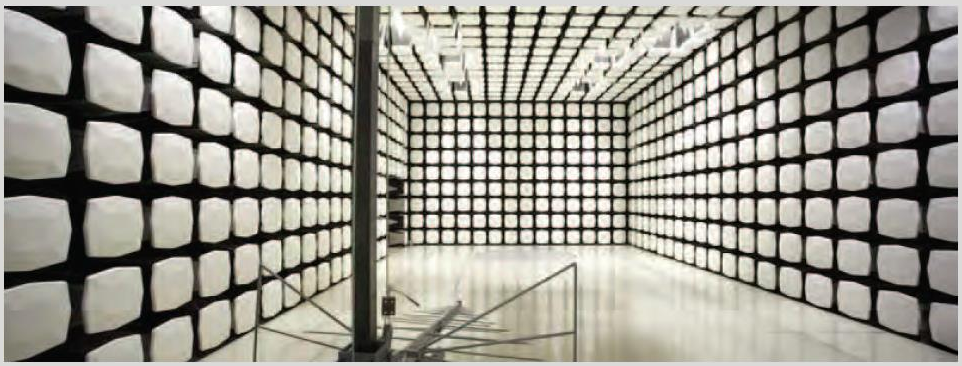
Garrett Metal Detectors

CS-3

2.4 GHz ISM Radio

FCC 15.247:2025
RSS-247 Issue 3:2023
RSS-Gen Issue 5:2018+A1:2019+A2:2021

Report: GARR0129.4 Rev. 1, Issue Date: April 9, 2025



Element Plano
1701 E. Plano Parkway #150
Plano, TX 75074 USA

ACCREDITED
CERT #214.19

TABLE OF CONTENTS

Section	Page Number

Certificate of Test 3
Revision History 5
Accreditations 6
Facilities 7
Measurement Uncertainty 8
Test Setup Block Diagrams 9
Product Description 12
Power Settings and Antenna Information 13
Configurations 14
Modifications 15
Duty Cycle 16
DTS Bandwidth (6dB) 17
Occupied Bandwidth (99%) 20
Output Power 23
Equivalent Isotropic Radiated Power 26
Power Spectral Density 29
Band Edge Compliance 32
Spurious Conducted Emissions 35
Radiated Spurious Emissions Restricted Band Edge 40
Spurious Radiated Emissions 45
End of Report 52

CERTIFICATE OF TEST

Last Date of Test: April 1, 2025
Garrett Metal Detectors
EUT: CS-3

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2025	ANSI C63.10:2020
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	N/A	15.207	RSS-Gen 8.8	6.2	Manufacturer states that EUT cannot transmit while charging.
Duty Cycle	N/A	KDB 558074 -6.0	RSS-Gen 3.2	11.6	Operates at 100%.
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	11.9.2.2.2	
Equivalent Isotropic Radiated Power	Pass	15.247(b)(3), KDB 558074 -8.3.1	RSS-247 5.4(d, f), RSS-Gen 6.12	11.9.2.2.2	
Power Spectral Density	Pass	15.247(e), KDB 558074 -8.4	RSS-247 5.2(b)	11.10.3	
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	
Radiated Band Edge 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, 6.6	
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, 6.4, 6.5, 6.6	

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

CERTIFICATE OF TEST

Deviations From Test Standards

None

Approved By:

Adam Bruno, Operations Manager
Signed for and on behalf of Element

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

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated FCC specification year to 2025.	2025-04-02	1
	HVIN added to Product Description page as part of EUT Identification.	2025-04-02	3
	Updated testing objective.	2025-04-02	12
	Firmware designated in Power Settings table.	2025-04-02	13
	Updated serial numbers in configurations and data.	2025-04-02	14
	Updated test descriptions in DTS Bandwidth (6 dB), Occupied Bandwidth (99%), Output Power, EIRP, and PSD.	2025-04-02	17, 20, 23, 26, 29
	AC Powerline data removed. CoT edited with comment "Manufacturer states EUT does not transmit while charging."	2025-04-02	3
	Test descriptions updated to include that AVGSA-1 method was used and site specific clauses of C63.10:2020.	2025-04-02	23, 26
	New radiated band edge measurements taken per C63.10:2020 and added as separate module. Pre-scans from 9 kHz to 30 MHz with corrected limit lines applied to existing SRE data.	2025-04-02	40-44
	Updated dates.	2025-04-02	3, 12, 15
	Retested OP/EIRP to correct high channel capture and verify expected readings. Transcribed proper channel power values.	2025-04-09	24, 27
	Update the OP, EIRP, and PSD method sections.	2025-04-09	3
	remove the RBW and duty cycle correction factor columns and updated test description.	2025-04-09	30

ACCREDITATIONS AND AUTHORIZATIONS

element
2025.02.07

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.

FDA - Recognized by the FDA as an Accreditation Scheme for Conformity Assessment (ASCA)-accredited testing laboratory for basic safety and essential performance.

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.

SCOPE

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

California Minnesota Oregon Washington

FACILITIES

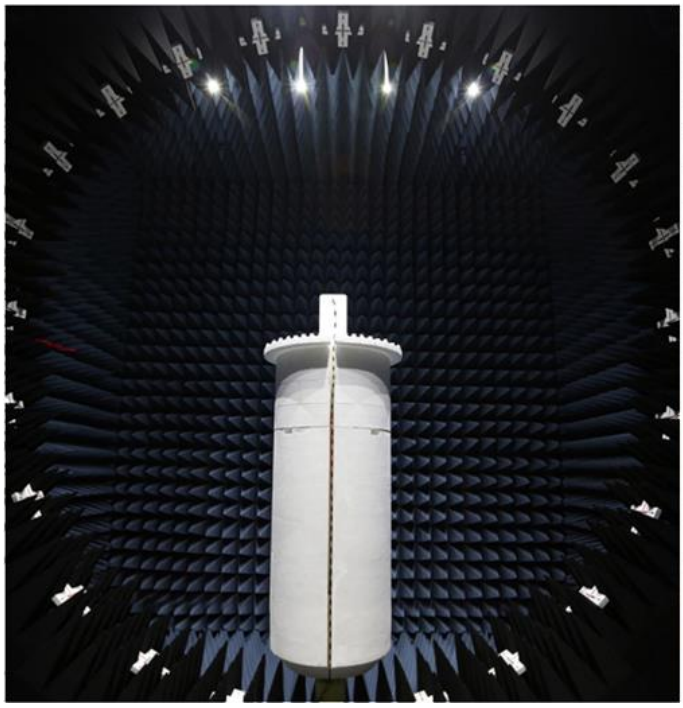
element
2025.01.03

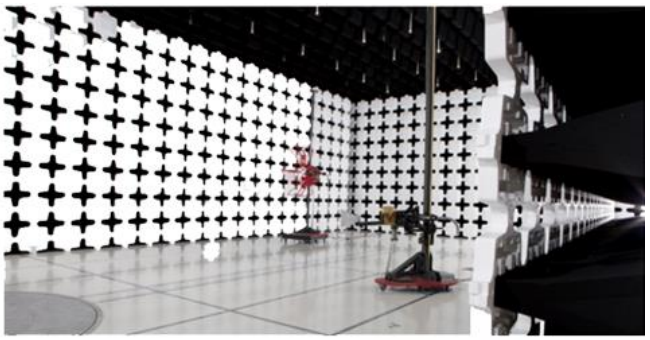
Testing was performed at the following location(s)

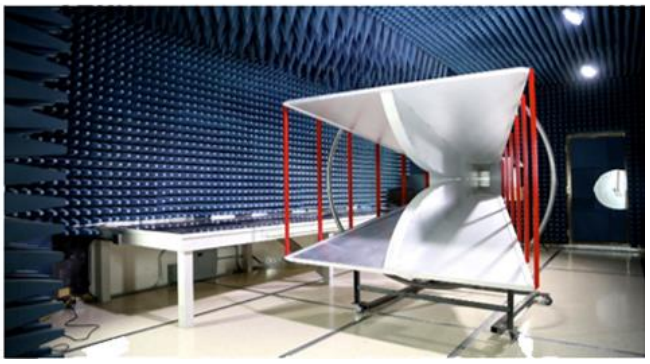
	Location	Labs (1)	Address	A2LA (2)	ISED (3)	BSMI (4)	VCCI (5)	CAB (6)	FDA (7)
☒	Plano Texas	PT01-15	1701 E Plano Pkwy, Ste 150 Plano, TX 75074 (972) 509-2566	214.19	32637	SL2-IN-E-057R	A-0426	US0054	TL-137
☐	Offsite	N/A	See Product Description	N/A	N/A	N/A	N/A	N/A	N/A

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, MOC, NCC, OFCA
(7) FDA ASCA No.







MEASUREMENT UNCERTAINTY

element
MU 2024-12-12

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 reported is based on statistical analysis that was performed by the laboratory. 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	PT01 (+/-)	PT15 (+/-)
10kHz-30MHz	1.8	N/A
30MHz-1GHz 3m	4.9	N/A
1GHz-6GHz	5.1	N/A
6GHz-18GHz	5	N/A

AC Powerline Conducted Emissions Measurements (dB)

Range	PT12 (+/-)
9kHz-150kHz LISN	3.6
150kHz-30MHz LISN	3.2
150kHz-30MHz CVP	3
150kHz-30MHz Telecom-ISN	4.4

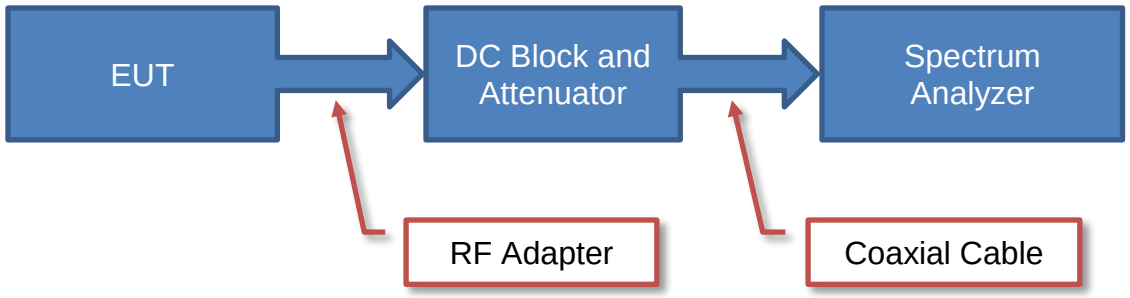
TEST SETUP BLOCK DIAGRAMS

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.

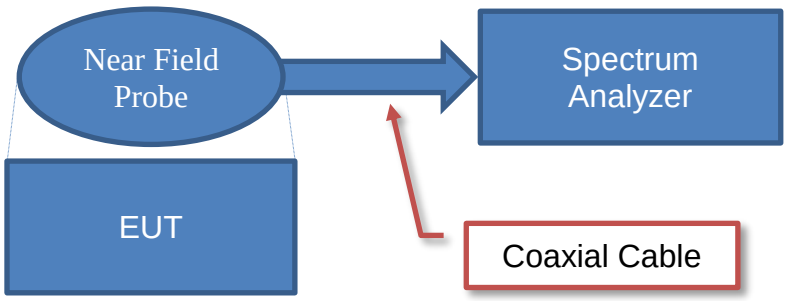
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

Near Field Test Fixture Measurements

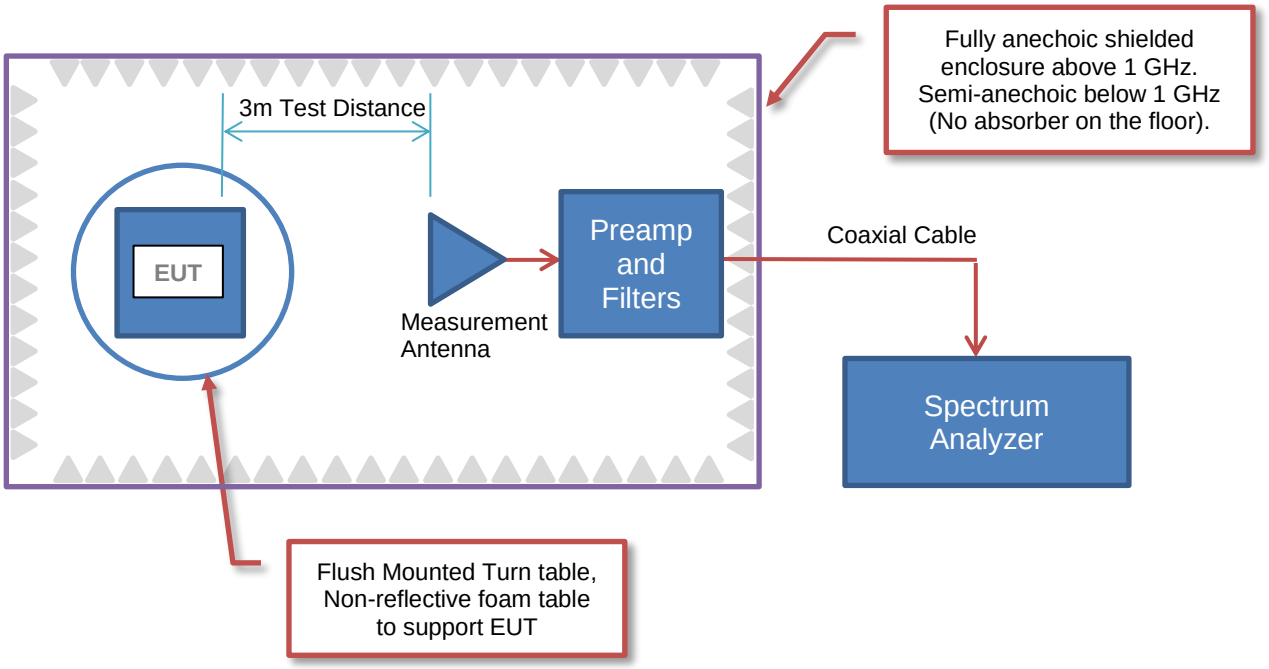


Sample Calculation (logarithmic units)

Measured Value		Measured Level		Reference Level Offset
71.2	=	42.6	+	28.6

TEST SETUP BLOCK DIAGRAMS

Emissions Measurements



Sample Calculation (logarithmic units)

Radiated Emissions:

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

Conducted Emissions:

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

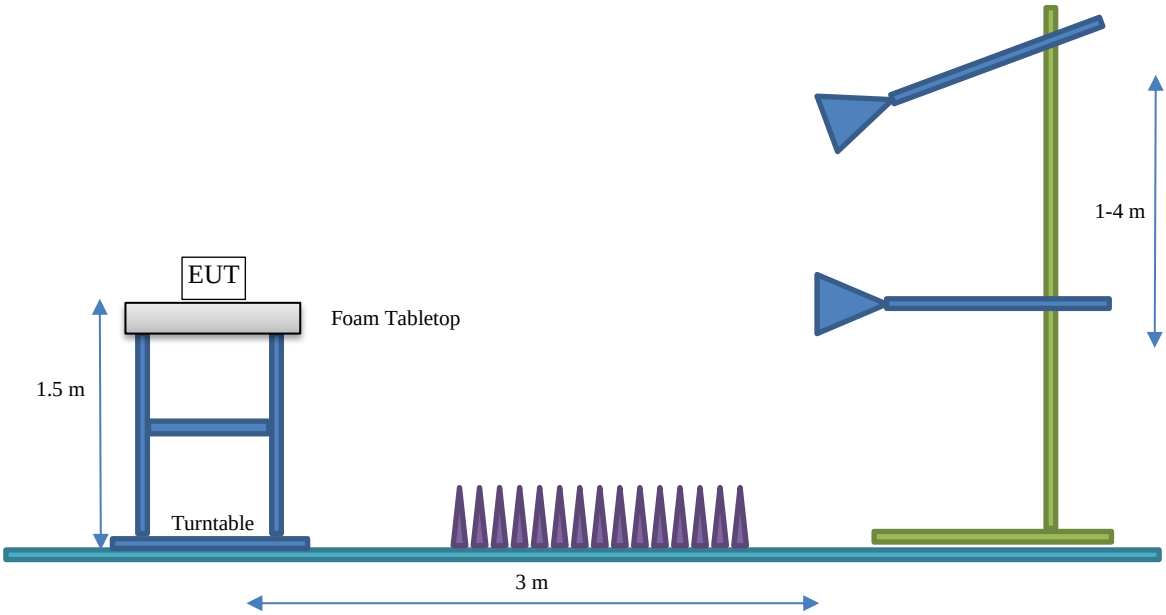
Radiated Power (ERP/EIRP) – Substitution Method:

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

TEST SETUP BLOCK DIAGRAMS

Bore Sighting (>1GHz)

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



PRODUCT DESCRIPTION

Client and Equipment under Test (EUT) Information

Company Name:	Garrett Metal Detectors
Address:	1881 West State Street
City, State, Zip:	Garland, TX 75042
Test Requested By:	Bob Podhrasky
EUT:	CS-3 (HVIN: 1635500)
First Date of Test:	February 20, 2025
Last Date of Test:	April 1, 2025
Receipt Date of Samples:	February 20, 2025
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Wireless Headphone pack using 2.4GHz Wideband Radio that allows user to connect their own headphones to a wireless module.

Testing Objective:
Seek to demonstrate compliance of the Wideband DTS Transceiver under FCC 15.247:2025 and RSS-247 Issue 3:2023 for operation in the 2400 MHz to 2483.5 MHz Band.

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)
25.58mm x 6.91mm, Inverted F	Texas Instruments, SWRU120D	2300 - 2700	3.3

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

☒ Test software settings Firmware used for testing: M144 Rev. 1.00
☐ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position	Frequency (MHz)	Power Setting
8FSK	Low Channel	2406	+5 dBm
	Mid Channel	2438	
	High Channel	2474	

CONFIGURATIONS

Configuration GARR0129-4

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Headphone (Modified)	Garrett Metal Detectors	Garrett Z-Link CS-3	E001

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC/DC Power Brick	Shenzhen Shi Ying Yuan Electronics	ICP20-050-30008	ICM20-050UV1

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB-C Charging Cable	Yes	94cm	No	Laptop Computer	Headphone

Configuration GARR0129-7

Software/Firmware Running During Test	
Description	**Version**
PurePath Wireless commander - Texas Instruments	1.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Headphone (Modified)	Garrett Metal Detectors	Garrett Z-Link CS-3	E001

Configuration GARR0129-8

Software/Firmware Running During Test	
Description	**Version**
PurePath Wireless commander - Texas Instruments	1.1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
PCB Board	Garrett Metal Detectors	rR2	2356000

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.2m	No	AC Mains	AC/DC Power Supply (Laptop)
DC Cable	No	1.6m	No	AC/DC Power Supply (Laptop)	Laptop Computer
USB-Micro USB Cable	No	1m	No	Laptop Computer	CC Debugger
Ribbon Cable	No	23.5cm	No	CC Debugger	Headphone (Modified)

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2025-02-20	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.
2	2025-02-20	Emissions 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.
3	2025-02-20	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.
4	2025-02-20	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.
5	2025-02-20	Spurious Emissions Unwanted Emission Strength	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	2025-02-21	Equivalent Isotropic Radiated Power (EIRP)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2025-02-21	Output Power	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2025-02-24	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.
9	2025-02-27	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.
10	2025-04-01	Radiated Spurious Emissions Restricted Band Edge	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

DUTY CYCLE

element
WTD.2024.12.31.0

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 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.

DTS BANDWIDTH (6 dB)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

DTS BANDWIDTH (6 dB)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-03-31
Customer:	Garrett Metal Detectors	Temperature:	23.7°C
Attendees:	None	Relative Humidity:	38.1%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

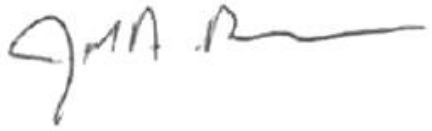
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



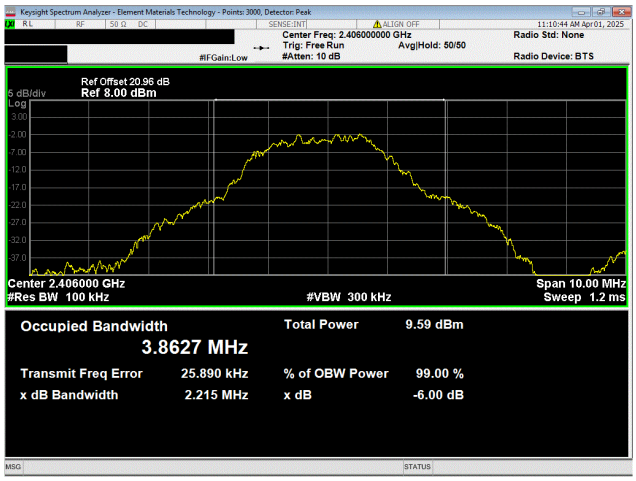
Tested By

TEST RESULTS

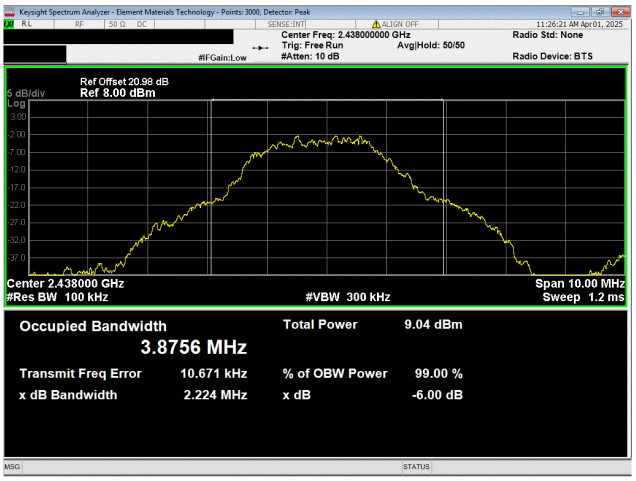
	Value	Limit (>)	Result
8FSK, 5Mbps			
Low Channel, 2406 MHz	2.215 MHz	500 kHz	Pass
Mid Channel, 2438 MHz	2.224 MHz	500 kHz	Pass
High Channel, 2474 MHz	2.203 MHz	500 kHz	Pass

DTS BANDWIDTH (6 dB)

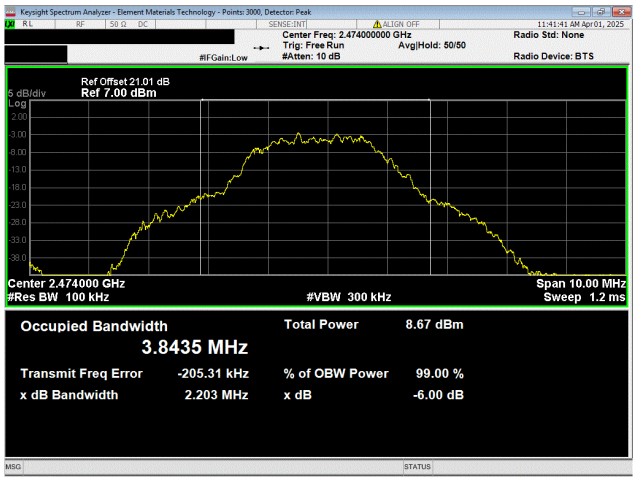
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

OCCUPIED BANDWIDTH (99%)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07

OCCUPIED BANDWIDTH (99%)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-03-31
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

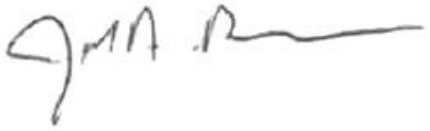
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



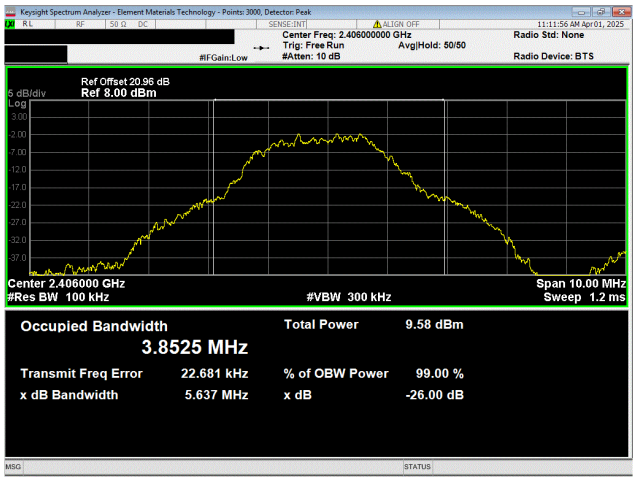
Tested By

TEST RESULTS

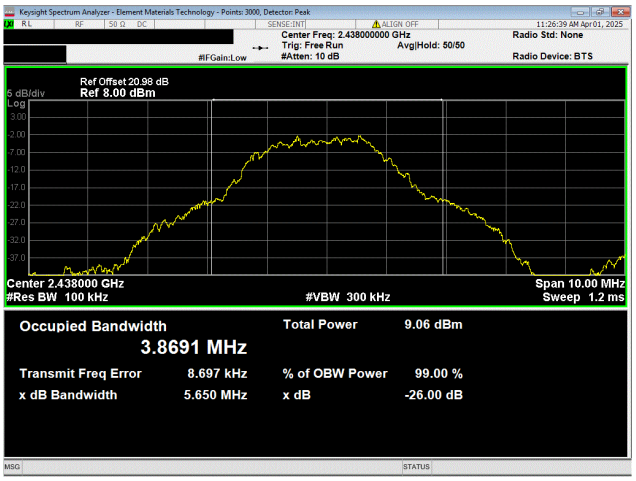
	Value	Limit	Result
8FSK, 5Mbps			
Low Channel, 2406 MHz	3.853 MHz	N/A	N/A
Mid Channel, 2438 MHz	3.869 MHz	N/A	N/A
High Channel, 2474 MHz	3.854 MHz	N/A	N/A

OCCUPIED BANDWIDTH (99%)

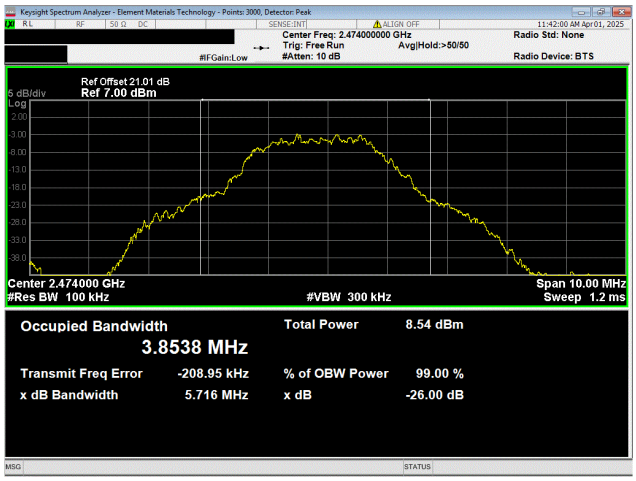
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

OUTPUT POWER

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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 fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-1 in section 11.9.2.2.2 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

OUTPUT POWER

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-04-07
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

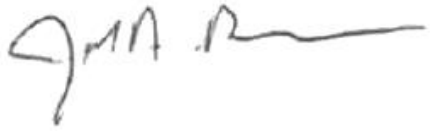
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



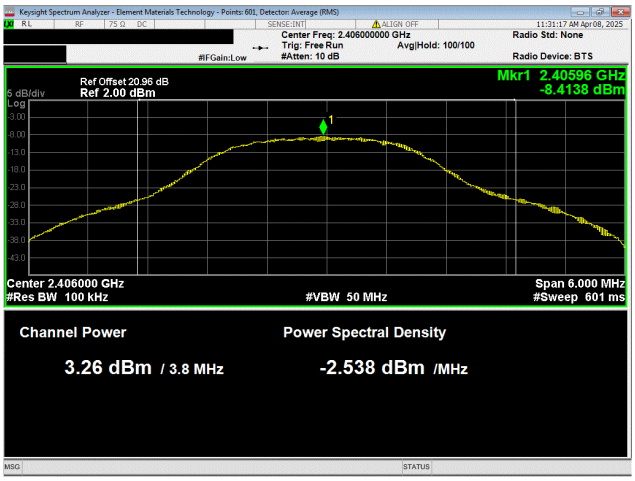
Tested By

TEST RESULTS

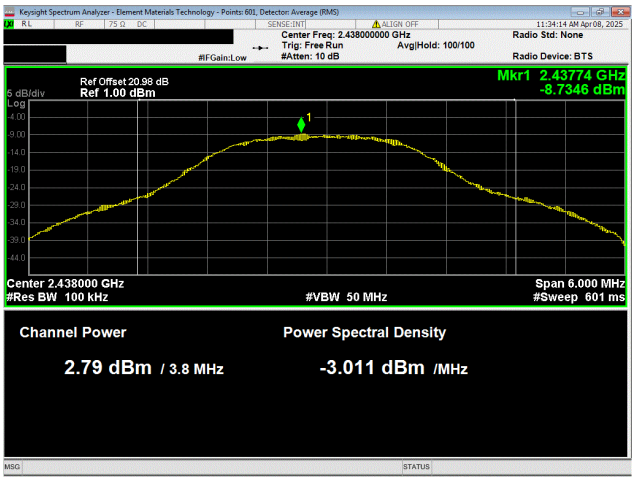
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Output Pwr (dBm)	Limit (dBm)	Result
8FSK, 5Mbps					
Low Channel, 2406 MHz	3.26	0	3.3	30	Pass
Mid Channel, 2438 MHz	2.79	0	2.8	30	Pass
High Channel, 2474 MHz	2.31	0	2.3	30	Pass

OUTPUT POWER

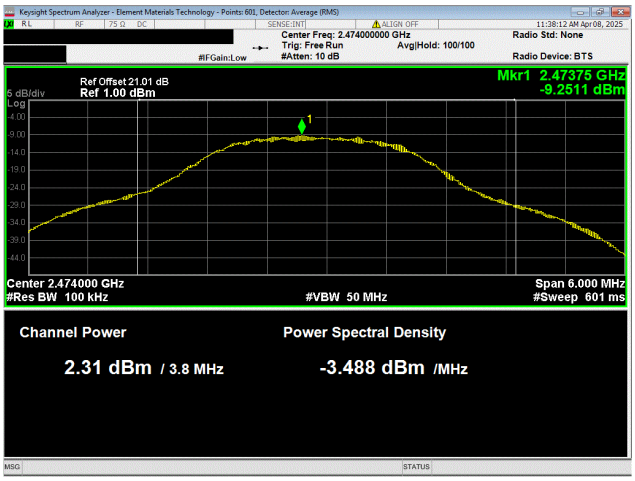
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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 fundamental emission output power (maximum average conducted output power) was measured using the channels and modes as called out on the following data sheets. The transmit power was set to its default maximum.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-1 in section 11.9.2.2.2 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-04-07
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

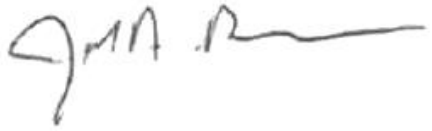
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



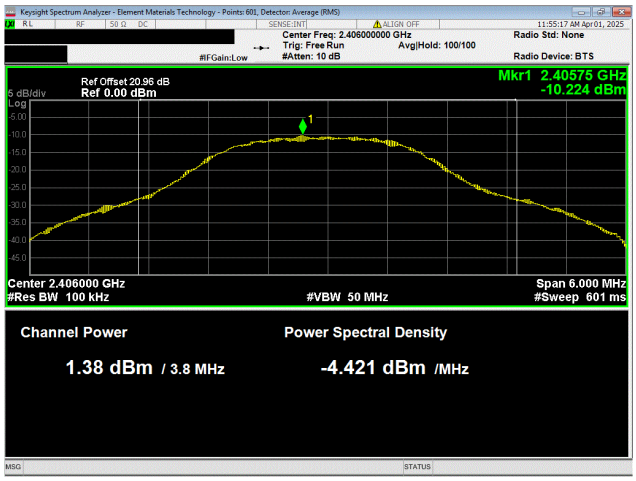
Tested By

TEST RESULTS

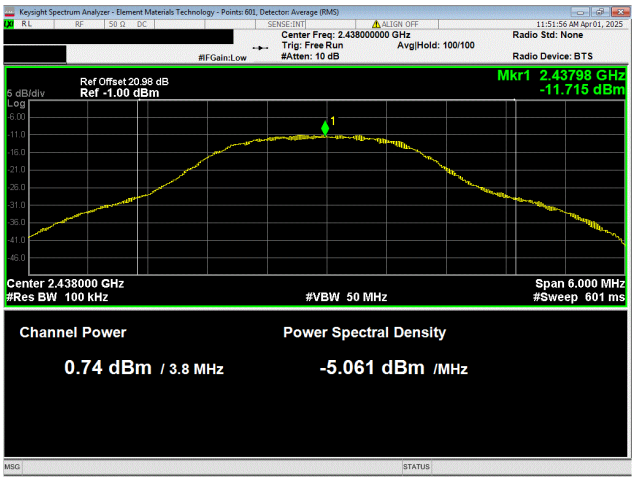
	Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
8FSK, 5Mbps							
Low Channel, 2406 MHz	3.26	0	3.3	3.3	6.6	36	Pass
Mid Channel, 2438 MHz	2.79	0	2.8	3.3	6.1	36	Pass
High Channel, 2474 MHz	2.31	0	2.3	3.3	5.6	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

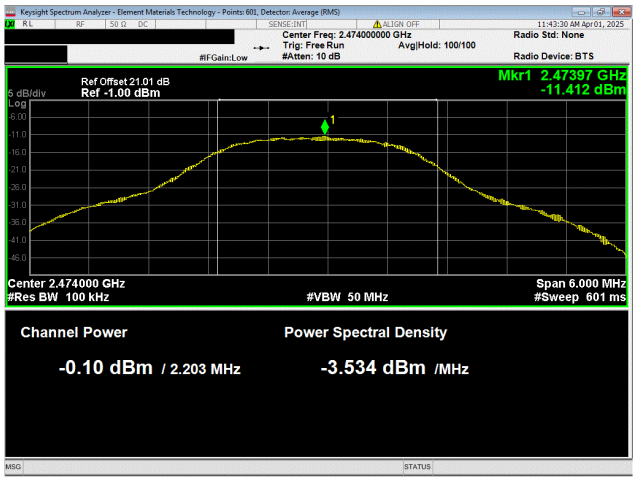
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

POWER SPECTRAL DENSITY

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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

The method AVGPSD-1 in clause 11.10.3 of ANSI C63.10:2020 was used to make the measurement. This method uses trace averaging and RMS detection across the ON and OFF times of the transmission. The analyzer was configured to the following settings:

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

POWER SPECTRAL DENSITY

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-03-31
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

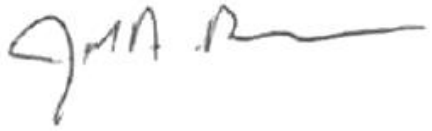
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



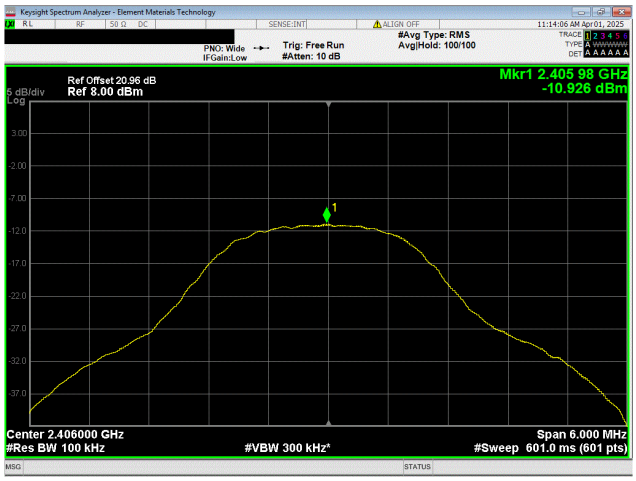
Tested By

TEST RESULTS

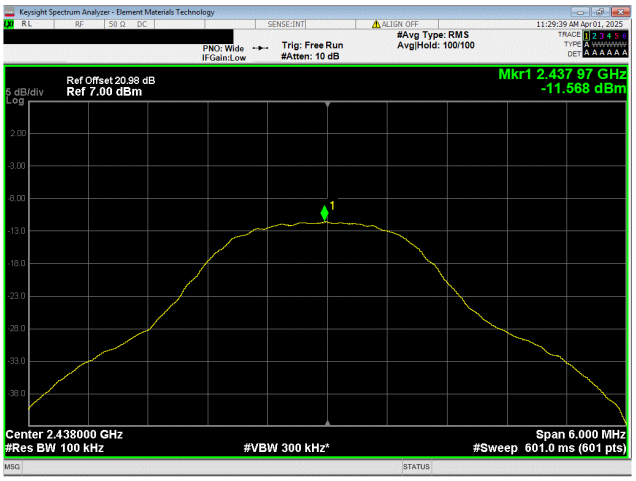
	Value dBm/100kHz	Limit ≤ (dBm/3kHz)	Results
8FSK, 5Mbps			
Low Channel, 2406 MHz	-10.926	8	Pass
Mid Channel, 2438 MHz	-11.568	8	Pass
High Channel, 2474 MHz	-12.035	8	Pass

POWER SPECTRAL DENSITY

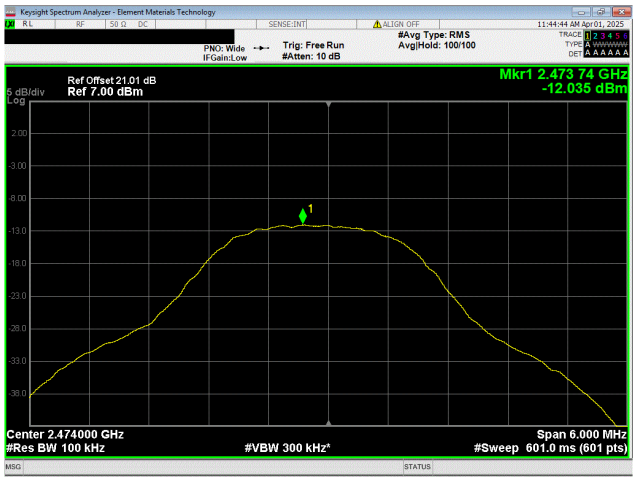
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

BAND EDGE COMPLIANCE

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

BAND EDGE COMPLIANCE

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	2356000	Date:	2025-03-31
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-3

COMMENTS

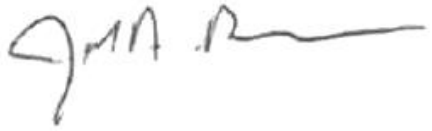
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



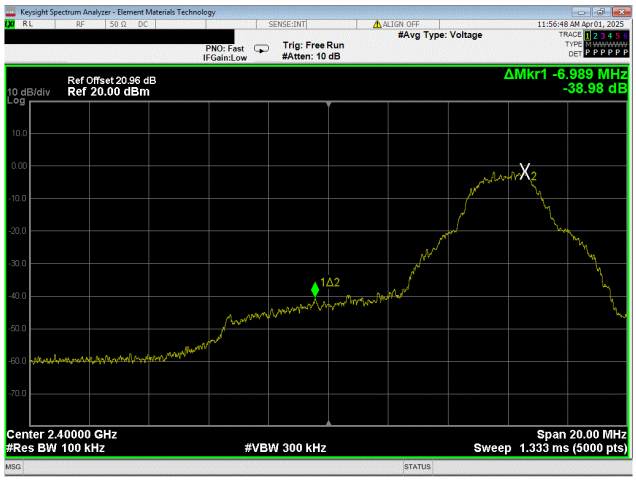
Tested By

TEST RESULTS

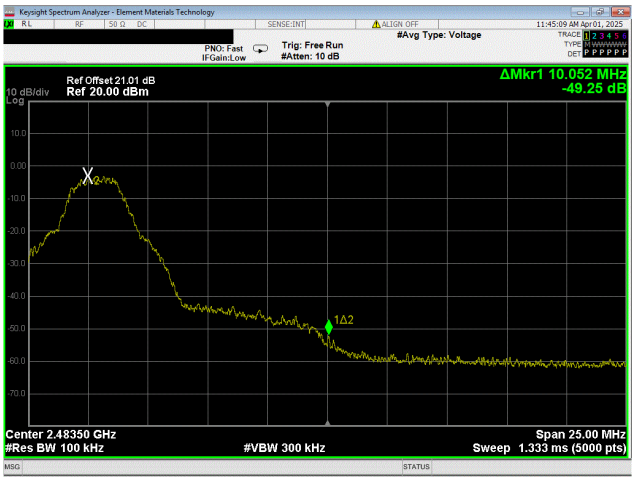
	Value (dBc)	Limit ≤ (dBc)	Result
8FSK, 5Mbps			
Low Channel, 2406 MHz	-38.98	-30	Pass
High Channel, 2474 MHz	-49.25	-30	Pass

BAND EDGE COMPLIANCE

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

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	Keysight	N9010A	AFQ	2025-02-21	2026-02-21
Block - DC	Centric RF	C0140	ANJ	NCR	NCR
Attenuator	Fairview Microwave	SA4018-20	TYE	2024-09-05	2025-09-05
Cable	UtiFlex Micro-Coax	UFD1150A-1-0720-200200	TXK	2024-09-03	2025-09-03
Generator - Signal	Agilent	N5173B	TIW	2023-08-07	2026-08-07
Power Supply - DC	Extech	382275	TSL	NCR	NCR

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	None	Date:	2025-03-31
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.7%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT14
Power:	3.7 VDC	Configuration:	GARR0129-8

COMMENTS

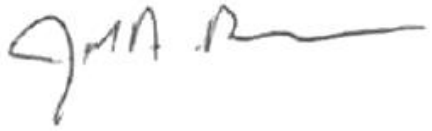
All losses in the measurement path were accounted for in the spectrum analyzer reference level offset where used; DC Block, attenuator, and cables.

DEVIATIONS FROM TEST STANDARD

None

CONCLUSION

Pass



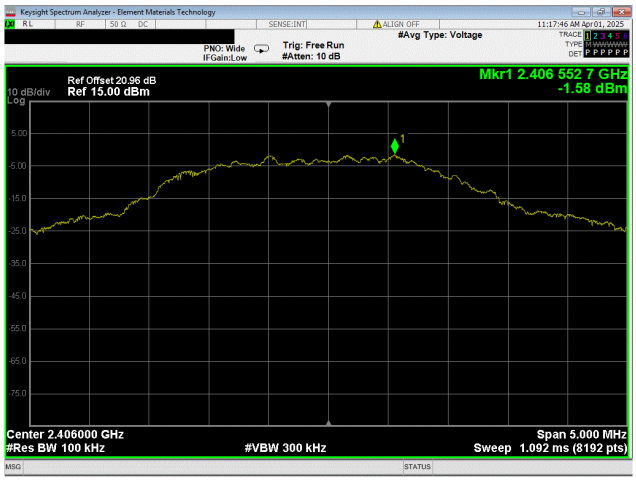
Tested By

TEST RESULTS

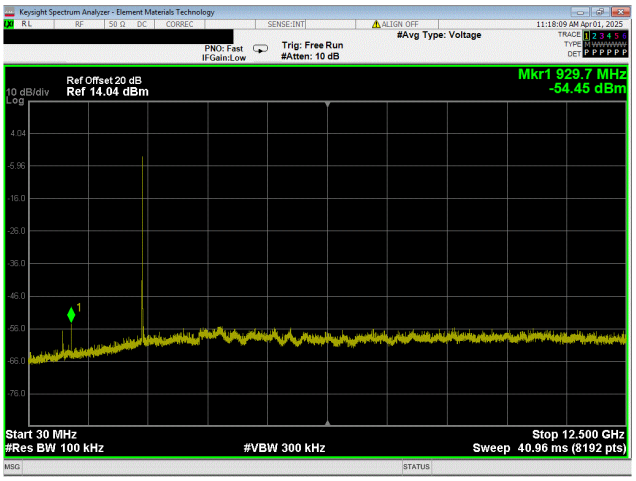
	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
8FSK, 5Mbps					
Low Channel, 2406 MHz	Fundamental	2406.55	N/A	N/A	N/A
	30 MHz - 12.5 GHz	929.74	-52.87	-30	Pass
	12.5 GHz - 25 GHz	24496.4	-50.55	-30	Pass
Mid Channel, 2438 MHz	Fundamental	2438.55	N/A	N/A	N/A
	30 MHz - 12.5 GHz	929.74	-49.22	-30	Pass
	12.5 GHz - 25 GHz	24943.54	-49.01	-30	Pass
High Channel, 2474 MHz	Fundamental	2473.5	N/A	N/A	N/A
	30 MHz - 12.5 GHz	929.74	-51.68	-30	Pass
	12.5 GHz - 25 GHz	23504.46	-49.93	-30	Pass

SPURIOUS CONDUCTED EMISSIONS

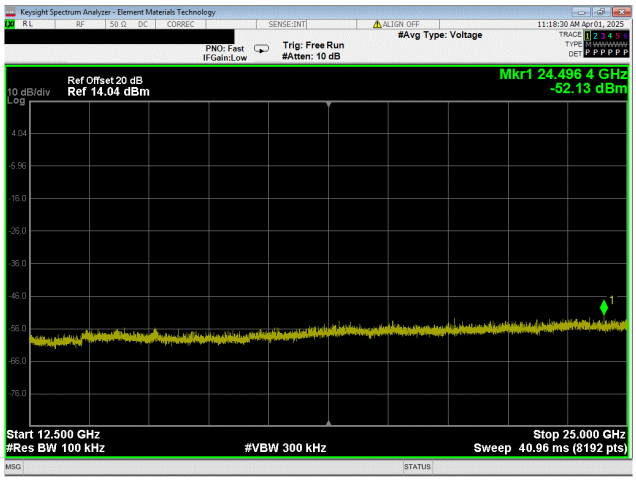
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



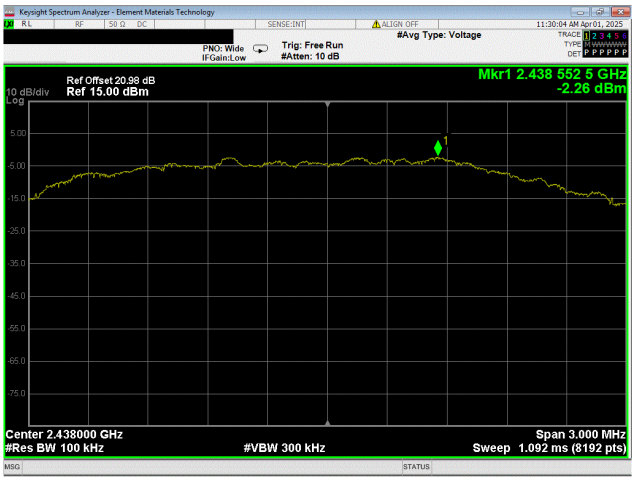
8FSK, 5Mbps
Low Channel, 2406 MHz



8FSK, 5Mbps
Low Channel, 2406 MHz



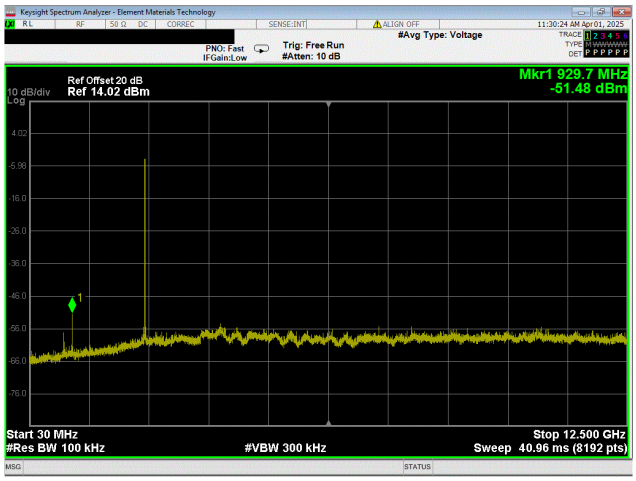
8FSK, 5Mbps
Low Channel, 2406 MHz



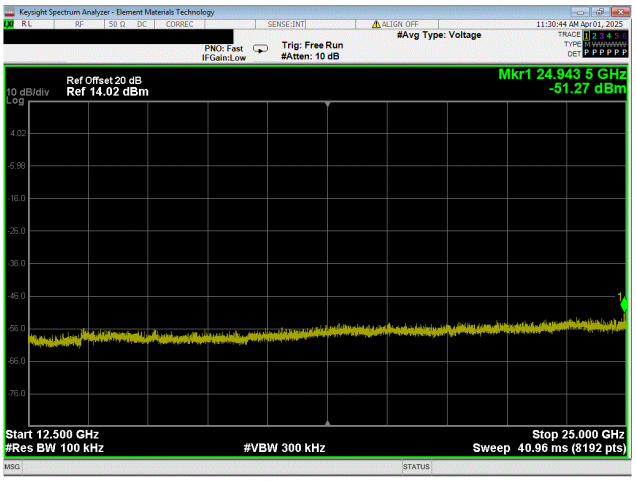
8FSK, 5Mbps
Mid Channel, 2438 MHz

SPURIOUS CONDUCTED EMISSIONS

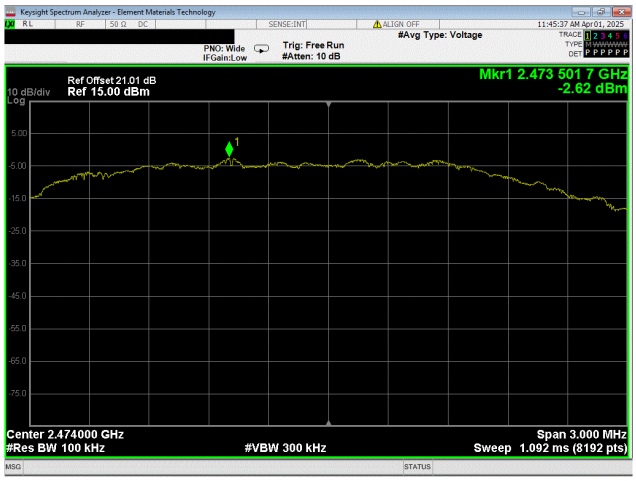
element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



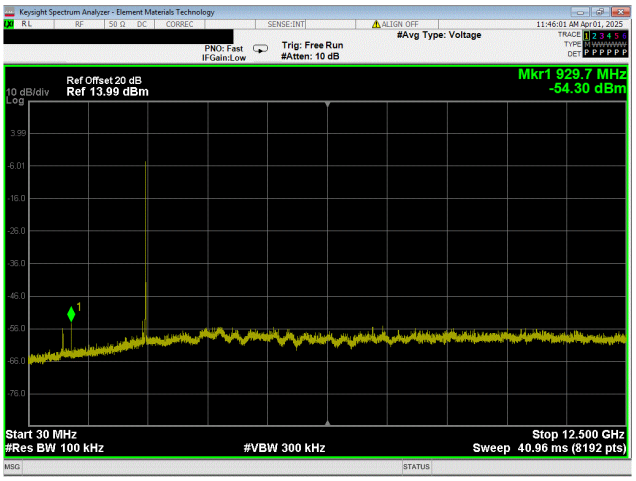
8FSK, 5Mbps
Mid Channel, 2438 MHz



8FSK, 5Mbps
Mid Channel, 2438 MHz



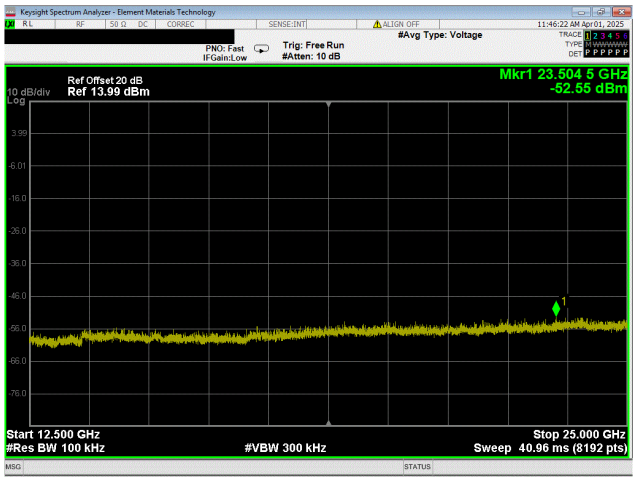
8FSK, 5Mbps
High Channel, 2474 MHz



8FSK, 5Mbps
High Channel, 2474 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2024.10.31.2
WTD.2024.12.31.0



8FSK, 5Mbps
High Channel, 2474 MHz

RADIATED SPURIOUS EMISSIONS RESTRICTED BAND EDGE

element
EmiR5 2024.05.24.5
WTD.2025.03.25.0

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 in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power.

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.

The 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 attenuation were used (if needed) 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:

PK = Peak Detector
AV = RMS Detector

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*log(1/dc).

RMS measurements taken for a FHSS radio also may have a duty cycle correction subtracted using the formula 10*log(DC), where DC is the worst-case dwell time of the radio while in a hopping mode in a 100 ms period.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AJN	2024-09-27	2026-09-27
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	2025-02-12	2026-02-12
Cable	Element	None	TXM	2024-07-09	2025-07-09
Attenuator	Weinschel Corp	4H-20	AWB	2025-02-12	2026-02-12
Analyzer - Spectrum Analyzer	Agilent	E4446A	AFZ	2025-02-12	2026-02-12

RADIATED SPURIOUS EMISSIONS
RESTRICTED BAND EDGE

element
EmiR5 2024.05.24.5
WTD.2025.03.25.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	E001	Date:	2025-04-01
Customer:	Garrett Metal Detectors	Temperature:	23.1°C
Attendees:	None	Relative Humidity:	38.9%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mbar
Tested By:	Jarrod Brenden	Job Site:	PT01
Power:	Battery	Configuration:	GARR0129-7

COMMENTS
None

DEVIATIONS FROM TEST STANDARD
None

CONCLUSION
Pass

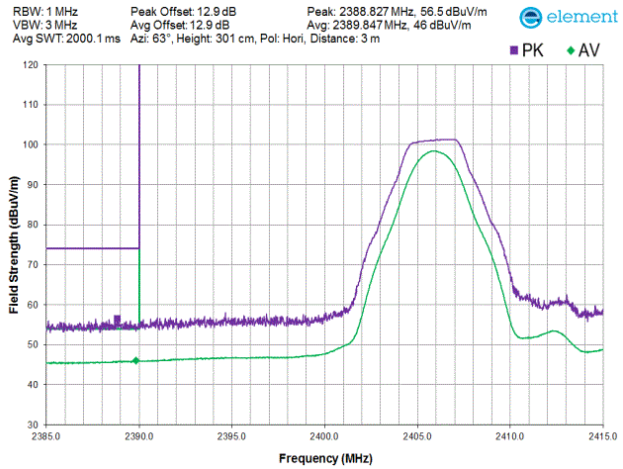
Tested By

TEST RESULTS

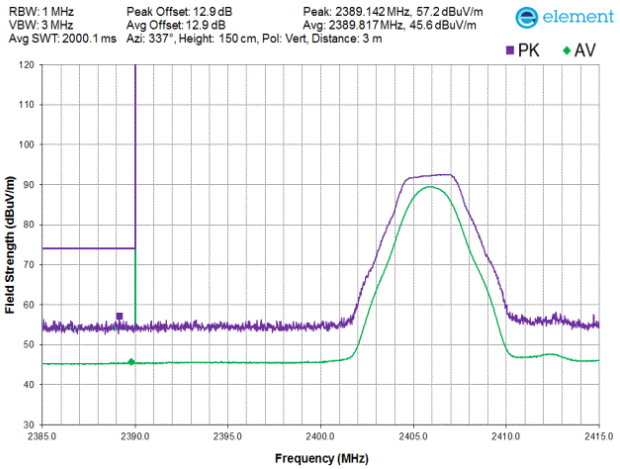
	Frequency (MHz)	PK (dBuV/m) AV (dBuV/m)	PK Lim (dBuV/m) AV Lim (dBuV/m)	Worst Margin (dB)	Pol. (H/V)	EUT Orientation	Results
8FSK 5 Mbps							
Low Channel, 2406 MHz	2388.827 2389.847	56.5 46.0	74.0 54.0	-8.0	H	Horizontal	Pass
	2389.142 2389.817	57.2 45.6	74.0 54.0	-8.4	V	Horizontal	Pass
	2389.667 2388.887	56.3 45.6	74.0 54.0	-8.4	H	Vertical	Pass
	2389.967 2389.772	58.0 45.7	74.0 54.0	-8.3	V	Vertical	Pass
	2387.596 2388.602	55.9 45.5	74.0 54.0	-8.5	H	on Side	Pass
	2385.900 2388.977	57.3 45.7	74.0 54.0	-8.3	V	on Side	Pass
High Channel, 2474 MHz	2487.510 2483.573	57.3 46.1	74.0 54.0	-7.9	V	Horizontal	Pass
	2484.428 2483.538	57.6 46.9	74.0 54.0	-7.1	V	Vertical	Pass
	2486.964 2483.503	58.6 47.0	74.0 54.0	-7.0	H	Vertical	Pass
	2484.028 2483.548	57.4 46.6	74.0 54.0	-7.4	H	on Side	Pass
	2483.773 2483.503	57.2 46.6	74.0 54.0	-7.4	V	on Side	Pass
	2485.243 2483.503	58.0 47.0	74.0 54.0	-7.0	H	Horizontal	Pass

RADIATED SPURIOUS EMISSIONS
RESTRICTED BAND EDGE

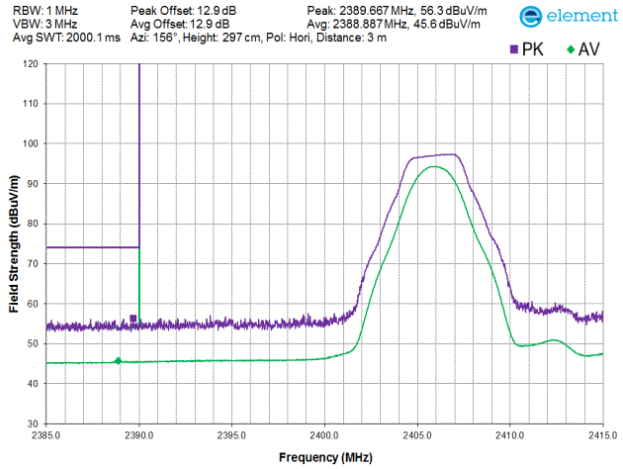
element
EmiR5 2024.05.24.5
WTD.2025.03.25.0



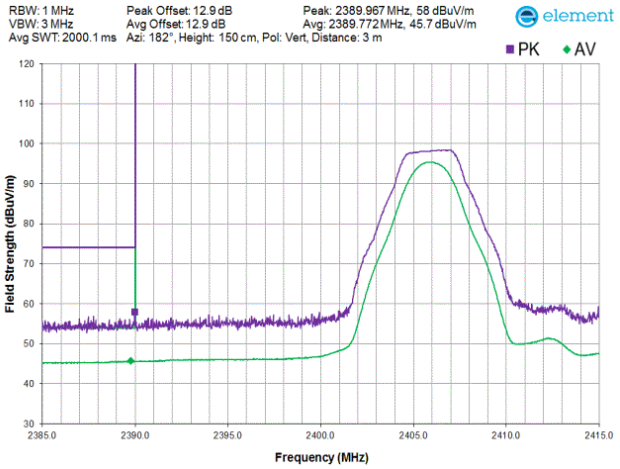
8FSK 5 Mbps
Low Channel, 2406 MHz
EUT Horizontal, RX Horizontal



8FSK 5 Mbps
Low Channel, 2406 MHz
EUT Horizontal, RX Vertical



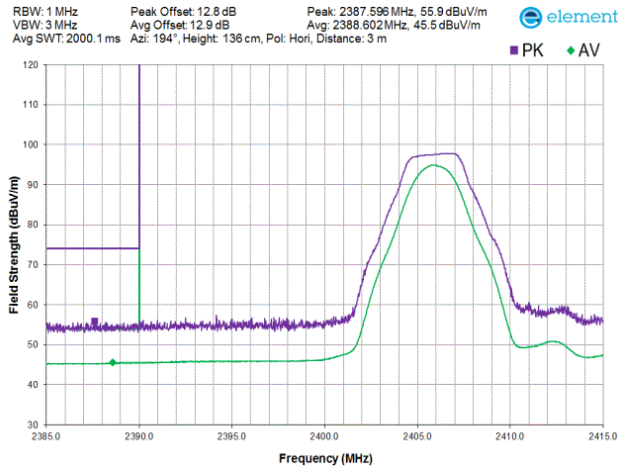
8FSK 5 Mbps
Low Channel, 2406 MHz
EUT Vertical, RX Horizontal



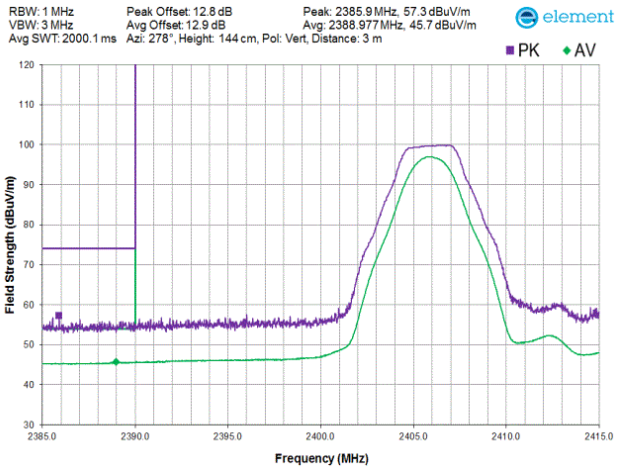
8FSK 5 Mbps
Low Channel, 2406 MHz
EUT Vertical, RX Vertical

RADIATED SPURIOUS EMISSIONS
RESTRICTED BAND EDGE

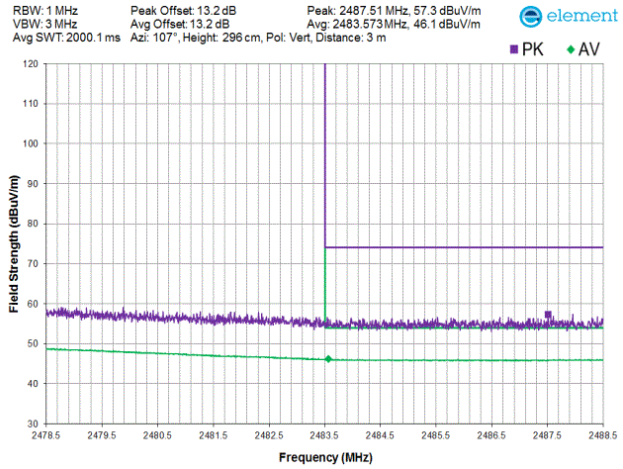
element
EmiR5 2024.05.24.5
WTD.2025.03.25.0



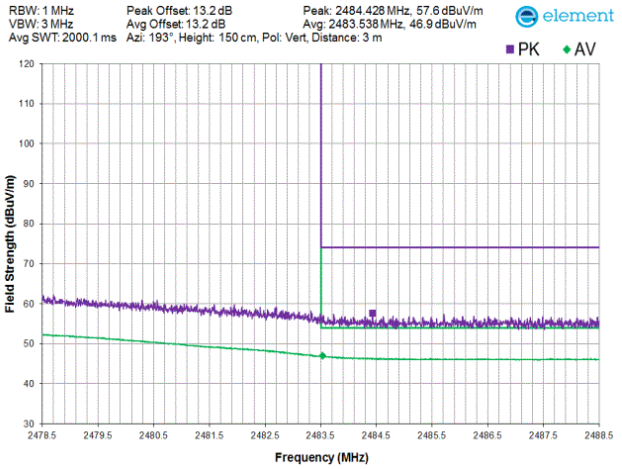
8FSK 5 Mbps
Low Channel, 2406 MHz
EUT on Side, RX Horizontal



8FSK 5 Mbps
Low Channel, 2406 MHz
EUT on Side, RX Vertical



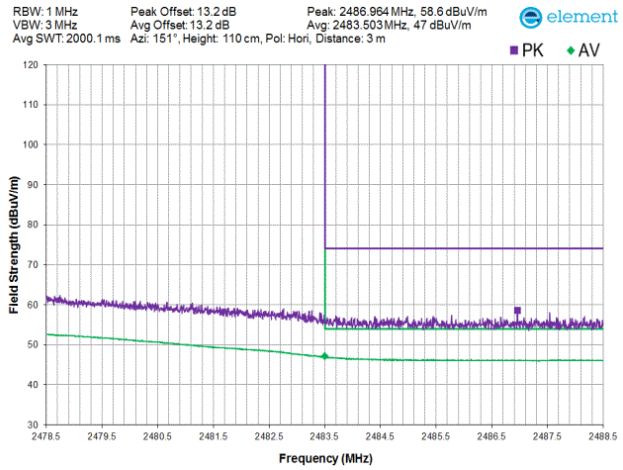
8FSK 5 Mbps
High Channel, 2474 MHz
EUT Horizontal, RX Vertical



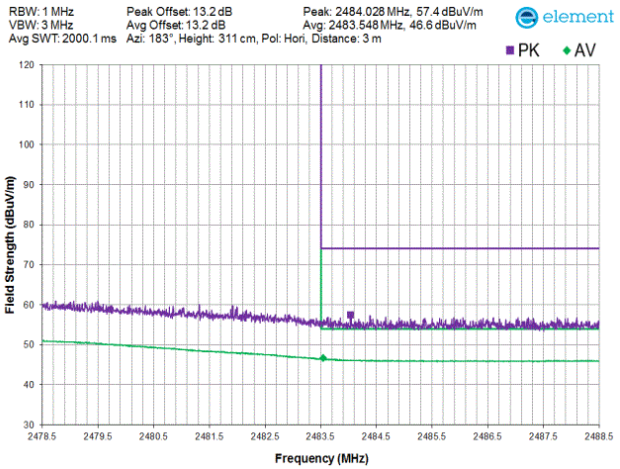
8FSK 5 Mbps
High Channel, 2474 MHz
EUT Vertical, RX Vertical

RADIATED SPURIOUS EMISSIONS
RESTRICTED BAND EDGE

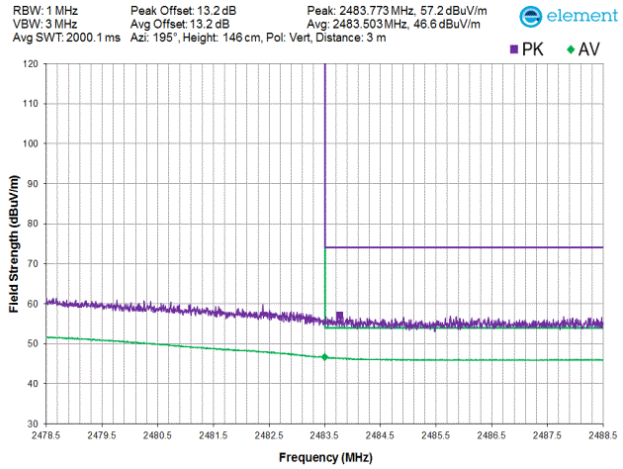
element
EmiR5 2024.05.24.5
WTD.2025.03.25.0



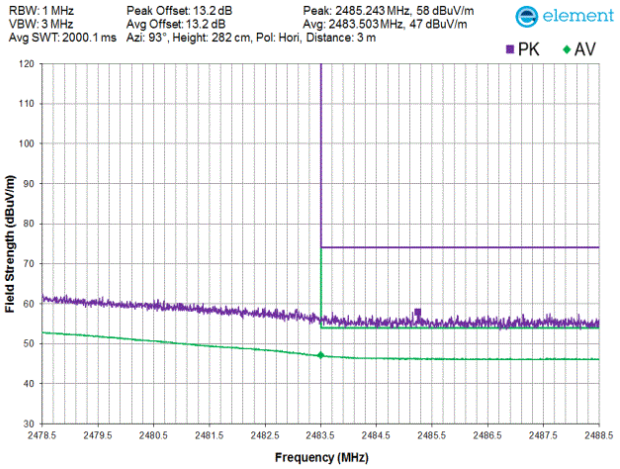
8FSK 5 Mbps
High Channel, 2474 MHz
EUT Vertical, RX Horizontal



8FSK 5 Mbps
High Channel, 2474 MHz
EUT on Side, RX Horizontal



8FSK 5 Mbps
High Channel, 2474 MHz
EUT on Side, RX Vertical



8FSK 5 Mbps
High Channel, 2474 MHz
EUT Horizontal, RX Horizontal

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

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 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. A reference preview scan (pre-scan) is 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:

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*log(1/dc).

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Antenna - Double Ridge	ETS Lindgren	3115	AJN	2024-09-27	2026-09-27
Cable	Element	None	TXM	2024-07-09	2025-07-09
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	2025-02-12	2026-02-12
Attenuator	Weinschel Corp	4H-20	AWB	2025-02-12	2026-02-12
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	2025-01-06	2026-01-06
Cable	Element	None	TXO	2024-07-09	2025-07-09
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	2024-08-29	2025-08-29
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	2025-01-06	2026-01-06
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	2024-08-29	2025-08-29
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXW	2024-09-17	2026-09-17
Cable	Northwest EMC	18-40GHz	TXE	2024-08-30	2025-08-30
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAM	2024-08-30	2025-08-30
Antenna - Biconilog	ETS Lindgren	3143B	AYF	2023-05-03	2025-05-03
Amplifier - Pre-Amplifier	Fairview Microwave	FMAM63001	PAS	2025-02-12	2026-02-12
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	2024-07-23	2025-07-23
Antenna - Loop	ETS Lindgren	6502	AZM	2024-07-24	2026-07-24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	2024-09-03	2025-09-03

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

FREQUENCY RANGE INVESTIGATED

1000 MHz TO 26500 MHz

POWER INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

GARR0129-7

MODES INVESTIGATED

EUT is Transmitting, +5dBm, Modulated

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

EUT:	CS-3	Work Order:	GARR0129
Serial Number:	E001	Date:	2025-02-27
Customer:	Garrett Metal Detectors	Temperature:	20°C
Attendees:	None	Relative Humidity:	43%
Customer Project:	None	Bar. Pressure (PMSL):	994 mb
Tested By:	Antonio Rico, Jarrod Brenden	Job Site:	PT01
Power:	Battery	Configuration:	GARR0129-7

TEST PARAMETERS

Run #:	144	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

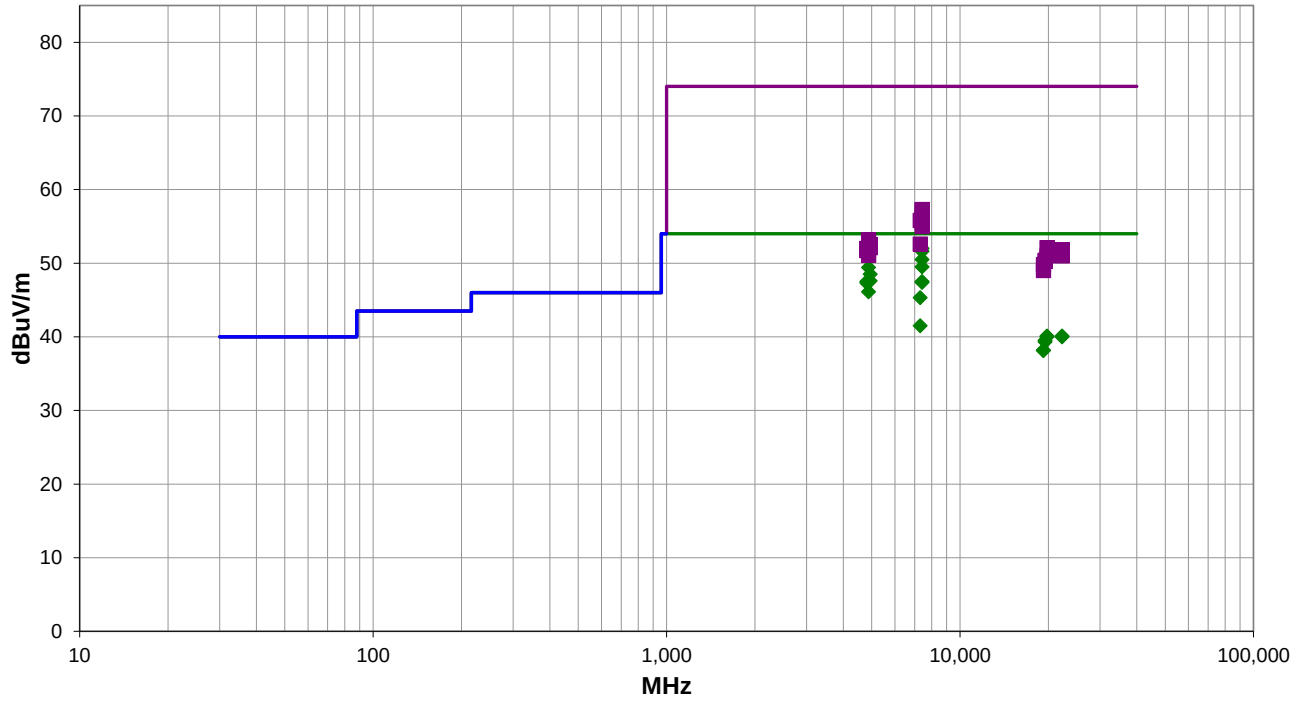
See individual line comments for EUT transmitting frequencies and orientation

EUT OPERATING MODES

EUT is Transmitting, +5dBm, Modulated

DEVIATIONS FROM TEST STANDARD

None



Run #: 144 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

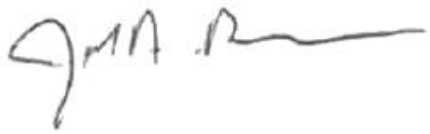
RESULTS - Run #144

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7421.625	39.4	12.6	1.4	37.0	3.0	0.0	Horz	AV	0.0	52.0	54.0	-2.0	High Frequency (2474GHz); EUT is Vertical
7421.642	39.0	12.6	1.5	80.0	3.0	0.0	Horz	AV	0.0	51.6	54.0	-2.4	High Frequency (2474GHz); EUT is Horizontal
7421.583	37.9	12.6	1.5	225.0	3.0	0.0	Horz	AV	0.0	50.5	54.0	-3.5	High Frequency (2474GHz); EUT is On Side
7421.583	36.9	12.6	3.2	308.0	3.0	0.0	Vert	AV	0.0	49.5	54.0	-4.5	High Frequency (2474GHz); EUT is Horizontal
4881.767	44.4	5.0	1.8	63.0	3.0	0.0	Vert	AV	0.0	49.4	54.0	-4.6	Middle Frequency (2438GHz); EUT is Horizontal
4941.725	43.2	5.3	1.8	38.0	3.0	0.0	Vert	AV	0.0	48.5	54.0	-5.5	High Frequency (2474GHz); EUT is Horizontal
4941.750	42.3	5.3	1.7	138.0	3.0	0.0	Horz	AV	0.0	47.6	54.0	-6.4	High Frequency (2474GHz); EUT is Vertical
7421.625	34.9	12.6	1.5	305.0	3.0	0.0	Vert	AV	0.0	47.5	54.0	-6.5	High Frequency (2474GHz); EUT is Vertical
4817.733	42.8	4.7	1.5	243.0	3.0	0.0	Vert	AV	0.0	47.5	54.0	-6.5	Low Frequency (2406GHz); EUT is Horizontal
7421.675	34.8	12.6	1.5	52.0	3.0	0.0	Vert	AV	0.0	47.4	54.0	-6.6	High Frequency (2474GHz); EUT is On Side
4817.742	42.6	4.7	1.8	147.0	3.0	0.0	Horz	AV	0.0	47.3	54.0	-6.7	Low Frequency (2406GHz); EUT is Vertical
4881.700	41.1	5.0	1.5	154.0	3.0	0.0	Horz	AV	0.0	46.1	54.0	-7.9	Middle Frequency (2438GHz); EUT is Vertical
7314.508	32.9	12.4	1.0	21.0	3.0	0.0	Horz	AV	0.0	45.3	54.0	-8.7	Middle Frequency (2438GHz); EUT is Vertical
7314.242	29.1	12.4	1.5	257.0	3.0	0.0	Vert	AV	0.0	41.5	54.0	-12.5	Middle Frequency (2438GHz); EUT is Horizontal
19794.450	46.9	-6.8	1.5	169.0	3.0	0.0	Horz	AV	0.0	40.1	54.0	-13.9	High Freq (2474GHz); EUT is in Vertical
22267.320	48.6	-8.5	1.5	39.0	3.0	0.0	Horz	AV	0.0	40.1	54.0	-13.9	High Freq (2474GHz); EUT is in Vertical
19793.920	46.8	-6.8	1.5	68.0	3.0	0.0	Vert	AV	0.0	40.0	54.0	-14.0	High Freq (2474GHz); EUT is in Horizontal
22265.370	48.5	-8.5	1.5	67.0	3.0	0.0	Vert	AV	0.0	40.0	54.0	-14.0	High Freq (2474GHz); EUT is in Horizontal
19503.570	46.2	-6.7	1.5	304.0	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5	Middle Freq (2438GHz); EUT is in Vertical
19504.620	46.0	-6.7	1.5	166.0	3.0	0.0	Vert	AV	0.0	39.3	54.0	-14.7	Middle Freq (2438GHZ); EUT is in Horizontal
19250.220	45.5	-7.3	1.5	204.0	3.0	0.0	Horz	AV	0.0	38.2	54.0	-15.8	Low Freq (2406GHz); Eut is in Vertical
19245.940	45.4	-7.3	1.5	38.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	Low Freq (2406GHz); EUT is in Horizontal
7421.658	44.7	12.6	1.4	37.0	3.0	0.0	Horz	PK	0.0	57.3	74.0	-16.7	High Frequency (2474GHz); EUT is Vertical
7421.608	44.6	12.6	1.5	80.0	3.0	0.0	Horz	PK	0.0	57.2	74.0	-16.8	High Frequency (2474GHz); EUT is Horizontal
7421.608	43.9	12.6	1.5	225.0	3.0	0.0	Horz	PK	0.0	56.5	74.0	-17.5	High Frequency (2474GHz); EUT is On Side
7313.725	43.4	12.4	1.0	21.0	3.0	0.0	Horz	PK	0.0	55.8	74.0	-18.2	Middle Frequency (2438GHz); EUT is Vertical
7421.767	43.1	12.6	1.5	305.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	High Frequency (2474GHz); EUT is Vertical
7421.658	43.1	12.6	3.2	308.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	High Frequency (2474GHz); EUT is Horizontal
7421.567	42.4	12.6	1.5	52.0	3.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	High Frequency (2474GHz); EUT is On Side
4881.475	48.2	5.0	1.8	63.0	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	Middle Frequency (2438GHz); EUT is Horizontal
7312.108	40.2	12.4	1.5	257.0	3.0	0.0	Vert	PK	0.0	52.6	74.0	-21.4	Middle Frequency (2438GHz); EUT is Horizontal
4941.458	47.2	5.3	1.8	38.0	3.0	0.0	Vert	PK	0.0	52.5	74.0	-21.5	High Frequency (2474GHz); EUT is Horizontal
4941.983	46.8	5.3	1.7	138.0	3.0	0.0	Horz	PK	0.0	52.1	74.0	-21.9	High Frequency (2474GHz); EUT is Vertical
19793.220	58.9	-6.8	1.5	169.0	3.0	0.0	Horz	PK	0.0	52.1	74.0	-21.9	High Freq (2474GHz); EUT is in Vertical
4817.800	47.3	4.7	1.8	147.0	3.0	0.0	Horz	PK	0.0	52.0	74.0	-22.0	Low Frequency (2406GHz); EUT is Vertical
22264.520	60.3	-8.5	1.5	67.0	3.0	0.0	Vert	PK	0.0	51.8	74.0	-22.2	High Freq (2474GHz); EUT is in Horizontal
4817.975	47.0	4.7	1.5	243.0	3.0	0.0	Vert	PK	0.0	51.7	74.0	-22.3	Low Frequency (2406GHz); EUT is Horizontal
4881.717	46.1	5.0	1.5	154.0	3.0	0.0	Horz	PK	0.0	51.1	74.0	-22.9	Middle Frequency(2438GHz); EUT is Vertical
19792.150	57.8	-6.8	1.5	68.0	3.0	0.0	Vert	PK	0.0	51.0	74.0	-23.0	High Frequency (2474GHz); EUT is in Horizontal
22264.380	59.5	-8.5	1.5	39.0	3.0	0.0	Horz	PK	0.0	51.0	74.0	-23.0	High Frequency (2474GHz); EUT is in Vertical
19502.030	57.1	-6.7	1.5	166.0	3.0	0.0	Vert	PK	0.0	50.4	74.0	-23.6	Middle Frequency (2474GHz); EUT is in Horizontal
19501.980	57.0	-6.7	1.5	304.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Middle Frequency (2438GHz); EUT is in Vertical
19246.810	57.1	-7.3	1.5	204.0	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	Low Frequency (2406GHz); Eut is in Vertical
19247.780	56.3	-7.3	1.5	38.0	3.0	0.0	Vert	PK	0.0	49.0	74.0	-25.0	Low Frequency (2406GHz); EUT is in Horizontal

SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

CONCLUSION
Pass



Tested By

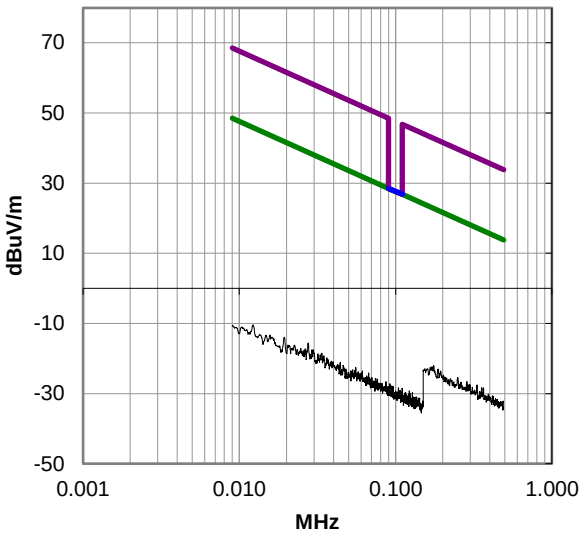
SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

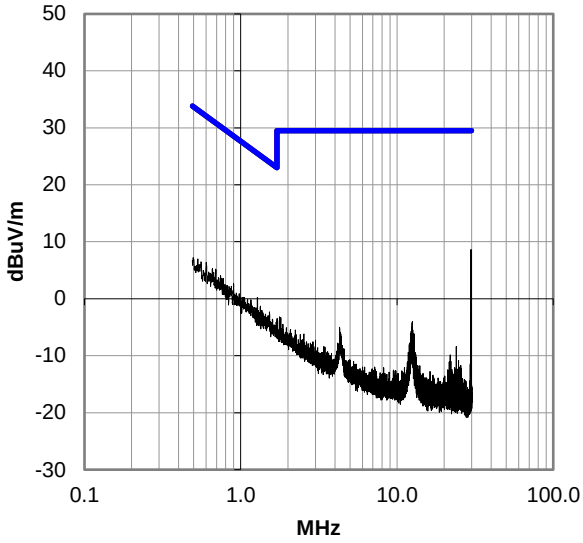
PRESCAN DATA

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.

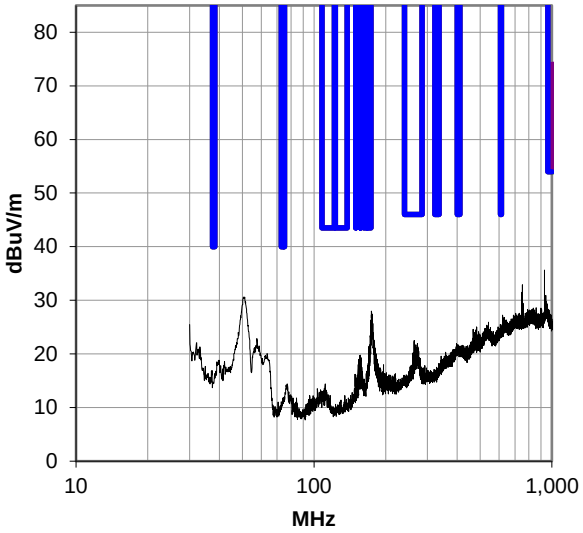
0.009-0.49 MHz, Run 173



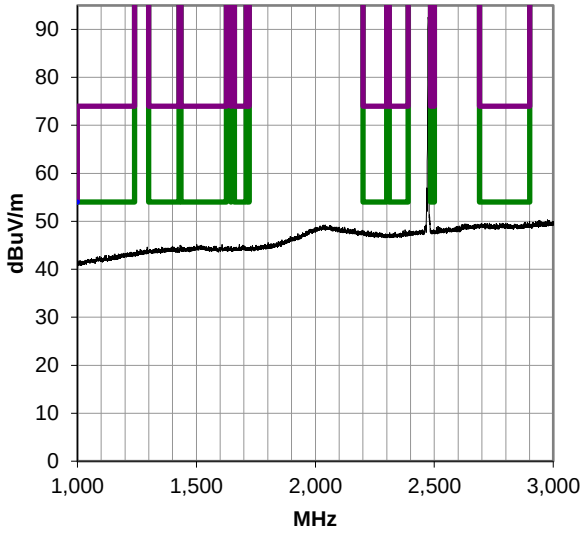
0.49-30 MHz, Run 174



30-1000 MHz, Run 122



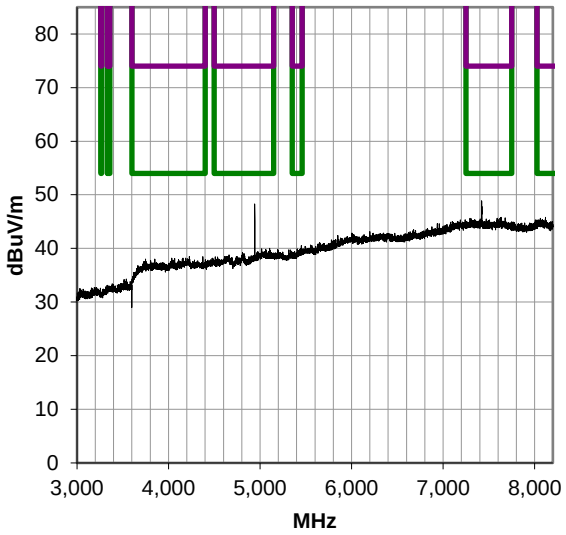
1000-3000 MHz, Run 138



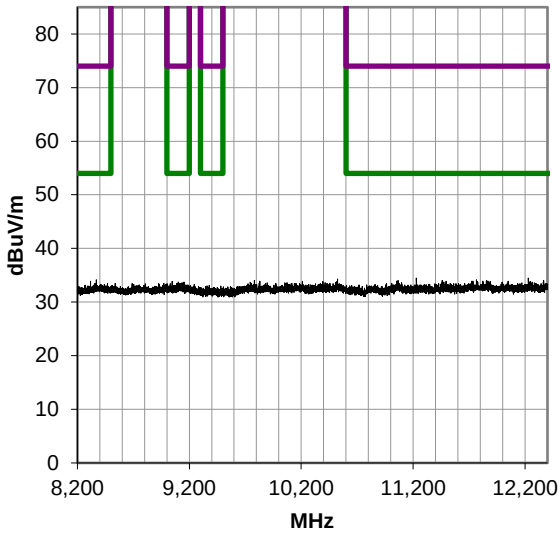
SPURIOUS RADIATED EMISSIONS

element
WTD.2024.12.31.0

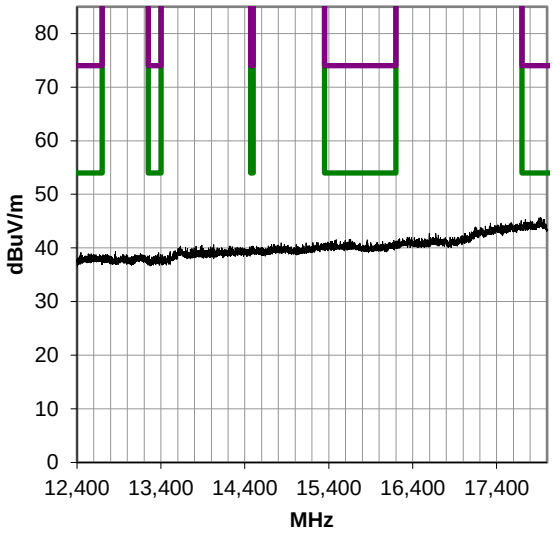
3000-8200 MHz, Run 139



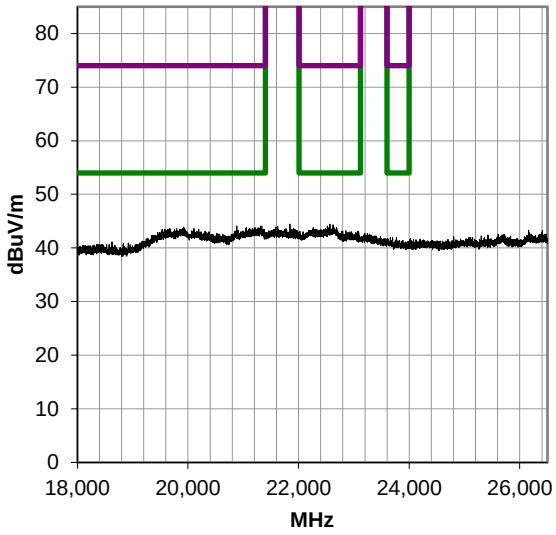
8200-12400 MHz, Run 140



12400-18000 MHz, Run 141



18000-26500 MHz, Run 149



End of Test Report