Checking Imaginary Parts of the Compton Amplitudes by the Optical Theorem

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The trick is that imaginary parts in our formulation can only come from s-channel rescattering diagrams. Onebody and Twobody are real below $\omega_\pi = m_\pi$.

$\Rightarrow$ Use optical theorem to relate to $\sigma_{tot}(\gamma\,{}^3He \to X)$ photodissociation.

Fortunately, I just can copy from [Hilde PhD (6.89)] with minor modifications: There are 2 spinstates in ${}^3He$ to be averaged over, not 3 as in the deuteron.

$$\Rightarrow \quad \sigma^{tot}[\gamma\,{}^3He \to X] = \frac{1}{\omega^2}\,\frac{1}{4} \sum_{\substack{n_i = n_f = \pm\frac{1}{2}\\ \lambda_i = \lambda_f = \pm 1}} \mathrm{Im}\Big[\underbrace{\mathcal{M}_{fi}(\vartheta = 0)}_{\alpha_{EM}\ \text{totalinterpolated}[\cdot]}\Big] .$$

with total = onebody + twobody

Johannes writes the Optical theorem as

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$$\sigma^{tot}[\gamma\,{}^3He \to X] = -\frac{2\pi\,\cancel{\alpha_{EM}}}{\sqrt{6}\,\omega^2} \sum_{\substack{n_i = n_f = \pm\frac{1}{2}\\ \lambda_i = \lambda_f = \pm 1}} \mathrm{Im}\left[T^{fi}_{\lambda'\lambda}(\vartheta = 0)\right] \quad ?$$

$\Rightarrow$ I speculate $\boxed{\mathrm{total}_{hg} = -\frac{8\pi}{\sqrt{6}}\, T^{fi}_{\text{Johannes}}}$

as the relation between hg & Johannes amplitudes.

units: hg amplitudes : $[\mathrm{fm}]^1$

Johannes : ?