

Erratum: Spin-exchange collisions in optical pumping of ^{129}Xe : A multiscale simulation [Phys. Rev. A **113**, 043101 (2026)]

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(Received 19 August 2026; published 1 September 2026)

DOI: [10.1103/8cy1-r24m](https://doi.org/10.1103/8cy1-r24m)

We have found an elementary error in our work, Sec. III G, in the conversion of our polarization transfers simulated by spin dynamics to estimates of the spin-exchange cross sections σ_{SE} for the ^{129}Xe isotope. The values quoted therein are significantly overestimated.

The simulated average polarization levels over Rb-Xe interaction events, $\langle p_{\text{Xe}} \rangle_{\epsilon} = p_{\text{Xe}}^{\text{eq}} + \langle \Delta p_{\text{Xe}} \rangle_{\epsilon}$, are listed in Table S4 in the Supplemental Material of our paper, for various event lifetime classes. Here, $p_{\text{Xe}}^{\text{eq}}$ is the thermal equilibrium polarization level and $\langle \Delta p_{\text{Xe}} \rangle_{\epsilon}$ is the average polarization transfer per event.

To convert the latter averages to corresponding average polarization transfer per Xe atom, $\langle \Delta p_{\text{Xe}} \rangle_{\text{Xe}}$, one should multiply the entries in Table S4 by the number of simulated events N_{ϵ} in each lifetime class, divided by the number N_{Xe} of the xenon atoms: $\langle \Delta p_{\text{Xe}} \rangle_{\text{Xe}} = \langle \Delta p_{\text{Xe}} \rangle_{\epsilon} N_{\epsilon} / N_{\text{Xe}}$. The σ_{SE} can then be approximately obtained as

$$\sigma_{\text{SE}} \approx \frac{1}{[\text{Rb}]} \frac{\langle \Delta p_{\text{Xe}} \rangle_{\text{Xe}}}{\Delta t}, \quad (1)$$

where $[\text{Rb}]$ is the Rb number density and Δt is the simulation time.

Using the corrected analysis at a magnetic-field value of $B = 1 \text{ mT}$, we obtain $\sigma_{\text{SE}} = 0.3 \times 10^{-21}$ and $0.1 \times 10^{-21} \text{ m}^3/\text{s}$ for spin exchange with ^{85}Rb and ^{87}Rb , respectively, in our longest van der Waals events (lifetimes between 100 and 1000 ps). Averaged over all lifetime classes, the corresponding estimates are 0.7×10^{-21} and $0.5 \times 10^{-21} \text{ m}^3/\text{s}$. The updated results are in a rather good agreement with recent experimental data, which reside in the range of 1×10^{-21} to $5 \times 10^{-21} \text{ m}^3/\text{s}$ [1]. Taking into account the many approximations in our estimate, this agreement can be considered promising but, to an extent, coincidental.

[1] M. Kelley and R. T. Branca, Theoretical models of spin-exchange optical pumping: Revisited and reconciled, *J. Appl. Phys.* **129**, 154901 (2021).