1 Single resonance implementation test

$$\epsilon = \left(1 + \frac{2|\vec{k}|^2}{Q^2}\tan^2\frac{\theta_e}{2}\right)^{-1} \quad (1)$$

$$\epsilon_L = \frac{\sqrt{Q^2}}{\nu} \times \epsilon, \quad \epsilon_T = ? \quad (2)$$

LOI:

Correction: add the factor $\frac{\nu}{\sqrt{Q^2}}$ to the second line in the equation (7) of LOI.

$$\frac{d\sigma}{d\Omega_K} = \frac{d\sigma_T}{d\Omega_K} + \epsilon_L \frac{d\sigma_L}{d\Omega_K} + \epsilon_T \frac{d\sigma_{TT}}{d\Omega_K}\cos(2\phi_K) + \sqrt{2\epsilon_L(1+\epsilon_T)}\frac{d\sigma_{TL}}{d\Omega_K}\cos(\phi_K) \quad (3)$$

$$M^{LOI}_{\lambda_\gamma \lambda_N \lambda_Y} \equiv M^{LOI} = \frac{< T_{em} >< T_{dec} > d^{J_r}_{\lambda_\gamma - \lambda_N, -\lambda_Y}}{M_R^2 - W^2 + i\Gamma_{tot} M_R} \quad (4)$$

Analytical calculation of the integrated cross section parts at $W = M_R$ when $J_R = 1/2$ yields:

$$\int \frac{d\sigma_T}{d\Omega_K} d\Omega_K = \left(\frac{4M_N q_\gamma A_{12}^2 \Gamma_{KY}}{(W^2 - M_N^2)\Gamma_{tot}}\right) \quad (5)$$

$$\int \epsilon_L \frac{d\sigma_L}{d\Omega_K} d\Omega_K = \epsilon_L \left(4\frac{\nu}{\sqrt{Q^2}}\right)\left(\frac{4M_N q_\gamma S_{12}^2 \Gamma_{KY}}{(W^2 - M_N^2)\Gamma_{tot}}\right) = 4\epsilon\left(\frac{4M_N q_\gamma S_{12}^2 \Gamma_{KY}}{(W^2 - M_N^2)\Gamma_{tot}}\right) \quad (6)$$

GEAN:

$$\frac{d\sigma}{d\Omega_K} = \frac{d\sigma_T}{d\Omega_K} + \epsilon \frac{d\sigma_L}{d\Omega_K} + \epsilon \frac{d\sigma_{TT}}{d\Omega_K}\cos(2\phi_K) + \sqrt{\epsilon(1+\epsilon)}\frac{d\sigma_{LT}}{d\Omega_K}\cos(\phi_K) \quad (7)$$

$$\frac{d\sigma_T}{d\Omega_K} = \frac{\chi}{(4\pi)^2}(H_{1,1} + H_{-1,-1}); \quad \frac{d\sigma_L}{d\Omega_K} = \frac{2\chi}{(4\pi)^2}(H_{0,0}); \quad (8)$$

$$\frac{d\sigma_{TT}}{d\Omega_K} = \frac{-\chi}{(4\pi)^2}(H_{1,-1} + H_{-1,1}); \quad (9)$$

$$\frac{d\sigma_{LT}}{d\Omega_K} = \frac{-\chi}{(4\pi)^2}(H_{0,1} + H_{1,0} - H_{-1,0} + H_{0,-1}); \quad (10)$$

where $H^{GEAN}_{\lambda_{\gamma_1}\lambda_{\gamma_2}} = \sum M^{LOI}_{\lambda_{\gamma_1}\lambda_N\lambda_Y}(M^{LOI}_{\lambda_{\gamma_2}\lambda_N\lambda_Y})^+$

$$H^{GEAN} = \sqrt{4\pi\alpha} \times H^{LOI} \quad (11)$$

Integrals of (3) and (7) coincide with (5), when $A_{12} \neq 0$ and $S_{12} = 0$.

Integrals of (3) and (7) coincide with (6), when $A_{12} = 0$ and $S_{12} \neq 0$.

Integral (6) does not go to 0 when Q^2 goes to 0. (?)