FCC & IC RADIO TEST REPORT
FCC ID: UCZ-TXLW2220
IC ID: 8575A-TXLW2220

Product：	2.4G wireless camera product TX
Trade Name：	N/A
Model Name：	LW2220
Serial Model：	N/A
Report No.：	NTEK-2012DG0425015F

Prepared for

Lorex Technology Inc.

250 Royal Crest Court , Markham, Ontario L3R 3S1
Canada

Prepared by

NTEK Testing Technology Co., Ltd.

1/F, Building E, Fenda Science Park, Sanwei Community,Xixiang Street
Bao'an District, Shenzhen P.R. China
Tel.: +86-0755-61156588 Fax.: +86-0755-61156599
Website:www.ntek.org.cn

TEST RESULT CERTIFICATION

Applicant's name	:	Lorex Technology Inc.
Address	:	250 Royal Crest Court , Markham, Ontario L3R 3S1 Canada
Manufacture's Name	:	OPCOM O.E.(DONG GUAN) INC
Address	:	Gu Cun Industry Estate,Dajing Countryside Committee, Houjie Town,Dong Guan City,Guang Dong Province,China

Product description

Product name	:	2.4G wireless camera product TX
Model and/or type reference	:	LW2220
Serial Model：		N/A
Standards	:	FCC Part15.247, RSS-210 Issue 8
Test procedure		ANSI C63.4-2003, RSS-Gen Issue 3

This device described above has been tested by NTEK, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of NTEK, this document may be altered or revised by NTEK, personal only, and shall be noted in the revision of the document.

Date of Test	:	
Date (s) of performance of tests	:	05 Apr. 2012 ~25 Apr. 2012
Date of Issue	:	25 Apr. 2012
Test Result	:	**Pass**

Testing Engineer : Apple Huang

(Apple Huang)

Technical Manager : Tom Zhang

(Tom Zhang)

Authorized Signatory : Bovey Yang

(Bovey Yang)

Table of Contents

Table of Contents

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C(15.247), RSS-Gen Issue 3 & RSS-210 Issue 8			
Standard Section	Test Item	Judgment	Remark
15.207&7.2.4	Conducted Emission	PASS	
15.247(a)(1)&A8.1	Hopping Channel Separation	PASS	
15.247(b)(1)&A8.4	Peak Output Power	PASS	
15.247(c)&A8.5	Radiated Spurious Emission	PASS	
15.247(a)(iii)&A8.1	Number of Hopping Frequency	PASS	
15.247(a)(iii) &A8.1	Dwell Time	PASS	
15.247(a)(1)&A8.2	Bandwidth	PASS	
15.205&A8.5	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

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

1.1 TEST FACILITY

NTEK Testing Technology Co., Ltd
Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen P.R. China.
FCC FRN Registration Nombre:238937; IC Registration Nombre:9270A-1

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	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>2.4G wireless camera product TX</td></tr>
<tr><td>Trade Name</td><td>N/A</td></tr>
<tr><td>Model Name</td><td>LW2220</td></tr>
<tr><td>Serial Model</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is a 2.4G wireless camera product TX
<table>
<tr><td>Operation Frequency:</td><td>2402~2480 MHz</td></tr>
<tr><td>Modulation Type</td><td>GFSK (FHSS)</td></tr>
<tr><td>Number Of Channel</td><td>40 CH</td></tr>
<tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr>
<tr><td>Antenna Gain(Peak)</td><td>1dBi</td></tr>
<tr><td>Output Power(Conducted):</td><td>17.41 dBm (Max.)</td></tr>
<tr><td>EIRP：</td><td>18.41dBm(Max.)</td></tr>
</table>
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.</td></tr>
<tr><td>Channel List</td><td>Please refer to the Note 2.</td></tr>
<tr><td>Adapter</td><td>Model:TEKA006-1200500UK,
AC Power Input: 100-240V~, 50/60Hz, 0.2A
Output: 12V ⎓ 0.5mA</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
<tr><td>Connecting I/O Port(s)</td><td>Please refer to the User's Manual</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer’s specifications or the User's Manual.
2.

Channel	Frequency (MHz)
01	2402
02	2404
……	…….
20	2440
21	2442
……	…….
39	2478
40	2480

3.

Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	External antenna	Reserve SMA-type	1.0	Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40
Mode 4	Nomal Link

For Conducted Emission	
Final Test Mode	Description
Mode 4	Nomal Link

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH20
Mode 3	CH40

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) The EUT use new battery.

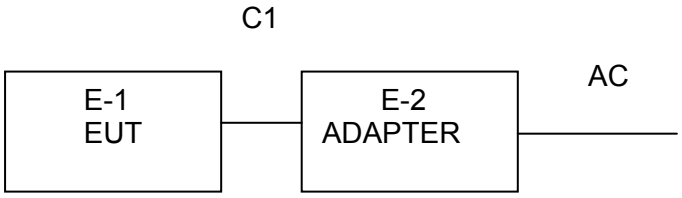
2.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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 of FHSS

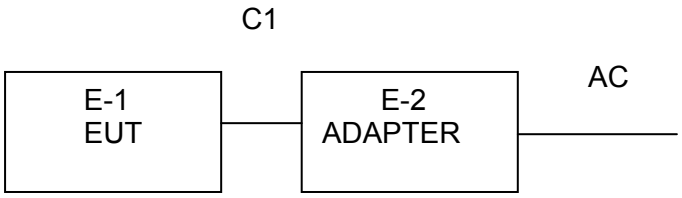
Test software Version	Test program: Broadcom		
Frequency	2402 MHz	2440 MHz	2480 MHz
Parameters(1Mbps)	DEF	DEF	DEF

2.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Conducted Emission Test



Radiated Spurious Emission Test



2.5 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	2.4G wireless camera product TX	N/A	LW2220	N/A	EUT
E-2	Adapter	N/A	TEKA006-1200500UK	N/A	E-2

Item	Shielded Type	Ferrite Core	Length	Note

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.
(3) “YES” is means “shielded” “with core”; “NO” is means “unshielded” “without core”.

2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	E4407B	160400005	Jul. 06. 2012
2	Test Receiver	R&S	ESPI	101318	Jul. 06. 2012
3	Bilog Antenna	TESEQ	CBL6111D	31216	Jul. 06. 2012
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264416	Jul. 06. 2012
5	Spectrum Analyzer	ADVANTEST	R3132	150900201	Jul. 06. 2012
6	Horn Antenna	EM	EM-AH-10180	2011071402	Jul. 06. 2012
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	Jul. 06. 2012
8	Amplifier	EM	EM-30180	060538	Jul. 06. 2012
9	Loop Antenna	ARA	PLA-1030/B	1029	Jul. 06. 2012
10	Power Meter	R&S	NRVS	100696	Jul. 06. 2012

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Test Receiver	R&S	ESCI	101160	Jul. 06. 2012
2	LISN	R&S	ENV216	101313	Jul. 06. 2012
3	LISN	EMCO	3816/2	00042990	Jul. 06. 2012
4	50Ω Coaxial Switch	Anritsu	MP59B	6200264417	Jul. 06. 2012
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	Jul. 06. 2012
6	Absorbing clamp	R&S	MOS-21	100423	Jul. 06. 2012

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

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

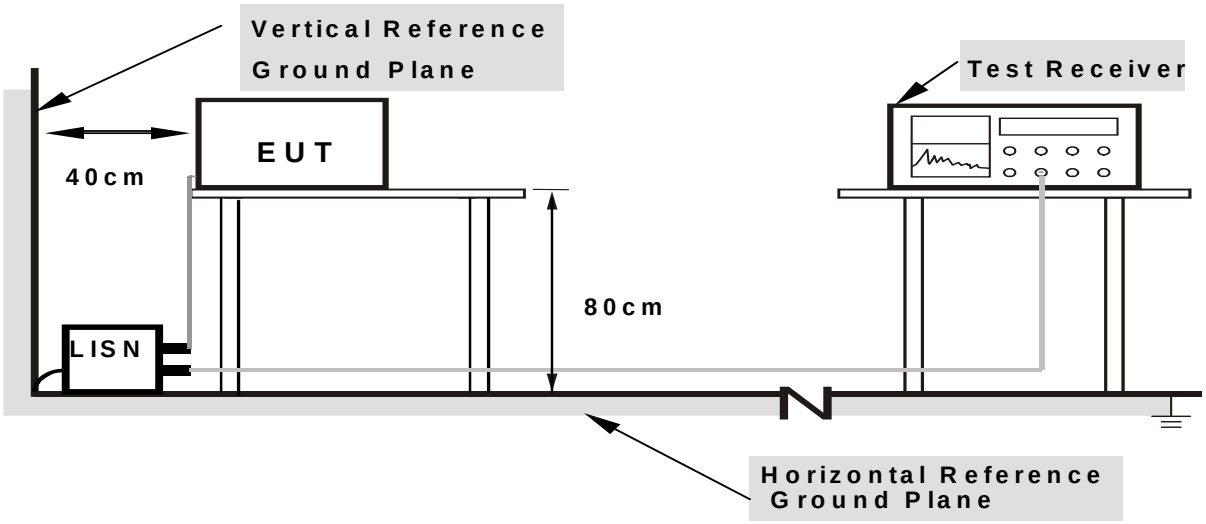
3.1.2 TEST PROCEDURE

a. The EUT was placed 0.4 meters from the horizontal 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 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 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

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

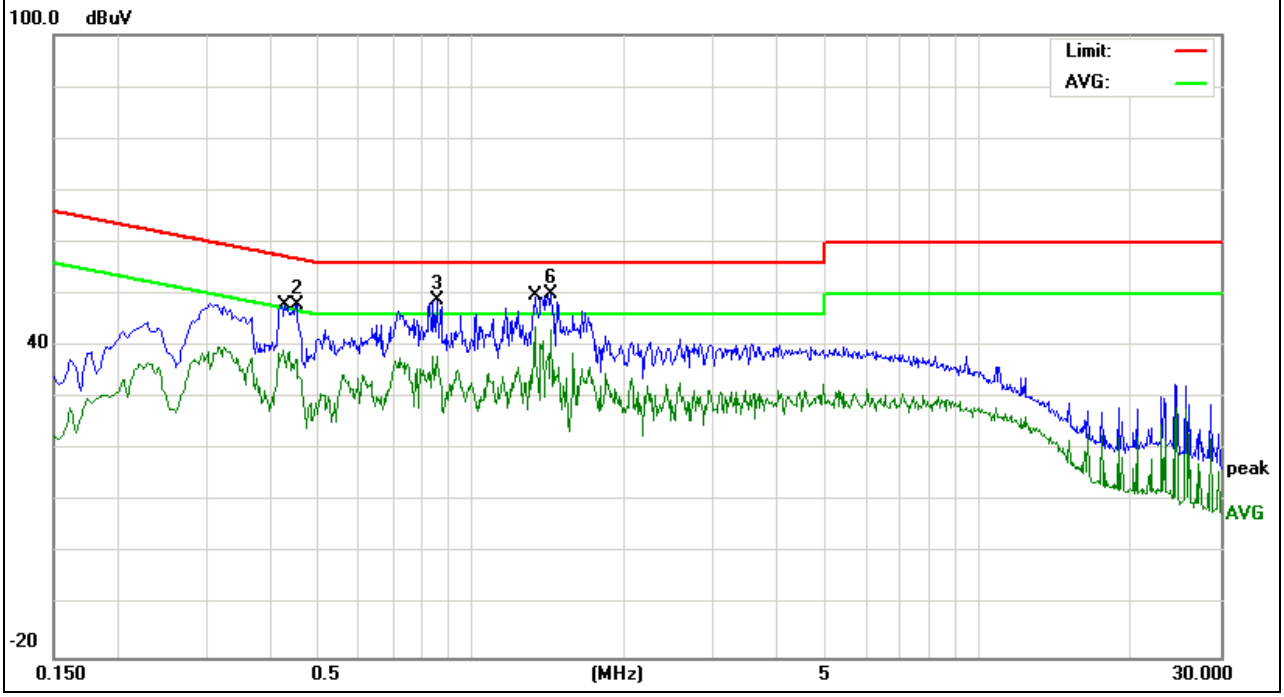
3.1.6 TEST RESULTS

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	L
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz	Test Mode：	Mode 4

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.4259	28.73	10.41	39.14	47.33	-8.19	AVG
0.4515	37.67	10.41	48.08	56.85	-8.77	QP
0.8539	38.28	10.43	48.71	56	-7.29	QP
0.8539	27.77	10.43	38.2	46	-7.8	AVG
1.334	33.33	10.45	43.78	46	-2.22	AVG
1.4339	39.65	10.45	50.1	56	-5.9	QP

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

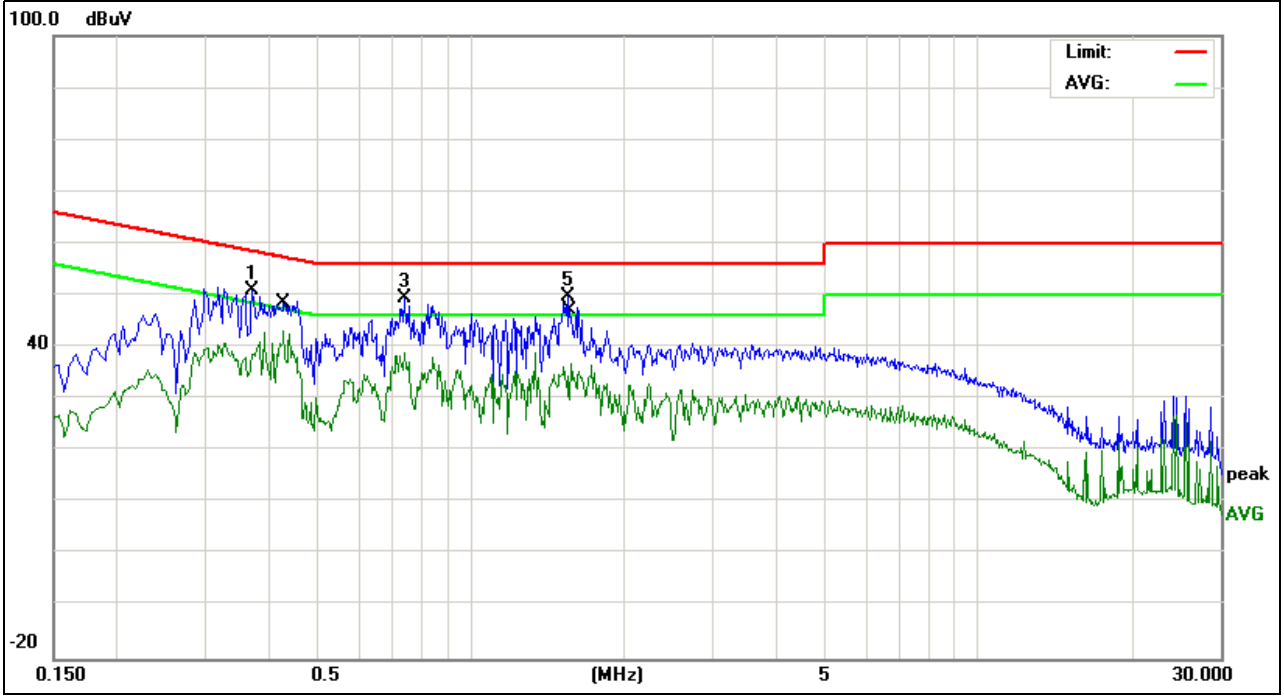


EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	26 ℃	Relative Humidity：	54%
Pressure：	1010hPa	Phase：	N
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz	Test Mode：	Mode 4

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV)	(dBμV)	(dB)	
0.3699	40.58	10.42	51	58.5	-7.5	QP
0.4259	32.84	10.41	43.25	47.33	-4.08	AVG
0.7378	39.09	10.41	49.5	56	-6.5	QP
0.7419	27.87	10.41	38.28	46	-7.72	AVG
1.55	39.24	10.42	49.66	56	-6.34	QP
1.57	26.5	10.42	36.92	46	-9.08	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. '*' means the worst case



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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
Above 960	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (dBuV/m) (at 3M)		Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80	60	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

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

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

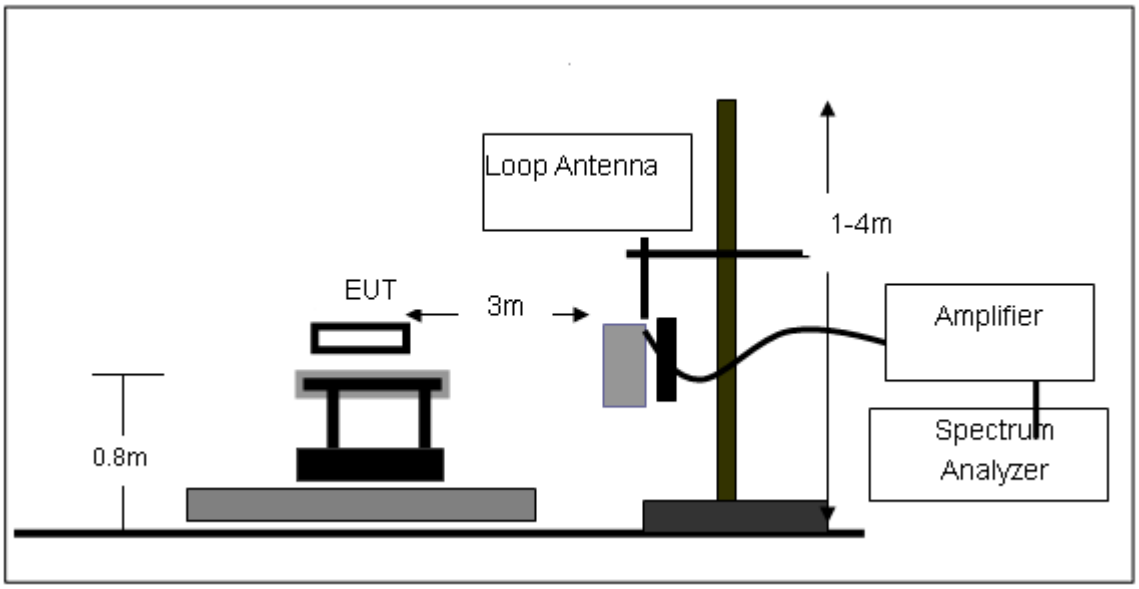
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

3.2.3 DEVIATION FROM TEST STANDARD

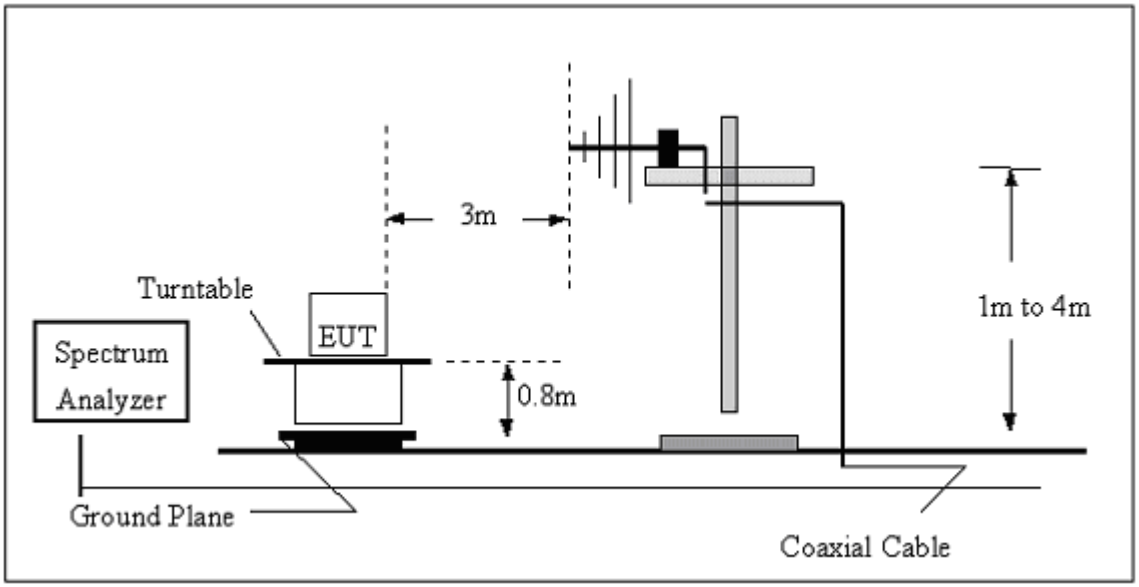
No deviation

3.2.4 TEST SETUP

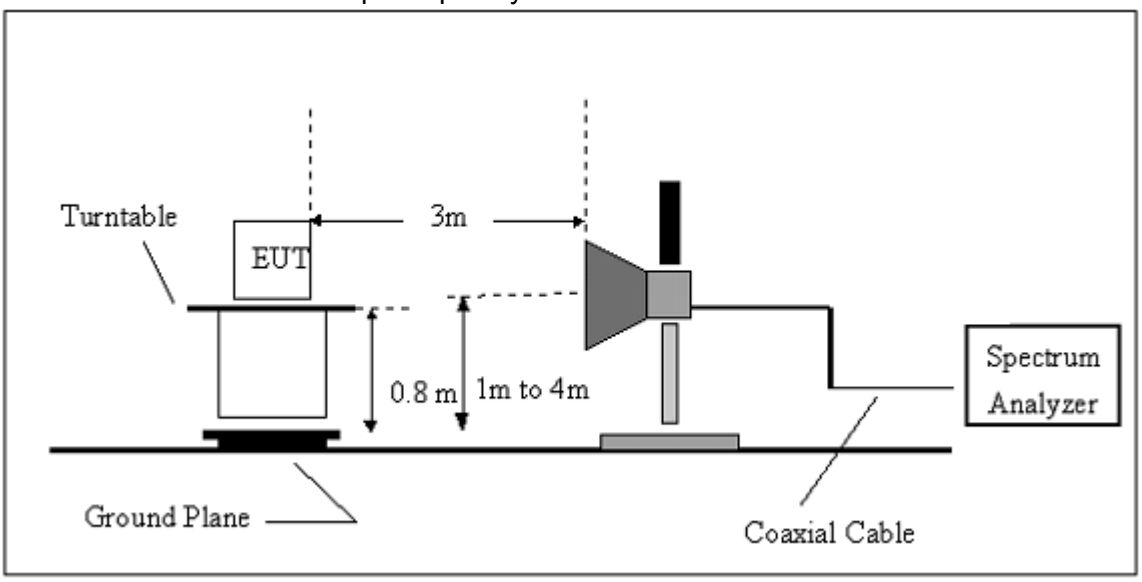
（A）Radiated Emission Test-Up Frequency Below 30MHz



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



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



3.2.5 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.

3.2.6 TEST RESULTS (BELOW 30 MHZ)

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	---
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX		

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

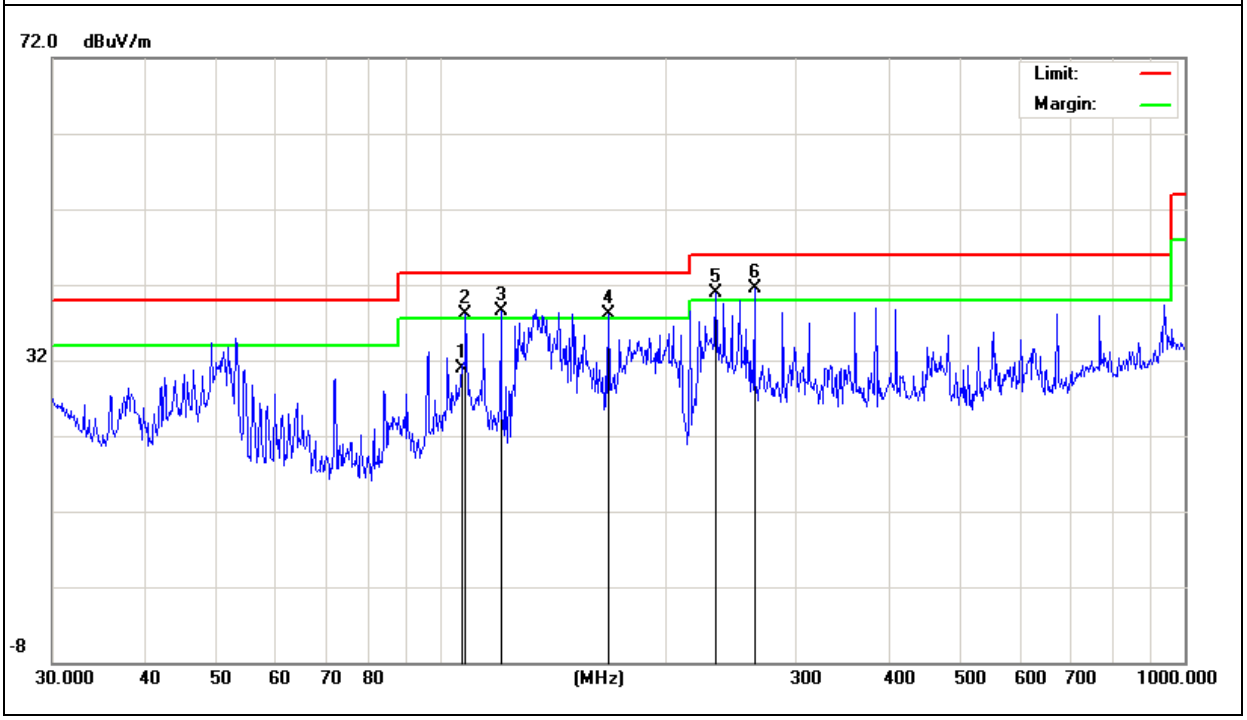
NOTE:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =20 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

3.2.7 TEST RESULTS (BETWEEN 30M – 1000 MHZ)

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	Horizontal
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX		

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
106.7587	19.73	11.1	30.83	43.5	-12.67	Quasi-Peak
107.8876	26.97	11.21	38.18	43.5	-5.32	Quasi-Peak
120.2766	26.79	11.78	38.57	43.5	-4.93	Quasi-Peak
167.824	27.84	10.21	38.05	43.5	-5.45	Quasi-Peak
234.1682	30.15	10.68	40.83	46	-5.17	Quasi-Peak
263.819	27.42	13.99	41.41	46	-4.59	Quasi-Peak

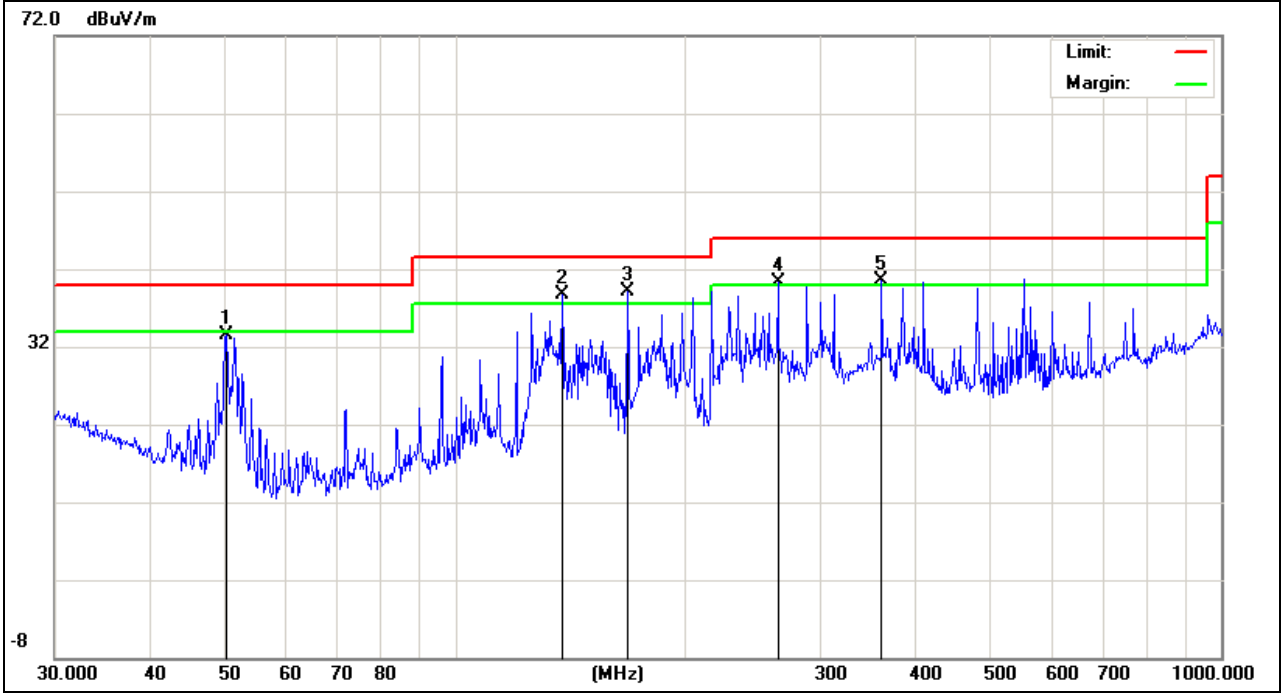
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
50.2324	25.35	8.07	33.42	40	-6.58	Quasi-Peak
137.9028	26.66	11.95	38.61	43.5	-4.89	Quasi-Peak
167.8242	28.97	10.21	39.18	43.5	-4.32	Quasi-Peak
263.819	26.22	13.99	40.21	46	-5.79	Quasi-Peak
360.4476	24.9	15.57	40.47	46	-5.53	Quasi-Peak
50.2324	25.35	8.07	33.42	40	-6.58	Quasi-Peak

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.

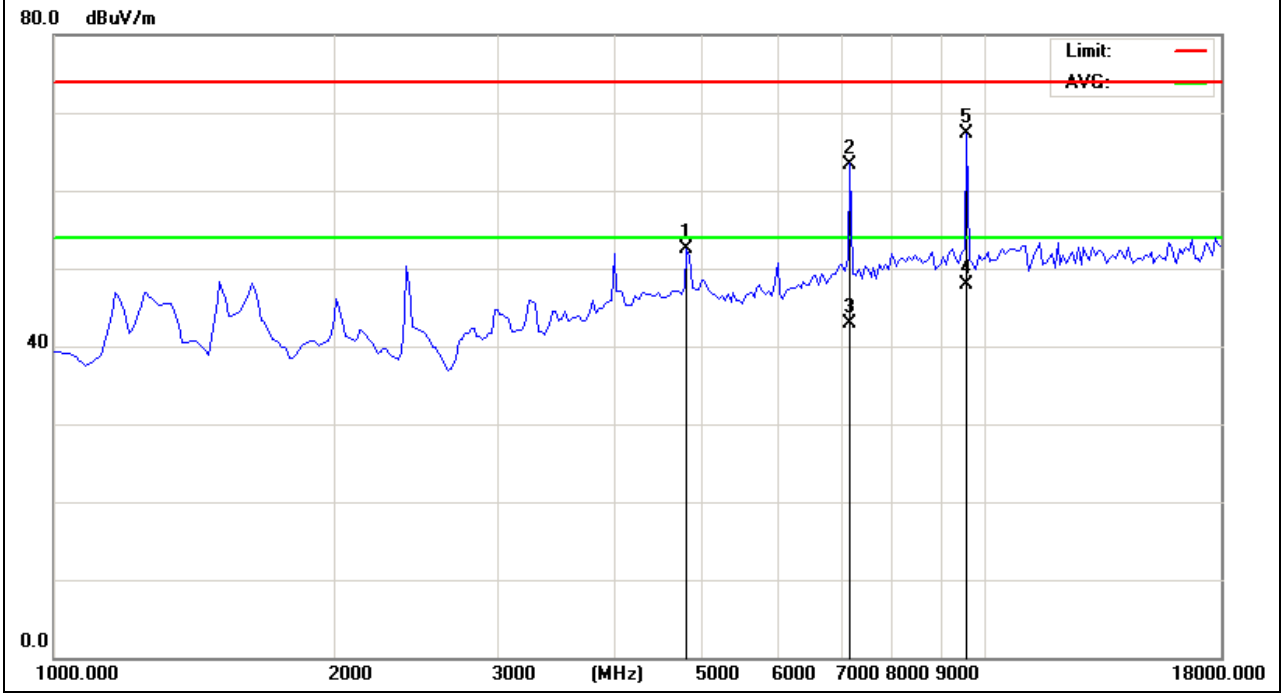


3.2.8 TEST RESULTS (ABOVE 1000 MHZ)

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 01	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	56	-3.59	52.41	74	-21.59	peak
7206	64.36	-0.96	63.4	74	-10.6	peak
7206	43.95	-0.96	42.99	54	-11.01	AVG
9608	46.13	1.79	47.92	54	-6.08	AVG
9608	65.55	1.78	67.33	74	-6.67	peak

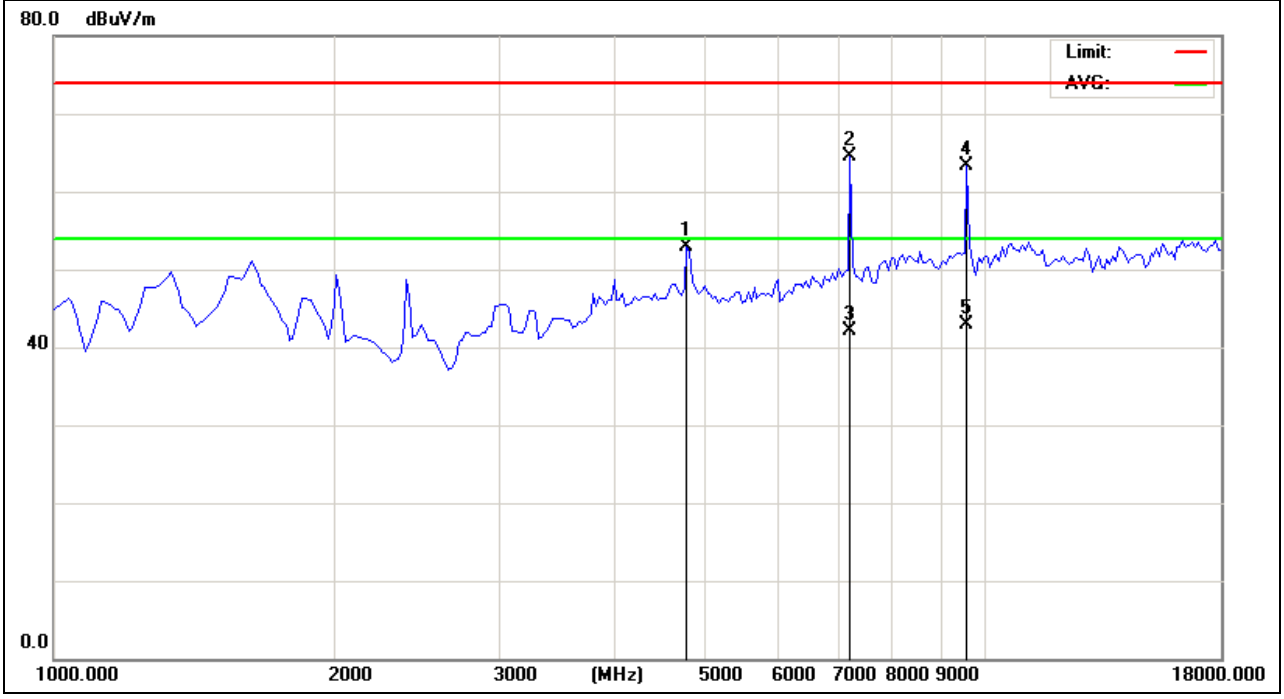
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	TX 2402MHz – CH 01	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	56.53	-3.59	52.94	74	-21.06	peak
7206	65.37	-0.96	64.41	74	-9.59	peak
7206	43.11	-0.96	42.15	54	-11.85	AVG
9608	61.52	1.78	63.3	74	-10.7	peak
9608	41.09	1.78	42.87	54	-11.13	AVG

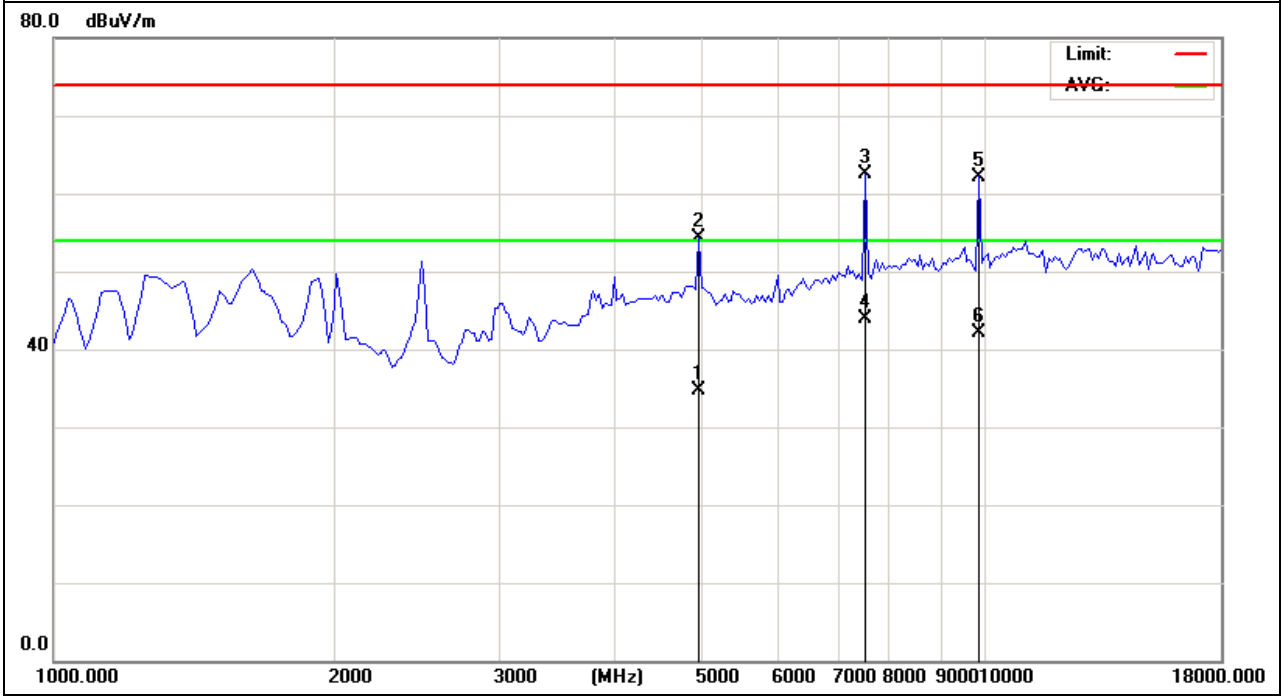
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	TX 2440MHz – CH 20	Polarization：	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4880	38.38	-3.64	34.74	54	-19.26	AVG
4880	57.87	-3.55	54.32	74	-19.68	peak
7320	63.27	-0.68	62.59	74	-11.41	peak
7320	44.51	-0.68	43.83	54	-10.17	AVG
9760	60.98	1.22	62.2	74	-11.8	peak
9760	40.9	1.22	42.12	54	-11.88	AVG

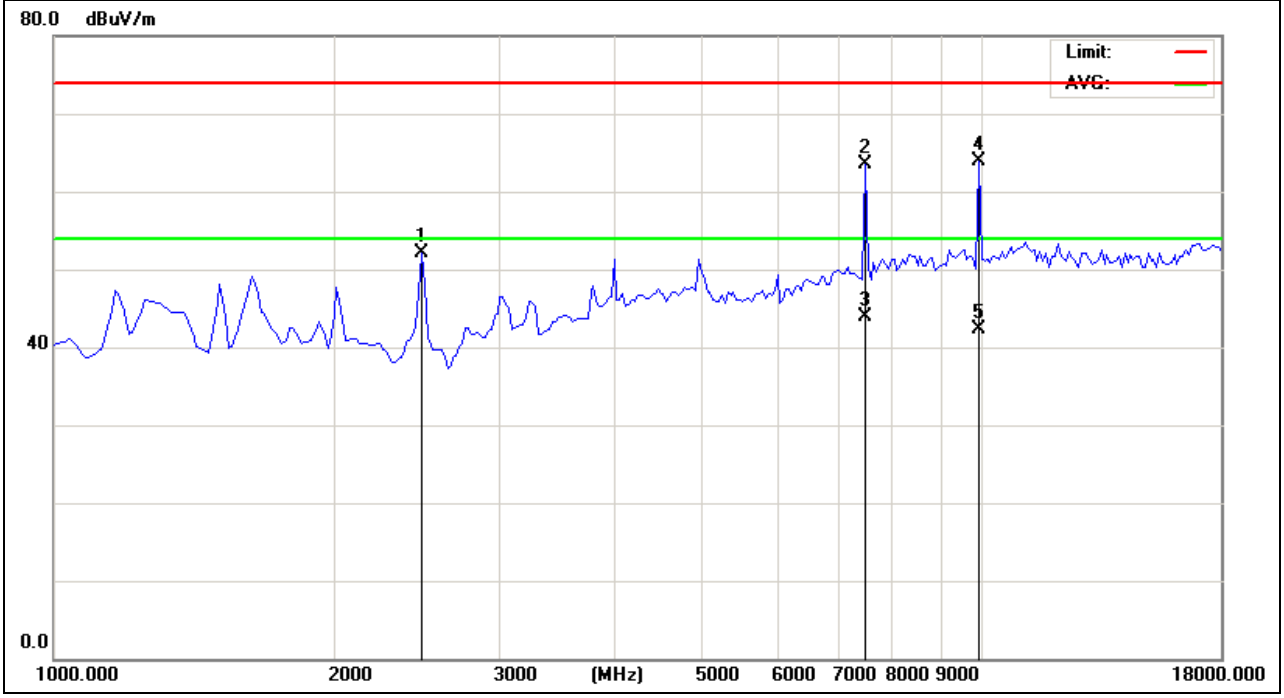
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX 2440MHz – CH 20		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2487.5	64.87	-12.77	52.1	74	-21.9	peak
7320	64.19	-0.68	63.51	74	-10.49	peak
7320	44.51	-0.68	43.83	54	-10.17	AVG
9760	62.74	1.22	63.96	74	-10.04	peak
9760	41.11	1.22	42.33	54	-11.67	AVG

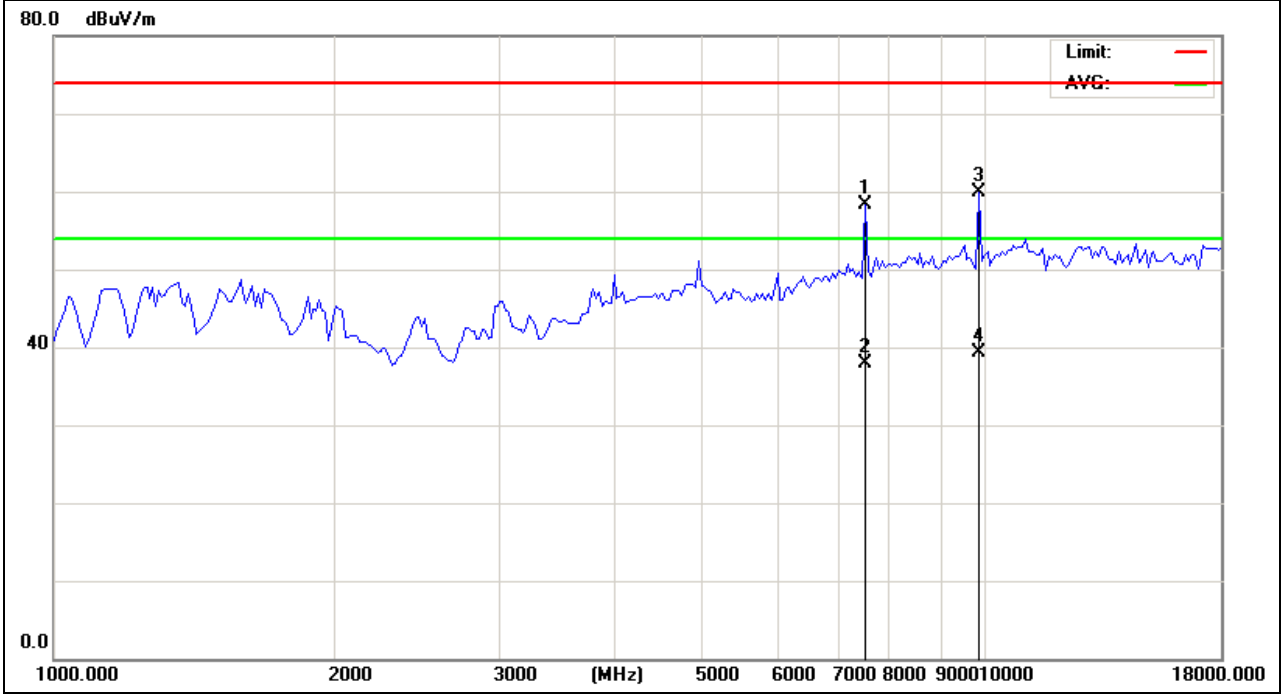
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	Horizontal
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX 2480MHz – CH 40		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
7440	59.08	-0.68	58.4	74	-15.6	peak
7440	38.51	-0.68	37.83	54	-16.17	AVG
9960	58.78	1.22	60	74	-14	peak
9960	38.08	1.22	39.3	54	-14.7	AVG

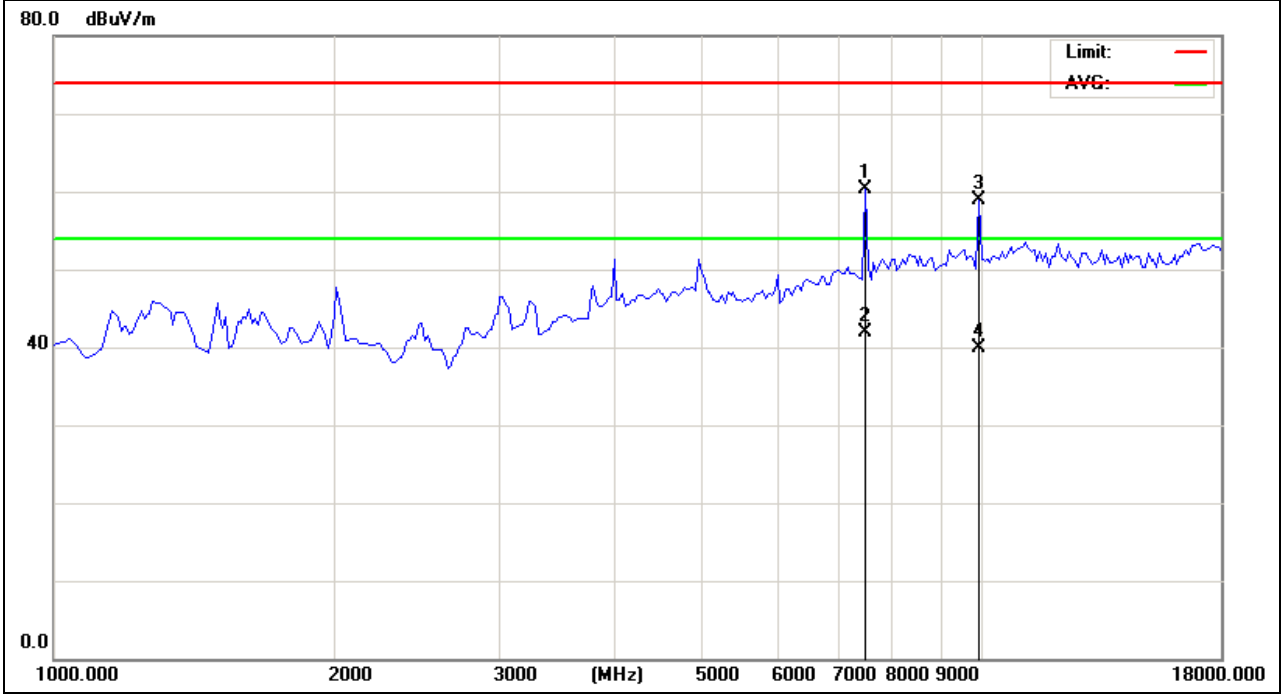
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Polarization：	Vertical
Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz		
Test Mode ：	TX 2480MHz – CH 40		

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
7440	61.08	-0.68	60.4	74	-13.6	peak
7440	42.58	-0.68	41.9	54	-12.1	AVG
9960	57.78	1.22	59	74	-15	peak
9960	38.66	1.22	39.88	54	-14.12	AVG

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
No emission detected above 18GHz

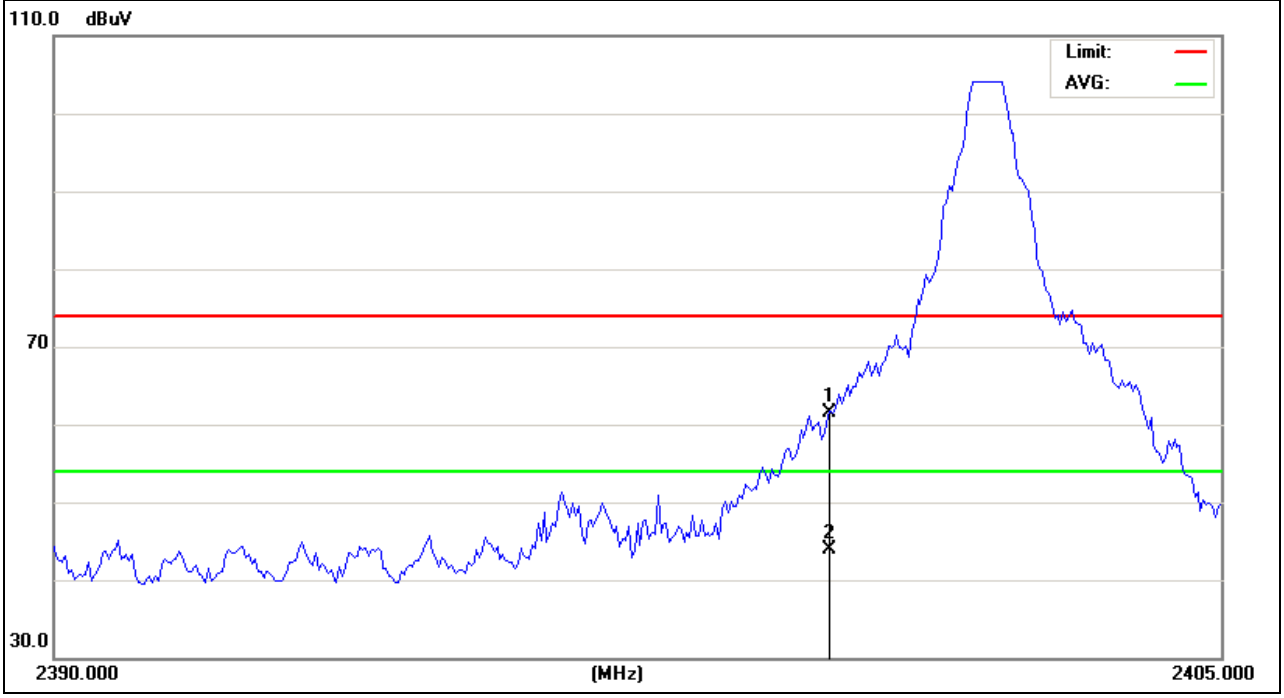


3.2.9 TEST RESULTS (RESTRICTED BANDS REQUIREMENTS)

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V
Test Mode ：	TX /2402MHz	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400	74.51	-12.99	61.52	74	-12.48	peak
2400	56.96	-12.99	43.97	54	-10.03	AVG

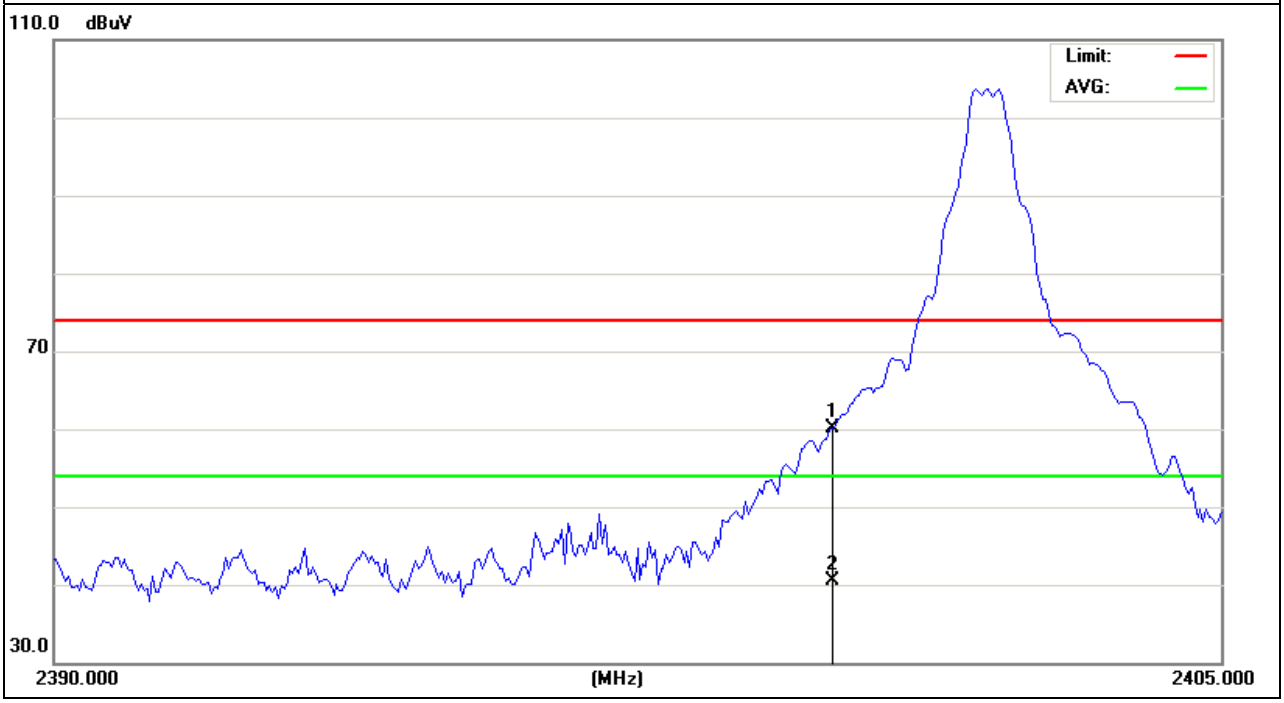
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V
Test Mode ：	TX /2402MHz	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400	73.14	-12.99	60.15	74	-13.85	peak
2400	53.44	-12.99	40.45	54	-13.55	AVG

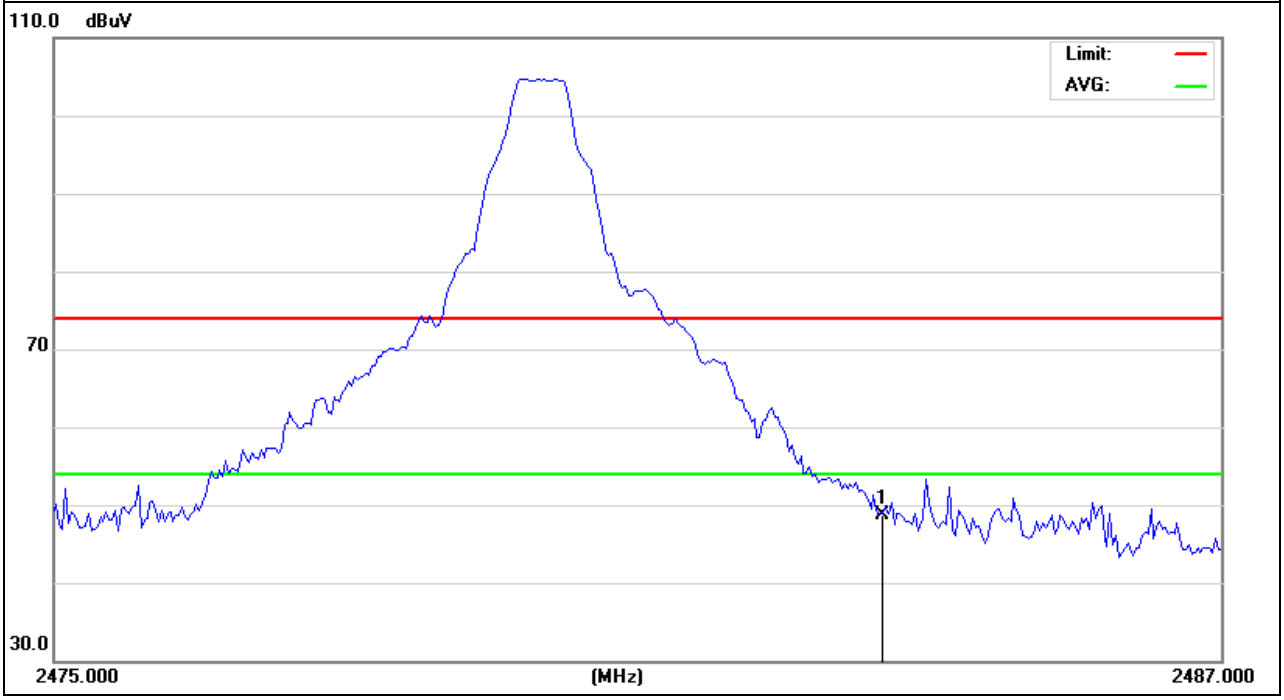
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V
Test Mode ：	TX /2480MHz	Polarization：	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	61.57	-12.78	48.79	74	-25.21	peak

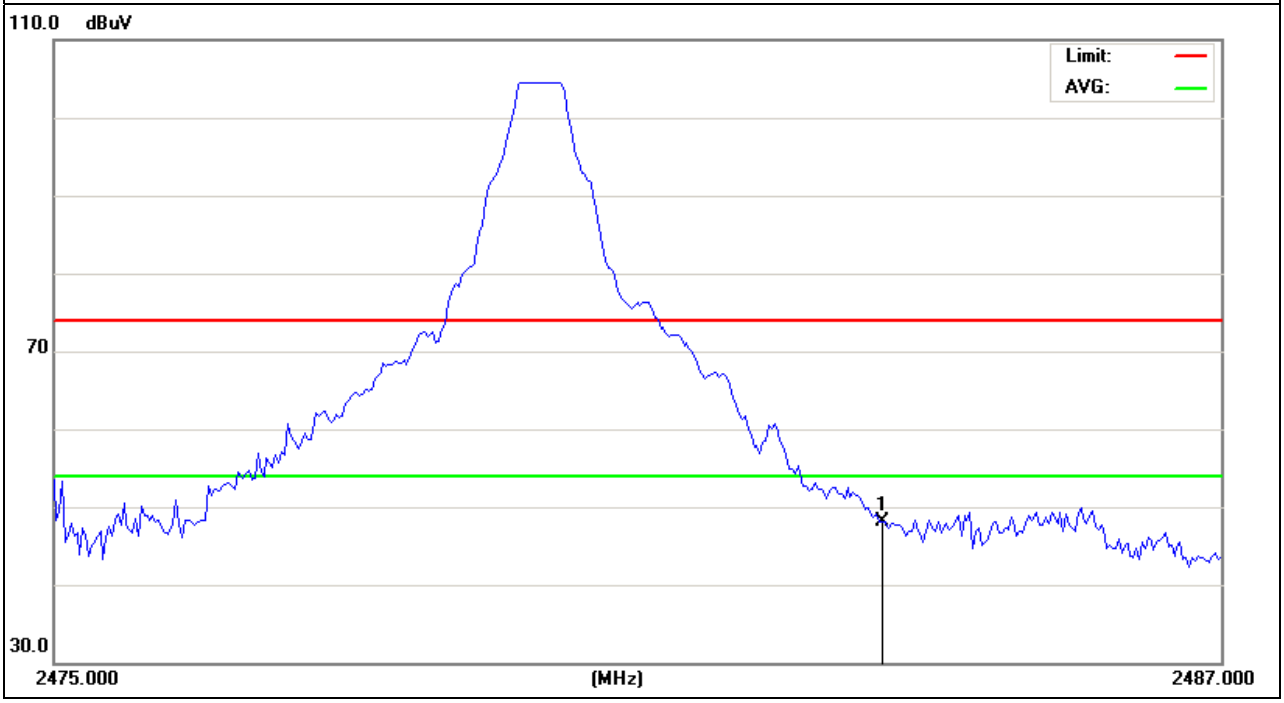
Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	20 ℃	Relative Humidity：	48%
Pressure：	1010 hPa	Test Voltage ：	DC 12.0V
Test Mode ：	TX /2480MHz	Polarization：	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2400	60.83	-12.78	48.05	74	-25.95	peak

Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.



4. NUMBER OF HOPPING CHANNEL

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

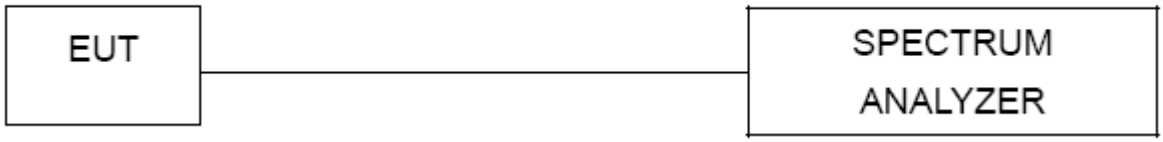
4.1.1 TEST PROCEDURE

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= 100KHz, VBW=100KHz, Sweep time = Auto.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



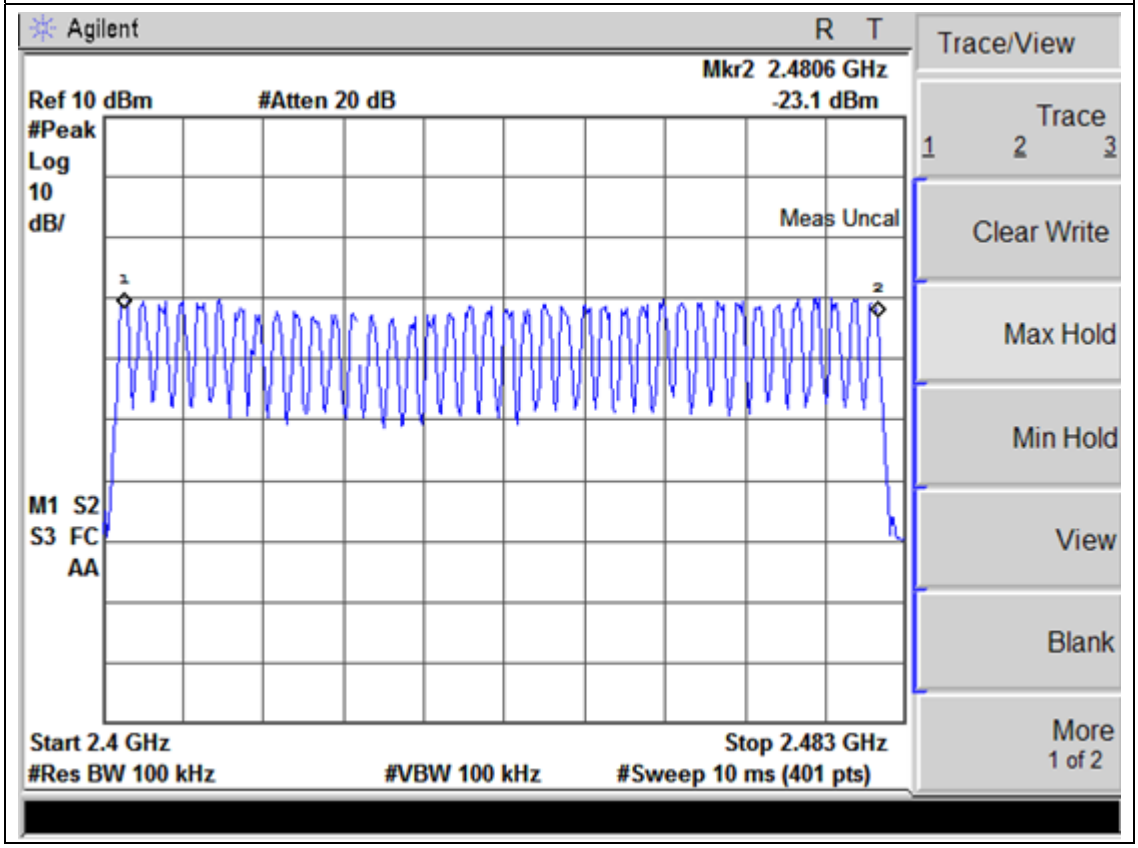
4.1.4 EUT OPERATION CONDITIONS

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.

4.1.5 TEST RESULTS

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1015 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	Hopping Mode		

Number of Hopping Channel	40



5. AVERAGE TIME OF OCCUPANCY

5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

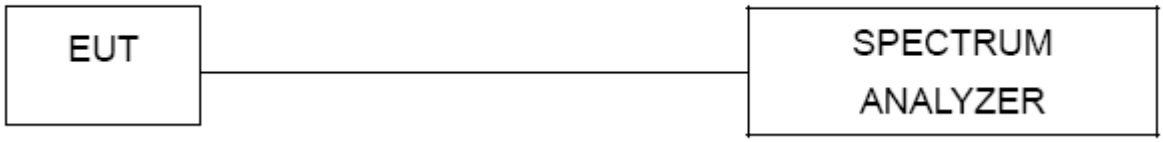
5.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. The dwell time = Time Slot Length * Hop Rate / Number of Hopping Channels * 0.4 * 40
DH5 Time Slot = 3 (ms) * (1600/(6*40))*16 = 320 (ms)

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



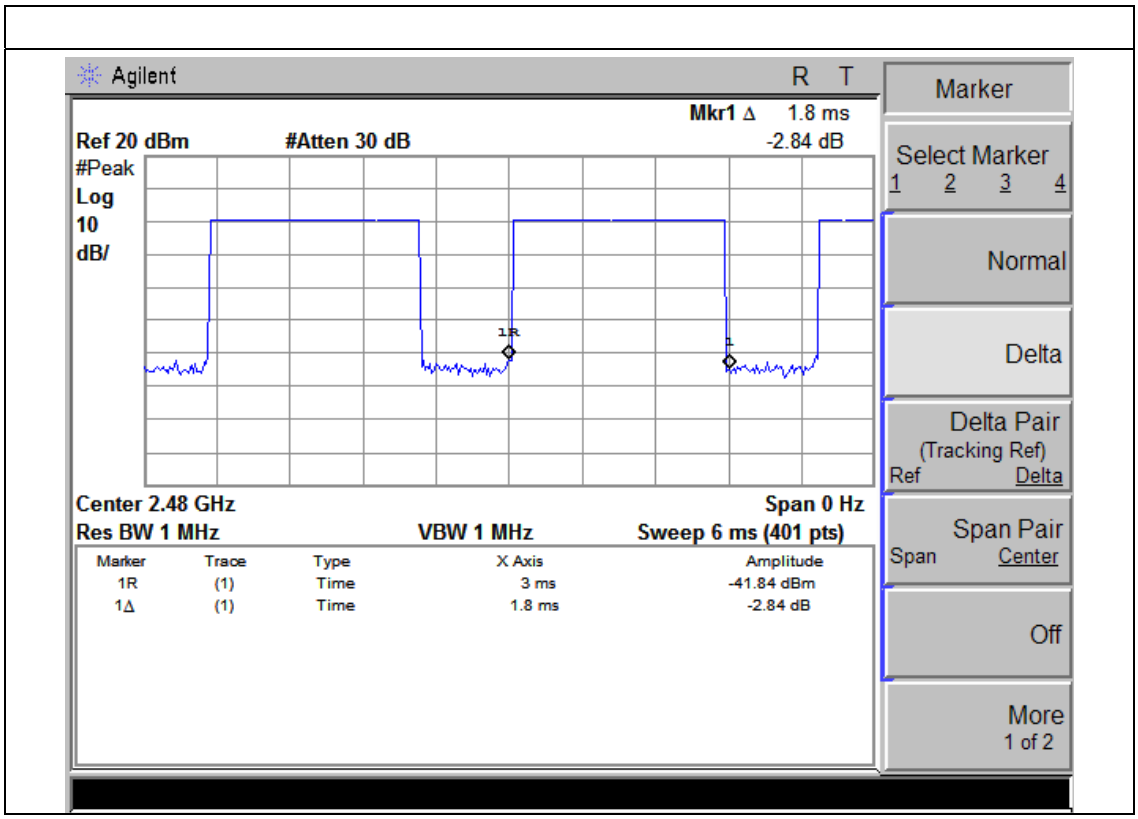
5.1.4 EUT OPERATION CONDITIONS

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.

5.1.5 TEST RESULTS

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	TX/2480MHz		

Data Packet	Frequency	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2480 MHz	3.000	0.320	0.4000



6. HOPPING CHANNEL SEPARATION MEASUREMENT

6.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 300 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

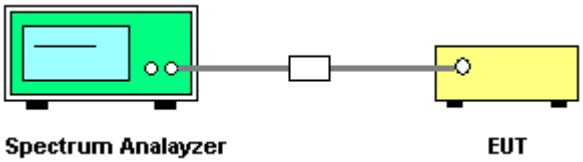
6.1.1 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
b. The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
c. The resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were utilised for channel separation measurement.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

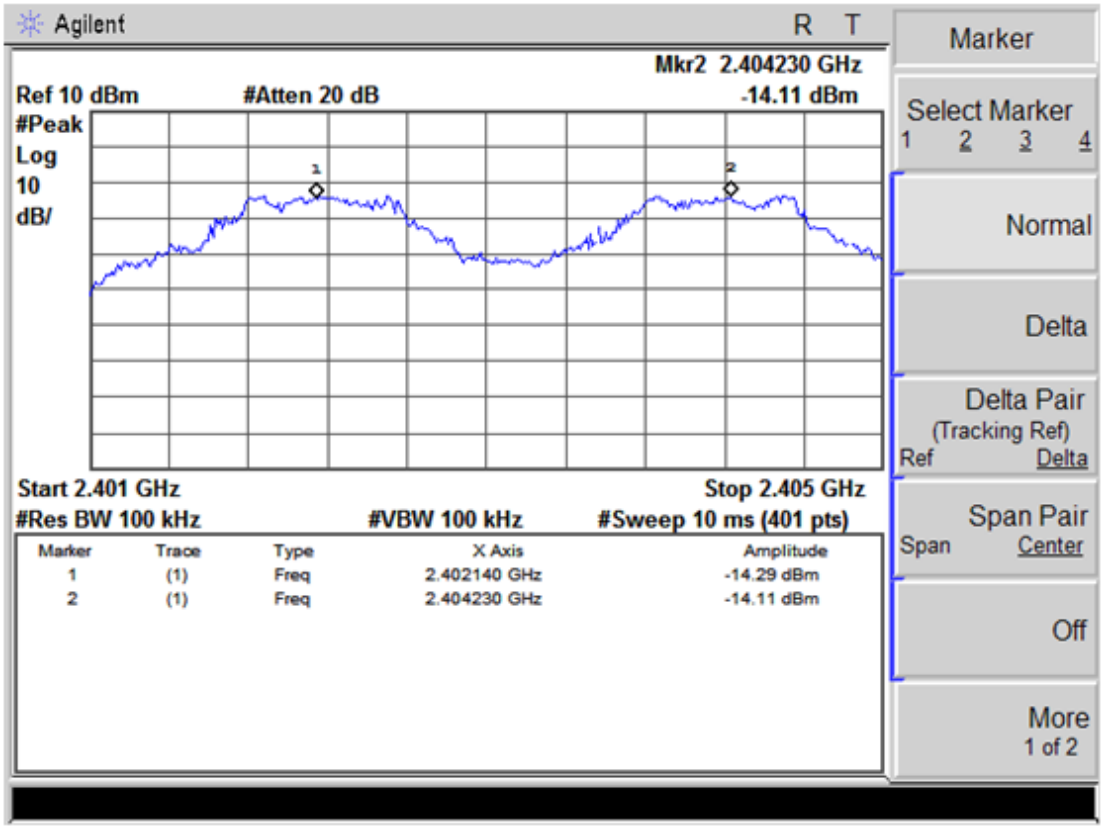
6.1.5 TEST RESULTS

EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	CH01/ CH20 /CH40		

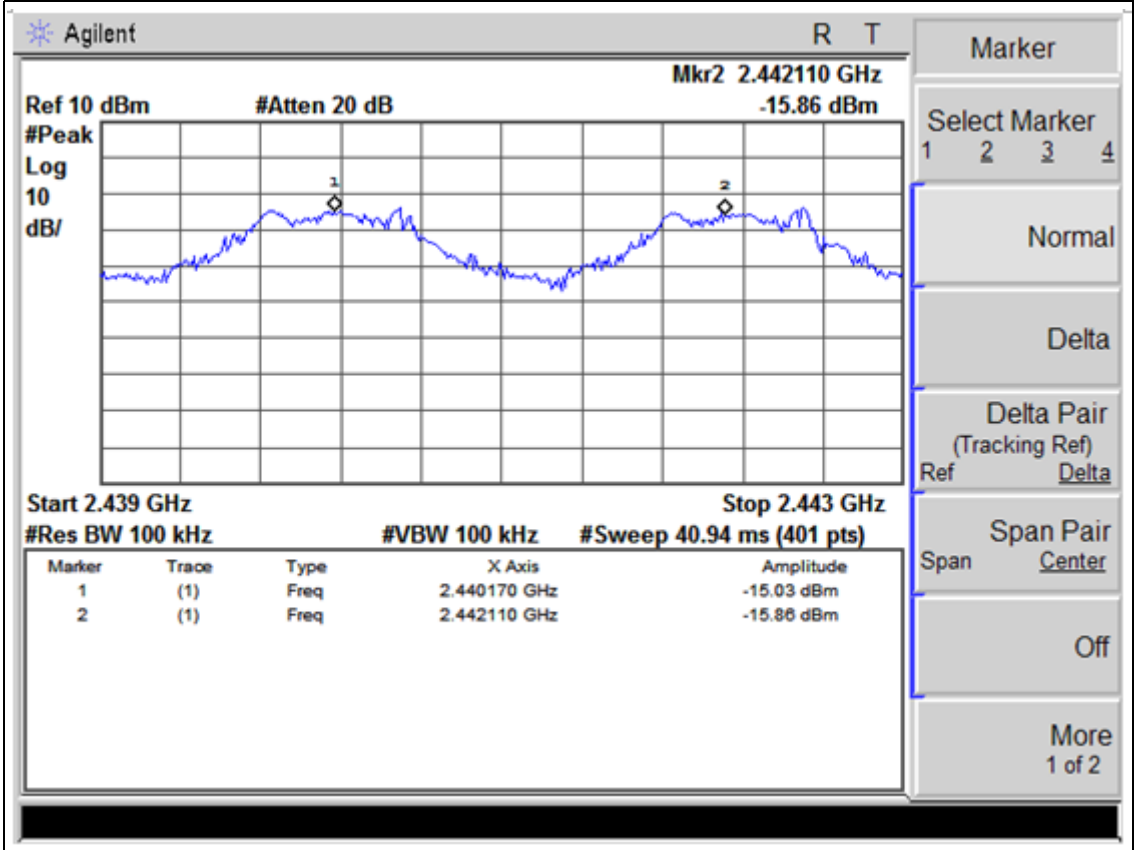
Frequency	Ch. Separation (MHz)	Result
2402 MHz	2.09	**Complies**
2440 MHz	1.94	**Complies**
2480 MHz	1.94	**Complies**

Ch. Separation Limits: >20dB bandwidth or >2/3 of 20dB bandwidth

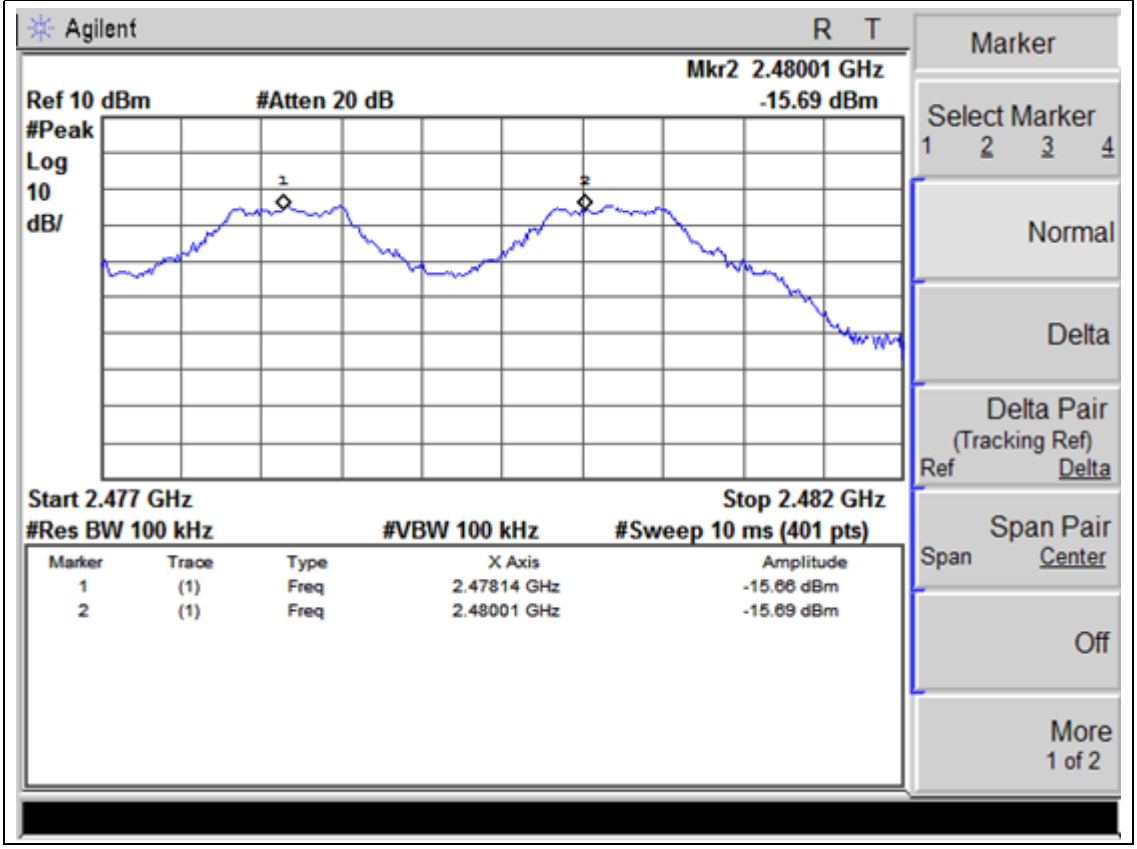
CH01



CH20


Agilent
R T
Mkr2 2.442110 GHz
Ref 10 dBm
#Atten 20 dB
-15.86 dBm
#Peak
Log
10
dB/
Start 2.439 GHz
Stop 2.443 GHz
#Res BW 100 kHz
#VBW 100 kHz
#Sweep 40.94 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.440170 GHz -15.03 dBm
2 (1) Freq 2.442110 GHz -15.86 dBm
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

CH40


Agilent
R T
Mkr2 2.48001 GHz
Ref 10 dBm
#Atten 20 dB
-15.69 dBm
#Peak
Log
10
dB/
Start 2.477 GHz
Stop 2.482 GHz
#Res BW 100 kHz
#VBW 100 kHz
#Sweep 10 ms (401 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.47814 GHz -15.66 dBm
2 (1) Freq 2.48001 GHz -15.69 dBm
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

7. BANDWIDTH TEST

7.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)	Bandwidth	(20dB bandwidth)	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

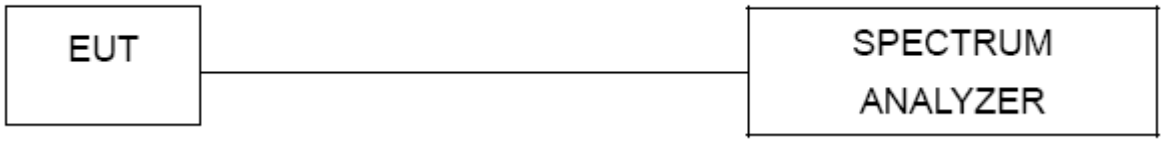
7.1.1 TEST PROCEDURE

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= 100KHz, VBW=100KHz, Sweep time = Auto.

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT OPERATION CONDITIONS

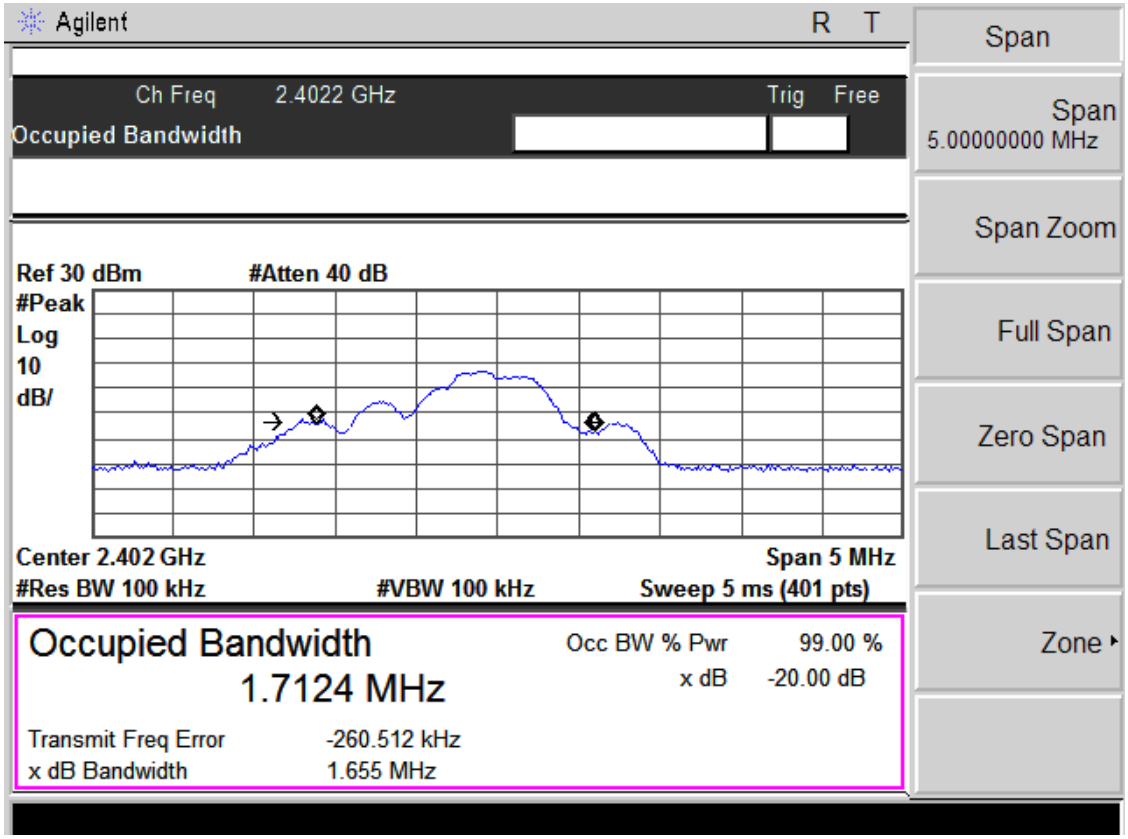
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.1.5 TEST RESULTS

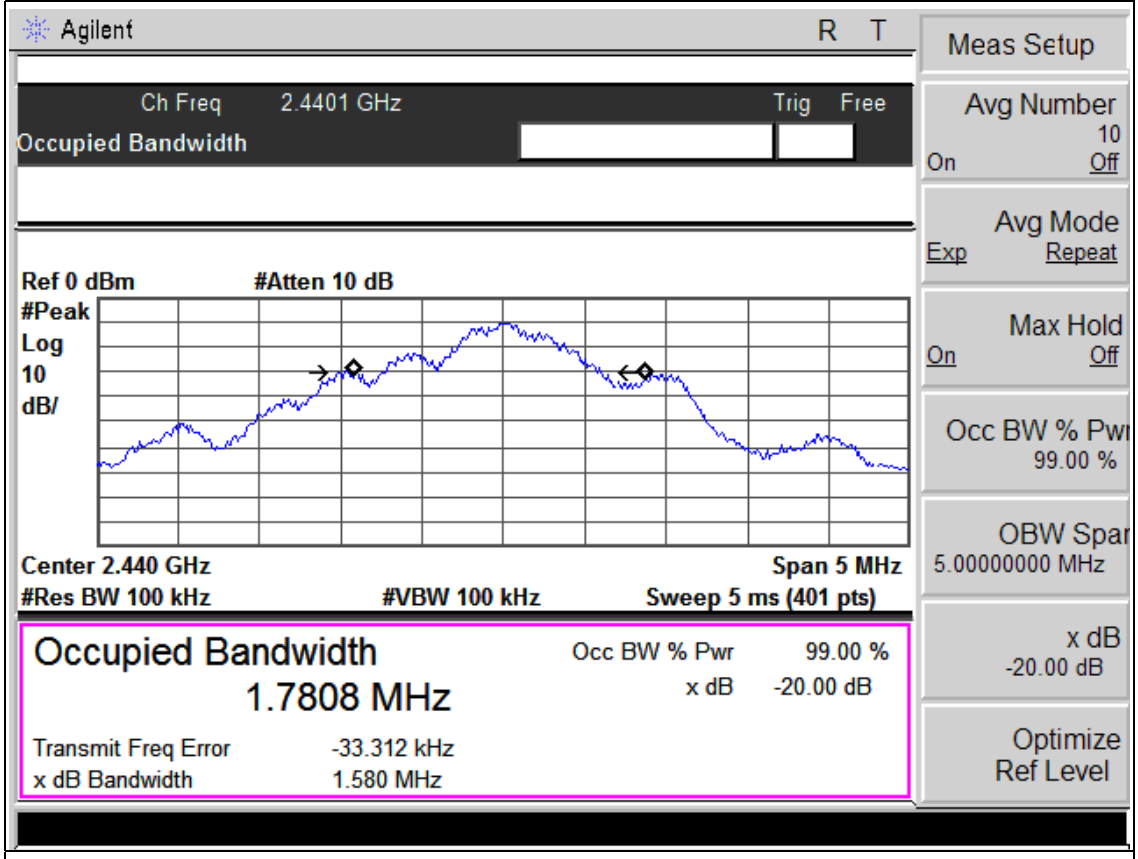
EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	CH01 / CH20 /C40		

Frequency	20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Result
2402 MHz	1.655	1.712	**PASS**
2440 MHz	1.580	1.780	**PASS**
2480 MHz	1.580	1.873	**PASS**

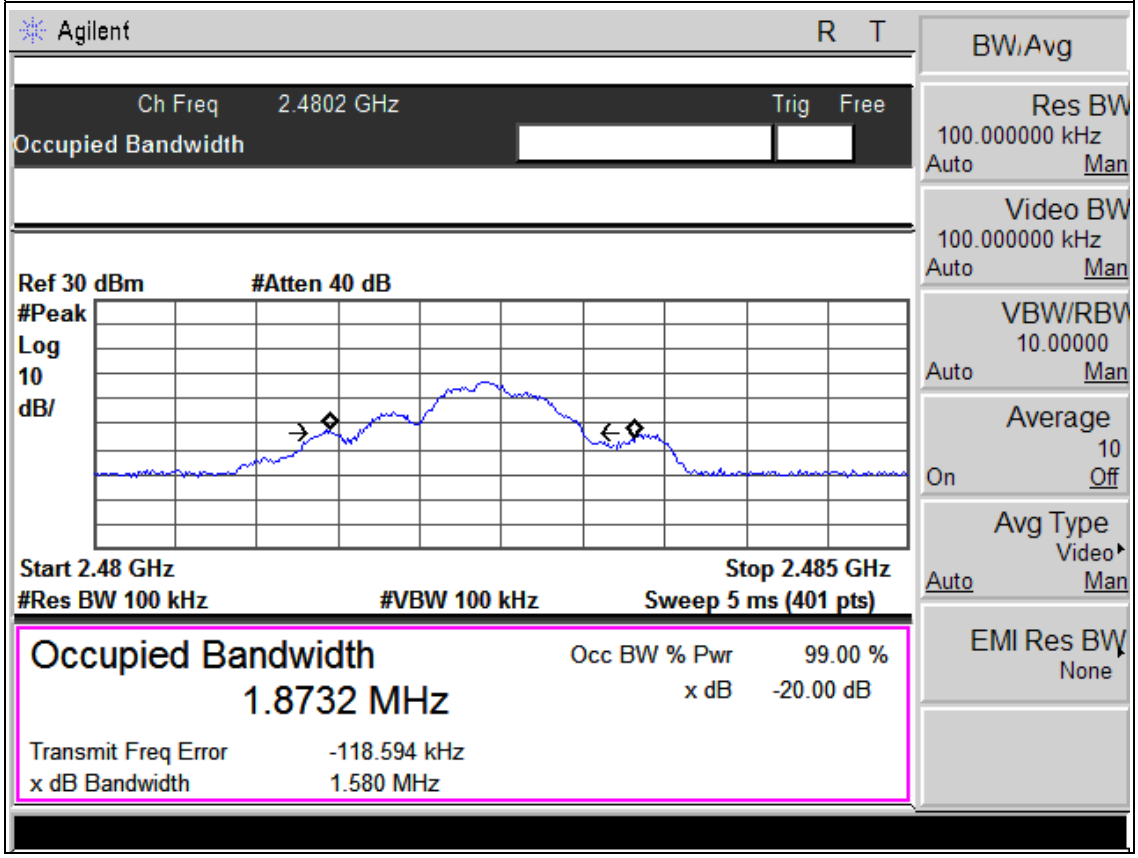
CH01



CH20


Agilent
R T
Ch Freq 2.4401 GHz
Trig Free
Occupied Bandwidth
Ref 0 dBm
#Atten 10 dB
#Peak
Log
10
dB/
Center 2.440 GHz
Span 5 MHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
1.7808 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -33.312 kHz
x dB Bandwidth 1.580 MHz
Meas Setup
Avg Number
10
On Off
Avg Mode
Exp Repeat
Max Hold
On Off
Occ BW % Pwr
99.00 %
OBW Span
5.00000000 MHz
x dB
-20.00 dB
Optimize
Ref Level

CH40


Agilent
R T
Ch Freq 2.4802 GHz
Trig Free
Occupied Bandwidth
Ref 30 dBm
#Atten 40 dB
#Peak
Log
10
dB/
Start 2.48 GHz
Stop 2.485 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 5 ms (401 pts)
Occupied Bandwidth
1.8732 MHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -118.594 kHz
x dB Bandwidth 1.580 MHz
BW/Avg
Res BW
100.000000 kHz
Auto Man
Video BW
100.000000 kHz
Auto Man
VBW/RBW
10.00000
Auto Man
Average
10
On Off
Avg Type
Video
Auto Man
EMI Res BW
None

8. PEAK OUTPUT POWER TEST

8.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (b)(i)	Peak Output Power	0.125 w or 20.96dBm	2400-2483.5	PASS

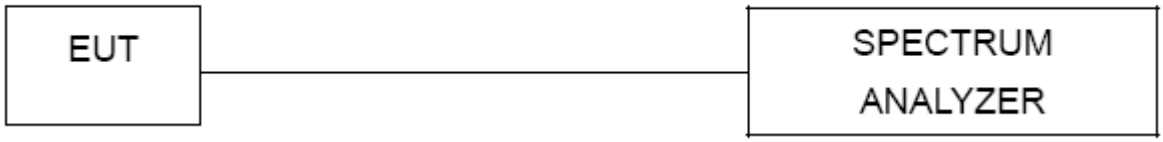
8.1.1 TEST PROCEDURE

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= 3MHz, VBW= 3MHz, Sweep time = Auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION CONDITIONS

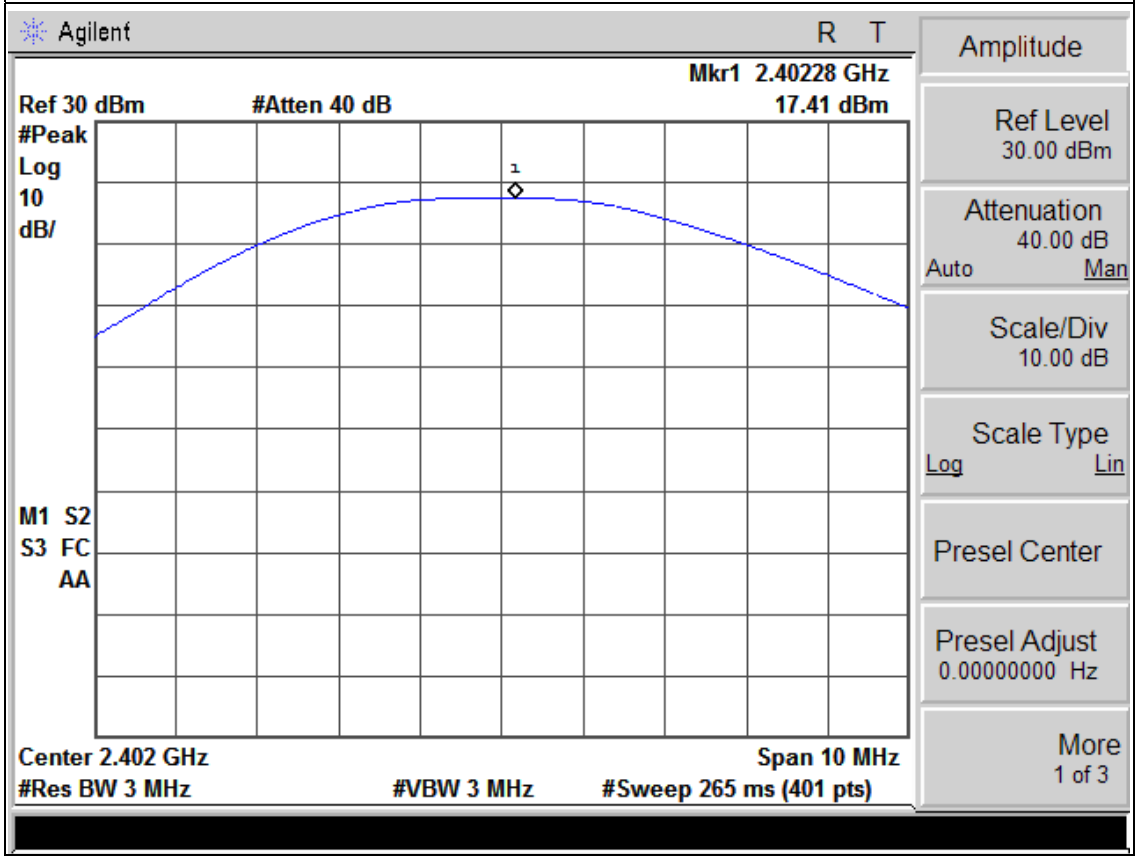
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

8.1.5 TEST RESULTS

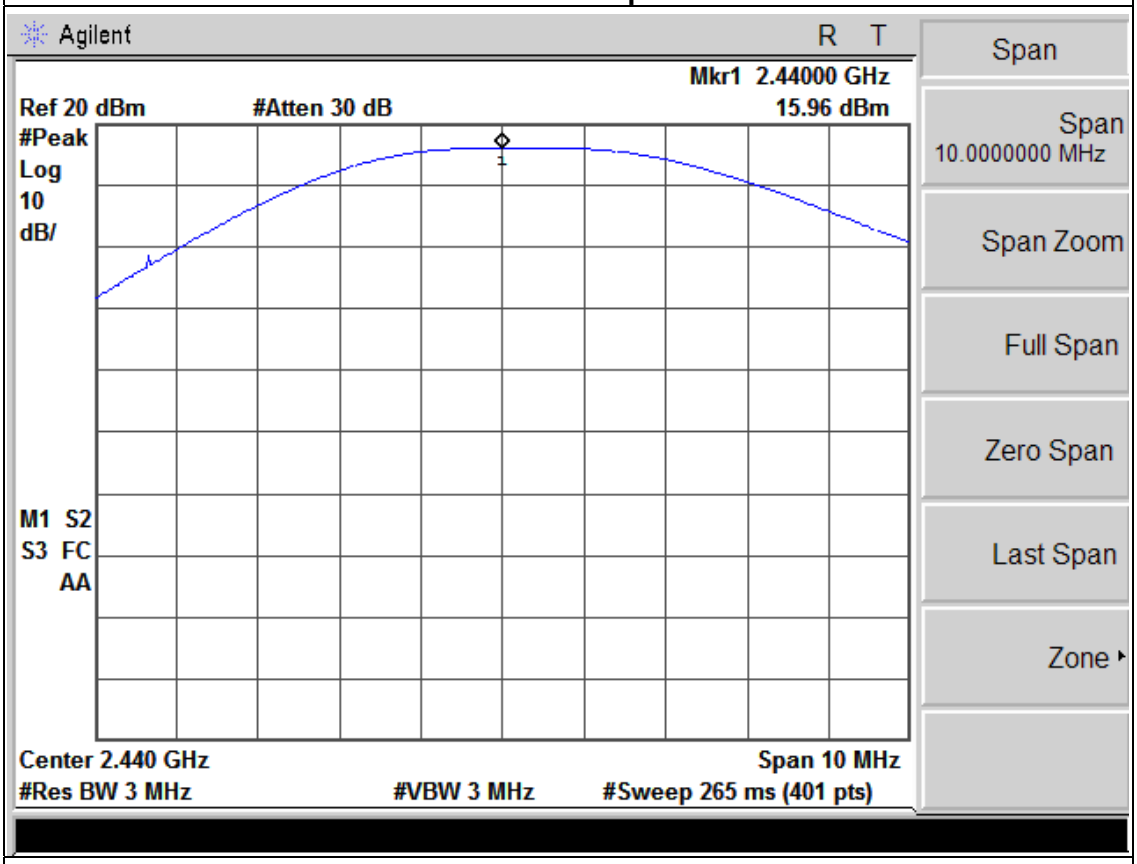
EUT：	2.4G wireless camera product TX	Model Name ：	LW2220
Temperature：	25 ℃	Relative Humidity：	60%
Pressure：	1012 hPa	Test Voltage ：	DC 12.0V from adapter AC 120V/60Hz
Test Mode ：	CH01/ CH20/CH40		

Test Channel	Frequency (MHz)	Peak Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
CH01	2402	17.41	20.96	1
CH20	2440	15.96	20.96	1
CH40	2480	17.00	20.96	1

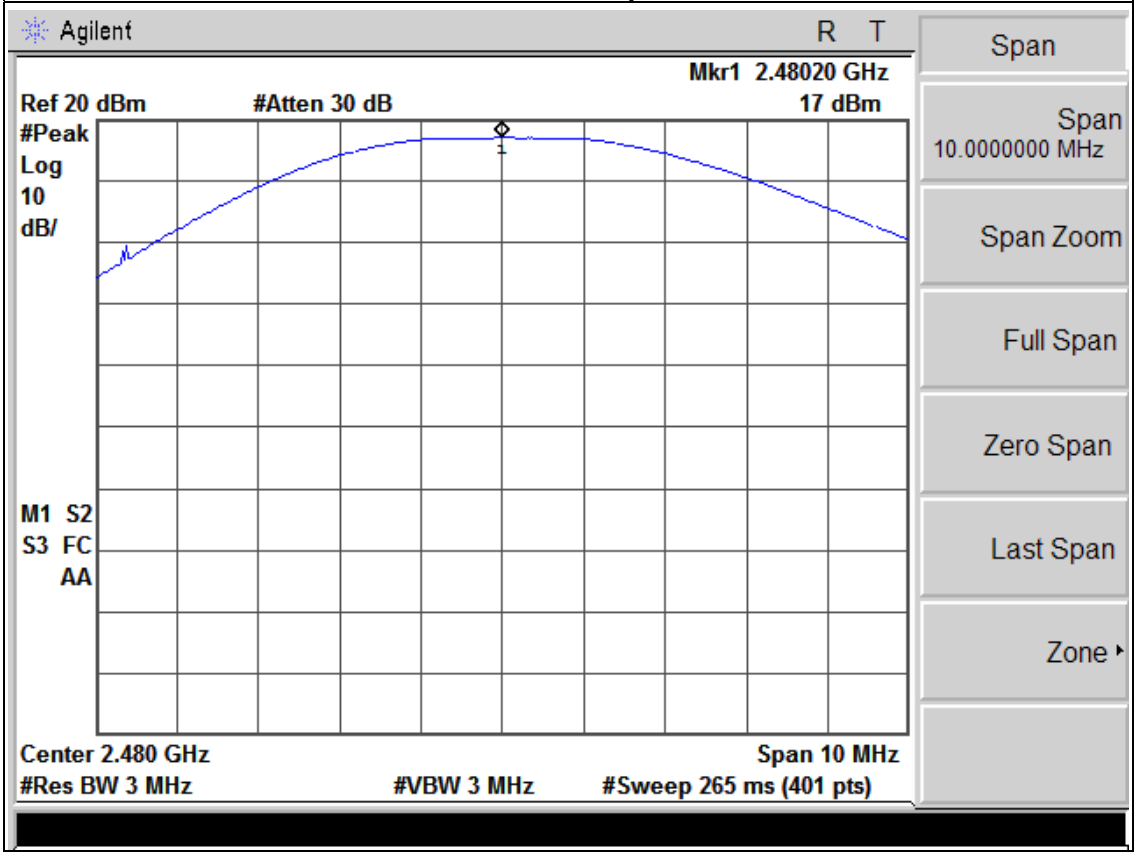
CH00



CH39 -1Mbps



CH78 -1Mbps



9. TEST RESULT

9.1 ANTENNA REQUIREMENT

9.1.1 STANDARD REQUIREMENT

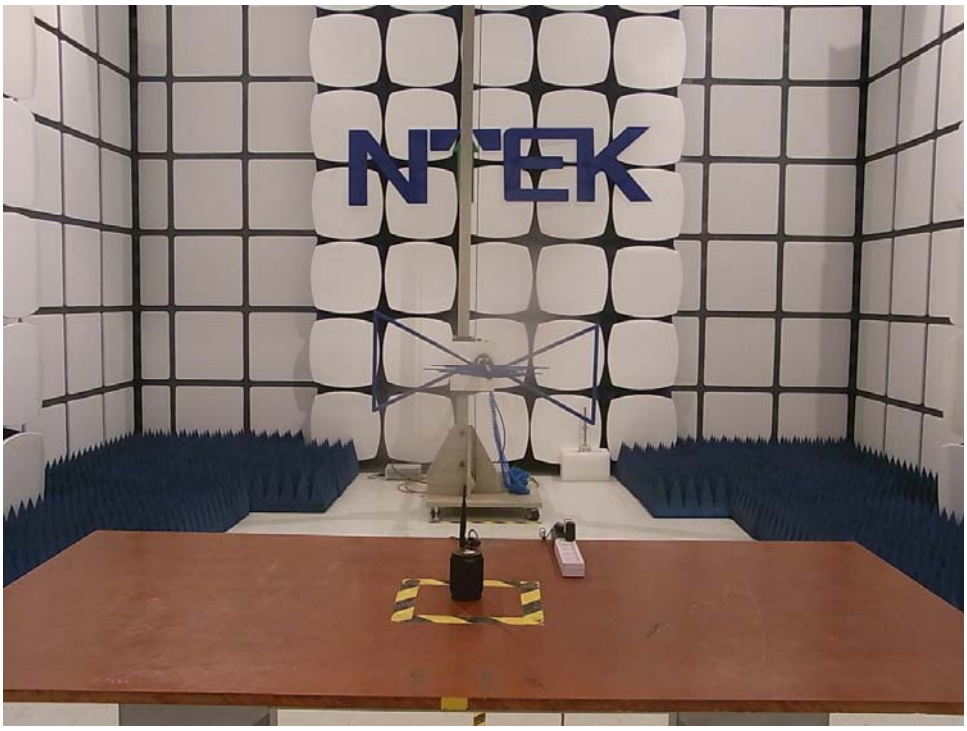
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

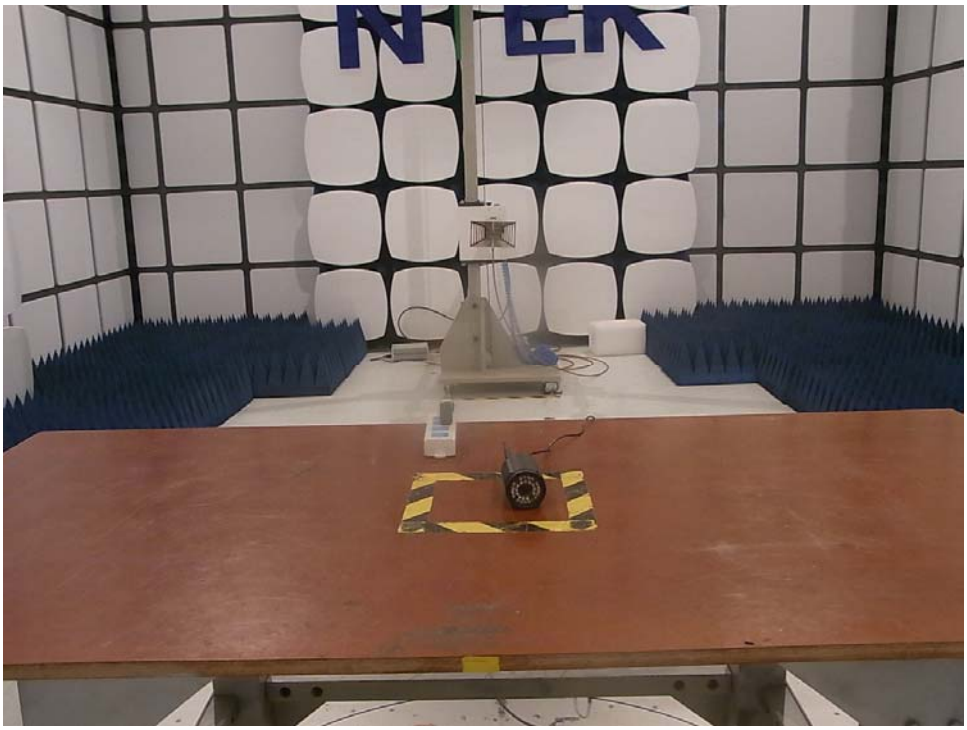
9.1.2 EUT ANTENNA

The EUT antenna is external antenna(Reserve SMA-type). It comply with the standard requirement.

10. EUT TEST PHOTO

Radiated Measurement Photos





Conducted Measurement Photos