
Project 18878-15

**Hubbell Control Solutions
NXOFM-1R1D-UNV**

Wireless Certification Report

Prepared for:

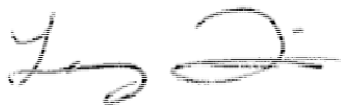
Hubbell Control Solutions
1812 Centre Creek Dr
Suite 240
Austin, TX 78754

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

16 Feb 2018

Reviewed by

A handwritten signature in black ink, appearing to read 'Larry Finn'.

Larry Finn
Chief Technical Officer

Written by

A handwritten signature in black ink, appearing to read 'Eric Lifsey'.

Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
DRAFT 02	Draft for review.	28 Jul 2017
Final 03	Add 99% BW.	16 Feb 2018

Corrections:

None.

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Compliance Certificate

Applicant	Device & Test Identification
Hubbell Control Solutions 1812 Centre Creek Dr Suite 240 Austin, TX 78754-3962 Certificate Date: 16 Feb 2018	FCC ID: YH9NXOFM1R1DUNV Industry Canada ID: 9044A-NXOFM1R1DUNV Model(s): NXOFM-1R1D-UNV Laboratory Project ID: 18878-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Requirement	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.107, 15.207	Conducted emission limits.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
RSS-247	Issue 2	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen	Issue 4	General Requirements and Information for the Certification of Radio Apparatus
RSS-102	Issue 5	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

*MPE is reported separately from this document. **Corresponding RSS references are listed in the body of the report.

I, Eric Lifsey, for Professional Testing (EMI), Inc., being familiar with the above requirements and test procedures have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

1.2 EUT Description

Table 1.2.1: Equipment Under Test		
Manufacturer / Model	Serial #	Description
Hubbell Building Automation / NXOFM-1R1D-UNV	None	2400-2483.5 MHz FHSS transceiver; using Bluetooth Low Energy radio protocols.

Table 1.2.2: Support Equipment		
Manufacturer / Model	Serial #	Description
none		none

The EUT is a sensor in support of a lighting control system. It is cylindrical and measures approximately 13.5 cm x 8 cm.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

The EUT was tested as a DTS device as its bandwidth satisfies the DTS minimum bandwidth requirements. In the final application it will be also hopping per the Bluetooth protocol.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

1.6 Radiated Measurements

Radiated levels are determined as follows:

$$\text{Raw Measured Level} + \text{Antenna Factor} + \text{Cable Losses} - \text{Amplifier Gain} = \text{Corrected Level}$$

Conducted RF levels are determined as follows:

$$\text{Raw Measured Level} + \text{Attenuator Factor} + \text{Cable Losses} = \text{Corrected Level}$$

Conducted mains levels are determined as follows:

$$\text{Raw Measured Level} + \text{LISN Factor} + \text{Cable/Filter/Limiter Losses} = \text{Corrected Level}$$

Additionally, measurement distance extrapolation factors are applied and documented where used.

1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents

Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
RSS-247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 1.7.2: Applicable Clauses

Parameter	FCC Part 15 Rule Paragraphs	IC RSS References
Transmitter Characteristics	15.247	RSS-247 5.2 (DTS) & 5.4, RSS-Gen
Bandwidth	15.247(a)(1), 2.1049, KDB 558074 D01	RSS-Gen 4.6
Spurious Emission	15.247, 15.209, 15.205	RSS-247 5.5, RSS-GEN 4.9, 4.10
Band Edge	15.247, 15.205	RSS-247 5.5, RSS-Gen 4.9
Antenna Requirement	15.203	RSS-Gen 8.3
Conducted Emissions, Mains	15.207	RSS-Gen 8.8

2.0 Fundamental Power and Duty Cycle

2.1 Test Procedure

Peak power is measured using radiated means. The transmitter hopping sequence is disabled to operate on a single channel for the measurement.

Duty cycle measurement is taken based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

2.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) // RSS-247 5.2	Fundamental Power Conducted Limits 1 W Limit Restated as Field: 125.23 dB μ V/m @ 3 m	19 May 2017

2.3 Test Results, Peak Power

The EUT was measured for radiated power in normal upright orientation. It is not operated hand-held.

Table 2.3.1 Power, Peak, Radiated			
Frequency MHz	Measured Peak Power dB μ V/m @ 3 m Vertical Polarity	Measured Peak Power dB μ V/m @ 3 m Horizontal Polarity	Maximum Measured Peak Power Restated as EIRP dBm
2402	90.0	91.7	-3.53
2440	88.3	93.0	-2.23
2480	87.8	91.7	-3.53

Measured in 1 MHz RBW, 3 MHz VBW.

The EUT was found to be in compliance with the applicable criteria.

2.4 Test Results, Duty Cycle

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

The measurement was not needed due to the low power and low spurious emissions.

3.0 Power Spectral Density

3.1 Test Procedure

A spectrum analyzer is either connected directly to the EUT or used by radiated means to measure the fundamental emission. It is adjusted to measure the power spectral density in the prescribed resolution bandwidth.

3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(e) // RSS-247, 5.2	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz	27 Jul 2017

3.3 Test Results

The fundamental peak power measured below the 8 dBm limit for this test; the EUT satisfies the criteria without additional measurement.

4.0 Occupied Bandwidth

4.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen 4.6	Bandwidth, 6 dB, 20 dB	19 Jun 2017

4.3 Test Results

The bandwidth measurement is used to verify DTS characteristics and/or for general reporting for agency application.

The EUT was found to be in compliance with applicable requirements.

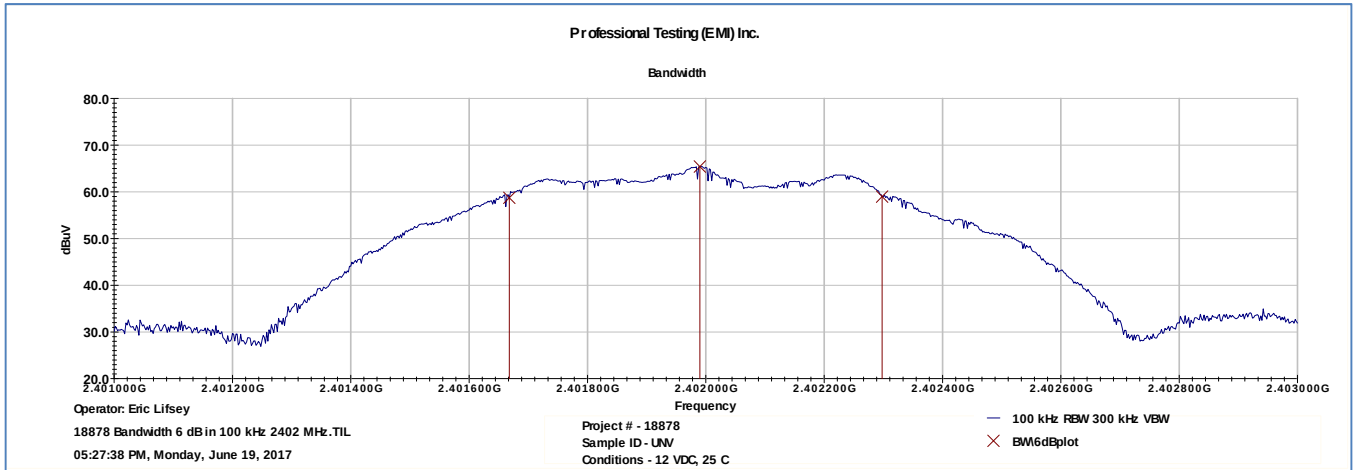
Table 4.3.1 Bandwidth 6 dB, Minimum 500 kHz in 100 kHz RBW			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Minimum BW (kHz)
630	628	624	624

Table 4.3.2 Bandwidth 20 dB, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
972	1076	1088	1088

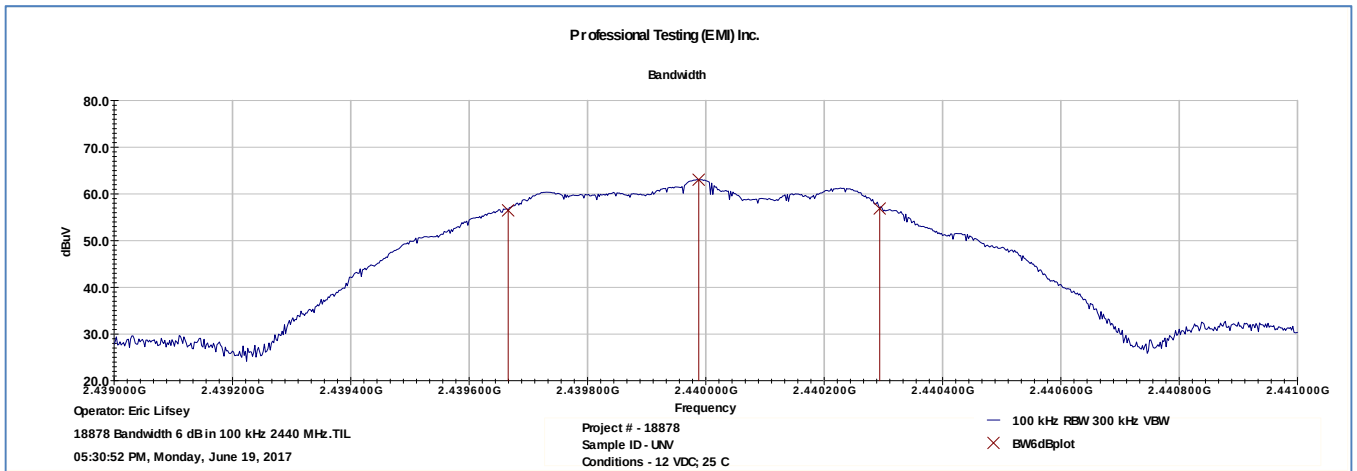
Table 4.3.3 Bandwidth OBW 99%, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
1018	1019	1015	1019

Plotted measurements appear on the following pages.

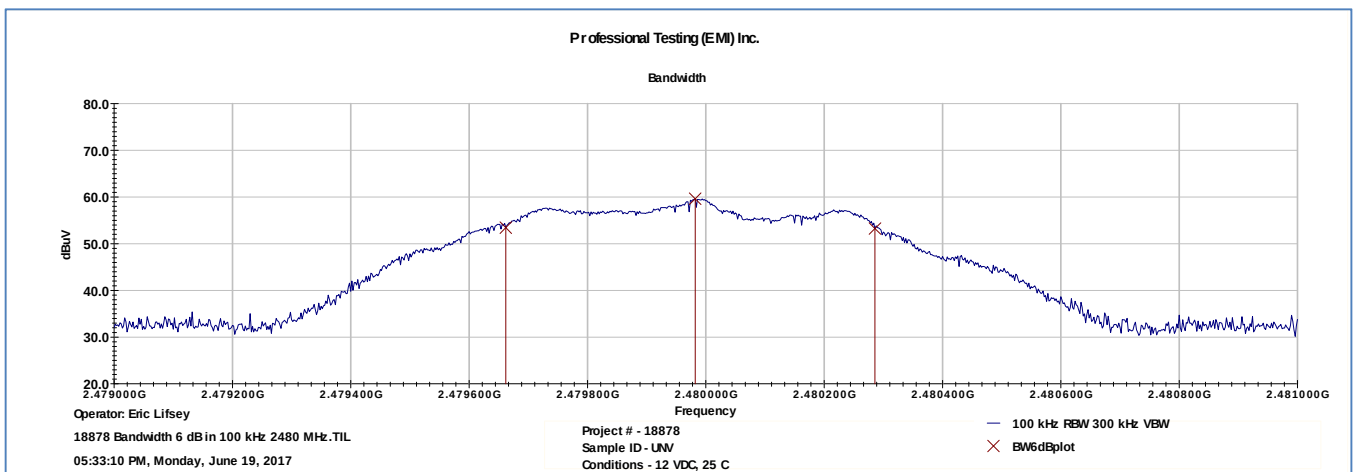
4.3.1 Bandwidth Plots, 6 dB



6 dB, Low Channel

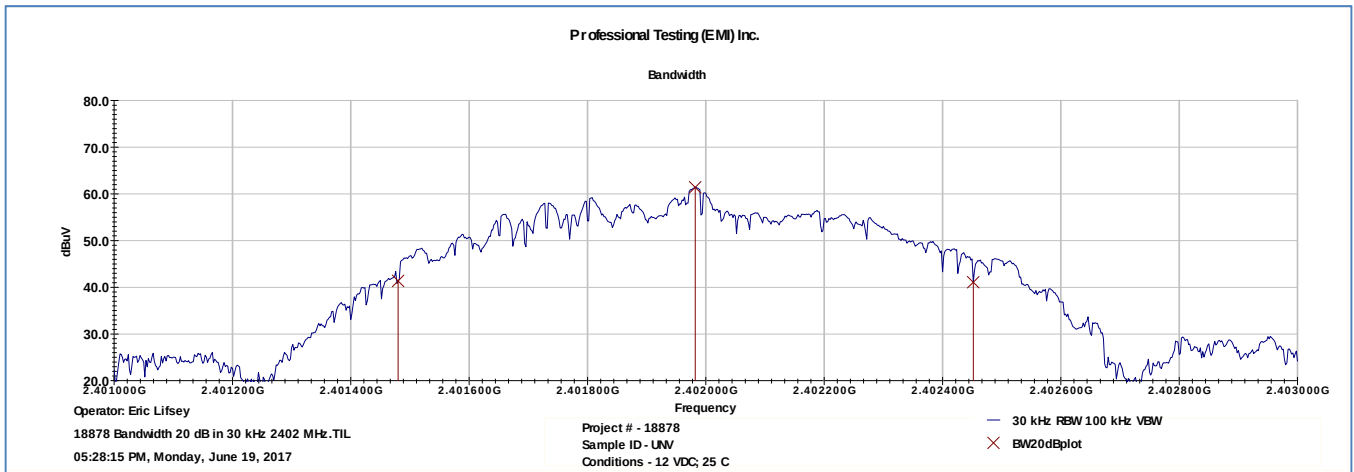


6 dB, Middle Channel

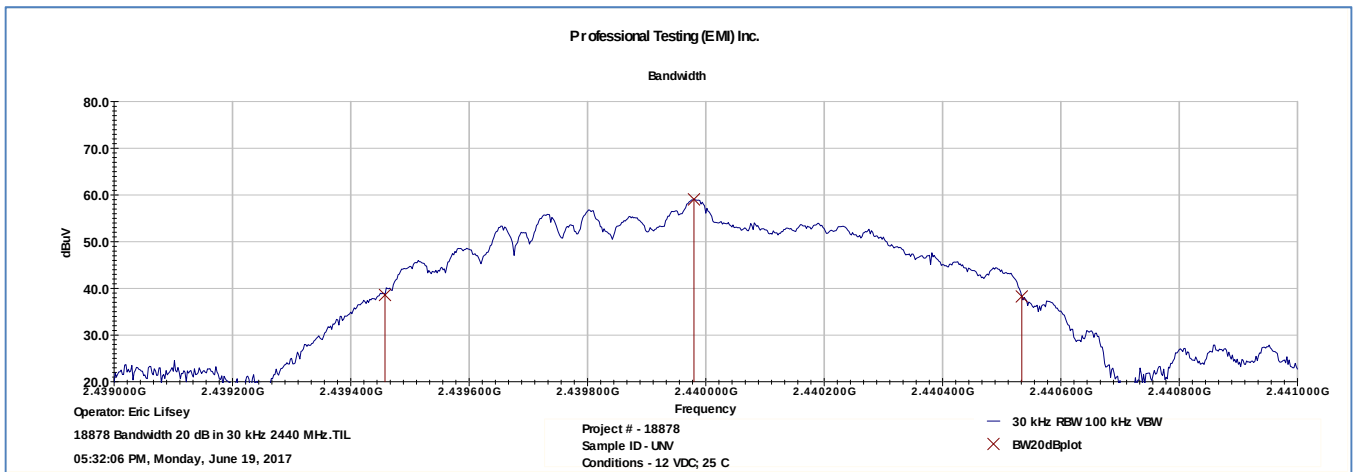


6 dB, High Channel

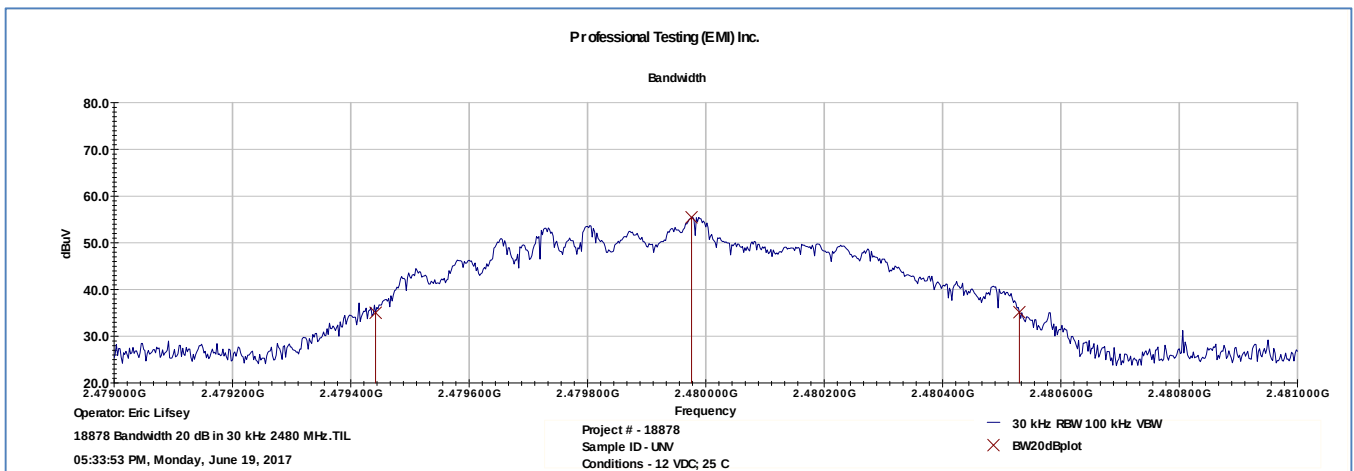
4.3.2 Bandwidth Plots, 20 dB



20 dB, Low Channel

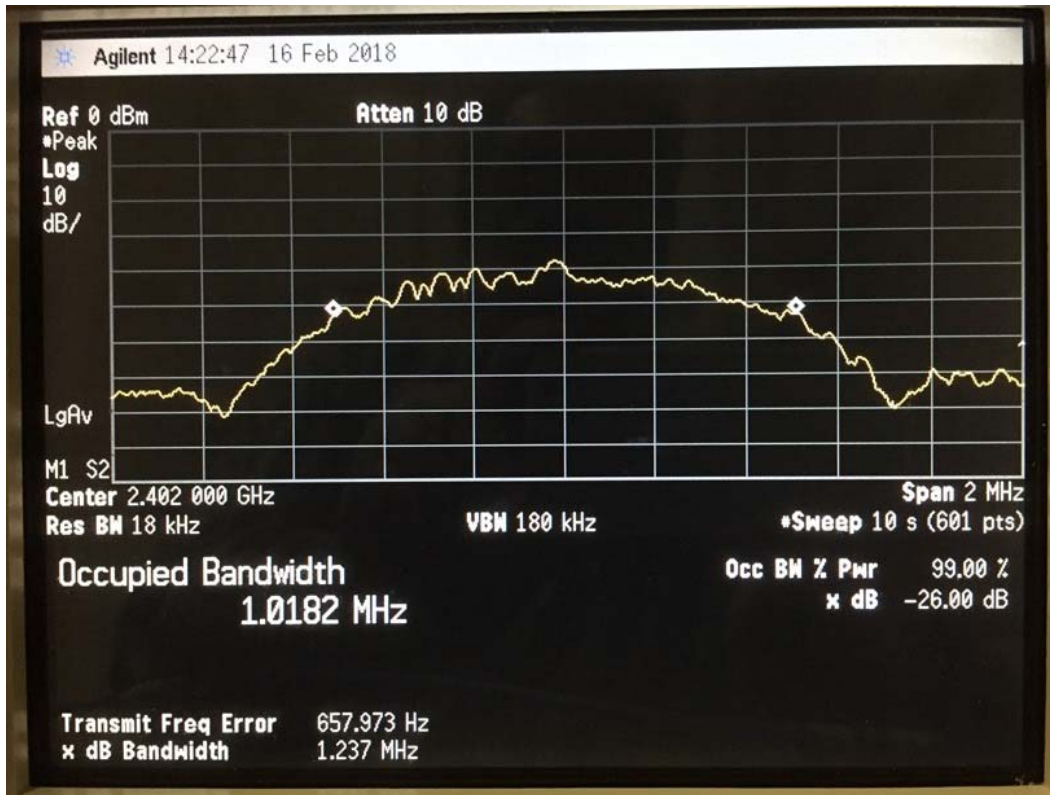


20 dB, Middle Channel

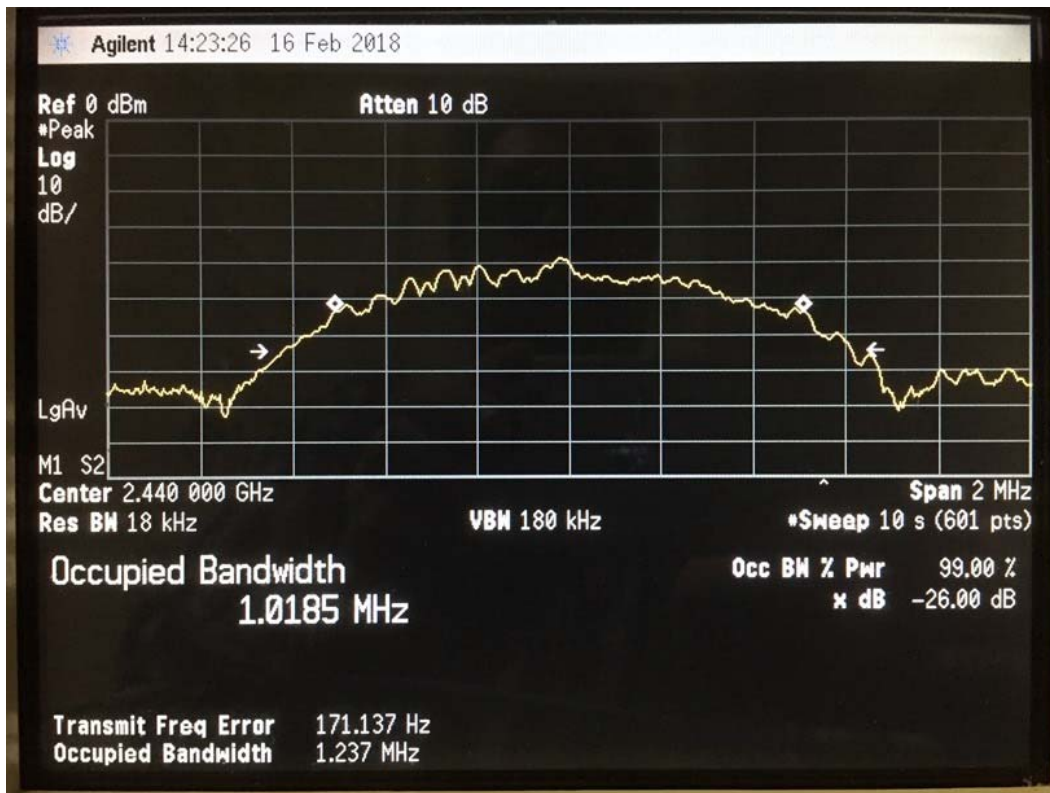


20 dB, High Channel

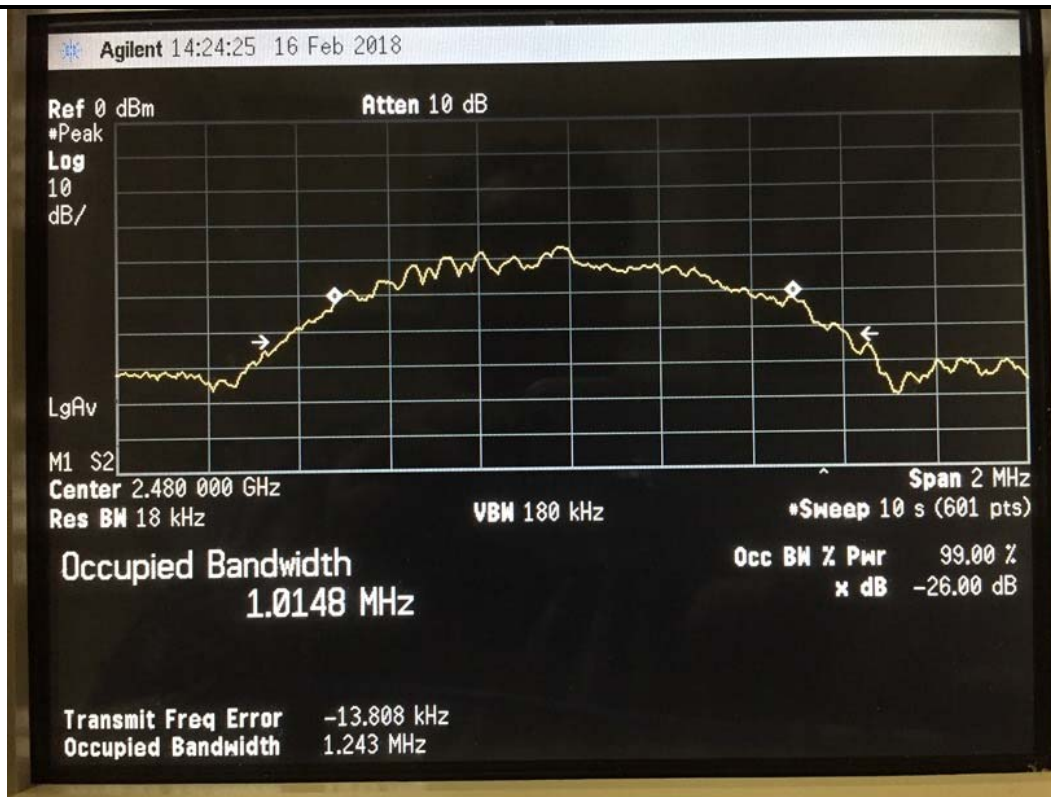
4.3.3 Bandwidth Plots, OBW 99%



Low Channel



Low Channel



High Channel

5.0 Band Edge

5.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is approximately centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method of C63.4 is utilized.

5.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 // RSS-247 5.5, RSS-Gen 4.9	Unwanted Emissions Adjacent to Authorized Band, Radiated	28 Jun 2017

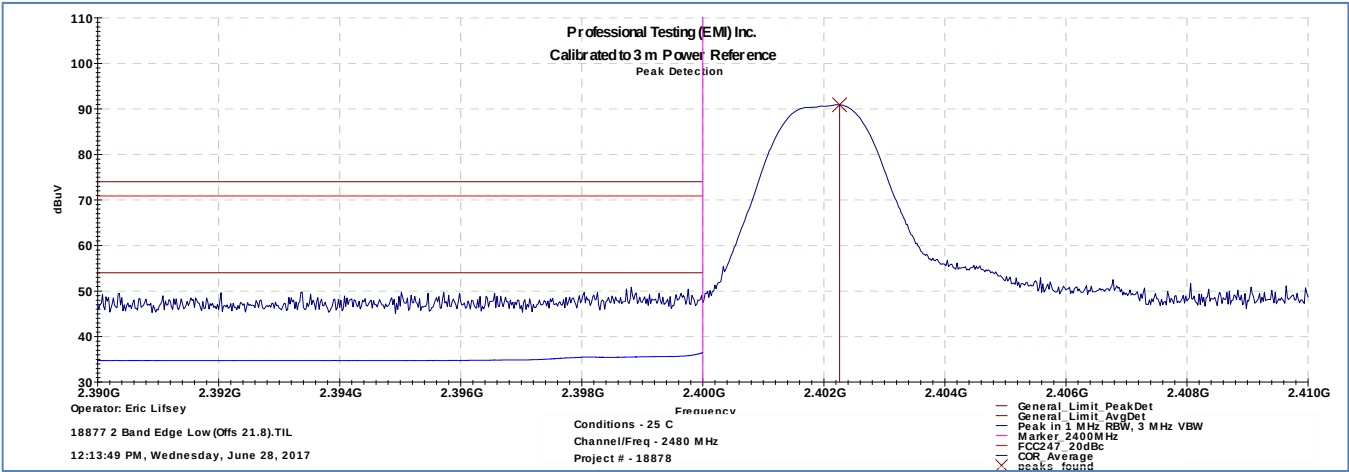
5.3 Test Results

Measurements included more than 2 standard bandwidths (standard bandwidth 1 MHz) from the band edges to provide a clear view of the fundamental and the declining emission levels. Peak detection with max-hold was employed.

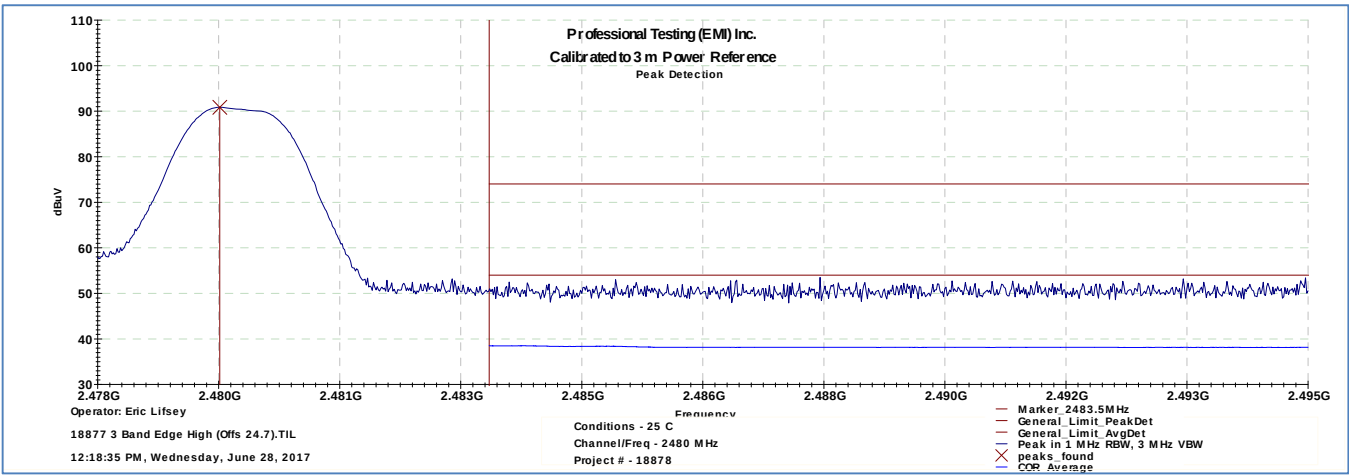
Peak detection of emissions at both band edges were below the general emission limits for average limit levels.

The EUT satisfied the criteria. Plotted results appears on the following pages.

5.3.1 Low Channel Band Edge



5.3.2 High Channel Band Edge

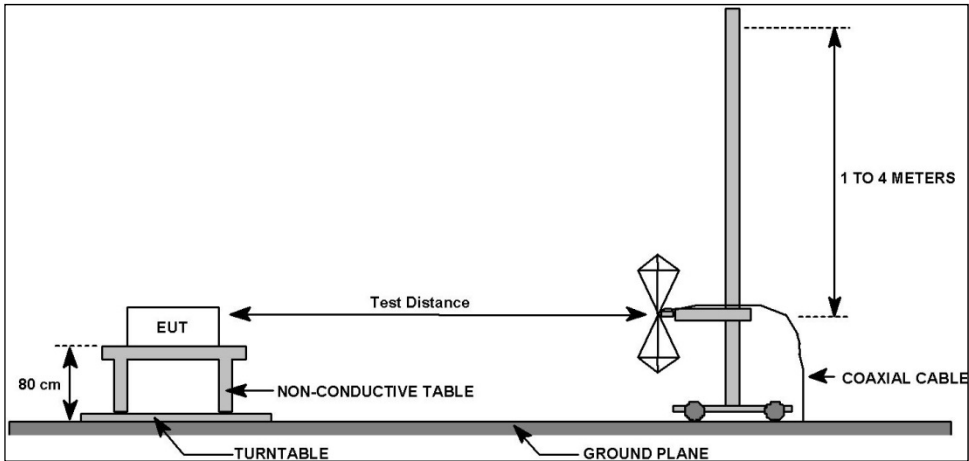


6.0 Radiated Spurious Emissions, Receive Mode

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate and 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Receive Mode	16 Jun 2017

6.3 Test Results

The EUT was tuned to the middle channel and placed in receive mode.

The EUT satisfied the criteria. Recorded data is presented below.

6.3.1 Up to 1 GHz

Professional Testing, EMI, Inc.

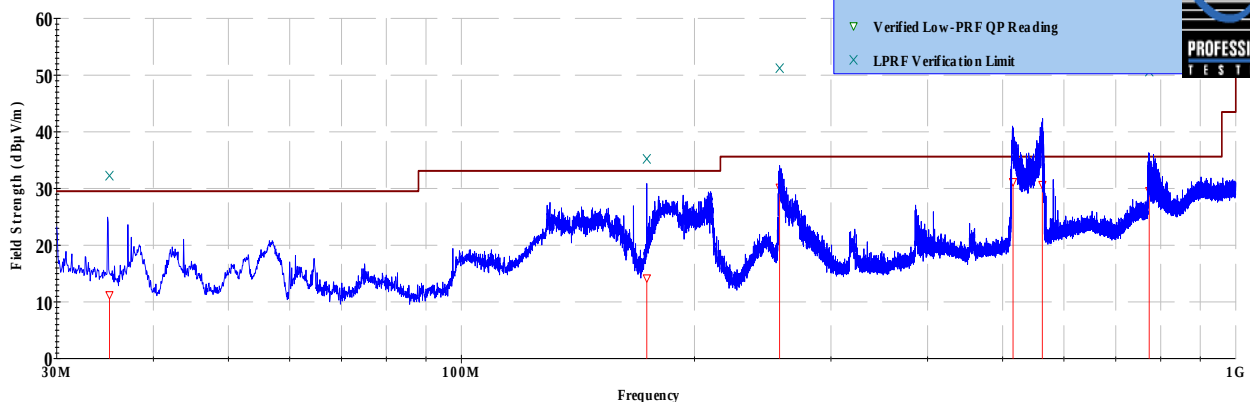
Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	6/16/2017	EUT Serial #:	None
Customer:	Hubbell Building Automation	EUT Part #:	None
Project Number:	18878-10	Test Technician:	Bob Redoutey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230 VAC			EUT Power Frequency:		50 Hz		
Antenna Orientation:		Vertical			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Receive Mode				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
35.1019	10	145	3.54	Quasi-peak	23.2	11.263	29.5	-18.2	Pass
173.56	10	28	1.28	Quasi-peak	29.8	14.212	33.1	-18.9	Pass
257.657	10	32	1.35	Quasi-peak	40.4	30.216	35.6	-5.4	Pass
515.661	10	9	3.69	Quasi-peak	36.5	31.192	35.6	-4.4	Pass
562.817	10	216	2.24	Quasi-peak	34.7	30.697	35.6	-4.9	Pass
773.462	10	141	2.2	Quasi-peak	29	29.624	35.6	-6.0	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30MHz - 1GHz Vertical Polarity Measured Emissions



Operator: Bob Redoutey
18878_11_2016 RE_041417.ttl
03:26:44 PM, Friday, June 16, 2017

EUT Mode: Receive Mode
EUT Power: 230VAC / 50Hz

EUT: NXOFM-UNV
Project Number: 18878-10
Client: Hubbell Building Automation

≤ 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	6/16/2017	EUT Serial #:	None
Customer:	Hubbell Building Automation	EUT Part #:	None
Project Number:	18878-10	Test Technician:	Bob Redoutey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Radiated Emissions Test Results Data Sheet

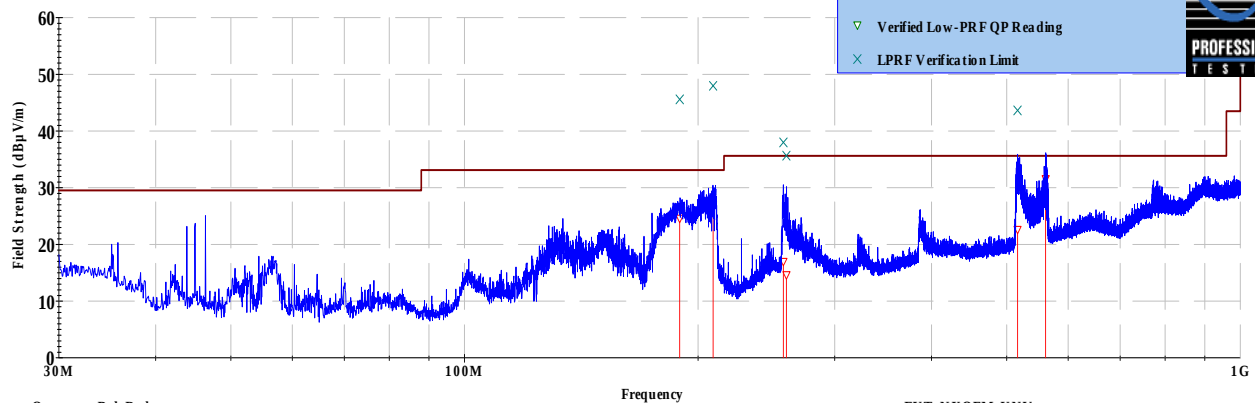
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EUT Line Voltage:		230 VAC			EUT Power Frequency:		50 Hz		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Receive Mode				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
189.446	10	59	3.56	Quasi-peak	39.9	24.577	33.1	-8.5	Pass
209.146	10	99	3.86	Quasi-peak	41.4	26.968	33.1	-6.1	Pass
257.73	10	292	1.13	Quasi-peak	27.2	16.978	35.6	-18.6	Pass
260.022	10	307	1.07	Quasi-peak	24.9	14.627	35.6	-21.0	Pass
516.291	10	227	1.41	Quasi-peak	27.9	22.622	35.6	-13.0	Pass
561.277	10	33	1.23	Quasi-peak	35.5	31.589	35.6	-4.0	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 10m Distance

30MHz - 1GHz Horizontal Polarity Measured Emissions



Operator: Bob Redoutey

18878_11_2016 RE_041417.tif

03:26:44 PM, Friday, June 16, 2017

EUT Mode: Receive Mode

EUT Power: 230VAC / 50Hz

EUT: NXOFM-UNV

Project Number: 18878-10

Client: Hubbell Building Automation

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

6.3.2 Above 1 GHz

Professional Testing, EMI, Inc.

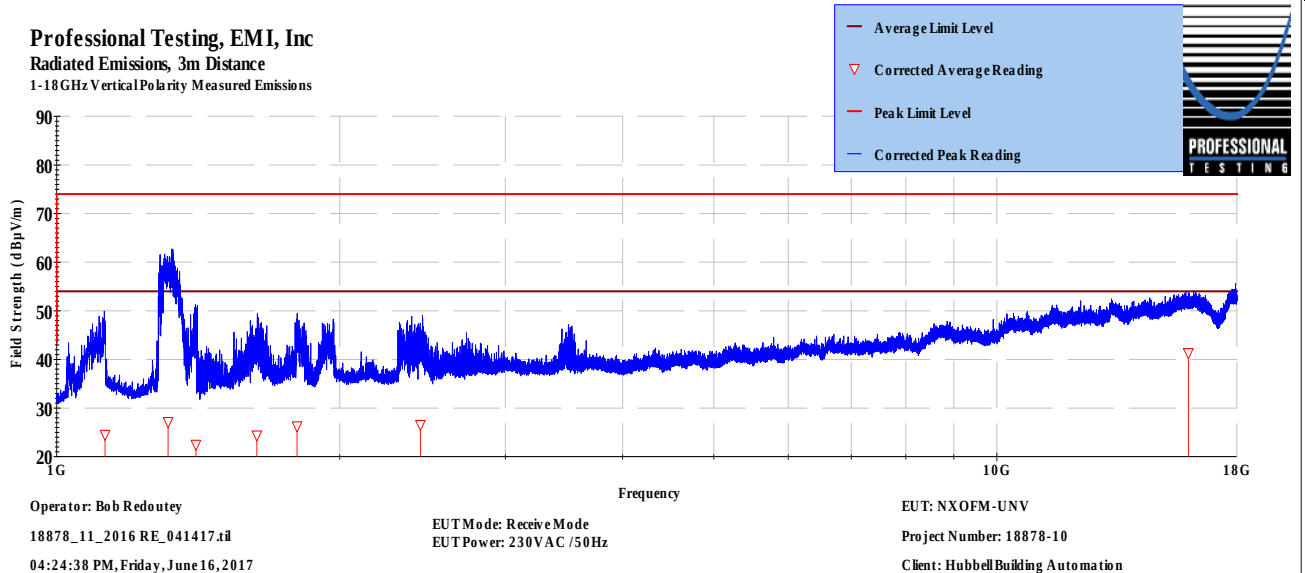
Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	6/16/2017	EUT Serial #:	None
Customer:	Hubbell Building Automation	EUT Part #:	None
Project Number:	18878-10	Test Technician:	Bob Redoutey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230 VAC			EUT Power Frequency:		50 Hz		
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Receive Mode				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1125.76	3	167	1.33	Average	37.2	24.504	54.0	-29.5	Pass
1313.5	3	44	1.29	Average	39.1	27.167	54.0	-26.8	Pass
1406.34	3	9	1.37	Average	34.5	22.475	54.0	-31.5	Pass
1632.74	3	134	1.51	Average	35.3	24.379	54.0	-29.6	Pass
1801.55	3	48	2.24	Average	36.1	26.269	54.0	-27.7	Pass
2436.85	3	134	2.01	Average	35.6	26.563	54.0	-27.4	Pass
15983.3	3	324	1.59	Average	27.1	41.351	54.0	-12.6	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Vertical Polarity Measured Emissions



> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	6/16/2017	EUT Serial #:	None
Customer:	Hubbell Building Automation	EUT Part #:	None
Project Number:	18878-10	Test Technician:	Bob Redoutey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Radiated Emissions Test Results Data Sheet

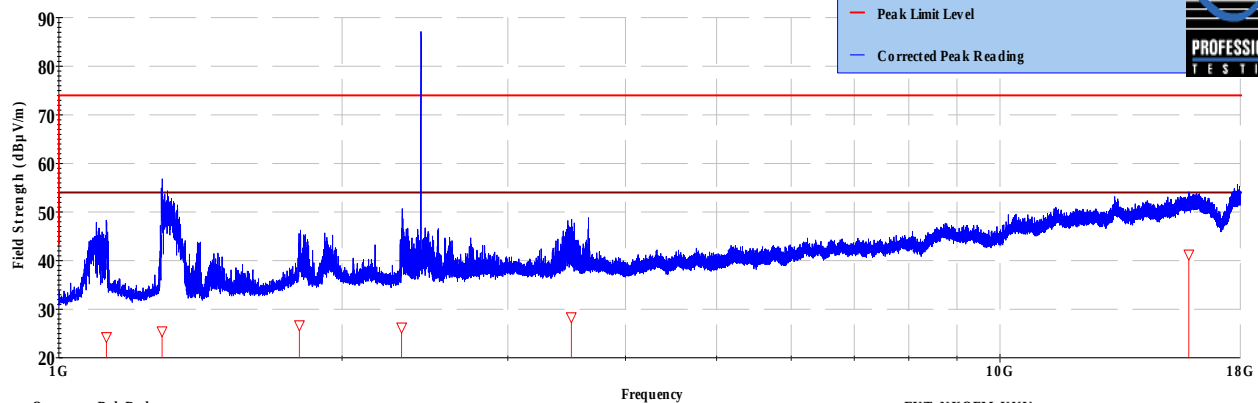
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EUT Line Voltage:		230 VAC			EUT Power Frequency:		50 Hz		
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Receive Mode				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
1123.59	3	270	1.82	Average	37	24.298	54.0	-29.7	Pass
1287.38	3	249	3.81	Average	37.4	25.507	54.0	-28.5	Pass
1801.47	3	326	2.24	Average	36.5	26.711	54.0	-27.2	Pass
2313.16	3	312	2.26	Average	35.7	26.26	54.0	-27.7	Pass
3503.36	3	173	2.86	Average	35.5	28.41	54.0	-25.5	Pass
15874.7	3	287	3.69	Average	27.4	41.292	54.0	-12.7	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Bob Redoutey

18878_11_2016 RE_041417.tif

04:24:38 PM, Friday, June 16, 2017

EUT Mode: Receive Mode
EUT Power: 230VAC / 50Hz

EUT: NXOFM-UNV

Project Number: 18878-10

Client: Hubbell Building Automation

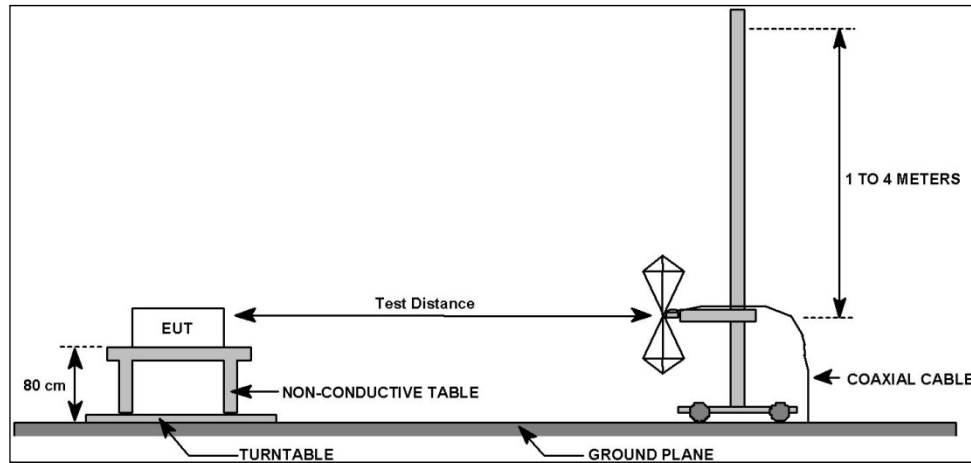
> 1GHz Horizontal Antenna Polarity Measured Emissions

7.0 Radiated Spurious Emissions, Transmit Mode

7.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate using 1 MHz resolution bandwidth. A diagram showing the test setup appears below.



7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-247 5.5, RSS-Gen 4.9 & 4.10	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	14 Mar 2017

7.3 Test Results

Below 1 GHz measurements were taken for the middle channel. Above 1 GHz measurements were taken for the three standard channels of the band.

All measurements used peak detection.

7.3.1 Up to 1 GHz, Middle Channel

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		3/14/2017			EUT Serial #:		0		
Customer:		Hubbell Building Automation			EUT Part #:		0		
Project Number:		18878			Test Technician:		Spencer Flint		
Purchase Order #:		0			Supervisor:		Lisa Arndt		
Equip. Under Test:		NXOFM-UNV			Witness' Name:		None		
Radiated Emissions Test Results Data Sheet									
Page: 1 of 1									
EUT Line Voltage:		230		VAC		EUT Power Frequency:		50 Hz	
Antenna Orientation:		Vertical		Frequency Range:		30MHz to 1GHz			
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
70.2463	10	39	1.35	Quasi-peak	39.7	19.528	29.5	-10.0	Pass
209.089	10	42	1.21	Quasi-peak	39.8	24.986	33.1	-8.1	Pass
258.563	10	187	1.31	Quasi-peak	37.7	27.046	35.6	-8.6	Pass
276.44	10	274	1.55	Quasi-peak	38.2	27.504	35.6	-8.1	Pass
515.576	10	71	3.99	Quasi-peak	36.7	30.578	35.6	-5.0	Pass
563.413	10	251	1.99	Quasi-peak	27.6	23.241	35.6	-12.4	Pass
773.87	10	36	2.08	Quasi-peak	28.9	28.512	35.6	-7.1	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Vertical Polarity Measured Emissions Operator: Spencer Flint 18878_2016 RE_2440M_30M-26G_04.tif 04:57:00 PM, Tuesday, May 16, 2017 — Quasi-peak Limit Level △ Corrected Quasi-peak Reading — Corrected Peak Value ▽ Verified Low-PRF QP Reading × LPRF Verification Limit EUT: NXOFM-UNV Project Number: 18878-15 Client: Hubbell Building									
≤ 1GHz Vertical Antenna Polarity Measured Emissions									

Professional Testing, EMI, Inc.

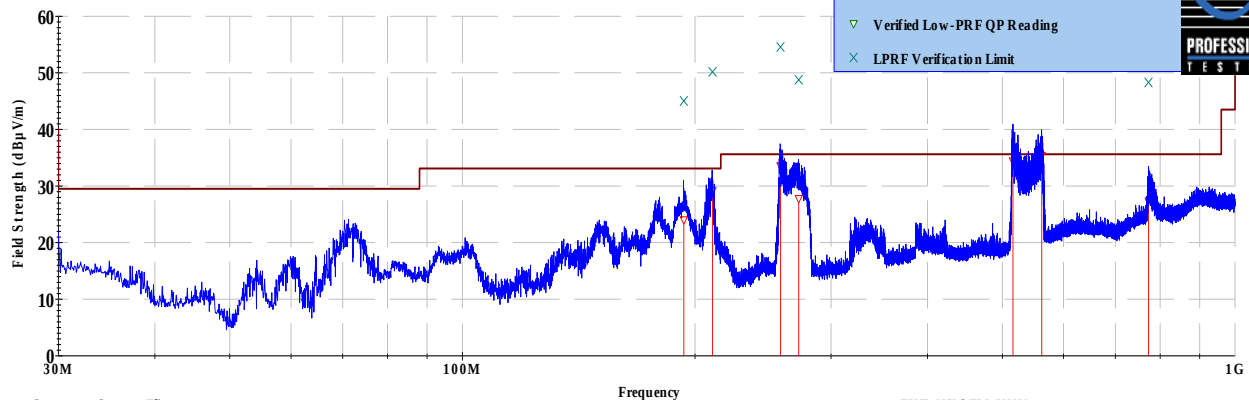
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
193.52	10	48	2.76	Quasi-peak	39.1	24.025	33.1	-9.1	Pass
210.746	10	275	3.02	Quasi-peak	44	29.184	33.1	-3.9	Pass
258.021	10	74	3.41	Quasi-peak	44.3	33.567	35.6	-2.0	Pass
272.471	10	61	1.86	Quasi-peak	38.4	27.767	35.6	-7.8	Pass
516.013	10	113	1.7	Quasi-peak	40.5	34.408	35.6	-1.2	Pass
562.179	10	132	1.15	Quasi-peak	39.7	35.373	35.6	-0.2	Pass
772.882	10	109	3.02	Quasi-peak	27.7	27.314	35.6	-8.3	Pass

Professional Testing, EMI, Inc.
Radiated Emissions, 10m Distance
30MHz - 1GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2440M_30M-26G_04.tif

04:57:00 PM, Tuesday, May 16, 2017

EUT Mode: Transmitting
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.2 1 GHz to 18 GHz, Bottom Channel

Professional Testing, EMI, Inc.

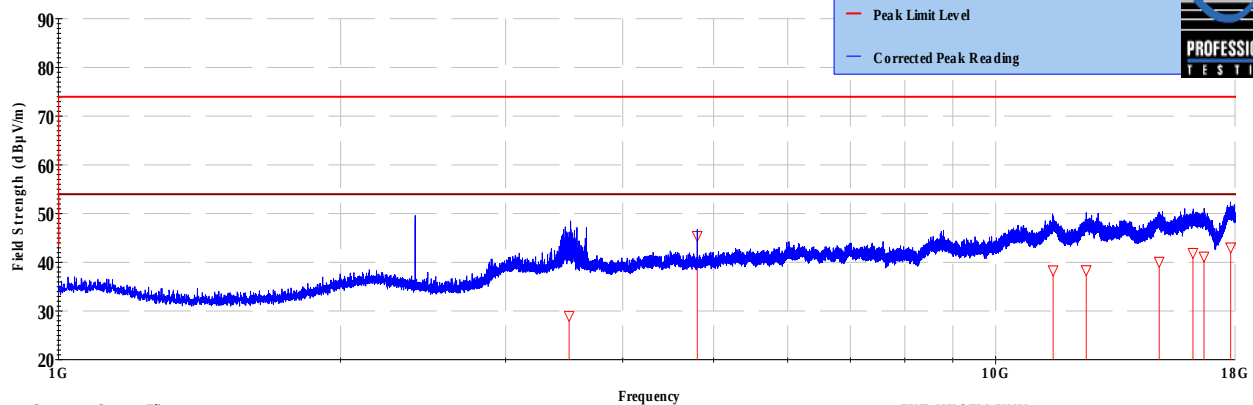
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Bottom Channel - 2402 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3506.61	3	171	2.23	Average	34.8	29.041	54.0	-24.9	Pass
4804.03	3	204	1.26	Average	49.1	45.423	54.0	-8.5	Pass
11515.8	3	132	2.01	Average	27.3	38.366	54.0	-15.6	Pass
12490.4	3	237	2.16	Average	27.7	38.426	54.0	-15.5	Pass
14944.4	3	183	3.8	Average	28.3	40.15	54.0	-13.8	Pass
16235.9	3	262	3.74	Average	27.5	41.938	54.0	-12.0	Pass
16684.9	3	311	1.43	Average	27.2	41.201	54.0	-12.8	Pass
17811.2	3	94	3.34	Average	27	43.078	54.0	-10.9	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Vertical Polarity Measured Emissions



Operator: Spencer Flint
18878_2016 RE_2402M_1-26G.tif
10:51:39 AM, Friday, May 19, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV
Project Number: 18878-15
Client: Hubbell Building

> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

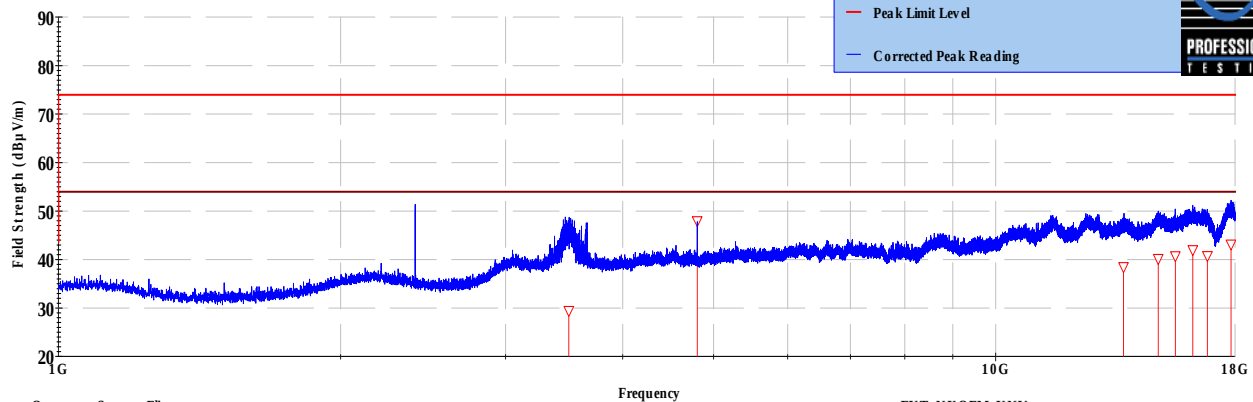
Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Bottom Channel - 2402 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3504.46	3	82	2.42	Average	35.2	29.437	54.0	-24.5	Pass
4803.97	3	75	2.77	Average	51.7	47.941	54.0	-6.0	Pass
13690.4	3	260	2.96	Average	28.4	38.467	54.0	-15.5	Pass
14911.2	3	50	1.13	Average	28.4	40.155	54.0	-13.8	Pass
15549.2	3	128	2.11	Average	27.1	40.723	54.0	-13.2	Pass
16231.6	3	92	2.77	Average	27.5	41.986	54.0	-12.0	Pass
16822.3	3	141	2.05	Average	27.5	40.76	54.0	-13.2	Pass
17827.8	3	308	1.81	Average	27	43.133	54.0	-10.8	Pass

Professional Testing, EMI, Inc. Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint
18878_2016 RE_2402M_1-26G.tif
10:51:39 AM, Friday, May 19, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV
Project Number: 18878-15
Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.3 1 GHz to 18 GHz, Middle Channel

Professional Testing, EMI, Inc.

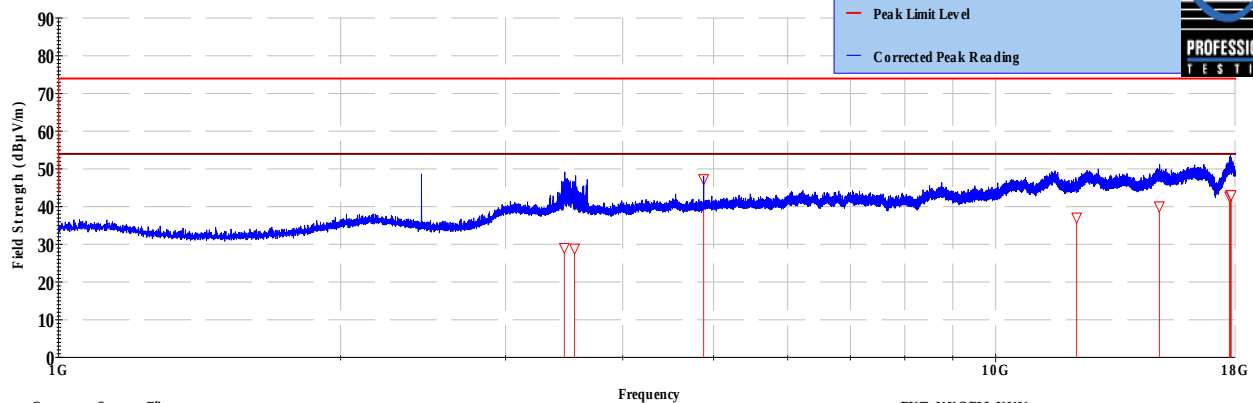
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:			230	VAC	EUT Power Frequency:			50	Hz
Antenna Orientation:			Vertical		Frequency Range:			Above 1GHz	
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3465.96	3	180	3.36	Average	35	29.103	54.0	-24.9	Pass
3554.21	3	286	2.54	Average	34.7	28.931	54.0	-25.0	Pass
4879.91	3	242	3.27	Average	50.8	47.339	54.0	-6.6	Pass
12198.8	3	320	2.73	Average	26.7	37.124	54.0	-16.8	Pass
14946.2	3	29	3.13	Average	28.2	40.118	54.0	-13.8	Pass
17767.8	3	104	1.09	Average	26.7	42.746	54.0	-11.2	Pass
17808.6	3	92	2.73	Average	27.1	43.142	54.0	-10.8	Pass
17835.7	3	19	3.09	Average	27	43.114	54.0	-10.8	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz VerticalPolarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2440M_30M-26G_04.tif

11:01:24 AM, Wednesday, May 17, 2017

EUT Mode: Transmitting
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

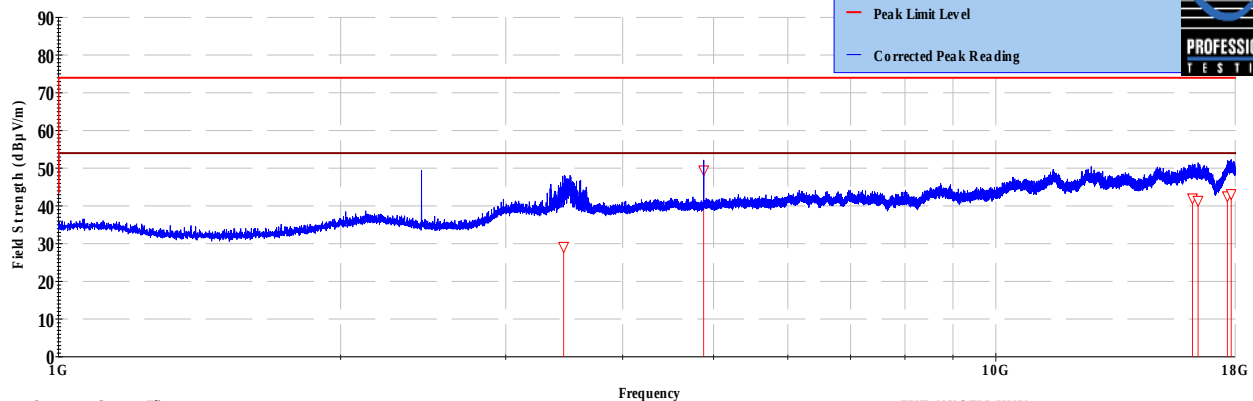
Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3458.6	3	103	1.28	Average	35.1	29.187	54.0	-24.8	Pass
4879.94	3	50	1.14	Average	53	49.491	54.0	-4.5	Pass
16209.8	3	128	2.05	Average	27.5	42.035	54.0	-11.9	Pass
16432.6	3	71	3.18	Average	27.2	41.415	54.0	-12.5	Pass
17664.9	3	49	2.92	Average	27	42.617	54.0	-11.3	Pass
17829.4	3	165	2.18	Average	27.1	43.233	54.0	-10.7	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2440M_30M-26G_04.tif

11:01:24 AM, Wednesday, May 17, 2017

EUT Mode: Transmitting
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.4 1 GHz to 18 GHz, Top Channel

Professional Testing, EMI, Inc.

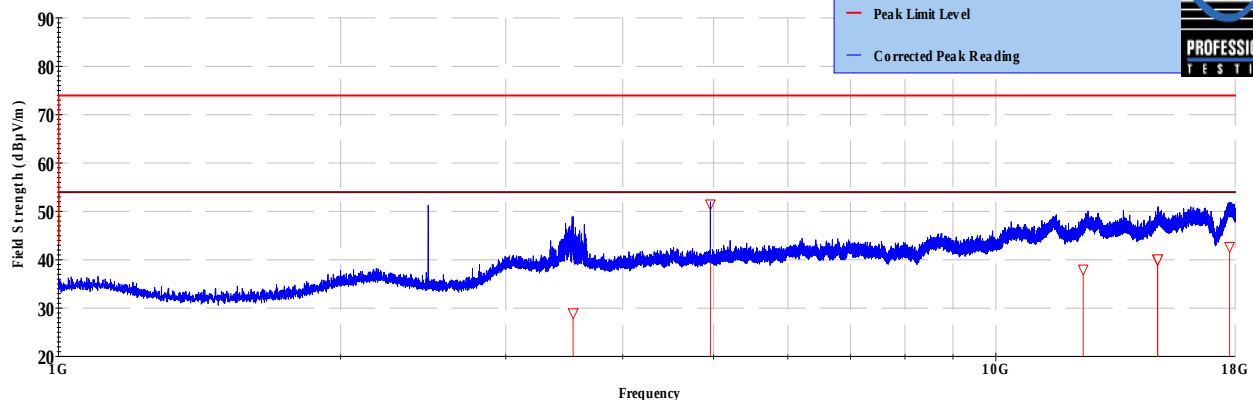
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:			230	VAC	EUT Power Frequency:			50	Hz
Antenna Orientation:			Vertical		Frequency Range:			Above 1GHz	
EUT Mode of Operation:					Transmitting (Top Channel - 2480 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3540.72	3	134	1.31	Average	34.7	28.983	54.0	-25.0	Pass
4959.94	3	210	1.2	Average	54.7	51.475	54.0	-2.5	Pass
12396.7	3	56	3.74	Average	27.3	38.016	54.0	-15.9	Pass
14877.8	3	123	1.96	Average	28.5	40.021	54.0	-13.9	Pass
14888.1	3	9	2.73	Average	28.5	40.109	54.0	-13.8	Pass
17760.3	3	135	2.89	Average	26.7	42.722	54.0	-11.2	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Vertical Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2480M_1-26G.tif

12:43:49 PM, Wednesday, May 17, 2017

EUT Mode: Tx

EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

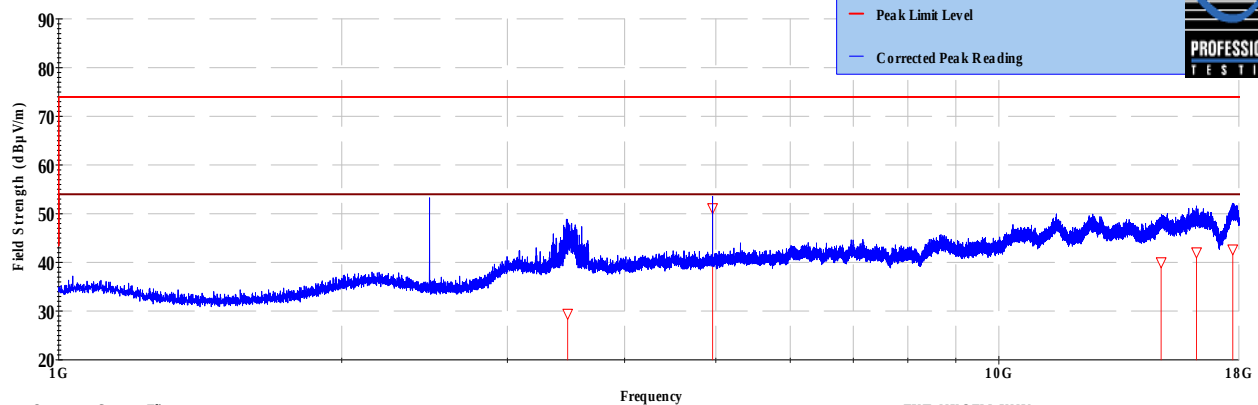
Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Top Channel - 2480 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
3478.34	3	82	2.67	Average	35.3	29.49	54.0	-24.5	Pass
4959.92	3	66	2.86	Average	54.4	51.179	54.0	-2.8	Pass
14881.2	3	266	1.35	Average	28.5	40.06	54.0	-13.9	Pass
16225.1	3	290	2.4	Average	27.6	42.107	54.0	-11.9	Pass
17732.8	3	182	2.37	Average	26.7	42.703	54.0	-11.3	Pass

Professional Testing, EMI, Inc.

Radiated Emissions, 3m Distance

1-18GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2480M_1-26G.tif

12:43:49 PM, Wednesday, May 17, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.5 18 GHz to 25 GHz, Bottom Channel

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		3/14/2017			EUT Serial #:		0		
Customer:		Hubbell Building Automation			EUT Part #:		0		
Project Number:		18878			Test Technician:		Spencer Flint		
Purchase Order #:		0			Supervisor:		Lisa Arndt		
Equip. Under Test:		NXOFM-UNV			Witness' Name:		None		
Radiated Emissions Test Results Data Sheet									
Page: 1 of 1									
EUT Line Voltage:		230		VAC		EUT Power Frequency:		50 Hz	
Antenna Orientation:		Vertical		Frequency Range:		Above 1GHz			
EUT Mode of Operation:					Transmitting (Bottom Channel - 2402 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
19217.9	3	182	1	Average	32.5	26.553	54.0	-27.4	Pass
20301.5	3	41	1	Average	32.6	26.886	54.0	-27.1	Pass
21612	3	347	1	Average	33	27.171	54.0	-26.8	Pass
23200.2	3	140	1	Average	33.7	28.579	54.0	-25.4	Pass
24009.3	3	293	1	Average	33.6	29.41	54.0	-24.5	Pass
24789.4	3	357	1	Average	34.3	30.478	54.0	-23.5	Pass
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions The graph displays field strength in dBµV/m on the y-axis (ranging from 20 to 90) against frequency in GHz on the x-axis (ranging from 18.0 to 26.5). A solid red line represents the Average Limit Level at approximately 75 dBµV/m. A dashed red line represents the Peak Limit Level at approximately 85 dBµV/m. A blue line with markers shows the corrected average readings, which remain consistently below the average limit level. Red triangles indicate the corrected peak readings, which are also well below the peak limit level. The background of the graph area is light blue. — Average Limit Level ▽ Corrected Average Reading — Peak Limit Level — Corrected Peak Reading PROFESSIONAL TESTING Operator: Spencer Flint 18878_2016 RE_2402M_1-26G.tif 12:34:59 PM, Friday, May 19, 2017 EUT Mode: Tx EUT Power: 230 VAC / 50 Hz EUT: NXOFM-UNV Project Number: 18878-15 Client: Hubbell Building									
> 1GHz Vertical Antenna Polarity Measured Emissions									

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

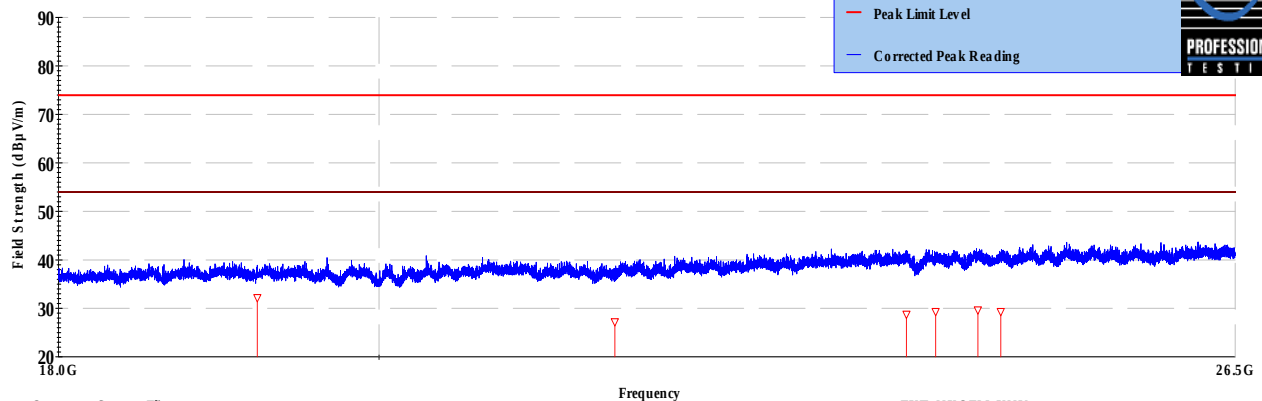
Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Bottom Channel - 2402 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
19215.7	3	16	1	Average	38.1	32.178	54.0	-21.8	Pass
21612	3	313	1	Average	33.1	27.199	54.0	-26.8	Pass
23786.5	3	165	1	Average	33.1	28.763	54.0	-25.2	Pass
24016.1	3	298	1	Average	33.5	29.318	54.0	-24.6	Pass
24351.8	3	236	1	Average	33.6	29.657	54.0	-24.3	Pass
24535.2	3	36	1	Average	33.3	29.317	54.0	-24.6	Pass

Professional Testing, EMI, Inc

Radiated Emissions, Measured at 1m and Scaled to 3m Distance
18-26.5 GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2402M_1-26G.tif

12:34:59 PM, Friday, May 19, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.6 18 GHz to 25 GHz, Middle Channel

Professional Testing, EMI, Inc.

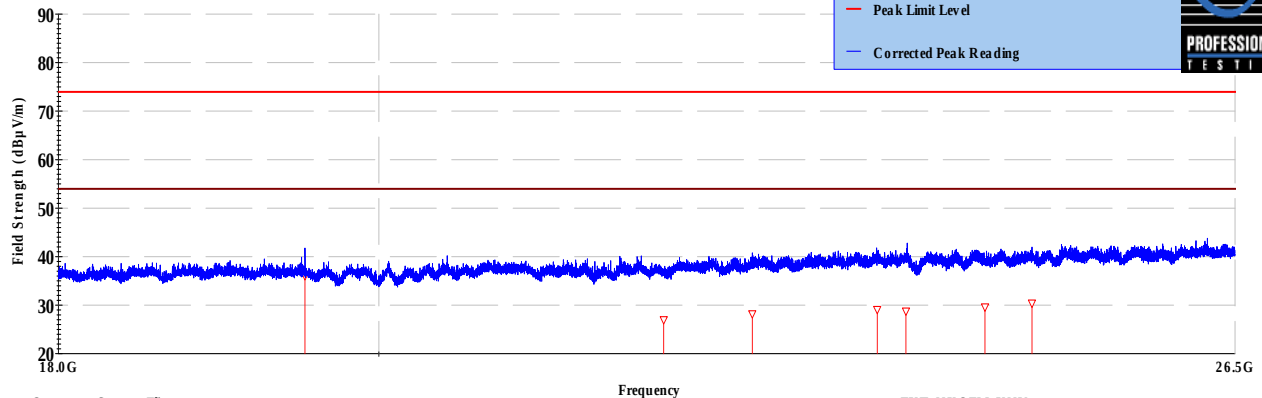
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
19519.8	3	17	1	Average	42	36.053	54.0	-17.9	Pass
21962.8	3	30	1	Average	32.5	26.981	54.0	-27.0	Pass
22611.8	3	206	1	Average	33.2	28.191	54.0	-25.8	Pass
23559.6	3	305	1	Average	33.7	29.075	54.0	-24.9	Pass
23783.9	3	139	1	Average	33.1	28.764	54.0	-25.2	Pass
24409.6	3	262	1	Average	33.6	29.6	54.0	-24.4	Pass
24789.7	3	120	1	Average	34.2	30.372	54.0	-23.6	Pass

Professional Testing, EMI, Inc
Radiated Emissions, Measured at 1m and Scaled to 3m Distance
18-26.5 GHz Vertical Polarity Measured Emissions



Operator: Spencer Flint

Copy of 18878_2016 RE_2440M_30M-26G_04.tif

02:11:38 PM, Friday, May 19, 2017

EUT Mode: Transmitting
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

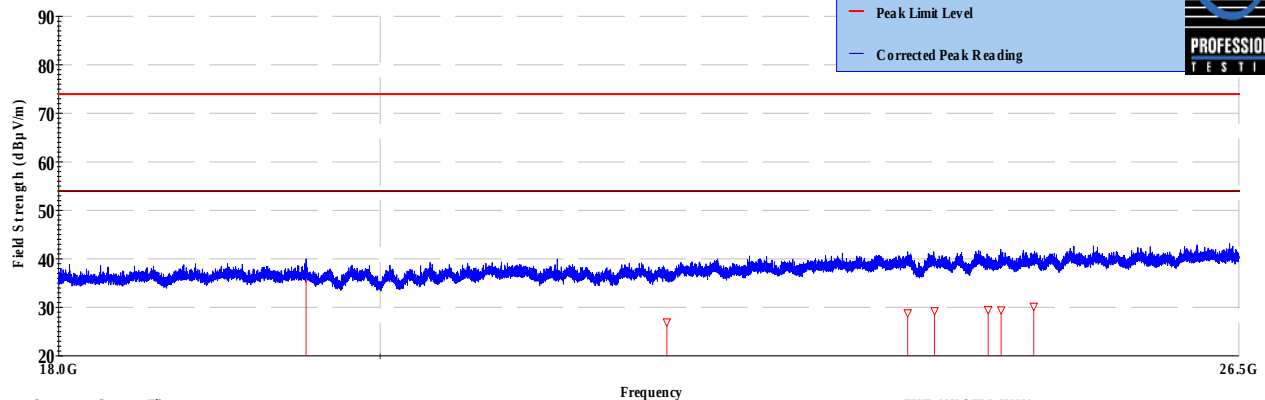
Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Mid Channel - 2440 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
19519.8	3	21	1	Average	36.2	30.277	54.0	-23.7	Pass
21969.4	3	201	1	Average	32.5	26.982	54.0	-27.0	Pass
23774	3	348	1	Average	33.2	28.867	54.0	-25.1	Pass
23984.9	3	344	1	Average	33.5	29.278	54.0	-24.7	Pass
24409.2	3	232	1	Average	33.5	29.504	54.0	-24.5	Pass
24513.7	3	18	1	Average	33.5	29.437	54.0	-24.5	Pass
24777.3	3	335	1	Average	34	30.194	54.0	-23.8	Pass

Professional Testing, EMI, Inc

Radiated Emissions, Measured at 1m and Scaled to 3m Distance
18-26.5 GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

Copy of 18878_2016 RE_2440M_30M-26G_04.tif

02:11:38 PM, Friday, May 19, 2017

EUT Mode: Transmitting
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

7.3.7 18 GHz to 25 GHz, Top Channel

Professional Testing, EMI, Inc.

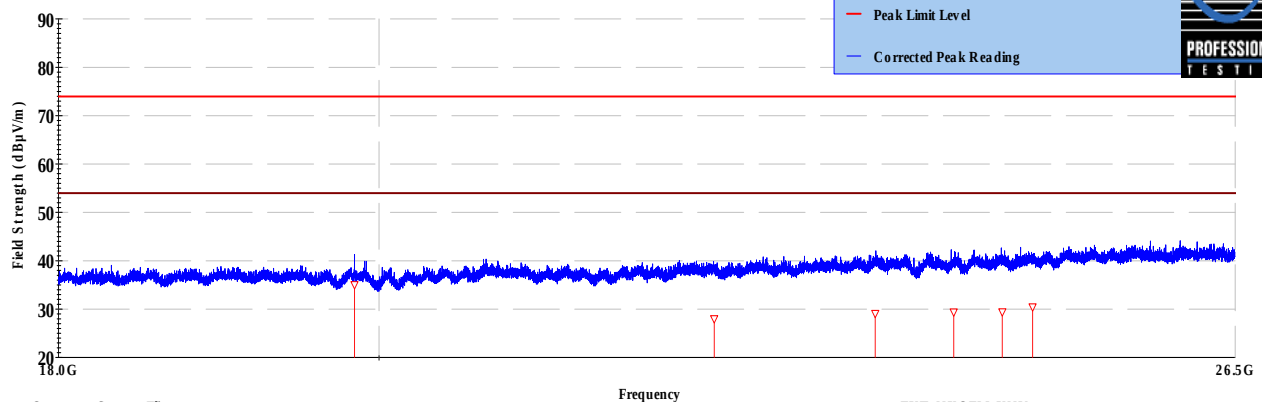
Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Vertical			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Top Channel - 2480 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
19839.9	3	17	1	Average	40.8	35.025	54.0	-18.9	Pass
22330	3	33	1	Average	33.1	27.995	54.0	-26.0	Pass
23544.2	3	306	1	Average	33.7	29.082	54.0	-24.9	Pass
24158.7	3	63	1	Average	33.4	29.368	54.0	-24.6	Pass
24548.1	3	205	1	Average	33.4	29.411	54.0	-24.5	Pass
24793.5	3	341	1	Average	34.2	30.444	54.0	-23.5	Pass

Professional Testing, EMI, Inc
Radiated Emissions, Measured at 1m and Scaled to 3m Distance
18-26.5 GHz Vertical Polarity Measured Emissions



Operator: Spencer Flint
18878_2016 RE_2480M_1-26G.tif
03:19:09 PM, Friday, May 19, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV
Project Number: 18878-15
Client: Hubbell Building

> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

Test Method:	ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	3/14/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	0
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	None

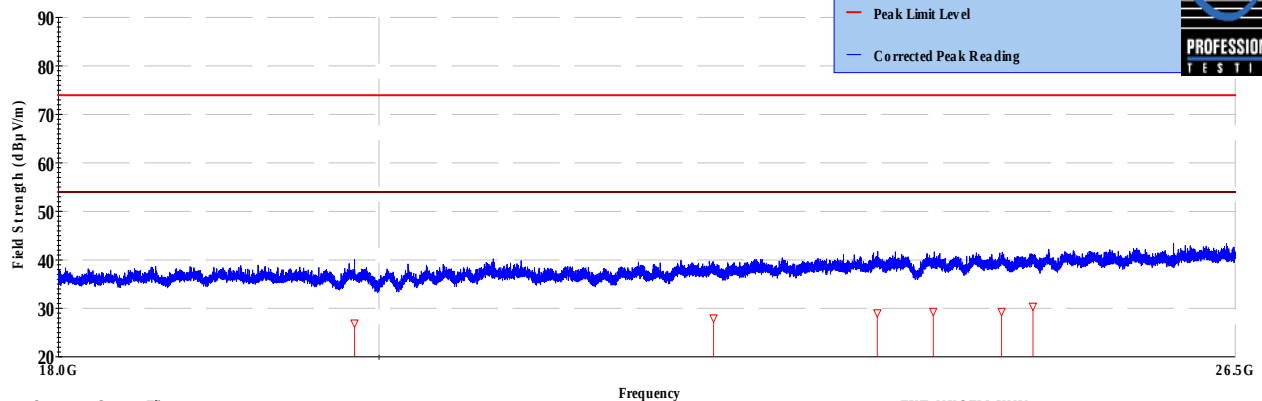
Radiated Emissions Test Results Data Sheet

Page: 1 of 1

EUT Line Voltage:		230	VAC		EUT Power Frequency:		50	Hz	
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmitting (Top Channel - 2480 MHz)				
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBμV)	Corrected Level (dBμV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
19839.7	3	245	1	Average	32.7	26.96	54.0	-27.0	Pass
22325.4	3	102	1	Average	33.1	27.997	54.0	-26.0	Pass
23560.1	3	67	1	Average	33.7	29.072	54.0	-24.9	Pass
23996.9	3	75	1	Average	33.5	29.349	54.0	-24.6	Pass
24541.5	3	301	1	Average	33.4	29.343	54.0	-24.6	Pass
24796.4	3	296	1	Average	34.2	30.396	54.0	-23.6	Pass

Professional Testing, EMI, Inc

Radiated Emissions, Measured at 1m and Scaled to 3m Distance
18-26.5 GHz Horizontal Polarity Measured Emissions



Operator: Spencer Flint

18878_2016 RE_2480M_1-26G.tif

03:19:09 PM, Friday, May 19, 2017

EUT Mode: Tx
EUT Power: 230 VAC / 50 Hz

EUT: NXOFM-UNV

Project Number: 18878-15

Client: Hubbell Building

> 1GHz Horizontal Antenna Polarity Measured Emissions

8.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

8.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

8.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203 // RSS-Gen 8.3	Antenna Construction	1 Nov 2017

8.3 Results

- Antenna is chip style component soldered to the circuit board.
- There is no external antenna connector.

The antenna design above satisfies the requirements of the rules.

9.0 Conducted Emissions, Mains

9.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor and 0.4 meters from the conductive reference plane (wall). The EUT is powered through a line impedance stabilization network (LISN) that provides a measurement tap and a termination approximating 50 Ohms in the measurement range of 150 kHz to 30 MHz. A spectrum analyzer is connected, in turn, to each mains line measurement tap and the measurement is taken.

9.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.107, 15.207 // RSS-Gen	Mains conducted emissions	18 May 2017

9.3 Test Results

The EUT satisfied the criteria.

Tabular and plotted measurements appear on the following pages.

9.3.1 Mains, Neutral

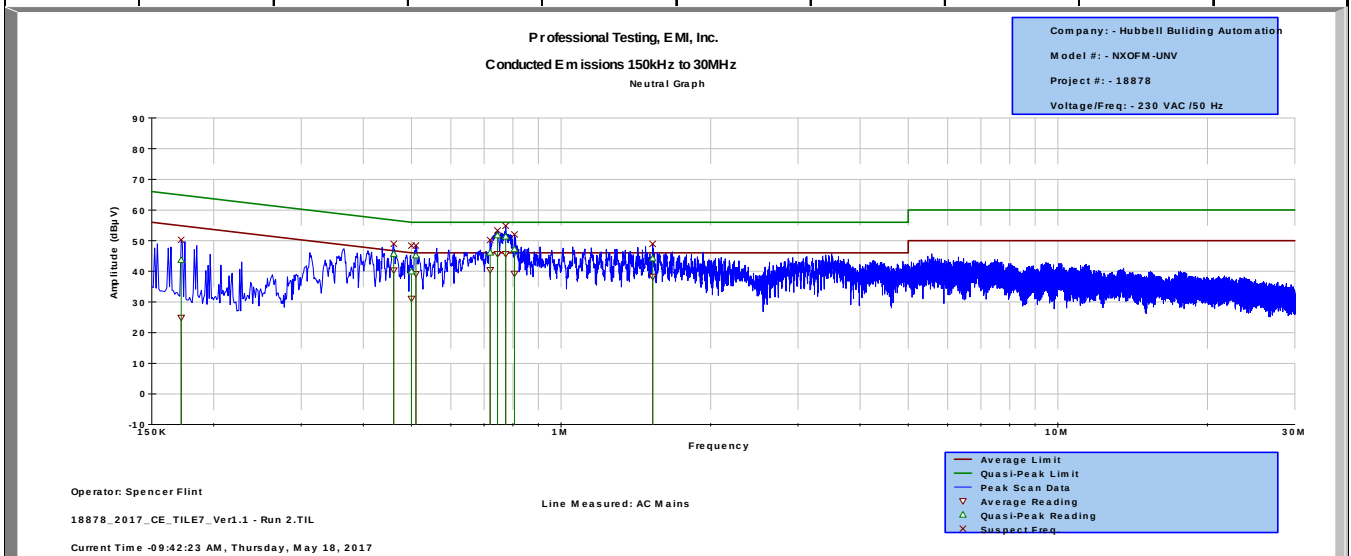
Professional Testing, EMI, Inc.

Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Limits		
Section:	15.107		
Test Date(s):	5/18/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	NXOFM-UNV
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Conducted Emissions Test Results Data Sheet - Neutral Lead

Page: 1 of 2

EUT Line Voltage:			230	VAC	EUT Line Frequency:			50	Hz
Frequency Measured (MHz)	Peak Detector Reading (dBμV)	Quasi-peak Detector Reading (dBμV)	Quasi-peak Detector Limit (dBμV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBμV)	Average Detector Limit (dBμV)	Average Detector Margin (dB)	Average Detector Test Results
0.1719	50.3	43.6	64.9	-21.2	PASS	24.9	54.9	-30	PASS
0.4604	50.4	45.6	56.7	-11.1	PASS	40.3	46.7	-6.4	PASS
0.5	49.6	39.9	56	-16.1	PASS	31.1	46	-14.9	PASS
0.5102	49.4	45.1	56	-10.9	PASS	39.2	46	-6.8	PASS
0.7201	52.5	46	56	-10	PASS	40.5	46	-5.5	PASS
0.745	55.7	51.6	56	-4.4	PASS	45.6	46	-0.4	PASS
0.7739	56.1	51.3	56	-4.7	PASS	45.6	46	-0.4	PASS
0.8057	55	47.1	56	-8.9	PASS	39.3	46	-6.7	PASS
1.5291	49.3	44.1	56	-11.9	PASS	38.2	46	-7.8	PASS



Measured Conducted Emissions - Neutral Lead

9.3.2 Mains, Phase

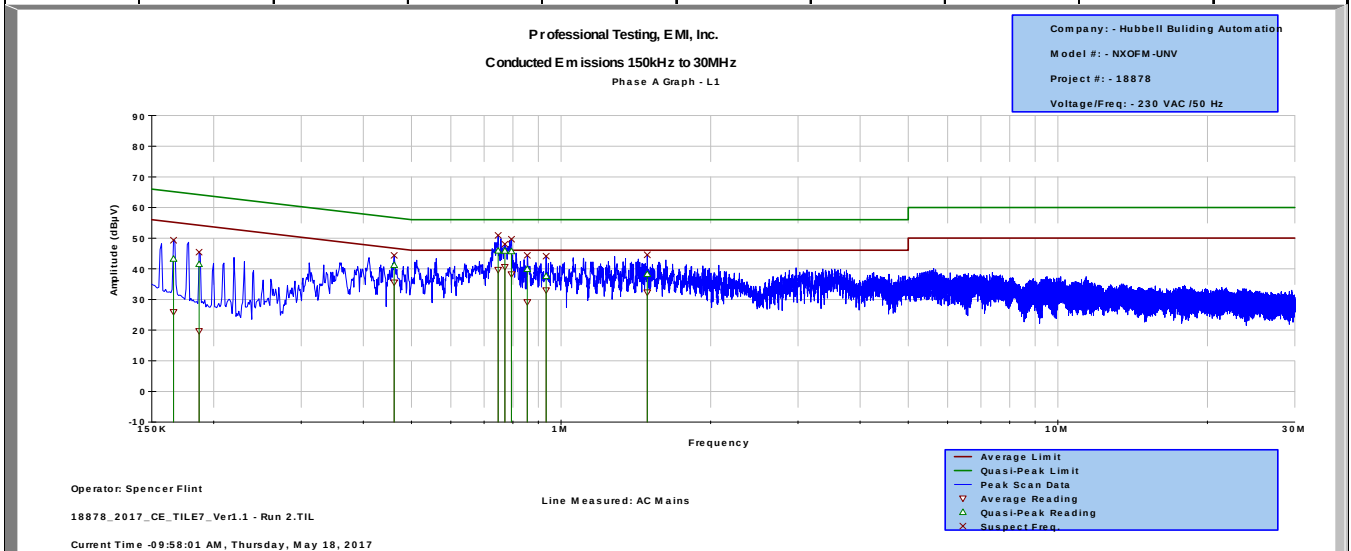
Professional Testing, EMI, Inc.

Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
In accordance with:	FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Limits		
Section:	15.107		
Test Date(s):	5/18/2017	EUT Serial #:	0
Customer:	Hubbell Building Automation	EUT Part #:	NXOFM-UNV
Project Number:	18878	Test Technician:	Spencer Flint
Purchase Order #:	0	Supervisor:	Lisa Arndt
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel

Conducted Emissions Test Results Data Sheet - Phase Lead (Line 1)

Page: 2 of 2

EUT Line Voltage:			230	VAC	EUT Line Frequency:			50	Hz
Frequency Measured (MHz)	Peak Detector Reading (dBμV)	Quasi-peak Detector Reading (dBμV)	Quasi-peak Detector Limit (dBμV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBμV)	Average Detector Limit (dBμV)	Average Detector Margin (dB)	Average Detector Test Results
0.1659	51.3	43.2	65.2	-22	PASS	26	55.2	-29.2	PASS
0.1868	50	41.4	64.2	-22.7	PASS	19.7	54.2	-34.5	PASS
0.4614	44.9	41.1	56.7	-15.5	PASS	35.6	46.7	-11.1	PASS
0.747	51.1	45.8	56	-10.2	PASS	39.7	46	-6.3	PASS
0.7709	51.9	45.8	56	-10.2	PASS	40.6	46	-5.4	PASS
0.7948	52.1	45.6	56	-10.4	PASS	38.3	46	-7.7	PASS
0.8555	45.6	39.9	56	-16.1	PASS	29.2	46	-16.8	PASS
0.9331	43.9	37.6	56	-18.4	PASS	33	46	-13	PASS
1.4913	44.9	38.2	56	-17.8	PASS	32.3	46	-13.7	PASS



Measured Conducted Emissions - Phase Lead (Line 1)

10.0 Equipment

10.1 Spurious Radiated Emissions 30 MHz to 25 GHz

Radiated Emissions Test Equipment List					
Tile! Software Version:		4.2.A, May 23, 2010, 08:38:52 AM			
Test Profile:		2016 RE_ClassA - Boresite+Mast_LowPRF_030617.til or 2016 RE_ClassB - Boresite+Mast_LowPRF_030617.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2017
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	2/1/2018
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/15/2017
2172	ETS-Lindgren	3142C	Antenna, Biconilog, 26 MHz-3GHz	49383	11/27/2018
C027D	PTI	None	Relay	none	N/A
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	6/19/2017
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	1/11/2018
C030	none	none	Cable Coax, N-N, 30m	none	10/1/2017
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
819	EMCO	3115	Antenna, Horn, DRG, 1-18GHz	113	8/4/2018

10.2 Bandwidth and Duty Cycle

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	30 Sep 2017
1831	HP	6622A	Power Supply	CIU
0472	Tektronix	THS730A	DMM/Scope	15 Nov 2017
C241	Pasternack	PE300-120	RG type cable	21 Jan 2018
None	ETS	5211	Shielded Enclosure	CIU
None	PTI	None	2 GHz Sleeve Sense Antenna	CIU

10.3 Mains Conducted Emissions

Professional Testing, EMI, Inc.					
Test Method:	ANSI C63.4: 2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz				
In accordance with:	FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Limits				
Section:	15.107				
Test Date(s):	5/18/2017	EUT Serial #:	0		
Customer:	Hubbell Building Automation	EUT Part #:	NXOFM-UNV		
Project Number:	18878	Test Technician:	Spencer Flint		
Purchase Order #:	0	Supervisor:	Lisa Arndt		
Equip. Under Test:	NXOFM-UNV	Witness' Name:	Tom Hartnagel		
Conducted Emissions Test Equipment List					
Tile! Software Version:		Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM			
Test Profile:		2017_CE_TILE7_Ver1.1.TIL or CE_Marine_100616.TIL			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1145	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2517A01821	7/20/2017
1834	HP	85662A	Spec Anal Dsply, use with A/N 1145	2349A06182	N/A
0990	HP	85685A	RF Preselector	3010A01119	7/20/2017
0085	HP	85650A	Quasi-Peak Adapter CISPR	3033A01458	7/20/2017
1173	PTI	100k HPF	Filter, High Pass, 100kHz	none	2/2/2018
1088	PTI	PTI-ALF4	Attenuator Limiter Filter	none	10/6/2017
C171	HP	08444-60018	Cable, RF, BNC-BNC, 18", Grey	none	6/13/2018
C303	Coleman Cable	RG-58A/U	Cable, BNC-BNC, 36" Black	None	3/25/2018
C107	Pomona	RG-223	Cable 9 ft BNC RG-223 (black)	none	8/4/2018
1185	EMCO	3825/2	LISN, 10kHz-100MHz	1235	8/1/2017
1132	AilTech	91550-1M	Probe, Current, 10kHz-100MHz	1856	2/9/2018
1683	Teseq	ISN T800	ISN-T8, Impedance Stabilization Network	27091	6/15/2017
0027	EMCO	3825/2	LISN, 10kHz-100MHz	9010-1708	10/5/2017
0586	HP	8447D	Preamp, 0.1-1300MHz, 26dB	1726A01364	2/12/2018

11.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	26500	1000	2	Multiple Sweeps
*Notes: 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz. 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz. 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.				

Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.01	0.15	0.3	7	Five 1 second sweeps
0.15	30	9	20	Five 1 second sweeps
*Notes: 1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 10-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.				

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7

End of Report

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