

FCC Part 15C Measurement and Test Report

For

Shenzhen CooSpo Tech Co.,Ltd

Room 401,Lingyun Building,Honglang North 2nd Rd.,Bao`an District,

Shenzhen,Guangdong,China(Mainland)

FCC ID: 2AF9HBK8

FCC Rule(s):	<u>FCC Part 15.249</u>
Product Description:	<u>bike speed/cadence sensor</u>
Tested Model:	<u>BK8</u>
Report No.:	<u>STR16048083I-2</u>
Tested Date:	<u>2016-04-08 to 2016-04-13</u>
Issued Date:	<u>2016-04-13</u>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	4
1.5 EUT SETUP AND TEST MODE.....	5
1.6 MEASUREMENT UNCERTAINTY.....	5
1.7 TEST EQUIPMENT LIST AND DETAILS.....	6
2. SUMMARY OF TEST RESULTS.....	7
3. ANTENNA REQUIREMENTS.....	8
3.1 STANDARD APPLICABLE.....	8
3.2 TEST RESULT.....	8
4. RADIATED EMISSIONS.....	9
4.1 STANDARD APPLICABLE.....	9
4.2 TEST PROCEDURE.....	9
4.3 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	11
4.4 ENVIRONMENTAL CONDITIONS.....	11
4.5 SUMMARY OF TEST RESULTS/PLOTS.....	11
5. OUT OF BAND EMISSIONS.....	20
5.1 STANDARD APPLICABLE.....	20
5.2 TEST PROCEDURE.....	20
5.3 ENVIRONMENTAL CONDITIONS.....	20
5.4 SUMMARY OF TEST RESULTS/PLOTS.....	20
6. EMISSION BANDWIDTH.....	23
6.1 STANDARD APPLICABLE.....	23
6.2 TEST PROCEDURE.....	23
6.3 ENVIRONMENTAL CONDITIONS.....	23
6.4 SUMMARY OF TEST RESULTS/PLOTS.....	23

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen CooSpo Tech Co.,Ltd
Address of applicant: Room 401,Lingyun Building,Honglang North 2nd Rd.,
Bao`an District, Shenzhen,Guangdong, China
(Mainland)
Manufacturer: Shenzhen CooSpo Tech Co.,Ltd
Address of manufacturer: Room 401,Lingyun Building,Honglang North 2nd Rd.,
Bao`an District, Shenzhen,Guangdong, China
(Mainland)

General Description of EUT	
Product Name:	bike speed/cadence sensor
Trade Name:	Coospo
Model No.:	BK8
Adding Model(s):	/
Rated Voltage:	DC 3V by one CR2032 battery
Power Adapter Model:	/
<i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model BK8, but the circuit and the electronic construction do not change, declared by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	2403-2480MHz
Max. Field Strength:	80.70dBuV/m
Data Rate:	/
Modulation:	GFSK
Quantity of Channels:	78
Channel Separation:	1MHz
Antenna Type:	PCB Antenna
Antenna Gain:	1.75dBi
Lowest Internal Frequency of EUT:	32.768kHz
Device Category:	Portable device

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen CooSpo Tech Co.,Ltd in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.4 Test Facility

FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

CNAS Registration No.: L4062

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101).

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	2403MHz
TM2	Middle Channel	2442MHz
TM3	High Channel	2480MHz

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Conducted Emissions	Conducted	$\pm 2.88\text{dB}$
Transmitter Spurious Emissions	Radiated	$\pm 5.1\text{dB}$

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16
Horn Antenna	ETS	3116B	00088203	2015-06-17	2016-06-16
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-06-17	2016-06-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2015-06-17	2016-06-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-06-17	2016-06-16

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.209(a)(f)	Radiated Spurious Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

3. Antenna Requirements

3.1 Standard Applicable

According to FCC Part 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of Harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

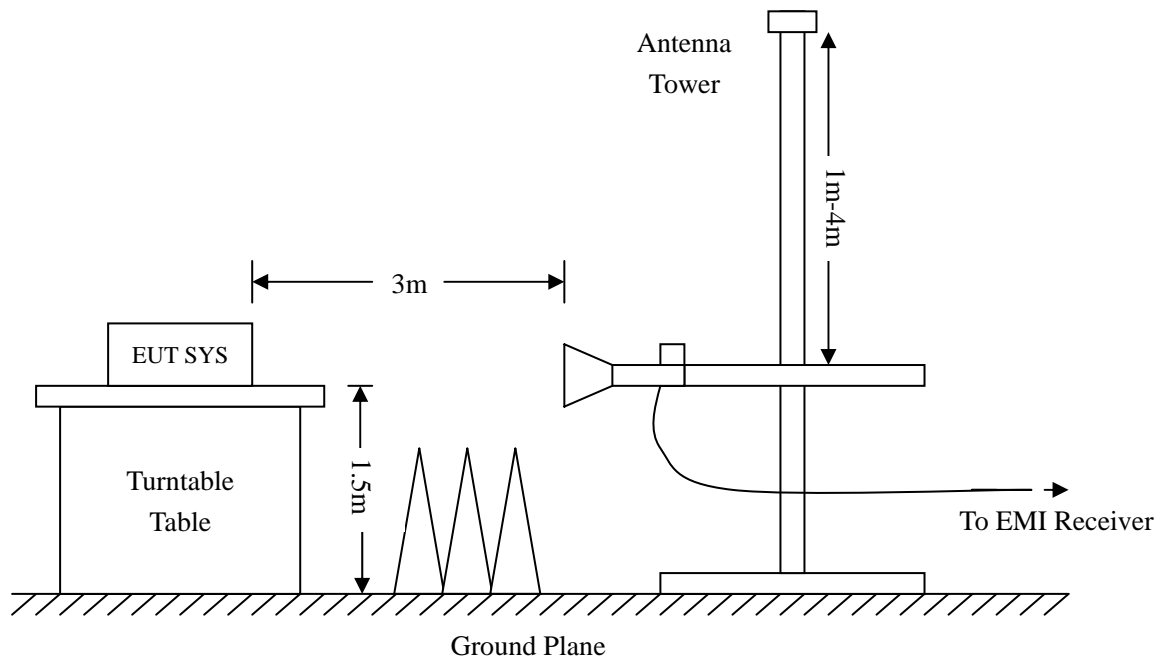
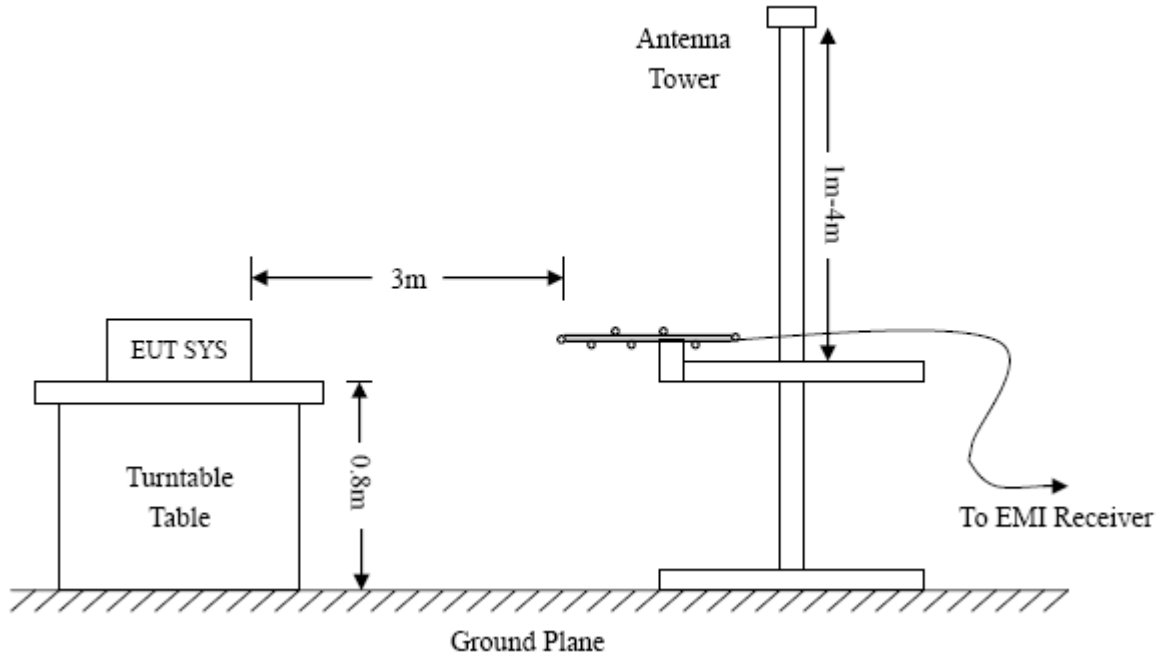
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

4.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.



Frequency :9kHz-30MHz
 RBW=10KHz,
 VBW =30KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak

Frequency :30MHz-1GHz
 RBW=120KHz,
 VBW=300KHz
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, QP

Frequency :Above 1GHz
 RBW=1MHz,
 VBW=3MHz(Peak), 10Hz(AV)
 Sweep time= Auto
 Trace = max hold
 Detector function = peak, AV

4.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.4 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

4.5 Summary of Test Results/Plots

According to the data below, the [FCC Part 15.205](#), [15.209](#) and [15.249](#) standards, and had the worst margin of:

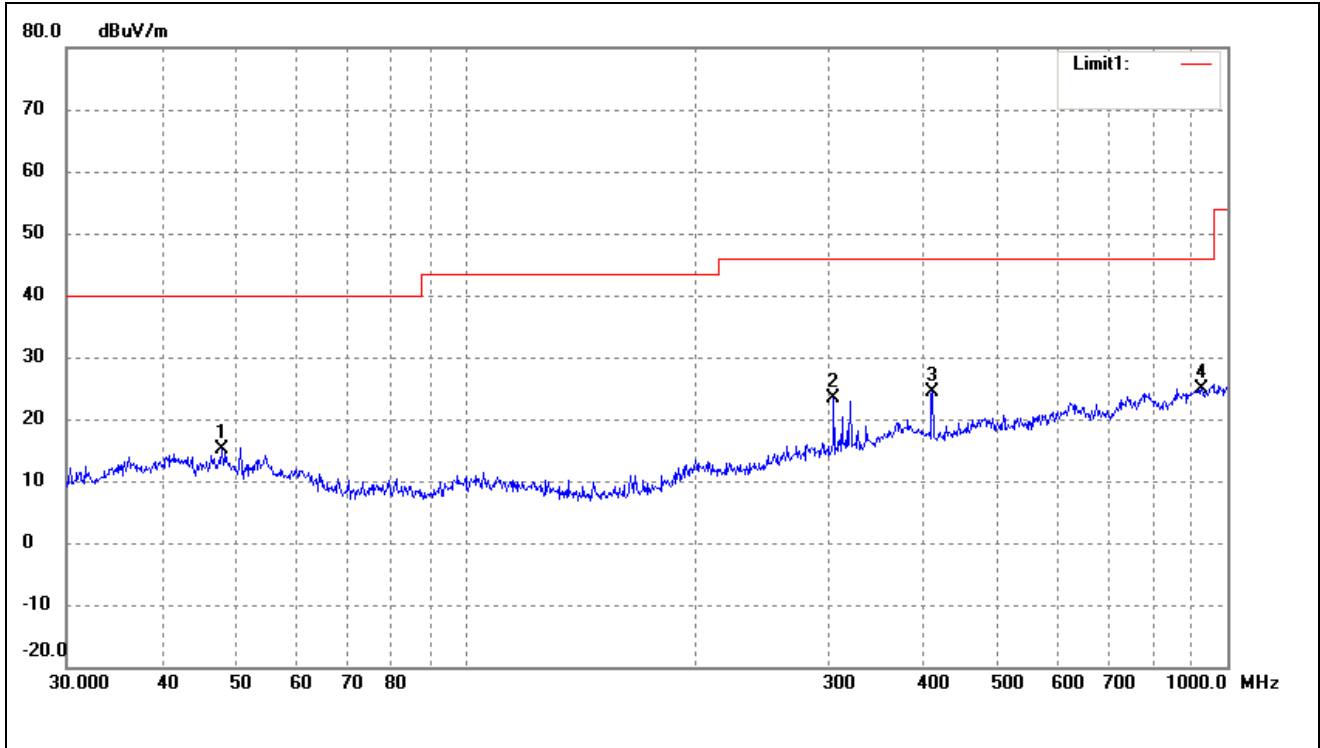
-20.57 dB at 185.7882 MHz in the Vertical polarization, Middle Channel, 9 kHz to 25 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Plot of Radiated Emissions Test Data (30MHz to 1GHz)

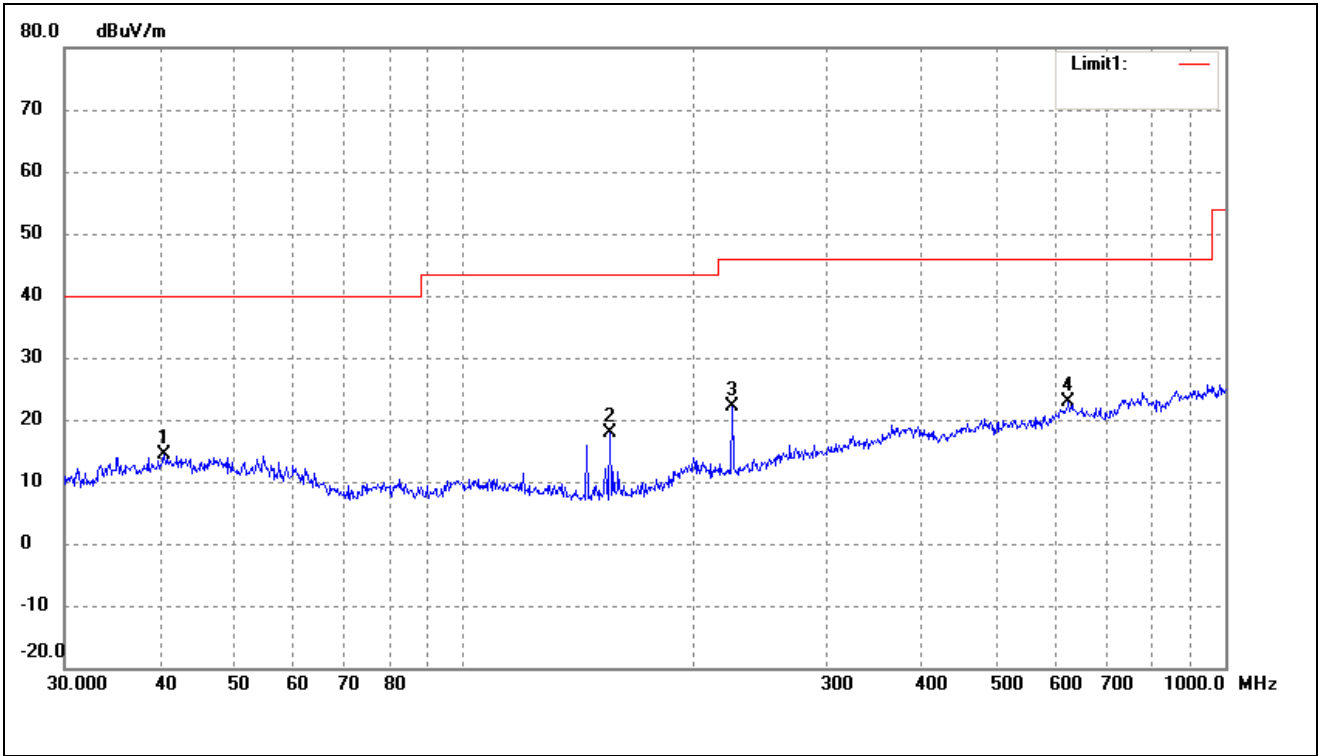
EUT: *Bike speed/cadence sensor*
 Tested Model: *BK8*
 Operating Condition: *Transmitting Low Channel (2403MHz)*
 Comment: *DC 3.0V Battery*

Test Specification: *Horizontal*



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	47.9940	23.34	-8.19	15.15	40.00	-24.85	264	100	peak
2	304.6100	28.91	-5.41	23.50	46.00	-22.50	100	200	peak
3	410.3825	27.69	-3.32	24.37	46.00	-21.63	287	100	peak
4	925.7563	21.04	3.83	24.87	46.00	-21.13	100	100	peak

Test Specification: Vertical

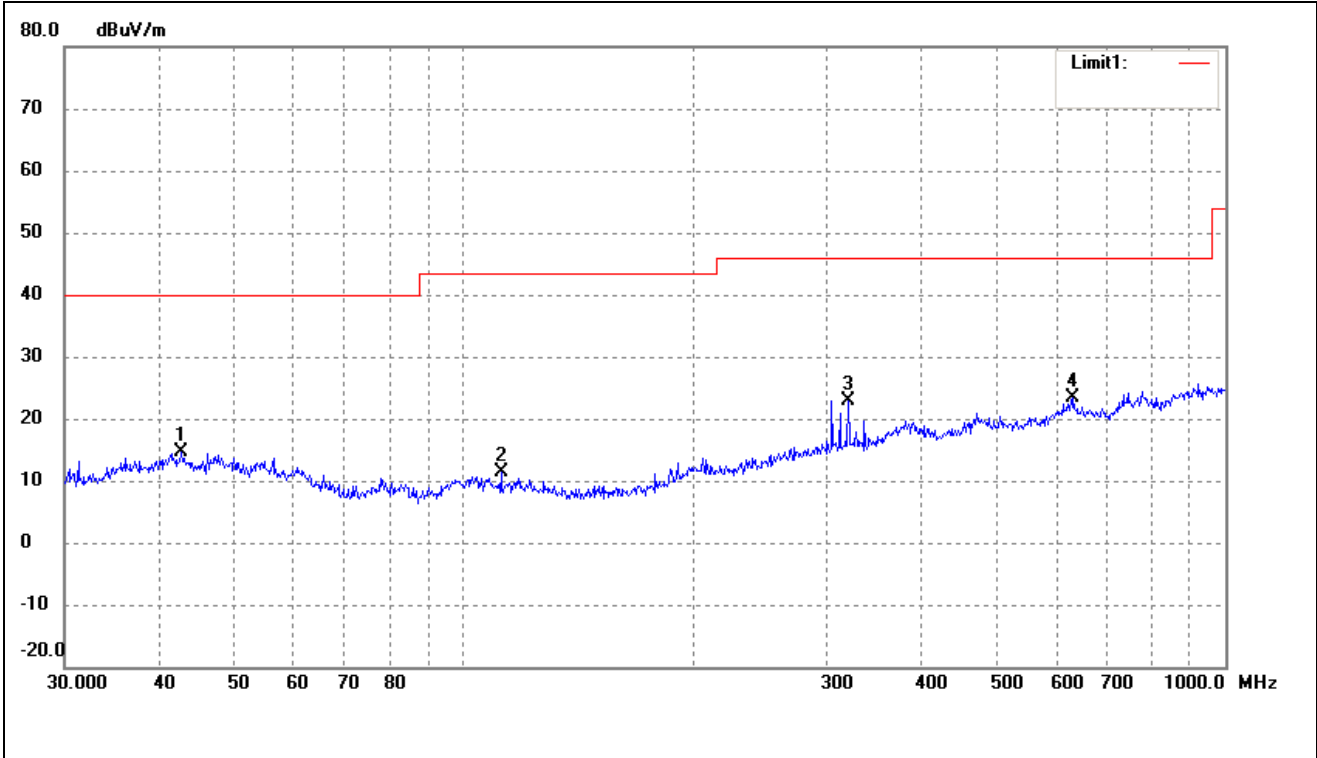


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	40.5591	22.05	-7.70	14.35	40.00	-25.65	234	100	peak
2	155.9101	30.27	-12.34	17.93	43.50	-25.57	118	100	peak
3	225.3080	30.90	-8.71	22.19	46.00	-23.81	164	100	peak
4	622.8900	21.81	1.16	22.97	46.00	-23.03	164	100	peak

Operating Condition: Transmitting Middle Channel (2441MHz)

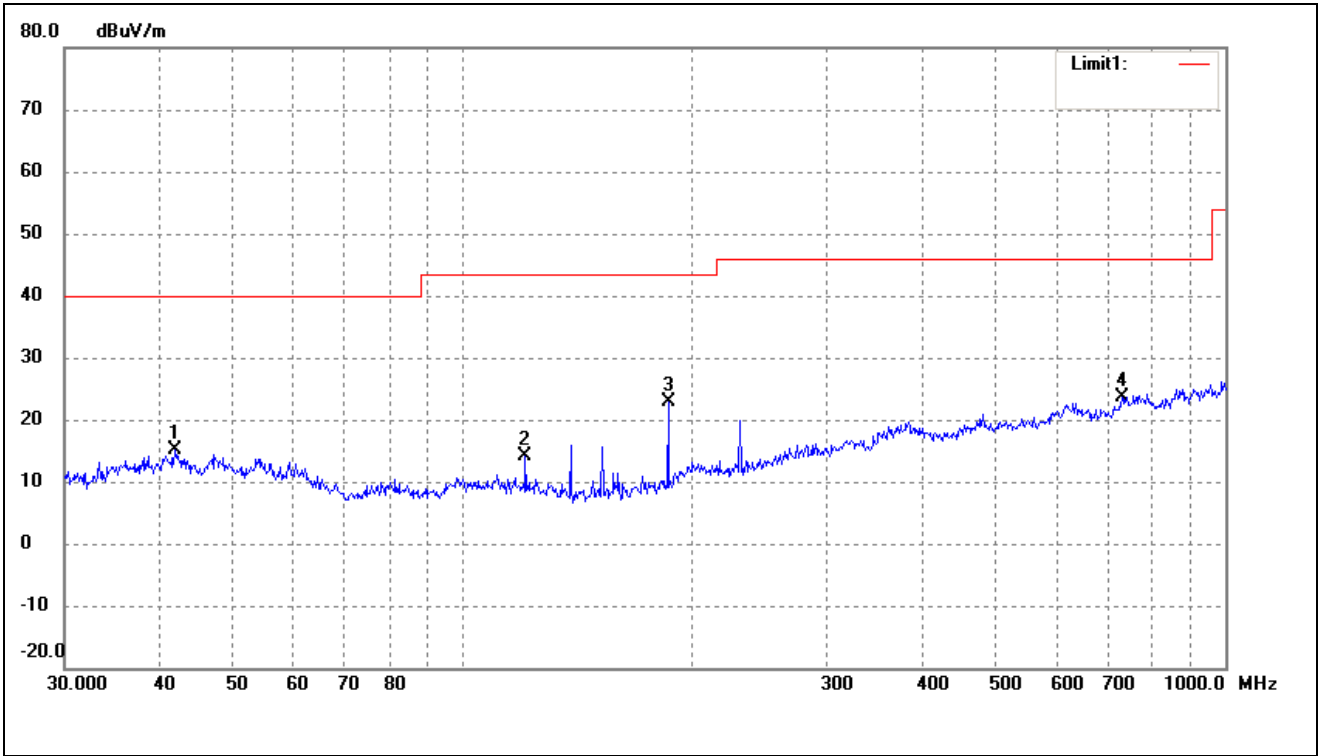
Comment: DC 3V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	42.7496	22.38	-7.84	14.54	40.00	-25.46	162	100	peak
2	112.1305	22.71	-11.23	11.48	43.50	-32.02	200	100	peak
3	319.9370	27.55	-4.62	22.93	46.00	-23.07	100	100	peak
4	631.6884	22.35	0.93	23.28	46.00	-22.72	100	100	peak

Test Specification: Vertical

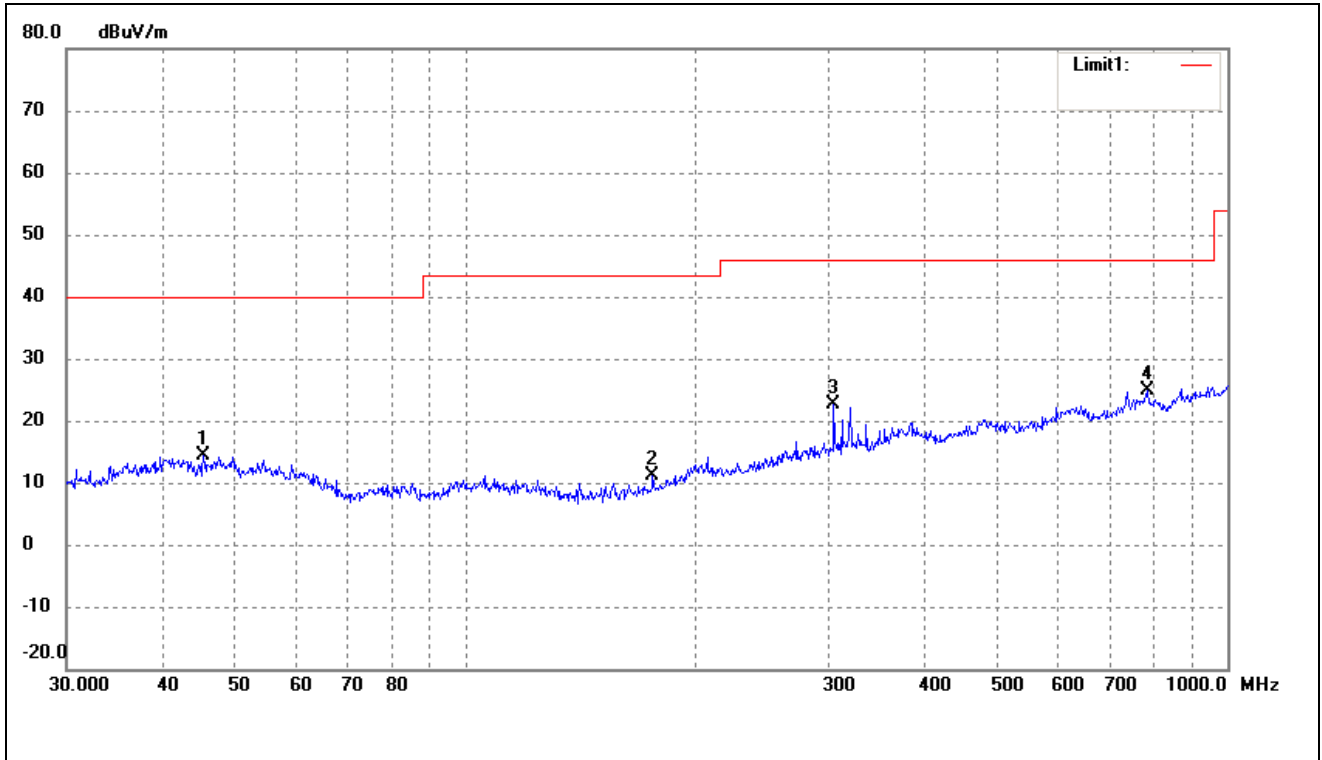


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	41.8596	22.95	-7.79	15.16	40.00	-24.84	240	100	peak
2	120.6991	25.67	-11.47	14.20	43.50	-29.30	187	100	peak
3	185.7882	33.51	-10.58	22.93	43.50	-20.57	220	100	peak
4	731.9203	21.93	1.66	23.59	46.00	-22.41	220	100	peak

Operating Condition: Transmitting High Channel (2480MHz)

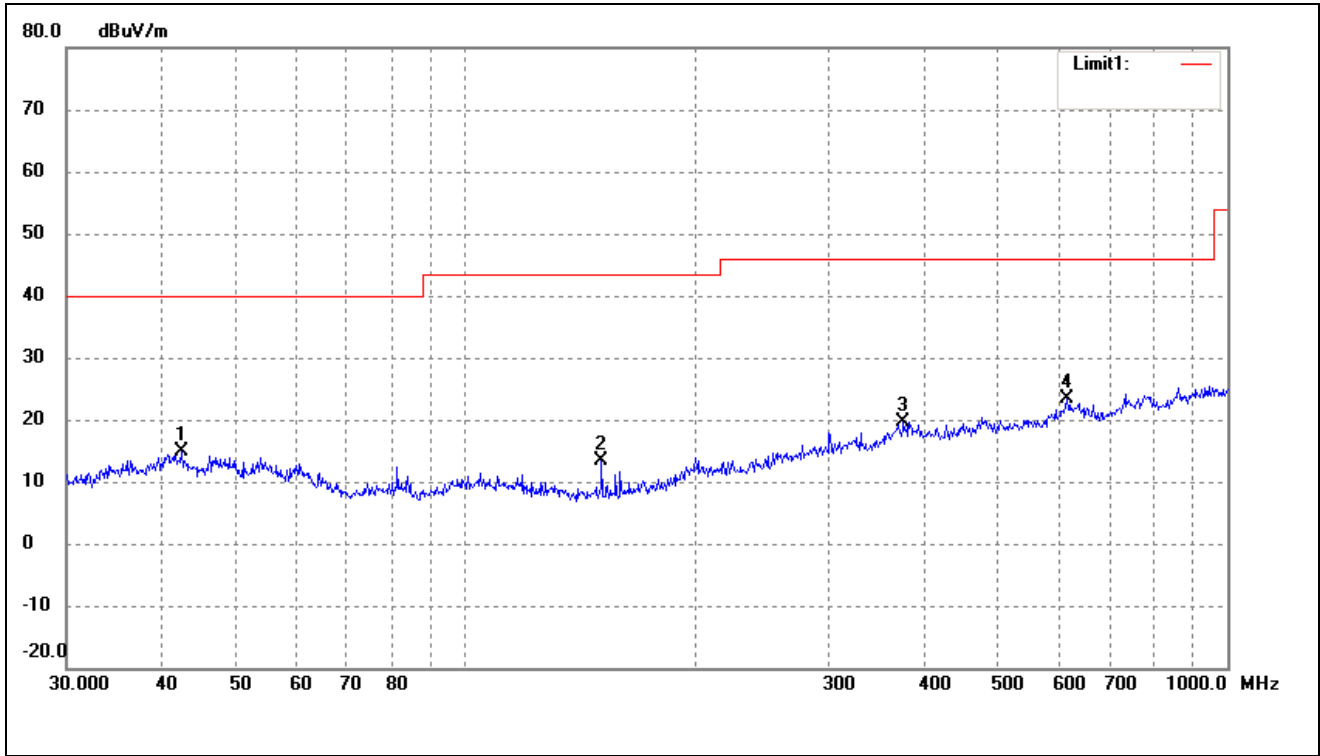
Comment: DC 3V

Test Specification: Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	45.3755	22.35	-8.02	14.33	40.00	-25.67	162	100	peak
2	176.2686	22.66	-11.52	11.14	43.50	-32.36	200	100	peak
3	304.6100	28.13	-5.41	22.72	46.00	-23.28	100	100	peak
4	785.0935	22.18	2.65	24.83	46.00	-21.17	100	100	peak

Test Specification: Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	42.4508	22.63	-7.83	14.80	40.00	-25.20	240	100	peak
2	151.0666	25.88	-12.41	13.47	43.50	-30.03	187	100	peak
3	375.9385	22.04	-2.33	19.71	46.00	-26.29	220	100	peak
4	616.3718	22.30	0.99	23.29	46.00	-22.71	220	100	peak

Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2403MHz							
2403	84.08	-3.49	80.59	114	-33.47	H	PK
2403	75.05	-3.49	71.56	94	-22.42	H	AV
4806	60.81	0.57	61.38	74	-12.59	H	PK
4806	46.75	0.57	47.32	54	-6.66	H	AV
7209	40.82	7.18	48.02	74	-25.98	H	PK
7209	28.80	7.18	35.98	54	-18.02	H	AV
2403	83.22	-3.49	79.73	114	-34.27	V	PK
2403	78.24	-3.49	74.75	94	-19.25	V	AV
4806	48.39	0.57	48.96	74	-25.04	V	PK
4806	35.12	0.57	35.69	54	-18.31	V	AV
7209	40.12	5.89	46.01	74	-27.99	V	PK
7209	28.10	6.15	34.25	54	-19.75	V	AV
Middle Channel-2441MHz							
2442	81.03	-3.43	77.60	114	-33.40	H	PK
2442	73.23	-3.43	69.80	94	-24.21	H	AV
4884	57.47	0.66	58.13	74	-15.87	H	PK
4884	42.89	0.66	43.55	54	-10.45	H	AV
7326	41.08	3.11	44.19	74	-29.81	H	PK
7326	28.93	3.33	32.26	54	-21.74	H	AV
2442	82.48	-3.43	79.05	114	-34.95	V	PK
2442	75.13	-3.43	71.70	94	-22.30	V	AV
4884	49.01	0.66	49.67	74	-24.33	V	PK
4884	36.08	0.66	36.74	54	-17.26	V	AV
7326	41.03	7.18	48.21	74	-25.79	V	PK
7326	28.83	7.18	36.01	54	-17.99	V	AV

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2480MHz							
2480	84.03	-3.33	80.70	114	-33.33	H	PK
2480	75.13	-3.33	71.80	94	-22.23	H	AV
4960	53.18	0.75	53.93	74	-20.07	H	PK
4960	39.56	0.75	40.31	54	-13.69	H	AV
7440	40.49	7.11	47.60	74	-26.40	H	PK
7440	28.70	7.18	35.88	54	-18.12	H	AV
2480	82.30	-3.33	78.97	114	-35.03	V	PK
2480	76.15	-3.33	72.82	94	-21.18	V	AV
4960	46.52	0.75	47.27	74	-26.73	V	PK
4960	33.70	0.75	34.45	54	-19.55	V	AV
7440	41.30	7.23	48.53	74	-25.47	V	PK
7440	28.76	7.18	35.94	54	-18.06	V	AV

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 5th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

The measurements greater than 20dB below the limit from 9kHz to 30MHz..

5. Out of Band Emissions

5.1 Standard Applicable

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.

5.2 Test Procedure

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

5.3 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

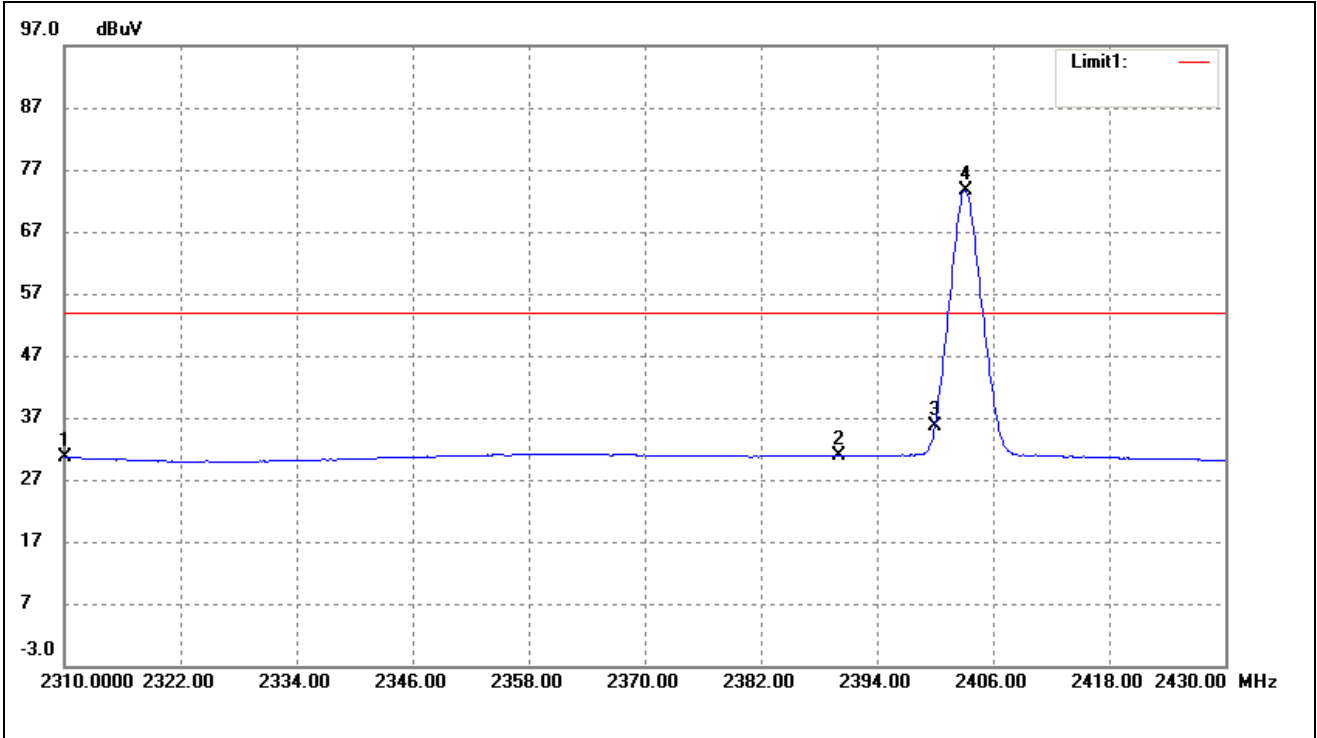
5.4 Summary of Test Results/Plots

Test mode	Frequency	Limit	Result
	MHz	dBuV / dBc	
Lowest	2310.00	<54 dBuV	Pass
	2390.00	<54 dBuV	Pass
	2400.00	<54 dBuV	Pass
Highest	2483.50	<54 dBuV	Pass
	2500.00	<54 dBuV	Pass

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

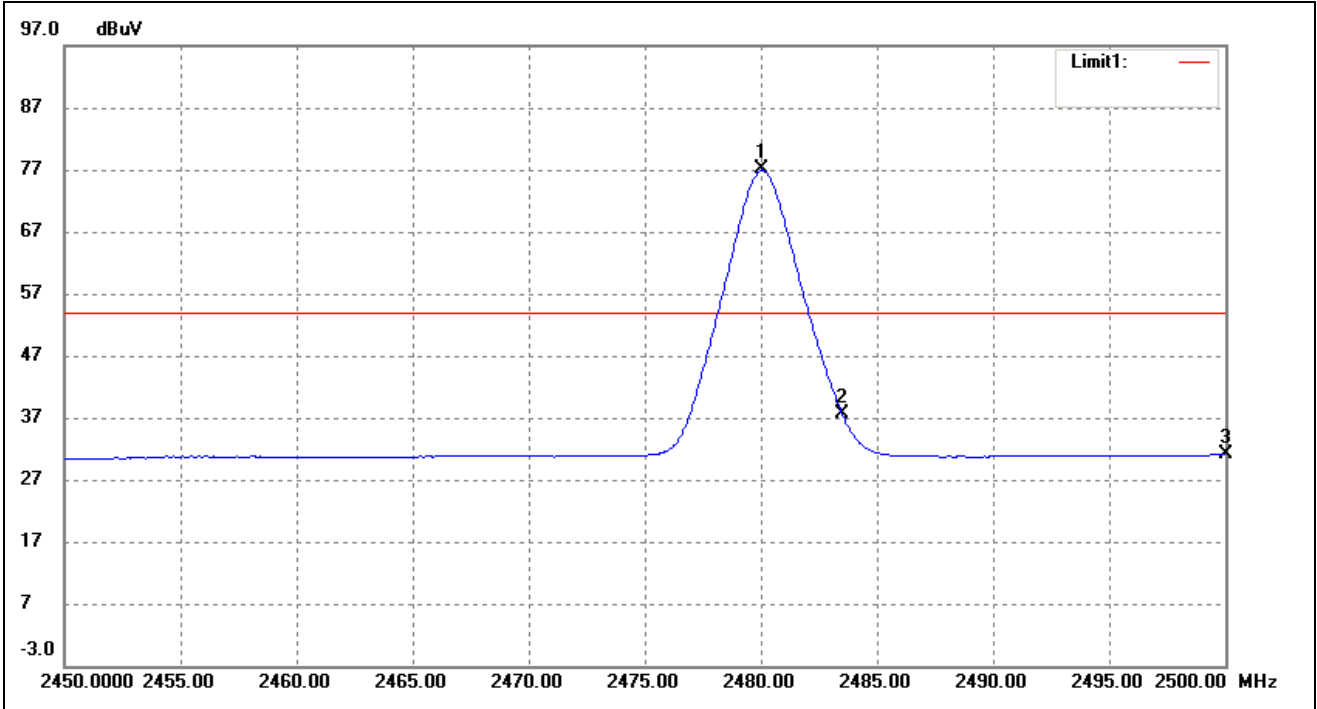
Please refer to the test plots as below.

Lowest Bandedge
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2310.000	34.24	-3.69	30.55	54.00	-23.45	Ave Detector
		46.63	-3.69	42.94	74.00	-31.06	Peak Detector
2	2390.000	34.34	-3.49	30.85	54.00	-23.15	Ave Detector
		46.95	-3.49	43.46	74.00	-30.54	Peak Detector
3	2400.000	39.18	-3.46	35.72	54.00	-18.28	Ave Detector
		49.81	-3.46	46.35	74.00	-27.65	Peak Detector

Highest Bandedge
Vertical (Worst case)



No.	Frequency (MHz)	Reading (dBuV)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.050	80.26	-3.25	77.01	54.00	23.01	Ave Detector
	2479.800	82.53	-3.25	79.28	74.00	5.28	Peak Detector
2	2483.500	Delta=41.68		35.33	54.00	-16.36	Ave Detector
	2483.500			37.60	74.00	-27.06	Peak Detector
3	2500.000	34.22	-3.20	31.02	54.00	-22.98	Ave Detector
	2500.000	46.78	-3.20	43.58	74.00	-30.42	Peak Detector

6. Emission Bandwidth

6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

6.2 Test Procedure

According to the ANSI 63.4-2014, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW \geq 1% 20dB Bandwidth, VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

6.3 Environmental Conditions

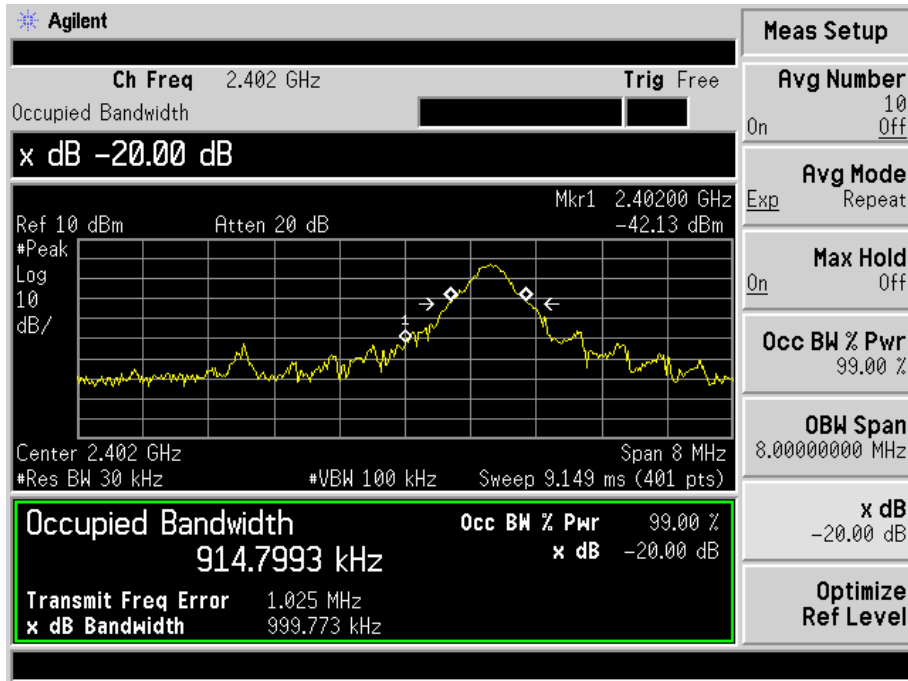
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.4 Summary of Test Results/Plots

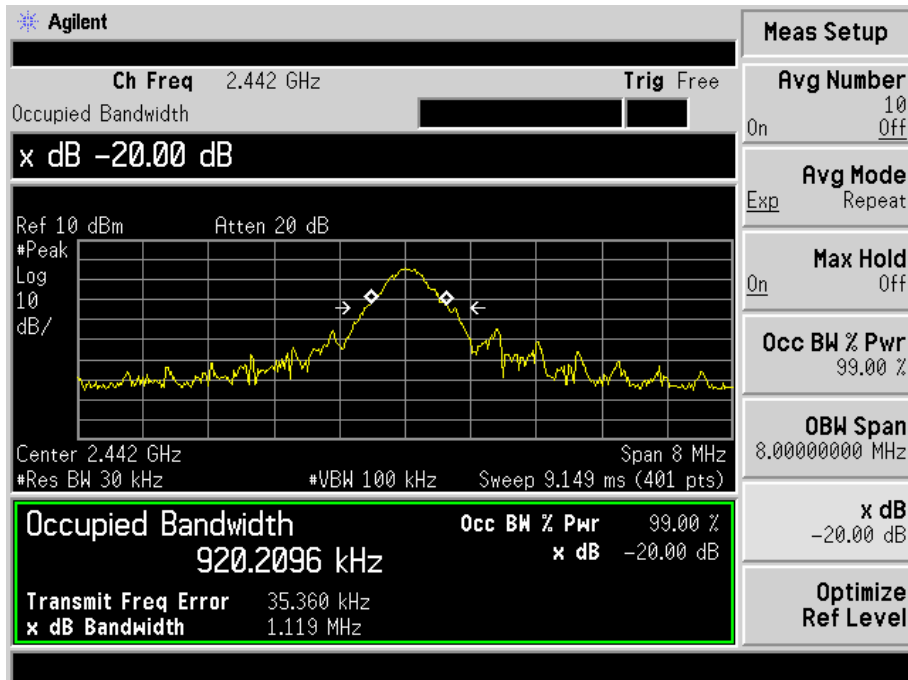
Channel	Frequency MHz	20dB Bandwidth kHz	99% Bandwidth kHz
Low Channel	2403	999.773	914.7993
Middle Channel	2442	1119.000	920.2096
High Channel	2480	1002.000	892.0527

Please refer to the following test plots

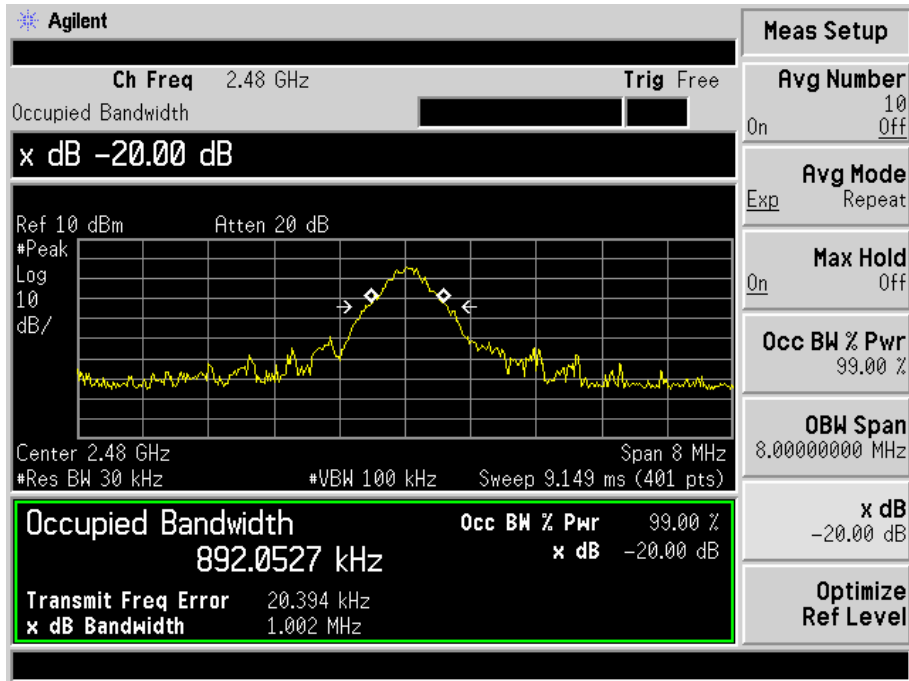
Low Channel:



Middle Channel:



High Channel:



***** END OF REPORT *****