



Test Report

Date : 2019-11-07
No. : HM19090032

Page 1 of 34

Applicant: Xenon Electronic Limited
Room 719, Worldwide Industrial Centre, 43-47 Shan Mei Street, Fo Tan,
Hong Kong

Manufacturer: Xenon Electronic Limited
Room 719, Worldwide Industrial Centre, 43-47 Shan Mei Street, Fo Tan,
Hong Kong

Description of Sample(s): Submitted sample(s) said to be
Product: HandyScope
Brand Name: DermLite Handyscope
Model No.: FFH2
FCC ID: 2ATBKFFH2

Date Samples Received: 2019-09-25

Date Tested: 2019-10-09 to 2019-10-15

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with
FCC 47CFR [Codes of Federal Regulations] Part 15: 2018 and ANSI
C63.10:2013 for FCC Certification.

Conclusions: The submitted product COMPLIED with the requirements of Federal
Communications Commission [FCC] Rules and Regulations Part 15.
The tests were performed in accordance with the standards described
above and on Section 2.2 in this Test Report.

Remarks: Bluetooth Low Energy (BLE) only



CHEUNG Chi, Kenneth
Authorized Signatory

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 2 of 34

CONTENT:

Cover	Page 1 of 34
Content	Page 2 of 34
<u>1.0 General Details</u>	
1.1 Test Laboratory	Page 3 of 34
1.2 Equipment Under Test [EUT] Description of EUT operation	Page 3 of 34
1.3 Date of Order	Page 3 of 34
1.4 Submitted Sample(s)	Page 3 of 34
1.5 Test Duration	Page 3 of 34
1.6 Country of Origin	Page 3 of 34
1.7 RF Module Details	Page 4 of 34
1.8 Channel List	Page 4 of 34
<u>2.0 Technical Details</u>	
2.1 Investigations Requested	Page 5 of 34
2.2 Test Standards and Results Summary	Page 5 of 34
<u>3.0 Test Results</u>	
3.1 Emission	Page 6-33 of 34
<u>Appendix A</u>	
List of Measurement Equipment	Page 34 of 34



Test Report

Date : 2019-11-07

Page 3 of 34

No. : HM19090032

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.

EMC Laboratory

Head Office: 10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Telephone: 852 2666 1888

Fax: 852 2664 4353

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product: HandyScope

Manufacturer: Xenon Electronic Limited

Room 719, Worldwide Industrial Centre, 43-47 Shan Mei Street,
Fo Tan, Hong Kong

Brand Name: DermLite Handyscope

Model Number: FFH2

Rating: DC 3.7V by built-in li-ion battery; DC 5V input via USB Port

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a 2.4GHz Bluetooth HandyScope. The tests were conducted under RF Test mode to maintain continuous transmission (>98% duty cycle) during test. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC; the type of modulation used was GFSK. The Test mode of the EUT was control by the software Smart RF studio 7, while the EUT was set to Highest RF output during Test.

1.3 Date of Order

2019-09-25

1.4 Submitted Sample(s):

2 Samples

1.5 Test Duration

2019-10-09 to 2019-10-15

1.6 Country of Origin

Hong Kong

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 4 of 34

1.7 RF Module Details

Module Model Number: CC2541
Module FCC ID: N/A
Module Transmission Type: Bluetooth Low Energy (BLE)
Modulation: GFSK
Data Rates: 1Mbps (Max)
Frequency Range: 2400-2483.5MHz
Carrier Frequencies: 2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

1.8 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 5 of 34

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2018 Regulations and ANSI C63.10:2013 for FCC Certification.
According FCC KDB 558074 DTS Measurement Guidance, Duty cycle $\geq 98\%$.
The device was realized by test software.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Maximum Peak Output Power	FCC 47CFR 15.247(b)(3)	ANSI C63.10: 2013	N/A	☒	☐	☐
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.10: 2013	N/A	☒	☐	☐
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10: 2013	N/A	☒	☐	☐
Power Spectral Density	FCC 47CFR 15.247(e)	ANSI C63.10: 2013	N/A	☒	☐	☐
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	ANSI C63.10: 2013	N/A	☒	☐	☐
Band Edge Emissions (Radiated)	FCC 47CFR 15.247(d)	ANSI C63.10: 2013	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 6 of 34

3.0 Test Results

3.1 Emission

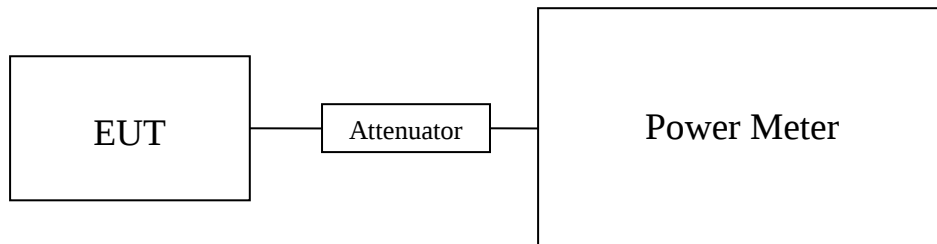
3.1.1 Maximum Peak Output Power

Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	ANSI C63.10: 2013
Test Date:	2019-10-10
Mode of Operation:	Tx mode

Test Method:

The RF output of the EUT was connected to the Power Meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

Test Setup:



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taiipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 7 of 34

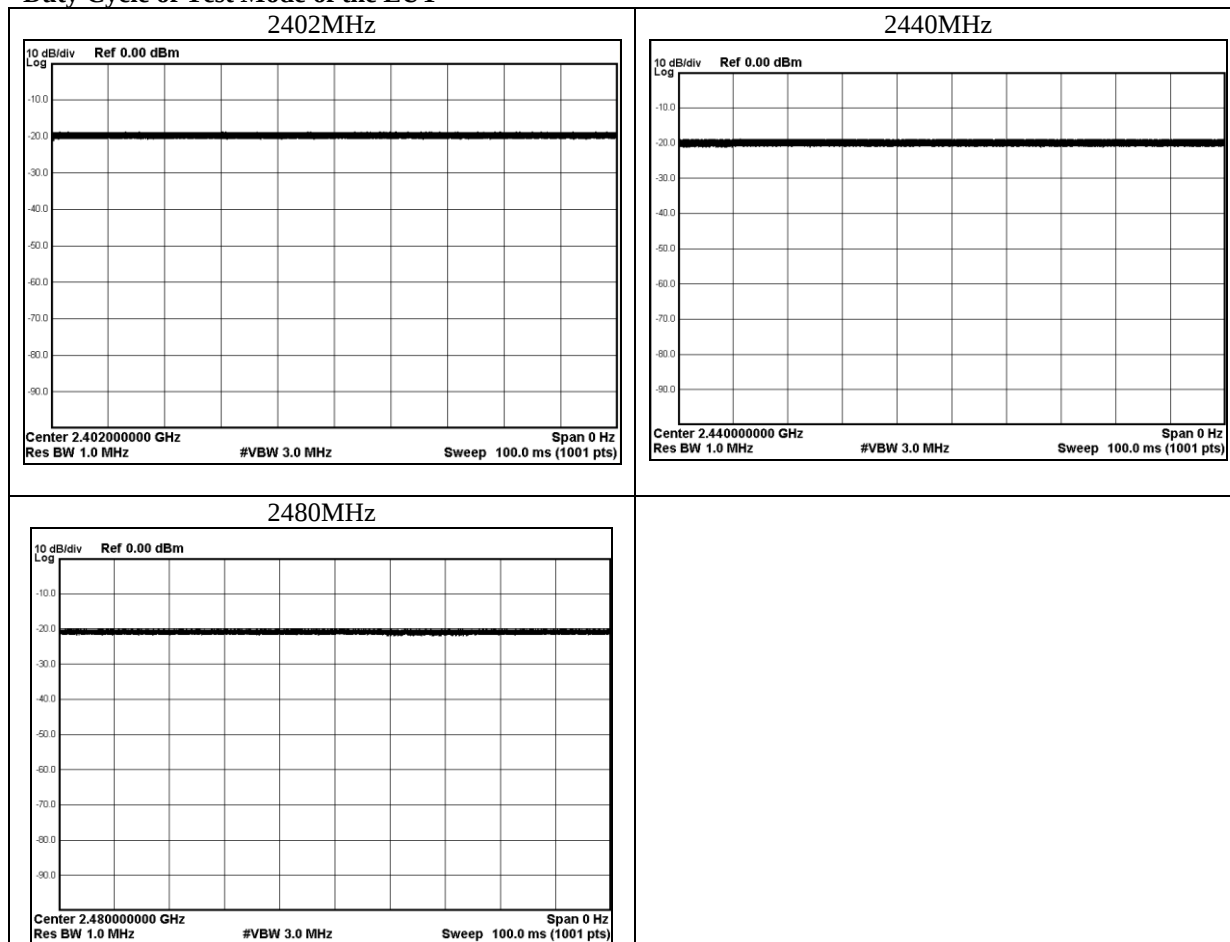
Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

Results of Tx Mode: Pass (TX Unit) Maximum conducted peak power

Channel	Frequency(MHz)	Output Power(Watt)
0	2402	0.0000058
19	2440	0.0000067
39	2480	0.0000083

Duty Cycle of Test Mode of the EUT



Calculated measurement uncertainty : 30MHz to 26GHz 1.7dB

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

Test Report

Date : 2019-11-07

No. : HM19090032

Page 8 of 34

3.1.2 Radiated Emissions

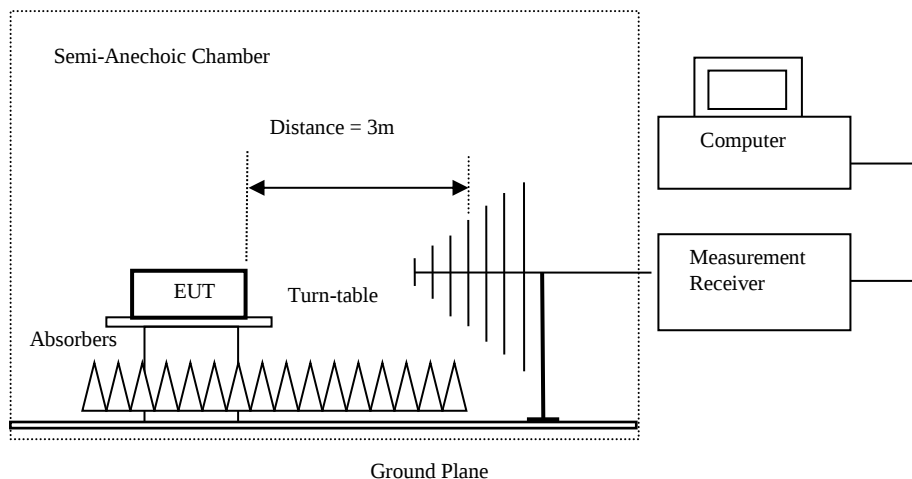
Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2019-09-06
Mode of Operation:	Tx mode

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The measured field strength would be calculated as EIRP.

Semi-anechoic chamber located at STC filed with Industry Canada File Number: 4789A

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.
- For emissions testing at or below 1 GHz, the table height shall be 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 9 of 34

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

Frequency Range	Quasi-Peak Limits
[MHz]	[μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

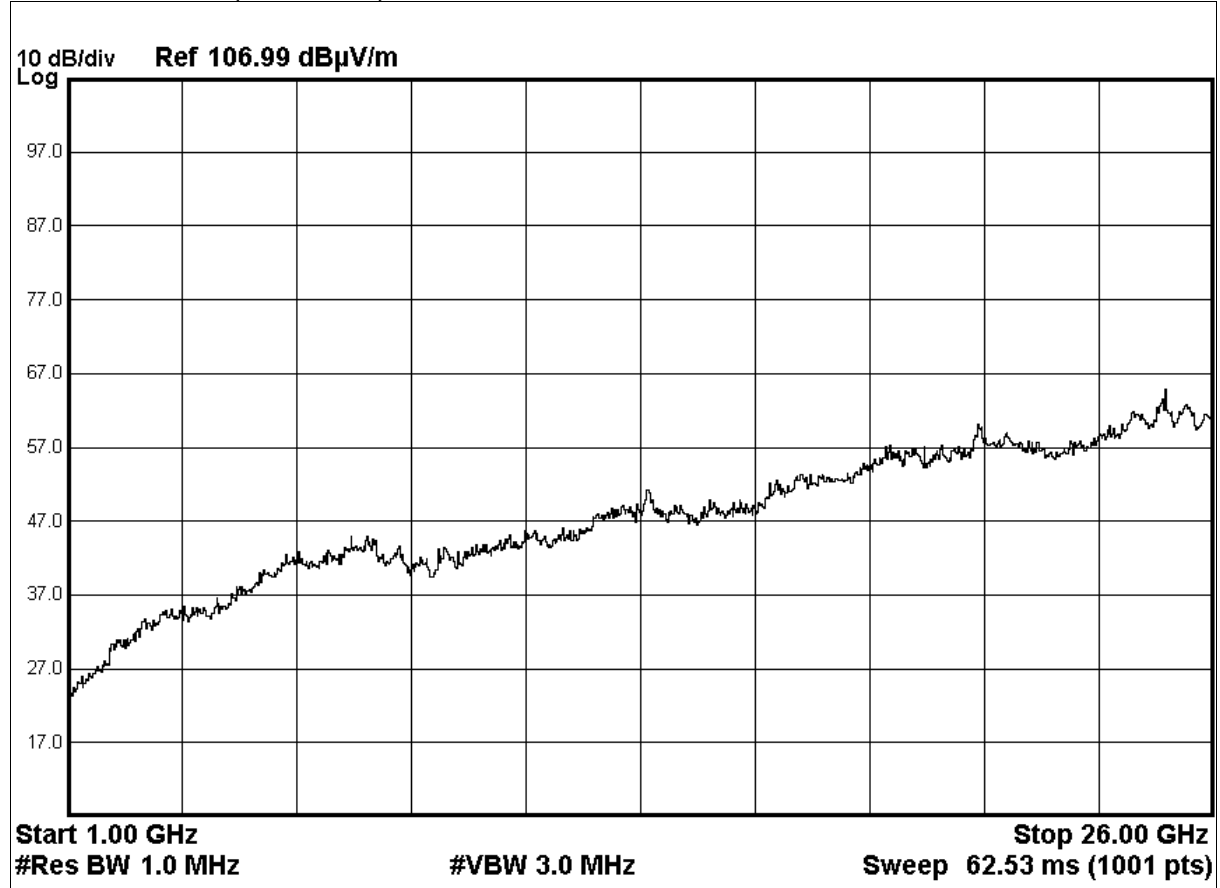


Test Report

Date : 2019-11-07
No. : HM19090032

Page 10 of 34

Result of Tx mode (2402.0 MHz)



Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 11 of 34

Result of Tx mode (2402.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

Result of Tx mode (2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	-3.4	32.1	28.7	74.0	45.3	Vertical
7206.0	-4.6	38.6	34.0	74.0	40.0	Vertical
9608.0	-4.1	41.3	37.2	74.0	36.8	Vertical
12010.0	-3.8	43.5	39.7	74.0	34.3	Vertical
4804.0	-4.3	32.1	27.8	74.0	46.2	Horizontal
7206.0	-5.1	38.6	33.5	74.0	40.5	Horizontal
9608.0	-4.3	41.3	37.0	74.0	37.0	Horizontal
12010.0	-4.1	43.5	39.4	74.0	34.6	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	-5.2	32.1	26.9	54.0	27.1	Vertical
7206.0	-6.3	38.6	32.3	54.0	21.7	Vertical
9608.0	-6.8	41.3	34.5	54.0	19.5	Vertical
12010.0	-6.7	43.5	36.8	54.0	17.2	Vertical
4804.0	-5.4	32.1	26.7	54.0	27.3	Horizontal
7206.0	-6.2	38.6	32.4	54.0	21.6	Horizontal
9608.0	-6.6	41.3	34.7	54.0	19.3	Horizontal
12010.0	-6.7	43.5	36.8	54.0	17.2	Horizontal

Remarks: the listed correction factors are equal to Antenna factor + cable loss in corresponding to measuring frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

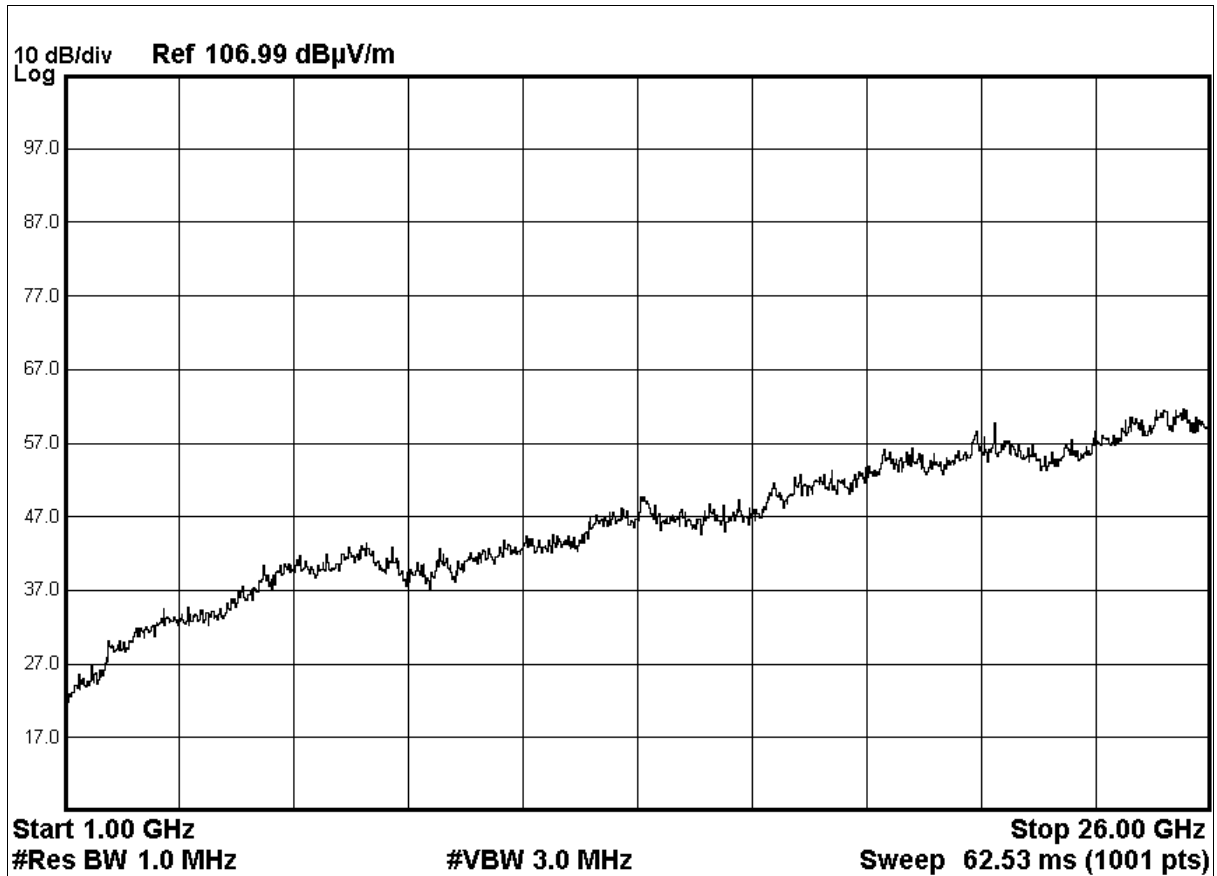


Test Report

Date : 2019-11-07
No. : HM19090032

Page 12 of 34

Result of Tx mode (2440.0 MHz)



Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 13 of 34

Result of Tx mode (2440.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

Result of Tx mode (2440.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4880.0	-3.6	32.1	28.5	74.0	45.5	Vertical
7320.0	-3.8	38.6	34.8	74.0	39.2	Vertical
9760.0	-4.6	41.3	36.7	74.0	37.3	Vertical
12200.0	-4.2	43.5	39.3	74.0	34.7	Vertical
4880.0	-3.8	32.1	28.3	74.0	45.7	Horizontal
7320.0	-4.1	38.6	34.5	74.0	39.5	Horizontal
9760.0	-4.5	41.3	36.8	74.0	37.2	Horizontal
12200.0	-4.3	43.5	39.2	74.0	34.8	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4880.0	-5.8	32.1	26.3	54.0	27.7	Vertical
7320.0	-6.3	38.6	32.3	54.0	21.7	Vertical
9760.0	-5.7	41.3	35.6	54.0	18.4	Vertical
12200.0	-6.8	43.5	36.7	54.0	17.3	Vertical
4880.0	-5.9	32.1	26.2	54.0	27.8	Horizontal
7320.0	-6.2	38.6	32.4	54.0	21.6	Horizontal
9760.0	-5.6	41.3	35.7	54.0	18.3	Horizontal
12200.0	-6.1	43.5	37.4	54.0	16.6	Horizontal

Remarks: the listed correction factors are equal to Antenna factor + cable loss in corresponding to measuring frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

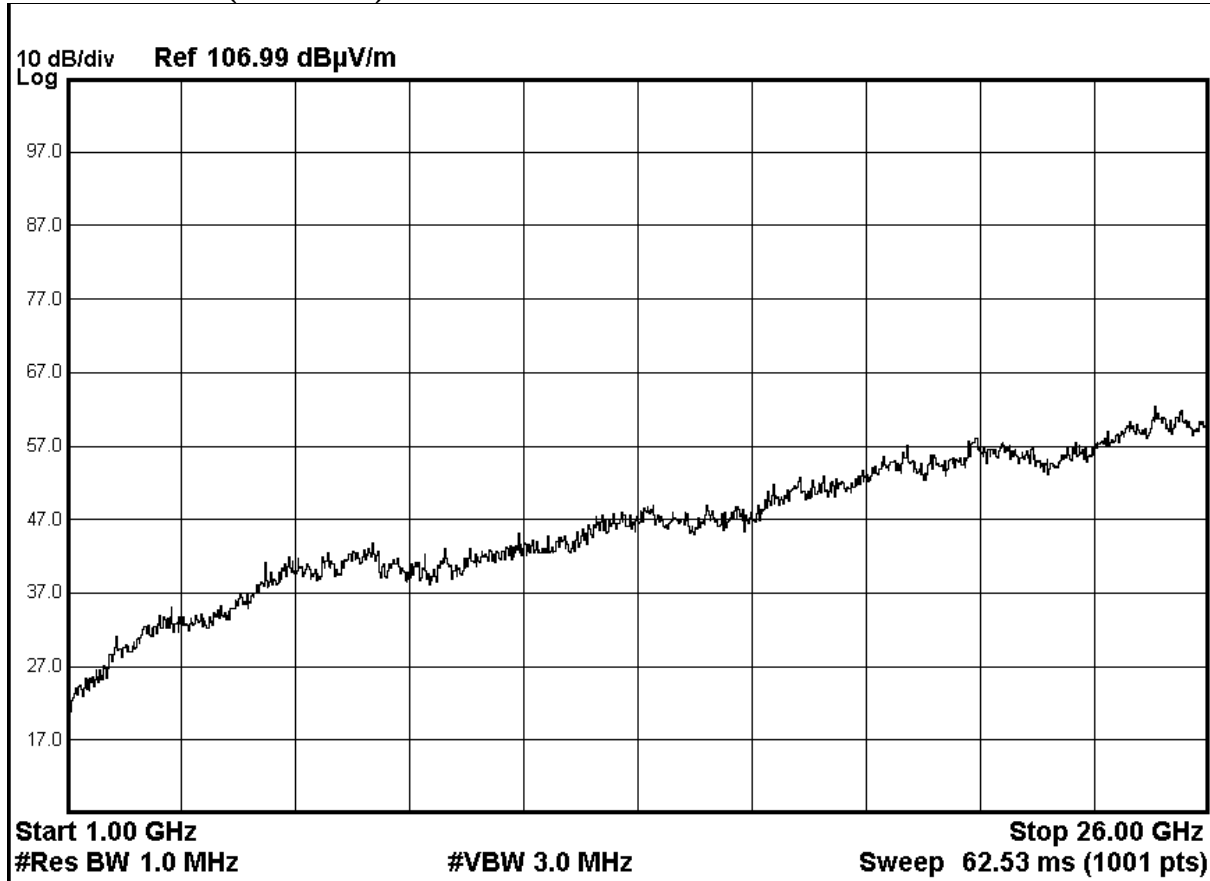


Test Report

Date : 2019-11-07
No. : HM19090032

Page 14 of 34

Result of Tx mode (2480.0 MHz)



Remarks: The fundamental frequency was not included in the pre-scan plot, a 2.4G notch filter was added prior to the Receiver, please refer the band-edge plot for the level of fundamental frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 15 of 34

Result of Tx mode (2480.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the Limits						

Result of Tx mode (2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	-3.4	32.2	28.8	74.0	45.2	Vertical
7440.0	-4.9	38.6	33.7	74.0	40.3	Vertical
9920.0	-5.1	42.1	37.0	74.0	37.0	Vertical
12400.0	-5.6	44.1	38.5	74.0	35.5	Vertical
4960.0	-3.6	32.2	28.6	74.0	45.4	Horizontal
7440.0	-4.7	38.6	33.9	74.0	40.1	Horizontal
9920.0	-5.3	42.1	36.8	74.0	37.2	Horizontal
12400.0	-5.5	44.1	38.6	74.0	35.4	Horizontal

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	-5.3	32.2	26.9	54.0	27.1	Vertical
7440.0	-6.7	38.6	31.9	54.0	22.1	Vertical
9920.0	-6.1	42.1	36.0	54.0	18.0	Vertical
12400.0	-6.3	44.1	37.8	54.0	16.2	Vertical
4960.0	-5.6	32.2	26.6	54.0	27.4	Horizontal
7440.0	-6.5	38.6	32.1	54.0	21.9	Horizontal
9920.0	-6.4	42.1	35.7	54.0	18.3	Horizontal
12400.0	-6.7	44.1	37.4	54.0	16.6	Horizontal

Remarks: the listed correction factors are equal to Antenna factor + cable loss in corresponding to measuring frequency.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 16 of 34

Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	9kHz-30MHz	3.3dB
		30MHz -1GHz	4.6dB
		1GHz -26GHz	4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 17 of 34

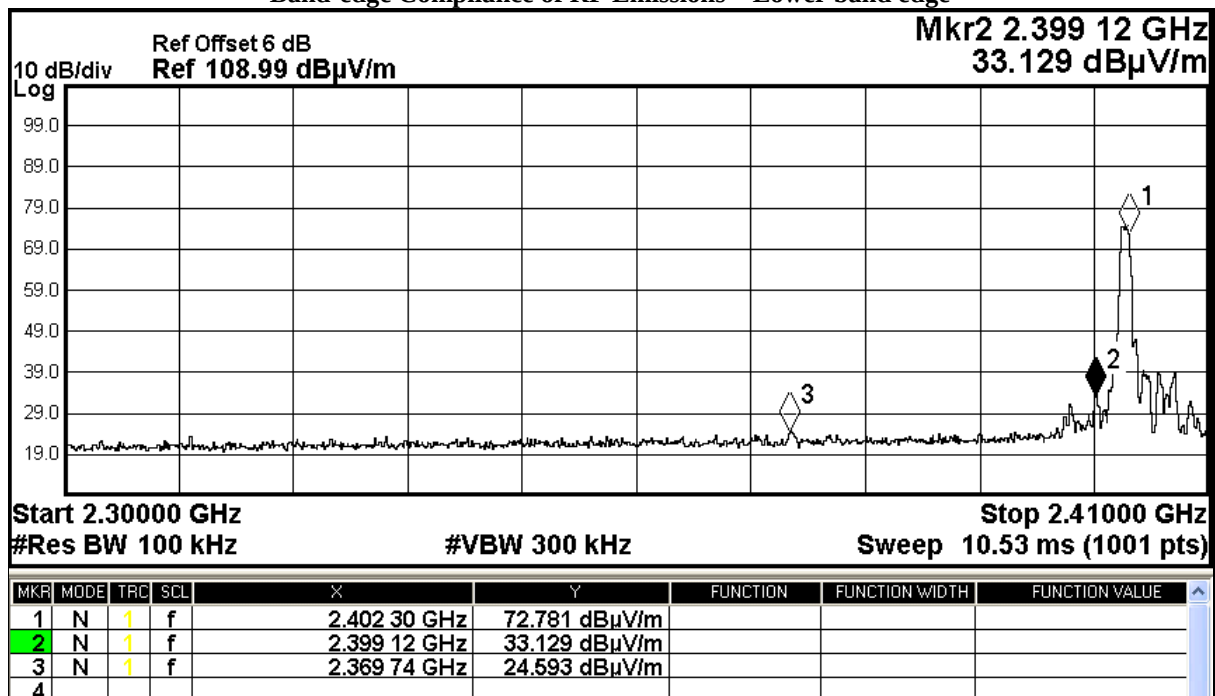
Band Edge Measurement:

Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

Frequency Range [MHz]	Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	39.7

Band-edge Compliance of RF Emissions – Lower band edge



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

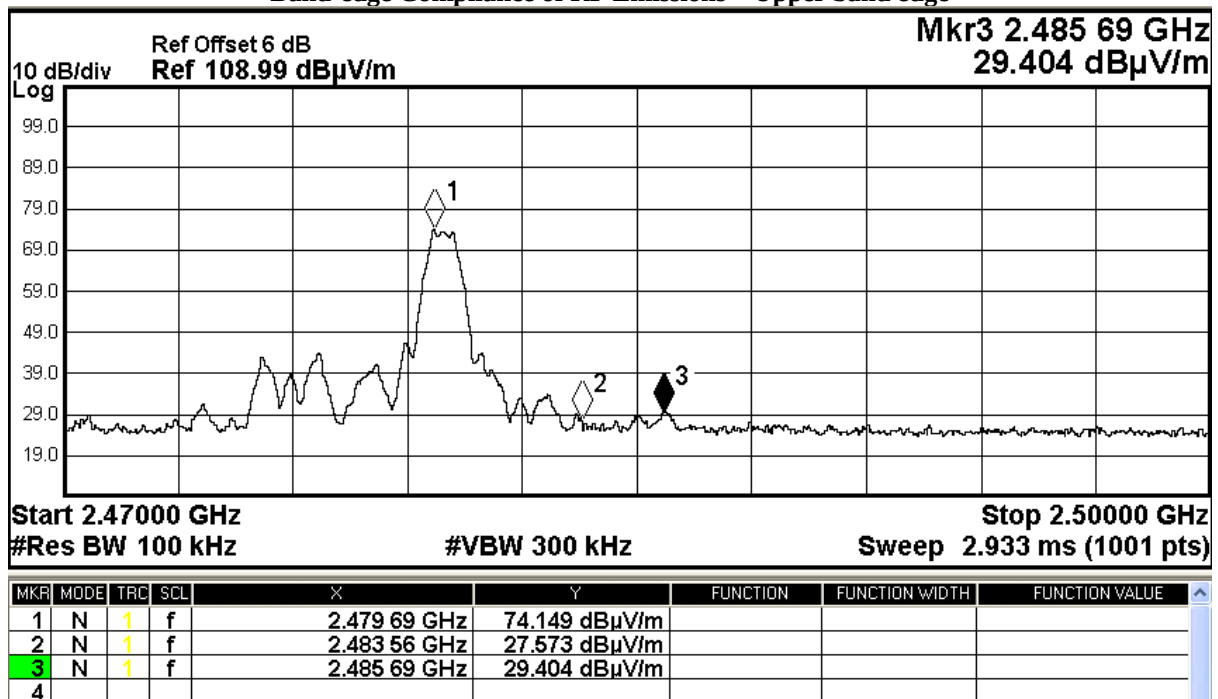
Date : 2019-11-07
No. : HM19090032

Page 18 of 34

Band-edge Compliance of RF Emissions Measurement:

Frequency Range [MHz]	Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	46.6

Band-edge Compliance of RF Emissions – Upper band edge



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 19 of 34

Radiated Emissions Band-edge and Restricted Band Result:

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2369.7	-3.3	27.9	24.6	74.0	49.4	Vertical
2485.7	1.5	27.9	29.4	74.0	44.6	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2369.7	-3.8	27.9	24.1	54.0	29.9	Vertical
2485.7	0.3	27.9	28.2	54.0	25.8	Vertical

Remarks:

The listed correction factors are equal to Antenna factor + cable loss in corresponding to measuring frequency.

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 20 of 34

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

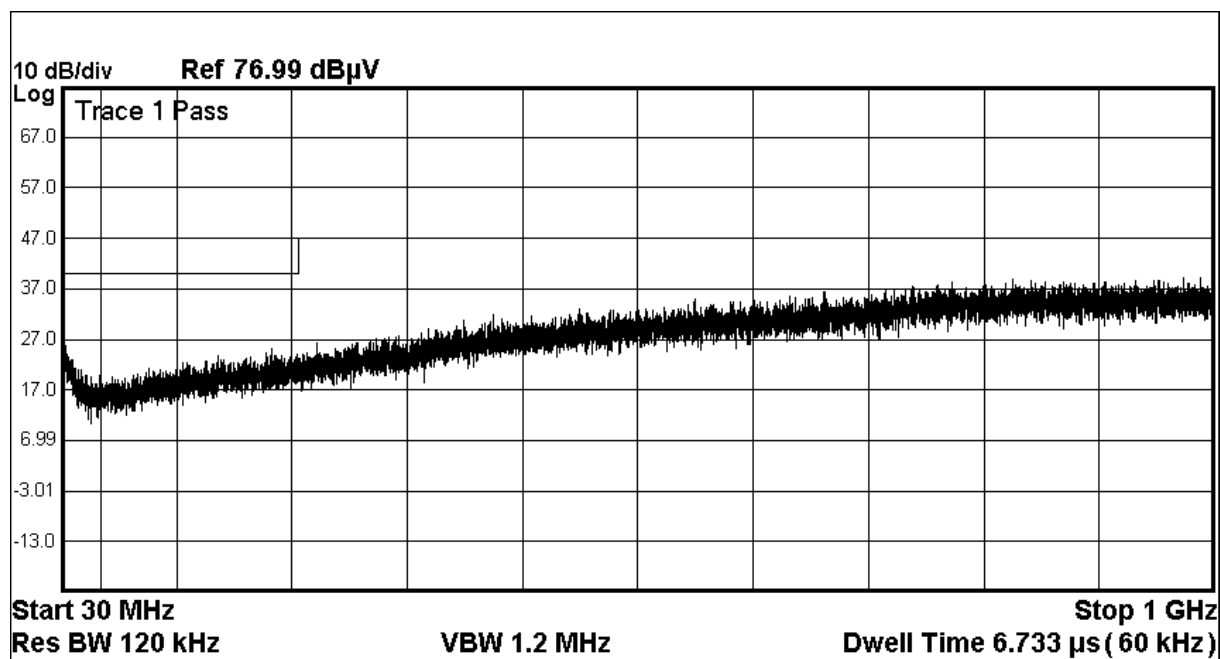
Frequency Range	Quasi-Peak Limits
[MHz]	[$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above 960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of Tx mode (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Horizontal



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

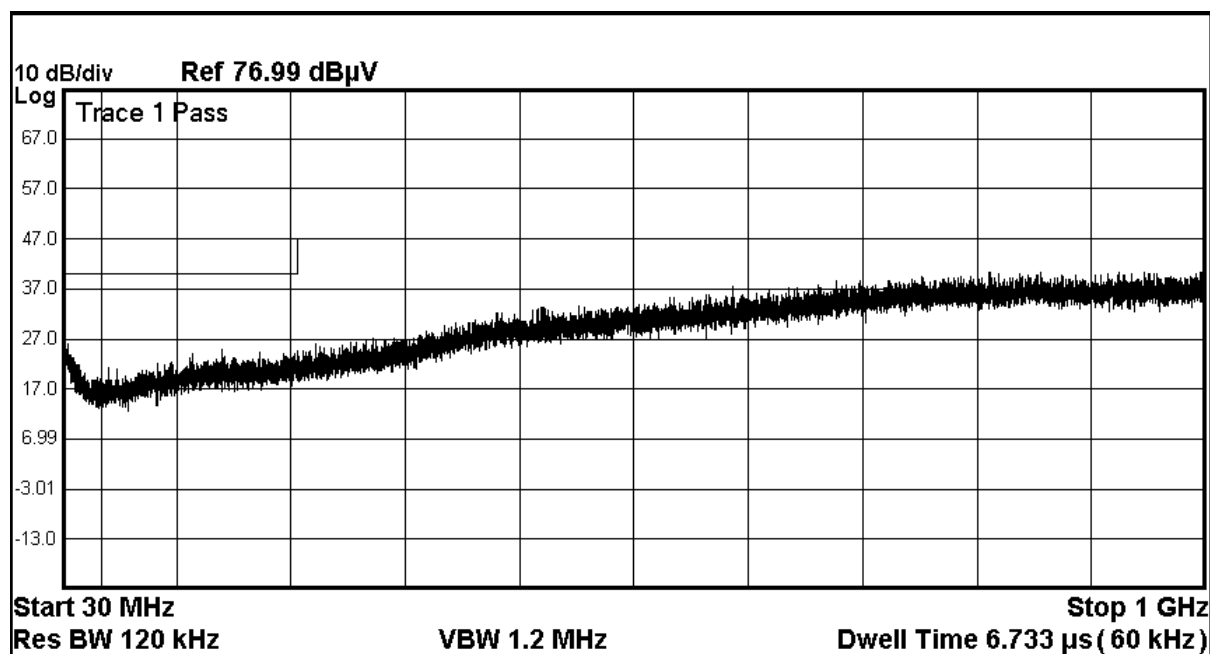
Date : 2019-11-07
No. : HM19090032

Page 21 of 34

Results of Tx mode (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Vertical



Radiated Emissions					
Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
43.5	Vertical	9.7	40.0	3.1	100
99.8	Vertical	13.5	43.5	4.7	150
130.5	Vertical	9.8	43.5	3.1	150
335.8	Horizontal	19.7	46.0	9.7	200
436.5	Horizontal	23.4	46.0	14.8	200
548.9	Horizontal	24.5	46.0	16.8	200

Remarks:

Calculated measurement uncertainty (30MHz – 1GHz): 4.6dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

Test Report

Date : 2019-11-07
No. : HM19090032

Page 22 of 34

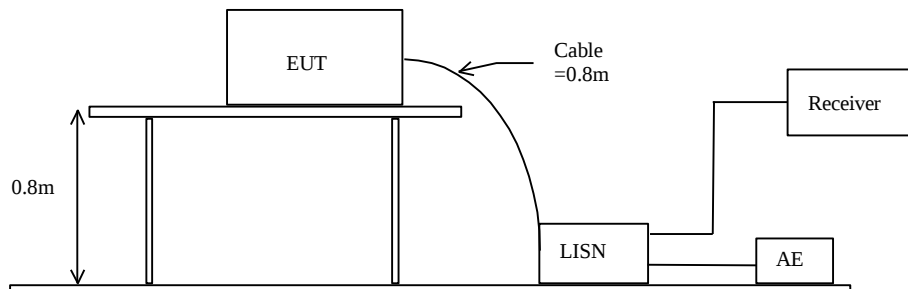
3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207 Class B
Test Method:	ANSI C63.10: 2013
Test Date:	2019-10-16
Mode of Operation:	Tx mode

Test Method:

The test was performed in accordance with ANSI C63.10: 2013, with the following: initial measurements were performed in peak and average detection modes on the live line, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:





Test Report

Date : 2019-11-07
No. : HM19090032

Page 23 of 34

Limits for Conducted Emissions (FCC 47 CFR 15.207):

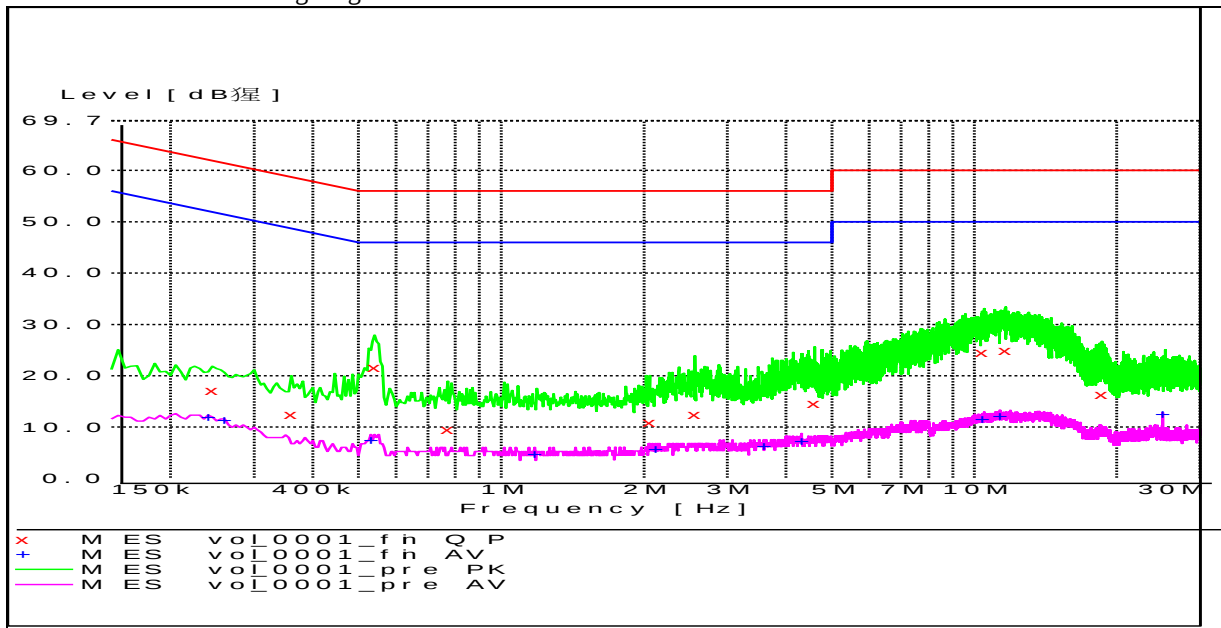
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of Tx mode (Live and Neutral): PASS

Please refer to the following diagram for individual results.



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 24 of 34

MEASUREMENT RESULT: "vol_0001_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.245000	17.20	9.9	62	44.7	N	GND
0.360000	12.40	10.0	59	46.4	L1	GND
0.540000	21.60	10.0	56	34.4	L1	GND
0.770000	9.50	10.0	56	46.5	L1	GND
2.060000	10.90	10.1	56	45.1	L1	GND
2.570000	12.50	10.1	56	43.5	L1	GND
4.595000	14.50	10.3	56	41.5	N	GND
10.380000	24.40	10.5	60	35.6	N	GND
11.655000	24.90	10.5	60	35.1	N	GND
18.670000	16.40	10.4	60	43.6	L1	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.240000	11.80	9.9	52	40.3	N	GND
0.260000	11.20	9.9	51	40.3	L1	GND
0.530000	7.30	10.0	46	38.7	N	GND
1.175000	4.70	10.0	46	41.3	L1	GND
2.120000	5.70	10.1	46	40.3	L1	GND
3.590000	6.20	10.2	46	39.8	L1	GND
4.315000	7.10	10.2	46	38.9	L1	GND
10.385000	11.50	10.5	50	38.5	L1	GND
11.360000	12.10	10.6	50	37.9	N	GND
25.060000	12.50	10.7	50	37.5	N	GND

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 25 of 34

3.1.4 Power Spectral Density

Test Requirement: FCC 47CFR 15.247(e)
Test Method: ANSI C63.10:2013
Test Date: 2019-10-11
Mode of Operation: Tx mode

Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=3kHz , VBW= 10kHz , Set the span to 1.5 times the DTS channel bandwidth. Detector = peak, Sweep time = auto couple , Trace mode = max hold.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Test Limit:

The maximum power spectral density (PSD) shall not exceeded 8dBm in any 3kHz band.

Results of Tx mode : Pass

Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level (dBm/3kHz)	Maximum Power spectral density limit (dBm/3kHz)
2402.0	-39.9	8dBm/3kHz
2440.0	-40.1	8dBm/3kHz
2480.0	-41.6	8dBm/3kHz

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taiipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

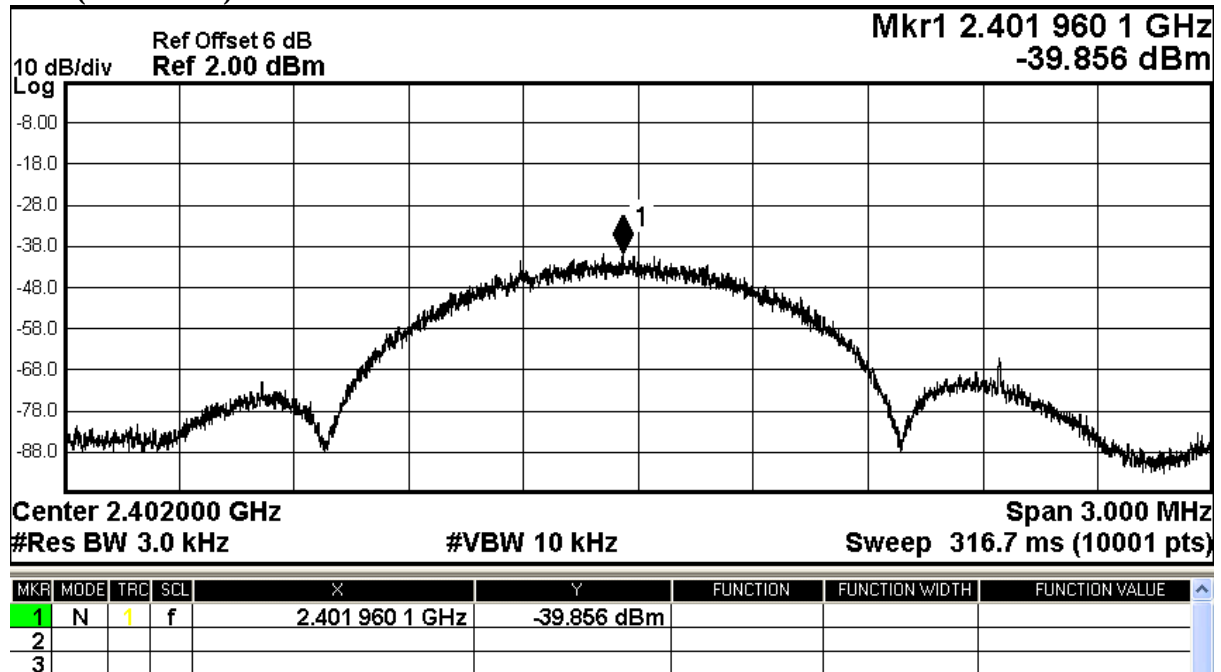


Test Report

Date : 2019-11-07
No. : HM19090032

Page 26 of 34

Tx mode
CH 1 (2402.0 MHz)



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

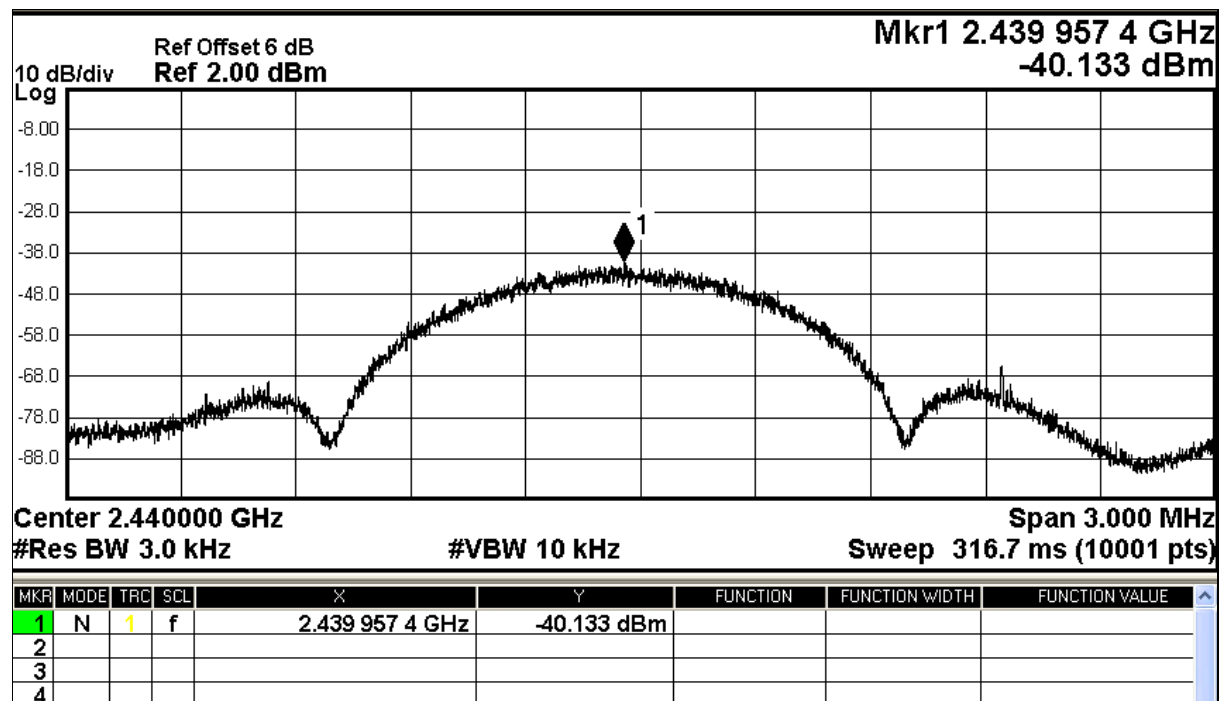


Test Report

Date : 2019-11-07
No. : HM19090032

Page 27 of 34

Tx mode
CH 19 (2440.0 MHz)



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

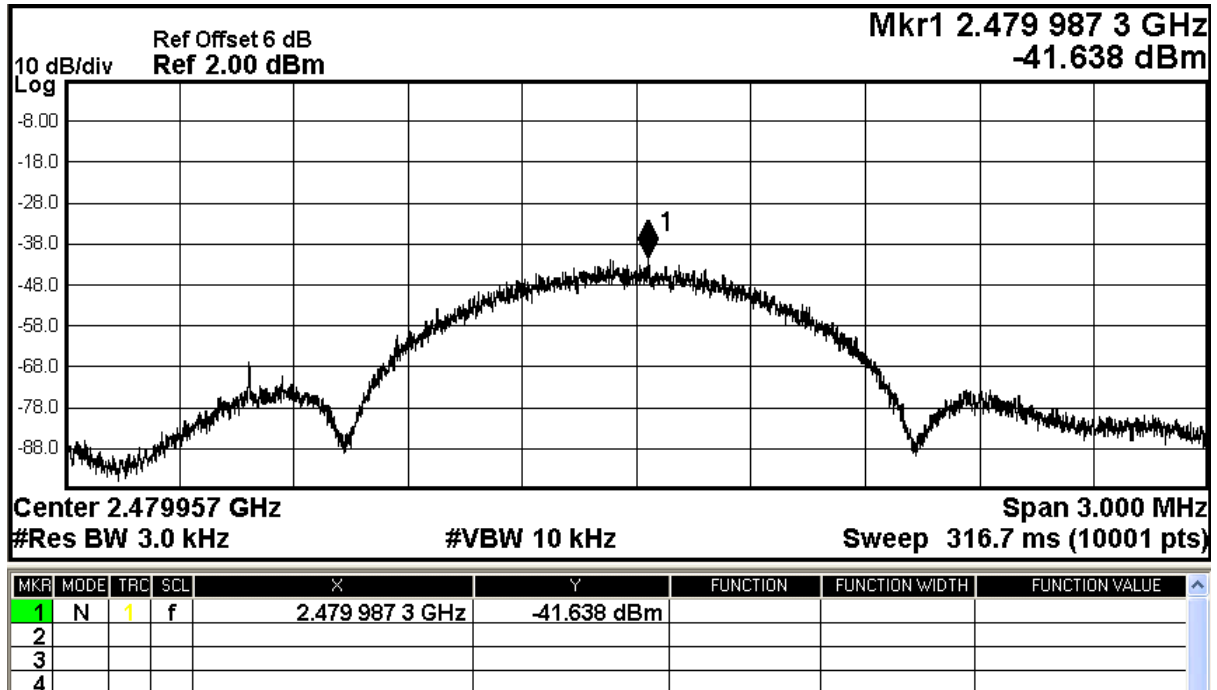


Test Report

Date : 2019-11-07
No. : HM19090032

Page 28 of 34

Tx mode
CH 39 (2480.0 MHz)



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 29 of 34

3.1.5 6dB Spectrum Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.10:2013
Test Date:	2019-10-11
Mode of Operation:	Tx mode

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

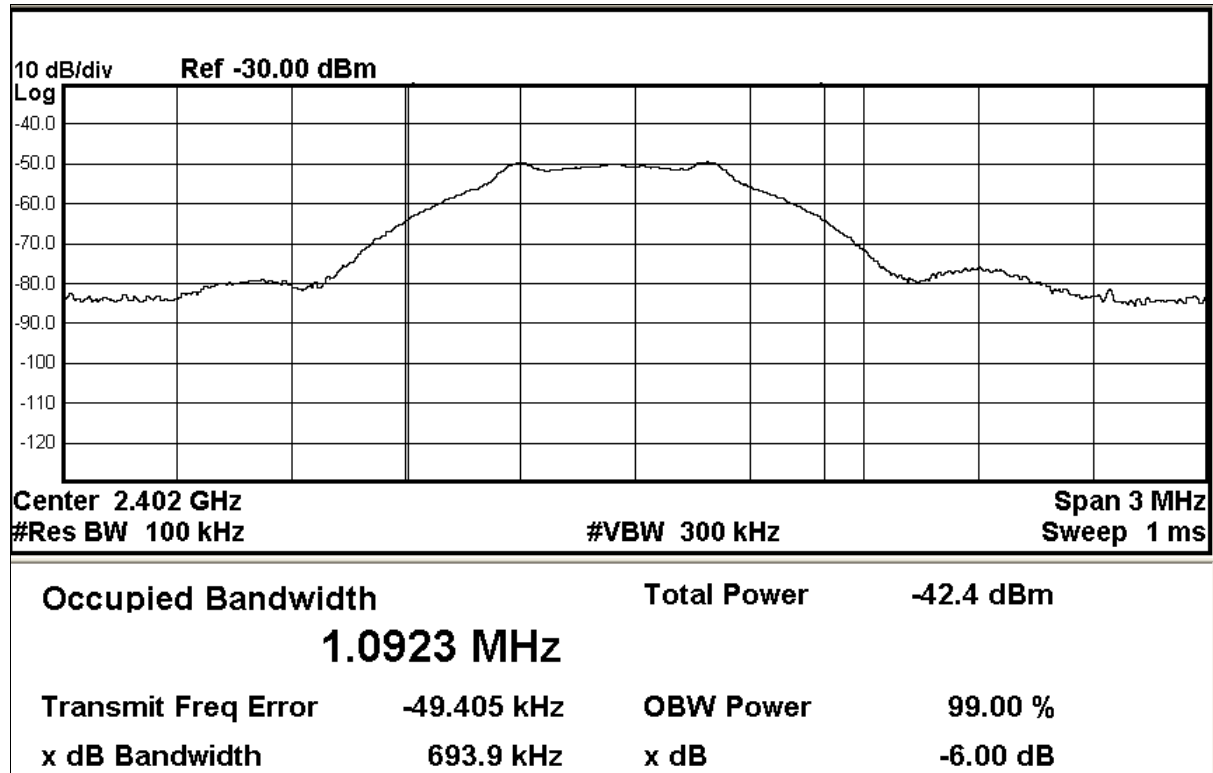
Date : 2019-11-07
No. : HM19090032

Page 30 of 34

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2402.0	693.9	> 500

6dB Bandwidth of Fundamental Emission on 2402MHz



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

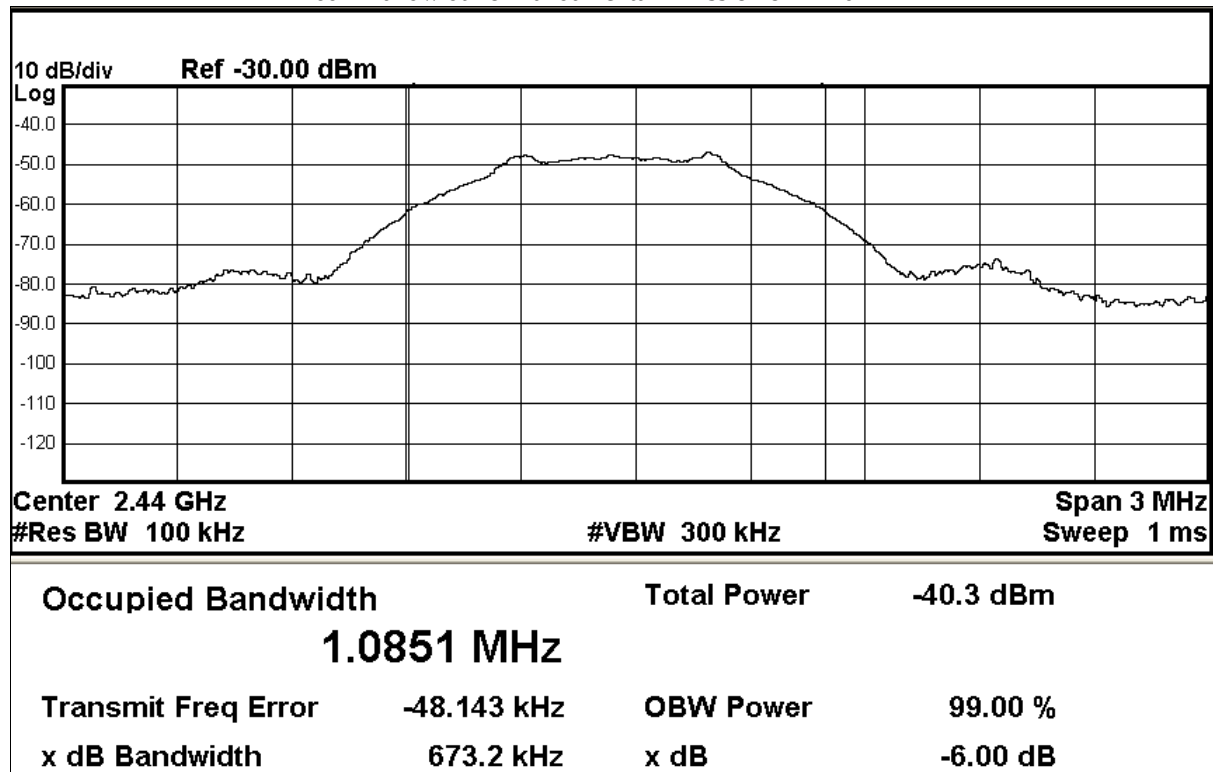
Date : 2019-11-07
No. : HM19090032

Page 31 of 34

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2440.0	673.2	> 500

6dB Bandwidth of Fundamental Emission on 2440MHz



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

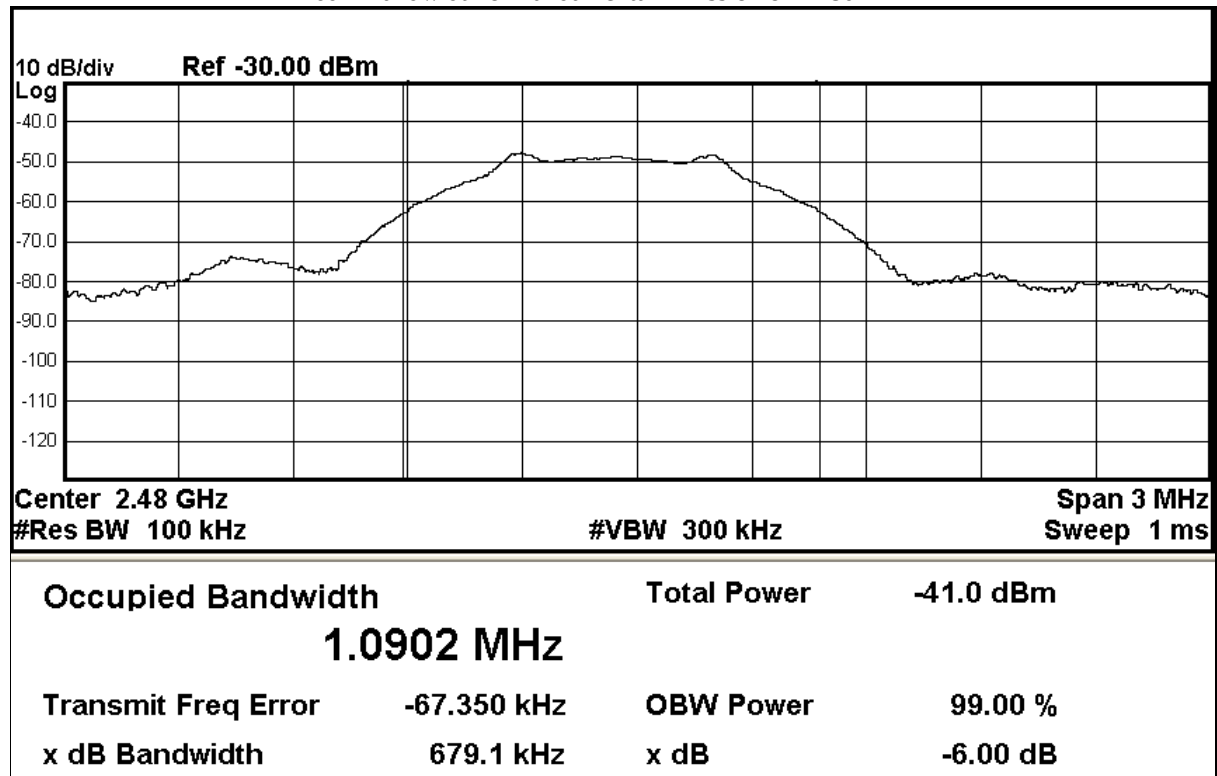
Date : 2019-11-07
No. : HM19090032

Page 32 of 34

Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2480.0	710.3	> 500

6dB Bandwidth of Fundamental Emission on 2480MHz



The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Taipo Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 33 of 34

3.1.6 RF Exposure

RF Exposure

Test Requirement: FCC 47CFR 15.247(i)
Test Date: 2019-10-15
Mode of Operation: Tx mode

Requirements:

In 15.247(i), an equipment shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the limits in §§ 1.1310 and 2.1093 of this chapter. Applications to the Commission for construction permits, licenses to transmit or renewals thereof, equipment authorizations or modifications in existing facilities must contain a statement confirming compliance with the limits unless the facility, operation, or transmitter is categorically excluded, as discussed below. Technical information showing the basis for this statement must be submitted to the Commission upon request.

According to KDB447498 D01 General RF Exposure Guidance v06, 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 Exclusion Threshold condition.

Test Results:

RF Exposure Evaluation

The highest measured power = 0.0083mW (-20.8dBm)@2.48GHz

Max. duty factor is 100%

Antenna gain = 0dBi

The Maximum tune-up power = 0.0123mW (-19.1dBm)

The test separation distances is ≥ 5 mm

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f}(\text{GHz})] \leq 3.0 \text{ for 1-g SAR, and } \leq 7.5 \text{ for 10-g extremity SAR,}$$

$$= 0.003875 < 3.0$$

therefore SAR is not applicable for the EUT

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.



Test Report

Date : 2019-11-07
No. : HM19090032

Page 34 of 34

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURN TABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2019/01/24	2020/01/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00142073	2018/03/29	2020/03/29
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2019/06/11	2020/06/11
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JTXLB- 10180-SF	J203109090300 7	2018/04/27	2020/04/27
EM318	USB WIDEBAND POWER SENSOR	AGILENT	U2022XA	MY53470001	2019/03/23	2021/03/23
EM353	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2018/04/16	2020/04/16

Remarks:-

CM Corrective Maintenance
N/A Not Applicable
TBD To Be Determined

***** End of Test Report *****

The Hong Kong Standards and Testing Centre Limited

10 Dai Wang Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

This report shall not be reproduced unless with prior written approval from The Hong Kong Standards and Testing Centre Limited.

For Conditions of Issuance of this test report, please refer to "Conditions of Issuance of Test Reports" section or Website.

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by The Hong Kong Standards & Testing Centre Limited (the “Company”) solely for testing and reporting in accordance with the following terms and conditions. The Company provides its services on the basis that such terms and conditions constitute express agreement between the Company and any person, firm or company requesting its services (the “Clients”).
2. Any report issued by the Company as a result of this application for testing service (the “Report”) shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to his customer, supplier or other persons directly concerned. Subject to clause 3, the Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
3. The Company shall be at liberty to disclose the testing-related documents and/or files anytime to any third-party accreditation and/or recognition bodies for audit or other related purposes. No liabilities whatsoever shall attach to the Company's act of disclosure.
4. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
5. The results in Report apply only to the sample as received and do not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.
6. When a statement of conformity to a specification or standard is provided, the ILAC-G8 Guidance document (and/or IEC Guide 115 in the electrotechnical sector) will be adopted as a decision rule for the determination of conformity unless it is inherent in the requested specification or standard, or otherwise specified in the Report.
7. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
8. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
9. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
10. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
11. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.
12. Issuance records of the Report are available on the internet at www.stc.group. Further enquiry of validity or verification of the Reports should be addressed to the Company.