Corrigendum

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Mott–Schwinger effect in the elastic scattering of neutrons from ^{209}Bi

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The results presented in our recent paper are in error. All of the theoretical developments contained therein are correct but the Mott–Schwinger (MS) interaction was doubly counted for small radii in our computations. That had a significant effect upon the exact values of the small-ℓ partial wave phase shifts. In fact, the correct variation of the first 20 partial wave phase shifts from purely nuclear scattering are much smaller than we presented before. Consequently the variation caused by the MS effect in predictions of the observables is smaller than previously indicated, and particularly so for scattering angles in excess of 20° for the cases of neutrons scattered from bismuth that were considered. At small angles, there are still characteristic and noticeable differences caused by the MS interaction for the scattering of 0·5, 14·5 and 24 MeV neutrons from ^{209}Bi. With the differential cross section, the forward angle effect remains as shown previously; that is, dominated by the $\cot(\frac{1}{2}\theta)$ element in the scattering amplitudes due to the infinite partial wave sum of MS phase contributions. But the deviations to the higher angle cross sections reported earlier are very much reduced. The major effects of the correction, however, are with the predictions of the spin-dependent measureables and the exact results for $P(\theta)$ and the two general variables, $X_{\rm var}(\theta)$ and $Y_{\rm var}(\theta)$.

The polarisation results are shown in Fig. 1*a* for all scattering angles to 60° and for the three energies 0·5 MeV (top), 14·5 MeV (middle) and 24 MeV (bottom). The results without MS corrections are displayed by the solid curves while the inclusion of the MS interaction gives the results portrayed by the dashed curves. The MS effects are still very pronounced at small scattering angles, as they were in the original paper, but the variations from a purely nuclear result beyond 20° are markedly less with the effect essentially nonexistent beyond 50°.

The new results for the variables $X_{\rm var}(\theta)$ and $Y_{\rm var}(\theta)$ for the three energies are shown in Figs 1*b* and 1*c* respectively. The results of purely nuclear calculations are again shown by the solid curves and the inclusion of the MS interaction leads to the results portrayed by the dashed curves. As with the polarisations, the influence of the MS term is only noticeable below 20° in the scattering with the small angle properties being the most pronounced.

These results are now quite similar to those found by Hogan and Seyler (1969). Details differ though, but the conclusion remains that the MS effect must be included in analyses of any small angle scattering data that has been accurately measured. Such has been considered by Roberts *et al.* (1991).

References

Hogan, W. S., and Seyler, R. G. (1969). *Phys. Rev.* **177**, 1706.

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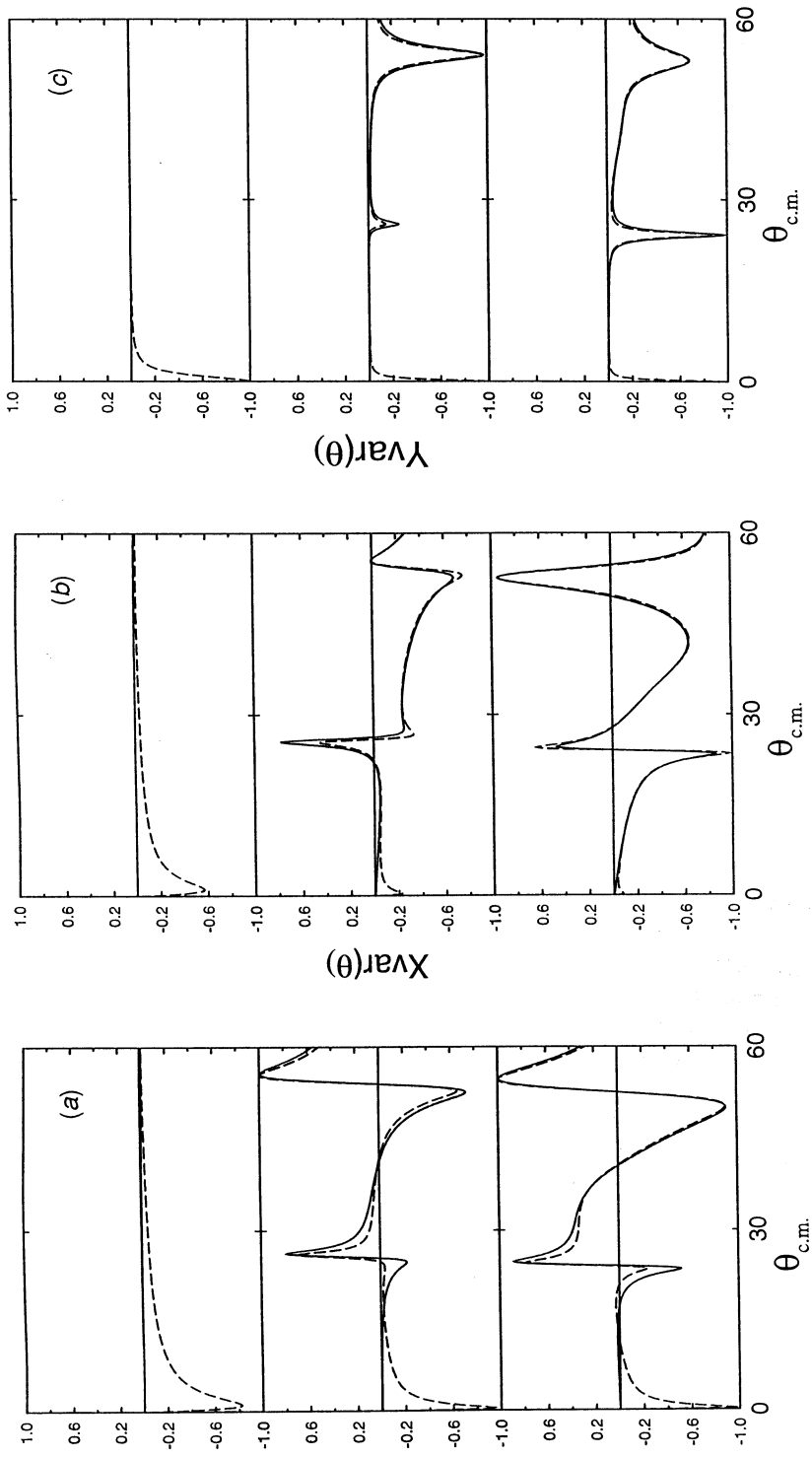

Fig. 1. New results for (*a*) $P(\theta)$, (*b*) $X_{\mathrm{var}}(\theta)$ and (*c*) $Y_{\mathrm{var}}(\theta)$.