



EMI TEST REPORT

Test Report No. : 25DE0134-HO-3

Applicant : Sony Corporation
Type of Equipment : Optical USB Wireless Mouse
Model No. : SMU-WCL2
Test standard : FCC Part 15 Subpart C
Section 15.209, Section 15.215
Section 15.227 : 2004
FCC ID : AK8WCM2-WCL2
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.

Date of test:

November 24 and 25, 2004

Tested by:

Norihisa Hashimoto
EMC Service

Approved by :

Hironobu Shimoji
Group Leader of
EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

<u>CONTENTS</u>	<u>PAGE</u>
SECTION 1: Client information	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results	4
SECTION 4: Operation of E.U.T. during testing.....	6
SECTION 5: Radiated emission (Fundamental and Spurious Emission).....	7
APPENDIX 1: Photographs of test setup	8
Spurious Emission (Radiated) SMU-WCL2	8
Worst Case Position (Y-axis:Horizontal / Y-axis:Vertical).....	9
APPENDIX 2: Test instruments	10
APPENDIX 3: Data of EMI test.....	11
Radiated Emission.....	11
20dB Bandwidth&99% Occupied Bandwidth.....	13

SECTION 1: Client information

Company Name : Sony Corporation
 Address : 6-7-35 Kitashinagawa Shinagawa-ku, Tokyo 141-0001 Japan
 Telephone Number : +81-3-5795-5506
 Facsimile Number : +81-3-5795-7955
 Contact Person : Hitoshi Tanabe

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Optical USB Wireless Mouse
 Model No. : SMU-WCL2
 Serial No. : 1
 Rating : DC3V
 Country of Manufacture : China
 Receipt Date of Sample : November 24, 2004
 Condition of EUT : Engineering prototype
 (Not for Sale: This sample is equivalent to mass-produced items.)

2.2 Product Description

The difference in SMU-WCL2 and SMU-WCM2 (Series models)	Case size
--	-----------

Clock frequency	27.045MHz
Equipment Type	Transceiver
Frequency of Operation	27.045MHz
Type of Modulation	FSK
Antenna Type	Integral
Mode of Operation	Simplex
ITU code	F1D
Operating temperature	+ 5deg.C. to +35deg.C.

<Receiver>

Equipment Type	Receiver
Frequency of Operation	27.045MHz
Local Oscillator frequency	26.590MHz
Intermediate frequency	455kHz
Operating temperature	+ 5deg.C. to +35deg.C.

FCC 15.31 (e)

This test was performed with the New Battery (DC 3V) and the constant voltage was supplied to this EUT during the tests. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the EUT. Therefore, the equipment complies with the antenna requirement of Section 15.203.

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C : 2004

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.227 Operation within the band 26.96 – 27.28MHz: 2004
Section 15.209 Radiated emission limits, general requirements: 2004
Section 15.215 Additional provisions to the general radiated emission limitations

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin*0)	Results
1	Fundamental Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.227 (b) RSS-210 8.6.1	Radiated	N/A	24.9dB 27.042MHz AV	Complied
2	Spurious Emission	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.227 (b) RSS-210 8.6.1	Radiated	N/A	9.0dB 189.284MHz Horizontal QP	Complied
3	20dB Bandwidth	ANSI C63.4:2003 13. Measurement of intentional radiators	Section 15.215 (c) RSS-210 8.6.1	Radiated	N/A	N/A	N/A

Note: UL Apex's EMI Work Procedures No.QPM05.

*0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.

Uncertainty:

*In case of the margin below the EMC Head Office's uncertainty.

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

Spurious Emission (Radiated)

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is $\pm 4.5\text{dB}(3\text{m})/\pm 4.7\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is $\pm 5.2\text{dB}(3\text{m})/\pm 3.8\text{dB}(10\text{m})$.

The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is $\pm 6.6\text{dB}$.

*These tests were also referred to "Guidance on Measurement for Digital Transmission Systems Section15.247".

*These tests were performed without any deviations from test procedure except for additions or exclusions.

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	RSS-210(issue 5): 2001 + Amendment:2002 + Amendment2:2003 + Amendment3:2004 + Amendment4: 2004	Radiated	N/A	N/A	N/A

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	Listed date (for FCC)	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	February 01, 2002	313583	IC4247	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	June 05, 2002	846015	IC4247-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 shielded room	-	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.4 measurement room	-	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.3 shielded room.

3.5 Test set up, Test instruments and Data of EMI

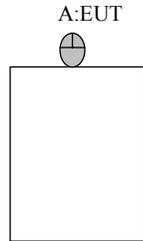
Refer to APPENDIX 1 to 3.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : Tx 27.045MHz mode(CCK 11Mbps)

4.2 Configuration and peripherals



*The test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	FCC ID
A	Optical USB Wireless Mouse	SMU-WCL2	1	SONY	AK8WCM2-WCL2

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 2 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for each antenna angle 0deg. , 45deg. and 90deg.

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector.

The radiated emission measurements were made with the following detector function of the test receiver.

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

With the position, the noise levels of all the frequencies were measured.

* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

Test data : APPENDIX 3

Test result : Pass

Date: November 24 and 25, 2004

Test engineer: Norihisa Hashimoto

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

APPENDIX 1: Photographs of test setup

Spurious Emission (Radiated) SMU-WCL2

Front



Rear



Worst Case Position (Y-axis:Horizontal / Y-axis:Vertical)

X-axis



Y-axis



Z-axis



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2004/04/12 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2004/10/14 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2004/10/14 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2004/02/24 * 12
MPA-06	Pre Amplifier	Hewlett Packard	8447D	RE	2004/08/29 * 12
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	RE	2004/11/12 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2003/12/16 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	ME	2004/02/03 * 12
MRENT-09	Spectrum Analyzer	Advantest	R3273	ME	2004/02/18 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	ME	2004/01/08 * 12
MCC-31	coaxial cable	ULApex	-	ME	2004/06/12 * 12

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

RE: Radiated Spurious Emission

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

MF060b(10.04.03)

APPENDIX 3: Data of EMI test

Radiated Emission

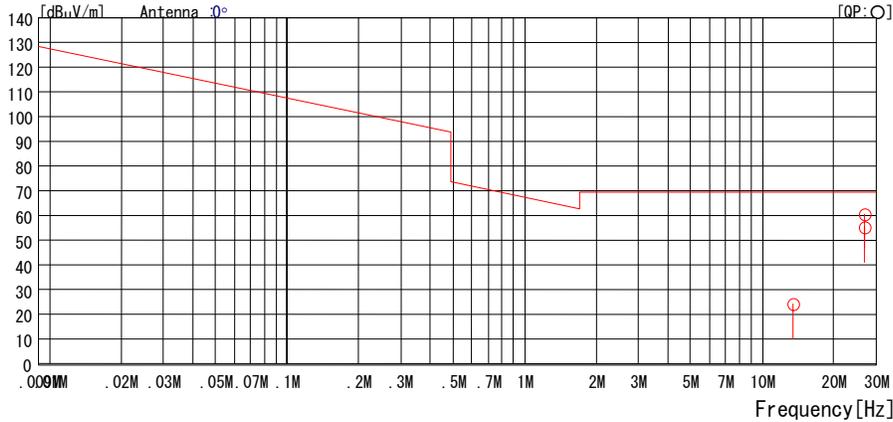
DATA OF MAGNETIC RADIATED EMISSION TEST

UL Apex Co.,LTD. Head Office EMC Lab. No.2 Semi Anechoic Chamber
 Date : 2004/11/25 20:42:37

Applicant : Sony
 Kind of EUT : Optical USB Wireless Mouse
 Model No. : SMU-WCL2
 Serial No. : No.1
 Report No. : 25DE0134-HO
 Power : DC3.0V
 Temp./ Humi. : 22 deg.C. / 40 %
 Operator : Norihisa Hashimoto

Mode / Remarks : Tx 27.045MHz Max-axis(Y)

LIMIT : FCC15C §15.209(a) 3m
 Except for the data below : adequate margin data below the limits.



No.	FREQ [MHz]	READING QP [dBµV]	ANT FACTOR [dB]	LOSS [dB]	RESULT [dBµV/m]	LIMIT [dBµV/m]	MARGIN [dB]	ANTENNA TABLE [DEG]
1	13.523	25.3	20.2	-21.2	24.3	69.4	45.1	0° QP
2	27.042	55.0	20.8	-20.7	55.1	80.0	24.9	0° AV
3	27.042	60.5	20.8	-20.7	60.6	100.0	39.4	0° PK

CHART : WITH FACTOR ANT TYPE : LOOP
 CALCULATION : READING + ANT FACTOR + LOSS(CABLE + ATTN. -AMP.)

DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2004/11/24 22:02:45

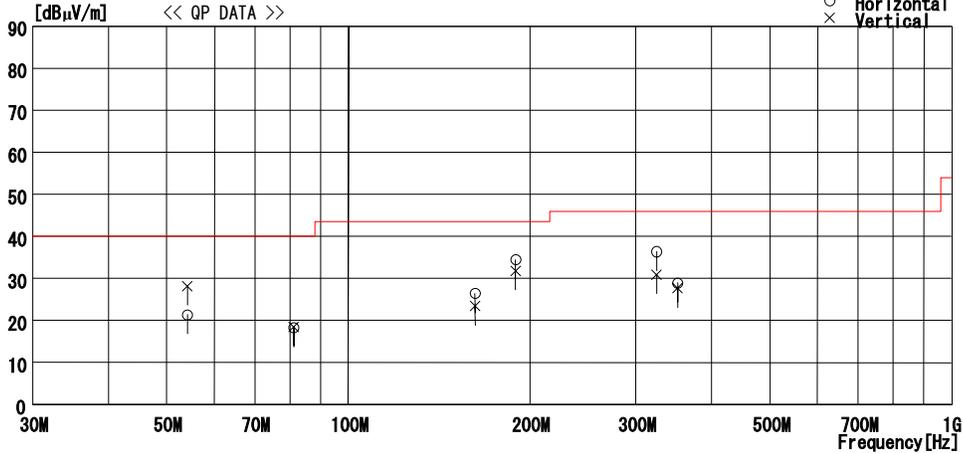
Applicant : Sony Corporation
Kind of EUT : Optical USB Wireless Mouse
Model No. : SMU-WCL2
Serial No. : No.1
Mode / Remarks : Tx 27.045MHz Max-axis (H:X / V:Y)

Report No. : 25DE0134-HO
Power : DC 3.0V
Temp°C/Humi% : 23deg. C / 42%
Operator : Norihisa Hashimoto

LIMIT : FCC 15C §15.209 3m

Except for the data below : adequate margin data below the limits.

All other spurious emissions were less than 20dB for the Limit



No.	FREQ [MHz]	READING QP [dBμV]	ANT FACTOR [dB/m]	LOSS [dB]	GAIN [dB]	RESULT [dBμV/m]	LIMIT [dBμV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	54.070	33.0	9.3	6.8	27.7	21.4	40.0	18.6	264	89
2	81.132	31.9	6.9	7.1	27.6	18.3	40.0	21.7	220	57
3	162.259	29.3	16.8	7.6	27.3	26.4	43.5	17.1	156	262
4	189.284	37.0	16.9	7.8	27.2	34.5	43.5	9.0	247	285
5	324.476	39.2	15.7	8.4	26.9	36.4	46.0	9.6	108	77
6	351.528	30.7	16.8	8.5	27.1	28.9	46.0	17.1	117	85
----- Vertical -----										
7	54.074	39.8	9.3	6.8	27.7	28.2	40.0	11.8	100	251
8	81.117	32.0	6.9	7.1	27.6	18.4	40.0	21.6	101	256
9	162.253	26.3	16.8	7.6	27.3	23.4	43.5	20.1	107	286
10	189.285	34.3	16.9	7.8	27.2	31.8	43.5	11.7	109	140
11	324.485	33.7	15.7	8.4	26.9	30.9	46.0	15.1	195	298
12	351.524	29.4	16.8	8.5	27.1	27.6	46.0	18.4	168	307

CHART: WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION : READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - AMP. GAIN Page:

UL Apex Co., Ltd.

Head Office EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

20dB Bandwidth&99% Occupied Bandwidth

