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Toward a Measurement of the Z Boson Decaying to Four B-Quarks with the CMS Detector

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We propose an analysis to measure the branching fraction of the Z boson decaying to $b\bar{b}b\bar{b}$ at the CMS detector. This quantity was previously measured by the LEP experiments to an uncertainty of about 36% but has not yet been measured at the LHC; such a measurement would be a high-precision test of QCD involving *b*-quarks. The rarity of this decay, about $4*10^{-4}$, and the multiplicity of decay products make this measurement difficult. We show that the best prospect for this analysis selects events with a boosted Z boson which produces two jets, one of which contains multiple tagged *b*-quarks. Requiring this multi-*b*-tagged jet strongly decreases the background events due to QCD interactions, though such events are still the largest background. We propose several ways in which these backgrounds can be further reduced, outline a proposed analysis strategy, and present expected sensitivities for pp collisions at $\sqrt{s} = 13$ TeV using an integrated luminosity of 138 fb⁻¹.

Mini Symposia (Invited Talks Only)

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