



element

Crystal Engineering

XP3i

Bluetooth Low Energy Radio

FCC 15.247:2024

FCC 15.207:2024

RSS-247 Issue 3:2023

RSS-Gen Issue 5:2018+A1:2019+A2:2021

Report: CREN0003.1 Rev. 1, Issue Date: February 27, 2024

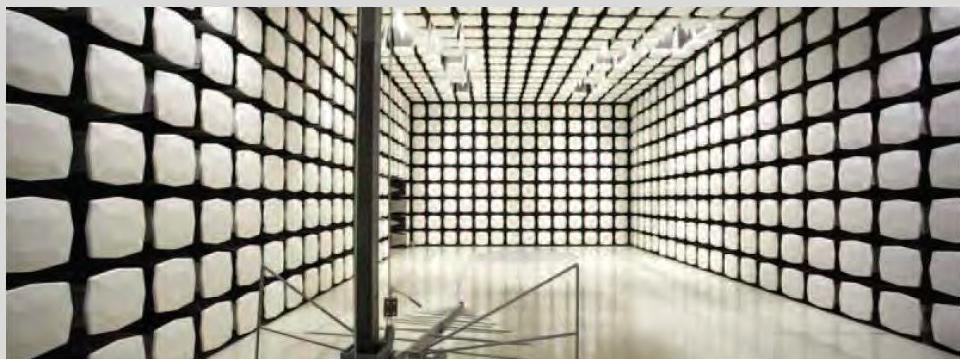


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CERTIFICATE OF TEST



Last Date of Test: February 23, 2024
Crystal Engineering
EUT: XP3i

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2024	ANSI C63.10:2013
FCC 15.207:2024	
RSS-247 Issue 3:2023	
RSS-Gen Issue 5:2018+A1:2019+A2:2021	

Guidance

FCC KDB 558074 v05r02:2019
Notice 2021 - CEB0001

Results

Test Description	Result	FCC Section(s)	RSS Section(s)	ANSI C63.10 Section(s)	Comments
Powerline Conducted Emissions	Pass	15.207	RSS-Gen 8.8	6.2	
Duty Cycle	Pass	KDB 558074 -6.0	RSS-Gen 3.2	11.6	
DTS Bandwidth (6 dB)	Pass	15.247(a)(2), 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	
Output Power	Pass	15.247(b)(3), KDB 558074 -8.3.1	RSS-247 5.4(d, f), RSS-Gen 6.12	11.9.1.1	
Equivalent Isotropic Radiated Power	Pass	15.247(b)(3), KDB 558074 -8.3.1	RSS-247 5.4(d, f), RSS-Gen 6.12	11.9.1.1	
Power Spectral Density	Pass	15.247(e), KDB 558074 -8.4	RSS-247 5.2(b)	11.10.2	
Band Edge Compliance	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Spurious Conducted Emissions	Pass	15.247(d), KDB 558074 -8.5	RSS-247 5.5	11.11	
Spurious Radiated Emissions	Pass	15.247(d), KDB 558074 - 8.6, 8.7	RSS-247 5.5, RSS-Gen 6.13, 8.10	11.12.1, 11.13.2, 6.5, 6.6	

Deviations From Test Standards

None

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



Approved By:



Johnny Candelas, Operations Manager

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REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Added 1 Mbps and 2 Mbps data rates.	2024-02-26	Throughout

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

Testing was performed at the following location(s)

Location	Labs ⁽¹⁾	Address	A2LA ⁽²⁾	ISED ⁽³⁾	BSMI ⁽⁴⁾	VCCI ⁽⁵⁾	CAB ⁽⁶⁾	FDA ⁽⁷⁾
<input checked="" type="checkbox"/> California	OC01-17	41 Tesla Irvine, CA 92618 (949) 861-8918	3310.04	2834B	SL2-IN-E-1154R	A-0029	US0158	TL-55
<input type="checkbox"/> Minnesota	MN01-11	9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	3310.05	2834E	SL2-IN-E-1152R	A-0109	US0175	TL-57
<input type="checkbox"/> Oregon	EV01-12	6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	3310.02	2834D	SL2-IN-E-1017	A-0108	US0017	TL-56
<input type="checkbox"/> Texas	TX01-09	3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	3310.03	2834G	SL2-IN-E-1158R	A-0201	US0191	TL-54
<input type="checkbox"/> Washington	NC01-05	19201 120th Ave NE Bothell, WA 98011 (425) 984-6600	3310.06	2834F	SL2-IN-E-1153R	A-0110	US0157	TL-67
<input type="checkbox"/> Offsite	N/A	See Product Description	N/A	N/A	N/A	N/A	N/A	N/A

See data sheets for specific labs

(1) The lab designations denote individual rooms within each location. (OC01, OC02, OC03, etc.)

(2) A2LA Certificate No.

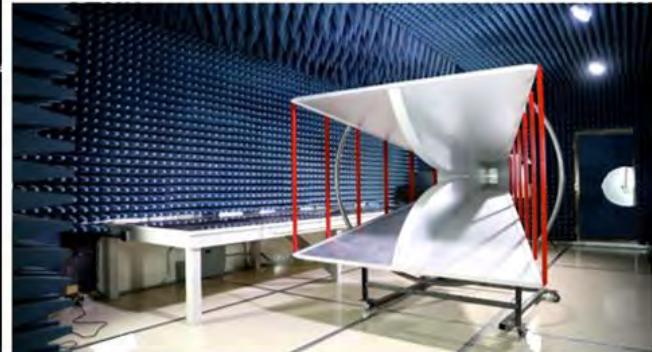
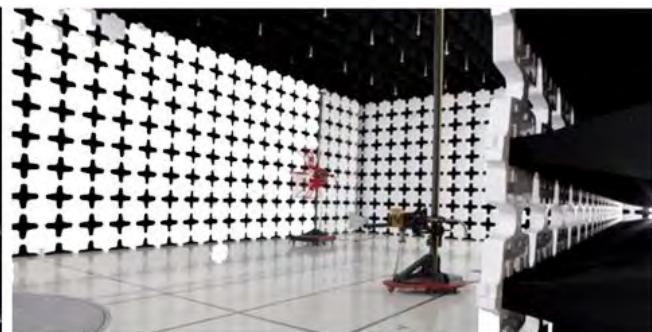
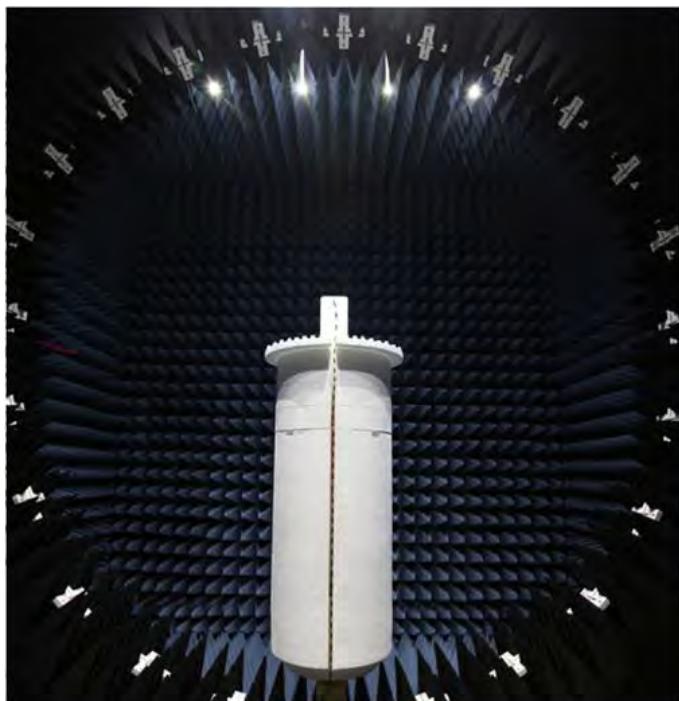
(3) ISED Company No.

(4) BSMI No.

(5) VCCI Site Filing No.

(6) CAB Identifier. Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA

(7) FDA ASCA No.



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.

Various Measurements

Test	All Labs (+/-)
Frequency Accuracy (%)	0.0007
Amplitude Accuracy (dB)	1.2
Conducted Power (dB)	1.2
Radiated Power via Substitution (dB)	0.7
Temperature (degrees C)	0.7
Humidity (% RH)	2.5
Voltage (AC) (%)	1
Voltage (DC) (%)	0.7

Field Strength Measurements (dB)

Range	OC10 (+/-)	OC13 (+/-)
10kHz-30MHz	1.8	N/A
30MHz-1GHz 3m	4.6	N/A
1GHz-6GHz	5	N/A
6GHz-40GHz	5.1	N/A

AC Powerline Conducted Emissions Measurements (dB)

Range	OC06 (+/-)	OC13 (+/-)
9kHz-150kHz LISN	3.6	N/A
150kHz-30MHz LISN	3.2	N/A
150kHz-30MHz CVP	3	N/A
150kHz-30MHz Telecom-ISN	4.4	N/A

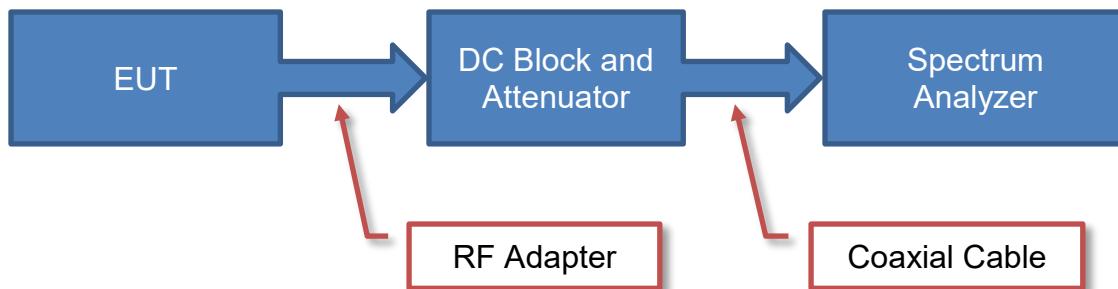
TEST SETUP BLOCK DIAGRAMS

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.

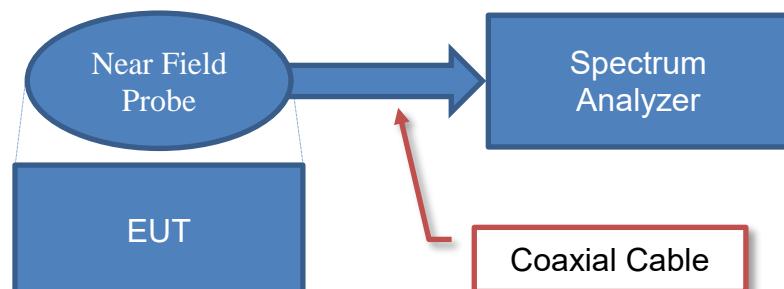
Antenna Port Conducted Measurements



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

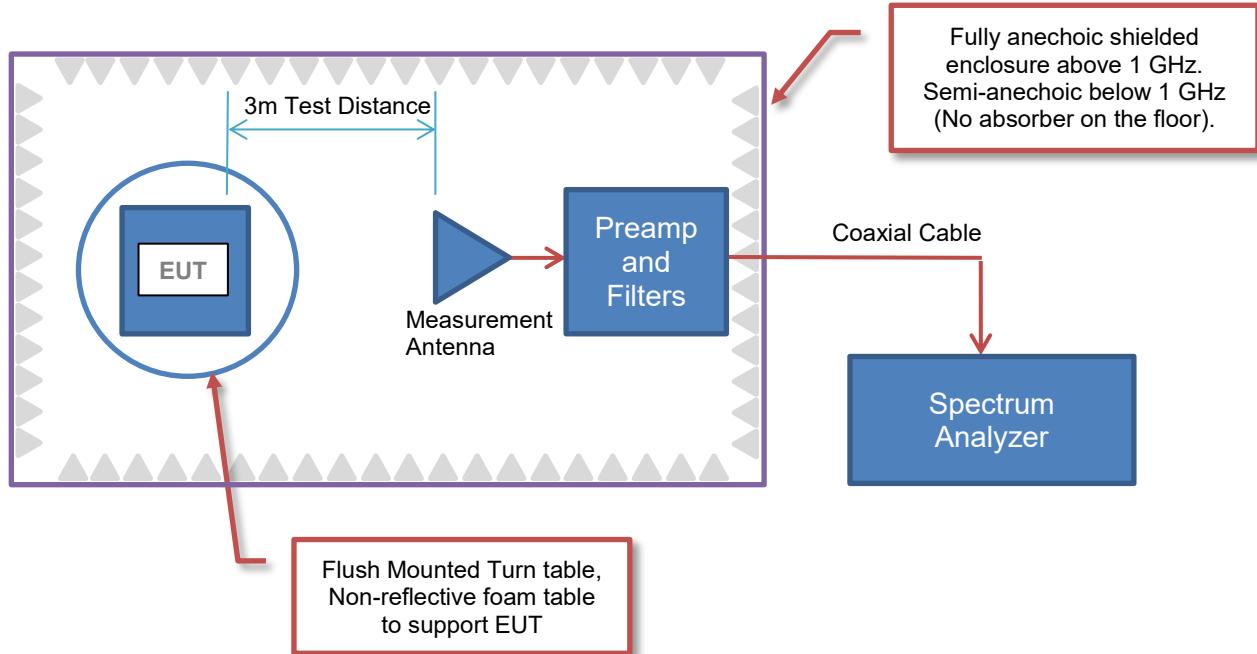


Sample Calculation (logarithmic units)

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

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

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

Conducted Emissions:

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

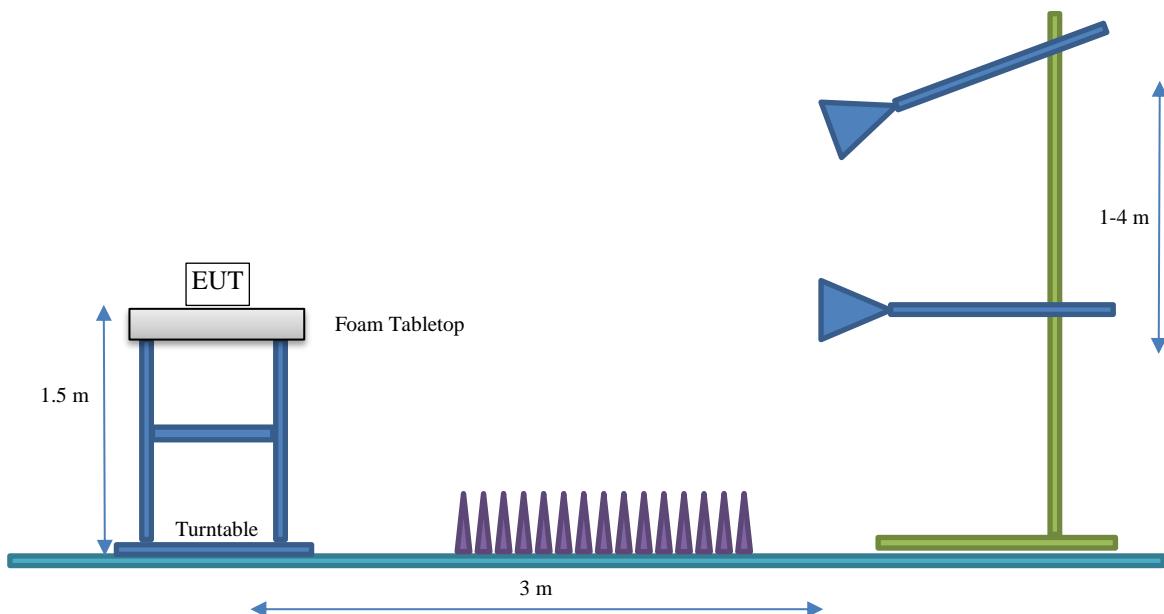
Radiated Power (ERP/EIRP) – Substitution Method:

Measured Level into Substitution Antenna (Amplitude dBm)	10.0	+	Substitution Antenna Factor (dBi)	6.0	-	EIRP to ERP (if applicable)	2.15	=	Measured power (dBm ERP/EIRP)	13.9/16.0
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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:	Crystal Engineering
Address:	708 Fiero Lane Suite 9
City, State, Zip:	San Luis Obispo, CA 93401
Test Requested By:	Trevor Leger
EUT:	XP3i
First Date of Test:	January 11, 2024
Last Date of Test:	February 23, 2024
Receipt Date of Samples:	January 11, 2024
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Digital Pressure Gauge with Battery Backup containing a Bluetooth LE radio.
Testing Objective:
To demonstrate compliance of the Bluetooth radio to FCC 15.247/RSS-247 requirements.

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 Trace	Field Theory	2400-2483.5	-2.8

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: XP3I_ElementTesting_1_11_24
 Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types / Data Rates	Type	Channel	Frequency (MHz)	Power Setting
BLE GFSK 1 Mbps, 2 Mbps	DTS	0	2402	6 dBm
		20	2442	6 dBm
		39	2480	6 dBm

CONFIGURATIONS



Configuration CREN0003-3

Software/Firmware Running During Test	
Description	Version
Firmware	XP3I_ElementTesting_1_11_24

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Battery Powered Digital Pressure Gauge	Crystal Engineering	XP3i-30PSI	220383	

Configuration CREN0003-4

Software/Firmware Running During Test	
Description	Version
Firmware	XP3I_ElementTesting_1_11_24

EUT				
Description	Manufacturer	Model/Part Number	Serial Number	
Battery Powered Digital Pressure Gauge	Crystal Engineering	XP3i-30PSI	303983	

Peripherals in Test Setup Boundary				
Description	Manufacturer	Model/Part Number	Serial Number	
Power Supply	HDP Power	HDP-QB05010U	None	

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	No	1m	No	Power Supply	AC Mains

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2024-01-17	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.
2	2024-02-19	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.
3	2024-02-19	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.
4	2024-02-19	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.
5	2024-02-19	Duty Cycle	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2024-02-19	Equivalent Isotropic Radiated Power	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2024-02-19	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.
8	2024-02-19	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.
9	2024-02-19	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.
10	2024-02-23	Spurious Radiated Emissions	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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	Gauss Instruments	TDEMI 30M	ARO	2023-04-25	2024-04-25
LISN	Solar Electronics	9252-50-24-BNC	LIA	2023-09-12	2024-09-12
Cable - Conducted Cable Assembly	Northwest EMC	OCP, HFP, AWC	OCPA	2023-03-07	2024-03-07

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.2 dB	-3.2 dB

CONFIGURATIONS INVESTIGATED

CREN0003-4

MODES INVESTIGATED

Transmitting Bluetooth Low Energy: Mid channel 20 (2442 MHz) at 1Mbps.

POWERLINE CONDUCTED EMISSIONS



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	303983	Date:	2024-01-17
Customer:	Crystal Engineering	Temperature:	21.6°C
Attendees:	None	Relative Humidity:	50.4%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	110VAC/60Hz	Configuration:	CREN0003-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

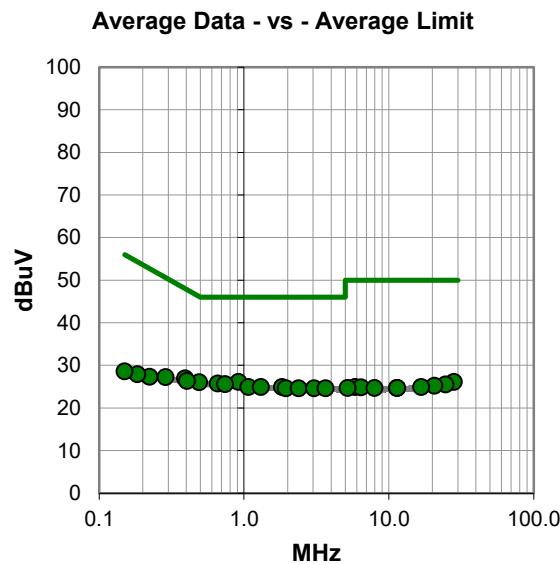
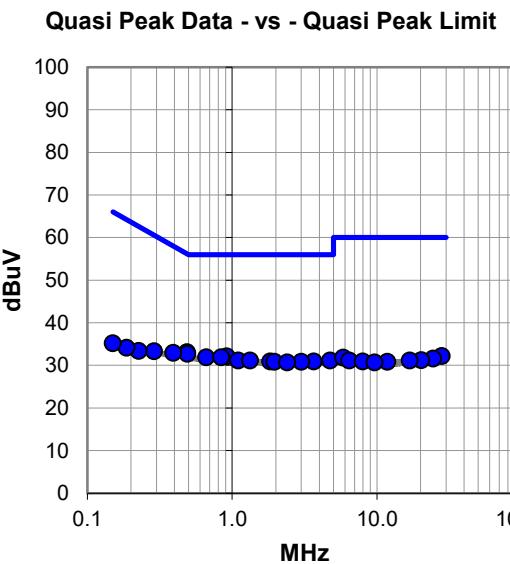
None

EUT OPERATING MODES

Transmitting Bluetooth Low Energy: Mid channel 20 (2442 MHz) at 1Mbps

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #1

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.487	13.2	19.9	33.1	56.2	-23.1
0.490	12.8	19.9	32.7	56.2	-23.5
0.917	12.1	20.0	32.1	56.0	-23.9
0.661	11.9	20.0	31.9	56.0	-24.1
0.840	11.9	20.0	31.9	56.0	-24.1
1.102	11.1	20.0	31.1	56.0	-24.9
1.328	11.0	20.1	31.1	56.0	-24.9
4.756	10.8	20.3	31.1	56.0	-24.9
0.393	13.0	19.9	32.9	58.0	-25.1
1.833	10.8	20.1	30.9	56.0	-25.1
3.658	10.6	20.3	30.9	56.0	-25.1
1.954	10.7	20.1	30.8	56.0	-25.2
3.008	10.6	20.2	30.8	56.0	-25.2
2.399	10.5	20.2	30.7	56.0	-25.3
0.289	13.3	20.0	33.3	60.6	-27.3
28.060	9.8	22.4	32.2	60.0	-27.8
5.850	11.3	20.5	31.8	60.0	-28.2
24.372	9.7	21.9	31.6	60.0	-28.4
20.239	9.7	21.5	31.2	60.0	-28.8
6.445	10.6	20.5	31.1	60.0	-28.9
16.815	9.8	21.3	31.1	60.0	-28.9
7.959	10.3	20.6	30.9	60.0	-29.1
11.819	9.9	20.9	30.8	60.0	-29.2
0.226	13.4	20.0	33.4	62.6	-29.2
9.633	10.0	20.7	30.7	60.0	-29.3

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.917	6.1	20.0	26.1	46.0	-19.9
0.490	6.1	19.9	26.0	46.2	-20.2
0.658	5.7	20.0	25.7	46.0	-20.3
0.739	5.6	20.0	25.6	46.0	-20.4
0.393	7.0	19.9	26.9	48.0	-21.1
1.076	4.9	20.0	24.9	46.0	-21.1
1.313	4.8	20.1	24.9	46.0	-21.1
1.834	4.8	20.1	24.9	46.0	-21.1
1.944	4.5	20.1	24.6	46.0	-21.4
2.393	4.4	20.2	24.6	46.0	-21.4
3.052	4.4	20.2	24.6	46.0	-21.4
3.667	4.3	20.3	24.6	46.0	-21.4
0.405	6.4	19.9	26.3	47.8	-21.5
0.287	7.2	20.0	27.2	50.6	-23.4
28.098	3.7	22.4	26.1	50.0	-23.9
24.715	3.6	21.9	25.5	50.0	-24.5
20.611	3.6	21.6	25.2	50.0	-24.8
5.835	4.4	20.5	24.9	50.0	-25.1
16.760	3.6	21.3	24.9	50.0	-25.1
6.424	4.3	20.5	24.8	50.0	-25.2
5.187	4.3	20.4	24.7	50.0	-25.3
7.965	4.1	20.6	24.7	50.0	-25.3
11.365	3.8	20.9	24.7	50.0	-25.3
11.459	3.8	20.9	24.7	50.0	-25.3
0.223	7.3	20.0	27.3	52.7	-25.4

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	303983	Date:	2024-01-17
Customer:	Crystal Engineering	Temperature:	21.6°C
Attendees:	None	Relative Humidity:	50.4%
Customer Project:	None	Bar. Pressure (PMSL):	1016 mb
Tested By:	Mark Baytan	Job Site:	OC06
Power:	110VAC/60Hz	Configuration:	CREN0003-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:2021	ANSI C63.10:2013

TEST PARAMETERS

Run #:	2	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

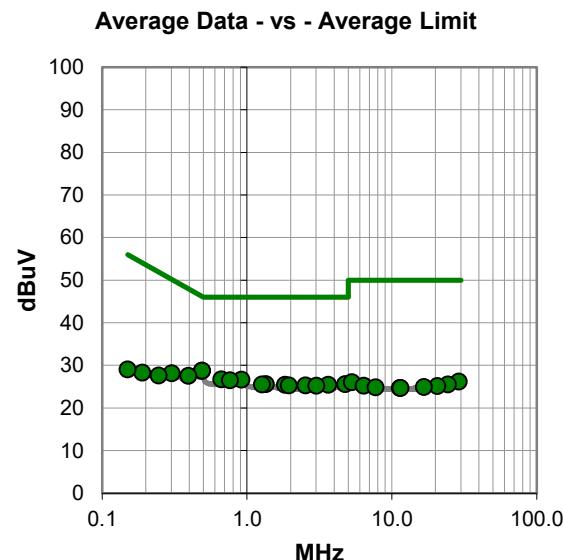
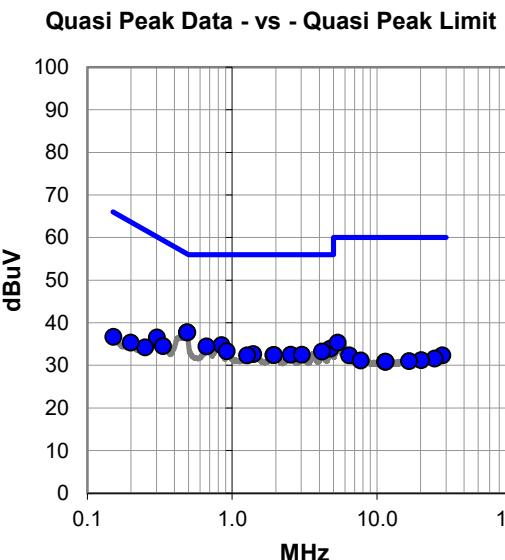
None

EUT OPERATING MODES

Transmitting Bluetooth Low Energy: Mid channel 20 (2442 MHz) at 1Mbps.

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #2

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.487	17.8	19.9	37.7	56.2	-18.5
0.490	17.8	19.9	37.7	56.2	-18.5
0.844	14.7	20.0	34.7	56.0	-21.3
0.664	14.4	20.0	34.4	56.0	-21.6
4.766	13.6	20.3	33.9	56.0	-22.1
0.917	13.3	20.0	33.3	56.0	-22.7
4.187	12.9	20.3	33.2	56.0	-22.8
1.397	12.5	20.1	32.6	56.0	-23.4
2.538	12.3	20.2	32.5	56.0	-23.5
3.025	12.3	20.2	32.5	56.0	-23.5
1.923	12.3	20.1	32.4	56.0	-23.6
1.946	12.3	20.1	32.4	56.0	-23.6
0.303	16.5	20.0	36.5	60.2	-23.7
1.271	12.2	20.1	32.3	56.0	-23.7
5.364	14.9	20.4	35.3	60.0	-24.7
0.333	14.5	20.0	34.5	59.4	-24.9
0.251	14.2	20.0	34.2	61.7	-27.5
28.318	9.9	22.4	32.3	60.0	-27.7
6.439	11.8	20.5	32.3	60.0	-27.7
25.004	9.7	21.9	31.6	60.0	-28.4
0.199	15.3	20.0	35.3	63.7	-28.4
20.214	9.7	21.5	31.2	60.0	-28.8
7.716	10.5	20.6	31.1	60.0	-28.9
16.673	9.7	21.3	31.0	60.0	-29.0
11.383	9.9	20.9	30.8	60.0	-29.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.487	8.8	19.9	28.7	46.2	-17.5
0.490	8.8	19.9	28.7	46.2	-17.5
0.664	6.7	20.0	26.7	46.0	-19.3
0.917	6.6	20.0	26.6	46.0	-19.4
0.765	6.5	20.0	26.5	46.0	-19.5
1.349	5.5	20.1	25.6	46.0	-20.4
4.761	5.3	20.3	25.6	46.0	-20.4
0.394	7.6	19.9	27.5	48.0	-20.5
1.270	5.4	20.1	25.5	46.0	-20.5
1.834	5.3	20.1	25.4	46.0	-20.6
3.644	5.1	20.3	25.4	46.0	-20.6
1.950	5.2	20.1	25.3	46.0	-20.7
2.539	5.1	20.2	25.3	46.0	-20.7
3.012	5.0	20.2	25.2	46.0	-20.8
0.303	8.1	20.0	28.1	50.2	-22.1
28.986	3.7	22.5	26.2	50.0	-23.8
5.301	5.6	20.4	26.0	50.0	-24.0
0.246	7.6	20.0	27.6	51.9	-24.3
24.423	3.6	21.9	25.5	50.0	-24.5
6.418	4.7	20.5	25.2	50.0	-24.8
20.608	3.5	21.6	25.1	50.0	-24.9
16.673	3.6	21.3	24.9	50.0	-25.1
7.727	4.2	20.6	24.8	50.0	-25.2
11.395	3.8	20.9	24.7	50.0	-25.3
11.475	3.8	20.9	24.7	50.0	-25.3

CONCLUSION

Pass

Tested By

DUTY CYCLE



TEST DESCRIPTION

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

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

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

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

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

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

DUTY CYCLE



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.6°C
Attendees:	None	Relative Humidity:	58.5%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:20201	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

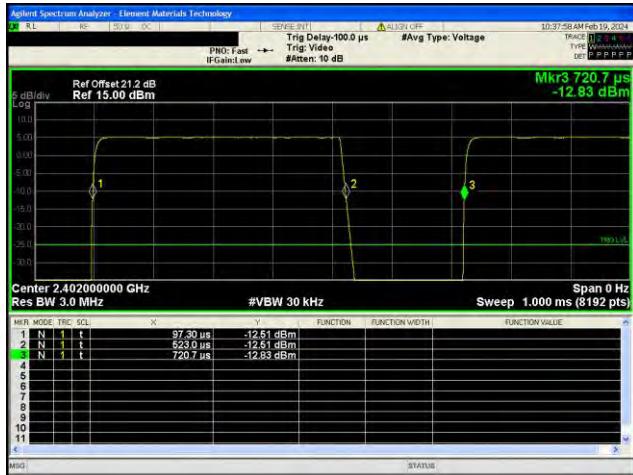
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Tested By

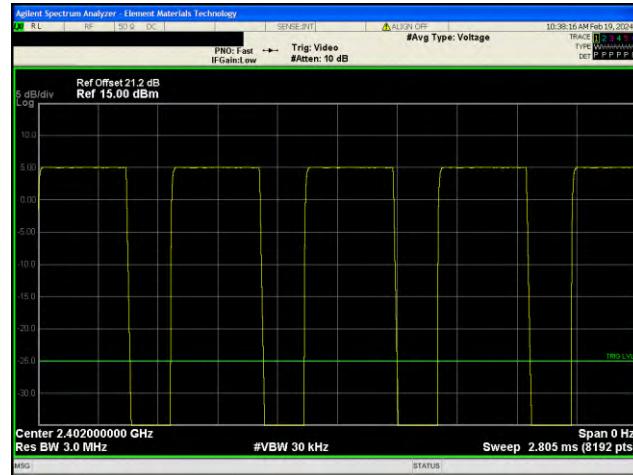
TEST RESULTS

	Pulse Width	Period	Number of Pulses	Value (%)	Limit N/A ()	Results
BLE/GFSK 1 Mbps						
Low Channel, 2402 MHz	425.686 us N/A	623.4 us N/A	1 5	68.3 N/A	N/A N/A	N/A N/A
Mid Channel, 2442 MHz	425.286 us N/A	626.8 us N/A	1 5	67.9 N/A	N/A N/A	N/A N/A
High Channel, 2480 MHz	425.464 us N/A	628 us N/A	1 5	67.7 N/A	N/A N/A	N/A N/A
BLE/GFSK 2 Mbps						
Low Channel, 2402 MHz	241.33 us N/A	627.2 us N/A	1 5	38.5 N/A	N/A N/A	N/A N/A
Mid Channel, 2442 MHz	242.108 us N/A	627.5 us N/A	1 5	38.6 N/A	N/A N/A	N/A N/A
High Channel, 2480 MHz	241.542 us N/A	627.4 us N/A	1 5	38.5 N/A	N/A N/A	N/A N/A

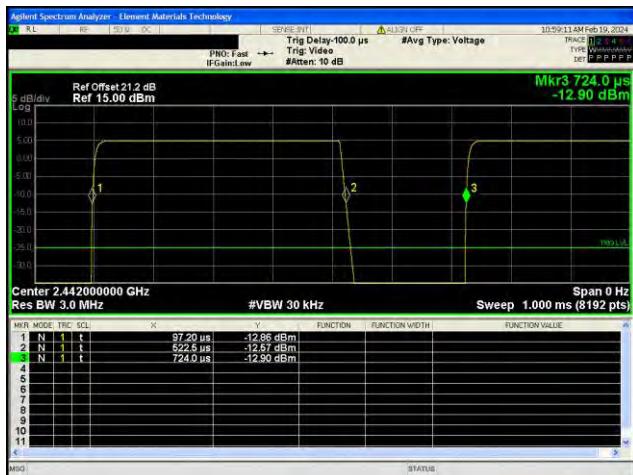
DUTY CYCLE



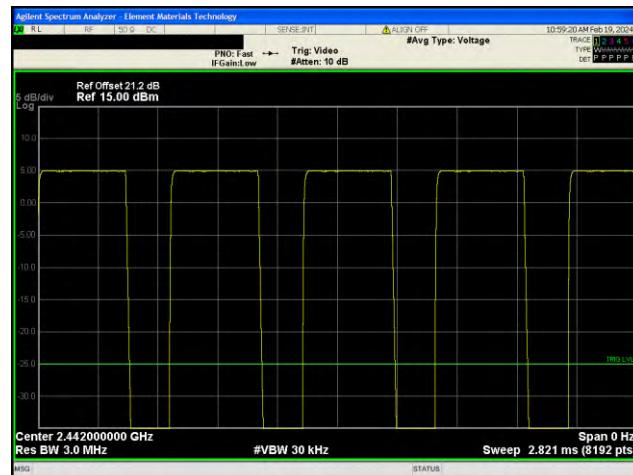
BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Low Channel, 2402 MHz

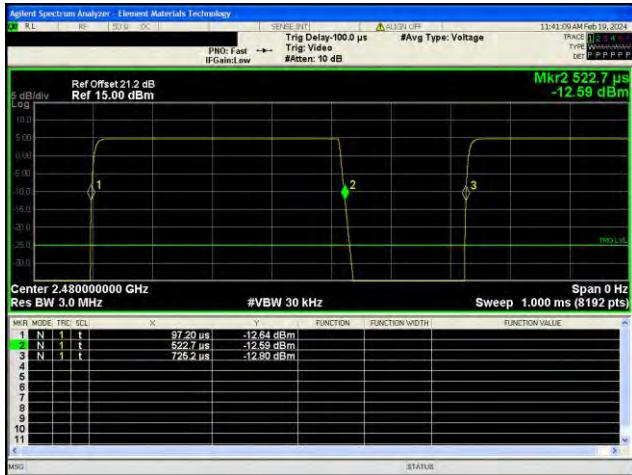


BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

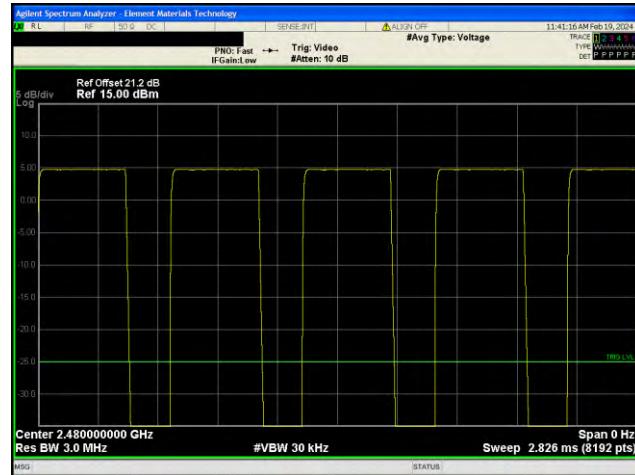


BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

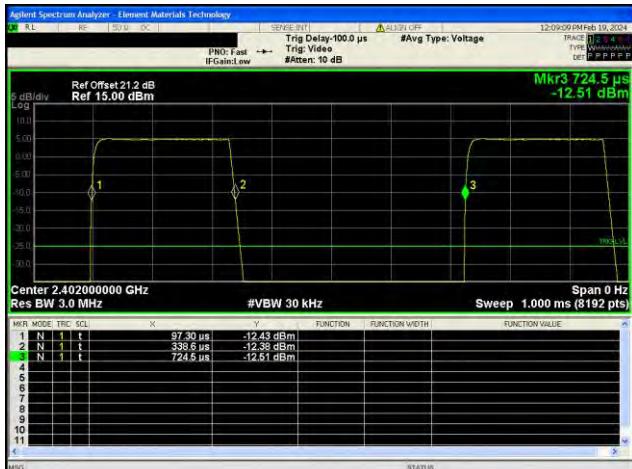
DUTY CYCLE



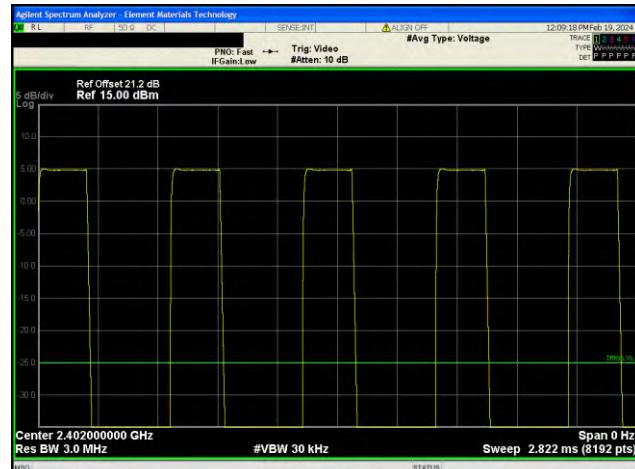
BLE/GFSK 1 Mbps
High Channel, 2480 MHz



BLE/GFSK 1 Mbps
High Channel, 2480 MHz

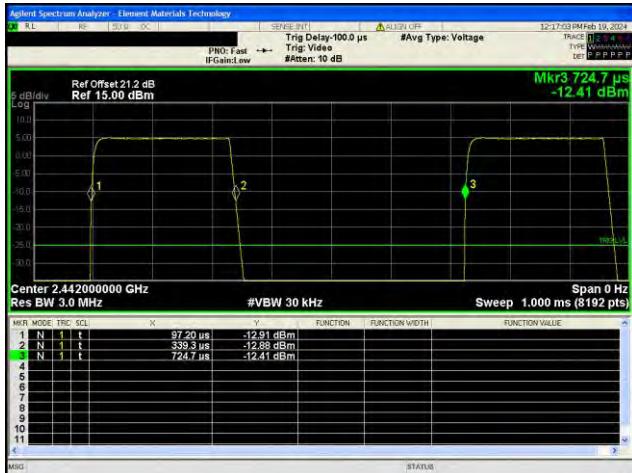


BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

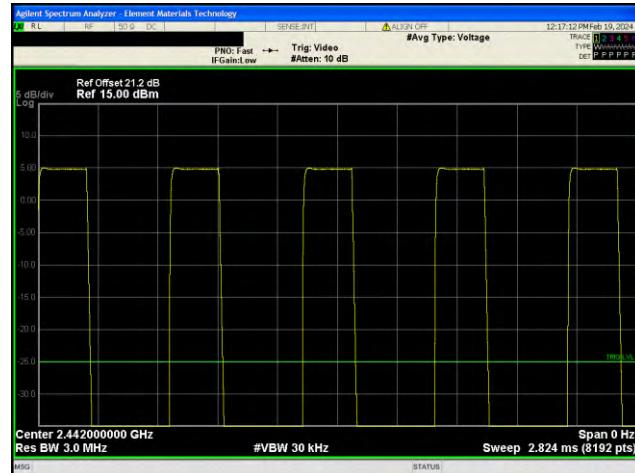


BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

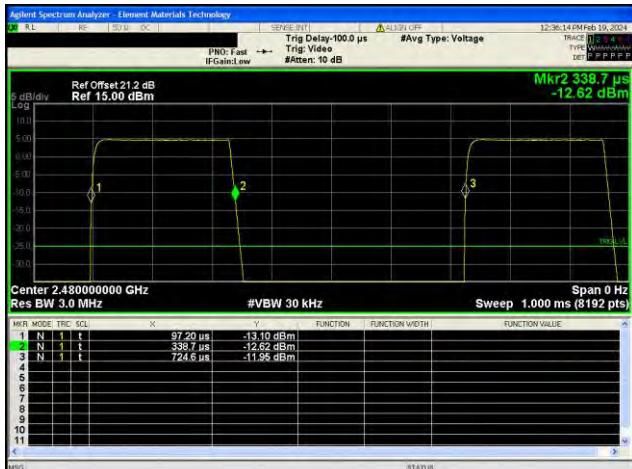
DUTY CYCLE



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

DTS BANDWIDTH (6 dB)



TEST DESCRIPTION

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 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

DTS BANDWIDTH (6 dB)

EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



Tested By

TEST RESULTS

	Value	Limit (≥)	Result
BLE/GFSK 1 Mbps			
Low Channel, 2402 MHz	682.791 kHz	500 kHz	Pass
Mid Channel, 2442 MHz	659.662 kHz	500 kHz	Pass
High Channel, 2480 MHz	667.757 kHz	500 kHz	Pass
BLE/GFSK 2 Mbps			
Low Channel, 2402 MHz	1.146 MHz	500 kHz	Pass
Mid Channel, 2442 MHz	1.125 MHz	500 kHz	Pass
High Channel, 2480 MHz	1.125 MHz	500 kHz	Pass

DTS BANDWIDTH (6 dB)



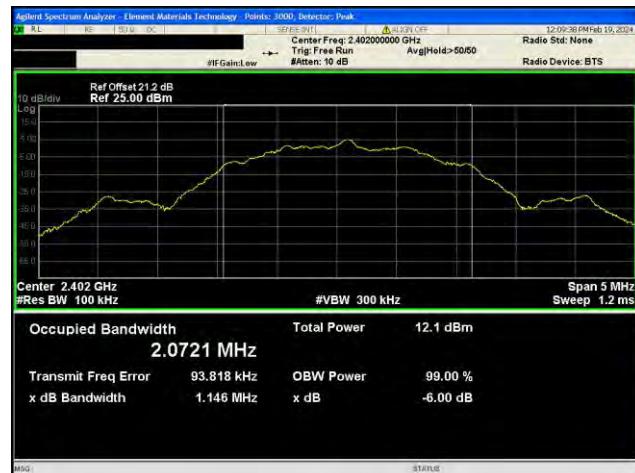
BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 1 Mbps
High Channel, 2480 MHz



BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

DTS BANDWIDTH (6 dB)



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

OCCUPIED BANDWIDTH (99%)



TEST DESCRIPTION

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 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

OCCUPIED BANDWIDTH (99%)



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013
RSS-Gen Issue 5:2018+A1:2019+A2:20201	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

N/A

Tested By

TEST RESULTS

	Value	Limit	Result
BLE/GFSK 1 Mbps			
Low Channel, 2402 MHz	1.021 MHz	N/A	N/A
Mid Channel, 2442 MHz	1.019 MHz	N/A	N/A
High Channel, 2480 MHz	1.018 MHz	N/A	N/A
BLE/GFSK 2 Mbps			
Low Channel, 2402 MHz	2.041 MHz	N/A	N/A
Mid Channel, 2442 MHz	2.029 MHz	N/A	N/A
High Channel, 2480 MHz	2.03 MHz	N/A	N/A

OCCUPIED BANDWIDTH (99%)



**BLE/GFSK 1 Mbps
Low Channel, 2402 MHz**



**BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz**



**BLE/GFSK 1 Mbps
High Channel, 2480 MHz**



**BLE/GFSK 2 Mbps
Low Channel, 2402 MHz**

OCCUPIED BANDWIDTH (99%)



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

OUTPUT POWER



TEST DESCRIPTION

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 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

OUTPUT POWER



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

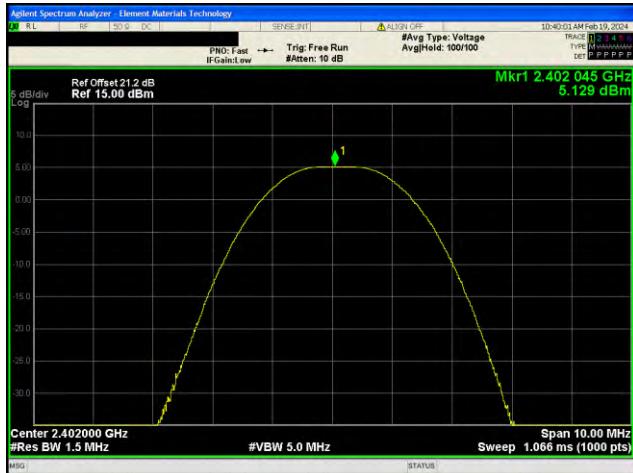
Pass

Tested By

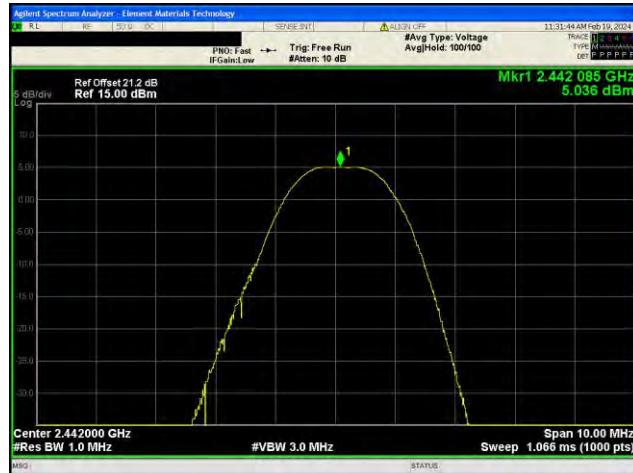
TEST RESULTS

	Out Pwr (dBm)	Limit (dBm)	Result
BLE/GFSK 1 Mbps			
Low Channel, 2402 MHz	5.129	30	Pass
Mid Channel, 2442 MHz	5.036	30	Pass
High Channel, 2480 MHz	4.862	30	Pass
BLE/GFSK 2 Mbps			
Low Channel, 2402 MHz	5.129	30	Pass
Mid Channel, 2442 MHz	5.111	30	Pass
High Channel, 2480 MHz	4.914	30	Pass

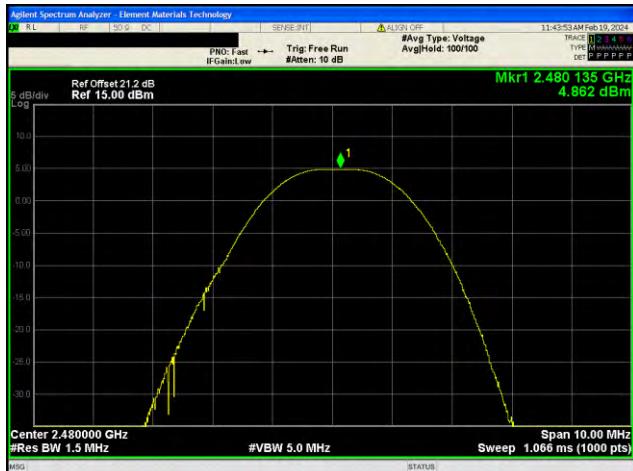
OUTPUT POWER



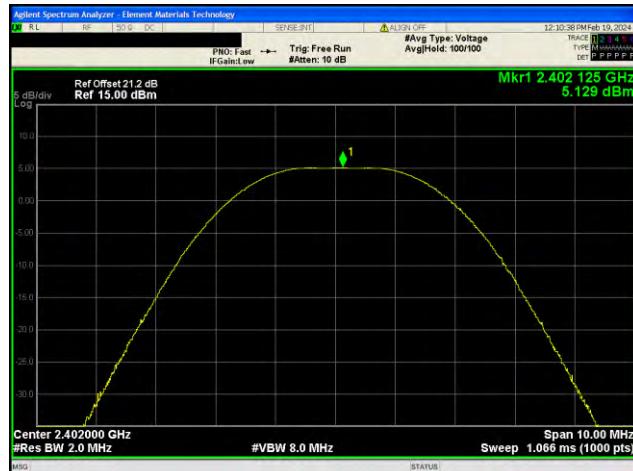
BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

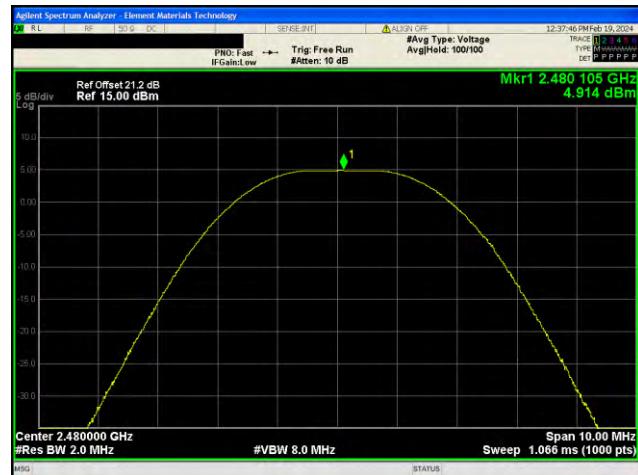


BLE/GFSK 1 Mbps
High Channel, 2480 MHz



BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

OUTPUT POWER



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TEST DESCRIPTION

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 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)

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

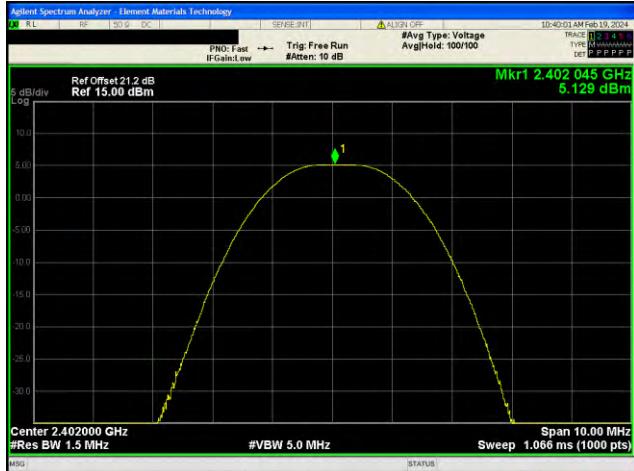
Pass

Tested By

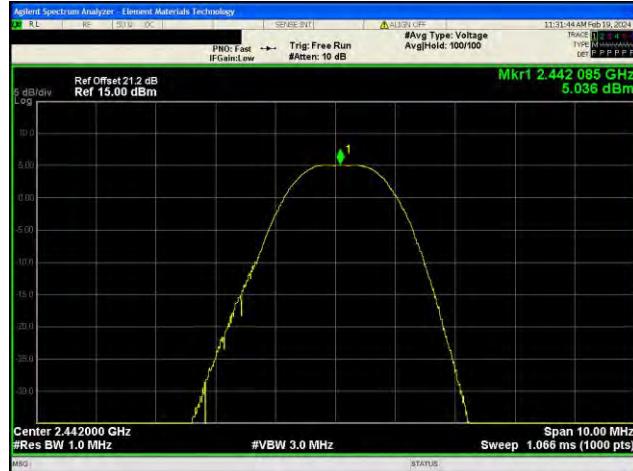
TEST RESULTS

	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE/GFSK 1 Mbps					
Low Channel, 2402 MHz	5.129	-2.8	2.329	36	Pass
Mid Channel, 2442 MHz	5.036	-2.8	2.236	36	Pass
High Channel, 2480 MHz	4.862	-2.8	2.062	36	Pass
BLE/GFSK 2 Mbps					
Low Channel, 2402 MHz	5.129	-2.8	2.329	36	Pass
Mid Channel, 2442 MHz	5.111	-2.8	2.311	36	Pass
High Channel, 2480 MHz	4.914	-2.8	2.114	36	Pass

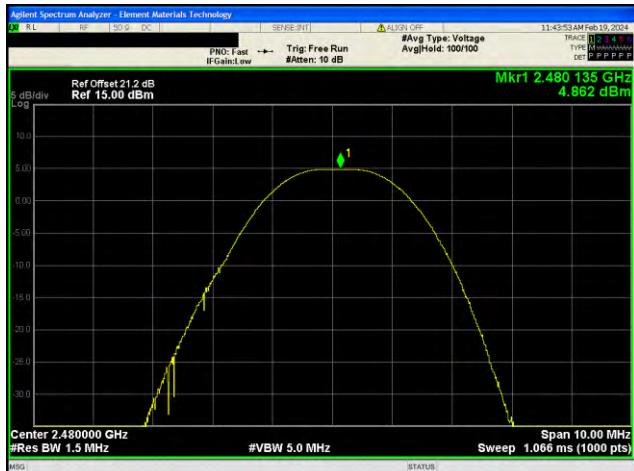
EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

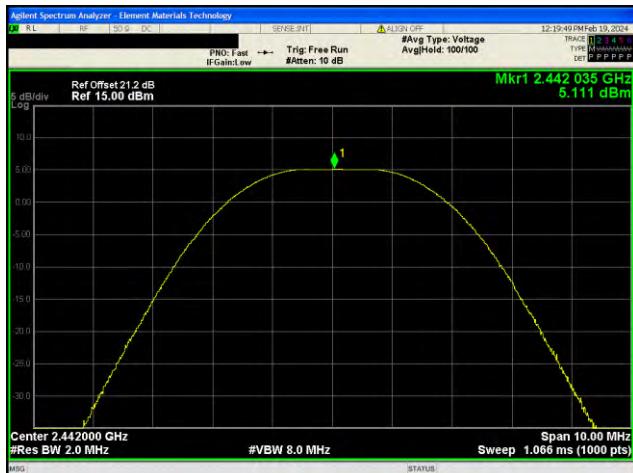


BLE/GFSK 1 Mbps
High Channel, 2480 MHz



BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



POWER SPECTRAL DENSITY



TEST DESCRIPTION

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

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

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

POWER SPECTRAL DENSITY



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

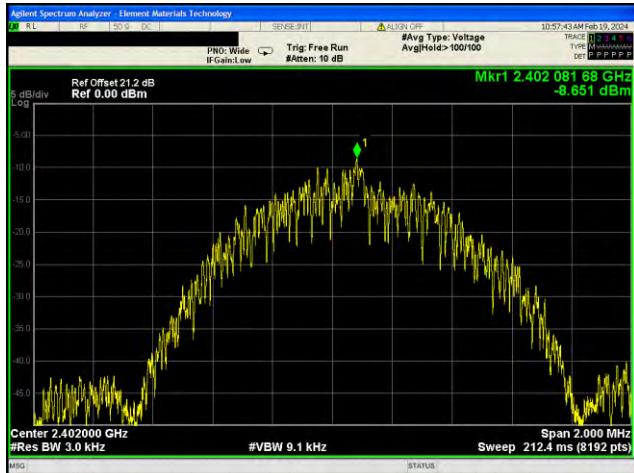
Pass

Tested By

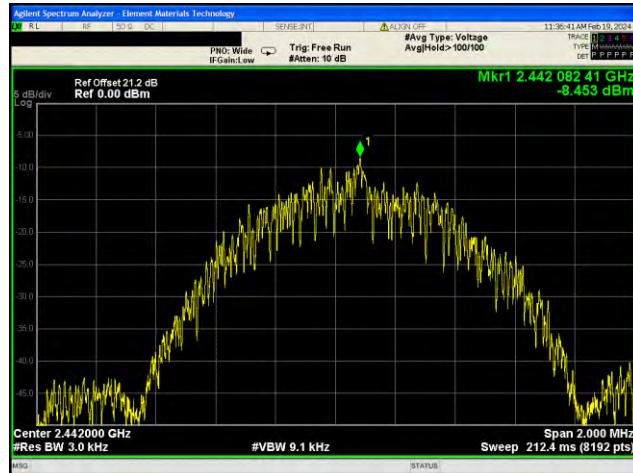
TEST RESULTS

	Value dBm/3kHz	Limit ≤ (dBm/3kHz)	Results
BLE/GFSK 1 Mbps			
Low Channel, 2402 MHz	-8.651	8	Pass
Mid Channel, 2442 MHz	-8.453	8	Pass
High Channel, 2480 MHz	-8.929	8	Pass
BLE/GFSK 2 Mbps			
Low Channel, 2402 MHz	-8.67	8	Pass
Mid Channel, 2442 MHz	-8.753	8	Pass
High Channel, 2480 MHz	-9.04	8	Pass

POWER SPECTRAL DENSITY



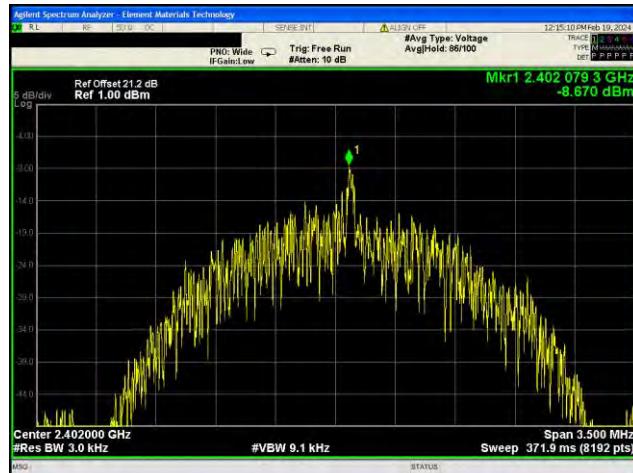
BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

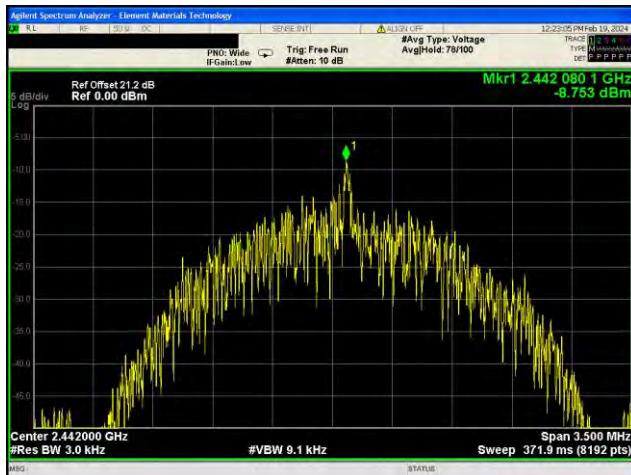


BLE/GFSK 1 Mbps
High Channel, 2480 MHz

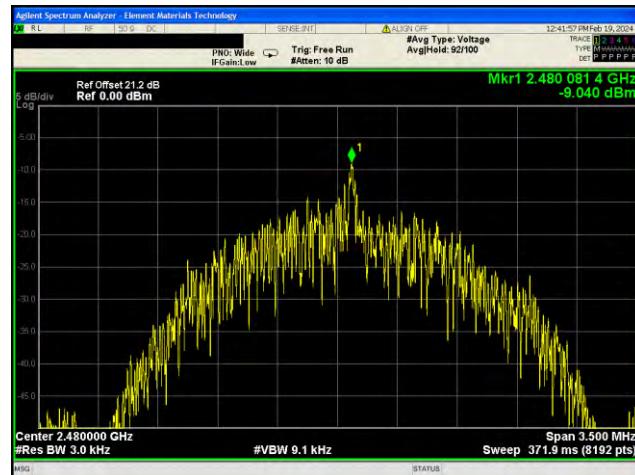


BLE/GFSK 2 Mbps
Low Channel, 2402 MHz

POWER SPECTRAL DENSITY



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

BAND EDGE COMPLIANCE



TEST DESCRIPTION

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 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. The analyzer screen captures for this test show an example of the emission mask for the test mode also used during the radiated spurious emissions at the restricted band edges test.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

BAND EDGE COMPLIANCE



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

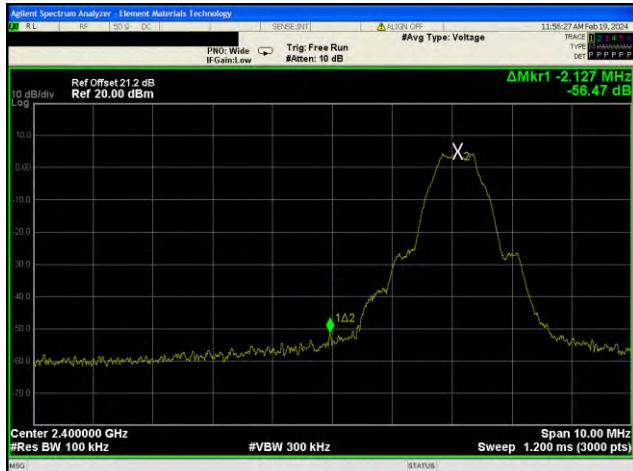
Pass

Tested By

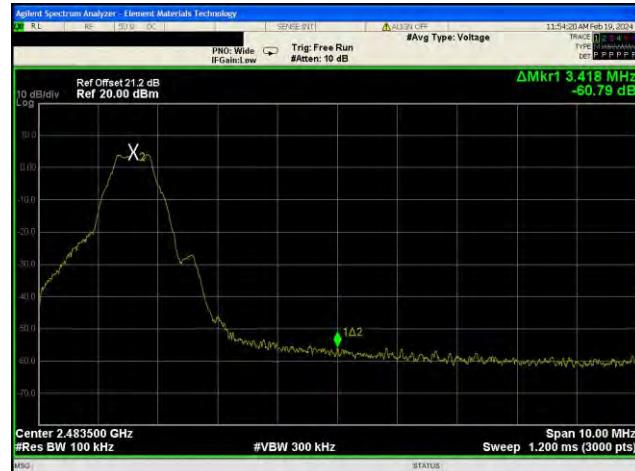
TEST RESULTS

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK 1 Mbps			
Low Channel, 2402 MHz	-56.47	-20	Pass
High Channel, 2480 MHz	-60.79	-20	Pass
BLE/GFSK 2 Mbps			
Low Channel, 2402 MHz	-36.89	-20	Pass
High Channel, 2480 MHz	-60.53	-20	Pass

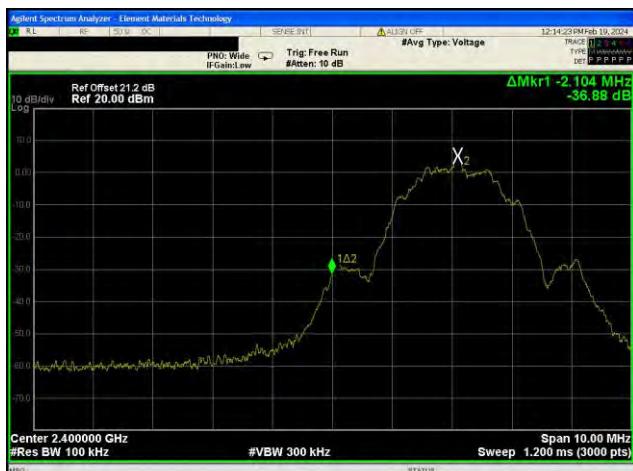
BAND EDGE COMPLIANCE



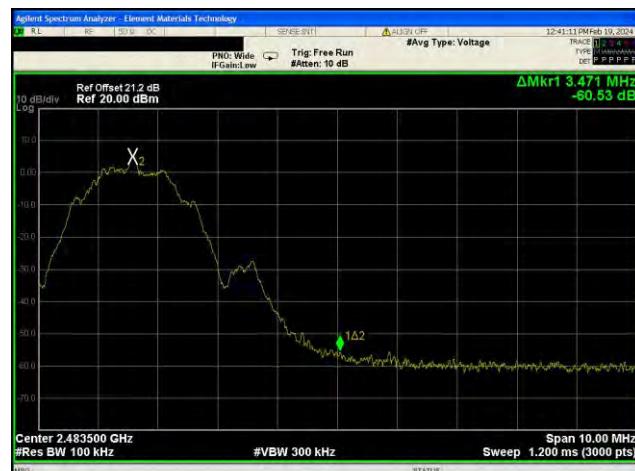
BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
High Channel, 2480 MHz



BLE/GFSK 2 Mbps
Low Channel, 2402 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

SPURIOUS CONDUCTED EMISSIONS



TEST DESCRIPTION

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 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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	2024-01-31	2025-01-31
Block - DC	Fairview Microwave	SD3379	ANG	2023-07-13	2024-07-13
Attenuator	Fairview Microwave	SA18H-20	UAZ	2023-03-22	2024-03-22
Cable	Micro-Coax	UFD150A-1-0720-200200	OCA	2023-12-29	2024-12-29
Generator - Signal	Keysight	N5182B	TFX	2023-05-14	2026-05-14

SPURIOUS CONDUCTED EMISSIONS



EUT:	XP3i	Work Order:	CREN0003
Serial Number:	220383	Date:	2024-02-19
Customer:	Crystal Engineering	Temperature:	20.7°C
Attendees:	None	Relative Humidity:	58.4%
Customer Project:	None	Bar. Pressure (PMSL):	1020 mbar
Tested By:	Mark Baytan	Job Site:	OC13
Power:	4.5VDC via Battery	Configuration:	CREN0003-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	ANSI C63.10:2013
RSS-247 Issue 3:2023	ANSI C63.10:2013

COMMENTS

Reference level offset included with measurements: DC Block + 20dB Attenuator + Coax Cable = 21.2 dB

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

[Test_Results]

Tested_By

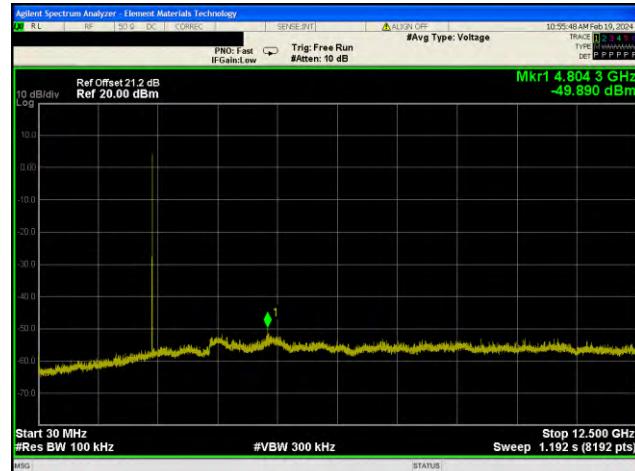
TEST RESULTS

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK 1 Mbps					
Low Channel, 2402 MHz	Fundamental	2402.08	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4804.25	-54.9	-20	Pass
	12.5 GHz - 25 GHz	23936.33	-55.66	-20	Pass
Mid Channel, 2442 MHz	Fundamental	2442.08	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4884.94	-54.16	-20	Pass
	12.5 GHz - 25 GHz	23918.02	-55.37	-20	Pass
High Channel, 2480 MHz	Fundamental	2480.07	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4959.54	-55.19	-20	Pass
	12.5 GHz - 25 GHz	23882.92	-54.55	-20	Pass
BLE/GFSK 2 Mbps					
Low Channel, 2402 MHz	Fundamental	2402.08	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4802.73	-55.37	-20	Pass
	12.5 GHz - 25 GHz	23620.44	-53.77	-20	Pass
Mid Channel, 2442 MHz	Fundamental	2442.09	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4775.33	-57.07	-20	Pass
	12.5 GHz - 25 GHz	24464.35	-54.7	-20	Pass
High Channel, 2480 MHz	Fundamental	2480.08	N/A	N/A	N/A
	30 MHz - 12.5 GHz	4959.54	-53.2	-20	Pass
	12.5 GHz - 25 GHz	24934.38	-55	-20	Pass

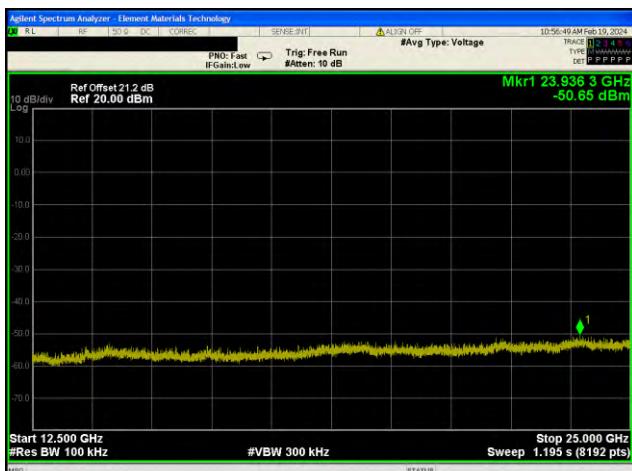
SPURIOUS CONDUCTED EMISSIONS



BLE/GFSK 1 Mbps
Low Channel, 2402 MHz



BLE/GFSK 1 Mbps
Low Channel, 2402 MHz

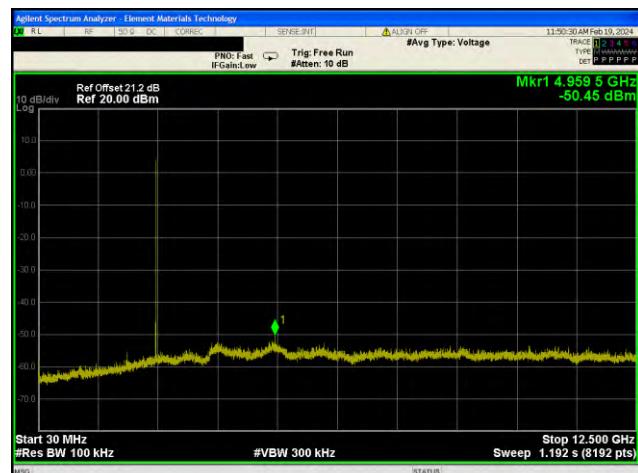
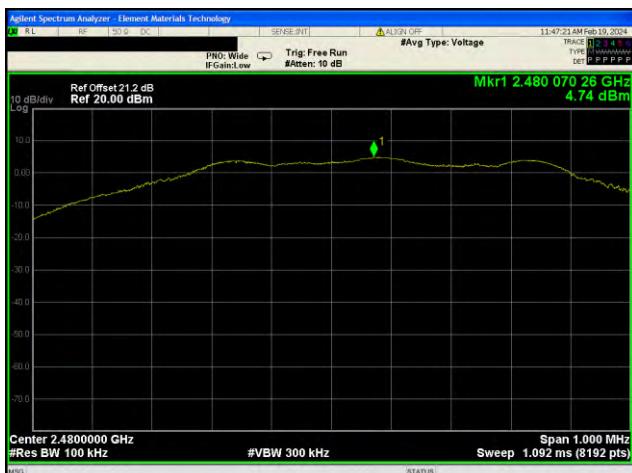
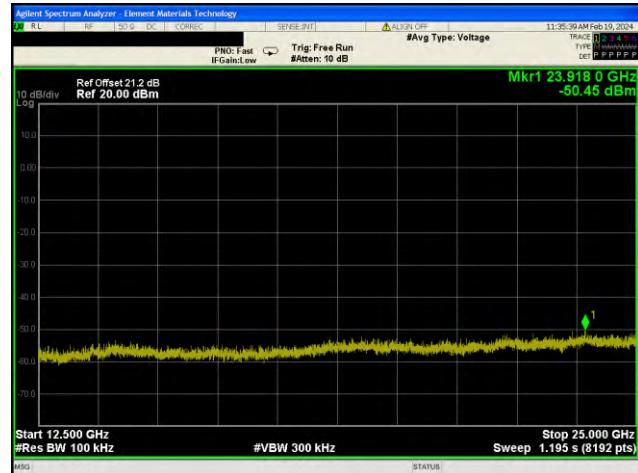
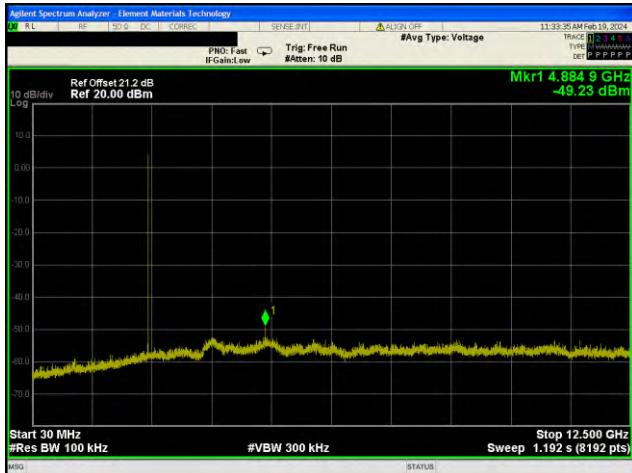


BLE/GFSK 1 Mbps
Low Channel, 2402 MHz

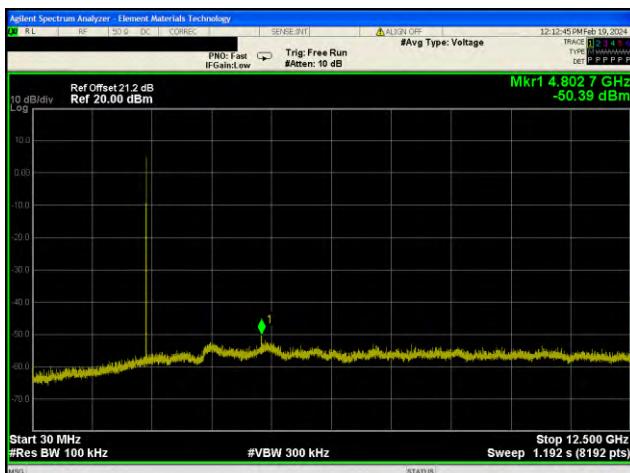
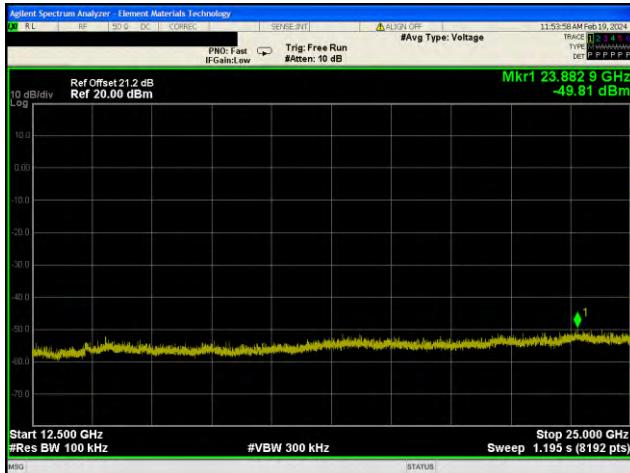


BLE/GFSK 1 Mbps
Mid Channel, 2442 MHz

SPURIOUS CONDUCTED EMISSIONS



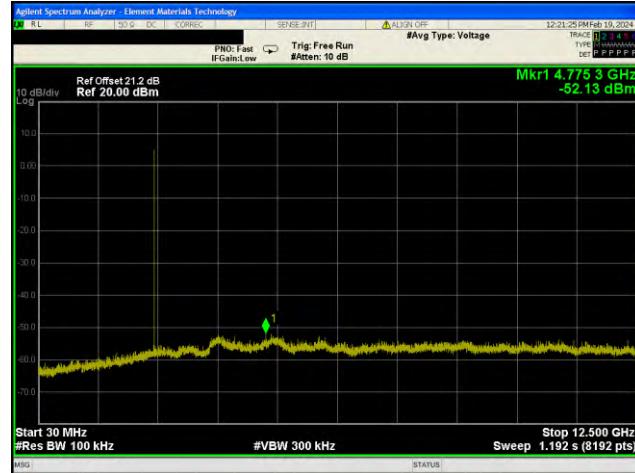
SPURIOUS CONDUCTED EMISSIONS



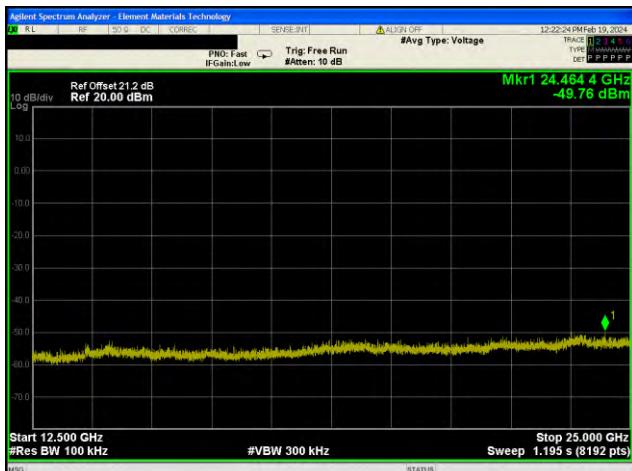
SPURIOUS CONDUCTED EMISSIONS



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz

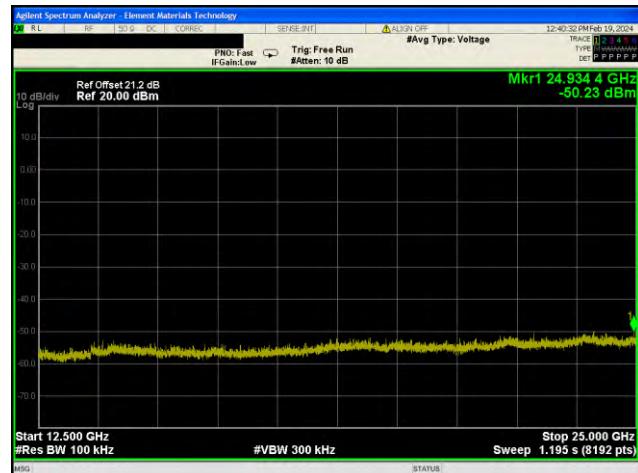
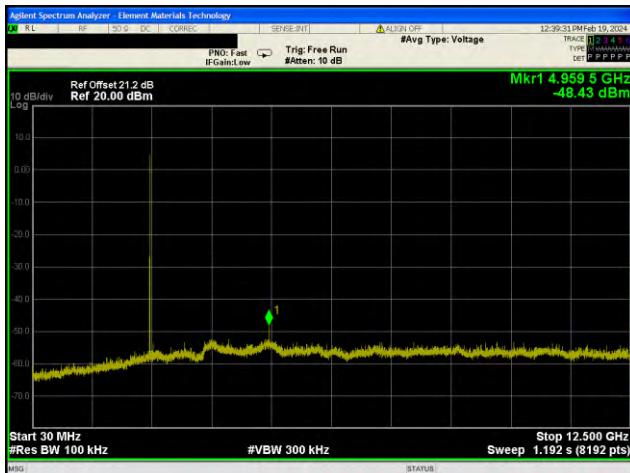


BLE/GFSK 2 Mbps
Mid Channel, 2442 MHz



BLE/GFSK 2 Mbps
High Channel, 2480 MHz

SPURIOUS CONDUCTED EMISSIONS



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 $10 \cdot \log(1/dc)$.

SPURIOUS RADIATED EMISSIONS



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	2023-05-23	2024-05-23
Amplifier - Pre-Amplifier	Cernex	CBL01084020-xx	PAX	2023-05-23	2024-05-23
Attenuator	Fairview Microwave	SA18H-20	TKQ	2023-05-22	2024-05-22
Analyzer - Spectrum Analyzer	Agilent	E4443A	AAR	2023-10-10	2024-10-10
Filter - High Pass	Micro-Tronics	HPM50111	HHX	2023-05-22	2024-05-22
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 - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	NCR
Cable	Northwest EMC	18-26GHz RE Cables	OCK	2023-12-15	2024-12-15
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	2023-12-15	2024-12-15
Antenna - Biconilog	Teseq	CBL 6141A	AYE	2023-08-08	2025-08-08
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	2023-05-31	2024-05-31
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	2023-05-31	2024-05-31
Filter - Low Pass	Micro-Tronics	LPM50004	LFT	2023-12-29	2024-12-29

MEASUREMENT UNCERTAINTY

Description			
Expanded k=2		5.1 dB	-5.1 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 26500 MHz

POWER INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

CREN0003-4

MODES INVESTIGATED

Transmitting Bluetooth Low Energy. Low channel 0 (2402 MHz), Mid channel 20 (2442 MHz), and High channel 39 (2480 MHz). Data rate: 1 Mbps, 2 Mbps

Transmitting Bluetooth Low Energy. Low channel 0 (2402 MHz), and High channel 39 (2480 MHz). Data rate: 1 Mbps, 2 Mbps

SPURIOUS RADIATED EMISSIONS

EUT:	XP3i	Work Order:	CREN0003
Serial Number:	303983	Date:	2024-02-23
Customer:	Crystal Engineering	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	40.8%
Customer Project:	None	Bar. Pressure (PMSL):	1018 mb
Tested By:	Nolan De Ramos	Job Site:	OC10
Power:	120VAC/60Hz	Configuration:	CREN0003-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	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 #:	28	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

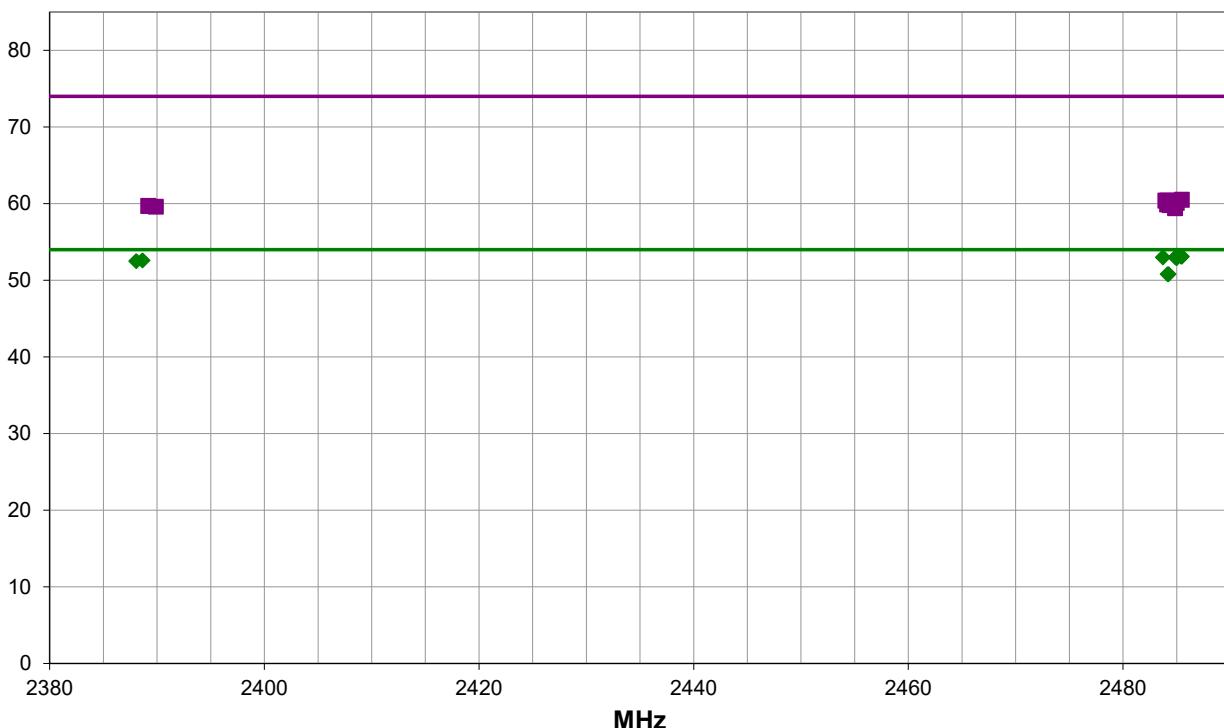
Band edge measurements. Duty Cycle for 1 Mbps: $0.677 \text{ DCCF (1 Mbps)} = 10 \times \text{LOG}(1/\text{DC}) = 1.7 \text{ dB}$. Duty Cycle for 2 Mbps: $0.385 \text{ DCCF (2 Mbps)} = 10 \times \text{LOG}(1/\text{DC}) = 4.1 \text{ dB}$.

EUT OPERATING MODES

Transmitting Bluetooth Low Energy. Low channel 0 (2402 MHz), and High channel 39 (2480 MHz). Data rate: 1 Mbps, 2 Mbps

DEVIATIONS FROM TEST STANDARD

None



Run #: 28

PK AV QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #28

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.483	40.3	-11.3	1.5	238.0	4.1	20.0	Horz	AV	0.0	53.1	54.0	-0.9	High Ch, EUT Vert, 2 Mbps
2485.417	40.3	-11.3	1.5	24.0	4.1	20.0	Vert	AV	0.0	53.1	54.0	-0.9	High Ch, EUT Vert, 2 Mbps
2483.717	40.2	-11.3	1.5	103.0	4.1	20.0	Horz	AV	0.0	53.0	54.0	-1.0	High Ch, EUT on Side, 2 Mbps
2484.900	40.2	-11.3	3.1	60.0	4.1	20.0	Vert	AV	0.0	53.0	54.0	-1.0	High Ch, EUT on Side, 2 Mbps
2484.917	40.2	-11.3	1.5	355.0	4.1	20.0	Horz	AV	0.0	53.0	54.0	-1.0	High Ch, EUT Horz, 2 Mbps
2485.000	40.1	-11.3	1.5	161.0	4.1	20.0	Vert	AV	0.0	52.9	54.0	-1.1	High Ch, EUT Horz, 2 Mbps
2388.643	40.2	-11.7	1.5	35.0	4.1	20.0	Vert	AV	0.0	52.6	54.0	-1.4	Low Ch, EUT Vert, 2 Mbps
2388.063	40.1	-11.7	1.5	107.0	4.1	20.0	Horz	AV	0.0	52.5	54.0	-1.5	Low Ch, EUT Vert, 2 Mbps
2484.237	40.4	-11.3	1.5	276.0	1.7	20.0	Horz	AV	0.0	50.8	54.0	-3.2	High Ch, EUT Vert, 1 Mbps
2484.163	40.4	-11.3	1.5	303.0	1.7	20.0	Vert	AV	0.0	50.8	54.0	-3.2	High Ch, EUT Vert, 1 Mbps
2483.947	51.7	-11.3	1.5	238.0	0.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	High Ch, EUT Vert, 2 Mbps
2485.467	51.8	-11.3	1.5	303.0	0.0	20.0	Vert	PK	0.0	60.5	74.0	-13.5	High Ch, EUT Vert, 1 Mbps
2484.170	51.7	-11.3	1.5	276.0	0.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	High Ch, EUT Vert, 1 Mbps
2484.993	51.4	-11.3	3.1	60.0	0.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9	High Ch, EUT on Side, 2 Mbps
2484.693	51.2	-11.3	1.5	24.0	0.0	20.0	Vert	PK	0.0	59.9	74.0	-14.1	High Ch, EUT Vert, 2 Mbps
2484.107	51.2	-11.3	1.5	103.0	0.0	20.0	Horz	PK	0.0	59.9	74.0	-14.1	High Ch, EUT on Side, 2 Mbps
2484.353	51.1	-11.3	1.5	161.0	0.0	20.0	Vert	PK	0.0	59.8	74.0	-14.2	High Ch, EUT Horz, 2 Mbps
2389.180	51.4	-11.7	1.5	35.0	0.0	20.0	Vert	PK	0.0	59.7	74.0	-14.3	Low Ch, EUT Vert, 2 Mbps
2389.887	51.3	-11.7	1.5	107.0	0.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	Low Ch, EUT Vert, 2 Mbps
2484.847	50.7	-11.3	1.5	355.0	0.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	High Ch, EUT Horz, 2 Mbps

CONCLUSION

Pass



Tested By

SPURIOUS RADIATED EMISSIONS

EUT:	XP3i	Work Order:	CREN0003
Serial Number:	303983	Date:	2024-02-23
Customer:	Crystal Engineering	Temperature:	21.8°C
Attendees:	None	Relative Humidity:	40.8%
Customer Project:	None	Bar. Pressure (PMSL):	1018 mb
Tested By:	Nolan De Ramos	Job Site:	OC10
Power:	120VAC/60Hz	Configuration:	CREN0003-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2024	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 #:	23	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

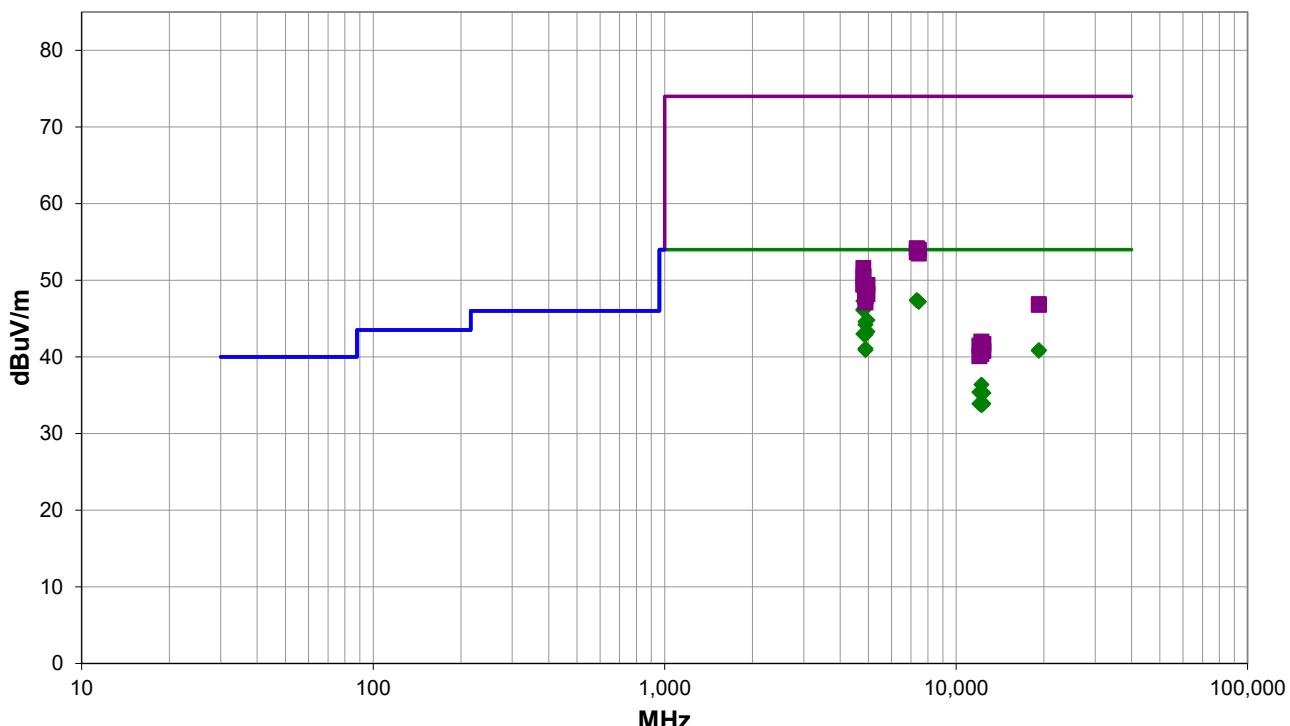
Duty Cycle for 1 Mbps: 0.677 DCCF (1 Mbps) = $10 \times \text{LOG}(1/\text{DC}) = 1.7$ dB. Duty Cycle for 2 Mbps: 0.385 DCCF (2 Mbps) = $10 \times \text{LOG}(1/\text{DC}) = 4.1$ dB.

EUT OPERATING MODES

Transmitting Bluetooth Low Energy. Low channel 0 (2402 MHz), Mid channel 20 (2442 MHz), and High channel 39 (2480 MHz). Data rate: 1 Mbps, 2 Mbps

DEVIATIONS FROM TEST STANDARD

None



Run #: 23

PK AV QP

SPURIOUS RADIATED EMISSIONS

RESULTS - Run #23

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7326.908	35.6	7.7	1.5	98.0	4.1	0.0	Horz	AV	0.0	47.4	54.0	-6.6	Mid Ch, EUT On Side, 2 Mbps
7326.817	35.6	7.7	1.5	292.0	4.1	0.0	Vert	AV	0.0	47.4	54.0	-6.6	Mid Ch, EUT Vert, 2 Mbps
4804.217	45.9	-2.7	3.7	335.0	4.1	0.0	Vert	AV	0.0	47.3	54.0	-6.7	Low Ch, EUT Vert, 2 Mbps
7437.783	35.2	7.9	1.5	105.0	4.1	0.0	Vert	AV	0.0	47.2	54.0	-6.8	High Ch, EUT Vert, 2 Mbps
7437.608	35.2	7.9	1.5	239.0	4.1	0.0	Horz	AV	0.0	47.2	54.0	-6.8	High Ch, EUT On Side, 2 Mbps
4804.058	45.0	-2.7	1.5	26.0	4.1	0.0	Horz	AV	0.0	46.3	54.0	-7.6	Low Ch, EUT On Side, 2 Mbps
4803.992	47.2	-2.7	2.3	24.0	1.7	0.0	Horz	AV	0.0	46.2	54.0	-7.8	Low Ch, EUT on Side, 1 Mbps
4960.150	42.7	-2.0	3.0	311.0	4.1	0.0	Vert	AV	0.0	44.8	54.0	-9.2	High Ch, EUT Vert, 2 Mbps
4884.200	42.8	-2.3	2.7	319.0	4.1	0.0	Vert	AV	0.0	44.6	54.0	-9.4	Mid Ch, EUT Vert, 2 Mbps
4884.225	42.4	-2.3	1.3	322.0	4.1	0.0	Horz	AV	0.0	44.2	54.0	-9.8	Mid Ch, EUT On Side, 2 Mbps
4960.067	41.2	-2.0	1.4	308.0	4.1	0.0	Horz	AV	0.0	43.3	54.0	-10.7	High Ch, EUT On Side, 2 Mbps
4884.167	41.3	-2.3	2.9	50.0	4.1	0.0	Vert	AV	0.0	43.1	54.0	-10.9	Mid Ch, EUT Horz, 2 Mbps
4804.092	44.0	-2.7	2.3	3.0	1.7	0.0	Vert	AV	0.0	43.0	54.0	-11.0	Low Ch, EUT Vert, 1 Mbps
4884.050	41.1	-2.3	2.7	338.0	4.1	0.0	Vert	AV	0.0	42.9	54.0	-11.1	Mid Ch, EUT On Side, 2 Mbps
4884.217	39.3	-2.3	1.5	18.0	4.1	0.0	Horz	AV	0.0	41.1	54.0	-12.9	Mid Ch, EUT Vert, 2 Mbps
4883.858	39.1	-2.3	1.5	303.0	4.1	0.0	Horz	AV	0.0	40.9	54.0	-13.1	Mid Ch, EUT Horz, 2 Mbps
19215.280	37.1	-0.3	1.5	292.0	4.1	0.0	Horz	AV	0.0	40.9	54.0	-13.1	Low Ch, EUT on Side, 2 Mbps
19218.430	37.0	-0.3	1.5	59.0	4.1	0.0	Vert	AV	0.0	40.8	54.0	-13.2	Low Ch, EUT Vert, 2 Mbps
12210.930	34.5	-2.2	2.2	291.0	4.1	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT on Side, 2 Mbps
12009.780	34.4	-3.1	1.0	360.0	4.1	0.0	Vert	AV	0.0	35.4	54.0	-18.6	Low Ch, EUT Vert, 2 Mbps
12399.720	33.2	-2.0	2.5	85.0	4.1	0.0	Horz	AV	0.0	35.3	54.0	-18.7	High Ch, EUT on Side, 2 Mbps
7328.167	46.5	7.7	1.5	292.0	0.0	0.0	Vert	PK	0.0	54.2	74.0	-19.8	Mid Ch, EUT Vert, 2 Mbps
7441.775	46.1	7.9	1.5	105.0	0.0	0.0	Vert	PK	0.0	54.0	74.0	-20.0	High Ch, EUT Vert, 2 Mbps
12010.010	32.9	-3.1	1.5	300.0	4.1	0.0	Horz	AV	0.0	33.9	54.0	-20.1	Low Ch, EUT on Side, 2 Mbps
12399.710	31.8	-2.0	1.5	240.0	4.1	0.0	Vert	AV	0.0	33.9	54.0	-20.1	High Ch, EUT Vert, 2 Mbps
7328.400	46.0	7.7	1.5	98.0	0.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Mid Ch, EUT On Side, 2 Mbps
12211.480	31.7	-2.1	1.5	235.0	4.1	0.0	Vert	AV	0.0	33.7	54.0	-20.3	Mid Ch, EUT Vert, 2 Mbps
7438.133	45.6	7.9	1.5	239.0	0.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	High Ch, EUT On Side, 2 Mbps
4803.775	54.3	-2.7	2.3	24.0	0.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4	Low Ch, EUT on Side, 1 Mbps
4804.742	53.2	-2.7	3.7	335.0	0.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	Low Ch, EUT Vert, 2 Mbps
4804.833	52.1	-2.6	2.3	3.0	0.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	Low Ch, EUT Vert, 1 Mbps
4960.650	51.4	-2.0	3.0	311.0	0.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	High Ch, EUT Vert, 2 Mbps
4804.150	52.1	-2.7	1.5	26.0	0.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Ch, EUT On Side, 2 Mbps
4884.642	51.6	-2.3	2.7	319.0	0.0	0.0	Vert	PK	0.0	49.3	74.0	-24.7	Mid Ch, EUT Vert, 2 Mbps
4884.592	51.1	-2.3	1.3	322.0	0.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	Mid Ch, EUT On Side, 2 Mbps
4883.933	50.6	-2.3	2.7	338.0	0.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Mid Ch, EUT On Side, 2 Mbps
4960.058	50.2	-2.0	1.4	308.0	0.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	High Ch, EUT On Side, 2 Mbps
4883.492	50.2	-2.3	2.9	50.0	0.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	Mid Ch, EUT Horz, 2 Mbps
4886.442	50.1	-2.3	1.5	303.0	0.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	Mid Ch, EUT Horz, 2 Mbps
4885.475	49.4	-2.3	1.5	18.0	0.0	0.0	Horz	PK	0.0	47.1	74.0	-26.9	Mid Ch, EUT Vert, 2 Mbps

SPURIOUS RADIATED EMISSIONS

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
19213.510	47.2	-0.3	1.5	59.0	0.0	0.0	Vert	PK	0.0	46.9	74.0	-27.1	Low Ch, EUT Vert, 2 Mbps
19215.460	47.1	-0.3	1.5	292.0	0.0	0.0	Horz	PK	0.0	46.8	74.0	-27.2	Low Ch, EUT on Side, 2 Mbps
12209.480	44.2	-2.2	2.2	291.0	0.0	0.0	Horz	PK	0.0	42.0	74.0	-32.0	Mid Ch, EUT on Side, 2 Mbps
12399.660	43.7	-2.0	2.5	85.0	0.0	0.0	Horz	PK	0.0	41.7	74.0	-32.3	High Ch, EUT on Side, 2 Mbps
12010.590	44.6	-3.1	1.0	360.0	0.0	0.0	Vert	PK	0.0	41.5	74.0	-32.5	Low Ch, EUT Vert, 2 Mbps
12398.080	42.8	-2.0	1.5	240.0	0.0	0.0	Vert	PK	0.0	40.8	74.0	-33.2	High Ch, EUT Vert, 2 Mbps
12211.110	42.5	-2.1	1.5	235.0	0.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Mid Ch, EUT Vert, 2 Mbps
12010.560	43.2	-3.1	1.5	300.0	0.0	0.0	Horz	PK	0.0	40.1	74.0	-33.9	Low Ch, EUT on Side, 2 Mbps

CONCLUSION

Pass



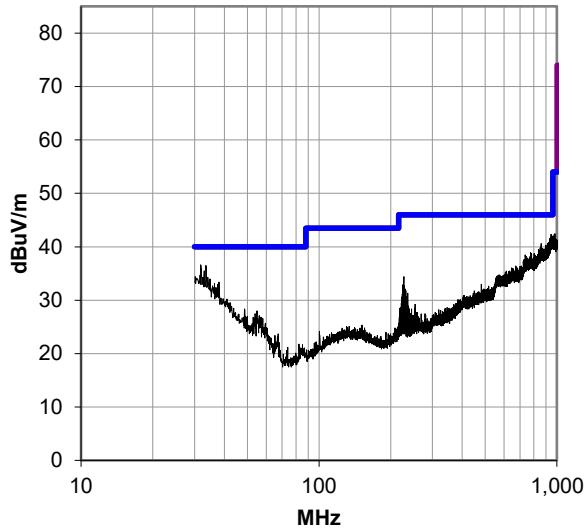
Tested By

SPURIOUS RADIATED EMISSIONS

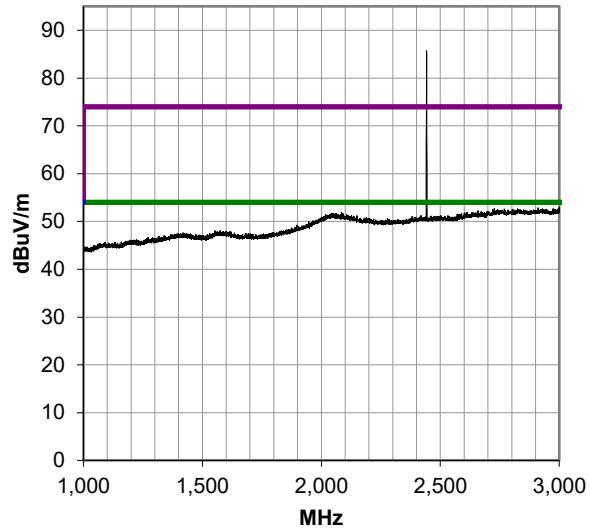
PRESCAN DATA

Radiated spurious emissions from the EUT are initially reviewed with Pre-scans (Preview scans). Pre-scans are performed, with the EUT transmitting on the lowest applicable data rate, for both vertical and horizontal polarizations. The Pre-scan plots below are shown with a peak detector and RBW for the following frequency ranges: 9 kHz RBW (< 30 MHz); 120 kHz RBW (30 - 1000 MHz); 1 MHz RBW (> 1 GHz). In the case where unintentional emissions are observed, an ambient or idle pre-scan with the radio off, will be shown for comparison.

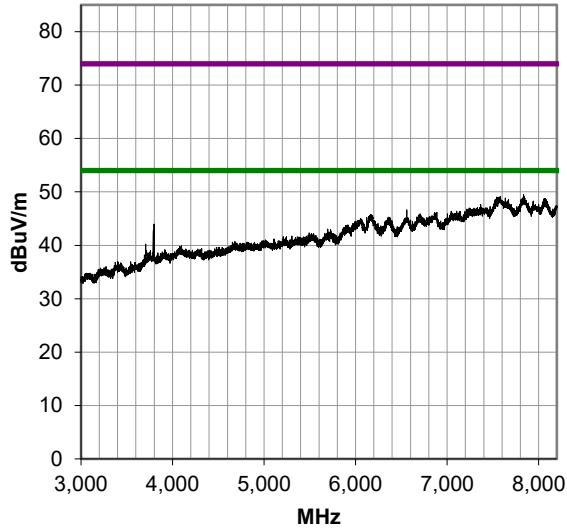
30-1000 MHz, Run 31



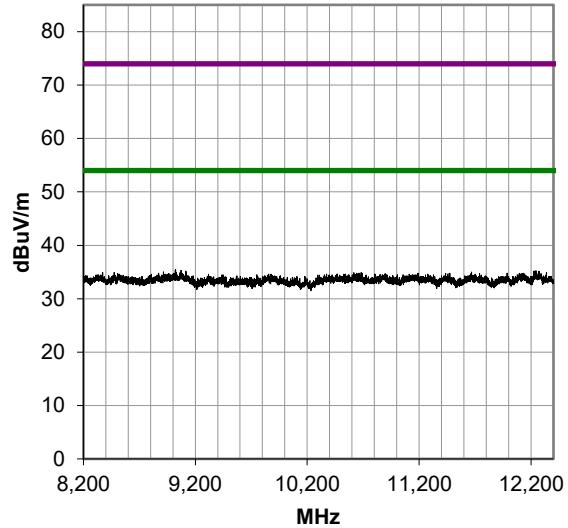
1000-3000 MHz, Run 6



3000-8200 MHz, Run 18



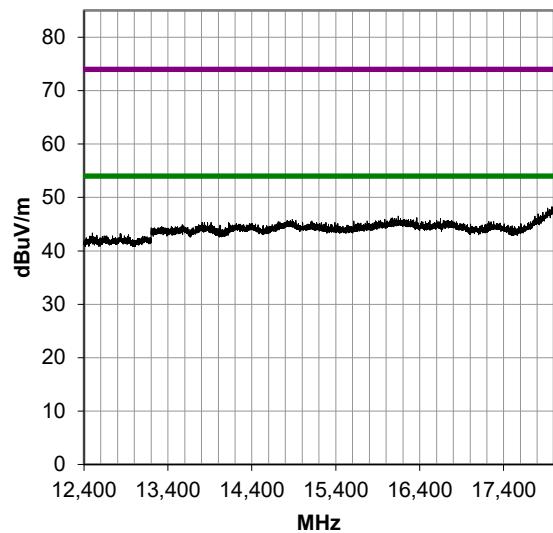
8200-12400 MHz, Run 19



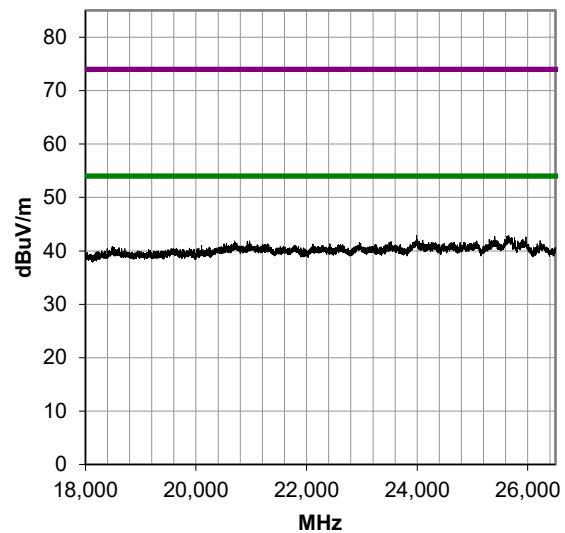
SPURIOUS RADIATED EMISSIONS



12400-18000 MHz, Run 20



18000-26500 MHz, Run 26



End of Test Report