Preparing the future

Second meeting of the Enigmass2 ISC

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Glossary

- Labex = excellence laboratory
- Idex = excellence ‘initiative’ = larger scale/site project
- ANR = National Agency for Research
- IR(*) = (very large) research infrastructure

CNRS:

- IN2P3 = National Institute of Nuclear and Particle Physics → funding agency of LAPP and LPSC
- INP = National Institute of Physics → LAPTh
- INSU = National Institute of Universe Science → IPAG

Universities:

- USMB = Savoie Mont Blanc University → administrative supervision of laboratories in Annecy
- UGA = Grenoble Alpes University → administrative supervision of laboratories in Grenoble

- PAGE = Particle physics, astrophysics, geoscience, environment and ecology

= a research coordination ‘centre’ of UGA

Brief history of Enigmass Labex

- 2012-2019 Labex Enigmass1 (8 years) – 7M€
  - involved laboratories LAPP, LAPTh, (part of) LPSC, LSM
  - steering board IN2P3, INP, UGA, USMB, CEA

- 2020-2024 Labex Enigmass2 (5 years) – 2.8M€
  - involved laboratories LAPP, LAPTh, (part of) LPSC (now including LSM)
  - Project leader F. Marion (LAPP), deputy F. Ledroit (LPSC)
  - steering board IN2P3, INP, UGA, USMB

- And after?

Why we want to continue

- Dynamics of the collaboration between the labs
  - Structuring effect/synergies :

    neutrinos (LAPP-LPSC), ATLAS upgrade (LAPP-LPSC), LHC physics (LAPTh-LPSC), flavour physics (LAPP-LAPTh), cosmology/LSST (LAPP-LPSC)
  - complementarity of expertise
- Enhancement of our means, complementing CNRS (IN2P3, INP)
  - ahead of the projects (innovative instrumentation, theory)

+ afterwards (scientific return) – fraction of HR (postdocs et PhDs) in the budget ~70%

  - other strategic actions : recurring international schools
  - leverage effect : ANR grants obtained on topics supported by the Labex

Context: Idex UGA

- Started in 2017
- Confirmed in July 2021

  ➔Labex budget and steering transferred from ANR to Idex (→ from national to local)

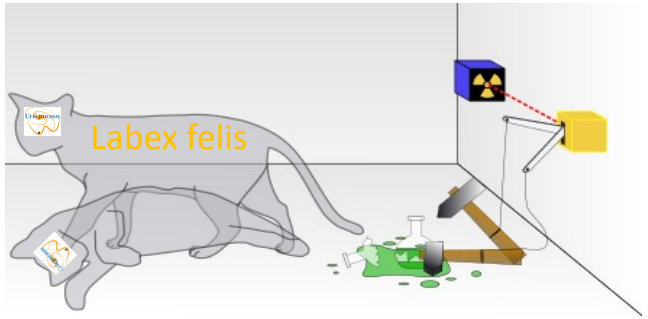
🙂 Enigmass2 budget secured

😐 What continuation after 2024?

- September 2022, after a long period of wavering

UGA declared the possibility for some Labex to continue

- call for proposals imminent, Enigmass should be invited (TBC)
- 8-year projects starting January 2025



⚠ Enigmass = special case: half of the Labex not part of UGA

Building a federation of 4 laboratories: Enigmass+

→ associate LAPP, LAPTh, LPSC and IPAG

- following on from the Labex, adding a laboratory based in Grenoble

- A federation provides a framework for this association and is meant to
  - stabilise our collaboration
  - stabilise the funding of our community by Universities, in particular Idex UGA
  - enable the possibility of long term forward planning
  - enable the possibility of joint applications for external funding
  - reinforce the regional visibility of our field

The federation would be useful regardless of the outcome of the Labex selection

- Status
  - Project steered by IN2P3 director
  - Project leader : Frédérique Marion, deputy Fabienne Ledroit
  - Steering board CNRS (IN2P3, INP, INSU), UGA, USMB:
    agreement in principle for a co-funding starting from 2025
  - Presented to CNRS last Tuesday
    - very positive feedback (‘avis très favorable’)

IPAG

Institute of Planetology and Astrophysics of Grenoble

- a laboratory member of PAGE (as well as LPSC, LAPP, LAPTh)
- based on the campus, administrative supervision by INSU

Seven research teams

- *Planéto* : planets, comets et meteorites of the solar system
- *Exoplanètes* : research and characterisation of exoplanets
- *Odyssey* : stellar and planetary formation
- *Interstellaire* : physico-chemistry of interstellar environment
  - Nika2 at IRAM
- *Sherpas* : accretion-ejection processes, emission of compact objects
  - H.E.S.S, CTA, SVOM, EM counterparts to GW sources, theory

    one on-going PhD co-supervised with LAPTh (CNRS funding)
- *Spectre* : volatile and organic material in planetary systems
- *Charm* : high spatial and spectral resolution instrumentation and high contrast

Enigmass+ science

Same scope as Enigmass2

slightly reorganised and reformulated + updated according to IN2P3 plan for next decade

Project currently outlined at the ‘bullet points’ level

- outline provided by management board to UGA in order to motivate our extension request
- largely driven by our current involvement in IR(*) projects (LHC, DUNE, CTA, Virgo, LSM, LSST)
- to be discussed more widely
- and then fleshed out to write the Labex extension application, if invited

WP1 : Hunting elementary constituents and their interactions seeking new physics

- Precise characterisation of the Higgs sector and direct search for new particles
- Study of matter-antimatter asymmetry, of flavour transitions in the quark sector and test of leptonic universality
- Exploration of the neutrino mixing paradigm (CP violation, mass hierarchy)

Enigmass+ : science

WP2 : Clarifying the nature of dark matter and dark energy

- Dark matter (models, direct and indirect searches)
- Dark energy and growth of structures in the universe
- Primordial Universe and inflation

WP3 : Deciphering extreme phenomena of the Universe

- Deconfined states of quarks and gluons (primordial matter, strong interaction)
- High energy astrophysics, transients
- Astronomy with gravitational waves (fundamental physics, multi-messengers)

Timeline for the Labex extension application

- 19th October: public audition of the Labex candidates
- November: call for proposals – deadline February 2023
  - Building of the application
- March-April 2023: expertise
  - Can we suggest your names as possible experts??
  - Are there additional/alternative experts you would like to suggest?
- May: proponents right to reply
- July: Idex decision
- October 2023: installation of a Scientific Advisory Board for each accepted Labex

Building the Labex application

- Until the invitation:
  - finalise the outline of the project with coordinators
  - identify lead-editors for the new work packages
- As soon as the invitation is received:
  - form a working group for each work package and start discussing the project
- Beginning of January
  - preliminary version for each WP
  - start building global picture
- February
  - last iterations to finalize the proposal

Recap

- Determination to continue a 10 year old collaboration
- Good progress from our funding agencies, with in-principle agreement to
  - create, as of January 2023
  - co-fund, as of January 2025

Enigmass+, a federation of 4 laboratories

- Open issues still to be ironed out
  - Will the Labex extension be granted?
  - What will the federation co-funding agreement be in practice?
  - What governance beyond 2024 – can it be kept simple and similar at the federation and Labex levels?
  - How will the federation and Labex be managed --CNRS admin vs UGA admin?
- Strong motivation to write a Labex extension application based on an exciting scientific project

BONUS

Enigmass+ science

Very preliminary state of discussions, as an example

WP1 : Hunting elementary constituents and their interactions seeking new physics

- Precise characterisation of the Higgs sector and direct search for new particles
  - IR* ATLAS at HL-LHC – ITk and calorimeter commissioning, Higgs (self-) coupling, di-boson, EFT
  - FCCee – vacuum calculations, machine-detector interface, Ecal,...
  - theory – tools for new physics, reinterpretation, QCD NLO corrections
- Study of matter-antimatter asymmetry, of flavour transitions in the quark sector and test of leptonic universality
  - IR* LHCb at HL-LHC -- radiative modes, Bs→μμγ, B(B→μμ)/B(Bs→μμ), ...
  - n2EDM (neutron EDM measurement)
  - theory – axions,...
- Exploration of the neutrino mixing paradigm (CP violation, mass hierarchy)
  - IR* DUNE (long baseline ν experiment) – vertical-drift TPC, atmospheric neutrinos,...

Enigmass+ : science

WP2 : Clarifying the nature of dark matter and dark energy

- Dark matter (models, direct and indirect searches)
  - IR* ATLAS at HL-LHC -- long-lived particles, dark QCD
  - IR direct searches at LSM (project boosted by recent hiring of expert senior scientist at LPSC -- Silvia Scorza)
  - IR* indirect detection with CTA (ground Gamma ray telescope)
  - theory – tools, axions (haloscope GraHal),...
- Dark energy and growth of structures in the universe
  - IR LSST (ground), Euclid (space-borne) telescopes (visible & IR) -- dark energy equation, matter distribution and growth of structures using probes of the recent universe (cosmic shear, SNe, clusters, etc)
  - CMB-S4 – CMB lensing and SZ to probe the matter distribution and growth of structures
- Primordial Universe and inflation
  - LiteBird (space-borne) and CMB-S4 (ground) – to measure CMB polarisation and constrain primordial B-modes (signature of inflation)
  - theory – computation of primordial power spectra in quantum cosmological scenarios

Enigmass+ : science

WP3 : Deciphering extreme phenomena of the Universe

- Deconfined states of quarks and gluons (primordial matter, strong interaction)
  - IR* ALICE at HL-LHC – (FoCal), ITS3, flavour-tagged jets, rapidity correlations
  - theory – nuclear PDFs
- High energy astrophysics, transients
  - IR* CTA (and synergy with SVOM and LSST for counterpart at other wavelengths, e.g. gamma-ray bursts)
  - theory
- Astronomy with gravitational waves (fundamental physics, multi-messengers)
  - IR* Virgo -- O5 observation run (AdV+ phase II), beyond O5 upgrades (Virgo_nEXT), third generation detector (Einstein Telescope)
  - theory - compact objects, including in extended models of gravity,…