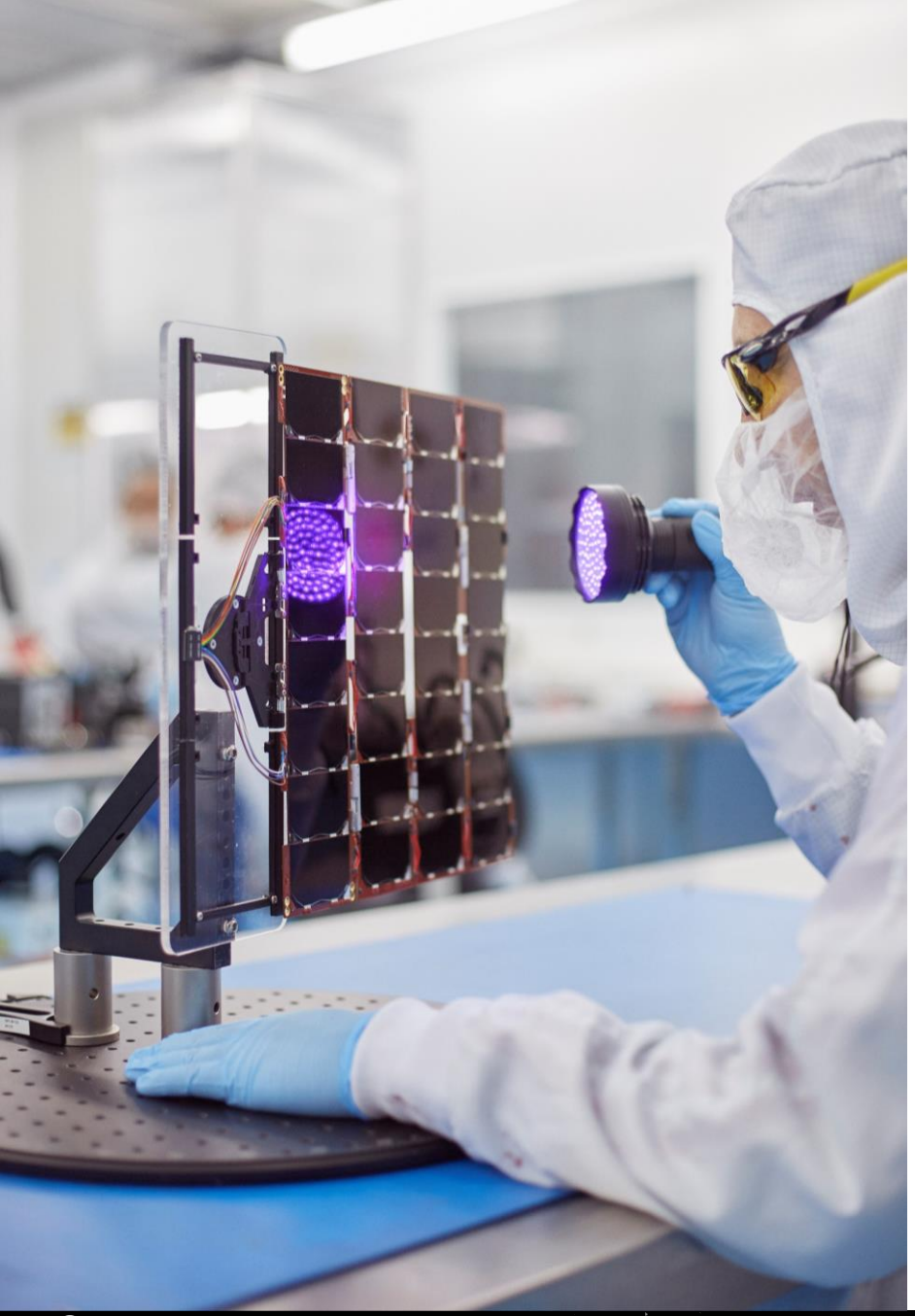
SADA Systems For Cubesat Missions

CubeSat Developers Workshop
April 25-27th 2023

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

Agenda

- Introduction to DHV
- Definition of SADA system
- SADA for CubeSats
    - microSADA-10 developed for the Dione mission of NASA Goddard Space Flight Center (TRL 8)
    - microSADA-18 developed under ESA GSTP program (TRL 8)
- Q&A



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

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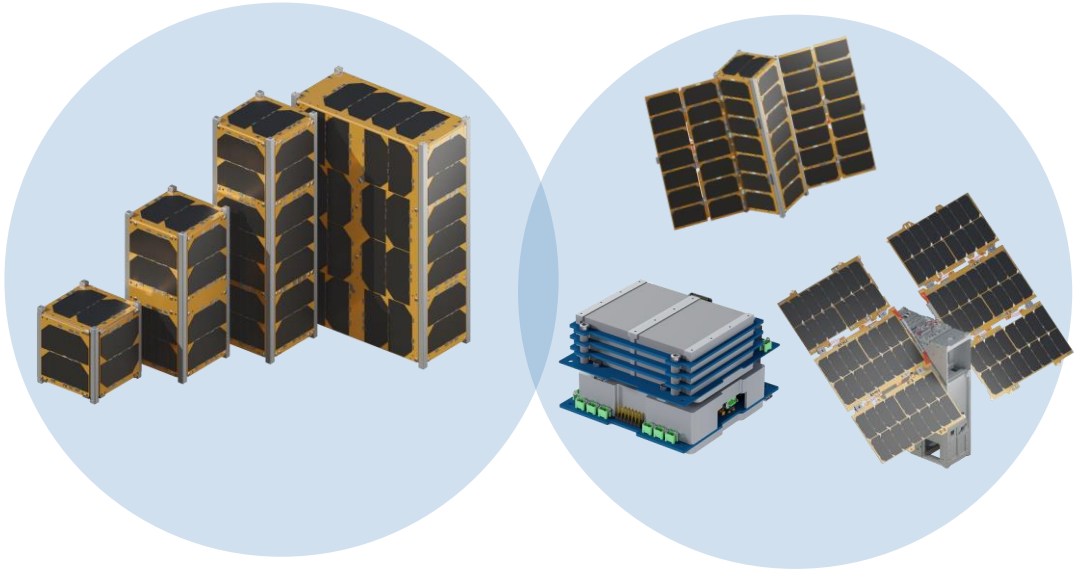
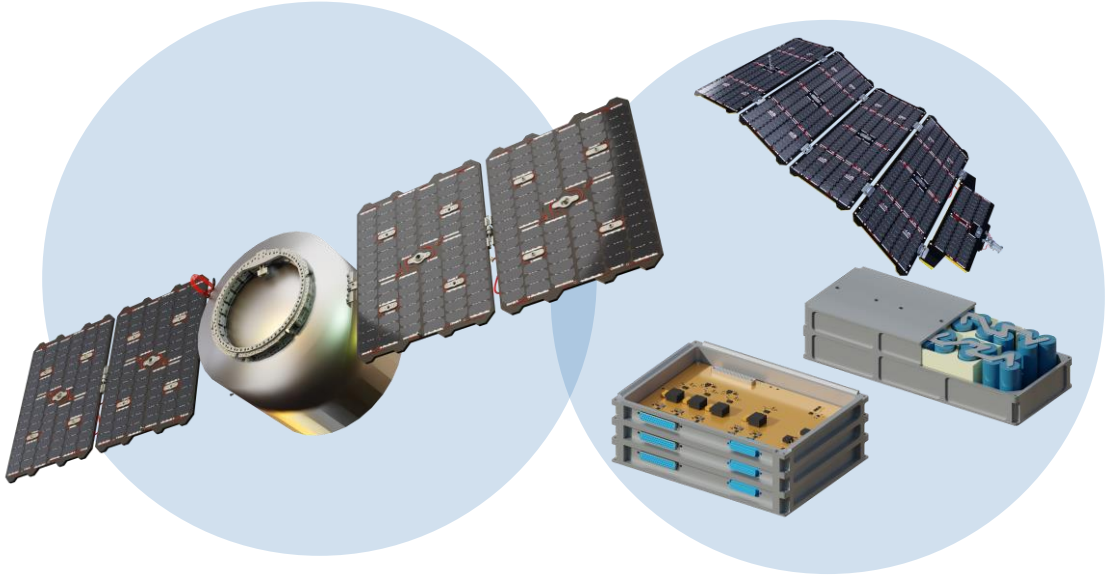
WHAT WE DO

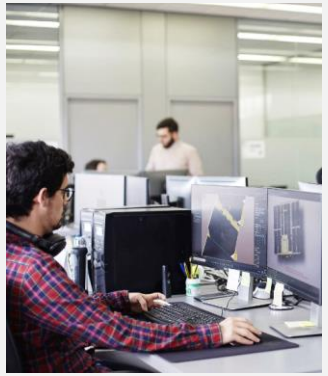
POWER SOLUTIONS FOR CUBESATS

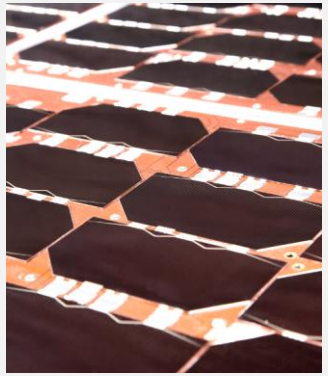


POWER SOLUTIONS FOR SMALLSATS



- Designing customized products
- Constellation projects manufacturing
- Solar panels for SmallSats and CubeSats
- Deployable solutions





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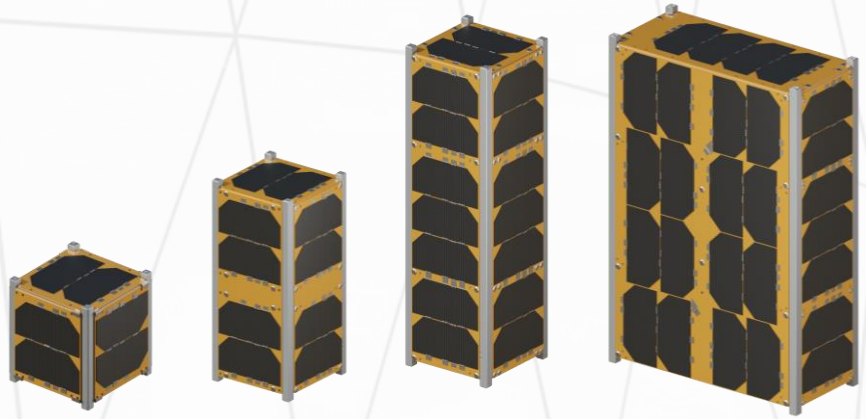
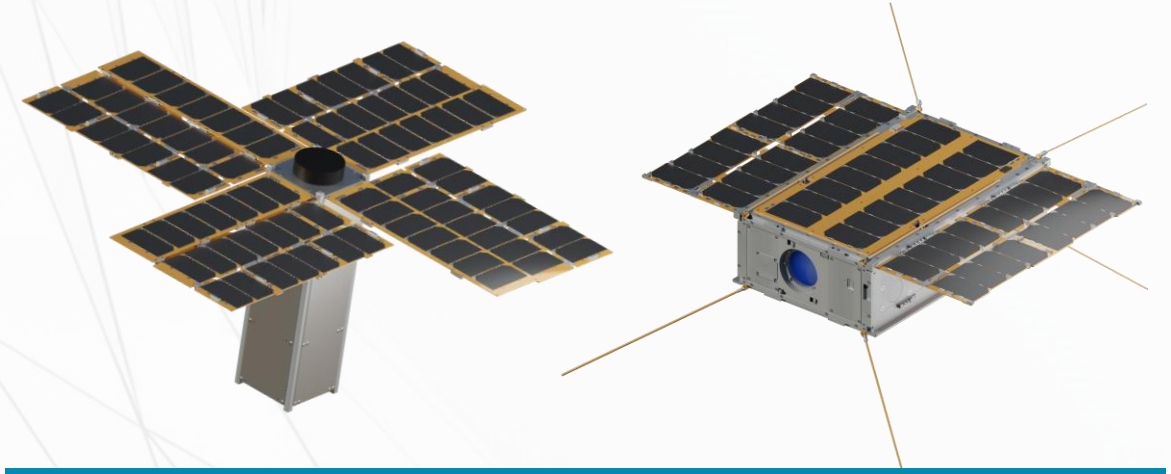
POWER SOLUTIONS FOR CUBESATS

SOLAR PANELS (Body Mounted)

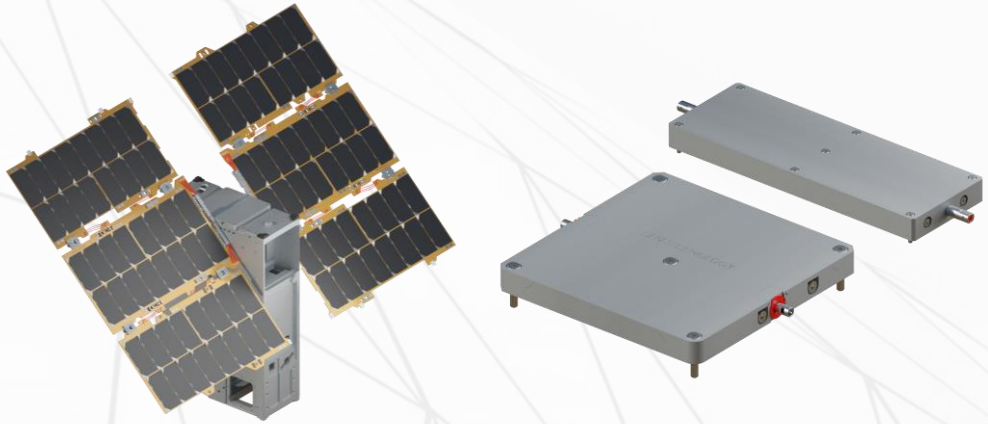


SOLAR PANELS (Deployables)



EPS (Electrical Power Systems)

SADA (Solar Array Drive Assembly)



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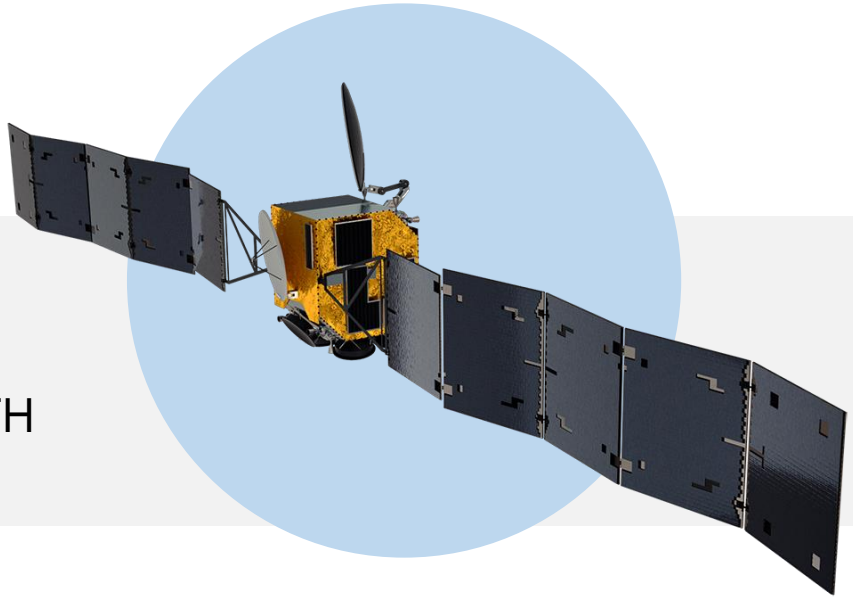
HERITAGE

250+
PROJECTS CARRIED OUT

3000+
ACCUMULATED DAYS IN ORBIT

225+
SATELLITES FLYING WITH OUR SOLUTIONS



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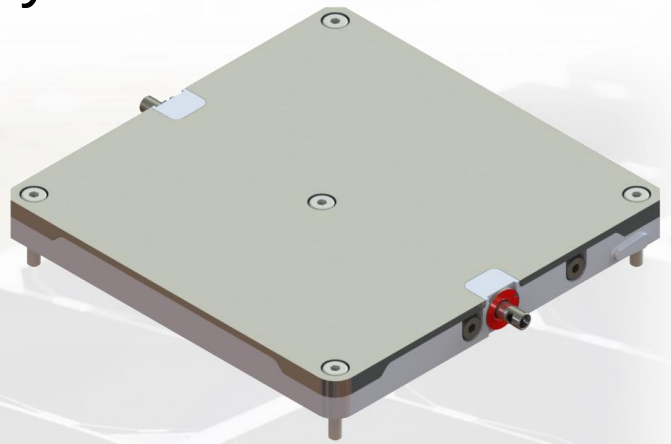
Definition of SADA system

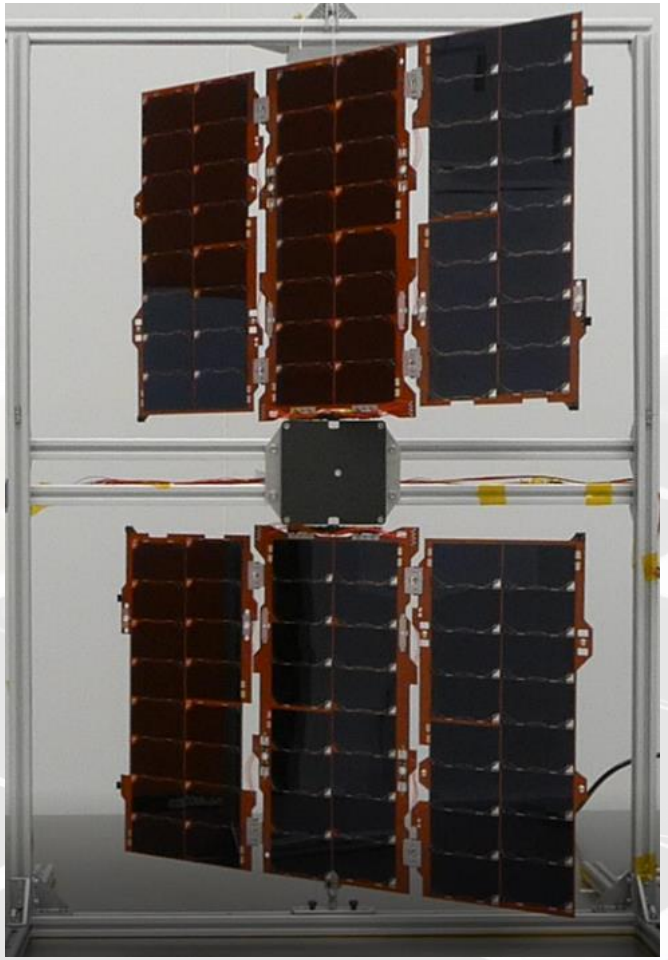
- The Solar Array Drive Assembly (SADA) is a rotatory system that increases the power generation of a Solar Array by active control of its orientation.
- It is composed of two modules:
  - SADM → Solar Array Drive Mechanism
  - SADE → Solar Array Drive Electronics
- It can work as an interface between the Solar Array and the satellite, transferring power and signals.



SADA for CubeSats

microSADA-10

- Project duration: 18 months
- Goal: SADA for 6U and 3U CubeSats
- Compact design: SADE and SADM included in the same module with only 10mm of height
- One-axis gimbal; rotation up to +/- 180 degrees
- Communication protocol: CAN, I^2C
- Power transfer: up to 94W
- Flight unit delivered to NASA Goddard for the Dione CubeSat mission

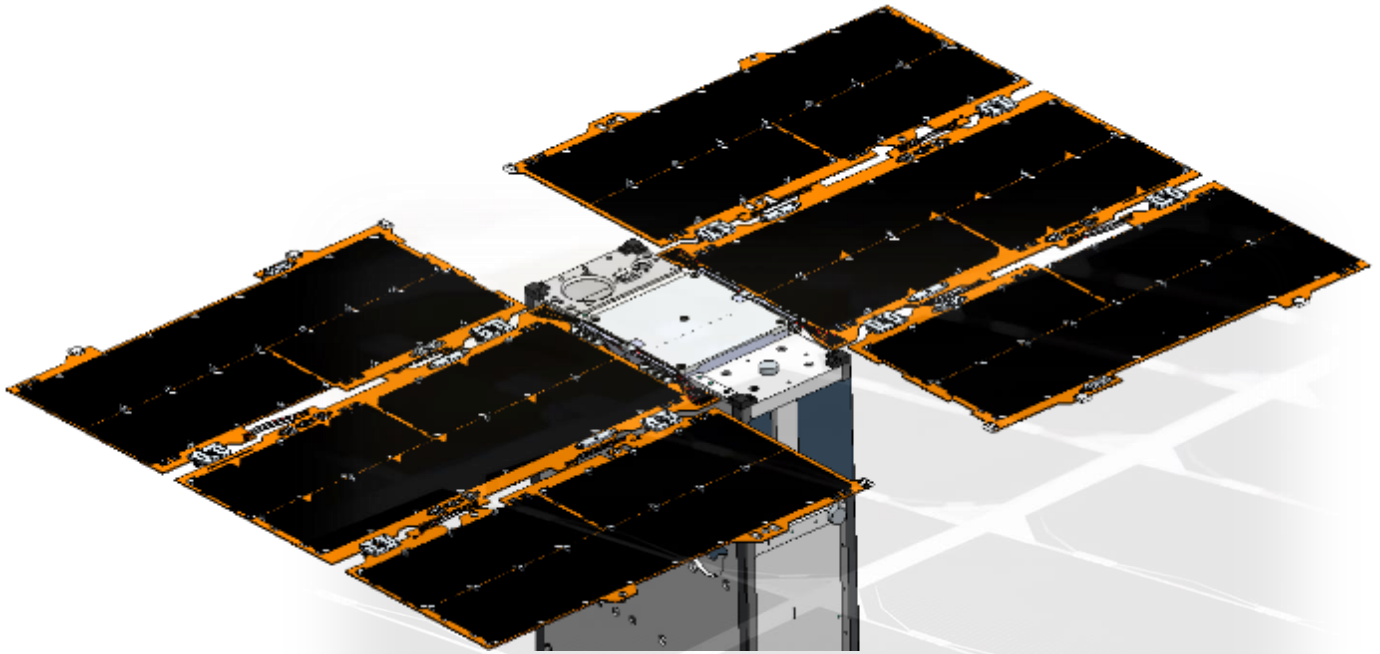


SADA for CubeSats

microSADA-10 – Specification

- Volume: 100mm x 100mm x 10mm
- Weight: < 250g
- Maximum slew rate: 2.5°/s
- Step resolution: 0.005°
- Number of transfer lines: up to 15
- Nominal voltage: 5V - 11V

Top/bottom side of the structure
(draft model)



SADA for CubeSats

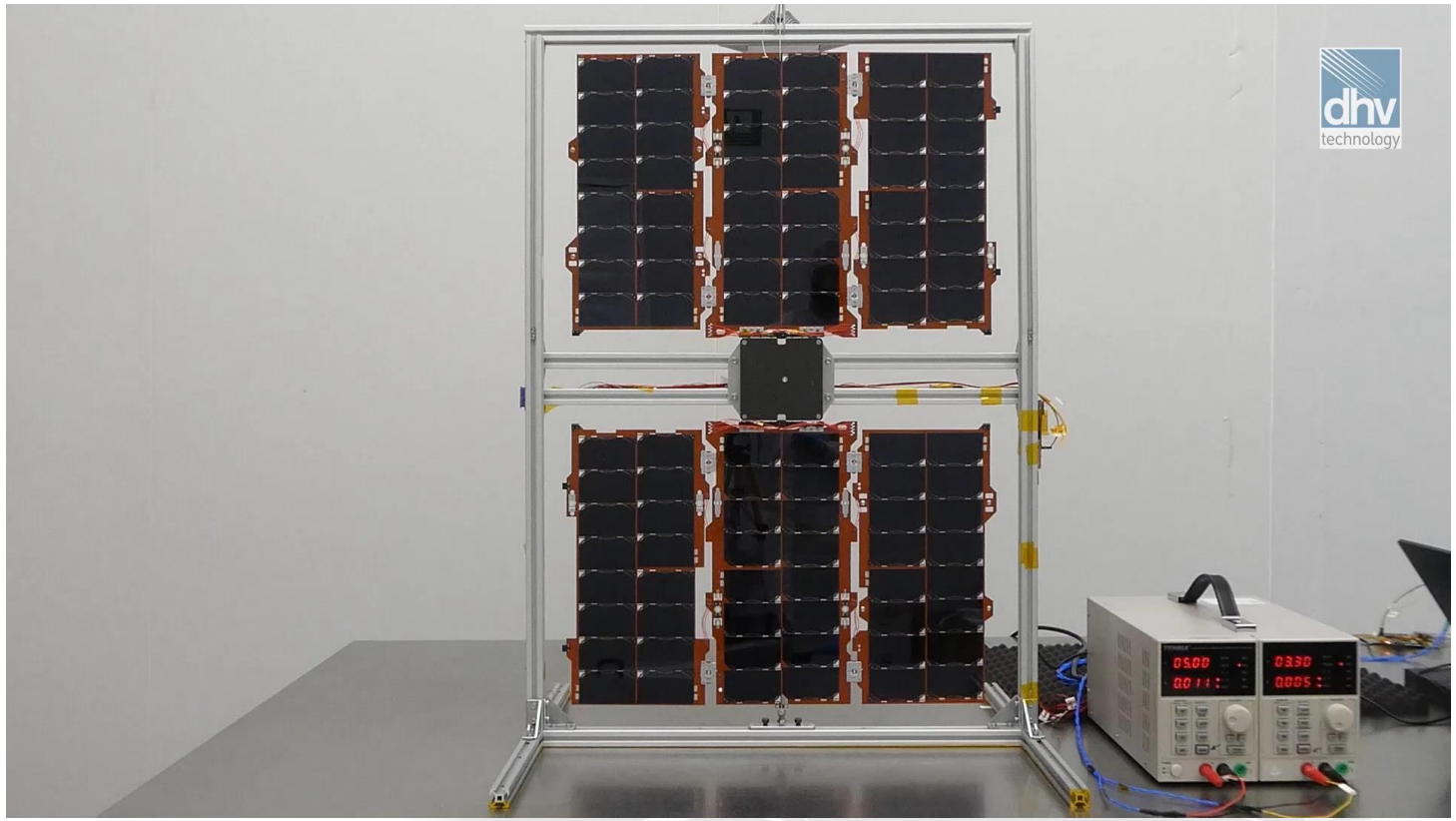
microSADA-10 – Specification

- Lifetime: 20.000 cycles
- Operational temperature range:

  -40°C to +70°C
- Survival temperature range:

  -50°C to +90°C
- Survival radiation level:

  up to 25 krads



SADA for CubeSats

microSADA-10 – Solar Array Wings Specification

- CIC 26,6 square cm. Triple junction 30% efficiency
- 12 series and 8 parallel strings 94.5 W BOL
- 1 year in LEO at 600 Km height.
- NTC thermistors as a temperature sensor
- Wires ATOX resistant
- Retention mechanism based on thermal knife

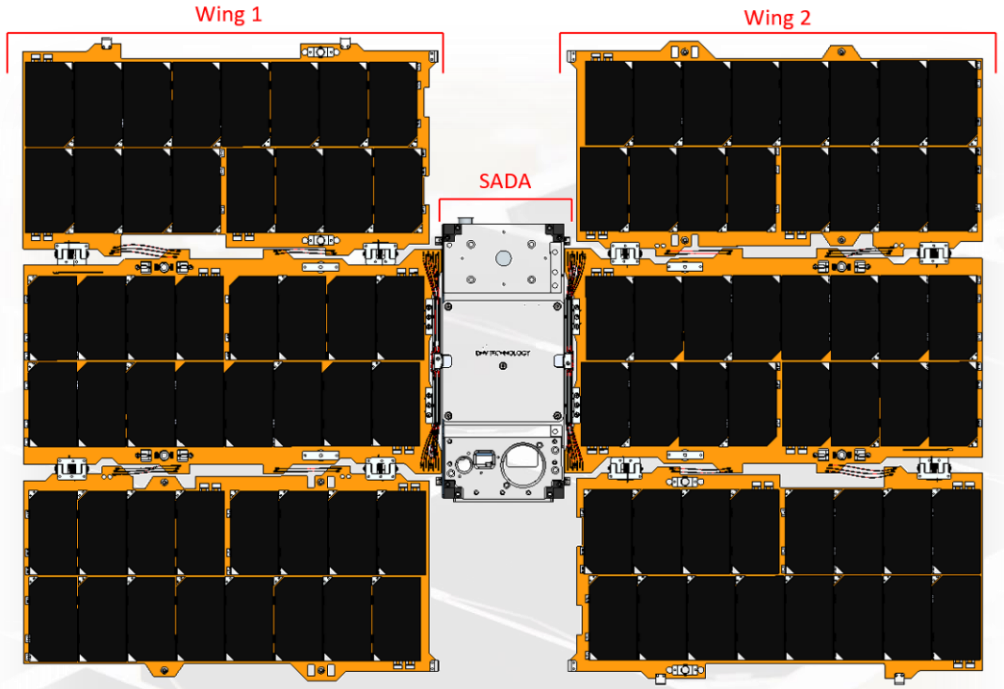
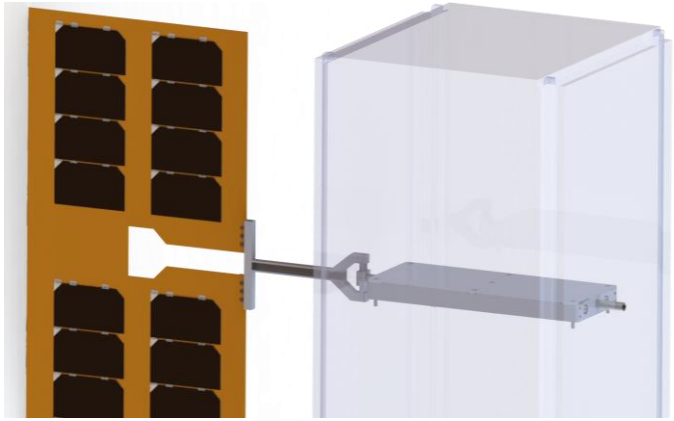


Figure 7. Solar array diagram designation (I).

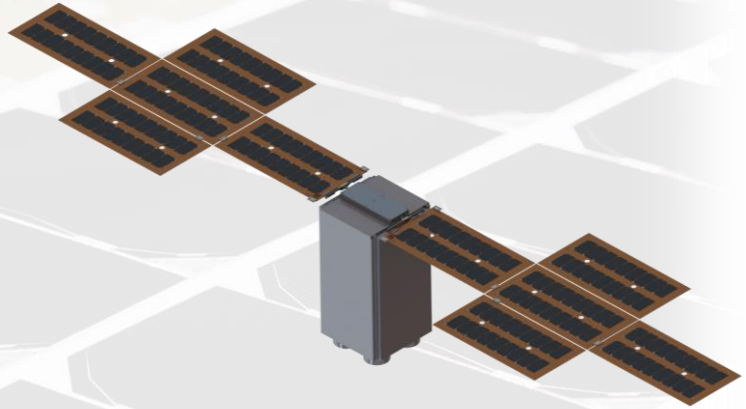
SADA for CubeSats

microSADA-18

- Project duration: 2 years
- ESA contract for General Support Technology Programme (GSTP)
- Goal: SADA for 16U and 12U CubeSats
- SADA is divided into two different modules: SADE and SADM
- One-axis gimbal; rotation up to +/- 180 degrees
- Different communication protocols: CAN, I^2C
- Power transfer: up to 212W



SADM inside the structure
(draft model)



SADM at the top/bottom side of the structure
(draft model)

SADA for CubeSats

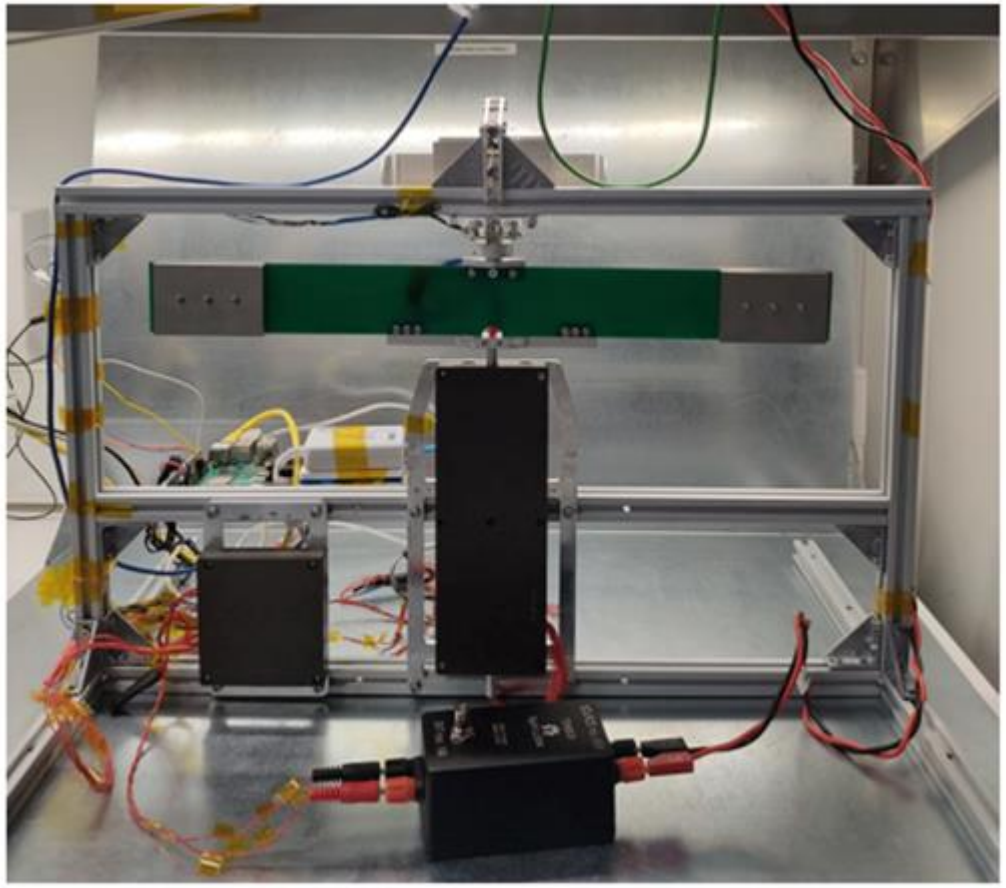
microSADA-18 – Specification

- Volume (customizable upon request):
  - SADM → 226mm x 80mm x 18mm
  - SADE → 95.9mm x 90.2mm x 18 mm (PC/104)
- Weight < 950g (SADE + SADM)
- Maximum slew rate: 5°/s
- Step resolution: 0.01°
- Number of transfer lines: up to 24
- Nominal voltage: 5V - 42V

SADA for CubeSats

microSADA-18 – Specification

- Lifetime: 40.000 cycles
- Operational temperature range: -40°C to +70°C
- Survival temperature range: -50°C to +90°C
- Survival radiation level: up to 25 krads
- Radiation tolerant model upon request

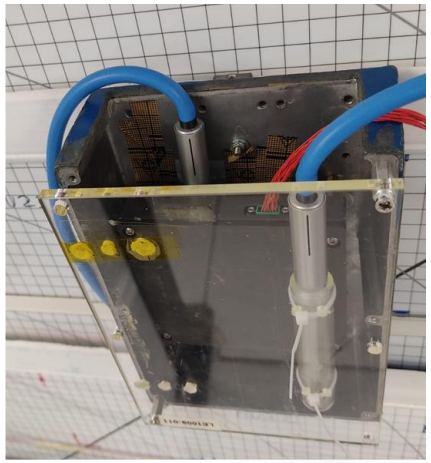


SADA for CubeSats

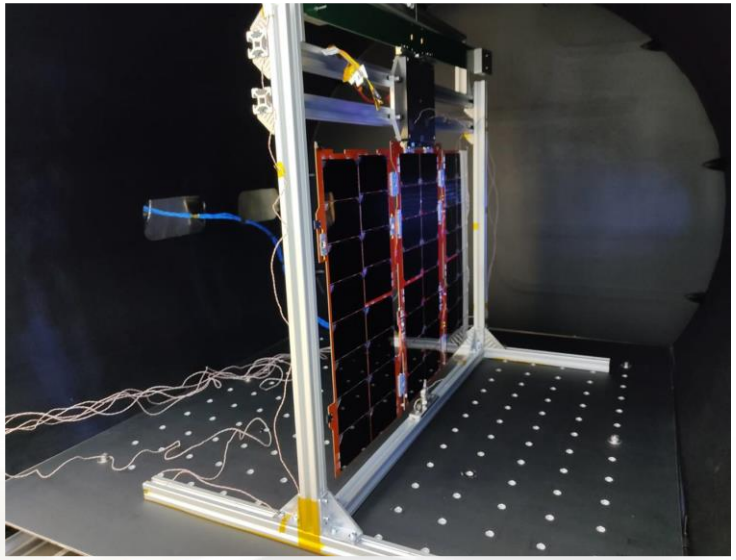
Qualification test campaign

- Functional tests including hardware and software.
- EMC tests.
- Vibration test including random, sine and shock.
- TVAC test operational and survival.
- TID test to check survivability up to 25krads. Rad-hard models available.

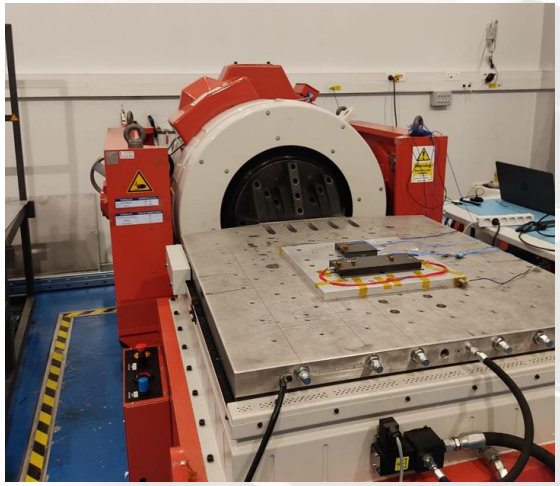
TID test



TVAC test



Vibration test



DHV Technology

www.dhvtechnology.com

CONTACT

Ryan Nugent
(Country Manager, North America)
ryan.nugent@dhvtechnology.com

Victor Burgos
(Sales Manager)
v.burgos@dhvtechnology.com

ADDRESS

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