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19th International Particle Physics Masterclasses

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Every year, during a period of 6-7 weeks in February and March, more than 225 universities and research centres in 60 countries invite high-school students for a day of immersion in particle physics. More than 13000 young people, 16 to 18 years old, are offered a glimpse in the world of scientific research, the aim being to inspire them and stimulate their interest in science. They have the opportunity to meet scientists, learn about particle physics, accelerators and detectors, and perform physics measurements analyzing real experimental data by means of dedicated analysis software. At the end of the day, during a videoconference with up to five institutes moderated by physicists, they discuss their results and ask questions. This, in a nutshell, is the International Masterclasses Programme (IMC), the flagship activity of the International Particle Physics Outreach Group (IPPOG), coordinated by IPPOG in collaboration with Quarknet. This year, the 19^{th} edition of IMC is taking place in the period 13^{th} of February-31^{st} of March, 2023.

The International Masterclasses were held for the first time in 2005 with the participation of 3000 students in 18 countries and have seen a spectacular increase over the years in the number of participating institutes, countries, and students. For many years, data from the Large Electron-Positron Collider (LEP) experiments at CERN were used for the hands-on part of the activity: the students were basically looking at Z^0 decays. With the start of the Large Hadron Collider (LHC), IPPOG decided to introduce measurements based on data from LHC. All four big LHC experiments offer a variety of measurements using real data: Z^0 and W decays, search for Higgs candidates, search for strange particles and observation of strangeness enhancement in lead collisions, measurement of the D^0 lifetime. Over the years, the physics scope of the masterclasses has expanded, as other high-energy physics experiments have entered the game. Nowadays the students can analyze data not only from ALICE, ATLAS, CMS and LHCb experiments, but also from the Belle II experiment in Japan, from a neutrino experiment (Minerva), and recently also from the Auger astro-particle physics experiment. In addition, a particle therapy masterclass highlights some of the benefits for society, in the field of medicine, from the technology developed for particle physics research.

Special masterclasses for girls were held on the 10^{th} of February, on the occasion of the International Day of Women and Girls in Science, introduced by the United Nations in 2015. These special sessions, with female scientists acting as lecturers, tutors or moderators, aim to inspire young girls, contributing to the effort to increase female participation in STEM-related studies.

With life back to normal after some difficult years due to the COVID pandemic, physicists are happy to welcome students in the institutes again, rather that holding online masterclasses. Still, a week dedicated to online masterclasses is included in this year's programme, giving the opportunity to students in remote places to have this unique experience.

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