

TEST REPORT

Korea EMC Laboratory Co., Ltd.

390 Bora-dong, Giheung-gu, Yongin-si, Gyeonggi-do,
Republic of Korea (446-904)

Tel : 82-31-286-5881 Fax : 82-31-286-2661

www.koreaemc.com

Report No :

KEL11-W12068

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**1. Client**

- Name : Larson Electronics, LLC
- Address : 9419 E. US Hwy 175, Kemp, TX 75143, USA
- Date of Receipt : December 26, 2011

2. Use of Report : Quality certification

3. Name of Product and Model : LED Light / LEDLB Series

4. Manufacturer : Larson Electronics, LLC

5. Date of Test : January 20, 2012 ~ January 26, 2012

6. Test method used : MIL-STD-461F (2007)

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)

February 06, 2012

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

KEL-D-QP-25-20/4

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Date Rev	ision	Page No
February 06, 2012	Originally issued	-

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1. National Accredited Testing Lab.

1.1 General condition

Name of Test Laboratory	Korea EMC Laboratory Co., Ltd.
President W	on-Hyang Oh
Address	390 Bora-dong, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea (446-904)
TEL +82	-31-286-5881
FAX +82	-31-286-2661
e-mail	webmaster@koreaemc.com

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	
FCC Part 15 & 18 EMI(Radiated & Conducted emission)	ANSI 63.4:2003	90751 (KR0002)	
VCCI EMI(Radiated & Conducted emission)	VCCI	C-2314 R-2139 R-2140	
UL Korea Ltd. Safety	Star Alliance Program	-	
European Conformity EMC & Safety	2004/108/EC 2006/95/EC	-	
TUV SUD Certification after Recognition of Agent's Testing EMC	ISO/IEC 17025:2005	ROK1006C	 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 ☐ FA IL
		CE102	☒ PASS ☐ FA IL
Conducted susceptibility MIL-STD-461E	MIL-STD-461E	CS101	☐ PASS ☐ FA IL
		CS114	☒ PASS ☐ FA IL
		CS115	☒ PASS ☐ FA IL
		CS116	☒ PASS ☐ FA IL
Radiated Emissions	MIL-STD-461E	RE101	☐ PASS ☐ FA IL
		RE102	☒ PASS ☐ FA IL
Radiated susceptibility	MIL-STD-461E	RS101	☐ PASS ☐ FA IL
		RS103	☒ PASS ☐ FA IL

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

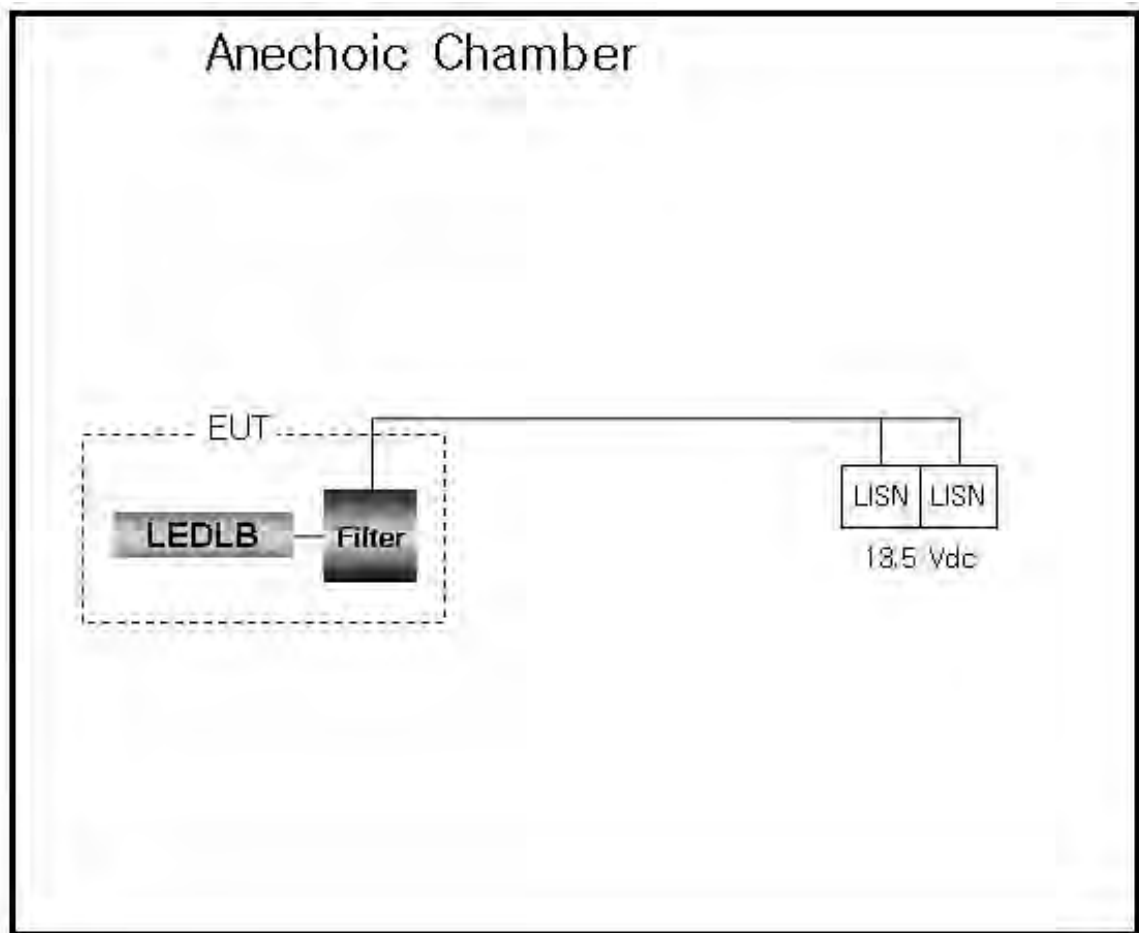
2.2 EUT Modify

*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 (dB μ V)	
	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.

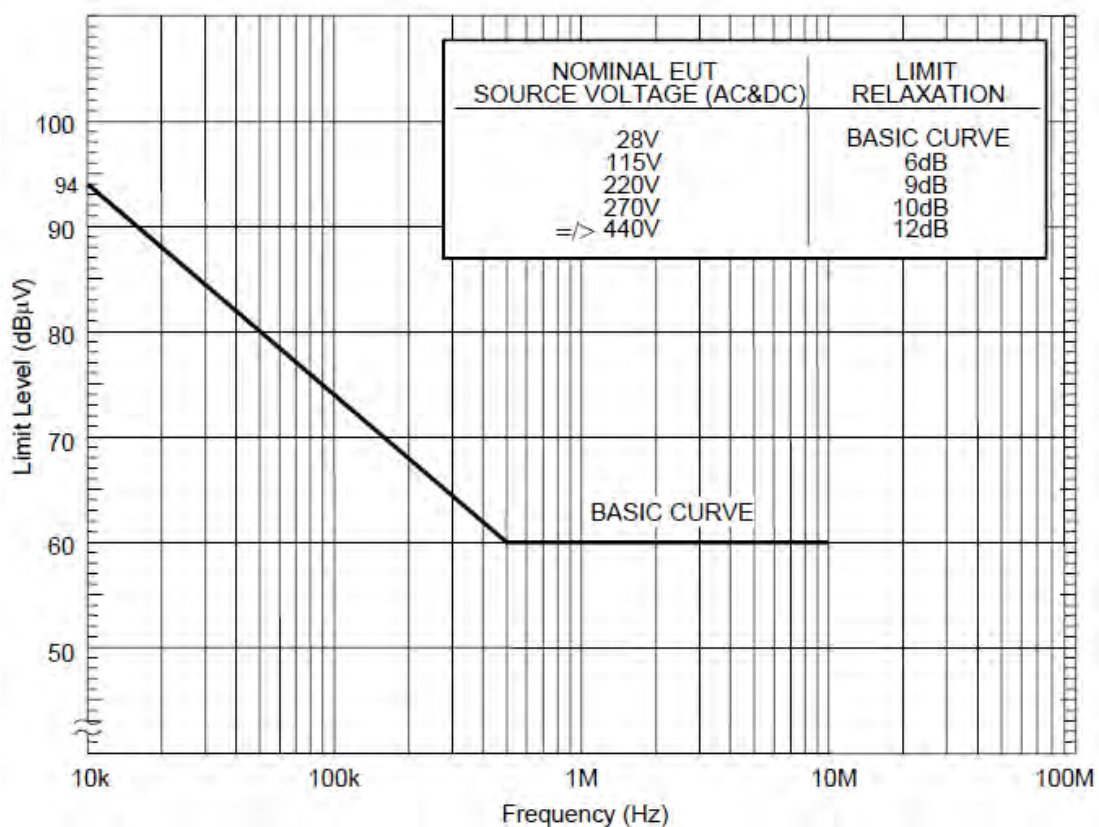


FIGURE CE 102-1. CE 102 Limit for all applications

* It is applied to the standard of BASIC Curve.

4.2 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 NUMBERS SHOWN IN FIGURE CS-114-1 AND LIMITS									
PLATFORM FREQUENCY RANGE		AIRCRAFT (EXTERNAL OR SAFETY CRITICAL)	AIRCRAFT INTERNAL	ALL SHIPS (ABOVE DECKS) AND SUBMARINES (EXTERNAL)*	SHIPS (METALLIC) (BELOW DECKS)	SHIPS (NON- METALLIC) (BELOW DECK)**	SUBMARINE (INTERNAL)	GROUND	SPACE
4 kHz to 1MHz	N	-	-	77 dBuA	77 dBuA	77 dBuA	77 dBuA	-	-
	A	5	5	2	2	2	1	3	3
	N	5	3	2	2	2	1	2	3
10 kHz to 2 MHz	AF	5	3	-	-	-	-	2	3
	A	5	5	5	2	4	1	4	3
	N	5	5	5	2	4	1	2	3
2 MHz to 30 MHz	AF	5	3	-	-	-	-	2	3
	A	5	5	5	2	2	2	4	3
	N	5	5	5	2	2	2	2	3
30 MHz to 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)

** For equipment located in the hangar deck of Aircraft Carriers

Table VI CS1 14 limit curves

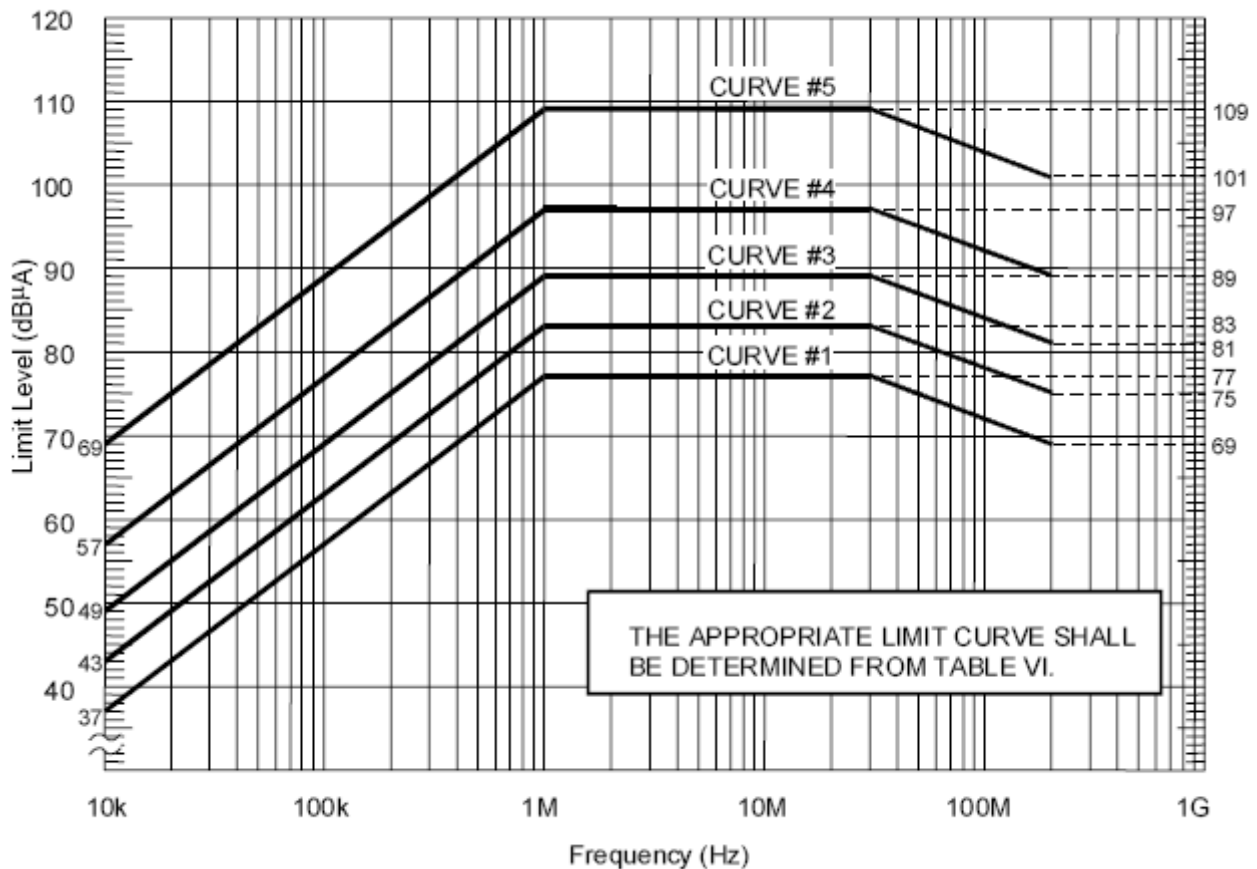


FIGURE CS 114-1. CS 114 CALIBRATION LIMIT FOR ALL APPLICATIONS.

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

4.3 CS115 Conducted Susceptibility Limits

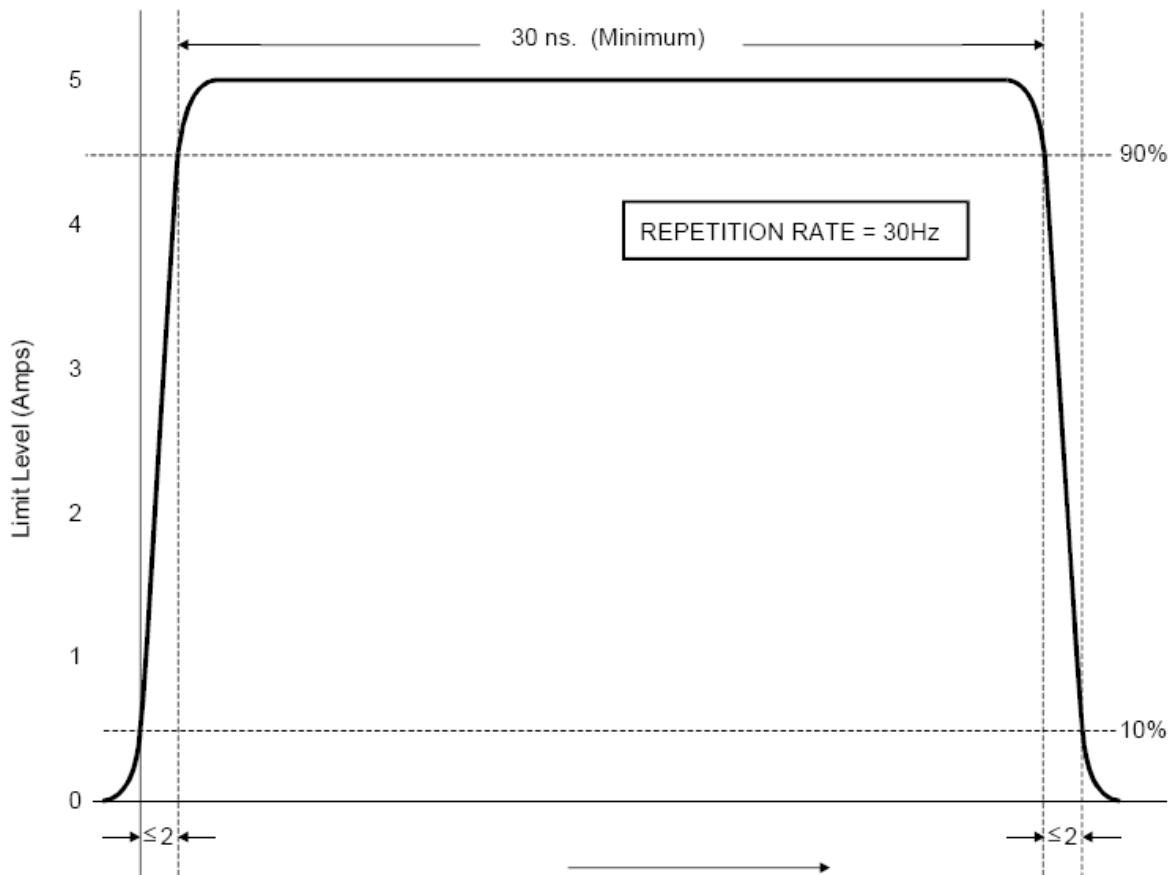


FIGURE CS 115-1. CS 115 SIGNAL CHARACTERISTICS FOR ALL APPLICATIONS.

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.

4.4 CS116 Conducted Susceptibility Limits

Frequency range (MHz)	Peak current (Amperes)
0.01 ~ 1	0.1 ~ 10
1 ~ 30	10
30 ~ 100	10 ~ 3

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.

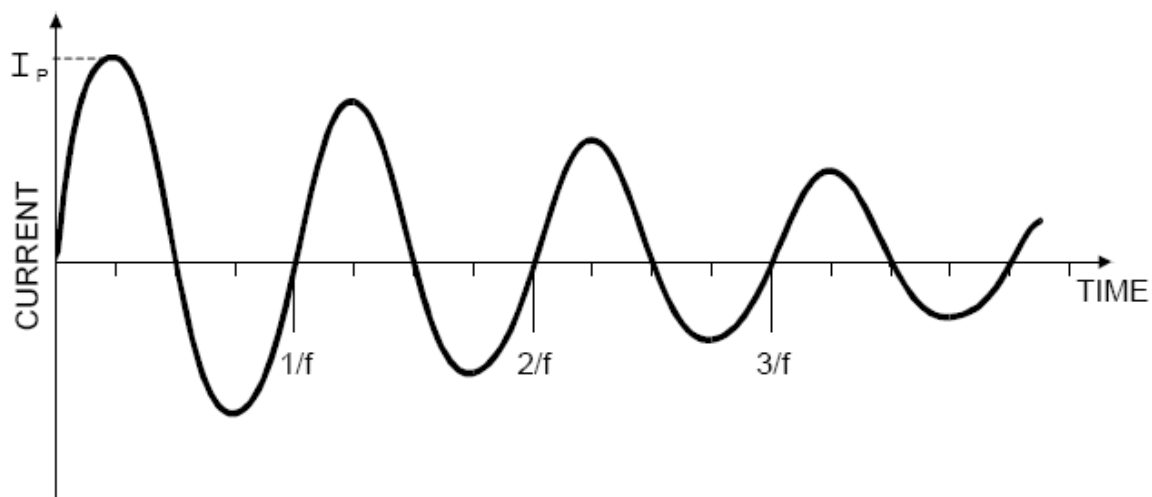


FIGURE CS116-1. TYPICAL CS116 DAMPED SINUSOIDAL WAVEFORM

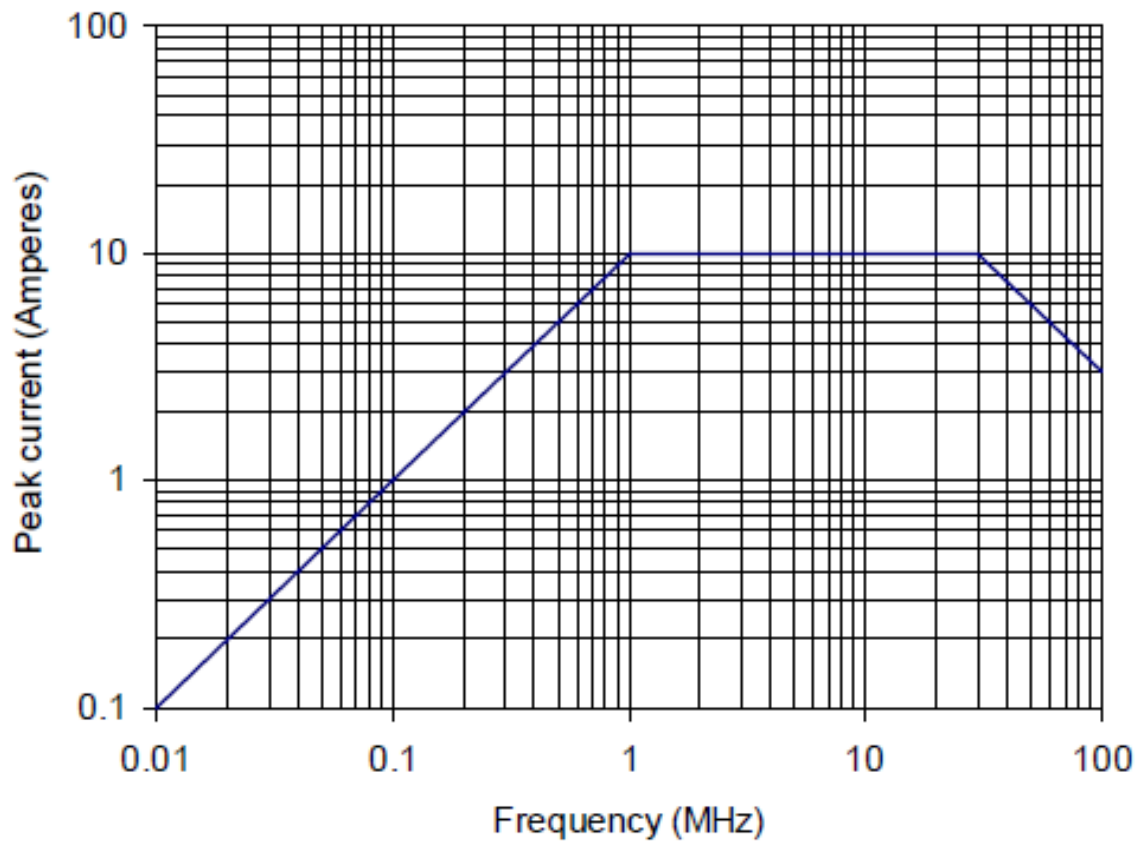


FIGURE CS 116-2. CS 116 Limit for all applications.

4.5 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 0	24 ~ 69	44 ~ 89

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

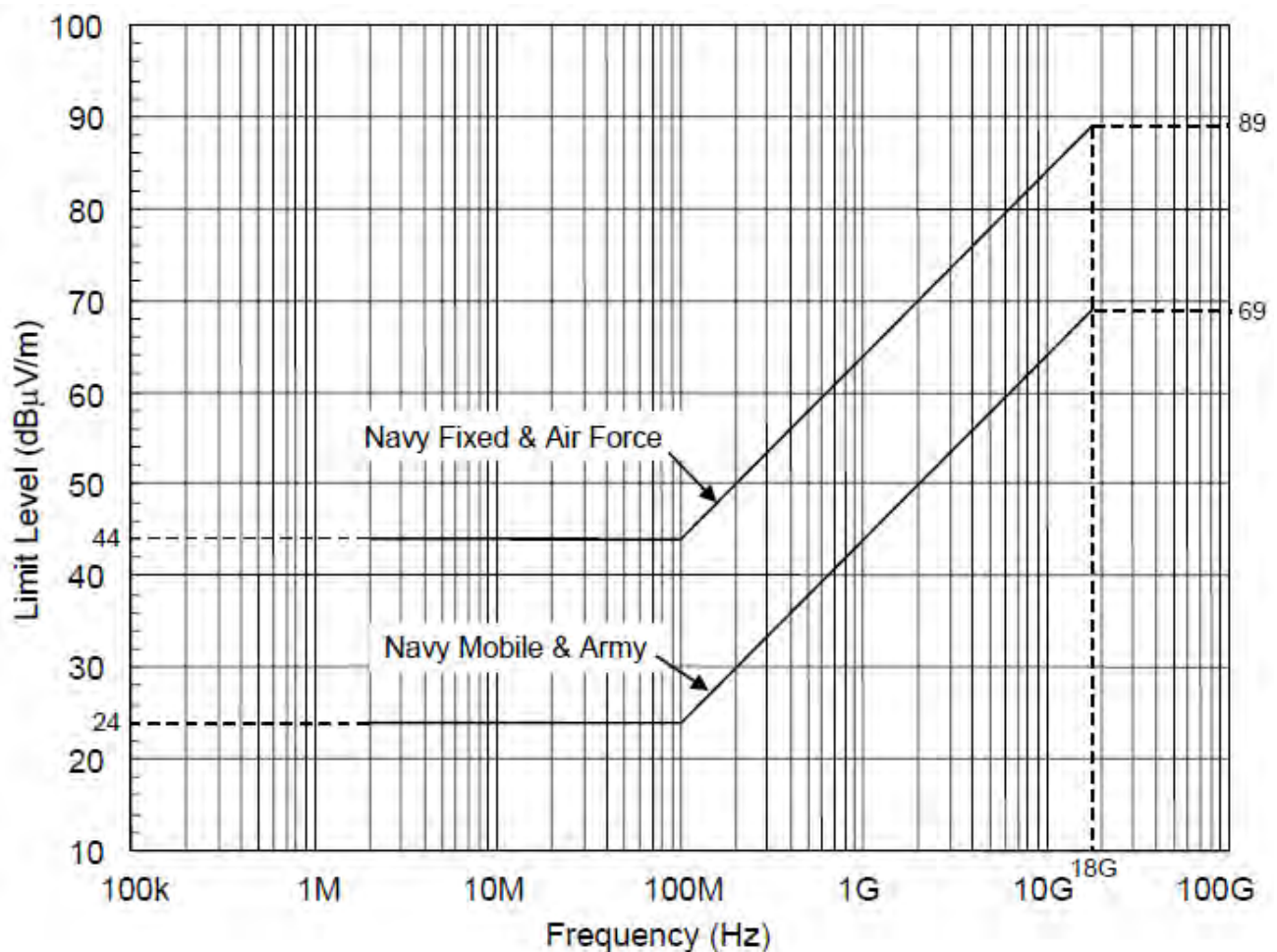


FIGURE RE 102-4 RE102 Limit for ground applications

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

4.6 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 ↓	A	200	200	200	10	50	5	50	20
	N	200	200	200	10	50	5	10	20
30 MHz	AF	200	20	-	-	-	-	10	20
30 MHz ↓	A	200	200	200	10	10	10	50	20
	N	200	200	200	10	10	10	10	20
1 GHz	AF	200	20	-	-	-	-	10	20
1 GHz ↓	A	200	200	200	10	10	10	50	20
	N	200	200	200	10	10	10	50	20
18 GHz	AF	200	60	-	-	-	-	50	20
18 GHz ↓	A	200	200	200	10	10	10	50	20
	N	200	60	200	10	10	10	50	20
40 GHz	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)

** Equipment located in the hanger deck of Aircraft Carriers

Table VII. R S103 limit s.

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.

4.7 Apply a Standard Unique Fact

* Operating Method

- 1) Check the Equipment Installation in section 3.1 and connect accordingly.
- 2) 13.5 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.

5.2 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	2012.07.18	☒
Signal Generator	2024	MARCONI	112225/092	2012.04.12	☒
LISN 9233	-50-TS-50-N	SOLAR	005237	2012.07.01	☒
LISN 9233	-50-TS-50-N	SOLAR	005238	2012.07.01	☒
Attenuator 1	1947A	Agilent	3107A04074	2013.01.10	☒

5.2.2 Test Area : 2nd Anechoic chamber

5.2.3 Test procedures.

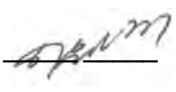
- 1) Setting EUT and test equipment as its manual.
- 2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
- 3) Testing EUT after connecting sub-equipment on every interface port.
- 4) 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 applying each value if correction factor is automatically corrected.

$$F1[\text{dBuV}] = F2[\text{dBuV}] + IL[\text{dB}] + CL[\text{dB}]$$

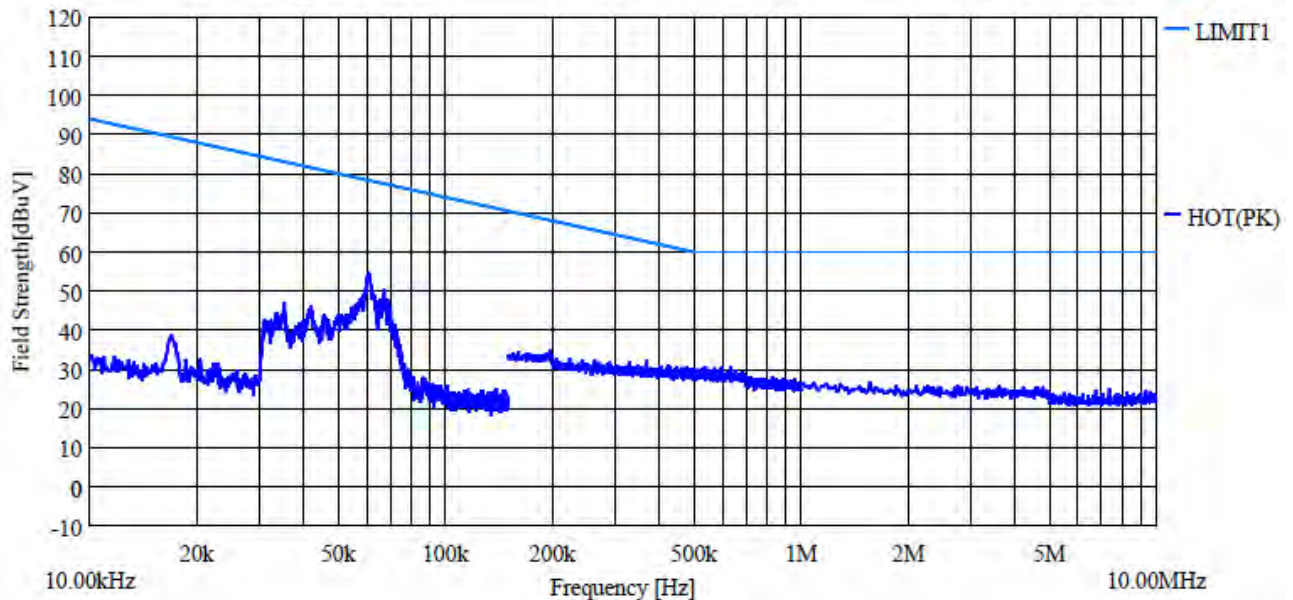
F1 : last measured value, F2 : Equipment instruction, IL : Insertion loss, CL : Cable loss

5.2.4 Test Result

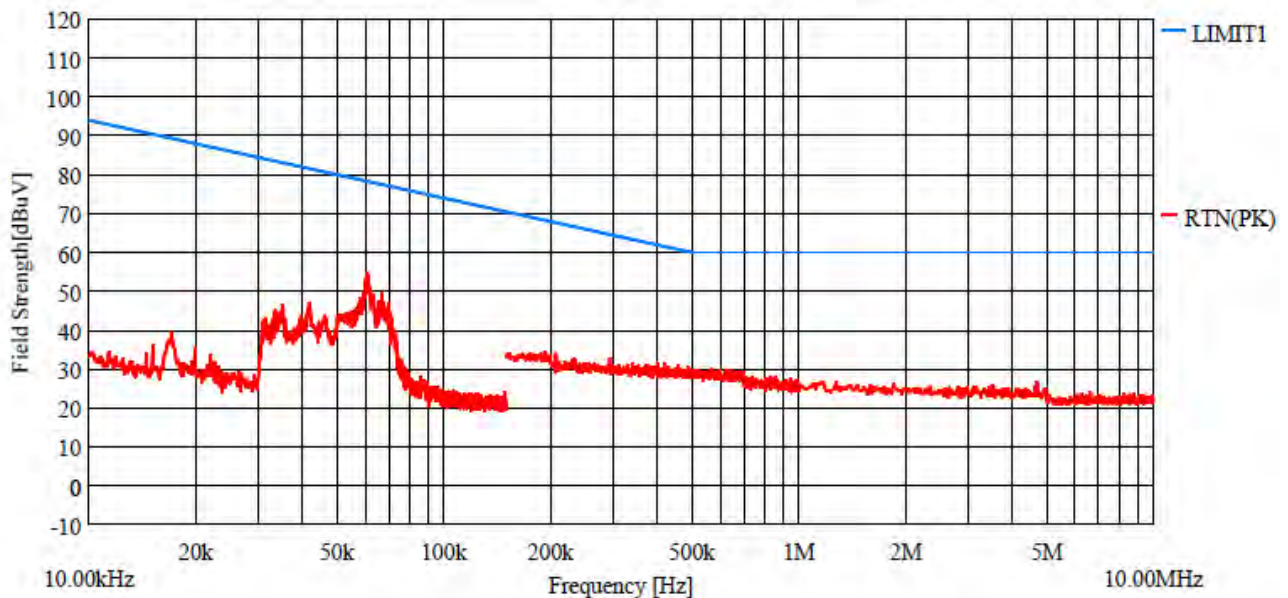
Start of test : January 20, 2012

Test by : Won-Kyu Lee 

10 kHz ~ 10 MHz



[HOT]



[RTN]

*** Test Result**☒ PASS☐ FAIL

5.3 CS1 14 Test

5.3.1 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	2013.01.12	☒
Current probe	9123-1N	SOLAR	510042	2012.07.14	☒
Power Amplifier	1000L	AR	21402	-	☒
Power Meter	NRVD	R&S	102156	2012.10.04	☒
DIODE Power Sensor	NRV-Z51	R&S	100523	2012.10.04	☒
DIODE Power Sensor	NRV-Z51	R&S	100524	2012.10.04	☒
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	☒

5.3.2 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) 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.

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**5.3.4 Test Result**

Start of test : January 25, 2012

Test by : Won-Kyu Lee 

Power

Frequency(MHz)	Limit (dBuA)	Calibration(dBu)	A) Re	Results	Remark
0.01 49.0		49.2		PASS	
0.02 55.0		55.5		PASS	
0.03 58.5		59.2		PASS	
0.04 61.0		62.3		PASS	
0.05 63.0		64.7		PASS	
0.06 64.6		67.3		PASS	
0.07 65.9		66.0		PASS	
0.08 67.1		67.2		PASS	
0.09 68.1		68.2		PASS	
0.10 69.0		69.2		PASS	
0.15 72.5		73.3		PASS	
0.18 74.1		74.2		PASS	
0.20 75.0		75.2		PASS	
0.30 78.5		78.7		PASS	
0.40 81.0		81.5		PASS	
0.45 82.1		82.2		PASS	
0.50 83.0		83.0		PASS	
0.60 84.6		84.7		PASS	
0.70 85.9		86.0		PASS	
0.80 87.1		87.2		PASS	
0.90 88.1		88.2		PASS	
1.00 89.0		89.3		PASS	
2.00 89.0		89.0		PASS	
3.00 97.0		97.1		PASS	
4.00 97.0		97.1		PASS	
5.00 97.0		99.5		PASS	
6.00 97.0		98.2		PASS	
7.00 97.0		97.2		PASS	
8.00 97.0		97.1		PASS	
9.00 97.0		97.3		PASS	
10.00 97.0		97.5		PASS	
12.00 97.0		97.0		PASS	

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Frequency(MHz)	Limit (dBuA)	Calibration(dBu)	A) Re	sults	Remark
15.00 97.0		97.4		PASS	
16.00 97.0		97.1		PASS	
18.00 97.0		97.1		PASS	
20.00 97.0		97.3		PASS	
25.00 97.0		97.0		PASS	
30.00 97.0		97.0		PASS	
32.00 96.7		96.8		PASS	
33.00 96.6		96.6		PASS	
35.00 96.3		96.4		PASS	
40.00 95.8		95.8		PASS	
45.00 95.3		95.4		PASS	
50.00 94.8		95.0		PASS	
55.00 94.4		94.6		PASS	
60.00 94.1		94.2		PASS	
65.00 93.7		93.8		PASS	
70.00 93.4		93.6		PASS	
75.00 93.1		93.2		PASS	
80.00 92.9		93.0		PASS	
85.00 92.6		92.7		PASS	
90.00 92.4		92.5		PASS	
95.00 92.1		92.2		PASS	
100.00 91.9		92.0		PASS	
120.00 91.2		91.3		PASS	
150.00 90.2		90.3		PASS	
200.00 89.0		89.0		PASS	

*** Test Result**☒ P ASS☐ FA IL

5.4 CS1 15 Test**5.4.1 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 TDS30	52B	TEKTRONIX	B011855	2012.10.02	☒
Current probe	9123-1N	SOLAR	510042	2012.07.14	☒
LISN	8616-50-TS-200-N	SOLAR 0761	37	2013.01.09	☒
LISN	8616-50-TS-200-N	SOLAR 0761	38	2013.01.09	☒
Coaxial load	8251	BIRD	11412	2013.01.10	☒
Attenuators 9410	-1	SOLAR	57741	-	☒

* 40 dB high voltage attenuator use.

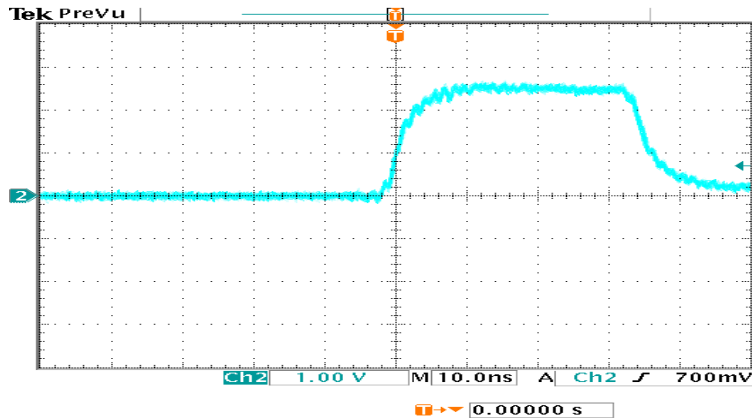
5.4.2 Test Area : RS chamber**5.4.3 Test procedures**

- 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) Adjust the pulse generator source for the risetime, pulse width, and pulse repetition rate requirements..
- 8) Monitor the EUT for degradation of performance.

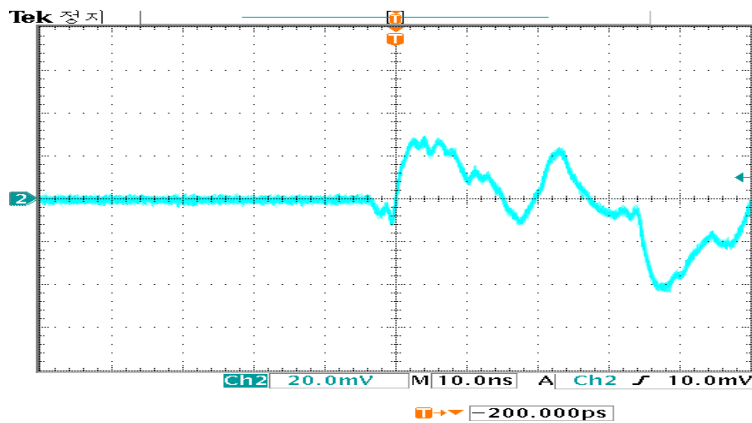
5.4.4 Test Result

Start of test : January 25, 2012

Test by : Won-Kyu Lee 



[Calibration]



[Power]

LEDLB

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

* Test Result

☒ PASS

☐ FAIL

5.5 CS1 16 Test**5.5.1 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 TDS30	52B	TEKTRONIX	B010526	2012.10.04	☒
Current probe	9123-1N	SOLAR	510042	2012.07.14	☒
LISN	8616-50-TS-200-N	SOLAR 0761	37	2013.01.09	☒
LISN	8616-50-TS-200-N	SOLAR 0761	38	2013.01.09	☒
Coaxial load	8251	BIRD	11412	2013.01.10	☒
Attenuators 9410	-1	SOLAR	57741	-	☒

* 40dB high voltage attenuator use

5.5.2 Test Area : RS chamber**5.5.3 Test procedures**

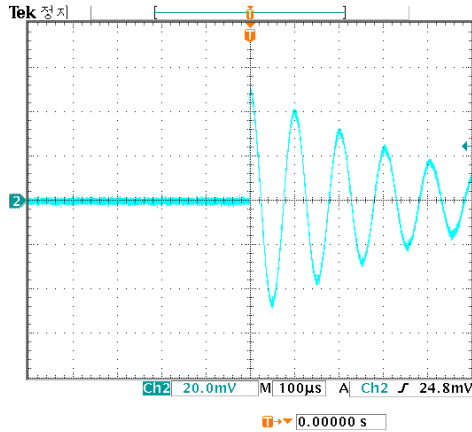
- 1) Setting EUT and test equipment as its manual
- 2) When EUT and other equipment are used together, connecting them separately When EUT is used a part of other system, installing EUT at system and then operating system.
- 3) Testing EUT after connecting sub-equipment on every interface port.
- 4) In case EUT have Ground port, grounding by them. And it EUT grounded internally using power and testing.
- 5) Usually, desktop 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

5.5.4 Test Result

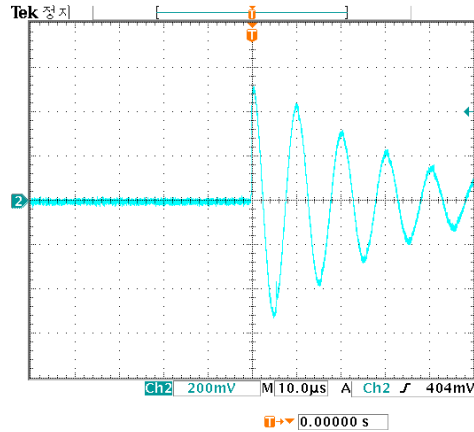
Start of test : January 25, 2012

Test by : Won-Kyu Lee *WKL*

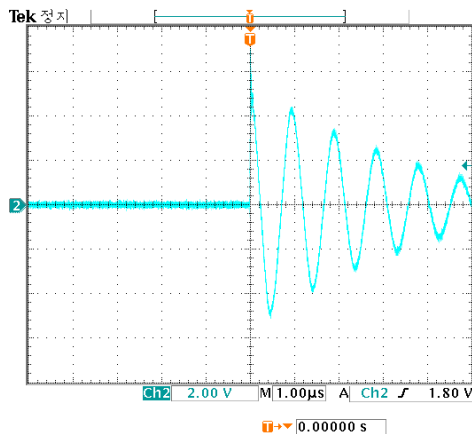
Calibration (10 kHz, 100 kHz, 1 MHz, 10 MHz, 30 MHz, 100 MHz)



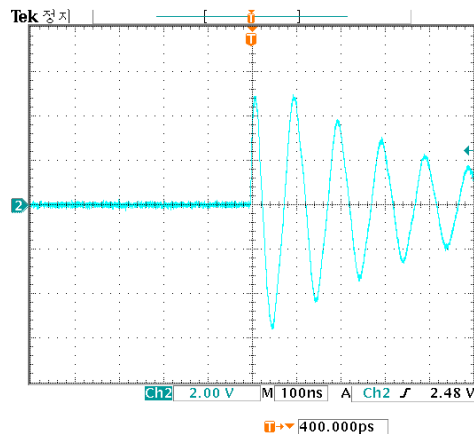
[Calibration - 10 kHz]



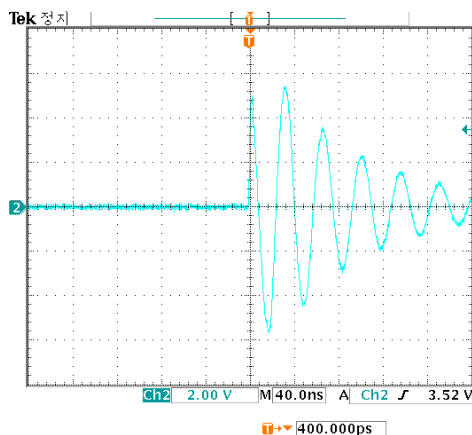
[Calibration - 100 kHz]



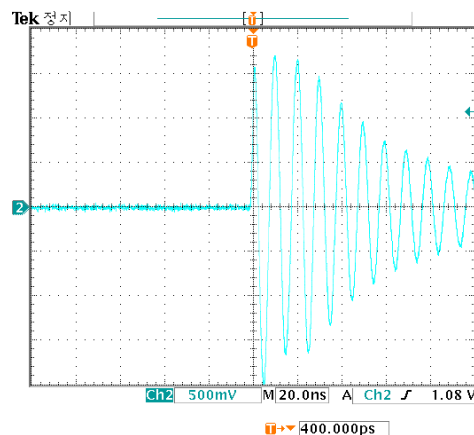
[Calibration - 1 MHz]



[Calibration - 10 MHz]

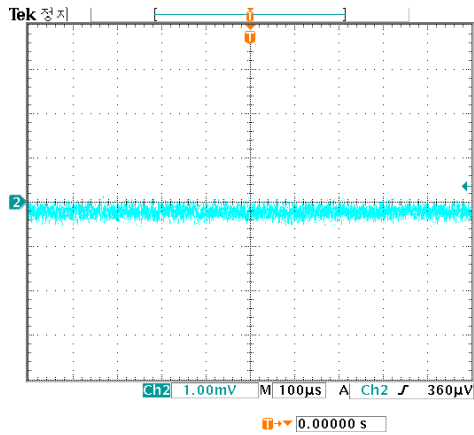


[Calibration - 30 MHz]

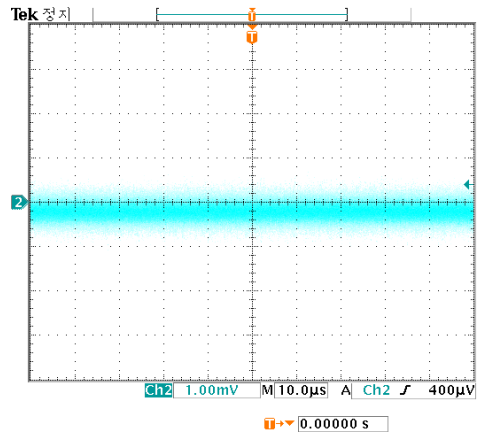


[Calibration - 100 MHz]

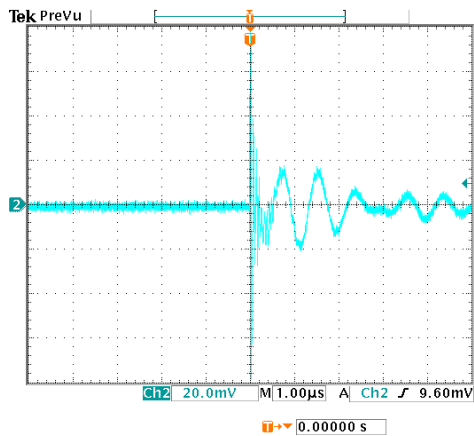
LEDP3W-9 – Power



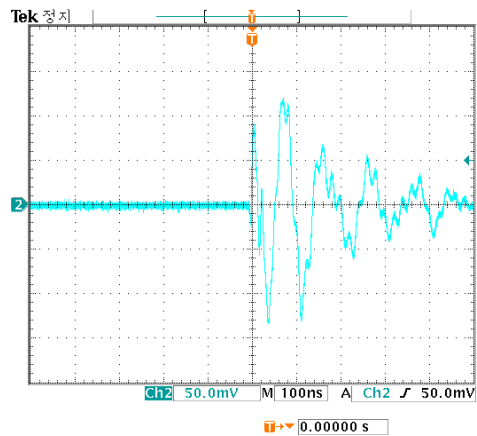
[10 kHz]



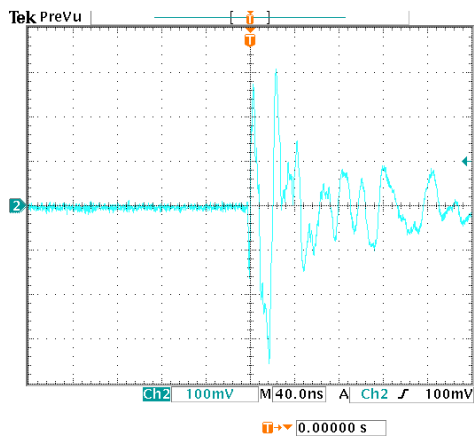
[100 kHz]



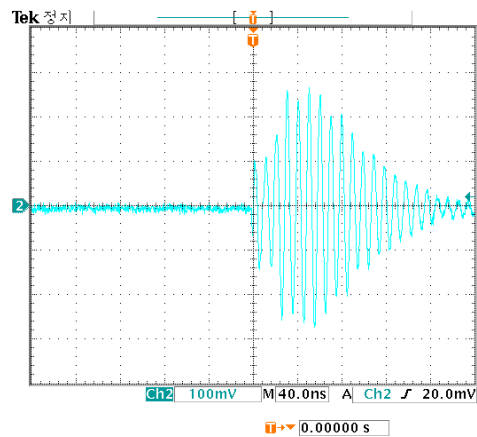
[1 MHz]



[10 MHz]



[30 MHz]



[100 MHz]

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**LEDLB – 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**☒ P ASS☐ FA IL

5.6 RE102 test**5.6.1 Test Equipment**

Instrument description	Model Number	Manufacturer	Serial Number	Due Cal.	Apply select
TEST RECEIVER	ESU40	R&S	100027	2012.07.18	☒
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	2013.12.09	☒
Biconical Ant	VHA 9103	Schwarzbeck	2581	2013.12.09	☒
HORN Ant	SAS-571	AH	500	2013.03.15	☒
Pre-Amplifier 8740	5-60021	Agilent	10004	2013.01.10	☒
Amplifier 310	N	SONOMA	261708	2013.01.10	☒
LISN 9233	-50-TS-50-N	SOLAR	005237	2012.07.01	☒
LISN 9233	-50-TS-50-N	SOLAR	005238	2012.07.01	☒

5.6.2 Test Area : 2nd Anechoic 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 0.9 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 set for both horizontal and vertically polarized fields.
- 9) Measurement distance 1 m.
- 10) Calculating noise electric strength as below and applying each value if correction factor is automatically corrected

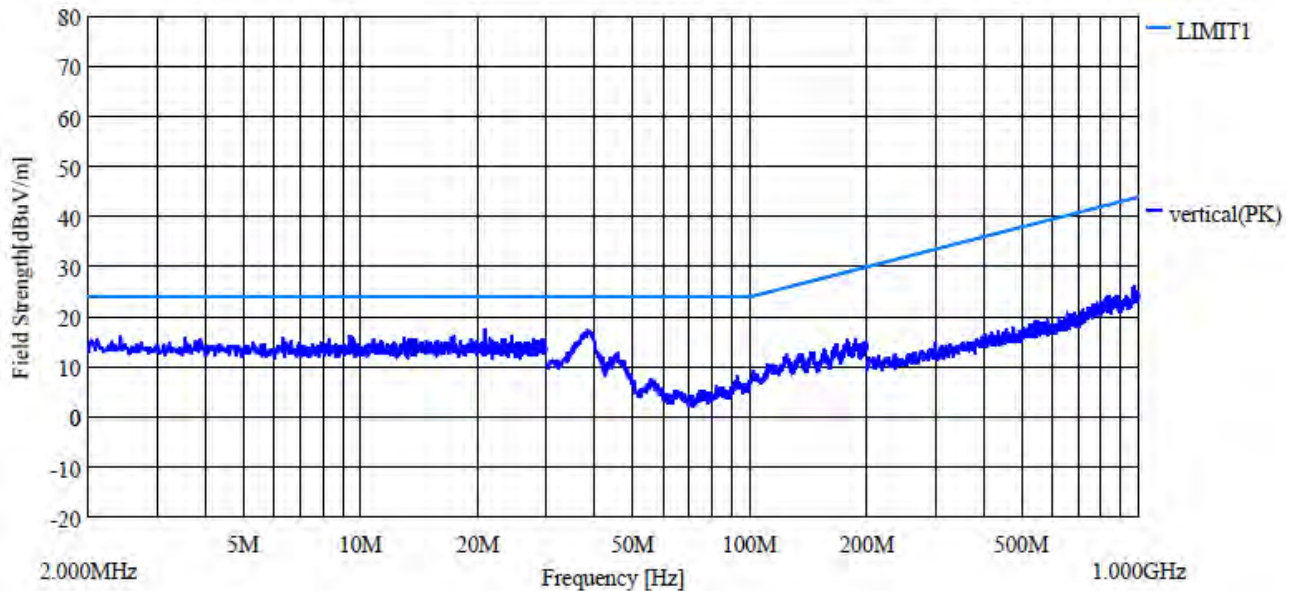
$$F1[\text{dBuV/m}] = (F2[\text{dBuV}] + AF[\text{dB/m}] + CL[\text{dB}]) - AG[\text{dB}]$$

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

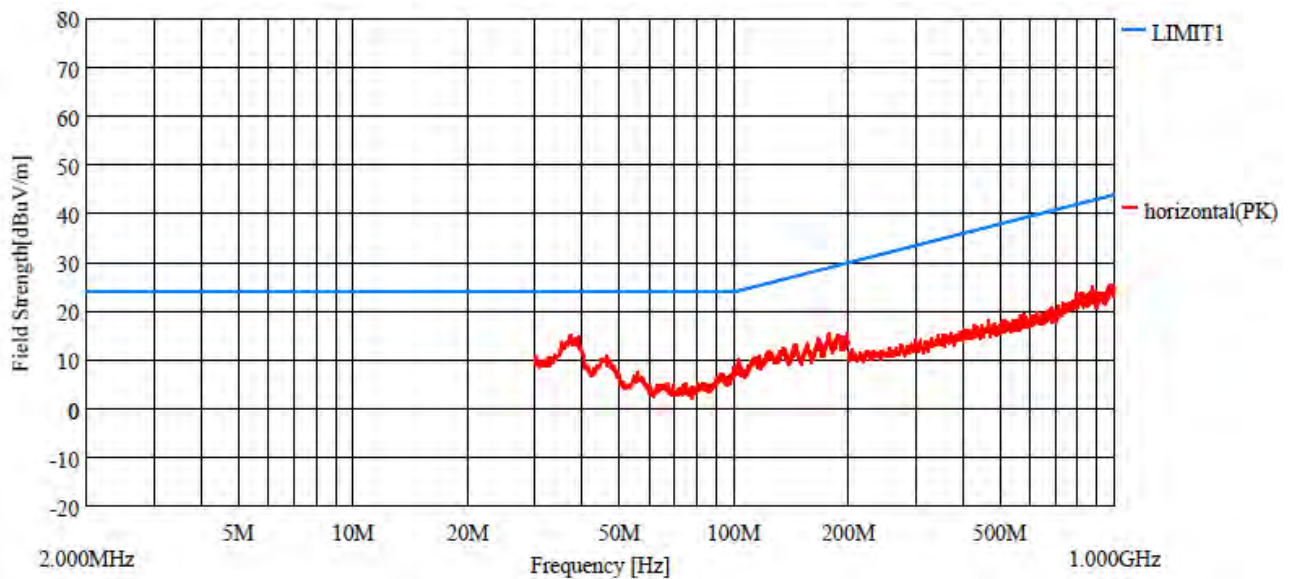
CL : Cable loss AG : amplifier gain

5.6.4 Test Result

Start of test : January 20, 2012

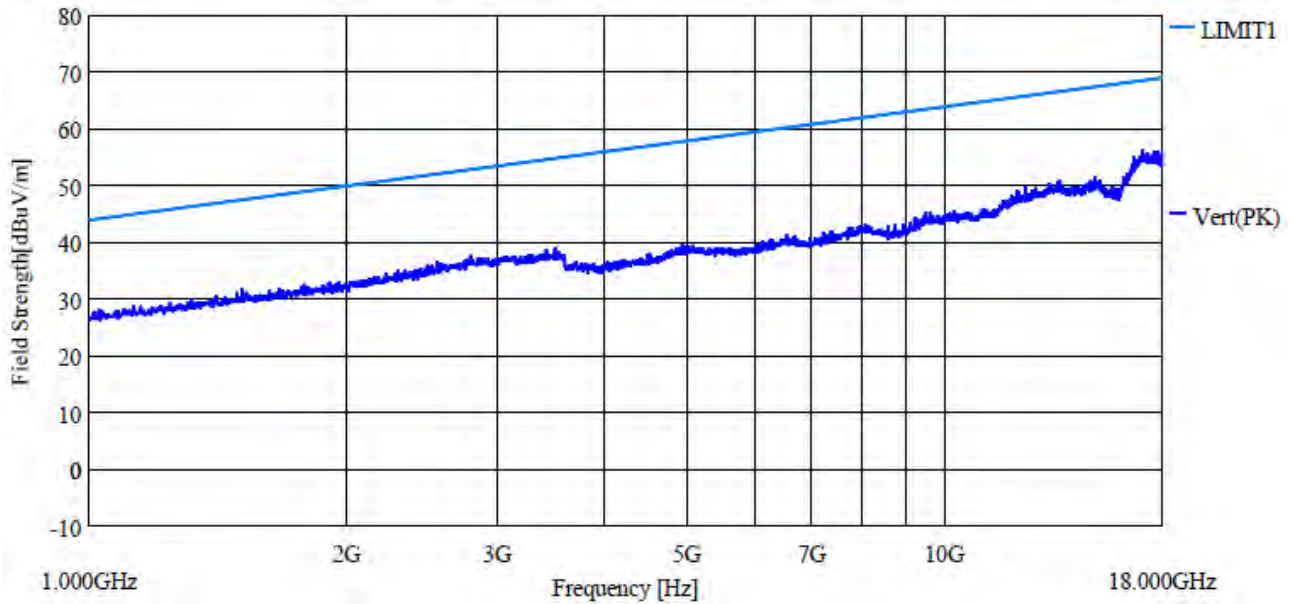
Test by : Won-Kyu Lee **5.6.4.1 2 MHz ~ 1000 MHz**

[vertical]

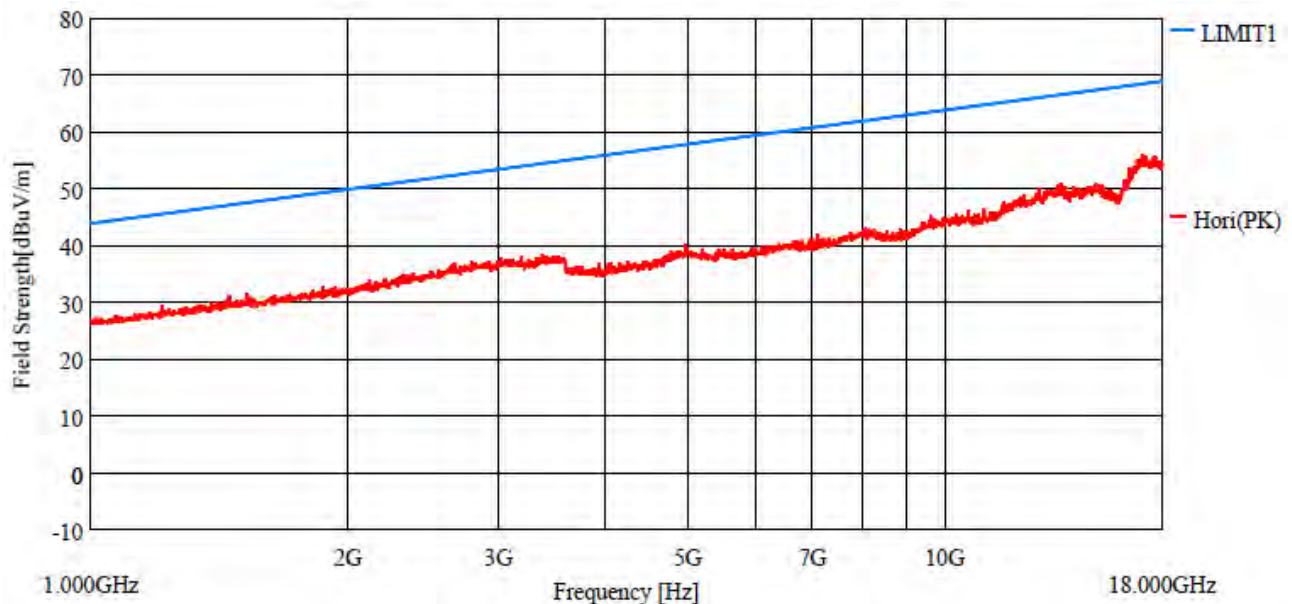


[Horizontal]

5.6.4.2 1000 MHz ~ 18 000 MHz



[Vertical]



[Horizontal]

*** Test Result**☒ PASS☐ FAIL

5.7 RS103 Test**5.7.1 Test Equipment**

Instrument description	Model Number	Manufacturer	Serial Number	Due Cal.	Apply select
Signal generators	2024	MARCONI	112225/092	2012.04.12	☒
Signal generators	83620B	HP	3844A01135	2012.07.01	☒
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	2012.10.04	☒
DIODE Power Sensor	NRV-Z51	R&S	100523	2012.10.04	☒
DIODE Power Sensor	NRV-Z51	R&S	100524	2012.10.04	☒
Directional coupler	DC7144A	AR	310783	2013.01.12	☒
Directional coupler	DC6180	AR	21034	2013.01.12	☒
Directional coupler	DC2500	AR	20036	2013.01.12	☒
Directional coupler	DC7435	AR	312856	2013.01.12	☒
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	2012.10.24	☒
LISN 8616	-50-TS-200-N	SOLAR	076137	2013.01.09	☒
LISN 8616	-50-TS-200-N	SOLAR	076138	2013.01.09	☒

5.7.2 Test Area : RS 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) 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

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**5.7.4 Test Result**

Start of test : January 25, 2012

Test by : Won-Kyu Lee **Vertical**

Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
2 50.0		50.4	PASS	
4 50.0		52.0	PASS	
6 50.0		50.4	PASS	
8 50.0		51.0	PASS	
10 50.0		51.1	PASS	
15 50.0		51.1	PASS	
20 50.0		50.1	PASS	
30 50.0		50.5	PASS	
40 50.0		50.7	PASS	
50 50.0		51.8	PASS	
60 50.0		50.8	PASS	
70 50.0		50.3	PASS	
80 50.0		51.7	PASS	
90 50.0		51.5	PASS	
100 50.0		50.5	PASS	
150 50.0		51.5	PASS	
200 50.0		50.1	PASS	
250 50.0		50.6	PASS	
300 50.0		50.3	PASS	
350 50.0		50.2	PASS	
400 50.0		50.2	PASS	
450 50.0		50.1	PASS	
500 50.0		50.0	PASS	
550 50.0		50.3	PASS	
600 50.0		50.4	PASS	
650 50.0		50.4	PASS	
700 50.0		50.6	PASS	
750 50.0		50.8	PASS	
800 50.0		50.3	PASS	
850 50.0		50.3	PASS	
900 50.0		50.5	PASS	
1000 50.0		50.1	PASS	
2000 50.0		50.6	PASS	

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Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
3000 50.0		51.5	PASS	
4000 50.0		50.6	PASS	
5000 50.0		50.6	PASS	
6000 50.0		51.8	PASS	
7000 50.0		50.2	PASS	
8000 50.0		50.3	PASS	
9000 50.0		51.4	PASS	
10 000	50.0	50.2	PASS	
11 000	50.0	50.4	PASS	
12 000	50.0	50.1	PASS	
13 000	50.0	51.6	PASS	
14 000	50.0	50.5	PASS	
15 000	50.0	50.4	PASS	
16 000	50.0	50.4	PASS	
17 000	50.0	50.1	PASS	
18 000	50.0	50.4	PASS	

Horizontal

Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
30 50.0		50.6	PASS	
40 50.0		50.5	PASS	
50 50.0		52.0	PASS	
60 50.0		50.2	PASS	
70 50.0		50.0	PASS	
80 50.0		50.2	PASS	
90 50.0		50.5	PASS	
100 50.0		50.2	PASS	
150 50.0		50.6	PASS	
200 50.0		50.7	PASS	
250 50.0		50.6	PASS	
300 50.0		50.4	PASS	
350 50.0		50.4	PASS	
400 50.0		50.2	PASS	
450 50.0		50.2	PASS	
500 50.0		50.3	PASS	
550 50.0		50.2	PASS	

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Frequency(MHz)	Limit (V/m)	Calibration(V/m)	Results	Remark
600 50.0		50.1	PASS	
650 50.0		50.1	PASS	
700 50.0		50.0	PASS	
750 50.0		50.2	PASS	
800 50.0		50.1	PASS	
850 50.0		50.0	PASS	
900 50.0		50.3	PASS	
1000 50.0		50.1	PASS	
2000 50.0		50.4	PASS	
3000 50.0		50.3	PASS	
4000 50.0		50.6	PASS	
5000 50.0		50.1	PASS	
6000 50.0		51.7	PASS	
7000 50.0		50.1	PASS	
8000 50.0		50.2	PASS	
9000 50.0		50.1	PASS	
10 000	50.0	50.2	PASS	
11 000	50.0	50.5	PASS	
12 000	50.0	50.3	PASS	
13 000	50.0	51.7	PASS	
14 000	50.0	50.4	PASS	
15 000	50.0	51.8	PASS	
16 000	50.0	50.6	PASS	
17 000	50.0	50.2	PASS	
18 000	50.0	50.3	PASS	

*** Test Result**☒ PASS☐ FA IL

6. Test Setup Photographs

6.1 CE102 Test setup photographs



[HOT]



[RTN]

6.2 CS114 Test setup photographs



[Front]

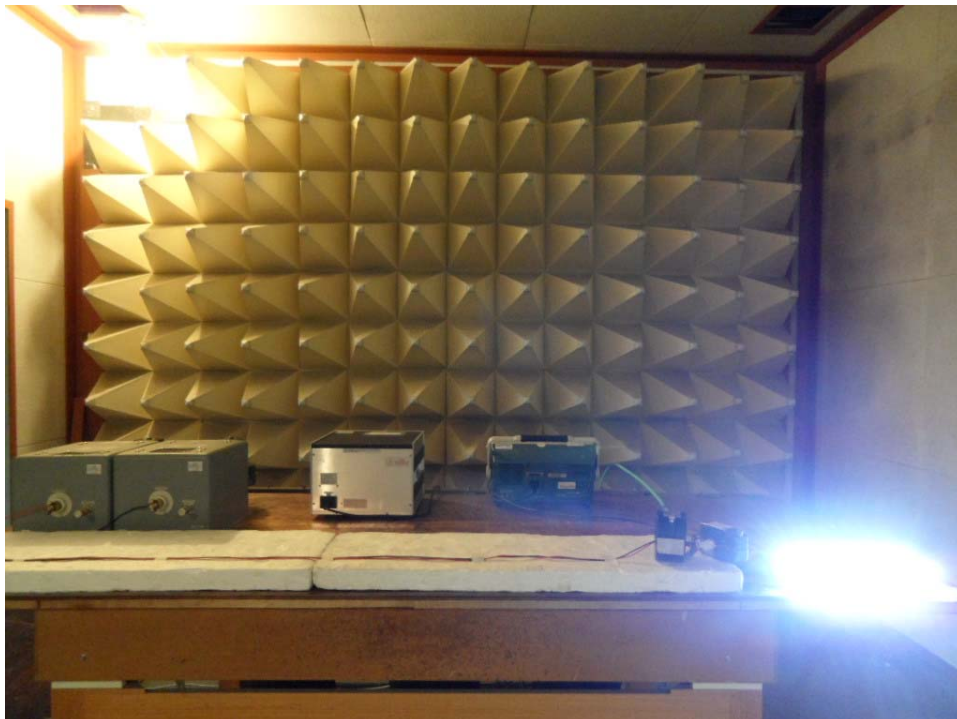


[Magnification]

6.3 CS115 Test setup photographs



[Front]



[Back]

6.4 CS116 Test setup photographs



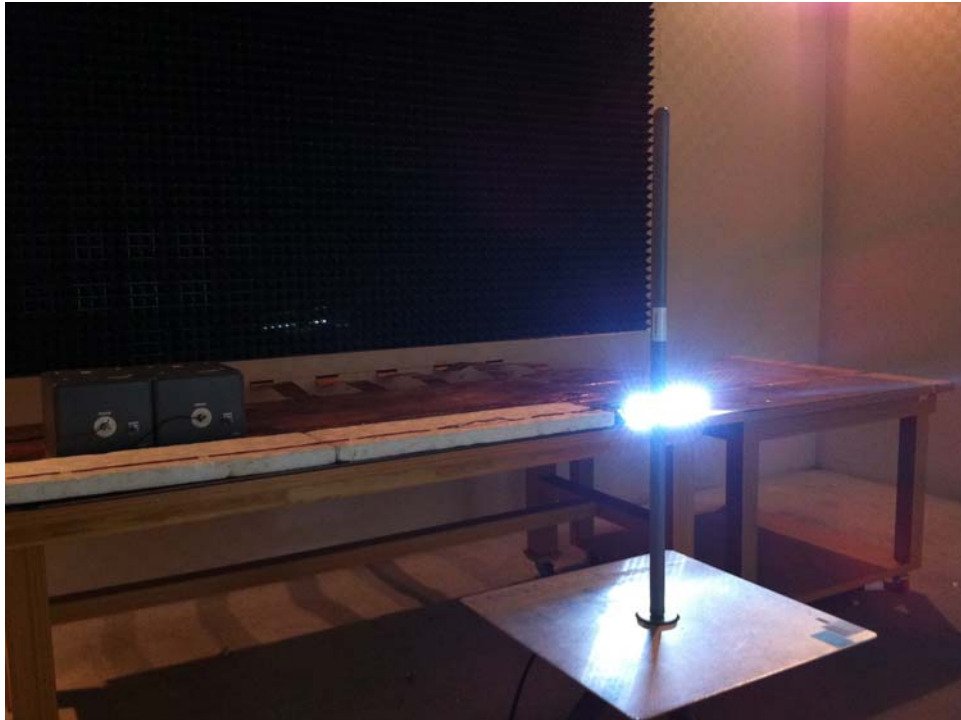
[Front]



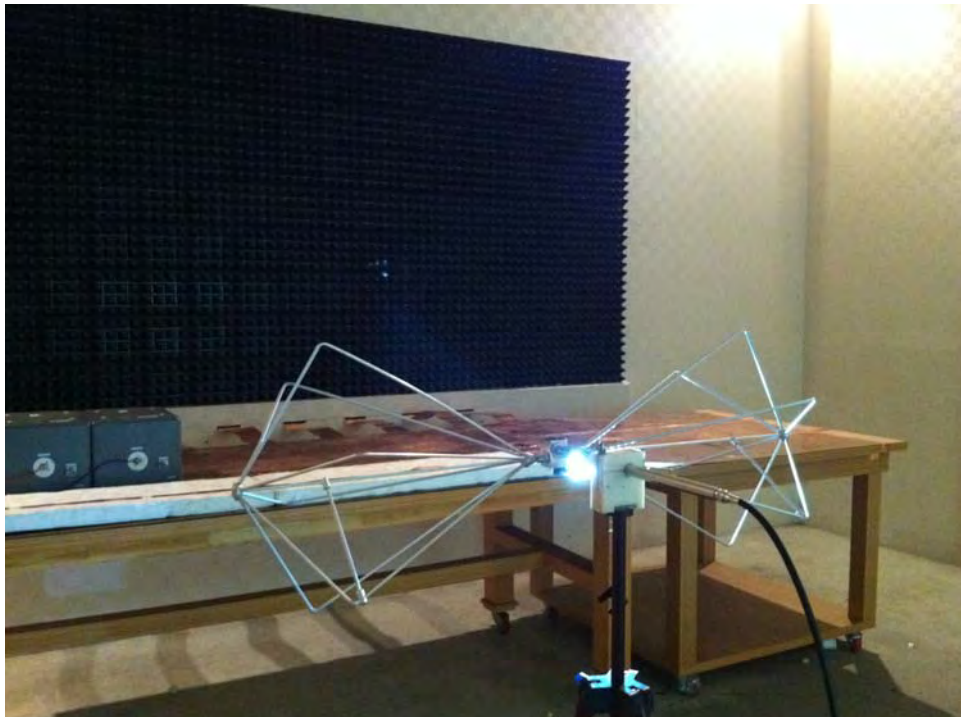
[Back]

6.5 RE102 Test setup photographs

6.5.1 : 2 MHz ~ 30 MHz

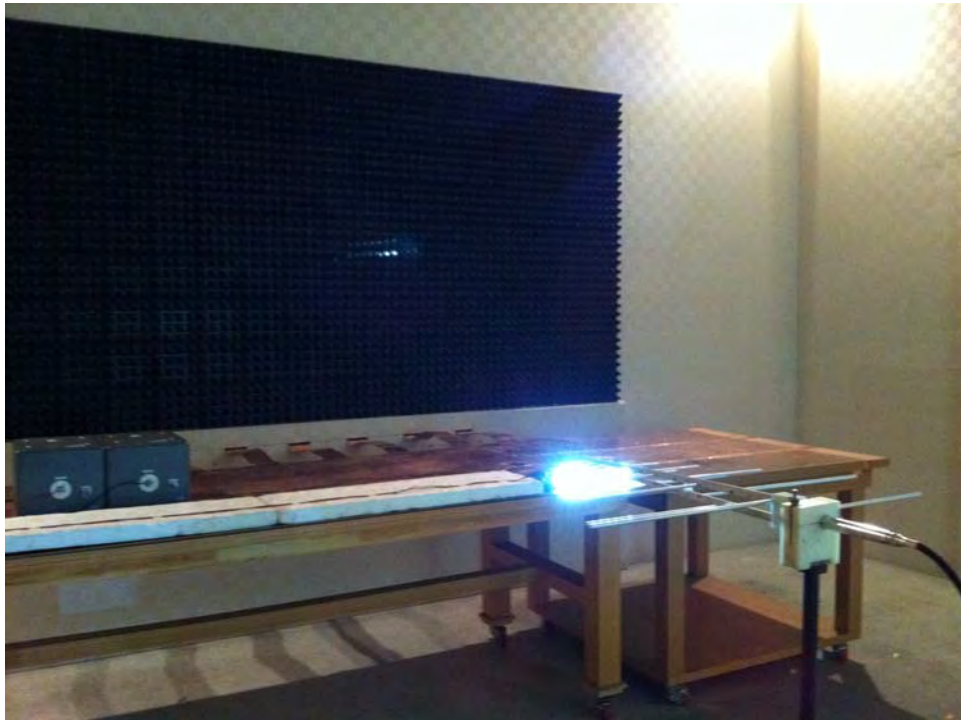


6.5.2 : 30 MHz ~ 200 MHz



[Horizontal / Vertical]

6.5.3 : 200 MHz ~ 1000 MHz



[Horizontal / Vertical]

6.5.4 : 1000 MHz ~ 18 000 MHz



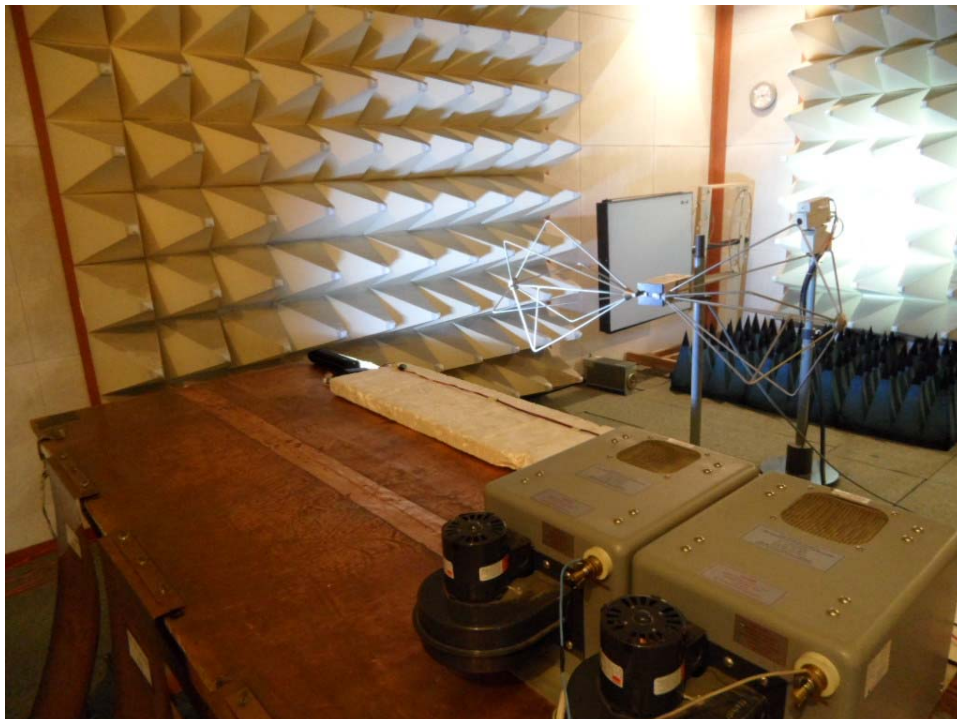
[Horizontal / Vertical]

6.6 RS103 Test setup photographs

6.6.1 : 2 MHz ~ 30 MHz



6.6.2 : 30 MHz ~ 200 MHz



[Horizontal / Vertical]

6.6.3 : 200 MHz ~ 1 000 MHz



[Horizontal / Vertical]

6.6.4 : 1000 MHz ~ 4200 MHz



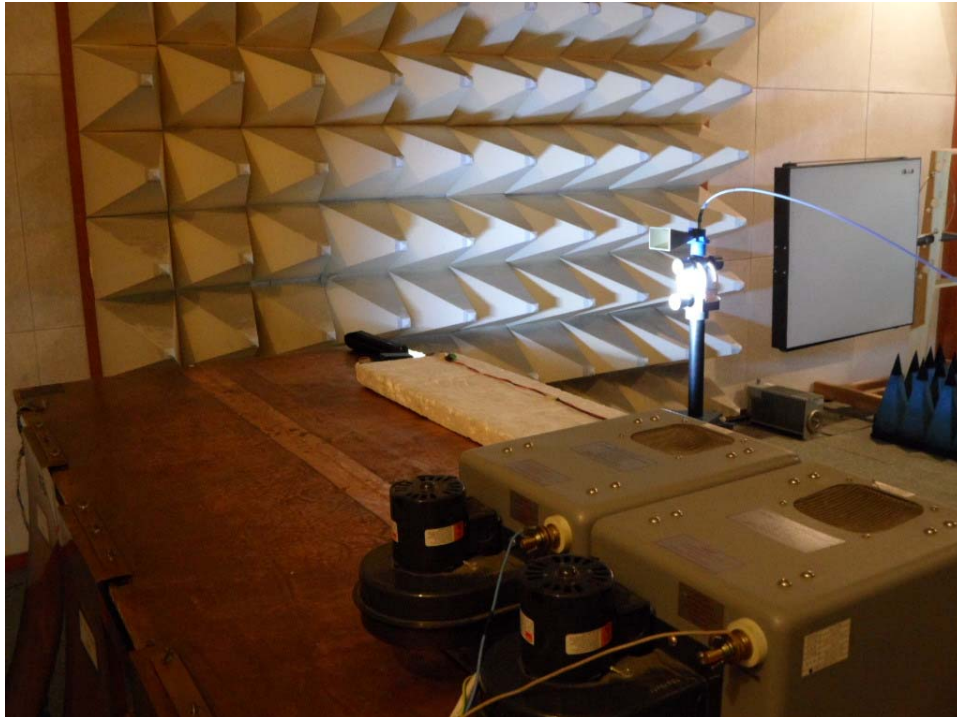
[Horizontal / Vertical]

6.6.5 : 4200 MHz ~ 7500 MHz



[Horizontal / Vertical]

6.6.6 : 7500 MHz ~ 18 000 MHz



[Horizontal / Vertical]

7. EUT Photographs

7.1 LEDLB



[Front]



[Back]

-The End-