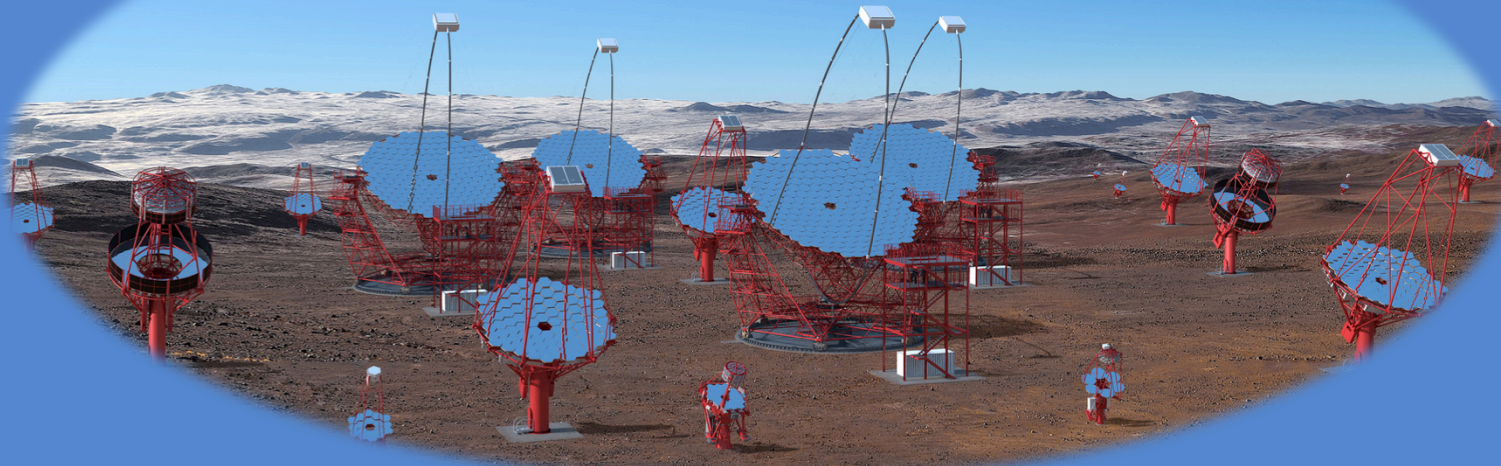


**From Science to Society: a fruitful Path**  
**Francesco Giordano**



# PNRR: overview

## Three key objectives

- 1 To tackle the economic and social damage of the pandemic crisis
- 2 Contribute to addressing the structural weaknesses of the Italian economy
- 3 Accelerate the digital and green transition

## For a country

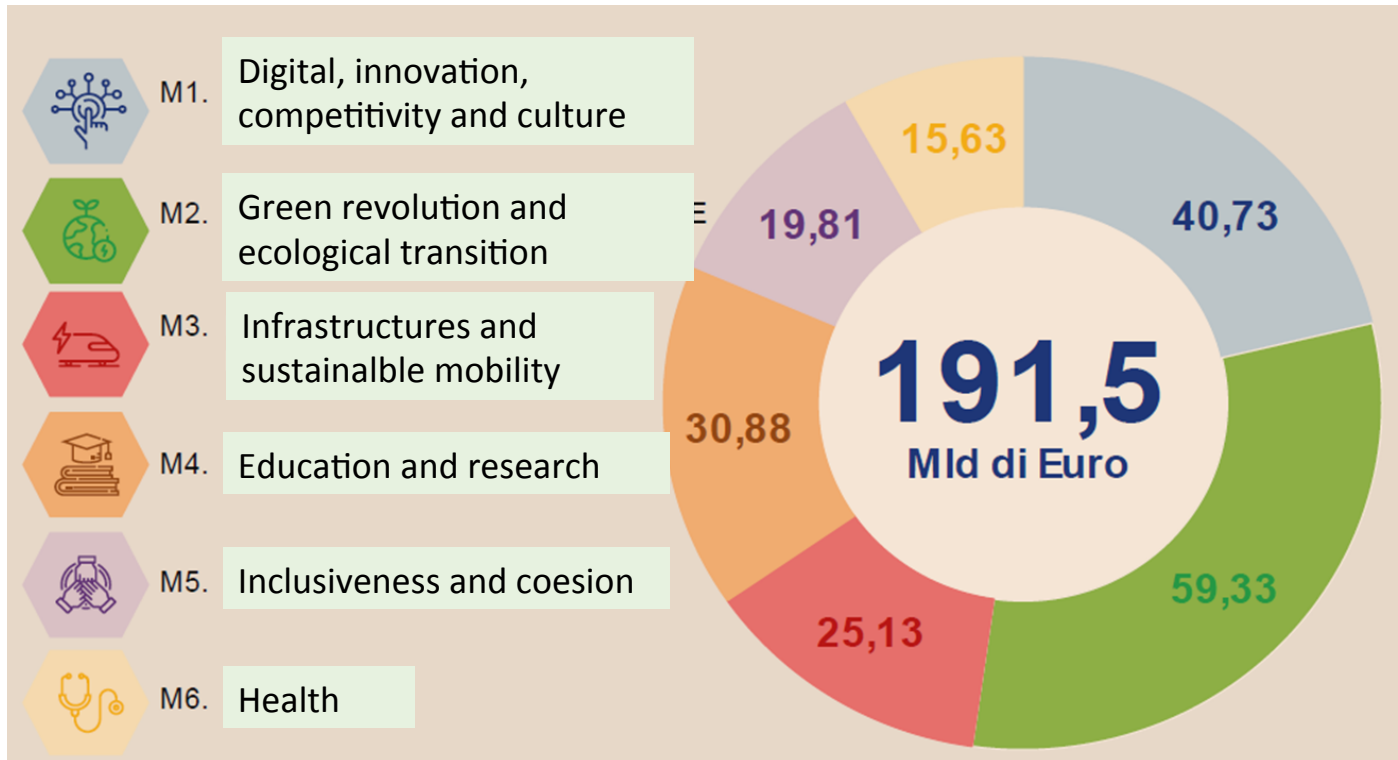
- + Innovative and digital
- + Open to young people and gender balance
- + Environmental friendly
- + Territorially cohesive

## Instruments

# PNRR

16 components,  
**6 Missions**

Received from and  
reflect to  
the italian strategic  
pillar



## MISSION 4 – EDUCATION AND RESEARCH



**31,90 MLD €**

**COMPONENT 1: EMPOWERING** services dedicated to education from kindergarten to universities (19,44 mld)

**COMPONENT 2: from research to industries** (11,44 mld)

# L'ASResources (1/3)

Investments	MIn€
1.6 from school to univ.	250
1.7 scholarship for enrollment to univ.	500
3.4 advanced teaching	500
4.1 more phds	432
1.1 fund for PNR (Programma Nazionale della Ricerca (PNR) and PRIN e Progetti di Ricerca di Rilevante Interesse Nazionale	1.800

UNIVERSITY OF TRENTO

Work with us | Work with our graduates

PROSPECTIVE STUDENT | STUDENT | INTERNATIONAL STUDENT | ALUMNI | PHDRSEARCH FELLOW | PROFESSOR AND STAFF | MEDIA

PhD SST  
Space Science and Technology

University Structures Research Education International UNITRENTOMAG

Home | Education | Doctoral programmes | Educational activities for PhD students | **National PhD Program in Space Science and Technology - SST**

### National PhD Program in Space Science and Technology - SST

**Educational activities for PhD students**

**Director:** Prof. Roberto Battiston  
**Deputy-director:** Prof. Myrka Zago

**Science and technology**

- Physics
- Information Engineering and Computer Science
- Civil, Environmental and Mechanical Engineering
- Industrial Innovation
- Mathematics
- Materials, Mechatronics and Systems Engineering
- Agrifood and Environmental Sciences
- Biomolecular Sciences
- Humanities**
  - European Cultures, Environment, Contexts, Histories, Arts, Ideas
- Doctoral School of Social Sciences
  - Announcement of selection
  - Economics and Management
  - SUSTEEMS
  - Sociology and Social Research
  - Forms of cultural exchange and textuality
  - Comparative and European Legal Studies
  - International Studies

**Curricula**

1. Observation of the Universe
2. Earth and the Sun-Earth system
3. Planetary Sciences
4. Astrobiology, Life Sciences and Space Medicine
5. Space sensing and instrumentation
6. Engineering and satellite platform technologies
7. Economics, law and space diplomacy

**Call for applications for the admission to the Doctoral programme in Space Science and Technology are now available.**  
Further information at the webpage:  
- [Announcement of selection](#)

**Educational Goals**

Italy has a long tradition in **space science and technology** and has developed a comprehensive chain of activities linking university education, academic, private research and industrial activities.

Space activities represent a **multidisciplinary field that requires specific education and training**.

The **National PhD Program in Space Science and Technology** aims to train young PhD's in the field of **science, engineering, technology and international relations in the space sector** through the development of knowledge, skills and competencies in the research areas of interest of the [twenty-seven participating Universities and Research Institutions](#).

The **training topics** related to space activities cover **multiple areas**, which makes the National PhD approach particularly effective. In this

# L'ASSEGNAZIONE DELLE RISORSE AL MUR

L'ATTUAZIONE DEL PNRR - Procedure finanziarie e contabili

Investiments	IMPORTO MIn€
1.2 Italian ERC (for young researcher)	600
1.3 Extended Partnership	1.610
1.4 Nazionale Reserach center (Campioni Nazionali)	1.600
1.5 ecosystems	1.300
3.1 Infrastructures	1.580
3.3 Industrial phds	600

DM 351  
DM 352

## PE

- 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10
  - 11
  - 12
  - 13
  - 14
- Artificial intelligence
  - Future scenario on energy
  - Natural and antropics risks for environment
  - Quantum tech.
  - Humanistic culture and patrimony for innovation in creativity
  - Diagnosys and therapy in precision medicine
  - Cybersecurity,
  - Ageing
  - Sustanibility
  - Food tech
  - Made-in-Italy circular economy
  - Neuroscience e neuropharmacologia
  - Emerging infective desease
  - Telecommunications for future

## 15 Space activites

### CN

- Simulations, HPC
- Tech for Agriculture (Agritech)
- Gene Therapy and RNA tech.
- Sustainable mobility
- Bio-diversity



cherenkov  
telescope  
array


**CTA+**

PNRR/INFRA project for CTA-S enhancement



# PNRR call

- Call for ESFRI ([PNIR 2021-27](#))
- **High priority IR: CTA(INAF), ET(INFN), KM3-NET(INFN)**
- Total budget (Physical Science&Engineering) 400M€/1080€ (line 3.1.1),
- 15M€/proposal (VAT incl.),
- target 20 proposals
- 40% for South of Italy
- Gender Parity (recruitment (t.d.) and Phd)
- **30 months**
  - **Bills < 2025**



## Infrastrutture di Ricerca

- Caratteristiche generali del bando [Avviso MUR 3264 del 28-12-2021]
  - Budget complessivo **1080 M€**
    - Altri 500 M€ per “Infrastrutture per l’Innovazione”, bando separato
    - Budget diviso per Aree ESFRI:
      - **Physical Sciences and Engineering (400 M€)**
  - Domanda riservata a soggetti titolari di I.R. incluse nel PNIR per [Art. 5.3]:
    - i) potenziamento di IR presente a priorità ALTA
    - ii) creazione di nuova IR presente a priorità ALTA e MEDIA
    - iii) creazione di RETE tra più IR presente a priorità ALTA e MEDIA su tema ESFRI
  - Scadenza: **28 febbraio ore 12.00**
    - **40%** nelle Regioni del **Sud**, **40%** reclutamento **donne**
    - solo contratti a tempo determinato di lavoro, no AR, sì dottorati, no amministrativi
    - fatture PAGATE entro 30 mesi dall’inizio e comunque NON oltre 31/12/2025
    - DNSH [Do Not Significant Harm], FAIR [Findable, Accessible, Interoperable, Reusable]

Ricercatori e Tecnologi - 10 Marzo 2022 Marco Pallavicini 4/11



# CTA+

## CTA alpha config.:

CTA-N: 4 LST + 9 MST

CTA-S: 0 LST + 14MST +37 SST

North site close to optimal situation

South Site in a reduced config.

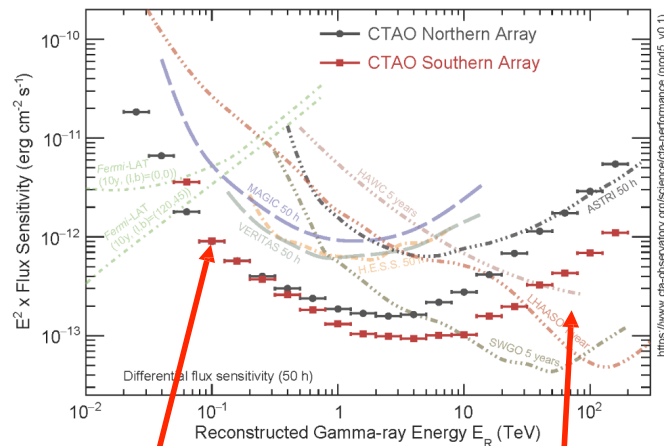
### PNRR proposal:

- Improve South Site (2 LSTs, 7 SSTs) plus other facilities (optical and radio telescopes)

- R&Ds on technologies close to CTA

More than 400 pages

- INAF is leading a proposal (~80 M€) to enhance the ESFR/ERIC CTA infrastructure at both **low (<1 TeV)** and **high (>100s TeV) energies**, and provide it with state-of-the-art ground-based multi-frequency telescopes for the follow-up of multimessenger transient sources (such as GRBs, GWs, Neutrinos, etc.) which are Core Science for CTA.



Increase (significantly)  
sensitivity here

...and here

TNG (North)



VST (South)



...and multi-ni follow-ups

# WBS

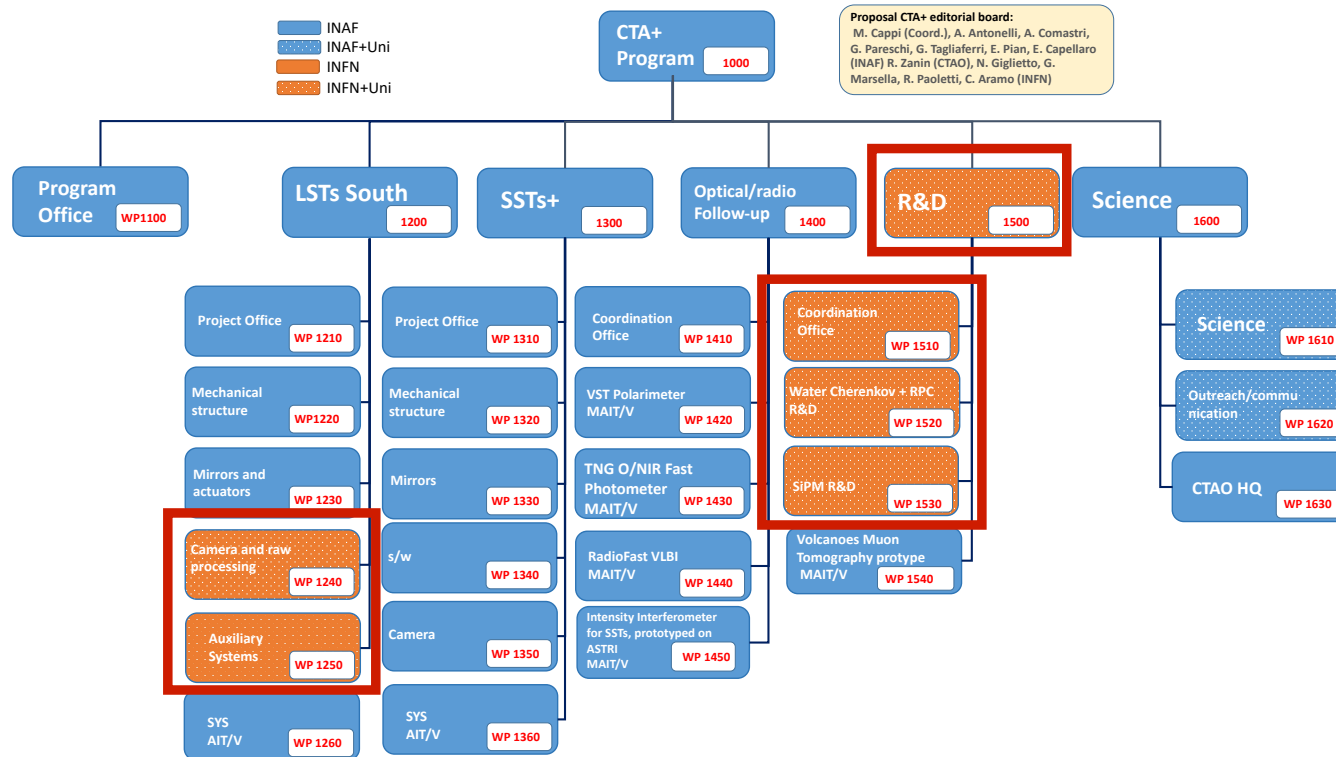
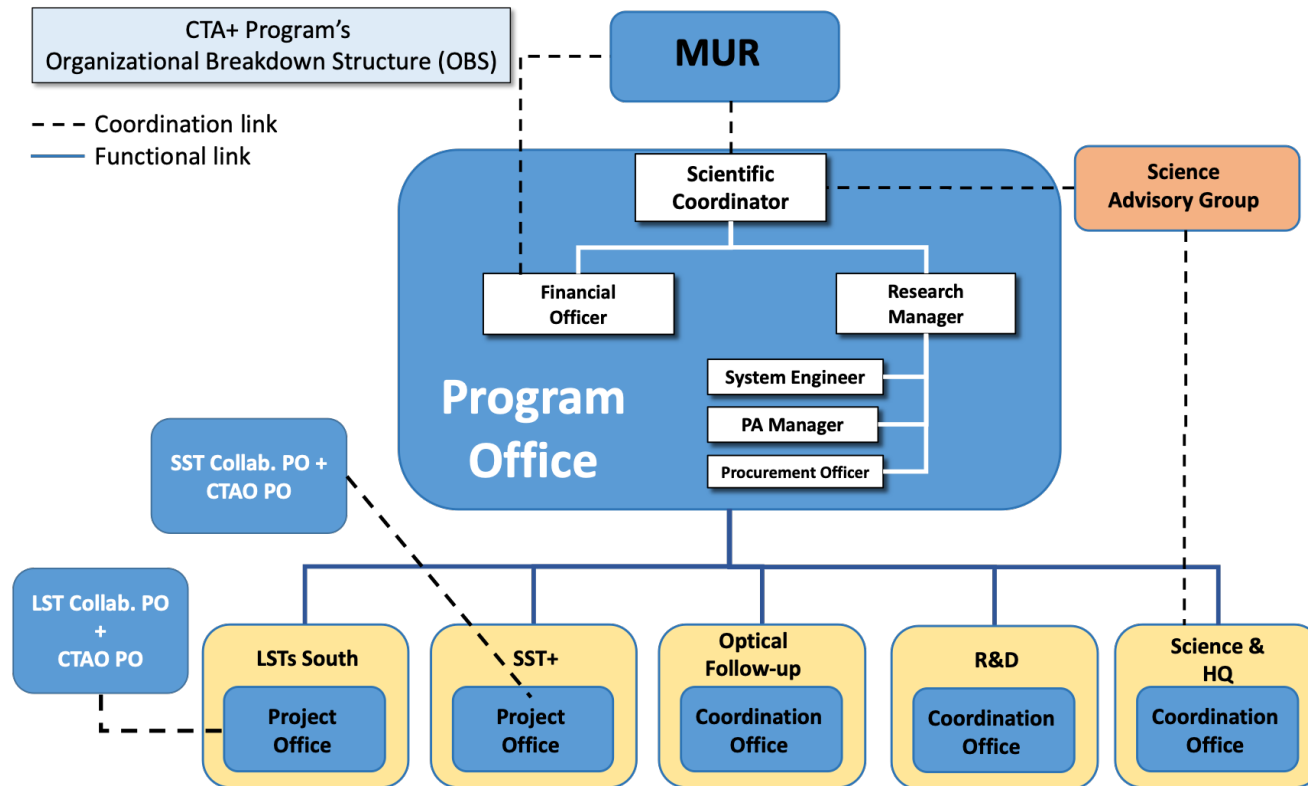


Fig. A - Work Breakdown Structure of CTA+ Program

# OBS



*Organization Breakdown Structure of CTA+ Program*

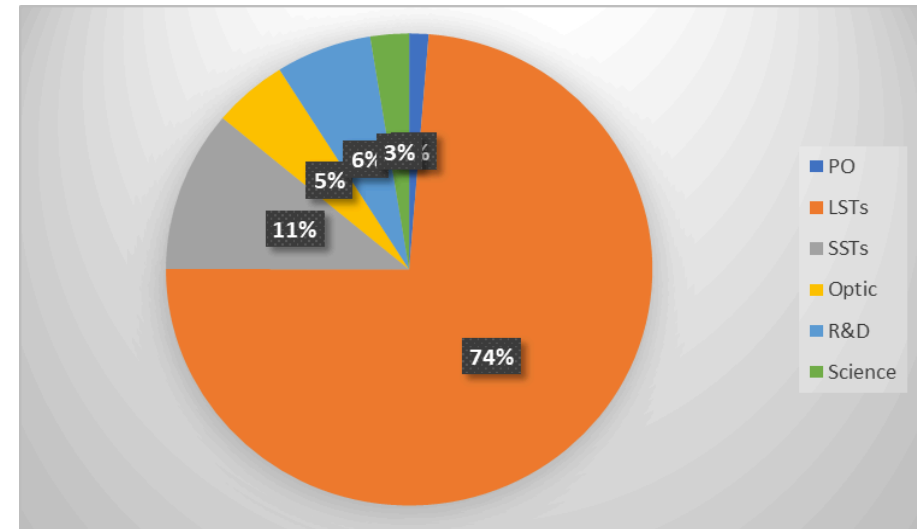
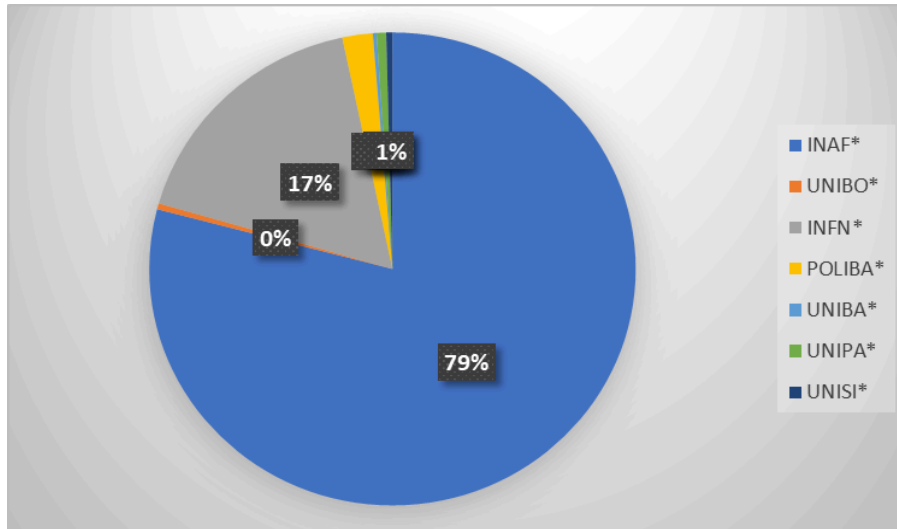
# Costs and WPs

WP#	Work Packages	Indirect costs	Infrastructure	Instrumentation	Personnel	Training	Total
1100	Program Office	€ 383.800,00	€ 0,00	€ 0,00	€ 662.200,00	€ 94.600,00	€ 1.140.600,00
1200	LSTs South	€ 60.239.000,00	€ 400.000,00	€ 100.000,00	€ 2.372.582,60	€ 210.000,00	€ 65.661.582,60
1300	SSTs+	€ 7.785.403,00	€ 1.271.568,00	€ 195.000,00	€ 555.775,00	€ 0,00	€ 9.807.746,00
1400	Optical/radio follow-ups	€ 215.000,00	€ 110.000,00	€ 3.328.200,00	€ 681.120,00	€ 70.000,00	€4.404.320,00
1500	R&D (CTA Technologies Enhancement)	€ 3.000.000,00	€ 0,00	€ 1.400.000,00	€ 889.071,30	€ 140.000,00	€ 5.429.071,30
1600	Science	€ 619.700,00	€ 175.000,00	€ 77.000,00	€ 705.031,30	€ 829.000,00	€ 2.405.731,30
	<b>Totale</b>	<b>€ 72.027.903,00</b>	<b>€ 1.846.568,00</b>	<b>€ 1.772.000,00</b>	<b>€ 5.184.660,20</b>	<b>€ 1.273.600,00</b>	<b>€ 88.849.051,20</b>

# CTA+ Budget (before cut)

Budget Totale						
54.1a Personnel	54.2b Instr, Eq & SW	54.3c Access	54.4d Infrastructure	54.5e Indirect	54.6f Training	Total Cost (€)
€ 6.469.654,90	€ 71.347.100,92	€ 36.000,00	€ 4.150.019,40	€ 6.261.052,07	€ 1.738.154,23	€ 89.243.505,60

Sud	€ 53.350.832,75
Nord	€ 35.892.672,85
Total Budget	€ 89.243.505,60
Sud/Totale	59,78%



# The ASTRI Mini-Array Project



**EIE GROUP**

Design and implementation of the telescope's & cameras electro-mechanical structures



Implementation of the site infrastructure @Tenerife



Design and implementation of cameras



Production of the SiPM sensors



ASIC design and production



Production of the primary mirrors reflecting panels



THIN FILM COATINGS



Coating of the secondary mirrors via magnetron sputtering



Polishing of the secondary mirrors surfaces



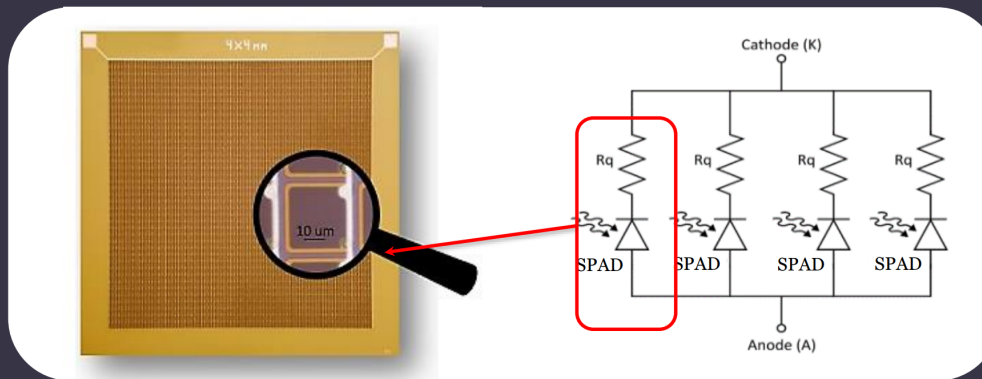
Production of the secondary mirrors via thermal slumping



Control sw based on the Alma Common Software

## The detectors: Silicon Photomultipliers

SiPMs: array of reverse-biased Single Photon avalanche Diodes (**SPADs**) connected in parallel



SiPM size:  
from 1x1 mm<sup>2</sup> to 10x10 mm<sup>2</sup>

SPAD size:  
from 5 μm to 40 μm (typical)

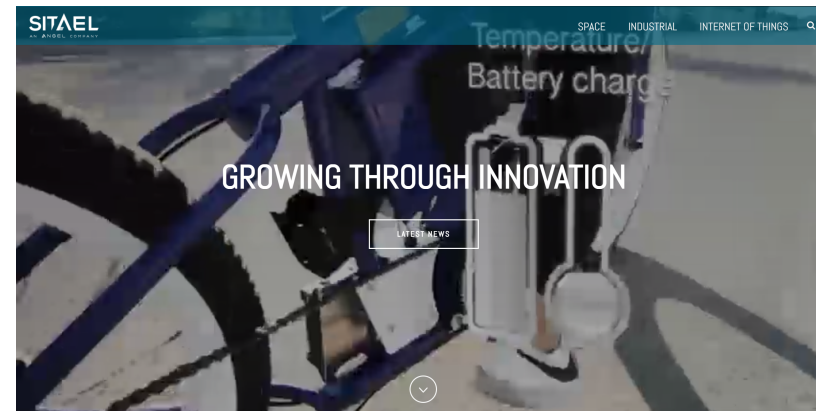
<http://advansid.com/resources/the-silicon-photomultiplier>





## FEEM Production

- Tender for the production of ~200 FEE modules for ~500k€
- Only one company applied: SITAEL SPA
- First part of the tender: production of 5 prototypes FEEMs
  - Prototypes delivered in mid May 2022
  - Tests of FEEM prototypes ongoing
- Full production to be started after prototypes validation
- FEEMs will be produced and delivered in batches of 75 modules
- Quality control test on each module to be performed
- Modules will be shipped to FLWO, Arizona (USA)



Keep home messages:

- Continue dialogue with private sector
- Intercept more calls for fundamental research and technology transfer
- Shorten the distance (academia and private sectors, north and south, gender gap)
- Open your mind to inter and multidisciplinary approach to research and to life