

FCC and ISED Test Report

ACR Electronics Inc
Bivy Stick, Model: 4601

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, FCC 47 CFR Part 25, ISED RSS-GEN, ISED RSS-170, ISED RSS-247 and ISED RSS-GEN (Iridium and 2.4 GHz Bluetooth Low Energy)

Prepared for: ACR Electronics Inc
Ravenswood Road, Fort Lauderdale
33312-6645, USA

FCC ID: B66-ACRBV2, Contains: HSW2832, Q639603N
IC: 1322A-ACRBV2, Contains: 4492A-2832, 4629A-9603N



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Document 75953325-01 Issue 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	02 February 2022

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, FCC 47 CFR Part 25, ISED RSS-GEN, ISED RSS-170 and ISED RSS-247. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Ahmad Javid	02 February 2022	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 2: 2020, FCC 47 CFR Part 15: 2020, FCC 47 CFR Part 25: 2020, ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02), ISED RSS-170: Issue 3 (07-2015) and ISED RSS-247: Issue 2 (02-2017) for the tests detailed in section 1.3.



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ACCREDITATION

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	02-February-2022

Table 1

1.2 Introduction

Applicant	ACR Electronics Inc
Manufacturer	ACR Electronics Inc
Model Number(s)	4601
Serial Number(s)	3
Hardware Version(s)	V2
Software Version(s)	33
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2020 FCC 47 CFR Part 15: 2020 FCC 47 CFR Part 25: 2020 ISED RSS-GEN: Issue 5 (2018-04) + A2 (2021-02) ISED RSS-170: Issue 3 (07-2015) ISED RSS-247: Issue 2 (02-2017)
Order Number	61473
Date	03-September-2021
Date of Receipt of EUT	08-December-2021
Start of Test	13-January-2022
Finish of Test	14-January-2022
Name of Engineer(s)	Ahmad Javid
Related Document(s)	ANSI C63.26: 2015 ANSI C63.10: 2013



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance FCC 47 CFR Part 15, FCC 47 CFR Part 25, ISED RSS-170 and ISED RSS-247 is shown below.

Section	Specification Clause						Test Description	Result	Comments/Base Standard
	FCC Part 2	FCC Part 15	FCC Part 25	RSS-GEN	RSS-170	RSS-247			
Configuration and Mode: Iridium and Bluetooth Low Energy									
2.1	2.1053	15.247 (d)	25.202 (f)	6.13	5.4.3.1	5.5 & 6.2	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.26 (2015)

Table 2



1.4 Application Form

Equipment Description

Technical Description: <i>(Please provide a brief description of the intended use of the equipment including the technologies the product supports)</i>	BLE Device pairs with BLE phone to transmit data via Iridium satellite modem	
Manufacturer:	ACR Electronics	
Model:	Bivy Stick	
Part Number:	4601	
Hardware Version:	V2	
Software Version:	33	
FCC ID of the product under test – see guidance here	B66-ACRBV2 Contains: HSW2832, Q639603N	
IC ID of the product under test – see guidance here	1322A-ACRBV2 Contains: 4492A-2832, 4629A-9603N	

Table 3

Intentional Radiators

Technology	BLE	Iridium				
Frequency Range (MHz to MHz)	2402 - 2480 MHz	1616 - 1626.5 MHz				
Conducted Declared Output Power (dBm)	4	30				
Antenna Gain (dBi)	2.2	-0.2				
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	2 MHz	31.5 kHz				
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GFSK	QPSK/BPSK				
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M0G1D	41K7Q7D				
Bottom Frequency (MHz)	2402 MHz	1616 MHz				
Middle Frequency (MHz)	2441 MHz	1621.25 MHz				
Top Frequency (MHz)	2480 MHz	1626.5 MHz				

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2480 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	1616 MHz
Class A Digital Device (Use in commercial, industrial or business environment) <input checked="" type="checkbox"/>	
Class B Digital Device (Use in residential environment only) <input type="checkbox"/>	

Table 5



AC Power Source

AC supply frequency:		Hz
Voltage		V
Max current:		A
Single Phase <input type="checkbox"/> Three Phase <input type="checkbox"/>		

Table 6

DC Power Source

Nominal voltage:	5	V
Extreme upper voltage:	7	V
Extreme lower voltage:	3.75	V
Max current:	1	A

Table 7

Battery Power Source

Voltage:	3.7	V
End-point voltage:	2.8	V (Point at which the battery will terminate)
Alkaline <input type="checkbox"/> Leclanche <input checked="" type="checkbox"/> Lithium <input type="checkbox"/> Nickel Cadmium <input type="checkbox"/> Lead Acid* <input type="checkbox"/> *(Vehicle regulated)		
Other <input type="checkbox"/>	Please detail:	

Table 8

Charging

Can the EUT transmit whilst being charged	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	---

Table 9

Temperature

Minimum temperature:	-12	°C
Maximum temperature:	40	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)		dB
--	--	----

Table 11



Antenna Characteristics

Antenna connector <input type="checkbox"/>		State impedance		Ohm	
Temporary antenna connector <input type="checkbox"/>		State impedance		Ohm	
Integral antenna <input checked="" type="checkbox"/> 2	Type:	1) Helical 2) PCB	Gain	1) -0.2 2) 2.2	dBi
External antenna <input type="checkbox"/>	Type:		Gain		dBi
For external antenna only: Standard Antenna Jack <input type="checkbox"/> If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed <input type="checkbox"/> Non-standard Antenna Jack <input type="checkbox"/>					

Table 12

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 13

I hereby declare that the information supplied is correct and complete.

Name: Anthony Rosen

Anthony.rosen@acrartex.com

Position held: Production Coordinator

Date: 01 November 2021



1.5 Product Information

1.5.1 Technical Description

BLE Device pairs with BLE phone to transmit data via Iridium satellite modem.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: 4601, Serial Number: 3			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 14

1.8 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Iridium and Bluetooth Low Energy		
Radiated Spurious Emissions (Simultaneous Transmission)	Ahmad Javid	UKAS

Table 15

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 15, Clause 15.247(d)
FCC 47 CFR Part 25, Clause 25.202(f)
ISED RSS-GEN, Clause 6.13
ISED RSS-170, Clause 5.4.3.1
ISED RSS-247, Clause 5.5 and 6.2

2.1.2 Equipment Under Test and Modification State

4601, S/N: 3 - Modification State 0

2.1.3 Date of Test

13-January-2022 to 14-January-2022

2.1.4 Test Method

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 5th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. The EUT is a portable device and therefore, prescans were performed in X, Y and Z orientations.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Prescans and final measurements were performed using the direct field strength method.

Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation:

$E \text{ (dBuV/m)} + 20\log(d) - 104.8 = \text{EIRP (dBm)}$ where (d) is the measurement distance.

$82.2 \text{ (dBuV/m)} + 20\log(3) - 104.8 = \text{EIRP (dBm)}$
 $-13.0 = \text{EIRP (dBm)}$

2.1.5 Example Test Setup Diagram

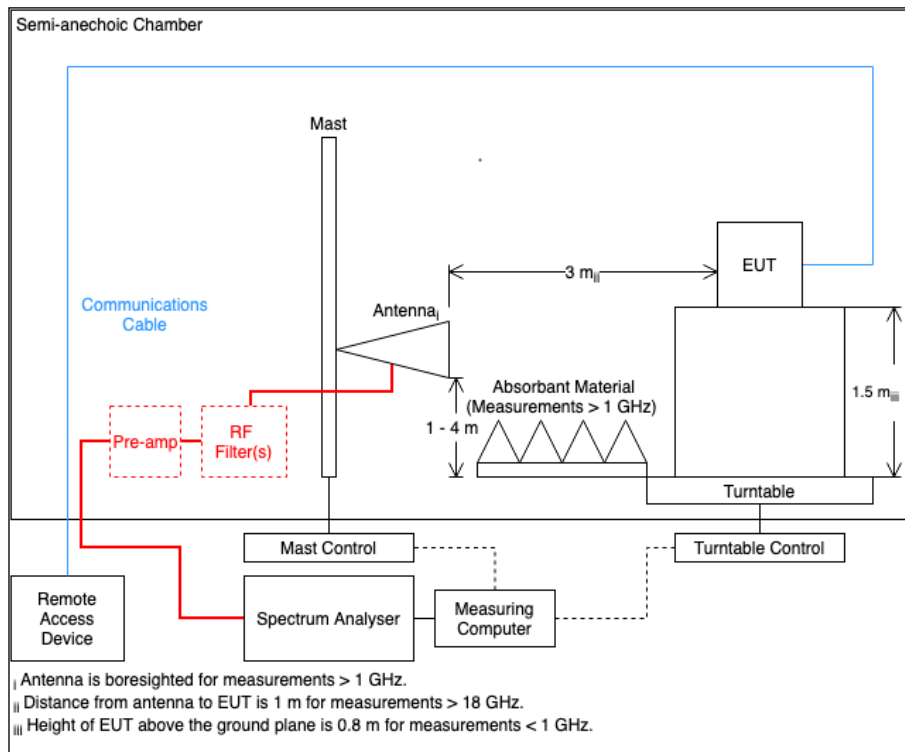


Figure 1

2.1.6 Environmental Conditions

Ambient Temperature 19.8 - 20.3 °C
Relative Humidity 31.1 - 33.3 %



2.1.7 Test Results

Iridium and Bluetooth Low Energy

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
3251.680	-31.4	-13.0	-18.4	Peak	47	101	Horizontal
3251.745	-33.2	-13.0	-20.2	Peak	191	100	Vertical
4877.595	-28.4	-13.0	-15.4	Peak	83	100	Horizontal
4877.600	-31.8	-13.0	-18.8	Peak	203	282	Vertical

Table 16 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: X, 30 MHz to 25 GHz

No other emissions found within 6 dB of the limit.

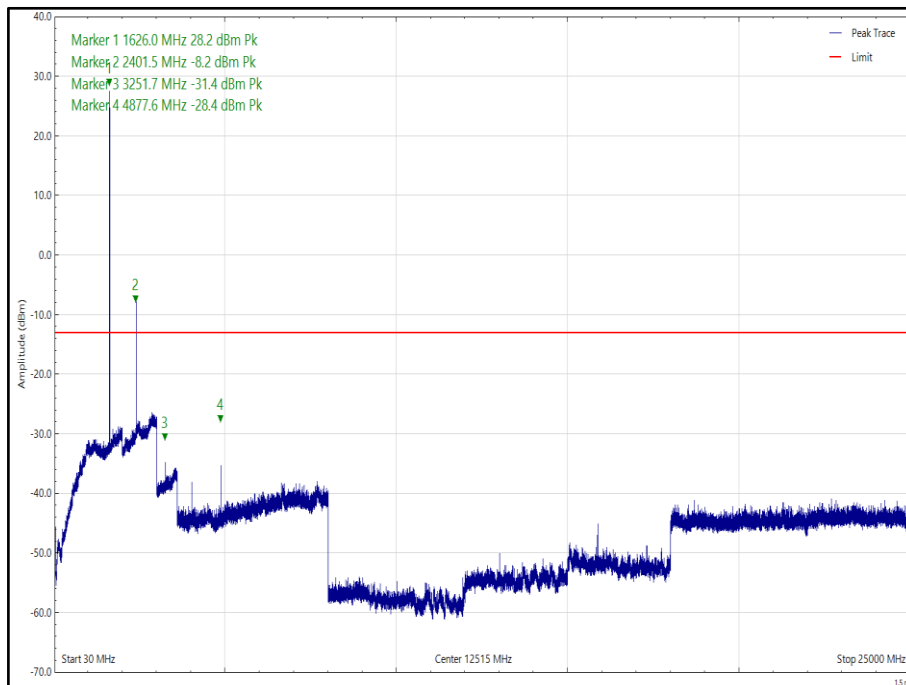


Figure 2 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: X, 30 MHz to 25 GHz, Horizontal (Peak)

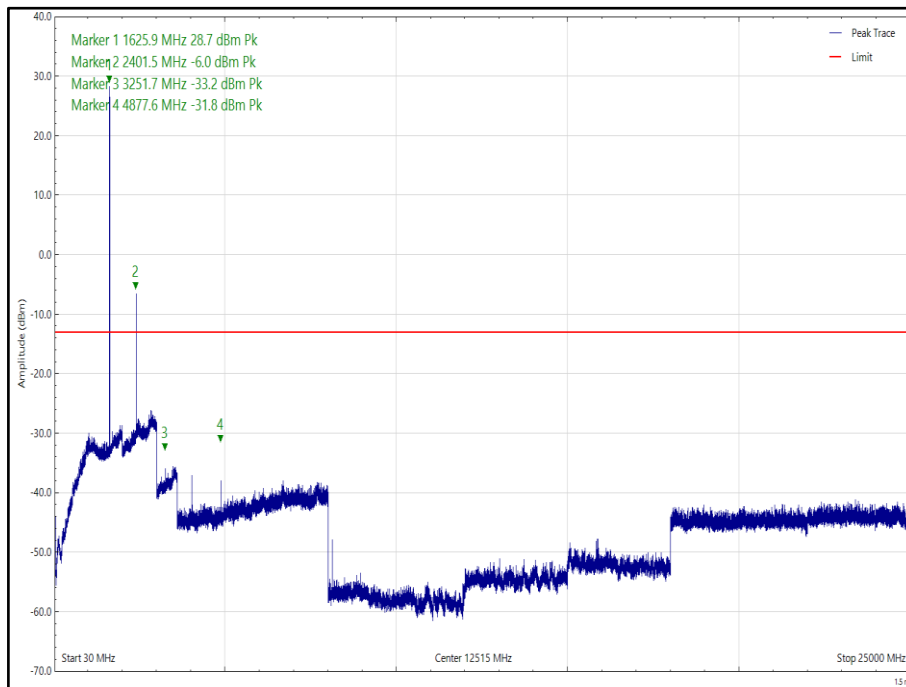


Figure 3 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: X, 30 MHz to 25 GHz, Vertical (Peak)



Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
3251.755	-31.9	-13.0	-18.9	Peak	225	100	Vertical
4877.535	-29.3	-13.0	-16.3	Peak	3	136	Vertical
4877.815	-32.7	-13.0	-19.7	Peak	270	110	Horizontal

Table 17 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Y, 30 MHz to 25 GHz

No other emissions found within 6 dB of the limit.

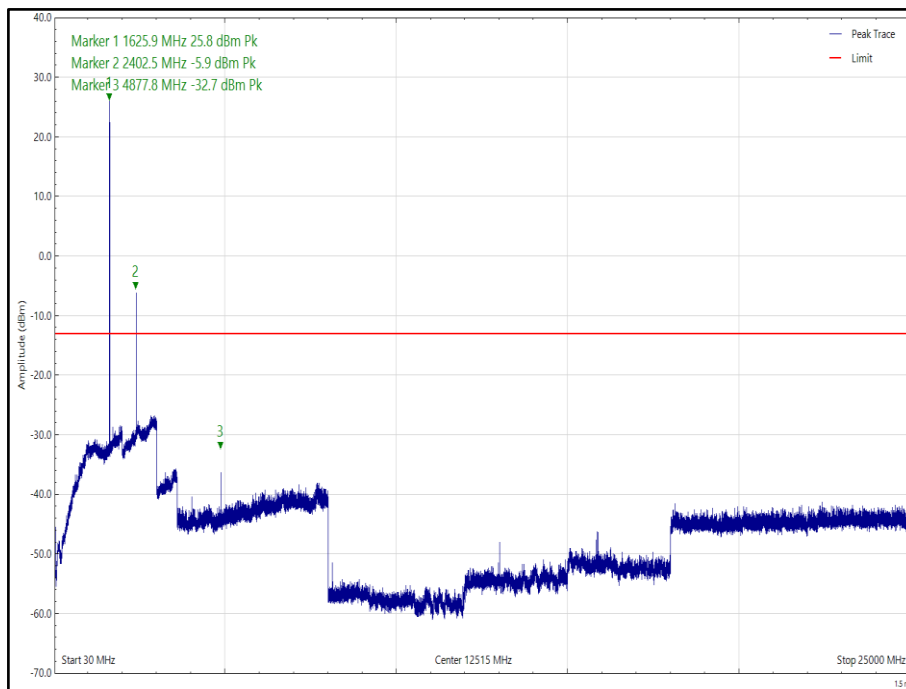


Figure 4 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Y, 30 MHz to 25 GHz, Horizontal (Peak)

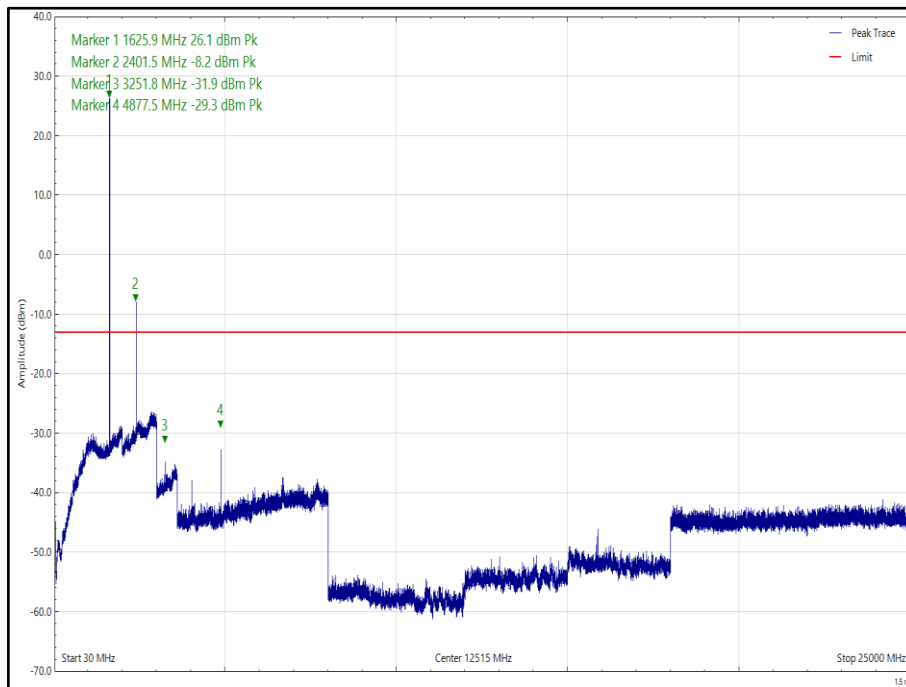


Figure 5 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Y, 30 MHz to 25 GHz, Vertical (Peak)



Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
4877.630	-28.7	-13.0	-15.7	Peak	84	178	Vertical
4877.695	-28.5	-13.0	-15.5	Peak	350	100	Horizontal

Table 18 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Z, 30 MHz to 25 GHz

No other emissions found within 6 dB of the limit.

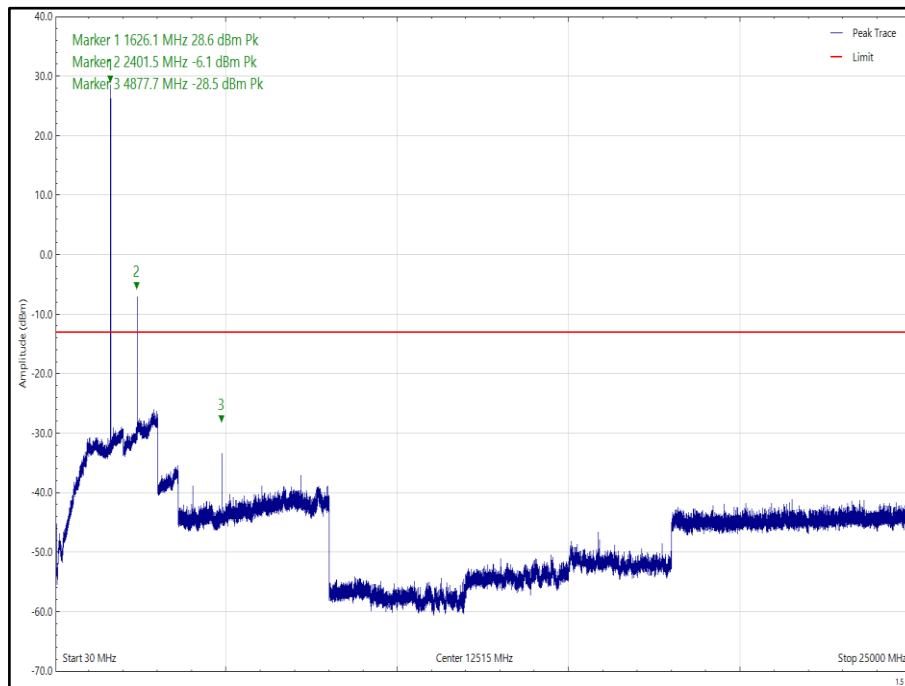


Figure 6 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Z, 30 MHz to 25 GHz, Horizontal (Peak)

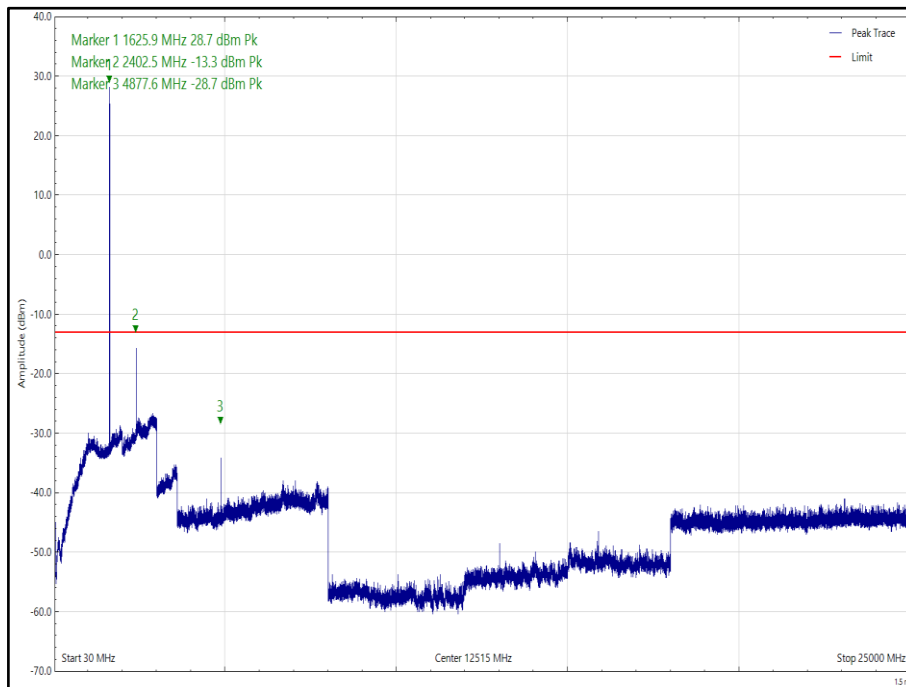


Figure 7 - LE1M, 2402 MHz (CH37) and Iridium, 1625.9791667 (CH240), Orientation: Z, 30 MHz to 25 GHz, Vertical (Peak)

FCC 47 CFR Part 15, FCC 47 Part 25 and ISED RSS-247

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 15.247 (d) / RSS-247 Clause 5.5	-20 dBc
FCC Part 25.202	-13 dBm (EIRP)

Table 19



2.1.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Antenna (DRG, 18 GHz to 40 GHz)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022
True RMS Multimeter	Fluke	79 Series III	411	12	13-Oct-2022
Power Supply Unit	Farnell	D302T	609	12	O/P Mon
Pre-Amplifier (8 GHz to 18 GHz)	Phase One	PS04-0086	1533	12	05-Feb-2022
Pre-Amplifier (18 GHz to 40 GHz)	Phase One	PSO4-0087	1534	12	02-Aug-2022
Test Receiver	Rohde & Schwarz	ESU40	3506	12	18-Mar-2022
Cable (K-Type to K-Type, 2 m)	Scott Cables	KPS-1501-2000-KPS	4526	6	06-Mar-2022
Emissions Software	TUV SUD	EmX V2.1.11	5125	-	Software
Cable (N-Type to N-Type, 8 m)	Teledyne	PR90-088-8MTR	5450	6	08-Mar-2022
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	31-Mar-2022
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5512	12	09-Apr-2022
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5610	12	15-Oct-2022
Antenna (DRG, 1 GHz to 10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	15-Oct-2022
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Turntable	Maturo Gmbh	Turntable 1.5 SI-2t	5614	-	TU
Antenna (Bi-Log, 30 MHz to 1 GHz)	Teseq	CBL6111D	5615	24	16-Oct-2022
Screened Room (12)	MVG	EMC-3	5621	36	11-Aug-2023

Table 20

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

3 Photographs

3.1 Test Setup Photographs



Figure 8 - 30 MHz to 1 GHz, Orientation X

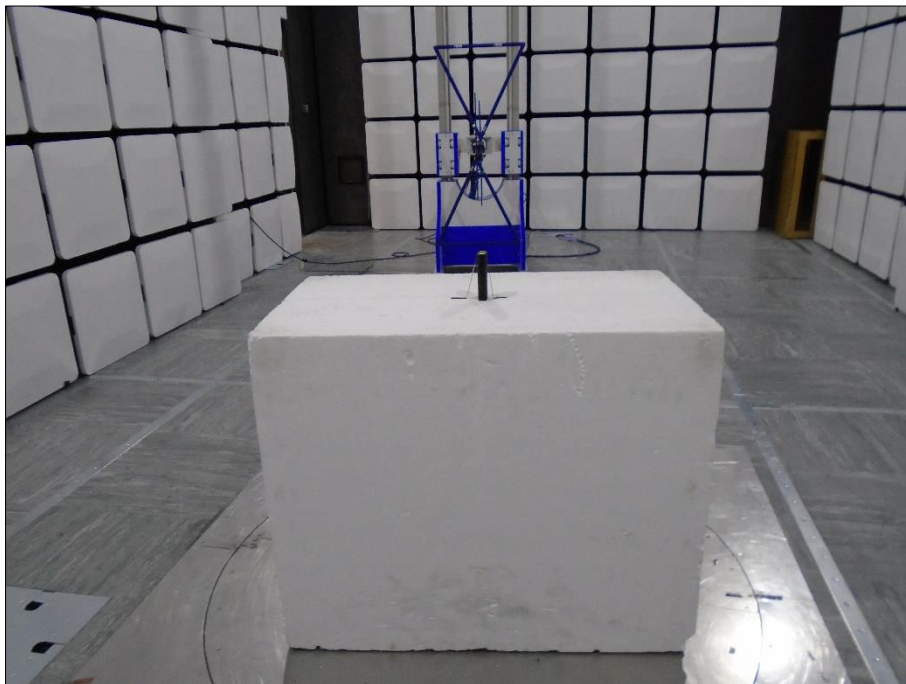


Figure 9 - 30 MHz to 1 GHz, Orientation Y

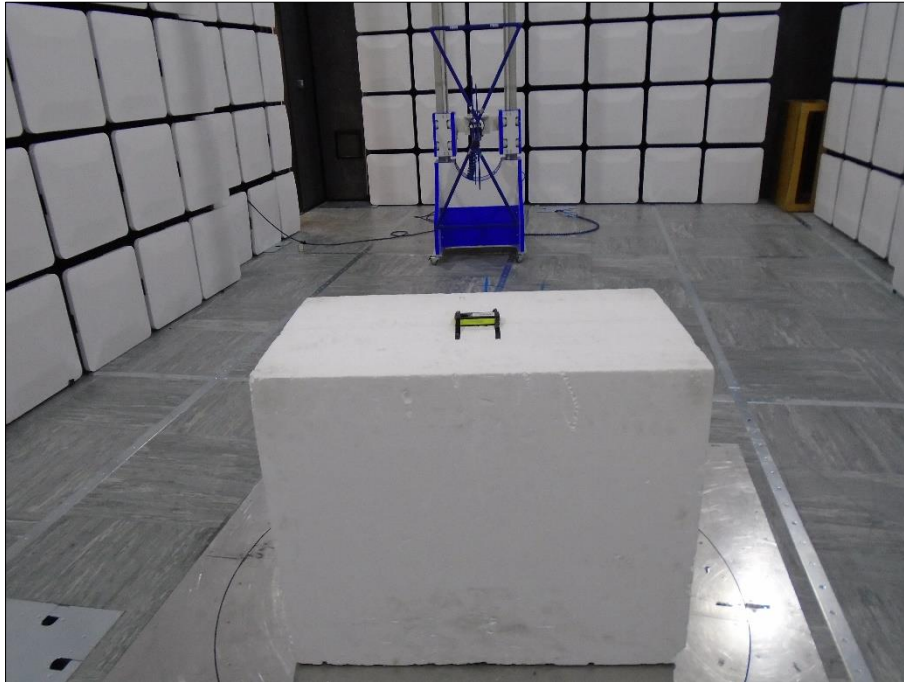


Figure 10 - 30 MHz to 1 GHz, Orientation Z

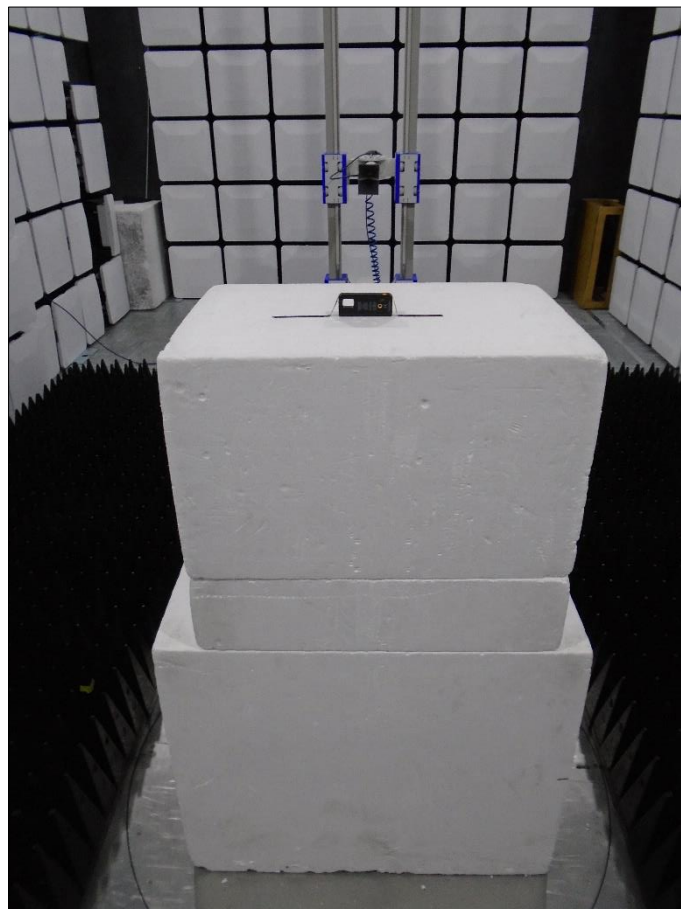


Figure 11 - 1 GHz to 25 GHz, Orientation X

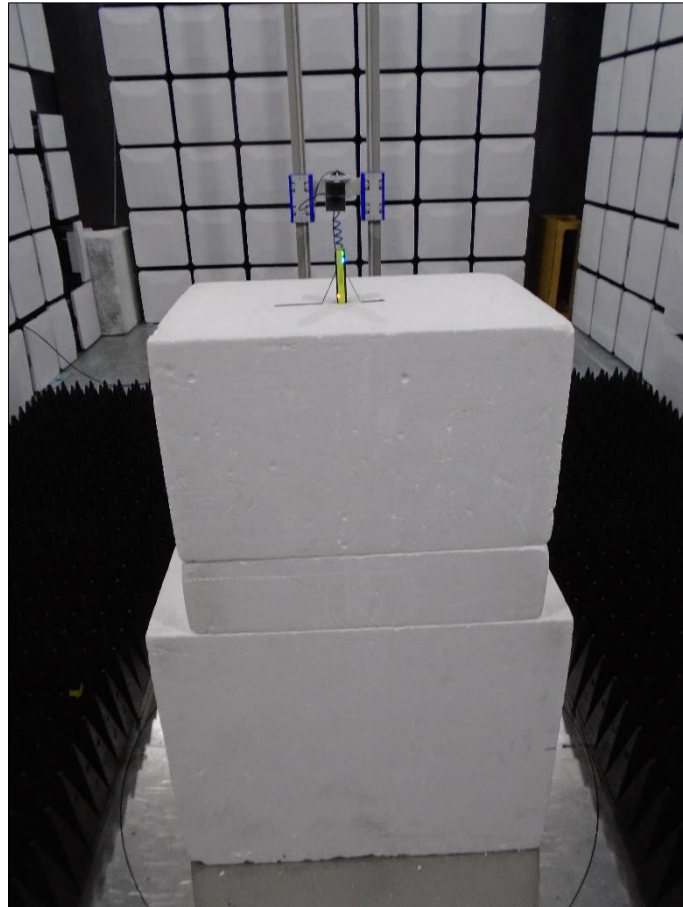


Figure 12 - 1 GHz to 25 GHz, Orientation Y



Figure 13 - 1 GHz to 25 GHz, Orientation Z



4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Radiated Spurious Emissions (Simultaneous Transmission)	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 21

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2007, Clause 4.4.3 and 4.5.1. (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.