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## Design and preliminary research of quadrupolar BPM for measuring space charge induced tune shift

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In high intensity proton synchrotrons, space charge effects can cause a shift in the beam's tune. This shift can lead to an increase in betatron oscillation amplitude and result in significant beam loss when the betatron tune spreads across a resonance line. By utilizing the quadrupolar beam transfer function, the coherent space-charge tune shift of quadrupolar beam oscillations can be determined based on the quadrupolar oscillating frequency. The China Spallation Neutron Source (CSNS) is a high-intensity accelerator facility that includes a linear accelerator and the Rapid Cycle Synchrotron (RCS). A quadrupolar BPM has been installed at the RCS to measure the space charge-induced tune shift. This paper will present the offline calibration method for the quadrupolar BPM and the preliminary results obtained from beam experiments conducted at CSNS/RCS.

### Footnotes

### Funding Agency

### I have read and accept the Privacy Policy Statement

Yes

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