



FCC RF Test Report

APPLICANT : Lyve Minds, Inc.
EQUIPMENT : Set Top Box
BRAND NAME : Lyve
MODEL NAME : HAN01
MARKETING NAME : Lyve Studio
FCC ID : 2ABQW-HAN
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

The product was received on Sep. 15, 2014 and testing was completed on Sep. 24, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION.....	5
1.1 Applicant	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test	5
1.4 Product Specification subjective to this standard	5
1.5 Modification of EUT	6
1.6 Testing Location	6
1.7 Applicable Standards.....	6
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST.....	7
2.1 Descriptions of Test Mode	7
2.2 Test Mode	8
2.3 Connection Diagram of Test System.....	8
2.4 Support Unit used in test configuration and system	9
2.5 EUT Operation Test Setup	9
3 TEST RESULT	10
3.1 Radiated Band Edges and Spurious Emission Measurement	10
3.2 Antenna Requirements	16
4 LIST OF MEASURING EQUIPMENT.....	17
5 UNCERTAINTY OF EVALUATION.....	18

APPENDIX A. RADIATED SPURIOUS EMISSION

APPENDIX B. SETUP PHOTOGRAPHS



REVISION HISTORY



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
-	15.247(a)(1)	RSS-210 A8.4(2)	Number of Channels	$\geq 15\text{Chs}$	Not Performed	Please refer to Sporton Report No. : FR421348A
-	15.247(a)(1)	RSS-210 A8.1(b)	Hopping Channel Separation	$\geq 2/3 \text{ of } 20\text{dB BW}$	Not Performed	Please refer to Sporton Report No. : FR421348A
-	15.247(a)(1)	RSS-210 A8.1(d)	Dwell Time of Each Channel	$\leq 0.4\text{sec in } 31.6\text{sec period}$	Not Performed	Please refer to Sporton Report No. : FR421348A
-	15.247(a)(1)	RSS-210 A8.1(a)	20dB Bandwidth	NA	Not Performed	Please refer to Sporton Report No. : FR421348A
-	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	$\leq 125 \text{ mW}$	Pass	-
-	15.247(d)	RSS-210 A8.5	Conducted Band Edges	$\leq 20\text{dBc}$	Not Performed	Please refer to Sporton Report No. : FR421348A
-	15.247(d)	RSS-210 A8.5	Conducted Spurious Emission	$\leq 20\text{dBc}$	Not Performed	Please refer to Sporton Report No. : FR421348A
3.1	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 5.12 dB at 201.990 MHz
-	15.207	RSS-Gen 7.2.4	AC Conducted Emission	15.207(a)	Not Performed	Please refer to Sporton Report No. : FR421348A
3.2	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Lyve Minds, Inc.

10001 N. De Anza Blvd, Ste 300 Cupertino, CA 95014

1.2 Manufacturer

FIH Mobile Limited

No. 4, Mingsheng St., Tu-Cheng Dist., New Taipei City 23679, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Set Top Box
Brand Name	Lyve
Model Name	HAN01
Marketing Name	Lyve Studio
FCC ID	2ABQW-HAN
EUT supports Radios application	WLAN 11b/g/n HT20/HT40 WLAN 11a/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth v4.0 EDR/LE
HW Version	EVT
SW Version	Andriod 4.2 V0.240
EUT Stage	Production Unit

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 7.39 dBm (0.0055 W) Bluetooth EDR (2Mbps) : 6.06 dBm (0.0040 W) Bluetooth EDR (3Mbps) : 6.22 dBm (0.0042 W)
Antenna Type	PIFA Antenna type with gain 4.83 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK



1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	Sporton Site No.	
	TH02-HY	03CH07-HY

1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.4-2003

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
Ch00	2402MHz	7.39 dBm	6.06 dBm	6.22 dBm
Ch39	2441MHz	6.60 dBm	5.04 dBm	5.19 dBm
Ch78	2480MHz	6.90 dBm	5.34 dBm	5.45 dBm

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 1Mbps for all the test items due to the highest RF output power.

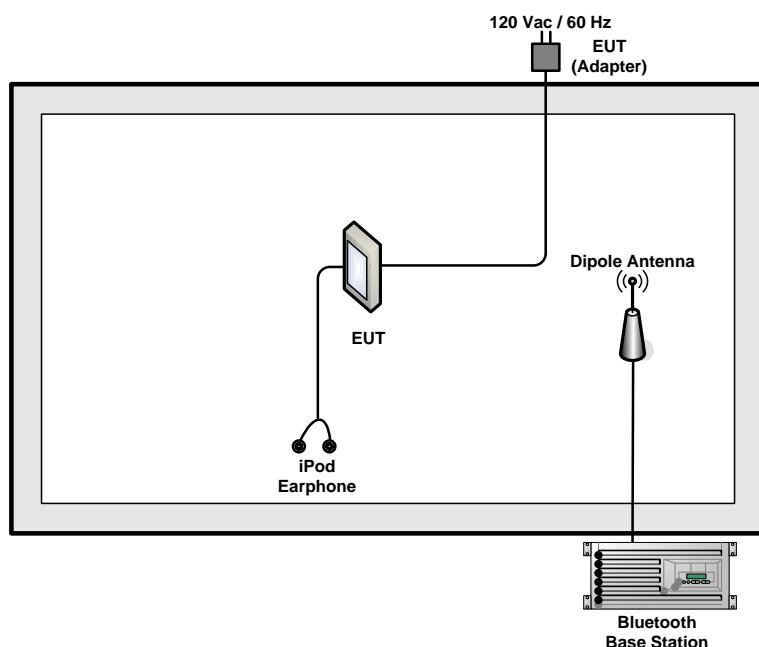
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal planes, and different data rates were conducted to determine the final configuration (X plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

2.2 Test Mode

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases	
Radiated Test Cases	Bluetooth BR 1Mbps GFSK
	Mode 1: CH78_2480 MHz
Remark: For radiated test cases, the worst mode data rate 1Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission.	

2.3 Connection Diagram of Test System





2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Base Station	R&S	CBT32	N/A	N/A	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.5 EUT Operation Test Setup

For Bluetooth function, the RF utility, “Bluetooth TestMode” was installed in EUT which was programmed in order to make the EUT get into the engineering modes to contact with Bluetooth base station for continuous transmitting and receiving signals.



3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.



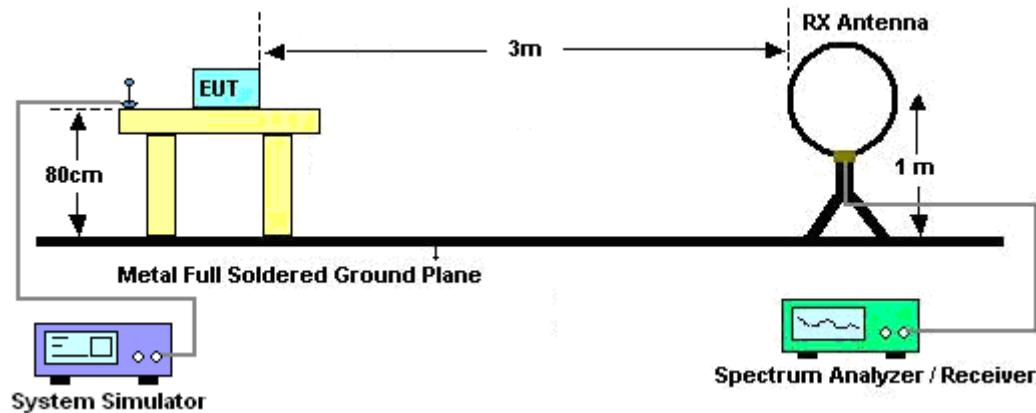
3.1.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz, RBW=1MHz for $f > 1$ GHz ; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c).
Duty cycle = On time/100 milliseconds
On time = $N_1 \cdot L_1 + N_2 \cdot L_2 + \dots + N_{n-1} \cdot L_{n-1} + N_n \cdot L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 \cdot \log(\text{Duty cycle})$
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

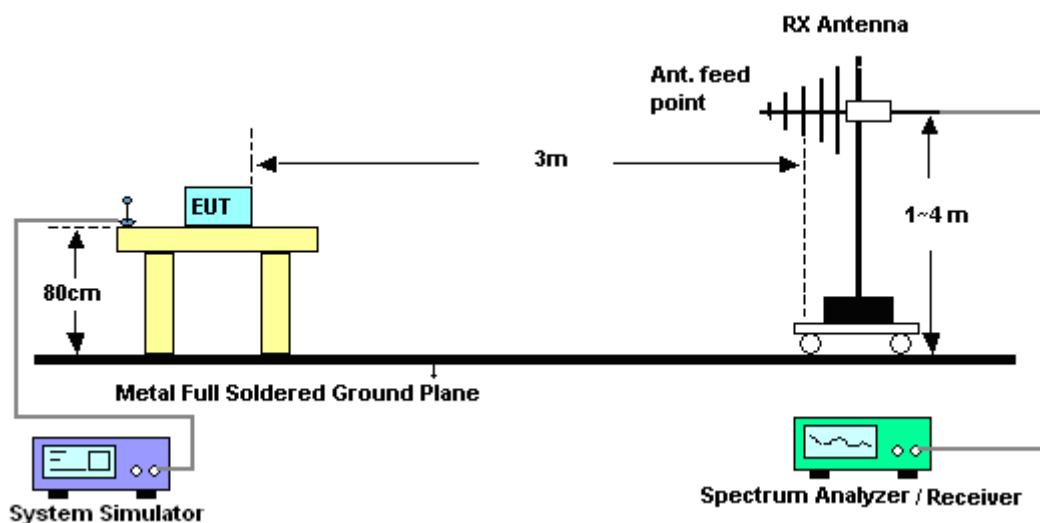
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from $20 \log(\text{dwell time}/100\text{ms})$. This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.1.4 Test Setup

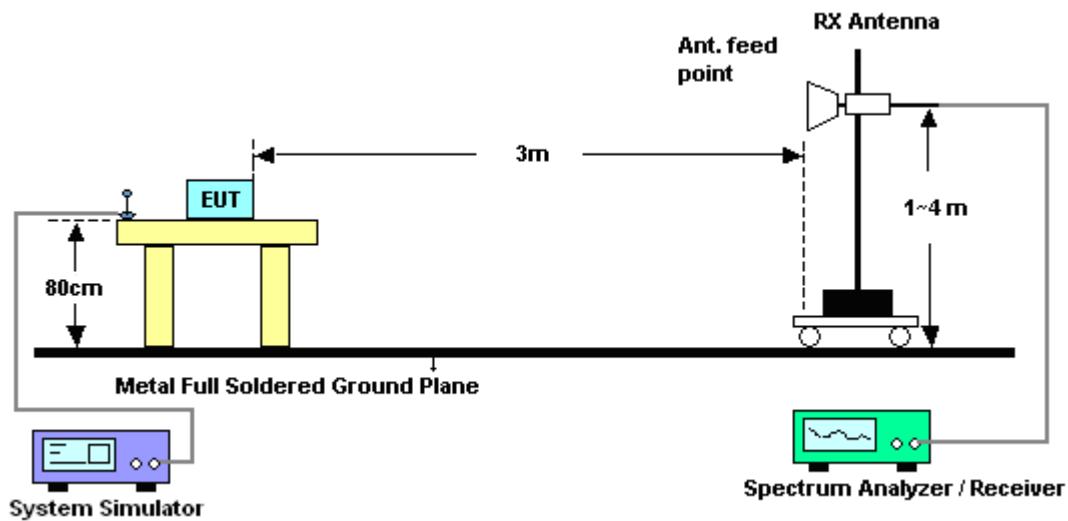
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

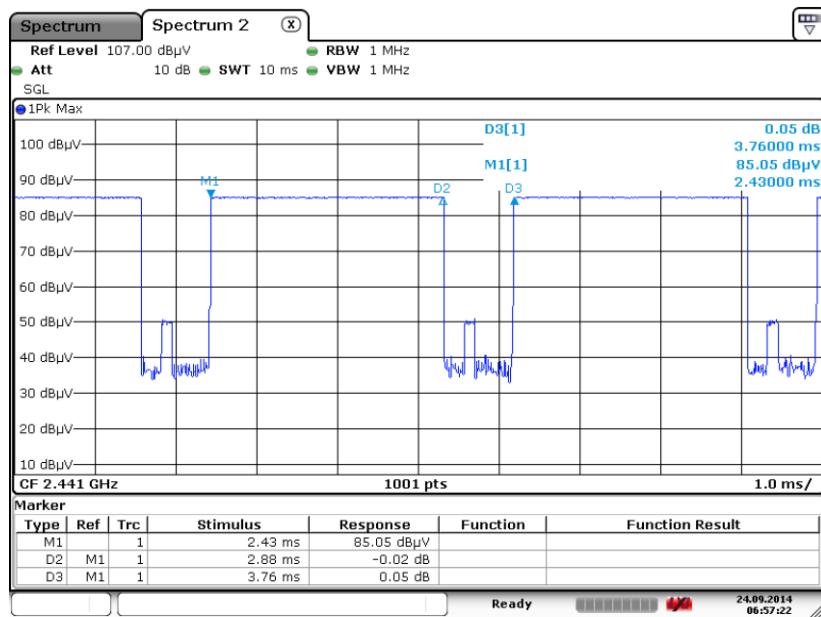


3.1.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

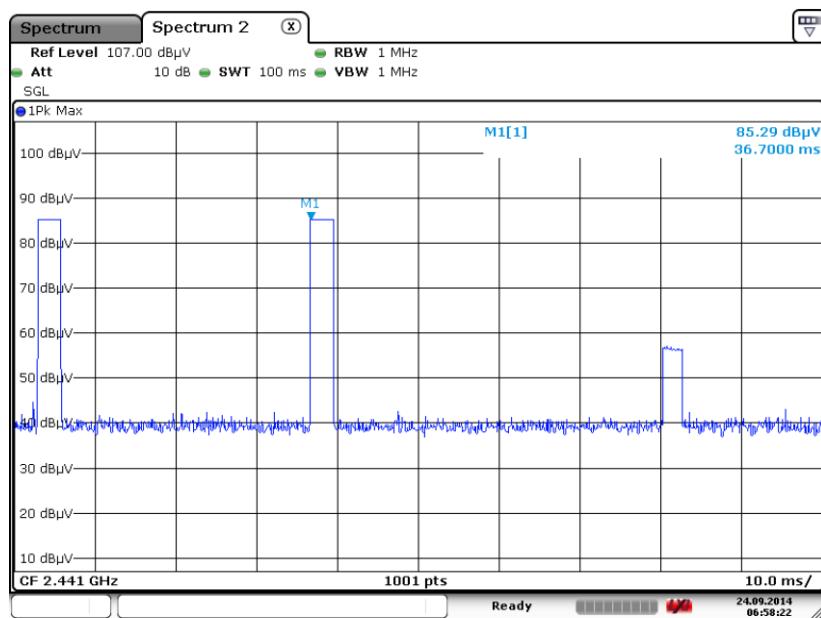
3.1.6 Duty cycle correction factor for average measurement

DH5 on time (One Pulse) Plot on Channel 39



Date: 24.SEP.2014 06:57:21

DH5 on time (Count Pulses) Plot on Channel 39



Date: 24.SEP.2014 06:58:22

Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.88 / 100 = 5.76 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.79 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.

**Duty Cycle Correction Factor Consideration for AFH mode:**

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

$$2.88 \text{ ms} \times 20 \text{ channels} = 57.6 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100\text{ms} / 57.6\text{ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.88 \text{ ms} \times 2 = 5.76 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.76 \text{ ms}/100\text{ms}) = -24.79 \text{ dB}$$

3.1.7 Test Result

Test Engineer :	Eric Shih	Temperature :	21~23°C
		Relative Humidity :	47~49%

The test results please refer Appendix A.



3.2 Antenna Requirements

3.2.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Agilent	E4416A	GB412923 44	300MHz~40GHz	Jan. 28, 2014	Sep. 20, 2014	Jan. 27, 2015	Conducted (TH02-HY)
Power Sensor	Agilent	E9327A	US404415 48	300MHz~40GHz	Jan. 28, 2014	Sep. 20, 2014	Jan. 27, 2015	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9 kHz~7 GHz	Aug. 30, 2014	Sep. 24, 2014	Aug. 29, 2015	Radiation (03CH07-HY)
Spectrum Analyzer	Rohde & Schwarz	FSV30	101749	10Hz ~ 30GHz	Feb. 10, 2014	Sep. 24, 2014	Feb. 09, 2015	Radiation (03CH07-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Dec. 02, 2012	Sep. 24, 2014	Dec. 03, 2014	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30 MHz ~ 1 GHz	Oct. 10, 2013	Sep. 24, 2014	Oct. 09, 2014	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 19, 2014	Sep. 24, 2014	Aug. 18, 2015	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	15 GHz- 40 GHz	Oct. 03, 2013	Sep. 24, 2014	Oct. 02, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1000MHz	Mar. 17, 2014	Sep. 24, 2014	Mar. 16, 2015	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023 62	1 GHz~26.5 GHz	Nov. 29, 2013	Sep. 24, 2014	Nov. 28, 2014	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	DC~18 GHz	Apr. 21, 2014	Sep. 24, 2014	Apr. 20, 2015	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Sep. 24, 2014	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Sep. 24, 2014	N/A	Radiation (03CH07-HY)



5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.50
---	------