FCC PART 15 SUBPART C TEST REPORT

for

Reader

Model No.: NAVIKEY

FCC ID: SPH-NAVIKEY

of

Applicant: **ASIS TECHNOLOGIES PTE LTD**
Address: **71, Ubi Crescent #08-05, Excalibur Centre , Singapore 408571**

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: 930600

Industry Canada filed test laboratory Reg. No. IC 5679A-1, IC 5107A-1

A2LA Accredited No.: 2732.01

Report No.: W6M21506-15065-C-1

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
TEL: 886-2-66068877 FAX: 886-2-66068879 E-mail: wts@wts-lab.com

TABLE OF CONTENTS

1 GENERAL INFORMATION 2

1.1 NOTES 2

1.2 TESTING LABORATORY 3

1.2.1 Location 3

1.2.2 Details of accreditation status 3

1.3 DETAILS OF APPROVAL HOLDER 4

1.4 APPLICATION DETAILS 4

1.5 GENERAL INFORMATION OF TEST ITEM 4

1.6 TEST STANDARDS 4

2 TECHNICAL TEST 5

2.1 SUMMARY OF TEST RESULTS 5

2.2 TEST ENVIRONMENT 5

2.3 TEST EQUIPMENT LIST 6

2.4 GENERAL TEST PROCEDURE 8

3 TEST RESULTS (ENCLOSURE) 10

3.1 OUTPUT POWER (FIELD STRENGTH) 11

3.2 OUT OF BAND RADIATED EMISSIONS 12

3.3 OCCUPIED BANDWIDTH 14

3.4 FREQUENCY TOLERANCE 15

3.5 POWER LINE CONDUCTED EMISSION 16

APPENDIX 17

1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.

The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.

Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.

Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.

The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.

The test report may only be reproduced or published in full.

Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.

Tester:

Date	WTS-Lab.	Name	Signature
September 07, 2016		Rick Chen	Rick Chen

Technical responsibility for area of testing:

Date	WTS	Name	Signature
September 07, 2016		Kevin Wang	Kevin Wang

Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

1.2 Testing laboratory

1.2.1 Location

OATS
No.5-1, Lishui, Shuang Sing Village,
Wanli Dist., New Taipei City 207,
Taiwan (R.O.C.)
3 meter semi-anechoic chamber
No.35, Aly. 21, Ln. 228, Ankang Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)
TEL:886-2-6613-0228
FAX:886-2-2791-5046

Company
Worldwide Testing Services(Taiwan) Co., Ltd.
6F, NO. 58, LANE 188, RUEY-KUANG RD.
NEIHU, TAIPEI 114, TAIWAN R.O.C.
Tel : 886-2-66068877
Fax : 886-2-66068879

1.2.2 Details of accreditation status

Accredited testing laboratory

A2LA accredited number: 2732.01

FCC filed test laboratory Reg. No. 930600

Industry Canada filed test laboratory Reg. No. IC 5679A-1**, IC 5107A-1**

Test location, where different from Worldwide Testing Services (Taiwan) Co., Ltd. :

Name:	./.
Accredited number:	./.
Street:	./.
Town:	./.
Country:	./.
Telephone:	./.
Fax:	./.

1.3 Details of approval holder

Name:	ASIS TECHNOLOGIES PTE LTD
Street:	71, Ubi Crescent #08-05, Excalibur Centre,
City:	./.
Country:	Singapore 408571
Telephone:	+65 6 844 2141
Fax:	+65 6 844 0213

1.4 Application details

Date of receipt of test item:	June 16, 2015
Date of test:	from June 17, 2015 to September 06, 2016

1.5 General information of Test item

Description of test item:	Reader
Type identification:	NAVIKEY
Multi-listing model number:	./.
Brand Name:	ASIS
Transmitting frequency:	13.56 MHz
Operation mode:	half-duplex
Voltage supply:	12 Vd.c.

(If the device is using battery, please check if the device is tested under fresh battery condition.)

Antenna type:	Loop antenna
Photos:	see Annex

Manufacturer: (if applicable)

Name:	./.
Street:	./.
Town:	./.
Country:	./.
Additional information:	./.

1.6 Test standards

Technical standard : FCC RULES PART 15 SUBPART C § 15.225 (2015-10)

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations as specified in 3 were ascertained in the course of the tests performed. ☐

2.2 Test environment

Temperature:	23 ^{o}C
Relative humidity content:	20 ... 75 %
Air pressure:	86 ... 103 kPa
Details of power supply:	12 Vd.c.
Extreme conditions parameters:.	/.

2.3 Test Equipment List

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2016/5/20	2017/5/19
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 008	HF-EICHLEITUNG RF STEP ATTENUATOR 139dB DPSP	334.6010.02	844581/024	R&S	Function Test	
ETSTW-CE 009	TEMP.&HUMIDITY CHAMBER	GTH-225-40-1P-U	MAA0305-009	GIANT FORCE	2016/7/15	2017/7/14
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2016/9/2	2017/9/1
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2016/5/20	2017/5/19
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2016/5/25	2017/5/24
ETSTW-RE 005	EMI TEST RECEIVER	ESVS10	843207/020	R&S	2016/7/4	2017/7/3
ETSTW-RE 012	TUNABLE BANDREJECT FILTER	D.C 0309	146	K&L	Function Test	
ETSTW-RE 013	TUNABLE BANDREJECT FILTER	D.C 0336	397	K&L	Function Test	
ETSTW-RE 018	MICROWAVE HORN ANTENNA	AT4560	27212	AR	2016/6/24	2017/6/23
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2016/6/29	2017/6/28
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2016/3/23	2017/3/22
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2016/1/25	2017/1/24
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2016/3/28	2017/3/27
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2016/4/14	2017/4/13
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2016/2/25	2017/2/24
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2016/2/25	2017/2/24
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2016/2/25	2017/2/24
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2016/2/27	2017/2/26
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2016/2/25	2017/2/24
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2016/4/13	2017/4/12
ETSTW-RE 064	Bluetooth Test Set	MT8852B-042	6K00005709	Anritsu	Function Test	
ETSTW-RE 069	Double-Ridged Guide Horn Antenna	3117	00069377	ETS-Lindgren	Function Test	
ETSTW-RE 072	CELL SITE TEST SET	8921A	3339A00375	HP	2016/9/2	2017/9/1
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2015/9/21	2016/9/20
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2016/2/25	2017/2/24
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	
ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2016/1/13	2017/1/12
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	Function test	
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2016/5/23	2017/5/22
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2016/8/10	2017/8/9

ETSTW-RE 126	5GHz Notch filter	5NSL12-5800/E221.3-O/O	1	K&L Microwave	2016/8/10	2017/8/9
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2016/2/25	2017/2/24
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2016/8/10	2017/8/9
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2016/8/10	2017/8/9
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-RE 142	Amplifier	8447D	2805A03378	Agilent	2016/4/13	2017/4/12
ETSTW-RE 143	Humidity Temperature Meter	TES-1260	110104623	TES	2016/8/19	2017/8/18
ETSTW-RE 147	Bi-log Hybrid Antenna	MCTD 2786B	BLB16M04005	ETC	2016/3/31	2017/3/30
ETSTW-EMI 011	USB Compact Modulator	SFC-U	101689	R&S	2016/5/4	2017/5/3
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2016/3/4	2017/3/3
ETSTW-GSM 003	Radio Communication Analyzer	MT8820C	6201342073	Anritsu	2016/2/3	2017/2/2
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2016/1/13	2017/1/12
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2016/1/13	2017/1/12
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2016/1/13	2017/1/12
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2016/1/13	2017/1/12
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2015/9/16	2016/9/15
ETSTW-Cable 010	BNC Cable	5 M BNC Cable	None	JYE BAO CO.,LTD.	2016/9/2	2017/9/1
ETSTW-Cable 011	BNC Cable	BNC Cable 1	None	JYE BAO CO.,LTD.	Pre-test Use NCR	
ETSTW-Cable 012	N TYPE To SMA Cable	Cable 012	None	JYE BAO CO.,LTD.	2016/9/2	2017/9/1
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2016/2/24	2017/2/23
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2016/2/24	2017/2/23
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2016/2/24	2017/2/23
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2016/2/24	2017/2/23
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2016/4/22	2017/4/21
ETSTW-Cable 022	N TYPE Cable	5006	0002	JYE BAO CO.,LTD.	2016/4/7	2017/4/6
ETSTW-Cable 026	Microwave Cable	SUCOFLEX 104	279075	HUBER+SUHNER	2016/2/25	2017/2/24
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2016/5/13	2017/5/12
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2015/9/21	2016/9/20
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2015/9/21	2016/9/20
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104（S_Cable 9）	279067	HUBER+SUHNER	2016/2/25	2017/2/24
ETSTW-Cable 031	Microwave Cable	SUCOFLEX 104（S_Cable 10）	238092	HUBER+SUHNER	2016/4/13	2017/4/12
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2016/4/13	2017/4/12
ETSTW-Cable 048	Microwave Cable	SUCOFLEX 104	325518	HUBER+SUHNER	2016/4/13	2017/4/12
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2016/4/7	2017/4/6
ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2016/4/13	2017/4/12
WTSTW-SW 002	EMI TEST SOFTWARE	EZ_EMC	None	Farad	Version ETS-03A1	

2.4 General Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.10-2013 6.2 using a LISN (if necessary). Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

RADIATION INTERFERENCE: The test procedure used was according to ANSI STANDARD C63.10-2013 6.3 employing a spectrum analyzer. For investigated frequency is equal to or below 1GHz, the RBW and VBW of the spectrum analyzer was 100 kHz and 100kHz respectively with an appropriate sweep speed. For investigated frequency is above 1GHz, both of RBW and VBW of the spectrum analyzer were 1 MHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBµV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB.

Example:

Freq (MHz)	METER READING + ACF + CABLE LOSS (to the receiver) = FS
33	20 dBµV + 10.36 dB + 6 dB = 36.36 dBµV/m @3m

The EUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m (non metallic table) and arranged according to ANSI C63.10-2013 Section 6.2.2 The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to the frequency specified as follows:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this Section, whichever is the higher frequency range of investigation.

For hand-held devices, a exploratory test was performed with three (3) orthogonal planes to determine the highest emissions.

Measurements were made by Worldwide Testing Services(Taiwan) Co., Ltd. at the registered open field test site located No.5-1, Lishui, Shuang Sing Village, Wanli Dist., New Taipei City 207, Taiwan (R.O.C.). The Registration Number: **930600.**

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

The formula is as follows:
Average = Peak + Duty Factor
Duty Factor = 20 log (dwell time/T)
T = 100ms when the pulse train period is over 100 ms or the period of the pulse train.

Modified Limits for peak according to 15.35 (b) = Max Permitted average Limits + 20dB

ANSI STANDARD C63.10-2013 B.2.7: Any measurements that utilize special test software shall be indicated and referenced in the test report. During testing, test software 'EZ EMC' was used for setting up different operation modes.

3 Test results (enclosure)

TEST CASE	Para. Number	Required	Test passed	Test failed
Output Power Field Strength	15.225 (a) (b) (c)	☒	☒	☐
Out of Band Radiated Emissions	15.225 (d)	☒	☒	☐
Band Edge	15.225 (d)	☒	☒	☐
Occupied Bandwidth	2.1049	☒	☒	☐
Frequency Stability	15.225 (e)	☒	☒	☐
Power Line Conducted Emission	15.207 (a)	☐	☐	☐

The following is intentionally left blank.

3.1 Output Power (Field Strength)

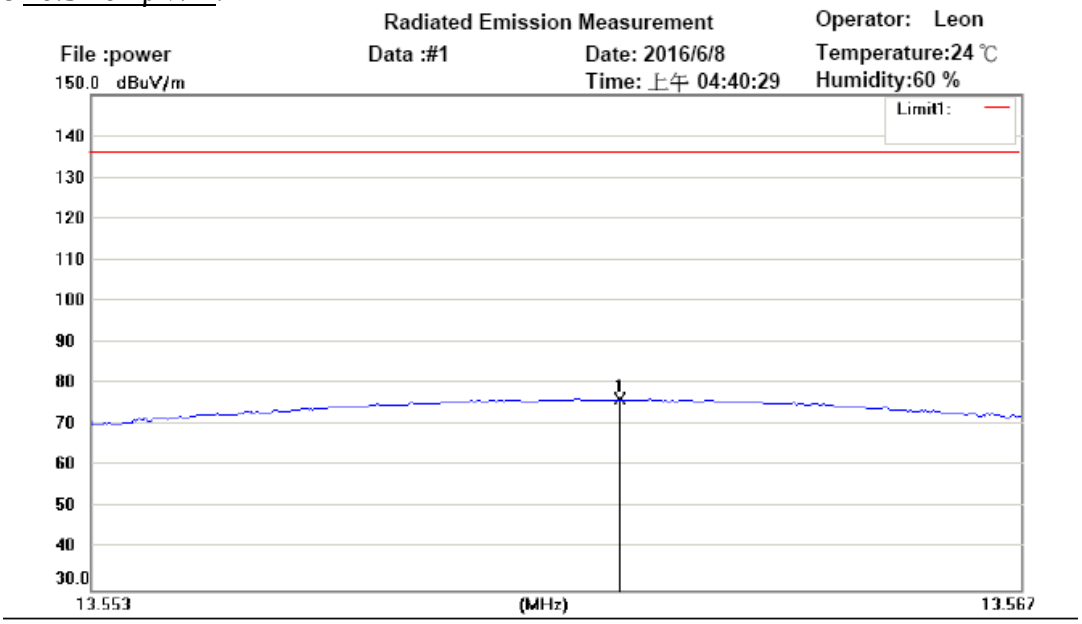
FCC Rules: 15.225 (a) (b) (c), 15.205, 15.209, 15.35
Operation within the band 13.110 - 14.010 MHz
Limit

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

Measurement Results:
The field strength at 1.2 meter distance as 76.34 dBµV/m. Extrapolated with 56 dB to 30 meter distance it would be 20.34 dBµV/m.



Site : Chamber
Condition : FCC SubpartC 15.225 power (13.56MHz)
EUT : W6M21506-15065
M/N:
Test Mode : TX 13.56MHz
Note :

Polarization:
Power : 12 Vd.c.
Distance: 1.2m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	13.5610	41.94	peak	34.40	76.34	135.92	100	75	-59.58	

Test equipment used: ETSTW-RE 027, ETSTW-RE 055

3.2 Out of Band Radiated Emissions

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

Frequency of Emission (MHz)	Limit	Measurement distance
0.009 – 0.490	2400 / f (KHz)	300
0.49 – 1.705	24000 / f (KHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Calculation of test results:

Such factors like antenna correction, cable loss, external attenuation etc. are already included in the provided measurement results. This is done by using validated test software and calibrated test system according the accreditation requirements.

Summary table with radiated data of the test plots

Model: -- Date: --
Mode: -- Temperature: -- °C Engineer: --
Polarization: -- Humidity: -- %

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Detector	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Table Degree (Deg.)	Ant. High (cm)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Note

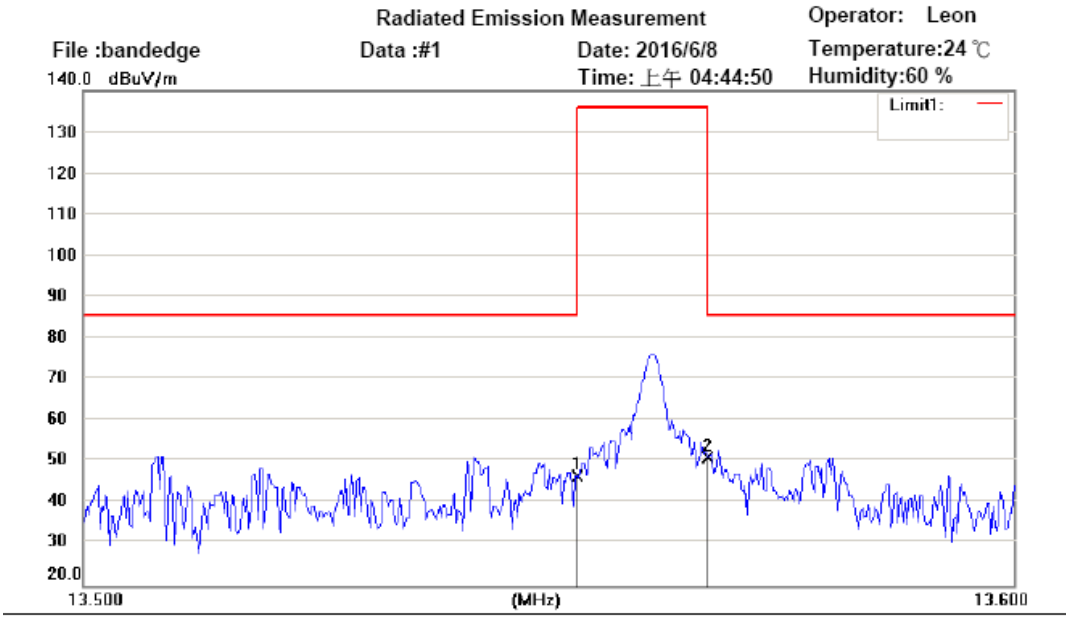
1. **Correction Factor = Antenna factor + Cable loss - Preamplifier**
2. **The formula of measured value as: Test Result = Reading + Correction Factor**
3. **Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average**
4. **All not in the table noted test results are more than 20 dB below the relevant limits.**
5. **Measurement uncertainty for 3m measurement: 0.009-30MHz ± 5.84 dB, 30-1000 MHz：± 4.69 dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.**
6. **See attached diagrams in appendix.**

All other not noted test plots do not contain significant test results in relation to the limits
Test results: The unit meet the FCC requirements.

Explanation: See attached diagrams for above 30MHz in appendix. For receiver part of above 30 MHz, Please refer to test report no.: W6M21506-15063-P-15B.
Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 142, ETSTW-RE 147, ETSTW-RE 062

Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

Test result of Band Edge



Site : Chamber
Condition : FCC SubpartC 15.225 bandedge (13.56MHz)
EUT : W6M21506-15065
M/N:
Test Mode : TX 13.56MHz
Note :

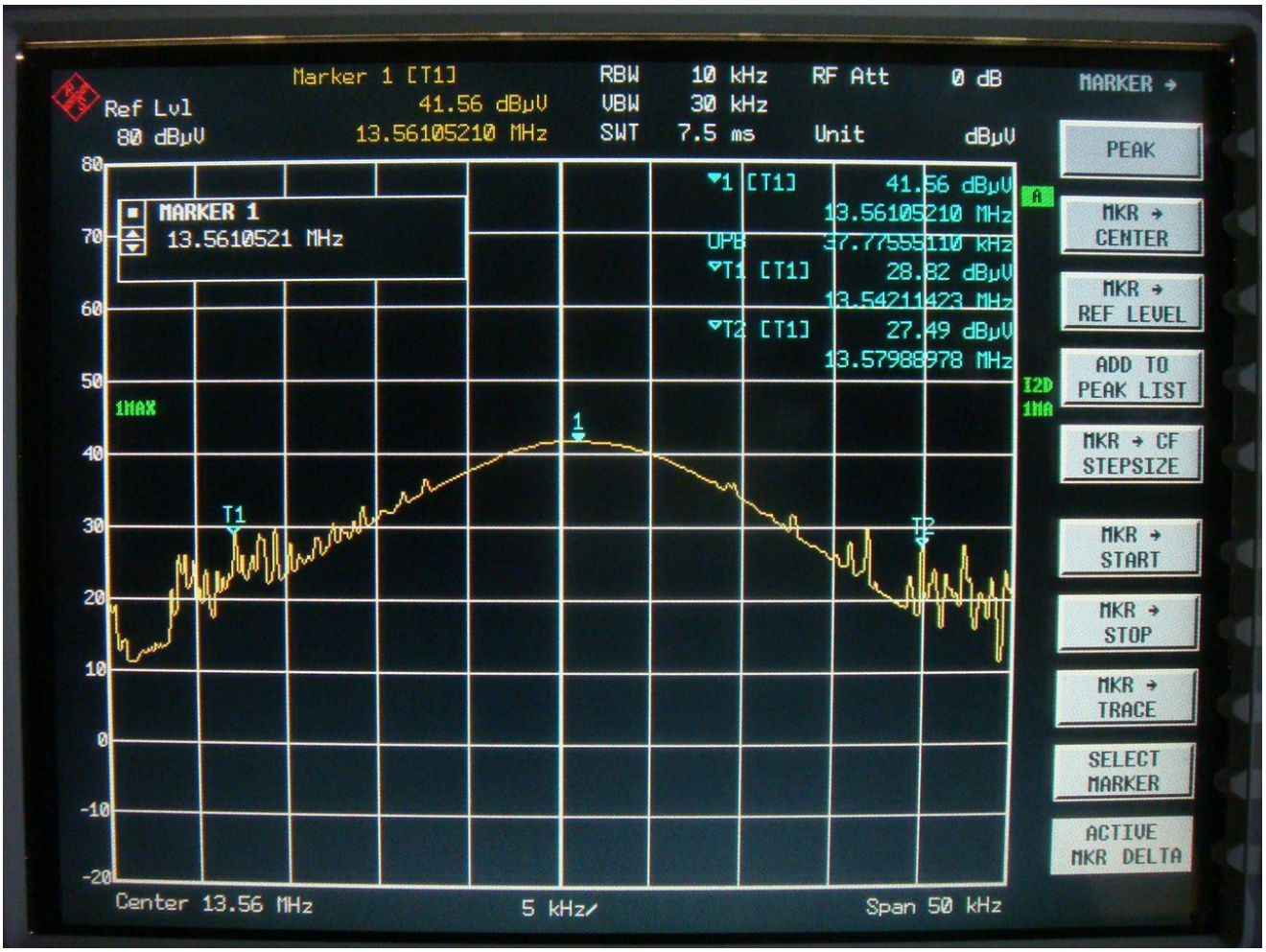
Polarization:
Power : 12 Vd.c.
Distance: 1.2m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	13.5530	12.13	peak	34.40	46.53	85.46	100	75	-38.93	
*	13.5670	16.76	peak	34.40	51.16	85.46	100	75	-34.30	

Test equipment used: ETSTW-RE 055

Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

3.3 Occupied Bandwidth



Test equipment used: ETSTW-RE 055, ETSTW-RE 064

3.4 Frequency tolerance

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20°C to +50°C C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C. For battery operated equipment, the equipment tests shall be performed using a new battery.

Measurement Results:

Temperature Degrees °C	Voltage	Frequency MHz	Frequency deviation kHz	Limit kHz (0.01%)
20°C	10.8	13.5610256	0.000	1.356
20°C	13.2	13.5610256	0.000	1.356
50°C	12	13.5609936	0.032	1.356
40°C	12	13.5610256	0.000	1.356
30°C	12	13.5610256	0.000	1.356
20°C	12	13.5610256	0.000	1.356
10°C	12	13.5610256	0.000	1.356
0°C	12	13.5610256	0.000	1.356
-10°C	12	13.5610256	0.000	1.356
-20°C	12	13.5610256	0.000	1.356

Test equipment used: ETSTW-RE 055, ETSTW-CE 009

3.5 Power Line Conducted Emission

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the table bellows with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

This measurement was transact first with instrumentation using an average and peak detector and a 10 kHz bandwidth. If the peak detector achieves a calculated level, the measurement is repeated by an instrumentation using a quasi-peak detector.

Frequency	Level (dBµV)	
	quasi-peak	average
150 kHz	lower limit line	Lower limit line

Model: -- Date: --
Mode: -- Temperature: -- °C Engineer: --
Polarization: -- Humidity: -- %

Frequency (MHz)	Reading (dBuV) QP	Reading (dBuV) Ave.	Factor (dB) Corr.	Result (dBuV) QP	Result (dBuV) Ave.	Limit (dBuV) QP	Limit (dBuV) Ave.	Margin (dB)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Polarization: --

Frequency (MHz)	Reading (dBuV) QP	Reading (dBuV) Ave.	Factor (dB) Corr.	Result (dBuV) QP	Result (dBuV) Ave.	Limit (dBuV) QP	Limit (dBuV) Ave.	Margin (dB)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Note: 1. The formula of measured value as: Test Result = Reading + Correction Factor
2. The Correction Factor = Cable Loss + LISN Insertion Loss + Pulse Limit Loss
3. Detector function in the form : PK = Peak, QP = Quasi Peak, AV = Average
4. All not in the table noted test results are more than 20 dB below the relevant limits
5. Measurement uncertainty = ±1.14 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.
6. Up Line: QP Limit Line, Down Line: Ave Limit Line.
7. This test is not required.

Limits:

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test equipment used: ETSTW-CE 001, ETSTW-CE 016, ETSTW-CE 006 , ETSTW-RE 045

Appendix

A. Photos

1. EUT Photos

2. Set Up Photo of Radiated Emission

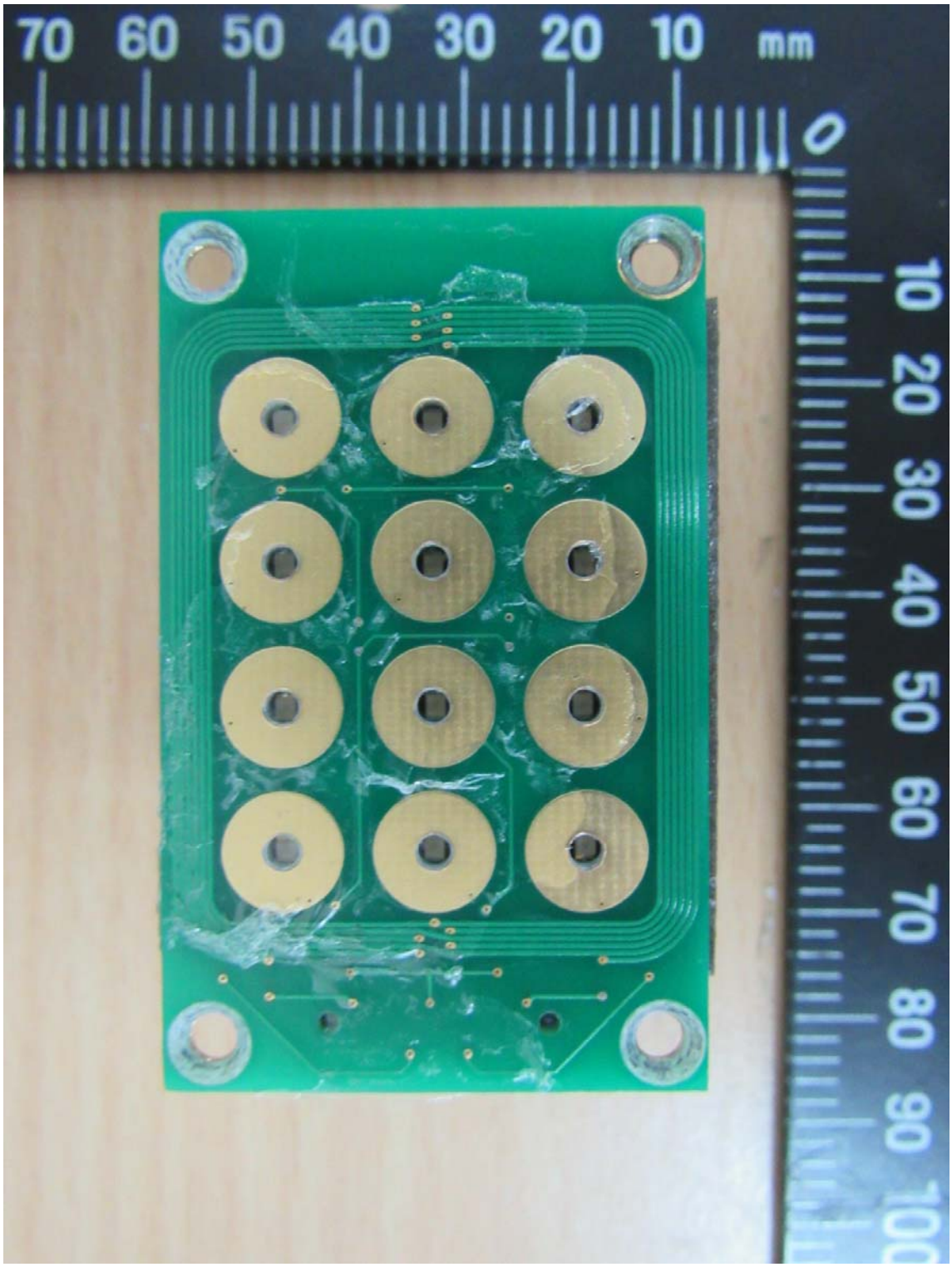
B. Measurement diagrams

Radiated Emissions

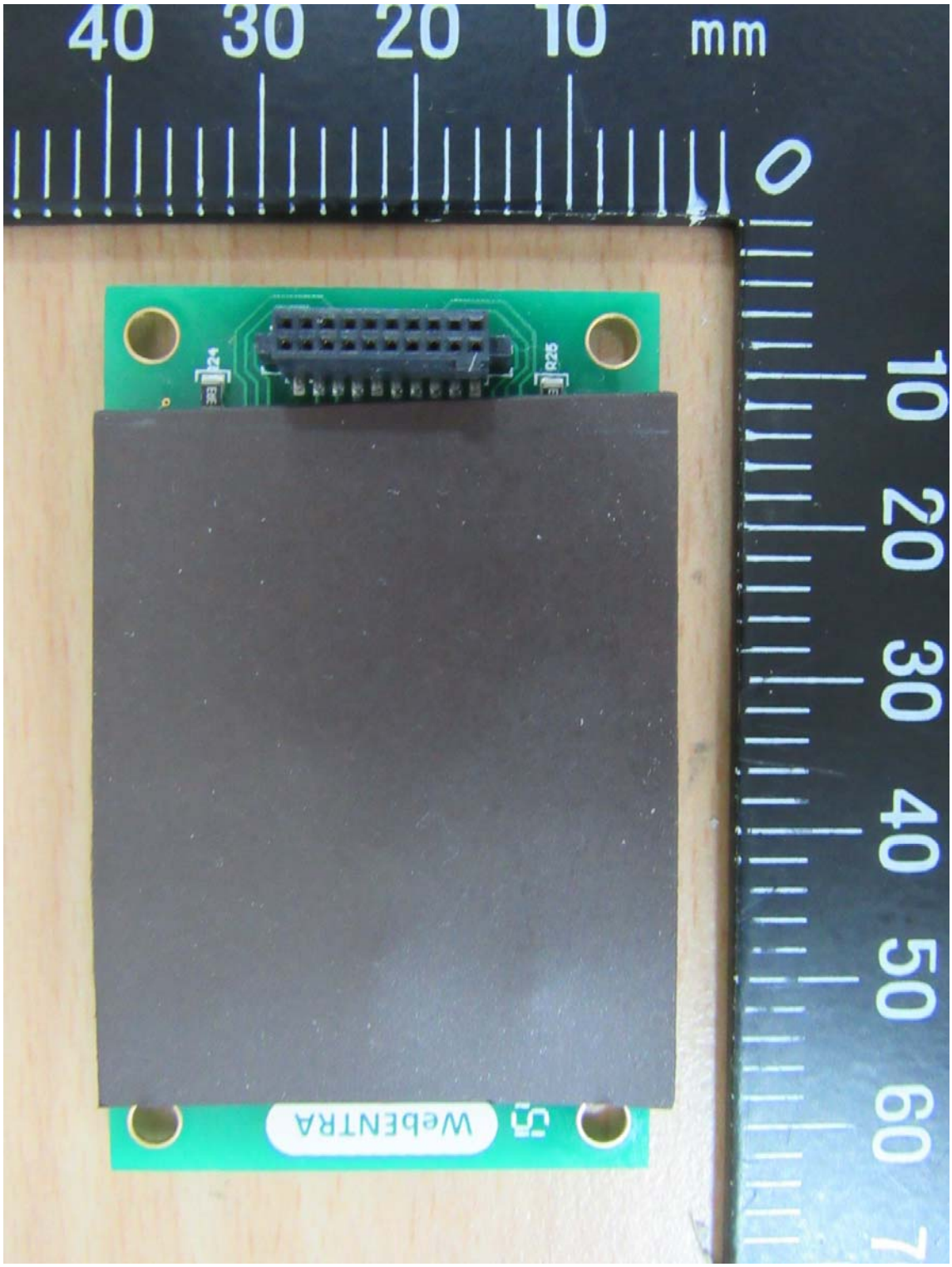
Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

EUT Photos

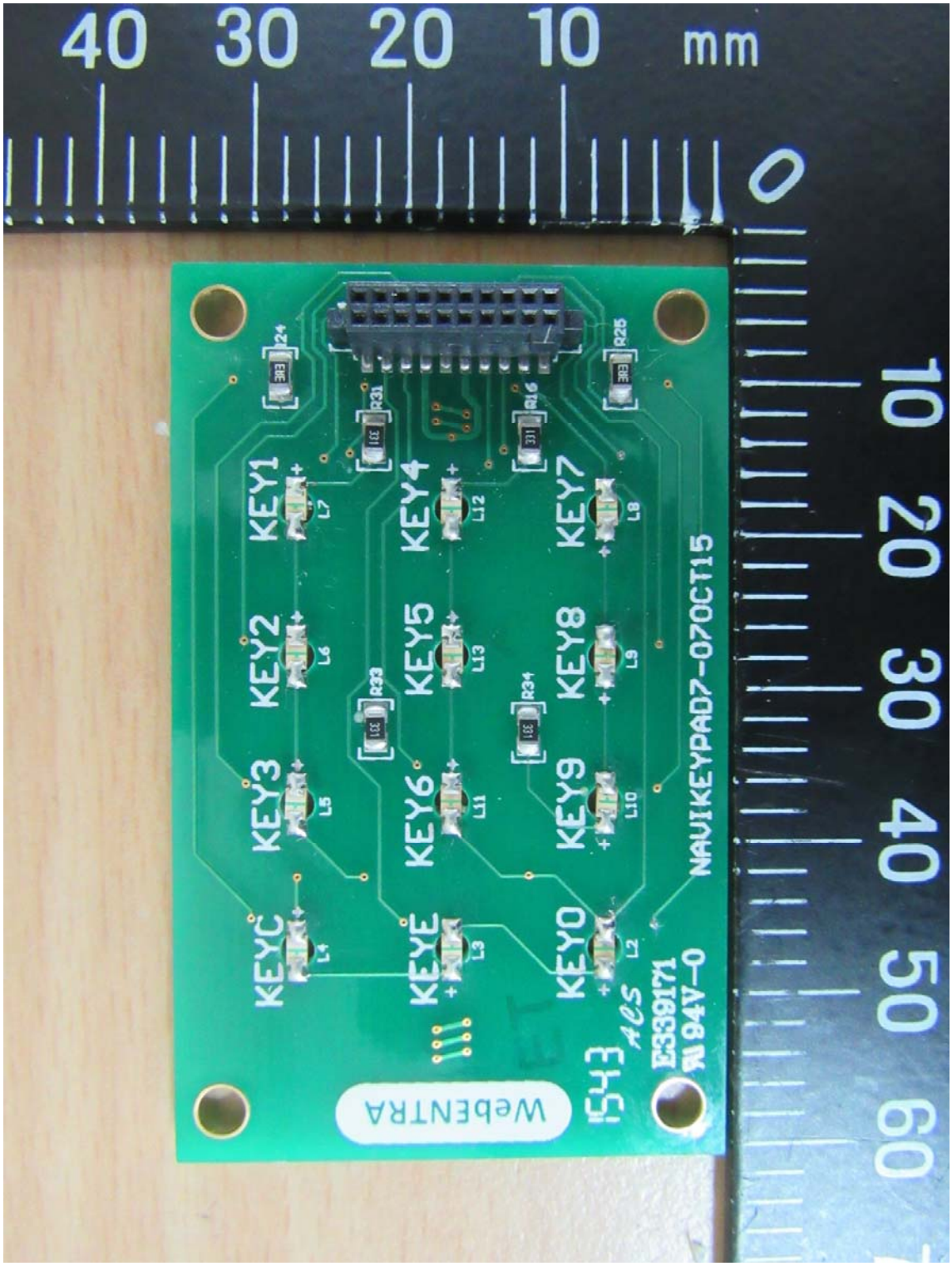
Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY



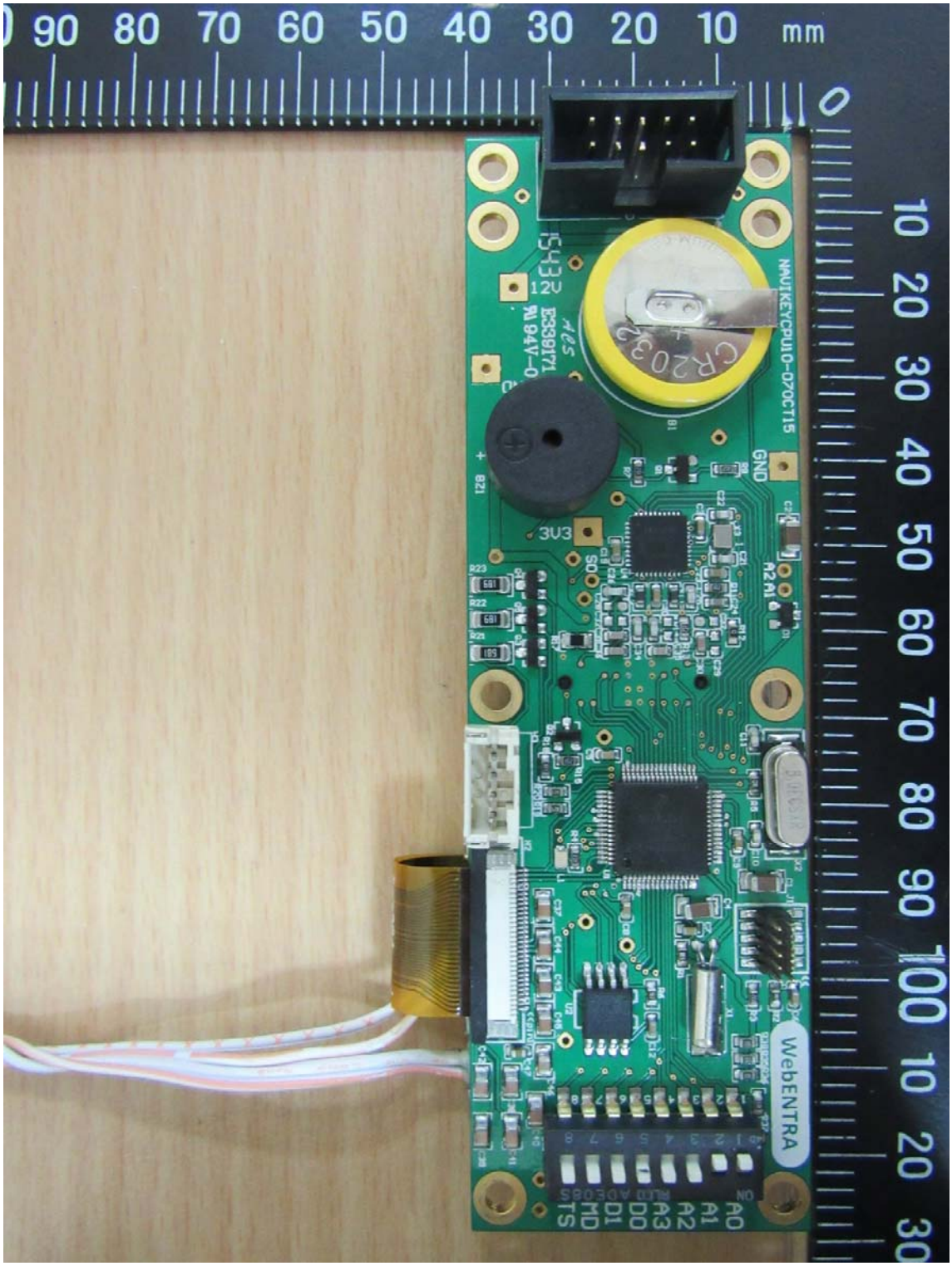
Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY



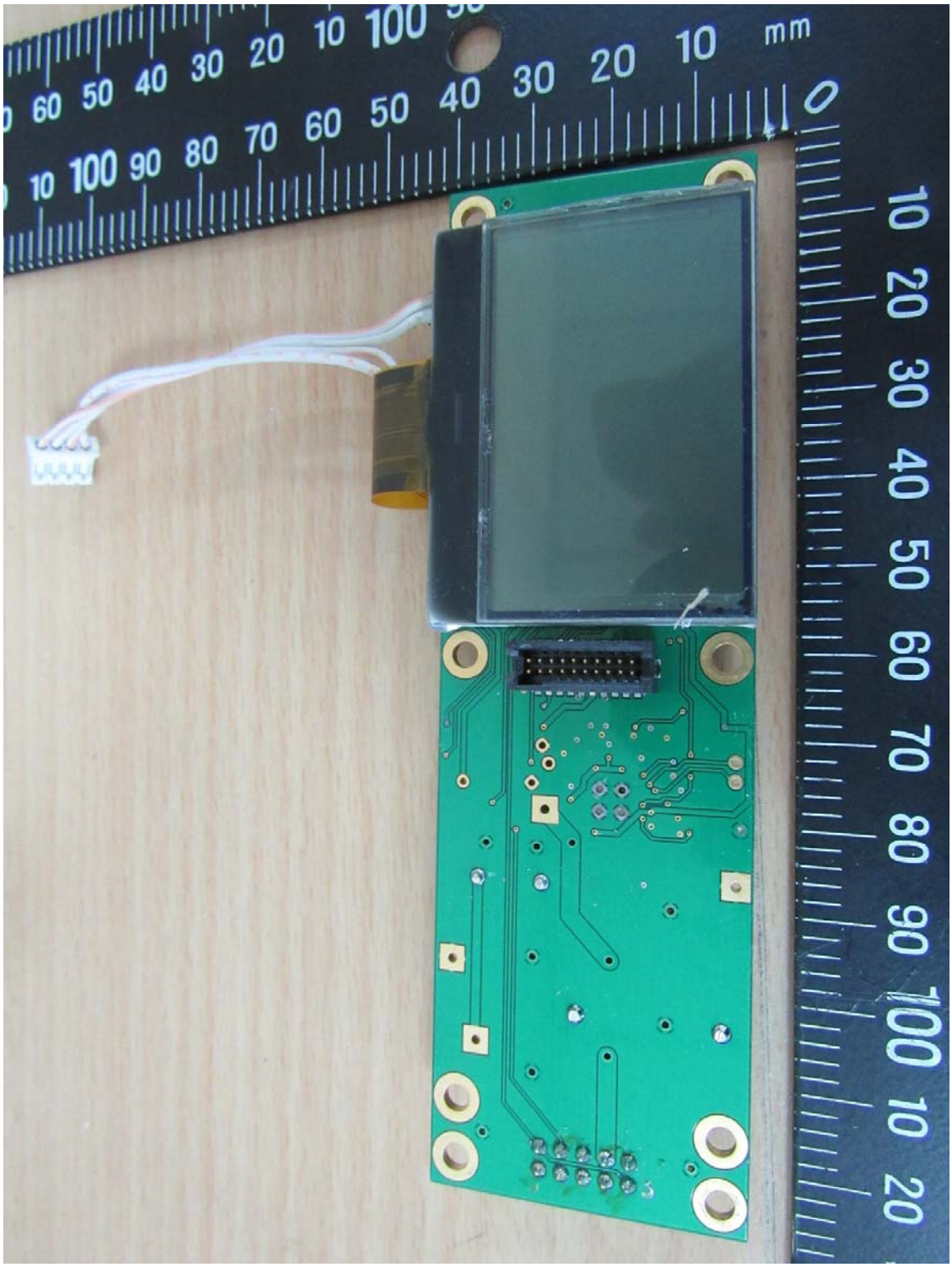
Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY



Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

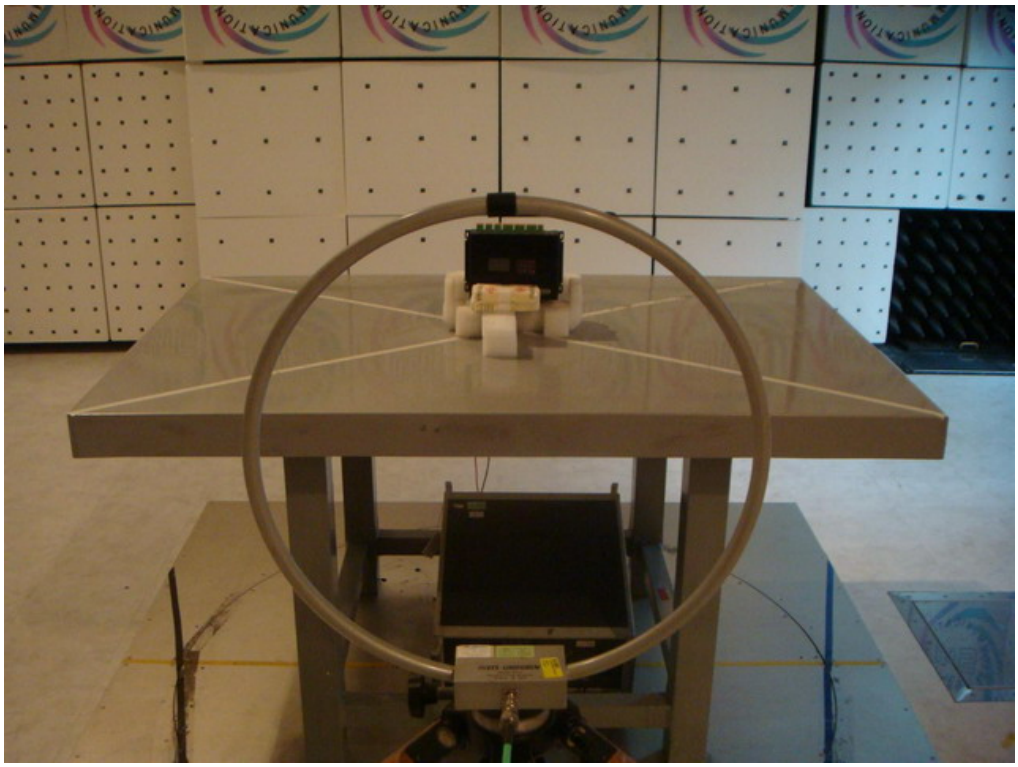


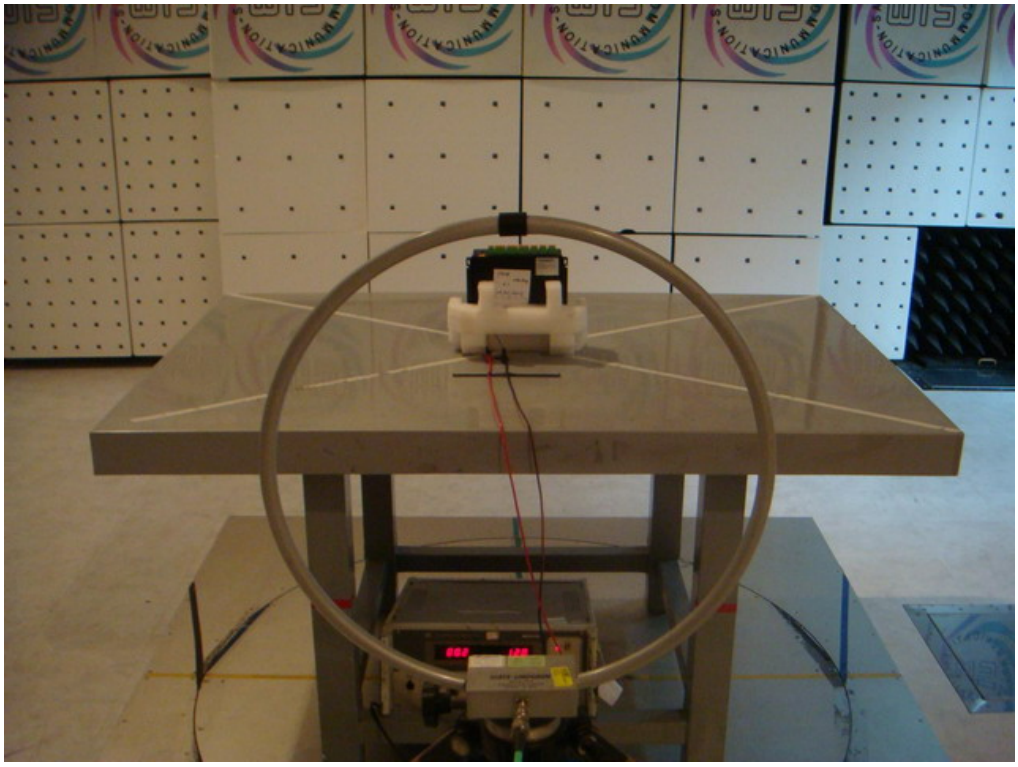
Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY



Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

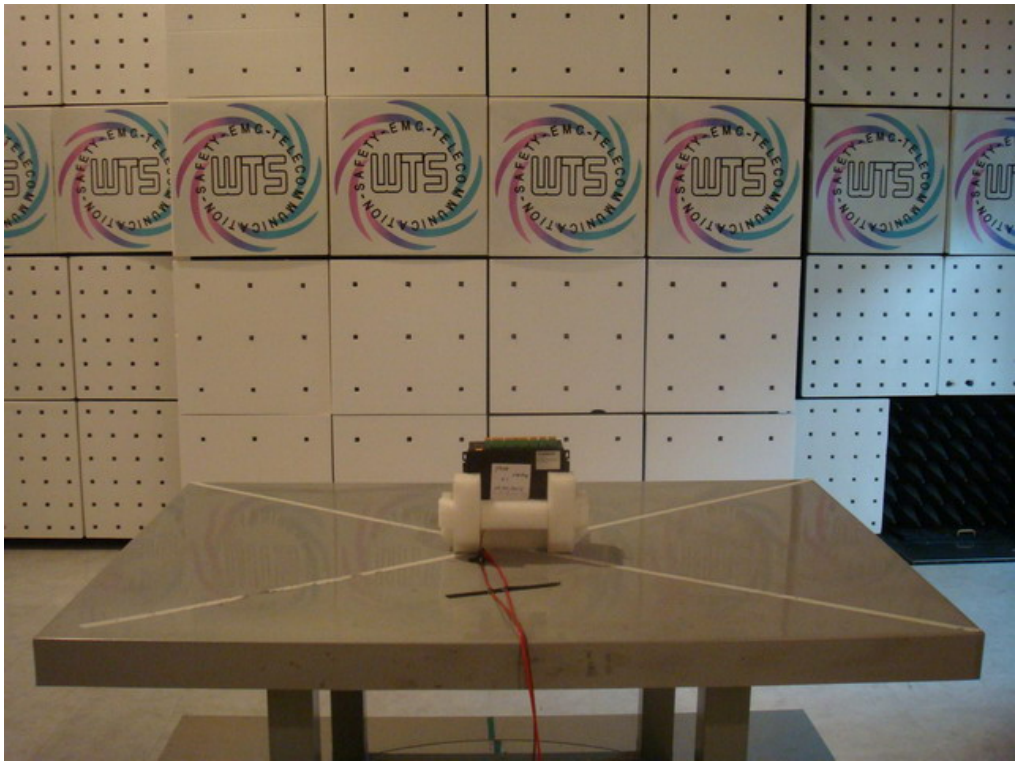
Set Up Photo of Radiated Emission
Below 30 MHz





Registration number: W6M21506-15065-C-1
FCC ID: SPH-NAVIKEY

Above 30 MHz



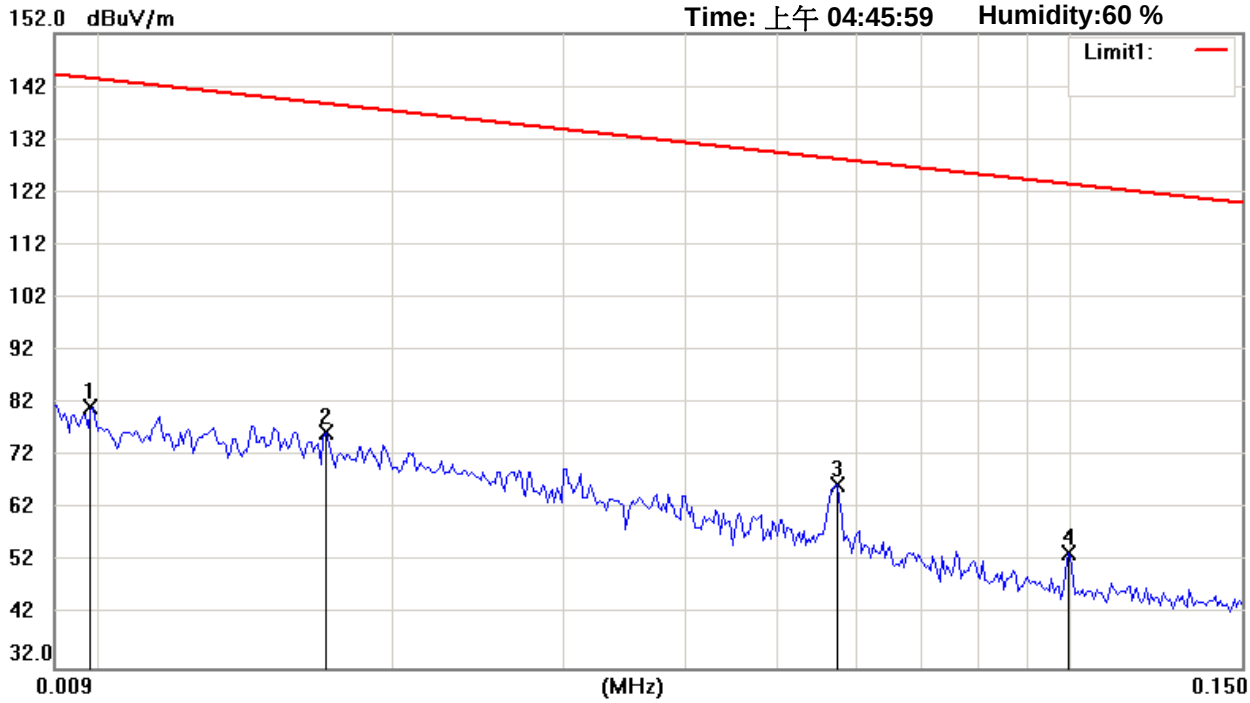
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :1 Data :#1 Date: 2016/6/8 Time: 上午 04:45:59

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC SubpartC 15.225 (<30MHz)

Polarization:

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 1.2m

Test Mode : TX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.0098	-5.47	peak	86.91	81.44	143.70	100	90	-62.26	
	0.0171	-7.11	peak	83.58	76.47	138.86	100	70	-62.39	
*	0.0575	-5.32	peak	71.89	66.57	128.33	100	60	-61.76	
	0.0994	-12.36	peak	66.01	53.65	123.58	100	15	-69.93	

*:Maximum data x:Over limit !:over margin

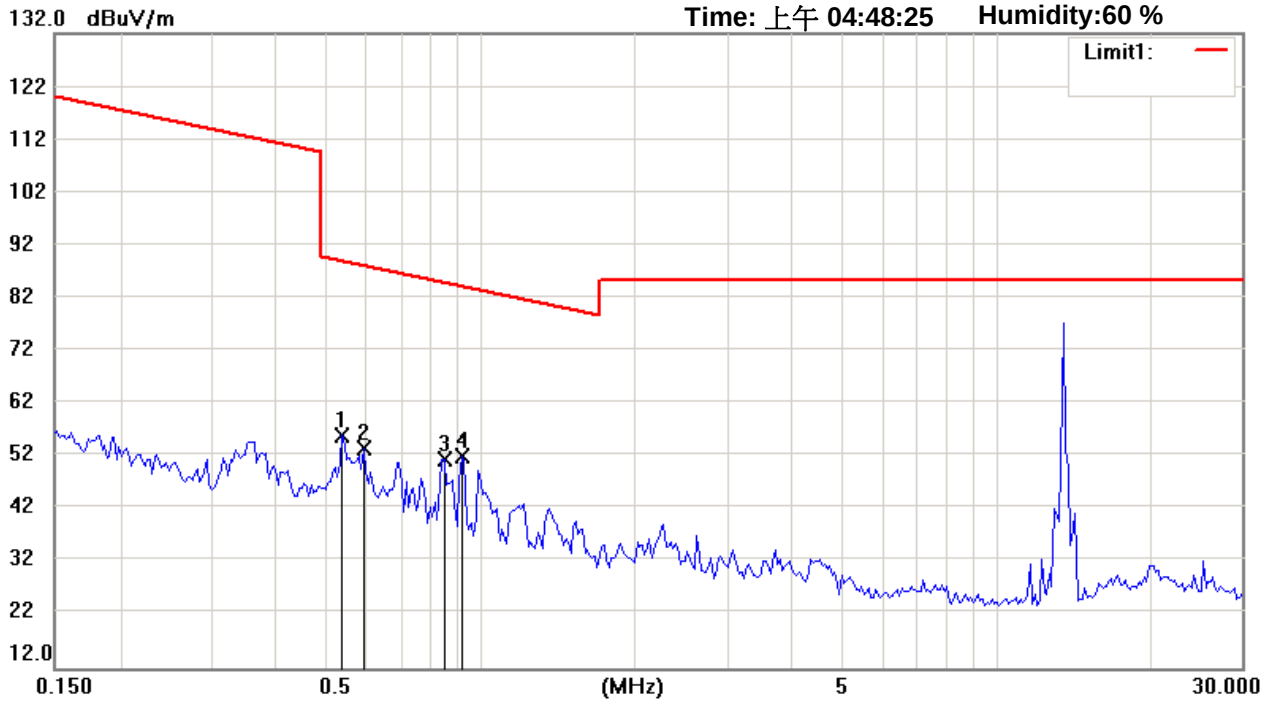
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :2 Data :#1 Date: 2016/6/8 Time: 上午 04:48:25

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC SubpartC 15.225 (<30MHz)

Polarization:

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 1.2m

Test Mode : TX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.5421	4.20	peak	51.90	56.10	88.84	100	50	-32.74	
	0.5964	2.25	peak	51.35	53.60	88.01	100	90	-34.41	
	0.8557	2.79	peak	48.70	51.49	84.88	100	40	-33.39	
*	0.9218	3.88	peak	48.03	51.91	84.23	100	15	-32.32	

*:Maximum data x:Over limit !:over margin

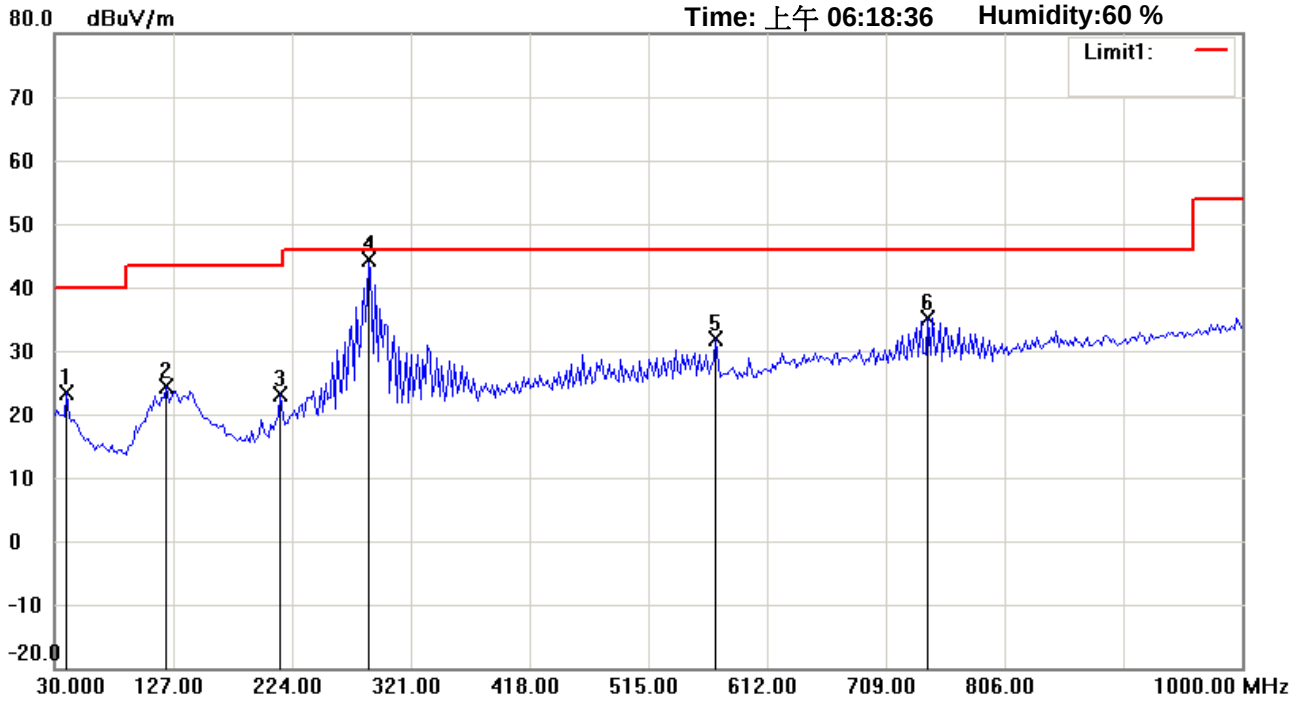
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :3 Data :#1 Date: 2016/6/8 Time: 上午 06:18:36

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

Polarization: *Horizontal*

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 3m

Test Mode : TX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	39.7194	31.59	peak	-8.15	23.44	40.00	100	75	-16.56	
	121.3627	30.52	peak	-6.26	24.26	43.50	100	125	-19.24	
	214.6693	32.75	peak	-9.73	23.02	43.50	100	190	-20.48	
*	286.5932	50.35	QP	-5.87	44.48	46.00	100	175	-1.52	
	570.4008	33.07	peak	-1.20	31.87	46.00	100	220	-14.13	
	743.4068	34.13	peak	0.91	35.04	46.00	100	135	-10.96	

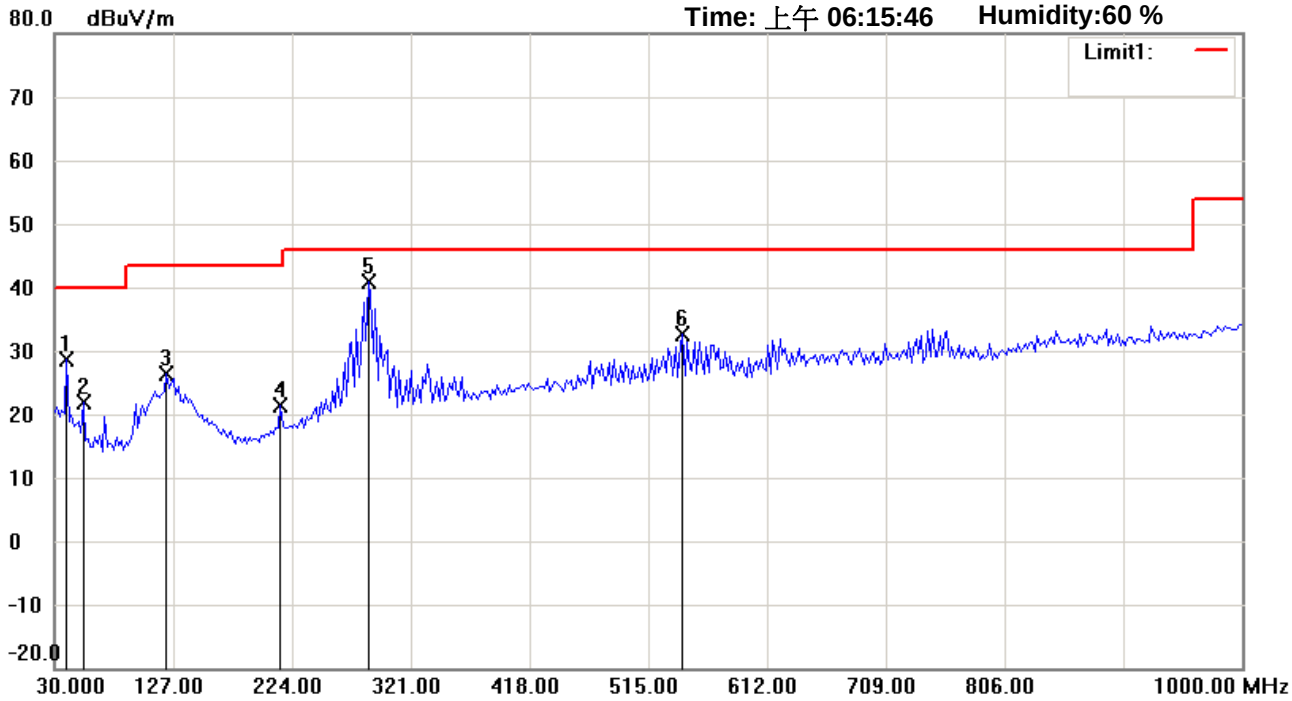
*:Maximum data x:Over limit !:over margin

Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :3 | Data :#2 | Date: 2016/6/8 | Time: 上午 06:15:46 | Temperature:24 ℃ | Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

Polarization: *Vertical*

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 3m

Test Mode : TX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	39.7194	36.87	peak	-8.15	28.72	40.00	100	245	-11.28	
	53.3267	32.71	peak	-10.75	21.96	40.00	100	70	-18.04	
	121.3627	32.59	peak	-6.26	26.33	43.50	100	180	-17.17	
	214.6693	31.18	peak	-9.73	21.45	43.50	100	155	-22.05	
*	286.5932	46.80	peak	-5.87	40.93	46.00	100	195	-5.07	
	543.1864	33.97	peak	-1.33	32.64	46.00	100	235	-13.36	

*:Maximum data x:Over limit !:over margin

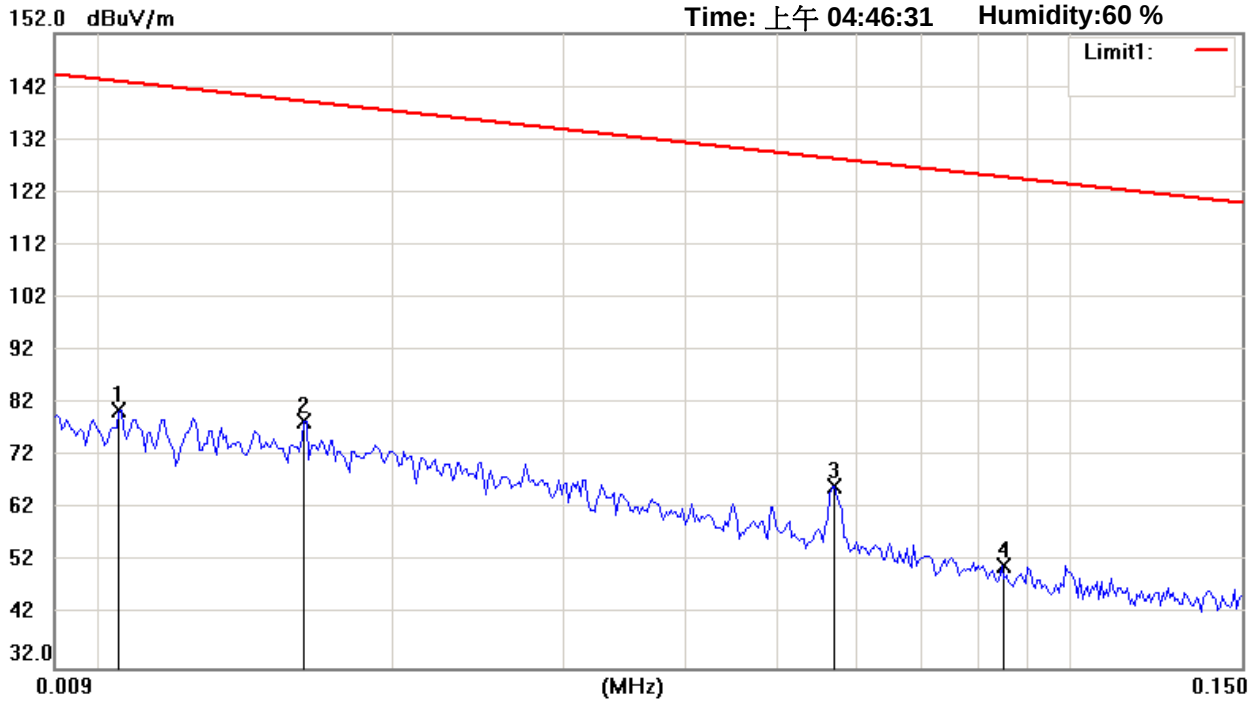
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :1 Data :#1 Date: 2016/6/8 Time: 上午 04:46:31

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC SubpartC 15.225 (<30MHz)

Polarization:

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 1.2m

Test Mode : RX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.0105	-5.76	peak	86.56	80.80	143.10	100	90	-62.30	
*	0.0163	-5.19	peak	83.94	78.75	139.28	100	355	-60.53	
	0.0570	-5.52	peak	71.96	66.44	128.41	100	20	-61.97	
	0.0850	-16.78	peak	68.03	51.25	124.94	100	15	-73.69	

*:Maximum data x:Over limit !:over margin

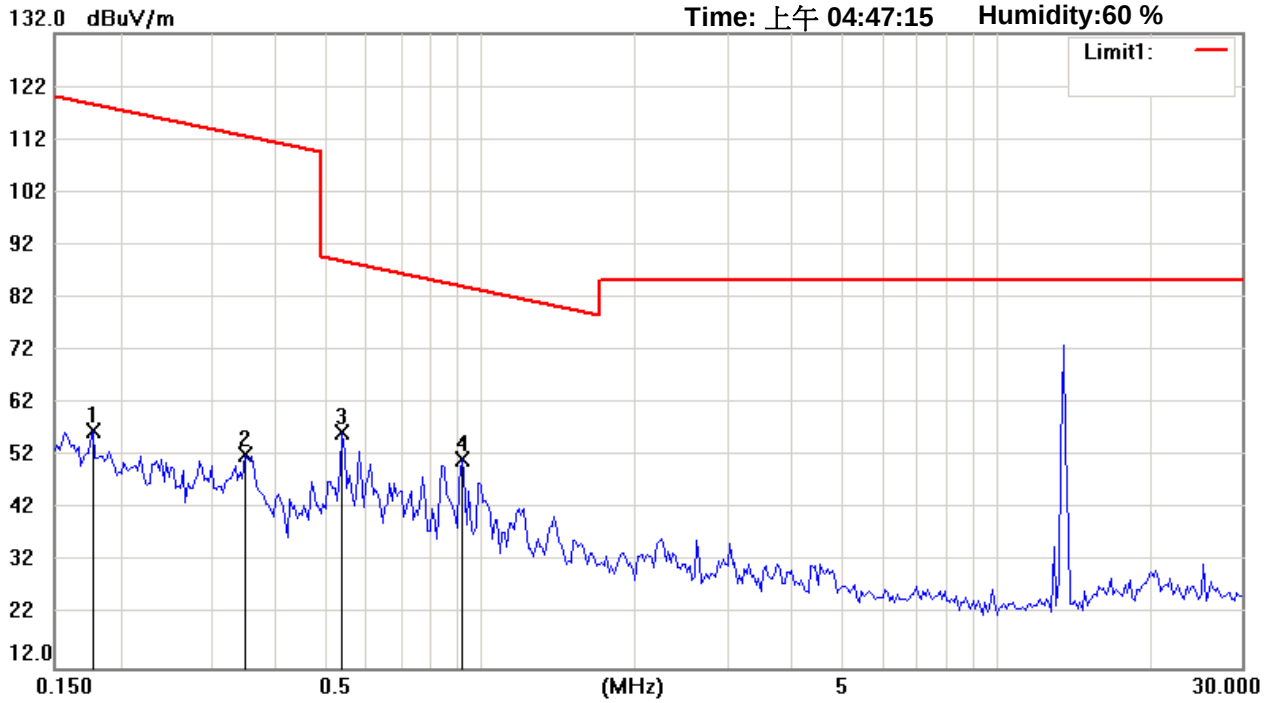
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :2 Data :#1 Date: 2016/6/8 Time: 上午 04:47:15

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC SubpartC 15.225 (<30MHz)

Polarization:

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 1.2m

Test Mode : RX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	0.1778	-5.68	peak	62.39	56.71	118.53	100	240	-61.82	
	0.3506	-3.33	peak	55.68	52.35	112.63	100	90	-60.28	
*	0.5421	4.64	peak	51.90	56.54	88.84	100	50	-32.30	
	0.9218	3.40	peak	48.03	51.43	84.23	100	175	-32.80	

*:Maximum data x:Over limit !:over margin

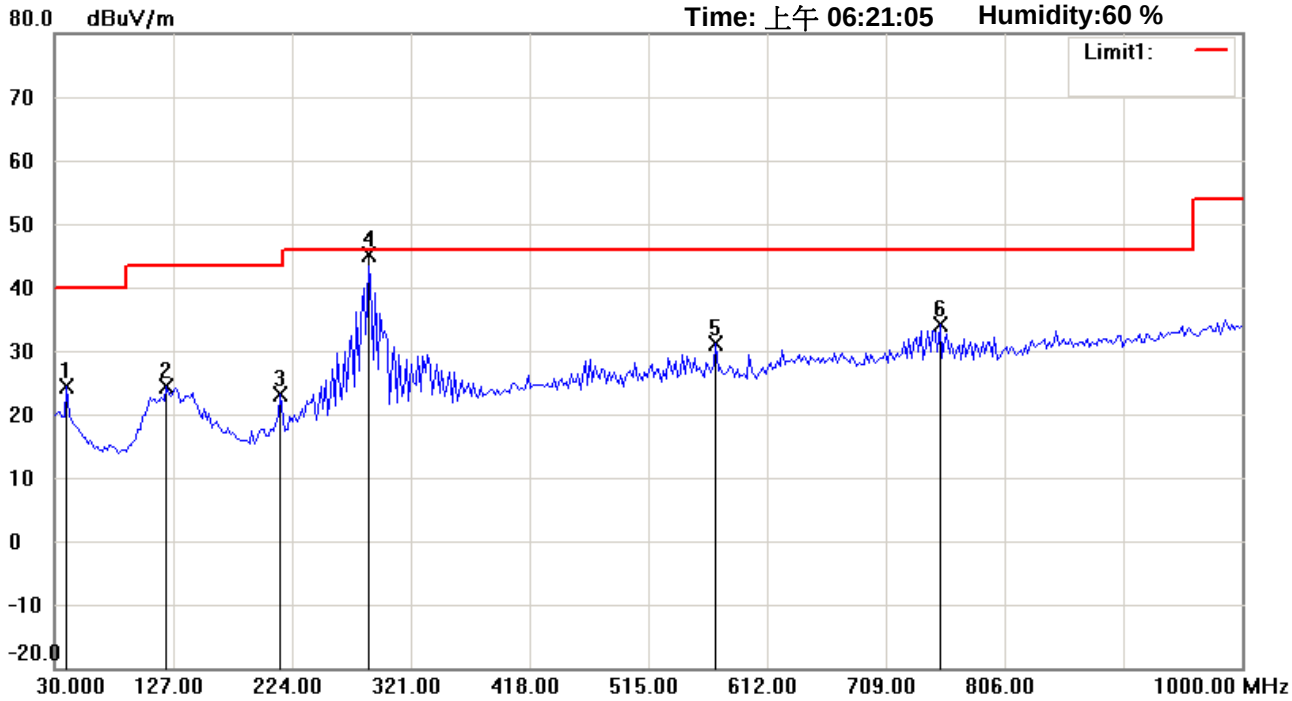
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :3 Data :#1 Date: 2016/6/8 Time: 上午 06:21:05

Temperature:24 ℃
Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class B_30-1000MHz

Polarization: *Horizontal*

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 3m

Test Mode : RX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	39.7194	32.64	peak	-8.15	24.49	40.00	100	280	-15.51	
	121.3627	30.66	peak	-6.26	24.40	43.50	100	140	-19.10	
	214.6693	32.80	peak	-9.73	23.07	43.50	100	65	-20.43	
*	286.5932	50.95	QP	-5.87	45.08	46.00	100	205	-0.92	
	570.4008	32.37	peak	-1.20	31.17	46.00	100	110	-14.83	
	753.1263	33.23	peak	1.02	34.25	46.00	100	160	-11.75	

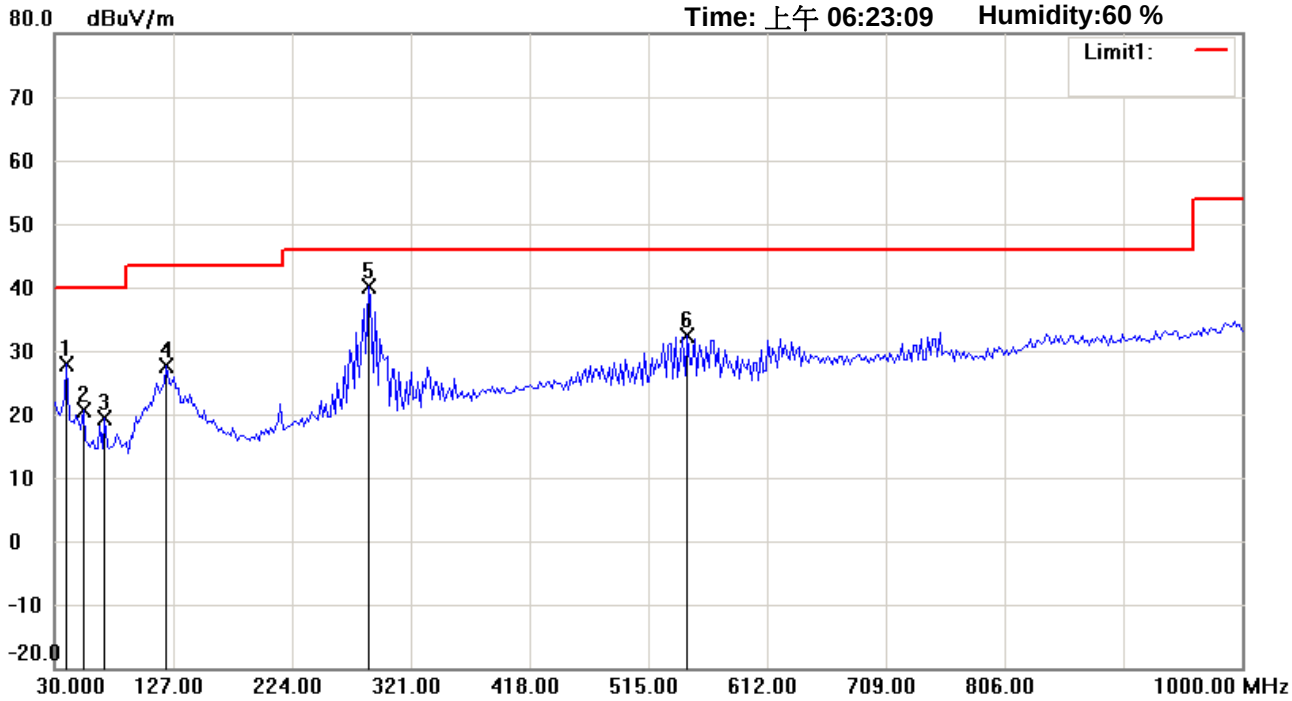
*:Maximum data x:Over limit !:over margin

Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Leon

File :3 | Data :#2 | Date: 2016/6/8 | Time: 上午 06:23:09 | Temperature:24 ℃ | Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class B_30-1000MHz

Polarization: *Vertical*

EUT : W6M21506-15065

Power : 12 Vd.c.

M/N:

Distance: 3m

Test Mode : RX 13.56MHz

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corr. factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	39.7194	36.04	peak	-8.15	27.89	40.00	100	175	-12.11	
	53.3267	31.44	peak	-10.75	20.69	40.00	100	40	-19.31	
	70.8215	32.20	peak	-12.79	19.41	40.00	100	120	-20.59	
	121.3627	33.83	peak	-6.26	27.57	43.50	100	35	-15.93	
*	286.5932	46.06	peak	-5.87	40.19	46.00	100	220	-5.81	
	547.0741	33.59	peak	-1.21	32.38	46.00	100	250	-13.62	

*:Maximum data x:Over limit !:over margin