

# Supporting Information

## Mass sensing for the advanced fabrication of nanomechanical resonators

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### I. NON-LINEARITIES OBSERVED VIA E-BEAM ELECTROMECHANICAL COUPLING

Figure S1 shows how the spectrum determined by e-beam electromechanical coupling evolves during the deposition of Pt on a carbon nanotube. For this measurement, spectra were recorded every  $\approx 0.32$  s with a resolution bandwidth  $BW \approx 5$  kHz over a frequency span of  $\approx 400$  kHz. At each time step, multiple equidistantly-spaced peaks can be observed (labeled  $n = 1, 2, 3, \dots, 10$ ), which correspond to harmonics of the same fundamental mode. This clearly points out that the resonator is deep in the non-linear regime of the detection.<sup>1</sup> Furthermore, the graph shows an increase in the signal-to-noise ratio and peak intensities as the particle grows. This indicates an increase of the coupling strength of the e-beam electromechanical coupling due to a larger volume interacting with the e-beam and a higher secondary electron (SE) yield. Furthermore, it hints towards the presence of self-oscillations.<sup>1</sup>

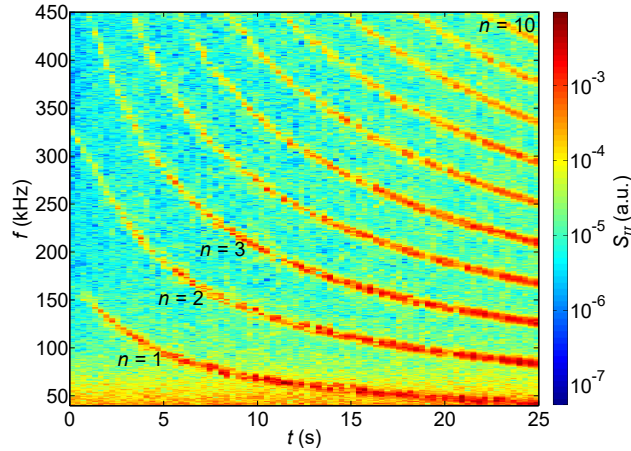


FIG. S1. Evolution of the spectra recorded via e-beam electromechanical coupling during the deposition of Pt on a carbon nanotube.

## II. OPTOMECHANICAL MEASUREMENT OF $f_{\text{res}}$

In order to confirm the resonance frequency  $f_{\text{res}}$  determined by e-beam electromechanical coupling, we conducted optomechanical measurements.<sup>2</sup> The measurement in Fig. S2 shows the thermally-driven peak with the resonance frequency  $f_{\text{res}} = 57.04$  kHz at room temperature. This value is reasonably close to the one observed using the e-beam electromechanical coupling  $f_{\text{res}} = 56.1$  kHz.

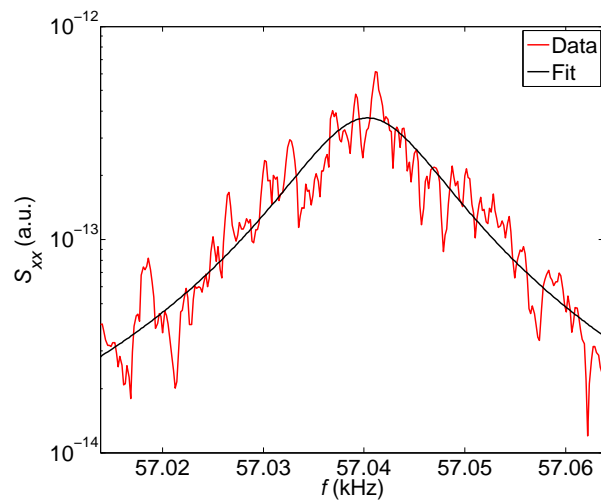


FIG. S2. Optomechanical measurement of the thermally-driven resonance peak (red) of the nanotube shown in Fig. 1 of the main text at room temperature and Lorentzian fit (black).

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- [1] Tsioutsios, I.; Tavernarakis, A.; Osmond, J.; Verlot, P.; Bachtold, A. *Nano Letters* **2017**, *17*, 1748.
- [2] Tavernarakis, A.; Stavrinadis, A.; Nowak, A.; Tsioutsios, I.; Bachtold, A.; Verlot, P. *Nature Communications* **2018**, *9*, 662.