



element

Exigent Sensors LLC

CFWS10

902 - 928 MHz Other Wideband (DTS) transceiver

Report: EXIG0020.1 Rev. 2, Issue Date: December 7, 2023



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CERTIFICATE OF TEST



Last Date of Test: June 21, 2023
Exigent Sensors LLC
EUT: CFWS10

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2023	
RSS-247 Issue 2:2017	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	

Guidance

FCC KDB 558074 v05r02:2019

Results

Test Description	Result	FCC Section(s)	RSS Section(s)	ANSI C63.10 Section(s)	Comments
Powerline Conducted Emissions (Transmitter)	N/A	15.207	RSS-Gen 8.8	6.2	Not required for a battery powered EUT.
Spurious Radiated Emissions	Pass	15.247(d), KDB 558074 -8.6, 8.7	RSS-247 5.5	6.5, 6.6, 11.12.1, 11.13.2	
Duty Cycle	N/A	15.247, KDB 558074 -6.0	RSS-Gen 3.2	11.6	Operates at 100%.
Carrier Frequency Separation	N/A	15.247(a)(1)	RSS-247 5.1(b)	7.8.2	Not required for DTS devices.
Number of Hopping Frequencies	N/A	15.247(a)(1)	RSS-247 5.1(d)	7.8.3	
Dwell Time	N/A	15.247(a)(1)	RSS-247 5.1(d)	7.8.4	
Output Power	Pass	15.247(b), KDB 558074 -8.3	RSS-247 5.4(d)	11.9.1.1	
Equivalent Isotropic Radiated Power (EIRP)	Pass	15.247(b), KDB 558074 -8.3	RSS-247 5.4(d)	11.9.1.1	
Band Edge Compliance	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Band Edge Compliance - Hopping Mode	N/A	15.247(d)	RSS-247 5.5	7.8.6	Not required for DTS devices.
DTS Bandwidth (6 dB)	Pass	15.247(a), KDB 558074 -8.2	RSS-247 5.2(a)	11.8.2	
Occupied Bandwidth (99%)	Pass	KDB 558074 -2.1	RSS-Gen 6.7	6.9.3	
Spurious Conducted Emissions	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Power Spectral Density	Pass	15.247(e), KDB 558074 -8.4	RSS-247 5.2(b)	11.10.2	See note below.

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.

CERTIFICATE OF TEST



Deviations From Test Standards

Power Spectral Density was taken with an average detector which does not match the peak method as used for Output Power. However, the maximum peak output power of 7.05 dBm taken with a 1 MHz resolution bandwidth, when applied directly to the 8 dBm / 3 kHz power spectral density limit shows that the EUT is compliant.

Approved By:

A handwritten signature in blue ink, appearing to read 'J. S. Candelas'.

Johnny Candelas, Operations Manager

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

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Included DCCF and Canada specs. Reformatted page.	2023-11-17	18-24
02	Clarified Power Spectral Density method used in this report.	2023-12-07	2-3, 46

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 - Each laboratory is accredited by A2LA to ISO / IEC 17025, and as a product certifier to ISO / IEC 17065 which allows Element to certify transmitters to FCC and IC specifications.

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 – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

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:

[California](#)

[Minnesota](#)

[Oregon](#)

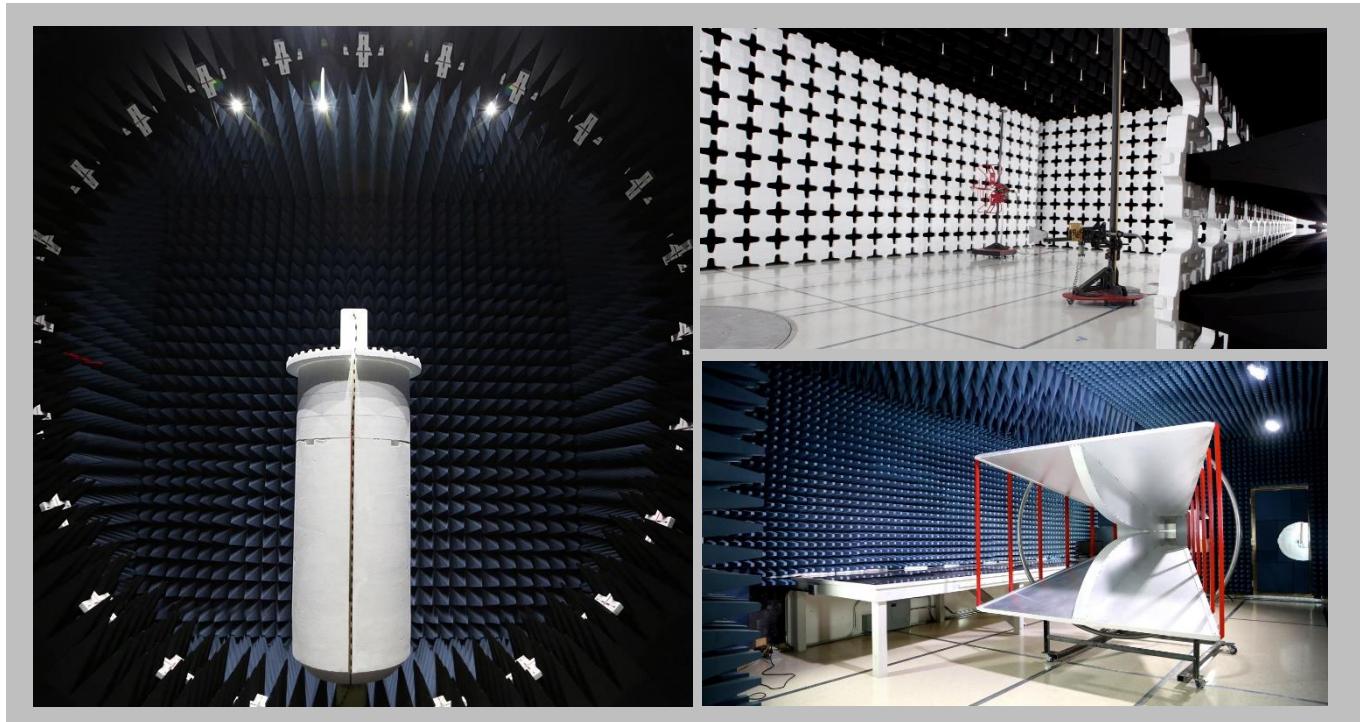
[Texas](#)

[Washington](#)

FACILITIES



California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425) 984-6600
A2LA				
Lab Code: 3310.04	Lab Code: 3310.05	Lab Code: 3310.02	Lab Code: 3310.03	Lab Code: 3310.06
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



MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

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

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

Test Location: California

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

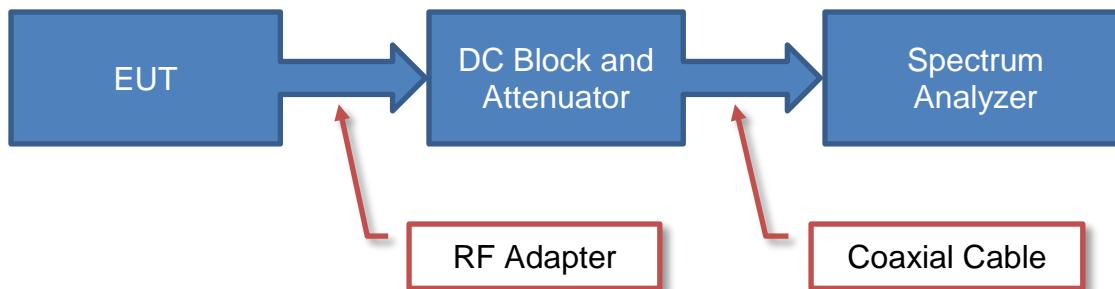
TEST SETUP BLOCK DIAGRAMS

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

Unless otherwise stated, measurements were made using the bandwidths and detectors specified. No video filter was used.

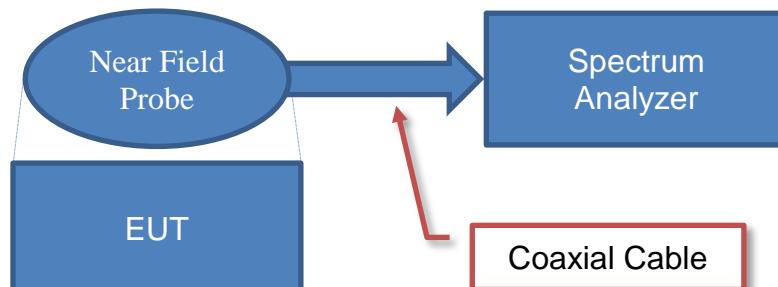
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

$$\begin{array}{ccc} \text{Measured} & \text{Measured} & \text{Reference} \\ \text{Value} & = & \text{Level} \\ 71.2 & = & 42.6 \\ & & + \\ & & \text{Level} \\ & & \text{Offset} \\ & & 28.6 \end{array}$$

Near Field Test Fixture Measurements

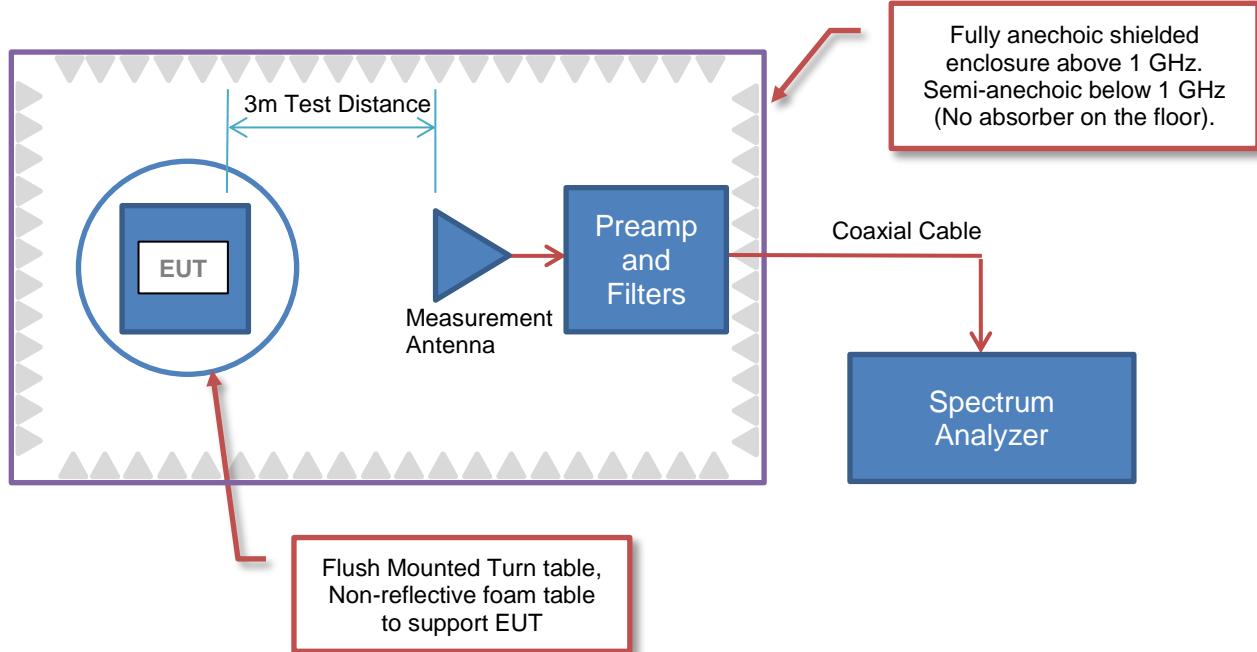


Sample Calculation (logarithmic units)

$$\begin{array}{ccc} \text{Measured} & \text{Measured} & \text{Reference} \\ \text{Value} & = & \text{Level} \\ 71.2 & = & 42.6 \\ & & + \\ & & \text{Level} \\ & & \text{Offset} \\ & & 28.6 \end{array}$$

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

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

Conducted Emissions:

Factor				
Measured Level (Amplitude)	Transducer Factor	Cable Factor	External Attenuation	Adjusted Level
26.7	0.3	0.1	20.0	= 47.1

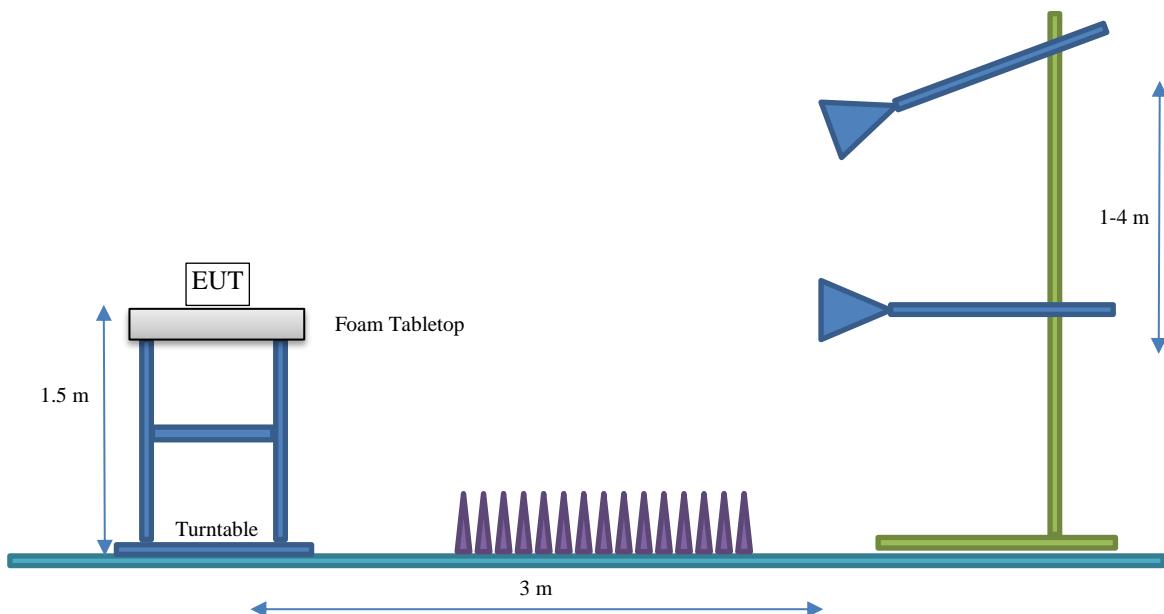
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)	Substitution Antenna Factor (dBi)	EIRP to ERP (if applicable)	Measured power (dBm ERP/EIRP)
10.0	6.0	- 2.15	= 13.9/16.0

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	Exigent Sensors LLC
Address:	11441 Markon Dr #1402
City, State, Zip:	Garden Grove, CA 92841
Test Requested By:	Chad Christensen
EUT:	CFWS10
First Date of Test:	May 30, 2023
Last Date of Test:	June 21, 2023
Receipt Date of Samples:	May 30, 2023
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Small battery powered wireless water sensor that sends a 900 MHz wireless signal to other alarms to alert the user of a water leak.

Testing Objective:

Seeking to demonstrate compliance in the 902 - 928 MHz band for operation under FCC 15.247:2023 and RSS-247 Issue 2:2017, RSS-Gen Issue 5:2018+A1:2019+A2:2021 specifications under technology category Other.

POWER SETTINGS AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information. The power settings below reflect the maximum power that the EUT is allowed to transmit at during normal operation.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
PCB	Exigent Sensors	902-915 MHz	-1.63

The EUT was tested using the power settings provided by the manufacturer which were based upon:

Test software settings Test software/firmware installed on EUT: _____ FCC TEST 1.0 _____
 Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Type	Data Rate	Position (if multiple channels)	Power Setting
		Low Channel (905.23 MHz)	
FSK	10 kbps	High Channel (913.23 MHz)	0XC0 (12dBm)

CONFIGURATIONS



Configuration EXIG0018- 1

Software/Firmware Running During Test	
Description	Version
Firmware	FCC Test 1.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Water Sensor	Exigent Sensors LLC	WS10	Sample B9.2

Configuration EXIG0019- 1

Software/Firmware Running During Test	
Description	Version
Firmware	FCC Test 1.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Water Sensor	Exigent Sensors LLC	WS10	D3

Configuration EXIG0020-1

Software/Firmware Running During Test	
Description	Version
Firmware	FCC Test 1.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Water Sensor	Exigent Sensors LLC	WS10	D1

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-05-30	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	2023-06-21	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.
3	2023-06-21	DTS Bandwidth (6 dB)	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	2023-06-21	Equivalent Isotropic Radiated Power (EIRP)	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	2023-06-21	Occupied Bandwidth (99%)	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	2023-06-21	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.
7	2023-06-21	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.
8	2023-06-21	Spurious Conducted Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS



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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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 $10^{\ast} \log(1/dc)$.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AIR	2022-07-19	2024-07-19
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	2023-04-04	2024-04-04
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2023-04-04	2024-04-04
Filter - High Pass	Micro-Tronics	HPM50108	HHW	2022-06-06	2023-06-06
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2023-01-20	2024-01-20
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	NCR
Cable	Northwest EMC	8-18GHz RE Cables	OCO	2023-04-04	2024-04-04
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	2023-04-04	2024-04-04
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOF	2023-04-04	2024-04-04
Antenna - Biconilog	EMCO	3142B	AXK	2022-04-19	2024-04-19
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2023-01-23	2024-01-23
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2023-01-23	2024-01-23
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFR	2023-01-16	2024-01-16
Filter - Low Pass	Micro-Tronics	LPM50003	HGO	2023-01-09	2024-01-09

MEASUREMENT UNCERTAINTY

Description			
Expanded k=2	5.1 dB		-5.1 dB

SPURIOUS RADIATED EMISSIONS



FREQUENCY RANGE INVESTIGATED

30 MHz TO 18 GHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

EXIG0018-1

EXIG0019-1

MODES INVESTIGATED

Transmitting High Channel 913.23 MHz, Power Setting: 0XC0 (12dBm). Data Rate FSK 10kbps

Transmitting Low Channel 905.23 MHz, Power Setting: 0XC0 (12dBm). Data Rate FSK 10kbps.

SPURIOUS RADIATED EMISSIONS



EUT:	CFWS10	Work Order:	EXIG0019
Serial Number:	D3	Date:	2023-05-30
Customer:	Exigent Sensors LLC	Temperature:	20.3°C
Attendees:	Chad Christensen	Relative Humidity:	0.593%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Luis Flores	Job Site:	OC10
Power:	Battery	Configuration:	EXIG0019-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	9	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

EUT Horz, Vert and on Side.

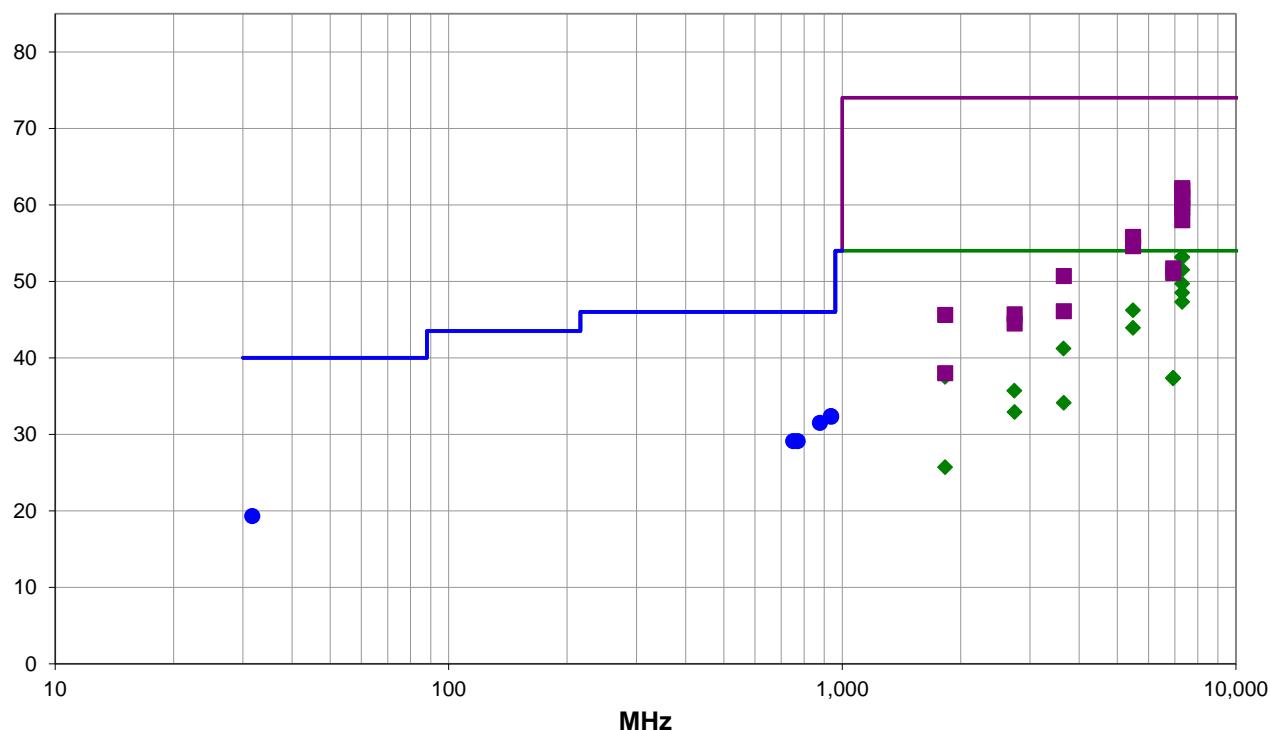
Sample tested at 100% Duty Cycle but EUT will never transmit more than 50% of the time therefore DCCF = -3.0dB
[DCCF = $10 \times \log(1/\text{Duty Cycle}) = 50.0\% = -3.010 \text{ dB}$]

EUT OPERATING MODES

Transmitting High Channel 913.23 MHz, Power Setting: 0XC0 (12dBm). Data Rate FSK 10

DEVIATIONS FROM TEST STANDARD

None



Run #: 9

PK AV QP

SPURIOUS RADIATED EMISSIONS



RESULTS - Run #9

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7304.450	48.5	7.7	1.1	311.0	-3.0	0.0	Vert	AV	0.0	53.2	54.0	-0.8	EUT Vert, High Ch, FSK 10kbps
7307.217	48.4	7.7	1.5	29.0	-3.0	0.0	Horz	AV	0.0	53.1	54.0	-0.9	EUT Horz, High Ch, FSK 10kbps
7307.292	46.8	7.7	1.6	225.0	-3.0	0.0	Horz	AV	0.0	51.5	54.0	-2.5	EUT Vert, High Ch, FSK 10kbps
7307.225	45.0	7.7	1.5	67.0	-3.0	0.0	Vert	AV	0.0	49.7	54.0	-4.3	EUT Horz, High Ch, FSK 10kbps
7307.217	43.8	7.7	1.5	90.0	-3.0	0.0	Horz	AV	0.0	48.5	54.0	-5.5	EUT on Side, High Ch, FSK 10kbps
7307.192	42.6	7.7	1.5	130.0	-3.0	0.0	Vert	AV	0.0	47.3	54.0	-6.7	EUT on Side, High Ch, FSK 10kbps
5480.408	51.4	-2.2	2.1	229.0	-3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	EUT Vert, High Ch, FSK 10kbps
5478.308	49.1	-2.2	2.3	224.0	-3.0	0.0	Vert	AV	0.0	43.9	54.0	-10.1	EUT Vert, High Ch, FSK 10kbps
7307.350	54.5	7.7	1.1	311.0	0.0	0.0	Vert	PK	0.0	62.2	74.0	-11.8	EUT Vert, High Ch, FSK 10kbps
7307.300	54.2	7.7	1.5	29.0	0.0	0.0	Horz	PK	0.0	61.9	74.0	-12.1	EUT Horz, High Ch, FSK 10kbps
3652.225	49.6	-5.4	1.5	175.0	-3.0	0.0	Vert	AV	0.0	41.2	54.0	-12.8	EUT Vert, High Ch, FSK 10kbps
7307.258	53.3	7.7	1.6	225.0	0.0	0.0	Horz	PK	0.0	61.0	74.0	-13.0	EUT Vert, High Ch, FSK 10kbps
935.805	14.4	18.0	3.7	138.0	0.0	0.0	Horz	QP	0.0	32.4	46.0	-13.6	EUT Vert, High Ch
937.308	14.3	18.0	2.4	16.0	0.0	0.0	Vert	QP	0.0	32.3	46.0	-13.7	EUT Vert, High Ch
7307.042	52.4	7.7	1.5	67.0	0.0	0.0	Vert	PK	0.0	60.1	74.0	-13.9	EUT Horz, High Ch, FSK 10kbps
7307.183	51.9	7.7	1.5	90.0	0.0	0.0	Horz	PK	0.0	59.6	74.0	-14.4	EUT on Side, High Ch, FSK 10kbps
877.058	14.3	17.2	1.0	40.0	0.0	0.0	Horz	QP	0.0	31.5	46.0	-14.5	EUT Vert, High Ch
7307.092	50.3	7.7	1.5	130.0	0.0	0.0	Vert	PK	0.0	58.0	74.0	-16.0	EUT on Side, High Ch, FSK 10kbps
1826.433	55.1	-14.6	1.0	178.0	-3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	EUT Vert, High Ch, FSK 10kbps
6932.717	34.3	6.1	1.9	96.0	-3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT Vert, High Ch, FSK 10kbps
6933.483	34.2	6.1	1.5	80.0	-3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	EUT Vert, High Ch, FSK 10kbps
770.226	13.9	15.2	2.8	114.0	0.0	0.0	Vert	QP	0.0	29.1	46.0	-16.9	EUT Vert, High Ch
750.592	14.3	14.8	2.9	313.0	0.0	0.0	Horz	QP	0.0	29.1	46.0	-16.9	EUT Vert, High Ch
5478.233	58.0	-2.2	2.1	229.0	0.0	0.0	Horz	PK	0.0	55.8	74.0	-18.2	EUT Vert, High Ch, FSK 10kbps
2739.217	48.9	-10.2	1.5	152.0	-3.0	0.0	Horz	AV	0.0	35.7	54.0	-18.3	EUT Vert, High Ch, FSK 10kbps
5480.392	56.8	-2.2	2.3	224.0	0.0	0.0	Vert	PK	0.0	54.6	74.0	-19.4	EUT Vert, High Ch, FSK 10kbps
3653.625	42.5	-5.4	2.9	216.0	-3.0	0.0	Horz	AV	0.0	34.1	54.0	-19.9	EUT Vert, High Ch, FSK 10kbps

SPURIOUS RADIATED EMISSIONS



RESULTS - Run #9 (continued)

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
31.693	13.3	6.0	2.8	288.0	0.0	0.0	Vert	QP	0.0	19.3	40.0	-20.7	EUT Vert, High Ch
2740.233	46.1	-10.2	4.0	255.0	-3.0	0.0	Vert	AV	0.0	32.9	54.0	-21.1	EUT Vert, High Ch, FSK 10kbps
6932.333	45.7	6.0	1.9	96.0	0.0	0.0	Horz	PK	0.0	51.7	74.0	-22.3	EUT Vert, High Ch, FSK 10kbps
6933.483	45.0	6.1	1.5	80.0	0.0	0.0	Vert	PK	0.0	51.1	74.0	-22.9	EUT Vert, High Ch, FSK 10kbps
3653.733	56.1	-5.4	1.5	175.0	0.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3	EUT Vert, High Ch, FSK 10kbps
3653.775	51.5	-5.4	2.9	216.0	0.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9	EUT Vert, High Ch, FSK 10kbps
2740.250	55.9	-10.2	1.5	152.0	0.0	0.0	Horz	PK	0.0	45.7	74.0	-28.3	EUT Vert, High Ch, FSK 10kbps
1826.567	43.3	-14.6	1.5	322.0	-3.0	0.0	Horz	AV	0.0	25.7	54.0	-28.3	EUT Vert, High Ch, FSK 10kbps
1826.750	60.2	-14.6	1.0	178.0	0.0	0.0	Vert	PK	0.0	45.6	74.0	-28.4	EUT Vert, High Ch, FSK 10kbps
2740.242	54.7	-10.2	4.0	255.0	0.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	EUT Vert, High Ch, FSK 10kbps
1825.733	52.6	-14.6	1.5	322.0	0.0	0.0	Horz	PK	0.0	38.0	74.0	-36.0	EUT Vert, High Ch, FSK 10kbps

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS



EUT:	CFWS10	Work Order:	EXIG0018
Serial Number:	Sample B9.2	Date:	2023-03-31
Customer:	Exigent Sensors LLC	Temperature:	19.7°C
Attendees:	Kevin Tain	Relative Humidity:	41.7%
Customer Project:	None	Bar. Pressure (PMSL):	1021 mb
Tested By:	Luis Flores	Job Site:	OC10
Power:	Battery	Configuration:	EXIG0018-1

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2017	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	35	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

EUT Horizontal, Vertical and on Side, 1.2 GHz High Pass Filter

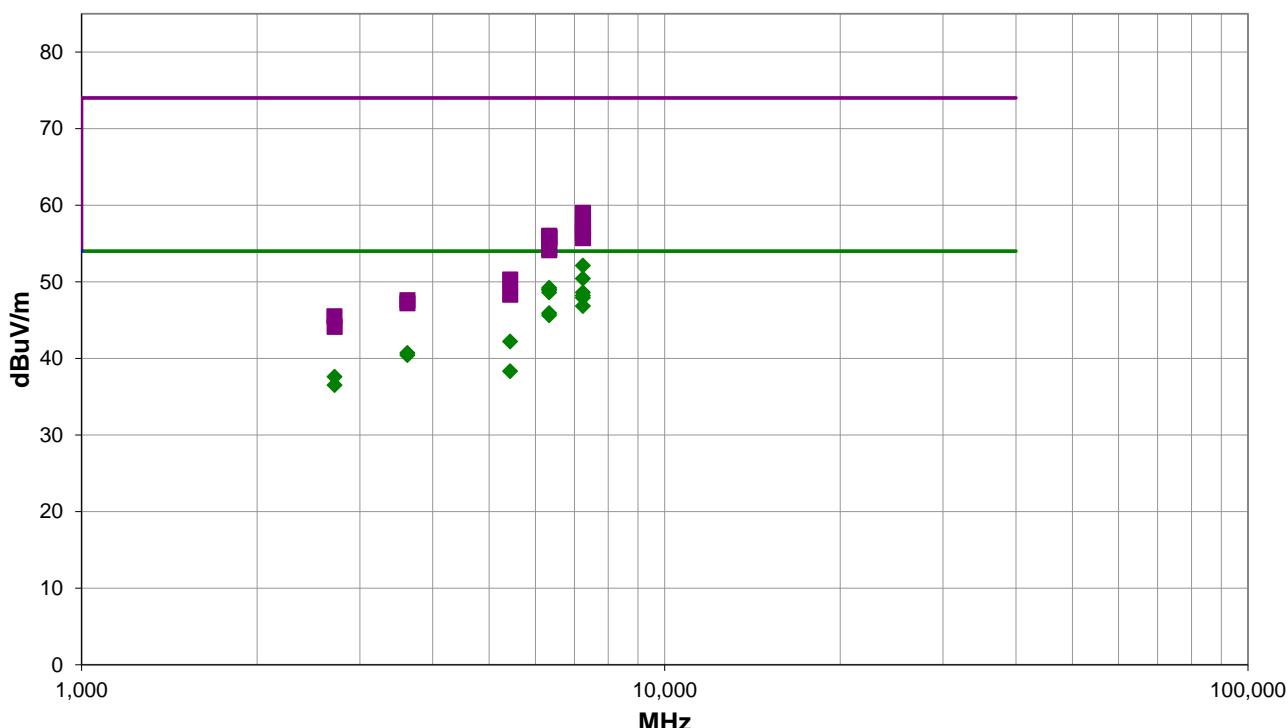
Sample tested at 100% Duty Cycle but EUT will never transmit more than 50% of the time therefore DCCF = -3.0dB
[DCCF = $10 \times \log(1/\text{Duty Cycle}) = 50.0\% = -3.010 \text{ dB}$]

EUT OPERATING MODES

Transmitting Low Channel 905.23 MHz, Power Setting: 0XC0 (12dBm). Data Rate FSK 10kbps.

DEVIATIONS FROM TEST STANDARD

None



Run #: 35

PK AV QP

SPURIOUS RADIATED EMISSIONS



RESULTS - Run #35

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	Duty Cycle Correction Factor (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7243.292	45.1	7.0	1.2	188.0	3.0	-3.0	Horz	AV	0.0	49.1	54.0	-4.9	EUT Vert, Low Ch, FSK 10kbps
7240.508	43.4	7.0	1.2	269.0	3.0	-3.0	Vert	AV	0.0	47.4	54.0	-6.6	EUT Horz, Low Ch, FSK 10kbps
6337.842	49.9	-0.7	1.2	51.0	3.0	-3.0	Horz	AV	0.0	46.2	54.0	-7.8	EUT on Side, Low Ch, FSK 10kbps
6335.417	49.7	-0.7	1.1	9.0	3.0	-3.0	Horz	AV	0.0	46.0	54.0	-8.0	EUT Horz, Low Ch, FSK 10kbps
6335.308	49.6	-0.7	1.1	132.0	3.0	-3.0	Horz	AV	0.0	45.9	54.0	-8.1	EUT Vert, Low Ch, FSK 10kbps
7240.500	41.6	7.0	3.4	238.0	3.0	-3.0	Horz	AV	0.0	45.6	54.0	-8.4	EUT Vert, Low Ch, FSK 10kbps
6337.892	49.3	-0.7	1.1	345.0	3.0	-3.0	Vert	AV	0.0	45.6	54.0	-8.4	EUT on Side, Low Ch, FSK 10kbps
7240.383	41.2	7.0	2.7	182.0	3.0	-3.0	Vert	AV	0.0	45.2	54.0	-8.8	EUT Vert, Low Ch, FSK 10kbps
7240.442	40.9	7.0	1.2	266.0	3.0	-3.0	Horz	AV	0.0	44.9	54.0	-9.1	EUT Horz, Low Ch, FSK 10kbps
7243.258	39.8	7.0	1.4	270.0	3.0	-3.0	Vert	AV	0.0	43.8	54.0	-10.2	EUT Horz, Low Ch, FSK 10kbps
6335.500	46.6	-0.7	1.2	254.0	3.0	-3.0	Horz	AV	0.0	42.9	54.0	-11.1	EUT Horz, Low Ch, FSK 10kbps
6335.400	46.3	-0.7	1.2	232.0	3.0	-3.0	Vert	AV	0.0	42.6	54.0	-11.4	EUT Horz, Low Ch, FSK 10kbps
5430.308	45.7	-3.5	1.3	191.0	3.0	-3.0	Horz	AV	0.0	39.2	54.0	-14.8	EUT Horz, Low Ch, FSK 10kbps
7243.450	52.0	7.0	1.2	188.0	3.0	0.0	Horz	PK	0.0	59.0	74.0	-15.0	EUT Vert, Low Ch, FSK 10kbps
7240.650	50.9	7.0	1.2	269.0	3.0	0.0	Vert	PK	0.0	57.9	74.0	-16.1	EUT Horz, Low Ch, FSK 10kbps
3620.175	48.3	-7.6	4.0	152.0	3.0	-3.0	Vert	AV	0.0	37.7	54.0	-16.3	EUT Vert, Low Ch, FSK 10kbps
3621.667	48.0	-7.6	1.2	186.0	3.0	-3.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT Horz, Low Ch, FSK 10kbps
7240.117	50.0	7.0	3.4	238.0	3.0	0.0	Horz	PK	0.0	57.0	74.0	-17.0	EUT Vert, Low Ch, FSK 10kbps
7240.525	49.6	7.0	1.2	266.0	3.0	0.0	Horz	PK	0.0	56.6	74.0	-17.4	EUT Horz, Low Ch, FSK 10kbps
7240.608	49.3	7.0	2.7	182.0	3.0	0.0	Vert	PK	0.0	56.3	74.0	-17.7	EUT Vert, Low Ch, FSK 10kbps
6338.100	56.7	-0.7	1.2	51.0	3.0	0.0	Horz	PK	0.0	56.0	74.0	-18.0	EUT on Side, Low Ch, FSK 10kbps
6335.375	56.6	-0.7	1.1	132.0	3.0	0.0	Horz	PK	0.0	55.9	74.0	-18.1	EUT Vert, Low Ch, FSK 10kbps
6335.300	56.5	-0.7	1.1	9.0	3.0	0.0	Horz	PK	0.0	55.8	74.0	-18.2	EUT Horz, Low Ch, FSK 10kbps
7243.400	48.7	7.0	1.4	270.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	EUT Horz, Low Ch, FSK 10kbps
6337.875	56.4	-0.7	1.1	345.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	EUT on Side, Low Ch, FSK 10kbps
5432.375	41.8	-3.5	1.2	211.0	3.0	-3.0	Horz	AV	0.0	35.3	54.0	-18.7	EUT Vert, Low Ch, FSK 10kbps
2715.233	48.9	-11.3	1.0	317.0	3.0	-3.0	Horz	AV	0.0	34.6	54.0	-19.4	EUT Horz, Low Ch, FSK 10kbps
6335.525	55.1	-0.7	1.2	254.0	3.0	0.0	Horz	PK	0.0	54.4	74.0	-19.6	EUT Horz, Low Ch, FSK 10kbps
6335.467	54.8	-0.7	1.2	232.0	3.0	0.0	Vert	PK	0.0	54.1	74.0	-19.9	EUT Horz, Low Ch, FSK 10kbps
2715.225	47.8	-11.3	1.2	321.0	3.0	-3.0	Horz	AV	0.0	33.5	54.0	-20.5	EUT Vert, Low Ch, FSK 10kbps
5430.375	53.8	-3.5	1.3	191.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	EUT Horz, Low Ch, FSK 10kbps
5430.583	51.8	-3.5	1.2	211.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	EUT Vert, Low Ch, FSK 10kbps
3621.592	55.2	-7.6	4.0	152.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT Vert, Low Ch, FSK 10kbps
3620.183	54.8	-7.6	1.2	186.0	3.0	0.0	Horz	PK	0.0	47.2	74.0	-26.8	EUT Horz, Low Ch, FSK 10kbps
2714.975	56.8	-11.3	1.0	317.0	3.0	0.0	Horz	PK	0.0	45.5	74.0	-28.5	EUT Horz, Low Ch, FSK 10kbps
2716.383	55.4	-11.3	1.2	321.0	3.0	0.0	Horz	PK	0.0	44.1	74.0	-29.9	EUT Vert, Low Ch, FSK 10kbps

SPURIOUS RADIATED EMISSIONS



CONCLUSION

Pass

Tested By



DUTY CYCLE

TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. 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.

The EUT operates at 100% Duty Cycle.

OUTPUT POWER



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

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.

OUTPUT POWER



TbTx 2022.06.03.0 XM1 2023.02.14.0

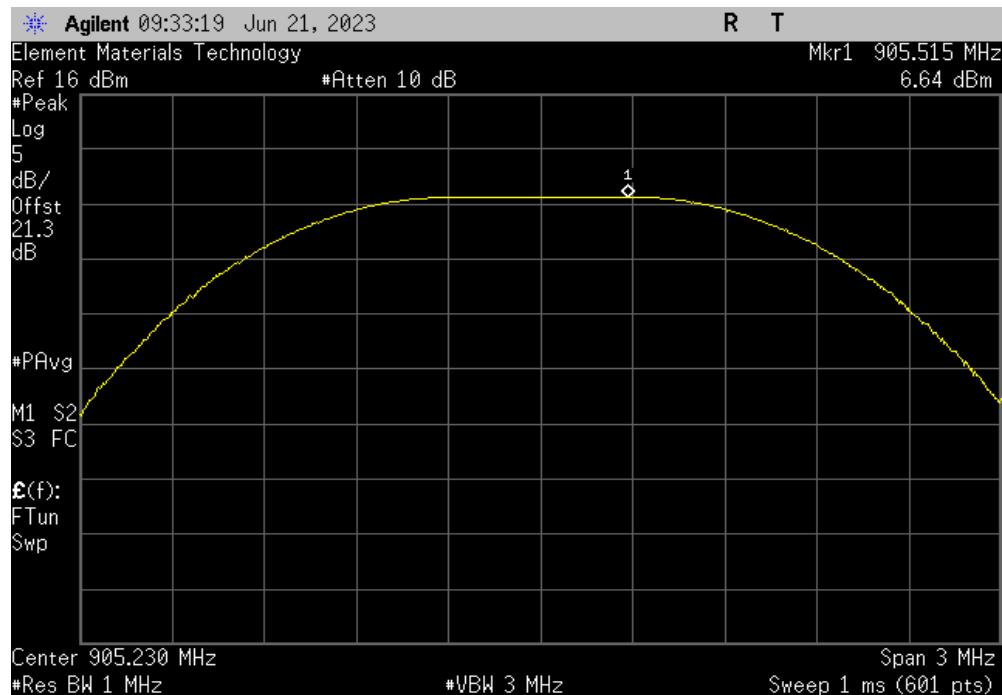
EUT:	CFWS10	Work Order:	EXIG0020												
Serial Number:	D1	Date:	06/21/2023												
Customer:	Exigent Sensors LLC	Temperature:	22.5°C												
Attendees:	Chad Christensen	Humidity:	46.7%												
Project:	None	Barometric Pres.:	1014 mbar												
Tested by:	Mark Baytan	Power:	3.0VDC via Battery												
		Test Method:	OC13												
TEST SPECIFICATIONS															
FCC 15.247:2023		ANSI C63.10:2013													
RSS-247 Issue 2:2017		ANSI C63.10:2013													
COMMENTS															
Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.															
DEVIATIONS FROM TEST STANDARD															
None															
Configuration #	EXIG0020-1	Signature													
<table border="1"> <thead> <tr> <th></th> <th>Out Pwr (dBm)</th> <th>Limit (dBm)</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>Low Channel, 905.23 MHz 10 kbps</td> <td>6.636</td> <td>30</td> <td>Pass</td> </tr> <tr> <td>High Channel, 913.23 MHz 10 kbps</td> <td>7.05</td> <td>30</td> <td>Pass</td> </tr> </tbody> </table>					Out Pwr (dBm)	Limit (dBm)	Result	Low Channel, 905.23 MHz 10 kbps	6.636	30	Pass	High Channel, 913.23 MHz 10 kbps	7.05	30	Pass
	Out Pwr (dBm)	Limit (dBm)	Result												
Low Channel, 905.23 MHz 10 kbps	6.636	30	Pass												
High Channel, 913.23 MHz 10 kbps	7.05	30	Pass												
DTS Radio															

OUTPUT POWER

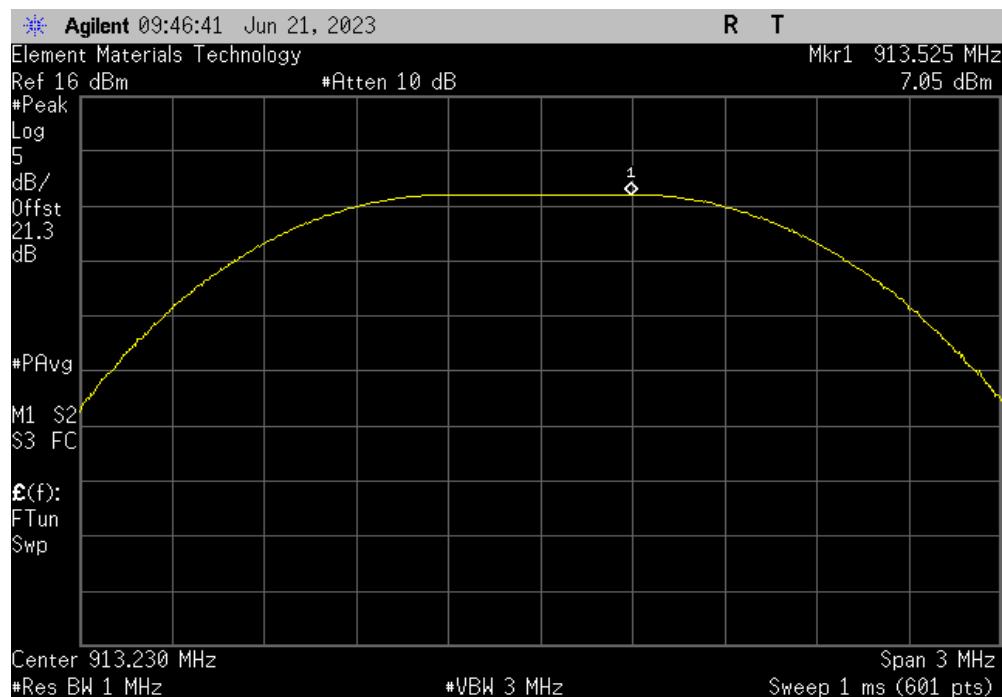


TbtTx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps				Out Pwr (dBm)	Limit (dBm)	Result
				6.636	30	Pass



DTS Radio, High Channel, 913.23 MHz, 10 kbps				Out Pwr (dBm)	Limit (dBm)	Result
				7.05	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

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.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TbTx 2022.06.03.0

XMit 2023.02.14.0

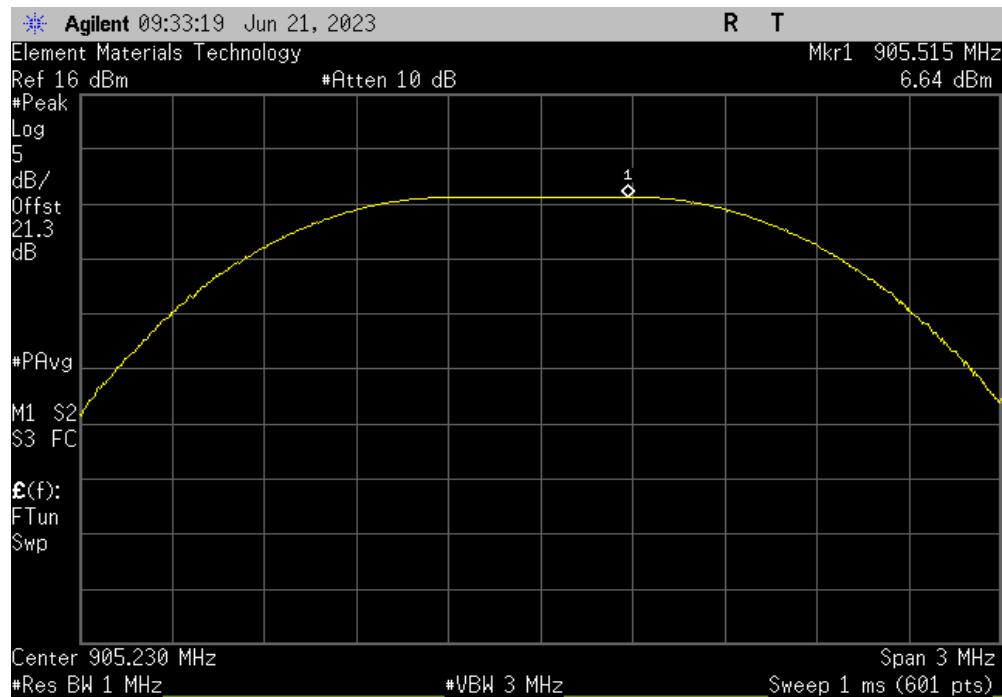
EUT: CFWS10	Work Order: EXIG0020						
Serial Number: D1	Date: 06/21/2023						
Customer: Exigent Sensors LLC	Temperature: 22.5°C						
Attendee: Chad Christensen	Humidity: 46.7%						
Project: None	Barometric Pres.: 1014 mbar						
Tested by: Mark Baytan	Job Site: OC13						
TEST SPECIFICATIONS							
FCC 15.247:2023	ANSI C63.10:2013						
RSS-247 Issue 2:2017	ANSI C63.10:2013						
COMMENTS							
Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.							
DEVIATIONS FROM TEST STANDARD							
None							
Configuration #	EXIG0020-1	Signature					
			Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
DTS Radio		Low Channel, 905.23 MHz 10 kbps	6.636	-1.63	5.006	36	Pass
		High Channel, 913.23 MHz 10 kbps	7.05	-1.63	5.42	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

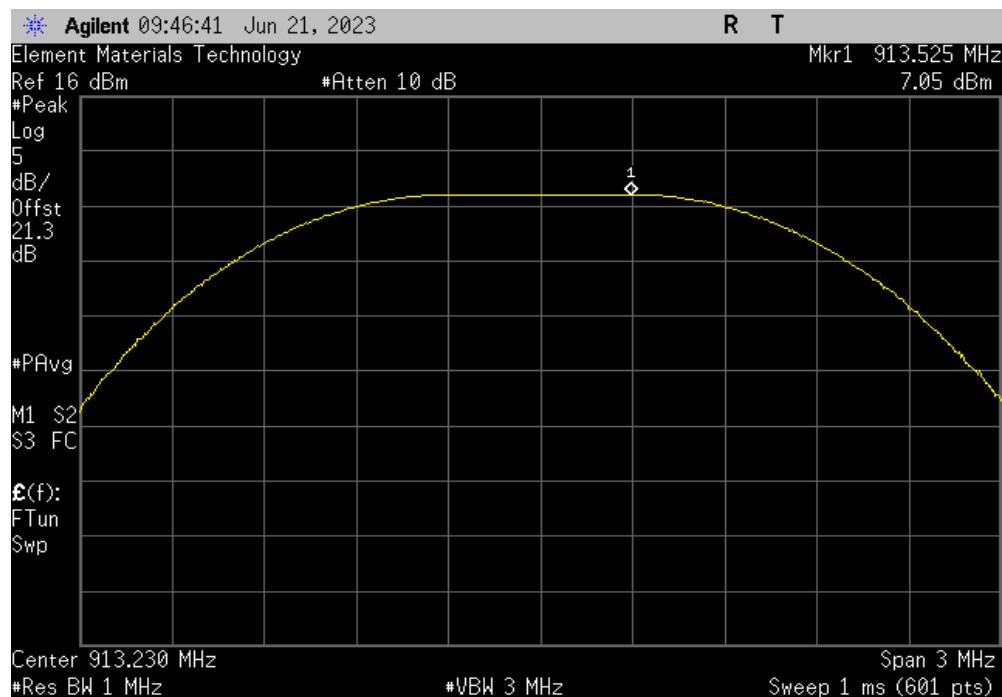


TbTx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps					
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
6.636	-1.63	5.006	36	Pass	



DTS Radio, High Channel, 913.23 MHz, 10 kbps					
Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
7.05	-1.63	5.42	36	Pass	



BAND EDGE COMPLIANCE



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

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



TbITx 2022.06.03.0

XMit 2023.02.14.0

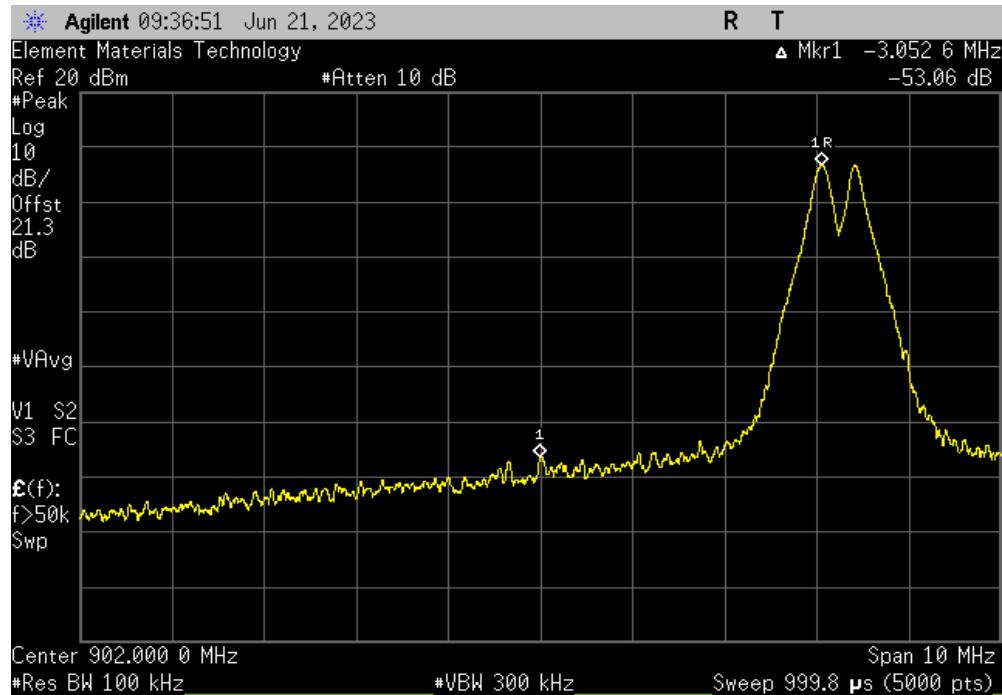
EUT:	CFWS10	Work Order:	EXIG0020	
Serial Number:	D1	Date:	06/21/2023	
Customer:	Exigent Sensors LLC	Temperature:	22.5°C	
Attendees:	Chad Christensen	Humidity:	46.7%	
Project:	None	Barometric Pres.:	1014 mbar	
Tested by:	Mark Baytan	Power:	3.0VDC via Battery	
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2023		ANSI C63.10:2013		
RSS-247 Issue 2:2017		ANSI C63.10:2013		
COMMENTS				
Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	EXIG0020-1	Signature		
		Value (dBc)	Limit ≤ (dBc)	Result
DTS Radio				
Low Channel, 905.23 MHz				
10 kbps		-53.06	-20	Pass
High Channel, 913.23 MHz				
10 kbps		-60.76	-20	Pass

BAND EDGE COMPLIANCE

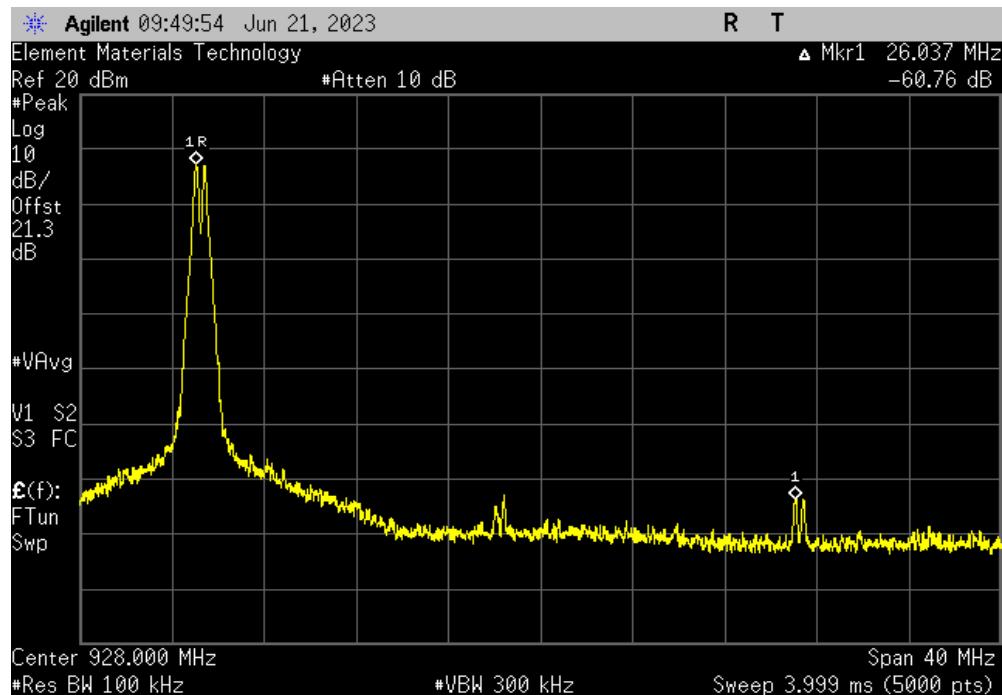


TbTx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps				Value (dBc)	Limit ≤ (dBc)	Result
				-53.06	-20	Pass



DTS Radio, High Channel, 913.23 MHz, 10 kbps				Value (dBc)	Limit ≤ (dBc)	Result
				-60.76	-20	Pass



DTS BANDWIDTH



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

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 DTS bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

DTS BANDWIDTH



TbITx 2022.06.03.0 XMlt 2023.02.14.0

EUT:	CFWS10	Work Order:	EXIG0020			
Serial Number:	D1	Date:	06/21/2023			
Customer:	Exigent Sensors LLC	Temperature:	22.5°C			
Attendees:	Chad Christensen	Humidity:	46.7%			
Project:	None	Barometric Pres.:	1014 mbar			
Tested by:	Mark Baytan	Power:	3.0VDC via Battery			
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2023		ANSI C63.10:2013				
RSS-247 Issue 2:2017		ANSI C63.10:2013				
COMMENTS	Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.					
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	EXIG0020-1	Signature				
		Value	Limit (>)	Result		
DTS Radio	Low Channel, 905.23 MHz 10 kbps	551.343 kHz	500 kHz	Pass		
	High Channel, 913.23 MHz 10 kbps	549.014 kHz	500 kHz	Pass		

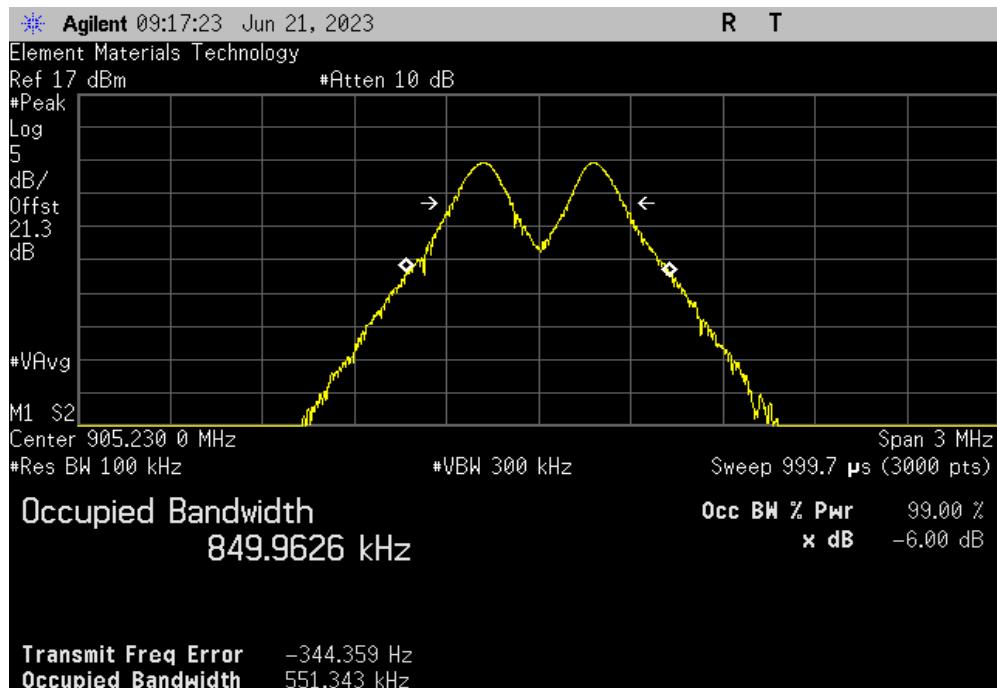
DTS BANDWIDTH



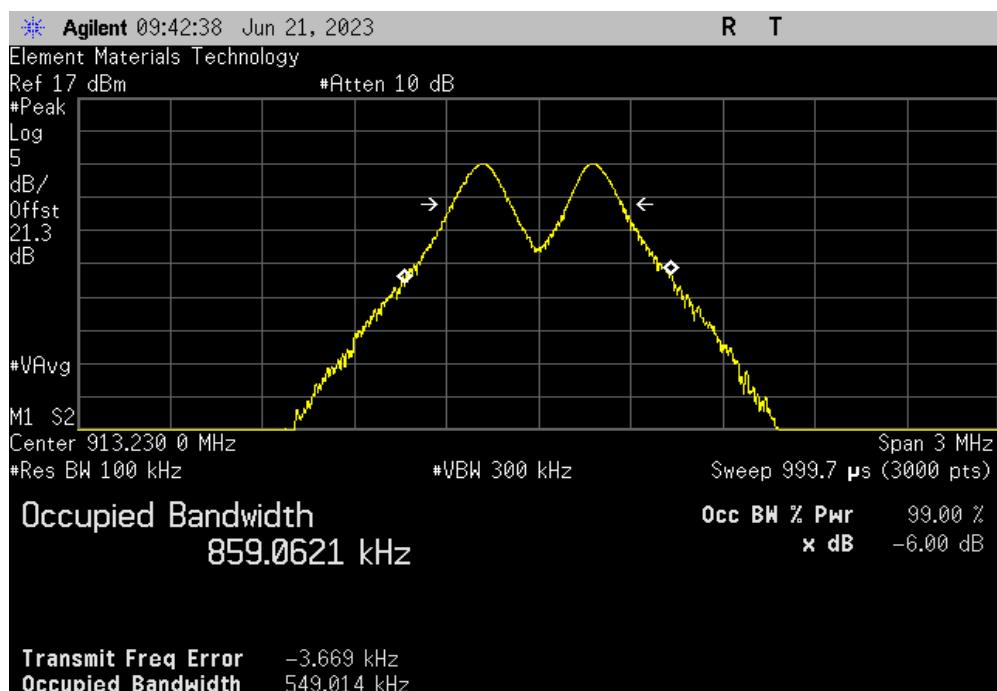
TbtTx 2022.06.03.0

XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps				Limit (>)	Result	
Value				551.343 kHz	500 kHz	Pass



DTS Radio, High Channel, 913.23 MHz, 10 kbps						
			Limit			
			Value	(>)	Result	
			549.014 kHz	500 kHz	Pass	



OCCUPIED BANDWIDTH



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer.

The 99% occupied bandwidth was measured with the EUT configured for continuous modulated operation.

Per ANSI C63.10:2013, 6.9.3, the spectrum analyzer was configured as follows:

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth (RBW) of the spectrum analyzer was set to the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) bandwidth was set to at least 3 times the resolution bandwidth. The analyzer sweep time was set to auto to prevent video filtering or averaging. A sample detector was used unless the device was not able to be operated in a continuous transmit mode, in which case a peak detector was used.

The spectrum analyzer occupied bandwidth measurement function was used to sum the power of the transmission in linear terms to obtain the 99% bandwidth.

OCCUPIED BANDWIDTH



TbtTx 2022.06.03.0 XMit 2023.02.14.0

EUT:	CFWS10	Work Order:	EXIG0020
Serial Number:	D1	Date:	06/21/2023
Customer:	Exigent Sensors LLC	Temperature:	22.5°C
Attendees:	Chad Christensen	Humidity:	46.7%
Project:	None	Barometric Pres.:	1014 mbar
Tested by:	Mark Baytan	Job Site:	OC13
TEST SPECIFICATIONS			
FCC 15.247:2023		ANSI C63.10:2013	
RSS-Gen Issue 5:2018+A1:2019+A2:2021		ANSI C63.10:2013	
RSS-247 Issue 2:2017		ANSI C63.10:2013	
COMMENTS			
Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	EXIG0020-1	 Signature	
		Value	Limit
DTS Radio			Result
Low Channel, 905.23 MHz			
10 kbps		480.607 kHz	N/A
High Channel, 913.23 MHz			
10 kbps		476.019 kHz	N/A
			N/A

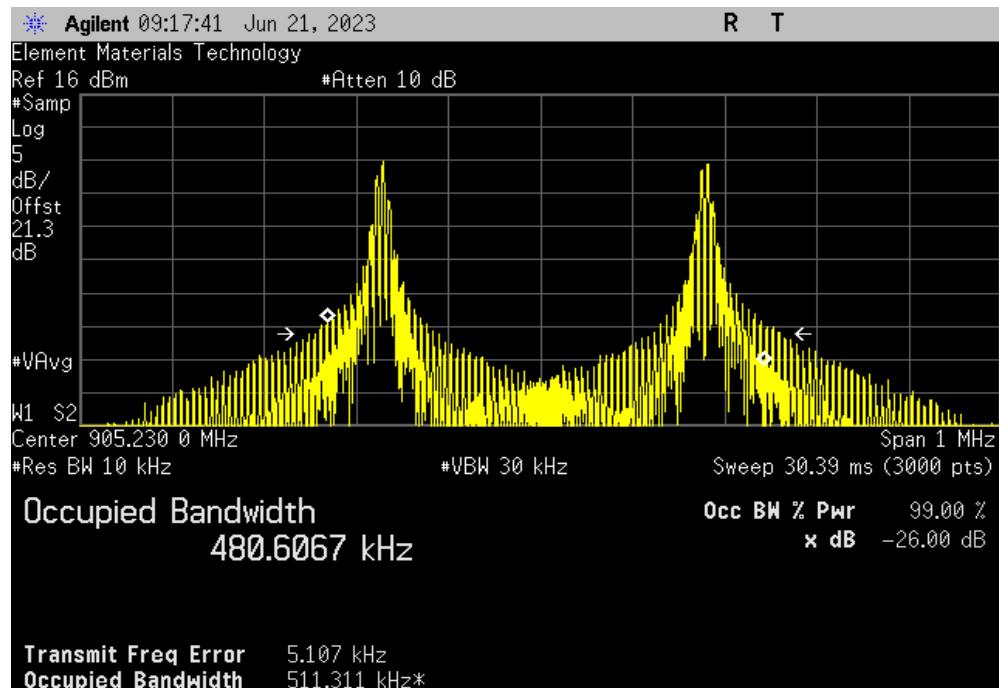
OCCUPIED BANDWIDTH



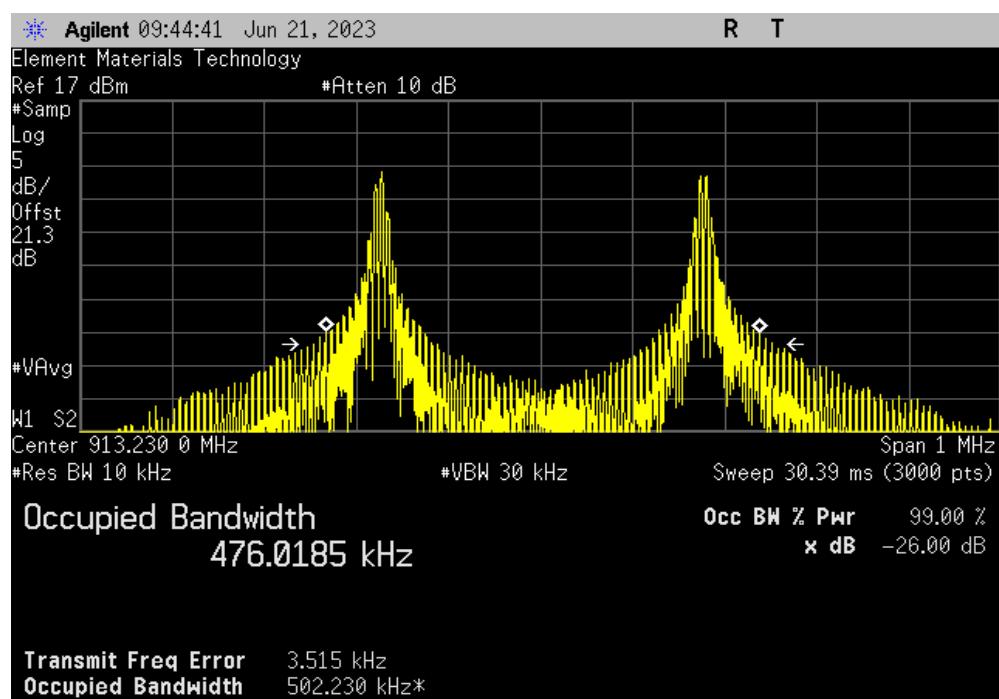
TbtTx 2022.06.03.0

XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps						
				Value	Limit	Result
				480.607 kHz	N/A	N/A



DTS Radio, High Channel, 913.23 MHz, 10 kbps						
				Value	Limit	Result
				476.019 kHz	N/A	N/A



SPURIOUS CONDUCTED EMISSIONS



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

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 fundamental was measured with a 100 kHz resolution bandwidth and the highest value was recorded. The rest of the spectrum was then measured with a 100 kHz resolution bandwidth and the highest value was found. The difference between the value found on the fundamental and the rest of the spectrum was compared against the limit to determine compliance.

The reference level offset for the fundamental screen capture was based on a measured value of the loss between the spectrum analyzer and the EUT which was verified at the time of test. The remaining screen capture(s) use an internal transducer factor on the analyzer to correct the displayed trace based on the cable loss over frequency. The reference level offset for the additional screen capture(s) is then based on the expected attenuator value and any other losses.

Fundamental Offset = Ref Lvl Offset showing measured composite factor of all losses

Remaining Screen capture(s) Offset = "Internal" cable loss factor not shown on screen capture + Ref Lvl Offset showing expected attenuator value and any other losses

SPURIOUS CONDUCTED EMISSIONS



TbtTx 2022.06.03.0

XMit 2023.02.14.0

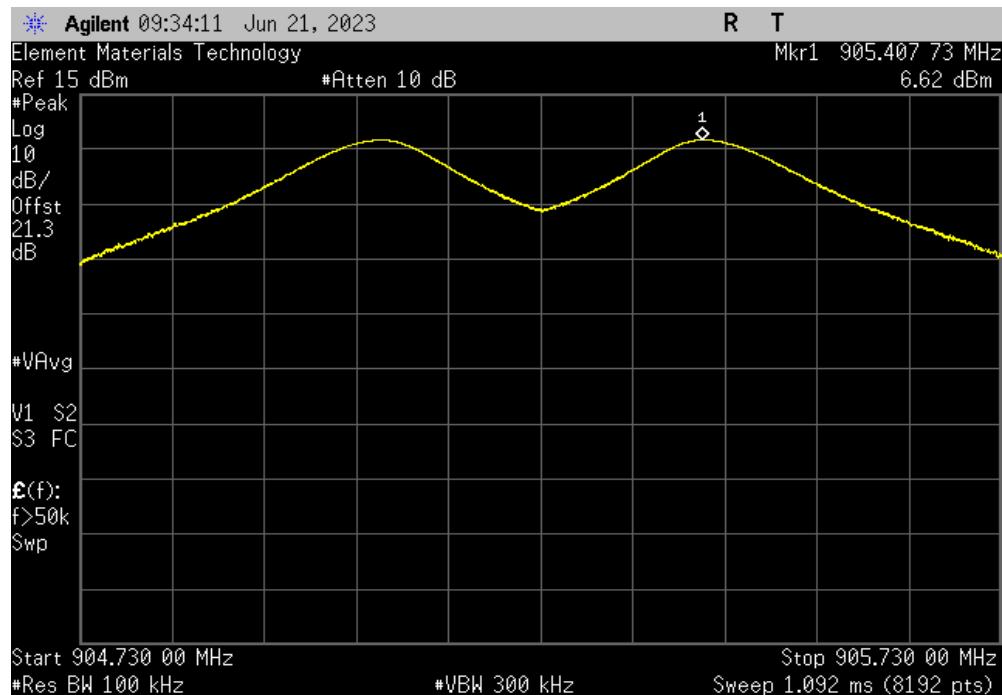
EUT:	CFWS10	Work Order:	EXIG0020			
Serial Number:	D1	Date:	06/21/2023			
Customer:	Exigent Sensors LLC	Temperature:	22.5°C			
Attendees:	Chad Christensen	Humidity:	46.7%			
Project:	None	Barometric Pres.:	1014 mbar			
Tested by:	Mark Baytan	Power:	3.0VDC via Battery			
TEST SPECIFICATIONS		Test Method				
FCC 15.247:2023		ANSI C63.10:2013				
RSS-247 Issue 2:2017		ANSI C63.10:2013				
COMMENTS	Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.					
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	EXIG0020-1	Signature				
		Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
DTS Radio						
Low Channel, 905.23 MHz						
10 kbps	Fundamental	905.41	N/A	N/A	N/A	Pass
10 kbps	30 MHz - 12.5 GHz	777.50	-59.95	-20	Pass	Pass
10 kbps	12.5 GHz - 25 GHz	13211.1	-62.10	-20	Pass	Pass
High Channel, 913.23 MHz						
10 kbps	Fundamental	913.41	N/A	N/A	N/A	Pass
10 kbps	30 MHz - 12.5 GHz	757.70	-81.39	-20	Pass	Pass
10 kbps	12.5 GHz - 25 GHz	24769.6	-82.83	-20	Pass	Pass

SPURIOUS CONDUCTED EMISSIONS

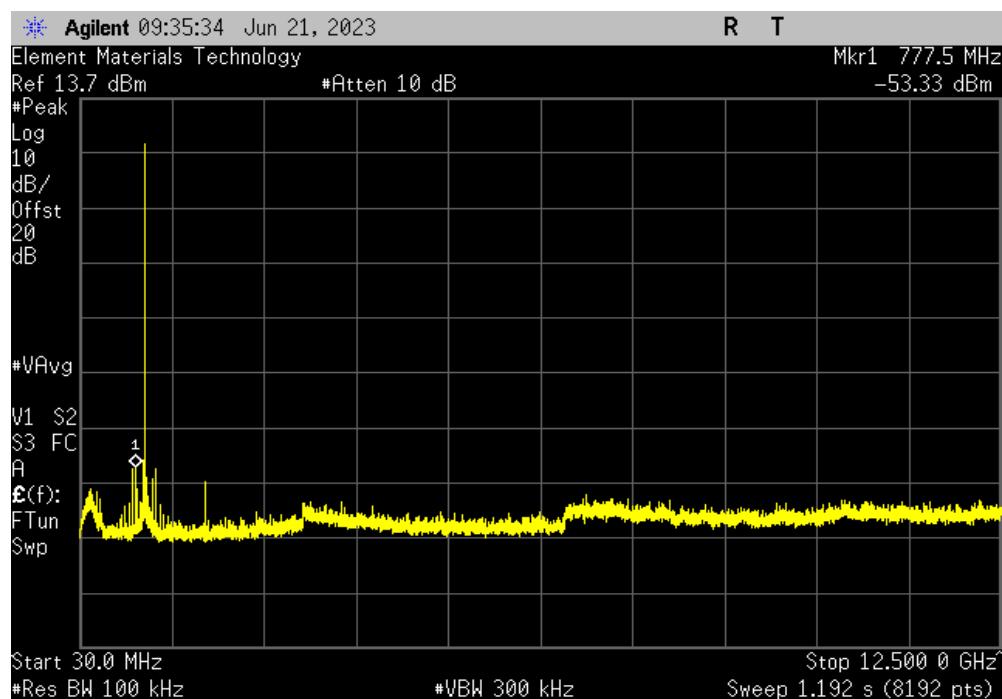


TbTx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	905.41	N/A	N/A	N/A	N/A



DTS Radio, Low Channel, 905.23 MHz, 10 kbps					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	777.50	-59.95	-20	Pass	

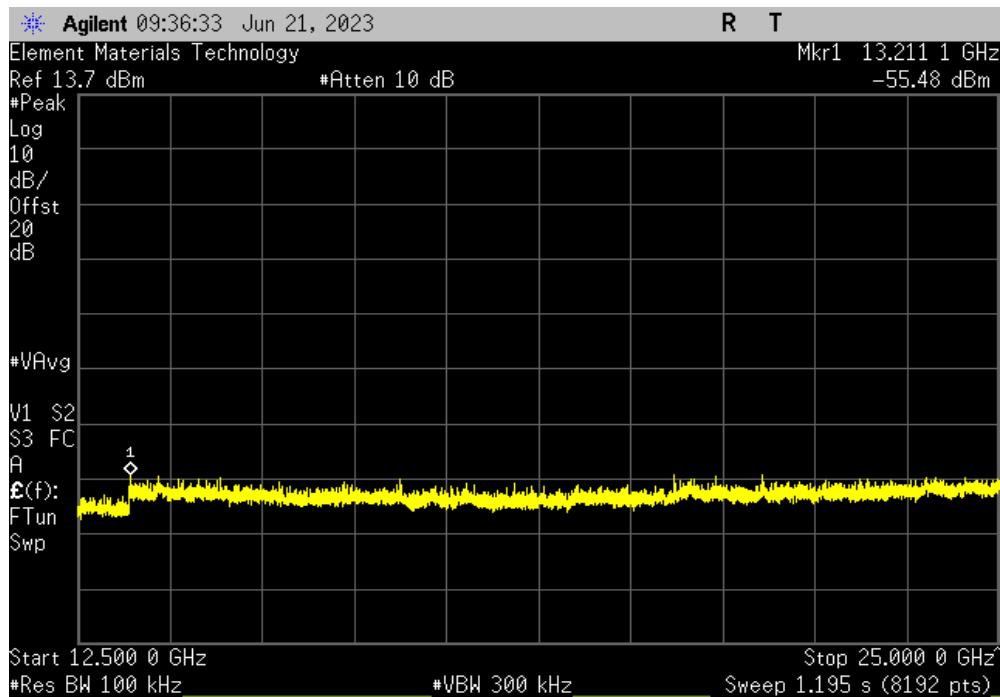


SPURIOUS CONDUCTED EMISSIONS

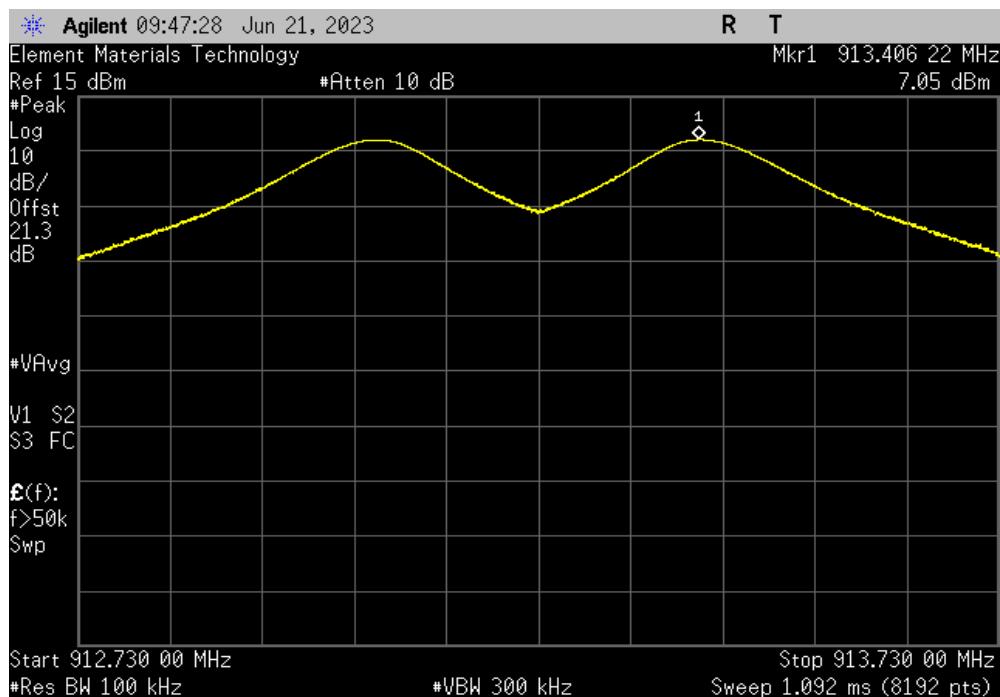


TbITx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit \leq (dBc)	Result	
12.5 GHz - 25 GHz	13211.1	-62.1	-20	Pass	



DTS Radio, High Channel, 913.23 MHz, 10 kbps					
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit \leq (dBc)	Result	
Fundamental	913.41	N/A	N/A	N/A	

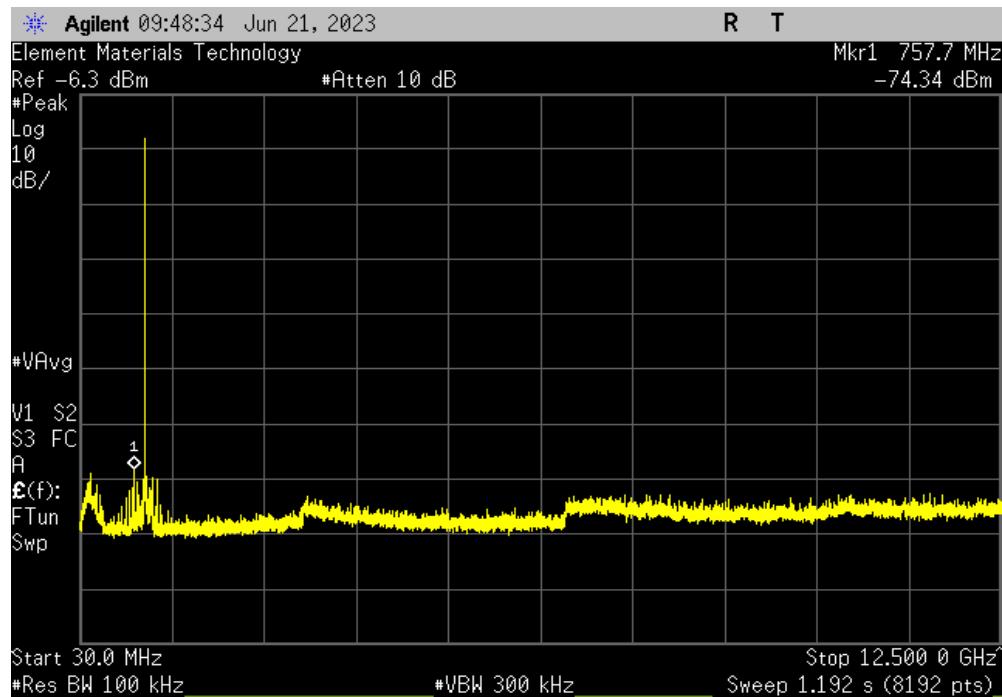


SPURIOUS CONDUCTED EMISSIONS

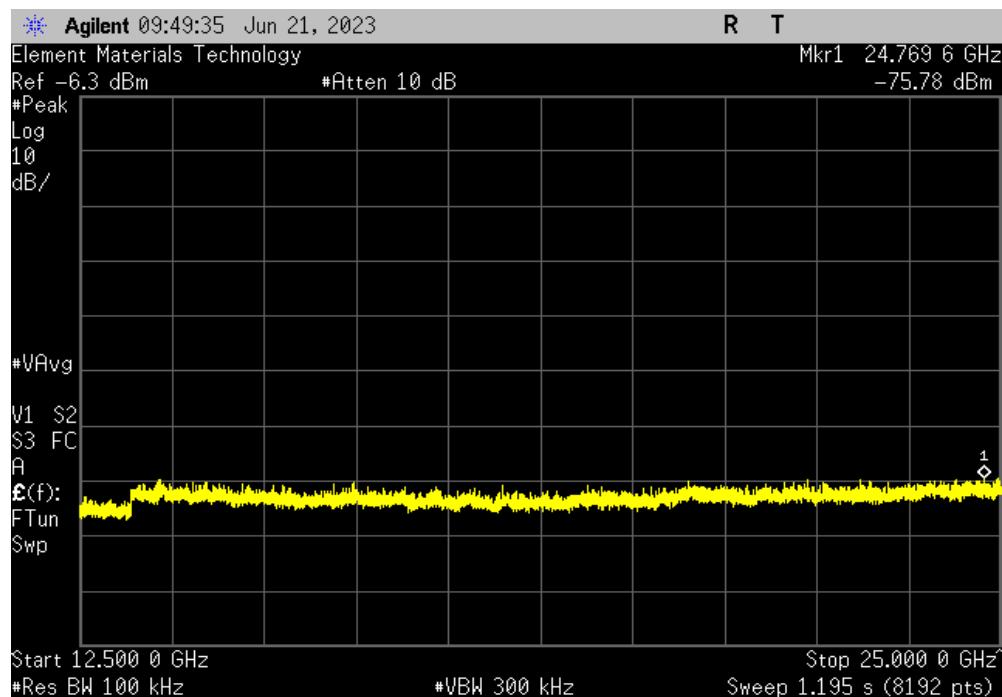


TbITx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, High Channel, 913.23 MHz, 10 kbps				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit \leq (dBc)	Result
30 MHz - 12.5 GHz	757.7	-81.39	-20	Pass



DTS Radio, High Channel, 913.23 MHz, 10 kbps				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit \leq (dBc)	Result
12.5 GHz - 25 GHz	24769.6	-82.83	-20	Pass



POWER SPECTRAL DENSITY



XMit 2023.02.14.0

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	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E8257D	TGU	2020-11-03	2023-11-03
Cable	Element	None	OC5	2023-01-30	2024-01-30
Attenuator	Fairview Microwave	SA18H-20	UAX	2022-07-26	2023-07-26
Block - DC	Aeroflex	INMET 8535	AMO	2023-01-30	2024-01-30
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	2022-10-21	2023-10-21

TEST DESCRIPTION

The power spectral density was measured using the channels and modes as called out in the following data sheets.

The method AVGPSD-2 in clause 11.10.5 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the ON and OFF times of the transmission. The analyzer was configured to the following settings:

Span = at least 1.5 * OBW
RBW = 100 kHz
VBW = 300 kHz
Detector = RMS
Sweep = 601 mS
Points = 601

The peak marker function was used to determine the maximum amplitude level. An additional [$10 \log(1/D)$], where D is the duty cycle was added to the peak marker to compute the average PSD during the actual transmission time. The resultant value was corrected to the reference bandwidth of 3 kHz using a correction factor of -15.2 dB, and compared to the limit.

$$\begin{aligned} \text{dBm/100kHz To dBm/3kHz} &= 10 \log(\text{Ref. RBW} / \text{Meas. Bandwidth}) \\ &= 10 \log(3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB} \end{aligned}$$

POWER SPECTRAL DENSITY



TbTx 2022.06.03.0

XMIT 2023.02.14.0

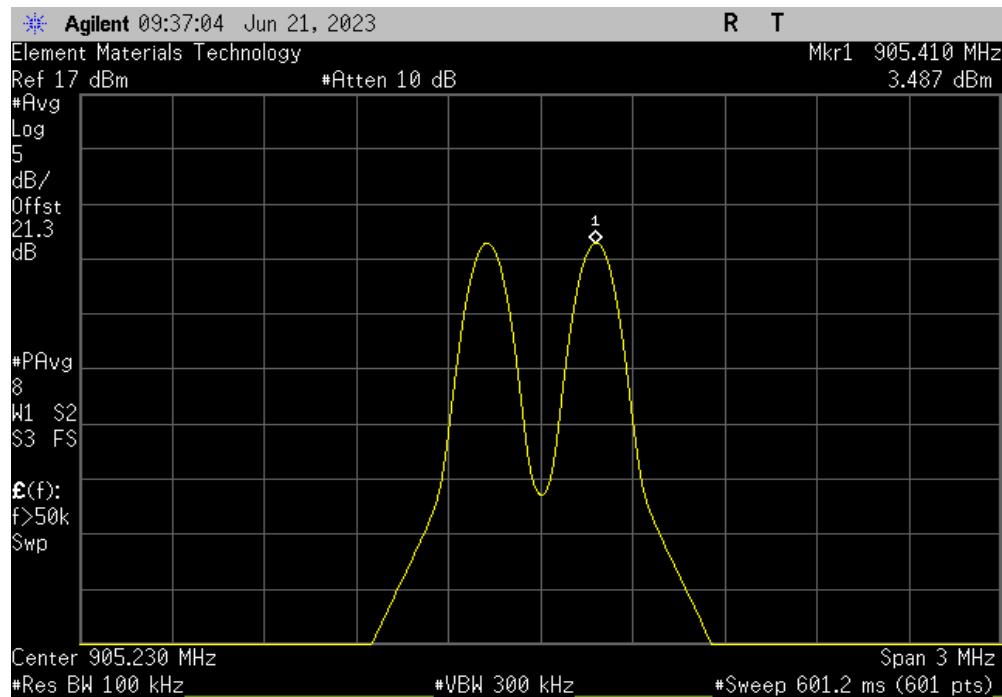
EUT: CFWS10	Work Order: EXIG0020					
Serial Number: D1	Date: 06/21/2023					
Customer: Exigent Sensors LLC	Temperature: 22.5°C					
Attendees: Chad Christensen	Humidity: 46.7%					
Project: None	Barometric Pres.: 1014 mbar					
Tested by: Mark Baytan	Power: 3.0VDC via Battery					
Job Site: OC13						
TEST SPECIFICATIONS						
Test Method						
FCC 15.247:2023	ANSI C63.10:2013					
RSS-247 Issue 2:2017	ANSI C63.10:2013					
COMMENTS						
Reference level offset of 21.3 dB to account for path loss: DC Block, 20dB Attenuator, RF Test and Patch Cables.						
DEVIATIONS FROM TEST STANDARD						
Power Spectral Density was taken with an average detector which does not match the peak method as used for Output Power. However, the maximum peak output power of 7.05 dBm taken with a 1 MHz resolution bandwidth, when applied directly to the 8 dBm / 3 kHz power spectral density limit shows that the EUT is compliant.						
Configuration #	EXIG0020-1					
Signature 						
		Value	dBm/100kHz	Value	Limit	
		dBm/100kHz	To dBm/3kHz	dBm/3kHz	< dBm/3kHz	Results
DTS Radio						
Low Channel, 905.23 MHz						
10 kbps		3.489	-15.2	-11.711	8	Pass
High Channel, 913.23 MHz						
10 kbps		3.902	-15.2	-11.298	8	Pass

POWER SPECTRAL DENSITY

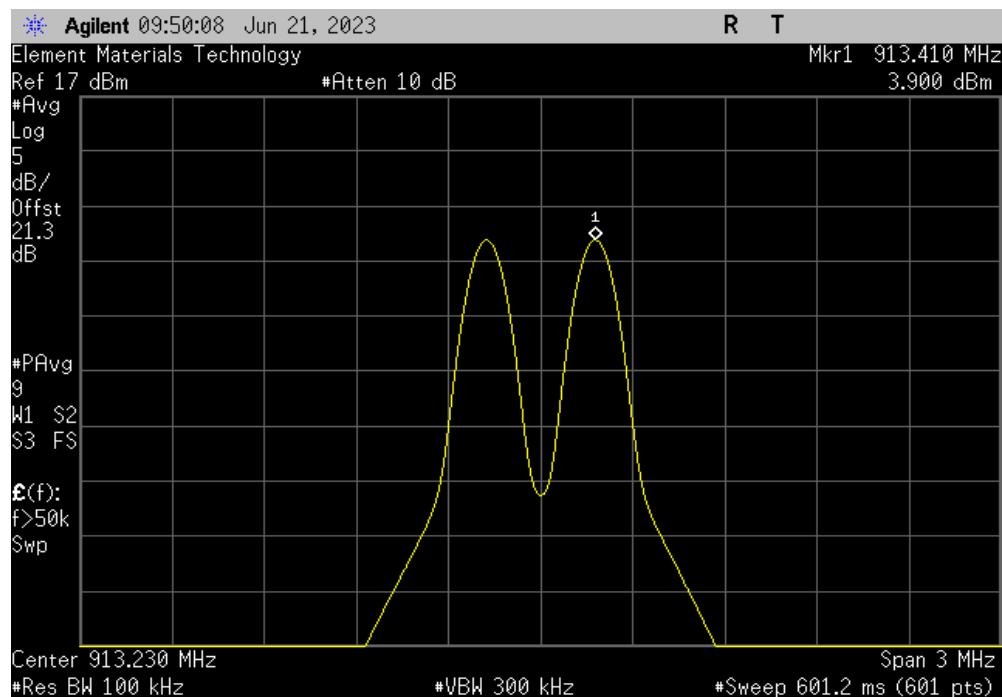


TbtTx 2022.06.03.0 XMit 2023.02.14.0

DTS Radio, Low Channel, 905.23 MHz, 10 kbps					
Value	dBm/100kHz	Value	Limit		
dBm/100kHz	To dBm/3kHz	dBm/3kHz	< dBm/3kHz	Results	
	3.489	-15.2	-11.711	8	Pass



DTS Radio, High Channel, 913.23 MHz, 10 kbps					
Value	dBm/100kHz	Value	Limit		
dBm/100kHz	To dBm/3kHz	dBm/3kHz	< dBm/3kHz	Results	
	3.902	-15.2	-11.298	8	Pass



End of Test Report