

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 : TR158C
FCC ID : KUJCE10721

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



The statement 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.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the U.S. Government.

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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 : TR158C
(3) Power Supply: DC 12V

Applicable Standards:

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: 2020. 02. 14

Reviewed by:

 (Annie Yu/Administrator)

Approved by:

 (Ben Cheng/Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2020. 02. 14	Original Report	EM-F180319

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
Manufacture	#1 Chungear Industrial Co., Ltd 12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan #2 Satellite Electronic (Zhongshan) Ltd. 8 CHUANG YE RD.TORCH DEVELOPMENT ZONE..ZHONGSHAN.GUANGDONG.528437 CHINA #3 Zhongshan Amity Electronic Ltd. No. 16 Torch Hi-Tech Industrial Development Zone, Zhong Shan City Guangdong Province China.
Product	Ceiling Fan Remote Controller (Transmitter)
Model	TR158C

3.2. Description of EUT

Test Model	TR158C
Serial Number	N/A
Power Rating	DC 12V
RF Features	ASK
Transmit Type	1T
Sample Status	Production
Date of Receipt	2019. 07. 26
Date of Test	2019. 07. 26 ~ 08. 01
Interface Ports of EUT	N/A
Accessories Supplied	N/A

3.3. Antenna Information

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

3.4. EUT Specifications Assessed in Current Report

Modulation	Fundamental Range (MHz)	Channel Number
ASK	304.25	1

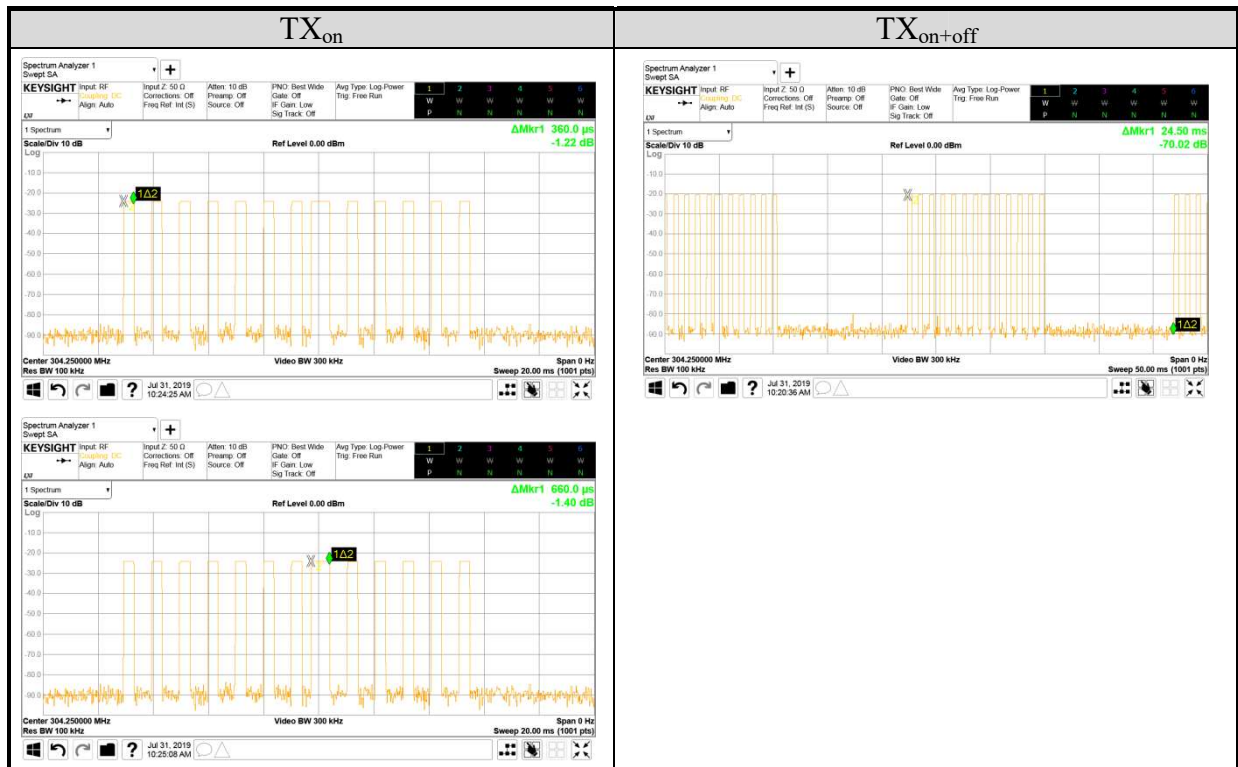
3.5. Description of Key Components

None.

3.6. Test Configuration

Duty Cycle

TX _{on} (ms)	TX _{on+off} (ms)	Duty Cycle Factor (dB)
0.36*12+0.660= 4.98	24.50	-13.83
Duty Cycle Factor = 20log (TX _{on} / TX _{on+off})		



AC Conduction	
Test Case	Normal operation

Item	Test Frequency
Radiated Spurious Emission and Fundamental Frequency	304.25MHz
Emission Bandwidth	304.25MHz
Periodic Operated	304.25MHz

Note 1: Mobile Device

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

3.7. Tested Supporting System List

None.

3.8. Setup Configuration

3.8.1. EUT Configuration for Power Line & Radiated Emission



3.8.2. EUT Configuration for RF Conducted Test Items



3.9. Operating Condition of EUT

To press the button of EUT is used for enabling EUT RF function under continues transmitting.

3.10. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, 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 17025:2005 (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 (1) Semi-Anechoic Chamber (IC Test Site Registration No.: 5183B-1) (2) Fully Anechoic Chamber (IC Test Site Registration No.: 5183B-4)

3.11. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	9kHz~30MHz	± 0.5dB
	30MHz~1000MHz	± 3.68dB
	Above 1GHz	± 5.82dB

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
Emission Bandwidth (20dB)	± 0.2kHz
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	2018. 09. 13	1 Year
2.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2019. 01. 04	1 Year
3.	Test Receiver	R & S	ESCS30	100338	2019. 06. 12	1 Year
4.	Amplifier	HP	8447D	2944A06305	2019. 01. 30	1 Year
5.	Amplifier	HP	8449B	3008A02678	2019. 03. 07	1 Year
6.	Bilog Antenna	CHASE	CBL6112D	33821	2019. 01. 20	1 Year
7.	Loop Antenna	R&S	HFH2-Z2	891847/27	2018. 12. 18	1 Year
8.	Double-Ridged Waveguide Horn	ETS-Lindgren	3117	00135902	2019. 03. 13	1 Year
9.	Digital Thermo-Hygro Meter	IMax	HTC-1	No.1 3m A/C	2019. 04. 20	1 Year
10.	Digital Thermo-Hygro Meter	EVERY DAY	E-512	RF-02	2019. 04. 20	1 Year
11.	Test Software	Audix	e3	V.6.110601	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	N9020B-544	MY57120357	2019. 01. 15	1 Year
2.	Wide Band Antenna	Diamond	RH799	N/A	N.C.R.	N.C.R.
3.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2019. 04. 20	1 Year

5. CONDUCTED EMISSION

【The EUT only employs Batteries power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207】

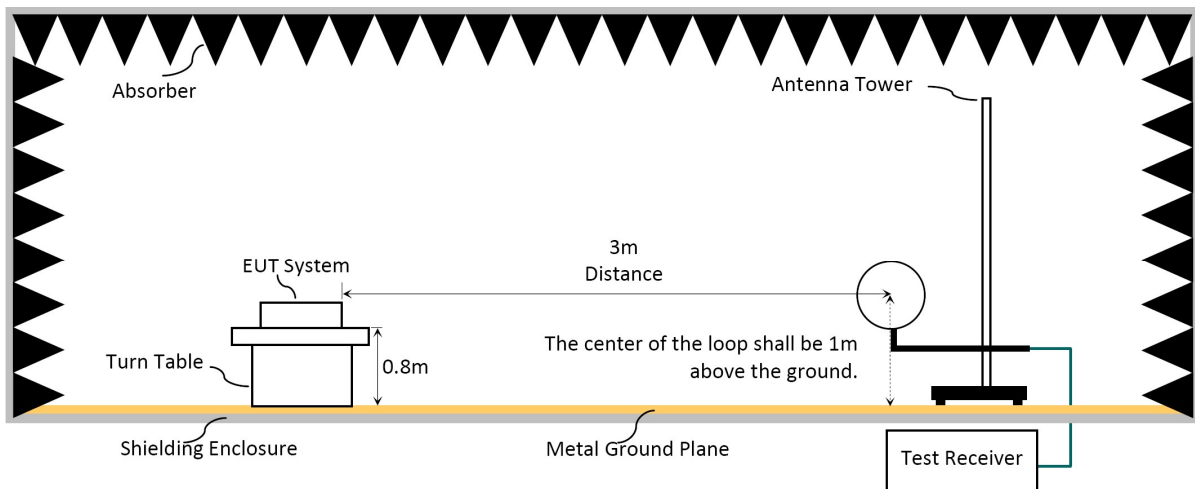
6. RADIATED SPURIOUS EMISSION

6.1. Block Diagram of Test Setup

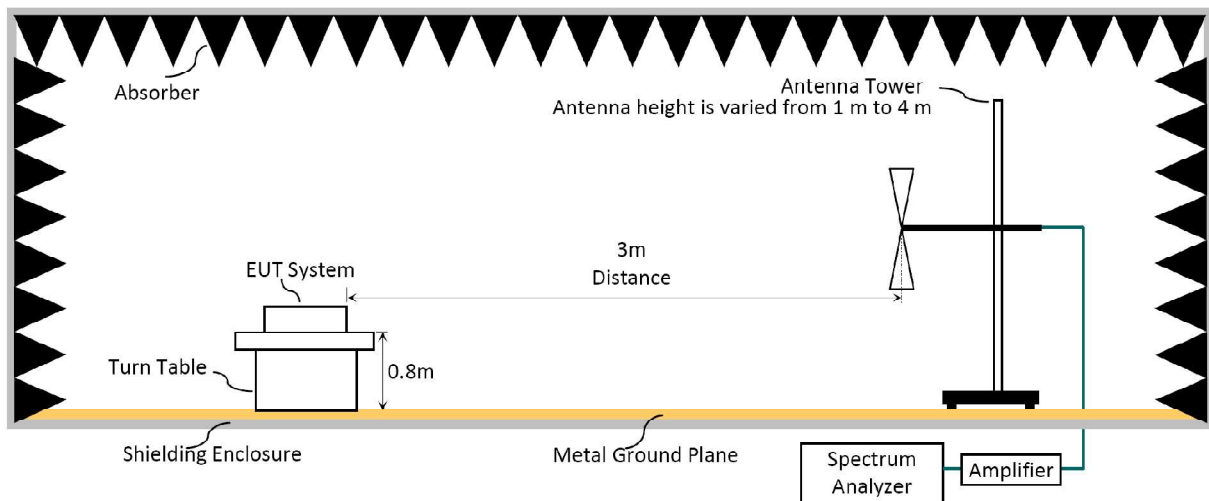
6.1.1. Block Diagram of EUT

Indicated as section 3.8

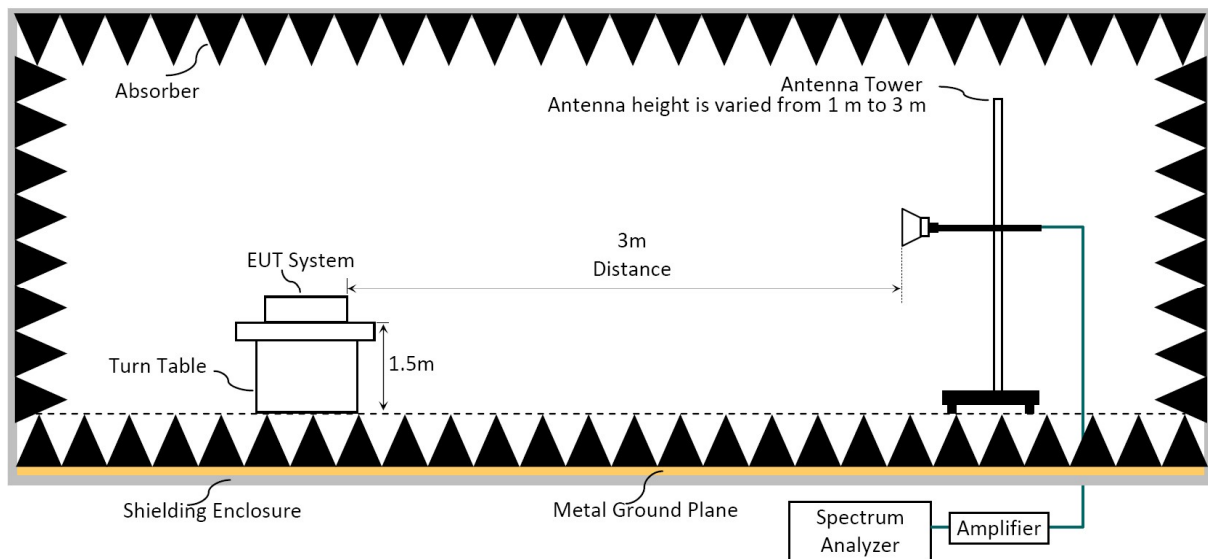
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30MHz-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

Radiated emissions which fall in restricted bands, as defined in Section 15.205 must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Limits	
		dB μ V/m	μ V/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 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

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

(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:

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

(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 turn table which has 0.8 m 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 to 10th harmonic:

The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) 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 1 GHz:

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.
- (7) 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.

Frequency above 1GHz to 10th harmonic:**Peak Detector:**

- (1) RBW = 1MHz
- (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.
- (7) 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 $\geq 1/ T$.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

 Option 2:

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

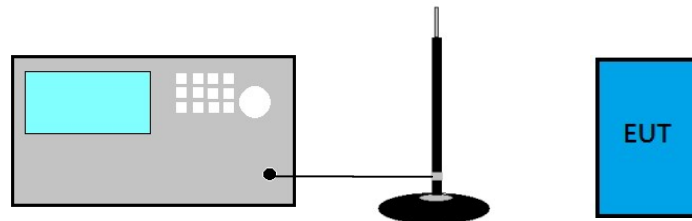
- Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading
- Average Emission Level=Antenna Factor + Cable Loss + Meter Reading
- Average Emission Level= Peak Emission Level+ DCCF
Duty Cycle Correction Factor (DCCF)= $20\log(TX_{on}/TX_{on+off})$ presented in section 3.6
- ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

7. EMISSION BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Specification Limits

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

7.3. Test Procedure

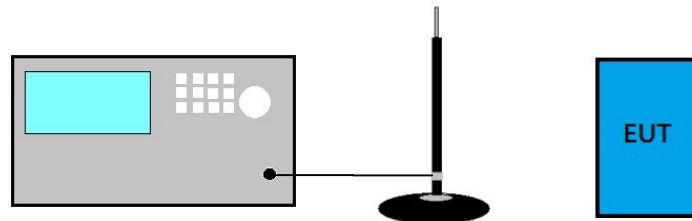
- (1) Set RBW close to 1-5 % of OBW.
- (2) Set $VBW \geq RBW$.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -20 dB to record the final bandwidth.

7.4. 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: TR158C)

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A.1 RADIATED SPURIOUS EMISSION

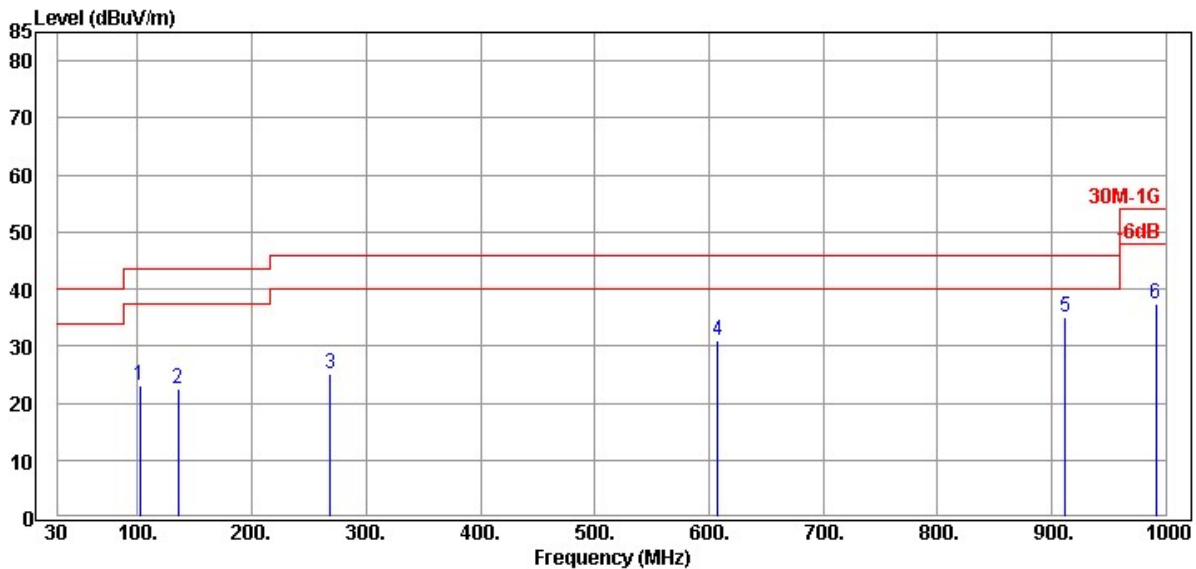
Test Date	2019/08/01	Temp./Hum.	24°C/52%
Test Frequency	TX 304.25MHz	Test Voltage	DC 12V

A.1.1 Emissions Applied to General Requirement

A.2.1.1 Frequency 9kHz~30MHz

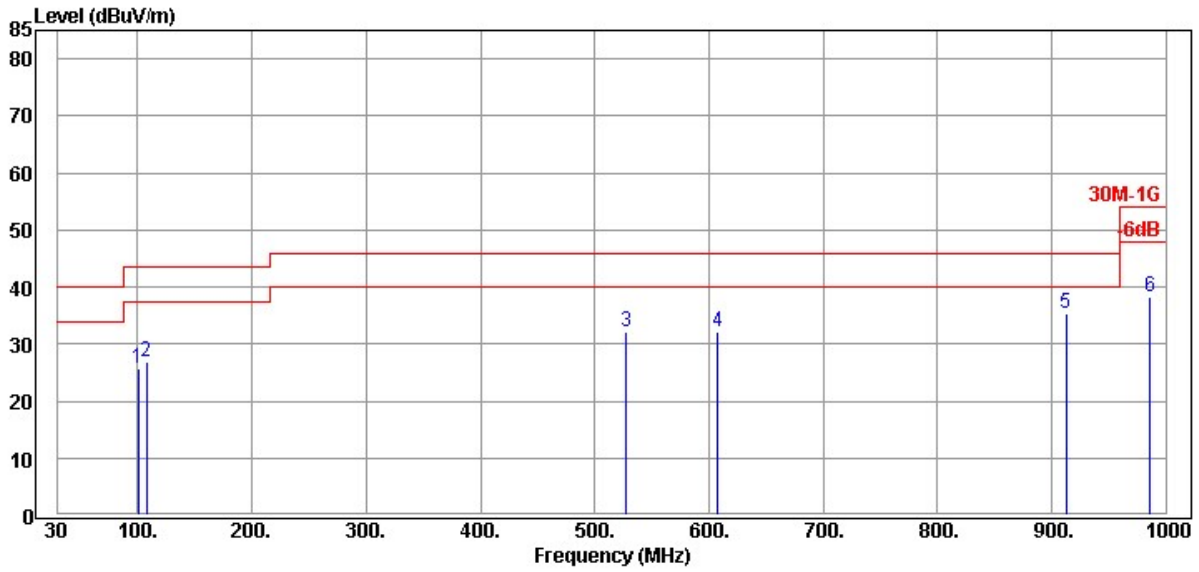
The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1 GHz



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
101.78	17.50	2.31	3.33	23.14	43.50	20.36	Peak
135.73	17.80	2.72	1.99	22.51	43.50	20.99	Peak
268.62	19.16	4.13	1.85	25.14	46.00	20.86	Peak
608.12	24.82	6.92	-0.73	31.01	46.00	14.99	Peak
911.73	27.41	8.52	-0.97	34.96	46.00	11.04	Peak
991.27	27.99	8.99	0.54	37.52	54.00	16.48	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
100.81	17.45	2.30	6.00	25.75	43.50	17.75	Peak
107.60	17.89	2.39	6.46	26.74	43.50	16.76	Peak
527.61	24.03	6.79	1.35	32.17	46.00	13.83	Peak
608.12	24.82	6.92	0.29	32.03	46.00	13.97	Peak
912.70	27.41	8.53	-0.52	35.42	46.00	10.58	Peak
986.42	27.97	8.96	1.42	38.35	54.00	15.65	Peak

A.2.1.3 Frequency Above 1 GHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2130.00	31.42	8.08	18.22	57.72	74.00	16.28	Peak
2738.00	32.34	8.42	10.54	51.30	74.00	22.70	Peak

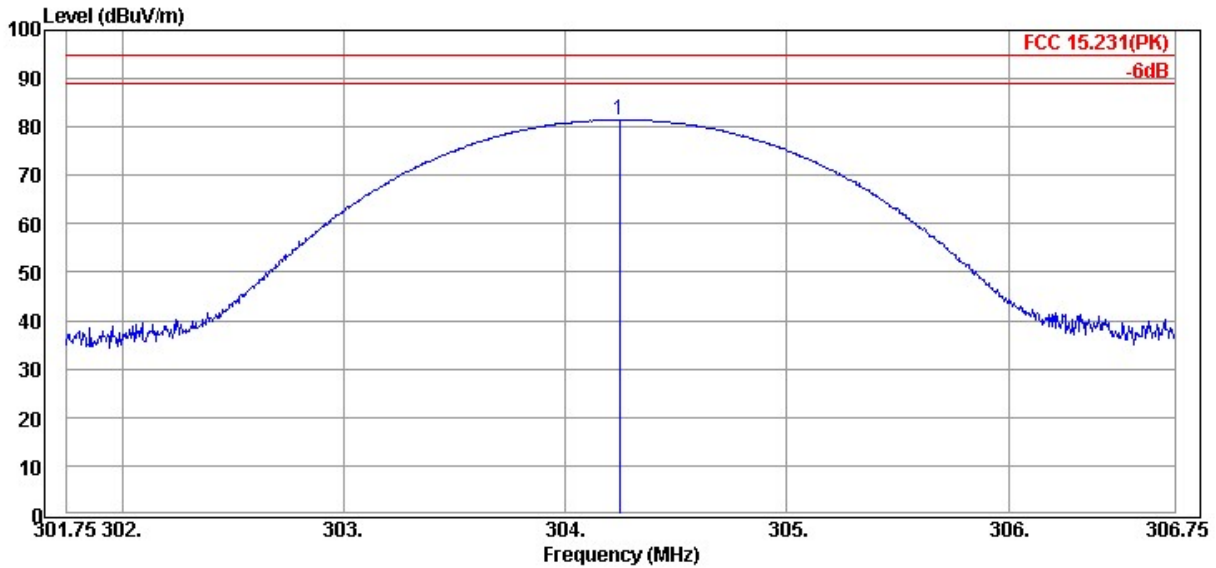
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2130.00	57.72	-13.82	43.90	54.00	10.10	Average
2738.00	51.3	-13.82	37.48	54.00	16.52	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2130.00	31.42	8.08	15.73	55.23	74.00	18.77	Peak
2738.00	32.34	8.42	7.39	48.15	74.00	25.85	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2130.00	55.23	-13.82	41.41	54.00	12.59	Average
2738.00	48.15	-13.82	34.33	54.00	19.67	Average

A.1.2 Fundamental Frequency



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
304.25	19.84	4.50	57.12	81.46	94.95	13.49	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
304.25	81.46	-13.82	67.64	74.95	7.31	Average

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

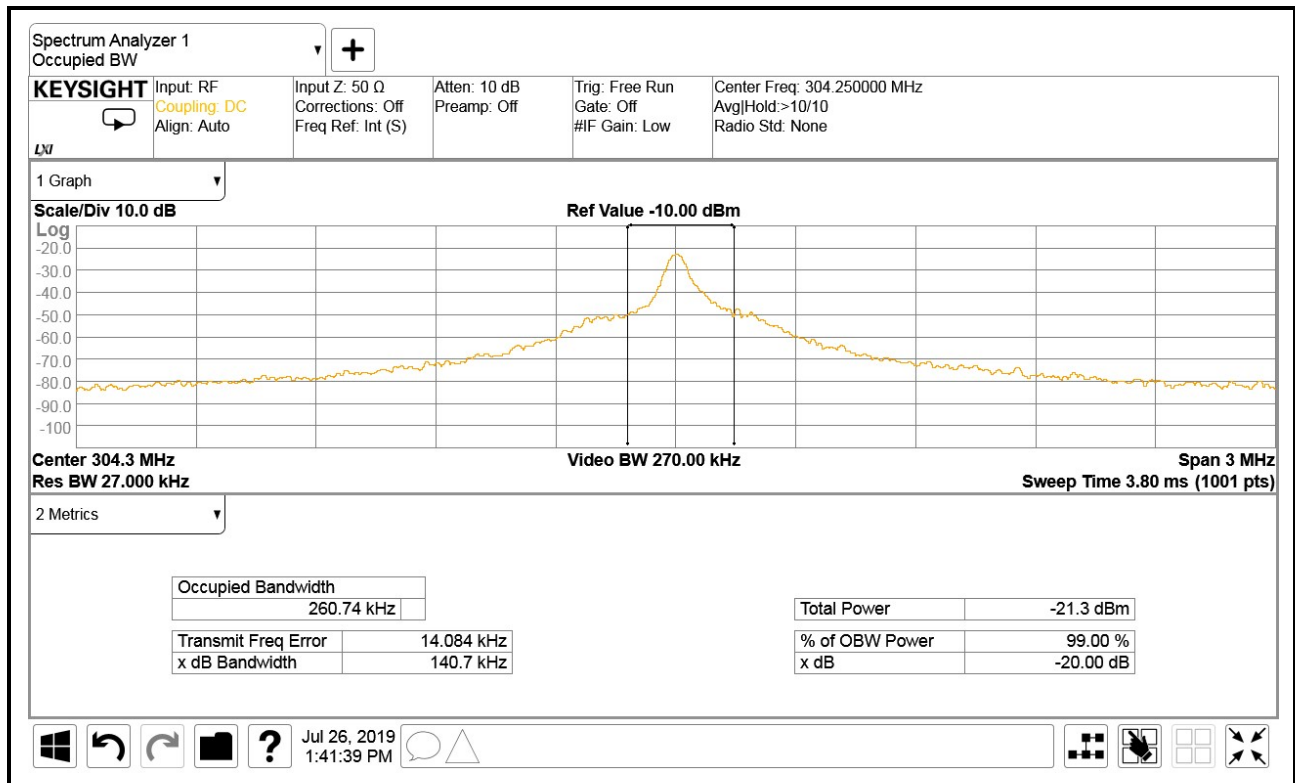
A.2 EMISSION BANDWIDTH MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	22°C/55%
Test Frequency	TX 304.25MHz	Test Voltage	DC 12V

A.2.1 Emission Bandwidth

Center Frequency (MHz)	20dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Tolerance (%)	Limit (%)
304.25	0.1407	0.26074	0.046	0.25

A.2.2 Measurement Plots



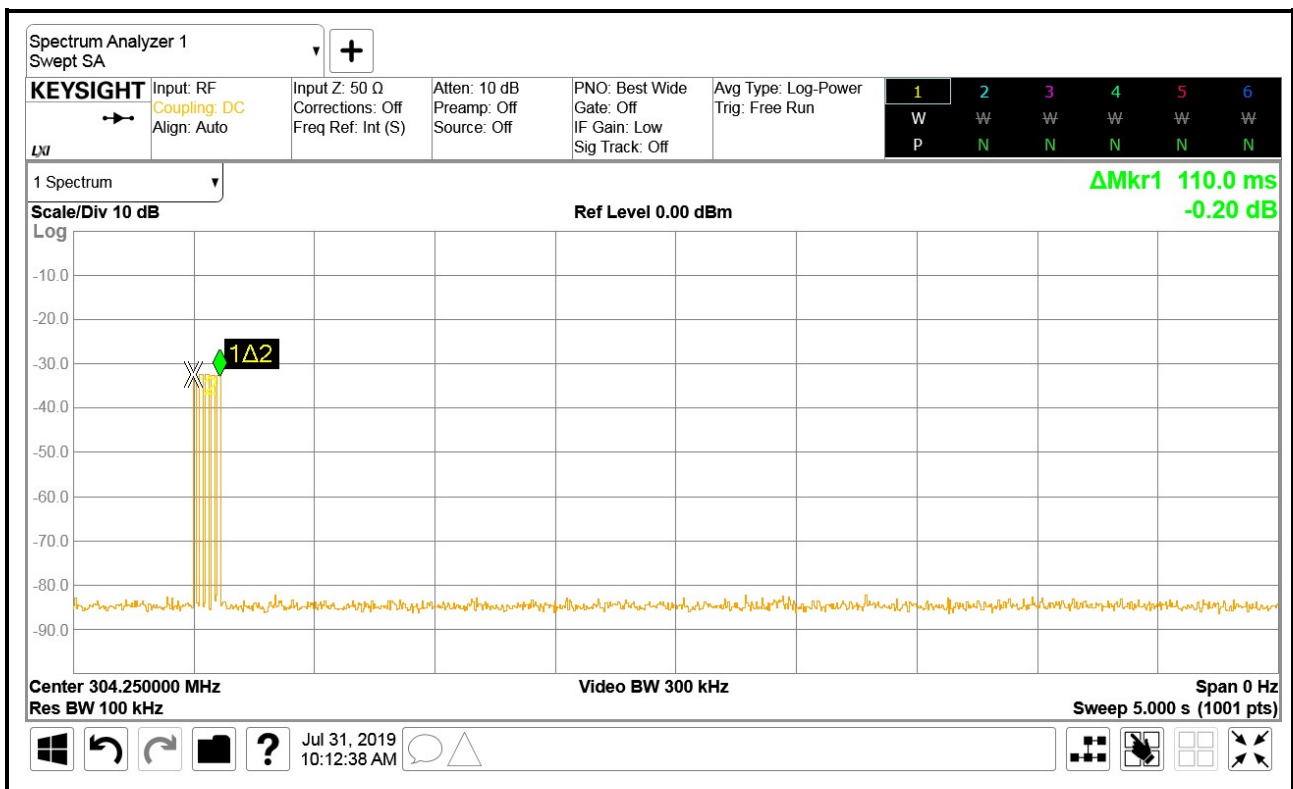
A.3 PERIODIC OPERATED MEASUREMENT

Test Date	2019/07/26	Temp./Hum.	25°C/43%
Test Frequency	TX 304.25MHz	Test Voltage	DC 12V

A.3.1 Periodic Operated

Center Frequency (MHz)	Time (Sec.)	Limit (Sec.)
304.25	0.11	< 5

A.3.2 Measurement Plots





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APPDNDIX B

TEST PHOTOGRAPHS

(Model: TR158C)