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Entangled Optical Phonons in Diamond at Room Temperature¹ MICHAEL R. SPRAGUE, KA CHUNG LEE², Clarendon Laboratory, University of Oxford, BENJAMIN J. SUSSMAN, National Research Council of Canada, JOSHUA NUNN, NATHAN K. LANGFORD, XIAN-MIN JIN³, TESSA CHAM-PION, PATRICK MICHELBERGER, KLAUS F. REIM, DUNCAN G. ENGLAND, DIETER JAKSCH⁴, IAN A. WALMSLEY, Clarendon Laboratory, University of Oxford — Diamond's many superlative features include a Raman-active optical phonon that is well-isolated from thermal fluctuations at room temperature. We enlist this mode to demonstrate entanglement between two macroscopic, spatially separated diamonds at room temperature with ultrashort pulses and a far-off-resonance Raman interaction. We measured the concurrence of the joint state of the Raman-scattered photons to determine that the optical phonon modes in the two diamonds were entangled. Our results demonstrate that entanglement can persist in the vibrational motion of macroscopic solids at room temperature.

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