Scientific Council Meeting Report for November 23 - 24, 2017

SC participants:

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The Science Council was tasked with answering the following specific questions during our meeting:

- *Evaluate the progress and value of the 5 on-going flagship projects*
- *Comment on the proposed strategy for P2IO renewal (2020-2024)*
- *Evaluate the 11 Expressions of Interest*

Introduction

The Scientific Council (SC) congratulates the P2IO management for the excellent progress that has been made since the last SC meeting in June 2016 and for continuing the outstanding accomplishments signified by the results of the Mid-Term review at the end of 2015. The Council is pleased to see that the (new) governance structure (CoDir) managed by one Director & Deputy and eleven technical experts, broadly distributed over the participating institutes with an excellent link to the scientific community, is working well with decisions usually taken by consensus. Nevertheless, the Council is concerned with the replacement of the Director and his deputy who both expressed their wish to step down last year after their two year mandate, and strongly reiterate their wish after now three years of excellent work. Considering the

importance of the next two years, through the completion of the originally proposed P2IO LabEx at the end of 2019, and the work necessary to prepare the future proposal to continue this effort beginning in 2020, the Council strongly recommends the nomination of a new Deputy Director by the end of the year. This person will work closely with the present Director during the first half of next year and will take over as Director beginning in July 2020. In order to make the posts more attractive to potential candidates, and ultimately to make more efficient use of the time of the post-holders, the Scientific Council recommends that an administrative support post be created to assist in routine data-gathering tasks etc.

The Council is satisfied with the excellent progress of the Emblematic Projects (reported individually below). It appreciates that last year's SC recommendation to "complement the (large) emblematic projects by allocating support to a few additional (small) R&D projects, doctoral or post-doctoral students, on themes less covered by the Emblematic Projects in order to ensure more uniform distribution of resources through the P2IO LabEx", has been followed. The Council notes that the currently implemented selection process of Ph.D. candidates and small research projects seems to result from the attainment of a true consensus of priorities among all P2IO participants. The Council further notes the high quality of the presentations at the poster session and very much enjoyed the enthusiastic and informed discussions with the graduate students and post-doctoral authors of these excellent posters.

The Council appreciates the efforts and new initiatives made last year to improve the visibility of the LabEx and its outreach projects, especially:

SCOPI: Séminaire Commun des Origines et de la Physique des deux Infinis.

P2IO thesis prizes

A programme d'attractivite « Emilie du Chatelet »

The Quart Touch is an excellent example of an innovative outreach effort. The project is to build a catchy video game, the "candy crush" of particle physics. It is a real challenge to use a video game to teach particle physics concepts and tools without the player losing the excitement of the hunt and the sense of adventure. The development team combines particle physics expertise with a hired engineer and video game professional that seems adequate to optimize the effort. We are looking forward to the results of the first tests of the game with non-expert members of the general public.

Emblematic Projects: Progress and Recommendations

Evolution of matter from the interstellar medium to exoplanets with the JWST

JWST is a flagship international facility and this emblematic project is set to exploit the data which will result across several important scientific areas. The project is well organized across the four Work Packages. Progress towards the ambitious objectives set by the project appears

to have been very good, however, the difference made by P2IO funding was not always made explicitly clear to the SC. There is obviously a great deal of collaborative activity taking place across P2IO, although it was not clear how many opportunities for young researchers from outside of P2IO to participate in these activities had been advertised and supported. There was a comment at the end of the presentation about further resources being required. It is suggested that (subsets of) the project would make potentially excellent bids for ERC funding for example, to allow completion and continuation of critical aspects of the current efforts.

PRAE: Platform for Research and Applications with Electrons

PRAE is a flagship project mobilizing a large number of researchers (60+) with complementary expertise from IMNC, IPNO and LAL and is a near-equal balance of technology development efforts, fundamental and applied research. The project is reusing an existing accelerator building with construction of an extension in a phased approach allowing deployment flexibility depending on the available resources. The current optimized version uses two beamlines rather than three and outsourcing the RF, hi-gradient linear accelerator and recovering the SLAC modulator will save money.

PRAE is a national (LPC Caen, Institut Curie) and international (JGU Frankfurt, GWU Washington) collaboration. Most previous SC concerns have been very well addressed (e.g., development of full costing and a timeline for the project has been established with proper project monitoring). The added value of Very High Energy Electron beams compared to proton therapy and photon therapy from a radiobiological point of view still needs to be documented by in vivo (cells, animal) proof of concept testing. Education and training could be enhanced given the breadth of the project.

The SC has some concerns about the lack of concrete alternative plans for procurement of funding to complete this program facility and to sustain its operation at the end of the current LabEx cycle. One question from previous reviews that has still not been addressed is, “Are oncologists already involved in the medical application of the project?” To maximize the impact of this project the SC believes that oncologists must be enthusiastically involved in PRAE. The SC encourages the participants to pursue this flagship project beyond the current LabEx cycle by both involving oncologists as soon as possible in the project, and by making sure that the issues with the existing structure can be made compatible with the project planning, including the “radiobiological dimension” in terms of present day safety and security requirements.

Charting Terra Incognita of Exotic Nuclei

This is a project involving IPNO, CSNSM and Irfu/SPhN that addresses topics of current interest, i.e. measurements of masses, spins-parities, charge-radius differences, and magnetic and quadrupole moments for exotic nuclei. The initial measurements will soon be made at the

ALTO facility and important experimental components, including POLAREX, MLLTRAP and Lino are in place and prepared for commissioning.

The SC congratulates the project on securing extra finances (more than double the original budget) for the new beam-line configuration. The SC appreciates: that the phase-imaging technique is excellent for high-precision mass measurements; the power of in-trap (MLLTRAP) spectroscopy for reaching to pure isotopic measurements; and the use of laser-induced nuclear orientation for measurements of magnetic and quadrupole moments. A window of opportunity (2019-2023) exists to do many measurements at ALTO before moving this equipment to SPIRAL2 DESIR, i.e. behind S3 (Super Spectrometer Separator) and encourages the project to make use of this window of opportunity to do as many measurements as possible. Finances for running these measurements should be granted by the IPN directorate.

CANEVAS: CAmera NEctarcam VAlidation at Paris-Saclay

CANEVAS will build and test a first prototype with astronomical data to validate the design and operation of NectarCAM, the camera design for Medium Size Telescopes of CTA. The project has made significant progress in several areas since the last meeting of the SC, both technically and in terms, for example, of the vital inception of the MST-N sub-consortium. As mentioned in last year's report, the inclusion of a significant outreach component is applauded, but there was little mention of progress on this aspect in this year's presentation. There was, however, explicit reference to the essential role that P2IO funding has played in the development of this project.

Due to factors beyond the control of the project, it appears that on-sky testing at the La Palma site will at best happen towards the end of the current P2IO LabEx. The project has dealt with such delays in a productive and effective manner previously and this gives the Scientific Council some reassurance that this will happen in this instance as well.

HIGHTEC: High Granularity Calorimetry for Future Collider Experiments in High Energy Physics

HIGHTEC is an ambitious project in calorimetry that combines the "particle flow" concept with high granularity calorimetry, involves participants from three major labs (LLR, LAL, IRFU) and three major frames SiW-ECALP(ILC), HGCAL(CMS), HGTC(ATLAS) and addresses crucial issues for the future of HEP experiments, e.g., Higgs studies. Important synergies have been established among the three labs, with several achievements on mechanical design, FE and BE electronics and joint exploitation of the local Omega micro-electronics laboratory. Visible progress towards 5D imaging calorimeters (position, energy, time), have been confirmed by test beam results. P2IO was key in securing extra funding for activities beyond 2019. An important question that still needs to be addressed is "What are the realistic prospects, timelines and costs for implementation of HIGHTEC in real collider detectors."

P2IO beyond 2020

The P2IO Council strongly supports the preparation of a P2IO renewal request.

The P2IO LabEx has already demonstrated its excellence and usefulness by being identified as (one of) the best LabEx during the midterm review. We are confident that P2IO is on track to be successful through its completion at the end of the present phase in December 2019. The Council is convinced that a P2IO (or similar) LabEx fostering the synergies between the various scientific institutes in the area and enhancing their visibility will be extremely useful in the future, beginning in 2020. The present reflection about the possible division of the institutes between two separate entities/universities makes the case for a LabEx even stronger in order to help bridge the gap between them.

In this context, the Council appreciates the initiatives launched to start preparation of the P2IO renewal proposal by requesting Expressions of Interest (EoIs, analysed later). The Council recommends that the Laboratory Directors and Tutelles soon begin discussions concerning the subjects to be included in a new proposal document. The SC also recommends that a first draft of this proposal should be completed by June 2018 and made available to all interested parties for comments that will improve the chances of success. This draft proposal should not only include some examples of EoIs but should also include an ambitious scientific strategy and how this strategy will contribute to the advances that are expected to be made in the subject areas encompassed by the next P2IO LabEx beginning in 2020. It should also include a summary of accomplishments and the value added by the P2IO LabEx over the initial funding period from 2011 to 2019.

P2IO has received EoIs to join the future LabEx from several different entities. The following accelerators [ALP-ALPEX (laser-plasma acceleration), e-IPHI (thermal neutrons) and PERLE (energy-recovery linac)], P2 teams [Cosmo2stars (structure formation), LISA (gravitational waves and multi-messenger) and SCIENCe (CMB calibration facility)] and other relevant groups [Hyper-Kamiokande, advanced bolometers for neutrinos, axions and dark matter, Gluonometrie (gluon tomography and saturation) and Stellar and Planetary Systems Formation] have expressed interest. They could all easily fit within the current P2IO research umbrella and would both add value to the future LabEx as well as derive great benefit from becoming part of this grand collaboration.

In the proposal for P2IO renewal it will be important to take into account the evolution of the fields encompassed by P2IO since 2011, and restructure the main themes of activity, if necessary. It will also be necessary for the management to have a clear idea of the procedure and criteria for selecting hyper-emblematic projects; they should seed new activities or strengthen interactions among participants. Management should also strive to keep a good balance between focused funding (Hyper-emblematic projects) and more distributed funding

(postdocs, Ph.D. students). The SC encourages proposals to be applied in areas which have not yet been covered.

The SC appreciated that the EoIs brought to the arena several emergent areas and new frontier research topics that were not included in the previous set of emblematic projects. Unfortunately, there was not enough information provided to the SC nor did the SC have sufficient time to make a considered comparative scientific assessment of the individual projects. The SC understands and supports the idea of not presenting too many individual projects in the renewal application. However, we believe that, for presentation purposes, the inclusion of the projects in five groupings can help to emphasize the synergies between projects inside each group. It should not be implied though that these are the five lines to be represented in the final choice for the renewal proposal, nor that one from each group should be retained.

In reviewing the accomplishments of P2IO the proposal should argue with no more than two or three examples the success of individual projects giving quantitative, concrete evidence of the scientific achievements in which P2IO has made a visible difference to the success of the project, reinforced pre-existing cross-lab interactions or collaborations, generated totally new cross-lab interactions and collaborations or increased the international impact or involvement of a project. The review could emphasize the efficiencies of P2IO in the shared use or development of common infrastructure among arguably unrelated projects or in acquisition of extra funds arguably attracted as the result of P2IO seed funding. In the renewal proposal P2IO should consider a dual scientific strategy: consolidation plus innovation. Consolidation and qualitative improvement of established local expertise and collaborative projects should be combined with new, innovative projects fostering the development of emerging areas and expertise in frontier research areas that are locally under-represented.

The SC recommends that for future review-presentations, all speakers should be asked to prepare explicit comments related to how P2IO support contributed to the achievement of the scientific goals of the project, reinforced pre-existing cross-lab interactions or collaborations, generated totally new cross-lab interactions and collaborations, increased the international impact or involvement of the project, profited from shared use or development of common infrastructure or won additional funding from outside sources thanks to P2IO seed funding. This dataset could then be easily consulted to present relevant examples of the value of P2IO to scientific visitors or to government officials on very short notice.

Thanks

The SC would like to thank all speakers for their excellent preparation, P2IO management for the excellent scientific organization and the very complete information provided before the meeting, the lab directors for their (constructive) input and the administrative staff for excellent administrative support. The SC would also like to offer sincere congratulations for the very effective P2IO management that has significantly enabled P2IO's success and would like to

recognize the dedication of Philippe, Pierre-Olivier and the CoDir members during the last 3 years. Finally we wish the best to Pierre-Olivier and hope for a speedy recovery.