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Exploring Dynamical Localization on a Quantum Information Processor

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An experiment which investigates dynamical localization in an implementation of the quantum sawtooth map is presented. In the appropriate parameter regimes, the quantum sawtooth map produces localized states which have a characteristic localization length. This unique quantum behavior, which we observe in a nuclear magnetic resonance quantum information processor, can be used to assess the accuracy of control achieved in a quantum computation device. Measurement of the predicted localization length provides a quantitative measure of experimental control of quantum coherence.