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Detecting atmospheric neutrino oscillations in ATLAS

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We discuss the possibility to study oscillations of atmospheric neutrinos in the ATLAS experiment at CERN. Due to the large detector mass, a significant number of events is expected, and during the shutdown phases of the LHC, reconstruction of these events will be possible with very good energy and angular resolutions. We argue that 500 live days of neutrino running should be achievable, and that a total of about 160 contained nu_mu events and about 750 upward going muons could be collected during this time. Despite the low statistics, the excellent detector resolution will allow for an unambiguous confirmation of atmospheric neutrino oscillations and for a measurements of the leading oscillation parameters. Though our simulations show that the sensitivity of ATLAS is worse than that of dedicated neutrino experiments, we demonstrate that more sophisticated detectors, e.g. at the ILC, could be highly competitive with upcoming superbeam experiments, and might even give indications for the mass hierarchy and for the value of theta_13.

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