

Abstract Submitted  
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**Low participation ratio vibrational modes in a limit-periodic structure**<sup>1</sup> CATHERINE MARCOUX, JOSHUA E. S. SOCOLAR, Duke University — Motivated by the demonstration that patterned colloidal particles may form a limit-periodic phase<sup>2</sup>, we study the nature of vibrational modes in a toy model based on the Taylor-Socolar tiling. We consider a triangular lattice of identical point masses with nearest neighbors connected by springs of two different strengths, where the pattern of spring constants reflects the limit-periodic structure of the tiling. Using calculations of the phonon spectra for crystalline approximants to the limit-periodic structure, we identify several hierarchies of modes shared by the full limit-periodic system that have arbitrarily low participation ratios. We present a heuristic explanation of the existence of such modes, which are robust in the presence of vacancies and small amounts of disorder in the spring constants.

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<sup>2</sup>C. Marcoux, T. W. Byington, Z. Qian, P. Charbonneau, and J. E. S. Socolar, *Phys. Rev. E* **90**, 012136 (2014).

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