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The Optical Stochastic Cooling Program at Fermilab

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Optical Stochastic Cooling (OSC) was recently demonstrated at Fermilab's Integrable Optics Test Accelerator (IOTA) storage ring. This demonstration marked the first realization of the stochastic cooling (SC) principle in the optical regime and achieved a system bandwidth of approximately 20 THz, more than three orders of magnitude greater than state-of-the-art SC systems. The initial experiments, which used 100-MeV electrons and a radiation wavelength of 950 nm, included comprehensive measurements with both beams and individual electrons in one, two and three-dimensional configurations. Here we describe the results of these experiments, which did not include optical amplification, as well as our current development efforts at the Fermilab Accelerator Science and Technology (FAST) facility towards a high-gain, amplified-OSC demonstration in the near future.

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