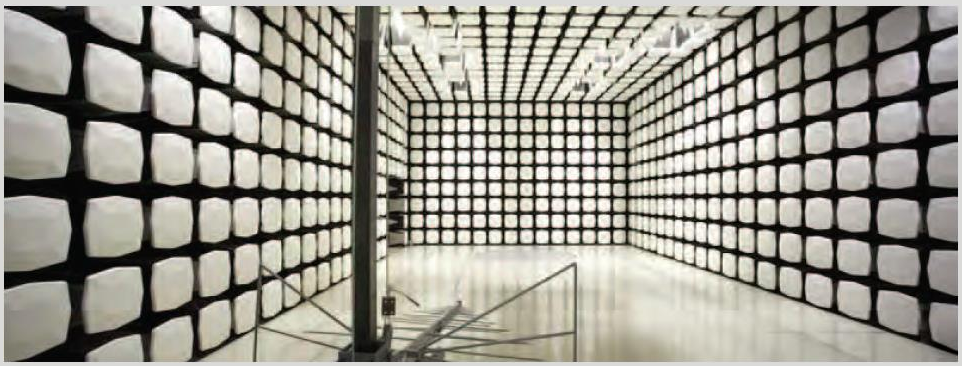
Emerson Process Management

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
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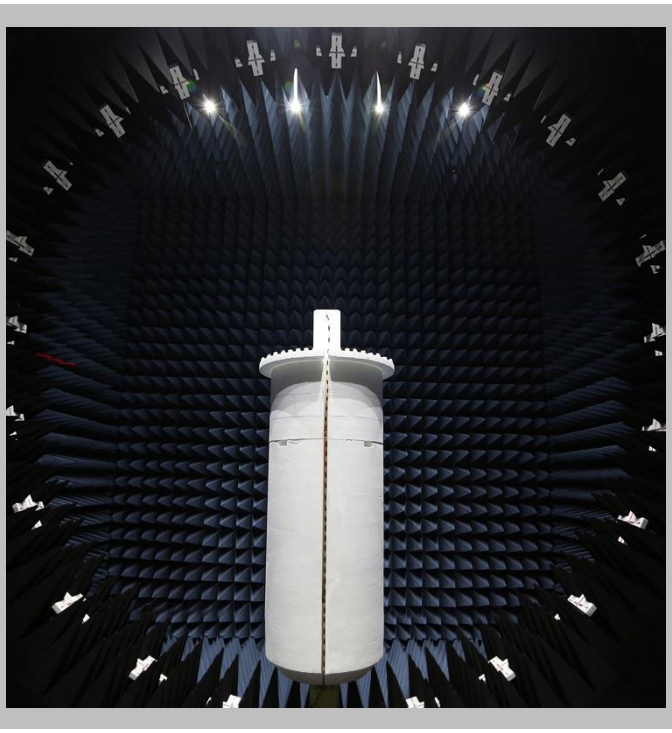
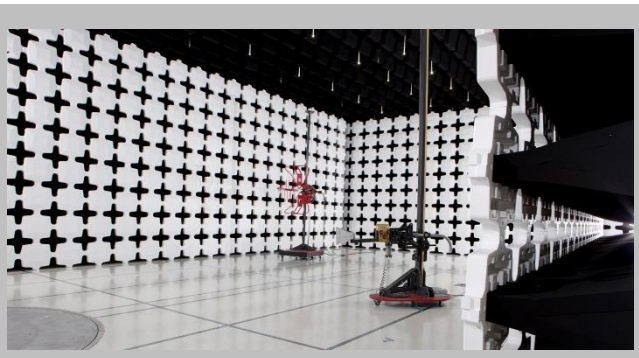
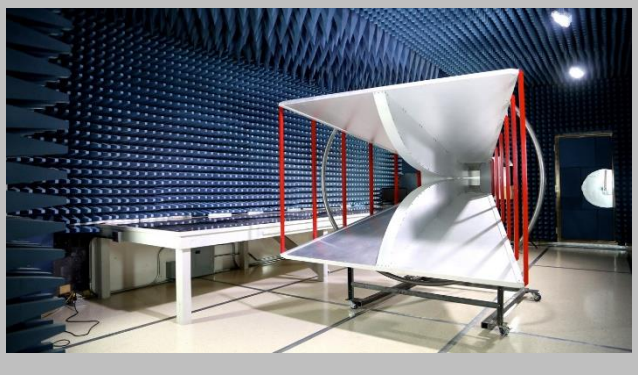
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

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.

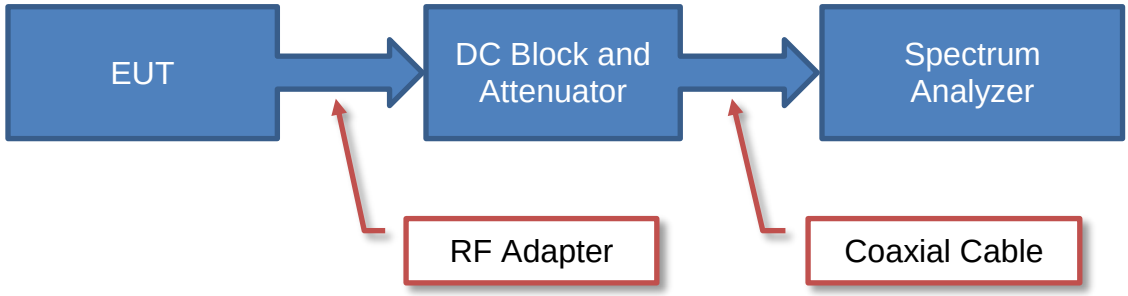
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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.

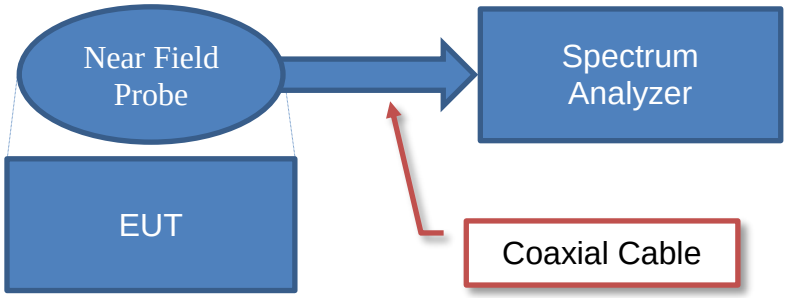
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

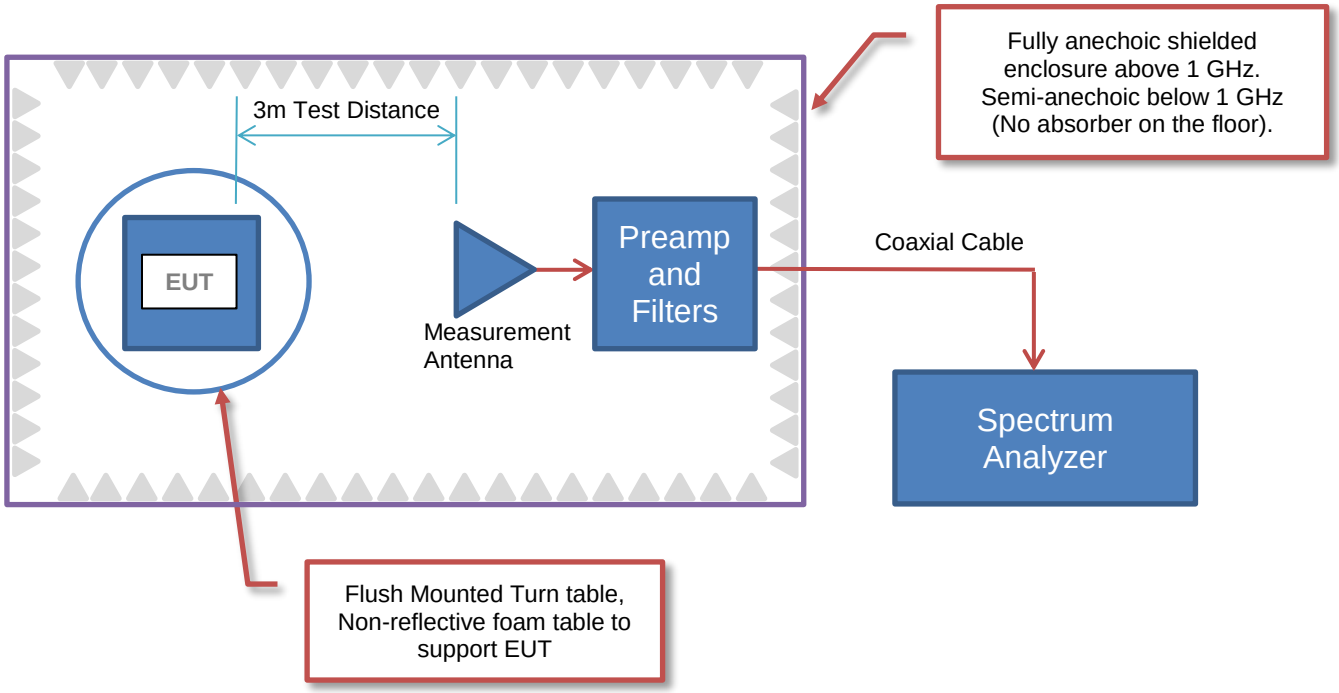
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

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

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
2.4 GHz DTS radio "field link" device used to extend a wireless field network.

Testing Objective:
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

TbtTx 2018.06.19 XMit 2017.12.13

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 Reierson, Merritt Pulkrabek	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.

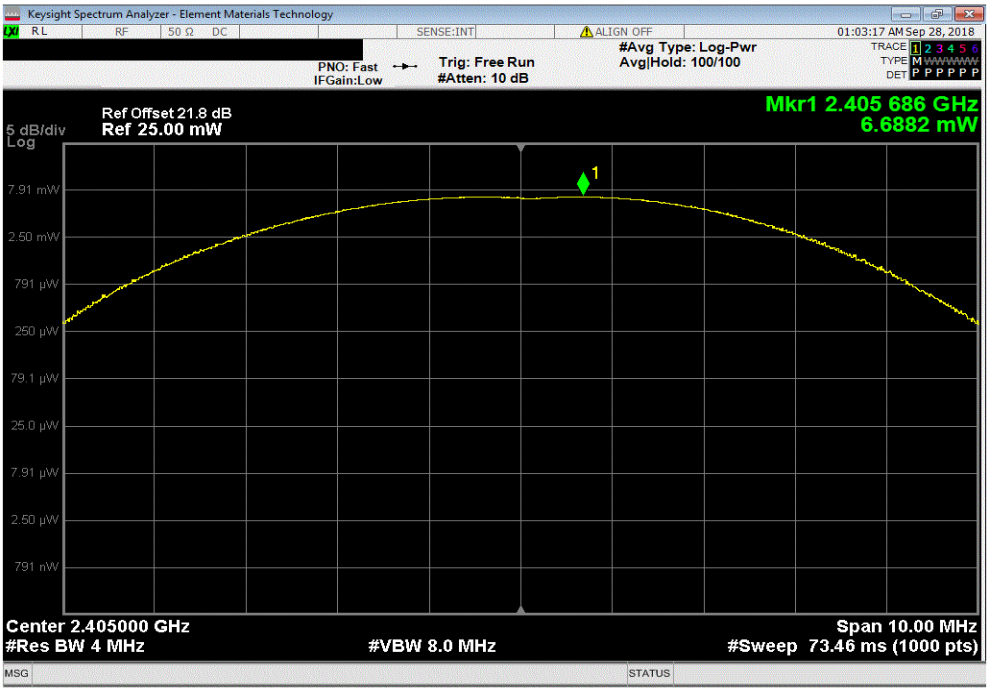
DEVIATIONS FROM TEST STANDARD

None

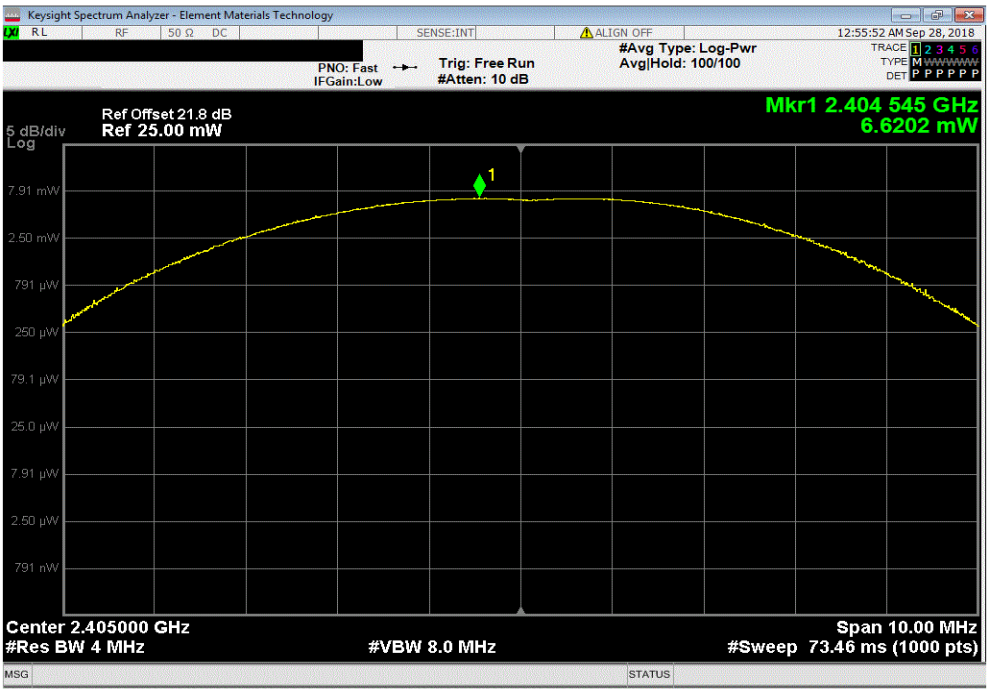
Configuration #	1	Signature

	Value	Limit (<)	Result
802.15.4 Low Channel, 2405 MHz			
Extreme Voltage 8.925 VDC	6.688 mW	1 W	Pass
Nominal Voltage 24 VDC	6.62 mW	1 W	Pass
Extreme Voltage 34.5 VDC	6.605 mW	1 W	Pass
802.15.4 Mid Channel, 2440 MHz			
Extreme Voltage 8.925 VDC	6.138 mW	1 W	Pass
Nominal Voltage 24 VDC	6.074 mW	1 W	Pass
Extreme Voltage 34.5 VDC	6.105 mW	1 W	Pass
802.15.4 High Channel, 2475 MHz			
Extreme Voltage 8.925 VDC	5.395 mW	1 W	Pass
Nominal Voltage 24 VDC	5.378 mW	1 W	Pass
Extreme Voltage 34.5 VDC	5.52 mW	1 W	Pass

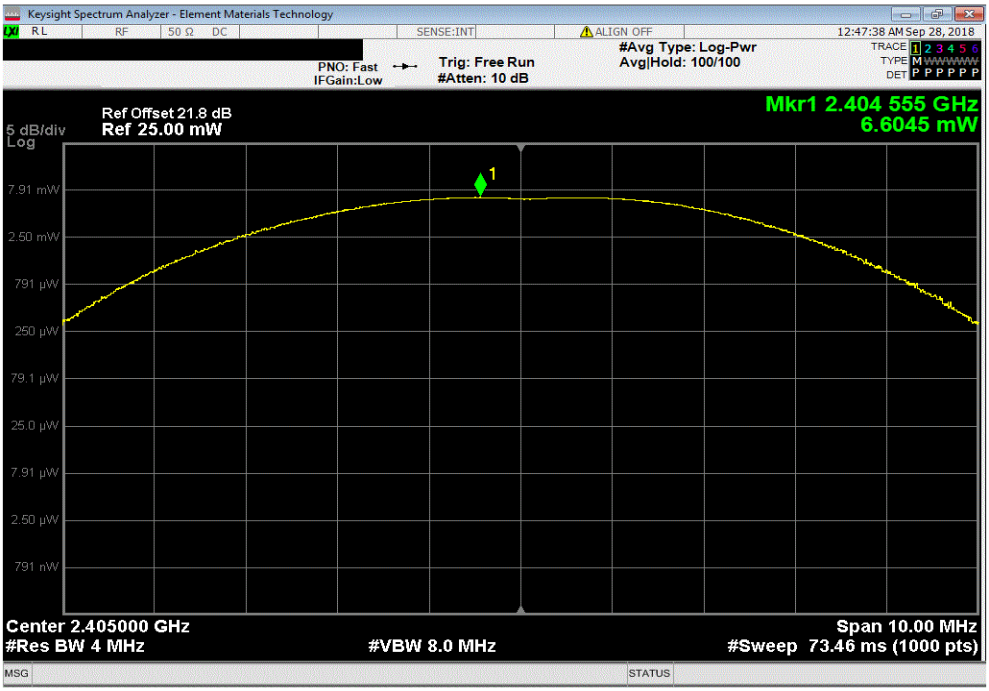
802.15.4 Low Channel, 2405 MHz, Extreme Voltage 8.925 VDC						
				Value	Limit (<)	Result
				6.688 mW	1 W	Pass



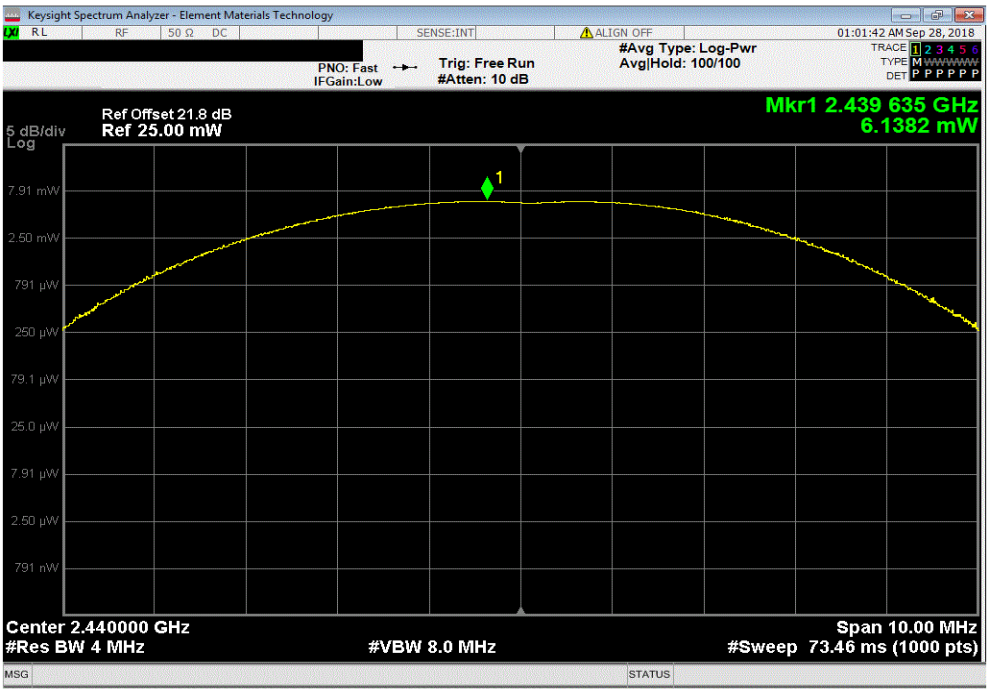
802.15.4 Low Channel, 2405 MHz, Nominal Voltage 24 VDC						
				Value	Limit (<)	Result
				6.62 mW	1 W	Pass



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

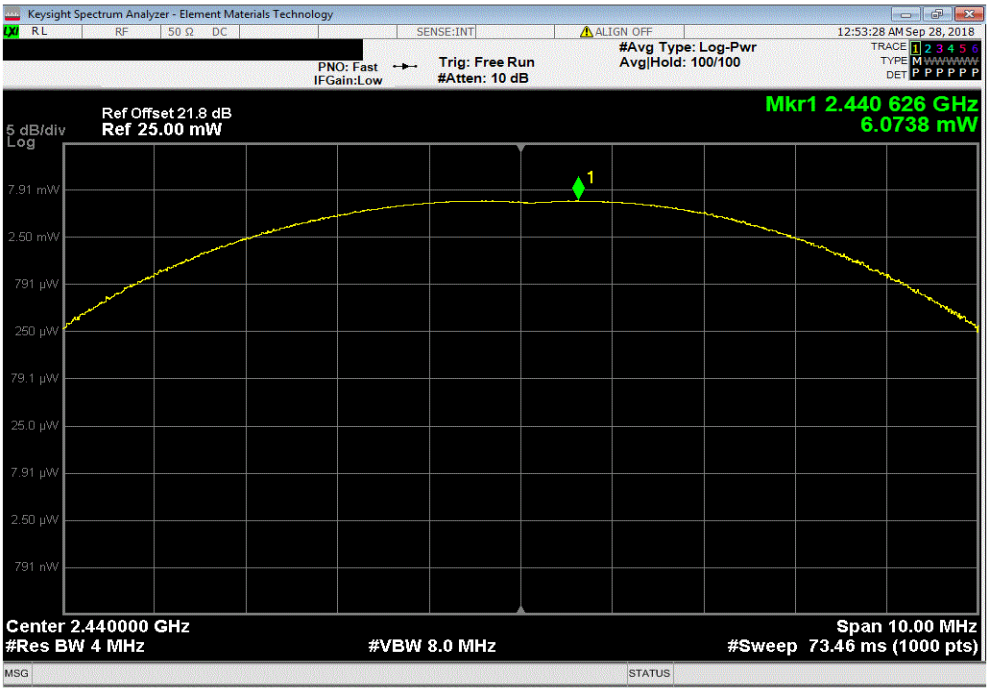


OUTPUT POWER

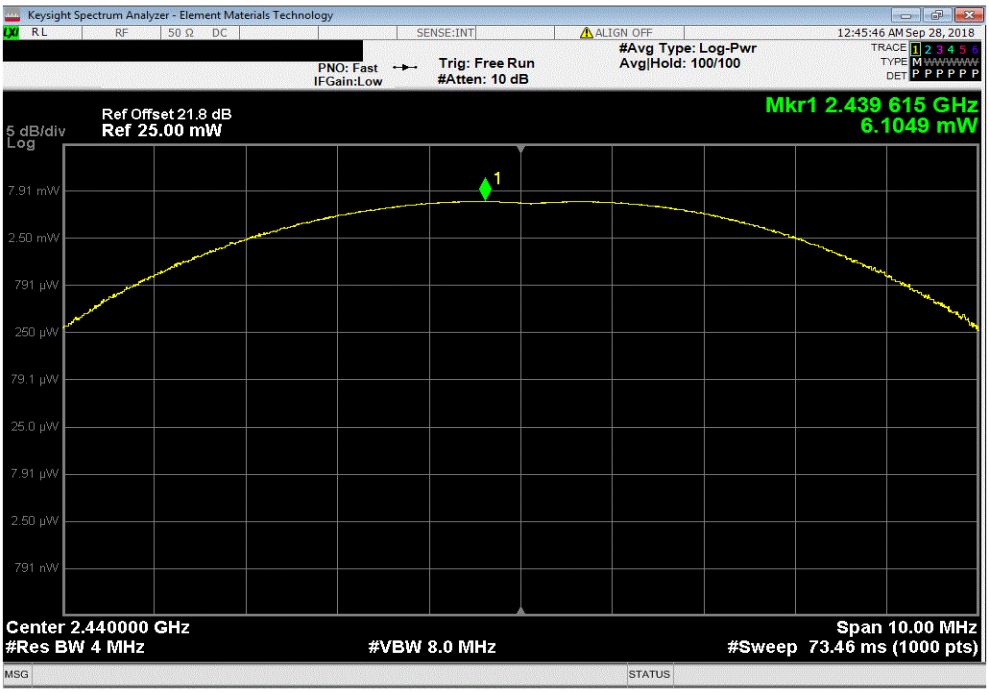
element

TbtTx 2018.06.19 XMit 2017.12.13

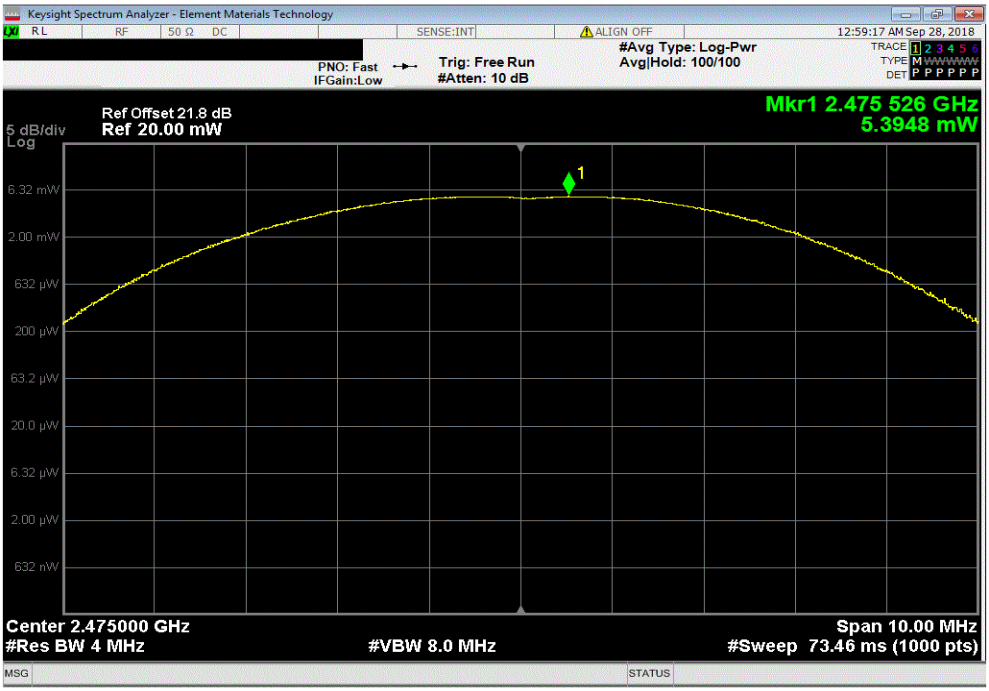
802.15.4 Mid Channel, 2440 MHz, Nominal Voltage 24 VDC						
				Value	Limit (<)	Result
				6.074 mW	1 W	Pass



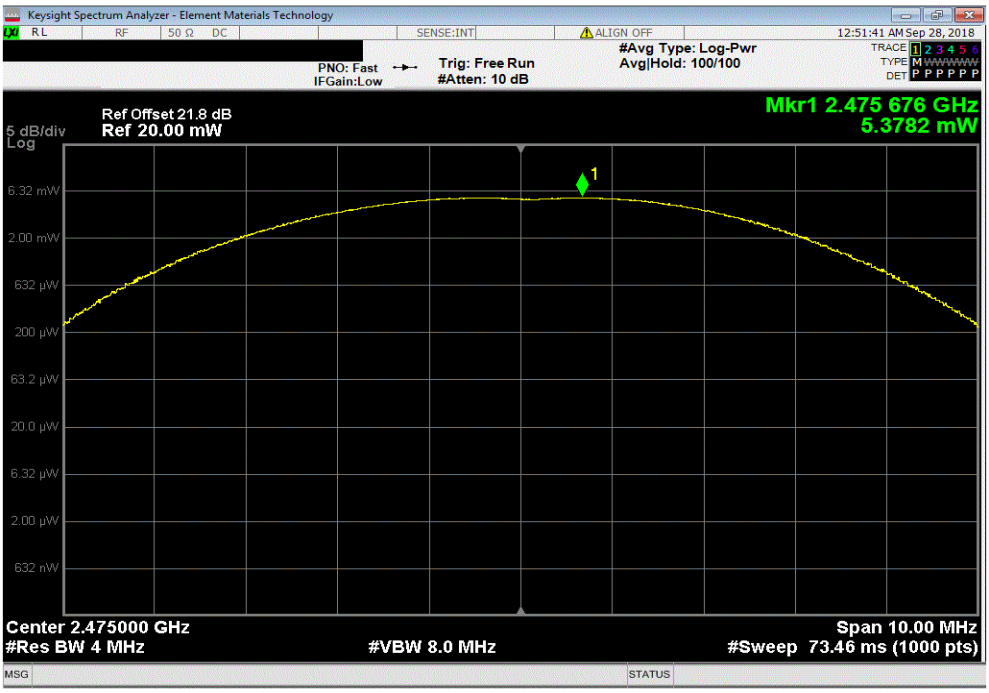
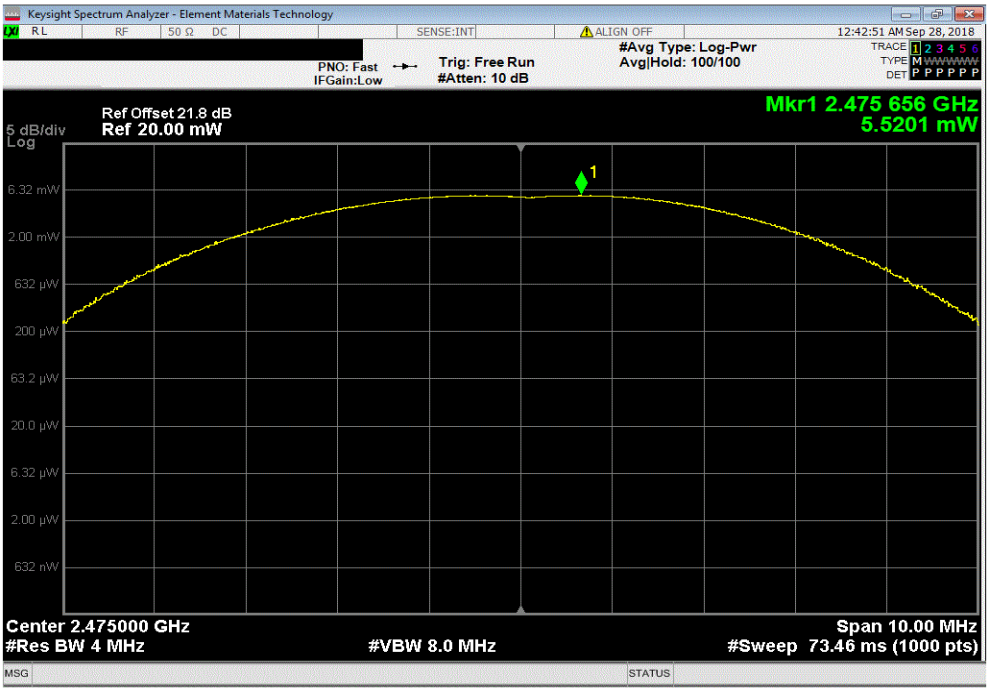
802.15.4 Mid Channel, 2440 MHz, Extreme Voltage 34.5 VDC						
				Value	Limit (<)	Result
				6.105 mW	1 W	Pass



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



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



802.15.4 High Channel, 2475 MHz, Extreme Voltage 34.5 VDC						
				Value	Limit (<)	Result
				5.52 mW	1 W	Pass