PRS μ, CPT week

CERN, Tuesday 4 November 2003

Update on new DT segment building

Stefano Lacaprara

Stefano.Lacaprara@pd.infn.it

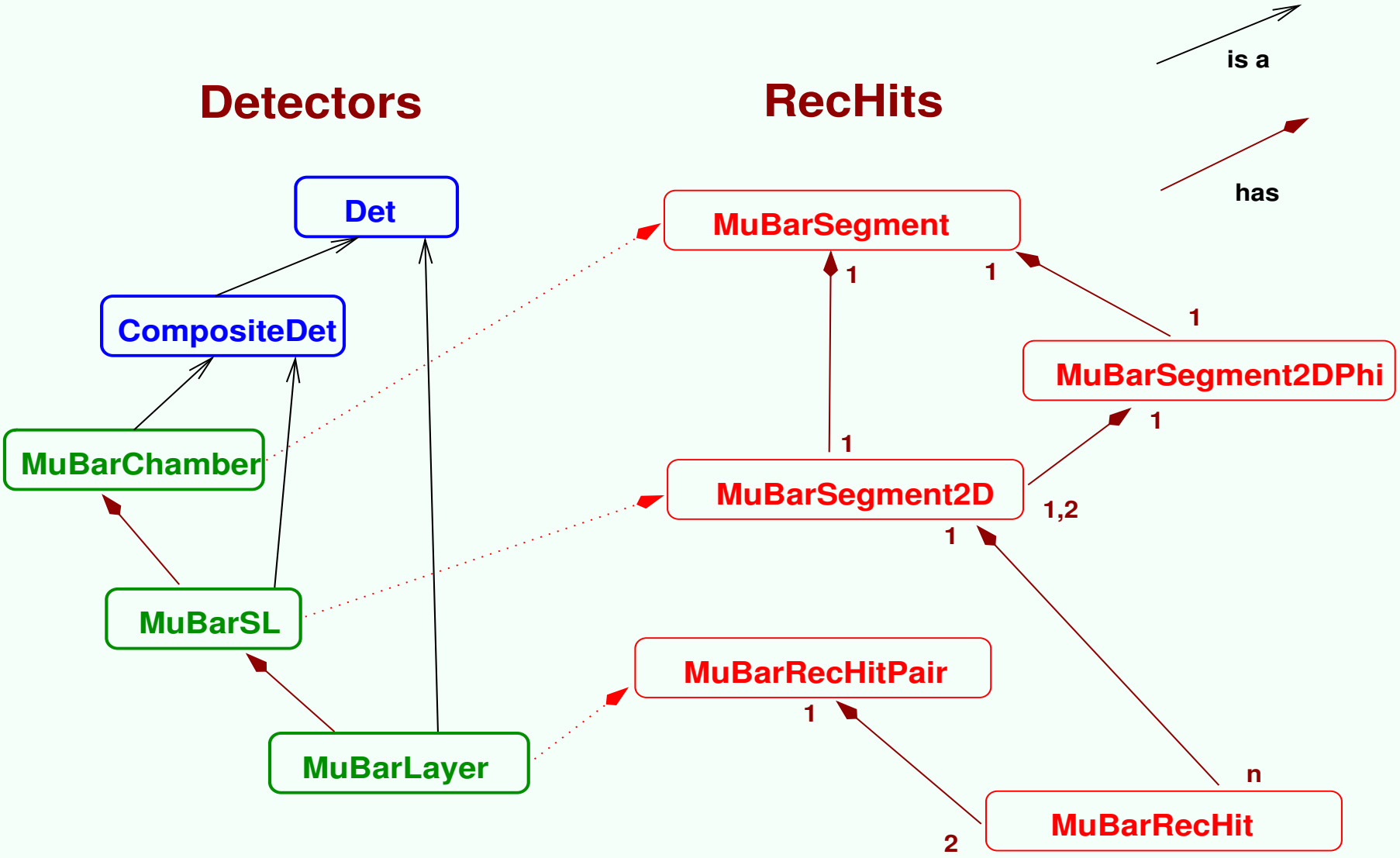
INFN and Padova University

Outline

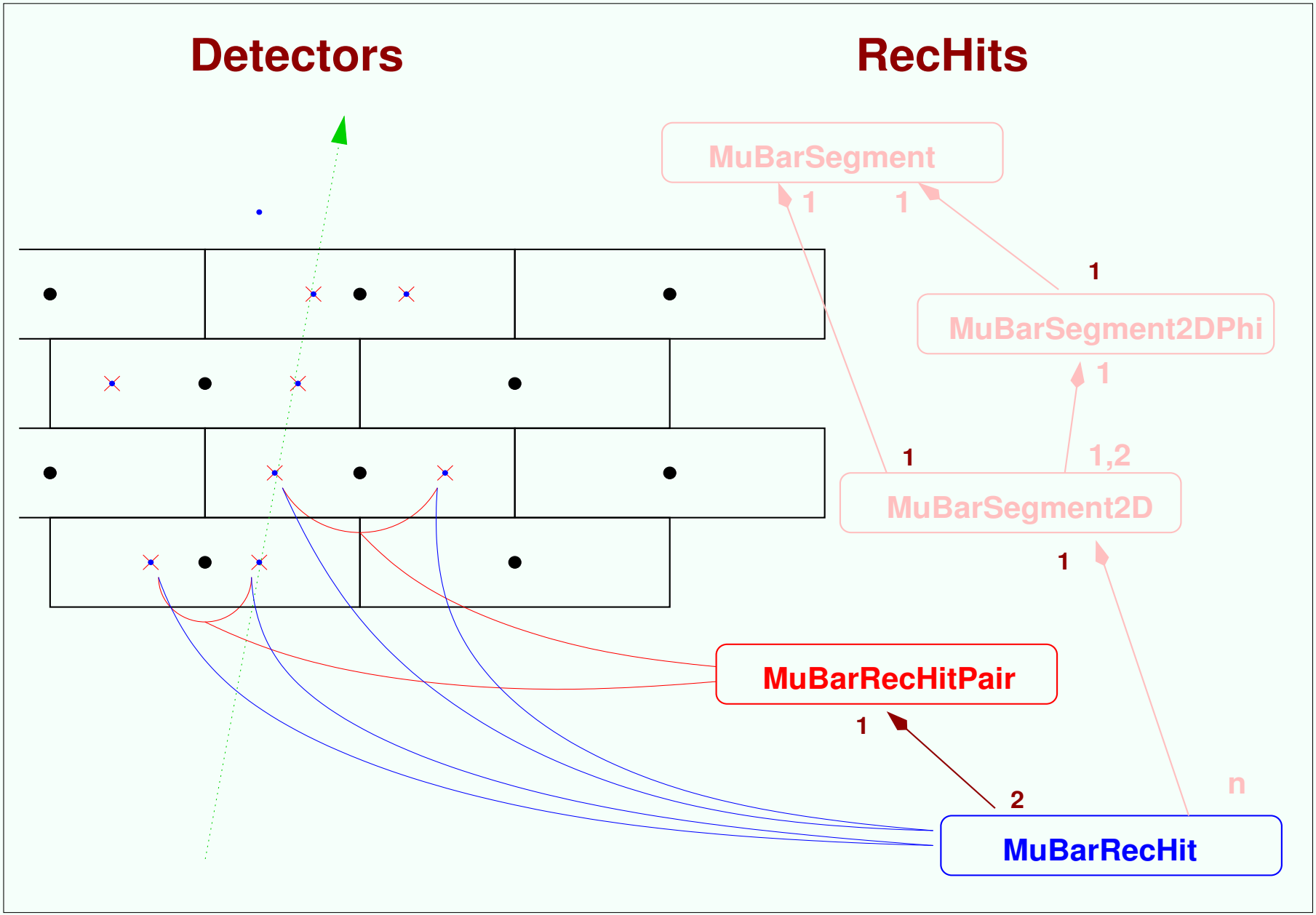
- Architecture,
- Results on Hits
- Results on Segments 2D
- Results on Segments 4D:resolution and pulls,
- What is still missing,
- Release plan and summary,

Architecture

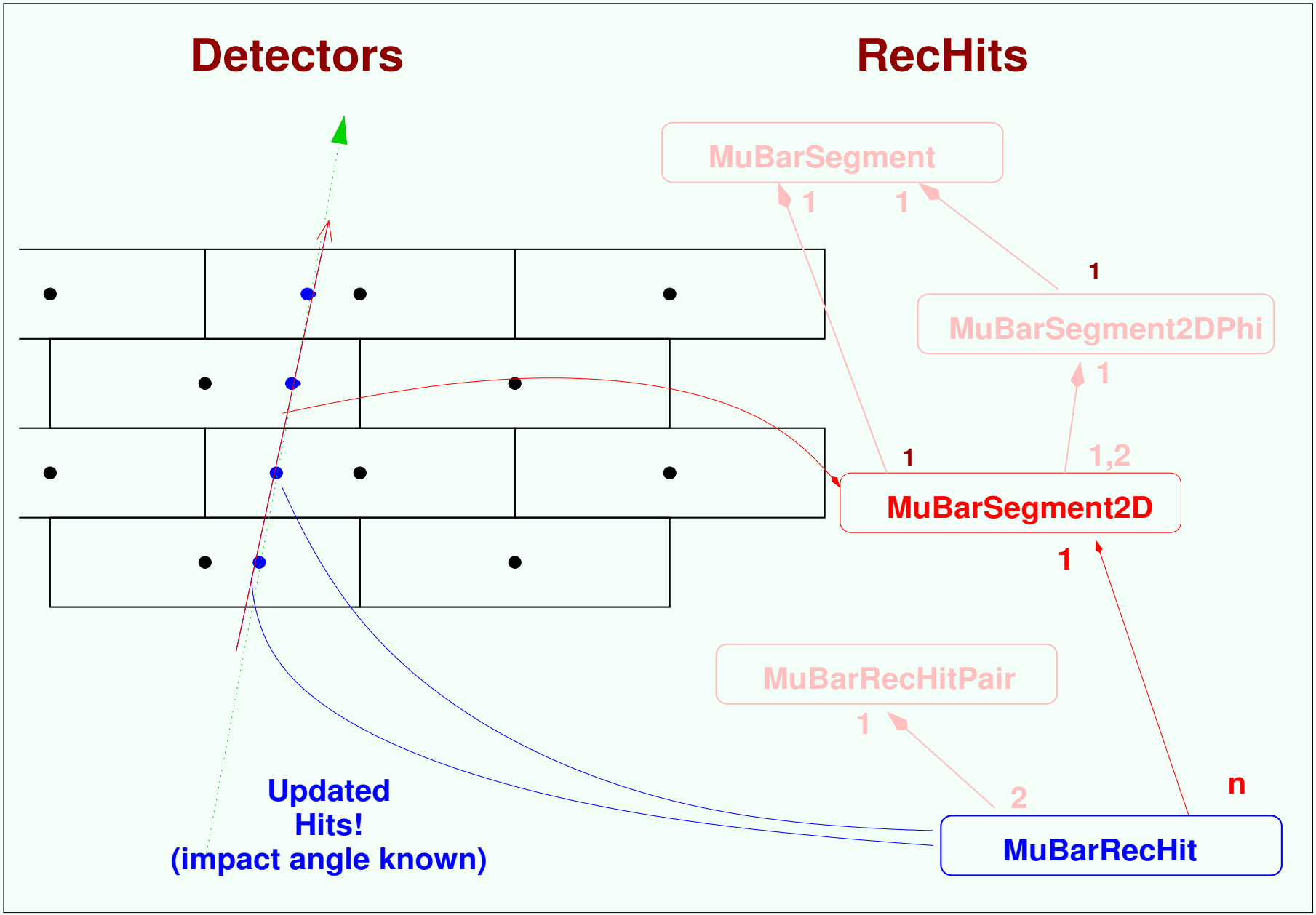
See my talk at PRSμ meeting on October, $14^{th}2003$



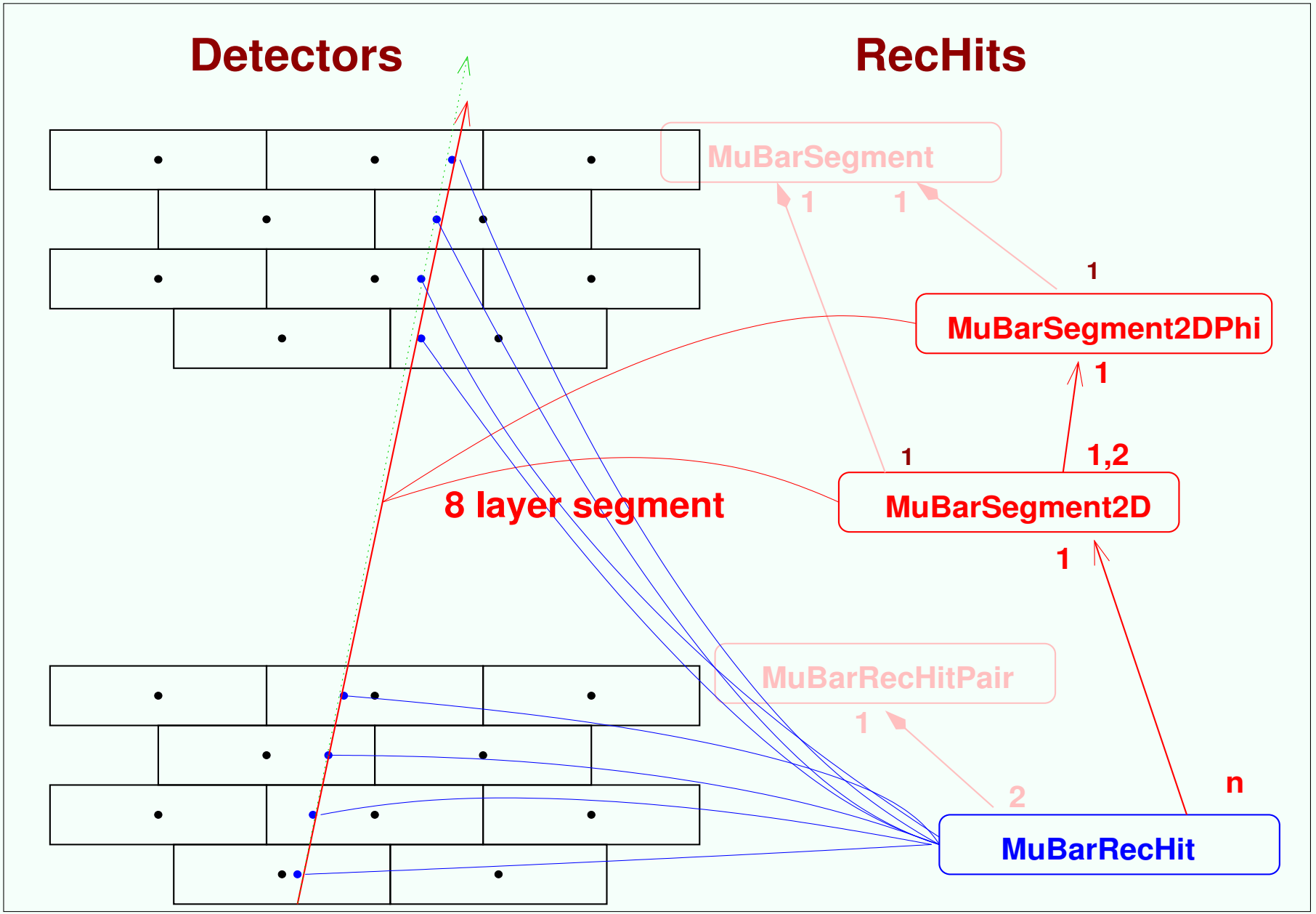
Layer hits and pairs



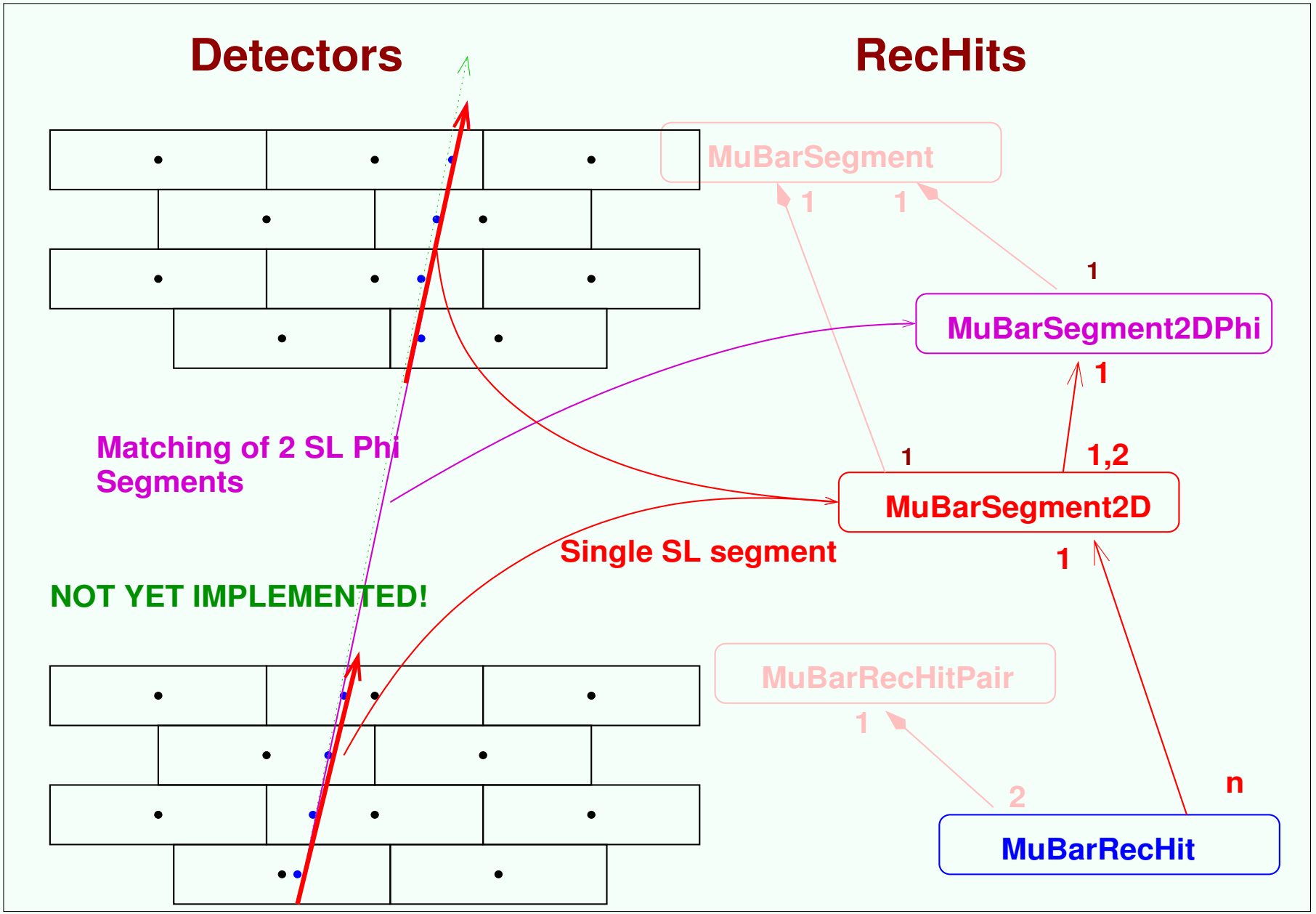
SL segments


Detectors
RecHits
MuBarSegment
1
1
1
MuBarSegment2DPhi
1
1
1,2
MuBarSegment2D
1
MuBarRecHitPair
1
2
n
MuBarRecHit
Updated
Hits!
(impact angle known)

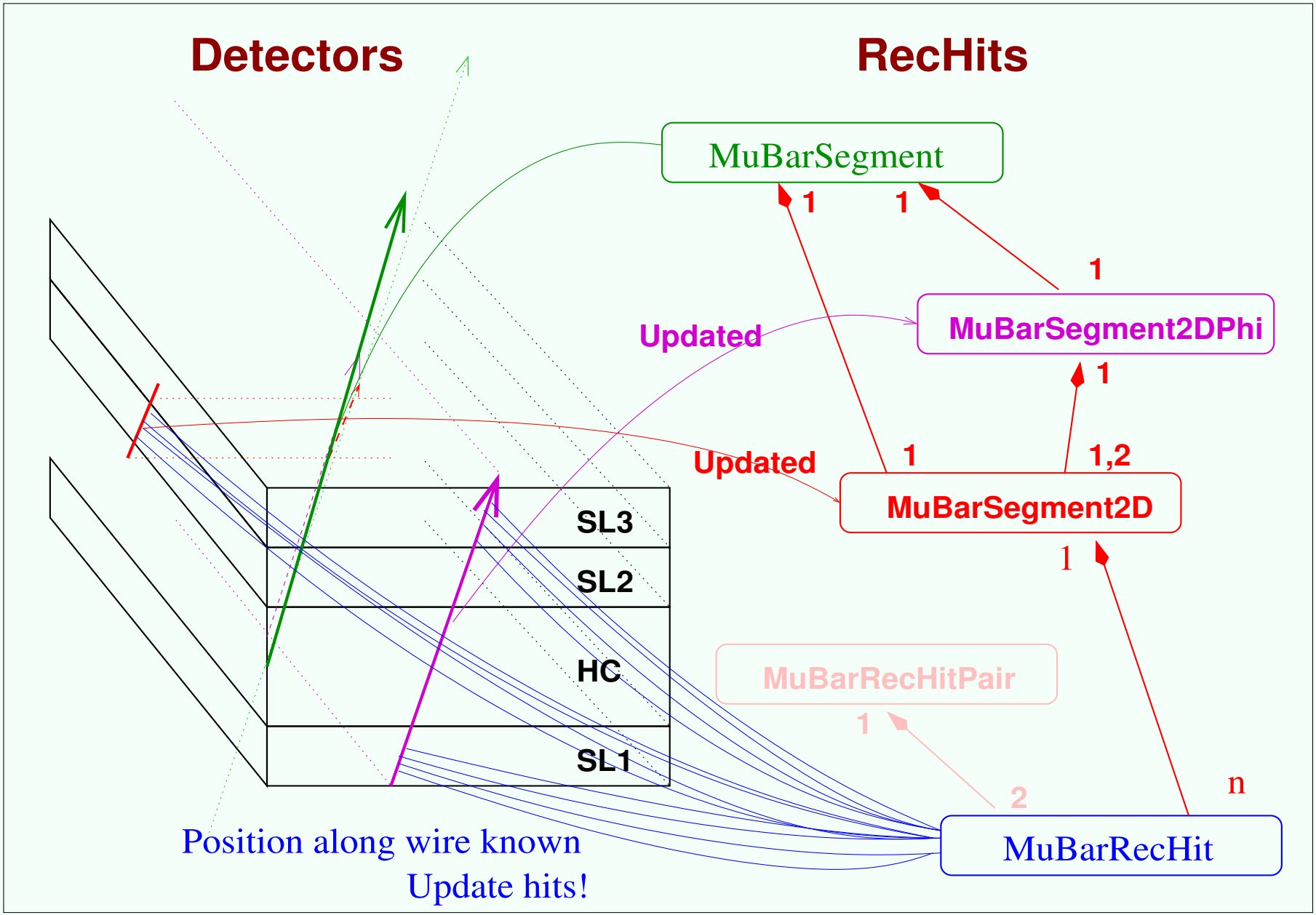
SL segments superϕ



SL segments twin ϕ

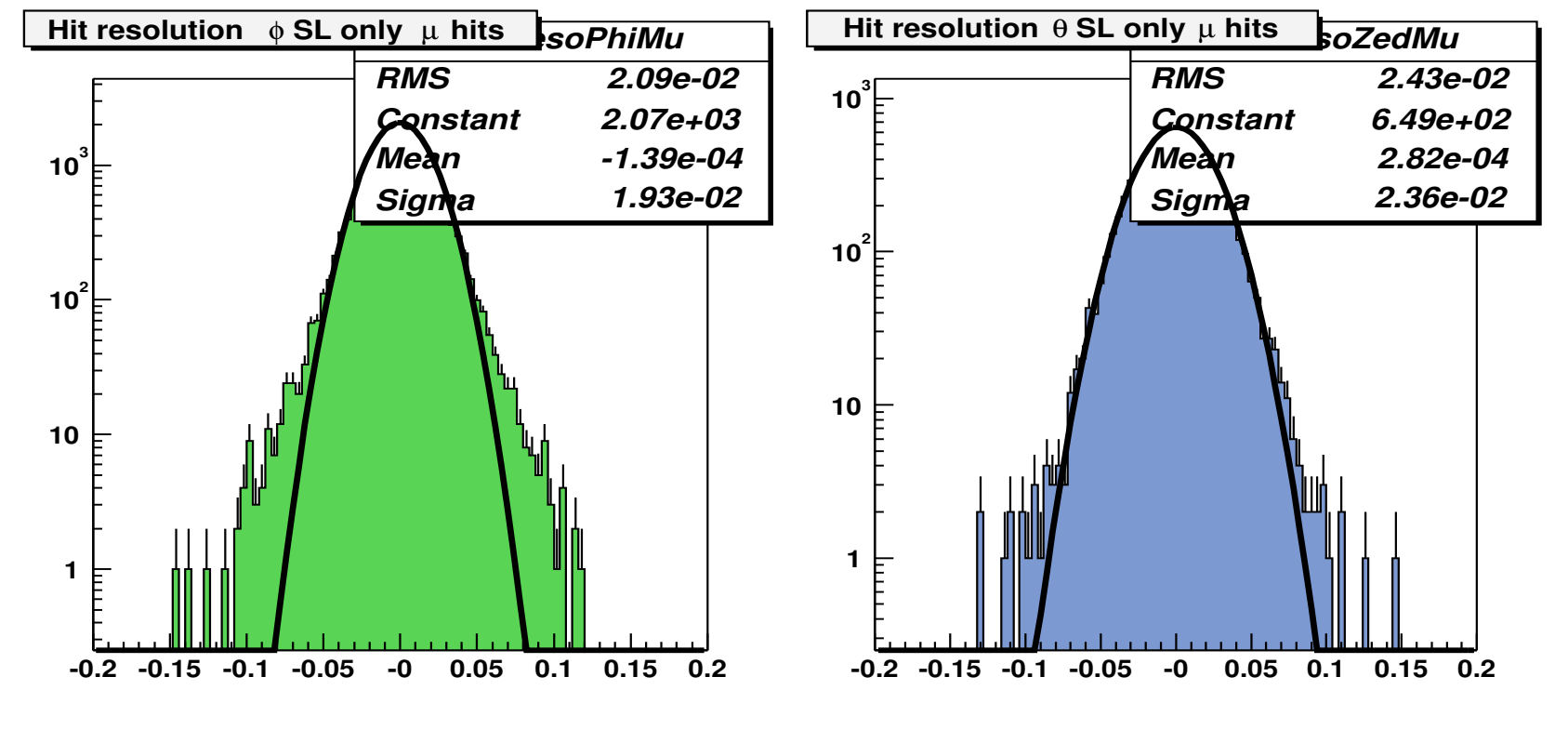


Chamber segments



Results: resolution and pulls

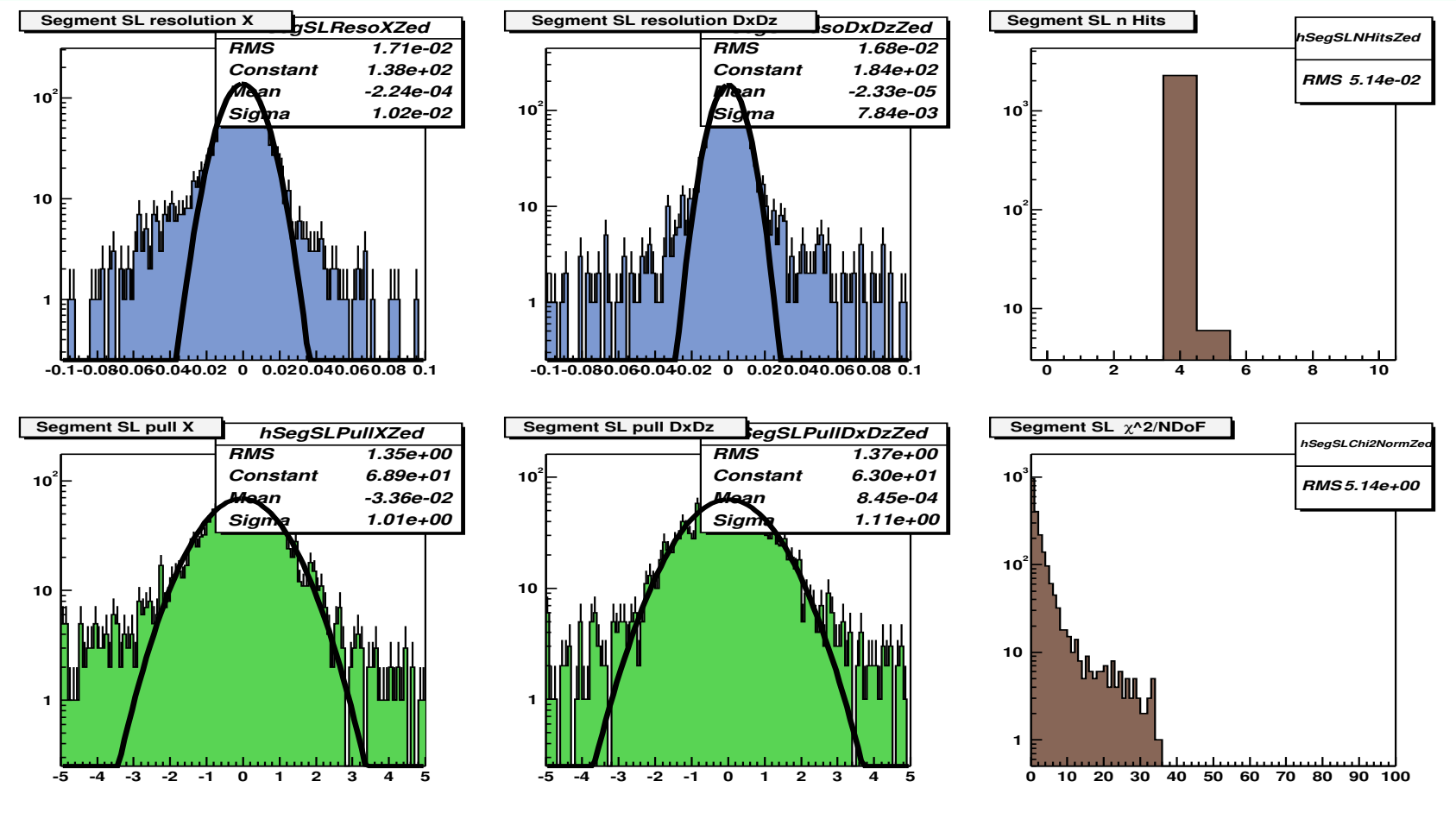
- Results with ORCA 750, dataset: single $\mu^{\pm}$, $p_t = 50$ GeV$/c$
- Using new digitizer and HitBuilder (see Nicola's talk)



- Resolution for Layer Hits: *"1^{st} step"*
  $\sigma_x \sim 190\ \mu m$ (ϕ SL), $\sigma_y \sim 230\ \mu m$ (θ SL)

Results: SL segments 2D θ

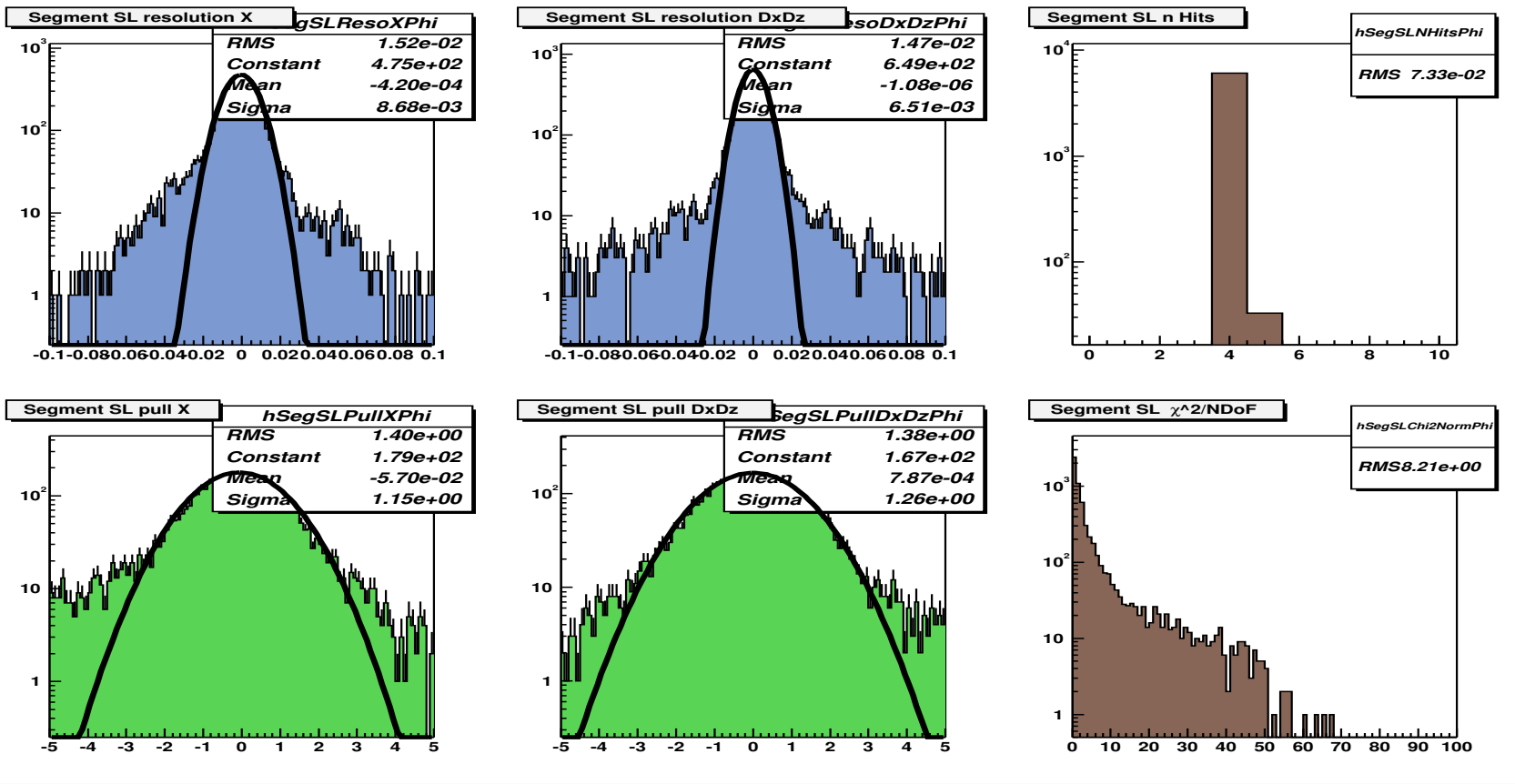
- Wrt *SimSegment*, defined from two μ SimHits in first and last Layer



- Reso $\sigma_x \sim 100\ \mu m$, $\sigma_\theta \sim 7.8\ mrad$
- $pull_x \sim 1.0$, $pull_\theta \sim 1.1$

Results: SL segments 2D ϕ

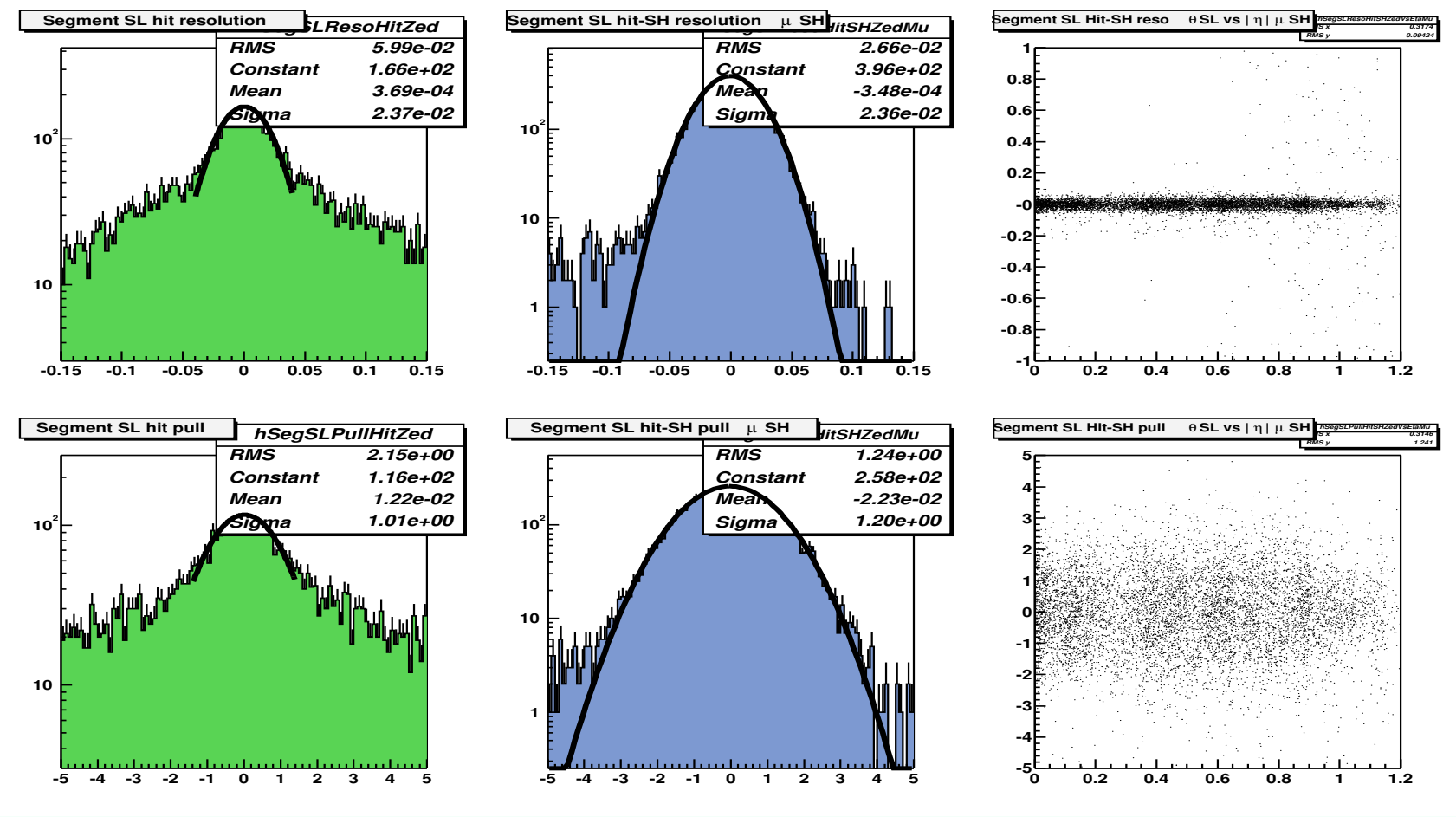
- One SL only! 4 layers



- $\sigma_x \sim 87\ \mu m$, $\sigma_\theta \sim 6.5\ mrad$
- $pull_x \sim 1.15$, $pull_\theta \sim 1.26$
- Hit with smaller angle $\rightarrow$ better resolution
- More tails (in reso and χ^2): to be investigated

Results: Hits in SL segments 2D θ

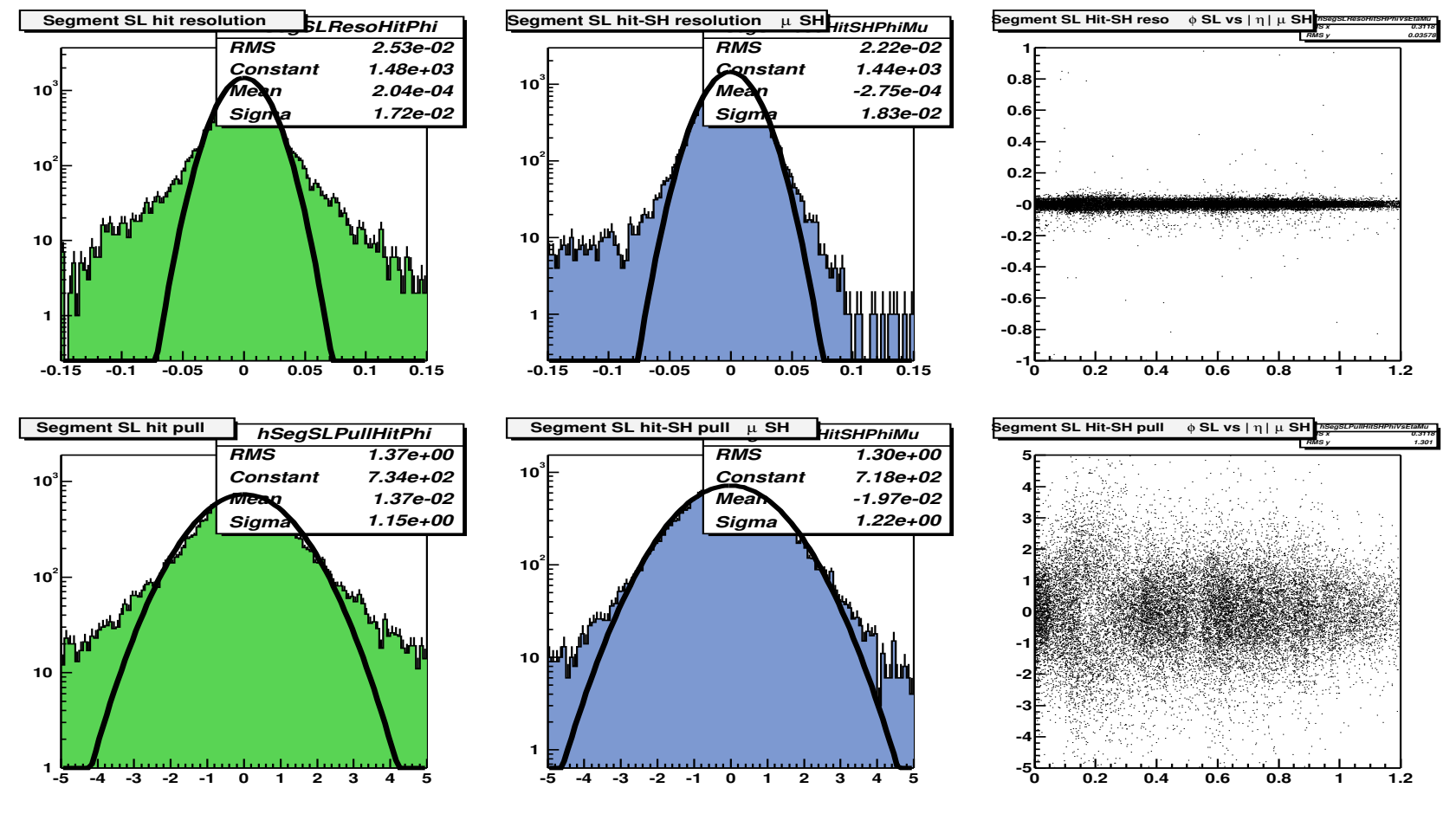
- Hit recomputed with impact angle correction



- wrt segment: $\sigma_x \sim 230\ \mu m$, $pull \sim\ 1$, large tails
- wrt SimHits: $\sigma_x \sim 230\ \mu m$, $pull \sim 1.2$ no significant improvement

Results: Hits in SL segments 2D ϕ

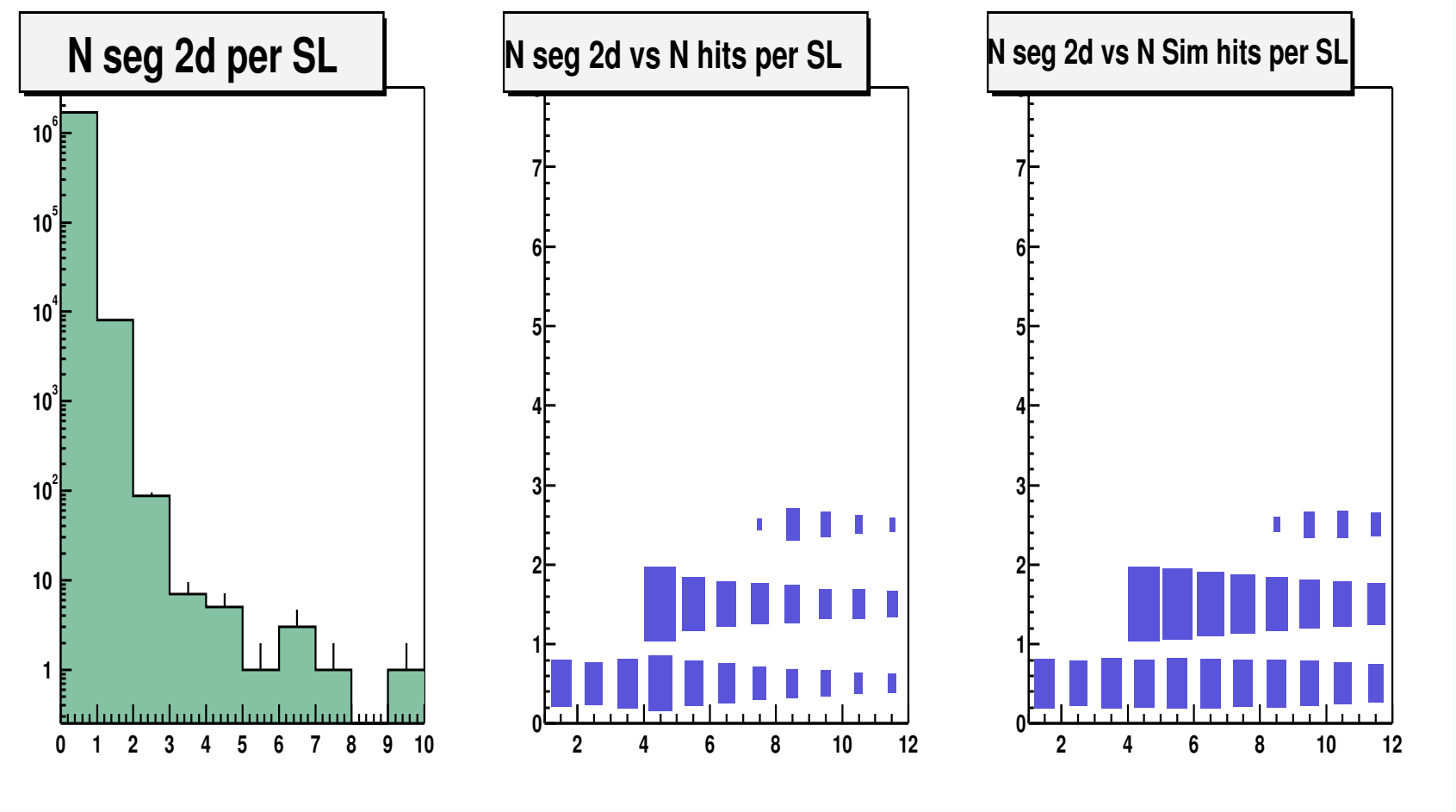
- Hit recomputed with impact angle correction



- wrt segment: $\sigma_x \sim 170\ \mu m$, $pull \sim\ 1.15$, tails
- wrt SimHits: $\sigma_x \sim 180$, $pull \sim 1.22$ no significant improvement

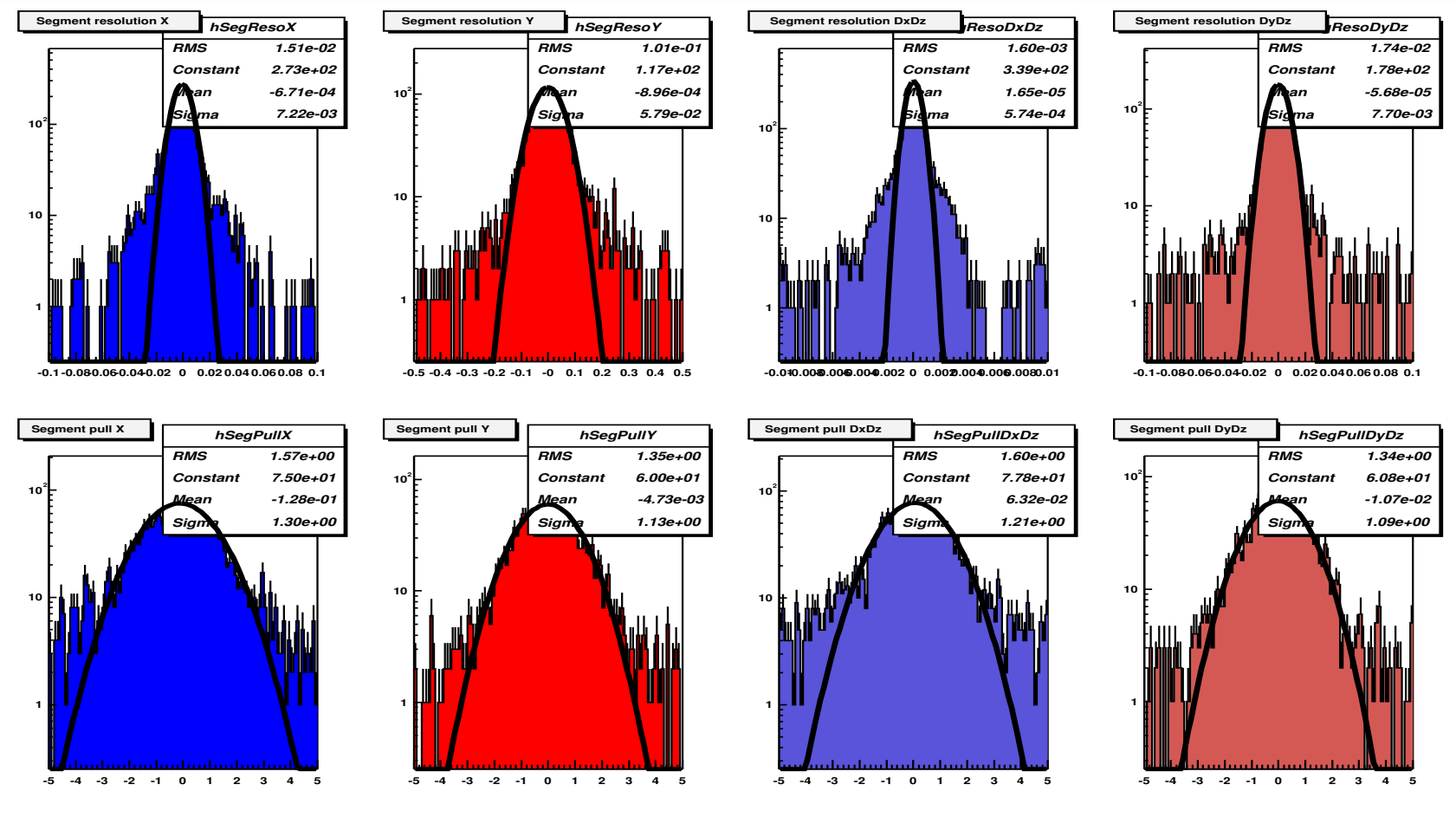
Results: # SL segments 2D vs # hits

- Small probability to have $N > 1$ segments per SL
- SL with SimHits and RecHits but no segments: to be investigated



Results: chamber segments 4D

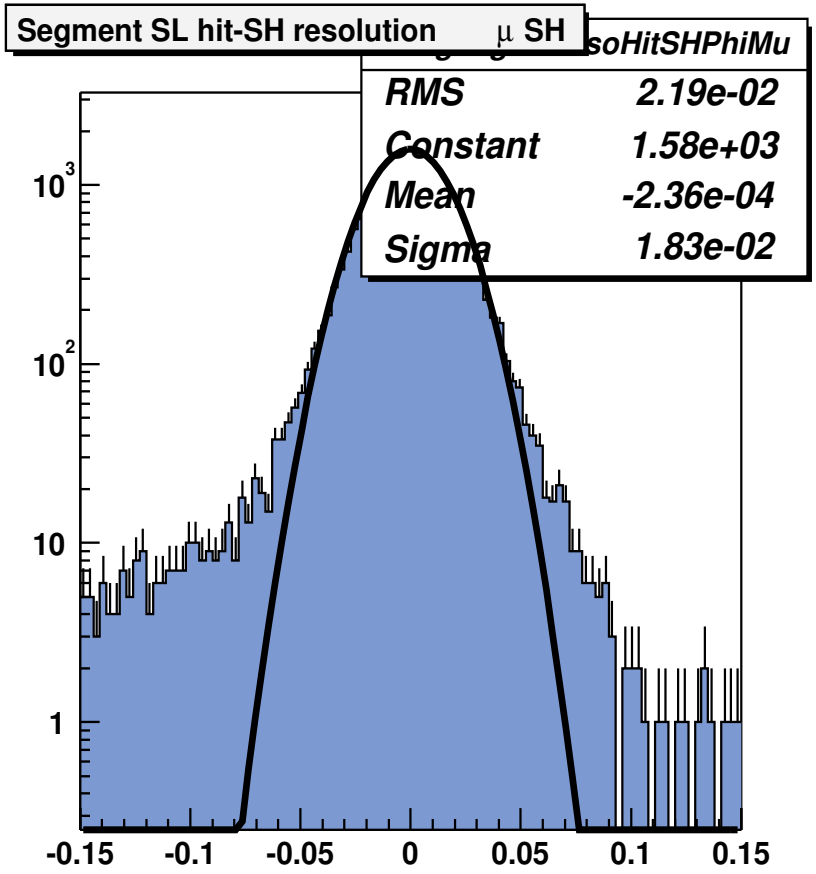
- ϕ view: $\sigma_x \sim 66\ \mu m$, $\sigma_\phi \sim 0.6\ mrad$ 8 layers
- θ view: $\sigma_y \sim 560\ \mu m$, $\sigma_\theta \sim 8.3\ mrad$ computed at chamber ref plane: extrapolation!!!

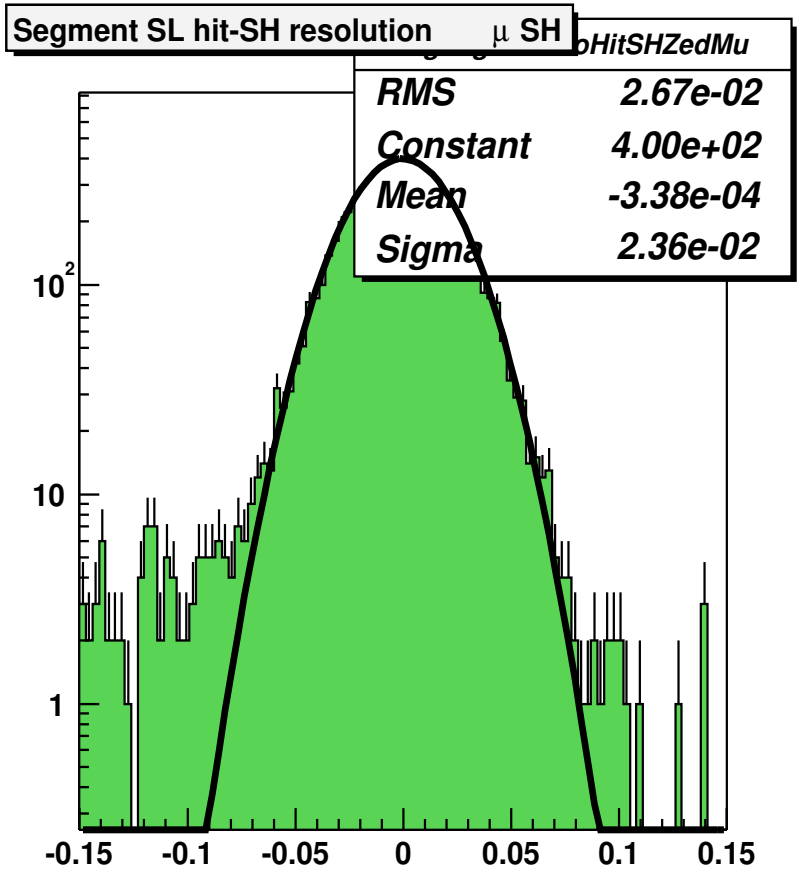


- Pull $\sim 1.2 \div 1.3$: errors too small

Results: hits in chamber segments 4D

- ϕ view: $\sigma_x \sim 184\ \mu m$
- θ view: $\sigma_x \sim 230\ \mu m$

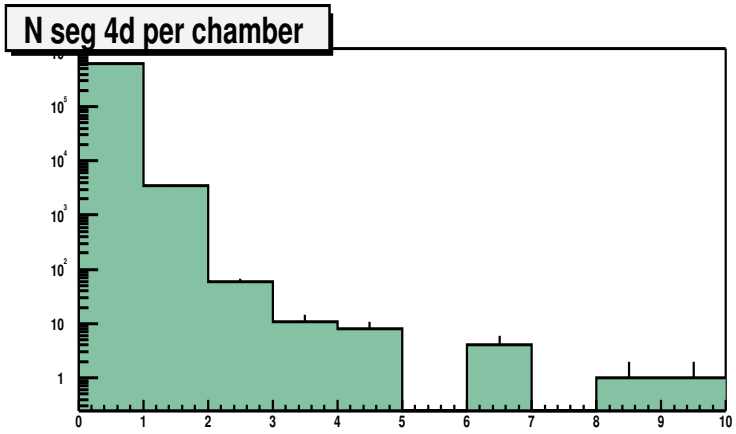


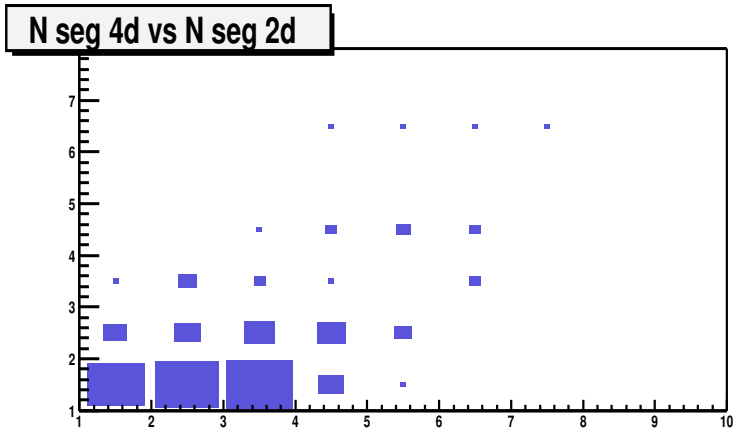


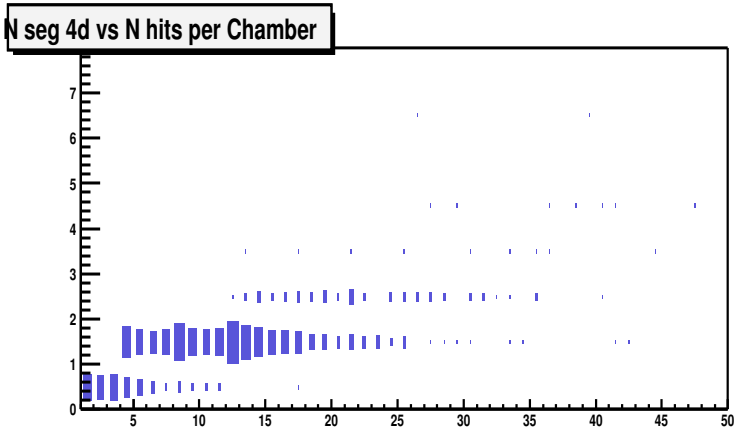
- No improvement!!! to be understood
- Bug found (too late), to be fixed

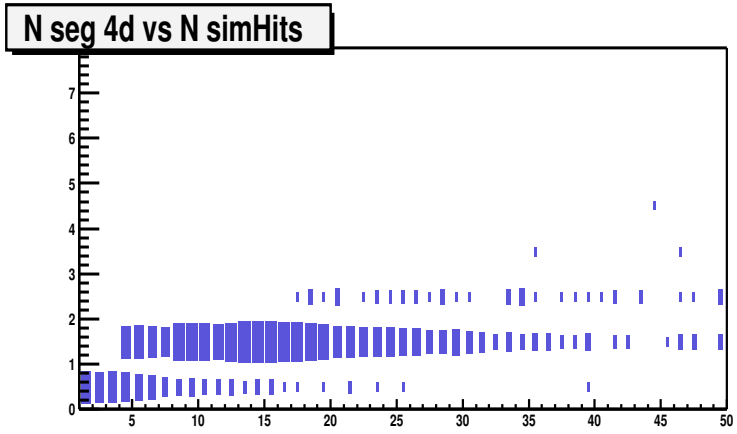
Results: # seg 4D vs # hits

- Most of the time just one segment is reconstructed: must check if it's the correct one or not
- In case of showering (many Sim/RecHit) also relatively many segments: must check if the "right" one is found









What is still missing

- Hits resolution does not improve as expected when including impact angle and position along wire as computed from segment fit
- Presence of tails in many resolution distribution: origin to be studied
- Performances on TestBeam data: not yet done
  - different environment: lot of muons in a very small region of a chamber with $25\ ns$ bunched beam
  - No Iron in front of the chamber
- Small showering, high probability of two or more muons with different *"bx"*
- Performances in case of showering: study just started
- Efficiency and purity
- Changes in Muon Track Finding to cope with new architecture **Done** to be tested carefully.
- Documentation: missing

Release plan

- Work is advanced but not yet finished
- More study and debugging needed
- Preliminary version fully working with good/reasonable performances
- It can be released now, with some caveats