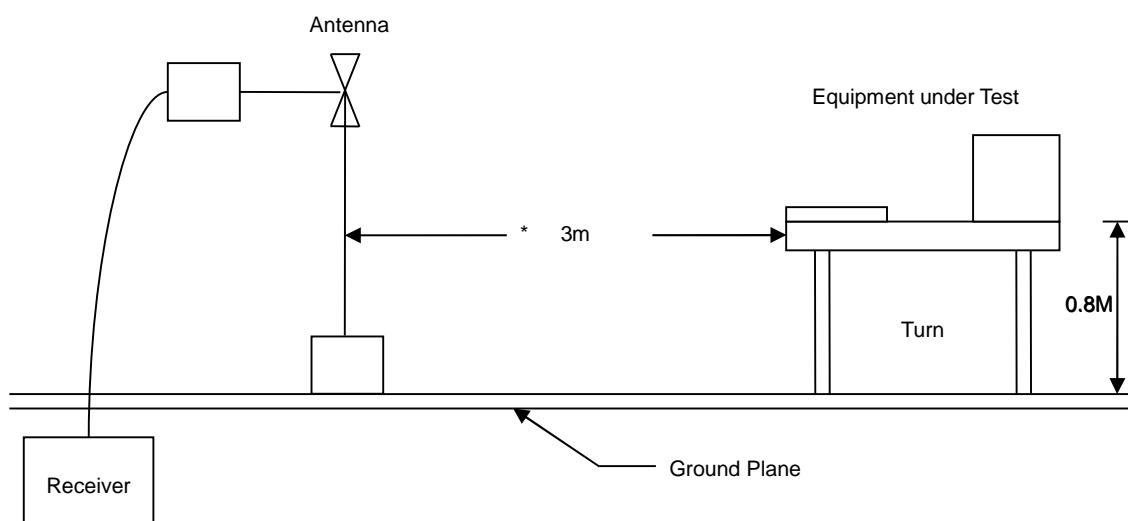


### 6.3 Typical Test Setup

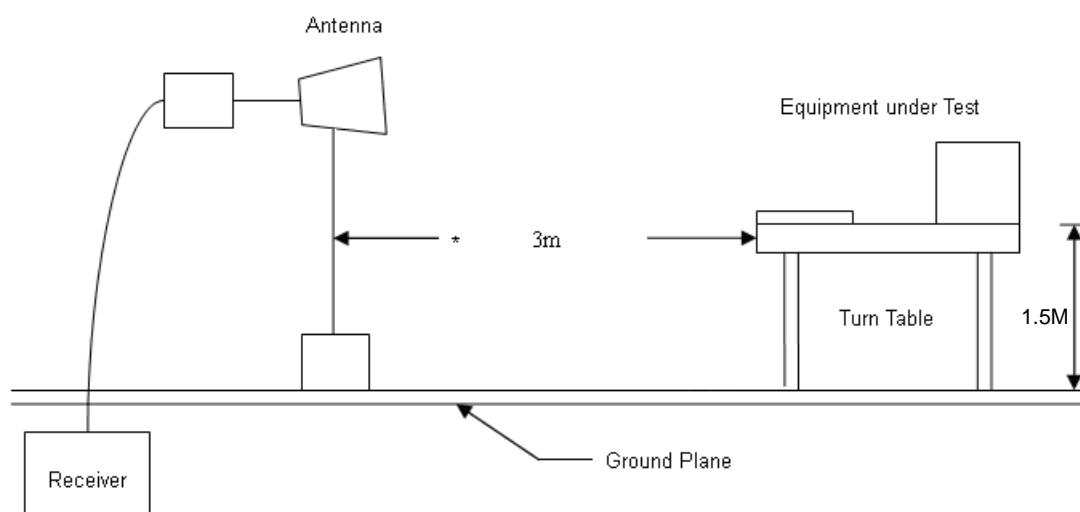
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup



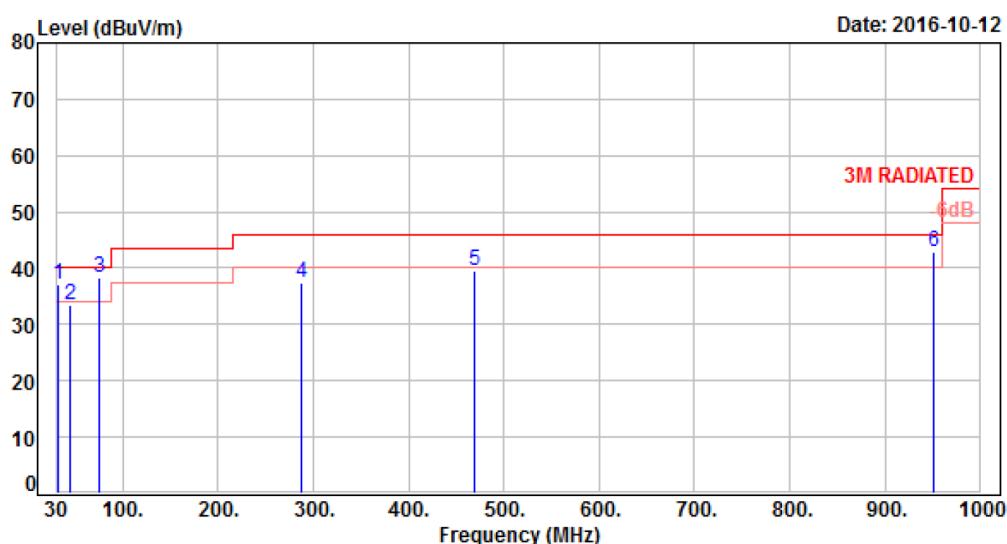


## 6.4 Test Result and Data (9KHz ~ 30MHz)

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

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

Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 2	Temperature	: 26 °C
Test Date	: Oct. 12, 2016	Humidity	: 52 %
Memo		Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth P/F (deg)	P/F
1	31.94	-10.66	47.63	36.97	40.00	-3.03	QP	100	342	P
2	45.52	-9.76	43.09	33.33	40.00	-6.67	QP	106	284	P
3	74.62	-13.59	51.96	38.37	40.00	-1.63	QP	104	198	P
4	288.02	-9.36	46.84	37.48	46.00	-8.52	Peak	400	0	P
5	468.44	-4.66	44.22	39.56	46.00	-6.44	Peak	400	0	P
6	951.50	3.12	39.64	42.76	46.00	-3.24	QP	146	268	P

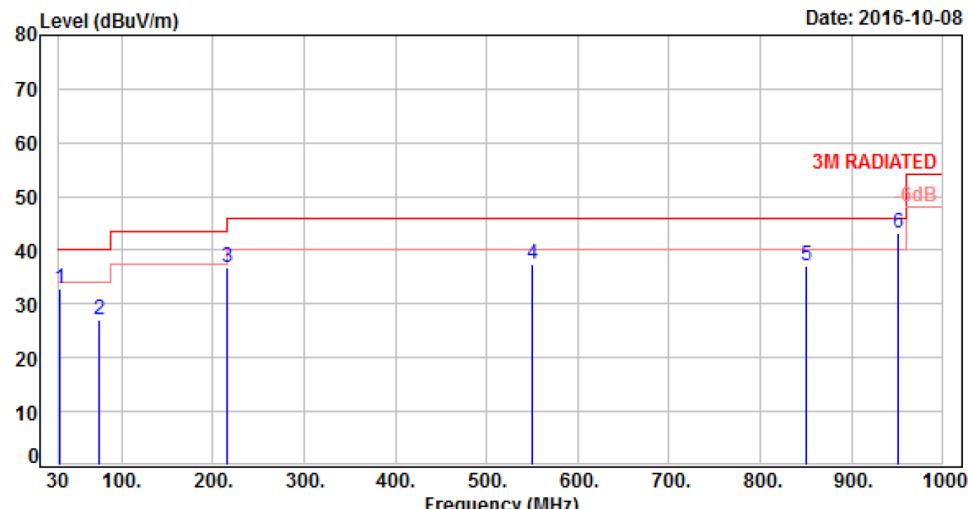
Note: Level = Reading + Factor

Margin = Level - Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 12, 2016	Humidity :	52 %
Memo :		Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	31.94	-10.66	43.50	32.84	40.00	-7.16	Peak	400	0	P
2	74.62	-13.59	40.68	27.09	40.00	-12.91	Peak	400	0	P
3	216.24	-12.67	49.38	36.71	46.00	-9.29	Peak	400	0	P
4	549.92	-3.29	40.82	37.53	46.00	-8.47	Peak	400	0	P
5	850.62	1.59	35.62	37.21	46.00	-8.79	Peak	400	0	P
6	951.50	3.12	40.19	43.31	46.00	-2.69	QP	132	225	P

Note: Level = Reading + Factor

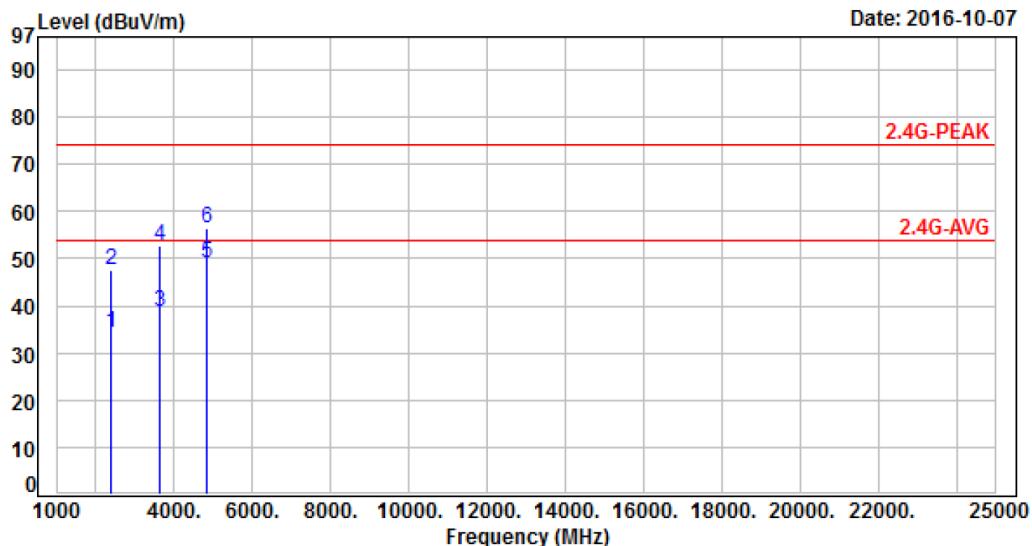
Margin = Level - Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



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

Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 1	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 01	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth P/F (deg)
1	2390.00	-0.91	35.27	34.36	54.00	-19.64	Average	100	145 P
2	2390.00	-0.91	48.55	47.64	74.00	-26.36	Peak	100	145 P
3	3618.00	4.74	34.10	38.84	54.00	-15.16	Average	252	316 P
4	3618.00	4.74	47.92	52.66	74.00	-21.34	Peak	252	316 P
5	4824.00	8.60	40.30	48.90	54.00	-5.10	Average	204	308 P
6	4824.00	8.60	47.88	56.48	74.00	-17.52	Peak	204	308 P

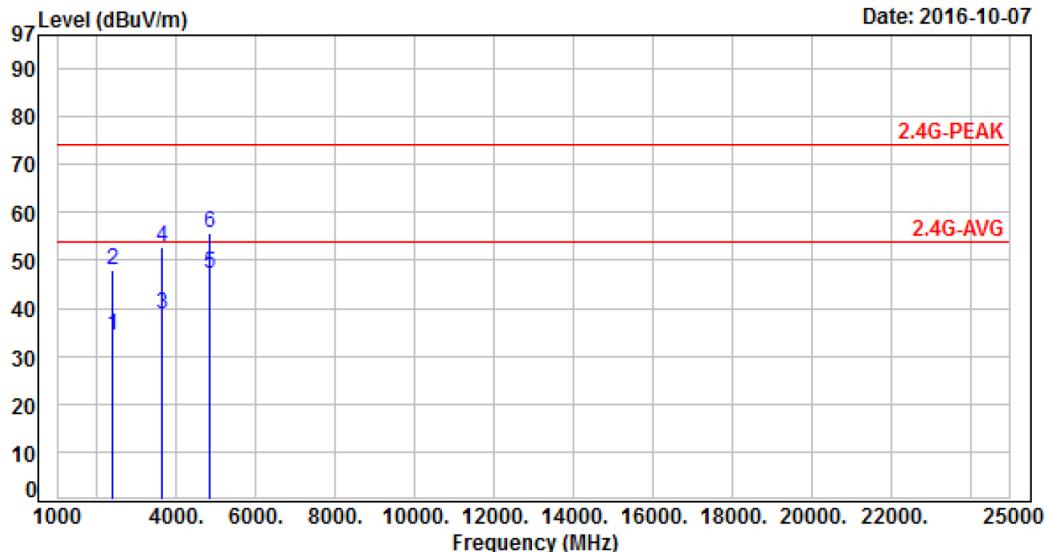
Note: Level = Reading + Factor

Margin = Level - Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 1	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 01	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	35.20	34.29	54.00	-19.71	Average	118	337	P
2	2390.00	-0.91	48.90	47.99	74.00	-26.01	Peak	118	337	P
3	3618.00	4.74	33.99	38.73	54.00	-15.27	Average	164	252	P
4	3618.00	4.74	48.08	52.82	74.00	-21.18	Peak	164	252	P
5	4824.00	8.60	38.44	47.04	54.00	-6.96	Average	115	49	P
6	4824.00	8.60	47.08	55.68	74.00	-18.32	Peak	115	49	P

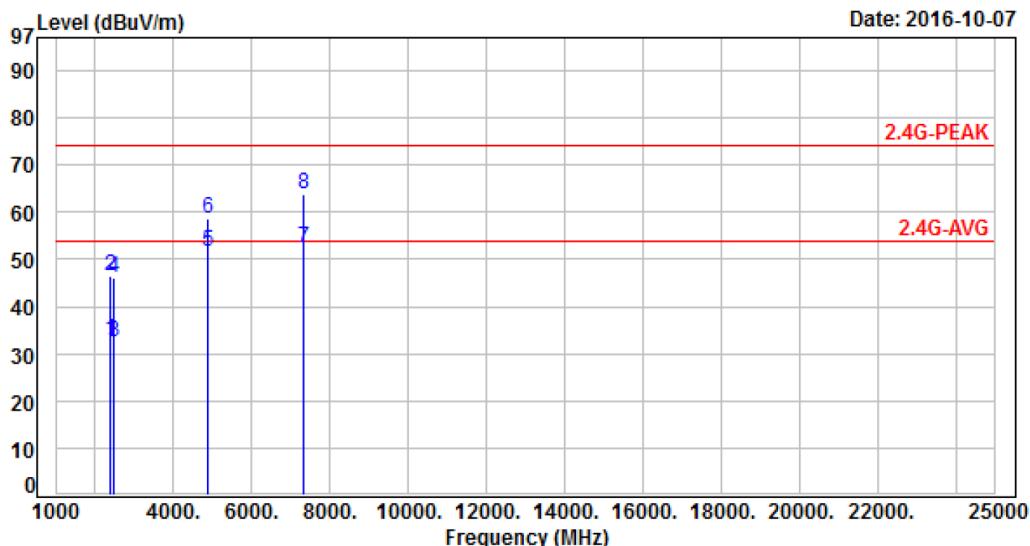
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Oct. 07, 2016	Humidity	: 52 %
Memo	: CH 06	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	33.75	32.84	54.00	-21.16	Average	152	268	P
2	2390.00	-0.91	47.45	46.54	74.00	-27.46	Peak	152	268	P
3	2483.50	-0.64	32.97	32.33	54.00	-21.67	Average	202	325	P
4	2483.50	-0.64	46.87	46.23	74.00	-27.77	Peak	202	325	P
5	4874.00	8.83	42.87	51.70	54.00	-2.30	Average	243	324	P
6	4874.00	8.83	49.64	58.47	74.00	-15.53	Peak	243	324	P
7	7311.00	13.69	38.60	52.29	54.00	-1.71	Average	161	134	P
8	7311.00	13.69	50.02	63.71	74.00	-10.29	Peak	161	134	P

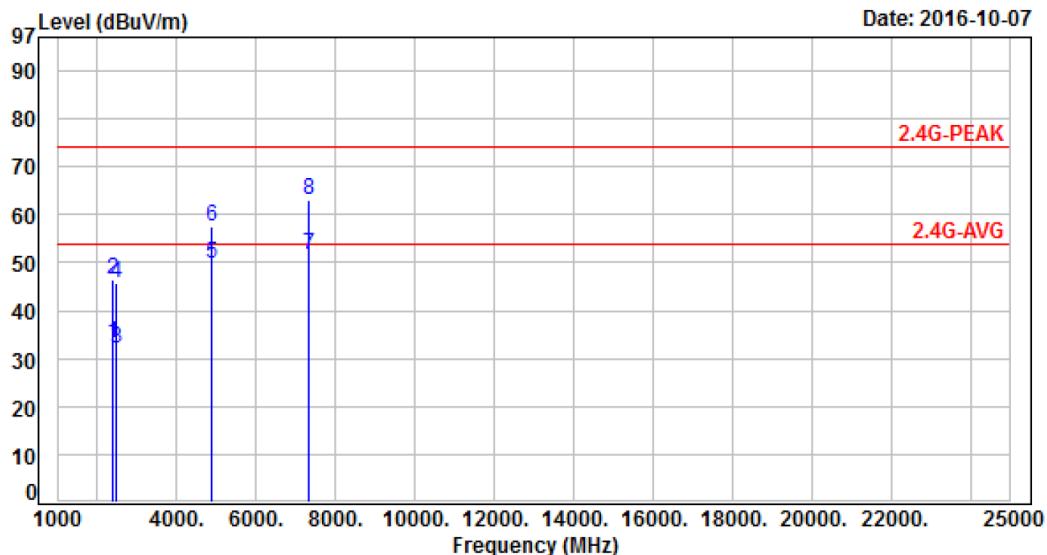
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1	Temperature	: 26 °C
Test Date	: Oct. 07, 2016	Humidity	: 52 %
Memo	: CH 06	Atmospheric Pressure	: 1030 hpa

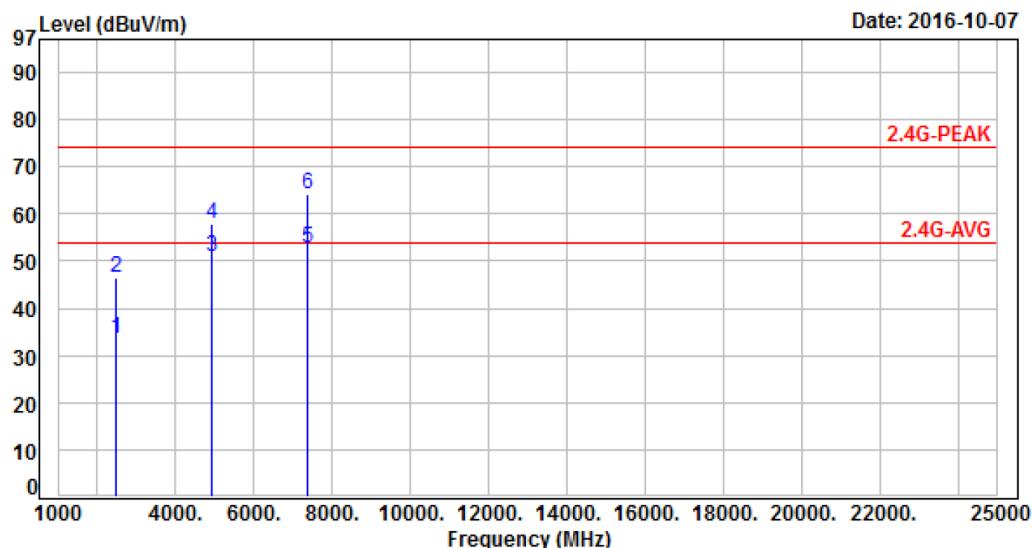


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth P/F	
1	2390.00	-0.91	33.99	33.08	54.00	-20.92	Average	212	298	P
2	2390.00	-0.91	47.53	46.62	74.00	-27.38	Peak	212	298	P
3	2483.50	-0.64	32.68	32.04	54.00	-21.96	Average	185	302	P
4	2483.50	-0.64	46.47	45.83	74.00	-28.17	Peak	185	302	P
5	4874.00	8.83	41.06	49.89	54.00	-4.11	Average	150	45	P
6	4874.00	8.83	48.71	57.54	74.00	-16.46	Peak	150	45	P
7	7311.00	13.69	37.84	51.53	54.00	-2.47	Average	184	5	P
8	7311.00	13.69	49.21	62.90	74.00	-11.10	Peak	184	5	P

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



Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 1	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 11	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-0.64	34.13	33.49	54.00	-20.51	Average	100	142	P
2	2483.50	-0.64	47.28	46.64	74.00	-27.36	Peak	100	142	P
3	4924.00	9.07	41.65	50.72	54.00	-3.28	Average	221	305	P
4	4924.00	9.07	48.85	57.92	74.00	-16.08	Peak	221	305	P
5	7386.00	13.83	38.96	52.79	54.00	-1.21	Average	120	133	P
6	7386.00	13.83	50.24	64.07	74.00	-9.93	Peak	120	133	P

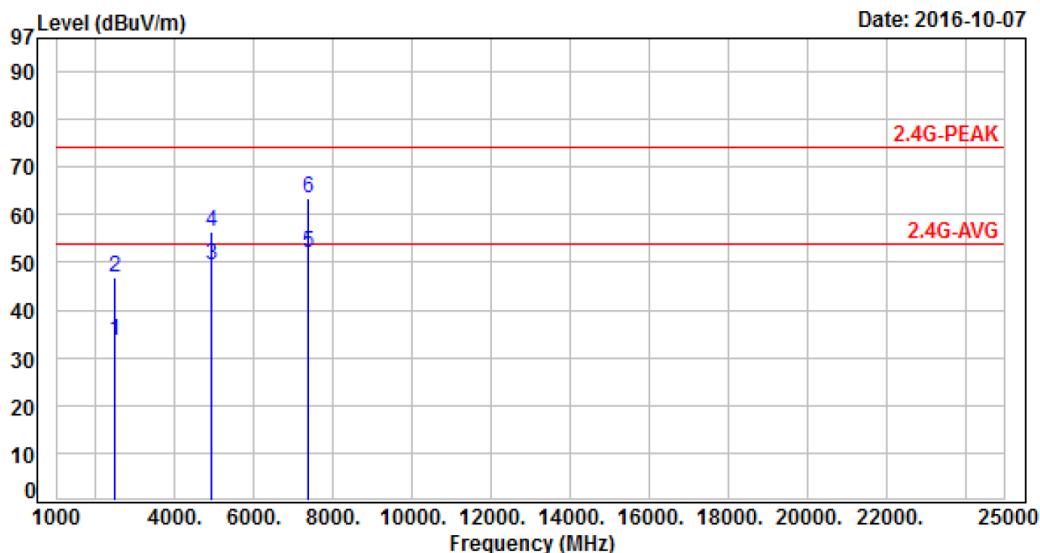
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 1	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 11	Atmospheric Pressure :	1030 hpa



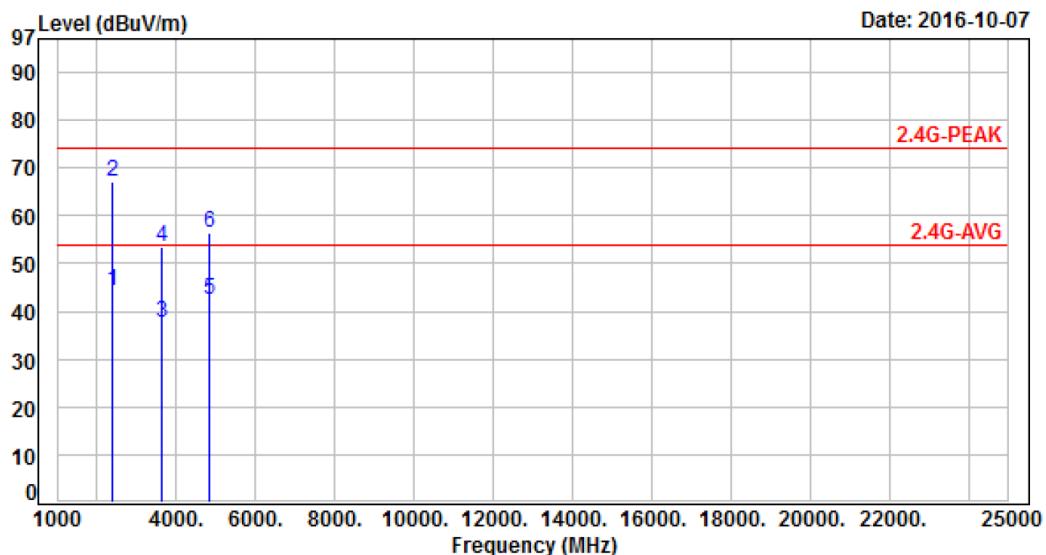
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 01	Atmospheric Pressure :	1030 hpa



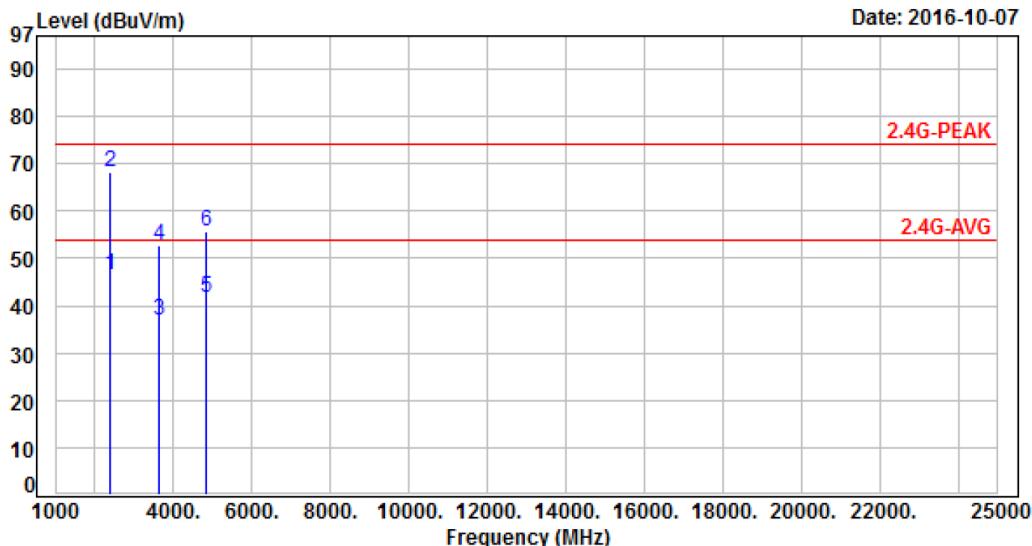
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 01	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	47.32	46.41	54.00	-7.59	Average	124	339	P
2	2390.00	-0.91	68.98	68.07	74.00	-5.93	Peak	124	339	P
3	3618.00	4.74	32.03	36.77	54.00	-17.23	Average	182	303	P
4	3618.00	4.74	47.98	52.72	74.00	-21.28	Peak	182	303	P
5	4824.00	8.60	33.01	41.61	54.00	-12.39	Average	178	47	P
6	4824.00	8.60	47.16	55.76	74.00	-18.24	Peak	178	47	P

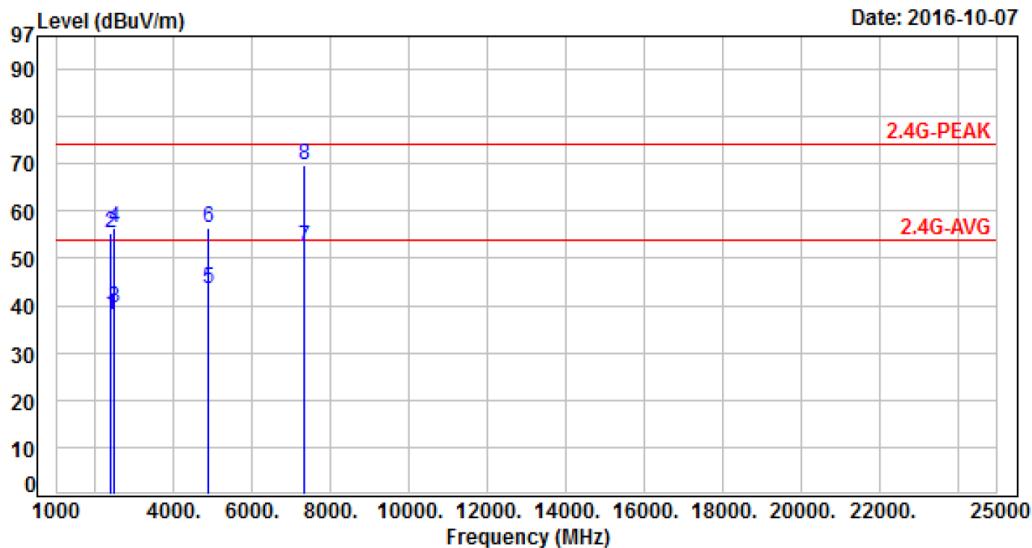
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 06	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	39.01	38.10	54.00	-15.90	Average	100	138	P
2	2390.00	-0.91	56.25	55.34	74.00	-18.66	Peak	100	138	P
3	2483.50	-0.64	40.15	39.51	54.00	-14.49	Average	124	143	P
4	2483.50	-0.64	57.18	56.54	74.00	-17.46	Peak	124	143	P
5	4874.00	8.83	34.55	43.38	54.00	-10.62	Average	247	324	P
6	4874.00	8.83	47.74	56.57	74.00	-17.43	Peak	247	324	P
7	7311.00	13.69	38.67	52.36	54.00	-1.64	Average	138	134	P
8	7311.00	13.69	56.20	69.89	74.00	-4.11	Peak	138	134	P

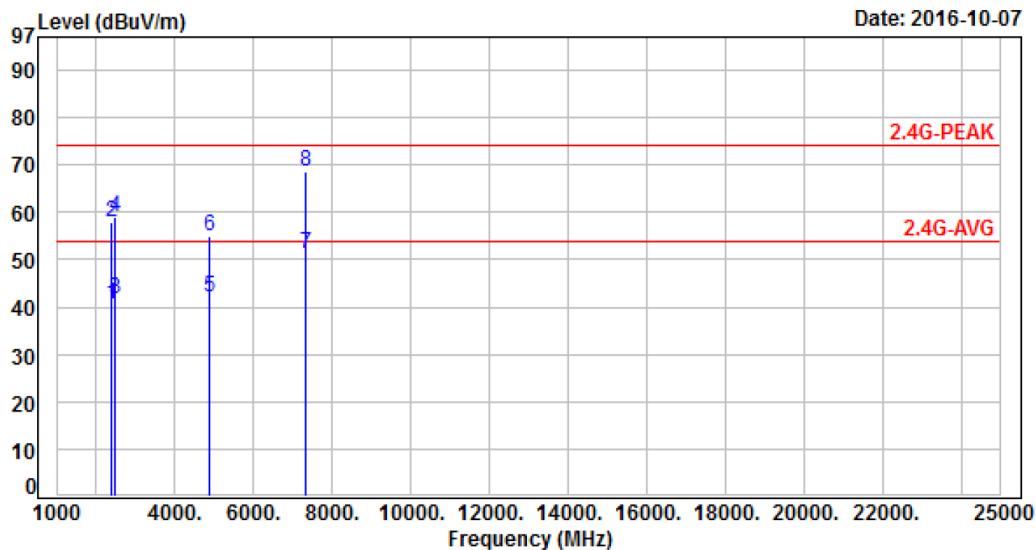
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 06	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	41.38	40.47	54.00	-13.53	Average	144	258	P
2	2390.00	-0.91	58.72	57.81	74.00	-16.19	Peak	144	258	P
3	2483.50	-0.64	42.45	41.81	54.00	-12.19	Average	187	302	P
4	2483.50	-0.64	59.66	59.02	74.00	-14.98	Peak	187	302	P
5	4874.00	8.83	33.17	42.00	54.00	-12.00	Average	138	64	P
6	4874.00	8.83	46.26	55.09	74.00	-18.91	Peak	138	64	P
7	7311.00	13.69	37.41	51.10	54.00	-2.90	Average	198	96	P
8	7311.00	13.69	54.88	68.57	74.00	-5.43	Peak	198	96	P

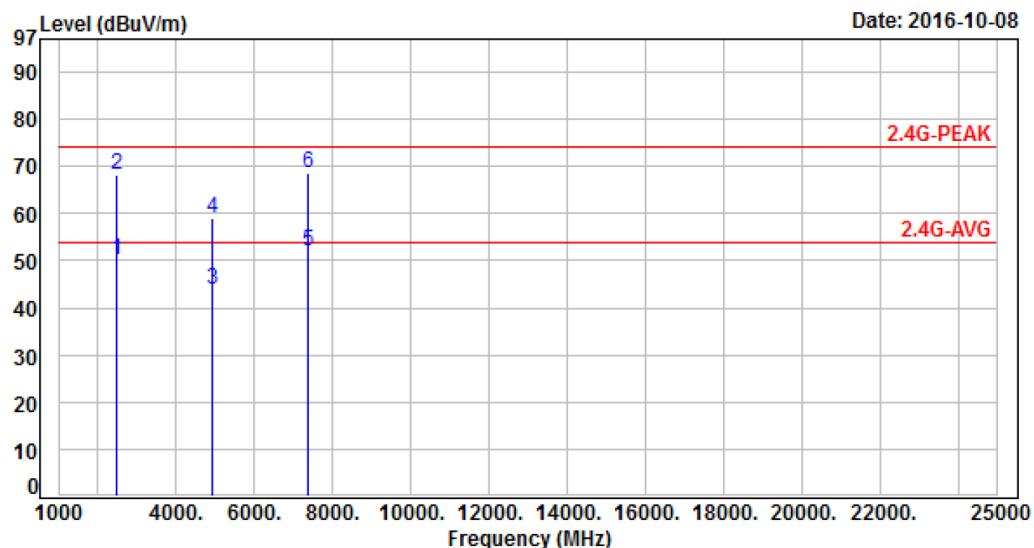
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 2	Temperature	: 26 °C
Test Date	: Oct. 07, 2016	Humidity	: 52 %
Memo	: CH 11	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-0.64	50.65	50.01	54.00	-3.99	Average	166	165	P
2	2483.50	-0.64	68.93	68.29	74.00	-5.71	Peak	400	176	P
3	4924.00	9.07	34.90	43.97	54.00	-10.03	Average	347	139	P
4	4924.00	9.07	49.80	58.87	74.00	-15.13	Peak	347	139	P
5	7386.00	13.83	38.34	52.17	54.00	-1.83	Average	307	210	P
6	7386.00	13.83	54.62	68.45	74.00	-5.55	Peak	307	210	P

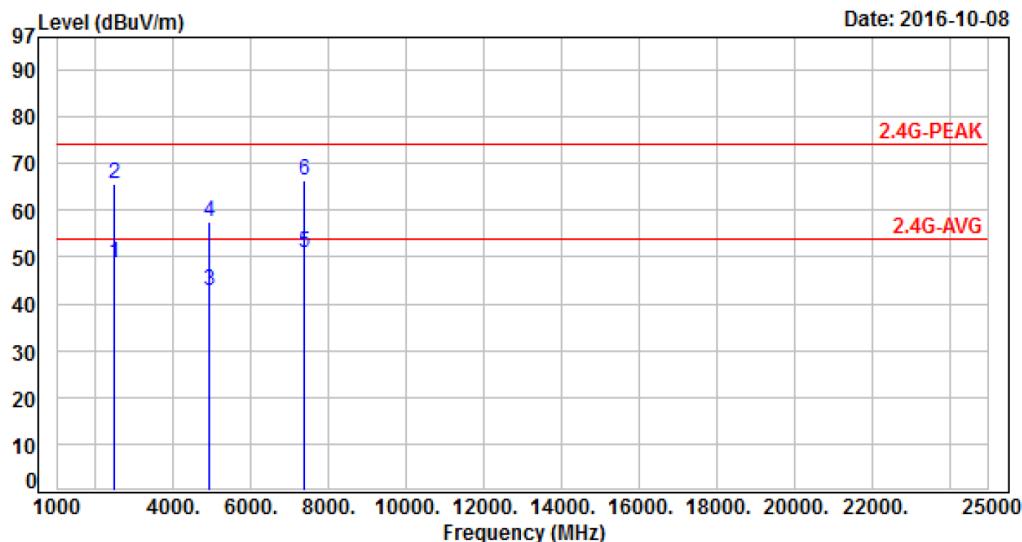
Note: Level = Reading + Factor

Margin = Level – Limit

Margin = EIRP - EIRP<sub>limit</sub>  
Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power :	DC 12V	Pol/Phase :	HORIZONTAL
Test Mode :	Mode 2	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 11	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth P/F (deg)
1	2483.50	-0.64	49.38	48.74	54.00	-5.26	Average	100	147 P
2	2483.50	-0.64	66.30	65.66	74.00	-8.34	Peak	100	147 P
3	4924.00	9.07	33.77	42.84	54.00	-11.16	Average	164	157 P
4	4924.00	9.07	48.31	57.38	74.00	-16.62	Peak	164	157 P
5	7386.00	13.83	36.96	50.79	54.00	-3.21	Average	211	102 P
6	7386.00	13.83	52.38	66.21	74.00	-7.79	Peak	211	102 P

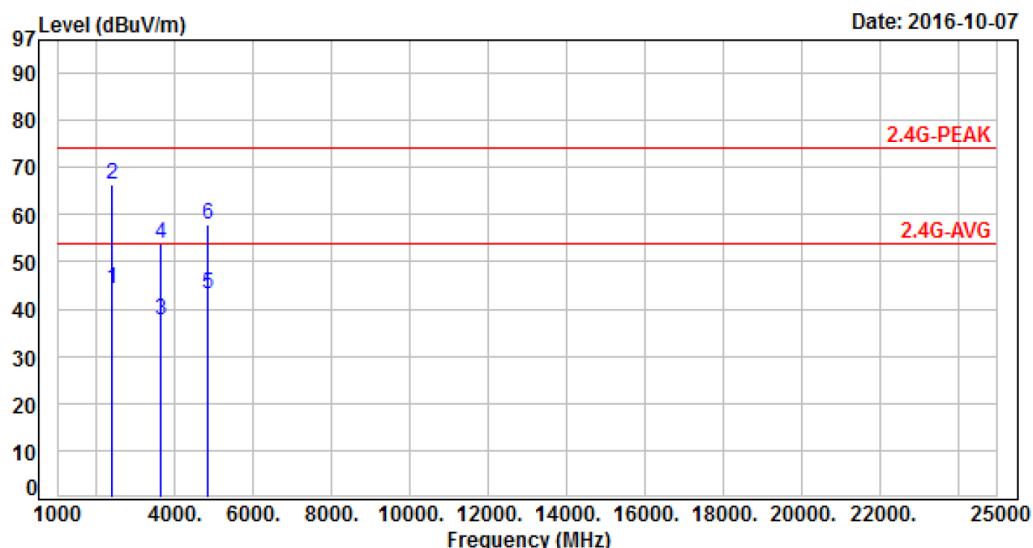
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 3	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 01	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	45.22	44.31	54.00	-9.69	Average	139	148	P
2	2390.00	-0.91	67.44	66.53	74.00	-7.47	Peak	139	148	P
3	3618.00	4.74	33.01	37.75	54.00	-16.25	Average	152	261	P
4	3618.00	4.74	49.01	53.75	74.00	-20.25	Peak	152	261	P
5	4824.00	8.60	34.64	43.24	54.00	-10.76	Average	105	288	P
6	4824.00	8.60	49.18	57.78	74.00	-16.22	Peak	105	288	P

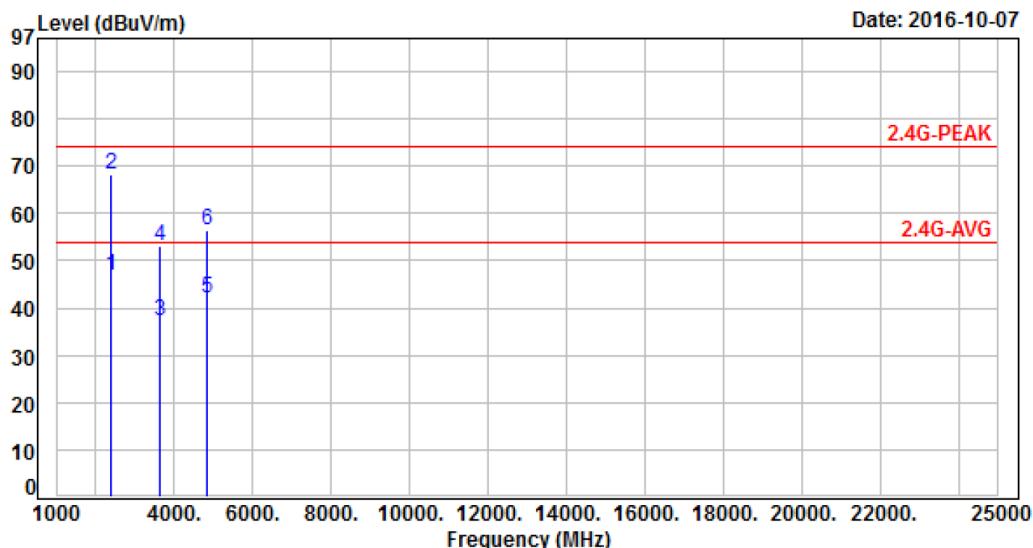
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3	Temperature	: 26 °C
Test Date	: Oct. 07, 2016	Humidity	: 52 %
Memo	: CH 01	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	47.78	46.87	54.00	-7.13	Average	100	127	P
2	2390.00	-0.91	69.22	68.31	74.00	-5.69	Peak	100	127	P
3	3618.00	4.74	32.55	37.29	54.00	-16.71	Average	172	252	P
4	3618.00	4.74	48.31	53.05	74.00	-20.95	Peak	172	252	P
5	4824.00	8.60	33.45	42.05	54.00	-11.95	Average	162	68	P
6	4824.00	8.60	47.87	56.47	74.00	-17.53	Peak	162	68	P

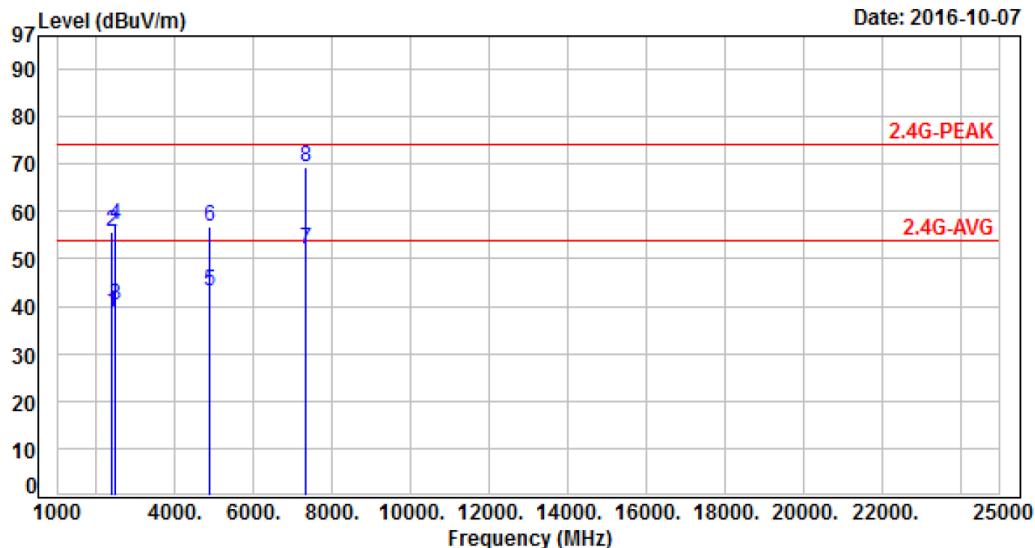
Note: Level = Reading ± Factor

Margin = Level - Limit

Factor = Antenna Factor + Cable Loss - Amplifier Factor.



Power :	DC 12V	Pol/Phase :	VERTICAL
Test Mode :	Mode 3	Temperature :	26 °C
Test Date :	Oct. 07, 2016	Humidity :	52 %
Memo :	CH 06	Atmospheric Pressure :	1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	39.46	38.55	54.00	-15.45	Average	126	202	P
2	2390.00	-0.91	56.59	55.68	74.00	-18.32	Peak	126	202	P
3	2483.50	-0.64	40.69	40.05	54.00	-13.95	Average	214	305	P
4	2483.50	-0.64	57.78	57.14	74.00	-16.86	Peak	214	305	P
5	4874.00	8.83	34.49	43.32	54.00	-10.68	Average	100	328	P
6	4874.00	8.83	48.00	56.83	74.00	-17.17	Peak	100	328	P
7	7311.00	13.69	38.22	51.91	54.00	-2.09	Average	349	212	P
8	7311.00	13.69	55.74	69.43	74.00	-4.57	Peak	349	212	P

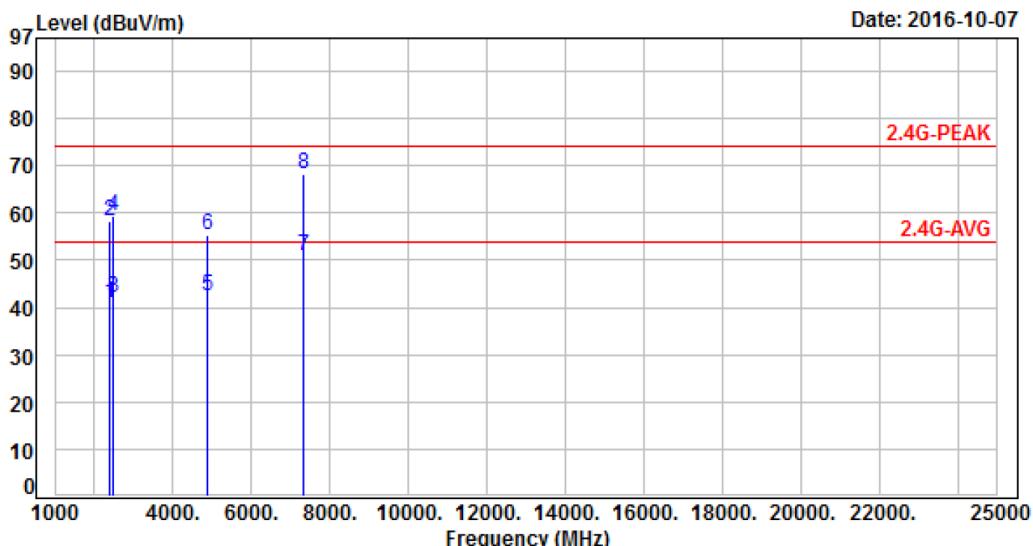
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3	Temperature	: 26 °C
Test Date	: Oct. 07, 2016	Humidity	: 52 %
Memo	: CH 06	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-0.91	41.67	40.76	54.00	-13.24	Average	125	204	P
2	2390.00	-0.91	59.00	58.09	74.00	-15.91	Peak	125	204	P
3	2483.50	-0.64	42.84	42.20	54.00	-11.80	Average	249	216	P
4	2483.50	-0.64	60.13	59.49	74.00	-14.51	Peak	249	216	P
5	4874.00	8.83	33.48	42.31	54.00	-11.69	Average	149	101	P
6	4874.00	8.83	46.62	55.45	74.00	-18.55	Peak	149	101	P
7	7311.00	13.69	37.12	50.81	54.00	-3.19	Average	245	133	P
8	7311.00	13.69	54.53	68.22	74.00	-5.78	Peak	245	133	P

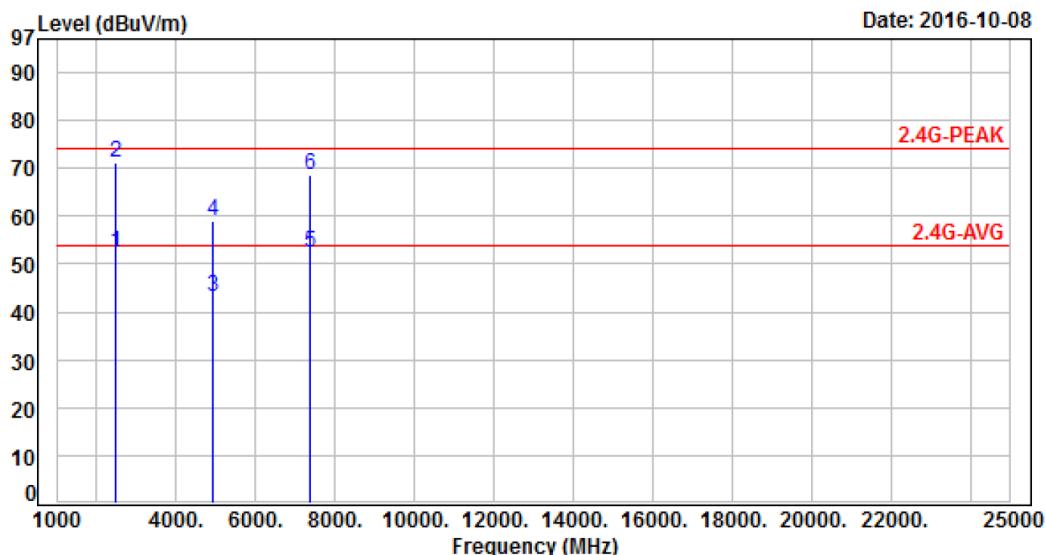
Note: Level = Reading + Factor

Margin = Level – Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor.



Power	: DC 12V	Pol/Phase	: VERTICAL
Test Mode	: Mode 3	Temperature	: 26 °C
Test Date	: Oct. 08, 2016	Humidity	: 52 %
Memo	: CH 11	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-0.64	52.91	52.27	54.00	-1.73	Average	106	168	P
2	2483.50	-0.64	71.67	71.03	74.00	-2.97	Peak	106	168	P
3	4924.00	9.07	34.22	43.29	54.00	-10.71	Average	218	187	P
4	4924.00	9.07	49.93	59.00	74.00	-15.00	Peak	218	187	P
5	7386.00	13.83	38.43	52.26	54.00	-1.74	Average	243	208	P
6	7386.00	13.83	54.96	68.79	74.00	-5.21	Peak	243	208	P

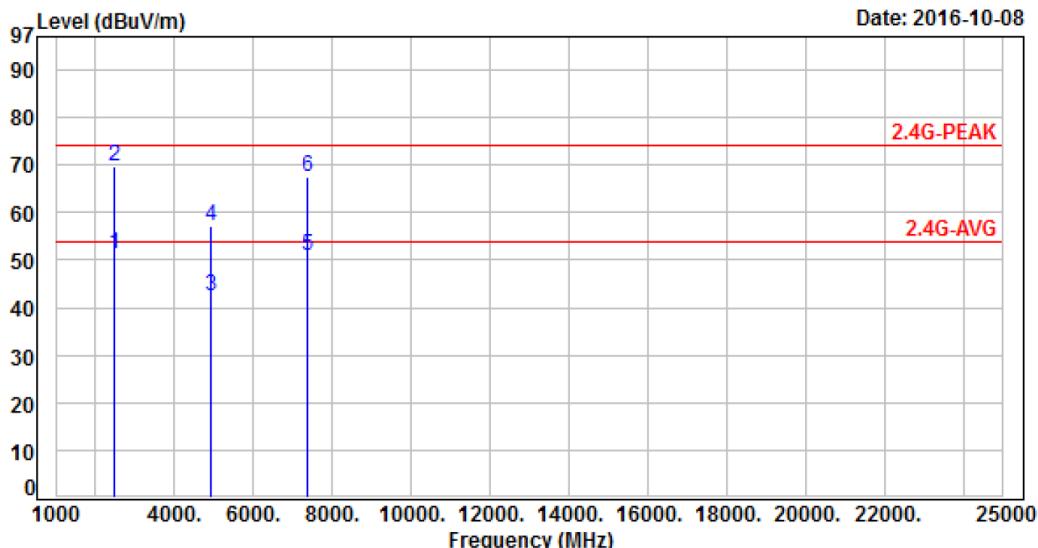
Note: Level = Reading + Factor

Margin = Level - Limit

Factor= Antenna Factor + Cable Loss - Amplifier Factor



Power	: DC 12V	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 3	Temperature	: 26 °C
Test Date	: Oct. 08, 2016	Humidity	: 52 %
Memo	: CH 11	Atmospheric Pressure	: 1030 hpa



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2483.50	-0.64	51.72	51.08	54.00	-2.92	Average	153	194	P
2	2483.50	-0.64	70.48	69.84	74.00	-4.16	Peak	153	194	P
3	4924.00	9.07	33.37	42.44	54.00	-11.56	Average	128	88	P
4	4924.00	9.07	48.12	57.19	74.00	-16.81	Peak	128	88	P
5	7386.00	13.83	37.23	51.06	54.00	-2.94	Average	148	202	P
6	7386.00	13.83	53.57	67.40	74.00	-6.60	Peak	148	202	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:

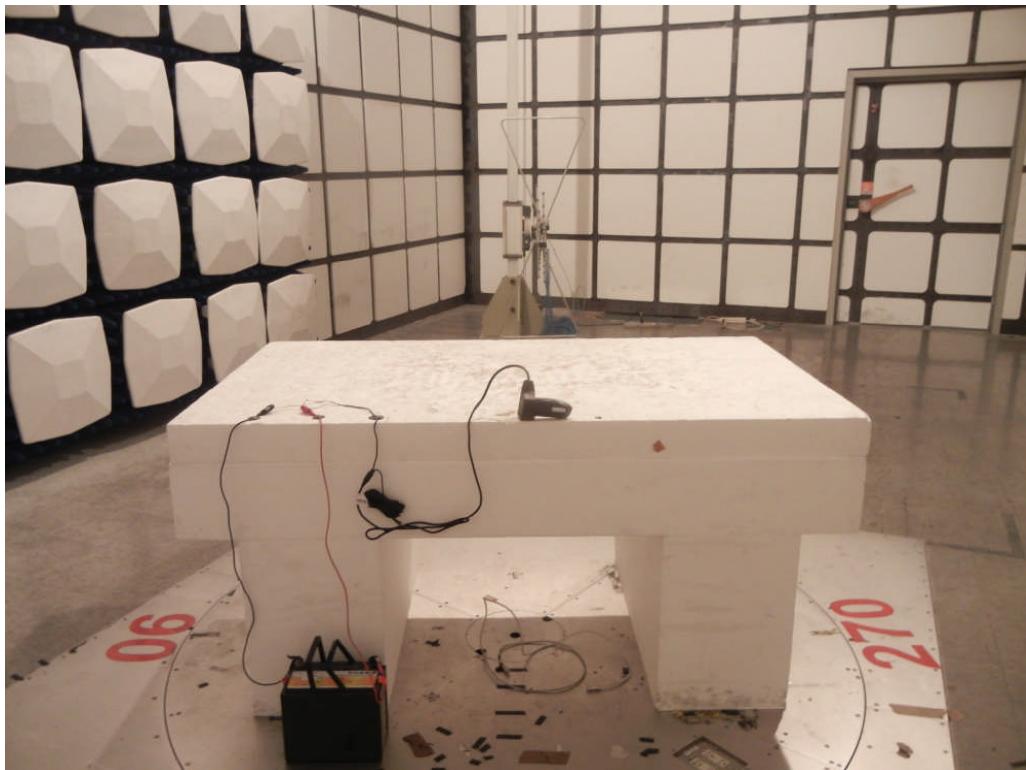
MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775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



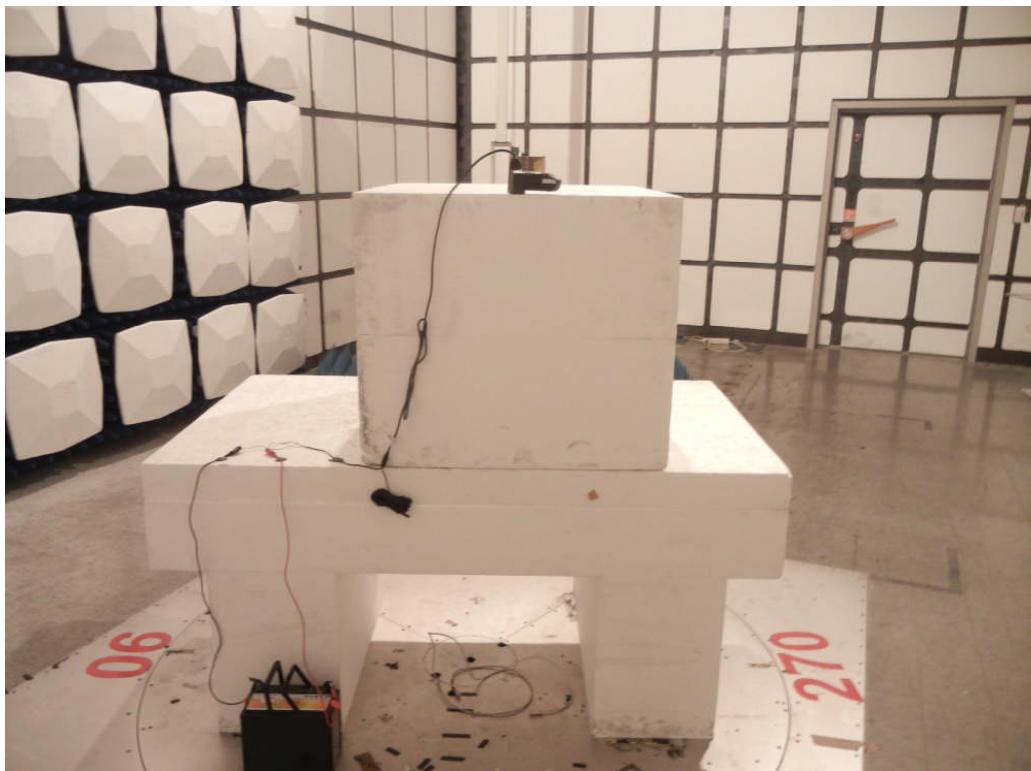
Rear View



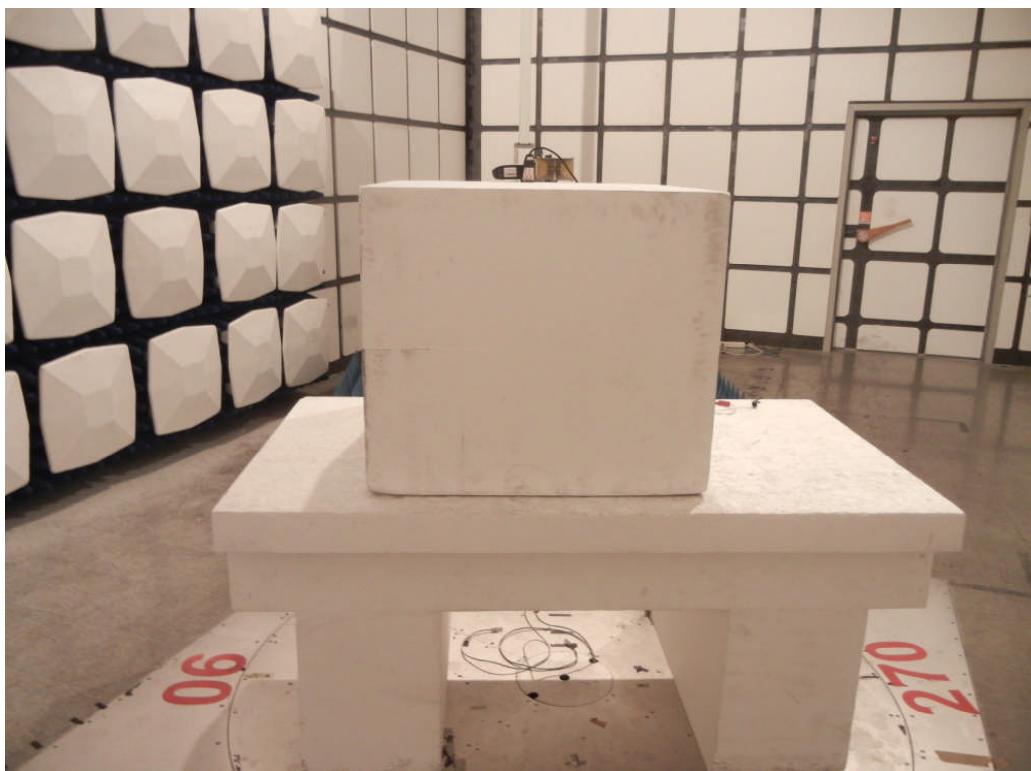


### 6.9 Test Photographs (1GHz ~ 25GHz)

Front View



Rear View





## 7. Test of Conducted Spurious Emission

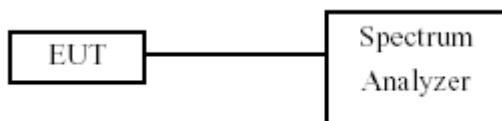
### 7.1 Test Limit

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 loss 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



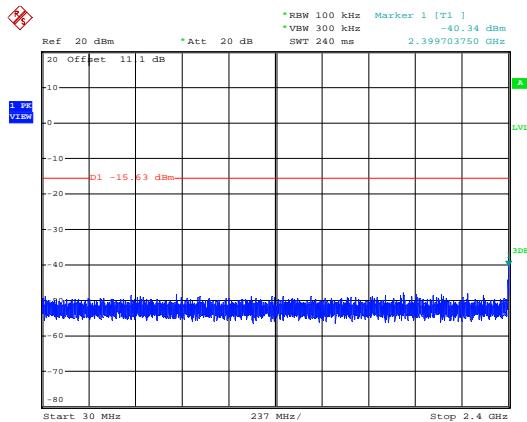
### 7.4 Test Result and Data

Test Date	:	Oct. 12, 2016	Temperature	:	24°C
Atmospheric pressure	:	1023 hPa	Humidity	:	66%
Test Result	:	PASS			

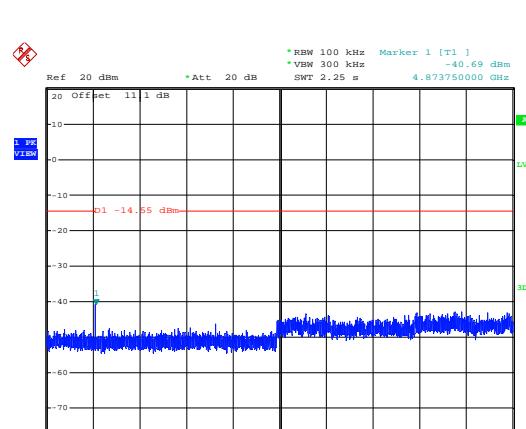
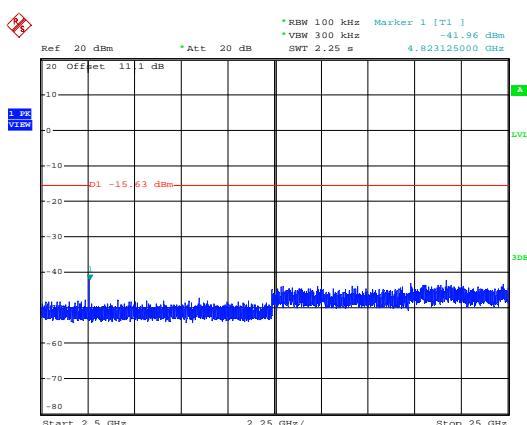
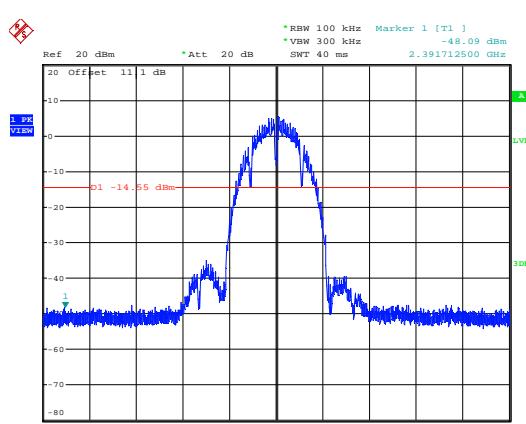
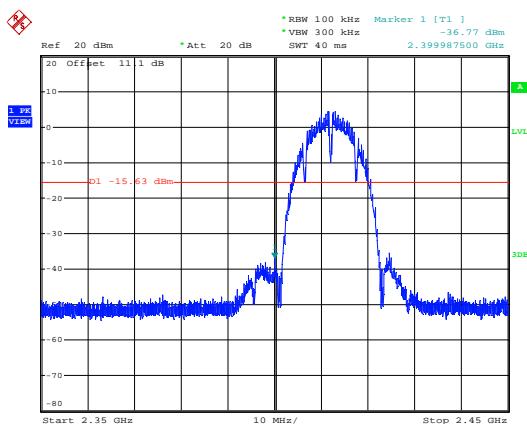
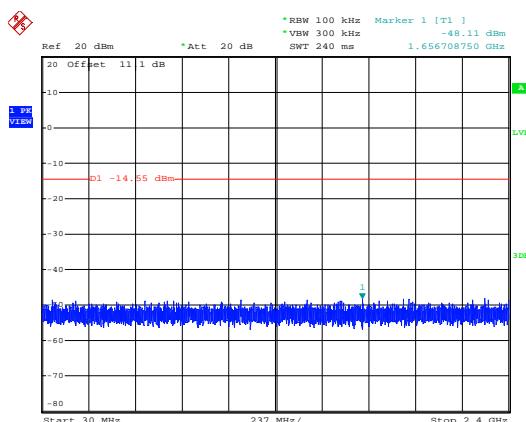
Note: Test plots refers to the following pages.



## Modulation Type: 802.11b, CH 01

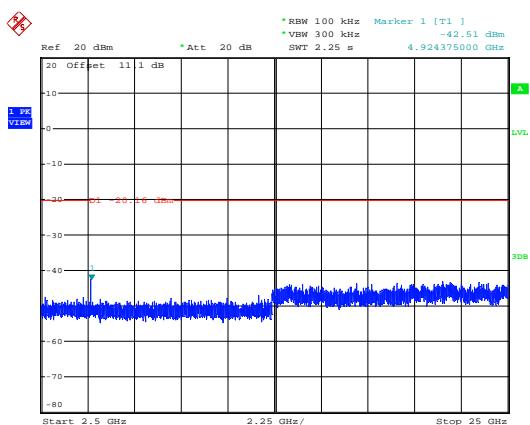
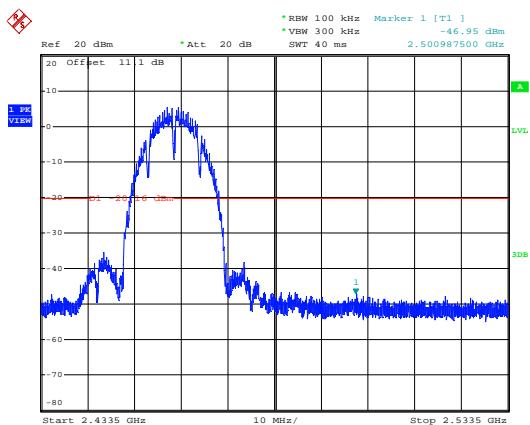
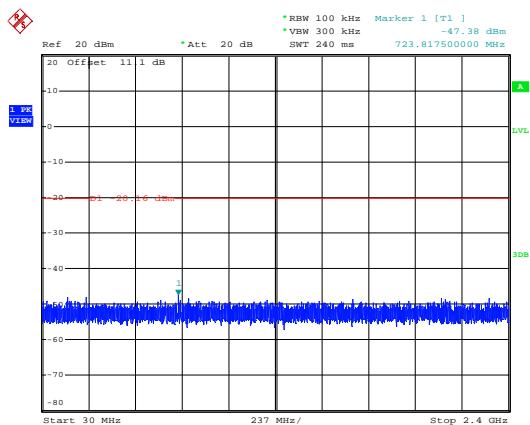


## Modulation Type: 802.11b, CH 06



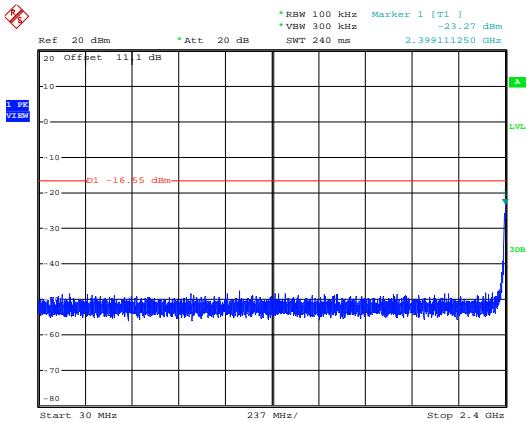


Modulation Type: 802.11b, CH 11

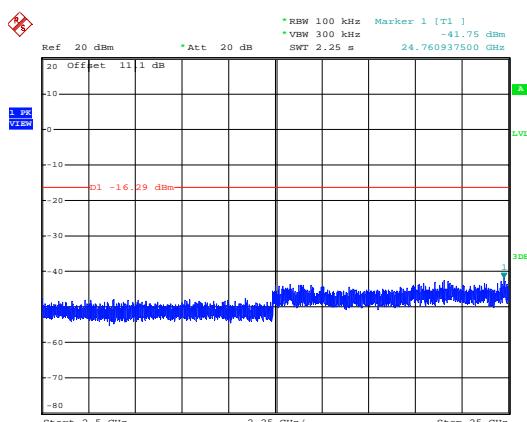
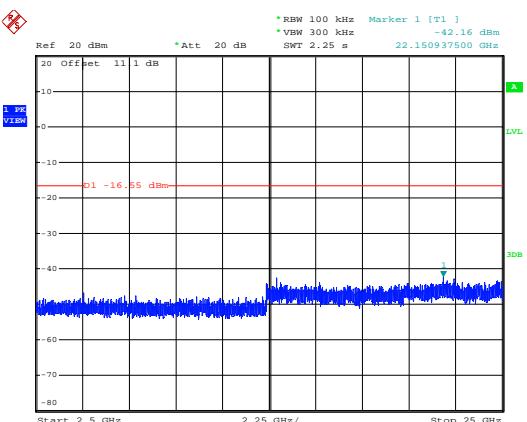
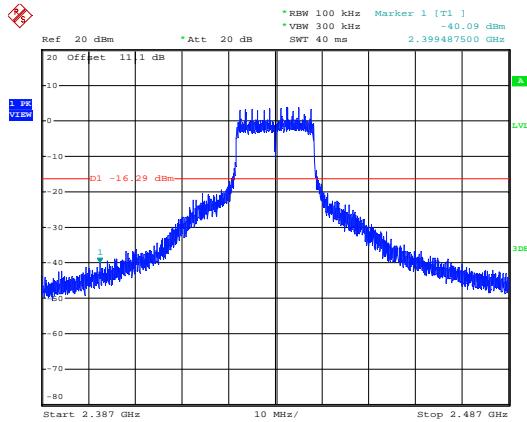
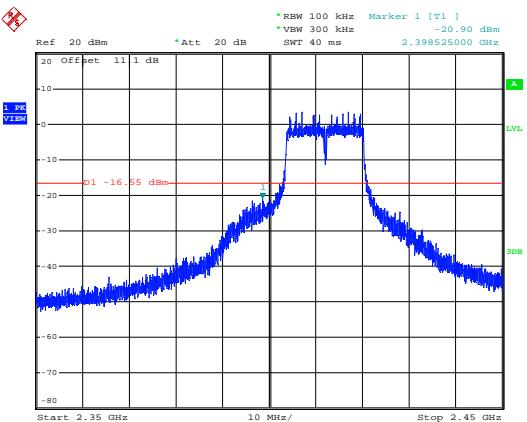
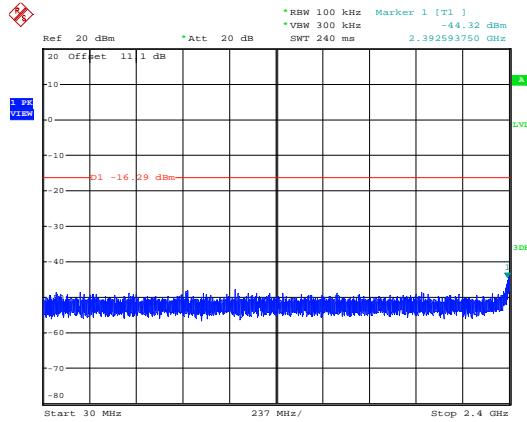




Modulation Type: 802.11g, CH 01

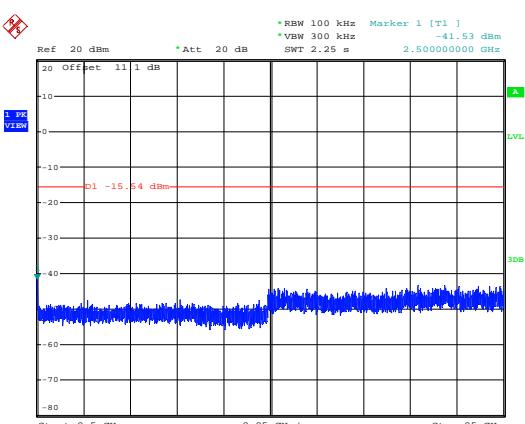
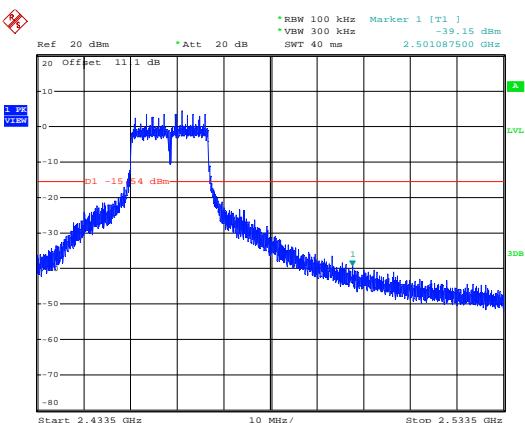
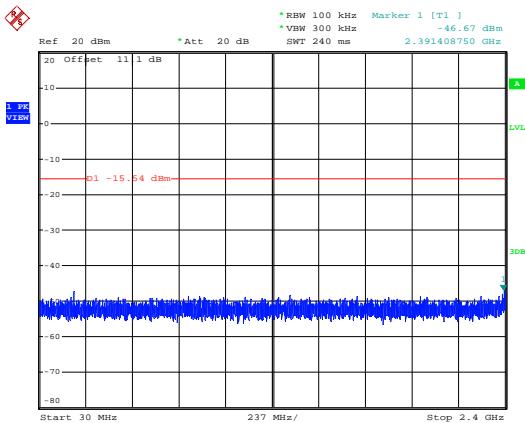


Modulation Type: 802.11g, CH 06



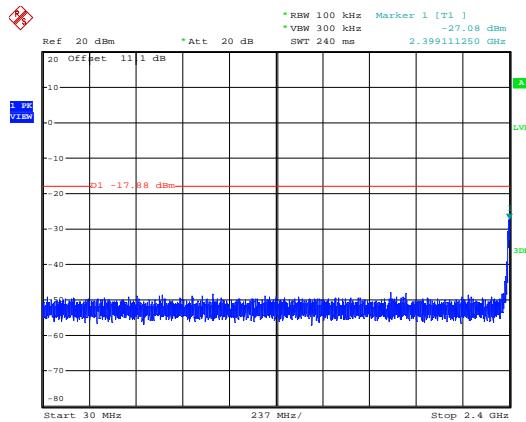


Modulation Type: 802.11g, CH 11

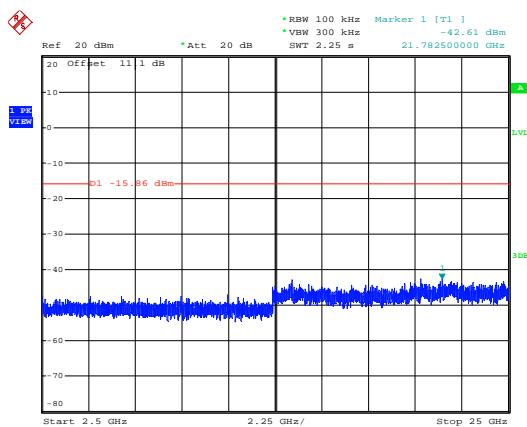
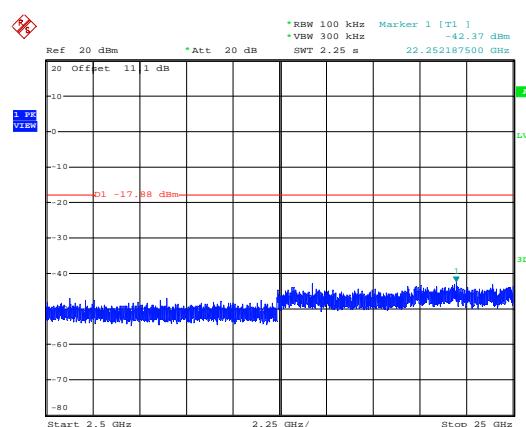
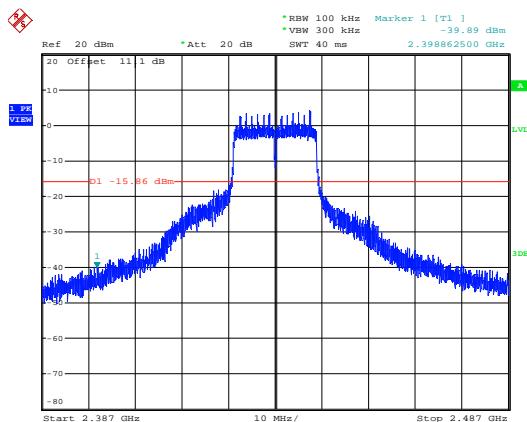
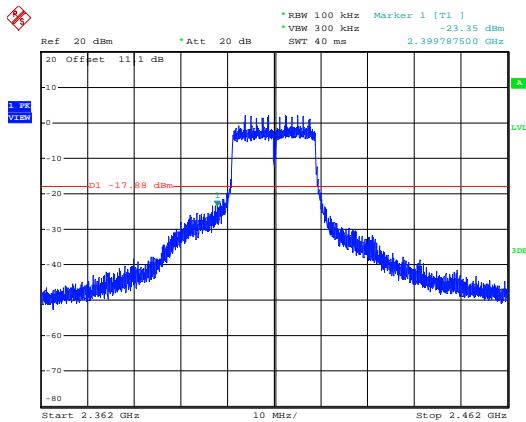
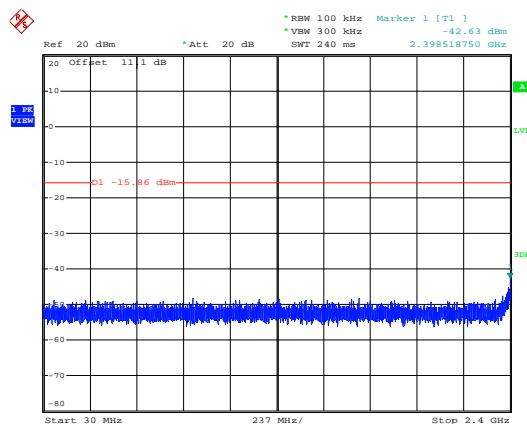




## Modulation Type: 802.11n HT20, CH 01

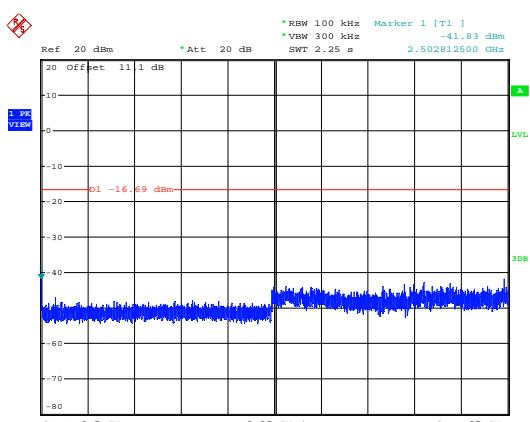
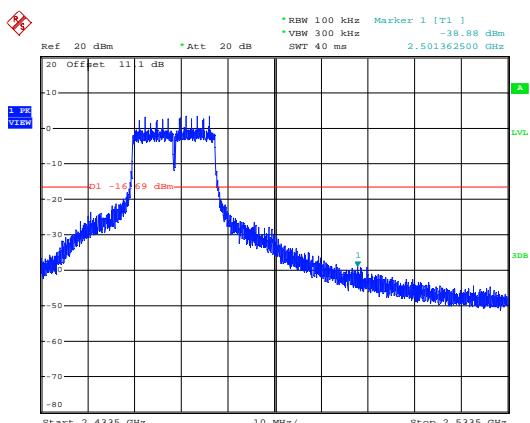
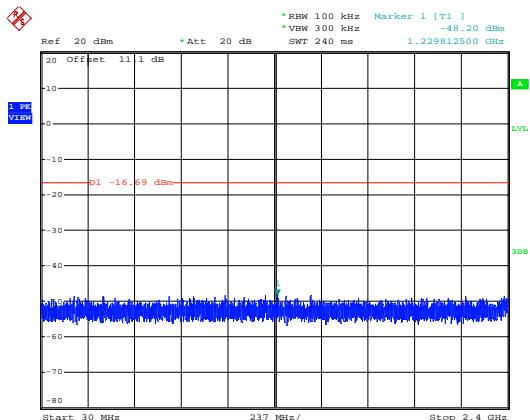


## Modulation Type: 802.11n HT20, CH 06





Modulation Type: 802.11n HT20, CH 11





## 8. 6dB Bandwidth Measurement Data

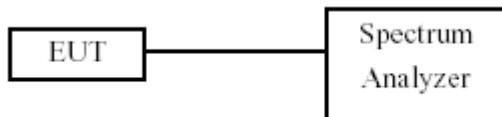
### 8.1 Test Limit

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 100KHz and VBW  $\geq 3 \times$  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





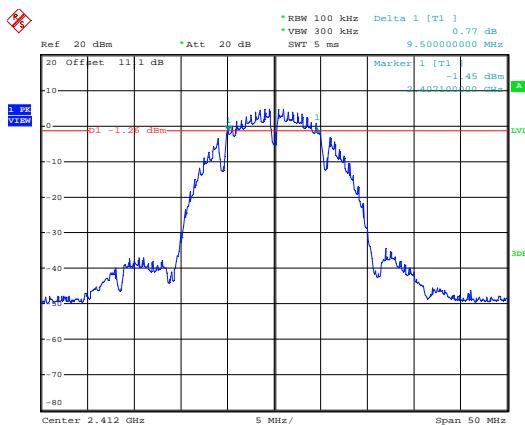
#### 8.4 Test Result and Data

Test Date : Oct. 12, 2016      Temperature : 24°C  
Atmospheric pressure : 1023 hPa      Humidity : 66%

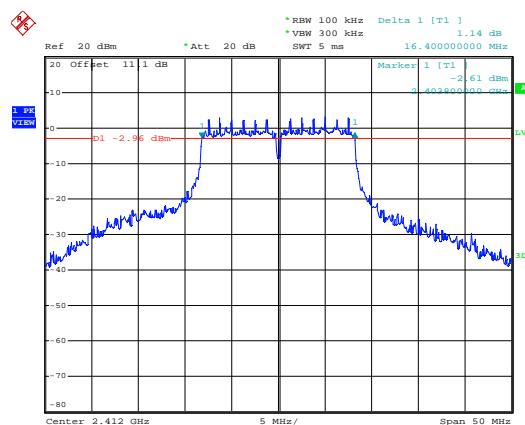
Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (MHz)
IEEE 802.11b (1Mbps)	01	2412	9.50
	06	2437	10.10
	11	2462	10.10
IEEE 802.11g (6Mbps)	01	2412	16.40
	06	2437	16.40
	11	2462	16.40
IEEE 802.11n HT20 (6.5Mbps)	01	2412	17.60
	06	2437	17.60
	11	2462	17.60



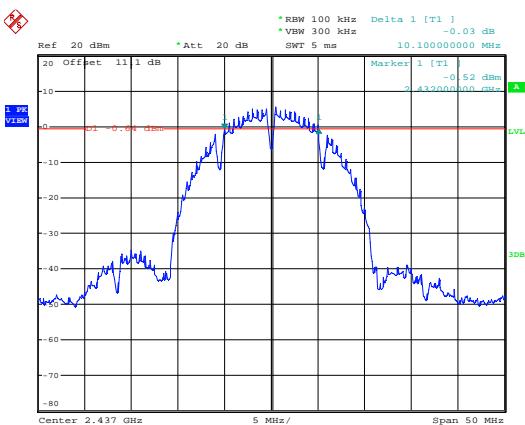
Modulation Type: 802.11b  
CH01



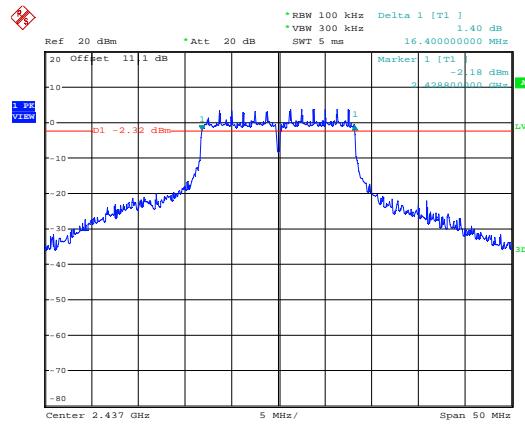
Modulation Type: 802.11g  
CH01



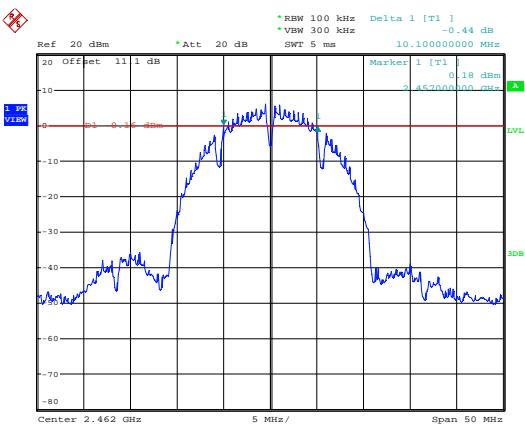
CH06



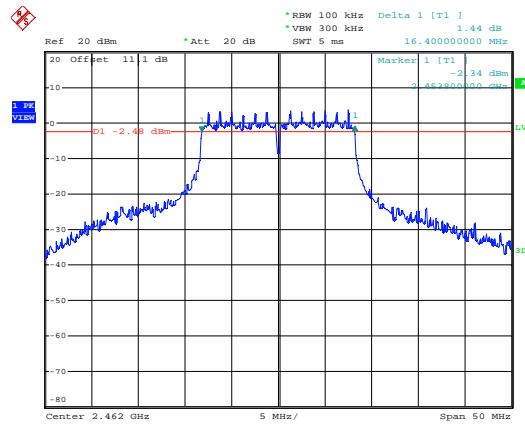
CH06



CH11

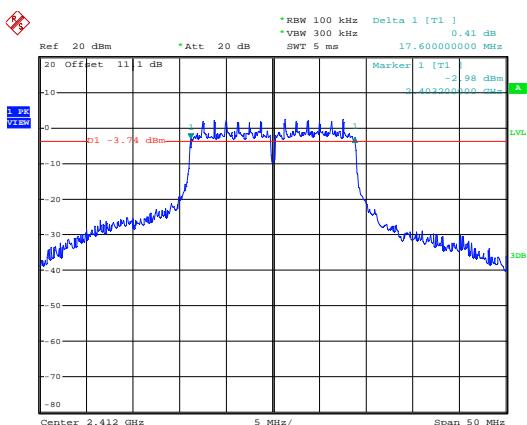


CH11

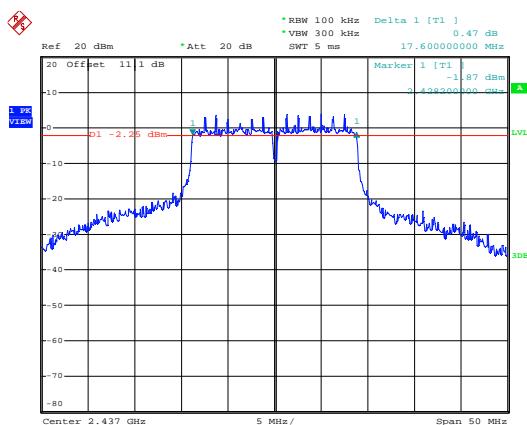




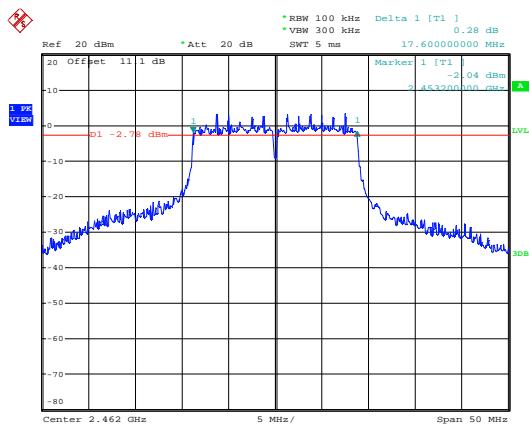
Modulation Type: 802.11n HT20  
CH01



CH06



CH11





## 9. Maximum Peak and Average Output Power

### 9.1 Test Limit

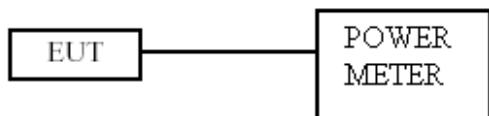
The Maximum Peak Output Power Measurement is 30dBm.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

### 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 : Oct. 12, 2016      Temperature : 24°C  
Atmospheric pressure : 1023 hPa      Humidity : 66%

Modulation Type	Channe	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Output (mW)
IEEE 802.11b (1Mbps)	01	2412	16.04	40.18
	06	2437	16.26	42.27
	11	2462	16.69	46.67
IEEE 802.11g (6Mbps)	01	2412	19.21	83.37
	06	2437	19.56	90.36
	11	2462	19.35	86.10
IEEE 802.11n HT20 (6.5Mbps)	01	2412	19.04	80.17
	06	2437	19.49	88.92
	11	2462	19.52	89.54

Modulation Type	Channe	Frequency (MHz)	Avg. Power Output (dBm)	Avg. Power Output (mW)
IEEE 802.11b (1Mbps)	01	2412	13.46	22.18
	06	2437	13.57	22.75
	11	2462	14.01	25.18
IEEE 802.11g (6Mbps)	01	2412	13.11	20.46
	06	2437	14.01	25.18
	11	2462	13.71	23.50
IEEE 802.11n HT20 (6.5Mbps)	01	2412	12.73	18.75
	06	2437	13.84	24.21
	11	2462	13.81	24.04



## 10. Power Spectral Density

### 10.1 Test Limit

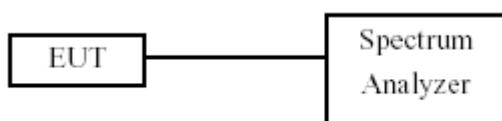
The Maximum of Power Spectral Density Measurement is 8dBm.

If transmitting antennas of directional gain greater than 6 dBi are used, the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

### 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





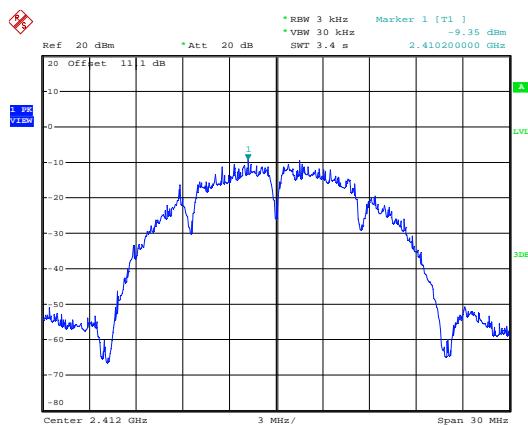
#### 10.4 Test Result and Data

Test Date : Oct. 17, 2016      Temperature : 24°C  
Atmospheric pressure : 1023 hPa      Humidity : 66%

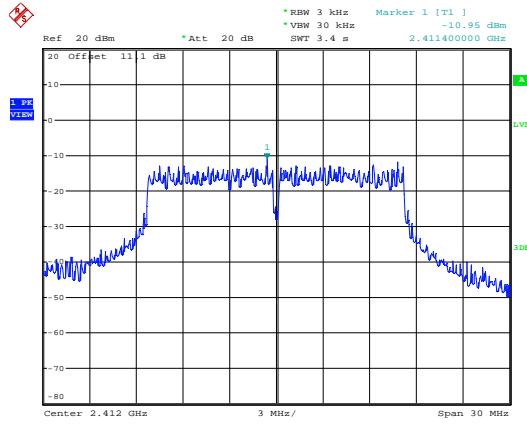
Modulation Type	Channel	Frequency (MHz)	Maximum Power Density of 3 kHz Bandwidth (dBm)
IEEE 802.11b (1Mbps)	01	2412	-9.35
	06	2437	-8.46
	11	2462	-8.65
IEEE 802.11g (6Mbps)	01	2412	-10.95
	06	2437	-9.48
	11	2462	-11.04
IEEE 802.11n HT20 (6.5Mbps)	01	2412	-11.69
	06	2437	-11.86
	11	2462	-12.05



Modulation Type: 802.11b  
CH01



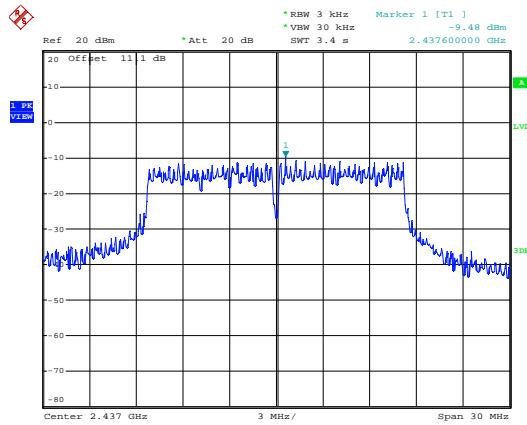
Modulation Type: 802.11g  
CH01



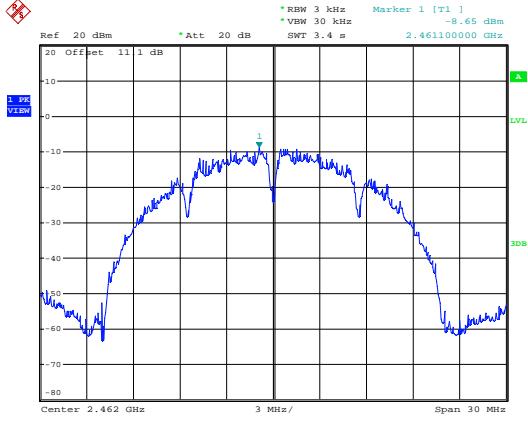
CH06



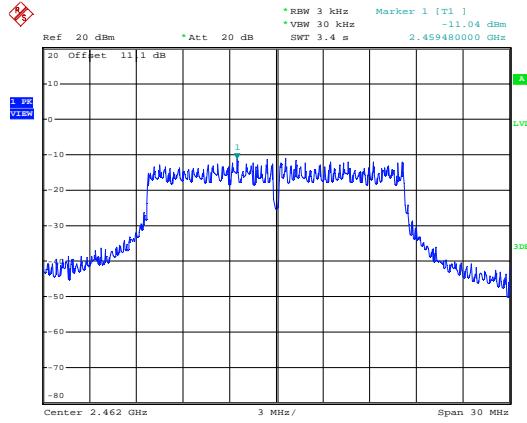
CH06



CH11

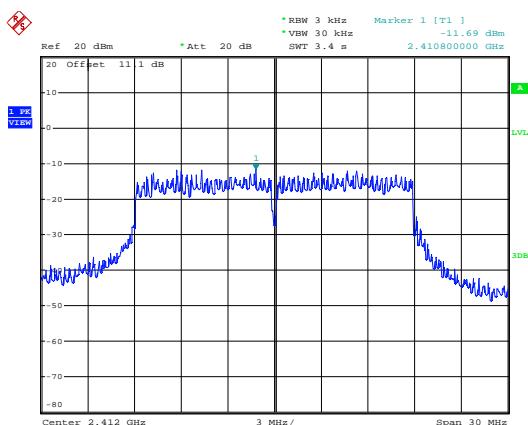


CH11

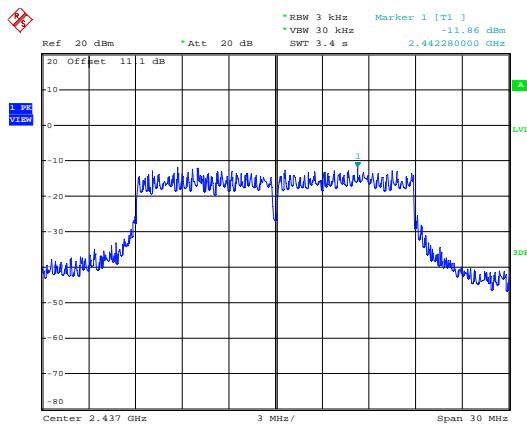




Modulation Type: 802.11n HT20  
CH01



CH06



CH11

