

Beam paper update

Seb Jones

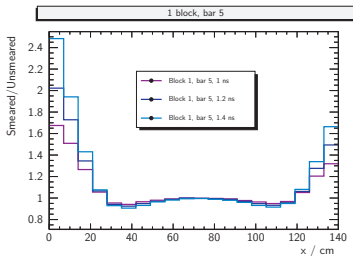
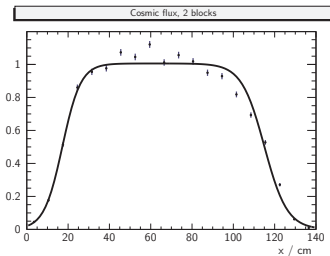
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Paper update

- New draft of beam paper available on Overleaf at <https://www.overleaf.com/project/5be9b39667be113d97d7b7f0> – will post link and PDF in #beampaper as well
- This week, updated efficiency section to better reflect the efficiency correction using cosmics
- Since last round of comments there have been a lot of changes with additional information/clarification in all sections
- Still a few unresolved marked todos in paper – proton MC stuff mainly, Toby will add on Monday or Tuesday

Recap



- Trying to remove/account for effects of finite time resolution when measuring bar efficiencies
- General idea: take some functional form motivated by the measured bar efficiencies then apply smearing in toy MC
- Comparing smeared and unsmeared distributions (see right) should leave us able to determine true smearing histogram

Moving towards true efficiency

- The functional form chosen is two sigmoids multiplied together

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

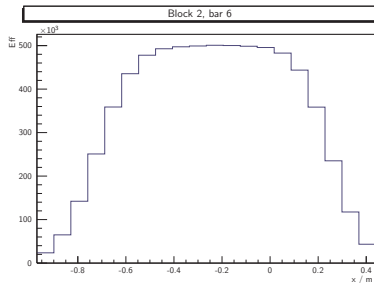
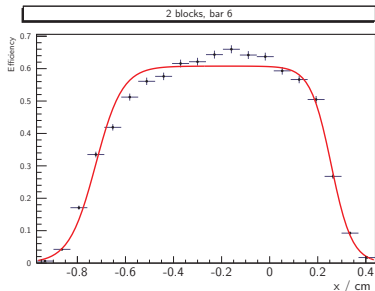
- Can fit this function to each of the bar efficiency histograms – get parameters out
- This histogram is the true efficiency smeared by the time resolution
- We want to find that functional form that, when smeared by some resolution gives *these* parameters – i.e. the true efficiency

Procedure

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

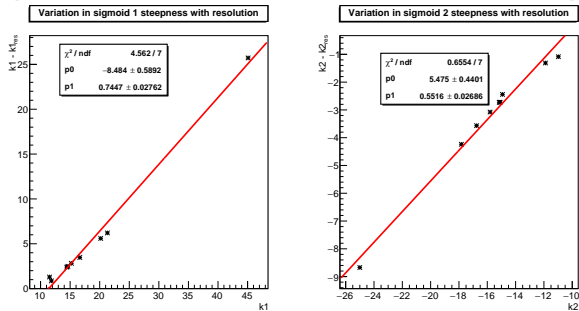
- Take the measured efficiency distributions for each bar and fit the above function to get a set of parameters
- Smear this distribution by an additional 1 ns, then fit the same function to this
- Compare parameter values – should allow us to generate functional form of true efficiency

Example histograms



- Left – data with function form fitted
- Right – functional form with additional smearing applied

Relationship between smeared and unsmeared parameters

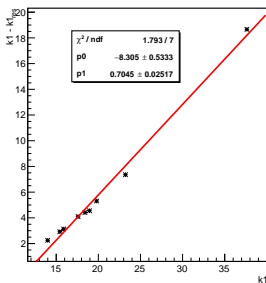


$$A \times \frac{1}{1 + e^{-k_1(x-x_{0,1})}} \times \frac{1}{1 + e^{-k_2(x-x_{0,2})}}$$

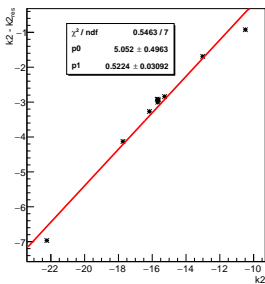
- Steepness controlled by k_n
- Not sure I understand why the slope value varies between sides

Relationship between smeared and unsmeared parameters

Variation in sigma 1 steepness with resolution



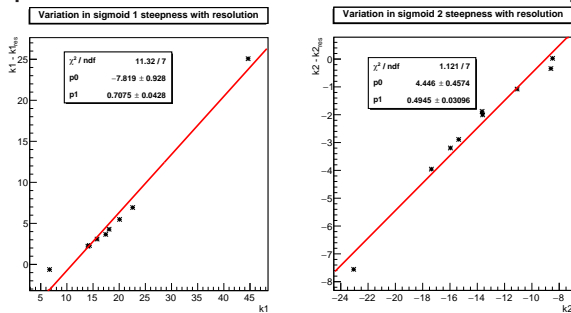
Variation in sigma 2 steepness with resolution



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

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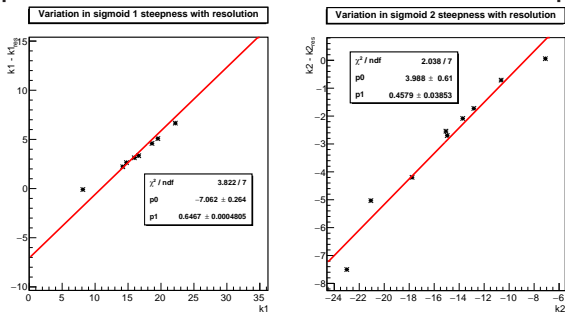
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$$A \times \frac{1}{1 + e^{-k_1(x-x_{0,1})}} \times \frac{1}{1 + e^{-k_2(x-x_{0,2})}}$$

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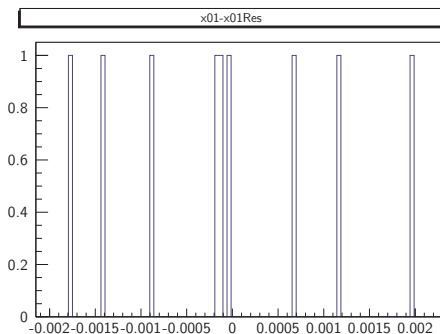
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Conclusion



- Little variation in other parameters observed with smearing
- Should be able to work back from the relationships shown on previous slides to get to 'true' efficiency distributions