

G.L. Electronic

Czech Company for Aerospace Technologies



Brno
Chropyně



Company Overview

-  Founded in 2008, Brno, Czech Republic
-  Expanded to Chropyně in 2025
-  Specialized in manufacturing and complete implementation of Hi-Rel electronics and cable harnesses for aerospace
-  Production within ESA ECSS standards in ISO 8 & ISO 7 cleanrooms
-  ESA & IPC certified employees



Our long-term partners:

OHB-I, OHB-DE, Avio, ESA, OHB-Luxspace, Airbus Defence and Space, Tas Alenia Space, Leonardo, Sener, Honeywell, SAB Aerospace (IT/CZ), Steel Electronique, Ariane Group SAS, Beyond Gravity (SE/SW)




ESA entity code:
1000014356



Certifications

 Cleanroom Validation ISO 8

VALIDACE ČISTÝCH PROSTOR 	
WEISS TECHNIK Praha spol. s r.o., Náchodská 2562/224, 193 00 Praha 9	
Druh dokumentu:	VALIDAČNÍ PROTOKOL + ZPRÁVA
Číslo dokumentu:	P 2832-01/25 + Z 2832-01/25
Název zakázky:	ČISTÝ PROSTOR Zařízení č. 1
Místo validace:	S.A.B. Aerospace s.r.o. Podnikatelská 4, 612 00 Brno
Stupeň:	PROCESNÍ KVALIFIKACE
Datum:	Leden 2025

 System Management
AS9100D



Issue date: 18 February 2025 Original approval(s): AS9100 - 18 February 2025
Expiry date: 17 February 2029
Certificate identity number: 10749959

Certificate of Approval

This is to certify that the Management System of:

G.L. Electronic s.r.o.

Podnikatelská 2902/4, 612 00 Brno-Křídlovo Pole, Czech Republic

has been approved by LRQA to the following standards:

AS9100D (technically equivalent to EN 9100:2018, JISQ 9100:2016 and KS Q 9100:2018)

This certification has been performed in accordance with the requirements of EN 9104-001:2013

LRQA Limited is accredited under the IAQG ICOP scheme

Certification Structure – Multiple Site

Approval number(s): AS9100 – 00051082-001

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

The scope of this approval is applicable to:

Design and development of electronic devices, mechanical parts and cable harnesses. Manufacturing, testing and qualification of electronic devices and cable harnesses for space and industrial applications according to customer specifications.

Marta Escudero

Marta Escudero

Regional Director, Europe
Issued by: LRQA Limited



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Issued by LRQA Limited, 1 Trinity Park, Bickenhill Lane, Birmingham B37 7ES, United Kingdom

 Laboratory Accreditation
ČSN EN ISO 17025:2018

 	
EA MLA Signatory Český institut pro akreditaci, o.p.s. (Czech Accreditation Institute) Hájkova 2747/22, Žižkov, 130 00 Praha 3 issues	
according to section 16 of Act No. 22/1997 Coll., on technical requirements for products and on changes and amendments to some Acts, as amended	
<h2>CERTIFICATE OF ACCREDITATION</h2>	
No. 424/2025	
G.L. Electronic s.r.o. with registered office Hrádky 804, 768 11 Chropyně Company Registration No. 28280105 for the Testing Laboratory No. 1774 G.L. Electronic Testing Laboratory	
Scope of accreditation: Testing of crimped, soldered, and printed circuit connections to the extent as specified in the appendix to this Certificate.	
This Certificate of Accreditation is a proof of accreditation issued on the basis of assessment of fulfilment of the accreditation criteria in accordance with ČSN EN ISO/IEC 17025:2018	
In its activities performed within the scope and for the period of validity of this Certificate, the abovementioned Accredited Body is entitled to refer to this Certificate, provided that the accreditation is not suspended and the Accredited Body meets the specified accreditation requirements in accordance with the relevant regulations applicable to the activity of an accredited conformity assessment body.	
This Certificate of Accreditation replaces, to the full extent, Certificate No.: 423/2022 of 26/08/2022, and/or any administrative acts building upon it.	
The Certificate of Accreditation is valid until: 14/08/2030	
Prague: 14/08/2025	
	Signed in the Czech original: Zdeňka Dvořáková 14/08/2025 Jan Velišek Director of the Department of Testing and Calibration Laboratories Czech Accreditation Institute
This translation of the Czech original has been issued by: Eliška Pivoňová	

Certifications

Employees



- ECSS-Q-ST-70-61, CAT2 & CAT3
- ECSS-Q-ST-70-18, CAT2 & CAT3
- ECSS-Q-ST-70-26, CAT2 & CAT3
- ECSS-Q-ST-70-28, CAT2 & CAT3

Operators and quality inspectors



- IPC-A-610
- IPC/WHMA-A- 620
- IPC J-STD-001

Verification Processes



- SMD hand soldering of flight level PCB (6/2015)



- SMD hand soldering of flight level PCB (3/2018, 10/2019, 2020-2021)



Workplace – Brno

- **Cleanroom ISO 8, class 100 000**
Manufacturing, warehouse, integration, electrical testing
- Continuous measurement of temperature ($22\text{ °C} \pm 3\text{ °C}$) and humidity ($55\% \pm 15\%$)
- Periodic measurement of dust particles
- Overall size: 250 m²



Workplace – Brno

- **Accredited Testing Laboratory**

Testing of crimped, soldered, and printed circuit connections

ČSN EN ISO 17025:2018 standard

Scope of accredited testing:

- Metallographic Microsection Test
- Tensile Strength Test,
- Four-terminal Voltage Drop Test

- **ISO 8 Integration Hall**

- Handling crane up to 2000 kg for flight hardware and small spacecrafts
- First integration facility for satellites after ESA's audit in Czech Republic



Workplace – Chropyně

- **Production Area:**
 - Overall size: 579,29 m²
 - ESD validated floor
- **Cleanroom ISO 7/8:**
 - Overall size: 30 m² (6 m² for changing room)
 - Equipped with Thermal Vacuum Chamber (TVAC), S-Cube, 1000-R05 Streicher



Thermal Vacuum Chamber (TVAC) in Chropyně Site

S-Cube 1000-R05 Streicher

Provides an extensive environmental test system to simulate the outer space and varying thermal conditions.

Parameters:

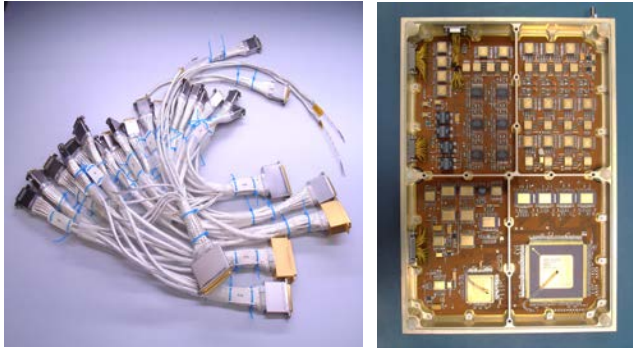
- Inside process area:
850 x 800 x 850 mm (W x H x L)
- Volume: 0.95 m³
- Operating temperature range: -80 °C to 180 °C
- Maximum operating pressure: 1000 mbar
- Maximum thermal system pressure: 1 barg

Capabilities:

- TQCM real-time monitoring
- PLC control and 6" HMI interface using Siemens



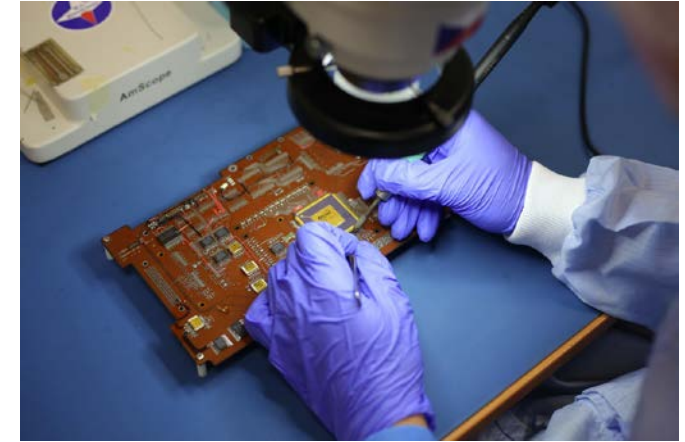
Our Core Activities



Harness & PCB Design & Manufacturing



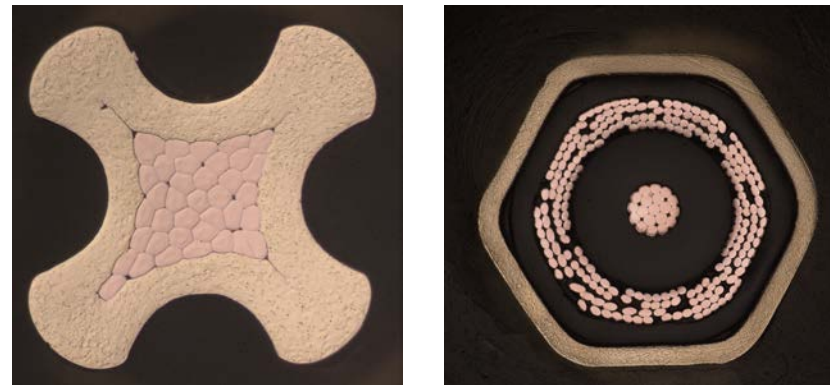
Certified Material Procurement & Full-Process Quality Control



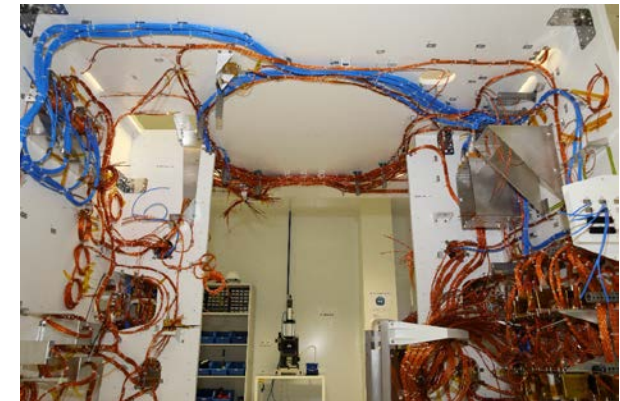
Hand Soldering (Through-hole, SMD) & Conformal Coating & Bonding



EGSE Test Boxes & Harness Production



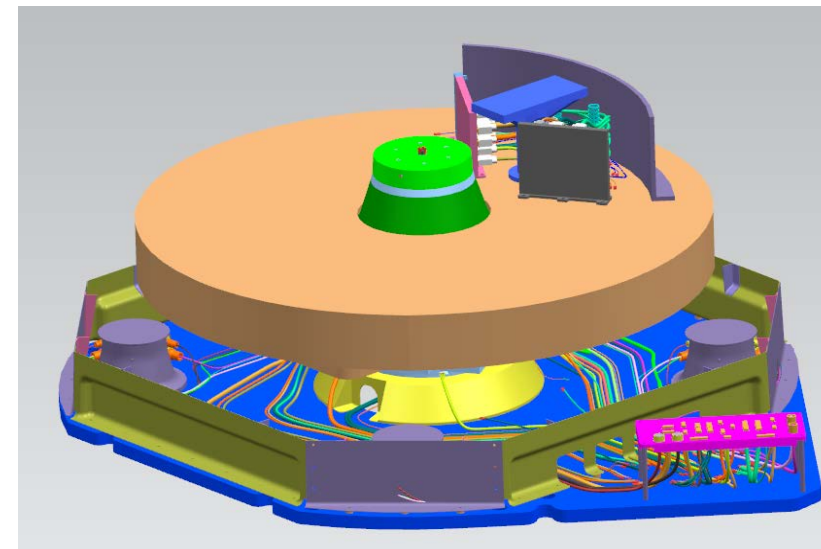
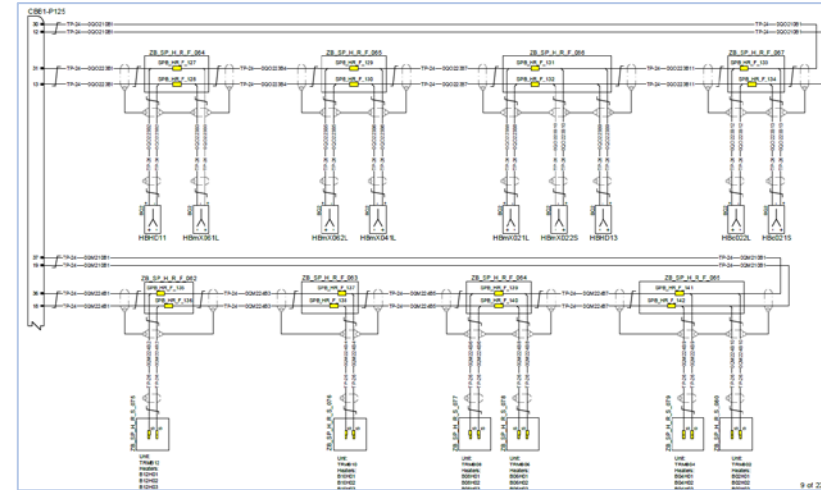
Electrical & Mechanical Testing of Harness and PCB



Harness Routing & Integration (Satellites, EGSE racks), Sensors Integration

Harness

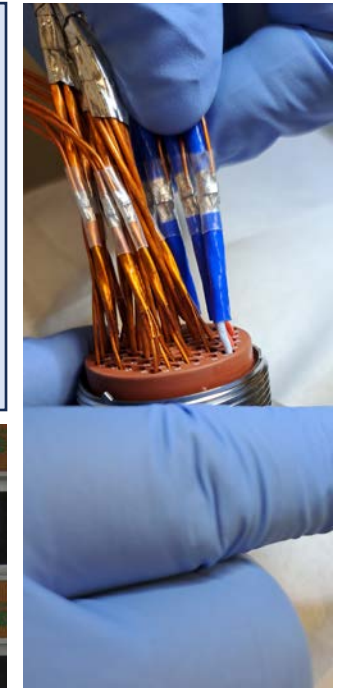
- Design
 - Harness:
 - Block diagrams
 - Wiring diagrams
 - Harness routing / 3D model
 - Mock-up and Trolley:
 - Technical drawing, 3D model
- Procurement
 - ESA qualified manufacturers and items
 - Certificates of Conformance (COC)



Harness

- Manufacturing
 - Harness
 - Mock-up 1:1 (3D printed / combination of standard and 3D printed), including units, boxes, interface, panel cut-out

Manufactured mock-ups



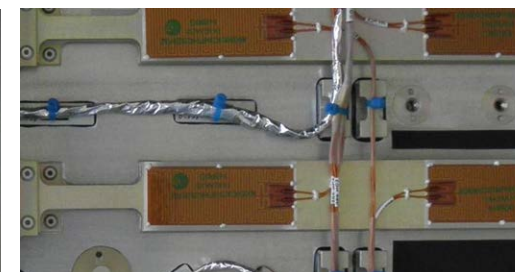
RF cable



Power cable



Cable with connector D-Sub for telecamera



Heaters assembly

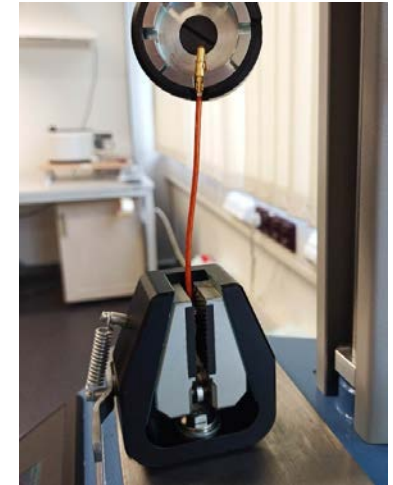
Circular connector

Harness

- Test

In compliance with ESA standards:

- Continuity Test: Double- and four-wire measurements
- Insulation, Short Circuit, Voltage Drop Tests
- Wire Tension Testing: Max. 2.5 kN
- Accredited Microsection Analysis of Crimped Joints, Failure Analysis
- Climatic Chamber: +5 °C above ambient up to 250/300 °C, 111 l volume
- Vibration Testing: Available via partner company
- High-Frequency Testing of RF Harnesses



G.L.Electronic Wire Intrinsic Tensile Strength Report

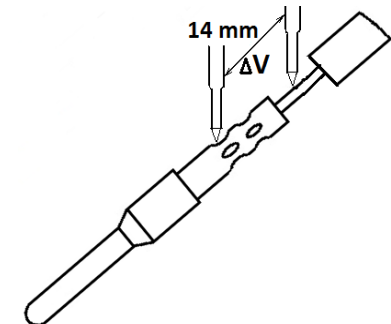
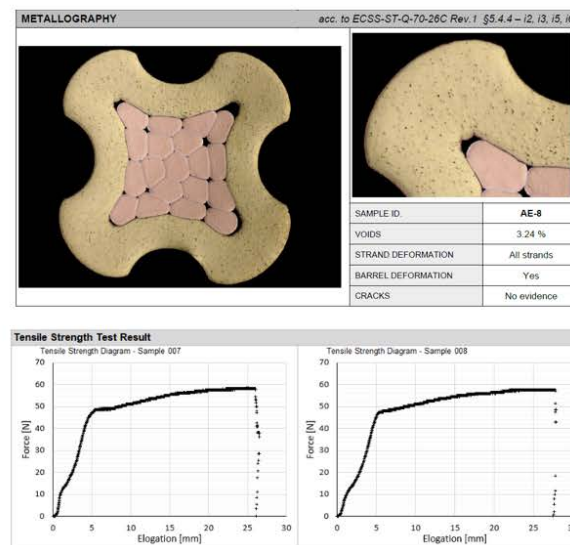
Doc. No. NIA/OLE-LAB-ITSR-ISA Issue: 01
Date: 18.10.2023 Page: 1 of 2

CRIMPING TOOLS QUALIFICATION			
Wire Intrinsic Tensile Strength Report			
ORDER IDENTIFICATION			
Order Number	N/A		
Customer	G.L. Electronic s.r.o., Hrádky 804, 788 11 Chvojná, Czech Republic		
Location of Tests	G.L. Electronic s.r.o. Testing Laboratory, Podvratecká 2962/4, 612 00 Brno, Czech Republic		
Project	N/A		
Items Incoming Date	17.10.2023		
ITEMS IDENTIFICATION			
Received Items	10 Tensile Strength Samples		
Wire Manufacturer	N/A		
Wire Manufacturer Part Number	N/A		
Wire Type	TP, TP		
Wire Composition	2 x 18 AWG		
Wire Description	2 stranded Silver Plated Copper conductors, and Polytetrafluoroethylene (PTFE) insulation. This cable has a maximum temperature of 200°C and is rated at 600V.		
NOTES			
Visual inspection			
RESULTS SUMMARY	NOTES		
Visual inspection	N/A		
DOCUMENT PREPARED BY			
Name (Function)	Date and Signature	APPROVED BY Name (Function) Date, Signature and Stamp	AUTHORIZED BY Name (Function) Date and Signature
N/A (Head of Testing)	18.10.2023	N/A (Quality Manager)	N/A (Director)
N/A (Test Operator)	18.10.2023		
CHANGE RECORD			
Issue	Date	Change Authority	Reason for Change and Affected Section
01	18.10.2023		Original Document
APPLIED PROCEDURES & REFERENCE STANDARDS			
Document ID	Issue/Revision	Description	
ECSS-Q-ST-70-26C	1.0	Crimping of High-Reliability Electrical Connections	
TSTP-36-OLE	1.0	Tensile Strength Test Procedure	

G.L.Electronic Wire Intrinsic Tensile Strength Report

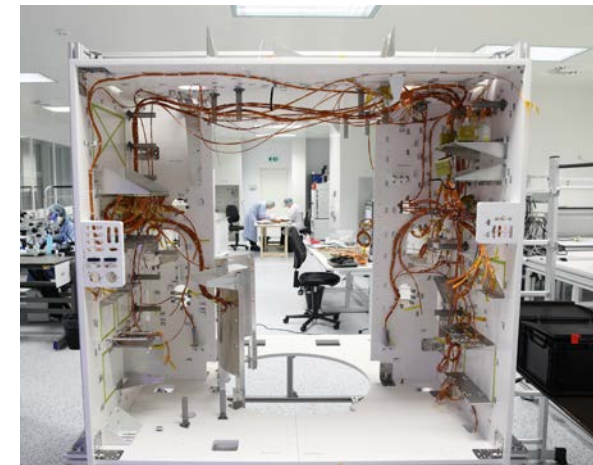
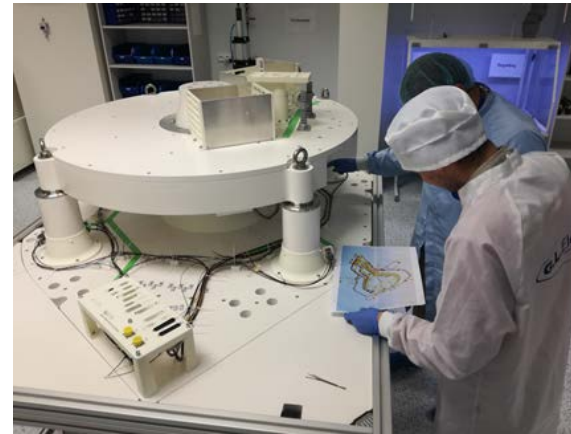
Doc. No. NIA/OLE-LAB-ITSR-ISA Issue: 01
Date: 18.10.2023 Page: 2 of 2

TECHNICAL DATA		
Length [mm]	200.00	
End Treatment	Curled wire tags, both ends.	
ENVIRONMENTAL REQUIREMENTS		
Reference Standard	ECSS-Q-ST-70-26C-Rev.11 (RM:2017) - (Supersedes: 1, June 2017)	
Temperature [°C]	21 ± 3	
Relative Humidity [%]	55 ± 10	
ENVIRONMENTAL CONDITIONS		
Temperature [°C]	N/A	
Relative Humidity [%]	N/A	
Atmospheric Pressure [kPa]	N/A	
TEST EQUIPMENT REQUIREMENTS		
Visual Inspection	Magnification = 7 to >40	
Tensile Test	Tensile testing machine conforming to ISO 7500 class 1 or better. Axial load applied at a rate of 20 ± 50 newtons/s 2 minutes.	
TEST EQUIPMENT		
GLE ID Number	Description	Calibration Valid Until
GLE MS02	Microscope Px 170 - 38MP Kamera, HCMT	N/A
GLE MFC1	Mechanical force tester Microtrain 2.2-3F	N/A
GLE MFC2	Force meter AF G 2500N	13.03.2024
*The measuring device is subject to regular calibration according to the CIPAC-02-OLE and CIPAC-03-OLE internal documents.		
TEST RESULTS		
Visual inspection according to ECSS-Q-ST-70-26C from § 2.4 to § 2.7		
Name (Function)	Date, Signature and Stamp	Result Summary
N/A (Quality Control)	18.10.2023	NA
Tensile Strength Test according to ECSS-Q-ST-70-26C § 4.3.5		
Test Item ID	Tensile Strength [N]	
001	NA	
002	NA	
003	NA	
004	NA	
005	NA	
006	NA	
007	NA	
008	NA	
009	NA	
010	NA	
AVERAGE MAX. FORCE [N]		
NA		



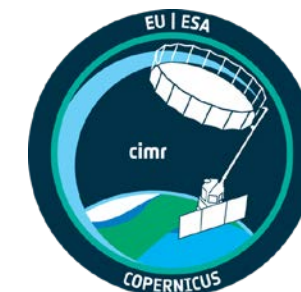
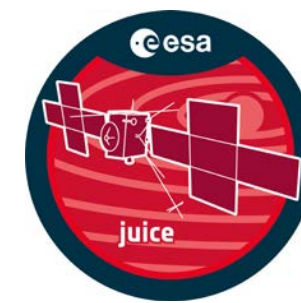
Harness

- **Integration**
 - Integration of harness on mock-up
 - Integration of harness and sensors on satellite units
 - Integration of harness into EGSE racks
- **Complete Technical Documentation**



Project Heritage: Harness

- CIMR (Thales Alenia Space and vH&S) – ongoing
- ROSE-L (Airbus Defence and Space) – ongoing
- RAMSES (Beyond Gravity) – ongoing
- COMPASSO (Airbus Defence and Space) – ongoing
- SERANIS (Luxspace) – ongoing
- ENVISION (TRL Space) – ongoing
- ARIEL (Airbus Defence and Space)
- TRITON-X (OHB LuxSpace)
- JUICE MGMA (Sener)
- MetOp SG MWI (OHB-I)
- HERA (OHB-I)
- NAOS (OHB-I)
- EDRS-C (OHB – Bremen)
- AIS RX Rebuild and Vessel Sat 1&2 (LuxSpace)
- LARES (OHB-I)
- ASIM (OHB-I)
- GALILEO – Fuse Box (OHB-I)



Project Heritage: Harness



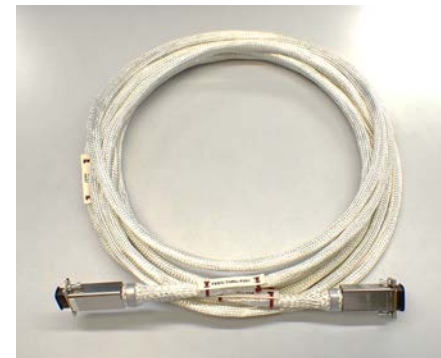
HERA (2022-2023)

- Manufacturing cable harnesses of the first part of the test campaign in Brno (Czech Republic)
- Cable harness assembly
- Testing of harnesses
- Integration of harnesses on a mock-up (1:1) of the satellite part



ARIEL (2023-2025)

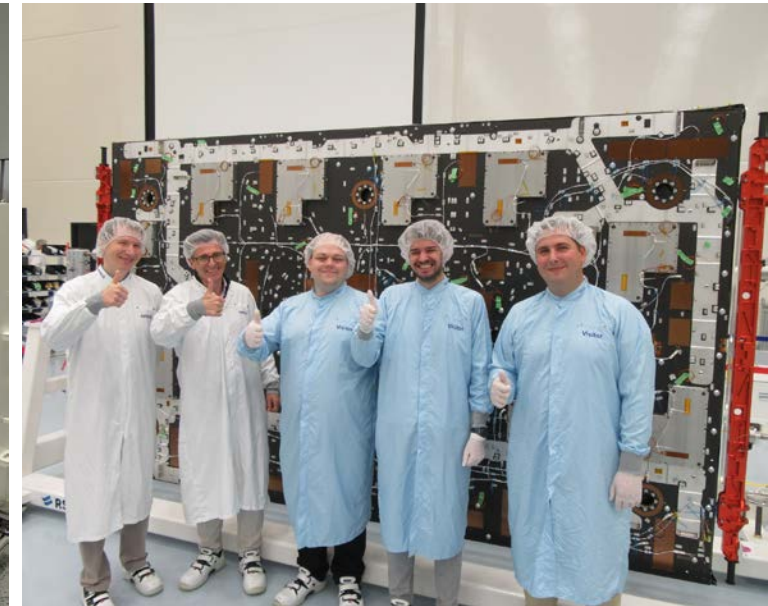
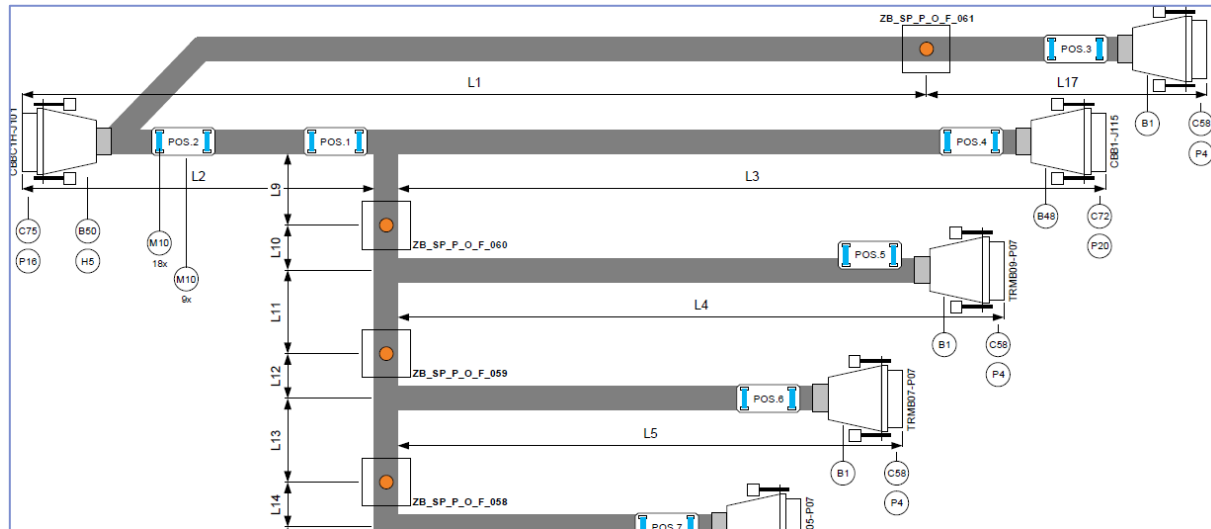
- Co-engineering, procurement, manufacturing, electrical testing, cleaning including bake-out, delivery of 185 Payload Test Harness bundles



Project Heritage: ROSE-L Antenna Harness

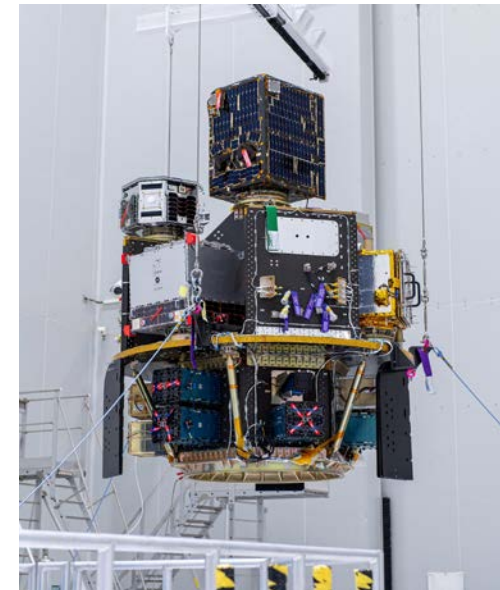
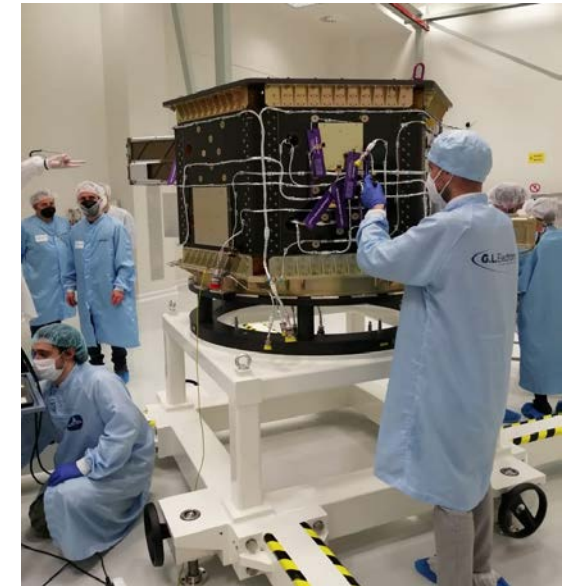
ROSE-L (Airbus Defence and Space) - ongoing

- Co-engineering, electrical and mechanical design, procurement, manufacturing, testing and integration of DC Harness:
 - 3,4 km of wire
 - 2400 stand-offs and tie bases
 - 560 connectors
 - 5 mock-ups



Project Heritage: Harness

- **Flight VV18 Vega Dispenser SSMS HEX Kourou (FG), March 2021**
 - Manufacturing in Brno (Czech Republic)
 - 2020-2021
 - Sensors assembly
 - Harness assembly and final integration of cables to the dispenser on the top of the VEGA rocket
- **Flight VV16 Vega Dispenser SSMS POC Kourou (FG), January 2020**
 - Final integration of cables to the dispenser on the top of the VEGA rocket
 - Final integration of deployers in Kourou



Project Heritage: Harness Final Integration

- Final Integration, VV02 - PROBA V (ESA, ASI, SAB Aerospace) Kourou (FG), 3/2013
- Final Integration, VV01 - LARES Satellite (ESA, ASI, CGS) Kourou (FG), 1/2012



Project Heritage: Ground Segment – Kourou (FG)

- **MANGOUSTA – Security camera system**

Activities:

- electrical assembly and final installation of
- camera system with IR sensors
- integration of A/V systems

- **Launching pads VEGA, SOYUZ**

Activities:

- electrical installations and assembly of
- switchboards (monitoring boxes)
- integration of A/V and telephone systems
- safety signalization (gas leak)
- installation of sensors
- installation of optical cables

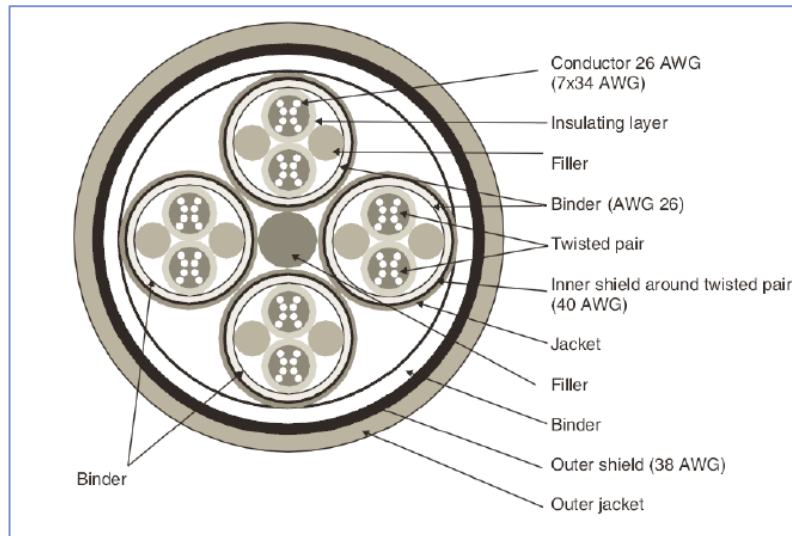


Research & Development: SpaceWire

SpaceWire (GLE activity under auspices of ESA) - ongoing

- SpaceWire links are full-duplex, point-to-point, serial data communication links designed for use in Space.
- General parameters:
 - operating temperature : -200 °C / +180 °C
 - impedance (between wires) : 100 Ω +/- 6 Ω at 400 MHz

Round Cable, Variant 02



Source: 3902-003_i4_ESCC_Cable, Spacewire, Round, quad using Symmetric Cables, Flexible, -200 to +180 °C

Micro-D Connector (9-Pin)



Contact number	Signal name
1	Din+
2	Sin+
3	Inner shield
4	Sout-
5	Dout-
6	Din-
7	Sin-
8	Sout+
9	Dout+

Source: 3401-029_i20_ESCC_Connectors Electrical Rectangular Microminiature based on type MDM



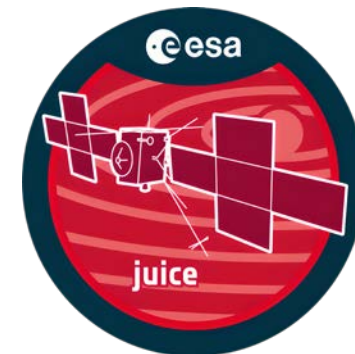
SpaceWire Cable Assembly



Source: https://www.axon-cable.com/en/04_markets/09_space/00/index.aspx

Project Heritage: Electronic Equipment

- K7 (SITAEL) – ongoing
- ARIEL (OHB) – ongoing
- FORUM (OHB) – ongoing
- ASTROMOWE (ČVUT) – ongoing
- ISS T-SHIRT (Masaryk University) – ongoing
- EAGLE BATTERY (SAB Aerospace) – ongoing
- COMET INTERCEPTOR – LEES, DAPU (AV, UK) – ongoing
- CHIME (SITAEL) – ongoing
- PLATINO IRIDE (SITAEL) – ongoing
- PLATINO BATTERY (SAB Aerospace) – ongoing
- ATHENA RAS DAPU (AV UFA)
- SOLAR ORBITER – SWA, TDS, RPW, STIX (UK-MMF, AV-UFA, ASU-CNES)
- JUICE: LF Board – BB/EM/FM (AV-UFA)
- MetOp SG – MWI: CPDU – EQM (OHB-I)
- ISS PRESSO, FM (ASI, Argotec)



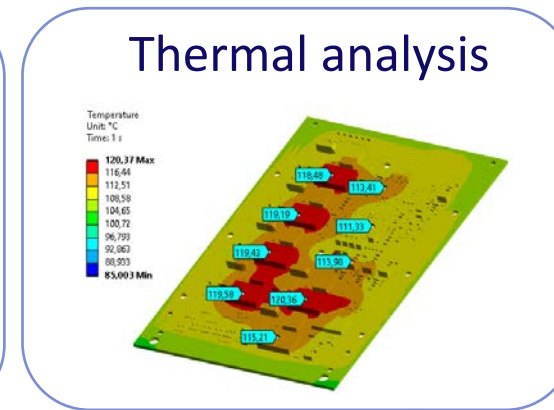
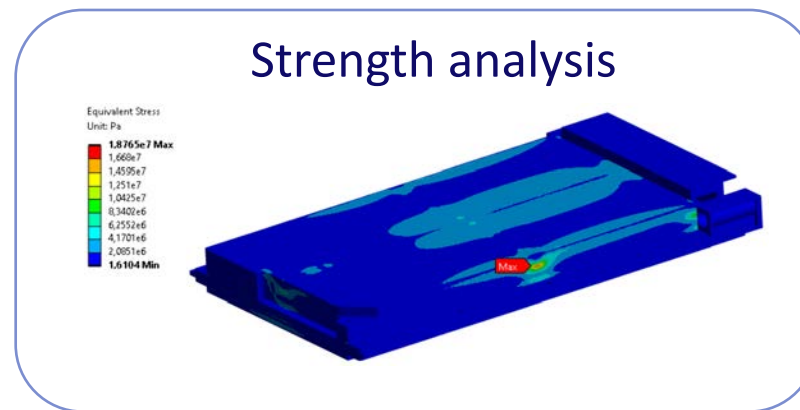
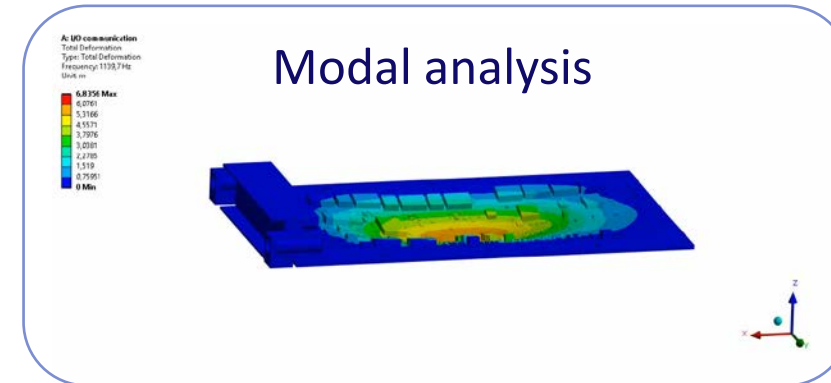
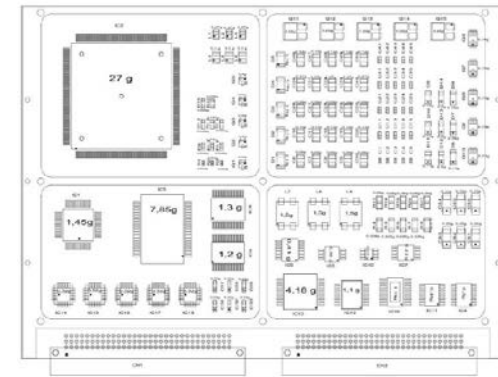
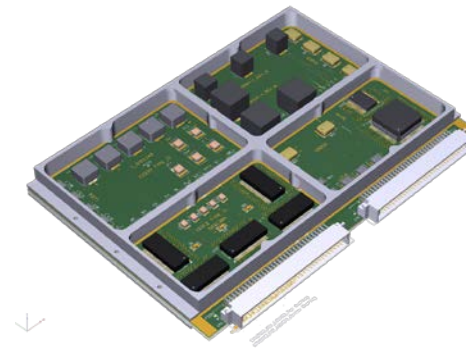
Printed Circuit Boards

- **Design**

Including finite element method (FEM) analyses in ANSYS 2023 R2 software:

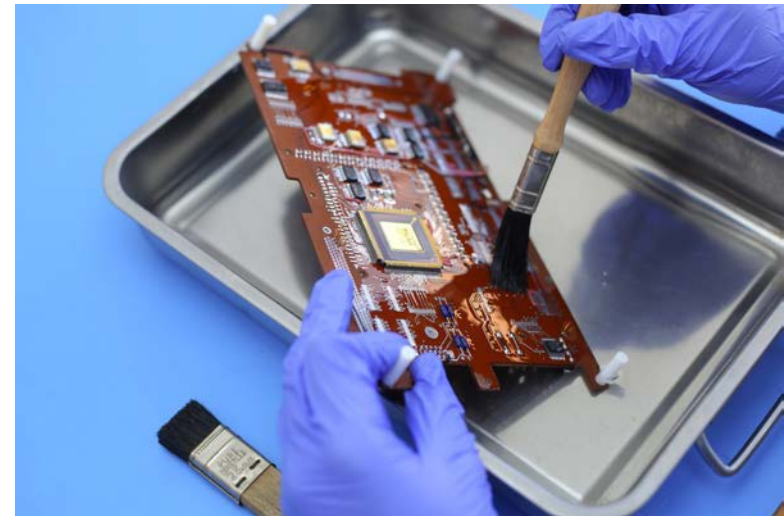
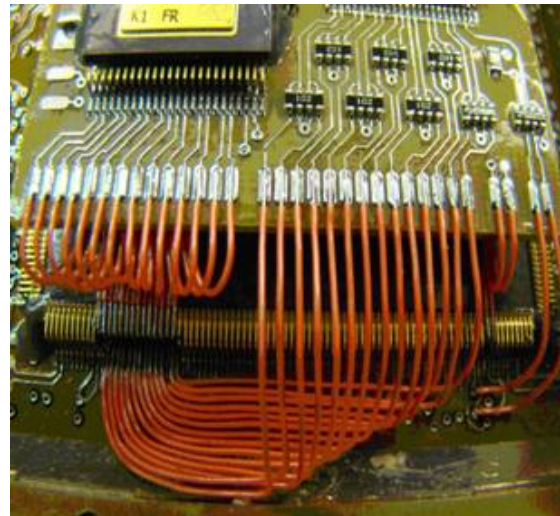
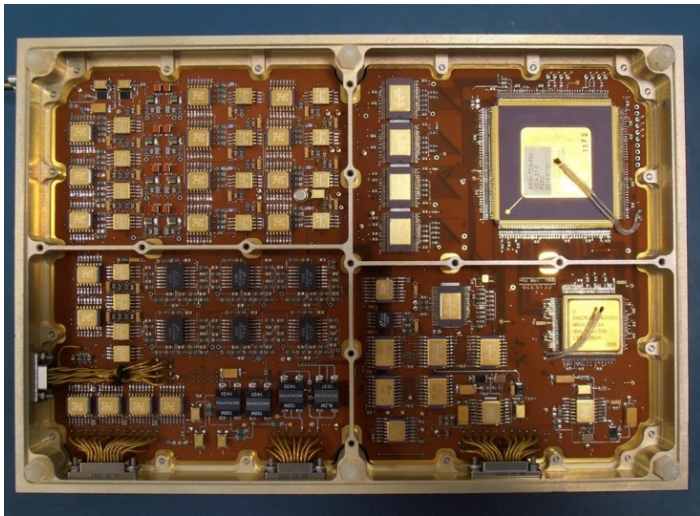
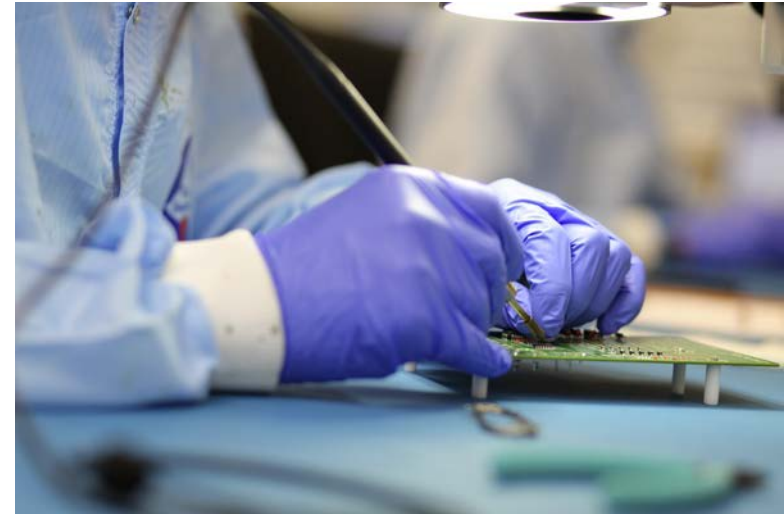
- strength and fatigue,
- thermal,
- computational fluid, dynamics (CFD),
- dynamic:
 - modal,
 - harmonic vibration,
 - random vibration.

- **Component footprint database management**
- **Component package and process qualifications according to ESA**
- **Procurement**



Printed Circuit Boards

- **Assembly**
 - Hand soldering of SMD and through hole components
 - Bonding & conformal coating



Printed Circuit Boards

- **Test**

In compliance with ESA standards:

- Electrical Test
- Endoscopic Inspection: HD resolution
- Microsection and Failure Analysis
- Final Inspection of Electronic Systems
- Vacuum Chamber: 0.15 mbar, heating up to +200 °C
- Thermal Cycling in Climatic Chamber: -70 °C to +180 °C, 150 l volume
- Vibration Testing and X-ray Inspection of Voids:
Available via partner company

- **Complete Technical Documentation**

Manufacturing Dossier, Bill of Material,

Electrical Test Procedures...



Endoscopic Inspection
Flexivision 100



Vacuum
chamber
Labimex
VD115



Climatic
chamber
Ecocell 111



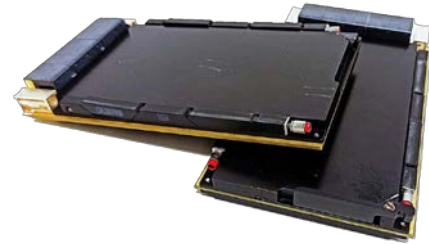
Climatic
chamber
LabEvent C

Project Heritage: Electronic Equipment

FLPP VPX Cards & SALTO - ongoing

Electronic & mechanical design with computational modelling and simulation, manufacturing and testing of 3 types of VPX cards in accordance with ANSI/VITA standards :

- I/O communication,
- RTD sensor acquisition,
- pressure sensor acquisition



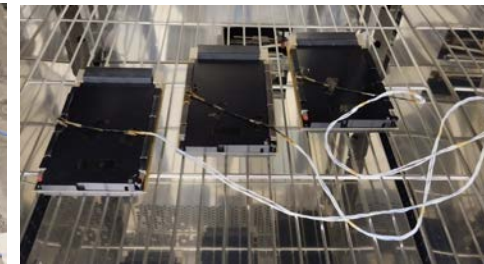
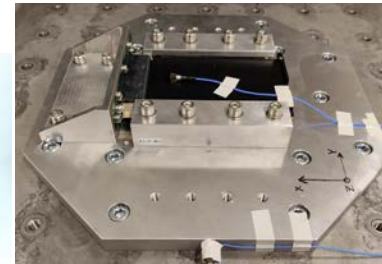
High performance and durability:

- Operating temperature $-40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$
- Storage temperature $-55\text{ }^{\circ}\text{C}$ to $105\text{ }^{\circ}\text{C}$
- Humidity: 0 to 95 %
- Low pressure: up to 50 000 ft
- Random vibration: $0,1\text{ g}^2/\text{Hz}$, 15 Hz – 2 kHz
- Shock: 40 g peak, half-sine, 11 ms



Development Status:

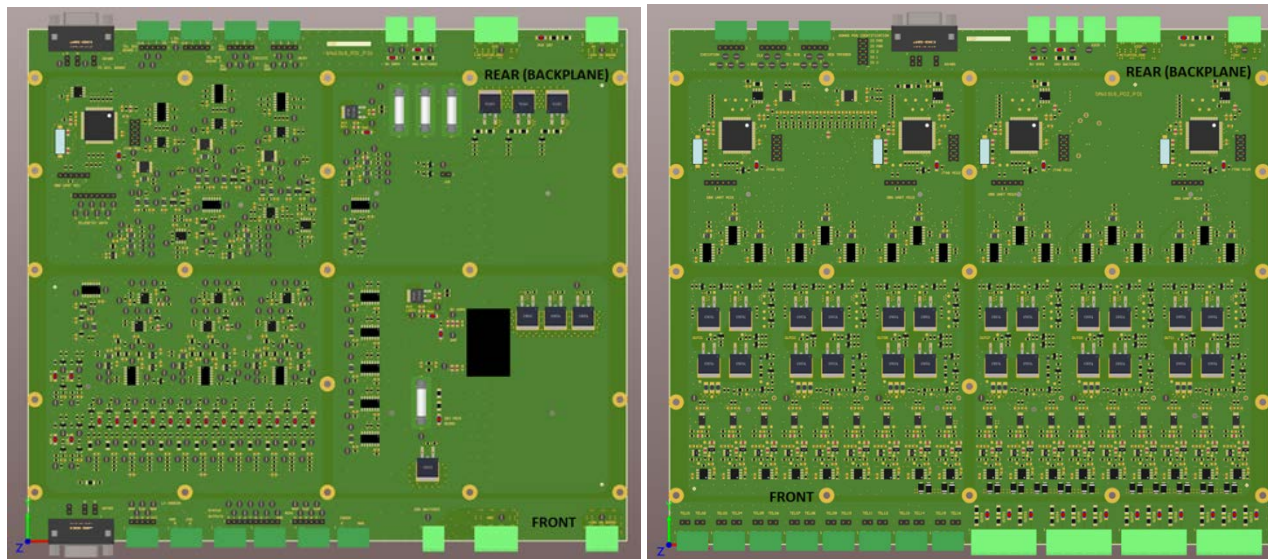
Successful completion of environmental testing of all 3 types of VPX cards



Project Heritage: Electronic Equipment

A6 Sequencer (ArianeGroup, SAB Aerospace)

- Design of electronics and manufacturing preparation of a new device – A6 MLS Sequencer
- First functional model („Breadboard“) which consists of 3 PCBs (1x main board, 2x output board) was successfully assembled
- The project has been stopped and is now being updated



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