

Emerson

781SA Smart Antenna

FCC 15.247:2020 Hybrid Radio

Report # EMPM0081



TESTING

NVLAP LAB CODE: 200881-0



CERTIFICATE OF TEST



Last Date of Test: January 10, 2020 Emerson EUT: 781SA Smart Antenna

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2020	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
7.8.2	Carrier Frequency Separation	Yes	Pass	
7.8.3	Number of Hopping Frequencies	Yes	Pass	
7.8.4	Dwell Time	Yes	Pass	
7.8.5	Output Power	Yes	Pass	
7.8.5	Equivalent Isotropic Radiated Power	Yes	Pass	
7.8.6	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
7.8.7	Occupied Bandwidth	Yes	Pass	
7.8.8	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	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	Descripti	on Da	ate ^{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) 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





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:	781SA Smart Antenna
First Date of Test:	January 3, 2020
Last Date of Test:	January 10, 2020
Receipt Date of Samples:	January 3, 2020
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

WirelessHART Field Link

Testing Objective:

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





Configuration EMPM0081-1

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
781SA Smart Antenna	Emerson	781SA	3007			

Peripherals in test setup boundary							
Description	Manufacturer	Model/Part Number	Serial Number				
AC/DC Adapter (Smart Antenna)	CUI Inc.	KSAFE2400100W1US	R1806				

Cables								
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2			
DC Cable (Smart Antenna)	No	1.8m	No	Power I/O Cable	AC/DC Adapter (Smart Antenna)			
Power I/O Cable	Yes	3.1m	No	781SA Smart Antenna	DC Cable (Smart Antenna)			

CONFIGURATIONS



Configuration EMPM0081-2

EUT							
Description	Manufacturer	Model/Part Number	Serial Number				
781SA Smart Antenna	Emerson	781SA	3004				

Peripherals in test setup boundary								
Description	Manufacturer	Model/Part Number	Serial Number					
AC/DC Adapter (Smart	CUILInc	KSAFE2400100W1US	R1806					
Antenna)		100/11 22400100001000						
Laptop 1	Lenovo	ThinkPad T510	431436U					
USB HART Interface	MACTek	Viator	346802					
AC Adapter (Laptop)	Lenovo	92P1160	11S92P1160Z1ZBGH87P524					

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable (Smart Antenna)	No	1.8m	No	Power I/O Cable	AC/DC Adapter (Smart Antenna)
Power I/O Cable	Yes	3.1m	No	781SA Smart Antenna	DC Cable (Smart Antenna)
AC Cable (Laptop)	No	1.0m	No	AC Mains	Power Supply (Laptop 1)
DC Cable (Laptop)	No	1.8m	Yes	Power Supply (Laptop 1)	Laptop 1
HART Interface Cable	No	2.0m	No	USB HART Interface	781SA Smart Antenna
USB Cable (HART Interface)	No	0.3m	No	USB HART Interface	Laptop 1

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
		Spurious	Tested as	No EMI suppression	EUT remained at
1	2020-01-03	Radiated	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
		David Edua	Tested as	No EMI suppression	EUT remained at
2	2020-01-07	Band Edge	delivered to	devices were added or	Element following the
		Compliance	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	EUT remained at
3	2020-01-07	Duty Cycle	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Equivalent	Tested as		
4	0000 04 07	Isotropic			EUT remained at
4	2020-01-07	Radiated		devices were added of	Element following the
		Power	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	EUT remained at
5	2020-01-07	Output Power	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Power	Tested as	No EMI suppression	EUT remained at
6	2020-01-07	Spectral	delivered to	devices were added or	Element following the
		Density	Test Station.	modified during this test.	test.
		Spurious	Tested as	No EMI suppression	EUT remained at
7	2020-01-07	Conducted	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
		Band Edge	Tested as	No EMI suppression	EUT remained at
8	2020-01-08	Compliance –	delivered to	devices were added or	Element following the
		Hopping Mode	Test Station.	modified during this test.	test.
		Carrier	Tested as	No EMI suppression	EUT remained at
9	2020-01-08	Frequency	delivered to	devices were added or	Element following the
		Separation	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	EUT remained at
10	2020-01-08	Dwell Time	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Number of	Tested as	No EMI suppression	EUT remained at
11	2020-01-08	Hopping	delivered to	devices were added or	Element following the
		Frequencies	Test Station.	modified during this test.	test.
		Powerline	Tested as	No EMI suppression	EUT remained at
12	2020-01-10	Conducted	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
		Occupied	Tested as	No EMI suppression	Scheduled testing
13	2020-01-10	Bandwidth	delivered to	devices were added or	was completed
		Danuwium	Test Station.	modified during this test.	was completed.



TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 500hm measuring port is terminated by a 500hm EMI meter or a 500hm resistive load. All 500hm measuring ports of the LISN are terminated by 500hm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESR7	ARI	2019-07-08	2020-07-08
Cable - Conducted Cable					
Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	2019-03-13	2020-03-13
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	2019-03-15	2020-03-15

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

EMPM0081-1

MODES INVESTIGATED

Transmitting WirelessHART - mid channel (2440 MHz) modulated



EUT:	781SA Smar	t Antenna			Work Order:	EMPM0081
Serial Number:	3007 [Date:	2020-01-10
Customer:	Emerson				Temperature:	22.2°C
Attendees:	Merritt Pulkra	abek			Relative Humidity:	21.6%
Customer Project:	None				Bar. Pressure:	1025 mb
Tested By:	Dustin Spark	(S			Job Site:	MN03
Power:	24VDC				Configuration:	EMPM0081-1
TEST SPECIFIC	CATIONS					
Specification:				Method:		
FCC 15.207:2020				ANSI C63.10:20	013	
TEST PARAME	TERS					
Run #: 4		Line:	High Line		Add. Ext. Attenuation (dB	b): 0
COMMENTS						
None						
EUT OPERATIN						
Transmitting Wirele	ssHART - mid	channel (2	440 MHz) modul	ated		
DEVIATIONS FROM TEST STANDARD						
None						





Peak Data - vs - Average Limit



RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit							
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)		
0.4	13.300	20.6	33.9	57.6	-23.7		
4.8	9.100	20.7	29.8	56.0	-26.2		
1.1	8.800	20.6	29.4	56.0	-26.6		
4.6	8.700	20.7	29.4	56.0	-26.6		
4.7	8.700	20.7	29.4	56.0	-26.6		
3.8	8.400	20.8	29.2	56.0	-26.8		
25.3	11.600	21.4	33.0	60.0	-27.0		
3.9	8.100	20.8	28.9	56.0	-27.1		
4.2	8.200	20.7	28.9	56.0	-27.1		
4.4	8.100	20.7	28.8	56.0	-27.2		
4.5	8.100	20.7	28.8	56.0	-27.2		
24.4	11.500	21.3	32.8	60.0	-27.2		
4.3	7.900	20.7	28.6	56.0	-27.4		
3.5	7.700	20.8	28.5	56.0	-27.5		
4.0	7.500	20.8	28.3	56.0	-27.7		
22.4	11.000	21.2	32.2	60.0	-27.8		
1.8	7.600	20.6	28.2	56.0	-27.8		
1.5	7.500	20.6	28.1	56.0	-27.9		
2.1	7.500	20.6	28.1	56.0	-27.9		
2.8	7.400	20.7	28.1	56.0	-27.9		
1.9	7.400	20.6	28.0	56.0	-28.0		
2.5	7.300	20.7	28.0	56.0	-28.0		
3.3	7.200	20.8	28.0	56.0	-28.0		
1.4	7.300	20.6	27.9	56.0	-28.1		
2.0	7.300	20.6	27.9	56.0	-28.1		

Peak Data - vs - Average Limit							
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)		
0.4	13.300	20.6	33.9	47.6	-13.7		
4.8	9.100	20.7	29.8	46.0	-16.2		
1.1	8.800	20.6	29.4	46.0	-16.6		
4.6	8.700	20.7	29.4	46.0	-16.6		
4.7	8.700	20.7	29.4	46.0	-16.6		
3.8	8.400	20.8	29.2	46.0	-16.8		
25.3	11.600	21.4	33.0	50.0	-17.0		
3.9	8.100	20.8	28.9	46.0	-17.1		
4.2	8.200	20.7	28.9	46.0	-17.1		
4.4	8.100	20.7	28.8	46.0	-17.2		
4.5	8.100	20.7	28.8	46.0	-17.2		
24.4	11.500	21.3	32.8	50.0	-17.2		
4.3	7.900	20.7	28.6	46.0	-17.4		
3.5	7.700	20.8	28.5	46.0	-17.5		
4.0	7.500	20.8	28.3	46.0	-17.7		
22.4	11.000	21.2	32.2	50.0	-17.8		
1.8	7.600	20.6	28.2	46.0	-17.8		
1.5	7.500	20.6	28.1	46.0	-17.9		
2.1	7.500	20.6	28.1	46.0	-17.9		
2.8	7.400	20.7	28.1	46.0	-17.9		
1.9	7.400	20.6	28.0	46.0	-18.0		
2.5	7.300	20.7	28.0	46.0	-18.0		
3.3	7.200	20.8	28.0	46.0	-18.0		
1.4	7.300	20.6	27.9	46.0	-18.1		
2.0	7.300	20.6	27.9	46.0	-18.1		

CONCLUSION

Pass

Dusting Dards

Tested By



EUT:	781SA Smar	t Antenna			Work Order:	EMPM0081		
Serial Number:	3007				Date:	2020-01-10		
Customer:	Emerson				Temperature:	22.2°C		
Attendees:	Merritt Pulkra	abek			Relative Humidity:	21.6%		
Customer Project:	None				Bar. Pressure:	1025 mb		
Tested By:	Dustin Spark	S			Job Site:	MN03		
Power:	24VDC				Configuration:	EMPM0081-1		
TEST SPECIFIC	CATIONS							
Specification:				Method:				
FCC 15.207:2020				ANSI C63.10:20	013			
TEST PARAME	TERS							
Run #: 5		Line:	Neutral		Add. Ext. Attenuation (dB	6): 0		
COMMENTS								
None								
EUT OPERATIN								
Transmitting Wirele	ssHART - mid	channel (2	440 MHz) modula	ated				
DEVIATIONS FROM TEST STANDARD								
None								





Peak Data - vs - Average Limit



RESULTS - Run #5

Peak Data - vs - Quasi Peak Limit							
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)		
0.4	14.300	20.6	34.9	57.3	-22.4		
4.7	10.200	20.7	30.9	56.0	-25.1		
3.8	9.300	20.8	30.1	56.0	-25.9		
2.3	8.500	20.7	29.2	56.0	-26.8		
3.6	8.300	20.8	29.1	56.0	-26.9		
4.4	8.400	20.7	29.1	56.0	-26.9		
4.9	8.500	20.6	29.1	56.0	-26.9		
4.1	8.200	20.8	29.0	56.0	-27.0		
2.7	8.200	20.7	28.9	56.0	-27.1		
2.2	8.100	20.7	28.8	56.0	-27.2		
3.1	8.100	20.7	28.8	56.0	-27.2		
23.7	11.500	21.3	32.8	60.0	-27.2		
24.5	11.400	21.4	32.8	60.0	-27.2		
4.3	8.000	20.7	28.7	56.0	-27.3		
2.0	8.000	20.6	28.6	56.0	-27.4		
4.6	7.900	20.7	28.6	56.0	-27.4		
4.8	7.900	20.7	28.6	56.0	-27.4		
24.7	11.100	21.4	32.5	60.0	-27.5		
11.7	11.500	20.9	32.4	60.0	-27.6		
23.9	11.100	21.3	32.4	60.0	-27.6		
20.7	11.200	21.1	32.3	60.0	-27.7		
24.2	11.000	21.3	32.3	60.0	-27.7		
3.5	7.400	20.8	28.2	56.0	-27.8		
4.2	7.500	20.7	28.2	56.0	-27.8		
3.8	7.300	20.8	28.1	56.0	-27.9		

Peak Data - vs - Average Limit							
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)		
0.4	14.300	20.6	34.9	47.3	-12.4		
4.7	10.200	20.7	30.9	46.0	-15.1		
3.8	9.300	20.8	30.1	46.0	-15.9		
2.3	8.500	20.7	29.2	46.0	-16.8		
3.6	8.300	20.8	29.1	46.0	-16.9		
4.4	8.400	20.7	29.1	46.0	-16.9		
4.9	8.500	20.6	29.1	46.0	-16.9		
4.1	8.200	20.8	29.0	46.0	-17.0		
2.7	8.200	20.7	28.9	46.0	-17.1		
2.2	8.100	20.7	28.8	46.0	-17.2		
3.1	8.100	20.7	28.8	46.0	-17.2		
23.7	11.500	21.3	32.8	50.0	-17.2		
24.5	11.400	21.4	32.8	50.0	-17.2		
4.3	8.000	20.7	28.7	46.0	-17.3		
2.0	8.000	20.6	28.6	46.0	-17.4		
4.6	7.900	20.7	28.6	46.0	-17.4		
4.8	7.900	20.7	28.6	46.0	-17.4		
24.7	11.100	21.4	32.5	50.0	-17.5		
11.7	11.500	20.9	32.4	50.0	-17.6		
23.9	11.100	21.3	32.4	50.0	-17.6		
20.7	11.200	21.1	32.3	50.0	-17.7		
24.2	11.000	21.3	32.3	50.0	-17.7		
3.5	7.400	20.8	28.2	46.0	-17.8		
4.2	7.500	20.7	28.2	46.0	-17.8		
3.8	7.300	20.8	28.1	46.0	-17.9		

CONCLUSION

Pass

Justing parts

Tested By



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

POWER SETTINGS INVESTIGATED

24VDC

CONFIGURATIONS INVESTIGATED

EMPM0081 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency 26500 MHz

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 - Low Pass	Micro-Tronics	LPM50004	HGG	17-Sep-2019	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HFM	18-Sep-2019	12 mo
Attenuator	Coaxicom	3910-20	AXY	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	L-3 Narda-MITEQ	AMF-6F-12001800-30-10P	PAP	23-Feb-2019	12 mo
Antenna - Standard Gain	ETS-Lindgren	3160-08	AJP	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	23-Feb-2019	12 mo
Cable	Element	Standard Gain Cable	MNW	23-Feb-2019	12 mo
Antenna - Standard Gain	ETS-Lindgren	3160-07	AJJ	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	23-Feb-2019	12 mo
Cable	Element	Double Ridge Guide Horn Cables	MNV	23-Feb-2019	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIB	27-Aug-2018	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1064-9079 and SA18E-10	AOO	23-Feb-2019	12 mo
Cable	Element	Biconilog Cable	MNX	23-Feb-2019	12 mo
Antenna - Biconilog	Ametek	CBL 6141B	AYS	19-Mar-2019	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFD	28-Jul-2019	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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



SA-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).



									EmiR5 2019.08.15.1	PSA	-ESCI 2019.05.1
Work	Order:	EMPM0081		Date:	3-Jan-	2020	t	7 0	\sim	0	
F	Project:	None	Ter	nperature:	22.1	°C	a	ust	mon	and	2
Jo	ob Site:	MN09		Humidity:	27.6%	RH			-7		
Serial N	umber:	3007	Barome	etric Pres.:	1012	nbar		Tested by	: Dustin Spark	S	
	EUT:	781SA Smart Antenna	a								
Configu	uration:	1									
Cus	stomer:	Emerson									
Atte	endees:	Merritt Pulkrabek									
EUT	Power:	24VDC									
Operating	Mode:	Transmitting Wireless	HART - low	v channel (2	2405 MHz), r	nid chann	el (2440 MI	Hz), and hi	gh channel (24	75 MHz) m	odulated
Devi	iations:	None									
Com	nments:	Duty cycle correction where 0.805 is the du the formula 20 * log(0 when the EUT was pl	factor (DCC ty cycle dur .172), wher aced in freq	CF) of 0.9 dB ing test. A D e 0.172 is th juency hopp	B added to F DCCF of 15. ne overall wo	RMS avera 3 dB was orst-case	age points b then subtra duty cycle o	based on th acted from observed d	ne formula 10 * the RMS avera uring a 100 ms	log(1/0.80 ge points b observatio	5), based on on period
Test Specific	ations					Test Meth	od				
-CC 15.247:2	2020					ANSI C63	10:2013				
Pup #	10	Tost Distance (m)	3	Antonna	Hoight(s)		1 to 4(m)		Posulte	Pas	6
Kun #	19	Test Distance (m)	3	Antenna	Height(S)		1 to 4(m)		Results	Pas	5
80											
70						_					
60						-			•		
50							1				
40							-		•		
30						*		* *			
20											
10											
<u>م</u> ل											
10		100			1000 MHz			10000		10	

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.517	48.7	-4.1	3.8	326.0	0.0	20.0	Vert	PK	0.0	64.6	74.0	-9.4	High ch, EUT vertical
2483.583	48.4	-4.1	1.0	333.0	0.0	20.0	Horz	PK	0.0	64.3	74.0	-9.7	High ch, EUT horizontal
2483.508	47.5	-4.1	1.0	73.0	0.0	20.0	Horz	PK	0.0	63.4	74.0	-10.6	High ch, EUT on side
2483.633	47.2	-4.1	4.0	40.0	0.0	20.0	Vert	PK	0.0	63.1	74.0	-10.9	High ch, EUT horizontal
2483.508	40.3	-4.1	3.8	326.0	-14.4	20.0	Vert	AV	0.0	41.8	54.0	-12.2	High ch, EUT vertical
2483.508	45.8	-4.1	3.7	185.0	0.0	20.0	Vert	PK	0.0	61.7	74.0	-12.3	High ch, EUT on side
2483.508	40.1	-4.1	1.0	333.0	-14.4	20.0	Horz	AV	0.0	41.6	54.0	-12.4	High ch, EUT horizontal
19795.700	46.2	14.7	1.7	35.0	0.0	0.0	Horz	PK	0.0	60.9	74.0	-13.1	High ch, EUT horizontal
2483.500	39.1	-4.1	1.0	73.0	-14.4	20.0	Horz	AV	0.0	40.6	54.0	-13.4	High ch, EUT on side
19515.740	45.6	14.5	1.7	37.0	0.0	0.0	Horz	PK	0.0	60.1	74.0	-13.9	Mid ch, EUT horizontal
19795.790	39.5	14.7	1.7	35.0	-14.4	0.0	Horz	AV	0.0	39.8	54.0	-14.2	High ch, EUT horizontal
2388.550	43.2	-4.2	3.1	319.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	Low ch, EUT vertical
2483.525	37.3	-4.1	4.0	40.0	-14.4	20.0	Vert	AV	0.0	38.8	54.0	-15.2	High ch, EUT horizontal
2486.567	42.9	-4.1	1.5	17.0	0.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	High ch, EUT vertical
19515.860	38.5	14.5	1.7	37.0	-14.4	0.0	Horz	AV	0.0	38.6	54.0	-15.4	Mid ch, EUT horizontal
19244.240	43.5	14.3	1.7	47.0	0.0	0.0	Horz	PK	0.0	57.8	74.0	-16.2	Low ch, EUT horizontal
2483.517	36.1	-4.1	3.7	185.0	-14.4	20.0	Vert	AV	0.0	37.6	54.0	-16.4	High ch, EUT on side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
19244.070	36.7	14.3	1.7	47.0	-14.4	0.0	Horz	AV	0.0	36.6	54.0	-17.4	Low ch, EUT horizontal
12377.480	51.3	-0.5	1.7	325.0	-14.4	0.0	Horz	AV	0.0	36.4	54.0	-17.6	High ch, EUT horizontal
12372.580	56.0	-0.5	1.7	325.0	0.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	High ch, EUT horizontal
2389.950	33.2	-4.2	3.1	319.0	-14.4	20.0	Vert	AV	0.0	34.6	54.0	-19.4	Low ch, EUT vertical
2483.608	31.5	-4.1	1.5	17.0	-14.4	20.0	Horz	AV	0.0	33.0	54.0	-21.0	High ch, EUT vertical
7318,400	40.1	12.7	3.8	64.0	0.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	Mid ch, EUT vertical
12027.500	48.2	-1.2	1.9	43.0	-14.4	0.0	Horz	AV	0.0	32.6	54.0	-21.4	Low ch. EUT horizontal
7424.467	39.7	12.8	1.5	265.0	0.0	0.0	Vert	PK	0.0	52.5	74.0	-21.5	High ch. EUT vertical
7321.275	39.7	12.7	2.8	308.0	0.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	Mid ch. EUT horizontal
12027.360	53.5	-1.2	1.9	43.0	0.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	Low ch. EUT horizontal
7424 575	39.1	12.8	1.5	360.0	0.0	0.0	Horz	PK	0.0	51.9	74.0	-22.1	High ch. EUT horizontal
12377 480	46.0	-0.5	3.4	316.0	-14.4	0.0	Vert	AV	0.0	31.1	54.0	-22.9	High ch. EUT vertical
12372 520	51.3	-0.5	3.4	316.0	0.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	High ch. EUT vertical
4811 083	47.0	3.4	3.0	321.0	0.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	Low ch. EUT horizontal
12022 550	51.5	-1.2	2.4	346.0	0.0	0.0	Vert	PK	0.0	50.3	74.0	-23.7	Low ch EUT vertical
12022.000	45.7	-1.2	2.4	346.0	-14.4	0.0	Vert	AV	0.0	30.1	54.0	-23.9	Low ch. EUT vertical
4810 992	40.6	3.4	3.0	321.0	-14.4	0.0	Horz	AV	0.0	29.6	54.0	-24.4	Low ch. EUT horizontal
4810 900	46.0	3.4	3.1	90.0	0.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low ch EUT on Side
7321 492	30.5	12.7	3.8	64.0	-14.4	0.0	Vert		0.0	28.8	54.0	-25.2	Mid ch EUT vertical
4881 100	45.0	3.5	29	85.0	0.0	0.0	Horz	PK	0.0	48 5	74.0	-25.5	Mid ch. EUT horizontal
4810 967	39.2	3.4	3.1	90.0	-14.4	0.0	Horz		0.0	28.2	54.0	-25.8	Low ch EUT on Side
7318 333	29.1	12.7	2.8	308.0	-14.4	0.0	Horz	AV	0.0	27.4	54.0	-26.6	Mid ch EUT horizontal
7422 825	28.6	12.0	1.5	265.0	-14.4	0.0	Vert	AV	0.0	27.0	54.0	-27.0	High ch EUT vertical
7422.020	28.6	12.0	1.5	360.0	-14.4	0.0	Horz	AV	0.0	27.0	54.0	-27.0	High ch EUT horizontal
1878 867	13.3	3.6	3.1	128.0	0.0	0.0	Vort	PK	0.0	46.9	74.0	-27.1	Mid ch ELIT vertical
4808 883	43.3	3.4	2.5	235.0	0.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	Low ch EUT vertical
4810 750	40.0	3.4	3.9	18.0	0.0	0.0	Vert	PK	0.0	46.1	74.0	-27.9	Low ch EUT on Side
4881 000	36.2	3.5	2.0	85.0	-14.4	0.0	Horz	۵۱/	0.0	25.3	54.0	-28.7	Mid ch ELIT horizontal
4810 958	36.0	3.4	2.5	235.0	-14.4	0.0	Vert	AV	0.0	25.0	54.0	-29.0	Low ch EUT vertical
4950 967	41 3	3.6	23	79.0	0.0	0.0	Horz	PK	0.0	44 9	74.0	-29.1	High ch EUT horizontal
4880 975	35.2	3.5	3.1	128.0	-14.4	0.0	Vert	Δ\/	0.0	24.3	54.0	-29.7	Mid ch EUT vertical
4810 950	35.1	3.4	3.9	18.0	-14.4	0.0	Vert	AV	0.0	24.1	54.0	-29.9	Low ch EUT on Side
4951 208	40.3	3.6	3.9	102.0	0.0	0.0	Vert	PK	0.0	43.9	74.0	-30.1	High ch EUT vertical
4809 692	38.8	3.4	1.5	52.0	0.0	0.0	Horz	PK	0.0	40.0	74.0	-31.8	Low ch ELIT vertical
4811 958	38.5	3.4	1.5	105.0	0.0	0.0	Vert	PK	0.0	41.9	74.0	-32.1	Low ch EUT horizontal
4950 967	32.5	3.6	23	79.0	-14.4	0.0	Horz		0.0	21.7	54.0	-32.3	High ch EUT horizontal
4951 008	31.3	3.6	3.9	102.0	-14.4	0.0	Vert	AV	0.0	20.5	54.0	-33.5	High ch EUT vertical
12024 620	40.8	-1.2	1.5	223.0	0.0	0.0	Horz	PK	0.0	39.6	74.0	-34.4	Mid ch ELIT horizontal
12024.020	40.0	-1.2	1.5	11.0	0.0	0.0	Vort	PK	0.0	38.9	74.0	-35.1	Mid ch, EUT vertical
/811 017	28.0	3.4	1.5	105.0	-14.4	0.0	Vort		0.0	17.0	54.0	-36.1	Low ch EUT borizontal
4810 942	20.5	3.4	1.5	52.0	-14.4	0.0	Horz		0.0	17.5	54.0	-36.3	Low ch EUT vertical
12022 080	30.2	-1 2	1.5	11.0	-14.4	0.0	Vort		0.0	14.6	54.0	-30.5	Mid ch ELIT vertical
12025 250	30.1	-1.2	1.5	223.0	-14 4	0.0	Horz	AV	0.0	14.5	54.0	-39.5	Mid ch. EUT horizontal





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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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.

								TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	781SA Smart Antenna						Work Order:	EMPM0081	
Serial Number:	3004						Date:	7-Jan-20	
Customer:	Emerson						Temperature:	22.3 °C	
Attendees:	None						Humidity:	23.3% RH	
Project:	None						Barometric Pres.:	1019 mbar	
Tested by:	Dustin Sparks		Power: 24VDC				Job Site:	MN09	
TEST SPECIFICATI	ONS		Test Met	thod					
FCC 15.247:2020			ANSI C6	3.10:2013					
				-	-				
COMMENTS									
Reference level off	set includes measuremen	t cable, DC block, 20 dB attenuator,	and the EUT's SMA connection	on.					
DEVIATIONS FROM	I TEST STANDARD								
None									
		~	9 0	2					
Configuration #	2	~	ustingpa	to					
		Signature	(
						Number of	Value	Limit	
			Pulse	Width	Period	Pulses	(%)	(%)	Results
WirelessHART									
	Low Channel, 2405 MHz		4.31	l1 ms	5.357 ms	1	80.5	N/A	N/A
	Low Channel, 2405 MHz		N	I/A	N/A	5	N/A	N/A	N/A
	Mid Channel, 2440 MHz		4.31	l1 ms	5.356 ms	1	80.5	N/A	N/A
	Mid Channel, 2440 MHz		N	I/A	N/A	5	N/A	N/A	N/A
	High Channel, 2475 MHz		4.3	1 ms	5.355 ms	1	80.5	N/A	N/A
	High Channel, 2475 MHz		N	I/A	N/A	5	N/A	N/A	N/A

		WirelessH	ART Low Channel	2405 MHz			
			Number of	Value	Limit		
	Pulse Width	Period	Pulses	(%)	(%)	Results	
	4.311 ms	5.357 ms	1	80.5	N/A	N/A	
🔆 Agilent 09	:18:03 Jan 7,	2020			RT		
Element Materia	als Technology					Mkr3 6.358	} ms
Ref 18 dBm		#Atten 10 c	IB			-2.88 d	Βm
#Peak							
Log 🔶 🔤				· · · · · · · · · · · · · · · · · · ·			
5							
dB/							
Offst 🛛 👘				2	3		
22.1	+						
dB							
#LaAv							
W1 S2							
Center 2.405 0	100 GHz					Span Ø	Hz
Res BW 3 MHz			#VBW 30 kHz		Sweep 8.1	91 ms (8192 p	ts)
Marker Tra	асе Туре	Х	Axis	Amp	litude		
	1) Time	1.	.001 ms	-4.9	11 dBm		
	1) Time	5.	.312 MS .358 MS	-3.1	is dBm 18 dBm		
	-/ 1100-	0.		2.0			

		WirelessHA	RT, Low Channe	l, 2405 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

<u>∦</u> A	gilent 09:1	18:09	Jan	7,2020	9					RΤ				
Element Rof 18	t Material: dBm	s lech	nolo	ду #Ω+	ton 10 di	R								
#Peak	uDill													
Log														
5 dB/ 011-1														
dB														
#LgAv														
W1 S2														
S3 VS														
£ (f): FTun														
Center	2.405 00)0 GHz											S	oan 0 Hz
Res BW	3 MHz_				+	ŧVBI	√ 30 k	:Hz	S	weep 24	4.57	ms	(81	.92 pts)

		**110103311	Number of	Value	Limit		
	Pulse Width	Period	Pulses	(%)	(%)	Res	ults
	4.311 ms	5.356 ms	1	80.5	N/A	N	/A
		-					
🔆 Agilent 09:	:24:44 Jan 7,	2020			RT		
Element Materia	als Technology					Mkr3	6.357 ms
Ref 18 dBm		#Atten 10 d	зB				4.84 dBm
#Peak							
Log 🗕 🔤							
5							
dB/				1 1			
Offst							
22.1	+ <u>+</u>						
dB	o				Ŷ		
					<u>_</u>		
#L @Qu							
*L9HV							
W1 S2							
Center 2.440 0	100 GHz						ipan 0 Hz
Res BW 3 MHz			₩VBW 30 kHz		Sweep 8.1	.91 ms (8	192 pts)
Marker Tra	асе Туре	Х	Axis	Am;	plitude		
	L) Time	1	.001 ms	-4.9	91 dBm		
	L) Time	5	.312 MS 357 me	-4 3	so abm 34 dBm		
		0	1001 IIIS	-4.0			

		WirelessHA	ART, Mid Channe	l, 2440 MHz		
			Number of	Value	Limit	
	Pulse Width	Period	Pulses	(%)	(%)	Results
	N/A	N/A	5	N/A	N/A	N/A

Pulse Width Period Pulses (%) Kesults 4.31 ms 5.355 ms 1 80.5 N/A N/A Agilent 09:31:59 Jan 7, 2020 R T Element Materials Technology Mkr3 6.357 ms -2.37 dBm *Peak -2.37 dBm -2.37 dBm -2.37 dBm #LogAv -2.37 dBm -2.37 dBm -2.37 dBm *LgAv -2.475 0000 GHz -2.37 dBm -2.37 dBm Res BW 3 MHz *VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude			WirelessHA	ART, High Channe	l, 2475 MHz		
Pulse Width Period Pulses (%) (%) Results 4.31 ms 5.355 ms 1 80.5 N/A N/A # Agilent 09:31:59 Jan 7, 2020 R T Element Materials Technology #Atten 10 dB -2.37 dBm #Peak -2.37 dBm -2.37 dBm #Peak -2.37 dBm -2.37 dBm GB/ -2.37 dBm -2.37 dBm #Log -2.37 dBm -2.37 dBm #LogAv -2.37 dBm -2.37 dBm #LogAv -2.37 dBm -2.37 dBm #LogAv -2.475 000 GHz -2.37 dBm Res BW 3 MHz WB 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis 4.30 Time 5.312 ms -2.37 dBm 3 (1) Time -3.89 dBm				Number of	Value	Limit	
Agilent 09:31:59 Jan 7, 2020 R T Element Materials Technology Mkr3 6.357 ms Ref 18 dBm #Atten 10 dB -2.37 dBm Peak -2.37 dBm Iog 2 Gffst 2 22.1 3 WI S2 Span 0 Hz Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBM 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 10 Time 1.802 ms -3.89 dBm 2 Ch Time 5.312 ms 2.27 dBm		Pulse Width	Period	Pulses	(%)	(%)	Results
** Agilent 09:31:59 Jan 7, 2020 R T Element Materials Technology Mkr3 6.357 ms Ref 18 dBm *Atten 10 dB -2.37 dBm *Peak -2.37 dBm go -2.37 dBm *Peak -2.37 dBm #Peak -2.37 dBm #Peak -2.37 dBm #Peak -2.37 dBm #Cop -2.37 dBm GB/ -2.37 dBm Offst -2.37 dBm 22.1		4.31 ms	5.355 ms	1	80.5	N/A	N/A
Element Materials Technology Mkr3 6.357 ms Ref 18 dBm #Atten 10 dB -2.37 dBm *Peak -2.37 dBm -2.37 dBm Log	🔆 Agilent (09:31:59 Jan 7,	2020			RT	
Ref 18 dBm #Atten 10 dB -2.37 dBm *Peak	Element Mate	rials Technology					Mkr3 6.357 ms
*Peak	Ref 18 dBm		#Atten 10 d	∄B			-2.37 dBm
Log 5 dB/ 0ffst 22.1 dB +LgAv w1 S2 Center 2.475 000 GHz Res BW 3 MHz 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms -2.37 dBm 3 (1) Time 6.357 ms -2.37 dBm	#Peak						
5 dB/ dB/ 0ffst 22.1 dB/ dB dB dB/ dB dB/ dB/ #LgAv dB/ dB/ #LgAv dB/ dB/ W1 S2 Span 0 Hz Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 5.312 ms -2.37 dBm 3 (1) Time 6.357 ms	Log 🔶 🚽						
dB/ Offst 22.1 dB i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i i	5 🗕 🔤						
Offst 22.1 dB dB #LgAv dB #LgAv dB W1 S2 Span 0 Hz Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis 1 (1) Time 1.882 ms 2 (1) Time 5.312 ms 3 (1) Time 6.357 ms -2.37 dBm -2.37 dBm	dB/						
22.1 Image: Constraint of the second sec	Offst	1			Ĭ	3	
dB	22.1	•				- Y	
#LgAv	gr hereite						
#LgAv							
#LgAv Image: Constraint of the second se							
#LgAv							
W1 S2 Span 0 Hz Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm	#LgAv						
W1 S2 Span 0 Hz Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm		 					
Center 2.475 000 GHz Span 0 Hz Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm	W1 S2						
Res BW 3 MHz #VBW 30 kHz Sweep 8.191 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm	Center 2.475	000 GHz					Span 0 Hz
Marker Trace Type X Axis Amplitude 1 (1) Time 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm	<u>Res BW 3 MHz</u>	Z		₩VBW 30 kHz		Sweep 8.1	01 ms (8192 pts)
1 (1) 11me 1.002 ms -3.89 dBm 2 (1) Time 5.312 ms 2.27 dBm 3 (1) Time 6.357 ms -2.37 dBm	Marker T	frace Type	X	Axis	Amp	litude	
3 (1) Time 6.357 ms -2.37 dBm	1	(1) Time	15	.002 ms .312 me	-3.8	9 aBm 7 dBm	
	3	(1) Time	6	.357 ms	-2.3	7 dBm	

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

🔆 Agilent 09:32:16 Jan 7, 2020								RT							
Element Materials Technology															
Ref 18	dBm			#At	ten 10 d	B									
#Peak															
Log															
5		i an		[· · · · ·						ĺ					
dB/															
Uffst															
22.1 dB															
uD															
#LaAv															
"L'GITO															
W1 S2															
S3 VS															
£ (f):															
FTun															
Center	2.475 00	0 GHz												Si	oan 0 Hz
Res BW	3 MHz				1	ŧVBI	1 30 k	:Hz		S	weep 24.	57	ms	(81	.92 pts)

CARRIER FREQUENCY SEPARATION

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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The channel carrier frequencies in the 2400-2483.5MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

CARRIER FREQUENCY SEPARATION

					TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	781SA Smart Antenna			Work Order:	EMPM0081	
Serial Number:	3004			Date:	8-Jan-20	
Customer:	Emerson	Temperature:	22.3 °C			
Attendees:	None	Humidity:	18.1% RH			
Project:	None			Barometric Pres.:	1032 mbar	
Tested by:	Dustin Sparks		Power: 24VDC	Job Site:	MN09	
TEST SPECIFICAT	DNS		Test Method			
FCC 15.247:2020		ANSI C63.10:2013				
COMMENTS						
Reference level off	et includes measurement cable, DC block, 20 dB atte	nuator, a	nd the EUT's SMA connection. Limit is equal to the 20 d	B bandwidth of the fundamental emis	sion.	
DEVIATIONS FROM	TEST STANDARD					
None						
Configuration #	2 Signature	\prec	Justin Sparks			
					Limit	
				Value	(≥)	Results
WirelessHART, 6-C	annel Hopping Mode			5.0 MHz	2.6 MHz	Pass
WirelessHART, 15-0	hannel Hopping Mode			5.1 MHz	2.6 MHz	Pass

Report No. EMPM0081

CARRIER FREQUENCY SEPARATION

NUMBER OF HOPPING FREQUENCIES

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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled. Per FCC KDB 558047 section 10, there is no minimum requirement for number of hopping channels for a hybrid device.

NUMBER OF HOPPING FREQUENCIES

						TbtTx 2019.08.30.0	XMit 2019.09.05
EUT:	781SA Smart Antenna		Work Order:	EMPM0081			
Serial Number:	3004		Date:	8-Jan-20			
Customer:	Emerson		Temperature:	22.5 °C			
Attendees:	None		Humidity:	18.2% RH			
Project:	None		Barometric Pres.:	1032 mbar			
Tested by:	Dustin Sparks		Power	24VDC	Job Site:	MN09	
TEST SPECIFICATI	ONS			Test Method			
FCC 15.247:2020				ANSI C63.10:2013			
COMMENTS							
Reference level off	set includes measurement o	cable, DC block, 20 dB attenuator, a	nd the EUT's SMA	connection.			
DEVIATIONS FROM	I TEST STANDARD						
None							
Configuration #	2	Signature	Instine	Spards			
					Number of	Limit	
					Channels	(≥)	Results
WirelessHART, 6-Ch	annel Hopping Mode				6	N/A	N/A
WirelessHART, 15-C	hannel Hopping Mode				15	N/A	N/A

Report No. EMPM0081

NUMBER OF HOPPING FREQUENCIES

element XMit 2019.09.05

TbtTx 2019.08.30.0

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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

The dwell time limit is 400 ms within a time span of 400 ms multiplied by the minimum number of hopping frequencies. On Time During 2.4 s (6-channel mode) = Pulse Width * Average Number of Pulses On Time During 6 s (15-channel mode) = Pulse Width * Average Number of Pulses

>Average Number of Pulses is based on 4 samples. A scale factor was used for the 15-channel mode.

Scale Factor = 6 Sec / Screen Capture Sweep Time = 6 Sec / 3 Sec = 2

EUT: 7815A Smart Antenna Work Order: EMPM0081 Serial Number: 3004 Date: 8-Jan-20 Customer: Emerson Temperature: 22.3 °C Attendees: None Humidity: 18% RH Project: None Humidity: 18% RH Tested by: Dustin Sparks Power: 24VDC Test by: Dustin Sparks Power: 24VDC Test By: Dustin Sparks Power: 24VDC Test Method Job Site: MN09 FCC 15.247:2020 ANSI C63.10:2013 COMMENTS Comment Composition of the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD Signature None Signature Pulse Width Number of Pulses Scale Image: Signature Pulse Width Number of Pulses VirelessHART, 6-Channel Hopping Mode 4211	
Serial Number: 3004 Date: 8-Jan-20 Customer: Emerson Temperature: 22.3 °C Attendees: None Humidity: 18% RH Project: None Barometric Pres.: 1032 mbar Tested by: Dustin Sparks Power: 24VDC TEST SPECIFICATIONS Test Method FCC 15.247:2020 ANSI C63.10:2013 COMMENTS Comment cable, DC block, 20 dB attenuator, and the EUT's SMA connection.	
Customer: Temperature: 22.3 °C Attendees: None Humidity: 18% RH Project: None Barometric Press: 1032 mbar Tested by: Dustin Sparks Power: 24VDC Job Site: MN09 TEST SPECIFICATIONS Test Method FCC 15.247:2020 ANSI C63.10:2013 Comments COMMENTS Comments Comments Signature Signature DEVIATIONS FROM TEST STANDARD Signature Vireless MART, 6-Channel Hopping Mode Scale Limit (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A N/A	
Attendees: Humidity: 18% RH Project: None Barometric Pres.: 1032 mbar Test de by: Dustin Sparks Job Site: MN09 TEST SPECIFICATIONS Test Method Job Site: MN09 FCC 15.247:2020 ANSI C63.10:2013 Job Site: MN09 COMMENTS Commercial Comme	
Project: None Barometric Press: 1032 mbar Test deby: Dustin Sparks Job Site: MN09 TEST SPECIFICATIONS Test Method FCC 15.247:2020 ANSI C63.10:2013 COMMENTS Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD None Quise Width Number of Average No. Scale Limit MirelessHART, 6-Channel Hopping Mode WirelessHART, 6-Channel Hopping Mode	
Tested by: Dustin Sparks Power: 24VDC Job Site: MN09 TEST SPECIFICATIONS Test Method Fest Method Fest Method Fest Method FCC 15.247:2020 ANSI C63.10:2013 A A Fest Method Fest Method COMMENTS COMMENTS A A A A A DEVIATIONS FROM TEST STANDARD A A A A A A None Signature Your Muser of Method Average No. Scale Limit (ms) Limit (ms) WirelessHART, 6-Channel Hopping Mode A A N/A N/A N/A N/A N/A	
TEST SPECIFICATIONS Test Method FCC 15.247:2020 ANSI C63.10:2013 COMMENTS COMMENTS DEVIATIONS FROM TEST STANDARD DEVIATIONS FROM TEST STANDARD None Configuration # 2 Signature Pulse Width Number of Average No. Scale On Time (ms) Limit (ms) WirelessHART, 6-Channel Hopping Mode WirelessHART, 6-Channel Hopping Mode	
FCC 15.247:2020 ANSI C63.10:2013 COMMENTS COMMENTS Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD None Pulse Width Number of Average No. Scale Factor On Time (ms) (ms) WirelessHART, 6-Channel Hopping Mode	
COMMENTS Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD None Configuration # 2 Signature Pulse Width Number of Average No. Scale Limit (ms) Pulses of Pulses Factor On Time (ms) (ms) WirelessHART, 6-Channel Hopping Mode	
COMMENTS Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD None Configuration # 2 Signature Pulse Width (ms) Number of Pulses Average No. Scale Factor Limit (ms) WirelessHART, 6-Channel Hopping Mode Low Channel Hopping Mode	
Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUI's SMA connection. DEVIATIONS FROM TEST STANDARD None Configuration # 2 Signature Pulse Width Number of Average No. Scale Continue (ms) Limit (ms) WirelessHART, 6-Channel Hopping Mode Non	
DEVIATIONS FROM TEST STANDARD None Configuration # 2 Signature Pulse Width (ms) Number of Pulses Average No. Scale Factor Limit (ms) Limit (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A N/A	
DEVIATIONS FROM TEST STANDARD None Signature Signature Limit Configuration # 2 2 Signature Pulse Width (ms) Number of Pulses Average No. of Pulses Scale Factor Limit (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A	
None Configuration # 2 Signature Pulse Width (ms) Number of Pulses Average No. of Pulses Scale Factor Limit (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A N/A	
Configuration # 2 Signature Pulse Width Number of Merage No. Scale Pulse Width (ms) Pulses Average No. of Pulses Scale Limit (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A N/A	
Configuration # 2 Signature Pulse Width (ms) Number of Pulses Average No. of Pulses Scale Factor Limit On Time (ms) WirelessHART, 6-Channel Hopping Mode 4211 N/A N/A N/A	
Signature Pulse Width (ms) Number of Pulses Average No. Scale Limit (ms) WirelessHART, 6-Channel Hopping Mode (ms) Pulses of Pulses Factor On Time (ms) (ms)	
Pulse width Number of (ms) Average No. Scale Limit WirelessHART, 6-Channel Hopping Mode (ms) Pulses of Pulses Factor On Time (ms) (ms)	
WirelessHART, 6-Channel Hopping Mode	Poculte
Viilelessnaki, orolaanie nopping wode Low Changel 2006 Mitz 4.211 N/A N/A N/A N/A N/A N/A	Results
	NI/A
Low Granel 2405 MHz 4.511 N/A 1V/A 1V/A 1V/A 1V/A 1V/A 1V/A	IN/A
LOW Chainine, 2405 MHZ N/A N/A N/A N/A N/A N/A N/A N/A	N/A
Low Gladinier, 2403 Min2 N/A N/A N/A N/A N/A N/A N/A	N/A N/A
Low Grannier, 2405 MHZ N/A N/A N/A N/A N/A N/A N/A	N/A N/A
Low Orlanine, 2405 MHz 4311 N/A 19 5 N/A 78 68 400	Page
LOW Crianner, 2405 MIRZ 4,0 ST	Pass
High Channel, 2475 Miltz 4,311 N/A N/A N/A N/A N/A N/A N/A	N/A
	N/A
High Channel, 24/5 MHz N/A N/A N/A N/A N/A N/A N/A	N/A
High Channel, 2475 MHz N/A N/A N/A N/A N/A	N/A
High Channel, 2475 MHz N/A N/A N/A N/A N/A N/A	N/A
High Channel, 2475 MHz 4.311 N/A 17.75 N/A 76.52 400	Pass
WirelessHART, 15-Channel Hopping Mode	
Low Channel, 2405 MHz 4.311 N/A N/A N/A N/A N/A N/A	N/A
Low Channel, 2405 MHz N/A N/A N/A N/A N/A N/A N/A	N/A
Low Channel, 2405 MHz N/A N/A N/A N/A N/A N/A N/A	N/A
Low Channel, 2405 MHz N/A N/A 10 N/A N/A N/A N/A N/A	N/A
Low Channel, 2405 MHz N/A N/A 6 N/A N/A N/A N/A N/A	N/A
Low Channel, 2405 MHz 4.311 N/A 9.25 2 79.75 400	Pass
High Channel, 2475 MHz 4.311 N/A N/A N/A N/A N/A N/A	N/A
High Channel, 2475 MHz N/A N/A 9 N/A N/A N/A N/A	N/A
High Channel, 2475 MHz N/A N/A N/A N/A N/A N/A	N/A
High Channel 2475 MHz N/A N/A N/A N/A N/A N/A	1 1// 1
High Channel 2475 MHz N/A N/A N/A N/A N/A N/A	N/A
High Channel 2475 MHZ 1/47 1/47 1/47 1/47 1/47 1/47 1/47 1/47	N/A N/A



			Wirele	ssHART, 6-Chanr	el Hopping Mode	e, Low Channel, 24	405 MHz		
	Pu	lse Width	Number of	Average No.	Scale		Limit		
		(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
		N/A	17	N/A	N/A	N/A	N/A	N/A	
							D T		
莱	Ag	ilent 10:0	01:37 Jan 8,	. 2020			кі		
Eler	ment	Materials	s Technology						
Ref	22.1	l2 dBm		#Atten 10 c	IB				
#Pe	ak								
Log									
5	,								
dR/	<u>.</u>								
Uff:	st								
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ET	in l								
Swn	"' -	_							
0115	·								
		_							
		0 405 00							
Cen	iter a	2.405 00	0 00 GHz					Span 1 MHz	
#Re	⊧s BW	- 300 kHz	2		#VBW 30 kHz		#Sweep 2.4	01 s (8192 pts)_	
	_		Wirele	ssHART, 6-Chanr	el Hopping Mode	e, Low Channel. 24	405 MHz		
	Pu	lse Width	Number of	Average No.	Scale	,	Limit		
		(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
		4.311	N/A	18.25	N/A	78.68	400	Pass	

Calculation Only

No Screen Capture Required











		Wireless	HART, 6-Chann	el Hopping Mode	, High Channel, 24	475 MHz		
	Pulse Width	Number of	Average No.	Scale		Limit		
	(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
	N/A	19	IN/A	N/A	N/A	N/A	N/A	
Nie	A	0.10 L. 0	1010			р т		
1945	Aglient 10:0	0:10 Jan o,	2020			RI		
Elen	nent Materials	lechnology		5				
Ket "Do	22.12 dBm		#Htten 10 d	IR				
#rea	ак							
LU9 F								
L L L	,							
0ffa Offa								
22.1								
dB		1 1	11 11	1 11	1		11	
#L ai	<u>ο</u> υ							
*L9I								
ដ1	\$2							
\$3	VS			┼┼───╢─				
~~~	••							
<b>£</b> (f)	)•			+- <mark>  </mark>				
FTu	in l							
Swn				┼┼───╢				
0"0								
~	0.475.000							
Cen	ter 2.475 000	0 00 GHZ					Span 1 MHz	
#Re:	s BW 300 kHz			#VBM 30 kHz		#Sweep 2.40	01 s (8192 pts)_	
		Wireless	HART. 6-Chann	el Hopping Mode	. High Channel. 2	475 MHz		
	Pulse Width	Number of	Average No.	Scale	, <u> </u>	Limit		
	(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
	4.311	N/A	17.75	N/A	76.52	400	Pass	

**Calculation Only** 

No Screen Capture Required







-	)	Wireles	sHART, 15-Chann	el Hopping Moo	le, Low Channel, 24	05 MHz	
ſ	(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results
	N/A	6	N/A	N/A	N/A	N/A	N/A
	ailant 10.08	R•17 . Jan 8	2020			РT	
Elemen	t Materials	Technology	2020			K I	
Ref 22	2.12 dBm	, connoiogy	#Atten 10 dl	В			
#Peak							
Log							
J dBZ							
Öffst							
22.1							
αD							
#LgAv							
W1 52							
S3 <u>V</u> S							
<b>£</b> (f):							
Swn							
Center	· 2.405 000	) 00 GHz					Span 1 MHz
#R 🗠 S 🗖				- HDH 200 LH-		#C	= 2 = 79100 = = = 1
-103 E	SM 300 KHZ			ŧVBW 30 kHz		#Swee	p 3 s (8192 pts)_
F	Pulse Width	Wireles: Number of	sHART, 15-Chann Average No.	₩BW 30 kHz el Hopping Moc Scale	e, Low Channel, 24	#Swee 05 MHz Limit	p 3 s (8192 pts)
	Pulse Width (ms)	Wireless Number of Pulses	sHART, 15-Chann Average No. of Pulses	ŧVBW 30 kH₂ el Hopping Moc Scale Factor	le, Low Channel, 24	#Swee 05 MHz Limit (ms)	Results
F	Pulse Width (ms) N/A	Wireles: Number of Pulses 10	sHART, 15-Chann Average No. of Pulses N/A	ŧVBW 30 kH2 el Hopping Moo Scale Factor N/A	le, Low Channel, 24 On Time (ms) N/A	#Swee 05 MHz Limit (ms) N/A	Results N/A
F F	Pulse Width (ms) N/A Agilent 10:03	Wireles: Number of Pulses 10 3:03 Jan 8,	sHART, 15-Chann Average No. of Pulses N/A	ŧVBN 30 kHz el Hopping Moo Scale Factor N/A	e, Low Channel, 24 On Time (ms)	#Swee	ep 3 s (8192 pts) Results N/A
F F Elemen	Pulse Width (ms) N/A Agilent 10:03	Wireles: Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A	ŧVBN 30 kHz el Hopping Moo Scale Factor N∕A	e, Low Channel, 24 On Time (ms)	#Swee D5 MHz Limit (ms) N/A R T	Results
F F Elemen Ref 22 #Peak	Pulse Width (ms) N/A Agilent 10:03 It Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	el Hopping Moo Scale Factor N/A	le, Low Channel, 24 On Time (ms)	#Swee 05 MHz Limit (ms) N/A R T	Results N/A
F F Elemen Ref 22 #Peak Log	Pulse Width (ms) N/A Agilent 10:03 It Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 d	₩BH 30 KHz el Hopping Moc Scale Factor N/A	e, Low Channel, 24 On Time (ms)	#Swee 05 MHz Limit (ms) N/A R T	Results N/A
₩ A Elemen Ref 22 #Peak Log 5	Pulse Width (ms) N/A Agilent 10:00 It Materials	Wireles: Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 di	BI 30 KHz el Hopping Moo Scale Factor N/A	e, Low Channel, 24 On Time (ms)	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F F Elemen Ref 22 #Peak Log 5 dB/	Pulse Width (ms) N/A Agilent 10:00 It Materials	Wireles: Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 d	₩BH 30 KHz el Hopping Moo Scale Factor N/A	e, Low Channel, 24 On Time (ms)	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1	Pulse Width (ms) N/A Agilent 10:00 Lt Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 d	B	de, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results N/A
Flemen Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB	Pulse Width (ms) N/A Agilent 10:00 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	de, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results N/A
F Element Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB	Pulse Width (ms) N/A sgilent 10:00 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	de, Low Channel, 24	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
Elemen Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB	Pulse Width (ms) N/A   Agilent 10:03 1.1 Materials 2.12 dBm	Wireles: Number of Pulses 10 9:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB #LaAv	Pulse Width (ms) N/A Agilent 10:00 It Materials 2.12 dBm	Wireless Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F F Elemen Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB #LgAv	Pulse Width (ms) N/A Agilent 10:00 Lt Materials 2.12 dBm	Wireless Number of Pulses 10 03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv	Pulse Width (ms) N/A sgilent 10:00 t Materials 2.12 dBm	Wireless Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩LgAv ₩1 \$2 \$3 ¥\$	Pulse Width (ms) N/A sgilent 10:00 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F F Elemen Ref 22 HPeak Log 5 dB/ Offst 22.1 dB #LgAv W1 \$2 \$3 V\$ £(f);	Pulse Width (ms) N/A sgilent 10:03 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	2	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 VS £(f): FTun	Pulse Width (ms) N/A Agilent 10:05 It Materials 2.12 dBm	Wireless Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	2	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 VS £(f): FTun \$wp	Pulse Width (ms) N/A Agilent 10:00 It Materials 2.12 dBm	Wireless Number of Pulses 10 0:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B	e, Low Channel, 24 On Time (ms) N/A	#Swee D5 MHz Limit (ms) N/A R T	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 VS £(f): FTun Swp	Pulse Width (ms) N/A Agilent 10:03 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B B B B B B B B B B B B B B B B B B B	e, Low Channel, 24 On Time (ms) N/A	*Swee	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 VS £(f): FTun Swp	Pulse Width (ms) N/A sgilent 10:00 t Materials 2.12 dBm	Wireless Number of Pulses 10 3:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B B B B B B B B B B B B B B	de, Low Channel, 24 On Time (ms) N/A	*Swee D5 MHz Limit (ms) N/A R T Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comparison Comp	Results           N/A
F Elemen Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv k1 \$2 \$3 V\$ £(f): FTun Swp Center	Pulse Width (ms) N/A sgilent 10:03 t Materials 2.12 dBm	Wireless Number of Pulses 10 9:03 Jan 8, Technology	sHART, 15-Chann Average No. of Pulses N/A 2020 #Atten 10 dl	B B B B B B B B B B C C C C C C C C C C C C C	de, Low Channel, 244 On Time (ms) N/A N/A	*Swee D5 MHz Limit (ms) N/A R T C C C C C C C C C C C C C	Results           N/A



			Wireless	HART, 15-Ch	annel Hoppir	ng Mode	e, Low Channe	el, 24	405 MH	Ηz			
	Pulse Widt	h Num	ber of	Average N	o. Sca	le	,		L	.imit			
	(ms)	Pu	lses	of Pulses	Fac	tor	On Time (n	ıs)	(	ms)	Resu	ilts	
	N/A		6	N/A	N/.	4	N/A			N/A	N/A	4	
ste			1 0	~~~~					•	т			
荣	Agilent 1	0:09:22	Jan 8,	2020					к				
Eler	nent Materi	als Lech	nology										
Ret	22.12 dBm	1		#Atten 10	dB								
#re	ак												
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#Ke	S DW 300 K	KHZ			_ #VBM 30	9 KHZ				#∋wеер	JS (81	L9Z pts	67
			Wireless	HART, 15-Ch	annel Hoppir	ig Mode	e, Low Channe	el, 24	405 MH	lz			
	Pulse Widt	h Num	ber of	Average No	o. Sca	le			L	imit			
	(ms)	Pu	Ises	of Pulses	Fac	tor	On Time (m	ıs)	(	<u>ms)</u>	Resu	ilts	
	4.311		I/A	9.25	2		/9./5			400	Pas	SS	

**Calculation Only** 

No Screen Capture Required



		V	Vireles	sHART '	15-Chann	el Hopping M	lode High (	Channel 24	75 MHz			
Р	ulse Width	Numb	er of	Avera	age No.	Scale		511011101, <u>2</u> 1	Limit			
	(ms)	Puls	ses	of P	ulses	Factor	On Ti	me (ms)	(ms)	Res	ults	
	4.311	N/	A		N/A	N/A		N/A	N/A	N/	A	
Nic. A	nilent 10.	04·21 .	lan 8	2020					RТ			
Flement	Materia	s Techn	oloav	2020					K I	▲ Mkr1	4311 ms	
Ref 22	.12 dBm		ology	#Atte	en 10 d	B					4.911 ms 1.90 dB	
#Peak					/// 10 G						1.00 40	
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#LgAv												
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Center	2.475 0	00 GHz								S	ipan 0 Hz	
Res BW	-ЗОО kH-					LIDIL DA L	U-7	(	Ween 81	29 ms (2	ͶͶͶ nts)	
	000 KH2				1	₩VDW ⊃0 K	112		0100p 0.1		.000 pt0/_	
	500 KH2	V	Vireles	sHART, <i>'</i>	15-Chann	≢ν⊡w ⊃υ κ el Hopping №	lode, High (	Channel, 24	75 MHz	.20 113 (2		
P	ulse Width	V Numb	Vireless er of	sHART, * Avera	15-Chann age No.	el Hopping N Scale	lode, High (	Channel, 24	75 MHz Limit	Poc	ulte	
P	ulse Width (ms) N/A	V Numb Puls	Vireless er of ses	sHART, * Avera of P	15-Chann age No. Pulses VA	■VDW_30K el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24 i <b>me (ms)</b> N/A	75 MHz Limit (ms) N/A	Res	ults /A	
P	ulse Width (ms) N/A	V Numb Puls	Vireless per of ses	sHART, ² Avera of P	15-Chann age No. Pulses VA	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24 i <b>me (ms)</b> N/A	75 MHz Limit (ms) N/A	Res	ults /A	
P	ulse Width (ms) N/A gilent 10:	V Numb Puls 9 06:47	Vireless er of ses lan 8,	sHART, 1 Avera of P 0 2020	15-Chann age No. Vulses VA	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24 i <b>me (ms)</b> N/A	75 MHz Limit (ms) N/A R T	Res	ults /A	
P * A Element	ulse Width (ms) N/A gilent 10:	Numb Puls 9 06:47 o s Techn	Vireless er of ses lan 8,	sHART, 4 Avera of P 0 2020	15-Chann age No. Pulses V/A	el Hopping № Scale Factor N/A	lode, High ( On Ti	Channel, 24 i <b>me (ms)</b> N/A	75 MHz Limit (ms) N/A R T	Res N/	ults /A	
P A Element Ref 22	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	۷ Numb Puls 9 06:47 د s Techn	Vireless er of ses lan 8, ology	sHART, Avera Avera of P 2020 #Atte	15-Chann age No. Vulses VA	el Hopping N Scale Factor N/A	lode, High ( On Ti	Channel, 24 Ime (ms) N/A	75 MHz Limit (ms) N/A R T	Res	ults /A	
P <b>* A</b> Element Ref 22 *Peak	ulse Width (ms) N/A gilent 10: Materia 12 dBm	V Numb Puls 9 06:47 s Techn	Vireless er of ses Jan 8, ology	sHART, ' Avera of P 2020 #Atte	15-Chann age No. Vulses VA	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24 i <b>me (ms)</b> N/A	75 MHz Limit (ms) N/A R T	Res	ults A	
P Element Ref 22. #Peak Log 5	ulse Width (ms) N/A gilent 10: Materia 12 dBm	V Numb Puls 9 06:47 J s Techn	Vireless er of ses lan 8, ology	sHART, 1 Avera of P 2020 #Atte	15-Chann age No. Yulses VA	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24 Ime (ms) N/A	75 MHz Limit (ms) N/A R T	Res	ults A	
P Element Ref 22. #Peak Log 5 dB/	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Vireless ber of ses lan 8, ology	sHART, 1 Avera of P 2020 #Atte	15-Chann age No. Vulses VA	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T		ults A	
P Element Ref 22. #Peak Log 5 dB/ 0ffst	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 06:47 c s Techn	Vireless ses lan 8, ology	sHART, ' Avera of P 2020 #Atte	15-Chann age No. Wises VA	el Hopping M Scale Factor N/A	Inz Iode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T		ults /A	
P Element Ref 22 #Peak Log 5 dB/ 0ffst 22.1	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 06:47 c s Techn	Vireless eer of ses Jan 8, ology	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T		ults /A	
P Element Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 06:47 c s Techn	Vireless er of ses Jan 8, ology	sHART, Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T	Res	ults A	
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 06:47 c s Techn	Vireless eer of ses lan 8, ology	sHART, Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping N Scale Factor N/A	lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T	Res N	ults A	
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Vireless ser of lan 8, ology	sHART, Avera of P 2020 #Atte	15-Channi age No. ulses J/A	el Hopping N Scale Factor N/A	lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T	Res N/	ults A	
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB	ulse Width (ms) N/A gilent 10: 12 dBm	V Numb Puls 9 06:47 c s Techn	Vireless ses	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	lode, High (	Channel, 24	75 MHz Limit (ms) N/A R T	Res N/		
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 C s Techn	Vireless ses	sHART, ' Avera of P N 2020 #Atte	15-Chann age No. ulses V/A	el Hopping M Scale Factor N/A	lode, High (	Channel, 24	75 MHz Limit (ms) N/A R T	Res N/		
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P Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv W1 S2 S3 VS	ulse Width (ms) N/A gilent 10: Materia 12 dBm	V Numb Puls 06:47 c s Techn	Vireless lan 8, logy	SHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	Inz lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T	Res N/	ults A	
P Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv W1 S2 S3 VS	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Vireless ses	sHART, ' Avera of P 2020 #Atte	15-Channa age No. ulses J/A	el Hopping M Scale Factor N/A	IIZ lode, High ( On Ti	Channel, 24	75 MHz Limit (ms) N/A R T	Res		
P Ref 22. #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv W1 S2 S3 VS £(f):	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Virelesses	sHART, ' Avera of P 2020 #Atte	15-Channa age No. ulses J/A	el Hopping M Scale Factor N/A	ITZ lode, High ( On Ti I	Channel, 24	75 MHz Limit (ms) N/A R T	Res		
P Ref 22. #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 S2 S3 VS £(f): FTun Sup	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Virelesses	sHART, ' Avera of P 2020 #Atte	15-Channa age No. tuises J/A	el Hopping M Scale Factor N/A	Inz	Channel, 24	75 MHz Limit (ms) N/A R T	Res		
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv W1 S2 S3 VS £(f): FTun Swp	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 c s Techn	Virelesses	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	IIZ lode, High ( On Ti I	Channel, 24	75 MHz Limit (ms) N/A R T	Res		
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv #LgAv W1 S2 S3 VS £(f): FTun Swp	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 s Techn	Virelesses	sHART, ' Avera of P 2020 #Atte	15-Chann age No. tulses J/A	el Hopping M Scale Factor N/A	IT2 lode, High ( On Ti I	Channel, 24	75 MHz Limit (ms) N/A R T	Res		
P Elemenn Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 V\$ £(f): FTun Swp	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 C s Techn	Virelesses	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	IIZ lode, High ( On Ti I	Channel, 24	75 MHz Limit (ms) N/A R T			
P Element Ref 22 #Peak Log 5 dB/ Offst 22.1 dB #LgAv ₩1 \$2 \$3 V\$ £(f): FTun \$wp	ulse Width (ms) N/A gilent 10: t Materia 12 dBm	V Numb Puls 9 06:47 C s Techn 5 Techn	Vireless ses lan 8, ology	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	el Hopping M Scale Factor N/A	ITZ lode, High ( On Ti !	Channel, 24	75 MHz Limit (ms) N/A R T			
P Elemenn Ref 22 #Peak Log 5 dB/ 0ffst 22.1 dB #LgAv ₩1 \$2 \$3 V\$ £(f): FTun \$wp Center #Res B	ulse Width (ms) N/A gilent 10: t Materia 12 dBm 2.475 01	V Numb Puls 9 06:47 c s Techn 5 Techn	Vireless ses lan 8, ology	sHART, ' Avera of P 2020 #Atte	15-Chann age No. ulses J/A	<pre>#VDN 30 k el Hopping N Scale Factor N/A B B #VBW 30 k</pre>	Hz	Channel, 24	75 MHz Limit (ms) N/A R T	Res N/	ults A	







		Wireless	HART. 15-Chann	el Hopping Mode	e. High Channel, 2	475 MHz		
	Pulse Width	Number of	Average No.	Scale	., <b>g</b> , _	Limit		
	(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
	N/A	12	N/A	N/A	N/A	N/A	N/A	
*	<ul> <li>Agilent 10:0</li> </ul>	7:58 Jan 8,	2020			RT		
Eler	ment Materials	Technology						
Ref	22.12 dBm		#Atten 10 d	В				
#Pe	ak 👘							
Log								
5								
dB≠	/							
Offs	st							
22.1	1					11.1		
dB		<u> </u>  _ _						
#Lg	Av							
W1	\$2							
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<b>£</b> (f	):							
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ten #Do				#UBN 30 rH⇒		#\$4000		
*NU	S DN SUU KHZ			NDM JU KHZ		+oweeh	<u>5 5 (6132 pts)</u>	1
		Wireless	HART, 15-Chann	el Hopping Mode	e, High Channel, 2	475 MHz		
	Pulse Width	Number of	Average No.	Scale		Limit		
	(ms)	Pulses	of Pulses	Factor	On Time (ms)	(ms)	Results	
	4.311	N/A	10.5	2	90.53	400	Pass	

**Calculation Only** 

No Screen Capture Required



XMit 2019.09.05





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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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:	781SA Smart Antenna					Work Order:	EMPM0081		
Serial Number:	3004					Date:	7-Jan-20		
Customer:	Emerson					Temperature:	22.3 °C		
Attendees:	None					Humidity:	23.1% RH		
Project:	None					Barometric Pres.:	1019 mbar		
Tested by:	Dustin Sparks		Power:	24VDC		Job Site:	MN09		
TEST SPECIFICAT	Test SPECIFICATIONS Test Method								
FCC 15.247:2020				ANSI C63.10:2013					
COMMENTS									
Reference level off	set includes measuremen	t cable, DC block, 20 dB attenuator, a	nd the EUT's SMA o	onnection.					
<b>DEVIATIONS FROM</b>	M TEST STANDARD								
None									
Configuration #	2	Signature	Justin	spards					
						Out Pwr (dBm)	Limit (dBm)	Result	
WirelessHART									
	Low Channel, 2405 MHz					13.435	30	Pass	
	Mid Channel, 2440 MHz					13.629	30	Pass	
	High Channel, 2475 MHz					13.636	30	Pass	









# EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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.

The antenna gain in dBi was added to the output power in order to calculate the EIRP.

## EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



								TbtTx 2019.08.30.0	XMit 2019.09.05
EUT	: 781SA Smart Antenna						Work Order:	EMPM0081	
Serial Number	: 3004						Date:	7-Jan-20	
Customer	: Emerson						Temperature:	22.6 °C	
Attendees	: None						Humidity:	22.9% RH	
Project	None						Barometric Pres.:	1019 mbar	
Tested by	: Dustin Sparks		Power:	24VDC			Job Site:	MN09	
TEST SPECIFICAT	TIONS			Test Method					
FCC 15.247:2020				ANSI C63.10:2013					
COMMENTS									
	fset includes measuremen	t cable, DC block, 20 dB atteni	uator, and the EUT's SMA	connection.					
DEVIATIONS FROM	WITEST STANDARD								
None									
Configuration #	2	Signature	Susting	Spards					
					Out Pwr	Antenna	EIRP	EIRP Limit	
					(dBm)	Gain (dBi)	(dBm)	(dBm)	Result
WirelessHART									
	Low Channel, 2405 MHz				13.435	2	15.435	36	Pass
	Mid Channel, 2440 MHz				13.629	2	15.629	36	Pass
	High Channel, 2475 MHz				13.636	2	15.636	36	Pass

## **EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)**





## **EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)**





## **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	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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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**





### **BAND EDGE COMPLIANCE**





## **BAND EDGE COMPLIANCE -HOPPING MODE**



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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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 band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 -HOPPING MODE**



					TbtTx 2019.08.30.0	XMit 2019.09.05				
EUT:	781SA Smart Antenna			Work Order	EMPM0081					
Serial Number:	3004			Date	: 8-Jan-20					
Customer:	Emerson		Temperature	22.5 °C						
Attendees:	None		Humidity	18.2% RH						
Project:	None		Barometric Pres.	1032 mbar						
Tested by:	Dustin Sparks		Job Site	: MN09						
TEST SPECIFICATI	IONS		Test Method							
FCC 15.247:2020			ANSI C63.10:2013							
COMMENTS										
Reference level off	Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection.									
DEVIATIONS FROM	I TEST STANDARD									
None										
Configuration #	# 2 Signature									
				Value (dBc)	Limit ≤ (dBc)	Result				
WirelessHART, 6-Cl	hannel Hopping Mode									
	Low Channel, 2405 MHz			-41.07	-20	Pass				
	High Channel, 2475 MHz		-50.05	-20	Pass					
WirelessHART, 15-0	Channel Hopping Mode									
	Low Channel, 2405 MHz		-40.68	-20	Pass					
	High Channel, 2475 MHz		-51.07	-20	Pass					

### **BAND EDGE COMPLIANCE - HOPPING MODE**





#VBW 300 kHz

Center 2.483 500 GHz

#Res BW 100 kHz

Span 25 MHz

Sweep 2.398 ms (1000 pts)

### **BAND EDGE COMPLIANCE - HOPPING MODE**





#VBW 300 kHz

Sweep 2.398 ms (1000 pts)

#Res BW 100 kHz



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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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.

Per FCC KDB 558074 Section 10(b)(3), there is no requirement for hybrid systems to comply with the 500 kHz minimum 6dB bandwidth for DTS devices. The 20 dB bandwidth was taken for reference purposes.















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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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.



#### XMit 2019.09. EUT: 781SA Smart Antenna Serial Number: 3004 Customer: Emerson Work Order: EMPM0081 Date: 7-Jan-20 Temperature: 22.3 °C Humidity: 23.3% RH Barometric Pres.: 1019 mbar Attendees: None Project: None Tested by: Dustin Sparks TEST SPECIFICATIONS Power: 24VDC Test Method Job Site: MN09 FCC 15.247:2020 ANSI C63.10:2013 COMMENTS Reference level offset includes measurement cable, DC block, 20 dB attenuator, and the EUT's SMA connection. DEVIATIONS FROM TEST STANDARD None Dusting Configuration # 2 sards Signature Frequency Measured Freq (MHz) Max Value Limit ≤ (dBc) Result (dBc) Range WirelessHART Low Channel, 2405 MHz Low Channel, 2405 MHz Low Channel, 2405 MHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz N/A -20 -20 N/A Pass Pass 2405.24 N/A 2394.3 14250.4 -53.62 -63.37 N/A Mid Channel, 2440 MHz Fundamental 2440.25 N/A N/A Mid Channel, 2440 MHz Mid Channel, 2440 MHz 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz 2558.7 -65.08 -20 -20 Pass Pass 14187.8 -62.5 High Channel, 2475 MHz High Channel, 2475 MHz Fundamental 30 MHz - 12.5 GHz 2475.24 2505.4 N/A -58.45 N/A -20 N/A Pass 12.5 GHz - 25 GHz High Channel, 2475 MHz 13798.7 -62.74 -20 Pass







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10 dB/ 055-1	m	San Mar						Mar when	~
dB	and the second								مل ^م رکر
	V								
#LgAv									
V1 S2									
S3 FC									
<b>£</b> (f): f>50k									
Swp									
Start 2	.438 500	0 GHz					Stop	2.441 50	00 0 GHz
#Res Bl	W 100 kH	z	#	VBW 300	kHz	S	weep 1.0	92 ms (81	192 pts)








## SPURIOUS CONDUCTED EMISSIONS



			WirelessHA	RT High Cha	innel 2475 MI	Hz						
	Frequency			Measured Max Value			Limit	Limit				
		Range			z) (dBo	c)	≤ (dBc)		sult			
		12.5 GHz - 25 GHz			-62.7	74	-20	Pa	ass			
※ Agilent 09:36:08 Jan 7, 2020 R T												
Element Materials TechnologyMkr1 13.798 7 GHz												
Ref	15 dBm	#	B				-5	-52.56 dBm				
#Pe	ak 🛛 👘											
Log												
10												
dB∕	′											
Offs	st 🔚 🚽											
22.1												
aв												
#Lgi	Av											
V1	<u>\$2</u>											
53	FU	1										
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Flu	in											
Swb												
Star	rt 12.500 0	GHz					S	top 25.0	000 0 <u>G</u>	Hz		
#Re	s BW 100 kH	lz	ŧ	ŧVBW 300 k	:Hz		Sweep 1.	195 s (8	3192 pt	s)_		



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	Agilent	E4440A	AFD	28-Jul-19	28-Jul-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.









*LgAv V1 S2 S3 FC £(f): f>50k Swp Center 2.440 000 0 GHz *Res BW 3 kHz ______*VBW 9.1 kHz ______Sweep 424.8 ms (8192 pts)



