

EMC TEST REPORT For FCC



Test Report No. : 2005020014
Date of Issue : February 16, 2005
FCC ID : SWUDUALEYE-600
Model/Type No. : DUALEYE-600
Kind of Product : RF CARD READER
Applicant : DUALi INC.
Applicant Address : #505, Samsung Technopark, 471, Woncheon-dong,
Yungtong-gu, Suwon, Korea
Manufacturer : DUALi INC.
Manufacturer Address : #505, Samsung Technopark, 471, Woncheon-dong,
Yungtong-gu, Suwon, Korea
Contact Person : TAEYANG-HA (Team Manager)
Telephone : +82-31-213-0074
Received Date : February 2, 2005
Test period : Start : February 2, 2005 End : February 15, 2005
Test Results : ☒ **In Compliance** ☐ **Not in Compliance**

The test results presented in this report relate only to the object tested.

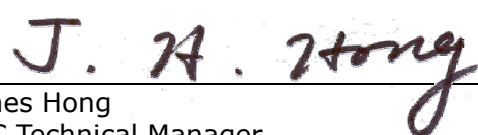
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Tested by



Young-Joon, Park
EMC Test Engineer
Date: February 16, 2005

Reviewed by



James Hong
EMC Technical Manager
Date: February 16, 2005

REPORT REVISION HISTORY

Date	Revision	Page No
February 16, 2005	Issued (2005020014)	All

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1.0 General Product Description

1.0.1 Tested Equipment

- ☒ Unless otherwise indicated, all tests were conducted on Model DUALEYE-600.
- ☐ Tests performed on Model _____ were considered to be representative of Model(s) _____.

1.0.2 Equipment Size, Mobility and Identification

Dimensions: 100(L) by 65(W) by 40(H) ☒ mm ☐ inch
Mobility: ☐ Hand-held ☒ Table-top ☐ Built-in
☐ Traveling ☐ Floor-standing
Serial No.: Prototype

1.0.3 Electrical Ratings

Input: Supplied by PC's USB port power (5Vdc)
Output: -

1.0.4 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage: 120 Vac
Frequency: 60 Hz

1.0.5 Clock & Other Frequencies Utilized

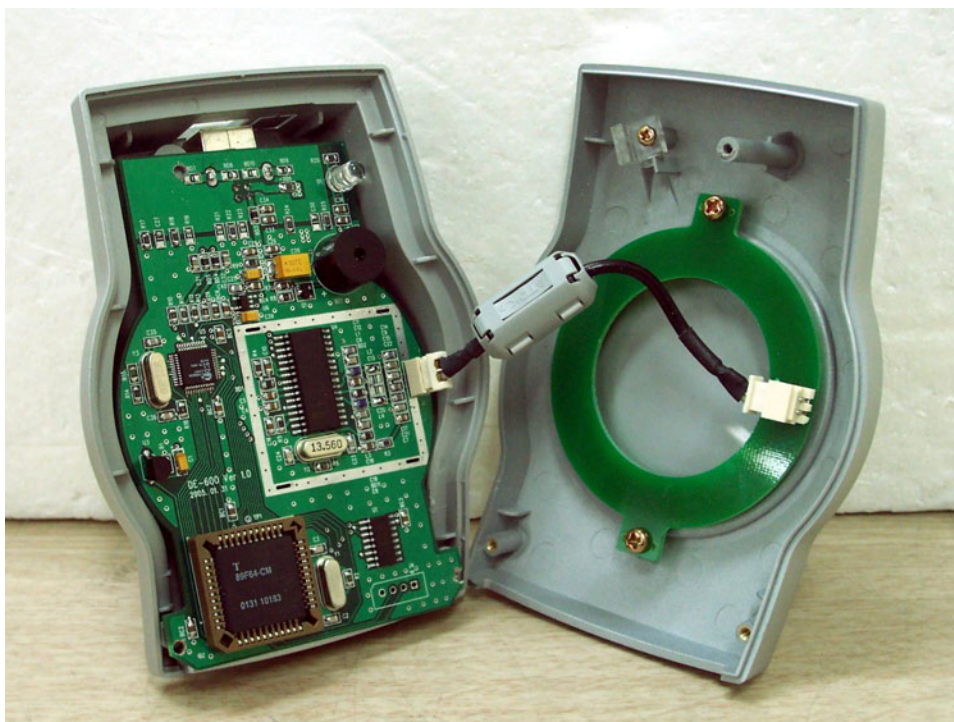
Main: 13.56 MHz

1.1 Model Differences

Not applicable

1.2 Device Modifications

The following modifications were necessary for compliance:



Ferrite core is inserted additionally.

Manufacturer : TDK Co., Ltd.

Part number : ZCAT1325 0530

1.3 EUT Configuration(s)

See Appendix A for individual test set-up configuration(s). The following peripheral devices and/or interface cables were connected during the measurement:

☒ Peripheral Devices

Device	Manufacturer	Model No.	Serial No.	FCC ID or DoC
Personal Computer	Hewlett-Packard Company	PD1059P	-	DoC
LCD Monitor	TIANJIN SAMSUNG ELECTRONICS DISPLAY	176T-DZ/KOR	N372HVEX225526	DoC
Adaptor (for LCD Monitor)	Anam Instruments (Shen Zhen) Co., Ltd.	AP04214-UV	-	-
Keyboard (PS/2 type)	COMPAQ	KB-0133	B55680FGA0985M	DoC
Mouse (PS/2 type)	SAMSUNG	OMS3CB	0303009873	DoC
Mouse (USB type)	SAMSUNG	OMS3CB	0303009881	DoC
Mouse (Serial type)	SAMSUNG	BASM1	4476257-20000	DoC
Printer (Parallel type)	Seiko Epson Corp.	Stylus Color 460	BWCE136524	DoC

☒ Cable Description

#	Description	Ferrite Core	Length (m)	Other Details
1	USB Cable, Shielded	Yes	1.8	Between the EUT and PC
2	Mouse cable, Shielded	No	1.5	USB type
3	Mouse cable, Shielded	No	2.1	Serial type
4	Mouse cable, Shielded	No	1.5	PS/2 type
5	Keyboard cable, Shielded	No	1.5	PS/2 type
6	LCD Monitor cable, Shielded	Yes	1.5	Between the PC and LCD Monitor
7	DC In Cable, Unshielded	Yes	1.5	Between the LCD Monitor and Adaptor
8	Printer cable, Shielded	No	1.5	Between the PC and Printer
9	AC power cable, Unshielded	No	1.5	Connect to AC power
10	AC power cable, Unshielded	No	1.5	Connect to AC power
11	AC power cable, Unshielded	No	1.5	Connect to AC power

1.4 Test Software

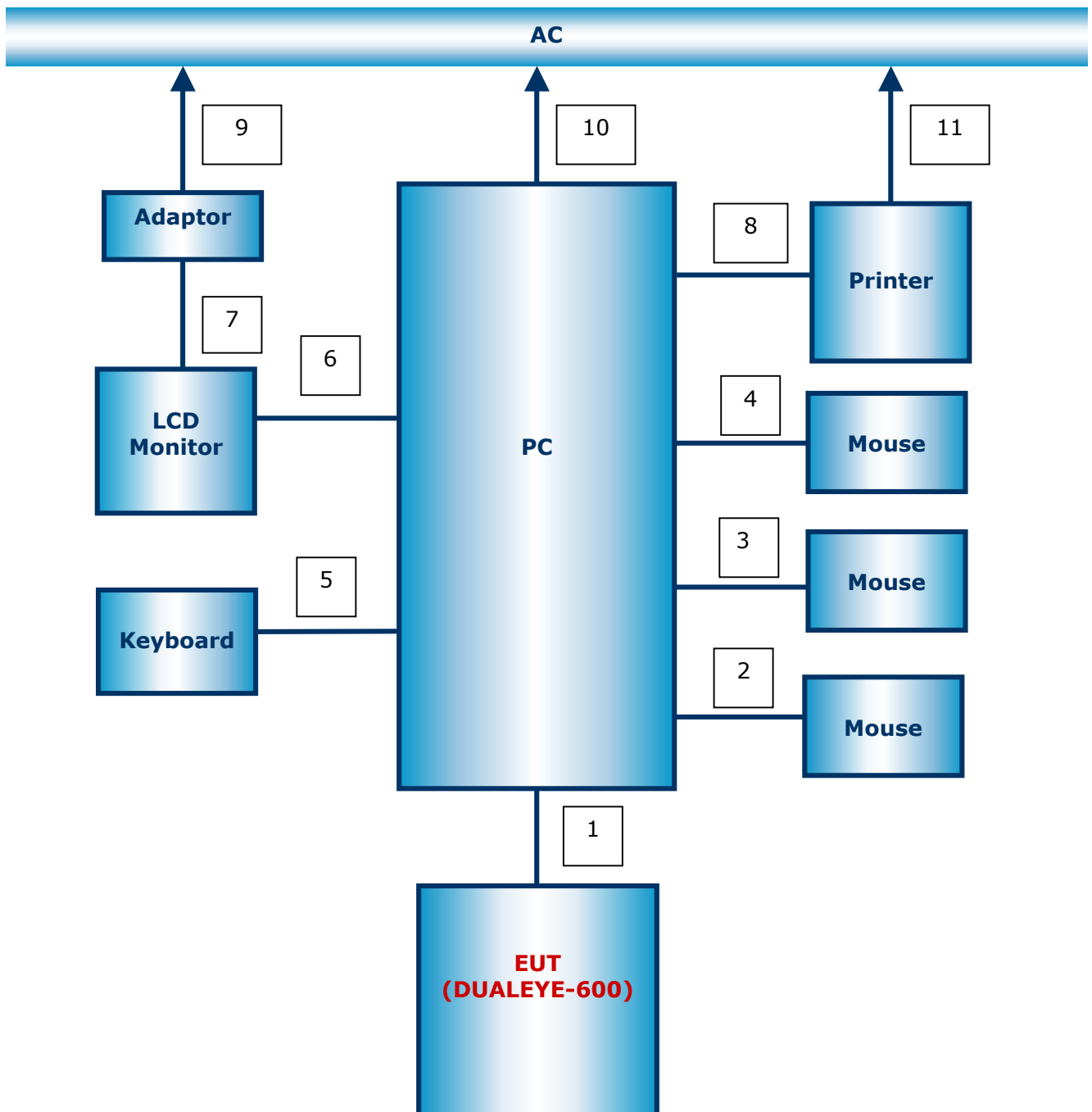
- ☐ EMC Test V 1.0
☐ Display Test Patterns - V1.5
☐ Ping.exe
☒ DUALCARD.exe (Program Name) / DUALi INC. (Manufacturer)

1.5 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

- ☐ Standby
☐ Display circles pattern
☒ Practice operation - During testing, the EUT was connected to a PC via a USB port.
- ☐ Scrolling 'H'
☐ Read / Write
- 1) Stand by mode
 2) Transmit mode (Card Type : A, B)

1.6 Configuration



1.7 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.8 Test Facility

The measurement facility is located at 386-1, Ho-Dong, Yongin-City, Kyungki-Do, Korea 449-100. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.9 Measurement Procedure

Preliminary AC power line conducted emissions tests were performed shielded room. To find worst mode, several typical mode and typical cable position were tested. Final AC power line conducted emissions test was performed shielded room. (location is same as Preliminary test)

Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

Preliminary radiated emissions test were performed anechoic chamber (Distance of antenna and EUT was 3 m). To find worst mode, several typical mode and typical cable position were tested and peak level and frequency were recorded.

Final radiated emissions test was performed Open Area Test Site. Based on the preliminary tests of the EUT, final test was proceeded worst case test mode and cable configuration.

* Measurement procedures was In accordance with ANSI C63.4-2001 7.2.3, 7.2.4, 8.3.1.1, 8.3.1.2

1.10 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	 93250
JAPAN	VCCI	10 meter Open Area Test Site and one conducted site.	 R-948, C-986
KOREA	MIC	EMI (10 meter Open Area Test Site and two conducted sites) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 No. 51, KR0025
International	KOLAS	EMC	 NO-119
Europe	GLAS	EMC EN 55011, EN 55022, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2, EN 61000-3-3, EN 61000-6-1, EN 61000-6-2, EN 50130-4, EN 55024, EN 61204-3, EN 60601-1-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11	 No.13000796-02

2.0 Emissions Test Regulations

The emissions tests were performed according to following regulations:

- | | | |
|--|----------------------------------|----------------------------------|
| ☐ EN 50081-1:1992 | ☐ Class A | ☐ Class B |
| ☐ EN 61000-6-3:2001 | ☐ Class A | ☐ Class B |
| ☐ EN 50081-2:1993 | ☐ Class A | ☐ Class B |
| ☐ EN 61000-6-4:2001 | ☐ Class A | ☐ Class B |
| ☐ EN 50083-2:2001 | | |
| ☐ EN 55011:1998 +A1:1999 | ☐ Group 1 | ☐ Group 2 |
| | ☐ Class A | ☐ Class B |
| ☐ EN 55013:1990 +A12:1994 +A13:1996 +A14:1999 | | |
| ☐ EN 55013:2001 | | |
| ☐ EN 55014-1:2000 | | |
| ☐ EN 55014-1:2000 +A1:2001 | | |
| ☐ EN 55015:2000 | | |
| ☐ EN 55015:2000 +A1:2001 | | |
| ☐ EN 55022:1994 +A1:1995 +A2:1997 | ☐ Class A | ☐ Class B |
| ☐ EN 55022:1998 | ☐ Class A | ☐ Class B |
| ☐ EN 55022:1998 +A1:2000 | ☐ Class A | ☐ Class B |
| ☐ EN 61000-3-2:1995 +A1:1998 +A2:1998 +A14:2000 | | |
| ☐ EN 61000-3-2:2000 | | |
| ☐ EN 61000-3-3:1995 | | |
| ☐ EN 61000-3-3:1995 +A1:2001 | | |
| ☐ VCCI V-3/2003.04 | ☐ Class A | ☐ Class B |
| ☐ AS/NZS 3548:1995 +A1:1997 +A2:1997 | ☐ Class A | ☐ Class B |
| ☒ FCC Part 15 Subpart C | | |
| ☐ CISPR 22:1997 | ☐ Class A | ☐ Class B |
| ☐ CISPR 22:1997 +A1:2000 | ☐ Class A | ☐ Class B |

2.1 Radiated Electric Field Emissions - 15.225(a)

Reference Standard

FCC Part 15.225(a)

Test Date

February 2, 2005

Test Location

☒ EMI-OATS: Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	Field Strength Meter	Rohde & Schwarz	ESHS30	828144/002	2006-02-01
☒	Loop Antenna	EMCO	6502	9107-2652	2005-02-23

Frequency Range of Measurement

13.553 MHz to 13.567 MHz

Instrument Settings

IF Band Width: 10 KHz

Radiated emission limits

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m (30m)	Field Strength of Fundamental dBuV/m (3m)
13.553-13.567	15,848	84	104

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

2.2 Radiated Electric Field Emissions - 15.225(b)(c)

Reference Standard

FCC Part 15.225(b)(c)

Test Date

February 11, 2005

Test Location

☒ EMI-OATS: Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	Field Strength Meter	Rohde & Schwarz	ESHS30	828144/002	2006-02-01
☒	Loop Antenna	EMCO	6502	9107-2652	2005-02-23

Frequency Range of Measurement

13.410 MHz to 13.553 MHz, 13.567 MHz to 13.710 MHz

13.110 MHz to 13.410 MHz, 13.710 MHz to 14.010 MHz

Instrument Settings

IF Band Width: 10 KHz

Radiated emission limits

Frequency (MHz)	Field Strength of Fundamental uV/m	Field Strength of Fundamental dBuV/m (30m)	Field Strength of Fundamental dBuV/m (3m)
13.410-13.553	334	50.4	70.4
13.567-13.710	334	50.4	70.4
13.110-13.410	106	40.5	60.5
13.710-14.010	106	40.5	60.5

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

Emissions 20dB's below the limit were not necessarily recorded.

2.3 Radiated Electric Field Emissions - 15.225(d)

Reference Standard

FCC Part 15.225(d), 15.209

Test Date

February 12, 2005

Test Location

☒ EMI-OATS: Testing was performed at a test distance of 3 m

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	Field Strength Meter	Rohde & Schwarz	ESVS30	826638/008	2005-04-08
☒	ULTRA Broadband Antenna	Rohde & Schwarz	HL562	361324/014	2005-05-21
☒	Field Strength Meter	Rohde & Schwarz	ESHS30	828144/002	2006-02-01
☒	Loop Antenna	EMCO	6502	9107-2652	2005-02-23

Frequency Range of Measurement

9 KHz to 1000 MHz

Instrument Settings

IF Band Width: 10 KHz (9 KHz to 30.0 MHz)

IF Band Width: 120 KHz (30.0 MHz to 1000 Mz)

Radiated emission limits

Frequency (MHz)	Field Strength of Fundamental $\mu\text{V/m}$	Field Strength of Fundamental dBuV/m (3m)
1.705-30.0	30	49.5
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	600	54

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data

2.4 Frequency Stability – 15.225(e)

Reference Standard

FCC Part 15.225(e)

Test Date

February 12, 2005

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	MICROWAVE FREQUENCY COUNTER	HP	5343A	2742A02615	2005-11-05
☒	Temp & Humi Chamber	Kunpoong Engineering	KP-1000	2002KP050041	2006-1-24

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Test Data

Timing	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Start-up	13.56018	13.56018	13.56015	13.56018	13.56018	13.56017	13.56012	13.56010
10Min	13.56018	13.56018	13.56015	13.56018	13.56017	13.56017	13.56010	13.56010
30Min	13.56018	13.56018	13.56015	13.56018	13.56017	13.56017	13.56010	13.56007

Timing	AC Power 85%	AC Power 115%
Start-up	13.560441	13.560441
10Min	13.560441	13.560441
30Min	13.560441	13.560441

2.5 Conducted Voltage Emissions – 15.207

Reference Standard

FCC Part 15.207

Test Date

February 15, 2005

Test Location

Shielded Room

Test Equipment

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
☒	Field Strength Meter	Rohde & Schwarz	ESHS30	828144/002	2006-02-01
☒	LISN	EMCO	3825/2	9607-2574	2005-09-03
☒	LISN	EMCO	3825/2	9409-2246	2005-09-03
☐	Field Strength Meter	Rohde & Schwarz	ESHS30	862024/001	2005-02-24
☐	LISN	Rohde & Schwarz	ESH3-Z5	100207	2005-12-15
☐	LISN	EMCO	3825/2	9206-1971	2005-12-15

Frequency Range of Measurement

150 kHz to 30 MHz

Conducted Emission limits

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test Results

The requirements are:

- ☒ MET
☐ NOT MET
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

APPENDIX A – TEST DATA

Radiated Electric Field Emissions (Quasi-Peak reading)

1) Fundamental Frequency Test Data

1) Stand By Mode

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
13.56	56.2	H	1.0	9.6	0.5	104.0	66.3	37.7
13.56	64.3	V	2.5	9.6	0.5	104.0	74.4	29.6

2) Transmit Mode (Card Type : A)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
13.56	50.9	H	1.1	9.6	0.5	104.0	61.0	43.0
13.56	60.6	V	3.1	9.6	0.5	104.0	70.7	33.3

3) Transmit Mode (Card Type :B)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
13.56	51.0	H	1.0	9.6	0.5	104.0	61.1	42.9
13.56	61.2	V	2.9	9.6	0.5	104.0	71.3	32.7

2) Frequency Range from 9 KHz to 30MHz Test Data

1) Stand By Mode

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
27.12	7.8	H	1.2	7.8	0.7	49.5	16.4	33.1
27.12	17.2	V	3.2	7.8	0.7	49.5	25.8	23.7

2) Transmit Mode (Card Type : A)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
27.12	7.9	H	1.0	7.8	0.7	49.5	16.5	33.0
27.12	17.5	V	2.4	7.8	0.7	49.5	26.1	23.4

3) Transmit Mode (Card Type :B)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
27.12	6.0	H	1.1	7.8	0.7	49.5	14.6	34.9
27.12	17.4	V	2.3	7.8	0.7	49.5	26.0	23.5

3) Frequency Range from 30 MHz to 1 GHz Test Data

1) Stand By Mode

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
456.81	8.1	H	2.0	14.8	4.1	37.0	27.0	10.0
468.91	7.3	H	2.3	15.0	4.0	37.0	26.3	10.7
481.13	8.3	H	1.8	15.2	4.3	37.0	27.8	9.2
493.21	10.3	H	1.0	15.3	4.3	37.0	29.9	7.1
505.30	9.3	H	4.0	15.7	4.3	37.0	29.3	7.7
798.72	3.8	V	4.0	19.5	5.6	37.0	28.9	8.1
898.21	0.5	V	2.0	20.6	6.0	37.0	27.1	9.9

2) Transmit Mode (Card Type : A)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
456.82	9.5	V	4.0	14.8	4.1	37.0	28.4	8.6
468.92	8.2	H	2.5	15.0	4.0	37.0	27.2	9.8
481.10	8.4	H	2.0	15.2	4.3	37.0	27.9	9.1
493.26	9.2	H	1.8	15.3	4.3	37.0	28.8	8.2
505.31	8.6	H	2.0	15.7	4.3	37.0	28.6	8.4
798.72	3.7	V	1.0	19.5	5.6	37.0	28.8	8.2
898.21	0.7	V	4.0	20.6	6.0	37.0	27.3	9.7

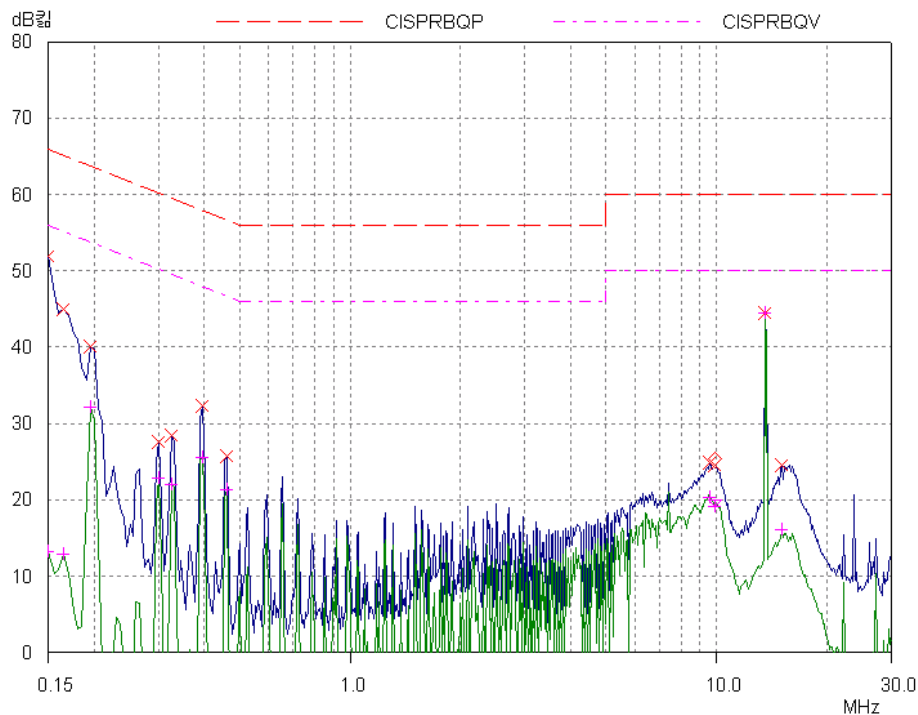
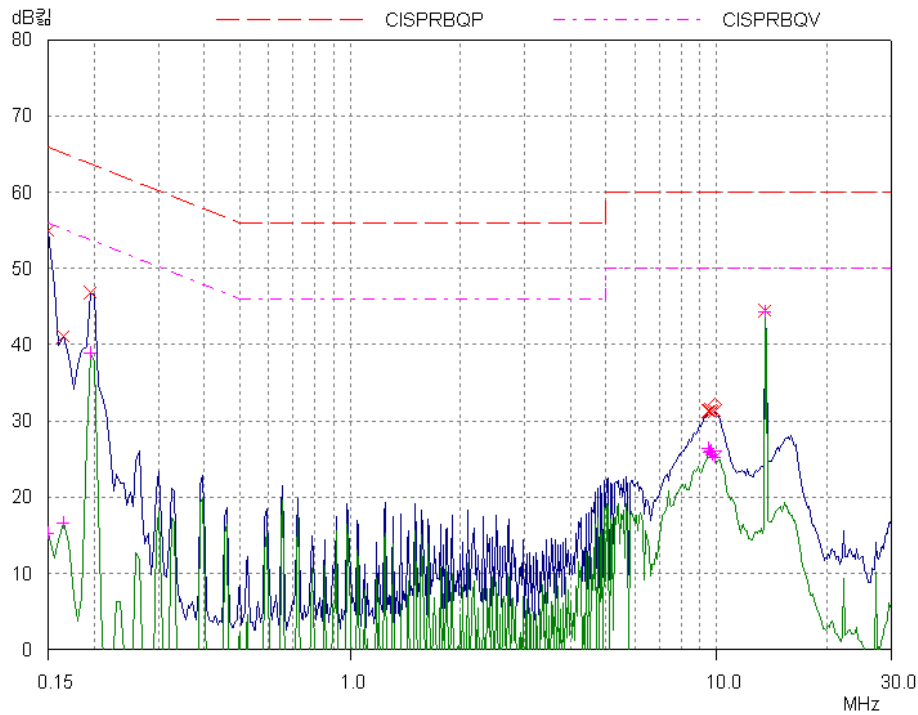
3) Transmit Mode (Card Type : B)

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor		Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable			
456.82	8.6	H	2.0	14.8	4.1	37.0	27.5	9.5
468.93	9.2	H	1.8	15.0	4.0	37.0	28.2	8.8
481.19	8.8	H	2.0	15.2	4.3	37.0	28.3	8.7
493.21	10.3	H	4.0	15.3	4.3	37.0	29.9	7.1
505.32	8.9	H	2.5	15.7	4.3	37.0	28.9	8.1
798.72	3.8	V	1.0	19.5	5.6	37.0	28.9	8.1
898.26	0.9	V	4.0	20.6	6.0	37.0	27.5	9.5

Conducted Voltage Emissions

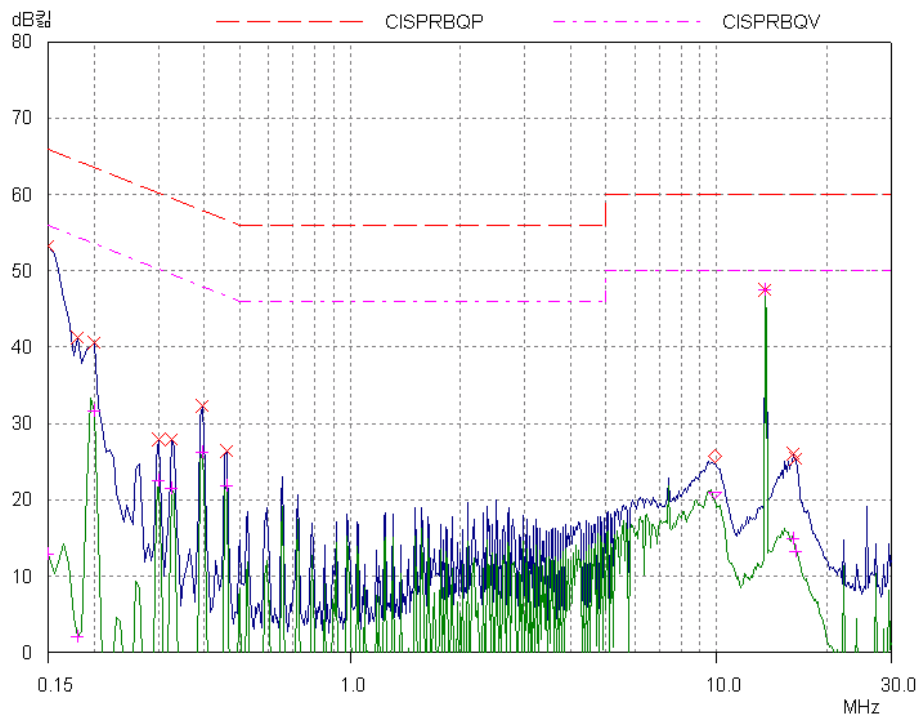
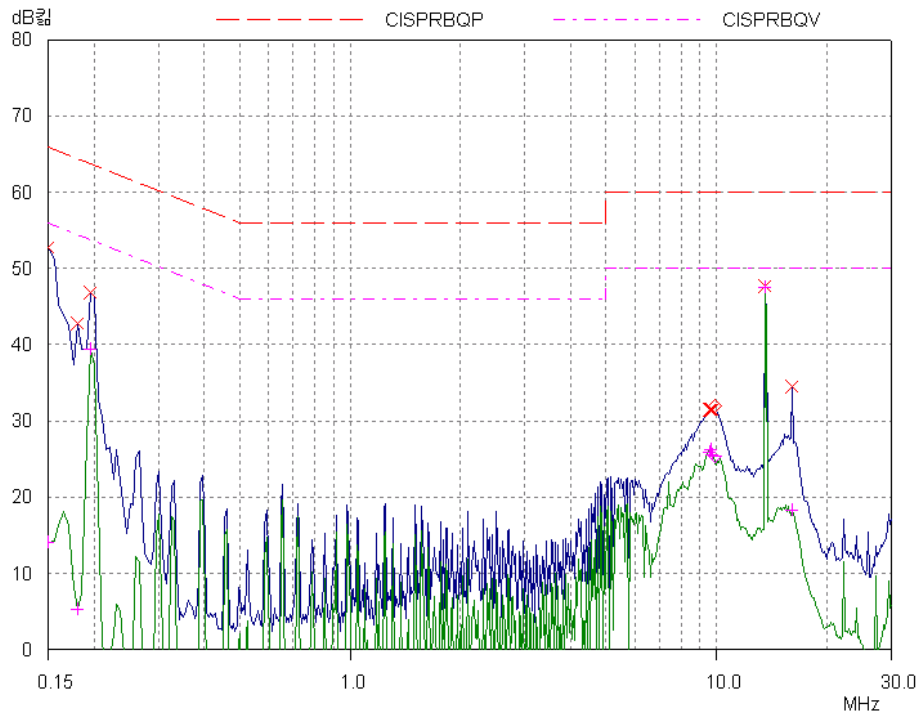
1) Stand By Mode

Frequency [MHz]	Correction Factor		Line	Quasi-peak				Average			
				Limit	Reading	Result	Margin	Limit	Reading	Result	Margin
	LISN	Cable		[dBuV]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dB]
0.15	0.2	0.1	H	66.0	54.5	54.8	11.2	56.0	14.9	15.2	40.8
0.16	0.2	0.1	N	65.5	44.6	44.9	20.6	55.5	12.5	12.8	42.7
0.19	0.2	0.1	H	64.0	46.4	46.7	17.3	54.0	38.6	38.9	15.1
0.32	0.1	0.1	N	59.7	28.1	28.3	31.4	49.7	25.3	25.5	24.2
9.48	0.1	0.2	H	60.0	30.9	31.2	28.8	50.0	26.0	26.3	23.7
9.68	0.1	0.2	H	60.0	31.0	31.3	28.7	50.0	25.2	25.5	24.5
13.56	0.2	0.2	N	60.0	44.1	44.5	15.5	50.0	44.0	44.4	5.6



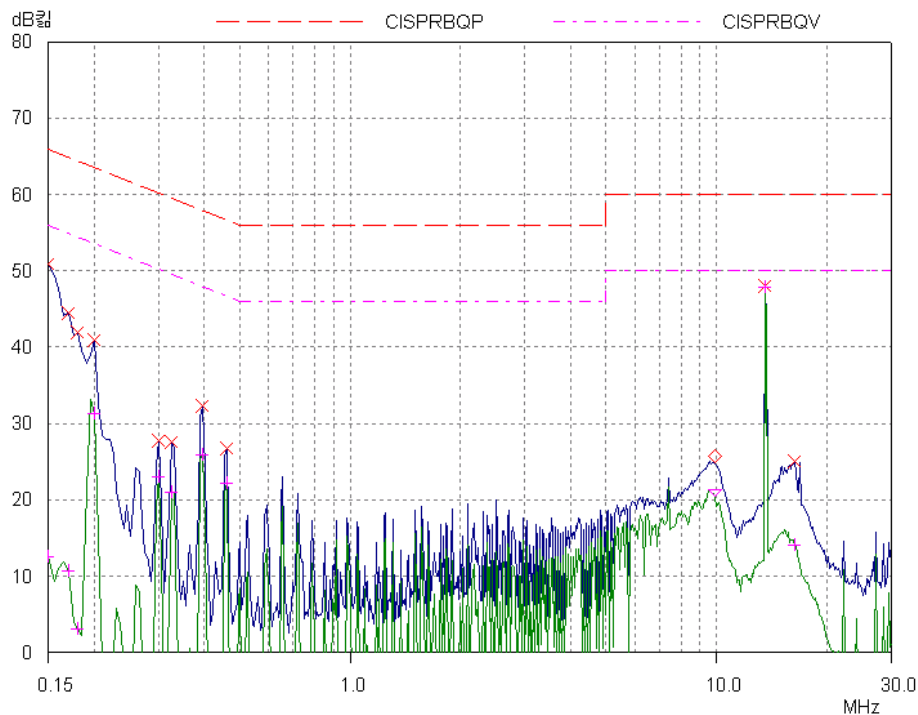
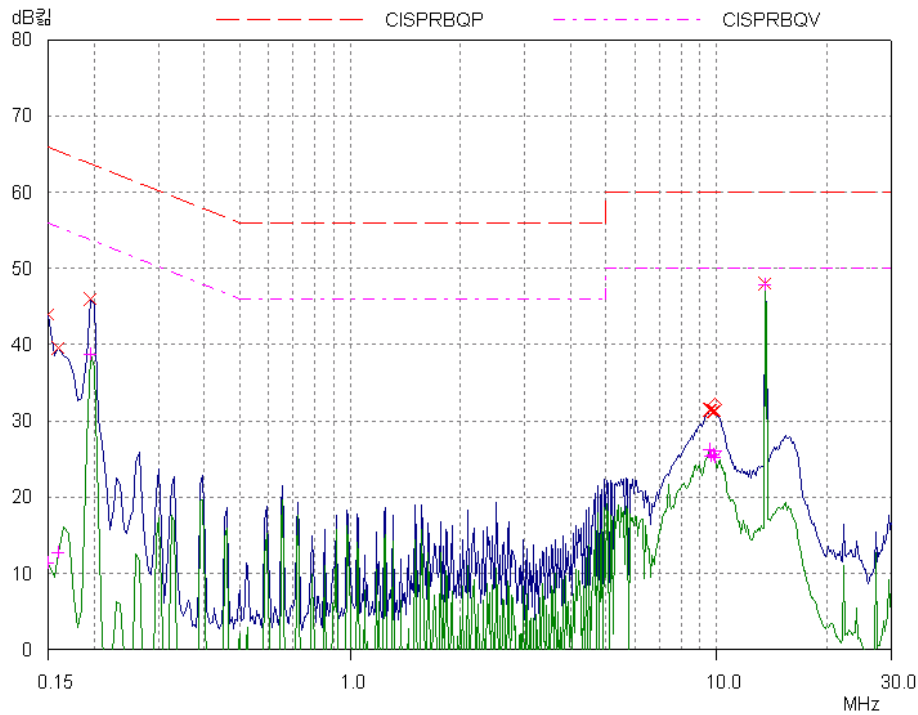
2) Transmit Mode (Card Type : A)

Frequency [MHz]	Correction Factor		Line	Quasi-peak				Average			
				Limit	Reading	Result	Margin	Limit	Reading	Result	Margin
	LISN	Cable		[dBuV]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dB]
0.15	0.2	0.1	N	66.0	52.9	53.2	12.8	56.0	12.6	12.9	43.1
0.19	0.2	0.1	H	64.0	46.4	46.7	17.3	54.0	39.0	39.3	14.7
0.20	0.2	0.1	N	63.6	40.3	40.6	23.0	53.6	31.2	31.5	22.1
0.39	0.1	0.1	N	58.1	32.0	32.2	25.9	48.1	26.0	26.2	21.9
0.46	0.1	0.1	N	56.7	26.1	26.3	30.4	46.7	21.6	21.8	24.9
9.61	0.1	0.2	H	60.0	31.1	31.4	28.6	50.0	25.9	26.2	23.8
13.56	0.2	0.2	H	60.0	47.2	47.6	12.4	50.0	47.2	47.6	2.4



3) Transmit Mode (Card Type : B)

Frequency [MHz]	Correction Factor		Line	Quasi-peak				Average			
				Limit	Reading	Result	Margin	Limit	Reading	Result	Margin
	LISN	Cable		[dBuV]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dB]
0.15	0.2	0.1	N	66.0	50.5	50.8	15.2	56.0	12.2	12.5	43.5
0.17	0.2	0.1	N	65.0	44.2	44.5	20.5	55.0	10.4	10.7	44.3
0.18	0.2	0.1	N	64.5	41.6	41.9	22.6	54.5	2.8	3.1	51.4
0.19	0.2	0.1	H	64.0	45.7	46.0	18.0	54.0	38.3	38.6	15.4
0.20	0.2	0.1	N	63.6	40.7	41.0	22.6	53.6	31.0	31.3	22.3
9.55	0.1	0.2	H	60.0	31.2	31.5	28.5	50.0	25.9	26.2	23.8
13.56	0.2	0.2	N	60.0	47.5	47.9	12.1	50.0	47.5	47.9	2.1



Bandwidth of the Operating Frequency

