

FCC 15.231 Report

for

Chungear Industrial Co., Ltd

106 Kanho Rd., Taichung, Taiwan

**Product Name : CEILING FAN REMOTE
CONTROLLER
(TRANSMITTER)**

Model Name : TR249A

FCC ID : KUJCE10507

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



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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.
Product Name : CEILING FAN REMOTE CONTROLLER (TRANSMITTER)
Model No. : TR249A
Serial No. : N/A
Power Supply : DC 3V (Via Batteries)

Applicable Standards:

47 CFR FCC Part 15 Subpart C:2015
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 Test: 2016. 06. 27 ~ 28

Date of Report: 2016. 06. 30

Producer: Sabrina Wang
(Sabrina Wang/Administrator)

Signatory: Ben Cheng
(Ben Cheng/Manager)

1. REPORT HISTORY

Revision	Date	Revision Summary	Report Number
0	2016. 06. 30	Original Report	EM-F160422

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
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	PASS

3. GENERAL INFORMATION

3.1. Description of EUT

Product	CEILING FAN REMOTE CONTROLLER (TRANSMITTER)
Model Number	TR249A
Serial Number	N/A
Applicant	Chungear Industrial Co., Ltd 106 Kanho Rd., Taichung, Taiwan
Manufacture#1	Chungear Industrial Co., Ltd 106 Kanho Rd., Taichung, Taiwan
Manufacture#2	SATELLITE ELECTRONIC (ZHONGSHAN)., LTD. 8 CHUANG YE RD.TORCH DEVELOPMENT ZONE. ZHONGSHAN.GUANGDONG.528437 CHINA
Manufacture#3	ZHONGSHAN AMITY ELECTRONIC LTD. NO.16,TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE, ZHONGSHAN CITY GUANGDONG PROVINCE CHINA
Fundamental Frequency	433.92MHz
Date of Receipt of Sample	2016. 06. 23
Ceiling Fan Remote Controller (Receiver) - Receiver	(1)Model No.: JY199, FCC by DoC (2)Model No.: JY326B, FCC by DoC (3)Model No.: JY326D, FCC by DoC (4)Model No.: MR36T, FCC by DoC (5)Model No.: MR36R, FCC by DoC (6)Model No.: MR58A, FCC by DoC (7)Model No.: MR56E, FCC by DoC (8)Model No.: MR101D, FCC by DoC (9)Model No.: MR101F, FCC by DoC (10)Model No.: MR101F-2, FCC by DoC (11)Model No.: MR62A, FCC by DoC (12)Model No.: MR76T, FCC by DoC (13) Model No.: MR153A (14) Model No.: JY1028 (15) Model No.: MR47B

3.2. EUT Specifications Assessed in Current Report

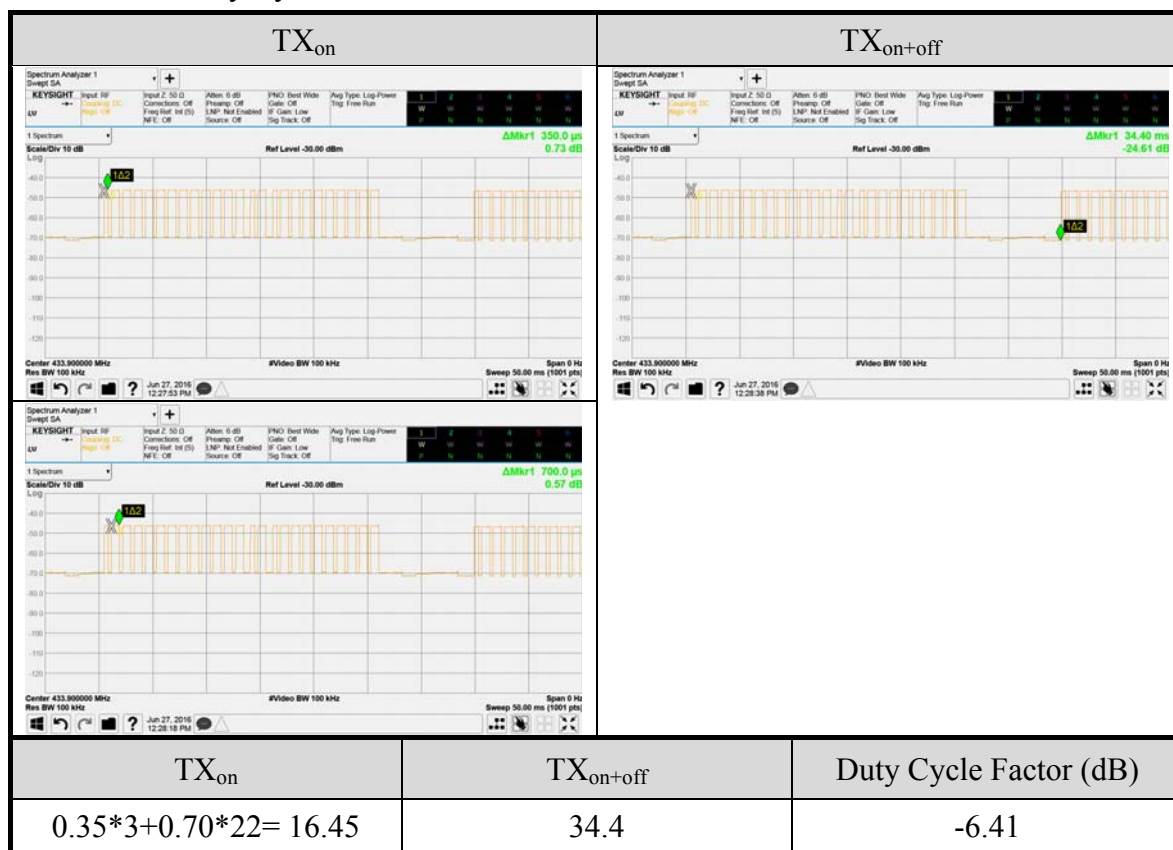
Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (bps)
433.92	1	ASK	---

3.3. Antenna Information

Manufacture	Antenna Type
N/A	Internal

3.4. Test Configuration

3.4.1. Duty Cycle Correction Factor



3.5. Setup Configuration



3.6. Operating Condition of EUT

To Set EUT on RF function under continues transmitting and choosing channel.

3.7. Description of Test Facility

Test Firm Name	:	AUDIX Technology Corporation EMC Department No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
Test Location & Facility	:	Semi-Anechoic Chamber Fully Anechoic Chamber No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan
NVLAP Lab. Code	:	200077-0
TAF Accreditation No	:	1724
FCC OET Designation	:	TW1004 & TW1090

3.8. Measurement Uncertainty

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

Remark : Uncertainty = $k u_c(y)$

Test Item	Uncertainty
Emission Bandwidth (20dB)	± 0.2kHz
Periodic Operated	± 0.05s

4. MEASUREMENT EQUIPMENT LIST

4.1. Radiated Emission Measurement

4.1.1. Frequency Range 30MHz~1000MHz (Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2015. 09. 14	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2016. 06. 23	1 Year
3.	Amplifier	HP	8447D	2944A06305	2016. 02. 23	1 Year
4.	Bilog Antenna	TESEQ	CBL6112D	33821	2016. 01. 30	1 Year
5.	Test Software	Audix	e3	V.6.1206197	N.C.R.	N.C.R.

4.1.2. Frequency Range Above 1GHz (Fully Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	2015. 08. 20	1 Year
2.	Amplifier	Sonoma	310N	187161	2016. 06. 13	1 Year
3.	Horn Antenna	ETS-Lindgren	3117	00135902	2016. 03. 09	1 Year
4.	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	Agilent	N9030B	N/A	2015. 12. 20	1 Year
2.	Wide Band Antenna	Diamond	RH799	N/A	N.C.R	N.C.R

5. CONDUCTED EMISSION MEASUREMENT

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

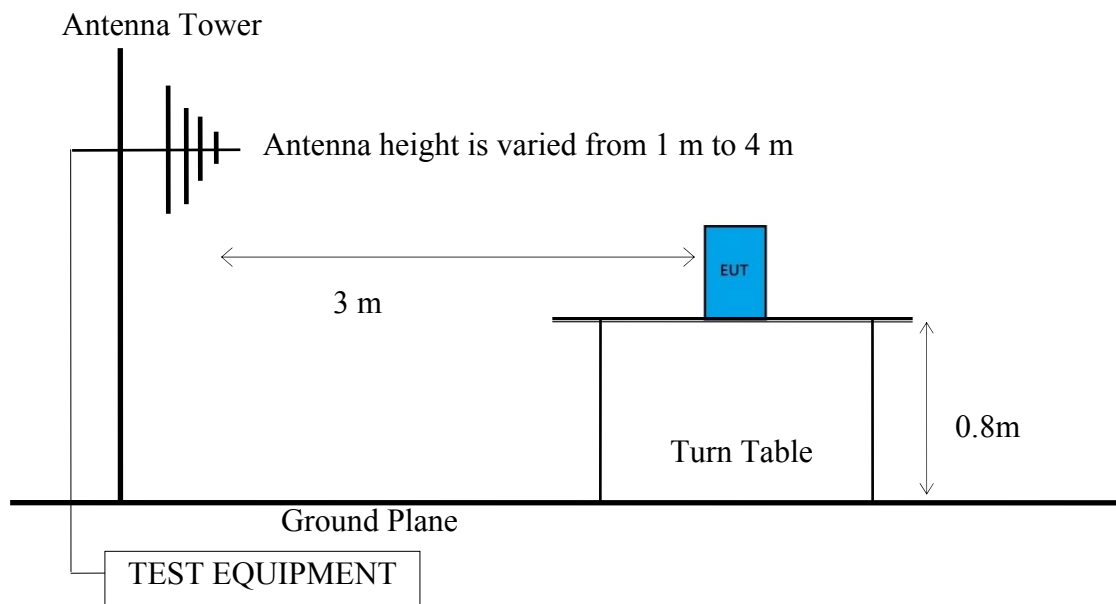
6. RADIATED EMISSION MEASUREMENT

6.1. Block Diagram of Test Setup

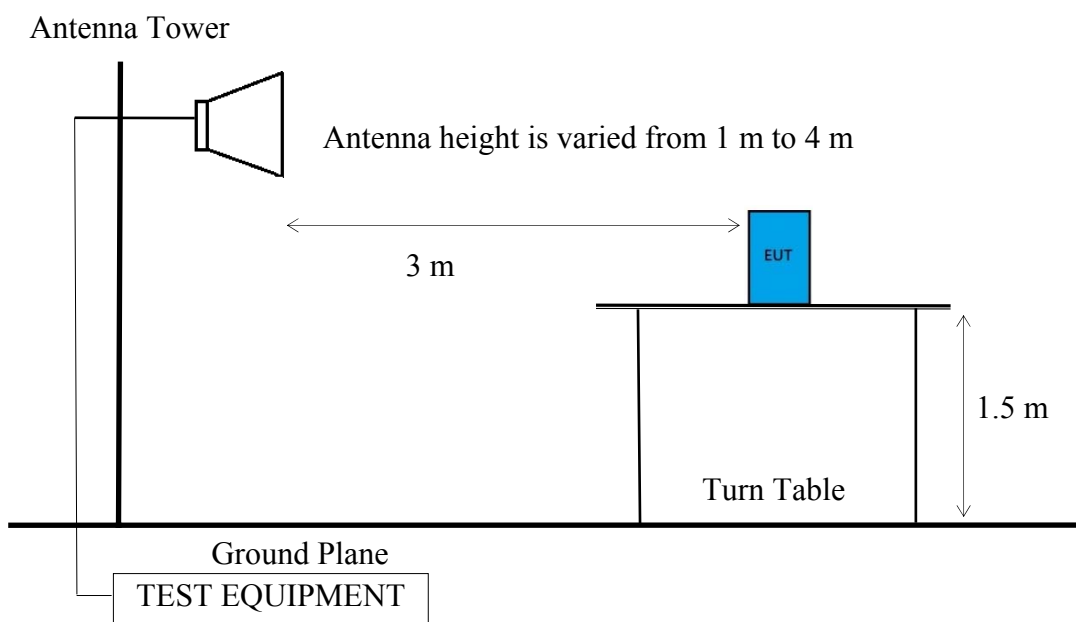
6.1.1. Block Diagram of connection between EUT and simulators

Indicated as section 3.5

6.1.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000 MHz



6.1.3. Fully Anechoic Chamber (3m) Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

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

Frequency (MHz)	Distance (m)	Field Strengths Limits	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (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:
 $41.6667 \times 433.92 - 7083.3333 = 10996.681164 \mu\text{V/m} = 80.83 \text{dB}\mu\text{V/m}$
- (5) The limits in this table are based on CFR 47 Part 15.231(b).

6.3. Test Procedure

The EUT setup on the turn table which has 0.8 m (for 30-1000MHz) or 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 finally 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 finally measurement.

Average Measurement:

☐ Option 1:

- (1) RBW = 1 MHz
- (2) VBW = 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 3.4
- ☐ EPR = Peak Emission Level - 95.2 dB - 2.14 dB

6.5. Measurement Result Explanation

Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading

6.6. Test Results

PASSED.

The EUT emitted the fundamental frequency with data code at the stand, side and lie conditions.

6.6.1. Emissions Applied to General Requirement

6.6.1.1. Frequency Below 1 GHz

Test Date	2016/06/28	Temp./Hum.	24°C/56%
Test Voltage	DC 3V	Frequency	TX 433.92MHz

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
*868.08	20.42	7.43	24.58	52.43	60.83	8.40	Peak

Remark: 1. "*" is the frequency not fall in the restricted band.

2. The emissions not reported for there is no emission be found.

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
*868.08	20.42	7.43	9.93	37.78	60.83	23.05	Peak

Remark: 1. "*" is the frequency not fall in the restricted band.

2. The emissions not reported for there is no emission be found.

6.6.1.2. Frequencies above 1 GHz:

The emissions (up to 10th harmonics) not reported for there is no emission be found.

Frequency	TX 433.92MHz	EUT Position	lie
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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
1304.00	28.04	3.80	20.80	52.64	74.00	21.36	Peak
1736.00	29.68	4.55	25.14	59.37	74.00	14.63	Peak
2170.00	31.84	5.51	17.97	55.32	74.00	18.68	Peak
2604.00	32.42	6.00	13.84	52.26	74.00	21.74	Peak
3036.00	32.89	6.25	8.17	47.31	74.00	26.69	Peak
3906.00	33.21	7.07	6.51	46.79	74.00	27.21	Peak
4774.00	34.21	7.77	7.88	49.86	74.00	24.14	Peak

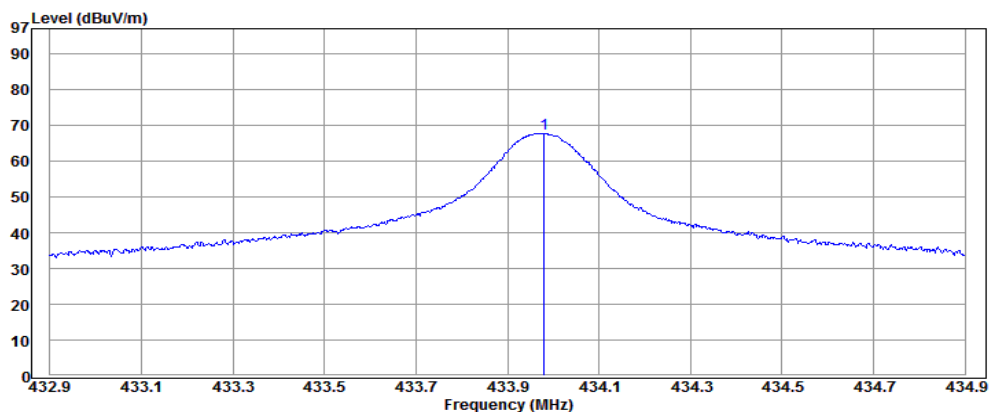
Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
1304.00	52.64	-6.41	46.23	54.00	7.77	Average
1736.00	59.37	-6.41	52.96	54.00	1.04	Average
2170.00	55.32	-6.41	48.91	54.00	5.09	Average
2604.00	52.26	-6.41	45.85	54.00	8.15	Average
3036.00	47.31	-6.41	40.90	54.00	13.10	Average
3906.00	46.79	-6.41	40.38	54.00	13.62	Average
4774.00	49.86	-6.41	43.45	54.00	10.55	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
1304.00	28.04	3.80	6.66	38.50	54.00	15.50	Peak
1736.00	29.68	4.55	9.30	43.53	54.00	10.47	Peak
2170.00	31.84	5.51	7.26	44.61	54.00	9.39	Peak
2604.00	32.42	6.00	3.88	42.30	54.00	11.70	Peak
3906.00	33.21	7.07	2.40	42.68	54.00	11.32	Peak

6.6.2. Fundamental Frequency:

Frequency	TX 433.92MHz	EUT Position	lie
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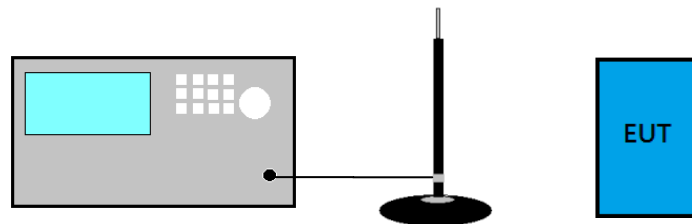
Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
433.98	16.07	5.94	45.69	67.70	80.83	13.13	Peak

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

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.

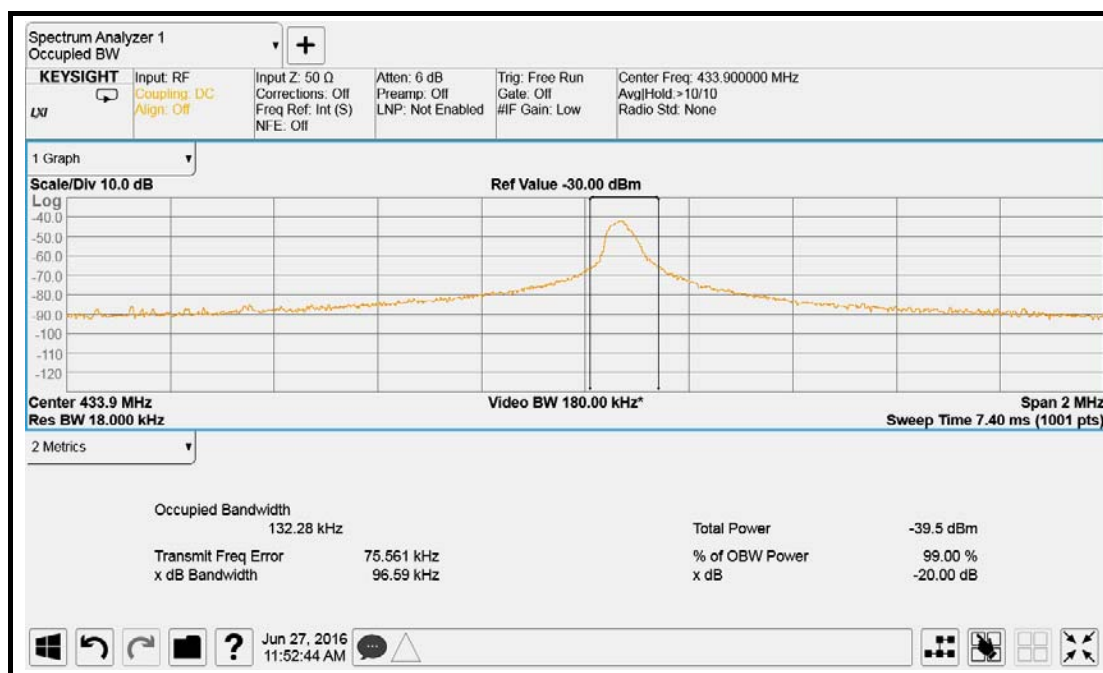
7.4. Test Results

Test Date	2016/06/27	Temp./Hum.	25°C/48%
Test Voltage	DC 3V	Frequency	TX 433.92MHz

7.4.1. Emission Bandwidth:

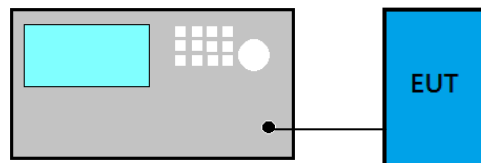
Center Frequency (MHz)	Occupied Bandwidth (MHz)	Tolerance (%)	Limit (%)
433.92	0.09659	0.022	0.25

7.4.2. Measurement Plot:



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

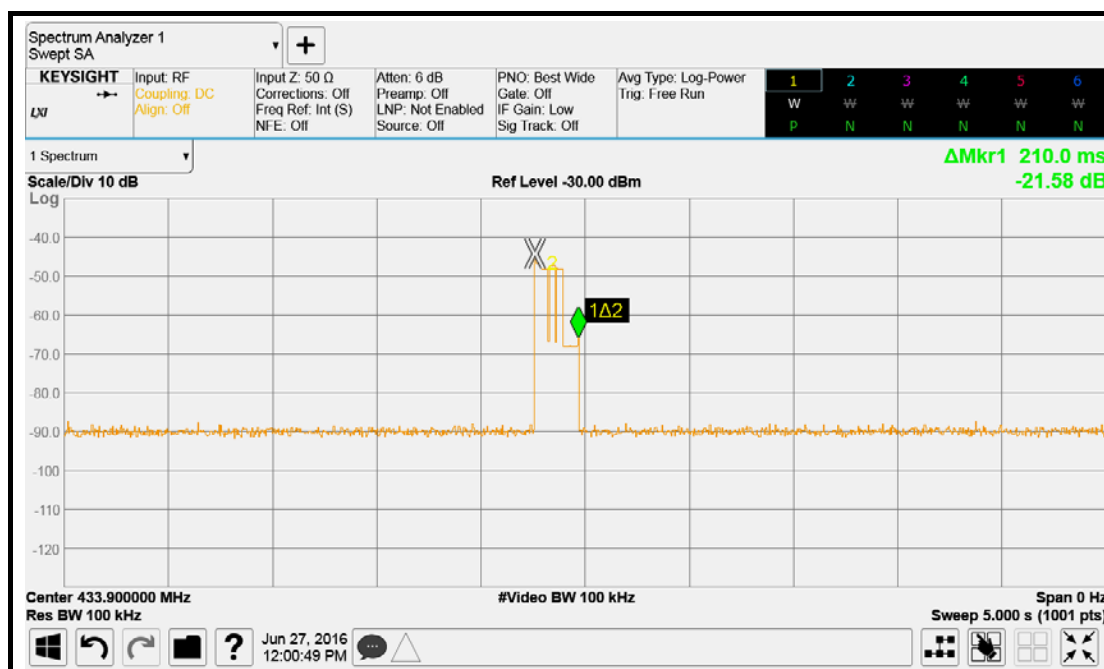
8.4. Test Results

Test Date	2016/06/27	Temp./Hum.	25°C/48%
Test Voltage	DC 3V	Frequency	TX 433.92MHz

8.4.1. Periodic Operated:

Center Frequency (MHz)	Time (Sec.)	Limit (Sec.)
433.92	0.210	< 5

8.4.2. Measurement Plot:



9. DEVIATION TO TEST SPECIFICATIONS

【NONE】