TEST REPORT

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KEL
Korea EMC Laboratory

1. Client

- Name : Larson Electronics, LLC
- Address : 9419 E. US Hwy 175, Kemp, TX 75143, USA

- Date of Receipt : March 31, 2011

2. Use of Report : Quality certification

3. Name of Product and Model : LED LIGHT / PAR46

4. Manufacturer : Larson Electronics, LLC

5. Date of Test : April 21, 2011 ~ April 22, 2011

6. Test method used : MIL-STD-461E (1999)

7. Testing Location : ☒ In Laboratory ☐ In Chamber ☐ On Site Test

8. Test Results : ☒ Pass ☐ Fail

Affirmation	Measurements performed by Name : Won-Kyu Lee (Signature)	Approved by Title : Technical Manager Name : Su-Gil Moon (Signature)

May 11, 2011

Korea EMC Laboratory Co., Ltd.

As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Korea EMC Laboratory Co., Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
May 11, 2011	Originally issued	-

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1. National Accredited Testing Lab.

1.1 General condition

Name of Test Laboratory	Korea EMC Laboratory Co., Ltd.
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1.2 Certificate of Designated Testing Laboratory

Accreditation Body and Category	Basis	Registration No.	Mark.
Radio Research Agency EMI(Radiated & Conducted emission) EMS(Radiated Immunity) Safety Radio Communication Part	No. 2011-12 (2011. 02. 18)	KR0002	방송통신위원회
Korea Laboratory Accreditation Scheme (KOLAS) EMI(Radiated & Conducted emission) EMS(Radiated Immunity) Safety Road Vehicle component test(EMC) Military EMC(MIL-STD-461E)	KS Q ISO/IEC 17025:2006	No. 154	KOLAS
FCC Part 15 & 18 EMI(Radiated & Conducted emission)	ANSI 63.4:2003	90751 (KR0002)	FC
VCCI EMI(Radiated & Conducted emission)	VCCI	C-2314 R-2139 R-2140	VCCI
UL Korea Ltd. Safety	Star Alliance Program	-	c UL us
European Conformity EMC & Safety	2004/108/EC 2006/95/EC	-	CE
TUV SUD Certification after Recognition of Agent's Testing EMC	ISO/IEC 17025:2005	ROK1006C	TÜV SÜD Product Service

2. Detailed Requirement

2.1 Test Standard and Test Result Summarize

LIST	Apply spec.		Apply select	Test Result
Conducted Emissions	MIL-STD-461E	CE101	☐	☐ PASS ☐ FAIL
		CE102	☒	☒ PASS ☐ FAIL
Conducted susceptibility	MIL-STD-461E	CS101	☒	☒ PASS ☐ FAIL
		CS114	☒	☒ PASS ☐ FAIL
		CS115	☒	☒ PASS ☐ FAIL
		CS116	☒	☒ PASS ☐ FAIL
Radiated Emissions	MIL-STD-461E	RE101	☐	☐ PASS ☐ FAIL
		RE102	☒	☒ PASS ☐ FAIL
Radiated susceptibility	MIL-STD-461E	RS101	☐	☐ PASS ☐ FAIL
		RS103	☒	☒ PASS ☐ FAIL

* At the request of the applicant, only the test items of CE102, CS101, CS114, CS115, CS116, RE102, and RS103 were performed.

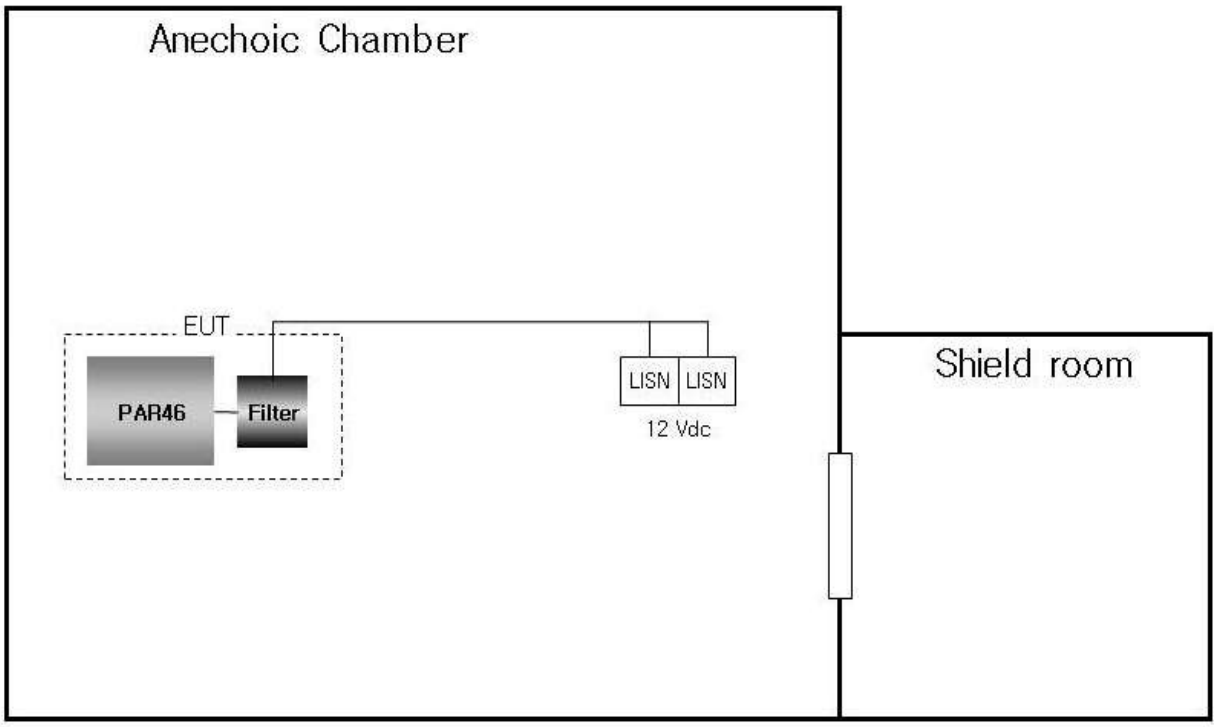
2.2 EUT Modify

*None.

3. EUT Test Setup and Layout

3.1 Test Setup and Layout

* Test setup



4. Electromagnetic Interference Limit

4.1 CE102 Conducted Emissions Limits

Frequency range (MHz)	Limit (dBμV)	
	Basic	220 V
0.01 ~ 0.5	94 ~ 60	103 ~ 69
0.5 ~ 10	60	69

Conducted emissions on power leads shall not exceed the applicable values shown on Figure CE102-1.

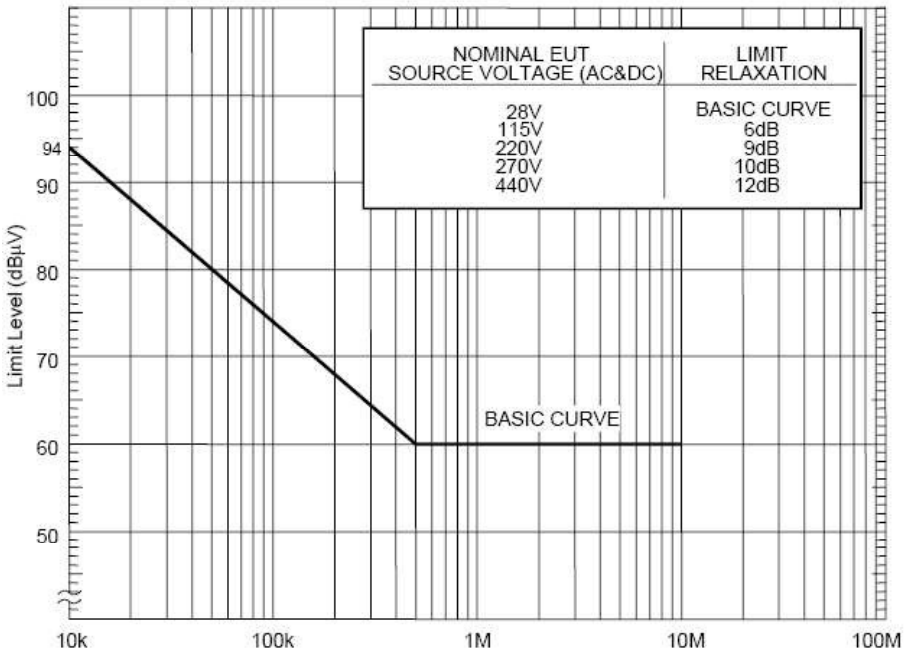


FIGURE CE 102-1. CE102 Limit for all applications

* It is applied to the standard of BASIC Curve.

4.2 CS101 Conducted Susceptibility Limits

Frequency range (kHz)	Limit (dBuV)	
	Curve #1	Curve #2
0.03 ~ 5	136	126
5 ~ 150	136 ~ 106.5	126 ~ 96.5

The EUT shall not exhibit any malfunction, degradation of performance or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification when subjected to a test signal with voltage levels as specified in Figure CS101-1.

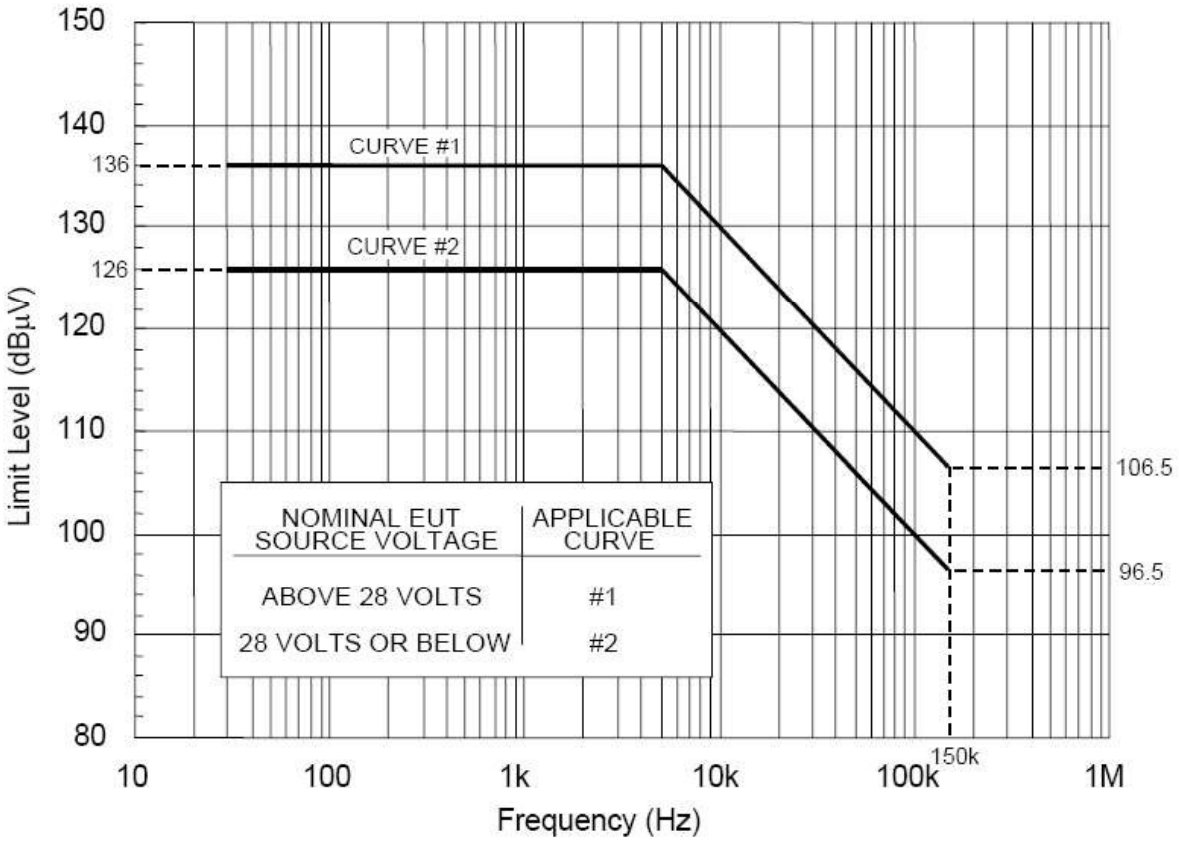


FIGURE CS101-1. CS101 Voltage limit for all applications

* It is applied to the standard of Curve #2.

4.3 CS114 Conducted Susceptibility Limits

Frequency range (MHz)	Limits (dBuA)				
	Curve #1	Curve #2	Curve #3	Curve #4	Curve #5
0.01 ~ 1	37 ~77	43 ~ 83	49 ~ 89	57 ~ 97	69 ~ 109
1 ~ 30	77	83	89	97	109
30 ~ 200	77 ~ 69	83 ~ 75	89 ~ 81	97 ~ 89	109 ~ 101

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to a injection probe drive level which has been pre-calibrated to the appropriate current limit shown in Figure CS114-1 and is modulated as specified below. The appropriate limit curve in Figure CS114-1 shall be selected from Table VI. Requirements are also met if the EUT is not susceptible at forward power levels sensed by the coupler that are below those determined during calibration provided that the actual current induced in the cable under test is 6 dB or greater than the calibration limit.

		LIMIT CURVE # FROM FIGURE CS114-1							
PLATFORM / FREQ. RANGE		AIRCRAFT (EXTERNAL OR SAFETY CRITICAL)	AIRCRAFT INTERNAL	ALL SHIPS (ABOVE DECKS) AND SUBMARINES (EXTERNAL)*	SHIPS (METALLIC) (BELOW DECKS)	SHIPS (NON-METALLIC) (BELOW DECKS)	SUBMARINES (INTERNAL)	GROUND	SPACE
10 kHz	A	5	5	2	2	2	1	3	3
↓	N	5	3	2	2	2	1	2	3
2 MHz	AF	5	3	-	-	-	-	2	3
2 MHz	A	5	5	5	2	4	1	4	3
↓	N	5	5	5	2	4	1	2	3
30 MHz	AF	5	3	-	-	-	-	2	3
30 MHz	A	5	5	5	2	2	2	4	3
↓	N	5	5	5	2	2	2	2	3
200 MHz	AF	5	3	-	-	-	-	2	3

KEY: A = Army
N = Navy
AF = Air Force

* For equipment located external to the pressure hull of a submarine but within the superstructure, use SHIPS (METALLIC)(BELOW DECKS)

Table VI CS114 limit curves

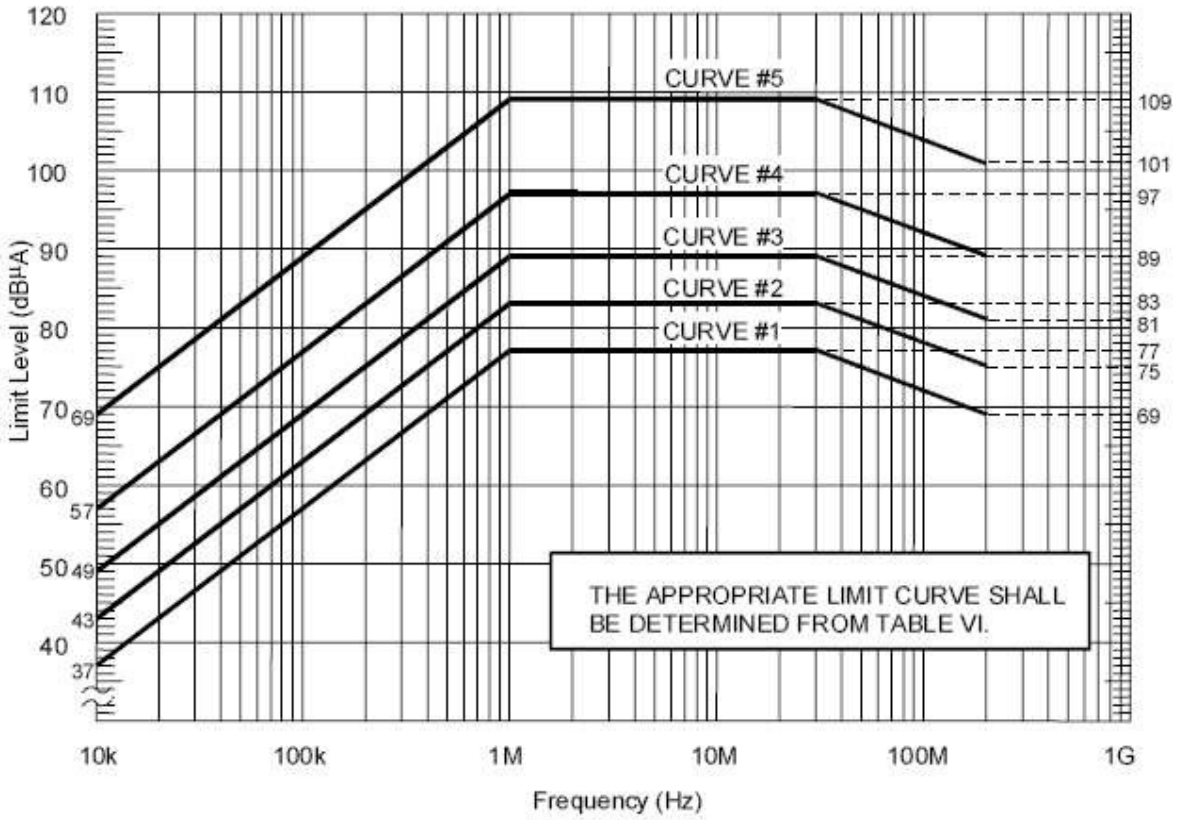


FIGURE CS114-1. CS114 CALIBRATION LIMIT FOR ALL APPLICATIONS.

* It is applied to the standard of CURVE #3 (10 kHz ~ 2 MHz) and CURVE #4 (2 MHz ~ 200 MHz) for Army and Ground.

4.4 CS115 Conducted Susceptibility Limits

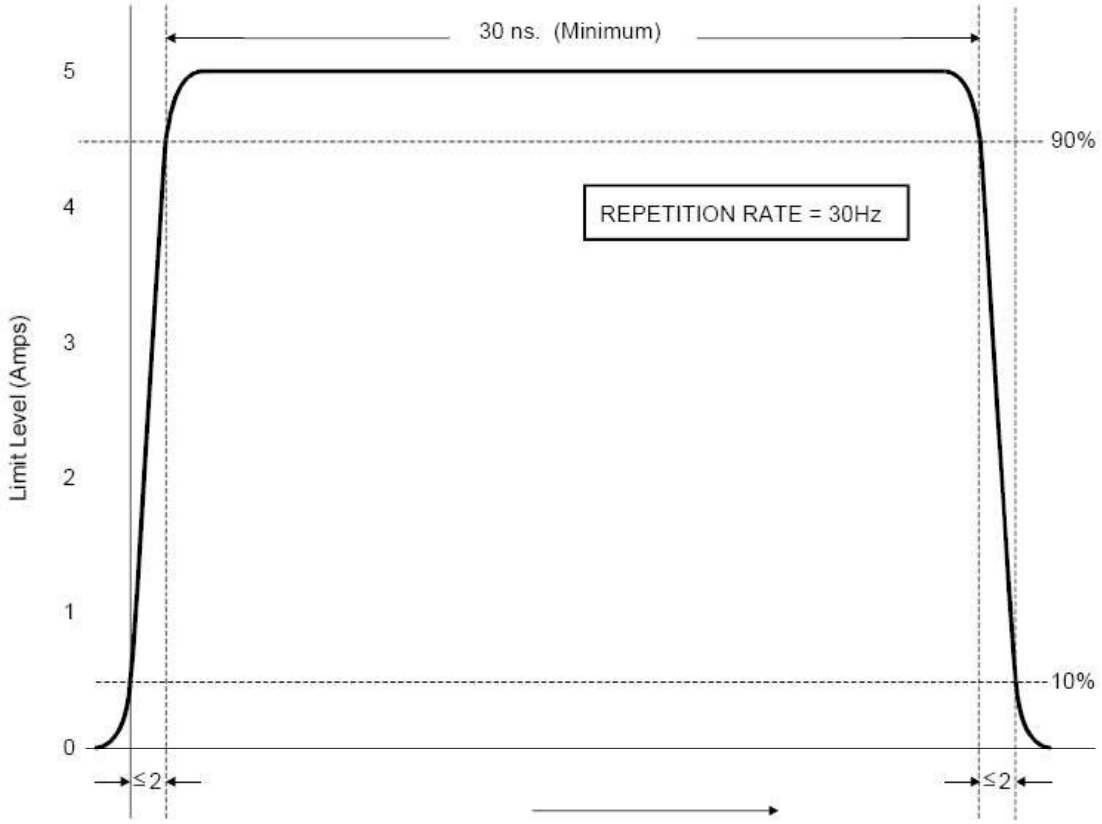


FIGURE CS115-1. CS115 SIGNAL CHARACTERISTICS FOR ALL APPLICATIONS.

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystems specification, when subjected to a pre-calibrated signal having rise and fall times, pulse width, and amplitude as specified in Figure CS115-1 at a 30 Hz rate for one minute.

4.5 CS116 Conducted Susceptibility Limits

Frequency range (MHz)	Imax A	
	Army and Navy(10 A)	Air force(5 A)
0.01 ~ 1	0.1 ~ 10	0.05 ~ 5
1 ~ 30	10	5
30 ~ 100	10 ~ 3	5 ~ 0.7

The EUT shall not exhibit any malfunction, degradation of performance, or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to a signal having the waveform shown in Figure CS116-1 and having a maximum current as specified in Figure CS116-2. The limit is applicable across the entire specified frequency range. As a minimum, compliance shall be demonstrated at the following frequencies: 0.01, 0.1, 1, 10, 30, and 100 MHz. If there are other frequencies known to be critical to the equipment installation, such as platform resonances, compliance shall also be demonstrated at those frequencies. The test signal repetition rate shall be no greater than one pulse per second and no less than one pulse every two seconds. The pulses shall be applied for a period of five minutes.

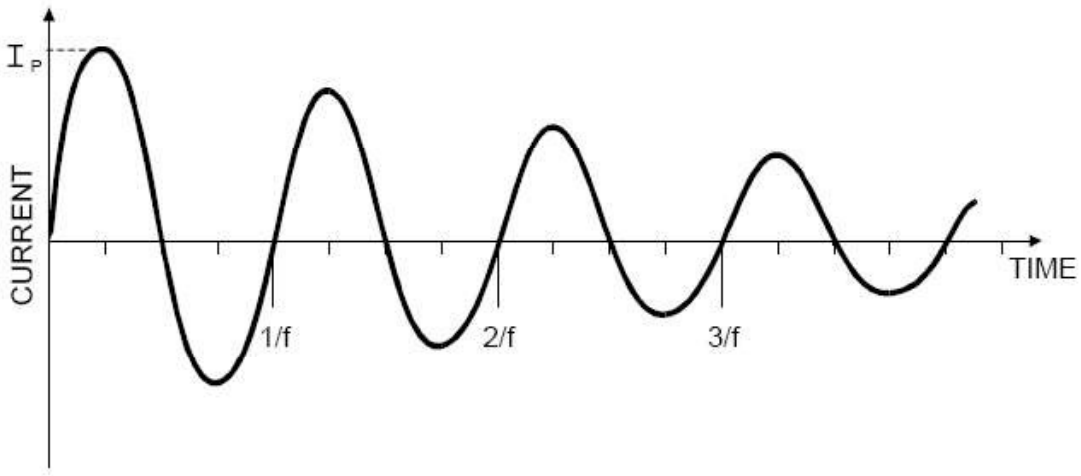
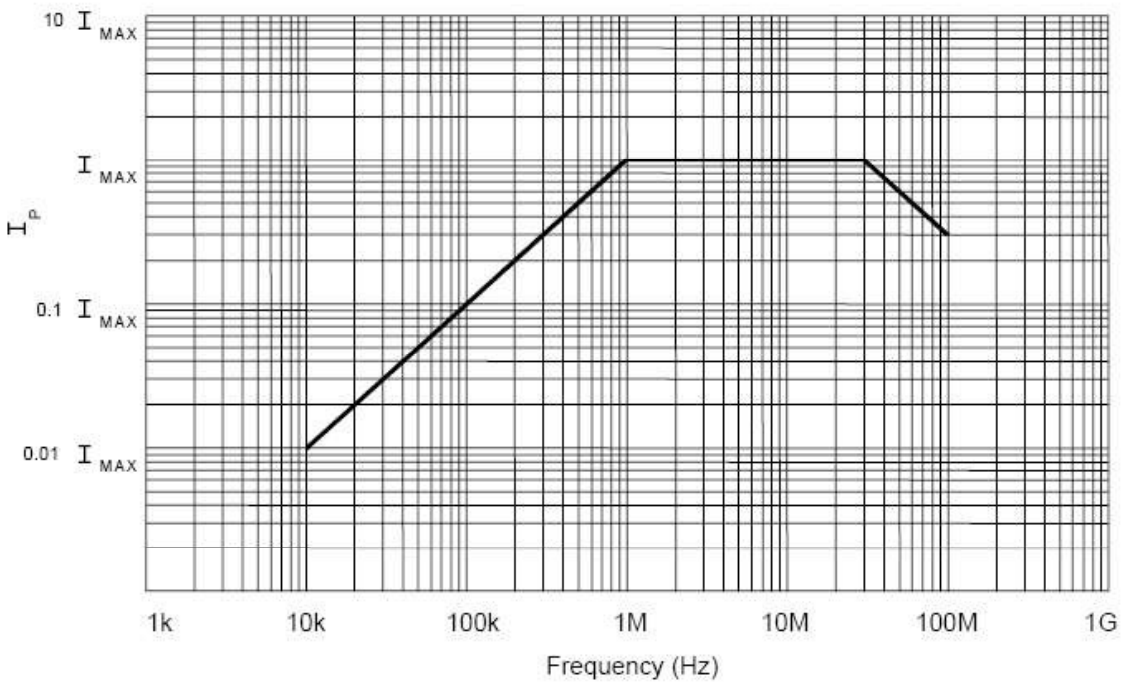


FIGURE CS116-1. TYPICAL CS116 DAMPED SINUSOIDAL WAVEFORM



NOTES:

1. For Army and Navy procurements, I_{MAX} = 10 amperes
2. For Air Force procurements, I_{MAX} = 5 amperes

FIGURE CS116-2. CS116 Limit for all applications.

* It is applied to the standard of Imax = 10 Amperes for Army and Navy.

4.6 RE102 Radiated Emissions Limits

Frequency range (MHz)	Ground (dBuV/m)	
	Navy Mobile and Army	Navy Fixed and AF
2 ~ 100	24	44
100 ~ 1 800	24 ~ 69	44 ~ 89

Electric field emissions shall not be radiated in excess of those shown in Figures RE102-4

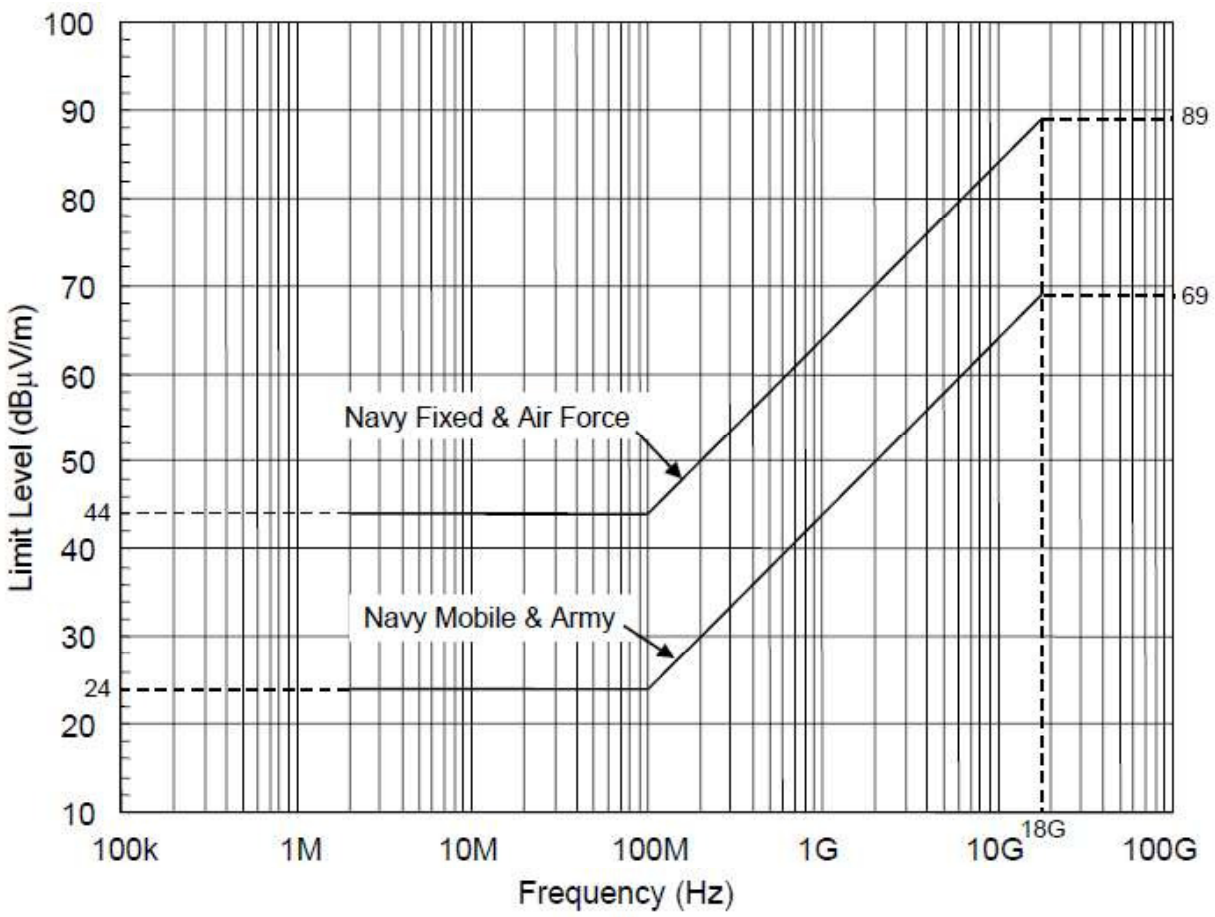


FIGURE RE102-4 RE102 Limit for ground applications

* It is applied to the limit of NAVY MOBILE and ARMY.

4.7 RS103 Radiated Susceptibility Limits

PLATFORM / FREQ RANGE		LIMIT LEVEL (VOLTS/METER)							
		AIRCRAFT (EXTERNAL OR SAFETY CRITICAL)	AIRCRAFT INTERNAL	ALL SHIPS (ABOVE DECKS) AND SUBMARINES (EXTERNAL)*	SHIPS (METALLIC) (BELOW DECKS)	SHIPS (NON-METALLIC) (BELOW DECKS)	SUBMARINES (INTERNAL)	GROUND	SPACE
2 MHz ↓ 30 MHz	A	200	200	200	10	50	5	50	20
	N	200	200	200	10	50	5	10	20
	AF	200	20	-	-	-	-	10	20
30 MHz ↓ 1 GHz	A	200	200	200	10	10	10	50	20
	N	200	200	200	10	10	10	10	20
	AF	200	20	-	-	-	-	10	20
1 GHz ↓ 18 GHz	A	200	200	200	10	10	10	50	20
	N	200	200	200	10	10	10	50	20
	AF	200	60	-	-	-	-	50	20
18 GHz ↓ 40 GHz	A	200	200	200	10	10	10	50	20
	N	200	60	200	10	10	10	50	20
	AF	200	60	-	-	-	-	50	20

KEY: A = Army
N = Navy
AF = Air Force

* For equipment located external to the pressure hull of a submarine but within the superstructure, use SHIPS (METALLIC)(BELOW DECKS)

Table VII. RS103 limits.

The EUT shall not exhibit any malfunction, degradation of performance or deviation from specified indications, beyond the tolerances indicated in the individual equipment or subsystem specification, when subjected to the radiated electric fields listed in Table VII and modulated as specified below. Up to 30 MHz, the requirement shall be met for vertically polarized fields. Above 30 MHz, the requirement shall be met for both horizontally and vertically polarized fields. Circular polarized fields are not acceptable.

* It is applied to the standard for Army and GROUND.

4.8 Apply a Standard Unique Fact

* Operating Methos

1) Check the Equipment Installation in section 3.1 and connect accordingly.

2) 12 Vdc power supply to operating EUT.

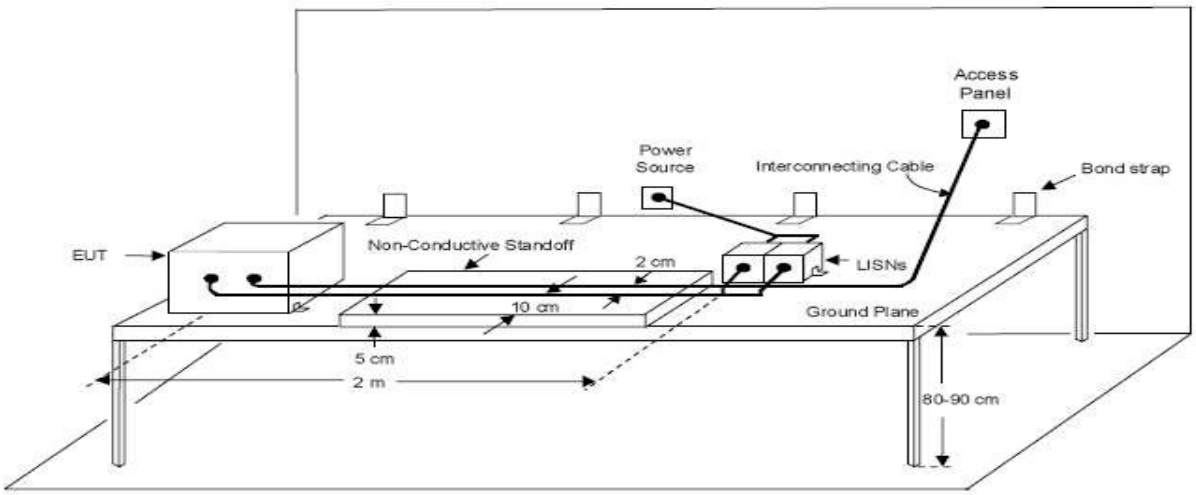
3) Waiting about 10 minutes to stabilize EUT and then perform EMC test.

* Performance test

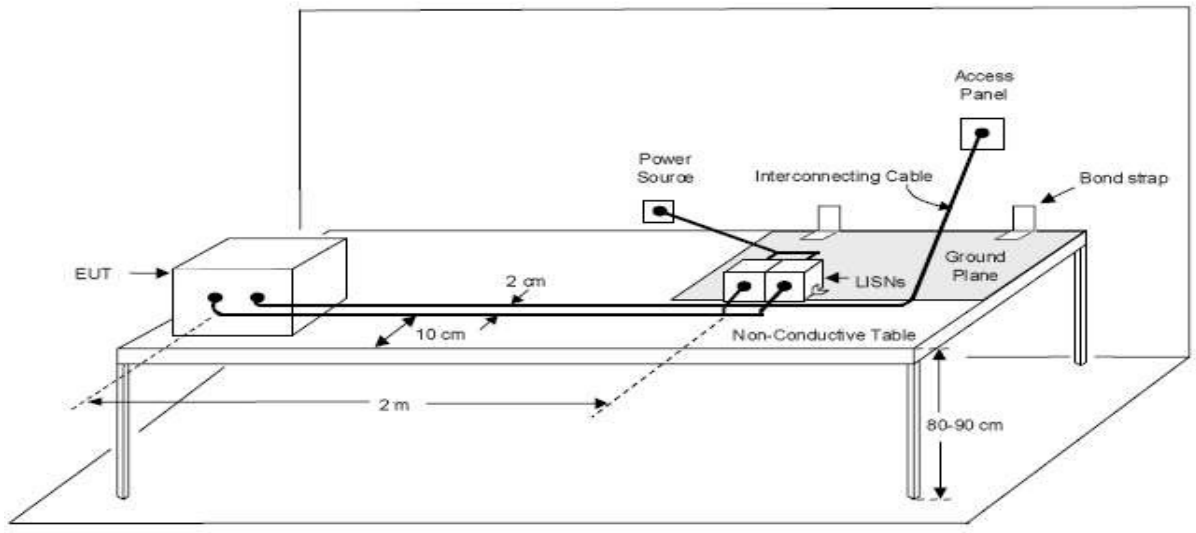
1) When EUT is exerted noise, EUT maintain a state of power ON.

5. EUT Testing and Results

5.1 Basic Setup



(General test setup)



(Test setup for non-conductive surface mounted EUT)

5.2 CE102 Test

5.2.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial number	Due Cal.	Apply select
EMI TEST RECEIVER	ESU40	R&S	100027	2011.07.14	☒
Signal Generator	2024	MARCONI	112225/092	2012.04.12	☒
LISN	9233-50-TS-50-N	SOLAR	005237	2011.07.14	☒
LISN	9233-50-TS-50-N	SOLAR	005238	2011.07.14	☒
Attenuator	20 dB	-	-	-	☒

5.2.2 Test Area : 2nd Anechoic chamber

5.2.3 Test procedures.

1) Setting EUT and test equipment as its manual.
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground.
6) Fixing EUT and connecting EUT with LISN power line and connecting attenuators between LISN and test equipment
7) Comparing test data with specification.
8) Calculating noise electric strength as below and applicating each value if correction factor is automatically corrected.

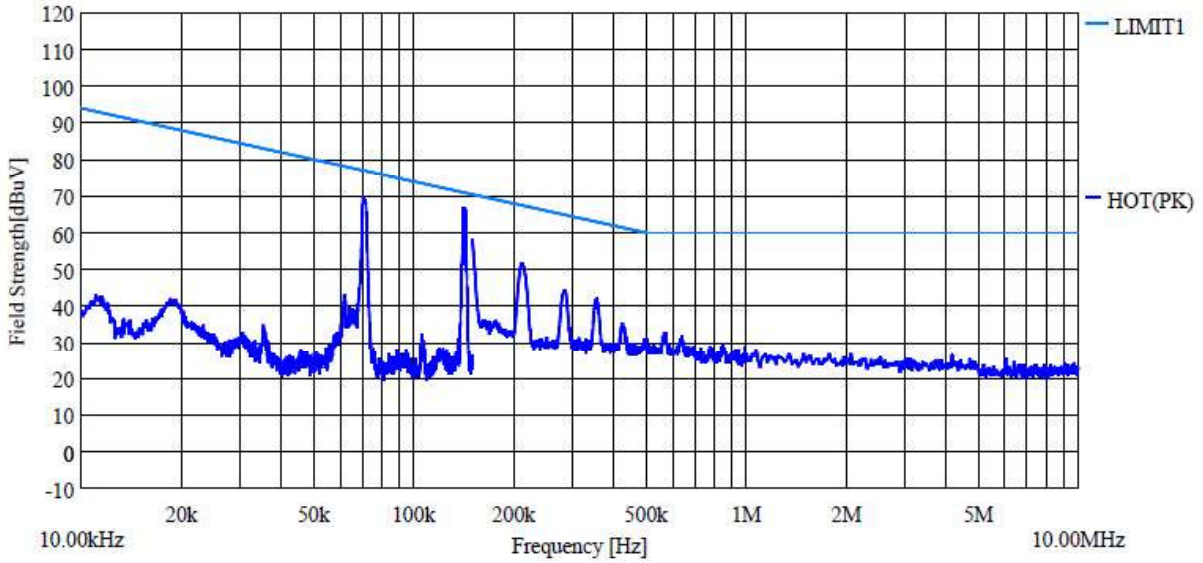
F1[dBuV] = F2[dBuV] + IL[dB] + CL[dB]

F1 : last measured value, F2 :Equipment instruction, IL : Insertion loss, CL :Cable loss

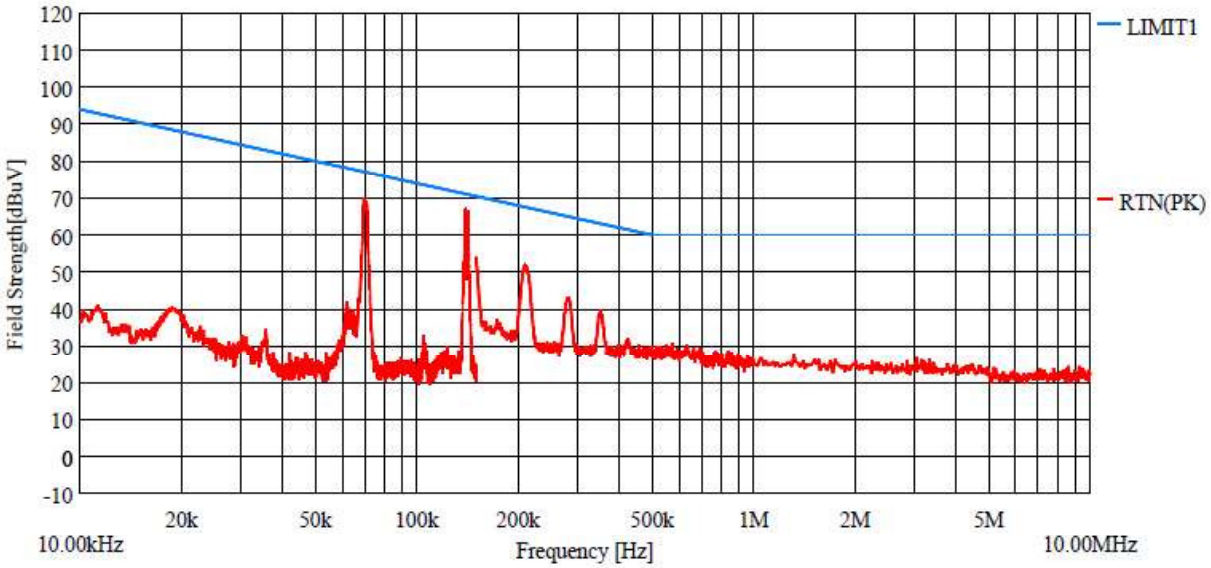
5.2.4 Test Result

Start of test : April 21, 2011 Test by : Won-Kyu Lee

10 kHz ~ 10 MHz



[HOT]



[RTN]

*** Test Result**

☒ PASS ☐ FAIL

5.3 CS101 test

5.3.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial number	Due Cal.	Apply select
Audio generator	AG-203A	KENWOOD	7060086	2012.01.10	☒
Capacitor (10 uF)	9146-1	SOLAR	-	-	☒
Isolation transformer	6220-2	SOLAR	-	-	☒
LISN	8616-50-TS-200-N	SOLAR	076137	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076138	2012.01.10	☒
Amplifier	PC65501N	YAMAHA	KTALK01009	-	☒
Resistor	9225-0.5	SOLAR	-	-	☒
Oscilloscope	TDS3052B	TEKTRONIX	B010526	2011.10.02	☒

5.3.2 Test Area : RS chamber

5.3.3 Test procedures.

1) Setting EUT and test equipment as its manual
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing.
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground
6) Set the signal generator to the lowest test frequency. Increase the signal level until the required voltage or power level is reached on the power lead.
7) Monitor the EUT for degradation of performance

5.3.4 Test Result

Start of test : April 21, 2011 Test by : Won-Kyu Lee

Power

Frequency(kHz)	Limit (V)	Measurement (V)	Results	Remark
0.03	2.00	2.03	PASS	
0.04	2.00	2.02	PASS	
0.05	2.00	2.02	PASS	
0.06	2.00	2.01	PASS	
0.07	2.00	2.01	PASS	
0.08	2.00	2.01	PASS	
0.09	2.00	2.02	PASS	
0.10	2.00	2.00	PASS	
0.20	2.00	2.04	PASS	
0.30	2.00	2.03	PASS	
0.40	2.00	2.05	PASS	
0.50	2.00	2.01	PASS	
0.60	2.00	2.04	PASS	
0.70	2.00	2.02	PASS	
0.80	2.00	2.00	PASS	
0.90	2.00	2.00	PASS	
1.00	2.00	2.01	PASS	
2.00	2.00	2.03	PASS	
3.00	2.00	2.02	PASS	
4.00	2.00	2.02	PASS	
5.00	2.00	2.00	PASS	
6.00	1.67	1.69	PASS	
7.00	1.43	1.48	PASS	
8.00	1.25	1.26	PASS	
9.00	1.11	1.12	PASS	
10.00	1.00	1.03	PASS	
20.00	0.50	0.52	PASS	
30.00	0.33	0.37	PASS	
40.00	0.25	0.28	PASS	
50.00	0.20	0.21	PASS	
60.00	0.17	0.19	PASS	
70.00	0.14	0.16	PASS	

Frequency(kHz)	Limit (V)	Measurement (V)	Results	Remark
80.00	0.13	0.14	PASS	
90.00	0.11	0.13	PASS	
100.00	0.10	0.12	PASS	
110.00	0.09	0.11	PASS	
120.00	0.08	0.10	PASS	
130.00	0.08	0.10	PASS	
140.00	0.07	0.09	PASS	
150.00	0.07	0.08	PASS	

*** Test Result**

☒ PASS ☐ FAIL

5.4 CS114 Test

5.4.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial number	Due Cal.	Apply select
Signal generator	2024	MARCONI	11225/092	2012.04.12	☒
Current injection probes	9144-1N	SOLAR	51822	-	☒
Current injection probes	9142-1N	SOLAR	510115	-	☒
Calibration fixture	9125-1	SOLAR	-	-	☒
Directional couplers	DC2500	AR	20036	2012.01.11	☒
Current probe	9123-1N	SOLAR	510042	2011.07.14	☒
Power Amplifier	1000L	AR	21402	-	☒
Power Meter	NRVD	R&S	102156	2011.10.02	☒
LISN	8616-50-TS-200-N	SOLAR	076137	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076138	2012.01.10	☒
Coaxial load	8251	BIRD	11412	2012.01.13	☒
Spectrum Analyzer	8560E	Hewlett-Packard	3517A01551	2012.01.11	☒
Attenuator(6 dB)	00-WA-MFN-06	BIRD	26036	2011.10.08	☒
Attenuator(30 dB)	8498A	HP	1801A04842	2012.01.11	☒

5.4.2 Test Area : RS chamber

5.4.3 Test procedures

1) Setting EUT and test equipment as its manual
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing.
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground.
6) Turn on the EUT and stabilized for enough time.
7) Set the signal generator to 10 kHz with 1 kHz pulse modulation, 50 % duty cycle.
8) Injection probe while monitoring the induced current.
9) Monitor the EUT for degradation of performance.

.

5.4.4 Test Result

Start of test : April 22, 2011 Test by : Won-Kyu Lee

Power

Frequency(MHz)	Limit (dBuA)	Calibration(dBuA)	Results	Remark
0.01	49.0	49.7	PASS	
0.02	55.0	55.2	PASS	
0.03	58.5	58.8	PASS	
0.04	61.0	61.2	PASS	
0.05	63.0	63.3	PASS	
0.06	64.6	65.3	PASS	
0.07	65.9	66.5	PASS	
0.08	67.1	67.5	PASS	
0.09	68.1	69.3	PASS	
0.10	69.0	69.2	PASS	
0.15	72.5	73.5	PASS	
0.18	74.1	77.2	PASS	
0.20	75.0	75.8	PASS	
0.30	78.5	79.8	PASS	
0.40	81.0	81.8	PASS	
0.45	82.1	82.7	PASS	
0.50	83.0	83.2	PASS	
0.60	84.6	86.0	PASS	
0.70	85.9	86.0	PASS	
0.80	87.1	88.2	PASS	
0.90	88.1	88.2	PASS	
1.00	89.0	89.3	PASS	
2.00	89.0	90.3	PASS	
3.00	97.0	97.0	PASS	
4.00	97.0	97.8	PASS	
5.00	97.0	97.7	PASS	
6.00	97.0	97.7	PASS	
7.00	97.0	97.5	PASS	
8.00	97.0	97.3	PASS	
9.00	97.0	97.3	PASS	
10.00	97.0	97.0	PASS	
12.00	97.0	97.0	PASS	

Frequency(MHz)	Limit (dBuA)	Calibration(dBuA)	Results	Remark
15.00	97.0	97.3	PASS	
16.00	97.0	97.3	PASS	
18.00	97.0	97.8	PASS	
20.00	97.0	98.2	PASS	
25.00	97.0	97.0	PASS	
30.00	97.0	97.5	PASS	
32.00	96.7	97.0	PASS	
33.00	96.6	96.7	PASS	
35.00	96.3	96.4	PASS	
40.00	95.8	96.4	PASS	
45.00	95.3	95.4	PASS	
50.00	94.8	94.9	PASS	
55.00	94.4	94.6	PASS	
60.00	94.1	94.1	PASS	
65.00	93.7	94.8	PASS	
70.00	93.4	94.0	PASS	
75.00	93.1	93.3	PASS	
80.00	92.9	93.0	PASS	
85.00	92.6	92.7	PASS	
90.00	92.4	92.6	PASS	
95.00	92.1	92.8	PASS	
100.00	91.9	92.0	PASS	
120.00	91.2	91.7	PASS	
150.00	90.2	90.5	PASS	
200.00	89.0	89.5	PASS	

*** Test Result**

☒ PASS ☐ FAIL

5.5 CS115 Test

5.5.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial number	Due Cal.	Apply select
Pulse generator	9355-1	SOLAR	41273	-	☒
Current injection probes	9144-1N	SOLAR	51822	-	☒
Calibration fixture	9125-1	SOLAR	-	-	☒
Oscilloscope	TDS3052B	TEKTRONIX	B011855	2011.10.02	☒
Current probe	9123-1N	SOLAR	510042	2011.07.14	☒
LISN	8616-50-TS-200-N	SOLAR	076137	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076138	2012.01.10	☒
Coaxial load	8251	BIRD	11412	2012.01.13	☒
Attenuators	9410-1	SOLAR	57741	-	☒

*** 40 dB high voltage attenuator use.**

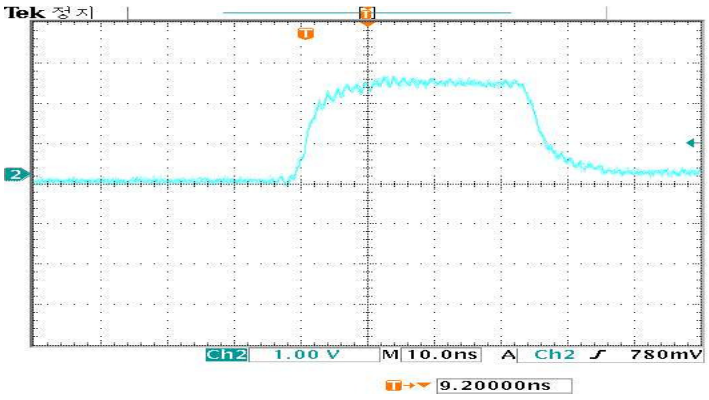
5.5.2 Test Area : RS chamber

5.5.3 Test procedures

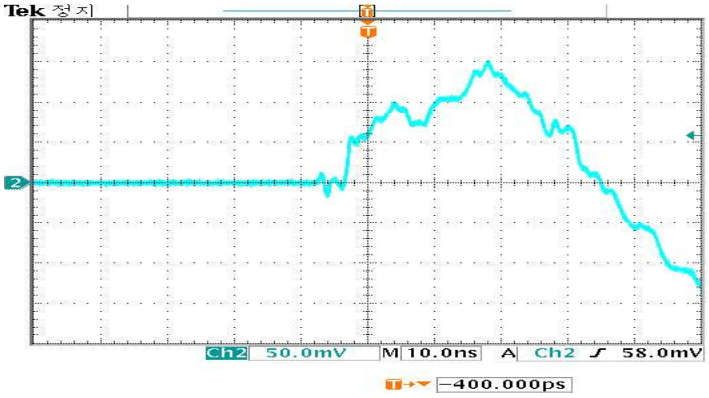
1) Setting EUT and test equipment as its manual
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing.
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground.
6) Turn on the EUT and stabilized for enough time
7) Adjust the pulse generator source for the risetime, pulse width, and pulse repetition rate requirements..
8) Monitor the EUT for degradation of performance.

5.5.4 Test Result

Start of test : April 21, 2011 Test by : Won-Kyu Lee



[Calibration]



[Power]

PAR46

Test cable	Limit	Calibration	PPS	Result
Power	5 A	5 A	30	Pass

*** Test Result**

☒ PASS ☐ FAIL

5.6 CS116 Test

5.6.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial number	Due Cal.	Apply select
Damped sinusoid transient generator	9354-1	SOLAR	49842	-	☒
Current injection probes	9142-1	SOLAR	0510115	-	☒
Current injection probes	9144-1	SOLAR	51822	-	☒
Calibration fixture	9125-1	SOLAR	-	-	☒
Oscilloscope	TDS3052B	TEKTRONIX	B010526	2011.10.02	☒
Current probe	9123-1N	SOLAR	510042	2011.07.14	☒
LISN	8616-50-TS-200-N	SOLAR	076137	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076138	2012.01.10	☒
Coaxial load	8251	BIRD	11412	2012.01.13	☒
Attenuators	9410-1	SOLAR	57741	-	☒

*** 40dB high voltage attenuator use**

5.6.2 Test Area : RS chamber

5.6.3 Test procedures

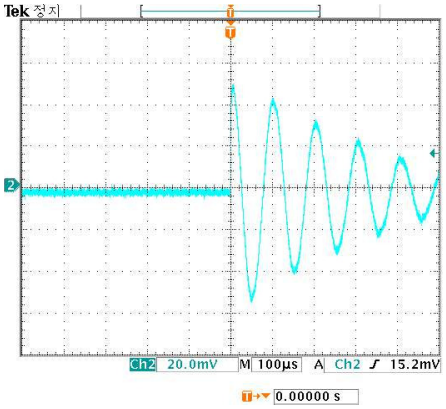
1) Setting EUT and test equipment as its manual
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing.
5) Usually, desk-top EUT tested on the table height 0.9m from the ground and EUT for ground Tested at the ground.
6) Turn on the EUT and stabilized for enough time
7) Set the damped sine generator to a test frequency.
8) Apply the test to each cable or power lead of the EUT sequentially. Slowly increase the damped sinewave generator output level to provide the specified.
9) Monitor the EUT for degradation of performance

5.6.4 Test Result

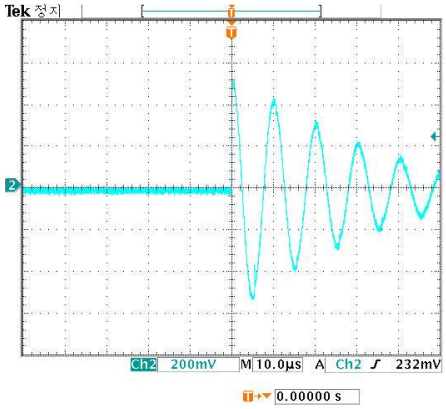
Start of test : April 21, 2011

Test by : Won-Kyu Lee

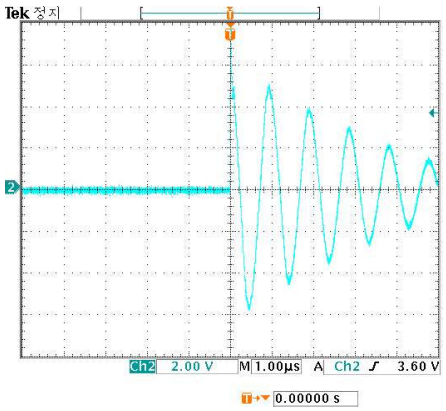
Calibration (10 kHz, 100 kHz, 1 MHz, 10 MHz, 30 MHz, 100 MHz)



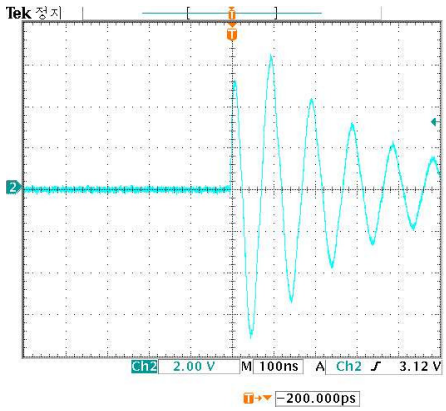
[Calibration - 10 kHz]



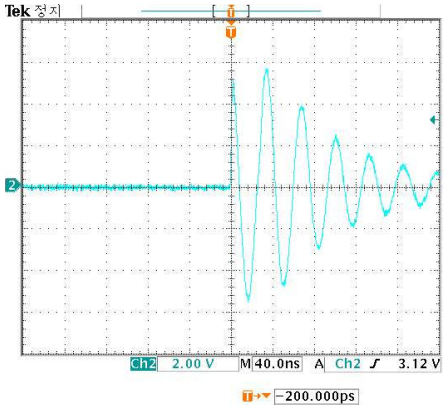
[Calibration – 100 kHz]



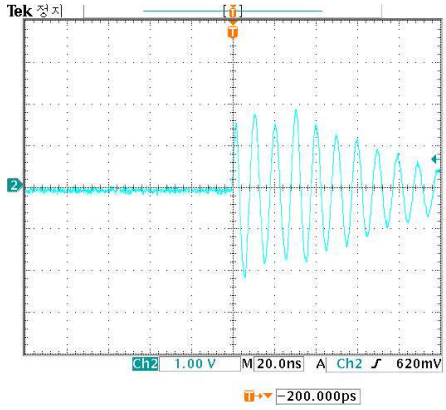
[Calibration – 1 MHz]



[Calibration – 10 MHz]

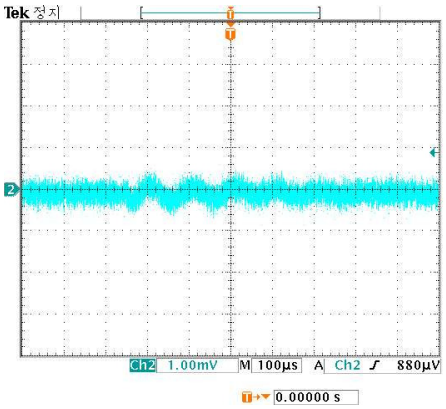


[Calibration - 30 MHz]

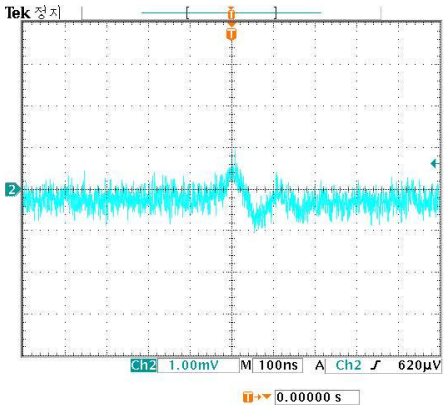


[Calibration - 100 MHz]

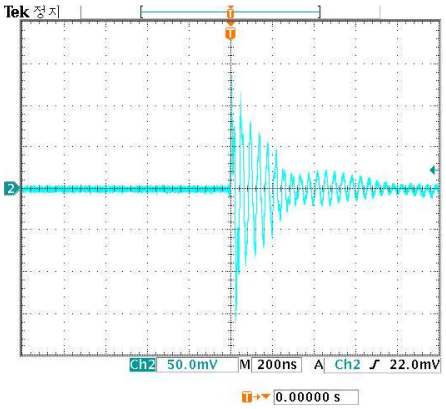
PAR46 – Power



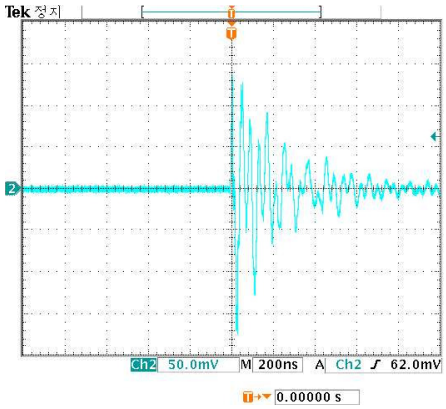
[10 kHz]



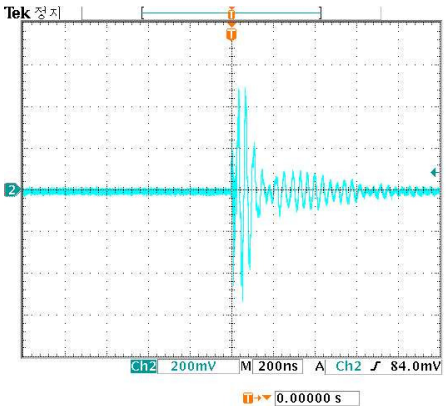
[100 kHz]



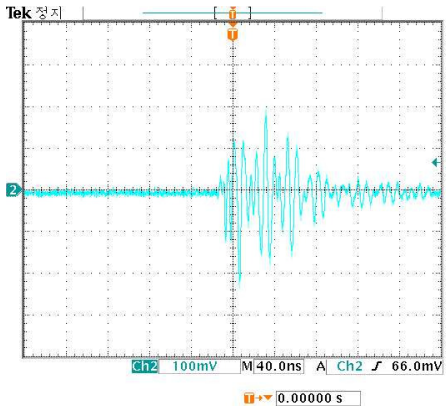
[1 MHz]



[10 MHz]



[30 MHz]



[100 MHz]

PAR46 – Power

Frequency(MHz)	Limit (A)	Calibration(A)	Result
0.01	0.10	0.10	PASS
0.10	1.00	1.00	PASS
1.00	10.00	10.00	PASS
10.00	10.00	10.00	PASS
30.00	10.00	10.00	PASS
100.00	3.00	3.00	PASS

*** Test Result**

☒ PASS ☐ FAIL

5.7 RE102 test

5.7.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial Number	Due Cal.	Apply select
TEST RECEIVER	ESU40	R&S	100027	2011.07.14	☒
Signal generator	2024	MARCONI	11225/092	2012.04.12	☒
Active ROD Ant	HFH2-Z6	R&S	100170	2012.12.01	☒
Log periodic Ant	USLP9143B	Schwarzbeck	012	2011.12.17	☒
Biconical Ant	VHA 9103	Schwarzbeck	2581	2011.12.15	☒
HORN Ant	SAS-571	AH	500	2013.03.15	☒
Pre-Amplifier	87405-60021	Agilent	10004	2012.01.10	☒
Amplifier	310N	SONOMA	261708	2012.01.11	☒
LISN	9233-50-TS-50-N	SOLAR	005237	2011.07.14	☒
LISN	9233-50-TS-50-N	SOLAR	005238	2011.07.14	☒

5.7.2 Test Area : 2nd Anechoic Chamber

5.7.3 Test procedures

1) Setting EUT and test equipment as its manual.
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground.
6) Selecting each highest value if the operation mode and speed are different.
7) Arrange the EUT as a condition of maximum radiated emissions when testing.
8) Fixing the EUT and by setting the height 1.2 m and looking for maximum radiated emissions By antenna
   ex) ROD Ant, BICONICAL Ant, LOG PERIODIC Ant, Horn Ant
   * Above 30 MHz, the limits shall be et for both horizontal and vertically polarized fields.
9) Measurement distance 1 m.
10) Calculating noise electric strength as below and applicating each value if correction factor is automatically corrected

    F1[dBuV/m] = (F2[dBuV] + AF[dB/m] + CL[dB]) - AG[dB]

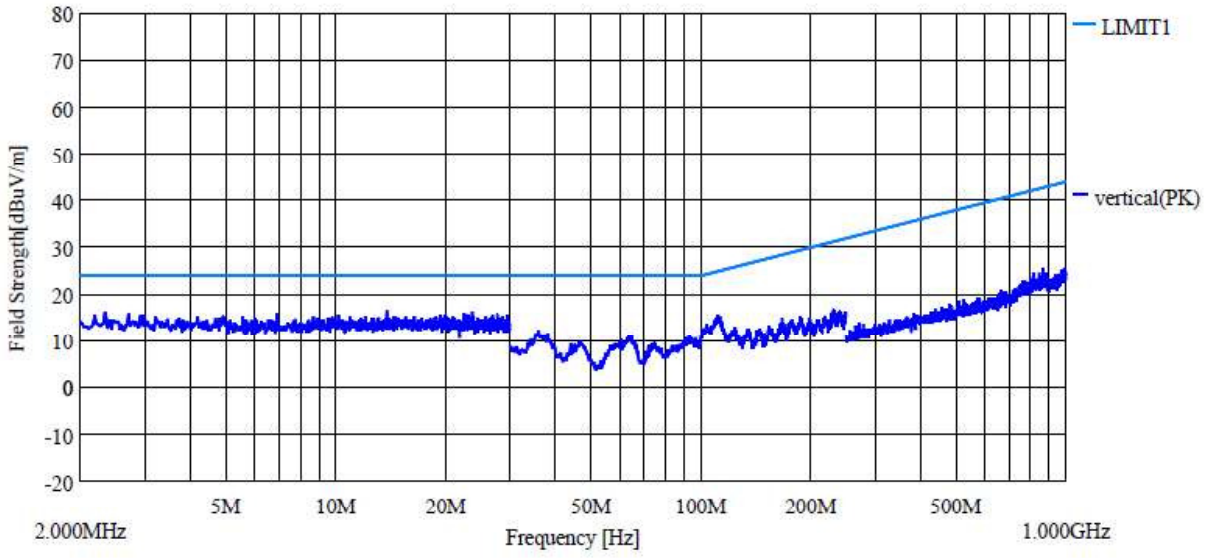
    F1 : Last measured value F2 : Equipment instruction AF : Antenna Factor

    CL : Cable loss AG : amplifier gain

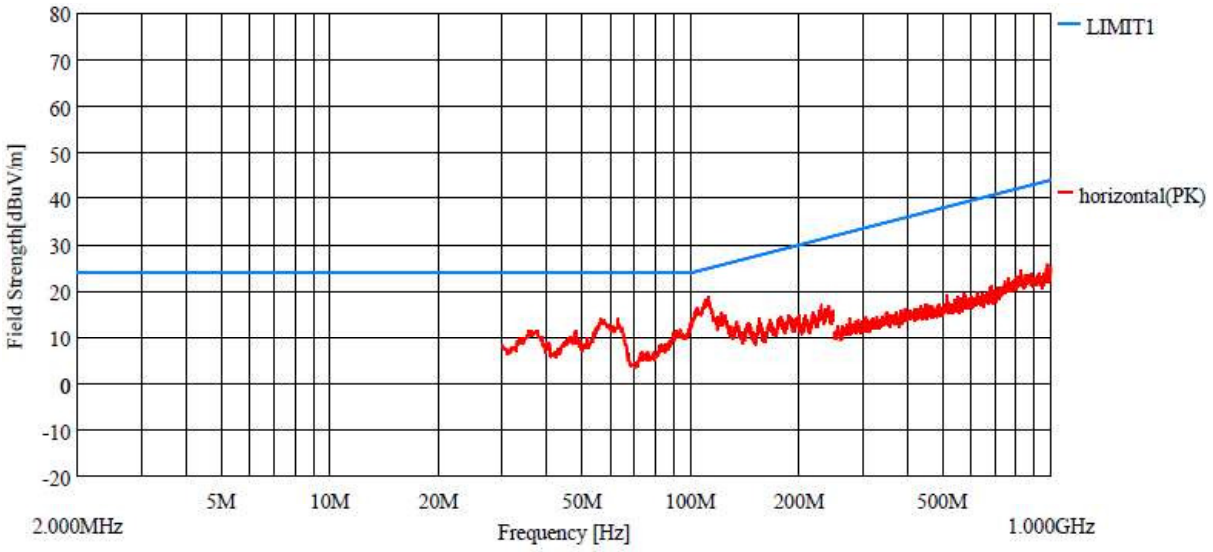
5.7.4 Test Result

Start of test : April 21, 2011 Test by : Won-Kyu Lee

5.7.4.1 2 MHz ~ 1000 MHz

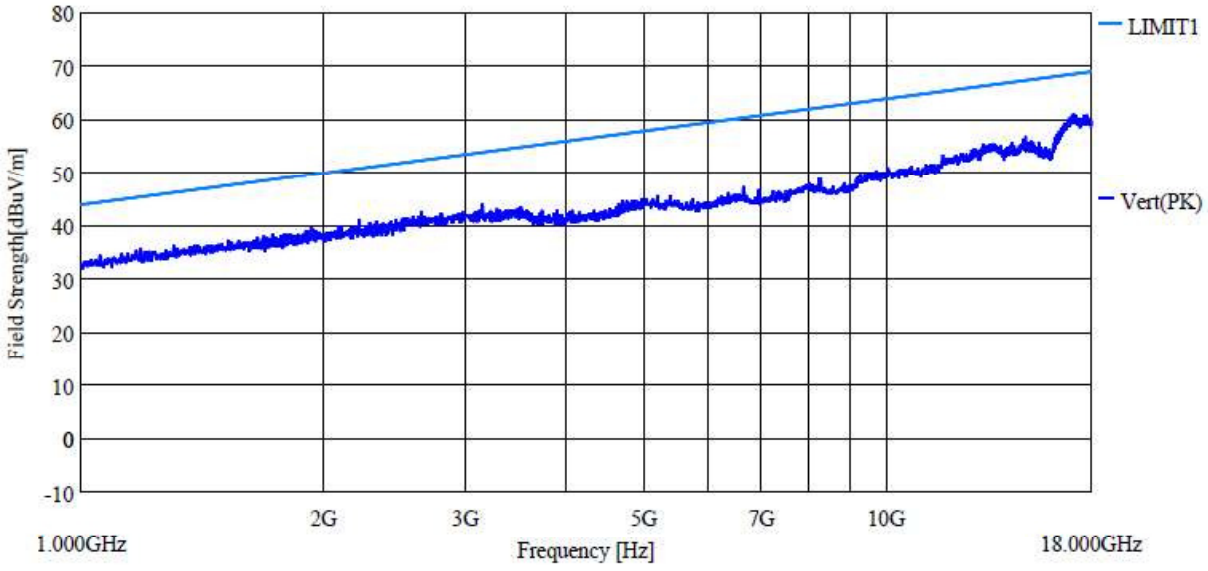


[vertical]

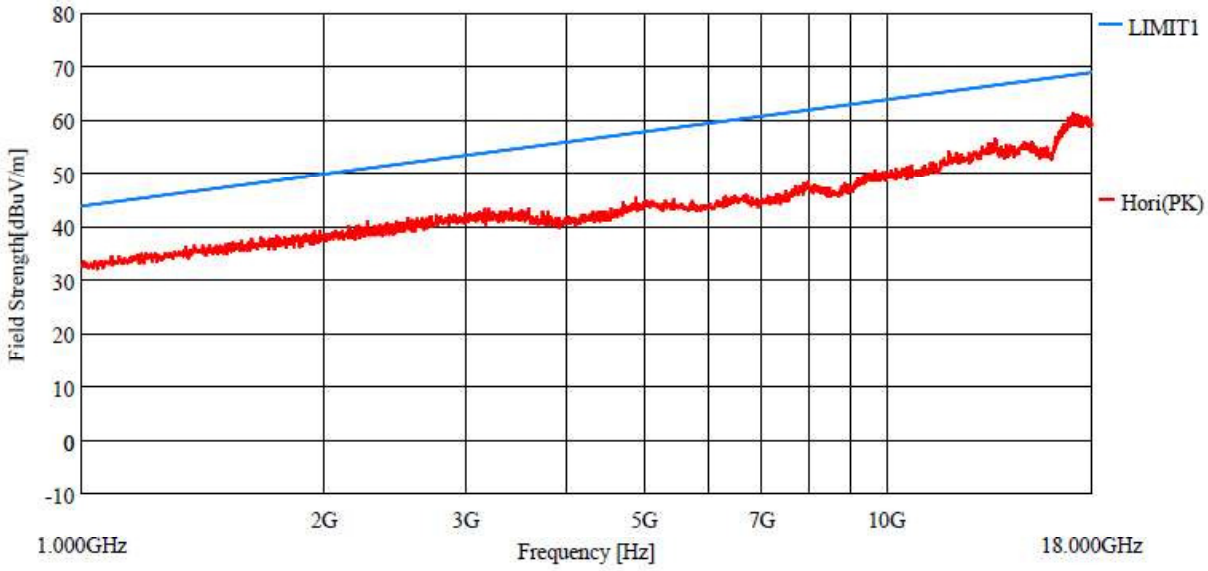


[Horizontal]

5.7.4.2 1000 MHz ~ 18 000 MHz



[Vertical]



[Horizontal]

*** Test Result**

☒ PASS ☐ FAIL

5.8 RS103 Test

5.8.1 Test Equipment

Instrument description	Model Number	Manufacturer	Serial Number	Due Cal.	Apply select
Signal generators	2024	MARCONI	112225/092	2012.01.10	☒
Signal generators	83620B	HP	3844A01135	2011.07.14	☒
E-Field Ant	EFG-3	ifi	J100-0905	-	☒
Double-Ridged Waveguide Horn Ant	3106	EMCO	00056871	-	☒
Horn Ant	AT4002A	AR	310148	-	☒
Biconical Ant.	3109	EMCO	9702-3096	-	☒
Horn Ant.	AT4530	AR	321334	-	☒
Power meter	NRVD	R&S	102156	2011.10.02	☒
DIODE Power Sensor	NRV-Z51	R&S	100523	2011.10.02	☒
DIODE Power Sensor	NRV-Z51	R&S	100524	2011.10.02	☒
Directional coupler	DC7144A	AR	310783	2012.01.10	☒
Directional coupler	DC6180	AR	21034	2012.01.10	☒
Directional coupler	DC2500	AR	20036	2012.01.10	☒
Directional coupler	DC7435	AR	312856	2012.01.10	☒
Power amplifier	500W100M5	AR	21402	-	☒
Power amplifier	1000L	AR	20888	-	☒
Power amplifier	100S1G4M1	AR	309165	-	☒
Power amplifier	20T4G18A	AR	313450	-	☒
Electric field sensors	HI-4422	ETS	00079860	2012.03.04	☒
Electric field sensors	HI-4455	ETS	44512	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076137	2012.01.10	☒
LISN	8616-50-TS-200-N	SOLAR	076138	2012.01.10	☒

5.8.2 Test Area : RS Chamber

5.8.3 Test procedures

1) Setting EUT and test equipment as its manual.
2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
3) Testing EUT after connecting sub-equipment on every interface port.
4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing
5) Usually, desk-top EUT tested on the table height 0.9 m from the ground and EUT for ground tested at the ground.
6) Selecting each highest value if the operation mode and speed are different.
7) Measurement distance 1 m.
8) Set the signal source to 1 kHz pulse modulation, 50 % duty cycle, and using appropriate amplifier and transmit antenna, establish an electric field at the test start frequency. Gradually increase the electric field level until it reaches the applicable limit.
9) Monitor the EUT for degradation of performance

5.8.4 Test Result

Start of test : April 22, 2011 Test by : Won-Kyu Lee

Vertical

Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
2	50.0	53.3	PASS	
4	50.0	51.3	PASS	
6	50.0	52.5	PASS	
8	50.0	51.9	PASS	
10	50.0	50.9	PASS	
15	50.0	50.6	PASS	
20	50.0	51.6	PASS	
30	50.0	50.4	PASS	
40	50.0	50.2	PASS	
50	50.0	50.7	PASS	
60	50.0	50.2	PASS	
70	50.0	50.1	PASS	
80	50.0	50.2	PASS	
90	50.0	50.1	PASS	
100	50.0	51.3	PASS	
150	50.0	50.1	PASS	
200	50.0	50.3	PASS	
250	50.0	50.3	PASS	
300	50.0	50.4	PASS	
350	50.0	50.5	PASS	
400	50.0	50.4	PASS	
450	50.0	50.3	PASS	
500	50.0	50.5	PASS	
550	50.0	50.3	PASS	
600	50.0	50.5	PASS	
650	50.0	50.1	PASS	
700	50.0	50.0	PASS	
750	50.0	50.5	PASS	
800	50.0	51.7	PASS	
850	50.0	50.5	PASS	
900	50.0	50.2	PASS	
1000	50.0	50.1	PASS	
2000	50.0	50.3	PASS	

Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
3000	50.0	51.7	PASS	
4000	50.0	50.2	PASS	
5000	50.0	50.3	PASS	
6000	50.0	51.5	PASS	
7000	50.0	50.0	PASS	
8000	50.0	50.4	PASS	
9000	50.0	50.5	PASS	
10 000	50.0	50.3	PASS	
11 000	50.0	50.4	PASS	
12 000	50.0	50.4	PASS	
13 000	50.0	51.7	PASS	
14 000	50.0	50.3	PASS	
15 000	50.0	50.6	PASS	
16 000	50.0	50.6	PASS	
17 000	50.0	50.3	PASS	
18 000	50.0	50.2	PASS	

Horizontal

Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
30	50.0	50.5	PASS	
40	50.0	50.4	PASS	
50	50.0	50.2	PASS	
60	50.0	51.2	PASS	
70	50.0	50.3	PASS	
80	50.0	50.1	PASS	
90	50.0	50.2	PASS	
100	50.0	51.3	PASS	
150	50.0	50.2	PASS	
200	50.0	50.8	PASS	
250	50.0	50.3	PASS	
300	50.0	50.5	PASS	
350	50.0	50.4	PASS	
400	50.0	50.5	PASS	
450	50.0	50.6	PASS	
500	50.0	50.3	PASS	
550	50.0	50.3	PASS	

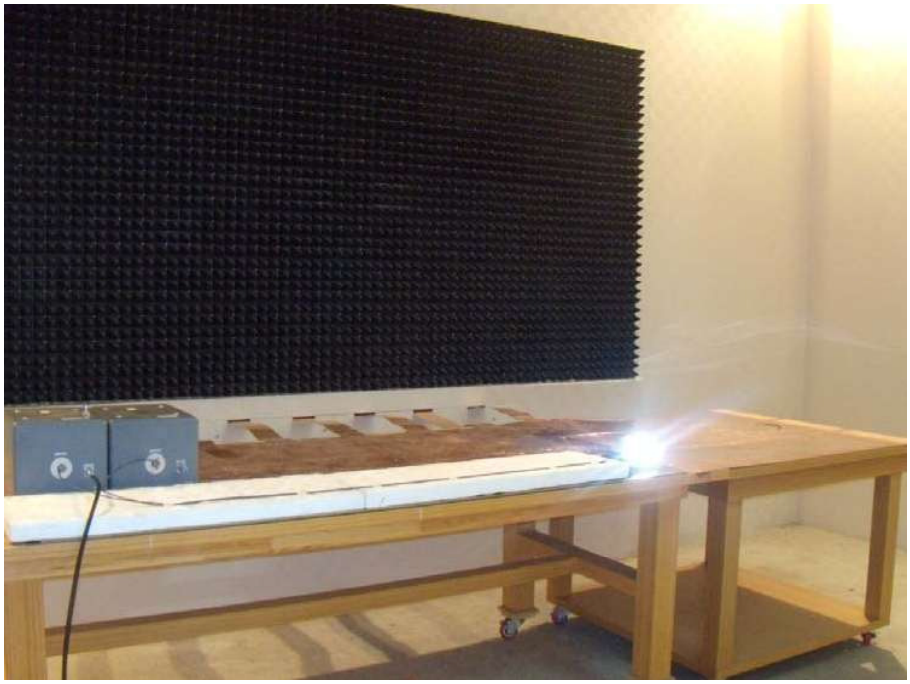
Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
600	50.0	50.4	PASS	
650	50.0	50.7	PASS	
700	50.0	50.4	PASS	
750	50.0	50.3	PASS	
800	50.0	50.2	PASS	
850	50.0	51.9	PASS	
900	50.0	50.6	PASS	
1000	50.0	50.6	PASS	
2000	50.0	50.1	PASS	
3000	50.0	50.6	PASS	
4000	50.0	50.4	PASS	
5000	50.0	50.4	PASS	
6000	50.0	51.7	PASS	
7000	50.0	50.3	PASS	
8000	50.0	50.5	PASS	
9000	50.0	50.5	PASS	
10 000	50.0	50.5	PASS	
11 000	50.0	50.0	PASS	
12 000	50.0	51.6	PASS	
13 000	50.0	51.6	PASS	
14 000	50.0	50.4	PASS	
15 000	50.0	50.3	PASS	
16 000	50.0	50.6	PASS	
17 000	50.0	50.1	PASS	
18 000	50.0	50.3	PASS	

*** Test Result**

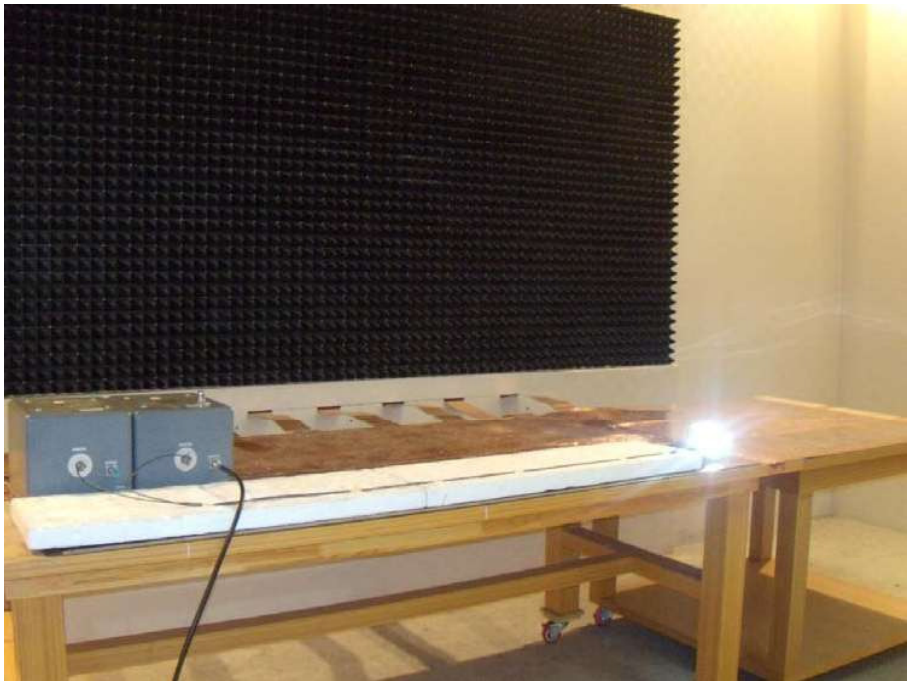
☒ PASS ☐ FAIL

6. Test Setup Photographs

6.1 CE102 Test setup photographs



[HOT]



[RTN]

6.2 CS101 Test setup photographs

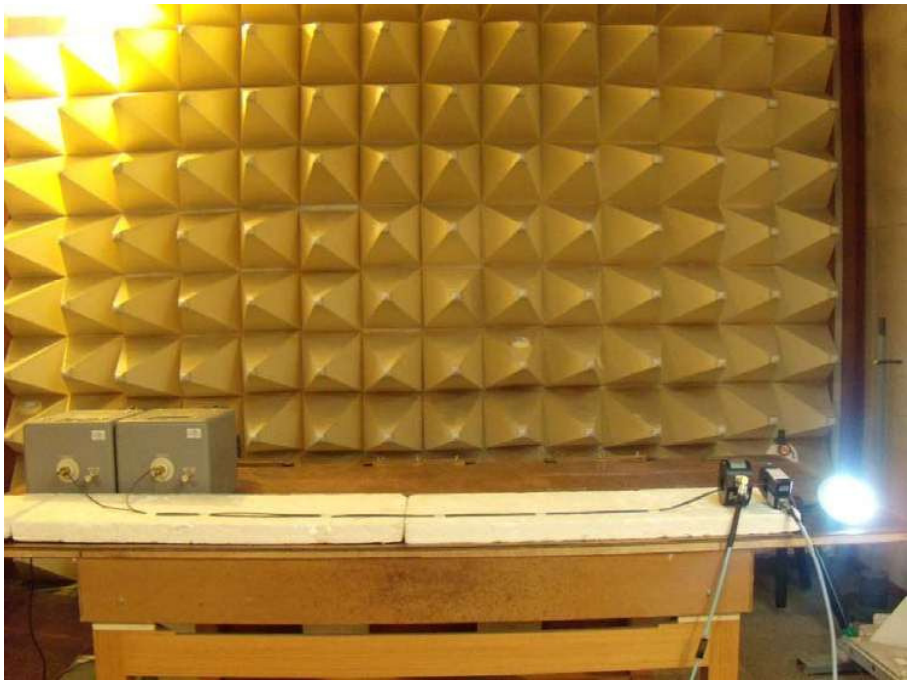


[Front]



[Back]

6.3 CS114 Test setup photographs



[Front]



[Magnification]

6.4 CS115 Test setup photographs



[Front]

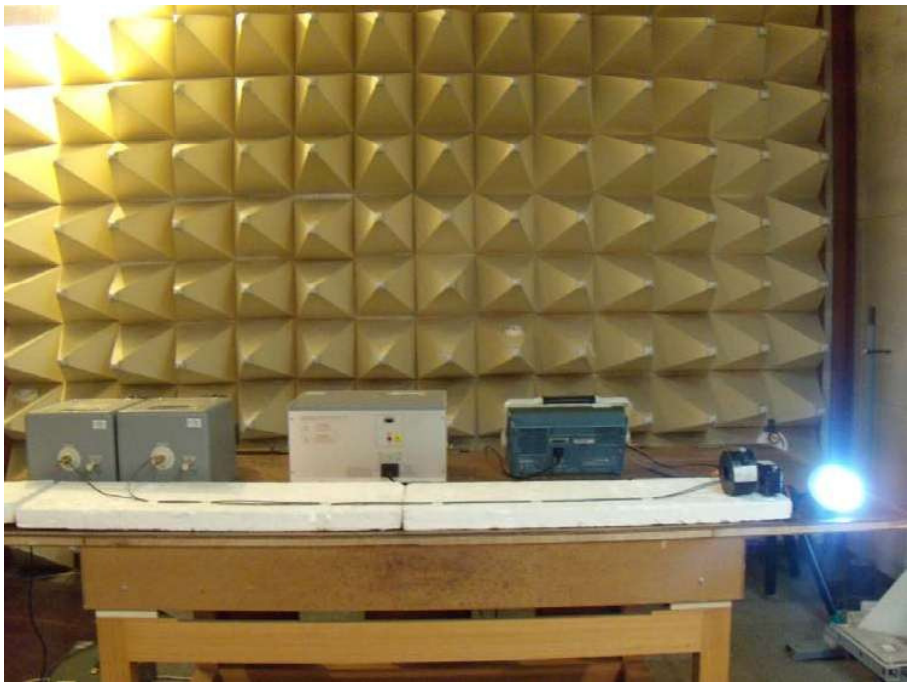


[Back]

6.5 CS116 Test setup photographs



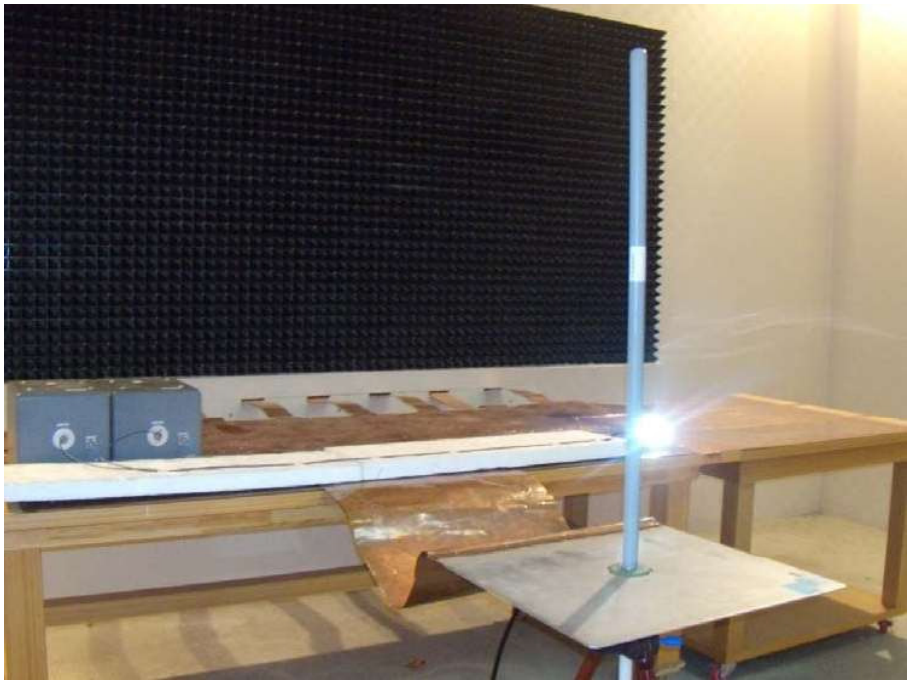
[Front]



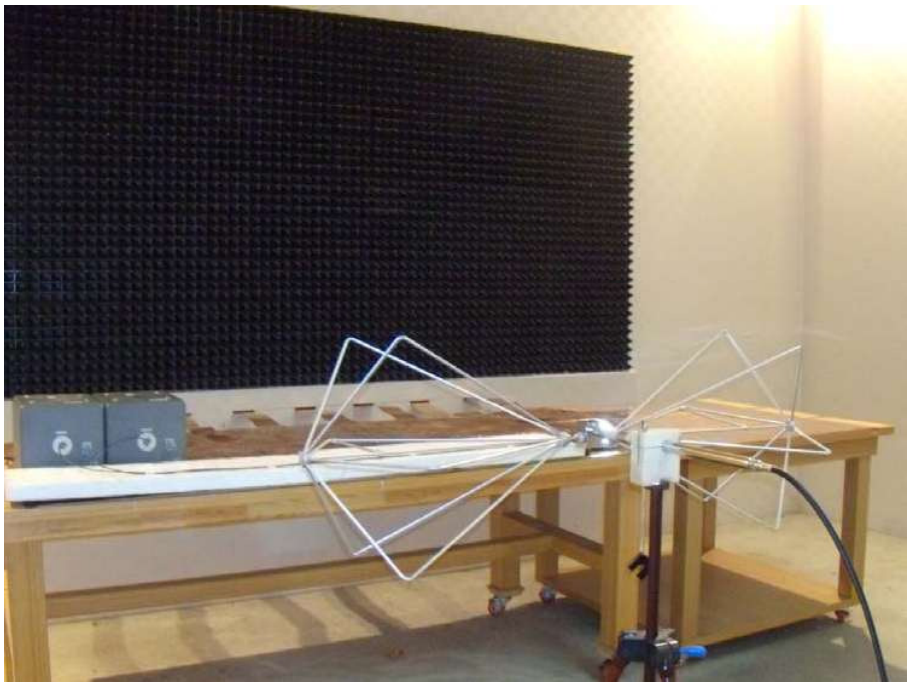
[Back]

6.6 RE102 Test setup photographs

6.6.1 : 2 MHz ~ 30 MHz

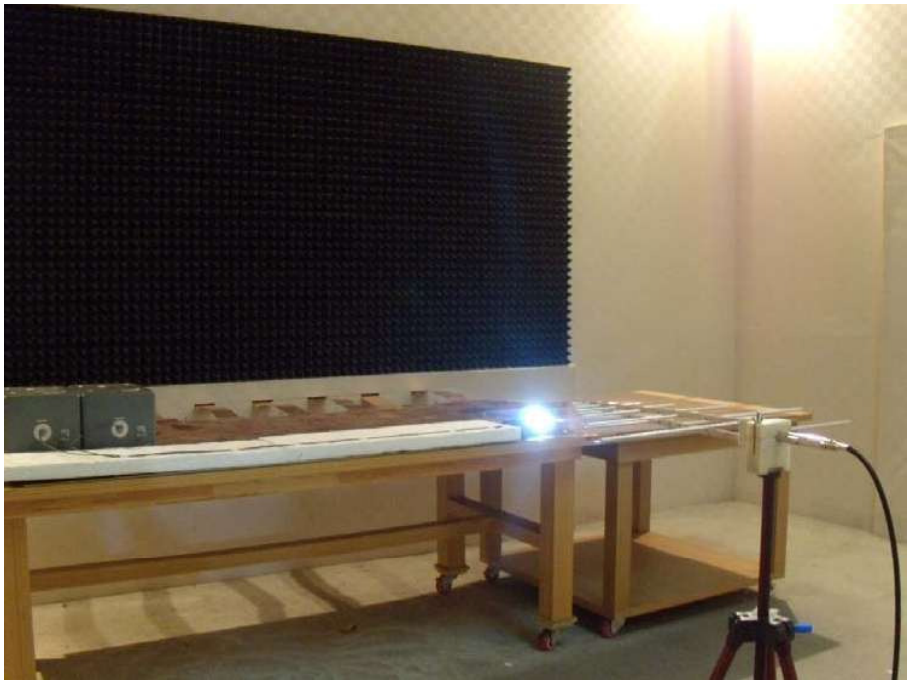


6.6.2 : 30 MHz ~ 200 MHz



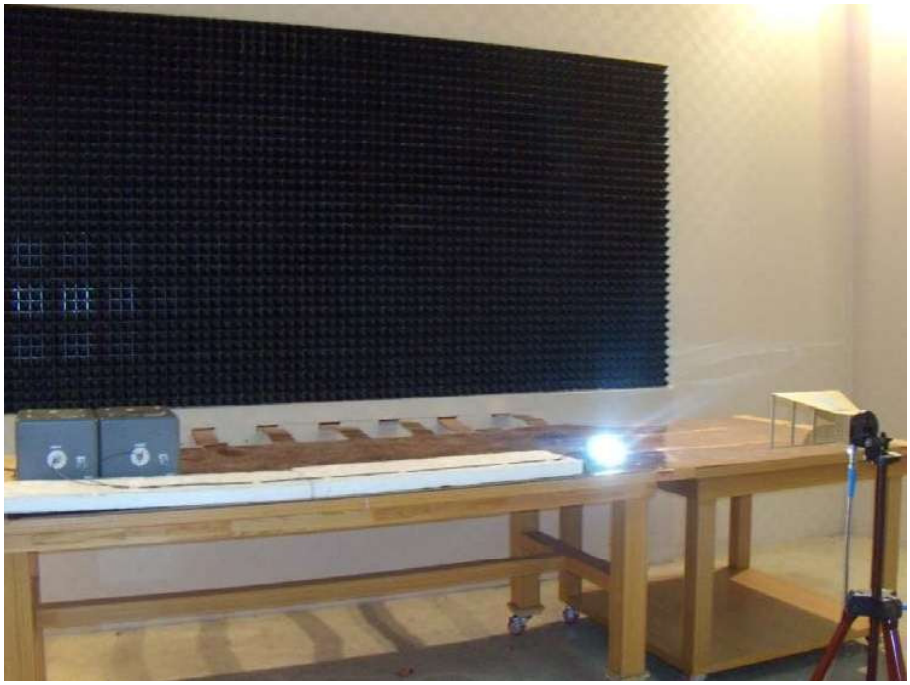
[Horizontal / Vertical]

6.6.3 : 200 MHz ~ 1000 MHz



[Horizontal / Vertical]

6.6.4 : 1000 MHz ~ 18 000 MHz



[Horizontal / Vertical]

6.7 RS103 Test setup photographs

6.7.1 : 2 MHz ~ 30 MHz



6.7.2 : 30 MHz ~ 200 MHz



[Horizontal / Vertical]

6.7.3 : 200 MHz ~ 1 000 MHz



[Horizontal / Vertical]

6.7.4 : 1000 MHz ~ 4200 MHz



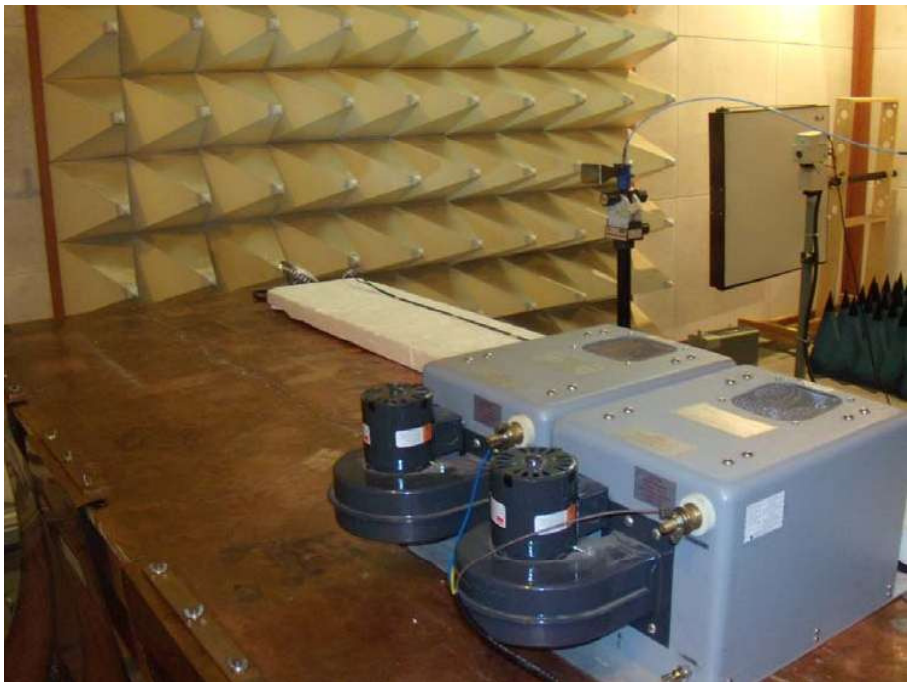
[Horizontal / Vertical]

6.7.5 : 4200 MHz ~ 7500 MHz



[Horizontal / Vertical]

6.8.6 : 7500 MHz ~ 18 000 MHz



[Horizontal / Vertical]

7. EUT Photographs

7.1 PAR46



[Front]



[Back]

-The End-