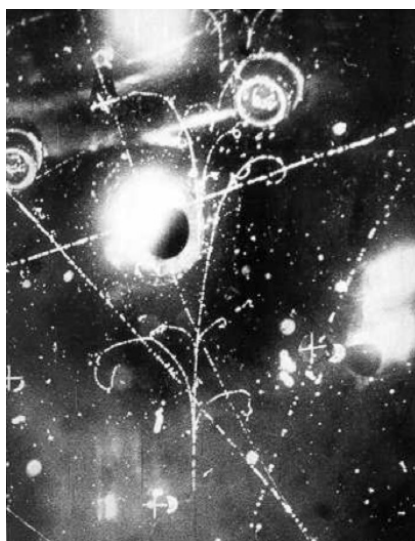


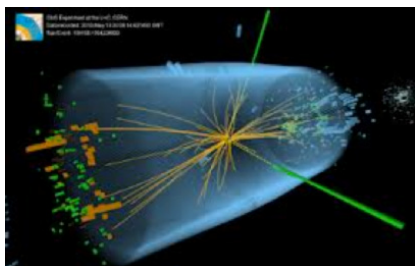
Particle Physics in Belgium



An example of a purely leptonic neutral current interaction

$$\bar{\nu}_{\mu} e^{-} \rightarrow \bar{\nu}_{\mu} e^{-}$$

Observed in the "Brussels part" of the film from the Gargamelle Bubble chamber.



Discovery of a new scalar Boson at a mass of about 125 GeV/c² in the CMS experiment at the CERN Large Hadron Collider as predicted by the Brout-Englert-Higgs mechanism.

As a founding member of CERN, Belgium has made many important contributions to experimental particle physics. Belgian teams have been involved in major experiments using all accelerators and colliders at CERN. A landmark achievement was the IIHE Brussels' contribution to the Gargamelle neutrino experiment at the CERN Proton Synchrotron which discovered the weak neutral current; the birth of the Standard Model.

Belgian scientists have contributed to experiments at CERN with neutrino beams, the electron-positron collider and nuclear physics experiments at the ISOLDE facility studying exotic, short-lived isotopes. They have also contributed to other experiments such as HARP and to the development of beta-beams which may lead to the design of neutrino factories. Outside of CERN, Belgian teams have been very active in the HERMES and H1 experiments at Desy (Hamburg).

The major Belgian theoretical contributions to the field are numerous and famous, ranging from the expansion of the universe and the "Big Bang" hypothesis from G.Lemaitre (1927) to the development of the Brout-Englert-Higgs mechanism (1964) predicting a scalar Boson that has been recently discovered at CERN (2012). Belgian theoretical physicist Léon van Hove served as Director-General of CERN, jointly with John B. Adams, from 1976 until 1980.

Today, the focus of activities at the high-energy frontier is the CMS experiment at the Large Hadron Collider, where the Belgian contributions span from the construction of the forward silicon tracker, the forward RPC muon system and the CASTOR forward calorimeter, to the design of the trigger for the experiment and the optimization of the analysis schemes. Belgian physicists have contributed to all phases of these projects: the design of the experiment, the construction of the apparatus, the collection of the data and their analysis and the discovery of a new Boson: the crowning of the Standard Model. Continuing the tradition of neutrino physics in Belgium, an active participation to the OPERA experiment at the Gran Sasso laboratory (Italy) studying the interactions of a neutrino beam from CERN. In the field of Astro-Particle Physics research, Belgian researchers make important contributions to the AMANDA-IceCube experiment embedded in the Antarctic ice of the South Pole. In nuclear physics, Belgian groups continue their leadership role at the cutting edge research conducted at the CERN ISOLDE facility.

Since 2002, the collaboration of experimental and theoretical particle physicists has been enhanced by a network supported by the federal government and called the "Interuniversity Attraction Pole (IAP)". Training, information exchange and outreach are among the objectives of this network. The participation of Belgium in the world-wide computing Grid is being actively pursued through various initiatives taken at regional and national levels.

Society and Skills

Preparing the next generations

The Belgian contingency working in the fields of Nuclear, Particle Physics and Astro-Particle Physics amounts to some 150 researchers from all universities in Belgium. Their research is mainly funded by the FWO Vlaanderen and the F.R.S. - FNRS. Through the IAP of fundamental interactions and HIE ISOLDE, integrated education and training provides some 20 PhD theses per year. Outreach to the wider public is a permanent activity of all involved with seminars, exhibitions and guided visits to CERN.

New technologies

An interconnected world

The WWW has been developed at CERN some 25 years ago and has since entered our daily life. Our compatriot R.Cailliau has been involved in this adventure. Today, LHC data is analyzed worldwide on the Computing Grid offering similar opportunities to other fields of science and technology.

Innovation

Continuing R&D on accelerator and detector technologies bring quite some added value to society at large. Scintillating crystals developed for photon detection in Particle Physics have revolutionized the PET scanner as a medical tool. A small animal PET scanner has been built at the VUB along this innovation and is since used as a valuable research tool. IBA (Ion Beam Applications) at Louvain-la-Neuve is a leading enterprise that delivers turnkey cyclotrons to the world market for medicine and research. IMEC in Leuven has been very instrumental in the development of the “Medipix” chip widely used in medical imaging and industrial applications. At the ISOLDE facility, techniques have been developed for radio isotope production for medicine and material science. As a final example of Belgian innovation, 50 thousand tons of low carbon steel coated with “Calamine” (small village in the Belgian east cantons) has been delivered for the production of the dipole magnets of the Large Hadron Collider.

