The University of Geneva Neutrino Group – recent activity

excerpts from the report to the Swiss National Fund – 30 January 2012

Collaborators

Alain Blondel (PO), Sandro Bravar (MER), Andrea Ferrero (MA, left in January 2011), Jean-Sebastien Graulich (MA, left in June 2011), Jeremy Argyriades (MA, left in September 2010), Fanny Dufour (MA), Gustav Wikström (MA since 09-2009, left in Spetember 2011), Alexander Korzenev (MA since 12-2009), Mark Rayner (Postdoc since June 2011), Yordan Karadhzov (Postdoc since April 2011), Raphaël Schroeter (A, 2005-2011 PhD Thesis11 March 2011), Vassil Verguilov (A, thesis in preparation), Nicolas Abgrall (A, PhD thesis 23 September 2011), Sebastien Murphy (A, thesis in preparation), Melody Ravonel (A, thesis in preparation), Alexis Haesler (A since 07-2010), Ruslan Asfandiyarov (A since December 2010); technical team (electronics, computing and mechanics) from DPNC: Pierre Béné, Stéphane Debieux, Didier Ferrere, Franck Cadoux, Florian Masciocchi, Yann Meunier.

Activities

Activities in 2010-2011 have been exceptionally successful. They can be summarized as follows.

- T2K experiment. The T2K experiment has taken data since January 2010 till March 2011, and produced its first physics results in 2011. The indication of ν_e appearance **Error! Reference source not found.**, and thus of a large value of the mixing angle θ_{13}, has been considered one of the ten most important breakthroughs in Physics in 2011 and the most important one in Particle Physics **Error! Reference source not found.**. The UniGe contributions have been in i) commissioning and operation of the tracking detector (a TPC with MicroMegas readout) for the near (280m) detector station; ii) analysis work for T2K with the extraction of the inclusive ν_μ Charged Current sample for normalization of the experiment, and preparation of the cross section measurement; iii) activities in the beamline group in particular with inclusion of NA61 data in the beam MonteCarlo. (A. Blondel, A. Bravar, A. Ferrero, F. Dufour, N. Abgrall, M. Ravonel, M. Rayner, S. Murphy, G.Wikström).

- NA61/T2K. We initiated in 2007 the measurement of hadron production off the T2K neutrino target (p-Carbon at 30 GeV) with the SHINE/NA61 detector at CERN. The UNIGE group contributed a new TOF system in 2007-2009 and a new trigger system in 2009-2010. Data taken in October 2007 were analyzed and first pion spectra published. Kaon spectra have submitted for publication. The method to extract particle production from the replica target has been developed and publication is prepared. The detector was upgraded in 2009 to allow 10 fold increase in statistics. Work is underway to analyse the data taken in 2009 with a thin target and 2010 with the T2K replica target. Discussions have begun to measure targets for

the neutrino experiments at Fermilab. (A. Blondel, A. Bravar, J. Argyriades, A. Korzenev, N. Abgrall, A. Haesler, S. Murphy).

- Muon Ionization Cooling Experiment (MICE) at Rutherford Laboratory. A. Blondel is the spokesman of this experiment. The first step of the experiment (beam commissioning) was completed in August 2010 leading to the first measurement of emittance with particle physics detectors. Experiment is on track to install the next steps in 2012 for data taking in 2013. Geneva has provided the data acquisition trigger of the experiment, and is now dedicated a large effort in the construction of the downstream calorimeter (EMR) for which the first three modules were tested on beam at RAL in summer 2011. Two Master student theses were achieved on the project. (A. Blondel, J.S. Graulich, Y. Karadhzov, V. Verguilov, R. Asfandiyarov, H. Wisting, K Rothenfusser).

- Future neutrino program: continued contributions to the International Design Study for the Neutrino Factory; preparation of test beam activities for future neutrino detector R&D in the framework of FP7-AIDA; preparation of several workshops and reports aimed at the definition of the European Strategy for Future Neutrino Physics, and organization of the NUFACT11 workshop and International Neutrino Summer School in Summer 2011. Finally, with the LAGUNA-LBNO study of a neutrino beam pointing to Pyhasalmi, an exciting perspective with mid-term important results and long term view is possible. (A. Blondel, A. Bravar, F. Dufour, A. Korzenev, G. Wikström).