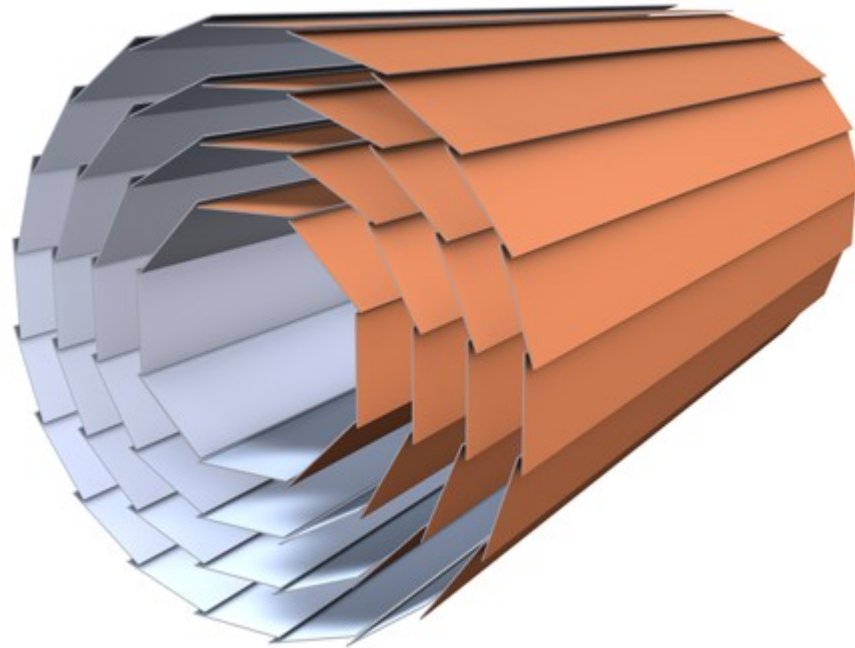
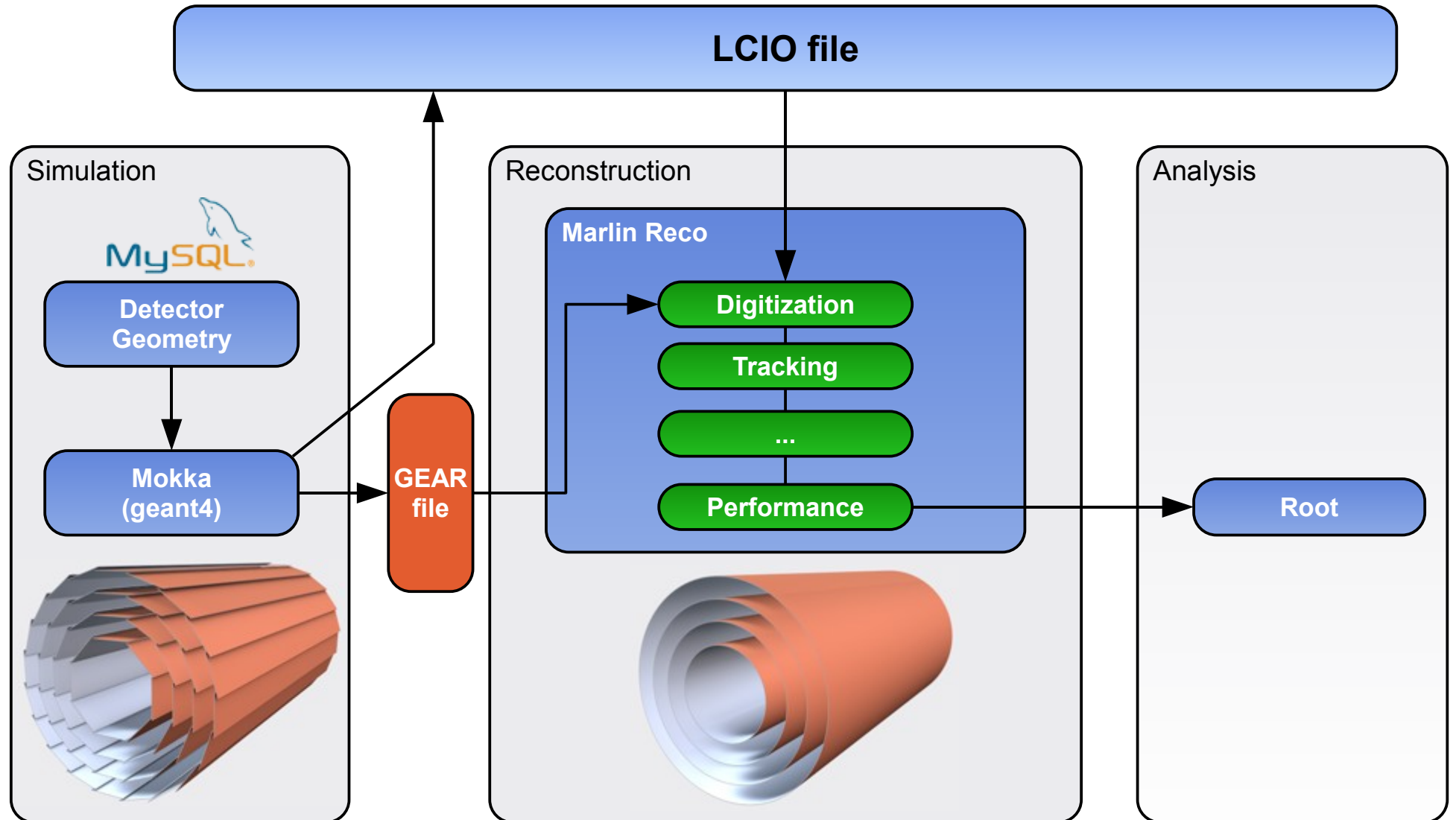
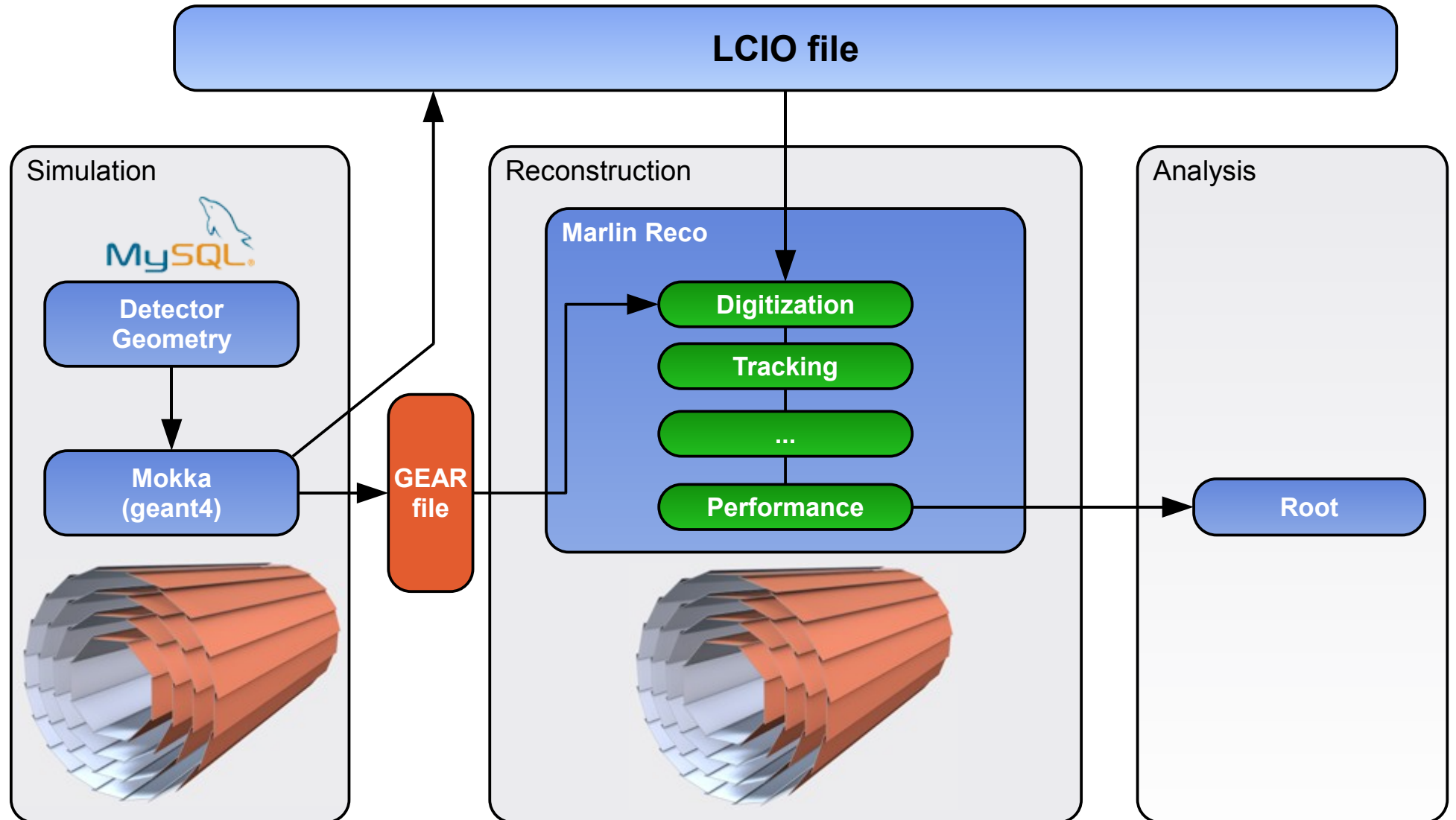


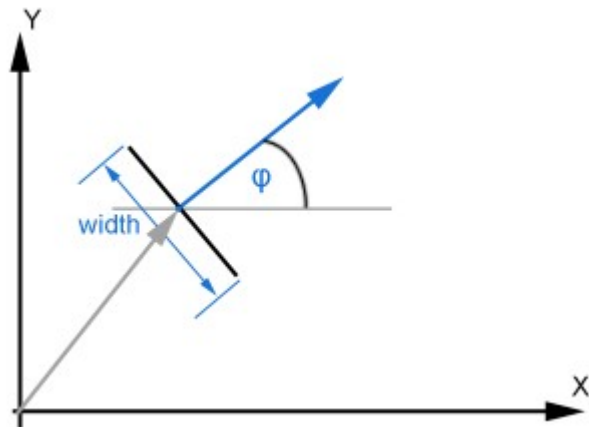
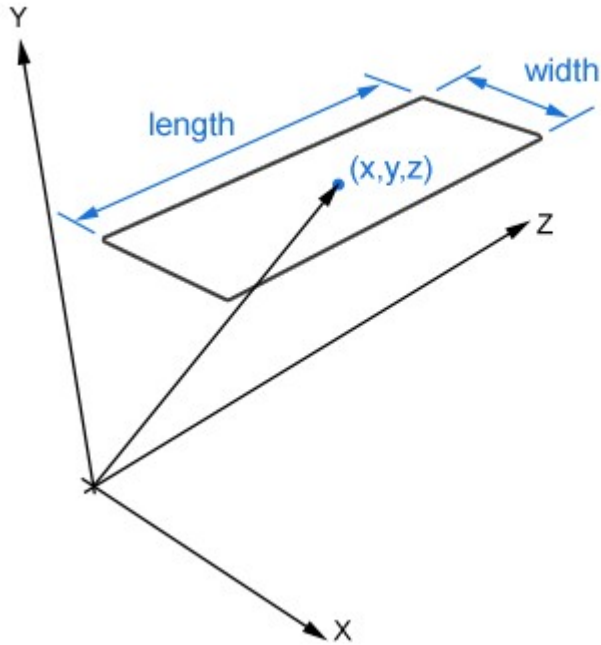
# Updates of the LDC Tracking package



Andreas Moll, Alexei Raspereza  
ILD Workshop, DESY Zeuthen  
15.01.2008



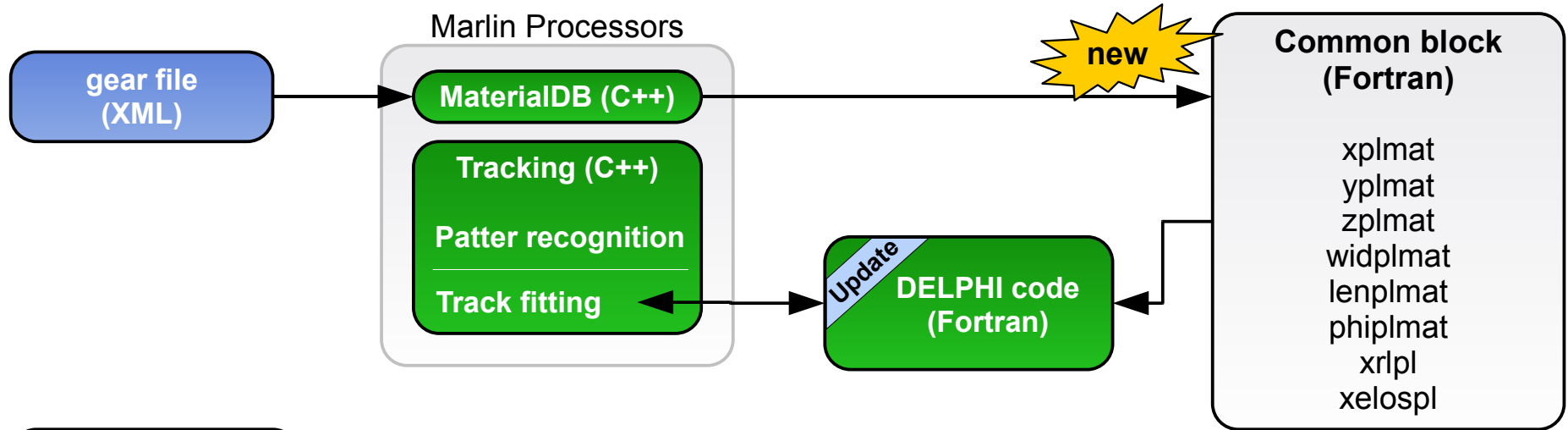




Each ladder is defined using 8 parameters:

- 1) – 3) vector to the center of the ladder (x,y,z)
- 4) width
- 5) length
- 6) φ angle between normal of ladder and line parallel to x axis
- 7) radiation length  $\frac{thickness}{X_0}$
- 8) energy loss  $thickness * \frac{dE}{dx}$

These 8 parameters are stored in a Fortran common block



**Update**  
**DELPHI code (Fortran)**

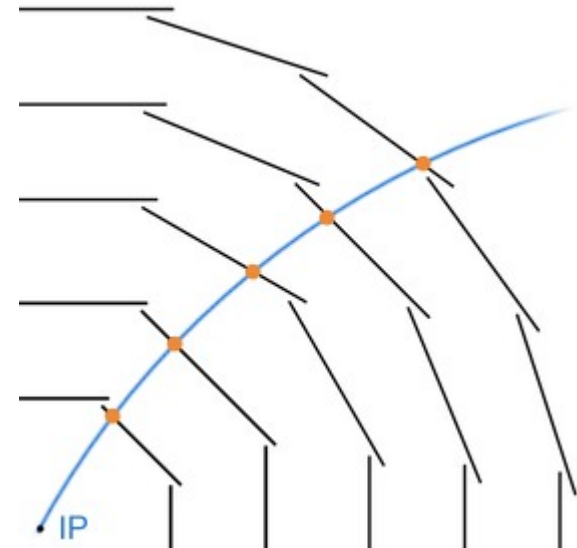
```

IF (IERR.EQ.3) THEN
  TVAL=QEC/QEQ

IF (TVAL.GE.0..AND
XF=PX+TVAL*DX
YF=PY+TVAL*DY
SINPNW=(XF-CX)/RTRK
COSPNW=(CY-YF)/RTRK

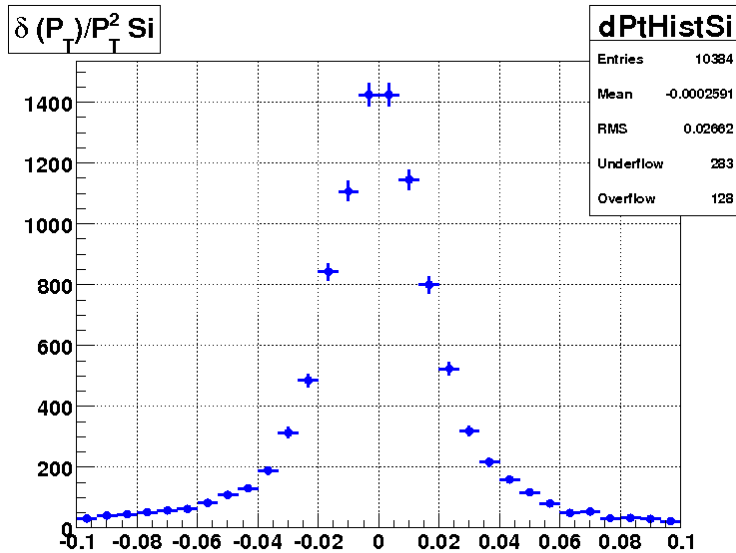
COSNOR=(COSLP*COSP
IERR=0
    
```

- Intersection helix with ladder
- Introduced surface type: "LADD"
- Ladder derivatives (Kalman filter)



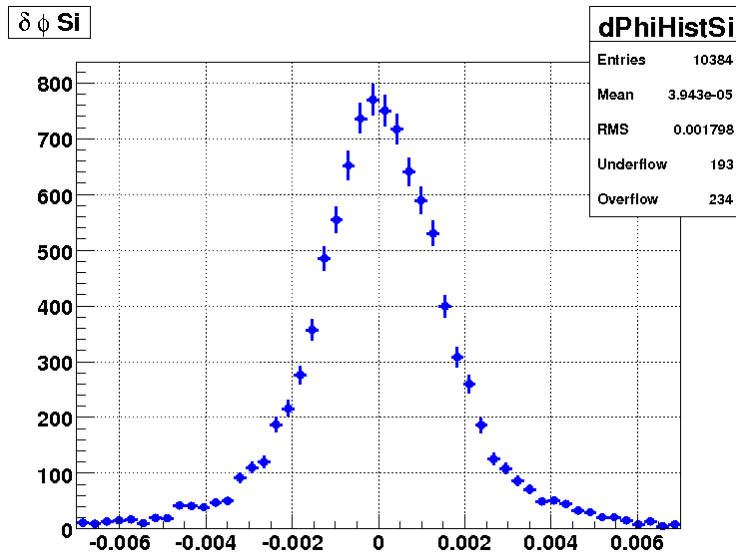
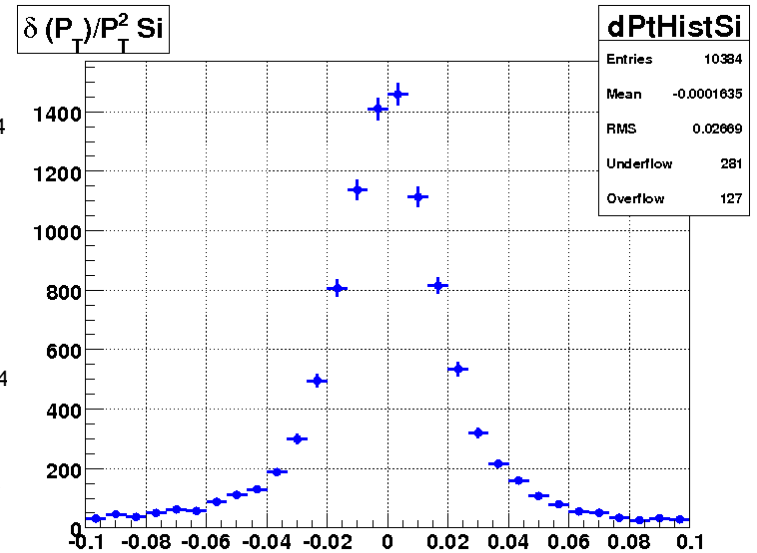
## Results

- 10000 muons
- 0.5 GeV
- angle uniformly smeared within VDX acceptance



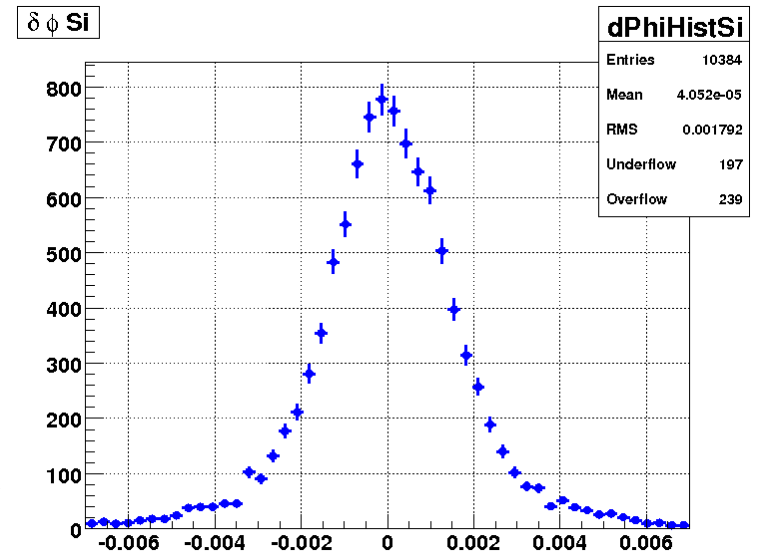
**cylinder structure**  
 $Mean: -2.6 \cdot 10^{-4} \pm 2.6 \cdot 10^{-4}$   
 $RMS: 2.7 \cdot 10^{-2}$

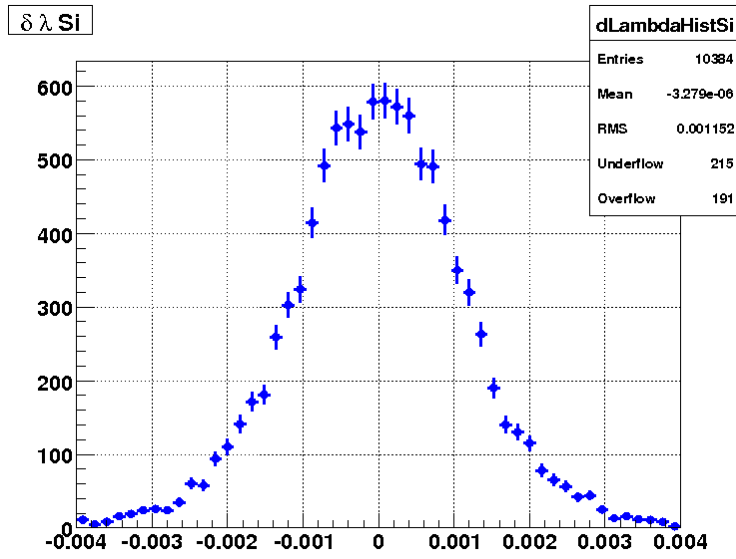
**ladder structure**  
 $Mean: -1.6 \cdot 10^{-4} \pm 2.6 \cdot 10^{-4}$   
 $RMS: 2.7 \cdot 10^{-2}$



**cylinder structure**  
 $Mean: 3.9 \cdot 10^{-5} \pm 1.8 \cdot 10^{-5}$   
 $RMS: 1.8 \cdot 10^{-3}$

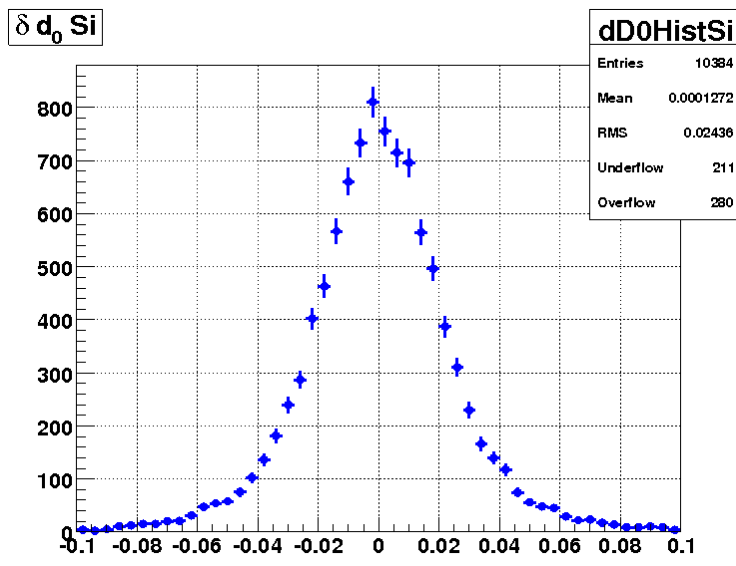
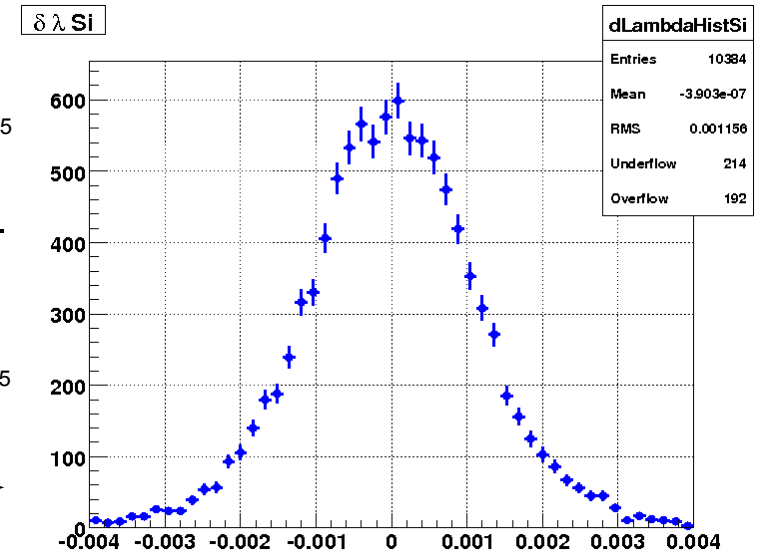
**ladder structure**  
 $Mean: 4.1 \cdot 10^{-5} \pm 1.8 \cdot 10^{-5}$   
 $RMS: 1.8 \cdot 10^{-3}$





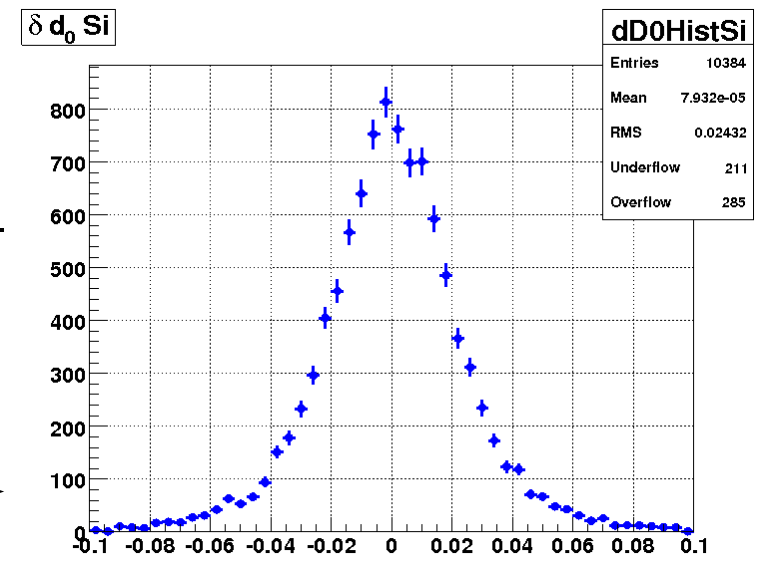
**cylinder structure**  
 $Mean: -3.3 \cdot 10^{-6} \pm 1.1 \cdot 10^{-5}$   
 $RMS: 1.2 \cdot 10^{-3}$

**ladder structure**  
 $Mean: -3.9 \cdot 10^{-7} \pm 1.1 \cdot 10^{-5}$   
 $RMS: 1.2 \cdot 10^{-3}$

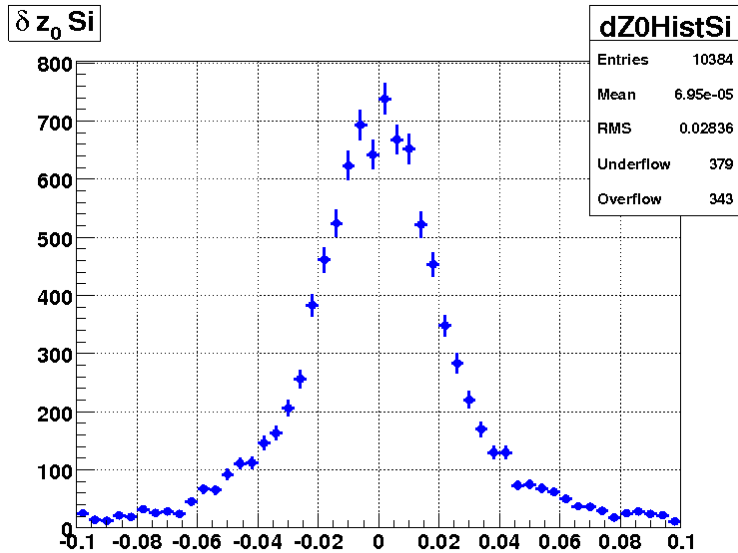


**cylinder structure**  
 $Mean: 1.3 \cdot 10^{-4} \pm 2.4 \cdot 10^{-4}$   
 $RMS: 2.4 \cdot 10^{-2}$

**ladder structure**  
 $Mean: 7.9 \cdot 10^{-5} \pm 2.4 \cdot 10^{-4}$   
 $RMS: 2.4 \cdot 10^{-2}$







**cylinder structure**

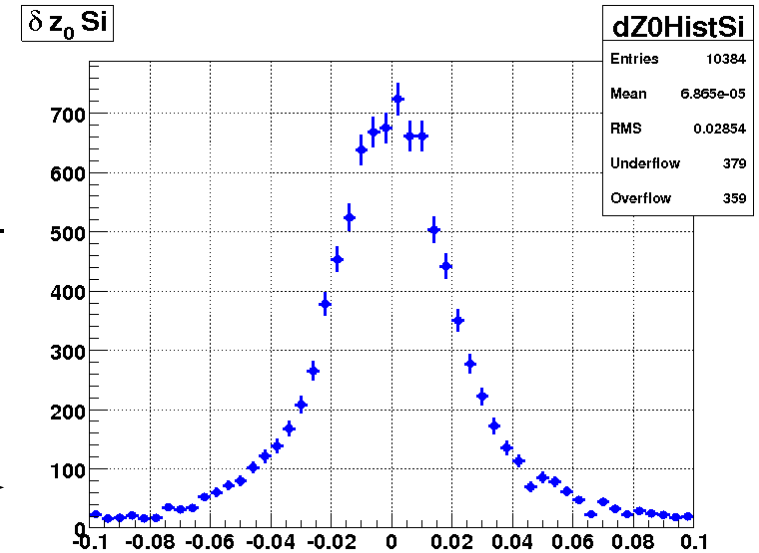
$$\text{Mean: } 7.0 \cdot 10^{-5} \pm 2.8 \cdot 10^{-4}$$

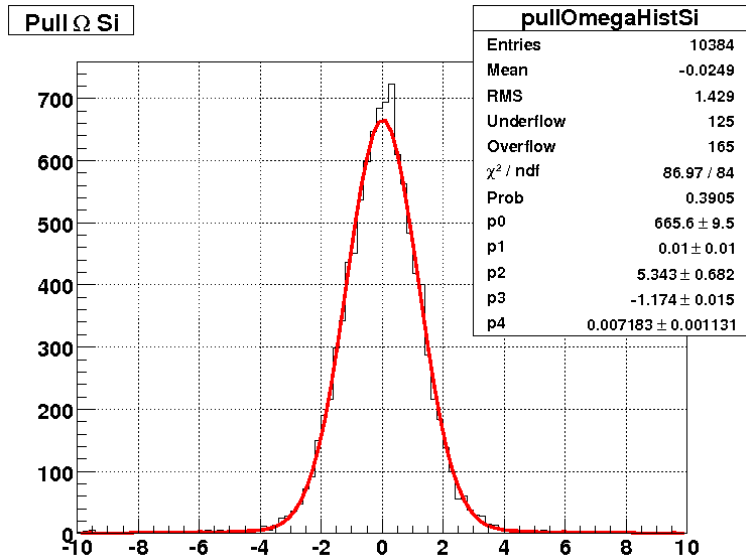
$$\text{RMS: } 2.8 \cdot 10^{-2}$$

**ladder structure**

$$\text{Mean: } 6.9 \cdot 10^{-5} \pm 2.8 \cdot 10^{-4}$$

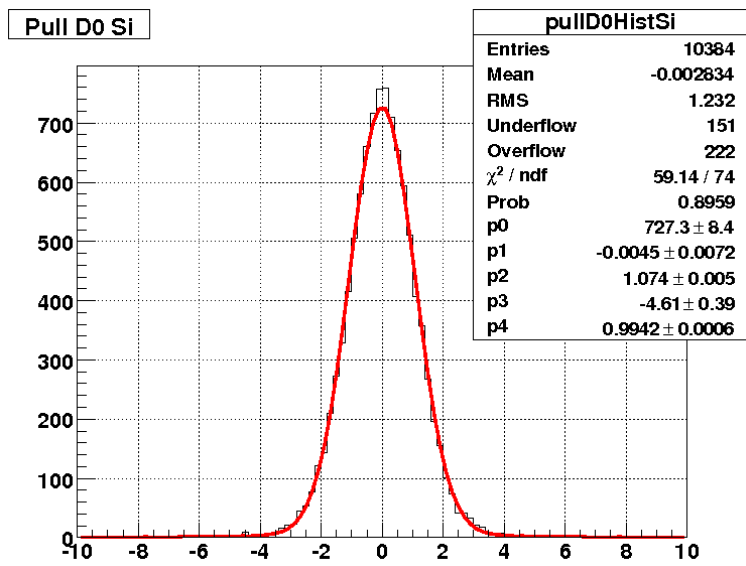
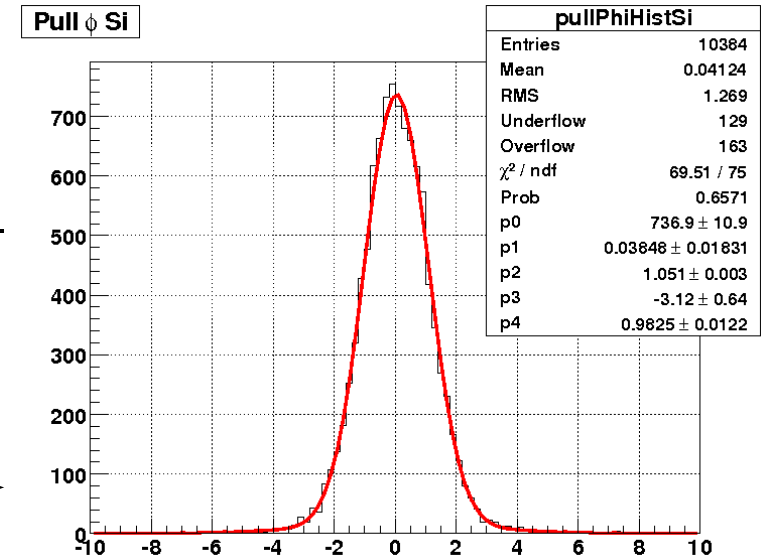
$$\text{RMS: } 2.8 \cdot 10^{-2}$$





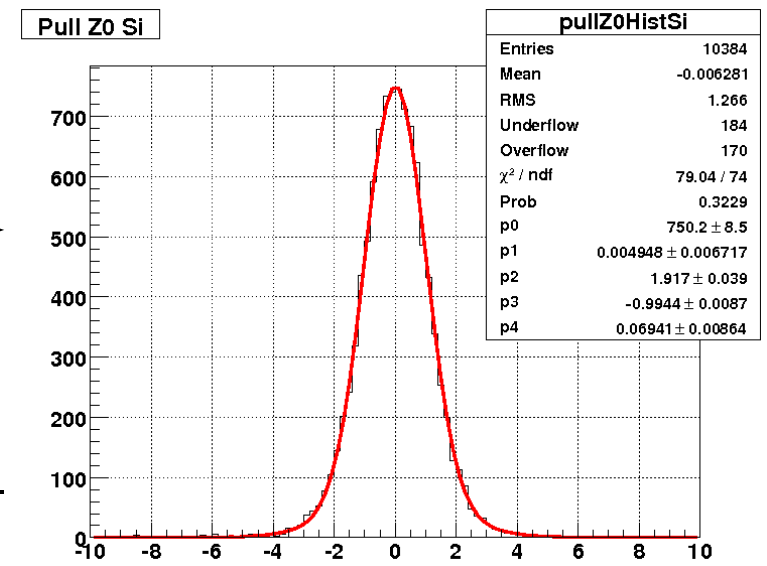
**Omega**  
*Mean: 0.01 ± 0.01*  
 *$\sigma: 1.17 ± 0.015$*

**Phi**  
*Mean: 0.04 ± 0.018*  
 *$\sigma: 1.05 ± 0.003$*



**Z0**  
*Mean: 0.005 ± 0.007*  
 *$\sigma: 0.99 ± 0.009$*

**D0**  
*Mean: -0.005 ± 0.007*  
 *$\sigma: 1.07 ± 0.005$*



# Summary and Outlook

- Realistic (laddered) vertex detector is implemented in the tracking package
- Performance is comparable to cylinder approximation



Cylinder approximation seems good enough for the current number of ladders per layer.

## Outlook:

- Further investigation is required:  
Testing the new implementation by using a more “extreme” ladder geometry (e.g. triangle).
- ...

