

HyCal Density Correction

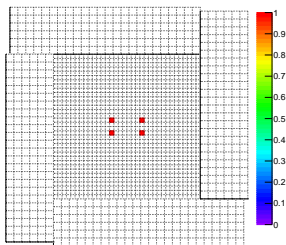
Maxime Levillain

November 3, 2017



Reconstruction Correction

- ▶ Method and functions taken from A. A. Lednev, NIM Physics Research A 366 (1995) 292-297
- ▶ correction of reconstruction on the variable
$$x_0 = (x_{rec} - x_{center}) / size_{cell}$$
- ▶ corrected variable $x = x_0 + c(x_0)$
- ▶ summation of 4 symmetrical modules to cancel out the physical distribution shape both in x and y coordinates

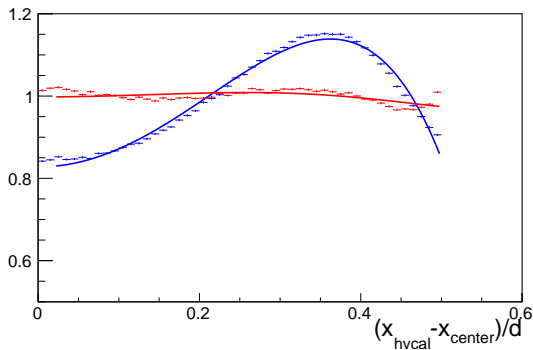


Correction Function

$$c(x_0) = a \cdot x_0 \cdot (x_0^4 + b \cdot x_0^2 + c) \cdot (x_0^2 - 1/4) \cdot (x_0^2 - q) \quad (1)$$

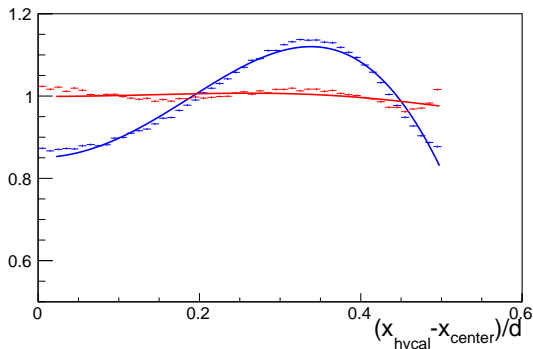
- ▶ density function: $f_{X_0}(x_0) = 1 + c'(x_0)$
- ▶ Fit raw density function between 0 and 1/2 with: $1 + c'(x_0)$

Results around ep peak at 2 GeV close to center



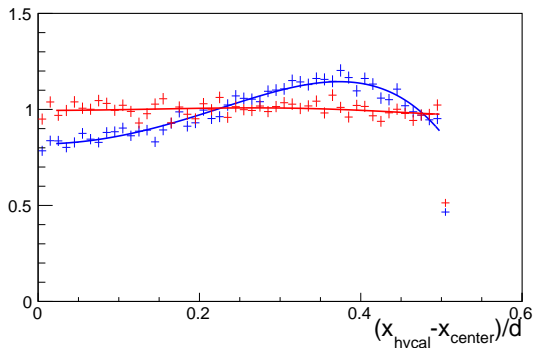
- ▶ Need big corrections near center (due to center hole)
- ▶ Correction not completely flat, but fit cannot go further

Results around *moller* peak at 2 GeV close to center



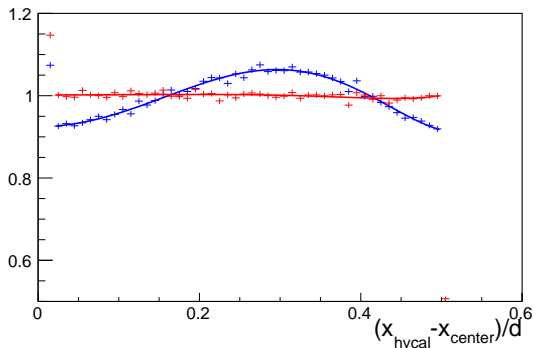
- ▶ Need big corrections near center (due to center hole)
- ▶ Correction not completely flat, but fit cannot go further

Results around ep peak at 2 GeV middle crystal



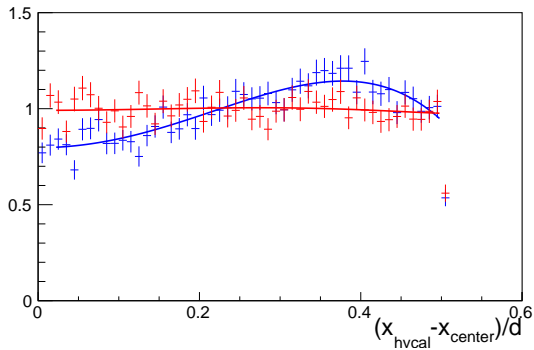
- ▶ Good results for crystal

Results around *moller* peak at 2 GeV middle crystal



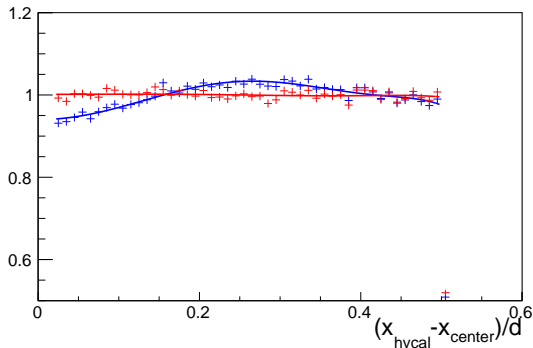
- ▶ Good results for crystal

Results around ep peak at 2 GeV further crystal



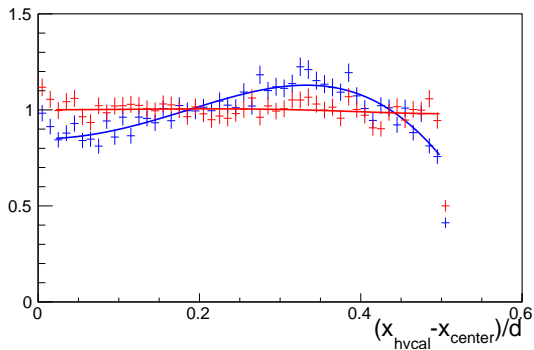
- Needs less correction for further modules

Results around *moller* peak at 2 GeV further crystal

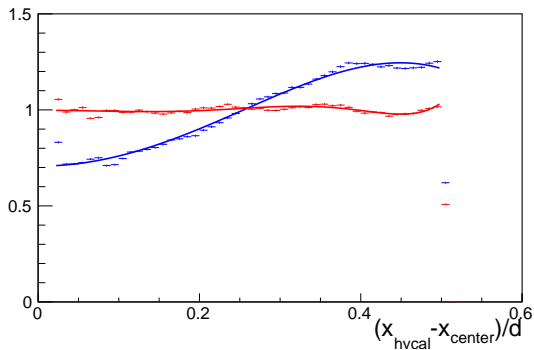


- Needs less correction for further modules

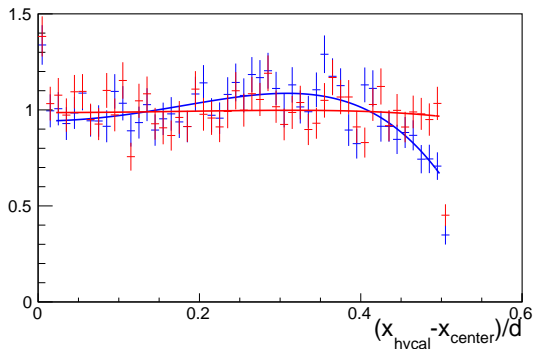
Results around ep peak at 2 GeV inner Ig



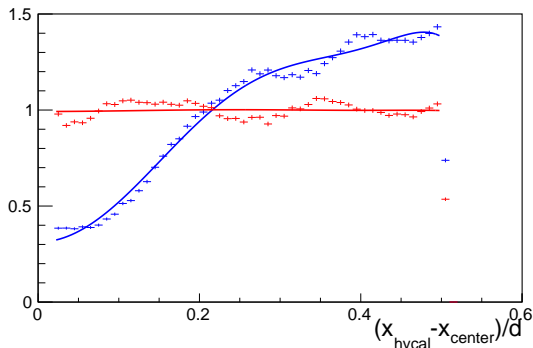
Results around *moller* peak at 2 GeV inner lg



Results around ep peak at 2 GeV outer lg



Results around *moller* peak at 2 GeV outer lg



- ▶ Strange shape due to edge of HyCal
- ▶ Still some efficient correction

To Do

- ▶ Test if it improves GEM matching efficiency