2016 data: profile plots with best aligned geometry (so far)

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2016 data @ 0.5 mm
Moller and FEE analysis with Sho's cuts

- One good detector chosen (my reference: v5-21)
- In reconstruction: fixed beamspot (0,0) and z_{target}=0
  - This means: z_{vtx} still wrong

- Purpose
  - analyse Moller pairs and FEE tracks with the same cuts applied by Sho for 2015 data (changing scale where needed)
  - Check consistency with 2015 results and internal consistency

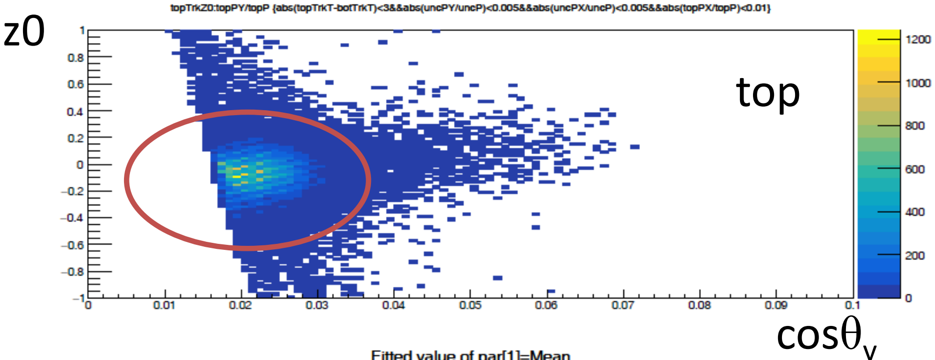
- Input: FEE and Moller ntuple out of the reconstruction
  - Checked by Miriam: no double corrections
  - Outputs in mm! (while hps-java gets offsets in cm… a ittle misunderstanding of scale)

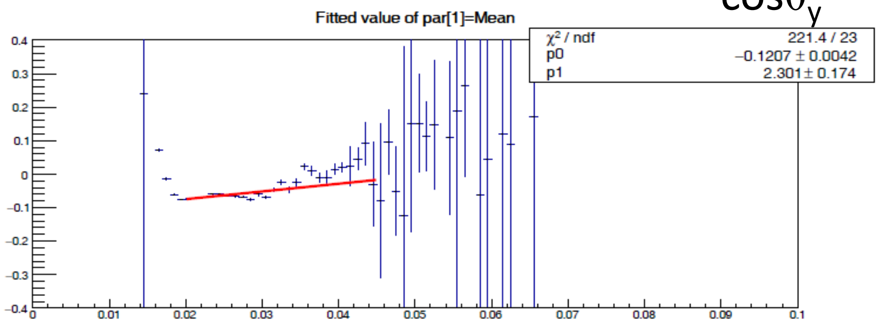
Moller events: common cuts

- Top-bottom track time:
  - |topTrkT-botTrkT|< 3 ns

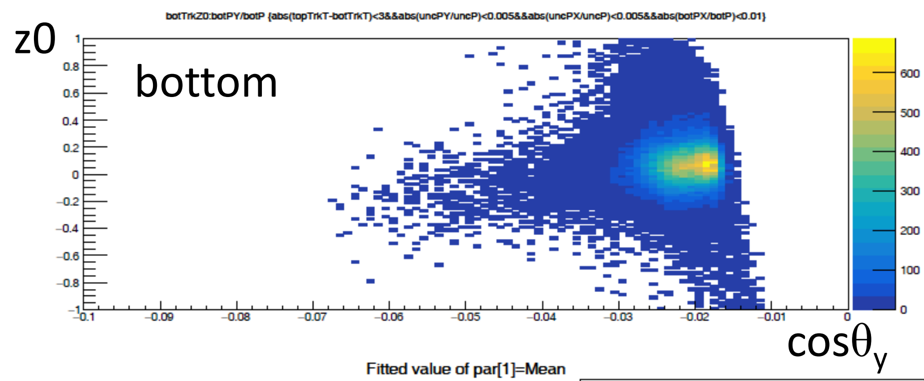
- Tracks in detector acceptance (close to z axis):
  - Large θ_x angle for tracks (from unconstrained and fitted momentum):
    - |uncPX/uncP|<0.005
    - |topPX/topP|<0.01 (same for bottom)
  - Large θ_y angle (from unconstrained and fitted momentum):
    - |uncPY/uncP|<0.005

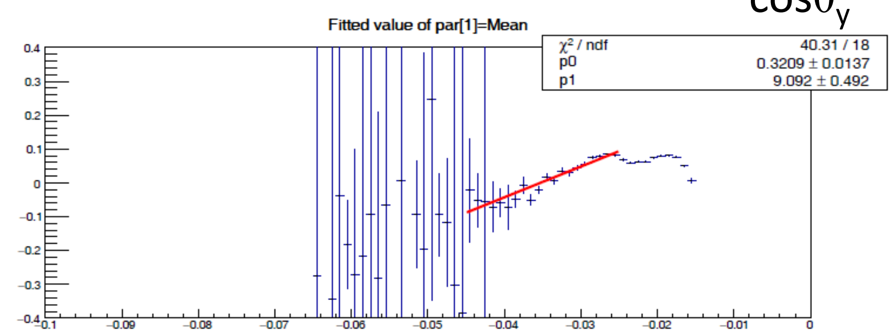
Moller evts: z_0 impact parameter vs $\cos\theta_y$





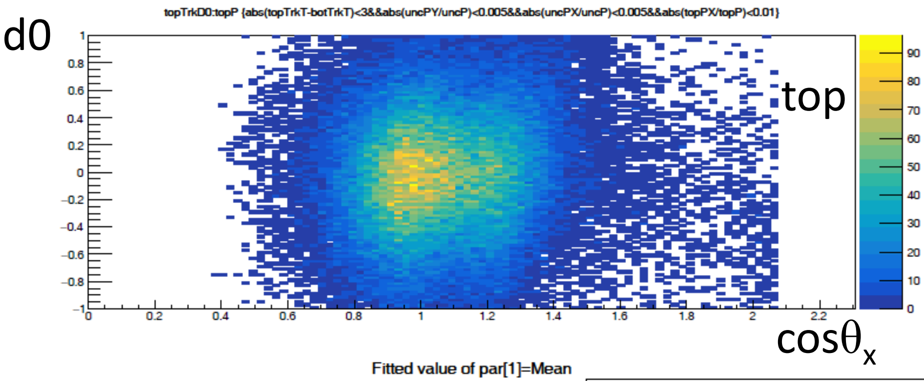
The TOP distribution has a less uniform structure (striped? Why only for top??) Some troubles with y coordinate reconstruction? (could be due to strip pitch by why not seen in both halves?)

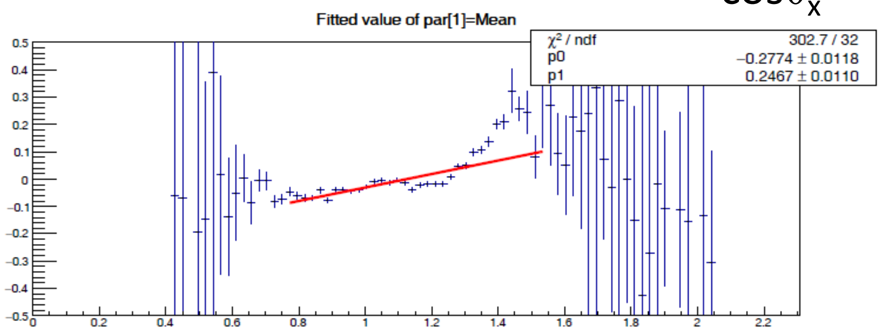




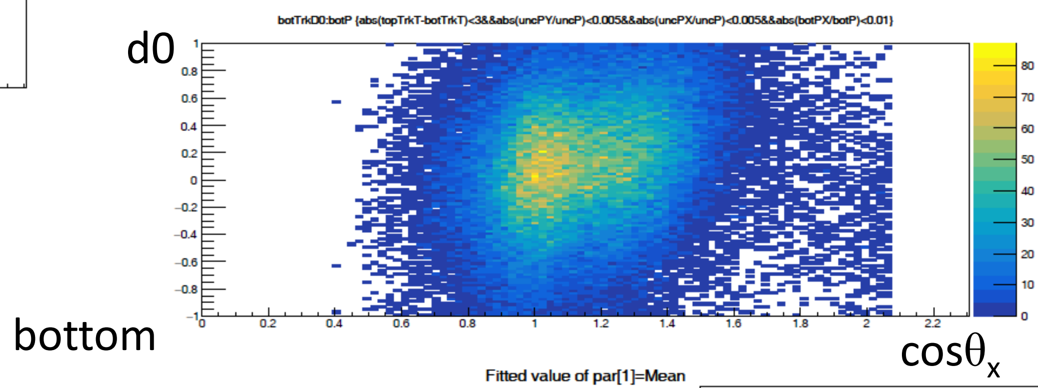
	Top	Bottom
P0	-0.12	0.32
P1	2.30	9.09

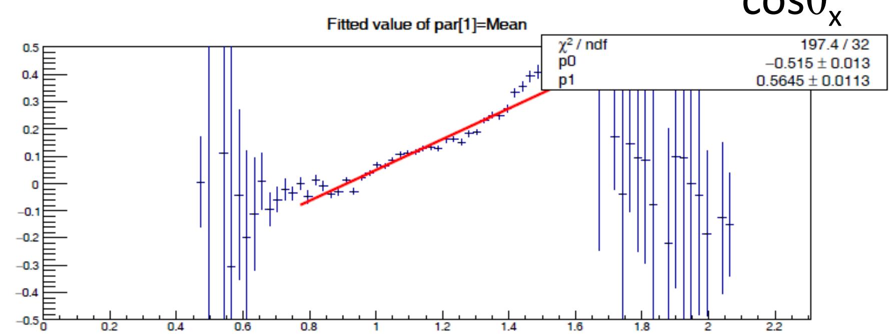
Moller evts: d_0 impact parameter vs $\cos\theta_y$





No structures seen (the problem is in the y coordinate!)





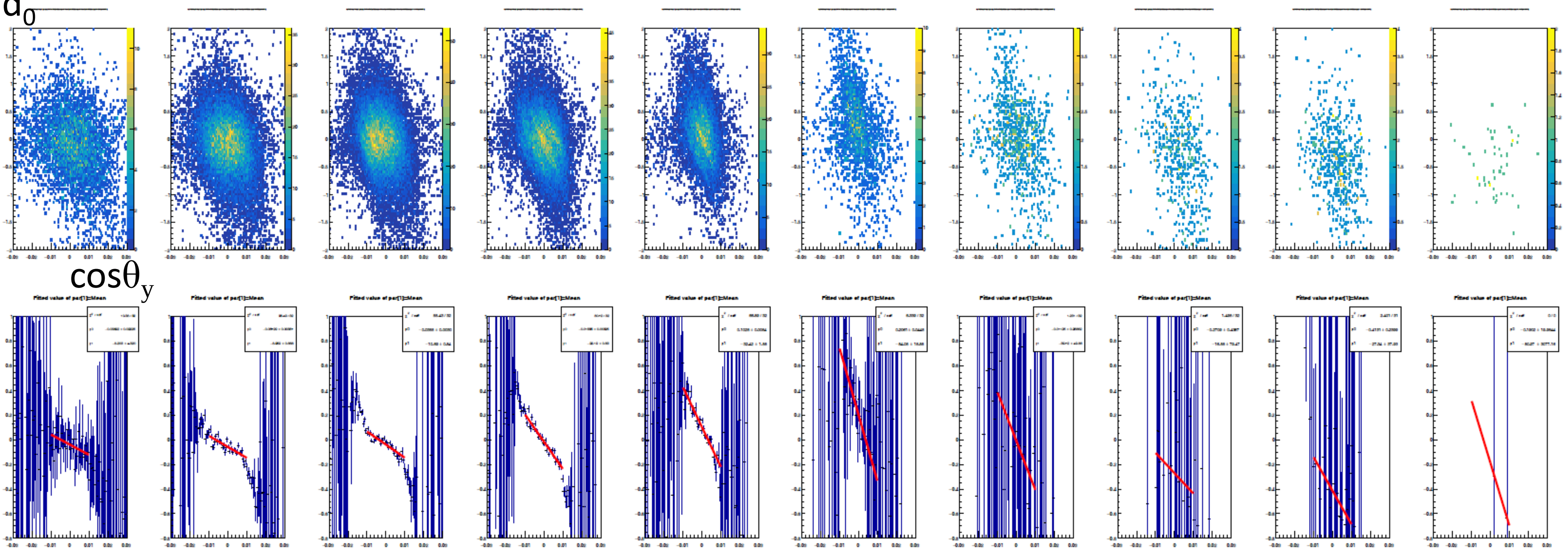
	Top	Bottom
P0	-0.28	-0.52
P1	0.25	0.56

Moller evts: d_0 impact parameter vs $\cos\theta_y$ in energy steps - TOP half

Selection in energy intervals 160 MeV wide from ~700 MeV
A dependence on energy should not be desirable (this would imply a dependence on acceptance)… but there is
Some sort of parabolic trend of d0 central value

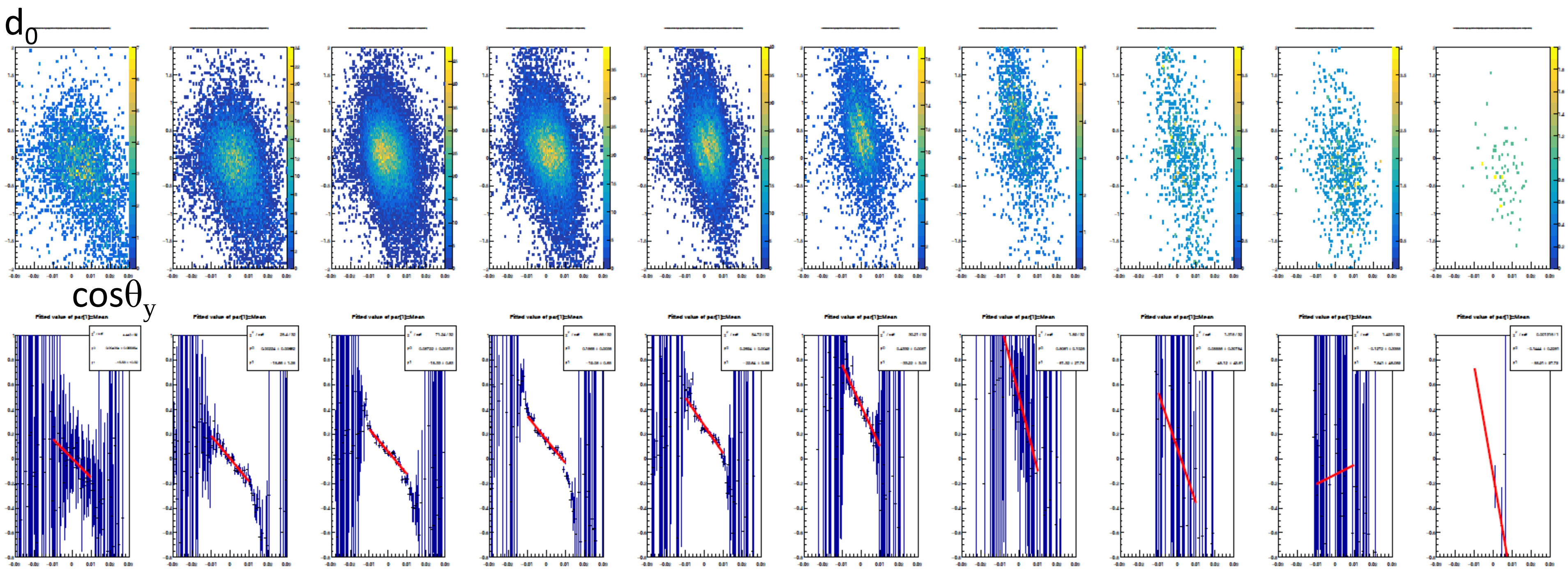
d_0

$\cos\theta_y$

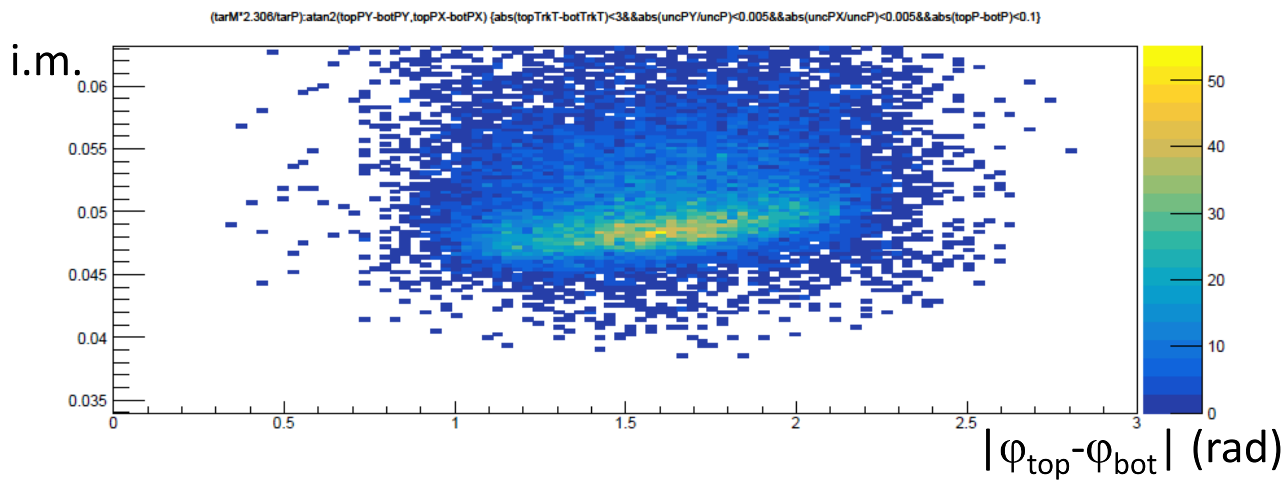


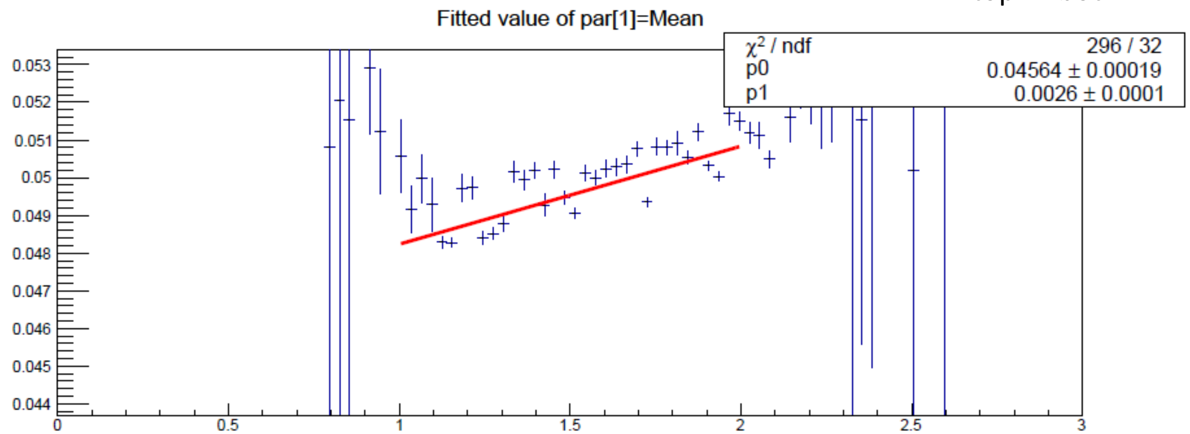
Moller evts: d_0 impact parameter vs $\cos\theta_y$ in energy steps- BOTTOM half

Selection in energy intervals 160 MeV wide from ~700 MeV



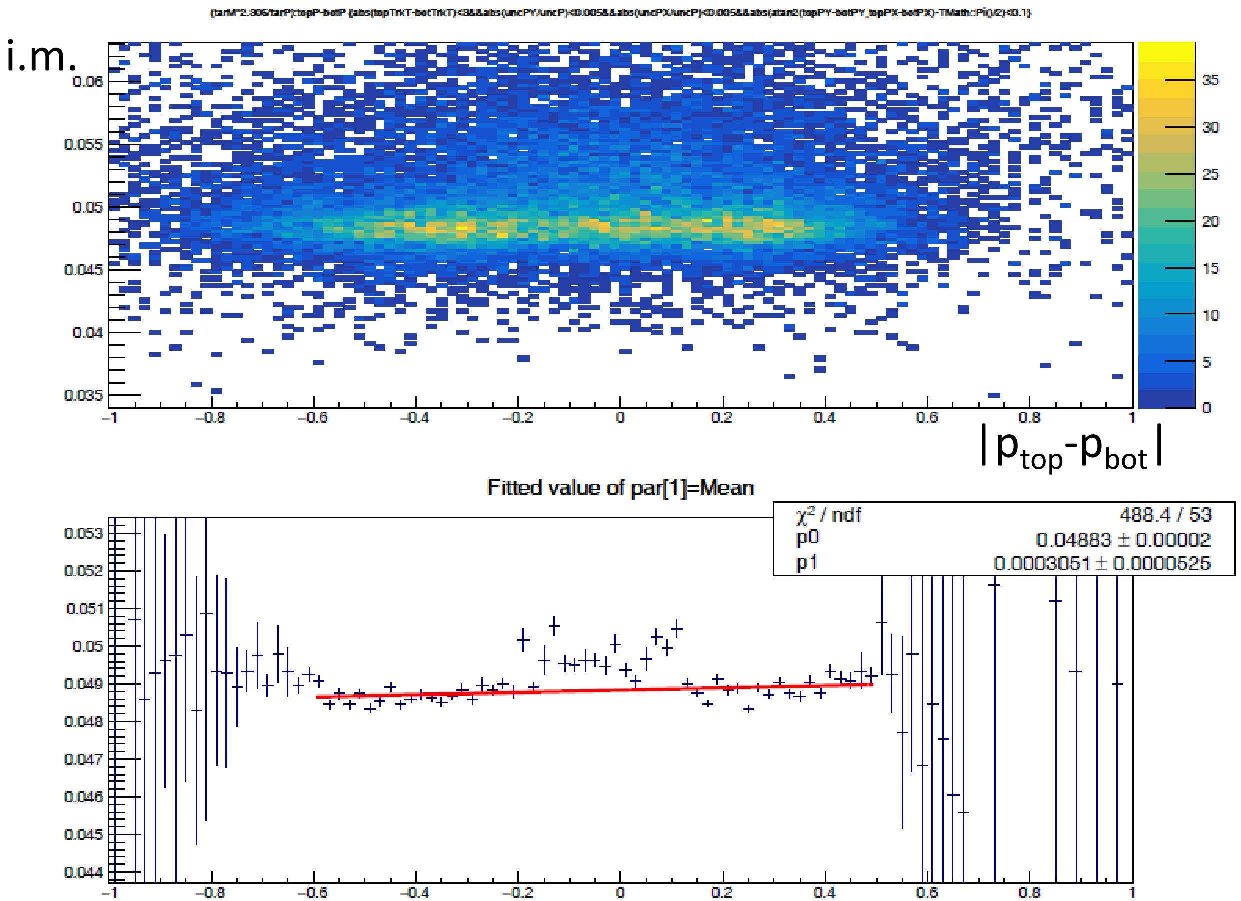
Moller evts: invariant mass (e^-e^-) vs $\Delta\varphi$ (opening angle between the two tracks)





When the tracks are at large azimuthal angles, the invariant mass of the electron pair is larger

Moller events: invariant mass (e^-e^-) vs Δp(top-bottom)



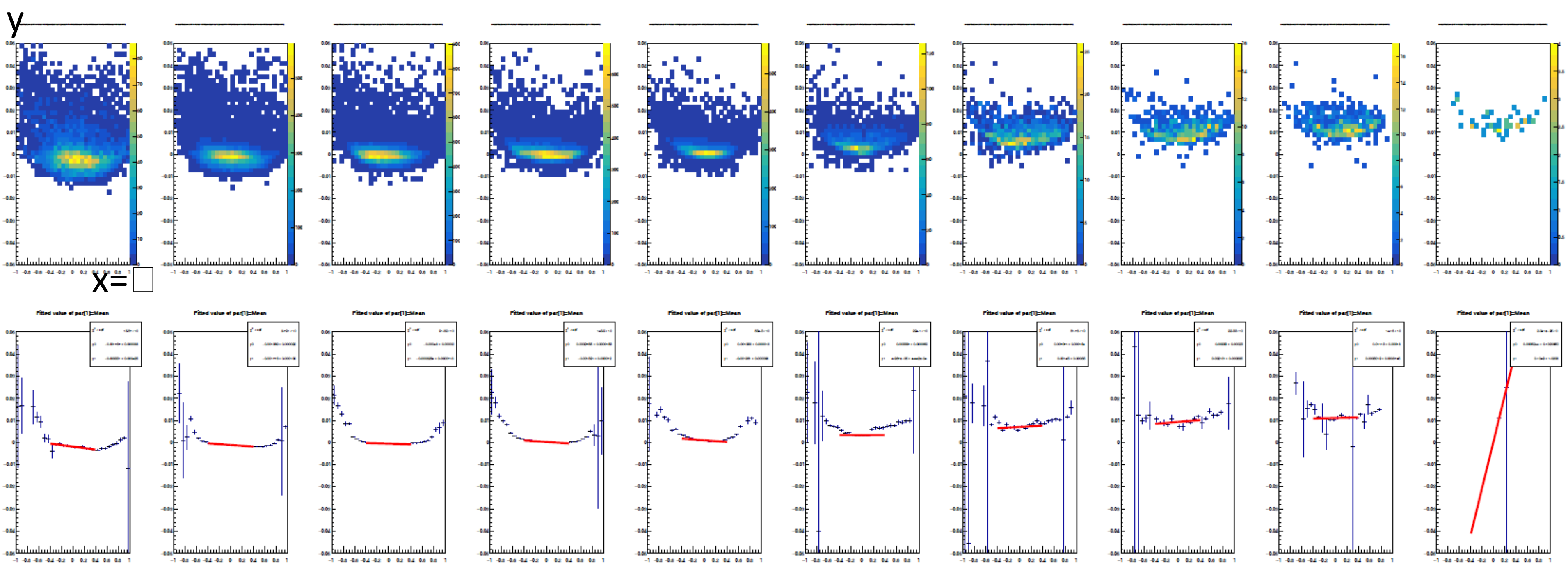
Flat enough to be happy enough

θ_z-θ (from Moller formula) vs φ in energy ranges – TOP half

Trend of dip angle correction as a function of the azimuth angle and energy

$$y = \arccos\theta_z - \arccos(1 - m_e(1/p - 1/E_b))$$

$$x = \arctan(p_y, p_x)$$



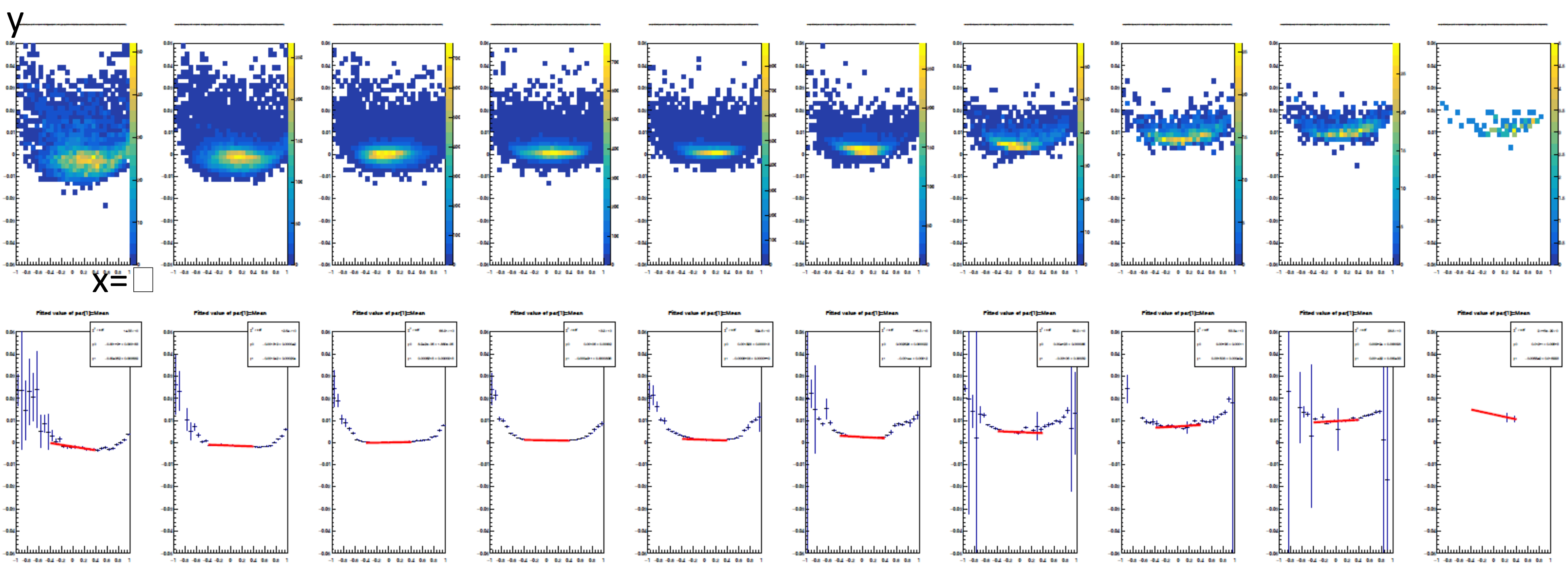
Selection in energy intervals 160 MeV wide from ~700 MeV

Flat enough

θ_z-θ (from Moller formula) vs φ in energy ranges – BOTTOM half

Selection in energy intervals 160 MeV wide from ~700 MeV

Flat enough

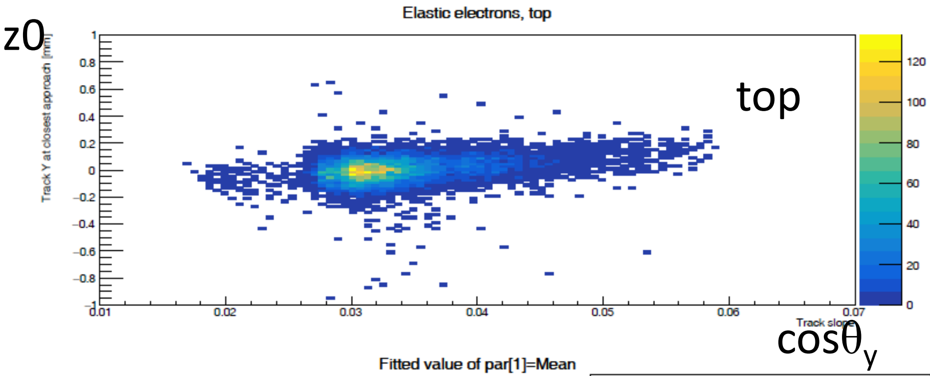


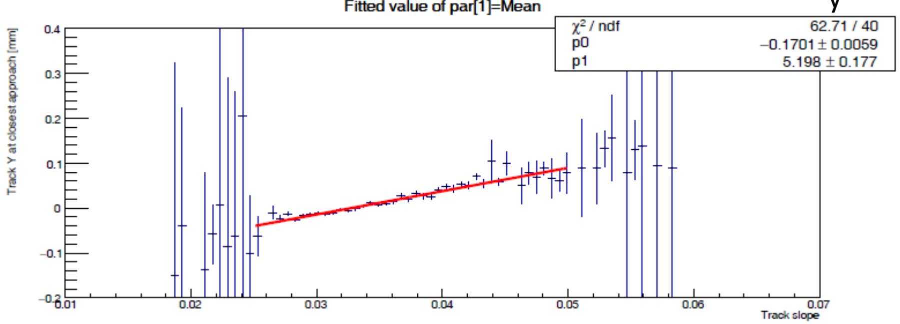
FEE events: common cuts

- Trigger:
  - isSingle0 || isSingle1
- Max number of hits per track:
  - fspTrkHits==6
- Ecal-svt match χ^2:
  - fspMatchChisq<3
- Ecal cluster energy: 85% Ebeam
  - fspClE < 0.85*Ebeam

- No cut of track fit quality (track χ^2 – I usually ask χ^2<20)

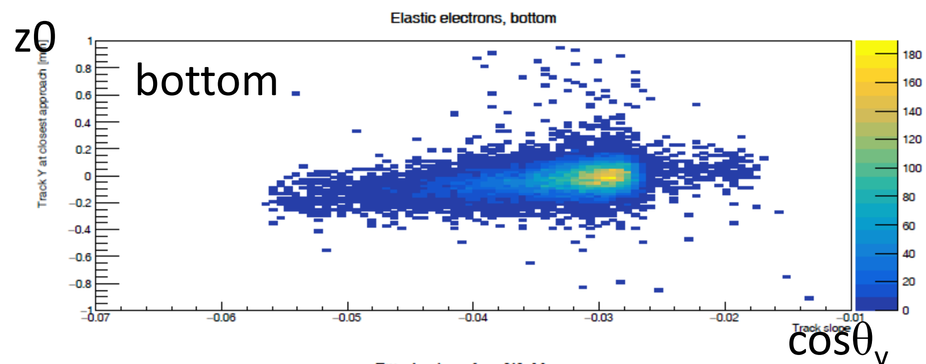
FEE: z_0 impact parameter vs $\cos\theta_y$

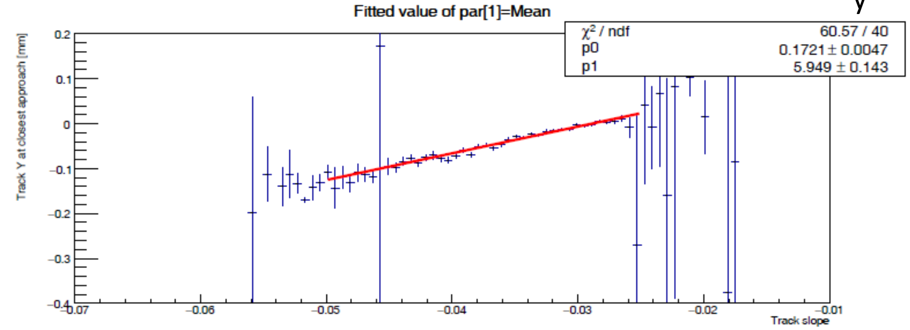




	Top	Bottom
P0	-0.17	0.17
P1	5.20	5.95

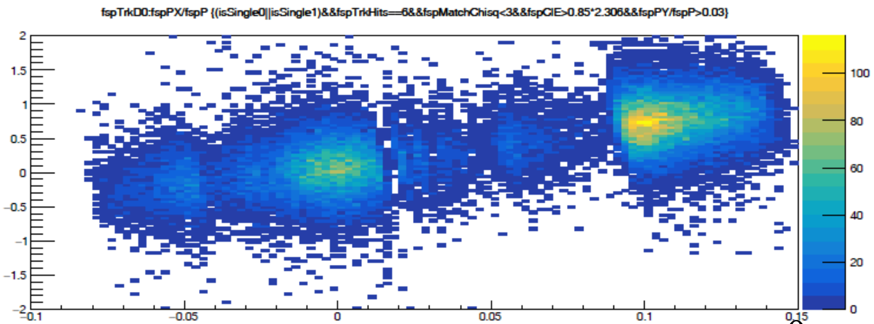
Use these values as z_{Tar} input for alignment?
(the "old famous" 5 mm…)





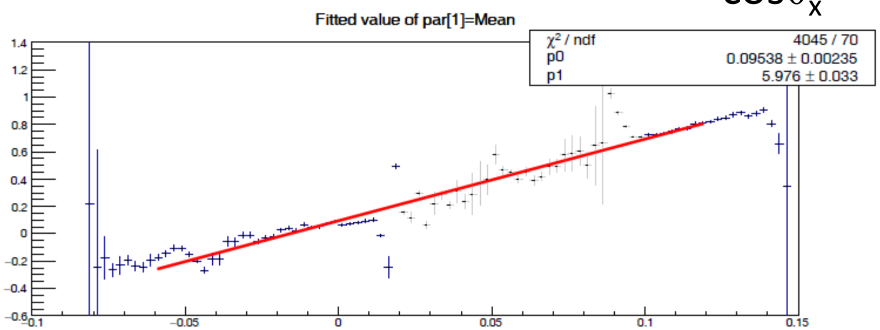
FEE: d_0 impact parameter vs $\cos\theta_x$

d0



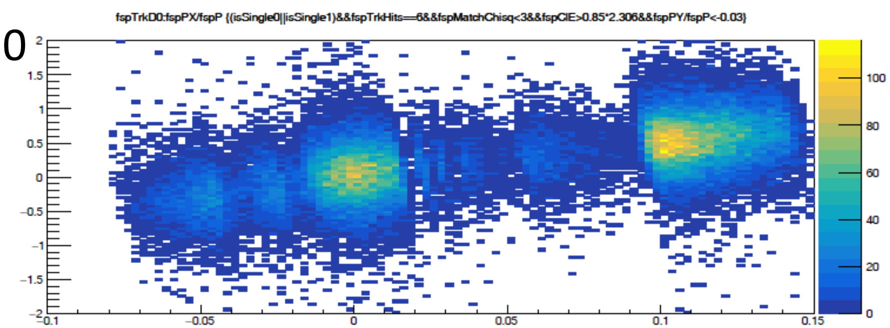
top

cosθx

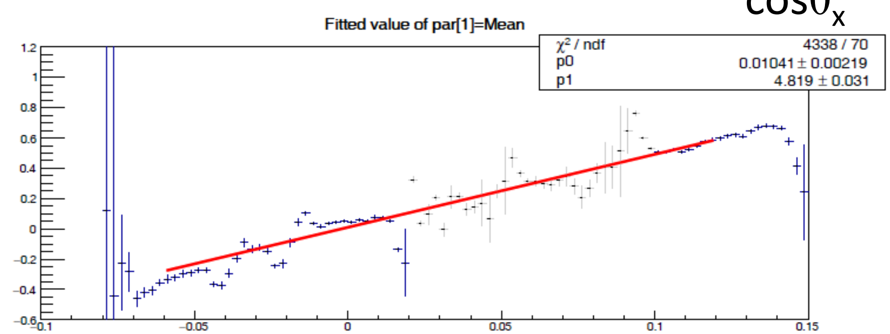


bottom

d0



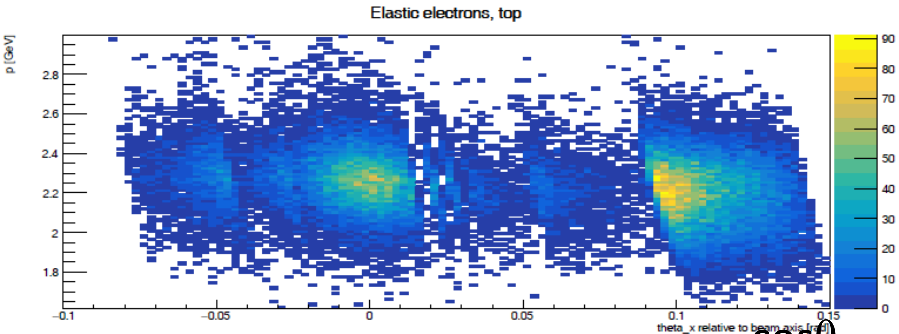
cosθx



	Top	Bottom
P0	0.1	0.01
P1	5.98	4.82

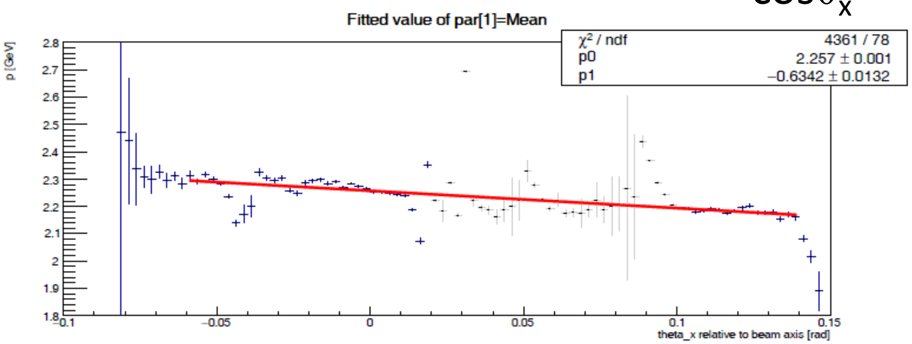
FEE: p vs cosθ_x

top

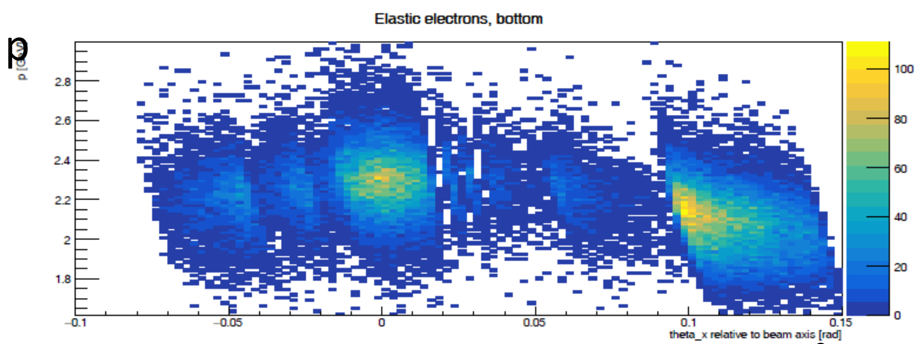


p

cosθ_x

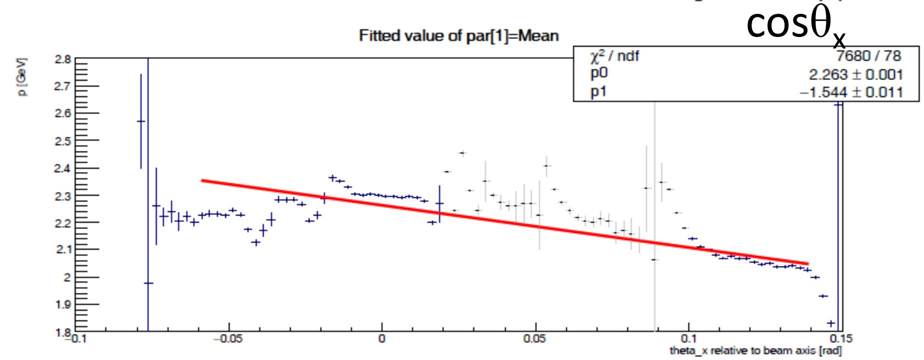


bottom



p

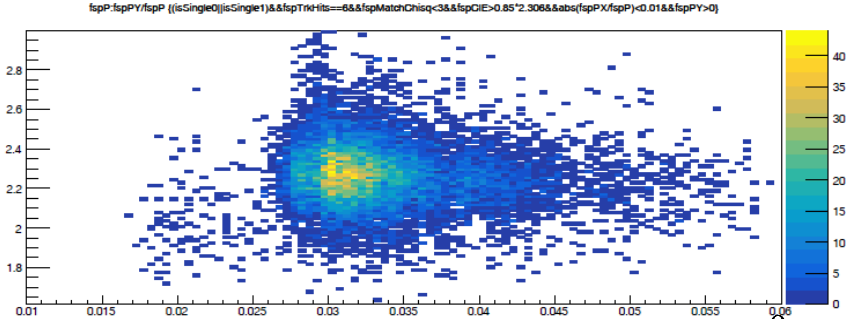
cosθ_x



	Top	Bottom
P0	2.26	2.26
P1	-0.63	-1.54

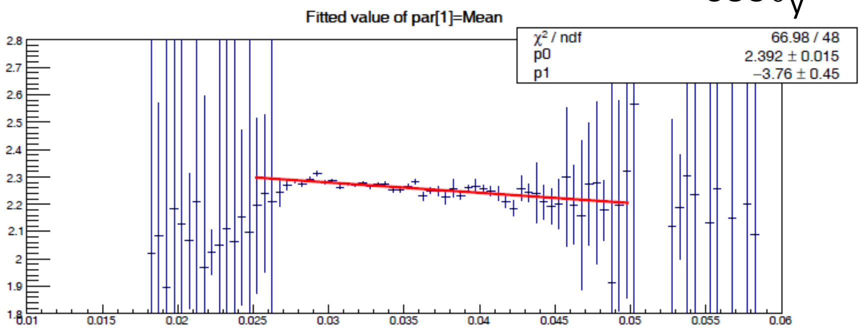
FEE: p vs $\cos\theta_y$

p



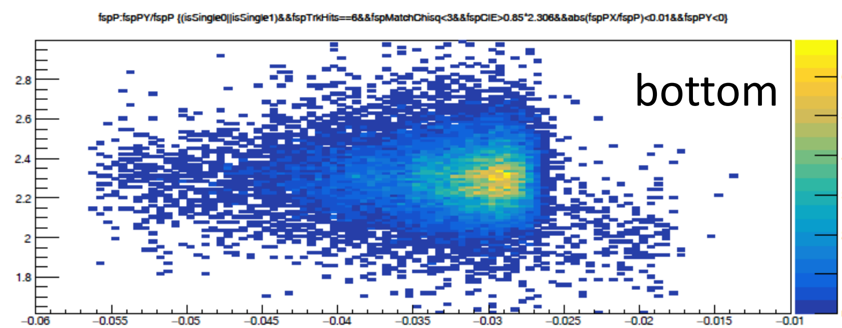
top

$\cos\theta_y$



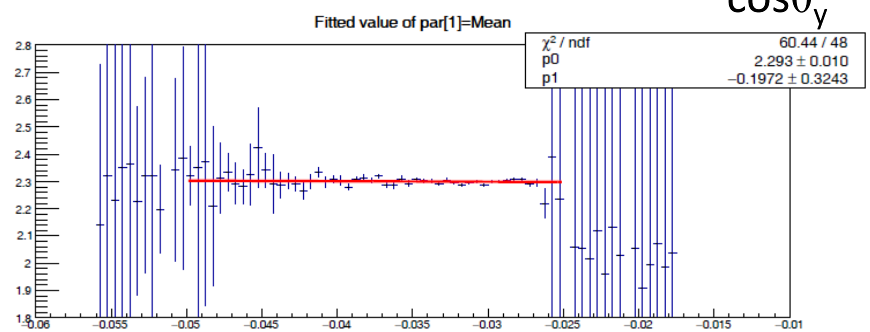
Electron side: fspPX/fspP<0.01
(hole side)

p



bottom

$\cos\theta_y$



	Top	Bottom
P0	2.39	2.93
P1	-3.76	-0.20

ToDo list

- FEE plots are the cleanest and reliable ones
  - Results are consistent with what was found for 2015 data
  - Both z_0 and d_0 scatter plots indicate the z_{Tar} is at about -5 mm

- Try to use the information from these plots to fix the position of the target (use the values provided by the scatter plots as offsets and check results)
  - Inserting the z_{tar} information as millepede global offset for z translations of all sensors is not particularly useful, as this offset is absorbed by other z alignment corrections
  - Check the effect on the reconstruction if the new target position is inserted in ReconParticleDriver