



Test Report Prepared By:

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EMC testing of the Tektelic Communication Inc. Seal/Seal Ex in accordance with FCC Part 15.247 and ANSI C63.10: 2013 as referenced by FCC OET KDB 558074 D01 15.247 Meas Guidance v05r02.

FCC ID: 2ALEPT0007705

Test Dates: 2023-09-22 to 2023-09-27

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Prepared for:

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REVISION RECORD

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DRAFT 1	2023-10-02	I. Akram	Initial draft submitted for review.
DRAFT 2	2023-10-16	I. Akram	Added serial#, antennas information, FCC ID.
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1.0 INTRODUCTION

1.1 Scope

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15.247 and ANSI C63.10-2013 to gain FCC Authorization for Low-Power License-Exempt transmitters. All test procedures, limits, criteria, and results described in this report apply only to the Tektelic Communication Inc. Seal/Seal Ex test sample, referred to herein as the EUT (Equipment Under Test).

This report does not imply product endorsement by the Electronics Test Centre, A2LA, nor any Canadian Government agency.

1.2 Applicant

This test report has been prepared for Tektelic Communication Inc., located in Calgary, Alberta, Canada.

1.3 Test Sample Description

As provided to ETC (Airdrie) by Tektelic Communication Inc.:

Product Name:		Seal/Seal Ex			
LoRa	Frequency Band	902 – 928 MHz			
	Frequency Range	902.3 – 914.9 MHz			
Radio	Mode of Operation	Hybrid 125KHz			
Radio	Max Transmit Power (Conducted)	0.023 W (13.58 dBm)			
Associated LoRa Antennas		RUN mXTEND [™] Model# NN02-224 operating ISM band (863 – 928 MHz) Peak Gain = 2.2 dBi, Polarization = Linear			
Model# (T	-Code)	T0008769			
Serial#		2341K0001, 2341K0002, 2338K0003			
Power supply:		Battery Powered			

Note: There are two variant of the EUT named as <u>Seal</u> and <u>Seal Ex</u>. There is no difference in radio circuitry/enclosure between two variant except Seal variant powered by three batteries and Seal Ex powered by two batteries and ATEX certified. The seal variant was chosen as a worst-case condition for emission testing. Both variant tested for emission profile and found no difference in emission. Detail differences between the models are given in <u>EUT description exhibit</u>. All three channels (LOW, MID, High) on each axis (X, Y & Z) are analyzed to determine the worse channel. Full emission scan is performed on worse channel at worse axis.

1.4 General Test Conditions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated. In order to meet the operational requirements during testing as per KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10-2013 clause 5.11 the device was programmed with a special firmware to transmit at a continuous transmit mode (100% duty cycle). Special firmware is strictly for testing purpose only and not available to end user. This special test case represents the worst-case duty cycle. For antenna port conducted emission SMA connector is soldered to the circuit board at the output of the radio to provide direct access to the radio output to connect the spectrum analyzer and power cable to battery terminals to connect DC power supply.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report. The environmental conditions are recorded during each test, and are reported in the relevant sections of this document.

1.5 Reference Standards

Standards	Description
FCC, title 47 CFR § 15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC, title 47 CFR § 15.207	Conducted limits for an intentional radiator that is designed to be connected to the public utility (AC) power line.
FCC, title 47 CFR § 15.107	Conducted limits for equipment that is designed to be connected to the public utility (AC) power line.
FCC, title 47 CFR § 15.209	Radiated emission limits; general requirements
FCC, title 47 CFR § 15.109	Radiated emission limits; from unintentional radiators digital devices.
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio – Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 KHz to 40 GHz
558074 D01 15.247 Meas Guidance v05r02	Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The FCC Rules

1.6 Test Methodology

Test methods are specified in the Basic Standard as referenced and/or modified by the Product Standard in the part of Section 2 of this report associated with each particular test case. EUT tested for RX mode to cover FCC Part 15 subpart B (digital Circuitry).

1.6.1 Variations in Test Methodology

Any variance in methodology or deviation from the reference Standard is documented in the part of Section 2 of this report associated with each particular Test Case.

1.6.2 Test Sample Verification, Configuration & Modifications

EUT setup, configuration, protocols for operation and monitoring of EUT functions, and any modifications performed in order to meet the requirements, are detailed in each Test Case of Section 2 of this report.

1.6.3 Uncertainty of Measurement:

The factors contributing to measurement uncertainty are identified and calculated in accordance with CISPR 16-4-2: 2011.

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Uncertainty
Radiated Emissions Level (9 KHz – 1 GHz)	±5.8 dB
Radiated Emissions Level (1 GHz – 18 GHz)	±4.9 dB
Radiated Emissions Level (18 GHz – 26.5 GHz)	±5.0 dB
Conducted Emissions Level (150 KHz – 30 MHz)	±3.0 dB
Uncertainty Conducted Power level	±0.5 dB
Uncertainty Conducted Spurious emission level	±0.6 dB
Uncertainty for Bandwidth test	±1.5 %

2.0 TEST CONCLUSION

STATEMENT OF COMPLIANCE

The customer equipment referred to in this report was found to comply with the requirements, as summarized below.

The EUT was subjected to the following tests. Compliance status is reported as **Compliant** or **Non-compliant**. **N/A** indicates the test was Not Applicable to the EUT.

The measurement uncertainty is not accounted for determination of the statement of compliance. The statement of compliance is based only on the measurement value recorded.

Note: Maintenance of compliance is the responsibility of the Manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the EUT with respect to the standards detailed in this test report.

The following table summarizes the tests performed in terms of the specification, class or performance criterion applied, and the EUT modification state.

Test Case	Test Type	Specification	Test Sample	Modifications	Config.	Result
2.1	AC Main Conducted Emissions	15.207 / 15.109	Seal/Seal Ex	none	see § 2.1	N/A
2.2	Occupied Bandwidth	15.247(a)(1) 15.247(2)(2)	Seal/Seal Ex	none	see § 2.2	Compliant
2.3	Max Output Average Power	15.247(b)	Seal/Seal Ex	none	see § 2.3	Compliant
2.4	Power Spectral Density	15.247(e) 15.247(f)	Seal/Seal Ex	none	see § 2.4	Compliant
2.5	Band Edge	15.247(d)	Seal/Seal Ex	none	see § 2.5	Compliant
2.6	Conducted Spurious Emission (Non-Restricted Band Operation)	15.247(d)	Seal/Seal Ex	none	see § 2.6	Compliant
2.7	Minimum channel separation	15.247(a)(1)	Seal/Seal Ex	none	see § 2.7	Compliant
2.8	Average time of Occupancy for hybrid System	15.247(f)	Seal/Seal Ex	none	see § 2.8	Compliant
2.9	EUT Position	ANSI C63.4	Seal/Seal Ex	none	see § 2.9	Y-Axis
2.10	Radiated Spurious Emission (Restricted Band)	15.205, 15.209 15.247(d)	Seal/Seal Ex	none	see § 2.10	Compliant
2.11	Radiated Emission	15.109	Seal/Seal Ex	none	see § 2.11	Compliant
2.12	RF Exposure	15.247(i)	Seal/Seal Ex	none	see § 2.12	Exempt

Refer to the test data for applicable test conditions.

2.1 AC Main Power Line Conducted Emissions: N/A

Test Lab: Electronics Test Centre, Airdrie	EUT: Seal/Seal Ex			
	Standard: FCC Part 15.207, FCC Part 15.107			
	Basic Standard: ANSI C63.10: 2013 Basic Standard: ANSI C63.4: 2014			
EUT stat	us: N/A			
Comments: EUT is Battery Powered. No Direct/indirect connection to AC main.				

2.2 Occupied Bandwidth

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Brendan Van Hee

Date: 2023-09-22 (21.7°C, 22.8% RH)

EUT: Seal/Seal Ex

Standard: FCC PART 15.247

Basic Standard: ANSI C63.10-2013 FCC OET KDB 558074

EUT status: Compliant

Specification: FCC Part 15.247 (a, 1, i)

Criteria: The maximum allowed 20 dB bandwidth of the hopping channel is 250 kHz.

2.2.1 Test Guidance: ANSI C63.10-2013, Clause 6.9.2 & 6.9.3/ FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following spectrum analyzer setting:						
Span	Between two time and five times the channel center frequency OBW					
RBW	1% to 5% of the OBW					
VBW Approximately three times of RBW						
Sweep	Auto Couple					
Detector Function Peak						
Trace Max Hold						
Allow the trace to stabilize. The automated 99% BW function of the spectrum analyzer is engaged, 20dB bandwidth is measured with the X dB function.						

2.2.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.2.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	each use
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before	e each use

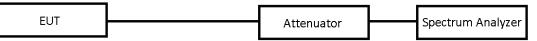
2.2.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

Test setup diagrams for Occupied Bandwidth testing:

Conducted:



2.2.5 Channel Occupied Bandwidth Data:

Mode of operation	Channel	Freq. [MHz]	Occupied BW [kHz]	20 dB BW [kHz]	Limit 20dB BW [KHz]	
	Low	902.3	127.99	138.1		
125KHz Hybrid	Mid	908.7	128.00	138.8	≤ 250	
	High	914.9	127.93	138.3		

<u>Hybrid (125 KHz) Mode</u>

Screen Captures from the spectrum analyzer: Low Channel



Screen Captures from the spectrum analyzer: MID Channel



Keysight Spectrum Analyzer - Occupied BW							- P	x
x RF 50Ω AC Center Freq 914.900000 M	– – – – – – – – – – – – – – – – – – –	SENSE:INT Center Freq: 914.90 Trig: Free Run Atten: 30 dB		IGN AUTO 10/10	11:18:08 A Radio Std Radio Dev		Frequency	
Ref Offset 10.22 dl 10 dB/div Ref 49.77 dBm Log	3							
29.8							Center Fr 914.900000 N	
9.77								
-10.2								
-30.2					Varse and a series	and wat		
Center 914.9000 MHz #Res BW 3 kHz		#VBW 10 k	ίHz			300.0 kHz 31.67 ms	CF St 30.000	kHi
Occupied Bandwidth	27.93 kHz		Power	29.9	dBm			Mar
Transmit Freq Error	357 Hz		BW Power	99	.00 %		Freq Off 0	se) Ha
x dB Bandwidth	138.3 kHz	z x dB		-20.	00 dB			
ISG 🧼 File < OBW.png> saved				STATUS	3			

Screen Captures from the spectrum analyzer: High Channel

2.3 Max Average Output Power

Test Lab: Electronics T	est Centre, Airdrie
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Test Personnel: Brendan Van Hee

Date: 2023-09-22 (21.7°C, 22.8% RH)

EUT: Seal/Seal Ex

Standard: FCC PART 15.247

Basic Standard: ANSI C63.10: 2013 FCC OET KDB 558074

EUT status: Compliant

Specification: FCC Part 15.247(b, 2)

Criteria For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels

2.3.1 Test Guidance: ANSI C63.10-2013, Clause 11.9.2.2.2 Clause 7.8.5 / FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Output Power Method AVGSA-1 For DTS						
Span	≥ 1.5 times the OBW					
RBW	$1 - 5$ % of the OBW, ≤ 1 MHz					
VBW	≥ 3 x RBW					
Number of Points in sweep	≥ 2 x Span / RBW					
Sweep time	Auto Couple					
Detector	RMS (Power Averaging)					
Sweep trigger	Free Run (Duty Cycle ≥98%)					
Trace Average	Minimum 100 traces in power Averaging (RMS)					
Power measured	Integrated the spectrum across the OBW of the signal using the S/A band power measurement function, with band limit set equal to the OBW band edge.					

2.3.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.3.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before each use	
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before each use	

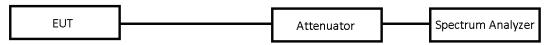
2.3.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

Test setup diagrams for Power testing:

Conducted:

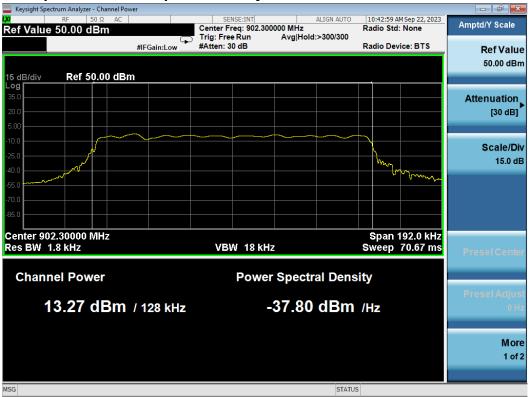


2.3.5 Max Output Power Data: DSS

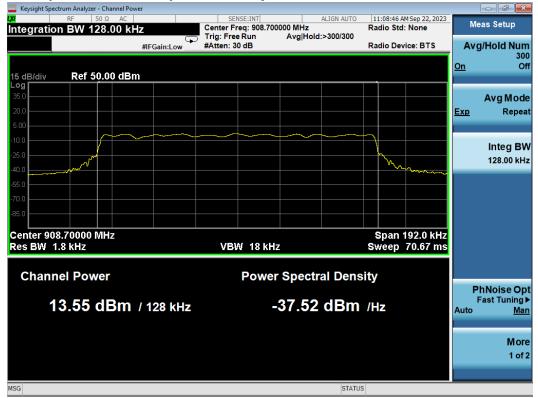
Mode of operation	Channel	Freq. [MHz]	Max Average Power [dBm]	Limit Power [dBm]
	Low	902.3	13.27	
125KHz Hybrid	Mid	908.7	13.55	≤ 30 (1Watt)
	High	914.9	13.58	

Hybrid (125 KHz) Mode

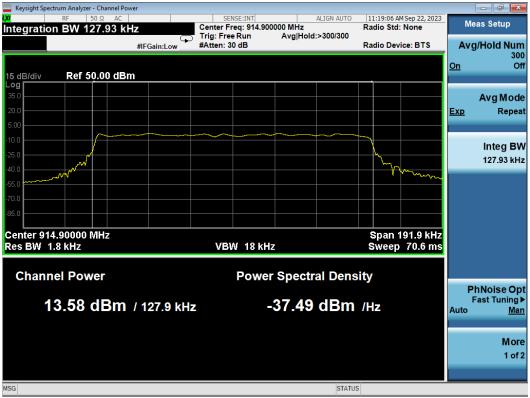
Screen Captures from the spectrum analyzer Low Channel



Screen Captures from the spectrum analyzer: MID Channel



Screen Captures from the spectrum analyzer: High Channel



2.4 **Power Spectral Density**

Test Lab: Electronics Test Centre, AirdrieEUT: Seal/Seal ExTest Personnel: Brendan Van HeeStandard: FCC PAR

Date: 2023-09-22 (21.7°C, 22.8% RH)

Standard: FCC PART 15.247 Basic Standard: ANSI C63.10: 2013

EUT status: Compliant

Specification: FCC Part 15.247(f)

Criteria The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

2.4.1 Test Guidance: ANSI C63.10-2013, Clause 11.10.3 / FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, in continuous transmission, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following Spectrum Analyzer settings					
Span	At least 1.5 times the OBW of channel center Frequency				
RBW	3 KHz				
VBW	≥ 3 x VBW				
Sweep	Auto Couple				
Detector Function	Power averaging (RMS) or Sample detector (when RMS not available.				
Trace	Employ trace average (rms) mode over a minimum of 100 traces.				
Ensure that the number of measurement points in the sweep \geq [2 x span / RBW]. Allow the					
trace to stabilize. Use	the peak marker function to determine the maximum amplitude level.				

2.4.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.4.3 Test Equipment

Testing was performed with this equipment:

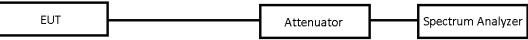
Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before	e each use

2.4.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

Test setup diagrams for Power Spectral Density testing: Conducted:



2.4.5 Average PSD Data

Mode of operation	Channel	Freq. [MHz]	PSD (dBm)	PSD Limit (dBm
	Low	902.3	-1.551	
LoRa 125 KHz	Mid	908.7	-1.519	≤ 8 3KHz
	High	914.9	-1.506	

Screen Capture from Spectrum Analyzer: Low Channel





Screen Capture from Spectrum Analyzer: MID Channel





2.5 Band Edge Attenuation

Test Lab: Electronics Test Centre, Airdrie	EUT: Seal
Test Personnel: Brendan Van Hee	Standard:

Date: 2023-09-22 (21.7°C, 22.8% RH)

EUT: Seal/Seal Ex Standard: FCC PART 15.247 Basic Standard: ANSI C63.10: 2013

EUT status: Compliant

Specification: FCC Part 15.247(d)

Criteria: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.209(a) (see §15.205(c)).

2.5.1 Test Guidance: ANSI C63.10-2013 Clause 6.10.4 & 7.8.6, 6.10.6 / FCC OET KDB 558074

This measurement is performed at the low and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following spectrum analyzer settings:					
Span	Wide enough to capture the peak level of the emission operating on				
	the channel closest to the band edge, as well as any modulation				
	products that fall outside of the authorized band of operation.				
Attenuation	Auto (at least 10 dB preferred).				
RBW	100 kHz				
VBW	300 kHz				
Sweep	Coupled				
Detector function	peak				
Trace	max hold				
Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the					
highest modulation product outside of the band, if this level is greater than that at the					
band edge. Enable the marker-delta function, and then use the marker-to-peak function					
to move the marke	er to the peak of the in-band emission.				

2.5.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.5.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before each use	
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before	e each use

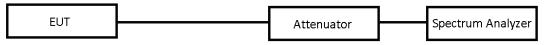
2.5.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

Test setup diagrams for Band Edge Attenuation testing:

Conducted:



2.5.5 Band Edge Data

Worse Case Data

Mode of operation	Channel	Attenuation at Band Edge	Attenuation Limit at Band Edge
Lora 125KHz	902.3	66.151 dBc	
(Non-Hopping)	914.9	49.137 dBc	
Lora 125KHz	902.3	52.615 dBc	≥30 dBc
(Hopping)	914.9	66.135 dBc	

Screen Capture from the spectrum analyzer: Lower Band Edge (Non-Hopping)

🚾 Keysight Spectrum Analyzer - Swept SA			
₩ RF 50 Ω AC Marker 2 317.800000 kHz	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	ALIGN AUTO 10:46:52 AM Sep 22, Avg Type: Log-Pwr TRACE 1 2 3 Avg Hold:>100/100 TYPE MWW DET P NN	456 Peak Search
Ref Offset 10.22 dB 10 dB/div Ref 30.22 dBm	IFGain:Low #Atten: 30 dB	ΔMkr2 317.8 k 49.137	HZ NextPeak dB
20.2 10.2 0.220		2	Next Pk Right
-9.78 -19.8 -29.8		1.16.73	Next Pk Left
-39.8 -49.8 -59.8		~~~^\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Marker Delta
Start 900.000 MHz #Res BW 100 kHz MKR MODE TRC SCL X	#VBW 300 kHz	Stop 902.300 N Sweep 1.000 ms (1001) TION FUNCTION WIDTH FUNCTION VALUE	IHz ots) Mkr→CF
2 Δ3 1 f (Δ)	67 8 MHz 13.318 dBm 317.8 kHz (Δ) 49.137 dB 50 0 MHz -35.820 dBm		Mkr→RefLv
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9			More 1 of 2
MSG		STATUS	

Screen Capture from the spectrum analyzer: Upper Band Edge (Non-Hopping)

Keysight Spectrum Analyzer - Swept SA	-	-		<u> </u>	
RF 50 Ω AC arker 2 Δ -13.150000000		SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>300/300	11:24:45 AM Sep 22, 2023 TRACE 1 2 3 4 5 6 TYPE M WWWW	Marker
Ref Offset 10.22 dB 0 dB/div Ref 30.22 dBm		Atten: 30 dB	.	-13.150 0 MHz 66.151 dB	Select Marker 2
οg 2Δ3 10.2 220					Norm
9.8				DL1 -16.42 dBm	Delt
9.8	harmon		- Andrew and and polymour	X3	Fixed
tart 914.900 MHz Res BW 100 kHz	#VBW 30		Sweep 1	Stop 930.000 MHz 467 ms (1001 pts)	c
2 Δ3 1 f (Δ) -13.1	50 0 MHz (Δ)	8.620 dBm 66.151 dB 8.526 dBm			Properties
7 8 9 9 0 1				v	Moi 1 of
G			STATUS		

Screen Capture from the spectrum analyzer: Lower Band Edge (Hopping)

₩ RF 50 Ω AC Marker 2 Δ 497.500000 kH		ALIGN AUTO 01:26:39 PM Sep 22, 2023 Avg Type: Log-Pwr TRACE 1 2 3 4 5 6 Avg Hold:>300/300 TYPE Mwwwww	Peak Search
Ref Offset 10.22 dB 10 dB/div Ref 30.22 dBm	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	ΔMkr2 497.5 kHz 52.615 dB	NextPeak
20.2 10.2 0.220		243	Next Pk Right
-9.78 -19.8 -29.8		DL1 -16.73 dBm	Next Pk Left
-39.8 -49.8 -59.8	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	man Martin	Marker Delta
Start 900.000 MHz #Res BW 100 kHz	#VBW 300 kHz	Stop 902.500 MHz Sweep 1.000 ms (1001 pts)	Mkr→CF
2 Δ3 1 f (Δ)	47 5 MHz 13.337 dBm 497.5 kHz (Δ) 52.615 dB 50 0 MHz -39.278 dBm		Mkr→RefLvl
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9		· · · · · · · · · · · · · · · · · · ·	More 1 of 2
MSG		STATUS	

Screen Capture from the spectrum analyzer: Upper Band Edge (Hopping)

				- 5 💌
₩ RF 50 Ω AC Marker 2 Δ -13.280600000	MHz PNO: Wide C Trig: Free Run	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>300/300	01:30:27 PM Sep 22, 2023 TRACE 1 2 3 4 5 6 TYPE MWWWWW	Peak Search
Ref Offset 10.22 dB 10 dB/div Ref 30.22 dBm	IFGain:Low #Atten: 30 dB	<u> </u>	-13.280 6 MHz 66.135 dB	NextPeak
20.2 2Δ3 10.2 0.220				Next Pk Right
-9.78			DL1 -16.42 dBm	Next Pk Left
-39.8	······································	agrant and alway and and	unigeti al freezense and a second	Marker Delta
Start 914.600 MHz #Res BW 100 kHz MKR MODE TRC SCL X 1 N 1 5 914.7	#VBW 300 kHz	Sweep 1.	Stop 930.000 MHz 533 ms (1001 pts) FUNCTION VALUE	Mkr→CF
2 Δ3 1 f (Δ) -13.2	836 6 MHz (Δ) 66.135 dB 150 0 MHz -52.474 dBm			Mkr→RefLvl
7 8 9 10 11				More 1 of 2
MSG		STATUS		

2.6	Conducted S	purious Emissions (N	on- Restricted Band)

Test Lab: Electronics Test Centre, Airdrie	EUT: Seal/Seal Ex
Test Personnel: Brendan Van Hee	Standard: FCC PART 15.247
Date: 2023-09-22 (21.7°C, 22.8% RH)	Basic Standard: ANSI C63.4-2014 FCC OET KDB 558470 v04 DTS

EUT status: Compliant

Specification: FCC Part 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

2.6.1 Test Guidance: ANSI C63.10-2013, Clause 6.7, 7.8.8 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed at the low, mid and high frequencies, with modulation. The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following s	spectrum analyzer settings:
Span	Set the center frequency and span to encompass frequency range to be measured.
RBW	100 kHz
VBW	300 kHz
Sweep	Auto Coupled
Detector function	peak
Trace	max hold
Allow the trace to	stabilize. Use the peak marker function to determine the maximum

Allow the trace to stabilize. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in

2.6.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.6.3 Test Equipment

Testing was performed with the following equipment:

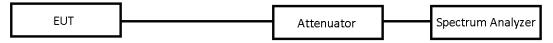
Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due					
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20					
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14					
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10					
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before each use						
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before each use						

2.6.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

Test setup diagram for Conducted Spurious Emissions testing:



2.6.5 Conducted Emissions Data:

Low Channel



Keysight Spe		- Spurious Emissions						Keysight Sp		- Spurious Emissions					
		0 Ω 🚹 DC	SENSE:INT Center Freq: 90		N AUTO 10:57:46 AM Se Radio Std: No		Range Table			50 Ω AC		NSE:INT reg: 902.300000 MHz		AM Sep 22, 2023	Range Table
Res BW '	10.000 KI	HZ	Talas Francis	12.300000 WITZ	Radio Stu. No	me		Ret Offs	et 10.12	αB	Takes Day		Radio S	ta. None	<u> </u>
PASS		IFGain:			Radio Device	BTS	Range	FAIL		IFGain:L			Radio D	evice: BTS	Range
		ii Gain.	Low Ministerio and				1			II Gam.c	.04				2
15 dB/div		set 10 dB 9.78 dBm			5.0959 -60.052		<u>On</u> Off	15 dB/div		fset 10.12 dB 9.90 dBm				2.31 MHz 192 dBm	<u>On</u> Off
Log 34.8 19.8 4.78							Start Freq 30.000 kHz	Log 34.9 19.9 4.90		FAIL (F) cor fundamenta	•			•1	Start Freq 30.000000 MHz
-10.2 -25.2 -40.2		1					Stop Freq 30.000000 MHz	-10.1 -25.1 -40.1							Stop Freq 1.000000000 GHz
-55.2 -70.2	n <mark>a th</mark>					Maria	Res BW 10.000 kHz Auto <u>Man</u>	-70.1 -70.14	yan da ka ya ka			ni lännan op av og falst men stat og som en stat i påne Mit i fanne ålskelde som en stat og som en stat i påne Mit i fanne ålskelde som en stat og som en stat og	<mark>na, na kao 1970, amin'ny dia kaodim-paositra dia kaominina dia kaominin</mark>		Res BW 100.00 kHz Auto <u>Man</u>
Start 30 k	(Hz				Stop 3	0 MHz FFT	Video BW 30.000 kHz	Start 30	MHz					Stop 1 GHz	Video BW 300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	∆ Limit		Auto <u>Man</u>	Spur	Range	Frequency	Amplitude	Limit	Δ Limit		Auto <u>Man</u>
1	1	95.95 kHz	-54.52 dBm	-16.73 dBm	-37.79 dB	^		1	2	902.3 MHz	13.21 dBm	F -16.73 d	3m 29.94 dB	^	
2	1	173.9 kHz	-55.71 dBm	-16.73 dBm	-38.98 dB		Filter Type	2	2	900.6 MHz	-51.45 dBm	-16.73 di	3m -34.72 dB		Filter Type
							Gaussian								Gaussian
3	1	113.9 kHz	-56.07 dBm	-16.73 dBm	-39.34 dB		Guuddhin	3	2	717.2 MHz	-52.55 dBm				Guadolan
4	1	191.9 kHz	-56.99 dBm	-16.73 dBm	-40.26 dB			4	2	956.7 MHz	-52.87 dBm	-16.73 di	3m -36.14 dB		
5	1	5.096 MHz	-59.49 dBm	-16.73 dBm	-42.76 dB			5	2	851.0 MHz	-53.15 dBm	-16.73 d	3m -36.42 dB		
6	1	275.8 kHz	-60.86 dBm	-16.73 dBm	-44.13 dB		More	6	2	954.8 MHz	-53.35 dBm				More
							1 of 3								1 of 3
/	1	6.277 MHz	-64.02 dBm	-16.73 dBm	-47.29 dB	\sim		/	2	977.8 MHz	-53.36 dBm	-16.73 di	3m -36.63 dB	~	
1100													074710		
MSG					STATUS 1 DC Couple	ea		MSG					STATUS		

🔤 Keysight Spi	ectrum Analyzer	- Spurious Emissions							- 6 .
V Points 20		0Ω AC		SE:INT eq: 902.300000 MHz	ALIGN AUTO	11:04:00 A	4 Sep 22, 2023	Rai	nge Table
PASS	5001	IFGain:	Trig: Free	Run		Radio Dev	ice: BTS		Range
15 dB/div		set 10.89 dB 0.67 dBm					46 GHz 09 dBm	<u>On</u>	3 Off
Log 35.7 20.7								1.00	Start Freq
5.67 -9.33 -24.3									Stop Freq
		dada ati o shi birilara ay filika ay		a Baran an an Arika Alika Anaran ang tao ang kana kana kana kana ang Mang tao ang kana kana ang tao	ale contra la contra de contra Especia de contra de c	alian ang santa sa sa sa	a sek anti-a sec a a a basil Mana a a constanti a basil	10.00	Res BW
-69.3								Auto	100.00 kHz <u>Man</u>
Start 1 G	Hz					Sto	p 10 GHz	Auto	Video BW 300.00 kHz Man
Spur	Range	Frequency	Amplitude	Limit	Δ	Limit		Auto	Ivian
1 2	<mark>3</mark> 3	1.805 GHz 3.038 GHz	-42.58 dBm -47.88 dBm	-16.73 dE -16.73 dE	im -31	5.85 dB I.15 dB	^	F	ilter Type
3	3 3	3.111 GHz 6.151 GHz	-47.97 dBm -48.04 dBm	-16.73 dE -16.73 dE		I.24 dB I.31 dB			Gaussian
5	3	6.036 GHz	-48.19 dBm	-16.73 dE		.46 dB			More
6 7	3 3	3.058 GHz 3.141 GHz	-48.26 dBm -48.33 dBm	-16.73 dE -16.73 dE		1.53 dB 1.60 dB	~		1 of 3
MSG					STATUS	5			

MID Channel



Keysight Sp		- Spurious Emissions					- đ 🔀	Keysight S		- Spurious Emissions					- 0 ×
Ref Offse		50 Ω <u>A</u> DC B	Takes Days D	908.700000 MHz	GN AUTO 11:16:02 AMS Radio Std: N		Range Table	Start Lir	nit -16.45	50 Ω AC dBm		908.700000 MHz	Radio Std: None	2023	Range Table
PASS		IFGain:			Radio Devic	e: BTS	Range	FAIL		IFGain:Lo			Radio Device: BT	s	Range
15 dB/div		set 10 dB 0.45 dBm			5.095 -59.14	9 MHz 9 dBm	0n Off	15 dB/div		fset 10.12 dB 0.57 dBm			908.71 N 13.332 d		2 D Off
20.5							Start Freq 30.000 kHz	20.6		FAIL (F) co fundamenta	orrespond to al TX = 908.				Start Freq 30.000000 MHz
-9.55 -24.6 -39.6		1					Stop Freq 30.000000 MHz	-9.43 -24.4 -39.4							Stop Freq 1.000000000 GHz
-54.6 -69.6 -84.6			<u>han tan</u> un tan	teritoria anti-teritoria terretta 1919 - Las Anti-terretta (h. 1919) 1919 - Las Anti-terretta (h. 1919)		n de la circi de La circi de la circi	Res BW 10.000 kHz Auto <u>Man</u>	-69.4 -114.154 -84.4	n Algel (an ann an t				n i her en der er her en her er fille en fille en er en	Au	Res BW 100.00 kHz ito <u>Man</u>
Start 30	kHz				Stop	30 MHz FFT		Start 30	MHz				Stop 1 0	SHZ	Video BW 300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	Δ Limit		Auto <u>Man</u>	Spur	Range	Frequency	Amplitude	Limit	Δ Limit	Au	to <u>Man</u>
1 2 3 4	1 1 1 1	119.9 kHz 203.9 kHz 5.096 MHz 179.9 kHz	-49.11 dBm -58.13 dBm -58.26 dBm -58.94 dBm	-16.45 dBm -16.45 dBm -16.45 dBm -16.45 dBm	-32.66 dB -41.68 dB -41.81 dB -42.49 dB	^	Filter Type Gaussian	1 2 3 4	2 2 2 2	908.7 MHz 907.6 MHz 907.0 MHz 906.2 MHz	13.35 dBm -51.55 dBm -52.64 dBm -53.05 dBm	 -16.45 dBm -16.45 dBm -16.45 dBm -16.45 dBm 	29.80 dB -35.10 dB -36.19 dB -36.60 dB	*	Filter Type Gaussian
5 6 7	1 1 1	317.8 kHz 227.8 kHz 8.885 MHz	-60.15 dBm -63.57 dBm -64.96 dBm	-16.45 dBm -16.45 dBm -16.45 dBm	-43.70 dB -47.12 dB -48.51 dB	~	More 1 of 3	5 6 7	2 2 2	857.8 MHz 862.2 MHz 914.0 MHz	-53.16 dBm -53.17 dBm -53.17 dBm	-16.45 dBm -16.45 dBm -16.45 dBm	-36.72 dB -36.72 dB -36.72 dB	~	More 1 of 3
MSG					STATUS 1 DC Cour	led		MSG					STATUS		

Keysight Sp	ectrum Analyzer	- Spurious Emissions							- 0 ×
	RF 5 et 10.89 c	50Ω AC		SE:INT eq: 908.700000 MHz Run	ALIGN AUTO	11:12:05 A Radio Std	M Sep 22, 2023 : None	Ra	nge Table
PASS		IFGain				Radio Dev	rice: BTS		Range
15 dB/div		set 10.89 dB 1.34 dBm					72 GHz 68 dBm	<u>On</u>	3 Off
Log 36.3 21.3 6.34								1.00	Start Freq 0000000 GHz
-8.66 -23.7 -38.7	•1							10.00	Stop Freq 0000000 GHz
-53.7 (1993) -68.7 -68.7				and the conjugate data with an algorithm.		hanna a lan daran mengan dara dara		Auto	Res BW 100.00 kHz <u>Man</u>
Start 1 G	Hz					Sto	p 10 GHz		Video BW 300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	Δ	Limit		Auto	Man
1	3	1.817 GHz	-40.57 dBm	-16.45 dE	im -24	.12 dB	^		
2	3	3.615 GHz	-47.51 dBm	-16.45 dE		.06 dB		1	ilter Type
3	3	2.453 GHz	-47.52 dBm	-16.45 dE		.07 dB			Gaussian
4	3	3.602 GHz	-47.75 dBm	-16.45 dE		.30 dB			
5	3	3.655 GHz	-48.24 dBm	-16.45 dE		.79 dB			More
6 7	3 3	6.158 GHz 2.998 GHz	-48.24 dBm -48.24 dBm	-16.45 dE -16.45 dE		.79 dB .79 dB			1 of 3
		2,390,0112	-40724-010111	-10.45 uE	-51		~		
ISG					STATUS				

High Channel



🔤 Keysigh		- Spurious Emissions						🛄 Keysight Sp	pectrum Analyzer	- Spurious Emissions					
x Ref Of	R⊧ set 10.00 (50 Ω <u>Λ</u> DC		22.450000 MHz	N AUTO 11:26:14 AM Sep 22 Radio Std: None	, 2023	Range Table	.× Start Lin	RF 16.42	50Ω AC dBm		q: 922.450000 MHz	ALIGN AUTO 11:27: Radio	23 AM Sep 22, 2023 Std: None	Range Table
PASS		IFGain	Low Trig: Free Run #Atten: 30 dB		Radio Device: B1	s	Range	FAIL		IFGain:	Low Trig: Free I #Atten: 30		Radio I	Device: BTS	Range
15 dB/di		fset 10 dB 0.23 dBm			5.0959 N -59.479 d		0n Off	15 dB/div	Ref Of Ref 5	fset 10.12 dB 0.35 dBm				4.92 MHz .495 dBm	2 <u>On</u> Off
Log 35.2 20.2 5.23							Start Freq 30.000 kHz	Log 35.4 20.4 5.35			orrespond to al TX = 914.	9 MHz		1	Start Freq 30.000000 MHz
-9.77 -24.8 -39.8							Stop Freq 30.000000 MHz	-9.65 -24.7 -39.7							Stop Freq 1.000000000 GHz
-54.8 -69.8 -84.8			des applications, et all pro-				Res BW 10.000 kHz Auto <u>Man</u>	-84.7		er anna hannan in in 1993 anna Salada (Kostijia) ya nisia di salad	se to from the source of the form of the source of the sou	<mark>n de la del de la del</mark> La del de la	a na ma parte de la comencia Anna ma parte de la comencia		Res BW 100.00 kHz Auto <u>Man</u>
Start 3	0 kHz				Stop 30 F	FT	Video BW 30.000 kHz	Start 30	MHz					Stop 1 GHz	300.00 kHz
Spu	r Range	Frequency	Amplitude	Limit	Δ Limit	4	luto <u>Man</u>	Spur	Range	Frequency	Amplitude	Lim	it ∆ Limit		Auto <u>Man</u>
1 2 3	1 1 1	83.96 kHz 131.9 kHz 5.096 MHz 185.9 kHz	-49.77 dBm -55.38 dBm -59.14 dBm -59.31 dBm	-16.42 dBm -16.42 dBm -16.42 dBm -16.42 dBm	-33.35 dB -38.96 dB -42.72 dB -42.89 dB	^	Filter Type Gaussian	1 2 3	2 2 2 2	914.9 MHz 913.8 MHz 916.1 MHz 916.7 MHz	13.50 dBm -50.13 dBm -50.18 dBm -50.38 dBm	F -16.42 c -16.42 c -16.42 c -16.42 c	IBm -33.71 dE IBm -33.76 dE	3	Filter Type Gaussian
4 5 6 7	1 1 1	197.9 kHz 227.8 kHz 251.8 kHz	-61.07 dBm -61.48 dBm -62.65 dBm	-16.42 dBm -16.42 dBm -16.42 dBm -16.42 dBm	-42.69 dB -44.65 dB -45.06 dB -46.23 dB	Ŷ	More 1 of 3	5 6 7	2 2 2 2	926.5 MHz 841.7 MHz 982.5 MHz	-53.13 dBm -53.15 dBm -53.25 dBm	-16.42 c -16.42 c -16.42 c	IBm -36.71 dE IBm -36.73 dE	3	More 1 of 3
MSG					STATUS 1 DC Coupled			MSG					STATUS		

🛄 Keysight Spi	ectrum Analyzer	- Spurious Emissions							- 6 -
X Start Lim		ioΩ AC dBm		e:INT q: 922.450000 MHz Rup	ALIGN AUTO	11:28:09 Al Radio Std:	None	Ra	nge Table
PASS		IFGain:				Radio Dev	ice: BTS		Range
15 dB/div		set 10.89 dB 1.12 dBm					98 GHz 12 dBm	<u>On</u>	3 Off
Log 36.1 21.1 6.12								1.00	Start Freq 0000000 GHz
-8.88 -23.9 -38.9	1							10.00	Stop Freq 0000000 GHz
-53.9 -68.9 -83.9			and and an a first of the angular difference of the	l yazı, yı İnferinte Den in Lean, sonal film redi			Conference of the second	Auto	Res BW 100.00 kHz <u>Man</u>
Start 1 G	Hz					Sto	p 10 GHz		Video BW 300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	Δ	Limit		Auto	Man
1 2	3 3	1.830 GHz 3.687 GHz	-38.85 dBm -47.02 dBm	-16.42 dE -16.42 dE	im -30	2.43 dB).60 dB	^	F	ilter Type Gaussian
3	3 3	3.186 GHz 3.178 GHz	-47.16 dBm -47.27 dBm	-16.42 dE -16.42 dE).74 dB).85 dB			Gaussian
5	3	6.189 GHZ	-47.67 dBm	-16.42 dE		.25 dB			Marr
6 7	3 3	3.135 GHz 6.119 GHz	-47.72 dBm -47.95 dBm	-16.42 dE -16.42 dE	im -31	.30 dB .53 dB	~		More 1 of 3
MSG					STATUS				

2.7 Channel Separation (Hybrid Mode)

Test Lab: Electronics	Test Centre, Airdrie
------------------------------	----------------------

Test Personnel: Brendan Van Hee

EUT: Seal/Seal Ex Standard: FCC Part 15.247

Date: 2023-09-22 (21.7°C, 22.8% RH) Basic Standard: ANSI C63.10: 2013

EUT status: Compliant

Specification: FCC Part 15.247(a, 1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

2.7.1 Test Guidance: ANSI 63.10 Clause 7.8.2 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed with the EUT transmitter frequency hopping function active.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

The spectrum analyzer is set for a frequency span wide enough to capture at least two adjacent channels. The RBW is set to at least 1% of the span. The Peak detector is used, with the trace set to Max Hold. Channel Separation is displayed with the Marker Delta function.

2.7.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.7.3 Test Equipment

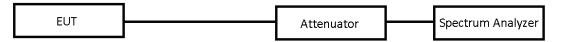
Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before	e each use

2.7.4 Test Sample Verification, Configuration & Modifications

SMA connector is soldered to the circuit board at the output of the radio to provide direct access to the radio output

EUT configuration for Channel Separation testing:



2.7.5 Channel Separation Data:

The channel separation is **Compliant** for this device.

Channel separation measured = 200 KHz

Screen Captures from the spectrum analyzer:

Keysight Spectrum Analyzer - Swept SA				
₩ RF 50 Ω AC Marker 2 Δ 200.000000 kH	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	01:01:44 PM Sep 22, 2023 TRACE 1 2 3 4 5 6	Marker
	PNO: Wide Trig: Free Run IFGain:Low #Atten: 30 dB	Avg Hold:>300/300	TYPE MWWWW DET PNNNNN	Select Marker
Ref Offset 10.22 dB 10 dB/div Ref 30.22 dBm		,	ΔMkr2 200 kHz 0.008 dB	2
20.2 10.2 0.220	×3			Normal
-9.78 -19.8 -29.8				Delta
-39.8 -49.8 -59.8				Fixed⊳
Center 908.7000 MHz #Res BW 51 kHz	#VBW 300 kHz		Span 1.000 MHz .000 ms (1001 pts)	Off
1 N 1 f 908 2 Δ3 1 f (Δ)	8.700 MHz 13.443 dBm 200 kHz (Δ) 0.008 dB 8.500 MHz 13.435 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	Properties►
7 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9			~	More 1 of 2
MSG		STATUS	3	

2.8 Time of Occupancy (Hybrid Mode)

Test Lab: Electronics Test Centre, Airdrie	EUT: Seal/Seal Ex
Test Personnel: Brendan Van Hee	Standard: FCC PART 15.247
Date: 2023-09-22 (21.7°C, 22.8% RH)	Basic Standard: ANSI C63.10: 20013

EUT status: Compliant

Specification: FCC Part 15.247 (f)

The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

2.8.1 Test Guidance: ANSI 63.10 Clause 7.8.4 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed with the EUT frequency hopping function active.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

The spectrum analyzer is set for Peak detection over a 0 Hz frequency span (time domain) centered on a hopping channel. The RBW shall be \leq Channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel. VBW \geq RBW. The sweep time is adjusted to clearly capture one transmission. The Dwell time is measured with the Marker Delta function.

Another sweep is set to capture enough transmission events to calculate the number of events within the specified period of time. The Peak detector is used, with the trace set to Max Hold.

2.8.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.8.3 Test Equipment

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-20	2023-12-20
Temp/Humidity	Extech	42270	5871	2023-04-14	2024-04-14
Attenuator	PCB	BWS102W263	6932	2022-12-10	2025-12-10
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use
DC Blocker	Centric RF	C0927 SMA	6987	Cal. before	e each use

Testing was performed with the following equipment:

2.8.4 Test Sample Verification, Configuration & Modifications

The EUT was operating in normal mode.

The EUT met the requirements without modification.

EUT configuration for Dwell Time testing:

EUT	Attenuator	Spectrum Analyzer
-----	------------	-------------------

2.8.5 Dwell Time Data:

Measured Dwell time	Limit
370.8ms	≤ 400ms

Window of measurement is equal to number of hopping channels multiple by 400ms =

0.4 x 64 = 25.6 Sec

Number of events in 25.6 Sec = 1 = 370.8 ms

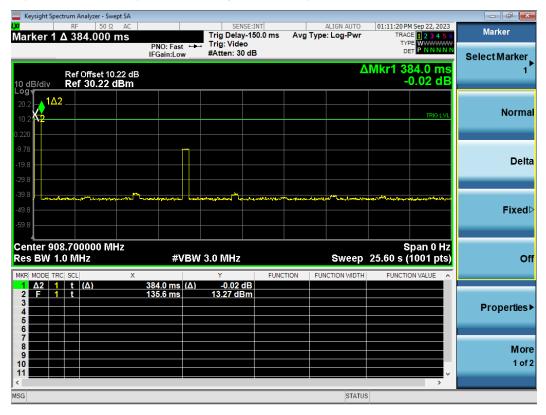
Measure numbers OF Channels= 64

									trum Analyzer	Keysight Spec
Marker	RACE 1 2 3 4 5 6	TRA	ALIGN AUTO : Log-Pwr :>300/300		SE:INT			0Ω AC 5000000		rker 2
Select Marker	DET	D	.~300/300	Avgino		#Atten: 30	PNO: Wide G			
2	.795 MHz -2.973 dB		ΔΜκ					: 10.22 dB 2 dBm	Ref Offset Ref 30.2	dB/div
Norma	יייייא <mark>ז אייייי</mark>	┲┲┲┲┲	ᡝᢇ᠂᠋᠇ᢛᡳᢧ	┱╺┰┲┙┲		┑┙┼╱┑╱┎╻		ѵ┰┲┶╆╱┲⋎	2∆3 √1771711	g .2 .2 .2
Delt										.8
Fixed	1]	.8 .8 .8
0	16.000 MHz s (1001 pts)	Stop 916 .400 ms (Sweep 5.			/ 300 kHz	#VBV		000 MHz 51 kHz	art 901.0 es BW :
	CTION VALUE	FUNCTI	ICTION WIDTH	CTION F		Y 8.849 dE	95 MHz	X 902 ·	C SCL	N 1
Properties					B	-2.973 (11.822 dE	795 MHz (Δ) 000 MHz	-12.	f (Δ) f	Δ3 1 F 1
Mor 1 of										
1 01										
	>		STATUS		_					
		<u> </u>	514105							

Screen Capture from the spectrum analyzer: sweep Time in 600ms

🔤 Keysight Sp	ectrum Analyzer - Sw								
Marker 1	RF 50 Ω Δ 370.800			SENSE: Trig Delay-1		g Type: Log-		8:05 PM Sep 22, 2023 TRACE 1 2 3 4 5 6 TYPE WWWWWWW	Marker
			NO: Fast ↔ Gain:Low	#Atten: 30 dl	3			DET	Select Marker
10 dB/div	Ref Offset 10 Ref 30.22 (ΔMkr	1 370.8 ms -0.44 dB	1
20.2		X~							Normal
0.220									
-9.78 -19.8									Delta
-29.8									
-39.8	understift, Andry angestift, same	L Marine M						alan managan and and and and and and and and and a	Fixed⊳
-59.8									
Center 90 Res BW 1	08.700000 MI I.0 MHz	Hz	#VBV	V 3.0 MHz		Swee	ep 600.0	Span 0 Hz ms (1001 pts)	Off
		X 37	0.8 ms (Δ)	۲ -0.44 dB	FUNCTION	FUNCTION	WIDTH F	UNCTION VALUE	
2 F 1 3 4 5 6		14	8.8 ms	12.20 dBm					Properties►
7 8 9 10									More 1 of 2
11 <							CTATUC	>	
MSG							STATUS		

Screen Capture from the spectrum analyzer: sweep Time in 25.6 Sec



2.9 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Janet Mijares

Date: 2023-09-22 (21.7°C, 22.8% RH)

Standard: FCC PART 15.247

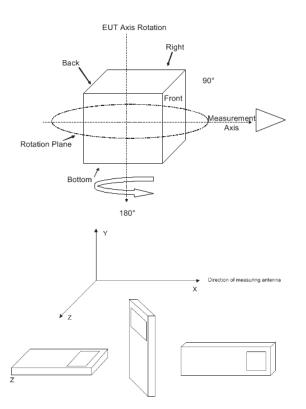
Basic Standard: ANSI C63.4-2014

EUT: Seal/Seal Ex

Comments: Y-Axis is worse axis.

Specification: ANSI C63.4-2014, Clause 6.3.2.1

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, but it may be larger or smaller to accommodate various sized EUTs (see Figure 6, Figure 7, and Figure 9). For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.



2.10 Radiated Spurious Emissions within restricted band

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Brendan Van Hee/Janet Mijares I. Akram EUT: Seal/Seal Ex Standard: FCC PART 15.247/15.209 Basic Standard: ANSI C63.10-2013

Date: 2023-09-22/25/27 (21.9° C,24.9 % RH)

EUT status: Compliant

Specification: FCC PART 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

940000 16 620000 - 25 660000 25 762500 - 37	5.804250 - 5.804750 5.500000 - 5.670000 7.500000 -	162.01250 - 167.17000 167.72000 - 173.20000	1660.0000 - 1710.0000 1718.8000 -	3.6000000 - 4.4000000 4.5000000 -	14.470000 - 14.500000 15.350000 -
660000 25 762500 - 37	5.670000			4.5000000 -	15 350000
	7 500000		1722.2000	5.1500000	16.200000
501000 00	3.250000 - 3.250000	240.00000 – 285.00000	2200.0000 – 2300.0000	5.3500000 – 5.4600000	17.700000 – 21.400000
	3.000000 - 4.600000	322.00000 - 335.40000	2310.0000 - 2390.0000	7.2500000 – 7.7500000	22.010000 – 23.120000
		399.90000 – 410.00000	2483.5000 – 2500.0000	8.0250000 – 8.5000000	23.600000 – 24.000000
		608.00000 - 614.00000	2655.0000 - 2900.0000	9.0000000 – 9.2000000	31.200000 – 31.800000
		960.00000 – 1240.0000 <mark>***</mark>	32600000 - 3267.0000	9.3000000 – 9.5000000	36.430000 - 36.500000
		1300.0000 – 1427.0000 <mark>***</mark>	3332.0000 – 3339.0000	10.600000 – 12.700000	Above 38.600000
		1435.0000 – 1626.5000	3345.8000 – 3358.0000	13.250000 – 13.400000	
		1645.5000 – 1646.5000	3500.0000 – 3600.0000		
1 22 55 55 34 44 5	47500 74 190000 - 74 193000 75 19750 - 10 120250 12 176750 - 12 176750 - 12 170000 - 14 10000 - 14 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 120000 - 15 13000 - 15 14000 - 15 1500 - 15 1500 - 15 1500 - 15 1500 - 15 1500 - 15 1500 - 15	47500 74.600000 990000 - 74.800000 - 93000 75.200000 19750 - 108.00000 - 121.94000 ** 376750 - 123.00000 - 177250 138.00000 - 10000 - 149.90000 - 10000 - 156.52475- 1230000 - 156.52525 194750 - 156.70000 - 156.90000 - 156.90000 -	47500 74.600000 335.40000 990000 74.800000 399.90000 93000 75.200000 410.00000 319750 108.00000 608.00000 320250 121.94000 614.00000 376750 123.00000 960.00000 3777250 138.00000 1240.0000 370000 149.90000 1300.0000 320000 156.52475 1435.0000 320000 156.52475 1435.0000 320000 156.72000 1645.5000	47500 74.600000 335.40000 2390.0000 990000 - 74.800000 - 399.90000 - 2483.5000 - 93000 75.200000 410.00000 2500.0000 19750 - 108.00000 - 608.00000 - 2655.0000 - 120250 121.94000 ** 614.00000 2900.0000 17750 - 123.00000 - 960.00000 - 32600000 - 177250 138.00000 ** 1240.0000 *** 3332.0000 - 160000 - 149.90000 - 1300.0000 - 3332.0000 - 120000 - 156.52475 - 1435.0000 - 3345.8000 - 120000 - 156.52525 1626.5000 358.0000 194750 - 156.70000 - 1646.5000 - 3600.0000 -	47500 74.600000 335.40000 2390.0000 7.7500000 990000 74.800000 399.90000 2483.5000 8.0250000 990000 75.200000 410.00000 2500.0000 8.0250000 3979.90000 2483.5000 8.0250000 8.5000000 3979.90000 2500.0000 8.0250000 8.5000000 319750 108.00000 608.00000 2655.0000 9.00000000 376750 123.00000 614.00000 3260.0000 9.3000000 377250 138.00000 1240.0000 3267.0000 9.5000000 410000 1300.0000 3332.0000 12.700000 420000 156.52475 1435.0000 3345.8000 13.250000 420000 156.52475 1435.0000 3345.8000 13.400000 4750 156.70000 1645.5000 3500.0000 3600.0000 495250 156.90000 1646.5000 3600.0000 3600.0000

Restricted Bands of Operation:

2.10.1 Test Guidance: ANSI C63.10-2013, Clause 13.4.2

From 9 kHz to 150 kHz (resolution bandwidth of 200 Hz) and from 150 kHz to 30 MHz (resolution bandwidth 9 kHz) measurements are performed with a loop antenna (as per KDB 460108).

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz The EUT is raised to 150 cm above the ground plane, and the area between the EUT and the antenna mast is covered with RF absorbent material.

The scan is performed at discreet increments of turntable azimuth and antenna height, which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

Frequencies having peak emissions within 10dB of the limits are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 - 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

2.10.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N/A	
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-12	2023-12-12
Loop Antenna (9KHz – 30MHz)	Electro-Metrics	ALP-70	3703	2022-01-05	2025-01-05
Biconilog Antenna (30 – 1000 MHz)	AR	JB1	6905	2021-10-29	2023-10-29
DRG Horn (1000 – 18000 MHz)	EMCO	3115	19357	2022-10-05	2024-10-05
Humidity/Temp Logger	Extech Ins. Corp.	42270	5892	2023-04-14	2024-04-14
Pre-Amplifier (30 – 1400 MHz)	HP	8447D	9291	2023-05-11	2024-05-11
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43-01001800-21- 5P	4354	2023-05-11	2024-05-11
RE Cable below 1GHz	Insulated Wire Inc.	KPS-1501A-3600- KPA-01102006	4419	2023-05-11	2024-05-11
Re Cable Above 1 GHz	A.H. System Inc.	SAC-26G-8.23	6187	2023-05-11	2024-05-11
0.9GHz Notch Filter	Microtronics	BRM20784	6947	2023-05-11	2024-05-11

Testing was performed with the following equipment:

2.10.4 Test Sample Verification, Configuration & Modifications

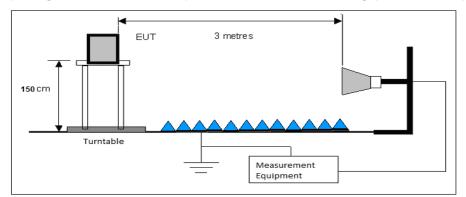
The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. LoRa radio is transmitting at mid channel in ingle carrier configuration and high channel in dual carrier configurations.

The EUT met the requirements without modification. Power cable is soldered to the battery terminal to connect the DC power supply during radiated emission.

Electrical Centre of Antenna EUT 3 metres 80 cm Ground Plane Turntable Measurement Equipment

Test setup diagram for Radiated Spurious Emissions testing (below 1GHz):

Test setup diagram for Radiated Spurious Emissions testing (above 1GHz):



2.10.5 Radiated Emissions Data: Hybrid (125 KHz)

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

Meter Reading in dBμV + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in dbμV/m. Delta = Field Strength – Limit

Notes:

When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss. Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak or Average detector after the height and azimuth have been adjusted for maximum emission. Preliminary scans were performed for all channels in Transmit modes. The LOW band channel 902.3 MHz was selected as the worst-case condition for detailed examination. In Transmit mode, the EUT was assessed up to 10.0 GHz.

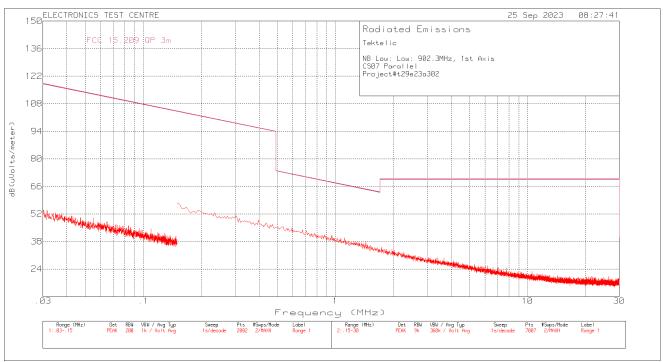
Freq. Marker	Freq. [GHz]	Raw reading[dBµv]	Det	Antenna Factor [dB/m]	Pre amp Gain [dB]	Corrected Reading [dBµv/m]	FCC 15.209 Limit [dBµv/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
1	1.8045	50.87	РК	27.5	-34	44.37	74	-29.63	169	400	Horizontal
1	1.8045	47.7	AV	27.5	-34	41.2	54	-12.80	169	400	Horizontal
2	*5.4139	41.44	PK	33.9	-30	45.34	74	-28.66	62	199	Horizontal
2	*5.4139	35.64	AV	33.9	-30	39.54	54	-14.46	62	199	Horizontal
4	*9.0229	37.34	PK	37.2	-25.1	49.44	74	-24.56	93	219	Horizontal
4	*9.0229	29.58	AV	37.2	-25.1	41.68	54	-12.32	93	219	Horizontal
5	1.8047	52.09	PK	27.5	-34	45.59	74	-28.41	78	255	Vertical
5	1.8047	49.28	AV	27.5	-34	42.78	54	-11.22	78	255	Vertical
6	*5.4138	40.95	РК	33.9	-30	44.85	74	-29.15	67	115	Vertical
6	*5.4138	34.55	AV	33.9	-30	38.45	54	-15.55	67	115	Vertical
8	7.2182	38.81	PK	36.1	-26.6	48.31	74	-25.69	321	228	Vertical
8	7.2182	31.35	AV	36.1	-26.6	40.85	54	-13.15	321	228	Vertical
9	*9.0232	37.09	РК	37.2	-25.1	49.19	74	-24.81	334	391	Vertical
9	*9.0232	28.59	AV	37.2	-25.1	40.69	54	-13.31	334	391	Vertical

Negative values for Delta indicate compliance.

PK: Peak Detector

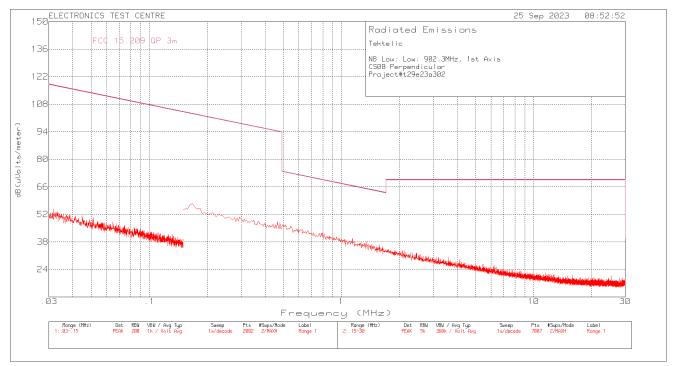
AV: Average Detector.

* Spurious Emission in Restricted Band

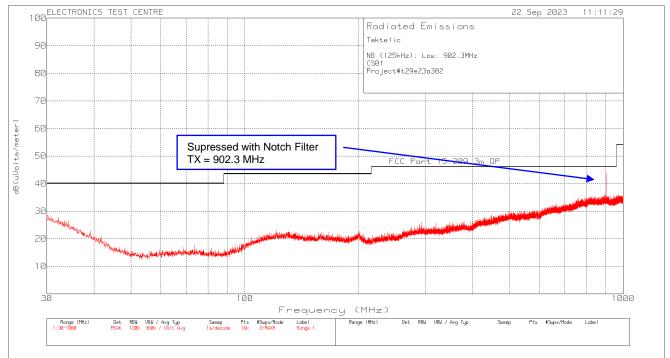


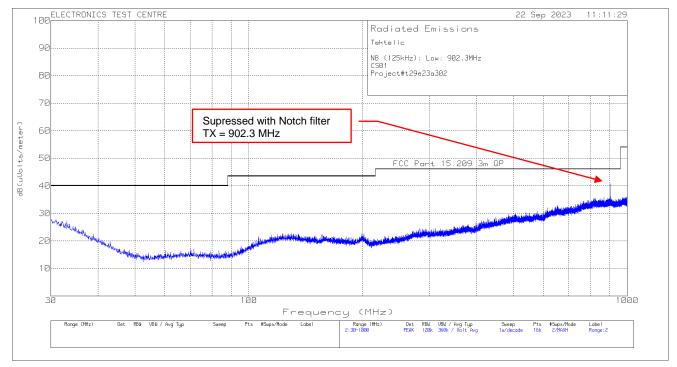
Plot of Radiated Emissions: Parallel

Plot of Radiated Emissions: Perpendicular

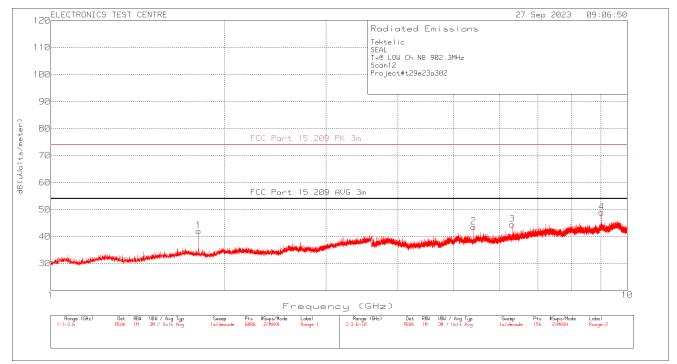


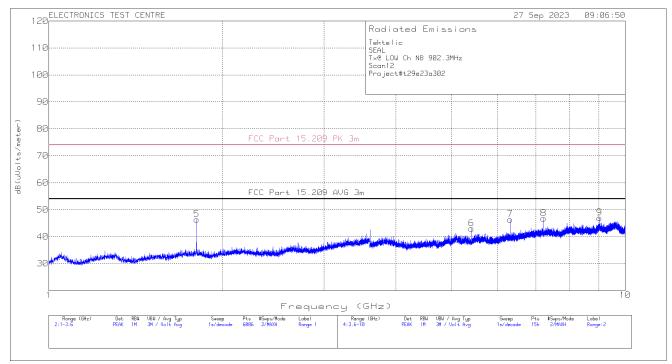












2.11 Radiated Emissions (RX Mode)

Test Lab: Electronics Test Centre, Airdrie	EUT: Seal/Seal Ex
Test Personnel: Brendan Van Hee / Janet Mijares	Standard: FCC Part 15.109
Date: 2023-09-22/26 (25.4° C,22.2 % RH)	Basic Standard: ANSI C63.4: 2014
	Class: B

EUT status: Compliant

Frequency (MHz)	FCC Part 15.109 Class B Limit (3m)				
30 – 88	40 (dBµV/m)				
88 – 216	43.52 (dBµV/m)				
216 – 960	46.02 (dBµV/m)				
Above 960	53.98 (dBµV/m)				
Criteria: The radiated emissions produced by a device, measured at a distance					

of 3 meters, shall not exceed the limits as specified.

2.11.1 Test Guidance:

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz.

The scan is performed at discreet increments of turntable azimuth and stepped antenna height, with peak detector and Max Hold function which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

After the pre-scan is completed, the frequencies of interest are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 - 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. This may produce a different reading than the pre scan trace. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

2.11.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

2.11.3 Test Equipment

Testing was performed with the following equipment:

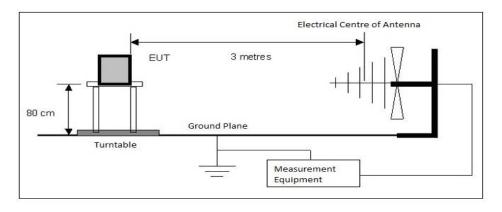
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N	/A
EMI receiver	Agilent	N9038A (FW A.22.08)	6906	2022-12-12	2023-12-12
Loop Antenna (9KHz – 30MHz)	Electro-Metrics	ALP-70	3703	2022-01-05	2025-01-05
Biconilog Antenna (30 – 1000 MHz)	AR	JB1	6905	2021-10-29	2023-10-29
DRG Horn (1000 – 18000 MHz)	EMCO	3115	19357	2022-10-05	2024-10-05
Humidity/Temp Logger	Extech Ins. Corp.	42270	5892	2023-04-14	2024-04-14
Pre-Amplifier (30 – 1400 MHz)	HP	8447D	9291	2023-05-11	2024-05-11
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43-01001800-21- 5P	4354	2023-05-11	2024-05-11
RE Cable below 1GHz	Insulated Wire Inc.	KPS-1501A-3600- KPA-01102006	4419	2023-05-11	2024-05-11
Re Cable Above 1 GHz	A.H. System Inc.	SAC-26G-8.23	6187	2023-05-11	2024-05-11
0.9GHz Notch Filter	Microtronics	BRM20784	6947	2023-05-11	2024-05-11

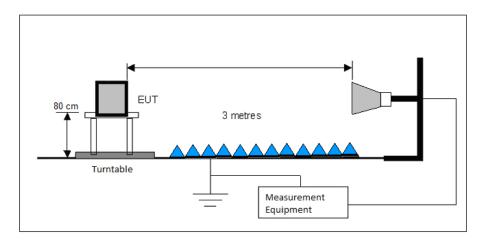
2.11.4 Test Sample Verification, Configuration & Modifications

To cover the unintentional radiated emission. The EUT was configured in receive mode. Unit was placed at the center of turntable in semi-anechoic chamber 80cm above the ground plane and at a distance of 3m from the test receive antenna.

The EUT met the requirements without modification.

EUT RX configuration Block Diagram for Radiated Emissions testing:





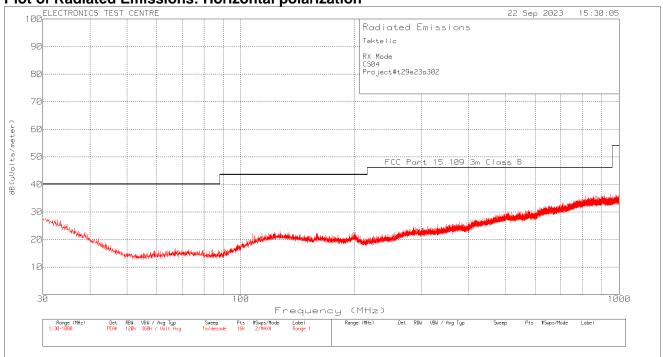
2.11.5 Radiated Emissions Data maximization:

No Emission observed within 10 dB from the specified limit

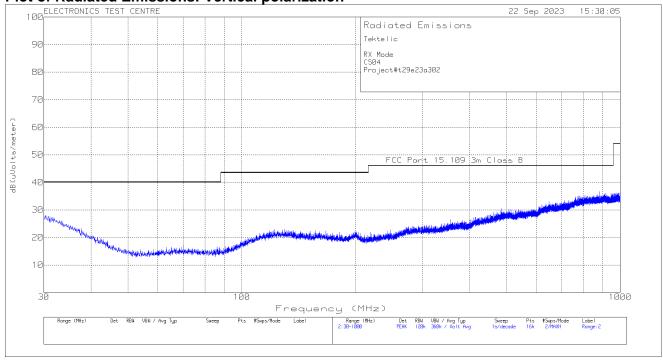
Meter Reading in dB μ V + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in db μ V/m.

- In receive mode, the EUT was assessed up to 12.5 GHz.

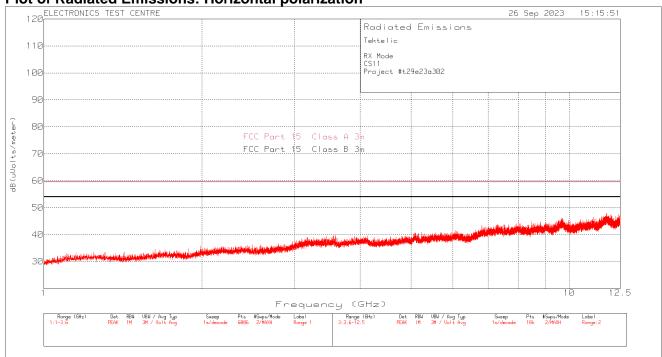
Test Sample: Seal/Seal Ex FCC ID:2ALEPT0007705

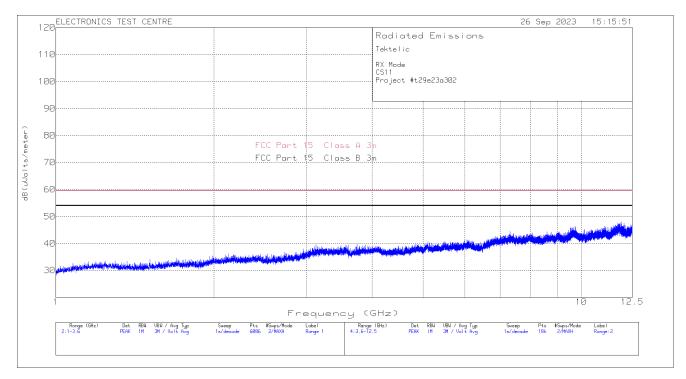


Plot of Radiated Emissions: Horizontal polarization









2.12 RF Exposure

Test Lab: Electronics Test Centre, Airdrie

Test Personnel:

EUT: Seal/Seal Ex Standard: FCC PART 15.247

Date:

EUT status: Compliant

Compliant: RF exposure assessment to be provided in a separate Exhibit.

3.0 TEST FACILITY

3.1 Location

The Seal/Seal Ex was tested at the Electronics Test Centre laboratory located in Airdrie, Alberta, Canada. The Radio Frequency Anechoic Chamber (RFAC), identified as Chamber 1, has a usable working space measuring 10.6 m long x 7.3 m wide x 6.5 m high.

Measurements taken at this site are accepted by Industry Canada as evidence of conformity per registration file # 2046A. This site is also listed with the FCC under Registration Number CA2046.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment located in the Control Room. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in the Control Room, consisting of two shielded vestibules joined together at the side of the main room. Cables are routed through bulkhead panels between the rooms and the test chamber as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

Either floor mounted or table-top equipment can be tested at this facility.

3.2 Grounding Plan

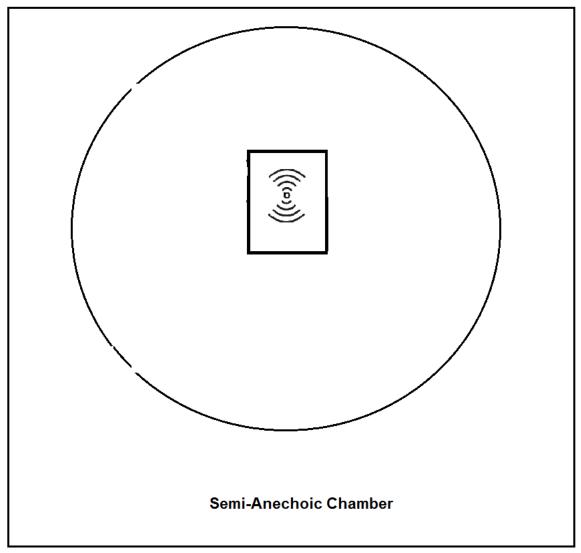
The Seal/Seal Ex was placed at the center of the test chamber turntable on top of an 80-cm high polystyrene foam table below 1GHz and at 1.5m high polystyrene foam table above 1 GHz for transmits mode and 80cm high for RX mode. Ground connection is provided as per customer specification. There is no external grounding.

3.3 Power Supply

For radiated Emission new three AA batteries was used. For antenna port conducted emission power supplied via DC power supply.

Appendix A – Test Setup Block Diagram





End of Document