Aharonov-Bohm scattering on parallel flux lines of the same magnitude



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# CORRIGENDUM

**Aharonov–Bohm scattering on parallel flux lines of the same magnitude**
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(i) The denominator $\sqrt{2\pi k\rho}$ on the RHS of equation (52) should become $\mathrm{i}\sqrt{2\pi k\rho}$. Correspondingly, the factor i should be cancelled from the coefficients of the second term inside the large parentheses on the RHS of equations (54) and (57), and from the first term inside the large parentheses of equations (55) and (56).

(ii) The first term inside the large square brackets of equation (A2.6) should become

$$-\tfrac{1}{2}\,\mathrm{e}^{-\mathrm{i}2\alpha\pi}\cos 2\theta. \tag{E1}$$

Correspondingly, the second term inside the curly brackets of equation (60) should become

$$-\mathrm{e}^{-\mathrm{i}2\alpha\pi}\cos 2\theta. \tag{E2}$$

(iii) It should be noted that the coefficients of the Mathieu functions $C^c_{ml}$, $\bar{C}^c_{ml}$, $S^c_{ml}, \ldots$ in equation (23) and those coefficients of equation (32) are functions of $\alpha$ and $q$. Hence when we expand those coefficients as a power series in $q$, there should be some additional terms for each such coefficient, for example, for $C^c_{ml}$ the additional terms are $c^c_{ml}q + \mathrm{O}(q^2)$. Correspondingly, the correct version of equation (58) is

$$\begin{aligned} f_c(\theta) = {} & \tfrac{1}{2}[H_0^+ + h_0^+ q + \mathrm{O}(q^2)]ce_0(\theta, q) + \sum_{n=1}^{\infty}[H_1^+ + h_{1n}^+ q + \mathrm{O}(q^2)]ce_{2n}(\theta, q) \\ & + \sum_{n=0}^{\infty}[H_2^+ + h_{2n}^+ q + \mathrm{O}(q^2)]ce_{2n+1}(\theta, q) \\ & + \sum_{n=0}^{\infty}[H_3^+ + h_{3n}^+ q + \mathrm{O}(q^2)]se_{2n+1}(\theta, q) \\ & + \sum_{n=0}^{\infty}[H_4^+ + h_{4n}^+ q + \mathrm{O}(q^2)]se_{2n+2}(\theta, q). \end{aligned} \tag{E3}$$

Here we use $f_c(\theta)$ to represent the corrected version of $f(\theta)$, similarly, we use $f_{1c}(\theta)$ to represent the corrected version of $f_1(\theta)$. Neglecting $\mathrm{O}(q^2)$, equation (E3) becomes

$$\begin{aligned} f_c(\theta) &= f_0(\theta) + f_{1c}(\theta) \\ &= f_0(\theta) + f_1(\theta) + q\Bigg(\tfrac{1}{2}h_{01}^+ + \sum_{n=1}^{\infty} h_{1n}^+\cos(2n\theta) + \sum_{n=0}^{\infty} h_{2n}^+\cos[(2n+1)\theta] \\ &\quad + \sum_{n=0}^{\infty} h_{3n}^+\sin[(2n+1)\theta] + \sum_{n=0}^{\infty} h_{4n}^+\sin[(2n+2)\theta]\Bigg). \end{aligned} \tag{E4}$$

(iv) When $\alpha \to 0$, we must have $f_c(\theta) = 0$, by the orthogonality of circular functions, equation (59) and the corrected version of equation (60), we get

$$h_0^+ = \frac{e^{-i\pi/4}}{\sqrt{2\pi}}\left(\frac{\pi}{2} + \tau + \sin\tau\right) \qquad h_{1n}^+ = -\frac{e^{-i\pi/4}}{\sqrt{2\pi}}\frac{\sin\tau}{4n^2-1}$$
$$h_{2n}^+ = \frac{-e^{-i\pi/4}}{\sqrt{2\pi}}\frac{\sin\tau}{(2n+1)^2-1} \qquad h_{3n}^+ = -\frac{e^{-i\pi/4}}{\sqrt{2\pi}}\frac{(2n+1)\cos\tau}{(2n+1)^2-1} \tag{E5}$$
$$h_{4n}^+ = -\frac{e^{-i\pi/4}}{\sqrt{2\pi}}\frac{(2n+2)\cos\tau}{(2n+2)^2-1}.$$

Substituting (E5) into the RHS of (E4) and using the corrected version of (60), we obtain

$$f_{1c}(\theta) = \frac{q\,e^{-i\pi/4}}{2\sqrt{2\pi}}\sin(2\alpha\pi)\{i\cos(2\theta) + \sin(2\theta) + \cos(\tau-\theta) \times [\cosh^{-1}|\sec(\tau+\theta)| + \ln|2\cos(\tau+\theta)|]\}. \tag{E6}$$

(v) Therefore, the corrected version of (63) is

$$\sigma = |f_c(\theta)|^2 = \frac{\sin^2(2\alpha\pi)}{2\pi}\cos^{-2}\left(\frac{\theta+\tau}{2} + \frac{\pi}{4}\right) - q\frac{\sin^2(2\alpha\pi)}{2\pi}\left[\cos 2\theta + \tan\left(\frac{\theta+\tau}{2} + \frac{\pi}{4}\right) \times \{\sin(2\theta) + \cos(\tau-\theta)[\cosh^{-1}|\sec(\tau+\theta)| + \ln|2\cos(\tau+\theta)|]\}\right] \tag{E7}$$

the corrected version of (64) is

$$\sigma = |f(\theta)|^2 = \frac{1}{2\pi\cos^2(\theta/2)} - \frac{q}{2\pi}[2\cos\theta - 1 - 2\sin^2(\theta/2)(\cosh^{-1}|\mathrm{cosec}\,\theta| + \ln|2\sin\theta|)] \tag{E8}$$

and the corrected version of (67) is

$$\sigma = |f|^2 = \frac{\cos^2(2\alpha\pi)}{2\pi^2 q^{1/2}}\left\{\left[p_0' + 2\sum_{n=0}^{\infty}(p_{2n+1}' - p_{2n}') + \frac{q}{\cos 2\alpha\pi}\sum_{n=0}^{\infty}\left(\frac{p_{2n+1}'}{(2n+1)^2-1} - \frac{p_{2n}'}{4n^2-1}\right)\right]^2 + p_0'^2\tan^2(2\alpha\pi)\right\}. \tag{E9}$$