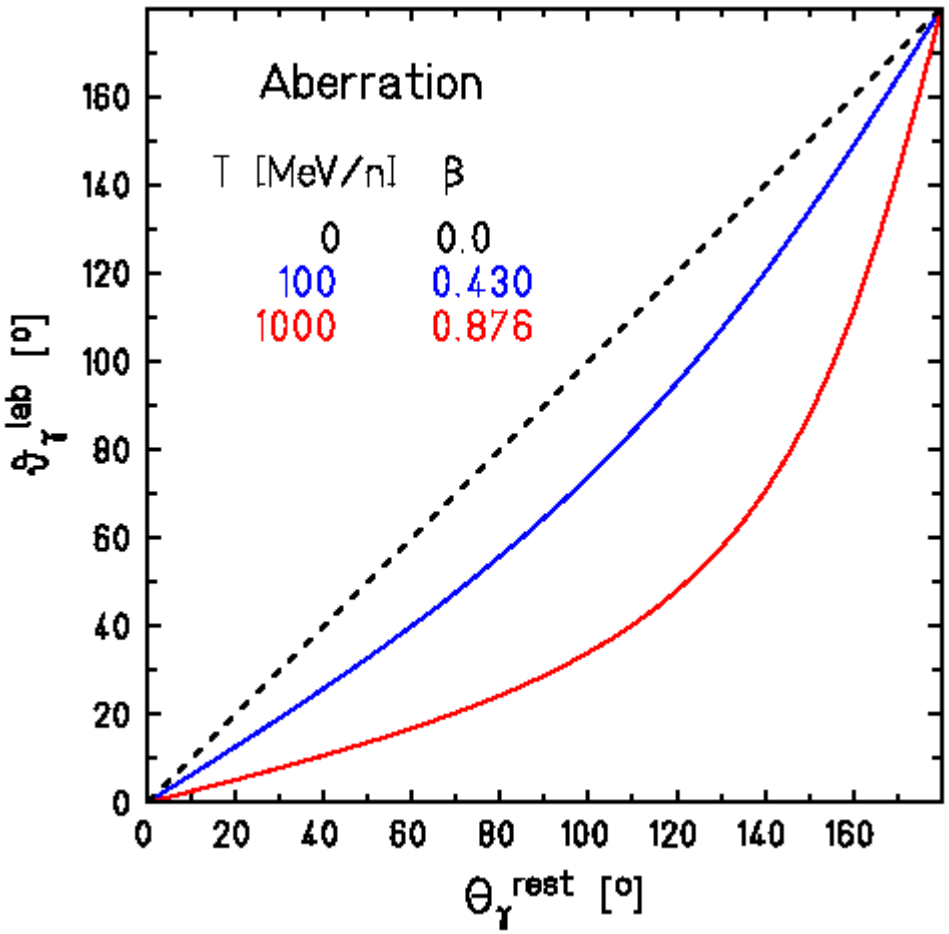
Relativistic Aberration

$$\cos\vartheta_\gamma^{\ell ab} = \frac{\cos\theta_\gamma^{rest} + \beta}{1 + \beta\cos\theta_\gamma^{rest}}$$

for $\vartheta_p \cong 0^0$

$$\cos\theta_\gamma^{rest} = \frac{\cos\vartheta_\gamma^{\ell ab} - \beta}{1 - \beta\cos\vartheta_\gamma^{\ell ab}}$$

$$\phi_\gamma^{rest} = \varphi_\gamma^{lab}$$

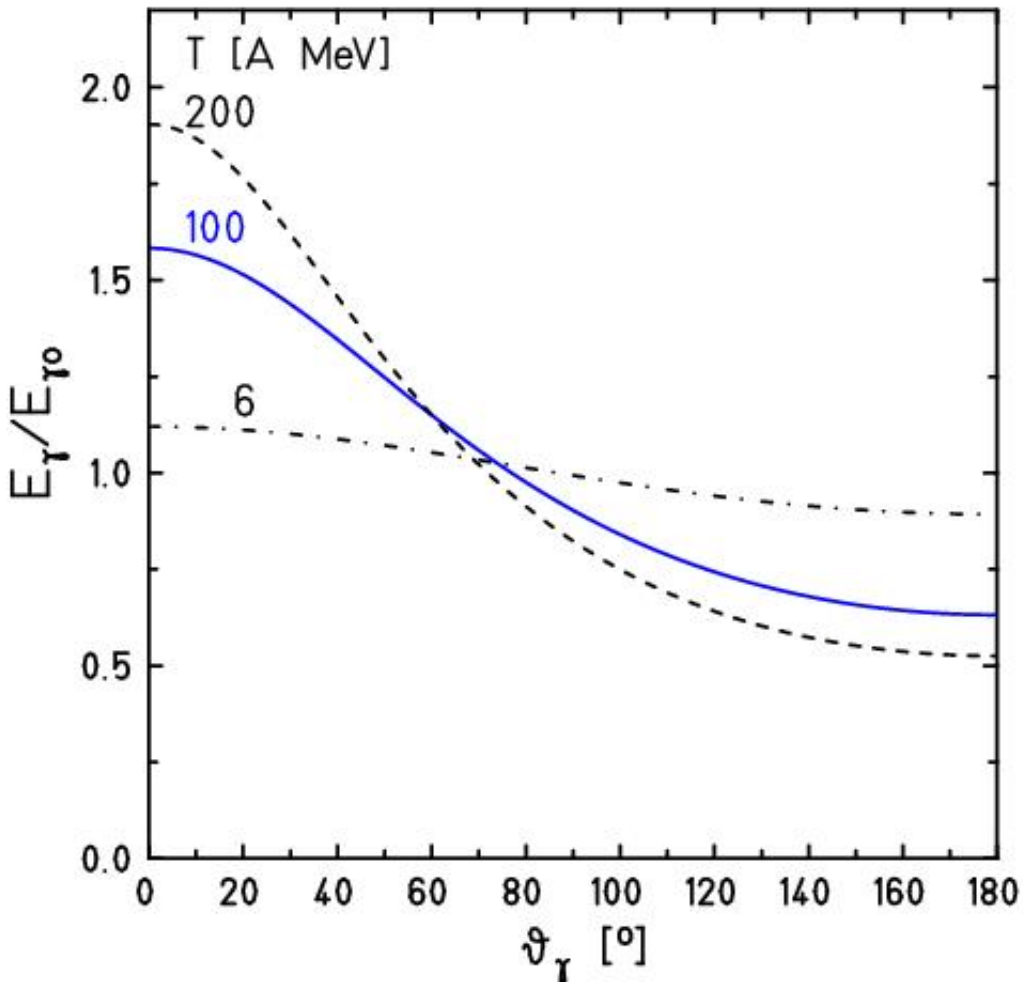


Doppler Effect

$$\frac{E_{\gamma 0}}{E_\gamma} = \frac{1-\beta\cdot\cos\vartheta_\gamma^{\ell ab}}{\sqrt{1-\beta^2}}$$

for $\vartheta_p \cong 0^0$

$$\frac{d\Omega_{rest}}{d\Omega_{lab}} = \left(\frac{E_\gamma}{E_{\gamma 0}}\right)^2$$

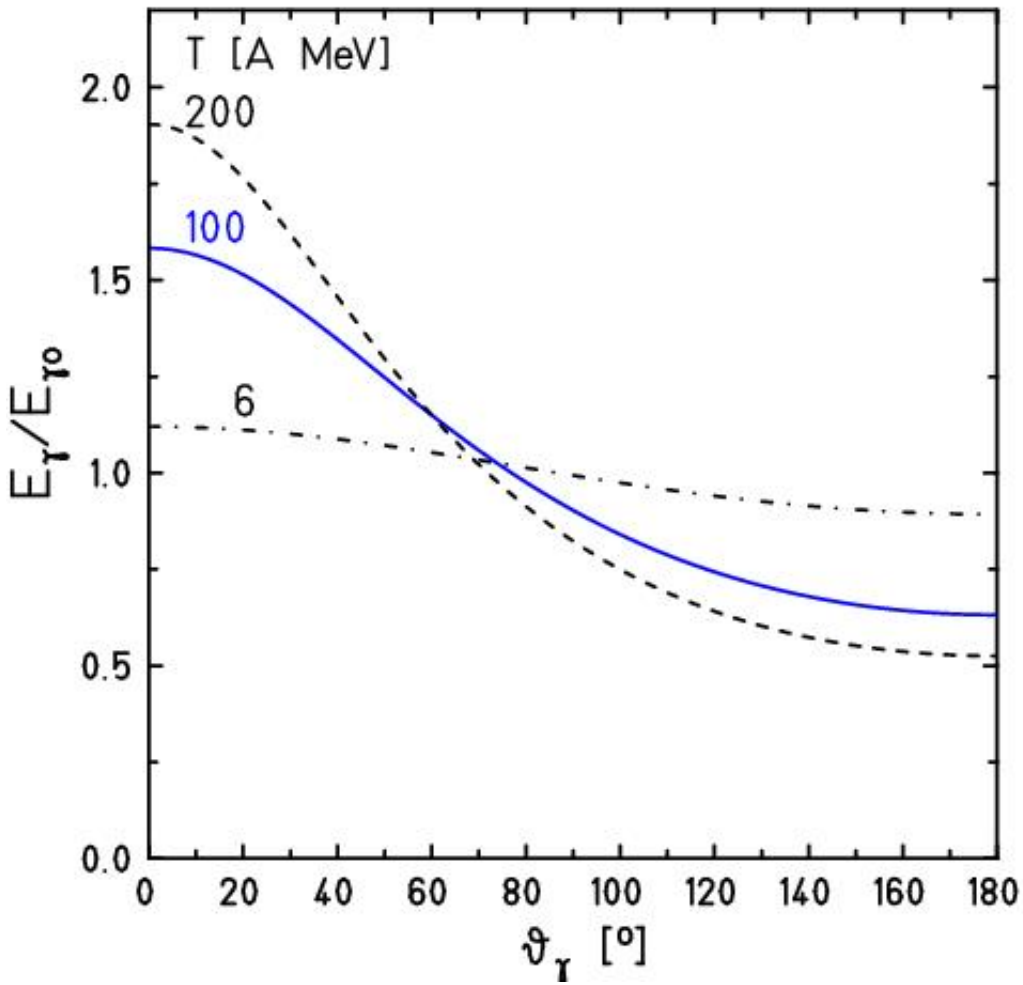


Headlight Effect

$$\frac{d\Omega_{rest}}{d\Omega_{\ell ab}} = \left(\frac{E_\gamma}{E_{\gamma 0}}\right)^2$$

for $\vartheta_p \cong 0^0$

$$\frac{E_{\gamma 0}}{E_\gamma} = \frac{1-\beta\cdot\cos\vartheta_\gamma^{\ell ab}}{\sqrt{1-\beta^2}}$$



Doppler Effect

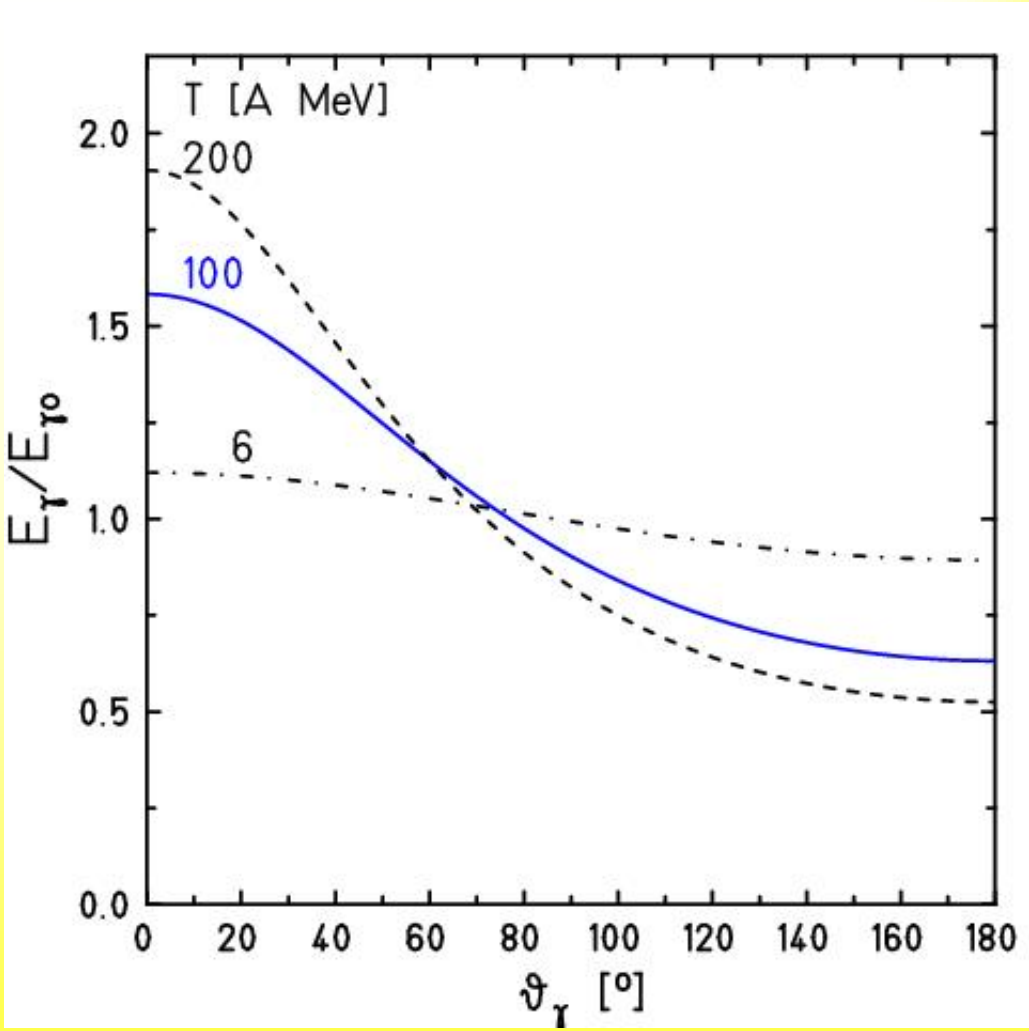
$$\frac{E_{\gamma 0}}{E_\gamma} = \frac{1-\beta\cdot\cos\vartheta_\gamma}{\sqrt{1-\beta^2}}$$

for $\vartheta_p \cong 0^0$

$$\frac{d\Omega_{rest}}{d\Omega_{lab}} = \left(\frac{E_\gamma}{E_{\gamma 0}}\right)^2$$

$$\cos\theta_\gamma^{rest} = \frac{\cos\vartheta_\gamma^{lab} - \beta}{1-\beta\cos\vartheta_\gamma^{lab}}$$

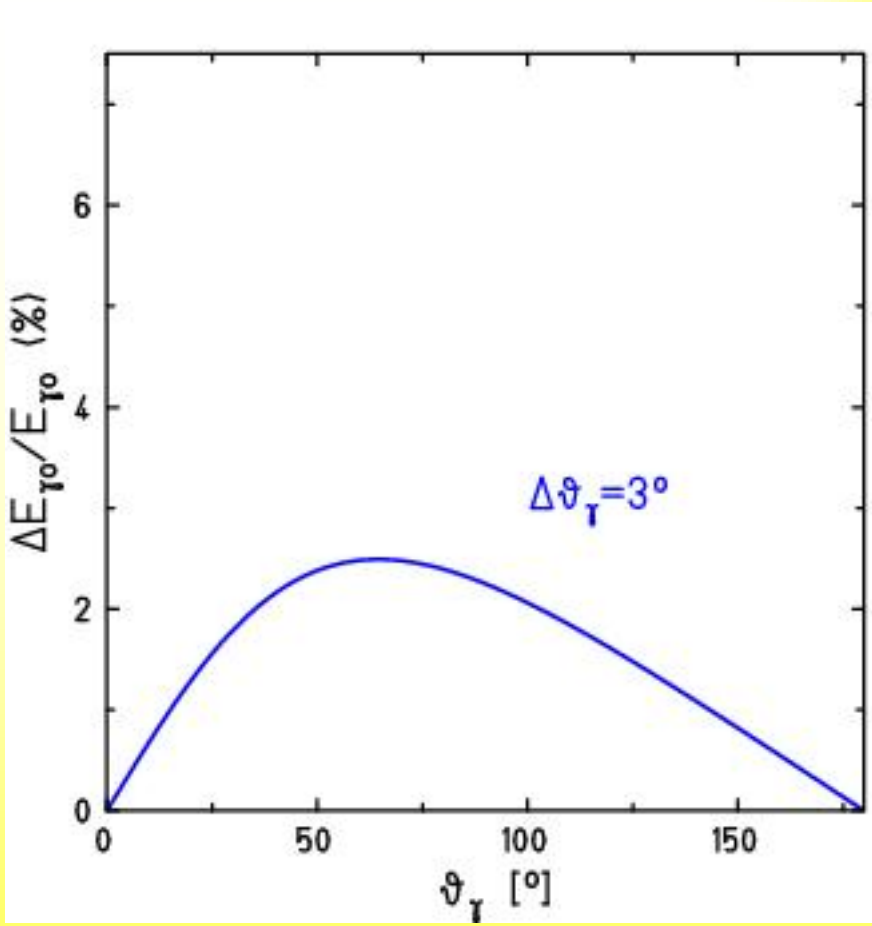
$$\phi_\gamma^{rest} = \varphi_\gamma^{lab}$$



Doppler Broadening

$$\frac{\Delta E_{\gamma 0}}{E_{\gamma 0}} = \frac{\beta \cdot \sin \vartheta_\gamma}{1 - \beta \cdot \cos \vartheta_\gamma} \cdot \Delta \vartheta_\gamma$$

for $\vartheta_p \cong 0^0$



with

$$\Delta \vartheta_\gamma = 0.622 \cdot \arctan \frac{d[mm]}{R[mm] + 30[mm]}$$

$$R = 700[mm]$$

$$d = 59[mm]$$

Doppler Broadening

$$\frac{\Delta E_{\gamma 0}}{E_{\gamma 0}} = \frac{\beta - \cos\vartheta_\gamma}{\left(1-\beta^2\right)\left(1-\beta\cdot\cos\vartheta_\gamma\right)}\cdot\Delta\beta$$

for $\vartheta_p \cong 0^0$

with $\Delta\beta = 6\%$