Test Lab
Cert 2951.01

TEST REPORT

Applicant:	KYE SYSTEMS CORP.
Address:	No. 492, Sec 5, Chongxin Rd., Sanchong Dist., New Taipei City 24160, Taiwan (R.O.C.)

Manufacturer or Supplier	KYE SYSTEMS CORP.
Address	No. 492, Sec 5, Chongxin Rd., Sanchong Dist., New Taipei City 24160, Taiwan (R.O.C.)
Product:	Wireless Mouse
Brand Name:	Genius
Model:	GM-130002/S
Additional Model & Model Difference:	GM-120030/S, GM-130001/S, See section 3.1
Date of tests:	Apr. 29, 2013 ~ May 14, 2013

the tests have been carried out according to the requirements of the following standard:

☒ **FCC Part 15, Subpart C (Section 15.249)**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Kent Liu Project Engineer / EMC Department	Approved by Sam Tung Manager / EMC Department
	 Date: May 14, 2013

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130429N006	Original release	May 14, 2013

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.249)			
STANDARD SECTION	**TEST TYPE AND LIMIT**	**RESULT**	**REMARK**
§15.203	Antenna Requirement	PASS	Compliant
§15.207 (a)	Conducted Emission	N/A	EUT is powered by battery
§15.205	Restricted Band of Operation	PASS	Compliant
§15.209 §15.249(a)	Radiated Emission	PASS	Compliant
§15.215(c)	20dB Bandwidth Test	PASS	Compliant

2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.44dB
Radiated emissions	30MHz ~1GHz	3.64dB
	1GHz ~ 18GHz	2.26dB
	18GHz ~ 40GHz	1.94dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless Mouse
MODEL NO.	GM-130002/S
FCC ID	FSUGMZKO
NOMINAL VOLTAGE	DC 1.5V By Battery
MODULATION TYPE	GFSK
OPERATING FREQUENCY	2402-2480MHz
ANTENNA TYPE	Integral PCB Antenna with gain 0 dBi
I/O PORTS	N/A
CABLE SUPPLIED	N/A

NOTE:

1. Additional models GM-120030/S, GM-130001/S are identical with the test model GM-130002/S except the model names and appearance for business need.

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

3.2 DESCRIPTION OF TEST MODES

79 channel(s) was (were) selected for the test as listed below.

TESTED CHANNEL	TESTED FREQUENCY
Low	2402 MHz
Middle	2448 MHz
High	2480 MHz

3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.249)

ANSI C63.10-2009

All test items have been performed and recorded as per the above standards.

NOTE: It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (Verification). The test report has been issued separately.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without any other necessary accessories or support units.

4 TEST TYPES AND RESULTS

4.1 RADIATED EMISSION MEASUREMENT

4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/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

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental (milli-volts/meter)	Field strength of harmonics (micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Spectrum Analyzer ROHDE & SCHWARZ	E4446A	MY46180622	Apr. 24,13	Apr. 23,14
Test Receiver ROHDE & SCHWARZ	ESVD	847398/003	May 14,13	May 13,14
Bilog Antenna TESEQ	CBL 6111D	25758	Jul. 16,12	Jul. 15,13
Horn Antenna EMCO	3117	00062558	Oct.18,12	Oct.17,13
10m Semi-anechoic Chamber ETS-LINDGREN	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Signal Amplifier EMCI	EMC330	980095	Nov 2,12	Nov.1,13
Pre-Amplifier HP	8449B	3008A00409	May 14,13	May 13,14
Test software ADT	ADT_Radiated_V7.6.15	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA.

2. The test was performed in Dongguan 10m Chamber.

3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.

4.1.3 TEST PROCEDURES

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

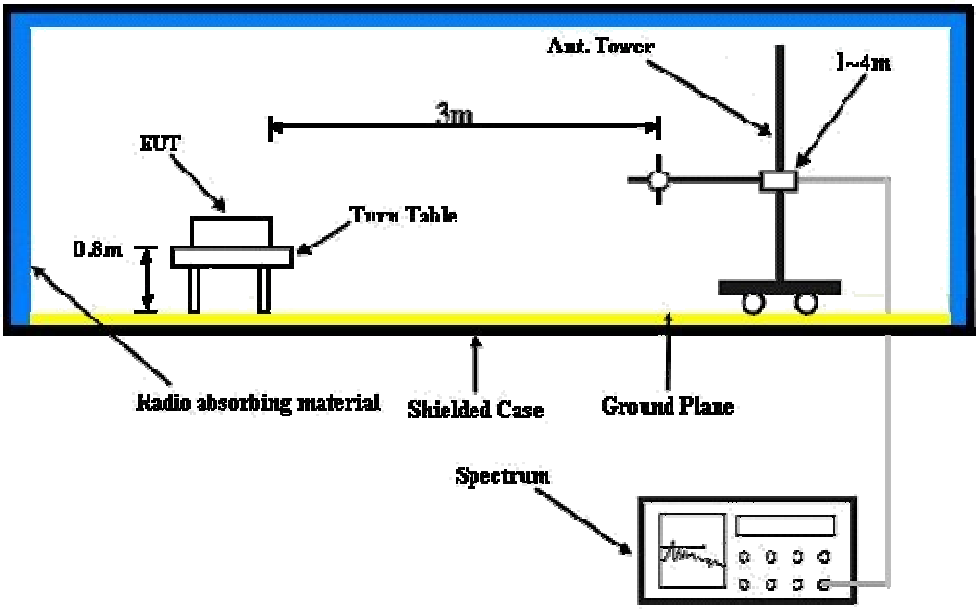
NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT OPERATING CONDITIONS

Set the EUT under transmission condition continuously at specific channel frequency.

4.1.7 TEST RESULTS

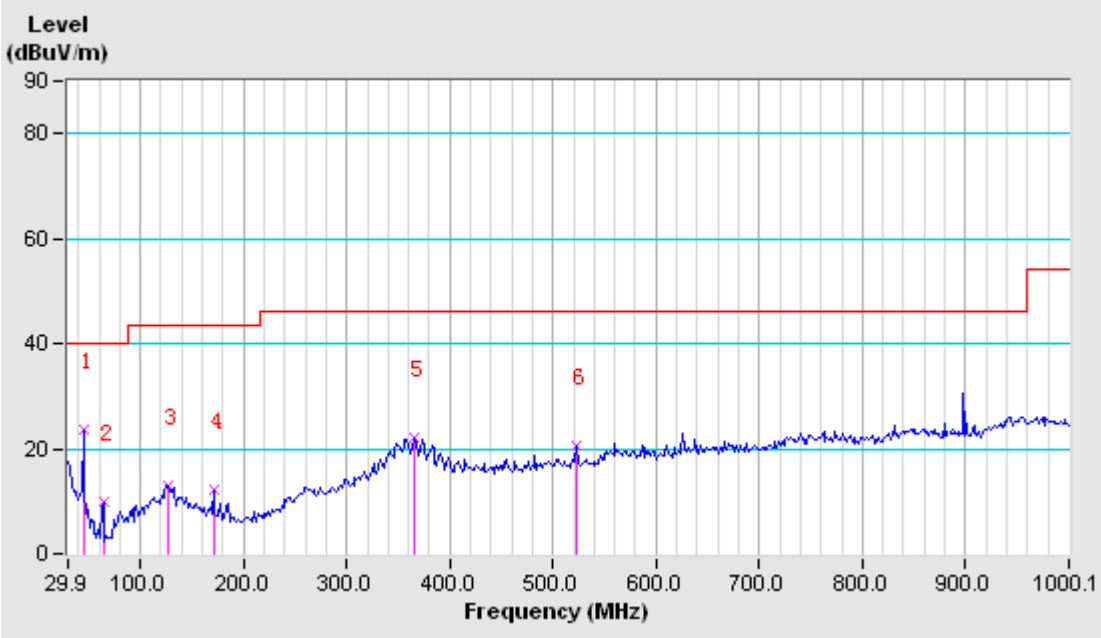
BELOW 1GHz WORST-CASE DATA

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	TX High Channel	FREQUENCY RANGE	Below 1000MHz
TEST VOLTAGE	DC1.5V by battery	DETECTOR FUNCTION	Quasi-Peak

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	**44.45**	**23.6 QP**	**40.0**	**-16.4**	**1.00 H**	**17**	**12.22**	**11.36**
2	63.86	10.0 QP	40.0	-30.1	1.00 H	132	2.82	7.13
3	126.92	13.0 QP	43.5	-30.5	1.00 H	72	-0.26	13.29
4	170.58	12.3 QP	43.5	-31.2	1.00 H	153	1.10	11.21
5	366.24	22.0 QP	46.0	-24.1	1.00 H	92	4.37	17.58
6	523.09	20.5 QP	46.0	-25.6	1.00 H	1	-0.84	21.29

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

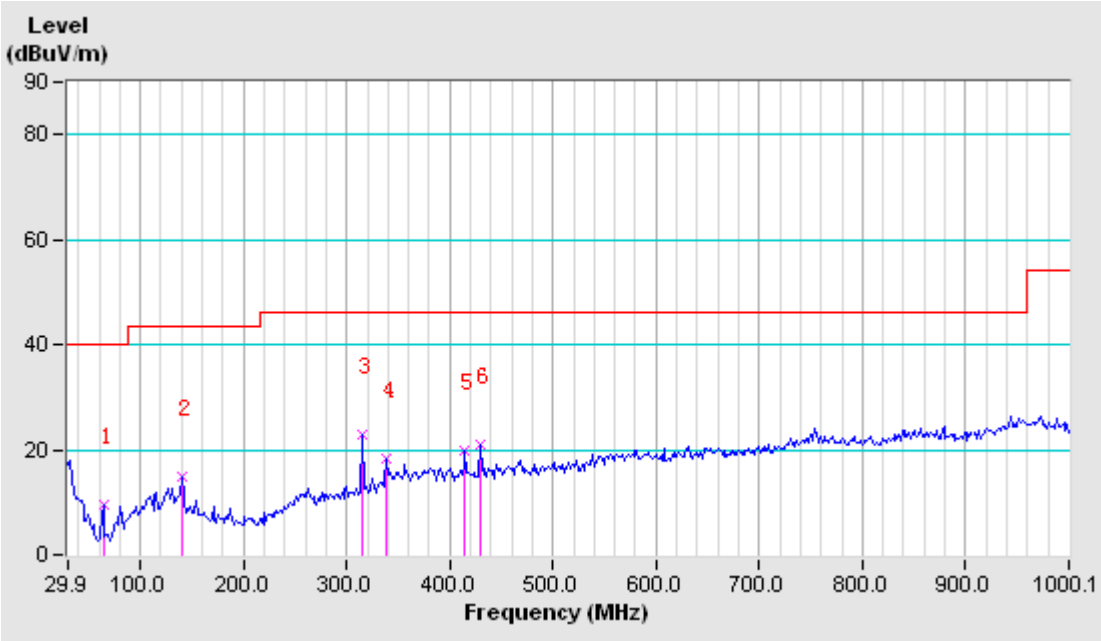


EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	TX High Channel	FREQUENCY RANGE	Below 1000MHz
TEST VOLTAGE	DC1.5V by battery	DETECTOR FUNCTION	Quasi-Peak

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	63.86	9.4 QP	40.0	-30.6	1.00 V	249	2.26	7.13
2	139.86	15.0 QP	43.5	-28.6	1.00 V	215	1.70	13.25
3	314.49	22.9 QP	46.0	-23.1	1.00 V	146	6.95	15.95
4	338.75	18.2 QP	46.0	-27.8	1.00 V	200	1.42	16.75
5	414.75	19.9 QP	46.0	-26.1	1.00 V	166	0.41	19.52
6	429.30	21.1 QP	46.0	-24.9	1.00 V	132	1.36	19.76

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



ABOVE 1GHz WORST-CASE DATA:

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	TX Low Channel	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC1.5V by battery	DETECTOR FUNCTION	Peak (PK) Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400	51.4 PK	74	-22.6	1.00 H	67	14.13	37.27
2	2400	32.9 AV	54	-21.1	1.00 H	67	-4.37	37.27
3	*2402	99.3 PK	114	-14.7	1.00 H	67	62.03	37.27
4	*2402	80.8 AV	94	-13.2	1.00 H	67	43.53	37.27
5	4804	59.1 PK	74	-14.9	1.10 H	70	17.49	41.61
6	4804	40.6 AV	54	-13.4	1.10 H	70	-1.01	41.61
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2400	46.5 PK	74	-27.5	1.00 V	336	9.23	37.27
2	2400	28 AV	54	-26	1.00 V	336	-9.27	37.27
3	*2402	85.9 PK	114	-28.1	1.00 V	336	48.63	37.27
4	*2402	67.4 AV	94	-26.6	1.00 V	336	30.13	37.27
5	4804	62.8 PK	74	-11.2	1.00 V	69	21.19	41.61
6	**4804**	**44.3 AV**	**54**	**-9.7**	**1.00 V**	**69**	**2.69**	**41.61**

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.76 ms / 8.008 ms) = -20.4 dB
   Please see page 16 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	TX Middle Channel	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC1.5V by battery	DETECTOR FUNCTION	Peak (PK) Average (AV)

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2448	99.6 PK	114	-14.4	1.00 H	70	62.25	37.35
2	*2448	81.1 AV	94	-12.9	1.00 H	70	43.75	37.35
3	4896	58.0 PK	74	-16	1.14 H	63	16.28	41.72
4	4896	39.5 AV	54	-14.5	1.14 H	63	-2.22	41.72
5	7344	59.6 PK	74	-14.4	1.00 H	156	13.8	45.8
6	7344	41.1 AV	54	-12.9	1.00 H	156	-4.7	45.8
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2448	86.3 PK	114	-27.7	1.00 V	346	48.95	37.35
2	*2448	67.8 AV	94	-26.2	1.00 V	346	30.45	37.35
3	4896	63.0 PK	74	-11	1.00 V	65	21.28	41.72
4	4896	44.5 AV	54	-9.5	1.00 V	65	2.78	41.72
5	7344	58.7 PK	74	-15.3	1.00 V	171	12.9	45.8
6	7344	40.2 AV	54	-13.8	1.00 V	171	-5.6	45.8

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.76 ms / 8.008 ms) = -20.4 dB
   Please see page 16 for plotted duty.

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	TX High Channel	FREQUENCY RANGE	1 ~ 25GHz
TEST VOLTAGE	DC1.5V by battery	DETECTOR FUNCTION	Peak (PK) Average (AV)

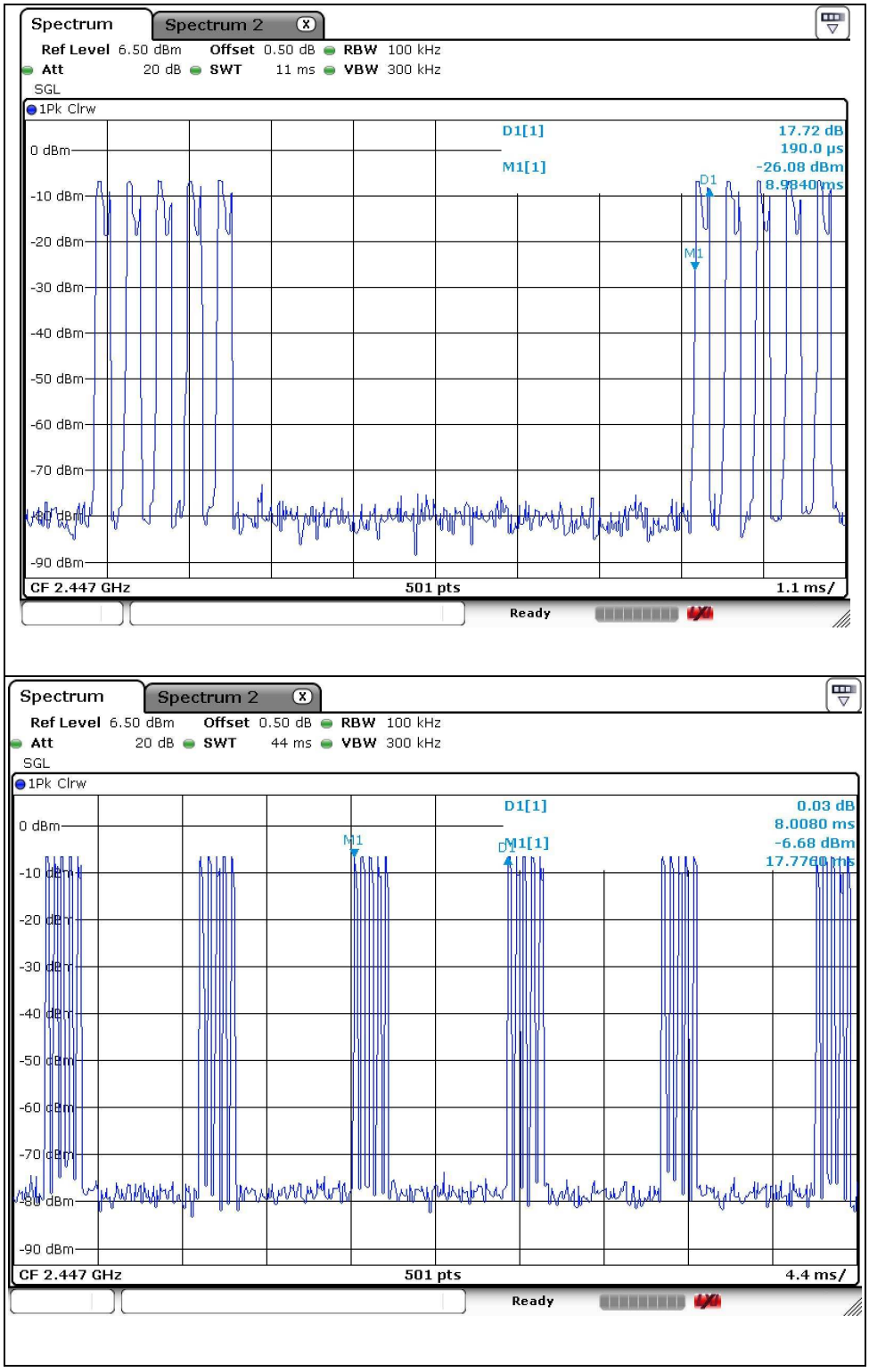
ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480	99.7 PK	114	-14.3	1.00 H	70	62.29	37.41
2	*2480	81.2 AV	94	-12.8	1.00 H	70	43.79	37.41
3	2483.5	50.9 PK	74	-23.1	1.00 H	70	13.49	37.41
4	2483.5	32.4 AV	54	-21.6	1.00 H	70	-5.01	37.41
5	4960	56.7 PK	74	-17.3	1.15 H	71	14.9	41.8
6	4960	38.2 AV	54	-15.8	1.15 H	71	-3.6	41.8
7	7440	55.8 PK	74	-18.2	1.00 H	160	9.98	45.82
8	7440	37.3 AV	54	-16.7	1.00 H	160	-8.52	45.82
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2480	87.8 PK	114	-26.2	1.00 V	334	50.39	37.41
2	*2480	69.3 AV	94	-24.7	1.00 V	334	31.89	37.41
3	2483.5	48.5 PK	74	-25.5	1.00 V	334	11.09	37.41
4	2483.5	30 AV	54	-24	1.00 V	334	-7.41	37.41
5	4960	62.9 PK	74	-11.1	1.00 V	64	21.1	41.8
6	4960	44.4 AV	54	-9.6	1.00 V	64	2.6	41.8
7	7440	57.4 PK	74	-16.6	1.00 V	172	11.58	45.82
8	7440	38.9 AV	54	-15.1	1.00 V	172	-6.92	45.82

REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB/m).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. " * ": Fundamental frequency.
6. The average value of fundamental frequency is: Average = Peak value + 20 log(Duty cycle) Where the duty factor is calculated from following formula:
   20 log (Duty cycle) = 20 log (0.76 ms / 8.008 ms) = -20.4 dB
   Please see page 16 for plotted duty.

Duty Cycle

20 log (Duty cycle) = 20 log (190us x 5 / 8.008 ms) = -18.5 dB



4.2 20dB BANDWIDTH MEASUREMENT

4.2.1 LIMITS OF 20dB BANDWIDTH MEASUREMENT

According to FCC 15.215(c), must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

4.2.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 24,13	Apr. 23,14
EMI Test Receiver	Rohde&Schwarz	ESVD	847398/003	May 14,13	May 13,14
Bilog Antenna (25MHz-2GHz)	Teseq	CBL 6111D	27089	Jul. 16,12	Jul. 15,13
Bilog Antenna	Teseq	CBL 6111D	25757	Nov. 22,12	Nov. 21,13
Horn Antenna (1GHz -18GHz)	EMCO	3117	00062558	Oct.18,12	Oct.17,13
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Jan. 04,11	Jan. 03,14
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,12	Nov. 03,13
Pre-Amplifier (20MHz-3GHz)	EMCI	EMC 330	980095	Nov. 02,12	Nov. 01,13
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 14,13	May 13,14
10m Semi-anechoic Chamber	CHANGLING	21.4m*12.1m*8.8m	NSEMC006	Mar. 24,13	Mar. 23,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 31,12	Oct. 30,13
Test Software	ADT	ADT_Radiated_V7.6.15	N/A	N/A	N/A

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA and NIM/CHINA

2. The test was performed in Dongguan Chamber 10m.

4.2.3 TEST PROCEDURE

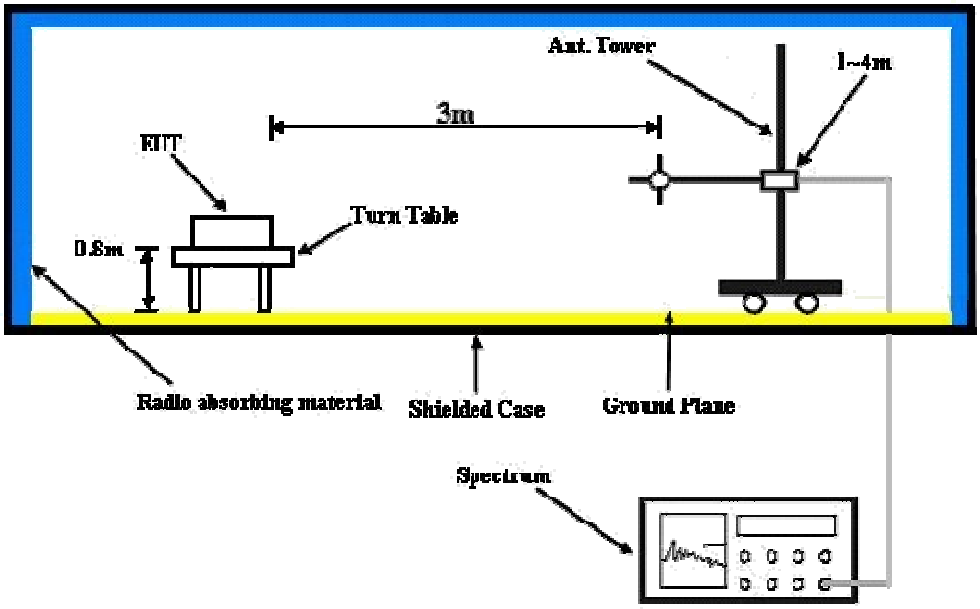
The EUT was placed on a turn table which was 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on a antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 to 4 m for horizontal and vertical polarizations.

The spectrum analyzer was receiving the maximum emission level. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



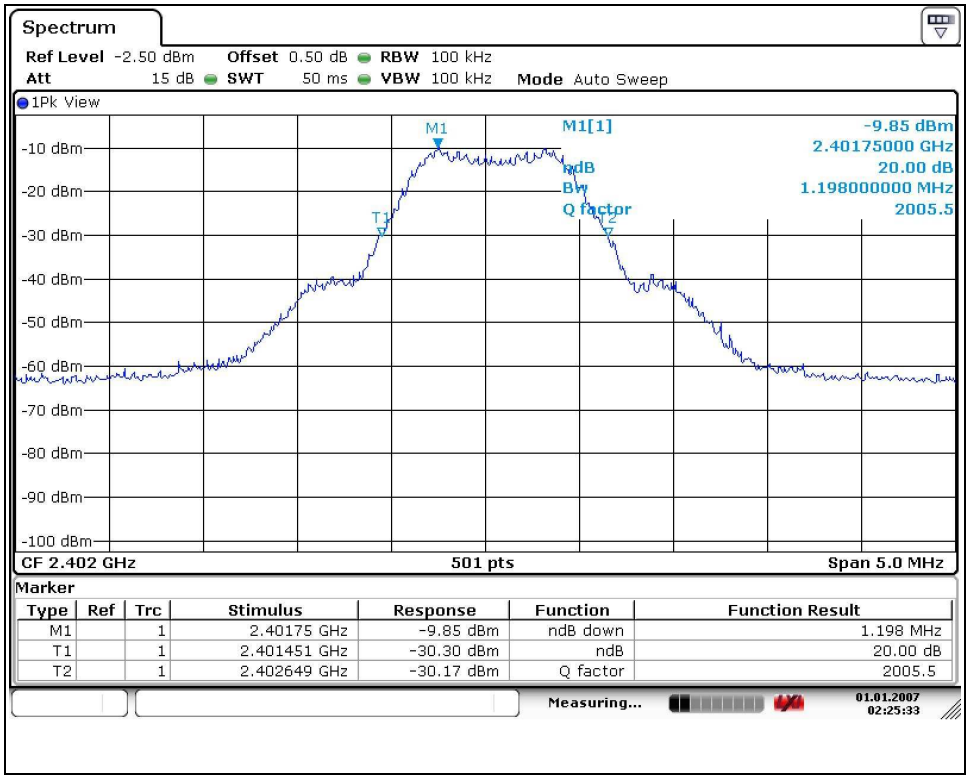
4.2.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

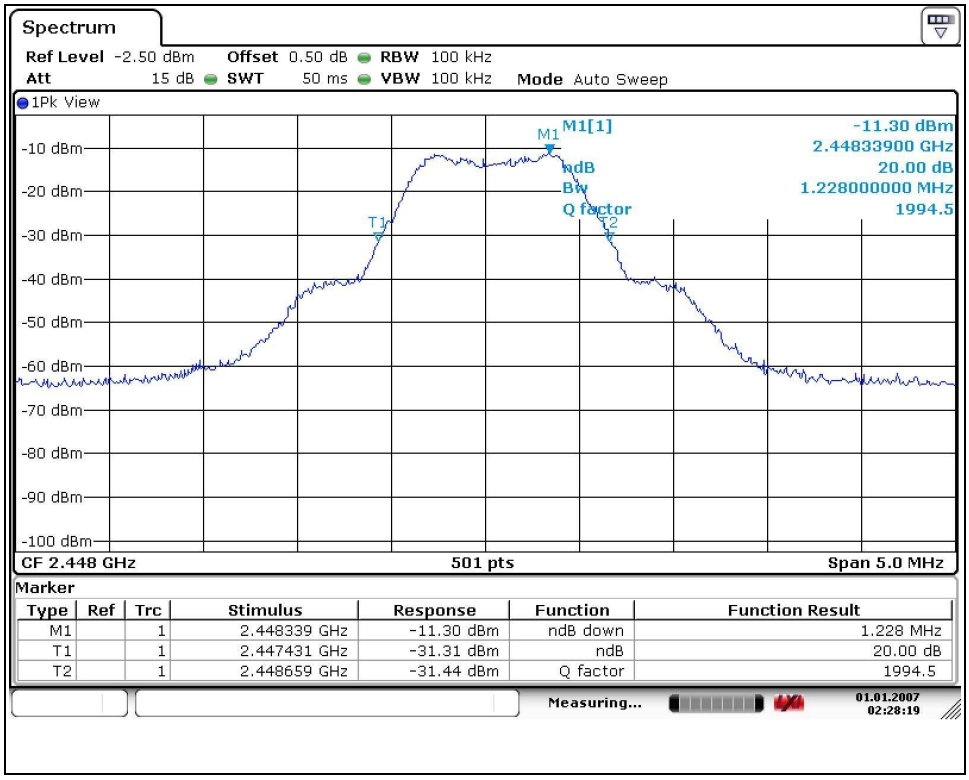
4.2.7 TEST RESULTS

CHANNEL	CHANNEL FREQUENCY (MHz)	20dB BANDWIDTH (MHz)
Low	2402	1.198
Middle	2448	1.228
High	2480	1.228

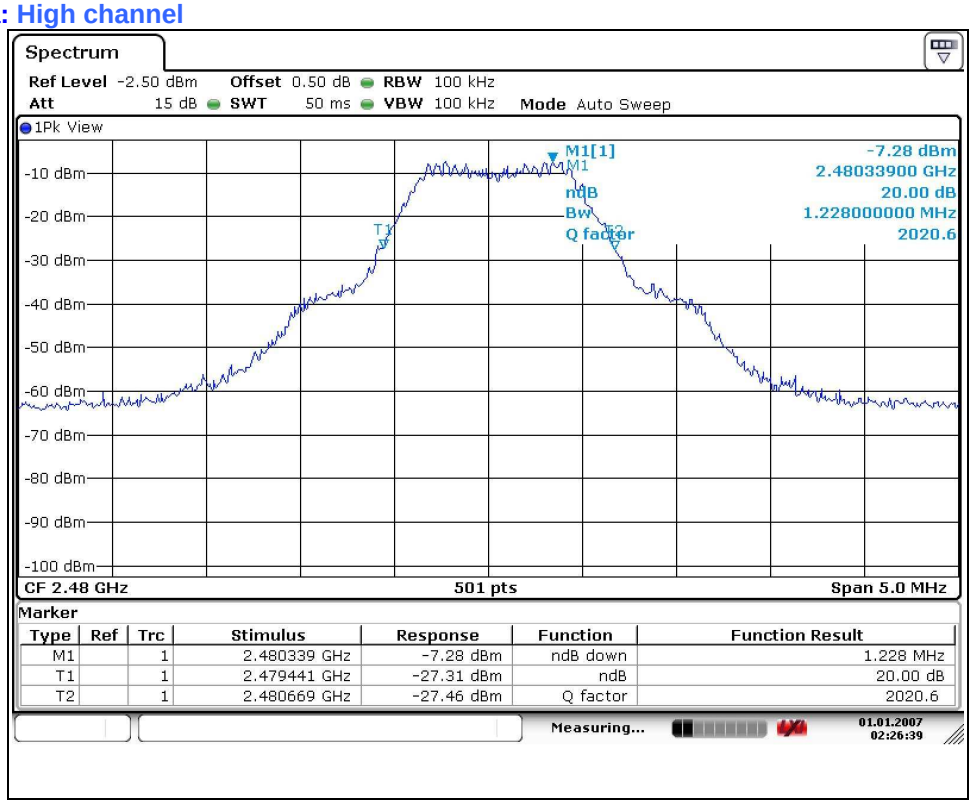
Test Data: Low channel



Test Data: Middle channel



Test Data: High channel



5 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

6 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications are made to the EUT by the lab during the test.

---END---