



element

Canary Medical
CTE with CHIRP System (Base Station)

FCC 95I:2020

MedRadio

Report: CAAL0013.4, Issue Date: November 23, 2020



NVLAP[®]
TESTING

NVLAP LAB CODE: 200676-0



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CERTIFICATE OF TEST



Last Date of Test: September 28, 2020
Canary Medical
EUT:CTE with CHIRP System (Base Station)

Radio Equipment Testing

Standards

Specification	Method
FCC 95I:2020	ANSI C63.26:2015

Results

Method Clause	Test Description	Applied	Results	Comments
ANSI C63.26 5.2.3.3	Duty Cycle Characterization	Yes	N/A	Characterization of radio operation.
ANSI C63.26 5.2.3.3	Conducted Output Power	Yes	Pass	
ANSI C63.26 5.2.3.3, 5.2.7	Radiated Power (EIRP)	Yes	Pass	
ANSI C63.26 5.4.3	Emission Bandwidth	Yes	Pass	
ANSI C63.26 5.5.4	Spurious Radiated Emissions	Yes	Pass	
ANSI C63.26 5.6	Frequency Stability	Yes	Pass	
ANSI C63.26 5.7	Spurious Conducted Emissions	Yes	Pass	
FCC 95.2579(a)(1)	Emission Mask	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

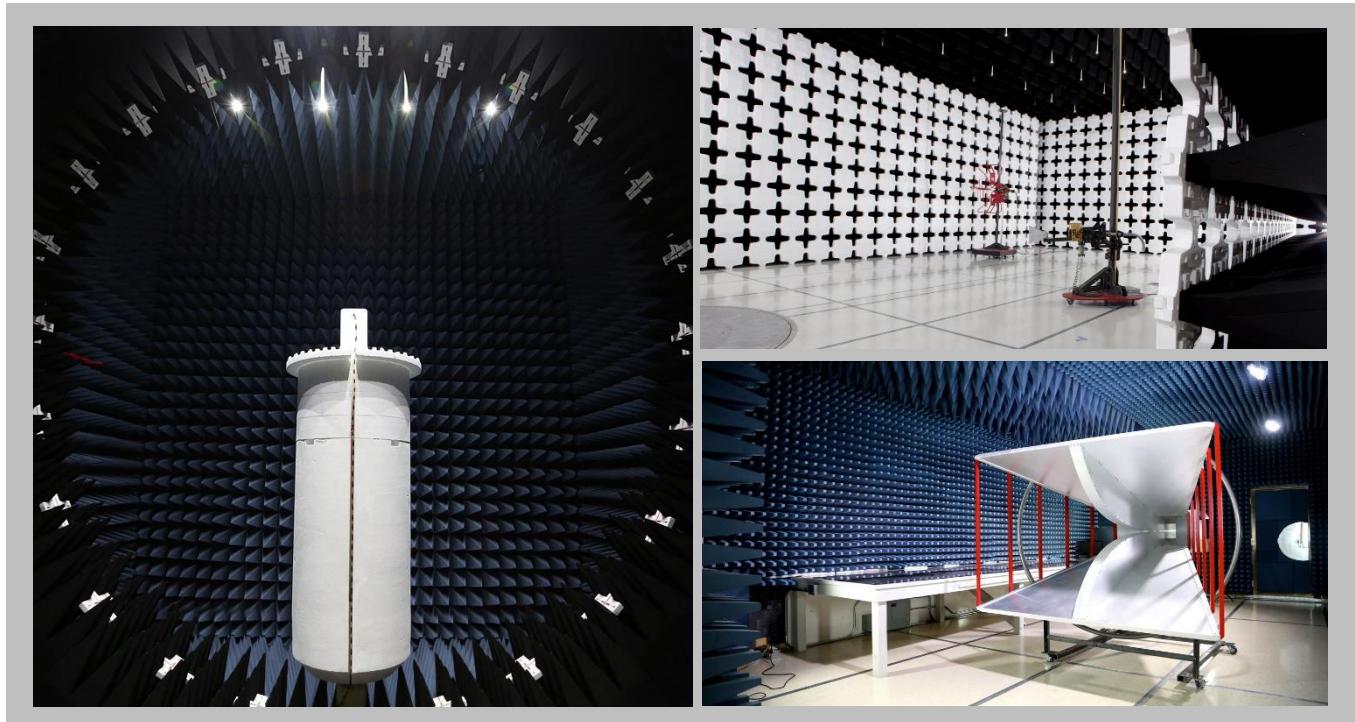
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

FACILITIES

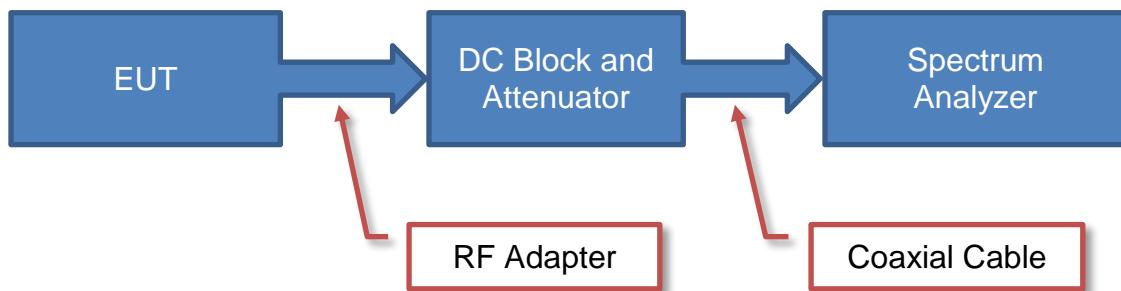


California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington 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/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157

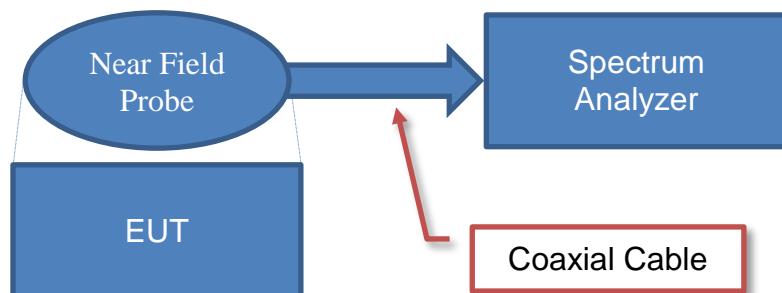


Test Setup Block Diagrams

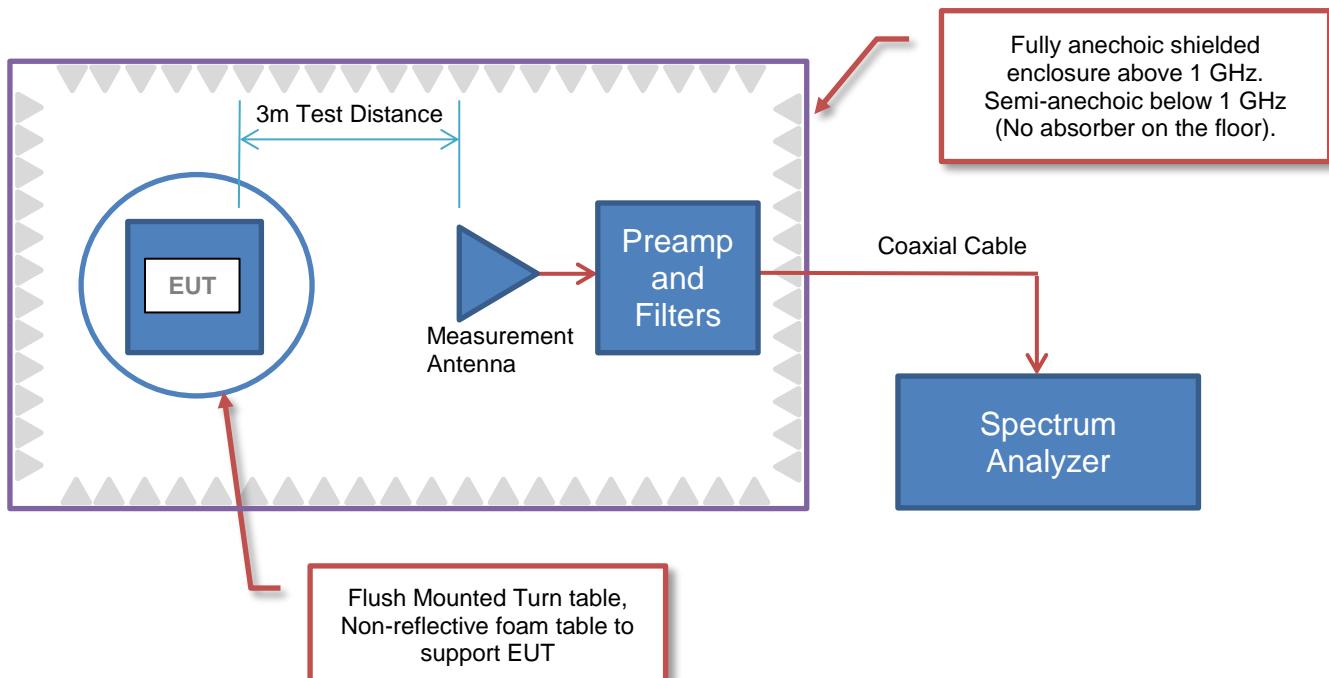
Antenna Port Conducted Measurements



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 1, 2020
Last Date of Test:	October 1, 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 FCC authorization for the MedRadio transmitter to FCC Part 95I.

CONFIGURATIONS



Configuration CAAL0013- 2

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	000024

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Power Supply (Laptop)	Dell	HA45NM140	CN-00285K-CH200-98S-C2DS-A07
Laptop	Dell	Inspiron 14 3000	CCZ66Z2

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	2m	No	Home Base Station	Laptop
AC Cable	No	2m	No	Power Supply (Laptop)	AC Mains
DC Cable	No	1.5m	Yes	Power Supply (Laptop)	Laptop

Configuration CAAL0013- 6

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	000012

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Dell	Inspiron 3482	HBV76Z2
Power Supply (Laptop)	Dell	HA45NM140	CN-00285K-CH200-98S-C2DS-A07

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	2m	No	Home Base Station	Laptop
AC Cable	No	2m	No	Power Supply (Laptop)	AC Mains
DC Cable	No	1.5m	Yes	Power Supply (Laptop)	Laptop

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2020-09-24	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.
2	2020-09-25	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	2020-09-28	Emission Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2020-09-28	Conducted Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2020-09-28	Frequency Stability	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	2020-09-28	Spurious 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.
7	2020-09-28	Emission Mask	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS



No adjustable power settings were provided. The EUT was tested using power settings pre-defined by the manufacturer.

DUTY CYCLE CHARACTERIZATION



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	E8257D	TGU	15-Feb-18	15-Feb-21
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Analyzer - Spectrum Analyzer	Agilent	E4446A	AYA	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 test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

CONDUCTED OUTPUT POWER



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
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

Per FCC Part 2.1046, RSS-GEN, the output power shall be measured at the RF terminal. The peak output power was measured with the EUT configured in the modes listed in the datasheet. The EUT was transmitting at its maximum data rate.

FCC Part 95 and RSS-243 have no conducted output power limit. It is a requirement to characterize this information and that data is contained within this datasheet.

CONDUCTED OUTPUT POWER



TbTx 2019.08.30.0 XMII 2020.03.25.0

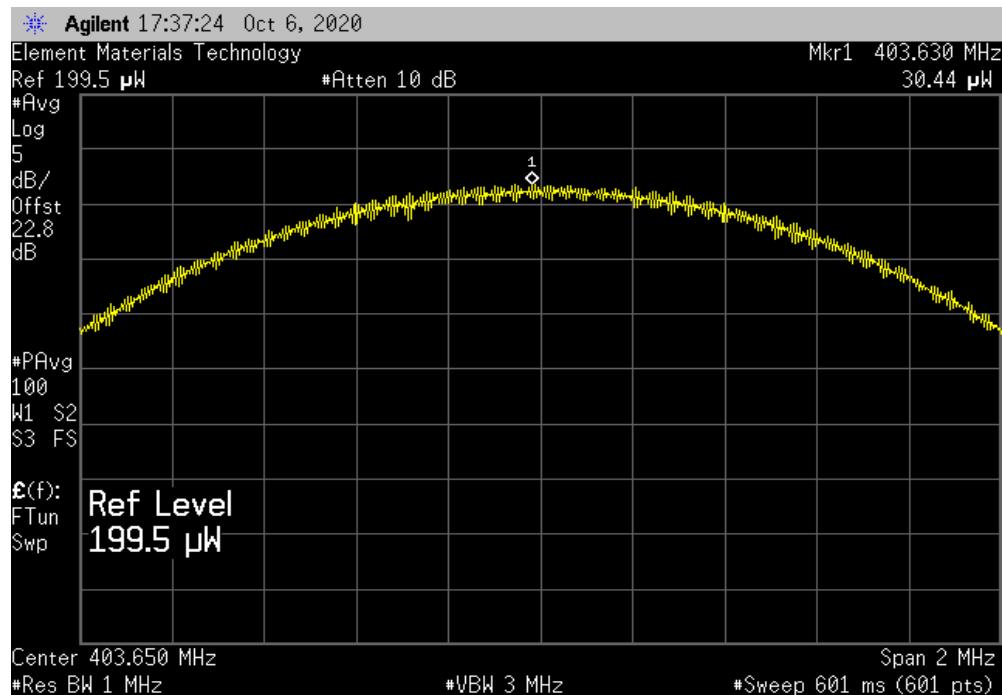
EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013		
Serial Number:	000024	Date:	28-Sep-20		
Customer:	Canary Medical	Temperature:	26.2 °C		
Attendees:	None	Humidity:	48.1% RH		
Project:	None	Barometric Pres.:	1014 mbar		
Tested by:	Nolan De Ramos	Power:	110VAC/60Hz		
TEST SPECIFICATIONS		Test Method			
FCC 95i:2020		ANSI C63.26:2015			
COMMENTS					
Reference level offset: RF Cable + DC Block + 20 dB Attenuator = 22.75 dB					
DEVIATIONS FROM TEST STANDARD					
Configuration #	2	Signature			
		Avg Cond Pwr (μW)	Value (μW)	Limit (μW)	Results
ANT 1	Mid Channel, 403.65 MHz	30.44	0	N/A	N/A
ANT 3	Mid Channel, 403.65 MHz	263.33	0	N/A	N/A

CONDUCTED OUTPUT POWER

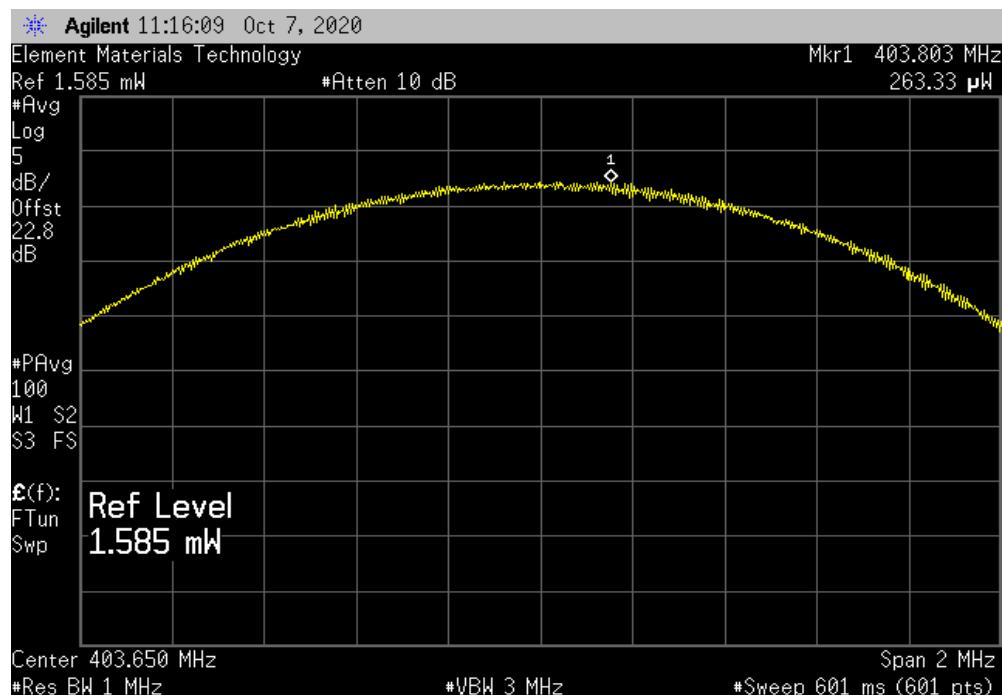


TbtTx 2019.08.30.0 XMit 2020.03.25.0

ANT 1, Mid Channel, 403.65 MHz		Value (μ W)	Limit (μ W)	Results
Avg Cond Pwr (μ W)	30.44			



ANT 3, Mid Channel, 403.65 MHz		Value (μ W)	Limit (μ W)	Results
Avg Cond Pwr (μ W)	263.33			



RADIATED POWER (EIRP)

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 MICS radio: Low Channel 0: 402.15 MHz, Mid Channel 5: 403.65 MHz, High Channel 9: 404.85 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

CAAL0013 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency	402 MHz	Stop Frequency	405 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
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAD	2020-07-01	12 mo
Cable	ESM Cable Corp.	30-1GHz cables	OCW	2020-05-01	12 mo
Antenna - Biconilog	EMCO	3142	AXB	2020-04-15	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2020-01-04	12 mo

TEST DESCRIPTION

Per 95.2567(a)(2), the maximum radiated field strength for a MICS transmitter is 25uW EIRP. The Field Strength of the Fundamental data was converted to EIRP with the formula based upon the Friis transmission equation with 6 dB removed due to reflections from the ground plane: $EIRP = ((E/2)^2 * d)^{2/30}$ where E is V/m and d = distance = 3m, and EIRP = W (Reference 95.2569(a)).

The Field Strength of the Fundamental was measured in the far-field at an FCC Listed Semi-anechoic Chamber. Spectrum analyzer and linearly polarized antennas were used to measure the radiated field strength of the fundamental.

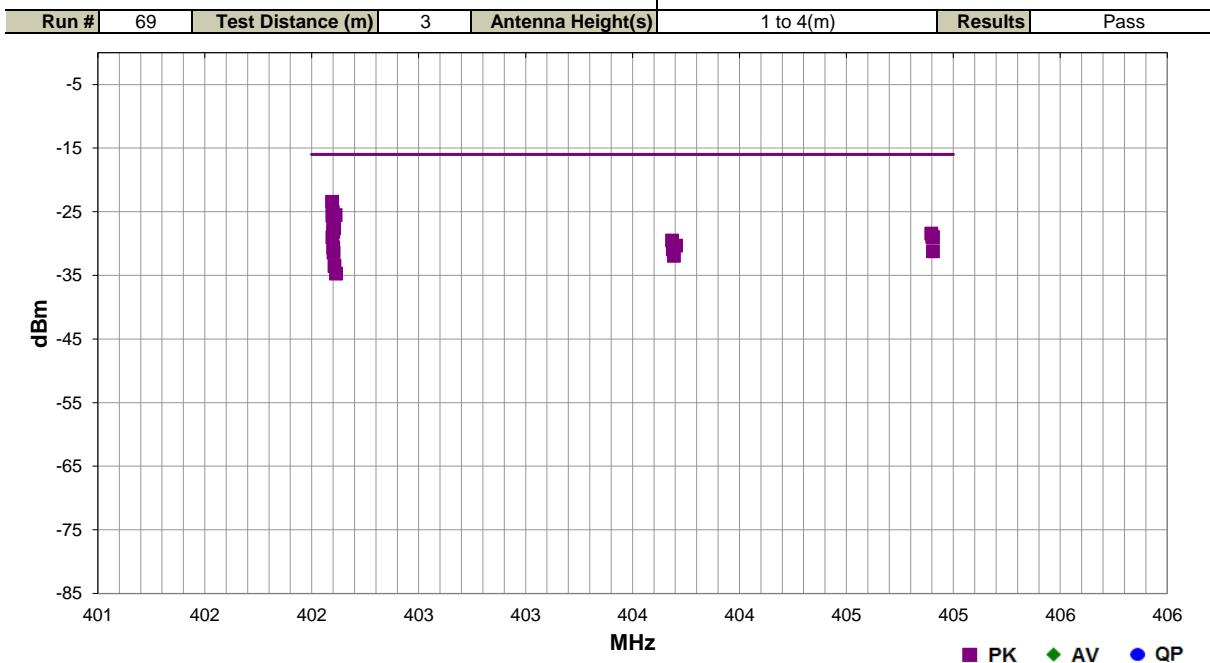
The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions. The turntable azimuth was varied to maximize the level of radiated emissions. The height of the measurement antenna was also varied from 1 to 4 meters. The amplitude and frequency of the emissions were noted.

The EUT was configured to transmit in a fixture that simulates the human torso. The dimensions of the test fixture and the characteristics of the tissue substitute material met the requirements 95.2569(c) and FCC KDB 617965. The height of the transmitter was 1.5-meter above the reference ground plane.

RADIATED POWER (EIRP)



Work Order:	CAAL0013	Date:	2020-10-14	EmiR5 2020.06.24.4	PSA-ESCI 2020.06.24.2
Project:	None	Temperature:	23.1 °C		
Job Site:	OC07	Humidity:	44% RH		
Serial Number:	000012	Barometric Pres.:	1018 mbar	Tested by:	Mark Baytan
EUT:	CTE with CHIRP System (Base Station)				
Configuration:	6				
Customer:	Canary Medical				
Attendees:	None				
EUT Power:	USB Powered				
Operating Mode:	Transmitting MICS radio: Low Channel 0: 402.15 MHz, Mid Channel 5: 403.65 MHz, High Channel 9: 404.85 MHz				
Deviations:	None				
Comments:	Home Base Station (Black Unit)				
Test Specifications		Test Method			
FCC 95i:2020		ANSI C63.26:2015			



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
402.095	0.99	108.0	Horz	PK	4.5E-6	-23.4	-16.0	-7.4	Low Ch 0, Ant 1, EUT Horz	
402.098	1.0	207.0	Horz	PK	3.1E-6	-25.0	-16.0	-9.0	Low Ch 0, Ant 3, EUT Horz	
402.112	1.19	226.0	Vert	PK	2.8E-6	-25.5	-16.0	-9.5	Low Ch 0, Ant 3, EUT Vert	
402.097	1.32	228.0	Vert	PK	2.7E-6	-25.6	-16.0	-9.6	Low Ch 0, Ant 1, EUT Vert	
402.100	1.0	107.0	Horz	PK	1.9E-6	-27.2	-16.0	-11.2	Low Ch 0, Ant 3, EUT Vert	
402.105	1.0	109.0	Horz	PK	1.7E-6	-27.6	-16.0	-11.6	Low Ch 0, Ant 3, EUT on Side	
402.100	1.0	109.0	Horz	PK	1.5E-6	-28.1	-16.0	-12.1	Low Ch 0, Ant 1, EUT on Side	
404.897	1.0	206.0	Horz	PK	1.4E-6	-28.4	-16.0	-12.4	High Ch 9, Ant 3, EUT Horz	
404.902	1.0	215.0	Horz	PK	1.3E-6	-28.9	-16.0	-12.9	High Ch 9, Ant 1, EUT Horz	
402.097	1.52	205.0	Vert	PK	1.3E-6	-29.0	-16.0	-13.0	Low Ch 0, Ant 1, EUT on Side	
404.905	1.22	210.0	Vert	PK	1.3E-6	-29.0	-16.0	-13.0	High Ch 9, Ant 3, EUT Vert	
403.685	1.0	195.0	Horz	PK	1.1E-6	-29.5	-16.0	-13.5	Mid Ch 5, Ant 1, EUT Horz	
403.703	1.0	203.0	Horz	PK	927.1E-9	-30.3	-16.0	-14.3	Mid Ch 5, Ant 3, EUT Horz	
402.100	1.0	84.0	Horz	PK	865.2E-9	-30.6	-16.0	-14.6	Low Ch 0, Ant 1, EUT Horz	
403.688	1.38	220.0	Vert	PK	807.5E-9	-30.9	-16.0	-14.9	Mid Ch 5, Ant 1, EUT Vert	
404.905	1.0	233.0	Vert	PK	753.6E-9	-31.2	-16.0	-15.2	High Ch 9, Ant 1, EUT Vert	
402.102	1.29	139.0	Vert	PK	719.6E-9	-31.4	-16.0	-15.4	Low Ch 0, Ant 3, EUT Horz	
403.693	1.27	204.0	Vert	PK	641.4E-9	-31.9	-16.0	-15.9	Mid Ch 9, Ant 3, EUT Vert	
402.107	1.0	123.0	Vert	PK	443.7E-9	-33.5	-16.0	-17.5	Low Ch 0, Ant 3, EUT on Side	
402.113	1.14	154.0	Vert	PK	336.6E-9	-34.7	-16.0	-18.7	Low Ch 0, Ant 1, EUT Vert	

EMISSION BANDWIDTH



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
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAZ	16-Dec-19	16-Dec-20

TEST DESCRIPTION

Per 47 CFR 95.2573(a), the emission bandwidth was determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. A spectrum analyzer using a peak detector with no video filtering was used with a resolution bandwidth equal to approximately 1.0 percent of the emission bandwidth of the EUT.

EMISSION BANDWIDTH



element

TbTx 2019.08.30.0

XMI 2020.03.25.0

EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013
Serial Number:	000024	Date:	28-Sep-20
Customer:	Canary Medical	Temperature:	26.2 °C
Attendees:	None	Humidity:	48.1% RH
Project:	None	Barometric Pres.:	1014 mbar
Tested by:	Nolan De Ramos	Power:	110VAC/60Hz
TEST SPECIFICATIONS		Test Method:	ANSI C63.26:2015
FCC 95i:2020			
COMMENTS			
Reference level offset: RF Cable + DC Block + 20 dB Attenuator = 22.75 dB. Emission Bandwidth measured on Antenna Port 1 based on worst case of EIRP.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature	
		Value	Limit
		245.673 kHz	(S) 300 kHz
		Result	
		Pass	

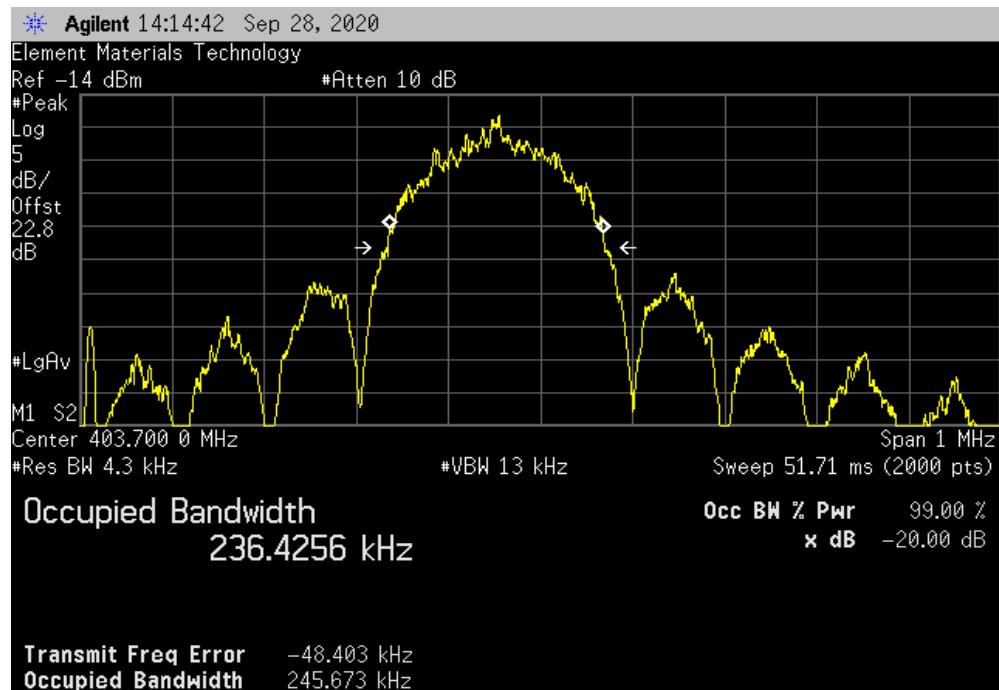
Mid Channel, 403.7 MHz

EMISSION BANDWIDTH



TbtTx 2019.08.30.0 XMit 2020.03.25.0

Mid Channel, 403.7 MHz			Value	Limit (≤)	Result
			245.673 kHz	300 kHz	Pass



SPURIOUS RADIATED EMISSIONS

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 MICS radio: Low Channel 0: 402.2 MHz, Mid Channel 5: 403.7 MHz, High Channel 9: 404.9 MHz. Single Data rate

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

CAAL0013 - 6

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	5000 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
Cable	ESM Cable Corp.	1-8GHz cables	OCX	2020-03-02	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVJ	2020-03-02	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIR	2020-07-07	24 mo
Amplifier - Pre-Amplifier	Mited	AM-1616-1000	PAD	2020-07-01	12 mo
Cable	ESM Cable Corp.	30-1GHz cables	OCW	2020-05-01	12 mo
Antenna - Biconilog	EMCO	3142	AXB	2020-04-15	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2020-01-04	12 mo

TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.26). A preamp was used for this test in order to provide sufficient measurement sensitivity.

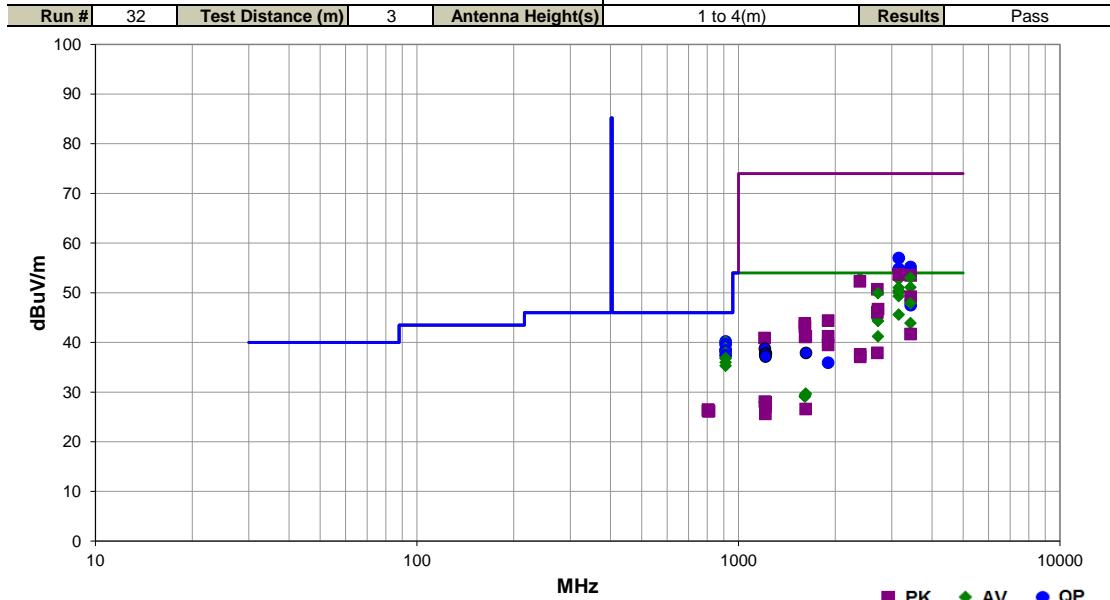
Per CFR 47 95.2579(a), field strength measurements were performed and compared to the specified limits.

SPURIOUS RADIATED EMISSIONS



Work Order:	CAAL0013	Date:	2020-09-25	EmIR5 2020.04.20.0	PSA-ESCI 2020.04.03.0
Project:	None	Temperature:	23 °C		
Job Site:	OC07	Humidity:	47% RH		
Serial Number:	000012	Barometric Pres.:	1015 mbar		
EUT:	CHIRP Base Station	Tested by:	Nolan De Ramos		
Configuration:	6				
Customer:	Canary Medical				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting MICS radio: Low Channel 0: 402.2 MHz, Mid Channel 5: 403.7 MHz, High Channel 9: 404.9 MHz. Single Data rate				
Deviations:	None				
Comments:	Highest emission found at 911.9 MHz when transmitting High Ch 404.9 MHz. Maximized 911.9 MHz on all 3 orientations and found worst case orientation per polarity: EUT Horz with Antenna Horz and EUT Vert with Antenna Vert. Measured 2nd, 3rd, and 4th harmonics of low, mid, and high chs using the worst case polarity and EUT orientation. Measured other emissions within 10 dB of the limit.				

Test Specifications	Test Method
FCC 951:2020	ANSI C63.26:2015



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
3152.607	52.9	-0.2	1.1	105.0	3.0	0.0	Vert	AV	0.0	52.7	54.0	-1.3	Antenna 1, Low Ch, 402.2 MHz, EUT Vert
3428.462	50.0	1.1	1.2	280.0	3.0	0.0	Vert	AV	0.0	51.1	54.0	-2.9	Antenna 1, Mid Ch, 403.7 MHz, EUT Vert
3152.553	50.6	-0.2	1.1	106.0	3.0	0.0	Vert	AV	0.0	50.4	54.0	-3.6	Antenna 1, High Ch, 404.9 MHz, EUT Vert
3152.592	50.5	-0.2	3.8	319.0	3.0	0.0	Horz	AV	0.0	50.3	54.0	-3.7	Antenna 1, Mid Ch, 403.7 MHz, EUT Horz
3152.518	50.2	-0.2	1.1	107.0	3.0	0.0	Vert	AV	0.0	50.0	54.0	-4.0	Antenna 1, Mid Ch, 403.7 MHz, EUT Vert
3152.548	49.5	-0.2	3.9	322.0	3.0	0.0	Horz	AV	0.0	49.3	54.0	-4.7	Antenna 1, Low Ch, 402.2 MHz, EUT Horz
3428.478	47.3	1.1	1.4	107.0	3.0	0.0	Vert	AV	0.0	48.4	54.0	-5.6	Antenna 1, Low Ch, 402.2 MHz, EUT Vert
912.009	27.2	13.0	1.0	221.0	3.0	0.0	Horz	QP	0.0	40.2	46.0	-5.8	Antenna 1, High Ch, 404.9 MHz, EUT Horz
912.008	27.1	13.0	1.0	0.0	3.0	0.0	Horz	QP	0.0	40.1	46.0	-5.9	High Ch 9, Ant 2, EUT Horz
912.010	26.6	13.0	1.21	314.0	3.0	0.0	Vert	QP	0.0	39.6	46.0	-6.4	High Ch 9, Ant 2, EUT Vert
3433.673	46.4	1.1	1.9	322.0	3.0	0.0	Vert	AV	0.0	47.5	54.0	-6.5	Antenna 1, High Ch, 404.9 MHz, EUT Vert
912.011	25.8	13.0	1.0	165.0	3.0	0.0	Horz	QP	0.0	38.8	46.0	-7.2	Antenna 1, High Ch, 404.9 MHz, EUT On Side
912.008	25.4	13.0	1.0	170.0	3.0	0.0	Horz	QP	0.0	38.4	46.0	-7.6	High Ch 9, Ant 2, EUT on Side
912.010	25.3	13.0	1.0	309.0	3.0	0.0	Horz	QP	0.0	38.3	46.0	-7.7	High Ch 9, Ant 2, EUT Vert
912.009	24.9	13.0	1.2	94.0	3.0	0.0	Vert	QP	0.0	37.9	46.0	-8.1	Antenna 1, High Ch, 404.9 MHz, EUT Vert
3152.595	45.8	-0.2	1.1	55.0	3.0	0.0	Horz	AV	0.0	45.6	54.0	-8.4	Antenna 1, High Ch, 404.9 MHz, EUT Horz
912.009	24.4	13.0	1.0	121.0	3.0	0.0	Horz	QP	0.0	37.4	46.0	-8.6	Antenna 1, High Ch, 404.9 MHz, EUT Vert
912.011	23.8	13.0	1.2	46.0	3.0	0.0	Vert	QP	0.0	36.8	46.0	-9.2	Antenna 1, High Ch, 404.9 MHz, EUT On Side
912.010	23.8	13.0	1.12	56.0	3.0	0.0	Vert	QP	0.0	36.8	46.0	-9.2	High Ch 9, Ant 2, EUT on Side
2702.790	47.5	-2.7	2.0	10.0	3.0	0.0	Vert	AV	0.0	44.8	54.0	-9.2	Antenna 1, Mid Ch, 403.7 MHz, EUT Vert
2718.800	47.0	-2.7	1.0	318.0	3.0	0.0	Vert	AV	0.0	44.3	54.0	-9.7	Antenna 1, High Ch, 404.9 MHz, EUT Vert
912.009	23.0	13.0	1.0	302.0	3.0	0.0	Vert	QP	0.0	36.0	46.0	-10.0	Antenna 1, High Ch, 404.9 MHz, EUT Horz
3428.442	42.8	1.1	3.4	207.0	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	Antenna 1, Mid Ch, 403.7 MHz, EUT Horz

FREQUENCY STABILITY



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
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Thermometer	Omega Engineering, Inc.	HH311	DUC	9-Nov-20	9-Nov-23
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPHS-32-3.5-SCT/AC	TBE	4-Feb-20	4-Feb-21
Power Supply - DC	Hewlett Packard	6574A	TPX	NCR	NCR
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAy	16-Dec-19	16-Dec-20

TEST DESCRIPTION

The spectrum analyzer is configured with a precision frequency reference that exceeds the stability requirement of the transmitter. The EUT was placed inside a temperature / humidity chamber. Marker Delta method was used calculate the center frequency of the EUT.

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of the nominal voltage.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (+55°, 50°, 40°, 30°, 20°, 10°, 0° C).

FREQUENCY STABILITY



TbTx 2019.08.30.0 XMII 2020.03.25.0

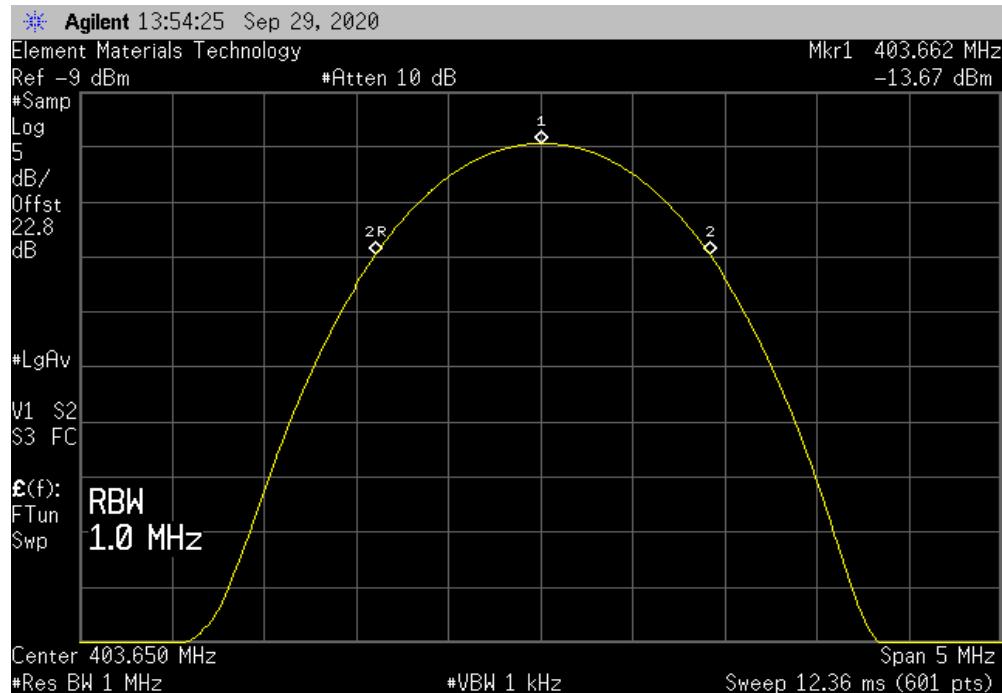
EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013			
Serial Number:	000024	Date:	28-Sep-20			
Customer:	Canary Medical	Temperature:	26.2 °C			
Attendees:	None	Humidity:	48.1% RH			
Project:	None	Barometric Pres.:	1014 mbar			
Tested by:	Nolan De Ramos	Power:	USB via 110VAC/60Hz			
TEST SPECIFICATIONS		Test Method	ANSI C63.26:2015			
FCC 95i:2020						
COMMENTS	Reference level offset includes RF Cable + DC Block + 20 dB Attenuator. Frequency stability was measured on Antenna Port 1 based on worst case of EIRP.					
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	2	Signature				
Normal Voltage	Mid Channel, 403.65 MHz	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
Extreme Voltage +15%	Mid Channel, 403.65 MHz	403.662	403.65	29.7	100	Pass
Extreme Voltage -15%	Mid Channel, 403.65 MHz	403.663	403.65	32.2	100	Pass
Extreme Temperature +55°C	Mid Channel, 403.65 MHz	403.662	403.65	29.7	100	Pass
Extreme Temperature +50°C	Mid Channel, 403.65 MHz	403.671	403.65	52	100	Pass
Extreme Temperature +40°C	Mid Channel, 403.65 MHz	403.67	403.65	49.6	100	Pass
Extreme Temperature +30°C	Mid Channel, 403.65 MHz	403.667	403.65	42.1	100	Pass
Extreme Temperature +20°C	Mid Channel, 403.65 MHz	403.663	403.65	32.2	100	Pass
Extreme Temperature +10°C	Mid Channel, 403.65 MHz	403.662	403.65	29.7	100	Pass
Extreme Temperature 0°C	Mid Channel, 403.65 MHz	403.659	403.65	22.3	100	Pass
	Mid Channel, 403.65 MHz	403.654	403.65	9.9	100	Pass

FREQUENCY STABILITY

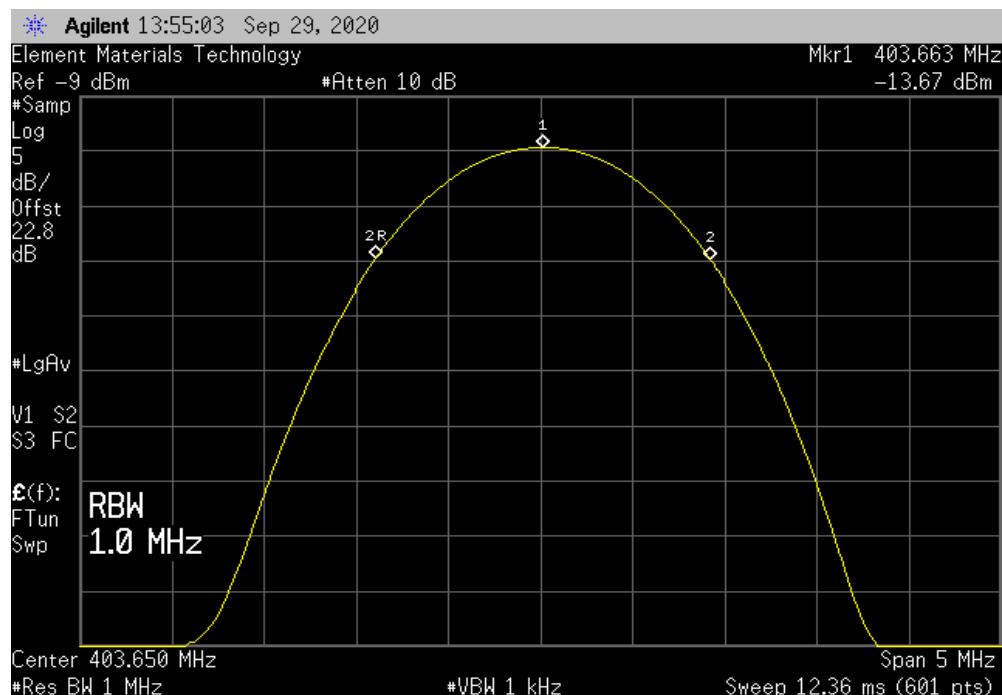


TbITx 2019.08.30.0 XMit 2020.03.25.0

Normal Voltage, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.662	403.65	29.7	100	Pass	



Extreme Voltage +15%, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.663	403.65	32.2	100	Pass	

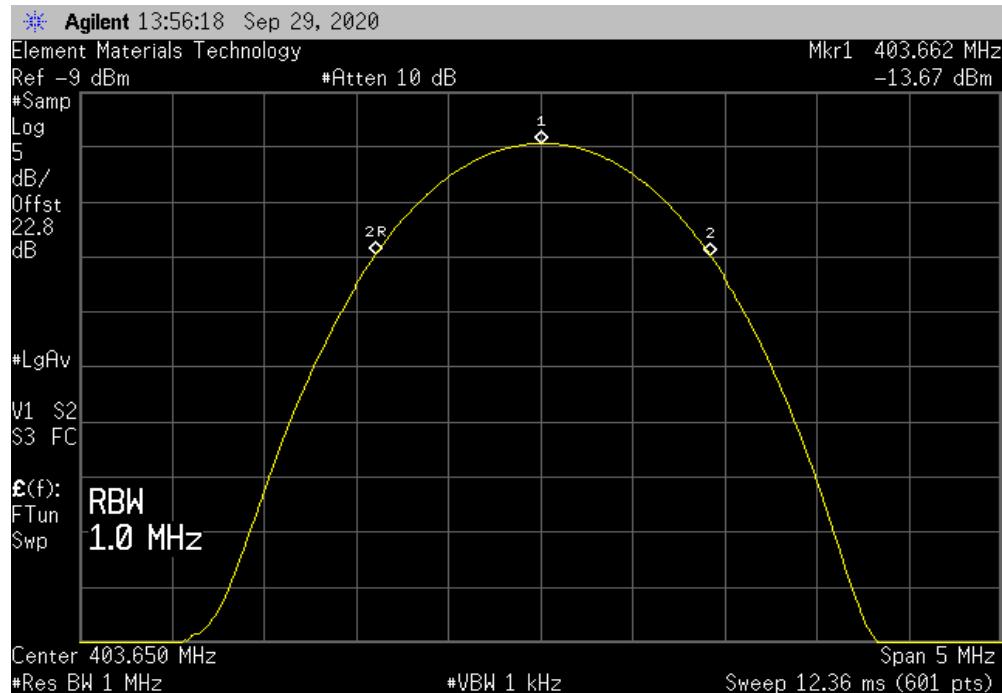


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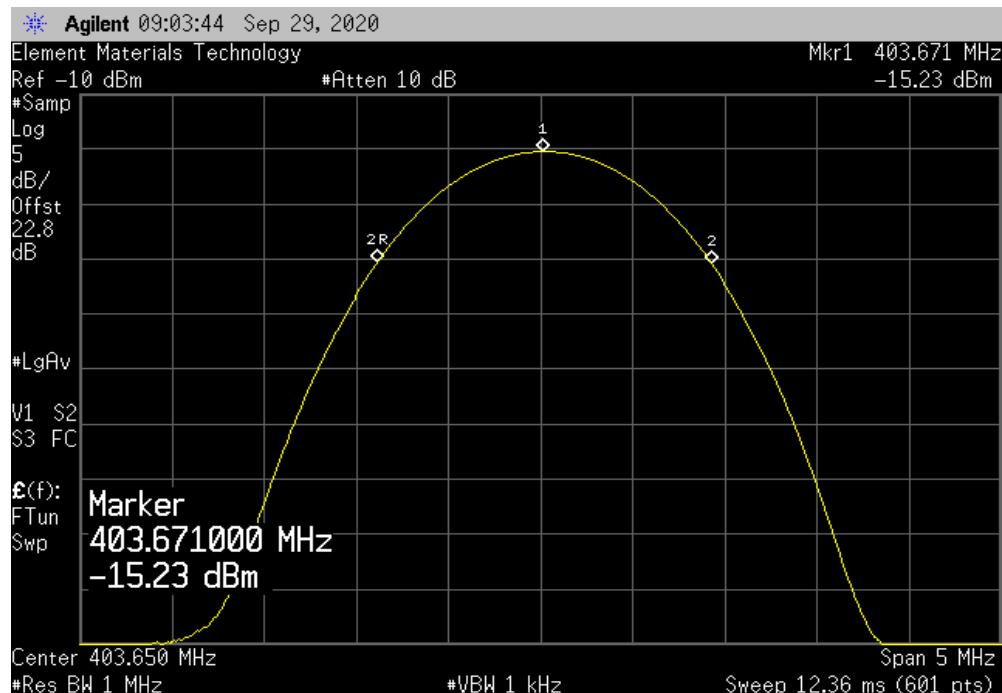


TbtTx 2019.08.30.0 XMit 2020.03.25.0

Extreme Voltage -15%, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.662	403.65	29.7	100	Pass	



Extreme Temperature +55°C, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.671	403.65	52	100	Pass	

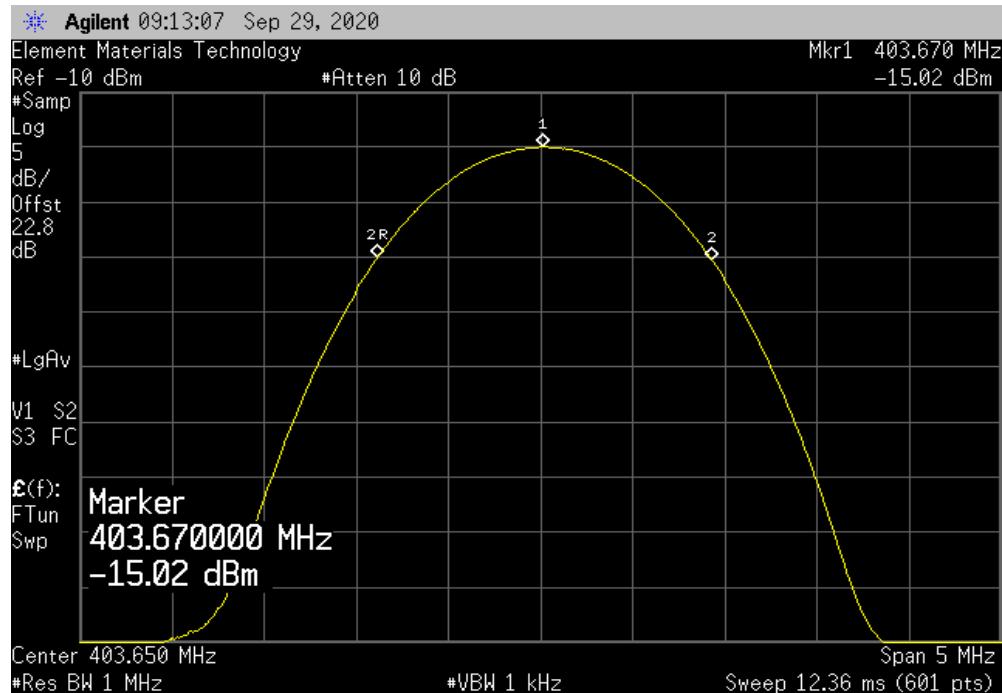


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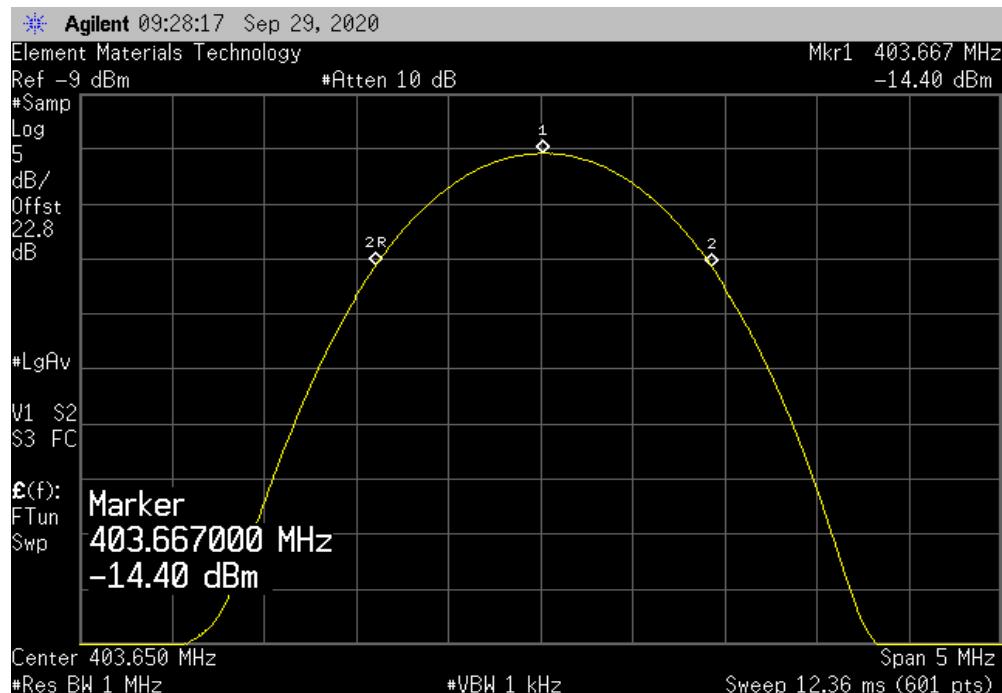


TbITx 2019.08.30.0 XMit 2020.03.25.0

Extreme Temperature +50°C, Mid Channel, 403.65 MHz					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	403.67	403.65	49.6	100	Pass



Extreme Temperature +40°C, Mid Channel, 403.65 MHz					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	403.667	403.65	42.1	100	Pass

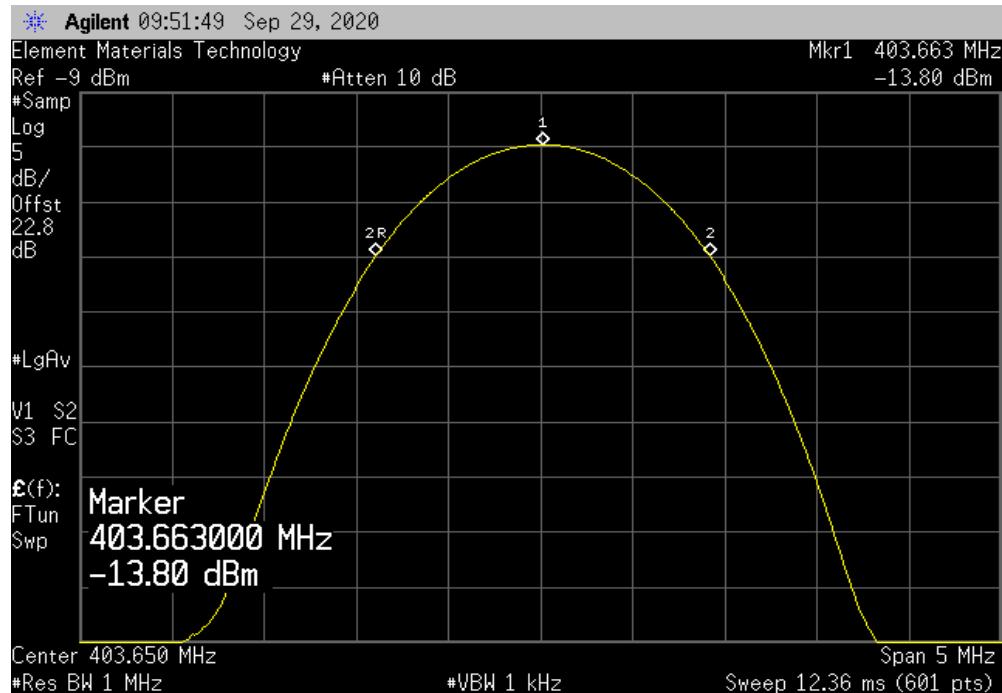


FREQUENCY STABILITY

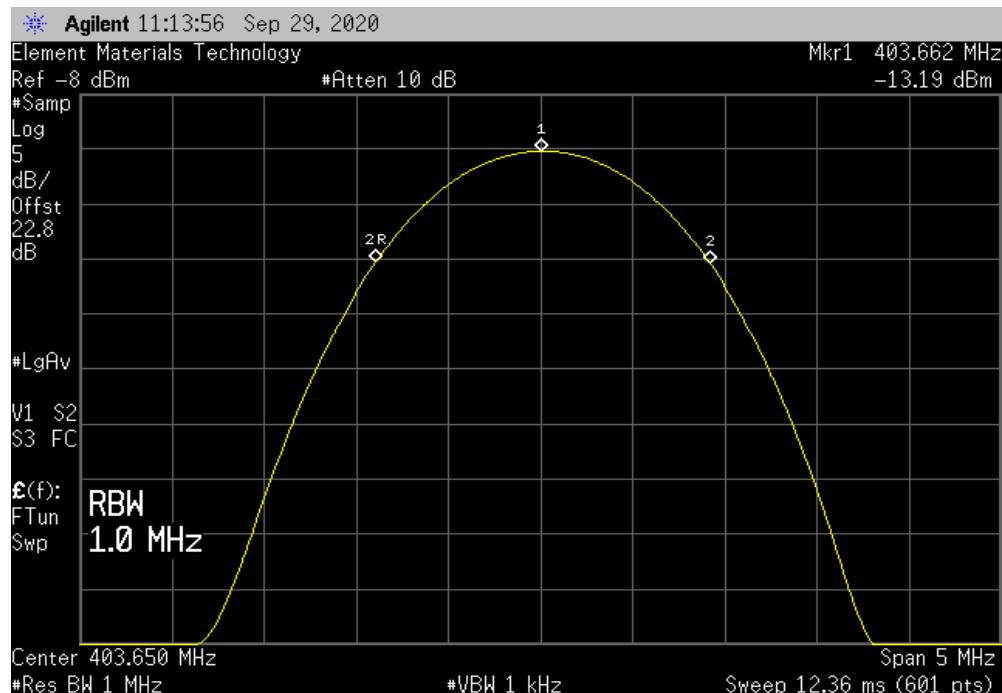


TbITx 2019.08.30.0 XMit 2020.03.25.0

Extreme Temperature +30°C, Mid Channel, 403.65 MHz					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	403.663	403.65	32.2	100	Pass



Extreme Temperature +20°C, Mid Channel, 403.65 MHz					
	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
	403.662	403.65	29.7	100	Pass

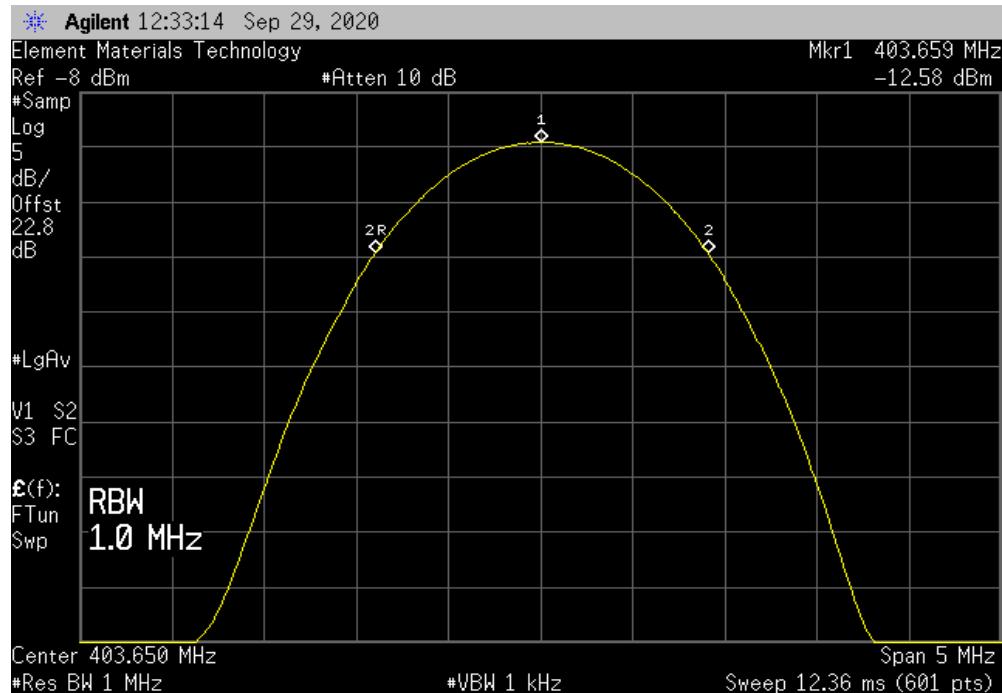


FREQUENCY STABILITY

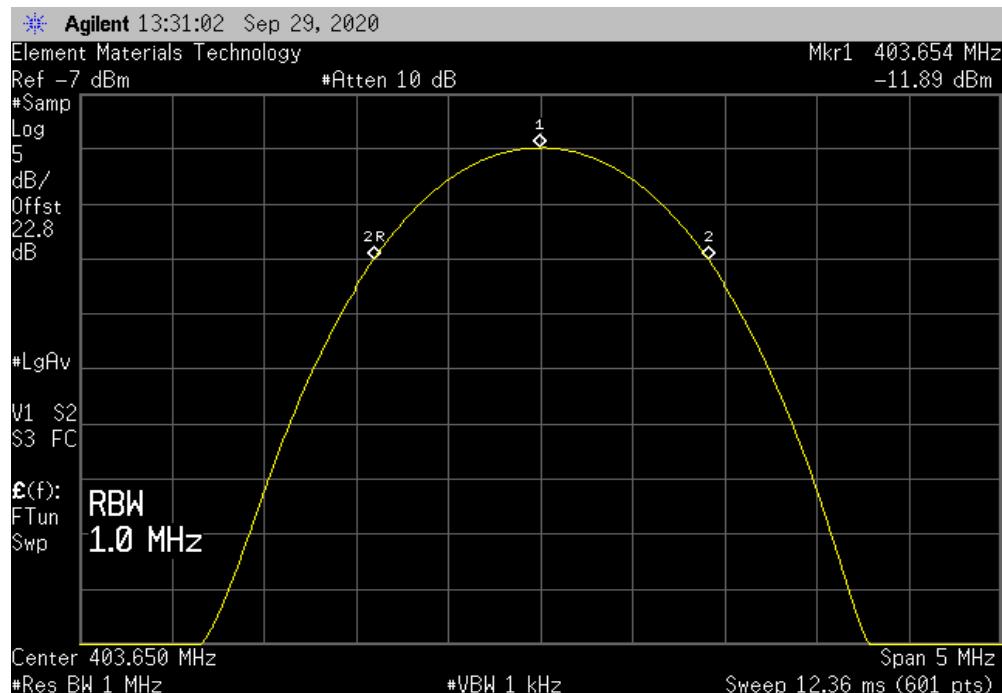


TbtTx 2019.08.30.0 XMit 2020.03.25.0

Extreme Temperature +10°C, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.659	403.65	22.3	100	Pass	



Extreme Temperature 0°C, Mid Channel, 403.65 MHz					
Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results	
403.654	403.65	9.9	100	Pass	



SPURIOUS CONDUCTED EMISSIONS



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
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

Per FCC Part 2.1051, the spurious emissions shall be measured at the RF terminal. The peak spurious emissions were measured with the EUT configured to the modes listed in the datasheet. The EUT was transmitting at its maximum data rate.

FCC Part 95 have no conducted spurious emissions limit. It is a requirement to characterize this information and that data is contained within this datasheet.

SPURIOUS CONDUCTED EMISSIONS



TbTx 2019.08.30.0 XMII 2020.03.25.0

EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013				
Serial Number:	000024	Date:	28-Sep-20				
Customer:	Canary Medical	Temperature:	26.2 °C				
Attendees:	None	Humidity:	48.1% RH				
Project:	None	Barometric Pres.:	1014 mbar				
Tested by:	Nolan De Ramos	Power:	110VAC/60Hz				
TEST SPECIFICATIONS		Test Method					
FCC 95i:2020		ANSI C63.26:2015					
COMMENTS							
Reference level offset: RF Cable + DC Block + 20 dB Attenuator = 22.75 dB							
DEVIATIONS FROM TEST STANDARD							
None							
Configuration #	2	Signature					
		Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result
ANT 1							
Mid Channel, 403.65 MHz							
9 kHz - 150 kHz 0.01 N/A -32.25 N/A N/A							
150 kHz - 30 MHz 0.27 N/A -54.94 N/A N/A							
30 MHz - 5 GHz 403.8 -2.15 N/A N/A N/A N/A							
ANT 3							
Mid Channel, 403.65 MHz							
9 kHz - 150 kHz 0.01 N/A -28.71 N/A N/A							
150 kHz - 30 MHz 3.51 N/A -51.5 N/A N/A							
30 MHz - 5 GHz 403.8 -2.49 N/A N/A N/A N/A							

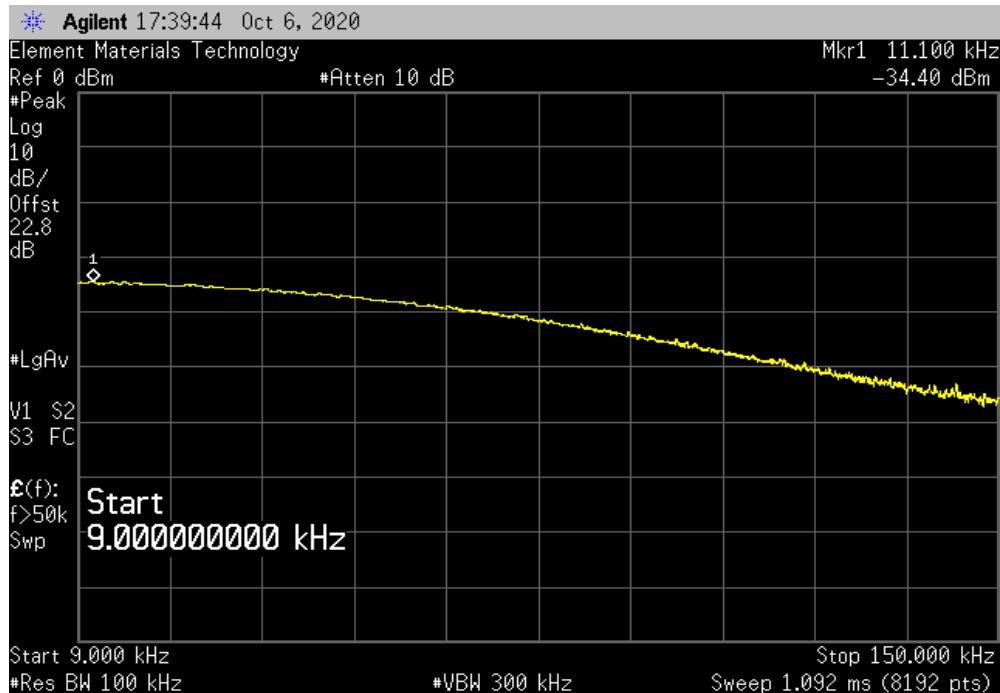
SPURIOUS CONDUCTED EMISSIONS



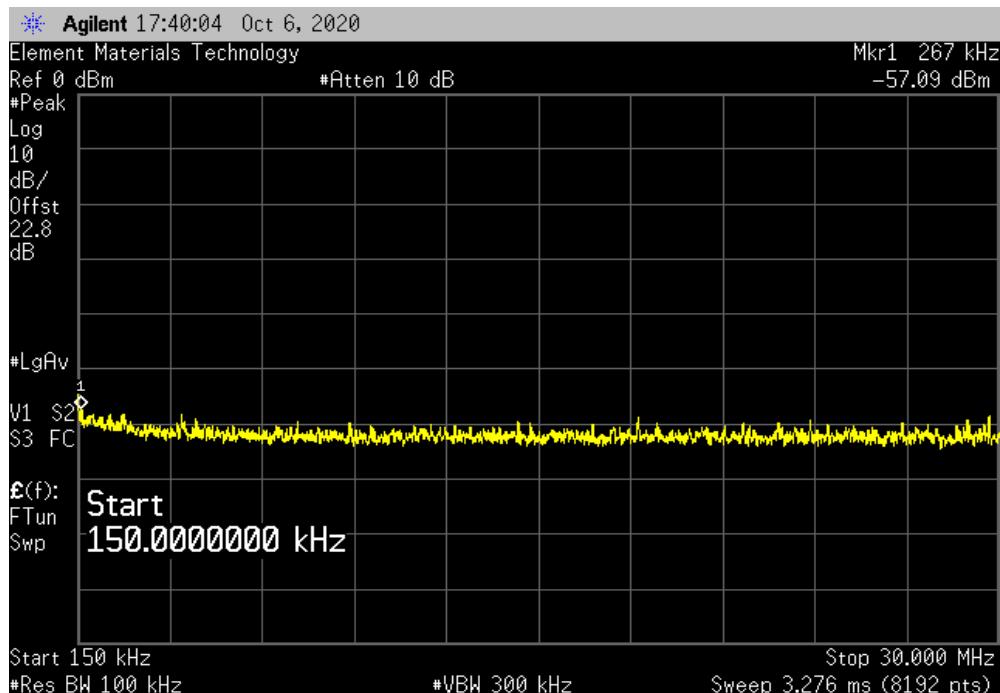
TbtTx 2019.08.30.0

XMit 2020.03.25.0

ANT 1, Mid Channel, 403.65 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result
9 kHz - 150 kHz	0.01	N/A	-32.25	N/A	N/A



ANT 1, Mid Channel, 403.65 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result
150 kHz - 30 MHz	0.27	N/A	-54.94	N/A	N/A



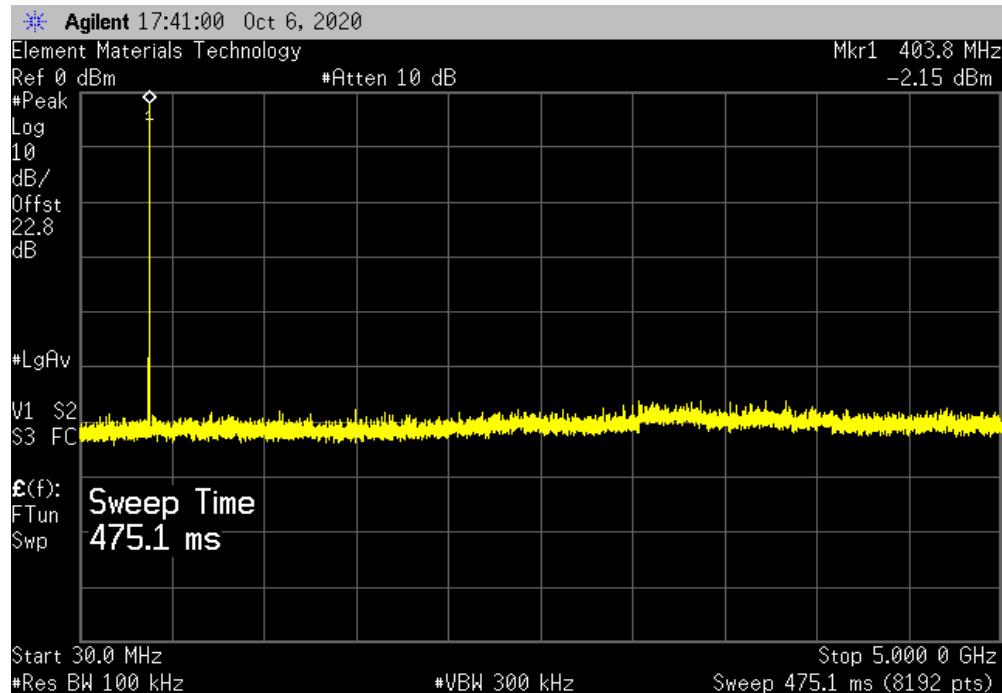
SPURIOUS CONDUCTED EMISSIONS



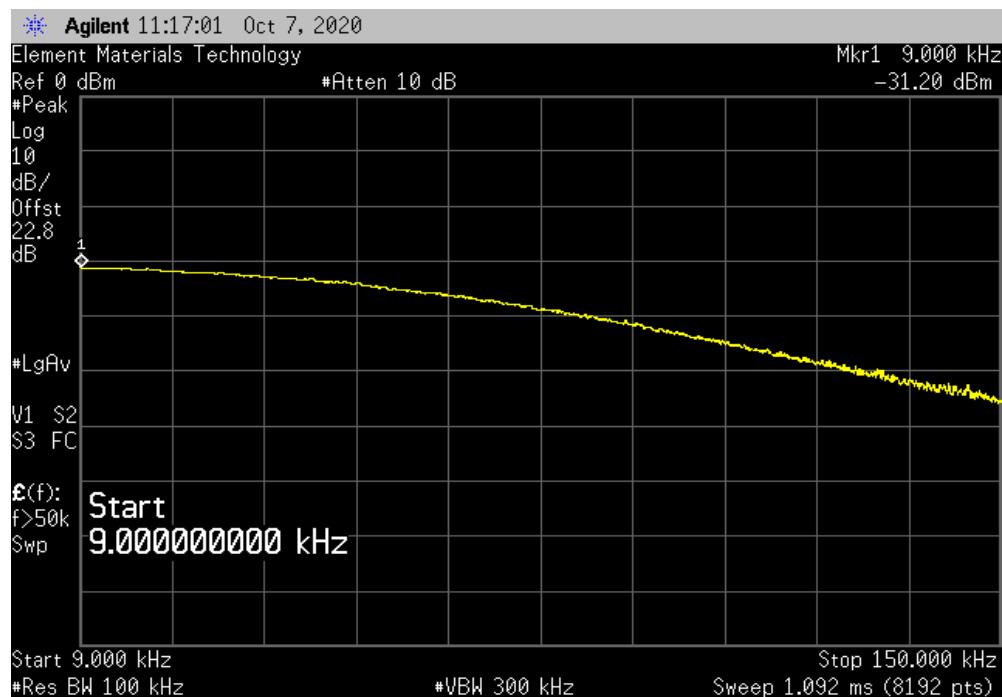
TbtTx 2019.08.30.0

XMit 2020.03.25.0

ANT 1, Mid Channel, 403.65 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result
30 MHz - 5 GHz	403.8	-2.15	N/A	N/A	N/A



ANT 3, Mid Channel, 403.65 MHz					
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result
9 kHz - 150 kHz	0.01	N/A	-28.71	N/A	N/A

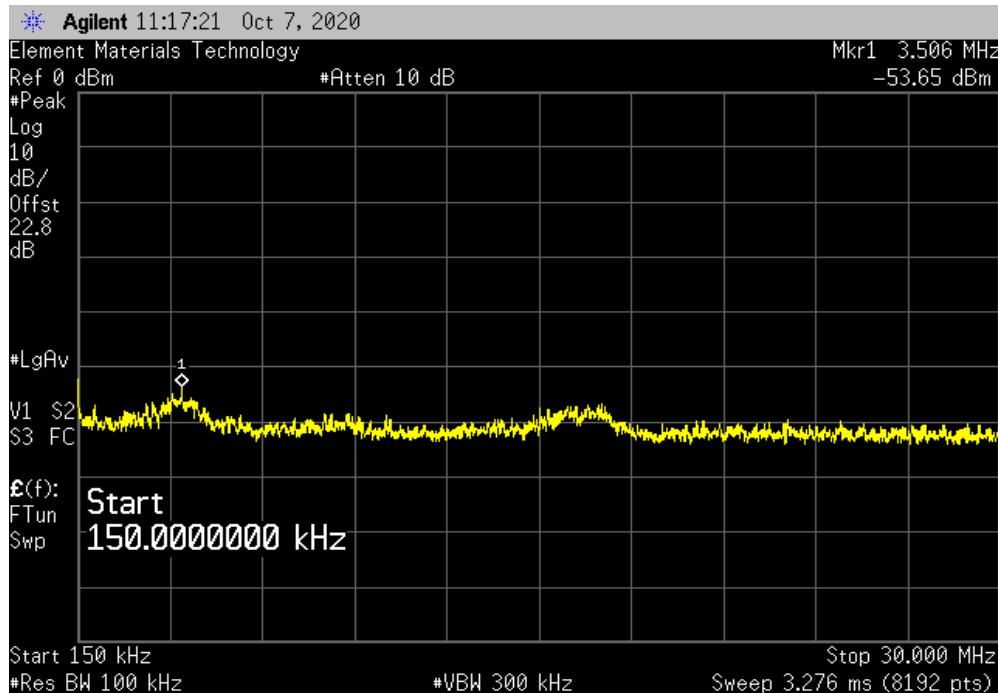


SPURIOUS CONDUCTED EMISSIONS

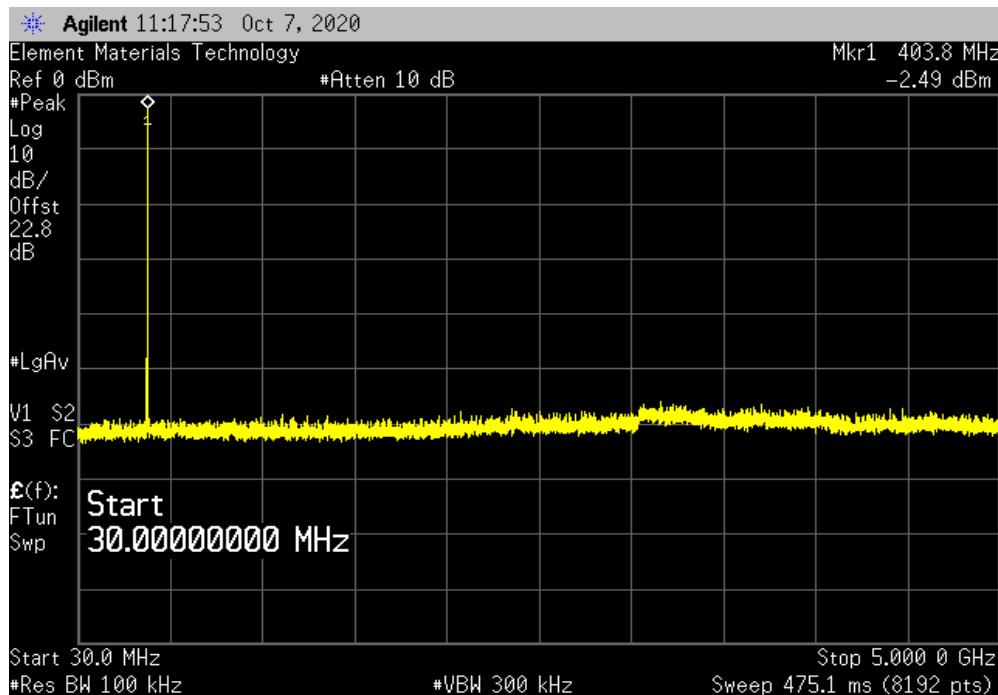


TbITx 2019.08.30.0 XMII 2020.03.25.0

ANT 3, Mid Channel, 403.65 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result	
150 kHz - 30 MHz	3.51	N/A	-51.5	N/A	N/A	



ANT 3, Mid Channel, 403.65 MHz						
Frequency Range	Measured Freq (MHz)	Max Value (dBm)	Value (dBc)	Limit A (dBc)	Result	
30 MHz - 5 GHz	403.8	-2.49	N/A	N/A	N/A	



EMISSION MASK



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
Attenuator	Fairview Microwave	SA18H-20	TKR	16-Dec-19	16-Dec-20
Block - DC	Fairview Microwave	SD3379	AMV	16-Dec-19	16-Dec-20
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	16-Dec-19	16-Dec-20

TEST DESCRIPTION

Per 47 CFR 95.2579(a)(1) the emission mask was measured. Emissions more than 150 kHz away from the center frequency must be attenuated below the transmitter output power by at least 20 dB. This was evaluated by the Occupied Bandwidth measurement according to 47 CFR 95.2573(a). In addition, emissions 250 kHz or less above and below the MICS band (402-405 MHz) must be attenuated below the maximum permitted output power by at least 20 dB.

A spectrum analyzer was used to measure the emission mask. A spectrum analyzer using a peak detector with no video filtering was used with a resolution bandwidth equal to approximately 1.0 percent of the emission bandwidth of the EUT. However, various plots were made using different frequency spans and resolution bandwidths in an attempt to not only satisfy the measurement criteria, but to also show that all emissions outside of the occupied band are greatly attenuated.

EMISSION MASK



TbTx 2019.08.30.0 XMII 2020.03.25.0

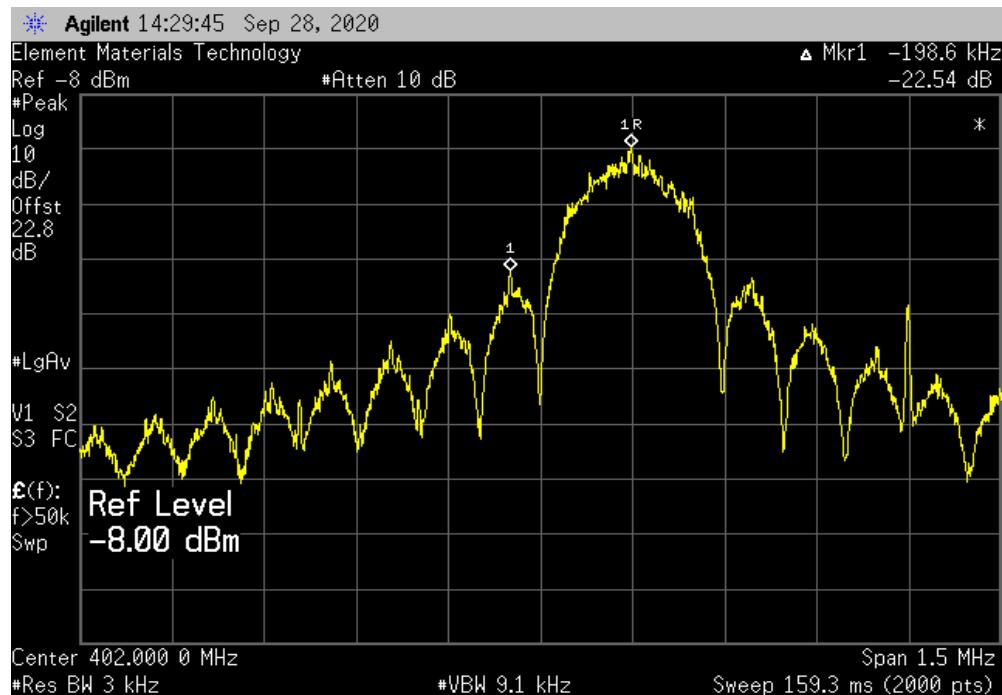
EUT:	CTE with CHIRP System (Base Station)	Work Order:	CAAL0013	
Serial Number:	000024	Date:	28-Sep-20	
Customer:	Canary Medical	Temperature:	26.2 °C	
Attendees:	None	Humidity:	48.1% RH	
Project:	None	Barometric Pres.:	1014 mbar	
Tested by:	Nolan De Ramos	Power:	110VAC/60Hz	
TEST SPECIFICATIONS		Test Method		
FCC 95i:2020		ANSI C63.26:2015		
COMMENTS				
Reference level offset: RF Cable + DC Block + 20 dB Attenuator = 22.75 dB. Emission Mask was measured on Antenna Port 1 based on worst case of EIRP.				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	2	Signature		
		Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 402.2 MHz		-22.54	-20	Pass
High Channel, 404.9 MHz		-25.3	-20	Pass

EMISSION MASK



TbtTx 2019.08.30.0 XMit 2020.03.25.0

Low Channel, 402.2 MHz		
	Value (dBc)	Limit ≤ (dBc)
	-22.54	-20



High Channel, 404.9 MHz		
	Value (dBc)	Limit ≤ (dBc)
	-25.3	-20

