

This report is a copy of the CHIPP Annual report 2014 which will be delivered to SCNAT.  
Therefore, it is structured and formatted along the SCNAT guidelines.

## SUMMARY

### *Highlights of the Year*

The main highlight of 2014 was the **Swiss celebration of the 60 years of CERN** during the CHIPP Plenary meeting held in Fribourg from 30 June to 2 July 2014 in conjunction with the annual meeting of the Swiss Physical Society (SPS). The celebration started on 30 June with a public conference by *Fabiola Gianotti* entitled “The Higgs boson and our life” on culminated on 2 July with the presence of the CERN Director-General, *Rolf Heuer*, who gave a talk on “60 Years of Science for Peace” and participated to the following panel discussion “CERN’s Impact on Switzerland and its Society”. The other personalities invited to this discussion moderated by *Olivier Dessibourg*, leader of the “Science & Environment” section at the journal “Le Temps” were: *Maurice Bourquin* (Former President of CERN Council), *Ralph Eichler* (President of ETHZ, Vice-President of CRUS), *Alexandre Fasel* (Ambassador, Permanent Representative of Switzerland to the United Nations Office and to the international organisations in Geneva), *Ulrich W. Suter* (President of SATW), *Friedrich K. Thielemann* (President of the platform MAP, SCNAT), and *Martin Vetterli* (President of SNSF research council). CHIPP prepared and displayed a series of 15 posters on the Swiss involvement in particle physics experiments and accelerator developments at CERN. They were exposed next to the official CERN celebration posters and the interactive LHC tunnel, a booth offering a fully immersive experience to enter the world of particle physics. This was a great opportunity to attract the interest of the nearly 500 participants to the SPS annual meeting.

Besides this celebration and outreach event, the actual [CHIPP Annual Plenary Meeting](#) welcomed 113 CHIPP members. It was the first time that SPS and CHIPP had their annual meetings together. This turned out to be very successful and will be repeated every second year to help strengthening the links between CHIPP and SPS. The well-established TASK (“Teilchen-, AStro- und Kernphysik”) session of the SPS meeting was devoted this year to the “CHIPP PhD and postdoc days” including 49 talks and 8 posters by CHIPP PhD students and postdocs. An SPS plenary talk by *Teresa Montaruli* (Uni. Geneva) on “Neutrino astronomy at its sunrise” and the awarding of the CHIPP Prize to *Marco Peruzzi* (ETHZ) completed the scientific part of the CHIPP Plenary. Its formal part took place on the afternoon of 30 June with the usual reports from CHIPP and from the Swiss representatives in various international bodies dealing with particle, astroparticle and nuclear physics. Reports on the CHIPP activities during the SPS annual meeting, the TASK session and the CERN 60-years event can be found in the [Issue 44 of the SPS Communication \(September 2014\)](#).

The other CHIPP highlights of 2014 were three activities supported by SCNAT, namely:

- The [Strategy Workshop on AstroParticles in Switzerland \(SWAPS\)](#) held in Cartigny (GE) on 11–13 June
- The [PSI Summer School on “More than Higgs – Effective Theories for Particle Physics”](#), which took place in Zuoz (GR) on 17–23 August
- The **outreach activities** on [“particlephysics.ch”](#) in continuation of the “Verflixtes Higgs” project of 2012–2013 with the SNSF-Agora project “Interactions” and the SCNAT project “Dialog”.

## SECTORS OF COMPETENCE: NETWORKING AND DEVELOPMENT OF SCIENCE

### Publications

After the preparation in 2013 of a White Paper on the “Strategy for Swiss contributions to large ground-based astroparticle physics research infrastructures” CHIPP initiated a similar process to define the Swiss strategy in the rapidly evolving domain of neutrino physics. This effort yielded a document of 8 pages presented to the CHIPP Board in November as an executive summary on “[Neutrino physics: Switzerland in the Global context](#)”. The document prepared by *Alain Blondel*, *Laura Baudis*, *Antonio Ereditato*, *Teresa Montaruli*, *André Rubbia*, and *Mikhail Shaposhnikov* provides a complete overview of the different neutrino experiments and projects with Swiss participation. This working document will serve as a basis for a strategy on neutrino physics in Switzerland, to be approved by the CHIPP Board in the near future.

### Meetings, Workshops and Schools

In addition to the CHIPP 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 networking and educational goals and organised or co-organised also in 2014 several meetings, schools and workshops:

- The [Future Circular Collider Study Kickoff Meeting](#) was held at the Uni. of Geneva on 12–15 February 2014. The local organisation was assumed both by the Uni. of Geneva and CERN and was chaired by *Alain Blondel*. It was a big, international, meeting gathering 341 participants and many speakers including *Rolf Heuer*, the CERN Director-General. The meeting addressed the motivation and the feasibility of a future circular collider of the 80 to 100 km scale. Such a facility implies a world-wide collaboration and could be constructed at CERN or, alternatively, in China.
- The [First SHIP Workshop](#) was held in at the Uni. of Zurich on 10–12 June 2014. SHIP (Search for Hidden Particles) is a project for a new beam dump experiment at the CERN Super Proton Synchrotron (SPS). Its aim is to search very weakly interacting long-lived particles, in particular heavy neutral leptons (right-handed partners of the known neutrinos), which are an interesting dark matter candidate. The organisation of this international meeting was lead by *Nicola Serra* (Uni. of Zurich). The workshop gathered 92 participants from all around the world with the objective to give a theoretical overview of the new physics that is within the reach of SHIP and to have discussions on the detector requirements and technologies.
- The [Strategy Workshop on AstroParticles in Switzerland \(SWAPS\)](#) was held in Cartigny (GE) on 11–13 June 2014. *Teresa Montaruli* (Uni. of Geneva) chaired the local organisation of this meeting supported by SCNAT and CHIPP. It was a successful workshop with 71 participants gathering the Swiss community working on high-energy astrophysics, neutrinos, and dark matter together with excellent speakers of international notoriety, both theorists and experimentalists. There was time for interesting discussions and *Alain Blondel* provided a summary talk covering interesting aspects for Switzerland in the next future.
- The [PSI Summer School on “More than Higgs – Effective Theories for Particle Physics”](#) took place in the Lyceum Alpinum of Zuoz (GR) on 17–23 August 2014. The school – supported by SCNAT and CHIPP – was organised by *Adrian Signer* and *Michael Spira* both from the Theory Group of the Laboratory for Particle Physics at PSI. The courses – given by nine lecturers from Switzerland and abroad – covered many aspects of effective theories and precision measurements and even the proton radius and strings.
- The Uni. of Zurich and the ETHZ organised on 12–13 September the traditional **PhD seminar** mandatory for all 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. 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	Swiss institutes	CHIPP Board Members	Institutes worldwide
High-Energy particle physics			
ATLAS	Bern, Geneva	Beck, Ereditato, Golling, Iacobucci, Mermod, Nessi, Weber, Wu	178
CMS	ETHZ, PSI, Zurich	Canelli, Chiochia, Dissertori, Grab, Horisberger, Kilminster, Pauss, Wallny	183
LHCb	EPFL, Zurich	Bay, Nakada, Schneider, Serra, Straumann	68
LHC Tier-2	ETHZ, CSCS	Grab	> 200
HL-LHC	EPFL, PSI	Rivkin	14
CLIC	EPFL, PSI	Rivkin	44
Astroparticle physics			
AMS	Geneva	Pohl	25
ArDM	Zurich	Rubbia	10
CTA	ETHZ, Geneva, Zurich	Biland, Courvoisier, Montaruli, Neronov, Straumann	173
DAMIC	Zurich	Kilminster	3
DARWIN	Bern, Zurich	Baudis, Kilminster, Schumann	11
IceCube	Geneva	Montaruli	35
MAGIC+FACT	ETHZ, Geneva	Biland, Montaruli	25
XENON	Bern, Zurich	Baudis, Schumann	13
Neutrino physics			
EXO	Bern	Gornea	16
GERDA	Zurich	Baudis	17
LAGUNA-LBNO / WA105	Bern, ETHZ, Geneva	Blondel, Ereditato, Rubbia	21
MicroBooNE	Bern	Ereditato, Weber	25
OPERA	Bern	Ereditato	28
T2K / NA61	Bern, ETHZ, Geneva	Blondel, Ereditato, Rubbia	64
High-precision and muon physics			
CREMA	ETHZ, PSI	Hildebrandt, Kirch	9
MEG	PSI	Hildebrandt, Ritt	12
Mu3e	ETHZ, Geneva, PSI, Zurich	Blondel, Dissertori, Grab, Hildebrandt, Pohl, Ritt, Straumann, Wallny	7
nEDM	ETHZ, Fribourg, PSI	Kirch, Weis	15

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, Uni. of Zurich, ETHZ and PSI participate in two of the European Commission’s FP7 Initial Training Networks, namely ‘[LHCPhenoNet](#)’ (Advanced Particle Phenomenology in the LHC era, 2011–2014) and ‘[HiggsTools](#)’ (2014–2017), whereas the Uni. of Bern is coordinating the activity of the [Flavour Lattice Averaging Group \(FLAG\)](#) (since 2011).

### **Institutional collaboration**

Several CHIPP Board members are acting as official delegates to international organisations in 2014:

- *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 Weber* (Uni. of Bern) is the CHIPP representative in the Advisory Committee of CERN Users (ACCU) (2009–2014).
- *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 2015. 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).
- *Florenca 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, until March 2015, the ad interim contact for the Swiss funding agencies (SERI & SNSF) in the interim International Executive Board (iIEB) for the Long Baseline Neutrino Facility (LBNF) at Fermilab, USA.

CHIPP sent a letter in support of the Tokai-to-Kamioka (T2K) neutrino experiment on 17 October to the Japan’s Ministry of Education, Culture, Sport, Science and Education (MEXT). The letter entitled “Swiss support to the Japanese neutrino programme” was addressed to Sadayuki Tuchiya, Deputy Minister, in response to MEXT’s decision to cut about 50% of the 2015 funding of T2K, an experiment to which three Swiss institutes participate.

## 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. An event was organised for physics teachers at the Uni. of Zurich.

More than 80 visits to CERN as well as to PSI and its particle physics and accelerator facilities took place, not only for university students in physics and other disciplines, but also for high-school pupils, alumni, members of societies, the media, and the public at large (attracting some 1500 participants). A multi-wire proportional chamber built in Lausanne for the Charpak group has been donated to the physics museum of the Uni. of Lausanne for display to the public. CHIPP Board Members gave about 60 outreach talks on particle physics for high-school students, societies and the general public.

The project “Interactions” (2013–2014), supported by SNSF through the Agora funding, builds up on the project “Verflixtes Higgs” (2012–2013) by intensifying the use of the social media (like Facebook, Twitter, YouTube), which leads to an increased participation of high school pupils in the discussion about the impact of research. Five so-called ‘double dialogue’ podium discussions took place in Google hangouts and at schools and reached about 1000 people.

Also in 2014, the [CHIPP Prize](#) was awarded to the best PhD student in experimental and theoretical particle physics. This year’s award went to *Marco Peruzzi* (ETHZ) “for his original contribution to the development of novel topological algorithms to identify single photons in the electromagnetic calorimeter of the CMS experiment at the LHC and discriminate them against abundant background from neutral pions”. The prize winner was presented with the prize money (3000 CHF) and the CHIPP diploma during the CHIPP Plenary in Fribourg.

### Information and coordination tasks supporting research and science

[CHIPP’s website](#) contains news, documents, information about 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 ongoing and planned research activities in the groups including funding and manpower needs. This information was collected also in 2014 and condensed as usual in a coherent table of particle and astroparticle physics projects. Graphical representations of the collected data were shown at the Board meeting of June 2014 and are publicly accessible.

On 7 February 2014, CHIPP provided to SERI a document entitled “CHIPP Input for the SERI Inventory” in the context of the update of the **Swiss Roadmap for Research Infrastructures 2017–2020**. It includes one page for each of the ten following experiments: ATLAS detector upgrade; CMS detector upgrade; LHCb detector upgrade; Maintenance & Operation of the LHC experiments; Computing for the LHC experiments; High-luminosity LHC upgrade R&D; Compact Linear Collider (CLIC) R&D; NA61, T2K and HyperK; WA105; and CLOUD. Other projects were not eligible to be part of this inventory and had to answer the joint SNSF/SERI call for new research infrastructures of national relevance by 23 January 2014. The submitted CHIPP-related projects are the Cherenkov Telescope Array (CTA), the dark matter detectors XENONnT & DARWIN, and MicroBooNE, a short-baseline neutrino experiment at Fermilab.

CHIPP took actively part in the bi-annual 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 CRUS.

Likewise, CHIPP puts its know-how and information at the disposal of the **Lenkungsausschuss FLARE** (LA FLARE), which defines the priorities for the SNSF's FLARE funding. In 2014, *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.

An exchange of observers was agreed in November 2013 between CHIPP and the College of Helvetic Astronomy ProfessorS (CHAPS). *Teresa Montaruli* (Uni. of Geneva) acts as the CHIPP observer in CHAPS, while *Alexandre Refregier* (ETHZ) is the CHAPS observer in the CHIPP Board.

CHIPP maintained and even strengthened his link with the SPS in 2014 with *Hans Peter Beck* succeeding to *Martin Pohl* in the SPS Committee as TASK section representative and by holding the CHIPP plenary meeting in conjunction with SPS annual meeting in Fribourg.

### **Dialogue with society**

Outreach has remained an active sector of CHIPP in 2014. Based on the results and benefits stemming from the SERI project “Verflixtes Higgs” in 2012–2013, SNSF granted the follow-on project “**Interactions – Swiss particle physicists initiate a dialogue with society**” (from Feb. 2013 extended to Jan. 2015). The main instrument of this project is an interdisciplinary dialogue of Swiss physicists with other people explaining the world like sociologists, theologians, philosophers, artists, novelists, and politicians. A successful event was for instance the dialogue between *Ruth Durrer* (Prof. of theoretical physics at the Uni. of Geneva) and *Christian Gonzenbach*, an artist of the Geneva area. The event entitled “la matière noire – l’invisible existe” took place on 10 Dec. 2014 and attracted the curiosity of the public on possible links between art and science around the theme of dark matter.

The SCNAT support for the project “**Dialog**” (2013–2014) is complementary to the SNSF-Agora project “Interactions” and has allowed to extend the range of use of the website [teilchenphysik.ch](http://teilchenphysik.ch) (also partly available in English at [particlephysics.ch](http://particlephysics.ch)) to the French ([physiquedesparticules.ch](http://physiquedesparticules.ch)) and the Italian ([physicadelleparticelle.ch](http://physicadelleparticelle.ch)) speaking parts of Switzerland.

The 37th international conference on high energy physics (ICHEP) held on 2–9 July in Valencia, Spain included a session and for the first time a plenary talk on education, communication and outreach – given by the CHIPP member *Hans Peter Beck* – suggesting that outreach activities start to get higher international recognition.

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 10 interviews were given for the TV, radio or journals. Several articles were also written for the CERN Courier and other magazines.

Last but not least, it is worth mentioning two celebration events, which took place in 2014. The first is the Swiss celebration of the 60 years of CERN, which was already presented in the Summary section, and the second is the **celebration of the 40 years of the Cyclotron ring accelerator at PSI**. The festive symposium at the occasion of this anniversary was organised by PSI, but is reported here as an important event for particle physics. It took place on 24 February 2014 and gathered many invited guests from the academic, political, industrial and technical communities.

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