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Optical squeezing via dissipation in optomechanics ANDREAS KRONWALD, University of Erlangen-Nuremberg, FLORIAN MARQUARDT, University of Erlangen-Nuremberg and Max Planck Institute for the Science of Light, AASHISH A. CLERK, Department of Physics, McGill University — The generation of quantum squeezed light is of interest from both fundamental and practical points of view. For example, squeezed light can be used to improve the measurement sensitivity in gravitational wave detectors or even in biophysical applications. In this talk, we discuss a simple yet surprisingly effective mechanism which allows the generation of squeezed output light from an optomechanical cavity, where mechanical motion is coupled to cavity photons via radiation pressure. In contrast to the well known mechanism of "ponderomotive squeezing" (realized recently in experiments [1-3]), our scheme generates squeezed output light by explicitly using the dissipative nature of the mechanical resonator. We show that our scheme has many advantages over ponderomotive squeezing; in particular, it is far more effective in the good cavity limit commonly used in experiments. Furthermore, the squeezing generated in our approach can be directly used to enhance the intrinsic measurement sensitivity of the optomechanical cavity; one does not have to feed the squeezed light into a separate measurement device.

[1] D. W. C. Brooks et al., Nature 488, 476 (2012).
[2] A. H. Safavi-Naeini et al., Nature 500, 185 (2013).
[3] T. P. Purdy et al., Phys. Rev. X 3, 031012 (2013).

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