Resideo (A Honeywell Company)

Redlink 3.0 Outdoor sensor hub

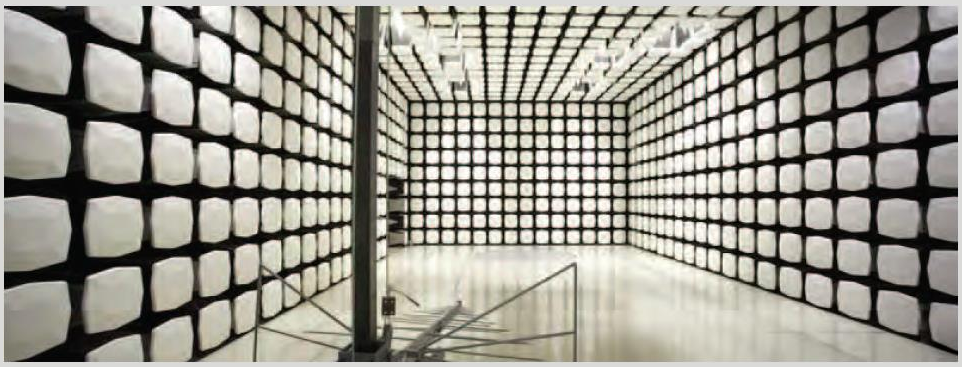
FCC 15.247:2023

RSS-247 Issue 2:2017

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

902 - 928 MHz FHSS Transceiver

Report: ADEM0042.4 Rev. 1, Issue Date: January 19, 2024



ACCREDITED
CERT #3310.05

TABLE OF CONTENTS

element
2023.04.17

Section	Page Number

CERTIFICATE OF TEST

Last Date of Test: October 19, 2023
Resideo (A Honeywell Company)
EUT: Redlink 3.0 Outdoor sensor hub

Radio Equipment Testing

Standards

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

Guidance

FCC KDB 558074 v05r02:2019

Results

Test Description	Result	FCC Section(s)	RSS Section(s)	ANSI C63.10 Section(s)	Comments
Powerline Conducted Emissions (Transmitter)	N/A	15.207	RSS-Gen 8.8	6.2	Not required. EUT has no direct connection to the public utility AC power lines.
Spurious Radiated Emissions	Pass	15.247(d)	RSS-247 5.5	6.5, 6.6	
Duty Cycle	Evaluated	15.247	RSS-Gen 3.2	7.5	The test software allows the EUT to operate at 100% Duty Cycle.
Carrier Frequency Separation	Pass	15.247(a)(1)	RSS-247 5.1(b)	7.8.2	
Number of Hopping Frequencies	Pass	15.247(a)(1)	RSS-247 5.1(d)	7.8.3	
Dwell Time	Pass	15.247(a)(1)	RSS-247 5.1(d)	7.8.4	
Output Power	Pass	15.247(b)	RSS-247 5.4(d)	7.8.5	
Equivalent Isotropic Radiated Power (EIRP)	Pass	15.247(b)	RSS-247 5.4(d)	7.8.5	
Band Edge Compliance	Pass	15.247(d)	RSS-247 5.5	7.8.6	
Band Edge Compliance - Hopping Mode	Pass	15.247(d)	RSS-247 5.5	7.8.6	
Emissions Bandwidth (dB)	Pass	15.247(a)	RSS-247 5.2(a)	7.8.7	
Occupied Bandwidth (99%)	Evaluated	15.247(a)	RSS-Gen 6.7	7.8.7	There is no compliance requirement to be met by this test
Spurious Conducted Emissions	Pass	15.247(d)	RSS-247 5.5	7.8.8	

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

Power Spectral Density	N/A	15.247(e)	RSS-247 5.2(b)	11.10.2	Not required for FHSS devices.
Powerline Conducted Emissions (Receiver)	N/A	15.101, 15.107	RSS-Gen 5.2	ANSI C63.4 - 12.2.4	Not included per FCC 15.101 as this will be covered under SDoC rules for the FCC. RSS-Gen section 7 stated receiver requirements only apply to standalone receivers operating in the 30-960 MHz band and this is not a standalone receiver.
Radiated Emissions for Receiver	N/A	15.101, 15.109	RSS-Gen 5.2	ANSI C63.4 - 12.2.5	Not included per FCC 15.101 as this will be covered under SDoC rules for the FCC. RSS-Gen section 7 stated receiver requirements only apply to standalone receivers operating in the 30-960 MHz band and this is not a standalone receiver.

Deviations From Test Standards

None

Approved By:

Eric Brandon, Department Manager

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

REVISION HISTORY

Revision Number	Description	Date (yyyy-mm-dd)	Page Number
01	Updated the Specification date	2024-01-19	Cover
	Updated comment on Conducted Emissions		3
	Updated Serial Number in Configuration 2		15
	Added Data Rate and Modulation		13
	Added HVIN number to the Functional Description		12
	Updated modulation		18,19,30,31,32,34,35,37,38,40, 41,43,44,46,47,49,50,52,53,54

ACCREDITATIONS AND AUTHORIZATIONS

element
2021.09.01

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

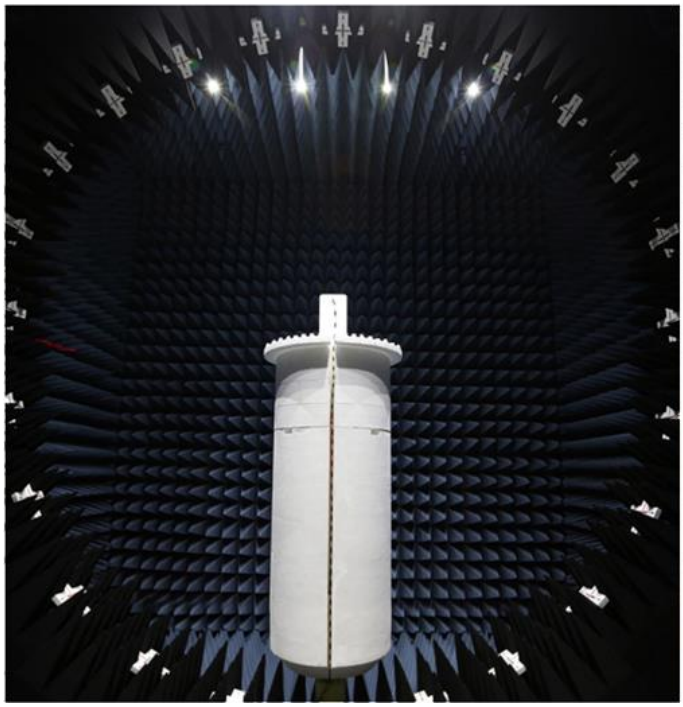
element
2023.09.21

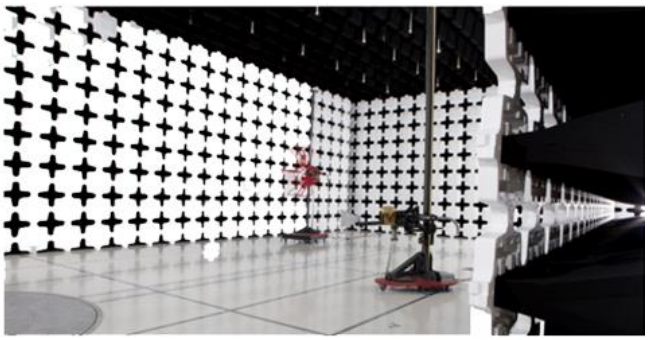
Testing was performed at the following location(s)

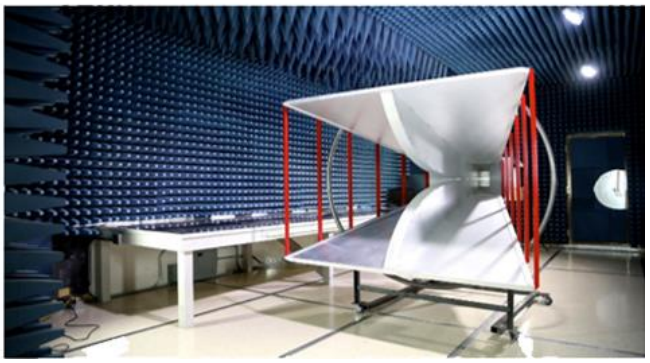
	Location	Labs (1)	Address	A2LA (2)	ISED (3)	BSMI (4)	VCCI (5)	CAB (6)	FDA (7)
☐	California	OC01-17	41 Tesla Irvine, CA 92618 (949) 861-8918	3310.04	2834B	SL2-IN-E-1154R	A-0029	US0158	TL-55
☒	Minnesota	MN01-11	9349 W Broadway Ave. Brooklyn Park, MN 55445 (612) 638-5136	3310.05	2834E	SL2-IN-E-1152R	A-0109	US0175	TL-57
☐	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
☐	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
☐	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
☐	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

element
RP.2023.05.08.0

Measurement Uncertainty

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

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

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

Test Location: Minneapolis

Test	+ MU	- MU
Frequency Accuracy	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	3.2 dB	-3.2 dB

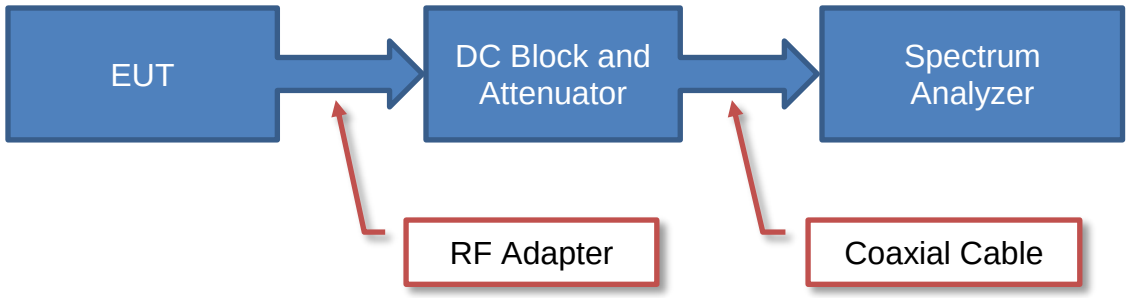
TEST SETUP BLOCK DIAGRAMS

Measurement Bandwidths

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

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

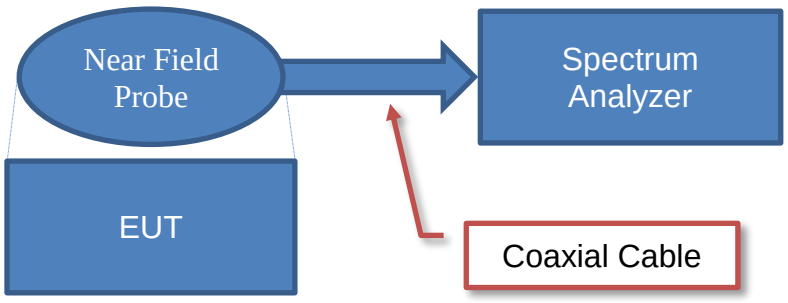
Antenna Port Conducted Measurements



Sample Calculation (logarithmic units)

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

Near Field Test Fixture Measurements

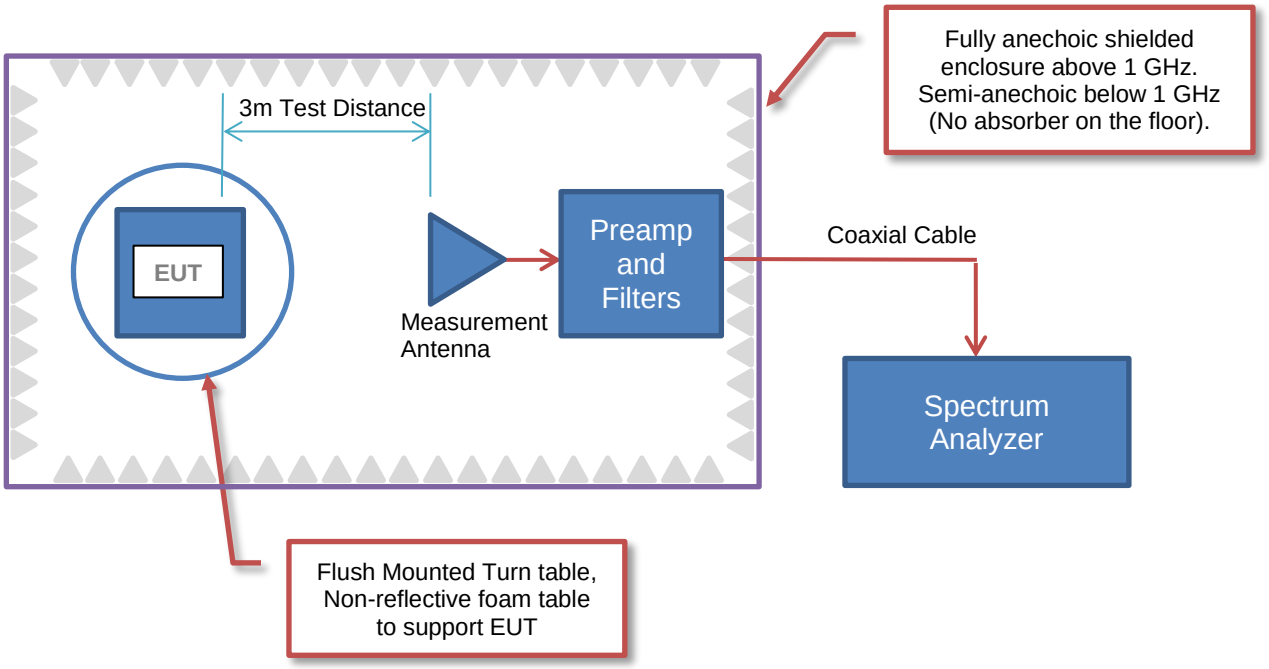


Sample Calculation (logarithmic units)

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**

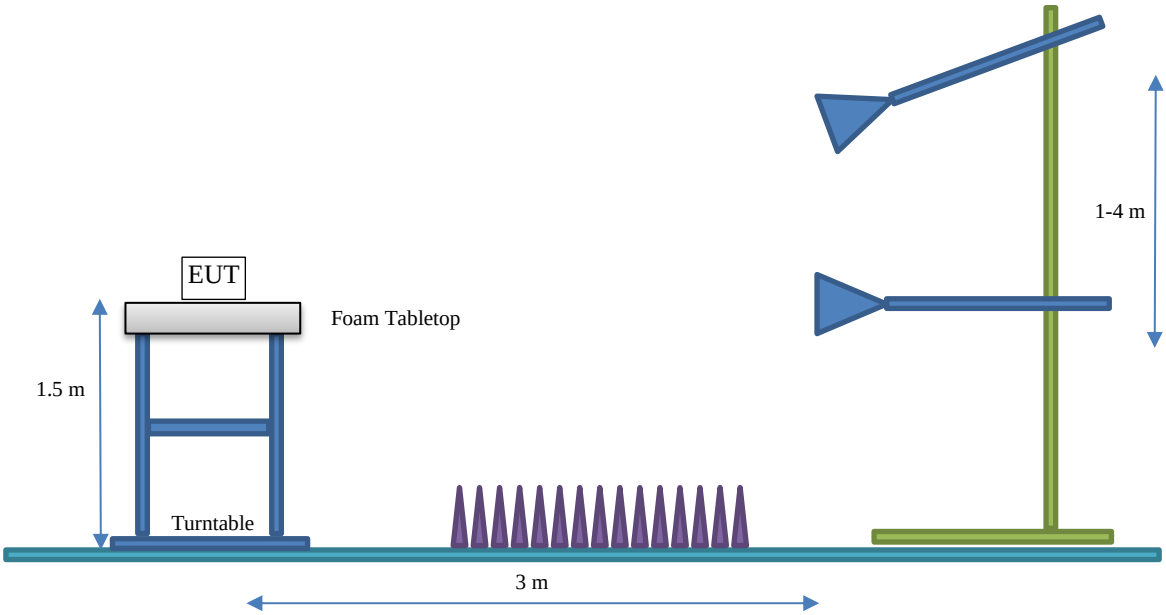
Radiated Power (ERP/EIRP) – Substitution Method:

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:	Resideo (A Honeywell Company)
Address:	Av. Victor Hugo #11517
City, State, Zip:	Chihuahua, 31136Mexico
Test Requested By:	Christian Fouth
EUT:	Redlink 3.0 Outdoor sensor hub
First Date of Test:	October 17, 2023
Last Date of Test:	October 19, 2023
Receipt Date of Samples:	October 17, 2023
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Wireless hub for remote monitoring of HVAC unit. The Outdoor Sensor Hub (OSH) is powered using the charging Current Transformer (CT) installed on power line of the Air-conditioning (AC) unit. Also, the device is capable of battery-powered operation in case of an AC outage. For this purpose, device contains internal 3xAA NiMH battery pack HVIN: LPX1200T2000

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

POWER SETTINGS AND ANTENNAS

42.4The 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	Ademco, Inc	902-928	-0.41

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: XTR
☒ Rated power settings

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position (if multiple channels)	Power Setting (dBm)
Modulation: 2-FSK Data rate: 38.4k baud	Low Channel	12.5
	Mid Channel	12.5
	High Channel	12.5

CONFIGURATIONS

Configuration ADEM0042-1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Redlink 3.0 Outdoor sensor hub	Ademco, Inc.	Redlink 3.0	49673010000173

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AC Adapter (24VDC Out)	CUI, Inc.	SW16-9-N	None
DC Regulator (24VDC in)	None	R32347441-001 Rev.C	None
Capacitor Clamp (2216)	None	2216 (50A/100mA)	None
Capacitor Clamp (2214)	None	2214 (20A/100mA)	None
Capacitor Clamp (2214)	None	2214 (20A/100mA)	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp
DC Power Cable (Regulator to Redlink 3.0)	No	0.9m	No	Redlink 3.0 Outdoor sensor hub	DC Regulator
DC Power Cable (AC Adapter to Regulator)	No	1.9m	Yes	AC Adapter	DC Regulator

CONFIGURATIONS

Configuration ADEM0042-2

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Redlink 3.0 Outdoor sensor hub	Ademco, Inc.	Redlink 3.0	49673010000169

Peripherals in Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Capacitor Clamp (2216)	None	2216 (50A/100mA)	None
Capacitor Clamp (2214)	None	2214 (20A/100mA)	None
Capacitor Clamp (2214)	None	2214 (20A/100mA)	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp
2 Wires Cable	No	1.1m	No	Redlink 3.0 Outdoor sensor hub	Capacitor Clamp

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2023-10-17	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	2023-10-18	Band Edge Compliance	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2023-10-18	Emissions Bandwidth (dB)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2023-10-18	Equivalent Isotropic Radiated Power (EIRP)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2023-10-18	Occupied Bandwidth (99%)	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2023-10-18	Output Power	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2023-10-18	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.
8	2023-10-19	Number of Hopping Frequencies	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	2023-10-19	Dwell Time	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	2023-10-19	Band Edge Compliance - Hopping Mode	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
11	2023-10-19	Carrier Frequency Separation	Tested as delivered to test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS

element
WTD.2023.10.09.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

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 (in no-hop, single channel mode) 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*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	AIP	2022-07-20	2024-07-20
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2023-01-14	2024-01-14
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	2023-02-06	2024-02-06
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2023-01-14	2024-01-14
Attenuator	Fiarview Microwave	SA18H-20	VAF	2023-09-11	2024-09-11
Filter - High Pass	Micro-Tronics	HPM50108	LFM	2023-08-23	2024-08-23
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2023-01-14	2024-01-14
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2023-01-14	2024-01-14
Antenna - Biconilog	Ametek	CBL 6141B	AYS	2023-03-28	2025-03-28
Cable	ESM Cable Corp.	Bilog Cables	MNH	2023-10-08	2024-10-08
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2023-10-08	2024-10-08
Filter - Low Pass	Micro-Tronics	LPM50003	LFJ	2023-08-23	2024-08-23
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	2023-08-23	2024-08-23
Attenuator	Fairview Microwave	SA18E-10	TYA	2023-08-23	2024-08-23
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HGS	2023-06-17	2024-06-17

SPURIOUS RADIATED EMISSIONS

element
WTD.2023.10.09.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	5.2 dB	-5.2 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 12400 MHz

POWER INVESTIGATED

24VDC

CONFIGURATIONS INVESTIGATED

ADEM0042-1

MODES INVESTIGATED

Transmitting Low, Mid, and High Channels (902.8, 914.5, and 926.4 MHz), 2-FSK modulated.

SPURIOUS RADIATED EMISSIONS

element
WTD.2023.10.09.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000173	Date:	2023-10-17
Customer:	Resideo (A Honeywell Company)	Temperature:	22°C
Attendees:	None	Relative Humidity:	43.4%
Customer Project:	None	Bar. Pressure (PMSL):	1014 mb
Tested By:	Christopher Heintzelman	Job Site:	MN05
Power:	24VDC	Configuration:	ADEM0042-1

TEST SPECIFICATIONS

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

TEST PARAMETERS

Run #:	11	Test Distance (m):	3	Ant. Height(s) (m):	1 to 4(m)

COMMENTS

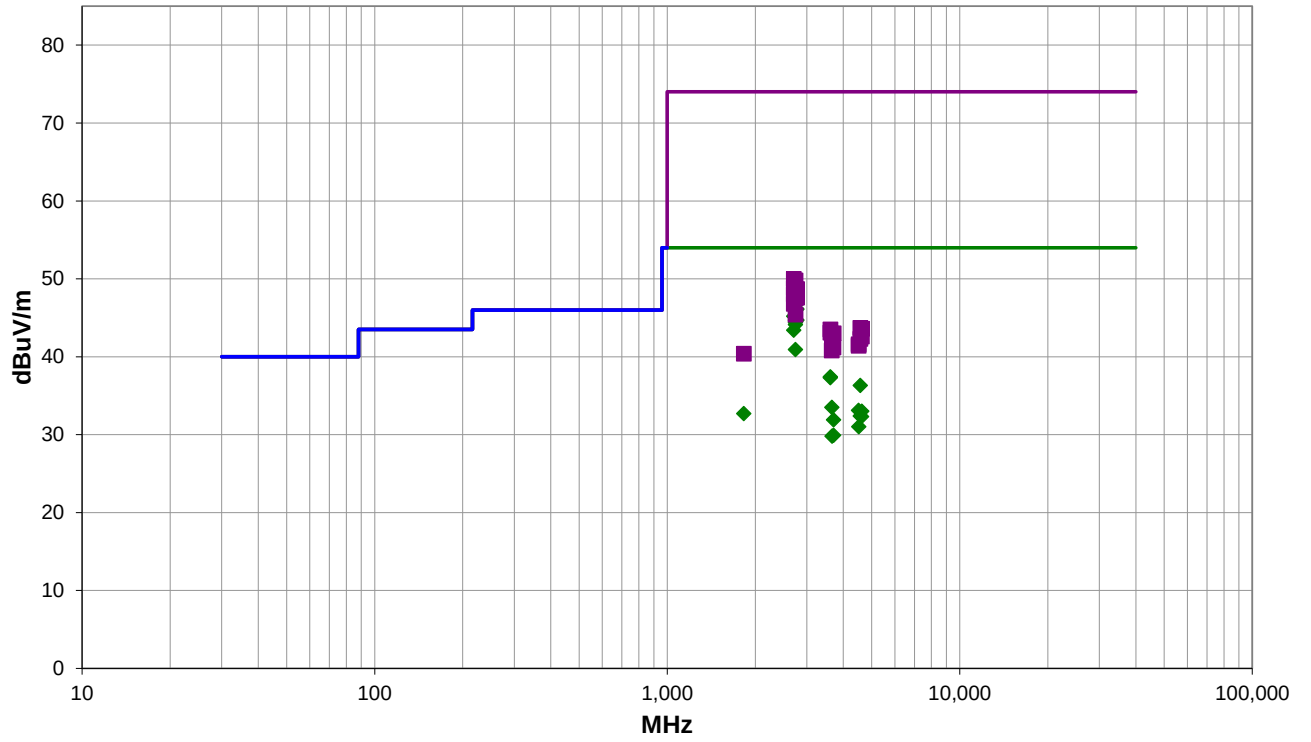
Test mode is 100% duty cycle. 24VDC supplied by AC/DC adapter powered at 120VAC/60Hz.

EUT OPERATING MODES

Transmiting Low, Mid, and High Channels (902.8, 914.5, and 926.4 MHz), 2-FSK modulated.

DEVIATIONS FROM TEST STANDARD

None



Run #: 11 ■ PK ◆ AV ● QP

SPURIOUS RADIATED EMISSIONS

element
WTD.2023.10.09.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

RESULTS - Run #11

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
2709.000	51.4	-3.7	2.72	138.9	3.0	0.0	Horz	AV	0.0	47.7	54.0	-6.3	EUT Horz, Low Ch
2743.825	51.2	-3.7	1.0	138.9	3.0	0.0	Horz	AV	0.0	47.5	54.0	-6.5	EUT Horz, Mid Ch
2709.050	49.9	-3.7	1.1	325.0	3.0	0.0	Vert	AV	0.0	46.2	54.0	-7.8	EUT Horz, Low Ch
2779.192	49.6	-3.5	1.05	135.9	3.0	0.0	Horz	AV	0.0	46.1	54.0	-7.9	EUT Horz, High Ch
2743.792	49.6	-3.7	3.0	196.9	3.0	0.0	Horz	AV	0.0	45.9	54.0	-8.1	EUT On Side, Mid Ch
2708.958	48.9	-3.7	1.21	6.9	3.0	0.0	Horz	AV	0.0	45.2	54.0	-8.8	EUT Vert, Low Ch
2743.808	48.4	-3.7	1.41	167.9	3.0	0.0	Vert	AV	0.0	44.7	54.0	-9.3	EUT Vert, Mid Ch
2779.160	48.2	-3.5	1.5	318.9	3.0	0.0	Vert	AV	0.0	44.7	54.0	-9.3	EUT Vert, High Ch
2743.792	48.1	-3.7	1.12	322.9	3.0	0.0	Vert	AV	0.0	44.4	54.0	-9.6	EUT Horz, Mid Ch
2743.792	47.8	-3.7	1.04	232.9	3.0	0.0	Vert	AV	0.0	44.1	54.0	-9.9	EUT On Side, Mid Ch
2708.992	47.1	-3.7	1.5	228.9	3.0	0.0	Vert	AV	0.0	43.4	54.0	-10.6	EUT Vert, Low Ch
2743.800	44.6	-3.7	1.51	203.9	3.0	0.0	Horz	AV	0.0	40.9	54.0	-13.1	EUT Vert, Mid Ch
3611.933	38.5	-1.1	1.01	150.9	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT Horz, Low Ch
3611.990	38.4	-1.1	3.41	175.9	3.0	0.0	Vert	AV	0.0	37.3	54.0	-16.7	EUT Vert, Low Ch
4572.975	34.5	1.8	2.97	159.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7	EUT Vert, Mid Ch
3658.383	34.8	-1.3	2.89	170.0	3.0	0.0	Vert	AV	0.0	33.5	54.0	-20.5	EUT Vert, Mid Ch
4515.025	31.6	1.5	3.75	246.9	3.0	0.0	Horz	AV	0.0	33.1	54.0	-20.9	EUT Horz, Low Ch
4631.983	30.7	2.3	1.12	354.9	3.0	0.0	Horz	AV	0.0	33.0	54.0	-21.0	EUT Horz, High Ch
1829.200	36.6	-3.9	1.5	326.9	3.0	0.0	Vert	AV	0.0	32.7	54.0	-21.3	EUT Vert, Mid Ch
4573.170	30.6	1.8	1.5	261.0	3.0	0.0	Horz	AV	0.0	32.4	54.0	-21.6	EUT Horz, Mid Ch
4622.460	30.1	2.2	1.5	63.0	3.0	0.0	Vert	AV	0.0	32.3	54.0	-21.7	EUT Vert, High Ch
3705.692	32.9	-1.0	3.76	229.9	3.0	0.0	Horz	AV	0.0	31.9	54.0	-22.1	EUT Horz, High Ch
4521.750	29.5	1.5	1.5	252.0	3.0	0.0	Vert	AV	0.0	31.0	54.0	-23.0	EUT Vert, Low Ch
2709.117	53.7	-3.7	2.72	138.9	3.0	0.0	Horz	PK	0.0	50.0	74.0	-24.0	EUT Horz, Low Ch
3705.600	30.9	-1.0	1.01	300.9	3.0	0.0	Vert	AV	0.0	29.9	54.0	-24.1	EUT Vert, High Ch
3660.380	31.1	-1.3	1.5	98.0	3.0	0.0	Horz	AV	0.0	29.8	54.0	-24.2	EUT Horz, Mid Ch
2743.667	53.5	-3.7	1.0	138.9	3.0	0.0	Horz	PK	0.0	49.8	74.0	-24.2	EUT Horz, Mid Ch
2708.942	52.5	-3.7	1.1	325.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	EUT Horz, Low Ch
2743.717	52.4	-3.7	3.0	196.9	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	EUT On Side, Mid Ch
2779.067	52.2	-3.5	1.05	135.9	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	EUT Horz, High Ch
2708.950	51.7	-3.7	1.21	6.9	3.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	EUT Vert, Low Ch
2743.875	51.3	-3.7	1.41	167.9	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT Vert, Mid Ch
2743.883	51.3	-3.7	1.04	232.9	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT On Side, Mid Ch
2778.990	51.1	-3.5	1.5	318.9	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT Vert, High Ch
2744.000	51.2	-3.7	1.12	322.9	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	EUT Horz, Mid Ch
2709.175	50.5	-3.7	1.5	228.9	3.0	0.0	Vert	PK	0.0	46.8	74.0	-27.2	EUT Vert, Low Ch
2744.100	49.1	-3.7	1.51	203.9	3.0	0.0	Horz	PK	0.0	45.4	74.0	-28.6	EUT Vert, Mid Ch
4573.158	41.9	1.8	2.97	159.0	3.0	0.0	Vert	PK	0.0	43.7	74.0	-30.3	EUT Vert, Mid Ch
4638.790	41.3	2.3	1.5	63.0	3.0	0.0	Vert	PK	0.0	43.6	74.0	-30.4	EUT Vert, High Ch
3611.950	44.6	-1.1	3.41	175.9	3.0	0.0	Vert	PK	0.0	43.5	74.0	-30.5	EUT Vert, Low Ch

SPURIOUS RADIATED EMISSIONS

element
WTD.2023.10.09.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

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
3612.017	44.2	-1.1	1.01	150.9	3.0	0.0	Horz	PK	0.0	43.1	74.0	-30.9	EUT Horz, Low Ch
3705.633	44.0	-1.0	3.76	229.9	3.0	0.0	Horz	PK	0.0	43.0	74.0	-31.0	EUT Horz, High Ch
4631.800	40.3	2.3	1.12	354.9	3.0	0.0	Horz	PK	0.0	42.6	74.0	-31.4	EUT Horz, High Ch
4570.120	40.5	1.8	1.5	261.0	3.0	0.0	Horz	PK	0.0	42.3	74.0	-31.7	EUT Horz, Mid Ch
4514.092	40.1	1.5	3.75	246.9	3.0	0.0	Horz	PK	0.0	41.6	74.0	-32.4	EUT Horz, Low Ch
3658.267	42.8	-1.3	2.89	170.0	3.0	0.0	Vert	PK	0.0	41.5	74.0	-32.5	EUT Vert, Mid Ch
4512.040	39.9	1.5	1.5	252.0	3.0	0.0	Vert	PK	0.0	41.4	74.0	-32.6	EUT Vert, Low Ch
3703.020	42.4	-1.2	1.01	300.9	3.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	EUT Vert, High Ch
3649.380	42.0	-1.2	1.5	98.0	3.0	0.0	Horz	PK	0.0	40.8	74.0	-33.2	EUT Horz, Mid Ch
1828.742	44.3	-3.9	1.5	326.9	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	EUT Vert, Mid Ch

CONCLUSION

Pass

Tested By

DUTY CYCLE

element
WTD.2023.04.25.0
EmiR5 2022.07.06.0
PSA-ESCI 2023.04.25.0

TEST DESCRIPTION

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

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

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

The test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

CARRIER FREQUENCY SEPARATION

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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.

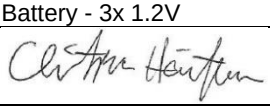
The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

CARRIER FREQUENCY SEPARATION

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-19
Customer:	Resideo (A Honeywell Company)	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	46.7%
Customer Project:	None	Bar. Pressure (PMSL):	1007 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.
The limit from 15.247 (a)(1) is 25 kHz or the 20dB Occupied Bandwidth, whichever is greater. The largest occupied bandwidth recorded was 76.8 kHz.

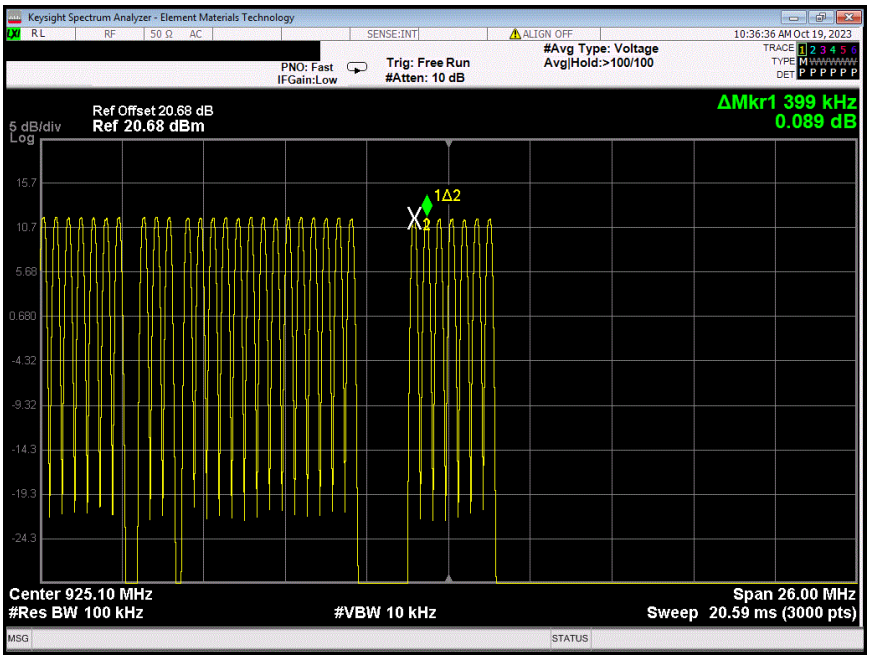
DEVIATIONS FROM TEST STANDARD

None

TEST RESULTS

	Value	Limit (≥)	Results
Hopping Mode (All Channels)	399 kHz	76.8 kHz	Pass

CARRIER FREQUENCY SEPARATION



Hopping Mode (All Channels)

NUMBER OF HOPPING FREQUENCIES

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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.

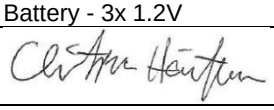
The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

NUMBER OF HOPPING FREQUENCIES

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-19
Customer:	Resideo (A Honeywell Company)	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	46.5%
Customer Project:	None	Bar. Pressure (PMSL):	1007 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

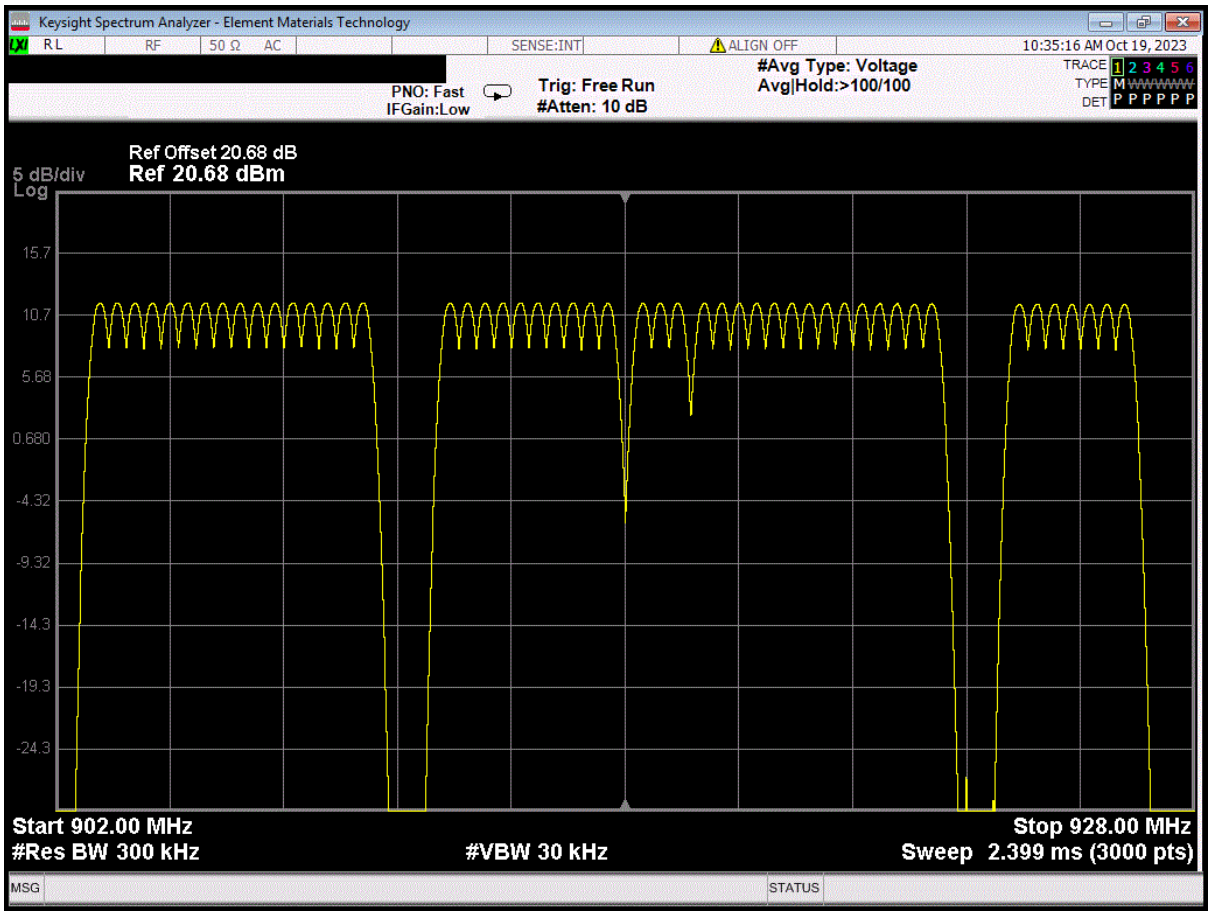
None

TEST RESULTS

	Number of Channels	Limit (≥)	Results
Hopping Mode (All Channels)	50	50	Pass

NUMBER OF HOPPING FREQUENCIES

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



Hopping Mode (All Channels)

DWELL TIME

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels * 400 mS. For the tested FHSS radio, this would be 50 Channels * 400mS = 20 seconds

On Time During 20 Sec = Pulse Width * Average Number of Pulses * Scale Factor

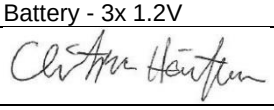
- Average Number of Pulses is based on 4 samples.
- Scale Factor =20 Sec / Screen Capture Sweep Time = 20 Sec / 20 sec Sec = 1

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

DWELL TIME

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-19
Customer:	Resideo (A Honeywell Company)	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	46.7%
Customer Project:	None	Bar. Pressure (PMSL):	1006 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.
Emissions below the 6dBm trigger level are adjacent channels and therefore not counted for the dwell time measurement.

DEVIATIONS FROM TEST STANDARD

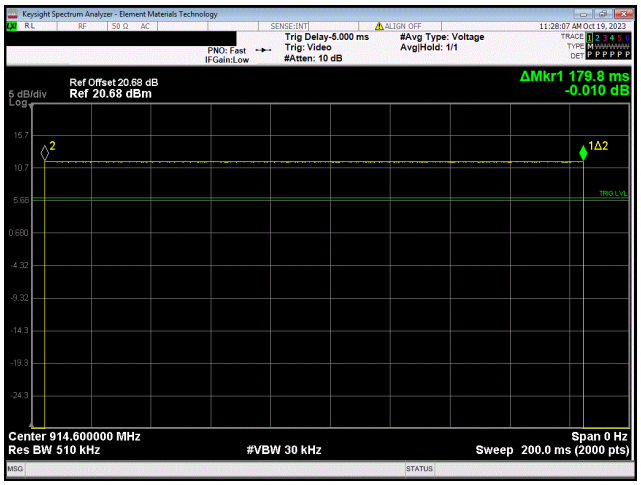
None

TEST RESULTS

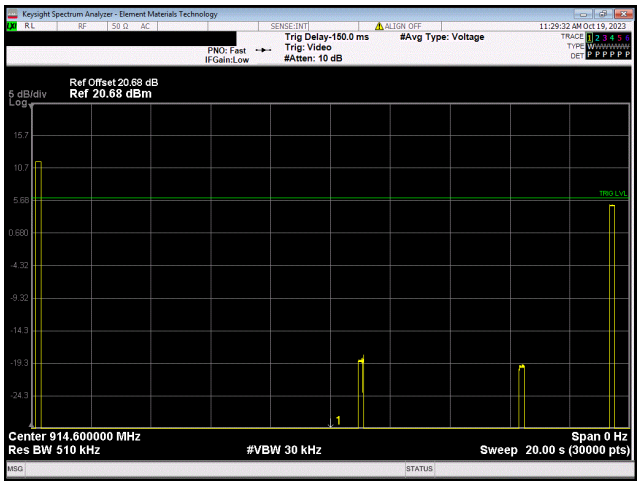
	Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 20 s	Limit (ms)	Results
Hopping Mode (All Channels), 2-FSK							
Mid Channel, 914.6 MHz	179.82	N/A	N/A	N/A	N/A	N/A	N/A
	N/A	1	N/A	N/A	N/A	N/A	N/A
	N/A	1	N/A	N/A	N/A	N/A	N/A
	N/A	1	N/A	N/A	N/A	N/A	N/A
	N/A	1	N/A	N/A	N/A	N/A	N/A
	179.82	N/A	1	1	179.82	400	Pass

DWELL TIME

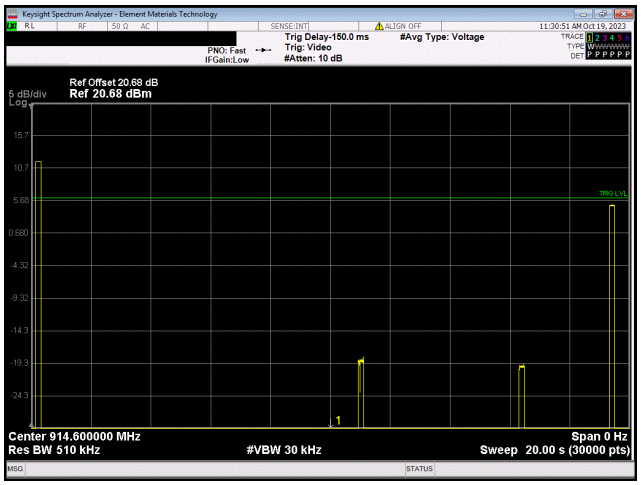
element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



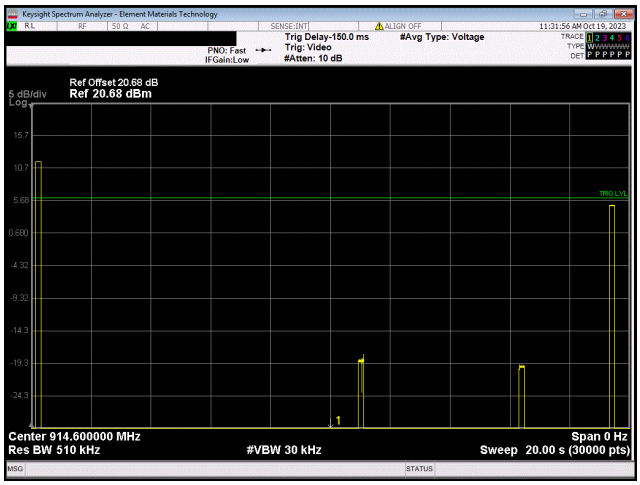
Hopping Mode (All Channels), 2-FSK
Mid Channel, 914.6 MHz



Hopping Mode (All Channels), 2-FSK
Mid Channel, 914.6 MHz

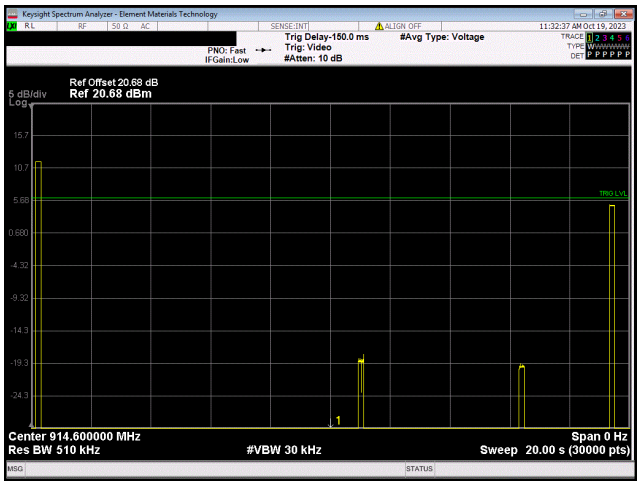


Hopping Mode (All Channels), 2-FSK
Mid Channel, 914.6 MHz



Hopping Mode (All Channels), 2-FSK
Mid Channel, 914.6 MHz

DWELL TIME



Hopping Mode (All Channels), 2-FSK
Mid Channel, 914.6 MHz

OUTPUT POWER

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

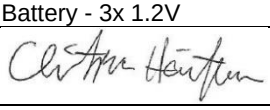
The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

OUTPUT POWER

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	41.4%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

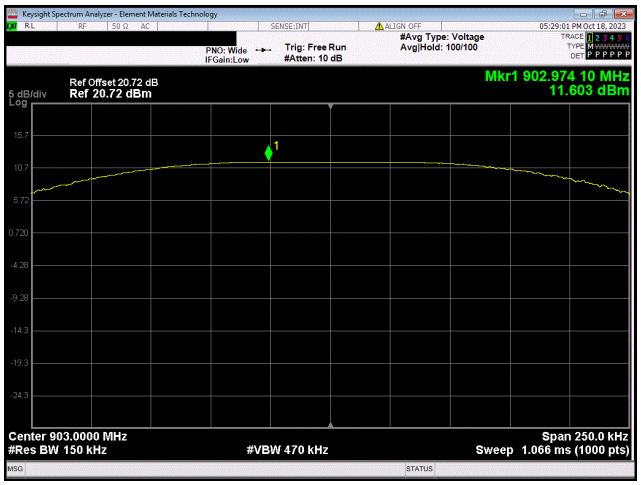
None

TEST RESULTS

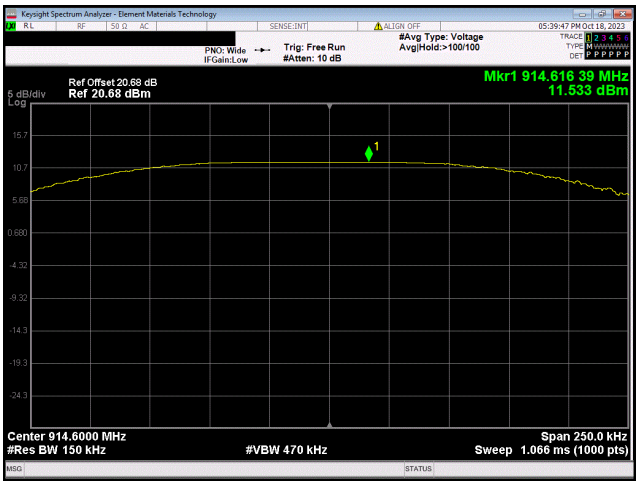
	Out Pwr (dBm)	Limit (dBm)	Result
2-FSK			
Low Channel, 903 MHz	11.603	21	Pass
Mid Channel, 914.6 MHz	11.533	21	Pass
High Channel, 926.4 MHz	11.423	21	Pass

OUTPUT POWER

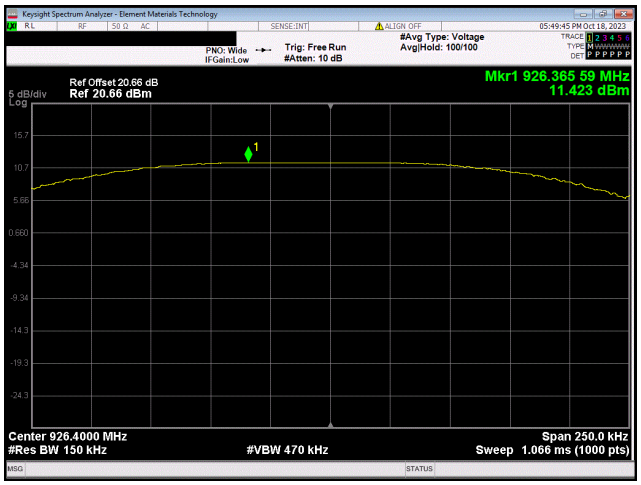
element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



2-FSK
Low Channel, 903 MHz



2-FSK
Mid Channel, 914.6 MHz



2-FSK
High Channel, 926.4 MHz

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

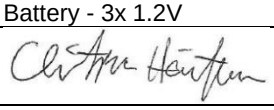
Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	41.6%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

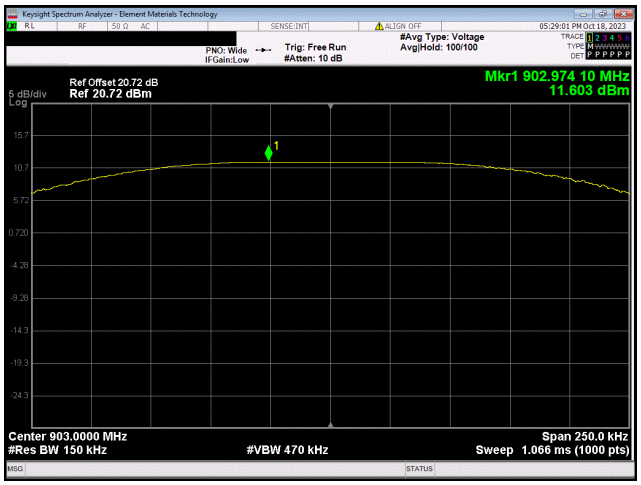
None

TEST RESULTS

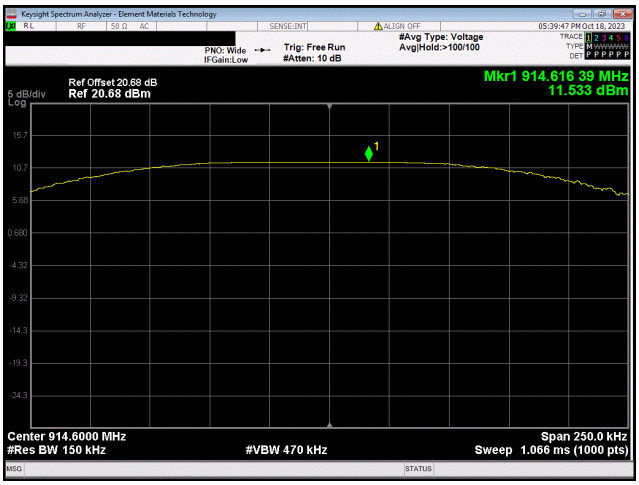
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
2-FSK					
Low Channel, 903 MHz	11.603	-0.41	11.193	37	Pass
Mid Channel, 914.6 MHz	11.533	-0.41	11.123	37	Pass
High Channel, 926.4 MHz	11.423	-0.41	11.013	37	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

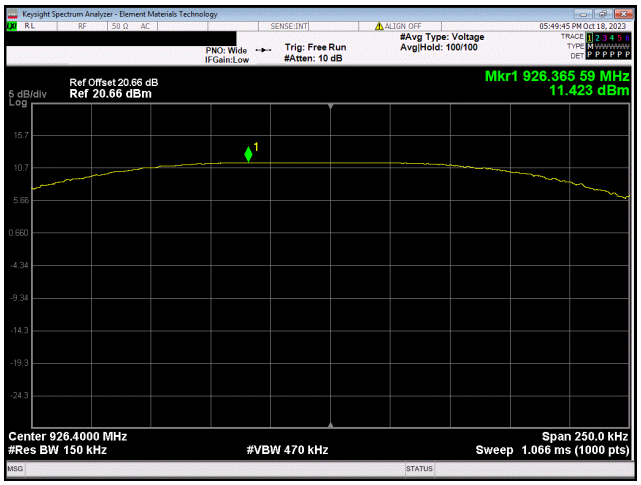
element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



2-FSK
Low Channel, 903 MHz



2-FSK
Mid Channel, 914.6 MHz



2-FSK
High Channel, 926.4 MHz

BAND EDGE COMPLIANCE

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

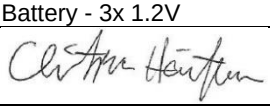
The spectrum was scanned below the lower band edge and above the higher band edge. The analyzer screen captures for this test show an example of the emission mask for the test mode also used during the radiated spurious emissions at the restricted band edges test.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

BAND EDGE COMPLIANCE

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	41.5%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013
FCC 15.247:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

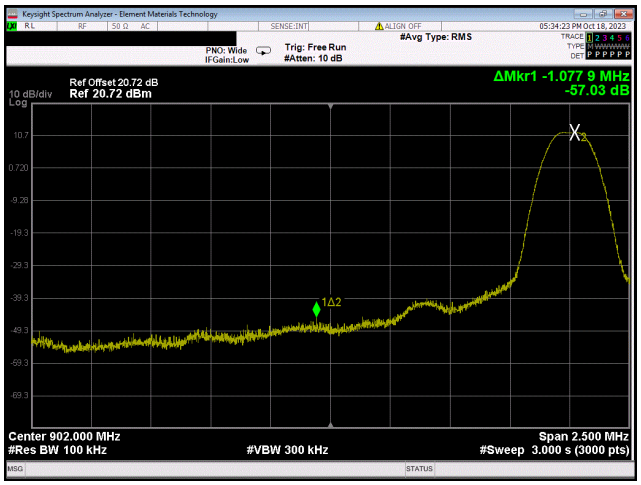
None

TEST RESULTS

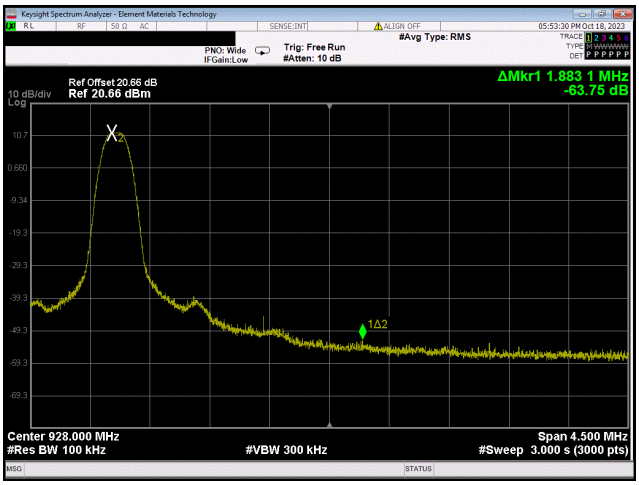
	Value (dBc)	Limit ≤ (dBc)	Result
2-FSK			
Low Channel, 903 MHz	-57.03	-20	Pass
High Channel, 926.4 MHz	-63.75	-20	Pass

BAND EDGE COMPLIANCE

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



2-FSK
Low Channel, 903 MHz



2-FSK
High Channel, 926.4 MHz

BAND EDGE COMPLIANCE - HOPPING MODE

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 band were measured with the EUT set to its normal pseudo-random hopping sequence. The EUT was transmitting at the data rate(s) listed in the datasheet.

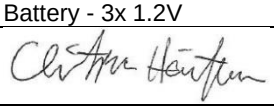
The spectrum was scanned below the lower band edge and above the higher band edge. The analyzer screen captures for this test show an example of the emission mask for the test mode also used during the radiated spurious emissions at the restricted band edges test.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

BAND EDGE COMPLIANCE - HOPPING MODE

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-19
Customer:	Resideo (A Honeywell Company)	Temperature:	22.3°C
Attendees:	None	Relative Humidity:	46.7%
Customer Project:	None	Bar. Pressure (PMSL):	1007 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.247:2023	ANSI C63.10:2013
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

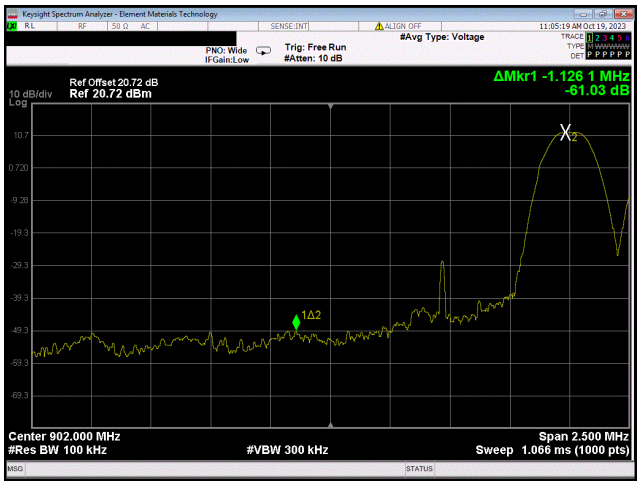
DEVIATIONS FROM TEST STANDARD

None

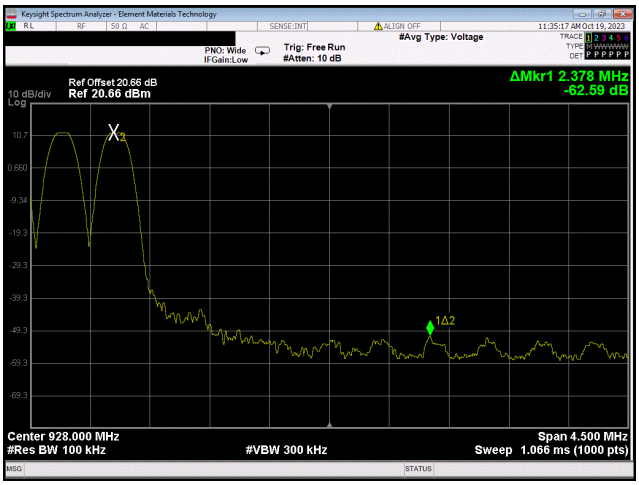
TEST RESULTS

	Value (dBc)	Limit ≤ (dBc)	Result
Hopping Mode (All Channels), 2-FSK			
Low Channel, 903 MHz	-61.03	-20	Pass
High Channel, 926.4 MHz	-62.59	-20	Pass

BAND EDGE COMPLIANCE - HOPPING MODE



Hopping Mode (All Channels), 2-FSK
Low Channel, 903 MHz



Hopping Mode (All Channels), 2-FSK
High Channel, 926.4 MHz

EMISSIONS BANDWIDTH

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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.

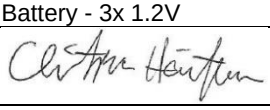
The 20 dB emissions bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

EMISSIONS BANDWIDTH

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.1°C
Attendees:	None	Relative Humidity:	41.7%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

None

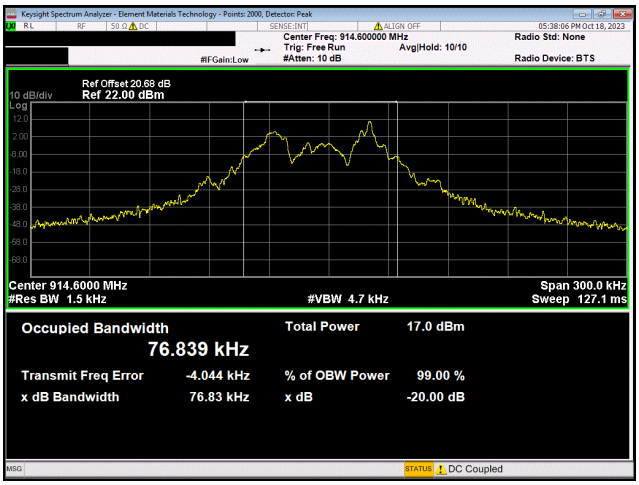
TEST RESULTS

	Value	Limit (<)	Result
2-FSK			
Low Channel, 903 MHz	69.8 kHz	500 kHz	Pass
Mid Channel, 914.6 MHz	76.826 kHz	500 kHz	Pass
High Channel, 926.4 MHz	74.745 kHz	500 kHz	Pass

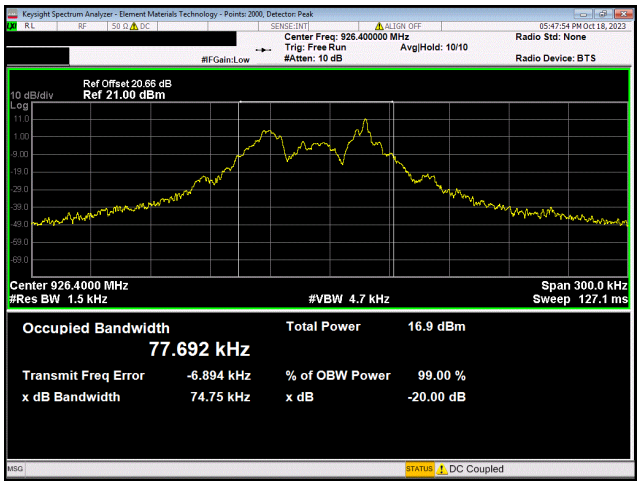
EMISSIONS BANDWIDTH

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

2-FSK
Low Channel, 903 MHz



2-FSK
Mid Channel, 914.6 MHz



2-FSK
High Channel, 926.4 MHz

OCCUPIED BANDWIDTH

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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.

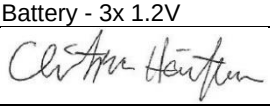
The spectrum analyzer occupied bandwidth measurement function was used to sum the power of the transmission in linear terms to obtain the 99% bandwidth.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

OCCUPIED BANDWIDTH

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.1°C
Attendees:	None	Relative Humidity:	41.9%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

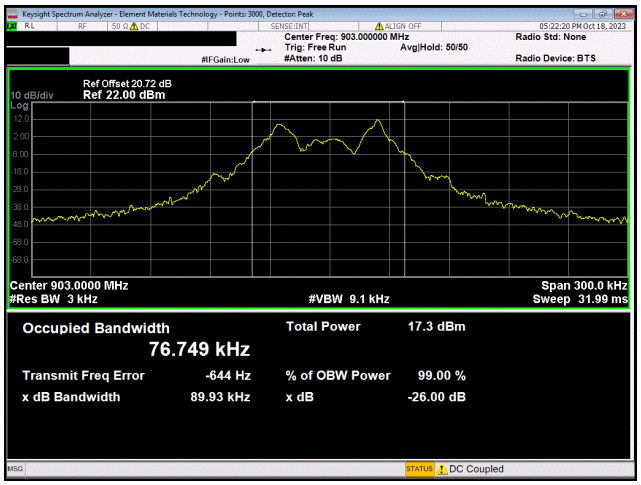
None

TEST RESULTS

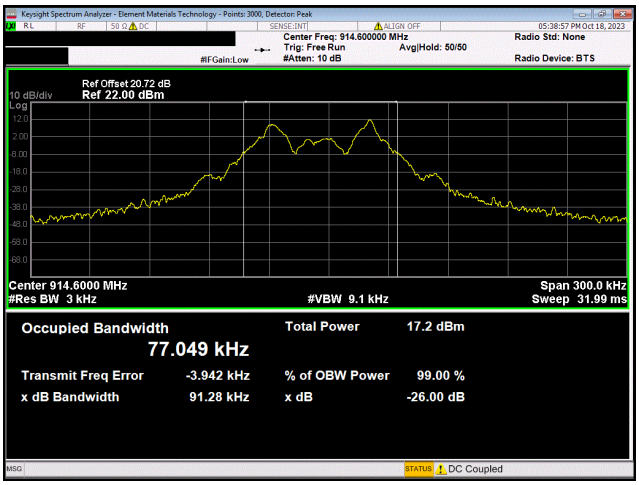
	Value	Limit	Result
2-FSK			
Low Channel, 903 MHz	76.749 kHz	N/A	N/A
Mid Channel, 914.6 MHz	77.049 kHz	N/A	N/A
High Channel, 926.4 MHz	78.157 kHz	N/A	N/A

OCCUPIED BANDWIDTH

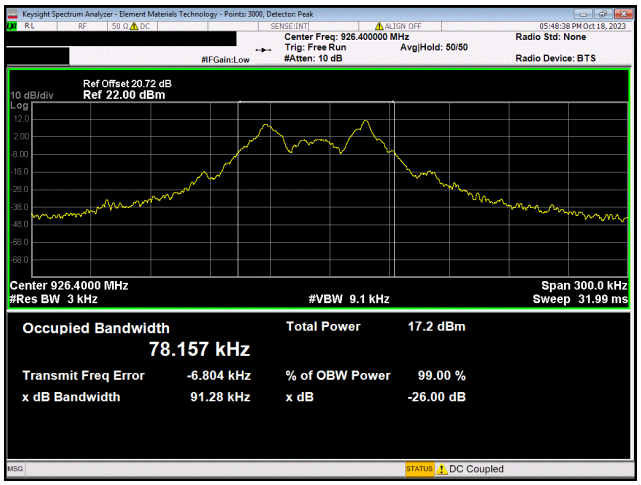
element
TbtTx 2023.08.15.2
WTD.2023.10.09.0



2-FSK
Low Channel, 903 MHz



2-FSK
Mid Channel, 914.6 MHz



2-FSK
High Channel, 926.4 MHz

SPURIOUS CONDUCTED EMISSIONS

element
TbtTx 2023.08.15.2
WTD.2023.10.09.0

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 in a no-hop mode. 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
Generator - Signal	Agilent	N5183A	TIK	2022-01-24	2025-01-24
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	2023-05-01	2024-05-01
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2023-09-05	2024-09-05
Block - DC	Fairview Microwave	SD3379	ANH	2023-09-05	2024-09-05
Attenuator	Fairview Microwave	SA4014-20	AQI	2023-09-05	2024-09-05

SPURIOUS CONDUCTED EMISSIONS

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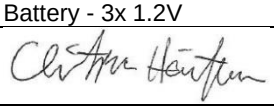
TbtTx 2023.08.15.2
WTD.2023.10.09.0

EUT:	Redlink 3.0 Outdoor sensor hub	Work Order:	ADEM0042
Serial Number:	49673010000169	Date:	2023-10-18
Customer:	Resideo (A Honeywell Company)	Temperature:	22.4°C
Attendees:	None	Relative Humidity:	41.6%
Customer Project:	None	Bar. Pressure (PMSL):	1003 mbar
Tested By:	Christopher Heintzelman	Job Site:	MN11
Power:	Battery - 3x 1.2V	Configuration:	ADEM0042-2
Signature:			

TEST SPECIFICATIONS

Specification:	Method:
RSS-247 Issue 2:2023	ANSI C63.10:2013

COMMENTS

Reference level offset includes measurement cable, attenuator, and DC block.

DEVIATIONS FROM TEST STANDARD

None

TEST RESULTS

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
2-FSK					
Low Channel, 903 MHz	Fundamental	902.97	N/A	N/A	N/A
	30 MHz - 10 GHz	1805.88	-56.95	-20	Pass
Mid Channel, 914.6 MHz	Fundamental	914.61	N/A	N/A	N/A
	30 MHz - 10 GHz	457.23	-57.4	-20	Pass
High Channel, 926.4 MHz	Fundamental	926.36	N/A	N/A	N/A
	30 MHz - 10 GHz	463.32	-56.97	-20	Pass

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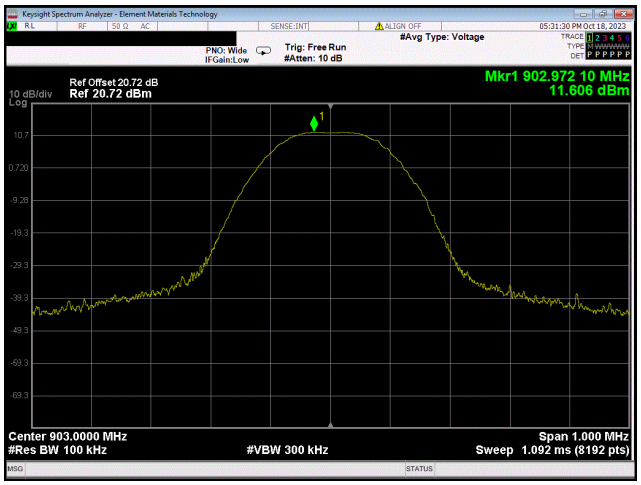
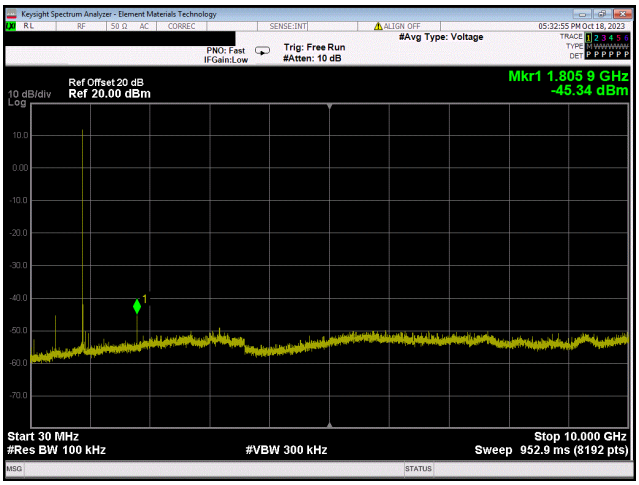
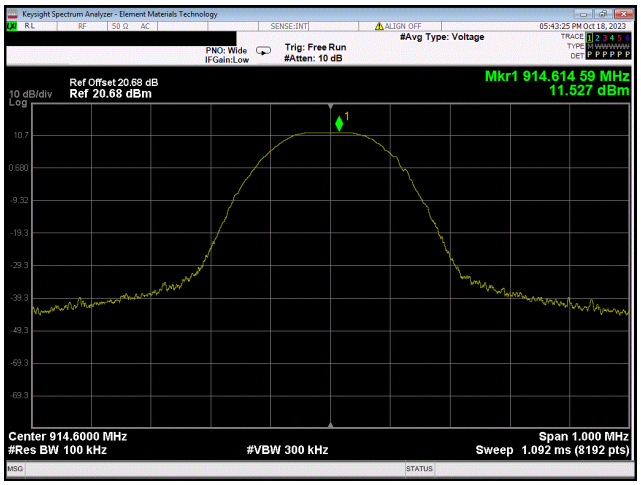
TbtTx 2023.08.15.2
WTD.2023.10.09.0



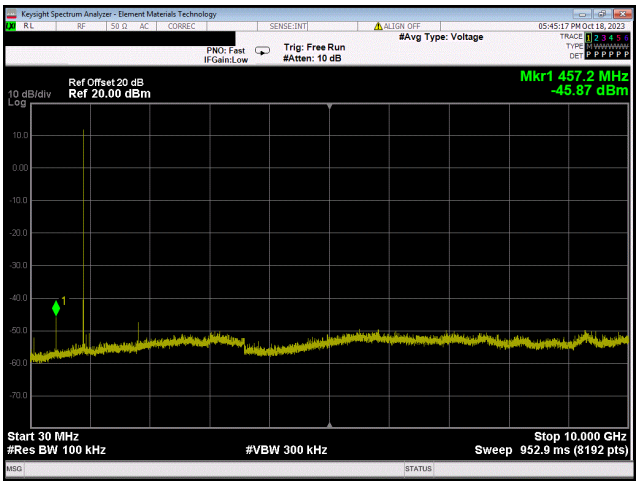
2-FSK
Low Channel, 903 MHz



2-FSK
Low Channel, 903 MHz



2-FSK
Mid Channel, 914.6 MHz



2-FSK
Mid Channel, 914.6 MHz

SPURIOUS CONDUCTED EMISSIONS

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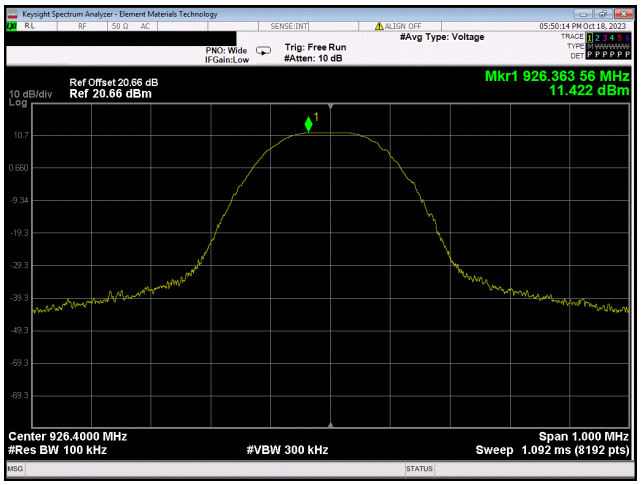
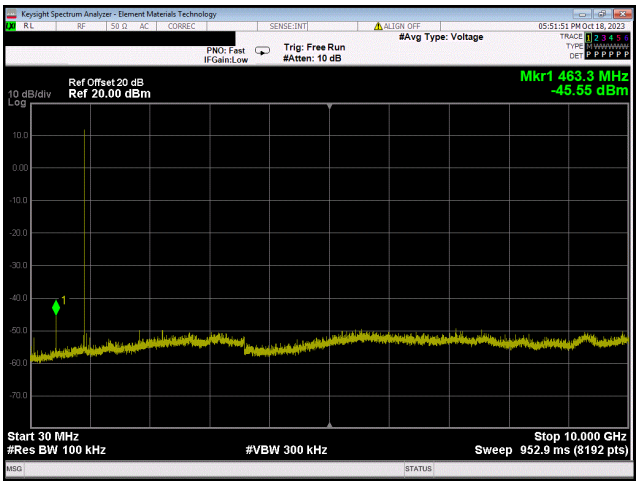
TbtTx 2023.08.15.2
WTD.2023.10.09.0



2-FSK
High Channel, 926.4 MHz



2-FSK
High Channel, 926.4 MHz

End of Test Report