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A shared ion trap quantum computer for the general research community[1] RICHARD RADEMACHER, MATTHEW DAY, NOAH GREENBERG, RAJIBUL ISLAM, CRYSTAL SENKO, UNIVERSITY OF WATERLOO/IQC — Some major barriers in the use of ion traps for quantum computation and simulation are the expense of the apparatus, and the technical knowledge necessary to convert circuit-level descriptions of quantum algorithms into the laser timing pulses and associated controls. We present the design for a multi-user, 10-qubit quantum computer that brings useability closer to the general research community. A new, custom control system provides users with remote control capability at various levels of abstraction: timing, gate, and circuit. Provisions for control of all hardware is provided along with built-in calibration, safety interlocks, advanced timing control and arbitrary pulse generation. A major innovation is a new individual laser addressing scheme for ion gates. This addressing scheme will use modular fibre-coupled components to split, modulate, and array the Raman addressing beams in order to reduce crosstalk between ion sites. The combination of multi-user control on a modern ion trap platform brings performance, and useability to both the experimentalist and theorist.

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