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Microwave frequency electromagnetic coupling to a thin membrane as one end of a cylindrical cavity ALESSANDRO CASTELLI, LUIS MARTINEZ, Univ of California - Merced, JERRY SPEER, None, JAY SHARPING, RAYMOND CHIAO, Univ of California - Merced — We demonstrate coupling of an 11.1 GHz radio frequency (RF) TE011 cylindrical cavity mode to the mechanical motion of a silicon nitride (Si3N4) membrane. The membrane is driven into motion through radiation pressure forces arising from the transverse magnetic field present at the membrane boundary. We use a cylindrical aluminum cavity where one end consists of a 500-nm thick Si3N4 membrane that has been sputtered with 300 nm of niobium (Nb). Cavity frequency tuning is controlled via an aluminum plunger attached to a micrometer at the other end of the cavity. The membrane is driven into motion by modulating the amplitude of the RF signal at the membrane's resonant frequency in the KHz range. The membrane's displacement is measured by means of a Michelson interferometer. We compare results from experimental runs utilizing both square and circular membrane geometries. This experiment shows that the TE011 mode gives rise to radiation pressure on the ends of a cylindrical cavity and demonstrates the feasibility of future work using high Q superconducting RF cavities to realize a dynamical Casimir effect (DCE) due to the membrane's motion at GHz frequencies.

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