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Development of Chip Platform Magneto-Optical Traps Integrating Machine Learning Techniques for Testbed Parameter Optimization[1]
ALEXANDRA CRAWFORD, Georgia Institute of Technology, LUKE BEMISH, Universities Space Research Association, SPENCER OLSON, Air Force Research Laboratory, CHANDRA RAMAN, Georgia Institute of Technology — The process of miniaturizing atomic experiments and developing chip-platform integrated techniques to effectively slow and trap atoms is a step towards making compact atomic clocks and inertial sensors for commercial use. Integrating Machine Learning (ML) techniques to improve the rigidity and stability of the testbed also provides the ability to continually optimize the system parameters based on fluctuating environmental conditions. This project contains two related setups that approach the same problem from two different directions. 1) A ColdQuanta RuBECi platform looks to integrate new compact electronics and home-built software to implement ML techniques for parameter optimization of a commercial product. Assembly of the platform and implementation of the optimization software to properly develop ML libraries will be discussed. 2) A business card-sized double magneto-optical trap system is a developmental approach to the chip-scaling of a Bose-Einstein Condensate (BEC) generating platform for atomic interferometry, where future ML implementation will enable autonomy from a controlled laboratory environment. Manufacture and assembly of the Business Card platform will also be discussed.

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