

# MoonLIGHT-2

INFN-CSN2 experiment: Test Gravity in the Solar System

CSN2-LNF, 28 June 2021

## Italian Participants:

INFN-LNF ..... ~ 6/7 FTE

INFN/University - Padova ..... ~ 2/3 FTE

INFN/University - Naples ..... ~ 2/3 FTE

ASI-Matera Laser Ranging Observatory ..... ~ 4/5 FTE

## USA Participants:

University of Maryland (UMD) at College Park, MD

Harvard-Smithsonian Center for Astrophysics (CfA), Cambridge, MA

University of California at San Diego

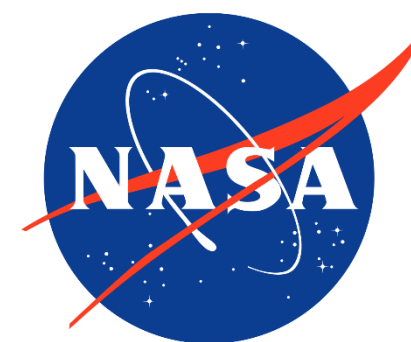
NASA-SSERVI

Approved flights:

NASA: ~ 2023

ESA: ~ 2023

## Partner Space Agencies:



# JointLab INFN-Frascati with ASI-Matera: 1 Jan 22 - 31 Dec 26 (delay/suspension due to COVID-19)

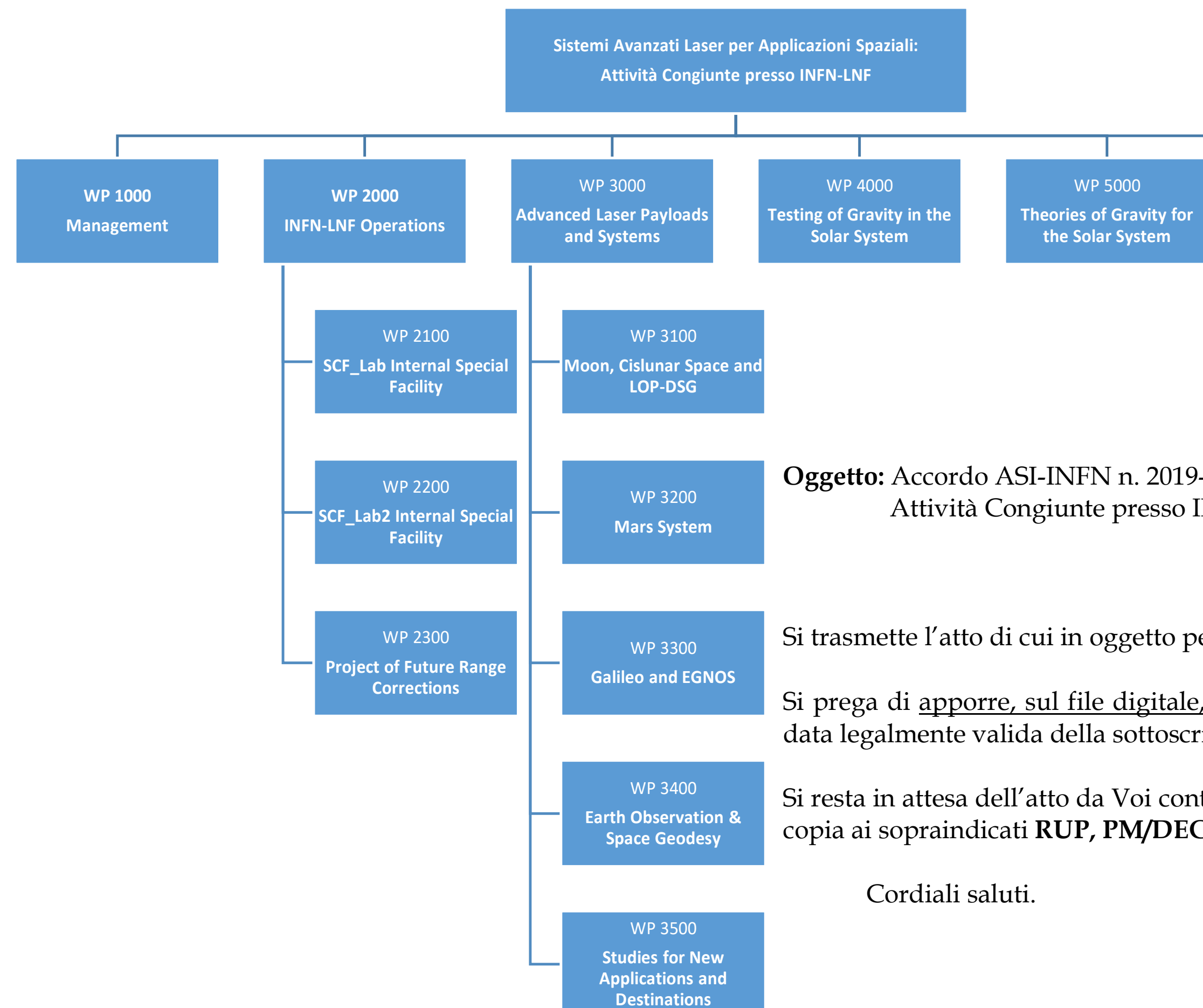


Spett.le  
Istituto Nazionale di Fisica  
Nucleare - INFN  
Via Enrico Fermi, 40  
00044 - Frascati

Att.ne  
Prof. Fernando Ferroni  
Presidente

PEC: [presidenza@pec.infn.it](mailto:presidenza@pec.infn.it)

c.c.: RUP: Giuseppe Bianco  
DEC /PM: Catia Benedetto  
Unità Contratti: Francesca Paccagnini  
Unità contratti - Segreteria Flora Leucci



**Oggetto:** Accordo ASI-INFN n. 2019-15-HH.0 per "Sistemi Avanzati Laser per Applicazioni Spaziali: Attività Congiunte presso INFN-LNF".

Si trasmette l'atto di cui in oggetto per la Vostra sottoscrizione.

Si prega di apporre, sul file digitale, la firma digitale, unitamente alla marca temporale, che attesta la data legalmente valida della sottoscrizione.

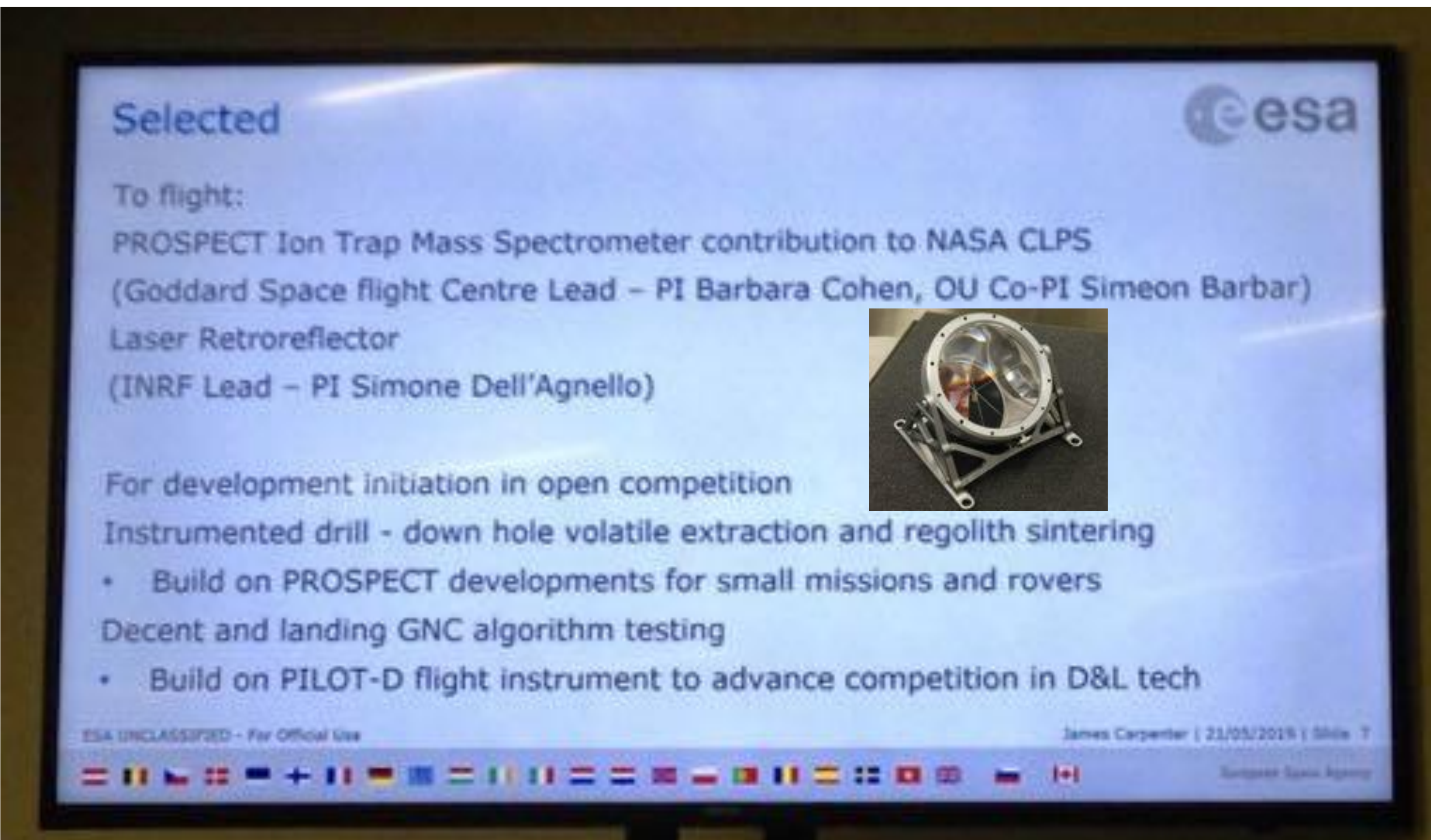
Si resta in attesa dell'atto da Voi controfirmato, da inviare ad [asi@asi.postacert.it](mailto:asi@asi.postacert.it), con comunicazione in copia ai sopraindicati **RUP, PM/DEC, Responsabile Contrattuale ed Unità Contratti-Segreteria**.

Cordiali saluti.

U.O. Contratti  
Il Responsabile  
Dott.ssa Luciana Gentile



# MoonLIGHT-2 **selected by ESA** for a lunar mission (250k€ for dual Earth pointing actuators)



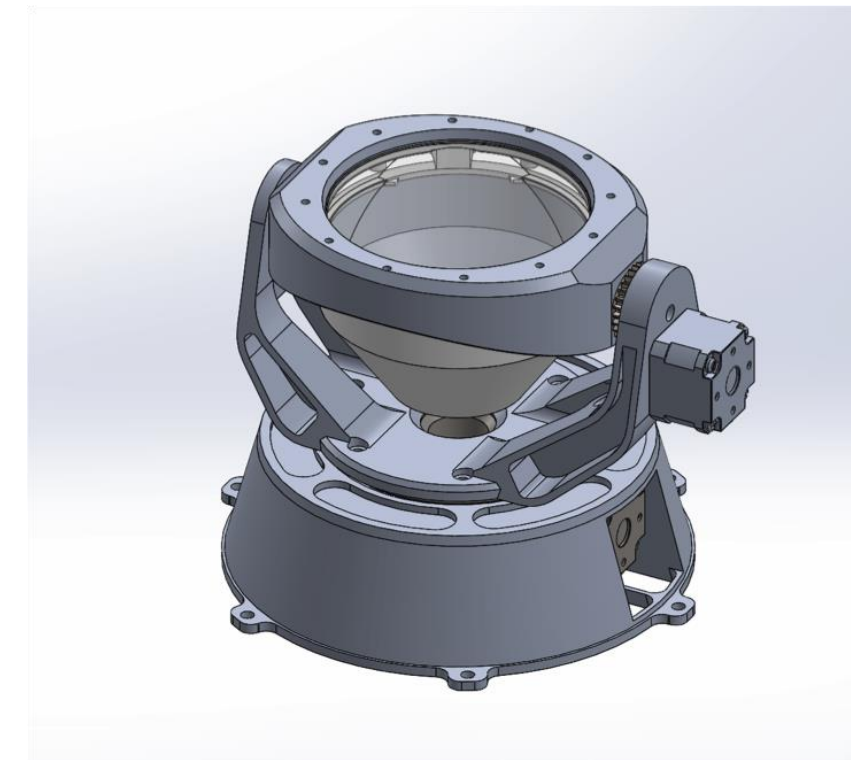
ESA Contract No. 4000129000/19/NL/TFD  
with  
INFN - Laboratori Nazionali di Frascati  
LUNAR LASER RETROREFLECTOR POINTING ACTUATOR

Contract for development of MPAc (MoonLIGHT Pointing Actuator)

INFN Resp.: M. Muccino



- **Advanced stage of manufacturing and test of MPAc (MoonLIGHT Pointing Actuator) for the completion and fulfilment of the dedicated ESA-INFN Contract in sight of launch of MoonLIGHT+MPAc+Robotic\_Cover in 2023 with NASA CLPS towards Reiner Gamma Crater (7N,59W).**
- **Advanced stage of manufacturing and test of MoonLIGHT with Fixed Pointing for the completion and fulfilment of the dedicated NASA-UMD Contract in sight of launch of MoonLIGHT with Fixed Pointing in 2023 with NASA CLPS towards Mare Crisium.**
- **Joint 2021 NASA Exploration Science Forum & European Lunar Symposium (<https://lunarscience.arc.nasa.gov/nesfels2021/>).**

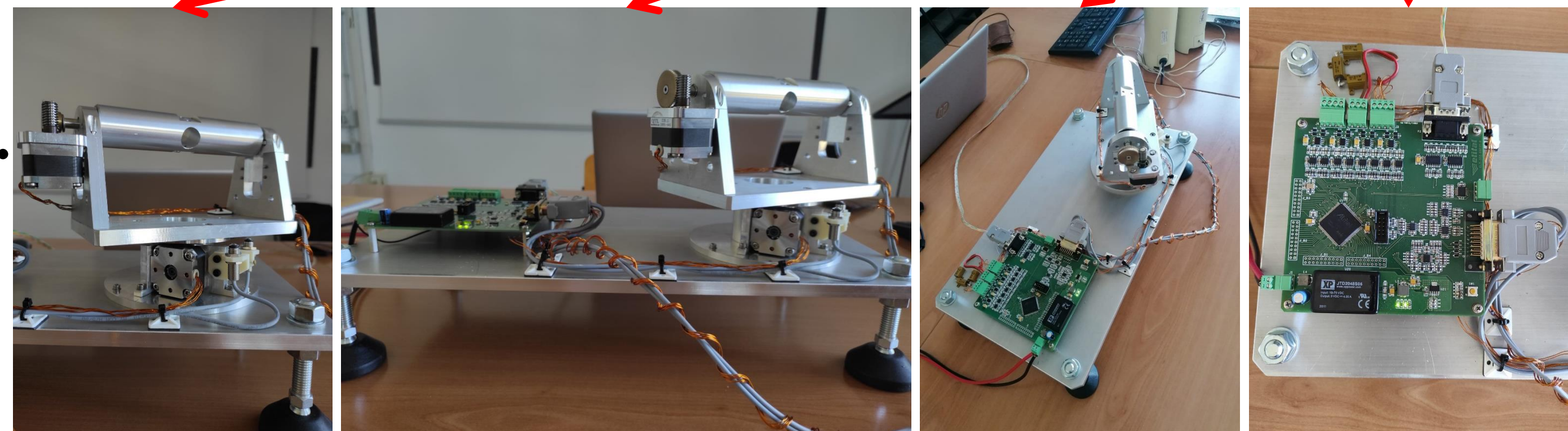


Late 2019



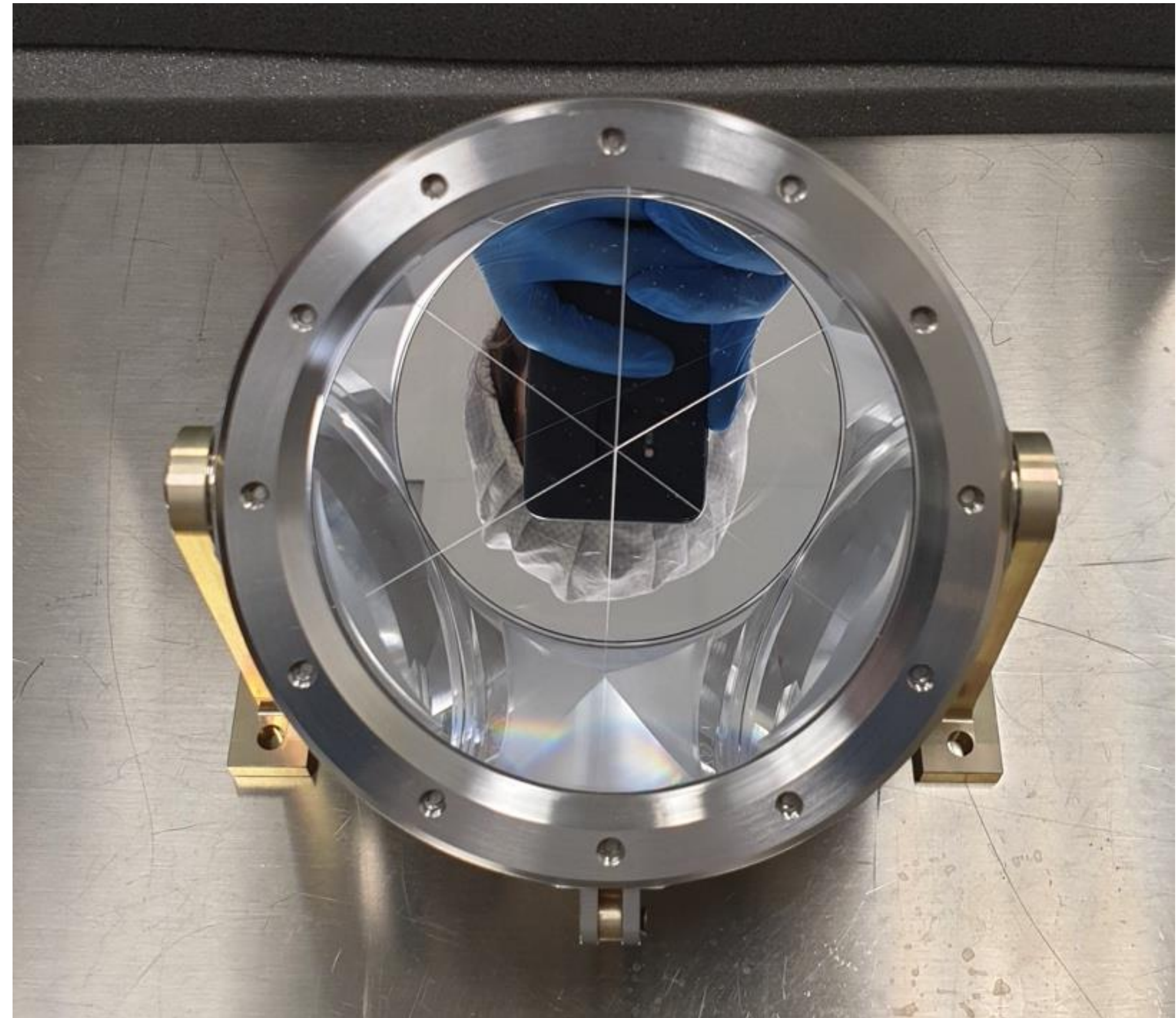
2020

2021





- **Advanced stage of manufacturing and test of MPAc (MoonLIGHT Pointing Actuator) for the completion and fulfilment of the dedicated ESA-INFN Contract in sight of launch of MoonLIGHT+MPAc+Robotic\_Cover in 2023 with NASA CLPS towards Reiner Gamma Crater (7N,59W).**
- **Advanced stage of manufacturing and test of MoonLIGHT with Fixed Pointing for the completion and fulfilment of the dedicated NASA-UMD Contract in sight of launch of MoonLIGHT with Fixed Pointing in 2023 with NASA CLPS towards Mare Crisium.**
- **Joint 2021 NASA Exploration Science Forum & European Lunar Symposium (<https://lunarscience.arc.nasa.gov/nesfels2021/>).**





- **Advanced stage of manufacturing and test of MPAc (MoonLIGHT Pointing Actuator) for the completion and fulfilment of the dedicated ESA-INFN Contract in sight of launch of MoonLIGHT+MPAc+Robotic\_Cover in 2023 with NASA CLPS towards Reiner Gamma Crater (7N,59W).**
- **Advanced stage of manufacturing and test of MoonLIGHT with Fixed Pointing for the completion and fulfilment of the dedicated NASA-UMD Contract in sight of launch of MoonLIGHT with Fixed Pointing in 2023 with NASA CLPS towards Mare Crisium.**
- **Joint 2021 NASA Exploration Science Forum & European Lunar Symposium (<https://lunarscience.arc.nasa.gov/nesfels2021/>).**

https://lunarscience.arc.nasa.gov/nesfels2021/

 NASA EXPLORATION SCIENCE FORUM &  EUROPEAN LUNAR SYMPOSIUM

**Joining efforts to bring the exploration science communities together.**

**July 20–23, 2021**

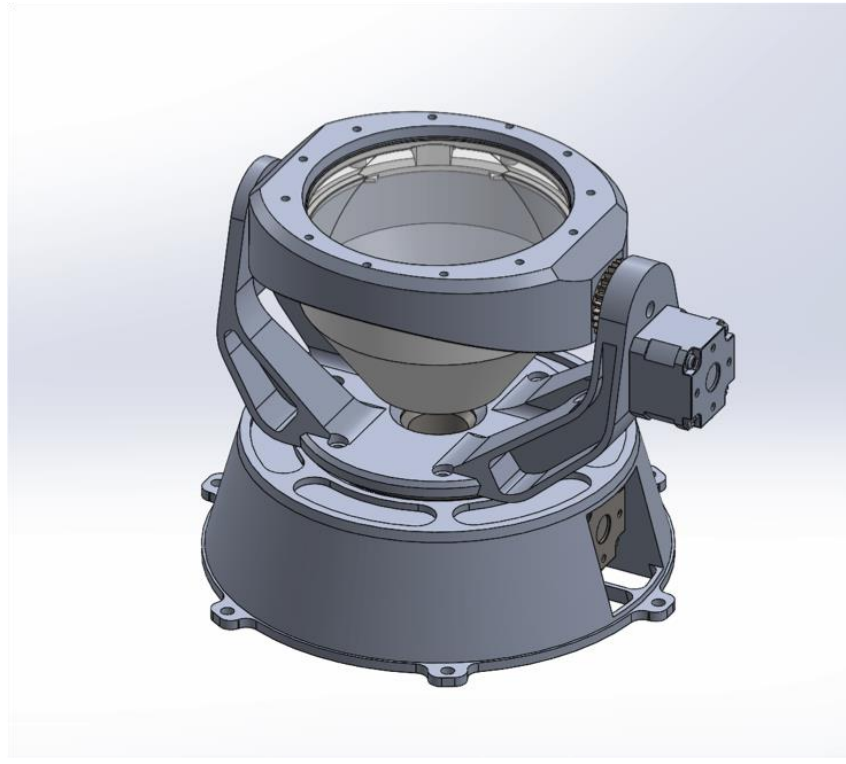
SSERVI and its European partner organizations will jointly co-host the 2021 NASA Exploration Science Forum & European Lunar Symposium as a virtual meeting.



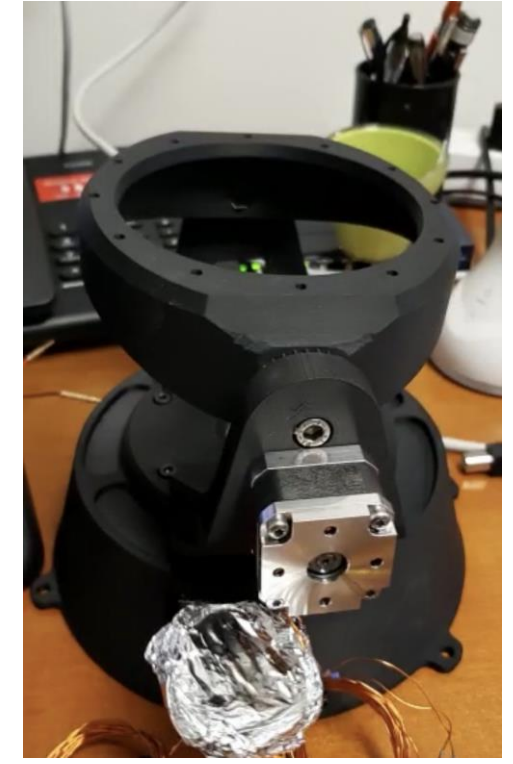
# MoonLIGHT-2 x 2022

## Test of Gravity in the Solar System

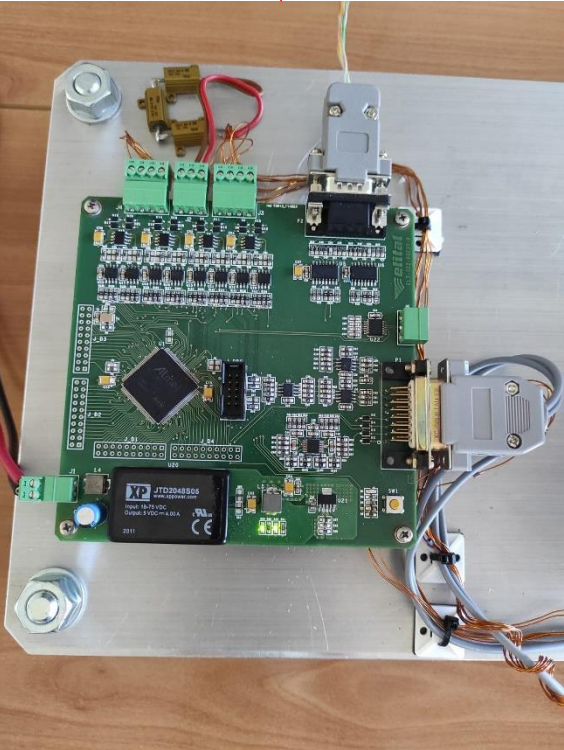
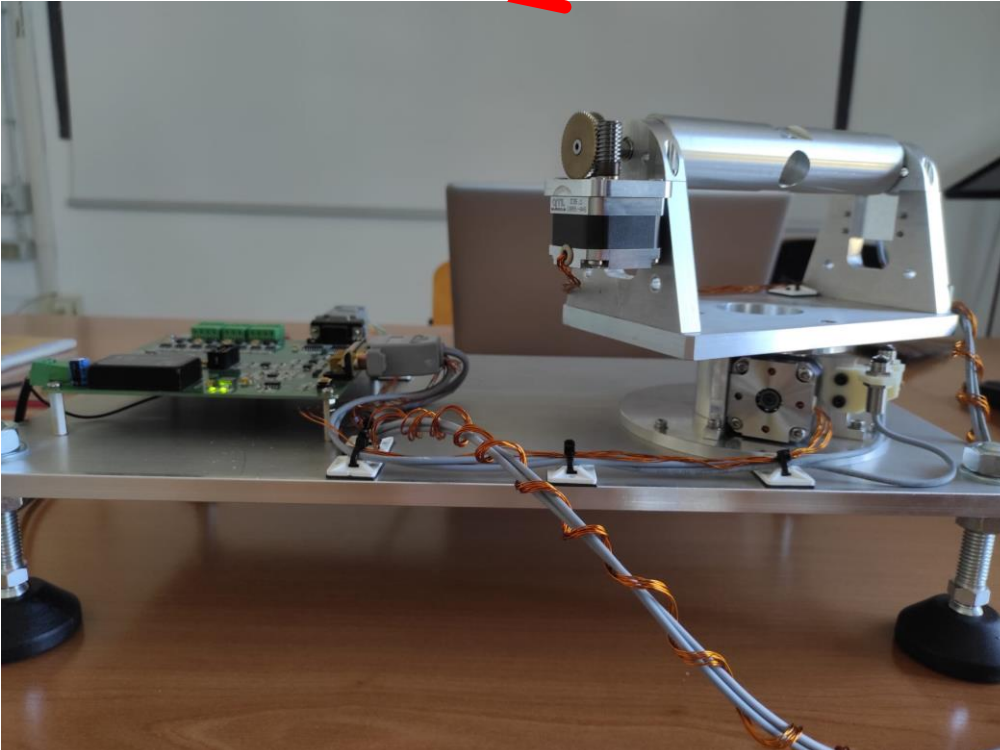
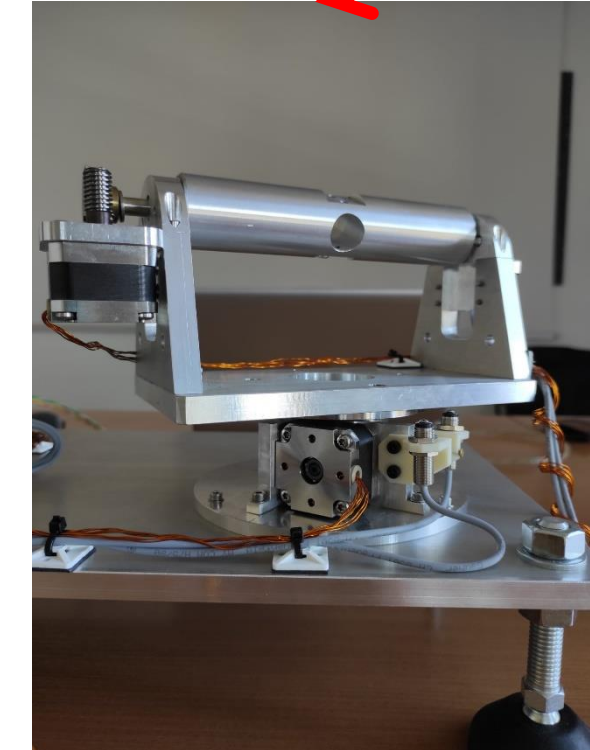
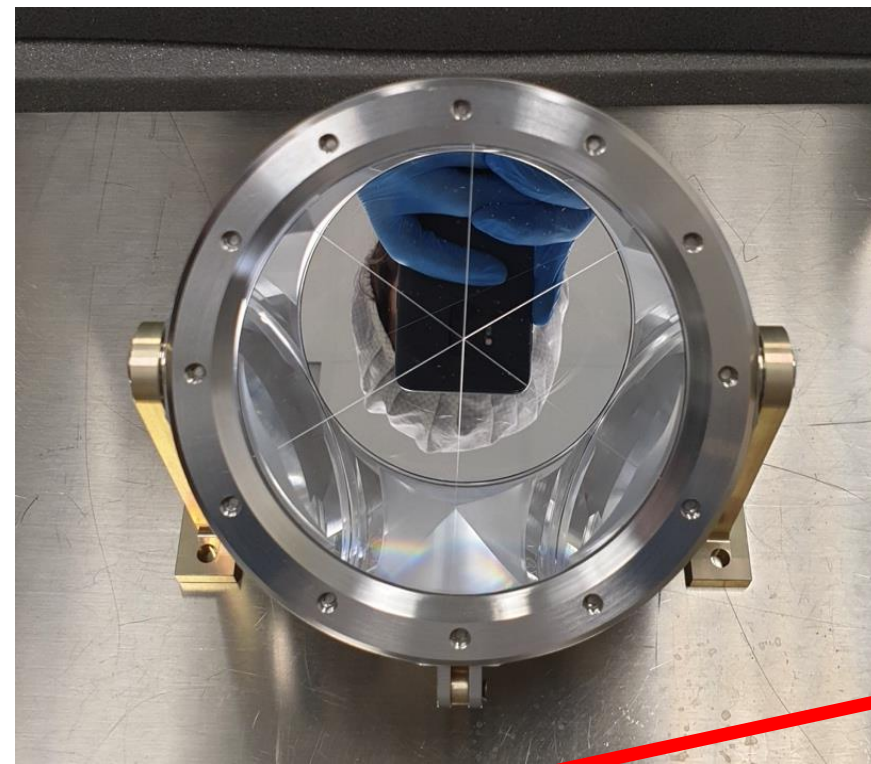
- **2021 Results:**
  - Advanced stage of manufacturing and test of MPAc (MoonLIGHT Pointing Actuator) for the completion and fulfilment of the dedicated ESA-INFN Contract in sight of launch in 2023.
  - Advanced stage of manufacturing and test of MoonLIGHT with Fixed Pointing in sight of launch in 2023.
  - Yet another Martian microreflector landed on Mars (LaRA on board Mars 2020).
  - Joint 2021 NASA Exploration Science Forum & European Lunar Symposium (<https://lunarscience.arc.nasa.gov/nesfels2021/>).
- **2022 Objectives:**
  - Delivery of MPAc to ESA.
  - Milestone of constructions for deliveries in 2022 and 2023.
  - European Lunar Symposium 2022.



Late 2019



2020



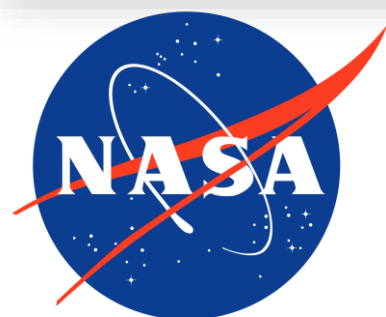
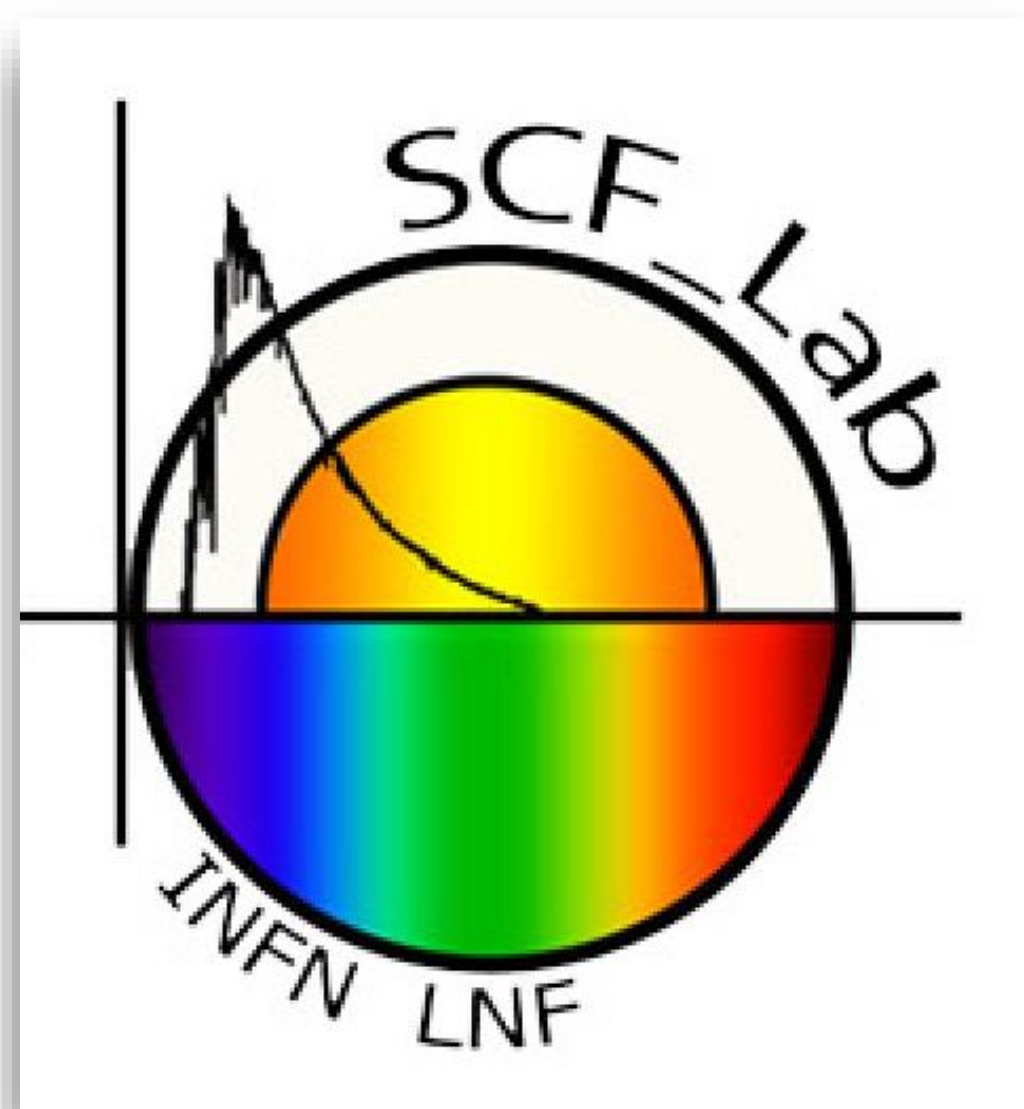
2021





# MoonLIGHT-2 x 2022

## MoonLIGHT-2 @ LNF

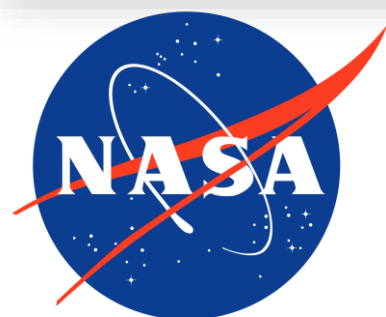
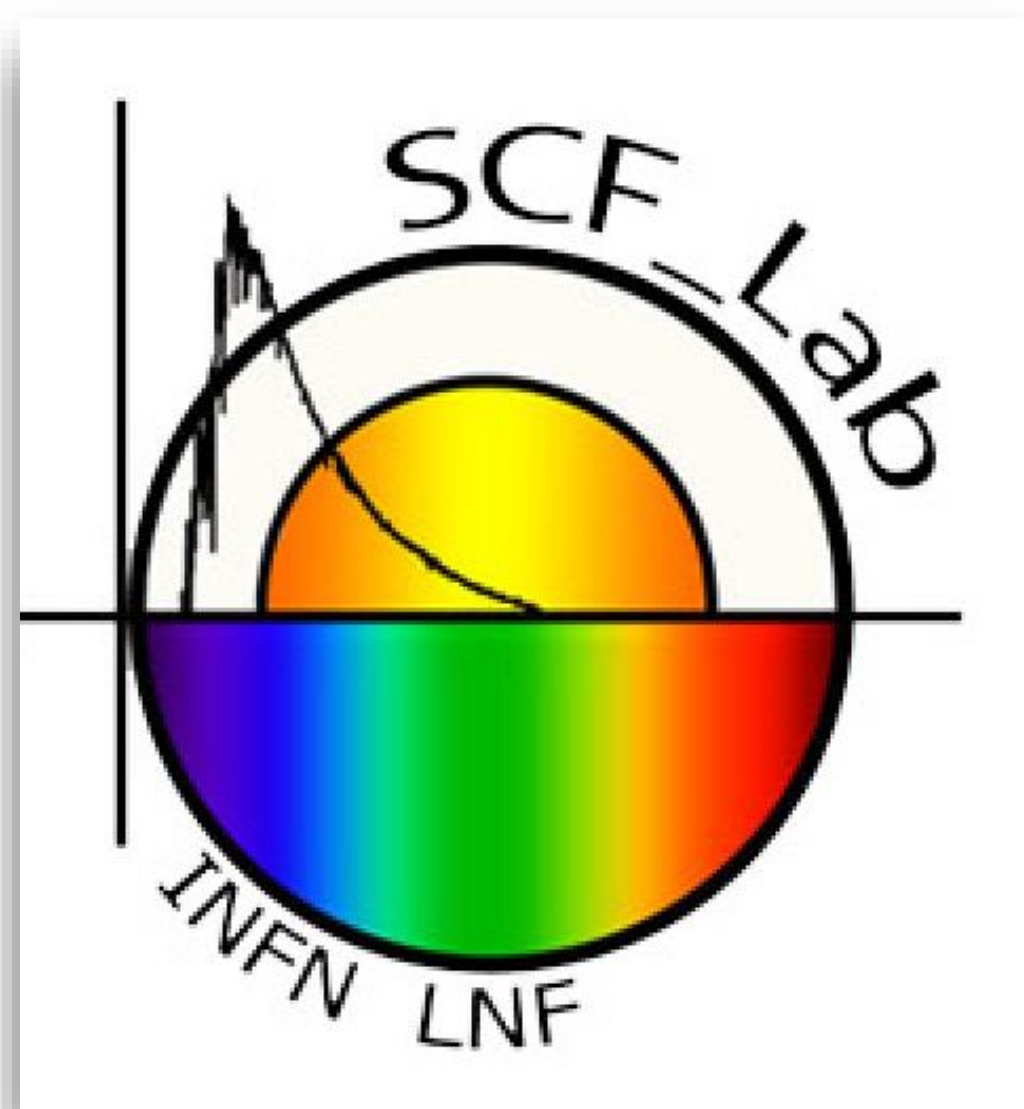


- **FTE:** ~ 5.7 FTE (Ricercatori/Tecnologi): D. Arnold 100%, G. Bellettini 50%, G. Bianco 30%, S. Dell'Agnello 40%, L. Filomena 80%, M. Maiello 100%, R. March 80%, L. Mauro 80%, L. Porcelli 80% (RN), L. Rubino 80%  
e  
C. Mondaini (CA) 100%, L. Salvatori (CTER) 100%, M. Tibuzzi 100% (CTER), M. Traini (CA)  
INFN/University - Padova ~ 2 FTE: Villoresi+1  
INFN/University - Naples ~ 2 FTE: Capozziello+1  
ASI-Matera Laser Ranging Observatory ~ 3 FTE
- **Richieste CSNII 2022 (TBD):** missioni 46k, consumo 20k, altri cons 10k, inventario 2k, license SW 15k, apparati 79.5k, servizi 44k
- **Richieste LNF 2022 (mesi-uomo) (TBD):** Officina 6; SPCM 2; Elettronica 0.5; DT 2; Crio 1; Laser 1; ES 1
- **Fondi Esterni:** JointLab INFN-Frascati with ASI-Matera, 1.5 Me; 250ke for dual Earth pointing actuator (MPAc)



# MoonLIGHT-2 x 2022

## SCF\_Lab @ LNF... Past & Future...



- The sci-tech R&D activity of the SCF\_Lab (started in 2004) is successfully growing (e.g., Martian microreflectors, Lunar payloads).
- For the LARES 2 Mission:
  - The PFM1 was integrated in the SCF\_Lab1: PFM1 delivered in 2020 to ESA; launch by Q2 2022, with the commissioning and maiden flight of ESA's new launcher, the Vega C.
  - The PFM2 will be integrated in the SCF\_Lab2 (Building 7B) in 2022 for launch opportunity from 2023 (TBD).
- Concerning Galileo 2<sup>nd</sup> Generation:
  - 2 existing contracts with Thales and Airbus for the provision of LRAs for 6 satellites + 6 satellites, to build in SCF\_Lab1 and SCF\_Lab2, and to deliver from 2023 to 2025.