

# Track matching efficiency

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$e\gamma$  Meeting

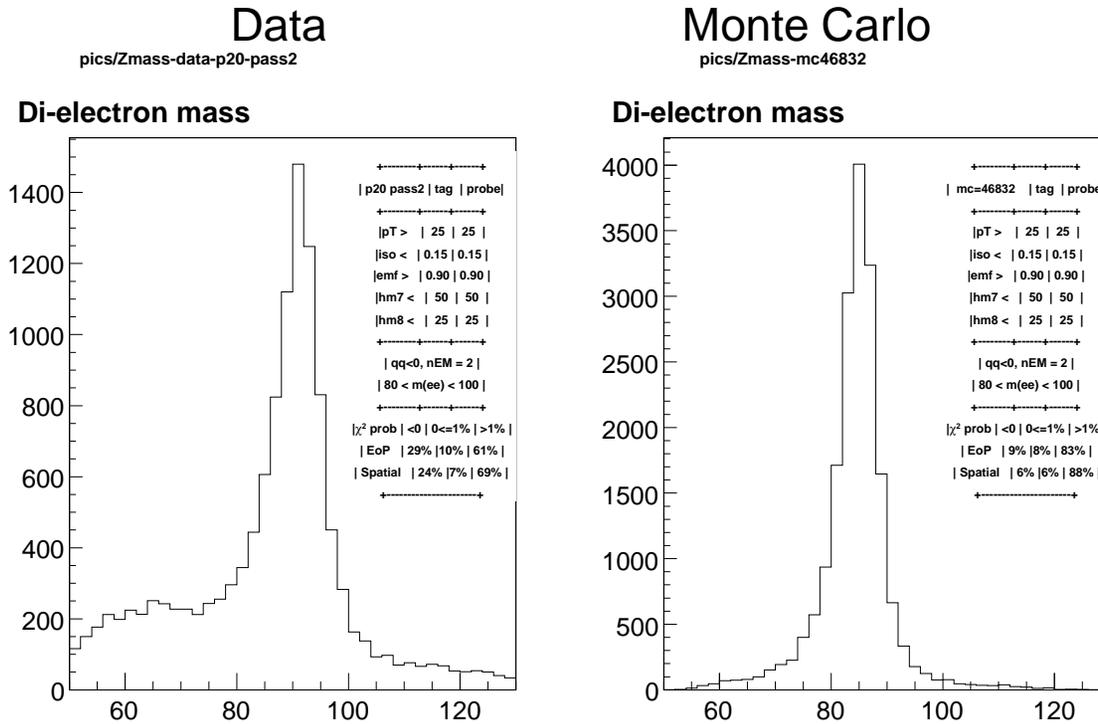
[http://www-d0.fnal.gov/~rakitin/d0\\_private/tex/2007.May.08.egamma/tr.pdf](http://www-d0.fnal.gov/~rakitin/d0_private/tex/2007.May.08.egamma/tr.pdf)



- I am going to show a few distributions from data (p20 pass2) and MC (req.id 46832)
- I select events with exactly two EM clusters
- Cuts (on both clusters):
  - $p_t > 25 \text{ GeV}/c^2$
  - $\text{iso} < 0.10$
  - $\text{emfrac} > 0.95$
  - $\text{HM7} < 50$
  - $\text{HM8} < 25$
  - Only use events with  $80 \text{ GeV}/c^2 < m(ee) < 100 \text{ GeV}/c^2$  (should be different for MC?)
- Divide all clusters into three categories:
  - Well-matched to tracks ( $\chi^2$  prob  $> 0.01$ )
  - Badly-matched to tracks ( $0.01 \geq \chi^2$  prob  $\geq 0$ )
  - Non-matched to tracks ( $\chi^2$  prob  $< 0$ )



# Z mass

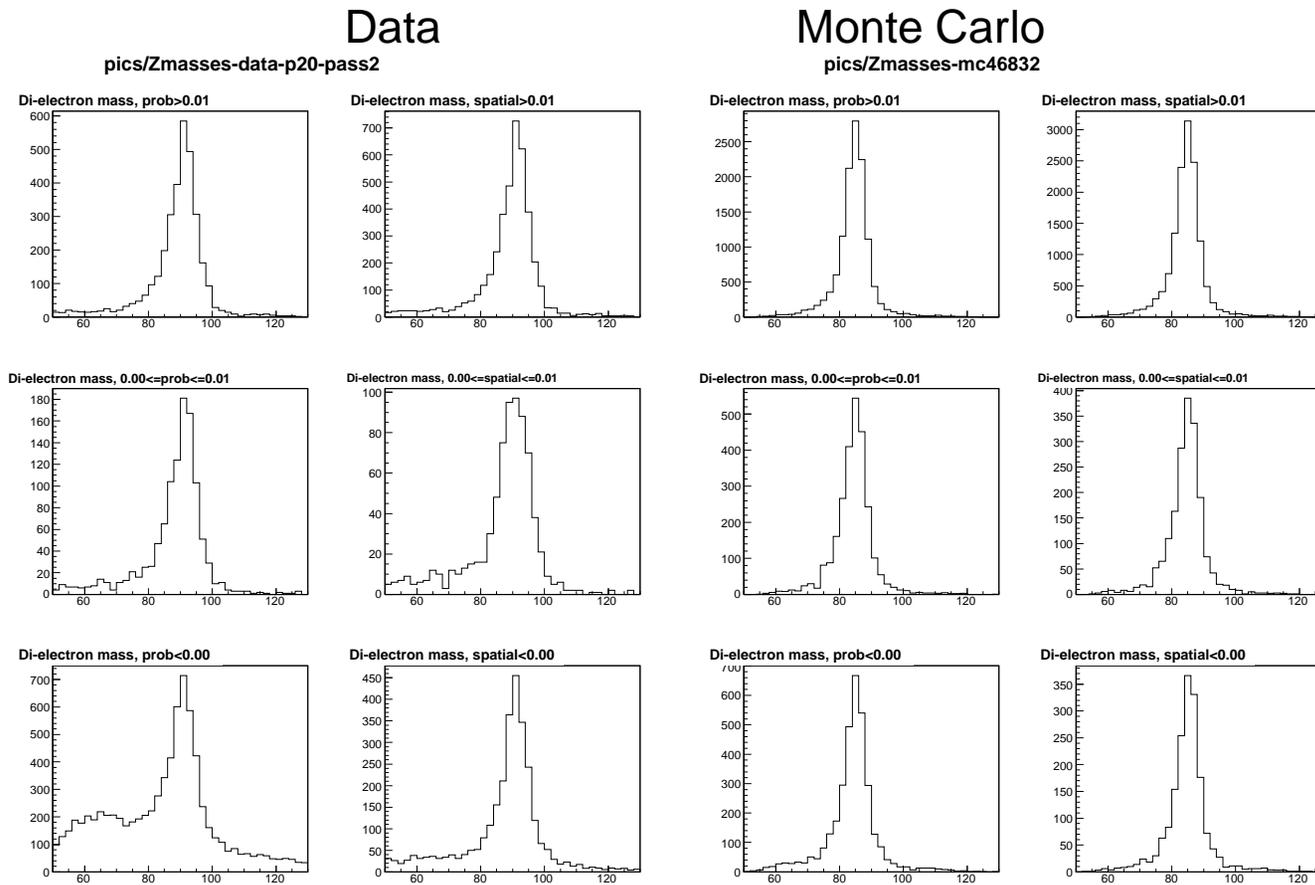


- Monte Carlo Z is lighter than the data one
- Percentages are simply numbers of events with  $80 \text{ GeV}/c^2 < m(ee) < 100 \text{ GeV}/c^2$  (I neglect background)

$\chi^2$	prob < 0 data/MC	$0 \leq \text{prob} \leq 0.01$ data/MC	prob > 0.01 data/MC
E over p	29%/9%	10%/8%	61%/83%
Spatial	24%/6%	7%/6%	69%/88%



# Z mass for three categories



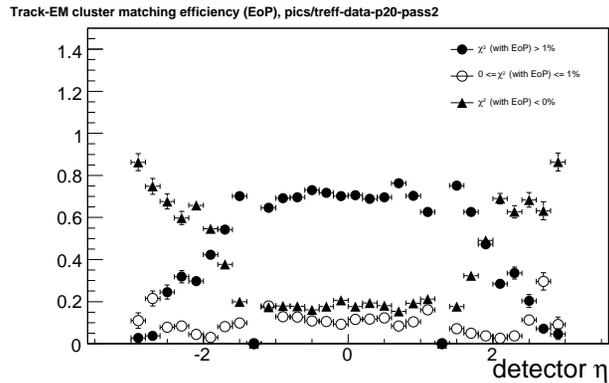
I neglect background even for non-matched tracks for the sake of simplicity



# Track-matching efficiency

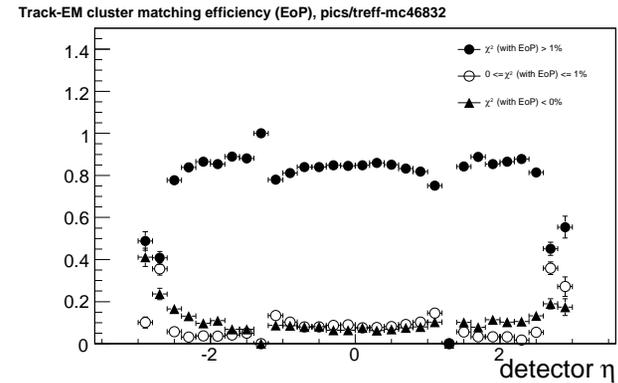
Data

pics/treff-data-p20-pass2

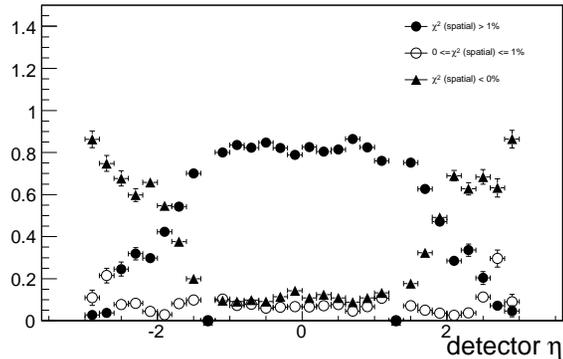


Monte Carlo

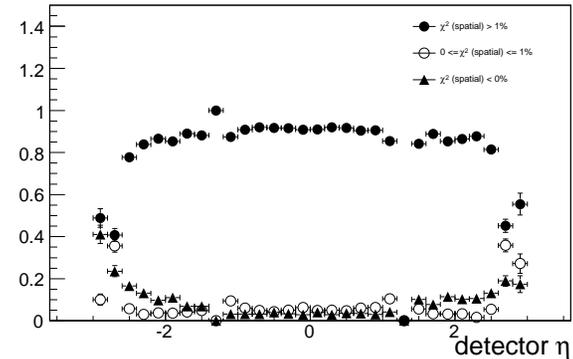
pics/treff-mc46832



Track-EM cluster matching efficiency (Spatial), pics/treff-data-p20-pass2



Track-EM cluster matching efficiency (Spatial), pics/treff-mc46832



Track-matching efficiency is lower for the data in region  $|\eta| > 1$

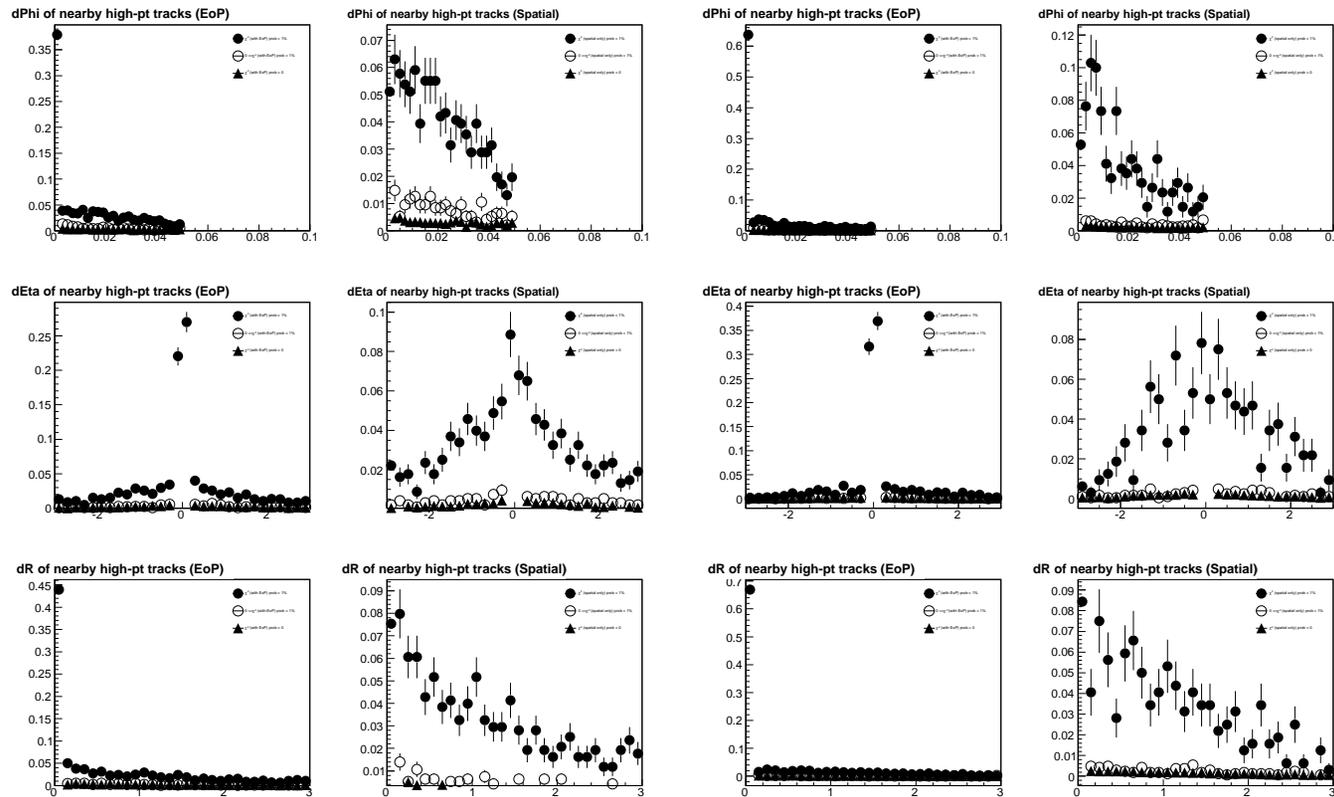


# $\Delta\phi$ , $\Delta\eta$ and $\Delta R$

High-pt ( $p_t > 5 \text{ GeV}/c$ ,  $p_t/E_t > 0.7$ ) tracks around ( $\Delta\phi < 0.05$ ) EM clusters:

Data

Monte Carlo



We see that skipping  $E/p$  in track matching leads to...

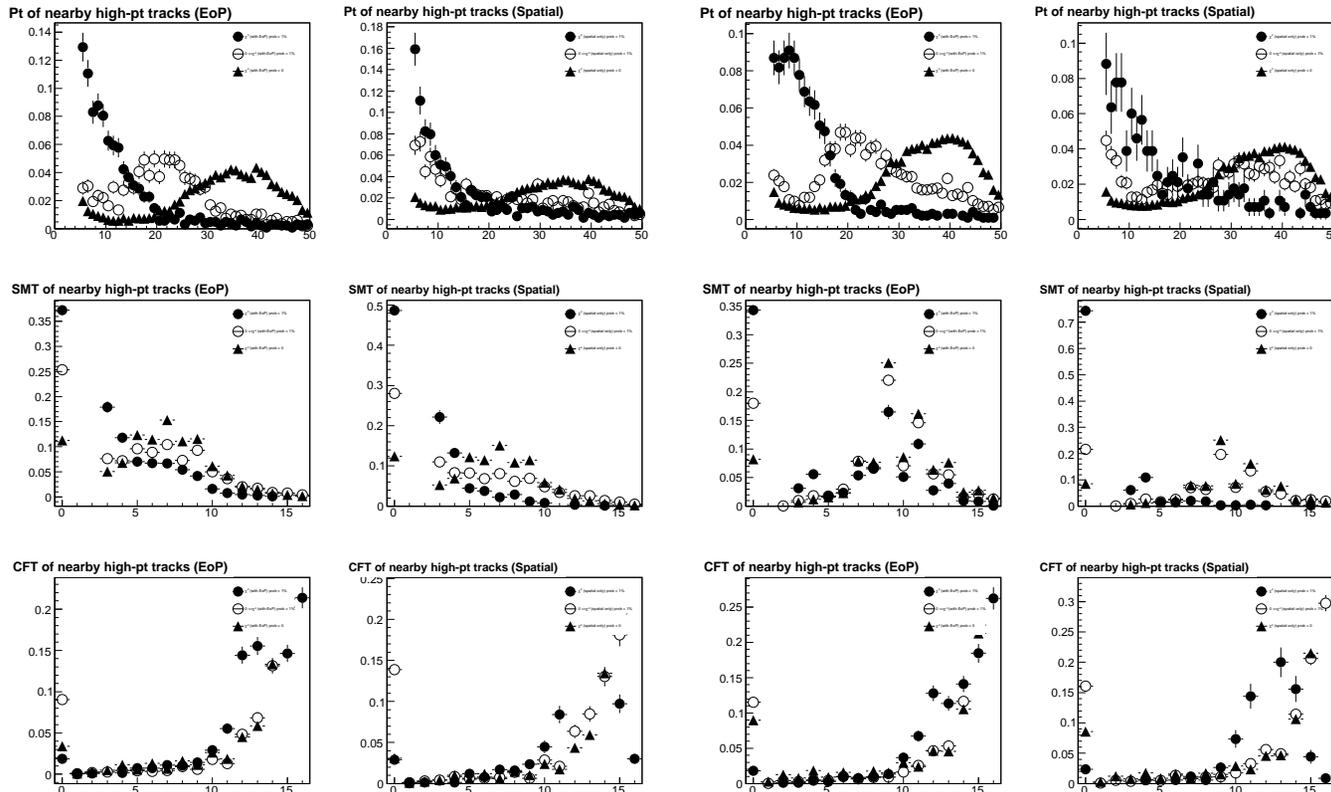


# $p_t$ and SMT/CFT hit distributions

High-pt ( $p_t > 5 \text{ GeV}/c$ ,  $p_t/E_t > 0.7$ ) tracks around ( $\Delta\phi < 0.05$ ) EM clusters:

Data

Monte Carlo



- Badly-matched clusters have no bump at high pt
- Non-matched clusters have a bump at high pt - consisting of non-matched tracks
- Distribution of SMT hits are similar
- Distribution of CFT hits are harder to explain

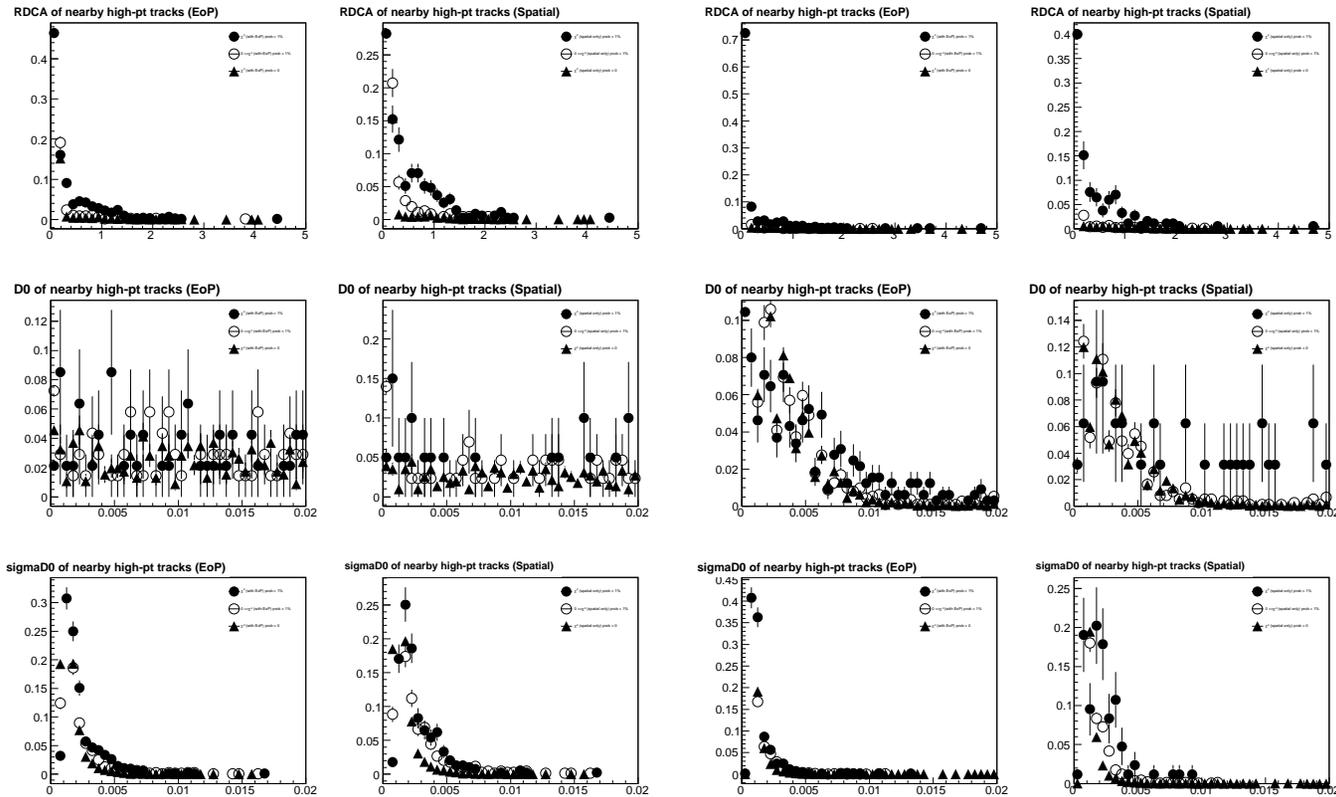


# Impact parameter and error on it

High-pt ( $p_t > 5 \text{ GeV}/c$ ,  $p_t/E_t > 0.7$ ) tracks around ( $\Delta\phi < 0.05$ ) EM clusters:

Data

Monte Carlo



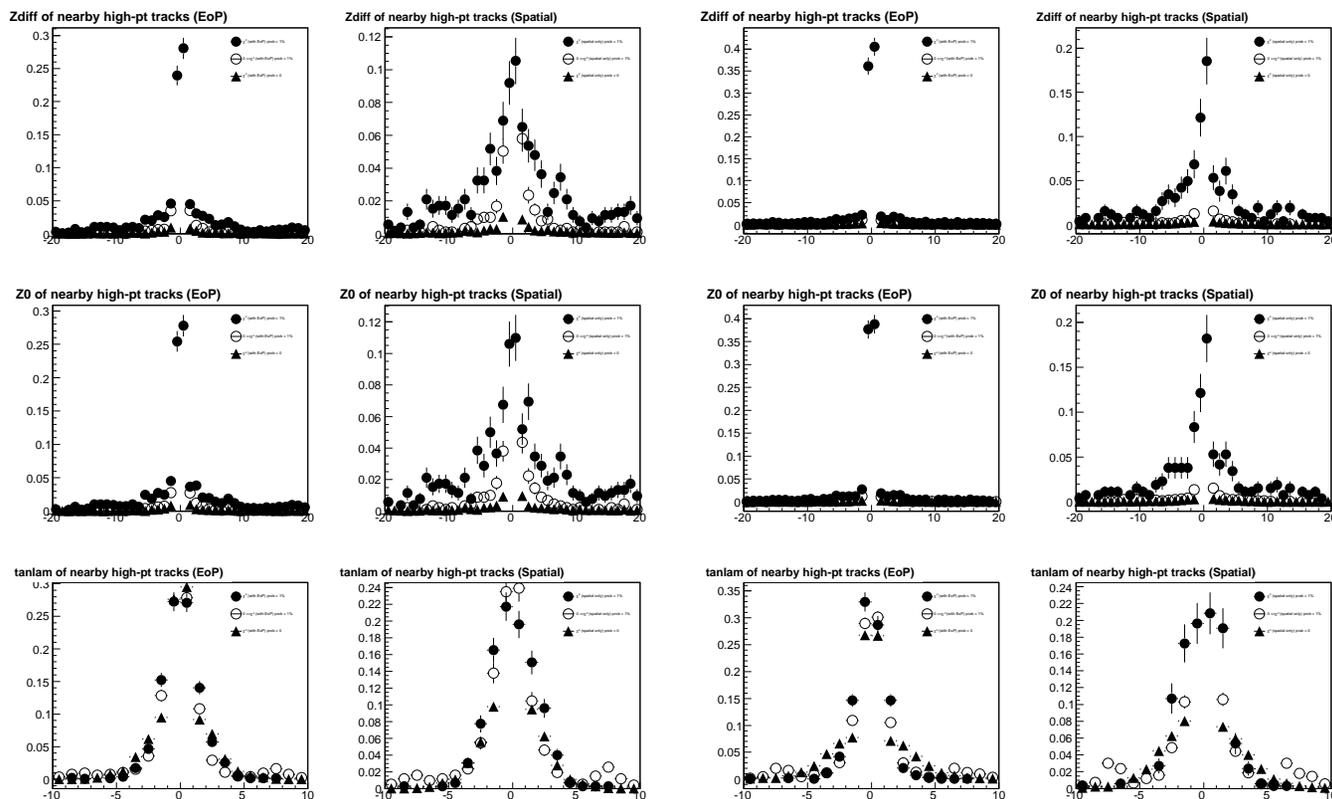


# z of tracks and $\tan \lambda$

High-pt ( $p_t > 5 \text{ GeV}/c$ ,  $p_t/E_t > 0.7$ ) tracks around ( $\Delta\phi < 0.05$ ) EM clusters:

Data

Monte Carlo





# Conclusion:



- ...