**Measurement of jets produced in top quark events using the $e\mu$ final state with 2 $b$-tagged jets in $pp$ collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector**

by

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University of California, Berkeley

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## Abstract

Measurement of jets produced in top quark events using the $e\mu$ final state with 2 $b$-tagged jets in $pp$ collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector

by

Jacquelyn Kay Brosamer
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Professor Marjorie Shapiro, Chair

The transverse momentum ($p_{\mathrm{T}}$) and multiplicity of jets produced in top quark events are measured using 20.3 fb$^{-1}$of $pp$ collision data at a center-of-mass energy of $\sqrt{s}$ =8 TeV. Jets are selected from top events requiring an opposite-charge $e\mu$ pair and two $b$-tagged jets in the final state. The data are corrected to obtain the particle-level fiducial cross section $\frac{1}{\sigma_{e\mu+2\ b\text{-jets}}}\frac{d\sigma_{\mathrm{jet}}}{dp_T}$for additional jets with rank 1-4, where rank=1 is the leading additional jet. These distributions are used to obtain the extra jet multiplicity as a function of minimum jet $p_{\mathrm{T}}$ threshold.

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# Bibliography

[1] Matteo Cacciari, Gavin P. Salam, and Gregory Soyez. The Catchment Area of Jets. *JHEP*, 0804:005, 2008.