



EMI TEST REPORT

Test Report No. : 24DE0125-HO-1

Applicant : DENSO WAVE INCORPORATED
Type of Equipment : Wireless LAN Adapter
Model No. : KCS
Test standard : FCC Part 15 Subpart C
Section 15.207, Section 15.247
FCC ID : PZWKCS
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.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test : November 4, 15, 24 and December 1, 2003

Tested by : 
Naoki Sakamoto
EMC Service

Approved by : 
Hironobu Shimoji
Group Leader of EMC Service

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(10.04.03)

CONTENTS	PAGE
SECTION 1: CLIENT 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.....	7
SECTION 5: CONDUCTED EMISSION, SECTION 15.207	9
SECTION 6: 6DB BANDWIDTH, SECTION 15.247(A)(2)	9
SECTION 7: MAXIMUM PEAK OUTPUT POWER, SECTION 15.247(B)(3)	9
SECTION 8: OUT OF BAND EMISSION, SECTION 15.247 (C)	10
SECTION 9: PEAK POWER DENSITY, SECTION 15.247 (C).....	10
APPENDIX 1: PHOTOGRAPHS OF TEST SETUP	11
Conducted Emission	11
Spurious Emission (Radiated)	12
Three axes X, Y, Z.....	13
APPENDIX 2: TEST INSTRUMENTS.....	14
APPENDIX 3: DATA OF EMI TEST	15
Conducted Emission	15
6dB BANDWIDTH(Conducted)	16
Maximum Peak OutPut Power (Conducted)	18
Out of Band Emission : Radiated Emission	19
Restricted Band Edges : Radiated(Ch1:2412MHz)	25
Restricted Band Edges : Radiated(Ch11:2462MHz)	26
Out of Band Emission : Conducted(Ch 1:2412MHz 20dBc)	27
Out of Band Emission : Conducted(Ch 6:2437MHz 20dBc)	28
Out of Band Emission : Conducted(Ch 6:2462MHz 20dBc)	29
Power Density (Conducted)	30

SECTION 1: Client information

Company Name : DENSO WAVE INCORPORATED
Address : 1-1, Showa-cho, Kariyashi, Aichi-ken Japan
Telephone Number : +81-566-61-3858
Facsimile Number : +81-566-25-4741
Contact Person : Noritaka Hirao

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

2.1 Identification of E.U.T.

Type of Equipment : Wireless LAN adapter
Model No. : KCS
Serial No. : K03633100001C01
Country of Manufacture : Taiwan
Receipt Date of Sample : October 30, 2003
Condition of EUT : Production model

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2.2 Product Description

DENSO WAVE INCORPORATED., Model No: KCS is the Wireless LAN adapter.

This product is 2.4GHz Wireless LAN of DSSS installed in barcode scanner.

RF specification is accordance with IEEE802.11b.

The clock frequency of EUT are 44MHz, 32.768kHz.

Equipment Type	:	Transceiver
Frequency band	:	2400-2483.5MHz
Frequency operation	:	2412-2462MHz
Type of modulation	:	DSSS(IEEE802.11b) CCK(5.5/11Mbps), BPSK(1Mbps), QPSK(2Mbps)
Channel spacing	:	5MHz
Channel access protocol	:	PTA
Mode of operation	:	Simplex
Antenna Type	:	Chip Antenna
Antenna Gain	:	-3.86dBi
Antenna connector Type	:	Hirose CL331-0471-0-10X1
Method of Frequency Generation	:	Synthesizer
Power Supply	:	DC3.0-3.6V

FCC 15.31 (e)

This EUT provides stable voltage(DC*V) constantly to RF Module regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

Type of Equipment and its antenna comply with this requirement since they are built in host device Model No.

When they are put up for sale and they are used with a particular antenna connector for this EUT.

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part15 Subpart C

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz,
2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted emission	ANSI C63.4:2001	Section 15.207	Conducted	N/A	23.0dB 0.200MHz N	Complied
2	6dB Bandwidth	ANSI C63.4:2001	Section 15.247(a)(2)	Conducted	N/A	-	Complied
3	Maximum Peak Output Power	ANSI C63.4:2001	Section 15.247(b)(3)	Conducted	N/A	14.4dB 2412MHz	Complied
4	Out of Band Emission	ANSI C63.4:2001	Section 15.247 (c)	Conducted/ Radiated	N/A	0.1dB 264.0MHz, 352.0MHz Horizontal (Radiated)	Complied
5	Restricted Band Edges	ANSI C63.4:2001	Section 15.247 (c)	Radiated	N/A	8.1dB 2390.0MHz Vertical	Complied
6	Power Density	ANSI C63.4:2001	Section 15.247 (d)	Conducted	N/A	19.6dB 2437.0MHz	Complied

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

*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 Confirmation

UL ApexCo., Ltd. hereby confirms that E.U.T., in the configuration tested, complies with the specifications
FCC Part 15 Subpart C Section 15.207 and 15.247.

Remarks : The EUT was separately tested in accordance with FCC Part 15 Subpart B and Declaration of Conformity was applied

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3.5 Uncertainty

Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test is $\pm 1.3\text{dB}$.

Spurious Emission (Radiated)

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

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

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

3.6 Test Location

UL Apex Co., Ltd. Head Office EMC Lab.

No.2 semi anechoic chamber.

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No.2 semi anechoic chamber has been fully described in a report submitted to FCC office, and listed on June 05, 2002. (Registration number: No.2:846015 Industry Canada: No.2: IC4247-2)

*NVLAP Lab. code: 200572-0

3.7 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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

4.1 Operating Modes

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

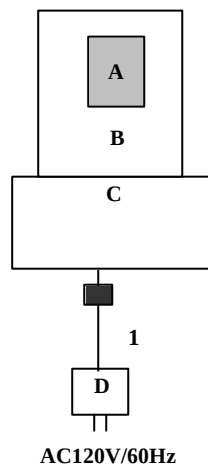
The sequence is used:

Transmitting mode	(CCK 11Mbps)
Low Channel	:2412MHz(Ch1)
Mid Channel	:2437MHz(Ch6)
High channel	:2462MHz(Ch11)

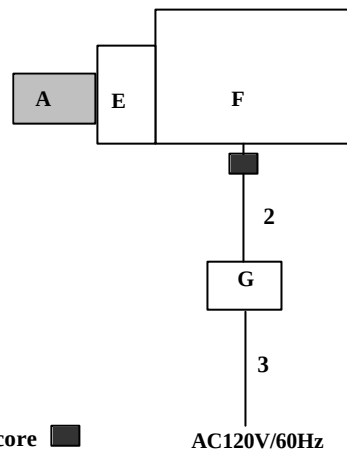
Justification: The system was configured in typical fashion (as a customer would normally use it) for testing.

4.2 Configuration and peripherals

AC Mains Conducted emission



Stand alone tests



* A:EUT

* Ferrite core ■

* Cabling was taken into consideration and test data was taken under worstcase conditions.

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Description of EUT and Support equipment

No	Item	Model number	Serial number	Manufacturer	FCC ID
A	Wireless LAN adapter	KCS	K03633100001C01	Wistron	PZWKCS
B	Barcode Handy Terminal	BHT-7500W	-	DENSO WAVE	-
C	Communication Unit	CU-7001	-	DENSO WAVE	-
D	AC Adaptor	496460-0130	1		
E	Expansion Unit	-	-	-	-
F	Personal Computer	CF-L1EA	DKSB09673456789	Panasonic	-
G	AC Adaptor	CF-AA1639 M7	000451726A	Panasonic	-

List of cables used

No	Name	Length (m)	Shield	Backshell Material
1	DC Power Cable	2.0	N	Polyvinyl chloride
2	DC Power Cable	1.8	N	Polyvinyl chloride
3	AC Power Cable	1.8	N	Polyvinyl chloride

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SECTION 5: Conducted Emission, Section 15.207

Test Procedure

EUT was placed on a platform of nominal size, 1m 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 LISN and excess AC cable was 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. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the input power source. All unused 50ohm connectors of the LISN were resistively terminated in 50ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT on a reference ground plane 4.0 x 4.0m in a No.2 semi Anechoic Chamber.

The EUT was connected to a Line Impedance Stabilization Network (LISN).

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 3

Test result : Pass

SECTION 6: 6dB Bandwidth, Section 15.247(a)(2)

Test Procedure

The minimum 6dB bandwidth was measured with a spectrum analyzer connected to the antenna port.

Test data : APPENDIX 3

Test result : Pass

SECTION 7: Maximum Peak Output Power, Section 15.247(b)(3)

Test Procedure

The Maximum Peak Output Power was measured with a Power Meter connected to the antenna port.

Test data : APPENDIX 3

Test result : Pass

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SECTION 8: Out of Band Emission, Section 15.247 (c)

[Radiated]

Test Procedure

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization.

The Radiated Electric Field Strength intensity has been measured in No.2 semi anechoic chamber (7.5x5.8x5.2m) with a ground plane and at a distance of 3m(Below 10GHz) and 1m(Upper 10GHz).

The measuring antenna height was varied between 1 to 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.

The noise was measured at each position of all three axes X, Y, Z to compare the level, and the maximum noise level was recorded.

In any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

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

Test data	:	APPENDIX 3
Test result	:	Pass

[Conducted]

Test Procedure

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

Test data	:	APPENDIX 3
Test result	:	Pass

SECTION 9: Peak Power Density, Section 15.247 (d)

[Conducted]

Test Procedure

The Peak Power Density was measured with a spectrum analyzer connected to the antenna port.

Test data	:	APPENDIX 3
Test result	:	Pass

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APPENDIX 1: Photographs of test setup

Conducted Emission

Front

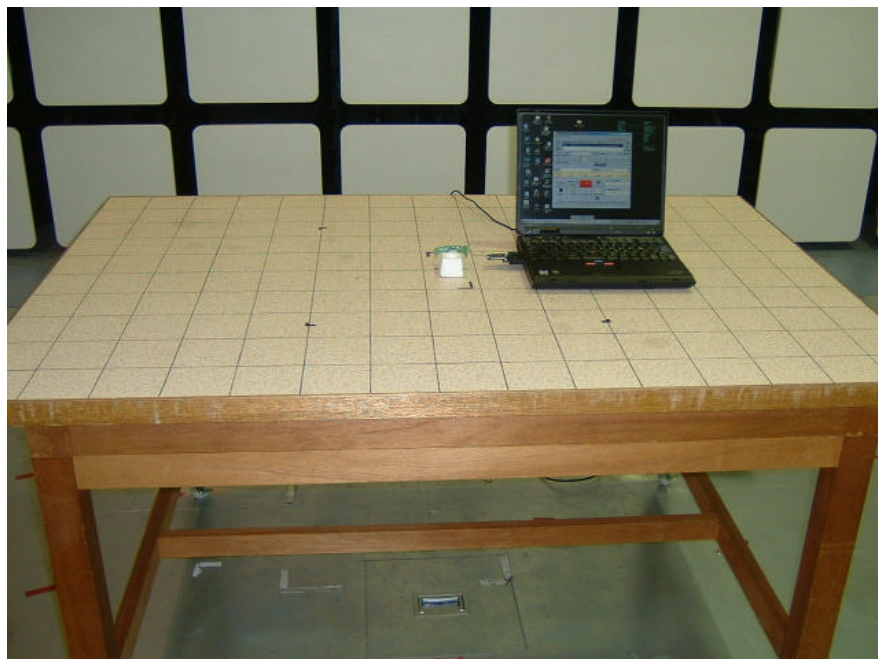


Rear

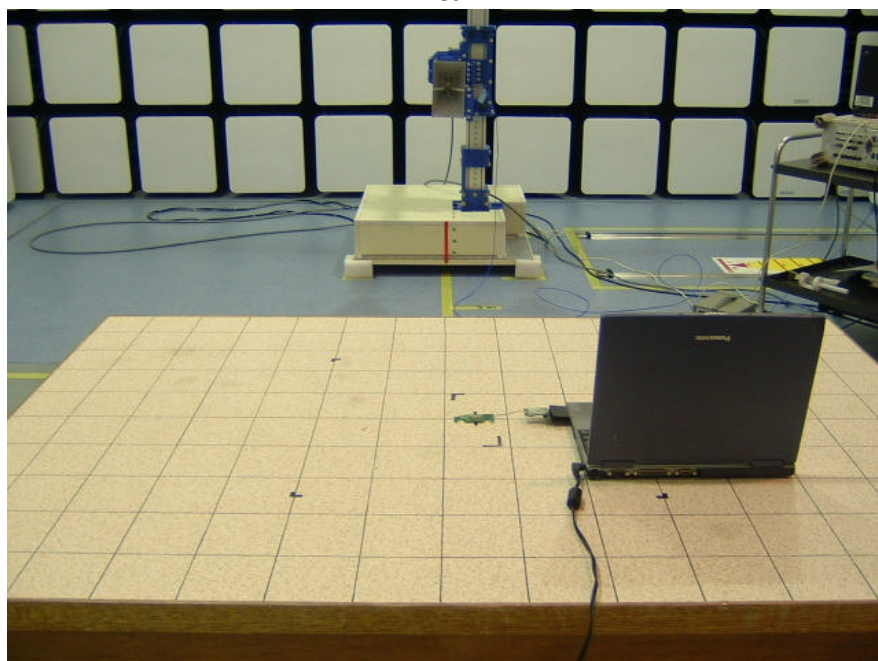


Spurious Emission (Radiated)

Front



Rear

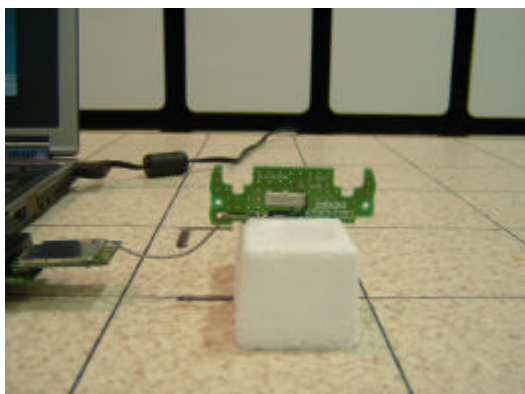


Three axes X, Y, Z

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	1 to 6	2003/04/11 * 12
MCC-13	Coaxial Cable	Fujikura/Agilent	-	1	2003/05/08 * 12
MLS-06	LISN(AMN)	Schwarzbeck	NSLK8127	1	2003/03/18 * 12
SA-07	Spectrum Analyzer	Advantest	R3273	1 to 6	2002/12/10 * 12
MTR-02	Test Receiver	Rohde & Schwarz	ESCS30	1, 4	2003/01/31 * 12
MTA-01	Termination	TME	CT-01	1	2003/01/07 * 12
MCC-04	Microwave Cable	Storm	421-011	4	2003/01/14 * 12
MPM-01	Power Meter	Agilent	E4417A	3	2003/04/14 * 12
MPSE-03	Power sensor	Agilent	E9327A	3	2003/04/14 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBA9106	4	2003/04/28 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	4	2003/04/28 * 12
MPA-02	Pre Amplifier	Agilent	87405A	4	2003/04/17 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	4	2002/12/24 * 12
MHA-02	High Pass Filter	Tokimec	TF323DC A	4	2003/09/19 * 12
MAT-20	Attenuator(10dB)	Hirose	AT-110	2 to 6	2003/02/04 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	4	2003/05/08 * 12
MPA-01	Pre Amplifier	Agilent	8449B	4	2003/02/08 * 12
MCC-24	Microwave Cable	Storm	-	4	2003/04/30 * 12
MHA-01	Horn Antenna	EMCO	3160-09	4	2003/01/11 * 12
MHA-05	Horn Antenna	Schwarzbeck	BBHA9120D	4	2003/01/11 * 12

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

Test Item:

- 1: Conducted emission**
- 2: 6dB Bandwidth**
- 3: Maximum Peak Output Power**
- 4: Out of Band Emission(Radiated)**
- 5: Out of Band Emission(Conducted)**
- 6: Peak Power Density**

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APPENDIX 3 Data of EMI Test

Data of Conduction Test UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber
Report No.:24DE0125-H0-1

Applicant : DENSO WAVE INCORPORATED
Kind of Equipment : Wireless LAN Adaptor/Barcode Handy Terminal
Model No. : KCS/BHT-7500W
Serial No. :
Power : AC120V/60Hz
Mode : Running
Remarks :
Date : 11/4/2003
Phase : Single Phase
Temperature : 24 °C
Humidity : 41 %
Regulation : FCC15.207

Engineer : Naoki Sakamoto

No.	FREQ. [MHz]	READING(N)		READING(L1)		LISN FACTOR [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS		MARGIN	
		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]				QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]
1.	0.1500	41.1	-	40.8	-	0.0	0.1	0.0	41.2	-	66.0	56.0	24.8	-
2.	0.3000	34.6	-	33.2	-	0.0	0.1	0.0	34.7	-	60.2	50.2	25.5	-
3.	0.2000	40.5	15.0	40.0	12.2	0.0	0.1	0.0	40.6	15.1	63.6	53.6	23.0	38.5
4.	0.4000	32.5	-	30.4	-	0.1	0.1	0.0	32.7	-	57.9	47.9	25.2	-
5.	0.5040	30.2	-	26.7	-	0.1	0.1	0.0	30.4	-	56.0	46.0	25.6	-
6.	0.9051	21.0	-	19.2	-	0.1	0.2	0.0	21.3	-	56.0	46.0	34.7	-
7.	9.8390	30.3	-	28.4	-	0.4	1.0	0.0	31.7	-	60.0	50.0	28.3	-

CALCULATION: READING[dBμV] + LISN FACTOR[dB] + CABLE LOSS[dB] + ATTEN[dB].

All other spurious emissions were less than 20dB for the limit.

6dB BANDWIDTH(Conducted)

DATA OF 6dB BANDWIDTH (CONDUCTED)

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Head Office EMC Lab. No.3 Shield Room

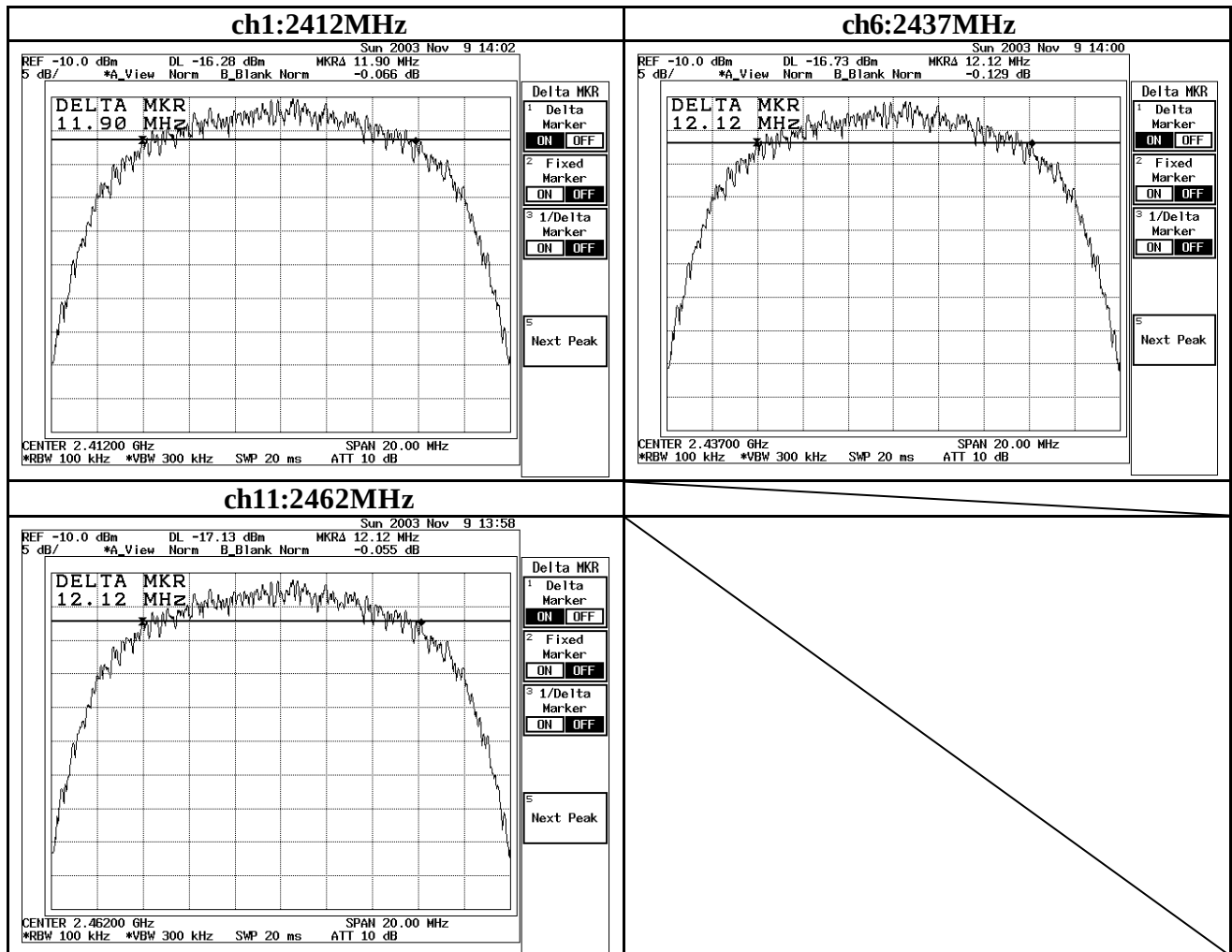
Company	: DENSO WAVE INCORPORATED	REPORT NO	: 24DE0125-HO
Equipment	: Wireless LAN adapter	REGULATION	: Fcc Part15 Subpart C 15.247(a)(2)
Model	: KCS	TEST DISTANCE	: -
Sample No.	:	DATE	: 11/09/2003
Power	: DC3.0V	TEMPERATURE	: 22°C
Mode	: Tx (ch1,6,11)	HUMIDITY	: 48%
FCC ID	: PZWKCS		
IC No.	: 1551C-KCS		

ENGINEER : Naoki Sakamoto

PK DETECT(RBW 100kHz,VBW 300kHz)

CH	FREQ	6dB Bandwidth	Limit
	[MHz]	[MHz]	[kHz]
ch1	2412.0	11.900	500.0
ch6	2437.0	12.120	500.0
ch11	2462.0	12.120	500.0

6dB Bandwidth (Conducted)



Maximum Peak OutPut Power (Conducted)

UL Apex Co., Ltd.
Head Office EMC Lab. No.3 Shield Room

Company : DENSO WAVE INCORPORATED
Equipment : Wireless LAN adapter
Model : KCS
Sample No. :
Power : AC120V/60Hz
Mode : Tx(ch1,6,11)
FCC ID : PZWKCS
IC No. : 1551C-KCS

REPORT NO : 24DE0125-HO
REGULATION : Fcc Part15 Subpart C 15.247(b)(3)
TEST DISTANCE : -
DATE : 12/01/2003
TEMPERATURE : 21°C
HUMIDITY : 52%

ENGINEER : Naoki Sakamoto

ch	FREQ [MHz]	Power Meter Reading [dBm]	Cable Loss [dB]	ATTEN. [dB]	Result [dBm]	Limit (1W) [dBm]	Margin [dB]
ch1	2412.0	3.6	2.0	10.0	15.6	30.0	14.4
ch6	2437.0	3.2	2.0	10.0	15.2	30.0	14.8
ch11	2462.0	3.0	2.0	10.0	15.0	30.0	15.0

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

DATA OF RADIATION TEST

UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber
Report No.: 24DE0125-H0-1

Applicant : DENSO
Kind of Equipment : Wireless LAN Adapter
Model No. : KCS
Serial No. : K03633100001C01
Power : DC3.3V (AC120V/60Hz)
Mode : Transmitting Ch1(2412MHz)
Remarks : DETECTOR:QP
Date : 11/24/2003
Test Distance : 3 m
Temperature : 20 °C
Humidity : 50 %
Regulation : FCC Part15C § 15.209(a)

Engineer : Naoki Sakamoto

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μV/m]	MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]		HOR [dB]	VER [dB]
1.	88.00	BB	35.0	27.3	6.4	23.4	1.1	6.0	25.1	17.4	40.0	14.9	22.6
2.	132.00	BB	36.4	30.7	13.8	23.3	1.5	6.0	34.4	28.7	43.5	9.1	14.8
3.	187.00	BB	39.1	30.7	16.2	23.3	1.8	6.0	39.8	31.4	43.5	3.7	12.1
4.	220.00	BB	42.5	30.0	16.5	23.2	2.1	6.0	43.9	31.4	46.0	2.1	14.6
5.	264.00	BB	42.9	37.0	17.8	23.1	2.2	6.0	45.8	39.9	46.0	0.2	6.1
6.	308.00	BB	46.0	31.5	14.6	23.2	2.4	6.0	45.8	31.3	46.0	0.2	14.7
7.	352.00	BB	44.3	35.5	15.9	23.0	2.5	6.1	45.8	37.0	46.0	0.2	9.0
8.	440.00	BB	41.4	34.0	17.7	22.9	2.8	6.2	45.2	37.8	46.0	0.8	8.2
9.	728.99	BB	27.7	27.3	20.9	23.0	3.9	6.1	35.6	35.2	46.0	10.4	10.8

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

All other spurious emissions were less than 20dB for the limit.
ANT.TYPE:30-300MHz:Biconical, 300-1000MHz:Logperiodic, 1GHz-:Horn

DATA OF RADIATION TEST

UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber
Report No.: 24DE0125-H0-1

Applicant : DENSO
Kind of Equipment : Wireless LAN Adapter
Model No. : KCS
Serial No. : K03633100001C01
Power : DC3.3V (AC120V/60Hz)
Mode : Transmitting Ch6(2437MHz)
Remarks : DETECTOR:QP
Date : 11/24/2003
Test Distance : 3 m
Temperature : 20 °C
Humidity : 50 %
Regulation : FCC Part15C § 15.209(a)

Engineer : Naoki Sakamoto

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μV/m]	MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]		HOR [dB]	VER [dB]
1.	88.00	BB	34.7	28.3	6.4	23.4	1.1	6.0	24.8	18.4	40.0	15.2	21.6
2.	132.00	BB	36.9	29.6	13.8	23.3	1.5	6.0	34.9	27.6	43.5	8.6	15.9
3.	187.00	BB	39.9	29.6	16.2	23.3	1.8	6.0	40.6	30.3	43.5	2.9	13.2
4.	220.00	BB	41.9	30.5	16.5	23.2	2.1	6.0	43.3	31.9	46.0	2.7	14.1
5.	264.00	BB	43.0	35.6	17.8	23.1	2.2	6.0	45.9	38.5	46.0	0.1	7.5
6.	308.00	BB	45.9	32.5	14.6	23.2	2.4	6.0	45.7	32.3	46.0	0.3	13.7
7.	352.00	BB	44.3	34.7	15.9	23.0	2.5	6.1	45.8	36.2	46.0	0.2	9.8
8.	440.00	BB	40.8	35.0	17.7	22.9	2.8	6.2	44.6	38.8	46.0	1.4	7.2
9.	728.99	BB	28.0	26.9	20.9	23.0	3.9	6.1	35.9	34.8	46.0	10.1	11.2

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

All other spurious emissions were less than 20dB for the limit.
ANT.TYPE:30-300MHz:Biconical, 300-1000MHz:Logperiodic, 1GHz-:Horn

DATA OF RADIATION TEST

UL Apex Co., Ltd. Head Office EMC Lab.
No.2 Semi Anechoic Chamber
Report No.: 24DE0125-H0-1

Applicant : DENSO
Kind of Equipment : Wireless LAN Adapter
Model No. : KCS
Serial No. : K03633100001C01
Power : DC3.3V (AC120V/60Hz)
Mode : Transmitting Ch11(2462MHz)
Remarks : DETECTOR:QP
Date : 11/24/2003
Test Distance : 3 m
Temperature : 20 °C
Humidity : 50 %
Regulation : FCC Part15C § 15.209(a)

Engineer : Naoki Sakamoto

No.	FREQ. [MHz]	ANT TYPE	READING		ANT FACTOR [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	ATTEN. [dB]	RESULT		LIMITS [dB μV/m]	MARGIN	
			HOR [dB μV]	VER [dB μV]					HOR [dB μV/m]	VER [dB μV/m]		HOR [dB]	VER [dB]
1.	88.00	BB	34.9	27.1	6.4	23.4	1.1	6.0	25.0	17.2	40.0	15.0	22.8
2.	132.00	BB	37.3	30.6	13.8	23.3	1.5	6.0	35.3	28.6	43.5	8.2	14.9
3.	187.00	BB	39.0	30.9	16.2	23.3	1.8	6.0	39.7	31.6	43.5	3.8	11.9
4.	220.00	BB	42.0	30.2	16.5	23.2	2.1	6.0	43.4	31.6	46.0	2.6	14.4
5.	264.00	BB	42.8	36.8	17.8	23.1	2.2	6.0	45.7	39.7	46.0	0.3	6.3
6.	308.00	BB	45.9	31.6	14.6	23.2	2.4	6.0	45.7	31.4	46.0	0.3	14.6
7.	352.00	BB	44.4	35.0	15.9	23.0	2.5	6.1	45.9	36.5	46.0	0.1	9.5
8.	440.00	BB	41.0	34.6	17.7	22.9	2.8	6.2	44.8	38.4	46.0	1.2	7.6
9.	728.99	BB	30.0	27.2	20.9	23.0	3.9	6.1	37.9	35.1	46.0	8.1	10.9

CALCULATION: READING + ANT.FACTOR + CABLE LOSS - AMP.GAIN + ATTEN.

All other spurious emissions were less than 20dB for the limit.
ANT.TYPE:30-300MHz:Biconical, 300-1000MHz:Logperiodic, 1GHz-:Horn

DATA OF SPURIOUS EMISSIONS(1GHz to 26GHz)

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : DENSO CORPORATION Co., Ltd.
QUIPMENT : Wireless LAN Module
MODEL : KCS
SAMPLE NO. :
POWER : DC3.3V
MODE : Transmitting (CH1:2412MHz)

REGULATION : Fcc Part15 Subpart C 15.247(c)
TEST DISTANCE : 3m(below 1GHz) / 1m(upper 1GHz)
DATE : 11/15/2003
TEMPERATURE : 20°C
HUMIDITY : 50%

ENGINEER : Naoki Sakamoto

PK DETECT

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT		Limit PK [dBuV/m]	MARGIN	
		HOR [dBuV/m]	VER					HOR [dB]	VER [dB]			
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)												
1	2390.0	44.8	47.4	30.5	36.9	6.2	10.0	54.6	57.2	74.0	19.4	16.8
2	4824.0	45.6	47.3	31.0	36.8	8.8	0.8	49.4	51.1	74.0	24.6	22.9
3	7236.0	44.0	43.7	37.7	36.5	10.7	0.5	56.4	56.1	74.0	17.6	17.9
4	9648.0	43.8	44.5	37.2	37.2	12.7	0.5	57.0	57.7	74.0	17.0	16.3
Test distance 1meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
5	12060.0	46.0	44.7	40.5	36.8	14.3	0.6	55.1	53.8	74.0	18.9	20.3
6	14472.0	44.0	44.2	43.0	35.3	15.8	0.6	58.6	58.8	74.0	15.4	15.2
7	16884.0	46.9	46.0	44.7	36.4	17.6	0.5	63.8	62.9	74.0	10.2	11.1
8	19296.0	43.2	44.5	40.5	36.0	19.0	0.7	57.9	59.2	74.0	16.1	14.8
9	21708.0	44.7	44.9	40.6	36.0	19.6	0.6	60.0	60.2	74.0	14.0	13.8
10	24120.0	44.3	46.8	40.2	36.9	21.0	1.3	60.4	62.9	74.0	13.6	11.1

AV DETECT

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)										
1	2390.0	33.6	36.1	30.5	36.9	6.2	10.0	43.4	45.9	54.0	10.6	8.1
2	4824.0	35.8	41.4	31.0	36.8	8.8	0.8	39.6	45.2	54.0	14.4	8.8
3	7236.0	30.7	30.7	37.7	36.5	10.7	0.5	43.1	43.1	54.0	10.9	10.9
4	9648.0	31.6	31.3	37.2	37.2	12.7	0.5	44.8	44.5	54.0	9.2	9.5
Test distance 1meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
5	12060.0	30.5	30.5	40.5	36.8	14.3	0.6	39.6	39.6	54.0	14.4	14.4
6	14472.0	29.1	29.5	43.0	35.3	15.8	0.6	43.7	44.1	54.0	10.3	9.9
7	16884.0	31.2	31.2	44.7	36.4	17.6	0.5	48.1	48.1	54.0	5.9	5.9
8	19296.0	31.0	31.0	40.5	36.0	19.0	0.7	45.7	45.7	54.0	8.3	8.3
9	21708.0	32.3	32.1	40.6	36.0	19.6	0.6	47.6	47.4	54.0	6.4	6.6
10	24120.0	33.4	33.6	40.2	36.9	21.0	1.3	49.5	49.7	54.0	4.5	4.3

Test Distance 1.0m : Distance Factor(Dfac) = 20log(3/1.0) = 9.5dB

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

*In the frequency over the fifth harmonic, the noise from the EUT was not seen. The data above is its base noise.

*The limit values at frequencies excepting restricted bands indicated in 15.205 are values 20dB below lower

* Attenuator : 1 to 3.5GHz, Filter : 3.5 to 26GHz

DATA OF SPURIOUS EMISSIONS(1GHz to 26GHz)

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : DENSO CORPORATION Co., Ltd.
QUIPMENT : Wireless LAN Module
MODEL : KCS
SAMPLE NO. :
POWER : DC3.3V
MODE : Transmitting (CH6:2437MHz)

REGULATION : Fcc Part15 Subpart C 15.247(c)
TEST DISTANCE : 3m(below 1GHz) / 1m(Upper 1GHz)
DATE : 11/15/2003
TEMPERATURE : 20°C
HUMIDITY : 50%

ENGINEER : Naoki Sakamoto

PK DETECT

No.	FREQ [MHz]	T/R READING HOR VER [dBuV/m]		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT HOR VER [dBuV/m]		Limit PK [dBuV/m]	MARGIN HOR VER [dB]	
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)												
1	4874.0	63.1	60.2	30.5	36.9	6.2	0.0	62.9	60.0	74.0	11.2	14.0
2	7311.0	44.9	45.7	31.0	36.8	8.8	0.8	48.7	49.5	74.0	25.3	24.5
3	9748.0	43.7	42.8	37.7	36.5	10.7	0.5	56.1	55.2	74.0	17.9	18.8
Test distance 1meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
4	12185.0	43.1	44.1	40.5	36.8	14.3	0.6	52.2	53.2	74.0	21.8	20.8
5	14622.0	42.8	43.4	43.0	35.3	15.8	0.6	57.4	58.0	74.0	16.6	16.0
6	17059.0	44.0	43.9	44.7	36.4	17.6	0.5	60.9	60.8	74.0	13.1	13.2
7	19496.0	43.2	44.5	40.5	36.0	19.0	0.7	57.9	59.2	74.0	16.1	14.8
8	21933.0	44.7	44.9	40.6	36.0	19.6	0.6	60.0	60.2	74.0	14.0	13.8
9	24370.0	44.3	46.8	40.2	36.9	21.0	1.3	60.4	62.9	74.0	13.6	11.1

AV DETECT

No.	FREQ [MHz]	T/R READING HOR VER [dBuV/m]		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT HOR VER [dBuV/m]		Limit AV [dBuV/m]	MARGIN HOR VER [dB]	
		Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)										
1	4874.0	46.0	43.6	30.5	36.9	6.2	0.0	45.8	43.4	54.0	8.2	10.6
2	7311.0	35.8	41.4	31.0	36.8	8.8	0.8	39.6	45.2	54.0	14.4	8.8
3	9748.0	30.7	30.7	37.7	36.5	10.7	0.5	43.1	43.1	54.0	10.9	10.9
Test distance 1meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
4	12185.0	30.5	30.4	40.5	36.8	14.3	0.6	39.6	39.5	54.0	14.4	14.5
5	14622.0	29.7	29.8	43.0	35.3	15.8	0.6	44.3	44.4	54.0	9.7	9.6
6	17059.0	31.5	31.8	44.7	36.4	17.6	0.5	48.4	48.7	54.0	5.6	5.3
7	19496.0	31.5	31.6	40.5	36.0	19.0	0.7	46.2	46.3	54.0	7.8	7.7
8	21933.0	31.8	31.7	40.6	36.0	19.6	0.6	47.1	47.0	54.0	6.9	7.0
9	24370.0	31.1	31.1	40.2	36.9	21.0	1.3	47.2	47.2	54.0	6.8	6.8

Test Distance 1.0m : Distance Factor(Dfac) = 20log(3/1.0) = 9.5dB

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

*In the frequency over the fifth harmonic, the noise from the EUT was not seen. The data above is its base noise.

*The limit values at frequencies excepting restricted bands indicated in 15.205 are values 20dB below lower

* Attenuator : 1 to 3.5GHz, Filter : 3.5 to 26GHz

DATA OF SPURIOUS EMISSIONS(1GHz to 26GHz)

UL Apex Co., Ltd.
Head Office EMC Lab. No.2 Semi Anechoic Chamber

COMPANY : DENSO CORPORATION Co., Ltd.
EQUIPMENT : Wireless LAN Module
MODEL : KCS
SAMPLE NO. :
POWER : DC3.3V
MODE : Transmitting (CH11:2462MHz)

REGULATION : Fcc Part15 Subpart C 15.247(c)
TEST DISTANCE : 3m(below 1GHz) / 1m(upper 1GHz)
DATE : 11/15/2003
TEMPERATURE : 20°C
HUMIDITY : 50%

ENGINEER : Naoki Sakamoto

PK DETECT

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT		Limit PK [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]						[dB]	[dB]			
Test distance 3meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)												
1	2483.5	43.6	46.1	30.5	36.9	6.2	10.0	53.4	55.9	74.0	20.6	18.1
2	4924.0	46.1	45.8	31.0	36.8	8.8	0.8	49.9	49.6	74.0	24.1	24.4
3	7386.0	44.9	43.5	37.7	36.5	10.7	0.5	57.3	55.9	74.0	16.7	18.1
4	9848.0	42.3	43.4	37.2	37.2	12.7	0.5	55.5	56.6	74.0	18.5	17.4
Test distance 1meters RESULT=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
5	12310.0	45.8	43.5	40.5	36.8	14.3	0.6	54.9	52.6	74.0	19.1	21.4
6	14772.0	43.4	44.0	43.0	35.3	15.8	0.6	58.0	58.6	74.0	16.0	15.4
7	17234.0	46.8	45.8	44.7	36.4	17.6	0.5	63.7	62.7	74.0	10.3	11.3
8	19696.0	44.6	44.4	40.5	36.0	19.0	0.7	59.3	59.1	74.0	14.7	14.9
9	22158.0	44.3	44.5	40.6	36.0	19.6	0.6	59.6	59.8	74.0	14.4	14.2
10	24620.0	44.8	44.7	40.2	36.9	21.0	1.3	60.9	60.8	74.0	13.1	13.2

AV DETECT

No.	FREQ [MHz]	T/R READING		ANT Factor [dB/m]	AMP GAIN [dB]	CABLE LOSS [dB]	Attenuator or Filter [dB]	RESULT		Limit AV [dBuV/m]	MARGIN	
		HOR	VER					HOR	VER		HOR	VER
		[dBuV/m]										
Test distance 3meters RESULT T=Reading + ANT Factor - Amp Gain + CABLE LOSS + Attenuator (or Filter)												
1	2483.5	33.4	35.2	30.5	36.9	6.2	0.0	33.2	35.0	54.0	20.8	19.0
2	4924.0	34.8	41.4	31.0	36.8	8.8	0.8	38.6	45.2	54.0	15.4	8.8
3	7386.0	31.1	30.7	37.7	36.5	10.7	0.5	43.5	43.1	54.0	10.5	10.9
4	9848.0	31.2	31.0	37.2	37.2	12.7	0.5	44.4	44.2	54.0	9.6	9.8
Test distance 1meters RESULT T=Reading + ANT Factor - Amp Gain + CABLE LOSS + Filter - Dfac												
5	12310.0	30.0	30.5	40.5	36.8	14.3	0.6	39.1	39.6	54.0	14.9	14.4
6	14772.0	37.9	29.5	43.0	35.3	15.8	0.6	52.5	44.1	54.0	1.5	9.9
7	17234.0	31.0	31.2	44.7	36.4	17.6	0.5	47.9	48.1	54.0	6.1	5.9
8	19696.0	31.7	32.1	40.5	36.0	19.0	0.7	46.4	46.8	54.0	7.6	7.2
9	22158.0	31.8	31.9	40.6	36.0	19.6	0.6	47.1	47.2	54.0	6.9	6.8
10	24620.0	32.4	32.6	40.2	36.9	21.0	1.3	48.5	48.7	54.0	5.5	5.3

Test Distance 1.0m : Distance Factor(Dfac) = 20log(3/1.0) = 9.5dB

*Except for the above table : All other spurious emissions were less than 20dB for the limit.

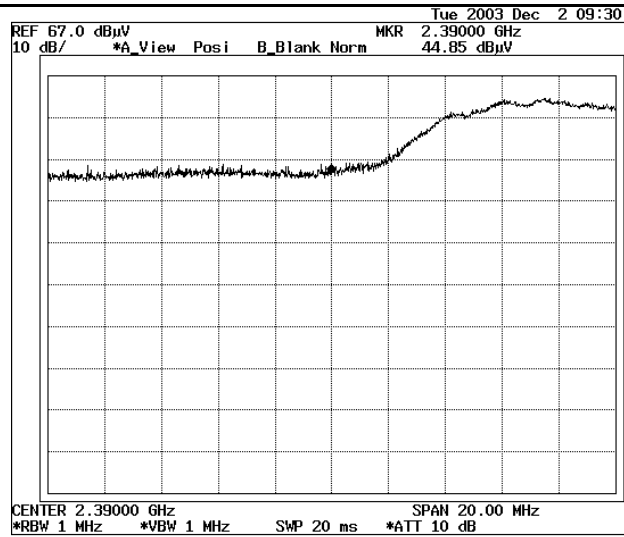
*In the frequency over the fifth harmonic, the noise from the EUT was not seen. The data above is its base noise.

*The limit values at frequencies excepting restricted bands indicated in 15.205 are values 20dB below lower

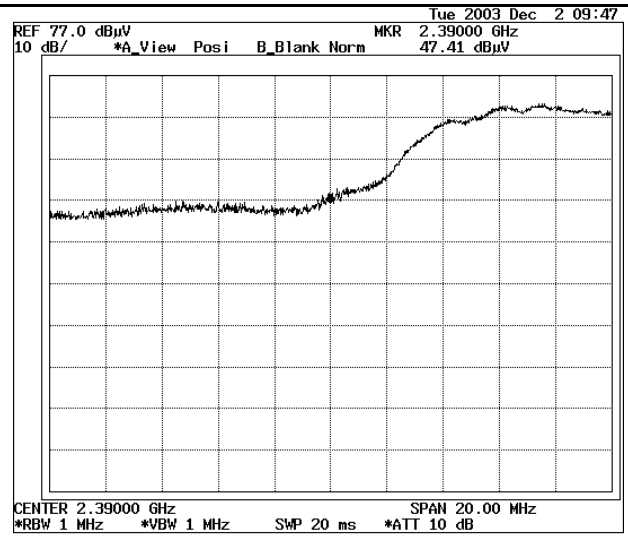
* Attenuator : 1 to 3.5GHz, Filter : 3.5 to 26GHz

Restricted Band Edges : Radiated(Ch1:2412MHz)

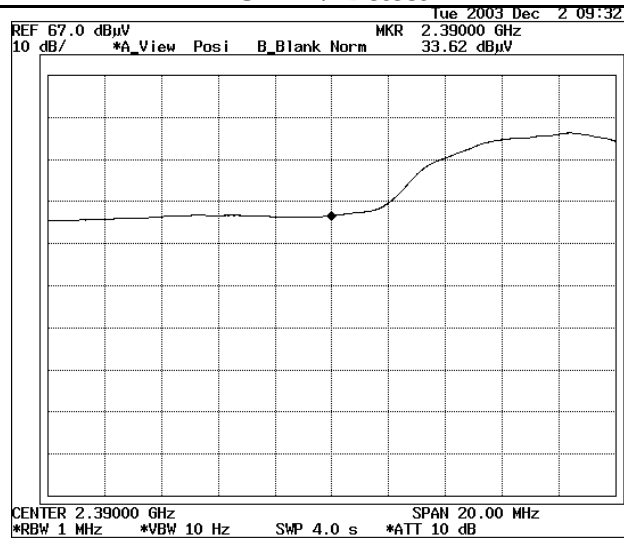
HOR PK Detect



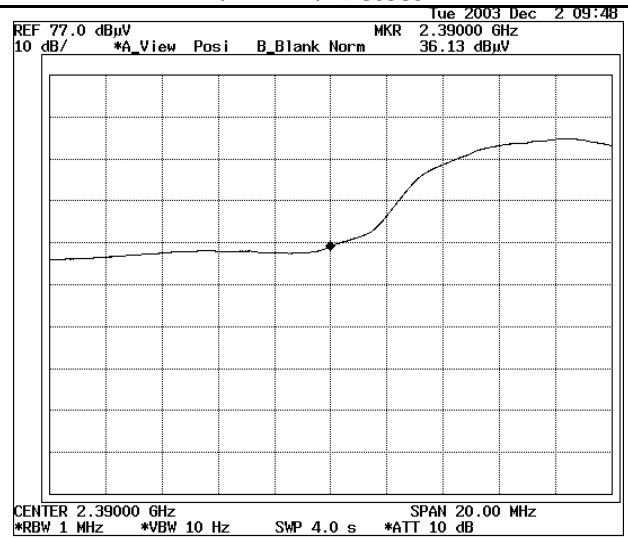
VER PK Detect



HOR AV Detect



VER AV Detect



UL Apex Co., Ltd.

Head Office EMC Lab.

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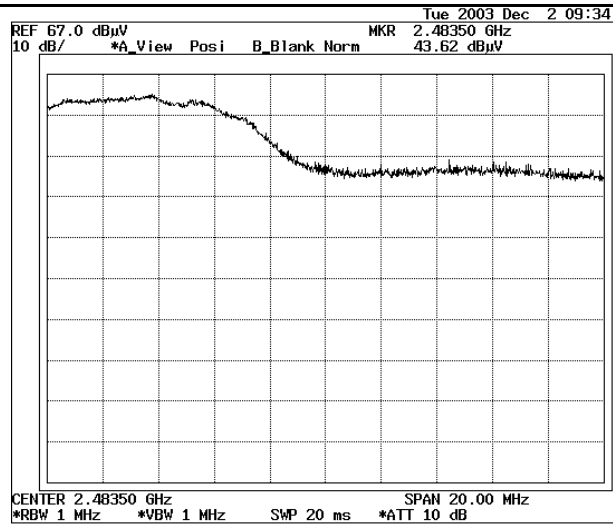
Telephone : +81 596 24 8116

Facsimile : +81 596 24 8124

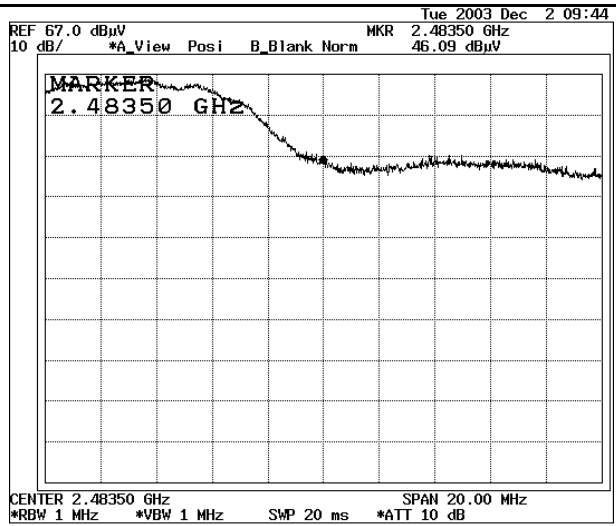
MF060b(10.04.03)

Restricted Band Edges : Radiated(Ch11:2462MHz)

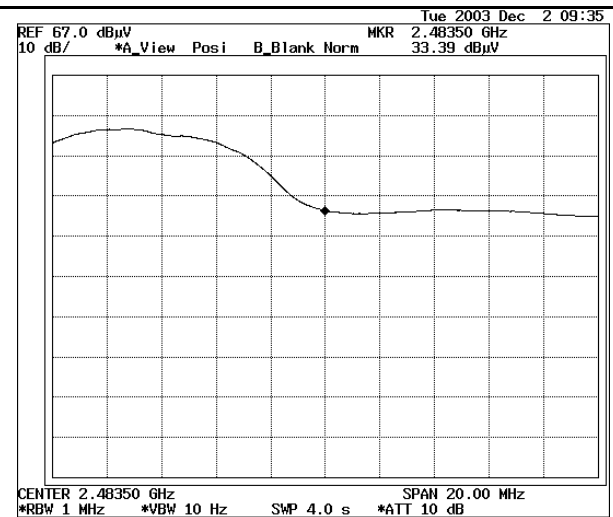
HOR PK Detect



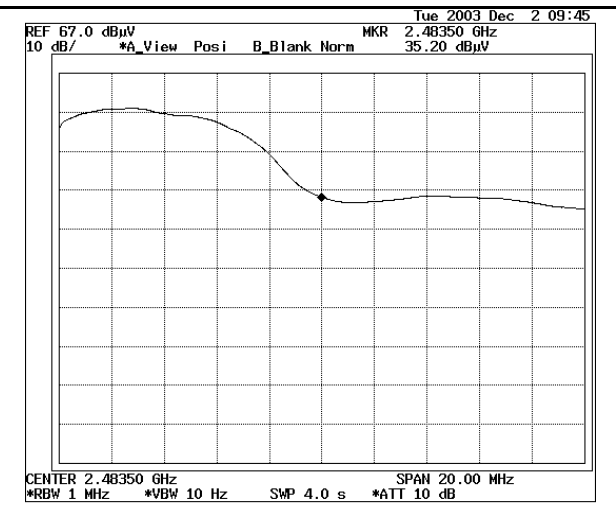
VER PK Detect



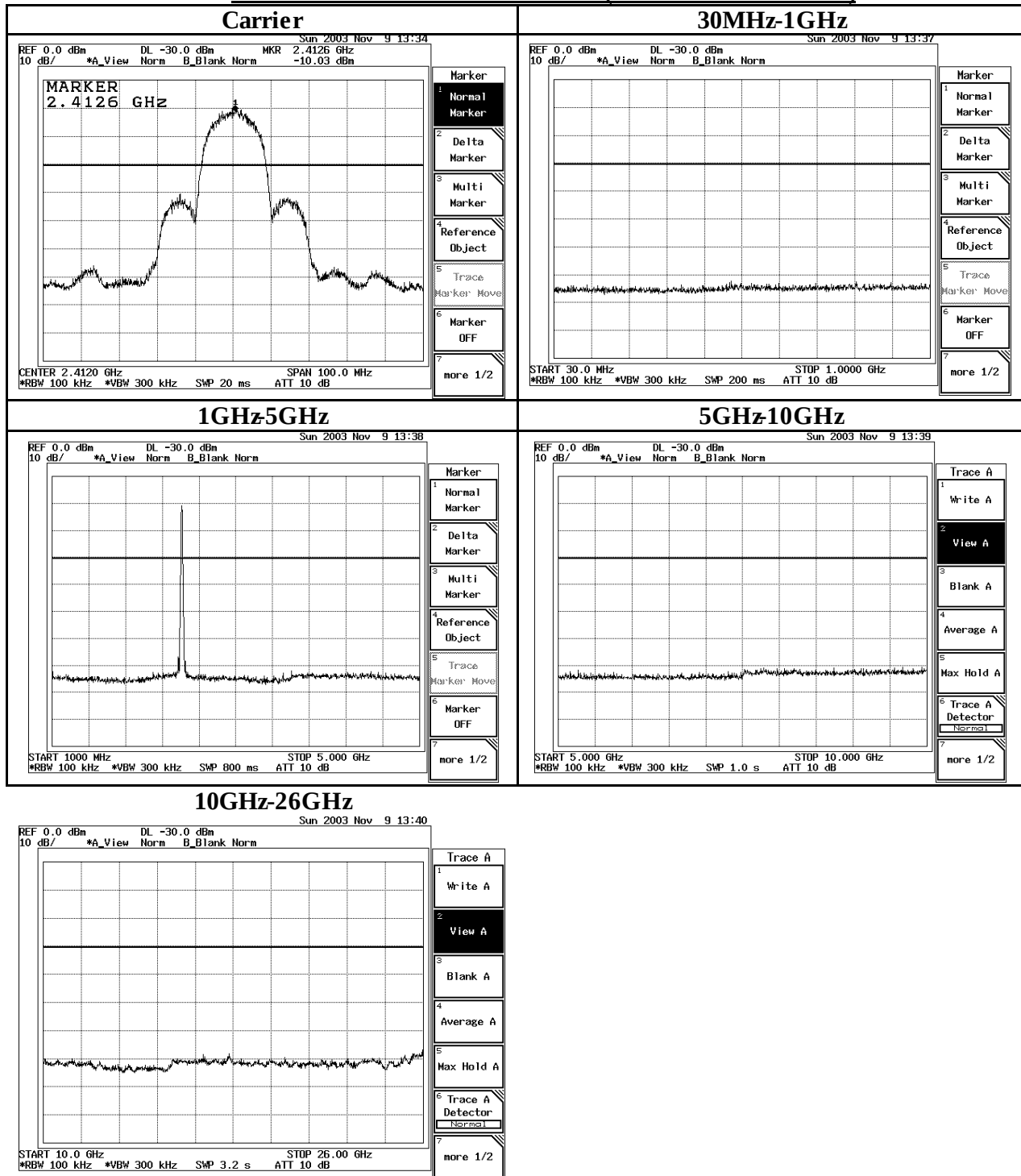
HOR AV Detect



VER AV Detect



Out of Band Emission : Conducted(Ch 1:2412MHz 20dBc)



UL Apex Co., Ltd.

Head Office EMC Lab.

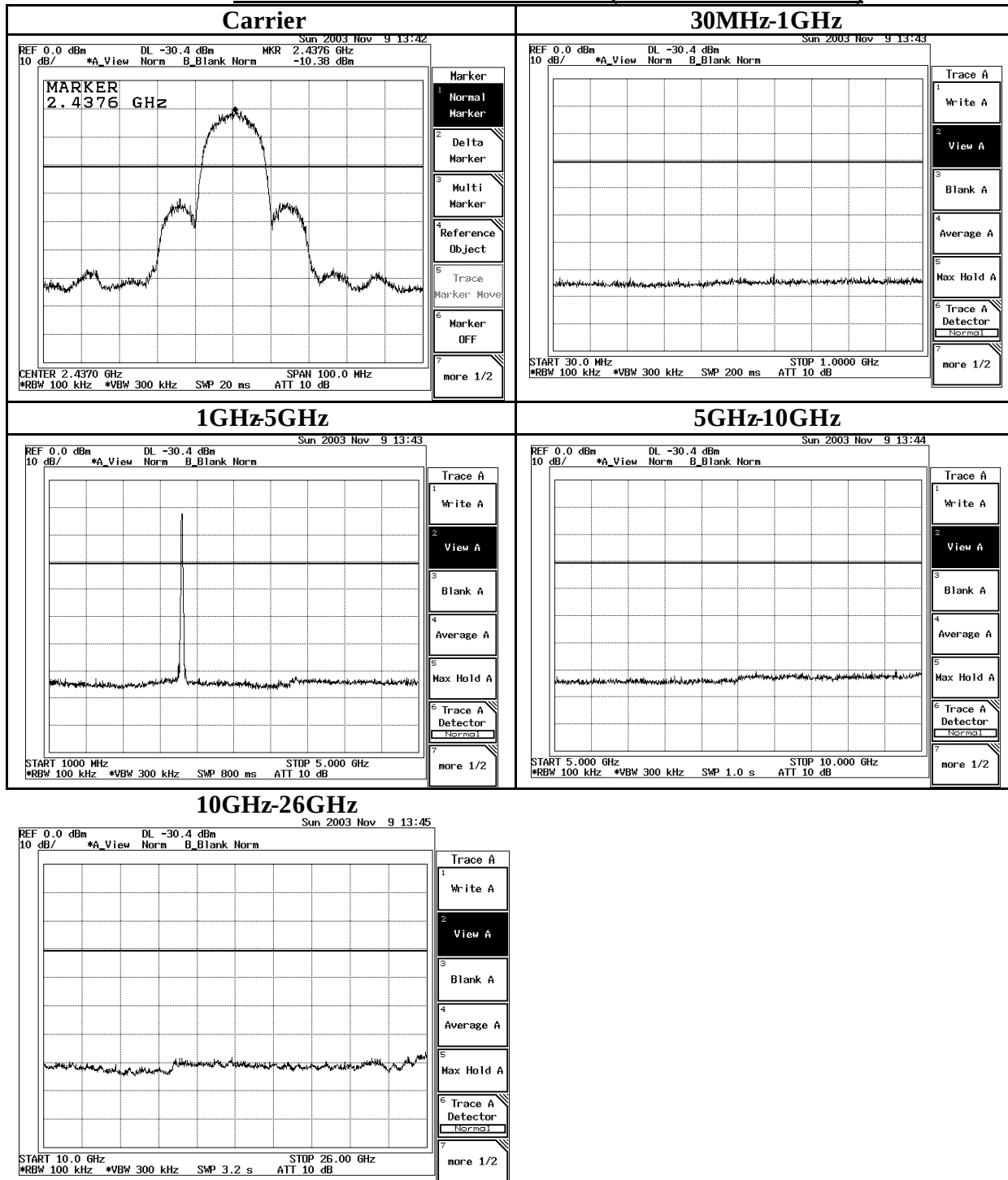
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Telephone : +81 596 24 8116

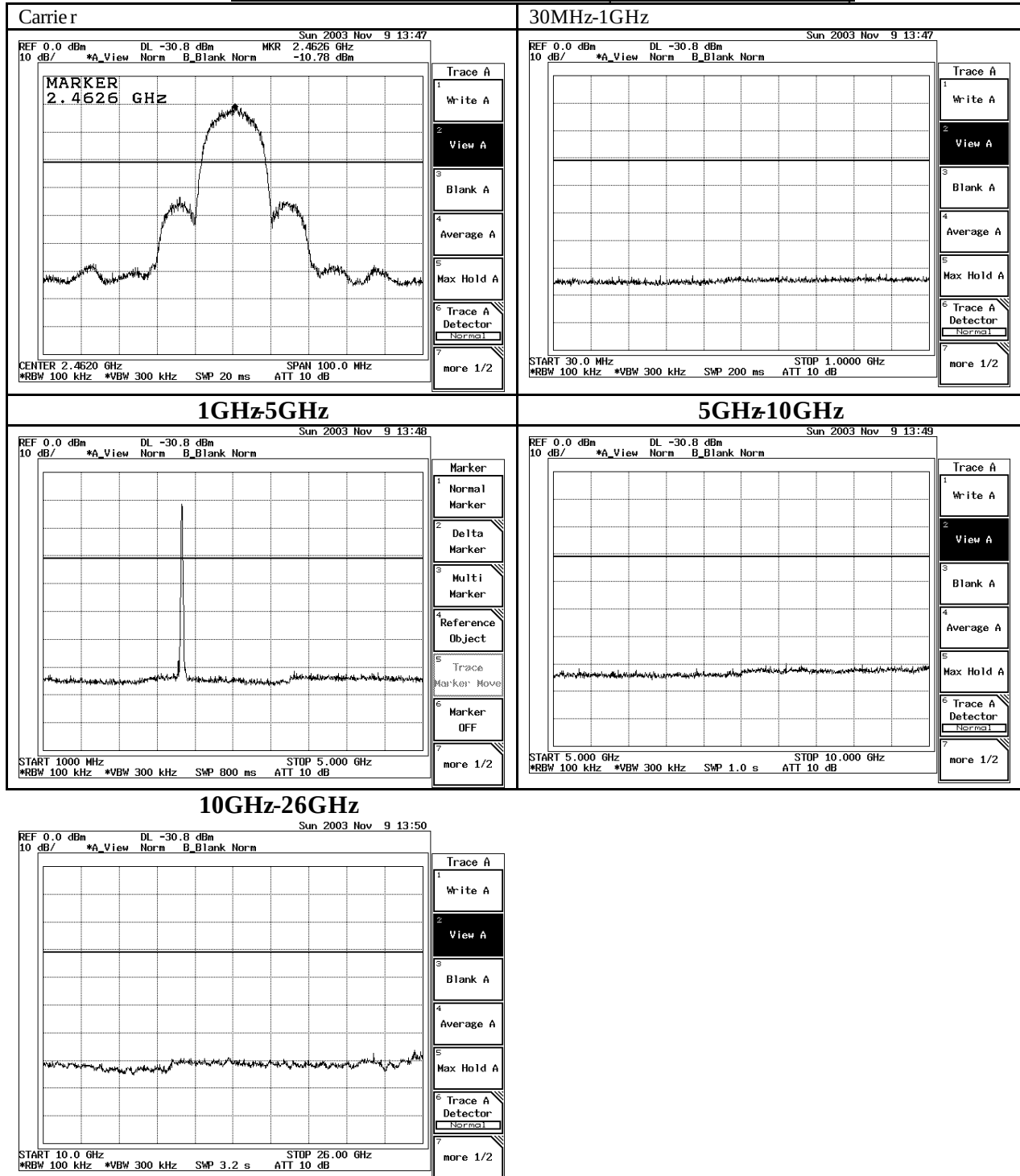
Facsimile : +81 596 24 8124

MF060b(10.04.03)

Out of Band Emission : Conducted(Ch 6:2437MHz 20dBc)



Out of Band Emission : Conducted(Ch 6:2462MHz 20dBc)



Power Density (Conducted)
DATA OF POWER DENSITY(CONDUCTED)

UL Apex Co., Ltd.
Head Office EMC Lab. No.3 Shield Room

COMPANY : DENSO
QUIPMENT : W-LAN
MODEL : KCS
SAMPLE NO. :
POWER : AC120V/60Hz
MODE : Tx (ch1,6,11)

REGULATION : Fcc Part15 Subpart C 15.247(d)
TEST DISTANCE : -
DATE : 11/09/2003
TEMPERATURE : 22°C
HUMIDITY : 65%

ENGINEER : Naoki Sakamoto

ch	FREQ [MHz]	S/A Reading [dBm]	Cable Loss [dB]	ATTEN [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
ch1	2412.3	-23.90	2.1	10.0	-11.8	8.0	19.8
ch6	2437.3	-23.70	2.1	10.0	-11.6	8.0	19.6
ch11	2462.3	-24.40	2.1	10.0	-12.3	8.0	20.3

Sample Calculation:

Result = Reading + Cable Loss + Attenuator

Power Density

