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Electronic control of trapped ion qubits

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Electronic control methods, where quantum gates are implemented without lasers, hold great potential for trapped-ion quantum computing due to their low fundamental errors and the ease of scalability. In this work, we demonstrate a new electronic control method, where addressed single-qubit rotations are implemented by localized AC electric fields, generated by trap electrodes. We demonstrate theoretically and experimentally how this tool enables local single-qubit control in a multizone trap, using only small voltages and existing trap structures. Finally, we discuss how electronic control techniques enable large-scale integration of trapped-ion quantum computers with scalable fabrication processes.

Primary authors: BALLANCE, Chris (Oxford Ionics, University of Oxford); HARTY, Tom (Oxford Ionics Limited)

Co-authors: ALLCOCK, David (Oxford Ionics, Univeristy of Oregon); Dr HUGHES, Amy (Oxford Ionics); Dr KING, Steven (Oxford Ionics); Dr LOSCHNAUER, Clemens (Oxford Ionics); MALINOWSKI, Maciej (Oxford Ionics); MATTHIESEN, Clemens (Oxford Ionics); Dr NEGNEVITSKY, Vlad (Oxford Ionics); Dr NOURSHARGH, Rustin (Oxford Ionics); Dr SRINIVAS, Raghavendra (Oxford Ionics)

Presenters: BALLANCE, Chris (Oxford Ionics, University of Oxford); HARTY, Tom (Oxford Ionics Limited)

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