ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Wireless Mouse

MODEL No.: ACK-800MRF

BRAND NAME: Solid Year

FCC ID: L2BACEKEY80M

REPORT NO: 020046-RF-ID

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Prepared for

Soild Year Co., Ltd.
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Prepared by

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1. GENERAL INFORMATION

1.1 Product Description

The Solid Year Co., Ltd. Model: ACK-800MRF (referred to as the EUT in this report) The EUT is an short range, lower power, wireless Mouse designed as an " Input Device. It is designed by way of utilizing the FSK modulation achieves the system operating.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 27.145 MHz, one channel.
B). Modulation : Frequency Shifting Key (FSK) Modulation
C). Antenna Designation: Non-User Replaceable (Fixed)
D). Power Supply: 3 Vdc by AAA *2 battery.

(F) Operation Methodology:
The U1 CPU encoder generates a pulse code serially transmit (typical designation) inside the U1. This pulse signal mixed with the carrier at modulator(inside U1) stage by way of FSK mode frequency modulation. The modulation depth is designed such as ± 5KHz in this application, that means the pulse(may be at high level state or low level state) will trigger the oscillator to generate a frequency at a specified fundamental frequency +5KHz or –5KHz, depended on the designation. For example, if the carrier frequency defined as fundamental frequency +5KHz at high level state, then the alternative carrier frequency will be fundamental frequency –5KHz at low level state. Then the U1 modulator(mixer) will output a modulated signal to the transmit antenna.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID : L2BACEKEY80M filing to comply with Section 15.227 of the FCC Part 15, Subpart C Rules. The composite system(receiver) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of C&C Laboratory, Co., Ltd. No. 81-1, 210 Lane, Pa-de 2nd Road, Lu-Chu Hsiang, Taoyuan, Taiwan, R.O.C.. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 1992 and CISPR 22/EN 55022 requirements.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.Conducted emissions from the EUT measured in the **frequency range between 0.45 MHz and 30MHz** using **CISPR Quasi-Peak detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as 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 C63.4-1992.

2.4 Limitation

(1) Conducted Emission (Not applicable in this report)

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency (MHz)	Emissions μV	Emissions dBμV
0.45-30	250	48

(2) Radiated Emission

a. The field strength of any emission within this band (section 15.227 frequency between 26.96MHz -27.28MHz) shall not exceed 10000 micro volts/meter at 3 meters. (80dBμV at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.

b.The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength μV/m	Distance(m)	Field strength at 3m dBμV/m
1.705-30	**30**	**30**	**69.54**
30-88	**100**	**3**	**40**
88-216	**150**	**3**	**43.5**
216-960	**200**	**3**	**46**
Above 960	**500**	**3**	**54**

Remark: 1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ15.205, then the general radiated emission limits in ξ 15.209 apply.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

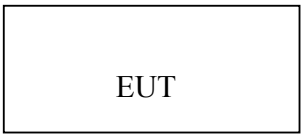


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.	Note
E-1	Mouse	Solid Year	ACK-80MRF	L2BACEKEY80M		EUT

Note:

(1) Unless otherwise denoted as EUT in『Remark』column , device(s) used in tested system is a support equipment.

3. Summary Of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.227	Radiated Emission	Compliant
§15.227	26 dB Bandwidth	Compliant

4. Description of test modes

The EUT (**Wireless Mouse**) has been tested under normal operating condition.
The EUT stay in continuous transmitting mode. The Frequency 27.045MHz are chosen for testing.

5. Conducted Emissions Test (Not applicable in this report)

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2 Test SET-UP (Block Diagram of Configuration)

5.3 Measurement Equipment Used:

Conducted Emission Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NO.**	**SERIAL NO.**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESCS30	847793/012	12/19/2001	12/18/2002
LISN	R&S	ESH2-Z5	843285/010	12/10/2001	12/09/2002
LISN	EMCO	3825/2	9003-1628	07/26/2002	07/25/2003
Spectrum Analyzer	ADVANTEST	R3261C	71720533	08/06/2002	08/05/2003
2X2 WIRE ISN	R&S	ENY22	100020	06/20/2002	06/19/2003
FOUR WIRE ISN	R&S	ENY41	100006	06/20/2002	06/19/2003

5.4 Measurement Result:

5.5 Conducted Measurement Photos:

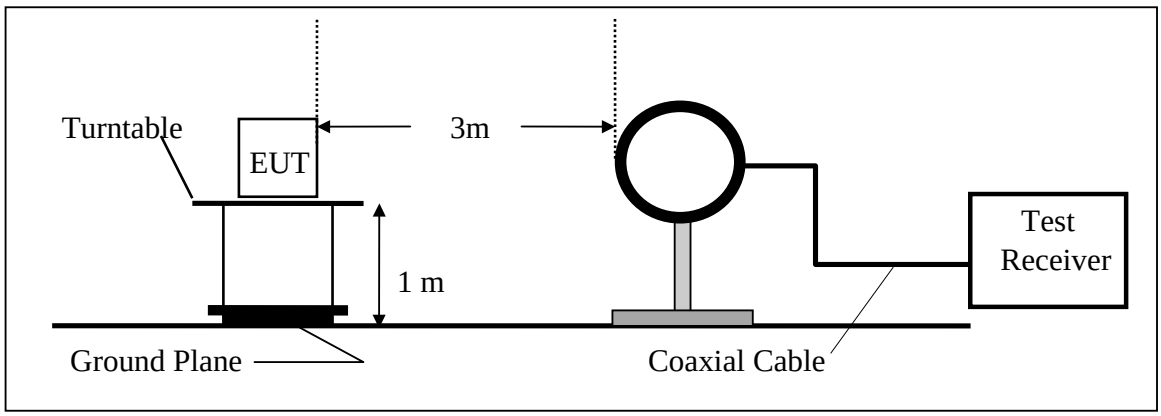
6. Radiated Emission Test

6.1 Measurement Procedure

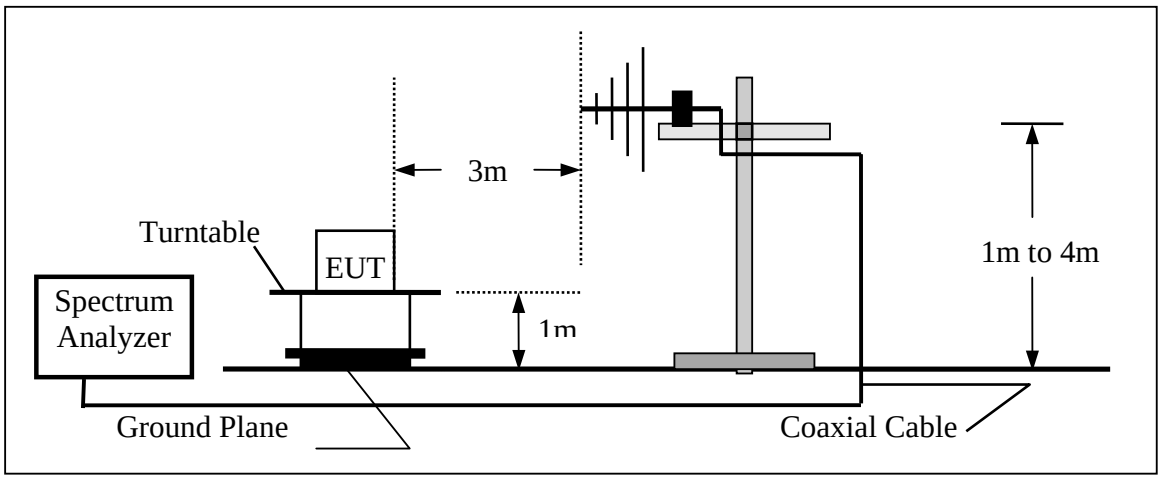
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level. 3
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

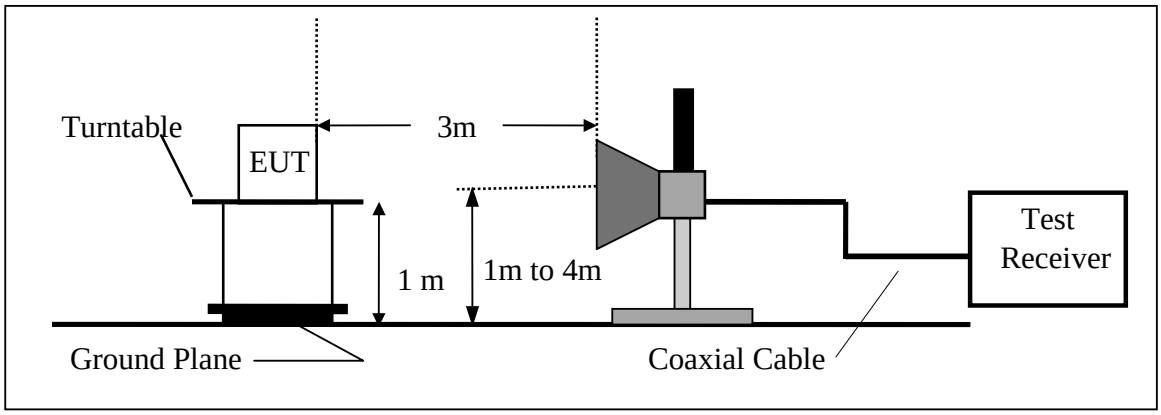
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



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



6.3 Measurement Equipment Used:

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/19/2002	03/18/2003
EMI Test Receiver	R&S	ESVS20	838804/004	01/05/2002	01/04/2003
Pre-Amplifier	HP	8447D	2944A09173	03/04/2002	03/03/2003
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/06/2002	07/05/2003
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	11/17/2001	11/16/2002
Horn antenna	Schwarzbeck	BBHA 9120	D210	2/24/2002	2/23/2003
Log-Periodic Antenna	EMCO	3146A	1157	7/11/2002	7/10/2003
Pre-Amplifier	HP	8449B	3008B00965	10/01/2001	10/02/2002

6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.3 Measurement Equipment Used:

Open Area Test Site # 3					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	ADVANTEST	R3261A	N/A	03/19/2002	03/18/2003
EMI Test Receiver	R&S	ESVS20	838804/004	01/05/2002	01/04/2003
Pre-Amplifier	HP	8447D	2944A09173	03/04/2002	03/03/2003
Bilog Antenna	SCHWAZBECK	VULB9163	145	07/06/2002	07/05/2003
Turn Table	EMCO	2081-1.21	9709-1885	N.C.R	N.C.R
Antenna Tower	EMCO	2075-2	9707-2060	N.C.R	N.C.R
Controller	EMCO	2090	9709-1256	N.C.R	N.C.R
RF Switch	ANRITSU	MP59B	M53867	N.C.R	N.C.R
Site NSA	C&C	N/A	N/A	11/17/2001	11/16/2002
Horn antenna	Schwarzbeck	BBHA 9120	D210	2/24/2002	2/23/2003
Loop Antenna	EMCO	6502	2356	7/11/2002	7/10/2003
Pre-Amplifier	HP	8449B	3008B00965	10/01/2001	10/02/2002

6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

6.5 Measurement Result

Operation Mode: Transmitting Mode
Fundamental Frequency: 27.145 MHz
Temperature : 26 ℃
Humidity : 68 %
Judgement：Passed by -7.96 dB at 27.145 MHz

Test Date : Aug. 23, 2002
Test By: Markba
Pol: Vertical

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
27.145	V	Peak	55.16	-4.40	50.76	80.00	-29.24	F
54.020	V	Peak	17.38	14.66	32.04	40.00	-7.96	H
72.520	V	Peak	11.68	9.97	21.65	40.00	-18.35	H
81.435	V	Peak	--		0.00	40.00	-40.00	H
107.336	V	Peak	8.68	13.19	21.87	43.50	-21.63	H
135.725	V	Peak	--		0.00	43.50	-43.50	H
162.870	V	Peak	--		0.00	43.50	-43.50	H
217.160	V	Peak	--		0.00	46.00	-46.00	H
244.420	V	Peak	9.95	16.09	26.04	46.00	-19.96	H
271.620	V	Peak	12.40	15.79	28.19	46.00	-17.81	H
298.820	V	Peak	10.67	16.63	27.30	46.00	-18.70	H

Remark：

(1) Measuring frequencies from 25 MHz to the 1GHz。
(2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
(3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
(4) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
(5) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(6) Datas 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.
(7) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

6.6 Measurement Result

Operation Mode: Transmitting Mode
Fundamental Frequency: 27.145 MHz
Temperature : 26 ℃
Humidity : 68 %
Test Date : Aug. 23, 2002
Test By: Markba
Pol: Horizital
Judgement：Passed by -10.54 dB at 27.145 MHz Ant.Pol. Hor.

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
27.145	H	Peak	73.86	-4.40	69.46	80.00	-10.54	F
54.020	H	Peak	14.44	14.66	29.10	40.00	-10.90	H
81.760	H	Peak	19.49	9.97	29.46	40.00	-10.54	H
108.420	H	Peak	14.11	13.05	27.16	43.50	-16.34	H
136.160	H	Peak	11.76	11.00	22.76	43.50	-20.74	H
162.820	H	Peak	11.91	11.60	23.51	43.50	-19.99	H
271.620	H	Peak	13.07	15.79	28.86	46.00	-17.14	H
298.820	H	Peak	17.04	16.63	33.67	46.00	-12.33	H
324.750	H	Peak	15.49	17.35	32.84	46.00	-13.16	H
352.910	H	Peak	14.77	18.19	32.96	46.00	-13.04	H
379.660	H	Peak	11.34	19.34	30.68	46.00	-15.32	H

Remark：

(1) Measuring frequencies from 25 MHz to the 1GHz。
(2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
(3) Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB
(4) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
(5) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(6) Datas 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.
(7) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

7. Occupied Bandwidth

7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency , RBW,VBW= 10KHz, Span =500KHz.
4. Set SPA Max hold. Mark peak, -26dB.

7.2 Test SET-UP (Block Diagram of Configuration)

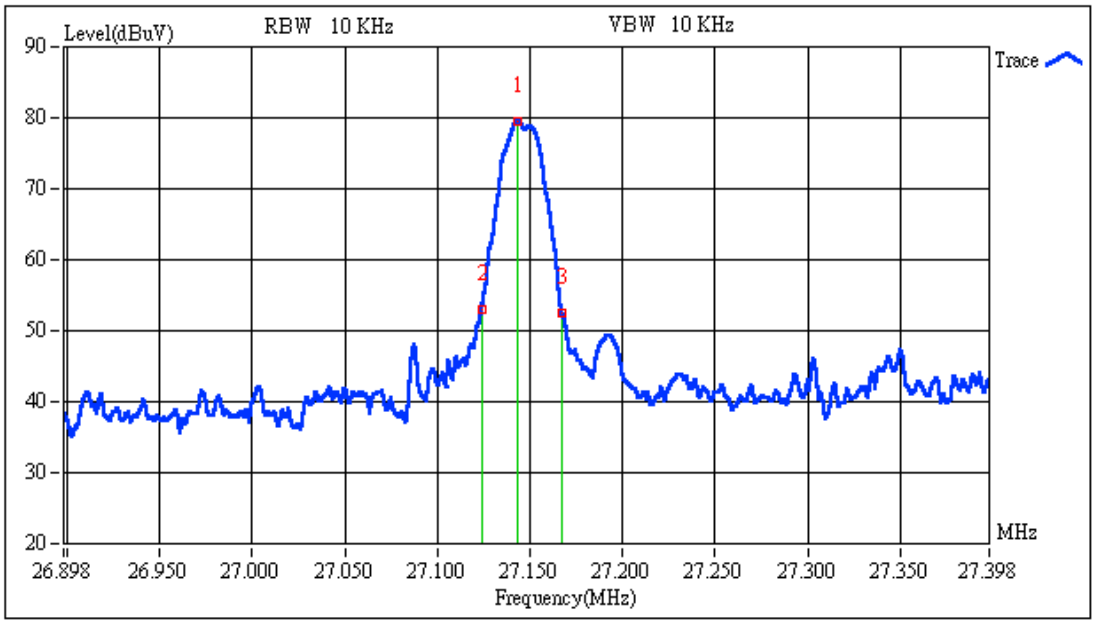
Same as 4.2 Radiated Emission Measurement.

7.3 Measurement Equipment Used:

Same as 4.2 Radiated Emission Measurement.

7.4 Measurement Results: Refer to attached data chart.

26 dB Band Width Test Data



Custom Name: Vincent
Engineer: Markba
Model Name: 10
Report No.:
Test Mode: TX 27MHz

Peak 0.00 MHz
0.00 dBuV
Band Width 0.043 MHz
Delta1 27.12 MHz
53.02 dBuV
Delta2 27.17 MHz
52.52 dBuV