This thesis is devoted to study the hard diffractive and exclusive events at the experiment ATLAS.
Right after the start-up of a new proton accelerator LHC in CERN they will be identied using the rapidity gap method. We therefore developed an alternative denition of the observed energy in the ATLAS calorimeter to identify diffractive and exclusive events. During the high luminosity operation of the accelerator, forward detectors (AFP) recently proposed to be installed far from the interaction point approaching the beam at few millimeters will allow to tag the intact scattered protons in these events unambiguously.
The simplest exclusive production is due to the exchange of two photons. We implemented twophoton exchanges in FPMC generator and analyzed the two-photon production of W and Z-pairs decaying leptonically to calculate sensitivities on triple and quartic anomalous gauge couplings of electroweak boson to photons. The obtained results are remarkable mainly for the quartic couplings. Their current limits can be improved by almost two orders of magnitude with early data and by four orders of magnitude using large luminosity and AFP detectors. In addition, we used two-photon dimuon events to determine the time needed to align one of the AFP stations with respect to beam to a desired precision.
Another type of exclusive events is the central exclusive production (CEP) initiated by the exchange of two gluons. We compared in detail the prediction of the available models to the Tevatron exclusive dijet data. This is crucial to predict the cross section at the LHC where the CEP of Higgs boson is an important part of the AFP physics program.