The Standard Waffle

EUROPEAN PHYSICAL SOCIETY HEP2019

Daily EPS-HEP 2019 Newsletter Friday 12 July 2019

Introduction

Yesterday we saw a first day of invigorating parallel sessions, today we continue on this track. Below we give some highlights of yesterday and a view of what's coming up, including an interesting evening program.

Lunch boxes

A reminder that **lunch boxes** can be purchased (except on Sunday) using tokens for sale at the registration desk.

Evening activities

The evening program consists of two stimulating activities.

At 18h45, a science history seminar presents you the story on the **Solvay council meetings**, which had a profound influence on the development of modern physics.

At 20h, a **classical music concert** by the Ghent University orchestra *Continuo* will bring a scientist-centered program. Works of Ives, Antheil, Borodin, and the creation of the piece *Supersymmetry* by Joris Blanckaert, who worked in the Ghent art@CMS project.
Make sure to bring your voucher, and buy it in time at the registration if you haven't yet.

Highlights of Thursday

In the session of **astroparticles and GW** exciting results were reported from the young field of ultra-high-energy neutrino astronomy. A multitude of operating and planned detectors guarantee a bright future for multimessenger astronomy. Also AMS flux measurements were discussed and keep bringing surprises.

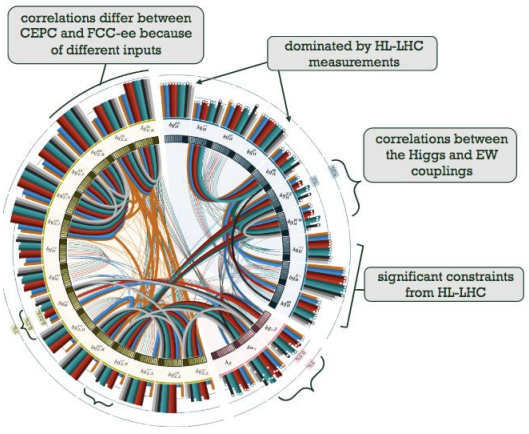
Concerning **detector R&D and data handling**, we are seeing yesterday's simulations becoming today's working detectors and ambitious concepts are changing the reality: eg. <100ps timing in tracking, calorimeters and particle ID!

All the components from sensor to electronics are pushed to their best performance in harsh conditions to meet challenges posed by future machines.

The all-day session on **dark matter** included presentations ranging from theoretical work connecting to gravitational waves, to recent experimental results from collider searches as well as direct and indirect detection facilities. Many presentations highlighted the experimental reach of planned new facilities and developments in instrumentation.

Regarding **flavour physics and CP violation**, recent measurements of CP violation in B-meson decays were presented, with the afternoon mainly dedicated to the charm CPV, including an attempt to predict the size of the recent direct observation. The status of the Belle II experiment was also reported.

In the **Higgs physics** session, ATLAS reported new H⟶μμ results, with a limit now at 1.7 x SM, while CMS presented 3.9σ evidence for ttH, H⟶bb. On the theory side, the connection between EW and Higgs parameters at future lepton colliders was highlighted, potentially significantly lessened by improved precision measurements in either sector.



New results in **heavy-ion physics** concerned constraints on the energy-loss mechanism in a QGP. Also extensive light-flavour probe studies

and heavy-flavor results were presented, placing constraints on charm hadrochemistry and heavy-quark energy loss in the QGP. New theory advances for the use of jets as multi-scale probes of the QGP have been discussed. LHCb, finally, reported high precision heavy-flavour measurements in pPb collisions, indicating a strong suppression of gluon PDF.

Neutrino physics remains vibrant. Through the analysis of solar neutrinos, the Borexino experiment observes the inner processes in the sun. Reactor neutrino experiments on the other hand report improved understanding of nuclear reactor fuel composition and evolution, and neutrino spectrum distortions.

In the area of **top and EWK physics**, ATLAS reported first evidence for top-antitop charge asymmetry in pp collisions, while CMS set indirect limits on the top Yukawa coupling (Y_t<1.67). On the theoretical side, multiple high-order calculations were reported to be in good agreement with data.

In the **searches for new physics**, the highlight comes from new results from ATLAS, showing an impressive sensitivity to charginos and neutralinos decaying via the Standard Model Higgs boson.

The session on **QFT and strings** saw a fascinating connection between the information paradox, black hole microstates and wormholes, as well as the expectation to verify experimentally QED non-linear effects in the near future.

Concerning **QCD and hadronic physics**, finally, a highlight is the FCC-ee capability of electroweak and Higgs parameter measurements with unprecedented precision. It also offers to decrease the experimental uncertainties on the strong and electromagnetic coupling measurements.

Today's sessions

We quickly overview here the programme of today's parallel sessions. The detailed Indico agendas are linked through the session titles.

Cosmology, Astroparticle Physics and GW

The morning session is focused on neutrinos, cosmic rays, and dark matter, while the afternoon session is fully devoted to cosmology.

Detector R&D and data handling

The focus is on novel techniques for trigger and reconstruction for several detector upgrades, mainly at the (HL-)LHC. The performance of current detectors is also reviewed.

Heavy Ion Physics

Measurements of quarkonium and heavy-flavor production in hadron collisions are presented, as well as phenomenological aspects and prospects for future accelerators.

Neutrino Physics

Status and prospects of many current and future long-baseline experiments are presented, as well as results from neutrino telescopes, $0\nu\beta\beta$ searches and other related projects.

QCD and hadronic physics

Phenomenological and experimental results on a variety of topics, including jet production, PDF and α_s, forward proton scattering, muon g–2, and much more.

Top and Electroweak physics

Morning reports on top production along with other particles and related to new physics are complemented with tools and future colliders top quark perspectives. The afternoon features electroweak boson measurements and precision physics at LHC and beyond.

Outreach, education and diversity

Many initiatives of the HEP community are presented to bring physics to a large public, including arts and games. The afternoon session will also analyze equality and diversity in science.

Flavour Physics and CP Violation

A wide variety of measurements in B-meson decays are covered, along with searches for lepton flavour violation with B decays and muon-electron transitions.

Searches for New Physics

The New Physics session turns to unconventional signatures, featuring low-mass resonances, long-lived particles, monopoles etc. Also prospects at future facilities are covered.

Higgs Physics

Continuing yesterday's diversity, featuring extra scalars in extended higgs sectors, more precision measurements, and a further view at future colliders.

Accelerators for HEP

Several developments from the LHC and HL-LHC are reported on, connecting beyond to other proposals at CERN and other facilities.

Did you know?

Make your mouth water with Ghentian gastronomy, foodies will be right at home here. Try **Stroverij**, a stew of beef, onions, bread, mustard, local beer, thyme, bay leaf, pepper and salt, delicious with Belgian fries. Or the amazing **Waterzooi** invented in the Middle Ages when this traditional soup was usually prepared with fish from the Lys or Scheldt Rivers. Later housewives opted to use chicken instead of fish. Complete the evening at the **'t Dreupelkot** to try the most peculiar Belgian jenever-cafe in whole Flanders.

Picture of the day

After the full day physics lectures, participants enjoyed a lecture on Belgian beer...

...followed by the experimental verification of the acquired theoretical knowledge.

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