

Resonance control of graphene drum resonator in nonlinear regime by standing wave of light

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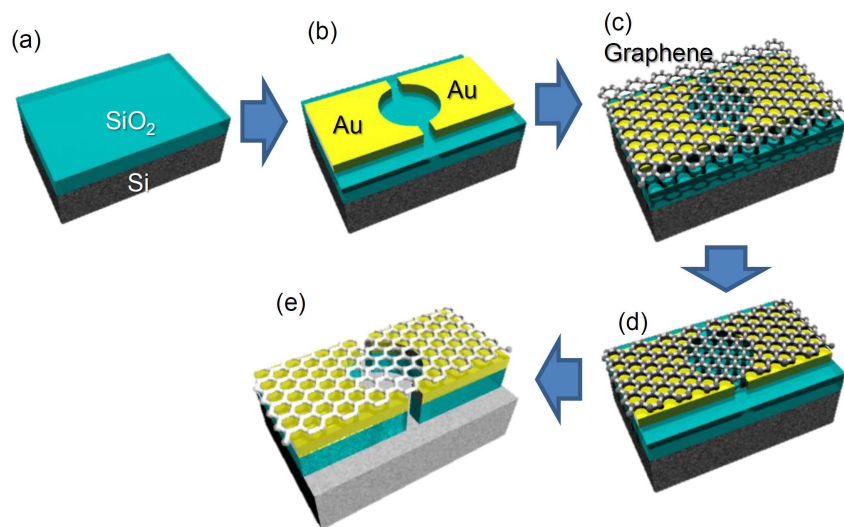


Figure S1 Schematic illustration of the flow of device fabrication. (a) Si substrate with 300-nm-thick SiO₂. (b) Au electrodes fabricated using conventional photolithography. (c) Transfer CVD-grown graphene. (d) Trimming of graphene by plasma etching. (e) Etching of SiO₂ layer underneath graphene.

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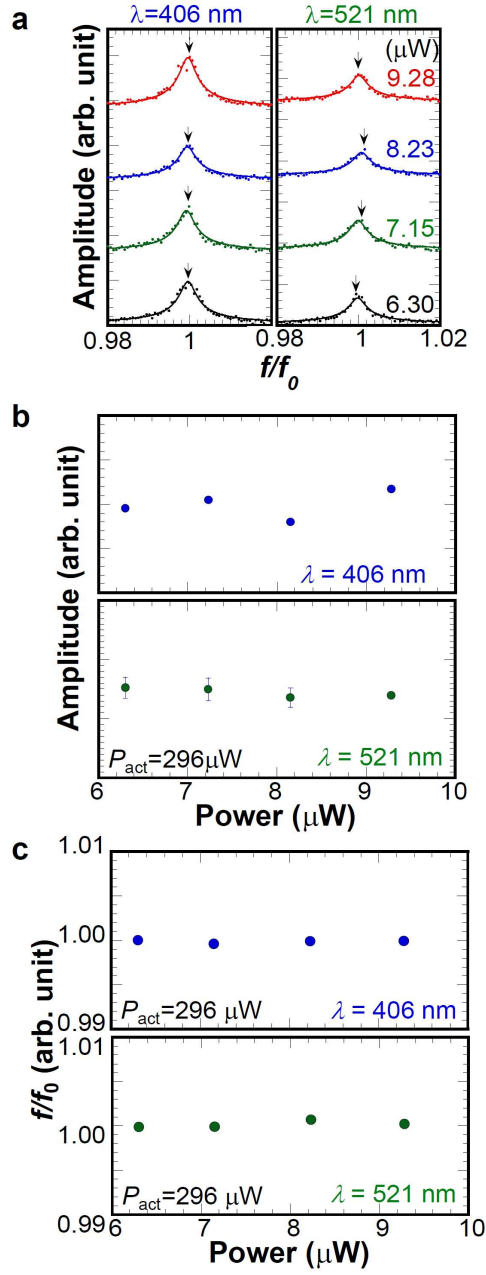


Figure S2 Resonance properties of G-MR under a linear oscillation regime. (a) Resonance curves measured under various probe laser intensities with different wavelengths of 406 and 521 nm. Solid lines for respective measured responses are the fitting curves fitted by the same Q factor of 250. (b) and (c) respectively represent probe laser power dependences of the oscillation amplitude and f/f_0 .

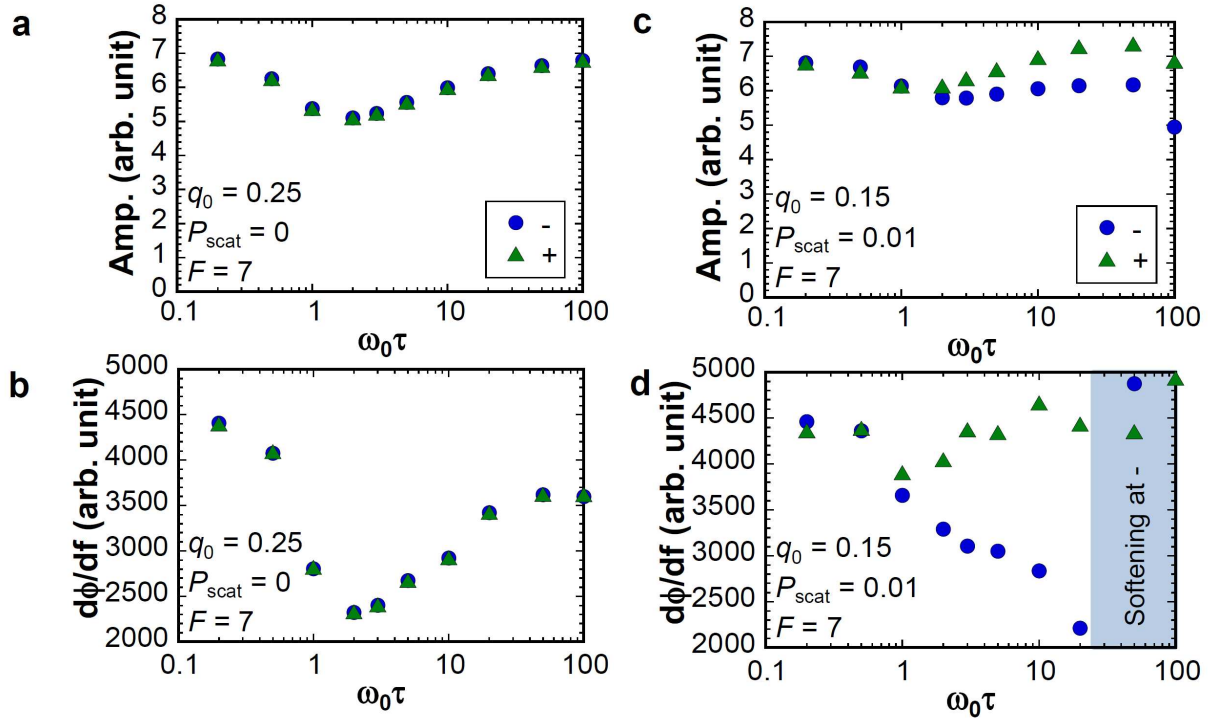


Figure S3 Delayed time constant dependence of nonlinearity of G-MR with or without scattering light effect. (a, b) Delayed time constant dependences of vibration amplitude and nonlinearity ($d\phi/df$) for both of negative or positive slope of the standing wave of light without scattering light effect. (c, d) Delayed time constant dependences of vibration amplitude and nonlinearity ($d\phi/df$) for both of negative or positive slope of the standing wave of light with scattering light effect. Softening nonlinearity was observed at gray area in (d) for the negative slope of standing wave of light corresponding to the 406-nm laser.

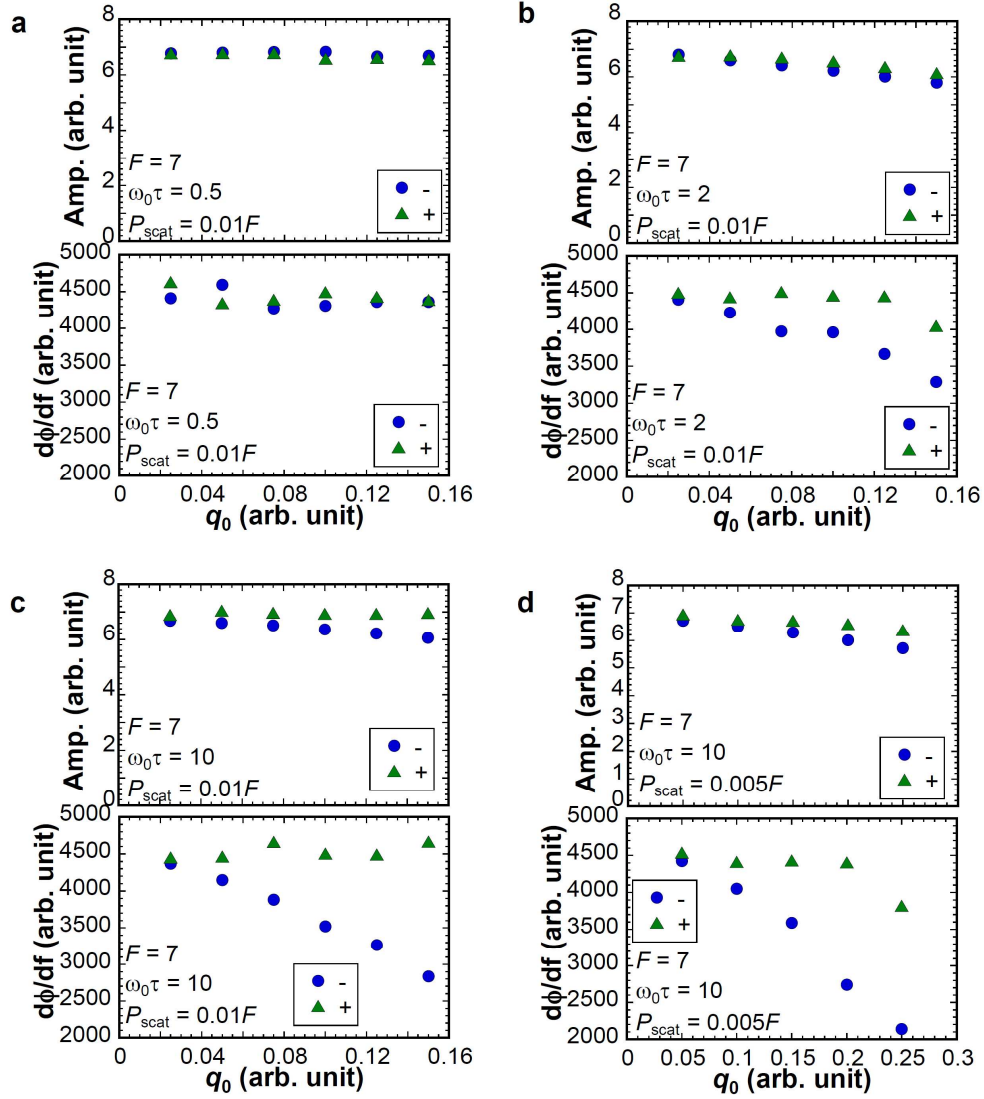


Figure S4 Simulated delayed time constant dependence of amplitude and nonlinearity of G-MR with scattering light effect. (a-c) Delayed time constant dependences of vibration amplitude and nonlinearity ($d\phi/df$) for both of negative or positive slope of the standing wave of light. (d) Delayed time constant dependences of vibration amplitude and nonlinearity ($d\phi/df$) for both of negative or positive slope of the standing wave of light with lower scattering light effect.