

FCC 15.231 Test Report

for

Chungear Industrial Co., Ltd

12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan

**Product Name : Ceiling Fan Remote
Controller (Transmitter)**
Model Name : TRD020Y2M
FCC ID : KUJCE11201

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

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APPENDIX A TEST PHOTOGRAPHS

APPENDIX B EUT PHOTOGRAPHS

TEST REPORT CERTIFICATION

Applicant : Chungear Industrial Co., Ltd
Manufacturer #1 : Chungear Industrial Co., Ltd
Manufacturer #2 : SATELLITE ELECTRONIC (ZHONGSHAN), LTD.
Manufacturer #3 : ZHONGSHAN AMITY ELECTRONIC LTD.,
EUT Description
(1) Product : Ceiling Fan Remote Controller (Transmitter)
(2) Model : TRD020Y2M
(3) Brand : N/A
(4) Power Rating : DC 3V (Via Batty)

Applicable Standards:

Title 47 CFR FCC Part 15 Subpart C
ANSI C63.10:2013

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2023. 10. 12

Reviewed by:

Sunnie Huang

(Sunnie Huang/Administrator)

Approved by:

Johnny Hsueh

(Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2022. 03. 30	Original Report	EM-F230510

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	N/A, Note
15.209/15.231(b)	Radiated Spurious Emission and Fundamental Frequency	PASS
15.231(c)	Emission Bandwidth	PASS
15.231(a)(1)	Periodic Operated	PASS
15.203	Antenna Requirement	Compliance
Note: The EUT only employs battery power for operation, so it is unnecessary to test.		

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	Chungear Industrial Co., Ltd 12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan
Manufacturer #1	Chungear Industrial Co., Ltd 12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan
Manufacturer #2	SATELLITE ELECTRONIC (ZHONGSHAN), LTD. 8 CHUANG YE RD.TORCH DEVELOPMENT ZONE. ZHONGSHAN.GUANGDONG.528437 CHINA
Manufacturer #3	ZHONGSHAN AMITY ELECTRONIC LTD., NO.16,TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE, ZHONGSHAN CITY GUANGDONG PROVINCE CHINA
Product	Ceiling Fan Remote Controller (Transmitter)
Model	TRD020Y2M

3.2. Description of EUT

Test Model	TRD020Y2M		
Serial Number	N/A		
Power Rating	DC 3V (Via Batty)		
RF Features	ASK		
Transmit Type	1T		
Test Sample	Sample No.	Test Item	Firmware
	01	RSE, RF Conducted	N/A
Sample Status	Production		
Date of Receipt	2023. 09. 01		
Date of Test	2023. 09. 08~ 11		
Interface Ports of EUT	None		
Accessories Supplied	None		

3.3. Reference Test Guidance

ANSI C63.10:2013

3.4. Antenna Information

No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	---	---	PCB	---	---

3.5. EUT Specifications Assessed in Current Report

Modulation	Fundamental Range (MHz)	Channel Number
ASK	304.25	1

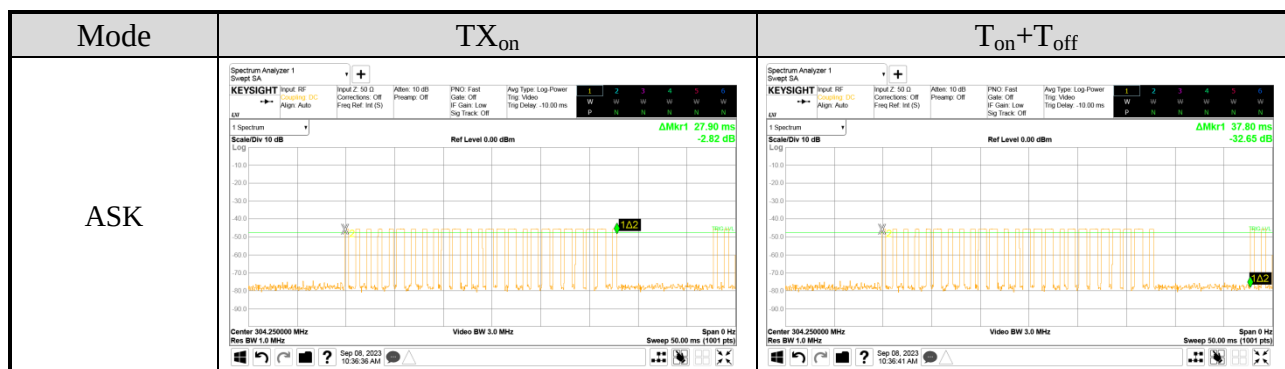
3.6. Description of Key Components

None

3.7. Test Configuration

Frequency (MHz)	TX _{on} (ms)	TX _{on+off} (ms)	1/ TX _{on} (kHz)	Duty Cycle Factor [10log(1/x)]
304.25	27.90	37.80	0.036	1.319

Note: When duty cycle is less than 98% (0.98) that duty cycle factor 10log(1/x) is needed to add in conducted test items measured in average detector.



Item		Test Frequency
Radiated Test Case	Radiated Band Edge ^{Note1}	304.25MHz
	Radiated Spurious Emission (30MHz-1GHz) ^{Note1}	304.25MHz
	Radiated Spurious Emission (Above 1GHz) ^{Note1}	304.25MHz
	Fundamental Frequency	304.25MHz
	Occupied Bandwidth 99% Power	304.25MHz
	Periodic Operated	304.25MHz

Note : ☐ Mobile Device ☒ Portable Device,and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: ☒ Lie ☐ Side ☐ Stand

3.8. Tested Supporting System List

None.

3.9. Setup Configuration



3.10. Operating Condition of EUT

To press the button of EUT is used for enabling EUT RF function under continues transmitting and choosing data rate/ channel.

3.11. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 491, Zhongfu Rd., Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber

3.12.Measurement Uncertainty

Test Items/Facilities			Frequency Range	Uncertainty
Conduction Test			9kHz-150kHz	±3.7dB
			150kHz-30MHz	±3.4dB
Radiation Test	☒	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.8dB
			200MHz-1000MHz, 3m, Horizontal	±4.1dB
			30MHz-200MHz, 3m, Vertical	±4.5dB
			200MHz-1000MHz, 3m, Vertical	±4.5dB
			1GHz-6GHz, 3m	±4.7dB
			6GHz-18GHz, 3m	±4.1dB
			18GHz-40GHz, 3m	±3.52dB
	☐	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
			200MHz-1000MHz, 3m, Horizontal	±4.2dB
			30MHz-200MHz, 3m, Vertical	±4.3dB
			200MHz-1000MHz, 3m, Vertical	±4.5dB
	☐	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
			200MHz-1000MHz, 3m, Horizontal	±4.5dB
			30MHz-200MHz, 3m, Vertical	±4.4dB
			200MHz-1000MHz, 3m, Vertical	±4.8dB
			1GHz-6GHz, 3m	±5.0dB
			6GHz-18GHz, 3m	±4.7dB
	☐	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.2dB
			200MHz-1000MHz, 3m, Horizontal	±4.3dB
			30MHz-200MHz, 3m, Vertical	±4.3dB
			200MHz-1000MHz, 3m, Vertical	±4.7dB
			1GHz-6GHz, 3m	±4.8dB
			6GHz-18GHz, 3m	±4.5dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
Emission Bandwidth	±1kHz
Periodic Operated	± 0.05s

4. MEASUREMENT EQUIPMENT LIST

4.1. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2023. 08. 16	1 Year
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2023. 03. 29	1 Year
3.	Test Receiver	R&S	ESCS30	100338	2023. 06. 20	1 Year
4.	Amplifier	HP	8447D	2944A06305	2022. 12. 29	1 Year
5.	Microwave Amplifier	HP	8449B	3008A01284	2023. 06. 06	1 Year
6.	Loop Antenna	TESEQ	HLA 6121	60478	2023. 02. 21	1 Year
7.	Bilog Antenna	TESEQ	CBL6112D	33821	2023. 06. 30	1 Year
8.	Double-Ridged Waveguide Horn	EMCO	3115	9112-3775	2023. 05. 04	1 Year
9.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2023. 01. 07	1 Year
10.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 106	RE-14	2023. 01. 07	1 Year
11.	Coaxial Cable	HUBER+SUHNER	RG223/U	RE-33	2023. 03. 02	1 Year
12.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2023. 04. 13	1 Year
13.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2023. 03. 29	1 Year
2.	Wide Band Antenna	Diamond	RH799	N/A	N.C.R	N.C.R
3.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF	2023. 04. 13	1 Year

5. CONDUCTED EMISSION MEASUREMENT

The conducted disturbance voltage limits are not required for EUT which only employ DC power for operation

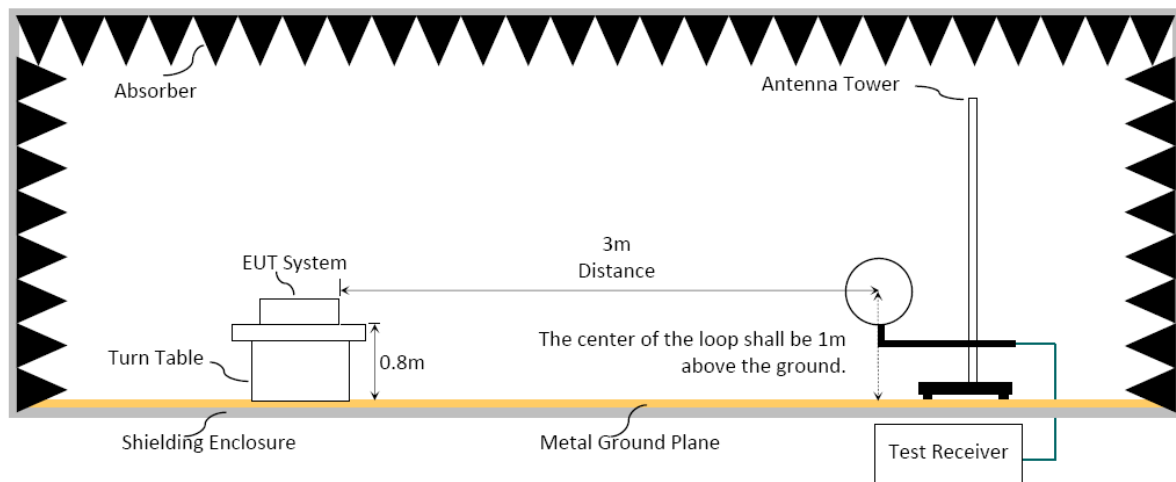
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

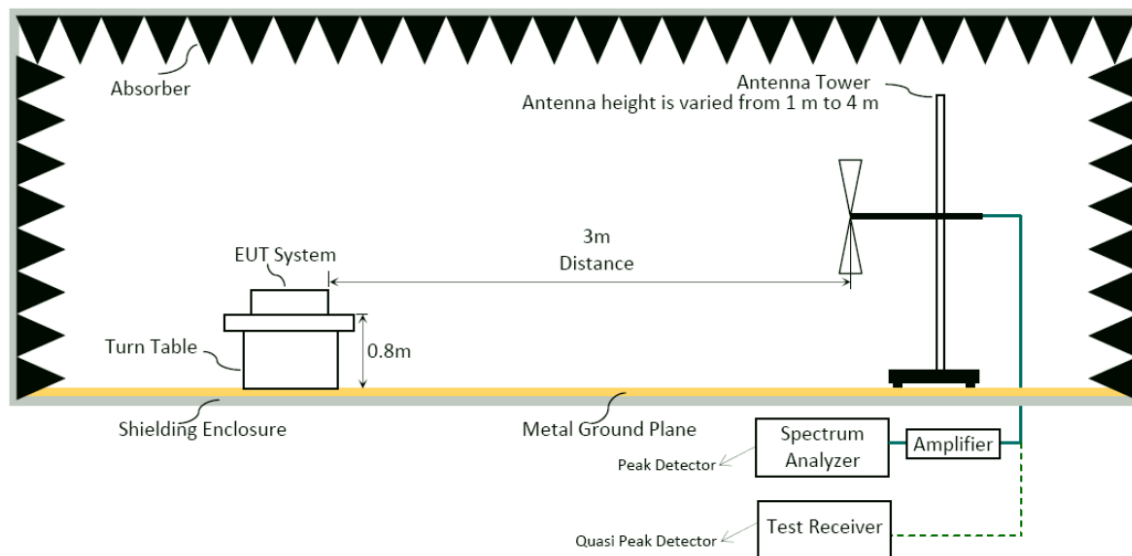
6.1.1. Block Diagram of EUT

Indicated as section 3.9

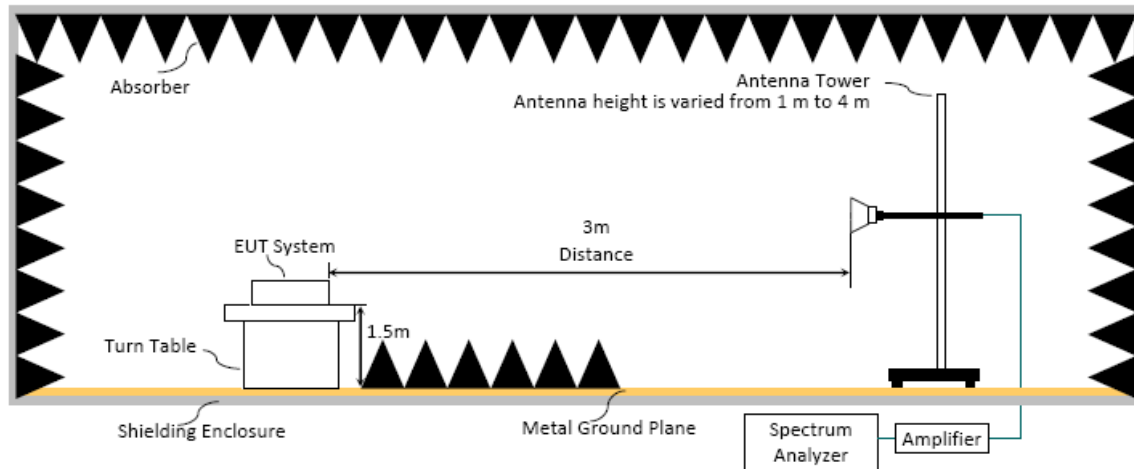
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in FCC Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance(m)	Limits	
		dBμV/m	μV/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dBμV/m (Peak) 54.0 dBμV/m (Average)	

Remark : (1) $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.2.2. Limite for Fundamental Frequency

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250
¹ :Linear Interpolations		

Remark : (1) $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

(2) The tighter limit applies to the edge between two frequency bands.

(3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

(4) Where limit of Fundamental Freq. is calculated by:

$$41.6667 \times 304.25 - 7083.3333 = 5593.760175 \mu\text{V/m} = 74.95 \text{dB}\mu\text{V/m}$$

(5) The limits in this table are based on CFR 47 Part 15.231(b).

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 80cm height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level.

In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

(1) RBW = 9kHz with peak and average detector.

(2) Detector: average and peak (9kHz-490kHz)

Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 4GHz:

The EUT setup on the turntable which has 80 cm (for 30-1000MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120kHz
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Frequency above 1GHz to 10th harmonic (up to 4 GHz):**Peak Detector:**

- (1) RBW = 1MHz for field strength of harmonics; 2MHz for field strength of fundamental
- (2) VBW $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:☐ **Option 1:**

- (1) RBW = 1MHz
- (2) VBW $\geq 1/T$. (Duty Cycle $< 98\%$, when duty cycle presented in section 3.7)

Modulation Type	VBW Setting (VBW $\geq 1/T$)
ASK	N/A

- (3) VBW = 10Hz (Duty Cycle $\geq 98\%$, when duty cycle presented in section 3.7)
- (4) Detector = Peak.
- (5) Sweep time = auto.
- (6) Trace mode = max hold.
- (7) Allow sweeps to continue until the trace stabilizes.

☐ **Option 2:**

Average Emission Level(dB μ V/m)= Peak Emission Level(dB μ V/m)+ D.C.C.F. (dB)

6.5. Measurement Result Explanation

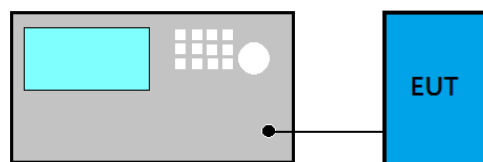
- ☒ Peak Emission Level(dBμV/m)=Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dBμV).
- ☐ Average Emission Level(dBμV/m)= Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dBμV).
- ☐ Average Emission Level(dBμV/m)= Peak Emission Level(dBμV/m)+ DCCF(dB)
Duty Cycle Correction Factor (DCCF)(dB)= $20\log(TX_{on}/TX_{on+off})$ presented in section 3.7.
- ☐ ERP(dBm)= Peak Emission Level(dBμV/m) -95.2dB-2.14dB

6.6. Test Results

Please refer to Appendix A.

7. EMISSION BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Test Procedure

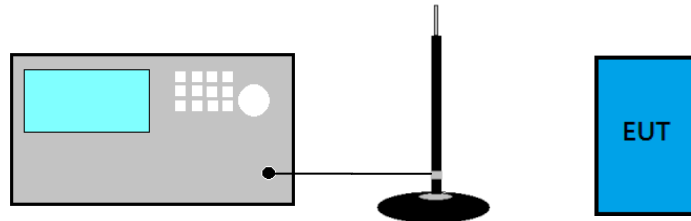
- (1) Set RBW close to 1-5 % of 20dB BW.
- (2) Set $VBW \geq RBW$.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -20dB to record the final bandwidth.

7.3. Test Results

Please refer to Appendix A

8. PERIODIC OPERATED MEASUREMENT

8.1. Block Diagram of Test Setup



8.2. Specification Limits

The operation of this device is manually operated transmitter that is automatically deactivated the transmitter within not more than 5 seconds of being released

8.3. Test Procedure

- (1) Span = zero
- (2) RBW $\geq$ 100kHz
- (3) VBW $\geq$ RBW
- (4) Sweep = 5s
- (5) Detector function = peak
- (6) Trace = single sweep

8.4. Test Results

Please refer to Appendix A

9. DEVIATION TO TEST SPECIFICATIONS

【NONE】



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APPENDIX A

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APPDNDIX A

TEST DATA AND PLOTS

(Model: TRD020Y2M)

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A.1 RADIATED EMISSION

Test Date	2023/09/11	Temp./Hum.	25°C/48%
Test Voltage	DC 3V (Via Batty)	Tested By	Kuper Hsu

A.1.1 Emissions Applied to General Requirement

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1GHz

Mode	ASK	Frequency	TX 304.25MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
36.000	21.58	1.55	26.48	36.17	32.82	40.00	7.18	Peak
120.000	17.88	2.85	26.16	31.33	25.91	43.50	17.59	Peak
378.000	21.04	5.69	26.28	38.71	39.16	46.00	6.84	Peak
486.000	22.94	6.65	27.04	33.09	35.64	46.00	10.36	Peak
848.000	25.62	8.48	27.13	33.23	40.19	46.00	5.81	Peak
994.000	26.92	9.26	26.68	32.62	42.12	54.00	11.88	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
36.000	21.58	1.55	26.48	36.69	33.35	40.00	6.65	Peak
126.000	17.66	2.93	26.12	30.84	25.30	43.50	18.20	Peak
378.000	21.04	5.69	26.28	38.33	38.77	46.00	7.23	Peak
510.000	23.26	6.80	27.16	32.17	35.06	46.00	10.94	Peak
777.000	24.92	8.08	27.30	32.78	38.47	46.00	7.53	Peak
966.000	26.71	9.12	26.77	33.32	42.39	54.00	11.61	Peak

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A.2.1.3 Frequency Above 1GHz

Mode	ASK	Frequency	TX 304.25MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1217.000	26.47	3.81	40.29	58.95	48.93	54.00	5.07	Peak

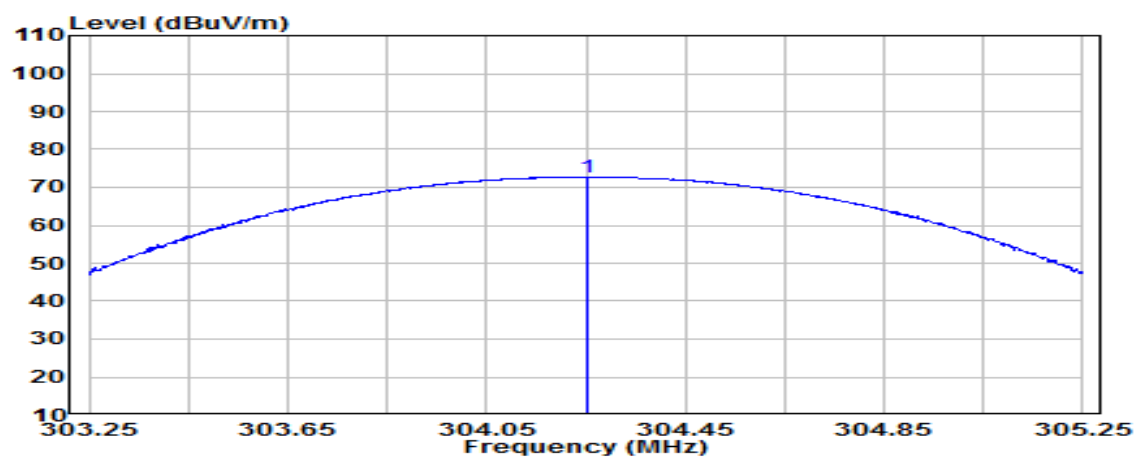
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
1217.000	26.47	3.81	40.29	53.94	43.92	54.00	10.08	Peak

A.1.2 Fundamental Frequency

Lie

Mode	ASK	Frequency	TX 304.25MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
304.252	19.03	4.42	25.70	74.94	72.69	74.95	2.26	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

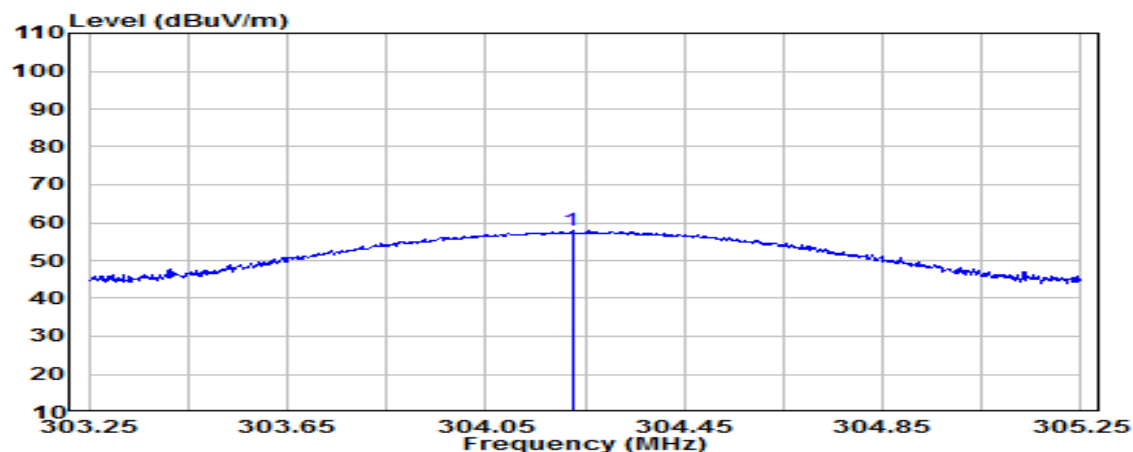
Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

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Side

Mode	ASK	Frequency	TX 304.25MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
304.224	19.03	4.42	25.70	60.26	58.01	74.95	16.94	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

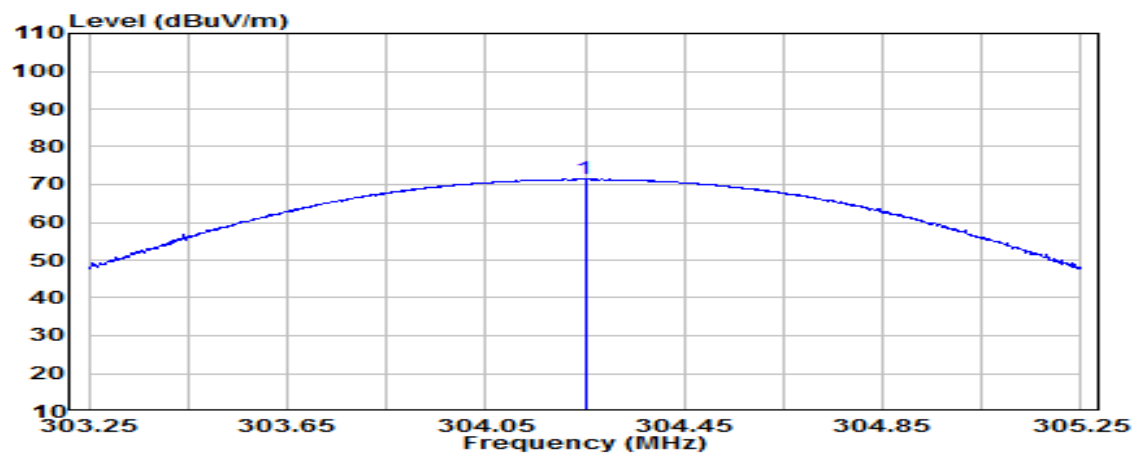
Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Audix Technology Corp.
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Stand

Mode	ASK	Frequency	TX 304.25MHz
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Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Detector
304.250	19.40	4.42	25.70	73.26	71.38	74.95	3.57	Peak

Remark: Horizontal is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

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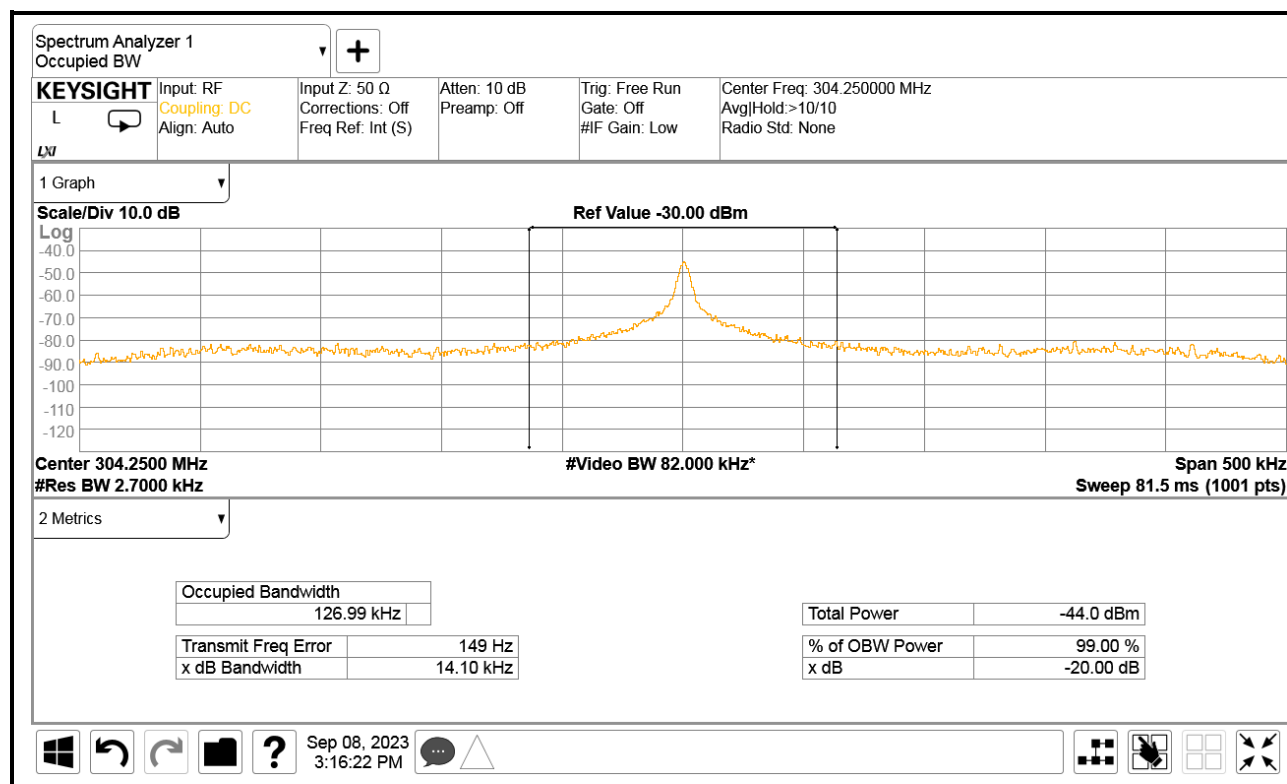
A.2 EMISSION BANDWIDTH MEASUREMENT

Test Date	2023/09/08	Temp./Hum.	24°C/64%
Test Voltage	DC 3V (Via Batty)	Tested By	Kuper Hsu

A.2.1 Emission Bandwidth

Center Frequency (MHz)	20dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Tolerance (%)	Limit (%)
304.25	0.01410	0.12699	0.005	0.25

A.2.2 Measurement Plots



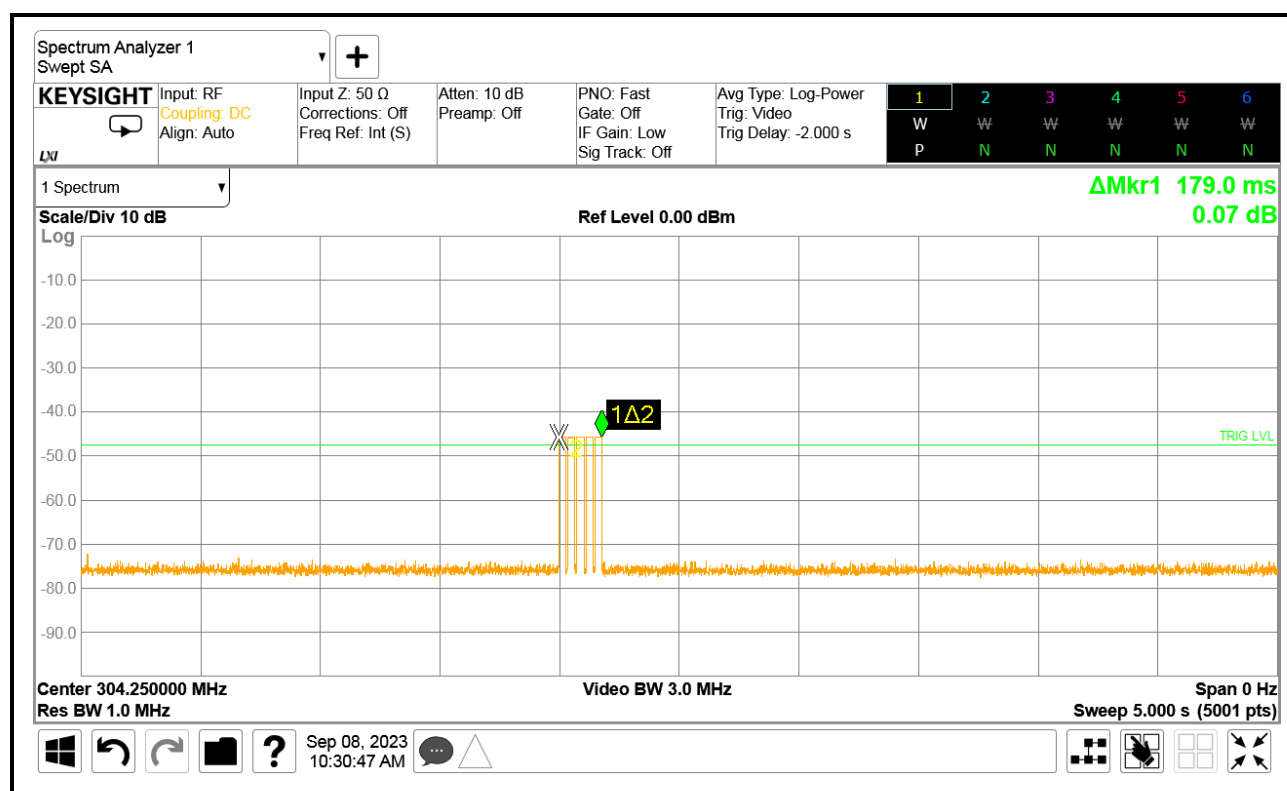
A.3 PERIODIC OPERATED MEASUREMENT

Test Date	2023/09/08	Temp./Hum.	24°C/64%
Test Voltage	DC 3V (Via Batty)	Tested By	Kuper Hsu

A.3.1 Periodic Operated

Center Frequency (MHz)	Time (Sec.)	Limit (Sec.)
304.25	0.179	< 5

A.3.2 Measurement Plots





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APPENDIX B

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APPDNDIX B

TEST PHOTOGRAPHS

(Model: TRD020Y2M)