

**Work subject and progress status of the P2IO project:
Top quark measurements as a probe to new physics**

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The project goal is the measurement of asymmetries and polarization in top quark production processes as well as the possible interpretation of the results in term of new physics (NP) models. The measurements are being pursued at the Large Hadron Collider (LHC), where top quarks are produced copiously in high energy proton-proton collisions. The work is being done at the ATLAS experiment. These types of measurement are particularly interesting due to the excess with respect to the Standard Model (SM) predictions, that has recently been reported by the Tevatron experiments. The collected number of the top quark production events at the LHC is much larger than the number of events obtained at Tevatron. The LHC measurements therefore enable more refined probes of differential asymmetry measurements even if the asymmetry is expected to be smaller. Due to their different initial states and the larger centre-of-mass energy of collisions at the LHC, the Tevatron and LHC measurements are complementary when probing NP extensions of the SM. Particularly sensitive NP probes can be devised when using a combination of asymmetry and polarization measurements. The LHC measurements pursued by the project are therefore of key importance for the interpretation of the Tevatron results and one of the most important top quark measurements and NP searches to be performed.

The work towards completion of the project started on March, 19th 2012. Since then a set of observables that serve as sensitive and experimentally robust NP probes has been identified. The studies have been presented by one of the project participants (A.F.) at the recent workshop, *Top physics: from charge asymmetry to the boosted regime*, at CERN. Much work has been invested into preparation for the analysis of the ATLAS data. Distributed computing techniques necessary for analysis of the large samples at the available computing facilities have been mastered. The complex analysis framework needed for processing the LHC data samples and for top quark reconstruction is being developed in the collaboration with the top quark physics experts at CEA-Saclay, Irfu/SPP. Using this framework, some first data and simulation comparisons have been made.