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Progress towards a shared ion trap quantum information processor for the research community[1] MATTHEW DAY, RICHARD RADEMACHER, NOAH GREENBERG, NIKOLAY VIDENOV, RAJIBUL ISLAM, CRYSTAL SENKO, Institute for Quantum Computing, University of Waterloo — The rise of commercial quantum computing devices has allowed for the testing of small-scale quantum algorithms on physical systems. These devices are generally limited in the flexibility of type, ordering and timing of operations, making them restrictive for researchers developing novel quantum protocols. In this talk we present progress towards a trapped ion system designed to have greater flexibility in order to provide a useful tool for the academic research community. Researchers will have remote access to native light-matter interactions that drive trapped ion quantum gates and therefore have the greatest possible suite of operations for realizing novel quantum computing protocols. This functionality is provided by a custom control system based on commercial FPGA boards to realize autonomous running of the trapped ion system with sub-nanosecond timing precision. Initially, the system will allow for fully connected interactions between up-to 16 individually addressed ions, with a modular design allowing for future upgrades to the system. The individual addressing scheme is based on a guided-light platform, enabled by the 532 nm wavelength of Ba^+ Raman transitions. We will present the progress made in the building of the system, and the challenges that lie ahead.

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