

This report is a copy of the CHIPP Annual report 2015 which will be delivered to SCNAT.  
Therefore, it is structured and formatted along the SCNAT guidelines.

## SUMMARY

### *Highlights of the Year*

CHIPP continued successfully its activities in 2015. The [CHIPP Annual Plenary Meeting](#) held at the Château de Bossey (VD) on 29 June – 1 July 2015 was the main highlight of the year. The event welcomed [112 participants](#) in this beautiful place overlooking the Lake of Geneva. A rich [scientific programme](#) covered the three pillars of CHIPP: particle physics at the high-energy and intensity frontiers, astroparticle physics, and neutrino physics. A session on future facilities, and two dedicated sessions on technology transfer completed the programme. The [CHIPP Prize 2015](#) for the best PhD student in experimental or theoretical particle physics was awarded on this occasion to *Lilian Witthauer* (Uni. Basel). The **formal CHIPP plenary** meeting was held on July 1<sup>st</sup>. It was the occasion to report on recent CHIPP activities and on developments in international bodies dealing with particle, astroparticle and nuclear physics.

The CHIPP Board reaffirmed in June 2015 its role in defining priorities for the Swiss funding of research infrastructures. This led to prioritisation discussions held in September for each of the three pillars of CHIPP. A concrete result was the completion and approval of a document entitled "[Experimental neutrino physics: Switzerland in the global context, a white paper](#)", which defines the priorities for the Swiss participation in international neutrino experiments.

Another highlight was the [CHIPP PhD Winter School](#) held in Grindelwald in January 2015. It gathered 18 students receiving from five lecturers an overview of many topics in particle and astroparticle physics. CHIPP supported two other events in 2015, both in Geneva: the workshop [SuGAR 2015 - Searching for the Sources of GALactic cosmic Rays](#) and the [28th TEXAS Symposium on Relativistic Astrophysics](#), which took place in January and December, respectively.

The SCNAT bicentennial celebration was an opportunity for CHIPP to promote particle physics to the general public in the frame of "[Forschung Live](#)". Thanks to a special extension of the SNSF-Agora grant, CHIPP organised **three screenings of the movie "Particle Fever"** (USA, 2013) at Open Air cinemas in Lucerne and in Aarau in August, as well as indoor in Sion at the end of September. The events were followed by interviews and question sessions and, in Sion, by an interdisciplinary podium discussion. The **TV programme "Rosanna Checkt's - Woraus besteht die Welt?"** broadcasted by SRF1 on September 29<sup>th</sup> showed that the Large Hadron Collider (LHC) at CERN can even be of interest for children.

The **100 years of the General Theory of Relativity** was celebrated with a series of public talks in Zurich and Geneva.

## SECTORS OF COMPETENCE: NETWORKING AND DEVELOPMENT OF SCIENCE

### Publications

The work initiated in 2014 towards defining the Swiss strategy in the field of neutrino physics ended in 2015 with the formal approval of a document entitled "[Experimental neutrino physics: Switzerland in the global context, a white paper](#)". This publication describes the current international challenges, experiments and future projects in the rapidly evolving field of neutrino physics, and defines the Swiss involvement foreseen in the coming years. It has been edited by six CHIPP Board members active in the field and was approved by the CHIPP Board on 14 November 2015 as an official CHIPP document to be publicly available on its website.

### Meetings, Workshops and Schools

In addition to the CHIPP Annual Plenary, which is to be considered as the Swiss national meeting on particle physics (see section 'Summary / Highlights' above), CHIPP continued to work on its networking and educational goals and organised or co-organised also in 2015 several meetings, schools and workshops:

- The traditional [Zurich Phenomenology Workshop](#) was devoted in 2015 to "The flavour of new physics". Organised by the Pauli Center for Theoretical Studies, this forum for particle physics researchers was held at the University of Zurich on 7–9 January 2015.
- The [CHIPP PhD Winter School](#) was held for the third time at the Hotel Schweizerhof in Grindelwald on 18–23 January 2015. Dedicated to PhD students in Switzerland, it welcomed 18 participants and 5 lecturers and covered the fields of particle detectors, LHC physics, neutrinos, cosmology and astroparticle physics, and flavour physics.
- The astro-particle workshop [SuGAR 2015 - Searching for the Sources of GALactic cosmic Rays](#) was organised at the University of Geneva on 21–23 January 2015. Supported by CHIPP, it gathered 50 participants working in the field of gamma rays, neutrinos and cosmic rays.
- The [28th TEXAS Symposium on Relativistic Astrophysics](#) was a truly international conference held at the International Conference Centre of Geneva on 13–18 December 2015. It was organised jointly by the astronomy and physics sections of the University of Geneva with CHIPP support. With 460 participants and excellent plenary sessions, it was a very successful event bridging astrophysics and particle physics in the region hosting the CERN and timely for the 100<sup>th</sup> anniversary of Einstein's theory of General Relativity.
- The University of Zurich, ETHZ and PSI organised on 26-27 August 2015 at PSI the traditional [PhD seminar](#) for particle physics PhD students in the Zurich area.

## 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. Research in this field usually involves large infrastructures, which again are the result of national, regional and worldwide collaborations. The table below shows a snapshot of the current experimental collaborations involving CHIPP members.

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	Swiss institutes	CHIPP Board Members	Institutes worldwide
High-Energy particle physics			
ATLAS	Bern, Geneva	Beck, Ereditato, Golling, Iacobucci, Mermod, Nessi, Sfyria, Weber, Wu	178
CMS	ETHZ, PSI, Zurich	Canelli, Chiochia, Dissertori, Grab, Horisberger, Kilminster, Pauss, Wallny	186
LHCb	EPFL, Zurich	Bay, Nakada, Schneider, Serra, Straumann	69
LHC Tier-2	ETHZ, CSCS	Grab	> 200
HL-LHC	EPFL	Rivkin	21
CLIC	ETHZ, PSI	Rivkin	62
FCC	Bern, EPFL, Geneva, PSI	Blondel, Ereditato, Iacobucci, Rivkin	72
Astroparticle physics			
AMS	Geneva	Pohl, Wu	56
ArDM	Zurich	Rubbia	7
CTA	ETHZ, Geneva, Zurich	Biland, Courvoisier, Montaruli, Neronov, Straumann	211
DAMIC	Zurich	Kilminster	9
DARWIN	Bern, Zurich	Baudis, Schumann	25
IceCube	Geneva	Montaruli	42
MAGIC+FACT	ETHZ, Geneva	Biland, Neronov, Pauss	25
XENON	Bern, Zurich	Baudis, Schumann	21
Neutrino physics			
EXO	Bern	Gornea	16
GERDA	Zurich	Baudis	17
MICE	Geneva	Blondel	21
NA61 / T2K / HyperK	Bern, ETHZ, Geneva	Blondel, Ereditato, Rubbia	54
SBN (MicroBooNE)	Bern	Ereditato, Weber	30
SHiP	EPFL, Geneva, Zurich	Bay, Blondel, Kilminster, Mermod, Serra, Shaposhnikov	45
WA105 + DUNE	Bern, ETHZ, Geneva	Blondel, Rubbia, Weber	43
High-precision and muon physics			
CREMA	ETHZ, PSI	Hildebrandt, Kirch	9
MEG II	PSI	Hildebrandt, Ritt	12
Mu3e	ETHZ, Geneva, PSI, Zurich	Blondel, Dissertori, Grab, Hildebrandt, Ritt, Straumann, Wallny	8
nEDM	ETHZ, Fribourg, PSI	Kirch, Weis	14

It is worth mentioning in addition that *André Rubbia* (ETHZ) was elected on 10 March 2015 as the co-Spokesperson of the Deep Underground Neutrino Experiment (DUNE) at Fermilab, USA.

In parallel 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:

- The [LHC Higgs cross-section working group \(LHCHXSWG\)](#) was created in 2010 to produce agreements on cross sections, branching ratios and pseudo-observables relevant to the Higgs boson(s);
- The Workshop Series “[Physics at TeV Colliders](#)” are meetings held at Les Houches (France) every second year since 1999;

- The [Snowmass physics studies](#).

In addition, University of Zurich, ETHZ and PSI participate in '[HiggsTools](#)' (2014–2017), an FP7 Initial Training Network of the European Commission, whereas the University of Bern is coordinating the activity of the [Flavour Lattice Averaging Group \(FLAG\)](#) (since 2011).

### **Institutional collaboration**

Several CHIPP members are acting as official delegates to international organisations in 2015:

- *Olivier Schneider* (EPFL) is the Swiss scientific delegate to the CERN Council since 2013 on mandate of the State Secretariat for Education, Research and Innovation (SERI).
- *Ulrich Straumann* (Uni. of Zurich) is mandated since 2010 by the “Round Table International” to represent the Swiss participants in the Resources Board of the Cherenkov Telescope Array (CTA) project.
- *Teresa Montaruli* (Uni. of Geneva) is the Swiss scientific delegate to the General Assembly of the Astroparticle Physics European Consortium (APPEC) since 2013.
- *Bernd Krusche* (Uni. of Basel) continued his longstanding mandate of the Swiss National Science Foundation (SNSF) as Swiss representative in the Nuclear Physics European Collaboration Committee (NuPECC).
- *Michael Dittmar* (ETHZ) is the Swiss representative in the Advisory Committee of CERN Users (ACCU) since 2015.
- *Leonid 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) from 2013 to 2018. In the Plenary ECFA, he is supported by *Terence Garvey* (PSI, since 2010), *Olaf Steinkamp* (Uni. of Zurich, since 2013), and *Sigve Haug* (Uni. of Bern, since 2014).
- *Florencia Canelli* (Uni. of Zurich) was elected as a member of commission C11 of the International Union of Pure and Applied Physics (IUPAP) on particles and fields for a three-year mandate (Nov. 2014 to Nov. 2017).
- *Hans Peter Beck* (Uni. of Bern) is the Swiss representative (since 2009) and the co-Chair (since 2013) of the International Particle Physics Outreach Group (IPPOG).
- *Antonio Ereditato* (Uni. of Bern) is the ad interim contact for the Swiss funding agencies (SERI & SNSF) for Swiss participation in the neutrino programme at Fermilab, USA.

## **COORDINATIVE TASKS**

### **Promotion of the next generation**

CHIPP members and CHIPP institutes continued their efforts to inform the public at large about particle and astroparticle physics and to attract young women and men to this field of research. Throughout Switzerland, more than 30 educational events like information days for BSc and MSc students, for pupils finishing high school and for high-school classes were organised involving more than 2000 people. One should mention specifically the participation of more than 150 Swiss high-school pupils (at the Universities of Bern, Geneva, Zurich and the ETHZ) in the frame of the [International Masterclasses “Hands on Particle Physics”](#), where over 10'000 Gymnasium level students in about 200 institutes in 42 countries can actually work with real data from the CERN LHC. A few events for physics teachers have been organised: two at the ETHZ and one at the University of Basel. EPFL and the University of Geneva also organised on 30 March 2015 the [Physics PhD Career Day](#) of the CUSO doctoral programme in physics.

About 50 visits to CERN took place, not only for university students in physics and other disciplines, but also for children (“Drôle de physique” programme), high-school pupils, alumni, members of societies, the media, and the public at large. The [Open Day at PSI](#) on 18 October 2015 attracted some 15'000 visitors. The particle physics lab proposed an exhibition and talks followed by more than 2000 people, including families. An open day for children towards their professional orientation (“Zukunftstag”) took place at the Universities of Basel and Bern, which also prepared a few exhibitions.

CHIPP Board Members gave about 80 outreach talks on particle physics for high-school students, societies and the general public.

Contacts from the bicentennial of SCNAT enabled a new experience for particle physics outreach to children. *Hans Peter Beck* made the complex world of the Large Hadron Collider (LHC) at CERN and the ATLAS detector understandable to the younger ones in the **TV programme “[Rosanna Checkt's - Woraus besteht die Welt?](#)”** broadcasted by SRF1 on 29 September 2015.

The **CHIPP Prize 2015** for the best PhD student in experimental or theoretical particle physics was awarded to *Lilian Witthauer* (Uni. of Basel). The laudatio says: “for her comprehensive study of photoproduction of  $\eta$ -mesons on nucleons bound in deuterium and  $^3\text{He}$  with polarized beams and targets, which covered all aspects from data-taking with two different experimental set-ups at two medium energy electron accelerators to detector calibration and a challenging analysis”. She received the prize money (3000 CHF) and the diploma at the CHIPP Plenary meeting, where she presented her thesis work.

### **Information and coordination tasks supporting research and science**

**CHIPP's website** contains news, documents, minutes of all meetings, as well as the complete membership database. The continuous dialogue between the institutes, which is enshrined in the **CHIPP Statutes and By-Laws**, aims at having at hand in a timely and transparent manner the information about current and planned research activities. This information is collected annually in the so-called **CHIPP Long-term Financial Tables** and includes for each experiment or project the detailed manpower involvement per institute and the attributed funds for past and current years, as well as projections and needs for the future years. The table format has been completely reworked in 2015, with a new template for a simplified edition of individual projects. The inputs received from the Swiss community were presented graphically at the CHIPP Board meeting of June 2015 and showed that the needs exceed the foreseeable future resources. This fact triggered a discussion, which reaffirmed **the role of CHIPP in defining priorities**. As a follow-up, a prioritisation process of the experiments with Swiss involvement was initiated, separately in each of the three pillars of CHIPP. A concrete outcome was the finalisation of the white paper on neutrino physics (see the publication section above). The CHIPP Tables were also used as input for the first **APPEC Census**, towards the completion of the APPEC Roadmap.

CHIPP took actively part in the biannual meetings of the SCNAT's **Round Table International**. This information forum on the participation of Swiss groups in international research facilities comprises – in addition to SCNAT and CHIPP – representatives of the SERI, SNSF, and “Swissuniversities”.

Likewise, CHIPP puts its know-how and information at the disposal of the **Lenkungsausschuss FLARE** (LA FLARE), which is the steering committee defining the priorities for Funding LARge international REsearch projects (FLARE). In 2015, *Rainer Wallny* (ETHZ) was the LA FLARE representative for particle physics and *Martin Pohl* (Uni. of Geneva) the one of astroparticle physics, while the LA FLARE observers for particle and astro-particle physics were *Olivier Schneider* (EPFL) and *Teresa Montaruli* (Uni. of Geneva), respectively.

Since an agreement in November 2013, *Teresa Montaruli* (Uni. of Geneva) acts as the CHIPP observer in the **College of Helvetic Astronomy ProfessorS** (CHAPS), while Xin Wu (Uni. of Geneva) was elected in March 2015, as the first CHIPP observer in the SCNAT **Commission for Space Research** (CSR).

CHIPP maintained its links with the **Swiss Physical Society** (SPS) in 2015 with *Hans Peter Beck* (Uni. of Bern) being in the SPS Committee as representative of the TASK (“Teilchen-, Astro- und Kernphysik”) section.

## Dialogue with society

The CHIPP outreach activities reduced slightly in 2015. Indeed, after the SERI project “Verflixtes Higgs” in 2012–2013, and the follow-up SNSF-Agora project “Interactions – Swiss particle physicists initiate a dialogue with society” (from February 2013 extended to January 2015), the CHIPP proposal for continued SNSF-Agora funding was not approved. Fortunately, the bicentennial of SCNAT in 2015 offered an opportunity for a special Agora funding, which was used by CHIPP to conduct an outreach project as part of the “[Forschung Live](#)” tour of Switzerland. The concept was to screen **the movie “Particle Fever”** (USA, 2013) at Open Air cinemas in Lucerne on 9 August and in Aarau on 23 August, as well as indoor in Sion on 25 September. The events were followed by live interviews of *Hans Peter Beck* in Lucerne and of *Lea Caminada* in Aarau, both animated by *Benedikt Vogel*. The last event in Sion was in the auditorium of a high school. A first screening was for the students and another one in the evening for the general public. The latter was followed by a **multi-disciplinary podium discussion** – moderated by *Elisabeth Chardon*, journalist at “Le Temps” – where *Olivier Schneider* represented the particle physics viewpoint next to the theologian *Jean-Blaise Fellay SJ* and the philosopher *Michel Sigger*. All three events were well attended, despite unpleasant meteorological conditions in Lucerne and Aarau.

A report on these events can be found on the multi-lingual website “[teilchenphysik.ch](#)”, which benefitted, again in 2015, from an SCNAT support via the project “**Dialog Schweizer Teilchenphysiker mit der Gesellschaft**” for the translation of part of the articles in English (“[particlephysics.ch](#)”), French (“[physiquedesparticules.ch](#)”), and Italian (“[physicadelleparticelle.ch](#)”).

In addition to the visits at CERN and PSI, as well as the outreach talks already mentioned in the section on the promotion of the next generation, about 5 interviews were given for the TV, radio or journals. Several articles were also written for the CERN Courier and other magazines, newspapers and newsletters.

The long-standing issue to find a Swiss representative in the **European Particle Physics Communication Network (EPPCN)** has been solved in 2015 with an annual financial support granted by SERI and the Board approval that *Marc Türlér* (CHIPP Administrator) will take this responsibility at the start of 2016. This positive development shall improve the communication channels between the CERN press office and the communication offices of Swiss universities and institutes, as well as with the media and the general public.

Last but not least, it is worth mentioning the outreach events to celebrate the **100 years of the General Theory of Relativity** published by *Albert Einstein* in November 1915. The biggest event was the [Einstein Symposium 2015](#) at the ETH Zurich on 12–14 November, with a series of excellent talks from international experts on the history and the modern developments and applications of this revolutionary theory. The event was completely open and free. At the University of Geneva, there was also an outreach event “[Les secrets de la gravitation – 100 ans de relativité générale](#)” with a series of four evening lectures for the public on 24–27 November. In addition, an outreach lecture called “[L’Héritage d’Einstein](#)” was given by *Michael Kramer* – director of the Max Planck institute for radio-astronomy in Bonn – on 15 December in the frame of the 28<sup>th</sup> Texas Symposium on Relativistic Astrophysics.

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