Test Report

Date : 2020-09-28
No. : HM20080062

Applicant: inMusic Brands Inc
200 Scenic View Drive Cumberland,
RI 02864 USA

Manufacturer: inMusic Brands Inc
200 Scenic View Drive Cumberland,
RI 02864 USA

Description of Sample(s): Submitted sample(s) said to be

Product:	Bluetooth Receiver with XLR outputs
Brand Name:	ALTO PROFESSIONAL
Model No.:	BLUETOOTH ® ULTIMATE
FCC ID:	Y4O-TBT2

Date Samples Received: 2020-08-24

Date Tested: 2020-08-27 to 2020-09-12

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

Dr. LEE Kam Chuen,
Authorized Signatory

Test Report

CONTENT:

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

FCC Test Firm Registration Number 723883
Designation Number HK0001

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product Name:	Bluetooth Receiver with XLR outputs
Manufacturer:	inMusic Brands Inc 200 Scenic View Drive Cumberland, RI 02864 USA
Brand Name:	ALTO PROFESSIONAL
Model Number:	BLUETOOTH ® ULTIMATE
Internal Product Code:	TBT2
Rating:	3.7Vd.c Li-ion Battery (500mAh) 5Vd.c of USB port of EUT

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a 2.4GHz Bluetooth Audio Receiver. The tests were conducted under RF Test mode to maintain continuous transmission during test. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC. The test mode was controlled by test software – "FCC_assist.exe "used during tests, which was provided by manufacturer.

1.3 Date of Order

2020-08-24

1.4 Submitted Sample(s):

2 Samples

1.5 Test Duration

2020-08-27 to 2020-09-12

1.6 Country of Origin

Not Provided

1.7 RF Module Details

Module Model Number: AC6925A
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

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. ANSI C63.10:2013 for FCC Certification. 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 FCC 47CFR 15.205	ANSI C63.10: 2013	N/A	☒	☐	☐
Conducted Spurious Emissions	FCC 47CFR 15.247(d)	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 Measurement	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

2.3 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.
Investigation has been done on all the possible configurations for searching the worst cases.
The following table is a list of the test modes shown in this test report.

Test software	FCC_assist.exe	
Power level setting	10	
Channel	0	2402 MHz
	19	2440 MHz
	39	2480 MHz

Test Items	
Maximum Peak Conducted Output Power	GFSK
Power Spectral Density	GFSK
Bandwidth Measurement	GFSK
Spurious Emissions	GFSK

Duty Cycle	
BLE	85%

3.0 Test Results

3.1 Emission

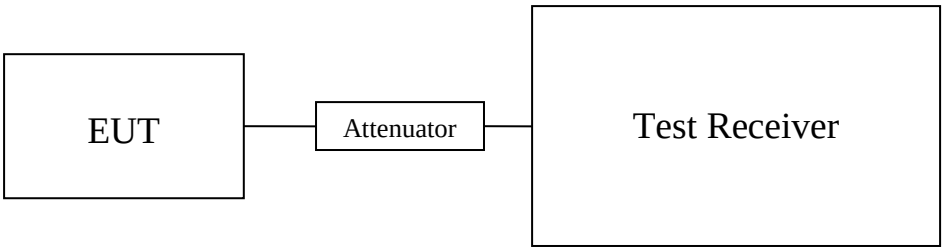
3.1.1 Maximum Peak Output Power

Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	ANSI C63.10: 2013
Test Date:	2020-09-07
Mode of Operation:	Tx mode

Test Method:

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

Test Setup:



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

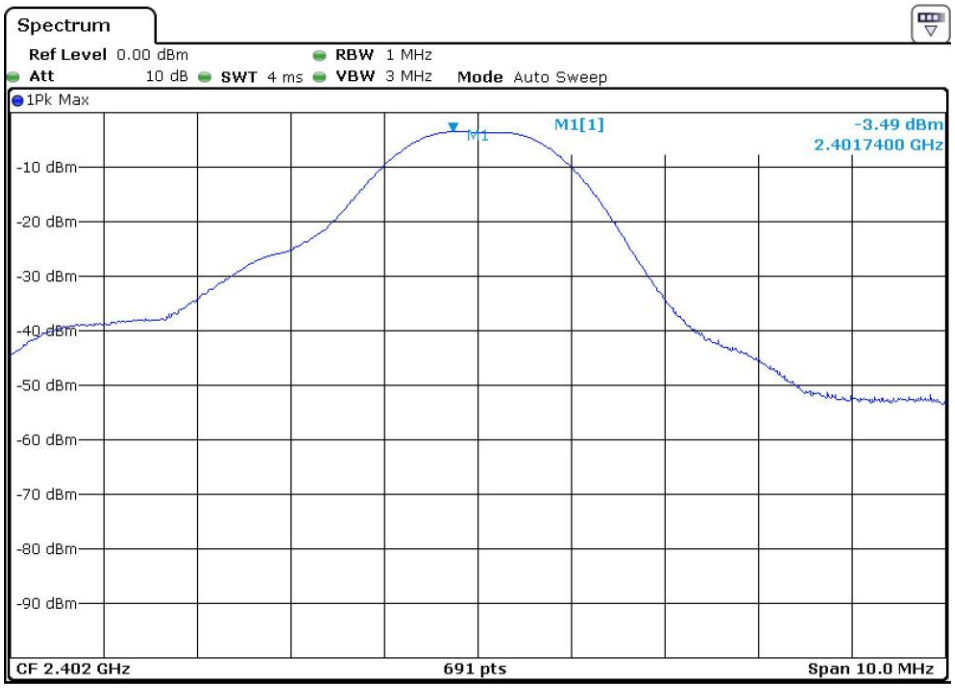
For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

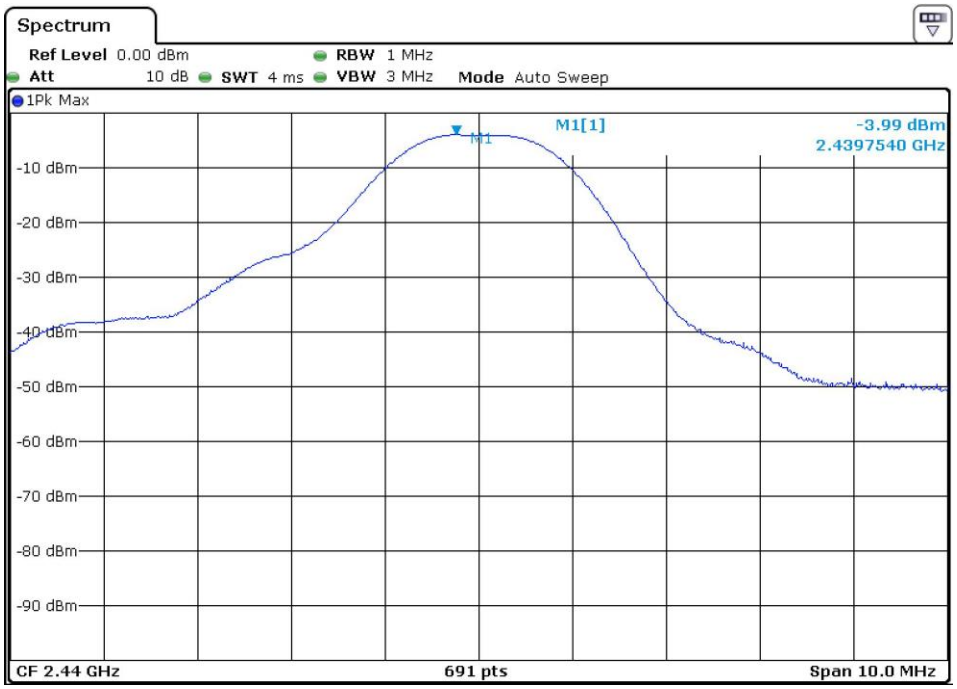
Results of Tx Mode: Pass (TX Unit)
Maximum conducted peak power

Channel	Frequency(MHz)	Output Power(dBm)	Output Power(Watt)
0	2402	-3.49	0.00048
19	2440	-3.99	0.00040
39	2480	-4.00	0.00040

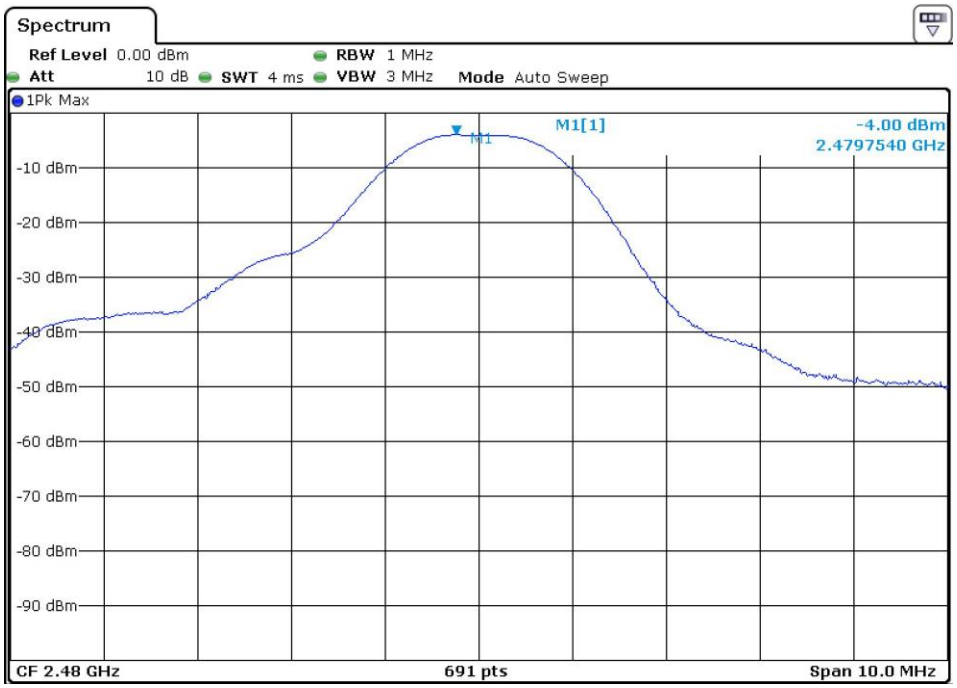
Calculated measurement uncertainty : 30MHz to 1GHz 4.4dB
1GHz to 26GHz 4.6dB

Result of Tx mode





Result of Tx mode



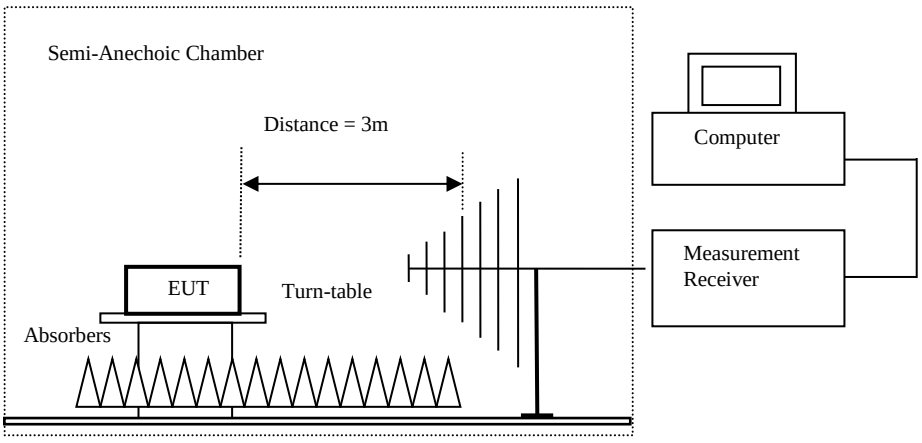
3.1.2 Radiated Emissions

Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2020-09-11
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.

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.

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

Frequency Range	Quasi-Peak Limits
[MHz]	[μV/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.

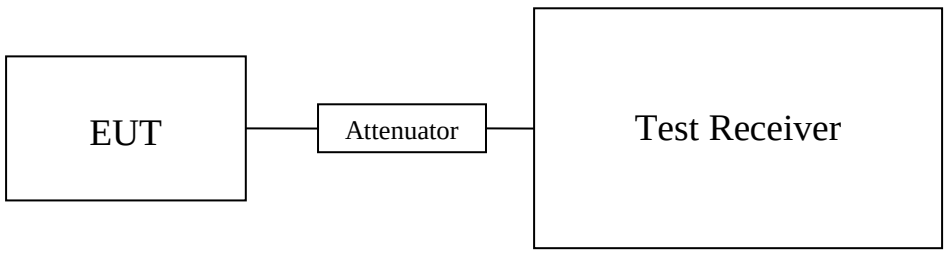
Spectrum Analyzer and EMI Test Receiver setting parameters are referred to RSS-Gen, ANSI 63.10, KDB 558074 and CISPR 16-1-1

Frequency range	**RBW**	**VBW**
9 kHz to 150 kHz	200 Hz	3 x RBW
0.15 MHz to 30 MHz	9 kHz	
30 MHz to 1 000 MHz	120 kHz	
1 GHz to 40 GHz	1 MHz	

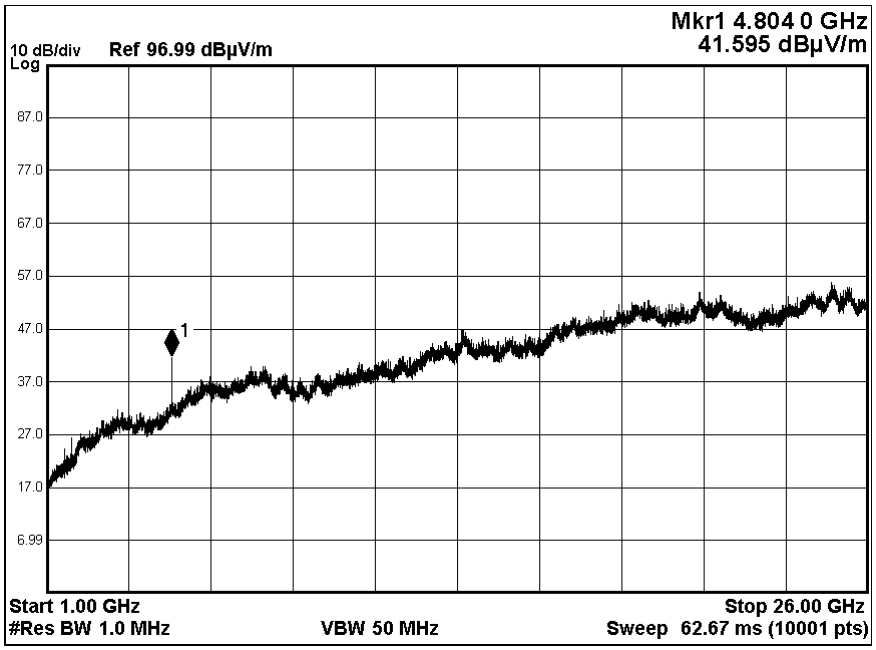
Conducted Spurious Emissions

Test Method:
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)).

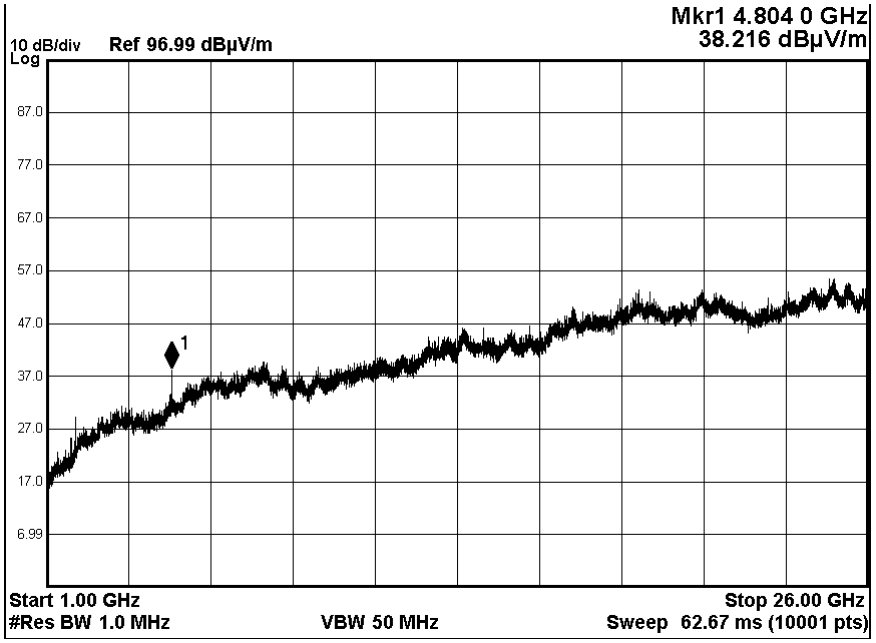
Test Setup:



Pre-scan graph of result of Tx mode (2402.0 MHz)
Horziontal



Vertical



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

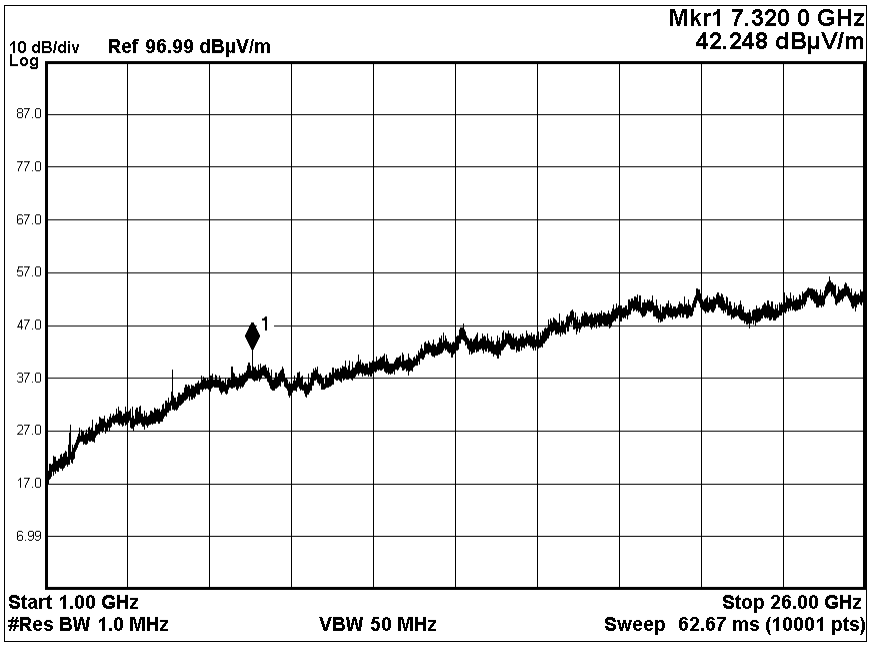
Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	56.3	27.9	84.2	N/A	N/A	Vertical
2399.9	29.4	27.9	57.3	64.2	6.9	Vertical
4804.0	6.1	32.1	38.2	74.0	35.8	Vertical
7206.0	-1.2	38.6	37.4	74.0	36.6	Vertical
9608.0	-2.3	41.3	39.0	74.0	35.0	Vertical

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 dBuV/m	E-Field Polarity
2402.0	53.1	27.9	81.0	N/A	N/A	Vertical
2399.9	26.1	27.9	54.0	61.0	7.0	Vertical
4804.0	1.1	32.1	33.2	54.0	20.8	Vertical
7206.0	-4.9	38.6	33.7	54.0	20.3	Vertical
9608.0	-6.1	41.3	35.2	54.0	18.8	Vertical

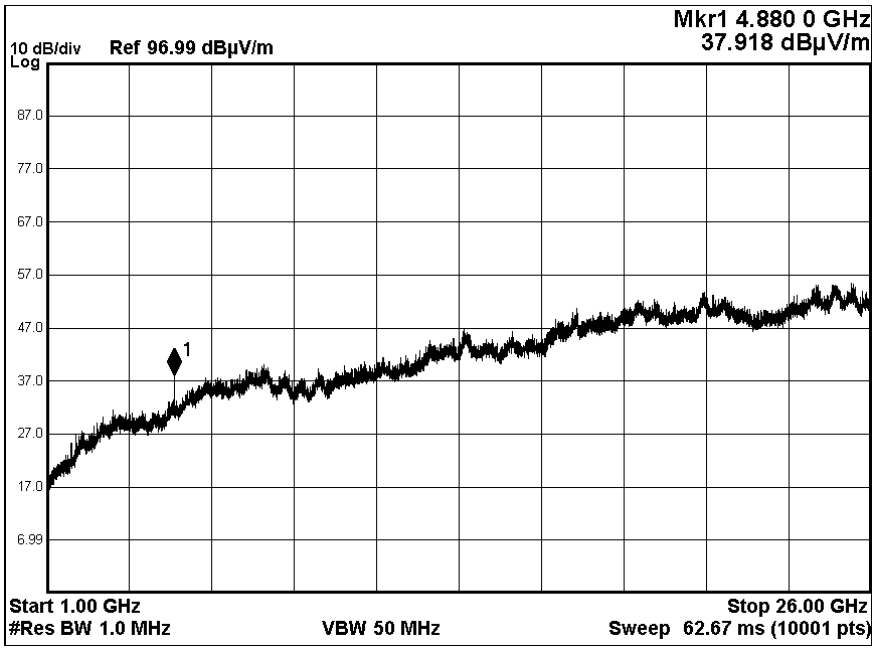
Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2402.0	68.4	27.9	96.3	N/A	N/A	Horizontal
2399.9	39.2	27.9	67.1	76.3	9.2	Horizontal
4804.0	9.5	32.1	41.6	74.0	32.4	Horizontal
7206.0	-2.3	38.6	36.3	74.0	37.7	Horizontal
9608.0	-3.1	41.3	38.2	74.0	35.8	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 dBuV/m	E-Field Polarity
2402.0	63.4	27.9	91.3	N/A	N/A	Horizontal
2399.9	35.4	27.9	63.3	71.3	8.0	Horizontal
4804.0	3.4	32.1	35.5	54.0	18.5	Horizontal
7206.0	-4.7	38.6	33.9	54.0	20.1	Horizontal
9608.0	-5.9	41.3	35.4	54.0	18.6	Horizontal

Pre-scan graph of result of Tx mode (2440.0 MHz)
Horizontal



Vertical



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

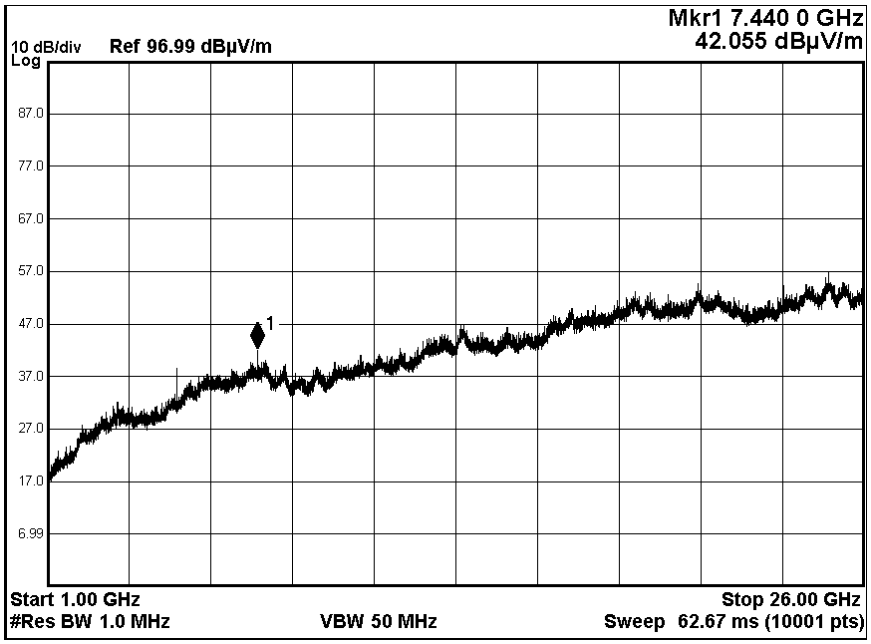
Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2440.0	53.2	27.9	81.1	N/A	N/A	Vertical
4880.0	5.8	32.1	37.9	74.0	36.1	Vertical
7320.0	-2.3	38.6	36.3	74.0	37.7	Vertical
9760.0	-4.8	41.3	36.5	74.0	37.5	Vertical
12200.0	-5.3	43.5	38.2	74.0	35.8	Vertical

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 dBuV/m	E-Field Polarity
2440.0	49.7	27.9	77.6	N/A	N/A	Vertical
4880.0	1.4	32.1	33.5	54.0	20.5	Vertical
7320.0	-5.8	38.6	32.8	54.0	21.2	Vertical
9760.0	-6.2	41.3	35.1	54.0	18.9	Vertical
12200.0	-6.4	43.5	37.1	54.0	16.9	Vertical

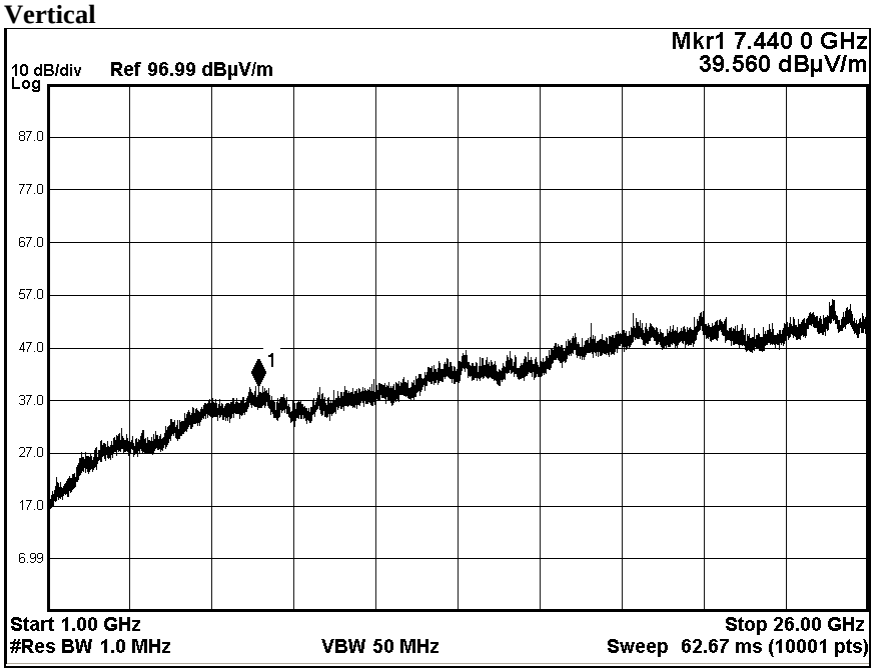
Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dBuV/m	E-Field Polarity
2440.0	62.5	27.9	90.4	N/A	N/A	Horizontal
4880.0	6.1	32.1	38.2	74.0	35.8	Horizontal
7320.0	3.6	38.6	42.2	74.0	31.8	Horizontal
9760.0	-4.8	41.3	36.5	74.0	37.5	Horizontal
12200.0	-5.7	43.5	37.8	74.0	36.2	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 dBuV/m	E-Field Polarity
2440.0	57.3	27.9	85.2	N/A	N/A	Horizontal
4880.0	1.4	32.1	33.5	54.0	20.5	Horizontal
7320.0	0.3	38.6	38.9	54.0	15.1	Horizontal
9760.0	-6.1	41.3	35.2	54.0	18.8	Horizontal
12200.0	-6.8	43.5	36.7	54.0	17.3	Horizontal

Pre-scan graph of result of Tx mode (2480.0 MHz)
Horizontal



Vertical



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 dBuV/m	E-Field Polarity
2480.0	57.3	27.9	85.2	N/A	N/A	Vertical
4960.0	4.1	32.2	36.3	74.0	37.7	Vertical
7440.0	0.9	38.6	39.5	74.0	34.5	Vertical
9920.0	-4.9	42.1	37.2	74.0	36.8	Vertical
12400.0	-5.1	44.1	39.0	74.0	35.0	Vertical

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 dBuV/m	E-Field Polarity
2480.0	52.7	27.9	80.6	N/A	N/A	Vertical
4960.0	0.8	32.2	33.0	54.0	21.0	Vertical
7440.0	-3.4	38.6	35.2	54.0	18.8	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

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 dBuV/m	E-Field Polarity
2480.0	66.4	27.9	94.3	N/A	N/A	Horizontal
4960.0	5.9	32.2	38.1	74.0	35.9	Horizontal
7440.0	3.4	38.6	42.0	74.0	32.0	Horizontal
9920.0	-5.1	42.1	37.0	74.0	37.0	Horizontal
12400.0	-5.9	44.1	38.2	74.0	35.8	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 dBuV/m	E-Field Polarity
2480.0	62.1	27.9	90.0	N/A	N/A	Horizontal
4960.0	1.4	32.2	33.6	54.0	20.4	Horizontal
7440.0	-0.7	38.6	37.9	54.0	16.1	Horizontal
9920.0	-6.3	42.1	35.8	54.0	18.2	Horizontal
12400.0	-6.8	44.1	37.3	54.0	16.7	Horizontal

Result of Tx mode (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						

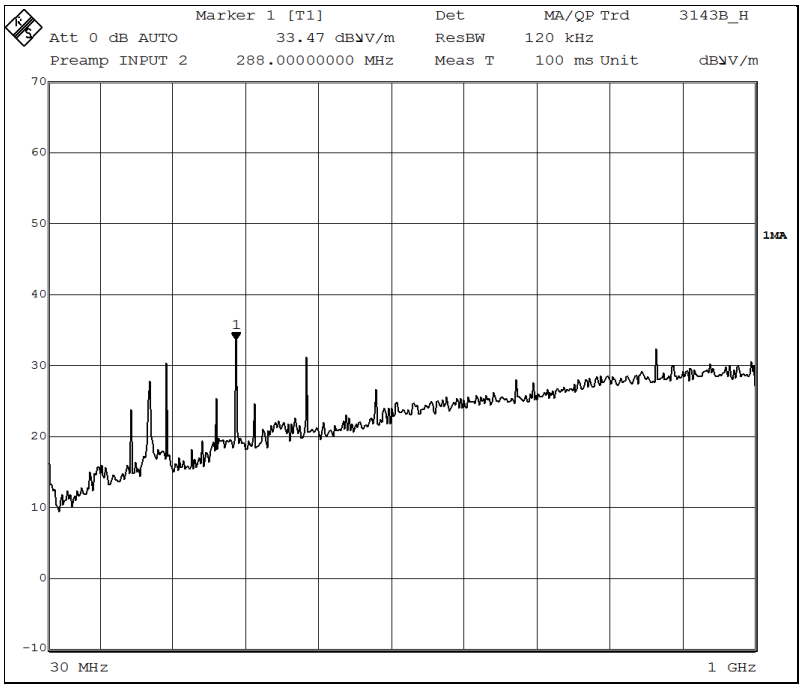
Remarks:
No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz
* Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

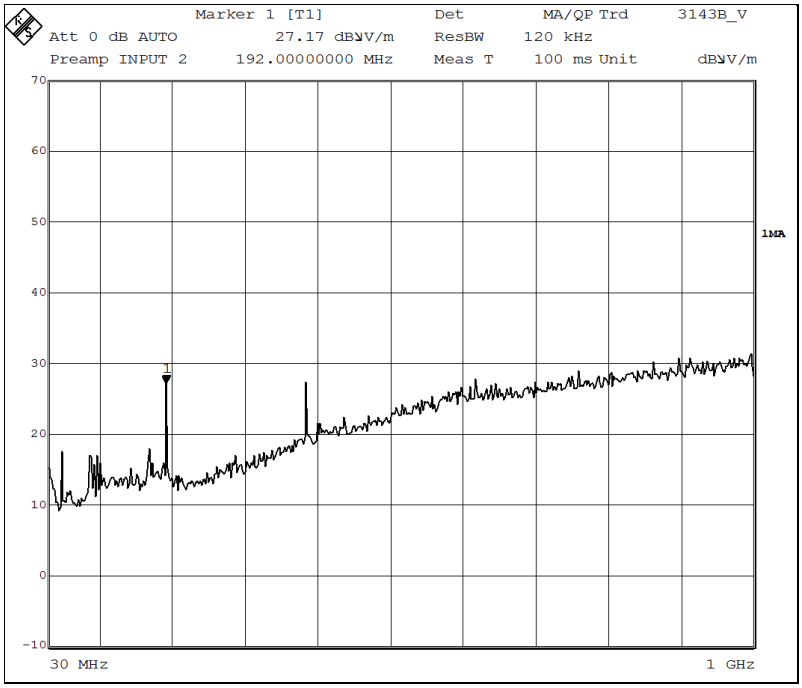
Calculated measurement uncertainty : 9kHz-30MHz 3.3dB
30MHz -1GHz 4.6dB
1GHz -26GHz 4.4dB

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

Pre-scan result of Tx mode (30MHz – 1GHz):
Horizontal



Vertical



Result of Tx mode (30MHz – 1GHz): PASS

Field Strength of Fundamental and Harmonics Emissions Quasi-Peak Value						
Frequency MHz	Measured Level @3m dBµV/m	Correction Factor dBµV/m	Field Strength dBµV/m	Field Strength µV/m	Limit @3m µV/m	E-Field Polarity
168.0	27.3	10.0	37.3	73.3	100	Horizontal
191.3	28.3	10.3	38.6	85.1	150	Horizontal
230.2	28.4	12.0	40.4	104.7	150	Horizontal
243.8	28.6	12.6	41.2	114.8	200	Horizontal
434.0	25.4	17.5	42.9	139.6	200	Horizontal
664.5	20.2	18.2	38.4	83.2	200	Vertical

Remarks:

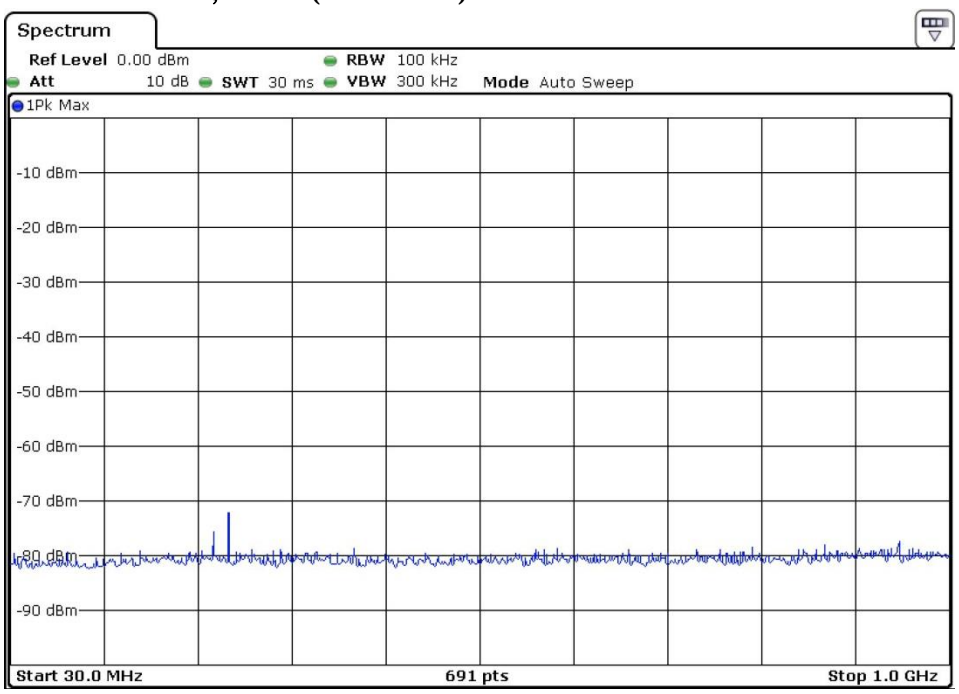
The pre-scan results are for reference, the frequencies found will perform final measurement which shown on the table below the graphs, therefore, there may be some different in measured frequencies and field strength shown on the graph and the table.

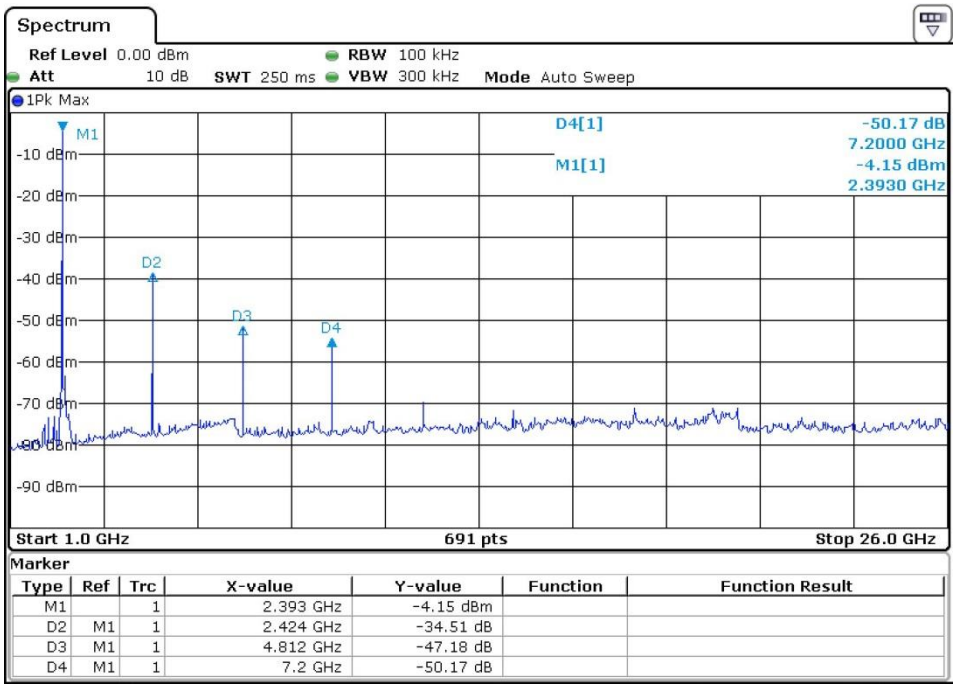
No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz
Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : (9kHz – 30MHz): 3.3dB
(30MHz – 18GHz): 4.6dB
(18GHz - 26GHz): 4.4dB

Conducted Spurious Emission

Result of Tx mode, GFSK (2402.0 MHz): Pass

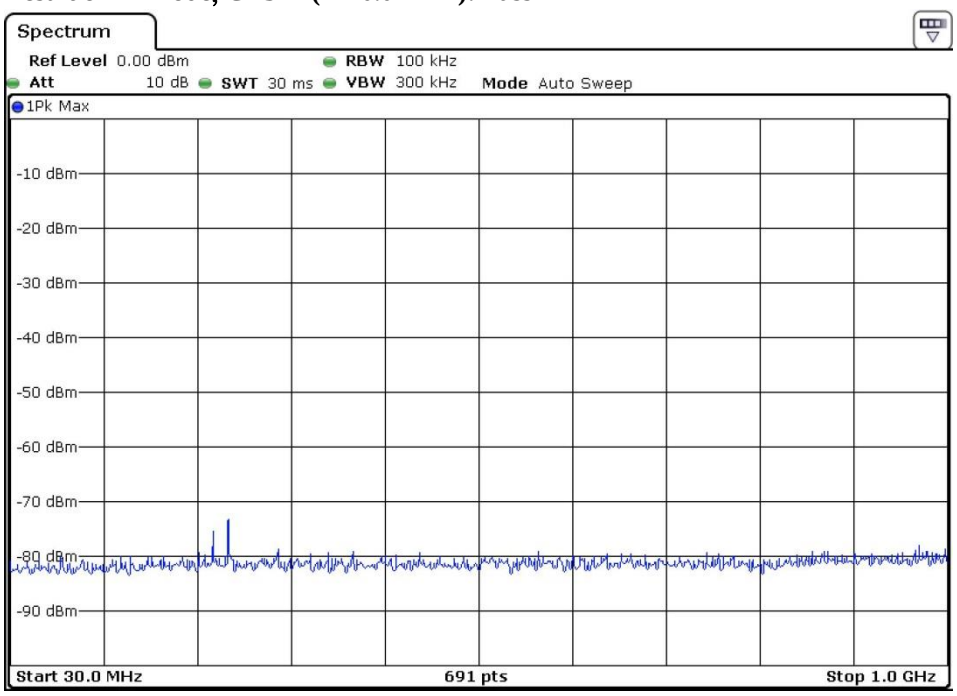


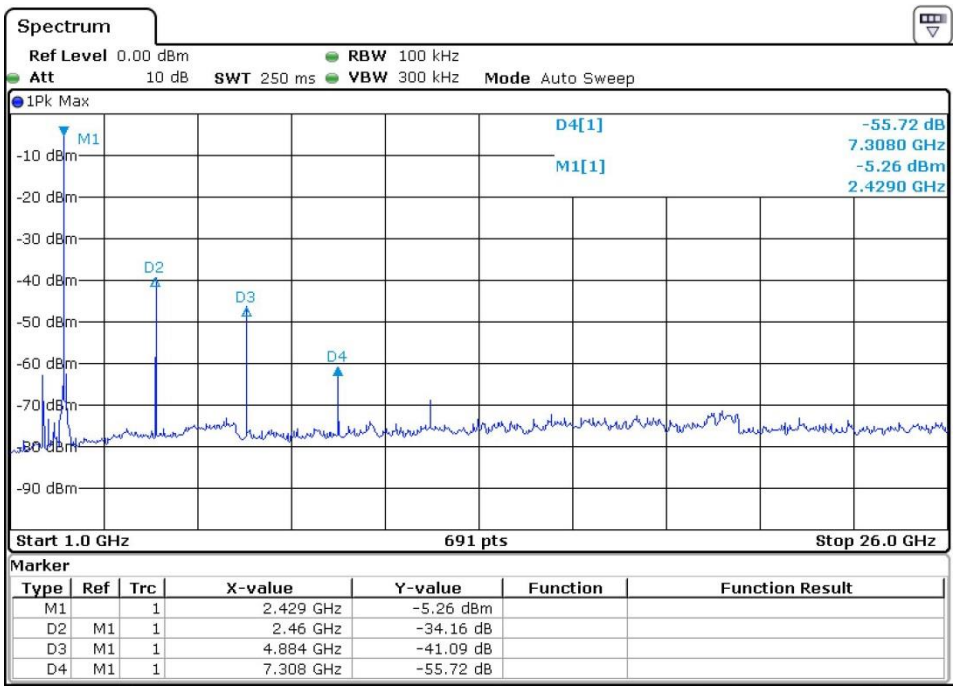


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.393 GHz	-4.15 dBm		
D2	M1	1	2.424 GHz	-34.51 dB		
D3	M1	1	4.812 GHz	-47.18 dB		
D4	M1	1	7.2 GHz	-50.17 dB		

Result of Tx mode, GFSK (2440.0 MHz): Pass

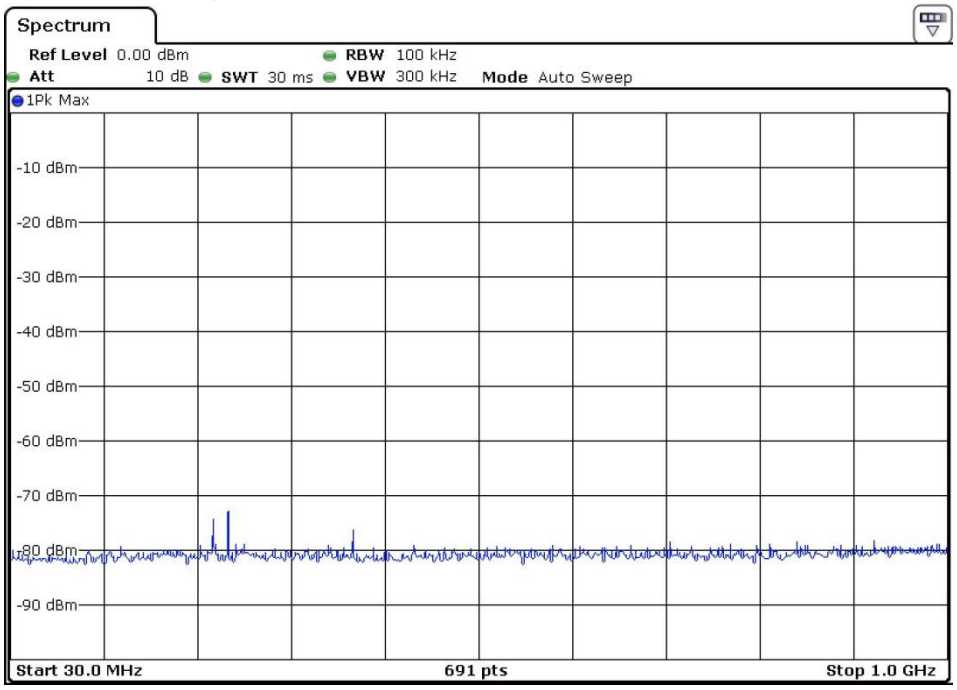


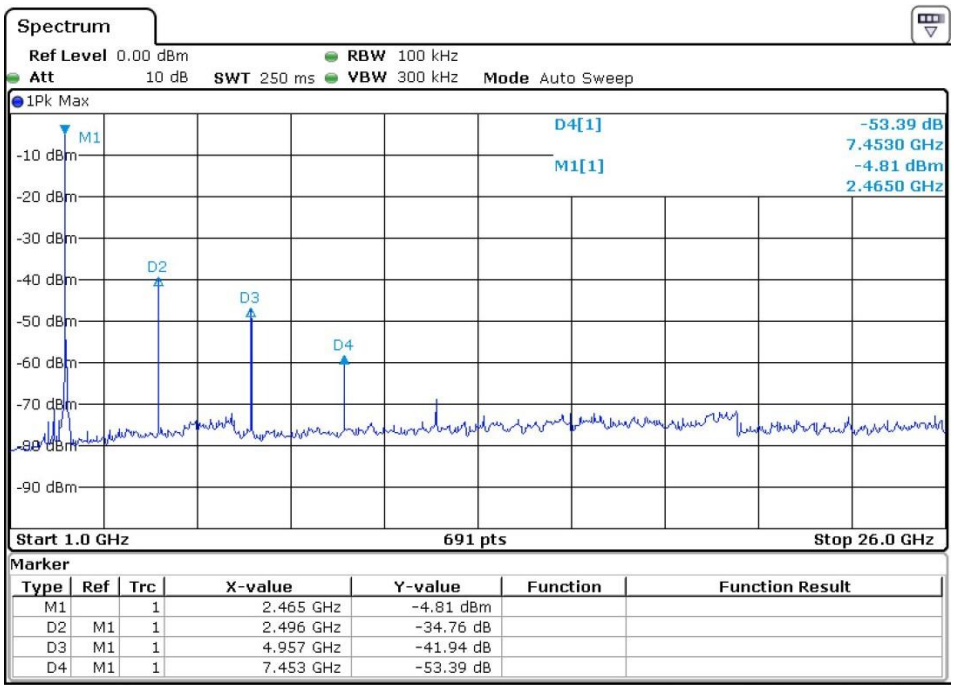


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.429 GHz	-5.26 dBm		
D2	M1	1	2.46 GHz	-34.16 dB		
D3	M1	1	4.884 GHz	-41.09 dB		
D4	M1	1	7.308 GHz	-55.72 dB		

Result of Tx mode, GFSK (2480.0 MHz): Pass





Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.465 GHz	-4.81 dBm		
D2	M1	1	2.496 GHz	-34.76 dB		
D3	M1	1	4.957 GHz	-41.94 dB		
D4	M1	1	7.453 GHz	-53.39 dB		

Remarks:

The pre-scan results are for reference, the frequencies found will perform final measurement which shown on the table below the graphs, therefore, there may be some different in measured frequencies and field strength shown on the graph and the table.

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

Correction Factor included Antenna Factor and Cable Attenuation.

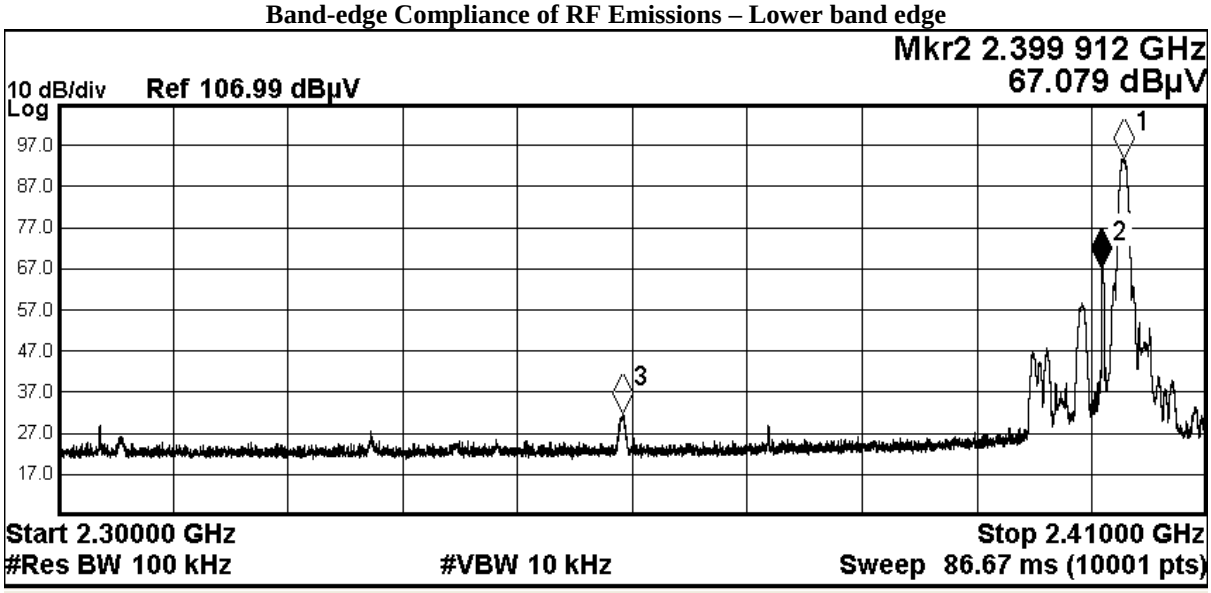
Calculated measurement uncertainty	:	(9kHz – 30MHz):	3.3dB
		(30MHz – 18GHz):	4.6dB
		(18GHz - 26GHz):	4.4dB

3.1.3
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)	26.8

Band-edge Compliance of RF Emissions – Lower band edge

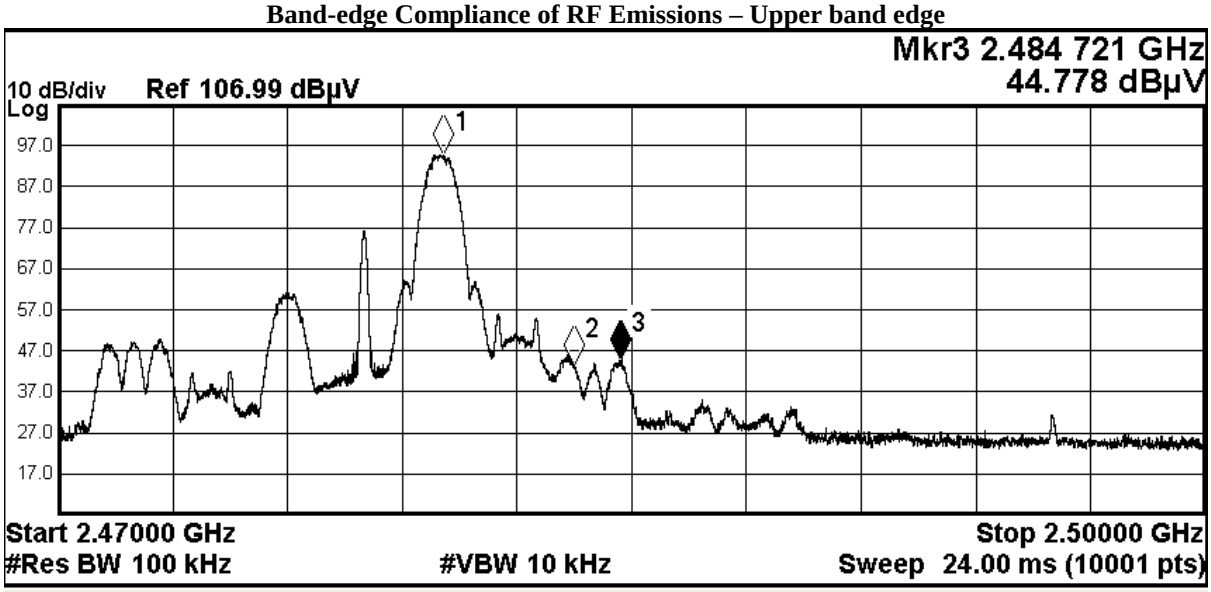


MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.402 058 GHz	93.914 dBµV			
2	N	1	f	2.399 912 GHz	67.079 dBµV			
3	N	1	f	2.354 087 GHz	31.936 dBµV			
4								

Band-edge Compliance of RF Emissions Measurement:

Frequency Range [MHz]	Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	51.3

Band-edge Compliance of RF Emissions – Upper band edge



MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	f	2.480 077 GHz	94.811 dBµV			
2	N	1	f	2.483 500 GHz	43.472 dBµV			
3	N	1	f	2.484 721 GHz	44.778 dBµV			
4								

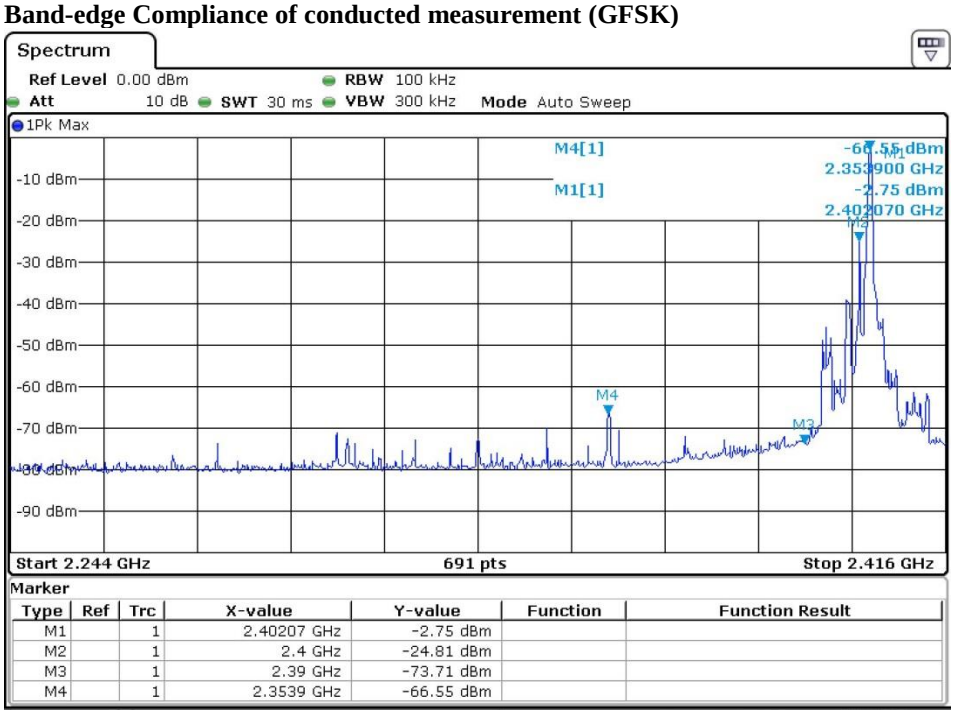
Radiated Emissions Band-edge and Restricted Band Result:

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 dBuV/m	E-Field Polarity
2370.0	11.5	27.9	39.4	74.0	34.6	Vertical
2484.0	10.1	27.9	38.0	74.0	36.0	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 dBuV/m	E-Field Polarity
2370.0	1.1	27.9	29.0	54.0	25.0	Vertical
2484.0	0.9	27.9	28.8	54.0	25.2	Vertical

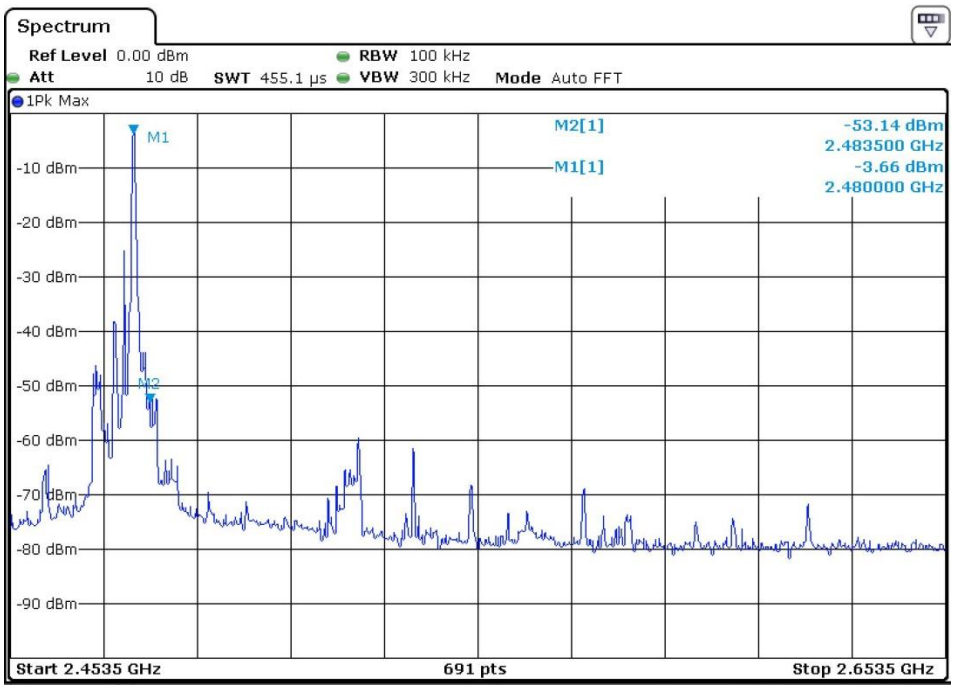
Conducted Band-edge measurement

Band-edge Compliance of conducted measurement (GFSK)



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40207 GHz	-2.75 dBm		
M2		1	2.4 GHz	-24.81 dBm		
M3		1	2.39 GHz	-73.71 dBm		
M4		1	2.3539 GHz	-66.55 dBm		



3.1.4 Power Spectral Density

Test Requirement:	FCC 47CFR 15.247(e)
Test Method:	ANSI C63.10:2013
Test Date:	2020-09-09
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:

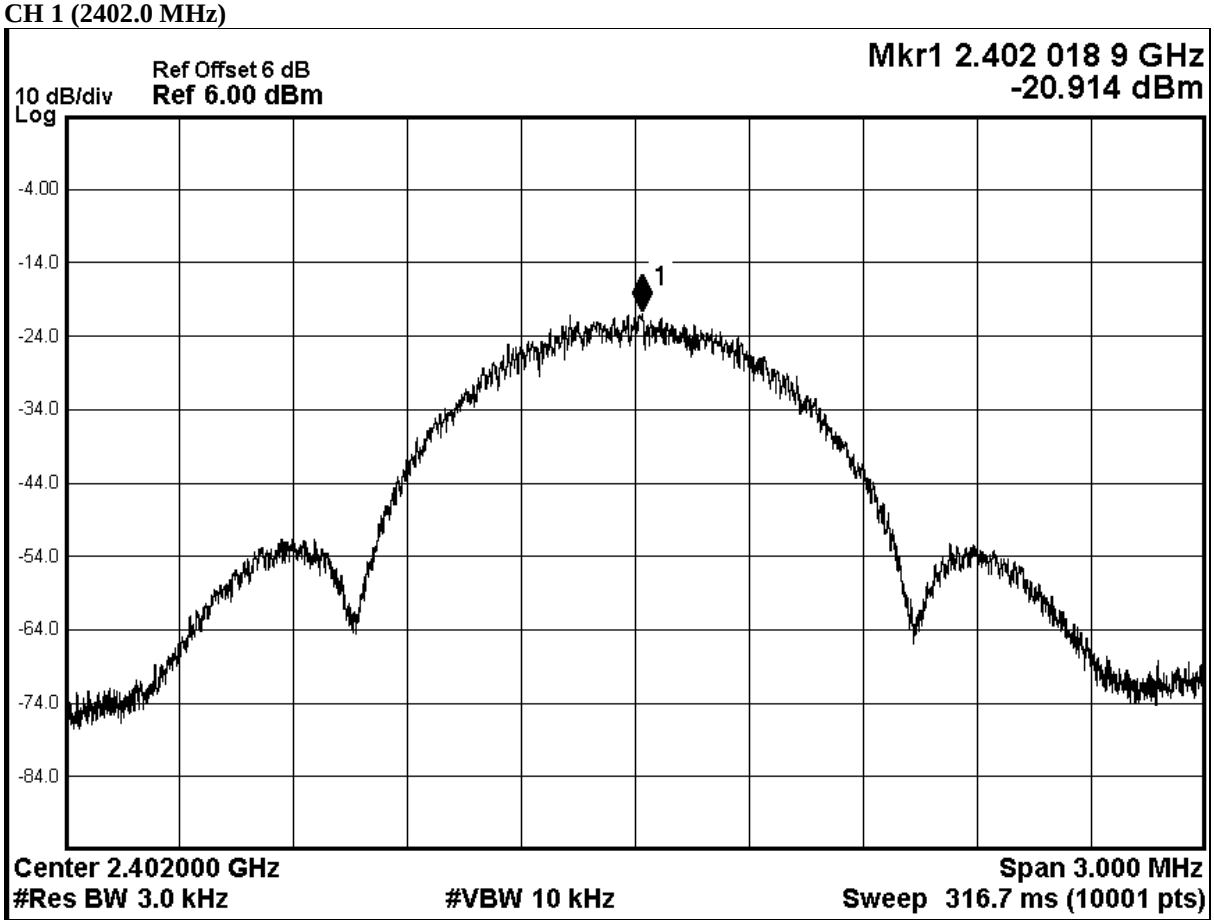
As Test Setup of clause 3.1.1 in this test report.

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

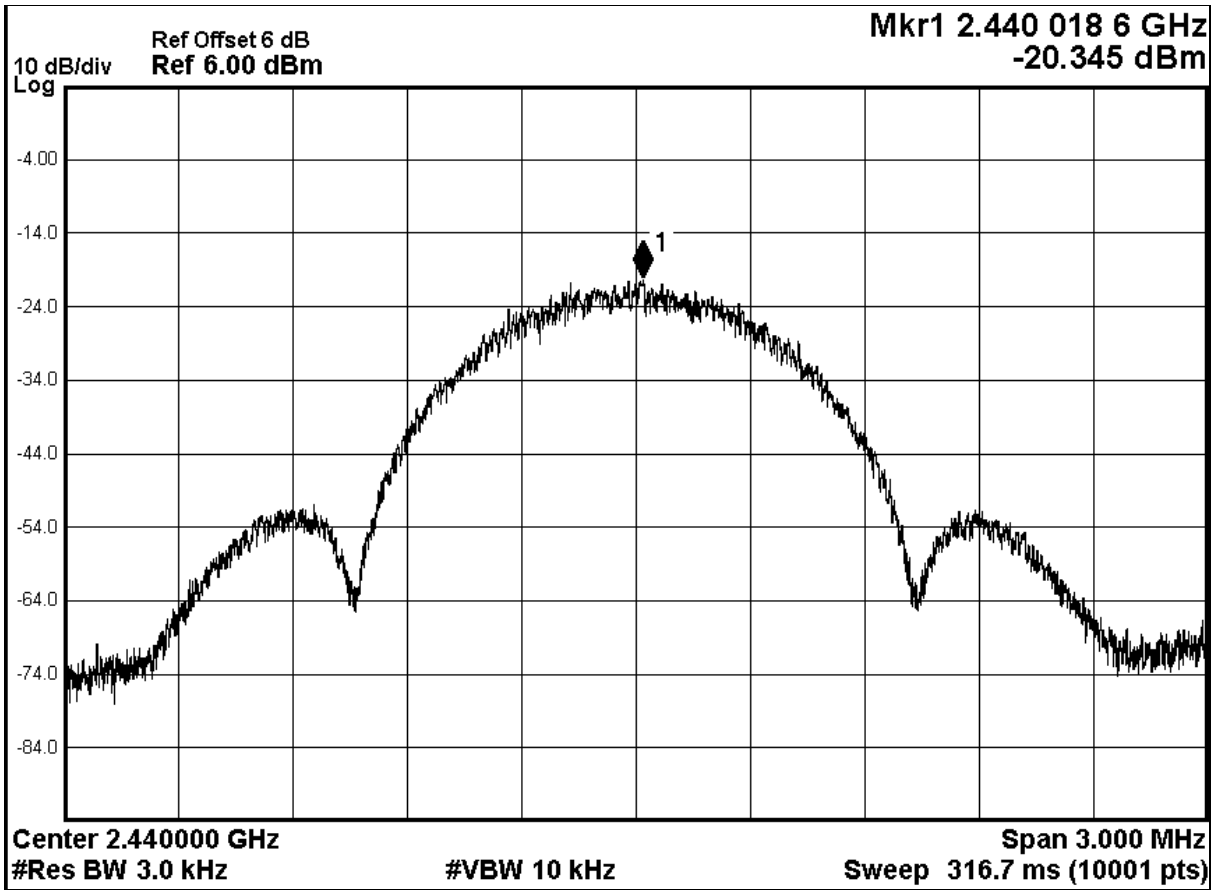
Results of Tx mode : Pass
Maximum power spectral density

Transmitter Frequency (MHz)	Maximum Power spectral density level / 3kHz band (dBm)	Maximum Power spectral density / 3kHz band limit
2402.0	-20.9	**8dBm**
2440.0	-20.3	**8dBm**
2480.0	-20.6	**8dBm**

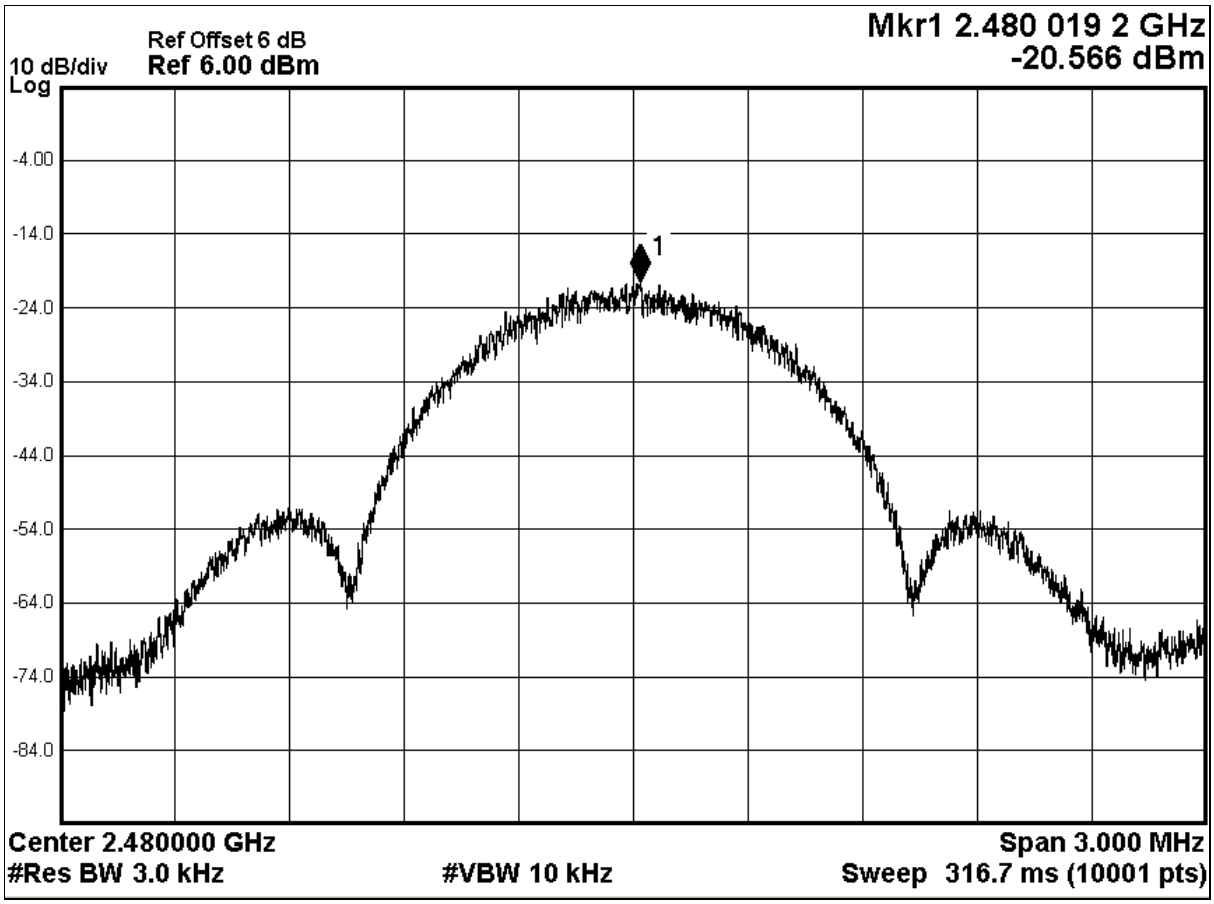
Tx mode
CH 1 (2402.0 MHz)



Tx mode
CH 7 (2440.0 MHz)



Tx mode
CH 13 (2480.0 MHz)



3.1.5 6dB Spectrum Bandwidth Measurement

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.10:2013
Test Date:	2020-09-09
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.

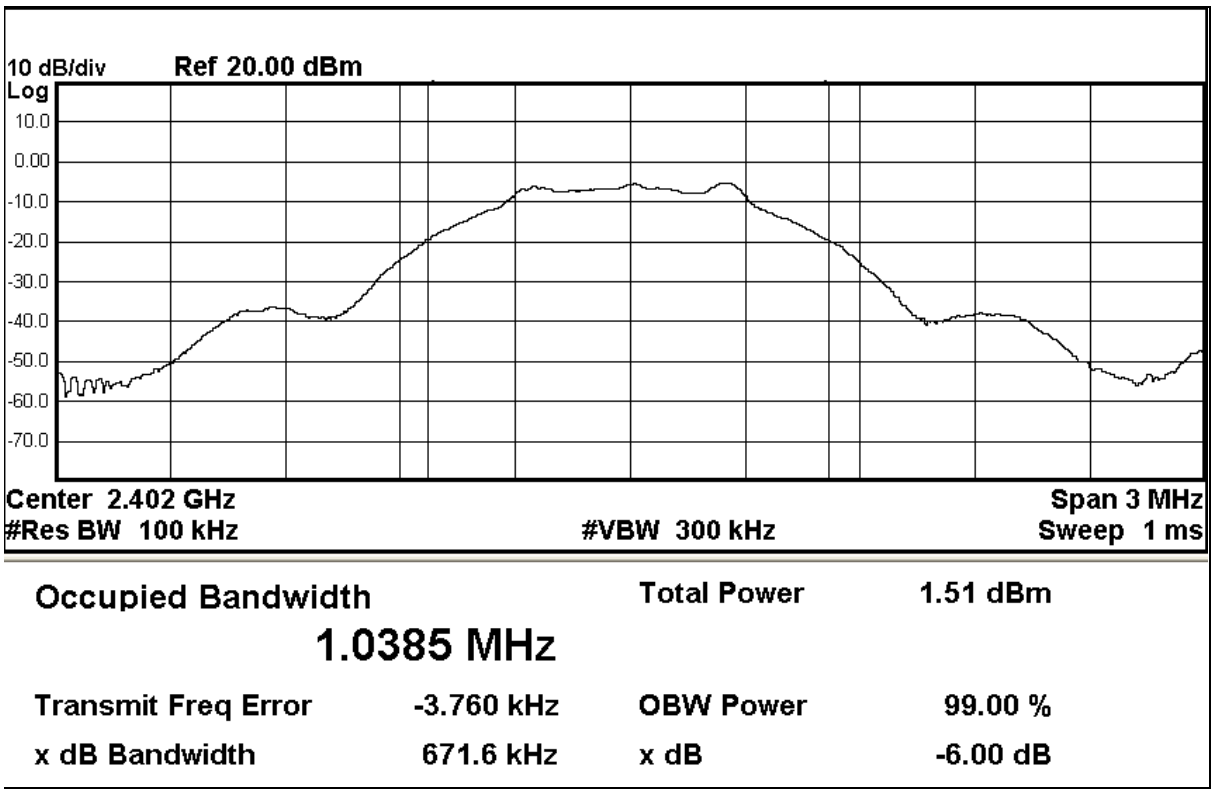
Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2402.0	671.6	> 500

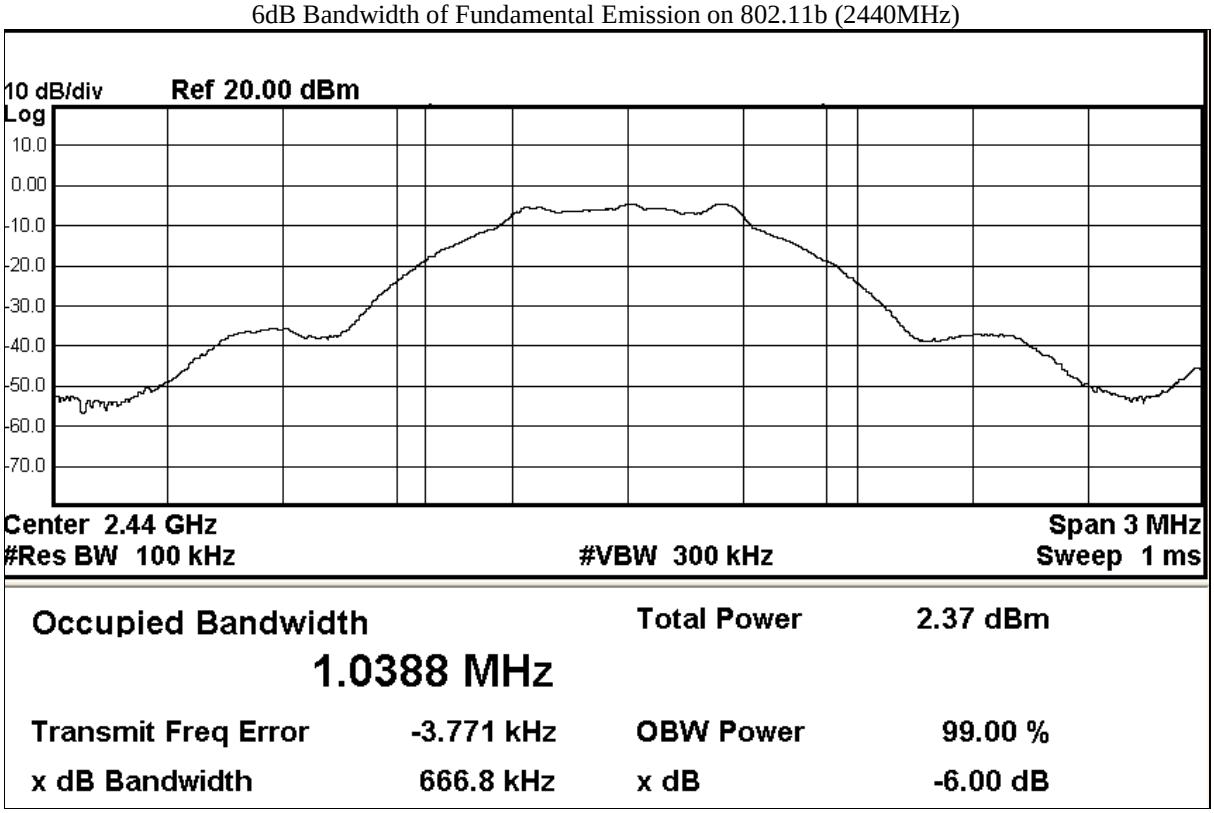
6dB Bandwidth of Fundamental Emission on 802.11b (2402MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2440.0	666.8	> 500

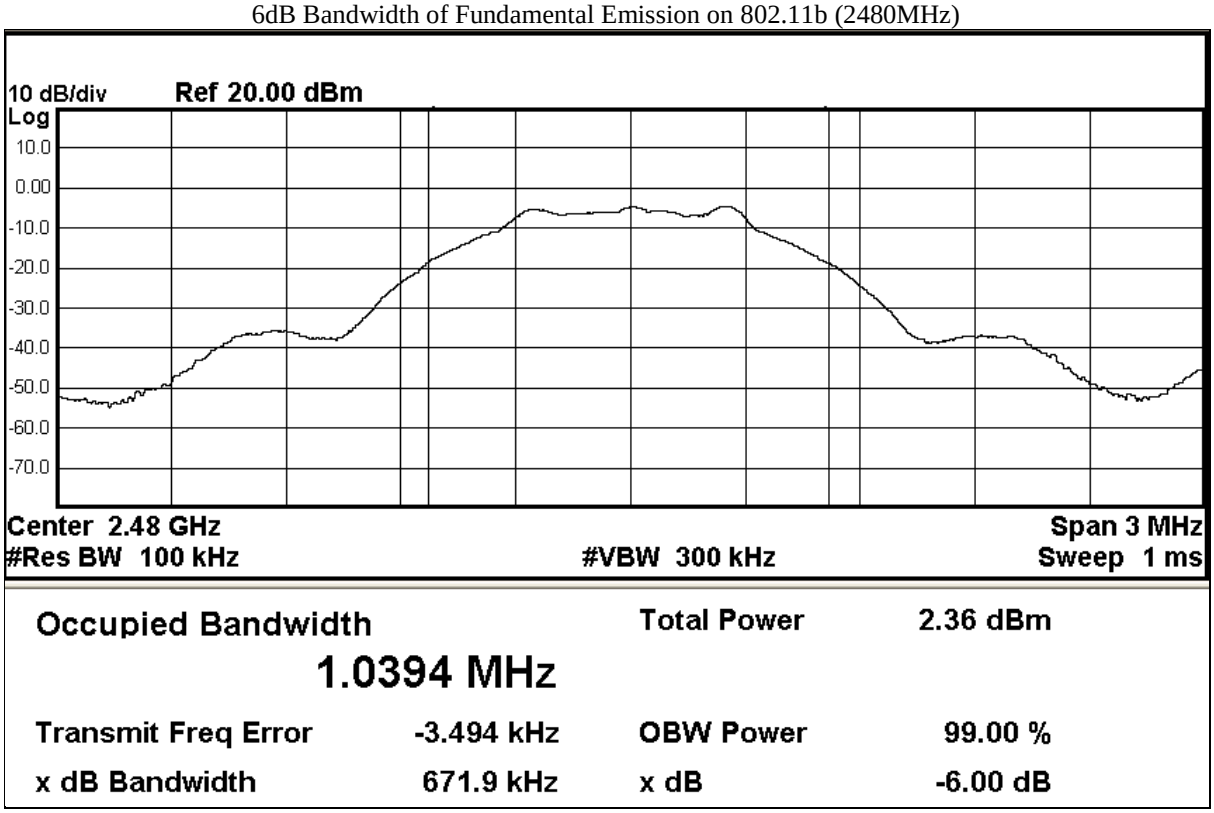
6dB Bandwidth of Fundamental Emission on 802.11b (2440MHz)



Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [kHz]	FCC Limits [kHz]
2480.0	671.9	> 500

6dB Bandwidth of Fundamental Emission on 802.11b (2480MHz)



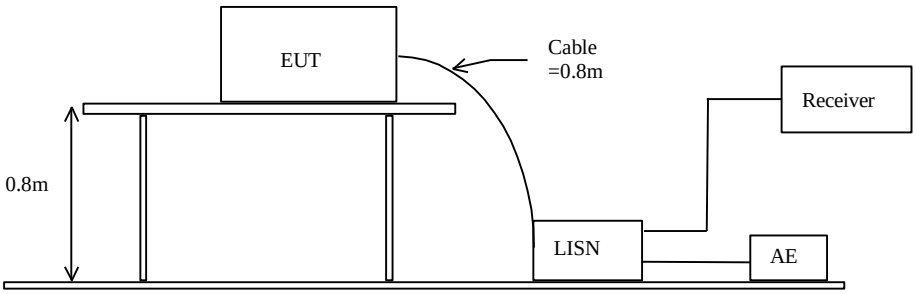
3.1.6 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207 Class B
Test Method:	ANSI C63.10: 2013
Test Date:	2020-08-27
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:



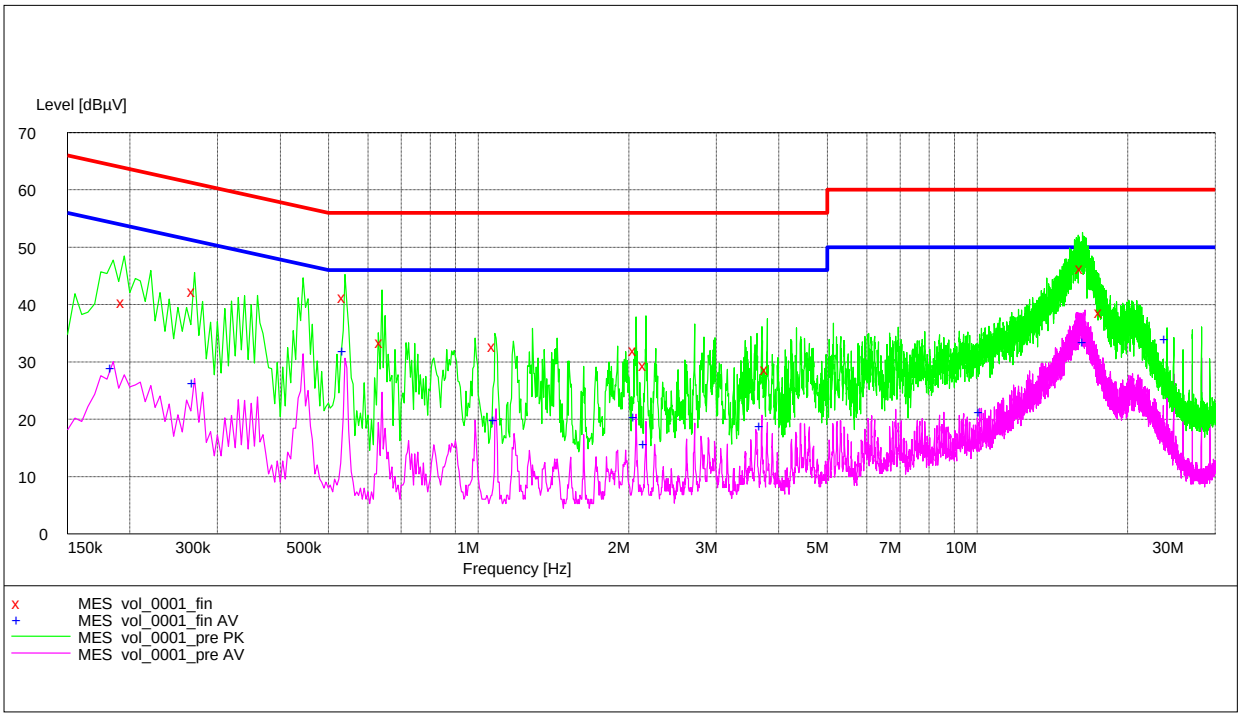
Limits for Conducted Emissions (FCC 47 CFR 15.207):

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.



MEASUREMENT RESULT: "vol_0001_fin QP"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.195000	40.50	9.9	64	23.3	N	GND
0.270000	42.40	9.9	61	18.7	L1	GND
0.540000	41.50	10.0	56	14.5	L1	GND
0.640000	33.60	10.0	56	22.4	N	GND
1.080000	32.80	10.0	56	23.2	N	GND
2.070000	32.20	10.1	56	23.8	N	GND
2.170000	29.60	10.1	56	26.4	N	GND
3.795000	28.80	10.2	56	27.2	N	GND
16.250000	46.50	10.5	60	13.5	N	GND
17.780000	38.80	10.3	60	21.2	N	GND

MEASUREMENT RESULT: "vol_0001_fin AV"

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.185000	29.10	9.9	54	25.2	L1	GND
0.270000	26.40	9.9	51	24.8	N	GND
0.540000	32.00	10.0	46	14.0	N	GND
1.085000	20.00	10.0	46	26.0	N	GND
2.070000	20.50	10.1	46	25.5	N	GND
2.170000	15.70	10.1	46	30.3	L1	GND
3.700000	19.00	10.2	46	27.0	L1	GND
10.200000	21.30	10.4	50	28.7	L1	GND
16.435000	33.60	10.5	50	16.4	N	GND
24.000000	34.10	10.8	50	15.9	L1	GND

3.1.7 Antenna Requirement

Test Requirements: § 15.203

Test Specification:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

This is Circuit printed meander line antenna. There is no external antenna port, the antenna gain = 0.0dBi. User is unable to remove or changed the Antenna.

3.1.8 RF Exposure

RF Exposure

Test Requirement: FCC 47CFR 15.247(i)
Test Date: 2020-09-11
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.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	* 100	6
3.0-30	1842/f	4.89/f	* $900/f^2$	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* 100	30
1.34-30	824/f	2.19/f	* $180/f^2$	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

An MPE evaluation for was performed in order to show that the device was compliant with §2.1091. The maximum power density was calculated for each transmitter at a separation distance of 20cm. For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Results:

Measurement uncertainty = 1.7 dB
Maximum conducted output power = -3.49dBm (0.45mW) @ 2402 MHz
Antenna gain = 0.0 dBi = 1.0
Tune-up EIRP = -1.79 dBm (0.66 mW)

Applicant stated minimum distance = 20 cm
MPE Limit at 2402MHz = 1.00 mW/cm^2

Power Density = 0.13mW/cm^2

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 TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2020/04/13	2021/04/13
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2020/05/13	2021/05/13
EM022	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2019/11/30	2021/11/30
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JXTXLB-10180-SF	J203109090300 7	2019/03/15	2021/03/15
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2019/05/13	2021/05/13
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	142073	2020/06/17	2022/06/17

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2020/06/30	2021/06/30
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2020/05/13	2021/05/13
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2020/01/13	2021/01/11

Support Equipment

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.
COMPUTER - THINKPAD X1 CARBON	LENOVO	TP00086A	SL10P98060
USB 5V ADAPTOR	APPLE	A1299	QU119D0PWT3DAG
USB TO MICRO CABLE (1M)	MOMAX	DM16	N/A

Remarks:-

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

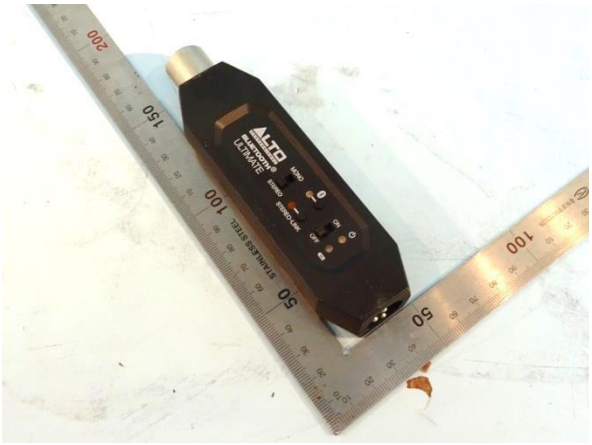
Appendix B

Photographs of EUT

Front View of the product

Rear View of the product

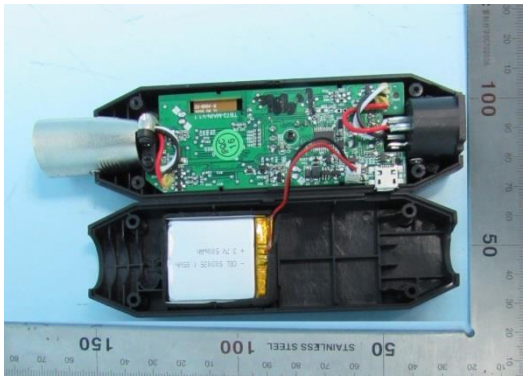
Front View of the product



Rear View of the product

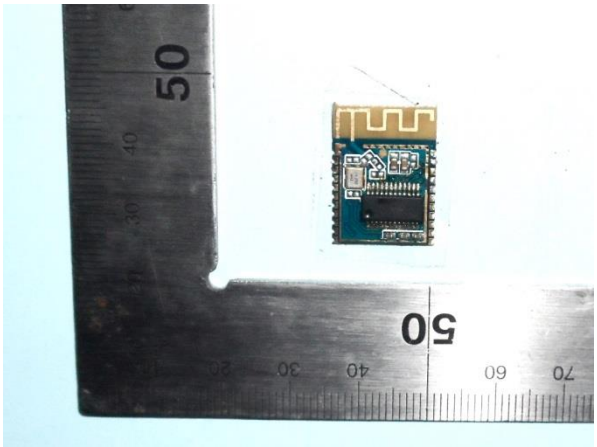
Photographs of EUT

Front View of the PCB of the product



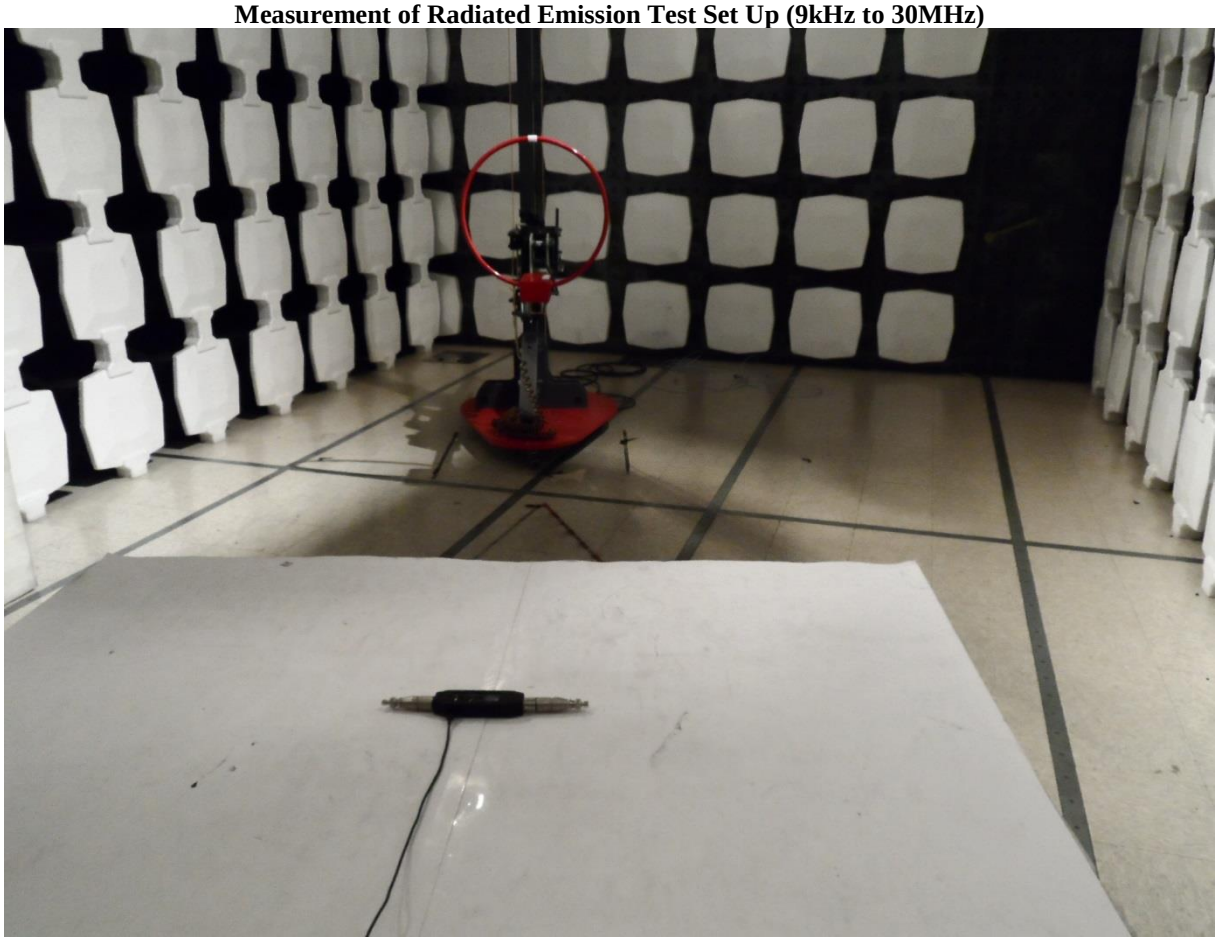
Rear View of the PCB of the product

RF module of the product



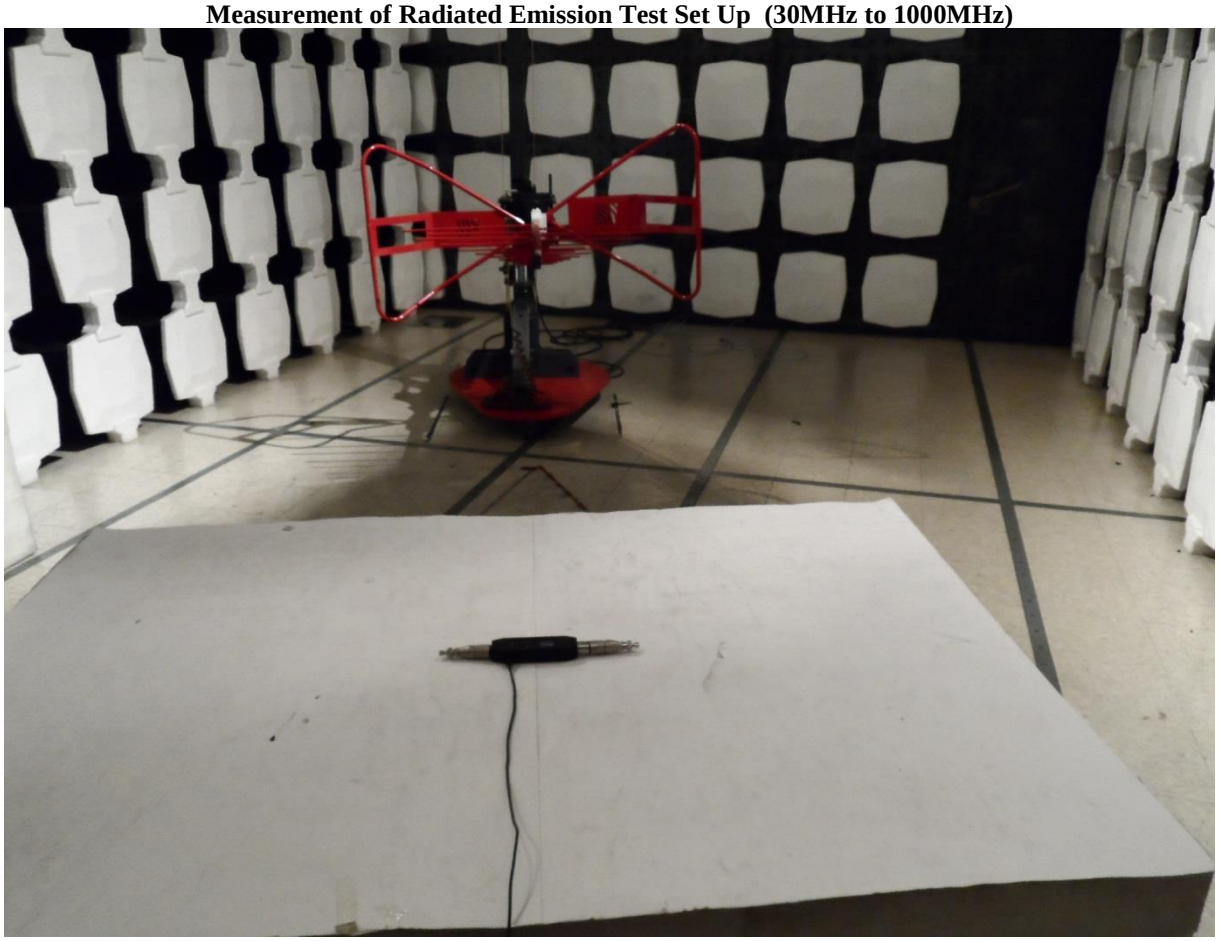
Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz to 30MHz)



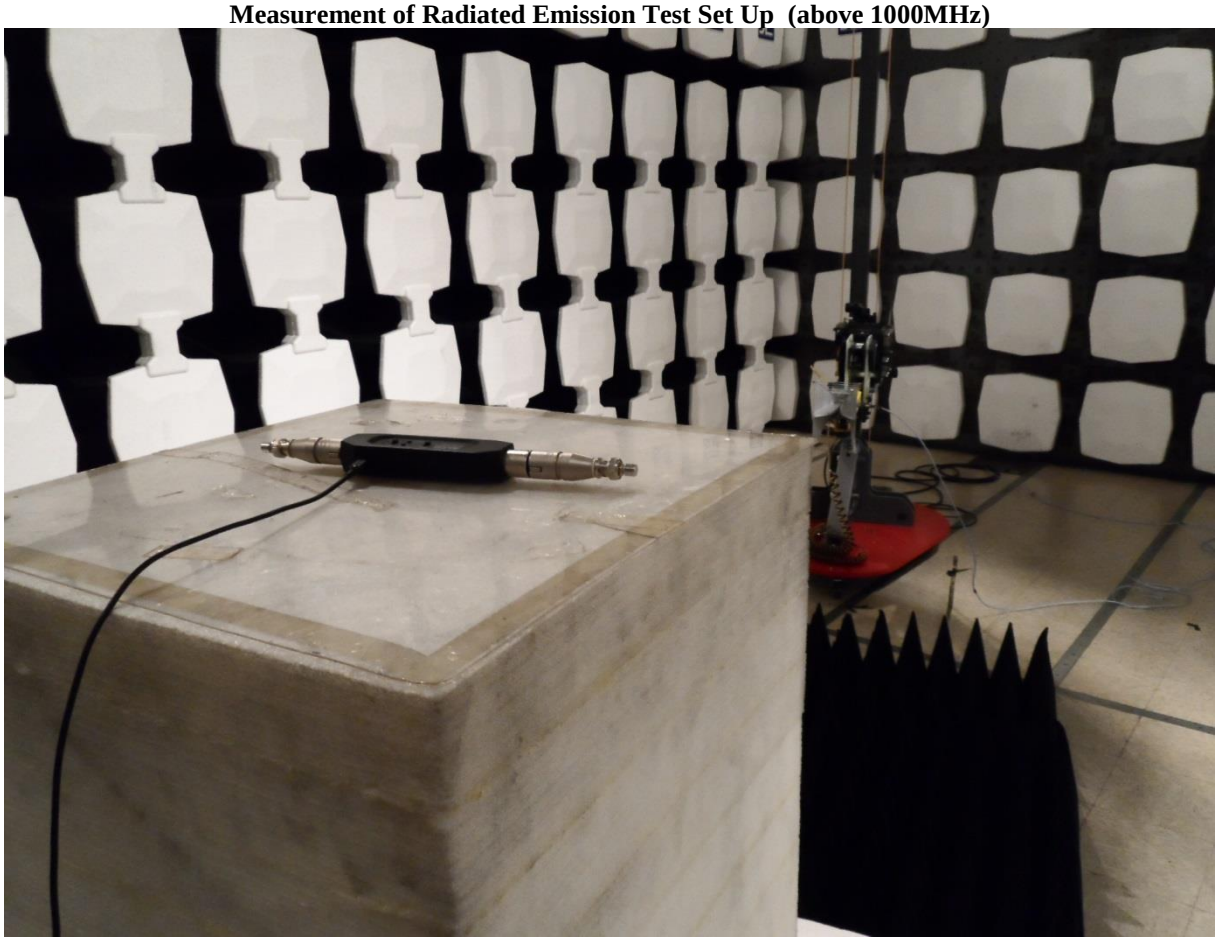
Photographs of EUT

Measurement of Radiated Emission Test Set Up (30MHz to 1000MHz)



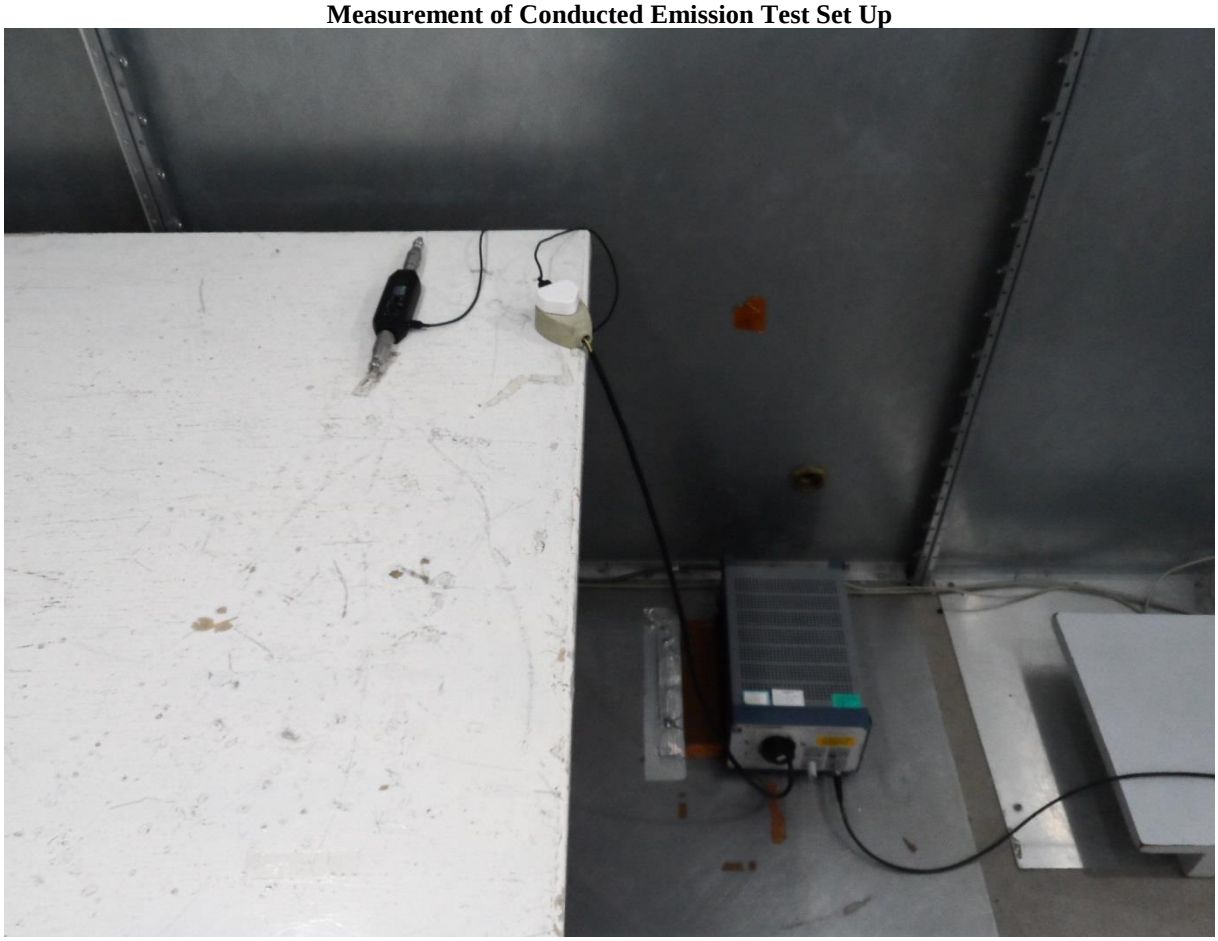
Photographs of EUT

Measurement of Radiated Emission Test Set Up (above 1000MHz)



Photographs of EUT

Measurement of Conducted Emission Test Set Up



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

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.