

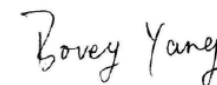
FCC RADIO TEST REPORT

Report Reference No. : NTEK-2011DG0829342F

Compiled by (+ signature) : Jim He



Approved by (+ signature) : Bovey Yang



Applicant's name : Intech Electronics Corp.

Address : Hall B3, Yuan-hu Industrial Park, Golf Road, Song-Yuan Village
Guan-Lan, Shenzhen City, Guangdong Province, China, P.R.C.

Manufacture's Name : Intech Electronics Corp.

Address : Hall B3, Yuan-hu Industrial Park, Golf Road, Song-Yuan Village
Guan-Lan, Shenzhen City, Guangdong Province, China, P.R.C.

Test specification:

Standard : FCC Part15.249

Test procedure : ANSI C63.4-2003

Test item description

Product name : 2.4GHz OPTICAL MOUSE

FCC ID : UC3WC052G400

Trademark :

Model and/or type reference : M-B05, M-C05,

Rating(s) : DC 1.5V from battery

Testing Laboratory information:

Testing Laboratory Name : NTEK Testing Technology Co., Ltd

Address : 1/F, Building E, Fenda Science Park, Sanwei Community,
Xixiang Street, Bao'an District, Shenzhen P.R. China.

This device described above has been tested by NTEK Testing Technology Co., Ltd, 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.

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Testing :

Date of receipt of test item : 26 Aug. 2011

Date (s) of performance of tests : 26 Aug. 2011 ~02 Sep. 2011

Date of Issue : 02 Sep. 2011

Test Result : **Pass**

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C (15.249) & RSS-Gen Issue 3 & RSS-210 Issue 8			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	Note(1)
15.203	Antenna Requirement	Pass	
15.249	Radiated Spurious Emission	Pass	
15.249	Occupied Bandwidth	Pass	

NOTE:

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

1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded 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	$\pm 1.38\text{dB}$
2	Radiated Emission Test	$\pm 3.17\text{dB}$
3	RF power,conducted	$\pm 0.16\text{dB}$
4	Spurious emissions,conducted	$\pm 0.21\text{dB}$
5	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
6	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	2.4GHz OPTICAL MOUSE	
Trade Name	N/A	
Model Name	M-B05, M-C05	
OEM Brand/Model Name	N/A	
Model Difference	The PCB is same, only the appearance is different	
Product Description	The EUT is a 2.4GHz OPTICAL MOUSE	
	Operation Frequency:	2403~2478 MHz
	Channel Number	20
	Modulation Type:	GFSK
	Antenna Designation:	PCB antenna
	Antenna Gain(Peak)	0 dBi
	Bit Rate of Transmission	1Mbps
	RF output Power:	-3.12dBm
Channel List	Please refer to the Note 2.	
Power Source	DC Voltage supplied from 1*AA battery	
Power Rating	DC 1.5V from battery	
Connecting I/O Port(s)	Please refer to the User's Manual	
Products Covered	N/A	
EUT Modification(s)	N/A	

Note:

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

2.

Channel List					
Group	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (MHz)
01	2403	2478	2453	2413	2466
02	2404	2474	2444	2424	2464
03	2405	2475	2445	2415	2465
04	2406	2476	2436	2456	2416

3.

Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	PCB Antenna	NA	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	2403MHz
Mode 2	2453MHz
Mode 3	2478MHz

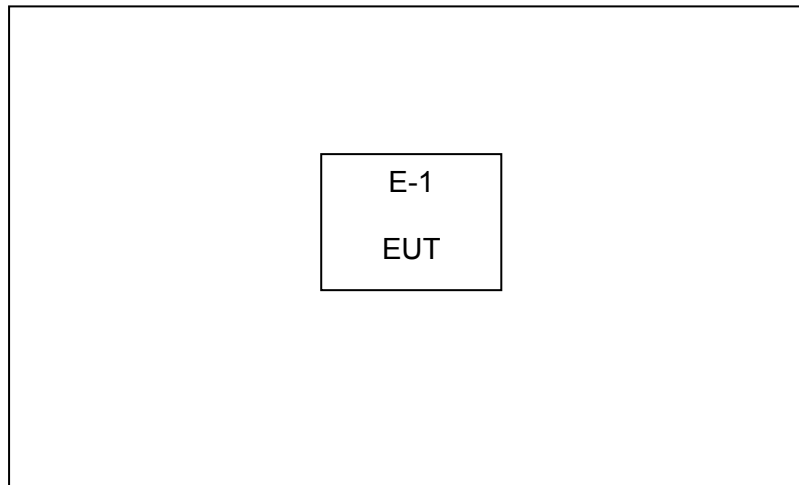
For Conducted Emission	
Final Test Mode	Description
-	"N/A" denotes test is not applicable in this Test Report

For Radiated Emission	
Final Test Mode	Description
Mode 1	2403MHz
Mode 2	2453MHz
Mode 3	2478MHz

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The EUT use new battery.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 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.	FCC ID	Series No.	Note
E-1	2.4GHz OPTICAL MOUSE	N/A	M-B05	UC3WC052G400	N/A	EUT

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.

2.4.1 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test Equipment:					
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Due Date dd-mm-yy
1	Spectrum Analyzer	Agilent	E4407B	160400005	2012-4-24
2	Test Receiver	R&S	ESPI7	101318	2012-4-24
3	Bilog Antenna	TESEQ	CBL6111D	31216	2012-4-24
4	50Ω Coaxial Switch	Anritsu	MP59B	620026441 6	2012-4-24
5	Spectrum Analyzer	ADVANTEST	R3182	150900201	2012-4-24
6	Low Noise Pre Amplifier	Tsj	MLA-0120-A02-34	2648A0473 8	2012-4-24
7	Broadband Horn Antenna	SCHWARZBEC K	BBHA9120D	451	2012-4-24
8	Loop Antenna	ARA	PLA-1030/B	1029	2012-3-19

Conduction Test equipment					
No	Test Equipment	Manufacturer	Model No	Serial No	Cal. Due Date dd-mm-yy
1**	Test Receiver	R&S	ESCI	101160	2012-4-24
2	LISN	R&S	ENV216	101313	2012-4-24
3	LISN	Kyoritsu	KNW-407	8-1789-3	2012-4-24
4**	50Ω Coaxial Switch	Anritsu	MP59B	620026441 7	2012-4-24
5	Passive Voltage Probe	R&S	ESH2-Z3	100196	2012-4-24
6	Absorbing clamp	R&S	MDS-21	100423	2012-4-24

3. TEST RESULT

3.1 ANTENNA REQUIREMENT

3.1.1 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.

3.1.2 EUT ANTENNA

The EUT antenna is integral Antenna. It comply with the standard requirement.

3.2 CONDUCTED EMISSION MEASUREMENT

3.2.1 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			66 - 56 *	56 - 46 *	CISPR
0.50 -5.0			56.00	46.00	CISPR
5.0 -30.0			60.00	50.00	CISPR

0.15 -0.5			66 - 56 *	56 - 46 *	LP002.
0.50 -5.0			56.00	46.00	LP002.
5.0 -30.0			60.00	50.00	LP002.

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

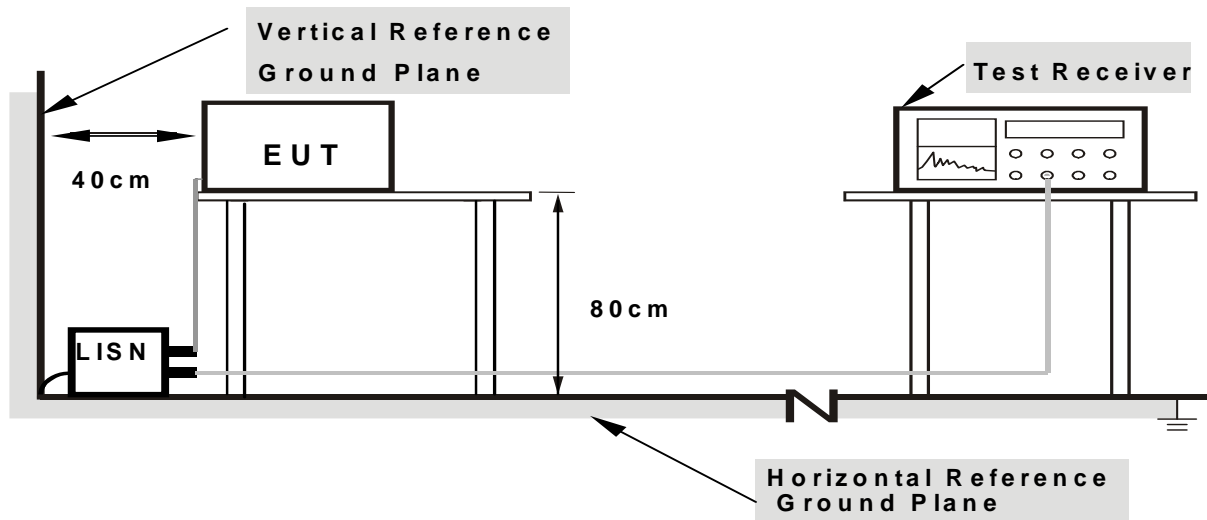
3.2.2 TEST PROCEDURE

- 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.3 DEVIATION FROM TEST STANDARD

No deviation

3.2.4 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

3.2.5 TEST RESULT

Cause the EUT only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Measurements to demonstrate compliance with the conducted limits are not required for devices

3.3 RADIATED EMISSION MEASUREMENT

3.3.1 Radiated Emission Limits (FCC 15.209)

Frequencies (MHz)	Field Strength (microvolt/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

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.249)

Frequency of Emission (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)
2400 - 2483.5	50	500

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.

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

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

3.3.2 TEST PROCEDURE

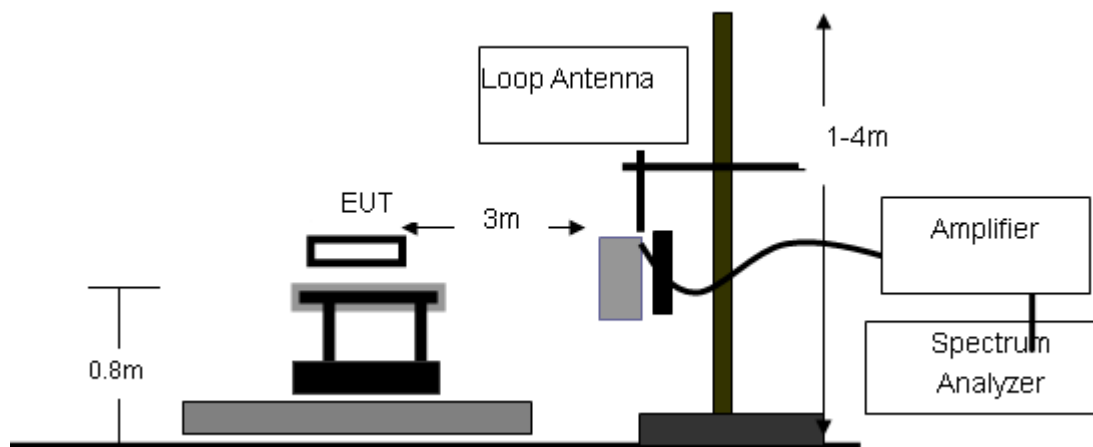
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m meter open area test site. The table was rotated 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. performed pretest to three orthogonal axis.
- 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.

3.3.3 DEVIATION FROM TEST STANDARD

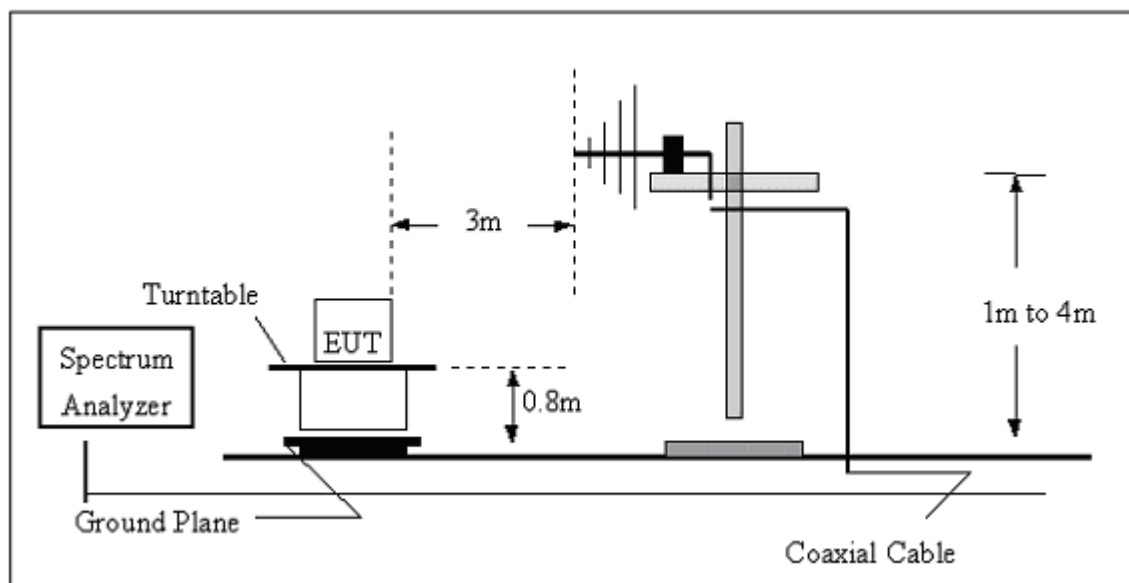
No deviation

3.3.4 TEST SETUP

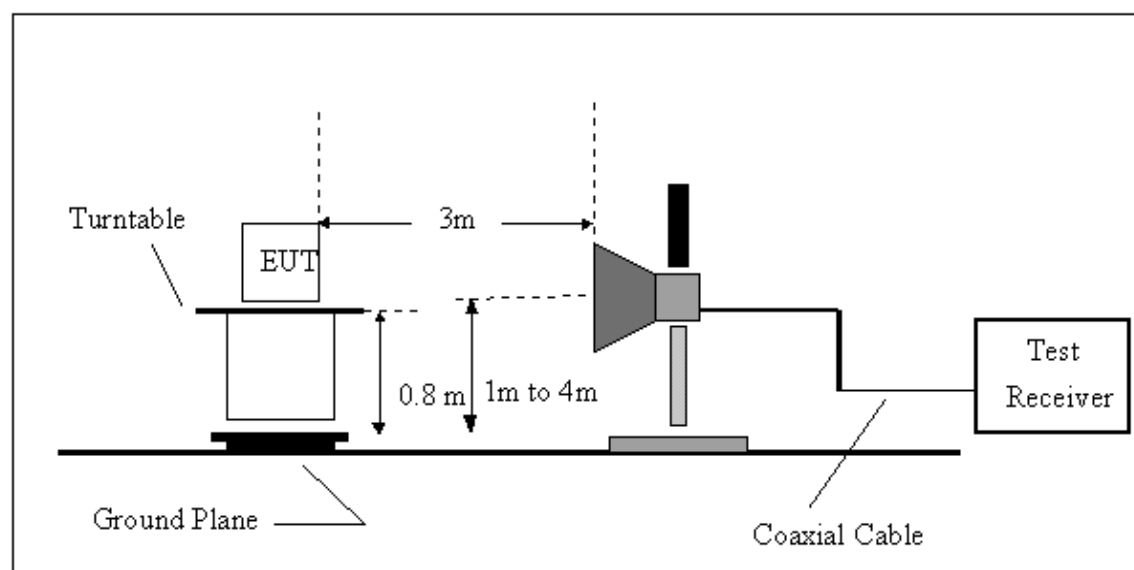
(A) Radiated Emission Test Set-Up Frequency Below 30 MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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



3.3.5 TEST RESULTS (BLOW 30MHz)

EUT :	2.4GHz OPTICAL MOUSE	Model Name. :	M-B05
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC3V
Test Mode :	TX	Polarization :	--

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 = $20 \log (\text{specific distance/test distance})(\text{dB})$;

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

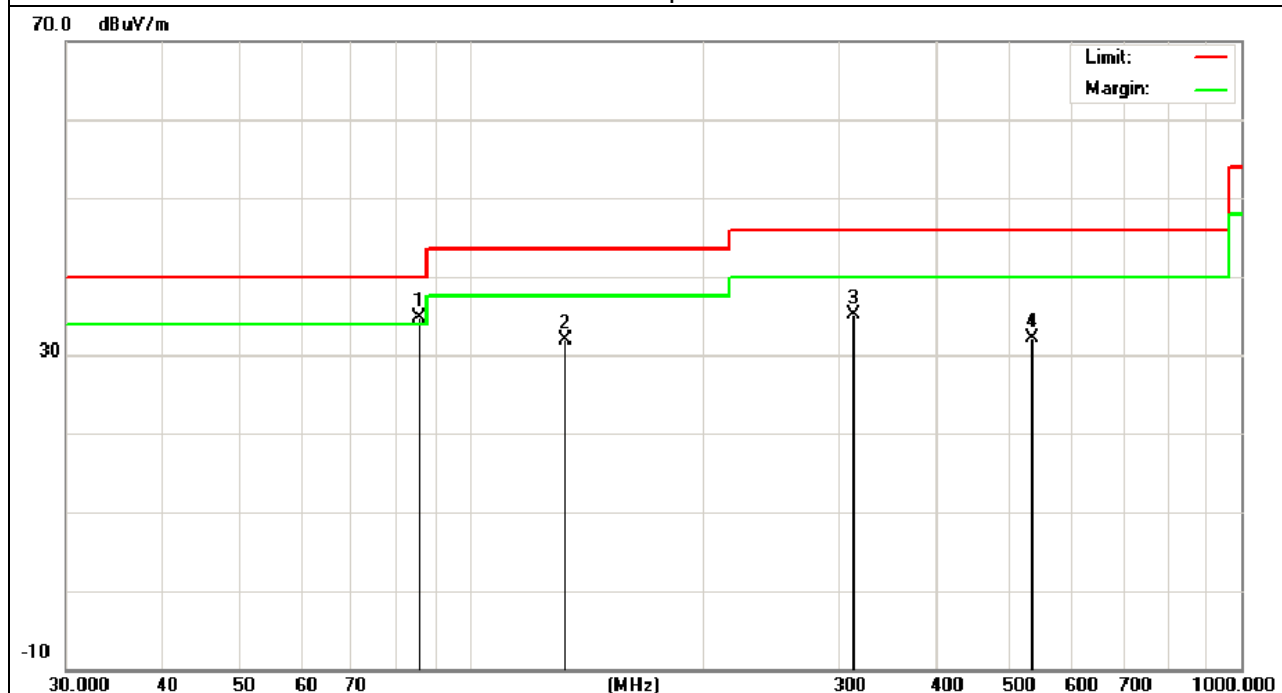
3.3.6 TEST RESULTS (BETWEEN 30 – 1000 MHZ)

EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-08-31
Test Mode :	TX	Polarization :	Horizontal
Test Power :	DC 1.5V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	85.6200	33.91	0.71	34.62	40.00	-5.38	QP
2		132.6400	31.23	0.66	31.89	43.50	-11.61	QP
3		313.6500	33.91	1.26	35.17	46.00	-10.83	QP
4		532.6800	28.91	3.16	32.07	46.00	-13.93	QP

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.

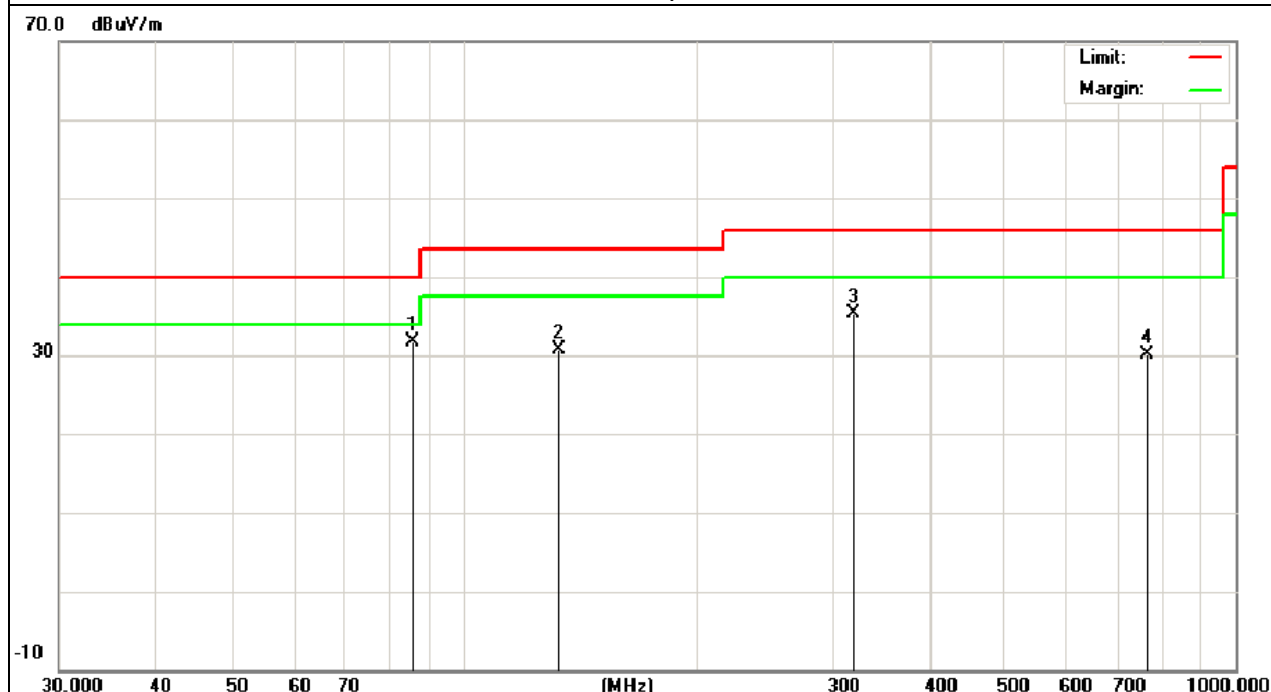


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX	Polarization :	Vertical
Test Power :	DC 1.5V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1	*	85.6200	30.98	0.71	31.69	40.00	-8.31	QP
2		132.6400	29.98	0.66	30.64	43.50	-12.86	QP
3		318.7800	34.11	1.15	35.26	46.00	-10.74	QP
4		768.6800	28.20	1.87	30.07	46.00	-15.93	QP

Remark:

1. Factor = Antenna Factor + Cable Loss – Pre-amplifier.



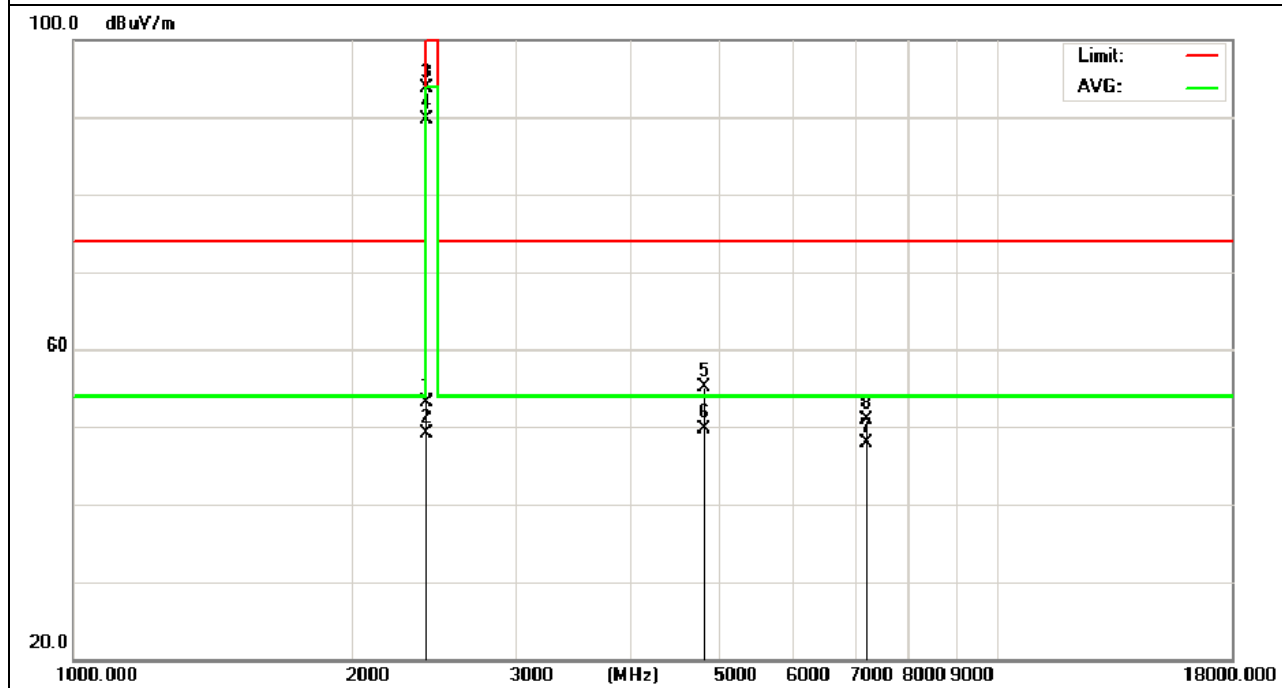
3.3.7 TEST RESULTS (ABOVE 1000 MHZ)

EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2403MHz	Polarization :	Horizontal
Test Power :	DC 1.5V		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		2400.000	30.54	22.65	53.19	74.00	-20.81	peak
2		2400.000	26.54	22.65	49.19	54.00	-4.81	AVG
3		2403.000	71.12	22.67	93.79	114.0	-20.21	peak
4	*	2403.000	67.13	22.67	89.80	94.00	-4.20	AVG
5		4806.000	21.00	34.02	55.02	74.00	-18.98	peak
6		4806.000	15.64	34.02	49.66	54.00	-4.34	AVG
7		7209.000	10.43	37.50	47.93	54.00	-6.07	AVG
8		7209.000	13.43	37.50	50.93	74.00	-23.07	peak

Remark:

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

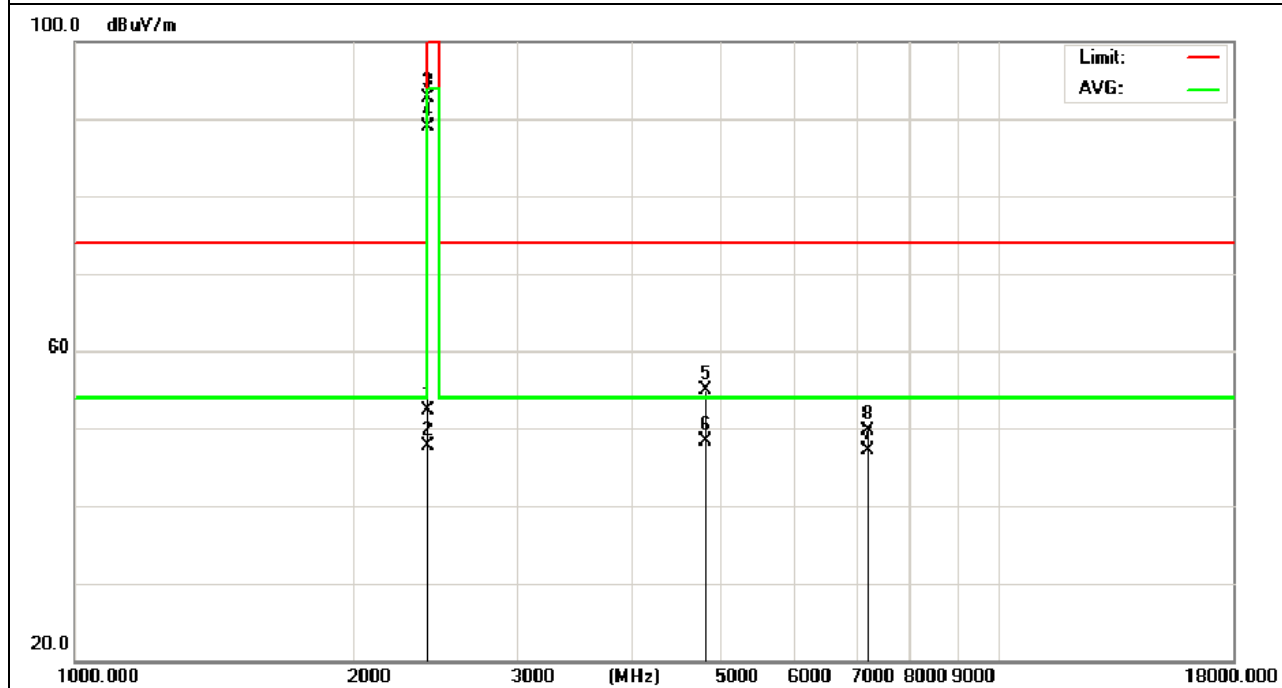


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2405MHz	Polarization :	Vertical
Test Power :	DC 1.5V		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		2400.000	29.67	22.65	52.32	74.00	-21.68	peak
2		2400.000	25.09	22.65	47.74	54.00	-6.26	AVG
3		2403.000	70.08	22.67	92.75	114.0	-21.25	peak
4	*	2403.000	66.23	22.67	88.90	94.00	-5.10	AVG
5		4806.000	20.98	34.02	55.00	74.00	-19.00	peak
6		4806.000	14.31	34.02	48.33	54.00	-5.67	AVG
7		7209.000	9.65	37.50	47.15	54.00	-6.85	AVG
8		7209.000	12.11	37.50	49.61	74.00	-24.39	peak

Remark:

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

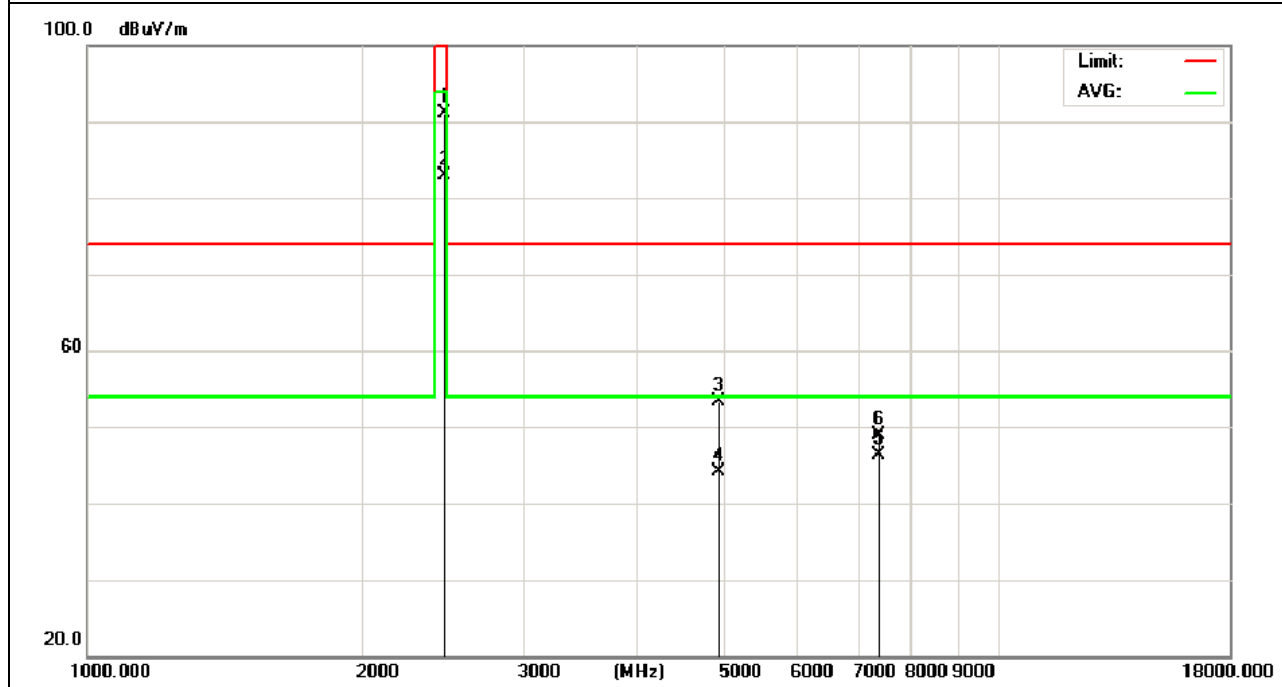


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2453MHz	Polarization :	Horizontal
Test Power :	DC 1.5V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB Detector
1		2453.000	68.10	23.04	91.14	114.0	-22.86 peak
2		2453.000	59.89	23.04	82.93	94.00	-11.07 AVG
3		4906.000	19.21	34.09	53.30	74.00	-20.70 peak
4		4906.000	9.99	34.09	44.08	54.00	-9.92 AVG
5	*	7359.000	8.13	38.18	46.31	54.00	-7.69 AVG
6		7359.000	10.76	38.18	48.94	74.00	-25.06 peak

Remark:

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

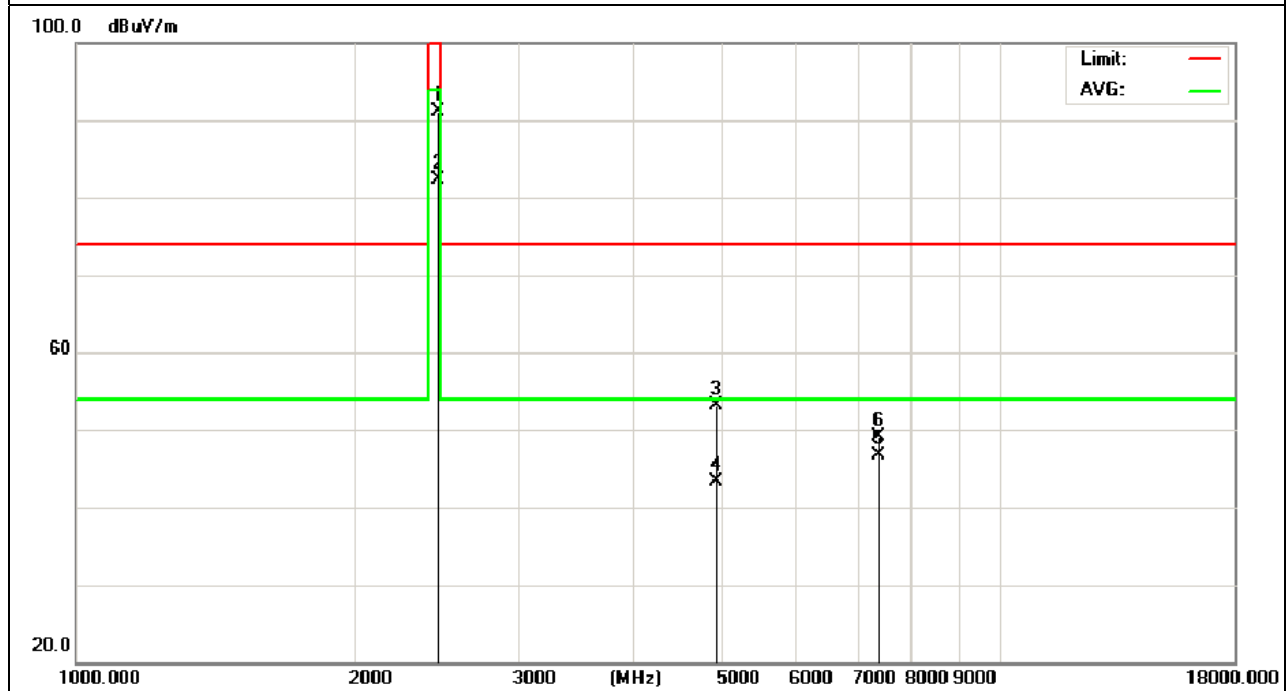


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2453MHz	Polarization :	Vertical
Test Power :	DC 1.5V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		2453.000	67.98	23.04	91.02	114.0	-22.98	peak
2		2453.000	59.23	23.04	82.27	94.00	-11.73	AVG
3		4906.000	19.09	34.09	53.18	74.00	-20.82	peak
4		4906.000	9.13	34.09	43.22	54.00	-10.78	AVG
5	*	7359.000	8.56	38.18	46.74	54.00	-7.26	AVG
6		7359.000	10.87	38.18	49.05	74.00	-24.95	peak

Remark:

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

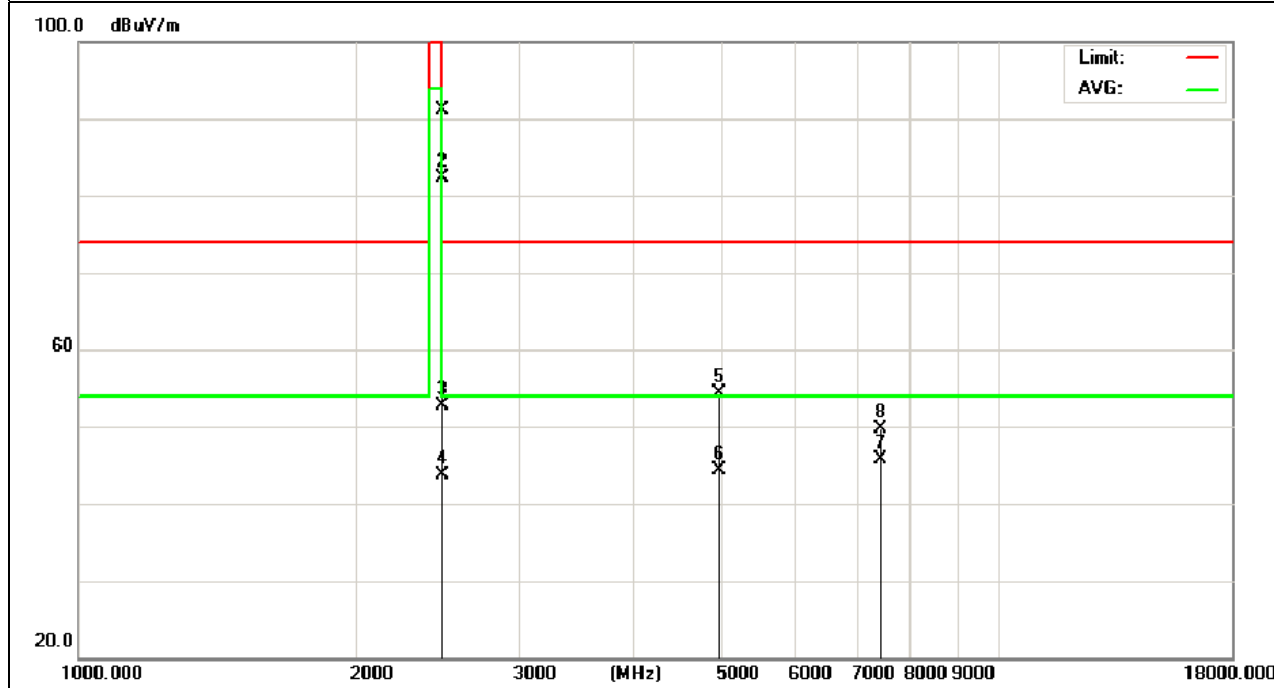


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2478MHz	Polarization :	Horizontal
Test Power :	DC 1.5V		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB Detector
1		2478.000	67.79	23.23	91.02	114.0	-22.98 peak
2		2478.000	59.04	23.23	82.27	94.00	-11.73 AVG
3		2483.500	29.43	23.27	52.70	74.00	-21.30 peak
4		2483.500	20.43	23.27	43.70	54.00	-10.30 AVG
5		4956.000	20.21	34.11	54.32	74.00	-19.68 peak
6		4956.000	10.21	34.11	44.32	54.00	-9.68 AVG
7	*	7434.000	7.09	38.52	45.61	54.00	-8.39 AVG
8		7434.000	11.21	38.52	49.73	74.00	-24.27 peak

Remark:

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

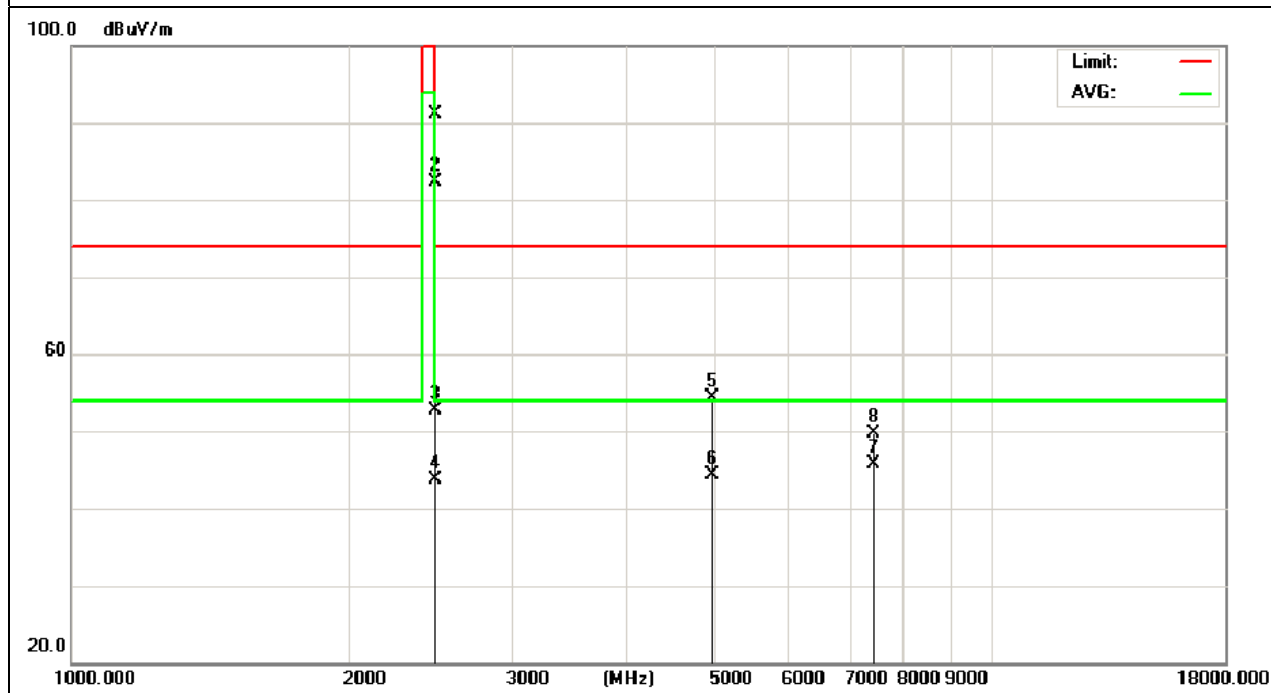


EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Test Date :	2011-8-31
Test Mode :	TX 2478MHz	Polarization :	Vertical
Test Power :	DC 1.5V		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector
1		2478.000	67.67	23.23	90.90	114.0	-23.10	peak
2		2478.000	59.01	23.23	82.24	94.00	-11.76	AVG
3		2483.500	29.21	23.27	52.48	74.00	-21.52	peak
4		2483.500	20.09	23.27	43.36	54.00	-10.64	AVG
5		4956.000	20.12	34.11	54.23	74.00	-19.77	peak
6		4956.000	10.08	34.11	44.19	54.00	-9.81	AVG
7	*	7434.000	6.78	38.52	45.30	54.00	-8.70	AVG
8		7434.000	10.87	38.52	49.39	74.00	-24.61	peak

Remark:

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



4. BANDWIDTH TEST

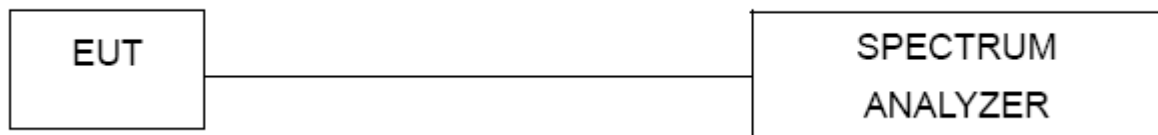
4.1 TEST PROCEDURE

- 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= 100KHz, VBW \geq RBW, Sweep time = Auto.

4.2 DEVIATION FROM STANDARD

No deviation.

4.3 TEST SETUP

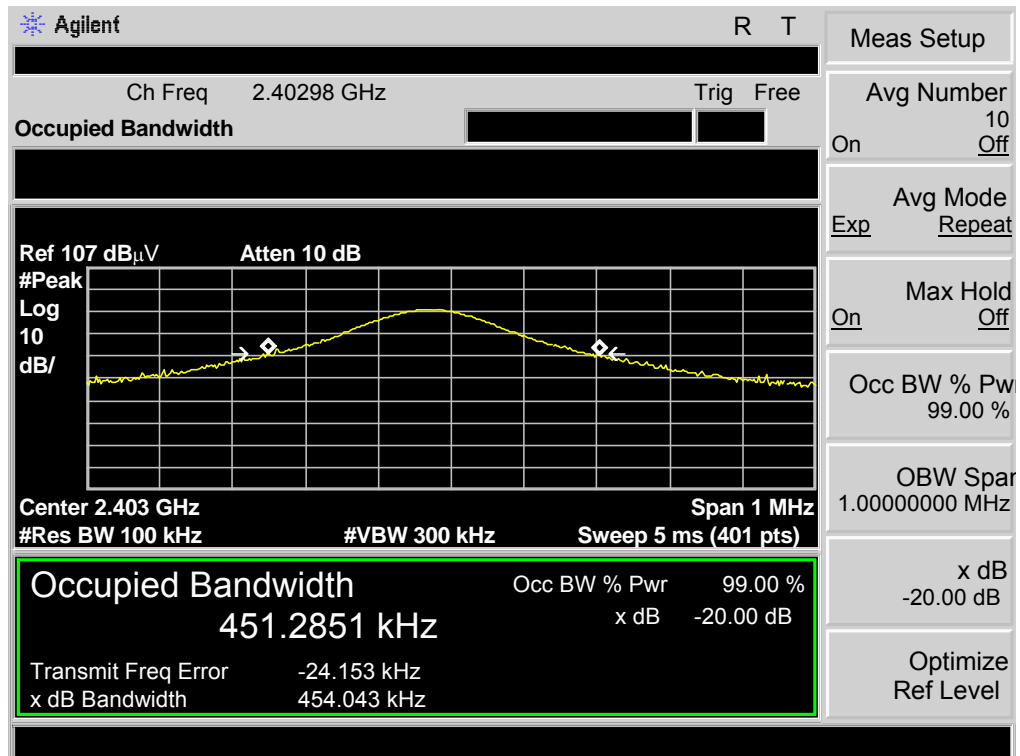


4.4 TEST RESULTS

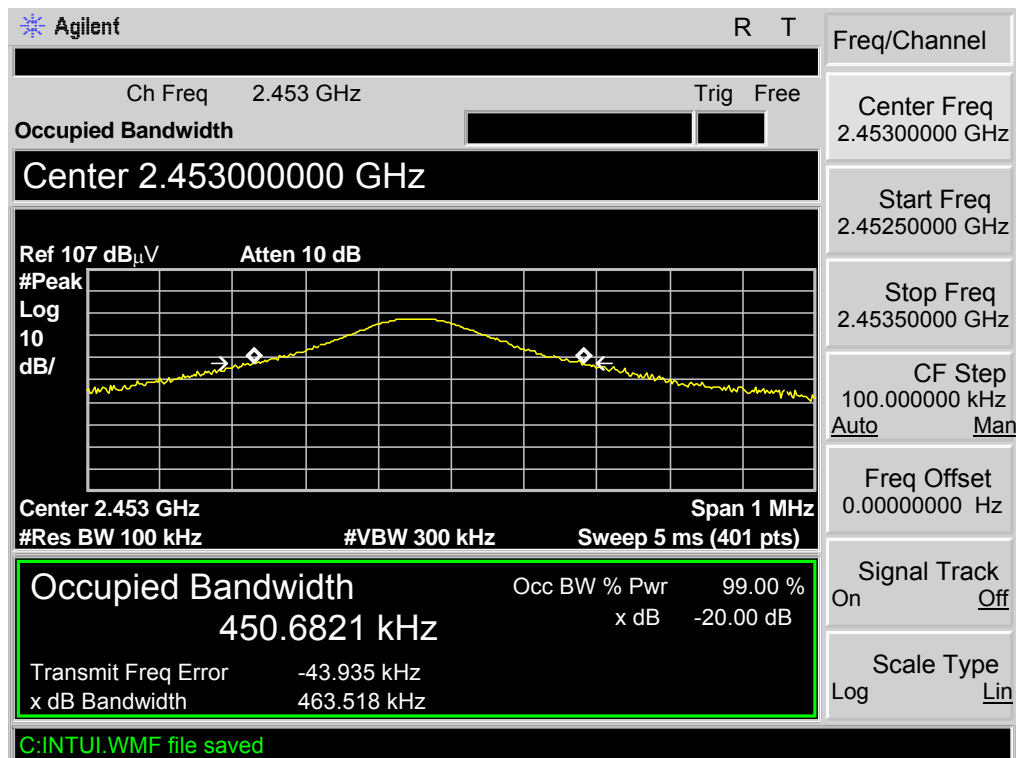
EUT :	2.4GHz OPTICAL MOUSE	Model Name :	M-B05
Temperature :	26 °C	Relative Humidity :	53%
Pressure :	1020 hPa	Test Power :	DC 1.5V
Test Mode :	TX (L/M/H)		

Test Channel	Frequency (MHz)	20 dBc Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2403	0.454	0.451
Middle	2453	0.463	0.450
High	2478	0.478	0.471

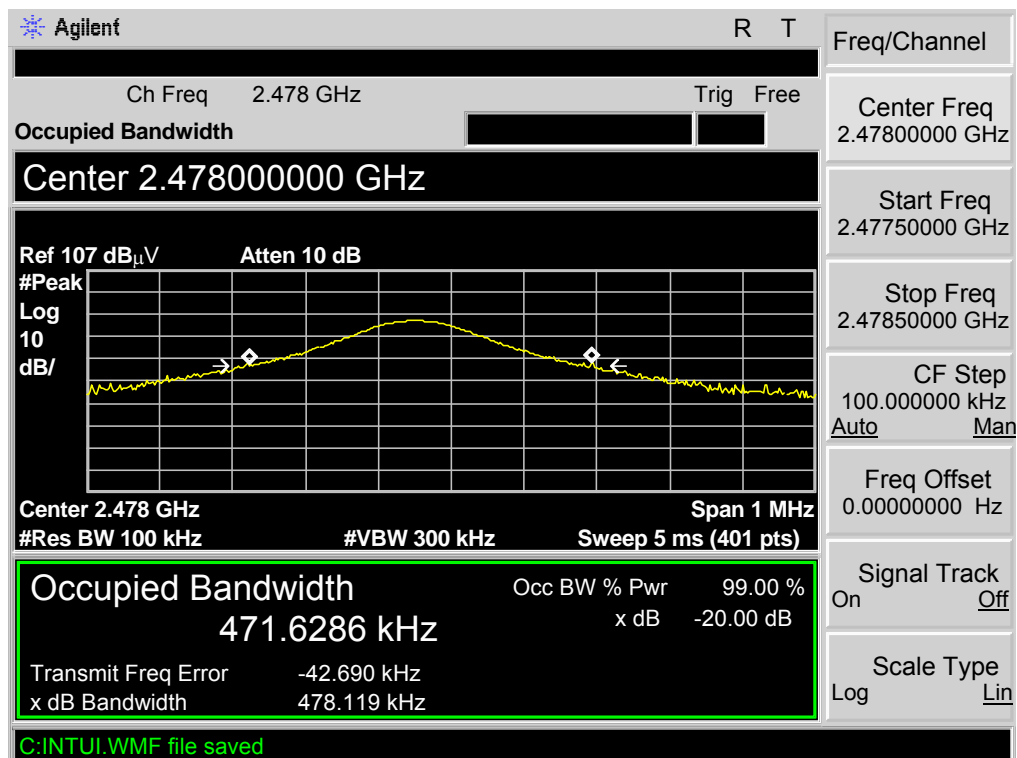
The Lowest Channel:2403MHz



The Middle Channel:2445MHz



The Middle Channel:2478MHz



5. EUT TEST PHOTO

Radiated Measurement Photos

