Casimir's spheres near the Coulomb limit: energy density, pressures and radiative effects

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Corrigendum

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In section 3.2 of the above paper, equation (3.13) was derived using $R/a = X \simeq L$ instead of the correct approximation $X \simeq L/2\sqrt{\pi}$. It should be corrected by (i) premultiplying it with $2\sqrt{\pi}$, and (ii) replacing $\xi \to \xi 2\sqrt{\pi}$. Moreover, the range $\xi \leqslant 1$ was confused with the range $r \leqslant R$. Consequently, equations (3.15) and (3.16) and the rest of that paragraph should be replaced by the following:

$$\rho(\xi, L \gg 1) \simeq \rho(\xi) \equiv \lim_{L\to\infty} \rho(\xi, L) = \lim_{L\to\infty} \frac{5\sqrt{\pi}}{2L^{7/2}} \sum_{l=1}^{L} l^{5/2} \exp(-4l\sqrt{\pi}\xi/L)$$

$$= \frac{5}{2048\pi} \left\{ \frac{15\pi^{1/4}}{\xi^{7/2}} \mathrm{erf}\left(2\pi^{1/4}\sqrt{\xi}\right) - \exp(-4\sqrt{\pi}\xi) \left[\frac{256\pi}{\xi} + \frac{160\sqrt{\pi}}{\xi^2} + \frac{60}{\xi^3} \right] \right\}, \qquad (3.15)$$

$$\rho(\xi \ll 1) = \frac{5\sqrt{\pi}}{7} - \frac{20\pi\xi}{9} + \frac{40\pi^{3/2}\xi^2}{11} + \ldots, \qquad \rho(\xi \gg 1) = \frac{75\xi^{-7/2}}{2048\pi^{3/4}} + \mathcal{O}\left(\frac{\mathrm{e}^{-4\sqrt{\pi}\xi}}{\xi}\right). \qquad (3.16)$$

(The leading term of $\rho(\xi \ll 1)$ tallies with the easily-calculated energy density on a flat sheet subject to the corresponding cut-off.) The mere fact that the limit is well defined makes it a function of ξ alone; this suffices to verify that the energy density is indeed localized in the way described above. Moreover, with increasing L, the approximation $\rho(\xi)$ approaches the true $\rho(\xi, L)$ quite fast wherever these functions are appreciable. For instance, as r decreases below R with $L \geqslant 10$, numerical work shows that $\rho(1.2, L)$ has already fallen to less than 1% of $\rho(0, L)$; and over the same range $\rho(\xi)/\rho(\xi, 10)$ falls from 0.969 to 0.783, while $\rho(\xi)/\rho(\xi, 100)$ falls from 0.997 only to 0.985. (With increasing ξ, these ratios fall further, but by then ρ itself has become negligible for all practical purposes.)

In appendix C, in the expression for U_{in}, replace $z^{l-2} \to z^{2l-2}$.

The rest of the paper is unaffected by the correction.

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