Daily Newsletter – Friday, July 24rd

After a great start we are on day two of EPS-HEP. It is an exciting day ahead of us. Our newsletter guides you through the highlights of the day.

Astroparticle Physics, Cosmology and Gravitation

Gamma rays are among the cleanest signals to detect Dark Matter in astrophysical environments: Fermi-LAT satellite experiment results will be scrutinized. Antimatter particles reaching Earth serve as messengers of high-energy or exotic phenomena in the cosmos: recent measurements by AMS on the International Space Station reveal novel characteristics of the electron and positron spectra. Controversial hints for light dark matter direct detection in underground laboratories have been either ruled out or raised doubt. With ever increasing sensitivity, solar neutrinos become a background but experiments enter a decisive period that allows to test the WIMP paradigm once and for all.

Flavour Physics and Fundamental Symmetries

The day starts with new measurements of two fundamental parameters of the Standard Model, the Cabibbo-Kobayashi-Maskawa matrix elements |Vub| and |Vcb| by LHCb, BaBar and Belle. The decays B -> D(*) tau nu are sensitive to New Physics models and deviations from the Standard Model were previously reported - updates will be shown today. The status of the search for lepton flavour violation in muon decays and the long standing discrepancy in anomalous magnetic moment of the muon (g-2) are reviewed.

Higgs and New Physics

The search for dark matter and non-standard Higgs boson signals as evidence for new physics beyond the Standard Model of Particle Physics, is a very popular topic. The session will cover the latest experimental and theoretical results, especially from the LHC experiments. Talks will present final results from run 1 and first prospects for run2 at new record energy of 13 TeV. Search of new long-lived particles that would leave direct detectable signals in experiments will be also addressed.

Top and Electroweak Physics

The morning is dedicated to the top quark, the heaviest known particle with a mass nearly equal to a gold atom. The top quark plays an important role in the search for new physics and thus precise measurement of its properties is essential. The latest results from LHC and Tevatron experiments on mass and decay channels will be discussed, as well as new theoretical developments. The afternoon will be dedicated to the production of W and Z bosons and their interaction with the Higgs boson. Such searches are important to investigate how the Higgs would possibly break the electroweak symmetry. Processes involving jet production will also be addressed. They are important for the search of new particles.

QCD and Hadronic Physics

Deep inelastic scattering of leptons on nucleons allows us to investigate their structure; HERA and COMPASS results are presented as well as state-of-the-art theory calculations. Quark distributions in

the proton are essential for all predictions at the LHC: latest measurements are discussed, including the charm and bottom quark content. First results from the 13 TeV LHC data are presented: LHCb for the cross sections for quarkonia, beauty and charm production, ATLAS and CMS for the production of jets in association with photons and massive vector bosons. The improvement of the theoretical description involves Higgs physics as well as the combination of parton showers with new higher-order perturbative calculations and computational methods.

Detector R&D and Data Handling

ATLAS and CMS will first show their current status, performance and the upgrade plans of their muon systems and calorimeters. CALICE will present highly granular calorimeters, a technology which will also be used by CMS for its forward calorimeter upgrade.
In the afternoon, CMS and ATLAS will present their trigger systems for LHC Run 2, including for ATLAS a Fast Tracker Trigger. LHCb will also show its performance for Run 2.

Neutrino Physics

Neutrinoless double beta decay is an extremely rare process that allows us to determine a long sought answer to the question whether the neutrino is a Majorana particle, i.e. whether neutrinos and antineutrinos are in fact the same particles. A positive answer to this would allow transformations from matter to antimatter with possible implications on our understanding of matter abundance in the universe. CUORE aims at looking at this process with unprecedented sensitivity and the community is looking forward to these results. Understanding the properties of CP symmetry in the lepton sector is one of the major goals of future studies in neutrino physics. Theoretical predictions of model-independent approaches using reactor, atmospheric and solar neutrino data will be presented. These can guide a future experimental research programme.

Heavy Ion Physics

Quark-Gluon Plasma (QGP) is the extremely dense and hot matter that made up the primordial fireball of the Big Bang during its first few microseconds. Determining the properties of the QGP, like the viscosity, is one of the main goals of heavy ion physics. Predictions from hydrodynamic models are in very good agreement with experimental data and can be used to constrain these transport properties of the QCD matter. Of special interest are the results from p-Pb and d-Au collisions where intriguing collective effects have been found. Thereby shedding light on the more complex Pb-Pb collisions. Suggestions for the future of the heavy ion physics programme are discussed in different contributions.

Social Events

At walking distance of the University, the exhibition “Spurensuche – die Bausteine des Universums” aims to ‘demystify’ particle physics for the general public: “meet Sheldon’s friends” in the gardens of the old Vienna Hospital.

Protraittheater, at 7:30 pm:
achievements of women in the field of science and technology illustrated through the portraits of Marie Curie, Lise Meitner and Hedy Lamarr.

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