Errata:

The Effects of Asymmetry on the Dynamics of Nanowires

M. R. Nelis, L. Yu, A. Raman, S. Mohammadi, J. F. Rhoads
Birck Nanotechnology Center
Purdue University

This document serves as an errata for the paper entitled *The Effects of Asymmetry on the Dynamics of Nanowires*, which was presented at the 2011 NSF Engineering Research and Innovation Conference in Atlanta, Georgia.

Correction 1. The expressions for the moment of inertia were incorrectly swapped in Eqs. (3) and (4) of the original document. The correct expressions are:

$$I_a = \frac{5a^3b}{128}, \tag{1}$$

$$I_b = \frac{5ab^3}{96}. \tag{2}$$

Correction 2. There is a typographical error in Eq. (5), it should read:

$$\delta = \frac{2(f_a - f_b)}{f_a + f_b} = \frac{2\sqrt{3}a - 4b}{\sqrt{3}a + 2b} \tag{3}$$

Correction 3. The relationship between frequencies, quality factors, and mistuning were not correctly stated. To reflect the assumptions made in the derivation the relationship should be:

$$\frac{\omega_a}{Q_a} = \frac{\omega_b}{Q_b} = \frac{\omega_n}{Q}. \tag{4}$$

This yields new expressions for nominal quality factor and natural frequency given by

$$Q = \frac{Q_a}{1 + \delta/2} = \frac{Q_b}{1 - \delta/2}, \tag{5}$$

$$\omega_n = \frac{\omega_a}{1 + \delta/2} = \frac{\omega_b}{1 - \delta/2}. \tag{6}$$

Correction 4. The refined definitions highlighted above render new transfer functions for Eqs. (9) and (10) in the original document:

$$Z_a = \frac{X}{F_a} = \frac{1}{\omega_n^2(-r^2 + \imath r/Q + (1 + \delta/2)^2)}, \tag{7}$$

$$Z_b = \frac{Y}{F_b} = \frac{1}{\omega_n^2(-r^2 + \imath r/Q + (1 - \delta/2)^2)}. \tag{8}$$

Because these transfer functions are different than those originally presented, the plots denoted as Figs. 5-7 in the manuscript must be updated. The corrected versions are shown in Figs. 1-3 respectively.

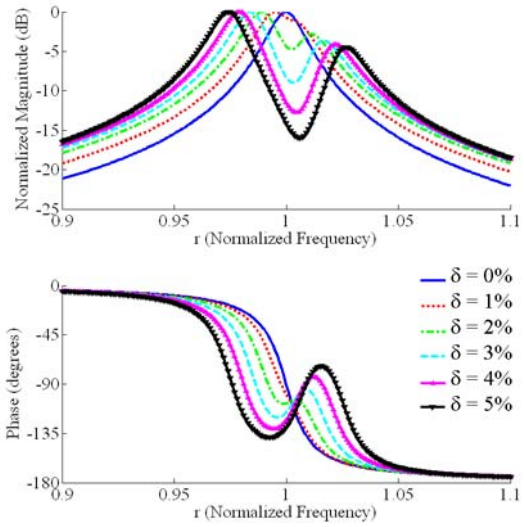

Figure 1: Theoretical frequency response of silicon nanowire as a function of mistuning. Assumed system properties: $Q = 60$, $\alpha = \frac{\pi}{6}$ Radians.

Correction 5. A fit of the corrected model with the experimentally-recovered response results in a new estimated center frequency of 6.249 MHz and new estimated mistuning of 3.04%. Figure 9 in the original manuscript is updated here in Fig. 4.

The authors apologize for any inconvenience any of these typographical or technical errors have caused.

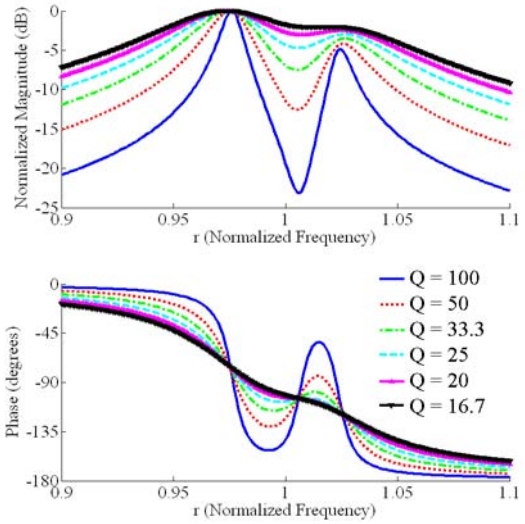

Figure 2: Theoretical frequency response of silicon nanowire as a function of quality factor. Assumed system properties: $\delta = 4.73\%$, $\alpha = \frac{\pi}{6}$ Radians.

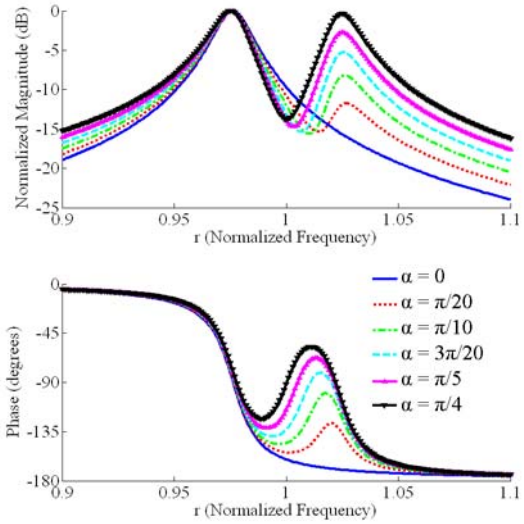

Figure 3: Theoretical frequency response of silicon nanowire as a function of viewing angle. Assumed system properties: $Q = 60$, $\delta = 4.73\%$.

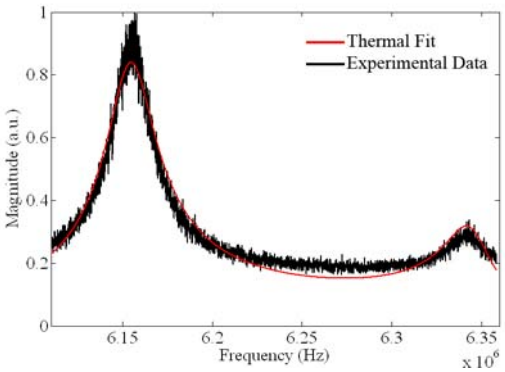

Figure 4: The frequency response of cantilevered device 8 from Table 1 fit with the model presented in Eq. (12). The experimentally-recovered and regression validated center frequency is approximately 6.249 MHz, and the mistuning 3.04%,