MadGraph5_aMC@NLO Femto Workshop

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The workshop was held on March 27, 2015 at the lecture hall of the Kavli IPMU, as a satellite workshop after the KAERU (Key Aspects in Exploring Road to Unification) Conference on March 25-26. [Organizers: Kaoru Hagiwara (KEK), Fabio Maltoni (UCLouvain), Shigeki Matsumoto (Kavli IPMU), Kentarou Mawatari (Vrije U Brussel), and Tim Stelzer (Illinois)].

These days, Monte Carlo event generators are indispensable for reliable theory predictions as well as experimental data analyses at the CERN LHC (Large Hadron Collider), which will resume soon at the upgraded 13 TeV center-of-mass energy, as well as at the ILC (International Linear Collider), which is planned to be built in Japan.

"MadGraph5_aMC@NLO (MG5_aMC in short)" is one of the event generators for high-energy physics, and has been used by many theorists as well as experimentalists. Although MG5_aMC has been maintained and developed for decades mainly by people in Europe and the US, the core code to compute Feynman diagrams (the so-called HELAS: HELicity Amplitude Subroutines) was created by Kaoru Hagiwara (one of the organizers of this workshop), Hitoshi Murayama (Director of the Kavli IPMU), and Isamu Watanabe in 1991. Tim Stelzer (Illinois) and Olivier Mattelaer (Durham) told us this interesting history in the opening address and in the review talk on MG5_aMC, respectively.

In the first half of the workshop, developers introduced their state-of-the-art simulation tools [Benjamin Fuks (Strasbourg): FeynRules2, MadAnalysis5; Olivier Mattelaer (Durham): MadGraph5_aMC@NLO; Barbara Jaeger (Tuebingen): VBFNLO], while Davide Pagani and Eleni Vryonidou (UCLouvain) reported recent progress on the automation of electroweak corrections and loop induced processes, respectively.

In the latter part, we discussed more physics applications based on tools. Chung Kao (Oklahoma) and Tilman Plehn (Heidelberg) talked about the importance of the Higgs-top couplings, while Mihoko Nojiri (KEK/Kavli IPMU) explained her recent paper on jet physics. After the tea break held at Piazza Fujiwara, the workshop resumed with Junichi Kanzaki (KEK), and this author reporting on the GPU project and the Higgs characterisation project, respectively. We also had three talks by young Japanese physicists, Sayaka Kawabata (Tohoku), Junya Nakamura (KEK) and Kohsaku Tobioka (KEK/Tel Aviv/Weizmann), leading to intense and exciting discussions with more than 50 participants from many countries.

The workshop was successfully closed by Fabio Maltoni (UCLouvain), who promised a similar workshop again in the near future. We hope that the workshop provided a valuable opportunity to learn about recent simulation tools and physics at the LHC as well as at the ILC, especially for young people.

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