

FCC PART 15 SUBPART C TEST REPORT

for

BIKE COMPUTER 120

Model No.: 2183316

FCC ID: 2AH2PBC120

of

Applicant: DECATHLON USA LLC

**Address: 2415 3rd street Suite 231 94107 San Francisco California
United States**

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



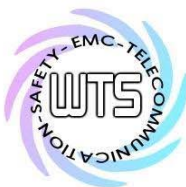
Report No.: W6M21702-16610-C-1

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



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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.

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:

February 20, 2017

Leon Chueh

Date

WTS-Lab.

Name

Signature

Technical responsibility for area of testing:

February 20, 2017

Kevin Wang

Date

WTS

Name

Signature



Worldwide Testing Services(Taiwan) Co., Ltd.

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1.2 Testing laboratory

1.2.1 Location

OATS

No.5-1, Shuang Sing Village,

LiShuei Rd., Wanli Dist.,

New Taipei City 207, Taiwan (R.O.C.)

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: DECATHLON USA LLC

Street: 2415 3rd street Suite 231 94107 San Francisco

Town: California

Country: United States

Telephone: ./.

Fax: ./.



Worldwide Testing Services(Taiwan) Co., Ltd.

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1.4 Application details

Date of receipt of test item: February 14, 2017

Date of test: from February 15, 2017 to February 20, 2017

1.5 General information of Test item

Type of test item: BIKE COMPUTER 120

Model Number: 2183316

Multi-listing model number: ./.

Brand name: BTWIN

Photos: see Appendix

Technical data

Transmitting Frequency: 40 kHz

Operation modes: Simplex

Antenna Type: Helical Antenna

Power supply: Battery 3Vdc

Manufacturer: (if different from Approval Holder)

Name: ECHOWELL ELECTRONIC CO., LTD.

Street: 7F-8, NO.8, SEC.1, JUNGSHING RD., WUGU DIST.,

Town: NEW TAIPEI CITY 24872,

Country: TAIWAN, R.O.C

Additional information: ./.

1.6 Test standards

Technical standard :

FCC RULES 15 SUBPART C § 2.1049, § 15.203, § 15.209 (2015-10)



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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 °C

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Details of power supply Battery 3Vdc

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



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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	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	2016/9/12	2017/9/11
ETSTW-CE 028	MXE EMI Receiver	N9038A	MY53220110	Agilent	2016/8/26	2017/8/25
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	2017/2/7	2018/2/6
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	2017/2/18	2018/2/17
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2017/2/18	2018/2/17
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2017/2/18	2018/2/17
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2017/2/18	2018/2/17
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2017/2/18	2018/2/17
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	2016/9/8	2017/9/7
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2016/9/20	2017/9/19
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2017/2/18	2018/2/17
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	2017/1/12	2018/1/11
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



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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	2017/2/18	2018/2/17
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	2017/2/2	2018/2/1
ETSTW-GSM 004	Wideband Radio Communication Tester	CMW500	128092	R&S	2016/12/15	2017/12/14
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2017/1/12	2018/1/11
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2017/1/12	2018/1/11
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2017/1/12	2018/1/11
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2017/1/12	2018/1/11
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2016/9/14	2017/9/13
ETSTW-Cable 010	BNC Cable	RGS-142	None	THERMAX	2016/9/12	2017/9/11
ETSTW-Cable 011	SMA to N type Cable	RGU-400	None	THERMAX	Pre-test Use NCR	
ETSTW-Cable 012	BNC Cable	RGS-400	None	THERMAX	2016/9/12	2017/9/11
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2017/2/18	2018/2/17
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2017/2/18	2018/2/17
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2017/2/18	2018/2/17
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2017/2/18	2018/2/17
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	2017/2/18	2018/2/17
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	2016/9/20	2017/9/19
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2016/9/20	2017/9/19
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 (S Cable 9)	279067	HUBER+SUHNER	2017/2/18	2018/2/17
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



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ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2016/4/13	2017/4/12
ETSTW-Cable 066	SMA type cable	32022	None	ASTROLAB	2016/9/12	2017/9/11
WTSTW-SW 002	EMI TEST SOFTWARE	EZ_EMC	None	Farad	Version ETS-03A1	
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	



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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.

Measurements were made by Worldwide Testing Services(Taiwan) Co., Ltd. at the registered open field test site located at 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.

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	☐	☐	☐

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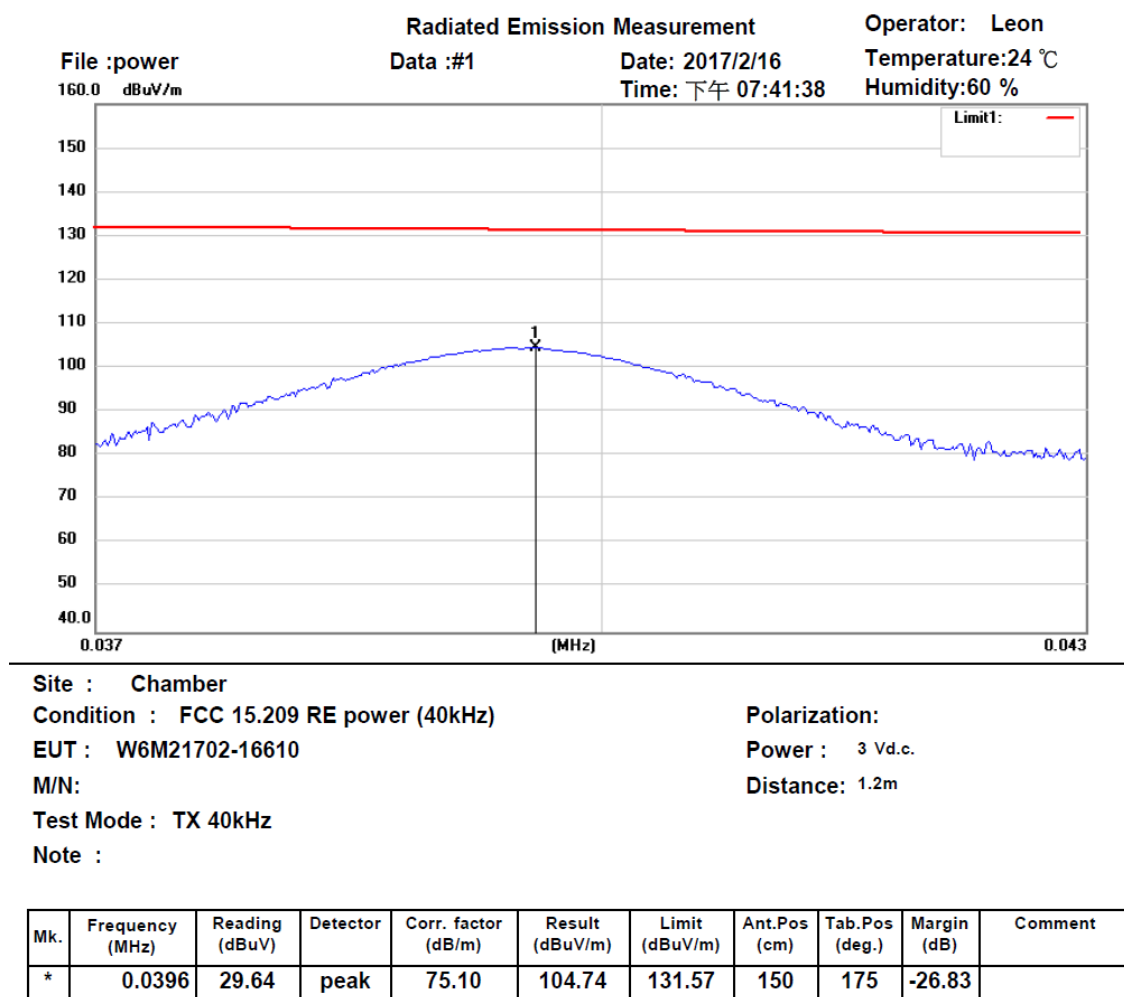
Registration number: W6M21702-16610-C-1

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3.1 Peak Output Power

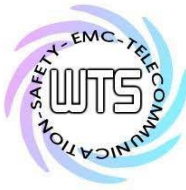
FCC Rules: 15.209

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



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 1.2 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) = $40 \log (D_1/D_2) = 95.92 \text{ dB}$, where

D₁ is the 300 meter specified measurement distance,

D₂ is the 1.2 meter test measurement distance.

For 40 kHz frequency the calculated limit is:

Limit_{1.2m} = Limit_{300m} + DF = 35.56 dBuV/m + 95.92 dB = 131.48 dBuV/m

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055.



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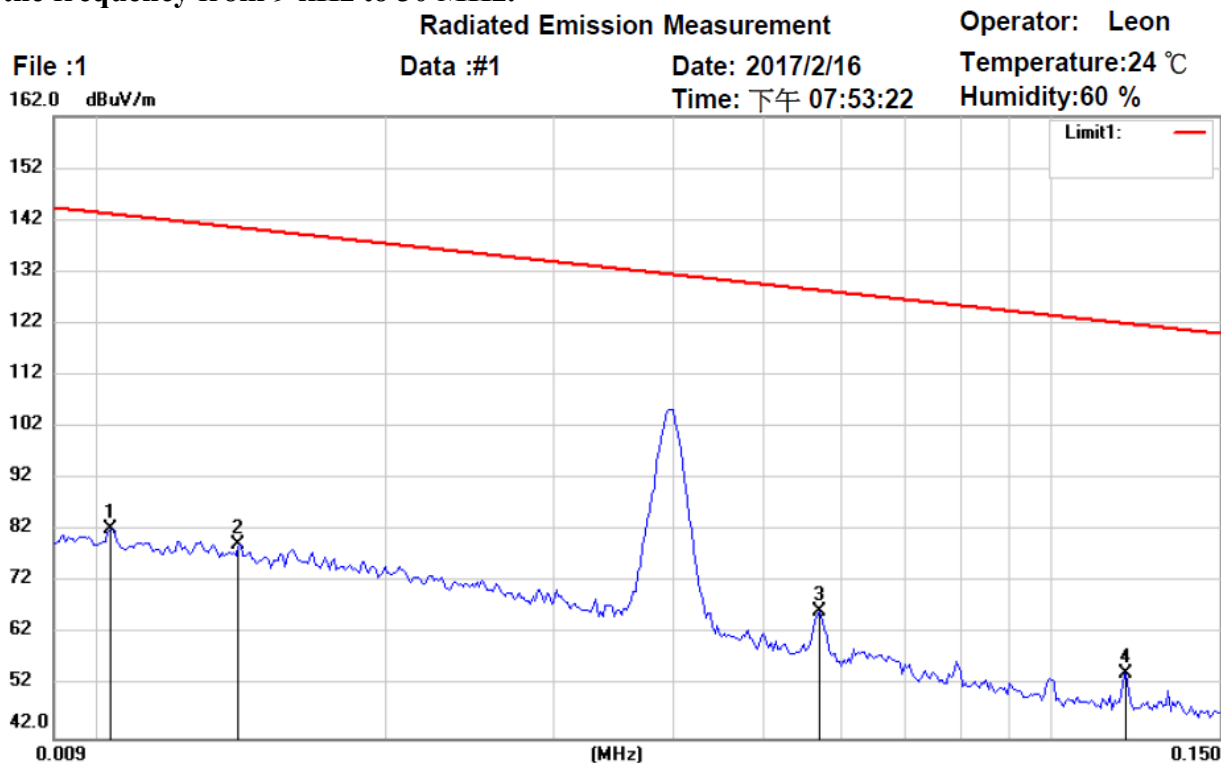
FCC ID: 2AH2PBC120

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.

For the frequency from 9 kHz to 30 MHz:



Site : Chamber

Condition : FCC 15.209 RE (<30MHz)

EUT : W6M21702-16610

M/N:

Test Mode : TX 40kHz

Note :

Polarization:

Power : 3 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
*	0.0103	-4.17	peak	86.46	82.29	143.27	150	160	-60.98	
	0.0141	-5.48	peak	84.74	79.26	140.54	150	90	-61.28	
	0.0572	-5.17	peak	71.53	66.36	128.38	150	75	-62.02	
	0.1197	-10.72	peak	65.10	54.38	121.96	150	235	-67.58	



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Radiated Emission Measurement

Operator: Leon
Temperature: 24 °C
Humidity: 60 %

File :2

Data :#1

Date: 2017/2/16

Time: 下午 07:54:14

132.0 dBuV/m



Site : Chamber

Condition : FCC 15.209 RE (<30MHz)

EUT : W6M21702-16610

M/N:

Test Mode : TX 40kHz

Note :

Polarization:

Power : 3 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
	0.1650	-5.39	peak	62.93	57.54	119.17	150	85	-61.63	
	0.5964	-9.39	peak	51.09	41.70	88.01	150	110	-46.31	
*	1.0250	-7.42	peak	46.57	39.15	83.31	150	145	-44.16	
	3.5881	1.69	peak	36.99	38.68	85.46	150	230	-46.78	



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For the frequency from 30 MHz to 1000 MHz.:

Radiated Emission Measurement

Operator: Leon

File :3

Data :#1

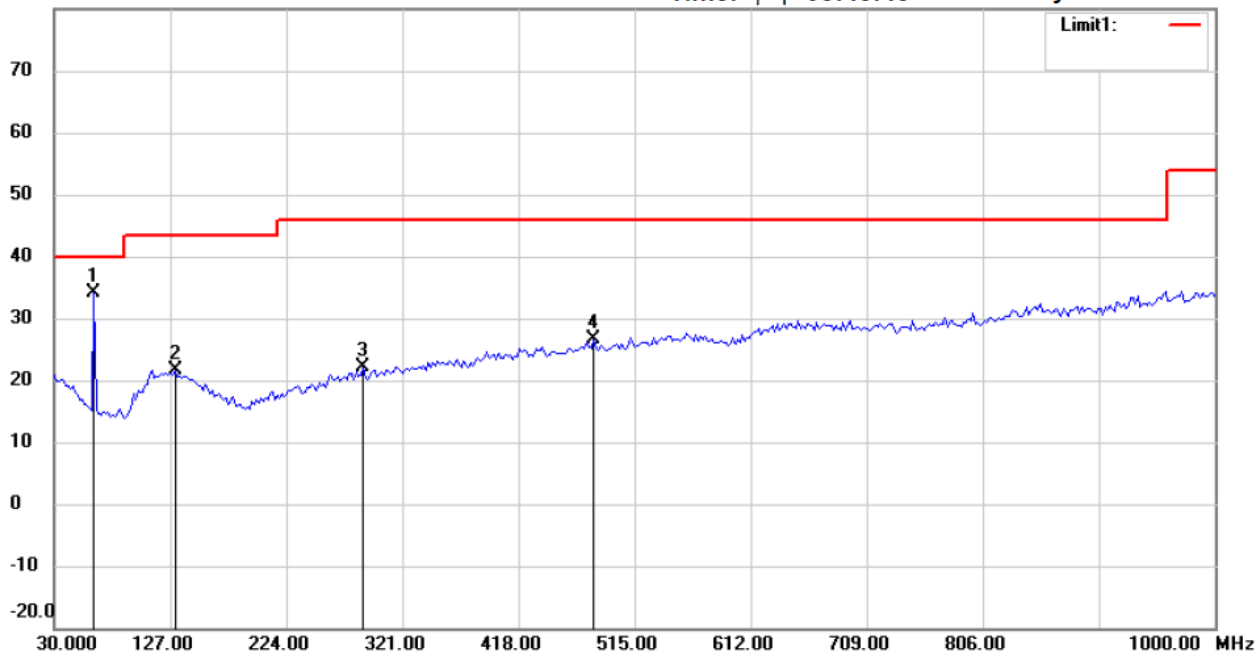
Date: 2017/2/16

Temperature:24 °C

80.0 dBuV/m

Time: 下午 08:45:48

Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

EUT : W6M21702-16610

M/N:

Test Mode : TX 40kHz

Note :

Polarization: *Horizontal*

Power : 3 Vd.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
*	63.0461	46.68	peak	-12.50	34.18	40.00	150	115	-5.82	
	131.0822	27.90	peak	-6.22	21.68	43.50	150	90	-21.82	
	288.5371	27.97	peak	-5.83	22.14	46.00	150	355	-23.86	
	480.9820	29.33	peak	-2.69	26.64	46.00	150	160	-19.36	



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Radiated Emission Measurement

Operator: Leon

File :3

Data :#2

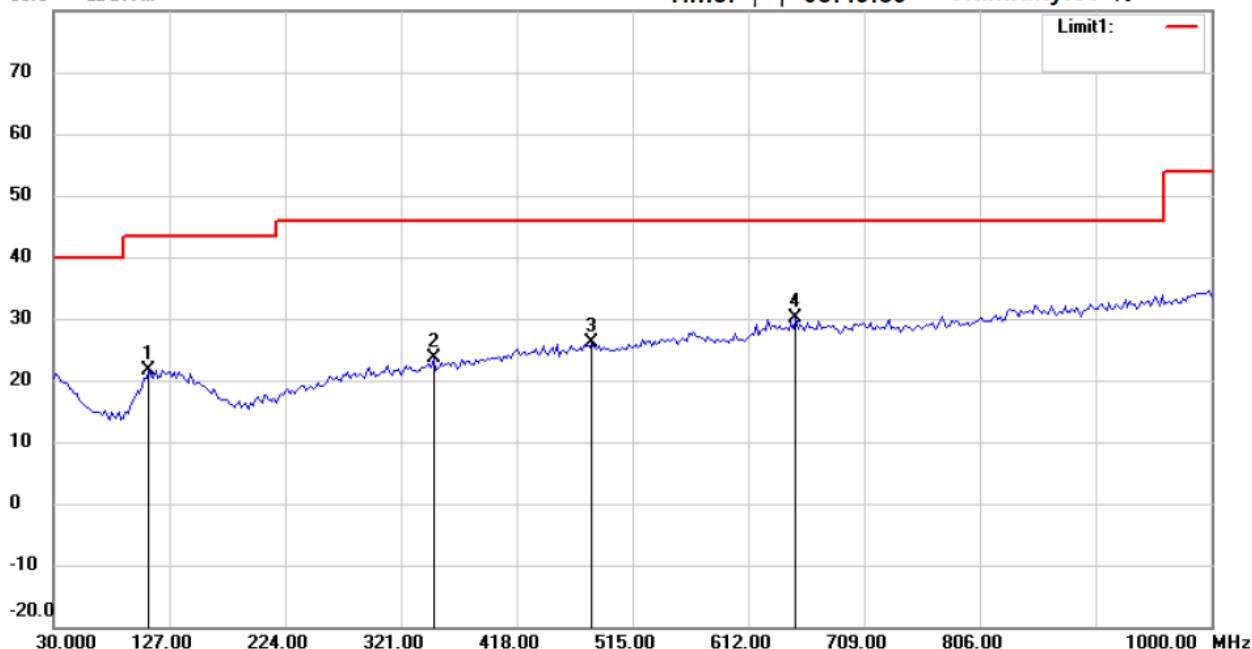
Date: 2017/2/16

Temperature:24 °C

80.0 dBuV/m

Time: 下午 08:49:39

Humidity:60 %



Site : Chamber

Condition : FCC_part 15 RE-Class C_30-1000MHz

Polarization: Vertical

EUT : W6M21702-16610

Power : 3 Vd.c.

M/N:

Distance: 3m

Test Mode : TX 40kHz

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
	109.6994	28.64	peak	-7.04	21.60	43.50	150	175	-21.90	
	348.7976	28.10	peak	-4.59	23.51	46.00	150	90	-22.49	
	480.9820	28.81	peak	-2.69	26.12	46.00	150	110	-19.88	
*	652.0440	28.99	peak	1.07	30.06	46.00	150	245	-15.94	

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 : 0.009-30 MHz : ± 2.17 dB, 30-1000 MHz ± 3.30 dB, 1-18 GHz ± 2.28 dB, 18-40 GHz ± 2.19 dB ;Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.



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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 1.2 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:

$DF = 40 \log (D_1/D_2)$, where

For D_1 is the 300 meter specified measurement distance.

D_2 is the 1.2 meter test measurement distance.

The DF = 95.92 dB was applied for limit calculation at 1.2 meter test distance measurements.

For D_1 is the 30 meter specified measurement distance.

D_2 is the 1.2 meter test measurement distance.

The DF = 55.92 dB was applied for limit calculation at 1.2 meter test distance measurements.

If the frequency between 9 – 490 kHz,

Limit = $20\log(2400/f(\text{kHz})) + 95.92$

If the frequency between 490 – 1705 kHz,

Limit = $20\log(2400/f(\text{kHz})) + 55.92$

If the frequency between 1705 – 30000 kHz,

Limit = $20\log 30 + 55.92$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055,
ETSTW-RE 146, ETSTW-RE 148.

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3.3 Occupied Bandwidth

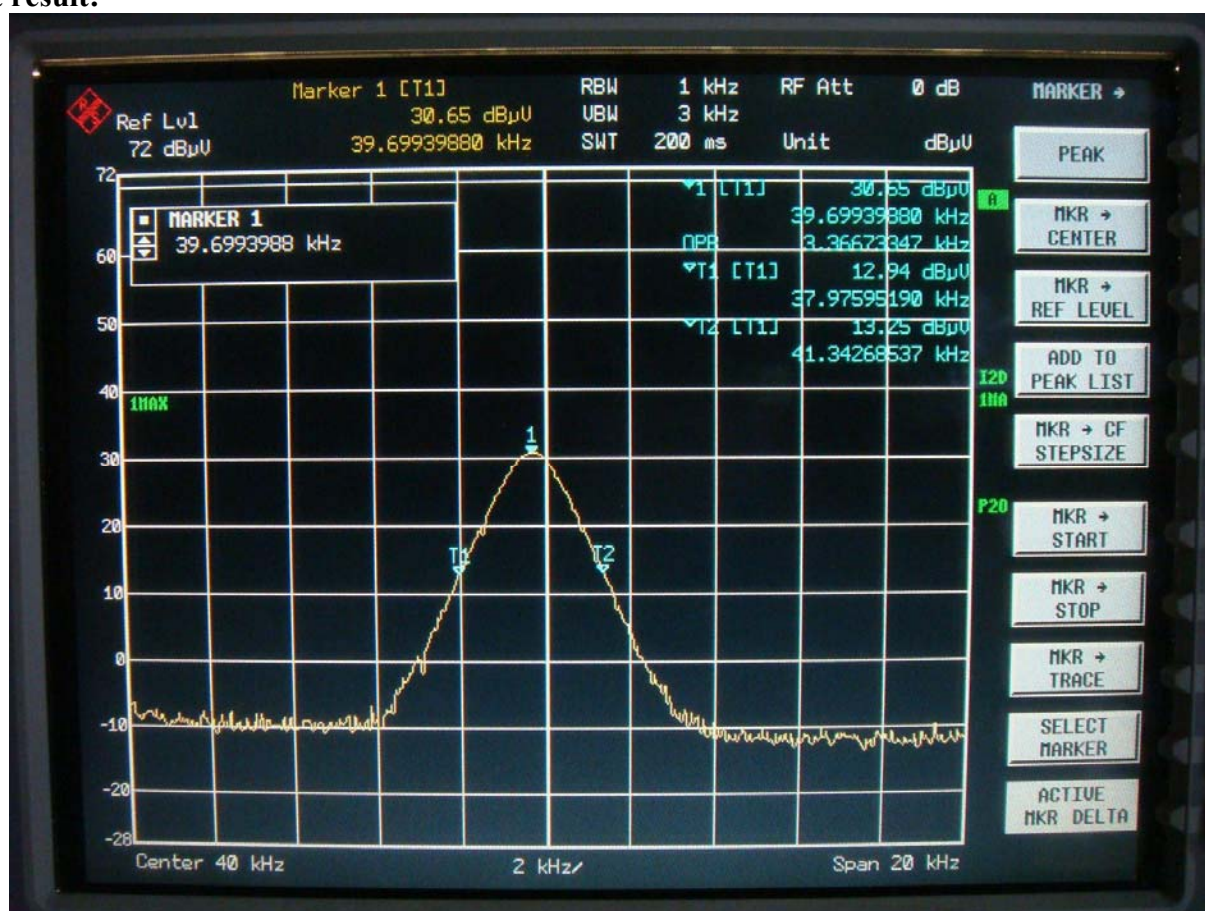
FCC Rules: 2.1049

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.

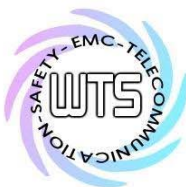
The resolution bandwidth of the spectrum analyzer shall be set to a value greater than 5.0% of the allowed bandwidth specifications are given, the following guidelines are used:

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 result:



Test equipment: ETSTW-RE 055



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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 Helical Antenna which passes antenna requirement.

The equipment meets the requirements	yes ☒	no ☐
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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 1.2 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:

$DF = 40 \log (D_1/D_2)$, where

For D_1 is the 300 meter specified measurement distance.

D_2 is the 1.2 meter test measurement distance.

The $DF = 95.92$ dB was applied for limit calculation at 1.2 meter test distance measurements.

For D_1 is the 30 meter specified measurement distance.

D_2 is the 1.2 meter test measurement distance.

The $DF = 55.92$ dB was applied for limit calculation at 1.2 meter test distance measurements.

If the frequency between 9 – 490 kHz, limit = $20\log(2400/f(\text{kHz})) + 95.92$

If the frequency between 490 – 1705 kHz, limit = $20\log(2400/f(\text{kHz})) + 55.92$

If the frequency between 1705 – 30000 kHz, limit = $20\log 30 + 55.92$

Test equipment used: ETSTW-RE 004, ETSTW-RE 027, ETSTW-RE 055, ETSTW-RE 146, ETSTW-RE 148

Explanation: This test is not required.



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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: 2183316

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 030, ETSTW-RE 062, ETSTW-RE 064, ETSTW-RE 142, ETSTW-RE 147

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 : 30-1000 MHz = ± 3.30 dB, 1-18 GHz = ± 2.28 dB, 18-40 GHz = ± 2.19 dB ; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.**
- 6. The test results are listed in separated test report no. W6M21702-16610 -P-15B.**



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FCC ID: 2AH2PBC120

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.

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

Model:	2183316	Date:	--					
Mode:	--	Temperature:	--	°C	Engineer:		--	
Polarization:	N	Humidity:	--	%				
Frequency (MHz)	Reading (dBuV) QP Ave.		Factor (dB) Corr.	Result (dBuV) QP Ave.		Limit (dBuV) QP Ave.		Margin (dB)
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

Polarization: L1								
Frequency (MHz)	Reading (dBuV)		Factor (dB) Corr.	Result (dBuV)		Limit (dBuV)		Margin (dB)
	QP	Ave.		QP	Ave.	QP	Ave.	
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--

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 = ±0.74 dB; Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.
6. This test is not required because the EUT is battery-used.

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 028.