REPORT FROM THE APPEC SAC

https://www.appec.org

Laura Baudis
University of Zurich
Virtual APPEC GA meeting
June 5, 2020

THE APPEC SAC

https://www.appec.org

- Scientific Advisory Committee: advisory body of the GA
  - chair L. Baudis; vice-chair J. Monroe; scientific secretary: J. de Kleuver
- SAC members:
  - Sijbrand de Jong (cosmic rays), Paula Chadwick (HE photons), Maarten de Jong, Chad Finley (UHE neutrinos), Karsten Danzmann, Marica Branchesi (gravitational waves), Marco Pallavicini, Silvia Pascoli (neutrino properties), Christian Weinheimer (neutrinos mass), Laura Baudis, Jocelyn Monroe (dark matter), Ofer Lahav (dark energy), Ken Ganga, Licia Verde (cosmology, CMB), Manfred Lindner, Sergey Troitsky (theory)
- SAC mandate: advice and input to the GA on scientific issues
- SAC can appoint sub-committees; these report to the SAC which takes the input and reports to GA

MAIN SAC ACTIVITIES IN 2020

- Final discussions of the double beta decay sub-committee recommendations, and follow-up
- Dark matter direct detection sub-committee
- Preparation of the APPEC Town Meeting topics
  - First step: overview of the status of the implementation of the APPEC roadmap recommendation
  - Coordination of the writing started by Jo van der Brand, Sijbrand de Jong recently took over
- Report by EUCAPT director Gianfranco Bertone on the first activities since summer 2019, feedback

THE DOUBLE BETA DECAY COMMITTEE

- We had appointed a committee to discuss the searches for the 0νββ-decay and the future of the European programme
- Organisation:
  - Chair: Silvia Pascoli
  - Members: A. Giuliani, J.J. Gomez Cadenas, E. Previtali, R. Saakyan, K. Schaeffner, S. Schönert
- Mandate from the SAC (approved by GA in December 2018):
  - The Double Beta Decay APPEC Sub-Committee should advise APPEC on the European (and international) programme in double beta decay physics. It should report to the APPEC SAC, providing an assessment of the current and future scientific opportunities in double beta decay over the next 10 year period.
  - Preprint: 1910.04688 [hep-ex]

TIMELINE FOR THE DOUBLE BETA PROCESS

SAC meeting in Zurich

Discussion of the mandate draft and the committee members

Mandate approved by GA in December then sent to committee

Nov 2018

SAC meeting at CERN

Detailed answers to the SAC questions; report on the arXiv

Oct 2019

SAC meeting in Zurich

Update from GA by T. Montaruli

May 2020

Aug 2018

Discussions re: ββ-committee and objectives; LB was asked to prepare a draft for the mandate

SAC meeting in Zurich

June 2019

Talk by S. Pascoli

Written report from committee

Community 0νββ-workshop

Nov 2019

Update by S. Pascoli; SAC discussed final recommendations and report to the GA

SAC meeting virtual

Written feedback from GA required

THE DARK MATTER COMMITTEE

- We appointed *an international* committee to discuss the direct searches for dark matter and the future of the European programme
- LB wrote the mandate, implemented comments from SAC members and GA chair and scientific secretary
- Organisation:
  - Chair: Leszek Roszkowski
  - Members: Julie Billard (crystals at mK), Mark Boulay (LAr), Susanna Cebrian (NaI crystals), Laura Covi (theory, particle), Giuliana Fiorillo (LAr), Anne Green (theory, astro), Joachim Kopp (theory, particle), Bela Majorovits (axions), Kimberly Palladino (LXe), Federica Petricca (crystals at mK), Marc Schumann (LXe)
- Mandate approved by the GA at the end of summer 2019
- Committee started its work after the Nov SAC meeting

THE DARK MATTER COMMITTEE MANDATE

- To aid in the discussions and to devise concrete recommendations for the next steps in direct DM detection in the next decade, the DM direct detection committee should provide an assessment of the current and future scientific opportunities in non-accelerator DM searches over the next 10-year period, in particular delivering:
  - The global context of DM particle searches, including the existing hints or evidence for DM particles, an inventory of alternatives for the particle nature of DM, and an inventory of present and best estimates of future sensitivities from measurements or observations from methods other than direct detection
  - An inventory of existing DM experiments and the technologies adopted by these, with current most competitive results
  - A comparative SWOT analysis of existing, planned and proposed technologies for DM direct detection with the potential to surpass current sensitivities in the next decade with the eventual goal of reaching or surpassing the neutrino floor

THE DARK MATTER COMMITTEE MANDATE

- An assessment of the required infrastructure in Europe, including maintenance and upgrades of existing facilities
- A list of (possible) technological and scientific synergies between the different direct detection technologies and with research and R&D outside of this field
- An inventory of physics, astronomy or other research that can be done in addition to DM direct detection with the various technologies. In addition it would be important to discuss if such other research can be done even within the specifically proposed DM experiments
- Synergies with other experiments of indirect, accelerator and cosmology DM searches should also be considered, including possible technical and R&D synergies, e.g with CERN, other laboratories and industry

THE DARK MATTER COMMITTEE

- The report was received by LB May 15, distributed to SAC
  - Leszek Roszkowski gave a presentation at the SAC meeting on May 19
  - Followed by many questions and lively discussions
- Next steps:
  - APPEC SAC members to send feedback until June 10, LB is collecting this feedback and will send to Leszek
  - Updated draft by the sub-committee by mid July, circulate again to the SAC, final comments by end of July
  - Draft can be made public by the end of August
  - Community meeting planned for late Sept or early October; feedback to be implemented and final report to be available for the GA Dec meeting 2020

MIDTERM REVIEW OF THE ASTROPARTICLE STRATEGY

- Originally Town Meeting planned for October 2020 (SAC = programme committee)
- Needed input from SAC on current status of the field
- Document was started in summer 2019, based on APPEC roadmap
  - Town Meeting postponed to 2021
  - SAC composition was (partially renewed)
- Goals for the review:
  - Overview of implementation status
  - Identify developments and new topics
  - Update addendum to the roadmap

MIDTERM REVIEW OF THE ASTROPARTICLE STRATEGY

- At the May 2020 SAC meeting, the lead authors were identified and additional topics and work plan were discussed
- Timeline:
  - Document to be ready in second half of September
  - Submit to GA for comments in November
  - Distribute to the community in early 2021
- Topics: compared to the roadmap, added following topics
  - Multi-messenger
  - Ecological footprint
  - Societal impact

REPORT ON EUCAPT

- Gianfranco Bertone reported on the activities since summer 2019, after briefly introducing the European Consortium for Astroparticle Theory (EuCAPT), namely its mission and steering committee
- Organisation: a census (660 scientist answered, from 31 European and 5 non-European countries), a number of workshops and virtual colloquia. A calendar listing all open (virtual) events is in preparation. First annual symposium postponed
- EuCAPT newsletter: in discussion, as well as several dedicated EuCAPT task forces
- SAC to give feedback on the EuCAPT White Paper; it will focus on theoretical perspectives and will be directed towards the experimental community
- Update to the SAC in autumn 2020 was requested

THANK YOU :-)

EXTRA SLIDES

THE DOUBLE BETA DECAY COMMITTEE

- Mandate from the SAC (approved by GA in December 2018):
  - Assessment of existing, planned and proposed technologies and how these compare with one another. The committee should thus first assess the status of ongoing and planned experiments, including major technical challenges and a comparison of their discovery potential. The committee should then assess the potential of proposed and future technologies to probe the inverted mass ordering scenario, and beyond. Here the status of ongoing R&D for next-generation experiments should also be discussed.

  - Discussion of the role of nuclear matrix elements (NME) and of the g_A coupling uncertainties; discussion of other mechanisms for the 0νββ-decay, apart from light Majorana neutrino exchange; discussion of other possible decay modes, and their relevance compared to 0νββ-decay

  - Consideration of existing and future input from other experiments and constraints in neutrino physics (direct mass determinations, neutrino oscillations, cosmology) and at colliders

  - Critical examination of the resources that would be required to ensure scientific advancement and a potential discovery during this timeframe

  - Assessment of the required infrastructure in Europe, including maintenance or upgrades of existing facilities.

  - Assessment of the status and progress of theoretical efforts in NME, and related theoretical efforts.