Erratum: Casimir-Polder attraction and repulsion between nanoparticles and graphene in out-of-thermal-equilibrium conditions [Phys. Rev. B 105, 195430 (2022)]

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There are sign errors in Eq. (25) of this paper that have no qualitative impact on the obtained results, but lead to some quantitative changes. Under the summation signs in $\lambda = \pm 1$ in both lines of Eq. (25) it is necessary to add the factor $-\lambda$. As a result, Eq. (25) takes the form

$$\Pi_{00}^{(1)}(\omega, k_\perp, T) = \frac{8\alpha\hbar c^2\tilde{p}}{v_{\rm F}^2}\int_0^\infty \frac{dv}{e^{Dv}+1}\left[1+\frac{1}{2}\sum_{\lambda=\pm1}\lambda\left(1-v^2-\frac{2\lambda\omega}{c\tilde{p}}v\right)^{1/2}\right],$$
$$\Pi^{(1)}(\omega, k_\perp, T) = \frac{8\alpha\hbar\omega^2\tilde{p}}{v_{\rm F}^2}\int_0^\infty \frac{dv}{e^{Dv}+1}\left[1+\frac{1}{2}\sum_{\lambda=\pm1}\lambda\frac{\left(\frac{c\tilde{p}v}{\omega}+\lambda\right)^2}{\left(1-v^2-\frac{2\lambda\omega}{c\tilde{p}}v\right)^{1/2}}\right]. \tag{25}$$

The added factor $-\lambda$ ensures the correct choice of branches of the square roots entering Eq. (25), which was obtained by the analytic continuation of the polarization tensor from the imaginary to real frequency axis in accordance to the rule formulated in Ref. [1] after Eq. (A20).

As a result, the bottom line in Fig. 1 related to $T_g = 77$ K undergoes a modification, which is shown in the corrected Fig. 1 presented here. As is seen in this figure, for a graphene sheet kept at $T_g = 77$ K the nonequilibrium Casimir-Polder force vanishes not at $a \approx 0.8\,\mu$m, as is indicated in the last paragraph of right column on p. 4, but at $a \approx 0.58\,\mu$m. At $a > 0.58\,\mu$m (in place of $a > 0.8\,\mu$m) the force becomes repulsive.

In a similar way, the bottom line in Fig. 3 also undergoes a corresponding modification shown in the corrected Fig. 3. From this figure, it is seen that the nonequilibrium Casimir-Polder force changes its sign and becomes repulsive from attractive when increasing separation to above 0.58 μm (instead of to above 0.8 μm).

There are also typos in this publication unrelated to the obtained scientific results. Thus, under the integration signs in Eqs. (9) and (10) one should add $d\omega$. In front of the integral in Eq. (19) c^2 should be replaced with c. In Eq. (20) the factor c^2 should be replaced with ω^2.

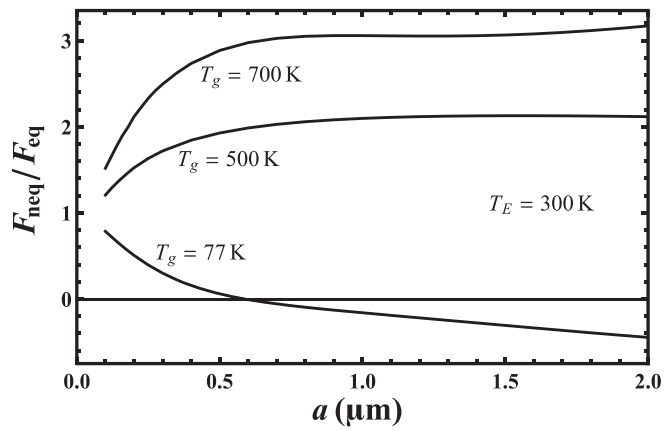

FIG. 1. The ratio of nonequilibrium to equilibrium Casimir-Polder forces between a nanoparticle and a graphene sheet is shown as the function of separation by the three lines for different graphene temperatures T_g. In all cases the temperatures of a nanoparticle and of the environment are equal to the temperature at thermal equilibrium T_E.

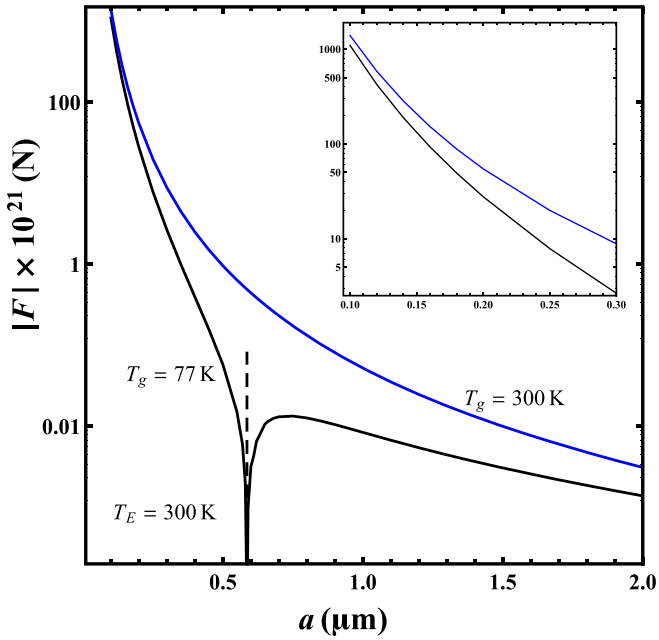

FIG. 3. The magnitude of nonequilibrium Casimir-Polder force between a metallic nanoparticle of diameter 5 nm and a cooled graphene sheet is shown as the function of separation by the bottom line. The force is attractive to the left of the dashed line and repulsive to the right of it. The respective equilibrium force is shown by the top line. The region of short separations is shown in the inset on an enlarged scale.

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[1] M. Bordag, G. L. Klimchitskaya, V. M. Mostepanenko, and V. M. Petrov, Quantum field theoretical description for the reflectivity of graphene, Phys. Rev. D **91**, 045037 (2015); **93**, 089907(E) (2016).