



Hong Kong

FCC / IC – Test report

Report Number : **60/960.15.027.03** Date of Issue: April 7, 2015

Model : **PM100**

Product Type : **Precision**

Applicant : 4iiii Innovation Inc.

Address : 228 River Ave Cochrane AB, Canada T4C2C1

Production Facility : 4iiii Innovation Inc.

Address : 228 River Ave Cochrane AB, Canada T4C2C1

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

Total pages including Appendices : 18

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.

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 1 of 18

Rev. no.: 2.1

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	5
6. General Remarks	6
7. Emission Test Results.....	7
7.1 Radiated Emission Test	7
7.2 Band edge measurement	12
7.3 20dB& 99% bandwidth measurement	14
7.4 Antenna Requirement	16
8. Test Equipment List	17
9. System Measurement Uncertainty	18



Hong Kong

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 Academy of Metrology and Quality Inspection
No.4 TongFa Road, Xili TownNanshan District, Shenzhen, China
Test Firm FCC Registration number:994606

National Digital Electronic Product Test
No.4 TongFa Road, Xili TownNanshan District, Shenzhen, China
IC Assigned Code: 11177A

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 3 of 18

Rev. no.: 2.1

3. Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Precision
Model no.:	PM100
Serial number:	NIL
Options and accessories:	NIL
FCC ID:	ZZNPM100
IC:	9896A-PM100
Rated Voltage:	3VDC
Rated Current:	NIL
Rated Power:	NIL
Frequency:	2457MHz
RF Transmission Frequency:	2457MHz
Antenna gain:	0 dBi
No. of Operated Channel:	1
Modulation:	GFSK
Description of the EUT:	Battery operated –1x 3.0V CR2032 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
RSS-Gen Issue 4 December 2014	General Requirements and Information for the Certification of Radio Apparatus
RSS-210 Issue 8 December 2010	RSS-210 — License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
ANSI C63.10:2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

5. Summary of Test Standards and Results

Emission Tests					
Test Condition	Pages	Test site	Test Result		
			Pass	Fail	N/A
Conducted Emission (47 CFR 15.207, 15.209&RSS-GEN 8.8)	NIL	/	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> *
Radiated Emission (47 CFR 15.249, 15.209 & RSS-210 A2.9, GEN 6.13)	7	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band edge (47 CFR 15.249, 15.209 & RSS-210 A2.9, GEN 6.13)	12	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20dB Bandwidth (47 CFR 15.215)	14	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
99% occupied bandwidth (RSS-GEN 6.6)	16	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna Requirements FCC §15.203	18	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark:

1. NA: Battery operated only.
2. For Spurious Radiated Emissions test, three set-up directions(X,Y,Z) were pretested, but only direction X 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: ZZNPM100complies with the FCC Part 15, Subpart C Rules.

This submittal(s) (test report) is intended for IC: 9896A-PM100, complies with the IC RSS 210 and RSS-GEN 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: February 16, 2015

Testing Start Date: February 16, 2015

Testing End Date: March 25, 2015

- TÜV SÜD HONG KONG LTD. -

Reviewed by:


Edmond FUNG



Prepared by:


CHAN Kwong Ngai

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 6 of 18

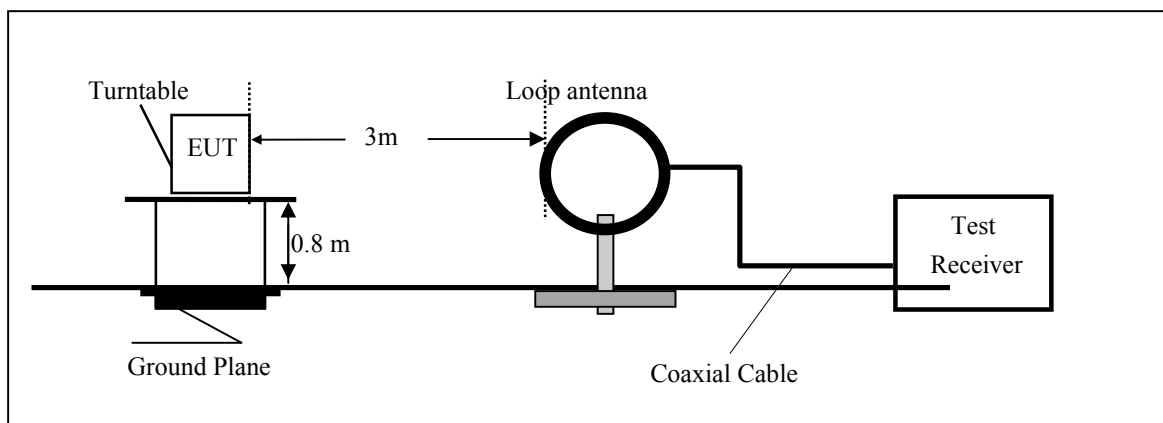
Rev. no.: 2.1

7. Emission Test Results

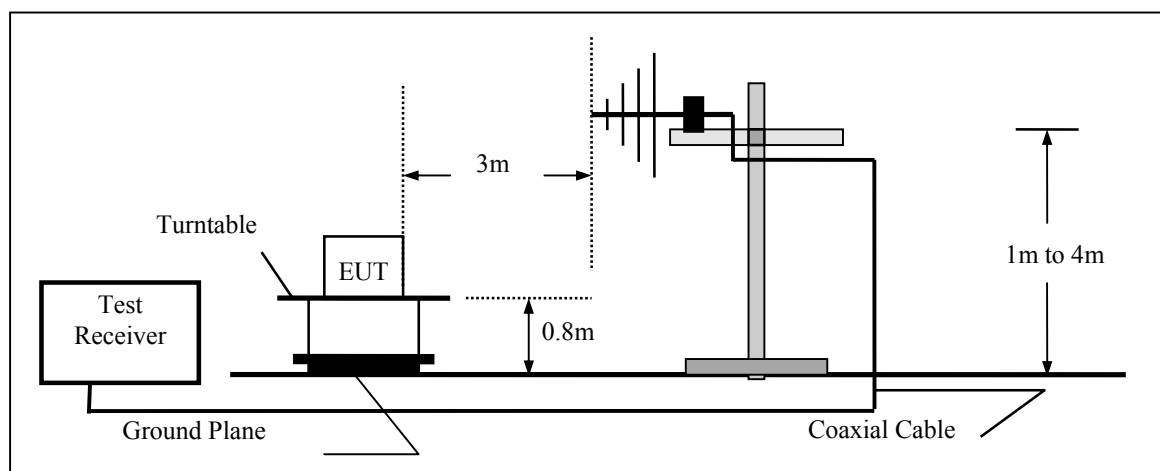
7.1 Radiated Emission Test

TEST CONFIGURATION

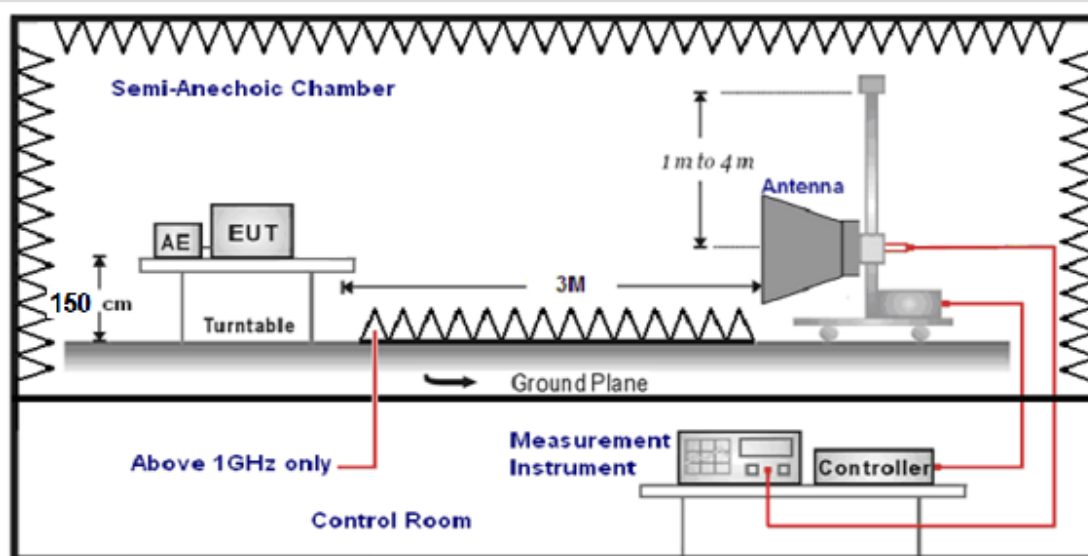
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane for below 1GHz and EUT was placed on a turn table which is 1.5m above ground plane with absorber refer to ANSI C63.10:2013
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
- 5 The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz.
6. Test antenna was located distance from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test Distance used
9KHz-30MHz	Loop Antenna	3m
30MHz-1GHz	Bilog Antenna	3m
1GHz-18GHz	Horn Antenna	3m
18GHz-26.5GHz	Horn Antenna	1m
26.5GHz-40GHz	Horn Antenna	1m

7. Set the spectrum analyzer/receiver in the following setting as:

9 KHz to 30MHz (Test Receiver):

RBW=200 Hz/VBW=1 KHz/Sweep=Auto/Dector: QP for 9 KHz to 150 KHz and RBW=9 KHz/VBW=120

KHz/Sweep=Auto/Dector: QP for 150 KHz to 30MHz

30MHz to 1 GHz (Test Receiver):

RBW=120 KHz/VBW=1MHz/Sweep=Auto/Dector: QP

Above 1 GHz (Spectrum analyzer)

a) Peak values: RBW=1MHz/VBW=3MHz/Sweep=Auto/Dector: Peak

b) Average values: RBW=1MHz/VBW=10Hz/Sweep=1s/Dector: Peak

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

According to § 15.249(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/ meter)/(dBμV/m)	Field strength of harmonics (microvolts/ meter)/(dBμV/m)	Distance (Meters)
902-928MHz	50/94	500/54	3
2400-2483.5MHz	50/94	500/54	3
5725-5875 MHz	50/94	500/54	3
24.0-24.25 GHz	250/108	2500/68	3

The above table limit values based on QP and above 1GHz based on Average, for Peak value will add 20dB based on above limit;

According to § 15.249(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

TEST RESULTS

Date of test : March 25, 2015
Test requirement : FCC Part 15 15.249
Test method : ANSI C63.10:2013
Operating mode : Transmit mode
Frequency channel : 2457MHz
Remarks : Fundamental

Test Result <input checked="" type="checkbox"/> Passed <input type="checkbox"/> Not Passed

Frequency (MHz)	Polarity (H/V)	Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
2457.000	H	31.8	78.4	114	-35.6	Peak
2457.000	V	31.8	90.5	114	-23.5	Peak
2457.000	H	31.8	63.1	94	-30.9	Average
2457.000	V	31.8	77.5	94	-16.5	Average

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
 Tel: +852-2776 1323 Fax: +852-2776 1206

Page 9 of 18

Rev. no.: 2.1

Remark:

1. The EUT was placed on the top of the turntable in test site area.
2. The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. For emissions measurement, the receiving antenna was placed 3 meters far away from the turntable
4. The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
5. Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
6. Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
7. Margin=Results-Limit

Date of test : **March 25, 2015**
Test requirement : **FCC Part 15 15.249**
Test method : **ANSI C63.10:2013**
Operating mode : **Transmit mode**
Frequency channel : **2457MHz**
Remarks : **9kHz-1GHz(Spurious)**
Test Result
☒ **Passed**
☐ **Not Passed**

Frequency (MHz)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
44.2	-33.4	18.2	40	-21.8	QP	H
61.5	-34.6	16.5	40	-23.5	QP	H
104.6	-34.8	19.6	43.5	-23.9	QP	H
189.8	-36.4	22.4	43.5	-21.1	QP	H
466.7	-29.7	23.5	46	-22.5	QP	H
854.2	-22.9	27.1	46	-18.9	QP	H
44.2	-34.6	17.5	40	-22.5	QP	V
61.5	-35.1	19.4	40	-20.6	QP	V
104.6	-34.1	18.3	43.5	-25.2	QP	V
189.8	-36.6	24.2	43.5	-19.3	QP	V
466.7	-30.2	25.4	46	-20.6	QP	V
854.2	-23.7	27.7	46	-18.3	QP	V

Remark:

1. No emissions can be detected between 9 kHz and 30 MHz
2. Margin=Results-Limit

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 10 of 18

Rev. no.: 2.1



Hong Kong

Date of test : March 25, 2015
Test requirement : FCC Part 15 15.249
Test method : ANSI C63.10:2013
Operating mode : Transmit mode
Frequency channel : 2457MHz
Remarks : 1GHz-25GHz(Harmonics and spurious)

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	Polarity (H/V)	Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
4914.000	H	-5.4	48.7	74.00	-25.3	Peak
4914.000	H	-5.4	39.5	54.00	-14.5	Average
7371.000	H	-2.2	41.2	74.00	-32.8	Peak
7371.000	H	-2.2	32.6	54.00	-21.4	Average
4914.000	V	-5.4	49.6	74.00	-24.4	Peak
4914.000	V	-5.4	37.5	54.00	-16.5	Average
7371.000	V	-2.2	43.5	74.00	-30.5	Peak
7371.000	V	-2.2	34.8	54.00	-19.2	Average

Remark:

1. The EUT was placed on the top of the turntable in test site area.
2. The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. For emissions measurement, the receiving antenna was placed 3 meters far away from the turntable
4. The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
5. Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
6. Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
7. Margin=Results-Limit

Report Number: **60/960.15.027.03**

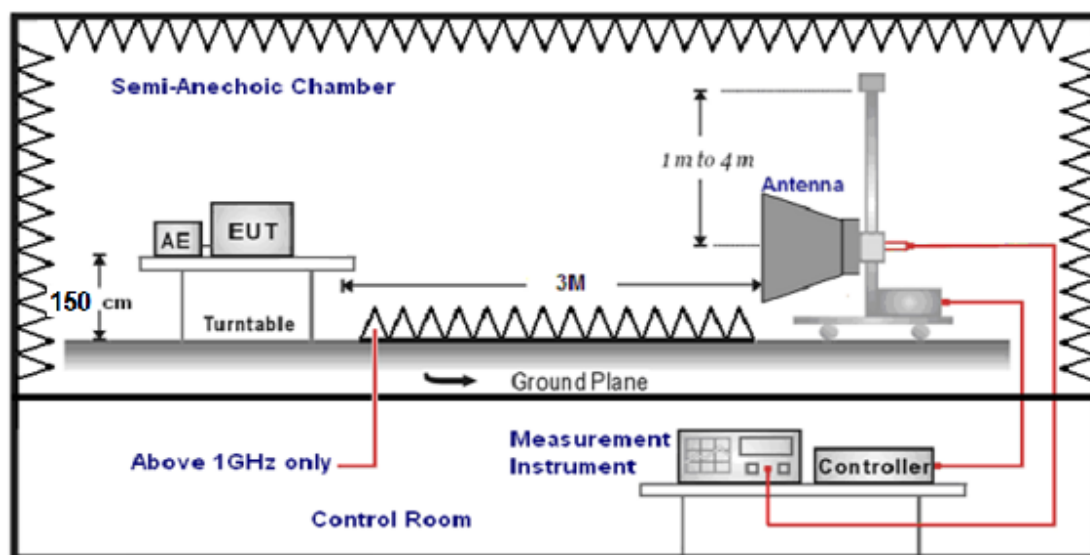
TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 11 of 18

Rev. no.: 2.1

7.2 Band edge measurement

TEST CONFIGURATION



LIMIT

According to § 15.249(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

TEST PROCEDURE

1. The EUT was placed on a turn table which is 1.5m above ground plane with absorber refer to ANSI C63.10:2013
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0°C to 360°C to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Test antenna was located 3 distances from the EUT on an adjustable mast.
6. Set the spectrum analyzer/receiver in the following setting as:
Above 1 GHz (Spectrum analyzer)
 - a) Peak values: RBW=1MHz/VBW=3MHz/Sweep=Auto/Dector: Peak
 - b) Average values: RBW=1MHz/VBW=10Hz/Sweep=1s/Dector: Peak

TEST RESULTS

Report Number: **60/960.15.027.03**

TÜV SÜD HONG KONG LTD., 3/F, West Wing, Lakeside 2, 10 Science Park West Avenue, Science Park, Shatin, HK.
Tel: +852-2776 1323 Fax: +852-2776 1206

Page 12 of 18

Rev. no.: 2.1

Date of test : March 25, 2015
Test requirement : FCC Part 15 15.249
Test method : ANSI C63.10:2013
Operating mode : Transmit mode
Frequency channel : 2457MHz
Remarks : Radiated Band edge

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

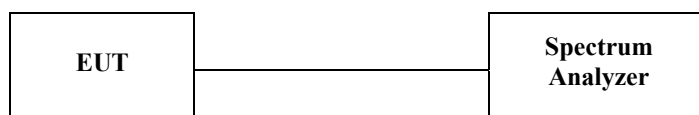
Frequency (MHz)	Polarity (H/V)	Factor (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
2390.000	H	31.3	54.1	74	-19.9	Peak
2390.000	V	31.3	57.6	74	-16.4	Peak
2483.500	H	31.9	59.7	74	-14.3	Peak
2483.500	V	31.9	62.2	74	-11.8	Peak
2390.000	H	31.3	42.2	54	-11.8	Average
2390.000	V	31.3	45.8	54	-8.2	Average
2483.500	H	31.9	48.8	54	-5.2	Average
2483.500	V	31.9	49.6	54	-4.4	Average

Remark:

1. The EUT was placed on the top of the turntable in test site area.
2. The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. For emissions measurement, the receiving antenna was placed 3 meters far away from the turntable
4. The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
5. Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
6. Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
7. $\text{Margin} = \text{Results} - \text{Limit}$

7.3 20dB& 99% bandwidth measurement

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer. Spectrum setting as follows

1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) =100 KHz.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.
8. Measure the maximum width of the emission that use 99% occupied bandwidth function.

TEST RESULTS

Date of test : March 25, 2015

Test requirement : FCC Part 15.215

Test method : ANSI C63.10:2013

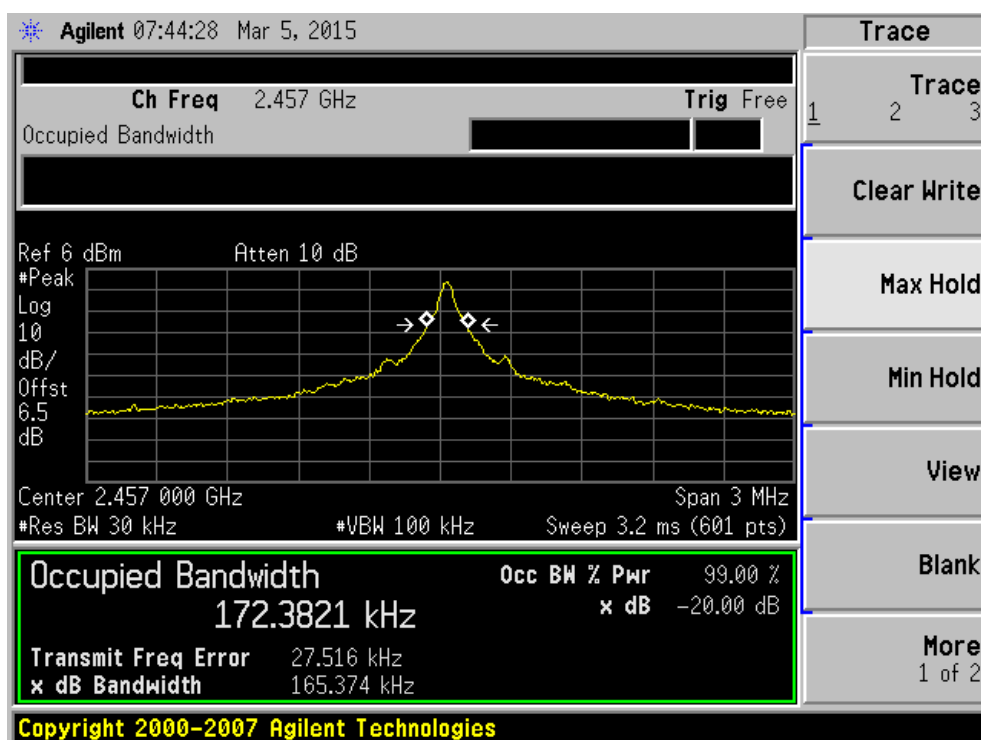
Operating mode : Transmit mode

Frequency channel : 2457MHz

Remarks : NIL

Test Result	
<input checked="" type="checkbox"/>	Passed
<input type="checkbox"/>	Not Passed

20 dB Bandwidth (KHz)	99% OBW (KHz)	Result
165.37	172.38	1



7.4 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.

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				
Description	Type No.	Serial No.	Calibrated date	Calibrated until
EMI Test Receiver	ESU40	SB8501/09	2014.05.16	2015.05.15
Bilog Antenna	Schwarzbeck	SB8501/04	2015.01.12	2016.01.11
Horn Antenna	HF906	SB3435	2015.01.12	2016.01.11
Amplifier(1-18GHz)	--	SB3435/01	2015.01.12	2016.01.11
Amplifier(18-40GHz)	--	SB3435/02	2015.01.12	2016.01.11
Horn Antenna	AT4560	SB5392/02	2014.05.16	2015.05.15
3m Semi-anechoic chamber	9X6X6	SB3450/01	2014.10.12	2015.10.11
Loop Antenna	6512	29604	2014.09.25	2015.09.24
RF cable(3.5m)	/	S02-1404-09-047	2014.05.11	2015.05.10
RF cable(1.2m)	/	S02-1404-09-052	2014.05.11	2015.05.10
Test Software	EMC32	N/A	N/A	N/A

Radiated Bandedge Emission				
Description	Type No.	Serial No.	Calibrated date	Calibrated until
EMI Test Receiver	ESU40	SB8501/09	2014.05.16	2015.05.15
Horn Antenna	HF906	SB3435	2014.01.20	2017.01.19
Amplifier(1-18GHz)	--	SB3435/01	2014.01.20	2015.01.19
3m Semi-anechoic chamber	9X6X6	SB3450/01	2014.10.12	2015.10.11
RF cable(3.5m)	/	S02-1404-09-047	2014.05.11	2015.05.10
RF cable(1.2m)	/	S02-1404-09-052	2014.05.11	2015.05.10
Test Software	EMC32	N/A	N/A	N/A

20dB& 99% bandwidth measurement				
Description	Type No.	Serial No.	Calibrated date	Calibrated until
RF cable(0.4m)	/	S02-1404-09-065	2014.05.11	2015.05.10
Spectrum Analyzer	E4445A	MY46181814	2014-12.11	2015.12.10

AC Conducted Emission measurement				
Description	Type No.	Serial No.	Calibrated date	Calibrated until
Test Receiver	ESCS	SB3319	2014.05.16	2015.05.15
LISN	ESH2-Z5	SB3321	2014.05.16	2015.05.15
LISN	ESH2-Z5	SB2604	2014.05.16	2015.05.15
Test Software	ESK1	N/A	N/A	N/A
RF cable(1.0m)	/	S02-1404-09-055	2014.05.11	2015.05.10

N.C.R: No calibration request

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