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Nonlinear optomechanics with graphene[1] AIRLIA SHAFFER, YOGESH SHARAD PATIL, HIL F. H. CHEUNG, KE WANG, MUKUND VENGALATTORE, Cornell University — To date, studies of cavity optomechanics have been limited to exploiting the linear interactions between the light and mechanics. However, investigations of quantum signal transduction, quantum enhanced metrology and manybody physics with optomechanics each require strong, nonlinear interactions. Graphene nanomembranes are an exciting prospect for realizing such studies due to their inherently nonlinear nature and low mass. We fabricate large graphene nanomembranes and study their mechanical and optical properties. By using dark ground imaging techniques, we correlate their eigenmode shapes with the measured dissipation. We study their hysteretic response present even at low driving amplitudes, and their nonlinear dissipation. Finally, we discuss ongoing efforts to use these resonators for studies of quantum optomechanics and force sensing.

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