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Measuring hadrons around leptonic Z bosons in CMS open data using Z drop($10'+5'$)

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We study the local properties of hadronic event activities using leptonic decaying Z bosons. We use the dimuon events in 8 TeV pp collisions from CMS open data, and we define the “leptonic Z jet” by enclosing particles within an angle R from the Z or by using standard jet clustering algorithms. A new hadronic observable called Z drop is defined which allows us to probe underlying events and pileup contributions. We examine the dependence on the Z transverse momentum, the radius R and the number of pileup events in real data and simulations, and we test the performance of pileup mitigation methods on this observable. The measurement will provide useful information about soft particle distribution uncorrelated with the leptonic Z decay, which allows us to perform precision studies of hadronic decays of Z bosons in future work. We also propose to use Z drop as a new probe of the quark-gluon plasma produced in heavy ion collisions.

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