Experimental High Energy Physics in Colombia

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ATLAS experiment

II Latin American Strategy Forum for Research Infrastructure:
an Open Symposium for HECAP – July 6-10, 2020
HEP experiments

- LHC experiments
- Neutrino experiments
- Cosmic-ray experiments
LHC experiments: timeline

• 2006: Universidad de los Andes joins CMS
• 2007: Universidad Antonio Nariño joins ATLAS
• 2014: Universidad Nacional de Colombia joins LHCb
• 2016: Universidad Industrial de Santander joins ALICE
• 2019: Universidad de Antioquia joins CMS
• 2020: Universidad Nacional de Colombia joins ATLAS
LHC experiments: Physics

- ATLAS: Searches for beyond standard model signatures; Charged Higgs, SUSY, Invisible Higgs, HNL
- CMS: Supersymmetry, HNL searches, DM searches and B physics
- LHCb: Charm quark physics, and Quarkonia-Exotics 
  $B_c$ meson decays for leptonic universality tests
  $B$ meson differential cross section production measurements
LHC experiments: Instrumentation and Service tasks

- ATLAS: Distributed computing shifts (remote), upgrade of the new inner detector (ITk) and ATLAS control network
- CMS: GRID maintenance and operation, Muon RPC detectors DAQ system & upgrade GEM detectors
- LHCb: Tracker association tool for reconstruction efficiency improvement in events with ghost tracks
- ALICE: SAMPA chips for TPCs
- Other efforts in accelerator physics and particle detectors
Neutrino experiments: timeline

- 2015: Universidad del Atlántico joins NOvA
- 2017: Universidad Antonio Nariño and Universidad Sergio Arboleda join DUNE
- 2019: Universidad del Magdalena joins NOvA
- 2019: Universidad EIA joins DUNE
Neutrino experiments

- NOvA: Data analysis, electron neutrino appearance, Non-standard interactions, Near detector physics, Neutrino cross-section
- DUNE: Photon detection system (electronics and hardware design), Detector electronics, Simulation, firmware development

* See D. Moreno’s talk for more details
Cosmic-ray experiments

- 2010: UIS joins LAGO
- 2015: UIS joins The Pierre Auger Observatory
- 2018: Universidad de Medellin joins The Pierre Auger Observatory
- Auger: Cosmic ray Air showers modelling and simulation and atmospheric phenomena
- LAGO: Development, construction and operation of Water Cherenkov Detectors, development of new electronics, DAQ custom system development
HEP experiments: going beyond

- The experience gained by all the groups has led to other projects
- Applications:
  - Instrumentation Lab @ UniAndes
  - MuTe, RACIMO @ UIS
- Outreach and Education:
  - Schools
  - Masterclasses
  - Open Data
  - ICTP-Physics Without Frontiers
  - CEVALE2VE: Network for HEP education
  - LA-CoNGA: Latin American Alliance for Capacity building in Advanced Physics
- Networks: CONHEP
Colombian Network on High Energy Physics (CONHEP)

- 15 institutions, 40 Physicists
- Theory and Experiment
- Colombian meeting on HEP since 2016
- Colombian Teachers program at CERN
- Outreach seminars, public talks, …