Erratum: GHz Rotation of an Optically Trapped Nanoparticle in Vacuum [Phys. Rev. Lett. **121**, 033602 (2018)]

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In this Letter, we state that we optically rotated *single* spherical nanoparticles with a diameter of 100 nm. However, recently we found that our experiments here have all been performed with *dumbbells* consisting of two 100 nm spheres.

Originally, verifying the shape of the trapped object was not within our experimental capabilities. After an upgrade of our experimental setup, we are now able to distinguish single spheres from dumbbells using a center-of-mass motion measurement as described in earlier work [1]. Doing so, we find that for the used nanoparticles [2] only dumbbells produce a measurable rotation signal on the detector used in this Letter.

This finding does not affect the main results of the Letter. The measured rotation frequencies, the scaling relations, and our conclusions remain correct. To remove ambiguity, all instances of the term “particle” in the Letter should be read as “dumbbell.” All instances in the Letter referring to the particle “diameter” should be adjusted to refer to a dumbbell composed of two spheres, each with a nominal diameter of 100 nm. Additionally, the following details need to be adjusted: (i) In the Letter we speculate about the detection mechanism and the origin of the optical torque driving the rotation, since for a spherical particle several mechanisms are plausible. For a dumbbell both the detection and driving originate mainly from its shape asymmetry. (ii) The estimated moment of inertia now reads $I = 2.8mR^2$, where $m \approx 1\text{fg}$ is the mass of a single sphere with radius $R = 50\text{ nm}$. (iii) The expression of the damping time in the Letter assumes a spherical particle and no longer holds for a dumbbell. However, the damping time of a dumbbell still scales inversely with the pressure, i.e., $t_{\text{damp}} \propto 1/p_{\text{gas}}$, leaving the interpretation of the experimental results untouched. (iv) In the outlook of the Letter we estimate the circumferential speed of the rotor and its maximal tensile strength. These estimations are now changed from ≈ 300 to $\approx 600\text{ m/s}$ (speed of fastest point on the surface of the rotor) and from ≈ 0.2 to $\approx 0.8\text{ GPa}$ (maximal tensile strength).

[1] J. Ahn, Z. Xu, J. Bang, Y. H. Deng, T. M. Hoang, Q. Han, R. M. Ma, and T. Li, *Phys. Rev. Lett.* **121**, 033603 (2018).

[2] DiagNano™ Red fluorescent silica nanoparticles, 100 nm, Cat. No. DNG-L016, Functional group: Fluorophore (Rhodamine B) from creative diagnostics.