Hong Kong

FCC – Test report

Report Number	:	**60/790.15.006.01**	Date of Issue:	March 27, 2015
Model	:	**Nevo**		
Product Type	:	**BLE Watch**		
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	:	35		

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1. Table of Contents

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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

3. Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	BLE Watch
Model no.:	Nevo
Serial number:	NIL
Options and accessories:	NIL
FCC ID:	O4GNEVOXX
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 3VCR2032battery

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
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5. Mode of Operation

All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: GFSK Continuous Transmitting Mode
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Note:
The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.
By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

6. 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.NA: Battery operated only.

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7. General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: O4GNEVOXX 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: February 15, 2015

Testing Start Date: February 16, 2015

Testing End Date: March 24, 2015

- TÜV SÜD HONG KONG LTD. -

Reviewed by: Edmond FUNG

Prepared by: CHAN Kwong Ngai

8. Emission Test Results

7.1 Spurious Emissions at Antenna Terminals

Date of test : February 16, 2015

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

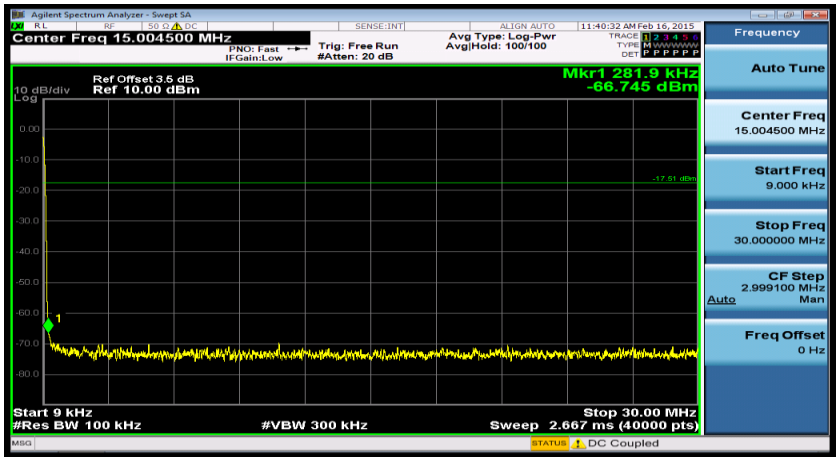
Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2402MHz

Remarks : 9KHz-25GHz

Pref.



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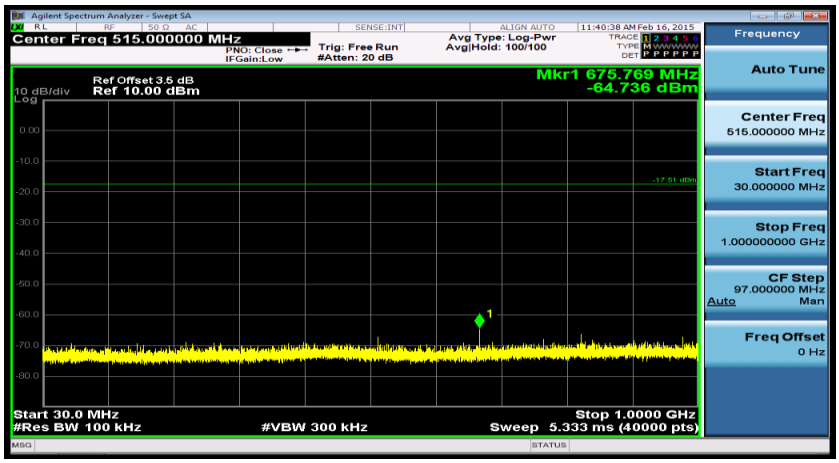

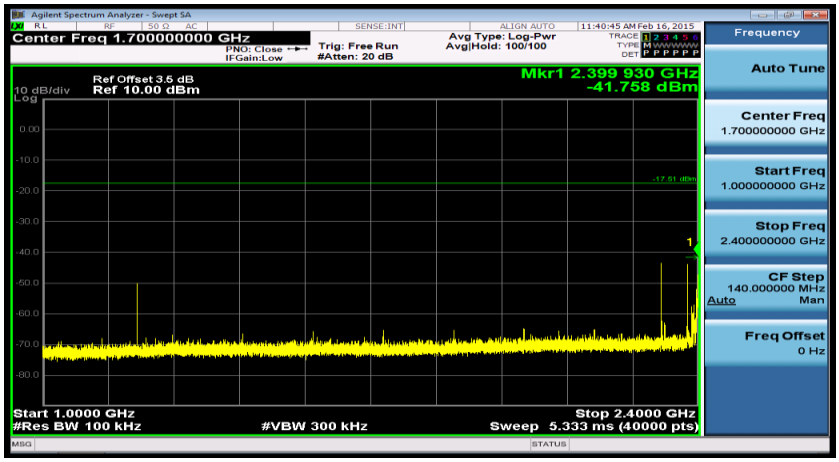

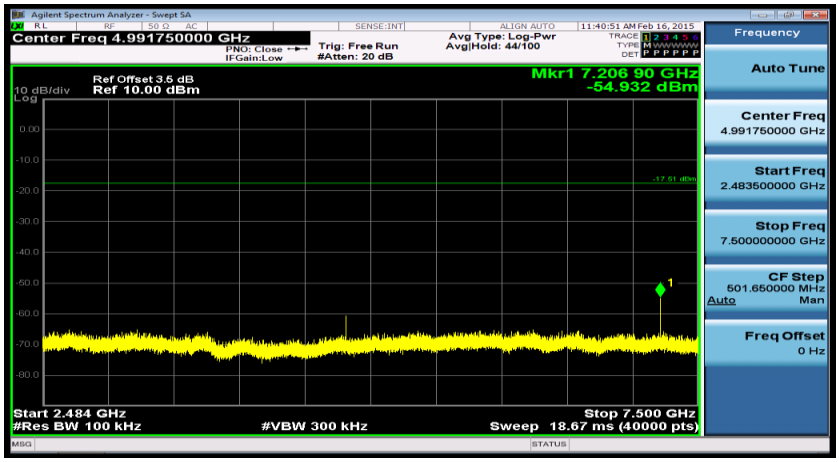

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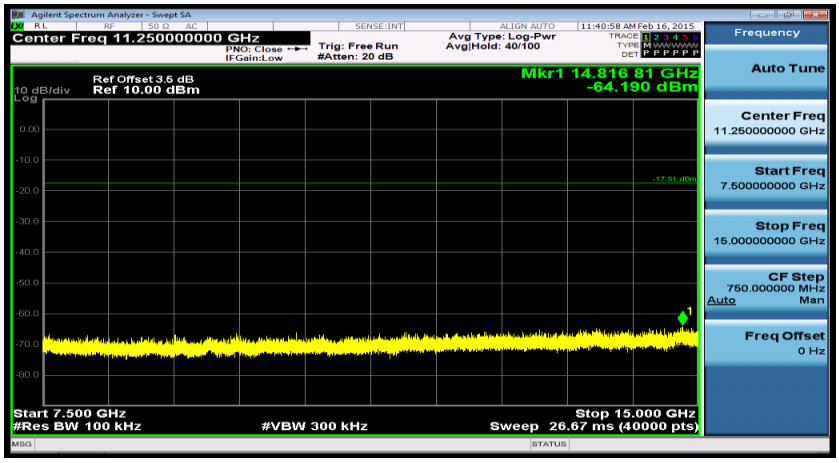

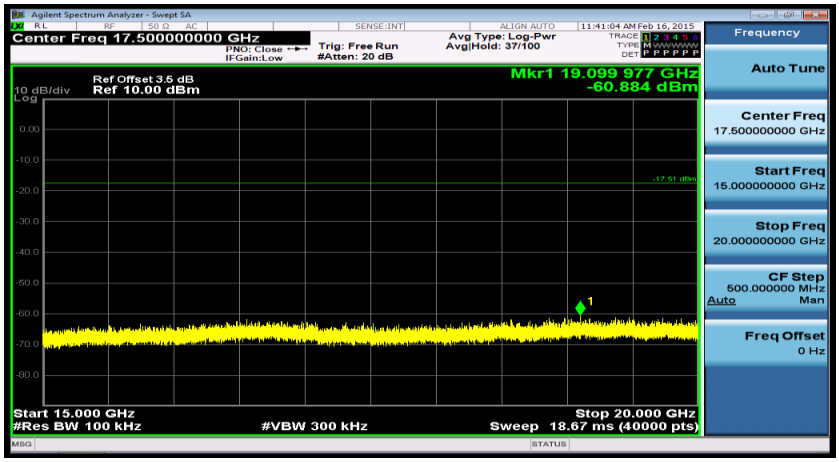

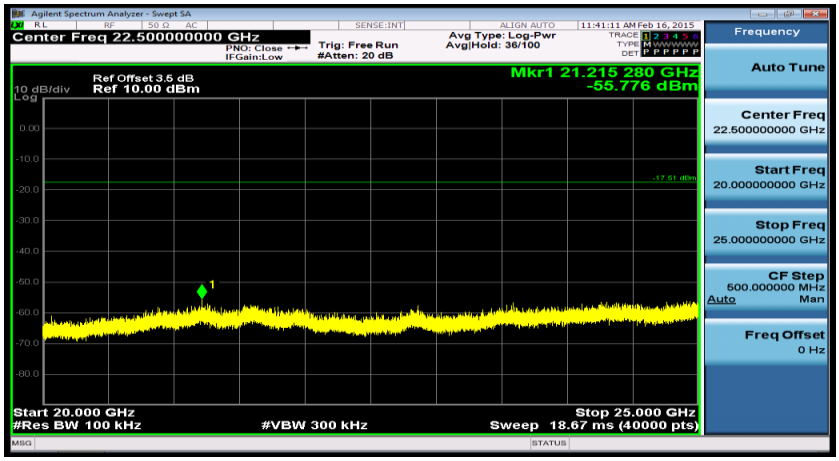

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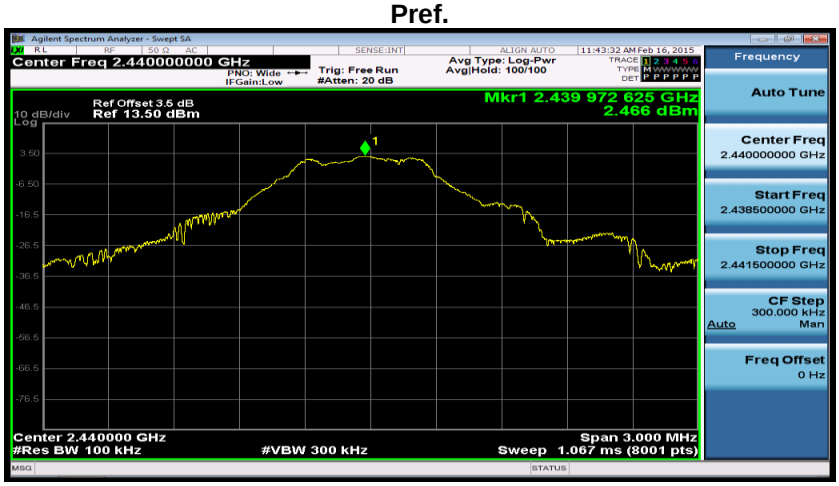
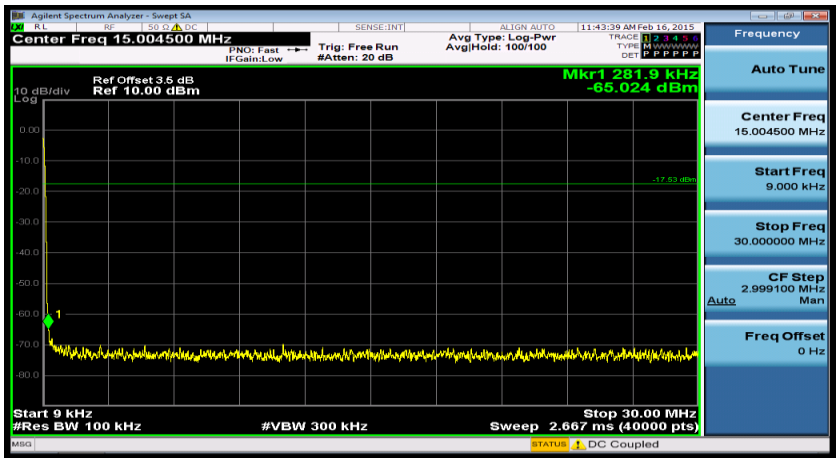
Date of test	:	February 16, 2015
Test requirement	:	FCC §2.1051 & §15.247(d)
Test method	:	Nevo
Operating mode	:	Conducted
Frequency channel	:	2440MHz
Remarks	:	9KHz-25GHz

Pref.





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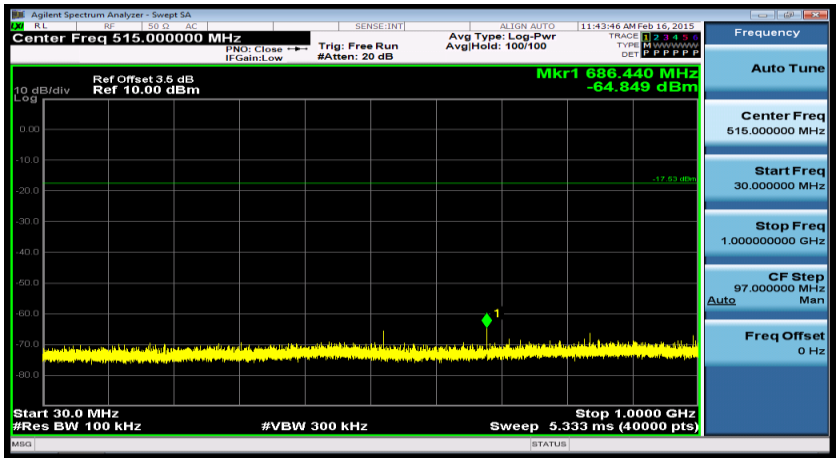

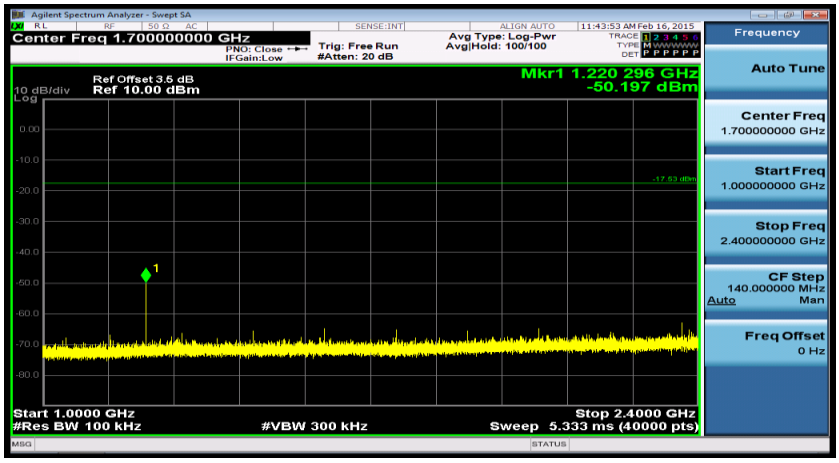

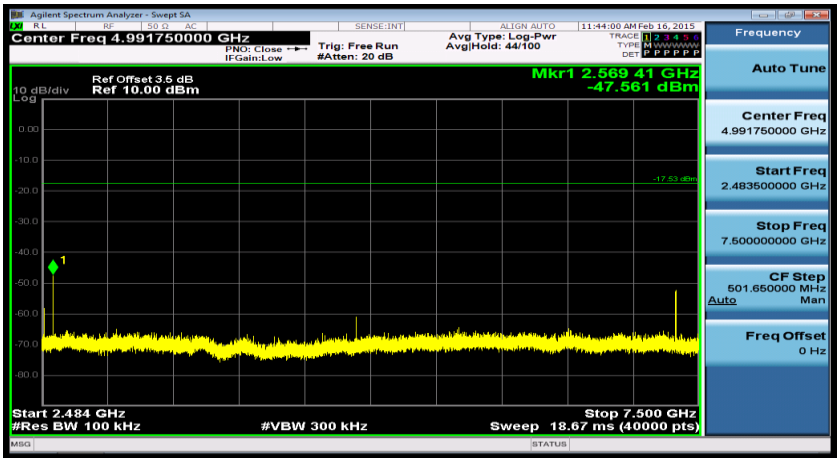

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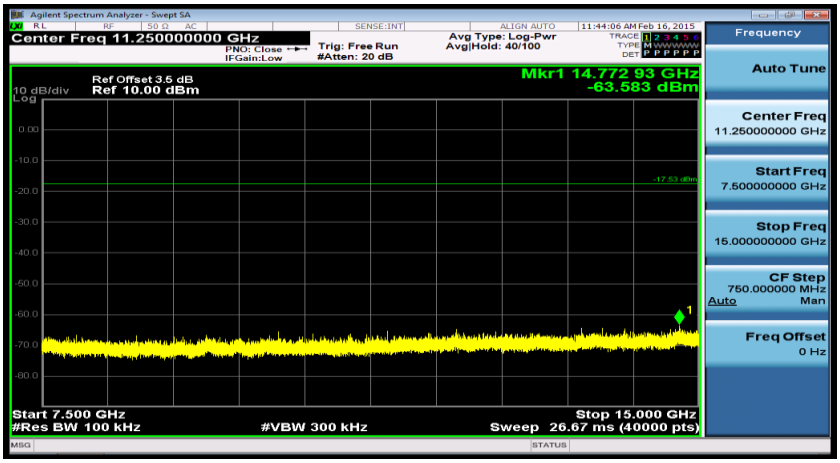

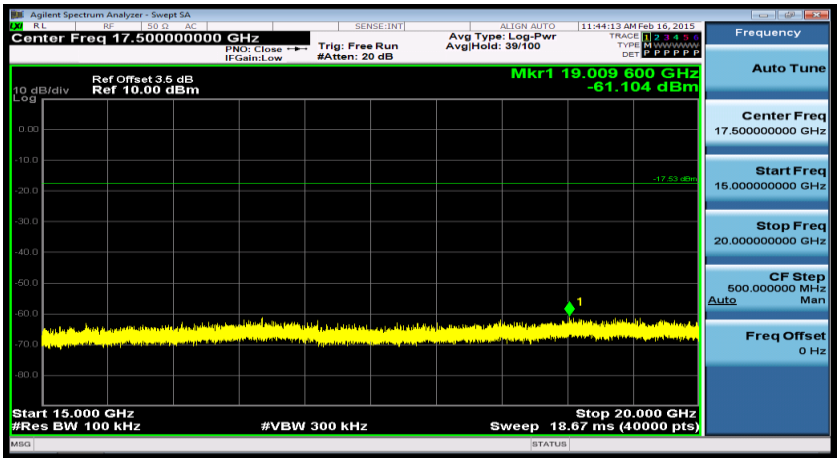

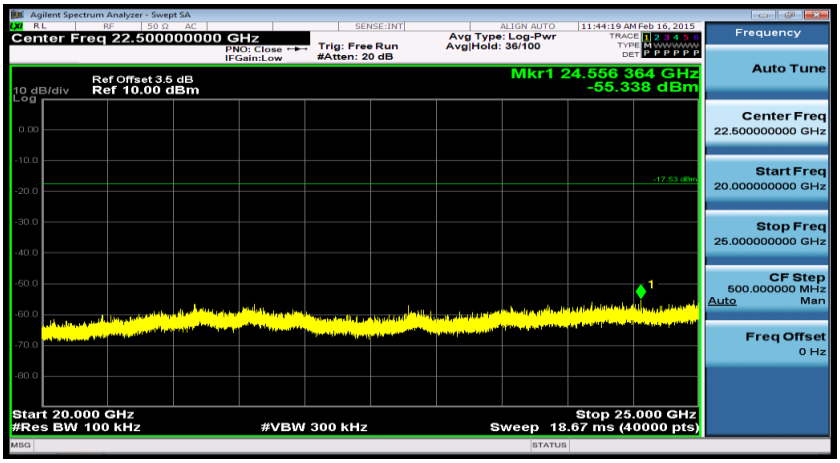

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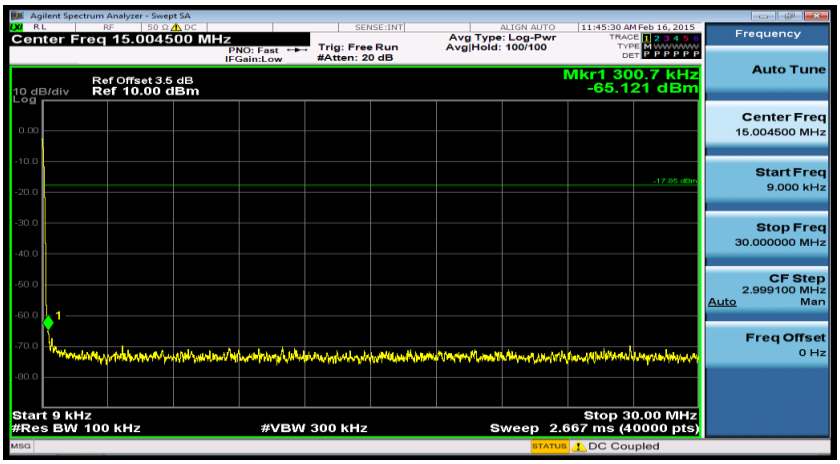
Date of test	:	February 16, 2015
Test requirement	:	FCC §2.1051 & §15.247(d)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2480MHz
Remarks	:	9KHz-25GHz

Pref.



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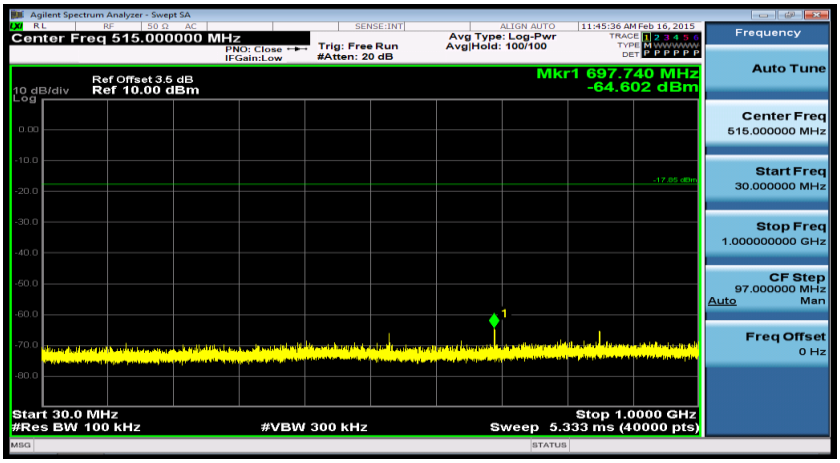

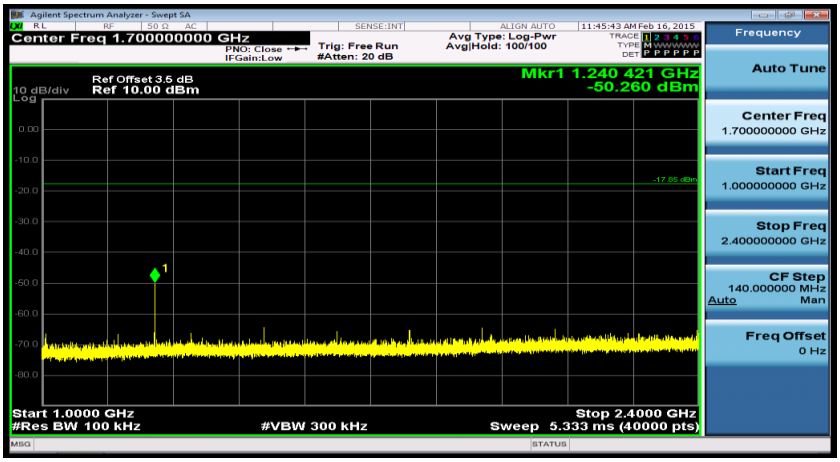

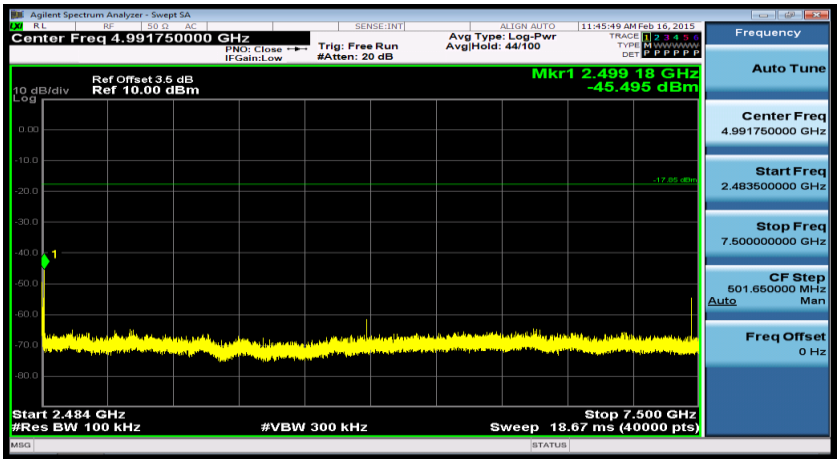

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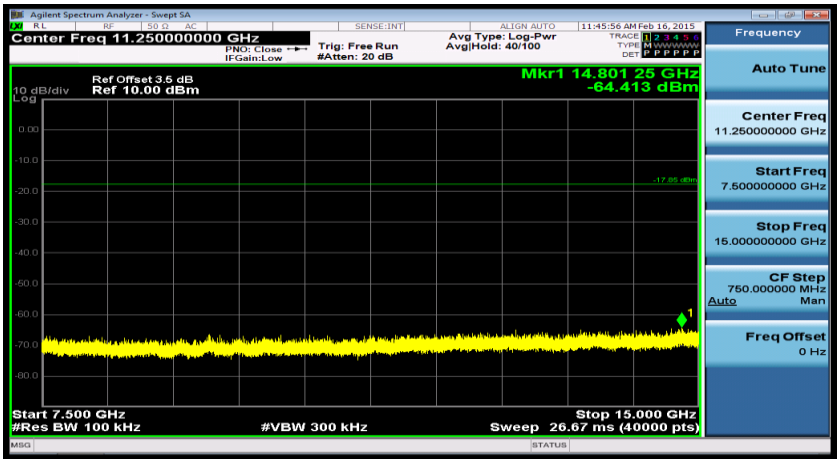

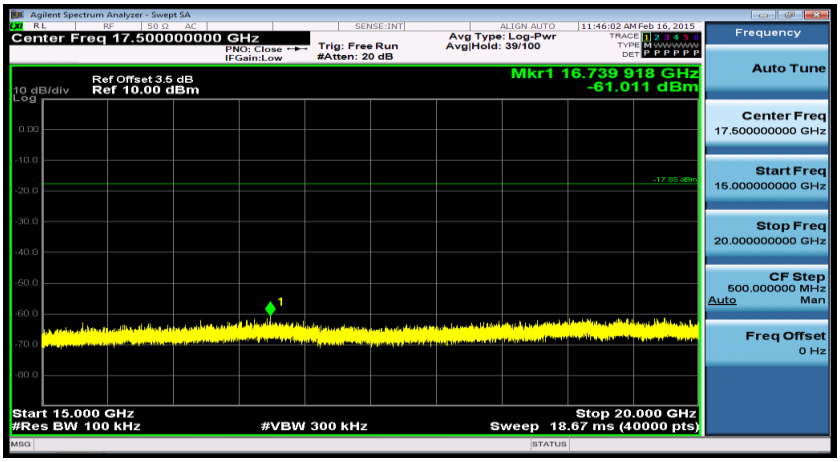

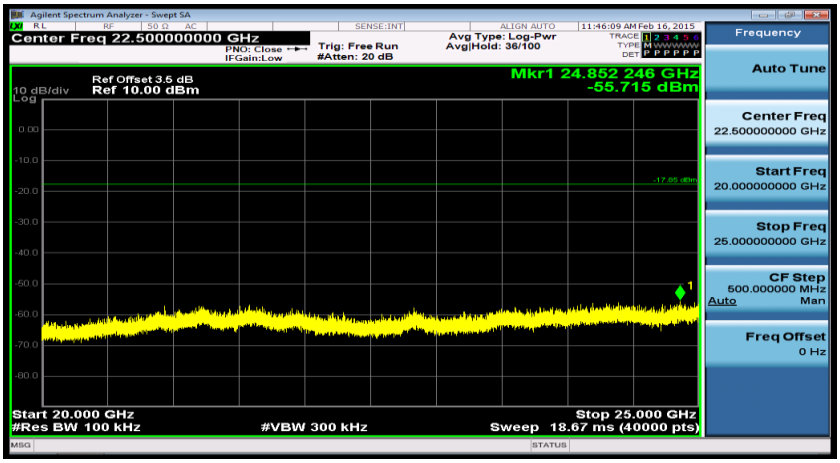

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7.2 Spurious Radiated Emissions

Date of test : January 24, 2015

Test requirement : FCC §15.205, §15.209 & §15.247(d)

Test method : Radiated

Operating mode : Transmit mode

Frequency channel : 2440MHz

Remarks : 9kHz-1GHz

Frequency (MHz)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
32.5	-35.7	18.4	40	-21.6	QP	H
52.1	-33.9	19.5	40	-20.5	QP	H
87.6	-37.7	20.6	40	-19.4	QP	H
88.4	-37.4	21.2	43.5	-22.3	QP	H
422.4	-29.9	20.5	46	-25.5	QP	H
783.5	-24.1	28.3	46	-17.7	QP	H
32.5	-36.9	17.9	40	-22.1	QP	V
52.1	-34.7	21.4	40	-18.6	QP	V
87.6	-36.4	20.8	40	-19.2	QP	V
88.4	-36.2	18.5	43.5	-25.0	QP	V
422.4	-30.7	22.4	46	-23.6	QP	V
783.5	-25.0	29.3	46	-16.7	QP	V

Remark: 1.No emissions can be detected between 9 kHz and 30 MHz.
2.All three channels (2042MHz, 2440MHzand2480MHz) were performed test, and the 2440MHz was the worst case.

Hong Kong

Date of test : January 24, 2015

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
4803.000	58.8	-5.4	53.4	74	-20.6	peak	H
4803.000	43.6	-5.4	38.2	54	-15.8	Average	H
7204.000	50.6	-2.7	47.9	74	-26.1	peak	H
7204.000	36.3	-2.7	33.6	54	-20.4	Average	H
4803.000	60.6	-5.4	55.2	74	-18.8	peak	V
4803.000	44.9	-5.4	39.5	54	-14.5	Average	V
7204.000	52.3	-2.7	49.6	74	-24.4	peak	V
7206.000	38.5	-2.7	35.8	54	-18.2	Average	V

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Hong Kong

Date of test : January 24, 2015

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
4880.000	57.1	-5.4	51.7	74	-22.3	peak	H
4880.000	42.2	-5.4	36.8	54	-17.2	Average	H
7320.000	50.9	-2.5	48.4	74	-25.6	peak	H
7320.000	34.4	-2.5	31.9	54	-22.1	Average	H
4880.000	57.6	-5.4	52.2	74	-21.8	peak	V
4880.000	42.2	-5.4	36.8	54	-17.2	Average	V
7318.000	47.3	-2.5	44.8	74	-29.2	peak	V
7318.000	35	-2.5	32.5	54	-21.5	Average	V

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Hong Kong

Date of test : January 24, 2015

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
4960.000	58.7	-5.4	53.3	74	-20.7	peak	H
4960.000	43.3	-5.4	37.9	54	-16.1	Average	H
7440.000	50.3	-2.1	48.2	74	-25.8	peak	H
7440.000	36.2	-2.1	34.1	54	-19.9	Average	H
4960.000	58.0	-5.4	52.6	74	-21.4	peak	V
4960.000	39.6	-5.4	34.2	54	-19.8	Average	V
7440.000	47.6	-2.1	45.5	74	-28.5	peak	V
7440.000	35.8	-2.1	33.7	54	-20.3	Average	V

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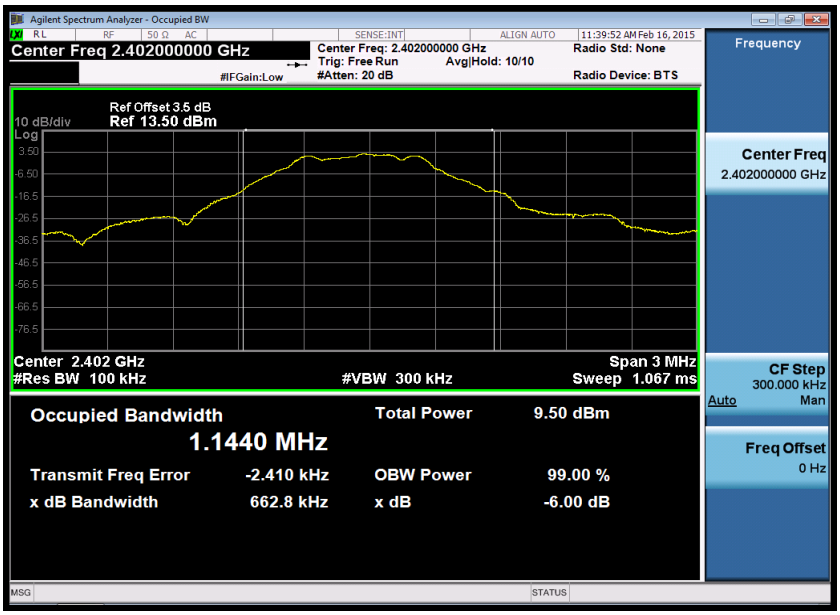
7.3 6dB & 99%Bandwidth

Date of test	:	February 16, 2015
Test requirement	:	FCC §15.247(a)(2)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2402MHz
Remarks	:	NIL

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
2402	662.8	>500
99% bandwidth:1144.0kHz		



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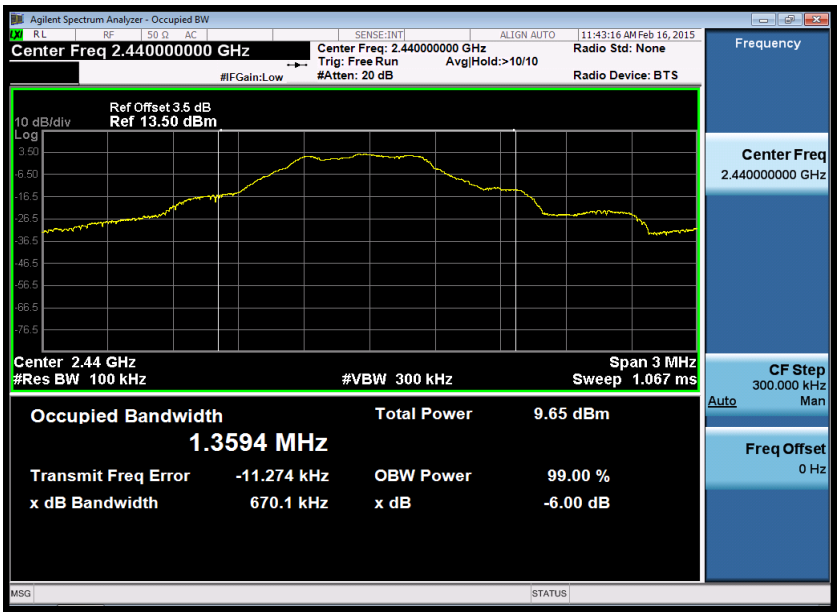
Date of test	:	February 16, 2015
Test requirement	:	FCC §15.247(a)(2)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2440MHz
Remarks	:	NIL

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
2440	670.1	>500
99% bandwidth: 1359.4kHz		



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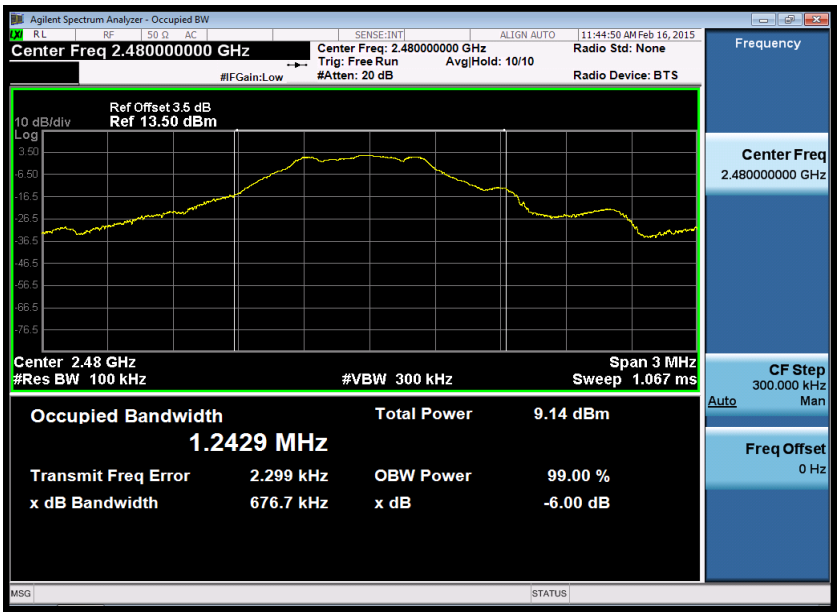
Date of test	:	February 16, 2015
Test requirement	:	FCC §15.247(a)(2)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2480MHz
Remarks	:	NIL

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	6dB Bandwidth (kHz)	Limit (kHz)
2480	676.7	>500
99% bandwidth: 1242.9kHz		



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7.4 Peak Output Power Measurements

Date of test : February 16, 2015

Test requirement : FCC §15.247(b)

Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2402/2440/2480MHz

Remarks :

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
2402	2.95	30
2440	2.81	30
2480	2.43	30

Note: The relevant measured result has the offset with cable loss already.

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7.5 100 kHz Bandwidth of Band Edges

Date of test : February 16, 2015

Test requirement : FCC §15.247(d)

Test method : Conducted

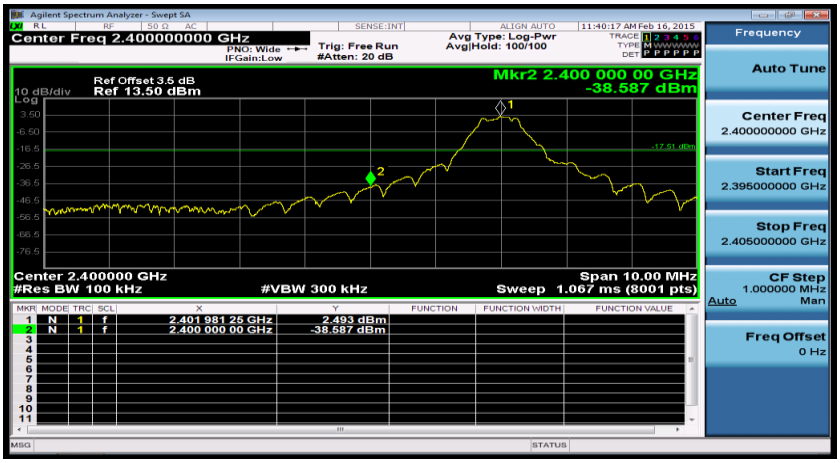
Operating mode : Transmit mode

Frequency channel : 2402MHz

Remarks : Conducted

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	Delta Peak to Band Emission (dB)	Limit (dB)
2402	41.080	>20



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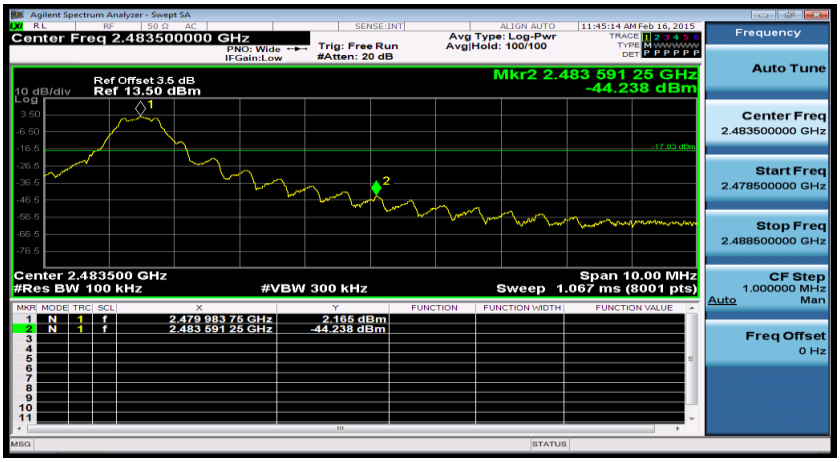
Hong Kong

Date of test	:	February 16, 2015
Test requirement	:	FCC §15.247(d)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2480MHz
Remarks	:	Conducted

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	Delta Peak to Band Emission (dB)	Limit (dB)
2480	46.404	>20



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Hong Kong

Date of test : January 24, 2015

Test requirement : FCC §15.247(d)

Test method : Radiated

Operating mode : Transmit mode

Frequency channel : 2402MHz&2480MHz

Remarks :

Test Result
☒ Passed
☐ Not Passed

Channel	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
2402MHZ	2390	55.4	74.00	-18.6	peak	H
	2390	40.8	54.00	-13.2	Average	H
	2390	52.9	74.00	-21.1	peak	V
	2390	41.1	54.00	-12.9	Average	V
2480MHz	2483.5	53.9	74.00	-20.1	peak	H
	2483.5	39.2	54.00	-14.8	Average	H
	2483.5	52.4	74.00	-21.6	peak	V
	2483.5	41.7	54.00	-12.3	Average	V

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7.6 Power Spectral Density

Date of test : February 16, 2015

Test requirement : FCC §15.247(e)

Test method : Conducted

Operating mode : Transmit mode

Frequency channel : 2402MHz

Remarks :

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
2402	-10.716	<8

Note: The relevant measured result has the offset with cable loss already.

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Hong Kong

Date of test	:	February 16, 2015
Test requirement	:	FCC §15.247(e)
Test method	:	Conducted
Operating mode	:	Transmit mode
Frequency channel	:	2440MHz
Remarks	:	

Test Result
☒ Passed
☐ Not Passed

Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
2440	-10.728	<8

Note: The relevant measured result has the offset with cable loss already.

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Date of test	:	February 16, 2015
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	-11.201	<8

Note: The relevant measured result has the offset with cable loss already.

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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 internal antenna. And the maximum Gain of this antenna is 0.0 dBi.

Antenna Gain

	Low channel	Middle channel	High channel
Conducted power（dBm）	2.95	2.81	2.43
Radiated Power（dBm）	2.74	2.77	2.11
Gain（dBi）	-0.21	-0.04	-0.32
Measurement uncertainty	±1.5dB(Cond.)/3dB(Rad.)		

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7.8 FCC RF Exposure

FCC ID: O4GNEVOXX
Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Portable Device
Refer Standard: KDB 447498 D01 General RF Exposure Guidance v05r02
FCC Part 2 §2.1093
Evaluation method
According to KDB447498 D01 General RF Exposure Guidance v05r01Section 4.3.1 Standalone SAR test exclusion considerations:" Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.22 The minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the test separation distances applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, typically in the SAR measurement or SAR analysis report, according to the required published RF exposure KDB procedures. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other published RF exposure KDB procedures must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.23 "
[(max. power of channel, including tune-up tolerance, mW)/ (min. test separation distance, mm)] · [√f (GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:
• f (GHz) is the RF channel transmit frequency in GHz
• Power and distance are rounded to the nearest mW and mm before calculation
• The result is rounded to one decimal place for comparison
• 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

Conducted Power Results

Bluetooth

Mode	Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
GFSK-BLE	00	2402	2.95
	19	2440	2.81
	39	2480	2.43

Manufacturing tolerance

Bluetooth

GFSK-BLE (Peak)			
Channel	Channel 00	Channel 19	Channel 39
Target (dBm)	2.0	2.0	2.0
Tolerance ±(dB)	1.0	1.0	1.0

Evaluation Results

Band/Mode	f (GHz)	Antenna Distance (mm)	RF output power (including tune-up tolerance)		SAR Test Exclusion Threshold	SAR Test Exclusion
			dBm	mW		
BT*	2.450	0	3.00	1.995	0.7<3.0	Yes

BT*-BT including BLE (lower power BT)

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v05r02.

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9. Test Equipment List

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	2015.01.20	2016.01.19
Horn Antenna	HF906	SB3435	2015.01.20	2016.01.19
Amplifier(1-18GHz)	--	SB3435/01	2015.01.20	2016.01.19
Amplifier(18-40GHz)	--	SB3435/02	2015.01.20	2016.01.19
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(0.4m)	/	S02-1404-09-065	2014.05.11	2015.05.10
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
Spectrum Analyzer	N9020A	MY53420615	2014.05.12	2015.05.11
Power Sensor	U2021XA	MY53180015	2014.05.24	2015.05.23
Power Sensor	U2021XA	MY53260040	2014.05.24	2015.05.23
Power Sensor	U2021XA	MY53360002	2014.05.24	2015.05.23
Power Sensor	U2021XA	MY53360006	2014.05.24	2015.05.23
USB Modular Simultaneous Data Acquisition	U2531A	TW53353509	N.C.R	/
USB Modular Simultaneous Data Acquisition	U2531A	TW53353511	N.C.R	/
Temp. & Humid. Chamber	FACT5-2.0	4166	2014.11.22	2015.11.21

N.C.R: No calibration request.

10. 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 (dBμV/m)	U=3.59dB(9kHz-30MHz) U=5.08dB(30MHz-1GHz) U=4.56dB (1GHz-18GHz) U=4.42dB (18GHz-25GHz)
CE	Disturbance Voltage (dBμV)	U=2.7dB

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