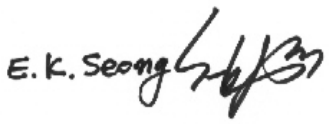
SKT

SK TECH CO., LTD.

Certificate of Compliance

Test Report No.:	**SKTOS-01059**		
NVLAP CODE :	**200220-0**		
Applicant:	**SEJIN ELECTRON INC.**		
Applicant Address:	60-19, KASAN-DONG, KEUMCHON-KU, SEOUL, KOREA		
Product:	**RF Mouse Receiver**		
FCC ID:	**GJJSWR-27MF1**	**Model No.:**	N/A
Receipt No.:	SKE20010419-318	**Date of receipt:**	Apr. 19, 2001
Date of Issue:	May 02, 2001		
Testing location:	**SK TECH CO., LTD.** 820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea		
Test Standards:	**ANSI C63.4 / 1992**		
Rule Parts:	**FCC part 15 Subpart B**		
Equipment Class :	**Class B Digital Device Peripheral**		
Test Result:	The above mentioned product has been tested and passed.		

Prepared by: *E.K. Seong* **Tested by**:*K.W.Song/Engineer* **Approved by**: *J.Y.Hyun /Lab.Manager*



Signature *Date*

Signature *Date*

Signature *Date*

Other Aspects :	
Abbreviations :	**· OK, Pass = passed · Fail = failed · N/A = not applicable**

☞
- **This test report is not permitted to copy partly without our permission.**
- **This test result is dependent on only equipment to be used.**
- **This test result is based on a single evaluation of one sample of the above mentioned.**
- **This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S Government.**
- **We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.**

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1. General

This equipment has been shown to be capable of compliance with the applicable technical standards and was tested in accordance with the measurement procedures as indicated in this report.

We attest to the accuracy of data. All measurements reported herein were performed by SK Tech Co., Ltd. and were made under Chief Engineer's supervision.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. Test Site

SK TECH Co., Ltd.

2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

The test site is in compliance with ANSI C63.4/1992 for measurement of radio interference.

2.2 List of Test and Measurement Instruments

Table 1 : List of Test and Measurement Equipment

- **Conducted Emissions**

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESHS10	862970/019	02.2002
Artificial Mains Network	KNW-407	M63284	07.2001
EMI Receiver	ESHS10	835871/002	11.2001
Artificial Mains Network	ESH3-Z5	836679/018	11.2001
Conducted Cable	N/A	N/A	07.2001

- **Radiated Emissions**

Kind of Equipment	Type	S/N	Calibrated until
EMI Receiver	ESVS 10	825120/013	02.2002
EMI Receiver	ESVS 10	834468/008	11.2001
Spectrum Analyzer	R3361A	11730187	07.2001
Amplifier	8447F	3113A05153	05.2001
Log Periodic Antenna	UHALP9107	91071238	02.2002
Biconical Antenna	BBA9106	N/A	02.2002
Open Site Cable	N/A	N/A	07.2001
Antenna Mast	5907	N/A	N/A
Antenna & Turntable controller	5906	91X519	N/A
Amp & Receiver connection cable	N/A	N/A	07.2001
Amp & Spectrum connection cable	N/A	N/A	07.2001
50Ω Switcher	MP59B	M93083	07.2001

2.3 Test Date

Date of Application : Apr. 19, 2001

Date of Test : Apr. 28, 2001

2.4 Test Environment

See each test item's description.

3. Description of the tested samples

The EUT is the RF Mouse Receiver.

3.1 Rating and Physical Characteristics

- Connector : Two button & wheel
- 1.8M Wire

3.2 Submitted Documents

N/A

4. Measurement Conditions

The operating voltage of the EUT is supplied by the PC.

(The PC Input Voltage is AC 120V, 60Hz)

4.1 Modes of Operation

The EUT was in the following operation mode during all testing;

The EUT is connected with the PC.

The EUT is received signal from the mouse .

Test was made on the mode of normal operating.

4.2 List of Peripherals

Description	Manufacturer	Model Name	Serial No.	FCC ID
Monitor	Samsung	SyncMaster750P	PG17HS9U/ADC	Doc
PC	Samsung	M6310	514892GN800897	Doc
Printer	H.P	2225C	3132S00310	DSI6XU2225
Mouse 1	Logitech	M-BE55	LZE02551778	Doc
Mouse 2	A4 Tech	AM-5E	951237243	H8GAM555C
Mouse 3	Sejin Electronics	SMB-200F1	771A27003	N/A
Keyboard	JING MOLD	LKB-0107	90602892	N/A
Personal Computer				
Mother board	Micro-Star	MS-6161	96K6262664G1144716	Doc
Power supply	HIPRO	HP-235ATXA6	F3-9911252206	Doc
FDD Drive	Panasonic	JU-257A604P	62638	Doc
HDD	Quantum	ProDrive LPS	9442203B	Doc
CD-ROM Drive	LG	GCD-R560B	6023002365	BEJGDC-R560B

4.3 Type of Used Cables

Description	Length	Type of shield	Manufacturer	Remark
PC power cable	1.5m	Non-Shield	None	
Monitor power cable	1.5m	Non-Shield	None	
Printer power cable	1.5m	Non-Shield	None	
Mouse 1 interface cable	1.2m	Non-Shield	None	
Mouse 2 interface cable	1.2m	Non-Shield	None	
Printer interface cable	1.8m	Shield	None	
Video interface cable	1.8m	Shield	None	
Keyboard interface cable	1.2m	Shield	None	

4.4 Test Setup

The test setup photographs showed the external supply connections and interfaces.

4.5 Uncertainty

1) Radiated disturbance

Uc (Combined standard Uncertainty) = ± 1.9dB

Expanded uncertainty U = KUc

K = 2

∴ U = ± 3.8dB

2) Conducted disturbance

Uc = ± 0.88dB

U = KUc = 2xUc = ± 1.8dB

5. EMISSION Test

5.1 Conducted Emissions

Result: **Pass**

The line-conducted facility is located inside a 2.0M x 3.6M x 7.2M shielded enclosure.
The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 604-05.
A 1m x 1.5m wooden table 80cm. high is placed 40cm. away from the vertical wall and 1.5m away from the side wall of the shielded room. ROHDE & SCHWARZ Model ESH3-Z5 (10kHz-30MHz) 50ohm/50 uH Line-Impedance Stabilization Networks(LISNs) are bonded to the shielded room.
The EUT is powered from the ROHDE & SCHWARZ LISN and the support equipment is powered from the ROHDE & SCHWARZ LISN. Power to the LISNs are filtered by a high-current high-insertion loss Lindgren enclosures power line filters (100dB 14kHz-10GHz).
The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure.
All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2".
If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the ROHDE & SCHWARZ LISN.
All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter length.
Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.
The spectrum was scanned from 450kHz to 30MHz with 100msec. sweep time.
The frequency producing the maximum level was reexamined using EMI/field Intensity Meter (ESHS 10) and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak mode.
The bandwidth of the receiver was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.
Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; if applicable; whichever determined the worst-case emission.
Photographs of the worst-case emission can be seen in photograph of conducted test.
Each EME reported was calibrated using self-calibrating mode.

Figure 1 : Spectral Diagram, LINE - PE

RF MOUSE RECEIVER 28 Apr 2001 15:01
CONDUCTED DISTURBANCE

EUT: SWR-27MF1
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: LINE-PE

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450kHz	30MHz	10kHz	10kHz	PK	100msec	Auto	OFF	60dB

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB

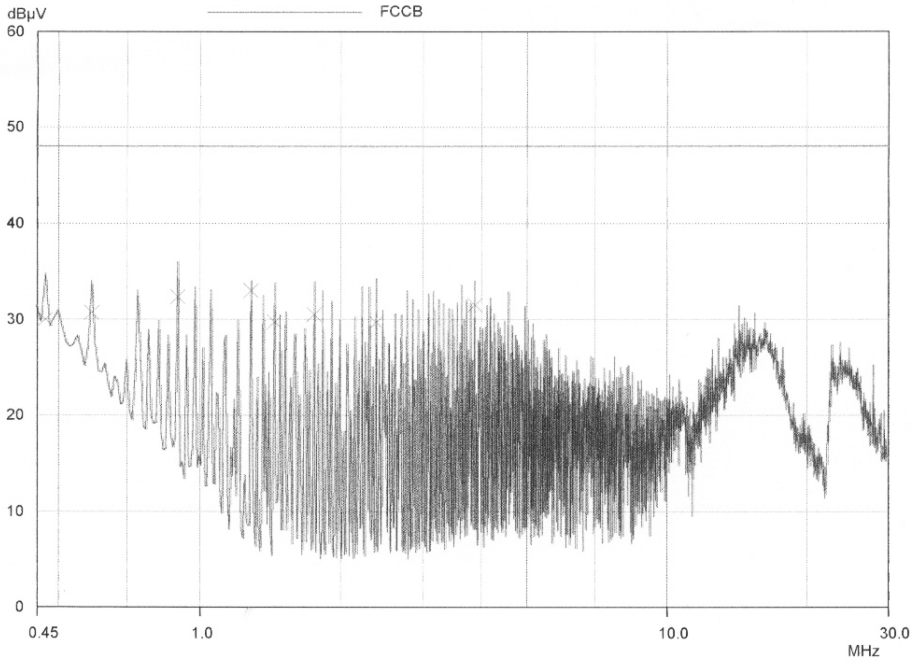

Figure 2 : Spectral Diagram, NEUTRAL – PE

RF MOUSE RECEIVER
CONDUCTED DISTURBANCE

28 Apr 2001 15:21

EUT: SWR-27MF1
Manuf:
Op Cond:
Operator:
Test Spec:
Comment: NEUTRAL-PE

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450kHz	30MHz	10kHz	10kHz	PK	100msec	Auto	OFF	60dB

Final Measurement: Detector: X QP
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB

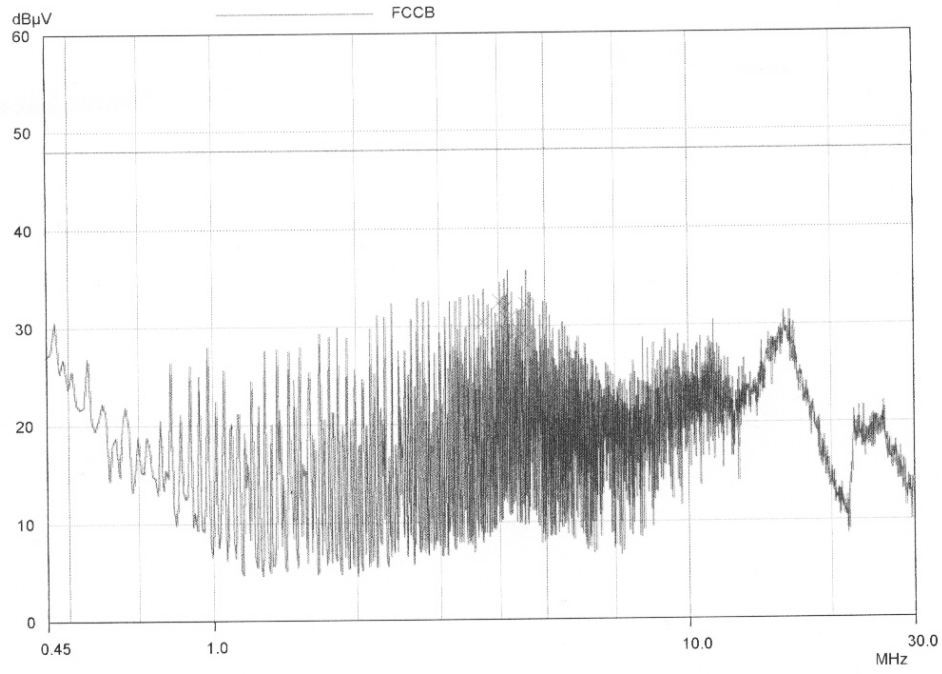

Table 2: Test Data, Conducted Emissions

Frequency (MHz)	(1)Reading (dBμV)	Line	(2)C/F (dB)	(3)C/L (dB)	(4)Actual (dBμV)	(5)Limit (dBμV)	(6)Margin (dB)
0.468	30.0	A	0.1	0.1	30.2	48.0	17.8
0.588	32.7	A	0.1	0.1	32.9	48.0	15.1
0.898	34.7	A	0.1	0.1	34.9	48.0	13.1
1.291	33.5	A	0.1	0.1	33.7	48.0	14.3
2.389	32.3	B	0.1	0.3	32.7	48.0	15.3
14.329	27.8	A	0.4	0.6	28.8	48.0	19.2

NOTES:

1. All modes of operation were investigated
   and the worst-case emission are reported.
2. All other emissions are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. Line A = LINE-PE, Line B = NEUTRAL-PE
6. C/F = Correction Factor
7. C/L = Cable Loss

♠ **Margin Calculation**

(6)Margin = (5)Limit - (4)Actual

[(4)Actual = (1)Reading + (2)C/F + (3)C/L]

5.2 Radiated Emissions

Result : **Pass**

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found.
The spectrum was scanned from 30 to 300 MHz using biconical antenna and from 300 to 1000 MHz using log-periodic antenna. Above 1GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using SCHWARZBECK dipole antennas. The test equipment was placed on a wooden table situated on a 4x4 meter area adjacent to the measurement area. Turntable was to protect from weather in the dome that made with FRP. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter(ESVS 10) and Quasi-Peak Adapter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1MHz depending on the frequency or type of signal.

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table.
The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.
Each emission was maximized by: varying the mode of operation or resolution; clock or data exchange speed, and/or support equipment, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission.
Photographs of the worst-case emission can be seen in photograph of radiated emission test.
Each EME reported was calibrated using self-calibrating mode.

Table 3 : Test Data, Radiated Emissions

Frequency (MHz)	Pol.	Height [m]	Angle [°]	(1) Reading (dBμV)	(2) AFCL (dB/m)	(3) Actual (dBμV/m)	(4) Limit (dBμV/m)	(5) Margin (dB)

Table. Radiated Measurements at 3-meters

※ ***Test results were under the required limit with 20dB margin or more*.**

NOTES:

1. All modes of operation were investigated
   and the worst-case emission are reported.
2. All other emission are non-significant.
3. All readings are calibrated by self-mode in receiver.
4. Measurements using CISPR quasi-peak mode.
5. AFCL = Antenna factor and cable loss
6. H = Horizontal, V = Vertical Polarization

♠ **Margin Calculation**

(5)Margin = (4)Limit - (3)Actual

[(3)Actual = (1)Reading + (2)AFCL]