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Measurement of the b -tagging efficiency using multijet events in ATLAS

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The identification of jets containing b-hadrons, b-tagging, plays an important role in many physics analyses in ATLAS. Several different machine learning algorithms have been deployed for the purpose of b-tagging. These tagging algorithms are trained using Monte-Carlo simulation samples, as such their performance in data must be measured. The b-tagging efficiencies (ϵ_b) have been measured in data using $t\bar{t}$ events in the past and this work presents the measurements in multijet events using data collected by the ATLAS detector at $\sqrt{s} = 13$ TeV for the first time. This offers several key advantages over the $t\bar{t}$ based calibrations, including a higher precision at low jet p_T and an ability to perform measurements of ϵ_b at significantly higher jet p_T . Two approaches are applied and for both a profile likelihood fit is performed to extract the number of b-jets in samples passing and failing a given b-tagging requirement. The b-jets yields are then used to determine ϵ_b in data and from that scale factors to the efficiency measured in MC. The two approaches differ primarily in the discriminating variable used in the fit. At low jet p_T the variable $p_{T,rel}$ is used, while for high jet p_T the signed impact parameter significance is used. Both calibrations give measurements of the scale factors as a function of the jet p_T .

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