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Optomechanical transducer for microwave-to-optical photon conversion[1] J. BOCHMANN, A. VAINSENCHER, D.D. AWSCHALOM, A.N. CLELAND, Department of Physics and California Nanosystems Institute, University of California, Santa Barbara — Mechanical resonators with highly confined optical and mechanical modes exhibit strong interaction between phonons and photons. At GHz mechanical frequencies and low temperature, nanomechanical resonators enter the quantum regime and can be interfaced with superconducting quantum circuits [2]. Here, we present the concept of a quantum transducer between microwave and optical photons. In our approach, the piezoelectric effect maps microwave quantum states to nanomechanical excitations which are up-converted to optical photons by optomechanical interaction. The exceptional properties of aluminum nitride allow the required photonic, nanomechanical and piezoelectric functionality to be integrated in one platform. Experimental progress towards this goal will be presented.

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[2]O'Connell, et al. *Nature* **464**, 697 (2010)

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