

47 CFR PART 15 SUBPART C TEST REPORT

for

SUB AirCharge LCD/LED Water Proof Scale

Model No.: SUB/SUBe

FCC ID: 2BFJV000001

of

Applicant: EXCELL PRECISION CO., LTD..

Address: 6F., No. 127, Lane 235, Baoqiao Road, Xindian District,
New Taipei City 23145, Taiwan

Tested and Prepared

by

Worldwide Testing Services (Taiwan) Co., Ltd.

FCC Registration No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A



Report No.: W6M22309-22961-C-1

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
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Registration number: W6M22309-22961-C-1
FCC ID: 2BFJV000001

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Worldwide Testing Services(Taiwan) Co., Ltd.

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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 its performance generally conforms to representative cases of communications equipment.

Laboratory disclaimer-

1. The test results of this test report relate exclusively to the item tested as specified in 1.5.
2. The test report may only be reproduced or published in full.
3. Reproduction or publication of extracts from the report requires the prior written approval of the Worldwide Testing Services(Taiwan) Co., Ltd.

Tester:

May 28, 2024

Sora Kuo

Date

WTS-Lab.

Name

Signature

Technical responsibility for area of testing:

May 28, 2024

Kevin Wang

Date

WTS

Name

Signature



Worldwide Testing Services(Taiwan) Co., Ltd.

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1.2 Testing laboratory

1.2.1 Location

10m 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

Worldwide Testing Services (Taiwan) Co., Ltd.

6F., No. 58, Ln. 188, Ruiguang Rd., Neihu Dist.,
Taipei City 114, Taiwan (R.O.C.)

Tel: 886-2-6606-8877

1.2.2 Details of accreditation status

Accredited testing laboratory

FCC filed test laboratory Reg. No.: TW1477, TW1072

Industry Canada filed test laboratory Reg. No.: 20037, 5107A

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

Name: ./.

Accredited number: ./.

Street: ./.

Town: ./.

Country: ./.

1.3 Details of approval holder

Name: EXCELL PRECISION CO., LTD.

Street: 6F., No. 127, Lane 235, Baoqiao Road, Xindian District,

Town: New Taipei City 23145,

Country: Taiwan

1.4 Application details

Date of receipt of test item: September 15, 2023

Date of test: from September 18, 2023 to February 07, 2024



Registration number: W6M22309-22961-C-1

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1.5 General information of Test item

Type of test item: SUB AirCharge LCD/LED Water Proof Scale

Model number: SUB/SUBe

Multi-listing model number: ./.

Brand name: EXCELL

Transmitting frequency: 128 kHz

Operation modes: ASK

Antenna type: Loop Antenna

Power supply: Adaptor(I/P: 100-240V-50/60Hz 0.5A Max
O/P: 12.0V=1.5A 18.0W)
Battery 3.7Vd.c.

Sample no.: #01

Manufacturer: (if different from Approval Holder)

Name: ./.

Street: ./.

Town: ./.

Country: ./.

1.6 Test standards

Technical standard :

47 CFR PART 15 SUBPART C § 15.209 (2021-10)



FCC ID: 2BFJV000001

2 Technical test

2.1 Summary of test results

☒

or

☐

2.2 Test environment

Details of power supply	Adaptor(I/P: 100-240V-50/60Hz 0.5A Max O/P: 12.0V=1.5A 18.0W) Battery 3.7Vd.c.
-------------------------	--

Extreme conditions parameters: test voltage : -- extreme
 min : -- V
 max : -- V

Test item Name	Measurement Uncertainty
Estimation Result of Uncertainty of Conducted Emission (Power Line Conducted Emission)	Expanded Uncertainty : AMN : 0.94 dB Voltage probe : 0.96 dB Include Pulse Limiter : 1.5 dB
Estimation Result of Uncertainty of Radiated Emission(3M) (Peak Output Power, Spurious Emissions radiated – Transmitter operating, Radiated Emissions from Receiver Section of Receiver Part)	Expanded Uncertainty : 0.009-30 MHz : 1.92 dB 30-1000 MHz : 3.96 dB 1-18 GHz : 2.98 dB 18-40 GHz : 2.44 dB
Estimation Result of Uncertainty of Bandwidth Measurement (Occupied Bandwidth)	Expanded Uncertainty : 0.45 kHz

The decision rule is: Measurement uncertainty is not included in the calculation of test results.



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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	2023/6/12	2024/6/11
ETSTW-CE 003	AC POWER SOURCE	APS-9102	D161137	GW	Function Test	
ETSTW-CE 004	ZWEILEITER-V-NETZNACHBILDUNG TWO-LINE V-NETWORK	ESH3-Z5	840731/011	R&S	2023/9/19	2024/9/18
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2023/9/25	2024/9/24
ETSTW-CE 008	HF-EICHLITUNG 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	2023/7/24	2024/7/23
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2023/10/26	2024/10/25
ETSTW-CE 028	MXE EMI Receiver	N9038A	MY53220110	Agilent	2023/7/17	2024/7/16
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2023/6/12	2024/6/11
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2023/10/19	2024/10/18
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	2023/7/21	2024/7/20
ETSTW-RE 019	MICROWAVE HORN ANTENNA	22240-25	121074	FM	2023/6/9	2024/6/8
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2023/6/28	2024/6/27
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2023/5/5	2024/5/4
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2023/3/2	2024/3/1
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2023/7/28	2024/7/27
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2023/7/31	2024/7/30
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2024/2/1	2025/1/31
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2024/2/1	2025/1/31
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2024/2/1	2025/1/31
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2023/3/22	2024/3/21
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2024/2/1	2025/1/31
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2023/2/20	2024/2/19
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	2023/10/22	2024/10/21
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2023/9/15	2024/9/14
ETSTW-RE 091	Match Pad	MDCS1500	None	WOKEN	2023/5/25	2024/5/24
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2024/2/1	2025/1/31
ETSTW-RE 112	AC POWER SOURCE	TFC-1005	T-0A023536	T-Power	Function test	



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ETSTW-RE 115	2.4GHz Notch Filter	N0124411	473874	MICROWAVE CIRCUITS	2024/1/3	2025/1/2
ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	2023/10/24	2024/10/23
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2023/6/7	2024/6/6
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2023/8/4	2024/8/3
ETSTW-RE 126	5GHz Notch filter	5NSL12-5800/E221.3-O/O	1	K&L Microwave	2023/8/4	2024/8/3
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2024/2/1	2025/1/31
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2023/8/4	2024/8/3
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2023/8/4	2024/8/3
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-RE 142	Amplifier	8447D	2805A03378	Agilent	2023/2/20	2024/2/19
ETSTW-RE 146	Preamplifier	JPA-10M1G	15090004	JPT	2023/5/26	2024/5/25
ETSTW-RE 152	Bi-log Hybrid Antenna	MCTD 2786B	BLB20J04029	ETC	2023/3/21	2024/3/20
ETSTW-RE 153	Signal Analyzer	FSV40	101929	R&S	2023/9/20	2024/9/19
ETSTW-RE 154	EMI Test Receiver	ESR3	102829	R&S	2023/4/13	2024/4/12
ETSTW-RE 159	Bi-log Hybrid Antenna (30M~1000 MHz)	MCTD 2786B	BLB21N04035	ETC	2023/12/27	2024/12/26
ETSTW-RE 160	Amplifier Module	CHC 3	None	WTS	2023/7/14	2024/7/13
ETSTW-RE 176	Loop Antenna	FMZB 1513-60	00039	SCHWARZBECK	2023/8/10	2024/8/9
ETSTW-RE 177	TRILOG Broadband Antenna	VULB 9168&EMCI-N-6-06	01380&AT-06007	SCHWARZBECK&EMC	2023/8/24	2024/8/23
ETSTW-RE 178	Double Ridged Guide Horn Antenna	DRH18-E	210505A18ES	RFSPIN	2023/8/17	2024/8/16
ETSTW-RF 002	Electromagnetic field probe	LF-30	K-0007	STT	2023/6/13	2024/6/12
ETSTW-EMI 011	USB Compact Modulator	SFC-U	101689	R&S	2023/5/28	2024/5/27
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2023/3/22	2024/3/21
ETSTW-GSM 003	Radio Communication Analyzer	MT8820C	6201342073	Anritsu	2023/5/10	2024/5/9
ETSTW-GSM 004	Wideband Radio Communication Tester	CMW500	128092	R&S	2023/10/18	2024/10/17
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40/12+9SS	3	WI	2024/1/3	2025/1/2
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2024/1/3	2025/1/2
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2024/1/3	2025/1/2
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2024/1/3	2025/1/2
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2023/8/28	2024/8/27
ETSTW-GSM 024	Radio Communication Analyzer	MT8821C	None	Anritsu	2023/4/24	2024/4/23
ETSTW-GSM 025	Band Reject Filter	BRM19835	001	Micro-Tronics	2023/8/4	2024/8/3
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2024/2/1	2025/1/31
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2024/2/1	2025/1/31
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2024/2/1	2025/1/31
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2024/2/1	2025/1/31
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2023/6/26	2024/6/25



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ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2023/4/27	2024/4/26
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2023/9/15	2024/9/14
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2023/9/15	2024/9/14
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S_Cable 9)	279067	HUBER+SUHNER	2024/2/1	2025/1/31
ETSTW-Cable 049	Microwave Cable	FA147A0015M2020	30064-1	UTIFLEX	2023/8/16	2024/8/15
ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2023/5/26	2024/5/25
ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2023/2/20	2024/2/19
ETSTW-Cable 071	N TYPE CABLE	EMCCFD400-NM- NM-25000	170239	EMCI	2023/5/26	2024/5/25
ETSTW-Cable 072	SMA type cable (8m)	SUCOFLEX 104	805800/4	HUBER+SUHNER	2023/2/20	2024/2/19
ETSTW-Cable 074	SMA type cable (2m)	SUCOFLEX 104	802563/4	HUBER+SUHNER	2023/2/20	2024/2/19
ETSTW-Cable 076	SMA type cable (1m)	N/A	812652/4	HUBER+SUHNER	2023/2/20	2024/2/19
ETSTW-Cable 077	SMA type cable (10m)	EMC104-SM- SM-10000	230511	EMCI	2023/7/14	2024/7/13
ETSTW-Cable 084	SMA type cable (1m)	SF104-11SMA-1000	816477/4	HONOVA	2023/7/14	2024/7/13
ETSTW-Cable 089	SMA type cable (2m)	SF104-11SMA-2000	SN 811889/4	HUBER+SUHNER	2023/7/14	2024/7/13
ETSTW-Cable 090	N type Cable (15m)	EMCCFD400- NM-NM-15000	230732	EMCI	2023/8/4	2024/8/3
ETSTW-Cable 091	N type Cable (15m)	EMCCFD400- NM-NM-15000	230733	EMCI	2023/8/4	2024/8/3
ETSTW-Cable 093	BNC Cable (3m)	EMCCFD-300 -BM-BM-3000	240109	EMCI	2024/1/10	2025/1/9
WTSTW-SW 002	EMI TEST SOFTWARE	EZ EMC	None	Farad	Version ETS-03A1 Version EMEC-3A1+	
WTSTW-SW 006	EMI TEST SOFTWARE	e3	None	AUDIX	Version 9.161014	
WTSTW-SW 008	Signal studio	Agilent	None	AUDIX	Version 2.0.0.1	
ETSTW-TH 002	Thermohygrometer	608-H1	45204317	Testo	2023/7/21	2024/7/20
ETSTW-TH 003	Wireless weather station	GAIA	N/A	TFA	2023/10/20	2024/10/19
ETSTW-TH 004	Thermohygrometer	88163	2205131	AZ	2023/9/13	2024/9/12



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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

ANSI STANDARD C63.10-2013 6.2.2 MEASUREMENT PROCEDURES: The EUT was placed on a table 80 cm height and with dimensions of 1m by 1.5m (non metallic table). The EUT was placed in the centre of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings.

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.

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.



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3 Test results (enclosure)

Test case	Para. Number	Required	Test passed	Test failed
Peak Output Power	15.209	☒	☒	☐
Spurious Emissions radiated – Transmitter operating	15.209	☒	☒	☐
Spurious Emissions radiated – Receiver operating	15.109	☐	☐	☐
Occupied bandwidth	2.1049	☒	☒	☐
Antenna Requirement	FCC 15.203	☒	☒	☐
Power Line Conducted Emission	FCC 15.207	☒	☒	☐

The following is intentionally left blank.



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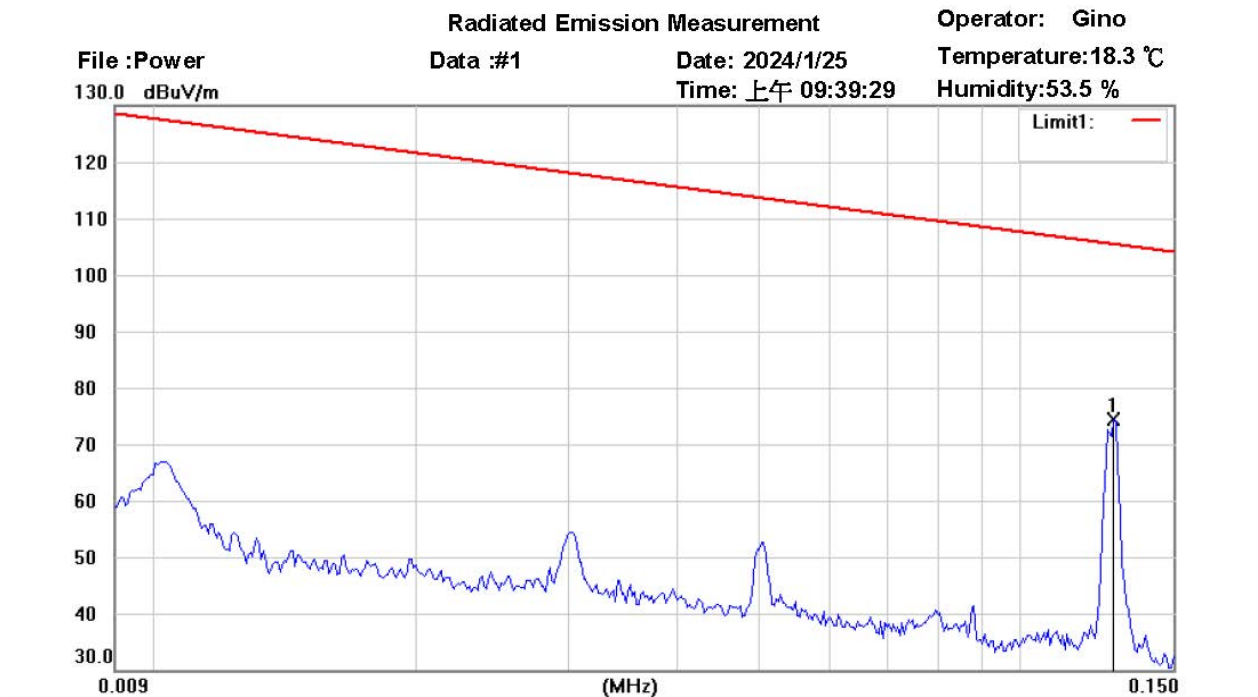
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3.1 Peak Output Power

FCC Rules: 15.209

The power was measured with modulation (declared by the applicant).



Site : Chamber

Condition : FCC_15.209 RE (9k-30M) (3M)

EUT : W6M22309-22961

M/N:

Test Mode : TX 128KHz

Note :

Polarization:

Power : 120 Vac.

Distance: 3m

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
*	0.1281	55.61	peak	18.83	74.44	105.45	100	360	-31.01	

Limits: 15.209

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	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



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The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

DF (distance factor) = $40 \log (D_1/D_2) = 80 \text{ dB}$, where

D₁ is the 300 meter specified measurement distance,

D₂ is the 3 meter test measurement distance.

For 128 kHz frequency the calculated limit is:

Limit_{3m} = Limit_{300m} + DF = 25.45 dBuV/m + 80 dB = 105.45 dBuV/m

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-Cable 020.



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3.2 Spurious Emissions radiated – Transmitter operating

FCC Rules: 15.209

The field strength of any emission appearing outside of the specific band shall not exceed the general radiated emission limits in 15.209.

Model:	SUB/SUBe	Date:	--					
Mode:	--	Temperature:	--	°C	Engineer:	--		
Polarization:	Horizontal	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. See attached diagrams in the Appendix.

All other not noted test plots do not contain significant test results in relation to the limits.

TEST RESULT (Transmitter): The unit DOES meet the FCC requirements.

Limits: 15.209

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	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

* In the emission table above, the tighter limit applies at the band edges.

The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:



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$DF = 40 \log (D_1/D_2) = 80 \text{ dB}$, where

For D_1 is the 300 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The $DF = 80 \text{ dB}$ was applied for limit calculation at 3 meter test distance measurements.

For D_1 is the 30 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The $DF = 40 \text{ dB}$ was applied for limit calculation at 3 meter test distance measurements.

If the frequency between 9 – 490 kHz,

$\text{Limit} = 20\log(2400/f(\text{kHz})) + 80$

If the frequency between 490 – 1705 kHz,

$\text{Limit} = 20\log(2400/f(\text{kHz})) + 40$

If the frequency between 1705 – 30000 kHz,

$\text{Limit} = 20\log 30 + 40$

For 128 kHz frequency the calculated limit is:

$\text{Limit}_{3m} = \text{Limit}_{300m} + DF = 25.45 \text{ dBuV/m} + 80 \text{ dB} = 105.45 \text{ dBuV/m}$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 142, ETSTW-RE 152,
ETSTW-Cable 020, ETSTW-Cable 064, ETSTW-Cable 072,
ETSTW-Cable 074, ETSTW-Cable 076.



Registration number: W6M22309-22961-C-1

FCC ID: 2BFJV000001

3.3 Occupied Bandwidth

FCC Rules: 2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated are each equal to 0.5% of the total mean power radiated by a given emission.

The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth specifications are given, the following guidelines are used:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 MHz to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

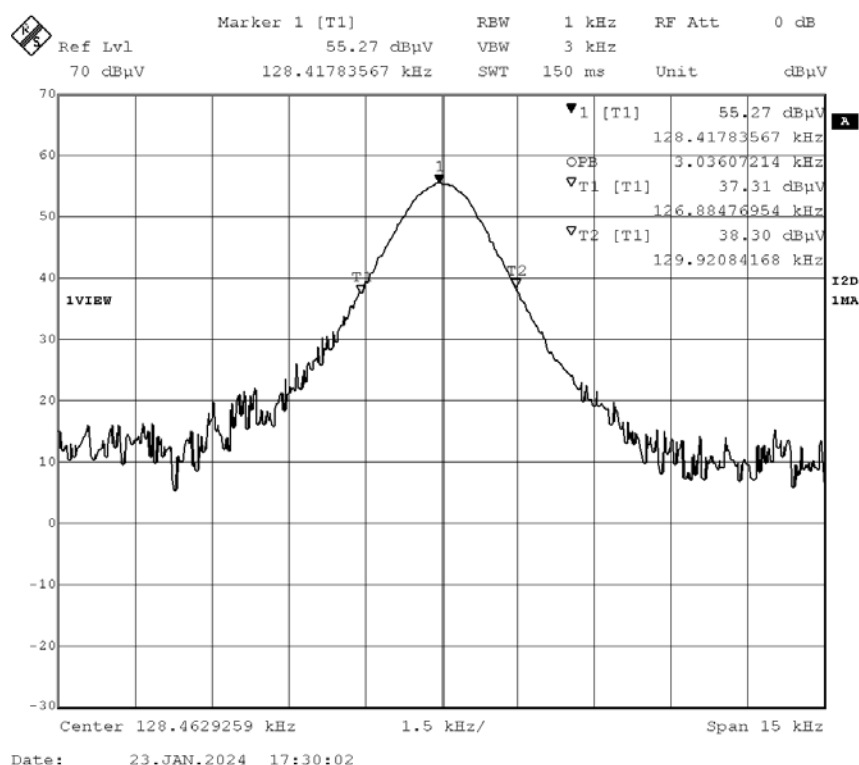
Test date: January 23, 2024

Temperature: 18.6°C

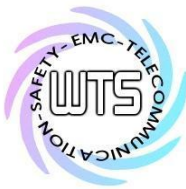
Humidity: 56.0 %

Tester: Sora

Test result:



Test equipment: ETSTW-RE 055



Registration number: W6M22309-22961-C-1
FCC ID: 2BFJV000001

3.4 Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Explanation: This antenna is Loop antenna which passes antenna requirement.

The equipment meets the requirements	yes ☒	no ☐
--------------------------------------	--	--------------------------------



Registration number: W6M22309-22961-C-1

FCC ID: 2BFJV000001

3.5 Radiated Emissions from Receiver Section of Receiver Part

For the frequency from 9 kHz to 30 MHz:

FCC Rule: 15.209

The field strength of any emission appearing outside of the specific band shall not exceed the general radiated emission limits in 15.209.

Frequency of Emission (MHz)	Field Strength of Fundamental Limit uV/m	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

* In the emission table above, the tighter limit applies at the band edges.

Note: The above field strength limits are specified at a distance of 3 meters.

The test was performed in the anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance factor DF:

$DF = 40 \log (D_1/D_2) = 80 \text{ dB}$, where

For D_1 is the 300 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The $DF = 80 \text{ dB}$ was applied for limit calculation at 3 meter test distance measurements.

For D_1 is the 30 meter specified measurement distance.

D_2 is the 3 meter test measurement distance.

The $DF = 40 \text{ dB}$ was applied for limit calculation at 3 meter test distance measurements.

If the frequency between 9 – 490 kHz, limit = $20\log(2400/f(\text{kHz})) + 80$

If the frequency between 490 – 1705 kHz, limit = $20\log(2400/f(\text{kHz})) + 40$

If the frequency between 1705 – 30000 kHz, limit = $20\log 30 + 40$

For 128 kHz frequency the calculated limit is:

$\text{Limit}_{3m} = \text{Limit}_{300m} + DF = 25.45 \text{ dBuV/m} + 80 \text{ dB} = 105.45 \text{ dBuV/m}$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-Cable 020

Explanation: See attached diagrams in appendix



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M22309-22961-C-1

FCC ID: 2BFJV000001

For the frequency from 30 MHz to 1000 MHz.:

FCC Rule: 15.109

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Field Strength (dBmicrovolts/meter)
30 – 88	100	40.0
88 – 216	150	43.5
216 – 960	200	46.0
Above 960	500	54.0

Model: SUB/SUBe

Date: --

Mode: --

Temperature: -- °C

Engineer: --

Polarization: Horizontal

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)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Test equipment used: ETSTW-RE 004, ETSTW-RE 142, ETSTW-RE 152,
ETSTW-Cable 064, ETSTW-Cable 072,
ETSTW-Cable 074, ETSTW-Cable 076.

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. Please refer to separated test report no.: WW6M22309-22961-P-15B.**



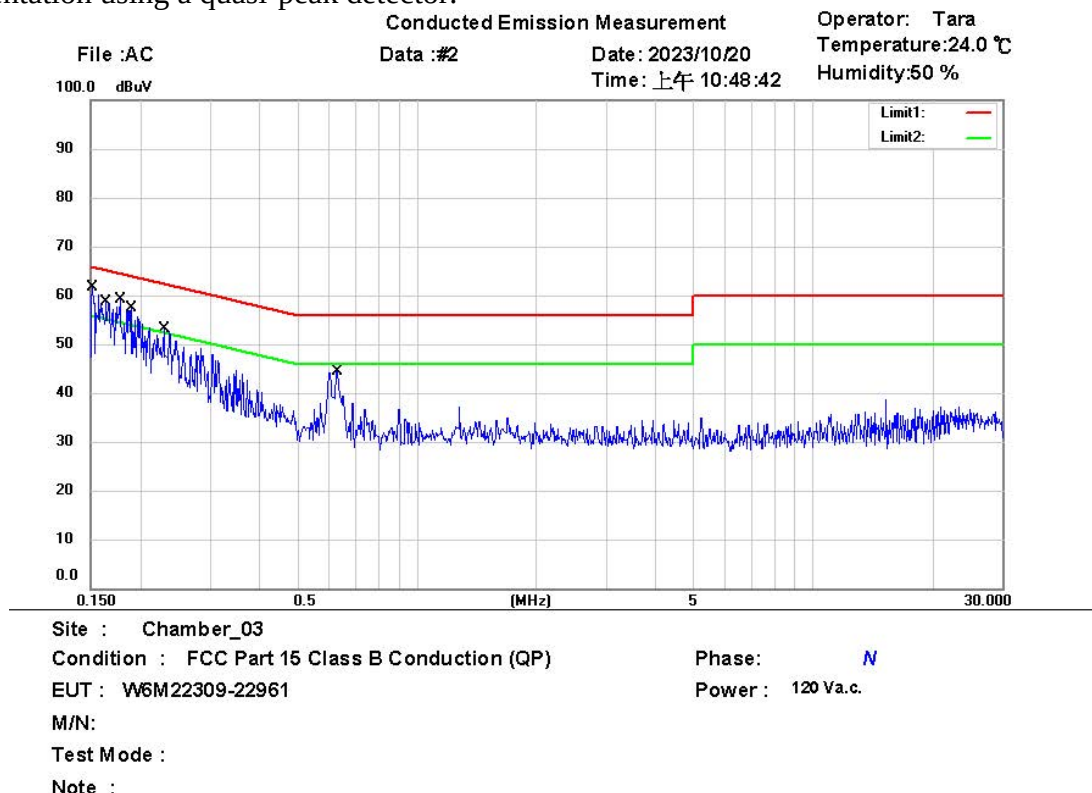
Registration number: W6M22309-22961-C-1

FCC ID: 2BFJV000001

3.6 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.



Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.1514	36.40	QP	9.59	45.99	65.92	-19.93	
	0.1514	22.55	AVG	9.59	32.14	55.92	-23.78	
*	0.1638	35.90	QP	9.59	45.49	65.27	-19.78	
	0.1638	17.52	AVG	9.59	27.11	55.27	-28.16	
	0.1777	33.69	QP	9.59	43.28	64.59	-21.31	
	0.1777	17.07	AVG	9.59	26.66	54.59	-27.93	
	0.1903	32.31	QP	9.59	41.90	64.02	-22.12	
	0.1903	17.17	AVG	9.59	26.76	54.02	-27.26	
	0.2284	28.55	QP	9.60	38.15	62.51	-24.36	
	0.2284	12.15	AVG	9.60	21.75	52.51	-30.76	
	0.6282	24.55	QP	9.65	34.20	56.00	-21.80	
	0.6282	12.10	AVG	9.65	21.75	46.00	-24.25	

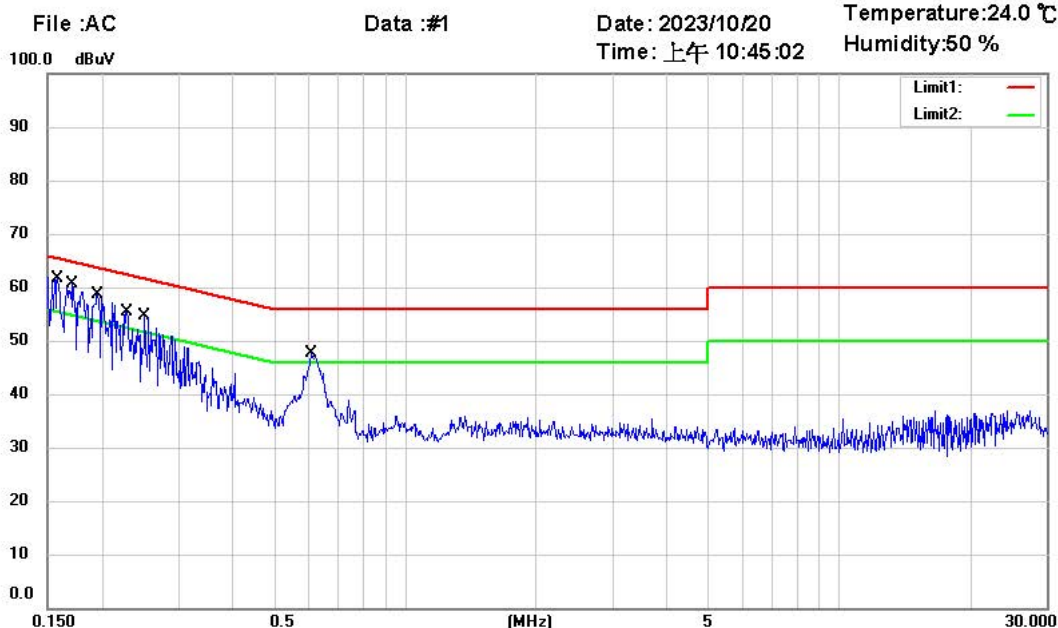


Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M22309-22961-C-1
FCC ID: 2BFJV000001

Conducted Emission Measurement

Operator: Tara
Temperature: 24.0 °C
Humidity: 50 %



Site : Chamber_03

Condition : FCC Part 15 Class B Conduction (QP)

Phase: L1

EUT : W6M22309-22961

Power : 120 V.a.c.

M/N:

Test Mode :

Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	0.1581	38.63	QP	9.63	48.26	65.56	-17.30	
	0.1581	25.22	AVG	9.63	34.85	55.56	-20.71	
	0.1707	37.54	QP	9.63	47.17	64.93	-17.76	
	0.1707	16.74	AVG	9.63	26.37	54.93	-28.56	
	0.1946	35.12	QP	9.63	44.75	63.84	-19.09	
	0.1946	16.74	AVG	9.63	26.37	53.84	-27.47	
	0.2270	30.98	QP	9.64	40.62	62.56	-21.94	
	0.2270	14.35	AVG	9.64	23.99	52.56	-28.57	
	0.2505	28.82	QP	9.64	38.46	61.74	-23.28	
	0.2505	13.30	AVG	9.64	22.94	51.74	-28.80	
	0.6080	33.34	QP	9.68	43.02	56.00	-12.98	
*	0.6080	25.46	AVG	9.68	35.14	46.00	-10.86	

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. Up Line: QP Limit Line, Down Line: Ave Limit Line.



Worldwide Testing Services(Taiwan) Co., Ltd.

Registration number: W6M22309-22961-C-1

FCC ID: 2BFJV000001

Limits:

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

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



Registration number: W6M22309-22961-C-1
FCC ID: 2BFJV000001

Appendix

Measurement diagrams

Spurious Emissions Radiated



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: Gino

File :1

Data :#1

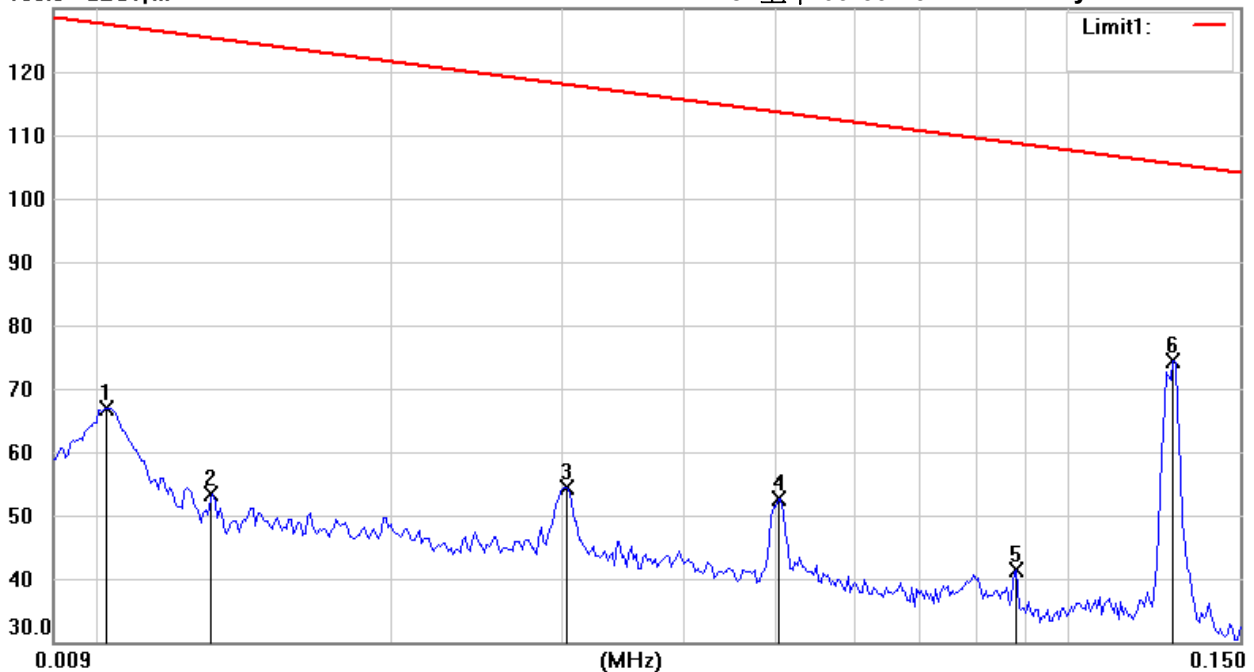
Date: 2024/1/25

Temperature:18.3 °C

Time: 上午 09:39:29

Humidity:53.5 %

130.0 dBuV/m



Site : Chamber

Condition : FCC_15.209 RE (9k-30M) (3M)

EUT : W6M22309-22961

M/N:

Test Mode : TX 128KHz

Note :

Polarization:

Power : 120 Va.c.

Distance: 3m

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
	0.0102	48.17	peak	18.80	66.97	127.42	100	360	-60.45	
	0.0131	34.24	peak	19.03	53.27	125.25	100	360	-71.98	
	0.0303	33.98	peak	20.37	54.35	117.97	100	360	-63.62	
	0.0502	32.87	peak	19.79	52.66	113.58	100	360	-60.92	
	0.0883	22.33	peak	18.99	41.32	108.68	100	360	-67.36	
*	0.1281	55.61	peak	18.83	74.44	105.45			-31.01	RF Power

*: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: Echo

File : 2

Data : #1

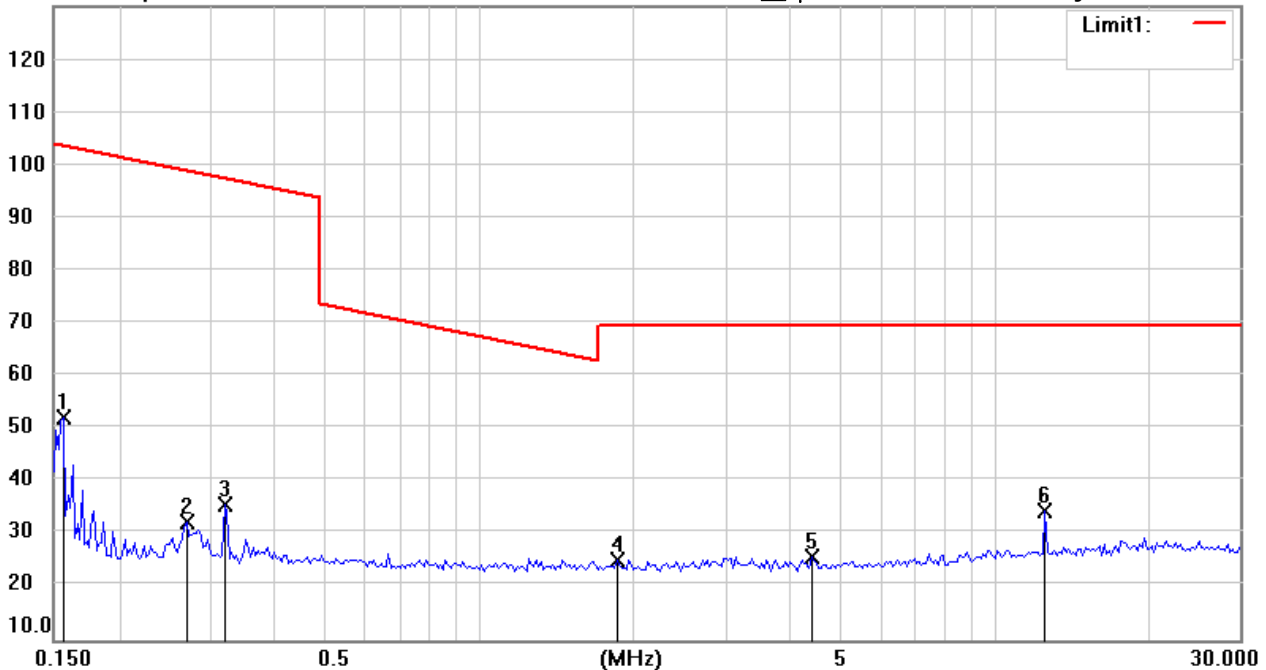
Date: 2024/1/25

Temperature: 18.3 °C

130.0 dBuV/m

Time: 上午 03:00:45

Humidity: 53.5 %



Site : Chamber

Condition : FCC_15.209 RE (9k-30M) (3M)

EUT : W6M22309-22961

M/N:

Test Mode : TX 128kHz

Note :

Polarization:

Power : 120 Va.c.

Distance: 3m

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
	0.1565	33.36	peak	18.92	52.28	103.71	100	245	-51.43	
	0.2717	13.09	peak	19.29	32.38	98.92	100	227	-66.54	
	0.3221	16.37	peak	19.32	35.69	97.44	100	310	-61.75	
	1.8576	5.93	peak	19.27	25.20	69.54	100	189	-44.34	
	4.4370	6.14	peak	19.73	25.87	69.54	100	29	-43.67	
*	12.5602	12.42	peak	21.94	34.36	69.54	100	158	-35.18	

*: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: Echo

File :3

Data :#1

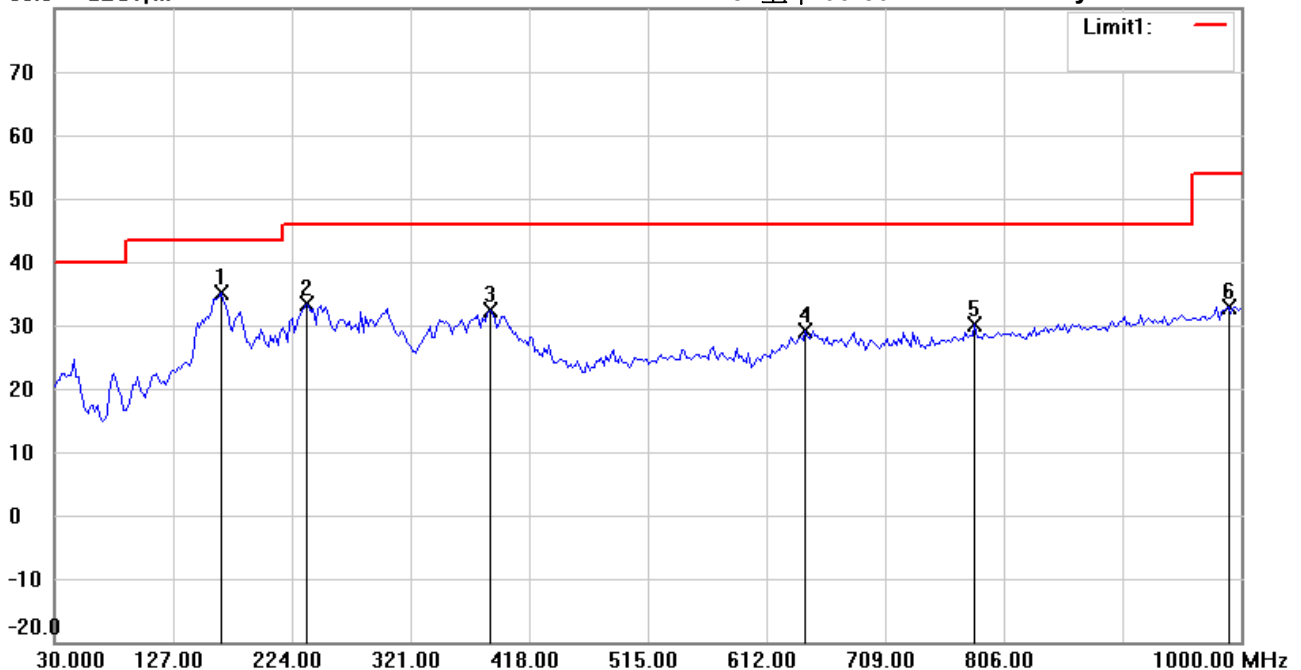
Date: 2024/1/25

Temperature:18.3 °C

80.0 dBuV/m

Time: 上午 03:50:21

Humidity:53.5 %



Site : Chamber

Condition : FCC_part 15.209 RE_30-1000MHz

EUT : W6M22309-22961

M/N:

Test Mode : TX 128kHz

Note :

Polarization: *Horizontal*

Power : 120 Va.c.

Distance: 3m

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
*	166.0721	45.16	peak	-10.10	35.06	43.50	100	150	-8.44	
	236.0521	41.90	peak	-8.42	33.48	46.00	100	225	-12.52	
	385.7315	36.62	peak	-4.13	32.49	46.00	100	193	-13.51	
	644.2685	28.53	peak	0.57	29.10	46.00	100	274	-16.90	
	782.2846	29.06	peak	1.04	30.10	46.00	100	218	-15.90	
	990.2806	26.97	peak	5.93	32.90	54.00	100	300	-21.10	

*: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: Echo

File : 3

Data : #2

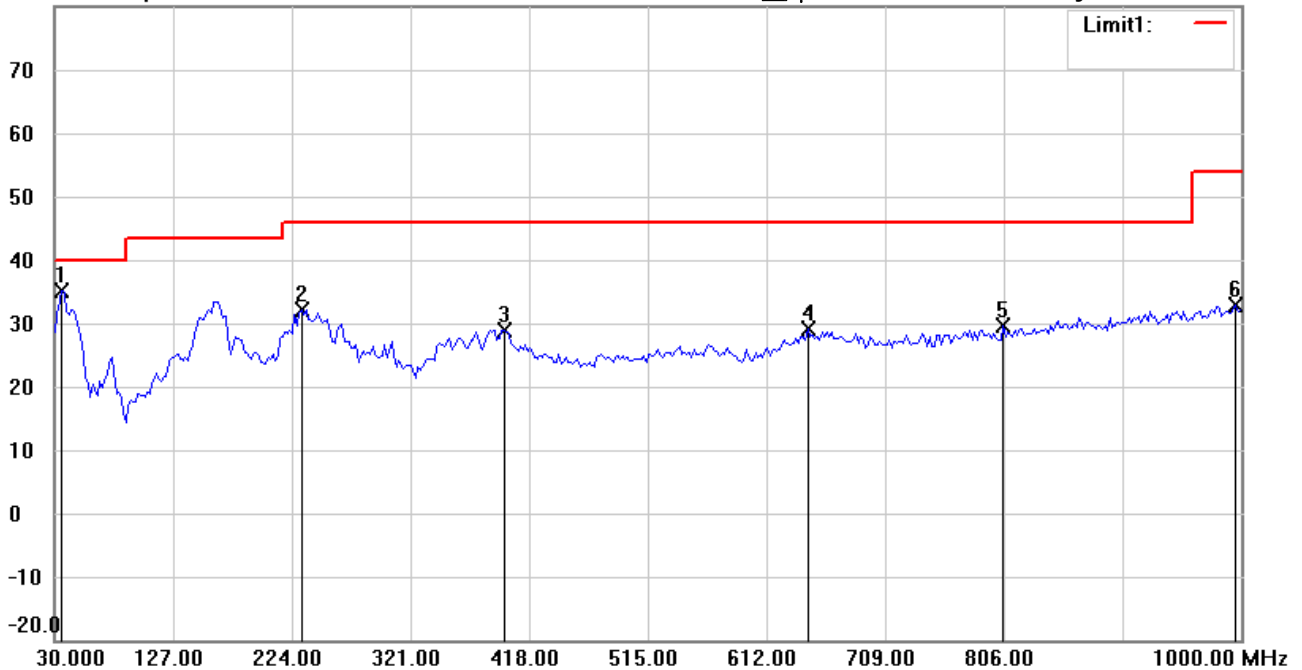
Date: 2024/1/25

Temperature: 18.3 °C

80.0 dBuV/m

Time: 上午 03:51:21

Humidity: 53.5 %



Site : Chamber

Condition : FCC_part 15.209 RE_30-1000MHz

EUT : W6M22309-22961

M/N:

Test Mode : TX 128kHz

Note :

Polarization: Vertical

Power : 120 Va.c.

Distance: 3m

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
*	35.8316	43.46	peak	-8.25	35.21	40.00	100	159	-4.79	
	232.1643	40.74	peak	-8.62	32.12	46.00	100	274	-13.88	
	397.3948	32.70	peak	-3.73	28.97	46.00	100	310	-17.03	
	646.2124	28.50	peak	0.71	29.21	46.00	100	185	-16.79	
	805.6112	28.16	peak	1.49	29.65	46.00	100	64	-16.35	
	996.1122	26.66	peak	6.13	32.79	54.00	100	27	-21.21	

*: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: Echo

File :1

Data :#1

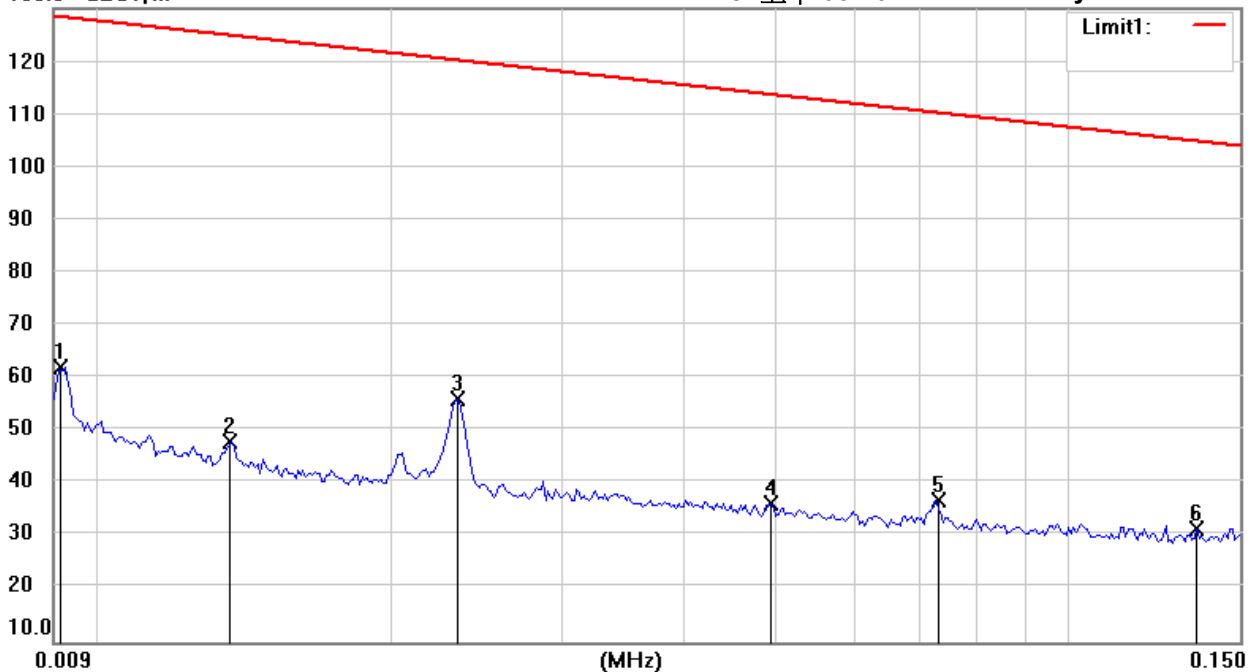
Date: 2024/1/25

Temperature:18.3 °C

Time: 上午 03:19:41

Humidity:53.5 %

130.0 dBuV/m



Site : Chamber

Condition : FCC_15.209 RE (9k-30M) (3M)

EUT : W6M22309-22961

M/N:

Test Mode : RX 128KHz

Note :

Polarization:

Power : 120 Va.c.

Distance: 3m

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
	0.0092	43.26	peak	18.80	62.06	128.32	100	310	-66.26	
	0.0137	28.89	peak	19.08	47.97	124.86	100	278	-76.89	
*	0.0235	36.20	peak	19.86	56.06	120.18	100	156	-64.12	
	0.0493	16.57	peak	19.81	36.38	113.74	100	217	-77.36	
	0.0730	17.42	peak	19.31	36.73	110.33	100	115	-73.60	
	0.1355	12.56	peak	18.85	31.41	104.96	100	163	-73.55	

*: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: Echo

File : 2

Data : #1

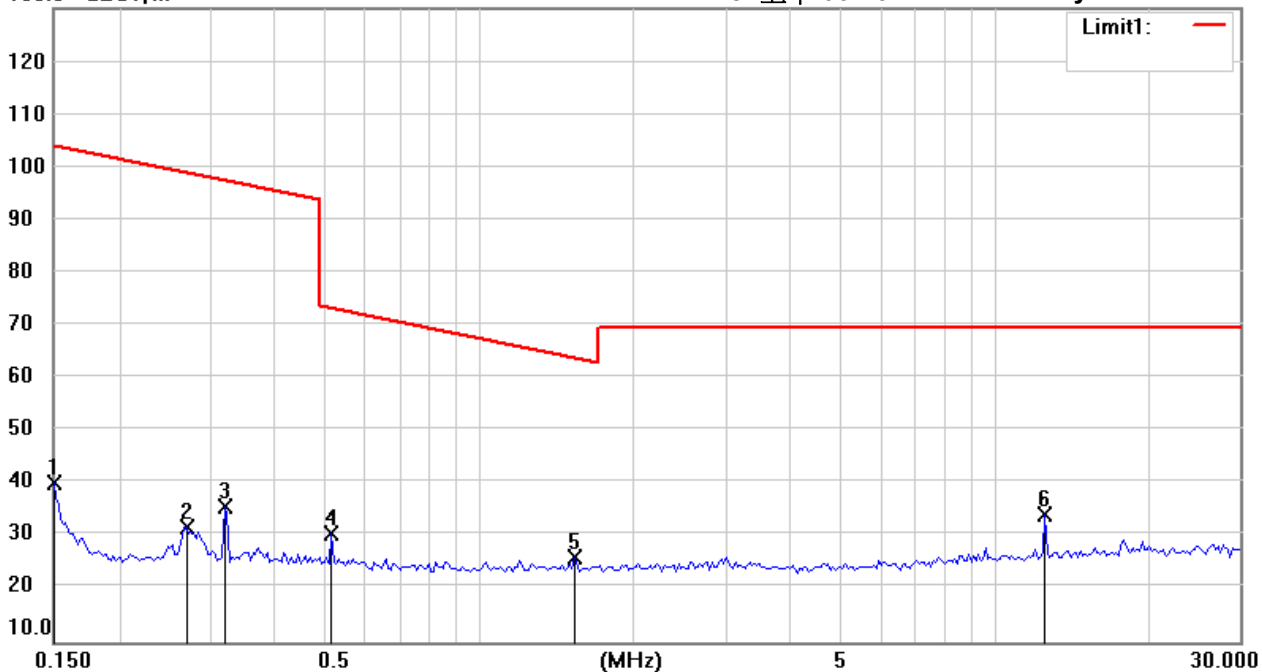
Date: 2024/1/25

Temperature: 18.3 °C

130.0 dBuV/m

Time: 上午 03:13:11

Humidity: 53.5 %



Site : Chamber

Condition : FCC_15.209 RE (9k-30M) (3M)

EUT : W6M22309-22961

M/N:

Test Mode : RX 128KHz

Note :

Polarization:

Power : 120 Va.c.

Distance: 3m

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
	0.1500	21.27	peak	18.90	40.17	104.08	100	220	-63.91	
	0.2717	12.49	peak	19.29	31.78	98.92	100	241	-67.14	
	0.3222	16.24	peak	19.32	35.56	97.44	100	190	-61.88	
	0.5195	11.76	peak	18.86	30.62	73.29	100	313	-42.67	
	1.5345	6.82	peak	19.24	26.06	63.88	100	188	-37.82	
*	12.5602	12.26	peak	21.94	34.20	69.54	100	152	-35.34	

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