

# ALPS Electric Ireland Ltd

## TEST REPORT FOR

**Asset Tracking Device, Model: HATI COMBO  
Power Supply, Model: KSA-6W-120050VUD**

### Tested to The Following Standards:

**FCC Part 15 Subpart C Section(s)**

**15.207 & 15.247  
(DTS 2400-2483.5 MHz)**

**Report No.: 111165-10**

**Date of issue: July 17, 2025**



**Test Certificate # 803.01**

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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## Administrative Information

### Test Report Information

**REPORT PREPARED FOR:**

ALPS Electric Ireland Ltd  
Clara Road, Millstreet  
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Ireland

Representative: Donal O'Shea  
Customer Reference Number: ACH 6-10-25

**REPORT PREPARED BY:**

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Mariposa, CA 95338

Project Number: 111165

**DATE OF EQUIPMENT RECEIPT:**

June 10, 2025

**DATE(S) OF TESTING:**

June 24, 25, 26, 27, and 30, 2025 and July 14, 2025

### Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



**Steve Behm**  
**Director of Quality Assurance & Engineering Services**  
**CKC Laboratories, Inc.**

## Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):  
CKC Laboratories, Inc.  
110 North Olinda Place  
Brea, CA 92823

## Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

## Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

\*CKC's list of NIST designated countries can be found at: <https://standards.gov/cabs/designations.html>

## Summary of Results

### Standard / Specification: FCC Part 15 Subpart C - 15.247 (DTS 2400-2483.5 MHz)

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable

#### ISO/IEC 17025 Decision Rule

The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

## Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

#### Summary of Conditions

No modifications were made during testing.

**Modifications listed above must be incorporated into all production units.**

## Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
<p><b>Test Condition #1</b></p> <p>The EUT is placed on the test bench, RF conducted measurement is performed at the provided RF output port. Power to the EUT set at 20Vdc. Nominal voltage of the EUT is 10-30VDC. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. This port is not used in normal operation.</p> <p>BLE: 1Mbps Freq: 2402MHz, 2440MHz, 2480MHz</p>
<p><b>Test Condition #2</b></p> <p>The EUT is placed on the test bench, RF conducted measurement is performed at the provided RF output port. Power to the EUT is from a AC-DC power supply, with AC voltage at 110V60Hz. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. This port is not used in normal operation.</p> <p>BLE: 1Mbps Freq: 2402MHz, 2440MHz, 2480MHz</p>
<p><b>Test Condition #3</b></p> <p>The EUT is placed on the test bench, RF conducted measurement is performed at the provided RF output port. Power to the EUT is a fully charge battery 3.6VDV. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. This port is not used in normal operation.</p> <p>BLE: 1Mbps Freq: 2402MHz, 2440MHz, 2480MHz</p>
<p><b>Test Condition #4 ( AC conducted emission)</b></p> <p>The EUT is place on the test bench, AC conducted measurement is performed at the AC main of a support AC/DC power supply. Power to the EUT set at 20Vdc. Nominal voltage of the EUT is 10-30VDC.. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. This port is not used in normal operation.</p> <p>BLE: 1Mbps Freq: 2440MHz</p>
<p><b>Test Condition #5 ( AC conducted emission)</b></p> <p>The EUT is place on the test bench, AC conducted measurement is performed at the AC main of the wallwort power supply. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. Support Micro-controller is unplugged from the EUT during this test. This port is not used in normal operation.</p> <p>BLE: 1Mbps Freq: 2440MHz</p>

**Test Condition #6 ( Radiated emission DC )**

The EUT is placed on Styrofoam block. Power to the EUT set at 20Vdc. Nominal voltage of the EUT is 10-30VDC.. And worse case configuration, the DC power lead includes additional I/O wiring. Support laptop sets the EUT in test mode via a microcontroller connected to the programing/service port of EUT. This port is not used in normal operation and the micro controller is removed from the EUT after setup. Battery is installed.

The EUT is placed upright with orientation arrow pointing up as intended.

BLE: 1Mbps

Freq: 2402MHz, 2440MHz, 2480MHz

## Equipment Under Test (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

### Configuration 1 RF conducted (10-30VDC )

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Asset Tracking Device	ALPS Electric Ireland Ltd	HATI COMBO	Unit A

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	13-d020nd	CND54686VP
Microcontroller	Segger	J-Link	260105436
Power supply	Topward	6306D	988614

### Configuration 2 RF conducted (AC power supply)

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Asset Tracking Device	ALPS Electric Ireland Ltd	HATI COMBO	Unit A
Power supply	CUI Inc.	KSA-6W-120050VUD	NA

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	13-d020nd	CND54686VP
Microcontroller	Segger	J-Link	260105436

### Configuration 3 RF conducted (Battery unit)

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Asset Tracking Device	ALPS Electric Ireland Ltd	HATI COMBO	Unit A

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	HP	13-d020nd	CND54686VP
Microcontroller	Segger	J-Link	260105436

#### Configuration 4 15 207 AC conducted (10-30VDC )

##### *Equipment Tested:*

Device	Manufacturer	Model #	S/N
Asset Tracking Device	ALPS Electric Ireland Ltd	HATI COMBO	Unit C

##### *Support Equipment:*

Device	Manufacturer	Model #	S/N
Laptop	HP	13-d020nd	CND54686VP
Microcontroller	Segger	J-Link	260105436
Power supply	Topward	6306D	988614

#### Configuration 5 15.207 AC conducted (AC power supply)

##### *Equipment Tested:*

Device	Manufacturer	Model #	S/N
Asset Tracking Device	ALPS Electric Ireland Ltd	HATI COMBO	Unit C
Power supply	CUI Inc.	KSA-6W-120050VUD	NA

##### *Support Equipment:*

Device	Manufacturer	Model #	S/N
Laptop	HP	13-d020nd	CND54686VP
Microcontroller	Segger	J-Link	260105436

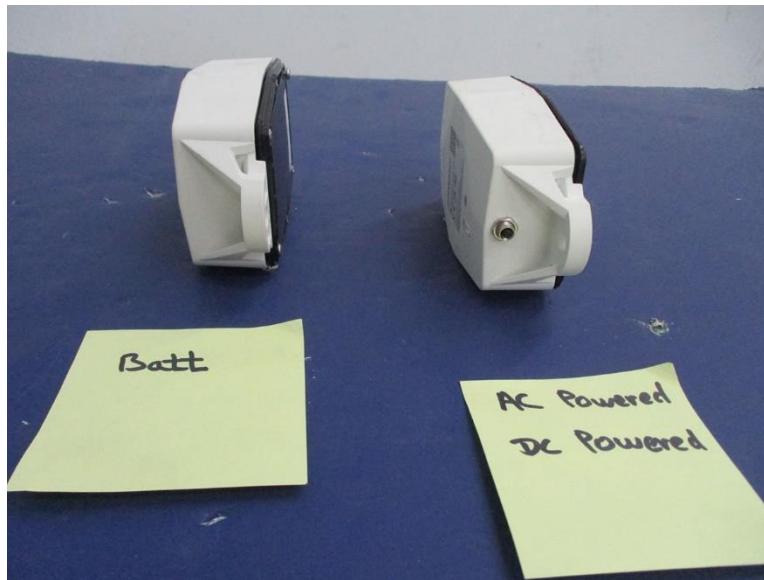
## General Product Information:

Description of EUT	
Asset Tracking Device	
Product Information	Manufacturer-Provided Details
Operating Frequencies Tested:	2402-2480MHz (BLE)
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	BLE
Maximum Duty Cycle:	98%
Modulation Type(s):	GFSK ( BLE 1Mbps)
Number of TX Chains:	1
Beamforming Type:	NA
Antenna Type(s) and Gain:	Chip , 4.36dBi*
Antenna Connection Type:	Integral (External connector provided to facilitate testing)
Nominal Input Voltage:	Battery 3.6V, DC 10 – 30V, AC 110**
Firmware / Software Version(s):	app_radio_test v1.0.2_b95bc812  EspRFTTestTool V3.6 PuTTY
Firmware / Software Description:	specialized FW prepared for certification purposes.  Chipset test mode control telnet client
Firmware / Software Setting(s):	BLE Power Setting: +4dBm
Tune-up or Adjustment(s):	NA
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

\* antenna gain from provided antenna test report for part number **YC0010AA**

\*\* The product has three input power variants, the difference is in the Power input connector, all digital circuits, RF circuits are identical between the variants.

**EUT and Accessory Photo(s)**



EUT, View 1



EUT, View 2



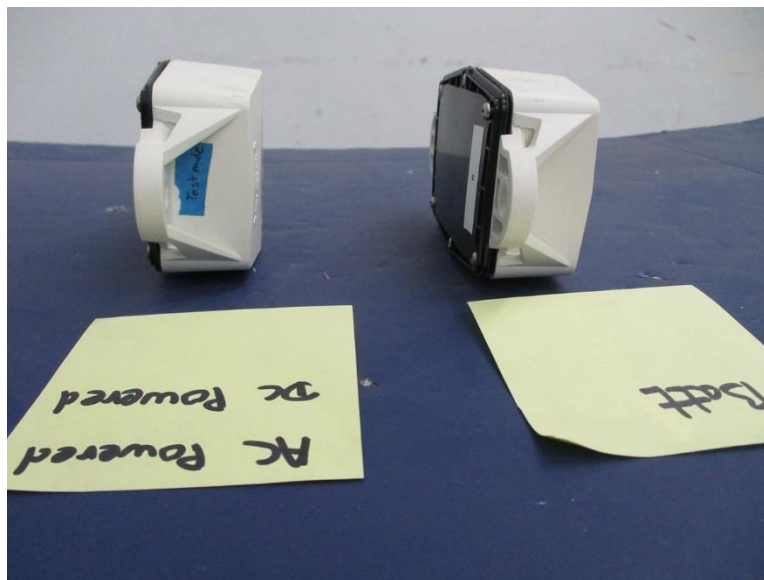
EUT, View 3



EUT, View 4



EUT, View 5



EUT, View 6



Accessories

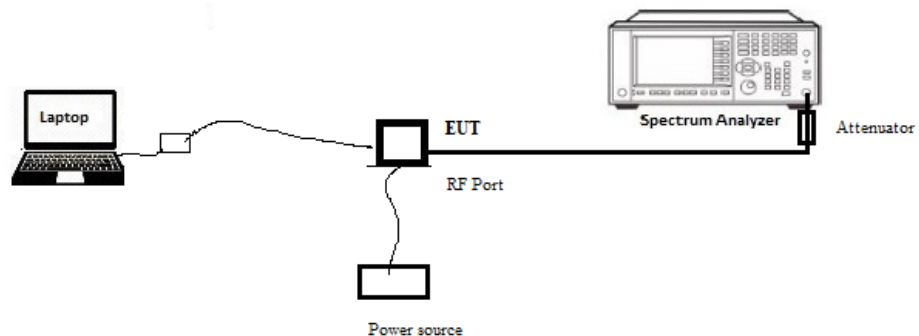
**Support Equipment Photo(s)**



### Block Diagram of Test Setup(s)

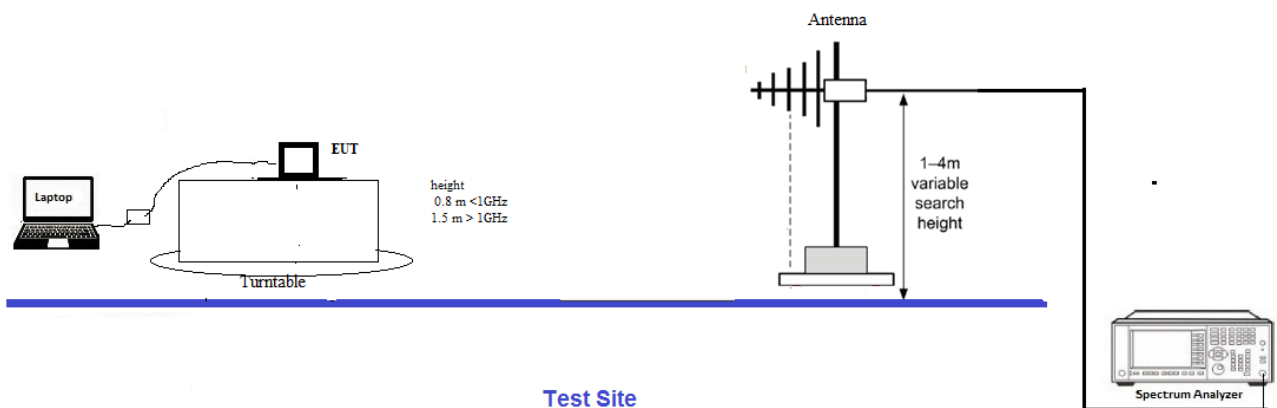
Setup	Description of Block Diagram
Conducted	See test condition 1,2,3
Radiated	See test condition 6

Conducted test setup



Test Site

Radiated test setup



Test Site

## FCC Part 15 Subpart C

### 15.247(a)(2) 6dB Bandwidth

#### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	6/24/2025 & 6/25/2025
Configuration:	1		
Test Setup:	Test condition 1		

#### Environmental Conditions

Temperature (°C)	24.8 -28.0	Relative Humidity (%):	50
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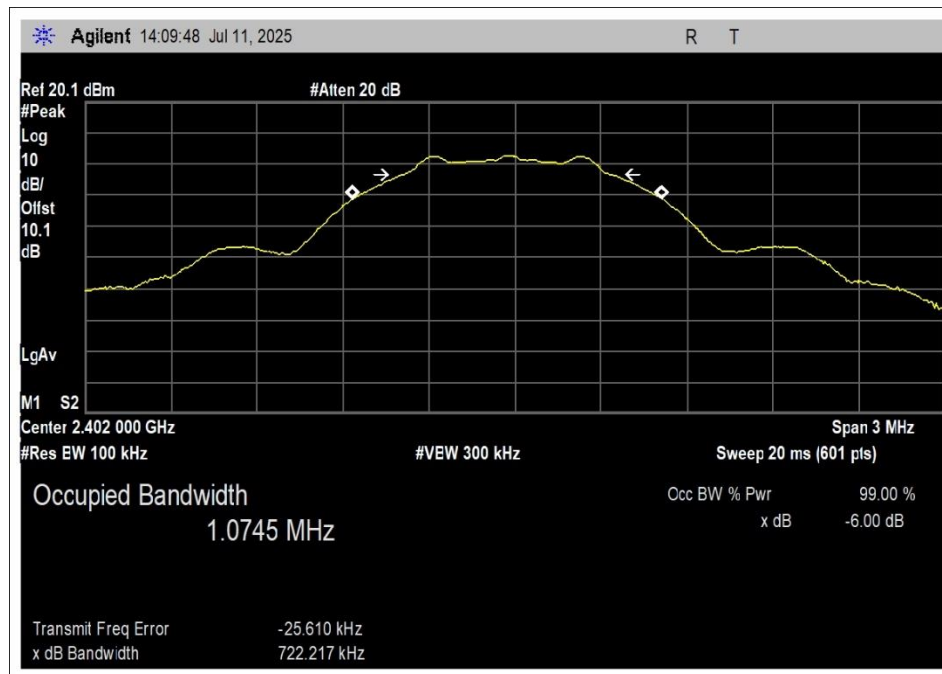
#### Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	1/23/2025	1/23/2026
P07657	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/3/2024	7/3/2026
P08223	Attenuator	Weinschel Associates	75A-10-1314	12/16/2024	12/16/2026

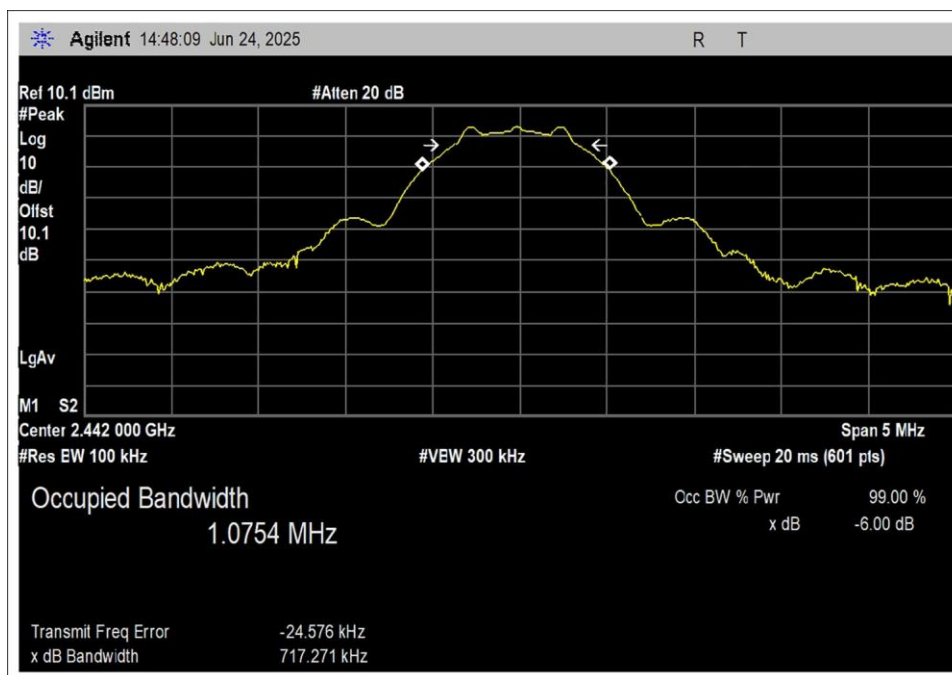
#### Test Data Summary

Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	1	BLE	722.6	≥500	Pass
2442	1	BLE	717.3	≥500	Pass
2480	1	BLE	709.8	≥500	Pass

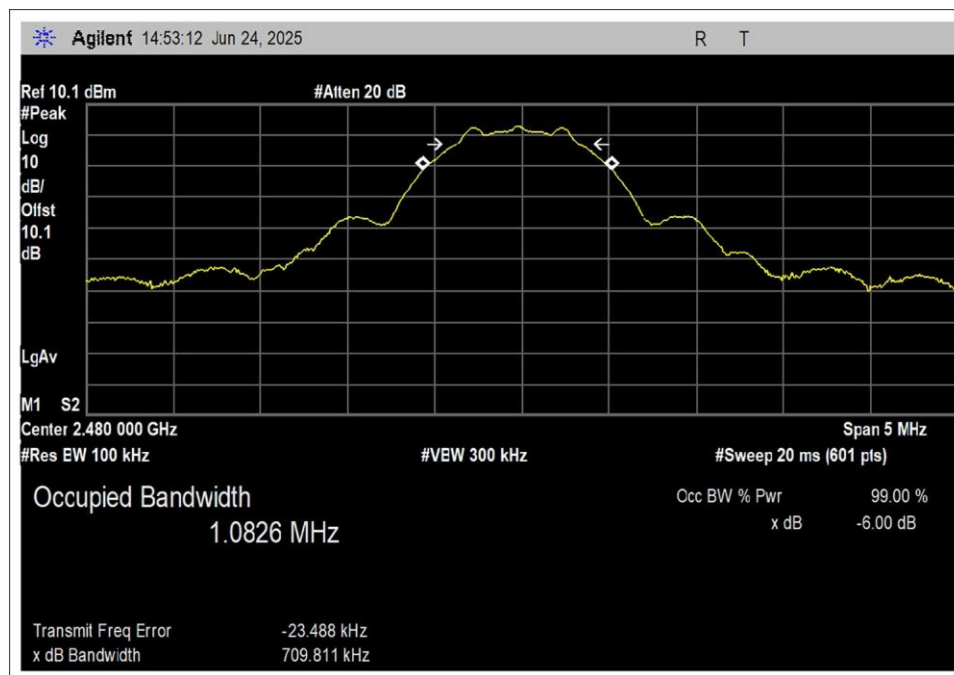
## Plot(s)



Low Channel

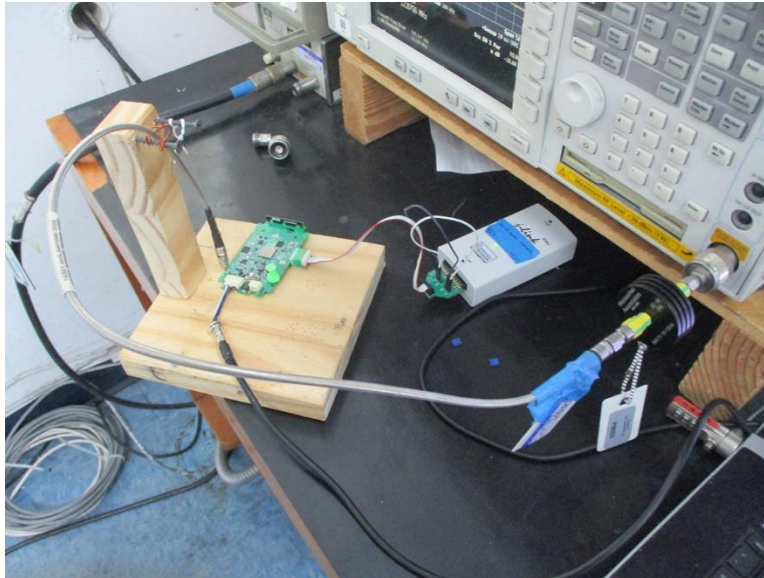


Middle Channel



High Channel

Test Setup Photo(s)



Measurement



Site D

## 15.247(b)(3) Output Power

### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	6/26/2025
Configuration:	1,2, & 3		
Test Setup:	Test condition 1,2, & 3		

### Environmental Conditions

Temperature (°C)	24.5 -28.0	Relative Humidity (%):	50- 56
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### Test Equipment

Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	1/23/2025	1/23/2026
P07657	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/3/2024	7/3/2026
P08223	Attenuator	Weinschel Associates	75A-10-1314	12/16/2024	12/16/2026
07164	Multimeter	Fluke	8845A/G	8/21/2023	8/21/2025

### Test Data Summary - Voltage Variations

Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
2402	BLE	3.4	3.4	3.4	0
2442	BLE	<b>3.8</b>	<b>3.8</b>	<b>3.8</b>	0
2480	BLE	3.6	3.6	3.6	0

Variant DC powered: +- 15%

Frequency (MHz)	Modulation / Ant Port	V <sub>Minimum</sub> (dBm)	V <sub>Nominal</sub> (dBm)	V <sub>Maximum</sub> (dBm)	Max Deviation from V <sub>Nominal</sub> (dB)
2442	BLE	3.8	3.8	3.8	0.0

Variant AC Powered: +- 15%

### Parameter Definitions:

Measurements performed at input voltage V<sub>Nominal</sub> ± 15%.

Parameter	Value (DC Powered)	Value (AC Powered)
V <sub>Nominal</sub> :	10-30V ( mid point 20V)	110V
V <sub>Minimum</sub> :	8.5V	93.5V
V <sub>Maximum</sub> :	34.5V	126V

### Test Data Summary - Voltage Variations

This equipment is battery powered. Power output tests were performed using a fresh battery.

Frequency (MHz)	Modulation / Ant Port	V <sub>Nominal</sub> (dBm)
2442	BLE	3.8

Variant: Battery powered:

### Test Data Summary - RF Conducted Measurement

Measurement Option: RBW > DTS Bandwidth

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
2402	BLE	Chip 4.36	3.4	≤ 30	7.8	≤36	Pass
2442	BLE	Chip 4.36	3.8	≤ 30	8.2	≤36	Pass
2480	BLE	Chip 4.36	3.6	≤ 30	8.0	≤36	Pass

Variant DC Powered

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
2442	BLE	Chip 4.36	3.8	≤ 30	8.2	≤36	Pass

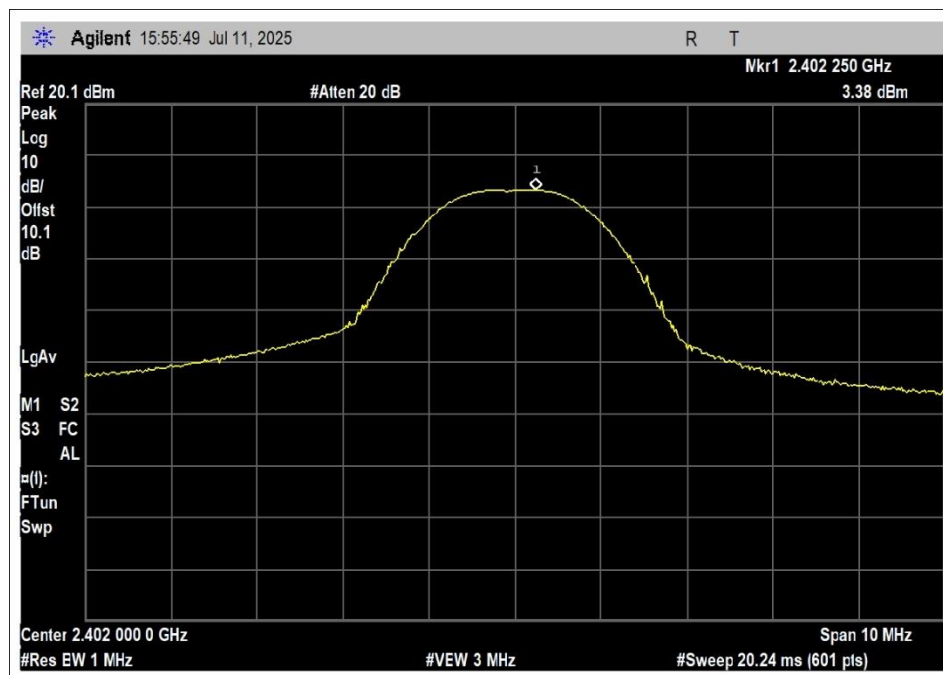
Variant AC Powered

Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
2442	BLE	Chip 4.36	3.8	≤ 30	8.2	≤36	Pass

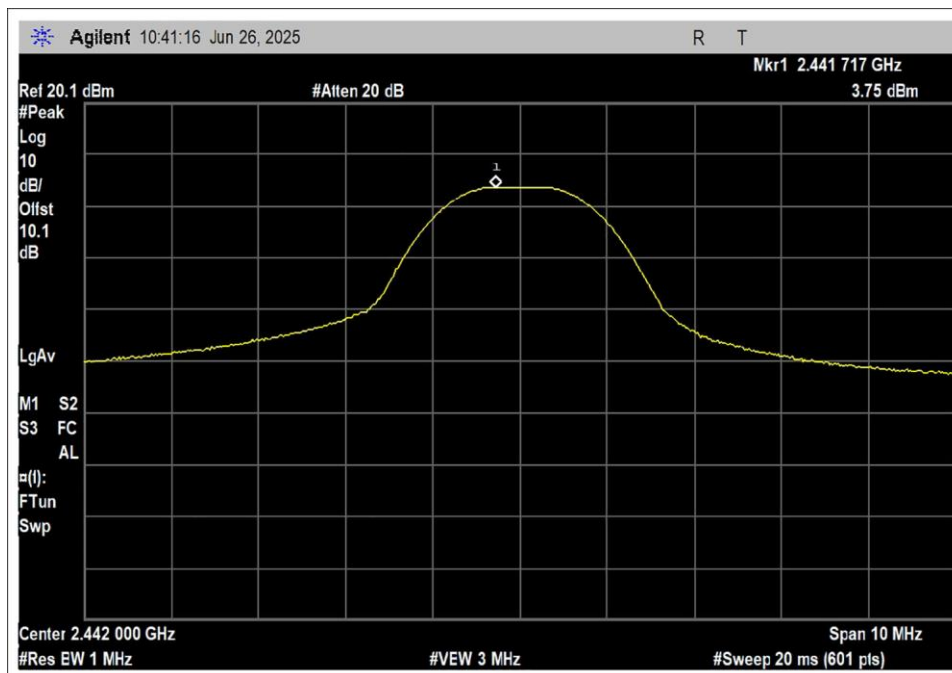
Variant: Battery. Test performed with a fresh battery

EIRP is calculated as RF conducted power (dBm) + antenna gain (dBi)

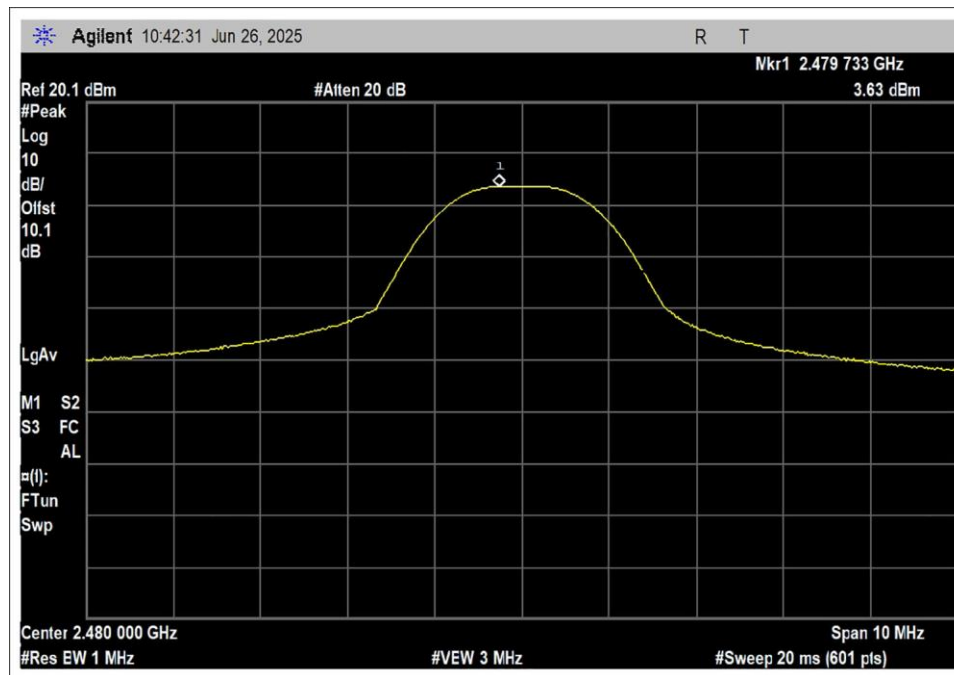
## Plots



Low Channel

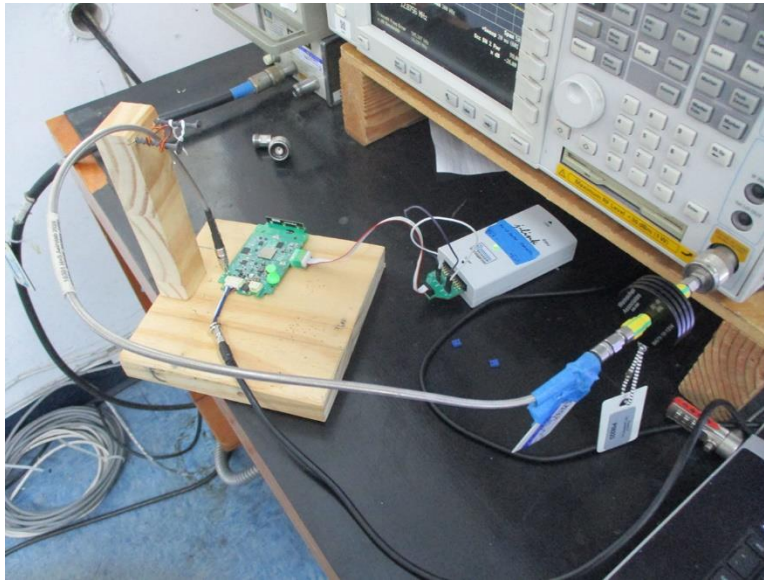


Middle Channel



High Channel

**Test Setup Photo(s)**



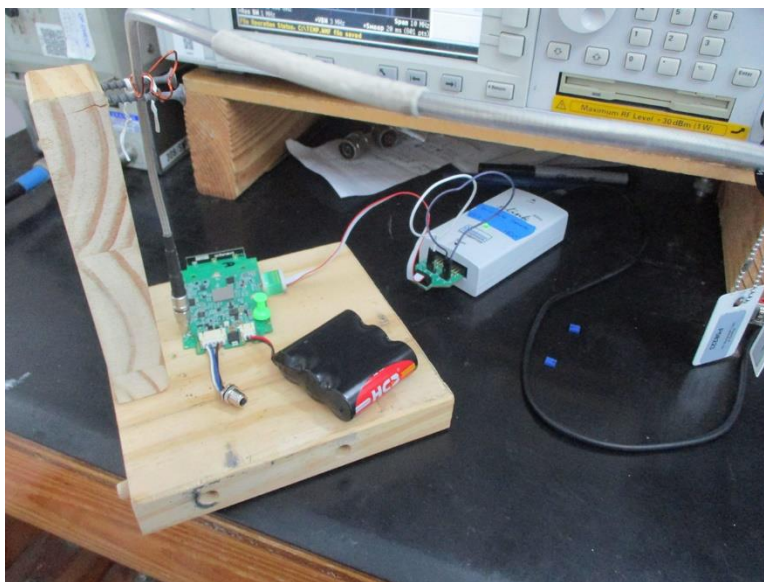
Measurement



AC Powered



DC Powered



Battery Powered



Site D

## 15.247(e) Power Spectral Density

### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	6/26/2025
Configuration:	1		
Test Setup:	Test condition 1		

### Environmental Conditions

Temperature (°C)	24.5-28.0	Relative Humidity (%):	50- 54
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### Test Equipment

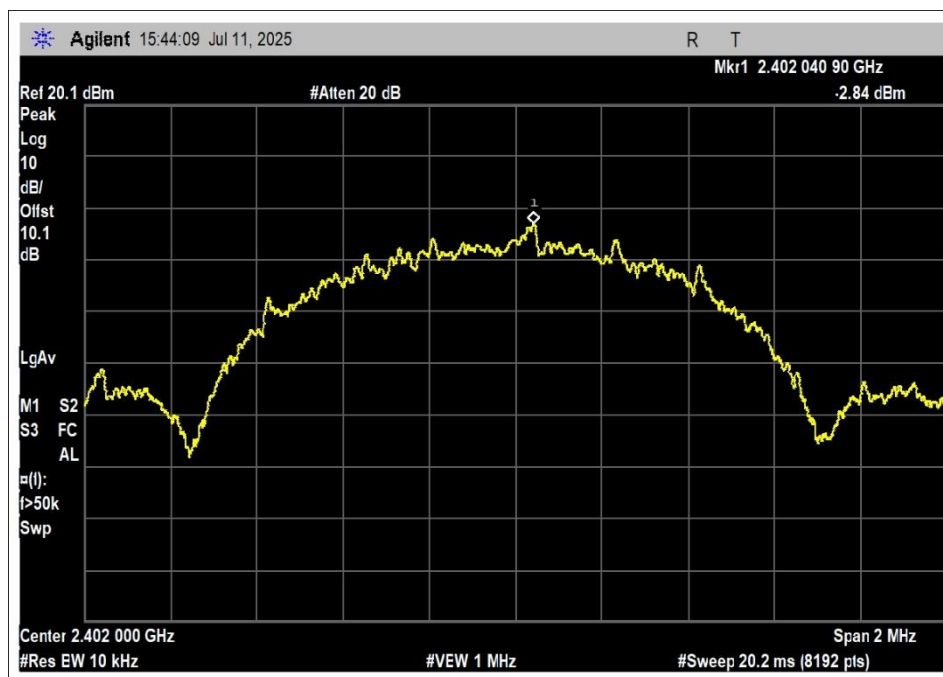
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
02869	Spectrum Analyzer	Agilent	E4440A	1/23/2025	1/23/2026
P07657	Cable	Astrolab, Inc.	32022-29094K-29094K-24TC	7/3/2024	7/3/2026
P08223	Attenuator	Weinschel Associates	75A-10-1314	12/16/2024	12/16/2026

### Test Data Summary - RF Conducted Measurement

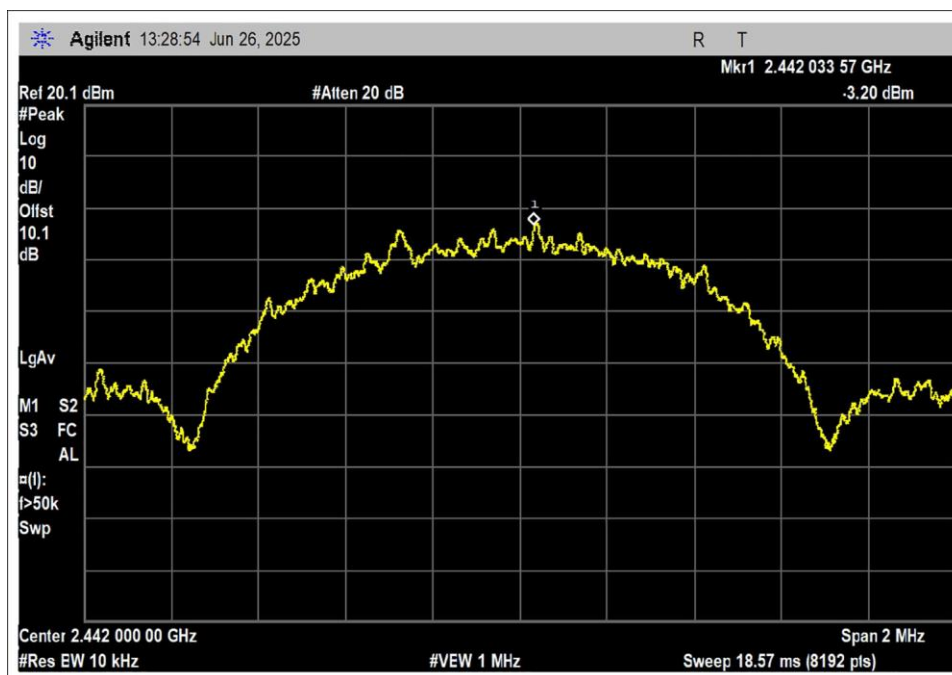
Measurement Method: PKPSD

Frequency (MHz)	Modulation	Measured (dBm/10kHz)	Limit (dBm/3kHz)	Results
2402	BLE	-2.8	≤8	Pass
2442	BLE	-3.2	≤8	Pass
2480	BLE	-3.8	≤8	Pass

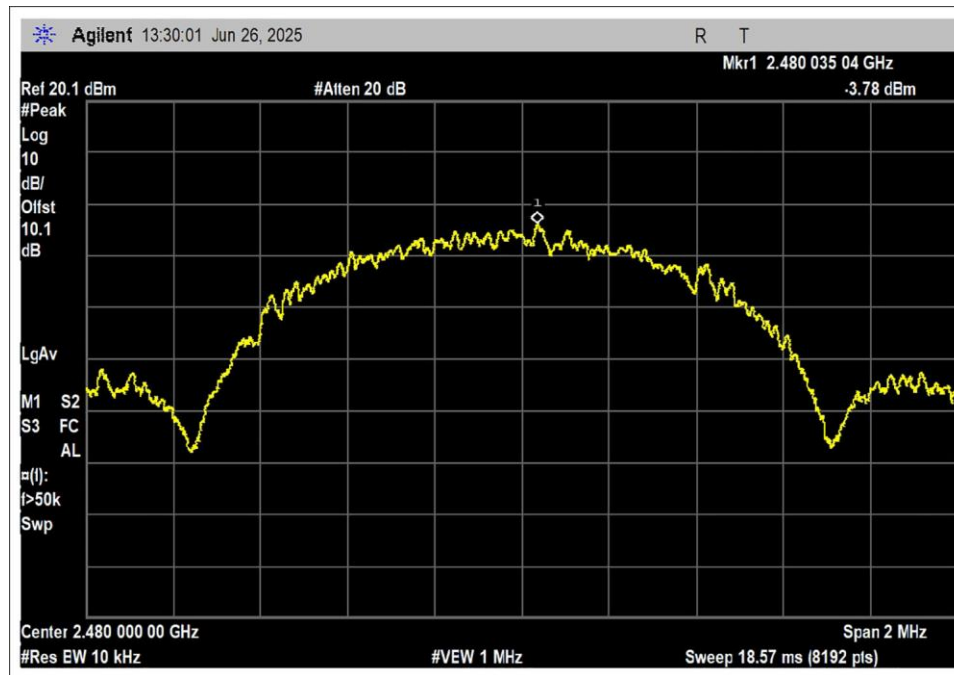
## Plots



Low Channel



Middle Channel



High Channel

## 15.247(d) RF Conducted Emissions & Band Edge

### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	6/26/2025
Configuration:	1		

### Environmental Conditions

Temperature (°C)	25.2-28.0	Relative Humidity (%):	48-50
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### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **111165**  
 Test Type: **Conducted Emissions**  
 Tested By: E. Wong  
 Software: EMITest 5.03.20

Date: 7/11/2025  
 Time: 16:00:12  
 Sequence#: 1  
 20V DC

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

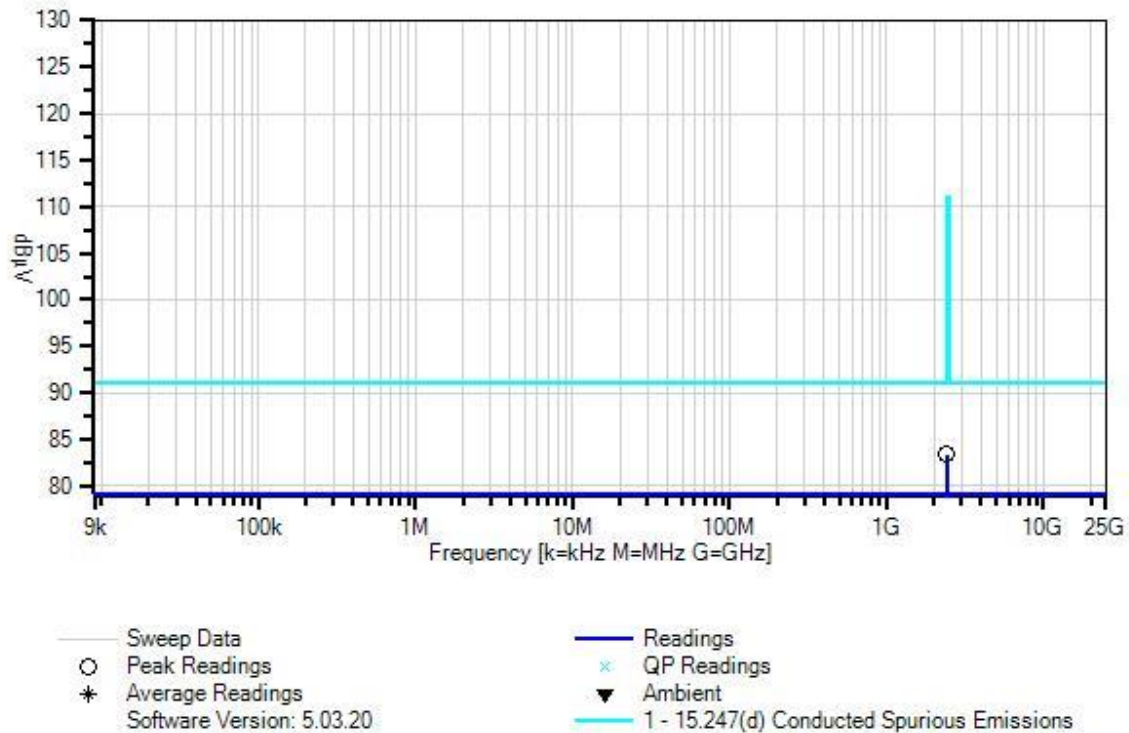
#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

Test Condition #1  Frequency range of measurement = 9kHz-25GHz. 9 kHz -150 kHz;RBW=200 Hz,VBW=600 Hz; 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz; 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz, 1000 MHz-25 000 MHz;RBW=1MHz,VBW=3 MHz.  Test Environment Conditions: Temperature: 25.2°C Relative Humidity: 48% Pressure: 100kPa
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ALPS Electric Ireland Ltd W/O#: 111165 Sequence#: 1 Date: 7/11/2025  
15.247(d) Conducted Spurious Emissions Test Lead: 20V DC Antenna port



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T2	ANP08223	Attenuator	75A-10-1314	12/16/2024	12/16/2026
T3	ANP07657	Cable	32022-29094K- 29094K-24TC	7/3/2024	7/3/2026
T4	ANP07655	Cable	32022-29094K- 29094K-24TC	7/20/2024	7/20/2026

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2400.000M	73.3	+0.0	+9.7	+0.4	+0.0	+0.0	83.4	91.0	-7.6	Anten
2	2400.000M	50.9	+0.0	+9.7	+0.0	+0.4	+0.0	61.0	91.0 Bandedge_L	-30.0	Anten
3	2483.500M	49.0	+0.0	+9.7	+0.5	+0.0	+0.0	59.2	91.0 Bandedge_H	-31.8	Anten
4	4808.470M	48.5	+0.0	+9.7	+0.6	+0.0	+0.0	58.8	91.0 BLE_L	-32.2	Anten
5	4959.917M	47.1	+0.0	+9.7	+0.7	+0.0	+0.0	57.5	91.0 BLE_H	-33.5	Anten
6	4883.858M	46.8	+0.0	+9.7	+0.6	+0.0	+0.0	57.1	91.0 BLE_M	-33.9	Anten
7	9616.930M	39.1	+0.0	+9.8	+1.1	+0.0	+0.0	50.0	91.0 BLE_L	-41.0	Anten
8	2543.670M	38.9	+0.0	+9.7	+0.5	+0.0	+0.0	49.1	91.0 BLE_H	-41.9	Anten
9	2506.000M	38.5	+0.0	+9.7	+0.5	+0.0	+0.0	48.7	91.0 BLE_M	-42.3	Anten
10	9766.830M	37.7	+0.0	+9.9	+1.0	+0.0	+0.0	48.6	91.0 BLE_M	-42.4	Anten
11	2377.700M	38.1	+0.0	+9.7	+0.4	+0.0	+0.0	48.2	91.0 BLE_M	-42.8	Anten
12	2339.800M	37.9	+0.0	+9.7	+0.4	+0.0	+0.0	48.0	91.0 BLE_L	-43.0	Anten
13	9919.917M	36.6	+0.0	+9.9	+1.0	+0.0	+0.0	47.5	91.0 BLE_H	-43.5	Anten
14	2531.800M	36.4	+0.0	+9.7	+0.5	+0.0	+0.0	46.6	91.0 BLE_L	-44.4	Anten
15	2608.170M	36.1	+0.0	+9.7	+0.5	+0.0	+0.0	46.3	91.0 BLE_H	-44.7	Anten
16	2635.000M	34.3	+0.0	+9.7	+0.5	+0.0	+0.0	44.5	91.0 BLE_M	-46.5	Anten
17	2467.800M	39.3	+0.0	+9.7	+0.5	+0.0	+0.0	49.5	111.0 BLE_L	-61.5	Anten
18	2416.170M	38.7	+0.0	+9.7	+0.4	+0.0	+0.0	48.8	111.0 BLE_H	-62.2	Anten

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.247(d) Conducted Spurious Emissions**  
 Work Order #: **111165** Date: 7/11/2025  
 Test Type: **Conducted Emissions** Time: 16:00:12  
 Tested By: E. Wong Sequence#: 1  
 Software: EMITest 5.03.20 20V DC

***Equipment Tested:***

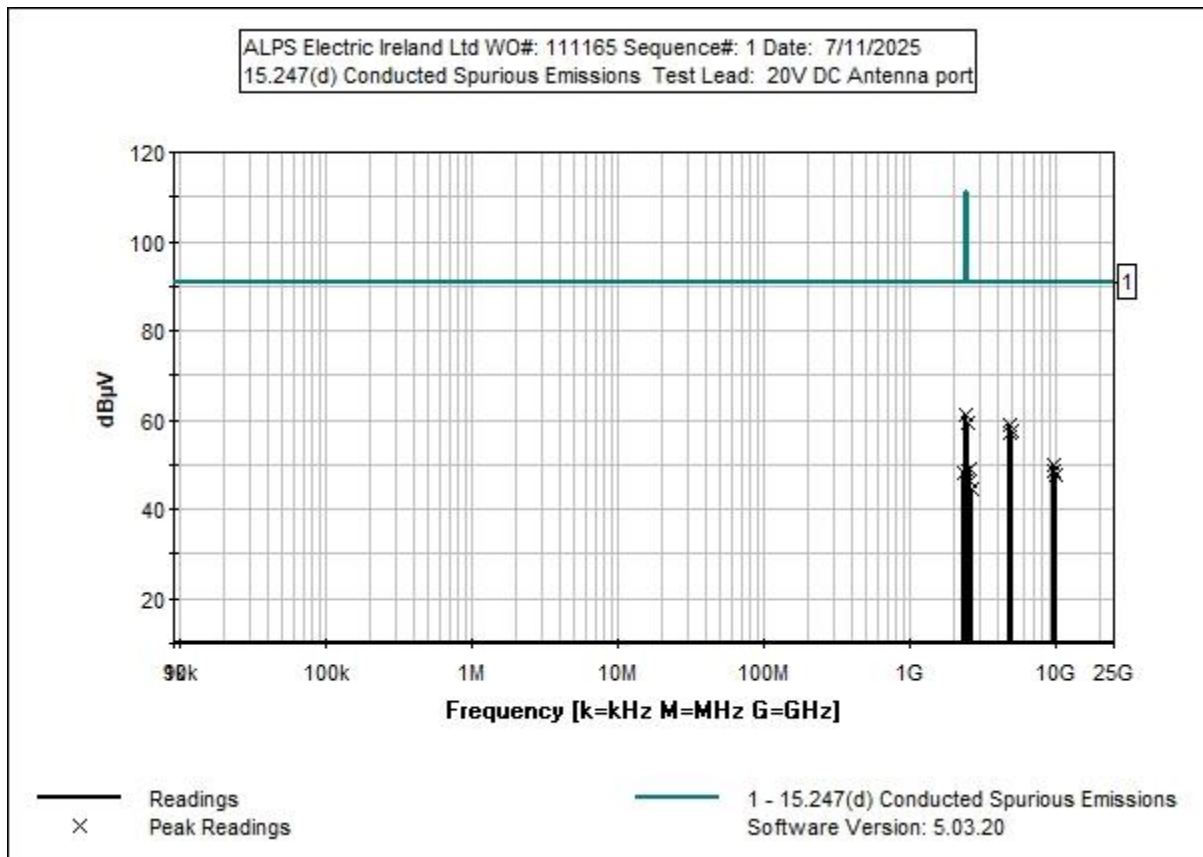
Device	Manufacturer	Model #	S/N
Configuration1			

***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration1			

***Test Conditions / Notes:***

Test Condition #1  Frequency range of measurement = 9kHz-25GHz. 9 kH -150 kHz;RBW=200 Hz,VBW=600 Hz; 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz; 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz, 1000 MHz-25 000 MHz;RBW=1MHz,VBW=3 MHz.  Test Environment Conditions: Temperature: 25.2°C Relative Humidity: 48% Pressure: 100kPa
---



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T2	ANP08223	Attenuator	75A-10-1314	12/16/2024	12/16/2026
T3	ANP07657	Cable	32022-29094K-29094K-24TC	7/3/2024	7/3/2026
T4	ANP07655	Cable	32022-29094K-29094K-24TC	7/20/2024	7/20/2026

**Measurement Data:**

Reading listed by margin.

Test Lead: Antenna port

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	2400.000M	50.9	+0.0	+9.7	+0.0	+0.4	+0.0	61.0	91.0 Bandedge_L	-30.0	Anten
2	2483.500M	49.0	+0.0	+9.7	+0.5	+0.0	+0.0	59.2	91.0 Bandedge_H	-31.8	Anten
3	4808.470M	48.5	+0.0	+9.7	+0.6	+0.0	+0.0	58.8	91.0 BLE_L	-32.2	Anten
4	4959.917M	47.1	+0.0	+9.7	+0.7	+0.0	+0.0	57.5	91.0 BLE_H	-33.5	Anten
5	4883.858M	46.8	+0.0	+9.7	+0.6	+0.0	+0.0	57.1	91.0 BLE_M	-33.9	Anten
6	9616.930M	39.1	+0.0	+9.8	+1.1	+0.0	+0.0	50.0	91.0 BLE_L	-41.0	Anten
7	2543.670M	38.9	+0.0	+9.7	+0.5	+0.0	+0.0	49.1	91.0 BLE_H	-41.9	Anten
8	2506.000M	38.5	+0.0	+9.7	+0.5	+0.0	+0.0	48.7	91.0 BLE_M	-42.3	Anten
9	9766.830M	37.7	+0.0	+9.9	+1.0	+0.0	+0.0	48.6	91.0 BLE_M	-42.4	Anten
10	2377.700M	38.1	+0.0	+9.7	+0.4	+0.0	+0.0	48.2	91.0 BLE_M	-42.8	Anten
11	2339.800M	37.9	+0.0	+9.7	+0.4	+0.0	+0.0	48.0	91.0 BLE_L	-43.0	Anten
12	9919.917M	36.6	+0.0	+9.9	+1.0	+0.0	+0.0	47.5	91.0 BLE_H	-43.5	Anten
13	2531.800M	36.4	+0.0	+9.7	+0.5	+0.0	+0.0	46.6	91.0 BLE_L	-44.4	Anten
14	2608.170M	36.1	+0.0	+9.7	+0.5	+0.0	+0.0	46.3	91.0 BLE_H	-44.7	Anten
15	2635.000M	34.3	+0.0	+9.7	+0.5	+0.0	+0.0	44.5	91.0 BLE_M	-46.5	Anten

## Band Edge

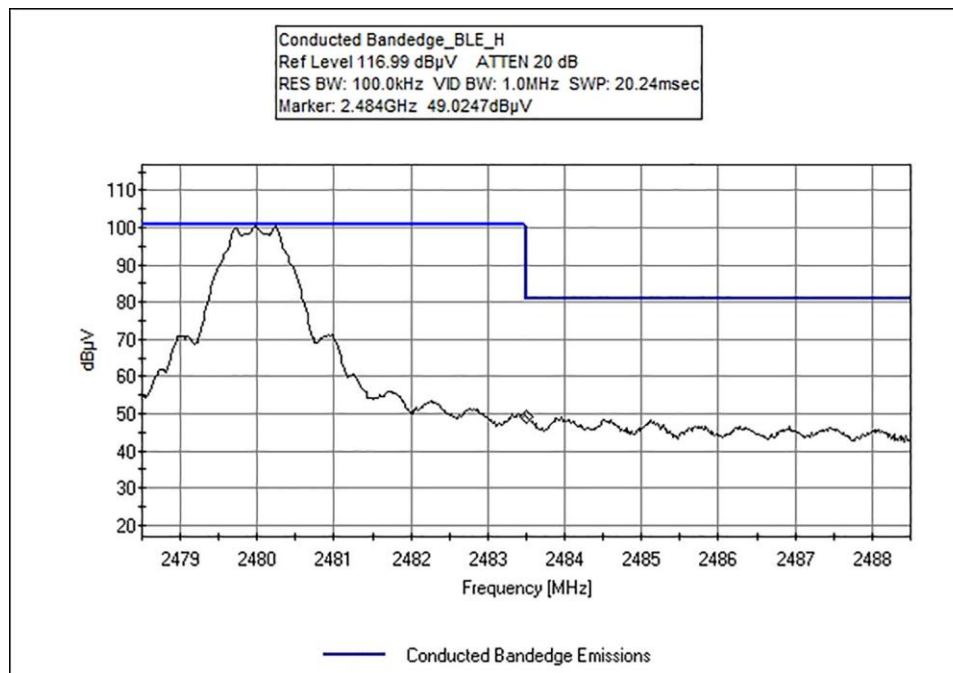
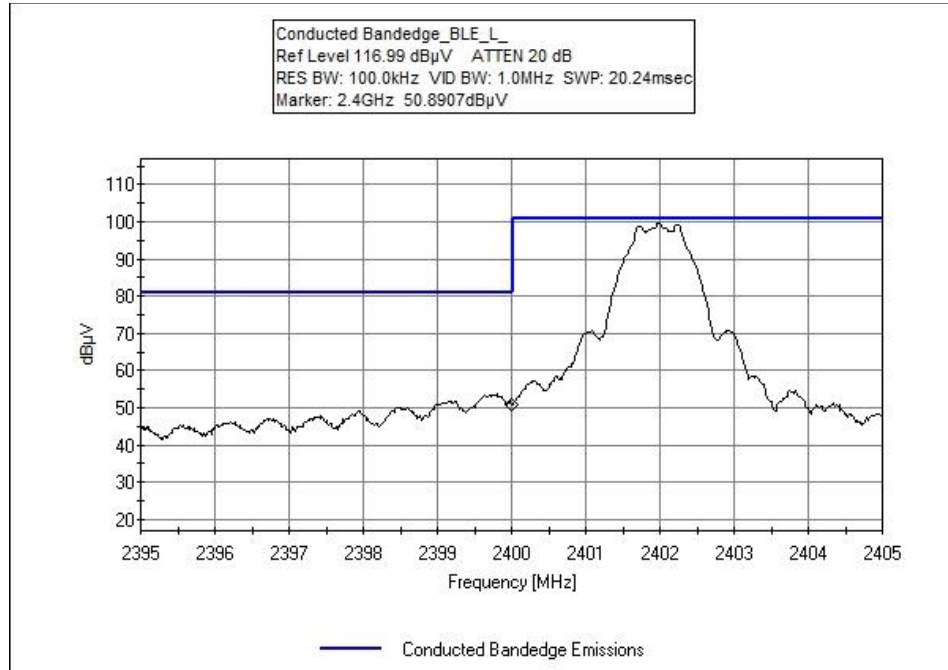
### Band Edge Summary

Limit applied: Max Power/100kHz - 20dB.

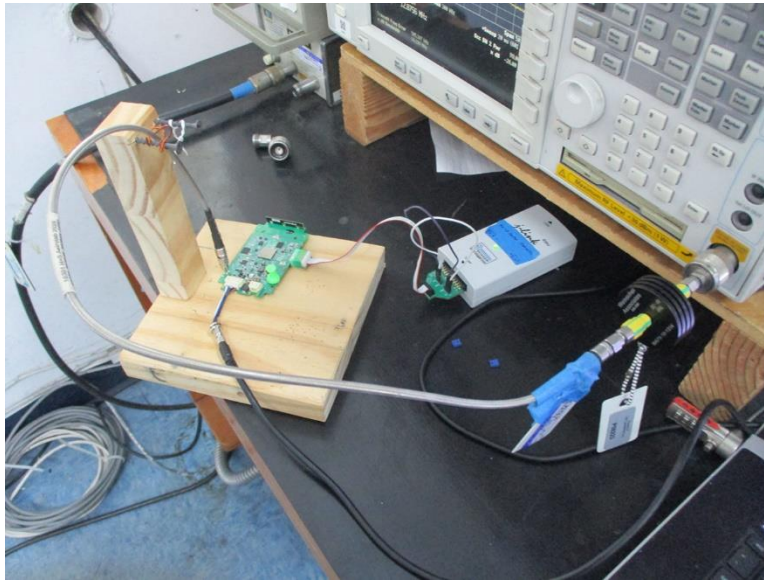
Frequency (MHz)	Modulation	Measured (dBm)	Limit (dBm)	Results
2400	BLE	-46.0	< -16	Pass
2483.5	BLE	-47.8	< -16	Pass

## Band Edge Plots

NOTE: Displayed limit corrected for all measuring equipment for comparison with the data.



**Test Setup Photo(s)**



Measurement



Site D

## 15.247(d) Radiated Emissions & Band Edge

### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020), KDB 558074	Test Date(s):	6/30/2025 & 7/14/2025
Configuration:	1		

### Environmental Conditions

Temperature (°C)	25	Relative Humidity (%):	51
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### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **111165** Date: 7/14/2025  
 Test Type: **Radiated Scan** Time: 18:05:14  
 Tested By: E. Wong Sequence#: 3  
 Software: EMITest 5.03.20

#### Equipment Tested:

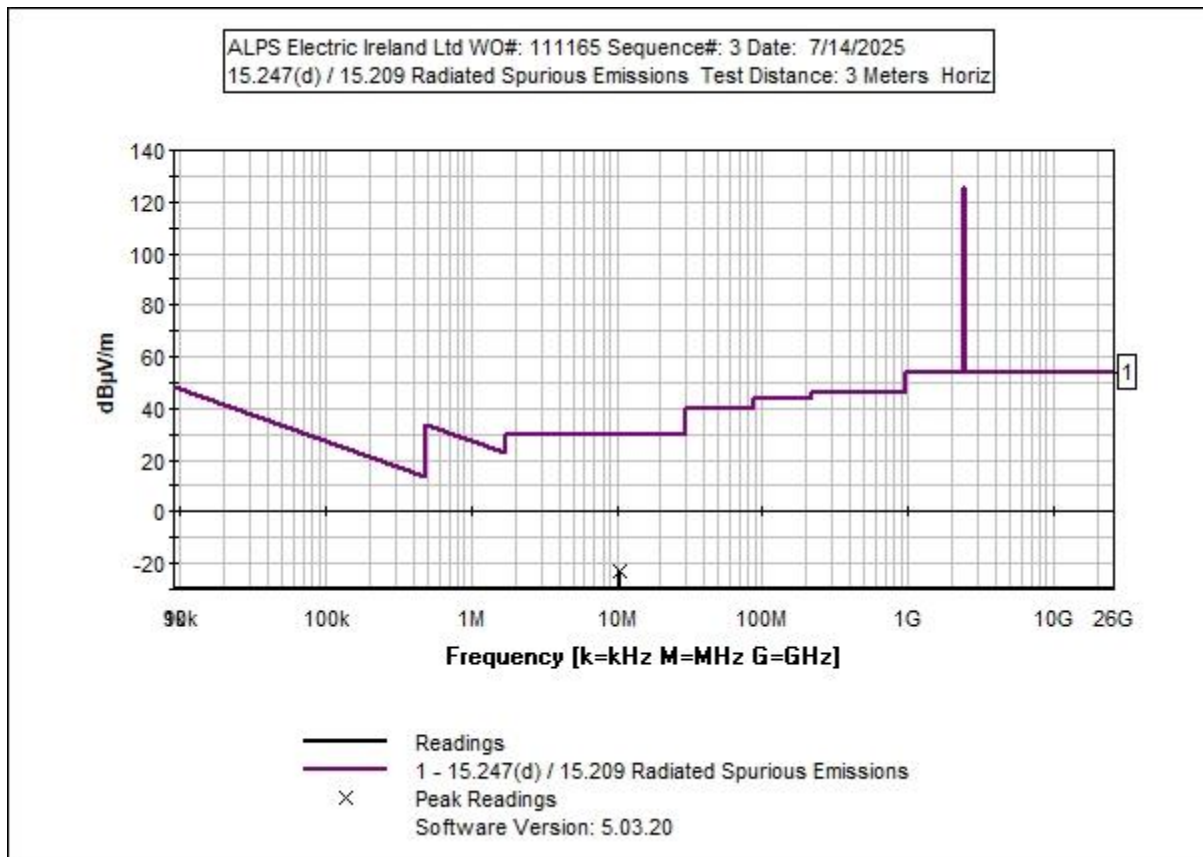
Device	Manufacturer	Model #	S/N
Configuration 1			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

#### Test Conditions / Notes:

Test Condition #6  Frequency range of measurement = 9kHz- 30MHz. 9 kHz -150 kHz;RBW=200 Hz,VBW=600 Hz; 150 kHz-30 MHz;RBW=9 kHz,VBW=27 kHz;  Test Environment Conditions: Temperature: 25.0°C Relative Humidity: 51% Pressure: 100kPa
--



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T2	ANP05198	Cable-Amplitude +15C to +45C (dB)	RG214/U	1/10/2025	1/10/2027
T3	AN00314	Loop Antenna	6502	5/3/2024	5/3/2026

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	10.500M	8.0	+0.0	+0.5	+8.8	-40.0	-22.7	29.5	-52.2	Paral
BLE_M										

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **111165** Date: 7/14/2025  
 Test Type: **Radiated Scan** Time: 18:05:14  
 Tested By: E. Wong Sequence#: 3  
 Software: EMITest 5.03.20

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 1			

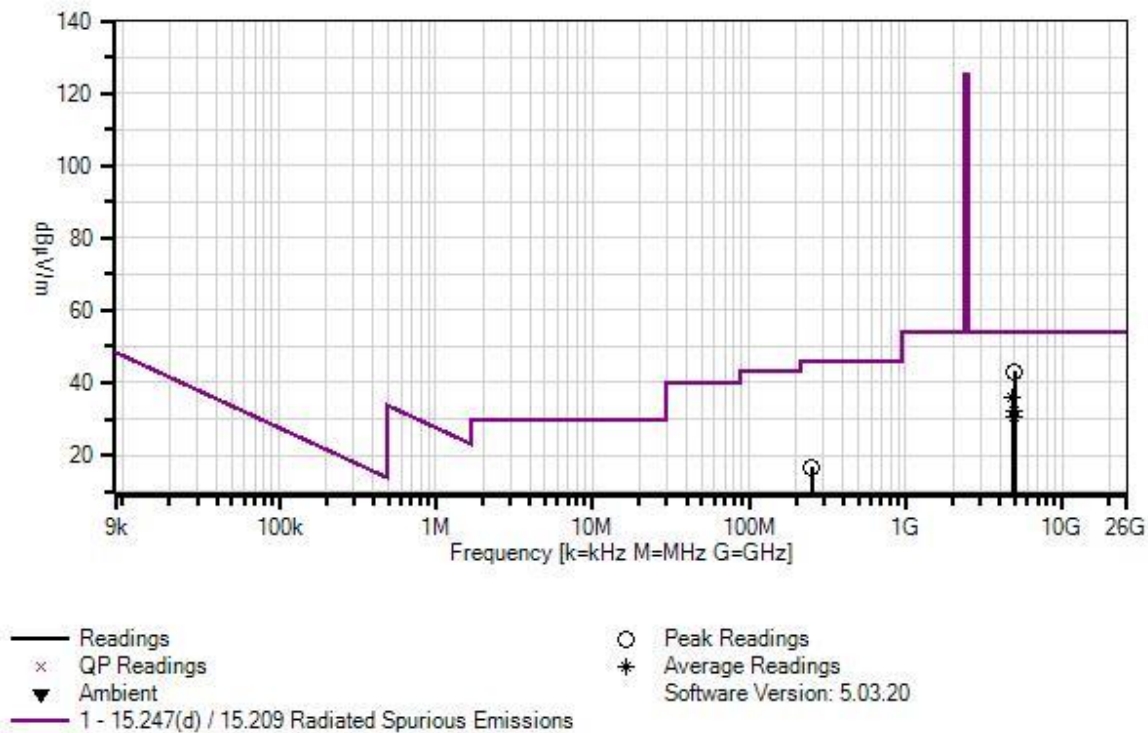
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 1			

***Test Conditions / Notes:***

Test Condition #6  Frequency range of measurement = 30MHz-25GHz. 30 MHz-1000 MHz;RBW=120 kHz,VBW=360 kHz, 1000 MHz-25 000 MHz;RBW=1MHz,VBW=3 MHz.  Test Environment Conditions: Temperature: 25.0°C Relative Humidity: 51% Pressure: 100kPa
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ALPS Electric Ireland Ltd WO#: 111165 Sequence#: 3 Date: 7/14/2025  
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Horiz



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T2	AN00849	Horn Antenna	3115	5/2/2025	5/2/2027
T3	ANP07630	Cable	Sucoflex 104	5/3/2024	5/3/2026
T4	AN00786	Preamp	83017A	2/4/2025	2/4/2026
T5	ANP07691	Cable	LDF1-50	9/23/2024	9/23/2026
T6	AN03385	High Pass Filter	11SH10-3000/T10000-O/O	5/9/2025	5/9/2027
	AN03367	Horn Antenna	62-GH-62-25.	8/10/2023	8/10/2025
T7	AN03850	Biconilog Antenna	3142E	5/23/2024	5/23/2026
T8	ANP05198	Cable-Amplitude +15C to +45C (dB)	RG214/U	1/10/2025	1/10/2027
T9	AN00309	Preamp	8447D	11/21/2023	11/21/2025
T10	ANP06662	Cable	PHASEFLEX EJR01N01024.0	5/3/2024	5/3/2026
	AN01413	Horn Antenna	84125-80008	10/15/2024	10/15/2026
	ANP07655	Cable	32022-29094K-29094K-24TC	7/20/2024	7/20/2026

ANP08087	Cable	32022-29094K-29094K-120TC	12/1/2023	12/1/2025
ANP08088	Cable	32022-29094K-29094K-120TC	12/1/2023	12/1/2025

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	4960.000M	41.4	+0.0 +5.3 +0.0	+33.4 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	43.2	54.0 BLE_H	-10.8	Vert
2	4803.500M Ave	34.4	+0.0 +5.2 +0.0	+33.0 +0.2 +0.0	+0.5 +0.0	-37.4 +0.0	+0.0	35.9	54.0 BLE_L	-18.1	Horiz
^	4803.500M	44.7	+0.0 +5.2 +0.0	+33.0 +0.2 +0.0	+0.5 +0.0	-37.4 +0.0	+0.0	46.2	54.0 BLE_L	-7.8	Horiz
4	4884.000M Ave	30.3	+0.0 +5.3 +0.0	+33.3 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	32.0	54.0 BLE_M	-22.0	Horiz
^	4884.000M	44.4	+0.0 +5.3 +0.0	+33.3 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	46.1	54.0 BLE_M	-7.9	Horiz
^	4884.000M	41.1	+0.0 +5.3 +0.0	+33.3 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	42.8	54.0 BLE_M	-11.2	Horiz
7	4960.000M Ave	28.9	+0.0 +5.3 +0.0	+33.4 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	30.7	54.0 BLE_H	-23.3	Horiz
^	4960.000M	43.2	+0.0 +5.3 +0.0	+33.4 +0.2 +0.0	+0.4 +0.0	-37.5 +0.0	+0.0	45.0	54.0 BLE_H	-9.0	Horiz
9	252.000M	23.6	+0.0 +0.0 -28.0	+0.0 +0.0 +0.1	+0.0 +18.3	+0.0 +2.8	+0.0	16.8	46.0 BLE_L	-29.2	Vert

## Band Edge

### Band Edge Summary

Limit applied at restricted bands: 15.209

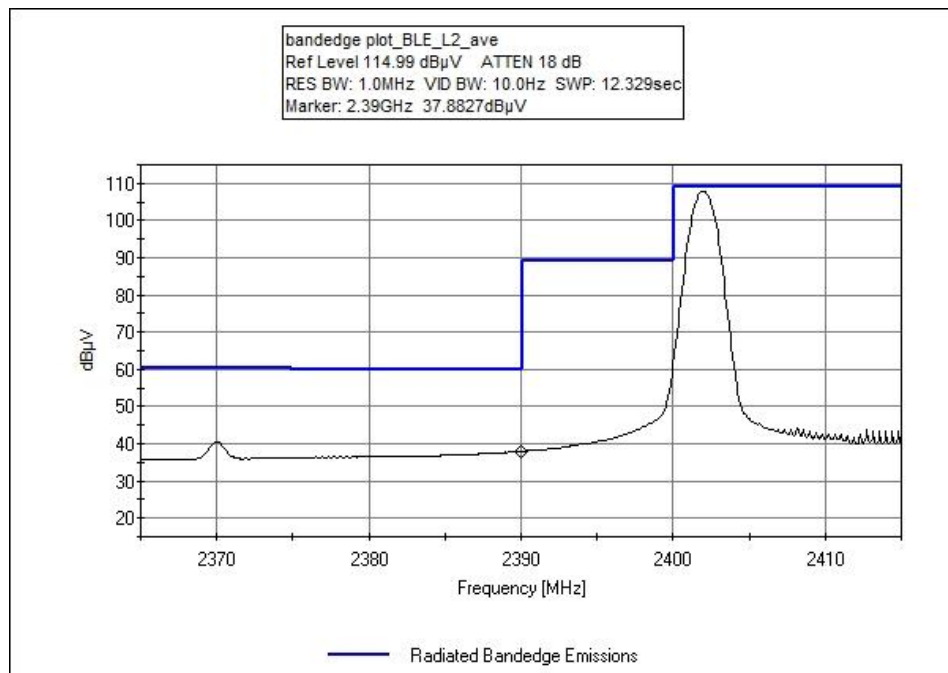
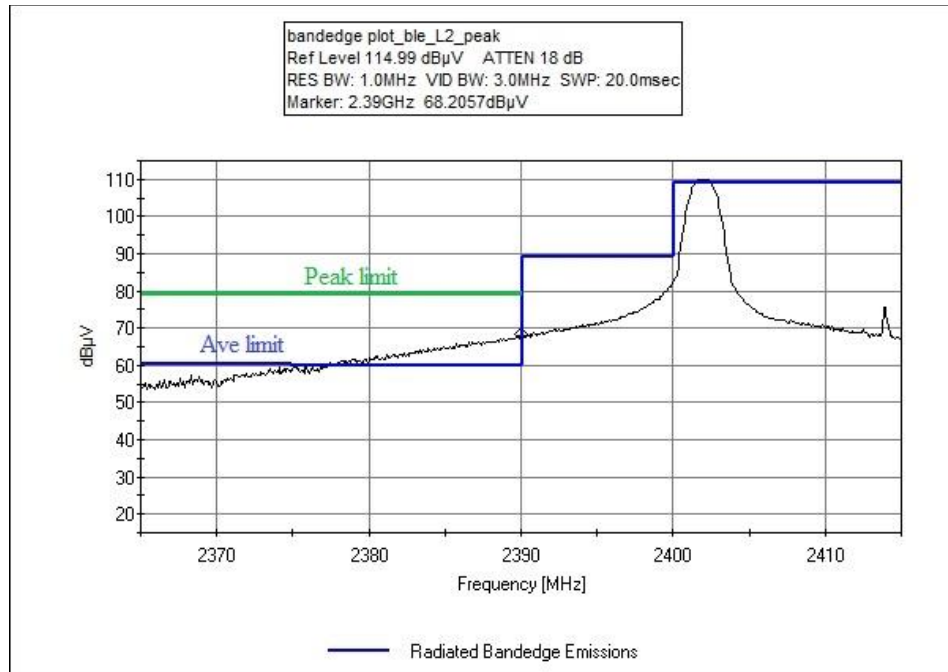
Limit applied for other than restricted bands: Max Power/100kHz - 20dB.

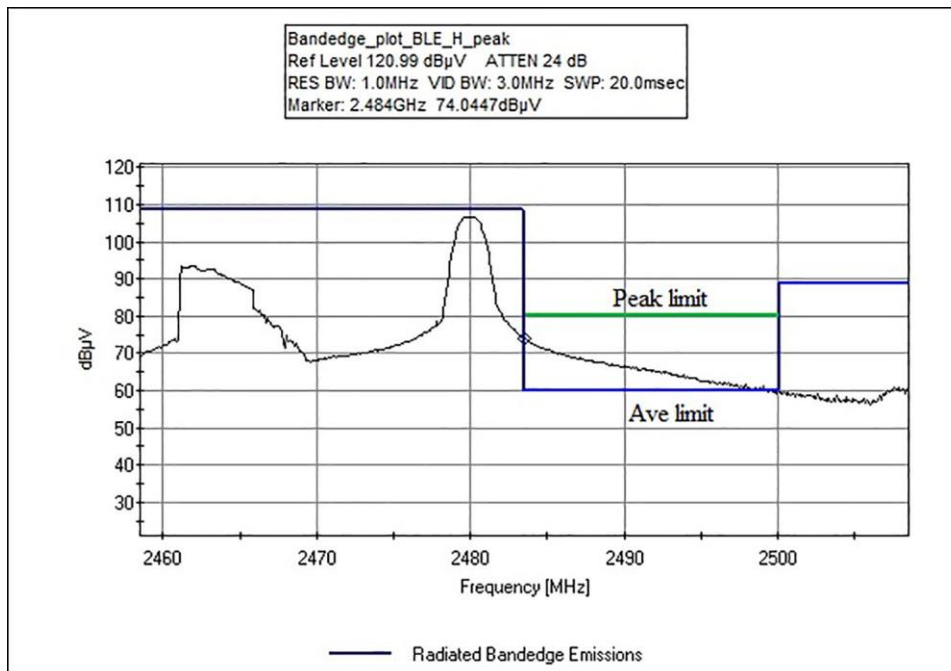
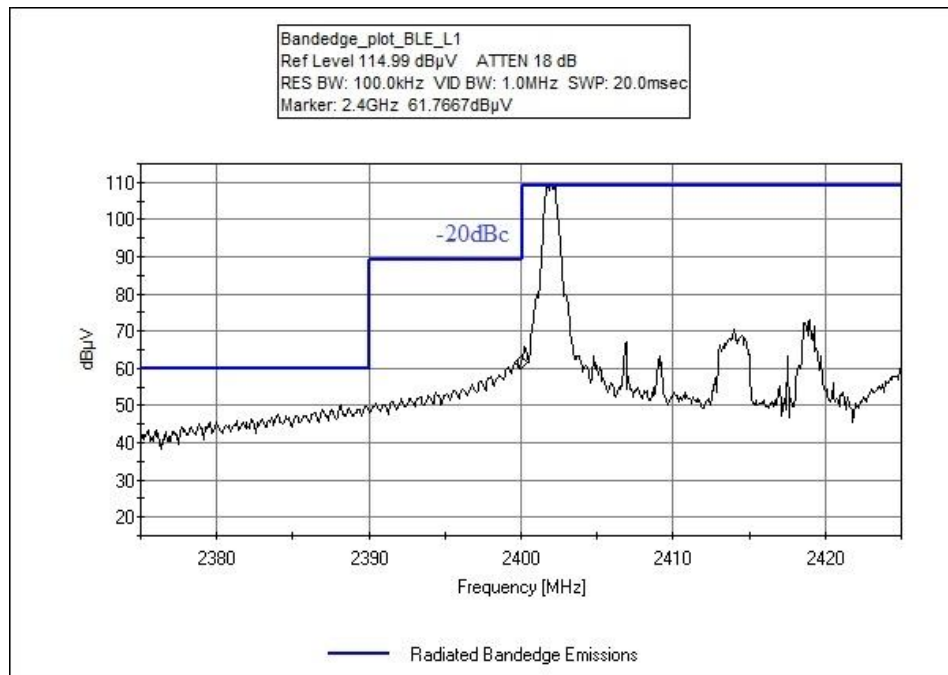
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Average (dBuV/m @3m)		Peak (dBuV/m @3m)		Results
			Measured	Limit	Measured	Limit	
2390.0	BLE	Chip 4.36	31.8	≤54	62.1	≤74	Pass
2400.0	BLE	Chip 4.36	NA2	NA2	55.6	≤ 83.0	Pass
2483.5	BLE	Chip 4.36	38.0	≤54	68.2	≤74	Pass

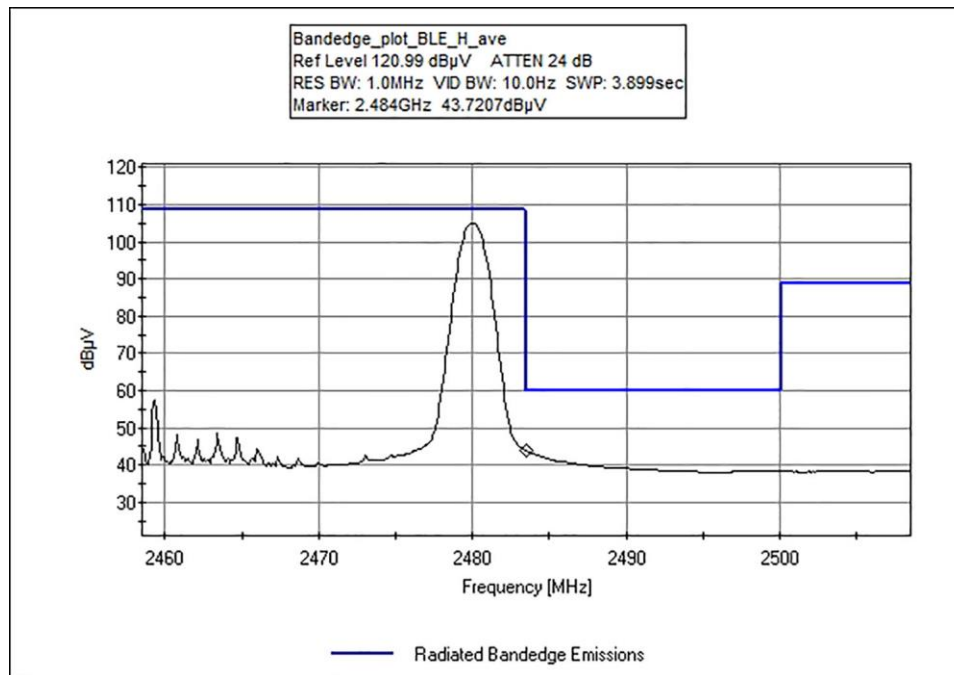
NA1	Peak measurement meets average limit.
NA2	Average limit not applicable when applying 20dBc limit.
NA3	Peak limit not applicable when applying 30dBc limit.

## Band Edge Plots

NOTE: Displayed limit corrected for all measuring equipment for comparison with the data.







### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**  
 Work Order #: **111165** Date: 7/14/2025  
 Test Type: **Radiated Scan** Time: 17:40:47  
 Tested By: E. Wong Sequence#: 3  
 Software: EMITest 5.03.20

#### *Equipment Tested:*

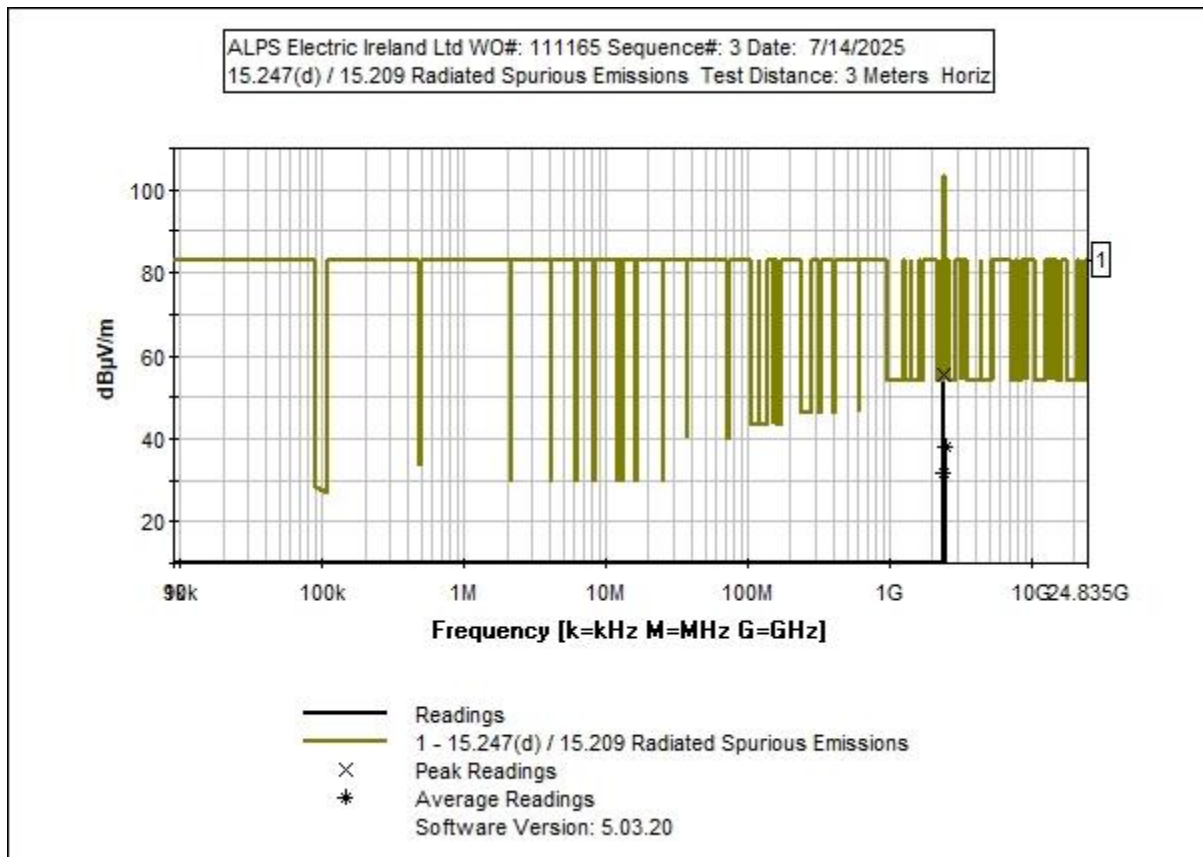
Device	Manufacturer	Model #	S/N
Configuration 1			

#### *Support Equipment:*

Device	Manufacturer	Model #	S/N
Configuration 1			

#### *Test Conditions / Notes:*

Test Condition #6  Frequency range of measurement = bandedge 1000 MHz-25 000 MHz;RBW=1MHz,VBW=3 MHz. / RBW= 100kHz, VBW=300kHz  Test Environment Conditions: Temperature: 25.0°C Relative Humidity: 51% Pressure: 100kPa
--



**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T2	AN00849	Horn Antenna	3115	5/2/2025	5/2/2027
T3	ANP07630	Cable	Sucoflex 104	5/3/2024	5/3/2026
T4	AN00786	Preamp	83017A	2/4/2025	2/4/2026
T5	ANP07691	Cable	LDF1-50	9/23/2024	9/23/2026

**Measurement Data:**

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	dB	dB	dB	dB	Table	dBμV/m	dBμV/m	dB	Ant
1	2483.500M Ave	43.8	+0.0 +3.7	+28.7	+0.3	-38.5	+0.0	38.0	54.0 Bandedge_BLE_H_ave	-16.0	Horiz
^	2483.500M	74.0	+0.0 +3.7	+28.7	+0.3	-38.5	+0.0	68.2	54.0 Bandedge_BLE_H_peak	+14.2	Horiz
3	2390.000M Ave	37.9	+0.0 +3.6	+28.5	+0.3	-38.5	+0.0	31.8	54.0 Bandedge_BLE_L2_ave	-22.2	Horiz
^	2390.000M	68.2	+0.0 +3.6	+28.5	+0.3	-38.5	+0.0	62.1	54.0 Bandedge_BLE_L2_peak	+8.1	Horiz
5	2400.000M	61.7	+0.0 +3.6	+28.5	+0.3	-38.5	+0.0	55.6	83.0 Bndedge_BLE_L1_rbw=100kHz	-27.4	Horiz

**Test Setup Photo(s)**



Below 1GHz, View 1



Below 1GHz, View 2



Above 1GHz, View 1



Above 1GHz, View 2



Above 1GHz, View 3



Above 1GHz, View 4



Above 1GHz, View 5



Above 1GHz, View 6

## 15.207 AC Conducted Emissions

### Test Setup/Conditions

Test Location:	Brea Lab A	Test Engineer:	E. Wong
Test Method:	ANSI C63.10 (2020)	Test Date(s):	6/27/2025
Configuration:	4 & 5		

### Environmental Conditions

Temperature (°C)	24.2	Relative Humidity (%):	56
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### Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.207 AC Mains - Quasi-peak**  
 Work Order #: **111165**  
 Test Type: **Conducted Emissions**  
 Tested By: E. Wong  
 Software: EMITest 5.03.20

Date: 6/27/2025  
 Time: 10:44:31 AM  
 Sequence#: 18  
 110/60Hz

#### Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 5			

#### Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 5			

#### Test Conditions / Notes:

Test Condition #5

BLE TX= 2442MHz

Frequency range of measurement = 150kHz - 30MHz.  
 150 kHz-30 MHz;RBW=9 kHz,VBW=30kHz

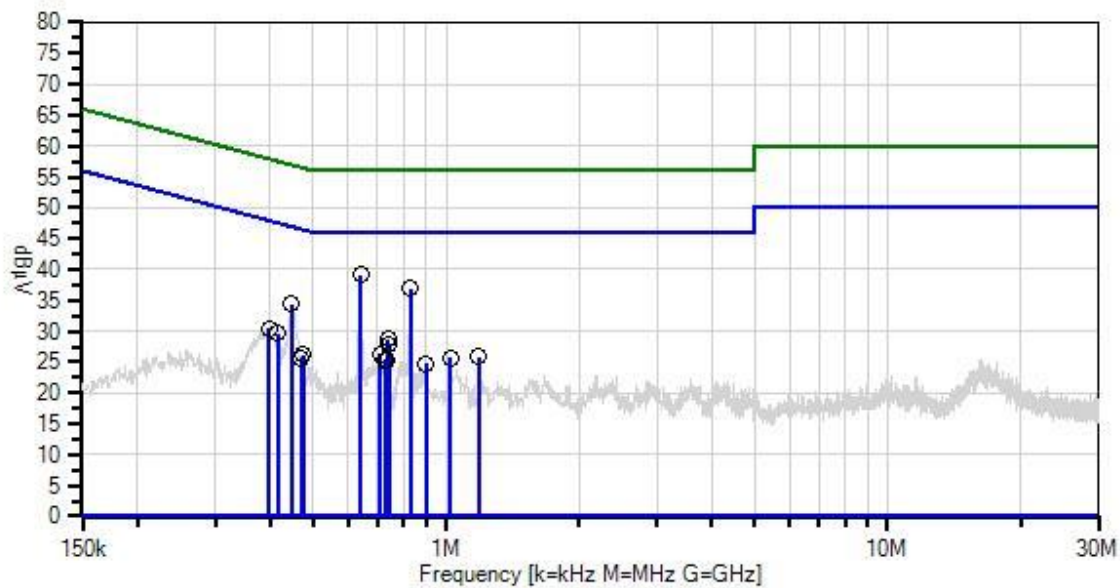
Test Environment Conditions:

Temperature: 24.2°C

Relative Humidity: 56%

Pressure: 100kPa

ALPS Electric Ireland Ltd WO#: 111165 Sequence#: 18 Date: 6/27/2025  
15.207 AC Mains - Quasi-peak Test Lead: 110/60Hz L1-Line



— Sweep Data  
× QP Readings  
Software Version: 5.03.20  
— Readings  
\* Average Readings  
— 1 - 15.207 AC Mains - Average  
○ Peak Readings  
▼ Ambient  
— 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	8/30/2023	8/30/2025
T2	ANP07338	Cable	2249-Y-240	1/10/2024	1/10/2026
T3	ANP08007	Attenuator	SA18N10W-06	10/28/2024	10/28/2026
T4	AN00969A	50uH LISN-Line (dB)	3816/2NM	4/18/2025	4/18/2026
	AN00969A	50uH LISN-Return (dB)	3816/2NM	4/18/2025	4/18/2026
T5	ANP07738	Cable-Line L1(dB)	90cm-extcord	1/15/2025	1/15/2027
	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	1/15/2025	1/15/2027

**Measurement Data:**

Reading listed by margin.

Test Lead: L1-Line

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	639.409k	32.9	+0.3 +0.0	+0.0	+5.8	+0.1	+0.0	39.1	56.0	-16.9	L1-Li
2	829.937k	30.6	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	36.9	56.0	-19.1	L1-Li
3	447.427k	28.2	+0.3 +0.0	+0.0	+5.8	+0.1	+0.0	34.4	56.9	-22.5	L1-Li
4	739.036k	22.4	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	28.7	56.0	-27.3	L1-Li
5	396.522k	24.4	+0.2 +0.0	+0.0	+5.8	+0.1	+0.0	30.5	57.9	-27.4	L1-Li
6	415.430k	23.5	+0.2 +0.0	+0.0	+5.8	+0.1	+0.0	29.6	57.5	-27.9	L1-Li
7	741.218k	21.6	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	27.9	56.0	-28.1	L1-Li
8	709.221k	20.0	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	26.3	56.0	-29.7	L1-Li
9	1.188M	19.7	+0.2 +0.0	+0.1	+5.8	+0.1	+0.0	25.9	56.0	-30.1	L1-Li
10	475.061k	19.9	+0.3 +0.0	+0.0	+5.8	+0.1	+0.0	26.1	56.4	-30.3	L1-Li
11	1.022M	19.5	+0.2 +0.0	+0.1	+5.8	+0.1	+0.0	25.7	56.0	-30.3	L1-Li
12	727.401k	19.1	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	25.4	56.0	-30.6	L1-Li
13	733.219k	19.0	+0.3 +0.0	+0.1	+5.8	+0.1	+0.0	25.3	56.0	-30.7	L1-Li
14	469.970k	19.5	+0.3 +0.0	+0.0	+5.8	+0.1	+0.0	25.7	56.5	-30.8	L1-Li
15	898.468k	18.6	+0.2 +0.0	+0.1	+5.8	+0.1	+0.0	24.8	56.0	-31.2	L1-Li

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.207 AC Mains - Quasi-peak**  
 Work Order #: **111165** Date: 6/27/2025  
 Test Type: **Conducted Emissions** Time: 10:41:01 AM  
 Tested By: E. Wong Sequence#: 17  
 Software: EMITest 5.03.20 110/60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration5			

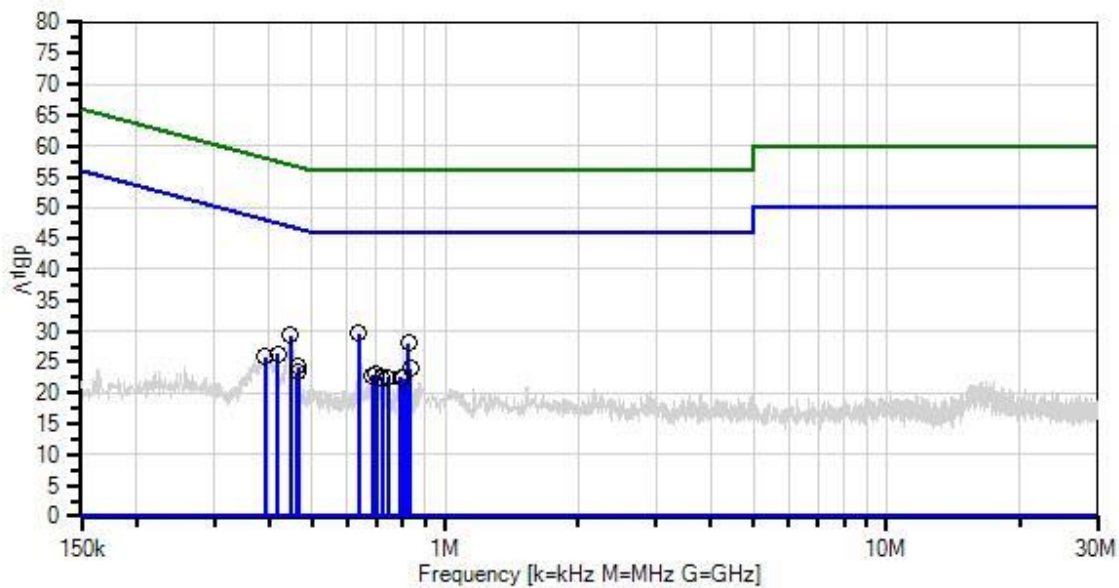
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration5			

***Test Conditions / Notes:***

Test Condition #5  BLE TX= 2442MHz  Frequency range of measurement = 150kHz - 30MHz. 150 kHz-30 MHz;RBW=9 kHz,VBW=30kHz  Test Environment Conditions: Temperature: 24.2°C Relative Humidity: 56% Pressure: 100kPa
---

ALPS Electric Ireland Ltd WO#: 111165 Sequence#: 17 Date: 6/27/2025  
15.207 AC Mains - Quasi-peak Test Lead: 110/60Hz L2-Neutral



— Sweep Data  
× QP Readings  
Software Version: 5.03.20  
— Readings  
\* Average Readings  
— 1 - 15.207 AC Mains - Average  
○ Peak Readings  
▼ Ambient  
— 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	8/30/2023	8/30/2025
T2	ANP07338	Cable	2249-Y-240	1/10/2024	1/10/2026
T3	ANP08007	Attenuator	SA18N10W-06	10/28/2024	10/28/2026
	AN00969A	50uH LISN-Line (dB)	3816/2NM	4/18/2025	4/18/2026
T4	AN00969A	50uH LISN-Return (dB)	3816/2NM	4/18/2025	4/18/2026
	ANP07738	Cable-Line L1(dB)	90cm-extcord	1/15/2025	1/15/2027
T5	ANP07738	Cable-Neutral L2(dB)	90cm-extcord	1/15/2025	1/15/2027

**Measurement Data:**

Reading listed by margin.

Test Lead: L2-Neutral

#	Freq MHz	Rdng dBμV	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	638.682k	23.4	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	29.7	56.0	-26.3	L2-Ne
2	447.427k	23.1	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	29.4	56.9	-27.5	L2-Ne
3	827.028k	21.7	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	28.1	56.0	-27.9	L2-Ne
4	416.884k	20.2	+0.2 +0.0	+0.0	+5.8	+0.2	+0.0	26.4	57.5	-31.1	L2-Ne
5	391.432k	19.7	+0.2 +0.0	+0.0	+5.8	+0.2	+0.0	25.9	58.0	-32.1	L2-Ne
6	834.300k	17.5	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	23.9	56.0	-32.1	L2-Ne
7	465.607k	18.0	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	24.3	56.6	-32.3	L2-Ne
8	696.858k	16.6	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	23.0	56.0	-33.0	L2-Ne
9	464.152k	17.1	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	23.4	56.6	-33.2	L2-Ne
10	683.769k	16.5	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	22.8	56.0	-33.2	L2-Ne
11	462.698k	17.0	+0.3 +0.0	+0.0	+5.8	+0.2	+0.0	23.3	56.6	-33.3	L2-Ne
12	719.402k	16.2	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	22.6	56.0	-33.4	L2-Ne
13	741.218k	16.1	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	22.5	56.0	-33.5	L2-Ne
14	791.395k	16.1	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	22.5	56.0	-33.5	L2-Ne
15	804.485k	15.9	+0.3 +0.0	+0.1	+5.8	+0.2	+0.0	22.3	56.0	-33.7	L2-Ne

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **111165** Date: 6/27/2025  
 Test Type: **Conducted Emissions** Time: 9:40:34 AM  
 Tested By: E. Wong Sequence#: 10  
 Software: EMITest 5.03.20 110/60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 4			

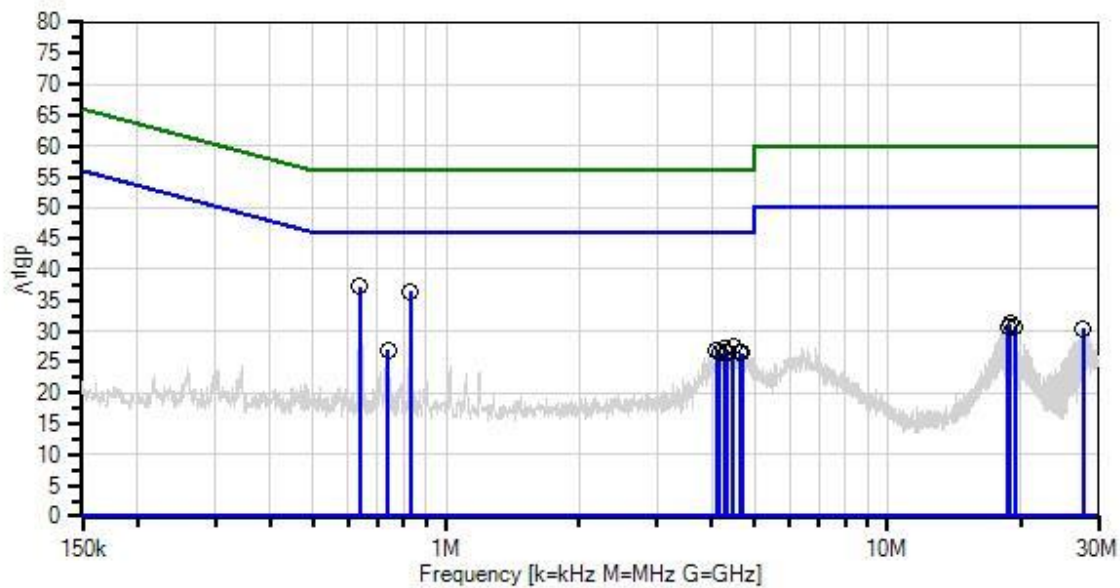
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 4			

***Test Conditions / Notes:***

Test Condition #4  BLE TX freq 2442MHz  Frequency range of measurement = 150kHz - 30MHz. 150 kHz-30 MHz;RBW=9 kHz,VBW=30kHz  Test Environment Conditions: Temperature: 24.2°C Relative Humidity: 56% Pressure: 100kPa
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ALPS Electric Ireland Ltd WO#: 111165 Sequence#: 10 Date: 6/27/2025  
15.207 AC Mains - Average Test Lead: 110/60Hz L1-Line



— Sweep Data  
× QP Readings  
Software Version: 5.03.20

— Readings  
\* Average Readings  
— 1 - 15.207 AC Mains - Average

○ Peak Readings  
▼ Ambient  
— 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	8/30/2023	8/30/2025
T2	ANP07338	Cable	2249-Y-240	1/10/2024	1/10/2026
T3	ANP08007	Attenuator	SA18N10W-06	10/28/2024	10/28/2026
T4	AN00969A	50uH LISN-Line (dB)	3816/2NM	4/18/2025	4/18/2026
	AN00969A	50uH LISN-Return (dB)	3816/2NM	4/18/2025	4/18/2026

**Measurement Data:**

Reading listed by margin.

Test Lead: L1-Line

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	638.682k	31.0	+0.3	+0.0	+5.8	+0.1	+0.0	37.2	46.0	-8.8	L1-Li
2	829.210k	30.2	+0.3	+0.1	+5.8	+0.1	+0.0	36.5	46.0	-9.5	L1-Li
3	4.479M	21.3	+0.1	+0.2	+5.8	+0.2	+0.0	27.6	46.0	-18.4	L1-Li
4	18.950M	24.3	+0.2	+0.4	+5.8	+0.6	+0.0	31.3	50.0	-18.7	L1-Li
5	4.267M	20.9	+0.1	+0.2	+5.8	+0.2	+0.0	27.2	46.0	-18.8	L1-Li
6	739.764k	20.7	+0.3	+0.1	+5.8	+0.1	+0.0	27.0	46.0	-19.0	L1-Li
7	4.088M	20.5	+0.1	+0.2	+5.8	+0.2	+0.0	26.8	46.0	-19.2	L1-Li
8	19.382M	23.7	+0.2	+0.4	+5.8	+0.6	+0.0	30.7	50.0	-19.3	L1-Li
9	4.313M	20.4	+0.1	+0.2	+5.8	+0.2	+0.0	26.7	46.0	-19.3	L1-Li
10	4.165M	20.3	+0.1	+0.2	+5.8	+0.2	+0.0	26.6	46.0	-19.4	L1-Li
11	18.716M	23.6	+0.2	+0.4	+5.8	+0.6	+0.0	30.6	50.0	-19.4	L1-Li
12	4.641M	20.2	+0.1	+0.2	+5.8	+0.2	+0.0	26.5	46.0	-19.5	L1-Li
13	4.330M	20.2	+0.1	+0.2	+5.8	+0.2	+0.0	26.5	46.0	-19.5	L1-Li
14	27.663M	23.1	+0.2	+0.5	+5.8	+0.9	+0.0	30.5	50.0	-19.5	L1-Li
15	4.675M	20.2	+0.1	+0.2	+5.8	+0.2	+0.0	26.5	46.0	-19.5	L1-Li

Test Location: CKC Laboratories, Inc. • 110 North Olinda Place • Brea, CA 92823 • (714) 993-6112  
 Customer: **ALPS Electric Ireland Ltd**  
 Specification: **15.207 AC Mains - Average**  
 Work Order #: **111165** Date: 6/27/2025  
 Test Type: **Conducted Emissions** Time: 9:45:30 AM  
 Tested By: E. Wong Sequence#: 11  
 Software: EMITest 5.03.20 110/60Hz

***Equipment Tested:***

Device	Manufacturer	Model #	S/N
Configuration 4			

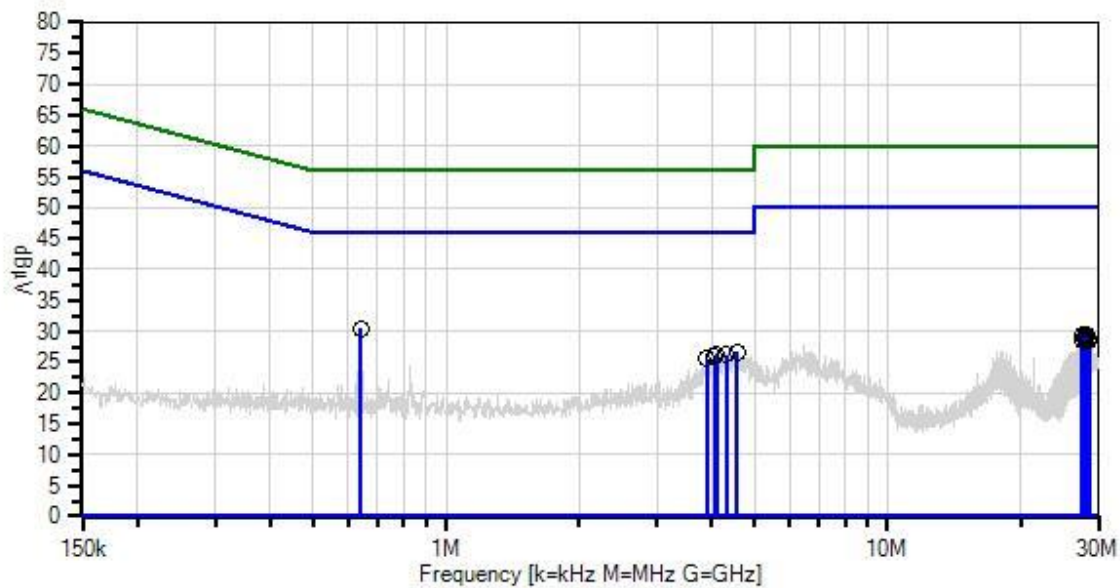
***Support Equipment:***

Device	Manufacturer	Model #	S/N
Configuration 4			

***Test Conditions / Notes:***

Test Condition #4  BLE TX frequency 2442MHz  Frequency range of measurement = 150kHz - 30MHz. 150 kHz-30 MHz;RBW=9 kHz,VBW=30kHz  Test Environment Conditions: Temperature: 24.2°C Relative Humidity: 56% Pressure: 100kPa
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ALPS Electric Ireland Ltd WO#: 111165 Sequence#: 11 Date: 6/27/2025  
15.207 AC Mains - Average Test Lead: 110/60Hz L2-Neutral



— Sweep Data  
× QP Readings  
Software Version: 5.03.20  
— Readings  
\* Average Readings  
— 1 - 15.207 AC Mains - Average  
○ Peak Readings  
▼ Ambient  
— 2 - 15.207 AC Mains - Quasi-peak

**Test Equipment:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	1/23/2025	1/23/2026
T1	AN02610	High Pass Filter	HE9615-150K-50-720B	8/30/2023	8/30/2025
T2	ANP07338	Cable	2249-Y-240	1/10/2024	1/10/2026
T3	ANP08007	Attenuator	SA18N10W-06	10/28/2024	10/28/2026
	AN00969A	50uH LISN-Line (dB)	3816/2NM	4/18/2025	4/18/2026
T4	AN00969A	50uH LISN-Return (dB)	3816/2NM	4/18/2025	4/18/2026

**Measurement Data:**

Reading listed by margin.

Test Lead: L2-Neutral

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	639.409k	24.1	+0.3	+0.0	+5.8	+0.2	+0.0	30.4	46.0	-15.6	L2-Ne
2	4.564M	20.3	+0.1	+0.2	+5.8	+0.3	+0.0	26.7	46.0	-19.3	L2-Ne
3	4.097M	20.0	+0.1	+0.2	+5.8	+0.3	+0.0	26.4	46.0	-19.6	L2-Ne
4	4.309M	19.8	+0.1	+0.2	+5.8	+0.3	+0.0	26.2	46.0	-19.8	L2-Ne
5	4.050M	19.4	+0.1	+0.2	+5.8	+0.3	+0.0	25.8	46.0	-20.2	L2-Ne
6	3.892M	19.1	+0.1	+0.2	+5.8	+0.3	+0.0	25.5	46.0	-20.5	L2-Ne
7	27.520M	22.0	+0.2	+0.5	+5.8	+1.0	+0.0	29.5	50.0	-20.5	L2-Ne
8	28.287M	21.9	+0.2	+0.5	+5.8	+1.0	+0.0	29.4	50.0	-20.6	L2-Ne
9	28.239M	21.7	+0.2	+0.5	+5.8	+1.0	+0.0	29.2	50.0	-20.8	L2-Ne
10	28.047M	21.6	+0.2	+0.5	+5.8	+1.0	+0.0	29.1	50.0	-20.9	L2-Ne
11	27.807M	21.4	+0.2	+0.5	+5.8	+1.0	+0.0	28.9	50.0	-21.1	L2-Ne
12	27.999M	21.4	+0.2	+0.5	+5.8	+1.0	+0.0	28.9	50.0	-21.1	L2-Ne
13	28.424M	21.4	+0.2	+0.5	+5.8	+1.0	+0.0	28.9	50.0	-21.1	L2-Ne
14	28.616M	21.0	+0.3	+0.5	+5.8	+1.0	+0.0	28.6	50.0	-21.4	L2-Ne
15	27.670M	21.0	+0.2	+0.5	+5.8	+1.0	+0.0	28.5	50.0	-21.5	L2-Ne

**Test Setup Photo(s)**



View 1



View 2



View 3



View 4

## Supplemental Information

### Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
$5.77 \times 10^{-10}$	Frequency Deviation
0.00005 s	Time Deviation
3.18 dB	Mains Conducted Emissions

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ . Compliance is deemed to occur provided measurements are below the specified limits.

### Emissions Test Details

#### TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

#### CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in  $\text{dB}\mu\text{V}/\text{m}$ , the spectrum analyzer reading in  $\text{dB}\mu\text{V}$  was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	( $\text{dB}\mu\text{V}$ )
+	Antenna Factor	( $\text{dB}/\text{m}$ )
+	Cable Loss	( $\text{dB}$ )
-	Distance Correction	( $\text{dB}$ )
-	Preamplifier Gain	( $\text{dB}$ )
=	Corrected Reading	( $\text{dB}\mu\text{V}/\text{m}$ )

#### TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

#### SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

##### Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

##### Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

##### Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.

**\*End of Report\***