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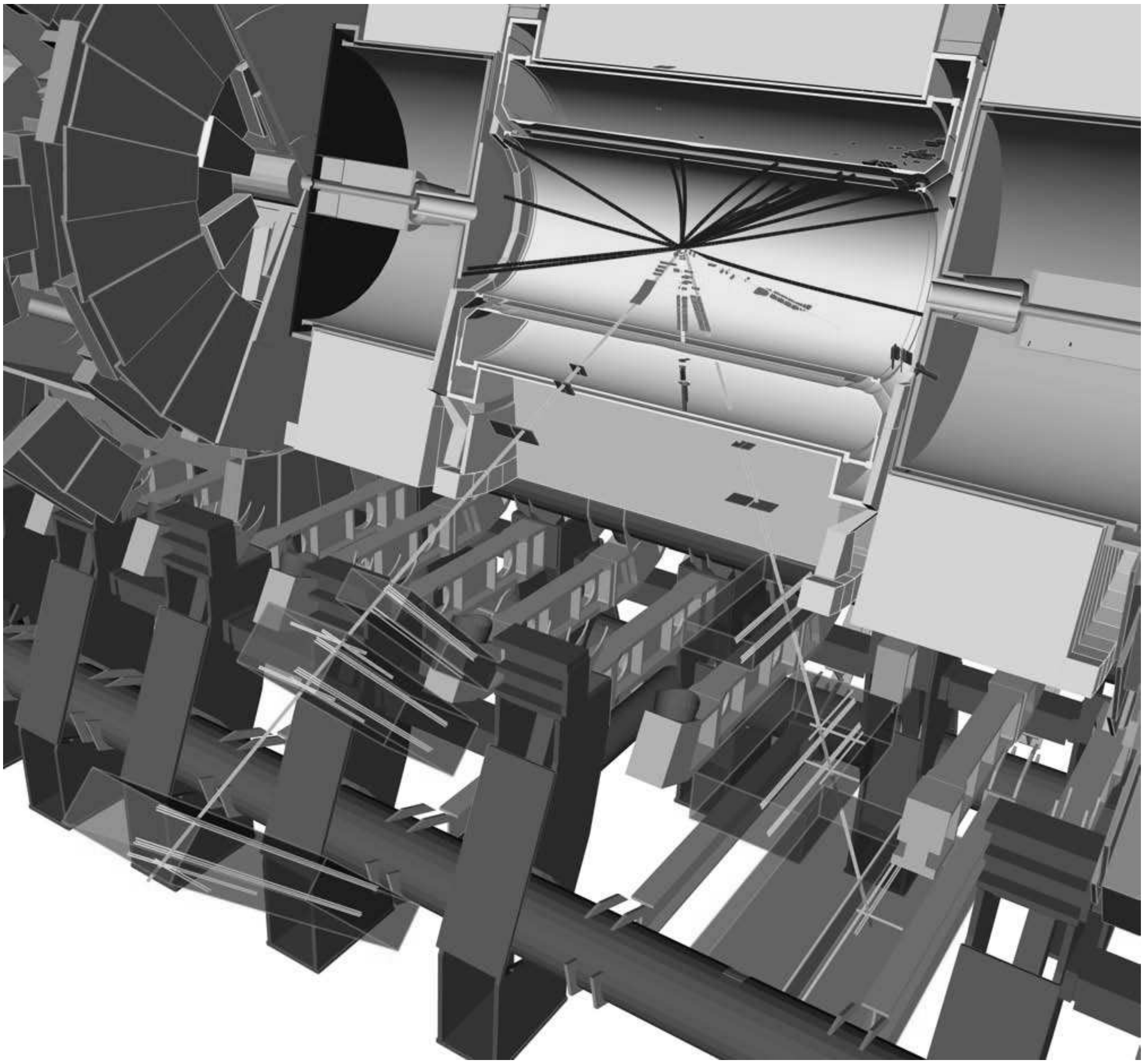
Expected Performance of the ATLAS Experiment

Detector, Trigger and Physics

The ATLAS Collaboration

A detailed study is presented of the expected performance of the ATLAS detector. The reconstruction of tracks, leptons, photons, missing energy and jets is investigated, together with the performance of *b*-tagging and the trigger. The physics potential for a variety of interesting physics processes, within the Standard Model and beyond, is examined. The study comprises a series of notes based on simulations of the detector and physics processes, with particular emphasis given to the data expected from the first years of operation of the LHC at CERN.



Display of a high-p_{T} $H \rightarrow ZZ^{*} \rightarrow ee\mu\mu$ decay (m_{H} = 130 GeV), after full simulation and reconstruction in the ATLAS detector. The four leptons and the recoiling jet with E_{T} = 135 GeV are clearly visible. Hits in the Inner Detector are shown in green for the four reconstructed leptons, both for the precision tracker (pixel and silicon micro-strip detectors) at the inner radii and for the transition radiation tracker at the outer radii. The other tracks reconstructed with $p_{\mathrm{T}} > 0.5$ GeV in the Inner Detector are shown in blue. The two electrons are depicted as reconstructed tracks in yellow and their energy deposits in each layer of the electromagnetic LAr calorimeter are shown in red. The two muons are shown as combined reconstructed tracks in orange, with the hit strips in the resistive-plate chambers and the hit drift tubes in the monitored drift-tube chambers visible as white lines in the barrel muon stations. The energy deposits from the muons in the barrel tile calorimeter can also be seen in purple.

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