

Report of the activity during my stay in Mexico City

In the framework of the HELEN project I visited the mexican group involved in the project for a period of one month, from June 25th to July 25th of 2006, at CINVESTAV in Mexico City. Our groups are both involved in ALICE, an high-energy physics experiment which will study heavy ion collisions in order to verify the possible creation of a new state of nuclear matter, called Quark Gluon Plasma (QGP). ALICE will exploit the new energy regime allowed by the Large Hadron Collider (LHC), studying lead-lead collisions at a center-of-mass energy of 5.5 TeV.

My principal research activity consists in the study and development of the software needed for the simulation and analyses of the physics processes expected in ALICE. This software is currently being developed by the ALICE off-line group in an object-oriented framework called AliRoot.

In AliRoot, simulated data are generated via Monte Carlo event generators. The generated tracks are then transported through the detector via detector simulation packages as GEANT3, FLUKA and GEANT4. These packages generate a detailed energy deposition in the detector, which is consequently transformed in a detector response, taking into account the electronic manipulation of the signals. The reconstruction algorithms reconstruct the information about particle trajectory. This software, used to study the detector performance in the study of the different physics processes interesting in heavy-ion collisions, is now being adapted to reconstruct real data.

During my visit in Mexico I worked together with the mexican colleagues and the main activity was the training of a student, Elizabeth Castañeda, on the different aspects of AliRoot, since she is going to spend 6 month at Cern working on ALICE. The items studied and discussed were the installation of the software, the simulation of events with different generators and the reconstruction of the simulated events. Apart from that, we started working on the development of simple c++ programs, so that she could acquire an adequate knowledge of c++ to handle with AliRoot.

As complementary activity, I started working on the development of analysis code for the study of the production of pions in proton-proton and lead-lead collisions. The mexican group, since several years, has been studying pion spectra in relativistic heavy-ion collisions [1,2]. I collaborated with them in order to allow this study also on the simulated data for ALICE. This analysis requires both tracking and particle identification. The code for track

reconstruction and particle identification is already implemented in AliRoot, but macros for the study of specific distributions of reconstructed particles are missing. This code, still under development, will be easily adapted also on real data, since the AliRoot framework is conceived for both simulated and real data.

1. “Finite size effects on pion spectra in relativistic heavy-ion collisions”, A. Ayala, E. Cuautle, J. Magnin, L.M. Montaño y A. Raya, Phys. Lett. B444 (2006)201-204.
2. “Density and expansion effects on pion spectra in RHIC”, A. Ayala, J. Barreiro y L.M. Montaño, Phys. Rev. C 60014904, 1999, 1-5.

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