

Unpolarized Radiative Corrections: Internal Radiation Update for d_2^n

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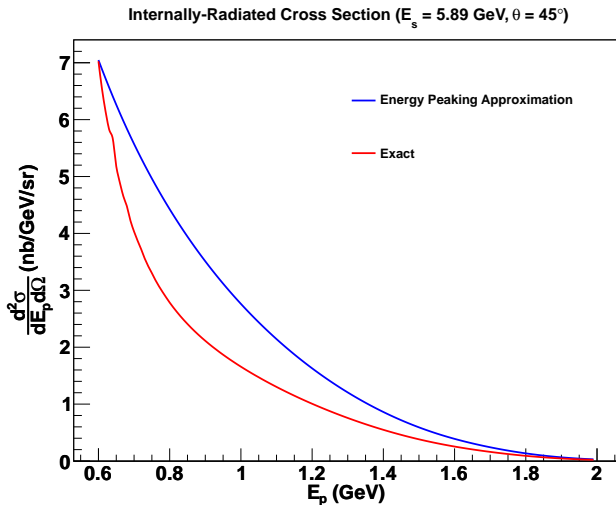
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Outline

- 1 Unpolarized Radiative Corrections
 - Internal Radiation
- 2 Summary

Internal Radiation (1)

Peaking Approximation vs. Exact



Internal Radiation (2)

Details of Exact Calculation

$$\frac{d^2\sigma_{ir}}{dE_p d\Omega}(E_s, E_p) = \frac{d^2\sigma_b}{dE_p d\Omega}(E_s, E_p)(1 + \delta_r) + \frac{d^2\sigma_r}{dE_p d\Omega}$$

$$\begin{aligned}\delta_r = & -\frac{\alpha}{\pi} \left[\frac{28}{9} - \frac{13}{6} \ln \frac{2s_\mu p^\mu}{m_e^2} \right. \\ & + \left(\ln \frac{E_s}{\Delta} + \ln \frac{E_p}{\Delta} \right) \left(\ln \frac{2s_\mu p^\mu}{m_e^2} - 1 \right) \\ & \left. - \Phi \left(\frac{E_p - E_s}{E_p} \right) - \Phi \left(\frac{E_s - E_p}{E_s} \right) \right]\end{aligned}$$

s, p = 4-vectors for incident and scattered electrons

Internal Radiation (3)

Details of Exact Calculation

$$\begin{aligned} \frac{d^2 \sigma_\tau}{dE_p d\Omega}(E_s, E_p) &= \frac{\alpha^3}{2\pi} \left(\frac{E_p}{E_s} \right) \int_{-1}^1 \frac{2M_T \omega d(\cos \theta_k)}{q^4 (u_0 - |\vec{u}| \cos \theta_k)} \\ &\times \left(\tilde{W}_2(q^2) \left\{ -\frac{am_e^2}{x^3} \left[2E_s(E_p + \omega) + \frac{q^2}{2} \right] \right. \right. \\ &- \frac{a' m_e^2}{y^3} \left[2E_p(E_s - \omega) + \frac{q^2}{2} \right] - 2 \\ &+ 2\nu (x^{-1} + y^{-1}) \{ m_e^2 (s_\mu p^\mu - \omega^2) \\ &+ s_\mu p^\mu [2E_s E_p - s_\mu p^\mu + \omega (E_s - E_p)] \} \\ &+ x^{-1} \left[2(E_s E_p + E_s \omega + E_p^2) + \frac{q^2}{2} - s_\mu p^\mu - m_e^2 \right] \\ &+ y^{-1} \left[2(E_s E_p - E_p \omega + E_s^2) + \frac{q^2}{2} - s_\mu p^\mu - m_e^2 \right] \left. \right\} \\ &+ \tilde{W}_1(q^2) \left[\left(\frac{a}{x^3} + \frac{a'}{y^3} \right) m_e^2 (2m_e^2 + q^2) \right. \\ &+ 4 + 4\nu (x^{-1} + y^{-1}) \\ &\left. \times s_\mu p^\mu (s_\mu p^\mu - 2m_e^2) + (x^{-1} + y^{-1}) (2s_\mu p^\mu + 2m_e^2 - q^2) \right] \end{aligned}$$

Summary and What's Next

- Internal Radiation
 - ▶ Peaking approximation and exact calculation are somewhat close
 - ★ Exact has more 'bend' to it
- What's next?
 - ▶ Continue development of POLRAD++
 - ★ Debugging, etc.
 - ▶ Exact integrals for unpolarized RCs: Are we doing the exact calculation correctly?
 - ★ Currently relies on **elastic** form factors – do we need to use transition form factors and integrate over them?
 - ▶ External effects for asymmetries from RADCOR