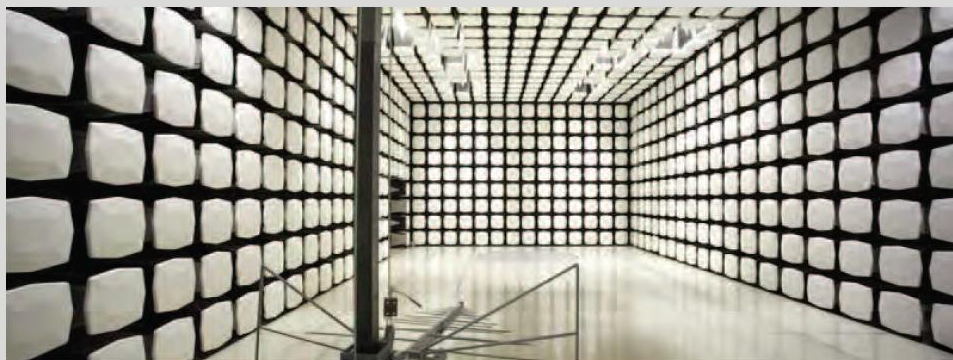




Canary Medical
CTE with CHIRP System (Base Station)

FCC 15.249:2020
2400 - 2483.5 MHz Transceiver

Report: CAAL0013.2, Issue Date: November 23, 2020



NVLAP LAB CODE: 200676-0



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CERTIFICATE OF TEST

Last Date of Test: October 12, 2020
 Canary Medical
 EUT: CTE with CHIRP System (Base Station)

Radio Equipment Testing

Standards

Specification	Method
FCC 15.249:2020	ANSI C63.10:2013

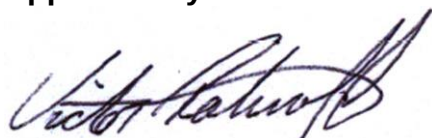
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Field Strength of Harmonics and Spurious Radiated Emissions	Yes	Pass	
6.6	Field Strength of Fundamental	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Victor Ratinoff, Operations Manager

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

REVISION HISTORY



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

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) 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/RRR, 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 included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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

Test	+ MU	- MU
Frequency Accuracy	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)	2.6 dB	-2.6 dB

Test Setup Block Diagrams

Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Canary Medical
Address:	2710 Loker Ave West
City, State, Zip:	Carlsbad, CA 92010
Test Requested By:	Peter Schiller
EUT:	CTE with CHIRP System (Base Station)
First Date of Test:	October 6, 2020
Last Date of Test:	October 12, 2020
Receipt Date of Samples:	September 1, 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:

The CTE system base station is a custom external medical electronic component with MICS radio and WiFi radio. It has a USB 2.0 connection for power and data transfer to and from a PC. The base station is used as a conduit between an implant placed in a patient's knee and LAN.

The home base station (EUT) devices all contain a MedRadio-compliant transceiver that communicates with implanted CTEs via 403 MHz radio. The base stations also contain hardware to communicate data bidirectionally to PC applications via USB

The Home base station, used as part of a system for an Implantable knee device with dual-band 2.45GHz and MICS band custom antenna. The base station will be operating over a PIFA antenna on 2.45 GHz for low-power wake-up and on an on-the-board helical antenna for the MICS band.

Testing Objective:

Seeking to demonstrate compliance under FCC 15.249:2020 for operation in the 2400 - 2483.5 MHz Band.

CONFIGURATIONS



Configuration CAAL0013- 8

Software/Firmware Running during test	
Description	Version
Canary_HOME_BST	v1.1.0

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Home Base Station	Canary Medical, Inc.	HBS1	000025

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply (EUT) Home Base Station	CUI Inc	SWM6-5-NH-U	190400820

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	USB Cable	1m	No	Home Base Station	Power Supply (EUT) Home Base Station

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-10-06	Field Strength of Fundamental	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	2020-10-07	Field Strength of Harmonics and 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.
3	2020-10-08	Powerline Conducted 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.
4	2020-10-12	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS



The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Type	Position	Frequency (MHz)	Power Setting
2.4 GHz Wake Up	SRD	Mid Channel	2410	Max

POWERLINE CONDUCTED EMISSIONS

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 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. 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	ESCI	ARG	2020-08-07	2021-08-07
LISN	Solar Electronics	9252-50-24-BNC	LIA	2020-01-07	2021-01-07
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2020-08-26	2021-08-26

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.6 dB	-2.6 dB

CONFIGURATIONS INVESTIGATED

CAAL0013-8

MODES INVESTIGATED

Transmitting 2.4GHz Wake-UP SRD: 2410 MHz

POWERLINE CONDUCTED EMISSIONS



EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013
Serial Number:	000025	Date:	2020-10-08
Customer:	Canary Medical	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	46.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Salvador Solorzano	Job Site:	OC06
Power:	110VAC/60Hz	Configuration:	CAAL0013-8

TEST SPECIFICATIONS

Specification: Equipment Class B FCC 15.249:2020	Method: ANSI C63.10:2013
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TEST PARAMETERS

Run #:	17	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

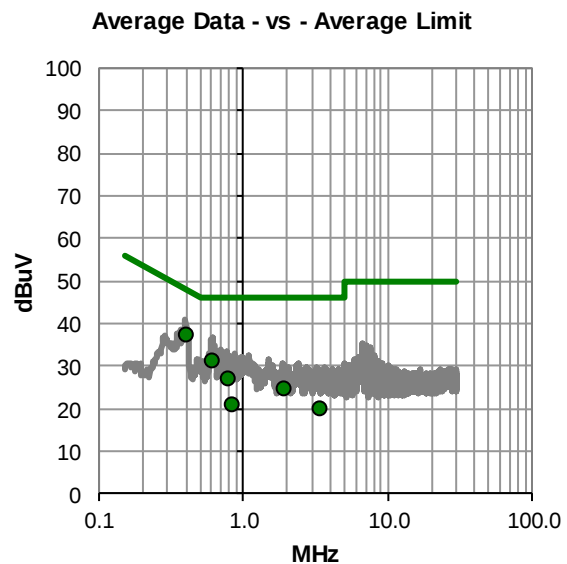
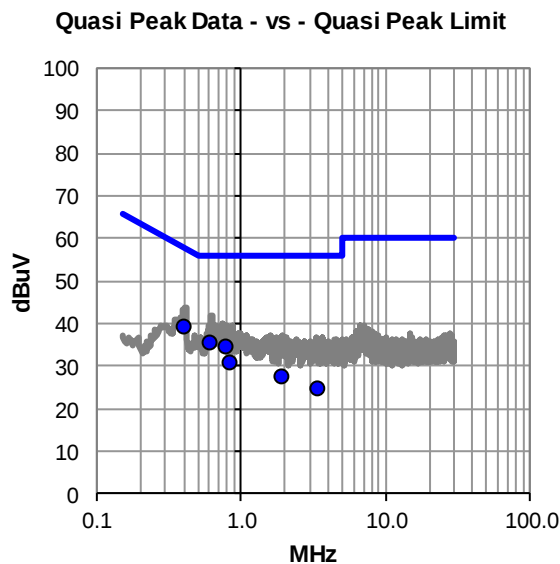
None

EUT OPERATING MODES

Transmitting 2.4GHz Wake-UP SRD: 2410 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #17

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.412	18.9	20.0	38.9	57.6	-18.7
0.621	15.3	20.0	35.3	56.0	-20.7
0.795	14.2	20.0	34.2	56.0	-21.8
0.848	10.4	20.0	30.4	56.0	-25.6
1.935	7.5	20.0	27.5	56.0	-28.5
3.379	4.5	20.1	24.6	56.0	-31.4

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.412	17.0	20.0	37.0	47.6	-10.6
0.621	11.1	20.0	31.1	46.0	-14.9
0.795	6.9	20.0	26.9	46.0	-19.1
1.935	4.5	20.0	24.5	46.0	-21.5
0.848	1.0	20.0	21.0	46.0	-25.0
3.379	-0.4	20.1	19.7	46.0	-26.3

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013
Serial Number:	000025	Date:	2020-10-08
Customer:	Canary Medical	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	46.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Salvador Solorzano	Job Site:	OC06
Power:	110VAC/60Hz	Configuration:	CAAL0013-8

TEST SPECIFICATIONS

Specification: Equipment Class B FCC 15.249:2020	Method: ANSI C63.10:2013
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TEST PARAMETERS

Run #:	18	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

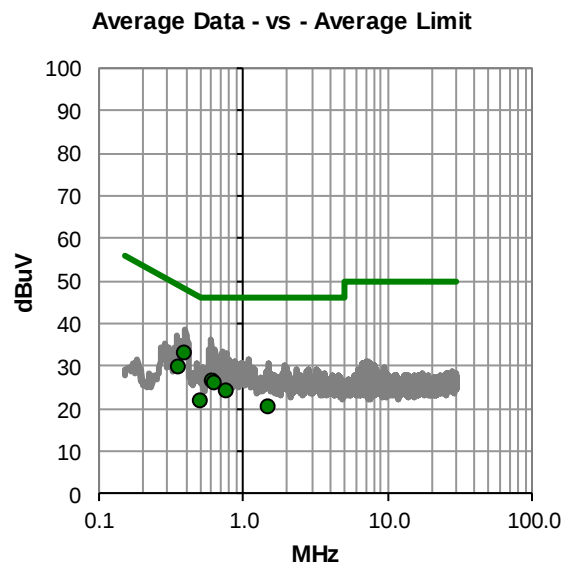
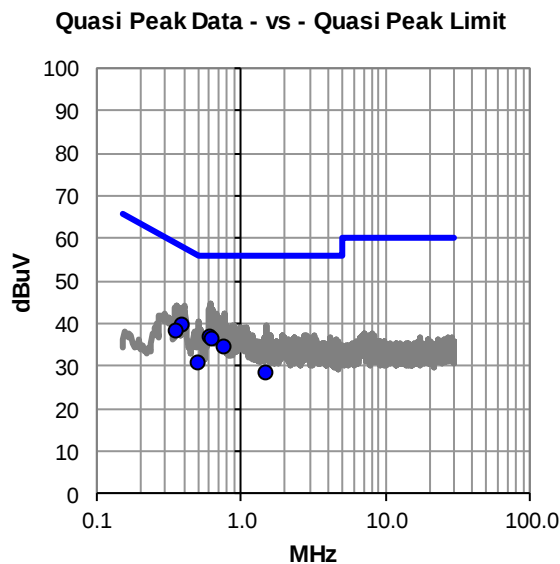
None

EUT OPERATING MODES

Transmitting 2.4GHz Wake-UP SRD: 2410 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #18

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.397	19.3	20.0	39.3	57.9	-18.6
0.620	16.9	20.0	36.9	56.0	-19.1
0.628	16.3	20.0	36.3	56.0	-19.7
0.357	18.0	20.1	38.1	58.8	-20.7
0.766	14.4	20.0	34.4	56.0	-21.6
0.502	10.5	20.0	30.5	56.0	-25.5
1.483	8.3	19.9	28.2	56.0	-27.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.397	13.2	20.0	33.2	47.9	-14.7
0.357	9.4	20.1	29.5	48.8	-19.3
0.620	6.5	20.0	26.5	46.0	-19.5
0.628	6.1	20.0	26.1	46.0	-19.9
0.766	4.3	20.0	24.3	46.0	-21.7
0.502	1.5	20.0	21.5	46.0	-24.5
1.483	0.6	19.9	20.5	46.0	-25.5

CONCLUSION

Pass



Tested By

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2020.06.24.2 BETA

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 2.4GHz Wake-UP SRD: 2410 MHz

POWER SETTINGS INVESTIGATED

USB Powered

CONFIGURATIONS INVESTIGATED

CAAL0013 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz
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SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Filter - High Pass	Micro-Tronics	HPM50111	HHX	30-Jun-20	30-Jun-21
Filter - Low Pass	Micro-Tronics	LPM50004	LFT	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKQ	1-Jul-20	1-Jul-21
Cable	Northwest EMC	8-18GHz RE Cable	OCO	27-Feb-20	27-Feb-21
Amplifier - Pre-Amplifier	Miteq	F-6F-12001800-30-	AOE	27-Feb-20	27-Feb-21
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	NCR
Amplifier - Pre-Amplifier	Miteq	F-6F-08001200-30-	AOE	27-Feb-20	27-Feb-21
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	NCR
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	NCR
Cable	Northwest EMC	8-26GHz RE Cable	OCK	13-Dec-19	13-Dec-20
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	28-Feb-20	28-Feb-21
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	28-Feb-20	28-Feb-21
Antenna - Double Ridge	EMCO	3115	AHE	22-Jul-20	22-Jul-22
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	1-Jul-20	1-Jul-21
Cable	Northwest EMC	kHz-1GHz RE Cab	OCH	1-Jul-20	1-Jul-21
Antenna - Biconilog	EMCO	3142B	AXK	30-Oct-19	30-Oct-21
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	3-Aug-20	3-Aug-21

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, 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.

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

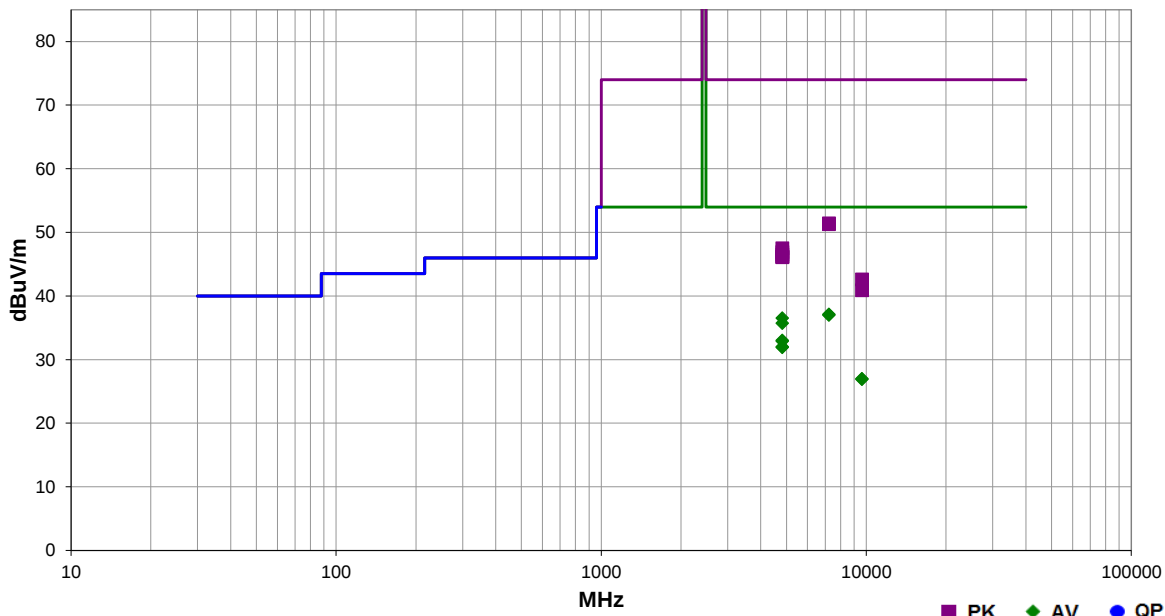
Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement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

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS



Work Order:	CAAL0013	Date:	2020-11-11	
Project:	None	Temperature:	17.3 °C	
Job Site:	OC10	Humidity:	47.6% RH	
Serial Number:	000025	Barometric Pres.:	1019 mbar	
EUT:	CHIRP System (Base Station)			
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Primary Antenna.			
Test Specifications				Test Method
FCC 15.249:2020				ANSI C63.10:2013

Run #	12	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7229.833	32.6	4.5	1.5	185.0	3.0	0.0	Vert	AV	0.0	37.1	54.0	-16.9	EUT on Side, Primary Ant.
7229.525	32.6	4.4	1.8	351.0	3.0	0.0	Horz	AV	0.0	37.0	54.0	-17.0	EUT Vert, Primary Ant.
4820.008	41.1	-4.6	2.5	253.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	EUT Vert, Primary Ant.
4820.007	40.3	-4.6	1.2	260.0	3.0	0.0	Vert	AV	0.0	35.7	54.0	-18.3	EUT on Side, Primary Ant.
4820.005	37.6	-4.6	1.5	142.0	3.0	0.0	Horz	AV	0.0	33.0	54.0	-21.0	EUT Horz, Primary Ant.
4820.042	37.5	-4.6	1.5	303.0	3.0	0.0	Horz	AV	0.0	32.9	54.0	-21.1	EUT on Side, Primary Ant.
4820.500	36.6	-4.6	1.5	130.0	3.0	0.0	Vert	AV	0.0	32.0	54.0	-22.0	EUT Vert, Primary Ant.
4820.088	36.5	-4.6	1.5	23.0	3.0	0.0	Vert	AV	0.0	31.9	54.0	-22.1	EUT Horz, Primary Ant.
7229.938	46.9	4.5	1.5	185.0	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	EUT on Side, Primary Ant.
7230.463	46.8	4.5	1.8	351.0	3.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	EUT Vert, Primary Ant.
4820.298	52.1	-4.6	1.2	260.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	EUT on Side, Primary Ant.
9640.725	31.1	-4.1	1.5	221.0	3.0	0.0	Vert	AV	0.0	27.0	54.0	-27.0	EUT on Side, Primary Ant.
4820.062	51.5	-4.6	2.5	253.0	3.0	0.0	Horz	PK	0.0	46.9	74.0	-27.1	EUT Vert, Primary Ant.
9640.725	31.0	-4.1	1.5	48.0	3.0	0.0	Horz	AV	0.0	26.9	54.0	-27.1	EUT Vert, Primary Ant.
4819.980	51.1	-4.6	1.5	23.0	3.0	0.0	Vert	PK	0.0	46.5	74.0	-27.5	EUT Horz, Primary Ant.
4819.923	50.8	-4.6	1.5	130.0	3.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	EUT Vert, Primary Ant.
4820.387	50.8	-4.6	1.5	142.0	3.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	EUT Horz, Primary Ant.
4820.435	50.7	-4.6	1.5	303.0	3.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9	EUT on Side, Primary Ant.
9638.950	46.7	-4.1	1.5	48.0	3.0	0.0	Horz	PK	0.0	42.6	74.0	-31.4	EUT Vert, Primary Ant.
9642.475	44.9	-4.0	1.5	221.0	3.0	0.0	Vert	PK	0.0	40.9	74.0	-33.1	EUT on Side, Primary Ant.

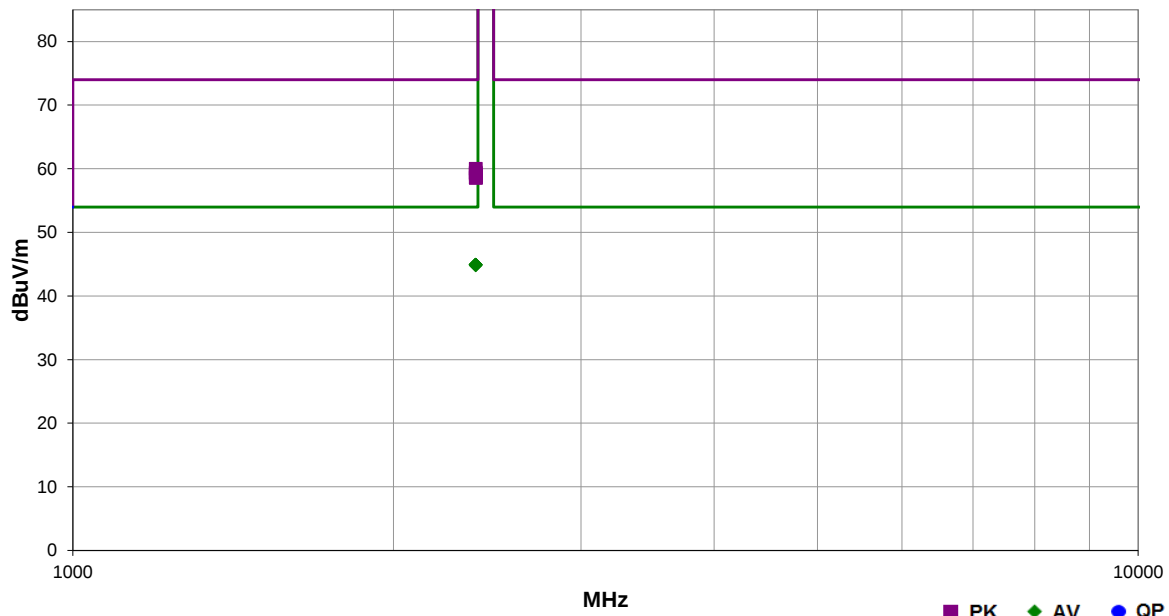
FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS



Work Order:	CAAL0013	Date:	2020-11-11	
Project:	None	Temperature:	17.3 °C	
Job Site:	OC10	Humidity:	47.6% RH	
Serial Number:	000025	Barometric Pres.:	1019 mbar	
EUT:	CHIRP System (Base Station)			
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Primary Antenna.			

Test Specifications	Test Method
FCC 15.249:2020	ANSI C63.10:2013

Run #	8	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
2388.213	36.9	-12.0	2.6	37.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1
2389.417	36.9	-12.0	1.5	137.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1
2388.270	36.9	-12.0	3.7	248.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1
2389.390	36.9	-12.0	2.1	78.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1
2389.217	36.9	-12.0	1.5	143.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1
2389.210	36.8	-12.0	2.6	219.0	3.0	20.0	Vert	AV	0.0	44.8	54.0	-9.2
2388.750	52.0	-12.0	2.6	37.0	3.0	20.0	Horz	PK	0.0	60.0	74.0	-14.0
2389.483	51.4	-12.0	3.7	248.0	3.0	20.0	Vert	PK	0.0	59.4	74.0	-14.6
2389.260	51.2	-12.0	1.5	137.0	3.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8
2389.593	50.9	-12.0	2.1	78.0	3.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1
2389.840	50.6	-12.0	2.6	219.0	3.0	20.0	Vert	PK	0.0	58.6	74.0	-15.4
2389.547	50.6	-12.0	1.5	143.0	3.0	20.0	Vert	PK	0.0	58.6	74.0	-15.4

FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS



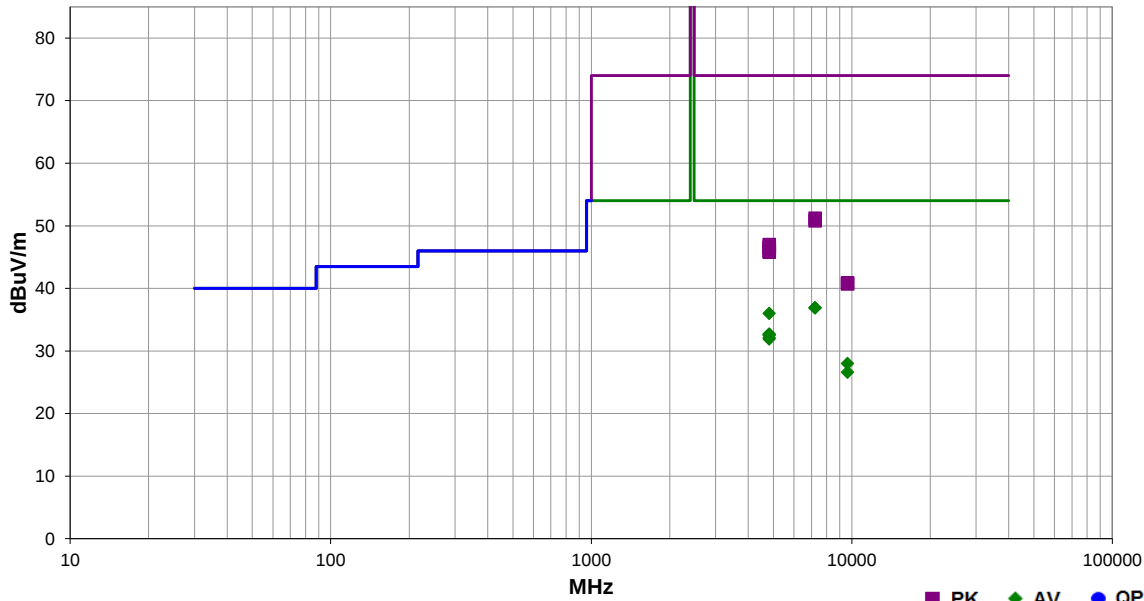
EmiRS 2020.06.24.4

PSA-ESCI 2020.06.24.2

Work Order:	CAAL0013	Date:	2020-11-11	
Project:	None	Temperature:	17.3 °C	
Job Site:	OC10	Humidity:	47.6% RH	
Serial Number:	000025	Barometric Pres.:	1019 mbar	Tested by: Mark Baytan
EUT:	CHIRP System (Base Station)			
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Secondary Antenna.			

Test Specifications	Test Method
FCC 15.249:2020	ANSI C63.10:2013

Run #	11	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7229.507	32.5	4.4	2.4	301.0	3.0	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Vert, Secondary Ant.
7229.662	32.5	4.4	2.7	138.0	3.0	0.0	Vert	AV	0.0	36.9	54.0	-17.1	EUT Horz, Secondary Ant.
4820.007	40.6	-4.6	2.3	273.0	3.0	0.0	Horz	AV	0.0	36.0	54.0	-18.0	EUT Vert, Secondary Ant.
4819.997	37.3	-4.6	1.5	311.0	3.0	0.0	Horz	AV	0.0	32.7	54.0	-21.3	EUT on Side, Secondary Ant.
4819.985	37.2	-4.6	1.8	96.0	3.0	0.0	Horz	AV	0.0	32.6	54.0	-21.4	EUT Horz, Secondary Ant.
4820.040	37.1	-4.6	1.5	18.0	3.0	0.0	Vert	AV	0.0	32.5	54.0	-21.5	EUT Horz, Secondary Ant.
4820.473	36.7	-4.6	1.5	14.0	3.0	0.0	Vert	AV	0.0	32.1	54.0	-21.9	EUT Vert, Secondary Ant.
4820.087	36.5	-4.6	1.5	282.0	3.0	0.0	Vert	AV	0.0	31.9	54.0	-22.1	EUT on Side, Secondary Ant.
7230.347	46.7	4.5	2.4	301.0	3.0	0.0	Horz	PK	0.0	51.2	74.0	-22.8	EUT Vert, Secondary Ant.
7229.628	46.4	4.4	2.7	138.0	3.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	EUT on Horz, Secondary Ant.
9637.908	32.1	-4.1	1.5	187.0	3.0	0.0	Vert	AV	0.0	28.0	54.0	-26.0	EUT Horz, Secondary Ant.
4820.073	51.6	-4.6	2.3	273.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	EUT Vert, Secondary Ant.
4820.055	51.2	-4.6	1.5	14.0	3.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	EUT Vert, Secondary Ant.
9637.917	30.7	-4.1	2.5	151.0	3.0	0.0	Horz	AV	0.0	26.6	54.0	-27.4	EUT Vert, Secondary Ant.
4819.758	51.1	-4.6	1.8	96.0	3.0	0.0	Horz	PK	0.0	46.5	74.0	-27.5	EUT Horz, Secondary Ant.
4820.107	51.0	-4.6	1.5	311.0	3.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	EUT on Side, Secondary Ant.
4819.928	50.5	-4.6	1.5	282.0	3.0	0.0	Vert	PK	0.0	45.9	74.0	-28.1	EUT on Side, Secondary Ant.
4820.405	50.4	-4.6	1.5	18.0	3.0	0.0	Vert	PK	0.0	45.8	74.0	-28.2	EUT Horz, Secondary Ant.
9639.142	45.0	-4.1	2.5	151.0	3.0	0.0	Horz	PK	0.0	40.9	74.0	-33.1	EUT Vert, Secondary Ant.
9642.458	44.7	-4.0	1.5	187.0	3.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	EUT Horz, Secondary Ant.

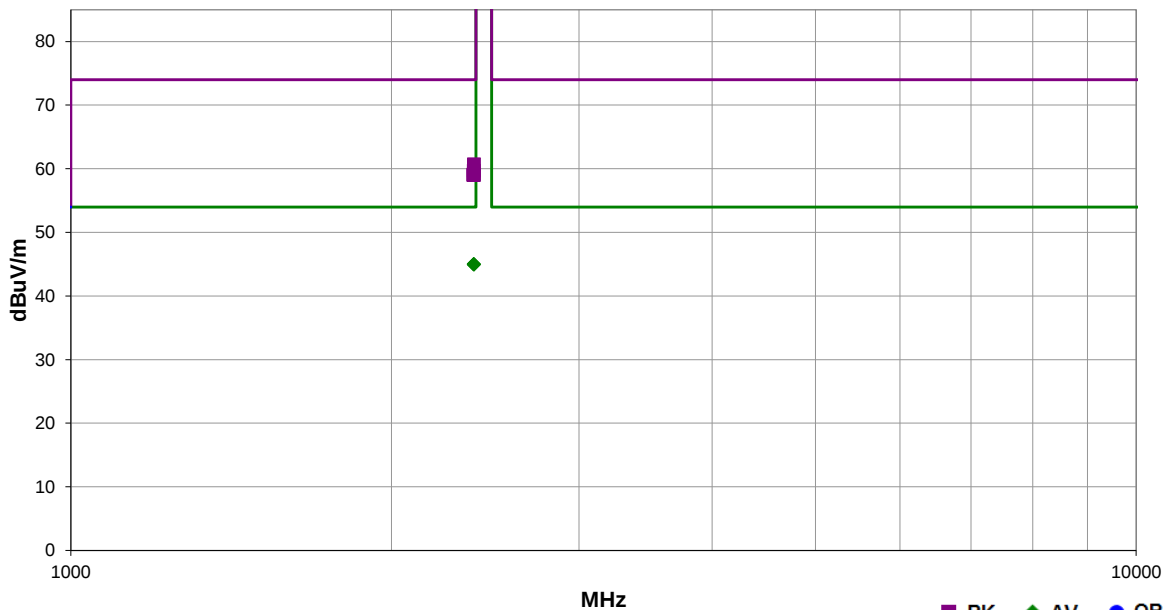
FIELD STRENGTH OF HARMONICS AND SPURIOUS RADIATED EMISSIONS



Work Order:	CAAL0013	Date:	2020-11-11	
Project:	None	Temperature:	17.3 °C	
Job Site:	OC10	Humidity:	47.6% RH	
Serial Number:	000025	Barometric Pres.:	1019 mbar	
EUT:	CHIRP System (Base Station)			
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Secondary Antenna.			

Test Specifications	Test Method
FCC 15.249:2020	ANSI C63.10:2013

Run #	10	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
2389.987	37.0	-12.0	1.5	103.0	3.0	20.0	Horz	AV	0.0	45.0	54.0	-9.0
2389.797	37.0	-12.0	1.5	49.0	3.0	20.0	Vert	AV	0.0	45.0	54.0	-9.0
2389.480	37.0	-12.0	1.5	198.0	3.0	20.0	Horz	AV	0.0	45.0	54.0	-9.0
2388.240	37.0	-12.0	1.5	125.0	3.0	20.0	Vert	AV	0.0	45.0	54.0	-9.0
2389.913	36.9	-12.0	1.5	164.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1
2389.800	36.9	-12.0	1.5	301.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1
2389.913	52.7	-12.0	1.5	125.0	3.0	20.0	Vert	PK	0.0	60.7	74.0	-13.3
2388.853	51.7	-12.0	1.5	103.0	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3
2388.590	51.1	-12.0	1.5	164.0	3.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9
2388.187	51.1	-12.0	1.5	49.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9
2388.417	51.0	-12.0	1.5	301.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0
2388.490	51.0	-12.0	1.5	198.0	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0

FIELD STRENGTH OF FUNDAMENTAL



PSA-ESCI 2020.04.03.0

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. 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 2.4GHz Wake-UP SRD: 2410 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

CAAL0013 - 8

FREQUENCY RANGE INVESTIGATED

Start Frequency	2400 MHz	Stop Frequency	2483.5 MHz
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SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2020-01-04	24 mo
Cable	ESM Cable Corp.	1-8GHz cables	OCX	2020-03-02	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIR	2020-07-07	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT and EUT antenna in 3 orthogonal planes.

RADIATED EMISSIONS

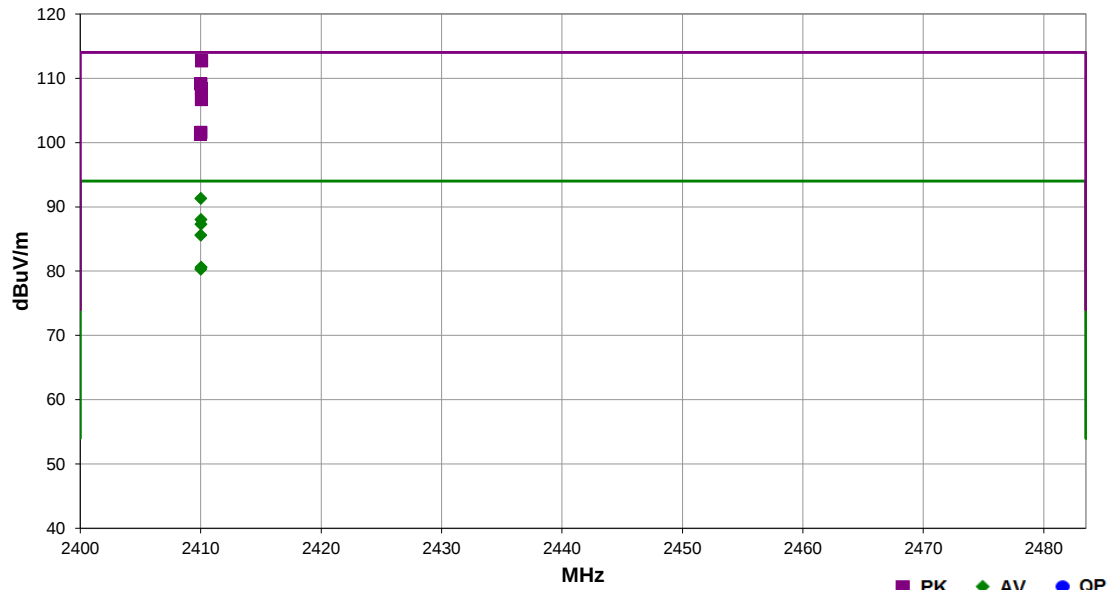


EmiRS 2020.06.24.4 PSA-ESCI 2020.06.24.2

Work Order:	CAAL0013	Date:	2020-11-10	
Project:	None	Temperature:	18.6 °C	
Job Site:	OC10	Humidity:	44.2% RH	
Serial Number:	000025	Barometric Pres.:	1020 mbar	
EUT:	CHIRP System (Base Station)			
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Primary Antenna.			

Test Specifications	Test Method
FCC 15.249:2020	ANSI C63.10:2013

Run #	4	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
2410.067	76.5	36.2	1.2	27.0	3.0	0.0	Horz	PK	0.0	112.7	114.0	-1.3
2410.017	55.1	36.2	1.2	27.0	3.0	0.0	Horz	AV	0.0	91.3	94.0	-2.7
2410.008	72.9	36.2	1.59	188.0	3.0	0.0	Horz	PK	0.0	109.1	114.0	-4.9
2410.058	72.2	36.2	1.5	106.0	3.0	0.0	Vert	PK	0.0	108.4	114.0	-5.6
2410.025	51.8	36.2	1.59	188.0	3.0	0.0	Horz	AV	0.0	88.0	94.0	-6.0
2410.033	51.1	36.2	1.5	106.0	3.0	0.0	Vert	AV	0.0	87.3	94.0	-6.7
2410.058	70.5	36.2	1.2	140.0	3.0	0.0	Horz	PK	0.0	106.7	114.0	-7.3
2410.008	49.4	36.2	1.2	140.0	3.0	0.0	Horz	AV	0.0	85.6	94.0	-8.4
2410.008	65.4	36.2	1.5	191.0	3.0	0.0	Vert	PK	0.0	101.6	114.0	-12.4
2409.983	65.1	36.2	1.2	93.0	3.0	0.0	Vert	PK	0.0	101.3	114.0	-12.7
2410.042	44.4	36.2	1.5	191.0	3.0	0.0	Vert	AV	0.0	80.6	94.0	-13.4
2410.017	44.1	36.2	1.2	93.0	3.0	0.0	Vert	AV	0.0	80.3	94.0	-13.7

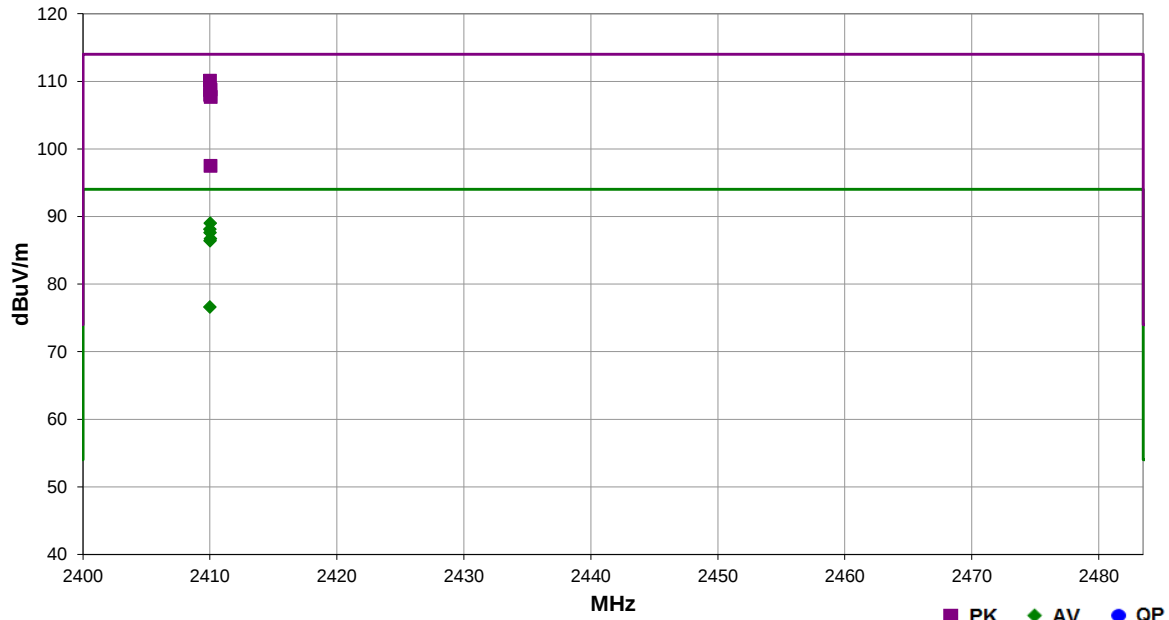
RADIATED EMISSIONS



Work Order:	CAAL0013	Date:	2020-11-10	EmiRS 2020.06.24.4 PSA-ESCI 2020.06.24.2 
Project:	None	Temperature:	18.6 °C	
Job Site:	OC10	Humidity:	44.2% RH	
Serial Number:	000025	Barometric Pres.:	1020 mbar	
EUT:	CHIRP System (Base Station)			Tested by: Mark Baytan
Configuration:	8			
Customer:	Canary Medical			
Attendees:	None			
EUT Power:	USB Powered			
Operating Mode:	Transmitting 2.4GHz Wake-UP SRD: 2410 MHz			
Deviations:	None			
Comments:	The EUT is only capable of transmitting in low channel which is 2410 MHz. When product goes to market it will not be able to broad cast in any other channel. Secondary Antenna.			

Test Specifications	FCC 15.249:2020	Test Method	ANSI C63.10:2013
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Run #	5	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
2410.000	73.9	36.2	1.2	22.0	3.0	0.0	Horz	PK	0.0	110.1	114.0	-3.9
2410.033	52.8	36.2	1.2	22.0	3.0	0.0	Horz	AV	0.0	89.0	94.0	-5.0
2410.050	72.6	36.2	4.0	357.0	3.0	0.0	Vert	PK	0.0	108.8	114.0	-5.2
2410.017	72.5	36.2	1.2	64.0	3.0	0.0	Vert	PK	0.0	108.7	114.0	-5.3
2410.008	51.9	36.2	4.0	357.0	3.0	0.0	Vert	AV	0.0	88.1	94.0	-5.9
2410.025	71.8	36.2	3.23	181.0	3.0	0.0	Horz	PK	0.0	108.0	114.0	-6.0
2410.067	71.5	36.2	3.25	174.0	3.0	0.0	Horz	PK	0.0	107.7	114.0	-6.3
2410.017	51.4	36.2	1.2	64.0	3.0	0.0	Vert	AV	0.0	87.6	94.0	-6.4
2410.042	50.5	36.2	3.23	181.0	3.0	0.0	Horz	AV	0.0	86.7	94.0	-7.3
2410.025	50.2	36.2	3.25	174.0	3.0	0.0	Horz	AV	0.0	86.4	94.0	-7.6
2410.042	61.3	36.2	1.2	207.0	3.0	0.0	Vert	PK	0.0	97.5	114.0	-16.5
2410.008	40.4	36.2	1.2	207.0	3.0	0.0	Vert	AV	0.0	76.6	94.0	-17.4

DUTY CYCLE



XMIT 2020.03.25.0

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	N5182A	TIF	29-Aug-20	29-Aug-23
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Block - DC	Aeroflex	INMET 8535	AMO	14-Feb-20	14-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

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 measured radiated in the RF chamber.

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

DUTY CYCLE



TSTx 2019.08.30.0 XMR 2020.03.25.0

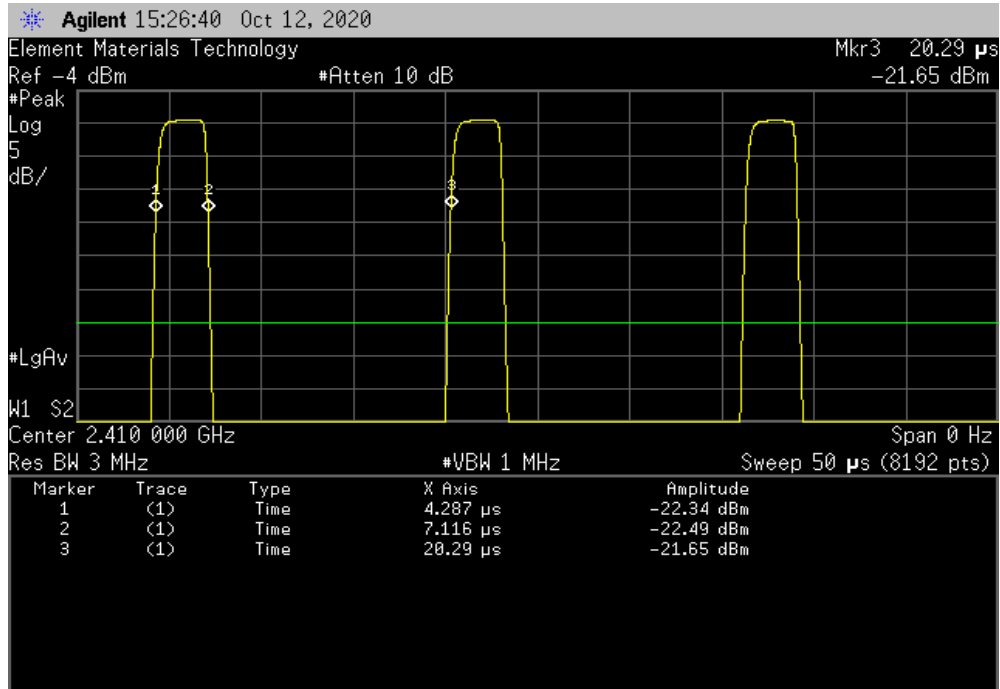
EUT: CTE with CHIRP System (Base Station)		Work Order: CAAL0013	
Serial Number: 000025		Date: 12-Oct-20	
Customer: Canary Medical		Temperature: 25.6 °C	
Attendees: None		Humidity: 48.1% RH	
Project: None		Barometric Pres.: 1014 mbar	
Tested by: Mark Baytan		Power: 110VAC/60Hz	
Job Site: OC13			
TEST SPECIFICATIONS		Test Method	
FCC 15.249:2020		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	8	Signature 	
		Pulse Width	Period
		Number of Pulses	Value (%)
		Limit (%)	Results
2400 MHz - 2483.5 MHz Band			
2.4 GHz SRD			
	2410 MHz	2.829 us	16.008 us
	2410 MHz	N/A	N/A
		1	17.7
		5	N/A
		N/A	N/A
		N/A	N/A

DUTY CYCLE



TMTx 2019.08.30.0 XMR 2020.03.25.0

2400 MHz - 2483.5 MHz Band, 2410 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	2.829 us	16.008 us	1	17.7	N/A	N/A



2400 MHz - 2483.5 MHz Band, 2410 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

