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Measurement of Luminosity Using Coincidence Counting and its Effect on Relative Luminosity PEDRO MONTUENGA, University of Illinois at Urbana-Champaign — $\Delta G(x)$, the spin dependent gluon distribution in the proton is presently not constrained due to the lack of data at low-x. Even a sizable $\Delta G(x)$ will result in small double longitudinal helicity asymmetries, down to $A_{LL} \sim 10^{-4}$, in this region. In order to be sensitive to such small asymmetries, the relative luminosity between same sign and opposite sign helicity proton-proton interactions must be understood at the same level of precision. Luminosity may be estimated from event yields in luminosity monitoring detectors. To reduce noise, the luminosity is often measured by counting coincidences of two detectors, typically placed symmetrically about the nominal proton-proton interaction point. This method requires collision pileup corrections, for which there are standard procedures. However, a collision vertex requirement might also be imposed and many details of the experimental configuration such as the acceptance of the detectors, the vertex resolution and the longitudinal profile of the particle bunches in the beam must be considered. We present results from a Monte Carlo simulation that seeks to quantify these effects. Our goal is to reduce the systematic uncertainty associated with relative luminosity in polarized proton-proton collision experiments.

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