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Measurement of Resonant Frequencies and Modes of Freestanding Nanoparticle Monolayers PONGSAKORN KAN-JANABOOS, James Franck Institute and Department of Physics, The University of Chicago, XIAO-MIN LIN, Center for Nanoscale Materials, Argonne National Laboratory, HEINRICH JAEGER, James Franck Institute and Department of Physics, The University of Chicago, JEF-FREY GUEST, Center for Nanoscale Materials, Argonne National Laboratory — We recently showed that freestanding membranes of ligated nanoparticles can be assembled in a one-step drying-mediated process [1]. These 10nm thin membranes can stretch over holes up to 100 microns in diameter and are supported by a substrate only along their outer edge, thereby freely suspending of the order of 100 million close-packed particles [2]. Previous work has focused on quasi-static mechanical properties [1-3]. Here we present the first investigation of the full dynamic response of freely suspended nanoparticle membranes, utilizing a high frequency laser interferometer with picometer sensitivity. This instrument allows us to rapidly measure the dynamical properties of freestanding nanoparticle monolayers for the first time including resonant frequencies, quality factors, and images of different modes.

- [1] Klara E. Mueggenburg et al., "Elastic membranes of close-packed nanoparticle arrays," Nature Materials 6, 656-660 (2007).
- [2] Jinbo He et al., "Fabrication and Mechanical properties of large-scale freestanding nanoparticle membranes," Small 6, 1449-1456 (2010).
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