FCC RF Test Report

APPLICANT	:	Castles Technology Co., Ltd.
EQUIPMENT	:	EFTPOS
BRAND NAME	:	CASTLES TECHNOLOGY
MODEL NAME	:	VEGA5000S
FCC ID	:	WIYVEGA5000S
STANDARD	:	FCC 47 CFR Part 2, 22(H), 24(E)
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)

This is a partial report which is included the RF conducted power and field strength of spurious radiation measurement test items. The product was received on May 21, 2014 and testing was completed on Sep. 29, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 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

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG452106B	Rev. 01	Initial issue of report	Oct. 14, 2014

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	§2.1046	RSS-132 (5.4) RSS-133 (6.4)	Conducted Output Power	N/A	PASS	-
	§22.913(a)(2)	RSS-132(5.4) SRSP-503(5.1.3)	Effective Radiated Power	< 7 Watts	PASS	-
	§24.232(c)	RSS-133 (6.4) SRSP-510(5.1.2)	Equivalent Isotropic Radiated Power	< 7 Watts	PASS	-
	§2.1053 §22.917(a) §24.238(a)	RSS-132 (5.5) RSS-133 (6.5)	Field Strength of Spurious Radiation	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 0.80 dB at 1672.000 MHz

1 General Description

1.1 Applicant

Castles Technology Co., Ltd.
2F, No.205, Sec. 3, Beixin Rd., Xindian District,New Taipei City 23143, Taiwan (R.O.C.)

1.2 Manufacturer

Castles Technology Co., Ltd.
2F, No.205, Sec. 3, Beixin Rd., Xindian District,New Taipei City 23143, Taiwan (R.O.C.)

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	EFTPOS
Brand Name	CASTLES TECHNOLOGY
Model Name	VEGA5000S
Integrated WWAN Module	Brand Name: Telit Model Name: UE910-NAD
FCC ID	WIYVEGA5000S
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/NFC
EUT Stage	Identical Prototype

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 Frequency	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8MHz
Rx Frequency	GSM850: 869.2 MHz ~ 893.8 MHz GSM1900: 1930.2 MHz ~ 1989.8 MHz
Maximum Output Power to Antenna	GSM850 : 31.42 dBm GSM1900 : 28.79 dBm
Antenna Type	Fixed Internal Antenna
Antenna Gain	GSM850 : -1.52 dBi GSM1900 : 3.09 dBi
Type of Modulation	GSM: GMSK GPRS: GMSK EDGE: GMSK / 8PSK

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 1st 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 47 CFR Part 2, 22(H), 24(E)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01
- FCC KDB 412172 D01 Determining ERP and ERIP v01

Remark:

All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Test Mode

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 9000 MHz for GSM850.
2. 30 MHz to 19000 MHz for GSM1900.

All modes and data rates and positions were investigated.

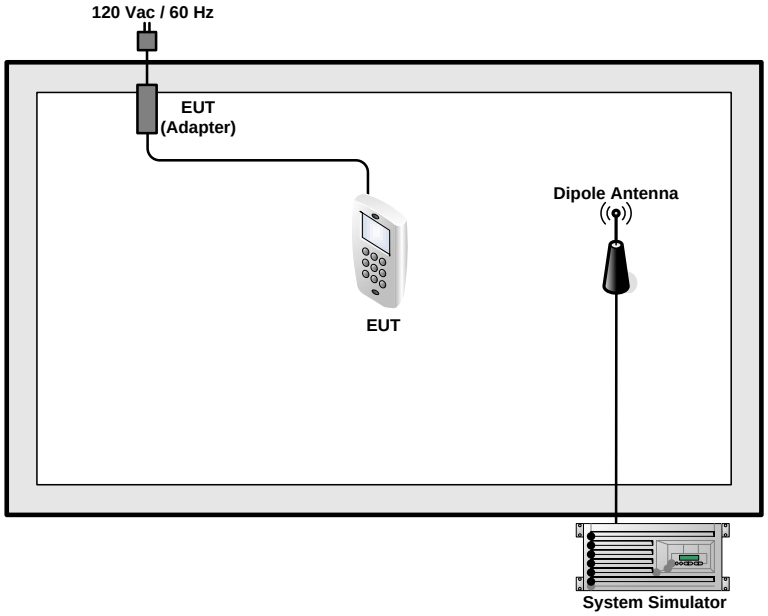
Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	**Radiated TCs**	**Conducted TCs**
GSM 850	■ GPRS class 8 Link ■ EDGE class 8 Link	■ GPRS class 8 Link ■ EDGE class 8 Link
GSM 1900	■ GPRS class 8 Link ■ EDGE class 8 Link	■ GPRS class 8 Link ■ EDGE class 8 Link

Conducted Power Measurement Results:

Conducted Power (*Unit: dBm)						
Band	**GSM850**			**GSM1900**		
Channel	**128**	**189**	**251**	**512**	**661**	**810**
Frequency	**824.2**	**836.4**	**848.8**	**1850.2**	**1880.0**	**1909.8**
GPRS class 8	31.30	31.37	**31.42**	28.53	28.68	**28.79**
GPRS class 10	31.27	31.34	31.40	28.51	28.66	28.77
EGPRS class 8	25.87	25.90	25.93	24.70	24.86	25.00
EGPRS class 10	25.74	25.83	25.97	24.64	24.81	24.97

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m

3 Test Result

3.1 Conducted Output Power and ERP/EIRP Measurement

3.1.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to enforce EUT transmitting at the maximum power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

The ERP of mobile transmitters must not exceed 7 Watts for Band 850.

The EIRP of mobile transmitters must not exceed 2 Watts for Band 1900.

According to KDB 412172 D01 Power Approach,

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

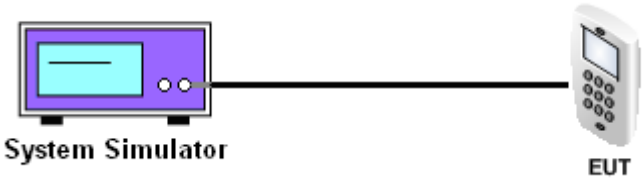
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure the maximum burst average power for GSM and maximum average power for other modulation signal.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

Cellular Band (G_T - L_C =-1.52 dB)						
Modes	GSM850 (GPRS class 8)			GSM850 (EDGE class 8)		
Channel	128 (Low)	189 (Mid)	251 (High)	128 (Low)	189 (Mid)	251 (High)
Frequency (MHz)	824.2	836.4	848.8	824.2	836.4	848.8
Conducted Power P_T (dBm)	31.3	31.37	31.42	25.87	25.9	25.93
Conducted Power P_T (Watts)	1.35	1.37	1.39	0.39	0.39	0.39
ERP(dBm)	27.63	27.70	27.75	22.20	22.23	22.26
ERP(Watts)	0.579	0.589	0.596	0.166	0.167	0.168

PCS Band (G_T - L_C = 3.09 dB)						
Modes	GSM1900 (GPRS class 8)			GSM1900 (EDGE class 8)		
Channel	512 (Low)	661 (Mid)	810 (High)	512 (Low)	661 (Mid)	810 (High)
Frequency (MHz)	1850.2	1880	1909.8	1850.2	1880	1909.8
Conducted Power P_T (dBm)	28.53	28.68	28.79	24.7	24.86	25
Conducted Power P_T (Watts)	0.71	0.74	0.76	0.30	0.31	0.32
EIRP(dBm)	31.62	31.77	31.88	27.79	27.95	28.09
EIRP(Watts)	1.452	1.503	1.542	0.601	0.624	0.644

Note: maximum burst average power for GSM, and maximum average power for WCDMA.

EIRP = $P_T + G_T – L_C$, ERP = EIRP -2.15, where

P_T = transmitter output power in dBm

G_T = gain of the transmitting antenna in dBi

L_C = signal attenuation in the connecting cable between the transmitter and antenna in dB

3.2 Field Strength of Spurious Radiation Measurement

3.2.1 Description of Field Strength of Spurious Radiated Measurement

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows FCC KDB 971168 v02r01 Section 5.8 and ANSI / TIA-603-C-2004 Section 2.2.12.
2. The EUT was placed on a rotatable wooden table 0.8 meters above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15
13. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
14. The limit line is derived from 43 + 10log(P) dB below the transmitter power P(Watts)

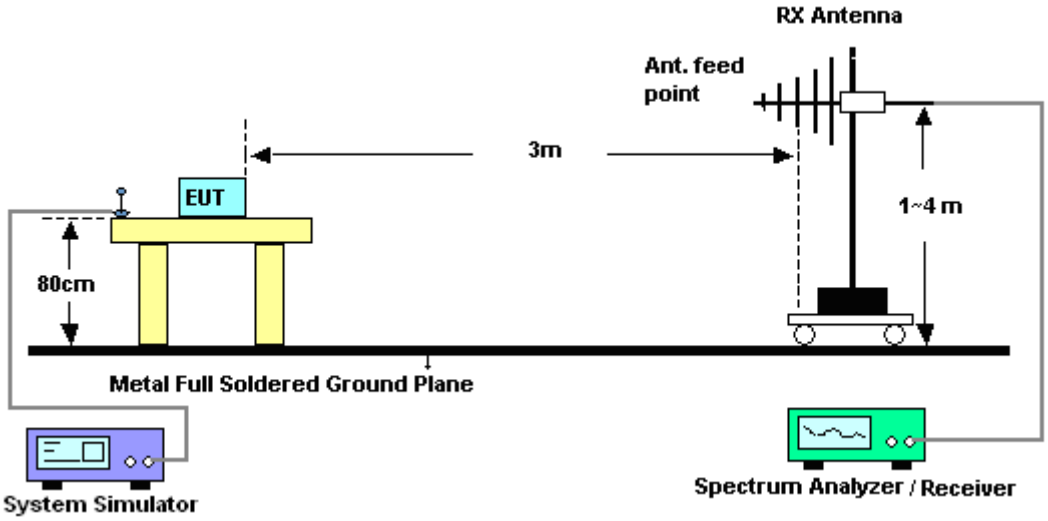
    = P(W) - [43 + 10log(P)] (dB)

    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)

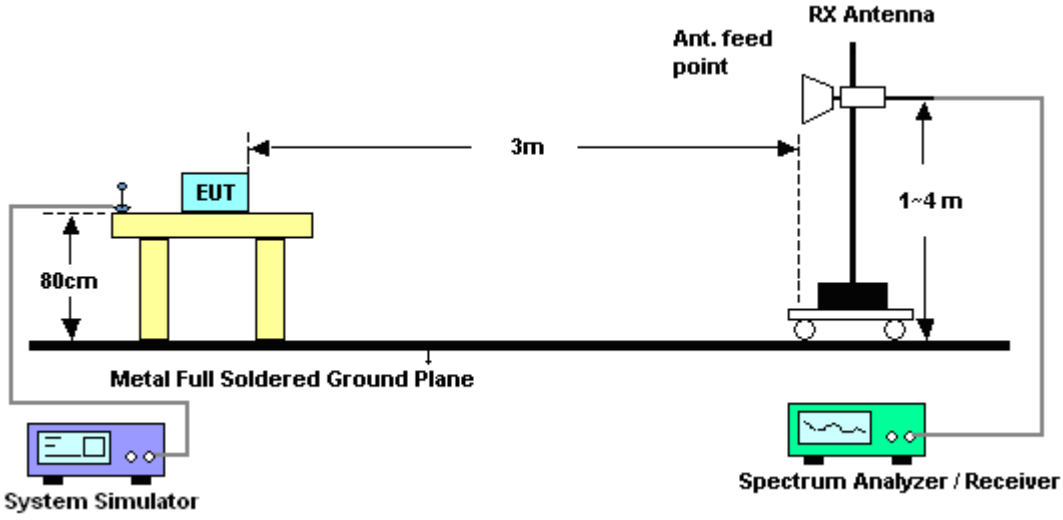
    = -13dBm.

3.2.4 Test Setup

For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.2.5 Test Result of Field Strength of Spurious Radiated

Band :	GSM850	Temperature :	23~24°C
Test Mode :	GPRS class 8 Link (GMSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-21.46	-13	-8.46	-29.87	-23.14	0.99	4.82	H	Pass
2509	-27.49	-13	-14.49	-40.57	-29.45	1.29	5.41	H	Pass
3346	-31.41	-13	-18.41	-47.92	-35.03	1.56	7.32	H	Pass
4180	-29.72	-13	-16.72	-51.83	-34.34	1.86	8.64	H	Pass
5020	-41.05	-13	-28.05	-62.77	-46.25	2.35	9.70	H	Pass

Band :	GSM850	Temperature :	23~24°C
Test Mode :	GPRS class 8 Link (GMSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-17.68	-13	-4.68	-29.37	-19.36	0.99	4.82	V	Pass
2509	-26.81	-13	-13.81	-43.02	-28.77	1.29	5.41	V	Pass
3346	-31.04	-13	-18.04	-50.91	-34.66	1.56	7.32	V	Pass
4180	-36.50	-13	-23.50	-57.7	-41.12	1.86	8.64	V	Pass
5020	-38.59	-13	-25.59	-62.47	-43.79	2.35	9.70	V	Pass

Band :	GSM850	Temperature :	23~24°C
Test Mode :	EDGE class 8 Link (8PSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-13.95	-13	-0.95	-22.4	-15.63	0.99	4.82	H	Pass
2509	-25.05	-13	-12.05	-38.12	-27.01	1.29	5.41	H	Pass
3346	-20.24	-13	-7.24	-36.72	-23.86	1.56	7.32	H	Pass
4180	-28.76	-13	-15.76	-50.69	-33.38	1.86	8.64	H	Pass
5020	-32.98	-13	-19.98	-54.79	-38.18	2.35	9.70	H	Pass
5855	-36.47	-13	-23.47	-60.93	-41.33	2.83	9.84	H	Pass
6690	-33.10	-13	-20.10	-60.25	-38.69	2.69	10.43	H	Pass

Band :	GSM850	Temperature :	23~24°C
Test Mode :	EDGE class 8 Link (8PSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1672	-13.80	-13	-0.80	-25.39	-15.48	0.99	4.82	V	Pass
2509	-23.36	-13	-10.36	-39.56	-25.32	1.29	5.41	V	Pass
3346	-21.26	-13	-8.26	-41.05	-24.88	1.56	7.32	V	Pass
4180	-35.82	-13	-22.82	-57.11	-40.44	1.86	8.64	V	Pass
5015	-29.08	-13	-16.08	-53.03	-34.28	2.35	9.70	V	Pass
5855	-38.48	-13	-25.48	-64.52	-43.34	2.83	9.84	V	Pass
6690	-39.82	-13	-26.82	-64.6	-45.41	2.69	10.43	V	Pass

Band :	GSM1900	Temperature :	23~24°C
Test Mode :	GPRS class 8 Link (GMSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-44.25	-13	-31.25	-60.81	-50.88	1.69	8.31	H	Pass
5640	-44.72	-13	-31.72	-67.78	-51.77	2.71	9.76	H	Pass
7520	-40.16	-13	-27.16	-67.66	-49.55	2.42	11.81	H	Pass

Band :	GSM1900	Temperature :	23~24°C
Test Mode :	GPRS class 8 Link (GMSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-38.06	-13	-25.06	-59.63	-44.69	1.69	8.31	V	Pass
5640	-41.47	-13	-28.47	-68.2	-48.52	2.71	9.76	V	Pass
7520	-41.67	-13	-28.67	-67.98	-51.06	2.42	11.81	V	Pass

Band :	GSM1900	Temperature :	23~24°C
Test Mode :	EDGE class 8 Link (8PSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Horizontal
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-48.51	-13	-35.51	-65.27	-55.14	1.69	8.31	H	Pass
5640	-45.17	-13	-32.17	-68.1	-52.22	2.71	9.76	H	Pass
7520	-40.79	-13	-27.79	-68.38	-50.18	2.42	11.81	H	Pass

Band :	GSM1900	Temperature :	23~24°C
Test Mode :	EDGE class 8 Link (8PSK)	Relative Humidity :	44~46%
Test Engineer :	Stan Hsieh	Polarization :	Vertical
Remark :	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
3760	-41.39	-13	-28.39	-62.95	-48.02	1.69	8.31	V	Pass
5640	-41.36	-13	-28.36	-67.96	-48.41	2.71	9.76	V	Pass
7520	-42.05	-13	-29.05	-68.28	-51.44	2.42	11.81	V	Pass

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Amplifier	SONOMA	310N	186713	9kHz~1GHz	Apr. 16, 2014	Sep. 29, 2014	Apr. 15, 2015	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL6112B	2885	30MHz -2GHz	Oct. 10, 2013	Sep. 29, 2014	Oct. 09, 2014	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz~18GHz	Jul. 24, 2014	Sep. 29, 2014	Jul. 23, 2015	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz~26.5GHz	Apr. 10, 2014	Sep. 29, 2014	Apr. 09, 2015	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211028	9kHz ~ 26.5GHz	Aug. 23, 2014	Sep. 29, 2014	Aug. 22, 2015	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	RG 142	NA	30MHz ~ 1GHz	Nov. 28, 2013	Sep. 29, 2014	Nov. 27, 2014	Radiation (03CH06-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	286027/4	1GHz ~ 26.5GHz	Nov. 28, 2013	Sep. 29, 2014	Nov. 27, 2014	Radiation (03CH06-HY)
Controller	INN-CO	CO2000	8000604	N/A	N/A	Sep. 29, 2014	N/A	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Oct. 03, 2013	Sep. 29, 2014	Oct. 02, 2014	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0 ~ 360 degree	N/A	Sep. 29, 2014	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1m~4m	N/A	Sep. 29, 2014	N/A	Radiation (03CH06-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**