Title: Study of jet fragmentation and inclusive jet production in heavy-ion collisions with the ATLAS experiment

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Abstract: This thesis presents two measurements - measurement of the jet fragmentation functions and inclusive jet production in heavy-ion collisions. The fragmentation functions are measured in Pb+Pb and pp collisions with the ATLAS detector at the LHC. The distributions are measured as a function of jet transverse momentum and rapidity. The analysis utilises an integrated luminosity of 0.14 nb$^{-1}$ of Pb+Pb data and 4.0 pb$^{-1}$ of pp data collected in 2011 and 2013, respectively, at the same centre-of-mass energy of 2.76 TeV. Modest but significant centrality-dependent modifications of fragmentation functions in Pb+Pb collisions with respect to those in pp collisions are seen. Measurements of the yield and nuclear modification factor, $R_{AA}$, for inclusive jets are performed using 25 pb$^{-1}$ of pp data at $\sqrt{s} = 5.02$ TeV and 0.49 nb$^{-1}$ of Pb+Pb data at $\sqrt{s_{NN}} = 5.02$ TeV. The jets are measured over the transverse momentum range of 100–1000 GeV in six rapidity intervals covering $|y| < 2.8$. The magnitude of the $R_{AA}$ increases with increasing $p_T$ and with decreasing centrality of the Pb+Pb collision. The $R_{AA}$ is independent of rapidity at low $p_T$ and it decreases with increasing rapidity at high $p_T$.

Keywords: jet quenching, fragmentation functions, nuclear modification factor, ATLAS detector