

Measurement Report

FCC ID: H8GRSOP55NThis report concerns (check one) : ☒ Original Grant ☐ Class II Change

Issued Date : Aug. 16, 2005

Project No. : 0507054

Equipment : RF Mouse

Model No. : RFSOP-55; RFSWOP-55; RP-655

Applicant : A-FOUR TECH CO., LTD.

6F, No.108, Min-Chuan Rd., Hsin-Tien,
Taipei, Taiwan, R.O.C.

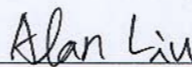
Tested by:

Neutron Engineering Inc. EMC Laboratory

Data of Test:

Apr. 14, 2005 ~ Jul. 28, 2005

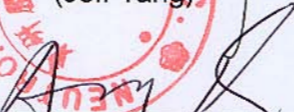
Testing Engineer :


(Alan Liu)

Technical Manager :


(Jeff Yang)

Authorized Signatory :


(Andy Chiu)**NEUTRON ENGINEERING INC.**No. 132-1, Lane 329, Sec. 2, Palain Rd.,
Shijr City, Taipei, Taiwan

TEL : (02) 2646-5426 FAX : (02) 2646-6815



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.

Neutron's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **Neutron** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **Neutron** issued reports.

Neutron's reports must not be used by the client to claim product endorsement by the authorities or any agency of the Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and **Neutron-self**, extracts from the test report shall not be reproduced except in full with **Neutron's** authorized written approval.

Neutron's laboratory quality assurance procedures are in compliance with the **ISO Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

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.

Assessment Authorities



Test Standard/Scope/Item Acceptance

FCC Part 15 Subpart B
IEC/CISPR22
AS/NZS CISPR 22
CNS 13438

FCC Part 15 Subpart B
CISPR 22/EN 55022
AS/NZS CISPR 22
VCCI -Technical Requirement
CNS 13438
SS IEC/CISPR 22
IEC/EN 61000-3-2 IEC/EN 61000-4-5
IEC/EN 61000-3-3 IEC/EN 61000-4-6
IEC/EN 61000-4-2 IEC/EN 61000-4-8
IEC/EN 61000-4-3 IEC/EN 61000-4-11
IEC/EN 61000-4-4

Table of Contents	Page
1 . General Information	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Equipment Under Tested	5
1.4 OEM Brand/Model	5
1.5 Model Difference	5
1.6 Product Descriptions	6
1.7 Connecting I/O Port(s)	6
1.8 Power Supplied	6
1.9 Products Covered	6
1.10 Description of Test Mode(s)	6
1.11 Summary of Test Results	7
2 . RFI Emissions Measurement	8
2.1 Test Facility	8
2.2 Standard Compliance	8
2.3 Test Methodolog	8
2.4 Deviations from Standard Test Method	8
2.5 Sample(s) Tested	8
2.6 Measurement Instruments	8
2.7 Measurement Uncertainty	9
2.8 Tested System Set-Up/Configuration Details	9
2.9 EUT Operating Conditions	13
3 . Justification	14
3.1 Limitations	14
3.1.1 Power Line Conducted Emission	14
3.1.2 Radiated Emission Limits	14
3.2 Measurement Justification	15
3.2.1 Conducted Emission	15
3.2.2 Radiated Emission	15
3.2.3 Field Strength Calculation	16
3.3 Measurement Data	16
Table 4 Conducted Emission Data	18
Table 5 Radiated Emission Data (30-1000MHz)	18
Attachment	20

Table of Contents	Page
Attachment - A	21
Attachment - B	23
Attachment - C	25

1. General Information**1.1 Applicant**

Name : A-FOUR TECH CO., LTD.

Address : 6F, No.108, Min-Chuan Rd., Hsin-Tien, Taipei, Taiwan, R.O.C.

1.2 Manufacturer

Name : N/A

Address : N/A

1.3 Equipment Under Tested

Name : RF Mouse

Trade Name : A4TECH

Model No. : RFSOP-55; RFSWOP-55; RP-655

1.4 OEM Brand/Model (if applicable)

OEM Brand(s)/Model(s) except the basic model in sub-clause 1.3 is (are) the follows:

OEM Brand : N/A

Model No. : N/A

1.5 Model Difference (Series, Versions, if any)

Except the basic model no. (model designation of the sample tested in this test report), additional model no. covered is(are) :

Model RFSWOP-55; RP-655 is identical to model RFSOP-55 except the model no. designation.

1.6 Product Descriptions (Application/Features/Specification)

The EUT is a RF Mouse. A major technical descriptions of EUT is described as following:

A. Operation Frequency	CH1: 27.045 MHz and CH2: 27.145 MHz
B. Modulation Type	FSK
C. Antenna Designation	Integral
D. Number Of Channel	2

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 .

1.7 Connecting I/O Port(s)

Please refer to the User's Manual.

1.8 Power Supplied

DC 2.7V, 36mA

1.9 Products Covered (if applicable)

The sample tested including the following sub-system/module/accessory :

Sub-system/ Module/ Accessory	Model/Type No.	Int. Inst./ Ext. Cont.
N/A	N/A	N/A

1.10 Description of Test Mode(s)

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.

Mode 1 CH1

Mode 2 CH2

The EUT system operated Mode 1/2, mentioned above was found to be the worst case during the pre-scanning test.

These operation modes were used for final testing and collecting test data included in this report.

1.11 Summary of Test Results

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

FCC Part15 (15.227), Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.207	Conducted Emission	Class B	0.15-30	PASS
15.209	Radiated Emission	Class B	30-1000	PASS
15.227	Radiated Emission	10000 μ V/m (80dB μ V/m) @ 3 m	26.96-27.28	PASS

2. RFI Emissions Measurement

2.1 Test Facility

The test facilities used to collect the test data in this report located at No.132-1, Lane 329, Sec. 2, Palain Road, Shijr City, Taipei, Taiwan.

2.2 Standard Compliance

The test data contained in this report relate only to the item(s) listed below :
FCC Part15, Subpart C / ANCI C63.4 : 2003

2.3 Test Methodolog

Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.

Test procedures according to the technical standards:
FCC Part15, Subpart C / ANSI C63.4 : 2003.

2.4 Deviations from Standard Test Method

N/A

2.5 Sample(s) Tested

The representative sample tested in this reports is(are): RFSOP-55

Test results in this test report relate only to the sample(s) tested.

The EUT has been tested according to the following environmental condition:

Input Power	DC: 3V
Environmental Conditions	Please refer to the measurement data.

2.6 Measurement Instruments

Valid measurement instruments used in this report refer to **Table-1** enclosed.

2.7 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 %.

A. Conducted Measurement :5.05dB

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	NOTE
OS-01	ANSI	30MHz ~ 200MHz	H	4.59	
		30MHz ~ 200MHz	V	4.80	
		200MHz ~ 1,000MHz	H	4.47	
		200MHz ~ 1,000MHz	V	5.03	

2.8 Tested System Set-Up/Configuration Details

The system was configured for testing in a typical fashion (as a user would normally use) or in-accordance with the operating configuration specified in the user's manual. A Block Diagram(please refer to the Diagram - 1) and Photos(please refer to the attachment - A) showing the set-up/configuration of system tested. In addition, **Table-2** and **Table-3** provide a detail of all equipment items and cables information used in the system tested.

Table -1 Measurement Instruments List

Item	Instruments	Mfr/Brand	Model/Type No.	Serial No.	Calibrated Date	Next Cali. Date	Note
1	LISN	EMCO	3825/2	9605-2539	2004-10-01	2005-09-30	✓
2	LISN	Rolf Heine	NNB-2/16Z	98083	2004-08-03	2005-08-02	
3	LISN	Rolf Heine	NNB-2/16Z	98053	2004-12-24	2005-12-23	
4	4L-V-LISN	Rolf Heine	NNB-4/63TL	02/10040	2005-04-08	2006-04-07	✓
5	LISN	EMCO	3816/2	00042991	2005-01-12	2007-01-11	
6	LISN	EMCO	4825/2	00028234	2005-04-01	2006-03-31	
7	ISN	SCHAFFNER	ISN T400	16017	2005-04-01	2007-03-31	
8	Pulse Limiter	Electro-Metrics	EM-7600	112644	2004-12-07	2005-12-06	✓
9	50Ω Terminator	N/A	N/A	N/A	2005-05-12	2007-05-11	✓
10	Test Cable	N/A	C01	N/A	2004-12-08	2005-12-07	✓
11	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3058	2004-10-20	2005-10-19	
12	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9160	3177	2005-02-07	2007-02-06	✓
13	Log-Bicon Antenna	MESS-ELEKTRONIK	VULB 9161	4022	2005-07-14	2006-07-13	
14	Test Cable	N/A	10M_OS01	N/A	2004-12-08	2005-12-07	✓
15	Test Cable	N/A	OS01-1/-2	N/A	2004-12-08	2005-12-07	✓
16	Test Cable	N/A	10M_OS02	N/A	2004-12-08	2005-12-07	
17	Test Cable	N/A	OS02-1/-2/-3	N/A	2004-12-08	2005-12-07	
18	RF Switch	Anritsu	MP59B	M65982	2004-12-07	2005-12-06	
19	Pre-Amplifier	Anritsu	MH648A	M09961	2004-11-24	2005-11-23	✓
20	Spectrum Analyzer	ADVAN TEST	R3261C	81720298	2004-09-01	2005-08-31	✓
21	Spectrum Analyzer	ADVAN TEST	R3132	81700025	2005-02-23	2006-02-22	
22	EMI Test Receiver	R&S	ESCI	1166.5950.03	2005-02-02	2007-02-01	
23	Test Receiver	R&S	ESH3	860156/018	2004-12-31	2005-12-30	
24	Test Receiver	R&S	ESVP	860687/009	2004-12-31	2005-12-30	
25	Test Receiver	MEB	SMV41	130	2004-12-06	2005-12-05	✓
26	Test Receiver	PMM	PMM 9000	4310J01002	2005-02-25	2006-02-24	
27	Horn Antenna	EMCO	3115	9605-4803	2005-06-15	2006-06-14	
28	Absorbing Clamp	R&S	MDS-21	841077/011	2004-09-09	2005-09-08	
29	Voltage Probe	R&S	ESH2-Z3	841.800/023	2004-09-07	2005-09-06	
30	Antenna Mast	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓
31	Turn Table	Chance Most	CMTB-1.5	N/A	N/A	N/A	✓
32	Loop Ant	R&S	HFH2-Z2	830749/020	2004-10-01	2005-09-30	
33	Loop Ant	EMCO	6502	00042960	2005-01-14	2008-01-13	

Remark :

(1)" ✓" indicates the instrument used in Test Report.

(2)" N/A" denotes No Model No. / Serial No. and No Calibration specified.

Diagram - 1
Block diagram showing the configuration of system tested

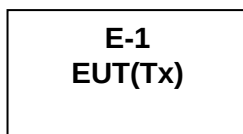


Table - 2 Equipments Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	RF Mouse	A4TECH	RFSOP-55	H8GRSOP55N	N/A	EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.
- (2) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (3) The support equipment was authorized by Declaration of Confirmation.

Table - 3 Information of Interface Cable

Item	Shielded Type	Ferrite Core	Length	Note
	N/A	N/A	N/A	

Note:

- (1) Unless otherwise marked as ※ in 『Remark』 column, Neutron consigns the support equipment to the tested system.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.9 EUT Operating Conditions

- (a) Only radiated testing was performed during the max. EMI emission evaluation. Conducted testing excepted because of the EUT is a battery operating device and no any other cable connection to PC device.
- (b) 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. Justification

3.1 Limitations

3.1.1 Power Line Conducted Emission

Measurement Frequency Range (MHz)	Mains Terminal Class A Limits (dBuV)		Mains Terminals Class B Limits (dBuV)		Note CISPR FCC Std.
	QP Mode	AV Mode	QP Mode	AV Mode	
0.15 - 0.50	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 - 5.00	73.00	60.00	56.00	46.00	CISPR
5.00 - 30.0	73.00	60.00	60.00	50.00	CISPR
0.15 - 0.50	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 - 5.00	73.00	60.00	56.00	46.00	FCC
5.00 - 30.0	73.00	60.00	60.00	50.00	FCC

Notes:

- (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.

3.1.2 Radiated Emission Limits (Frequency Range 30MHz-1000MHz)

Measurement Frequency Range (MHz)	Quasi-Peak Mode Class A Limits (dBuV/m)		Quasi-Peak Mode Class B Limits (dBuV/m)		Note CISPR FCC Std.
	10m	30m	10m	3m	
30.00 -230.00	40.00	30.00	30.00	40.00	CISPR
230.0 -1000.0	47.00	37.00	37.00	47.00	CISPR
30.00 - 88.00	39.00	N/A	30.00	40.00	FCC
88.00 - 216.0	43.50	N/A	33.50	43.50	FCC
216.0 -960.0	46.00	N/A	36.00	46.00	FCC
above 960.0	49.50	N/A	46.00	54.00	FCC

Notes:

- (1). The tighter limit applies at the band edges.
- (2). Emission level (dBuV/m)=20log Emission level (uV/m).
- (3). A measuring distance Of 10m is a primary used. However, either 3m or 10m (instead of 10m) distance my be allowed. If the distance is 3m, add 10dB to the QP-limit above. If the distance is 10m, subtract 10dB from the QP-limit above.

3.2 Measurement Justification

3.2.1 Conducted Emission

The EUT is placed on a table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** were made with a **Spectrum Analyzer** using **CISPR Quasi-Peak detector mode**.

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 these signals are then Quasi Peak detector mode and/or Average detector mode re-measured.

Data of **Table - 4**. lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value lower than both QP Mode and AV Mode Limit, EUT shall be deemed to compliance with both QP & AV Limits and then no additional QP Mode or AV Mode measurement performed.

If additional QP or AV Mode measurement needed, and if the QP Mode measured value compliance with the QP Mode Limit and lower than AV Mode Limit, the EUT shall be deemed to meet both QP & AV Limits and then only QP Mode was measured, but AV Mode was not performed °.

3.2.2 Radiated Emission

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

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, Peak or Average detector mode re-measured.

Data of **Table – 5** lists the significant emission frequencies, measured levels, limits and safe margins. All readings are Peak Mode measured unless otherwise stated as QP or AV in column of " Remark ".

If the Peak Mode measured value compliance with and lower than Quasi Peak or Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.

3.2.3 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as **$FS = RA + AF + CL - AG$**

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor (1)

CL = Cable Attenuation Factor(Cable Loss) (1)

AG = Amplifier Gain (1)

Remark :

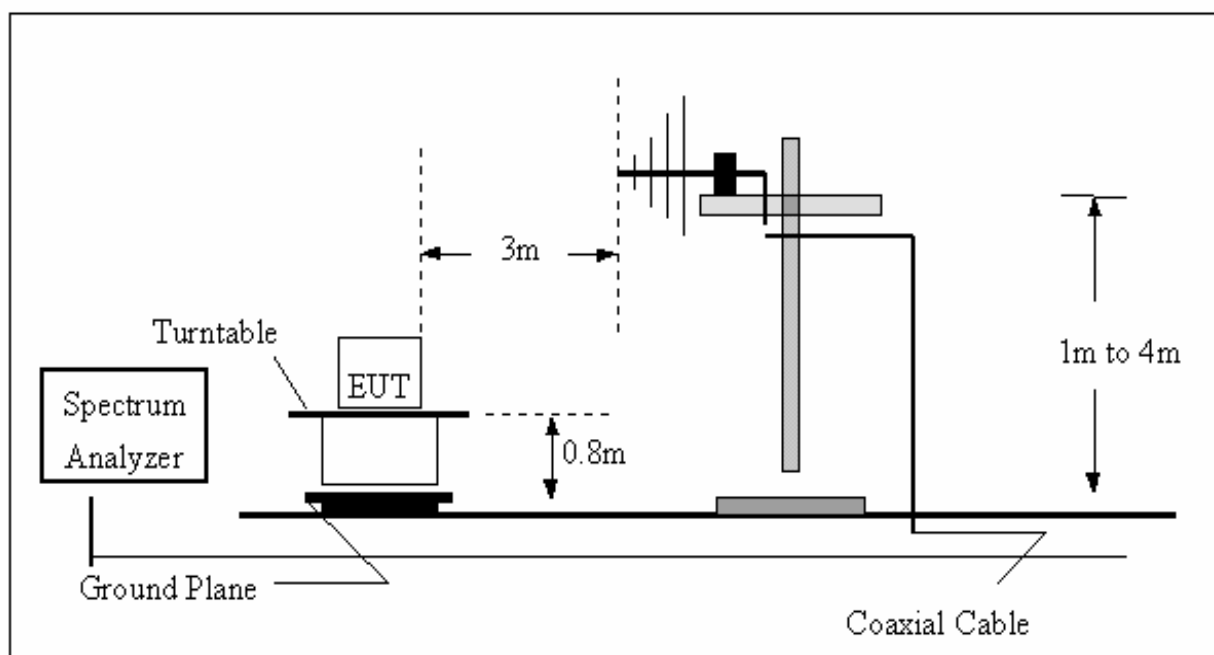
(1) The Correction Factor = $AF + CL - AG$, as shown in the data tables' Correction Factor column.

3.3 Measurement Data

Table - 4. Conducted Emission Data (0.15-30MHz)- Not Applicable

Table - 5. Radiated Emission Data (30-1000MHz)

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



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

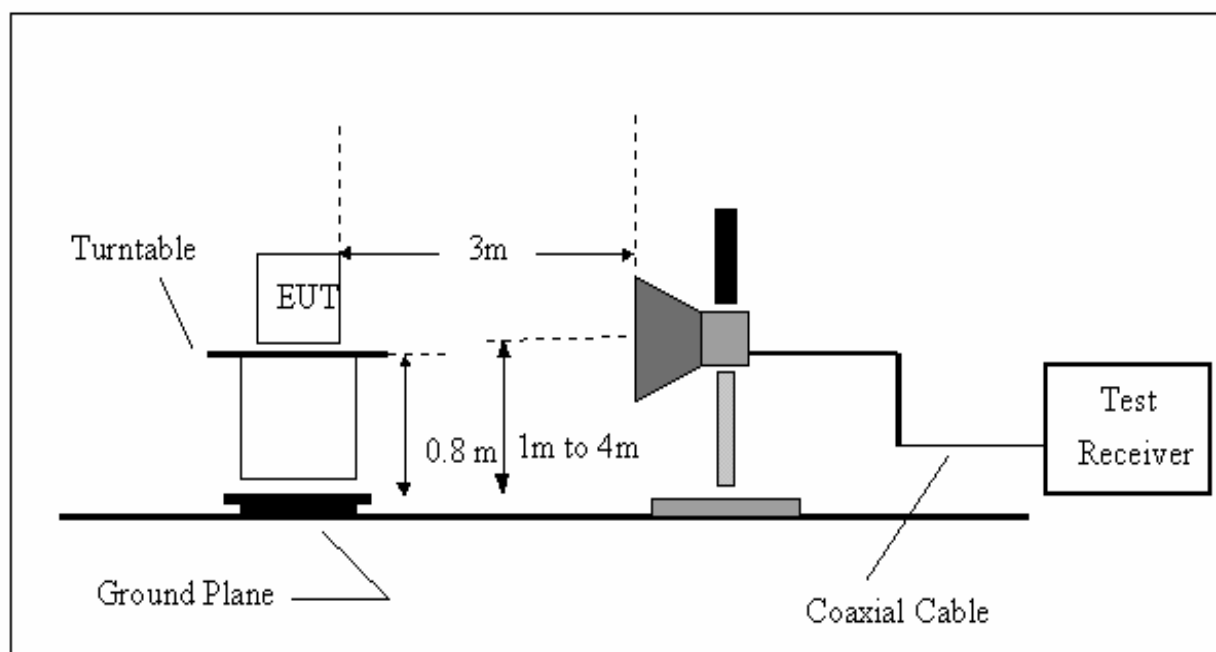


Table 4 Conducted Emission Data - Not Applicable**Table 5 Radiated Emission Data (30-1000MHz)**

EUT : RF Mouse

Model/Type No. : RFSOP-55

Temperature : 32.5 °C Relative Humidity : 75 % Pressure : 1011 hPa

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

Mode 1

Minimum passing margin is -16.47dB at 54.09MHz

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit-3m (dBuV/m)	Safe Margins (dBuV/m)	Note
27.05	V	Peak	49.90	- 16.12	33.78	80.00	- 46.22	F
26.96	V	Peak	17.60	- 16.12	1.48	69.50	- 68.02	E
27.28	V	Peak	18.20	- 16.13	2.07	69.50	- 67.43	E
54.10	V	Peak	24.85	- 5.79	19.06	40.00	- 20.94	H
81.09	V	Peak	31.25	- 9.34	21.91	40.00	- 18.09	H
108.13	V	Peak	26.32	- 6.60	19.72	43.50	- 23.78	H
135.21	V	Peak	27.65	- 4.73	22.92	43.50	- 20.58	H
162.26	V	Peak	25.53	- 3.79	21.74	43.50	- 21.76	H
27.05	H	Peak	55.50	- 16.12	39.38	80.00	- 40.62	F
26.96	H	Peak	18.20	- 16.12	2.08	69.50	- 67.42	E
27.28	H	Peak	18.40	- 16.13	2.27	69.50	- 67.23	E
54.09	H	Peak	29.32	- 5.79	23.53	40.00	- 16.47	H
81.11	H	Peak	29.32	- 9.33	19.99	40.00	- 20.01	H
108.17	H	Peak	29.27	- 6.60	22.67	43.50	- 20.83	H
135.21	H	Peak	27.22	- 4.73	22.49	43.50	- 21.01	H
162.25	H	Peak	26.80	- 3.79	23.01	43.50	- 20.49	H

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 measurement didn't perform.

(3) Measuring frequency range from 30MHz to 1000MHz.

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

Table 5 Radiated Emission Data (30-1000MHz)

EUT : RF Mouse

Model/Type No. : RFSOP-55

Temperature : 32.5 °C Relative Humidity : 75 % Pressure : 1011 hPa

Special Notes : (EUT Operation Mode or Test Configuration Mode, if applicable)

Mode 2

Minimum passing margin is -16.16dB at 54.28MHz

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit-3m (dBuV/m)	Safe Margins (dBuV/m)	Note
27.15	V	Peak	50.80	- 16.13	34.67	80.00	- 45.33	F
26.96	V	Peak	18.40	- 16.12	2.28	69.50	- 67.22	E
27.28	V	Peak	18.20	- 16.13	2.07	69.50	- 67.43	E
54.29	V	Peak	26.65	- 5.78	20.87	40.00	- 19.13	H
81.42	V	Peak	28.65	- 9.31	19.34	40.00	- 20.66	H
108.57	V	Peak	31.72	- 6.56	25.16	43.50	- 18.34	H
135.72	V	Peak	26.85	- 4.71	22.14	43.50	- 21.36	H
162.87	V	Peak	28.42	- 3.83	24.59	43.50	- 18.91	H
27.15	H	Peak	56.00	- 16.13	39.87	80.00	- 40.13	F
26.96	H	Peak	18.00	- 16.12	1.88	69.50	- 67.62	E
27.28	H	Peak	18.60	- 16.13	2.47	69.50	- 67.03	E
54.28	H	Peak	29.62	- 5.78	23.84	40.00	- 16.16	H
81.43	H	Peak	28.40	- 9.31	19.09	40.00	- 20.91	H
108.58	H	Peak	30.75	- 6.56	24.19	43.50	- 19.31	H
135.72	H	Peak	27.82	- 4.71	23.11	43.50	- 20.39	H
162.87	H	Peak	27.40	- 3.83	23.57	43.50	- 19.93	H

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 measurement didn't perform.

(3) Measuring frequency range from 30MHz to 1000MHz.

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

Attachment

Table Contents

- A. EUT Test Photos
- B. Product Labeling
- C. Bandwidth Requirement (Plot)