



Hong Kong

FCC – Test report

Report Number : **60/790.14.014.01** Date of Issue: 24th June 2014

Model : **Interchange Combo**

Product Type : **Bike speed and cadence transmitter**

Applicant : **DAYTON INDUSTRIAL CO.,LTD**

Address : **2-12 Kwai Fat Road,11-A Kwai Chung,New Territories,Hong Kong**

Production Facility : **KENDY ENTERPISE LTD**

Address : **2-12 Kwai Fat Road,11-A Kwai Chung,New Territories,Hong Kong**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including Appendices : **28**

TÜV SÜD Hong Kong Ltd. is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Hong Kong Ltd. reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Hong Kong Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Hong Kong Ltd. issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval.

1. Table of Contents

1.	Table of Contents	2
2.	Details about the Test Laboratory	3
3.	Description of the Equipment Under Test	4
4.	Summary of Test Standards	5
5.	Summary of Test Standards and Results	6
6.	General Remarks	7
7.	Emission Test Results	8
7.1	Spurious Emissions at Antenna Terminals	8
7.2	Spurious Radiated Emissions	11
7.3	6dB & 99% Bandwidth	15
7.4	Peak Output Power Measurements	18
7.5	100 kHz Bandwidth of Band Edges	21
7.6	Power Spectral Density	23
7.7	Antenna Requirement	26
8.	Test Equipment List	27
9.	System Measurement Uncertainty	28

2. Details about the Test Laboratory

Details about the Test Laboratory

Test site 1

Company name: TÜV SÜD HONG KONG LTD.
3/F, West Wing, Lakeside 2,
10 Science Park West Avenue,
Science Park, Shatin
HK.

Telephone: 852 2776 1323

Fax: 852 2776 1372

Test site 2

Company name: Shenzhen Zhongjian Nanfang Testing Co.,Ltd
1st Floor, Block No.2, Laodong Industrial Zone,
Xixiang Road Baoan District, Shenzhen, China
Test Firm FCC Registration number:817957

3. Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Bike speed and cadence transmitter
Model no.:	Interchange Combo
Serial number:	NIL
Options and accessories:	NIL
FCC ID:	O4GINTCOM
Rated Voltage:	3 VDC
Rated Current:	NIL
Rated Power:	NIL
Frequency:	2402-2480MHz
RF Transmission Frequency:	2402-2480MHz
Antenna gain:	0 dBi
No. of Operated Channel:	40
Modulation:	GFSK
Description of the EUT:	Battery operated – 1x 3V battery

4. Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C, Intentional Radiators, 10-1-12 Edition	PART 15 – RADIO FREQUENCY DEVICES Subpart C – Intentional Radiators

5. Summary of Test Standards and Results

Emission Tests					
Test Condition	Pages	Test site	Test Result		
			Pass	Fail	N/A
AC Line Conducted Emissions FCC §15.207(a)	NIL	/	☐	☐	☒
Spurious Emissions at Antenna Terminals FCC §2.1051 & §15.247(d)	8	Site 2	☒	☐	☐
Spurious Radiated Emissions FCC §15.205, §15.209 & §15.247(d)	11	Site 2	☒	☐	☐
6 dB Bandwidth & 99%OBW FCC §15.247(a)(2)	15	Site 2	☒	☐	☐
Peak Output Power FCC §15.247(b)	18	Site 2	☒	☐	☐
100 kHz Bandwidth of Band Edges FCC §15.247(d)	21	Site 2	☒	☐	☐
Power Spectral Density FCC §15.247(e)	23	Site 2	☒	☐	☐
Antenna Requirements FCC §15.203	26	Site 2	☒	☐	☐

Remark: 1. Battery operate only.

2. For Radiated Emissions test, three set-up directions(X,Y,Z) were pretested, but only direction Z test data was recorded in this report for it is the worst case.

6. General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: O4GINTCOM complies with the FCC Part 15, Subpart C Rules.

All the configurations of the product were tested and only the worst test results are listed in the report.

SUMMARY:

All tests according to the regulations cited on page 6 were

- ☒ - Performed
- ☐ - **Not** Performed

The Equipment Under Test

- ☒ - **Fulfills** the general approval requirements.
- ☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: 02nd June 2014

Testing Start Date: 03th June 2014

Testing End Date: 12th June 2014

- TÜV SÜD HONG KONG LTD. -

Reviewed by:


Edmond FUNG

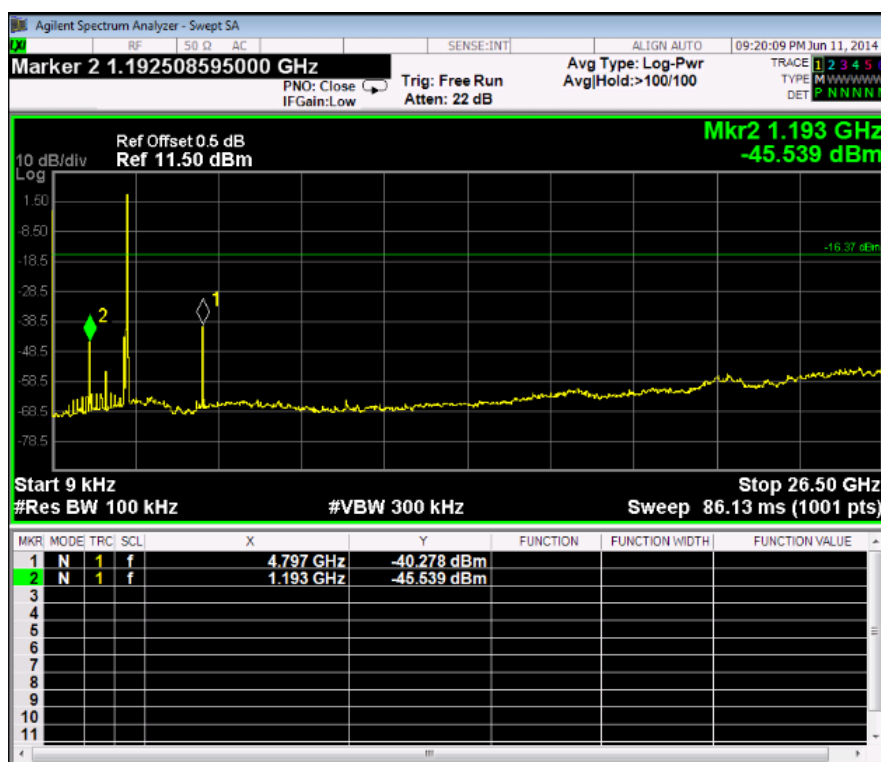
Prepared by:


CHAN Kwong Ngai

7. Emission Test Results

7.1 Spurious Emissions at Antenna Terminals

Date of test : 5th June 2014
 Test requirement : FCC §2.1051 & §15.247(d)
 Test method : Conducted
 Operating mode : Transmit mode
 Frequency channel : 2402MHz
 Remarks : 9KHz-25GHz



Date of test : 5th June 2014

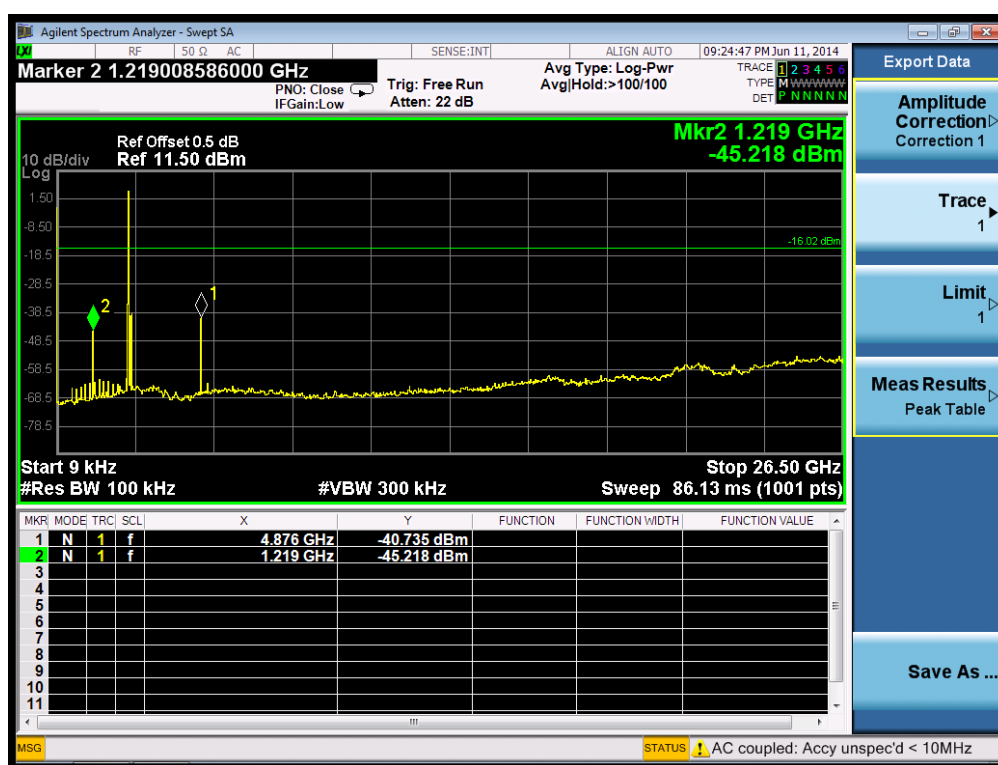
Test requirement : FCC §2.1051 & §15.247(d)

Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2440MHz

Remarks : 9KHz-25GHz



Date of test : 5th June 2014

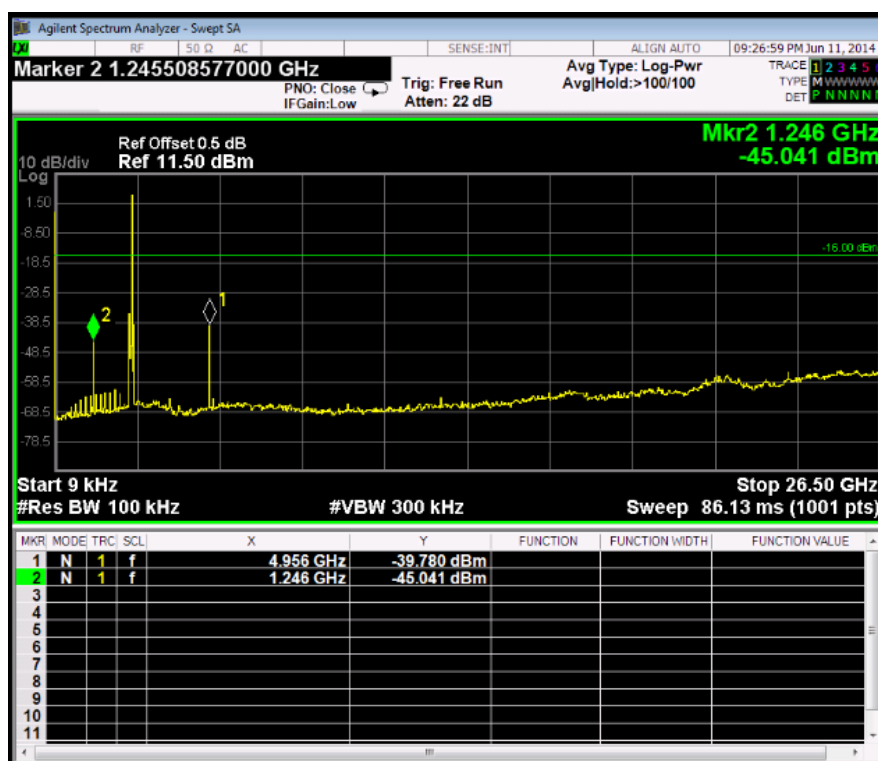
Test requirement : FCC §2.1051 & §15.247(d)

Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2480MHz

Remarks : 9KHz-25GHz



7.2 Spurious Radiated Emissions

Date of test : 5th June 2014
 Test requirement : FCC §15.205, §15.209 & §15.247(d)
 Test method : Radiated
 Operating mode : Transmit mode
 Frequency channel : 2402MHz(worst case)
 Remarks : 9kHz-1GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
41.26	40.57	-33.4	7.17	40.0	-32.83	QP	H
297.12	50.63	-35.7	14.93	43.5	-28.57	QP	H
381.19	47.81	-31.3	16.51	46.0	-29.49	QP	H
491.21	54.51	-28.9	25.61	46.0	-20.39	QP	H
755.43	46.67	-24.2	22.47	46.0	-23.53	QP	H
998.21	46.27	-21.0	25.27	54.0	-28.73	QP	H
63.56	50.42	-35.2	15.22	40	-24.78	QP	V
86.98	55.28	-38.0	17.28	43.5	-26.22	QP	V
184.92	44.88	-37.3	7.58	43.5	-35.92	QP	V
230.24	52.5	-35.0	17.5	46	-28.50	QP	V
491.92	51.37	-28.9	22.47	46	-23.53	QP	V
662.76	53.1	-25.6	27.5	46	-18.50	QP	V

Remark: All three frequencies (2042MHz, 2440MHz and 2480MHz) were performed test, and the 2480MHz was the worst case.

Date of test : 5th June 2014
 Test requirement : FCC §15.205, §15.209 & §15.247(d)
 Test method : Radiated
 Operating mode : Transmit mode
 Frequency channel : 2402MHz
 Remarks : 1GHz-25GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2402	85.7	1.8	87.5	/	/	/	H
2402	73.6	1.8	75.4	/	/	/	H
4804	55.4	0.2	55.6	74.0	-18.4	peak	H
4804	45.5	0.2	45.7	54.0	-8.3	Average	H
2402	86.8	1.8	88.6	/	/	/	V
2402	74.4	1.8	76.2	/	/	/	V
4804	56.9	0.2	57.1	74.0	-16.9	peak	V
4804	46.4	0.2	46.8	54.0	-7.2	Average	V

Date of test : 5th June 2014
 Test requirement : FCC §15.205, §15.209 & §15.247(d)
 Test method : Radiated
 Operating mode : Transmit mode
 Frequency channel : 2440MHz
 Remarks : 1GHz-25GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2440	86.3	1.8	88.1	/	/	/	H
2440	74.4	1.8	76.2	/	/	/	H
4880	55.2	0.4	55.6	74.0	-18.4	peak	H
4880	45.2	0.4	45.6	54.0	-8.4	Average	H
2440	85.8	1.8	87.6	/	/	/	V
2440	76.0	1.8	77.8	/	/	/	V
4880	53.9	5.9	54.3	74.0	-19.7	peak	V
4880	43.6	5.9	44.0	54.0	-10.0	Average	V

Date of test : 5th June 2014
 Test requirement : FCC §15.205, §15.209 & §15.247(d)
 Test method : Radiated
 Operating mode : Transmit mode
 Frequency channel : 2480MHz
 Remarks : 1GHz-25GHz

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2480	85.6	1.9	87.5	/	/	/	H
2480	73.4	1.9	75.3	/	/	/	H
4960	57.5	0.8	58.3	74	-15.7	peak	H
4960	37.6	0.8	38.4	54	-15.6	Average	H
2480	86.7	1.9	88.6	/	/	/	V
2480	74.9	1.9	76.8	/	/	/	V
4960	59.5	0.8	60.3	74	-13.7	peak	V
4960	39.4	0.8	40.2	54	-13.8	Average	V

7.3 6dB & 99% Bandwidth

Date of test : 5th June 2014

Test requirement : FCC §15.247(a)(2)

Test method : Conducted

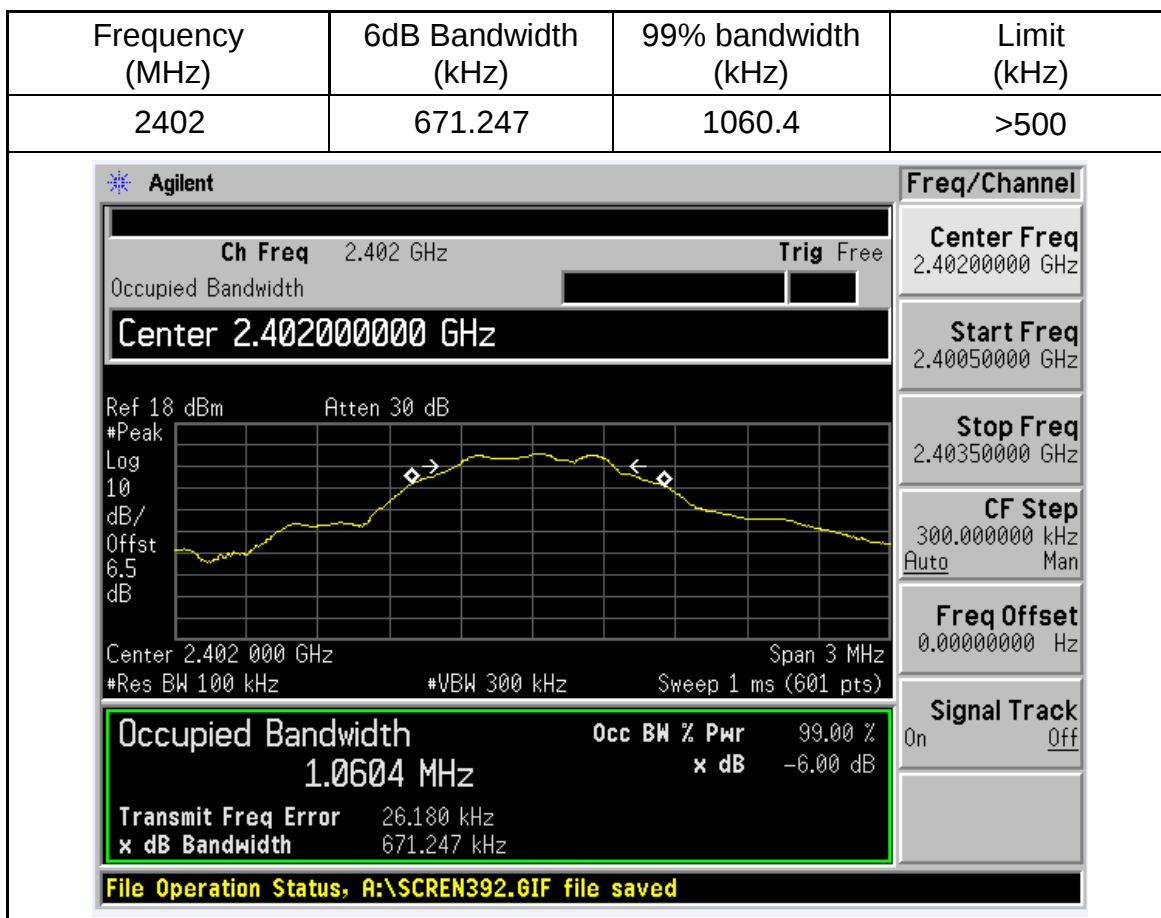
Operating mode : Transmit mode

Frequency channel : 2402MHz

Remarks : NIL

Test Result

☒ Passed

☐ Not Passed


Date of test : 5th June 2014

Test requirement : FCC §15.247(a)(2)

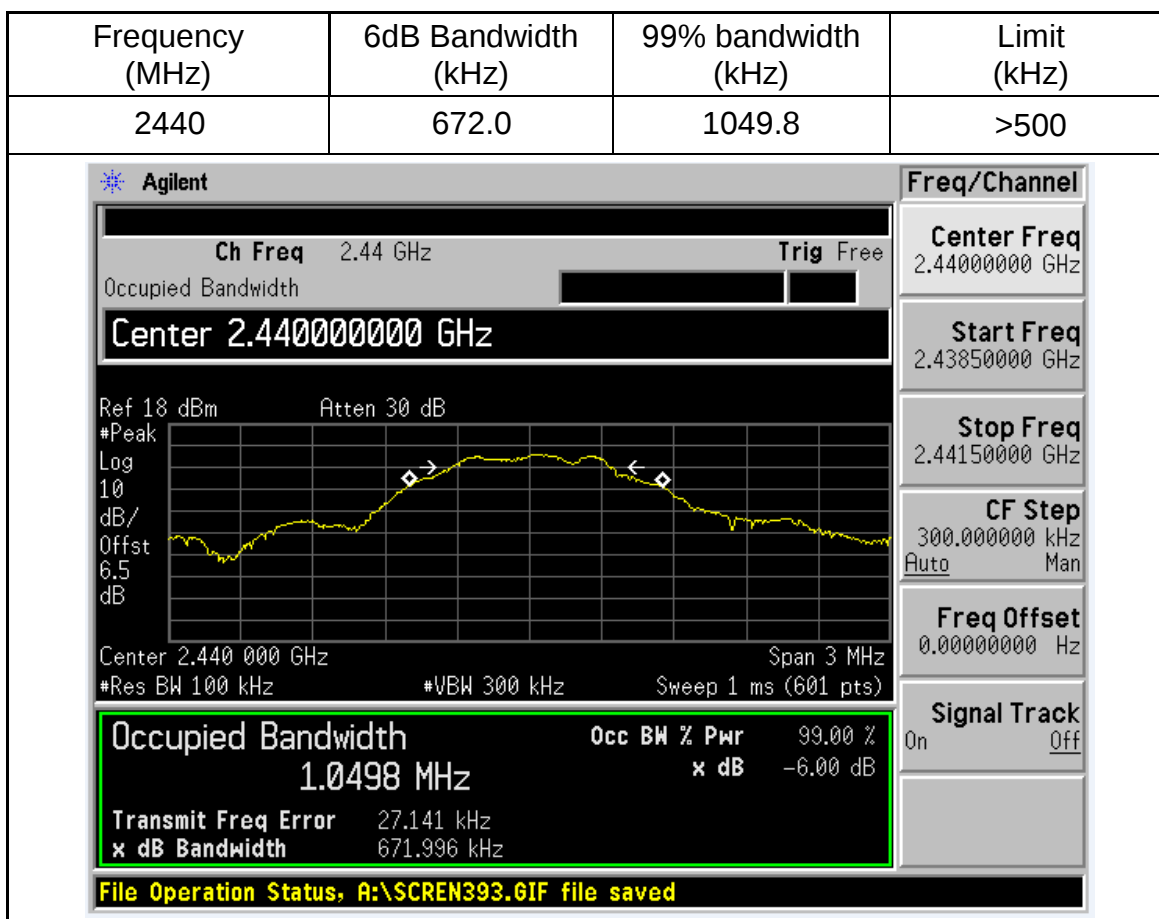
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2440MHz

Remarks : NIL

Test Result	
☒	Passed
☐	Not Passed



Date of test : 5th June 2014

Test requirement : FCC §15.247(a)(2)

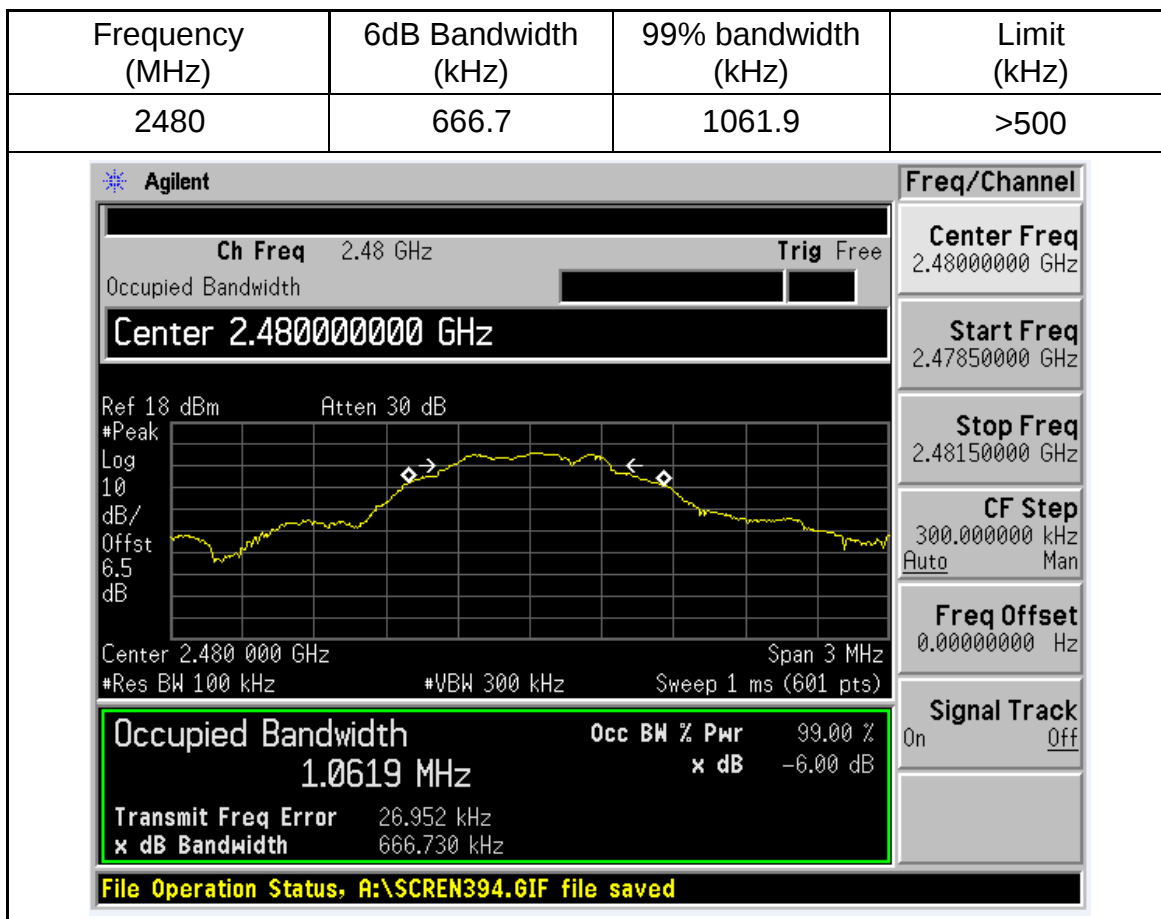
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2480MHz

Remarks : NIL

Test Result	
☒	Passed
☐	Not Passed



7.4 Peak Output Power Measurements

Date of test : 5th June 2014

Test requirement : FCC §15.247(b)

Test method : Conducted

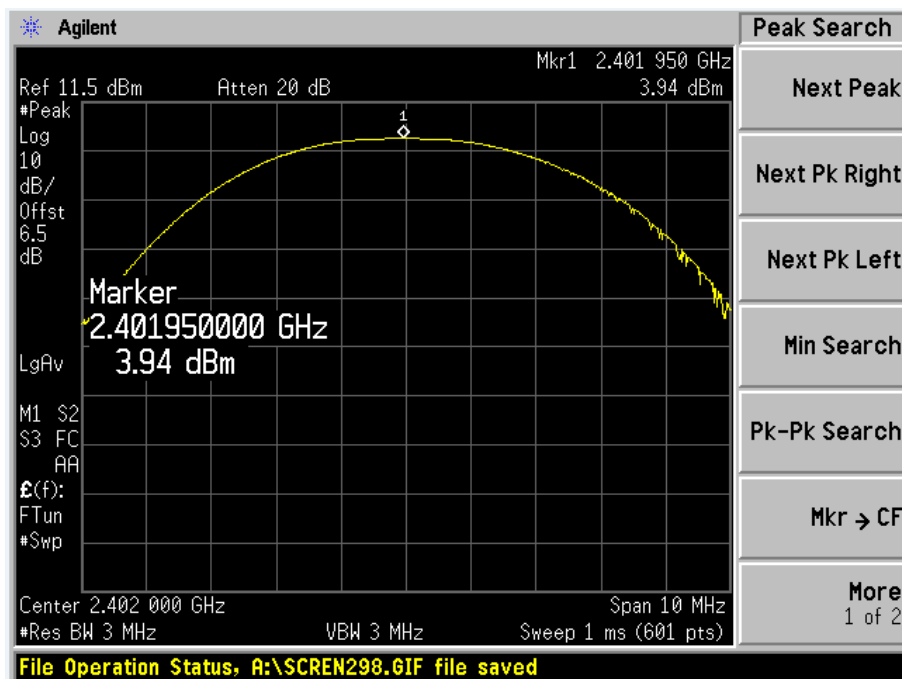
Operating mode : Transmit mode

Frequency channel : 2402MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed

Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
2402	3.94	30



Date of test : 5th June 2014

Test requirement : FCC §15.247(b)

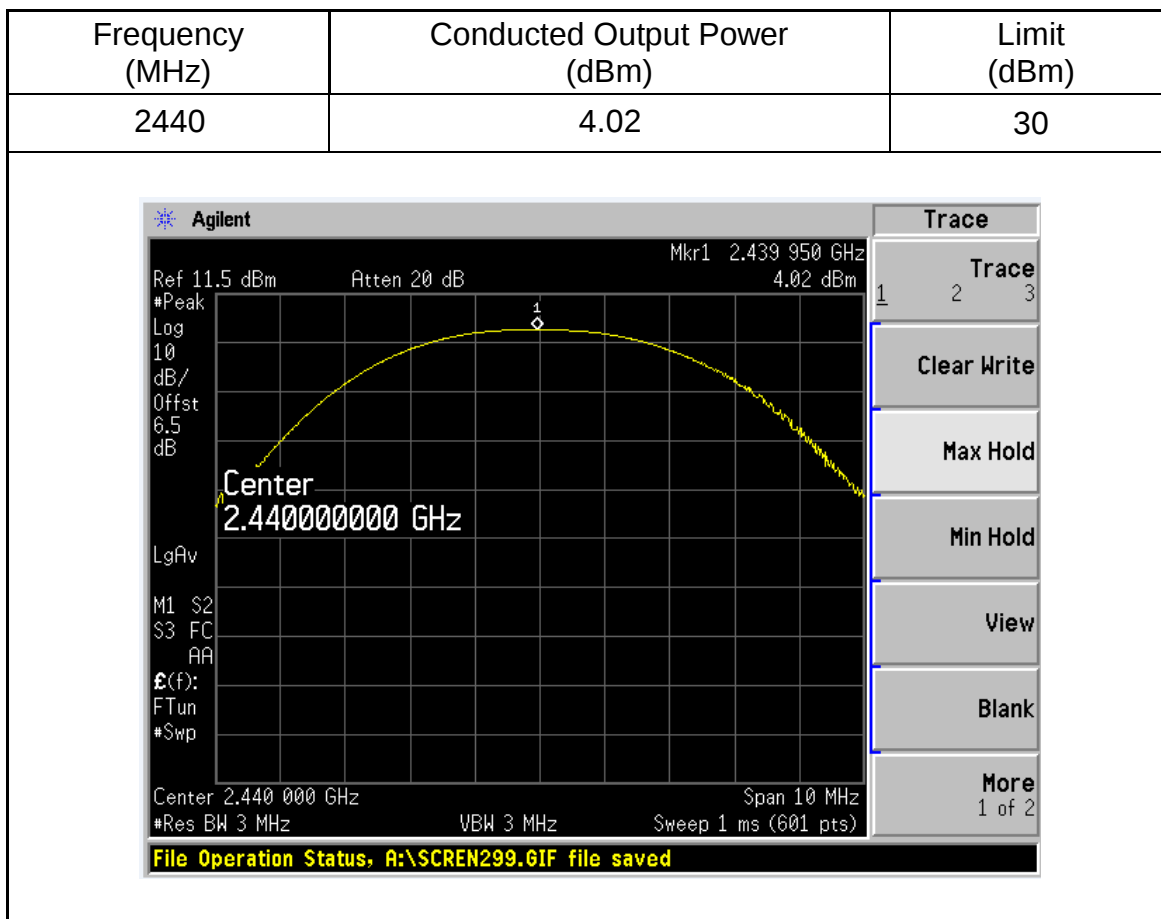
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2440MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed



Date of test : 5th June 2014

Test requirement : FCC §15.247(b)

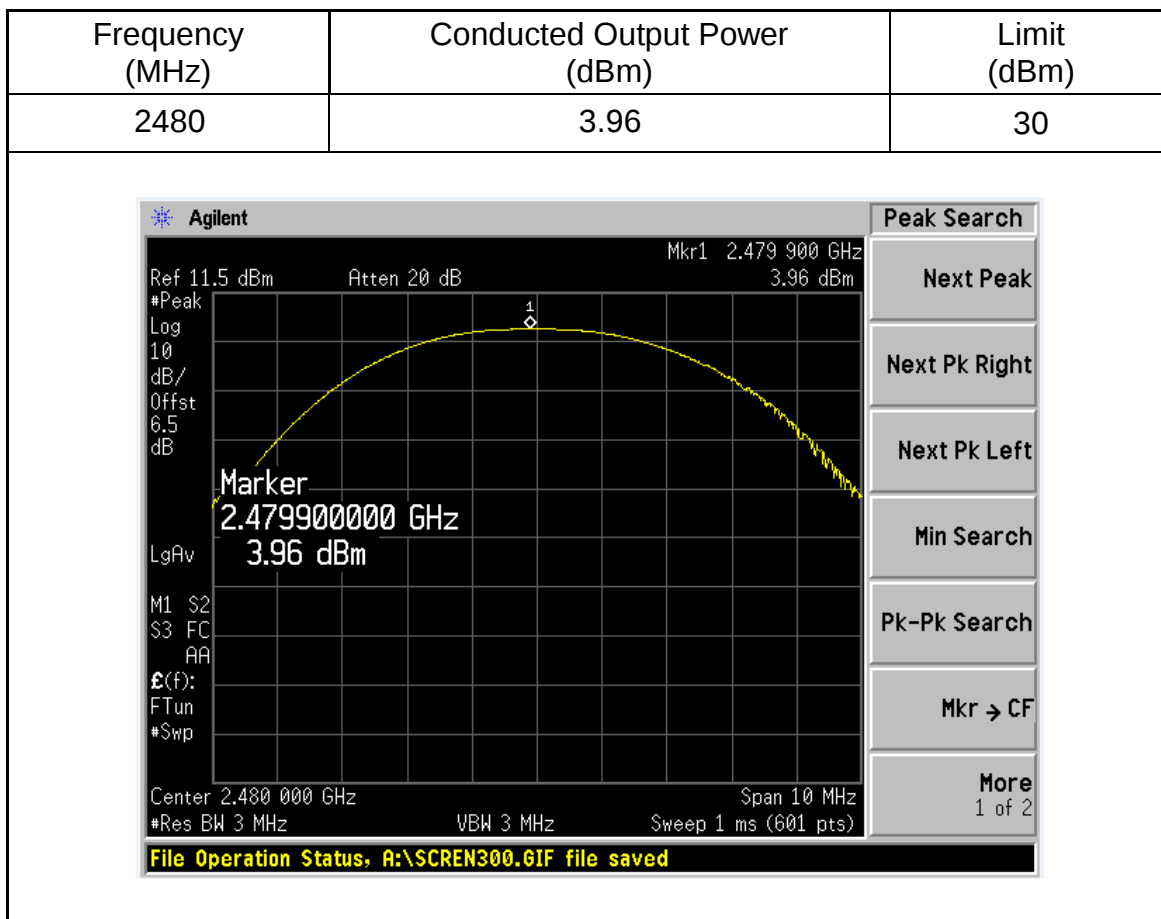
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2480MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed



7.5 100 kHz Bandwidth of Band Edges

Date of test : 5th June 2014

Test requirement : FCC §15.247(d)

Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2402MHz

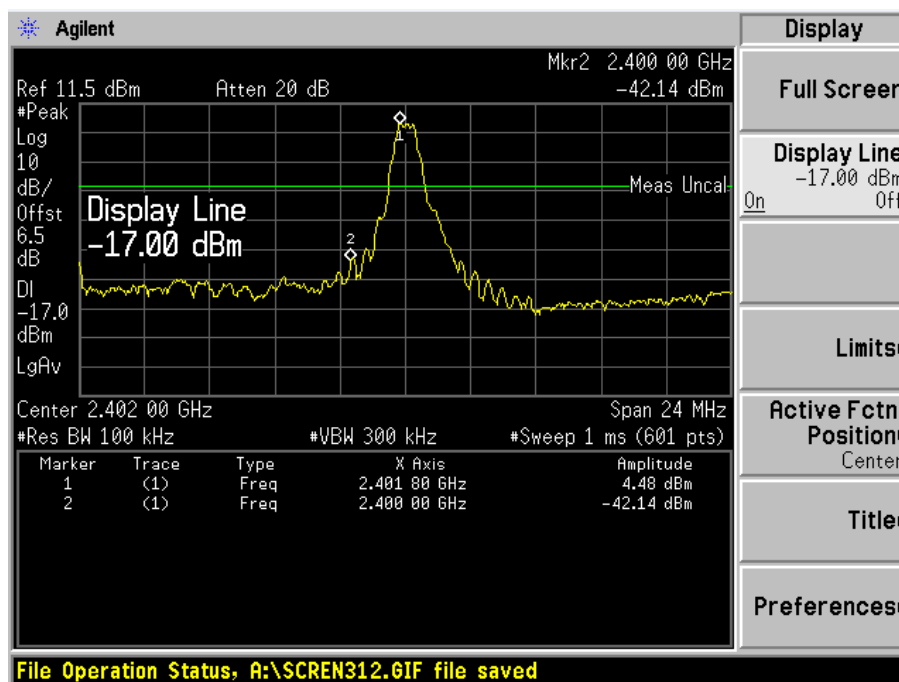
Remarks :

Test Result

☒ Passed

☐ Not Passed

Frequency (MHz)	Delta Peak to Band Emission (dB)	Limit (dB)
2402	46.62	>20



Date of test : 5th June 2014

Test requirement : FCC §15.247(d)

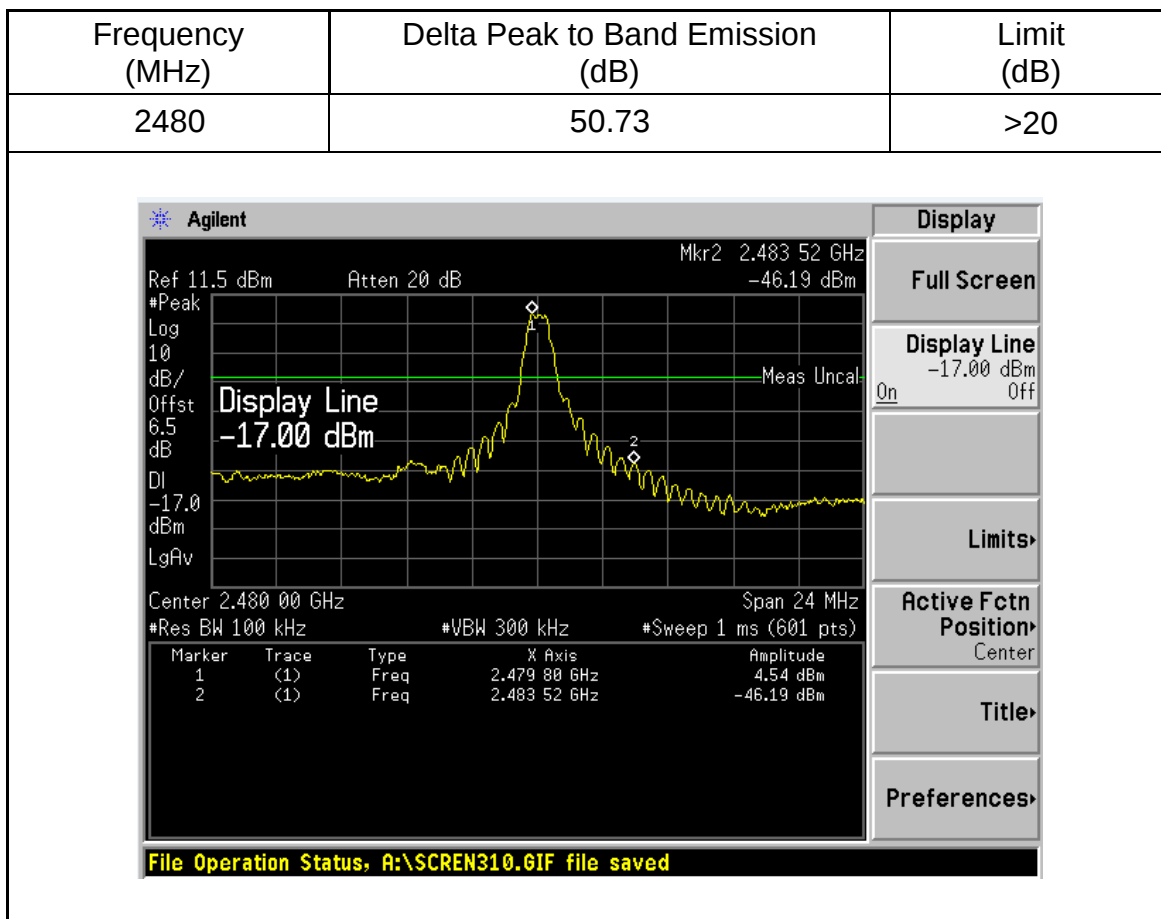
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2480MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed



7.6 Power Spectral Density

Date of test : 5th June 2014

Test requirement : FCC §15.247(e)

Test method : Conducted

Operating mode : Transmit mode

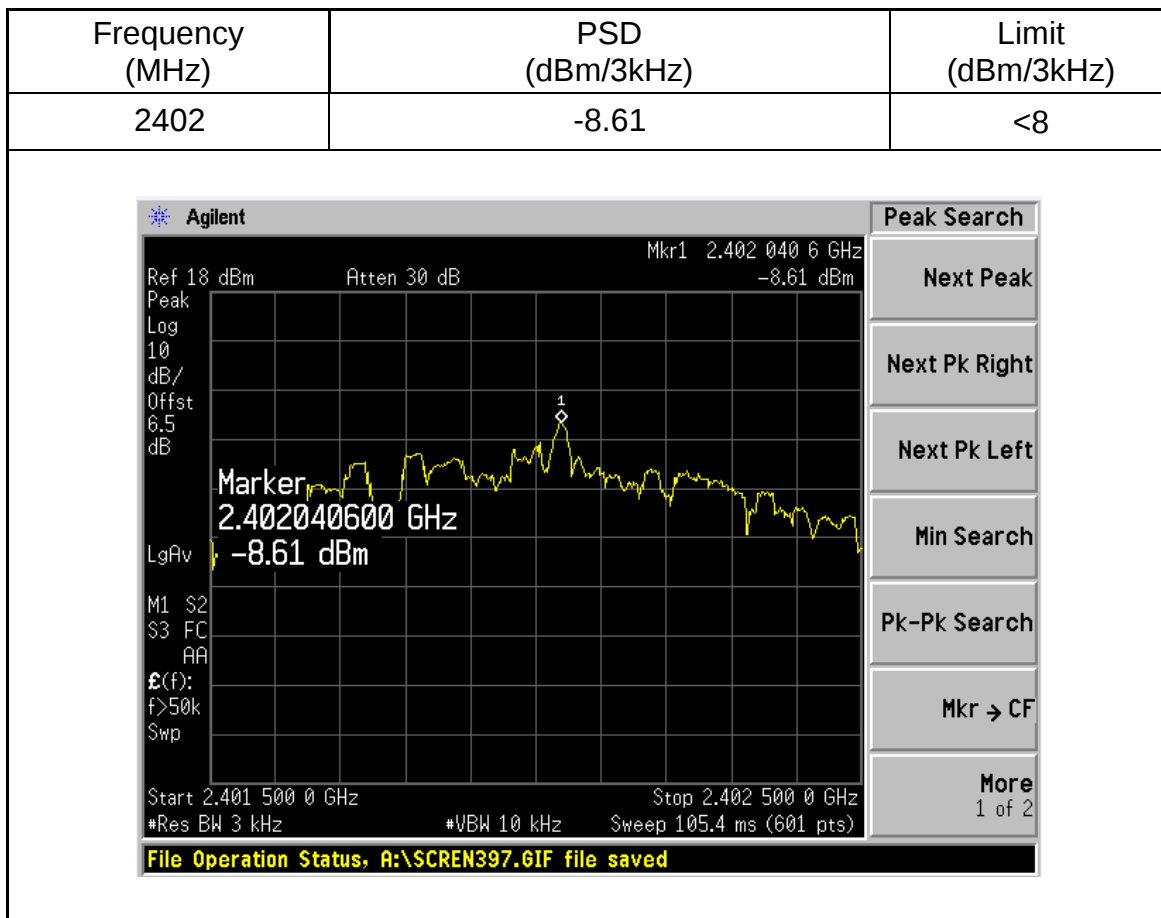
Frequency channel : 2402MHz

Remarks :

Test Result

☒ Passed

☐ Not Passed



Date of test : 5th June 2014

Test requirement : FCC §15.247(e)

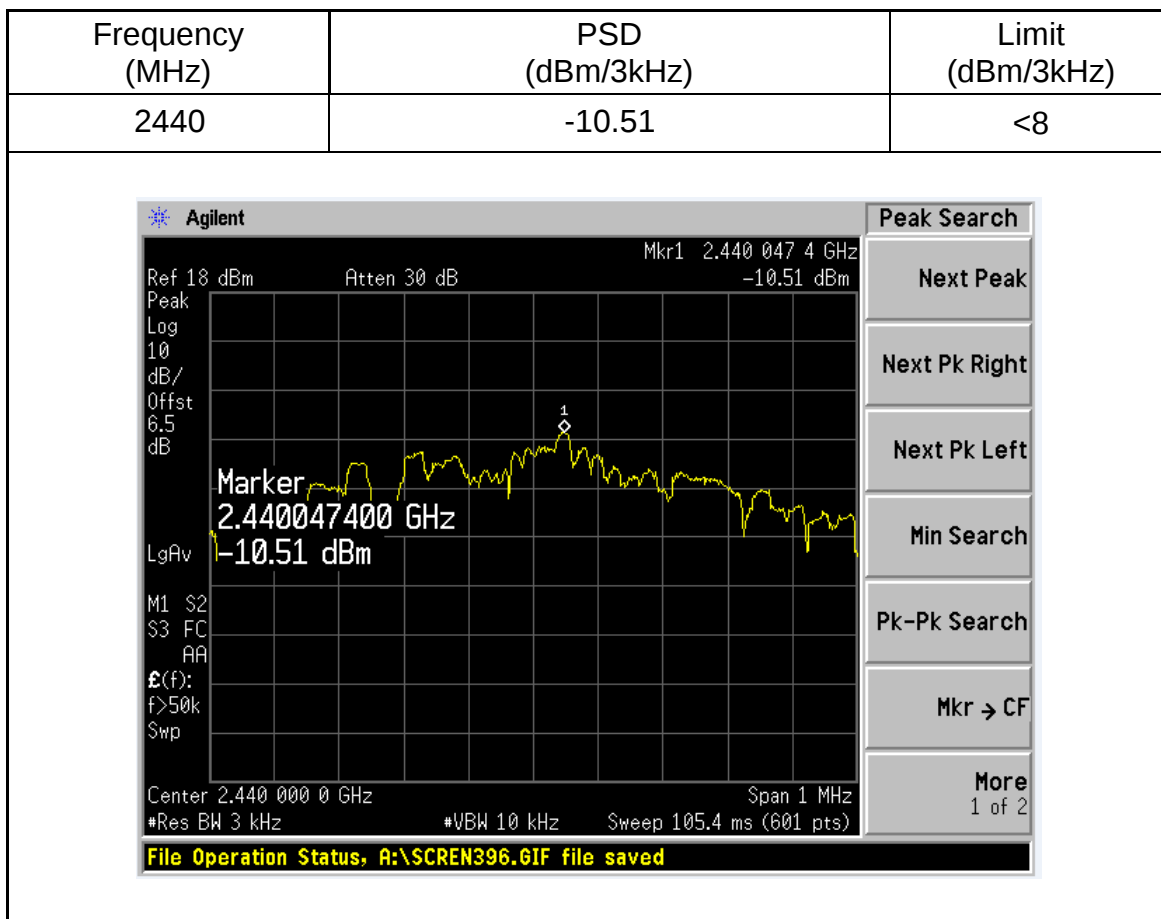
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2440MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed



Date of test : 5th June 2014

Test requirement : FCC §15.247(e)

Test method : Conducted

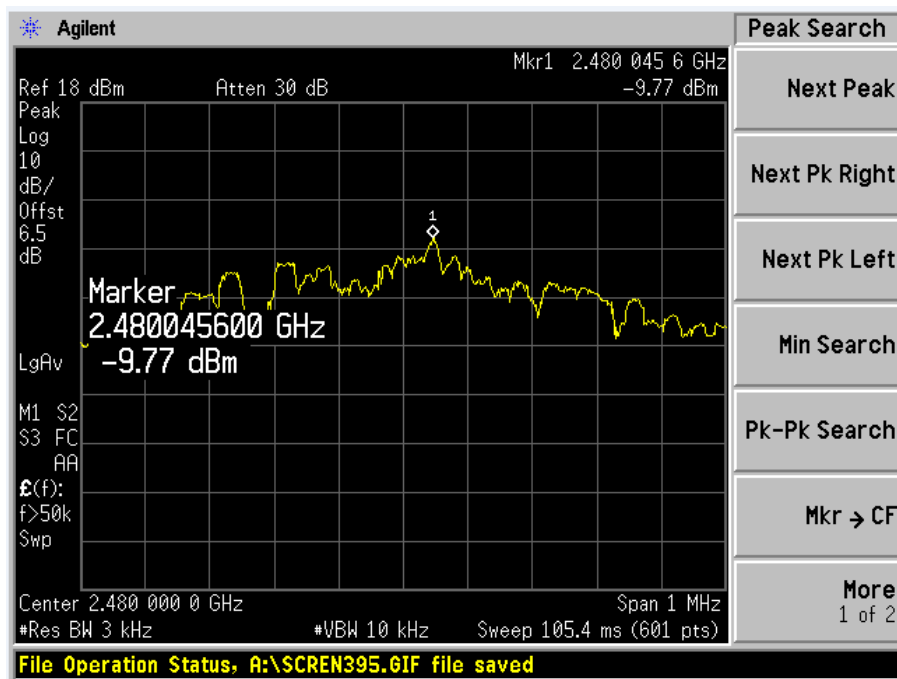
Operating mode : Transmit mode

Frequency channel : 2480MHz

Remarks :

Test Result	
☒	Passed
☐	Not Passed

Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
2480	-9.77	<8



7.7 Antenna Requirement

Limit

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

Antenna Connector Construction

The antenna used in this product is PCB antenna. And the maximum Gain of this antenna is 0.0 dBi.

8. Test Equipment List

Radiated Emission Test

DESCRIPTION	Type No.	Serial No.	Calibrated date	Calibrated until
Antenna	VULB9163	9163 330	2014.02.25	2015.02.24
Antenna	3117	00066577	2014.04.02	2015.04.01
Antenna	3160-09	00118388	2013.09.06	2014.09.05
Loop Antenna	6512	29604	2013.09.25	2014.09.24
Spectrum Analyzer	E4440A	US42220815	2013.06.14	2014.06.13
Spectrum Analyzer	FSP 40	100378	2013.12.23	2014.12.22
EMI Test Receiver	ESCI	100701	2013.08.04	2014.08.03
Spectrum Analyzer	FSV40	100903	2014.01.27	2015.01.26
Agilent	E4445A	MY46181814	2013.12.11	2014.12.10
Test Cable	SUCOFLEX 104	MY2320/4	2014.02.18	2015.02.17
Amplifier	150A250	326446	2014.03.19	2015.03.17
Temp. & Humid. Chamber	FACT5-2.0	4166	2013.11.22	2014.11.21

9. System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=3.59dB (9kHz-30MHz)
		U=5.08dB (30MHz-1GHz)
		U=4.56dB (1GHz-18GHz)
		U=4.42dB (18GHz-25GHz)
CE	Disturbance Voltage (dB μ V)	U=2.7dB