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Luminosity maximization in a small vertex region at RHIC

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For the 2024 100 GeV proton run at RHIC, the new sPHENIX detector will require a maximum amount of collisions within ± 10 cm of its central Interaction Point (IP), and preferably few or no collisions outside this range. To maximize the collisions within the vertex, a large crossing angle of up to 2 mrad will be used, operating the Large Piwinski Angle (LPA) scheme. To compensate for the reduction in luminosity from the large Piwinski angle, a $\beta=50$ cm lattice has been designed and supported with dynamic aperture simulations. To further compensate the luminosity reduction, injector studies have been performed to support up to a 45% increase in the injected intensity relative to the previous 100 GeV run in 2015.¹

Footnotes

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