CE EMC Test Report

Equipment	:	**Bluetooth Dual Mode UART AT featuring smartBASIC**
Model No.	:	**BT900-SA, BT900-SC (please refer to 1.1.1 for more details.)**
Brand Name	:	**Laird Technologies**
Applicant	:	**Laird Technologies**
Address	:	**11160 Thompson Ave., Lenexa, Kansas 66219, USA**
Standard	:	**EN 301 489-1 V1.9.2 (2011-09) EN 301 489-17 V2.2.1 (2012-09)**
Received Date	:	**Apr. 28, 2014**
Tested Date	:	**Apr. 29 ~ May 05, 2014**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Approved & Reviewed by:

Kent Chen / Assistant Manager

Testing Laboratory 2732

Table of Contents

1 GENERAL DESCRIPTION 5

1.1 Information 5
1.2 Test Equipment and Calibration Data 6
1.3 Testing Applied Standards 7
1.4 Measurement Uncertainty 7

2 TEST CONFIGURATION 8

2.1 Testing Condition 8
2.2 The Worst Case Measurement Configuration 8
2.3 Local Support Equipment List 9
2.4 Test Setup Chart 10
2.5 Test Software and Operating Condition 12

3 EMISSION TEST RESULTS 13

3.1 Conducted Emissions 13

4 IMMUNITY TESTS 25

4.1 General Description 25
4.2 Performance Criteria Description 26
4.3 Electrostatic Discharge (ESD) 27
4.4 Radio Frequency Electromagnetic Field (RS) 32

5 PHOTOGRAPHS OF THE TEST CONFIGURATION 34

6 TEST LABORATORY INFORMATION 44

Release Record

Report No.	Version	Description	Issued Date
EH442807	Rev. 01	Initial issue	May 28, 2014

Summary of Test Results

EN 301 489-1 Emission Tests				
Ref. Std. Clause	**Test Standard**	**Test Items**	**Measured**	**Result**
8.3/8.4	EN 55022:2010/AC:2011, Class B	Conducted Emissions	-7.09dB AV@ 0.154MHz.	Pass
8.7	EN 55022:2010/AC:2011, Class B	Conducted Emissions at Telecommunication Ports	Note[1]	N/A
8.2	EN 55022:2010/AC:2011, Class B	Radiated Emissions	Note[2]	N/A
8.5	EN 61000-3-2:2006/A1:2009 and A2:2009, Class A	Harmonic Current Emissions	Note[3]	N/A
8.6	EN 61000-3-3:2013	Voltage Fluctuations and Flicker	Note[3]	N/A
N/A means Not Applicable. Note[1]: The EUT w/o telecom port. Note[2]: According to Clause 7.1 of EN 301 489-1, the test is not required. Note[3]: The EUT consumes DC power, so the test is not required.				

EN 301 489-1 Immunity Tests					
Ref. Std. Clause	**Test Standard**	**Description of Test**		**Pass Criterion**	**Result**
9.3	EN 61000-4-2:2009	Electrostatic Discharge (ESD)		A	Pass
9.2	EN 61000-4-3:2006/A1:2008/ A2:2010	Radio Frequency Electromagnetic Field (RS)		A	Pass
9.4	EN 61000-4-4:2012	Electrical Fast Transient/Burst (EFT)		Note[1]	N/A
9.8	EN 61000-4-5:2006	Surge		Note[2]	N/A
9.5	EN 61000-4-6:2009	Conducted Disturbances (CS)		Note[1]	N/A
9.7	EN 61000-4-11:2004	Voltage Dips	0% residual for 0.5 cycle	Note[2]	N/A
			0% residual for 1 cycle	Note[2]	N/A
			70% residual for 25 cycle	Note[2]	N/A
		Voltage Interruption	0% residual for 250 cycle (w/o battery back-up)	Note[2]	N/A
Note[1]: The EUT consumes DC power, and it is not intended to be used with cables longer than 3m. So this test is not carried out. Note[2]: The EUT consumes DC power, so the test is not required.					

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

Brand Name	Model Name	Product Name	Description
Laird Technologies	BT900-SA	Bluetooth Dual Mode UART AT featuring smartBASIC	Integrated antenna onboard
	BT900-SC		No integrated antenna, only IPEX connector for external antenna

1.1.2 Specification of the Equipment under Test (EUT)

Operating Frequency	2402 MHz ~ 2480 MHz
Antenna Type	Refer to section 1.1.3
Modulation Type	GFSK

1.1.3 Antenna Details

Ant. No.	EUT Model	Type	Ant. Brand / Model	Gain (dBi)	Connector
1	BT900-SC	Dipole	Nearson S181FL-L-RMM-2450S	2	UFL
2		PCB Dipole	Laird EBL2449A1-15UFL	2	
3		Dipole	Laird MAF94190	2	
4		Dipole	Laird WRR2400- IP04-B(MAF94019)	1.5	
5	BT900-SA	Chip	ACX AT3216-B2R7HAA_3216	0.5	N/A

1.1.4 Power Supply Type of the Equipment under Test (EUT)

Power Supply Type	3.3Vdc from host.

1.1.5 Accessories

N/A

1.2 Test Equipment and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Apr. 23, 2014	Apr. 22, 2015
50 ohm terminal (Support Unit)	NA	50	04	Apr. 18, 2014	Apr. 17, 2015
Note: Calibration Interval of instruments listed above is one year.					

Test Item	ESD				
Test Site	ESD room 1 / (ES01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
ESD Generator	EMTest	Dito	V1248114239	Aug. 19, 2013	Aug. 18, 2014
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Immunity (80 MHz - 6 GHz)				
Test Site	RS room 1 / (RS01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Signal Generator	R & S	SMB100A	103294HA	Oct. 29, 2013	Oct. 28, 2014
Power Sensor	R & S	NRP-Z91	101094-UL	Nov. 01, 2013	Oct. 31, 2014
Power Sensor	R & S	NRP-Z91	101095-KY	Nov. 01, 2013	Oct. 31, 2014
Power Amplifier	BONN	BLWA 0810-160/100D	107972A	N/A	N/A
Power Amplifier	BONN	BLMA 1060-100D	107972B	N/A	N/A
Antenna	R & S	HL046E	100076-Cd	N/A	N/A
Note: Calibration Interval of instruments listed above is one year.					

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

EN 301 489-1 V1.9.2 (2011-09)
EN 301 489-17 V2.2.1 (2012-09)

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty		
Test Item	**Frequency**	**Uncertainty**
Conducted Emissions	150kHz ~ 30MHz	±2.92 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	21°C/70%	Alex Tsai
ESD	ES01-WS	25°C/55%/ 97kPa	JN Chen
RS	RS01-WS	22°C/58%/ 97kPa	JN Chen

2.2 The Worst Case Measurement Configuration

The Worst Test Configurations	
Conducted Emissions	
Test Mode	**Operating Description**
1	BT900-SC with Antenna 1
2	BT900-SC with Antenna 2
3	BT900-SC with Antenna 3
4	BT900-SC with Antenna 4
5	BT900-SA with Antenna 5
Immunity Tests	
Test Mode	**Operating Description**
1	BT900-SC with Antenna 1
2	BT900-SC with Antenna 2
3	BT900-SC with Antenna 3
4	BT900-SC with Antenna 4
5	BT900-SA with Antenna 5

2.3 Local Support Equipment List

Support Equipment List (EMI)					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Signal cable / Length (m)**
In control area					
1	Notebook	DELL	Latitude E5430	6R4RWW1	---
2	Printer	EPSON	XP-30	QSDK002410	USB, 1.8m shielded w/o core.
3	USB 3.0 HDD	WD	WDBKXH5000ABK	WX31AB210213	USB, 0.5m shielded w/o core.
4	Mouse	DELL	MS111-L	2C3-00MM	USB, 1.8m shielded w/o core.
In remote area					
5	Notebook	DELL	Latitude E5430	264RWW1	---
6	BT Dongle	Aibo	LY-MIC-BT001-V4	---	---

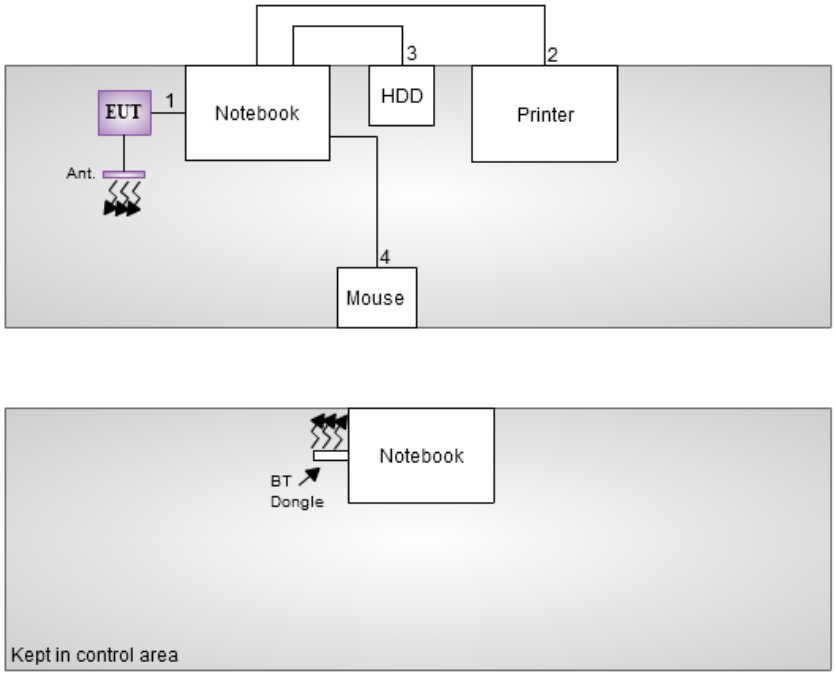
Note: No.6 was supplied by applicant.

Support Equipment List (EMS)					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Signal cable / Length (m)**
In control area					
1	Notebook	DELL	Latitude E5430	6R4RWW1	---
In remote area					
2	Notebook	DELL	Latitude E5430	264RWW1	---
3	BT Dongle	Aibo	LY-MIC-BT001-V4	---	---

Note: No.3 was supplied by applicant.

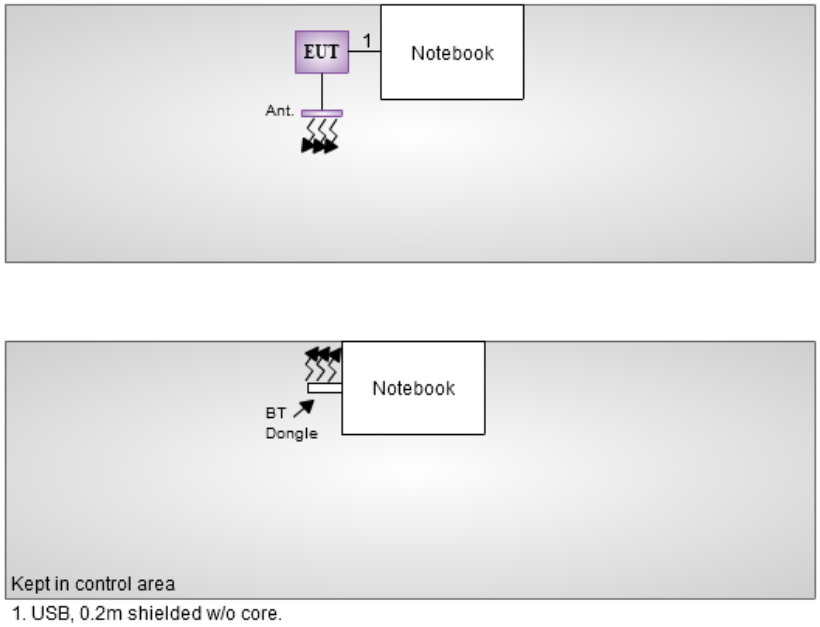
2.4 Test Setup Chart

Test Setup Diagram (EMI)_Model: BT900-SC



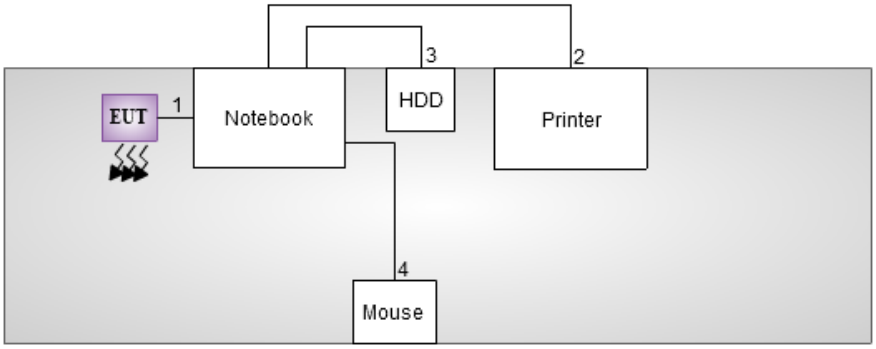
1. USB, 0.2m shielded w/o core.
2. USB, 1.8m shielded w/o core.
3. USB, 0.5m shielded w/o core.
4. USB, 1.8m shielded w/o core.

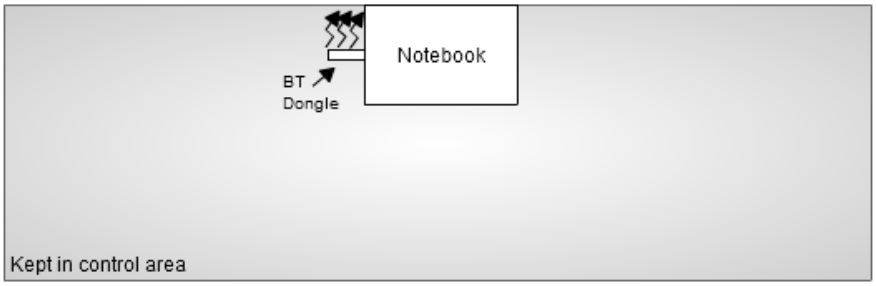
Test Setup Diagram (EMS)_Model: BT900-SC



1. USB, 0.2m shielded w/o core.

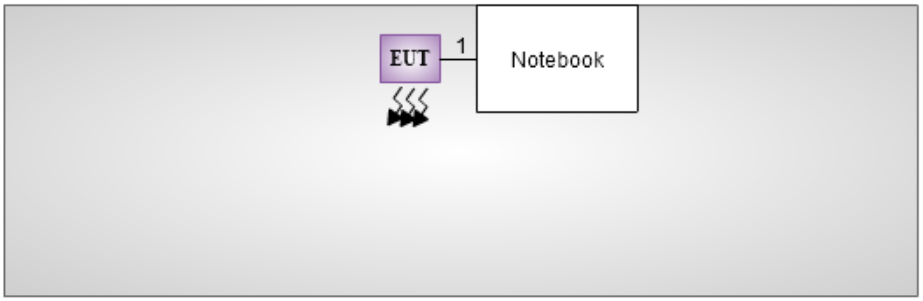
Test Setup Diagram (EMI)_Model: BT900-SA

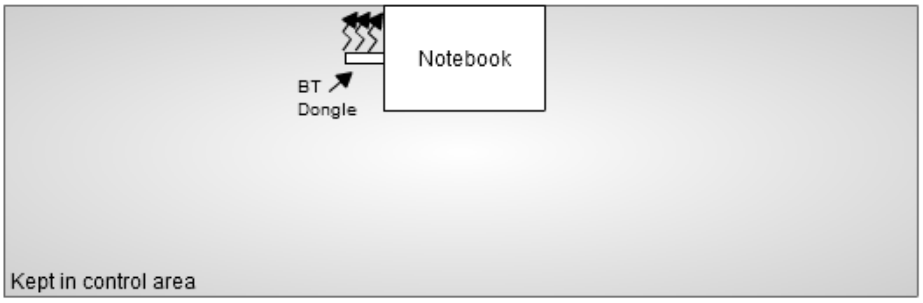




1. USB, 0.2m shielded w/o core.
2. USB, 1.8m shielded w/o core.
3. USB, 0.5m shielded w/o core.
4. USB, 1.8m shielded w/o core.

Test Setup Diagram (EMS)_Model: BT900-SA





1. USB, 0.2m shielded w/o core.

2.5 Test Software and Operating Condition

EMI

a. To enable all functions of test system.
b. The notebook (in remote area) enabled BT dongle and executed “Teraterm.exe” to transmit and receive data with EUT.
c. The notebook (in control area) ran “EMCTest.exe” to send “H” patterns to its monitor and the monitor displayed them.
d. The notebook (in control area) ran “EMCTest.exe” to send “H” patterns to the printer.

EMS

a. To enable all functions of test system.
b. The notebook (in remote area) enabled BT dongle and executed “Teraterm.exe” to transmit and receive data with EUT.

3 Emission Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

Frequency Range (MHz)	Class A (dBμV)		Class B (dBμV)	
	Limits			
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	79	66	66 to 56	56 to 46
0.50 to 5	73	60	56	46
5 to 30	73	60	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.				

3.1.2 Test Procedures

a. The EUT was placed on a table with a height of 0.8 meters from the metal ground plane and 0.4 meters from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.

b. The test equipment EUT installed received DC power through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.

c. All the support units were connected to the other LISN.

d. The LISN provides 50 ohm coupling impedance for the measuring instrument.

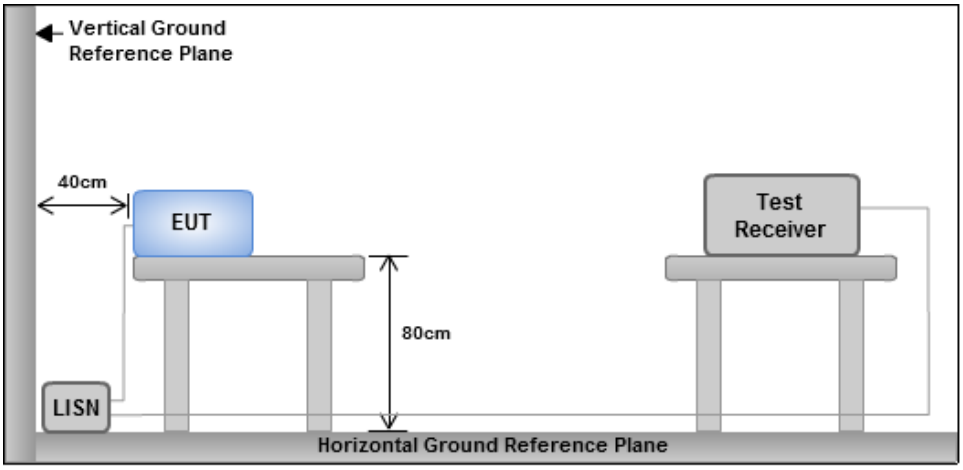
e. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.

f. Both sides of AC line were checked for maximum conducted interference.

g. The measurement frequency range extends from 150 kHz to 30 MHz.

h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

3.1.3 Test Setup

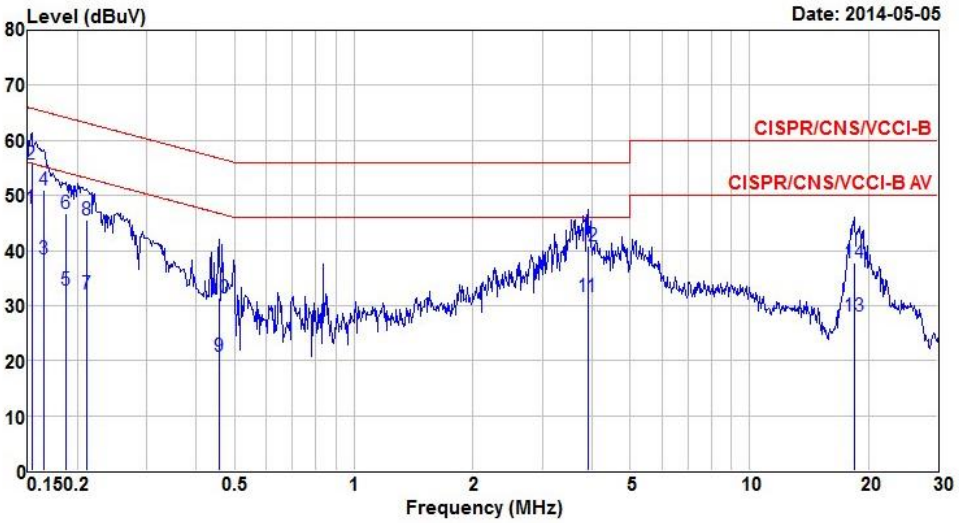


Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

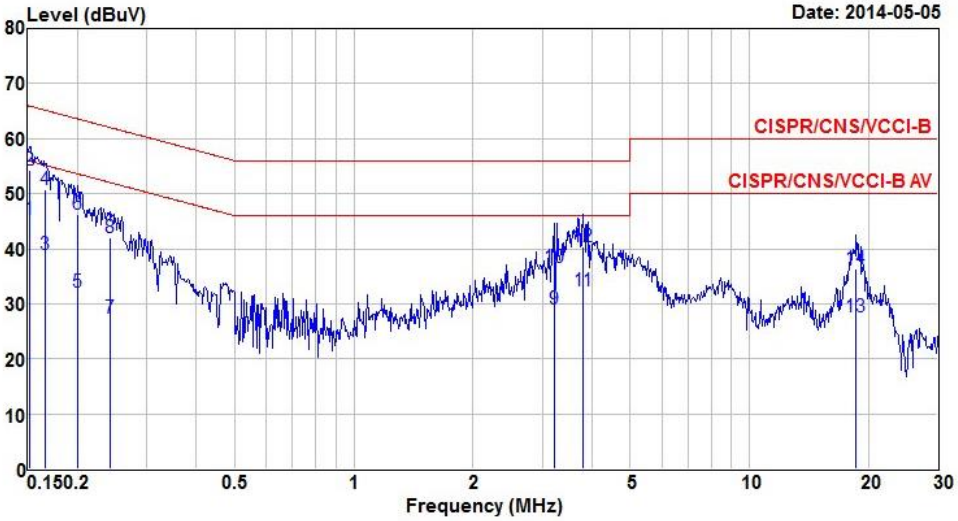
Power Phase	Line	Test Mode	1



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.153	47.66	55.82	-8.16	47.24	0.40	0.02	Average
2	0.153	55.67	65.82	-10.15	55.25	0.40	0.02	QP
3	0.165	38.47	55.21	-16.74	38.05	0.40	0.02	Average
4	0.165	50.87	65.21	-14.34	50.45	0.40	0.02	QP
5	0.187	32.81	54.15	-21.34	32.41	0.39	0.01	Average
6	0.187	46.62	64.15	-17.53	46.22	0.39	0.01	QP
7	0.211	32.18	53.18	-21.00	31.78	0.39	0.01	Average
8	0.211	45.50	63.18	-17.68	45.10	0.39	0.01	QP
9	0.456	20.83	46.76	-25.93	20.39	0.39	0.05	Average
10	0.456	31.39	56.76	-25.37	30.95	0.39	0.05	QP
11	3.901	31.67	46.00	-14.33	31.06	0.46	0.15	Average
12	3.901	40.78	56.00	-15.22	40.17	0.46	0.15	QP
13	18.426	28.18	50.00	-21.82	27.26	0.55	0.37	Average
14	18.426	37.77	60.00	-22.23	36.85	0.55	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

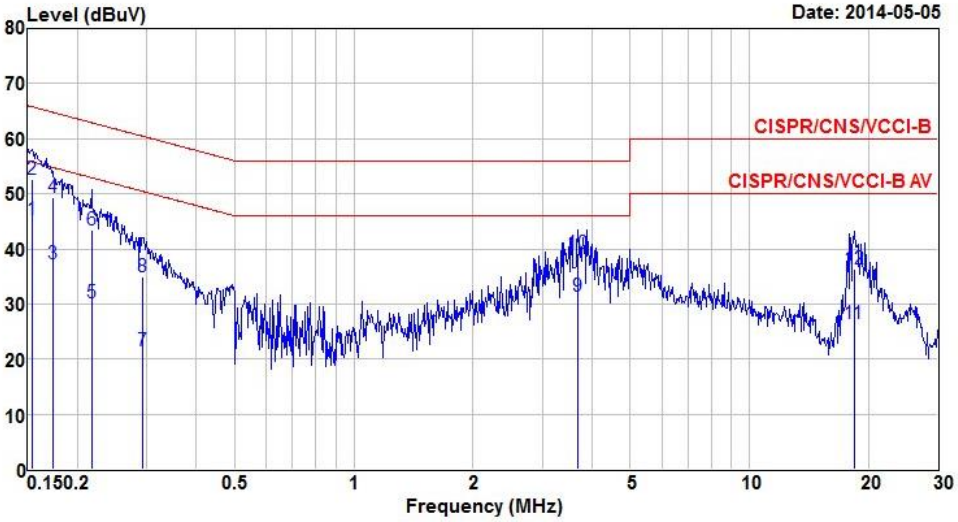
Power Phase	Neutral	Test Mode	1



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.152	45.26	55.91	-10.65	44.76	0.48	0.02	Average
2	0.152	54.23	65.91	-11.68	53.73	0.48	0.02	QP
3	0.166	38.92	55.16	-16.24	38.42	0.48	0.02	Average
4	0.166	50.73	65.16	-14.43	50.23	0.48	0.02	QP
5	0.200	32.08	53.62	-21.54	31.59	0.48	0.01	Average
6	0.200	46.31	63.62	-17.31	45.82	0.48	0.01	QP
7	0.242	27.28	52.04	-24.76	26.79	0.48	0.01	Average
8	0.242	41.90	62.04	-20.14	41.41	0.48	0.01	QP
9	3.207	28.96	46.00	-17.04	28.34	0.51	0.11	Average
10	3.207	36.65	56.00	-19.35	36.03	0.51	0.11	QP
11	3.799	32.39	46.00	-13.61	31.73	0.52	0.14	Average
12	3.799	40.36	56.00	-15.64	39.70	0.52	0.14	QP
13	18.622	27.62	50.00	-22.38	26.68	0.56	0.38	Average
14	18.622	36.29	60.00	-23.71	35.35	0.56	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

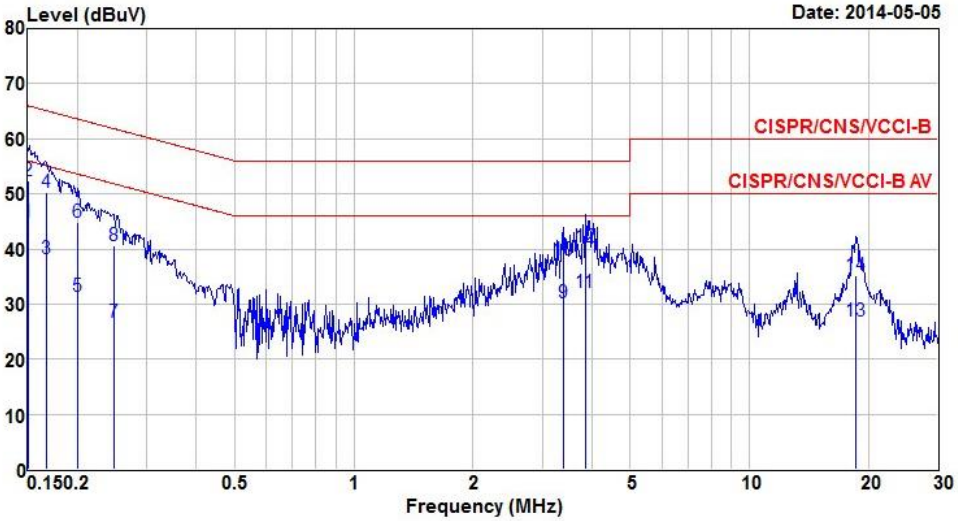
Power Phase	Line	Test Mode	2



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.154	45.32	55.78	-10.46	44.90	0.40	0.02	Average
2	0.154	52.74	65.78	-13.04	52.32	0.40	0.02	QP
3	0.173	37.38	54.81	-17.43	36.96	0.40	0.02	Average
4	0.173	49.28	64.81	-15.53	48.86	0.40	0.02	QP
5	0.217	30.31	52.92	-22.61	29.91	0.39	0.01	Average
6	0.217	43.42	62.92	-19.50	43.02	0.39	0.01	QP
7	0.292	21.42	50.46	-29.04	21.01	0.39	0.02	Average
8	0.292	34.92	60.46	-25.54	34.51	0.39	0.02	QP
9	3.681	31.44	46.00	-14.56	30.85	0.46	0.13	Average
10	3.681	39.27	56.00	-16.73	38.68	0.46	0.13	QP
11	18.426	26.52	50.00	-23.48	25.60	0.55	0.37	Average
12	18.426	36.27	60.00	-23.73	35.35	0.55	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

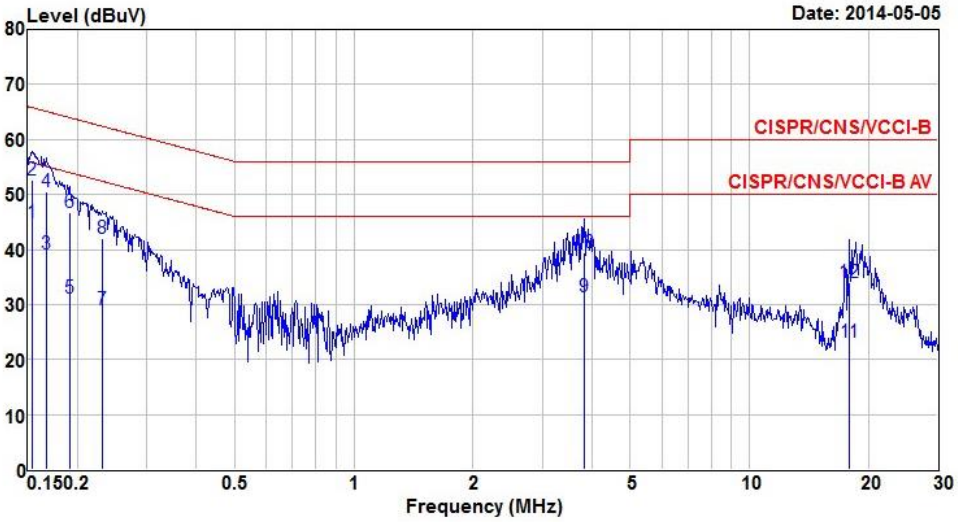
Power Phase	Neutral	Test Mode	2



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.151	44.90	55.96	-11.06	44.40	0.48	0.02	Average
2	0.151	52.38	65.96	-13.58	51.88	0.48	0.02	QP
3	0.168	38.16	55.08	-16.92	37.66	0.48	0.02	Average
4	0.168	50.27	65.08	-14.81	49.77	0.48	0.02	QP
5	0.200	31.31	53.62	-22.31	30.82	0.48	0.01	Average
6	0.200	44.82	63.62	-18.80	44.33	0.48	0.01	QP
7	0.247	26.56	51.86	-25.30	26.07	0.48	0.01	Average
8	0.247	40.58	61.86	-21.28	40.09	0.48	0.01	QP
9	3.399	30.32	46.00	-15.68	29.68	0.52	0.12	Average
10	3.399	37.92	56.00	-18.08	37.28	0.52	0.12	QP
11	3.840	32.22	46.00	-13.78	31.56	0.52	0.14	Average
12	3.840	40.29	56.00	-15.71	39.63	0.52	0.14	QP
13	18.622	27.02	50.00	-22.98	26.08	0.56	0.38	Average
14	18.622	35.27	60.00	-24.73	34.33	0.56	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

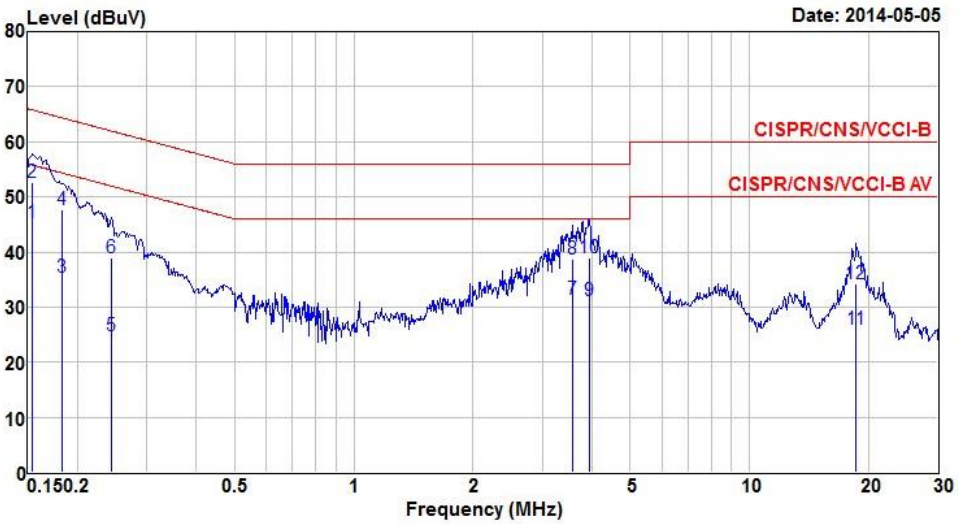
Power Phase	Line	Test Mode	3



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.154	44.84	55.78	-10.94	44.42	0.40	0.02	Average
2	0.154	52.63	65.78	-13.15	52.21	0.40	0.02	QP
3	0.167	39.18	55.12	-15.94	38.76	0.40	0.02	Average
4	0.167	50.57	65.12	-14.55	50.15	0.40	0.02	QP
5	0.191	31.07	53.98	-22.91	30.67	0.39	0.01	Average
6	0.191	46.62	63.98	-17.36	46.22	0.39	0.01	QP
7	0.232	29.02	52.39	-23.37	28.62	0.39	0.01	Average
8	0.232	42.05	62.39	-20.34	41.65	0.39	0.01	QP
9	3.820	31.44	46.00	-14.56	30.84	0.46	0.14	Average
10	3.820	39.51	56.00	-16.49	38.91	0.46	0.14	QP
11	17.944	23.23	50.00	-26.77	22.31	0.55	0.37	Average
12	17.944	34.11	60.00	-25.89	33.19	0.55	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

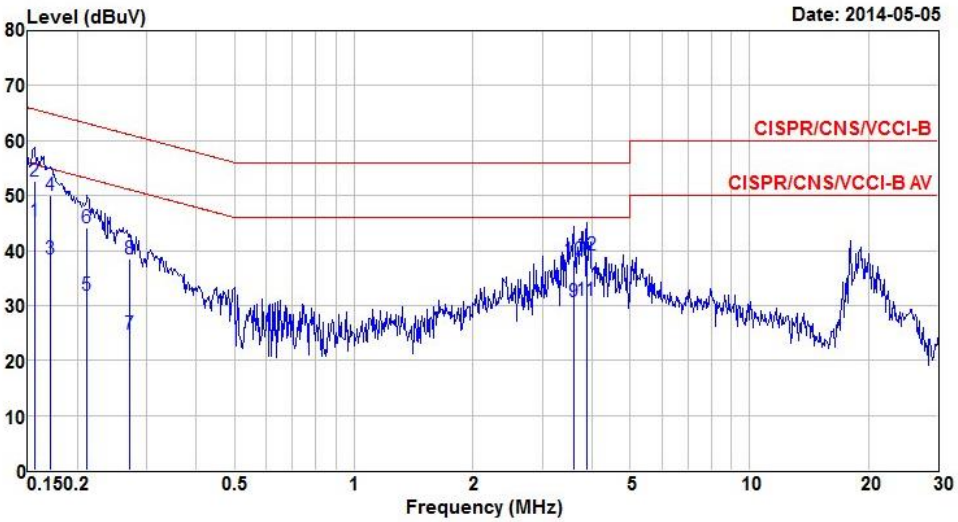
Power Phase	Neutral	Test Mode	3



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.154	45.30	55.78	-10.48	44.80	0.48	0.02	Average
2	0.154	52.63	65.78	-13.15	52.13	0.48	0.02	QP
3	0.183	35.41	54.33	-18.92	34.92	0.48	0.01	Average
4	0.183	47.67	64.33	-16.66	47.18	0.48	0.01	QP
5	0.244	24.90	51.95	-27.05	24.41	0.48	0.01	Average
6	0.244	39.03	61.95	-22.92	38.54	0.48	0.01	QP
7	3.565	31.36	46.00	-14.64	30.71	0.52	0.13	Average
8	3.565	38.70	56.00	-17.30	38.05	0.52	0.13	QP
9	3.943	31.23	46.00	-14.77	30.56	0.52	0.15	Average
10	3.943	38.94	56.00	-17.06	38.27	0.52	0.15	QP
11	18.622	25.95	50.00	-24.05	25.01	0.56	0.38	Average
12	18.622	34.31	60.00	-25.69	33.37	0.56	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

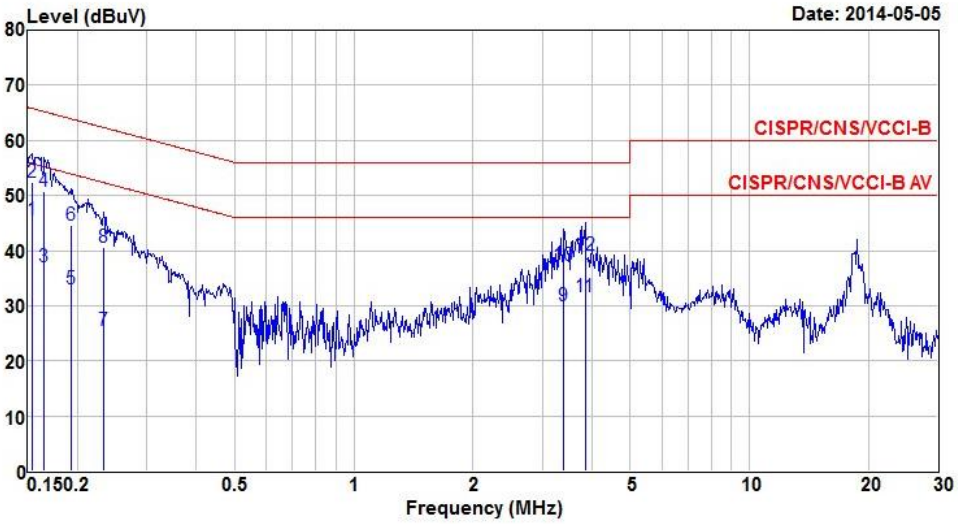
Power Phase	Line	Test Mode	4



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.156	45.23	55.69	-10.46	44.81	0.40	0.02	Average
2	0.156	52.66	65.69	-13.03	52.24	0.40	0.02	QP
3	0.171	38.40	54.90	-16.50	37.98	0.40	0.02	Average
4	0.171	50.06	64.90	-14.84	49.64	0.40	0.02	QP
5	0.212	31.88	53.14	-21.26	31.48	0.39	0.01	Average
6	0.212	44.17	63.14	-18.97	43.77	0.39	0.01	QP
7	0.272	24.83	51.07	-26.24	24.43	0.39	0.01	Average
8	0.272	38.46	61.07	-22.61	38.06	0.39	0.01	QP
9	3.603	30.74	46.00	-15.26	30.15	0.46	0.13	Average
10	3.603	38.25	56.00	-17.75	37.66	0.46	0.13	QP
11	3.881	30.91	46.00	-15.09	30.31	0.46	0.14	Average
12	3.881	39.15	56.00	-16.85	38.55	0.46	0.14	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

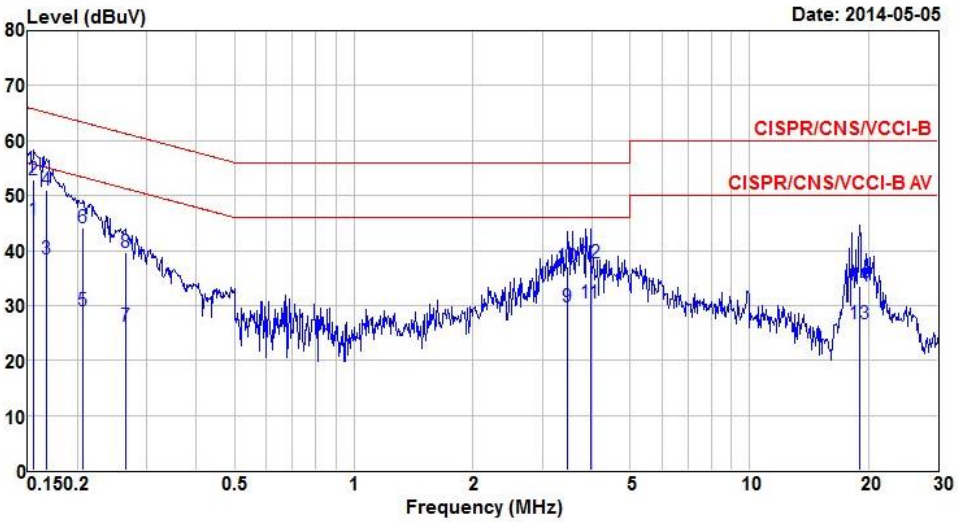
Power Phase	Neutral	Test Mode	4



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.154	45.45	55.78	-10.33	44.95	0.48	0.02	Average
2	0.154	52.37	65.78	-13.41	51.87	0.48	0.02	QP
3	0.165	37.10	55.21	-18.11	36.60	0.48	0.02	Average
4	0.165	50.73	65.21	-14.48	50.23	0.48	0.02	QP
5	0.193	33.13	53.89	-20.76	32.64	0.48	0.01	Average
6	0.193	44.66	63.89	-19.23	44.17	0.48	0.01	QP
7	0.233	25.48	52.35	-26.87	24.99	0.48	0.01	Average
8	0.233	40.53	62.35	-21.82	40.04	0.48	0.01	QP
9	3.399	29.89	46.00	-16.11	29.25	0.52	0.12	Average
10	3.399	37.31	56.00	-18.69	36.67	0.52	0.12	QP
11	3.840	31.58	46.00	-14.42	30.92	0.52	0.14	Average
12	3.840	39.26	56.00	-16.74	38.60	0.52	0.14	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

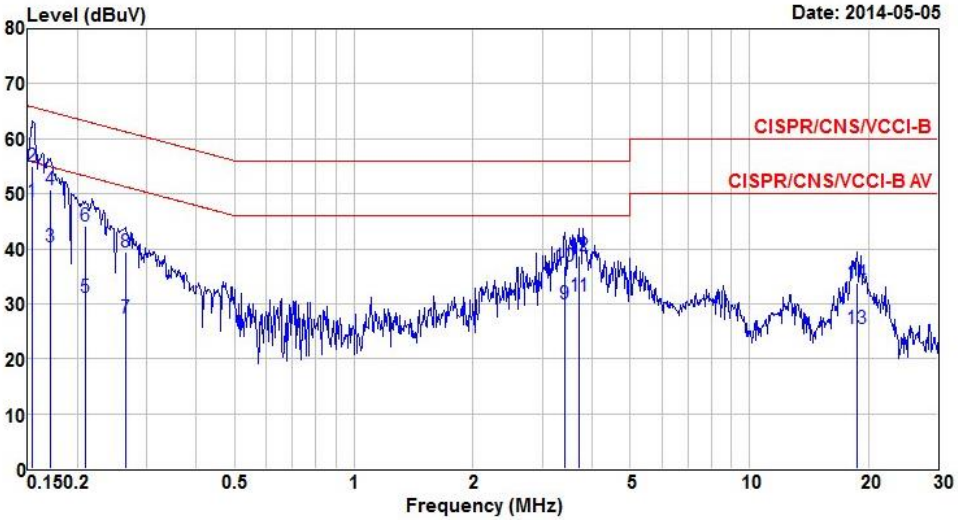
Power Phase	Line	Test Mode	5



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.155	45.51	55.74	-10.23	45.09	0.40	0.02	Average
2	0.155	52.78	65.74	-12.96	52.36	0.40	0.02	QP
3	0.168	38.46	55.08	-16.62	38.04	0.40	0.02	Average
4	0.168	50.93	65.08	-14.15	50.51	0.40	0.02	QP
5	0.207	28.94	53.32	-24.38	28.54	0.39	0.01	Average
6	0.207	44.17	63.32	-19.15	43.77	0.39	0.01	QP
7	0.264	26.28	51.29	-25.01	25.88	0.39	0.01	Average
8	0.264	39.58	61.29	-21.71	39.18	0.39	0.01	QP
9	3.472	29.77	46.00	-16.23	29.20	0.45	0.12	Average
10	3.472	37.16	56.00	-18.84	36.59	0.45	0.12	QP
11	3.964	30.44	46.00	-15.56	29.83	0.46	0.15	Average
12	3.964	37.83	56.00	-18.17	37.22	0.46	0.15	QP
13	19.021	26.65	50.00	-23.35	25.72	0.55	0.38	Average
14	19.021	33.48	60.00	-26.52	32.55	0.55	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

Power Phase	Neutral	Test Mode	5



	Freq	Level	Limit Line	Over Limit	Read Level	LISN factor	cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1*	0.154	48.69	55.78	-7.09	48.19	0.48	0.02	Average
2	0.154	55.03	65.78	-10.75	54.53	0.48	0.02	QP
3	0.170	40.33	54.94	-14.61	39.83	0.48	0.02	Average
4	0.170	50.66	64.94	-14.28	50.16	0.48	0.02	QP
5	0.209	31.15	53.23	-22.08	30.66	0.48	0.01	Average
6	0.209	44.24	63.23	-18.99	43.75	0.48	0.01	QP
7	0.264	27.34	51.29	-23.95	26.85	0.48	0.01	Average
8	0.264	39.34	61.29	-21.95	38.85	0.48	0.01	QP
9	3.417	29.90	46.00	-16.10	29.26	0.52	0.12	Average
10	3.417	36.91	56.00	-19.09	36.27	0.52	0.12	QP
11	3.720	31.45	46.00	-14.55	30.79	0.52	0.14	Average
12	3.720	38.74	56.00	-17.26	38.08	0.52	0.14	QP
13	18.721	25.48	50.00	-24.52	24.54	0.56	0.38	Average
14	18.721	33.65	60.00	-26.35	32.71	0.56	0.38	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Limit Line (dBuV) – Level (dBuV).

4 Immunity Tests

4.1 General Description

Product Standard: EN 301 489-1, EN 301 489-17		
Basic Standard	**Spec. Requirement**	**Performance Criteria**
EN 61000-4-2 (ESD)	Contact Discharge: ± 4 kV Air Discharge: ± 8 kV	B
EN 61000-4-3 (RS)	80-1000 MHz, 1400-2700 MHz 3 V/m, 1 kHz Sine Wave 80%, AM Modulation	A

4.2 Performance Criteria Description

Performance Criteria	
Performance criteria for Continuous phenomena applied to Transmitters (CT)	The performance criteria A shall apply.
Performance criteria for Transient phenomena applied to Transmitters (TT)	The performance criteria B shall apply.
Performance criteria for Continuous phenomena applied to Receivers (CR)	The performance criteria A shall apply.
Performance criteria for Transient phenomena applied to Receivers (TR)	The performance criteria B shall apply.

Performance Table		
Criteria	**During test**	**After test**
A	Shall operate as intended. May show degradation of performance (see note1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 2). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 1). No unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 2).
Note 1:	Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.	
Note 2:	No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect form the apparatus if used as intended.	

4.3 Electrostatic Discharge (ESD)

4.3.1 Test Specification of Electrostatic Discharge (ESD)

Basic Standard	EN 61000-4-2
Discharge Voltage	Contact Discharge: ± 2 kV / ± 4 kV Air Discharge: ± 2 kV / ± 4 kV / ± 8 kV
Discharge Impedance	330 ohm / 150 pF
Number of Discharge	Air Discharge: minimum 20 times at each test point Contact Discharge: minimum 20 times at each test point
Discharge Mode	Single Discharge
Discharge Period	1 second minimum

4.3.2 Test Procedures

a. In the case of air discharge testing the climatic conditions shall be within the following ranges:
- ambient temperature: 15°C to 35°C;
- relative humidity : 30% to 60%;
- atmospheric pressure : 86 kPa (860 mbar) to 106 kPa (1060 mbar).

b. Test programs and software shall be chosen so as to exercise all normal modes of operation of the EUT. The use of special exercising software is encouraged, but permitted only where it can be shown that the EUT is being comprehensively exercised.

c. The test voltage shall be increased from the minimum to the selected test severity level, in order to determine any threshold of failure. The final severity level should not exceed the product specification value in order to avoid damage to the equipment.

d. The test shall be performed with both air discharge and contact discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on air discharge. On preselected points at least 10 single discharges (in the most sensitive polarity) shall be applied on contact discharge.

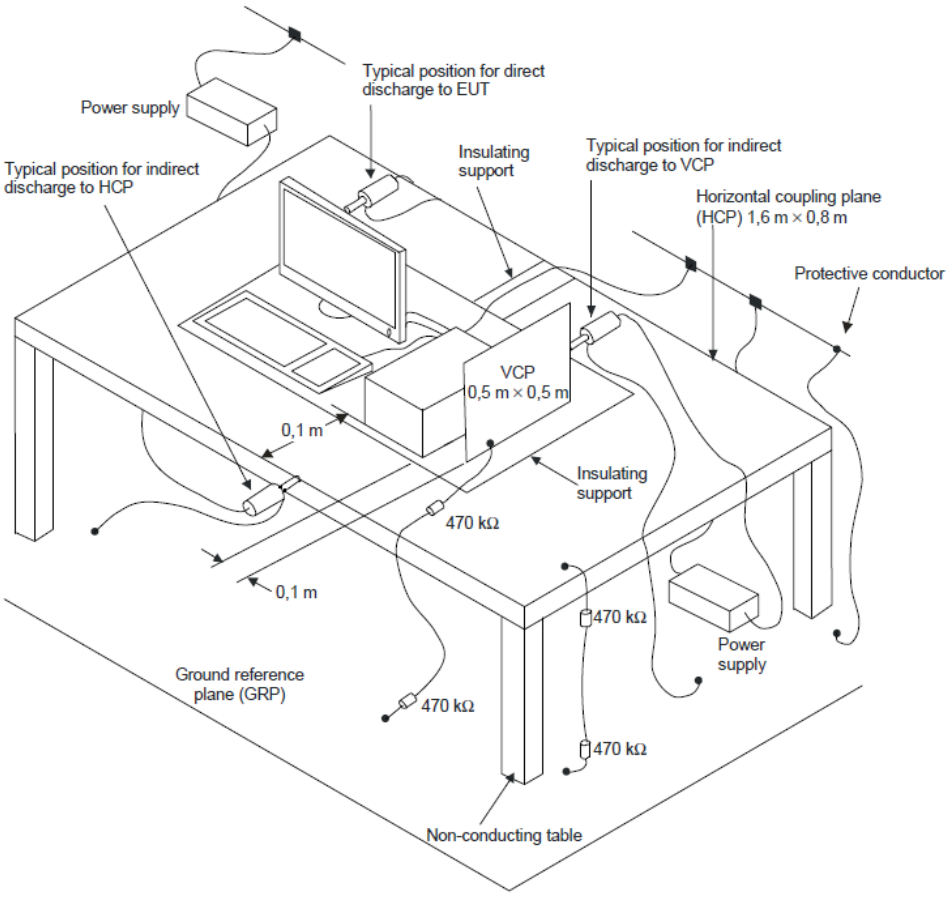
e. For the time interval between successive single discharges an initial value of one second is recommended. Longer intervals may be determined whether a system failure has occurred.

f. In the case of contact discharges, the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

g. In the case of painted surface covering a conducting substrate, the following procedure shall be adopted:
- If the coating is not declared to be an insulating coating by the equipment manufacturer, then the pointed tip of the generator shall penetrate the coating so as to make contact with the conducting substrate.
- Coating declared as insulating by the manufacturer shall only be submitted to the air discharge.
- The contact discharge test shall not be applied to such surfaces.

h. In the case of air discharges, the round discharge tip of the discharge electrode shall be approached as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator (discharge electrode) shall be removed from the EUT. The generator is then retriggered for a new single discharge. This procedure shall be repeated until the discharges are completed. In the case of an air discharge test, the discharge switch, which is used for contact discharge, shall be closed.

4.3.3 Test Setup



The test setup shall consist of a non-conductive table, (0.8 ± 0.08) m high, standing on the ground reference plane.

A horizontal coupling plane (HCP), (1.6 ± 0.02) m × (0.8 ± 0.02) m, shall be placed on the table. The EUT and its cables shall be isolated from the coupling plane by an insulating support (0.5 ± 0.05) mm in thickness.

4.3.4 Test Result of Electrostatic Discharge (ESD)

Test Mode	1, 3, 4				
Direct Application					
Test Voltage (kV)	**Polarity**	**Test Point**	**Contact Discharge**	**Air Discharge**	**Performance Criteria**
2, 4, 8	+/-	1	-	Note	A
Indirect Application					
Test Voltage (kV)	**Polarity**	**Test Point**	**Horizontal Coupling Plane (HCP)**	**Vertical Coupling Plane (VCP)**	**Performance Criteria**
2, 4	+/-	At front, rear, left and right side	Note	Note	A

Note: There was no abnormal situation during the test compared with initial operation.

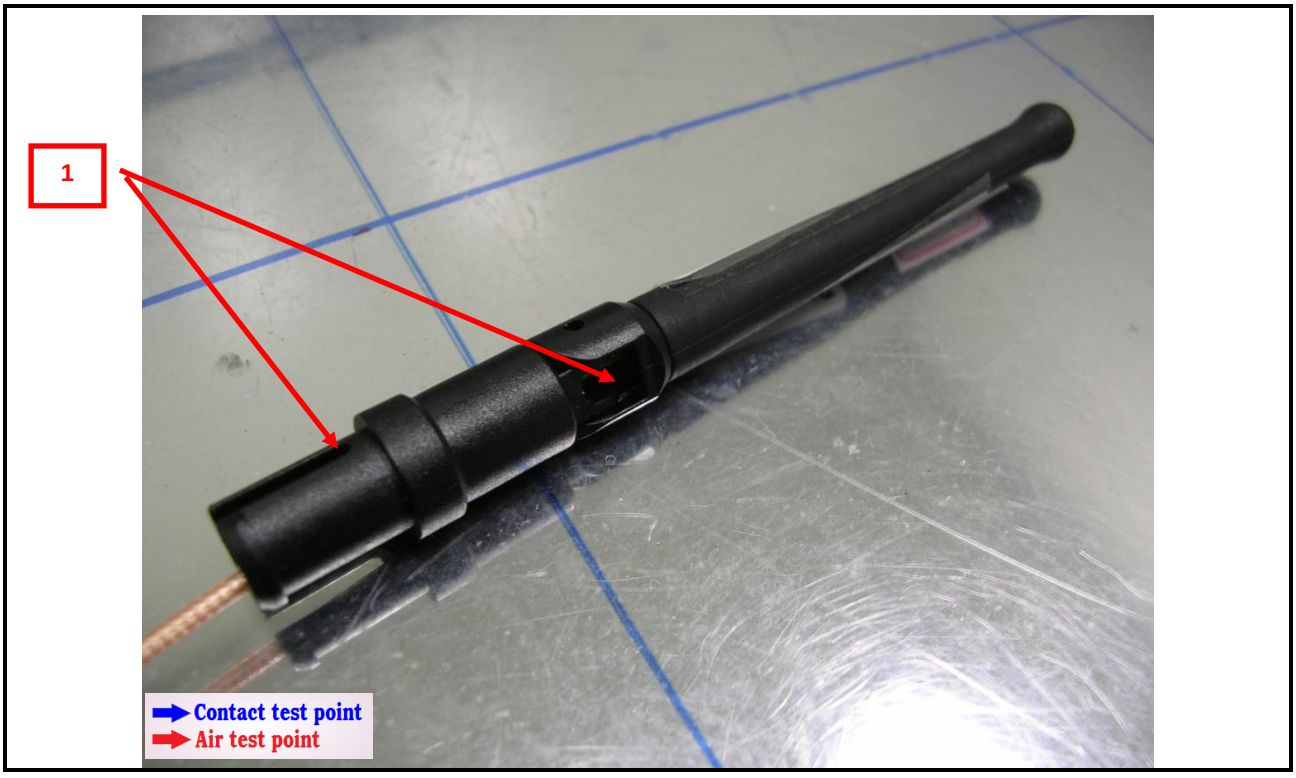
Test Mode	2, 5				
Direct Application					
Test Voltage (kV)	**Polarity**	**Test Point**	**Contact Discharge**	**Air Discharge**	**Performance Criteria**
-	-	-	-	-	-
Indirect Application					
Test Voltage (kV)	**Polarity**	**Test Point**	**Horizontal Coupling Plane (HCP)**	**Vertical Coupling Plane (VCP)**	**Performance Criteria**
2, 4	+/-	At front, rear, left and right side	Note	Note	A

Note: There was no abnormal situation during the test compared with initial operation.

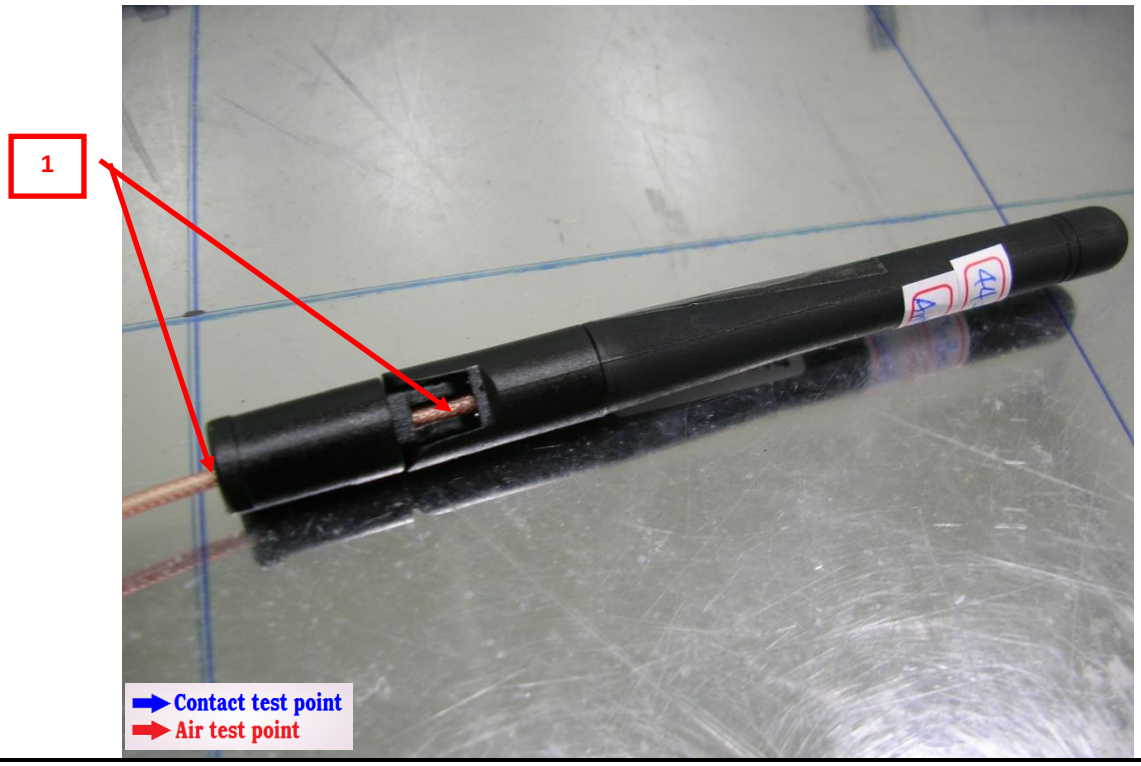
4.3.5 Test Point Photo

Mode 1

Mode 3



Mode 4



4.4 Radio Frequency Electromagnetic Field (RS)

4.4.1 Test Specification of Radio Frequency Electromagnetic Field (RS)

Basic Standard	EN 61000-4-3
Frequency Range	80 MHz ~ 1000 MHz, 1400 MHz to 2700 MHz
Field Strength	3 V/m
Modulation	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step	1 % of preceding frequency value
Polarity of Antenna	Horizontal and Vertical
Antenna Height	1.5 m
Dwell Time	3 seconds

Note: The exclusion band for the transmitter and / or receiver part of the 2.48 GHz RLAN equipment under test shall extend from 2280 MHz to 2607.675 MHz.

4.4.2 Test Procedures

a. The test level shall be 3 V/m (measured unmodulated). The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1000 Hz. If the wanted signal is modulated at 1000 Hz, then an audio signal of 400 Hz shall be used.

b. The test shall be performed over the frequency range 80 MHz to 1000 MHz & 1400MHz to 2700MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers, as appropriate.

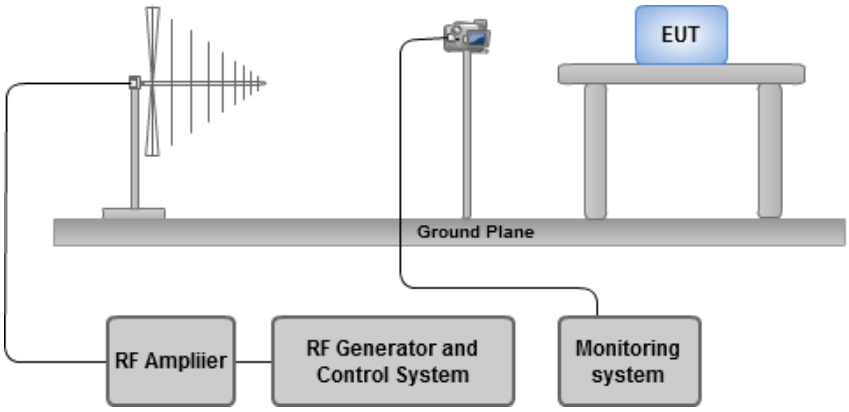
c. For receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary used frequency, unless specified otherwise in the part of EN 301 489 series [i.13] dealing with the relevant type of radio equipment.

d. Further product related spot frequency tests may be specified in the relevant part of EN 301 489 series [i.13] dealing with the particular type of radio equipment.

e. Responses on receivers occurring at discrete frequencies, which are narrow band responses, shall be disregarded from the test.

f. The frequencies selected and used during the test shall be recorded in the test report.

4.4.3 Test Setup



Note: The procedure defined in this part requires the generation of electromagnetic fields within which the test sample is placed and its operation observed. To generate fields that are useful for simulation of actual (field) conditions may require significant antenna drive power and the resultant high field strength levels. To comply with local regulations and to prevent biological hazards to the testing personnel, it is recommended that these tests be carried out in a shielded enclosure or semi-anechoic chamber.

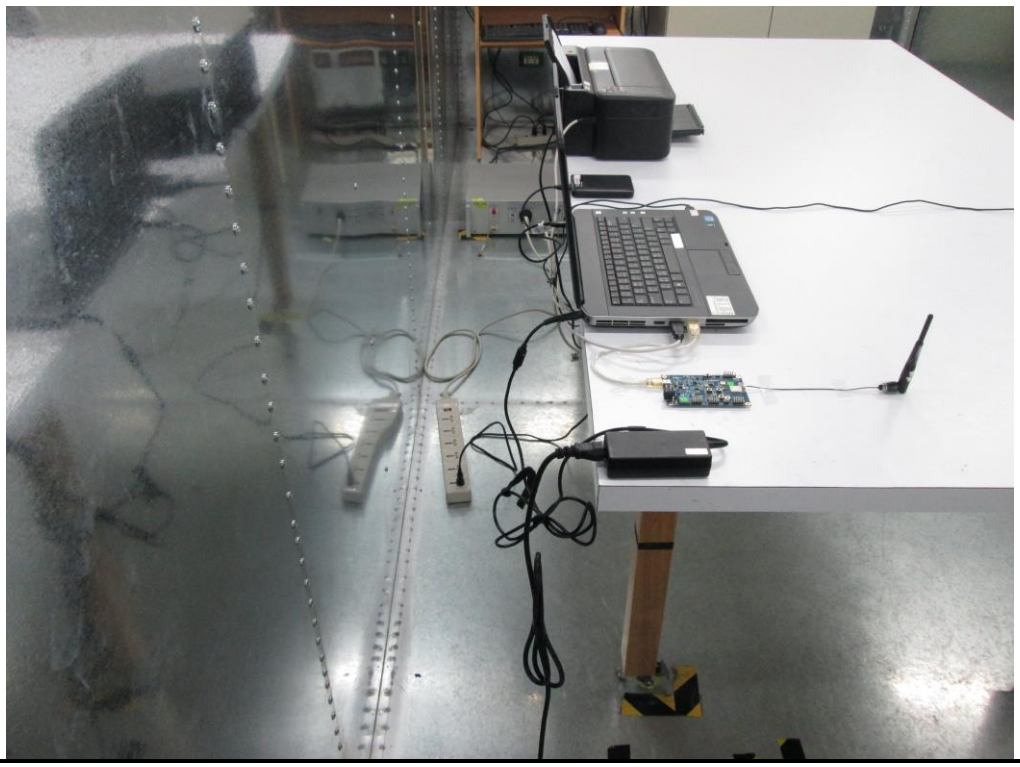
4.4.4 Test Result of Radio Frequency Electromagnetic Field (RS)

Test Mode	1, 2, 3, 4, 5				
Frequency Range (MHz)	Azimuth	Polarity	Test Field Strength (V/m)	Observation	Performance Criteria
80 – 1000	0	V&H	3	Note	A
80 – 1000	90	V&H	3	Note	A
80 – 1000	180	V&H	3	Note	A
80 – 1000	270	V&H	3	Note	A
1400 – 2700	0	V&H	3	Note	A
1400 – 2700	90	V&H	3	Note	A
1400 – 2700	180	V&H	3	Note	A
1400 – 2700	270	V&H	3	Note	A

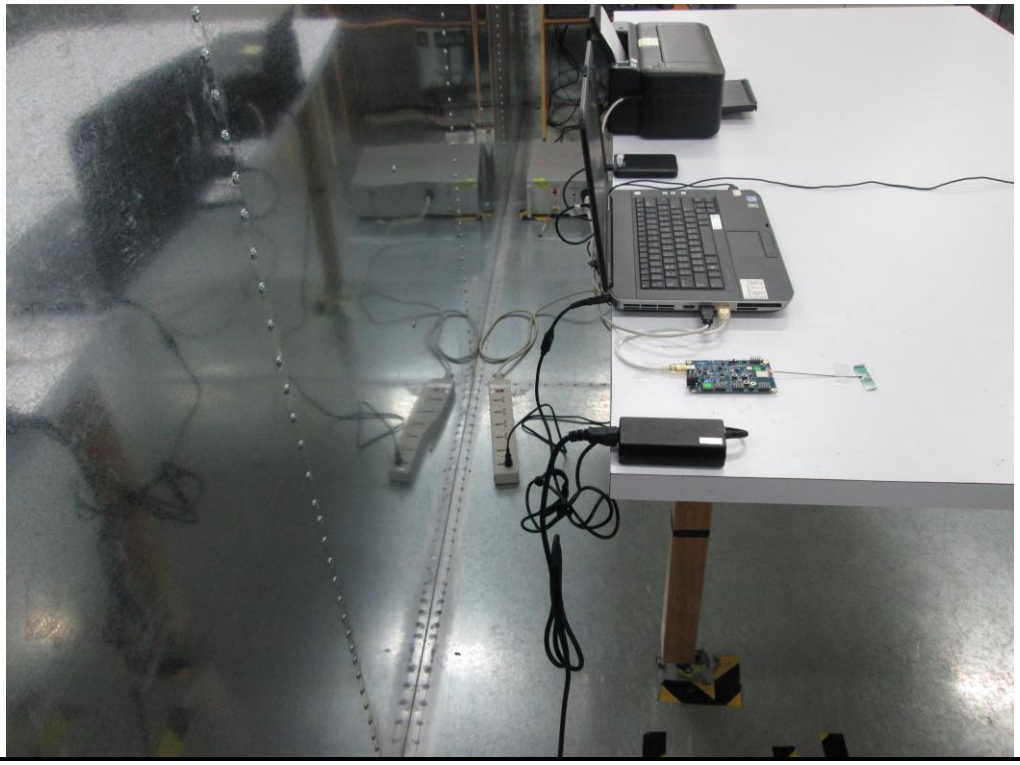
Note: There was no abnormal situation during the test compared with initial operation.

5 Photographs of the Test Configuration

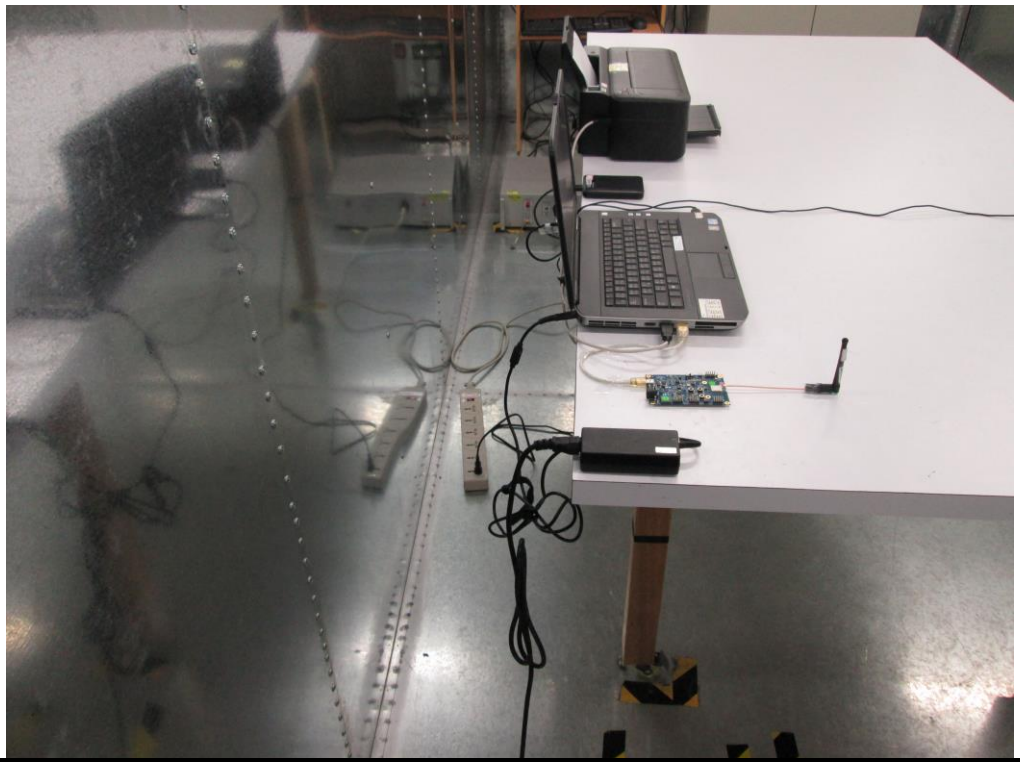
Conducted Emission Test (Test Mode 1)



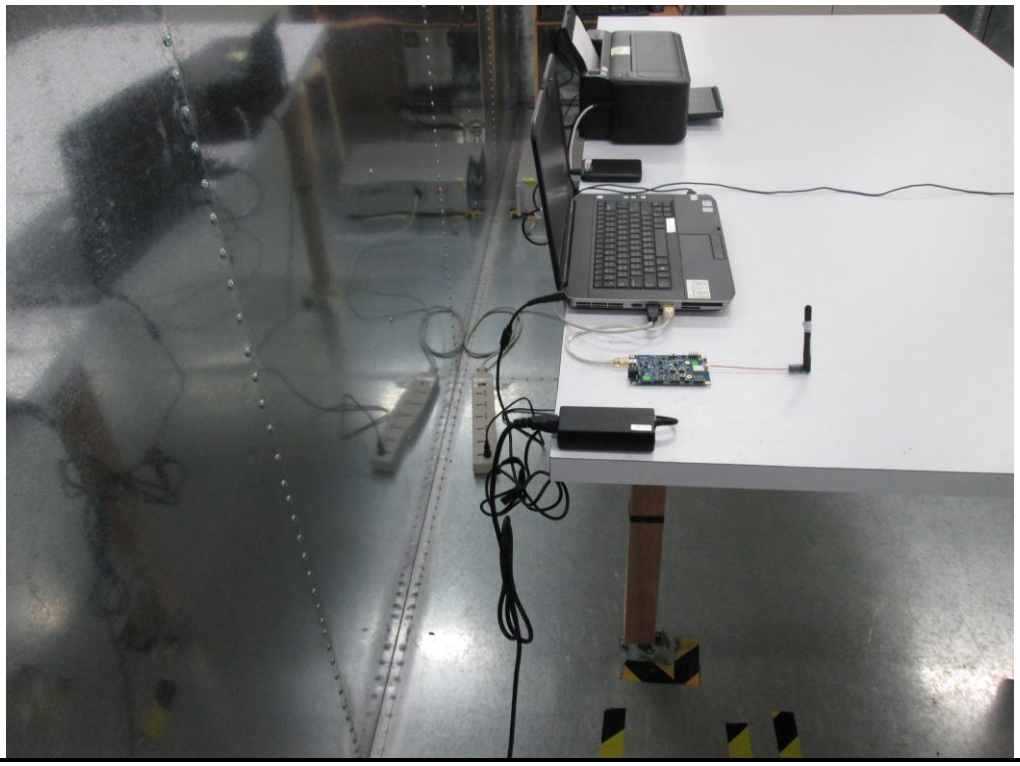
Conducted Emission Test (Test Mode 2)



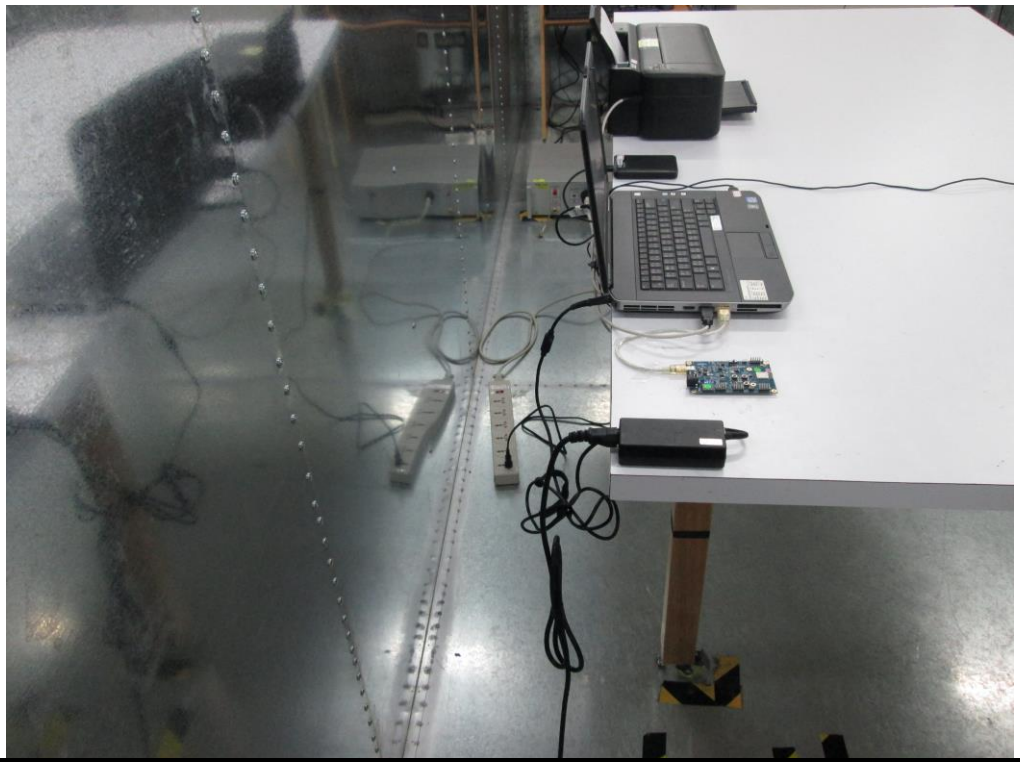
Conducted Emission Test (Test Mode 3)



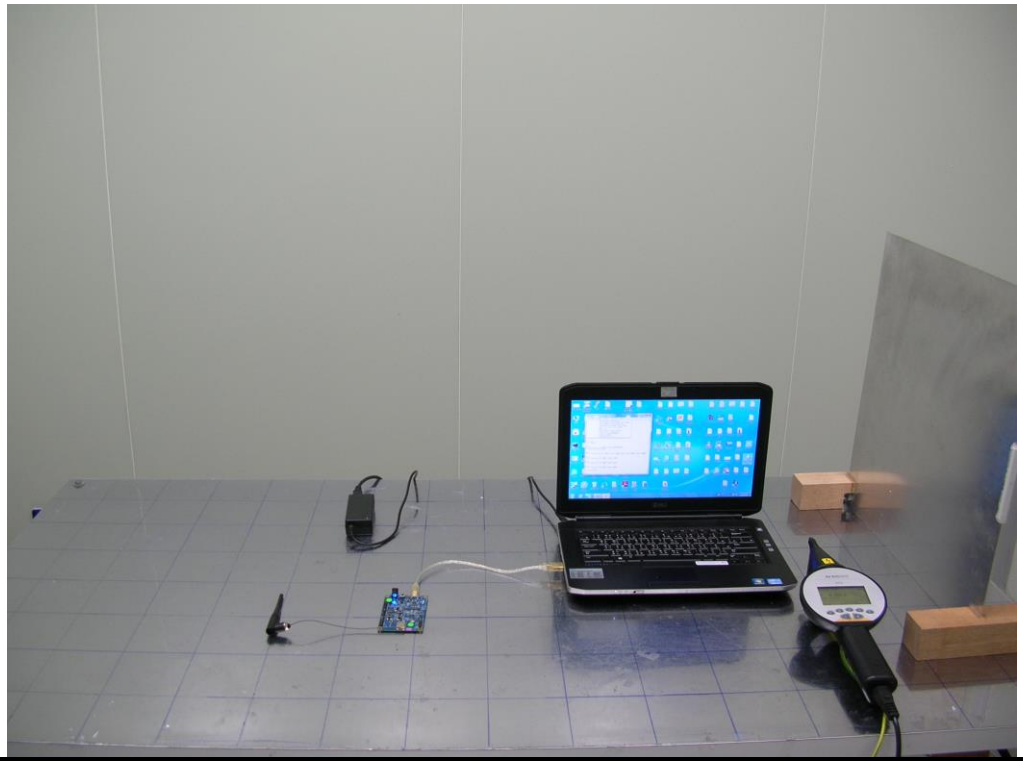
Conducted Emission Test (Test Mode 4)



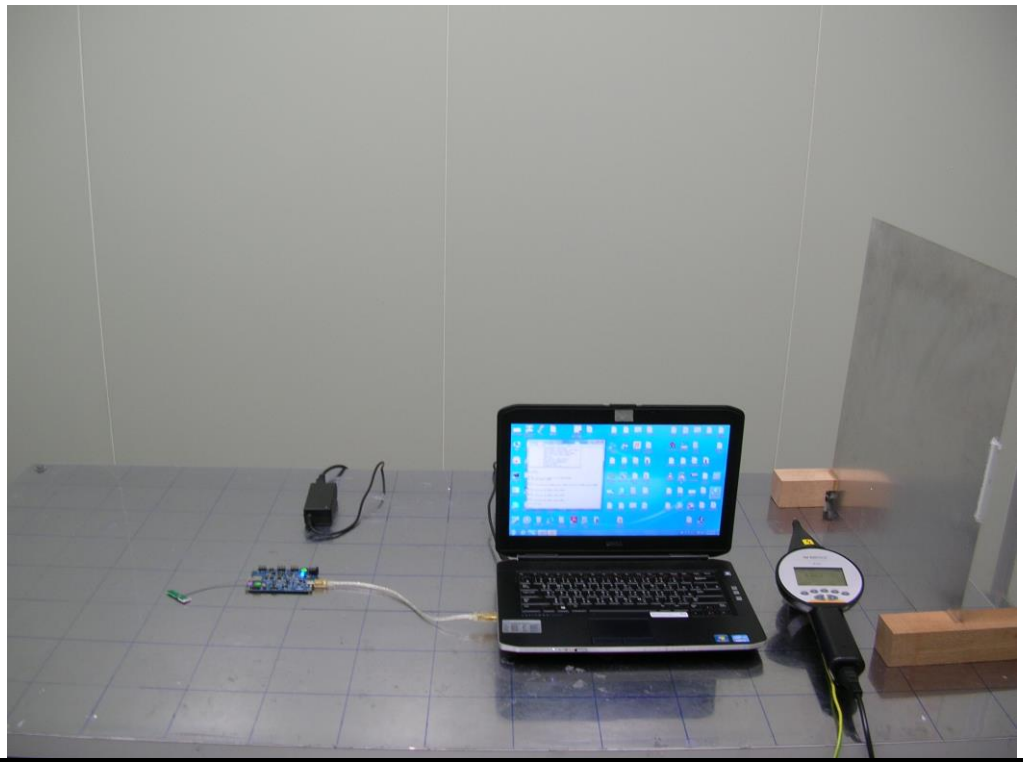
Conducted Emission Test (Test Mode 5)



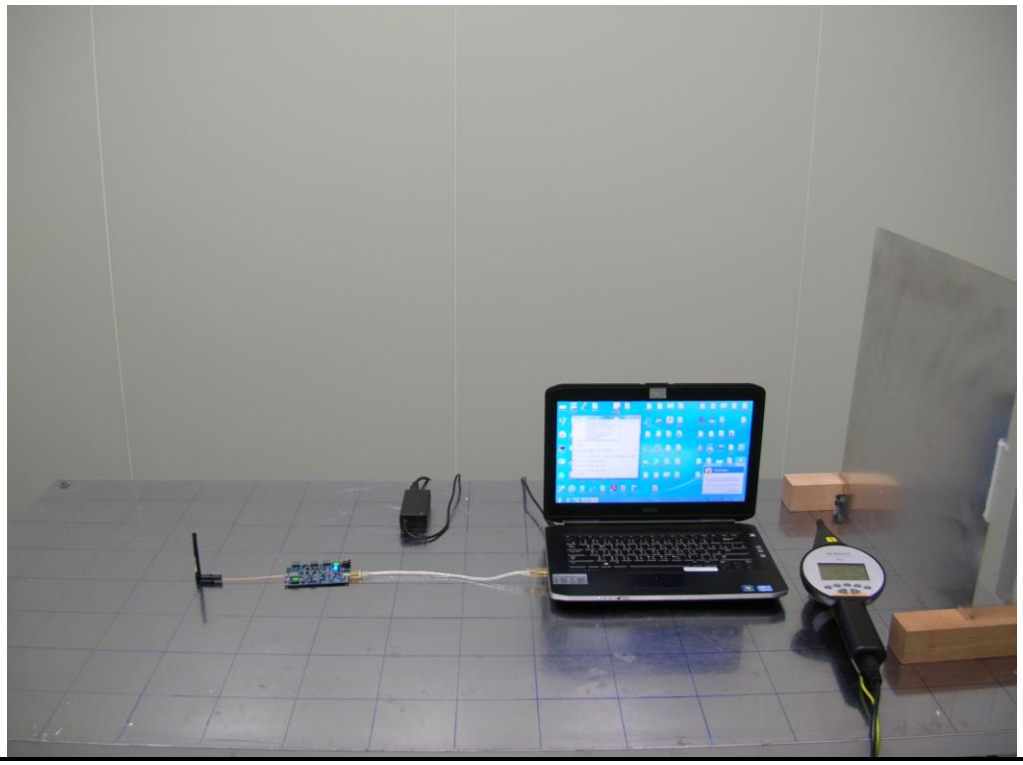
ESD Test (Test Mode 1)



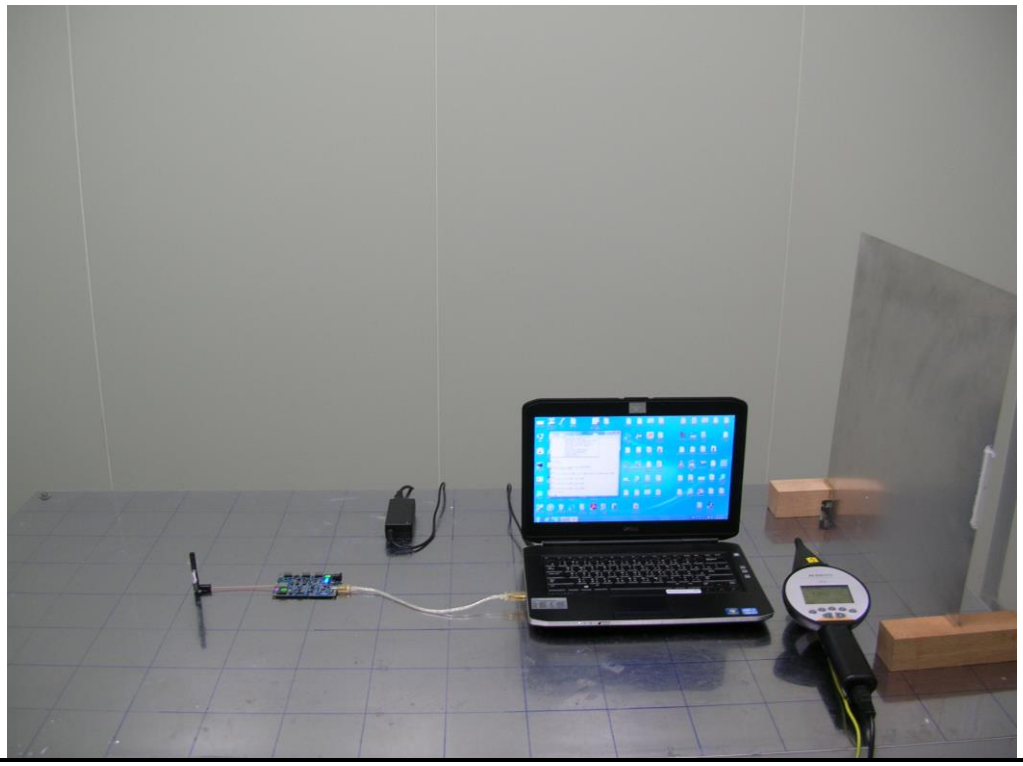
ESD Test (Test Mode 2)



ESD Test (Test Mode 3)

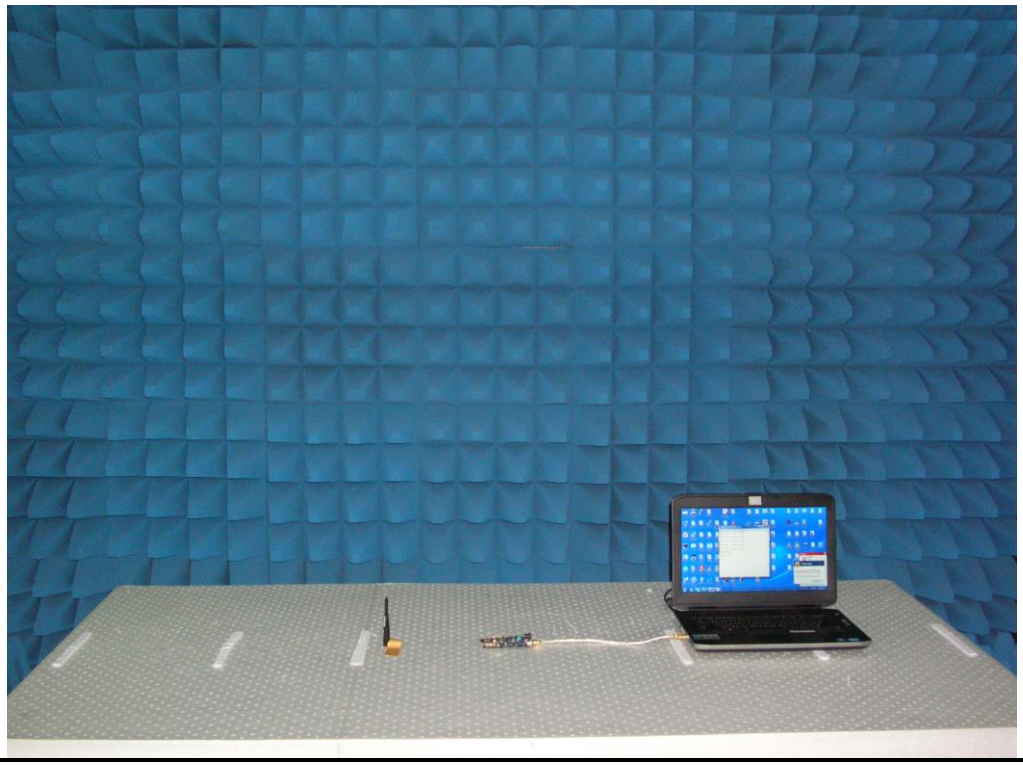


ESD Test (Test Mode 4)

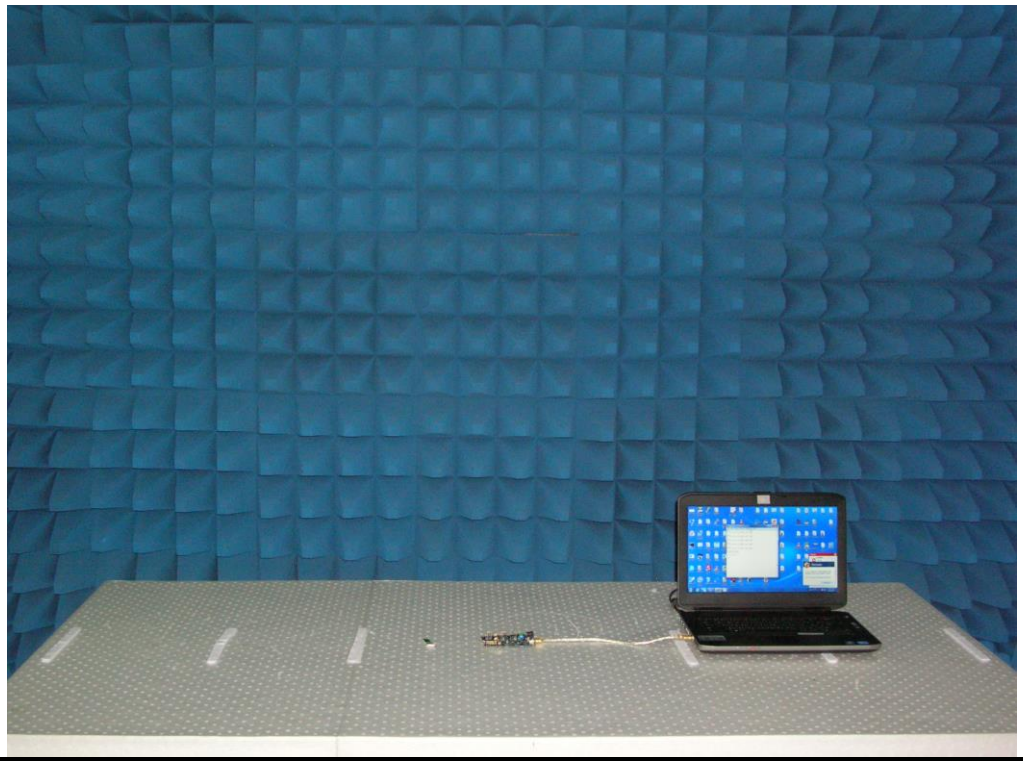


ESD Test (Test Mode 5)

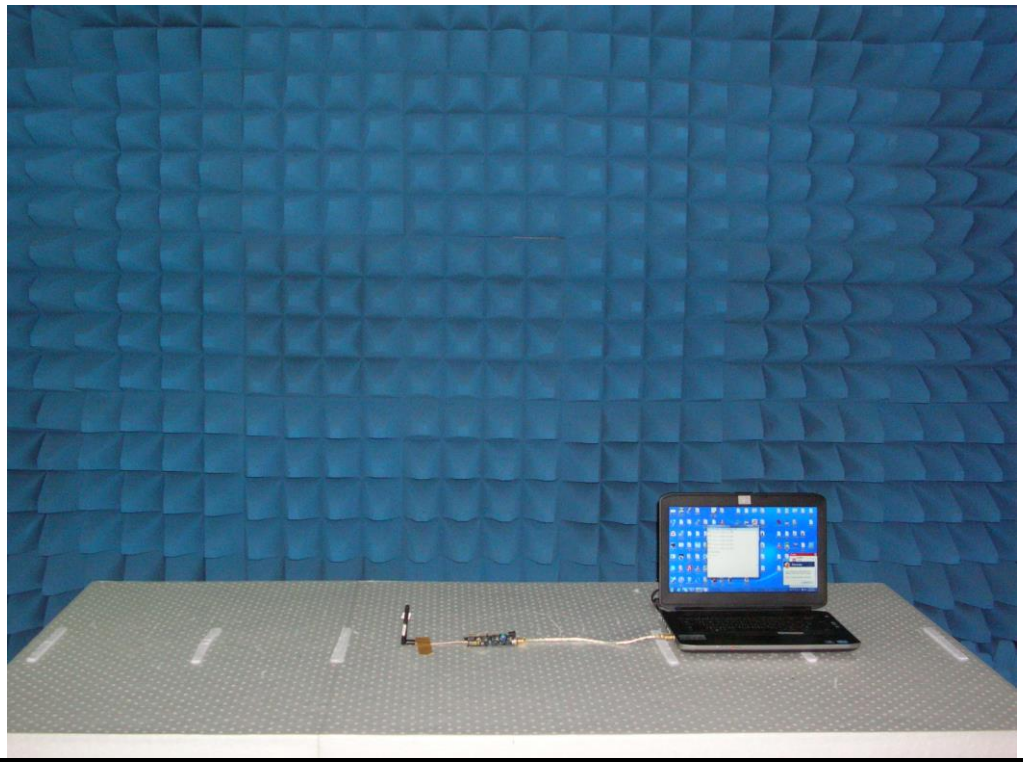
RS Test (Test Mode 1)



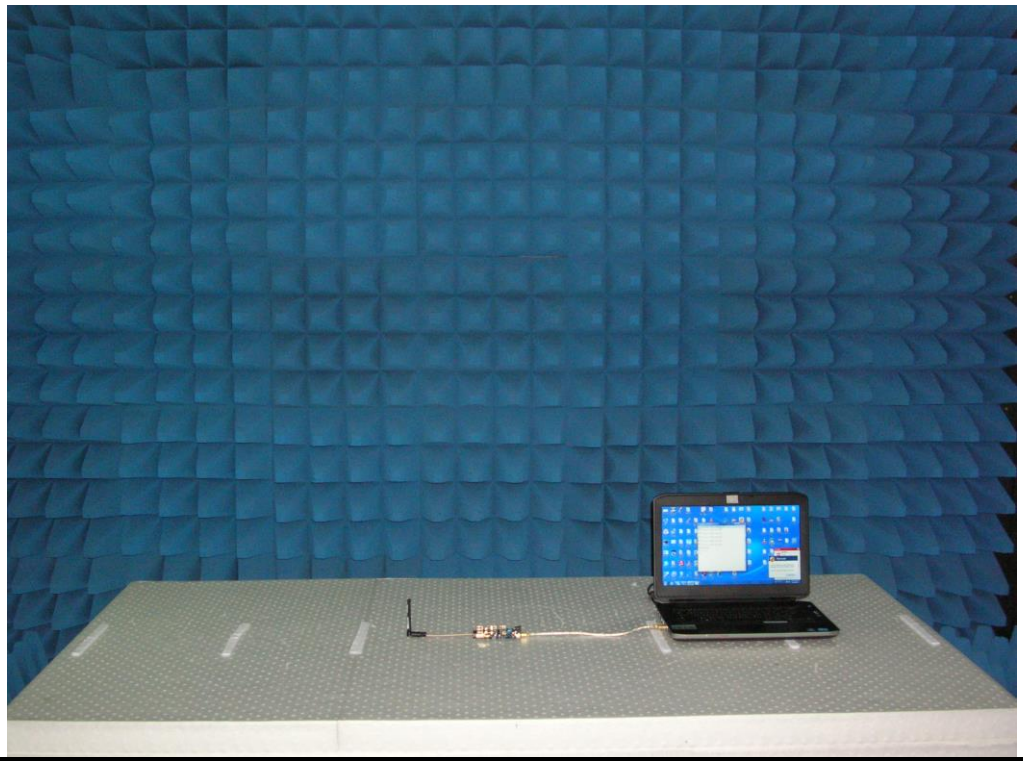
RS Test (Test Mode 2)



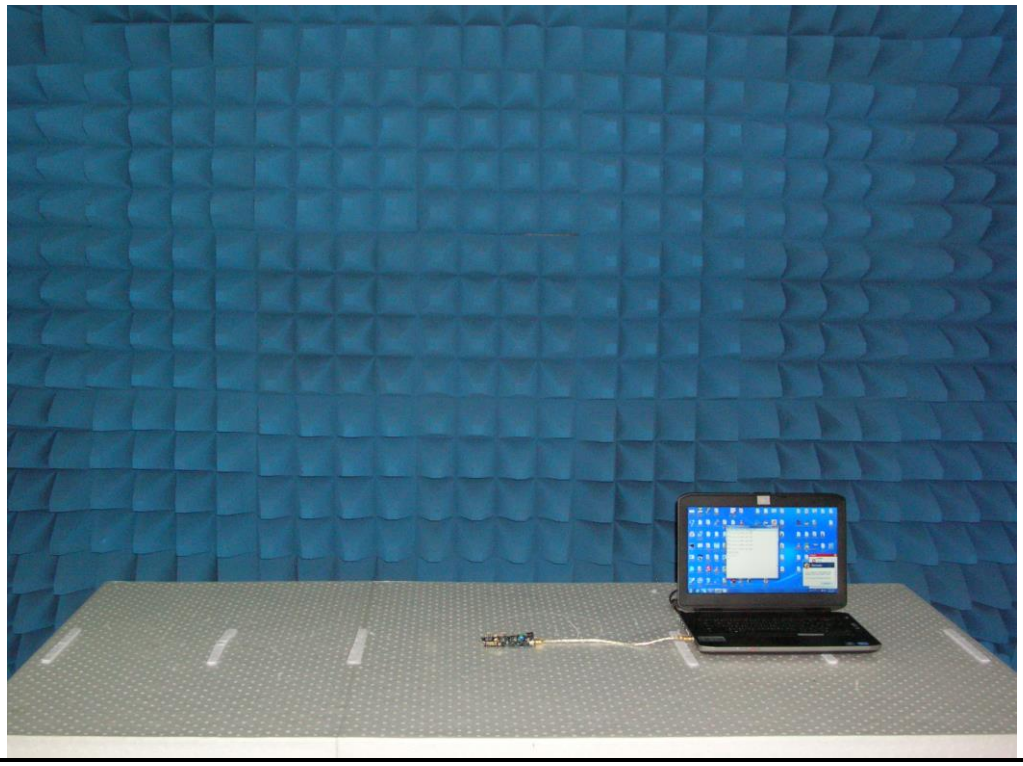
RS Test (Test Mode 3)



RS Test (Test Mode 4)



RS Test (Test Mode 5)



6 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp, it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan Hsiang. Location map can be found on our website http://www.icertifi.com.tw.

Linkou

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No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

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If you have any suggestion, please feel free to contact us as below information

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