IGFAE Galician Institute of High Energy Physics

IGFAE-LIP Meeting — Lisboa 13.04.2023



Carlos A. Salgado

EXCELENCIA MARÍA DE MAEZTU





Context

Joint research center of the University of Santiago de Compostela and Xunta de Galicia - created in 1999

Legally under the administrative structure of the university, not independent for

- Hiring personnel
- Managing funds (contract, etc) in particular overheads
- Decide on premises
- etc.

But governance, etc fixed by own regulations

Strong boost after the Maria de Maeztu Excellence Unit in 2017

- Highest distinction in Spain for research centers/units
- (Strong decrease in Particle Physics units in last years)
- New governing model and periodic evaluation **SAB**



This fixes strong boundary conditions for most of our actions but also provides some stability, e.g. in administration and professor positions













IGFAE

Instituto Galego de Física de Altas Enerxías



8 Ramón y Cajal / Tenure-track





2023

SA1_HQCD



2020

SA1_LHCB



2018 SA1_LHCB

Personnel 2017 \longrightarrow 2022





Strategic Research Areas

Pierre Auger LIGO NEXT Phenomenology DUNE [New] HyperK [exploratory]

SA2: Particles from the Cosmos and fundamental Physics

String Theory SM Phenomenology

SA1: The Standard Model to the limits

GSI-FAIR ACTAR Laser Acceleration

SA3: Nuclear Physics from the lab to improve people's heath



LHCb Instrumentation

HCB

Installation on time for LHC 3rd running period

Movie from CERN



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.HCB

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SA1 LHCB - analyses



Hardware

- Upgrade VELO
- High-level trigger
- Codex-b





E.g. CP violation in $B \rightarrow 3Pions$



Challenging the Standard Model of Particle Physics — still not clear signal of departure... but some of the most interesting results from LHC





SA1_STRI



Strongly coupled quantum systems with holography

Anisotropic holographic fluids Flow of information in ABJM theory Multilayer systems Numerical holography

Integrability in String Theory and AdS/CFT

From GR to quantum gravity

Geometric infation



Pierre Auger Observatory

The observatory is a detector of high-energy cosmic rays that uses two different techniques

Mendoza, Argentina

The collision between the particles produces a faint light captured by four fluorescence telescopes

activities

High energy tay

Air shower

Inclined showers

- Energy spectrum
- Composition
- Anisotropies
- Neutrinos in UHECR

MMA with neutrinos in Auger Coherent radiopulses for HE showers in MHz-GHz

SA2_AUGE





Change of slope at 13x10¹⁸ eV

Excludes UHECR from small number of nearby sources

Multimessenger Astronomy - with SA2_GRWA

The particles are also recorded when they react with the water inside an array of 1,600

lox

surface detectors





BBG WHAT YOUR BRAIN DOES TO CREATE REALITY SA2 SCIENCE FOCUS Why people think How to beat

COVID-19 BY 2022





How a string of strange discoveries could reveal a cosmos hidden just out of view

IN THIS ISSUE —

THEY CAN HEAR THE DEAD

Health

Nature -The truth about gene-edited food Are climbing plants conscious?



GW190521 as a Merger of new boson stars?





SA2_NEXT

Are neutrinos Majorana?



- Optical TPC prototypes
- DUNE near detector

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□ HyperK - exploratory



INDELAB

IGNITE Contribution to DUNE near-side detector



SA3_NUCL

FAIR

- CALIFA calorimeter and Si-tracker
- Definition of scientific program
- Simulation software

Lower energies

- Active target TPC
- Fission at GANIL
- Optical TPC for fission

Applications

- Medical imaging
- Natural radiation laboratory

Installation of the Califa detector for

USC



USC

SA3_LACC

Laser particle acceleration — local infrastructure



Production of radioisotopes for PET Plasma mirror for ELI **□** FLASH therapy proof-of-principle experiment Laser-driven neutron sources Micrometric X-ray sources

HL: Strategy for new facilities

IGFAE participates in global strategy - members of coordination group, working groups, chapter editors, ECFA...













	シジン取りた
 Obras de reform instalacións do Altas Enerxías (Monte da Conde Propietario USC 	
Comezo 03.11.2022 + 95 semanas Arquitectos Laura Fidalgo Soto Aradráa Sata Núñez	sució s nico ús
Andres Solo Nullez Coordinador de Seguridade e Saude Miguel Oroza Díaz VIIII VIIII VIIIII VIIII VIIIII VIIII VIIII VIIII VIIII VIIII VIIIII VIIIIII	Α

Technology Transfer

TT unit created - one person hired - Pablo Cabanelas A lot of activity, several opportunities identified

A lot of activity, several opportunities identified *IP protection *Metrology *Protontherapy *Pre-clinical mini-PET in collaboration with Vall d'Hebron *Applications to Proof-of-concept *WG KTI at SOMMa *Homeland security - Galician ports *Industrial doctorate