TEST REPORT

Report Number: 102801000ATL-001
Project Number: G102801000

Report Issue Date: December 21, 2016

Product Designation: **Light Controller Model(s): 99373, 99375, 99195**
(differences are for marketing purposes only)

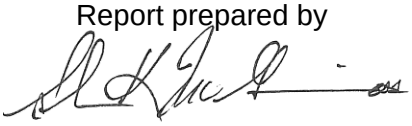
FCC: IN2TX47
IC: 3558A-TX47

Standards: **47 CFR Part 15, Subpart C** (15.231 - Periodic operation in the band 40.66-40.70 MHz and above 70 MHz)
RSS-210, Issue:2016/04/01 Issue:9 Low Power License-Exempt Radio communication Devices (All Frequency Bands) - Category I Equipment

Tested by:
Intertek Testing Services NA, Inc.
1950 Evergreen Blvd. Suite 100
Duluth GA 30096

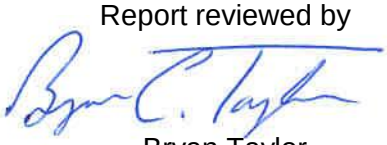
Client:
Hunter Fan Company
7130 Goodlett Farms Pkwy, Suite 400
Memphis, TN 38016

Report prepared by



Shawn K McGuinness
EMC Engineering Supervisor

Report reviewed by



Bryan Taylor
Team Leader

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TABLE OF CONTENTS (OPTIONAL)

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2 Test Summary

Section	Test full name	Test date	Result
3	Description of Equipment Under Test		
0	System setup including cable interconnection details, support equipment and simplified block diagram		
5	Radiated emissions (E-field) for low power intentional radiators		Pass
6	Bandwidth Requirements (FCC 15C - 15.231(c))		Pass
7	Conducted Emissions		NA
8	Restrictions (FCC 15C - 15.231(a))		Pass

3 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Ceiling Fan Remote	Hunter Fan Company	99373, 99375, 99195 (differences are for marketing purposes only)	ATL1612031215-001

Receive Date:	12-03-2016
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The Ceiling Fan Remote is a 433.9MHz wall mounted transmitter used for remote control of a ceiling fan and light assembly. Powered by two AAA, 1.5V batteries. Provided with an on/off power disconnect switch. Difference in models are for marketing purposes only EUT only operates at one select frequency per client information.

Transmitter Overview:	
FCC Identifier	**IN2TX47**
IC Identifier	**3558A-TX47**
Frequency Range	433MHz
Modulation	ASK Modulation
Antenna type (15.203)	Integral

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3V Battery	0.018A	NA	NA

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	For radiated testing, EUT was programmed to operate at a steady repeat in its normal modulation scheme.
2	For Duty Cycle and BW testing, EUT was programmed to operate in its normal mode and modulation scheme.

NOTE:

4 System setup including cable interconnection details, support equipment and simplified block diagram

4.1 Method:

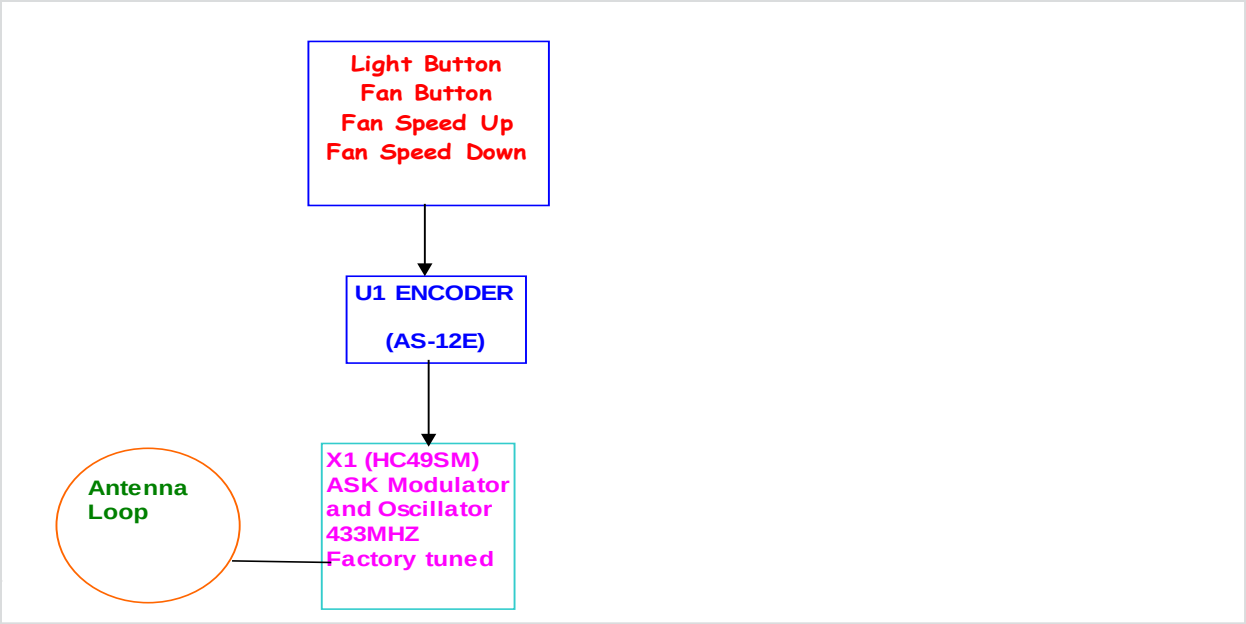
Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

Data:

ID	Description	Length	Shielding	Ferrites
None				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

4.2 EUT Block Diagram:



Description: The top box of the diagram below represents all of the potential keys that may be pressed for Hunter K6300/K6731,K6927 Transmitters. Pressing any key generates an encoded PCM code word which will modulate on a 434 MHZ RF carrier for transmission. The encoded PCM code word is obtained from encode U1 and is ASK modulated by the RF oscillator formed by Oscillator X1. Encoder U1 also provides selectable security bits which can be set by the user.

5 Radiated emissions (E-field) for low power intentional radiators

5.1 Method

The test method and equipment setup for radiated emissions tests shall follow the guidelines of ANSI C63.4:2014.

Measurements below 1 GHz shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

Bandwidths:
30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW
Above 1000 MHz: 1 MHz RBW and 3 MHz VBW
Detectors:
Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)
Above 1000 MHz: Average detector (applies to average limit)
Above 1000 MHz: Peak detector (applies to peak limit)

Limits:
Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change. Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

Frequency range of radiated measurements
For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

Measurement antenna requirements:
Below 30 MHz - Loop antenna
30 to 1000 MHz - Biconical, Log Periodic, or equivalent
Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission levels. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency. The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its orthogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane for frequencies below 1GHz and was tested at 1.5m above the ground plane for frequencies from 1GHz to 6GHz. The table shall be constructed of nonconductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

TEST SITE
The test site for radiated emissions consists of a 10Meter semi-anechoic chamber and is located at Intertek Testing Services NA, Inc. 1950 Evergreen Blvd. #100, Duluth GA – USA

5.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
232944;	EMI Receiver 10Hz-26.5GHz	Agilent	MXE-9038A	MY51210135	07/28/2016	07/28/2017
MM2;	RF Coax Cable 10KHz-18GHz	Maury Microwave	UC-N-MM78	1514381	05/11/2016	05/11/2017
MM1;	RF Coax Cable 10KHz-18GHz	Maury Microwave	UC-N-MM36	161471	05/11/2016	05/11/2017
TW2;	Cable TW2	Andrews	Cable TW2	TW2	05/03/2016	05/03/2017
ST-6;	RF Coax Cable - Rated 9 kHz to 18 GHz.	Megaphase	A81-0303-275	16-01-801	02/10/2016	02/10/2017
200069;	Preamplifier, 10 MHz to 2000 MHz, 40 dB gain	Mini-Circuits	ZKL-2	D011105	04/13/2016	04/13/2017
211386;	Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	2622	04/04/2016	04/04/2017
200108;	Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	199	06/14/2016	06/14/2017
BOX-HORN-1	Antenna, Horn, <18 GHz	EMCO	3115	9512-4632	09/04/2016	09/04/2017
212104;	Barometric Pressure/Humidity/Temperature Datalogger	Extech	SD700	A.074980	10/21/2016	10/21/2017

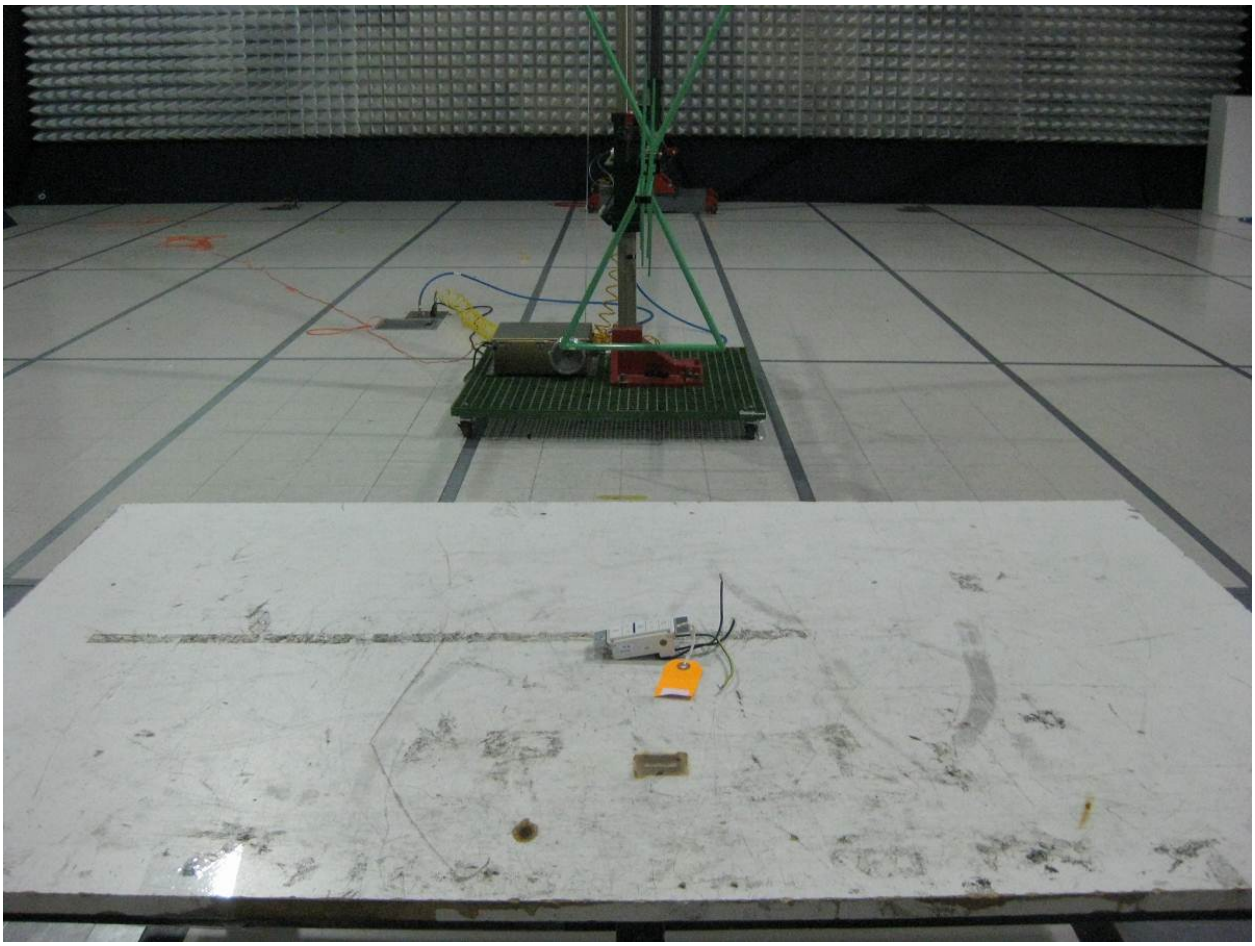
Software Utilized:

Name	Manufacturer	Version
Tile – Emissions for RS	Quantum Change	3.4.K.22

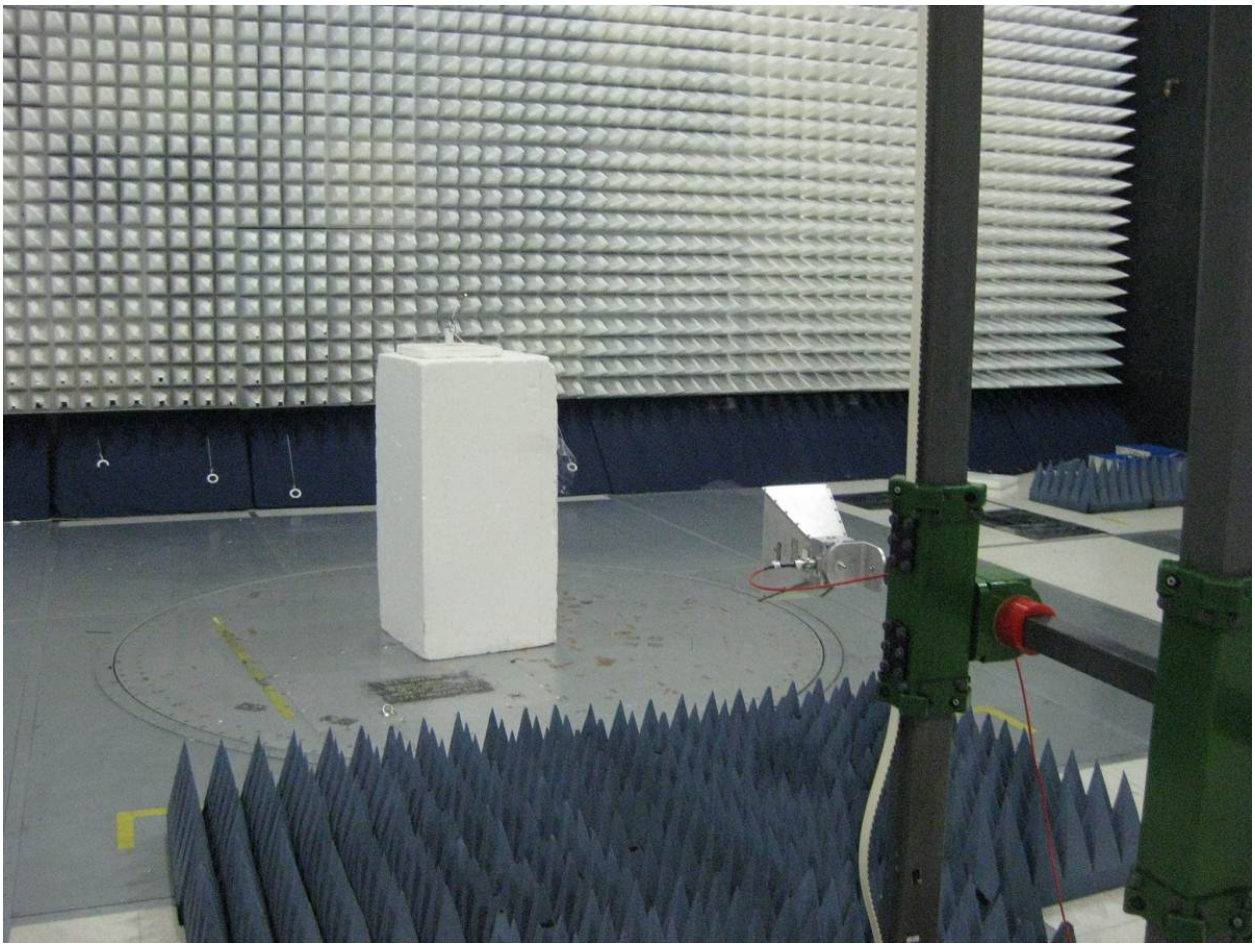
5.3 Results:

The sample tested was found to Comply.

5.4 Setup Photographs:

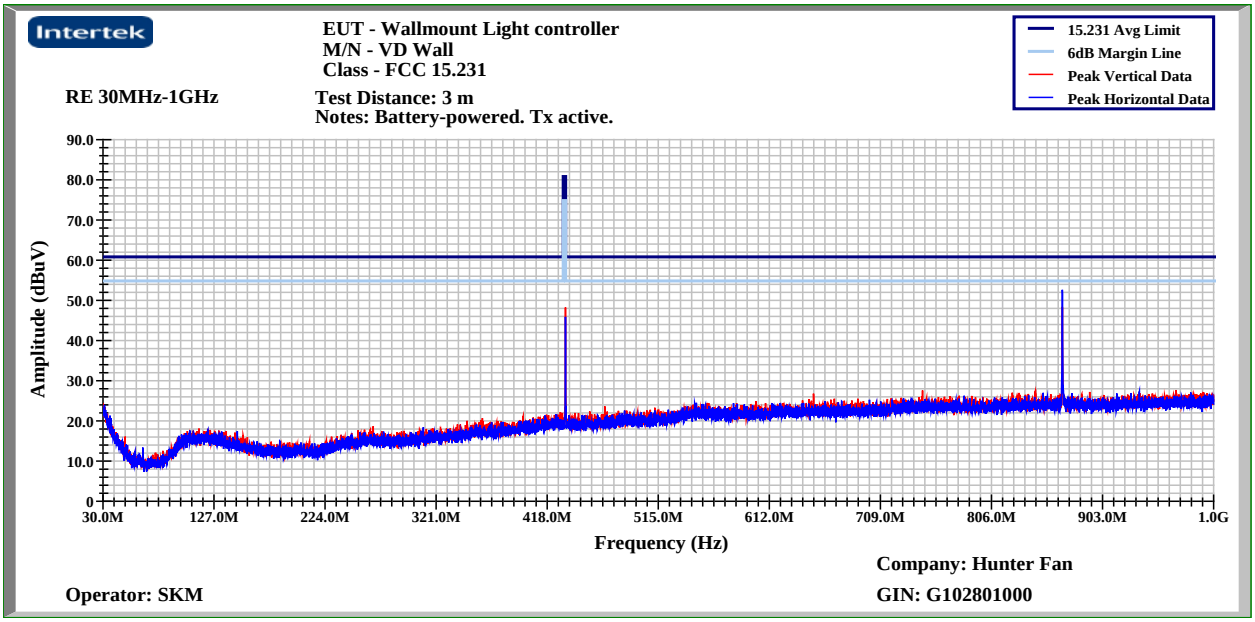


30-1000MHz Test setup

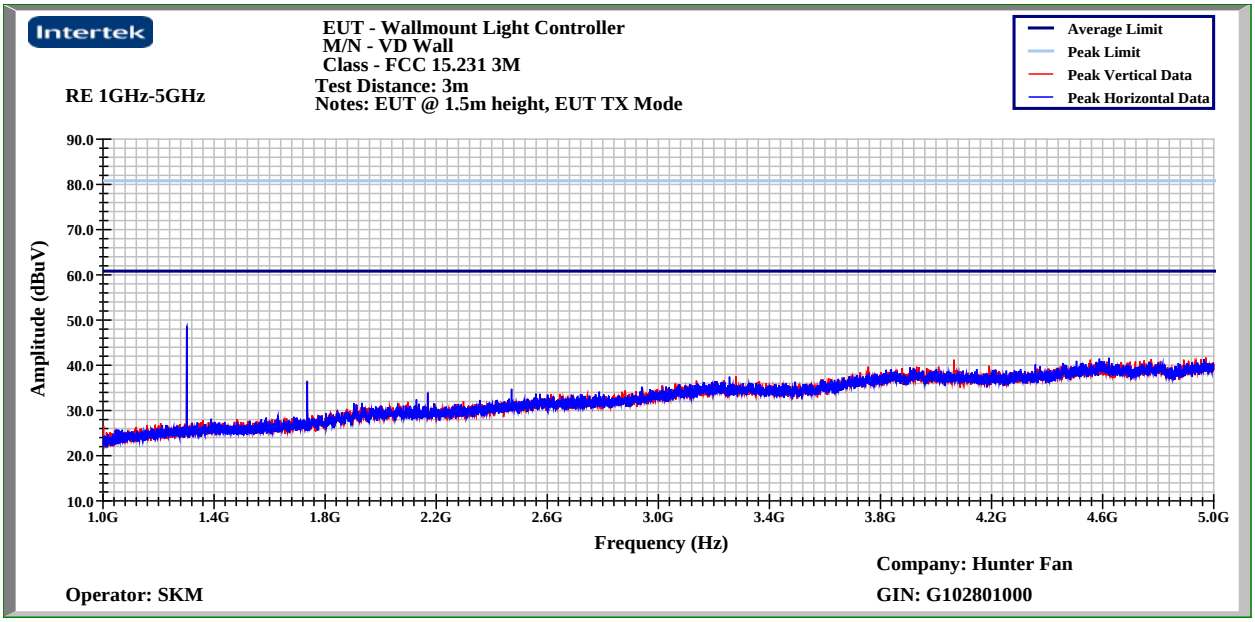


1-6GHz Test setup

5.5 Plots:



Emissions plot: 30 to 1000 MHz



Emissions plot: 1000 to 6000 MHz

5.6 Test Data:

Client: Hunter Fan
Model Number: VD Wall
Project Number: G102801000
Tested By: SKM
Date: Dec. 4, 2016
Frequency Range (MHz): 30-1000
Input power: Battery

Receiver: MXA
Antenna: Chase 2622
Cables: MM9 +MP3+ST-6
Preamp: PAM-0118
Test Distance (m): 3
Limit: FCC 15.231 Avg
Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
V	433.924	61.2	23.1	4.1	38.2	50.3	100.8	-50.5	PK 120/300K
V	433.924	61.2	23.1	4.1	38.2	50.3	80.8	-30.5	PK 120/300K
H	433.924	57.8	22.7	4.1	38.2	46.5	100.8	-54.3	PK 120/300K
H	433.924	57.8	22.7	4.1	38.2	46.5	80.8	-34.3	PK 120/300K
H	867.853	59.8	26.6	5.9	38.0	54.4	60.8	-6.4	PK 120/300K
H	867.853	55.1	26.6	5.9	38.0	49.7	60.8	-11.1	QP 120/300K
V	867.853	54.6	27.4	5.9	38.0	49.9	60.8	-10.9	PK 120/300K
V	867.853	48.7	27.4	5.9	38.0	44.0	60.8	-16.8	QP 120/300K
Calculations		G=C+D+E-F		I=G-H					

30 to 1000MHZ Data: FCC15.231 Limits

Client: Hunter Fan
Model Number: VD Wall
Project Number: G102801000
Tested By: SKM
Date: Dec. 4, 2016
Frequency Range (MHz): 30-1000
Input power: Battery

Receiver: MXA
Antenna: EMCO 3115
Cables: MM9 +MP3+E-211
Preamp: PAM-0118
Test Distance (m): 3
Limit: FCC 15.231 Avg
Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**Limit dB(uV/m)**	**Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
H	1302.000	56.7	25.7	7.5	37.8	52.1	60.8	-8.7	PK 1m/3m
H	1302.000	50.5	25.7	7.5	37.8	45.9	60.8	-14.9	Avg 1m/3m
V	1302.000	52.2	25.5	7.5	37.8	47.3	60.8	-13.5	PK 1m/3m
V	1302.000	48.6	25.5	7.5	37.8	43.7	60.8	-17.1	Avg 1m/3m
H	1736.000	40.2	26.1	8.7	38.0	37.0	60.8	-23.8	PK 1m/3m
H	1736.000	34.8	26.1	8.7	38.0	31.6	60.8	-29.2	Avg 1m/3m
V	1736.000	41.5	26.2	8.7	38.0	38.3	60.8	-22.5	PK 1m/3m
V	1736.000	36.5	26.2	8.7	38.0	33.3	60.8	-27.5	Avg 1m/3m
Calculations		G=C+D+E-F		I=G-H					

1000 to 6000MHZ Data: FCC15.231 Limits

Notes: (a) EUT was rotated through x, y, and z axis to determine maximum emissions and tested at maximum orientation.
(b) EUT only operates at one select frequency per client information.

Deviations, Additions, or Exclusions: None

6 Bandwidth Requirements (FCC 15C - 15.231(c))

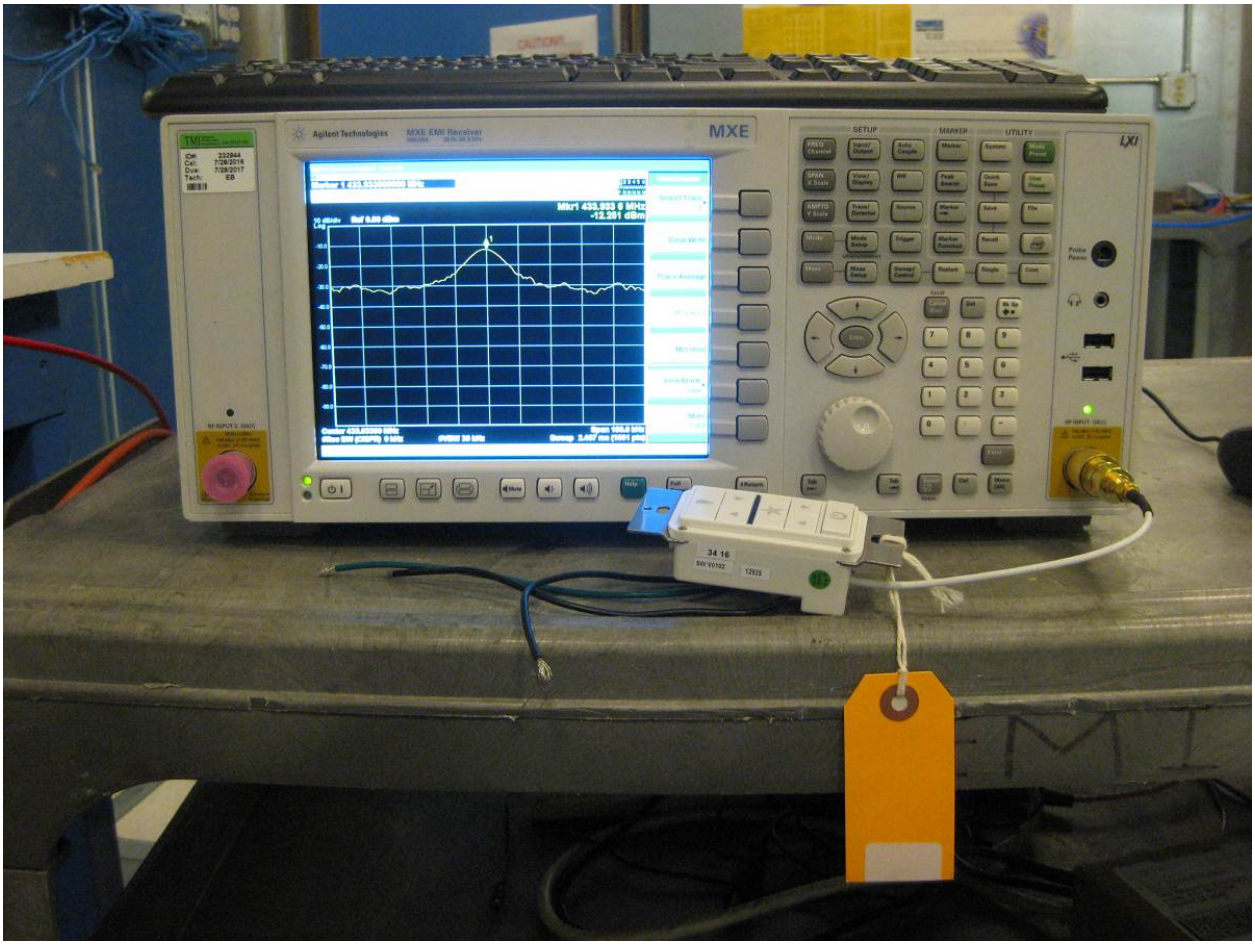
6.1 Method

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.
- Center Frequency is set to the fundamental of transmitter.
- Resolution Bandwidth is set to approximately 1% of the emission bandwidth.
- Video Bandwidth is set greater than or equal to the Resolution Bandwidth.

6.2 Test Equipment Used:

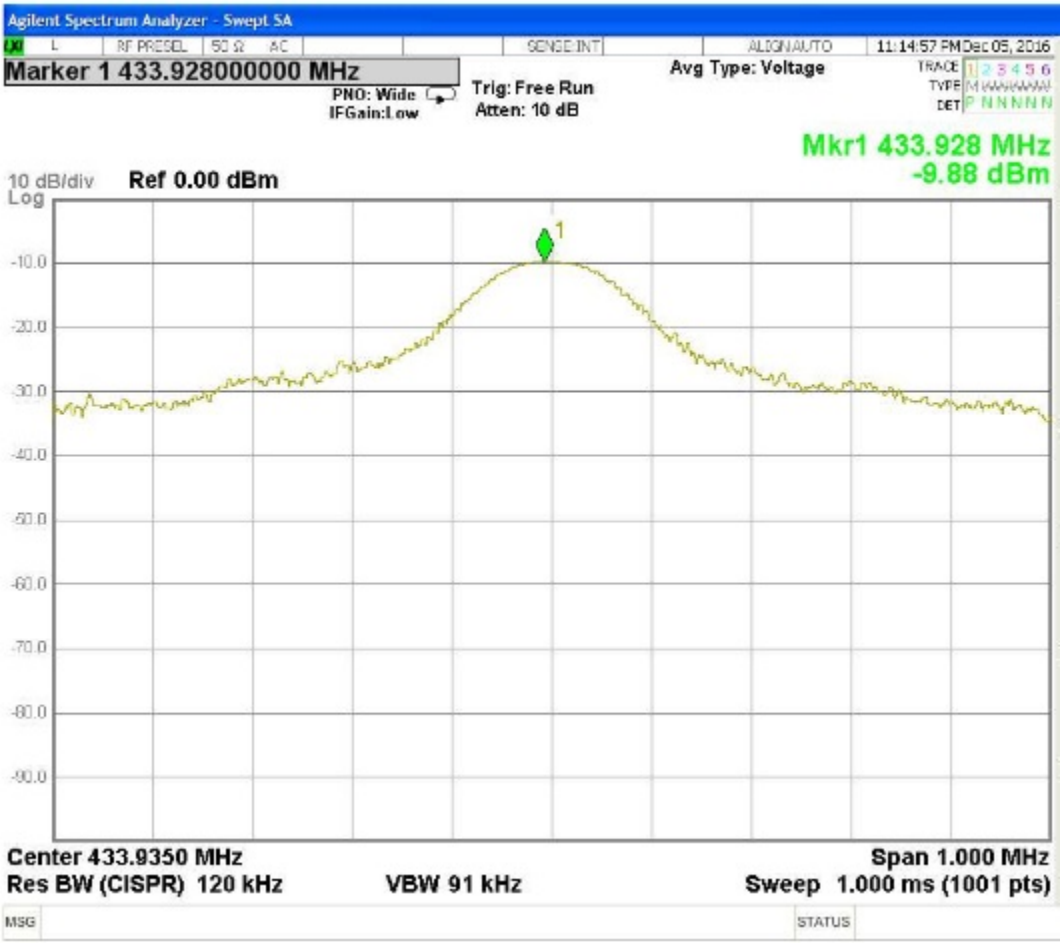
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
232944;	EMI Receiver 10Hz-26.5GHz	Agilent	MXE-9038A	MY51210135	07/28/2016	07/28/2017
212104;	Barometric Pressure/Humidity/Temperature Datalogger	Extech	SD700	A.074980	10/21/2016	10/21/2017

6.3 Setup Photographs:

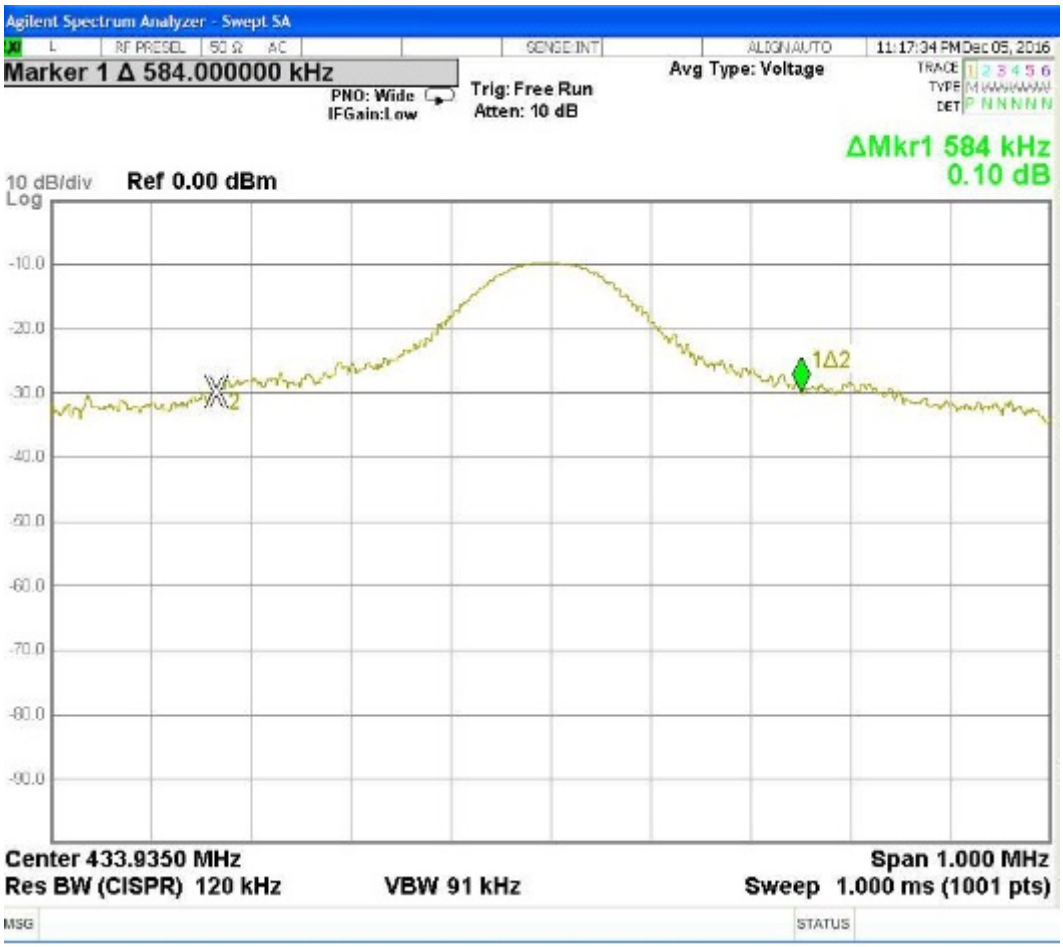


6.4 Plots:

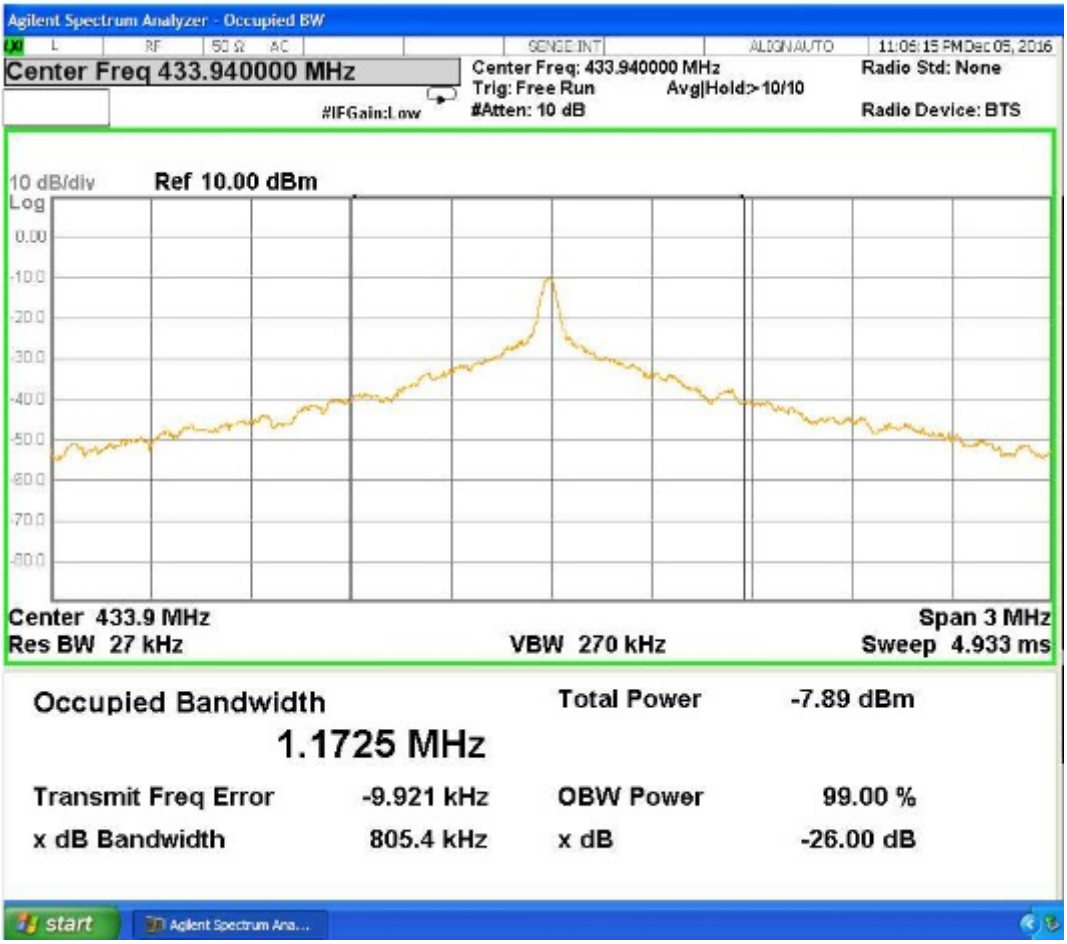
Fundamental Freq	25% Fund BW	Measure 20dB BW	Result
433.95MHz	108.49KHz	584KHz	Pass



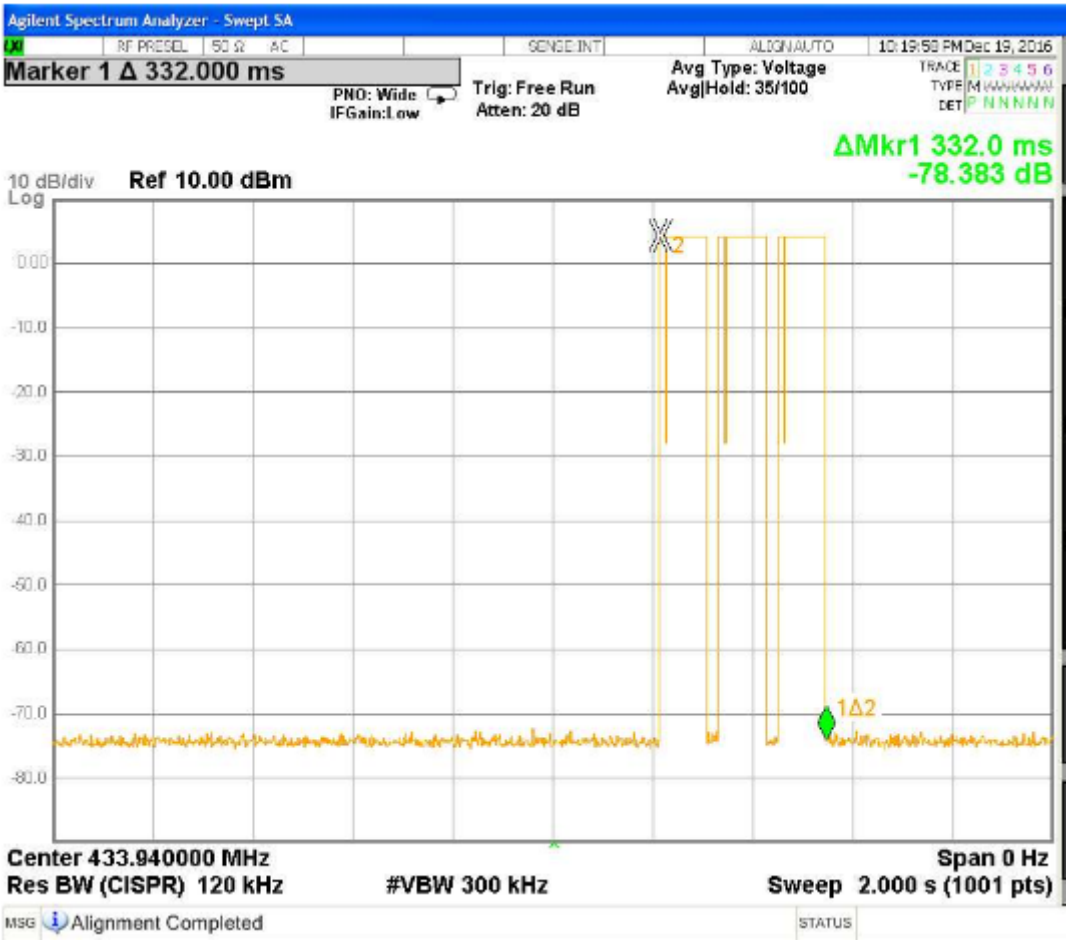
Peak Value


Agilent Spectrum Analyzer - Swept SA
RF PRESEL
50 Ω AC
SENSE:INT
ALIGN AUTO
11:17:34 PM Dec 05, 2016
Marker 1 Δ 584.000000 kHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Voltage
TRACE 1 2 3 4 5 6
TYPE M WWWWW
DET P N N N N N
ΔMkr1 584 kHz
0.10 dB
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
1Δ2
Center 433.9350 MHz
Res BW (CISPR) 120 kHz
VBW 91 kHz
Span 1.000 MHz
Sweep 1.000 ms (1001 pts)
MSG
STATUS

20dB BW


Agilent Spectrum Analyzer - Occupied BW
Center Freq 433.940000 MHz
Center Freq: 433.940000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 433.9 MHz
Res BW 27 kHz
VBW 270 kHz
Span 3 MHz
Sweep 4.933 ms
Occupied Bandwidth
1.1725 MHz
Total Power
-7.89 dBm
Transmit Freq Error
-9.921 kHz
OBW Power
99.00 %
x dB Bandwidth
805.4 kHz
x dB
-26.00 dB
start
Agilent Spectrum Ana...

26dB 99% BW



5 Sec. Signal Cut Off

6.5 Results:

The sample tested was found to Comply.

Deviations, Additions, or Exclusions: None

7 AC Mains Conducted Emissions

Not applicable: EUT is battery Powered.

8 Restrictions (FCC 15C - 15.231(a))

8.1 Method:

15.231(a) The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in
paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door
openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with
a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:
(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
(2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
(3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition
(5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
232944;	EMI Receiver 10Hz-26.5GHz	Agilent	MXE-9038A	MY51210135	07/28/2016	07/28/2017
MM2;	RF Coax Cable 10KHz-18GHz	Maury Microwave	UC-N-MM78	1514381	05/11/2016	05/11/2017
MM1;	RF Coax Cable 10KHz-18GHz	Maury Microwave	UC-N-MM36	161471	05/11/2016	05/11/2017
TW2;	Cable TW2	Andrews	Cable TW2	TW2	05/03/2016	05/03/2017
ST-6;	RF Coax Cable - Rated 9 kHz to 18 GHz.	Megaphase	A81-0303-275	16-01-801	02/10/2016	02/10/2017
200069;	Preamplifier, 10 MHz to 2000 MHz, 40 dB gain	Mini-Circuits	ZKL-2	D011105	04/13/2016	04/13/2017
211386;	Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	2622	04/04/2016	04/04/2017
200108;	Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	199	06/14/2016	06/14/2017
BOX-HORN-1	Antenna, Horn, <18 GHz	EMCO	3115	9512-4632	09/04/2016	09/04/2017
212104;	Barometric Pressure/Humidity/Temperature Datalogger	Extech	SD700	A.074980	10/21/2016	10/21/2017

Software Utilized:

Name	Manufacturer	Version
Tile – Emissions for RS	Quantum Change	3.4.K.22

8.3 Results:

The sample tested was found to Comply.

8.4 Restricted Band Data

Client: Hunter Fan
Model Number: VD Wall
Project Number: G102801000
Tested By: SKM
Date: Dec. 4, 2016
Frequency Range (MHz): 30-1000
Input power: Battery

Receiver: MXA
Antenna: EMCO 3115
Cables: MM9 +MP3+MM9
Preamp: PAM-0118
Test Distance (m): 3
Limit: FCC 15.231 Avg
Modifications for compliance (y/n): n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**Net dB(uV/m)**	**R Band Limit dB(uV/m)**	**R Band Margin dB**	**Detectors / Bandwidths Det/RBW/VBW**
H	1302.000	56.7	25.7	8.9	37.8	53.5	74.0	-20.5	Pk 1M/3M
H	1302.000	50.5	25.7	8.9	37.8	47.3	54.0	-6.7	Avg 1M/3M
V	1302.000	52.2	25.5	8.9	37.8	48.7	74.0	-25.3	Pk 1M/3M
V	1302.000	48.6	25.5	8.9	37.8	45.1	54.0	-8.9	Avg 1M/3M
Calculations		G=C+D+E-F		I=G-H					

15.231(a)	Response	Requirement
Frequency Range (Mhz, max)	433.95MHz*	40.66-40.70 MHz and > 70MHz
Frequency Range (MHz, min)	433.95MHz*	40.66-40.70 MHz and > 70MHz
Transmit only control signal?	Yes	Only control signal allowed
Continuous transmission?	No	No
Voice transmission?	No	No
Video transmission?	No	No
Radio control of toy?	No	No

15.231(a)(1)

Manually operated?	Yes	
Deactivates within 5 seconds?	Yes	Yes
Show plot (2 second sweep)	Yes (See Pg. 16)	Yes

15.231(a)(2)

Automatically operated?	No	
Deactivates within 5 seconds?	NA	Yes

15.231(a)(3)

Periodically transmits at predetermined intervals?	No	Allowed, with restrictions
Polling signals?	No	Allowed, with restrictions
Polling rate and timing	NA	< 2 seconds per hour

15.231(a)(4)

For Emergency Use?	No	Allowed

15.231(a)(5)

Exceed 15.231(a)(1) or (a)(2) requirements?	No	Allowed for professional install

* EUT only operates at one select frequency per client information.

10 Revision History

Revision Level	Date	Report Number	Notes
0	Dec. 21, 2016	102801000ATL-001	Original Issue