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avs

EN 9100

ISO 9001

SHRIMP

cubeSat High-Resolution IMaging with Propulsion

UK EO WEEK 2021

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

RSPSoc
remote sensing & photogrammetry society

Centre for EO Instrumentation

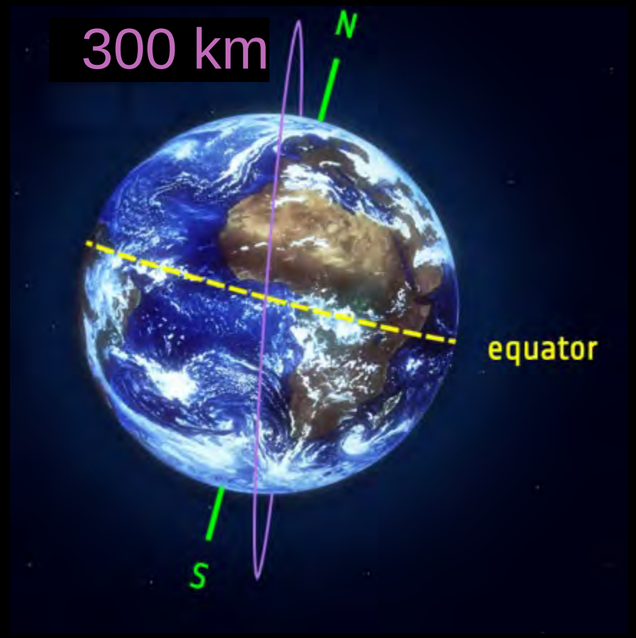
Problem

Affordable CubeSats are too small for housing high resolution EO optics.

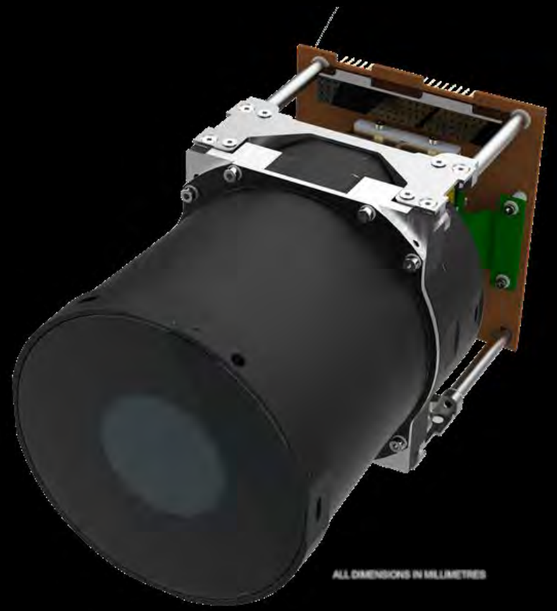
Innovative approaches to address this issue are being developed, but are not yet proven.

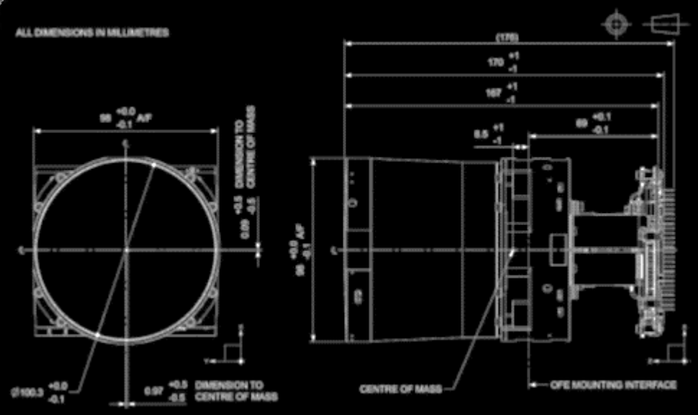
A ready-to-fly payload that includes a flight-proven camera with a dedicated propulsion sub-system.

This combination enables Very Low Earth Orbit (VLEO) operations, resulting in <3 m GSD resolution, for at least 6 months.



SIMERA Sense MultiScape100





In-House Propulsion Subsystem

Who We Are

- EN9100 approved supplier of the majority of the worldwide Space primes
- Turn-key solutions for high-value missions
- Innovative catalogue of Space products, based on:
  - Mechanical
  - Opto-mechanical
  - Thermal
  - Propulsion

TURN-KEY

SCIENCE	ATHENA ISS
EXPLORATION	PERSERVERANCE SFR / MSR ISRU
TELECOM	THERMAL (MPL) THERMAL (PDP) ONESAT EPPM HDRM FUEL CELLS
EO	COPERNICUS CHIME SEOSAT UVSAT
IOS	REFUELLING CAPTURE MECHS FLUIDICS PROPULSION
SS	SPACE DEBRIS GROUND TELESCOPES
GSE	TVAC MGSE OGSE

PRODUCTS

MECHANICAL	CAPTURE MECHS SAMPLE COLLECTION DEPLOYABLES HDRM STRUCTURES MGSE incl. VACUUM POWER STORAGE
OPTO-MECHANICAL	SCANNING MIRROR ROTATING / POINTING OPTICAL BENCH ON-BOARD CALIBRATION SHUTTERS
THERMAL	MPL PUMPS HEAT EXCHANGERS HEAT PIPES CONNECTORS TVAC / TCU
PROPULSION	THRUSTERS PROPULSION SYSTEMS EPPM / TPM / TOM PPU / MW PSU / PDU PMU VALVES MINI TANKS

FACILITIES





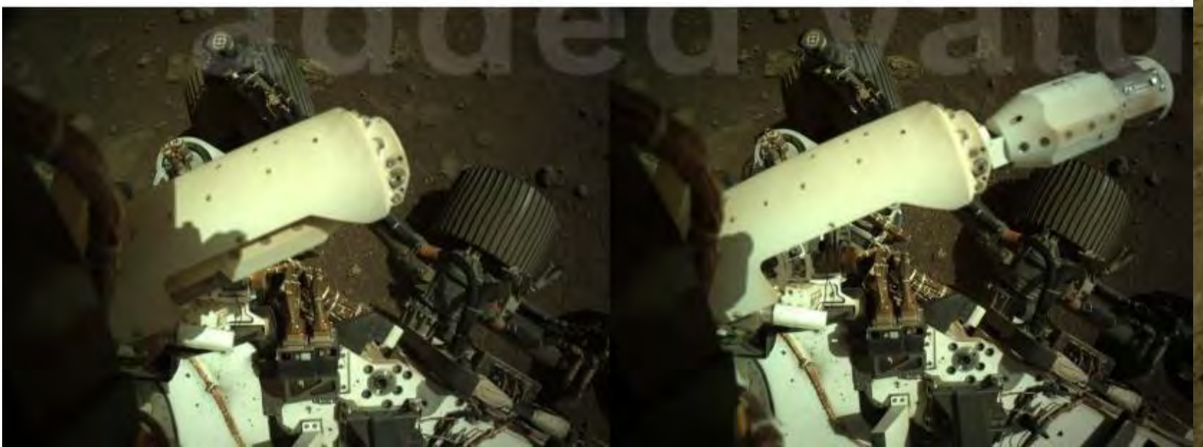





WESTCOTT | URA | TESTA + ENSAMBLA

MEDA + SuperCAM
MSR | PERSEVERANCE

Jet Propulsion Laboratory
California Institute of Technology



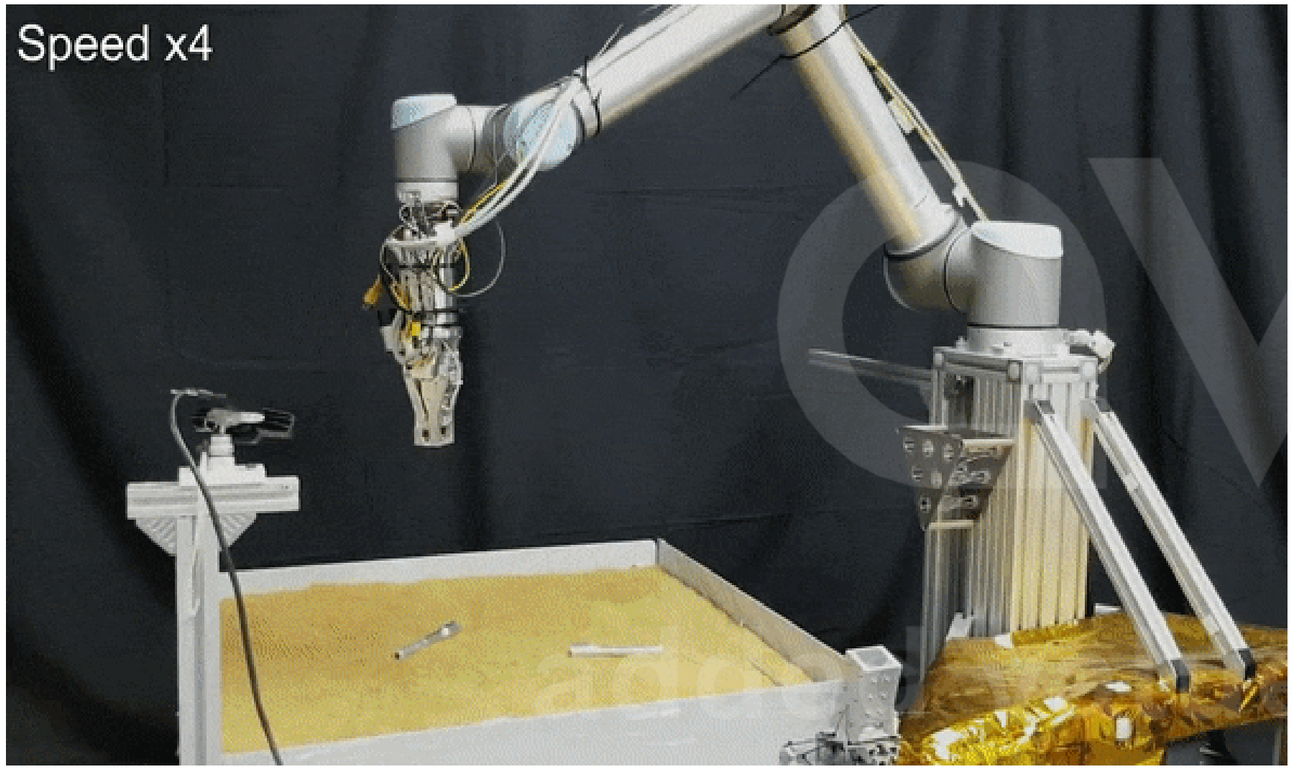
AVS arrived in Mars

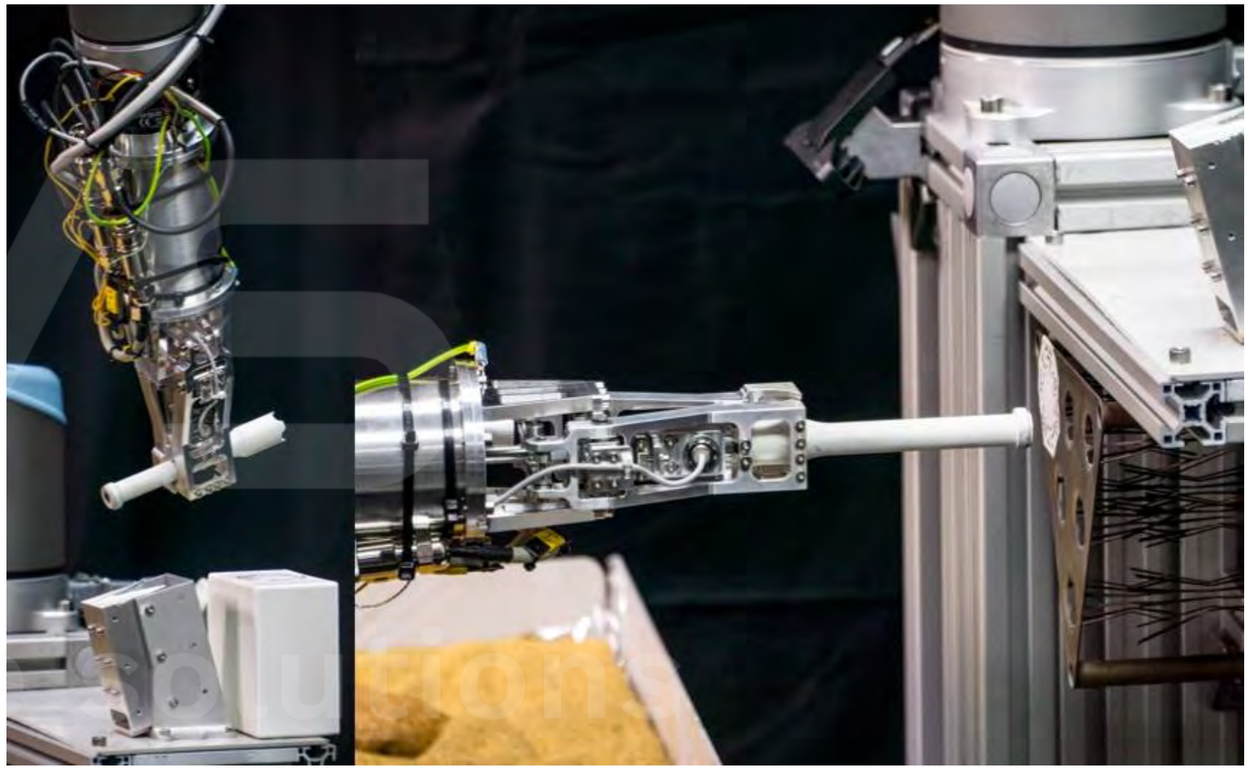
SUPERCAM
Calibration Target
RAMAN LIBS

MEDA
Mars Environmental
Dynamics Analyzer
Wind Sensors

GRIPPER | END-EFFECTOR
MSR | SFR | 2026

AND WE ARE COMING BACK IN 2026





PROPULSION | THRUSTERS

TECHNOLOGIES

- MICROWAVE ECR
- MICROWAVE ELECTROTHERMAL
- MICROWAVE GRIDDED ION ENGINE
- ELECTROSPRAY
- HALL EFFECT THRUSTERS
- CHEMICAL BI-PROP
- DUAL-MODE SYSTEMS

PROPELLANTS

- WATER
- AMMONIA
- ENERGETIC IONIC LIQUID (EMI-BF4)
- XENON / KRYPTON
- H2 / 02
- CO2 / N2
- O2

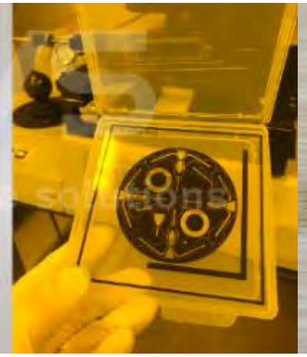
KEY FEATURES

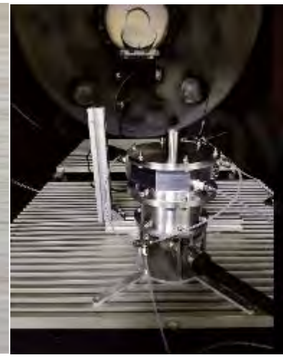
- ALTERNATIVE PROPELLANTS
- HIGH TTPR
- FILLING THE GAPS
- INNOVATIVE MICROWAVE TECH
- WATER [URA] PROPULSION
- DUAL-MODE SYSTEMS

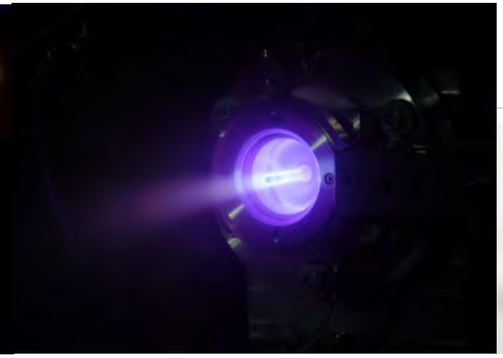
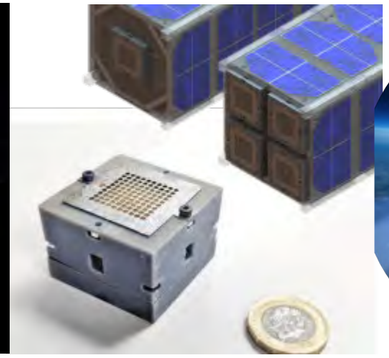
APPLICATIONS

- NANOSATELLITES
- MICROSATELLITES
- SMALL SATELLITES
- GEO SATELLITES
- INTERPLANETARY / EXPLORATORY
- RACS / AOCS / ADCS FOR LARGE Satellites (Airbus, TAS…)
- OTV / Space-tugs

PROPULSION | THRUSTERS




ICE

Water Electrolysis

ICE5 | ICE10 | ICE50

ICE100 | ICE1000 | ICE5000

MEMS thrusters

1-10 [N] RACS for large sats

Smallsats: 5-100 [mN]

P [W]	30-120 | 200-800
I_{sp} [s]	300 - 310
TTPR [mN/kW]	150 - 200

MET

Microwave Electrothermal

MET-75 | MET-150

MET-250 | MET-500

Xe | Kr | H_20 | NH_3

X-band PSU: 75 | 150

S-band PSU: 250 | 500

P [W]	75 - 500
I_{sp}[s]	100 - 800
TTPR	100 - 900

PET

Electrospray

PET-100 | PET-200

PET-400

EMI-BF4

3.5 kV PPU

62% efficiency

P [W]	50 - 200
I_{sp}[s]	4000 - 5500
TTPR	20 - 30

PROPULSION | DUAL-MODE ARCHITECTURES

IMPULSE

Dual mode (fully-all-electric)

MET → BOL + RACS

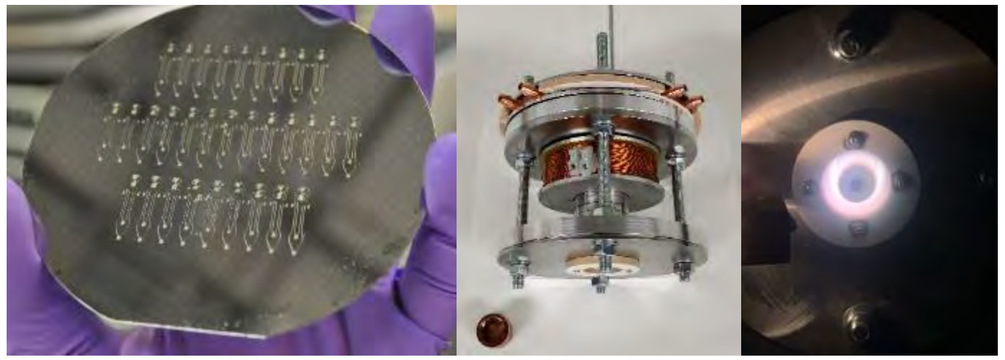
EPT → SK + OR + EOL

MW PSU: 250 W | 500 W

HV PPU: 2 kW | 5 kW

Propellants: Xe | Kr

P [W]	2000 - 5000
I_{sp}[s]	MET: 100 EPT: 3500
TTPR	n/a



HYDRA

Dual mode (CP + EP)

ICE → BoL + RACS + high thrust

AQUAHET / WETHET → SK + OR + EoL

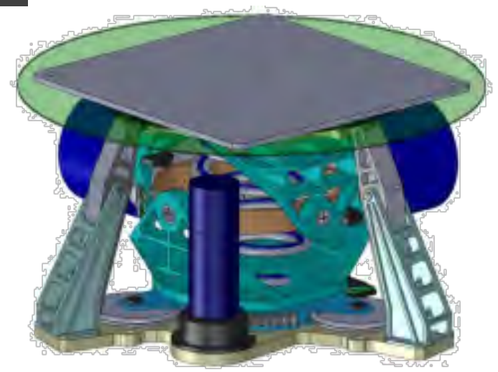
HYDRA-200 | HYDRA-1000

HYDRA-2000

Propellant: H_20

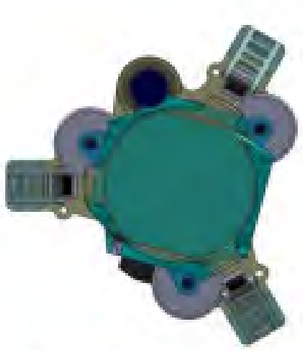
P [W]	2000 - 5000
I_{sp}[s]	ICE: 310 (H_20) WETHET: 1000 (O_2)
TTPR	n/a

PROPULSION | TPM



TPM-5000

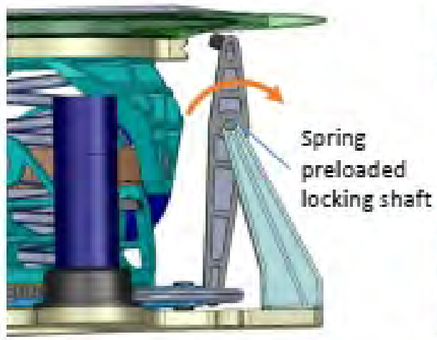
3-7 kW EP engines



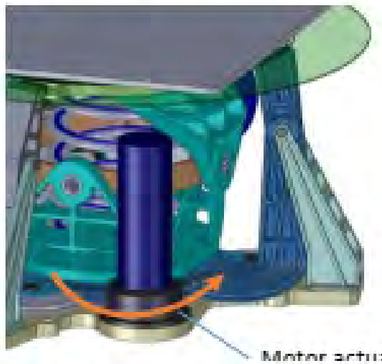
Un-Locked configuration

→Locking system rotation→

Locked configuration



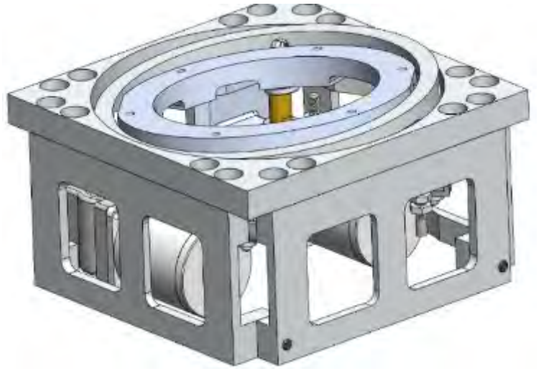
Spring preloaded locking shaft

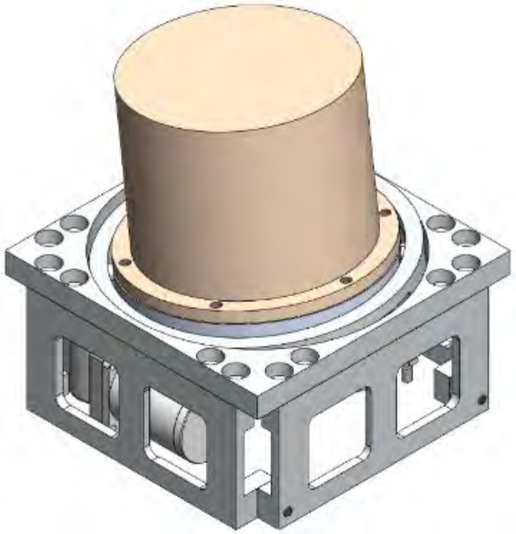


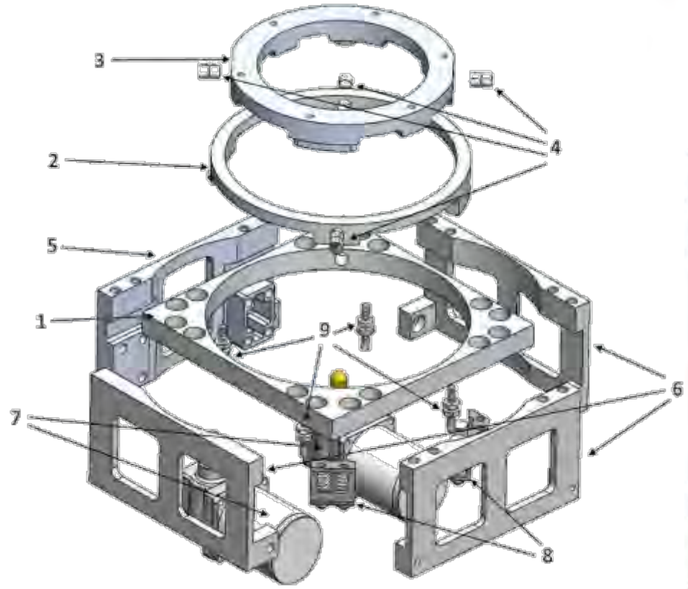
Motor actuation

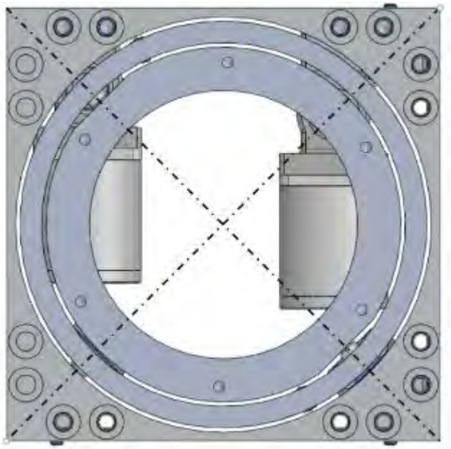
TPM-250 | 500

50-500 W EP engines









UVAS

SEOSAT
UV & VIS
ATMOSPHERIC SOUNDER
- Scanning
- Shutter
- Calibration

UVSAT

ISO 9001

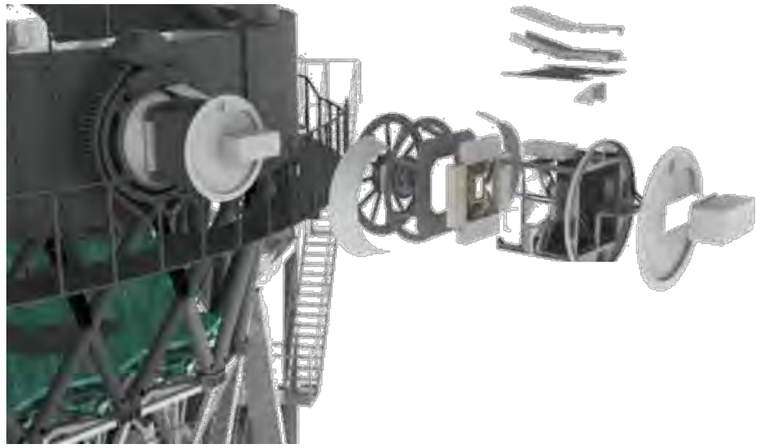
EN 9100

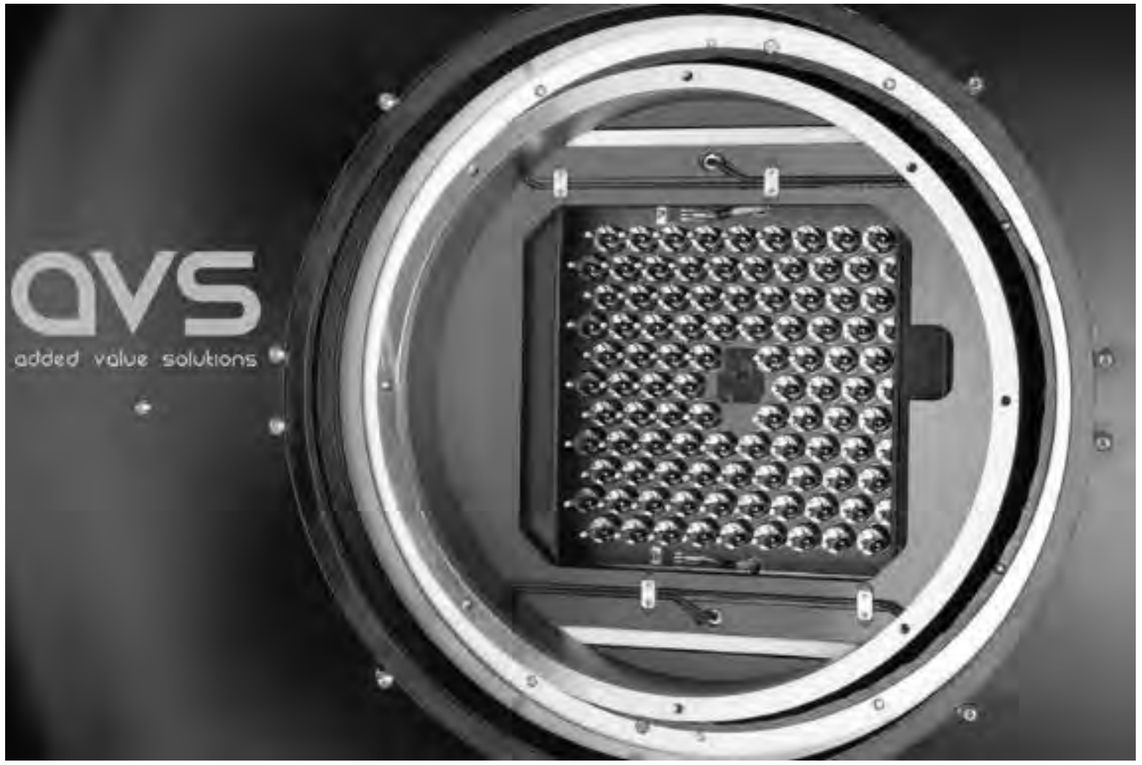
ASTRONOMY

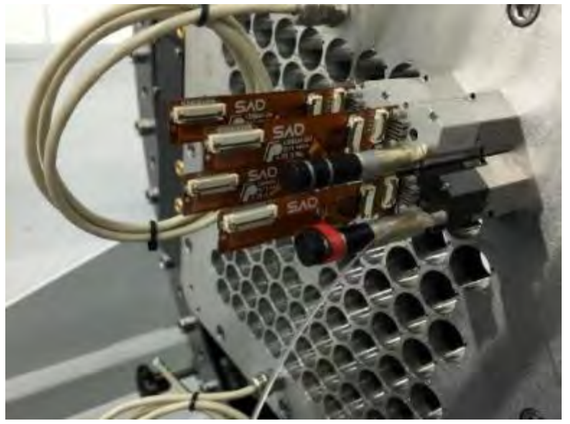
MEGARA (10.4m GTC Telescope)

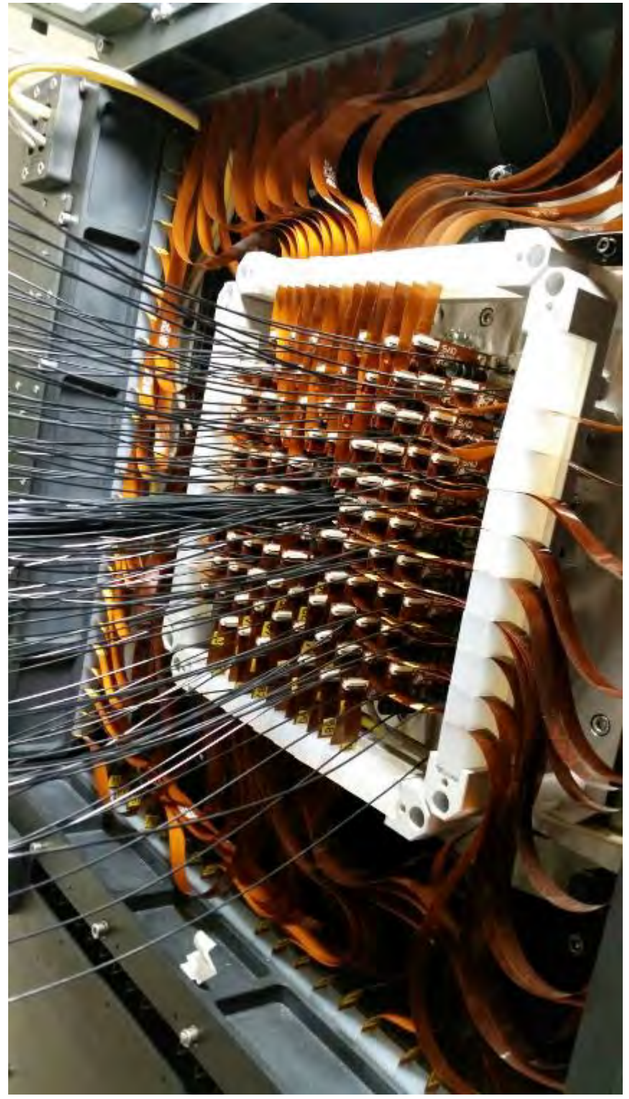
Multi Object Spectrograph

Fiber Robots, Focal Plane & Filter Wheel









ASTRONOMY

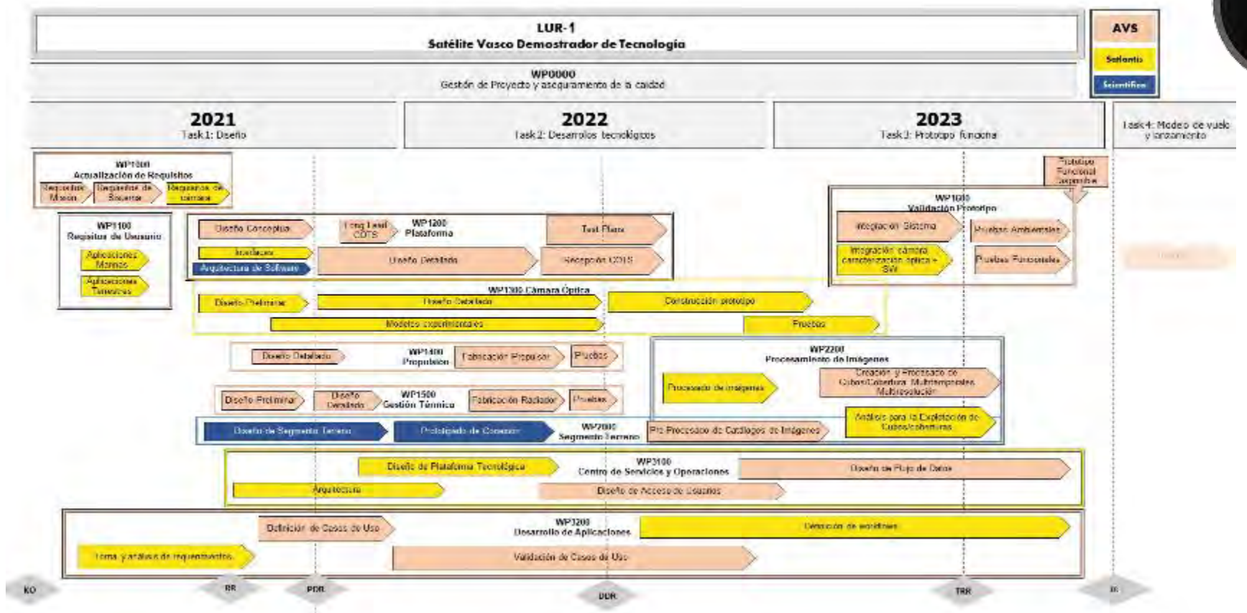
UF UNIVERSITY of FLORIDA

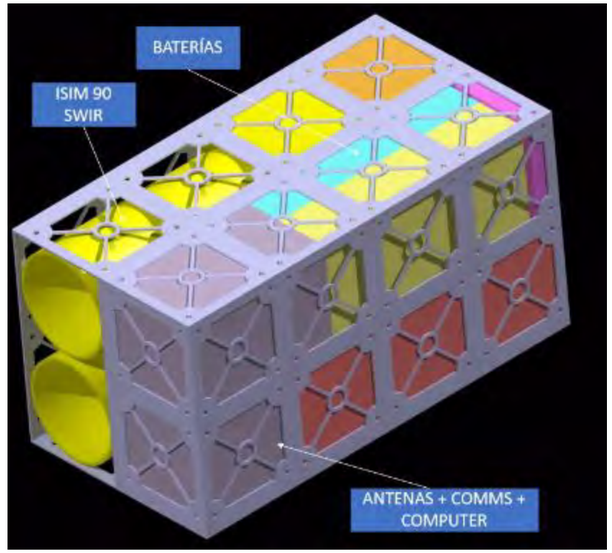
MIRADAS Cryogenic Probe Arms

LUR-1: Space, Ground and User Segments System

EO micro-satellite to observe from VNIR (2m GSD) to SWIR (5-10m GSD)

with propulsion & thermal management.





SATLANTIS vicomtech EUSKO JAURLARITZA GOBIERNO VASCO

Goals

An opportunity to fly the payload.

Connect with community, specifically potential Downstream partners (Agrotech experts?) to refine business case.

Leverage the experience developed in astronomy, previous space and current EO activities to further develop capabilities in the UK.