

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION

Product Name : Wireless Mouse Receiver
Model Number : WMXXXR Series
Trade Name : N/A
FCC ID : XSDWMXXXR
Report Number : SZEE090911430902
Date : October 17, 2009

Standards	Results
<input checked="" type="checkbox"/> 47 CFR FCC Part 15 Subpart C 15.249	PASS

Prepared for:

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N/A means not applicable.

1. CERTIFICATION INFORMATION

Applicant & Address: Advanced Sun Wah Electronic Co., Ltd
Unit 10,19F/,Kowloon Plaza, No.485 Castle Peak Road, Lai Chi Kok, Kowloon,Hongkong,China

Manufacturer & Address: Advanced Sun Wah Electronic Co., Ltd
Unit 10,19F/,Kowloon Plaza, No.485 Castle Peak Road, Lai Chi Kok, Kowloon,Hongkong,China

Type of Test: FCC Part 15 (Certification)

FCC ID: XSDWMXXXR

Equipment Under Test: Wireless Mouse Receiver

Model Name: WMXXXR(XXX stand for 000-999)

Test Model: WM113R

Trade Name: N/A

Serial Number: Not Applicable

Technical Data: DC 5V by PC USB Port

Date of test: September 21,2009 to October 17, 2009

Condition of Test Sample: Normal

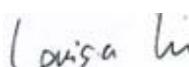
The above equipment was tested by Centre Testing International for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart C and the measurement procedure according to ANSI C63.4.

The test results of this report relate only to the tested sample identified in this report.

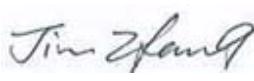
Prepared by :


Saky Yan

Reviewed by :


Louisa Lu

Approved by :


Jim Zhang

Manager

Date

October 17, 2009



2. TEST SUMMARY

Clause	Test Item	Result
1	20dB Bandwidth	PASS
2	Bandedge Emission	PASS
3	Radiated Emission	PASS

3. MEASUREMENT UNCERTAINTY

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

Measurement items	Uncertainty
Maximum Peak Conducted Output Power	0.5 dB
Radiated Emissions / Bandedge Emission	3.4 dB

4. PRODUCT INFORMATION

Items	Description
Rating	DC 5V by PC USB Port
Intentional Transceiver	Intentional Transceiver
Modulation	FSK
Frequency Range	2402 ~ 2480 MHz
Channel Number	79 (at intervals of 1MHz)
Antenna	Type: PCB Antenna
	Gain: 0dBi

The models of Wireless Mouse Receiver is WMXXXXR, all the models are identical except for the color, the appearance and the model name. And the test model is WM113R, all the test results are applicable to the other models.

5. SYSTEM TEST CONFIGURATION

5.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. It was powered by 12V DC. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

5.2 EUT Exercising Software

The EUT exercise program RF Test, (provided by client) used during testing was designed to exercise the various system components in a manner similar to a typical use.

6. TABLE OF TEST MODE

Preliminary tests were performed the entire possible Configuration in different modulation type and different data rate according to the following table to find the worst cases. And only one group of the worst - case data for each test item is shown in the report.

Test Items	Test Mode	Modulation	Channel
20dB Bandwidth	Transmitting	FSK	1 / 79
Bandedge Emission	Transmitting	FSK	1 / 79
Radiated Emission	Transmitting	FSK	1 / 40 / 79

7. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model Number	Serial Number	Due Date
Receiver	R&S	ESCI	100435	08/25/2010
Spectrum Analyzer	Agilent	E4443A	MY45300910	08/25/2010
Biconilog Antenna	A.H.System	SAS-521-2	487	06/05/2010
Horn Antenna	ETS-LINDGREN	3117	00057407	06/27/2010
Loop Antenna	ETS-LINDGREN	6502	00071730	08/25/2010
3M Chamber & Accessories	ETS-LINDGREN	FACT-3	N/A	05/11/2010

8. SUPPORT EQUIPMENT LIST

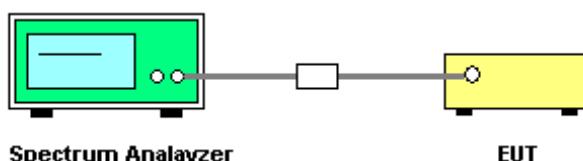
Equipment	Manufacturer	Model Number	Serial Number
Notebook PC	Sony	PCG-3G1T	282170999014058

9. 20DB BANDWIDTH MEASUREMENT

9.1. LIMITS

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, 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.

9.2. BLOCK DIAGRAM OF TEST SETUP



9.3. TEST PROCEDURE

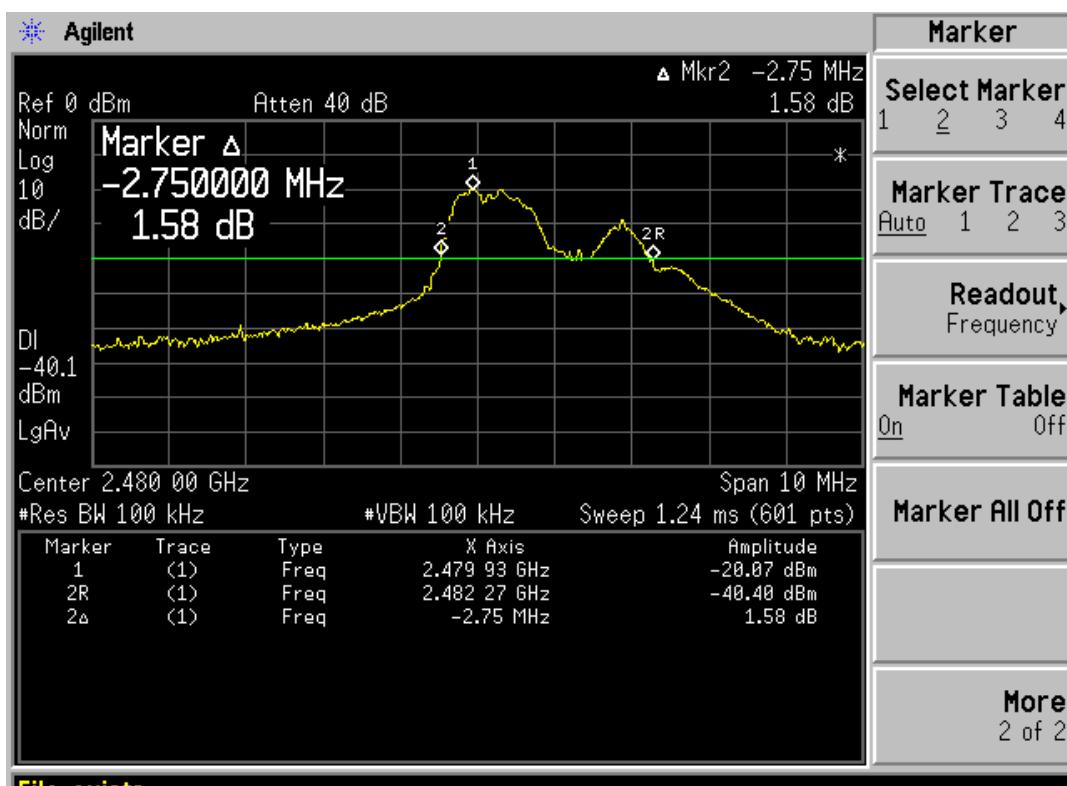
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level.
4. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

9.4. TEST RESULT

Channel	Frequency (MHz)	20 dB BW (MHz)	Result
CH1	2402	4.15	4.1500 MHz
CH79	2480	2.75	



Channel 1_ 2402 MHz



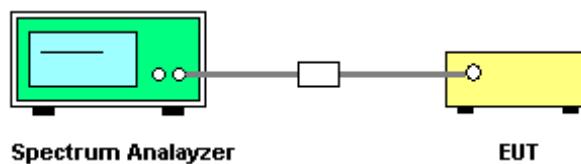
Channel 79_ 2480 MHz

10. BAND EDGE EMISSION MEASUREMENT

10.1. LIMITS

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 §15.209, whichever is the lesser attenuation.

10.2. BLOCK DIAGRAM OF TEST SETUP

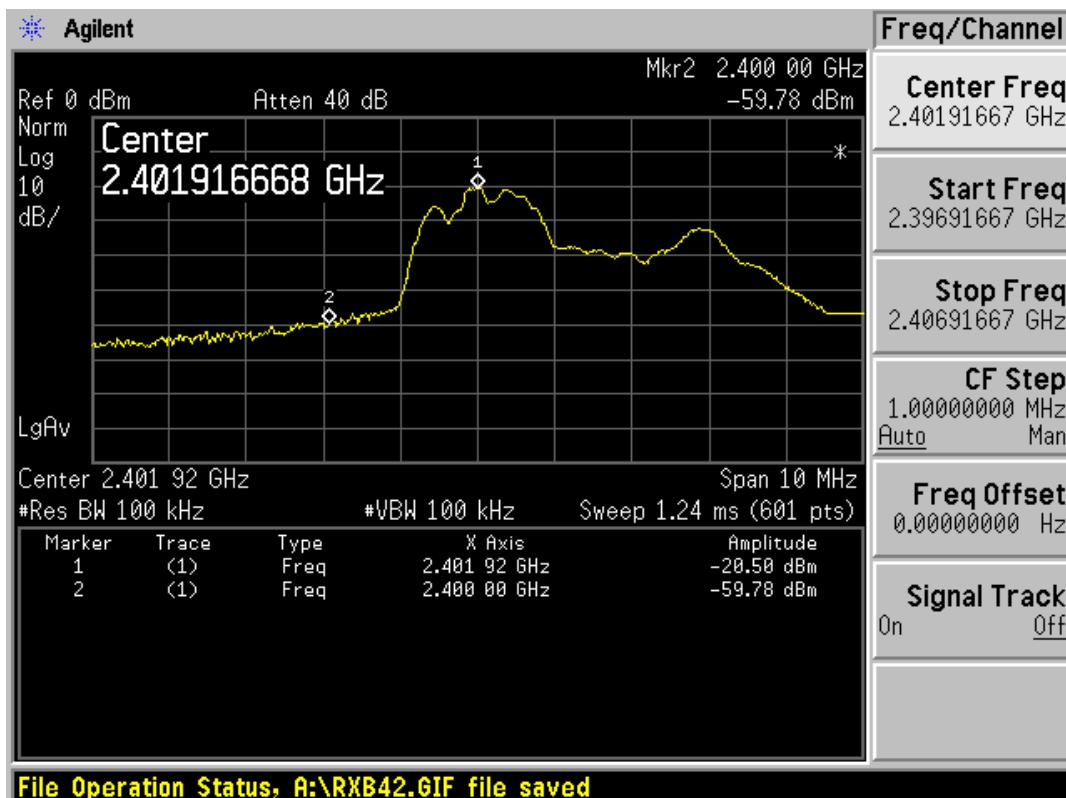


10.3. TEST PROCEDURE

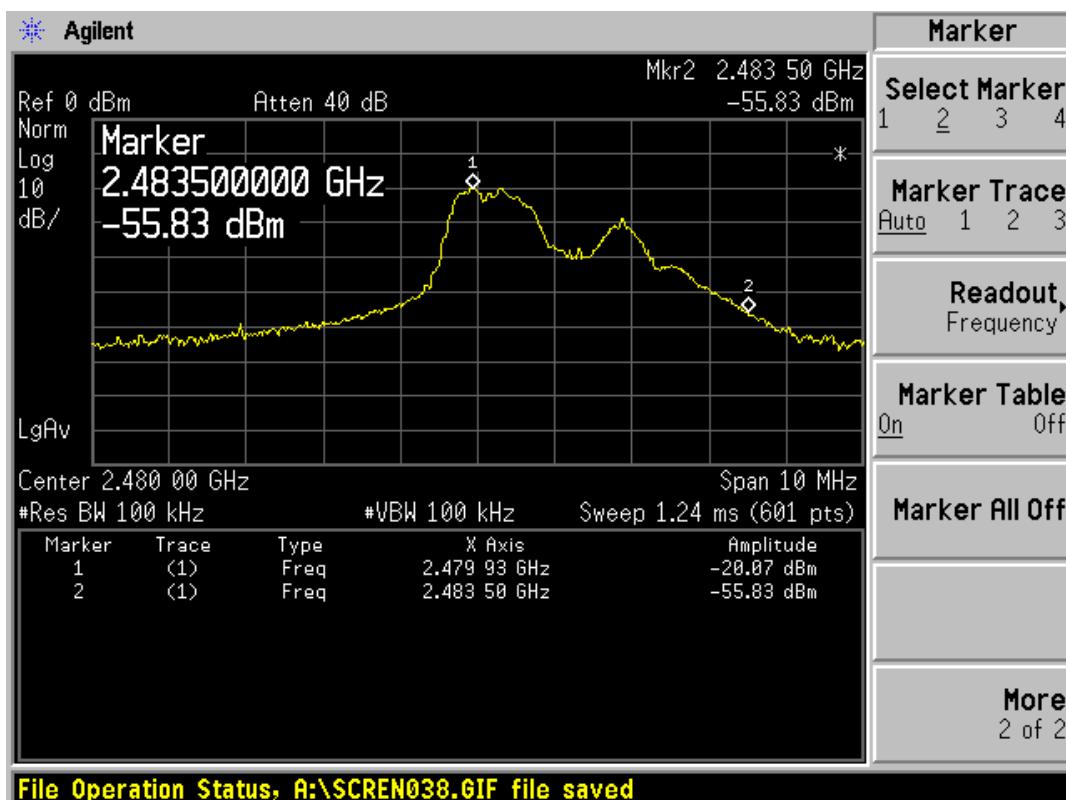
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the emission drops at the band-edge relative to the highest fundamental emission level.
4. Use the marker-delta method to determine band-edge compliance as required.

10.4. TEST RESULT

Channel _Freq. (MHz)	Fundamental Emission (dB μ V/m)	delta	AV factor (dB)	Final Emission (dB μ V/m)	Limit (dB μ V/m)	Result (Pass / Fail)
CH1_2402	88.00	-39.28	--	48.72	74 (PK)	Pass
CH1_2402	88.00	-39.28	-30	18.72	54 (AV)	Pass
CH79_2480	87.58	-35.76	--	51.82	74 (PK)	Pass
CH79_2480	87.58	-35.76	-30	21.82	54 (AV)	Pass



CH1 _ 2402MHz



CH79 _ 2480MHz

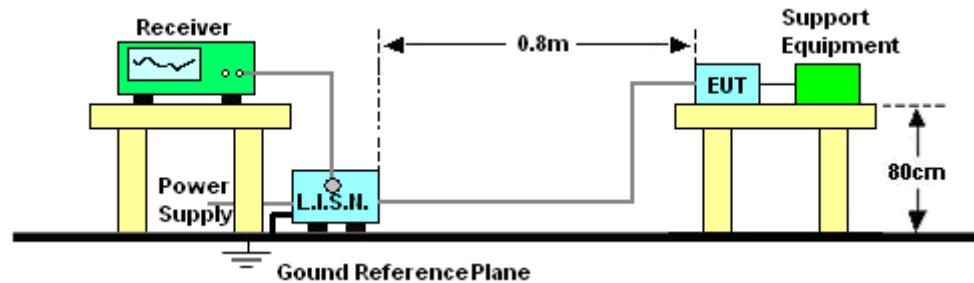
11. CONDUCTED EMISSIONS MEASUREMENT

11.1. LIMITS

Frequency	Maximum RF Line Voltage	
	Q.P. (dBuV)	Average (dBuV)
150kHz-500kHz	66-56	56-46
500kHz-5MHz	56	46
5MHz-30MHz	60	50

Note: the tighter limit applies at the band edges.

11.2. BLOCK DIAGRAM OF TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

11.3. PROCEDURE OF CONDUCTED EMISSION TEST

- The EUT was placed 0.4 meters from the conducting wall of the shielded room and connected to the main through Line Impedance Stability Network (LISN). This provided a 50ohm coupling impedance for the tested equipments.
- The bandwidth of the field strength meter (Receiver) was set at 9kHz in 150kHz ~ 30MHz.
- The disturbance levels and the frequencies of at least two highest disturbances were recorded from each power line which comprises the EUT.

11.4. TEST RESULT OF CONDUCTED EMISSION TEST

EUT : Wireless Mouse Receiver **Voltage** : AC120V/ 60Hz
M/N : WM113R **Temperature** : 26°C
Mode : NORMAL **Humidity** : 50%

FCC Conducted Emission Test Result													
Frequency (MHz)	Reading Level (dBuV)			Correct Factor (dB)	Measurement (dBuV)			Limits (dBuV)		Margin		Result (P/F)	Remarks (L/N)
	Peak	Q.P.	Avg.		Peak	Q.P.	Avg.	Q.P.	Avg.	Q.P.	Avg.		
0.1860	22.82	--	-5.22	22.01	44.83	--	16.79	64.21	54.21	<-10	-37.42	P	L
0.4580	20.64	--	-7.37	21.62	42.26	--	14.25	56.73	46.73	<-10	-32.48	P	L
2.7340	18.26	13.78	8.51	20.50	38.76	34.28	29.01	56.00	46.00	-21.72	-16.99	P	L
4.9900	17.38	--	6.11	20.37	37.75	--	26.48	56.00	46.00	<-10	-19.52	P	L
6.8380	18.72	--	2.63	20.37	39.09	--	23.00	60.00	50.00	<-10	-27.00	P	L
16.4860	21.32	--	14.32	20.78	42.10	--	35.10	60.00	50.00	<-10	-14.90	P	L
0.2316	23.39	--	6.93	22.06	45.45	--	28.99	62.39	52.39	<-10	-23.40	P	N
0.9420	12.07	--	-10.40	21.56	33.63	--	11.09	56.00	46.00	<-10	-34.91	P	N
2.0580	17.74	--	-8.39	20.90	38.64	--	12.51	56.00	46.00	<-10	-33.49	P	N
2.8060	18.09	--	9.61	20.45	38.54	--	30.06	56.00	46.00	<-10	-15.94	P	N
16.8260	23.04	16.52	12.52	20.83	43.87	37.35	33.35	60.00	50.00	-22.65	-16.65	P	N
24.4540	20.08	--	6.51	22.52	42.60	--	29.03	60.00	50.00	<-10	-20.97	P	N

Frequency
Reading level
Correct Factor
Measurement
Limit (dBuV)
Margin(dB)
"---"

= Emission frequency in MHz
= Uncorrected receiver reading
= Cable loss + LISN inserting loss
= Reading level + Factor
= Limit stated in standard
= Reading in reference to limit
= The emission level complied with the
Average limits, with at least 10 dB margin,
so no further recheck.

12. RADIATED EMISSIONS MEASUREMENT

12.1. LIMITS

Intentional radiators operated within these frequency bands shall comply with the following:

Frequency (MHz)	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

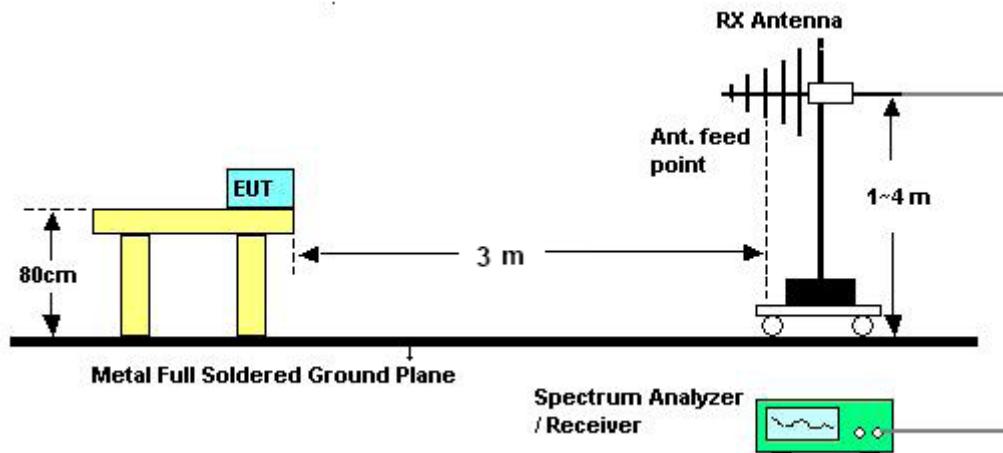
The field strength of any emissions, which appear outside of operating frequency band and restricted band specified on 15.205(a), shall not exceed the general radiated emission limits as below.

Frequency (MHz)	Field strength (μ V/m)	Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

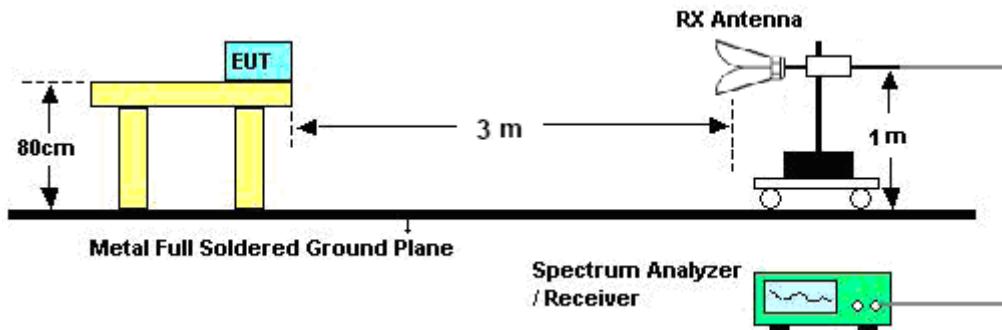
Note: the tighter limit applies at the band edges.

12.2. BLOCK DIAGRAM OF TEST SETUP

For radiated emissions from 30 - 1000MHz



For radiated emissions from 1GHz to 25GHz



12.3. TEST PROCEDURE

A. Above 30MHz

- The EUT was placed on the top of a turntable 0.8 meters above the ground in the chamber, 3 meters away from the antenna (wideband antenna), which was mounted on the top of a variable-height antenna tower. The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- 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 turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

B. Below 30MHz

- The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 1 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.
- For each suspected emission, the EUT was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test frequency analyzer system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

12.4. TEST RESULT

Worst case-- Modulation Type: FSK Data Rate: 1Mbps

Note: Limit $\text{dB}\mu\text{V/m}$ @1m = Limit $\text{dB}\mu\text{V/m}$ @300m + 90
 Limit $\text{dB}\mu\text{V/m}$ @1m = Limit $\text{dB}\mu\text{V/m}$ @30m + 50
 Limit $\text{dB}\mu\text{V/m}$ @1m = Limit $\text{dB}\mu\text{V/m}$ @3m +10

RE Test Result					
Frequency (MHz)	Emission (dBuV/m)	AV Factor (dB)	Final Emission (dBuV/m)	Limit (dBuV/m)	Result (P/F)
513.3832	34.51	---	32.07 (QP)	46	Pass
566.7333	33.42	---	31.14 (QP)	46	Pass
2402.0000	88.00	---	88.00(PK)	---	Pass
2402.0000	88.00	-30.00	58.00 (AV)	---	Pass
4804.0000	57.31	---	57.31 (PK)	74	Pass
4804.0000	57.31	-30.00	27.31 (AV)	54	Pass
7206.0000	45.61	---	45.61(PK)	74	Pass
7206.0000	45.61	-30.00	15.61 (AV)	54	Pass
9608.0000	46.29	---	46.29 (PK)	74	Pass
9608.0000	46.29	-30.00	16.29 (AV)	54	Pass

CH1 _ 2402MHz

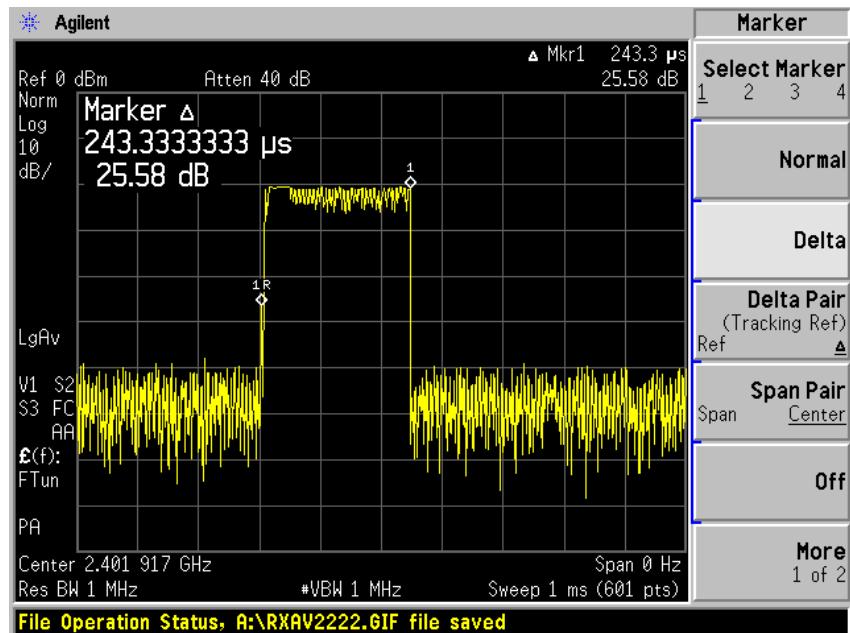
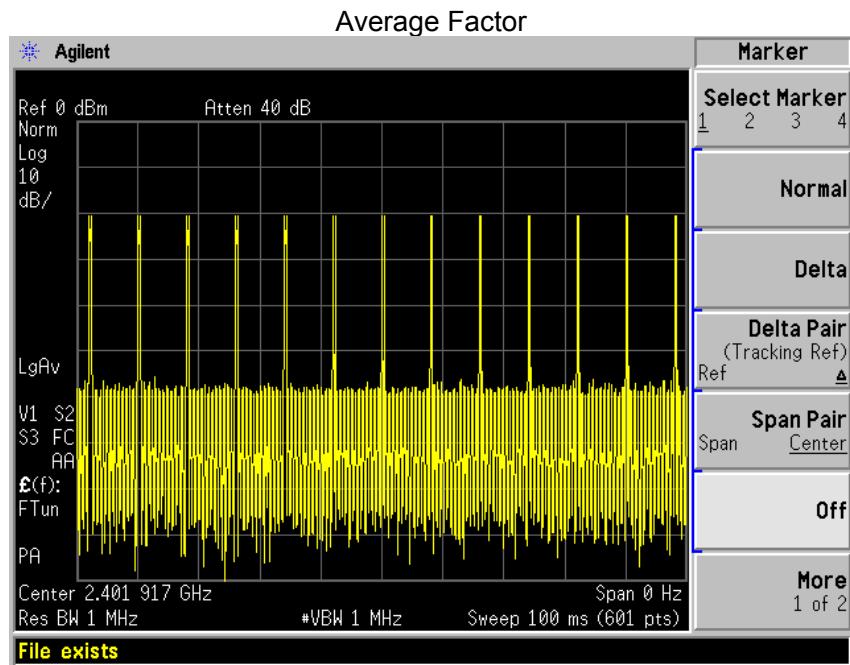
RE Test Result					
Frequency (MHz)	Emission (dBuV/m)	AV Factor (dB)	Final Emission (dBuV/m)	Limit (dBuV/m)	Result (P/F)
468.1167	29.42	---	26.07 (QP)	46	Pass
851.2667	36.54	---	31.52 (QP)	46	Pass
2440.0000	87.39	---	87.39 (PK)	---	Pass
2440.0000	87.39	-30.00	57.39 (AV)	---	Pass
4880.0000	57.16	---	57.16 (PK)	74	Pass
4880.0000	57.16	-30.00	27.16 (AV)	54	Pass
7320.0000	44.55	---	44.55 (PK)	74	Pass
7320.0000	44.55	-30.00	14.55 (AV)	54	Pass
9760.0000	48.37	---	48.37 (PK)	74	Pass
9760.0000	48.37	-30.00	18.37 (AV)	54	Pass

CH40 _ 2440MHz



RE Test Result					
Frequency (MHz)	Emission (dBuV/m)	AV Factor (dB)	Final Emission (dBuV/m)	Limit (dBuV/m)	Result (P/F)
417.7667	27.10	---	24.17 (QP)	46	Pass
529.5500	29.44	---	27.40 (QP)	46	Pass
2480.0000	87.58	---	87.58(PK)	---	Pass
2480.0000	87.58	-30.00	57.58 (AV)	---	Pass
4960.0000	59.72	---	59.72 (PK)	74	Pass
4960.0000	59.72	-30.00	29.72 (AV)	54	Pass
7440.0000	44.06	---	44.06 (PK)	74	Pass
7440.0000	44.06	-30.00	16.06 (AV)	54	Pass
9920.0000	47.13	---	47.13 (PK)	74	Pass
9920.0000	47.13	-30.00	17.13 (AV)	54	Pass

CH79_2480MHz



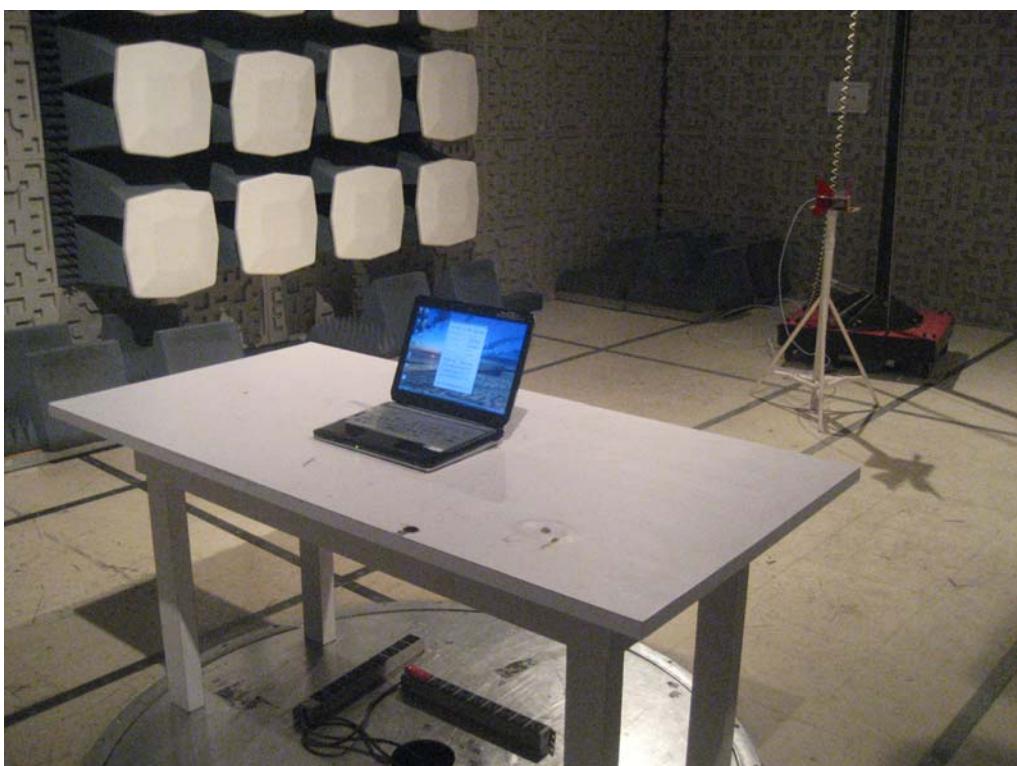
The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 100ms

Effective period of the cycle = $13 \times 243\mu\text{s}$
= 3.159ms

DC = 3.159ms / 100ms = 0.03159

Therefore, the averaging factor is found by $20 \log_{10} 0.03159 = -30 \text{ dB}$

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP**TEST SETUP OF RADIATED EMISSION (30MHz-1GHz)****TEST SETUP OF RADIATED EMISSION (above 1GHz)**

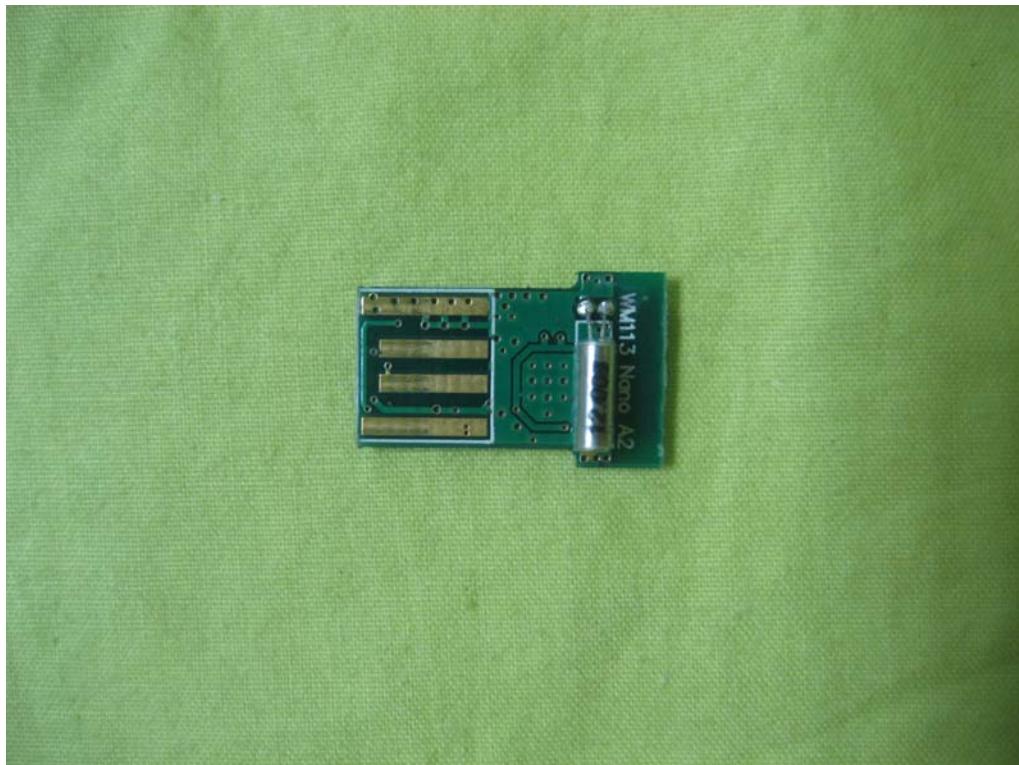
**TEST SETUP OF CONDUCTED EMISSION**

APPENDIX 2 EXTERNAL PHOTOGRAPHS OF EUT

Front View of EUT



Rear View of EUT

APPENDIX 3 INTERNAL PHOTOGRAPHS OF EUT

Uncovered View of EUT-1



Uncovered View of EUT-2

----- End of report -----