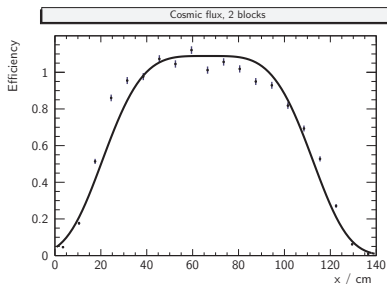# Beam paper update

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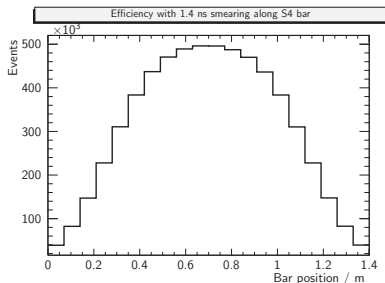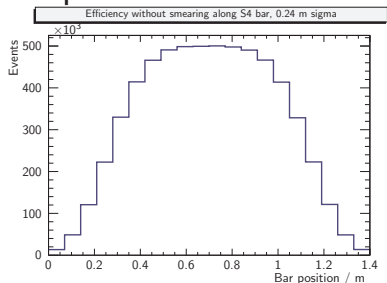University College London

November 22, 2019

Recap - Efficiency smearing

- Finite bar timing resolution is leading events to be shifted out of their true bins
- Bar efficiency (calculated with cosmics) seems to be well described by gaussian with flattened top $\longrightarrow A e^{-\left(\frac{x-\mu}{2\sigma}\right)^4}$
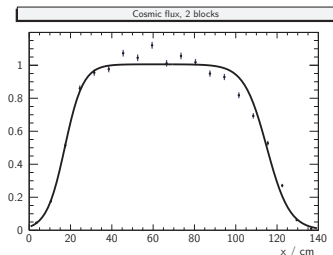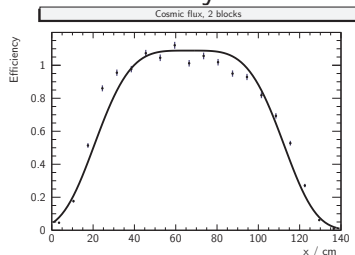

Cosmic flux, 2 blocks

Recap - Procedure

- Generate true efficiency histogram according to a range of different values of σ (see left)
- Create a real histogram by smearing the positions of these points with an additional time resolution (see right)
- Take the ratio of these two histograms
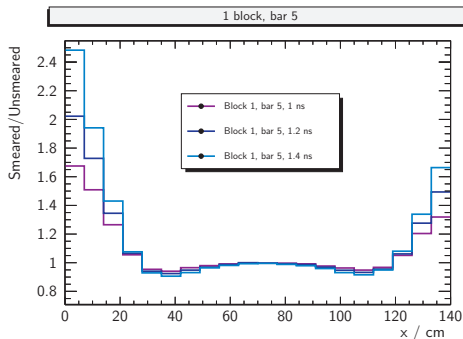- Weight events by this ratio

New efficiency function

- However the flat-topped Gaussian does not represent the data in some key ways
- It assumes the efficiency falls equally at either end of the bar (differences in light collection and PMT efficiency mean this is not true)
- Instead, fit two sigmoids multiplied together

$$A \times \frac{1}{1 + e^{-k_1(x - x_{0,1})}} \times \frac{1}{1 + e^{-k_2(x - x_{0,2})}}$$

Further changes

- Now, fit the new function to the cosmic data for each bar individually
- Use these parameters for each bar to generate the smeared and unsmeared histograms
- Left is the smearing histogram for one bar
- In the process of fine-tuning parameters to match data and MC spatial distributions