FCC TEST REPORT

according to

FCC Part 15, Subpart C (15.249) / ANSI C63.4: 2009

Applicant	:	Zentan Technology Co., Ltd.
Address	:	NO.92, Hsing-Sheng Road,Chia-Li District 72254 Tainan City, Taiwan R.O.C.
Equipment	:	G2 ANT+ Heart Rate Transmitter
Model No.	:	ZT21AC
FCC ID	:	QSWAHRCS3
Trade Name	:	CARDIOSPORT

Laboratory Accredition

Testing Laboratory
1332

- 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.

Contents

CERTIFICATE OF COMPLIANCE

according to

FCC Part 15, Subpart C (15.249) / ANSI C63.4: 2009

Applicant	:	Zentan Technology Co., Ltd.
Address	:	NO.92, Hsing-Sheng Road,Chia-Li District 72254 Tainan City, Taiwan R.O.C.
Equipment	:	G2 ANT+ Heart Rate Transmitter
Model No.	:	ZT21AC
FCC ID	:	QSWAHRCS3

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4.** The equipment was ***passed*** the test performed according to **FCC Part 15, Subpart C (15.249) / ANSI C63.4: 2009.**

The test was carried out on Oct. 12, 2011 at ***Cerpass Technology Corp.***

Signature

Clark Lin
EMC/RF B.U. Manager

1. Report of Measurements and Examinations

1.1. List of Measurements and Examinations

FCC Rule	Test Type	Result	Remark
15.207	Conducted Emission	Pass	6Vdc from batteries
15.209 15.249	Radiated Emission	Pass	Minimum Passing margin is -7.23dB at832.00 MHz

Note: the information of measurement uncertainty is available upon the customer's request.

2. Test Configuration of Equipment under Test

2.1. Feature of Equipment under Test

- Heart rate range: 30~240 bpm
- Storage Temperature: -40~85°C
- Average Active Current: typical 65uA
- Peak Active Current: 12mA (for RF)
- Stand-by Current: less than 2uA
- Battery: CR2032
- RF Operating Frequency: 2457MHz
- Maximum Output Power: 0~4dBm
- RF Duty Cycle: 0.0008 (ANT + Sport Protocol)

2.2. 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 Heartbeat Simulator and EUT for RF test.

c. The EUT was executed to keep transmitting and receiving data via Wireless.

d. The following test mode were performed for conduction and radiation test:

- TX Mode (Transmitting)
- CH01: 2457MHz

2.3. Description of Test System

Device	Manufacturer	Model No.	Description
Heartbeat Simulator	ZENTAN	N/A	N/A

2.4. History of this test report

■ ORIGINAL.

☐ Additional attachment as following record:

Attachment No.	Issue Date	Description
TEFI1108003	Oct. 20, 2011	Original.

3. General Information of Test

Test Site :	Cerpass Technology Corp. 2F-11, No. 3, Yuan Qu St. (Nankang Software Park), Taipei, Taiwan 115, R.O.C.
Test Site Location (OATS1-SD):	No. 68-1, Shibachong Si, Shihding Township, Taipei County, Taiwan, R.O.C.
FCC Registration Number :	TW1061, TW1056, 390316, 488071
IC Registration Number :	4934B-1, 4934D-1
VCCI Registration Number :	T-543 for Telecommunication Test C-3328 for Conducted emission test R-3428 for Radiated emission test G-97 for Radiated emission test above 1GHz.
Test Voltage:	DC 3V
Test in Compliance with:	FCC Part 15, Subpart C (15.249) / ANSI C63.4: 2009
Frequency Range Investigated:	Conducted Emission Test: from 150kHz to 30 MHz Radiated Emission Test: from 30 MHz to 25000 MHz
Modulation Type:	GFSK
Test Distance:	The test distance of radiated emission above 1GHz from antenna to EUT is 3 M.

4. Test of Conducted Emission

4.1. Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz on the 120 VAC power and return leads of the EUT according to the methods defined in ANSI C63.4-2003 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 2.2. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

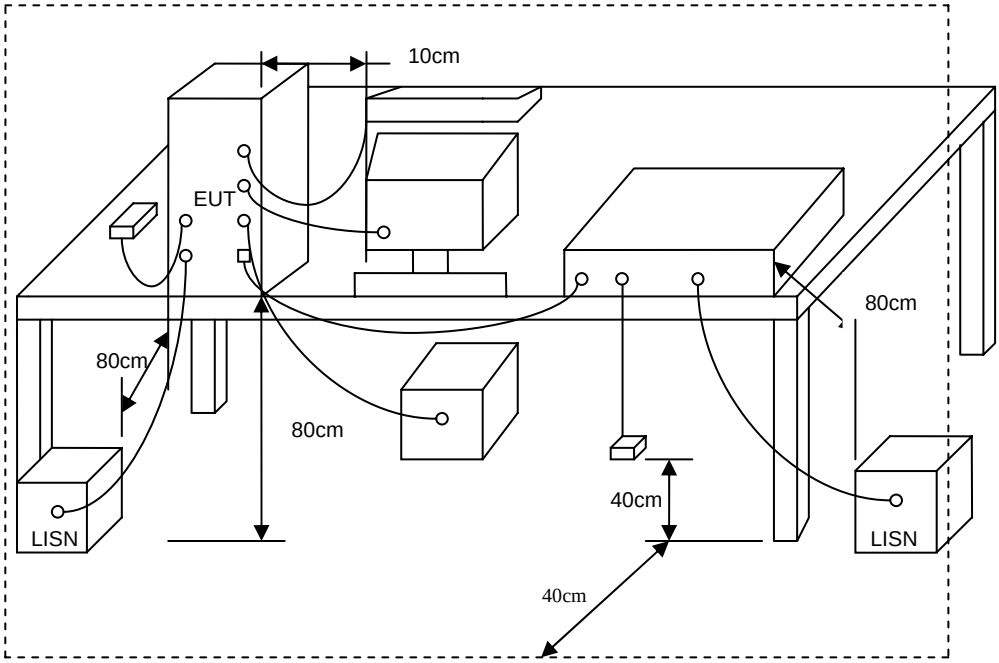
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

4.2. Test Procedures

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
f. Both sides of AC line were checked for maximum conducted interference.
g. The frequency range from 150 kHz to 30 MHz was searched.
h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

4.3. Typical Test Setup



4.4. Test Result and Data

The test item is not applicable, because the EUT is powered from DC.

5. Test of Radiated Emission

5.1. Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

Frequency (MHz)	Distance	Limit (μV/ m)
0.09 ~ 0.490	300m	2400/F(kHz)
0.490 ~ 1.705	30m	24000/ F(kHz)
1.705 ~ 30	30m	30
30 ~ 88	3m	100
88 ~ 216	3m	150
216 ~ 960	3m	200
Above 960	3m	500

Fundamental Frequency:

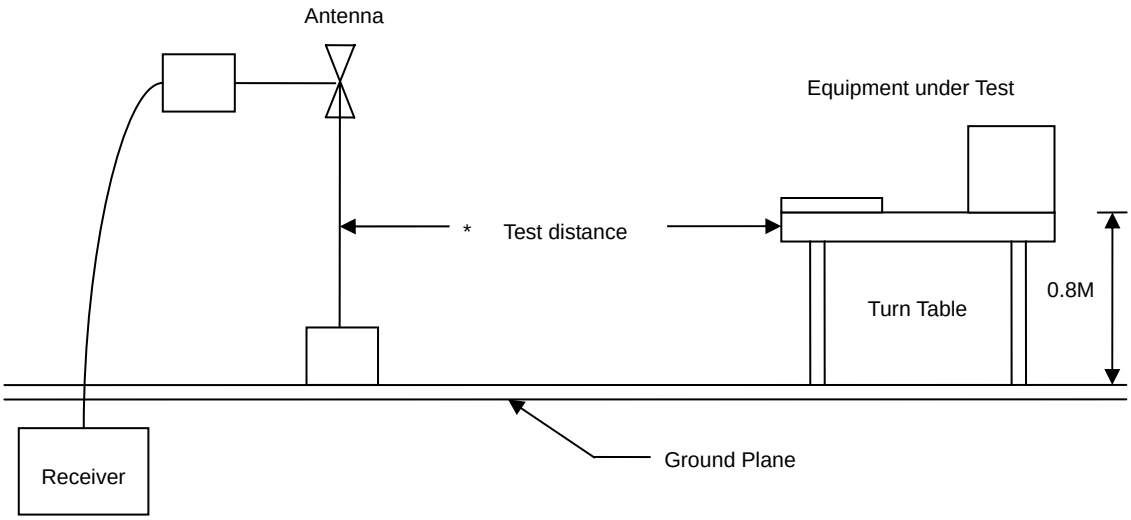
Fundamental Frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

5.2. Test Procedures

a. The EUT was placed on a rotatable table top 0.8 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 beamwidth of the measurement antenna.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

5.3. Typical Test Setup Layout of Radiated Emission



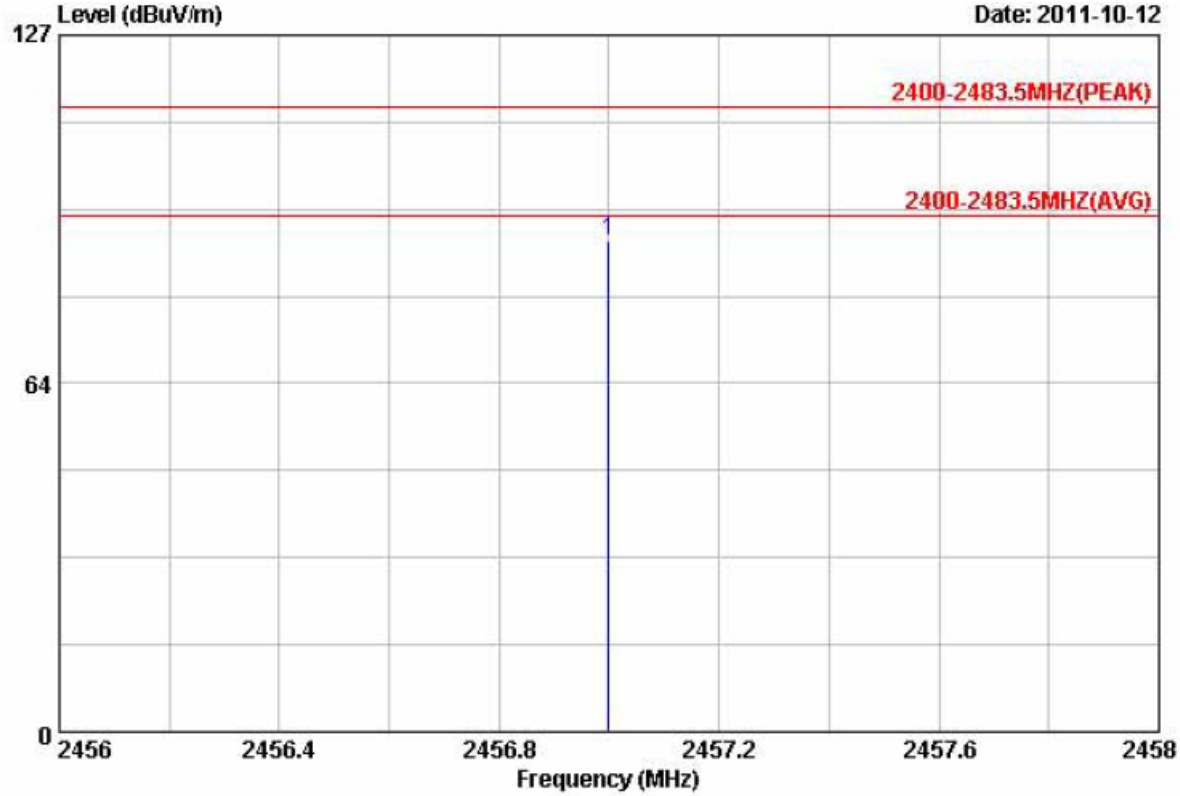
5.4. Measurement equipment

Instrument/Ancillary	Manufacturer	Model No.	Serial No.	Calibration Date	Valid Date
Amplifier	Agilent	8447D	2944A10531	2011/01/21	2012/01/20
Bilog Antenna	Schaffner	CBL6112D	22242	2011/02/09	2012/02/08
EMI Receiver	R&S	ESCI	101200	2011/07/26	2012/07/25
SPECTRUM ANALYZER	R&S	FSP40	100219	2010/11/05	2011/11/04
HORN ANTENNA	EMCO	3115	31589	2011/05/02	2012/05/01
Preamplifier	Agilent	8449B	3008A01954	2011/03/02	2012/03/01

5.5. Test Result and Data

5.5.1. **Test Result of Fundamental Emission**

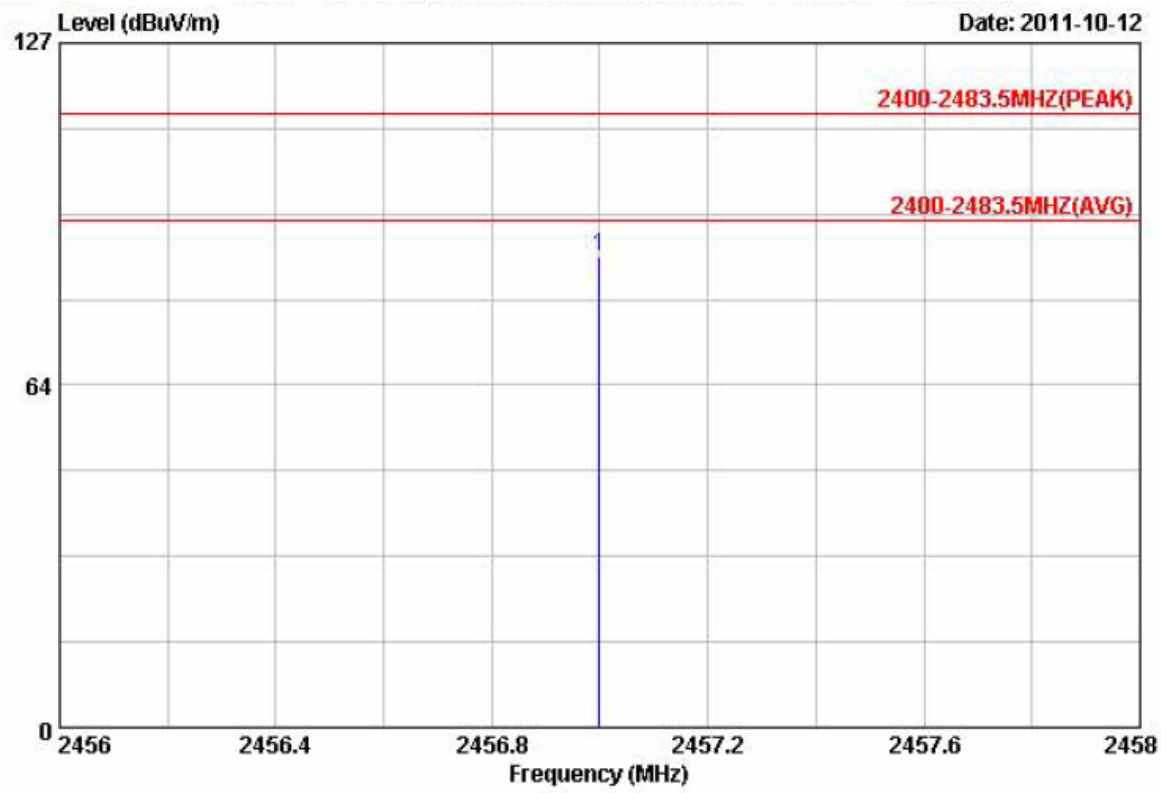
Power	:	DC 3V	Pol/Phase	:	VERTICAL
Test Mode	:	Transmit	Temperature	:	26 °C
Operation Channel	:	1	Humidity	:	57 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1021 hPa



Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2457.00	90.70	-1.13	89.57	114.00	-24.43	Peak	100	360

Notes:
1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier

Power	:	DC 3V	Pol/Phase	:	HORIZONTAL
Test Mode	:	Transmit	Temperature	:	26 °C
Operation Channel	:	1	Humidity	:	57 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1021 hPa

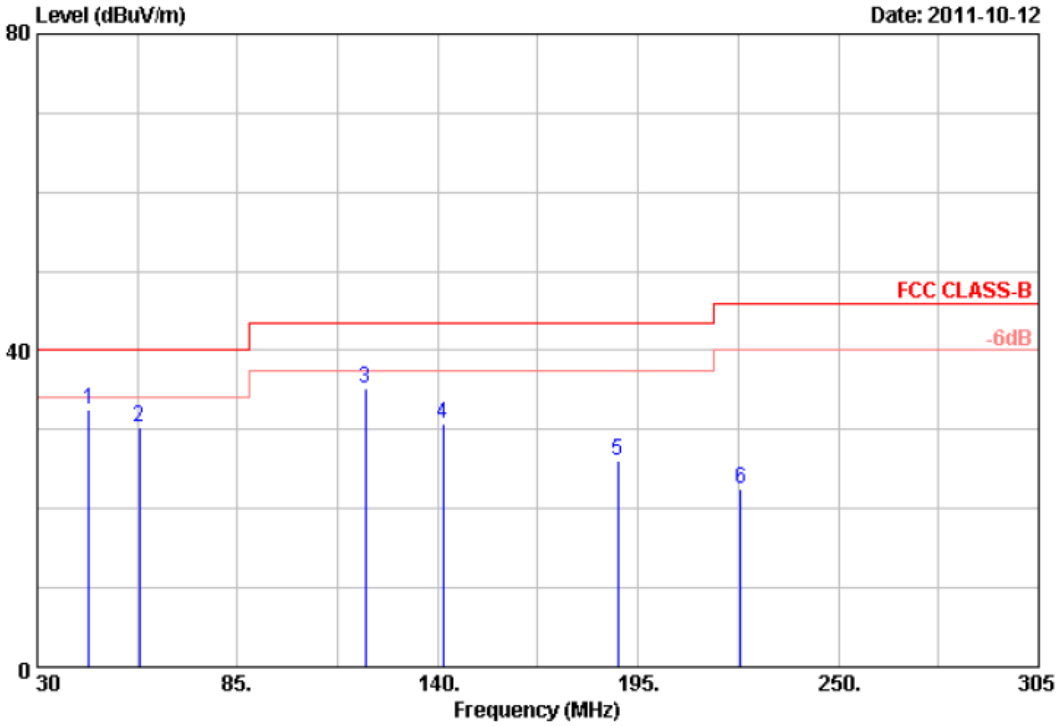


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2457.00	86.77	0.51	87.28	114.00	-26.72	Peak	100	50

Notes:
1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier

5.5.2. **Test Result of Unwanted Spurious emission**

Power	:	DC 3V	Pol/Phase	:	VERTICAL
Test Mode	:	Transmit	Temperature	:	23 °C
Operation Channel	:	1	Humidity	:	65 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1021 hPa

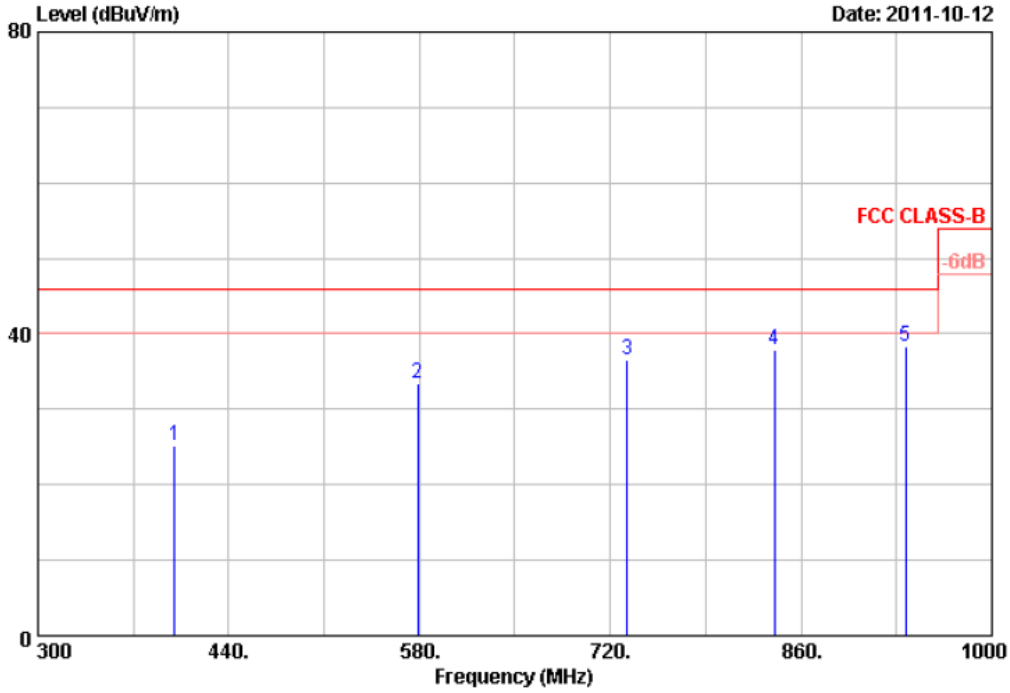


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	44.30	29.35	3.12	32.47	40.00	-7.53	Peak	100	360
2	58.05	34.47	-4.19	30.28	40.00	-9.72	Peak	100	360
3	120.20	27.48	7.80	35.28	43.50	-8.22	Peak	100	360
4	141.38	28.98	1.87	30.85	43.50	-12.65	Peak	100	360
5	189.50	25.89	0.27	26.16	43.50	-17.34	Peak	100	360
6	223.05	23.89	-1.49	22.40	46.00	-23.60	Peak	100	360

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. All emission below 1GHz at 802.11b/g/n mode are all the same,so the 802.11g/n mode chosen as representative in final test.
5. According to technical experiences,all spurious emission of 802.11g/n mode at channel 1,6,11 or 3,6,9(for HT40) are almost the same below 1GHz,so that the channel 1 or 3(for HT40)was chosen as representative in final test.
6. The data is worse case.

Power	:	DC 3V		Pol/Phase	:	VERTICAL	
Test Mode	:	Transmit		Temperature	:	26 °C	
Operation Channel	:	1		Humidity	:	57 %	
Modulation Type	:	GFSK		Atmospheric Pressure	:	1021 hPa	

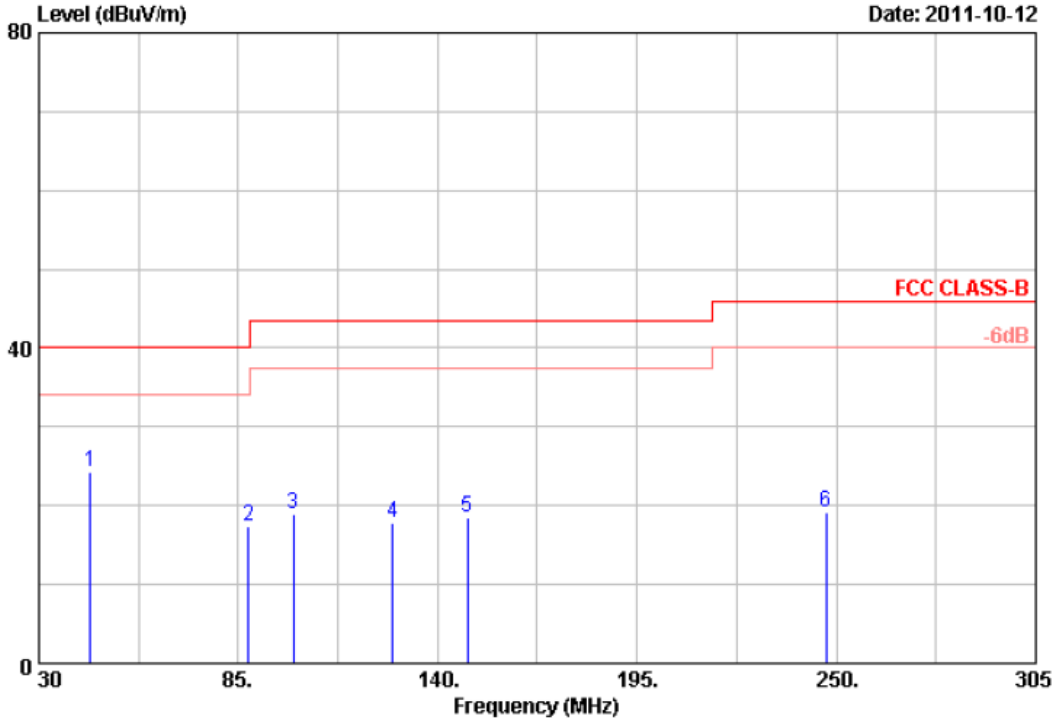


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	400.10	24.53	0.55	25.08	46.00	-20.92	Peak	100	0
2	578.60	24.94	8.46	33.40	46.00	-12.60	Peak	100	0
3	732.60	25.51	11.10	36.61	46.00	-9.39	Peak	100	0
4	840.40	22.26	15.58	37.84	46.00	-8.16	Peak	100	0
5	937.00	23.44	14.95	38.39	46.00	-7.61	QP	100	0

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. All emission below 1GHz at 802.11b/g/n mode are all the same,so the 802.11g/n mode chosen as representative in final test.
5. According to technical experiences,all spurious emission of 802.11g/n mode at channel 1,6,11 or 3,6,9(for HT40) are almost the same below 1GHz,so that the channel 1 or 3(for HT40)was chosen as representative in final test.
6. The data is worse case.

Power	:	DC 3V		Pol/Phase	:	HORIZONTAL	
Test Mode	:	Transmit		Temperature	:	26 °C	
Operation Channel	:	1		Humidity	:	57 %	
Modulation Type	:	GFSK		Atmospheric Pressure	:	1021 hPa	

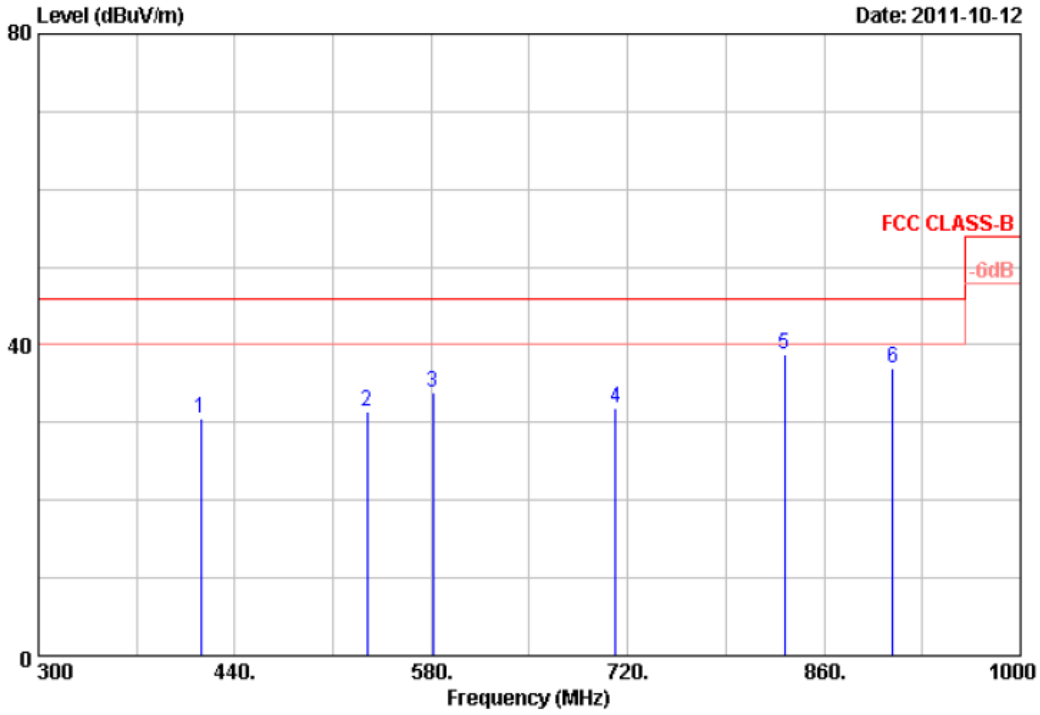


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	44.30	29.48	-5.29	24.19	40.00	-15.81	Peak	100	360
2	87.75	29.20	-11.77	17.43	40.00	-22.57	Peak	100	360
3	100.13	26.90	-8.02	18.88	43.50	-24.62	Peak	100	360
4	127.63	26.96	-9.07	17.89	43.50	-25.61	Peak	100	360
5	148.25	26.53	-7.93	18.60	43.50	-24.90	Peak	100	360
6	247.25	24.81	-5.54	19.27	46.00	-26.73	Peak	100	360

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. All emission below 1GHz at 802.11b/g/n mode are all the same,so the 802.11g/n mode chosen as representative in final test.
5. According to technical experiences,all spurious emission of 802.11g/n mode at channel 1,6,11 or 3,6,9(for HT40) are almost the same below 1GHz,so that the channel 1 or 3(for HT40)was chosen as representative in final test.
6. The data is worse case.

Power	:	DC 3V		Pol/Phase	:	HORIZONTAL
Test Mode	:	Transmit		Temperature	:	26 °C
Operation Channel	:	1		Humidity	:	57 %
Modulation Type	:	GFSK		Atmospheric Pressure	:	1021 hPa

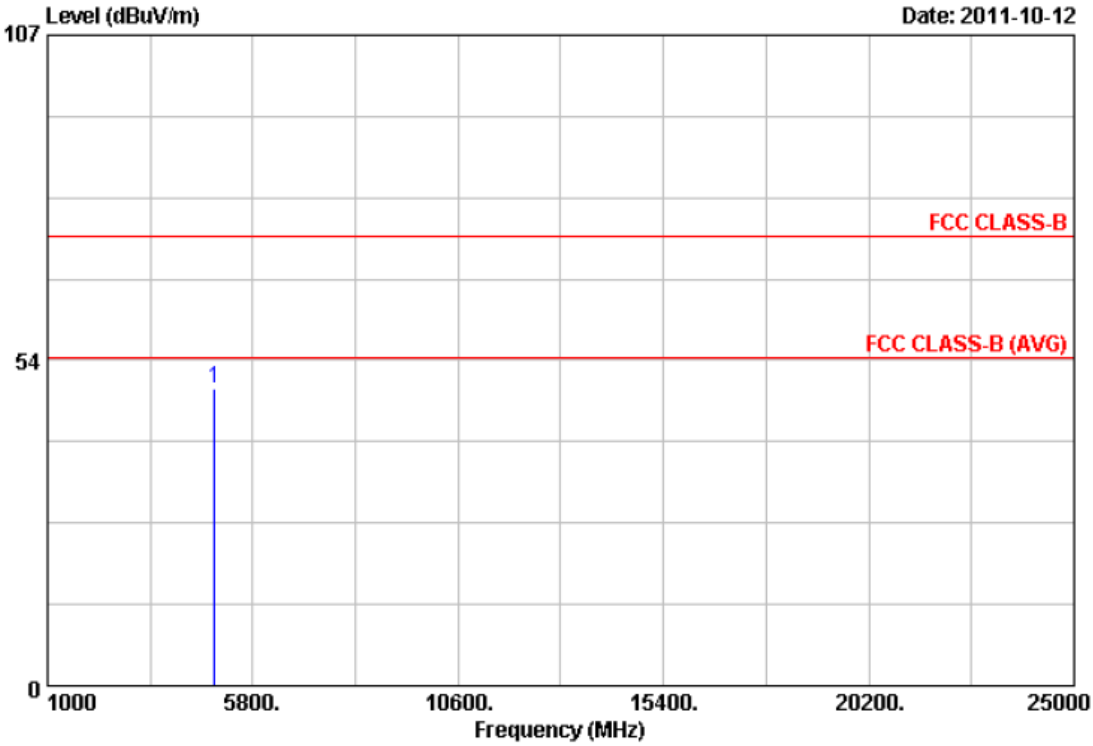


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	415.50	31.00	-0.54	30.46	46.00	-15.54	Peak	100	0
2	534.50	25.99	5.36	31.35	46.00	-14.65	Peak	100	0
3	581.40	24.88	8.91	33.79	46.00	-12.21	Peak	100	0
4	711.60	24.95	6.94	31.89	46.00	-14.11	Peak	100	0
5	832.00	25.20	13.57	38.77	46.00	-7.23	Peak	100	0
6	909.00	25.26	11.77	37.03	46.00	-8.97	Peak	100	0

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. All emission below 1GHz at 802.11b/g/n mode are all the same,so the 802.11g/n mode chosen as representative in final test.
5. According to technical experiences,all spurious emission of 802.11g/n mode at channel 1,6,11 or 3,6,9(for HT40) are almost the same below 1GHz,so that the channel 1 or 3(for HT40)was chosen as representative in final test.
6. The data is worse case.

Power	:	DC 3V	Pol/Phase	:	VERTICAL
Test Mode	:	Transmit	Temperature	:	30 °C
Operation Channel	:	1	Humidity	:	51 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1021 hPa

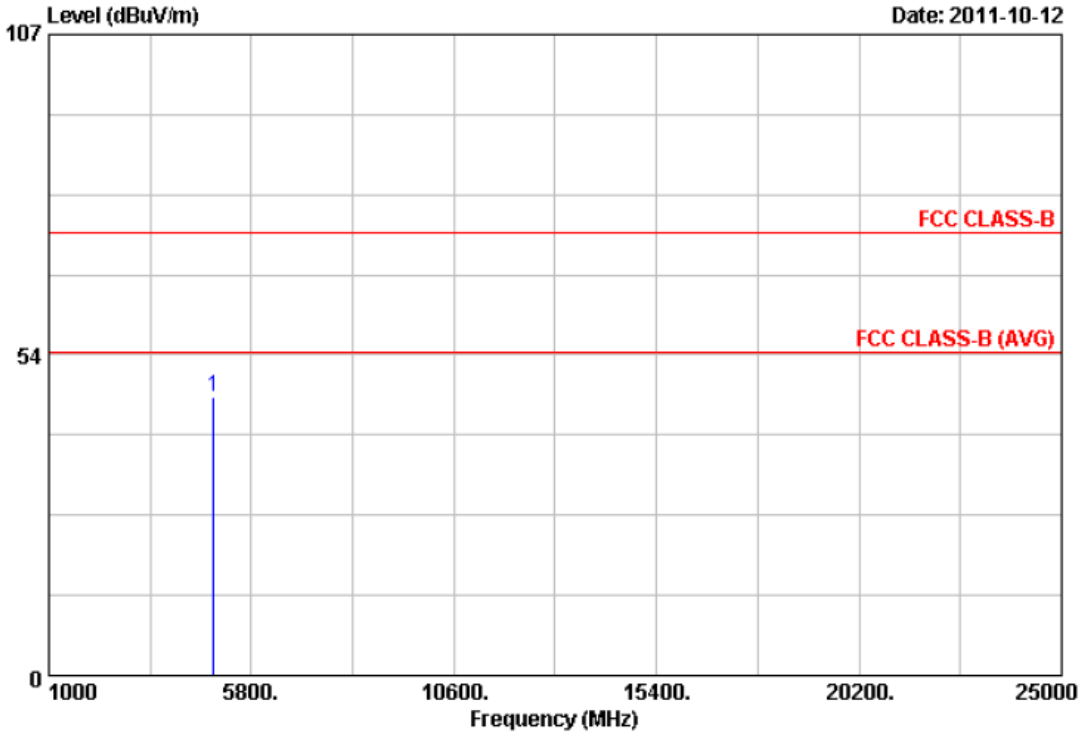


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	4914.00	41.86	6.92	48.78	74.00	-25.22	Peak	100	142

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.

Power	:	DC 3V	Pol/Phase	:	HORIZONTAL
Test Mode	:	Transmit	Temperature	:	30 °C
Operation Channel	:	1	Humidity	:	51 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1021 hPa



Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	4914.00	41.68	4.93	46.61	74.00	-27.39	Peak	100	142

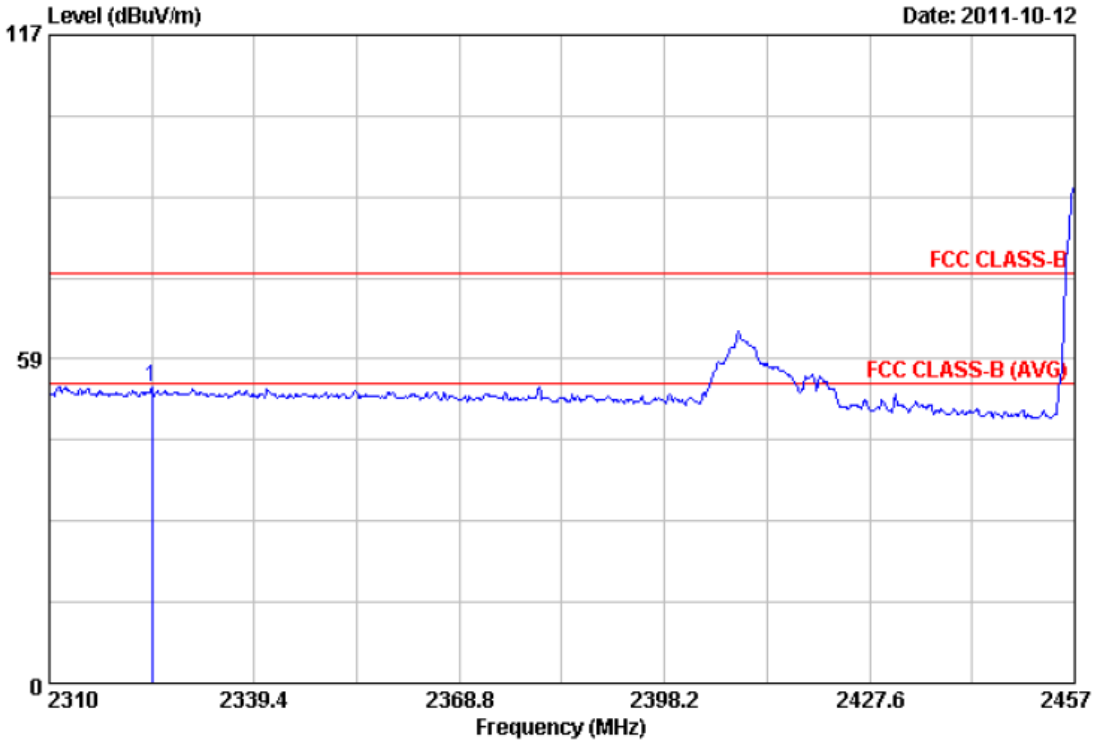
Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.

Test engineer: Ben

5.5.3. **Test Result of Band Edges Measurement**

Power	:	DC 3V	Pol/Phase	:	VERTICAL
Test Mode	:	Transmit	Temperature	:	29 °C
Operation Channel	:	1	Humidity	:	54 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1020 hPa

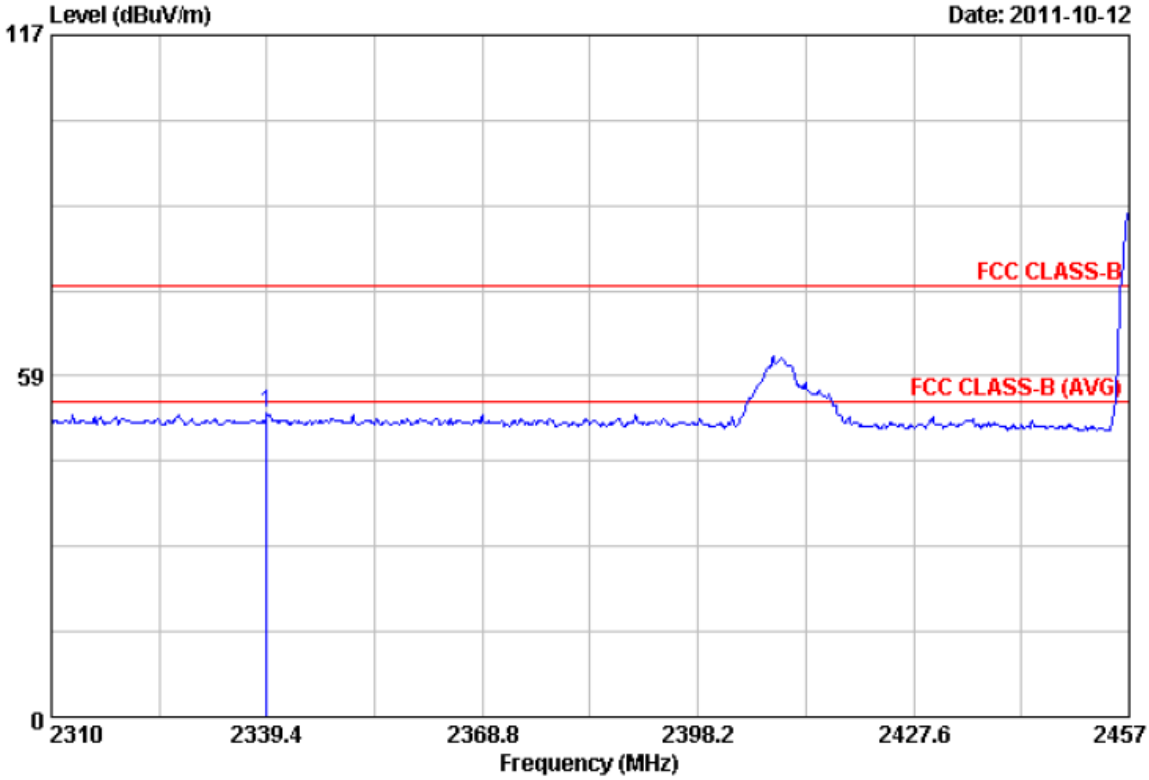


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2324.70	50.33	3.17	53.50	74.00	-20.50	Peak	100	28

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.

Power	:	DC 3V	Pol/Phase	:	VERTICAL
Test Mode	:	Transmit	Temperature	:	29 °C
Operation Channel	:	1	Humidity	:	54 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1020 hPa

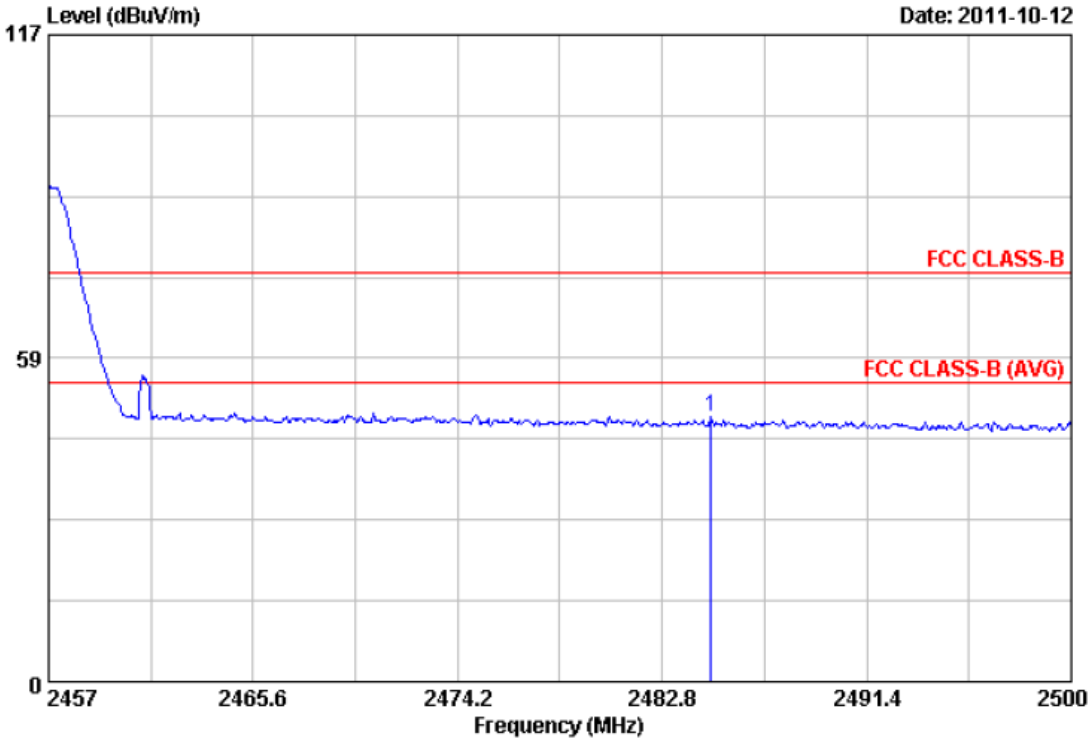


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2339.40	50.33	1.66	51.99	74.00	-22.01	Peak	100	360

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.

Power	:	DC 3V	Pol/Phase	:	HORIZONTAL
Test Mode	:	Transmit	Temperature	:	29 °C
Operation Channel	:	1	Humidity	:	54 %
Modulation Type	:	GFSK	Atmospheric Pressure	:	1020 hPa

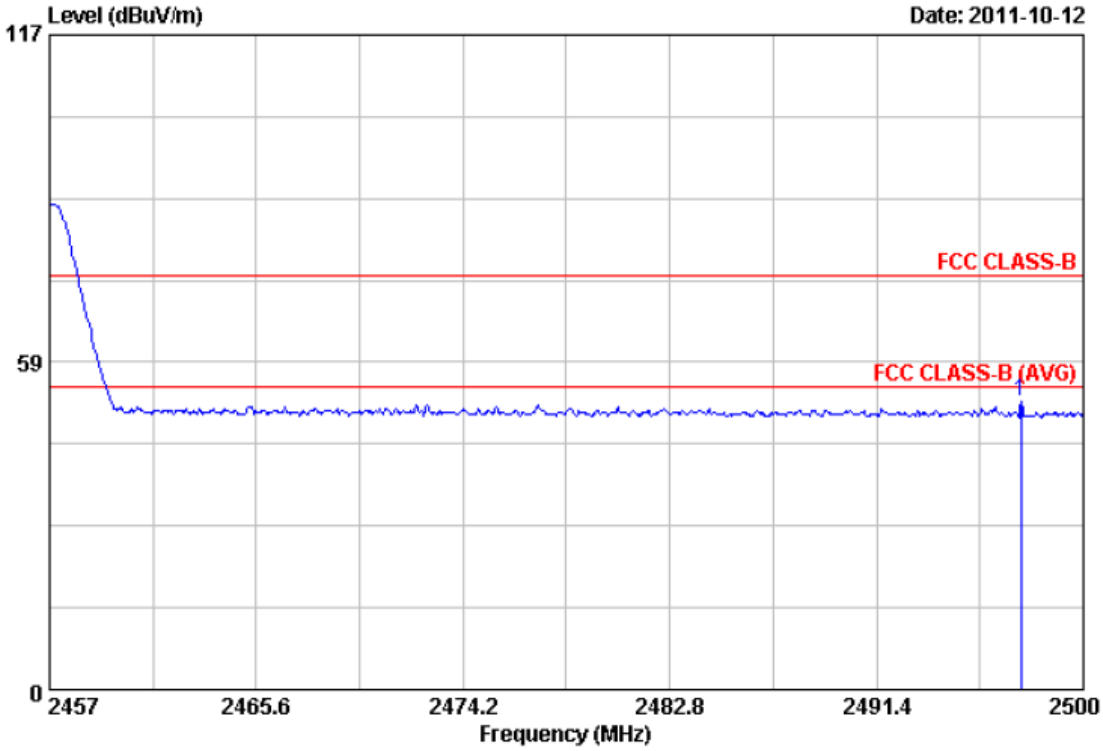


Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2484.86	50.53	-2.62	47.91	74.00	-26.09	Peak	100	0

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.

Power	:	DC 3V		Pol/Phase	:	HORIZONTAL
Test Mode	:	Transmit		Temperature	:	29 °C
Operation Channel	:	1		Humidity	:	54 %
Modulation Type	:	GFSK		Atmospheric Pressure	:	1020 hPa



Item	Freq	Read Value	Factor	Result	Limit	Margin	Remark	Ant Pos	Tab Pos
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	Deg
1	2497.42	51.71	-0.11	51.60	74.00	-22.40	Peak	100	360

Notes:

1. Result = Read Value + Factor
2. Factor = Antenna Factor + Cable Loss - Amplifier
3. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHz for Peak detection and Quasi-peak detection at frequency below 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average detection at frequency above 1GHz.
6. The other emissions is too low to be measured.
7. The data is worse case.