

Information on APPEC activities

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APPEC GA Chair

<http://www.appec.org>



Update to the EU Strategy process

- CERN Council approved the composition of the:
 - European Strategy Group (ESG): establishes a proposal for the periodic update of the medium-and long-term EU Strategy for Particle Physics which it submits to the **CERN Council for approval**. The APPEC and NuPPEC Chairs are invited.
 - Physics Preparatory Group: drafts its update proposal taking into account the **160** scientific submitted inputs and community input (Granada open symposium). Closer members to the ApP community: **Stan Bentvelsen & Marco Zito Neutrinos and Cosmic Messengers; Dark Sector M. Carena and S. Asai**
 - The Strategy Secretary, Halina Abramowicz, Chairs both committees.
 - There are 5 WGs in the ESG: **WG 1** - social and career, **WG2** - Organizational aspects in the implementation of the European Strategy, **WG3** - **relations with external bodies and other fields of physics**, **WG4** - Knowledge and technology transfer, **WG5** - Outreach, education and communication, **WG6** - Sustainability and environmental impact. **WG3 coordinated by Tatsuya Nakada.**
- All information on the current process in: <http://europeanstrategyupdate.web.cern.ch>
- **Input documents** in <https://indico.cern.ch/event/765096/contributions/>
- Open Symposium, Granada, May 13-16. Agenda: <https://indico.cern.ch/event/808335/timetable/#all.detailed>



Update to the EU Strategy process

- Meetings of the ESG: Jun 21 (also WG3), Sep 24, Dec 10 (during CERN Council Week)
- Physics Briefing Book (S. Bentevelsen and M. Zito, M Carena, S. Asai) available on Aug. 26 for comments of ESG, then provided to Council on Sep 9 for comments; final version to be submitted on Sep. 27
- Dec 2-3 APPEEC General Assembly to approve recommendations which have to be ready by Dec 10
- 20-24 Jan Strategy Update write up of ESG members and invited members (Bad Honnef)
- May 2020 Strategy Update Document approved by Council

Huge presence of APP Science in Granada!

Mon afternoon

DM
 H. Murayama Ultra-light and Ultra-Heavy DM
 J. Monroes DD DM
 C. Weniger ID DM

Tue

Neutrinos & GW
 S. Pascoli Nu Mass and leptonic CP violation
 E. Lisi Neutrino mass
 M. Mezzetto Prospects
 F. Sanchez Neutrino Cross sections
 S. Mertens measurements of neutrino mass
 B. Fleming Sterile neutrinos
 N. Serra Heavy neutral leptons
 S. Bangalore Gravitational Waves

Wed morning

Messengers
 A. Haungs Cosmic Ray Physics
 F. Halzen Neutrino Astroparticle Physics
 M. Kowalski Multimessenger Physics

Wed afternoon

Perspective on the European Strategy from the Americas (20'+10')	Young-Kee Kim
Granada Conference Center	14:45 - 15:15
Perspective on the European Strategy from Asia (20'+10')	Geoffrey Taylor
Granada Conference Center	15:15 - 15:45
ApPEC Roadmap (20'+5')	Teresa Montaruli
Granada Conference Center	15:45 - 16:10
NuPPEC long term plan (20'+5')	Marek Lewitowicz
Granada Conference Center	16:10 - 16:35

Big message from the Open Symposium

SM + gravity \neq cosmos (Pilar Hernandez)

Big questions yet need an answer

matter-antimatter asymmetry,
dark matter
dark energy
inflation

The big questions cannot be addressed only by accelerators.
CERN science \neq accelerators science but big question science

Relevant comments :

When will CERN worry about unifying gravity with other fundamental forces?

ET is an accelerator without a beam

Synergies particle/astroparticle/cosmology via GWs

- **Dark Matter:** BHs contribution to DM ? What they tell us about DM ?
- Gravity tests
- **Multimessenger astronomy:** new lab for matter in most extreme conditions (NS, SN...)
- **Cosmology:** How far back will GW measurements bring us ? Inflation, phase transitions ?

P. Hernandez

Einstein Telescope

...and the match to the expertise of a leading particle physics lab like CERN

Vacuum: Vacuum systems for planned 3G detectors will be the largest UHV systems ever conceived (total volume $\sim 10^3\text{m}^3$) and will account for a substantial fraction of the cost

Cryogenics: The cryogenic cooler must deliver an extremely low noise, steady cooling power of $\sim 100\text{mW}$ at 10K to the mirror, and must be flexible to support operation

Controls and automation: Control systems for gravitational wave detectors and particle accelerators share the need to control multiparameter systems with a high degree of complexity

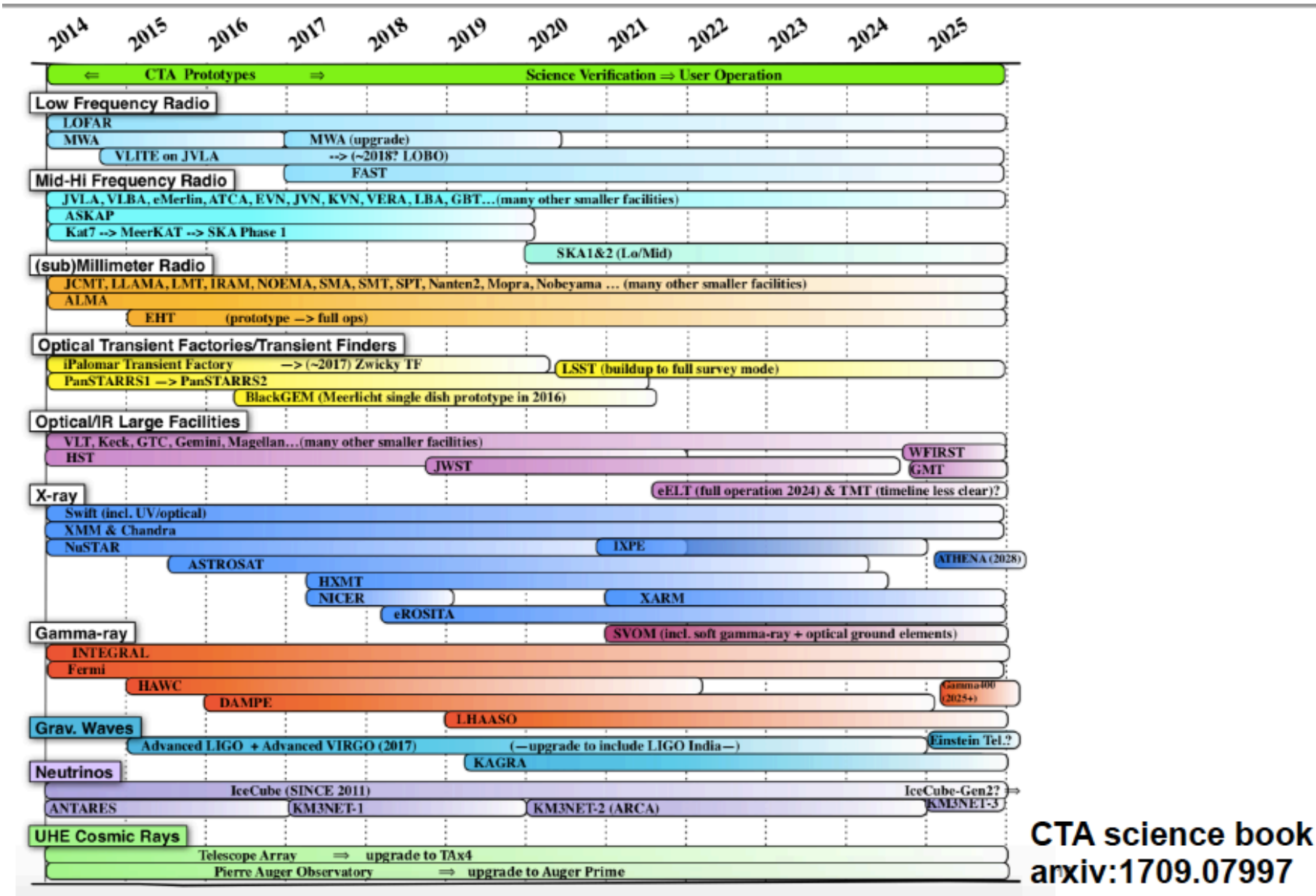
Electronics, DAQ: Gravitational wave interferometers are complex opto-mechanical systems, which need to be complemented with vast amounts of electronics

Underground facilities: Minimizing the site facility and infrastructure influence on performance

Governance: Ranging from management technology transfer to realization and management of ET

M. Kowalski

M. Kowalski: the long schedules are due to lack of European framework for APP large infrastructures?



CTA science book
arxiv:1709.07997

i) the **dark matter searches**;

- ◆ A **Joint Science WG**: *Increase presence of DD/ID scientists in Physics Beyond Colliders / LHC DM WG / a new WG? for cooperation on data analysis methods and comparison of data strategies*
- ◆ DM searches require a strong **theoretical support**.

ii) the **multi-messenger astronomy**, in particular the **3G GW** experiments (ET);

- ◆ synergy with the multi-messenger astrophysics has the potential with the future generation of gravitational wave detector, the Einstein Telescope, to incorporate gravity within the model of fundamental interactions, to pin down the nature of dark matter and to explore matter in extreme conditions.
- ◆ Cooperation on structuring the governance, long term operation of underground infrastructures and on technology being defined by the Collaboration.
- ◆ APPEC support through a committee of experts on large organisations and infrastructures

iii) **the neutrino physics**;

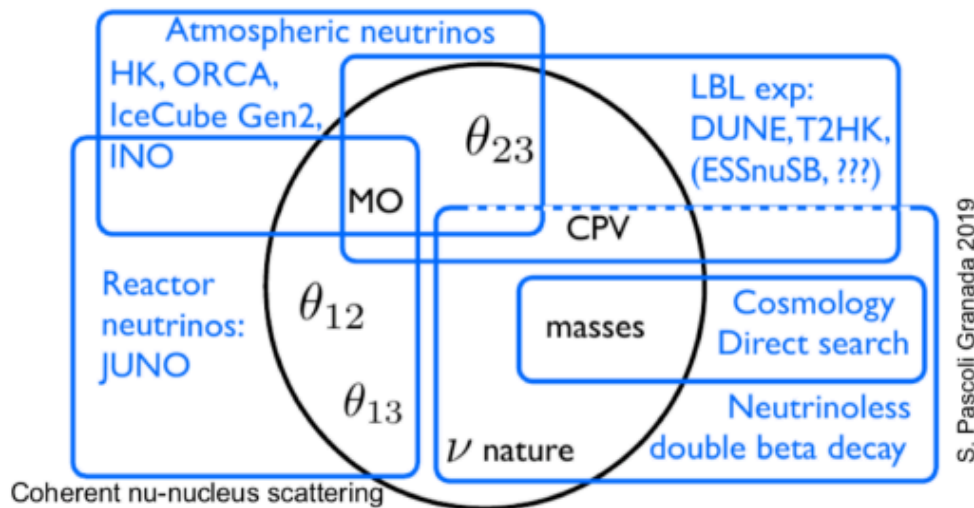
- ◆ Full support to exploitation of **CERN Platform program** and participation to discussion on interplay of results from atmospheric neutrinos (hierarchy, ν_{τ} appearance, matrix elements & mass-squared differences precision, cross sections at HE, sterile neutrinos,...), and astrophysical neutrinos (exotic interactions, ν_{τ} appearance)
- ◆ Clarification on nature of neutrinos is a major quest. Roadmap for **neutrinoless-double beta decay**. Workshop in Sep-Oct followed by meeting with US later.

iv) the creation of a **European Center for AstroParticle Theory (EuCAPT)**

Report from Open Symposium in Granada

Neutrino physics and Astroparticle

A very diverse experimental approach

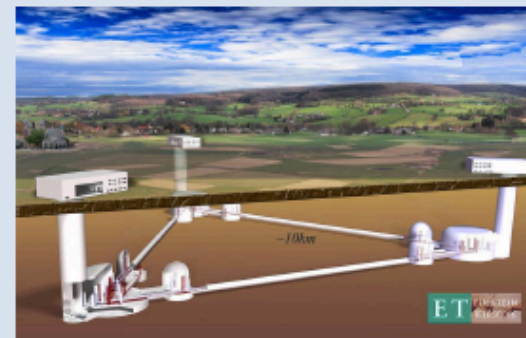


S. Pascoli Granada 2019

Motivation : necessary to get a complete picture, make the most out of every neutrino source, test at different L/E, possible existence of new neutrino states, of Non-Standard-Interactions

Astroparticle physics

- Gravitational waves and multimessenger physics open up a new window on the Universe. Very strong physics case.
- There is a very high impact on the field of particle physics (and fundamental interactions) (eg dark matter, neutrinos, general relativity, ...)
- There is clearly an opportunity for the particle physics community and laboratories to expand their involvement in this program



Einstein telescope needs CERN expertise
“Triangular accelerator without beam”

EuCAPT – European Centre for Astroparticle and Particle Theory

- Astroparticle Physics European Consortium (ApPEC) has long wished to establish a joint Theoretical Centre; CERN is an Observer to ApPEC.
- In 2018 the General Assembly of ApPEC asked CERN to found a European Centre for Astroparticle and Particle Theory (EuCAPT) for an initial period of five years:
 - CERN contributes 0.5 FTE from TH as part of the ongoing research in the group (no new position)
 - is ready to host meetings and provide (limited) secretarial support
 - a budget of up to 20 kCHF/a equally shared between CERN and ApPEC
- An external Director of EuCAPT has just been nominated (**Gianfranco Bertone** – NIKHEF)
Kick-off at CERN on July 10, 2019

A. Riotto is a member of Steering Committee



Other activities on Implementation of the APPEC Roadmap for 0nubb and DM and 'Strong APPEC'

Roadmap document for 0nubb of the panel chaired by S. Pascoli under discussion in the SAC

APPEC workshop in London on Oct 31, 2019 for Community inputs
Presentation to Int. Community
Approval in General Assembly on Dec 2-3

Direct Detection Dark Matter mandate been finalized by the SAC + Panel Composition

Proposal to ensure continuation of APPEC approved by GA: an APPEC centre, that can legally represent it, and offers in kind contribution of FTEs.
Call documents being prepared.

Activities between APPEC-ECFA-NuPPEC

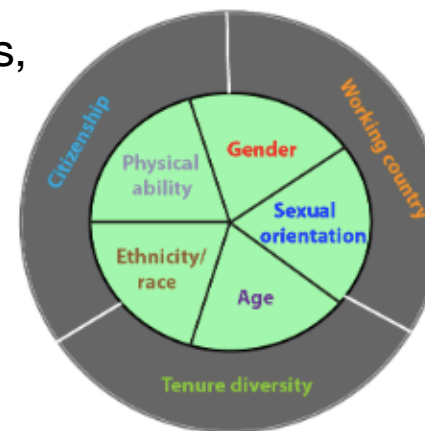
<https://jenas-2019.lal.in2p3.fr>



APPEC **transversal** contacts with other communities are very important. First Seminar of triennial APPEC-ECFA-NuPECC meetings has a finalized program and > 100 invited people registered. From **1 June 2019** the community at large will be invited to register, and the remaining seats will be allocated on a first come basis.

Scientific Program on:

- Physics challenges, DM, vs, Beyond Standard Symmetries, Cosmology in the GW era.
- Big and Open data, Computing challenges
- Photosensors, Solid State devices, Calorimetry, Magnets, Accelerator technology, cryogenic
- Education, Outreach, Panel on **Diversity (charter and survey)**
- 1 **early scientist**/country/field for their feedback.



Next **APPEC Technology Forum** will be open to ECFA and NUPPEC

APPEC Representative of ECFA panel

Federica Petricca

MPP, Munich



May 2005 Ph.D. in Physics Max-Planck-Institut für Physik, Munich
Ludwig Maximilian Universität, Munich
PhD, magna cum laude

Staff researcher Max-Planck-Institut für Physik, Munich

Since 2014: Spokesperson of the CRESST (Cryogenic Rare Event Search with Superconducting Thermometers) collaboration for the direct search of dark matter interactions with cryogenic detectors

2014 -2016: Group leader of the cryogenic detectors group at MPP

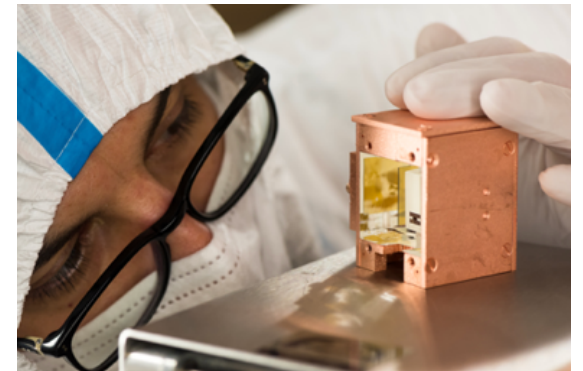
Redesign of the CRESST detectors to optimize the performance for low-mass dark matter search. This improvement opened the possibility to explore the sub-GeV/c² dark matter mass range.

2005 - 2012: Cryogenic detectors R&D coordinator

Development of detectors that lead to the best sensitivity for dark matter particles with mass lighter than 2GeV/c².

2001 - 2005: Early career researcher

Development of cryogenic detectors for scintillation light employed in CRESST with a detection threshold of <10 photons.



Main detector expertise

Low-temperature detector technology and methods, low-background techniques, electronics of data acquisition systems and signal processing

Next meeting to agree on new Chair and what the panel can do in relation to APPEC

Conclusions

- Astroparticle Field is supported by very strong communities (in Italy now > 50% of FTE, Spain, Germany, > 30% FTE)
- The Science is various and high potential