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The optical stochastic cooling program at Fermilab

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Recently, Optical Stochastic Cooling (OSC) became the first demonstrated method for ultra-high-bandwidth stochastic cooling. The initial experiments at Fermilab's IOTA ring explored the essential physics of the method and demonstrated cooling, heating and manipulation of beams and single particles. Having been validated in practice, with continued development, OSC carries the potential for dramatic advances in the state-of-the-art performance and flexibility for beam cooling and control. The ongoing program at Fermilab is now focused on the development of an OSC system that includes high-gain optical amplification, which promises a two-order-of-magnitude increase in the strength of the OSC force. Here we review the progress and plans for the amplified OSC program. This includes detailed lattice designs and tracking simulations for the various experimental configurations, designs and status for the various hardware systems, and near-term operational plans and use cases.

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