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Parton distributions and the W mass measurement

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We examine the sources of parton distribution errors in the W mass measurement, and point out shortcomings in the existing literature. Optimistic assumptions about strategies to reduce the error by normalizing to Z observables are examined and found to rely too heavily on assumptions about the parametrization and degrees of freedom of the parton distribution functions (PDFs). We devise a strategy to combine measurements as efficiently as possible using error correlations to reduce the overall uncertainty of the measurement, including Z data, and estimate a PDF error of $^{+10}_{-12}$ MeV is achievable in a W mass measurement at the LHC. Further reductions of the W mass uncertainty will require improved fits to the parton distribution functions.

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