47 CFR PART 15 SUBPART C TEST REPORT

for

Hybrid Security System

Model No.: HYGW-Gen2-V1

FCC ID: GX9HYGWGEN2

of

Applicant: CLIMAX TECHNOLOGY CO., LTD.
Address: No. 258, Sinhu 2nd Rd., Neihu District, Taipei City 114, Taiwan (R.O.C.)

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.: W6R22209-22106-C-1

6F, NO. 58, LANE 188, RUEY-KUANG RD., NEIHU TAIPEI 114, TAIWAN, R.O.C.
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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 is 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:

Date	WTS-Lab.	Name	Signature
October 06, 2022		Sora Kuo	Sora

Technical responsibility for area of testing:

Date	WTS	Name	Signature
October 06, 2022		Kevin Wang	Kevin Wang

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:	CLIMAX TECHNOLOGY CO., LTD.
Street:	No. 258, Sinhu 2nd Rd., Neihu District,
Town:	Taipei City 114,
Country:	Taiwan (R.O.C.)

1.4 Application details

Date of receipt of test item: September 06, 2022
Date of test: from September 07, 2022 to October 06, 2022

1.5 Test item

Description of test item: Hybrid Security System

Type identification: HYGW-Gen2-V1

Brand name: Alarm.com

Multi-listing model number: /.

Transmitting frequency: 433.82 MHz

Operation mode: FSK

Voltage supply: 16~18Va.c.

Antenna type: PCB antenna

Sample no.: #01

Manufacturer (if applicable)
Name: ./.
Street: ./.
Town: ./.
Country: ./.

1.6 Test standards

Technical standard: 47 CFR PART 15 SUBPART C § 15.231 (a) (2020-10)

2 Technical test

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 were ascertained in the course of the tests performed. ☐

2.2 Test environment

Relative humidity content: 20 ... 75 %

Air pressure: 86 ... 103 kPa

Test item Name	Uncertainty
Estimation Result of Uncertainty of Conducted Emission (Conducted Measurement at (AC) Power Line)	Expanded Uncertainty： AMN：1.03 dB Voltage probe：1.05 dB
Estimation Result of Uncertainty of Radiated Emission(3M) (Output Power (Field Strength), Out of Band Radiated Emissions, Transmitter Radiated Emissions in restricted Bands, Spurious Emission radiated)	Expanded Uncertainty： 0.009-30 MHz：3.48 dB 30-1000 MHz：4.48 dB 1-18 GHz：4.15 dB 18-40 GHz：3.78 dB
Estimation Result of Uncertainty of Bandwidth Measurement (Channel Bandwidth)	Expanded Uncertainty：0.45 kHz
Estimation Result of Uncertainty of Frequency Drift Measurement (Frequency Tolerance)	Expanded Uncertainty：6.11 Hz
Estimation Result of Uncertainty of Duty Cycle Measurement (Active Time)	Expanded Uncertainty：0.1 ms

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

2.3 Test Mode

This EUT is the portable device. So the EUT was tested on three different axes. Please see assessment test results as section 3 of this test report.

2.4 Test equipment utilized

No.	Test equipment	Type	Serial No.	Manufacturer	Cal. Date	Next Cal. Date
ETSTW-CE 001	EMI TEST RECEIVER	ESHS10	842121/013	R&S	2022/6/22	2023/6/21
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	2021/11/9	2022/11/8
ETSTW-CE 006	IMPULSBEGRENZER PULSE LIMITER	ESH3-Z2	100226	R&S	2022/9/16	2023/9/15
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	2022/8/3	2023/8/2
ETSTW-CE 016	TWO-LINE V-NETWORK	ENV216	100050	R&S	2021/11/8	2022/11/7
ETSTW-CE 028	MXE EMI Receiver	N9038A	MY53220110	Agilent	2022/7/29	2023/7/28
ETSTW-RE 003	EMI TEST RECEIVER	ESI 26	831438/001	R&S	2022/6/21	2023/6/20
ETSTW-RE 004	EMI TEST RECEIVER	ESI 40	832427/004	R&S	2022/9/16	2023/9/15
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	2022/8/18	2023/8/17
ETSTW-RE 019	MICROWAVE HORN ANTENNA	22240-25	121074	FM	2022/6/13	2023/6/12
ETSTW-RE 027	Passive Loop Antenna	6512	00034563	ETS-Lindgren	2022/6/22	2023/6/21
ETSTW-RE 030	Double-Ridged Guide Horn Antenna	3117	00035224	ETS-Lindgren	2022/5/23	2023/5/22
ETSTW-RE 042	Biconical Antenna	HK116	100172	R&S	2022/3/4	2023/3/3
ETSTW-RE 043	Log-Periodic Dipole Antenna	HL223	100166	R&S	2022/6/28	2023/6/27
ETSTW-RE 044	Log-Periodic Antenna	HL050	100094	R&S	2022/8/1	2023/7/31
ETSTW-RE 045	ESA-E SERIES SPECTRUM ANALYZER	E4404B	MY45111242	Agilent	Pre-test Use	
ETSTW-RE 050	Attenuator 10dB	50HF-010-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 051	Attenuator 6dB	50HF-006-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 053	Attenuator 3dB	50HF-003-1	None	JFW	2022/2/18	2023/2/17
ETSTW-RE 055	SPECTRUM ANALYZER	FSU 26	200074	R&S	2022/3/28	2023/3/27
ETSTW-RE 060	Attenuator 30dB	5015-30	F651012z-01	ATM	2022/2/18	2023/2/17
ETSTW-RE 062	Amplifier Module	CHC 2	None	KMIC	2022/5/13	2023/5/12
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	2021/10/27	2022/10/26
ETSTW-RE 088	SOLID STATE AMPLIFIER	KMA180265A01	99057	KMIC	2022/9/16	2023/9/15
ETSTW-RE 091	Match Pad	MDCS1500	None	WOKEN	2022/6/9	2023/6/8
ETSTW-RE 099	DC Block	50DB-007-1	None	JFW	2022/2/18	2023/2/17
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	2022/1/5	2023/1/4

ETSTW-RE 120	RF Player	MP9200	MP9210-111022	ADIVIC	2021/10/29	2022/10/28
ETSTW-RE 122	SIGNAL GENERATOR	SMF100A	102149	R&S	2022/6/20	2023/6/19
ETSTW-RE 125	5GHz Notch filter	5NSL11-5200/E221.3-O/O	1	K&L Microwave	2022/8/3	2023/8/2
ETSTW-RE 126	5GHz Notch filter	5NSL12-5800/E221.3-O/O	1	K&L Microwave	2022/8/3	2023/8/2
ETSTW-RE 127	RF Switch Box	RFS-01	None	WTS	2022/2/18	2023/2/17
ETSTW-RE 128	5.3GHz Notch filter	N0153001	SN487233	Microwave Circuits	2022/8/3	2023/8/2
ETSTW-RE 129	5.5GHz Notch filter	N0555984	SN487234	Microwave Circuits	2022/8/3	2023/8/2
ETSTW-RE 130	Handheld RF Spectrum Analyzer	N9340A	CN0147000204	Agilent	Pre-test Use	
ETSTW-RE 142	Amplifier	8447D	2805A03378	Agilent	2022/5/13	2023/5/12
ETSTW-RE 146	Preamplifier	JPA-10M1G	15090004	JPT	2022/5/27	2023/5/26
ETSTW-RE 152	Bi-log Hybrid Antenna	MCTD 2786B	BLB20J04029	ETC	2022/9/30	2023/9/29
ETSTW-RE 153	Signal Analyzer	FSV40	101929	R&S	2022/9/16	2023/9/15
ETSTW-RE 159	Bi-log Hybrid Antenna (30M~1000 MHz)	MCTD 2786B	BLB21N04035	ETC	2021/12/06	2022/12/05
ETSTW-RF 002	Electromagnetic field probe	LF-30	K-0007	STT	2022/7/14	2023/7/13
ETSTW-EMI 011	USB Compact Modulator	SFC-U	101689	R&S	2022/6/10	2023/6/9
ETSTW-GSM 002	Universal Radio Communication Tester	CMU 200	109439	R&S	2022/3/28	2023/3/27
ETSTW-GSM 003	Radio Communication Analyzer	MT8820C	6201342073	Anritsu	2022/5/9	2023/5/8
ETSTW-GSM 004	Wideband Radio Communication Tester	CMW500	128092	R&S	2021/10/29	2022/10/28
ETSTW-GSM 019	Band Reject Filter	WRCTF824/849-822/851-40 /12+9SS	3	WI	2022/1/5	2023/1/4
ETSTW-GSM 020	Band Reject Filter	WRCD1747/1748-1743/1752-32/5SS	1	WI	2022/1/5	2023/1/4
ETSTW-GSM 021	Band Reject Filter	WRCD1879.5/1880.5-1875.5/1884.5-32/5SS	3	WI	2022/1/5	2023/1/4
ETSTW-GSM 022	Band Reject Filter	WRCT901.9/903.1-904.25-50/8SS	1	WI	2022/1/5	2023/1/4
ETSTW-GSM 023	Power Divider	4901.19.A	None	SUHNER	2022/9/2	2023/9/1
ETSTW-GSM 024	Radio Communication Analyzer	MT8821C	None	Anritsu	2022/5/3	2023/5/2
ETSTW-GSM 025	Band Reject Filter	BRM19835	001	Micro-Tronics	2022/8/3	2023/8/2
ETSTW-Cable 011	SMA to N type Cable	RGU-400	None	THERMAX	Pre-test Use NCR	
ETSTW-Cable 016	BNC Cable	Switch Box	B Cable 1	Schwarz beck	2022/2/18	2023/2/17
ETSTW-Cable 017	BNC Cable	X Cable	B Cable 2	Schwarz beck	2022/2/18	2023/2/17
ETSTW-Cable 018	BNC Cable	Y Cable	B Cable 3	Schwarz beck	2022/2/18	2023/2/17
ETSTW-Cable 019	BNC Cable	Z Cable	B Cable 4	Schwarz beck	2022/2/18	2023/2/17
ETSTW-Cable 020	N TYPE Cable	OATS Cable 1	N30N30-L335-15M	JYE BAO CO.,LTD.	2022/6/15	2023/6/14
ETSTW-Cable 027	Microwave Cable	SUCOFLEX 104	279083	HUBER+SUHNER	2022/5/6	2023/5/5
ETSTW-Cable 028	Microwave Cable	FA147A0015M2020	30064-2	UTIFLEX	2022/9/16	2023/9/15
ETSTW-Cable 029	Microwave Cable	FA147A0015M2020	30064-3	UTIFLEX	2022/9/16	2023/9/15
ETSTW-Cable 030	Microwave Cable	SUCOFLEX 104 （S_Cable 9）	279067	HUBER+SUHNER	2022/2/18	2023/2/17
ETSTW-Cable 043	Microwave Cable	SUCOFLEX 104	317576	HUBER+SUHNER	2022/5/13	2023/5/12
ETSTW-Cable 047	Microwave Cable	SUCOFLEX 104	325518	HUBER+SUHNER	2022/7/1	2023/6/30

ETSTW-Cable 058	Microwave Cable	SUCOFLEX 104	none	HUBER+SUHNER	2022/5/27	2023/5/26
ETSTW-Cable 064	Microwave Cable	SUCOFLEX 104	MY28891	HUBER+SUHNER	2022/5/13	2023/5/12
ETSTW-Cable 071	N TYPE CABLE	EMCCFD400-NM-NM-25000	170239	EMCI	2022/5/27	2023/5/26
ETSTW-Cable 072	SMA type cable (8m)	SUCOFLEX 104	805800/4	HUBER+SUHNER	2022/5/13	2023/5/12
ETSTW-Cable 074	SMA type cable (2m)	SUCOFLEX 104	802563/4	HUBER+SUHNER	2022/5/13	2023/5/12
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	2022/9/16	2023/9/15
ETSTW-TH 003	Wireless weather station	GAIA	N/A	TFA	2021/10/18	2022/10/17

2.5 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 ANSI STANDARD C63.10-2013 6.3 using a spectrum analyzer. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was the 100 kHz and the video bandwidth was 300 kHz.

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/m + 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 high and with dimensions of 1m by 1.5m (non metallic table). The EUT was placed in the center 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.

3 Test results (enclosure)

☒ 1st test ☐ test after modification ☐ production test

TEST CASE	Para. Number	Required	Test passed	Test failed
Transmission Requirements	15.231(a)	☒	☒	☐
Radiated Emission	15.231(b)	☒	☒	☐
Bandwidth of Emission	15.231(c)	☒	☒	☐
Frequency Tolerance	15.231(d)	☐	☐	☐
Period Alternate Field Strength Requirements	15.231(b)	☒	☒	☐
Antenna Requirement	15.203	☒	☒	☐
Conducted Measurement at (AC) Power Line	15.207	☒	☒	☐

The following is intentionally left blank.

3.1 Transmission Requirements

FCC 15.231(a)

Test date: October 04, 2022
Temperature: 24.6˚C
Humidity: 52.3%
Tester: Sora

3.1.1 Limit of Transmission Time

☒ According to 15.231(a)(1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

☐ According to 15.231(a)(2), a transmitter activated automatically shall cease transmission within 5 seconds after activation.

3.1.2 Active Time

Test date: October 04, 2022
Temperature: 24.6˚C
Humidity: 52.3%
Tester: Sora

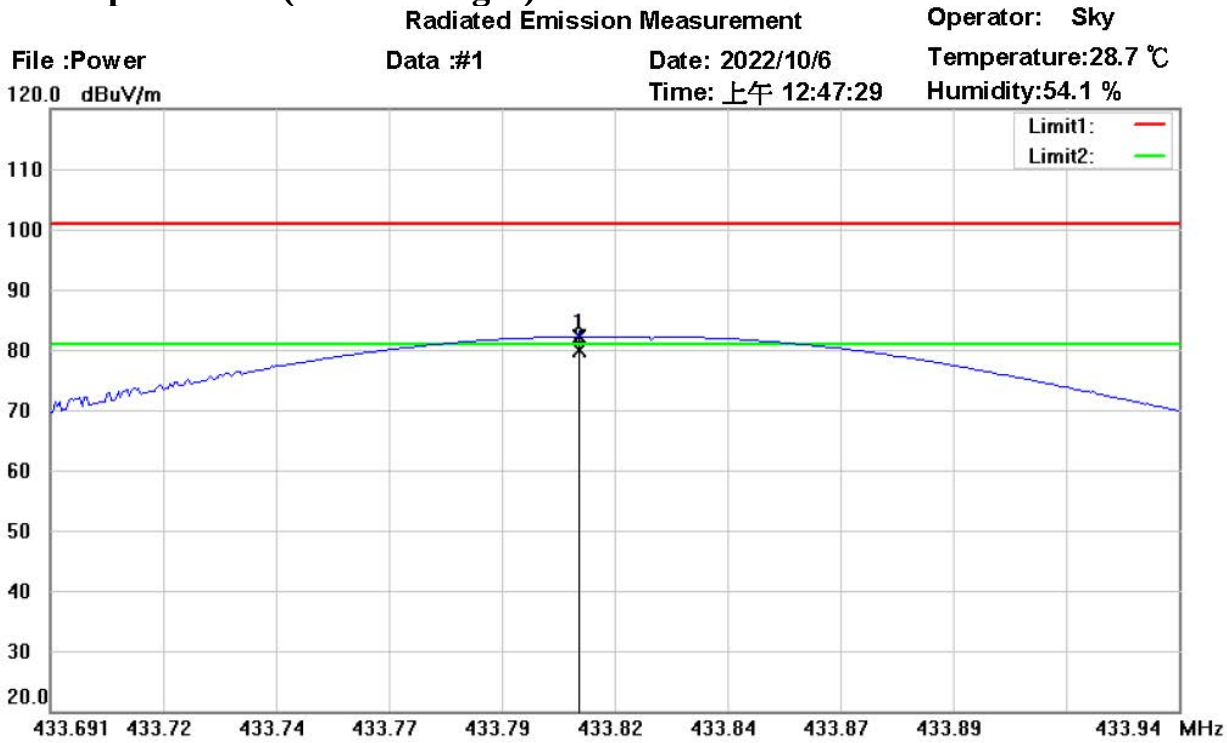
☒ This manually operated transmitter employs a switch that automatically deactivate the transmitter within 344.551282 ms of being released.

☐ This transmitter is operated by automatic activation and active will cease transmission in __ ms after activation..

Test equipment used : ETSTW-RE 004

Explanation: See attached diagrams in appendix.

3.2 Output Power (Field Strength)

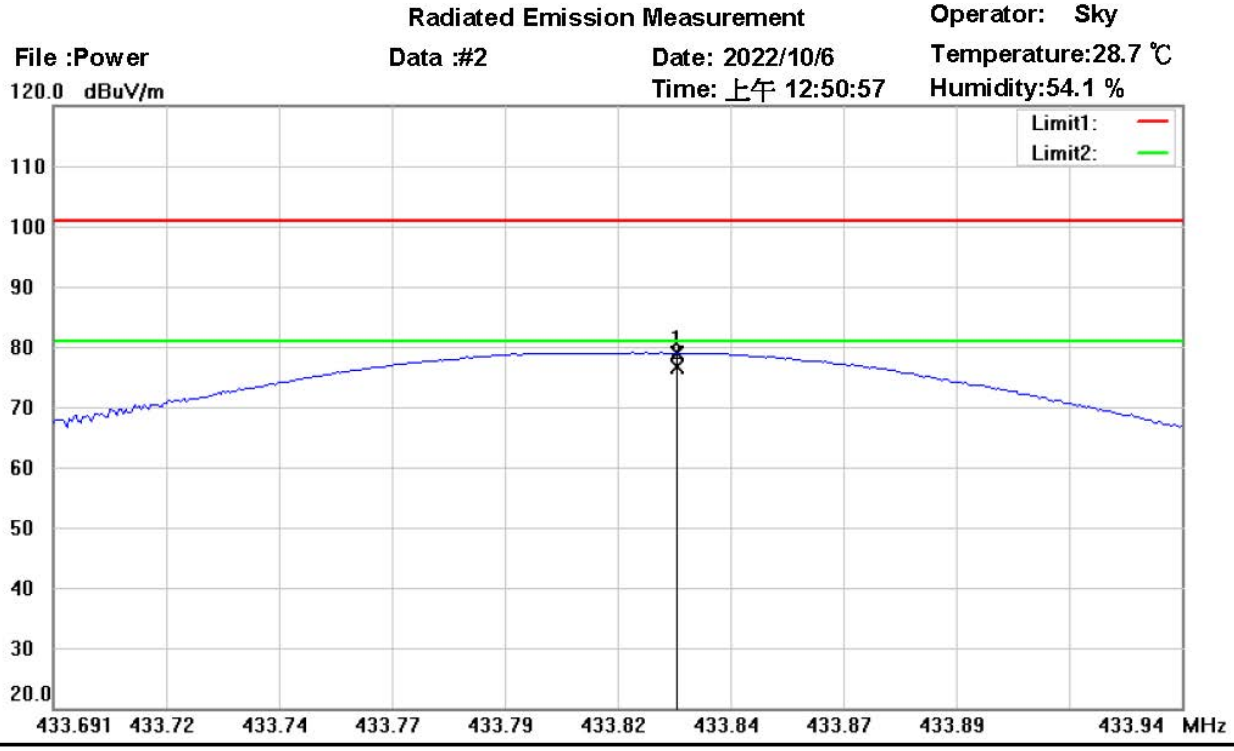


Site : Chamber
Condition : FCC 15.231 Power(PK)
EUT : W6R22209-22106
M/N:
Test Mode : TX 433.82MHz
Note :

Polarization: *Horizontal*
Power : 18 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
	433.8081	57.21	peak	24.81	82.02	100.80	150	120	-18.78	
*	433.8081	55.01	AVG	24.81	79.82	80.80	150	120	-0.98	

Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2



Site : Chamber
Condition : FCC 15.231 Power(PK)
EUT : W6R22209-22106
M/N:
Test Mode : TX 433.82MHz
Note :

Polarization: *Vertical*
Power : 18 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
	433.8290	54.14	peak	24.81	78.95	100.80	100	235	-21.85	
*	433.8290	51.94	AVG	24.81	76.75	80.80	100	235	-4.05	

Limit 15.231(b)

Fundamental Frequency (MHz)	Field strength of fundamental, limit µV/m
40.66 – 40.70	2,250
70 – 130	1,250
130 – 174	1,250 to 3,750
174 – 260	3,750
260 – 470	3,750 to 12,500** (433.82 MHz: 80.82 dBµV/m = 10992.51 µV/m)
Above 470	12,500

** linear interpolation
Test equipment used: ETSTW-RE 004, ETSTW-RE 062, ETSTW-RE 142, ETSTW-RE 152
Explanation: See attached diagrams in appendix.

3.3 Out of Band Radiated Emissions

FCC Rule: 15.231(b) , 15.35
For out of band emissions that are close to or that exceed the 20 dB attenuation requirement described in the specification, radiated measurements were performed at a 3 m separation distance to determine whether these emissions complied with the general radiated emission requirement.

Guidance on Measurement of pulsed emission: 15.35(c)
"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."

Duty Cycle correction = 20 log (dwell time/100ms or one period)

Limits:
For frequencies (Average measurements)
Correction factor conform 15.35 (c) (Average measurements)
Duty cycle correction :
Max. Peak reading – duty cycle correction

Max permitted average Limits = Max permitted Fundamental limit – 20 dB

For example for 433.82 fundamental carrier:
Max permitted average Limit: 80.82 dBµV/m - 20 dB= 60.82 dBµV/m

For frequencies above 1GHz (Peak measurements).
Modified Limits for peak conform 15.35 (b) = Max Permitted average Limits + 20dB (because Peak detector is used)

3.4 Transmitter Radiated Emissions in restricted Bands

FCC Rules: 15.231 (b), 15.205, 15.209, 15.35
Radiated emission measurements were performed from 30 MHz to 8000 MHz.
For radiated emission tests, the analyzer setting was as followings:
RES BW VID BW
Frequency <1 GHz 100 kHz 100 kHz (Peak measurements)
Frequency >1 GHz 1 MHz 1 MHz (Peak measurements)
1 MHz 1 MHz (Average measurements)
Limits:

For frequencies below 1GHz :

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

For frequencies above 1GHz (Average measurements).
Guidance on Measurement of pulsed emission:
"If the emission is pulsed, modify the unit for continues operation , use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

For frequencies above 1GHz (Average measurements).

The correction factor, based on the channel dwell tine in a 100 ms period, may be mathematically applied to a measurement made with an average detector, to further reduce the value.

Duty cycle correction = 20 log (dwell time/100ms)
No duty cycle correction was added to the reading

Modified Limits for peak conform 15.35 (b) = Max Permitted average Limits + 20dB (because Peak detector is used)

Above 960 MHz
For mode DSSS CW: 54 dBµV/m + 20 dB = 74 dBµV/m

Explanation: See attached diagrams in appendix.

3.5 Spurious Emission radiated, Transmitter

Spurious emission was measured with modulation (declared by manufacturer).

The limits on the field strength of the spurious emission in the table § 15.231(b) are based on the fundamental frequency of the intentional radiator. Spurious emission shall be attenuated to the average (or alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in § 15.209, whichever limit permits a higher field strength.
In addition, radiated emission which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).
SAMPLE CALCULATION OF LIMIT. All results will be updated by an automatic measuring system in accordance to point 2.3.

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.

The peak and average spurious emission plots was measured with the average limits.
In the Table being listed the critical peak and average value an exhibit the compliance with the above calculated Limits.

Summary table with radiated data of the test plots

Model: HSGW-Gen2-V1 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. **Up Line: PK Limit Line, Down Line: Ave Limit Line.**

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.

Test equipment used: ETSTW-RE 004, ETSTW-RE 030, ETSTW-RE 062, ETSTW-RE 142, ETSTW-RE 152

Explanation: See attached diagrams in appendix.

3.6 Channel Bandwidth

Measurement of Necessary Bandwidth (BN)

Test date: October 04, 2022
Temperature: 24.6˚C
Humidity: 52.3%
Tester: Sora

Used frequency	Bandwidth	Limit
433.82 MHz	48.076923077 kHz	1.0845 MHz

Limits:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test equipment used: ETSTW-RE 004

Explanation: See attached diagrams in appendix.

3.7 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 PCB antenna is integral antenna which passes antenna requirement.

The equipment meets the requirements	yes ☒	no ☐

3.8 Duty Cycle

The correction factor, based on the channel dwell time in a 100ms period, may be mathematically applied to a measurement made with an average detector, to further reduce the measured value.

Average Reading = Peak Reading (dBuV/m) + Duty Cycle Correction

Test date: September 26, 2022
Temperature: 25.9˚C
Humidity: 48.0%
Tester: Sora

Duty Cycle Correction = 20 log (Cycle)
In order to determine the Duty Cycle, the EUT is measured as:

Testing Mode	T period (ms)	T on (ms)	Duty Cycle	Duty Cycle Correction 20*log(Duty Cycle)
Transmitting mode	100	77.64487	0.77644873	-2.20

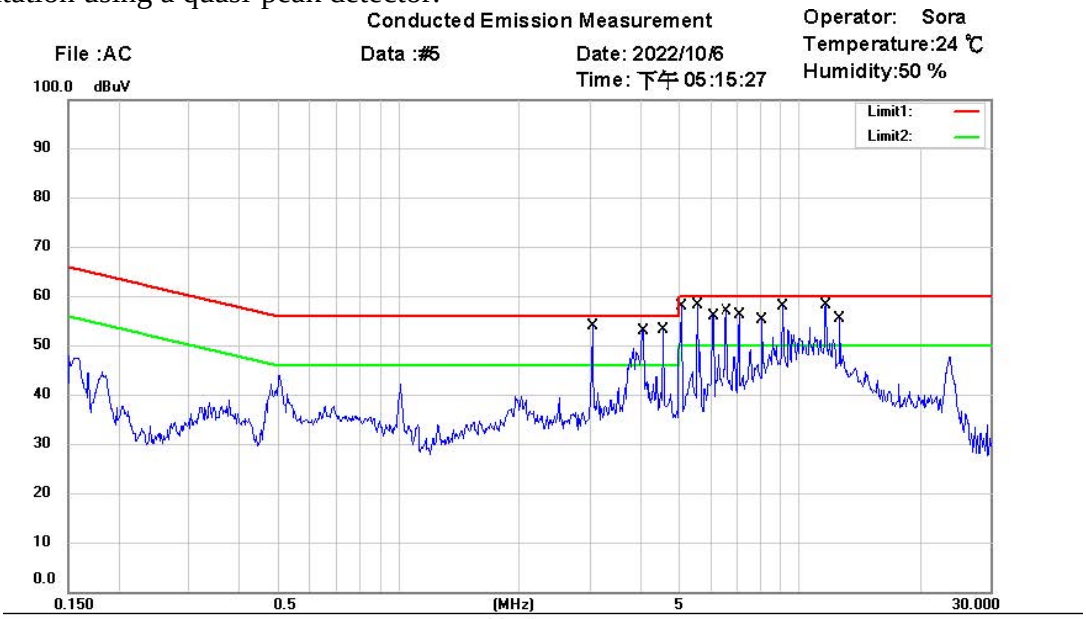
Test equipment used: ETSTW-RE 055, ETSTW-RE 004

Explanation: See attached diagrams in appendix.

3.9 Conducted Measurement at (AC) Power Line

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.



Site : Chamber_03
Condition : FCC Part 15 Class B Conduction (QP)
Phase: N
EUT : W6R22209-22106
Power : 18 Va.c.
M/N:
Test Mode :
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	3.0325	41.61	QP	9.65	51.26	56.00	-4.74	
	3.0325	23.37	AVG	9.65	33.02	46.00	-12.98	
	4.0445	39.54	QP	9.80	49.34	56.00	-6.66	
	4.0445	26.08	AVG	9.80	35.88	46.00	-10.12	
	4.5533	36.63	QP	10.07	46.70	56.00	-9.30	
	4.5533	18.86	AVG	10.07	28.93	46.00	-17.07	
	5.0520	46.07	QP	10.29	56.36	60.00	-3.64	
	5.0520	28.77	AVG	10.29	39.06	50.00	-10.94	
	5.5600	40.10	QP	10.19	50.29	60.00	-9.71	
	5.5600	28.95	AVG	10.19	39.14	50.00	-10.86	
	6.0675	42.79	QP	10.09	52.88	60.00	-7.12	
	6.0675	32.34	AVG	10.09	42.43	50.00	-7.57	
	6.5710	47.97	QP	10.01	57.98	60.00	-2.02	
	6.5710	36.95	AVG	10.01	46.96	50.00	-3.04	
	7.0750	45.13	QP	9.93	55.06	60.00	-4.94	
	7.0750	34.56	AVG	9.93	44.49	50.00	-5.51	

Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2

Site : Chamber_03
Condition : FCC Part 15 Class B Conduction (QP) **Phase:** *N*
EUT : W6R22209-22106 **Power :** 18 Va.c.
M/N:
Test Mode :
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	8.0885	47.28	QP	9.80	57.08	60.00	-2.92	
	8.0885	36.02	AVG	9.80	45.82	50.00	-4.18	
	9.1000	37.57	QP	9.73	47.30	60.00	-12.70	
	9.1000	25.50	AVG	9.73	35.23	50.00	-14.77	
	11.6250	42.87	QP	9.88	52.75	60.00	-7.25	
*	11.6250	38.36	AVG	9.88	48.24	50.00	-1.76	
	12.6355	37.28	QP	9.97	47.25	60.00	-12.75	
	12.6355	33.63	AVG	9.97	43.60	50.00	-6.40	

Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2

Conducted Emission Measurement

File :AC
Data :#6
Date: 2022/10/6
Time: 下午 05:24:34
Operator: Sora
Temperature:24 ℃
Humidity:50 %

Site : Chamber_03
Condition : FCC Part 15 Class B Conduction (QP)
Phase: L1
EUT : W6R22209-22106
Power : 18 Va.c.
M/N:
Test Mode :
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	3.0333	40.91	QP	9.62	50.53	56.00	-5.47	
	3.0333	23.29	AVG	9.62	32.91	46.00	-13.09	
	3.7783	32.76	QP	9.72	42.48	56.00	-13.52	
	3.7783	25.97	AVG	9.72	35.69	46.00	-10.31	
	4.0458	40.12	QP	9.77	49.89	56.00	-6.11	
	4.0458	24.82	AVG	9.77	34.59	46.00	-11.41	
	4.5518	35.23	QP	10.03	45.26	56.00	-10.74	
	4.5518	21.62	AVG	10.03	31.65	46.00	-14.35	
*	5.0560	46.99	QP	10.25	57.24	60.00	-2.76	
	5.0560	29.27	AVG	10.25	39.52	50.00	-10.48	
	5.5575	42.78	QP	10.14	52.92	60.00	-7.08	
	5.5575	27.23	AVG	10.14	37.37	50.00	-12.63	
	6.0665	42.75	QP	10.04	52.79	60.00	-7.21	
	6.0665	32.06	AVG	10.04	42.10	50.00	-7.90	
	6.5735	44.07	QP	9.96	54.03	60.00	-5.97	
	6.5735	35.73	AVG	9.96	45.69	50.00	-4.31	

Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2

Site : Chamber_03
Condition : FCC Part 15 Class B Conduction (QP) **Phase:** L1
EUT : W6R22209-22106 **Power :** 18 Va.c.
M/N:
Test Mode :
Note :

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Comment
	7.0740	43.61	QP	9.88	53.49	60.00	-6.51	
	7.0740	33.74	AVG	9.88	43.62	50.00	-6.38	
	7.5820	44.01	QP	9.81	53.82	60.00	-6.18	
	7.5820	33.86	AVG	9.81	43.67	50.00	-6.33	
	8.5915	43.76	QP	9.70	53.46	60.00	-6.54	
	8.5915	33.92	AVG	9.70	43.62	50.00	-6.38	
	9.6030	41.61	QP	9.68	51.29	60.00	-8.71	
	9.6030	35.14	AVG	9.68	44.82	50.00	-5.18	
	10.6135	42.95	QP	9.72	52.67	60.00	-7.33	
	10.6135	37.51	AVG	9.72	47.23	50.00	-2.77	
	11.6280	39.67	QP	9.79	49.46	60.00	-10.54	
	11.6280	34.54	AVG	9.79	44.33	50.00	-5.67	

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.**

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-RE 045.

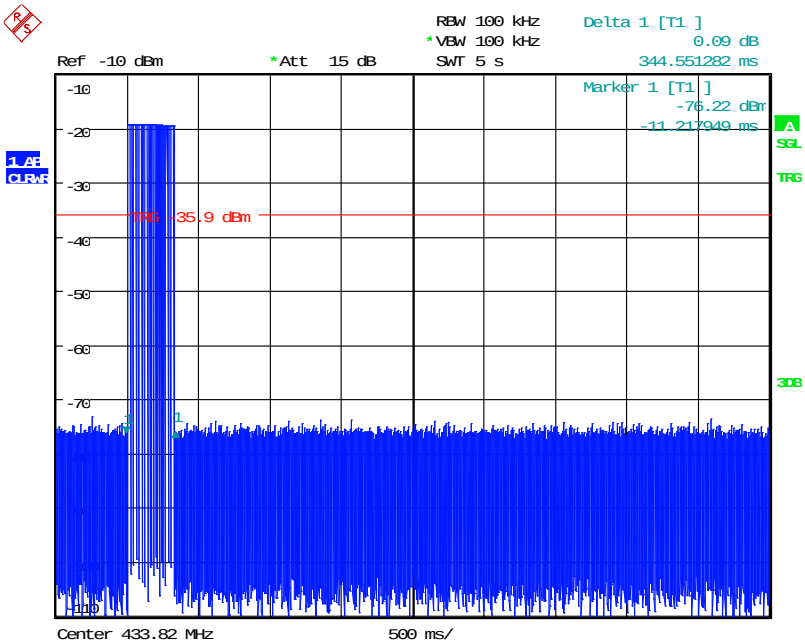
Appendix

Measurement diagrams

1. Active Time
2. Duty Cycle
3. Bandwidth
4. Spurious Emissions radiated

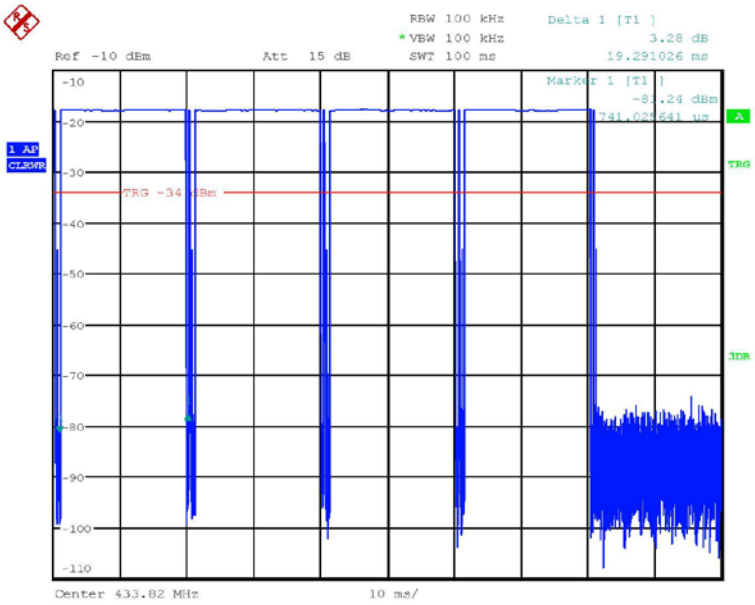
Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2

Active Time



Date: 4.OCT.2022 13:05:48

Duty Cycle



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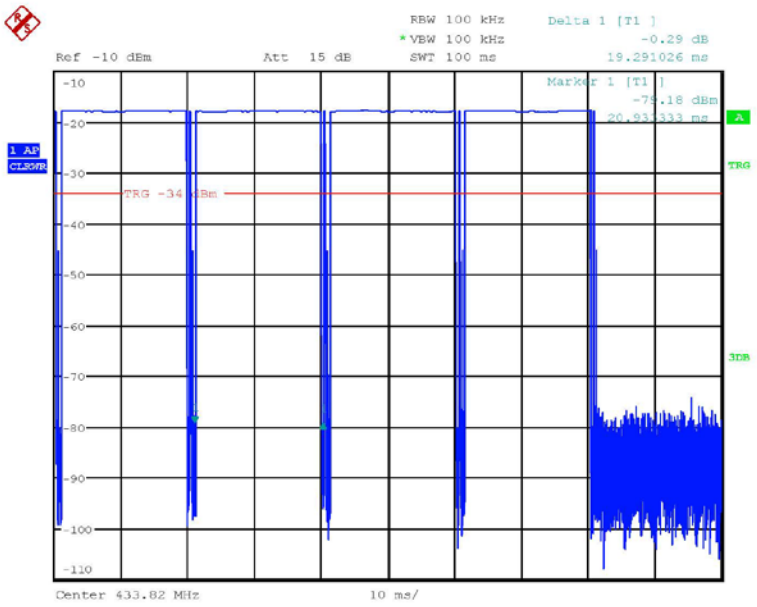
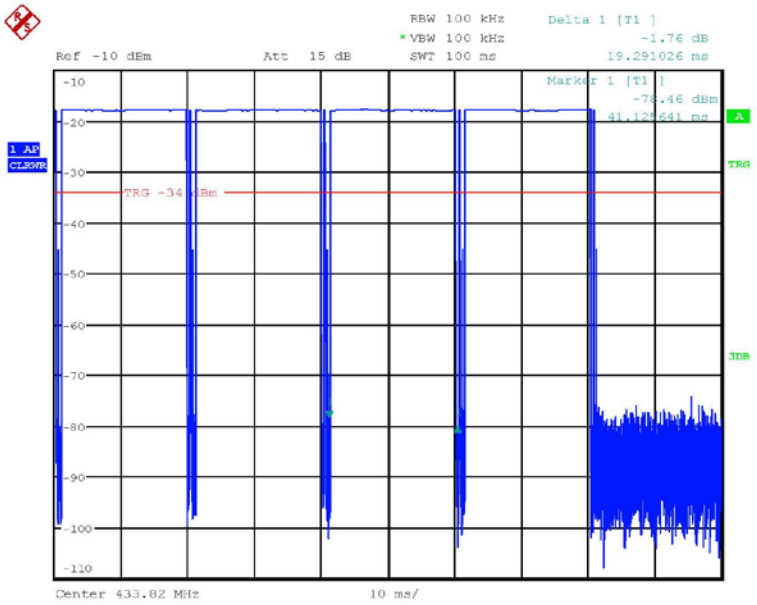
Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2

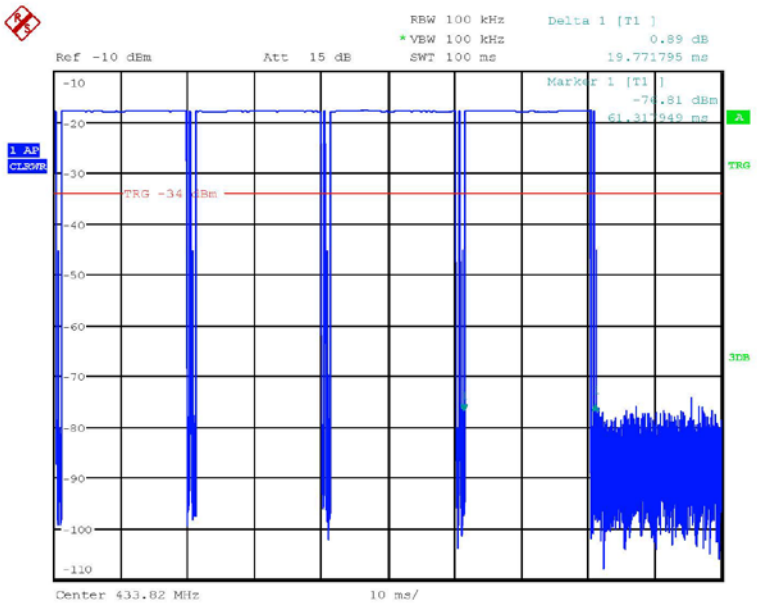


Date: 26.SEP.2022 16:53:14

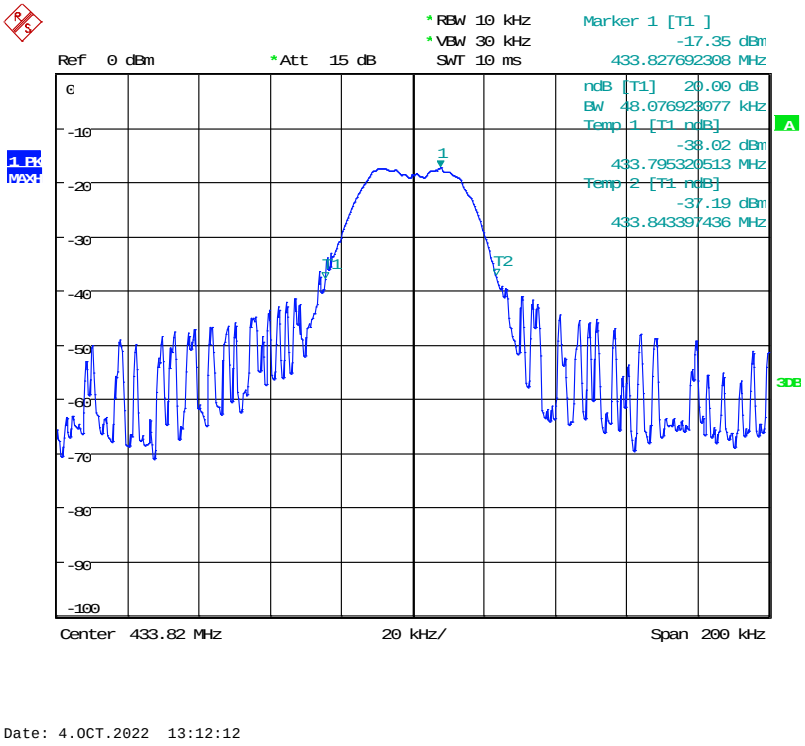


Date: 26.SEP.2022 16:54:43

Registration number: W6R22209-22106-C-1
FCC ID: GX9HYGWGEN2



Bandwidth



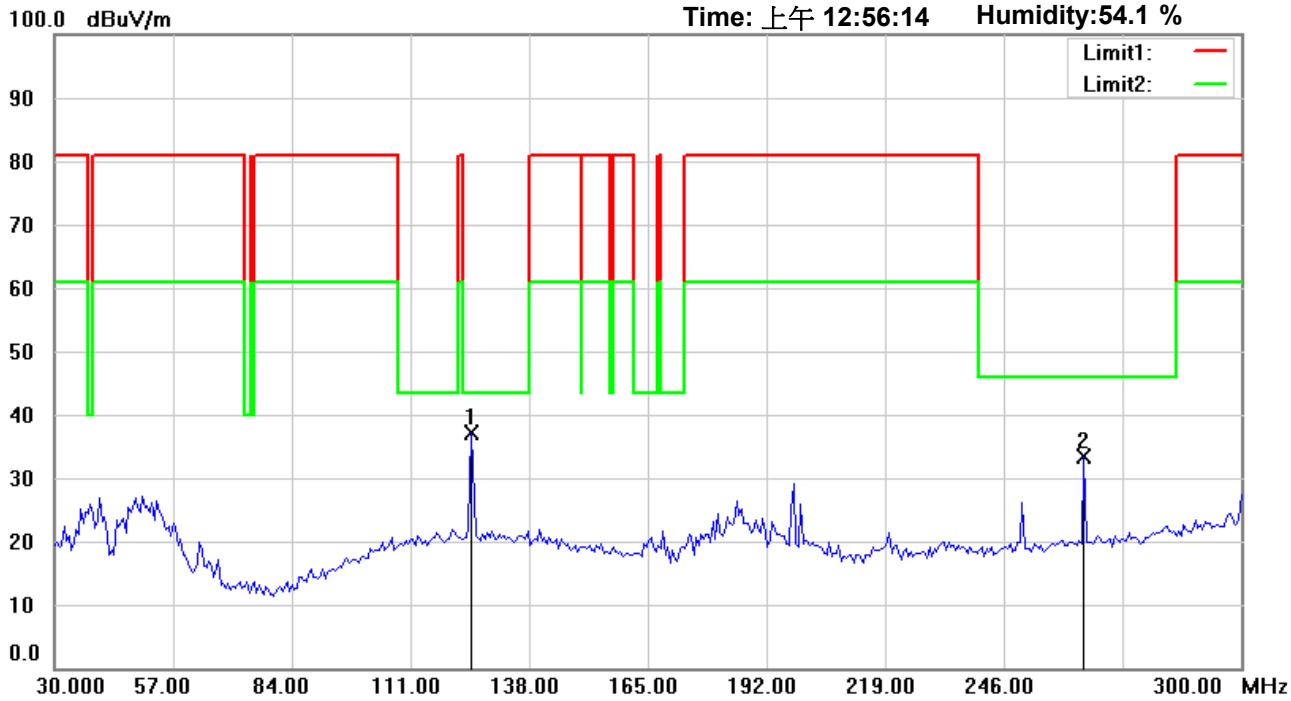
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Sky

File :1 Data :#1 Date: 2022/10/6 Time: 上午 12:56:14

Temperature:28.7 ℃
Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 30-300(PK)

Polarization: *Horizontal*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
*	124.6894	43.47	peak	-6.31	37.16	43.50	103	47	-6.34	
	264.2886	40.16	peak	-6.82	33.34	46.00	100	150	-12.66	

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

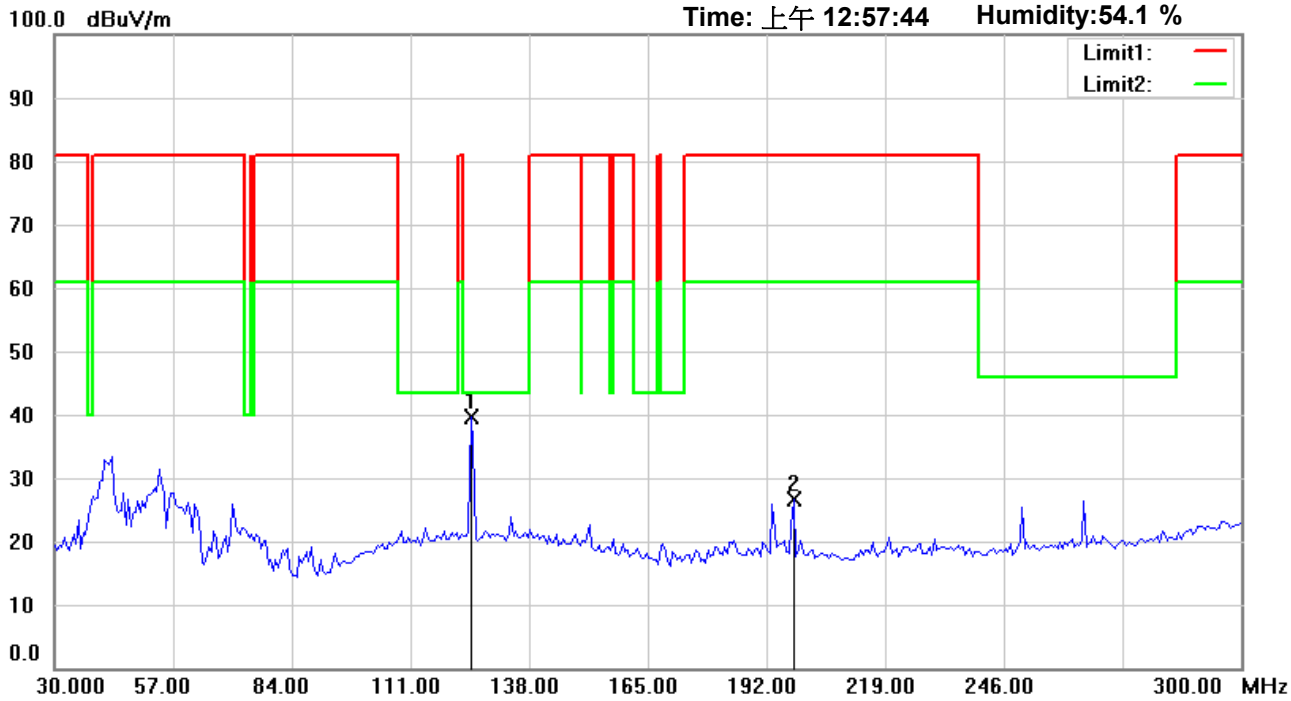
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Sky

File :1 Data :#2 Date: 2022/10/6 Time: 上午 12:57:44

Temperature:28.7 ℃
Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 30-300(PK)

Polarization: *Vertical*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
*	124.6894	46.03	peak	-6.31	39.72	43.50	110	24	-3.78	
	198.2766	37.33	peak	-10.79	26.54	80.80	103	17	-54.26	

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

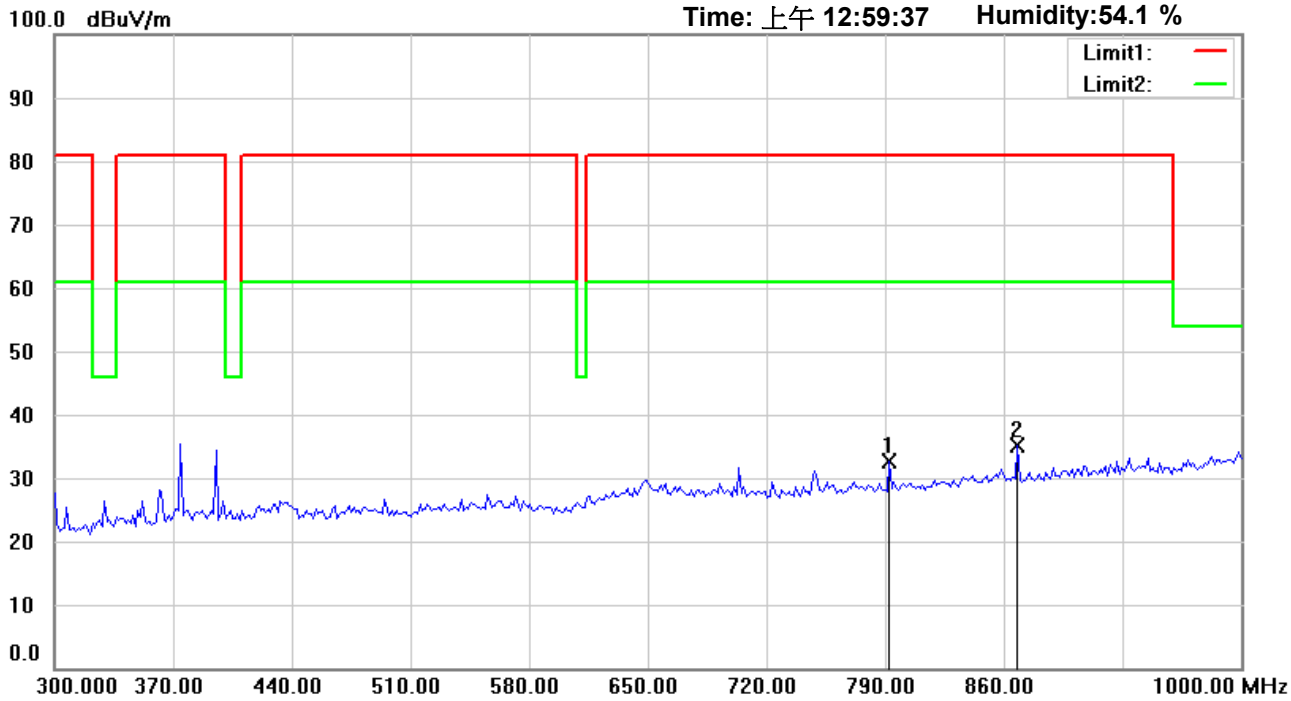
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Sky

File :2 Data :#1 Date: 2022/10/6 Time: 上午 12:59:37

Temperature:28.7 ℃
Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 300-1000(PK)

Polarization: *Horizontal*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
	792.3847	31.36	peak	1.22	32.58	80.80	114	3	-48.22	
*	868.1363	32.05	peak	3.19	35.24	80.80	107	218	-45.56	

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

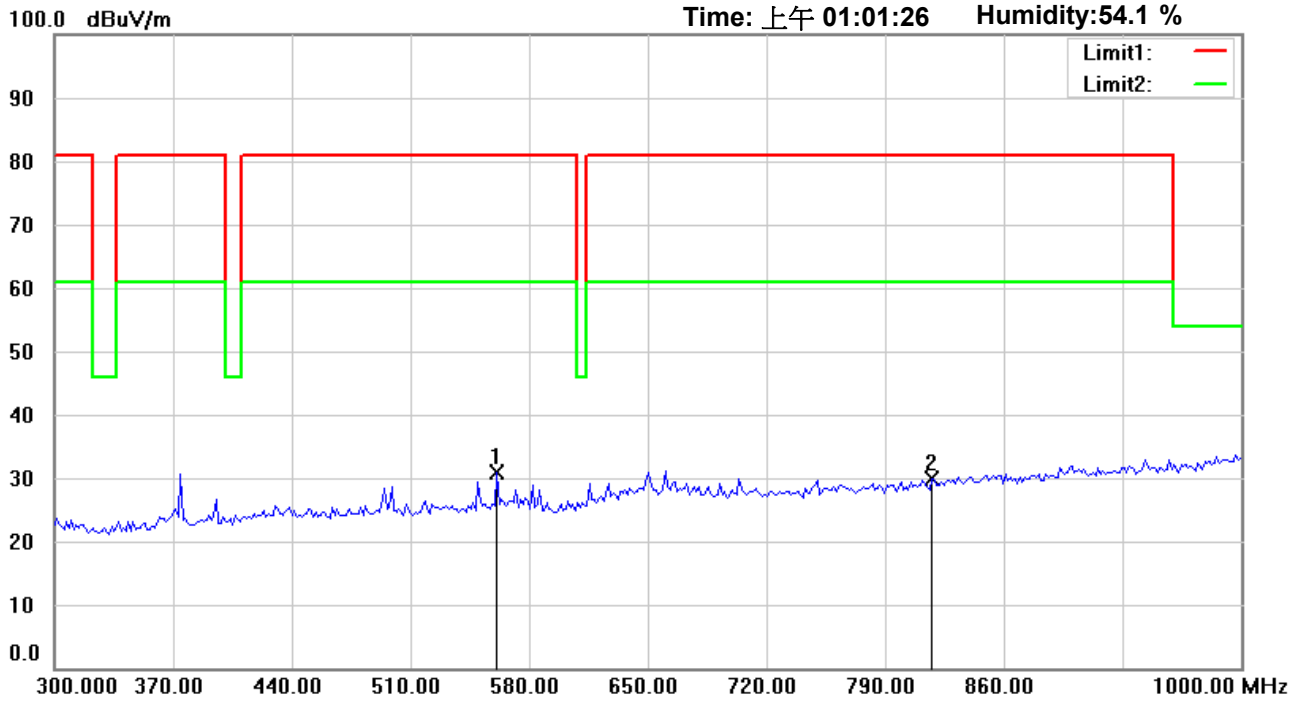
Address:6F.,No.58,Ln 188,Ruey Kuang Rd,Neihu,Taipei
Tel:+886-2-6606-8877
Fax:+886-2-6606-8875

Radiated Emission Measurement

Operator: Sky

File :2 | Data :#2 | Date: 2022/10/6 | Time: 上午 01:01:26

Temperature:28.7 ℃
Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 300-1000(PK)

Polarization: *Vertical*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
*	560.9218	32.80	peak	-1.95	30.85	80.80	113	28	-49.95	
	817.6352	27.99	peak	1.87	29.86	80.80	142	116	-50.94	

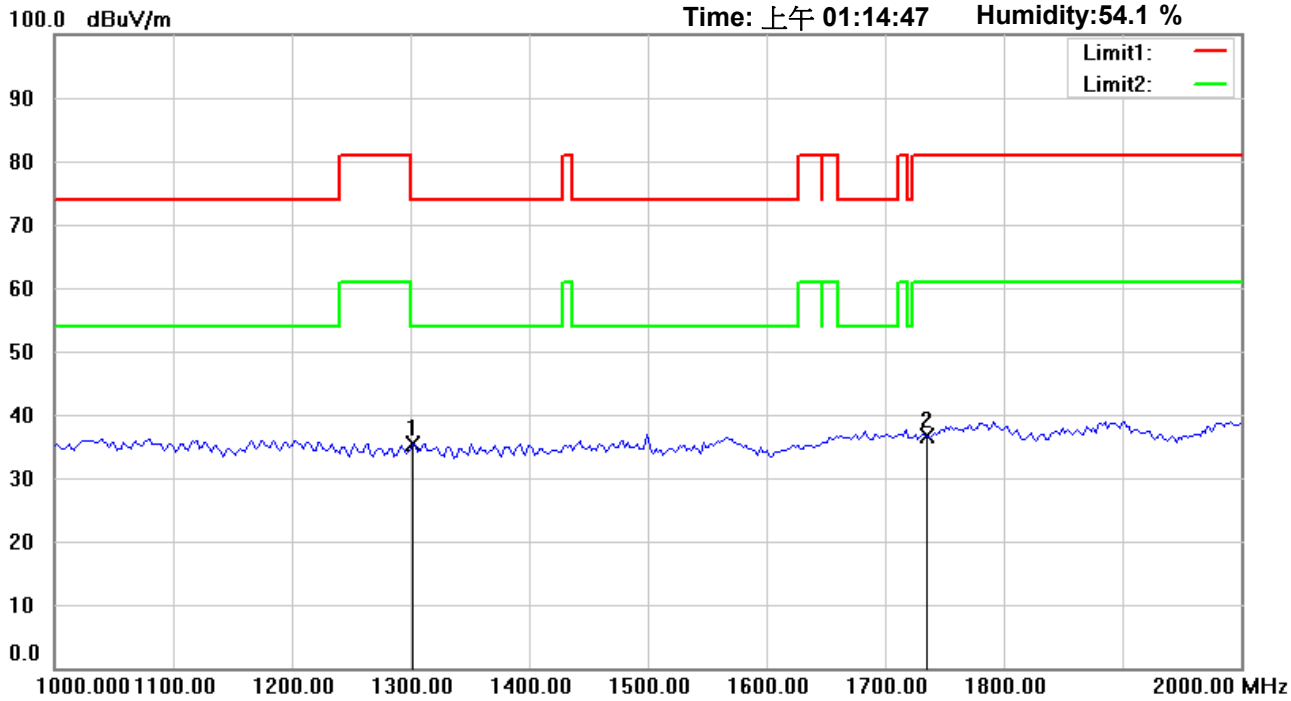
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#1 | Date: 2022/10/6 | Time: 上午 01:14:47 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 1000-2000(PK)

Polarization: *Horizontal*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
*	1301.000	43.32	peak	-7.95	35.37	74.00	150	2	-38.63	
	1735.000	42.65	peak	-6.10	36.55	80.80	150	39	-44.25	

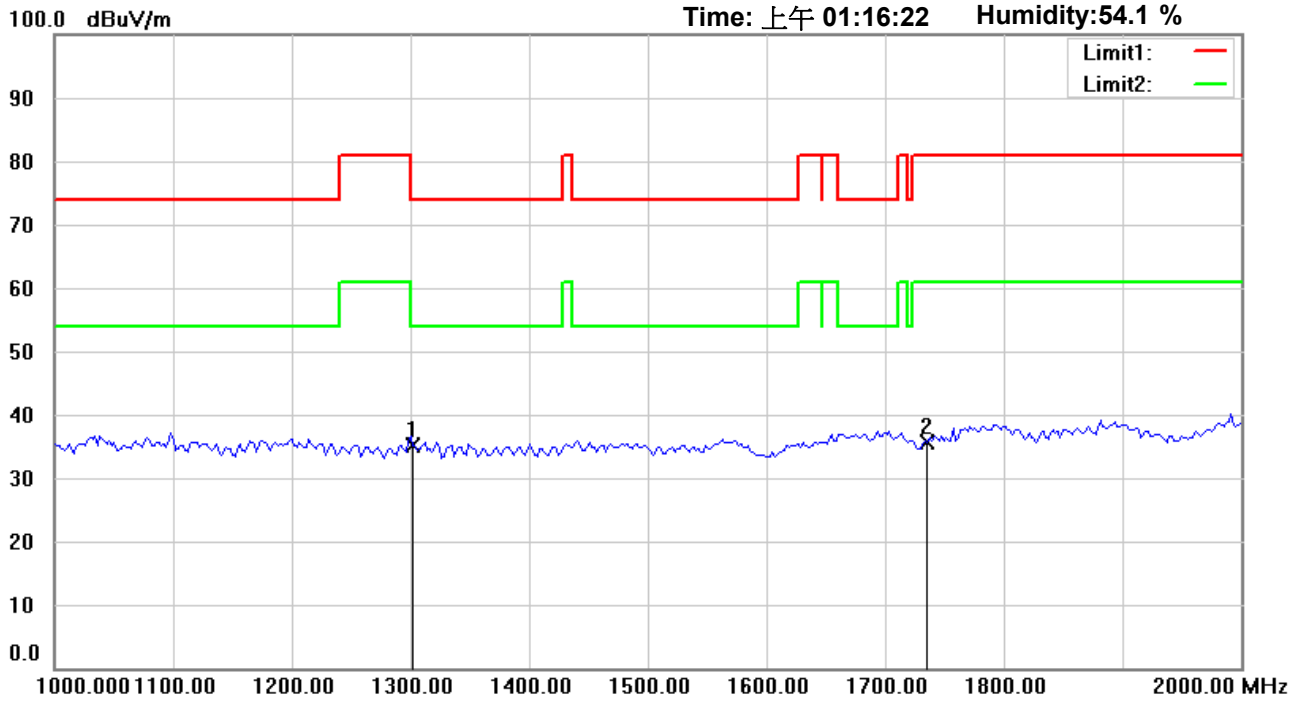
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#4 | Date: 2022/10/6 | Time: 上午 01:16:22 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 1000-2000(PK)

Polarization: *Vertical*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
*	1301.000	43.09	peak	-7.95	35.14	74.00	150	106	-38.86	
	1735.000	41.70	peak	-6.10	35.60	80.80	150	10	-45.20	

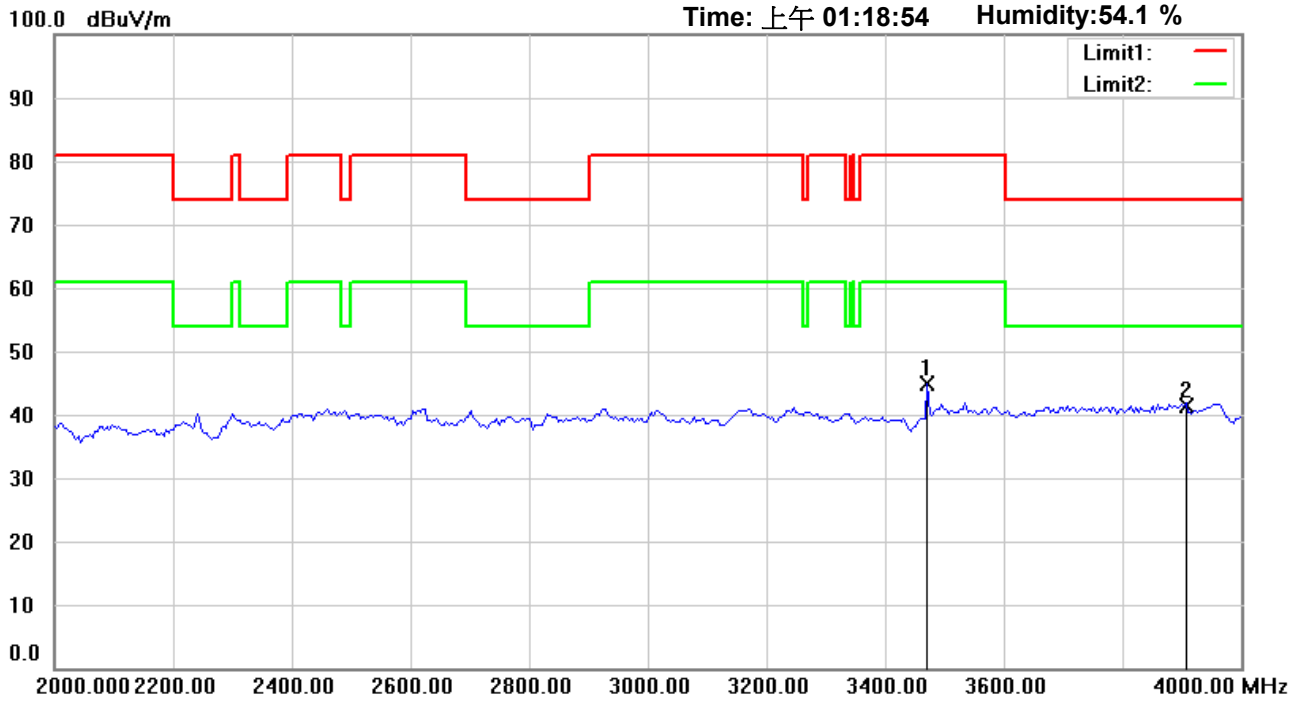
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#2 | Date: 2022/10/6 | Time: 上午 01:18:54 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 2000-4000(PK)

Polarization: *Horizontal*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
	3470.000	47.45	peak	-2.45	45.00	80.80	150	30	-35.80	
*	3904.000	41.61	peak	-0.27	41.34	74.00	150	14	-32.66	

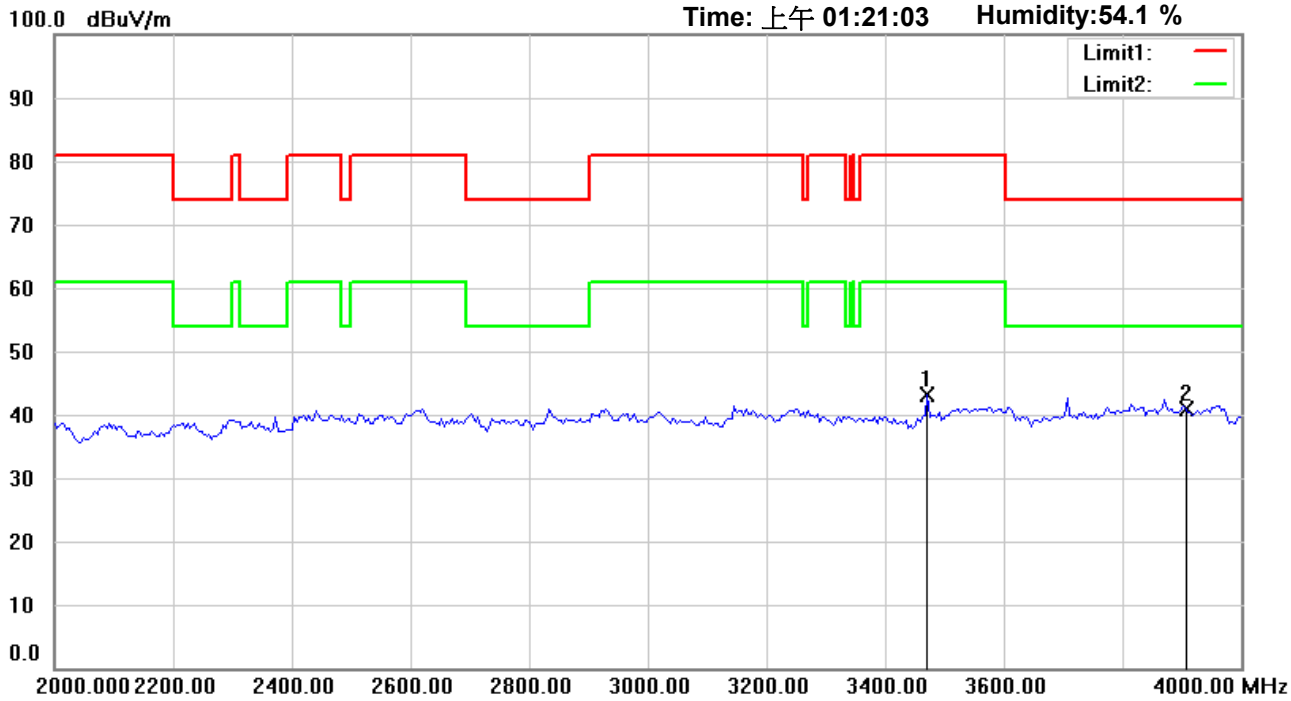
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#5 | Date: 2022/10/6 | Time: 上午 01:21:03 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 2000-4000(PK)

Polarization: *Vertical*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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
	3470.000	45.65	peak	-2.45	43.20	80.80	150	47	-37.60	
*	3904.000	41.15	peak	-0.27	40.88	74.00	150	109	-33.12	

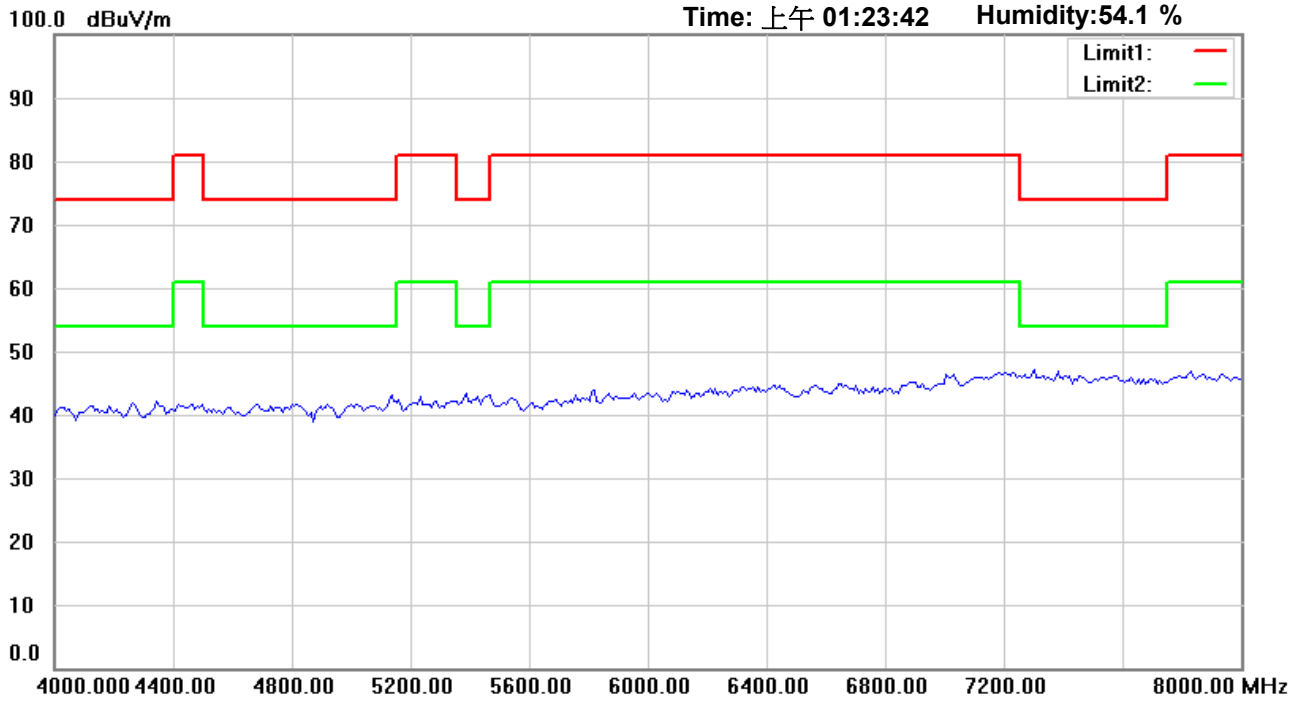
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#3 | Date: 2022/10/6 | Time: 上午 01:23:42 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 4000-8000(PK)

Polarization: *Horizontal*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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

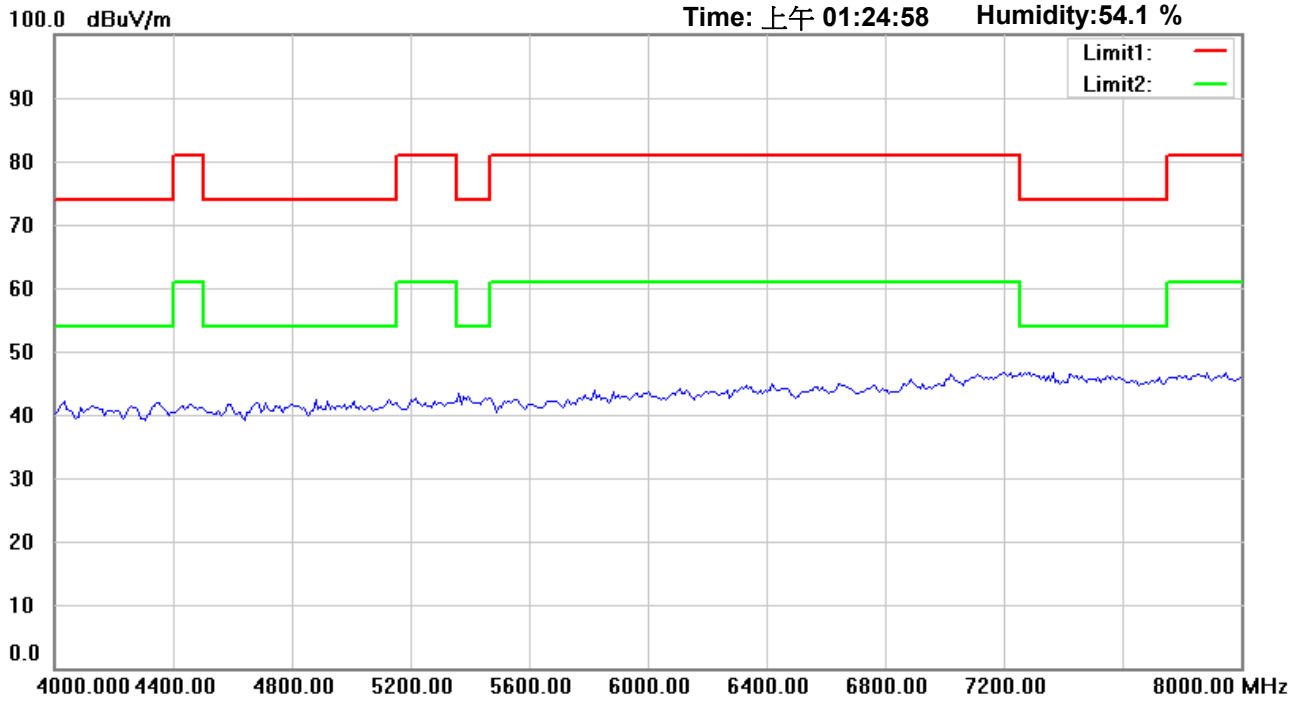
*:Maximum data x:Over limit !:over margin

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: Sky

File :3 | Data :#6 | Date: 2022/10/6 | Time: 上午 01:24:58 | Temperature:28.7 ℃ | Humidity:54.1 %



Site : Chamber

Condition : FCC 15.231(433MHz) 4000-8000(PK)

Polarization: *Vertical*

EUT : W6R22209-22106

Power : 18 Va.c.

M/N:

Distance: 3m

Test Mode : TX 433.82MHz

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

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