IPAC'25 - the 16th International Particle Accelerator Conference



Contribution ID: 2419 Contribution code: SUPS059

Type: Student Poster Presentation

## Demonstrating a Fisher Information based methodology for optimizing BPM placements in AS2

Sunday 1 June 2025 14:00 (2 hours)

The next generation Australian Synchrotron project (AS2), is a proposed 4th generation light source, aims to deliver ultra-low emittance  $\sim$ 100 pm-radians and highly coherent, bright light. Constraints on emittance place tight demands on beam optics correction techniques like linear optics of closed orbit (LOCO) and consequently constraints on accurate estimation of the beam centroid along the orbit.

In this work, we propose a Fisher Information Matrix (FIM) -based method for optimizing BPM placement. To achieve this, we use the fully differentiable accelerator code Cheetah, which integrates accelerator modelling with automatic differentiation to enable fast simulations and efficient computation of partial derivatives - including the FIM from the second derivative. Using this we derive optimal BPM placements that minimize variance in estimation of the beam centroid parameters for a segment of the AS2 system.

## Footnotes

Paper preparation format

LaTeX

**Region represented** 

Asia

## **Funding Agency**

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Session Classification: Student Poster

**Track Classification:** MC6: Beam Instrumentation and Controls,Feedback and Operational Aspects: MC6.T03 Beam Diagnostics and Instrumentation