

FCC Radio Test Report

FCC ID: OMOTX145W

Report No. : BTL-FCCP-1-2304C040
Equipment : Glide Wind Sensor
Model Name : TX145W, TXxxxx, TXxxxx-xxx, TXxxxxxx, TXxxxxxx-xxx, TXxxxx-xx, TXxxxx-xx-xxx (x can be 0~9 or A~Z or a~z, the difference for different version are the product shell color , and packaging upgrade version number, when upgrade a version the number progressed to next number. The hardware is the same. The software upgrade don't influence the RF characteristic. All the models are electrically identical.)
Brand Name : LA CROSSE TECHNOLOGY
Applicant : La Crosse Technology Ltd.
Address : 2809 Losey Blvd. South La Crosse Wisconsin 54601 United States
Radio Function : 433.92 MHz
FCC Rule Part(s) : FCC CFR Title 47, Part 15, Subpart C (15.231)
Measurement Procedure(s) : ANSI C63.10-2013
Date of Receipt : 2023/3/6
Date of Test : 2023/4/27 ~ 2023/5/2
Issued Date : 2023/5/15

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-1-2304C040	R00	Original Report.	2023/5/15	Valid

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC Power Line Conducted Emissions	-----	N/A	NOTE(1)
15.209 15.231(b)	Radiated Emissions	APPENDIX A APPENDIX B	Pass	-----
15.231(c)	20 dB Spectrum Bandwidth	APPENDIX C	Pass	-----
15.231(a)(1)	Timing Testing	APPENDIX D	Pass	-----

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report.

(2) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test locations stated below are under the TAF Accreditation Number 0659.

The test location(s) used to collect the test data in this report are:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)

☐ C05 ☐ CB08 ☐ CB11 ☒ SR10 ☐ SR11

No. 72, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)

☐ C06 ☒ CB21 ☐ CB22

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. Radiated emissions test :

Test Site	Measurement Frequency Range	U,(dB)
CB21	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

B. Conducted test :

Test Item	U,(dB)
20 dB Spectrum Bandwidth	0.5338

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

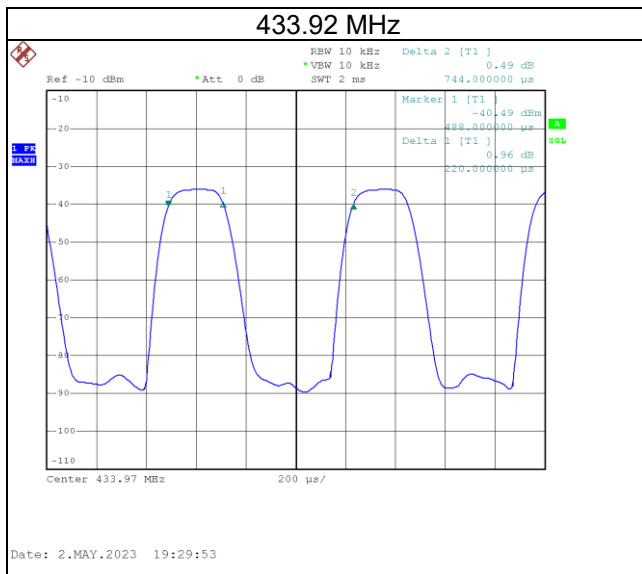
Test Item	Environment Condition	Test Voltage	Tested by
Radiated emissions below 1 GHz	Refer to data	DC 4.5V	Mark Wang
Radiated emissions above 1 GHz	Refer to data	DC 4.5V	Mark Wang
20 dB Spectrum Bandwidth	22.3 °C, 61 %	DC 4.5V	Tim Lee
Timing Testing	22.3 °C, 61 %	DC 4.5V	Tim Lee

1.4 DUTY CYCLE

If duty cycle is $\geq 98\%$, duty factor is not required.

If duty cycle is $< 98\%$, duty factor shall be considered.

Remark	Delta 1			Delta 2	On Time/Period	20 log(1/Duty Cycle)
Mode	ON (ms)	Numbers (ON)	On Time (B) (ms)	Period (ON+OFF) (ms)	Duty Cycle (%)	Duty Factor (dB)
433.92 MHz	0.220	1	0.220	0.744	29.57%	-10.58



2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	Glide Wind Sensor
Model Name	TX145W, TXxxxx, TXxxxx-xxx, TXxxxxxx, TXxxxxxx-xxx, TXxxxx-xx, TXxxxx-xx-xxx (x can be 0~9 or A~Z or a~z, the difference for different version are the product shell color , and packaging upgrade version number, when upgrade a version the number progressed to next number. The hardware is the same. The software upgrade don't influence the RF characteristic. All the models are electrically identical.)
Brand Name	LA CROSSE TECHNOLOGY
Model Difference	The difference for different version are the product shell color , and packaging upgrade version number, when upgrade a version the number progressed to next number. The hardware is the same. The software upgrade don't influence the RF characteristic. All the models are electrically identical.
Power Source	Supplied from battery.
Power Rating	DC 4.5V
Products Covered	N/A
Frequency Range	433.92 MHz
Field Strength	62.18 dBuV/m (Average)
Test Model	TX145W
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

(1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

(2) Channel List:

Channel	Frequency (MHz)
01	433.92

(3) Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Fuzhou SINOSTR Electronic Co., Ltd	TX069	Coil	N/A	0

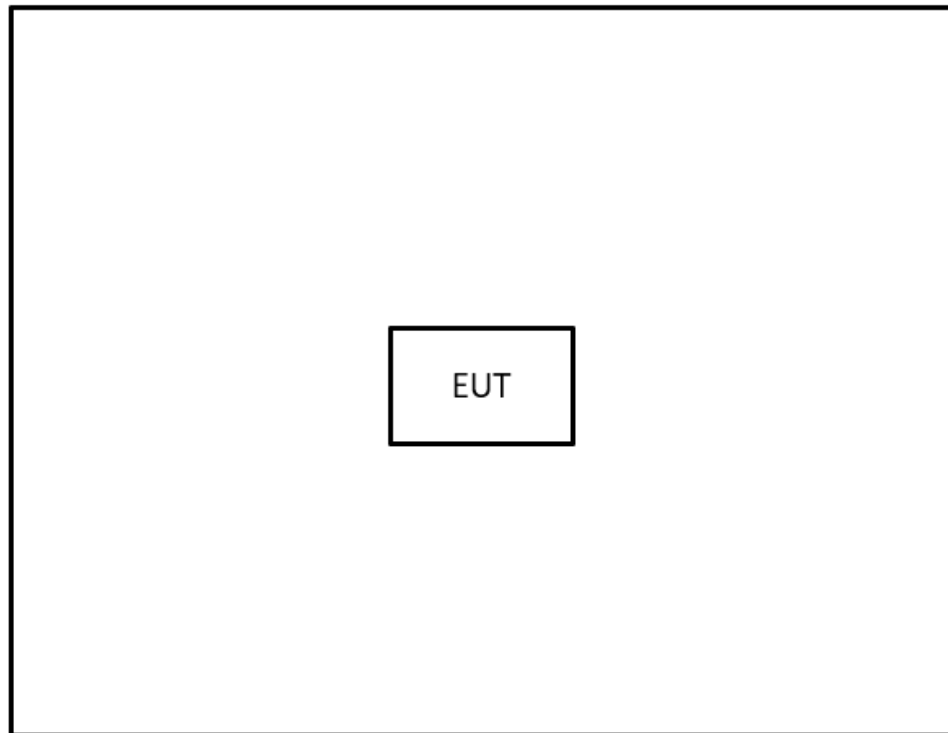
(4) The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 TEST MODES

Test Items	Test mode	Channel	Note
Transmitter Radiated Emissions (below 1GHz)	TX / 433.92 MHz	01	-
Transmitter Radiated Emissions (above 1GHz)	TX / 433.92 MHz	01	-
20 dB Bandwidth	TX / 433.92 MHz	01	-
Timing Testing	TX / 433.92 MHz	01	-

2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
-	-	-	-	-	-

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

3 RADIATED EMISSIONS TEST

3.1 LIMIT

LIMITS OF FIELD STRENGTH OF FUNDAMENTAL MEASUREMENT

Frequency Band (MHz)	Field strength of fundamental Limit(μ V/m) at 3m
40.66-40.70	2250
70-130	1250
130-174	(**)1250 To 3750
174-260	3750
260-470	(**)3750 To 12500
Above 470	12500

**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μ V/m at 3 meters = $22.72727 \times (\text{operating frequency, MHz}) - 2454.545$.

(2) For the band 260 - 470 MHz, μ V/m at 3 meters = $16.6667 \times (\text{operating frequency, MHz}) - 2833.3333$.

So the field strength of emission limits has been calculated in below table.

Carrier Frequency (MHz)	Fundamental Emissions Limit(dBuV/m) at 3m
433.92 MHz	72.87 (Average)
433.92 MHz	92.87 (Peak)

MEASURING INSTRUMENTS AND SETTING (FIELD STRENGTH OF FUNDAMENTAL EMISSIONS)

Receiver Parameter	Setting
Attenuation	Auto
Center Frequency	Fundamental Frequency
RBW	120 kHz
Detector	Peak / Average

RADIATED EMISSIONS MEASUREMENT

Devices complying with 47 CFR FCC part 15 subpart C, section 15.231(e). The field strength of emissions from intentional radiators at 3 meters operated under this Section shall not exceed the following:

Frequency Band (MHz)	Field strength of spurious emissions (μ V/m) at 3m
40.66-40.70	225
70-130	125
130-174	(**)125 to 375
174-260	375
260-470	(**)375 to 1250
Above 470	1250

**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μ V/m at 3 meters = $22.72727 \times (\text{operating frequency, MHz}) - 2454.545$.

(2) For the band 260 - 470 MHz, μ V/m at 3 meters = $16.6667 \times (\text{operating frequency, MHz}) - 2833.3333$.

(3) The maximum permitted unwanted emissions level is 20 dB below the maximum permitted fundamental level. In addition field strength of any emissions which appear inside of the restriction band shall not exceed the general radiated emissions limits in Section 15.209(a).

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000MHz for QP detector

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, AV Mode with Dwell time

3.2 TEST PROCEDURE

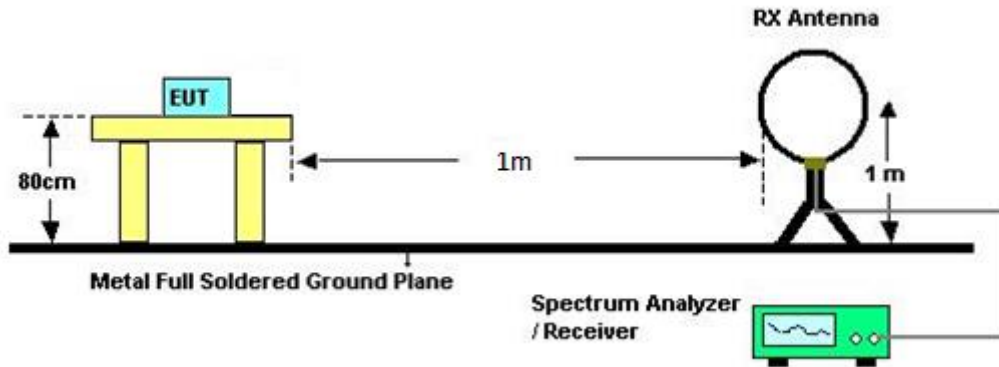
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz..
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.(below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

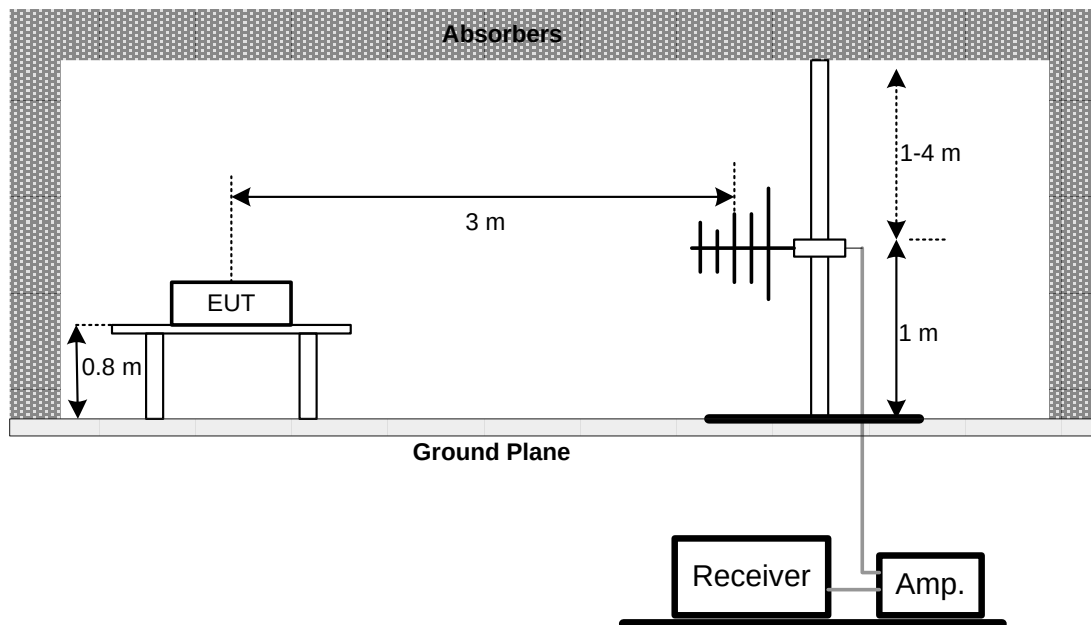
No deviation.

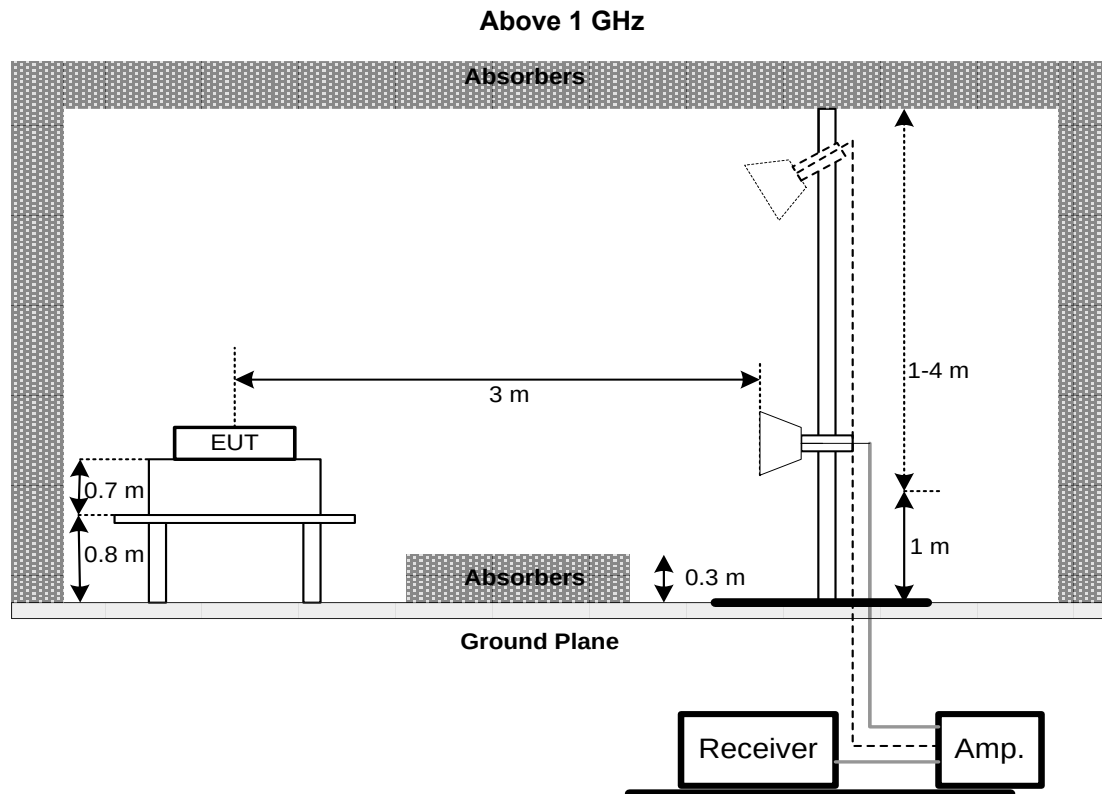
3.4 TEST SETUP

9 kHz to 30 MHz



30 MHz to 1 GHz





3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 TEST RESULT – BELOW 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

3.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX A

3.8 TEST RESULT –ABOVE 1 GHZ

Please refer to the APPENDIX B

NOTE:

- (1) No limit: This is fundamental signal, the judgment is not applicable. For fundamental signal judgment was referred to Peak output test.

4 20 dB SPECTRUM BANDWIDTH MEASUREMENT

4.1 LIMIT

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. So the emission bandwidth limits have been calculated in below table.

Fundamental Frequency	20 dB Bandwidth Limits (MHz)
433.92 MHz	1.0848

4.2 MEASURING INSTRUMENTS AND SETTING

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RB	10 kHz
VB	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

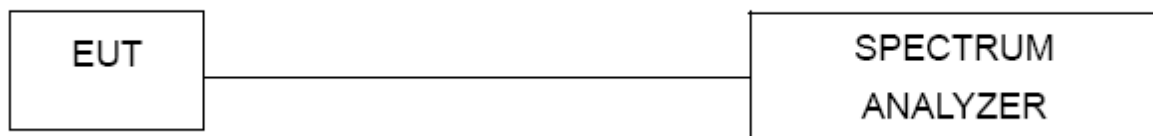
4.3 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were used.
- Measured the spectrum width with power higher than 20 dB below carrier.

4.4 DEVIATION FROM TEST STANDARD

No deviation.

5.4 TEST SETUP



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT

Please refer to the APPENDIX C

5 TIMING TESTING

5.1 LIMIT

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

5.2 MEASURING INSTRUMENTS AND SETTING

Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	Zero Span
RB	1 MHz
VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	100 seconds

5.3 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 1 MHz and the video bandwidth of 1 MHz were used.

5.4 DEVIATION FROM TEST STANDARD

No deviation.

5.5 TEST SETUP



5.6 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.7 TEST RESULT

Please refer to the APPENDIX D

6 LIST OF MEASURING EQUIPMENTS

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2022/9/19	2023/9/18
2	Preamplifier	EMCI	EMC118A45SE	980819	2023/3/7	2024/3/5
3	Preamplifier	EMCI	EMC001340	980579	2022/9/30	2023/9/29
4	Test Cable	EMCI	EMC104-SM-SM-1000	220319	2023/3/14	2024/3/13
5	Test Cable	EMCI	EMC104-SM-SM-3000	220322	2023/3/14	2024/3/13
6	Test Cable	EMCI	EMC104-SM-SM-7000	220324	2023/3/14	2024/3/13
7	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
8	Loop Ant	Electro-Metrics	EMCI-LPA600	291	2022/9/19	2023/9/18
9	Horn Antenna	RFSPIN	DRH18-E	211202A18EN	2022/5/18	2023/5/17
10	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2022/5/20	2023/5/19
11	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2022/5/20	2023/5/19
12	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

20 dB Spectrum Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/25

Timing Testing						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2023/3/27	2024/3/25

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

7 EUT TEST PHOTO

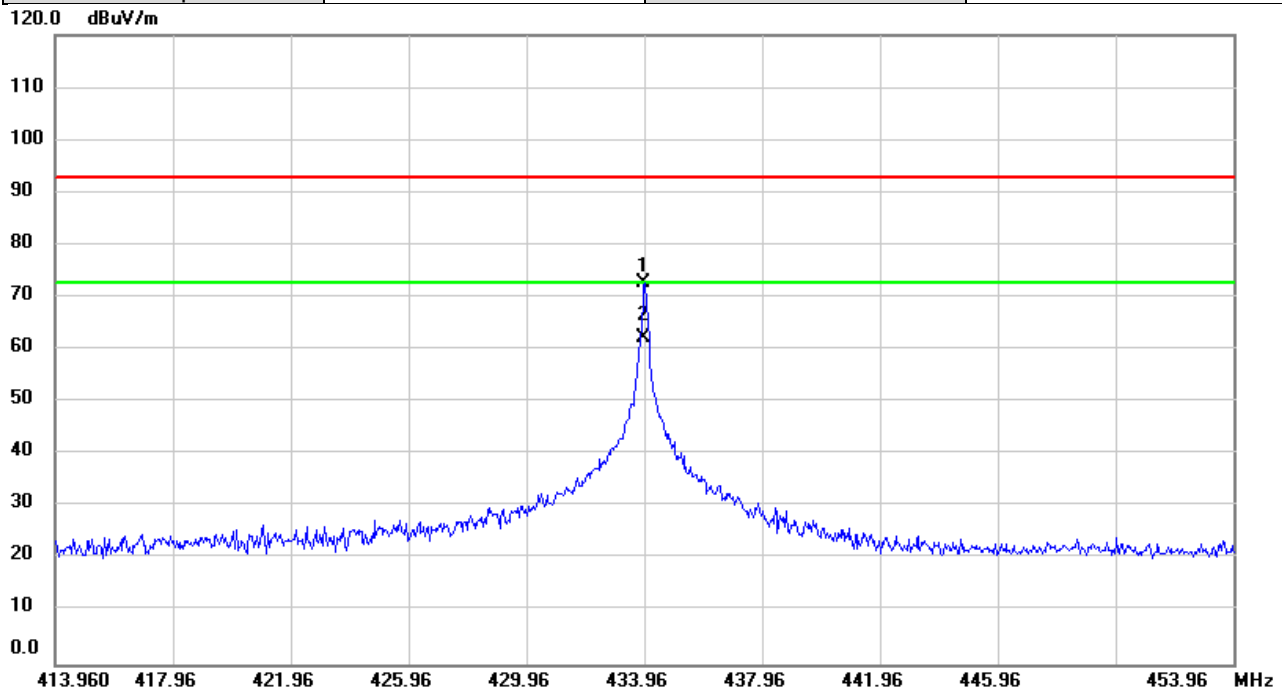
Please refer to document Appendix No.: TP-2304C040-FCCP-1 (APPENDIX-TEST PHOTOS).

8 EUT PHOTOS

Please refer to document Appendix No.: EP-2304C040-1 (APPENDIX-EUT PHOTOS).

APPENDIX A RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Vertical
Temp	21°C	Hum.	69%



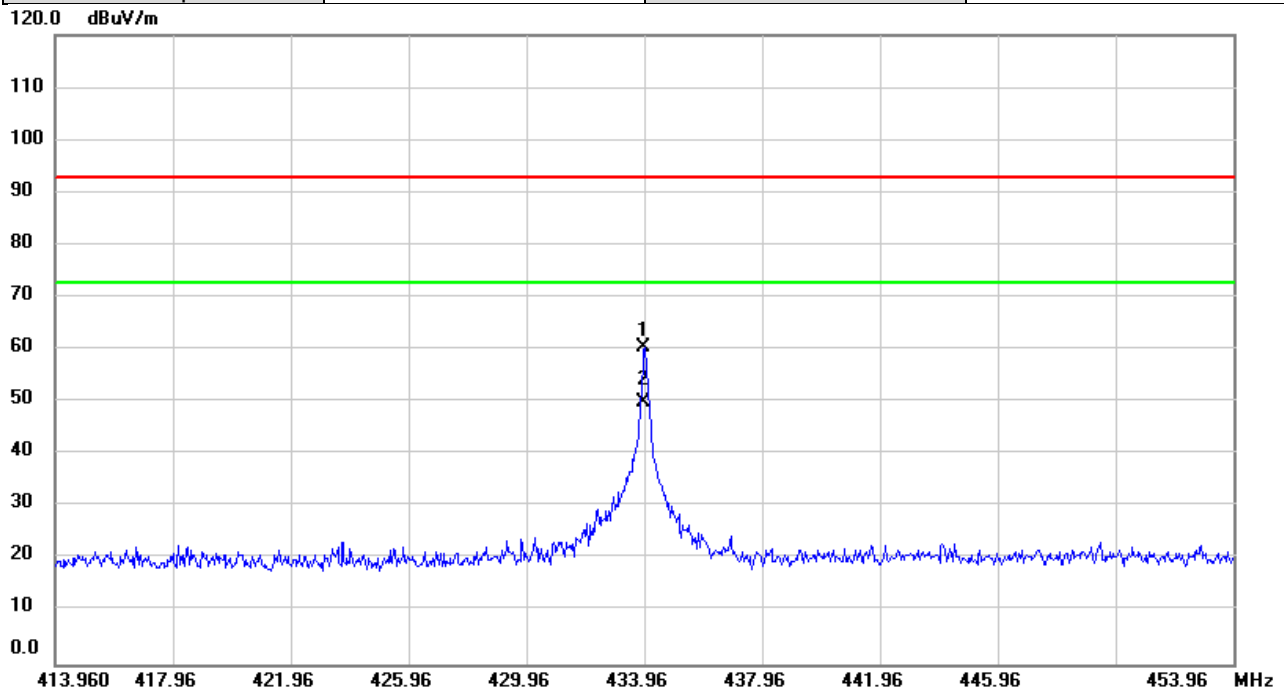
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		433.9200	80.44	-7.68	72.76	92.87	-20.11	peak	
2	*	433.9200	72.76	-10.58	62.18	72.87	-10.69	AVG	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Horizontal
Temp	21°C	Hum.	69%



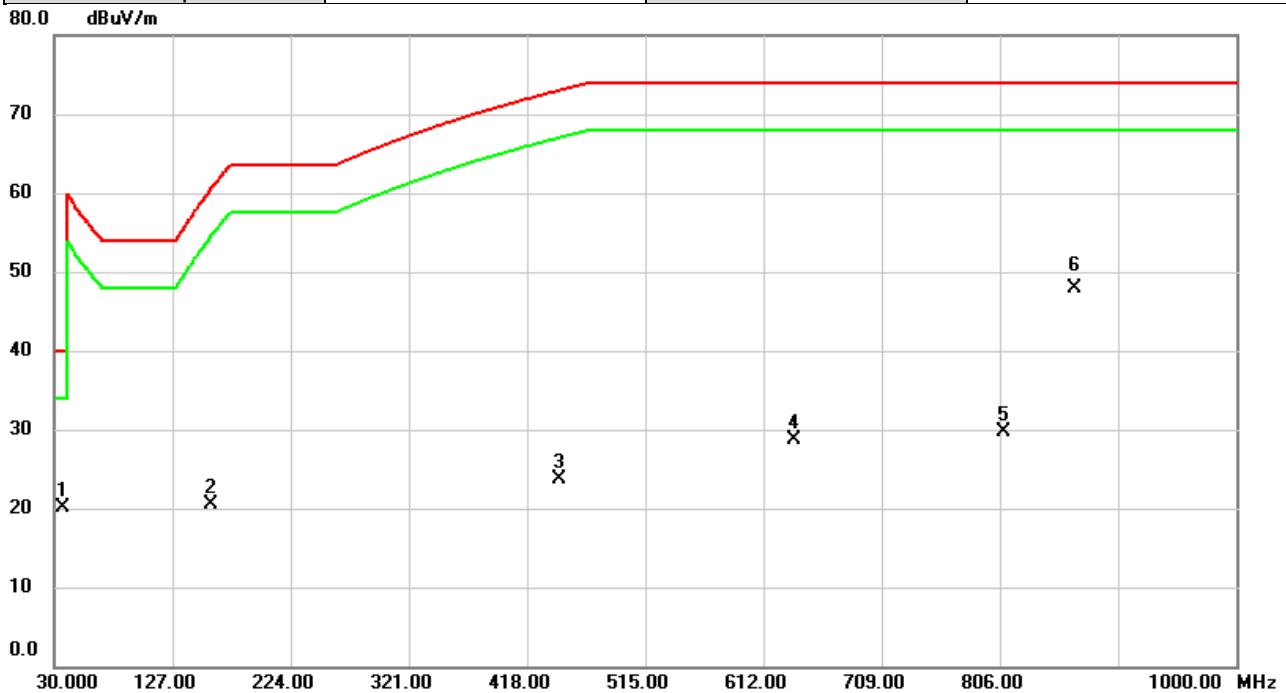
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		433.9200	68.25	-7.68	60.57	92.87	-32.30	peak	
2	*	433.9200	60.57	-10.58	49.99	72.87	-22.88	AVG	

REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Vertical
Temp	21°C	Hum.	69%

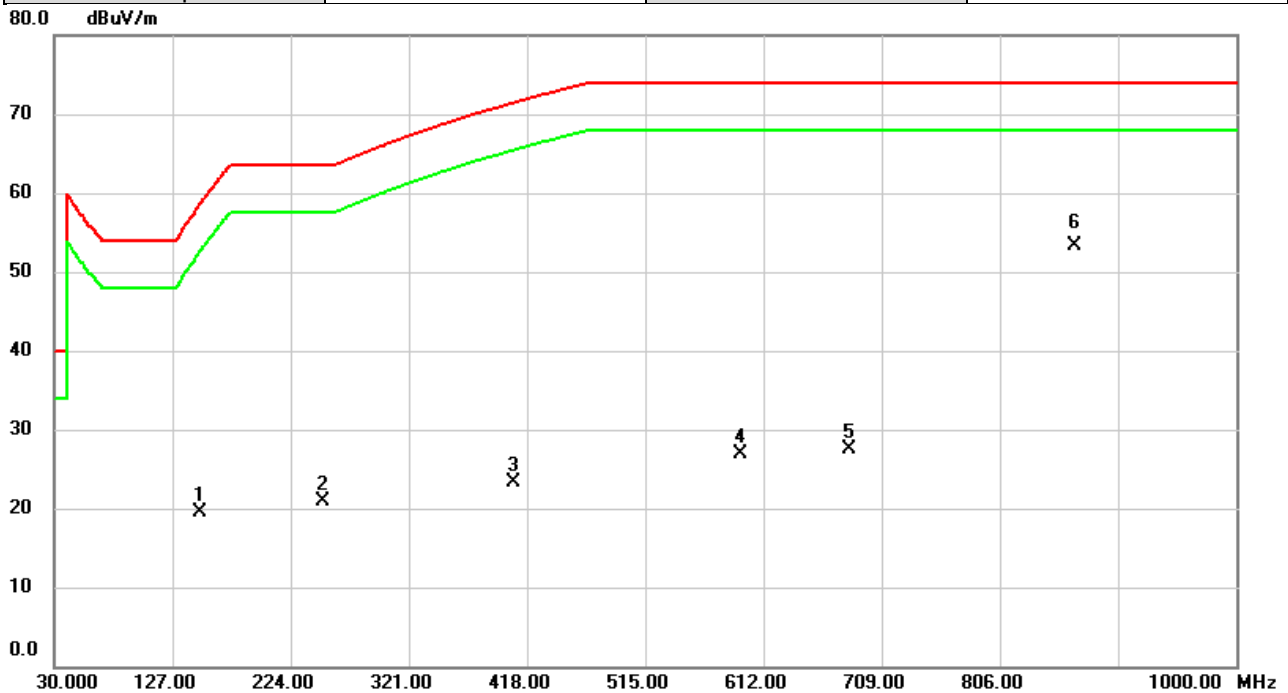


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	36.8545	32.93	-12.88	20.05	40.00	-19.95	peak	
2		159.1716	32.52	-11.99	20.53	60.61	-40.08	peak	
3		444.9983	30.96	-7.34	23.62	73.03	-49.41	peak	
4		636.8320	32.16	-3.47	28.69	74.00	-45.31	peak	
5		808.8130	30.57	-0.78	29.79	74.00	-44.21	peak	
6		867.9506	47.82	0.04	47.86	74.00	-26.14	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Horizontal
Temp	21°C	Hum.	69%



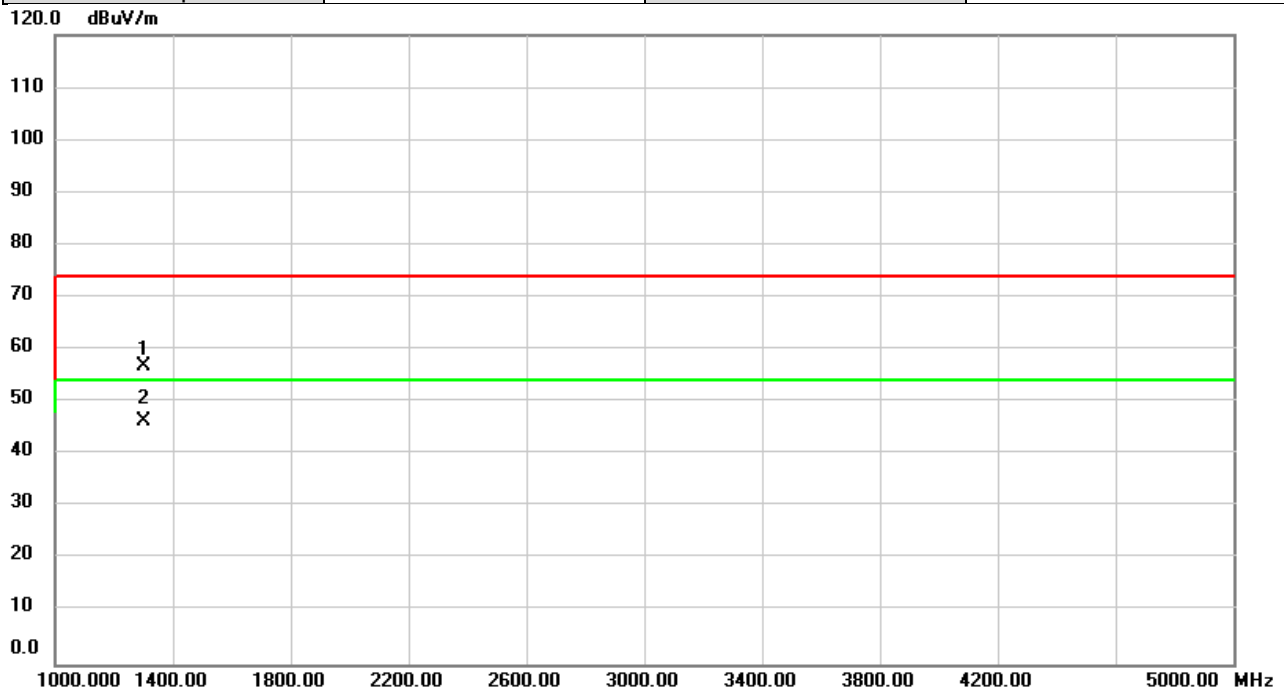
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		149.8920	31.53	-12.06	19.47	58.64	-39.17	peak	
2		249.9960	34.21	-13.24	20.97	63.52	-42.55	peak	
3		407.5887	31.71	-8.48	23.23	71.48	-48.25	peak	
4		593.0525	31.03	-4.06	26.97	74.00	-47.03	peak	
5		682.9393	30.51	-2.99	27.52	74.00	-46.48	peak	
6	*	867.9507	53.23	0.04	53.27	74.00	-20.73	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX B RADIATED EMISSIONS - ABOVE 1000 MHZ

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Vertical
Temp	24°C	Hum.	58%

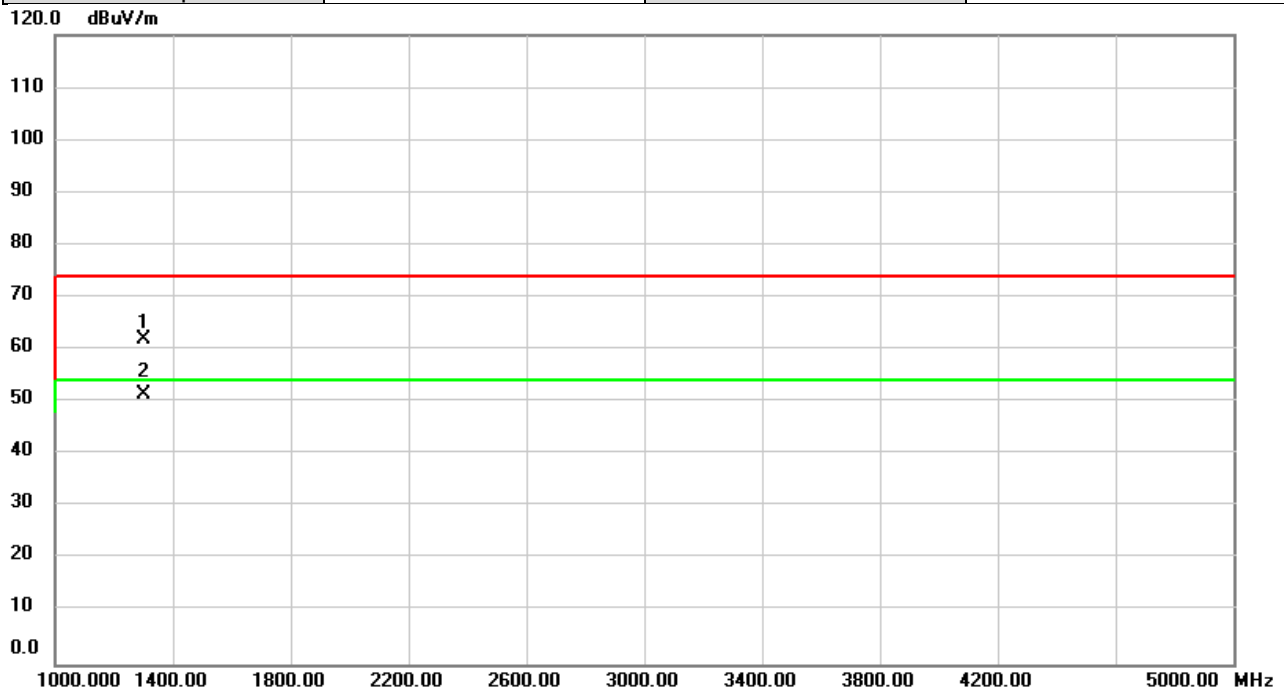


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1302.000	64.85	-8.00	56.85	74.00	-17.15	peak	
2	*	1302.000	56.85	-10.58	46.27	54.00	-7.73	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX	Test Date	2023/4/27
Test Frequency	433.92MHz	Polarization	Horizontal
Temp	24°C	Hum.	58%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1302.000	69.90	-8.00	61.90	74.00	-12.10	peak	
2	*	1302.000	61.90	-10.58	51.32	54.00	-2.68	AVG	

REMARKS:

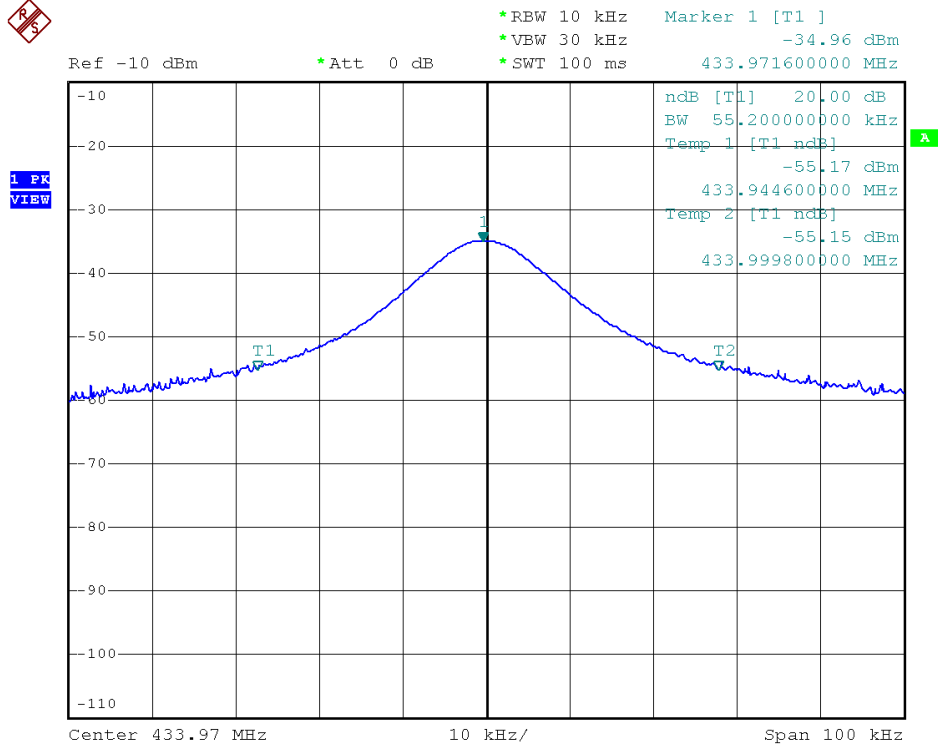
(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C 20 dB SPECTRUM BANDWIDTH

Test Mode 433.92MHz

Frequency (MHz)	20 dB Bandwidth (kHz)	20 dB BW Limits (MHz)
433.92	55.20	1.0848



Date: 2.MAY.2023 19:16:47

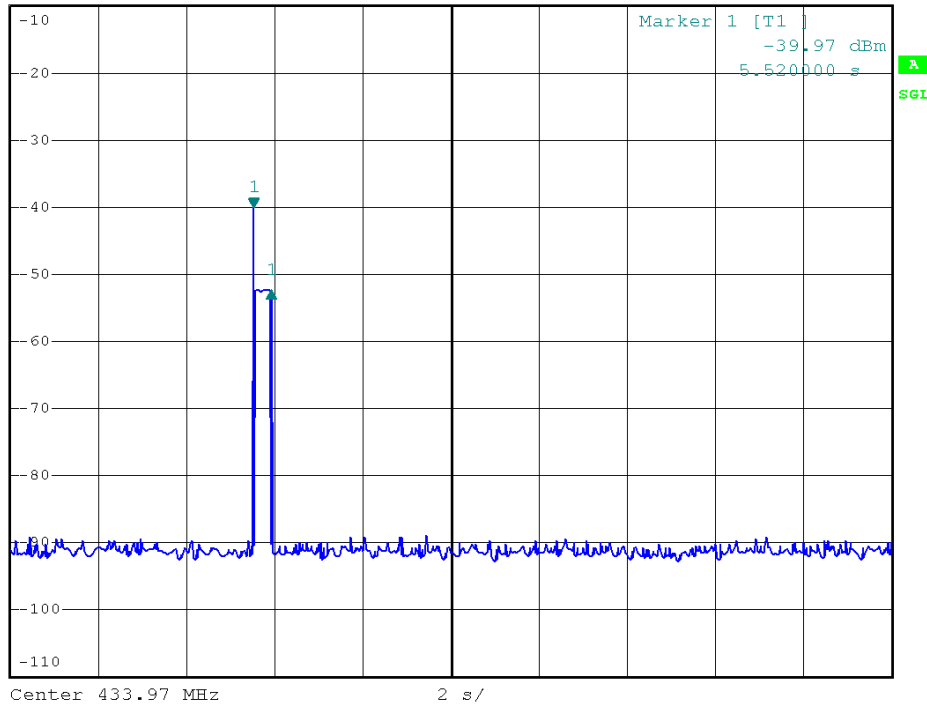
APPENDIX D TIMING TESTING

Test Mode	433.92MHz
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Ref -10 dBm *Att 0 dB RBW 10 kHz Delta 1 [T1]
 *VBW 10 kHz -12.50 dB
 SWT 20 s 400.000000 ms

1 PK
VIEW



Date: 2.MAY.2023 19:25:10

End of Test Report