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# Dissipative and dispersive cavity optomechanics with a suspended frequency-dependent mirror

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An optomechanical microcavity can considerably enhance the interaction between light and mechanical motion by confining light to a subwavelength volume. However, this comes at the cost of an increased optical loss rate. A pathway to reduce optical losses is to use a strongly frequency-dependent mirror, such as a photonic crystal mirror.
In this talk, I will present the quantum-coupled-mode description we formulated for such a system [1], including both the standard dispersive optomechanical coupling as well as dissipative coupling, and show how it matches our experimental measurements of a free-space on-chip optomechanical microcavity [2]. Finally, I will outline strategies to achieve ground-state cooling in such a device [1], including using a coherent feedback scheme [3].

[1] J. Monsel, A. Ciers, S. K. Manjeshwar, W. Wieczorek, and J. Splettstoesser, Phys. Rev. A 109, 043532 (2024).
[2] S. Kini Manjeshwar, A. Ciers, J. Monsel, H. Pfeifer, C. Peralle, S. M. Wang, P. Tassin, and W. Wieczorek, Opt. Express 31, 30212 (2023).
[3] L. Du, J. Monsel, W. Wieczorek, and J. Splettstoesser, arXiv:2405.13624.

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