Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Measurement of microwave-induced strain in a metallic parallel-plate cavity[1] MINGKANG WANG, QI ZHANG, SHUBO WANG, CHE TING CHAN , HOBUN CHAN, Hong Kong Univ of Sci Tech — We measure the local mechanical deformation induced by microwave radiation on two parallel metallic plates that constitute a resonating unit in a metamaterial. Each plate measures 1 cm square in size. One of them is sufficiently thin to be deformable by the microwave radiation. The strain, measured with a fiber optic interferometer, attains maximum at the microwave resonance as the electromagnetic field between the two plates is strongly enhanced. By measuring the amplitude and phase of multiple mechanical vibrational modes of the plate and extrapolating to zero-frequency, we distinguish deformation induced by the electromagnetic force from deformation caused by photothermal forces. The measured spatial distribution of the strain agrees with theoretical calculations. Remarkably, the maximal local stress can reach 6.7mN/mˆ2 exceeding the conventional photon pressure by a factor of ˜600 at the microwave resonance. Our findings show that the strong coupling between the electromagnetic wave and resonating units offers new opportunities to modify the properties of the metamaterial to construct tunable or reconfigurable systems.

[1]Supported by AoE and CRF

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Date submitted: 10 Nov 2016 Electronic form version 1.4