LTA
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http://www.ltalab.com

Dates of Tests: August 18-21, 2014
Test Report S/N: LR500121408S
Test Site : LTA CO., LTD.

EMC TEST REPORT

Model No. **HS6618U**

APPLICANT **Hanshin Information Technology Co., Ltd.**

Device Category	:	**Ultra-Wide Band (UWB)Device**
Manufacturing Description	:	**UWB Module**
Manufacturer	:	**Hanshin Information Technology Co., Ltd.**
Model name	:	**HS6618U**
Test Device Serial No.:	:	**Identical prototype**
ETSI Rule Part(s)	:	**ETSI EN 301 489-1 V1.9.2(2011.09)**
		ETSI EN 301 489-33 V1.1.1(2009.02)
Frequency Range	:	**6336 MHz ~ 7920 MHz**
Max. Output Power	:	**Max -24.89 dBm – EIRP**
Date of issue	:	**August 27, 2014**

This test report is issued under the authority of:

Dong in Youn, Technical Manager

The test was supervised by:

Ju Hong Sin, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

NVLAP LAB CODE 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri,Yangji-Myeon,Youngin-Si, Kyunggi-Do, Korea. 449-822

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Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2014-09-30	ECT accredited Lab.
RRA	KOREA	KR0049	2015-03-06	EMC accredited Lab.
FCC	U.S.A	610755	2017-04-21	FCC filing
FCC	U.S.A	649054	2015-04-17	FCC CAB
VCCI	JAPAN	R2133(10 m), C2307	2017-06-21	VCCI registration
VCCI	JAPAN	T-2009	2016-12-23	VCCI registration
VCCI	JAPAN	G-563	2015-05-28	VCCI registration
IC	CANADA	5799A-1	2015-06-21	IC filing
KOLAS	KOREA	NO.551	2017-01-08	KOLAS accredited Lab.

2. Information's about test item

2-1 Client / Manufacturer

Company name	:	Hanshin Information Technology Co.,Ltd.
Address	:	(305-510) 201, IT Venture Tower, 694 Taprip-Dong, Yuseong-Gu, Daejeon, Korea
Telephone / Facsimile	:	+82-42-933-8507 / +82-42-933-8509

2-2 Equipment Under Test (EUT)

Trade name	:	HANSHIN
Model name	:	HS6618U
Date of receipt	:	July 28, 2014
EUT condition	:	Pre-production, not damaged
Antenna type	:	PCB Antenna with Max Gain: 2.8 dBi
Frequency Range	:	6336 MHz ~ 7920 MHz
RF output power	:	Max -24.89 dBm – EIRP
Type of Modulation	:	MB-OFDM
Power Source	:	DC 3.3V

2-3 Tested Condition

Temperature	:	(21-28) ℃	Operating mode	:	UWB mode
Humidity	:	(55-59) %R.H.	Power supply	:	DC 5 V
Pressure	:	(88 –10.3) kPa			

2-4 Ancillary Equipment

Equipment	Model No.	Serial No.	Manufacturer
Printer	STYLUS C59	JF5Y020824	EPSON
NoteBook	4540S	2CE2253MKJ	HP

3. Test Report

3.1 Summary of tests

Reference	Parameter	Status (note)
I. Emission		
Radiated Emission	EN 55022:2010	C note3
Conducted Emission (DC port)	EN 55022:2010	NA
Conducted Emission (AC port)	EN 55022:2010	C
Harmonic Current Emission (AC port)	EN 61000-3-2:2006/A2:2009	NA note1
Voltage Fluctuations and Flicker (AC port)	EN 61000-3-3:2013	NA note2
Conducted Emission (Telecommunication port)	EN 55022:2010	NA
II. Immunity		
RF Electromagnetic field (80 MHz to 2.7 GHz)	EN 61000-4-3:2006/A2:2010	C
Electrostatic Discharge	EN 61000-4-2:2009	C
Fast Transients Common mode	EN 61000-4-4:2012	C
RF common mode 0,15 MHz to 80 MHz	EN 61000-4-6:2009	C
Voltage dips and Interruptions	EN 61000-4-11:2004	C
Surges, line to line and line to ground	EN 61000-4-5:2006	C
C=Complies NC=Not Complies NA=Not Applicable		

Note 1 We did not test EN61000-3-2 (Harmonic current emissions) for the **HS6618U** because equipment whose rated power is less or equal 75W don't need to be tested.

Note 2 We did not test EN 61000-3-3 (Flicker) for the **HS6618U** because of clause 6.1, this standard Predicate as follows: "Devices which produce no significant voltage dips or flicker with a certain probability have not to be tested."

Note 3 The highest internal source of an EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less. (The highest internal source of an EUT : 7.92 GHz)

Note 4 The sample was tested according to the following specification:

ETSI Standards; ETSI EN 301 489-1 V1.9.2(2011.09), ETSI EN 301 489-33 V1.1.1(2009.02)

3.2 EMISSION

3.2.1 Radiated Emission

Definition:

The test assesses the ability of ancillary equipment to limit their internal noise from being radiated from the enclosure. We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 55022:2010
Measuring Distance	:	10 m for below 1 GHz / 3 m for above 1 GHz
Measurement Frequency range	:	30 MHz – 6 000 MHz
Measurement RBW	:	120 kHz @ 10 m / 1 MHz @ 3 m
Test mode	:	UWB mode
Result	:	**Complies**

Measurement Data:

→ **Refer to the Next page** (Maximum emission configuration)

→ No other emissions were detected at a level greater than 20 dB below limit.

- The highest internal source of an EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less. (The highest internal source of an EUT : 7.92 GHz)

TEST EQUIPMENT USED: 01, 04, 06, 07, 08, 18, 19, 38, 42, 43, 59, 62

Limit:

CLASS A

Frequency Range	EN 55022 @ 10 m (Quasi-peak)
(30 – 230) MHz	40 dBµV/m
(230 – 1 000) MHz	47 dBµV/m
NOTE:	The lower limit applies at the transition frequency.

CLASS B

Frequency Range	EN 55022 @ 10 m (Quasi-peak)
(30 – 230) MHz	30 dBµV/m
(230 – 1 000) MHz	37 dBµV/m
NOTE:	The lower limit applies at the transition frequency.

CLASS A

Frequency Range	Average Limit @ 3 m (dBµV/m)	Peak limit @ 3 m (dBµV/m)
(1 000 – 3 000) MHz	56	76
(3 000 – 6 000) MHz	76	80
NOTE:	The lower limit applies at the transition frequency.	

CLASS B

Frequency Range	Average Limit @ 3 m (dBµV/m)	Peak limit @ 3 m (dBµV/m)
(1 000 – 3 000) MHz	50	70
(3 000 – 6 000) MHz	54	74
NOTE:	The lower limit applies at the transition frequency.	

TEST EQUIPMENT USED: 01, 04, 06, 07, 08, 18, 19, 38, 42, 43, 59, 62

Measurement Data : Below 1 GHz

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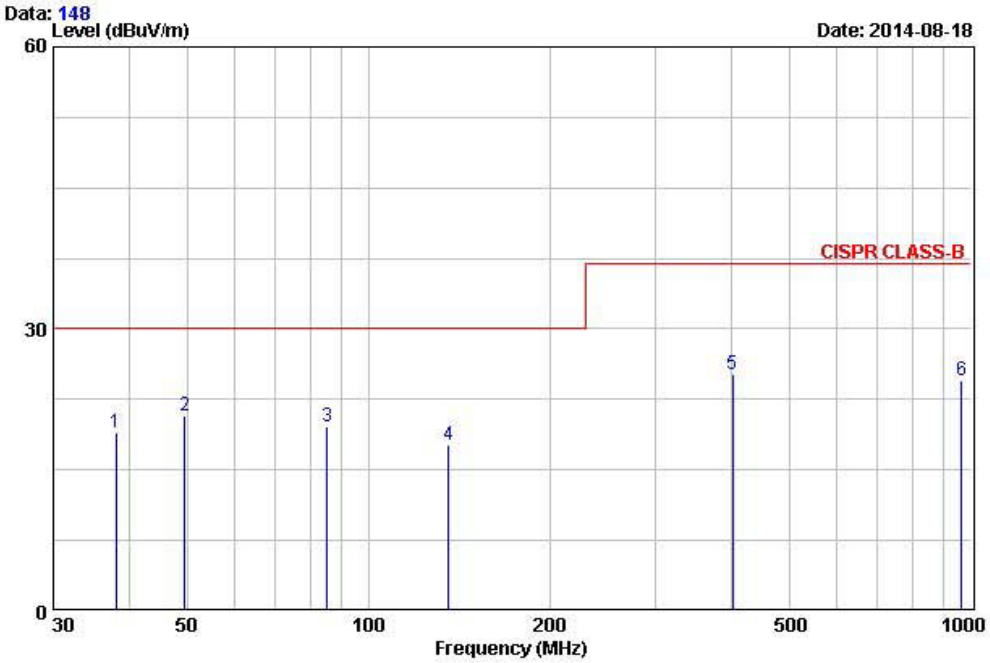
EUT/Model No.: HS6618U TEST MODE: UWM mode

Temp Humi : 28 / 59 Tested by: SIN J H



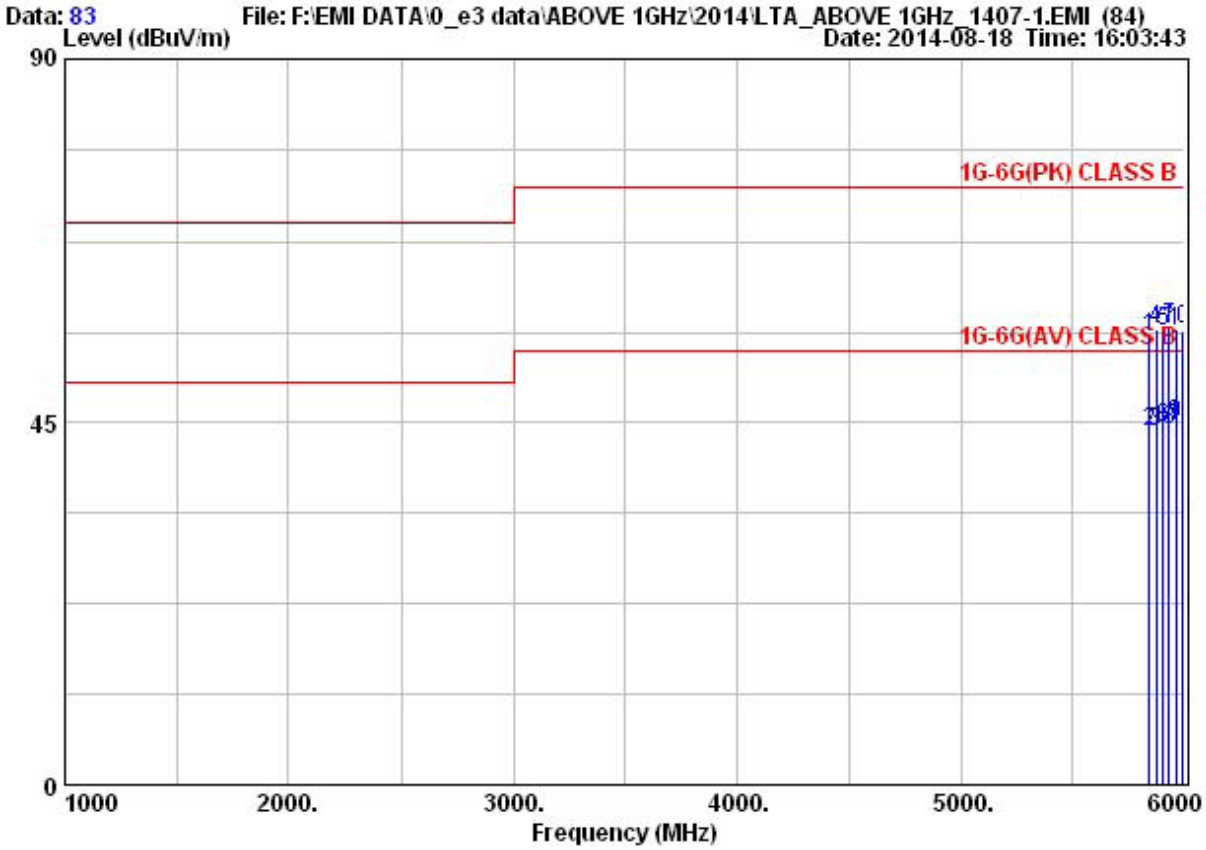
	Freq	Reading	C.F	Result	Limit QP	Margin	Height	Angle	Polarity
	MHz	dBuV/m	dB/m	dBuV/m	dBuV/m	dB	cm	deg	
1	38.17	35.20	-16.28	18.92	30.00	11.08	100	154	VERTICAL
2	49.58	36.20	-15.48	20.72	30.00	9.28	100	51	VERTICAL
3	85.40	40.20	-20.56	19.64	30.00	10.36	100	126	VERTICAL
4	135.87	32.90	-15.28	17.62	30.00	12.38	100	284	VERTICAL
5	402.54	35.30	-10.11	25.19	37.00	11.81	124	147	HORIZONTAL
6	965.40	22.80	1.73	24.53	37.00	12.47	100	89	VERTICAL

Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

Measurement Data : Above 1 GHz

EUT/Model No.: HS6618U Temp/Humi: 22 / 55

Test Mode : UWB mode Tested by: SIN J H



Manufacturer: Hanshin Information Technology Co., Ltd. Test Date Temp.: [℃] Humidity: [%] Barometric [mbar]

Model : HS6618U 2014/8/18 22 55

TEST mode : UWB mode

Freq.(MHz)	Reading(PK)	Reading(AV)	C.F	Result(PK)	Result(AV)	Limit(PK)	Limit(AV)	Margin(PK)	Margin(AV)	Height	Angle	Polarity
MHz	dBuV	dBuV	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	cm	deg	Hor/Ver
5845.2	42.2	30.4	13.56	55.76	43.96	74.0	54.0	18.24	10.04	100	114	H
5874.7	42.8	30.0	13.78	56.58	43.78			17.42	10.22	100	51	V
5904.2	42.3	30.5	13.99	56.29	44.49			17.71	9.51	100	274	V
5933.8	42.9	30.1	14.11	57.01	44.21			16.99	9.79	100	153	H
5963.4	42.7	42.5	14.22	56.92	56.72			17.08	-2.72	100	334	H
5993.0	42.1	30.3	14.33	56.43	44.63			17.57	9.37	100	175	H

3.2.2 Conducted emissions (AC Power In/Output port)

Definition:

The test assesses the ability of the EUT to limit its internal noise from being present on the AC mains Power In/Output ports.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 55022:2010
Measurement Frequency range	:	150 kHz – 30 MHz
Measurement RBW	:	9 kHz
Test mode	:	- mode
Result	:	**Not Applicable**

Measurement Data:

→ **Refer to the Next page** (Maximum emission configuration)

→ No other emissions were detected at a level greater than 20 dB below limit.

Limit: Clause 8.3.3

Limits for conducted disturbance at the mains ports of class A ITE

Frequency Range	Quasi-peak	Average
(0.15 - 0.5) MHz	79 dBµV	66 dBµV
(0.5 – 30) MHz	73 dBµV	60 dBµV
Note: The limits will decrease with the frequency logarithmically within 0.15MHz to 0.5MHz		

Limits for conducted disturbance at the mains ports of class B ITE

Frequency Range	Quasi-peak	Average
(0.15 - 0.5) MHz	(66 – 56) dBµV	(56 – 46) dBµV
(0.5 – 5) MHz	56 dBµV	46 dBµV
(5 – 30) MHz	60 dBµV	50 dBµV
Note: The limits will decrease with the frequency logarithmically within 0.15 MHz to 0.5 MHz		

TEST EQUIPMENT USED: 02, 03, 05, 22, 32, 38, 41, 43, 44, 45, 60

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15 MHz to 30 MHz for class A equipment

Frequency Range	Voltage limits		Current limits	
	Quasi-peak	Average	Quasi-peak	Average
(0.15 - 0.5) MHz	(97 − 87) dBμV	(84 − 74) dBμV	(53 − 43) dBμV	(40 − 30) dBμV
(0.5 – 30) MHz	87 dBμV	74 dBμV	43 dBμV	30 dBμV

Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$ 150/I= 44 dB)

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15 MHz to 30 MHz for class B equipment

Frequency Range	Voltage limits		Current limits	
	Quasi-peak	Average	Quasi-peak	Average
(0.15 - 0.5) MHz	(84 − 74) dBμV	(74 − 64) dBμV	(40 − 30)dBμV	(30 − 20) dBμV
(0.5 – 30) MHz	74 dBμV	64 dBμV	30 dBμV	20 dBμV

Note 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

Note 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$ 150/I= 44 dB)

TEST EQUIPMENT USED: 02, 03, 05, 22, 32, 38, 41, 43, 44, 45, 60

3.2.3 Harmonic Current (AC power input port)

Definition:

This part deals with the Limitation of harmonic currents injected into the public supply system.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-3-2:2006/A2:2009
Test mode	:	-
Rated power	:	- W max
Result	:	**Not Applicable**

Measurement Data:

Note : We did not test EN61000-3-2 (Harmonic current emissions) for the **HS6618U** because equipment whose rated power is less or equal 75W don't need to be tested.

TEST EQUIPMENT USED: 33, 34, 38, 56, 60

3.2.4 Voltage Variation and Flicking (AC power input port)

Definition:

This section is concerned with the limitation of voltage fluctuations and flicker impressed on the public low-voltage system.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-3-3:2013
Test mode	:	-
Result	:	**Not Applicable**

Measurement Data:

Note : We did not test EN 61000-3-3 (Flicker) for the **HS6618U** because of clause 6.1, this standard Predicate as follows: “Devices which produce no significant voltage dips or flicker with a certain probability have not to be tested.”

TEST EQUIPMENT USED: 33, 34, 38, 56, 60

3.3 IMMUNITY

3.3.1 Radio Frequency Electromagnetic field (80 MHz to 1 GHz and 1.4 GHz to 2.7 GHz)

Definition:

The test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic field disturbance.

Test method	:	EN 61000-4-3:2006/A2:2010
Frequency range	:	80 MHz to 1 GHz and 1.4 GHz to 2.7 GHz
Test level	:	3 V/m (measured unmodulated)
Amplitude Modulation	:	AM, 80 %, 1 kHz Audio signal
Step size	:	1 % of fundamental
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A)**

Measurement Data:

Pol	Side	Remark
Horizontal	Front	No reaction recognized
	Left	No reaction recognized
	Rear	No reaction recognized
	Right	No reaction recognized
Vertical	Front	No reaction recognized
	Left	No reaction recognized
	Rear	No reaction recognized
	Right	No reaction recognized

TEST EQUIPMENT USED: 19, 25, 26, 27, 28, 29, 38, 55, 59

3.3.2 Electrostatic Discharge

Definition:

The test assesses the ability of the EUT to operate as intended in the event of an electrostatic discharge.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-4-2:2009
Temperature / Humidity / Pressure	:	22 ℃ / 55 %RH / 99.7 kPa
Discharge Impedance	:	(330 ±10%) Ω / (150 ±10%) pF
Type of Discharge (air discharge)	:	± 2 kV, ± 4 kV, ± 8 kV
Type of Discharge (contact discharge)	:	± 2 kV, ± 4 kV
Polarity of Output Voltage	:	Positive and Negative
Number of discharges at each point	:	10 of each polarity
Discharge Repetition on Rate	:	1 / sec
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A)**

Measurement Data:

1. Indirect Discharge

No.	Position	Kind of Discharge	Results	Remarks
①	HCP	Contact	Complies	No reaction recognized
②	VCP	Contact	Complies	No reaction recognized

2. Direct Discharge

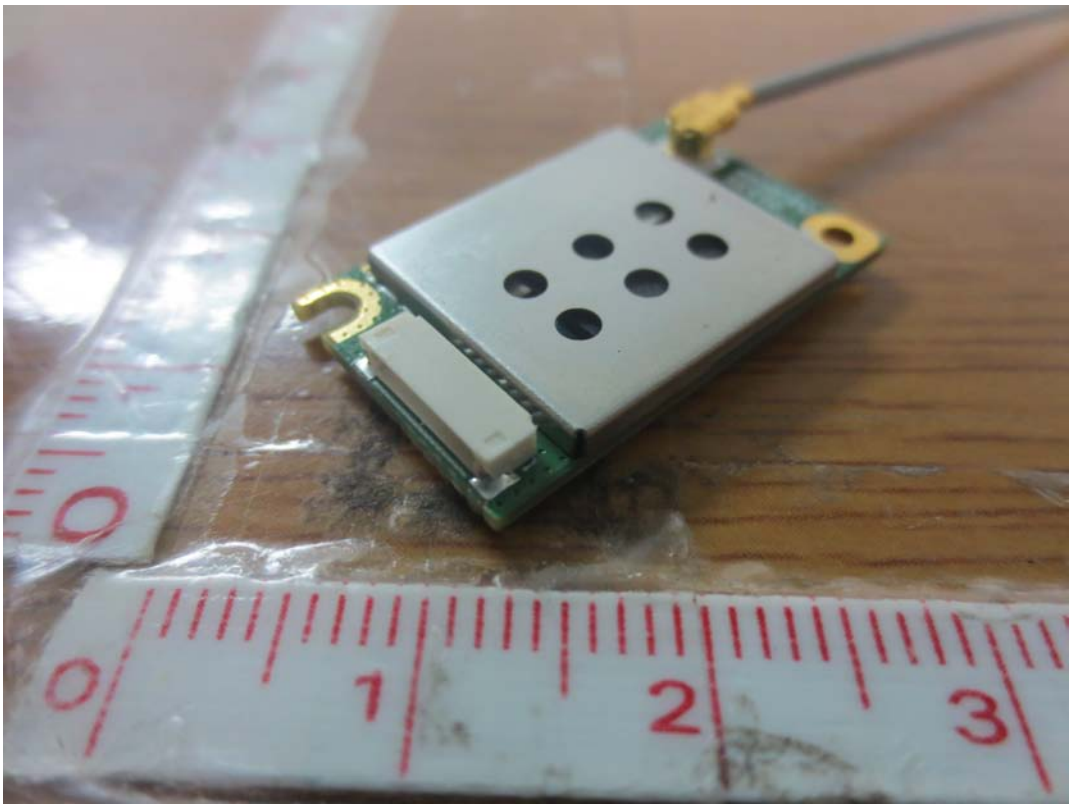
Position No.	Position	Kind of Discharge	Result	Remarks
-	-	-	-	-

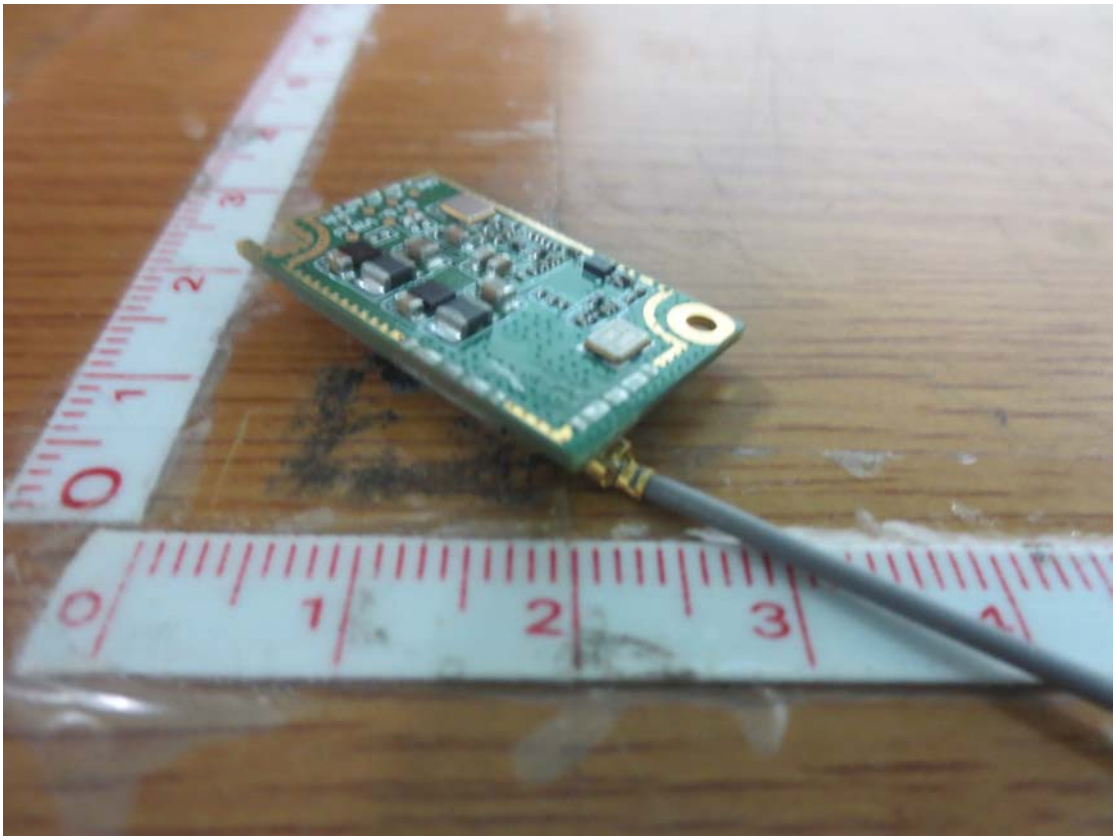
TEST EQUIPMENT USED: 10, 38, 61

Air discharge

Contact discharge

ESD TEST POINT





3.3.3 Electric Fast Transient Pulse Group Immunity

Definition:

The test assesses the ability of the EUT to operate as intended in the event of fast transients presence on one of the input/output ports.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-4-4:2012
Cable length	:	< 3 m
Test level	:	0.5 kV (Signal / Communication / Control ports / DC power input port) 1.0 kV (AC power input port)
Polarity	:	Negative/ Positive
Repetition frequency	:	5 kHz
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A)**

Measurement Data:

AC power Line	Test level	Result	Remarks
L - N	+ 1 kV	Complies	No reaction recognized
	- 1 kV	Complies	No reaction recognized

Signal Line	Test level	Result	Remarks
-	-	–	-
	-	–	-

TEST EQUIPMENT USED: 12, 38, 58, 61, 63

3.3.4 Radio Frequency, common mode

Definition:

The test assesses the ability of the EUT to operate as intended in the presence of a radio frequency electromagnetic disturbance on the input/output ports.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-4-6:2009
Cable length	:	< 3 m
Frequency range	:	0.15 MHz – 80 MHz
Test level	:	3 Vrms unmodulated
Amplitude Modulation	:	AM, 80 %, 1 kHz Audio signal
Step size	:	1 % of fundamental.
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A)**

Measurement Data:

Port	Test mode	Result	Remarks
AC power	UWB mode	Complies	No reaction recognized

TEST EQUIPMENT USED: 29, 30, 31, 38, 46, 54, 60

3.3.5 Voltage Dips and Interruption

Definition:

The test assesses the ability of the EUT to operate as intended in the event of voltage dips and interruptions present on the AC mains power input ports.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-4-11:2004
Voltage dip	:	0 % residual voltage for 0.5 cycle and 1 cycle 70 % residual voltage for 25 cycle
Voltage Interruption	:	0 % residual voltage for 250 cycle
Ut	:	230 Vac, 50Hz
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A/B)**

Measurement Data:

Test Level %Ut	Voltage droop and interruptions %Ut	Duration of Reduction (cycle)	Result	Remarks
0	>95	0.5	Complies	No reaction recognized
0	>95	1	Complies	No reaction recognized
70	30	25	Complies	No reaction recognized
0	>95	250	Complies	During :EUT power off After : Reboot by user Operation

Performance Criteria:

- Criteria for voltage dips of 0.5,1 cycles duration: B.

- Criteria for voltage dips of 25 cycle and voltage interruptions of 250 cycle duration: C.

TEST EQUIPMENT USED: 11, 38, 47, 57, 61

3.3.6 Surge

Definition:

The test assesses the ability of the EUT to operate as intended in the event of surge presence on the AC main power input ports.

We were performed the test according to LTA procedure LTA-QI-04.

Test method	:	EN 61000-4-5:2006
Test level	:	1.0 kV (line to line) 2.0 kV (line to ground)
Polarity	:	Negative/ Positive
Wave shape	:	1,2 / 50 μs pulse
Number of surges	:	5 (at each phase)
Test mode	:	UWB mode
Result	:	**Complies** (**Performance Criteria: A)**

Measurement Data:

Phase	Line	level	Result	Phase	Line	level	Result
0°	Line(L) to line(N)	+ 1 kV	Complies	90°	Line(L) to line(N)	+ 1 kV	Complies
		- 1 kV	Complies			- 1 kV	Complies
	Line(L) to ground(PE)	+ 2 kV	Complies		Line(L) to ground(PE)	+ 2 kV	Complies
		- 2 kV	Complies			- 2 kV	Complies
	Line(N) to ground(PE)	+ 2 kV	Complies		Line(N) to ground(PE)	+ 2 kV	Complies
		- 2 kV	Complies			- 2 kV	Complies
180°	Line(L) to line(N)	+ 1 kV	Complies	270°	Line(L) to line(N)	+ 1 kV	Complies
		- 1 kV	Complies			- 1 kV	Complies
	Line(L) to ground(PE)	+ 2 kV	Complies		Line(L) to ground(PE)	+ 2 kV	Complies
		- 2 kV	Complies			- 2 kV	Complies
	Line(N) to ground(PE)	+ 2 kV	Complies		Line(N) to ground(PE)	+ 2 kV	Complies
		- 2 kV	Complies			- 2 kV	Complies

TEST EQUIPMENT USED: 14, 15, 16, 40, 52, 53, 54, 55, 56, 57, 61

APPENDIX A

PERFORMANCE CRITERIA FOR IMMUNITY

The performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

Table 1: Performance criteria

Criteria	During	After test
A	Shall operate as intended with a permissible degradation of performance (see note 1) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance (see notes 1 and 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 or after 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: After the test no change of actual operating data or user retrievable data is allowed.

Performance criteria for Continuous phenomena applied to Transmitters (CT)

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Transmitters (TT)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Continuous phenomena applied to Receivers (CR)

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

Performance criteria for Transient phenomena applied to Receivers (TR)

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

APPENDIX B

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment are identified by the Test Laboratory.

	Description	Model No.	Serial No.	Manufacturer	Interval	LAST Cal.
1	EMI TEST Receiver	ESCI7	100722	R&S	1 year	Sep-13
2	Two-Line V-Network <MAIN>	ESH3-Z5	893045/017	R&S	1 year	Apr-14
3	LISN <SUB>	KNW-407	8-1430-1	Kyoritsu	1 year	Sep-13
4	RF Amplifier(-1.3GHz)	8447D OPT 010	2944A07684	HP	1 year	Sep-13
5	Test Receiver(-30MHz)	ESHS10	828404/009	R&S	1 year	Mar-14
6	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	May-13
7	Log.-Per. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	2 year	Apr-13
8	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	2 year	Apr-13
9	Spectrum Analyzer (-2.9GHz)	8594E	3624A03313	HP	2 year	Mar-12
10	ESD Simulator	ESS-100L	6089C1173	NoiseKen	1 year	Sep-13
11	Modula System	MODULA6100	34395	SCHAFFNER	1 year	Sep-13
12	EFT Clamp	CDN 8015	21240	SCHAFFNER	1 year	Sep-13
13	Lightning Surge Simulator	LSS-6030	LSS02X0153	NOISEKEN	1 year	Sep-13
14	Signal line Coupling Network	CDN 117	20985	SCHAFFNER	N/A	N/A
15	Signal line Coupling Network	CDN 118	20082	SCHAFFNER	N/A	N/A
16	Induction Coil	INA 702	132	SCHAFFNER	1 year	Apr-14
17	ELF Magnetic Field meter	4080	316	SYPRIS	1 year	Jun-14
18	HORN ANTENNA	3115	00114105	ETS	2 year	May-13
19	Amplifier (1 – 26.5 GHz)	8449B	3008A02126	Agilent	1 year	Mar-14
20	ABSORBING CLAMP	MDS21	3665	SCHWARZBECK	1 year	Sep-13
21	EFT software	STANDARD MODULE 2 ST-017	1.01	(C)NOISE LABORATORY CO.,LTD	N/A	N/A
22	One-Line V-NETWORK	ESH3-Z6	100378	R&S	1 year	Sep-13
23	Signal generator	SML03	103026/0013	R&S	1 year	Mar-14
24	NRVD POWER METER	NRVD	101689	R&S	1 year	Mar-14
25	Electric Field Sensor	HI-6005	79822	ETS-LINDGREN	1 year	Mar-14
26	Power Amplifier	CBA9433	T43646	SCHAFFNER	N/A	N/A
27	Power Amplifier	HD14919-25	1025	HD Communication Corp.	N/A	N/A
28	Log.-Per.Antenna (70M - 1.8GHz)	VULP 9118E	9118E-812	SCHWARZBECK	2 year	Apr-14
29	RF-Power-Amplifier	FLL75A	1033	FRANKONIA	N/A	N/A
30	CDN (M1,2,3 etc)	TSCDN	-	F.C.C	1 year	Sep-13
31	EM INJECTION CLAMP (10K - 1GHz)	TSIC-23	529	F.C.C	1 year	May-14
32	EZ-17 RF-CURRENT PROBE	EZ-17	100508	ROHDE&SCHWARZ	1 year	Jan-13

	Description	Model No.	Serial No.	Manufacturer	Interval	LAST Cal.
33	PM6000 Universal Power Analyzer	PM6000	100006700108	Voltech Instruments	2 year	Apr-14
34	Reference Impedance Network	ES4152	9074424	NF Corp.	2 year	Mar-13
35	Signal Generator	8648C	3623A02597	HP	1 year	Mar-14
36	Attenuator (3dB)	8491A	37822	HP	2 year	Sep-12
37	Attenuator (10dB)	8491A	63196	HP	2 year	Sep-12
38	Hygro-Thermograph	THB-36	0041557-01	ISUZU	1 year	Oct-13
39	Mini-Circuits Splitter	ZFSC-2-2500	SF617800326	Mini-Circuits	N/A	N/A
40	Mini-Circuits Splitter	ZFM-150	15542	Mini-Circuits	N/A	N/A
41	Pulse Limiter	ESH3-Z2	100710	R&S	1 year	Mar-14
42	RF AMPLIFIER(-1.3GHz)	8447D OPT 010	2944A07684	HP	1 year	Sep-13
43	e3 software	e3	5.5.201a	AUDIX	-	-
44	Impedance Stabilization Network	ISN T800	27109	TESEQ	1 year	Jan-13
45	Impedance Stabilization Network	ENY81-CA6	101565	R&S	1 year	Jan-13
46	Decoupling clamp Luthi	FTC40X15E	5637	Luthi	N/A	N/A
47	STEP TRANSFORMER	INA6502	34270	SCHAFFNER	1 year	Sep-13
48	R-BOX (4x100OHM)	INA 172	SL403-109	SCHAFFNER	N/A	N/A
49	R-BOX (4x160OHM)	INA 175	SL403-474	SCHAFFNER	N/A	N/A
50	Coupling Accessory with 0.1uF (5ea)	INA 171	SL403-108	SCHAFFNER	N/A	N/A
51	Coupling Accessory (5ea)	INA 170	SL403-107	SCHAFFNER	N/A	N/A
52	Coupling Accessory 0.5uF (1ea)	INA 174	SL403-209	SCHAFFNER	N/A	N/A
53	Short Circuit Plug	INA 173	403-110	SCHAFFNER	N/A	N/A
54	CS software	TEPTO-S6	2.6.8	TSJ corp.	N/A	N/A
55	RS software	TEPTO-RS	4.7.7	TSJ corp.	N/A	N/A
56	Harmonic-Fliker software	PM6000	1.03.02	Voltech	N/A	N/A
57	EMS software	WIN Modula	2.31c	SCHAFFNER	N/A	N/A
58	EFT Simulator	FNS-AX2	4000B01332	NoiseKen	1 year	Sep-13
59	DIGITAL THERMO HYGROMETER	DHT-1	12103	DYS	1 year	Oct-13
60	DIGITAL THERMO HYGROMETER	DHT-1	12104	DYS	1 year	Oct-13
61	DIGITAL THERMO HYGROMETER	DHT-1	12105	DYS	1 year	Oct-13
62	DIGITAL THERMO HYGROMETER	DHT-1	12106	DYS	1 year	Oct-13

APPENDIX C

Measurement Uncertainty

1. Conducted Emission

2. Radiated Emission

1. Conducted Emission

Input Quantity	Probability Distribution	Probability Distribution (dB)	Standard
		9 kHz – 30 MHz	
Cable loss(RG400)	Standard Deviation(SD)	± 0.061	10th measurement
Receiver corrections; -Sine wave voltage -Pulse amplitude response -Pulse repetition rate response	 Rectangular (√ 3) Rectangular (√ 3) Rectangular (√ 3)	 ± 0.17 ± 0.02 ± 0.58	 Cal. Report Cal. Report Cal. Report
LISN corrections (ENV216) ; -Voltage division factor	Normal (k = 2)	± 0.09	Cal. Report
Mismatch ; - Receiver VRC* : Γi = 0.09 -LISN VRC :Γg = 0.14(150kHz) = 0.05(30MHz) - Uncertainty: 20log(1± Γi Γg)	U-type(√ 2)	± 0.89	Cal. Report
System Repeatability	Standard Deviation(SD)	± 0.28	10th measurement
Combined measurement uncertainty Uc(y)	Normal	+ 0.73 - 0.73	
Expended measurement uncertainty (95.%,Confidence level,k = 2)dB	Normal(k = 2)	+ 1.46 - 1.46	

2.Below 1 GHz Radiated Emission

Input Quantity	Probability Distribution	Probability Distribution (dB)		Standard
		Trilog		
		3m	10m	
Antenna Factor (VULB 9160)	Normal (k = 2)	30 M – 1 GHz ± 2.00	30 M – 1 GHz ± 2.00	ANT Cal. uncertainty
Cable loss (HFB-5010/HFC12D)	Standard Deviation(SD)	± 0.14	± 0.14	10th measurement
Receiver corrections; -Sine Wave Voltage -Pulse amplitude response -Pulse repetition rate response	 Normal (k = 2) Normal (k = 2) Rectangular(√ 3)	 ± 0.17 ± 0.58 ± 1.50	 ± 0.17 ± 0.58 ± 1.50	 Cal. Report Cal. Report CISPR16-4-2
Antenna Directivity	Rectangular(√ 3)	± 1.00	± 1.00	CISPR16-4-2
AF Height Dependence	Rectangular(√ 3)	± 0.10	± 0.10	CISPR16-4-2
Phase Center Location	Rectangular(√ 3)	± 0.20	± 0.20	CISPR16-4-2
Separation Distance	Rectangular(√ 3)	± 0.30	± 0.30	CISPR16-4-2
Uncertainty of Site	Triangular(√ 6)	± 2.97	± 2.97	NSA
Mismatch ; - Receiver VRC* : Γi = 0.09 -ANT. VRC : Γg = 0.09 - Uncertainty: 20log(1± Γi Γg)	U-type (√ 2)	± 0.54	± 0.54	CISPR16-4-2
Pre-amp.	Normal (k = 2)	± 0.14	± 0.14	Cal. Report
System Repeatability	Standard Deviation(SD)	± 0.60	± 0.60	10th measurement
Combined measurement uncertainty Uc(y)	Normal	+ 1.97 - 1.97	+ 1.97 - 1.97	
Expended measurement uncertainty (95%,Confidence level,k=2)dB	Normal(k = 2)	30 M – 1 GHz + 3.94 - 3.94	30 M – 1 GHz + 3.94 - 3.94	

Note:VRC(Voltage Reflection Coefficient)

3. Above 1 GHz Radiated Emission

Input Quantity	Probability Distribution	Probability Distribution (dB)	Standard
		HORN	
Antenna Factor (ETS 3115)	Normal (k=2) (normal)	1 GHz - 6 GHz ± 1.00	ANT Cal. uncertainty
Cable loss (SUHNER MULTIFLEX microwave cables)	Standard Deviation(SD)	± 0.32	10th measurement
Receiver corrections; -Sine Wave Voltage -Pulse amplitude response -Pulse repetition rate response	 Normal (k = 2) Normal (k = 2) Rectangular(√ 3)	 ± 0.17 ± 0.58 ± 1.50	 Cal. Report Cal. Report CISPR16-4-2
Antenna Directivity	Rectangular(√ 3)	± 1.00	CISPR16-4-2
AF Height Dependence	Rectangular(√ 3)	± 0.10	CISPR16-4-2
Phase Center Location	Rectangular(√ 3)	± 0.20	CISPR16-4-2
Separation Distance	Rectangular(√ 3)	± 0.30	CISPR16-4-2
Uncertainty of Site	Standard Deviation(SD)	± 0.13	SVSWR 10th measurement
Mismatch ; - Receiver VRC* : Γi = 0.09 -ANT. VRC : Γg = 0.09 - Uncertainty: 20log(1± Γi Γg)	U-type (√ 2)	± 0.54	CISPR16-4-2
Pre-amp.	Normal (k = 2)	± 0.60	Cal. Report
System Repeatability	Standard Deviation(SD)	± 0.34	10th measurement
Combined measurement uncertainty Uc(y)	Normal	+ 1.73 - 1.73	
Expended measurement uncertainty (95%,Confidence level,k=2)dB	Normal(k = 2)	1 GHz - 6 GHz + 3.46 - 3.46	

Note:VRC(Voltage Reflection Coefficient)

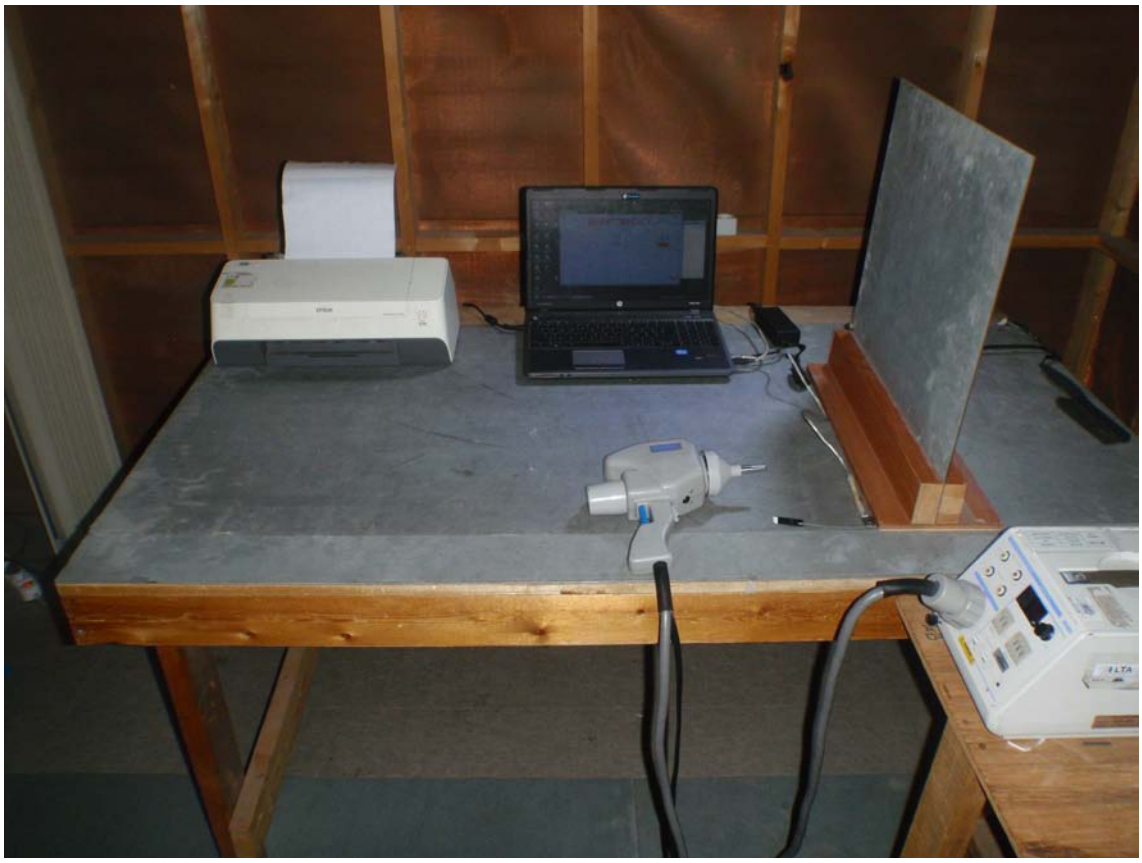
APPENDIX D

PHOTOGRAPHS

Radiated emission (Maximum emission configuration) – Below 1GHz

Radiated emission (Maximum emission configuration) – Above 1GHz

Electrostatic Discharge



Radio Frequency Electromagnetic field

Fast Transients Common mode

Radio Frequency common mode

Voltage dips and Interruptions

Surges