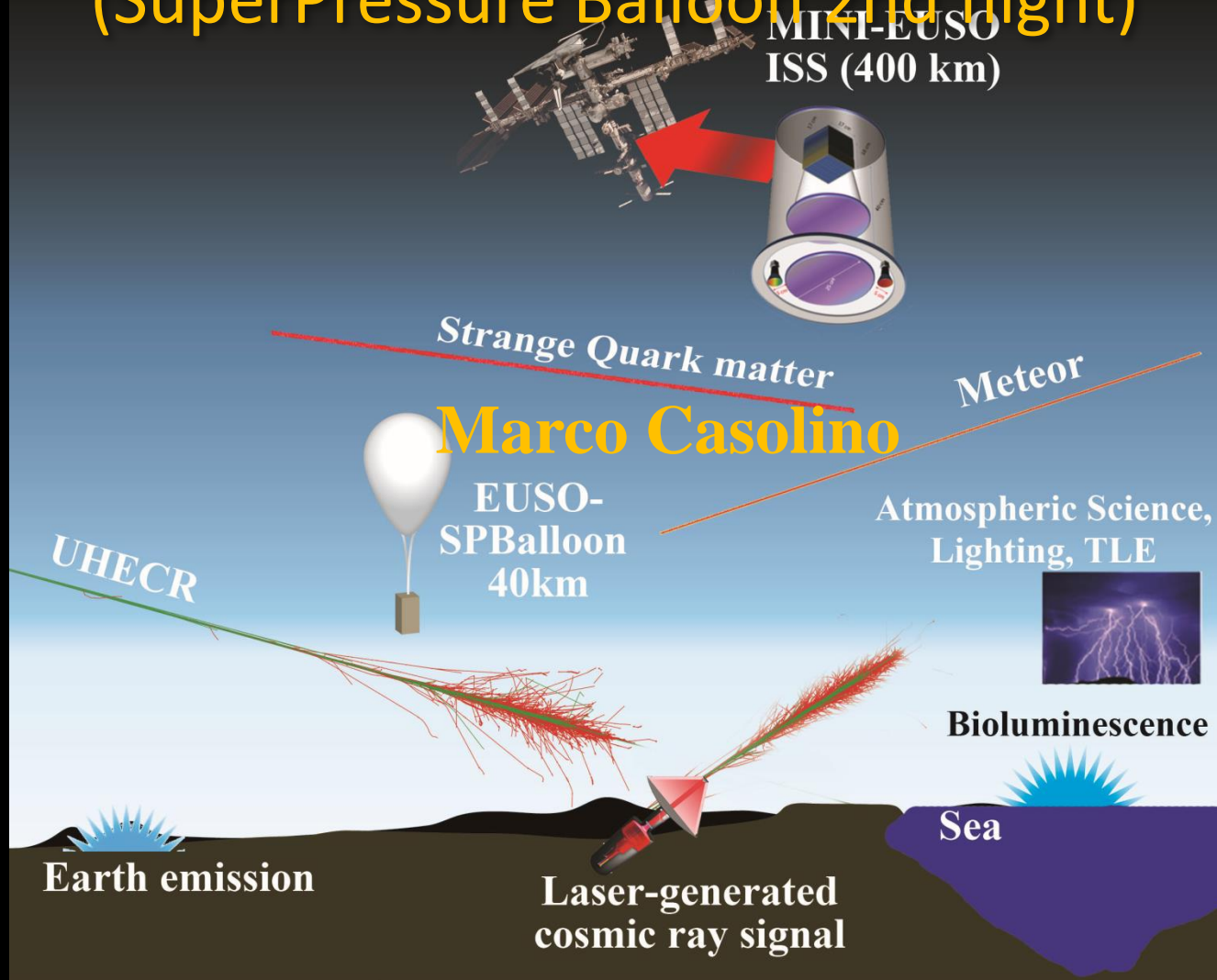


SPB2 (SuperPressure Balloon 2nd flight)



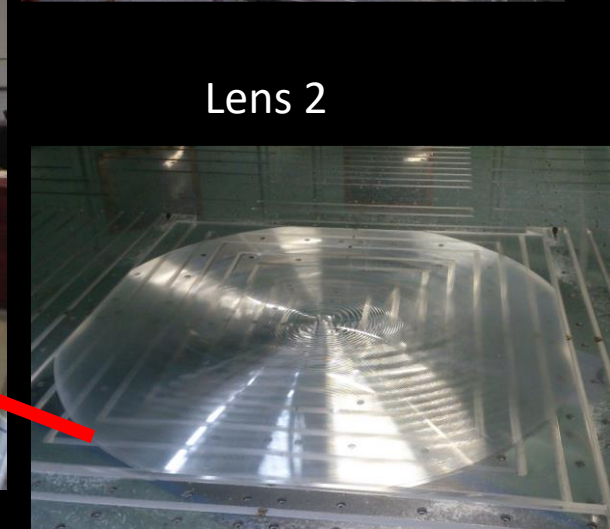
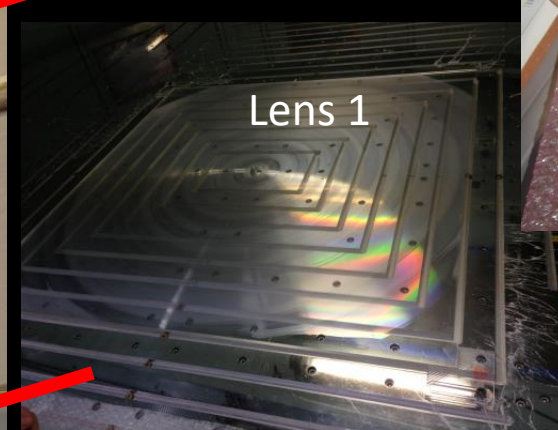
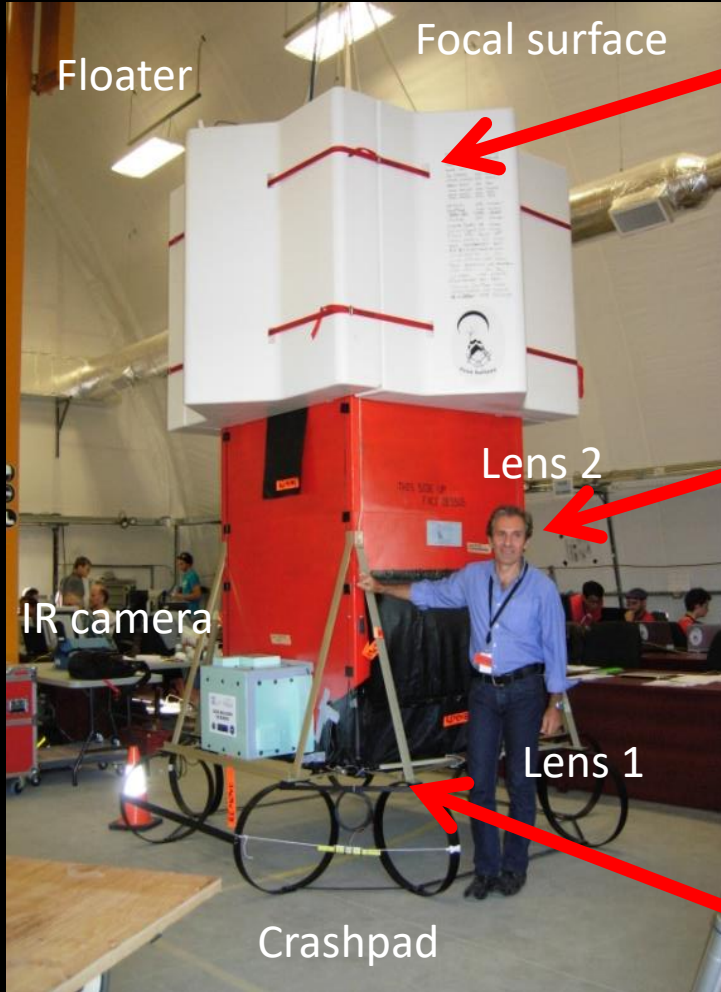
EUSO Balloon flights

1st flight, Aug 2014
Timmins (CA)

Payload built by JEM-EUSO collaboration
CNES (French Space Agency) mission

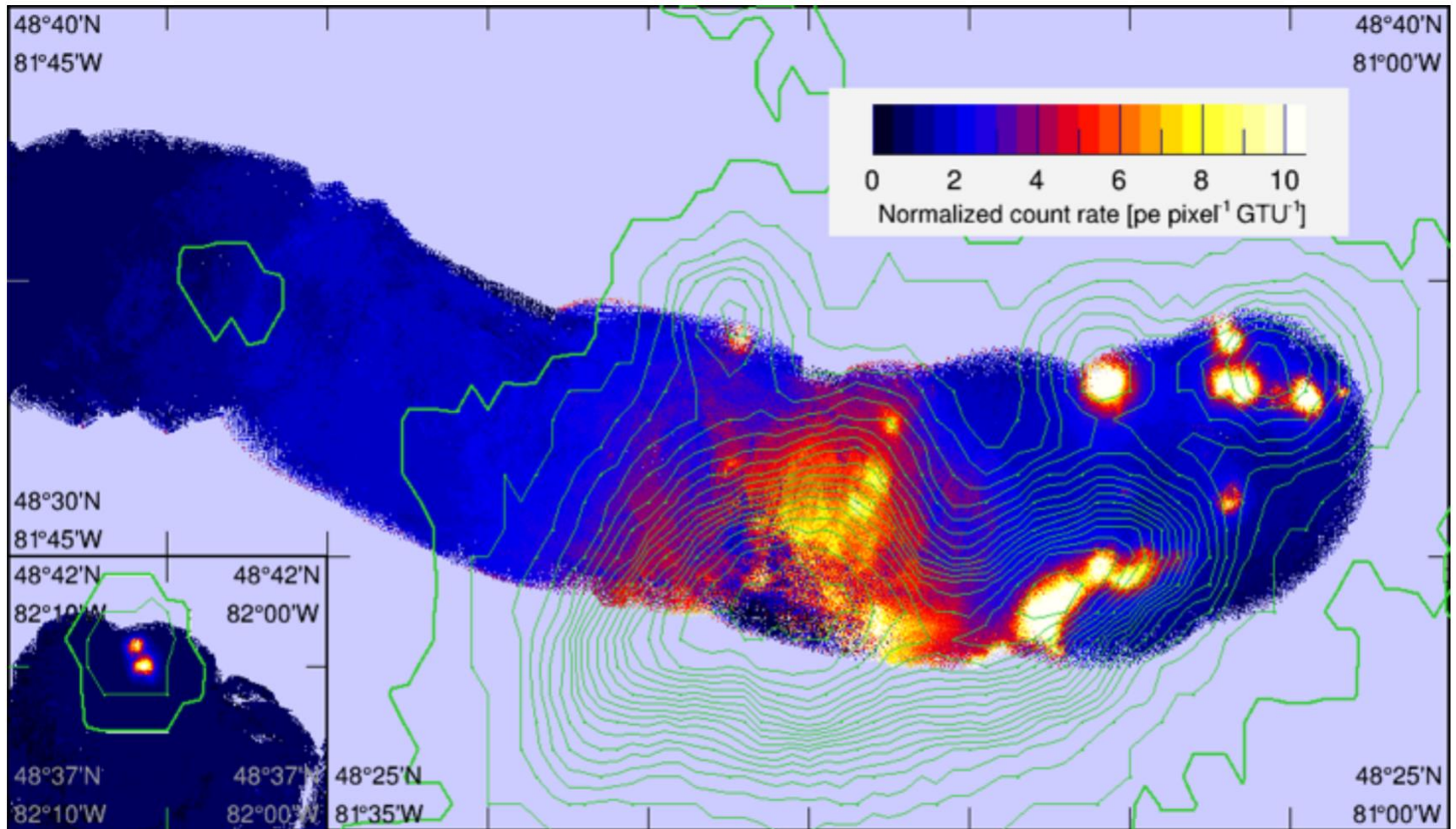


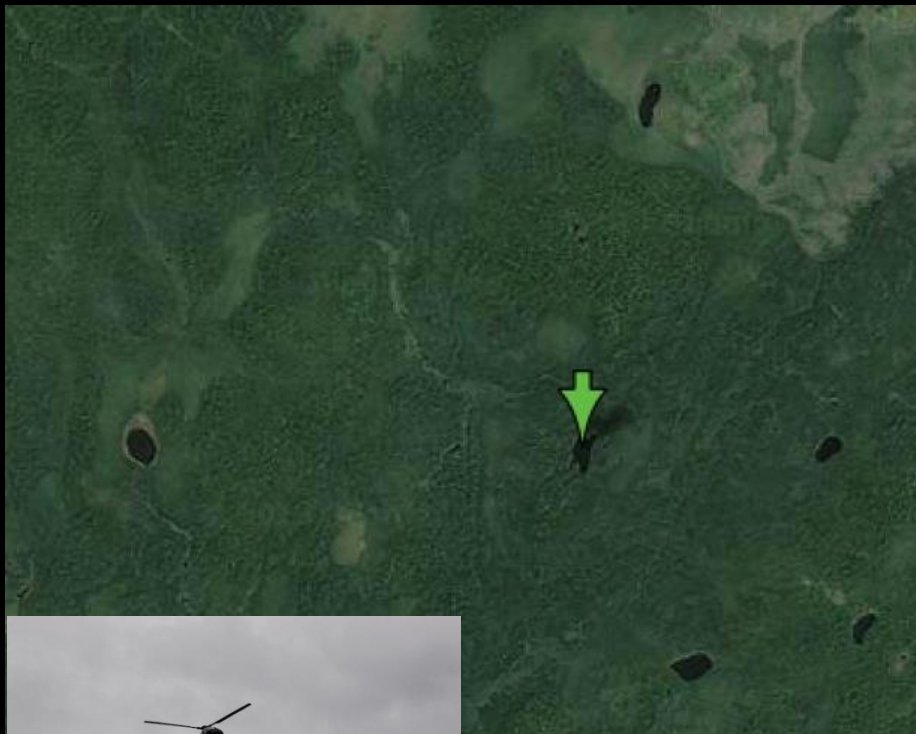
Timmins Balloon payload





UV emissions of Earth





EUSO 2nd Balloon flight (EUSO-SPB), March-May 2017 Wanaka, New Zealand

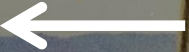
- NASA Mission
- Cost of all mission
50M\$
- 2nd Payload built by
JEM-EUSO
collaboration
- New lenses, new Focal
Surface, Improved
Electronics
- Satellite data link



Tests in September 2016 Black rock mesa, Utah

TA FD

FAST



EUSO-SPB

(balloon)

EUSO-TA

(ground)

Photo by Malek Mustafa

Launch: 25 April 2017



Launch April 25th 2017
(4/24 23:50 UTC)

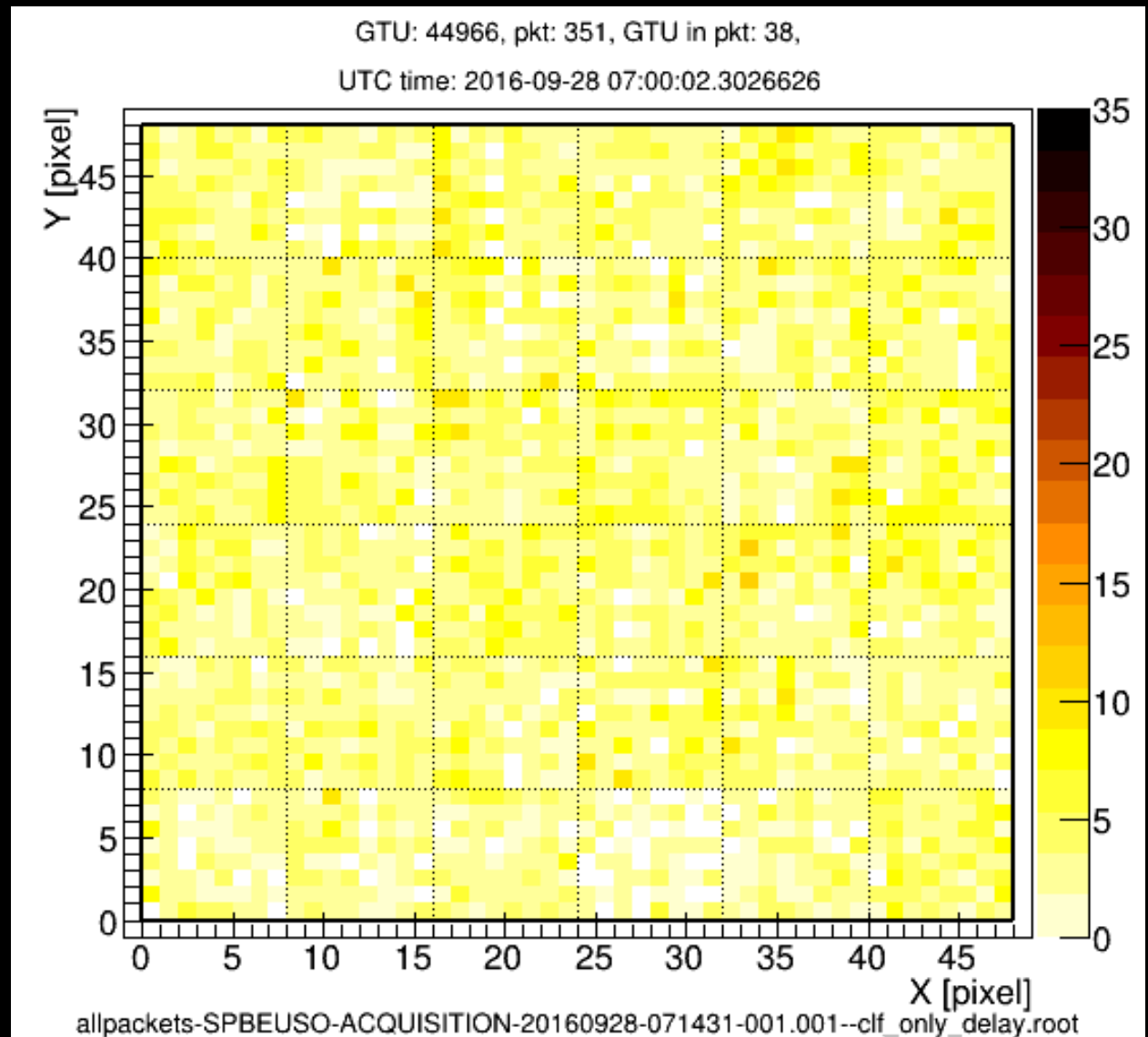


CSBF Flight 679NT SPB 2017



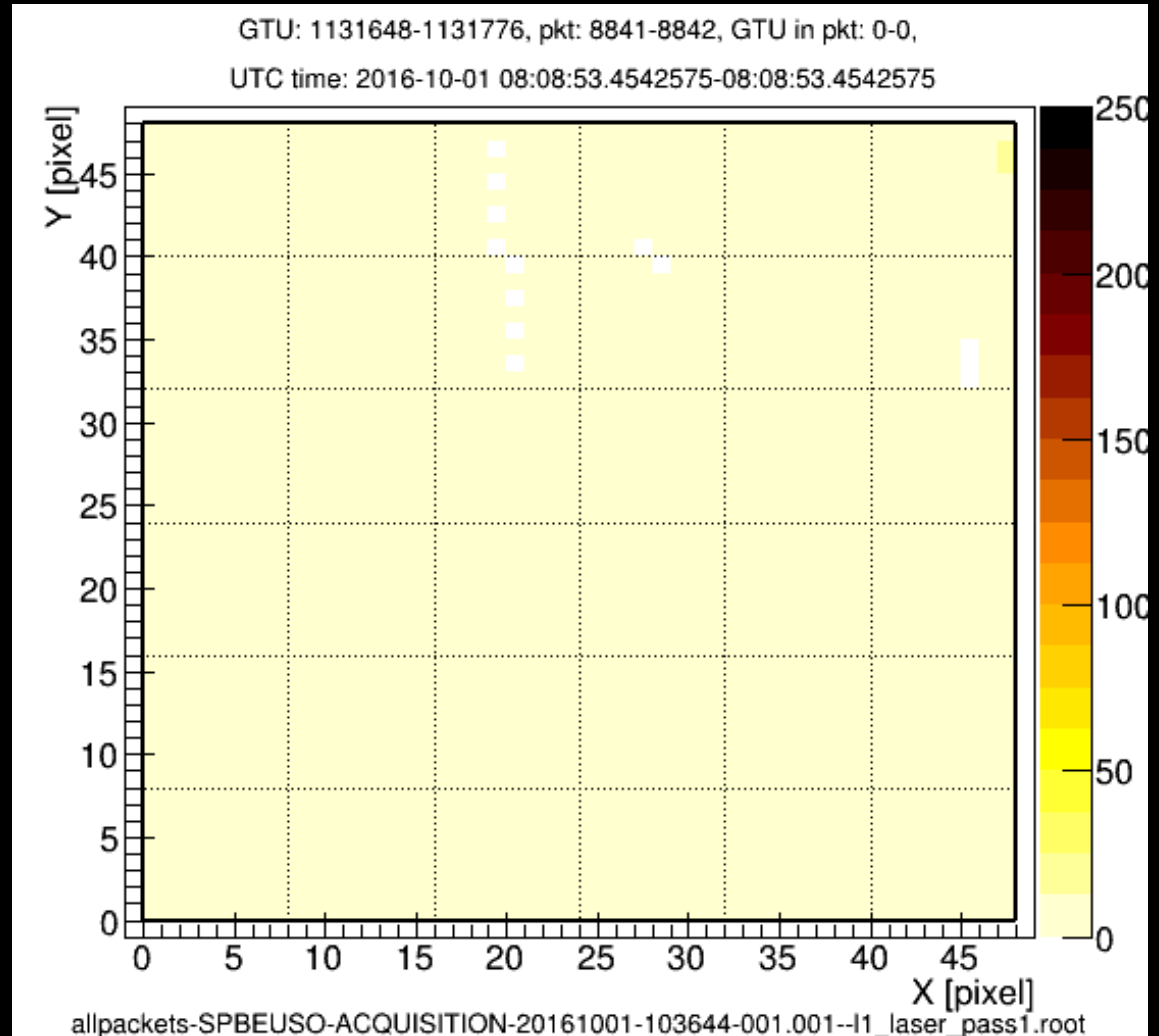
Event Typology (laser shots 20km)

Fast Mode: 2.5
microsecond
sampling rate



Event Typology (meteor)

Average
Mode: 40 ms
sampling rate



MINI-EUSO

Multi-band, Multi-Wavelength telescope inside ISS

- Ultraviolet, with Fresnel lenses
- Near Infrared
- Visible

45kg, 60 W

60*37*37 cm

Night observations
From inside UV-transparent window of Zvezda

Launch 22 August 2019



JEM-EUSO collaboration

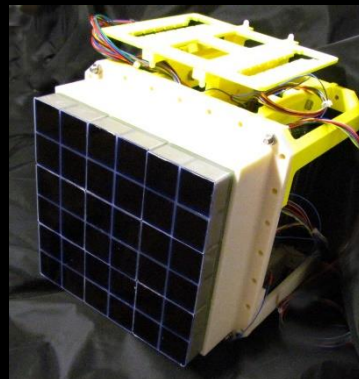
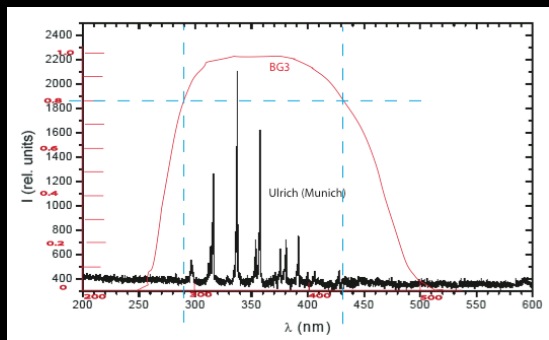
16 Countries, 93 Institutes, 351 people



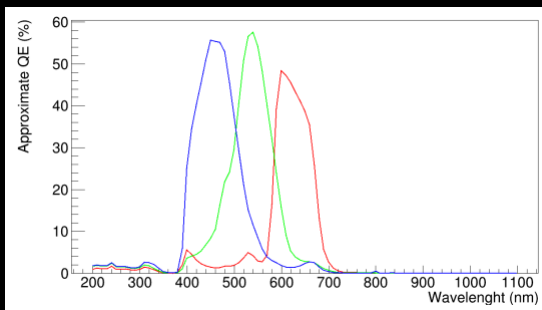
Sensors

East Japan and Tokyo bay

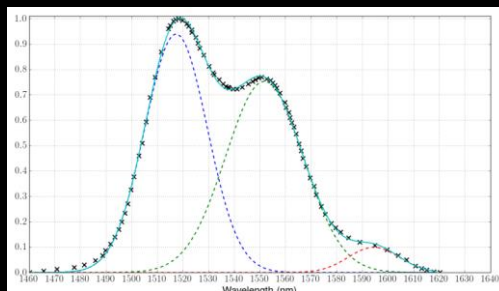
UV main camera
 48*48 pixels
 40 deg 243km 5km/pix
 2.5ms and above

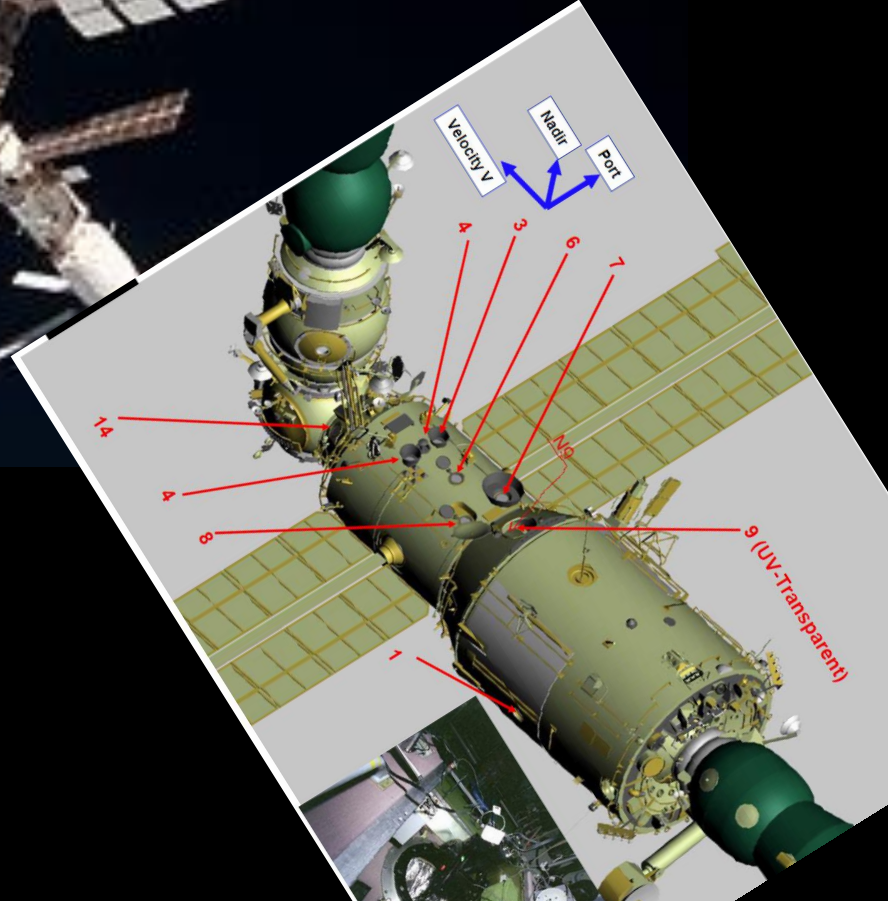
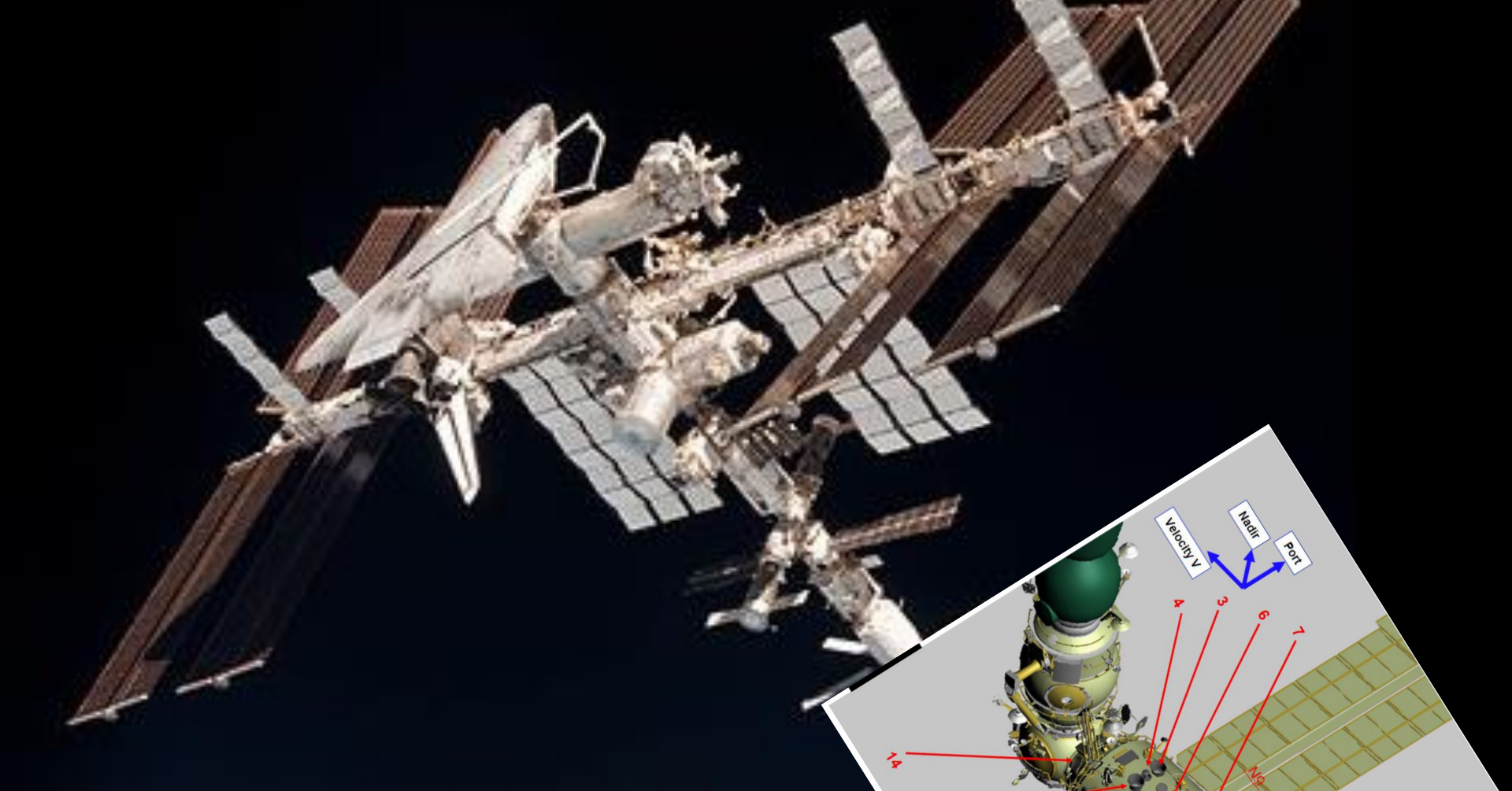


RGB camera
 1280*960 pixels
 33.2*24.8 degrees
 231*174 km 180 m/pixel
 1s



NIR camera
 (BW with phosphor coating)
 1280*960 pixels
 33.2*24.8 degrees
 231*174 km 180 m/pixel
 4s





Imaging systems: Detectors

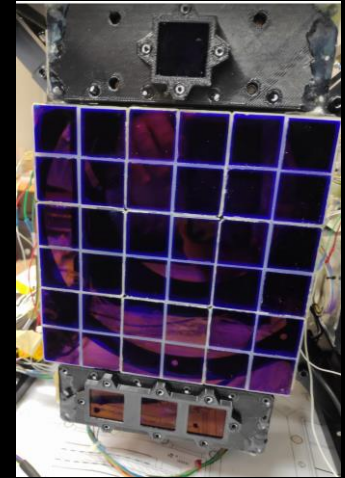
Multi-anode Photomultipliers

Proven technology

Balloon, ground and space

Needs High Voltage (1100V)

Damaged by sunlight



Silicon Photomultipliers

Low Voltage (70V)

Robust to light

Low TRL in space

Launched in 2002 on ISS

Imaging system prototype will be launched
with MINI-EUSO

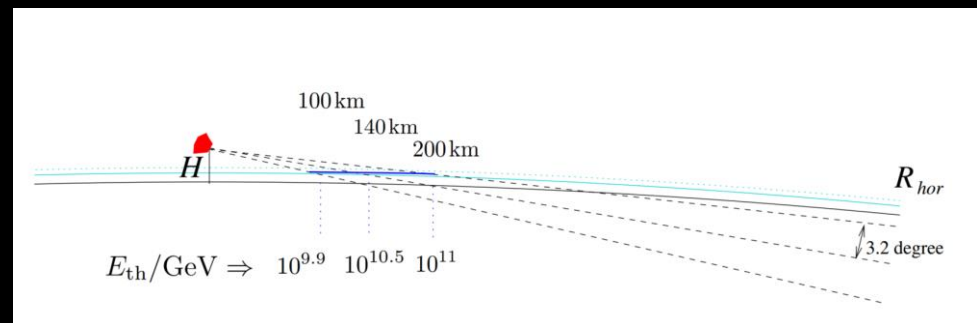
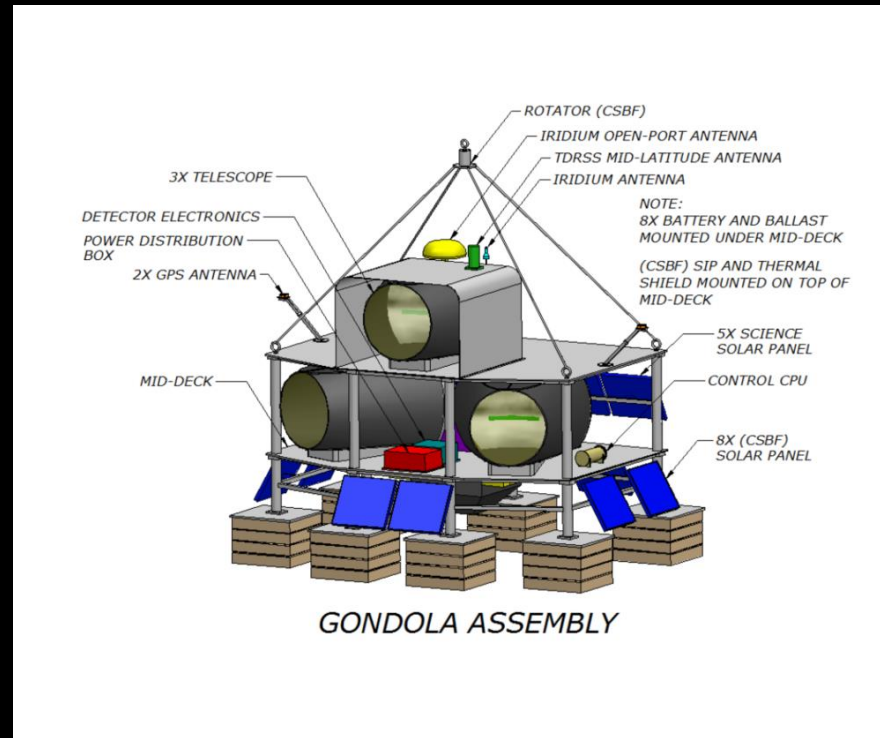


SPB2

- UHECR air-showers, Cherenkov light from stratosphere. $10^{16} < E < 10^{17}$ eV
- Discrimination of p, nuclei, photons looking at Cherenkov profile
- White paper Arxiv 1703.04513

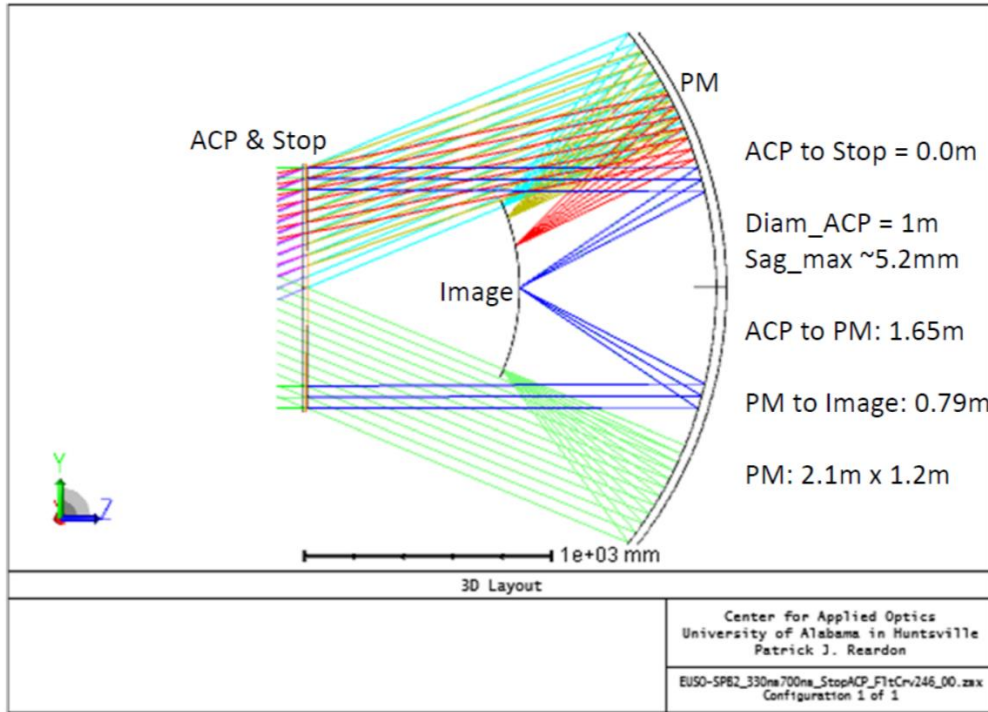
Approved

Launch in 2022



UHECR mirror based detector

Pat Reardon



Optical Field of view

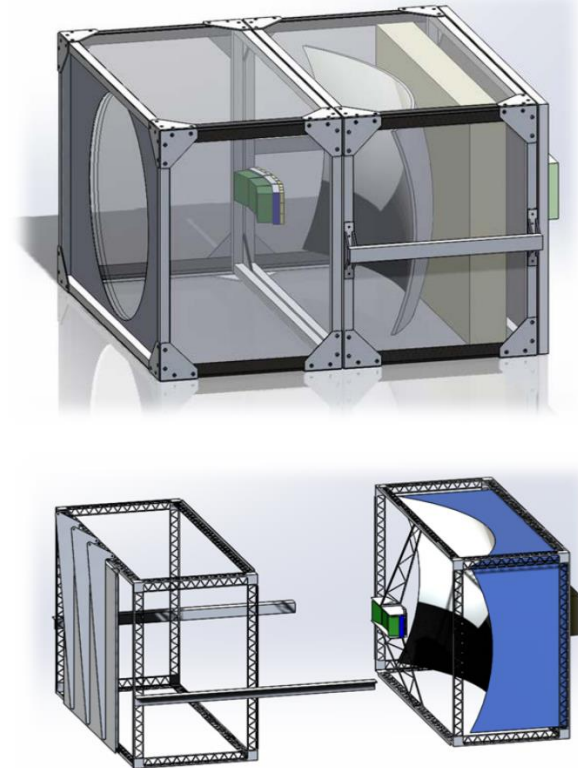
40 azimuth x 11 elevation

FOV reduced from 45 deg to save weight (glass mirrors)

Primary Mirror (PM) dimensions above need to be updated

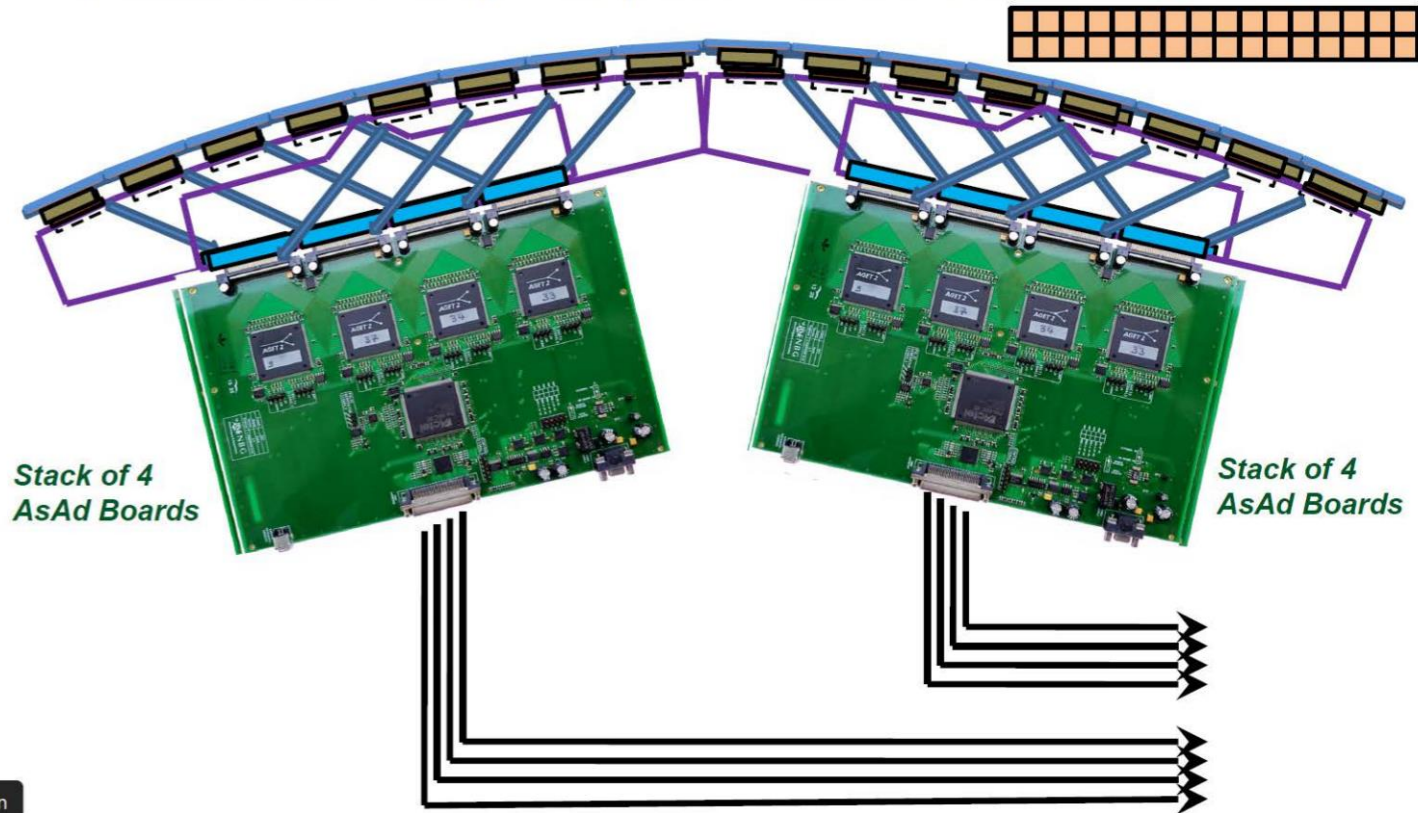
Camera Corrector + Filter design for FT needs to be finished

Yitz Finch



Cherenkov camera

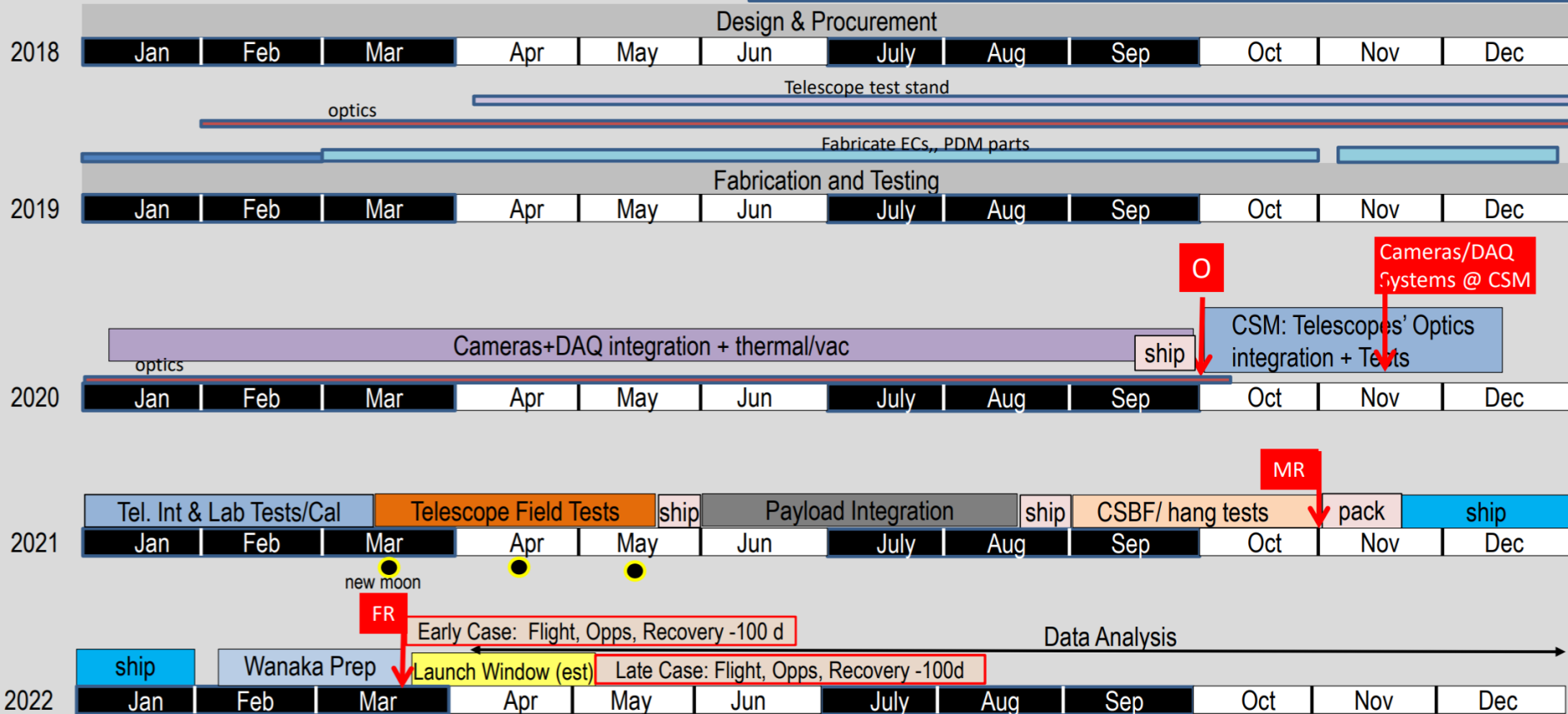
Focal Plane Layout (2 x 16 SiPM Sensors Option)



Schedule

SPB2 Schedule for 2022 Launch

MAPMTS



O Optics delivered CSM

FR Flight Ready

MR Mission Ready

Richieste ToV

Co-Finanziamento ASI (SPB1 + nuovo contratto)

- Sviluppo software CPU e sistema di acquisizione: 20k
- Sviluppo e qualifica SiPM per lo spazio: readout, sistema di trigger, ottica: 15k
 - (confronto tra vari tipi di SiPM, varie ditte)
- Missioni: 15k

Anagrafica

Nome	Ricercatori		Contratto	Qualifica	%
	Età				
1 Cambiè Giorgio		Associato		Dottorando	100
2 Casolino Marco		Dipendente		Primo Ricercatore	80
3 Conti Livio		Associato		Ricercatore Universitario	70
4 De Santis Cristian		Dipendente		Tecnologo	20
5 Fornaro Claudio		Associato		Ricercatore Universitario	70
6 Marcelli Laura		Dipendente		Tecnologo	30
7 Narici Livio		Associato		Prof. Associato	40
8 Picozza Piergiorgio		Associato		Prof. Ordinario	0
9 Senesi Roberto		Associato		Prof. Associato	60
Numero Totale Ricercatori				9	FTE: 4.7