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# DESIGN OF AN OPTICAL AMPLIFIER FOR AMPLIFIED OSC IN IOTA FACILITY AT FERMILAB

*Wednesday 13 August 2025 16:00 (2 hours)*

Optical stochastic cooling (OSC) is a cutting-edge beam cooling technology to reduce, control the 3 dimensional spread and the motion of particle beams. It has recently been successfully, experimentally, demonstrated in Fermilab's IOTA storage ring, marking a major step forward in beam cooling. OSC has the potential to significantly improve both the performance and flexibility as a beam cooling system. One promising way to boost OSC performance is by adding a high-gain optical amplifier. However, this amplifier must be carefully designed to meet the specific constraints of the OSC system. A major challenge lies in the limited optical delay, which is just 6 mm for the case of IOTA, set by the beam bypass, restricts us to use a short-length gain medium. This, along with IOTA's high repetition rate and the relatively long duration of the optical pulses, limits the peak power available for the pump laser without damaging the crystal, which is crucial for achieving strong nonlinear gain. Additionally, it's essential to preserve the phase coherence of the undulator radiation during amplification, which further complicates the amplifier design. This report details a specialized amplifier setup that addresses these challenges, includes simulations of the integrated system, and summarizes the latest experimental progress and results.

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Yes

## Footnotes

## Funding Agency

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Yes

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