Fit curves for energy deposition and photon yield

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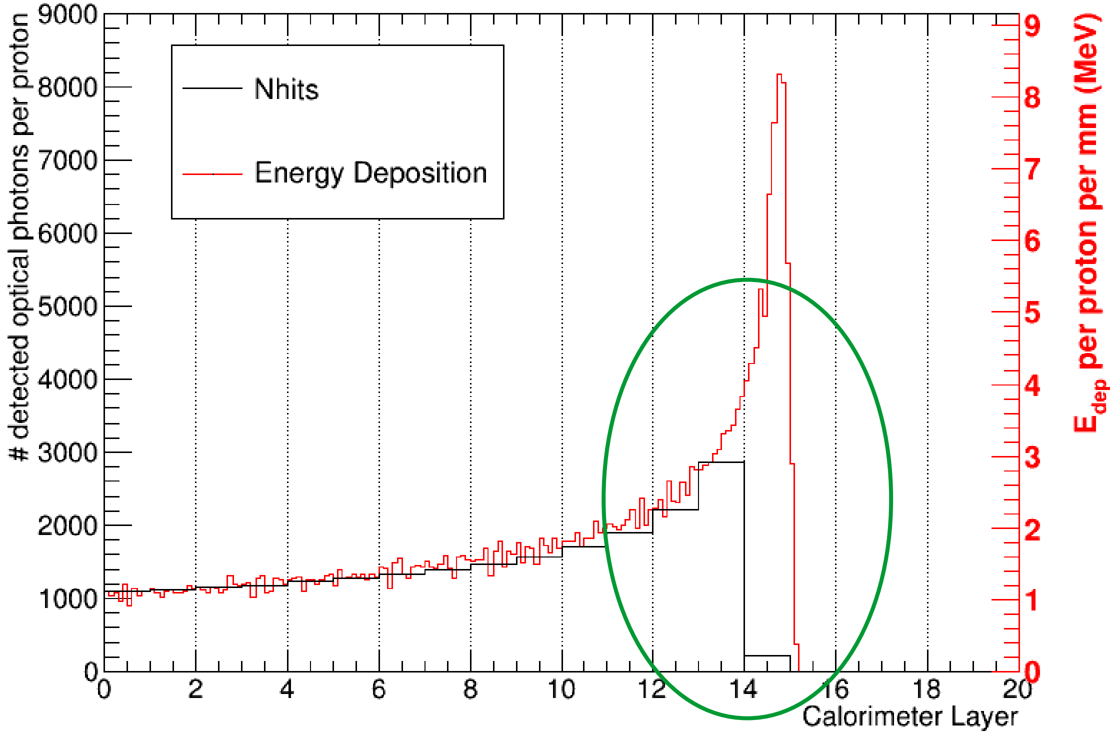
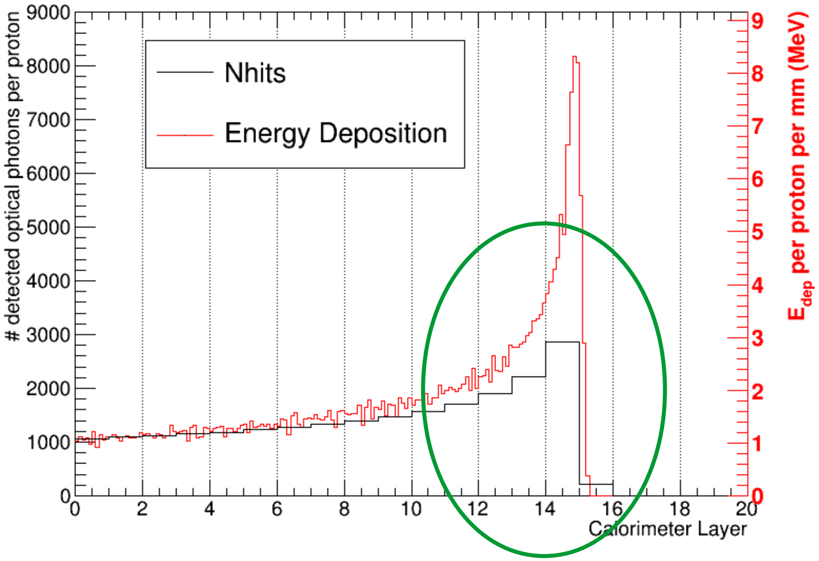
Last weeks update: Wrong alarm



That was actually nothing;
A bug guzzled one calorimeter layer

This is how it really looks like:



Bortfeld1997

/E_0, which is in

esulting from the translate $\Phi_E(E)$ $R)\Delta R$ is the flu- $R+\Delta R$. This is elation $\Phi_R(R)$ y relationship of

(21)

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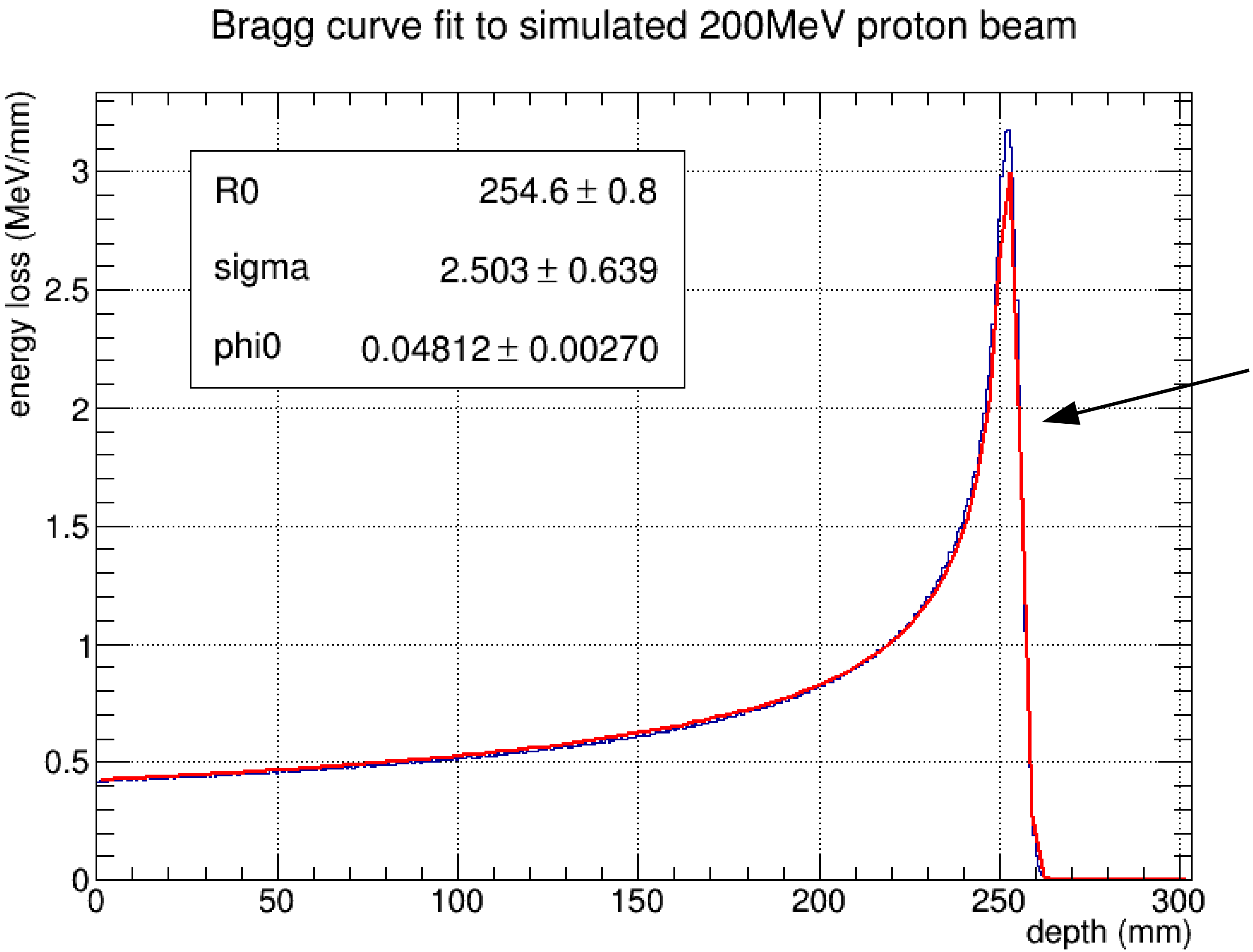
Note that this expression is of the same form as the second term, $\hat{D}_2(z)$, of Eq. (11). Straggling can now be considered in the same way as in the previous section, which results in the final expression $D_{\rm tail}(z)$. Adding this expression to the $D(z)$ of Eq. (15) gives

$$D(z)=\Phi_0 \frac{e^{-\zeta^2/4}\sigma^{1/p}\Gamma(1/p)}{\sqrt{2\pi}\varrho p \alpha^{1/p}(1+\beta R_0)}\left[\frac{1}{\sigma}\mathscr{D}_{-1/p}(-\zeta) + \left(\frac{\beta}{p}+\gamma\beta+\frac{\epsilon}{R_0}\right)\mathscr{D}_{-1/p-1}(-\zeta)\right]. \quad (26)$$

TABLE II. Parameters for the fit of Eq. (29) to measured data published in the literature.

Calculate D() numerically: Coded in C++/ROOT
Unfortunately, ROOT has no routine for parabol. Cyl. functions

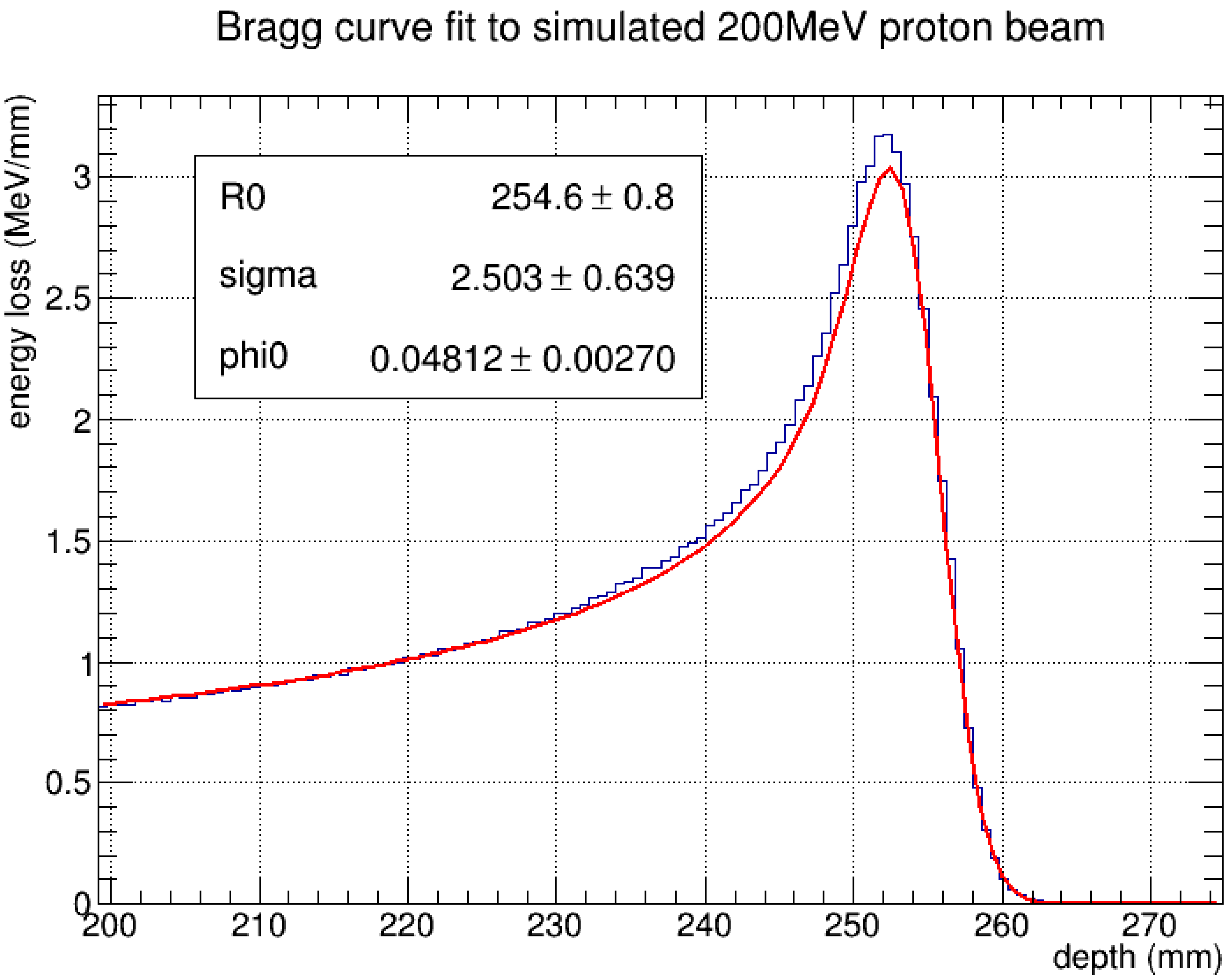


I'm still using the material-dependent model parameter for water!
Fit should improve when adapting parameter to scintillator

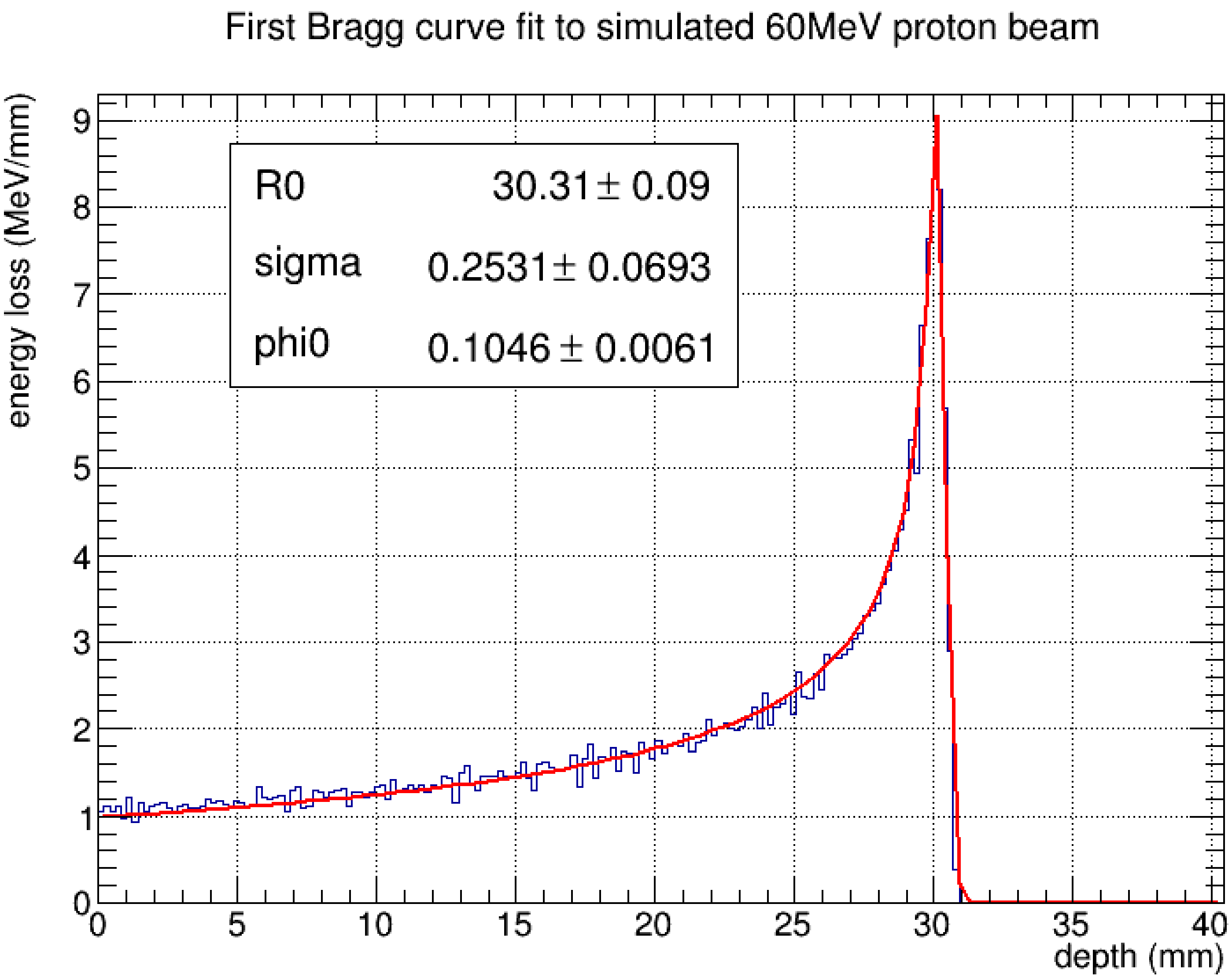
From fitted range R0, calculate E0 = (R0/beta)^(-1/p)

Model parameter:
beta = 0.012 cm MeV^(-p)
p = 1.77

Zoom to Bragg peak



E0 = 197.582 MeV

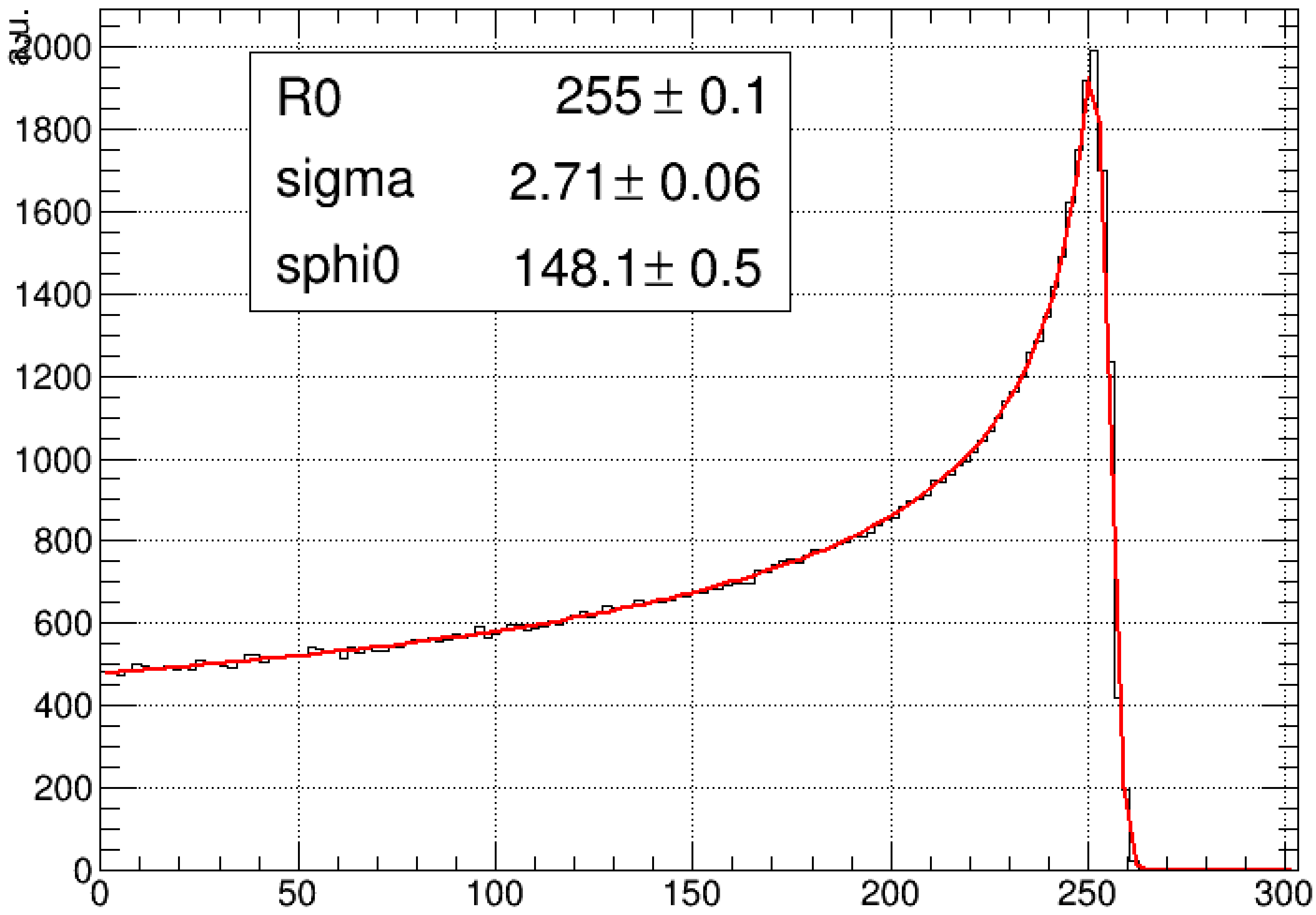


E0 = 59.3767 MeV

Photon yield fit

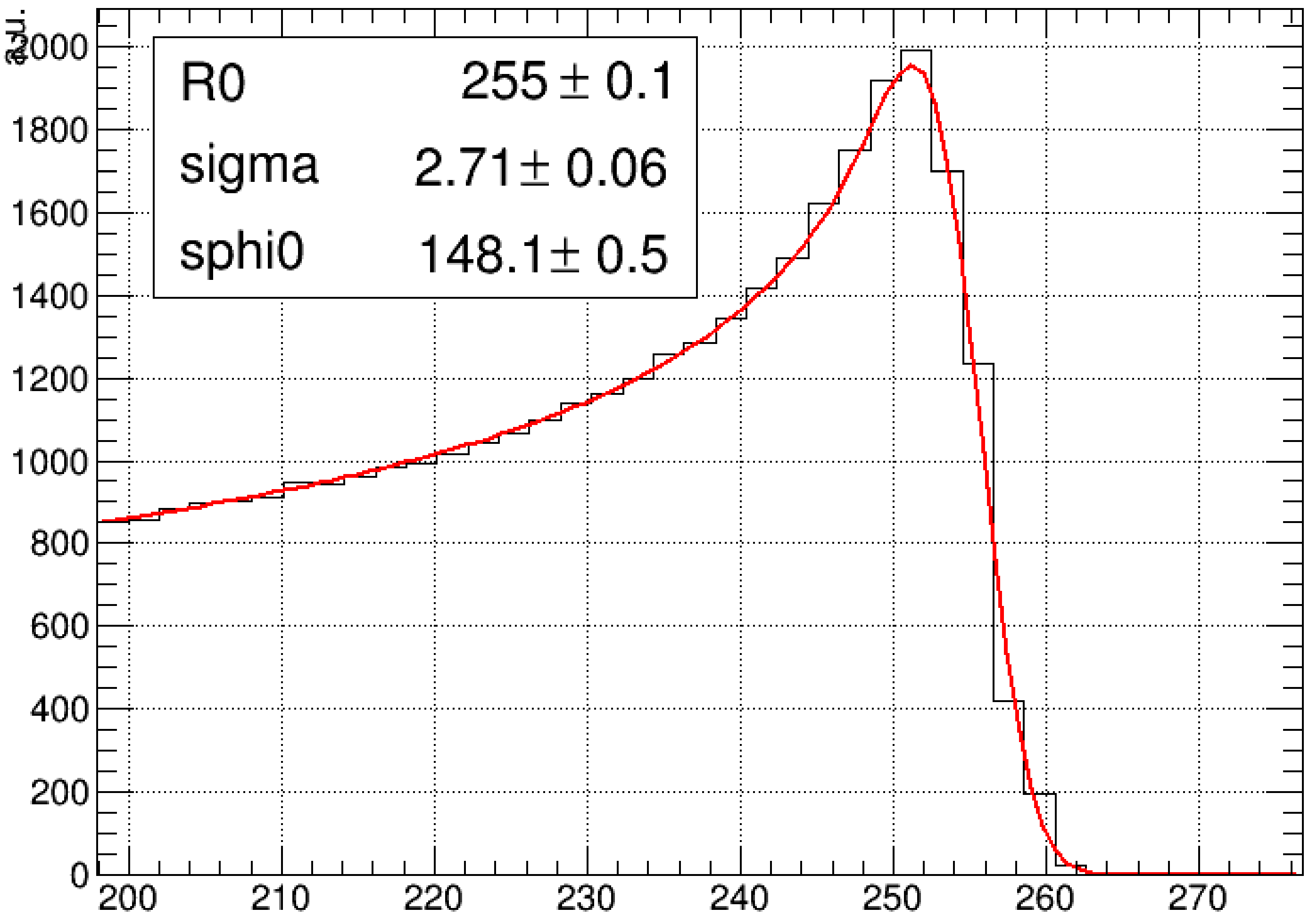
- Develop fit curve for photon yield, starting from Bortfeld's Bragg fit curve
- Use Birk's law $\frac{dL}{dx}=\frac{S}{\left(\frac{dE}{dx}\right)^{-1}+b}$ s,b const
- Replace dE/dx in derivation of Bragg curve with dL/dx and proceed analogously
- Voila

Simulated and fitted photon yield for a 200MeV proton beam

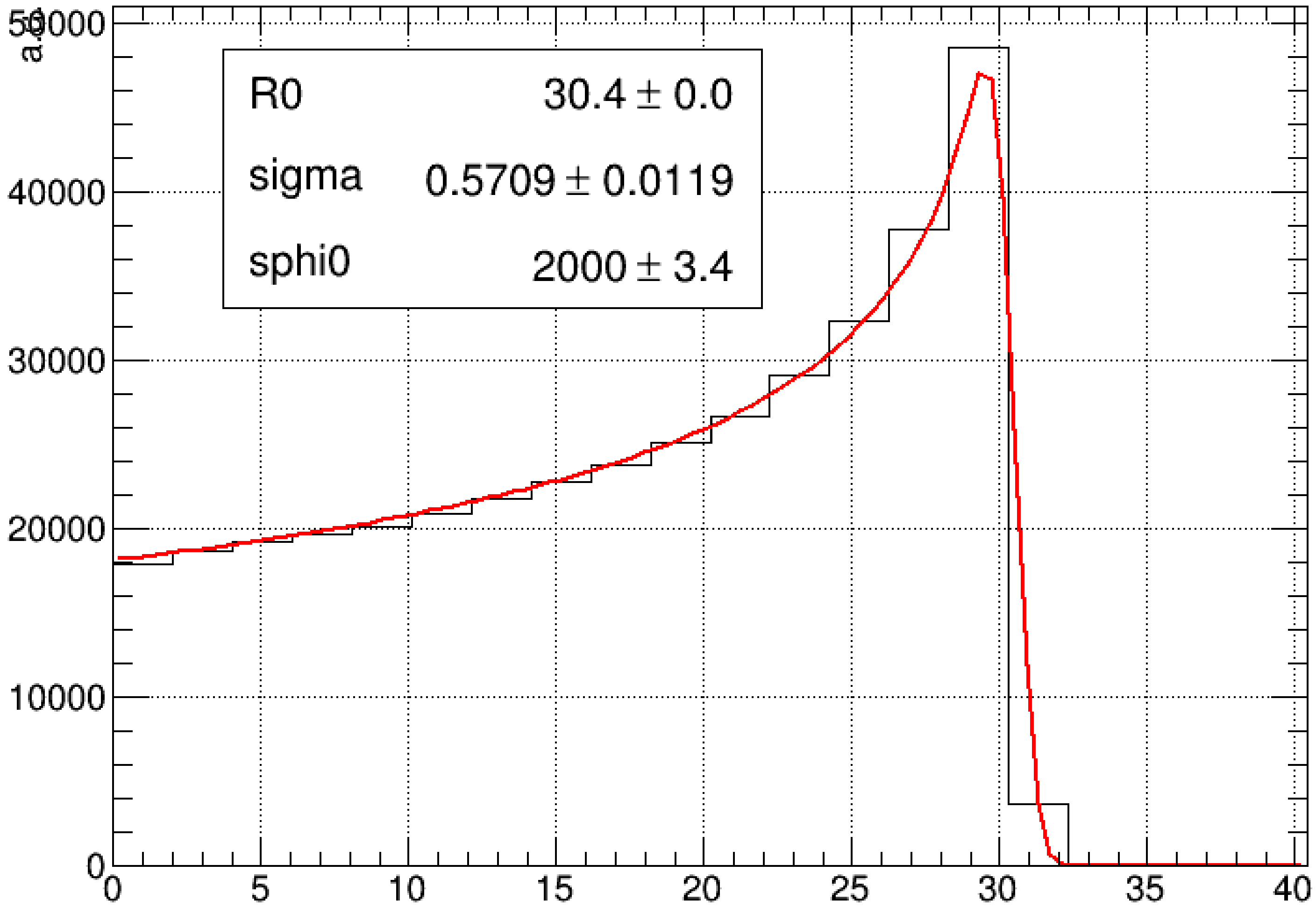


E0 = 197.757 MeV

Zoom to photon peak at 200MeV



Simulated and fitted photon yield for a 60MeV proton beam



E0 = 59.4702 MeV

To Do

- Improve numerical performance
- Improve Bragg Fit
- Adjust model parameter to scintillator material
- Simulate 5mm layers and test fit performance