

TEST REPORT FOR CERTIFICATION
On Behalf of
Chungear Industrial Co., Ltd
Ceiling Fan Remote Controller (Transmitter)
Model No.: TR109E
FCC ID: KUJCE10309

Prepared for : Chungear Industrial Co., Ltd
106 Kanho Rd., Taichung, Taiwan

Prepared By : AUDIX Technology Corporation
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Date of Report : 2014. 12. 04

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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 : Ceiling Fan Remote Controller (Transmitter)
 FCC ID : KUJCE10309
 (A) Model No. : TR109E
 (B) Serial No. : N/A
 (C) Power Supply : DC 12V
 (D) Test Voltage : DC 12V (Via Battery)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, October 2013
AND ANSI C63.4/2003

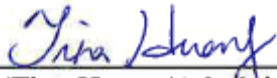
(FCC CFR 47 Part 15C, §15.207, §15.209 and §15.231)

The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart C limits both radiated and conducted emissions.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test : 2014. 11. 25 ~ 12. 04 Date of Report : 2014. 12. 04

Producer : 
 (Tina Huang/Administrator)

Signatory: 
 (Ben Cheng/Manager)

1. DESCRIPTION OF VERSION

Edition No.	Date of Rev.	Revision Summary	Report No.
0	2014. 12. 04	Original Report.	EM-F140751

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	:	Ceiling Fan Remote Controller (Transmitter)
Model Number	:	TR109E
FCC ID	:	KUJCE10309
Applicant	:	Chungear Industrial Co., Ltd 106 Kanho Rd., Taichung, Taiwan
Manufacturer #1	:	Chungear Industrial Co., Ltd. 106 Kanho Rd., Taichung, Taiwan
Manufacturer #2	:	Satellite Electronic (Zhongshan), Ltd No.15, Torch Hi-Tech Industrial Development Zone, Zhong Shan City Guangdong Province China
Manufacturer #3	:	Zhongshan Amity Electronic Ltd. No. 16 Torch Hi-Tech Industrial Development Zone, Zhong Shan City Guangdong Province China.
Fundamental Frequency	:	433.92MHz
Power Supply	:	DC 12V
Date of Receipt of Sample	:	2014. 11. 19
Date of Test	:	2014. 11. 25 ~ 12. 04

* 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

Remark:

Antenna requirement: This EUT's transmitter antenna is designed to be soldered on a printed circuit board, comply with §15.203 and inform to user that any change and modify is prohibited.

2.2. Description of Test Facility

Name of Firm : **AUDIX Technology Corporation**
EMC Department
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan

Test Site : **Semi-Anechoic Chamber**
 (Semi-AC)
 No. 53-11, Dingfu, Linkou Dist.,
 New Taipei City 244, Taiwan
 Federal Communication Commission
 Registration Number: 90993
 Filing on: 2012. 05. 11

NVLAP Lab. Code : 200077-0

TAF Accreditation No : 1724

2.3. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty
Radiation Test (Distance: 3m)	30MHz~300MHz	$\pm 3.64\text{dB}$
	300MHz~1000MHz	$\pm 4.07\text{dB}$
	Above 1GHz	$\pm 2.94\text{dB}$

Remark : Uncertainty = $k_{uc}(y)$

Test Item	Uncertainty
Emission Bandwidth (20dB)	$\pm 0.2\text{kHz}$
Periodic Operated	$\pm 0.05\text{s}$

3. CONDUCTED EMISSION MEASUREMENT

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

4. RADIATED EMISSION MEASUREMENT

4.1. Test Equipment

The following test equipment was used during the radiated emission test:

4.1.1. For 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	2014. 09. 15	1 Year
2	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
3	Amplifier	HP	8447D	2944A06305	2014. 02. 19	1 Year
4	Bilog Antenna	CHASE	CBL6112D	33821	2014. 08. 02	1 Year

4.1.2. For Frequency Range above 1GHz (Semi-Anechoic Chamber)

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Amplifier	Agilent	8449B	3008A02676	2014. 02. 21	1 Year
3	Horn Antenna	EMCO	3115	9609-4927	2014. 06. 17	1 Year

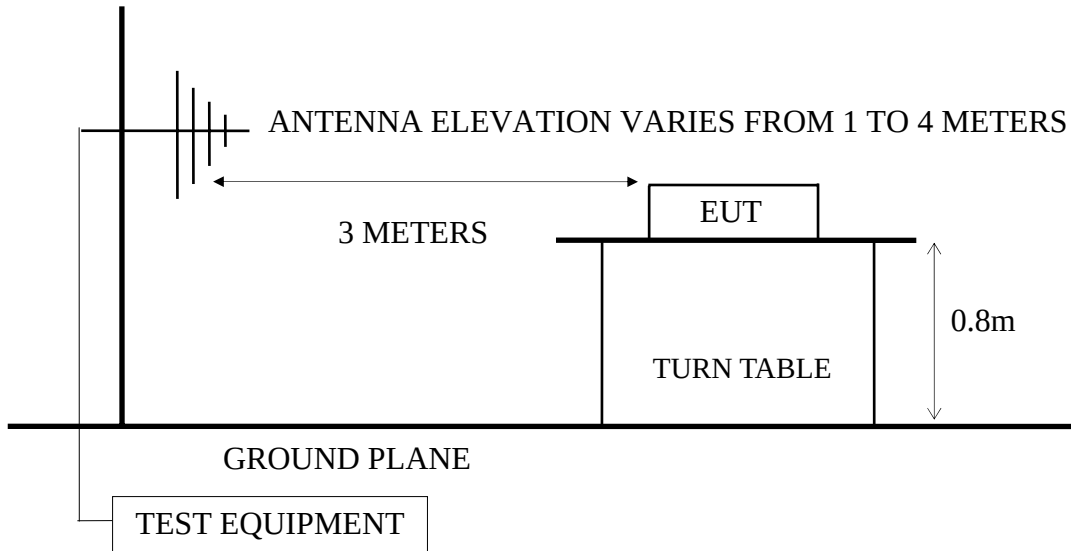
4.2. Test Setup

4.2.1. Block Diagram of connection between EUT and simulators

**CEILING FAN REMOTE
CONTROLLER (TRANSMITTER)
(EUT)**

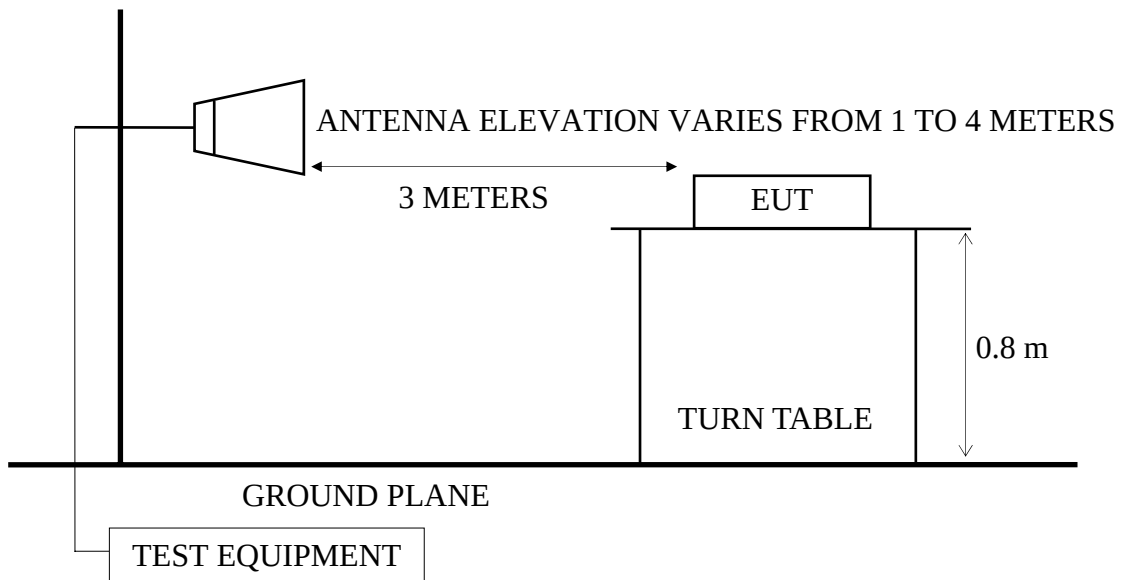
4.2.2. Semi-Anechoic Chamber (3m) Setup Diagram for 30-1000MHz

ANTENNA TOWER



4.2.3. Semi-Anechoic Chamber (3m) Setup Diagram for above 1GHz

ANTENNA TOWER



4.3. Radiation Emission Limits (§15.209)

Frequency MHz	Distance Meters	Field Strengths Limits	
		$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 - 88	3	100	40.00
88 - 216	3	150	43.50
216 - 960	3	200	46.00
Above 960	3	500	54.00

Remarks : (1) Emission level ($\text{dB}\mu\text{V/m}$) = $20 \log$ Emission level ($\mu\text{V/m}$)
 (2) The tighter limit applies at 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.

4.4. Operating Condition of EUT

- 4.4.1. Set up the EUT and simulator as shown on 4.2.
- 4.4.2. The EUT emitted the fundamental frequency with data code at the stand, side and lying conditions. (The worst mode is lying)
- 4.4.3. The EUT was operated on maximum transmitting status during all testing (lying condition).

4.5. Test Procedure

The EUT and was placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set to 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log- periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of test receiver was set at 120kHz for frequencies below 1GHz and resolution bandwidth of spectrum analyzer was set at 1MHz for frequencies above 1GHz.

The frequency range from 30MHz to 5GHz (Up to 10th harmonics from fundamental frequency) was checked. 30MHz to 1000MHz was measured with Quasi-Peak detector. Pursuant to ANSI 63.4: 4.2, peak detector is an alternate option for frequency from 30MHz to 1000MHz.

Above 1GHz was measured with peak and average detector. For frequency from 4GHz to 5GHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist.

Pursuant to ANSI C63.4 8.3.1.2, when peak value complies with the average limit, we didn't perform measurement in average detector.

4.6. Radiated Emission Noise Measurement Results

4.6.1. Frequency Range 30MHz to 1GHz Measurement Results: **PASSED.**

Date of Test : 2014. 12. 04 Temperature : 25°C

EUT : Ceiling Fan Remote Controller (Transmitter) Humidity : 44%

Test Mode : Transmit, Frequency: 433.92MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
101.78	11.03	3.23	10.47	24.73	43.50	18.77
580.96	18.08	6.49	3.38	27.95	46.00	18.05
* 868.08	20.42	7.43	20.98	48.83	60.82	11.99

Remark: 1. Emission Level = Ant. Factor + Cable Loss + Reading
 2. "*" is Harmonic Frequency, where limit of Harmonic Frequency is calculated by:
 $41.6667 \times 433.92 - 7083.333 = 10996.68 \mu\text{V/m}$
 $20\log(10996.68) = 80.82 \text{ dB}\mu\text{V/m}$ (Limit for fundamental frequency)
 $80.82 - 20\text{dB} = 60.82 \text{ dB}\mu\text{V/m}$ (Limit for harmonic frequency)

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
124.09	12.06	3.40	20.64	36.10	43.50	7.40
194.90	9.24	3.94	9.66	22.84	43.50	20.66
* 868.08	20.42	7.43	12.18	40.03	60.82	20.79

Remark: 1. Emission Level = Ant. Factor + Cable Loss + Reading
 2. "*" is Harmonic Frequency, where limit of Harmonic Frequency is calculated by:
 $41.6667 \times 433.92 - 7083.333 = 10996.68 \mu\text{V/m}$
 $20\log(10996.68) = 80.82 \text{ dB}\mu\text{V/m}$ (Limit for fundamental frequency)
 $80.82 - 20\text{dB} = 60.82 \text{ dB}\mu\text{V/m}$ (Limit for harmonic frequency)

4.6.2. Frequency Range 1GHz to up to 10th harmonics Measurement Results:
PASSED.

Date of Test : 2014. 12. 04 Temperature : 25°C

EUT : Ceiling Fan Remote Controller (Transmitter) Humidity : 54%

Test Mode : Transmit, Frequency: 433.92MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Horizontal (dBμV)	Emission Level Horizontal (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2170.96	27.98	4.92	22.87	55.77	74.00	18.23
3037.72	29.98	6.42	12.68	49.08	74.00	24.92
3906.28	32.13	7.44	14.03	53.60	74.00	20.40

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. Above all final readings were measured with Peak detector.

Emission Frequency (MHz)	Peak Value (dB)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2170.96	55.77	-9.51	46.26	54.00	7.74
3037.72	49.08	-9.51	39.57	54.00	14.43
3906.28	53.60	-9.51	44.09	54.00	9.91

Remarks: 1. Average value=Peak value + Duty Cycle Correction Factor.
2. Duty Cycle Correction Factor
= $20\log(\text{cumulative on}/T)$
= $20\log \{[0.348(\text{ms}) \cdot 18 + 0.730(\text{ms}) \cdot 11] / 42.84\text{ms}\}$
= $20\log [14.327\text{ms} / 42.84\text{ms}]$
= -9.51
“T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
3. Margin= Limit –Average Value.

Date of Test : 2014. 12. 04 Temperature : 25°C

EUT : Ceiling Fan Remote Controller Humidity : 54%
(Transmitter)

Test Mode : Transmit, Frequency: 433.92MHz

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading Vertical (dBμV)	Emission Level Vertical (dBμV/m)	Limits (dBμV/m)	Margin (dB)
2170.96	27.98	4.92	20.80	53.70	74.00	20.30
3906.28	32.13	7.44	19.91	59.48	74.00	14.52

Remarks: 1. Emission level=Antenna Factor + Cable Loss + Reading.
2. Above all final readings were measured with Peak detector.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Correction Factor (dB)	Average Value Horizontal (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2170.96	53.70	-9.51	44.19	54.00	9.81
3906.28	59.48	-9.51	49.97	54.00	4.03

Remarks: 1. Average value=Peak value + Duty Cycle Correction Factor.
2. Duty Cycle Correction Factor
= $20\log(\text{cumulative on}/T)$
= $20\log \{ [0.348(\text{ms}) \cdot 18 + 0.730(\text{ms}) \cdot 11] / 42.84\text{ms} \}$
= $20\log [14.327\text{ms} / 42.84\text{ms}]$
= -9.51
“T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms
3. Margin= Limit –Average Value.

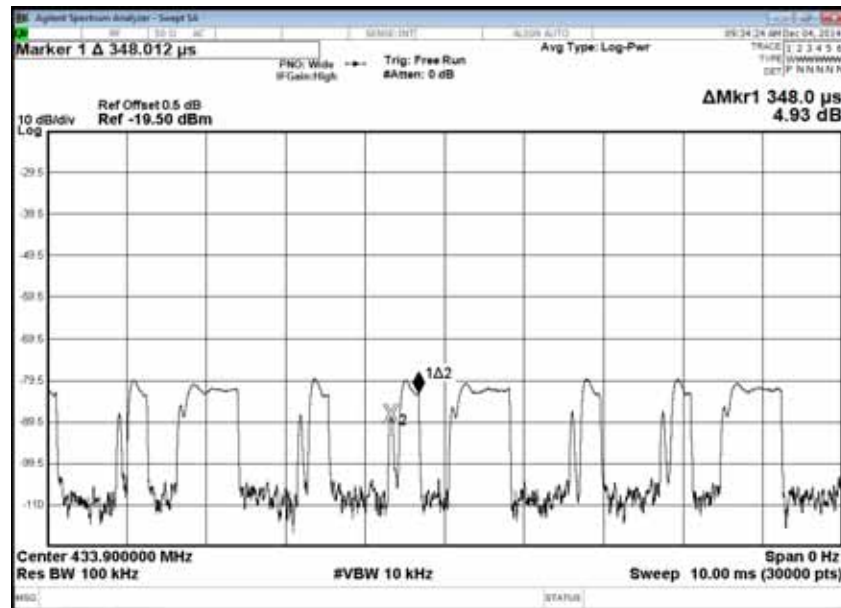
4.7. Duty Cycle Factor

4.7.1. For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

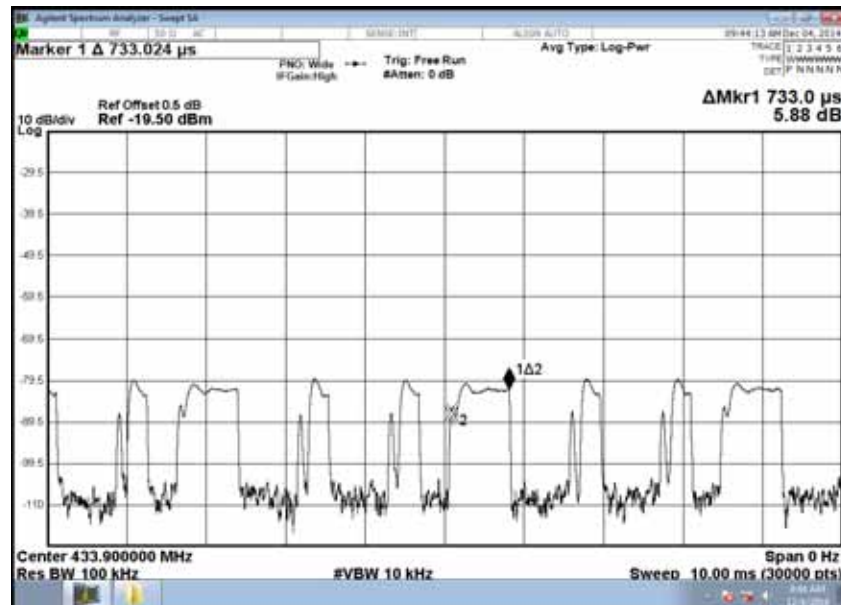
4.7.2. Duty Cycle Factor Result

The complete envelope includes 2 types of frame A and B.

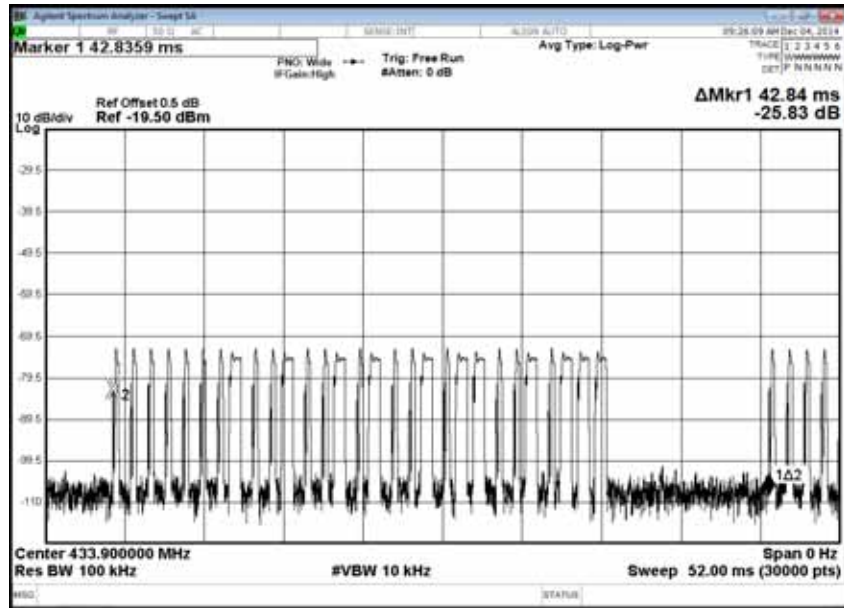
Frame A:



Frame B:



TX ON in 100ms:



There are 18 A frames and 11B frames in 42.84ms, so Duty Cycle Factor
 $= 20\log (\text{cumulative on}/T)$
 $= 20\log \{ [0.348(\text{ms}) * 18 + 0.730(\text{ms}) * 11] / 42.84\text{ms} \}$
 $= 20\log [14.327\text{ms} / 42.84\text{ms}]$
 $= -9.51$

5. FUNDAMENTAL MEASUREMENT

5.1. Test Equipment

The following test equipment was used during the radiated emission test:

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Test Receiver	R & S	ESCS30	100338	2014. 06. 24	1 Year
3	Amplifier	HP	8447D	2944A06305	2014. 02. 19	1 Year
4	Bilog Antenna	CHASE	CBL6112D	33821	2014. 08. 02	1 Year

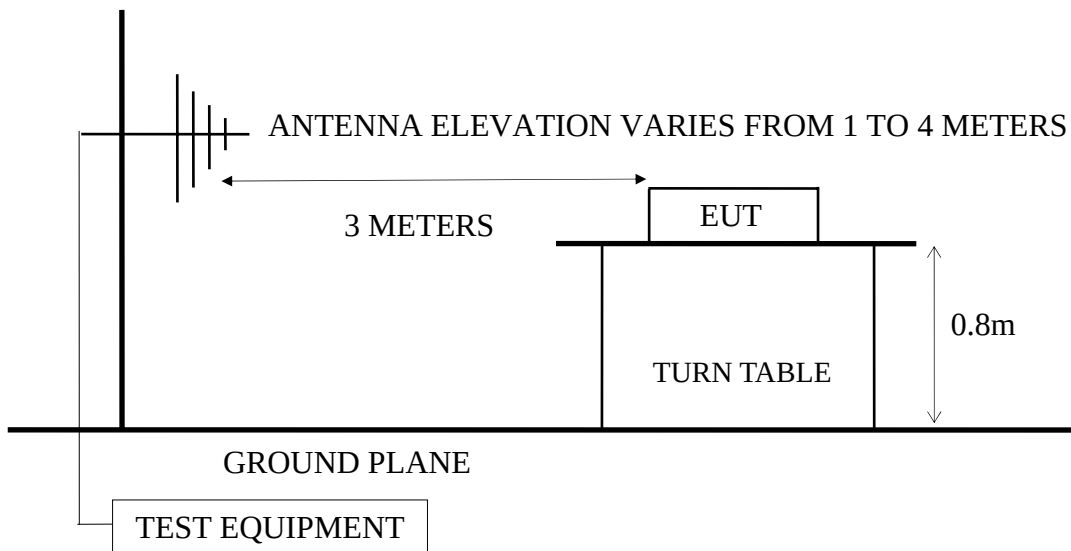
5.2. Test Setup

5.2.1. Block Diagram of connection between EUT and simulators

**CEILING FAN REMOTE
CONTROLLER (TRANSMITTER)
(EUT)**

5.2.2. Semi-Anechoic Chamber (3m) Setup Diagram

ANTENNA TOWER



5.3. Radiation Emission Limits (§15.231)

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		

Remarks :

- (1) Emission level (dBμV/m) = 20 log Emission level (μV/m)
- (2) The tighter limit applies at 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:
 $41.6667 \times 433.92 - 7083.3333 = 10996.6814 \mu\text{V/m} = 80.82 \text{dB}\mu\text{V/m}$
- (5) The limits in this table are based on CFR 47 Part 15.231(b).

5.4. Operating Condition of EUT

- 5.4.1. Set up the EUT and simulator as shown on 5.2.
- 5.4.2. The EUT emitted the fundamental frequency with data code at the stand, side and lying conditions. (The worst mode is lying)
- 5.4.3. The EUT was operated on maximum transmitting status during all testing (lying condition).

5.5. Test Procedure

The EUT and was placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set to 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna could be moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna such as calibrated biconical and log- periodical antenna or horn antenna is used as a receiving antenna. Both polarizations horizontal and vertical are set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

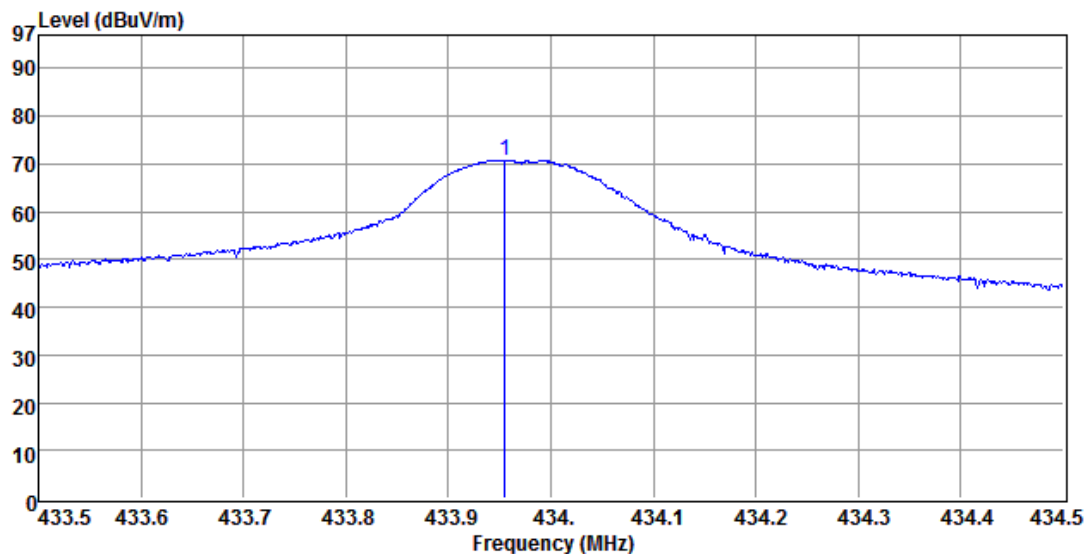
5.6. Fundamental Measurement Results

Test Date: 2014. 11. 28 Temperature: 25°C Humidity: 54%



AUDIX TECHNOLOGY Corp. EMC Department
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244, Taiwan R.O.C.
Tel:+886-2-26092133 Fax:+886-2-26099303
Email:emc@audixtech.com

Data: 2



Site no. : Audix NO.1 Chamber Data no. : 2
Dis. / Ant. : 3m CBL6112D 33821 Ant. pol. : HORIZONTAL
Limit :
Env. / Ins. : 25°C / 54% N9010A Engineer : Johnny_Hsueh
EUT : TR109E
Power Rating : DC 12V
Test Mode : Tx 433.92MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
1	433.96	16.07	5.94	48.80	70.81			Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading
2. The emission levels that are 20dB below the official limit are not reported.

**Horizontal is the strongest polarization and Peak value has complied with limit,
So Vertical won't be listed in test report.**

**Because RBW of spectrum is larger than PRF, thus PDCF is no need for finding
true peak level.**

6. EMISSION BANDWIDTH MEASUREMENT

6.1. Test Equipment

The following test equipment was used during the Emission Bandwidth Test :

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Wide Band Antenna	Diamond	RH799	N/A	N.C.R	1 Year

6.2. Block Diagram of Test Setup



6.3. Specification Limits (§15.231-(c))

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.

6.4. Emission Bandwidth Measurement Results

PASS.

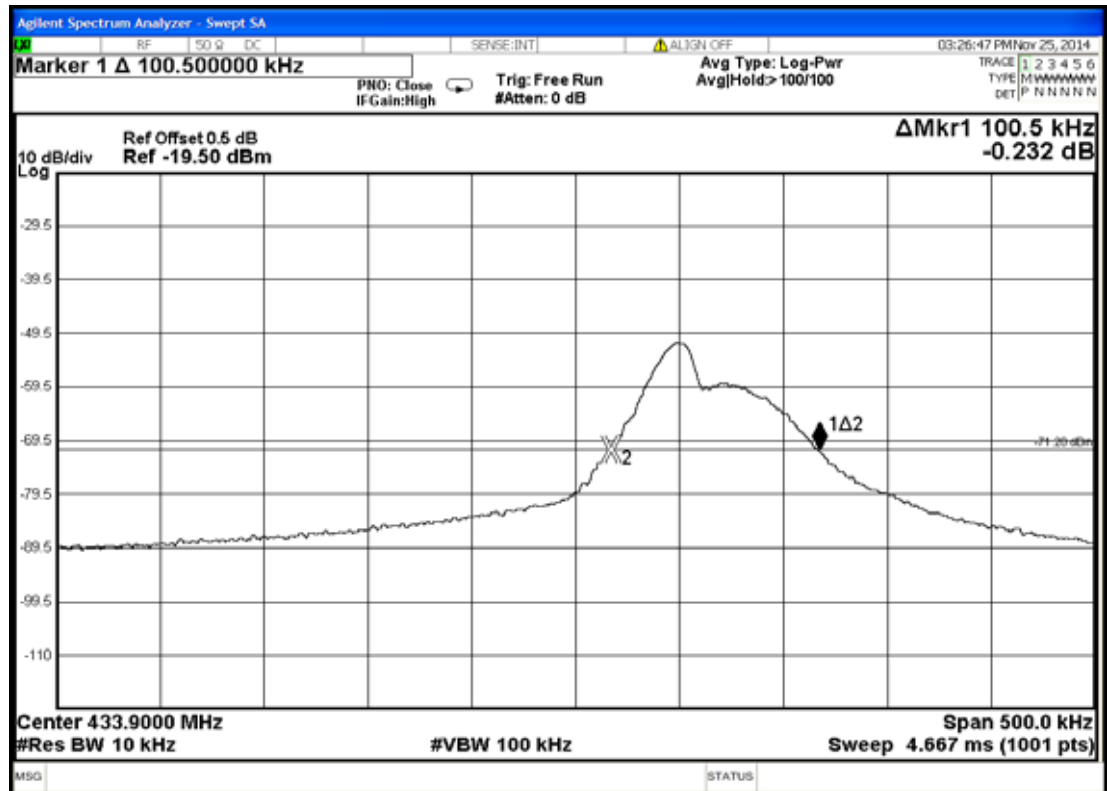
Fundamental Frequency: 433.92MHz

Test Date: 2014. 11. 25 Temperature: 25°C Humidity: 50%

No.	Center Frequency	Bandwidth	Tolerance	Limited
1.	433.92 MHz	0.1005 MHz	0.023 %	0.25%

The bandwidth of emission was measured at the point 20dB down from the center frequency of modulated carrier.

Graph of Bandwidth Measurement



Note: “◇” The line is 20dB from the modulated carrier.

7. PERIODIC OPERATED MEASUREMENT

7.1. Test Equipment

The following test equipment was used during the periodic operated test :

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2014. 09. 15	1 Year
2	Wide Band Antenna	Diamond	RH799	N/A	N.C.R	1 Year

7.2. Block Diagram of Test Setup



7.3. Specification Limits [§15.231-(a)-(1)]

The operation of this device is manually operated transmitter that is automatically deactivated the transmitter within not more than 5 seconds of being released, Compliance with §15.231 (a)- (1).

7.4. Periodic Operated Measurement Results

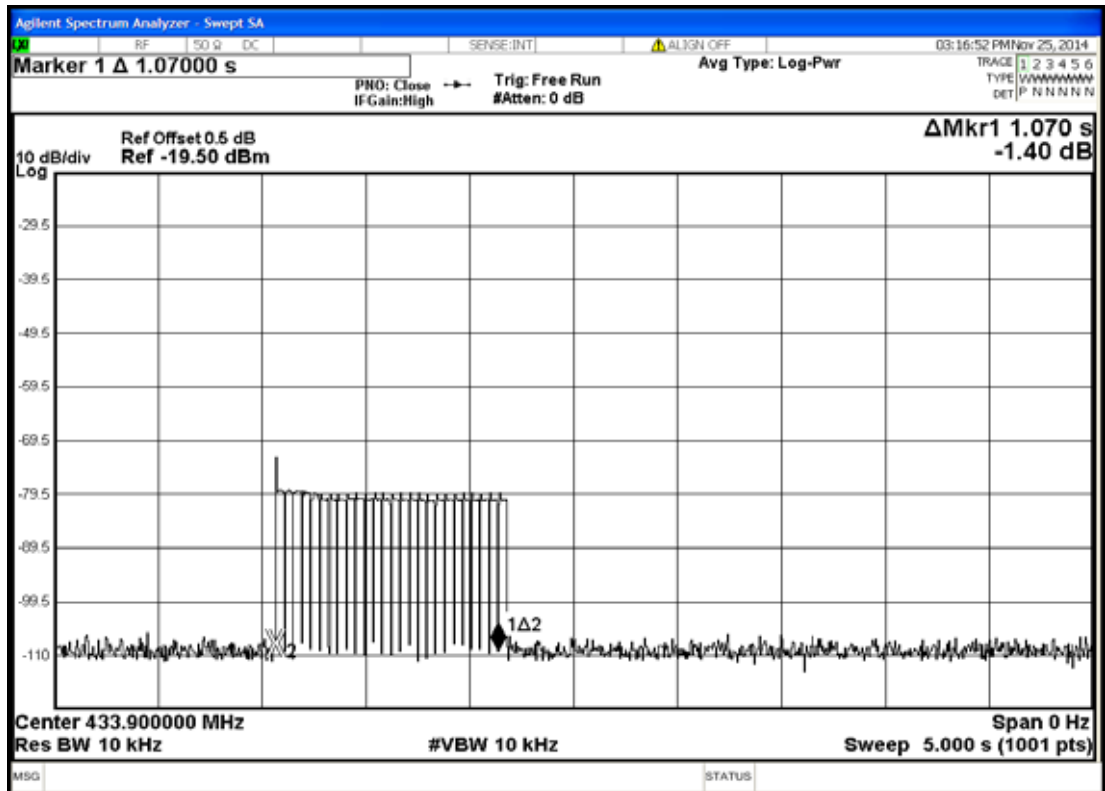
PASS. T = 1.070s. (< 5sec.)

Fundamental Frequency: 433.92MHz

Test Date: 2014. 11. 25 Temperature: 25°C Humidity: 50%

The graph of testing is attached in next page.

Graph of Periodic Operated Measurement



8. DEVIATION TO TEST SPECIFICATIONS

【NONE】

9. PHOTOGRAPHS

9.1. Photos of Radiated Measurement at Semi-Anechoic Chamber (30~1000MHz)

EUT on Stand



EUT on Side



EUT on Lying



9.2. Photos of Radiated Measurement at Semi-Anechoic Chamber (Above 1GHz)

EUT on Stand



EUT on Side



EUT on Lying



9.3. Photo of Section RF Near Field Measurement

