



Development of a Synchronized Deployment Solar Array Wing for SmallSats

Ismael Sanchez

Director of Product Development

i.sanchez@dhvtechnology.com

PRESENTATION

CONTENTS

1. WHO WE ARE

2. SOLAR ARRAY WING

- Clockspring driven hinges
- Flexprints
- Deployment Synchronization Mechanism
- Damper

3. ENVIRONMENTAL TEST CAMPAIGN

- Articulation Thermal Test
- TVAC
- Vibration

4. CONCLUSIONS



WHO WE ARE



DHV Technology is a Spain-based international company that **designs and manufactures solar panels and other power subsystems for space applications.**

DHV Technology supplies solar panels and fully customized solutions for the main international companies in the space sector.

Our facilities, with a total of **3700 m²**, consist of:

- + 1200 m² clean room
- + 1000 m² offices
- + 1500 m² warehouse and others



HERITAGE

350+

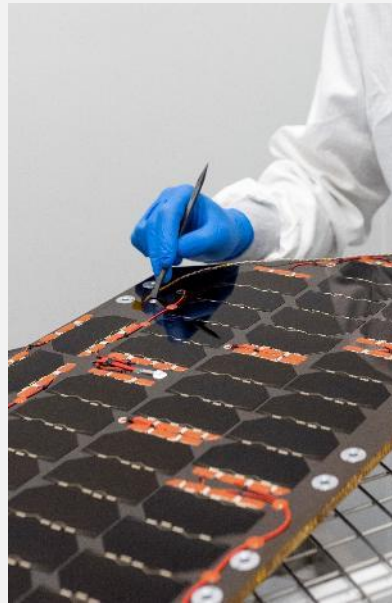
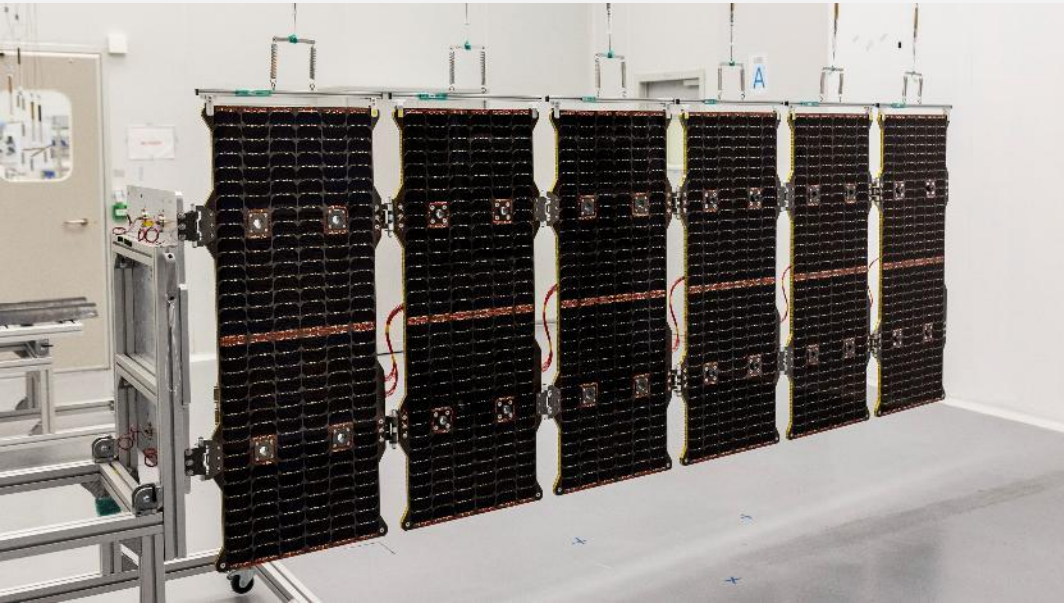
PROJECTS
CARRIED OUT

3000+

ACCUMULATED
DAYS IN ORBIT

330+

SATELLITES FLYING
WITH OUR SOLUTIONS



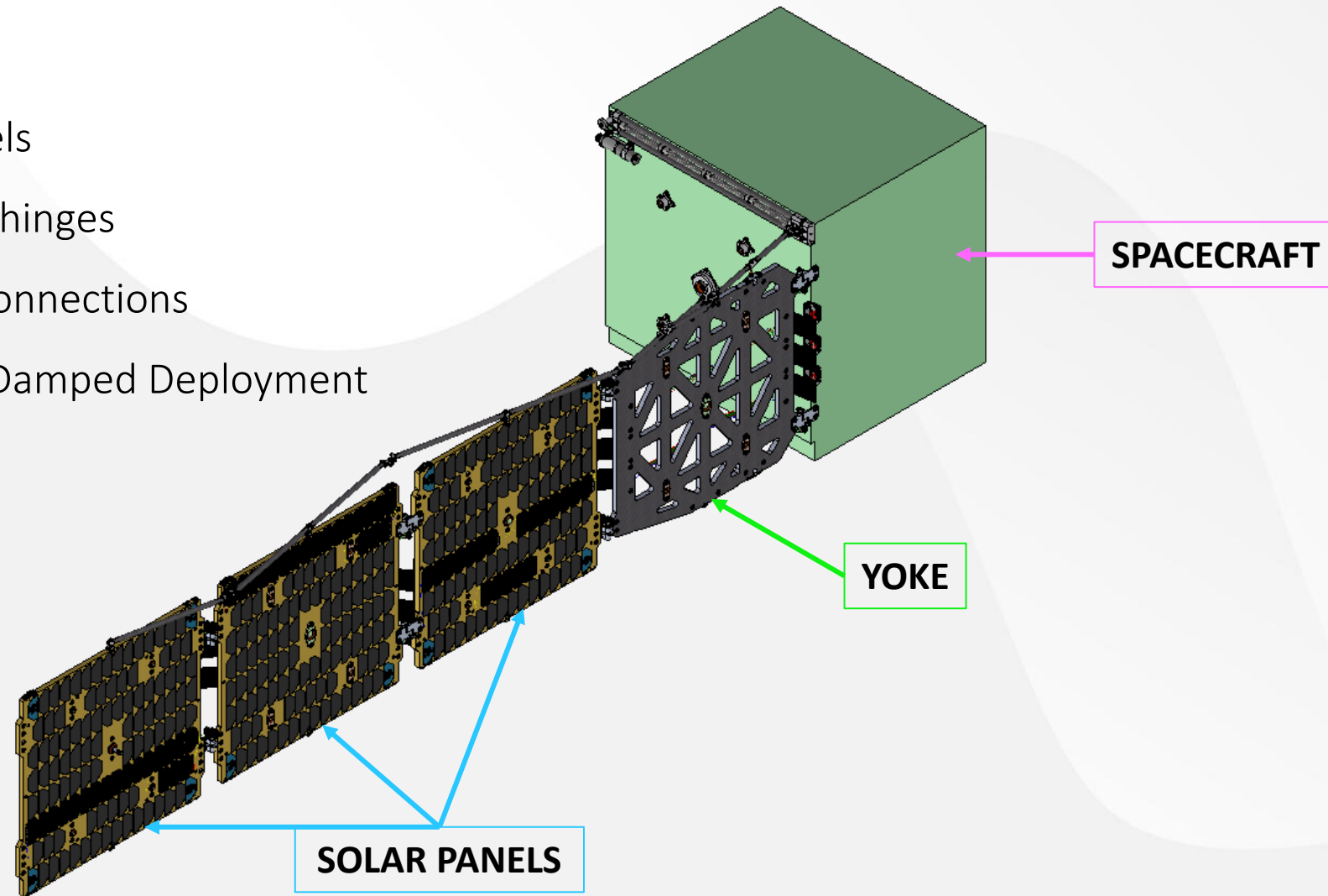
Pre-Development Context

- Larger solar array wings demand for the SmallSats market
- Hinge motorization adjustment required during integration
- Electrical wire bundles become stiffer
- Confirmation of full deployment in flight by signals
- Controlled and synchronized deployment required

SYNCHRONIZED DEPLOYABLE SOLAR ARRAY WING (SAW)

Features:

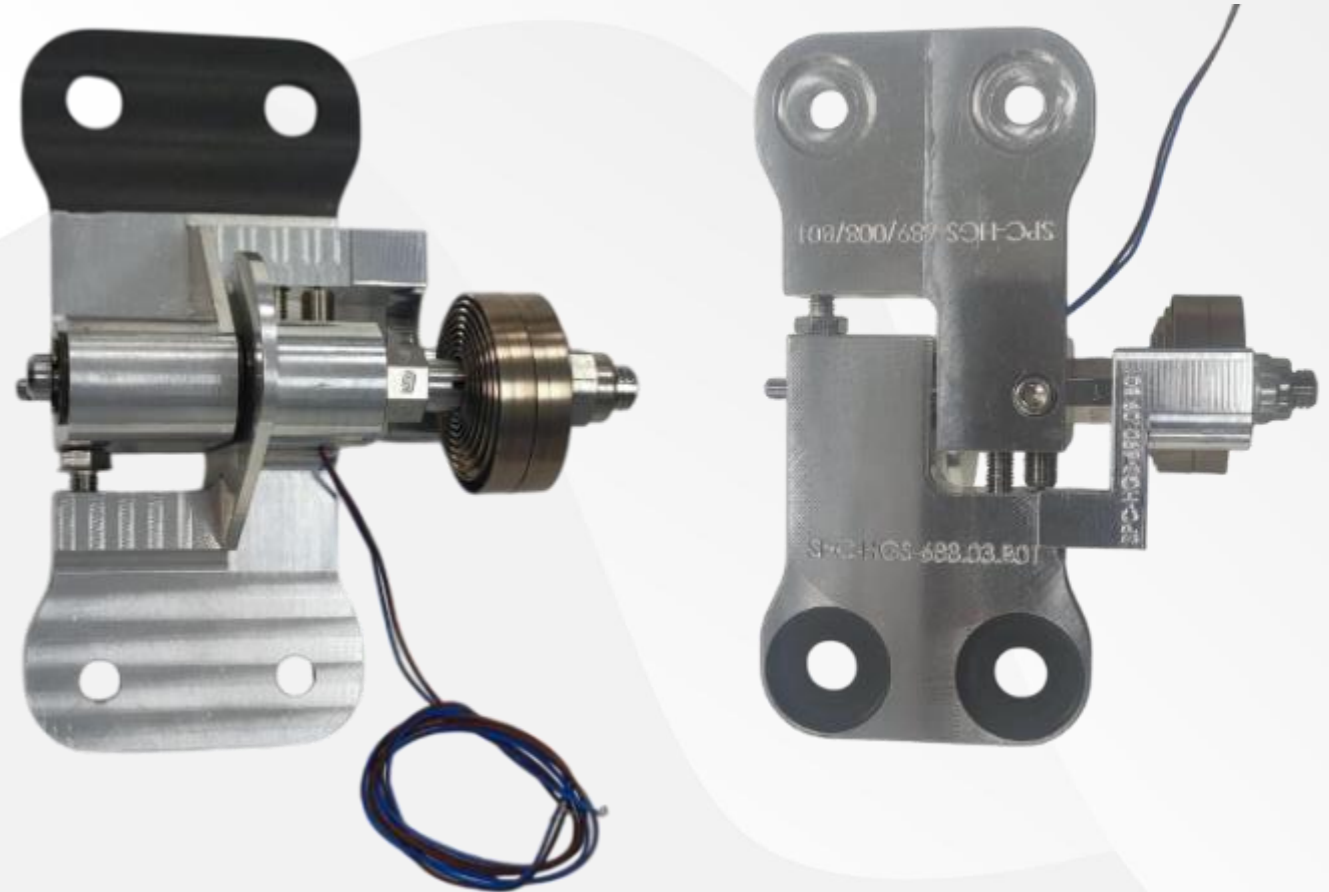
- Yoke + 3 Solar Panels
- Clockspring driven hinges
- Flexible PCB interconnections
- Synchronized and Damped Deployment



SAW CLOCKSPRING DRIVEN HINGE

Features:

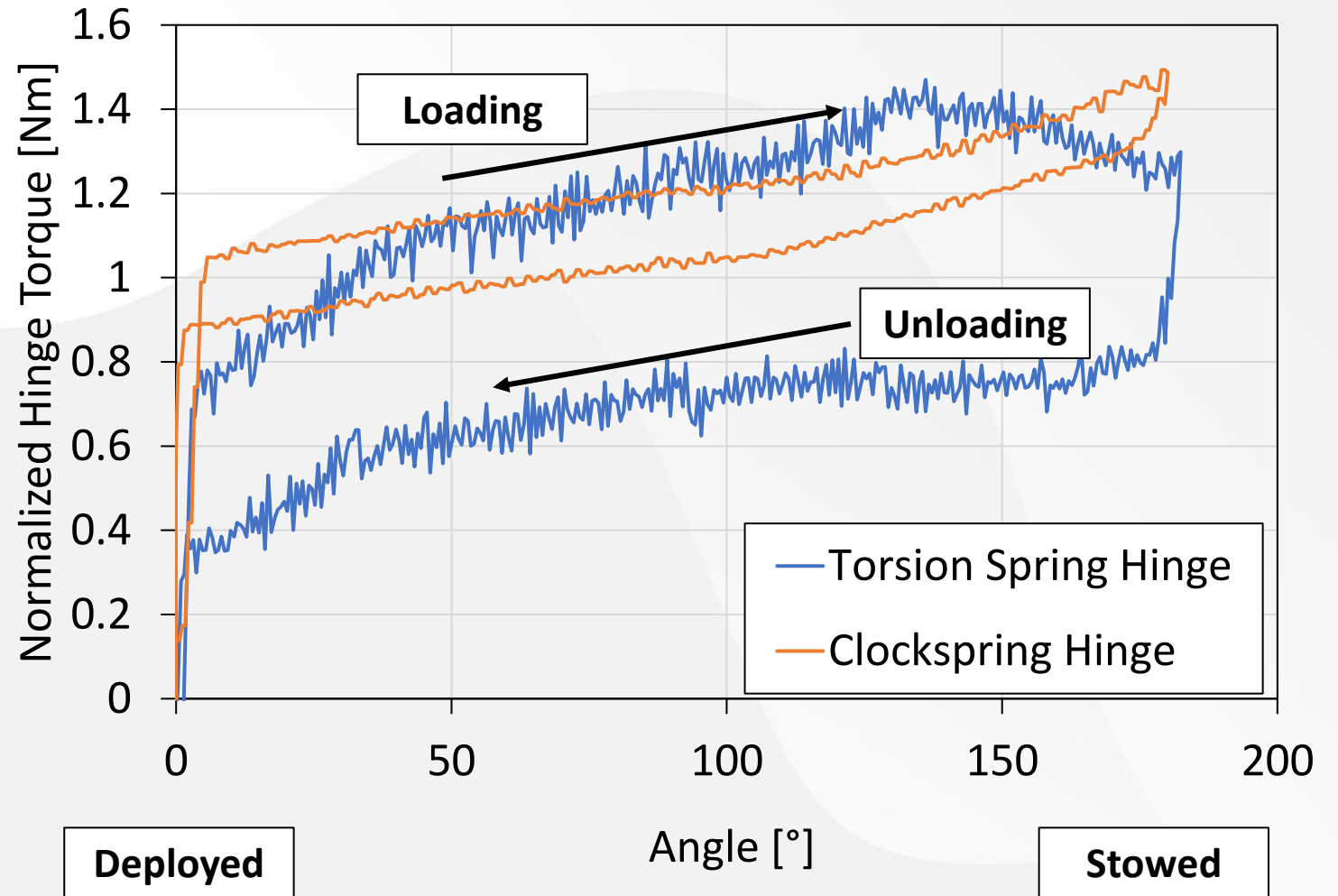
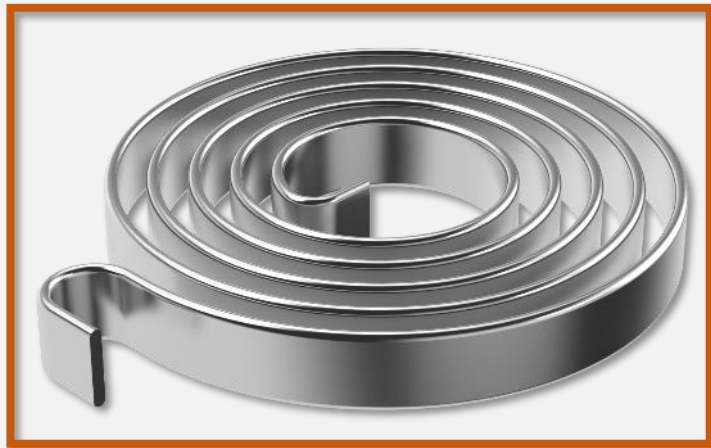
- Clocksprings → Adjustable torque
- Latching pin
- Adjustable stoppers → Reduce backlash
- Electrical insulation
- Deployment sensor



SAW CLOCKSPRING DRIVEN HINGE

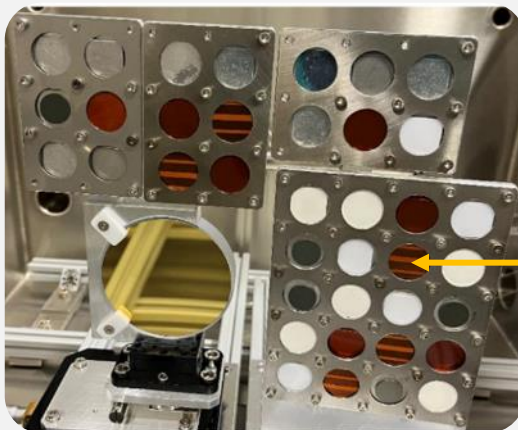


VS



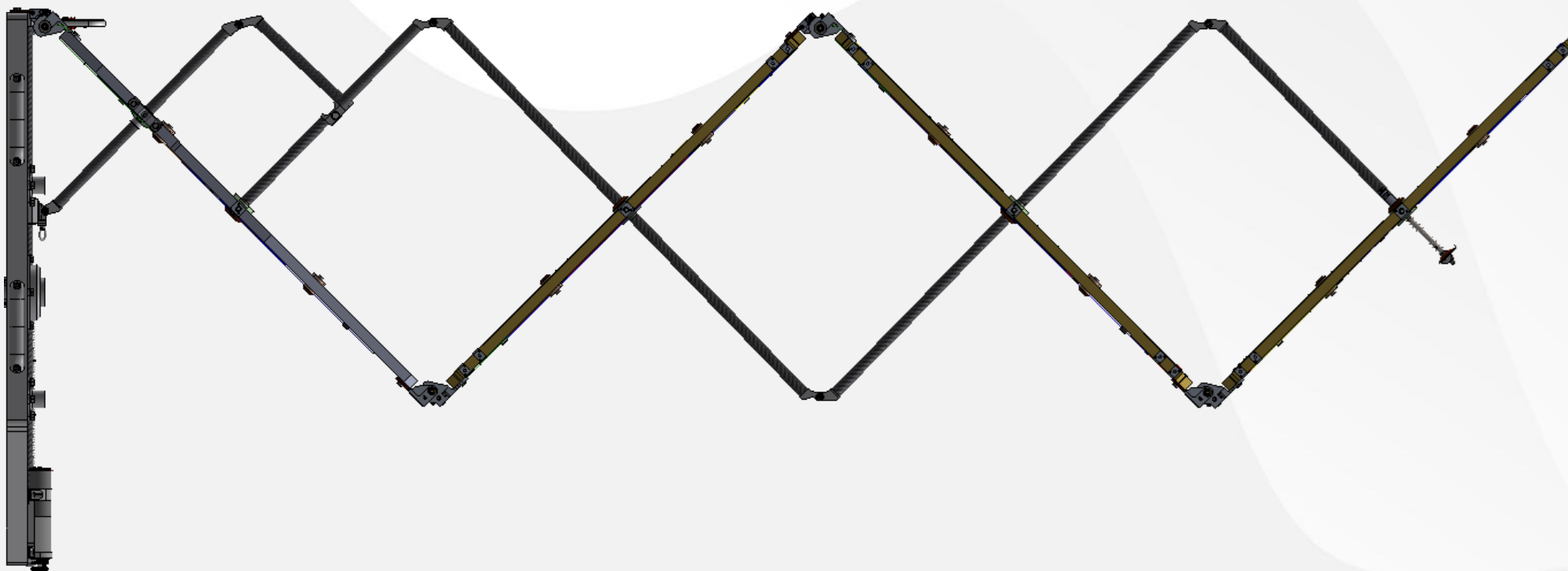
Features:

- <10 mm vending radius
- 15 tracks
- Insulation > 100MΩ at 500V
- 3,2 A per track
- ATOX protection layer: Tested at ESA ESTEC

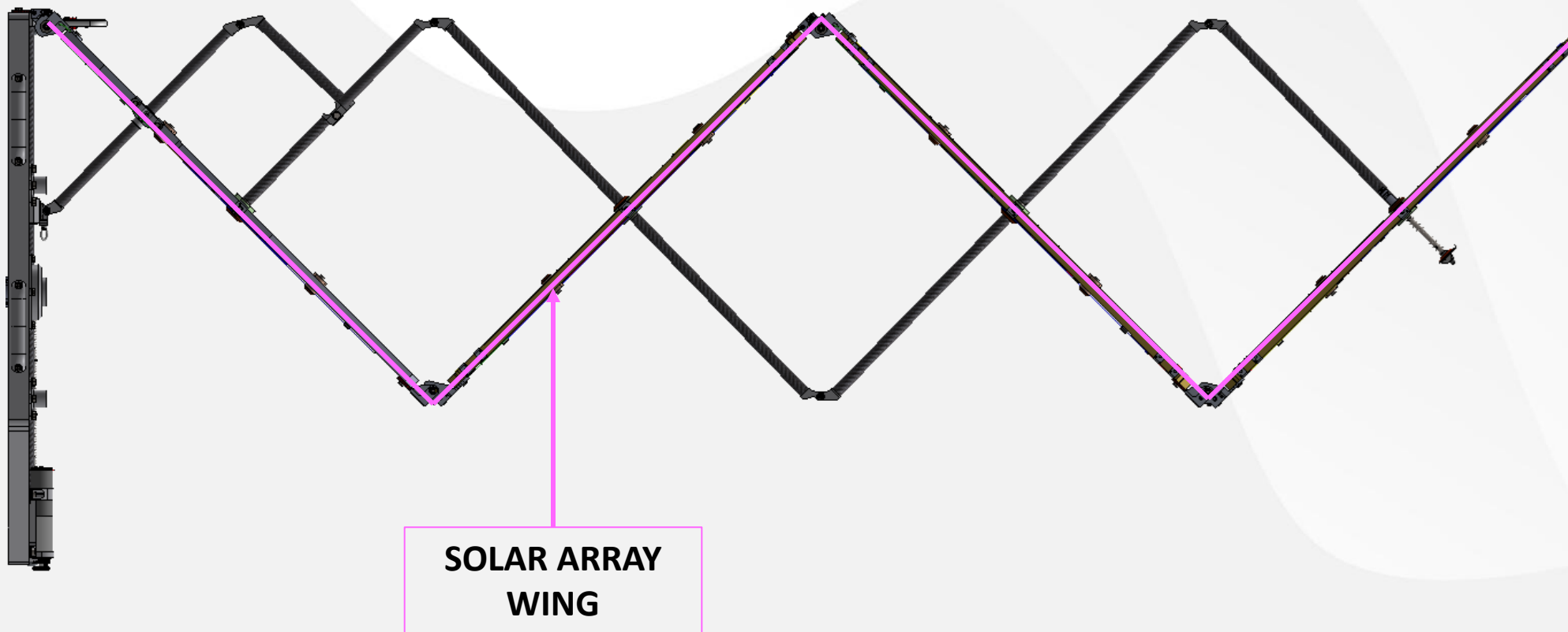


FLEXPRIINT SAMPLES

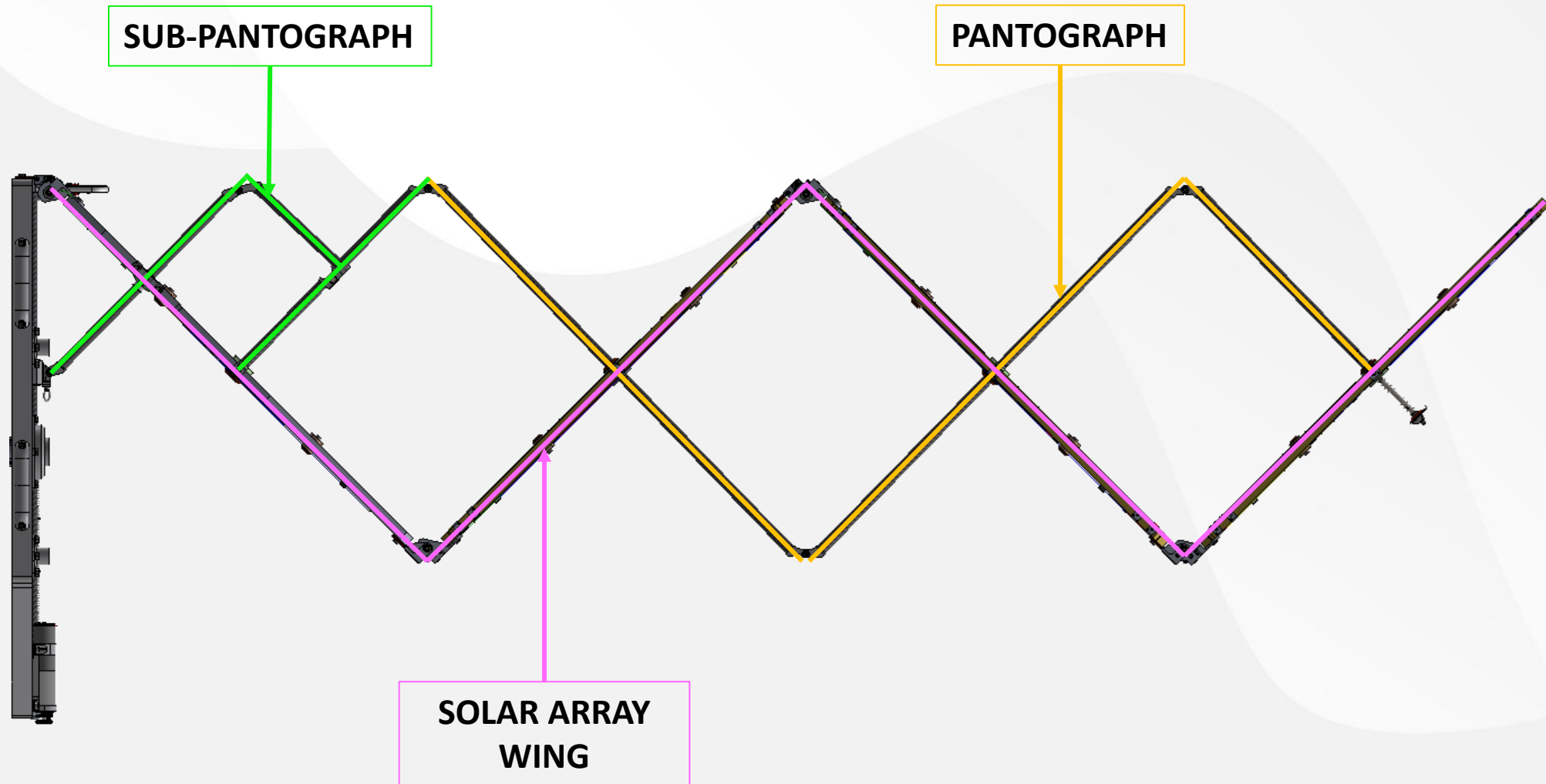
SAW DEPLOYMENT SYNCHRONIZATION MECHANISM



SAW DEPLOYMENT SYNCHRONIZATION MECHANISM



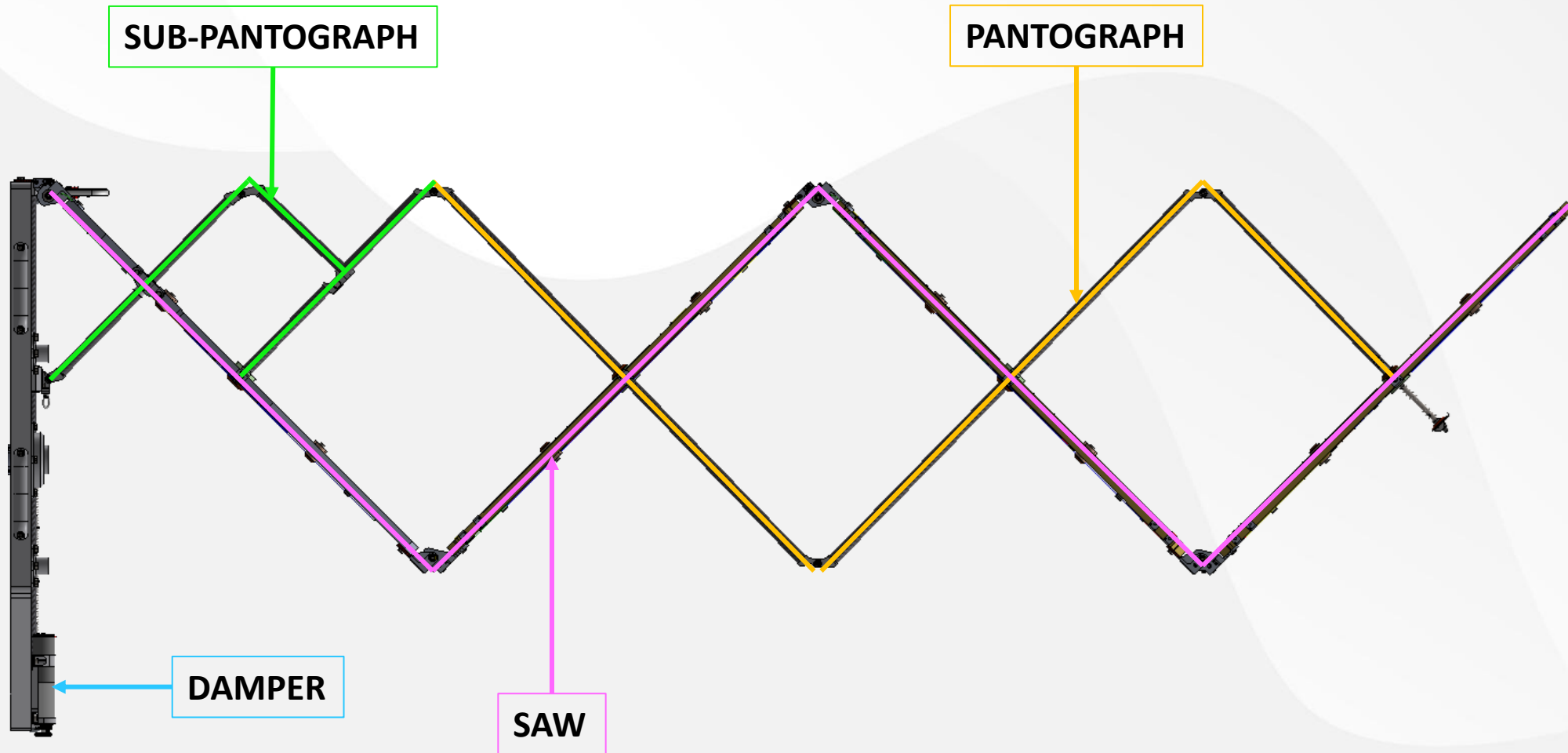
SAW DEPLOYMENT SYNCHRONIZATION MECHANISM



SAW DEPLOYMENT SYNCHRONIZATION MECHANISM

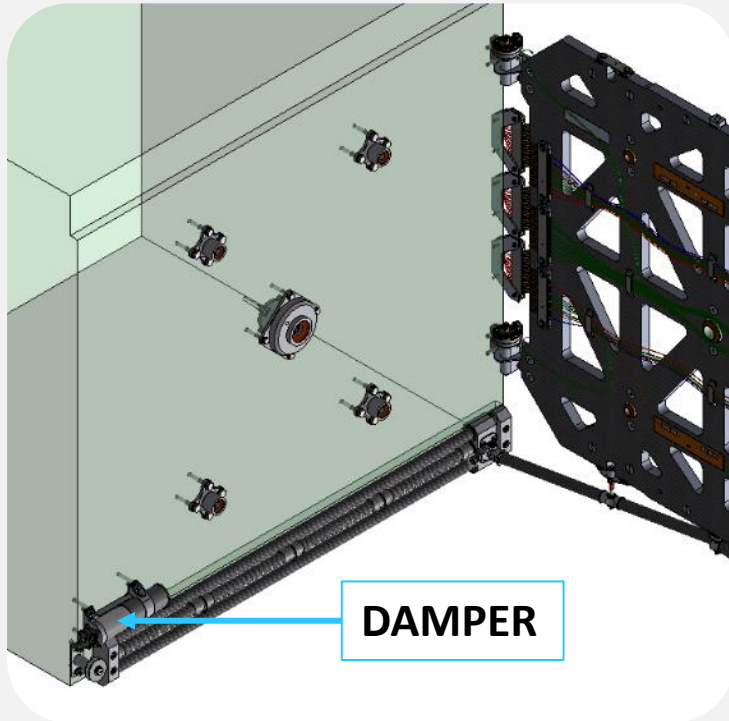
Deployment → Clocksprings driven hinges + Flexprints + Deployment Synchronization Mechanism





Features:

- Eddy current damper
- Adjustable damping factor



W/O DAMPER:



WITH DAMPER:



ENVIRONMENTAL TEST CAMPAIGN

ARTICULATION THERMAL TEST

Hinge configurations:

- Hinge
- Hinge + Latching pin
- Hinge + Sensor
- Hinge + Flexprint

SENSOR

(Room Temp.)



FLEXPRINT

(Room Temp.)



LATCHING PIN

(Hot Temp.)



HINGE

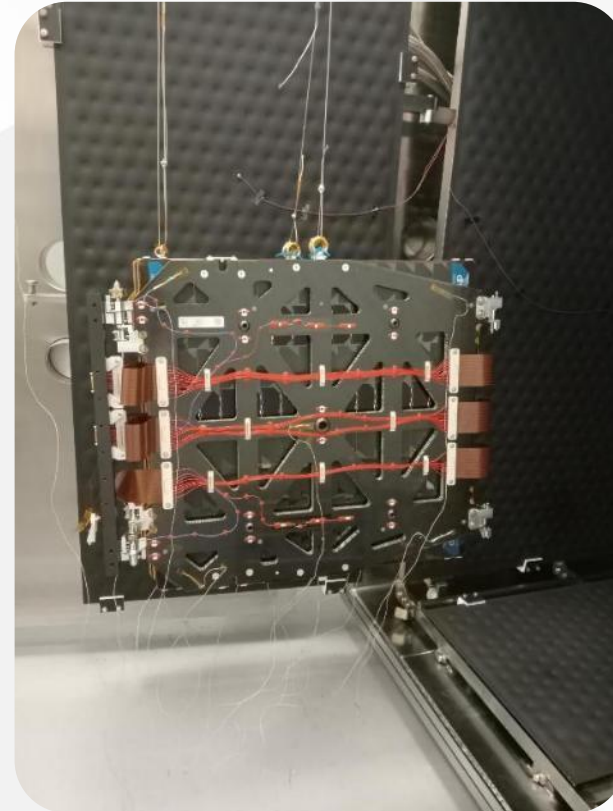
(Cold Temp.)



ENVIRONMENTAL TEST CAMPAIGN

THERMAL VACUUM CHAMBER

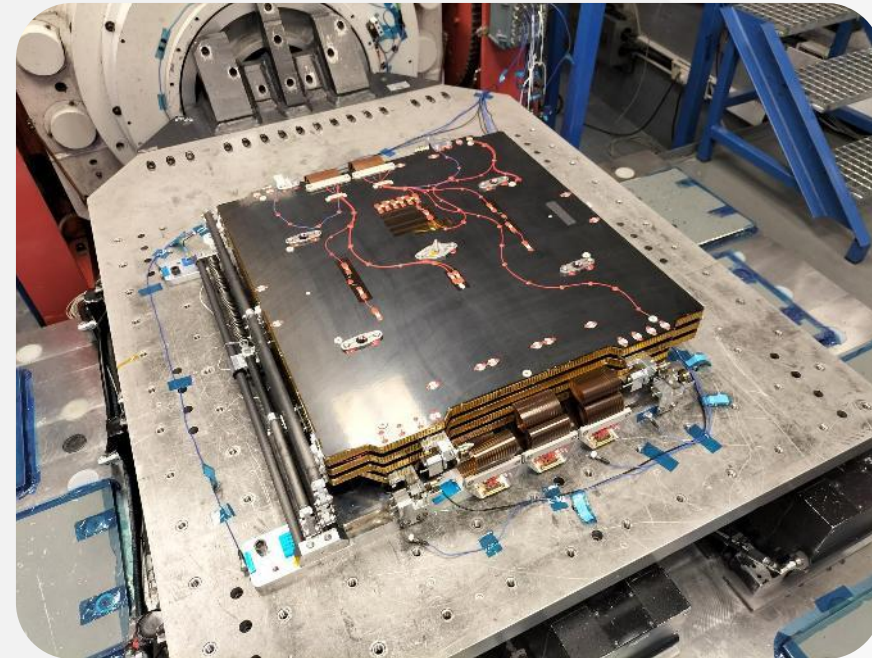
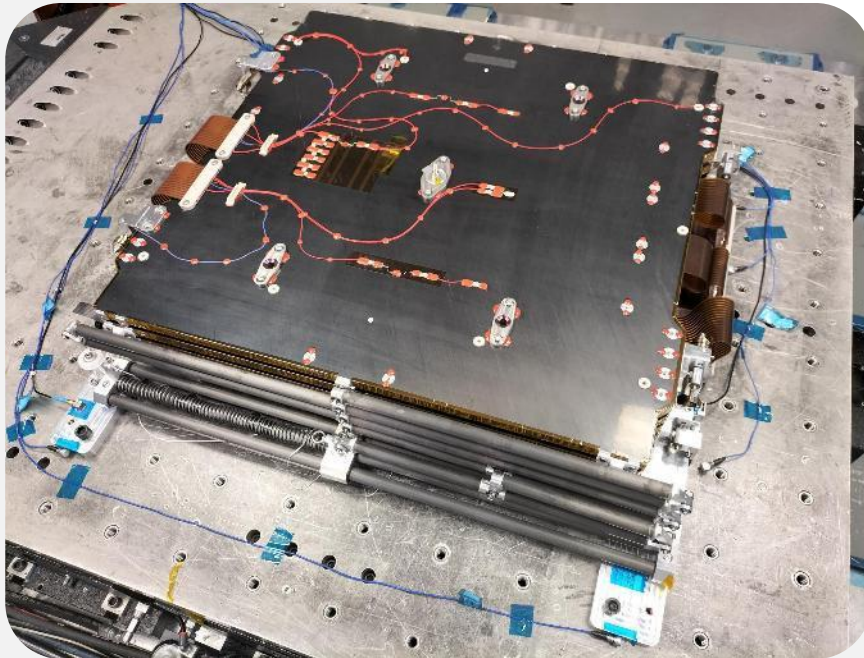
- Bake out:
 - $+125^{\circ}$ → 24 hours
- TVAC
 - $-120^{\circ}/+125^{\circ}$ → 10 cycles
 - Performed at DHV's TVAC chamber
 - Monitoring the solar cell strings electrical continuity



ENVIRONMENTAL TEST CAMPAIGN

VIBRATION

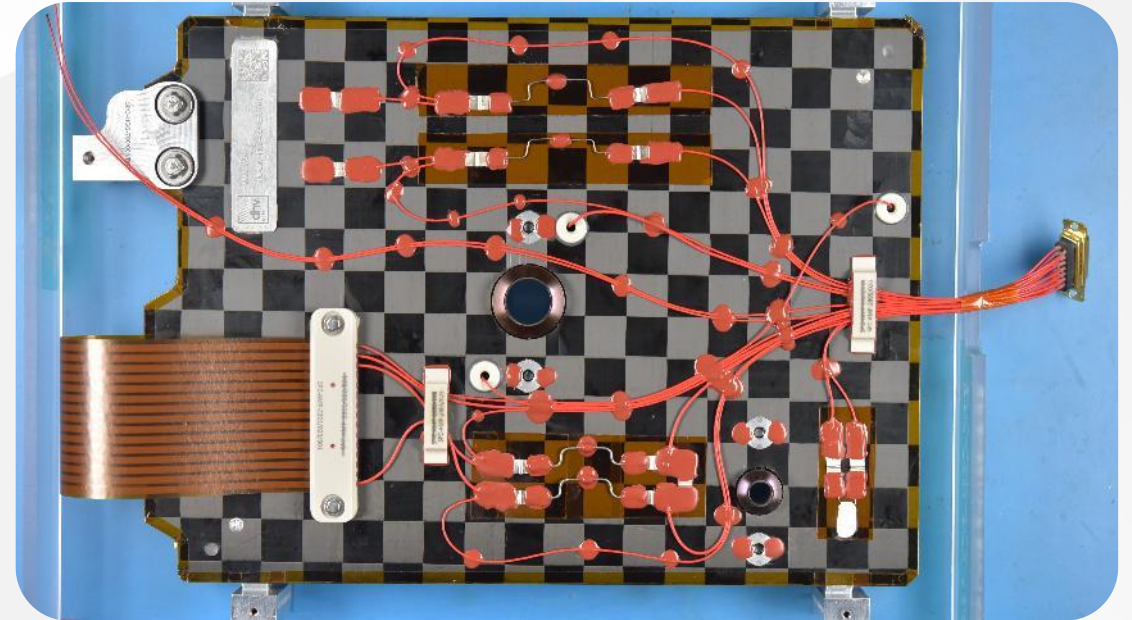
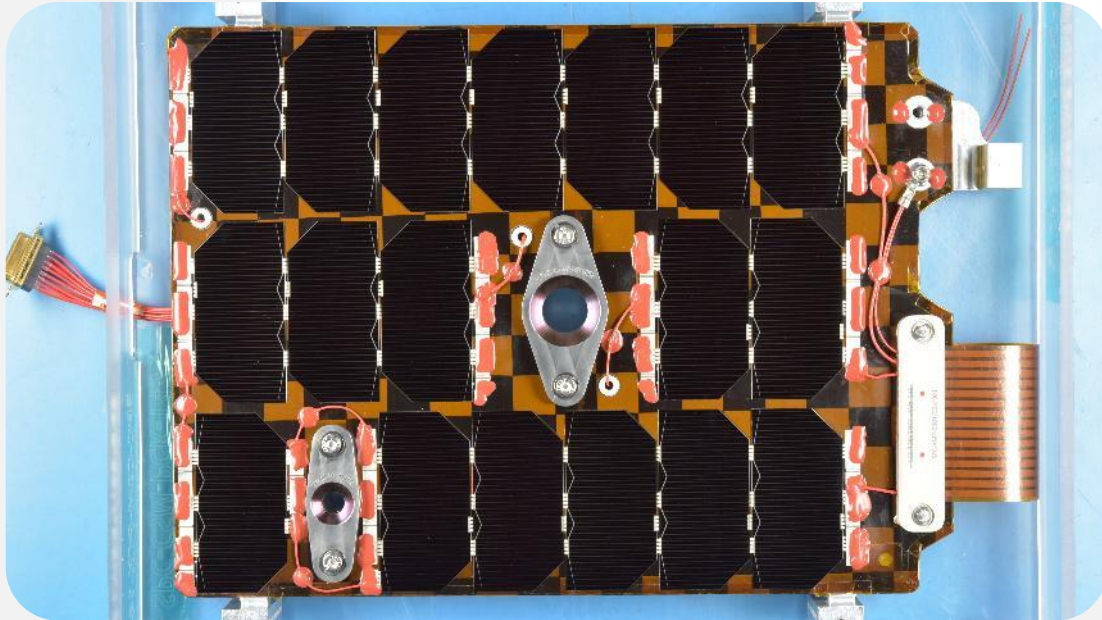
- Sinusoidal vibration test
- Random vibration test → NASA GEVS



ENVIRONMENTAL TEST CAMPAIGN

APTC Thermal Cycling

- $-120^{\circ}/+125^{\circ} \rightarrow 1000$ cycles and beyond (LEO)



- New solar array wing developed for the potential SmallSat market
- Improved hinges and retention mechanisms
- Synchronized deployment using auxiliary mechanisms
- Damped deployment to avoid accelerations in the satellite's attitude
- Substrate technology developed to be modular and cost-efficient
- New electrical interconnections between panels using flexible parts
- TRL-8 to be reached before mid-2025



DHV Technology

www.dhvtechnology.com



CONTACT

Ismael Sanchez

i.sanchez@dhvtechnology.com



ADDRESS

C/ Severo Ochoa 13
Tech Park of Andalusia
29590 Málaga (SPAIN)



Supported by ESA's General Support Technology Programme (GSTP) Element 2 – Make



DHV Technology

Space Power Workshop 2025

Tech Park of Andalusia
Severo Ochoa 13 – 29590 Malaga (SPAIN)