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Dates of Tests: July 28 ~ August 29, 2014
Test Report S/N: LR500121409C
Test Site : LTA CO., LTD.

Model No.

HS6618U

APPLICANT

Hanshin Information Technology Co.,Ltd.

Device Category	:	Ultra Wideband Transmitter (UWB)
Manufacturing Description	:	UWB Module
Manufacturer	:	Hanshin Information Technology Co.,Ltd.
Model name	:	HS6618U
Test Device Serial No.:	:	Identical prototype
Rule Part(s)	:	ETSI EN 302 065 V1.2.1(2010-10)
Frequency Range	:	6336 MHz ~ 7920 MHz
Max. Output Power	:	Max -24.89 dBm – EIRP
Data of issue	:	September 1, 2014

This test report is issued under the authority of:

Jae-Ho Lee, Manager

The test was supervised by:

Ha-Ram Lee, 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 Government.

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1. General information

1-1 Test Performed

Company name : LTA Co., Ltd.
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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(10m), 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 about test item

2-1 Applicant & Manufacturer

Company name : Hanshin Information Technology Co.,Ltd.
 Address : (305-510) 201, IT Venture Tower, 694 Taprip-Dong, Yuseong-Gu, Daejeon, Korea
 Tel / Fax : TEL No : +82-42-933-8507 / FAX No : +82-42-933-8509

2-2 Equipment Under Test (EUT)

Trade name : 
 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 frequency

Band Group	Frequency range (MHz)
BG3	6336 ~ 7920

2-4 Test conditions

Test Conditions	Temperature(℃)	Voltage(V)	
Normal	+20	3.30	
TLVL	-20	2.97	
TLVH	-20	3.63	
THVL	+55	2.97	
THVH	+55	3.63	

Note 1: N : Normal L : Lowest H : Highest T : Temperature V : Voltage

3. Test Report

3.1 Summary of tests

Reference EN 302 065	Parameter	Limit	Status
Transmitter Requirements			
4.1.1	Operating bandwidth	refer to sub clause 4.1.1.3	C
4.1.2	Maximum value of mean power spectral density	refer to sub clause 4.1.2.3	C
4.1.3	Maximum value of peak power	refer to sub clause 4.1.3.3	C
4.1.4	Transmit Power Control	refer to sub clause 4.1.4.3	NA
4.1.5	Receiver spurious emissions	refer to sub clause 4.1.5.3	NA
4.1.6	Detect-And-Avoid (DAA)	refer to sub clause 4.1.6.3	NA
4.1.7	Low Duty Cycle (LDC)	refer to sub clause 4.1.7.3	NA
4.1.8	Equivalent mitigation techniques	refer to sub clause 4.1.8	NA

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

Note 3: There is no DAA and TPC function in HS6618U.

The sample was tested according to the following specification:

ETSI EN 302 065 V1.2.1(2010-10)

3.2 Transmitter requirements

3.2.1 Operating bandwidth

Definition:

The width of a frequency band such that, below the lower and above the upper frequency limit, the mean powers emitted are each equal to a percentage of 5% of the total mean power of a given emission.

Test method : EN 302 065 clause 5.8.4
Assigned Frequency band : 6000 ~ 9000 MHz
Result : **Complies**

Measurement Data:

Band Group	Frequency range (MHz)	Test Results (MHz)
BG3	6336 ~ 7920	1512.9
Measurement uncertainty		$\pm 1 \times 10^{-5}$

LIMIT: Clause 4.1.1.3

The operating bandwidth shall be greater than 50 MHz (at -13 dB relative to the maximum spectral power density).

3.2.2 Maximum value of mean power spectral density

Definition:

The maximum mean power spectral density (specified as e.i.r.p.) of the radio device under test, at a particular frequency, is the average power per unit bandwidth (centred on that frequency) radiated in the direction of the maximum level under the specified conditions of measurement.

Test method : EN 302 065 clause 5.8.2

Assigned Frequency band : 6000 ~ 9000 MHz

Result : **Complies**

Measurement Data:

Band Group	Frequency range (MHz)	Test Results (GHz)
		$6 < f \leq 8,5$
BG3	6336 ~ 7920	-56.72
Measurement uncertainty		$\pm 6\text{dB}$

LIMIT: Clause 4.1.2.3

Frequency (GHz)	Maximum value of mean power spectral density (dBm/MHz)	
	Devices with additional mitigation (e.g. DAA, LDC)	Devices without additional mitigations
$f \leq 1,6$	-90	
$1,6 < f \leq 2,7$	-85	
$2,7 < f \leq 3,1$	-70	
$3,1 < f \leq 3,4$	$\leq -41,3$ (see notes 1, 2 and 3)	-70
$3,4 < f \leq 3,8$	$\leq -41,3$ (see notes 1, 2 and 3)	-80
$3,8 < f \leq 4,8$	$\leq -41,3$ (see notes 1, 2 and 3)	-70
$4,8 < f \leq 6$	-70	
$6 < f \leq 8,5$	<u>$\leq -41,3$ (see note 4)</u>	
$8,5 < f \leq 9$	$\leq -41,3$ (see notes 5 and 6)	-65
$9 < f \leq 10,6$	-65	
$f > 10,6$	-85	

NOTE 1: When DAA is implemented, equipment shall implement the whole frequency range from 3,1 GHz to 4,8 GHz. Radio devices shall be capable of selecting an operating channel anywhere within the band 3,1 GHz to 4,8 GHz.

NOTE 2: LDC or DAA is required (see clause 4.1.6 or 4.1.7).

NOTE 3: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of LDC or combination of TPC and DAA. TPC shall have a range of 12 dB with respect to the maximum value of mean power spectral density. If only DAA is implemented then the following applies: $-3,1 \text{ GHz to } 4,8 \text{ GHz} \leq -53,3 \text{ dBm/MHz}$.

NOTE 4: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of LDC or Transmit Power Control (TPC). TPC shall have a range of 12 dB with respect to the maximum value of mean power spectral density. If TPC or LDC is not implemented then the following applies:

$-6 \text{ GHz to } 8,5 \text{ GHz} \leq -53,3 \text{ dBm/MHz}$

NOTE 5: If DAA is not implemented then the following applies: $-8,5 \text{ GHz to } 9 \text{ GHz} \leq -65 \text{ dBm/MHz}$.

NOTE 6: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of either DAA and LDC or DAA and TPC. TPC shall have a range of 12 dB with respect to the maximum value of mean power spectral density. If only DAA is implemented then the following applies: $8,5 \text{ GHz to } 9 \text{ GHz} \leq -53,3 \text{ dBm/MHz}$.

3.2.3 Maximum value of peak power

Definition:

The peak power specified as e.i.r.p. contained within a 50 MHz bandwidth at the frequency at which the highest mean radiated power occurs, radiated in the direction of the maximum level under the specified conditions of measurement.

Test method : EN 302 065 clause 5.8.3

Assigned Frequency band : 6000 ~ 9000 MHz

Result : **Complies**

Measurement Data:

Band Group	Frequency range (MHz)	Test Results (GHz)
		$6 < f \leq 8,5$
BG3	6336 ~ 7920	-24.89
Measurement uncertainty		$\pm 6\text{dB}$

LIMIT: Clause 4.1.3.3

Frequency (GHz)	Maximum peak power(dBm, measured in 50 MHz)	
	Devices with additional mitigation (e.g. DAA, LDC)	Devices without additional mitigations
$f \leq 1,6$	-50	
$1,6 < f \leq 2,7$	-45	
$2,7 < f \leq 3,1$	-36	
$3,1 < f \leq 3,4$	≤ 0 (see notes 1, 2 and 3)	-36
$3,4 < f \leq 3,8$	≤ 0 (see notes 1, 2 and 3)	-40
$3,8 < f \leq 4,8$	≤ 0 (see notes 1, 2 and 3)	-30
$4,8 < f \leq 6$	-30	
$6 < f \leq 8,5$	≤ 0 (see note 4)	
$8,5 < f \leq 9$	≤ 0 (see notes 5 and 6)	-25
$9 < f \leq 10,6$	-25	
$f > 10,6$	-45	

NOTE 1: When DAA is implemented, equipment shall implement the whole frequency range from 3,1 GHz to 4,8 GHz. Radio devices shall be capable of selecting an operating channel anywhere within the band 3,1 to 4,8 GHz.

NOTE 2: LDC or DAA is required (see clause 4.1.6 or 4.1.7).

NOTE 3: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of LDC or combination of TPC and DAA. TPC shall have a range of 12 dB with respect to the maximum value of peak power. If only DAA is implemented then the following applies: $-3,1 \text{ GHz to } 4,8 \text{ GHz} \leq -12 \text{ dBm}$, measured in 50 MHz.

NOTE 4: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of LDC or Transmit Power Control (TPC). TPC shall have a range of 12 dB with respect to the maximum value of peak power. If TPC or LDC is not implemented then the following applies:

$-6 \text{ GHz to } 8,5 \text{ GHz} \leq -12 \text{ dBm}$, measured in 50 MHz.

NOTE 5: If DAA is not implemented then the following applies: $-8,5 \text{ GHz to } 9 \text{ GHz} \leq -25 \text{ dBm}$, measured in 50 MHz.

NOTE 6: In case of radio devices installed in road and rail vehicles, operation is subject to the implementation of DAA and LDC or DAA and TPC. TPC shall have a range of 12 dB with respect to the maximum value of peak power. If only DAA is implemented then the following applies: $-8,5 \text{ GHz to } 9 \text{ GHz} \leq -12 \text{ dBm}$, measured in 50 MHz.

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Interval	Last Cal. Date
1	Signal Analyzer (9kHz~30GHz)	FSV-30	100757	R&S	1 year	2014-01-16
2	Signal Generator (~3.2GHz)	8648C	3623A02597	HP	1 year	2014-03-25
3	SYNTHESIZED CW GENERATOR	83711B	US34490456	HP	1 year	2014-03-25
4	Attenuator (3dB)	8491A	37822	HP	1 year	2014-09-16
5	Attenuator (10dB)	8491A	63196	HP	1 year	2014-09-16
6	Test Receiver (~30MHz)	ESHS10	828404/009	R&S	1 year	2014-03-25
7	EMI Test Receiver (~7GHz)	ESCI7	100722	R&S	1 year	2014-09-16
8	RF Amplifier (~1.3GHz)	8447D OPT 010	2944A07684	HP	1 year	2014-09-16
9	RF Amplifier (1~26.5GHz)	8449B	3008A02126	HP	1 year	2014-03-25
10	Horn Antenna (1~18GHz)	3115	00114105	ETS	2 year	2013-05-13
11	DRG Horn (Small)	3116B	81109	ETS-Lindgren	2 year	2014-02-26
12	DRG Horn (Small)	3116B	133350	ETS-Lindgren	2 year	2014-02-26
13	TRILOG Antenna	VULB 9160	9160-3237	SCHWARZBECK	2 year	2013-05-03
14	Temp.Humidity Data Logger	SK-L200TH II A	00801	SATO	1 year	2014-03-26
15	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-	-
16	Power Divider	11636A	06243	HP	1 year	2014-09-16
17	DC Power Supply	6674A	3637A01657	Agilent	-	-
18	Frequency Counter	5342A	2826A12411	HP	1 year	2014-03-25
19	Power Meter	EPM-441A	GB32481702	HP	1 year	2014-03-25
20	Power Sensor	8481A	3318A99464	HP	1 year	2014-01-17
21	Audio Analyzer	8903B	3729A18901	HP	1 year	2014-09-15
22	Modulation Analyzer	8901B	3749A05878	HP	1 year	2014-09-15
23	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	1 year	2014-09-16
24	Stop Watch	HS-3	812Q08R	CASIO	1 year	2014-04-03
25	LISN	KNW-407	8-1430-1	Kyoritsu	1 year	2014-09-16
26	Two-Lime V-Network	ESH3-Z5	893045/017	R&S	1 year	2014-03-26
27	UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	106243	R&S	1 year	2014-07-11
28	Highpass Filter	WHKX1.5/15G-10SS	74	Wainwright Instruments	-	-
29	Highpass Filter	WHKX3.0/18G-10SS	118	Wainwright Instruments	-	-
30	Active Loop Antenna	FMZB1519	1519-031	SCHWARZBECK	1 year	2014-01-07
31	OSP120 BASE UNIT	OSP120	100859	R&S	1 year	2014-08-20
32	Signal Generator(100kHz~40GHz)	SMB100A03	177621	R&S	1 year	2014-08-20
33	Signal Analyzer (10Hz~40GHz)	FSV40	101367	R&S	1 year	2014-08-20