RADIO TEST REPORT

Report No: STS2002003W06

Issued for

The Product Workshop Limited

Unit 1303A, Henley Industrial Centre, 9-15 Bute Street, Mong Kok, Kowloon, Hong Kong

Product Name:	Kobotix Real Racer First Person View (FPV) RC Car
Brand Name:	KOBOTIX
Model Name:	KBRR10T
Series Model:	N/A
FCC ID:	2ARNG-KBRR1XT
IC:	24571-KBRR1XT
Test Standard:	FCC Part 15.249
	RSS 210 Issue 9

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TEST RESULT CERTIFICATION

Applicant's Name ..... :	The Product Workshop Limited
Address ..... :	Unit 1303A, Henley Industrial Centre, 9-15 Bute Street, Mong Kok, Kowloon, Hong Kong
Manufacture's Name ..... :	The Product Workshop Limited
Address ..... :	Unit 1303A, Henley Industrial Centre, 9-15 Bute Street, Mong Kok, Kowloon, Hong Kong

Product Description

Product Name ..... :	Kobotix Real Racer First Person View (FPV) RC Car
Brand Name ..... :	KOBOTIX
Model Name ..... :	KBRR10T
Series Model ..... :	N/A
Test Standards ..... :	FCC Part15.249
	RSS 210 Issue 9
Test Procedure ..... :	ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC/IC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test ..... :	
Date of receipt of test item ..... :	18 Feb. 2020
Date of performance of tests .. :	18 Feb. 2020 ~ 26 May 2020
Date of Issue ..... :	26 May 2020
Test Result..... :	**Pass**

Testing Engineer : Chris Chen
(Chris Chen)

Technical Manager : Sean She
(Sean she)

Authorized Signatory : Vita Li
(Vita Li)

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Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	26 May 2020	STS2002003W06	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 15.249 , Subpart C RSS 210 Issue 9			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen Issue 5	Conducted Emission	N/A	--
15.203 RSS-Gen Issue 5	Antenna Requirement	Pass	--
15.249 RSS 210 Issue 9 (B.10)	Radiated Spurious Emission	Pass	--
15.205	Radiated Band Edge Emission	Pass	--
15.249 RSS-Gen Issue 5	Occupied Bandwidth	Pass	--
RSS-Gen Issue 5	Frequency Stability	PASS	--

NOTE:

(1) 'N/A' denotes test is not applicable in this Test Report.

(2) All tests are according to ANSI C63.10-2013.

1.1 TEST FACTORY

SHENZHEN STS TEST SERVICES CO., LTD
Add. : A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China
FCC test Firm Registration Number: 625569
IC test Firm Registration Number: 12108A
A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	RF output power, conducted	±0.68dB
2	Unwanted Emissions, conducted	±2.988dB
3	All emissions, radiated 30-1GHz	±6.7dB
4	All emissions, radiated 1G-6GHz	±5.5dB
5	All emissions, radiated>6G	±5.8dB
6	Conducted Emission (9KHz-150KHz)	±4.43dB
7	Conducted Emission (150KHz-30MHz)	±5dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Kobotix Real Racer First Person View (FPV) RC Car
Trade Name	KOBOTIX
Model Name	KBRR10T
Series Model	N/A
Model Difference	N/A
Product Description	The EUT is a Kobotix Real Racer First Person View (FPV) RC Car Operation Frequency: 2402 MHz – 2481 MHz Modulation Type: GFSK Antenna Designation: Copper Pipe Antenna Gain(Peak): 0 dBi Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.
Channel List	Please refer to the Note 2.
Power Rating	Input: DC 6V (4 x 1.5V AAA)
Hardware version number	Ver1.0
Software version number	Ver1.0

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual.

2. Frequency list

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402	21	2422	41	2442	61	2462
2	2403	22	2423	42	2443	62	2463
3	2404	23	2424	43	2444	63	2464
4	2405	24	2425	44	2445	64	2465
5	2406	25	2426	45	2446	65	2466
6	2407	26	2427	46	2447	66	2467
7	2408	27	2428	47	2448	67	2468
8	2409	28	2429	48	2449	68	2469
9	2410	29	2430	49	2450	69	2470
10	2411	30	2431	50	2451	70	2471
11	2412	31	2432	51	2452	71	2472
12	2413	32	2433	52	2453	72	2473
13	2414	33	2434	53	2454	73	2474
14	2415	34	2435	54	2455	74	2475
15	2416	35	2436	55	2456	75	2476
16	2417	36	2437	56	2457	76	2477
17	2418	37	2438	57	2458	77	2478
18	2419	38	2439	58	2459	78	2479
19	2420	39	2440	59	2460	79	2480
20	2421	40	2441	60	2461	80	2481

3. Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	KOBOTIX	KBRR1X	Copper Pipe	N/A	0 dBi	Antenna

2.2 DESCRIPTION OF THE TEST MODES

For conducted test items and radiated spurious emissions
Each of these EUT operation mode(s) or test configuration mode(s) mentioned below was evaluated respectively.

Pretest Mode	Description	Data/Modulation
Mode 1	TX Low channel	GFSK
Mode 2	TX Mid channel	GFSK
Mode 3	TX High channel	GFSK

Note:

(1) All above mode have been measurement, only worst data was reported.

(2) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation, and the worst case of 120V,50/60Hz is shown in the report.

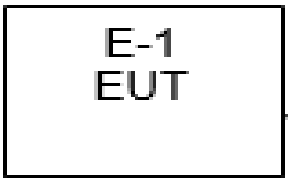
For AC Conducted Emission

Test Case	
AC Conducted Emission	Mode 4 : Keeping TX

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters.

Radiated Spurious Emission Test



2.4 DESCRIPTION OF NECESSARY ACCESSORIES AND SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Serial No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Note:

(1) The support equipment was authorized by Declaration of Confirmation.

(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.07.29	2020.07.28
Signal Analyzer	Agilent	N9020A	MY51110105	2020.03.05	2021.03.04
Active loop Antenna	ZHINAN	ZN30900C	16035	2018.03.11	2021.03.10
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2020.11.01
Horn Antenna	SCHWARZBECK	BBHA 9120D(1201)	9120D-1343	2018.10.19	2021.10.18
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2018.03.11	2021.03.10
Pre-Amplifier(0.1M-3GHz)	EM	EM330	060665	2019.10.09	2020.10.08
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2019.10.09	2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2019.10.09	2020.10.08
turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2019.7.29	2020.7.28
LISN	R&S	ENV216	101242	2019.10.9	2020.10.8
LISN	EMCO	3810/2NM	23625	2019.10.9	2020.10.8
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2019.10.09	2020.10.08
Signal Analyzer	Agilent	N9020A	MY49100060	2019.10.09	2020.10.08
Temperature & Humidity	HH660	Mieo	N/A	2019.10.12	2020.10.11
Test SW	FARAD	LZ-RF /LzRf-3A3			

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 15.249& RSS-Gen Issue 5 limit in the table below has to be followed.

FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

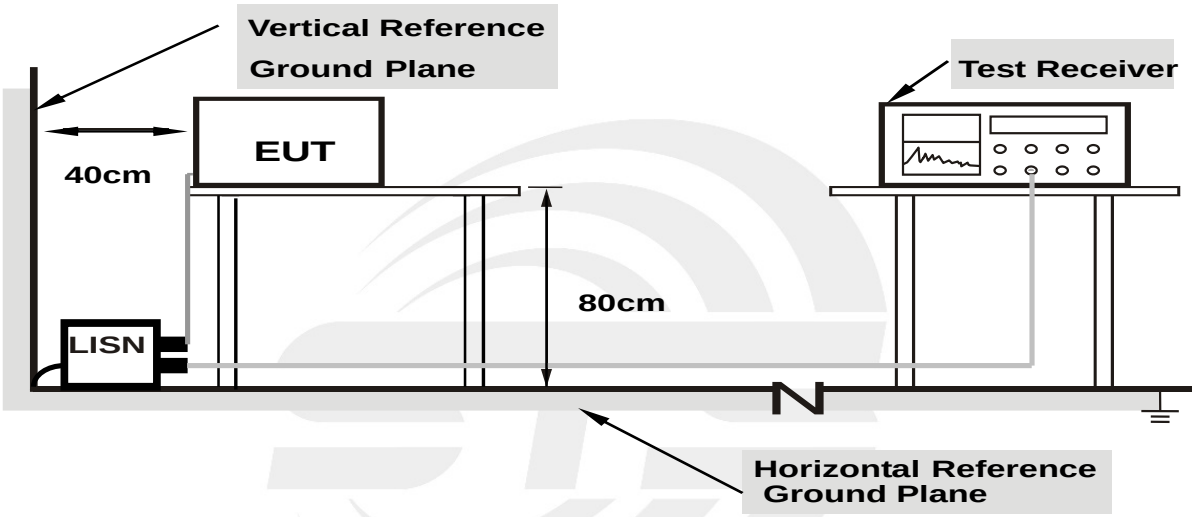
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 TEST RESULT

Temperature:	25.3℃	Relative Humidity:	62%
Test Voltage:	N/A	Phase:	L/N
Test Mode:	N/A		

Note: EUT is only power by battery, So it is not applicable for this test.

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on Part 15.249 and the Part 15.209(a) limit in the table below has to be followed.

Standard FCC 15.209

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3
Above 1000	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	3

Standard FCC 15.249

Frequency of Emission (MHz)	**Field Strength of fundamental (millivolts /meter)**	**Field Strength of Harmonics (microvolts/meter)**
900~928	50	500
2400~2483.5	50	500
5725~5875	50	500
24000~242500	250	2500

Notes:

(1) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

In case the emission fall within the restricted band specified on RSS-Gen Issue 4 limit in the followed
. In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency given below:
(a) If the equipment operates below 10 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) If the equipment operates at or above 10 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency, as well as to those frequencies removed from the carrier by multiples of the oscillator frequency.
Radiation at the frequencies of multiplier stages should also be checked.
The amplitude of spurious emissions attenuated more than 20 dB below the permissible value need not be reported.
When limits are expressed in absolute terms, compliance with the emission limits below 1000 MHz shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limits can be demonstrated using measuring equipment employing a peak detector function properly adjusted for factors such as pulse desensitization as required, with an equal or greater measurement bandwidth relative to the applicable CISPR quasi-peak bandwidth.
Above 1000 MHz, compliance with the emission limits shall be demonstrated using an average detector with a minimum resolution bandwidth of 1 MHz.

In case the emission fall within the restricted band specified on RSS 210 Issue 9 (B.10) limit in the followed
1. The field strength of fundamental and harmonic emissions, measured at 3 m, shall not exceed 50 mV/m and 0.5 mV/m respectively.
The field strength limits shall be measured using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using an International Special Committee on Radio Interference (CISPR) quasi-peak detector.
2. Emissions radiated outside of the specified frequency bands, except for harmonic emissions, shall be attenuated by at least 50 dB below the level of the fundamental emissions or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

NOTE:
(1) The limit for radiated test was performed according to RSS 210 Issue 9.
(2) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Detector	Peak/AV
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB (emission in restricted band)	>20BW
VB (emission in restricted band)	=3xRB

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
	90kHz~110kHz / RB 200Hz for QP
	110kHz~490kHz / RB 200Hz for PK & AV
	490kHz~30MHz / RB 9kHz for QP
	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of arotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Below 1GHz)

b. The measuring distance of 3m shall used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Above 1GHz)

c. The height of the test antenna shall vary between 1m to 4m.Both horizontal and vertical polarization Of the antenna are set to make the measurement.

d. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

e. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading compliance with the QP limits and then QP Mode measurement didn't perform (Below 1GHz)

f. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value compliance with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak & AVG limits and then only Peak mode was measured, but AVG mode didn't perform.(Above 1GHz)

g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

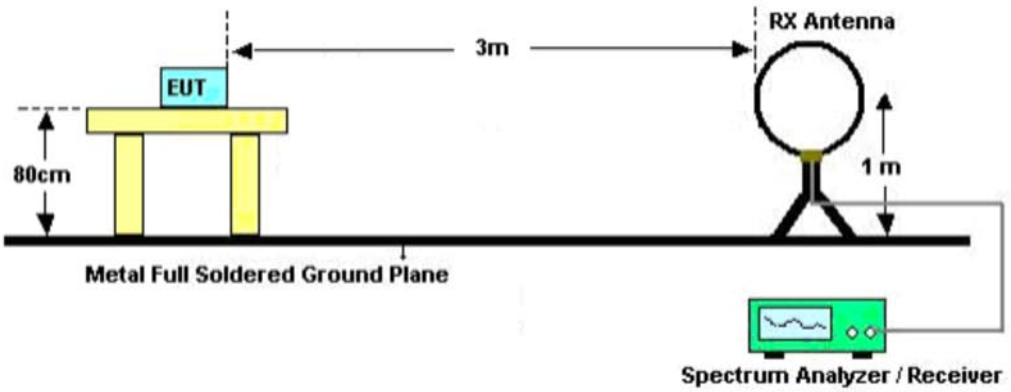
Note: Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

3.2.3 DEVIATION FROM TEST STANDARD

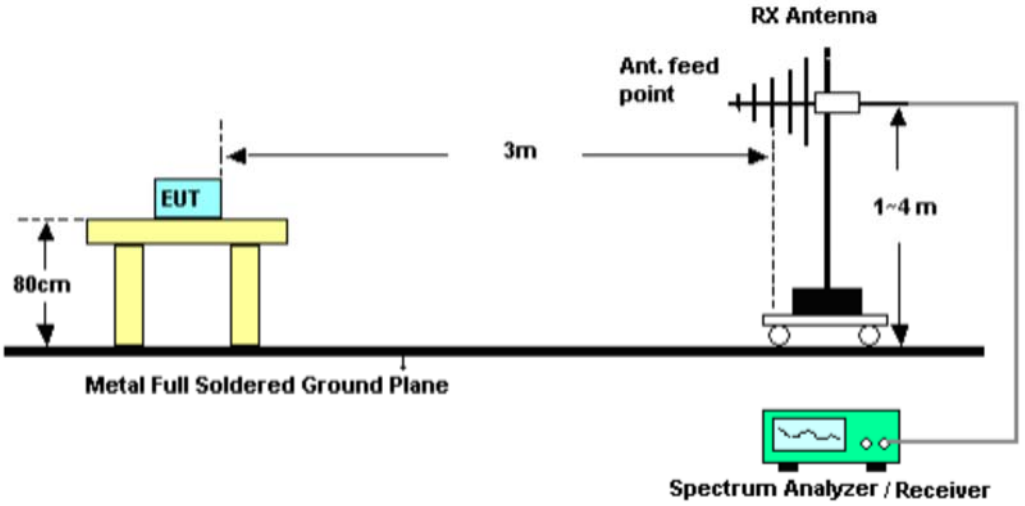
No deviation

3.2.4 TEST SETUP

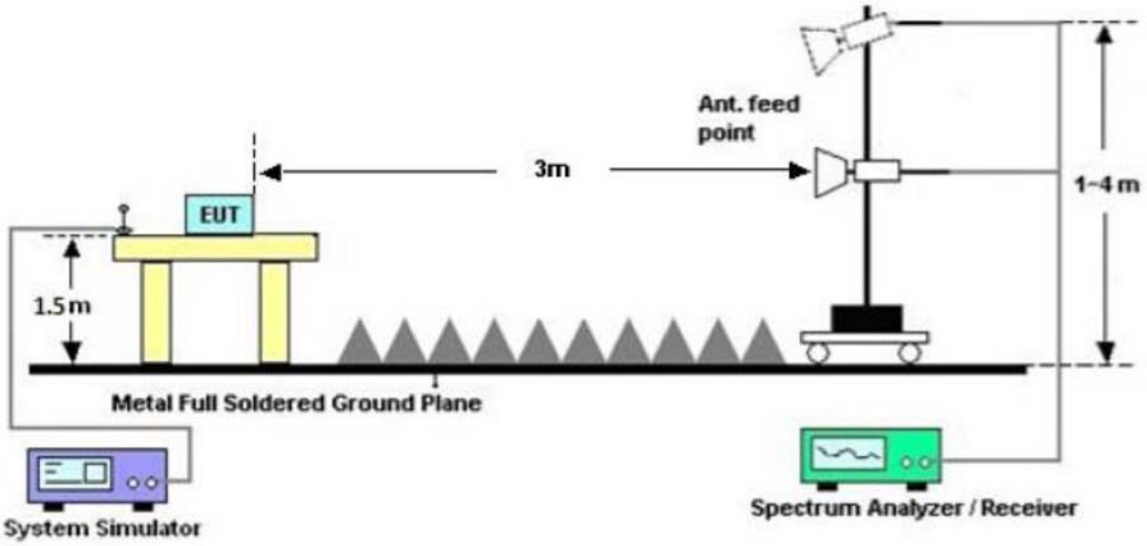
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.5 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:
Margin=PL-PK L or AL- AV L; Margin only shown the worst case.
Where
PR = Peak Reading
AR = Average Reading
PL = Peak Level
AL = Average Level
AF = Antenna Factor
PK L = Peak Limit
AV L = AV Limit
For example

Frequency	PR	AR	AF	PL	AL	PK L	AV L	Margin
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)	(dB)
2178	40.23	30.31	9.83	50.06	40.14	74.00	54.00	-13.86

3.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

Below 30 MHz

Temperature:	22.9(C)	Relative Humidity:	55%RH
Test Voltage:	DC 6V	Polarization:	---
Test Mode:	TX Mode		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

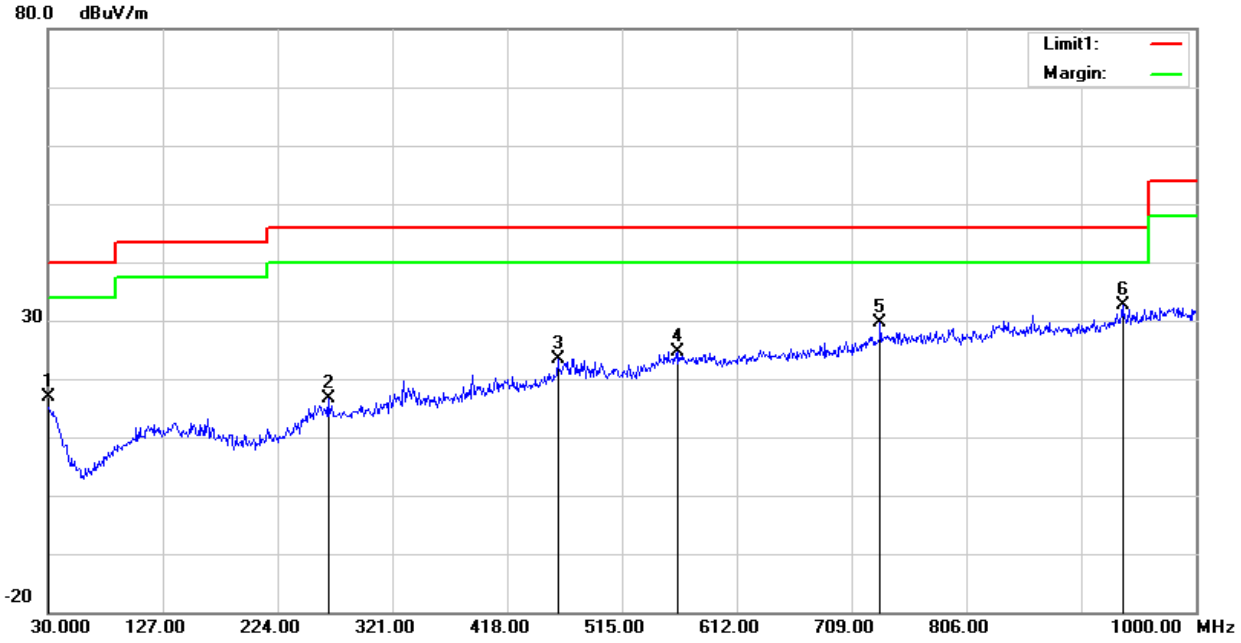
Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1000 MHz Radiation Spurious

Temperature:	22.9(C)	Relative Humidity:	55%RH
Test Voltage:	DC 6V	Phase:	Horizontal
Test Mode:	Mode 1~3(Mode 3 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.0000	29.70	-12.85	16.85	40.00	-23.15	QP
2	266.6800	31.64	-14.94	16.70	46.00	-29.30	QP
3	460.6800	32.75	-9.43	23.32	46.00	-22.68	QP
4	562.5300	30.20	-5.52	24.68	46.00	-21.32	QP
5	733.2500	31.95	-2.35	29.60	46.00	-16.40	QP
6	937.9200	31.46	1.20	32.66	46.00	-13.34	QP

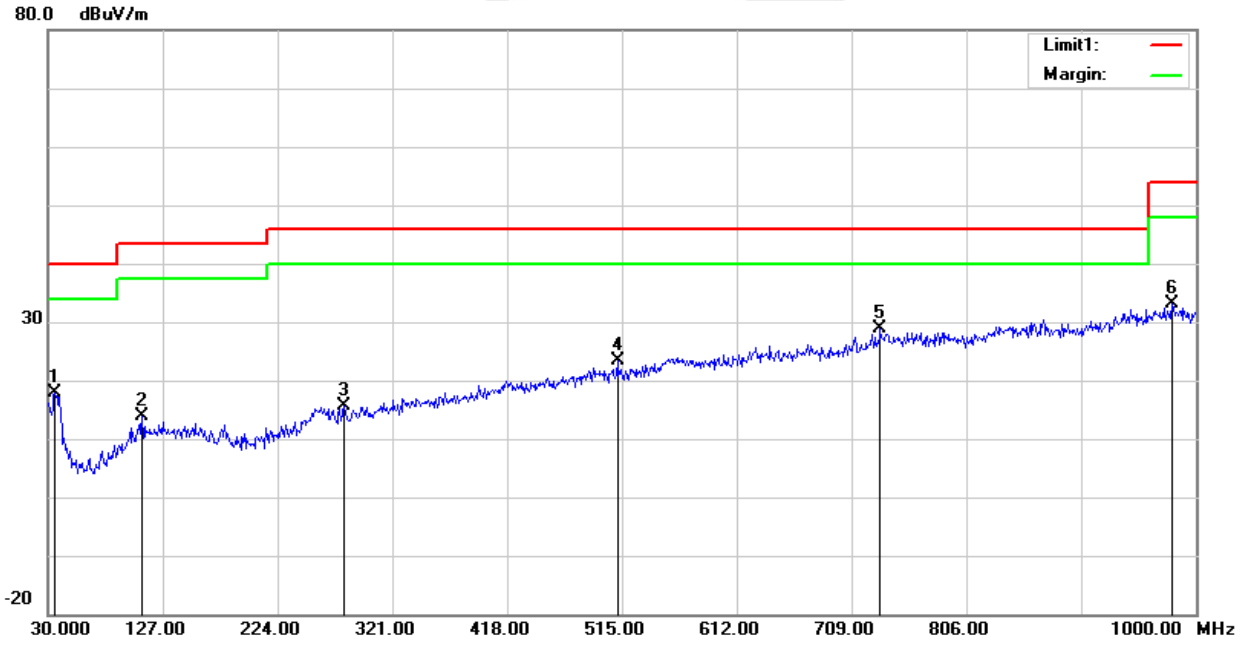
Remark:
1. Margin = Result (Result =Reading + Factor)–Limit



Temperature:	22.9(C)	Relative Humidity:	55%RH
Test Voltage:	DC 6V	Phase:	Vertical
Test Mode:	Mode 1~3(Mode 3 worst mode)		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	35.8200	33.68	-15.91	17.77	40.00	-22.23	QP
2	109.5400	33.06	-19.11	13.95	43.50	-29.55	QP
3	280.2600	31.25	-15.60	15.65	46.00	-30.35	QP
4	511.1200	31.22	-7.93	23.29	46.00	-22.71	QP
5	733.2500	31.32	-2.35	28.97	46.00	-17.03	QP
6	979.6300	30.39	2.65	33.04	54.00	-20.96	QP

Remark:
1. Margin = Result (Result =Reading + Factor)–Limit



Above 1G Radiation Spurious

Low channel

PK

Frequency	Meter Reading	Detector	Amplifier	Loss	Antenna Factor	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
								Limit	Margin	Polar
(MHz)	(dBμV/m)	(PK/QP/AV)	（dB）	（dB）	（dB/m）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4804.08	62.35	PK	50.33	8.84	31.22	-10.27	52.08	74	-21.92	H
4804.08	61.84	PK	50.33	8.84	31.22	-10.27	51.57	74	-22.43	V
7205.98	58.03	PK	55.48	9.31	34.05	-12.12	45.91	74	-28.09	H
7205.98	56.99	PK	55.48	9.31	34.05	-12.12	44.87	74	-29.13	V
9607.98	64.09	PK	59.13	9.89	36.99	-12.25	51.84	74	-22.16	H
9607.98	63.53	PK	59.13	9.89	36.99	-12.25	51.28	74	-22.72	V

AV

Frequency	PK Reading	Duty cycle factor	AV Reading	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
						Limit	Margin	Polar
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4804.08	62.35	6.69	55.66	-10.27	45.39	54.00	-8.61	H
4804.08	61.84	6.69	55.15	-10.27	44.88	54.00	-9.12	V
7205.98	58.03	6.69	51.34	-12.12	39.22	54.00	-14.78	H
7205.98	56.99	6.69	50.30	-12.12	38.18	54.00	-15.82	V
9607.98	64.09	6.69	57.40	-12.25	45.15	54.00	-8.85	H
9607.98	63.53	6.69	56.84	-12.25	44.59	54.00	-9.41	V

AV = Peak +20Log10(duty cycle factor) =PK-6.69

Mid channel

PK

Frequency	Meter Reading	Detector	Amplifier	Loss	Antenna Factor	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
								Limit	Margin	Polar
(MHz)	(dBμV/m)	(PK/QP/AV)	（dB）	（dB）	（dB/m）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4884.04	61.08	PK	50.33	8.84	31.22	-10.27	50.81	74	-23.19	H
4884.04	60.32	PK	50.33	8.84	31.22	-10.27	50.05	74	-23.95	V
7326.18	57.63	PK	55.48	9.31	34.05	-12.12	45.51	74	-28.49	H
7326.18	56.82	PK	55.48	9.31	34.05	-12.12	44.70	74	-29.30	V
9768.07	63.99	PK	59.13	9.89	36.99	-12.25	51.74	74	-22.26	H
9768.07	63.18	PK	59.13	9.89	36.99	-12.25	50.93	74	-23.07	V

AV

Frequency	PK Reading	Duty cycle factor	AV Reading	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
						Limit	Margin	Polar
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4884.04	61.08	6.69	54.39	-10.27	44.12	54.00	-9.88	H
4884.04	60.32	6.69	53.63	-10.27	43.36	54.00	-10.64	V
7326.18	57.63	6.69	50.94	-12.12	38.82	54.00	-15.18	H
7326.18	56.82	6.69	50.13	-12.12	38.01	54.00	-15.99	V
9768.07	63.99	6.69	57.30	-12.25	45.05	54.00	-8.95	H
9768.07	63.18	6.69	56.49	-12.25	44.24	54.00	-9.76	V

AV = Peak +20Log10(duty cycle factor) =PK-6.69

High channel

PK

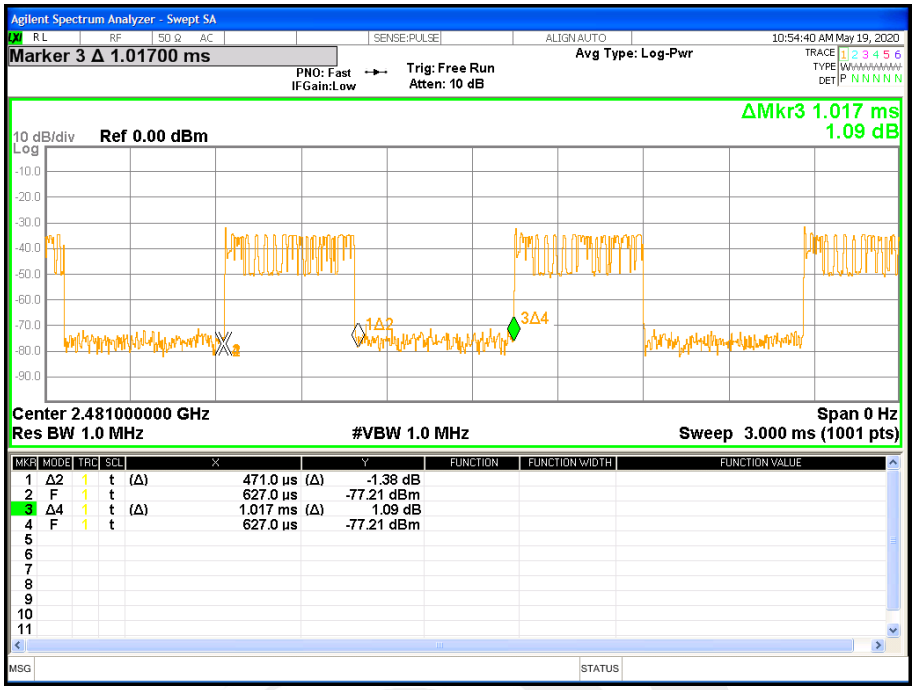
Frequency	Meter Reading	Detector	Amplifier	Loss	Antenna Factor	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
								Limit	Margin	Polar
(MHz)	(dBμV/m)	(PK/QP/AV)	（dB）	（dB）	（dB/m）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4962.06	62.03	PK	50.33	8.84	31.22	-10.27	51.76	74	-22.24	H
4962.06	61.11	PK	50.33	8.84	31.22	-10.27	50.84	74	-23.16	V
7443.00	56.83	PK	55.48	9.31	34.05	-12.12	44.71	74	-29.29	H
7443.00	56.09	PK	55.48	9.31	34.05	-12.12	43.97	74	-30.03	V
9923.98	64.05	PK	59.13	9.89	36.99	-12.25	51.80	74	-22.20	H
9923.98	63.89	PK	59.13	9.89	36.99	-12.25	51.64	74	-22.36	V

AV

Frequency	PK Reading	Duty cycle factor	AV Reading	Orrected Factor	Corrected Amplitude	FCC Part 15.249/15.209/205		RX Antenna
						Limit	Margin	Polar
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
4962.06	62.03	6.69	55.34	-10.27	45.07	54.00	-8.93	H
4962.06	61.11	6.69	54.42	-10.27	44.15	54.00	-9.85	V
7443.00	56.83	6.69	50.14	-12.12	38.02	54.00	-15.98	H
7443.00	56.09	6.69	49.40	-12.12	37.28	54.00	-16.72	V
9923.98	64.05	6.69	57.36	-12.25	45.11	54.00	-8.89	H
9923.98	63.89	6.69	57.20	-12.25	44.95	54.00	-9.05	V

AV = Peak +20Log10(duty cycle factor) =PK-6.69

Duty cycle



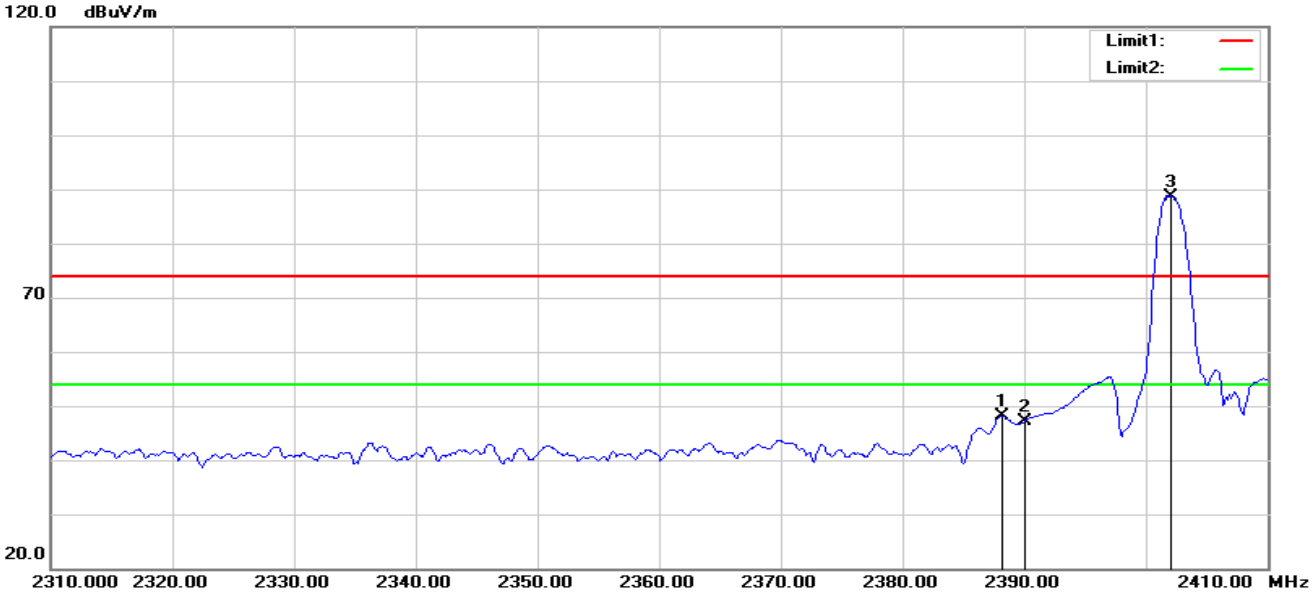
Ton (µs)	Tp (µs)	Duty Factor
471	1017	6.69

Note: Duty cycle correction factor(db)=20Log10(duty cycle)

(Radiation **Band edge)**

Low channel

Horizontal

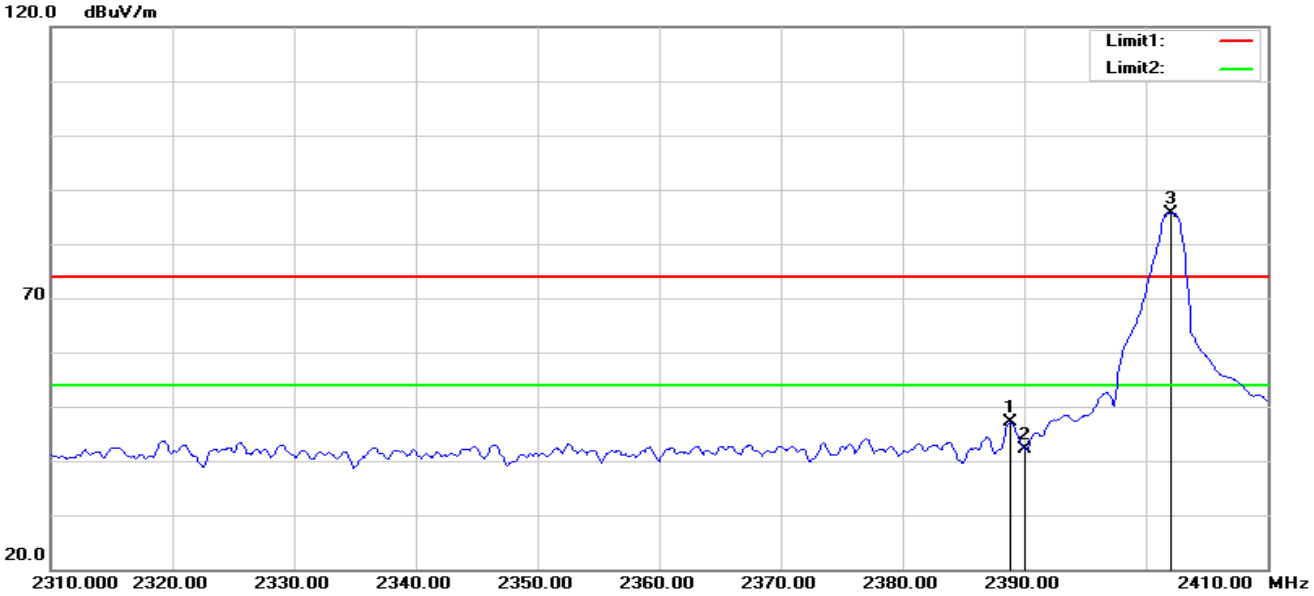


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2388.200	43.83	4.31	48.14	74.00	-25.86	peak
2	2390.000	42.81	4.34	47.15	74.00	-26.85	peak

Fundamental Frequency

No.	Frequency	Reading	Correct	Duty cycle	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
3	2402.000	84.25	4.49	-	88.74	114.00	-25.26	peak
4	2402.000	84.25	4.49	6.69	82.05	94.00	-11.95	AV

Vertical



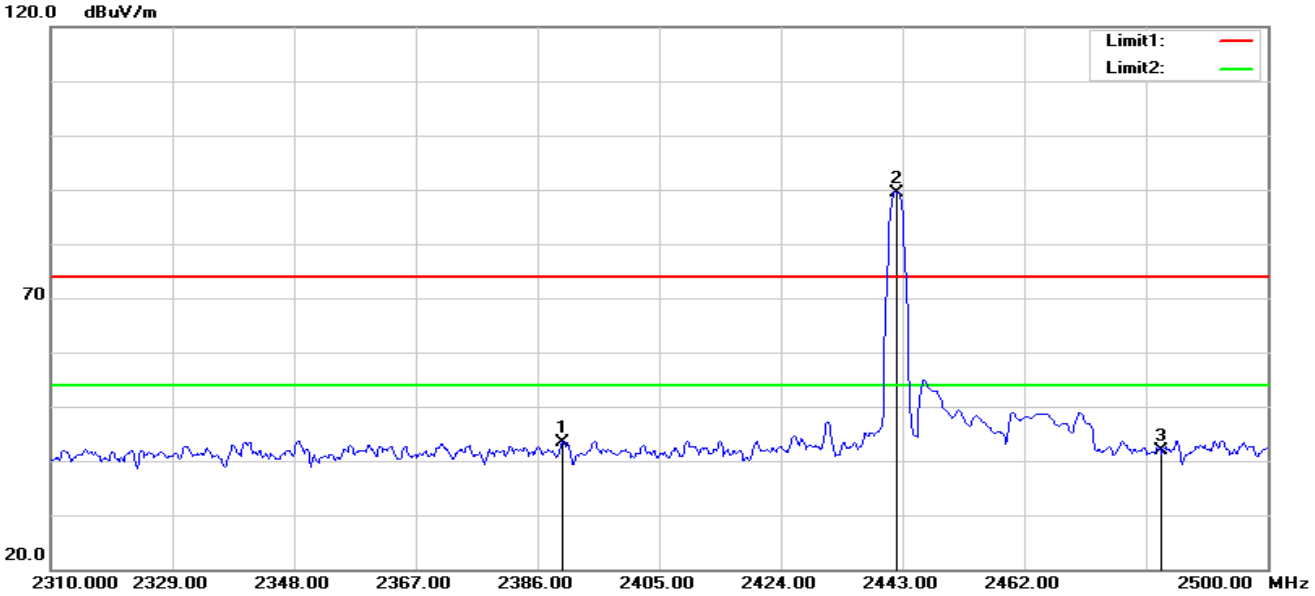
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2388.900	42.69	4.32	47.01	74.00	-26.99	peak
2	2390.000	37.81	4.34	42.15	74.00	-31.85	peak

Fundamental Frequency

No.	Frequency	Reading	Correct	Duty cycle	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
3	2402.000	81.15	4.49	-	85.64	114.00	-28.36	peak
4	2402.000	81.15	4.49	6.69	78.95	94.00	-15.05	AV

Mid channel

Horizontal

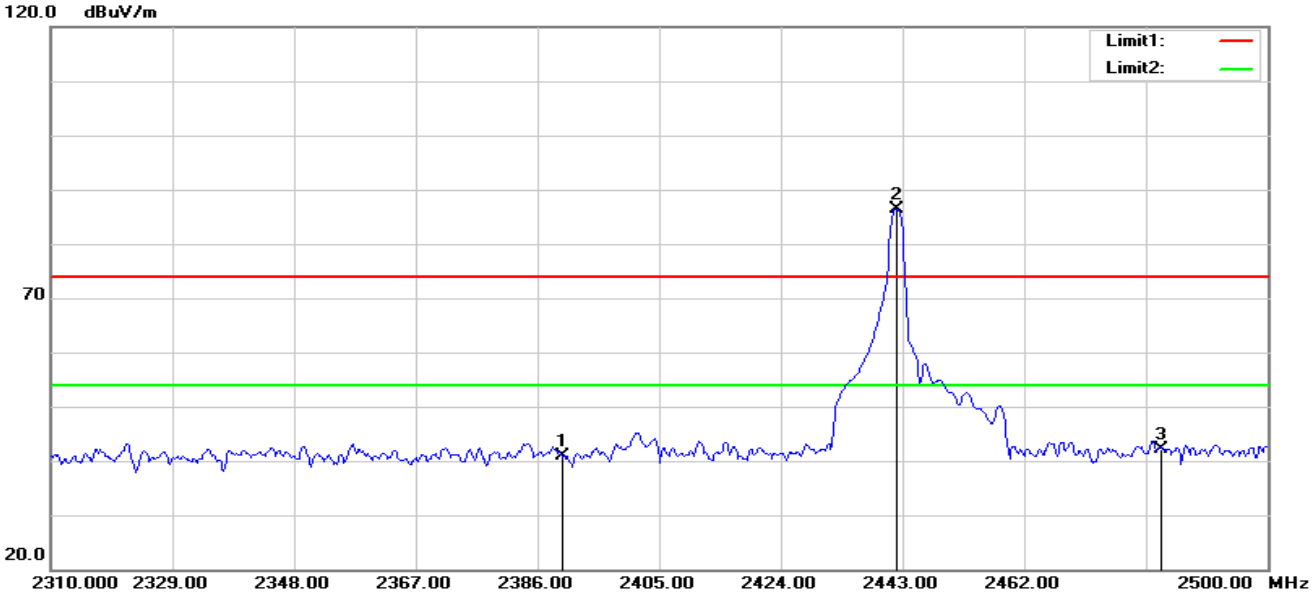


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	39.01	4.34	43.35	74.00	-30.65	peak
3	2483.500	37.35	4.60	41.95	74.00	-32.05	peak

Fundamental Frequency

No.	Frequency	Reading	Correct	Duty cycle	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
2	2442.000	84.86	4.51	-	89.37	114.00	-24.63	peak
4	2442.000	84.86	4.51	6.69	82.68	94.00	-11.32	AV

Vertical



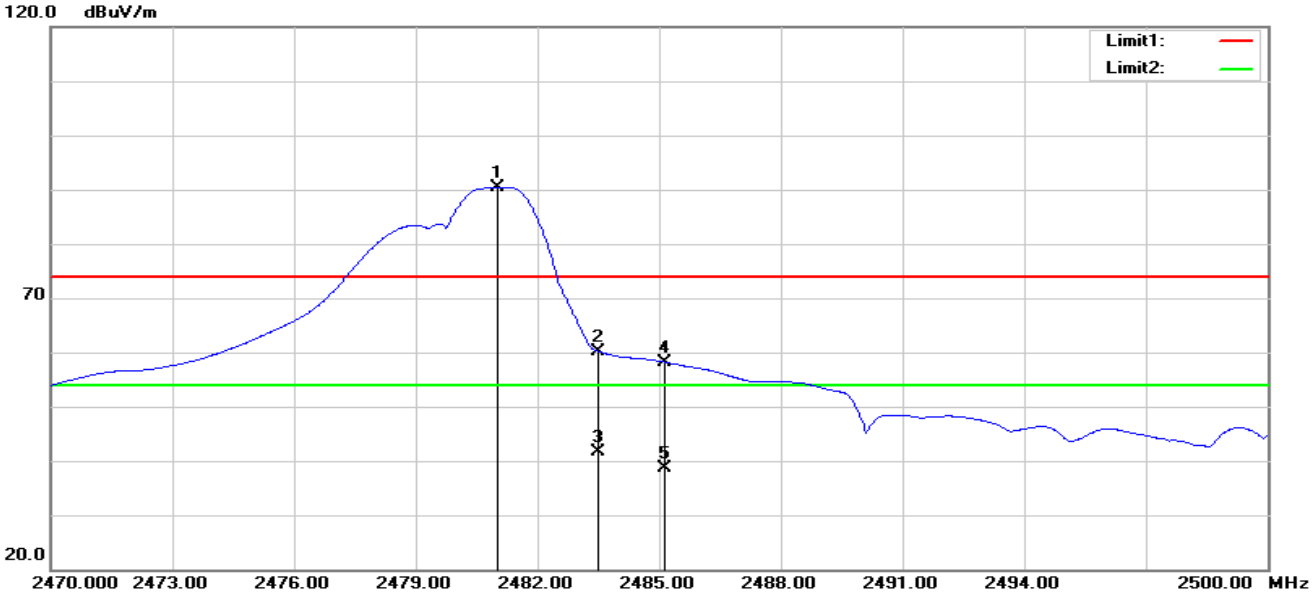
No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2390.000	36.46	4.34	40.80	74.00	-33.20	peak
3	2483.500	37.44	4.60	42.04	74.00	-31.96	peak

Fundamental Frequency

No.	Frequency	Reading	Correct	Duty cycle	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
2	2442.000	81.82	4.51	-	86.33	114.00	-27.67	peak
4	2442.000	81.82	4.51	6.69	79.64	94.00	-14.36	AV

High channel

Horizontal

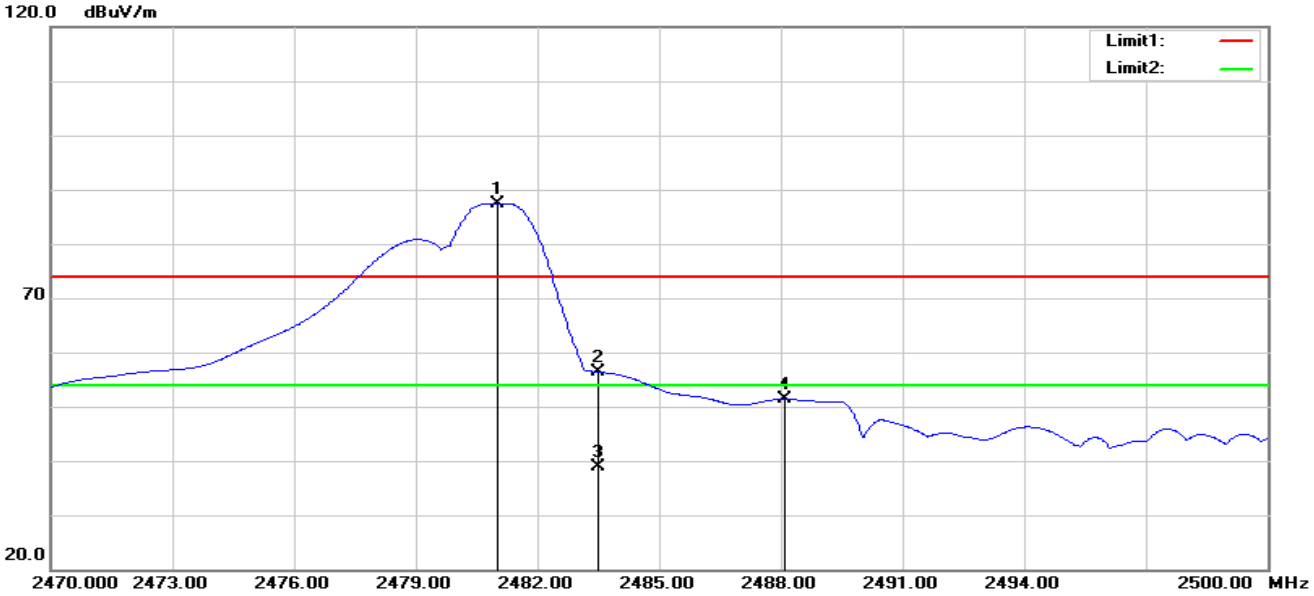


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
2	2483.500	55.63	4.60	60.23	74.00	-13.77	peak
3	2483.500	36.96	4.60	41.56	54.00	-12.44	AVG
4	2485.150	53.59	4.61	58.20	74.00	-15.80	peak
5	2485.150	33.96	4.61	38.57	54.00	-15.43	AVG

Fundamental Frequency

No.	Frequency	Reading	Correct	Duty cycle	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	2481.000	85.81	4.61	-	90.42	114.00	-23.58	peak
6	2481.000	85.81	4.61	6.69	83.73	94.00	-10.27	AV

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
2	2483.500	51.76	4.60	56.36	74.00	-17.64	peak
3	2483.500	34.34	4.60	38.94	54.00	-15.06	AVG
4	2488.090	46.76	4.62	51.38	74.00	-22.62	peak

Fundamental Frequency

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Duty cycle Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2481.000	82.78	4.61	-	87.39	114.00	-26.61	peak
5	2481.000	82.78	4.61	6.69	80.7	94.00	-13.3	AV

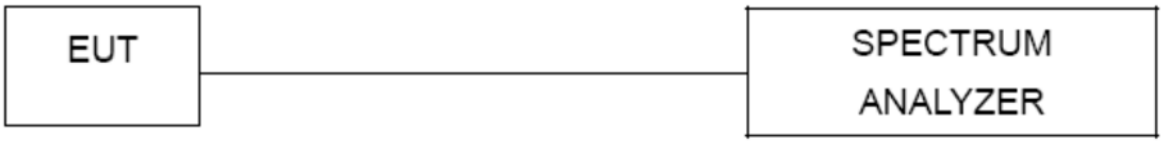
4. BANDWIDTH TEST

4.1 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,

b. Spectrum Setting : RBW= 30KHz, VBW≧RBW, Sweep time = Auto.

4.2 TEST SETUP



4.3 EUT OPERATION CONDITIONS

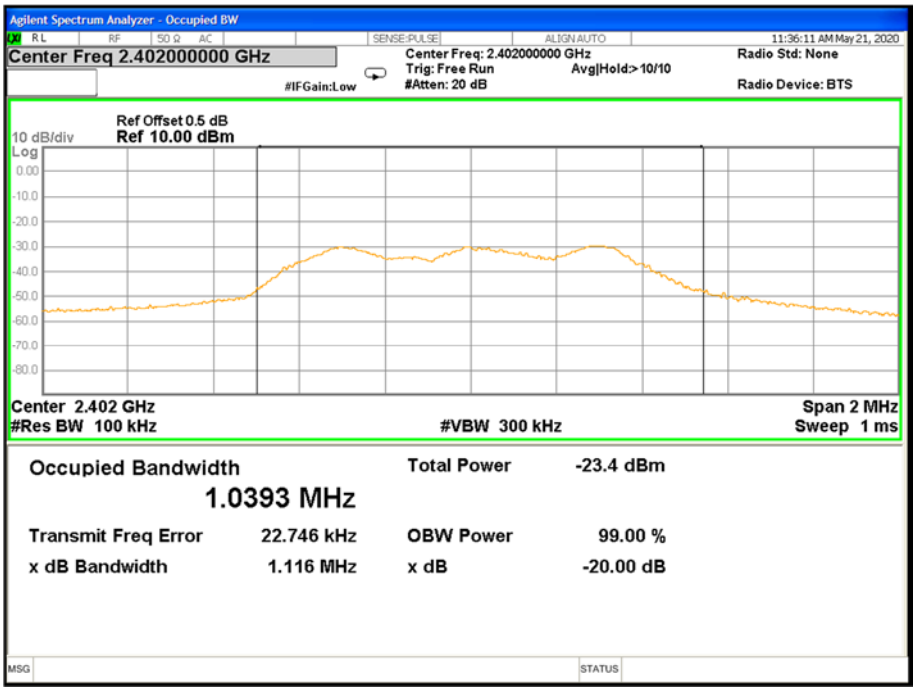
TX mode.

4.4 TEST RESULTS

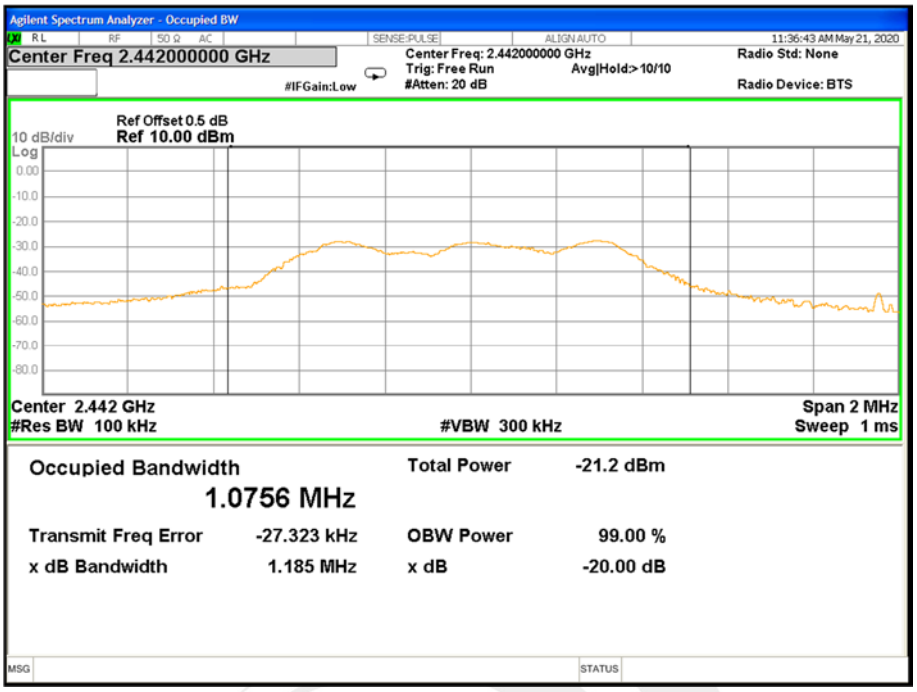
Temperature:	25 ℃	Relative Humidity:	50%
Test Voltage:	DC 6V		

Test Channel	Frequency(MHz)	20 dB Bandwidth(MHz)	99% Bandwidth(MHz)
CH01	2402	1.116	1.039
CH02	2442	1.185	1.076
CH03	2481	1.365	1.262

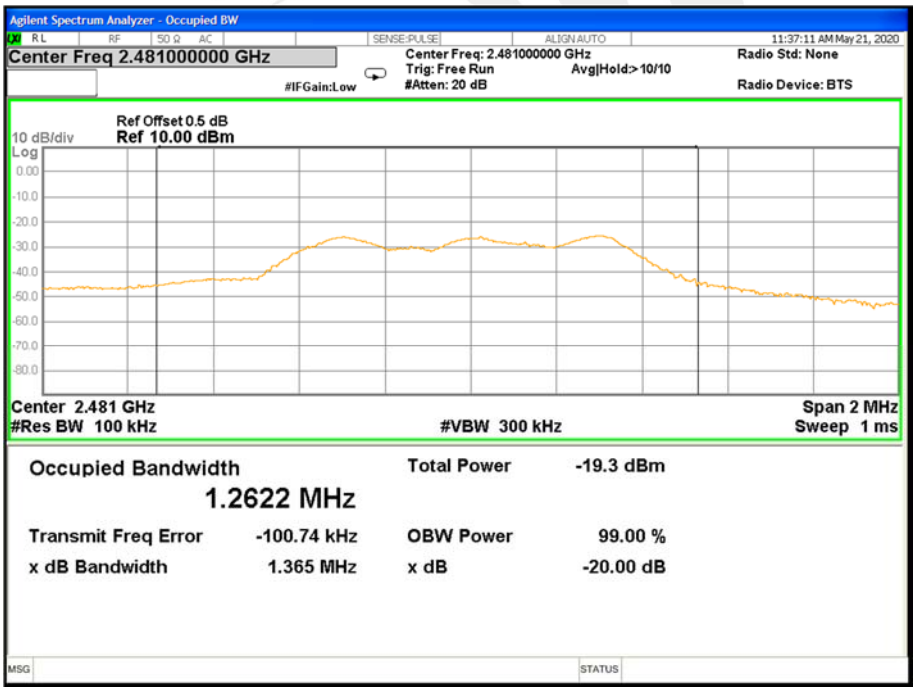
Low Channel



Mid Channel



High Channel



5. ANTENNA REQUIREMENT

5.1 STANDARD REQUIREMENT

According to the FCC Part 15 Paragraph 15.203& RSS-Gen Issue 5, 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.

5.2 EUT ANTENNA

The EUT antenna is Copper Pipe Antenna.It conforms to the standard requirements.

6. FREQUENCY STABILITY

6.1 LIMITS

The frequency tolerance of the carrier signal shall be maintained within +/-0.02% of the operating frequency over a temperature variation of -30 degrees to 50 degrees C at normal supply voltage,and for a variation in primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees.

6.2 TEST PROCEDURE

1. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
2. Turn the EUT on and couple its output to spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize,turn the EUT on and measure the operating frequency after 2,5,and 10 minutes.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes.The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

6.3 TEST RESULT

Channel 02 (2442MHz)

Voltage vs. Frequency Stability

Voltage vs. Frequency Stability Voltage(V)	Measurement Frequency(MHz)
6.9	2442.0032
6	2442.0029
5.1	2442.0027
Max.Deviation(MHz)	0.0032
Max.Deviation(ppm)	1.31

Rated working voltage: DC 6V

Temperature vs. Frequency Stability

Temperature(℃)	Measurement Frequency(MHz)
-30	2442.0026
-20	2442.0023
-10	2442.0024
0	2442.0025
10	2442.0018
20	2442.0021
30	2442.0023
40	2442.0023
50	2442.0022
Max.Deviation(MHz)	0.0026
Max.Deviation(ppm)	1.06

APPENDIX- PHOTOS OF TEST SETUP

Note: See test photos in setup photo document for the actual connections between Product and support equipment.

※※※※※END OF THE REPORT※※※※※