



FCC 47 CFR PART 15 SUBPART C

RF Test Report

Applicant : IN WIN DEVELOPMENT INC.

Product Type : AURORA wireless remote control fans

Trade Name : IN WIN

Model Number : AURORAFNA1225P

Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013

Receive Date : Sep. 08, 2016

Test Period : Oct. 03 ~ Oct. 19, 2016

Issue Date : Oct. 24, 2016

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C)
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330

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Revision History

Rev.	Issue Date	Revisions	Revised By
00	Oct. 24, 2016	Initial Issue	Snow Wang



Verification of Compliance

Issued Date: Oct. 24, 2016

Applicant : IN WIN DEVELOPMENT INC.
Product Type : AURORA wireless remote control fans
Trade Name : IN WIN
Model Number : AURORAFNA1225P
FCC ID : 2AJSPAURORA
EUT Rated Voltage : DC 12V, 0.3mA
Test Voltage : DC 3V (AAA Battery * 2 PCS)
Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013
Test Result : Complied

Performing Lab. : A Test Lab Techno Corp.
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Taoyuan City 33465, Taiwan (R.O.C)
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1330 <http://www.atl-lab.com.tw/e-index.htm>



A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By : Fly Lu Reviewed By : Eric Ou Yang
(Manager) (Fly Lu) (Testing Engineer) (Eric Ou Yang)

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1 General Information

1.1. Summary of Test Result

Reference	Test	Results	Remark
FCC Part 15.231			
15.207	Ac Power Conducted Emission	N/A	This device use DC power source.
15.231(a)	Transmitter Deactivation Time	PASS	----
15.231(b)	Transmitter Field Strength of Emissions	PASS	----
15.231(c)	Bandwidth of the Emission	PASS	----
CFR 47 Part 15.231(2010) / ANSI C63.10:2013			

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	9kHz ~ 150KHz	2.7
	150kHz ~ 30MHz	2.8
Radiated Emission	30MHz ~ 1000MHz	6.300
	1000MHz ~ 18000MHz	5.474
	18000MHz ~ 26500MHz	5.630
	26500MHz ~ 40000MHz	5.054
Conducted Output Power	+0.27 dB / -0.28 dB	
RF Bandwidth	4.96%	
Power Spectral Density	+0.71 dB / -0.77 dB	



2 EUT Description

Applicant	IN WIN DEVELOPMENT INC. No.57, Ln. 350, Nanshang Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
Manufacturer	IN WIN DEVELOPMENT INC. No.57, Ln. 350, Nanshang Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
Product Type	AURORA wireless remote control fans
Trade Name	IN WIN
Model Number	AURORAFNA1225P
FCC ID	2AJSPAURORA
Frequency Range	315 MHz
Modulation Type	AM
Number of Channels	1 Channel
Antenna Type	PCB Antenna

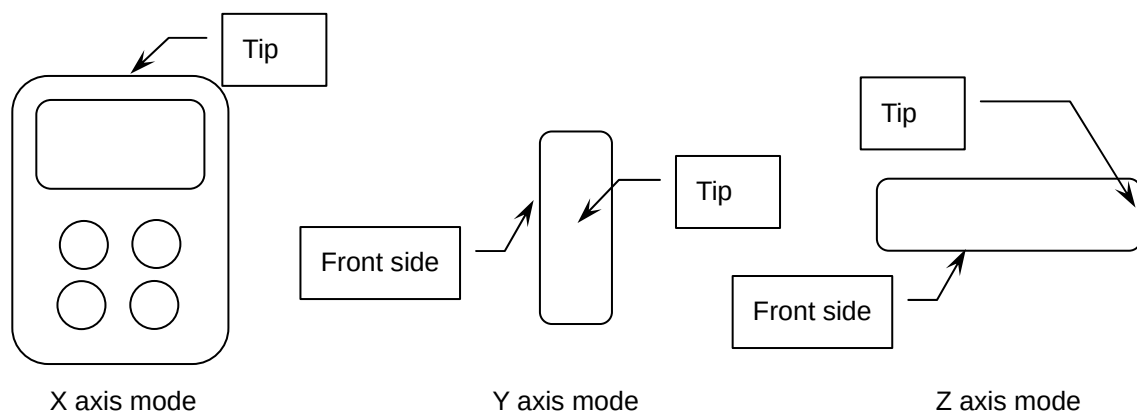
3 Test Methodology

3.1. Mode of Operation

Test Mode
Mode 1: Transmitter Mode

Then, the above highest fundamental level mode of the configuration of the EUT and antenna was chosen for all final test items.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

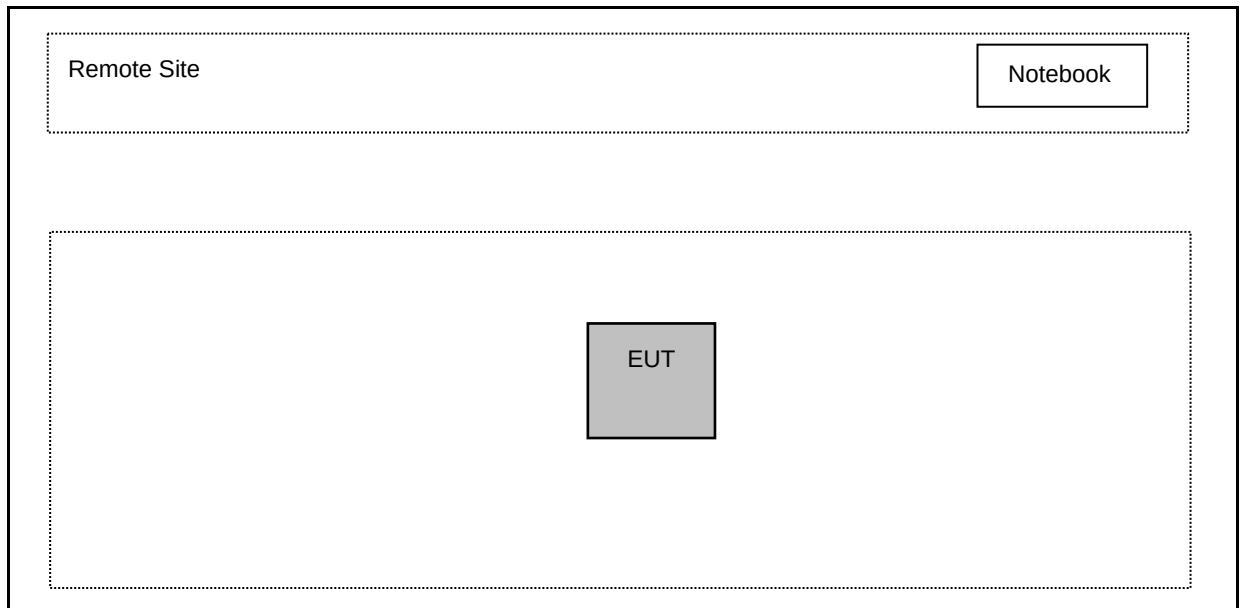


3.2. EUT Exercise Software

1.	Setup the EUT as shown on 3.3.
2.	Turn on the power of all equipment.
3.	The EUT will start to operate function.

3.3. Configuration of Test System Details

Radiated Emissions



3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

4 Test Results

4.1. Radiated Emissions Measurement

■ Limit

According to FCC Part 15.231(b) requirement:

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

Fundamental and harmonics emission limits

Frequency range	Average Field Strength of Fundamental		Peak Field Strength of Fundamental
(MHz)	($\mu\text{V}/\text{m}@3\text{m}$)	($\text{dB}\mu\text{V}/\text{m}@3\text{m}$)	($\text{dB}\mu\text{V}/\text{m}@3\text{m}$)
315	6041.772	75.62	95.62

General Radiated emission Limit

Frequency range	Field Strength of Fundamental	Field Strength of Harmonics
(MHz)	($\mu\text{V}/\text{m}$ at 3m)	($\mu\text{V}/\text{m}$ at 3m)
40.66 to 40.70	2250 (67.04 dBuV)	225 (47.04 dBuV)
70 to 130	1250 (61.94 dBuV)	125 (41.94 dBuV)
130 to 174	1250 (61.94 dBuV) to 3750 (71.48 dBuV)	125 (41.94 dBuV) to 375 (51.48 dBuV)
174 to 260	3750 (71.48 dBuV)	375 (51.48 dBuV)
260 to 470	3750 (71.48 dBuV) to 12500 (81.94 dBuV)	375 (51.48 dBuV) to 1250 (61.94 dBuV)
470 and above	12500 (81.94 dBuV)	1250 (61.94 dBuV)

Remark: 1. The table above tighter limit applies at the band edges.

- The measurement distance in meters, which that between form closest point of EUT to instrument antenna.



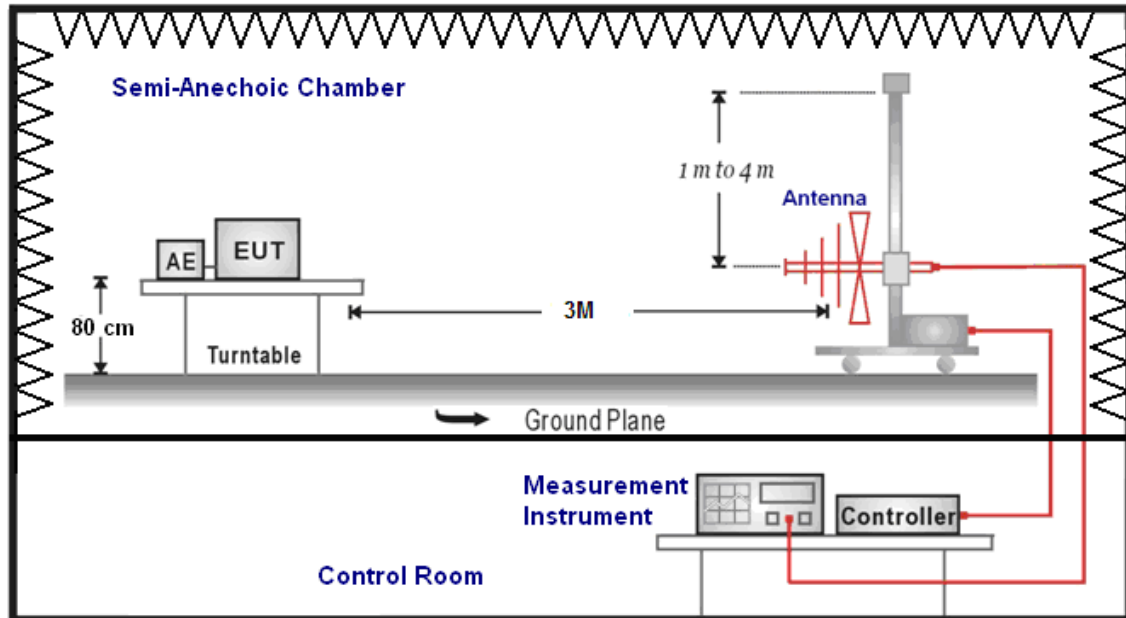
■ Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
RF Pre-selector	Agilent	N9039A	MY46520256	01/08/2016	1 year
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/08/2016	1 year
Pre Amplifier	Agilent	8449B	3008A02237	10/11/2016	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Broadband Antenna	Schwarzbeck	VULB9168	416	10/13/2016	1 year
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/06/2016	1 year
Horn Antenna (18~40GHz)	ETS	3116	86467	09/05/2016	1 year
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	02/01/2016	1 year
Microwave Cable	EMCI	EMC102-KM-KM-14000	151001	02/23/2016	1 year
Microwave Cable	EMCI	EMC-104-SM-SM-14000	140202	02/23/2016	1 year
Microwave Cable	EMCI	EMC104-SM-SM-600	140301	02/23/2016	1 year
Test Site	ATL	TE01	888001	08/29/2016	1 year

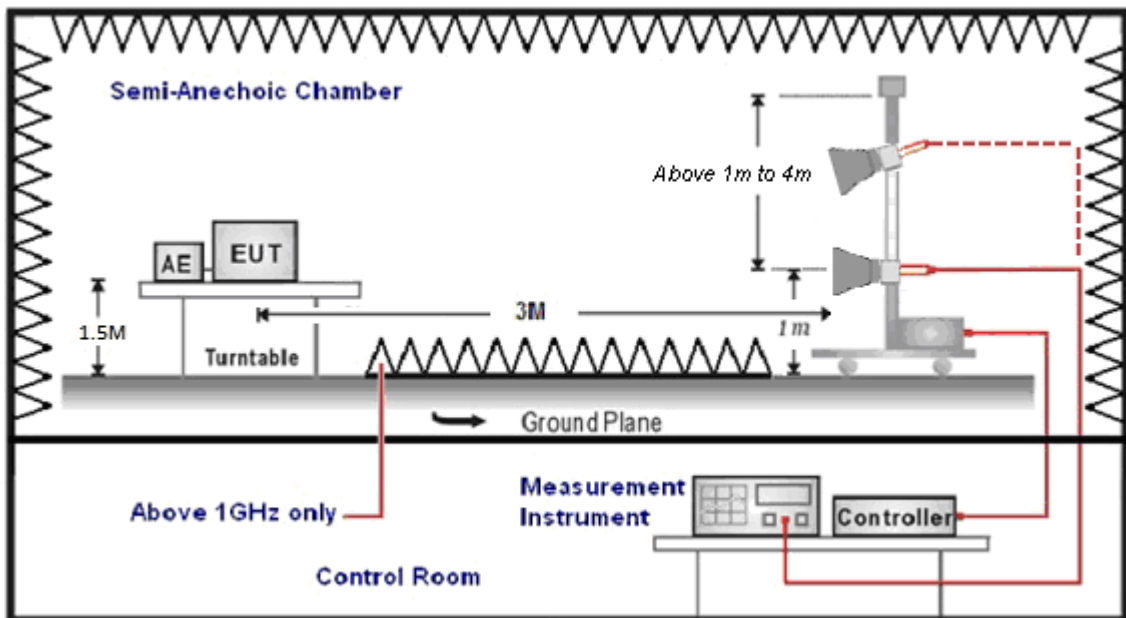
Note: N.C.R. = No Calibration Request.

■ Setup

Below 1GHz



Above 1GHz



■ Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 or 1.5 meters height (below 1GHz use 0.8m turntable / above 1GHz use 1.5m turntable), top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro volts per meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m) = FI (dBuV) + AF (dBuV) + CL (dBuV) - Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m) = Amplitude (dBuV) - Dis(dB)}$$

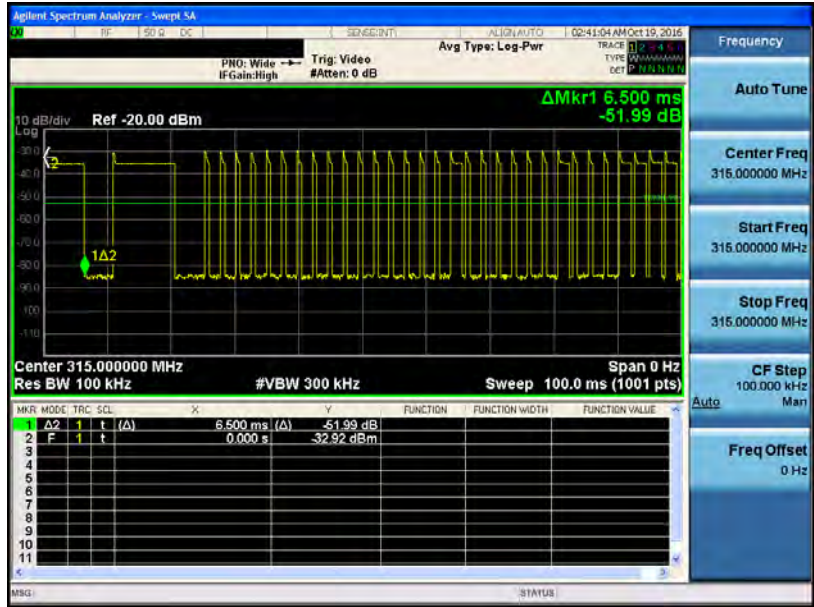
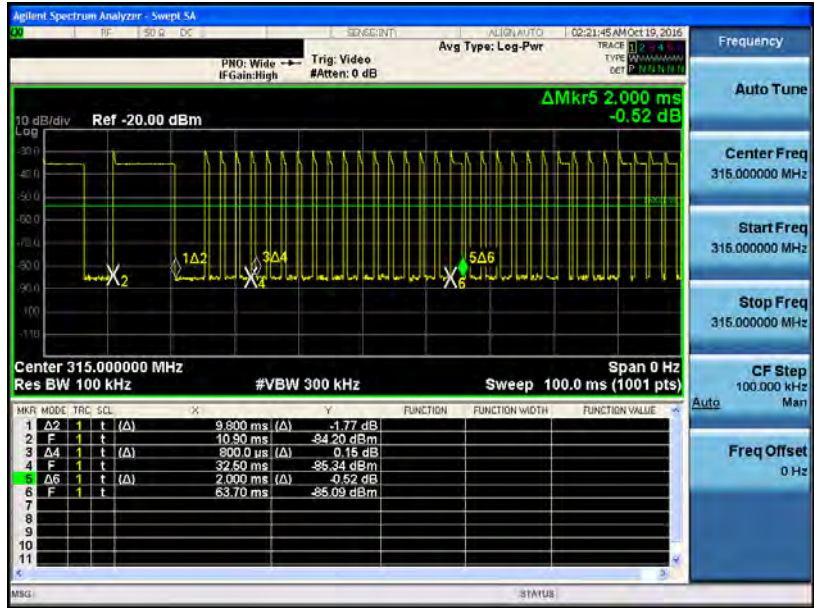
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

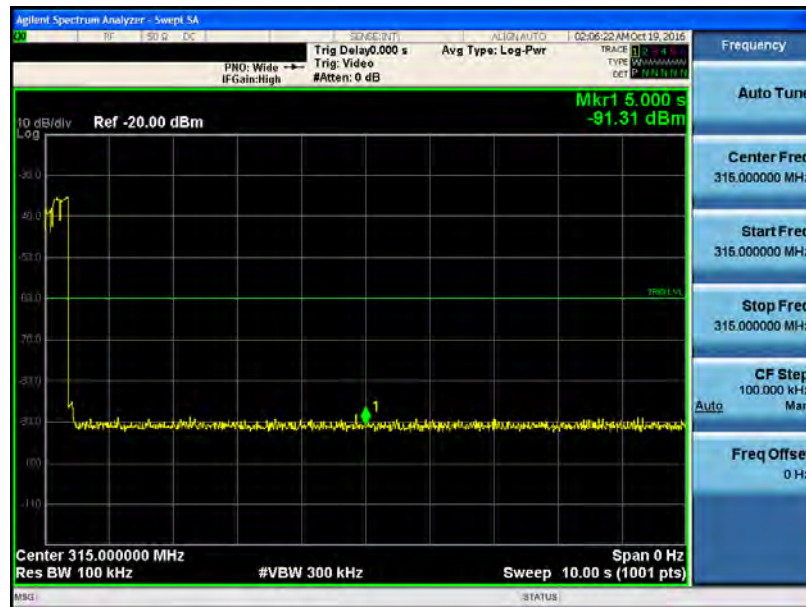
Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

■ Test Result

Duty Cycle Test Diagrams	
Length of a complete pulse train-1	
Length of a complete pulse train-2	



The EUT was complied with the requirement of FCC 15.231 (a) (1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.





■ Calculation of Average Factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

Please see the diagrams below.

(*) When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

■ Duty Cycle Results

Item	Results	Note
Length of a complete pulse train	100.00 ms	-----
Long Pulse-1 (Number of Pulse)	1	-----
Long Pulse-2 (Number of Pulse)	1	-----
Short Pulse-1 (Number of Pulse)	25	-----
Short Pulse-2 (Number of Pulse)	6	-----
Long Pulse-1 (T)	6.5 ms	-----
Long Pulse-2 (T)	9.8 ms	-----
Short Pulse-1 (T)	0.8 ms	-----
Short Pulse-2 (T)	2 ms	-----
Total ON interval in a complete pulse train	58.1 ms	-----
Duty Cycle	0.581	-----
Averaging Factor (20 log * Duty Cycle)	-4.717	-----

Please see the diagrams below.

Note:

1. RB=100 KHz, VB=300 KHz, SPAN=0
2. Total ON interval in a complete pulse train = (Long Pulse * Long Pulse (Number of Pulse)) + (Short Pulse * Short Pulse (Number of Pulse))
3. Duty Cycle=
$$\frac{(\text{Total On Interval in a Complete Pulse Train})}{(\text{Length of a Complete Pulse Train})}$$

**■ Fundamental Frequency Test Results**

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Fundamental Frequency	Power:	DC 3V
Model Number:	AURORAFNA1225P	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	Mode 1	Date:	10/19/2016
Ant.Polar.:	Horizontal	Test By:	Eric Ou Yang
Description:			

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.0300	77.44	-9.16	68.28	75.62	-7.34	peak

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Fundamental Frequency	Power:	DC 3V
Model Number:	AURORAFNA1225P	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	Mode 1	Date:	10/19/2016
Ant.Polar.:	Vertical	Test By:	Eric Ou Yang
Description:			

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	315.0150	65.14	-9.16	55.98	75.62	-19.64	peak

Note: The peak results are less than average limit, so not need to measurement average.



Below 1GHz

Standard:		FCC Part 15C		Test Distance:		3m	
Test item:		Transmitter Unwanted Emissions		Power:		DC 3V	
Model Number:		AURORAFNA1225P		Temp.(°C)/Hum.(%RH):		26(°C)/60%RH	
Test Mode:		Mode 1		Date:		10/19/2016	
				Test By:		Eric Ou Yang	
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
184.5000	35.20	-12.71	22.49	43.50	-21.01	QP	H
274.5000	25.73	-10.16	15.57	46.00	-30.43	QP	H
486.5000	33.64	-5.50	28.14	46.00	-17.86	QP	H
630.0000	43.98	-2.41	41.57	46.00	-4.43	peak	H
780.0000	24.90	0.48	25.38	46.00	-20.62	QP	H
945.0000	37.14	3.56	40.70	46.00	-5.30	peak	H
184.5000	34.11	-12.71	21.40	43.50	-22.10	QP	V
385.5000	30.48	-7.85	22.63	46.00	-23.37	QP	V
486.5000	33.94	-5.50	28.44	46.00	-17.56	QP	V
630.0000	47.35	-2.41	44.94	46.00	-1.06	QP	V
727.5000	25.62	-0.59	25.03	46.00	-20.97	QP	V
945.0000	39.72	3.56	43.28	46.00	-2.72	QP	V

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

3. No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).



■ Above 1GHz

Standard:	RSS-Gen			Test Distance:	3m		
Test item:	Transmitter Unwanted Emissions			Power:	DC 3V		
Model Number:	AURORAFNA1225P			Temp.(℃)/Hum.(%RH):	26(℃)/60%RH		
Test Mode:	Mode 1			Date:	10/19/2016		
Frequency:	315MHz			Test By:	Eric Ou Yang		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
1260.000	75.17	-19.46	55.71	74.00	-18.29	peak	H
1260.000	71.84	-19.46	52.38	54.00	-1.62	AVG	H
1575.000	70.79	-17.73	53.06	74.00	-20.94	peak	H
1575.000	67.44	-17.73	49.71	54.00	-4.29	AVG	H
1890.000	64.02	-16.61	47.41	74.00	-26.59	peak	H
1260.000	71.44	-19.46	51.98	74.00	-22.02	peak	V
1575.000	69.17	-17.73	51.44	74.00	-22.56	peak	V
1890.000	63.11	-16.61	46.50	74.00	-27.50	peak	V

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

4.2. 20 dB Bandwidth Measurement

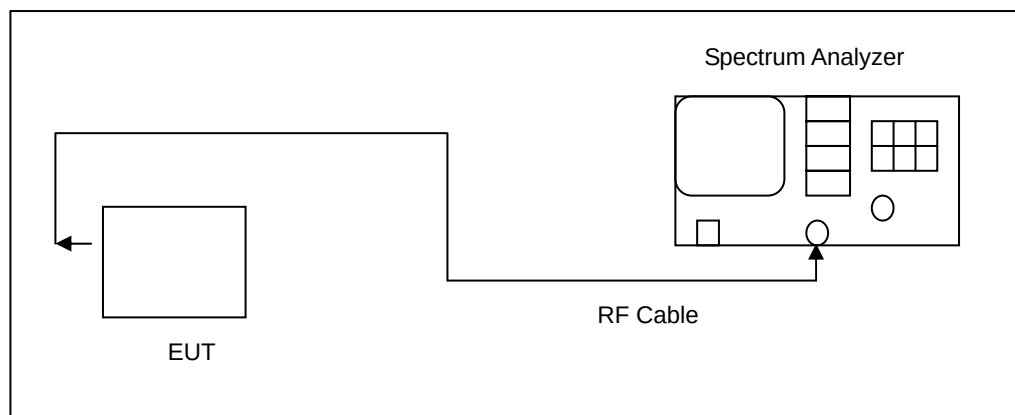
■ Limit

According to FCC Part 15.231(c) requirement:

The 20dB bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

B.W Limit = $0.25\% \times f \text{ (MHz)} = 0.25\% \times 315 \text{ MHz} = 787.5 \text{ kHz}$

■ Test Setup



■ Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/19/2016	1 year
Test Site	ATL	TE02	TE05	N.C.R.	-----

Note: N.C.R. = No calibration request.



■ Test Procedure

20dB Bandwidth

The RF output port of the Equipment-Under-Test is directly coupled to the input of the analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The RF function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = 300 kHz
2. RBW $\geq$ 1% of the 20dB span
3. VBW $\geq$ RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

■ Test Result

Model Number	AURORAFNA1225P	
Mode	Mode 1	
Date of Test	10/19/2016	
Frequency (MHz)	20 dB Bandwidth (KHz)	Limited (KHz)
315	24	787.5



■ Test Graphs

20 dB Bandwidth

