EMC TEST Report

FCC ID: H8GNB20DP

This report concerns (check one) : ■ Original Grant □ Class II Change

Issued Date : Aug. 09, 2006
Report No. : 0606050
Equipment : Wireless Battery Free Optical Mouse
Model No. : NB-20D

Applicant : A-FOUR TECH CO., LTD.
Address : 6F, No.108, Min-Chuan Rd., Hsin-Tien, Taipei, Taiwan, R.O.C.

Tested by:
Neutron Engineering Inc. EMC Laboratory
Data of Test:
Jun. 08, 2006 ~ Jun. 27, 2006

Testing Engineer : _____ (Josh Lin)

Technical Manager : _____ (Jeff Yang)

Authorized Signatory : _____ (Andy Chiu)

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NVLAP Lab Code: 200145-0 ilac-MRA TAF Testing Laboratory 0659

Declaration

Neutron represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**) of **R.O.C**., or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

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1. CERTIFICATION

Equipment: Wireless Battery Free Optical Mouse
Trade Name: A4TECH
Model No.: NB-20D
Applicant: A-FOUR TECH CO., LTD.
Data of Test: Jun. 08, 2006 ~ Jun. 27, 2006
Test Item: ENGINEERING SAMPLE
Standards: FCC Part15, Subpart C / RSS-210: 2004/ ANCI C63.4 : 2003

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-1-0606050) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of NVLAP and CNLA according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards: (Antenna to EUT distance is **3** m)

FCC Part15, Subpart C				
Standard	Test Item	Limit	Frequency Range (MHz)	Judgment
15.207	Conducted Emission	Class B	0.15 - 30	PASS
15.209	Radiated Emission	Class B	0.09 -1000	PASS

NOTE:

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

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **C01/OS02** at the location of No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

2.2 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** %。

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U，(dB)	NOTE
C01	ANSI	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U，(dB)	NOTE
OS01	ANSI	30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
OS02	ANSI	30MHz ~ 200MHz	V	2.48	
		30MHz ~ 200MHz	H	2.16	
		200MHz ~ 1,000MHz	V	2.50	
		200MHz ~ 1,000MHz	H	2.66	

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Wireless Battery Free Optical Mouse
Trade Name	A4TECH
Model No.	NB-20D
OEM Brand/Model No.	N/A
Model Difference	N/A
Product Description	The EUT is a Wireless Battery Free Optical Mouse. Operation Frequency: 121 KHz – 128 KHz Product Class: Class 1 Receiver Class: Class 3 Modulation Type: ASK Antenna Designation: Integra (Induction coil) Output Power: 2.5 mW (Max.) Mode of Operation: Simplex 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.
Power Supply	Power Pad: DC 5 V, 300mA/ Supplied from PC USB port Wireless Battery Free Optical Mouse: DC 5 V, 90mA/ Faradism
Connecting I/O Port(s)	Please refer to the User's Manual
Products Covered	N/A

Note:

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

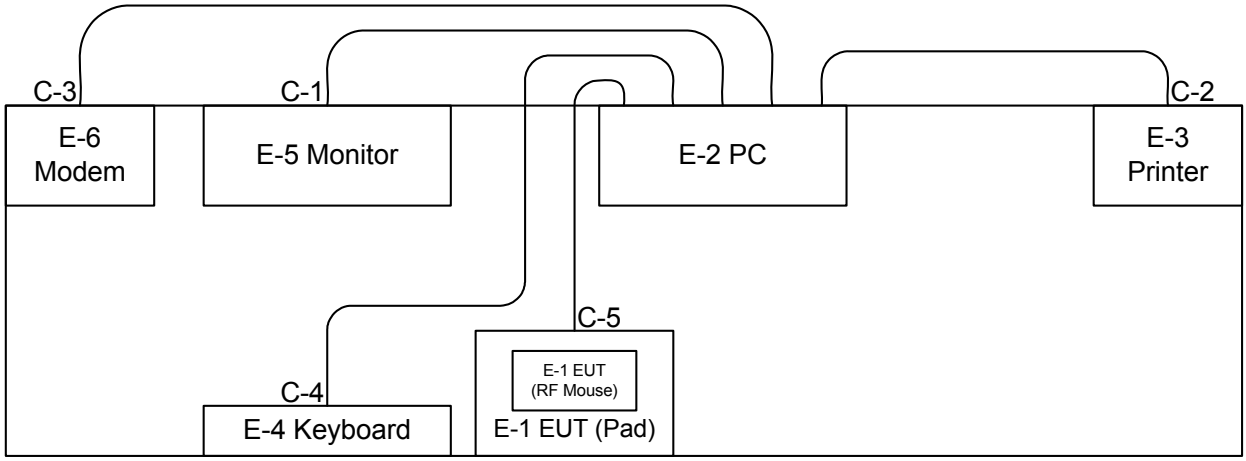
3.2 DESCRIPTION OF TEST MODES

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 Test Mode	Description
Mode 1	121.0 KHz
Mode 2	124.5 KHz
Mode 3	128.0 KHz

For Conducted / Radiated Test	
Final Test Mode	Description
Mode 2	124.5 KHz

3.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



C-1 VGA Cable
C-2 Centronics Cable
C-3 Interface Cable
C-4 Data Cable
C-5 Data Cable

3.4 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Wireless Battery Free Optical Mouse	A4TECH	NB-20D	H8GNB20DP	N/A	EUT
E-2	PC	IBM	8196-I5V	DOC	99M1136	
E-3	19" LCD Monitor	Samsung	SyncMaster 193P	GH19PH	DI19H4JXC05517A	
E-4	PS/2 K/B	Logitech	Y-SJ17(ACK260A)	DOC	SYU44664880	
E-5	Modem	ACEEX	DM-1414V	DOC	8041708	
E-6	Printer	SII	DPU-414	DOC	1045105A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	YES	YES	1.5M	
C-2	YES	NO	1.8M	
C-3	YES	NO	1.5M	
C-4	YES	NO	1.5M	
C-5	NO	NO	0.8M	

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.

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

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

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

Note:

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

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

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	Rolf Heine	NNB-2/16Z	98053	Dec. 19, 2006
2	4L-V-LISN	Rolf Heine	NNB-4/63TL	02/10040	Apr. 10, 2007
3	Pulse Limiter	Electro-Metrics	EM-7600	112644	Nov. 29, 2006
4	50Ω Terminator	N/A	N/A	N/A	May.11, 2007
5	Test Cable	N/A	C01	N/A	Nov. 29, 2006
6	EMI Test Receiver	R&S	ESCI	100082	Feb. 01, 2007

Remark: ” N/A” denotes No Model No. , Serial No. or No Calibration specified.

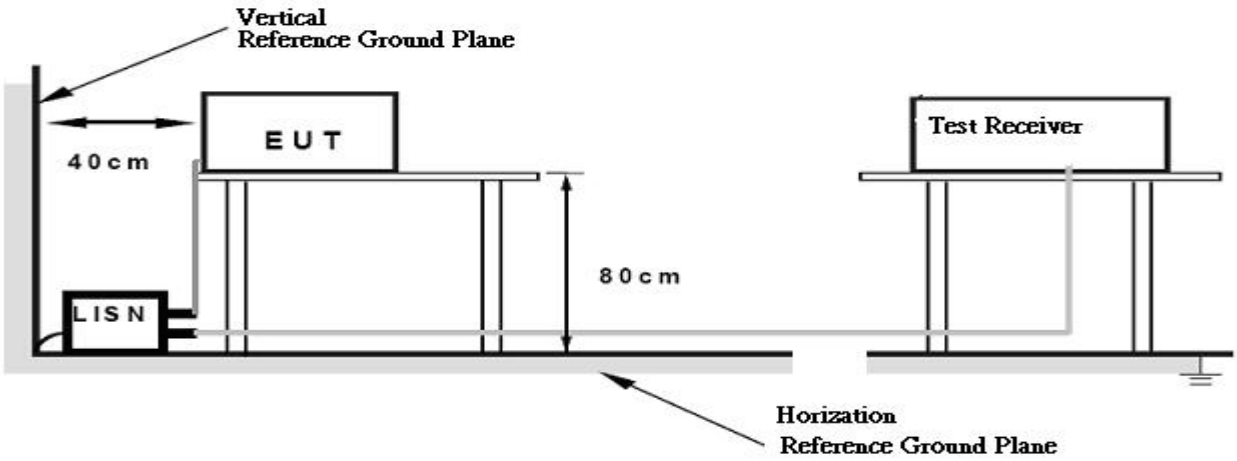
4.1.3 TEST PROCEDURE

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.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation

4.1.5 TEST SETUP



4.1.6 EUT OPERATING CONDITIONS

The EUT exercise program used during radiated and/or conducted emission measurement was designed to exercise the various system components in a manner similar to a typical use. The program contained on a PC hard disk and is auto-starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is:

1. Read (write) from (to) mass storage device (Disk).
2. Send "H" pattern to video port device (Monitor).
3. Send " H " pattern to parallel port device (Printer).
4. Send " H " pattern to serial port device (Modem).
5. Repeated from 2 to 4 continuously.

4.1.7 TEST RESULTS

EUT：	Wireless Battery Free Optical Mouse	Model No. ：	NB-20D
Temperature：	25 ℃	Relative Humidity：	57 %
Pressure：	1017 hPa	Test Power ：	AC 120V/60Hz
Test Mode ：	124.5 KHz		

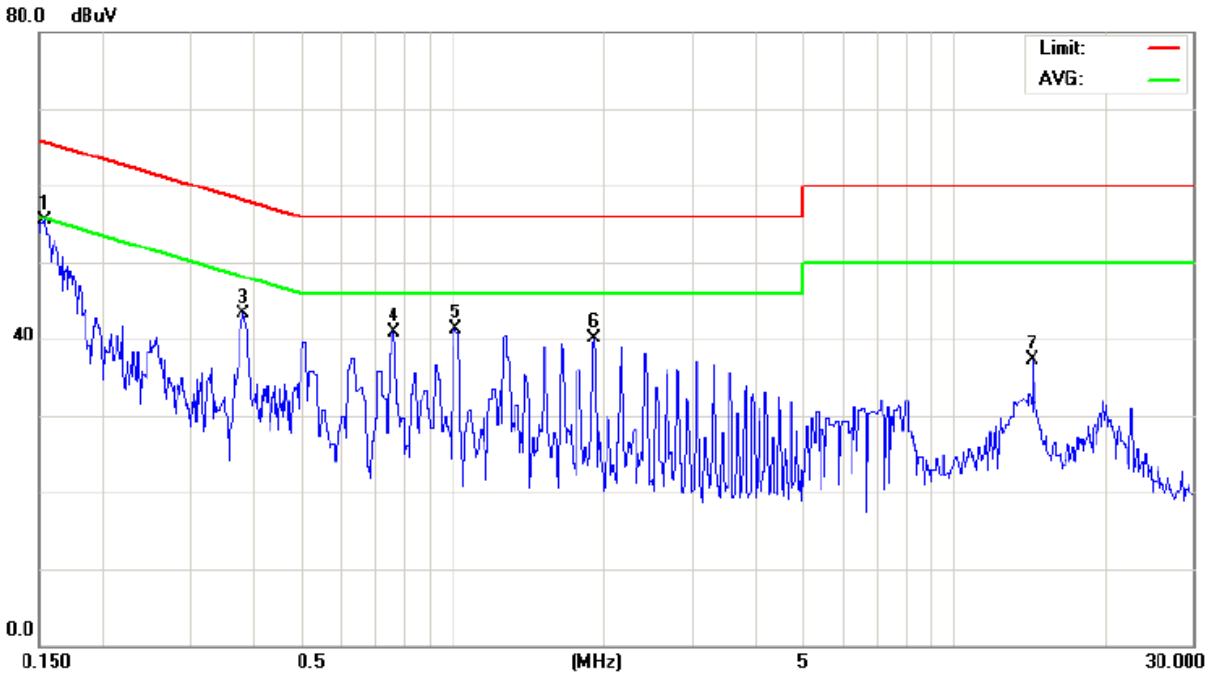
Freq. (MHz)	Terminal L/N	Measured(dBuV)		Limits(dBuV)		Margin (dB)	Note
		QP-Mode	AV-Mode	QP-Mode	AV-Mode		
0.15	Line	55.48	33.22	65.81	55.81	-10.33	(QP)
0.38	Line	43.37	*	58.27	48.27	-14.90	(QP)
0.76	Line	40.81	*	56.00	46.00	-15.19	(QP)
1.01	Line	41.26	*	56.00	46.00	-14.74	(QP)
1.91	Line	40.08	*	56.00	46.00	-15.92	(QP)
14.35	Line	37.23	*	60.00	50.00	-22.77	(QP)

Remark

(1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz；SPA setting in RBW=10KHz,VBW =10KHz, Swp. Time = 0.3 sec./MHz。Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Swp. Time =0.3 sec./MHz。

(2) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。In this case, a " * " marked in AVG Mode column of Interference Voltage Measured。

(3) Measuring frequency range from 150KHz to 30MHz。



EUT：	Wireless Battery Free Optical Mouse	Model No. ：	NB-20D
Temperature：	25 ℃	Relative Humidity：	57 %
Pressure：	1017 hPa	Test Power ：	AC 120V/60Hz
Test Mode ：	124.5 KHz		

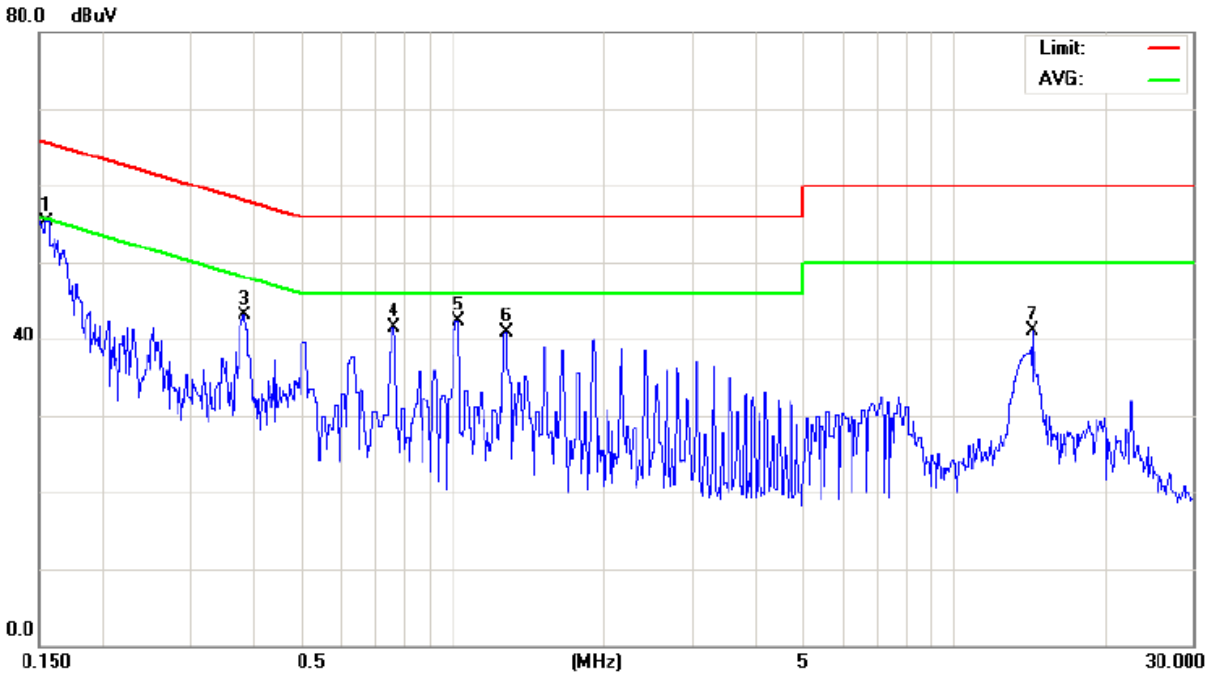
Freq. (MHz)	Terminal L/N	Measured(dBuV)		Limits(dBuV)		Margin (dB)	Note
		QP-Mode	AV-Mode	QP-Mode	AV-Mode		
0.15	Neutral	55.34	32.82	65.77	55.77	-10.43	(QP)
0.38	Neutral	43.18	*	58.20	48.20	-15.02	(QP)
0.76	Neutral	41.44	*	56.00	46.00	-14.56	(QP)
1.02	Neutral	42.26	*	56.00	46.00	-13.74	(QP)
1.27	Neutral	40.95	*	56.00	46.00	-15.05	(QP)
14.35	Neutral	41.15	*	60.00	50.00	-18.85	(QP)

Remark

(1) Reading in which marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz；SPA setting in RBW=10KHz,VBW =10KHz, Swp. Time = 0.3 sec./MHz。Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Swp. Time =0.3 sec./MHz。

(2) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform。In this case, a " * " marked in AVG Mode column of Interference Voltage Measured。

(3) Measuring frequency range from 150KHz to 30MHz。



4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS

Frequency (MHz)	Field Strength Limitation		Field Strength Limitation at 3m Measurement Dist	
	(uV/m)	Dist	(uV/m)	(dBuV/m)
0.009 – 0.490	2400 / F(KHz)	300m	10000 * 2400/F(KHz)	20log 2400/F(KHz) + 80
0.490 – 1.705	24000 / F(KHz)	30m	100 * 24000/F(KHz)	20log 24000/F(KHz) + 40
1.705 – 30.00	30	30m	100* 30	20log 30 + 40
30.0 – 88.0	100	3m	100	20log 100
88.0 – 216.0	150	3m	150	20log 150
216.0 – 960.0	200	3m	200	20log 200
Above 960.0	500	3m	500	20log 500

Notes:

(1) The tighter limit shall apply at the boundary between two frequency range.

(2) Limitation expressed in dBuV/m is calculated by 20log Emission Level (uV/m).

(3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d_2/d_1)^2$.
Example:
F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as $L_{d1} = L_1 = 30uV/m * (10)^2 = 100 * 30$ uV/m

4.2.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3058	Nov. 29, 2006
2	Test Cable	N/A	10M_OS02	N/A	Nov. 29, 2006
3	Test Cable	N/A	OS02-1/-2/-3	N/A	Nov. 29, 2006
4	Pre-Amplifier	Anritsu	MH648A	M09961	Nov. 29, 2006
5	EMI Test Receiver	R&S	ESCI	100082	Feb. 01, 2007
6	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A
7	Turn Table	Chance Most	CMTB-1.5	N/A	N/A
8	Loop Ant	EMCO	6502	00042960	Jan. 13, 2008

Remark: ” N/A” denotes No Model No. / Serial No. and No Calibration specified.

4.2.3 TEST PROCEDURE

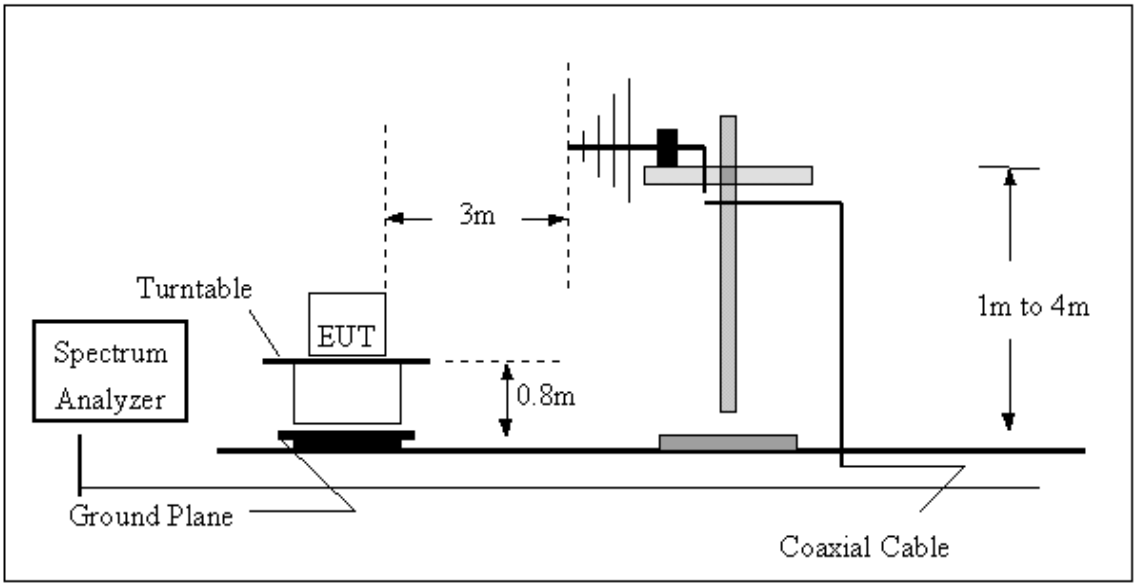
a. The measuring distance of at 3m or 10m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3m or 10 meter open area test site. The table 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.

4.2.4 DEVIATION FROM TEST STANDARD

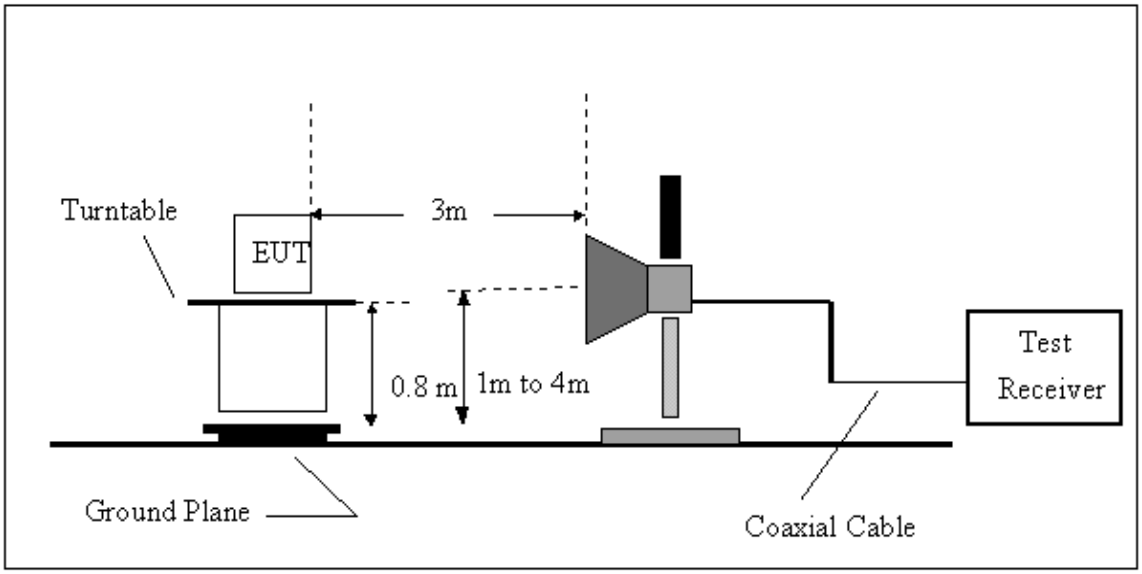
No deviation

4.2.5 TEST SETUP

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



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



4.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.6** Unless otherwise a special operating condition is specified in the follows during the testing.

4.2.7 TEST RESULTS (Below 30MHz)

EUT：	Wireless Battery Free Optical Mouse	Model No. ：	NB-20D
Temperature：	26 ℃	Relative Humidity：	70 %
Pressure：	1010 hPa	Test Power ：	AC 120V/60Hz
Test distance ：	3m		
Test Mode ：	124.5 KHz		

Freq. (KHz)	Receiver Reading in dBuV/m	Factor (dB)	Field Strength Limit (uV/m)	Required Measurement Distance(m)	Limitation Converted 3m dist. (dBuV/m)	Over Limit	Dectector Mode PK/AV
124.50	79.97	13.00	19.28	300.00	105.70	- 12.73	Peak
249.00	44.48	12.80	9.64	300.00	99.68	- 42.40	Peak
373.50	-	12.80	6.43	300.00	96.16	-	Peak
498.00	29.63	12.70	48.19	30.00	73.66	- 31.33	Peak
622.50	-	12.70	38.55	30.00	71.72	-	Peak
747.00	-	12.80	32.13	30.00	70.14	-	Peak
871.50	-	12.80	27.54	30.00	68.80	-	Peak
996.00	-	12.80	24.10	30.00	67.64	-	Peak
1120.50	-	12.90	21.42	30.00	66.62	-	Peak
1245.00	-	12.90	19.28	30.00	65.70	-	Peak

Remark：

(1) Spectrum Setting:
9 KHz – 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms.
150 K Hz – 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms.
30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.

(2) All receiver readings (the measured field strength levels) are measured from loop antenna directly.

(3) The emission limits shown in the above table are base on measurements employing a quasi-peak detector except for the frequency bands 9-90 KHz, 110-490 KHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(4) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

(Between 30 – 1000 MHz)

EUT：	Wireless Battery Free Optical Mouse	Model No. ：	NB-20D
Temperature：	325 ℃	Relative Humidity：	72 %
Pressure：	1010 hPa	Test Power ：	AC 120V/60Hz
Test distance ：	3m		
Test Mode ：	124.5 KHz		

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dB)	Note
60.25	V	Peak	33.74	-7.07	26.67	40.00	- 13.33	
132.66	V	Peak	32.41	-5.87	26.54	43.50	- 16.96	
150.08	V	Peak	32.86	-5.46	27.40	43.50	- 16.10	
161.82	V	Peak	31.86	-5.56	26.30	43.50	- 17.20	
250.16	V	Peak	35.71	-6.44	29.27	46.00	- 16.73	
664.13	V	Peak	29.94	3.72	33.66	46.00	- 12.34	

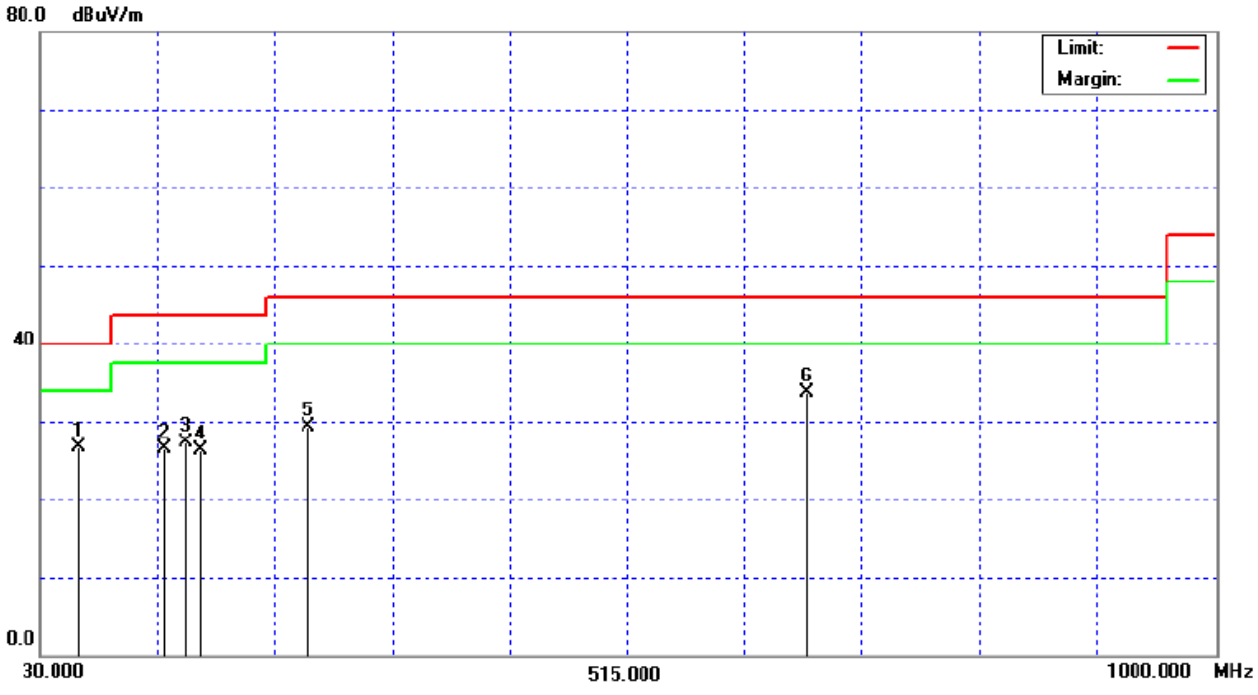
Remark：

(1) Spectrum Setting:
9 KHz – 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms.
150 K Hz – 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms.
30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn‘t perform ◦

(3) Measuring frequency range from 30MHz to 1000MHz(@10m) ◦

(4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table ◦



EUT：	Wireless Battery Free Optical Mouse	Model No. ：	NB-20D
Temperature：	325 ℃	Relative Humidity：	72 %
Pressure：	1010 hPa	Test Power ：	AC 120V/60Hz
Test distance ：	3m		
Test Mode ：	124.5 KHz		

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dB)	Note
61.12	H	Peak	29.59	-7.13	22.46	40.00	- 17.54	
132.06	H	Peak	29.47	-5.88	23.59	43.50	- 19.91	
186.34	H	Peak	32.55	-7.72	24.83	43.50	- 18.67	
200.12	H	Peak	33.01	-8.81	24.20	43.50	- 19.30	
250.00	H	Peak	33.78	-6.44	27.34	46.00	- 18.66	
350.29	H	Peak	34.00	-3.80	30.20	46.00	- 15.80	

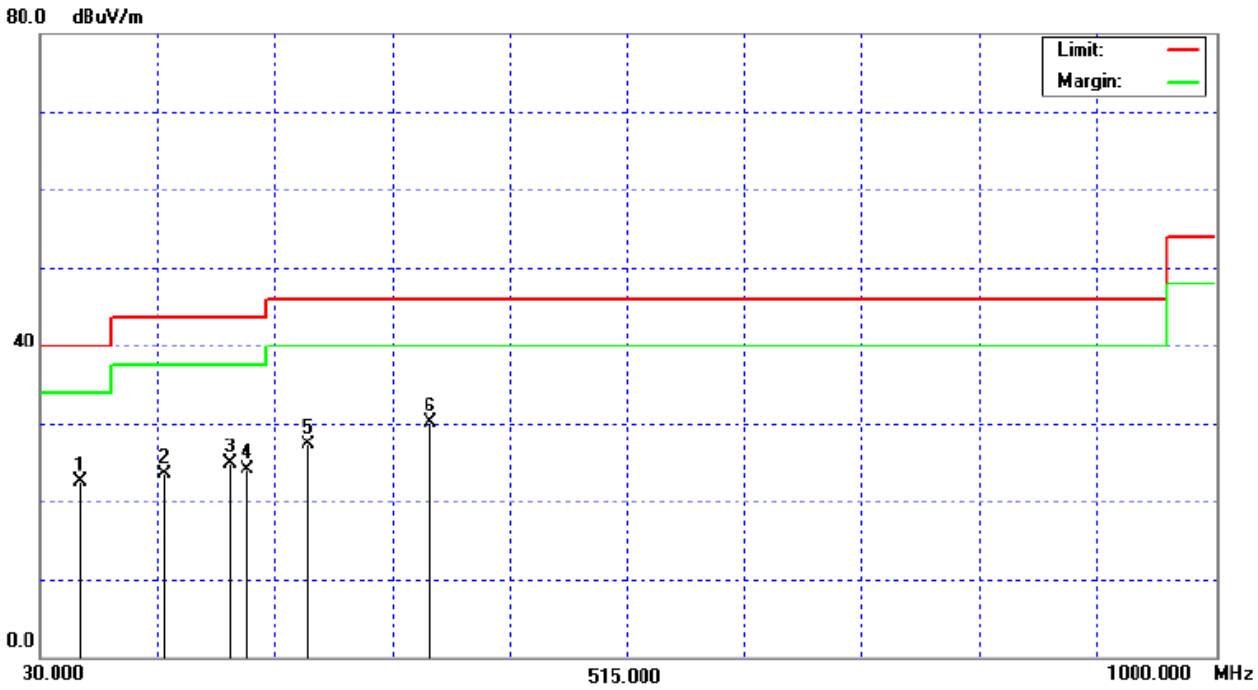
Remark：

(1) Spectrum Setting:
9 KHz – 150 KHz, RBW= 1 KHz, VBW=1 KHz, Sweep time = 200 ms.
150 K Hz – 30 MHz, RBW= 9 KHz, VBW=9 KHz, Sweep time = 200 ms.
30 MHz – 1000 MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.

(2) All readings are Peak unless otherwise stated QP in column of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measure-ment didn‘t perform。

(3) Measuring frequency range from 30MHz to 1000MHz(@10m)。

(4) If the peak scan value lower limit more than 20dB, then this signal data does not how in table。



ATTACHMENT

PHOTOGRAPHS OF EUT