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Nuclear Physics B 875 (2013) 483–535

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PHYSICS Bwww.elsevier.com/locate/nucphysb

Dynamics of isolated-photon plus jet production in pp collisions at $\sqrt{s} = 7$ TeV with the ATLAS detector[☆]

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Received 25 July 2013; accepted 30 July 2013

Available online 8 August 2013

Abstract

The dynamics of isolated-photon plus jet production in pp collisions at a centre-of-mass energy of 7 TeV has been studied with the ATLAS detector at the LHC using an integrated luminosity of 37 pb^{-1} . Measurements of isolated-photon plus jet bin-averaged cross sections are presented as functions of photon transverse energy, jet transverse momentum and jet rapidity. In addition, the bin-averaged cross sections as functions of the difference between the azimuthal angles of the photon and the jet, the photon–jet invariant mass and the scattering angle in the photon–jet centre-of-mass frame have been measured. Next-to-leading-order QCD calculations are compared to the measurements and provide a good description of the data, except for the case of the azimuthal opening angle.

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Keywords: QCD; Photon; Jet

1. Introduction

The production of prompt photons in association with a jet in proton–proton collisions, $pp \rightarrow \gamma + \text{jet} + X$, provides a testing ground for perturbative QCD (pQCD) in a cleaner environment than in jet production, since the photon originates directly from the hard interaction. The measurements of angular correlations between the photon and the jet can be used to probe the dynamics of the hard-scattering process. Since the dominant production mechanism in pp collisions at the LHC is through the $qg \rightarrow q\gamma$ process, measurements of prompt-photon plus jet production have been used to constrain the gluon density in the proton [1,2]. Furthermore, precise measurements of photon plus jet production are also useful for the tuning of the Monte

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