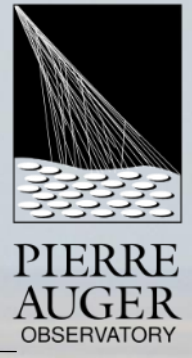
AUGER-CZ: Pierre Auger Observatory – participation of the Czech Republic



Institute of Physics of the Czech Academy of Sciences (FZU – Fyzikální ústav)

Charles University (CU)

Palacký University in Olomouc (PU)

Petr Travnicek (FZU)

Uniqueness of the Pierre Auger Observatory

HEAT (mirrors from FZU, Olomouc)

AMARILLA (mirrors from FZU, Olomouc)

COIHUECO (mirrors from FZU, UP Olomouc)

Upgraded surface detector station x 1660

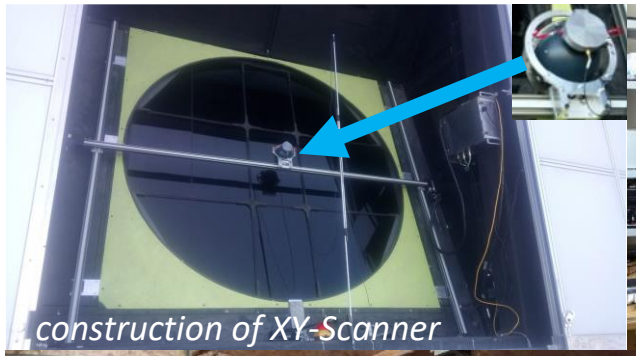
MORADOS

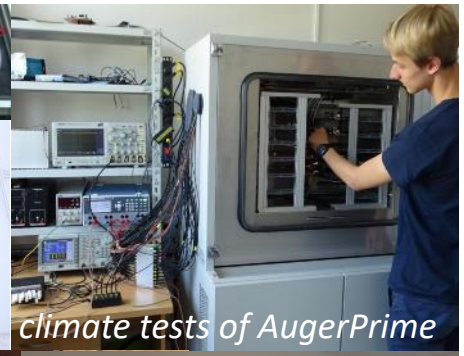
LEONES

unique data, unprecedented statistics

- World largest observatory
- to detect and study the highest energy cosmic rays
- 3000 km^2 array of (1600) surface detector stations
- 27 fluorescence telescopes
- 15 segmented mirrors (16 m^2) from UP Olomouc
- **Fluorescence detector (FD) under responsibility of the Czech groups**
- First CR hybrid detector
- Now in upgrade phase, new detectors
- Location: Mendoza, Argentina
- **AUGERPrime – recent upgrade with strong Czech contribution in electronics testing**

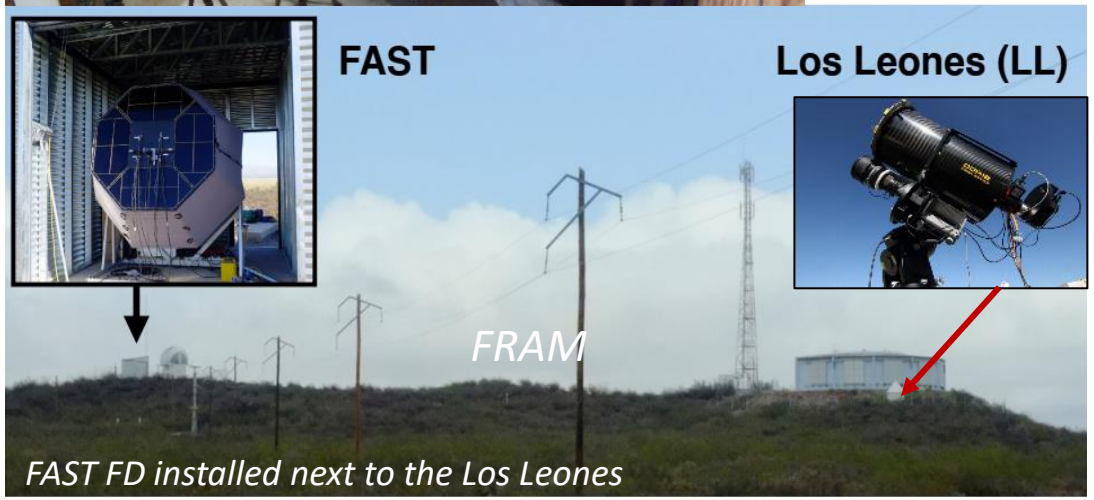
AUGER-CZ


construction of XY-Scanner


climate tests of AugerPrime


Construction of optomechanical system for FAST telescope


Remote control room Prague



FAST FD installed next to the Los Leones

- **Optical lab for entire AUGER collaboration**
  - Mirrors production and maintenance
  - New calibration system **XY-Scanner -** Steerable extended uniform light source moved in front of the FD aperture (developed together with the Karlsruhe group); General purpose integrating sphere as the most suitable representative of the extended uniform light source (improved by the Olomouc group)
- **New FD detector** concept - Fluorescence detector Array of Single-pixel Telescopes (**FAST**) is a design concept for a next-generation UHECR observatory
  - Design and production of optical and mechanical system
- **Climate test of new electronics**
  - tests of entire production of 2000 electronics boards in Prague laboratory
- **FRAM telescopes and ALL SKY cameras for atmospheric monitoring**
  - broad experience and expertise in atmospheric monitoring
- **Leadership in Fluorescence detector working package**
  - Responsibility for organization of detector operation and maintenance
- **Leadership in Monte Carlo production work package**
  - VO AUGER founded and operated by AUGER-CZ, responsibility for MC library production
- **Leadership in Mass composition work package**
- **Leadership in Air shower physics work package**

Development of AUGER-CZ

- 1990–1997 first conceptual ideas of AUGER
- 1997 Pierre Auger collaboration formed
- 1997–1999 Czech involvement negotiated
- 1997–2000 first projects in various countries, construction of engineering array started
- 2000–2004 construction of engineering array
- 2004–2008 construction of the main array
- **2004–2008 – construction of the fluorescence and HEAT telescopes with the Czech mirrors**
- **2004 construction of Czech FRAM telescope to monitor atmospheric conditions**
- **2004 –2010 – construction of the first Czech all-sky cameras**
- 2008–2014 full operation of the main array, preparation for the AUGER upgrade
- 2014 upgrade solution chosen
- 2014 international agreement regarding future operation of the Pierre Auger Observatory signed
- 2015 further plans regarding AUGER upgrade, proposal for climatic chamber in the Czech node
- 2015 FRAM in steady mode for observing showers within the Shoot-The-Shower program 2016 negotiations with MEYS about AUGER-CZ concluded and project LM2015038 started
- 2016 first upgraded detectors in the field of the Pierre Auger Observatory
- **2016 upgrade of the Czech all-sky cameras**
- 2017 climatic chamber installed in Prague for AUGERPrime electronics tests
- 2017 The CTA Sun/Moon photometer has been temporarily installed to confirm the validity of the FRAM aerosol algorithms
- 2018 In collaboration with the German partners we have worked on the preparation of the new device for the calibration of the fluorescence detectors 2018 upgrade of FRAM finished
- 2018 increased responsibility for creation of extensive libraries of simulated cosmic ray showers
- 2019 partial installations on site in Argentina carried out for the new system for absolute calibration of the fluorescence detector
- 2019 The first FAST telescope was installed at the Pierre Auger Observatory
- 2020-2021 second FRAM system being produced and approved for the usage at the Observatory
- 2020 first batches of 2000 UUBs being tested at the Prague laboratory
- 2020 work on new calibration system for fluorescence telescopes continues together with the German partners
- 2020 remote control room for fluorescence telescopes operation established in Prague
- **2022 FRAM2 in Argentina**
- **2023 last UUB boards for AUGER-Prime tested in Prague**
- **2023 xy scanner used in almost all bays of FD**
- **2023 next FAST housing produced**
- **2024 another task under leadership of AUGER-CZ member**
- **2024 FAST prototype housing tested in Ondrejov**
- **2024 prolongation of AUGER**

PIERRE AUGER OBSERVATORY

November 2024 – Festivities in Malargue to celebrate prolongation of the Observatory

Annex

to the

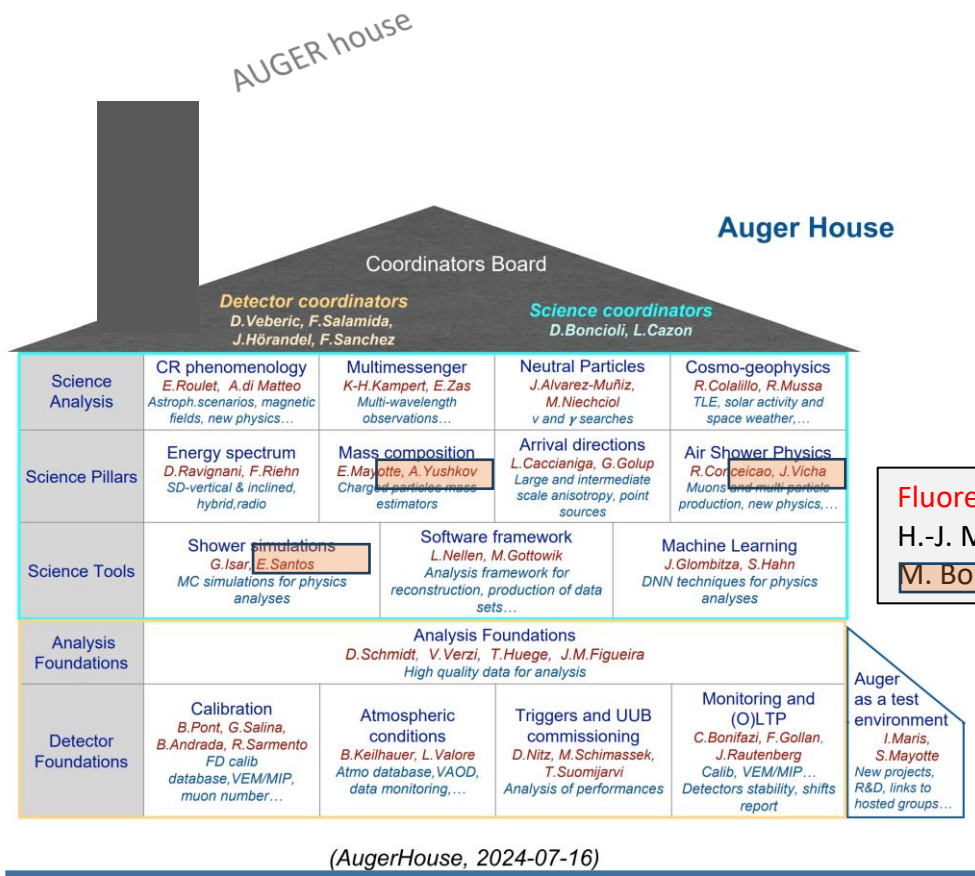
Pierre Auger Observatory

International Agreement
for the
Organization, Management and Funding
for the
Operation
of the
Pierre Auger Observatory

Among the
Science Funding Institutions of
Countries in the

Pierre Auger Collaboration

Key milestones >2024, activities



Fluores. Det. & HEAT
H.-J. Mathes
M. Bohačová

(AugerHouse, 2024-07-16)

Our people in AUGER house

Martina Bohacova
Task leader of FD

Alexey Yushkov
Task leader of mass composition

Eva Santos
Task leader of MC simulation

Jakub Vicha
Task leader of Air Shower Physics

- 2024-2025 – finishing installation of second FAST telescope
- >2025 – more FAST telescopes (mniarray) to test stereo
- >2026 – FRAMs next generation
- 2024 - finishing deployment of AUGERPrime (CZ participates)
- 2024 - 2025 – production and installation of the third FAST telescope
- > 2024 – operation of the upgraded Observatory
- >2024 xy scanner participation in development of the device and on-site callibrations
- >2024 – continuing **responsibility** for fluorescence detector system including operator shifts onsite and remote
- >2024 - participation during calibration campaigns using new XY scanner
- >2024 – continuing contributions in Monte Carlo simulation tasks and scientific group regarding mass composition and air shower physics