

**SITAE**L  
AN **ANGEL** COMPANY





# A worldwide leading Transportation and Aerospace Group



**SYNERGIC HIGH-TECH COMPANIES WITH  
1000+ HIGHLY SKILLED EMPLOYEES**



VIDEO

 **mermec**



RAILWAY

**SIT**AEL



SPACE

**BLACKSHAPE** 



AVIATION

SITAEI is a member company of the **Angel** hi-tech holding, which includes **MERMEC**, worldwide leader in diagnostic and signaling systems for railways, and **BLACKSHAPE** manufacturing leisure and training carbon-fiber aircrafts.



- Largest **Italian** and **privately owned** Company operating in the **Space Sector** .
- More than **350** high qualified employees and state of the art facilities
- Extensive heritage in all Design, Development, Production and Qualification processes for **Small Satellites, Advanced Propulsion Systems, Instruments for Earth Observation and Science, Platform and Payload Avionics**.
- Leading **contractor and preferred partner** for many stakeholders in several international space projects.





# Plants

SITAEL

● Mola di Bari, ITALY

SITAEL

● Pisa, ITALY

SITAEL

● Forlì, ITALY

SITAEL

● Rome, ITALY

SITAEL

● Salonicco, GREECE

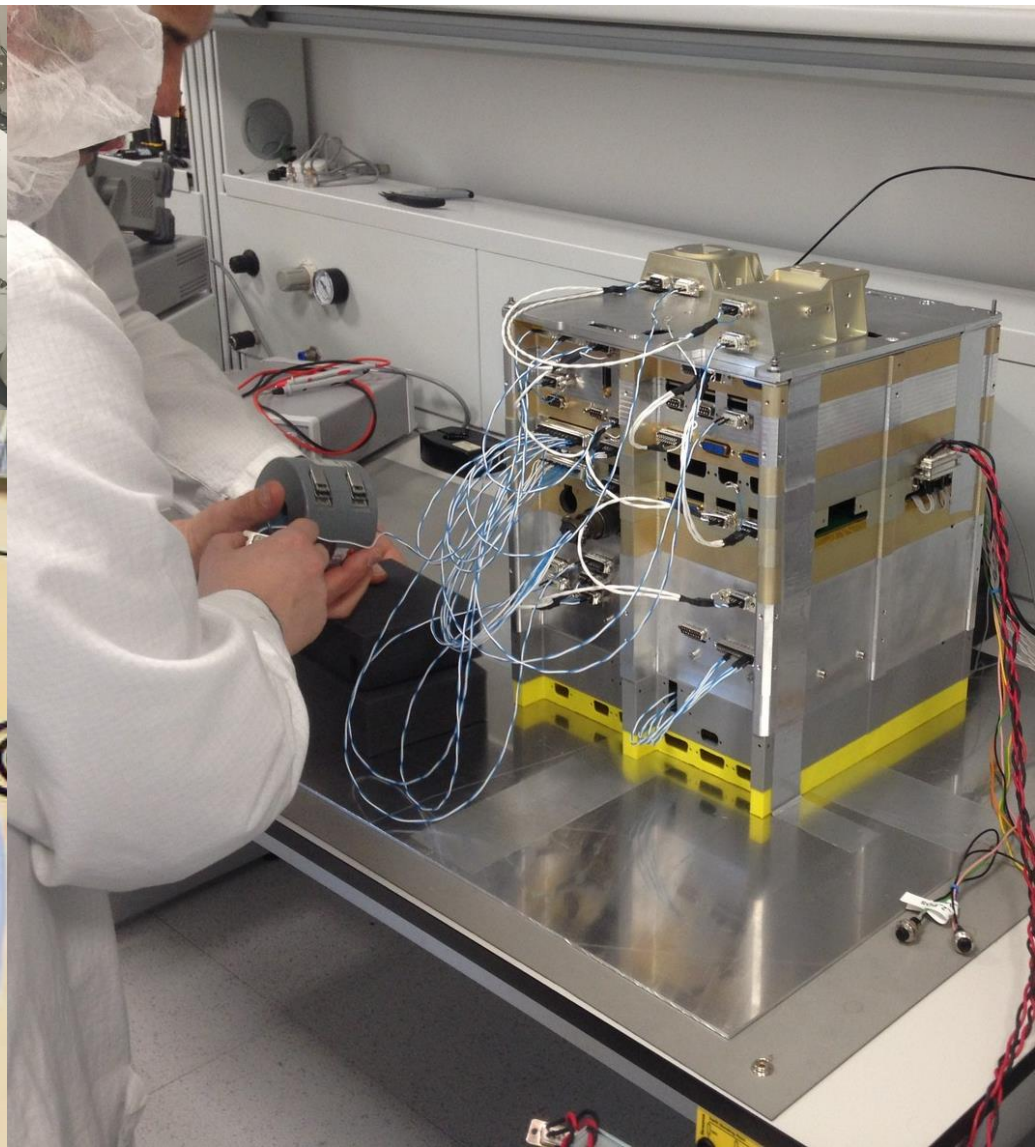
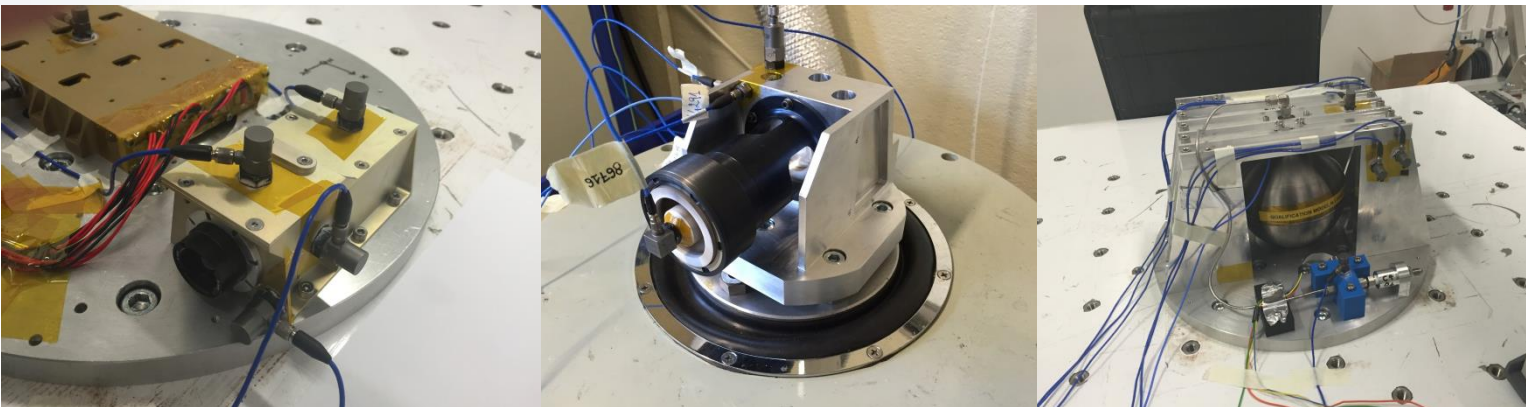








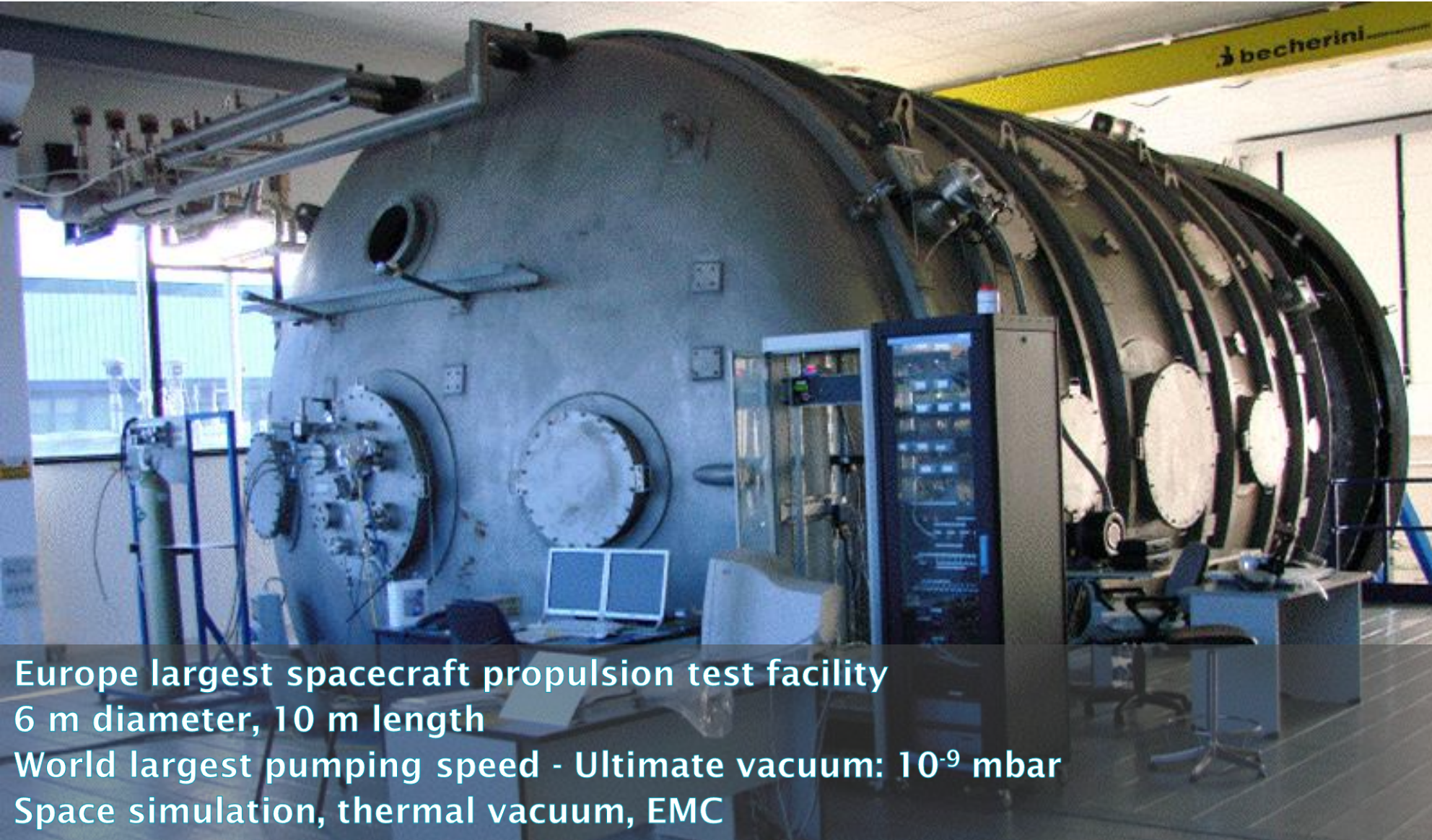
# Small satellites Integration







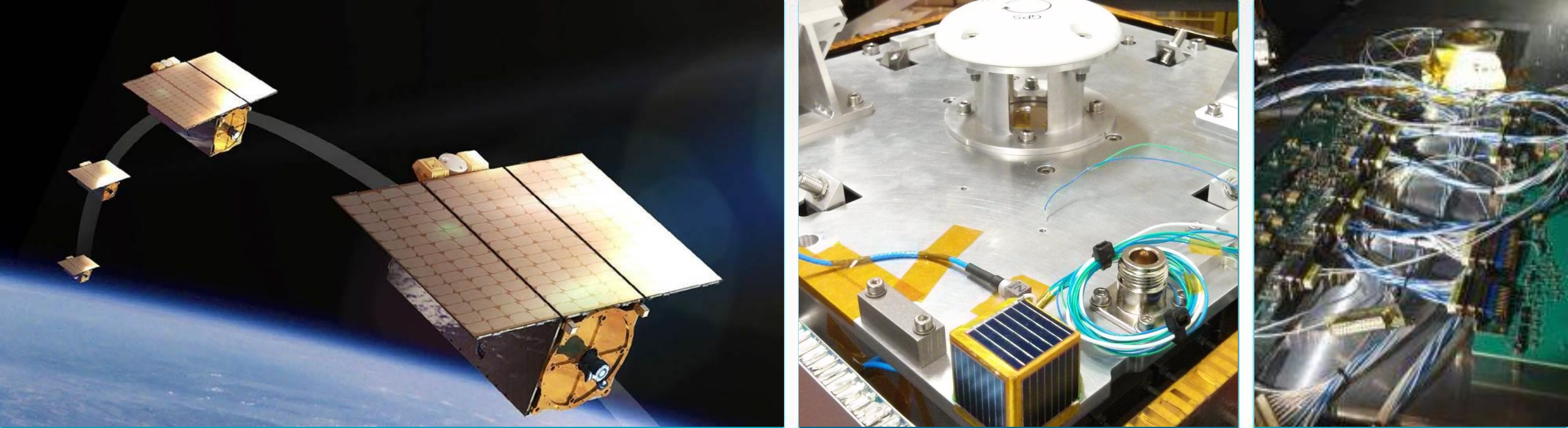
# Unique testing capabilities for space systems



Europe largest spacecraft propulsion test facility  
6 m diameter, 10 m length  
World largest pumping speed - Ultimate vacuum:  $10^{-9}$  mbar  
Space simulation, thermal vacuum, EMC







# A NEW GENERATION OF SMALL SATELLITES FOR INNOVATIVE INTEGRATED SERVICES





# Satellites and Earth Observation



# Small Satellites Solutions



300  
kg

## SITAEL S-300

-P/L up to 100kg/1kW

- High power missions
- EO missions:
  - High Res.
  - Hyper-Sp.
  - Small SAR
- Telecom missions (LEO/MEO HTS const.)

200  
kg

## SITAEL S-200

-P/L up to 80kg/120W

- Scalable platform
- Multi-purpose
- EO missions:
  - High Res. PAN-VIS
  - NIR/SWIR/TIR
  - Multi-spectral P/L
- Integrated EO const.
- Small TLC payloads

75  
kg

## SITAEL S-75

-P/L up to 20kg/30W

- Low cost missions
- IOV/IOD applications
- EO (Low Res. PAN/VIS)
- EO constellation (TIR)

50  
kg

## SITAEL S-50

ESEO Satellite (ESA)  
-IOV-IOD



SITAEL offers a complete **Small Satellites** Product Line, based on smart, modular and scalable platform solutions, able to cover a wide range of possible missions/applications in satellites-class range **from 50 kg to 300 kg**.

## COMPETENCES

### Mission Analysis

Requirements Analysis  
Mission Concepts  
Business Plan

### Satellite Design

Configurable architecture  
Multiple Payload Accommodation  
In-house subsystems and units

### Satellite Manufacture & Test

Complete AIV-AIT process  
Thermal-Vacuum Testing  
Radiation Verification, EMC and  
Vibration Testing

### Launch Management

Selection of the launch vehicle  
Launch campaign operations

### Services and Operations

In Orbit Commissioning  
In Orbit Operations  
Ground Segment



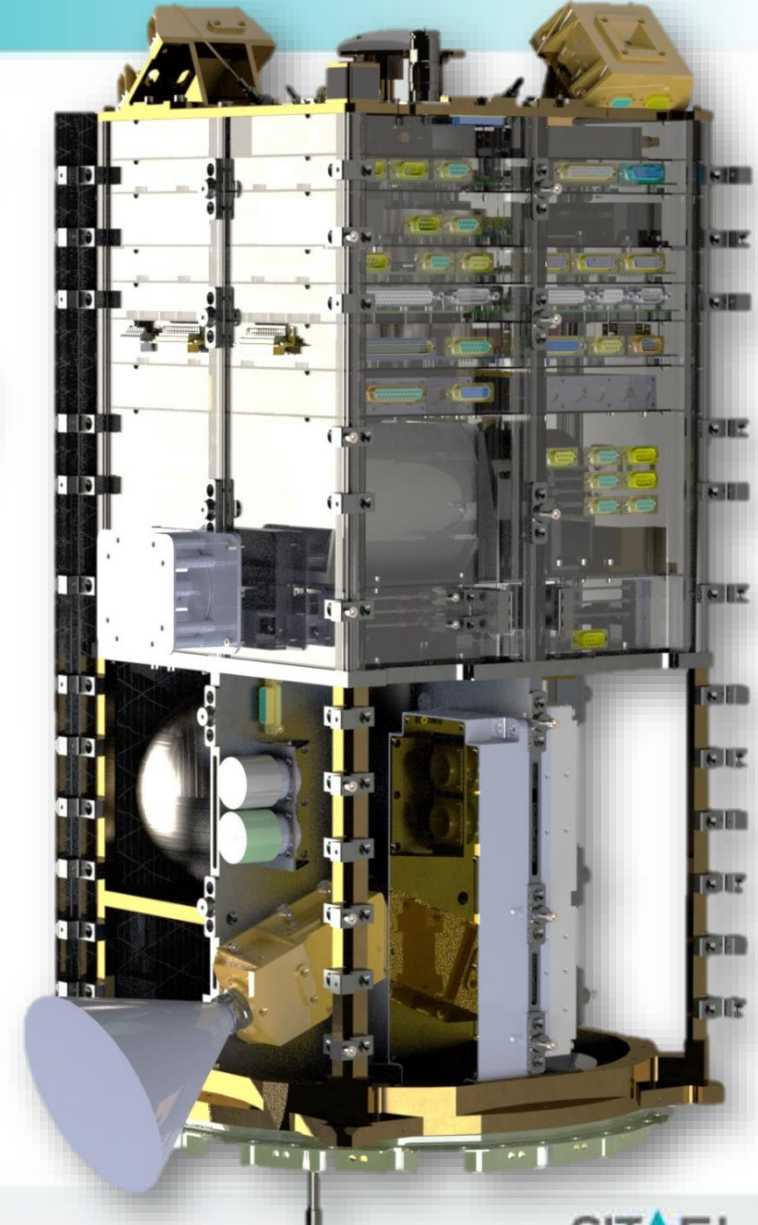
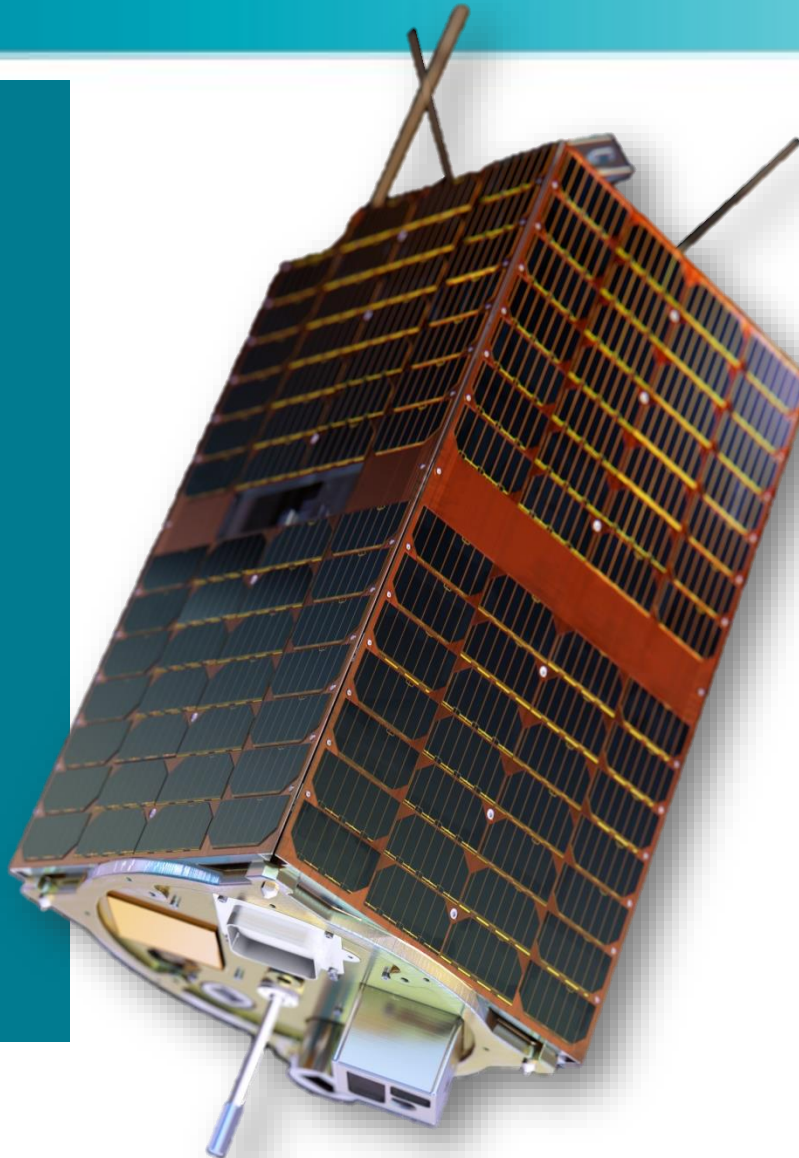


# S-50 Micro-Satellite

## SITAEL S-50

Targeted mission	SSO in LEO @450-800 km
P/L max mass	10 kg
P/L avg power cons.	Up to 10 W (*)
P/L allowable volume	270x270x300 mm <sup>3</sup>
S/C launch mass (kg)	50 kg
S/C envelope LxWxH	340 x 340 x 750 mm <sup>3</sup>
S/C power gen.(W)	65 W Peak
Battery capacity	Li-Ion, 340 Whr
Pointing accuracy	Up to 0.1° (*), 3-axis stabilization
Pointing knowledge	Up to 0.006° (*)
Propulsion	Cold Gas (*)
TT&C	UHF, 10 kbps
PDHT data rate	S/X-band, up to 5 Mbps
PDHT data storage	Up to 16 GB
S/C redundancies	Full-cold P/F red.
Lifetime	Up to 3 years
	(*): Optional (depending on H/W)

Current Project: ESEO (ESA)



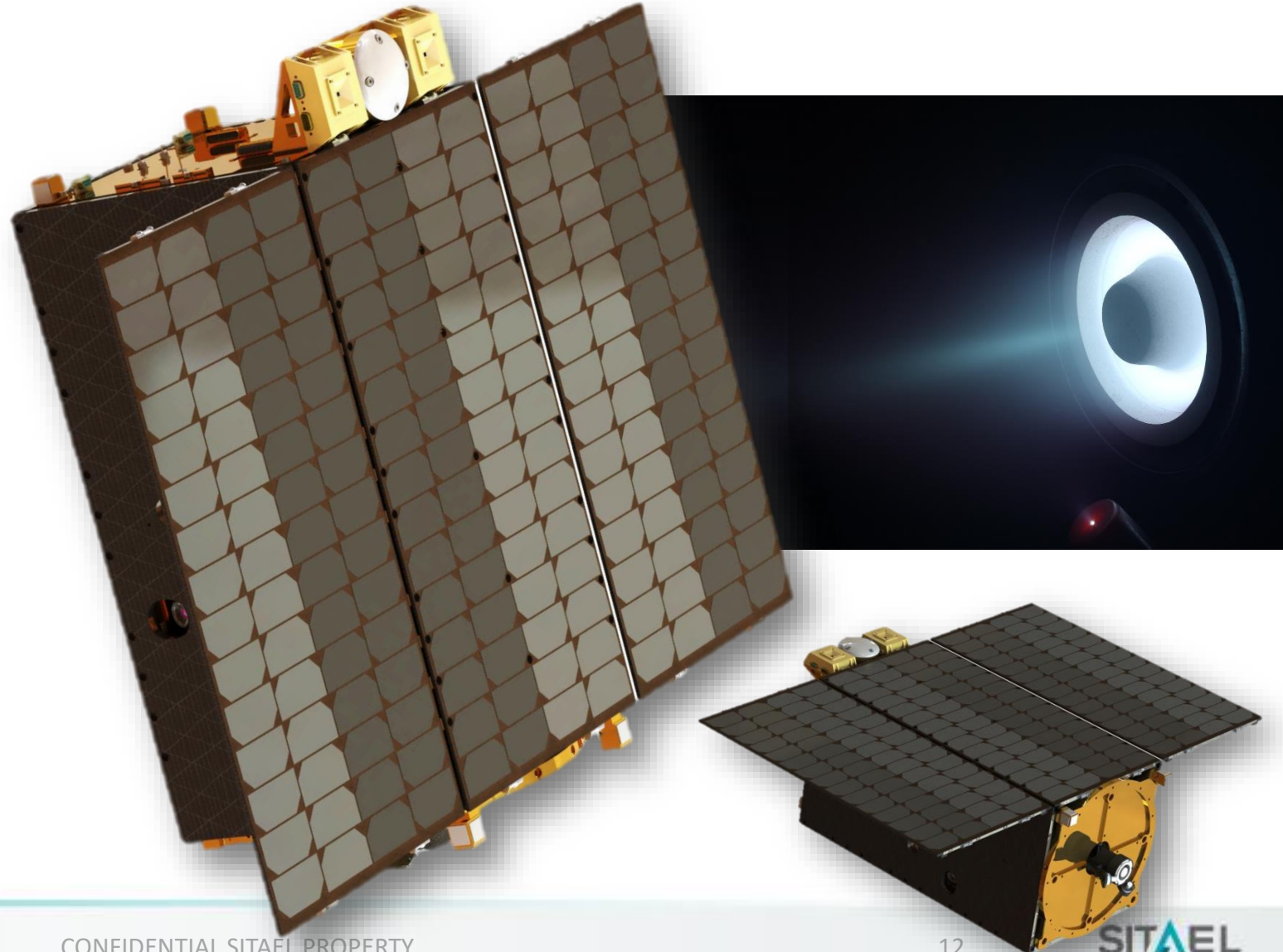


# S-75 Micro-Satellite

## SITAEL S-75

Targeted mission	EO SSO in LEO @450-800 km
P/L max mass	20 kg
P/L avg power cons.	Up to 30 W (*)
P/L allowable volume	270x270x400 mm <sup>3</sup>
S/C launch mass (kg)	75 kg
S/C envelope LxWxH	340 x 340 x 750 mm <sup>3</sup>
S/C power gen.(W)	Up to 100 W Avg (*), 160 W Peak
Battery capacity	Li-Ion, 680 Whr
Pointing accuracy	Up to 0.1° (*), 3-axis stabilization
Pointing knowledge	Up to 0.006° (*)
Delta-V	Up to 500 m/s (*)
TT&C	UHF, 10 kbps
PDHT data rate	S/X-band, up to 20 Mbps
PDHT data storage	Up to 64 GB
S/C redundancies	Full-cold P/F red.
Lifetime	Up to 3 years
	(*): Optional (depending on H/W)

Current Project: uHETsat (ESA)



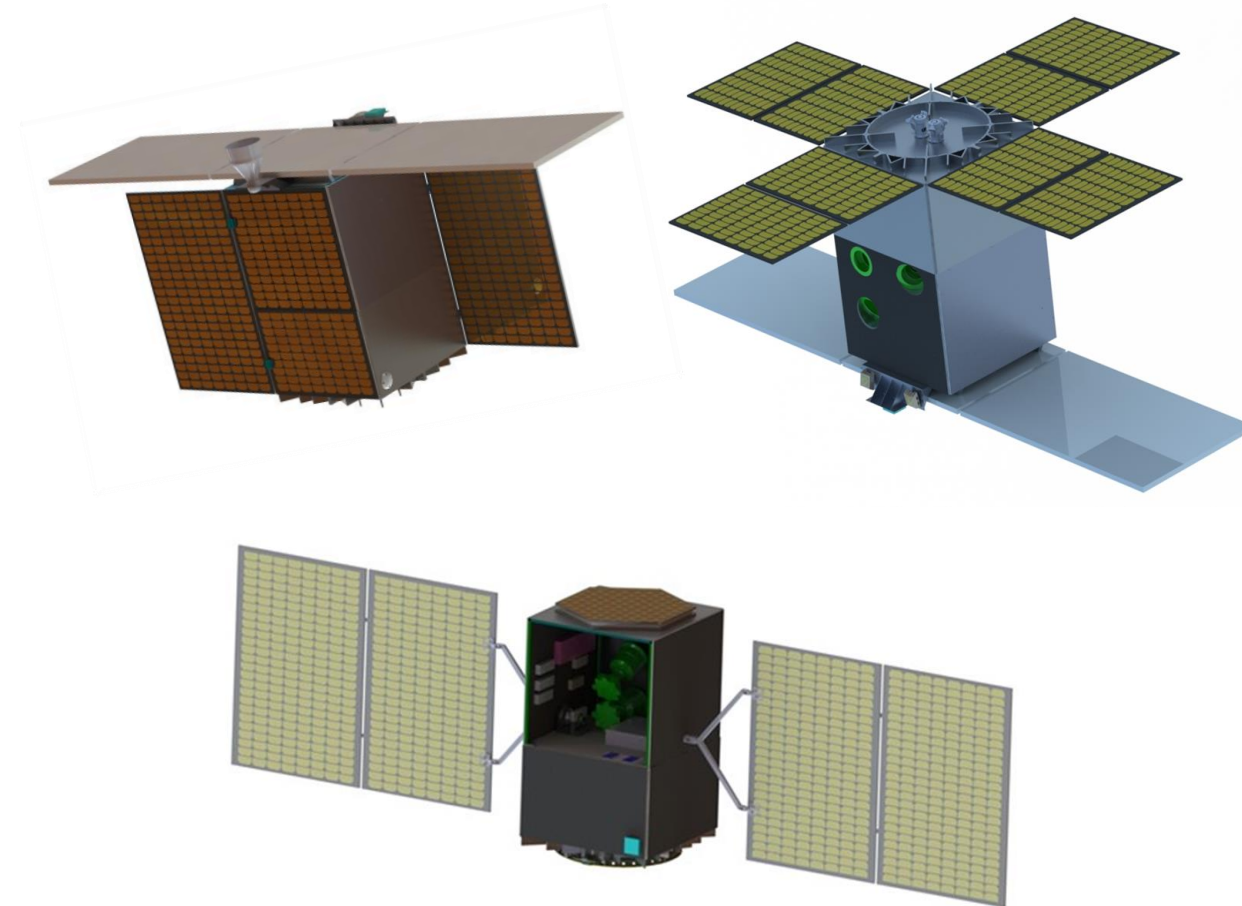




# S-200 Mini-Satellite

## SITAEL S-200

Targeted mission	EO-TLC (multi-purpose) SSO/incl. @350-800 km
P/L max mass	Up to 80 kg
P/L power cons.	Up to 150 W (avg), 750 W (peak)
P/L allowable volume	Up to 750x750x660 mm <sup>3</sup> (LxWxH)
S/C launch mass (kg)	< 200 kg
S/C envelope LxWxH	750 x 750 x 1200 mm <sup>3</sup> (LxWxH)
P/L to S/C mass ratio	0,4
S/C power gen.(W)	up to 1000 W (peak)
Solar array layout	Multiple conf. (fixed, deployable)
Pointing accuracy	<0.035°, 3-axis stabilization
Pointing knowledge	0.009°
Pointing stability	0.0048°/sec
Position accuracy	10m
Slew rate	Up to 5 °/sec
Delta-V	Up to 1 km/s
TT&C	S-band, up to 1 Mbps (TM TX)
PDHT data rate	X-band, up to 500 Mbps
PDHT data storage	Up to 1 Tb
S/C redundancies	Full-cold red.
Lifetime	3 to 5 years



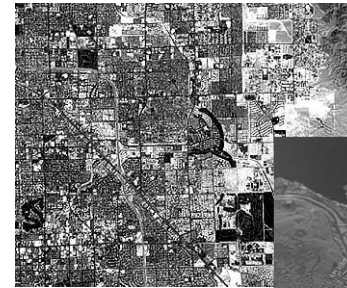
## Current Project: PLATiNO

The PLATiNO platform in different mission configurations

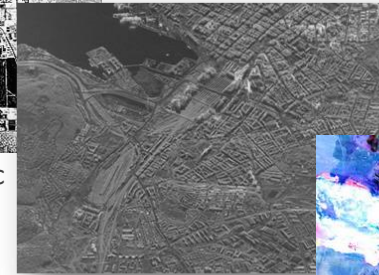


## S-200 Platform

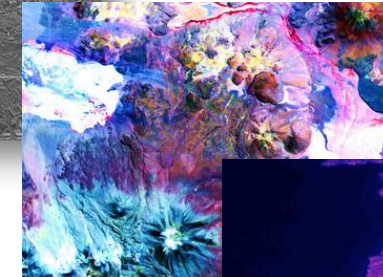
- **Multi-applicability** for a wide set of missions, e.g.:
- Earth Observation missions
  - Hi-Res Optical (LEO and very-LEO):
    - Hyperspectral
    - Panchromatic
    - Very Near Infrared (VNIR)
    - Thermal Infrared (TIR)
  - Mini-SAR, active or passive
- Telecom missions (high throughput or low data rate)
- **Deployment in constellations (> 20 satellites)**



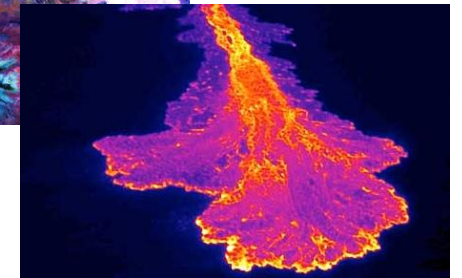
Panchromatic



SAR



VNIR



TIR





# Small Satellites Applications and Services

*Innovative approach to elaborate information from multi-sources data*



*Innovative and efficient Data Integration Centre*

SITael provides “Turn-Key” **Earth Observation services taking care of the complete chain** from the Mission Concept to the Small Satellites Production up to the Ground Infrastructure services.

The **combination of data** from Small Satellites, Institutional and Commercial Satellites, Airborne and In-situ sensors, through an innovative and efficient Data Integration Centre, provide **useful services** for Environmental Monitoring, Humanitarian Aid & Civil Protection, Industrial & Home activities and Security, Surveillance and Defence applications.



Environment



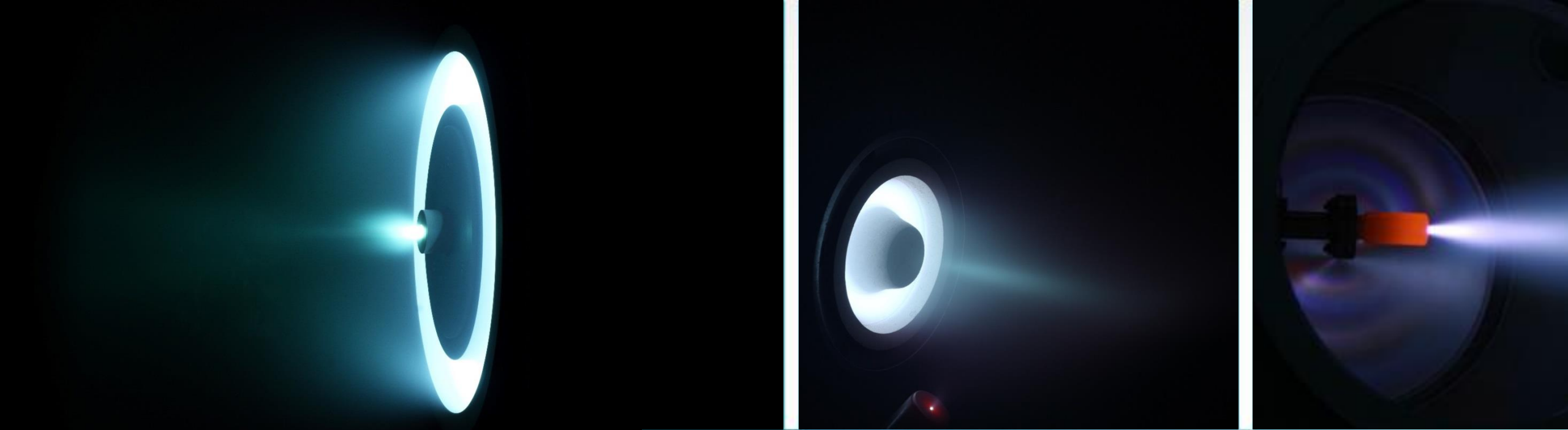
Aid & Civil Protection



Industrial & Home



Security & Defence



# A KEY-ENABLING TECHNOLOGY FOR INNOVATION: ELECTRIC PROPULSION





# Advanced Space Propulsion



# Advanced Space Propulsion

## Turn-key Electric Propulsion Systems for small and large space vehicles

SITAEL is today world leader in development of **Complete Electric Propulsion Systems** (Thruster, Hollow Cathode, PPU, Fluidics and diagnostics).

### COMPETENCES

#### System/sub-system Design

Electric Propulsion, Chemical Propulsion, Liquid Propellant Inducers / Turbopumps, Diagnostics, Propellant Management Assembly, Thermal-Vacuum facilities

#### Manufacturing

CNC machining, Lapping, Plasma Sputtering

#### System Integration

##### Test

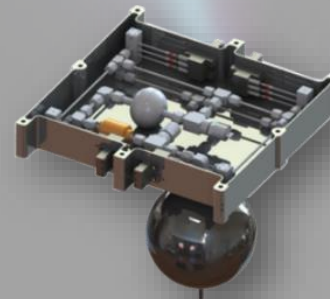
Performance, Endurance, Environmental (TVT, Shock and Vibration), Hypersonics and Aerothermodynamics, Turbopump Cavitation and Rotordynamics, Green Propellant Rockets

#### Analysis, modeling, simulation

PiC & DSMC proprietary codes

#### Propellant Management Assemblies

- Fluidics
- Tank



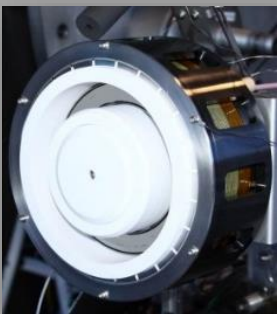
#### Propulsion Electronics

- Power and Processing Units
- High Voltage Power Supply Systems



#### Thrusters Units

- HET
- Resistojet / Arcjet
- FEPP
- MPD

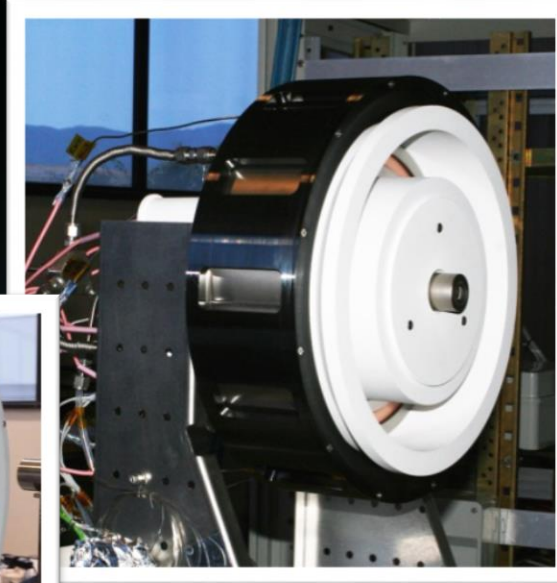






# A Wide Portfolio of Hall Effect Propulsion Systems

HT20k



HT5k



HT400

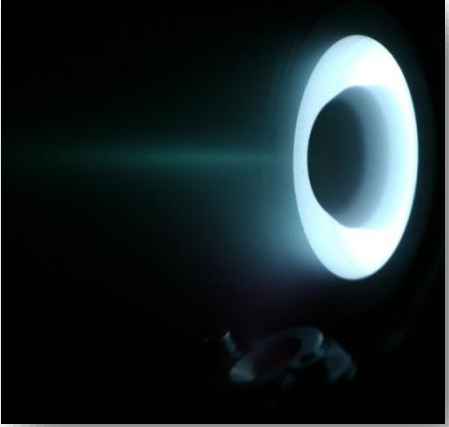


HT100





## Low Power EP Applications (HT100/HT400)

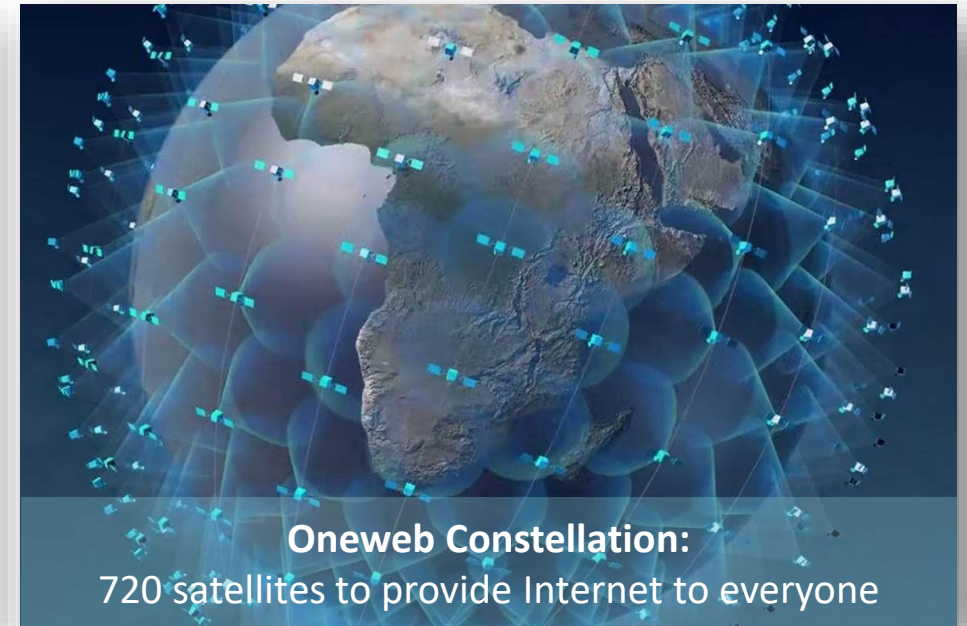


- Orbit maintenance of spacecraft in Low and Very-Low Earth Orbit
- Accurate final orbit insertion after separation from launcher
- Spacecraft end-of-life disposal
- Deployment of small and large constellations



**LEOSAT Constellation:**

78-108 satellites in LEO to provide worldwide Ka-band services



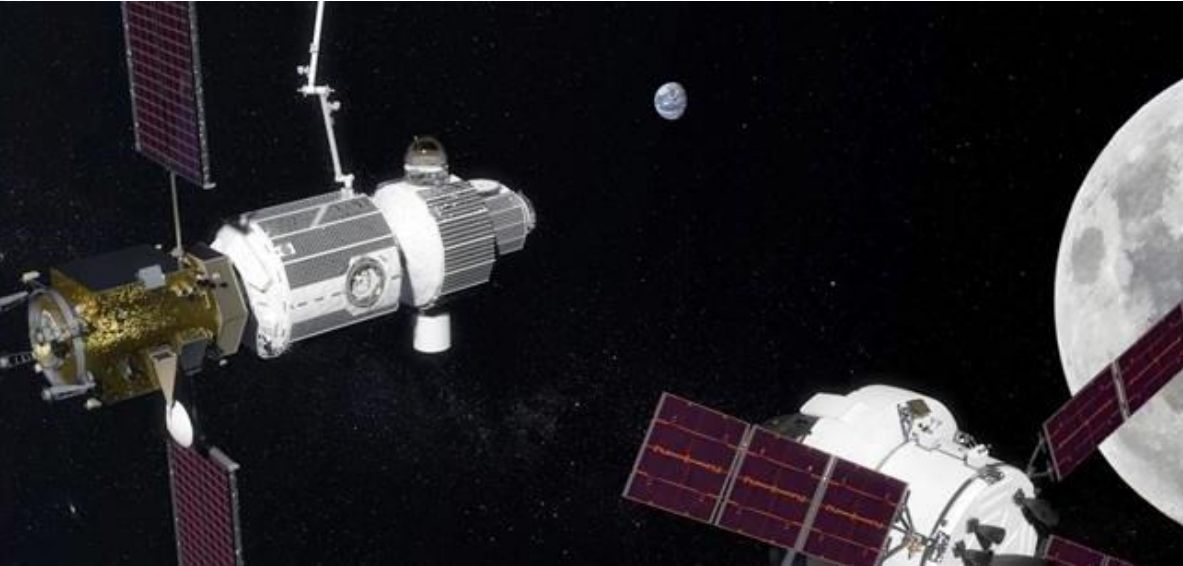
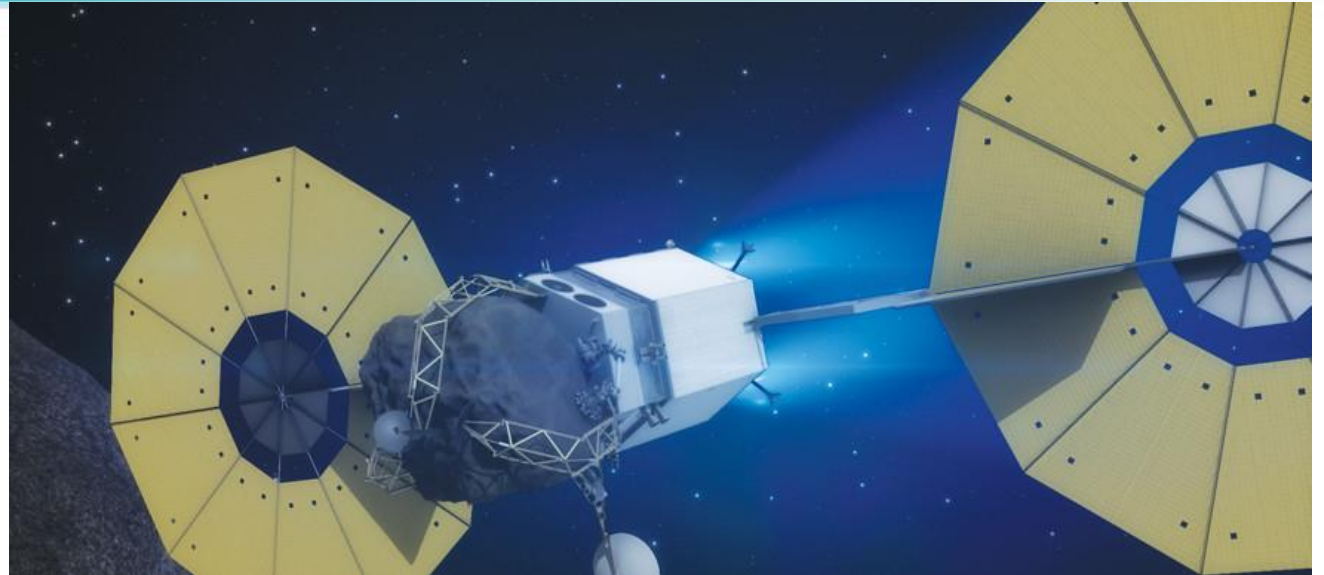
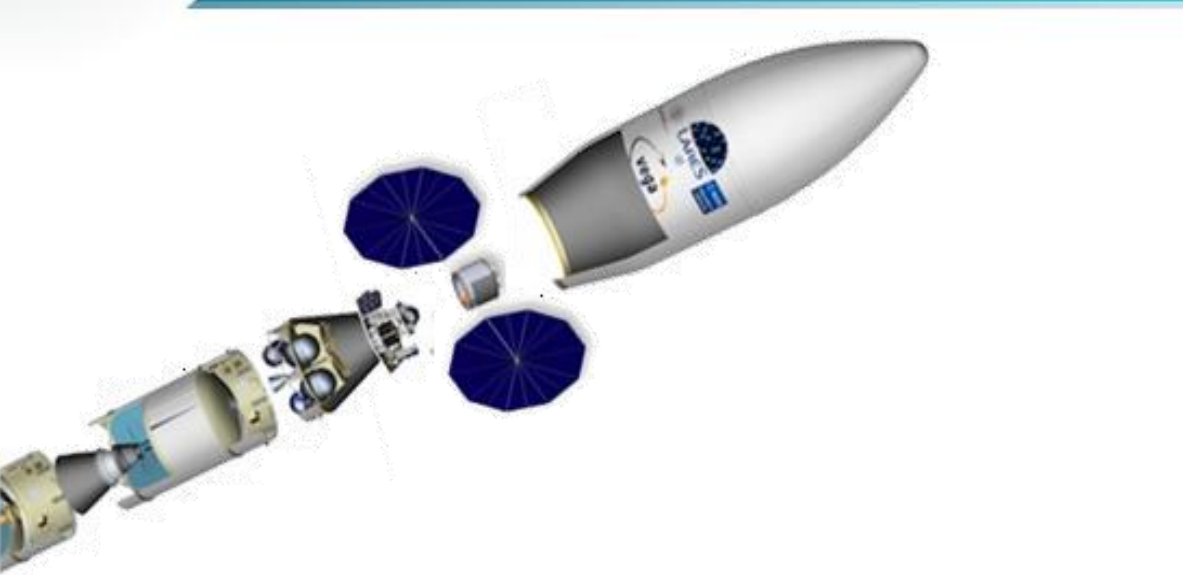
**Oneweb Constellation:**

720 satellites to provide Internet to everyone





## High Power EP Applications (HT5k/HT20k)



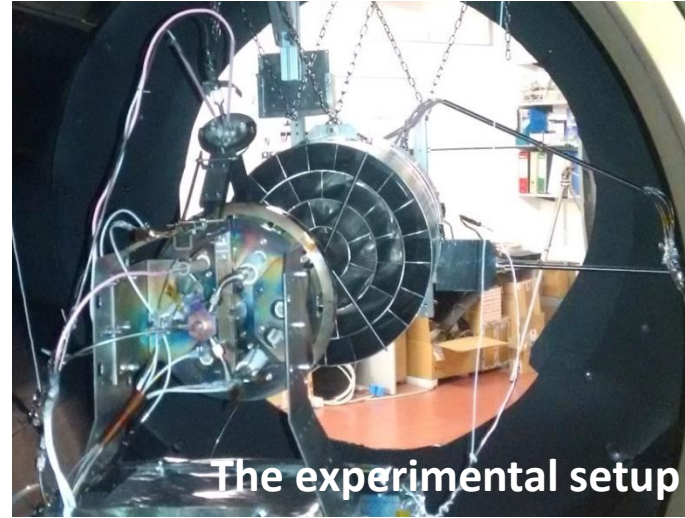
- Orbit Raising and Station Keeping for large GEO satellites
- Launcher upper stage (to increase launcher capability)
- Space Tug (one HT20k or a cluster of HT5k LL)
- Exploration (Cislunar PPM and interplanetary missions)
- Asteroid Redirect Missions (ARM)



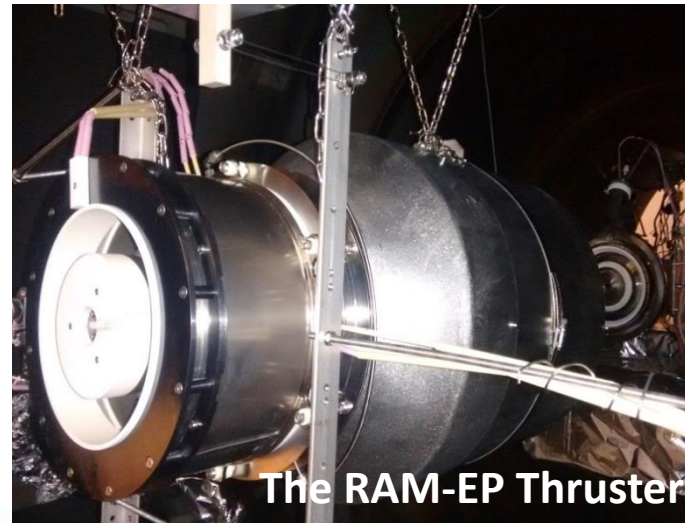
## Disruptive EP: RAM-EP

A world's first experimental demonstration of the RAM-EP concept

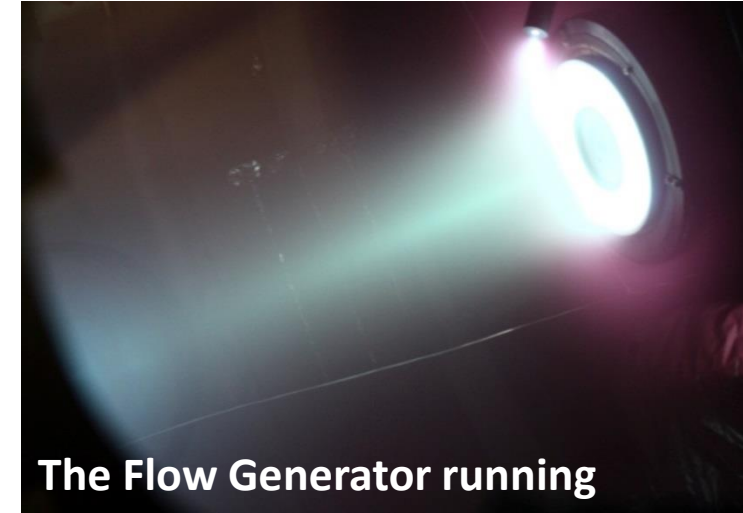
- An innovative approach to enable Electric Propulsion by collecting propellant from atmosphere to produce thrust and compensate drag, to extend LEO mission duration and lower the S/C operational altitude
- The ongoing experimental campaign aims at verifying whether the RAM-EP system can provide a positive net thrust
- The Particle Flow Generator can be operated either on Xe or on N<sub>2</sub> / O<sub>2</sub> mixtures simulating the atmospheric composition at 160-250 km



The experimental setup



The RAM-EP Thruster

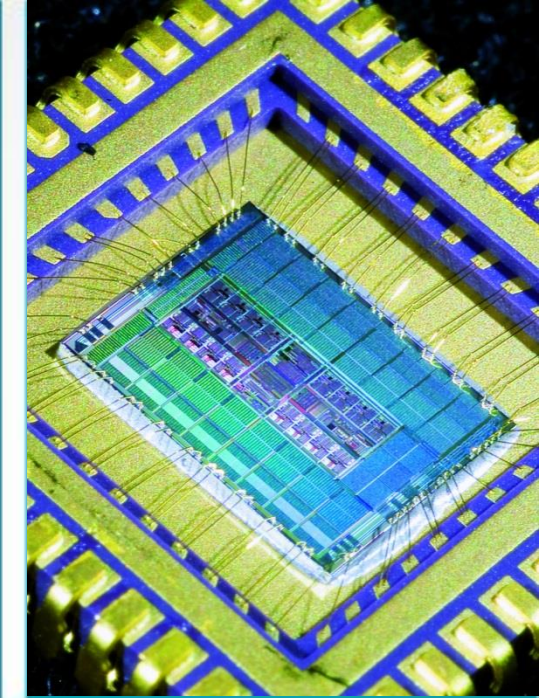
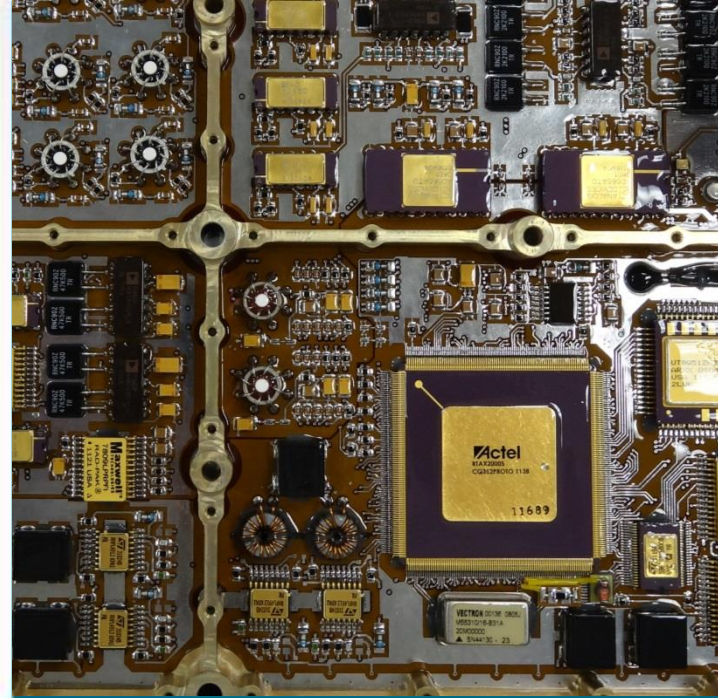
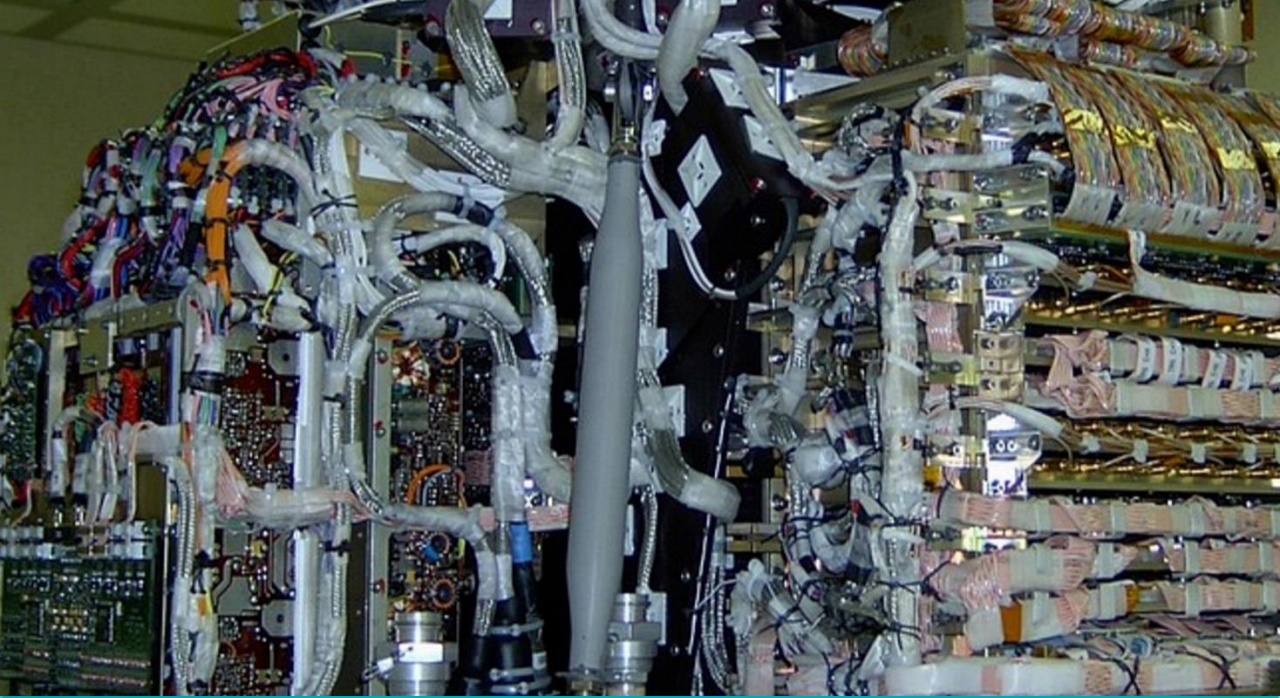


The Flow Generator running



The RAM-EP test firing





## A SOLID BACKGROUND ON HI-REL AND COTS-BASED PLATFORM AND PAYLOAD AVIONICS





# INSTRUMENTS AND AVIONICS



Since more than 20 years SITAEL is designing and producing electronic equipment for large space missions. Nowadays SITAEL is one of the leading companies providing **innovative Earth Observation Payloads and Avionics for spacecraft and launchers.**

## COMPETENCES

### Design

- Feasibility study/product specification
- FW/SW development
- Design Analysis (FMECA, PSA, Radiation, ...)
- Schematics, Layout, Mechanical design
- Prototyping
- Rad-tolerant ASIC/FPGA
- Design & Layout

### Production

- Space qualified manual assembly in SMT and THT
- High-Rel Automatic Assembly in SMT and THT

- Coating, Potting, Anodization
- Automatic Optical Inspection (AOI) and X-Ray (XCT) ctrl
- System integration
- ASIC manufacturing and assembly management

### Test

- Functional and Electrical Characterization
- Environmental (TVT, Vibration, Shock), EMC
- Radiation Verification Test
- Management
- ASIC Screening and Qualification Management
- FPGA PPBI Management





# Space Power, Data and Control Avionics

## POWER, DRIVE AND CONTROL



High, Low and Medium Voltage Power Supplies



Drive Electronics for Cryocoolers

Power and Processing Units for Electric Propulsion



EGSE, Unit Testers



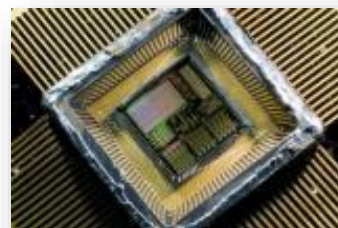
On Board Computers



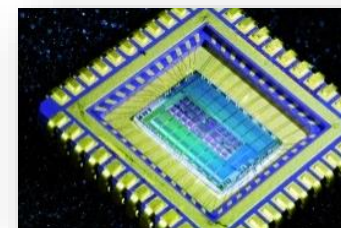
## DATA & COMMUNICATIONS



ASIC



IP Cores



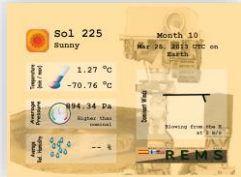
## SPACE MICROELECTRONICS





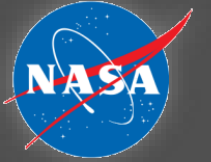


## Success Stories: Curiosity and AMS-02



### With Curiosity on Mars

On 5 August 2012 10:31 p.m. PDT, NASA's Mars Science Laboratory ("Curiosity" Rover) landed on Mars surface. SITAEL developed a key component in the mission, the **REMS ASIC**, a miniaturized device able to withstand Mars' extreme radiations and temperatures. Installed inside the weather monitoring station of the rover, the integrated circuit is currently taking measurements for five minutes every hour, on Mars' environmental parameters (Wind, Humidity, Temperature), giving an invaluable contribution to the mission's.



### With AMS-02 on the International Space Station

On May 19th 2011, the AMS-02 has been safely installed on the ISS and then successfully activated. For 10 years the experiment will use the unique environment of Space to study the Universe and its origin by searching for antimatter, dark matter while performing precision measurements of cosmic rays composition and flux. SITAEL provided about 80% of electronic devices for all the AMS-02 sub-detectors, working perfectly since payload switch on, thus allowing AMS-02 data collection.



WORKING FOR SPACE MISSIONS SINCE MORE THAN 20 YEARS

TELECOM, EARTH OBSERVATION, SCIENCE AND EXPLORATION





# Main Space Customers







# LOOKING FOR AN AUSTRALIAN FOOTPRINT





# IAC 2017 - The Letter of Intent between **SITAEL** and **Inovor**



South Australian Minister for Defense and Space Industries **Martin Hamilton-Smith** with Mr. **Nicola Zaccheo**, CEO of SITAEL and Dr. **Matthew Tetlow**, CEO of Inovor Technologies



**Aim:** partnering on the development of a new small satellites product line

**Strenght:** Complementary capabilities in designing, developing and manufacturing nano, micro, mini satellites and ground stations

**Plan:** Investments in resources and infrastructures for a novel Australian Satellite Manufacturing Plant





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Thank you.

