

Polish input to the Update of European Strategy for Particle Physics 2020-2025

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Abstract:

This is a position paper which aims at describing the current status and plans of Polish PP research community for the coming Update of ESPP 2020. The document does not discuss some subject closely related to PP in Poland like the Polish research in Astroparticle Physic and Nuclear Physics, and education, outreach and technology transfer issues.

The worldwide activities of PP in the coming five to ten years are already, to large extend, defined by the present world wide programme of LHC and HL-LHC, KEK, and LBNO (DUNE) preparations. The main unknown is the shape of PP in the longer perspective. In particular, both the time-scale and venues of the future colliders, many of which are in the various stages of discussions and planning, are presently unknown.

It is clear to us that the present update of the ESPP has to include, as one of the high priority items, strategic decisions on the future development of the high-energy frontier, as well as the accelerator and detector research needed for future colliders.

The Addendum to this document describes in more detail the current activities of the Polish PP community with some informations on funding, resources (including HR) and future plans.

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1. General Issues

1.1. Organisation and funding of Particle Physics in Poland

Particle Physics (experimental and theoretical) is being done in 16 research institutions¹—leading universities and research institutes—distributed in 9 centres in Poland. The size of centre varies from large (Cracow—4 and Warsaw—3) to small (1 institution with 2 researchers)

The number of researchers in Polish PP counted in FTE is about 360 staff and 150 PhD and MSc Students. The number of engineers and technicians and other technical and administrative staff is difficult to estimate, because of frequent sharing between the research fields.

For the better coordination of domestic efforts and funding the research groups in Poland, working closely together, federate themselves into consortia. There are more than 10 operating consortia in Polish PP, both in experimental and theoretical PP.

The funding of PP in Poland comes from 4 main sources listed here in the order of importance: 1) directly from the Ministry of Science and Higher Education (MNiSW)—mostly for the maintenance of the large scientific infrastructure in Europe, 2) National Science Centre (NCN)— mostly for specific research activities though dedicated grants, 3) Foundation for Polish Science (FNP) — dedicated grants for outstanding individual scientists, and 4) outside funding agencies, including EU funding and other international agencies.

More details on the funding of various activities are given in Sec. 2.

The level of funding approved from the first two main sources listed above is adequate for the research activities centred in Europe in 2018-2021, but it is generally harder to obtain for activities outside of it. The level of funding for the next period 2022-2026 is presently unknown.

1.2. International Collaboration

The PP in Poland is working through the extensive and well established networks of international collaborations including laboratories and projects worldwide. This is evident from Sec.2.

¹ Białystok: University of Białystok, Cracow: AGH University of Technology, H. Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences, Jagiellonian University, T. Kościuszko University of Technology, Katowice: University of Silesia, Kielce: Jan Kochanowski University of Humanities and Sciences, Lódź: University, University of Technology, Szczecin: University of Szczecin, Warsaw: National Centre for Nuclear Research, University of Warsaw, Warsaw University of Technology, Wrocław: University , University of Technology, Zielona Góra: University

The most important collaborations in which we participate are centred in CERN experiments. These are LHC, SPS experiments, and also substantial activities in the ISOLDE and nTOF nuclear physics domain, which are not subject of this paper.

The neutrino physics, very important in Poland, and flavour physics exhibit the wider range of contacts centred in Japan (neutrino exps., SuperKEKB) and USA (neutrino exps.).

2. Summary of scientific activities of the Polish PP community

The detailed information on these activities is given in the **Addendum1**.

Polish PP scientific community participates in the following activities:

1. The LHC experiments:
 - 1.1. ALICE
 - 1.2. ATLAS
 - 1.3. CMS
 - 1.4. LHCb
2. Flavour physics studies:
 - 2.1. LHCb
 - 2.2. BELLE II at KEK2
3. ILC and other future higgs factories
4. QCD and Heavy Ion physics
 - 4.1. NA61
 - 4.2. COMPASS
5. Neutrino physics and Dark Matter searches in dedicated experiments
6. Research in instrumentation: electronics, detector and accelerator physics
7. Particle Physics theory

3. Conclusions and recommendations

Polish PP research community is a lively one comprising of relatively many experimental and theoretic groups in wide range of fields. The community is well connected on the international basis. In particular, becoming a CERN Member State in 1991 gave Polish PP a strong boost, which we feel even now.

Given the level of funding and its structural limitations, the Polish community is strongly in favour of continuing the extremely fruitful collaboration with CERN. We plan to participate in fully exploiting the CERN experimental programme at the LHC and at its other accelerators. Also it is very important for us that CERN should be an important centre for the accelerator and detector research for the future collider in 2020-2025, and hopefully, the seat of the future global collider in the forthcoming period.

There is a strong scientific case for an electron-positron collider, which is a complementary tool to study the properties of the Higgs boson and the top quark with unprecedented precision and to test the possible extensions of the Standard Model. If such a project is proposed outside Europe, CERN should be the leading European partner allowing for and

coordinating additional contributions to such project from CERN's Member and Associate Member States in Europe. If the Japanese government decides to host the ILC in Japan, Polish groups are eager to participate and contribute to such projects in either of the cases.. At the same time, it is also very important to continue, in Europe and at CERN, the accelerator and detector research for the next-generation global collider project.

2. Authors

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