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**Motional sideband asymmetry in a quantum electro-mechanical device** AARON WEINSTEIN, CHAN U LEI, EMMA WOLLMAN, Caltech, JUNHO SUH, KRISS, ANJA METELMANN, AASH CLERK, McGill University, KEITH SCHWAB, Caltech — Quantum electro-mechanical systems offer a unique opportunity to probe quantum noise properties in macroscopic devices, properties which ultimately stem from Heisenberg's uncertainty relations. A simple example of this is expected to occur in a microwave parametric transducer, where mechanical motion generates motional sidebands corresponding to the up and down frequency-conversion of microwave photons. Due to quantum vacuum noise, the rates of these processes are expected to be unequal. We measure this fundamental imbalance in a microwave transducer coupled to a radio-frequency mechanical mode, cooled near the ground state of motion. We also discuss the subtle origin of this imbalance: with linear detection of the output light field, the imbalance is most naturally attributed to the quantum fluctuations of the electromagnetic field.

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