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Direct measurements of RHIC BPM data at the IP using linear regression

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Many mature methods to study the betatron function of a lattice rely on beam position monitor (BPM) data and the model of the whole machine. In this study, we focused on analyzing specific parts of the lattice of the Relativistic Heavy Ion Collider (RHIC), taking advantage of BPMs separated by drift space near interaction points (IPs) of RHIC. This (local) approach would provide an alternative measure of beta $ands$ at specific regions which can be compared to previous (global) methods. This process utilizes the phase transfer matrix built from existing BPM data from RHIC using Linear Regression techniques. Results at the IPs were compared to B3/B4 magnet sections. These were then compared to previous methods. It was found that this local method does just as well as existing global methods in certain regions (around IP10 and 12) while doing subpar in other regions (around IP6). However, we propose that AC dipole data will perform better than the previous set of BPM data, though results are currently pending. This method of considering specific regions with special conditions could be extended to experiments at NSLS-II and the upcoming EIC for further luminosity optimization.

Footnotes

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