

Abstract for Regional Report

at the 7th UNISEC–Global Meeting

Prof. Fernando Aguado

Point of Contact

Unisec Global. UVIGO

POC – Spain

Tokyo, December 2, 2019

UVIGO Activities

- Tailoring of Quality Standards →
- Small Satellites
- System Design: End → End



- Technological Demonstrator <-> New Technology



- International Cooperation
- Application (Amazonia)



- System of Systems
- FIRE –RS Fire Detection and Mapping



- Mixed Research Unit: Industry 4.0
- 6U Remote Sensing Satellites

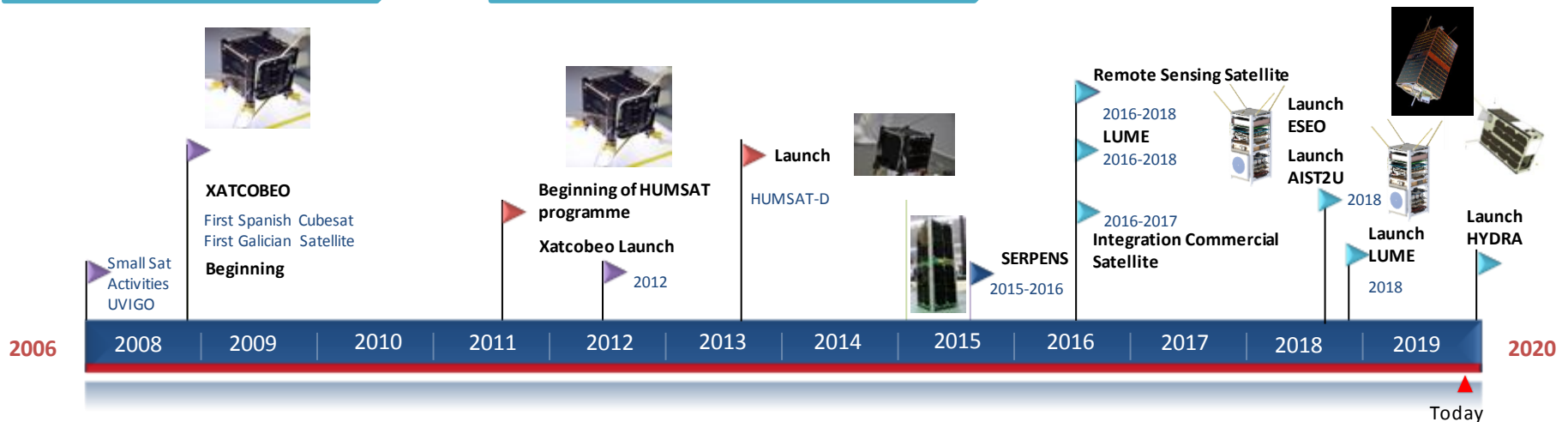


Research–Industry 4.0 UVIGO/CINAE

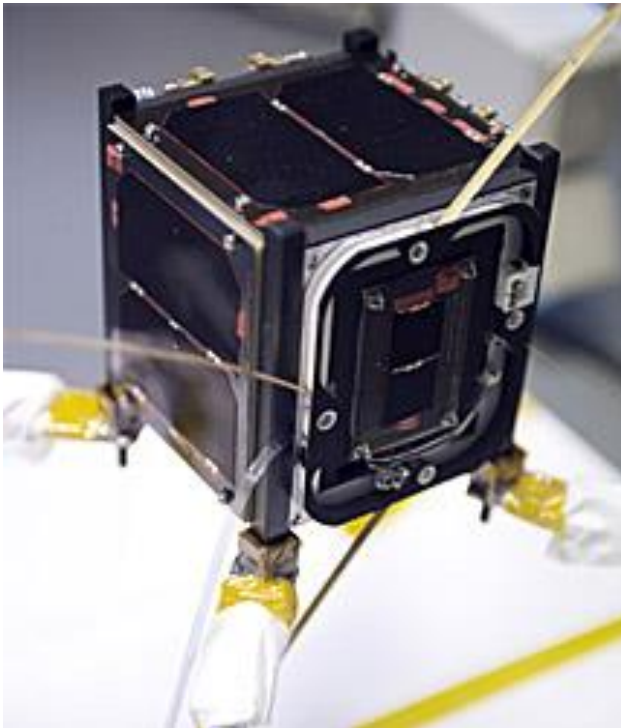
- Commercial AIV
- Constellations



January 2019 - Start-up Alén



Satellite Missions: Xatcobeo



- First spanish cubesat (1U)
- Three Payloads:
 - Software defined Radio.
 - Radiation Sensor
 - Panel deployer mechanism.
- Satellite developed tailoring the professional standards of the ESA (ECSS)
- Launch in inaugural Vega flight (13/02/2012)
- 2.5 Years of operation (re-entry)

Satellite Missions: Humsat-D



- Second spanish cubesat (1U)
- Two Payloads:
 - HUMPL (Messages communications system)
 - Radiation Sensor
- Humsat Constellation demonstrator
- Launch in Dnepr (November 2013)
- 1 Year of operation



Satellite Missions: Serpens

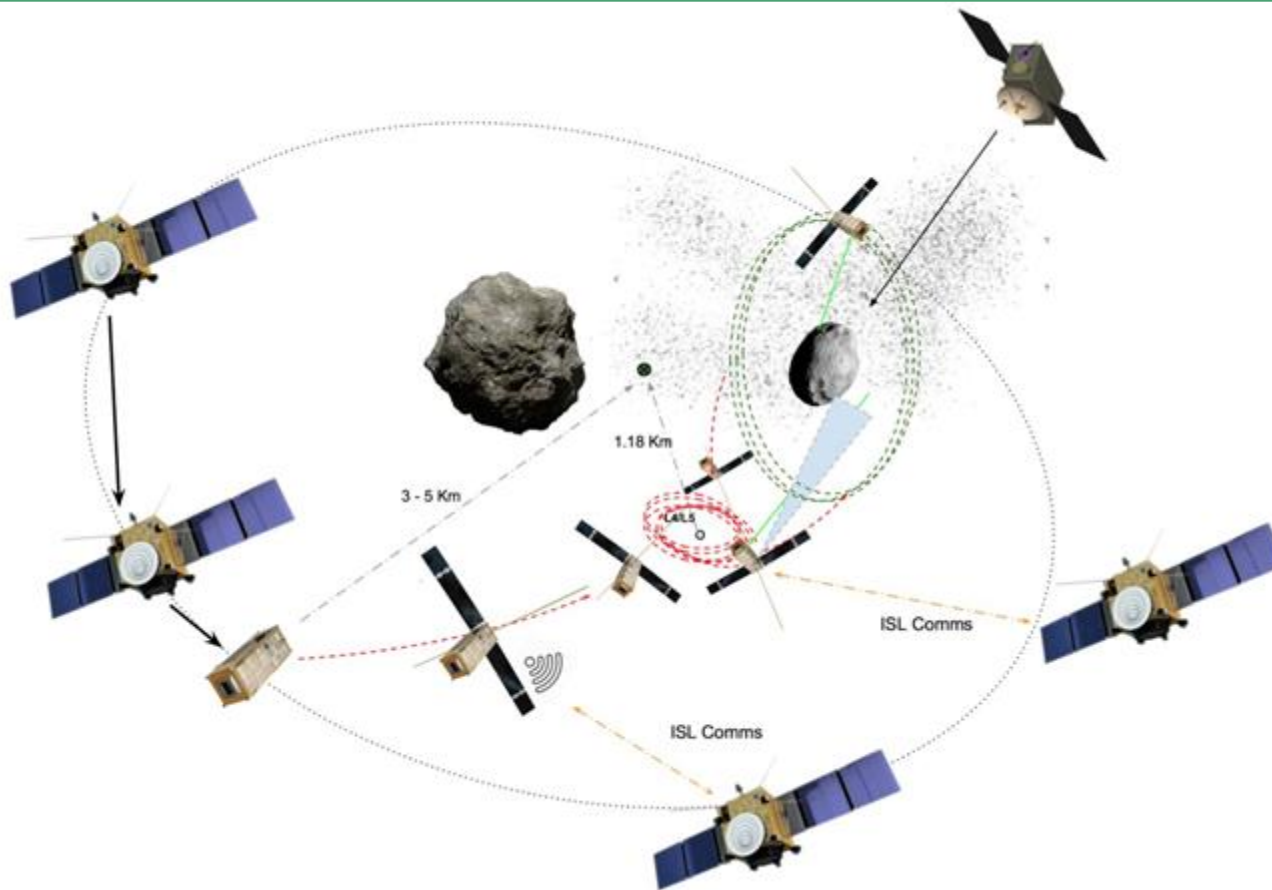
Sector B
Humsat
Satellite

Sector A
Brazilian
University
Consortium



- Third Cubesat of the Team (3U)
- Funded by Agência Espacial Brasileira (AEB)
- Two different sectors. Sector-B fully developed by UVIGO
- 2° Humsat Constellation service tested to:
 - Europe, South-America, EEUU, Antarctica
- Launch from the ISS (19/08/2015)
- Re-entry at April 2016
- Automatic Operations, more than 50000 Telecommands executed by Serpens (Sector-

Dustcube – Asteroid impact Mission



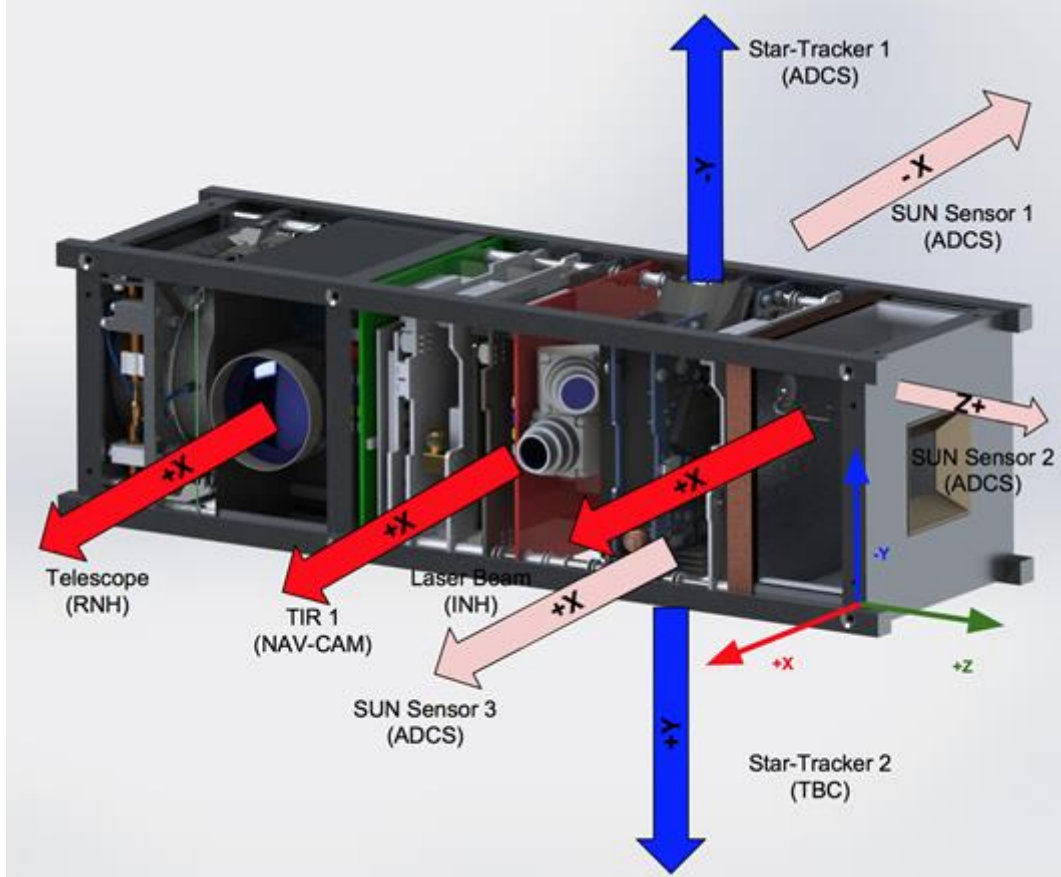
Concept of Operations Phases

1. Cruise
2. Injection
 - a. Commissioning
3. Pre-Impact
4. Impact
5. Post-Impact
6. Disposal (TBD)

Discussion (per phase):

- Duration
- S/C main OPS activities
- Level of Autonomy
- Derived Requirements for AIM S/C

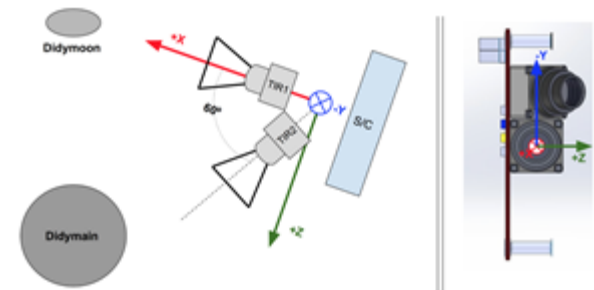
SC Configuration (Optical



ion)

Optical components orientation during nominal OPS:

- RNH Telescope + NAV Cams located within +X Face
 - Pointing towards Didymos system
- INH Laser Beam: located within +X Face
 - Pointing towards Didymos system
- Star-Tracker(s): located within -Y and -Y (spare)
 - Pointing towards deep space avoiding the system and Sun.
- Fine Sun sensors: (x3)(TBC):
 - SUN-1: Face-X
 - SUN-2: Face-Z
 - SUN-3: Face+X
- Coarse Sun sensors: (TBC): installed on solar panels.



Satellite Missions: Fire - RS



LUME Architecture

Satellite LUME-1 :

- ❑ Communication with remote devices M2M-IoT
- ❑ Communication with UAVs
- ❑ Onboard processing unit

LUME configuration

Type: 2U Cubesat

Orbit: SSO Ap: 520 Km Pe: 485 Km

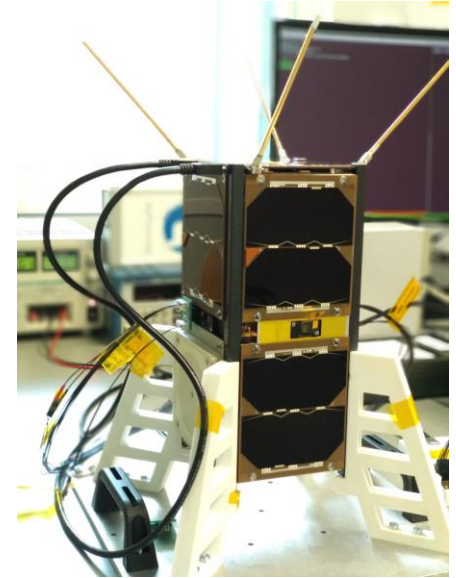
Orbital Period: 94.5 Min

Coms Band: UHF/S-Band/L-Band

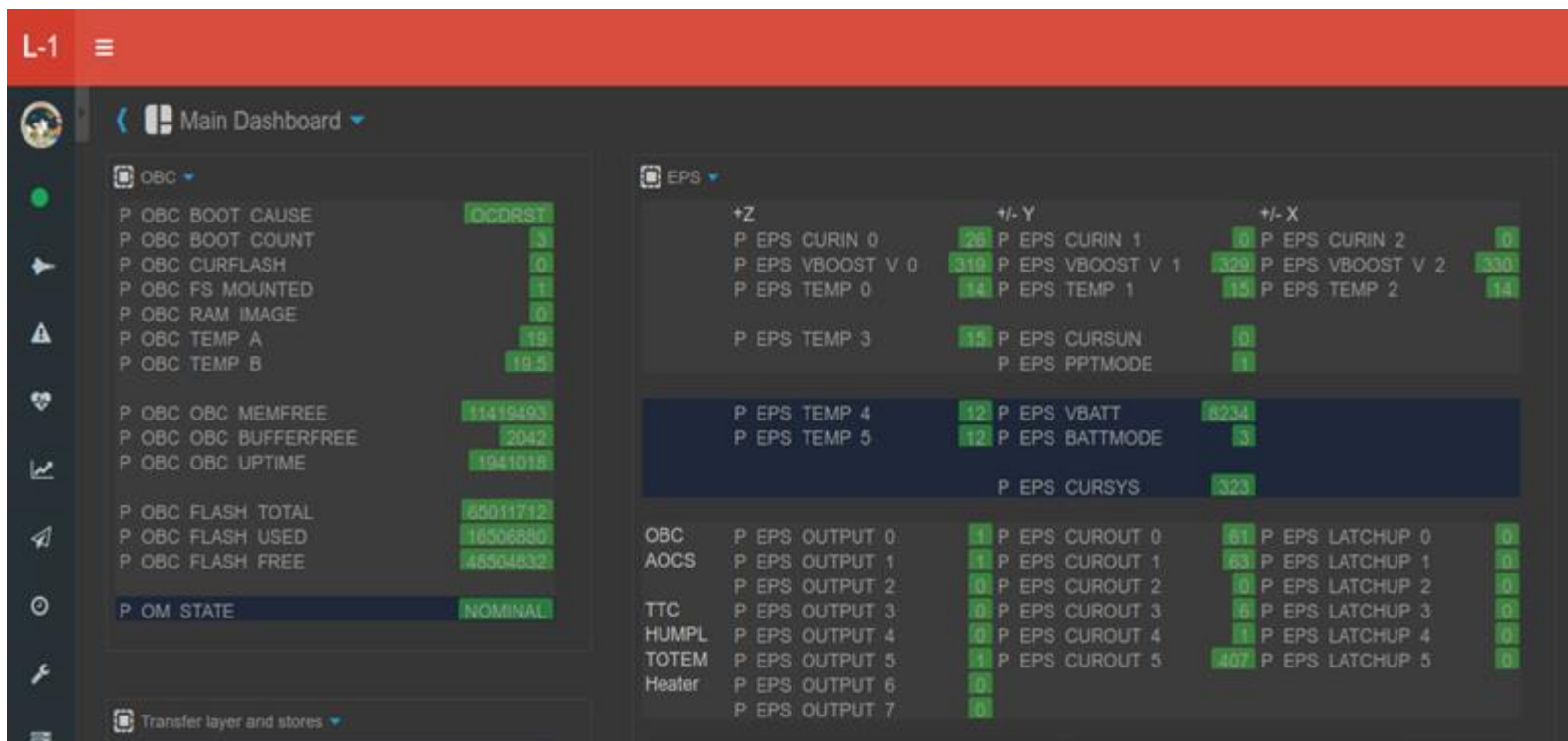
Launc: 27-12-2018. Soyuz

Payload: M2M - SDR TOTEM + HUMSAT

Test Area: SUDOE (Galicia + North of Portugal).



SDR Results



SDR Results



Regional Point of Contact since 2011

- *Attended UNISEC-Global Meeting in 2012, 2017 and 2019*
- *Organized MIC Seminars, Workshops in 2012 and 2013*
- *CanSat Training Program/Competition in the course 2019-20202 in cooperation with the European Space Agency*
- *Practical Space Projects*
 - *5 CubeSats already launched.*
 - *More than 100 students have participated in the educational and research activities since 2007.*

UNISEC-Global Activities in 2019



**Number of

- Member Universities: 1 (4 Engineering Schools: Telecommunications, Industrial, Software and Space)
 - Students: 10
 - Professors: 4
 - Others (Corporate members, etc.): Alén Space (spin-off company of UVIGO))
-
- *Organizing a Program/Training/Competition*
 - *Master Degree on Systems Engineering*
 - *Operation Training using LUME-1 satellite*
 - *UNISEC-Global Meeting attendance: 2019 in Japan*
 - *On-going Practical Space Projects : 3*
 - *Wiptherm (Wireless Power Transmission – H2020 project)*
 - *Operation of LUME-1 satellite*
 - *Arcoptix with the European Space Agency.*
 - *CanSat Competition/Training: 1 in cooperation with the European Space Agency*

Plan for 2020 and beyond

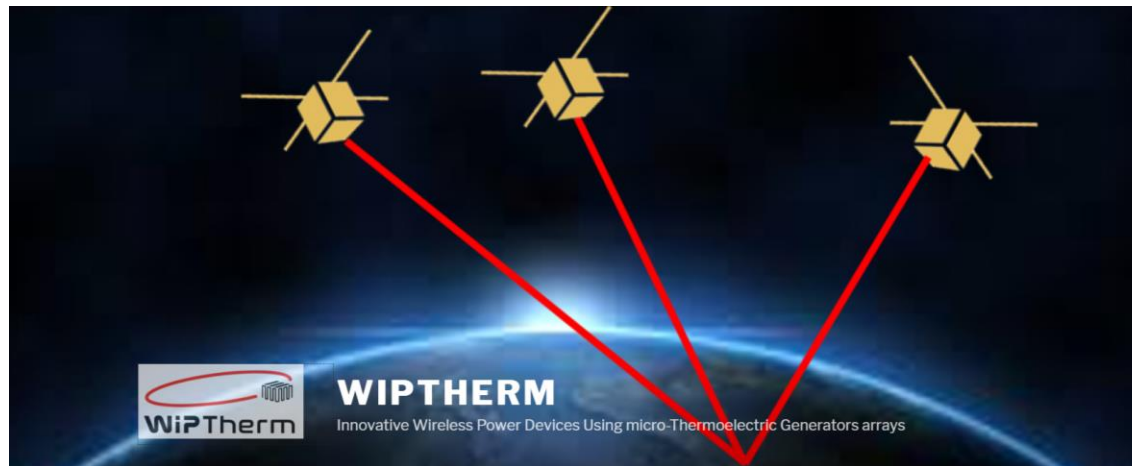
Please describe plan for 2020 and beyond in your local chapter and the region.

- *Establish a student lab for nanosatellites*
 - *Telecommunications*
 - *Software*
 - *Aerospace*
 - *Mechanical*

Launch every 2-3 years a complete manufactured in-house by students -> Coming back to the Cubesat origins

Plan for 2020 and beyond

- *Consolidate the Cansat program with regional secondary schools.*
- *Initiate a Laser Communication Program for Nanosatellite missions, including the participation of the OGS located at the Astrophysics Institute of Canarias Islands in Tenerife.*



Mission and Objectives of FET actions are expected to initiate radically new lines of technology through unexplored collaborations between **advanced multidisciplinary science and cutting-edge engineering**.

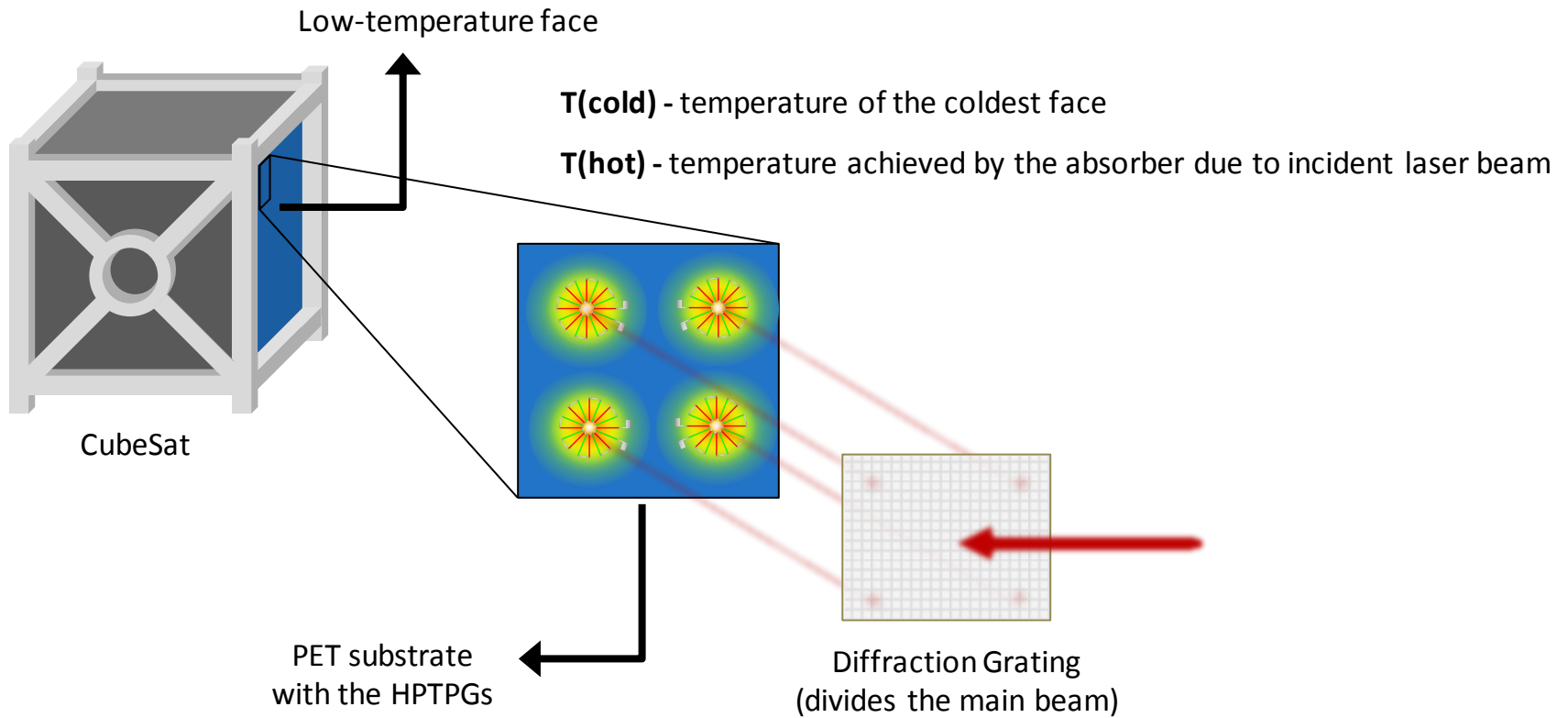
FETOPEN-01-2018-2019-2020 - FET-Open Challenging Current Thinking

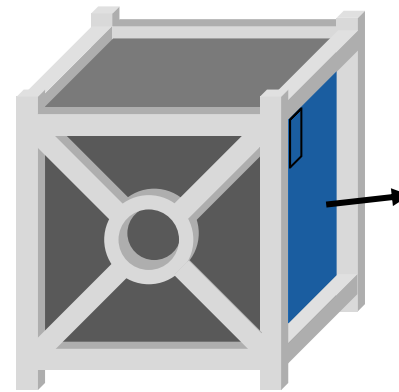
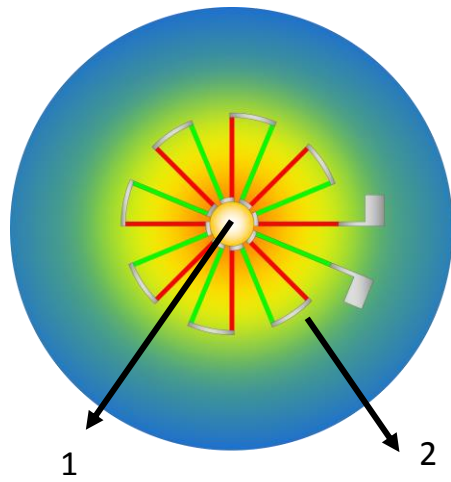
MEMBERS OF THE 2.3 M€ Project CONSORTIUM

- University of Porto (Science Faculty)
- Centiv
- University of Limoges
- Inesc TEC

OBJETIVES

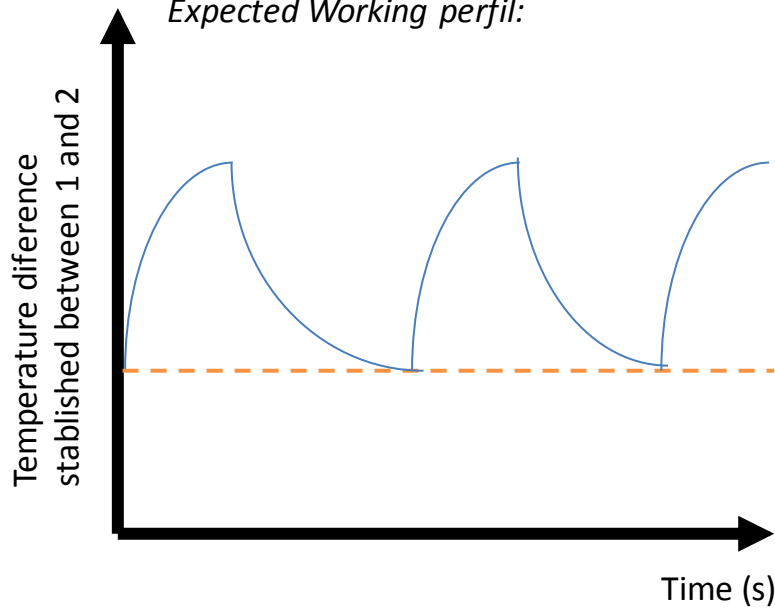
- The WiPTherm project will design, implement and pilot an innovative Wireless Energy Transfer (WET) system, able to wirelessly recharge the energy storage components used in CubeSat technologies.
- The energy harvesting system comprises dozens of microarrays of 2D thermoelectric generators, resulting in a photo-thermoelectric plasmonic (HPTP) system that has the ability to convert photon energy into electrical energy (via thermal gradient).
- The wireless thermal stimulation will be performed through a large-range pulsed highpower laser beam capable of operating remotely





Under operation (laser working), the average temperature of this face should not surpass the highest temperature threshold possible for the cubesat.

Expected Working perfil:



Maximum
as possible