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Bayesian optimization for beam centroid correction at ISAC

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Beam tuning in a post-accelerator facility such as TRIUMF's ISAC involves a considerable amount of overhead and often leads to tunes which diverge from the theoretical optimum for the system, introducing undesirable effects such as aberrations or chromatic couplings. Bayesian Optimization for Ion Steering (BOIS) has been developed and tested to perform centroid corrective steering, after the transverse optics have been set to theory, in a method which is fully online and easy to deploy. Naïve multi-objective adaptations, scaleBOIS and boundBOIS have been introduced to perform corrective transverse steering with minimal transverse fields . Tests in the low-energy electrostatic transport beamlines at ISAC I performed comparably to human operators. This work holds promise for enhancing the efficiency and reliability of beam delivery via autonomous tuning methods, supporting TRIUMF's scientific mission.

Footnotes

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