Preliminary Cross Section measurements for ^{16}O campains

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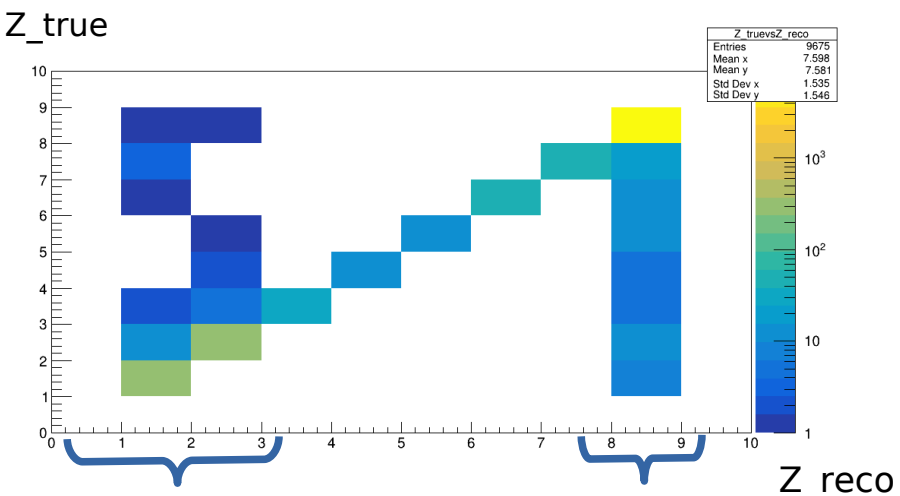
Goal

- **Starting a complete analysis project with code integrated in SHOE:**
  - Decode → DecodeGlb → DecodeGlbAna → ComputeXSec
- **Ready for 4-dimensional cross-section as function of: Z,θ,E_k,A**
  - Automatically switch in less dimensions (i.e. only Z and θ in GSI2021 campain)
- **Starting with MC (for validation pourposes)**
  - Then using real data
- **Work in progress...**

Ingredients GSI2021 setup

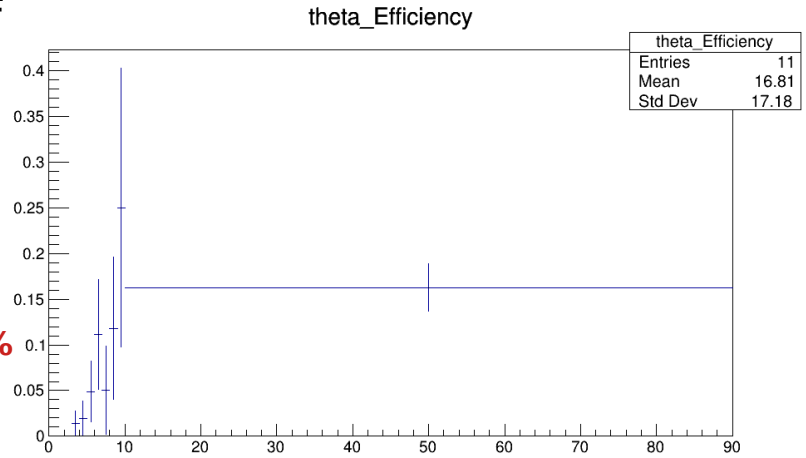
- **Reconstruction efficiency (GSI_2021_MC):**
  reco tracks / simulated particles

TW Z match



Mismatch of Z=1,2,8
→ TW Z reconstruction algo

eff



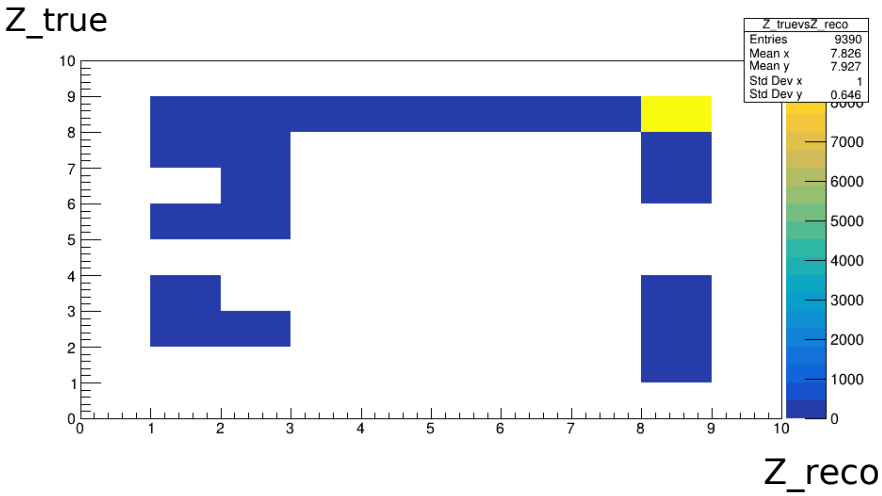
~ 10 %

Z=2

Ingredients full setup 16O_400

- **Test the full setup for 4-d cross-section**
- **For Reconstruction efficiency:**

TW Z match



Wrong parametrization of TW
Z reconstruction algo file
(Already in contact with the expert to fix it)

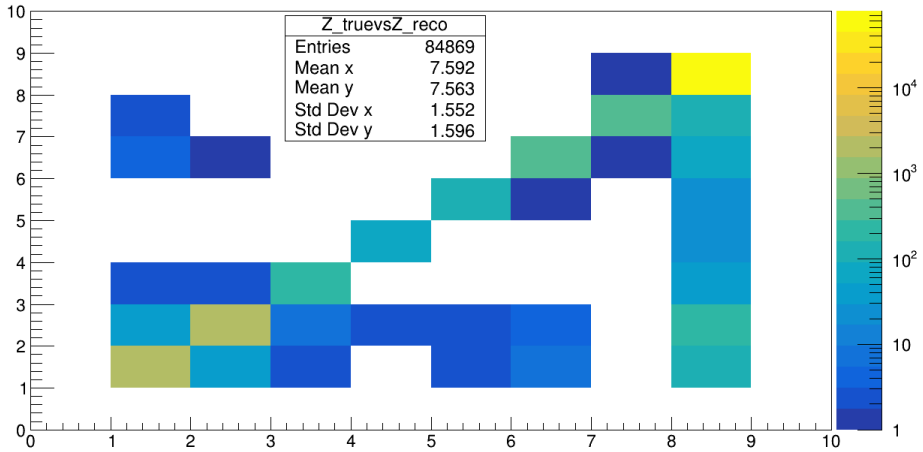
parametrization or on-fly BB measurement?

Ingredients full setup

- **Fixed using True charge in TW point: TWMCMatch**

Z_true

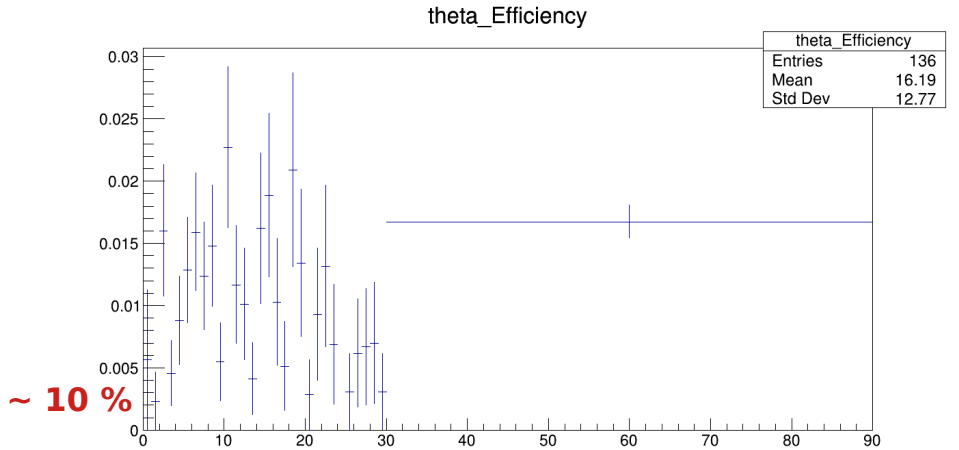
TW Z match



Z_reco

Not so diagonal
→ issue in TW point match with a reco track

eff



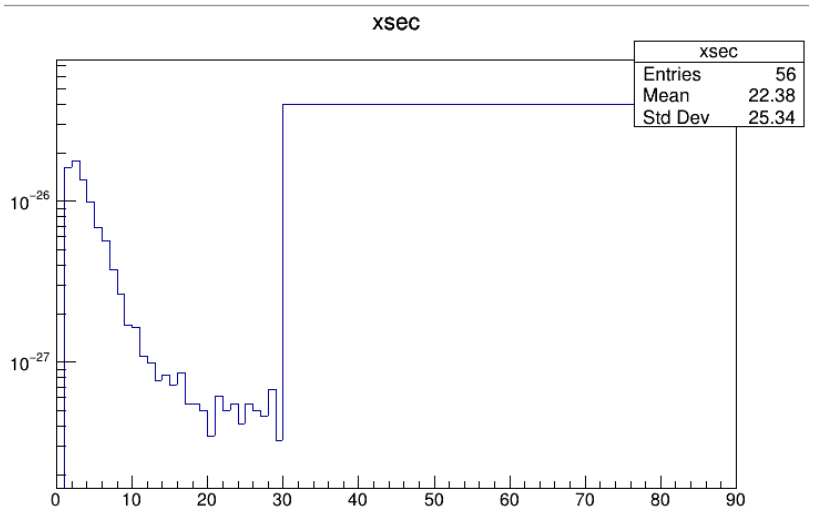
~ 10 %

θ (°)

Very very preliminary differential cross section

$$\frac{d\sigma_f}{d\theta} = \frac{Y_f}{N_{Prim} \cdot N_t \cdot \Omega_\theta \quad \epsilon_f}$$

cm^2

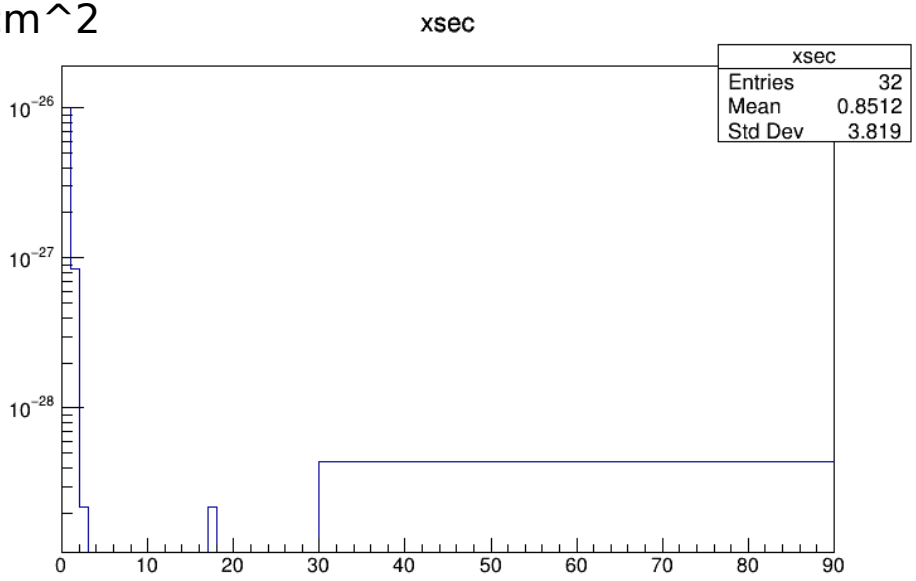


~ 10 mb

θ (°)

Z=2

cm^2



θ (°)

Z=7

Conclusions

- **Work in progress to complete the cross-section analysis in <= 4-dimension**
- **Preliminary estimation of reconstruction efficiencies:**
  - Issues with TW Z reconstruction algo and
  - TW point match with track

    → need dedicated studies
- **Goal: first cross-section measurement in September for my thesis**


GRAZIE E BUONE VACANZE

Global reconstruction

From SHOE branch “glbreco_v1”:
libs/src/TAGfoot/***GlobalRecoAna.cxx***

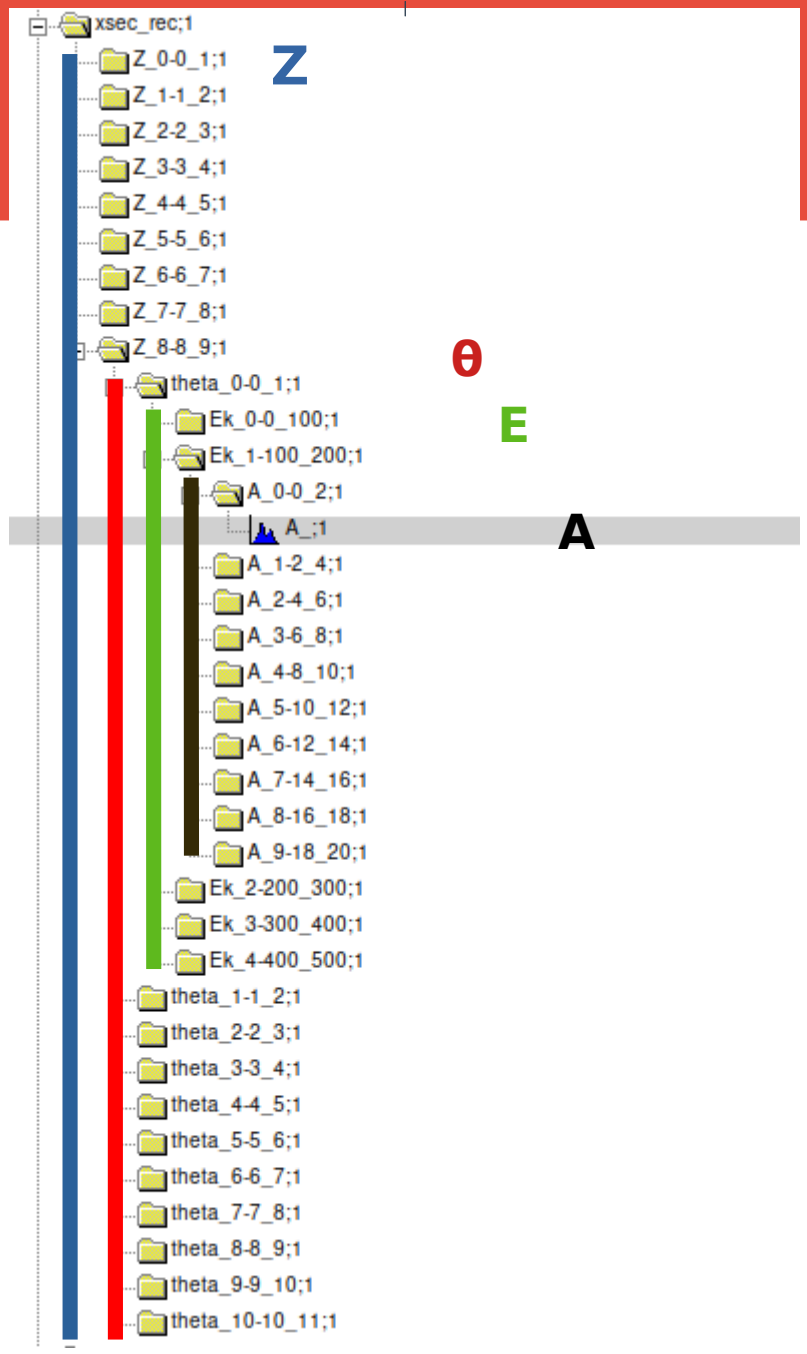
Global reconstruction of an event
- Particle ID: **Z**,**A**
- Kinematics: **E**,p
- Angular distribution: **θ**

.root file with histograms of variable distribution

Aim of the new software:
- Measure differential cross section **σ** (Z,A,θ,E) wrt all combination of variables

- Written in **python**

Exampe of Input file From SHOE



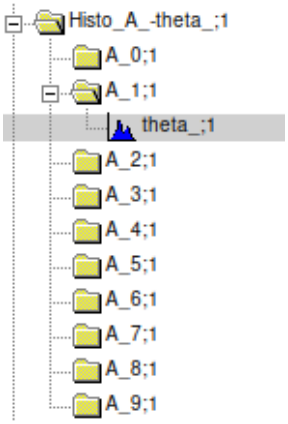
- There are only **histos of A**
- Every subdirectory is due to **input binning** of the variable
- Every histo is univocally discriminated by its path

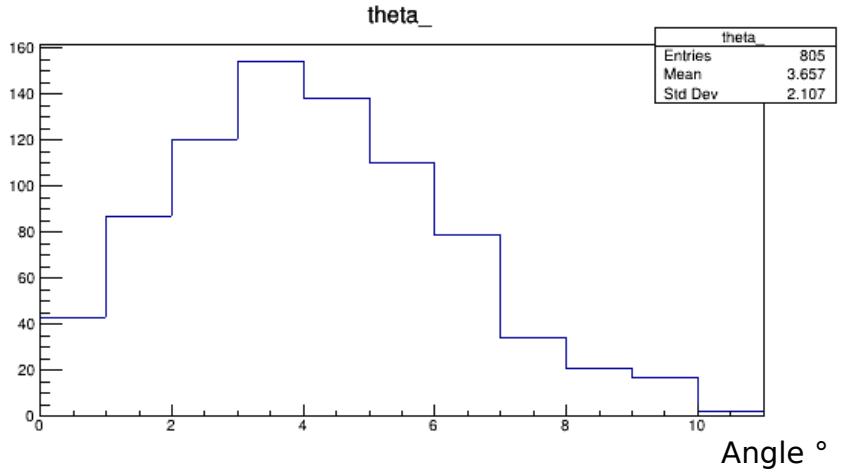
The software

- takes info dinamically about input variables and binning
- Generates **differential distribution** wrt all combinations of variables

Es. beam of O_**16** of 200 Mev/n against a target of C2H4 (MC)

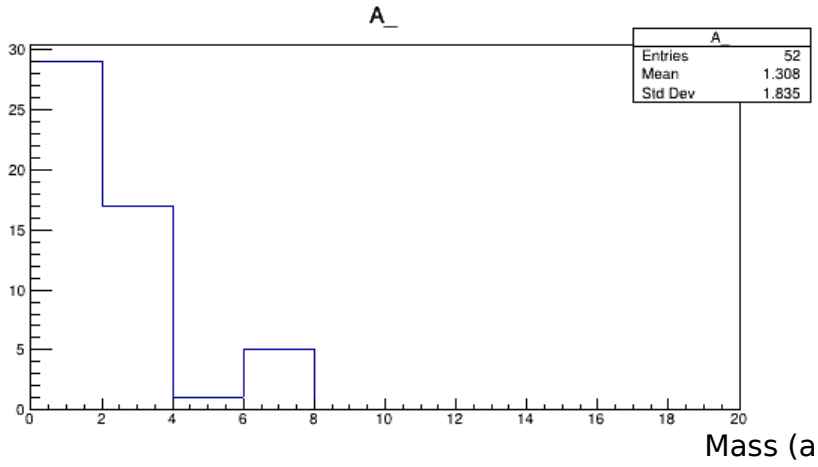
Write_Histo_events ("***A_/theta_***", eventContainer, outFile,inputPar_dict)





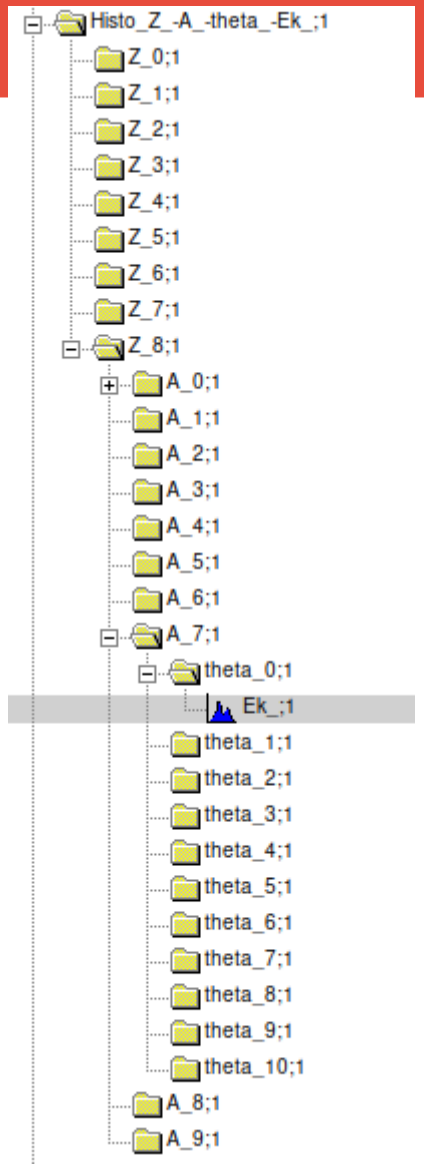
A_1: 2<A<4 amu
0°<θ<11°

Write_Histo_events ("***theta_/A_***", eventContainer, outFile,inputPar_dict)

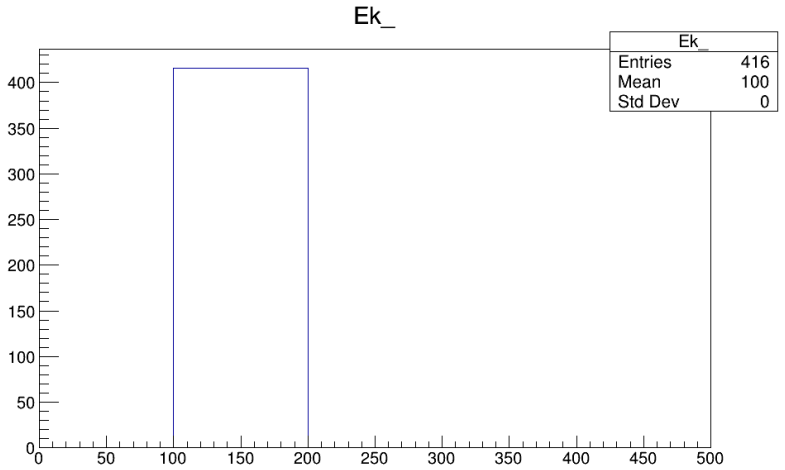


θ_9: 9°<θ<10°
0<A<20 amu

4 – differential distribution



Write_Histo_events ("***Z_/A_/theta_/Ek_***", eventContainer, outFile,inputPar_dict)



Z = 8
14<A<16
0°<θ<1°

TW point match with the track

current Event: 99776
------- track reconstruction
track n° 0
  TrkIdMC= 0
TW POINT; TrackIdMc: 0 4
 Fluka code: -2
  charge TW : 2 charge Fit : 2

---------- MC study
traccia MC: 0
*** fluka ID: -2(8)***
traccia MC: 1
  fluka ID: -6(2)
traccia MC: 2
  fluka ID: -6(2)
traccia MC: 3
  fluka ID: -6(2)
traccia MC: 4
  fluka ID: -6(2)
traccia MC: 5
  fluka ID: -2(6)

--> il TW interagisce con 2 punti, e prende il secondo (quello con TrackIdMc = 4) per ricostruire la carica, quando il vero TrackIdMC della particella è 0

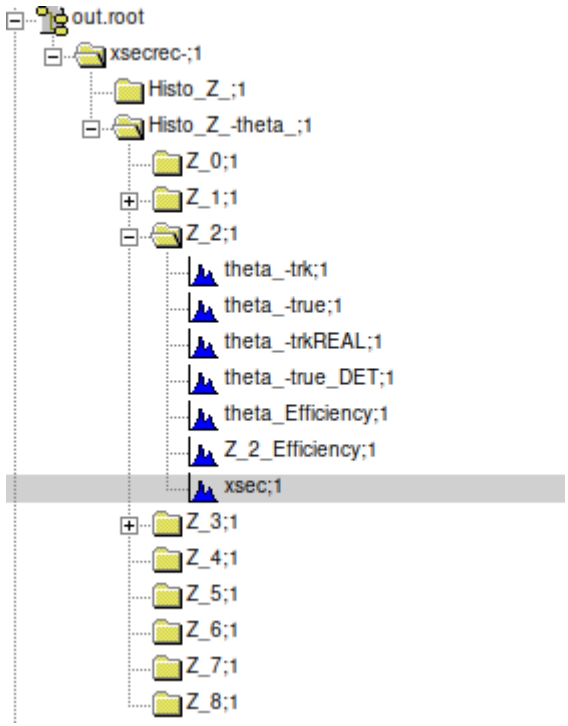
TW ALGO wrong Z reconstruction

current Event: 220
------- track reconstruction
track n° 0
TrkIdMC= 0
TW POINT; TrackIdMc: 0
Fluka code: -2
charge TW : 2 charge Fit : 2

---------- MC study
traccia MC: 0
fluka ID: -2, **charge: 8**

Output directories

```
supersig.Compute_XSection("Z_/theta_")
```



https://baltig.infn.it/gubaldi/xshoe