

1957-59 (Talmud
Bioscience da
dly zone)

Dear Prof. Dyson.

After suggesting to me the calculation of the complete ^{spin} density matrix in Coulomb scattering you had asked me to get to work to take my time over it. Following dutifully and at tortoise pace your suggestions I calculated the dens. I first expressed the density matrix in terms of Mott's functions F and G which have been nicely tabulated by Sherman and derived analytical expressions corresponding to the second order Born approximation, neglecting screening.

I was busy calculating the elements of the density matrix in case of arbitrary initial polarization using Sherman's tables when Pasternack and Goldhaber (and later Soudant) ^{sounded the alarm and} asked me to rush my calculations and immediately submit a letter to the Phys. Rev. as they had received a similar letter from Tamm which they would not show me. ^{Goldhaber also asked me to include a rough analysis of recent double scat. exp. by Shalit.} As a result I had to write up ~~what~~ part of what I had done so far and give it to them without even having had time to ask your opinion about it.

So please accept my apologies for this unfortunate rush. I wrote up what was immediately relevant to the scattering of longitudinally polarized beams. But I have also derived formulae (exact and approximate) for arbitrary initial polarization and considered in some detail double scattering within a single scatterer (should we call it a plural scattering of order 2?). I hope to publish those results later on when I have ^{some} handsome curves ^{if you think to show.}

If you think the letter inadequate, I suppose I can still withdraw it. Otherwise I would appreciate ~~to~~ receiving your comments.

By the way, some of my former ^(crackpot) investigations which led me to express the most general interaction operator as $\sum_{i=1}^5 G_i O_i (C_i + \gamma_5 D_i + E_i \Gamma + F_i \gamma_5 \Gamma)$ where Γ is the charge conjugation operator ($\Gamma \psi = C \psi^*$) and $G_i O_i$ the usual S, P, T, A, V operators ~~are~~ the essence of a discussion ~~of~~ of β interactions by Pauli (to be published in Nuovo Linceo) & I wonder if my interpretation ^(in the case of the electron) of gauge transformation, charge conjugation, γ_5 transformation etc as special ~~(proper and improper)~~ ^{spatial} Lorentz transformations of the orthogonal tetrad attached to the particle is still ~~at all~~ worth publishing. The four unit vectors are in the directions of $\vec{V}_0 = \text{Re} \psi \gamma_\mu \psi$, $\vec{V}_1 = \text{Im} \psi \gamma_\mu \psi$, $\vec{V}_2 = \text{Re} \psi \gamma_\mu \Gamma \psi$ and $\vec{V}_3 = \text{Im} \psi \gamma_\mu \Gamma \psi$. The special gauge transf. $\psi \rightarrow \gamma_5 \psi$ leaves \vec{V}_0 and \vec{V}_3 invariant and reverses the signs of \vec{V}_1 and \vec{V}_2 . The charge conjugation $\psi \rightarrow \Gamma \psi$ leaves \vec{V}_0 and \vec{V}_2 invariant and reverses the signs of \vec{V}_1 and \vec{V}_3 . They are special rotations in the rest frame ($\psi=1$) of the electron.

I hope you are having a happy time in Berkeley. Please give my greetings to Sviratchki if you see him there.

Yours sincerely,

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