

Stratospheric platforms and nano-satellite development for science, engineering and education at UNAM, México

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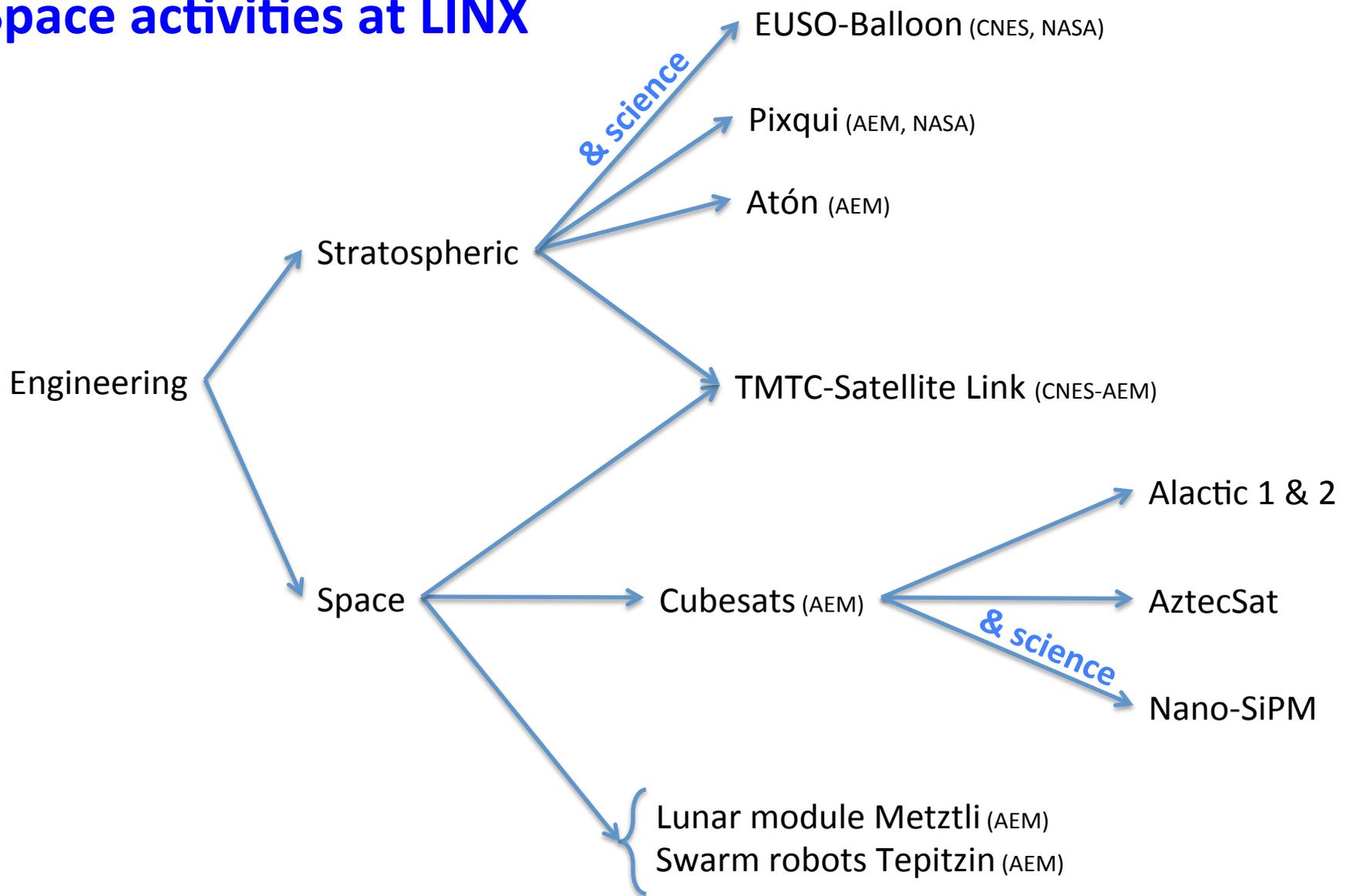
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Mission → development of:

- Space instrumentation for science and engineering
- Infrastructure for space technology
- Human resources in space engineering

Space activities at LINX



Stratospheric platforms

- Easy and fast suborbital access for educational, engineering and scientific applications
- Support for atmospheric & oceanographic research
- Support for meteorological forecasting and mitigation of climatic catastrophes



Stratospheric access in Mexico

Three mass scenarios for payload:

Less than 3 kg → ATON → @ Mexico with local logistics and infrastructure

Between 3 and 30 kg → Pixqui → as piggy-back (NASA, etc.)

More than 30 kg → e.g. EUSO → international scientific cooperation

EUSO-Balloon:
Timmins, Canada, August 24th, 2014

Management and flight vehicle: **CNES**

Collaboration countries:

France

Germany

Italy

Japan

Korea

Mexico

Poland,

Spain,

USA



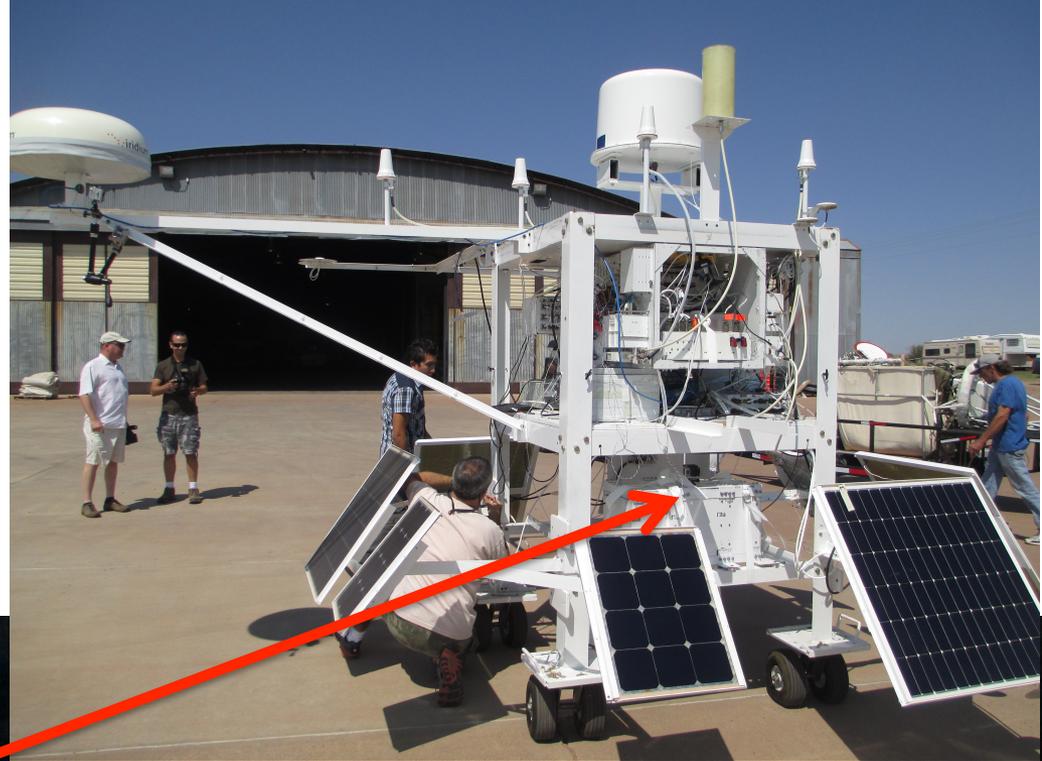
Piggy-backing: PIXQUI

First flight: PIXQUI v.1

Fort Sumner, NM, USA

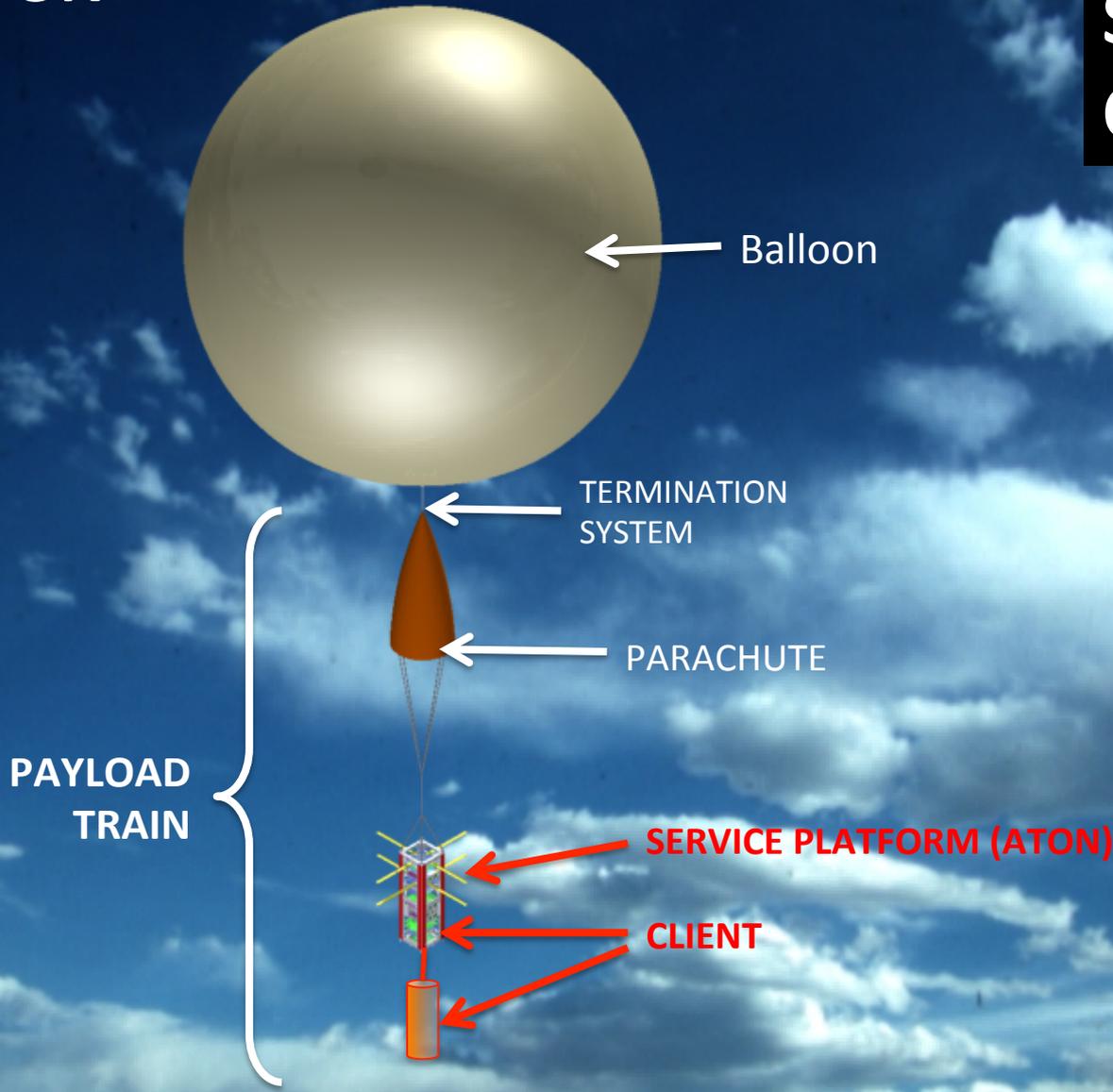
August 2013

Agreement: ICN-UNAM/AEM/NASA

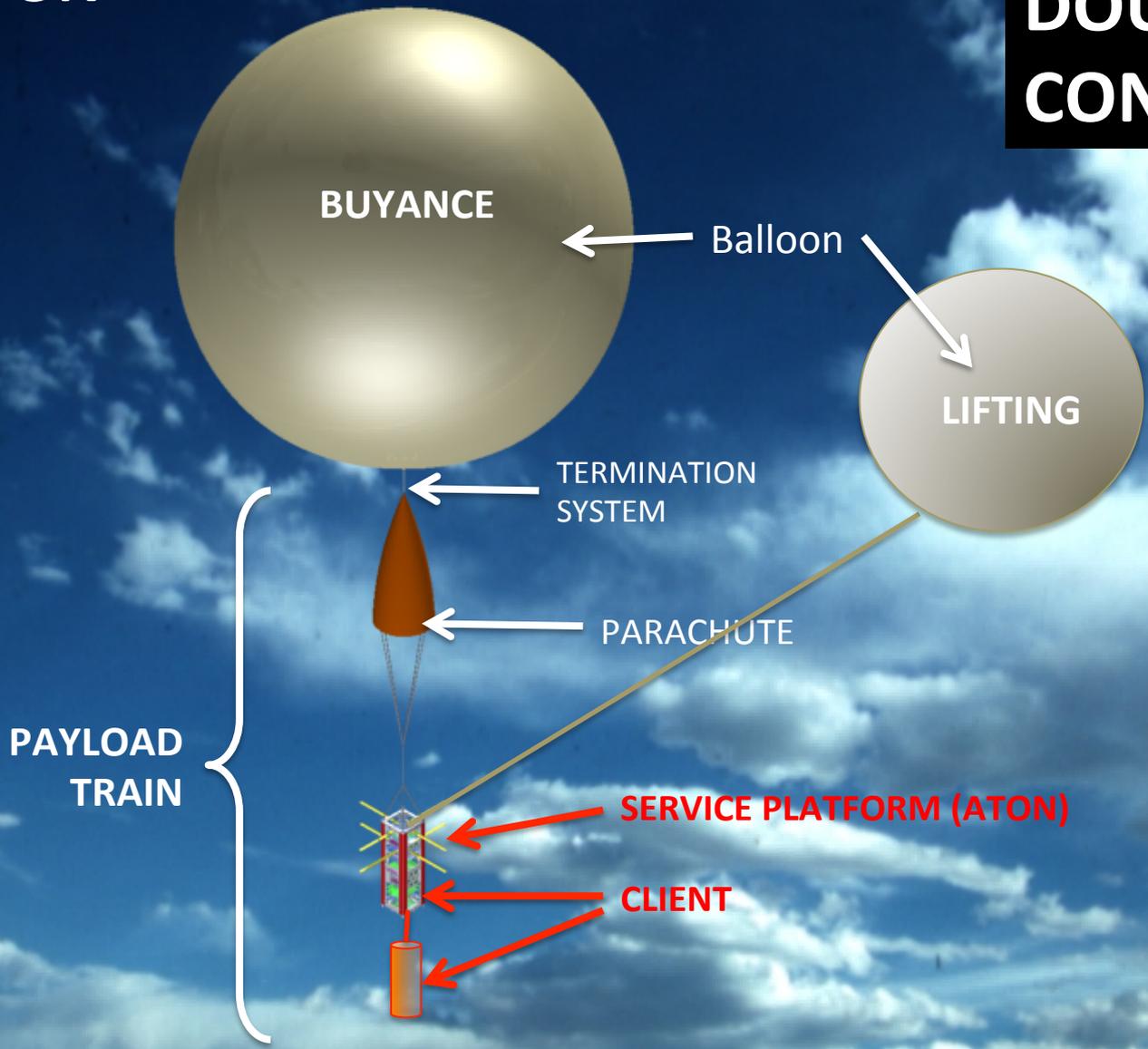


ATON

SINGLE BALLOON CONFIGURATION



DOUBLE BALLOON CONFIGURATION



ATON structure

Parachute support +
Bluetooth cutting system
LED flasher

Beacon sytem

Secondary battery pack

COMM1

OBC (hot-redundant)

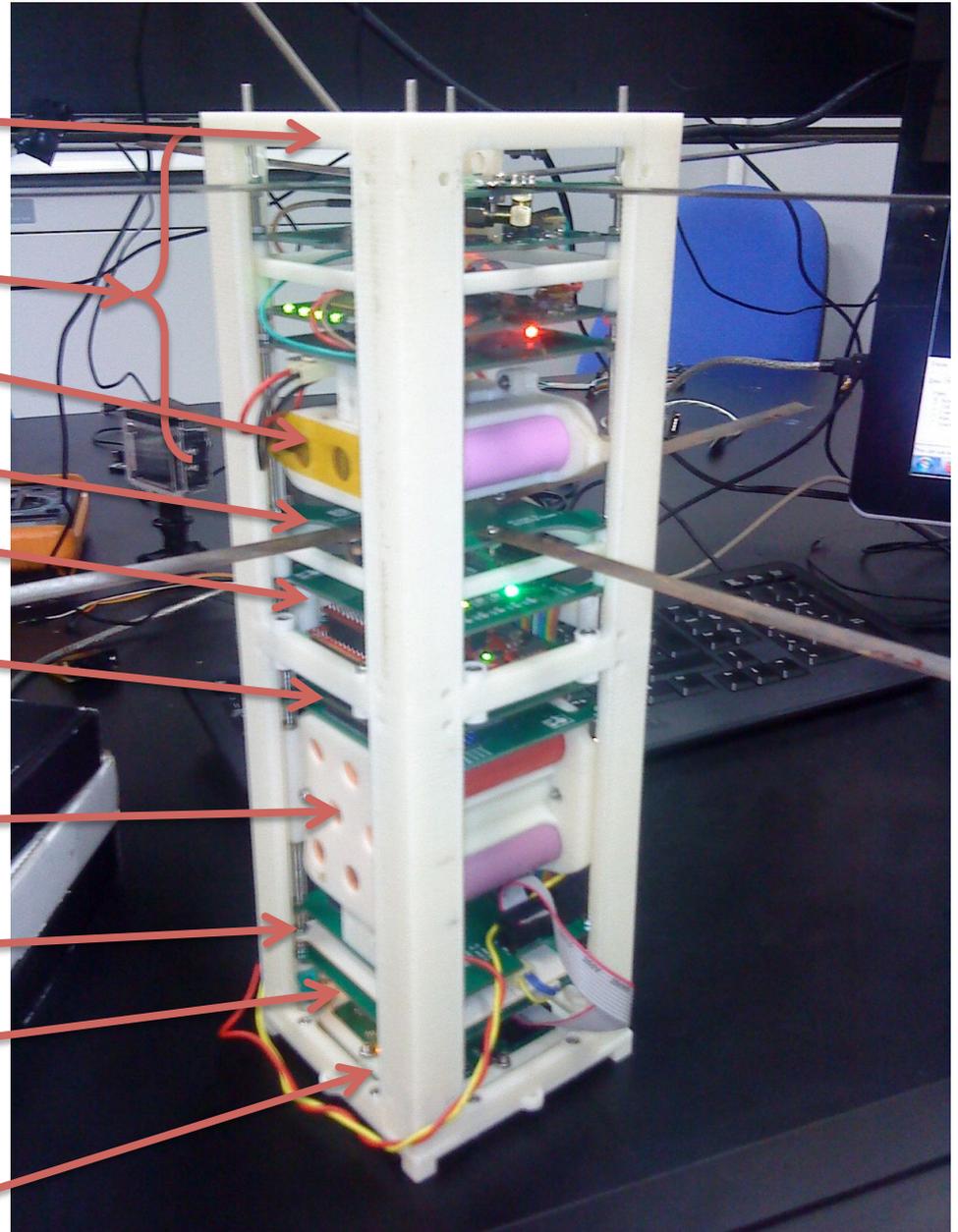
Monitoring: GPS, magnetometer,
giroscopes, accelerometers (x,y,z),
P, T, V, I

Main battery pack

Switches & debbuging connectors

SoC (HigRes immagine processing)

Secondary imaging system (GoPro)
Landing sound alarm



Differential Serial connection to client

Aton:
tethered flight tests (2015)

Target:
Meteorological applications
@ sea



Aton: Guadalajara (12/2015) free flight

Payload train (3kg):
Aton: monitoring & service platform
Sub-payload (user): TubeSat



Stratospheric balloon facility

Launching and payload assembly

To be built at Hidalgo state north of Mexico City



Stratospheric balloon facility

Launching base



Stratospheric balloon facility



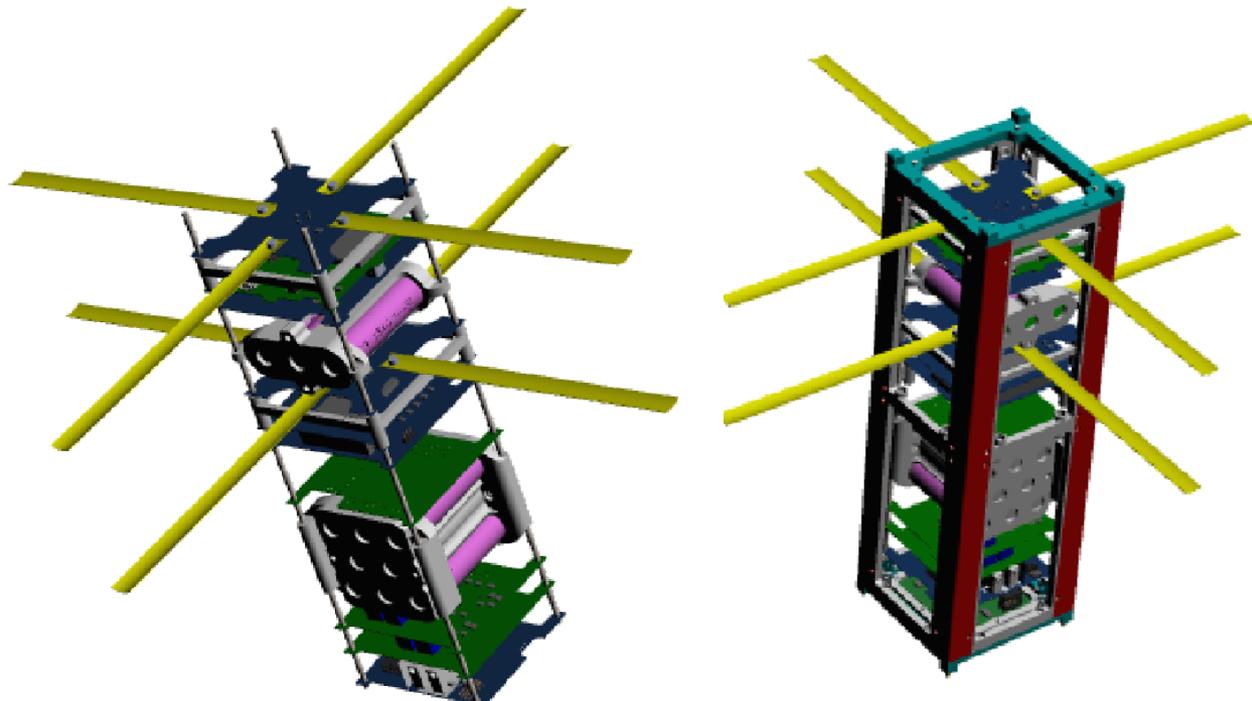
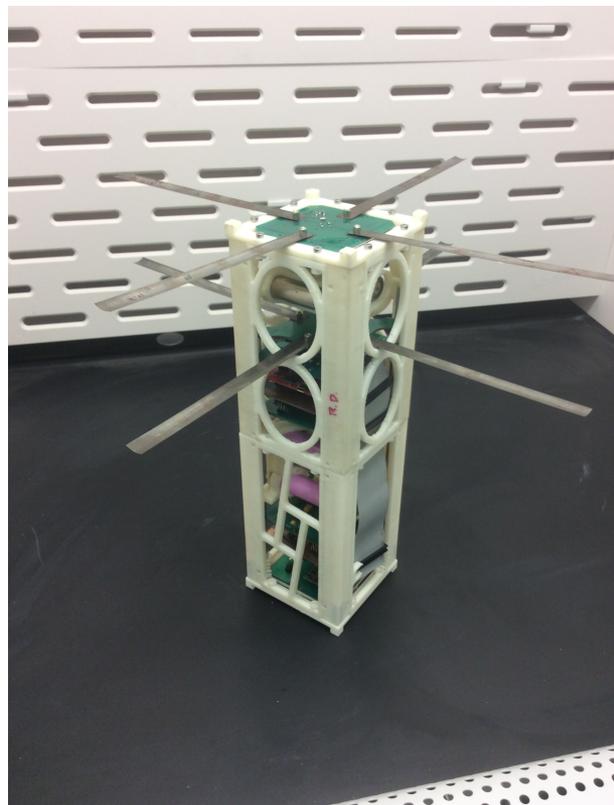
Nano-satellites

- Educational, engineering and scientific applications



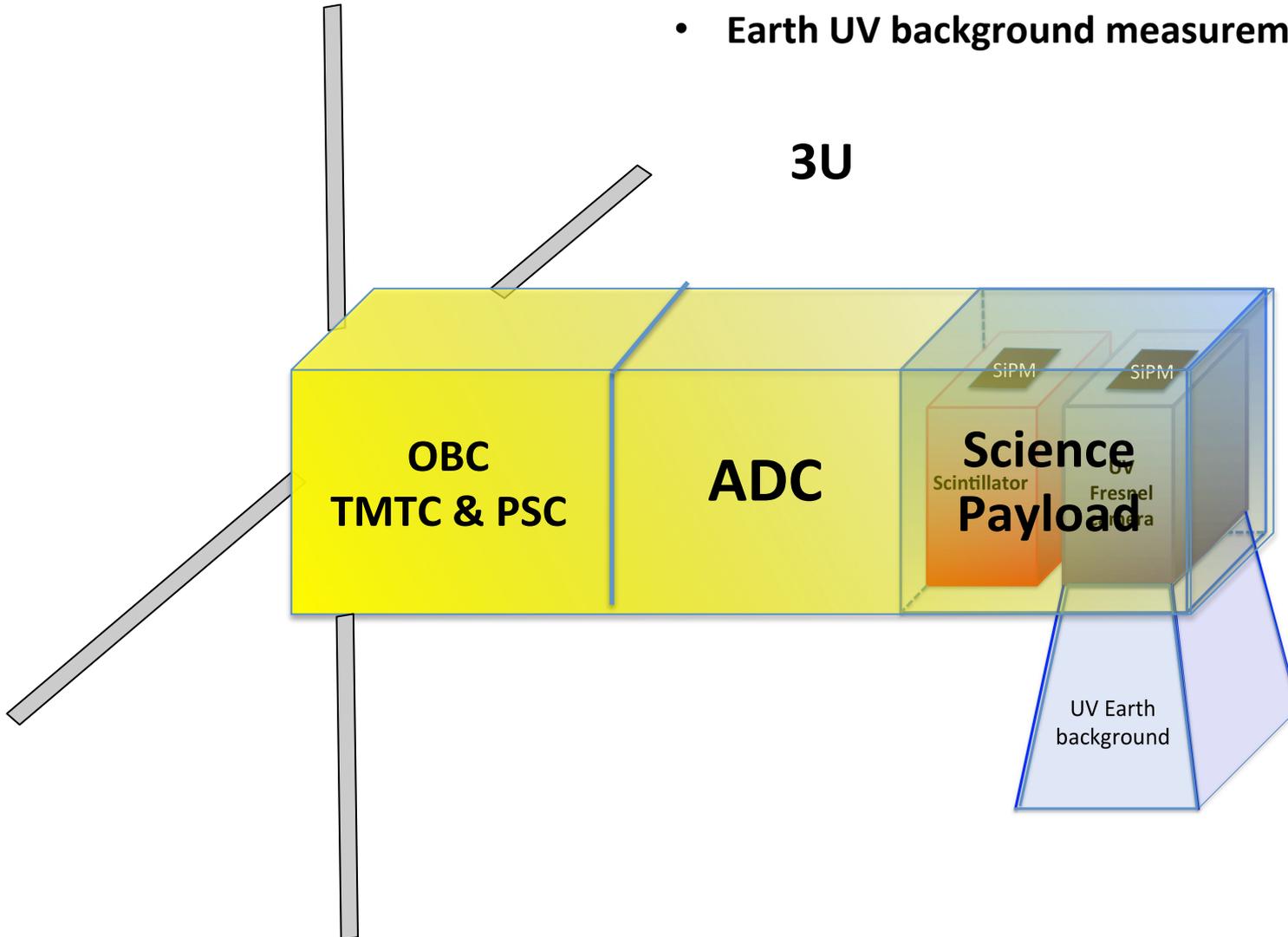
Nano-sats: CubeSat standard / engineering demonstrators + science

- ALACTIC 1 (3U) → Parabolic flight (2016) → Engineering
- ALACTIC 2 (3U) → Orbital flight (2016/2017) → Engineering
- AztecSat (1U) → Orbital (2017) → Telecomm testing
- Nano-SiP (3U) → Orbital (2017) → Sci/Eng: astroparticules & UV bckground

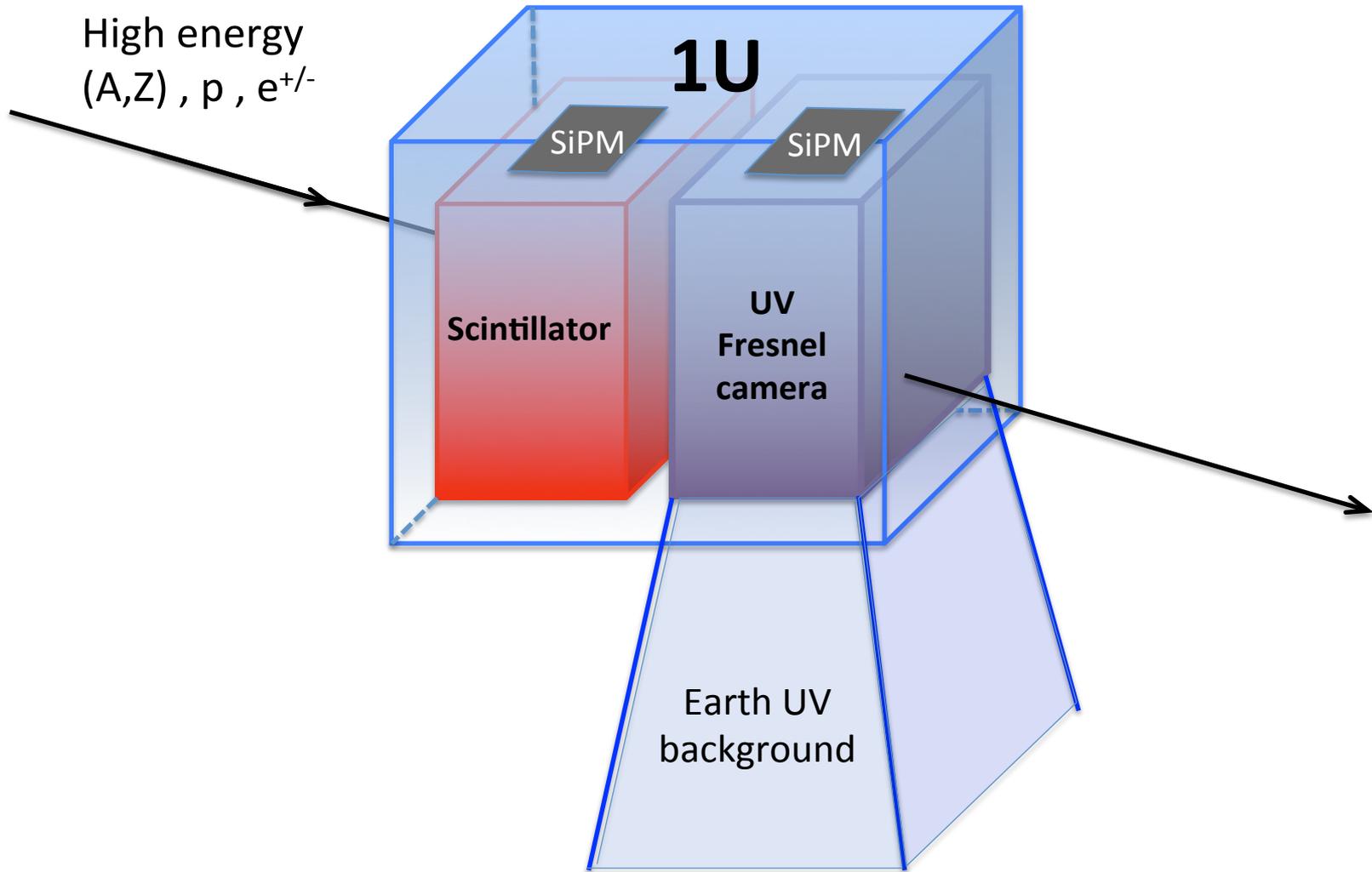


Nano-SiPM science cubesat

- Validation of SiPM for space science applications
- Earth UV background measurement



Nano-SiPM science payload



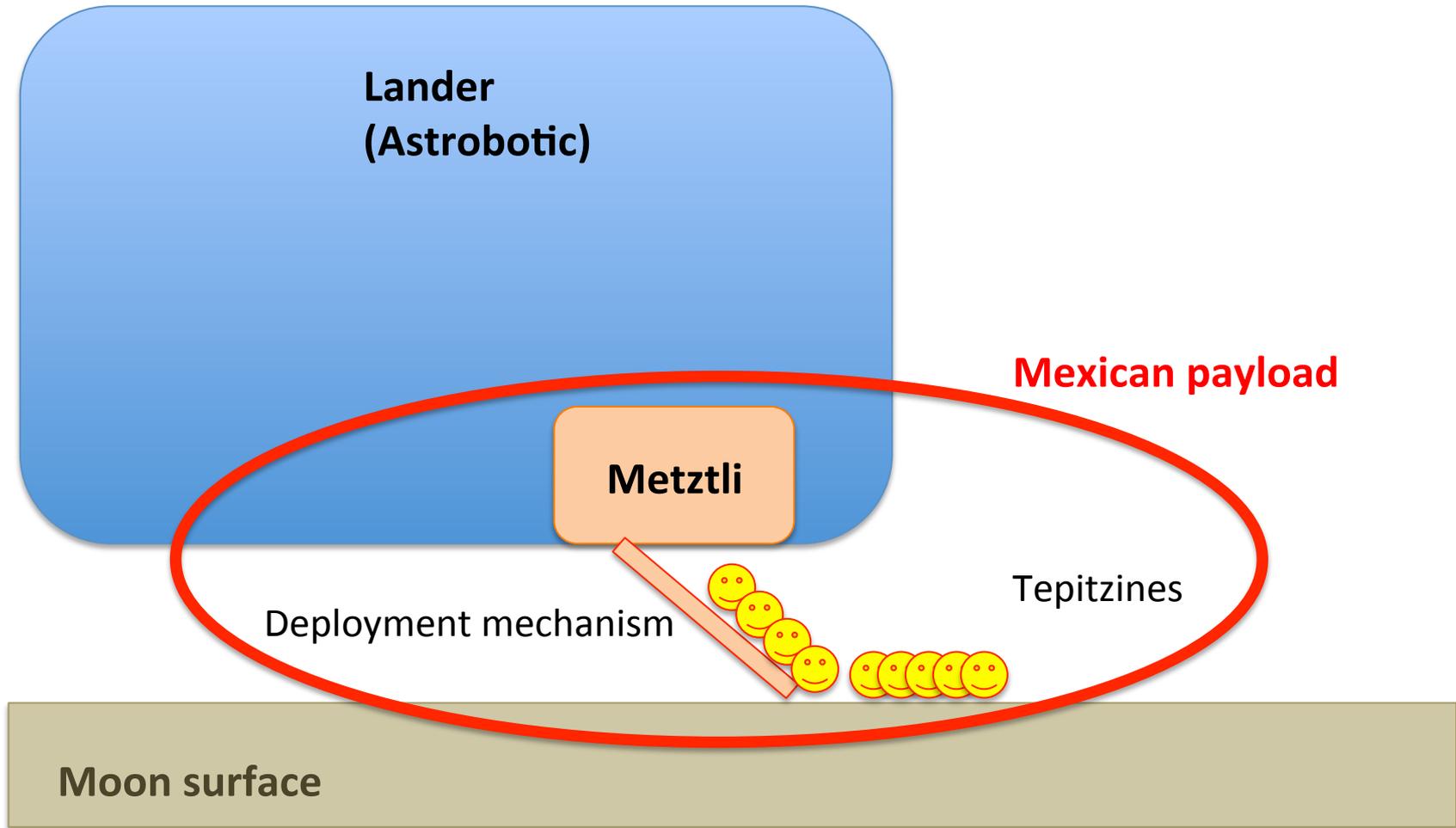
Inspirational project ...building into the future



Lunar mission: Metztli / Tepitzin

- Demonstrative of structure assembly by a robotic swarm on the Moon surface
- Small payload (under 1 kg)
- Two main components:
 - System of robots capable of self-organization
 - Deployment and telemetry module
- Carrier: Astrobotic

Metztli / Tepitzin Lunar mission overview



Current stage

- Definition of mission & robots
- Numerical simulation of robots & rules of operation
- Construction of robots for physical implementation and validation of numerical simulations
- Study of availability of light, miniature hardware (sensors, power, MCU, locomotion)
- Production of regolith emulator for a Lunar surface simulator

Summary

- Stratospheric access and ballooning for
 - Engineering validation of space technology
 - Science: particle physics, astrophysics, meteorology, oceanography
 - Hurricane prediction, characterization and effects mitigation
 - Education: fast/low-cost cubesat technology validation

→ open to international cooperation with education institutions

- Nano-satellites
 - Engineering
 - Science: particle physics, astrophysics, meteorology, oceanography

Contact

International cooperation is
very welcome

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