



# element

**Emerson Process Management**  
**VN210 radio module in Model 781F host device**

**FCC 15.247:2018**  
**2.4 GHz DTS Radio**

**Report # EMPM0050.1**



NVLAP LAB CODE: 200881-0



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# CERTIFICATE OF TEST



Last Date of Test: September 27, 2018  
Emerson Process Management  
VN210 radio module in Model 781F host device

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.247:2018	ANSI C63.10:2013, KDB 558074

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.6	Duty Cycle	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.8.2	Occupied Bandwidth	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.9.1.1	Output Power	Yes	Pass	Testing completed in new host with variation in DC Voltage to verify continuing compliance.
11.10.2	Power Spectral Density	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.11	Band Edge Compliance	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA
11.11	Spurious Conducted Emissions	No	N/A	Testing covered under original grant for FCC ID:2AKZ5-CDSVN210ISA

### Deviations From Test Standards

None

### Approved By:

Matt Nuernberg, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

# REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

# ACCREDITATIONS AND AUTHORIZATIONS



## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

## SCOPE

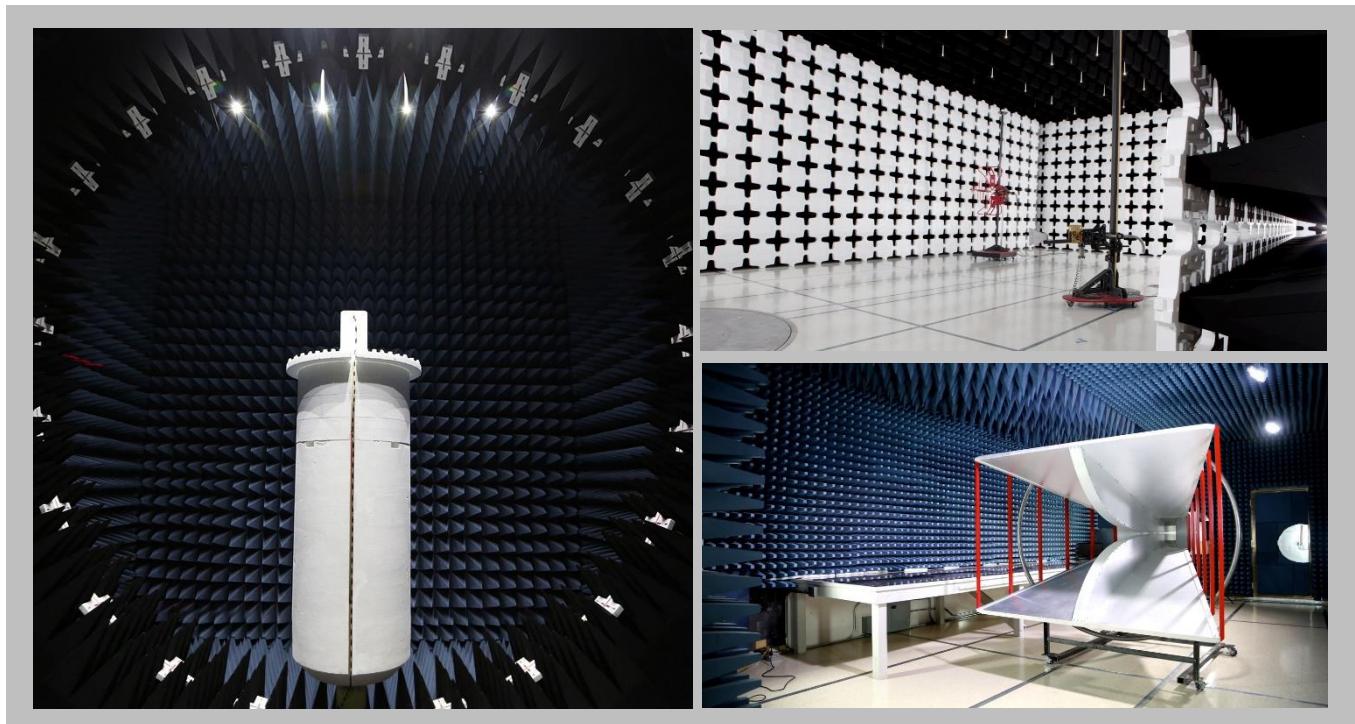
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

# FACILITIES



California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425) 984-6600
<b>NVLAP</b>					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code: 201049-0	NVLAP Lab Code: 200629-0
<b>Innovation, Science and Economic Development Canada</b>					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	US0017	US0191	US0157



# MEASUREMENT UNCERTAINTY



## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

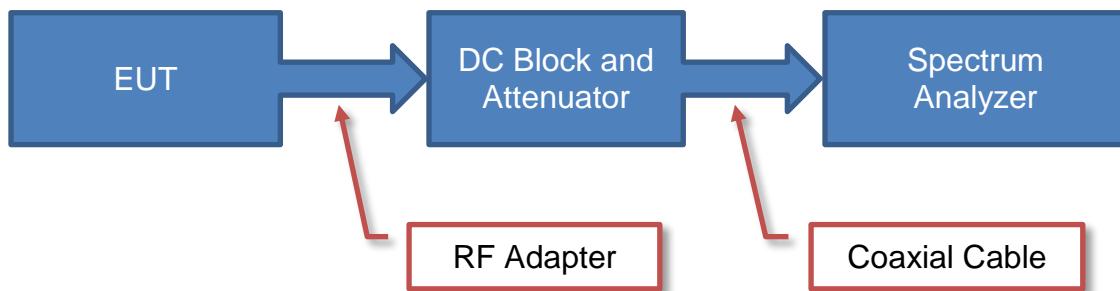
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

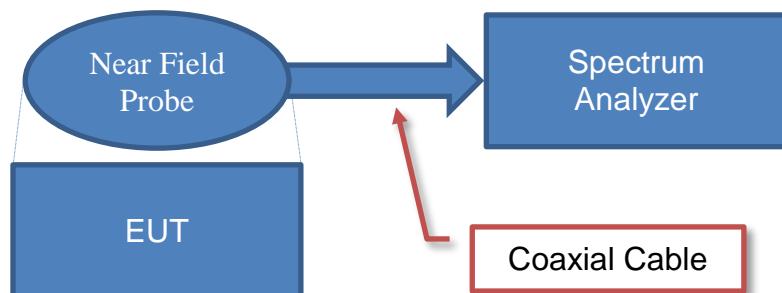
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

# Test Setup Block Diagrams

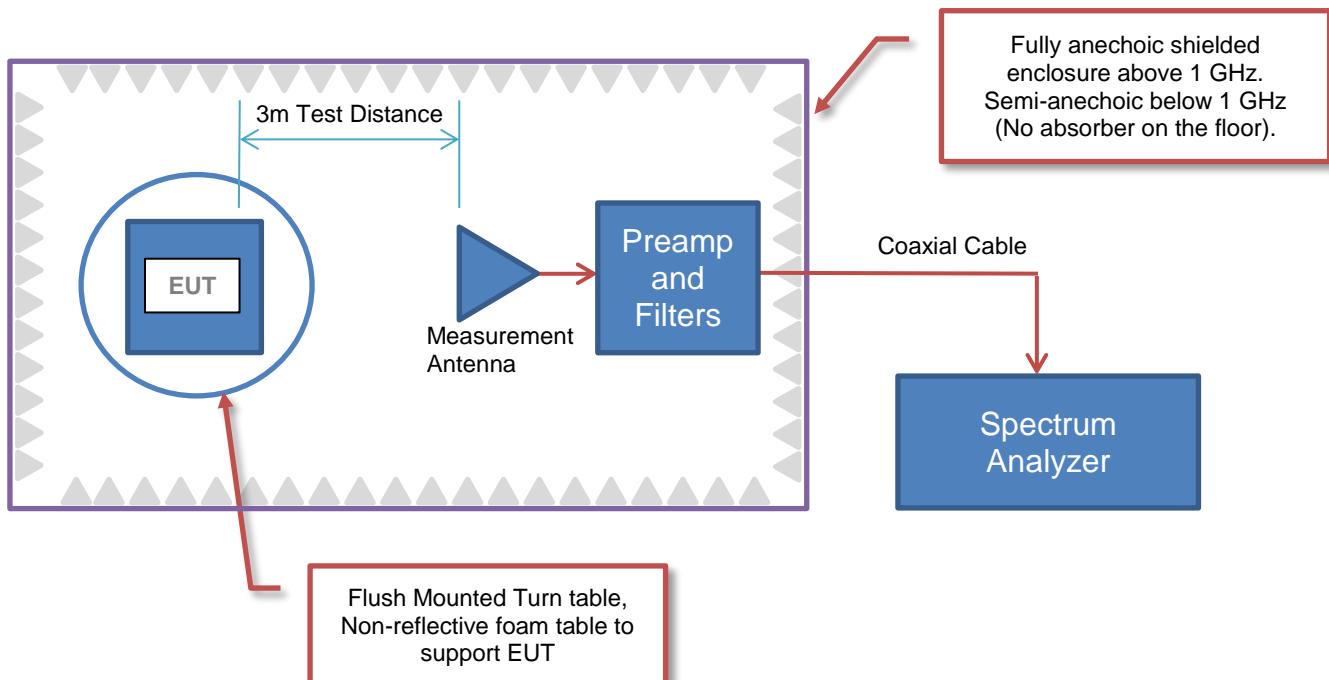
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions



# PRODUCT DESCRIPTION



## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	Emerson Process Management
<b>Address:</b>	8200 Market Blvd. MS SC3L
<b>City, State, Zip:</b>	Chanhassen, MN 55317
<b>Test Requested By:</b>	Merritt Pulkabek
<b>Model:</b>	VN210 radio module in Model 781F host device
<b>First Date of Test:</b>	September 27, 2018
<b>Last Date of Test:</b>	September 27, 2018
<b>Receipt Date of Samples:</b>	September 27, 2018
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage
<b>Purchase Authorization:</b>	Verified

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
2.4 GHz DTS radio "field link" device used to extend a wireless field network.
<b>Testing Objective:</b>
To demonstrate compliance of the 2.4 GHz DTS radio to FCC 15.247 requirements through a Class 2 Permissive Change (C2PC) to the limited modular approval under FCC ID:2AKZ5-CDSVN210ISA.

# CONFIGURATIONS



## Configuration EMPM0050- 1

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Radio Module	Control Data Systems	VN210	Unknown	
Field Link Model 781F	Emerson Process Management	781A1D1I5WA3WM3	0688512	

Peripherals in test setup boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Smart Wireless Gateway	Emerson Process Management	1410D2ADWNANA	0002585	
Laptop	Dell	Latitude 7480	5GTMGH2	
AC Adapter (Smart Wireless Gateway)	Volgen	KTPS10-24005WA	1410-6	

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
I/O Cable	Yes	1.4 m	No	781 Field Link Model 781F	Smart Wireless Gateway
DC Power (Smart Wireless Gateway)	No	1.4 m	Yes	Smart Wireless Gateway	AC Adapter (Smart Wireless Gateway)
Ethernet Cable	No	2.1 m	No	Smart Wireless Gateway	Laptop
Power Cable	No	>3.0 m	No	781 Field Link Model 781F	R166

# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-09-27	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# OUTPUT POWER



XMit 2017.12.13

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Harmonics/Flicker Test System	California Instruments	PACS-1	R167	31-Jul-18	31-Jul-19
Power Source	California Instruments	X5K10C4Y01200	R166	27-Dec-17	27-Dec-18
Meter - Multimeter	Fluke	117	MLS	23-Jan-17	23-Jan-20
Generator - Signal	Agilent	E4422B	TGQ	15-Mar-18	15-Mar-21
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	15-Mar-18	15-Mar-19
Block - DC	Fairview Microwave	SD3379	AMI	7-Sep-18	7-Sep-19
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-18	13-Feb-19
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	19-Dec-17	19-Dec-18

## TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

**De Facto EIRP Limit:** The EUT meets the de facto EIRP limit of +36 dBm.

# OUTPUT POWER



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TbTx 2018.06.19

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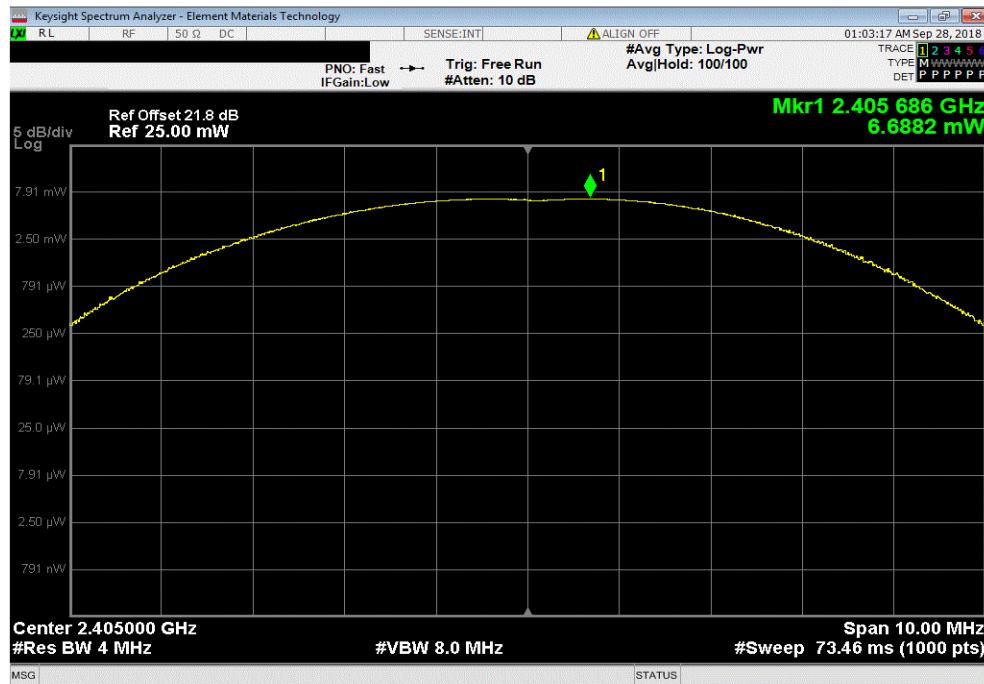
EUT:	VN210 radio module in Model 781F host		Work Order:	EMPM0050				
Serial Number:	0688512		Date:	27-Sep-18				
Customer:	Emerson Process Management		Temperature:	22.8 °C				
Attendees:	Elizabeth Reiersen, Merritt Pulkabek		Humidity:	40.9% RH				
Project:	None		Barometric Pres.:	1012 mbar				
Tested by:	Kyle McMullan	Power:	24VDC	Job Site: MN08				
TEST SPECIFICATIONS	Test Method							
FCC 15.247:2018	ANSI C63.10:2013							
COMMENTS	Grant is for 11.77 mW.							
DEVIATIONS FROM TEST STANDARD								
None								
Configuration #	1	Signature						
			Value	Limit (<)				
802.15.4 Low Channel, 2405 MHz			6.688 mW	1 W				
Extreme Voltage 8.925 VDC			6.62 mW	1 W				
Nominal Voltage 24 VDC			6.605 mW	1 W				
Extreme Voltage 34.5 VDC				Pass				
802.15.4 Mid Channel, 2440 MHz			6.138 mW	1 W				
Extreme Voltage 8.925 VDC			6.074 mW	1 W				
Nominal Voltage 24 VDC			6.105 mW	1 W				
Extreme Voltage 34.5 VDC				Pass				
802.15.4 High Channel, 2475 MHz			5.395 mW	1 W				
Extreme Voltage 8.925 VDC			5.378 mW	1 W				
Nominal Voltage 24 VDC			5.52 mW	1 W				
Extreme Voltage 34.5 VDC				Pass				

# OUTPUT POWER

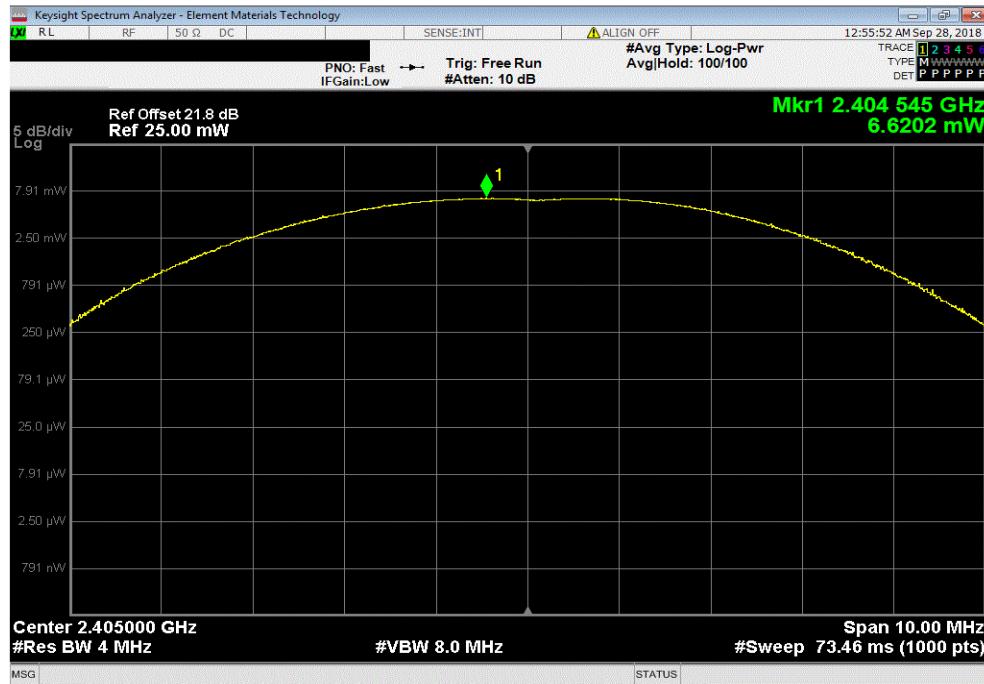


TbTx 2018.06.19 XMI 2017.12.13

802.15.4 Low Channel, 2405 MHz, Extreme Voltage 8.925 VDC			Limit
Value	(<)	Result	
6.688 mW	1 W	Pass	



802.15.4 Low Channel, 2405 MHz, Nominal Voltage 24 VDC			Limit
Value	(<)	Result	
6.62 mW	1 W	Pass	



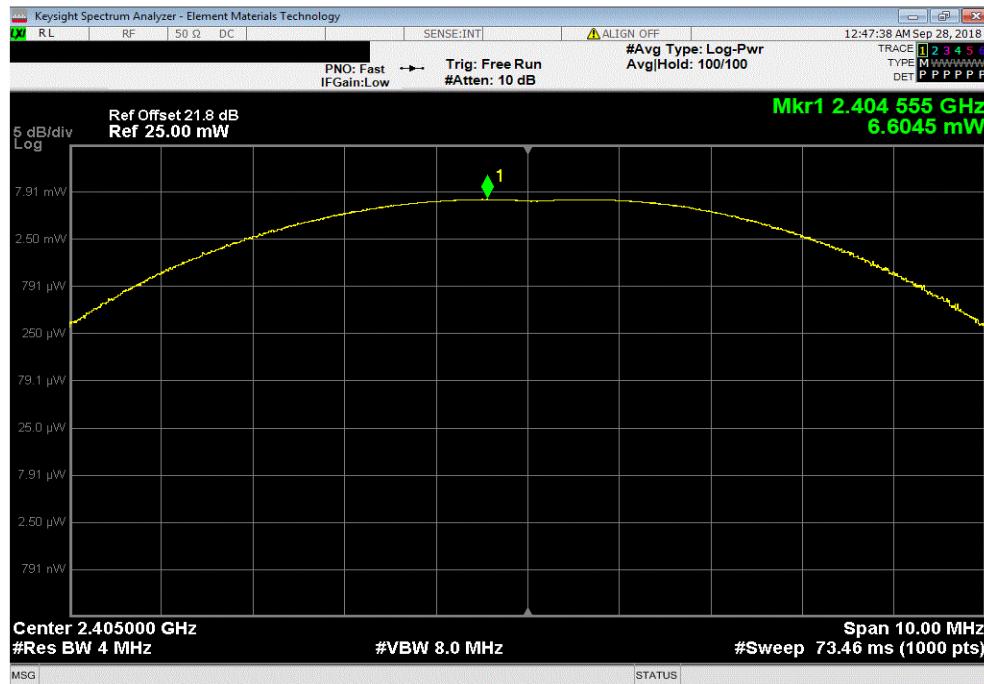
# OUTPUT POWER



TbTx 2018.06.19 XMI 2017.12.13

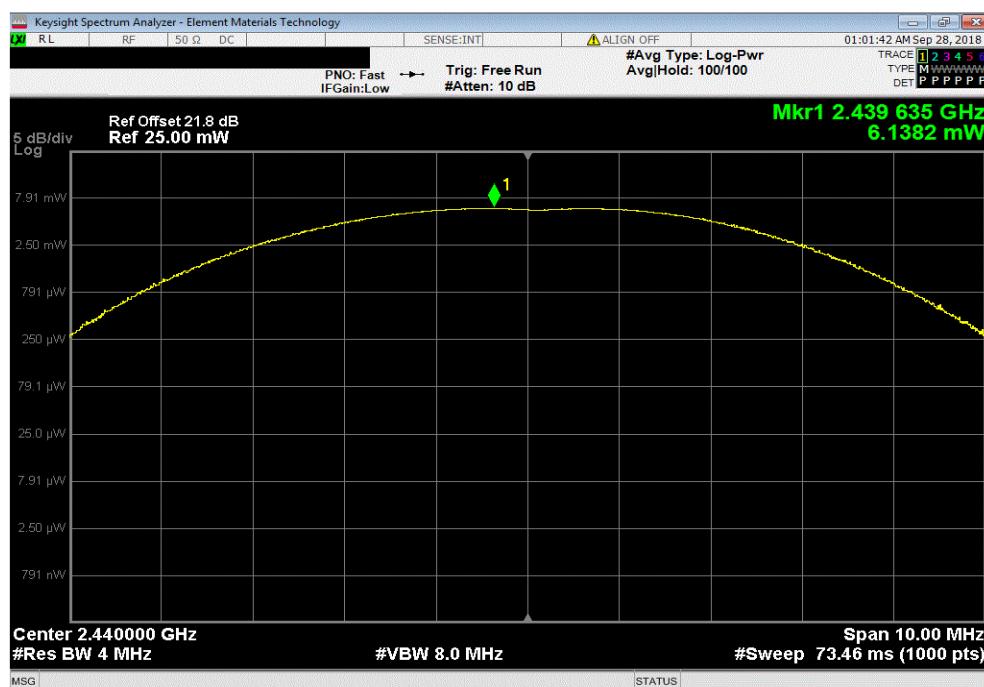
802.15.4 Low Channel, 2405 MHz, Extreme Voltage 34.5 VDC

Value	Limit (<)	Result
6.605 mW	1 W	Pass



802.15.4 Mid Channel, 2440 MHz, Extreme Voltage 8.925 VDC

Value	Limit (<)	Result
6.138 mW	1 W	Pass

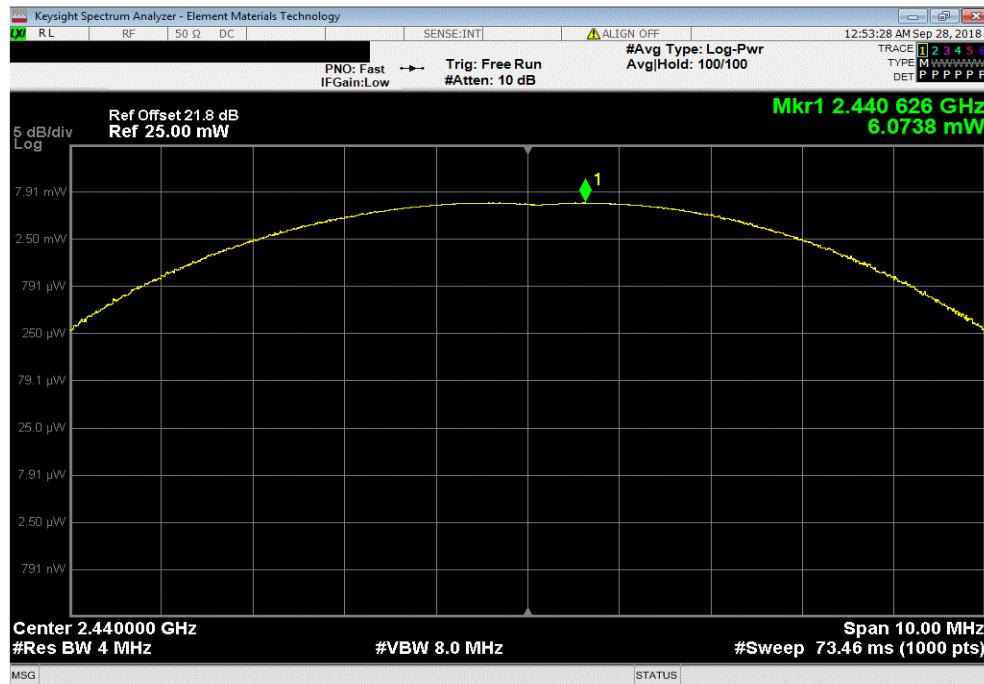


# OUTPUT POWER

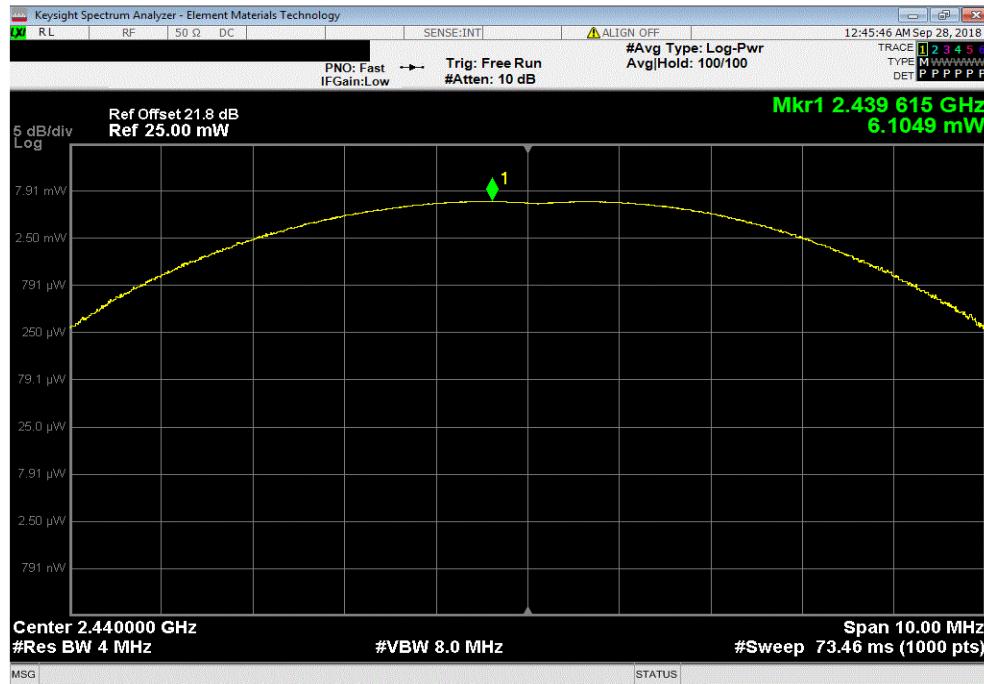


TbTx 2018.06.19 XMT 2017.12.13

802.15.4 Mid Channel, 2440 MHz, Nominal Voltage 24 VDC			Limit
Value	(<)	Result	
6.074 mW	1 W	Pass	



802.15.4 Mid Channel, 2440 MHz, Extreme Voltage 34.5 VDC			Limit
Value	(<)	Result	
6.105 mW	1 W	Pass	

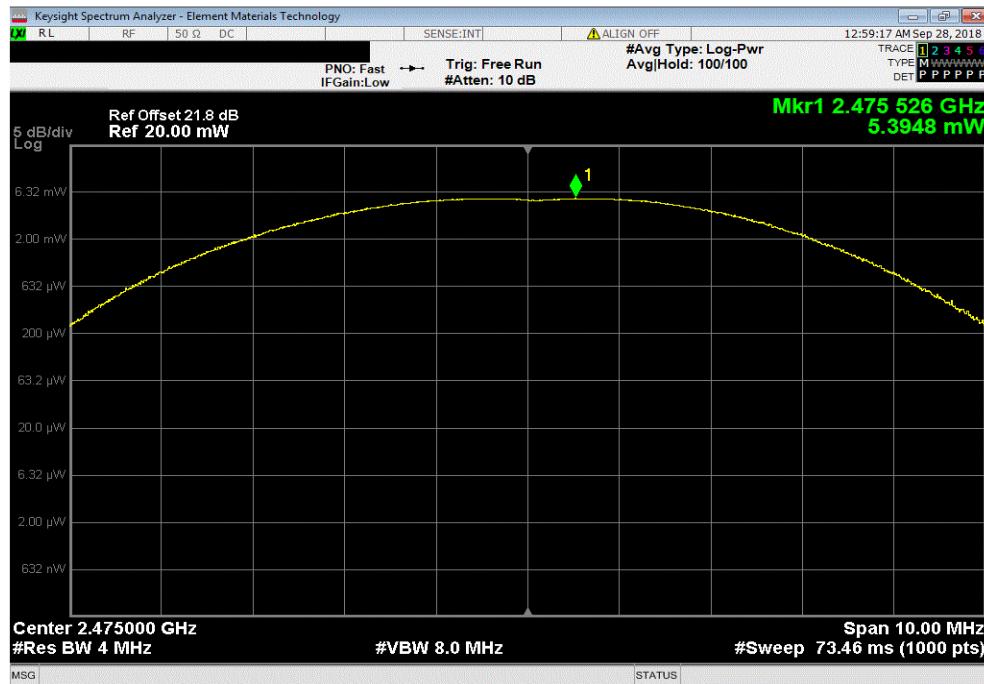


# OUTPUT POWER

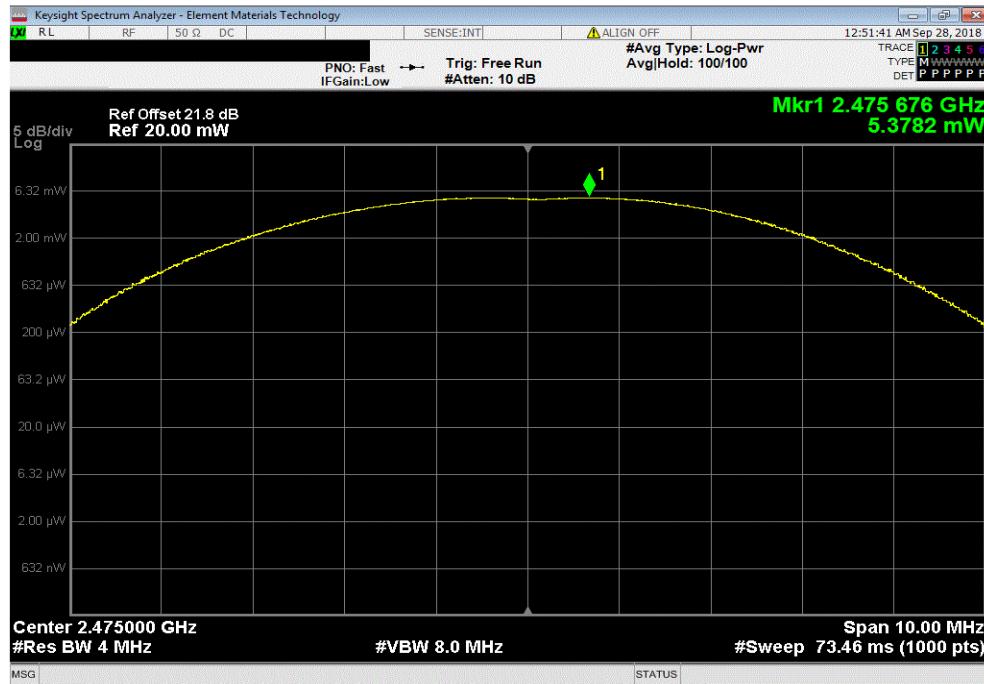


TbTx 2018.06.19 XMI 2017.12.13

802.15.4 High Channel, 2475 MHz, Extreme Voltage 8.925 VDC			Limit
Value	(<)	Result	
5.395 mW	1 W	Pass	



802.15.4 High Channel, 2475 MHz, Nominal Voltage 24 VDC			Limit
Value	(<)	Result	
5.378 mW	1 W	Pass	



# OUTPUT POWER



TbTx 2018.06.19 XM1 2017.12.13

802.15.4 High Channel, 2475 MHz, Extreme Voltage 34.5 VDC

	Value	Limit (<)	Result
	5.52 mW	1 W	Pass

