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Measurement of the total cross section in pp collisions at $\sqrt{s}=7$ TeV with the ALFA sub-detector of ATLAS

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The total pp cross section is a fundamental parameter of the strong interaction which cannot be calculated in QCD but still can be measured using the optical theorem, which states that the total cross section can be obtained from the extrapolation to $t=0$ of the differential elastic cross section measured at small four-momentum transfer t .

The ATLAS Collaboration has collected 80 μb^{-1} of elastic data in a dedicated run with high beta* optics at 7 TeV centre-of-mass energy with the ALFA Roman Pot detector in order to perform this measurement. From the extrapolation of the differential elastic cross section to $t=0$ using the optical theorem the total cross section is extracted with the luminosity-dependent method. In addition the nuclear slope of the elastic t -spectrum, the total elastic and inelastic cross sections are determined.

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