



EMI TEST REPORT

Test Report No. : 28HE0115-HO-02-B

Applicant : NEC Corporation
Type of Equipment : Factory Computer as FC-NOTE Series
Model No. : FC-N22A
FCC ID : BSFFC-N22A
Test regulation : FCC Part 15 Subpart E: 2008
Section 15.407
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: April 21 to July 4, 2008

Tested by:

Yutaka Yoshida
EMC Services

Takayuki Shimada
EMC Services

Kazufumi Nakai
EMC Services

Approved by:

Tetsuo Maeno
Site Manager of EMC Services

NVLAP[®]

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://uljapan.co.jp/emc/nvlap.htm>

UL Japan, Inc.

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 (09.01.08)

<u>CONTENTS</u>	<u>PAGE</u>
SECTION 1: Customer information.....	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results.....	5
SECTION 4: Operation of E.U.T. during testing	9
SECTION 5: Conducted Emission	12
SECTION 6: Spurious Emission and Band Edge Compliance.....	13
SECTION 7: 26dB Emission Bandwidth.....	14
SECTION 8: Maximum Peak Output Power.....	14
SECTION 9: Peak Power Spectral Density.....	14
SECTION 10: Peak Excursion Ratio	14
APPENDIX 1: Photographs of test setup	15
Conducted Emission	15
Spurious Emission (Radiated)	16
Worst Case Position (Horizontal: Y-axis/Vertical: X-axis)	17
APPENDIX 2: Data of EMI test	18
Conducted Emission	18
26dB Emission Bandwidth.....	26
Maximum Peak Output Power.....	28
Radiated Spurious Emission.....	35
Radiated Spurious Emission (below 1GHz)	37
Radiated Spurious Emission (above 1GHz: restricted band).....	46
Radiated Spurious Emission (above 1GHz:Outside of the restricted band).....	53
Conducted Spurious Emission(DSSS and other forms of modulation)	62
Conducted emission Band Edge compliance.....	78
Peak Power Spectral Density.....	79
Peak Excursion Ratio	81
99%Occupied Bandwidth	83
APPENDIX 3:Test instruments.....	84

SECTION 1: Customer information

Company Name : NEC Corporation
Address : 1-10 Nissin-cho, Fuchu-shi, Tokyo, 183-8501 Japan
Telephone Number : +81-42-333-1031
Facsimile Number : +81-42-333-1054
Contact Person : Tomomi Nakano

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

2.1 Identification of E.U.T.

Type of Equipment : Factory Computer as FC-NOTE Series
Model No. : FC-N22A
Serial No. : PP-004: Used for Conducted emission test
PP-090: Used for Radiated emission test
PP-091: Used for Antenna terminal conducted tests
Rating : AC100-240V / 1.1A-0.5A
Receipt Date of Sample : April 21, 2008
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

UL Japan, Inc.

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

2.2 Product Description

Model No: FC-N22A (referred to as the EUT in this report) is the Factory Computer as FC-NOTE Series.

Feature of EUT: EUT is the Factory Computer as FC-NOTE Series which has IEEE802.11b, IEEE802.11g, IEEE802.11a functions and approved Bluetooth module (FCC ID: CWTUGPZ6-C3).

	IEEE802.11b	IEEE802.11g	IEEE802.11a	Bluetooth		
Frequency band	2412 - 2462MHz	5180-5240MHz (Lower band) 5260-5320MHz (Middle band) 5745-5825MHz (Upper band)		2402-2480MHz		
Clock frequencies in the system (radio part)	CPU: 1.05GHz					
Channel spacing	5MHz		20MHz	1MHz		
Type of Modulation	DSSS	OFDM		FHSS		
Antenna Type	PIFA					
Antenna Connector Type	U.FL-LP-088					
Antenna Gain	Main: L=570mm Gain w/cable loss 2400-2500MHz: 0.36 dBi (peak)	Main: L=570mm Gain w/cable loss 5150-5350MHz: 0.69 dBi (peak) 5470-5725MHz: 1.27 dBi (peak) 5725-5850MHz: 0.32 dBi (peak)	-3.0dBi			
	Aux: L=385mm Gain w/cable loss 2400-2500MHz: -2.28 dBi (peak)	Aux: L=385mm Gain w/cable loss 5150-5350MHz: 4.32 dBi (peak) 5470-5725MHz: 4.42 dBi (peak) 5725-5850MHz: 1.84 dBi (peak)				
Power Supply (radio part)	DC 3.3V					

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart E: 2008, final revised on May 19, 2008
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart E Unlicensed National Information Infrastructure Devices
Section 15.407 General technical requirements

*The revision on May 19, 2008 does not influence the test specification applied to the EUT.

FCC 15.31 (e)

This EUT provides stable voltage(DC3.3V) constantly to RF Module regardless of input voltage. 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 Japan, Inc.

Head Office EMC Lab.

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

Telephone : +81 596 24 8116

Faxsimile : +81 596 24 8124

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	26dB Emission Bandwidth	FCC : FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands ".	FCC : 15.407(a)(1)(2)(3)	Conducted	N/A	See data	N/A
		IC: -	IC: RSS-210 A9.2 (1)(2)(3)				
2	Maximum Peak Output Power	FCC : FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands ".	FCC : 15.407(a)(1)(2)(3)	Conducted	N/A	Complied	
		IC: -	IC: RSS-210 A.9.2(1)(2)(3)				
3	Peak Power Spectral Density	FCC : FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands ".	FCC : 15.407(a)(1)(2)(3)(5)	Conducted	N/A	See data	Complied
		IC: -	IC: RSS-210 A.9.2 (1)(2)(3)				
4	Peak Excursion Ratio	FCC : FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands ".	FCC : 15.407(a)(6)	Conducted	N/A	See data	Complied
		IC: -	IC: -				
5	Spurious Emission	FCC: ANSI C63.4:2003	FCC : 15.407(b)(1)(2)(3)(4)(5)(6)(7), 15.205 and 15.209	Conducted Radiated	N/A N/A	[Tx] 2.7dB 37240.00MHz, Vertical [Rx] 8.6dB 129.854MHz, Vertical	Complied *1)
		IC: -	IC: RSS-210 2.6, 2.7 and A.9.3 (1)(2)(3)(4)				
6	Conducted Emission	FCC :ANSI C63.4:2003	FCC: 15.407(b)(6) and 15.207	Conducted	N/A	[QPI] 22.9dB 0.15440MHz, N [AV] 22.7dB 0.49512MHz, N 0.49586MHz, N	Complied
		IC: RSS-Gen 7.2.2	IC: RSS-Gen 7.2.2				
7	Band Edge Compliance	FCC :ANSI C63.4:2003	FCC : 15.407(b)(1)(2)(3)(4)(7), 15.205 and 15.209	Conducted Radiated	N/A	See data	Complied
		IC: -	IC: RSS-210 2.6, 2.7 and A.9.3 (1)(2)(3)(4)				
8	Dynamic Frequency Selection	FCC: FCC 06-96 APPENDIX	FCC : 15.407(h)(2)	Conducted	N/A	N/A	N/A *2)
		IC: -	IC: RSS-210 A9.4				

Note: UL Japan, Inc.'s EMI Work Procedures No.QPM05 and QPM15.

*1) Co-location & Co-operation are included in this test.

*2) Refer to 28HE0115-HO-02-G, FCC part 15E (FCC 15.407) DFS report.

*These tests were also referred to FCC Public Notice DA 02-2138A1 "Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands".

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

UL Japan, Inc.

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

3.3 Addition to standards

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Conducted	N/A	N/A	N/A

3.4 Uncertainty

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)	
		150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz
No.1 semi-anechoic Chamber (\pm)	3.7dB	3.1dB	4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (\pm)	3.7dB	-	-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (\pm)	3.7dB	-	-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (\pm)	3.7dB	-	-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB

*10m/3m = Measurement distance

Conducted emission test

The data listed in this test report has enough margin, more than the site margin.

Radiated emission test(3m)

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

[Rx] The data listed in this test report has enough margin, more than the site margin.

Other test except Conducted Emission and Spurious Emission (Radiated)

The measurement uncertainty for this test is $\pm 3.0\text{dB}$.

UL Japan, Inc.

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

3.5 Test Location

UL Japan, Inc. 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

	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	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.75 x 5.4 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

UL Japan, Inc.

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

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

4.1 Operating Modes

The mode was used as shown on the following table:

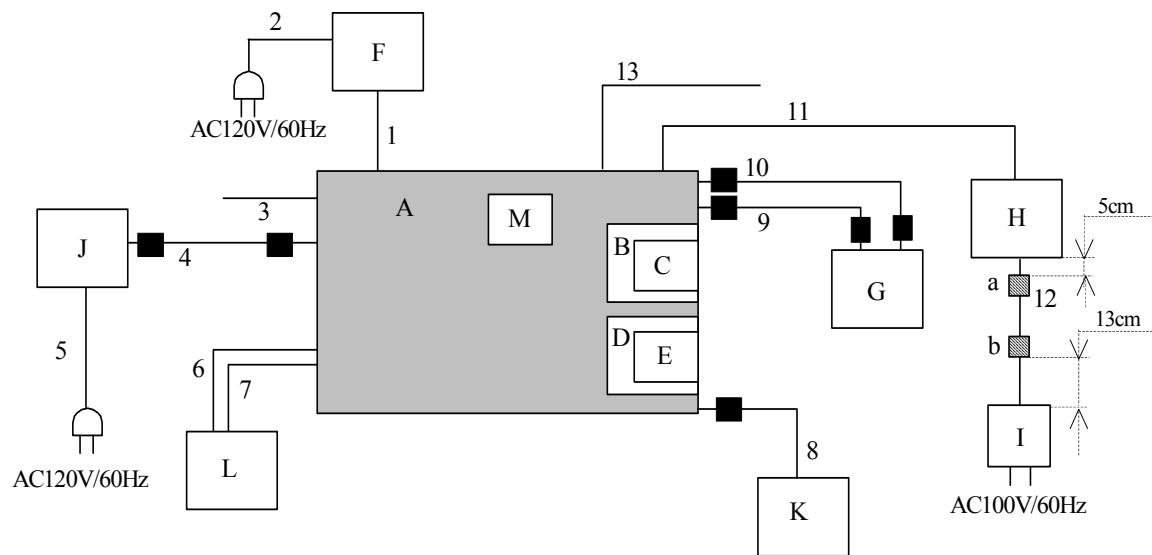
Test Item	Test mode	Test frequency	Channel	Used Antenna
Conducted Emission	-IEEE802.11a Transmitting (Tx), 6Mbps, Payload: PN9	Low Band	5180MHz(L) 5220MHz(M) 5240MHz(H)	36 44 48
		Middle Band	5260MHz(L) 5300MHz(M) 5320MHz(H)	52 60 64
	-IEEE802.11a Receiving (Rx)	Low Band	5220MHz(L)	44
		Middle Band	5300MHz(M)	60
Spurious Emission	-IEEE802.11a Transmitting (Tx), 6Mbps, Payload: PN9	Low Band	5180MHz(L) 5220MHz(M) 5240MHz(H)	36 44 48
		Middle Band	5260MHz(L) 5300MHz(M) 5320MHz(H)	52 60 64
	-IEEE802.11a Transmitting (Tx), 6Mbps, Bluetooth (EDR) Hopping mode, PRBS9	Low Band	5220MHz(L)	44
		Middle Band	5300MHz(M)	60
	-IEEE802.11a Receiving (Rx)	Low Band	5220MHz(L) 5300MHz(M)	44 60
26dB Emission Bandwidth Maximum Peak Output Power Peak Power Spectral Density Peak Excursion Ratio 99% Occupied Bandwidth	-IEEE802.11a Transmitting (Tx), 6Mbps, Payload: PN9	Low Band	5180MHz(L) 5220MHz(M) 5240MHz(H)	36 44 48
		Middle Band	5260MHz(L) 5300MHz(M) 5320MHz(H)	52 60 64

As a result of preliminary test, the formal test was performed with the above modes, which had the maximum power.

As for the Radiated Spurious Emission test, the antenna which transmits the largest power as a pre-test was verified.

The antenna which transmits the largest power was selected as an antenna for formal test. Please refer to P.35 and P.36.

4.2 Configuration and peripherals



■ : Standard Ferrite Core

■ : Ferrite Core

* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

* The EUT noise was not influenced by these Ferrite Cores.

* The Full port test was confirmed by the test of FCC Part 15 Subpart B.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Factory Computer as FC-NOTE Series	FC-N22A	PP-004 *1) PP-090 *2) PP-091 *3)	NEC	EUT
B	PC Card Adapter	BN-SDDBP3	P3021981R	Matsushita	-
C	SD Card	GH-SDC2G6X	-	Green House	-
D	Express Card	GH-EX25AD	R000/5340	Green House	-
E	SD Card	SD-M08O	-	TOSHIBA	-
F	AC Adapter	FC-AA01N	0803 PP 0000231G *1) 0000177 *2)	NEC	-
G	CD/DVD-Drive	FC-CW002U	S6Z0984M	NEC	-
H	Modem	MRV56R2	70107585	Micro Reserch	-
I	AC Adapter	-	-	-	-
J	Monitor	F15 T6A	2400026G1	NEC	-
K	Mouse	-	X05-87477	Microsoft	-
L	Earphone/Mic	-	-	Creative	-
M	SD Card	-	-	IO Data	-

*1) Used for Conducted emission test

*2) Used for Radiated emission test

*3) Used for Antenna terminal conducted tests

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.8	Unshielded	Unshielded	-
2	AC Cable	2.0	Unshielded	Unshielded	-
3	LAN Cable	0.1	Unshielded	Unshielded	-
4	Monitor Cable	2.0	Unshielded	Unshielded	-
5	AC Cable	2.0	Unshielded	Unshielded	-
6	Audio Cable	2.4	Unshielded	Unshileded	-
7	Audio Cable	2.4	Unshielded	Unshielded	-
8	USB Cable	1.5	Shielded	Shielded	-
9	USB Cable	0.55	Shielded	Shielded	-
10	USB Cable	0.55	Shielded	Shielded	-
11	RS-232C Cable	6.6	Shielded	Shielded	-
12	DC Cable	1.8	Unshielded	Unshielded	a: Ferrite Core (model: TFC16816, manufacturer: KG, Two turns) b: Ferrite Core (model: RFC-8, manufacturer: KG, Two turns)
13	IEEE 1394 Cable	1.5	Shielded	Shielded	-

UL Japan, Inc.

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

SECTION 5: Conducted Emission

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN)/ Artificial mains Network (AMN) and excess AC cable was bundled in center .

For the tests on EUT with other peripherals (as a whole system)

I/O cable and AC cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber or a Measurement Room.

The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The measurements have been performed with a CISPR quasi-peak detector (IF BW 9 kHz).

Measurement range: 0.15-30MHz

Test data : APPENDIX 2
Test result : Pass

SECTION 6: Spurious Emission and Band Edge Compliance

[Conducted]

Test Procedure

The Out of Band Emission was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass

[Radiated]

Test Procedure

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane. The Radiated Electric Field Strength intensity has been measured in a Semi Anechoic Chamber with a ground plane and at a distance of 3m(Below 10GHz) , 1m(10-26.5GHz, Distance Factor : $20\log(3[m]/1[m])$) and 0.5m(Upper 26.5GHz, Distance Factor : $20\log(3[m]/0.5[m])$).

The height of the measuring 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 with the Test Receiver or the Spectrum Analyzer.

Below 1GHz

The result also satisfied with the general limits specified in section 15.209(a).

Above 1GHz

Restricted bands (Section 15.205): Apply to limit in the Section 15.209(a)
Outside of the restricted bands (Section 15.407): Limit -27dBm EIRP

Frequency	Below 1GHz	Above 1GHz (Restricted bands)	Above 1GHz (Outside of the restricted bands)
Instrument use	Test Receiver	Spectrum Analyzer *1)	Spectrum Analyzer *1)
Detector IF Bandwidth	QP: BW 120kHz IF Bandwidth	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz	PK: RBW:1MHz/VBW: 1MHz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

*The noise from the EUT was not seen in the above 18GHz. The measurement was made in the residual noise levels.

Test data : APPENDIX 2
Test result : Pass

UL Japan, Inc.

Head Office EMC Lab.

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

Telephone : +81 596 24 8116

Faxsimile : +81 596 24 8124

SECTION 7: 26dB Emission Bandwidth

Test Procedure

The 26dB Emission Bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 2
Test result : Pass

SECTION 8: Maximum Peak Output Power

Test Procedure

The Peak Transmit Power was measured with a spectrum analyzer connected to the antenna port. The test was made with the spectrum analyzer that has a function of channel-power measurement. We followed the method 1 specified in DA-02-2138A1.

Test data : APPENDIX 2
Test result : Pass

SECTION 9: Peak Power Spectral Density

Test Procedure

The Peak Power Spectral Density was measured with a spectrum analyzer connected to the antenna port. We followed the method 2 specified in DA-02-2138A1.

Test data : APPENDIX 2
Test result : Pass

SECTION 10: Peak Excursion Ratio

Test Procedure

The Peak Excursion Ratio was measured with a spectrum analyzer connected to the antenna port. The second Sweep was measured based on Method 1 specified in DA-02-2138A1.

Test data : APPENDIX 2
Test result : Pass

UL Japan, Inc.

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