Erratum: Coherent photon scattering background in sub-GeV/ c^2 direct dark matter searches

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The original publication calculated the coherent photon scattering recoil spectrum for helium using relativistic form factors with anomalous scattering corrections. Due to a sign error, these corrections were incorrectly applied. In addition, these anomalous scattering corrections are an approximation that explicitly excludes contributions from nuclear Thomson scattering [1]. The coherent scattering recoil rate in helium has been recalculated as a coherent sum of explicitly defined nuclear Thomson, Delbrück, and Raleigh scattering components. Delbrück scattering is calculated in the lowest-order Born approximation using lookup tables [2], where imaginary amplitudes are interpolated in energy by the pair-production cross section [3] and other interpolations are linear. Raleigh scattering is calculated using recommended nonrelativistic form factors [1,4]. The corrected Fig. 1 and Table 1 are shown.

FIG. 1. Corrected coherent scattering energy differential cross sections in He for 1460 keV photons.

TABLE I. Corrected coherent photon scattering rates in a helium-target low-background calorimeter.

Recoil energy range [eV]	Integrated scattering rate [recoils (kg · yr) ⁻¹]		
	Ge	Si	He
<0.01	72	16	1.0
0.01–0.1	34	13	0.5
0.1–1	16	5	0.013
1–10	0.8	0.9	1.6×10^{-4}
>10	0.10	0.012	0.012

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- [1] D. E. Cullen, J. H. Hubbell, and L. Kissel, Tech. Rep. No. UCRL-50400 (LLNL, 1997), <https://www.osti.gov/scitech/biblio/295438-uZu33l/webviewable/>.
- [2] H. Falkenberg, A. Hüniger, P. Rullhusen, M. Schumacher, A. Milstein, and K. Mork, *At. Data Nucl. Data Tables* **50**, 1 (1992).
- [3] M. Berger, J. Hubbell, S. Seltzer, J. Chang, J. Coursey, R. Sukumar, D. Zucker, and K. Olsen, XCOM: Photon cross section database (version 1.5), <http://physics.nist.gov/xcom>.
- [4] J. H. Hubbell, W. J. Veigele, E. A. Briggs, R. T. Brown, D. T. Cromer, and R. J. Howerton, *J. Phys. Chem. Ref. Data* **4**, 471 (1975); **6**, 615 (1977).