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Environment-induced bound entanglement JULIO T. BARREIRO, P. SCHINDLER, Institut fuer Experimentalphysik, Universitaet Innsbruck, O. GUEHNE, Institut fuer Theoretische Physik, Universitaet Innsbruck, T. MONZ, M. CHWALLA, Institut fuer Experimentalphysik, Universitaet Innsbruck, V. NEBENDAHL, Institut fuer Theoretische Physik, Universitaet Innsbruck, M. HENNRICH, Institut fuer Experimentalphysik, Universitaet Innsbruck, R. BLATT, Institut fuer Experimentalphysik, Universitaet Innsbruck and IQOQI, Oesterreichische Akademie der Wissenschaften — Entanglement, the most powerful physical resource for quantum information, has been conjectured to decay, under the influence of decoherence, into a seemingly unprofitable form, known as bound entanglement. Bound entangled states have several applications, but most importantly, they underline our understanding of multiparticle entanglement and its dynamics under decohering environments. Here, we present our experiments with trapped calcium ions showing the existence of bound entanglement in nature. By embedding an entangled and multipartite distillable quantum state of four qubits in a locally dephasing environment (via spontaneous decay), we observe a transition into full separability via bound entanglement. To our knowledge, our work is the first to experimentally explore such multiparticle entanglement dynamics.

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