

Emerson Location Awareness Anchor

GEO20

FCC 15.247:2019 DTS Radio

Report # EMPM0080 Rev. 1







CERTIFICATE OF TEST



Last Date of Test: November 15, 2019

Emerson EUT: GEO20

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2019	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Eric Brandon, Department 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		
01	Antenna Gain value updated	2020-08-11	25-27

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) and as a CAB for the acceptance of test data.

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

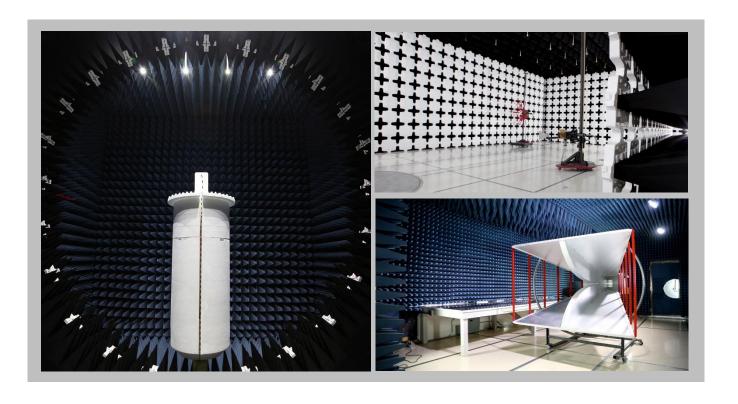
FACILITIES







California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600			
		NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	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	2834D-1	2834G-1	2834F-1			
	BSMI						
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R			
	VCCI						
A-0029	A-0109	A-0108	A-0201	A-0110			
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA							
US0158	US0175	US0017	US0191	US0157			



EMISSIONS MEASUREMENTS



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.

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Sample Calculations

Radiated Emissions:

Field Strength		Measured Level		Antenna Factor		Cable Factor		Amplifier Gain		Distance Adjustment Factor		External Attenuation
33.5	=	42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0

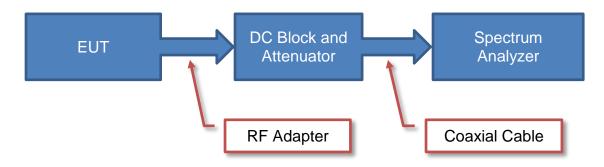
Conducted Emissions:

Adjusted		Measured		Transducer		Cable		External
Level		Level		Factor		Factor		Attenuation
47.1	=	26.7	+	0.3	+	0.1	+	20.0

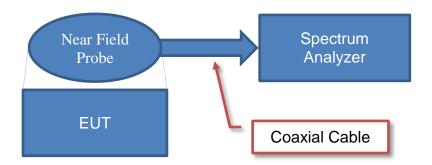
Test Setup Block Diagrams



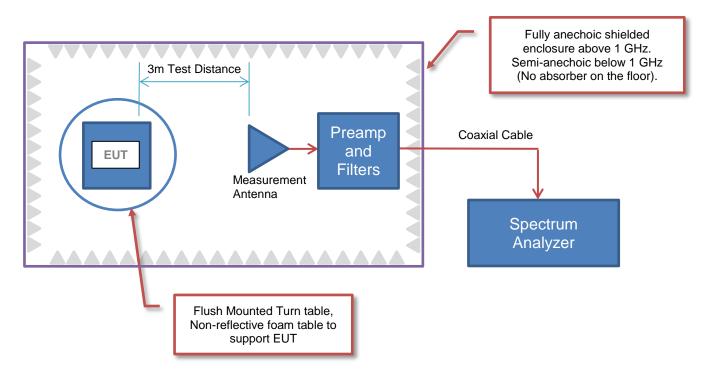
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Emerson
Address:	6021 Innovation Boulevard
City, State, Zip:	Shakopee, MN 55379
Test Requested By:	Merritt Pulkrabek
EUT:	GEO20
First Date of Test:	November 12, 2019
Last Date of Test:	November 15, 2019
Receipt Date of Samples:	November 11, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

The GEO20 (Anchor) is a fixed low power wireless device that communicates with 2 devices using 2 different radios.

Testing Objective:

To demonstrate compliance of the 2.4 GHz DTS radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration EMPM0080-1

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
Wireless Location Anchor	Emerson	GEO20	2400F			

Remote Equipment Outside of Test Setup Boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
Laptop 2	Acer	Aspire One	LUSAL0B137011502C81601			
Power Supply (Laptop 2)	Delta Electronics, Inc.	ADP-40TH A	AP0400100201107459P101			

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB-HART Interface Cable	Yes	2.2 m	No	Wireless Location Anchor	Laptop
DC Cable (Laptop 2)	No	2.5 m	Yes	Power Supply (Laptop 2)	Laptop 2

Configuration EMPM0080- 2

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
Wireless Location Anchor	Emerson	GEO20	2402C			

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-11-12	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test
2	2019-11-15	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-11-15	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-11-15	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2019-11-15	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-11-15	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2019-11-15	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2019-11-15	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.



XMit 2019.09.05

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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.



EUT: GEO20
Serial Number: 2400F
Customer: Emerson
Attendees: None
Project: None
Tested by: Dustin Sparks
TEST SPECIFICATIONS Work Order: EMPM0080
Date: 15-Nov-19
Temperature: 23.1 °C Humidity: 24.3% RH
Barometric Pres.: 1030 mbar Power: Battery
Test Method Job Site: MN08 ANSI C63.10:2013 FCC 15.247:2019 COMMENTS DEVIATIONS FROM TEST STANDARD Dusting Configuration # Dardo Signature Value (%) 77.6 Limit (%) N/A Number of Pulses Period 5.554 ms Pulse Width Results WirelessHART (802.15.4) Low Channel, 2405 MHz N/A N/A N/A N/A N/A WirelessTART (802.15.4) Low Channel, 2405 MHz WirelessHART (802.15.4) Low Channel, 2440 MHz WirelessHART (802.15.4) Mid Channel, 2440 MHz WirelessHART (802.15.4) High Channel, 2475 MHz WirelessHART (802.15.4) High Channel, 2475 MHz N/A 5.554 ms N/A 5.555 ms N/A 77.6 N/A 77.5 N/A N/A N/A N/A N/A N/A N/A 4.309 ms N/A 5 1 4.306 ms N/A N/A

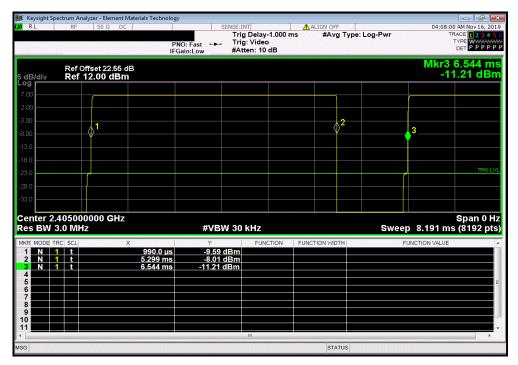


WirelessHART (802.15.4) Low Channel, 2405 MHz

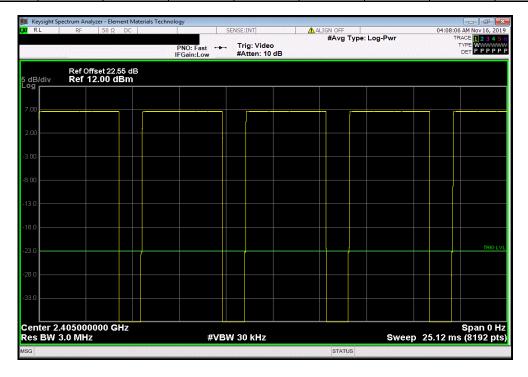
Number of Value Limit

Pulse Width Period Pulses (%) (%) Results

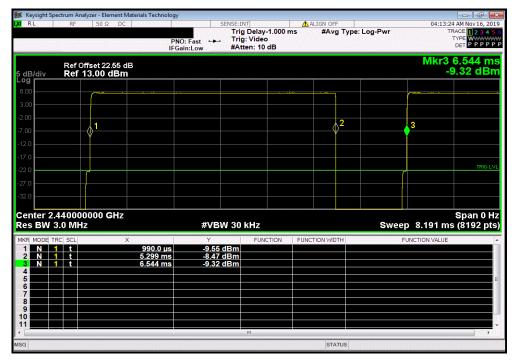
4.309 ms 5.554 ms 1 77.6 N/A N/A



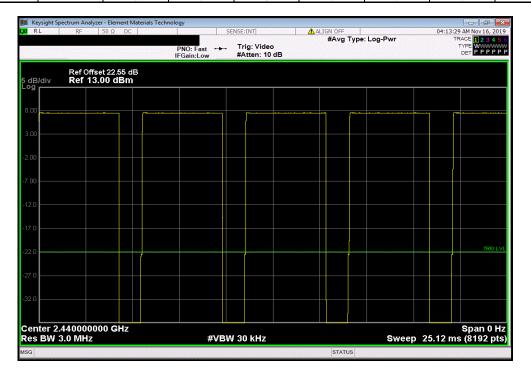
	WirelessHART (802.15.4) Low Channel, 2405 MHz								
				Number of	Value	Limit			
		Pulse Width	Period	Pulses	(%)	(%)	Results		
i		N/A	N/A	5	N/A	N/A	N/A		







	WirelessHART (802.15.4) Mid Channel, 2440 MHz								
				Number of	Value	Limit			
		Pulse Width	Period	Pulses	(%)	(%)	Results		
ĺ		N/A	N/A	5	N/A	N/A	N/A		



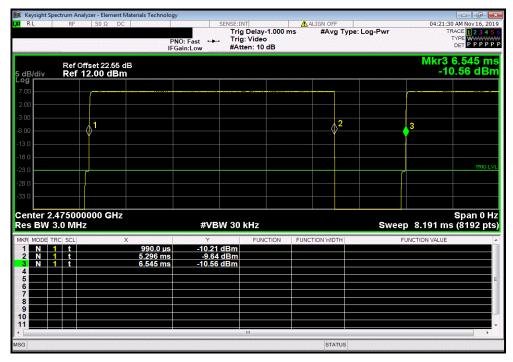


 WirelessHART (802.15.4) High Channel, 2475 MHz

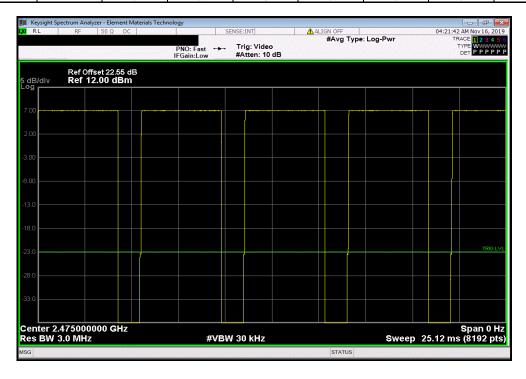
 Number of Value
 Limit

 Pulse Width
 Period
 Pulses
 (%)
 Results

 4.306 ms
 5.555 ms
 1
 77.5
 N/A
 N/A



	WirelessHART (802.15.4) High Channel, 2475 MHz								
				Number of	Value	Limit			
		Pulse Width	Period	Pulses	(%)	(%)	Results		
i		N/A	N/A	5	N/A	N/A	N/A		





XMit 2019 09 05

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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.



						TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	GEO20				Work Order:	EMPM0080	
Serial Number:	2400F				Date:	15-Nov-19	
Customer:	Emerson				Temperature:	23.1 °C	
Attendees:	None				Humidity:	24.6% RH	
Project:	None				Barometric Pres.:	1030 mbar	
Tested by:	Dustin Sparks			Power: Battery	Job Site:	MN08	
TEST SPECIFICATI	ONS			Test Method			
FCC 15.247:2019				ANSI C63.10:2013			
COMMENTS							
None							
DEVIATIONS FROM	I TEST STANDARD						
None							
			K	2 . 0			
Configuration #	1		~	Tustin Sparls			
_		Signature		300000			
		· · · · · ·				Limit	
					Value	(>)	Result
WirelessHART (802.	15.4) Low Channel, 2405 N	ИНz			1.579 MHz	500 kHz	Pass
WirelessHART (802.	15.4) Mid Channel, 2440 M	ИНz			1.581 MHz	500 kHz	Pass
WirelessHART (802.	15.4) High Channel, 2475	MHz			1.602 MHz	500 kHz	Pass



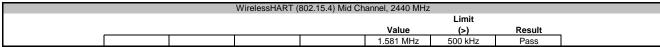
WirelessHART (802.15.4) Low Channel, 2405 MHz

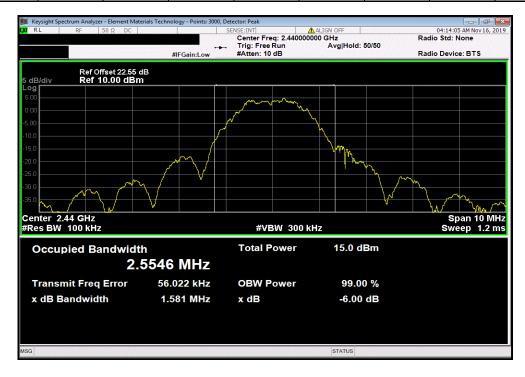
Limit

Value (-) Result

1.579 MHz 500 kHz Pass







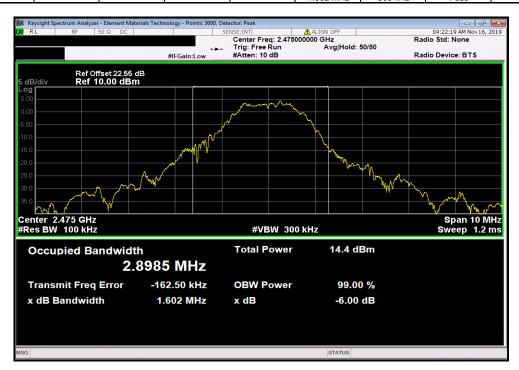


WirelessHART (802.15.4) High Channel, 2475 MHz

Limit

Value (>) Result

1.602 MHz 500 kHz Pass





XMit 2019.09.05

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TEST EQUIPMENT

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Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

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.



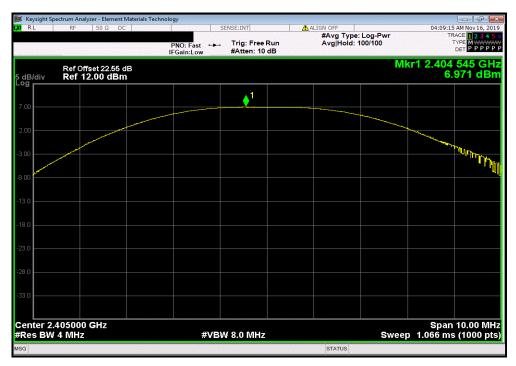
					TbtTx 2019.08.30.0	XMit 2019.09.05
EUT: GEO	020			Work Order:	EMPM0080	
Serial Number: 240	0F			Date:	15-Nov-19	
Customer: Em	erson			Temperature:	23.1 °C	
Attendees: Nor	ne			Humidity:	24.5% RH	
Project: Nor	ne			Barometric Pres.:	1030 mbar	
Tested by: Dus	stin Sparks		Power: Battery	Job Site:	MN08	
TEST SPECIFICATIONS			Test Method			
FCC 15.247:2019			ANSI C63.10:2013			
COMMENTS						
None						
DEVIATIONS FROM TE	ST STANDARD					
None						
Configuration #	1	Signature	Tustin Sparls			
		- 5		Out Pwr	Limit	
				(dBm)	(dBm)	Result
WirelessHART (802.15.4) Low Channel, 2405 MHz		·	6.971	30	Pass
WirelessHART (802.15.4) Mid Channel, 2440 MHz			7.924	30	Pass
WirelessHART (802.15.4) High Channel, 2475 MHz	7	7.585	30	Pass	



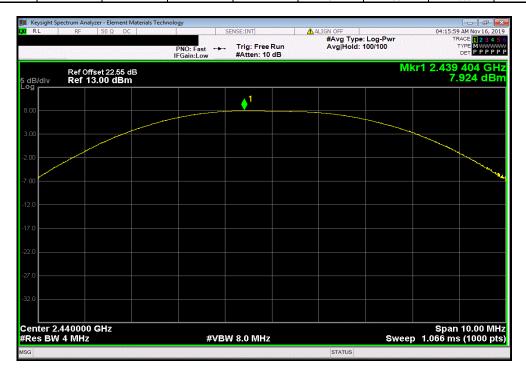
WirelessHART (802.15.4) Low Channel, 2405 MHz

Out Pwr Limit
(dBm) (dBm) Result

6.971 30 Pass



WirelessHART (802.15.4) Mid Channel, 2440 MHz								
	Out Pwr Limit							
1	(dBm) (dBm) Result							
l [7.924	30	Pass	

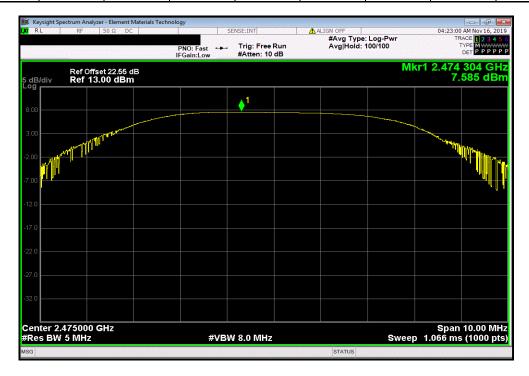




WirelessHART (802.15.4) High Channel, 2475 MHz

Out Pwr Limit
(dBm) (dBm) Result

7.585 30 Pass





XMit 2019.09.05

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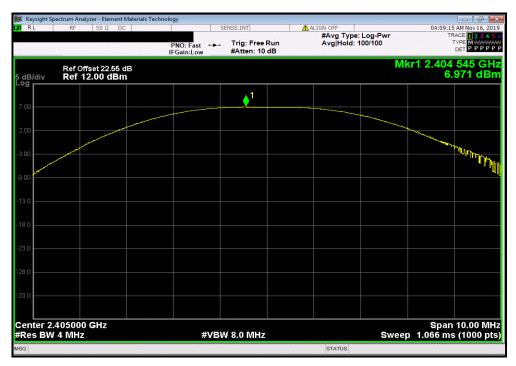
The antenna gain of the EUT was added to the measured output power to calculate the EIRP.



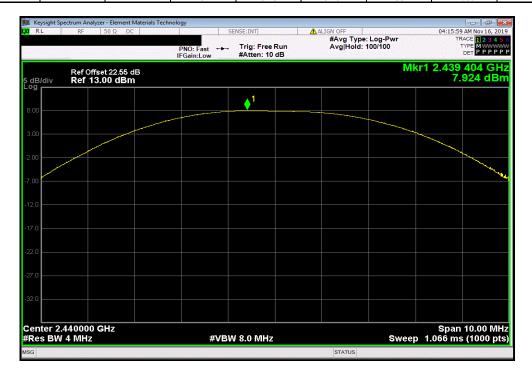
								TbtTx 2019.08.30.0	XMit 2019.09.0
EUT:	GEO20						Work Order:	EMPM0080	
Serial Number:	2400F						Date:	15-Nov-19	
Customer:	Emerson						Temperature:	23.1 °C	
Attendees:	None						Humidity:	24.6% RH	
Project:	None						Barometric Pres.:	1030 mbar	
Tested by:	Dustin Sparks		Powe	er: Battery			Job Site:	MN08	
TEST SPECIFICATI	IONS			Test Method					
FCC 15.247:2019				ANSI C63.10:2013					
COMMENTS									
None									
DEVIATIONS FROM	II TEST STANDARD								
None									
Configuration #	1		Duntin.	Spares					
		Signature		2/200					
					Out Pwr	Antenna	EIRP	EIRP Limit	
					(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
WirelessHART (802	.15.4) Low Channel, 2405 I	MHz			6.971	0.18	7.151	36	Pass
WirelessHART (802.15.4) Mid Channel, 2440 MHz 7.924						0.18	8.104	36	Pass
WirelessHART (802	relessHART (802.15.4) High Channel, 2475 MHz 7.585						7.765	36	Pass



WirelessHART (802.15.4) Low Channel, 2405 MHz
Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result
6.971 0.18 7.151 36 Pass



WirelessHART (802.15.4) Mid Channel, 2440 MHz						
		Out Pwr	Antenna	EIRP	EIRP Limit	
		(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
		7.924	0.18	8.104	36	Pass

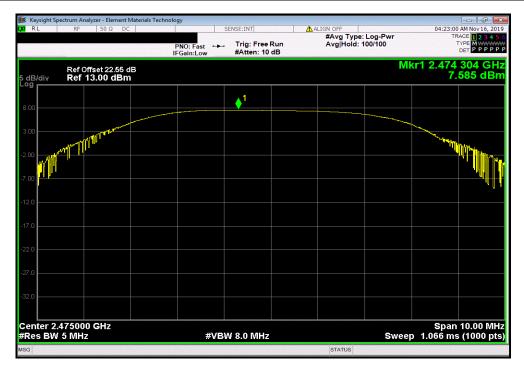




WirelessHART (802.15.4) High Channel, 2475 MHz

Out Pwr Antenna EIRP EIRP Limit
(dBm) Gain (dBi) (dBm) (dBm) Result

7.585 0.18 7.765 36 Pass





XMit 2019.09.05

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
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.



						TbtTx 2019.08.30.0	XMit 2019.09.05
EUT: 0	SEO20				Work Order	: EMPM0080	
Serial Number: 2	400F				Date	: 15-Nov-19	
Customer:	merson				Temperature	23.1 °C	
Attendees: N	lone				Humidity	24.4% RH	
Project: N	lone				Barometric Pres.	: 1030 mbar	
Tested by: [Oustin Sparks			Power: Battery	Job Site	: MN08	
TEST SPECIFICATIO	NS			Test Method			
FCC 15.247:2019				ANSI C63.10:2013			
COMMENTS							
None							
DEVIATIONS FROM	TEST STANDARD						
None							
			10-				
Configuration #	1		Ju	tingondo			
		Signature		2/000			
					Value	Limit	
					dBm/3kHz	< dBm/3kHz	Results
WirelessHART (802.1	5.4) Low Channel, 2405 N	ИHz			-5.435	8	Pass
WirelessHART (802.1	5.4) Mid Channel, 2440 M	1Hz			-4.9	8	Pass
WirelessHART (802.1	5.4) High Channel, 2475	MHz			-5.251	8	Pass

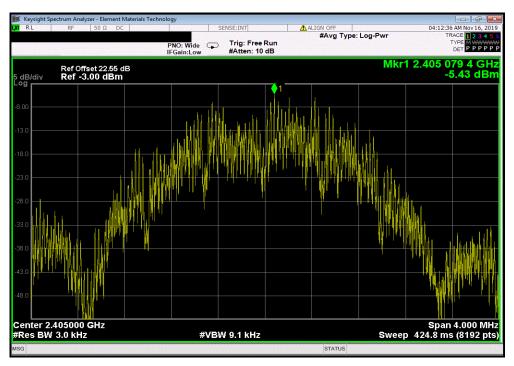


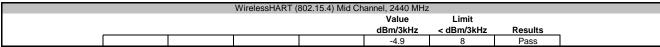
WirelessHART (802.15.4) Low Channel, 2405 MHz

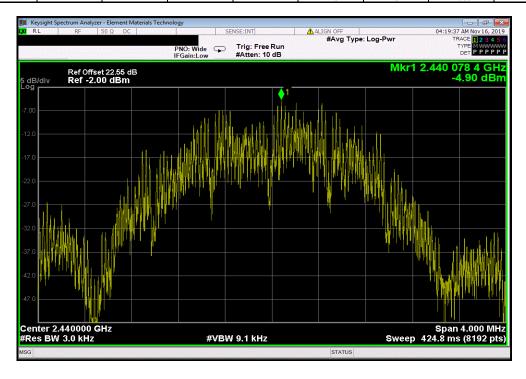
Value Limit

dBm/3kHz < dBm/3kHz Results

-5.435 8 Pass







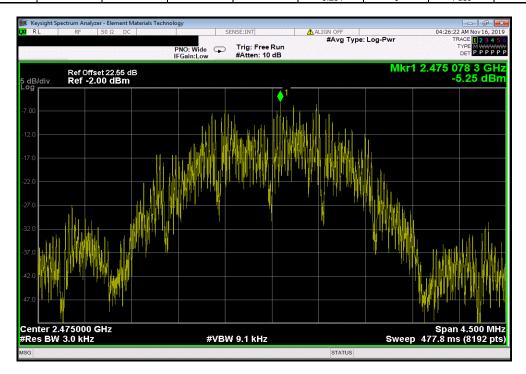


WirelessHART (802.15.4) High Channel, 2475 MHz

Value Limit

dBm/3kHz < dBm/3kHz Results

-5.251 8 Pass



BAND EDGE COMPLIANCE



XMit 2019.09.05

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	D	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE



						TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	GEO20				Work Order:	EMPM0080	
Serial Number:	2400F					15-Nov-19	
Customer:	Emerson				Temperature:	23 °C	
Attendees:	None					24.5% RH	
Project:	None				Barometric Pres.:		
Tested by:	Dustin Sparks		Powers	Battery	Job Site:	MN08	
TEST SPECIFICATI	ONS			Test Method			
FCC 15.247:2019				ANSI C63.10:2013			
COMMENTS							
None							
DEVIATIONS FROM	M TEST STANDARD						
None							
			9 11	7			
Configuration #	1	~	Justine	Spares			
		Signature					
					Value	Limit	
					(dBc)	≤ (dBc)	Result
	.15.4) Low Channel, 2405 I				-41.33	-20	Pass
WirelessHART (802.	.15.4) High Channel, 2475	MHz			-48.35	-20	Pass

BAND EDGE COMPLIANCE



WirelessHART (802.15.4) Low Channel, 2405 MHz

Value Limit
(dBc) ≤ (dBc) Result

-41.33 -20 Pass



WirelessHART (802.15.4) High Channel, 2475 MHz							
Value Limit							
				(dBc)	≤ (dBc)	Result	
				-48.35	-20	Pass	





XMit 2019 09 0

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	D	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	15-Sep-19	15-Sep-20
Attenuator	S.M. Electronics	SA26B-20	RFW	13-Feb-19	13-Feb-20
Block - DC	Fairview Microwave	SD3379	AMI	6-Aug-19	6-Aug-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	1-May-19	1-May-20

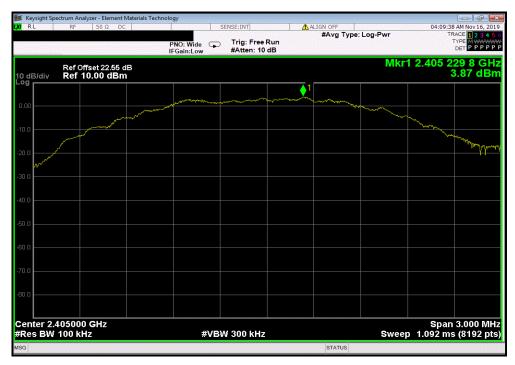
TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

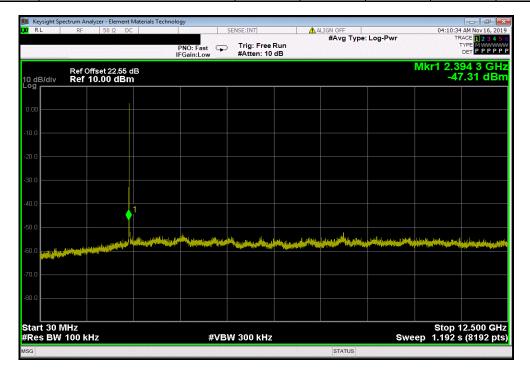


							TbtTx 2019.08.30.0	XMit 2019.09.0
EUT: GEO2						Work Order:		
Serial Number: 2400F							15-Nov-19	
Customer: Emer	rson					Temperature:	23.1 °C	
Attendees: None	9					Humidity:		
Project: None	e					Barometric Pres.:	1030 mbar	
Tested by: Dusti	in Sparks		Power	r: Battery		Job Site:	MN08	
TEST SPECIFICATIONS				Test Method				
FCC 15.247:2019				ANSI C63.10:2013				
COMMENTS								
None								
DEVIATIONS FROM TEST	T STANDARD							
DEVIATIONS FROM TEST None	T STANDARD							
None	T STANDARD		A 11					
	T STANDARD 1		Dustin	Spalo				
None	T STANDARD 1	Signature	Dustin	Spals				
None	1	Signature	Dustin	Frequency	Measured	Max Value	Limit	
None Configuration #	1	Signature	Dustin	-(Measured Freq (MHz)	(dBc)	Limit ≤ (dBc)	Result
None Configuration #	1	Signature	Dustin	Frequency				Result N/A
None	1 Low Channel, 2405 MHz	Signature	Dustin	Frequency Range	Freq (MHz)	(dBc)	≤ (dBc)	
None Configuration # WirelessHART (802.15.4) I	1 Low Channel, 2405 MHz Low Channel, 2405 MHz	Signature	Dustin	Frequency Range Fundamental	Freq (MHz) 2405.23	(dBc) N/A	≤ (dBc) N/A	N/A
None Configuration # WirelessHART (802.15.4) I WirelessHART (802.15.4) I	1 Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz	Signature	Dustin	Frequency Range Fundamental 30 MHz - 12.5 GHz	Freq (MHz) 2405.23 2394.29	(dBc) N/A -51.18	≤ (dBc) N/A -20	N/A Pass
None Configuration # WirelessHART (802.15.4) I WirelessHART (802.15.4) I WirelessHART (802.15.4) I	Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz Mid Channel, 2440 MHz	Signature	Dustin	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	Freq (MHz) 2405.23 2394.29 24243.07	(dBc) N/A -51.18 -54.68	≤ (dBc) N/A -20 -20	N/A Pass Pass
None Configuration # WirelessHART (802.15.4) WirelessHART (802.15.4) WirelessHART (802.15.4) WirelessHART (802.15.4) WirelessHART (802.15.4)	Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz Mid Channel, 2440 MHz Mid Channel, 2440 MHz	Signature	Dustin	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	Freq (MHz) 2405.23 2394.29 24243.07 2440.24	(dBc) N/A -51.18 -54.68 N/A	≤ (dBc) N/A -20 -20 N/A	N/A Pass Pass N/A
None Configuration # WirelessHART (802.15.4) I WirelessHART (802.15.4) I WirelessHART (802.15.4) I WirelessHART (802.15.4) I	Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz Mid Channel, 2440 MHz Mid Channel, 2440 MHz Mid Channel, 2440 MHz	Signature	Dustin	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	Freq (MHz) 2405.23 2394.29 24243.07 2440.24 3807.08	(dBc) N/A -51.18 -54.68 N/A -57.99	≤ (dBc) N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass
None Configuration # WirelessHART (802.15.4) I	Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz Mid Channel, 2440 MHz Mid Channel, 2440 MHz Mid Channel, 2440 MHz High Channel, 2475 MHz	Signature	Dustin	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	Freq (MHz) 2405.23 2394.29 24243.07 2440.24 3807.08 24053.84	(dBc) N/A -51.18 -54.68 N/A -57.99 -54.67	≤ (dBc) N/A -20 -20 N/A -20 -20 20	N/A Pass Pass N/A Pass Pass





WirelessHART (802.15.4) Low Channel, 2405 MHz						
	Frequency	Max Value	Limit			
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
1	30 MHz - 12.5 GHz	2394.29	-51.18	-20	Pass	



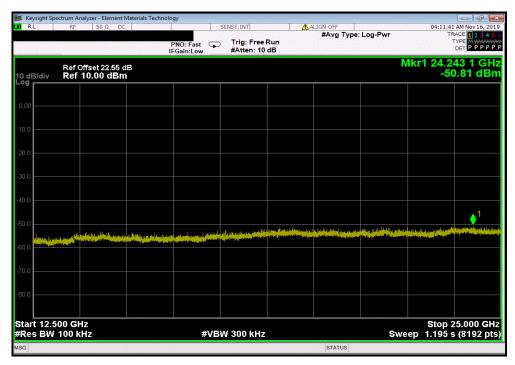


 WirelessHART (802.15.4) Low Channel, 2405 MHz

 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24243.07
 -54.68
 -20
 Pass



WirelessHART (802.15.4) Mid Channel, 2440 MHz						
Frequency	Max Value	Limit				
Range	Freq (MHz)	(dBc)	≤ (dBc)	Result		
Fundamental	2440.24	N/A	N/A	N/A		



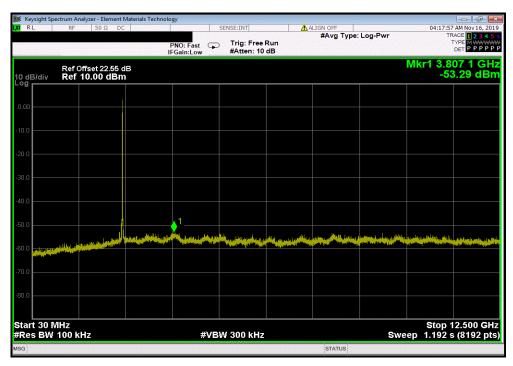


 WirelessHART (802.15.4) Mid Channel, 2440 MHz

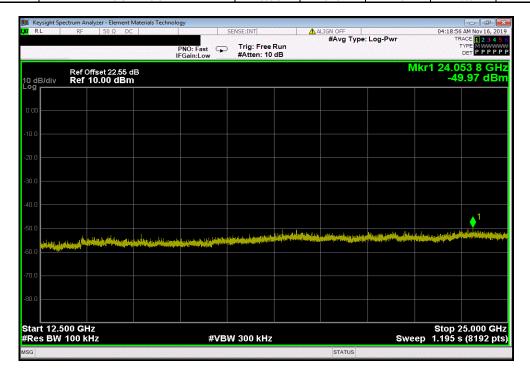
 Frequency
 Measured
 Max Value
 Limit

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 30 MHz - 12.5 GHz
 3807.08
 -57.99
 -20
 Pass



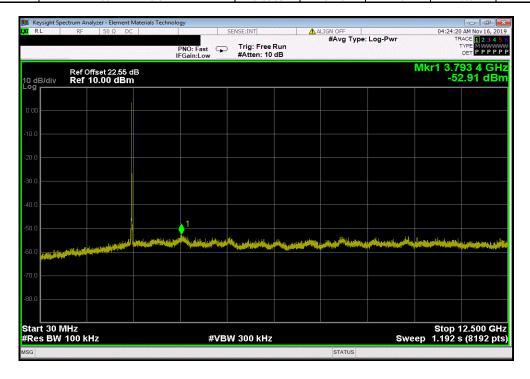
WirelessHART (802.15.4) Mid Channel, 2440 MHz						
	Frequency	Max Value	Limit			
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
,	12.5 GHz - 25 GHz	24053.84	-54.67	-20	Pass	







WirelessHART (802.15.4) High Channel, 2475 MHz						
	Frequency	Max Value	Limit			
	Range	Freq (MHz)	(dBc)	≤ (dBc)	Result	
	30 MHz - 12.5 GHz	3793.38	-57.23	-20	Pass	



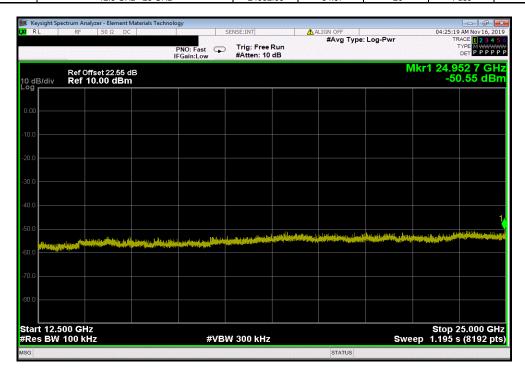


 WirelessHART (802.15.4) High Channel, 2475 MHz

 Frequency
 Measured
 Max Value
 Limit
 Result

 Range
 Freq (MHz)
 (dBc)
 ≤ (dBc)
 Result

 12.5 GHz - 25 GHz
 24952.69
 -54.87
 -20
 Pass



SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2019.05.10

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting WirelessHART (802.15.4) - low channel (2405 MHz), mid channel (2440 MHz), and high channel (2475 MHz) modulated

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

EMPM0080 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz Stop Frequency 26500 MHz	Start Frequency	30 MHz	Stop Frequency	26500 MHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Filter - High Pass	Micro-Tronics	HPM50111	LFN	12-Sep-2019	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	17-Sep-2019	12 mo
Attenuator	Fairview Microwave	SA18E-20	TWZ	17-Sep-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	11-Sep-2019	12 mo
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	11-Sep-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	8-Feb-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	8-Mar-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	8-Feb-2019	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	8-Feb-2019	12 mo
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	17-Sep-2019	12 mo
Antenna - Double Ridge	ETS-Lindgren	3115	AJQ	16-Jan-2019	24 mo
Cable	ESM Cable Corp.	Bilog Cables	MNH	18-Oct-2019	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYD	25-Jan-2018	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	13-Dec-2018	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)			
0.01 - 0.15	1.0	0.2	0.2			
0.15 - 30.0	10.0	9.0	9.0			
30.0 - 1000	100.0	120.0	120.0			
Above 1000	1000.0	N/A	1000.0			

Report No. EMPM0080 Rev. 1

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2019.05.10

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector PK = Peak Detector

AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc).

SPURIOUS RADIATED EMISSIONS

Date:

12-Nov-2019

EMPM0080

Work Order:



Work Orde				Date:		v-2019	_/	7 1			2	
Projec				nperature:		7°C	2	tusti	mx	Sand	20	
Job Sit				Humidity:		% RH			(
Serial Number		2C	Barome	tric Pres.:	1032	mbar		Tested by:	Dustin Spa	rks		=
	T: GEO20											-
Configuratio	r: Emerson											-
Attendee												-
EUT Powe												=
	Transmitting	Wirelessh	-IΔRT (802	15.4) - low	channel (2	405 MHz) 1	mid channe	al (2440 MH	z) and high	channel (2475 MHz)	-
Operating Mod	e: modulated	, vv 11 0100001	1711(1002	.10.4) 10W	criamici (2	.+00 IVII 12), I	ma chamin	51 (2440 WII I	z), and mgm	oriaririor (2	2470 IVII 12)	
	None											
Deviation	s:											
	Duty cycle c	Duty cycle correction factor (DCCF) of 1.1 dB added to all RMS average measurements. Based on a measured duty cycle									-	
Comment	s: of 77.5% and						Ü				, ,	
Test Specification	Test Method										ı	
FCC 15.247:2019		ANSI C63.10:2013										<u>-</u>
												=
Run # 64	Test Dista	ance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pa	ass	-
80												
00												
70												
60												
										_		
50												
						"		2				
								* -				
40												
30								🔻				
30												
20												
40												
10												
0											Ш	
10		100			1000			10000			100000	
					MHz				- D (A 417	• OB	
									■ PK	◆ AV	QP	
				Duty Cycle		Polarity/						
Freq Amplitude	Factor A	ntenna Height	Azimuth	Correction Factor	External Attenuation	Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz) (dBuV)	(dB)	(meters)	(degrees)	(dB)	(dB)	,,		(dB)	(dBuV/m)	(dBuV/m)	(dB)	
2492 92F 20 0	2.0	1 5	200.0	1.4	20.0	\/c=t	AV	0.0	E0 F	EAO	2.5	Comments High ch, EUT on side
2483.825 33.2 2483.558 33.1	-3.8 -3.8	1.5 2.6	288.0 186.9	1.1 1.1	20.0 20.0	Vert Horz	AV AV	0.0 0.0	50.5 50.4	54.0 54.0	-3.5 -3.6	High ch, EUT on side
2483.608 33.0	-3.8	1.5	141.0	1.1	20.0	Horz	AV	0.0	50.3	54.0	-3.7	High ch, EUT horizontal
2487.308 32.8	-3.7	1.5	152.0	1.1	20.0	Horz	AV	0.0	50.2	54.0	-3.8	High ch, EUT vertical
2484.408 32.8	-3.8	1.5	347.9	1.1	20.0	Vert	AV	0.0	50.1	54.0	-3.9	High ch, EUT vertical High ch, EUT horizontal
2488.425 32.7 2385.500 32.5	-3.7 -3.6	1.5 1.5	169.9 82.9	1.1 1.1	20.0 20.0	Vert Vert	AV AV	0.0 0.0	50.1 50.0	54.0 54.0	-3.9 -4.0	Low ch, EUT on side
7423.575 33.3	13.3	2.1	160.9	1.1	0.0	Horz	AV	0.0	47.7	54.0	-6.3	High ch, EUT vertical
7423.633 32.0	13.3	1.8	214.0	1.1	0.0	Vert	AV	0.0	46.4	54.0	-7.6	High ch, EUT on side
7423.350 31.9	13.3	1.5	336.0	1.1	0.0	Vert	AV	0.0	46.3	54.0	-7.7	High ch, EUT horizontal
7423.592 31.5 7426.392 31.2	13.3 13.3	1.5 1.5	108.0 300.0	1.1 1.1	0.0 0.0	Horz Horz	AV AV	0.0 0.0	45.9 45.6	54.0 54.0	-8.1 -8.4	High ch, EUT on side High ch, EUT horizontal
7321.983 30.6	13.5	2.0	127.9	1.1	0.0	Vert	AV	0.0	45.0	54.0	-8.8	Mid ch, EUT on side
7426.192 30.7	13.3	3.2	159.0	1.1	0.0	Vert	AV	0.0	45.1	54.0	-8.9	High ch, EUT vertical
7318.558 30.5	13.5	1.5	268.0	1.1	0.0	Horz	AV	0.0	45.1	54.0	-8.9	Mid ch, EUT vertical
2484.283 45.0	-3.8	1.5	288.0	0.0	20.0	Vert	PK	0.0	61.2	74.0	-12.8	High ch, EUT on side

-3.8 -3.7 -3.7

1.5 1.5 1.5

288.0 347.9

141.0

0.0 0.0 0.0

20.0 20.0

20.0

Vert

Vert

Horz

AV PK PK

0.0 0.0 0.0

61.2 61.1

61.0

54.0 74.0 74.0 74.0

-12.8 -12.9

-13.0

2484.283 2488.267

2487.708

45.0

44.8

High ch, EUT vertical Mid ch, EUT vertical
High ch, EUT on side
High ch, EUT vertical
High ch, EUT horizontal

Freq	Amplitude	Factor	Antenna Height	Azimuth	Duty Cycle Correction Factor	External Attenuation	Polarity/ Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(dB)	(dB)	туре	Detector	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
(Comments
2484.367	44.6	-3.8	2.6	186.9	0.0	20.0	Horz	PK	0.0	60.8	74.0	-13.2	High ch, EUT on side
2389.192	44.0	-3.6	1.5	82.9	0.0	20.0	Vert	PK	0.0	60.4	74.0	-13.6	Low ch, EUT on side
2486.800	44.0	-3.7	1.5	169.9	0.0	20.0	Vert	PK	0.0	60.3	74.0	-13.7	High ch, EUT horizontal
2487.133	43.9	-3.7	1.5	152.0	0.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	High ch, EUT vertical
7423.550	44.7	13.3	2.1	160.9	0.0	0.0	Horz	PK	0.0	58.0	74.0	-16.0	High ch, EUT vertical
4949.108	32.0	4.8	1.5	164.9	1.1	0.0	Horz	AV	0.0	37.9	54.0	-16.1	High ch, EUT vertical
4810.933	32.1	4.6	1.9	324.0	1.1	0.0	Vert	AV	0.0	37.8	54.0	-16.2	Low ch, EUT on side
4879.250	31.5	4.7	2.2	196.9	1.1	0.0	Horz	AV	0.0	37.3	54.0	-16.7	Mid ch, EUT vertical
4950.808	31.1	4.8	1.5	246.9	1.1	0.0	Vert	AV	0.0	37.0	54.0	-17.0	High ch, EUT on side
4879.067	31.1	4.7	1.5	271.9	1.1	0.0	Vert	AV	0.0	36.9	54.0	-17.1	Mid ch, EUT on side
7423.875	43.1	13.3	1.8	214.0	0.0	0.0	Vert	PK	0.0	56.4	74.0	-17.6	High ch, EUT on side
4809.017	30.7	4.6	1.5	73.0	1.1	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Low ch, EUT vertical
7423.433	42.9	13.3	1.5	300.0	0.0	0.0	Horz	PK	0.0	56.2	74.0	-17.8	High ch, EUT horizontal
7426.717	42.9	13.3	1.5	336.0	0.0	0.0	Vert	PK	0.0	56.2	74.0	-17.8	High ch, EUT horizontal
7426.533	42.9	13.3	1.5	108.0	0.0	0.0	Horz	PK	0.0	56.2	74.0	-17.8	High ch, EUT on side
7423.300	41.8	13.3	3.2	159.0	0.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	High ch, EUT vertical
7320.900	41.6	13.5	2.0	127.9	0.0	0.0	Vert	PK	0.0	55.1	74.0	-18.9	Mid ch, EUT on side
7317.925	41.6	13.5	1.5	268.0	0.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	Mid ch, EUT vertical
12202.450	35.8	-1.8	1.6	319.0	1.1	0.0	Horz	AV	0.0	35.1	54.0	-18.9	Mid ch, EUT vertical
12202.420	34.8	-1.8	1.9	45.0	1.1	0.0	Vert	AV	0.0	34.1	54.0	-19.9	Mid ch, EUT on side
12027.470	34.9	-2.1	1.7	49.9	1.1	0.0	Vert	AV	0.0	33.9	54.0	-20.1	Low ch, EUT on side
12377.470	31.9	-0.7	1.9	206.0	1.1	0.0	Vert	AV	0.0	32.3	54.0	-21.7	High ch, EUT on side
12027.420	32.7	-2.1	1.0	336.9	1.1	0.0	Horz	AV	0.0	31.7	54.0	-22.3	Low ch, EUT vertical
12377.430	30.7	-0.7	1.5	270.0	1.1	0.0	Horz	AV	0.0	31.1	54.0	-22.9	High ch, EUT vertical
4808.975	43.3	4.6	1.9	324.0	0.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	Low ch, EUT on side
4950.925	43.0	4.8	1.5	164.9	0.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	High ch, EUT vertical
4879.208	42.8	4.7	1.5	271.9	0.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Mid ch, EUT on side
4879.117	42.7	4.7	2.2	196.9	0.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	Mid ch, EUT vertical
4810.325	42.4	4.6	1.5	73.0	0.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	Low ch, EUT vertical
4950.192	42.0	4.8	1.5	246.9	0.0	0.0	Vert	PK	0.0	46.8	74.0	-27.2	High ch, EUT on side
12202.340	44.5	-1.8	1.6	319.0	0.0	0.0	Horz	PK	0.0	42.7	74.0	-31.3	Mid ch, EUT vertical
12027.430	44.2	-2.1	1.7	49.9	0.0	0.0	Vert	PK	0.0	42.1	74.0	-31.9	Low ch, EUT on side
12202.470	43.7	-1.8	1.9	45.0	0.0	0.0	Vert	PK	0.0	41.9	74.0	-32.1	Mid ch, EUT on side
12372.920	41.9	-0.7	1.9	206.0	0.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	High ch, EUT on side
12027.280	43.1	-2.1	1.0	336.9	0.0	0.0	Horz	PK	0.0	41.0	74.0	-33.0	Low ch, EUT vertical
12372.680	41.0	-0.7	1.5	270.0	0.0	0.0	Horz	PK	0.0	40.3	74.0	-33.7	High ch, EUT vertical