# Compton Publication Status

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# Outline

- Where we are with Compton paper?
- How to extract Compton differential cross section?

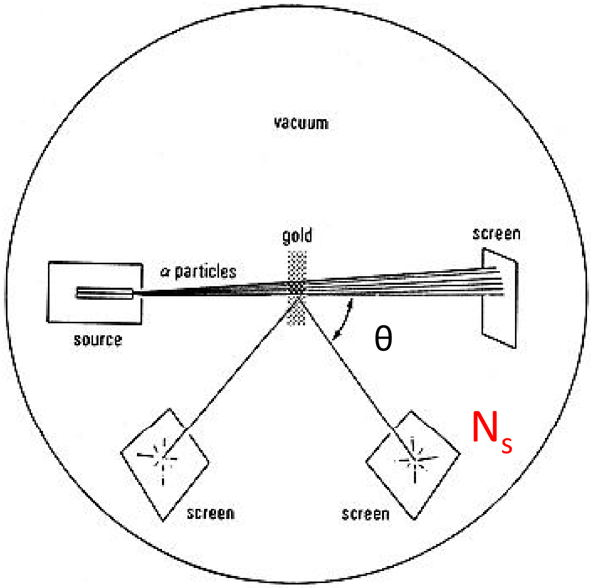
# Where we are with Compton paper?

- Draft version #4 has been distributed in the Compton paper committee. We are waiting for final result and figures in order to submit for collaboration approval

- Three groups analyzed total cross section. The results are in agreement within their uncertainties. The Compton committee suggested to use Pawel's result for publication. The systematic error budget needs more discussion at this meeting

- Only one analysis result on differential cross section from Pawel. We need more discussion on how to present the differential cross section at this meeting

# How to measure differential cross section?




At a perticular angle $\theta$ with a solid angle $\Delta\Omega$,

$$N_s = \Gamma \bullet N_{tar} \bullet \Delta\sigma \bullet \varepsilon$$

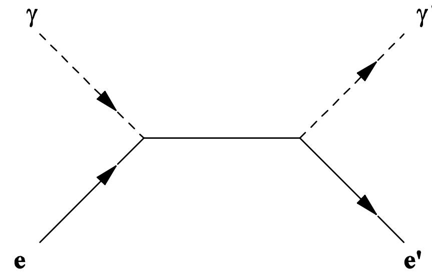
$$\Delta\sigma = \frac{N_s}{\Gamma \bullet N_{tar} \bullet \varepsilon}$$

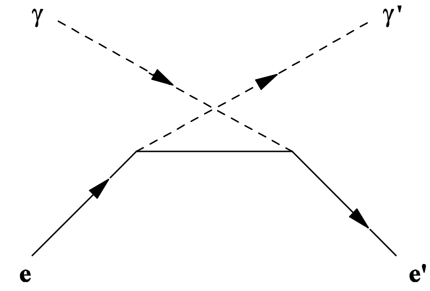
Differential cross section: $\dfrac{d\sigma}{d\Omega} = \dfrac{\Delta\sigma}{\Delta\Omega} = \dfrac{N_s}{\Gamma \bullet N_{tar} \bullet \varepsilon \bullet \Delta\Omega}$

Detection efficiency: $\varepsilon = \dfrac{N_s}{\Gamma \bullet N_{tar} \bullet \Delta\sigma}$ is the ratio of the number of events detected in $\Delta\Omega$ and the number of events scattered in $\Delta\Omega$ by the nature.

# Compton Scattering

(1) Leading term (Klein-Nishina):

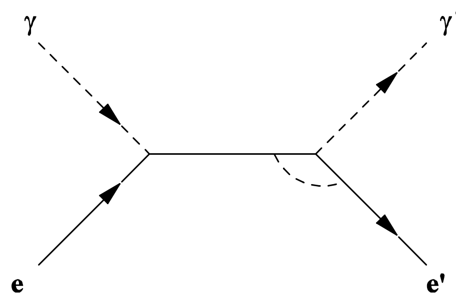


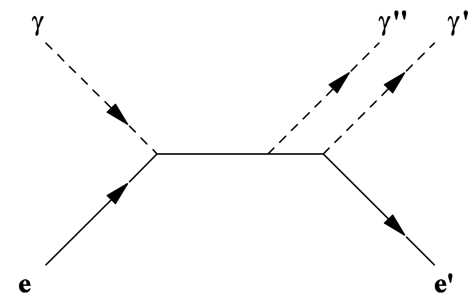




(2) Radiative contributions:

(a)

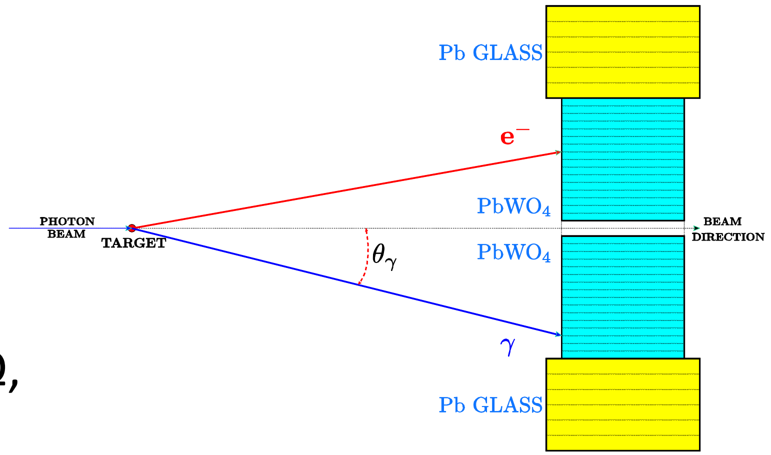
(b)




$$\delta^{SV} + \delta^{HD}$$

# How to extract Compton differential cross section without radiative correction?




(1) Select Compton events

(2) Divide detected Compton events into angular bins

(3) For each angular bin with a solid angle $\Delta\Omega$, assume the number of events detected is $Y_{exp}$

$$\left\langle \frac{\Delta\sigma}{\Delta\Omega} \right\rangle_{Mea} = \frac{Y_{\exp}}{\Gamma_\gamma \bullet N_e \bullet \varepsilon \bullet \Delta\Omega}$$

where $\varepsilon$ is the ratio of the number of Compton events detected in $\Delta\Omega$ and the number of events created by nature in $\Delta\Omega$. It is calculated using Monte Carlo with Klein – Nishina formula for generator.

# How to extract Compton differential cross section with radiative correction?

(1) The first method:

$$\left\langle \frac{\Delta\sigma}{\Delta\Omega} \right\rangle_{Mea} = \frac{Y_{\exp} - (Y_{MC}^{SV} + Y_{MC}^{HD})}{\Gamma_{\gamma} \bullet N_{e} \bullet \varepsilon \bullet \Delta\Omega}$$

where is $Y_{MC}^{SV}$ and $Y_{MC}^{HD}$ are the yield contributions from the virtual-soft double compton ($\delta^{SV}$) and hard-double Compton ($\delta^{HD}$) processes respectively, and are calculated by Monte Carlo

# Extract Compton differential cross section with radiative correction continue

(2) The second method:

$$\left\langle \frac{\Delta\sigma}{\Delta\Omega} \right\rangle_{Mea} = \frac{Y_{\exp}}{\Gamma_{\gamma} \bullet N_e \bullet \varepsilon \bullet \Delta\Omega} \bullet \frac{Y_{MC}^{KN}}{(Y_{MC}^{KN} + Y_{MC}^{SV} + Y_{MC}^{HD})}$$

where is $Y_{MC}^{KN}$ is the yield calculated by Monte Carlo using Klein – Nishina.

Therefore,

$$\left\langle \frac{\Delta\sigma}{\Delta\Omega} \right\rangle_{Mea} = \frac{Y_{MC}^{KN}}{\Gamma_{\gamma} \bullet N_e \bullet \varepsilon \bullet \Delta\Omega} \bullet \frac{Y_{\exp}}{(Y_{MC}^{KN} + Y_{MC}^{SV} + Y_{MC}^{HD})} = \left\langle \frac{d\sigma}{d\Omega} \right\rangle_{KN} \bullet \frac{Y_{\exp}}{(Y_{MC}^{KN} + Y_{MC}^{SV} + Y_{MC}^{HD})}$$