

This report is a copy of the CHIPP Annual report 2013 which will be delivered to SCNAT.
Therefore, it is structured and formatted along the SCNAT guidelines.

SUMMARY

Highlights of the Year

CHIPP enjoyed several highlights in 2013:

- In a special meeting, held on 30 May 2013 in Brussels, the CERN Council approved the **revised European Strategy for Particle Physics** that sets the course for the future of this research field for Europe¹. The strategy is the result of a broad effort of the community over the last two years, to which CHIPP actively participated with a representative (see section 'Institutional collaboration' below) and two written input contributions². The strategy makes recommendations for projects and research sectors to be pursued with priority, both for the near-term and the long-term future, but shows also the challenges of the implementation of the European ambitions and its engagement in a global corporation outside of Europe in a given framework of limited available resources. CHIPP has analyzed the implications of this revised strategy to Switzerland and to the Swiss research community and has presented its findings to Mauro Dell'Ambrogio, State Secretary for Education, Research and Innovation³. The State Secretary's answer presented at the CHIPP Plenary meeting (see below) showed clearly that the CHIPP's concerns had been taken up seriously by the State Secretariat for Education, Research and Innovation SERI, and that the State Secretariat will continue to support CERN and the Swiss particle physics community also in the coming years⁴.
- More than 90 CHIPP Members attended the **Plenary meeting** at Campus Sursee (24-26 June 2013) and listened to almost 30 talks, each followed by a discussion session. The meeting focussed on the future of Swiss particle physics, i.e. highlighted and discussed the concrete intentions of Swiss research groups for the implementation of the different chapters of the European Strategy in Particle Physics. In addition, reports from 4 international committees as well as from the CHIPP Outreach Board, the CHIPP Computing Board and the Swiss Physical Society were presented. Finally, the prize for the best PhD thesis in experimental and theoretical particle physics was awarded⁵ (see section 'Promotion of the next generation' below).
- End February 2013 and after nine months of intense efforts, the **outreach project „Verflixtes Higgs“** has come to an end in time and in budget. It showed that the social media platforms like Facebook, Twitter and YouTube are particularly well suited tools for bringing particle physics and its results to a large and young audience. The webpage www.teilchenphysik.ch with its appetizer video and the

¹ <http://council.web.cern.ch/council/en/EuropeanStrategy/ESBrochure.pdf>

² http://www.chipp.ch/documents/CHIPP_European-Strategy-input-21_07_2012_final.pdf;

http://www.chipp.ch/documents/CHIPP_European-Strategy-input-final-15_10_2012.pdf

³ http://www.chipp.ch/documents/ImplementationOfStrategy2013_slides-for-SERI_2013-06-13.pdf

⁴ <https://indico.cern.ch/getFile.py/access?contribId=9&sessionId=1&resId=1&materialId=slides&confId=239949>

⁵ http://www.chipp.ch/documents/results_Plenary2013_rev2.pdf

short interviews with Swiss particle physicists often served as entrance door, and led also to other web pages (like the search tool digithek, the iLab at PSI, or www.schulphysik.ch). It became also obvious that the impact was higher when preparation and supporting activities like teaching material (posters and brochures), teachers' instruction days, and structured visits at Mittelschulen were included. Early March the follow-on projects "Interactions" and "Dialog" took over, building on the achievements of the "Verflixtes Higgs" (see section 'Promotion of the next generation' below). All outreach projects are run by PD Dr. Hans-Peter Beck (University of Berne).

- Benefitting from positive decisions of the CHIPP Board and the SNSF (September and December 2012, resp.), **Switzerland joined ApPEC** (Astroparticle Physics European Consortium) as of 24 January 2013. The SNSF as the participating institution is supported in the meetings of the General Assembly by the CHIPP representative Prof. Teresa Montaruli (University of Geneva).
- Every 3-4 years, Switzerland (like all the other participating countries) is in the focus of the **European Committee for Future Accelerators ECFA**. Between two country visits (2009; 2016) a mid-term report about the particle and astroparticle physics community is due. The latest **Swiss mid-term report**⁶ was delivered on 22 November 2013 and gives an excellent overview on ongoing and planned projects, the implementation of the European Strategy (see above), the CHIPP Roadmap and other topics.

SECTORS OF COMPETENCE: NETWORKING AND DEVELOPMENT OF SCIENCE

Publications

- The **White Paper: Strategy for Swiss contributions to large ground-based astroparticle physics research infrastructure** was edited on 17 March 2013 by Proff. Laura Baudis, Teresa Montaruli, André Rubbia and Ueli Straumann. Its publication as official CHIPP document had been approved by the Board. It recommends that the Swiss astroparticle physics community should concentrate in the long run on the three large projects CTA, DARWIN, and LAGUNA-LBNO⁷. Such a strategy, which focuses on large and important contributions to a few projects (rather than being present as smaller players in many projects), was formulated for the first time in Switzerland for the field of astroparticle physics.
- In order to get started on an endeavour for more work on common themes aiming at a deep understanding and insight of the most fundamental questions of our universe, several CHIPP institutes got together in 2011/2012 for drafting a pre-proposal for the **NCCR Universe – Constituents, Forces, Space-Time**. Major parts of the Swiss communities working in the fields of particle physics, astrophysics and cosmology set out to envisage common projects and to inter-connect these specialised research fields on a bigger scale. Although the proposal did not find the support of the relevant decision making bodies, CHIPP found it worthwhile to publish it in February 2013 as an interesting and rather complete compilation of research plans in the three seemingly disconnected fields, and as a proof of its conviction of the need for continued enthusiastic and coordinated research in these fields⁸.

Meetings, Workshops and Schools

In addition to the Plenary, which is to be considered as the Swiss national conference on Particle Physics (see section 'Summary / Highlights' above), CHIPP continued to work on its educational goals and organised or co-organised also in 2013 several Schools and Workshops:

⁶ http://www.chipp.ch/documents/131121_PECFA_final.pdf

⁷ http://www.chipp.ch/documents/astroparticle_whitepaper_17Mar2013_approved.pdf

⁸ http://www.chipp.ch/documents/NCCR_sciencePart_brochure.pdf

- The **CHIPP PhD School 2013** was organised by Prof. Vincenzo Chiochia (University of Zurich) in Grindelwald on 20-25 January 2013. 27 participants attended the successful school, which focussed on experimental and theoretical aspects of LHC physics (<http://cern.ch/chiochia/CHIPP2013>). The school programme included lectures of the five speakers (2 from Switzerland, 3 from abroad) on **accelerator and non-accelerator particle physics**. A session for student presentations was scheduled and discussion sessions between lecturers and students took place every evening to deepen the topics presented during the day.
- The theme of the prestigious **Latsis Symposium 2013** (3-6 June 2013) was 'Forces of nature at the energy frontier'. It was organised by ETH Zurich, the University of Zurich, and the Paul Scherrer Institute and took place under the auspices of the ETHZ's Pauli Center for theoretical physics (Prof. Charalampos Anastasiou) (<http://www.latsis2013.ethz.ch>). The four days brought together leading experts from the world of particle physics to discuss the fundamental laws of nature at the new energy frontier explored by the Large Hadron Collider. In the large public lecture, the 2004 Nobel prize winner in physics David Gross spoke about "Nature at the Energy Frontier".
- The **Workshop on eXtreme QCD 2013** (XQCD13, <http://www.xqcd13.unibe.ch/>, Chair: Prof. Urs Wenger, University of Berne) took place from 5-7 August 2013 in Berne. Organised by the University of Berne and the ETHZ, the event assembled some 80 active participants. 9 invited speakers (two from Switzerland, 7 from abroad) covered recent advances in the theory and phenomenology of QCD under extreme conditions of temperature and/or baryon density, together with related topics.
- Despite the fact that the 2013 **Annual Meeting of the Swiss Physical Society SPS** took place in Linz, many Swiss participants attended the 4-days event between 3 and 6 September 2013 (http://www.sps.ch/en/events/joint_annual_meeting_2013/). Particle physics themes covered by talks and posters were LHC physics, astroparticle and non-accelerator physics, protons and neutrons, flavour physics, and detectors (Convenor: Prof. Martin Pohl, University of Geneva). Two public lectures, one held by the 2012 Nobel prize winner in physics Serge Haroche, completed the programme.
- The **3rd Workshop on Physics of fundamental Symmetries and Interactions PSI2013** was organised by PSI (Chair: Prof. Klaus Kirch, PSI-ETHZ) and took place from 9-12 September 2013 (www.psi.ch/psi2013). It attracted more than 180 Swiss and foreign participants and was a great success with its focus on the physics at the low energy, high precision frontier without neglecting complementary approaches. Present activities and future developments were highlighted by more than 70 speakers. One session was shared with the CHIPP workshop on Detector R&D (see below).
- The **CHIPP Workshops on Detector R&D** took place at PSI (Organizer: Dr. Malte Hildebrandt, PSI, <http://indico.psi.ch/conferenceDisplay.py?ovw=True&confId=2486>). 40 registered participants working in this field spent 12 and 13 September 2013 at PSI to share and to discuss experiences and to find possible synergies. The first session with four overview talks on detector and signal processing techniques was shared with the Workshop PSI 2013 (see above), whereas the subsequent 14 presentations focussed in detail on the huge variety of ongoing R&D work for different particle detectors.
- The **International Workshop on Antimatter and Gravity (WAG 2013)** was hosted from 13-15 November 2013 by the University of Berne (Chair: Prof. em. Claude Amsler, University of Berne, www.einstein.unibe.ch/WAG2013). The meeting reviewed the experimental and theoretical aspects of the gravitational interaction of antimatter with matter and included a session on the relevance of antimatter with respect to Dark Energy and Dark Matter in the Universe. The successful workshop was attended by 70 participants (~70% from abroad) and offered a good opportunity also for experimental and theoretical newcomers.
- As it is tradition in August, the University of Zurich and the ETHZ organised the PhD seminar mandatory for all particle physics PhD students in the Zurich area.
- The University of Berne has established graduate courses and seminars mandatory for the Bernese PhD students.

INTERNATIONAL ACTIVITIES

Scientific cooperation

Particle and astroparticle physics is compelled to extensive transnational and international cooperation, as the research projects in this domain are mostly large undertakings, representing an important intellectual and technological challenge and requiring a large amount of human and financial resources. In addition, experiments in particle and astroparticle physics usually involve research facilities, which again are the result of national, regional and global collaboration. The table below shows a snapshot of the experimental collaborations ongoing at present and publicly known.

Further, smaller cooperation projects exist; many of them occur naturally – between groups working in the same field or requiring the same type of infrastructure – or are coordinated bottom-up by CHIPP. Such collaborations may be carried out at an informal level and are sometimes not even noted at the level of the home institution.

Project	Participating Swiss institutions	Participating CHIPP Board Members	# of institutes worldwide
AMS	ETHZ, Geneva	Pohl, Rubbia	25
ArDM	Berne, Zurich	Amsler, Rubbia	10
ATLAS	Berne, Geneva	Beck, Ereditato, Iacobucci, Nessi, Weber, Wu	177
CLIC	EPFL, PSI	Rivkin	44
CMS	ETHZ, PSI, Zurich	Canelli, Chiochia, Dissertori, Grab, Horisberger, Kilminster, Pauss, Wallny	181
CREMA	ETHZ, PSI	Hildebrandt, Kirch	9
CTA	ETHZ, Geneva, ISDC, Zurich	Montaruli, Biland, Courvoisier, della Volpe, Neronov, Straumann, Walter	183
DAMIC	Zurich	Kilminster	4
DARWIN	Berne, Zurich	Baudis, Schumann	11
EXO	Berne	Gornea	16
GERDA	Zurich	Baudis	17
HL-LHC	EPFL, PSI	Rivkin	14
ICECUBE	EPFL, Geneva	Montaruli, Ribordy	35
LHC Computing Grid	All universities	All LHC professors	>150
LHCb	EPFL, Zurich	Bay, Nakada, Schneider, Serra, Straumann	64
MAGIC	ETHZ	Biland	25
MEG	PSI	Hildebrandt, Ritt	12
MicroBooNE	Berne	Ereditato	22
mu3e	ETHZ, Geneva, Zurich	Blondel, Dissertori, Grab, Hildebrandt, Pohl, Ritt, Straumann, Wallny	7
NA61	Berne, ETHZ, Geneva	Blondel, Ereditato, Rubbia	24
nEDM	ETHZ, Fribourg, PSI	Kirch, Weis	15
OPERA	Berne	Ereditato	28
T2K	Berne, ETHZ, Geneva	Blondel, Ereditato, Rubbia	64
WA105 (LBNO-LAGUNA)	Berne, ETHZ, Geneva	Blondel, Ereditato, Rubbia	21
XENON	Berne, Zurich	Baudis, Schumann	13

In addition to these experimental collaborations and projects, Swiss theorists are involved in numerous international collaborations. The following list shows the largest and most important ones, in which Swiss theory institutes are key players:

- CERN Higgs Working group (<https://twiki.cern.ch/twiki/bin/view/LHCPhysics/CrossSections>);
- Les Houches Workshop 'Physics at TeV Colliders' working groups (<https://phystev.in2p3.fr/>);
- Snowmass studies (arXiv:1307.5288, arXiv:1308.1430 and arXiv:1310.5189)

In addition, University of Zurich, ETHZ and PSI participate in two of the European Union's FP7 ITN Networks, i.e. 'LHCPhenoNet' (<http://www.lhcphenonet.eu/>) and 'HiggsTools' (<http://higgstools.org/>), whereas the University of Berne is coordinating the activity of Flavour Lattice Averaging Group FLAG (<http://itpwiki.unibe.ch/flag>).

Institutional collaboration

Several CHIPP Board members are acting as official delegates to international organisations and endeavours in 2013:

- Prof. Olivier Schneider (EPFL) completed the first year of his SERI mandate (State Secretariat for Education, Research and Innovation [*the former State Secretariat for Education and Research*]) as Swiss scientific delegate to the CERN Council.
- Prof. Ulrich Straumann (University of Zurich) is mandated since 2010 by the "Round Table International" to represent the Swiss participants in the Resources Board of the CTA project (Cherenkov Telescope Array).
- Prof. Teresa Montaruli (University of Geneva) started the mandate given to her by the CHIPP Plenary in September 2012 as Swiss scientific delegate to the ApPEC General Assembly (Astroparticle Physics European Consortium) on 1 January 2013.
- Prof. Bernd Krusche (University of Basel) continued his longstanding SNSF mandate (Swiss National Science Foundation) as Swiss representative in NuPECC (Nuclear Physics European Collaboration Committee).
- PD Dr. Michele Weber (University of Berne) is serving since January 2009 as CHIPP representative in the Advisory Committee of CERN Users (ACCU).
- Prof. Lenny Rivkin (EPFL and PSI) is mandated by the CHIPP Plenary to represent the Swiss particle physics community in the Restricted ECFA (European Committee for Future Accelerators) as from 1 January 2013 onwards. In the Plenary ECFA, he is supported by PD Dr. Michele Weber (University of Berne, since 2008), by Dr. Terence Garvey (PSI, since 2010), and by Dr. Olaf Steinkamp (University of Zurich, since 2013). Prof. Rivkin was also a member of the European Strategy Group as the representative of PSI as one of the major European national labs.
- Prof. Klaus Kirch (PSI and ETHZ) was the Swiss representative in the European Strategy Group, working on the update of the 2006 European Strategy in Particle Physics; his mandate ended with the approval of the revised European Strategy by the CERN Council end May 2013.

COORDINATIVE TASKS

Promotion of the next generation

CHIPP Members and CHIPP institutes continued their efforts of informing the public at large about particle and astroparticle physics and of attracting young women and men to this field of research. Throughout Switzerland, more than 40 educational events like information days for future students and

for Matura/Kantonsschulklassen were organised involving more than 4000 people. The four open days for children at University of Zurich and University of Berne) attracted more than 100 participants, and 90 persons attended the four education days on elementary particles for physics teachers. One should mention specifically the participation of more than 150 Swiss Gymnasium level pupils (at the Universities of Berne, Geneva, Zurich and the ETHZ) in the frame of the International Masterclasses “Hands on Particle Physics”, where over 10'000 Gymnasium level students from more than 160 institutes in 37 countries can actually work with real data from the CERN LHC.

Maturaarbeiten were carried out at EPFL (construction of a cosmic ray detector), and PSI (quantum mechanical behaviour of neutrons); the latter work received a prize and was presented at the SPS meeting in Linz (see section ‘Meetings, Workshops and Schools’ above). In Geneva, some 2000 school kids came to the Physiscope exhibition. CHIPP Board Members from ETHZ and University of Berne gave 17 talks targeted to Gymnasium students. More than 150 visits to CERN as well as to PSI and its particle physics and accelerator facilities took place, not only for university students in physics but also for the public at large (some 1800 participants). In addition, the CHIPP Board Members active in the LHC detectors at CERN participated in the CERN Open Days.

The project „Verflixtes Higgs“, funded by the (then) State Secretariat for Education and Research SER (since 2013 State Secretariat for Education, Research and Innovation SERI), found a successful end. It visualises in a comprehensible way the newest results from particle physics (like Higgs) to Swiss Mittelschülerinnen and Mittelschüler. In the centre of the project is the new dedicated internet page www.teilchenphysik.ch, where explanatory text, figures and videos dealing in one way or the other with particle physics, the Higgs mechanism and the standard model.

The SCNAT support for the project “Dialog” has allowed to start with translating parts of the internet page www.teilchenphysik.ch into French and Italian⁹; this effort is ongoing beyond 2013.

The project “Interactions”, supported by SNSF through the AGORA funding line, builds up on the project “Verflixtes Higgs” by intensifying the use of the social media (like Facebook, Twitter, YouTube), which leads to an increased participation of Mittelschülerinnen and Mittelschüler in the discussion about the impact of research. Two so-called ‘double dialogue’ podium discussions (see also sections ‘Promotion of the next generation’ and ‘Dialogue with society’ below) took place and reached about 300 persons.

Also in 2013, CHIPP has awarded a prize for the best PhD student in experimental and theoretical particle physics. This year’s award went to Martin Fertl from PSI for work in connection with his thesis on the Hg co-magnetometer in the nEDM experiment at PSI. The *laudatio* says: “For his original contributions to the design and contribution of a new experiment planning to measure the electric dipole moment of the neutron at PSI”. The selected prize winner was presented with the prize money (3000 CHF) and the CHIPP diploma during the CHIPP Plenary at Campus Sursee¹⁰.

Information and coordination tasks supporting research and science

CHIPP’s webpage www.chipp.ch contains news, documents, information about meetings, as well as the complete membership data base. The continuous dialogue between the institutes, which is enshrined in the Statutes and By-Laws¹¹, aims at having at hand in a timely and transparent manner the information about ongoing and planned research activities in the groups including funding and manpower needs. This information was collected also in 2013 and condensed as usual in a coherent table of particle and astroparticle physics projects, made available for planning purposes to the SERI and the SNSF.

⁹ www.physiquedesparticules.ch, www.fisicadelleparticelle.ch

¹⁰ <http://www.chipp.ch/chipp-prize.html>

¹¹ <http://www.chipp.ch/documents/StatutesBylaws.pdf>

CHIPP took actively part in the SCNAT's Round Table International, an information forum on participation of Swiss groups in international research facilities, comprising – in addition to SCNAT and CHIPP – representatives of the SERI, SNSF, and CRUS.

Likewise, CHIPP puts its know-how and information at the disposal of the Lenkungsausschuss FLARE (LA FLARE), which defines the priorities for the SNF's FLARE funding.

Dialogue with society

Under the guidance of the SCNAT President (and CHIPP Member) Prof. Thierry Courvoisier, the **SCNAT Annual Congress** took place on 21/22 November 2013 in Winterthur. It was dedicated to the celebration of the hundredth anniversary of the discovery of the quantum atomic model by the Danish physicist Niels Bohr. Some 180 registered participants followed the 12 high quality talks, one of them being delivered by CHIPP Member Prof. Ruth Durrer.

Outreach has been one of the growing sectors of CHIPP also in 2013: The results and benefits stemming from the SERI project "Verflixtes Higgs" became available, the SNSF granted the follow-on project "Interactions – Swiss particle physicists initiate a dialogue with society", and the project "Dialog" (supported by the SCNAT) allowed to extend the range of use of the webpage www.teilchenphysik.ch to the French and the Italian speaking parts of Switzerland¹². The main instrument of the project "Interactions", complementing the video portraits produced from selected CHIPP Members, and the more than 30 news messages written for the website www.teilchenphysik.ch, is an interdisciplinary dialogue of Swiss physicists with other people explaining the world like sociologists, theologians, philosophers, artists, novelists, and politicians. In addition, the participation of Mittelschülerinnen and Mittelschüler through the use of the social media (like Facebook, Twitter, YouTube), which had been started in the project "Verflixtes Higgs", has been intensified.

Several CHIPP Members gave a total of almost 40 public lectures (e.g. at Volkshochschule, Senioren-Universität) and participated as speakers at also approx. 20 events and gatherings (e.g. radio and TV interviews, 'double dialogue' podium discussions (see above), ICT Networking Party 2013, Erdgas Zurich Annual Meeting, SwissGrid, Rotary and Lion Club). Further, a press release and several press events have been organized around the Nobel Prize award 2013.

- o x o -

¹² www.physiquedesparticules.ch, www.fisicadelleparticelle.ch