Status of the paper proposal & update on the analysis

Arianna Torres, Shyam Kumar, Francesco Barile

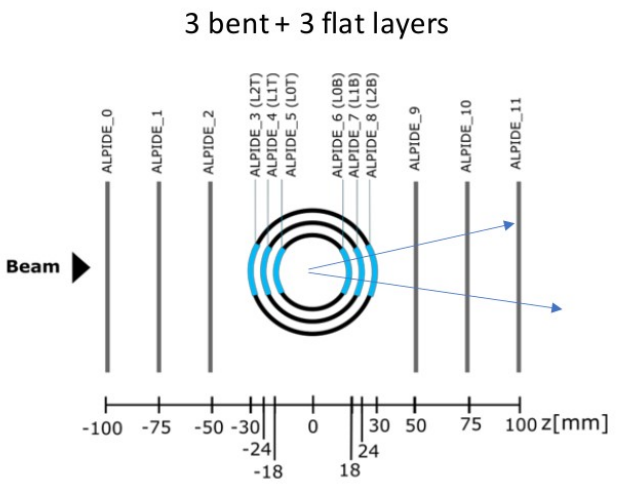
Università degli Studi di Bari and INFN Sezione di Bari

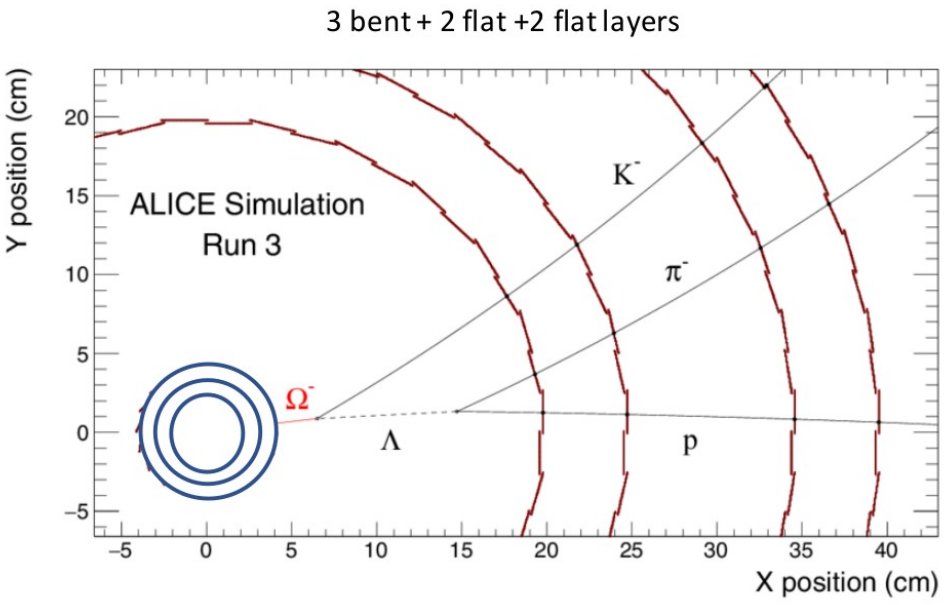
Goals of this paper

- **Title:** **Tracking performance of bent Monolithic Active Pixel Sensors mimicking a truly cylindrical barrel configuration**

Goal 1:

- Produce a paper where we prove that we can reconstruct tracks and vertices from hadronic interactions in a geometrical configuration ***very close*** to the next full ITS detector (including ITS3)



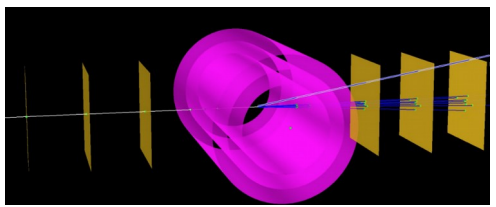


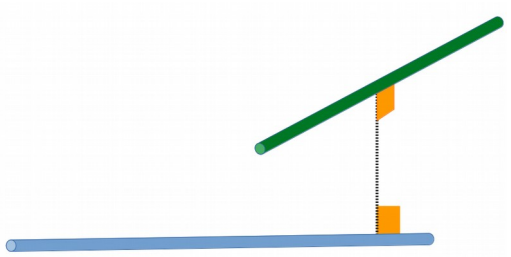
Goals of this paper

- **Title:** **Tracking performance of bent Monolithic Active Pixel Sensors mimicking a truly cylindrical barrel configuration**

Goals:

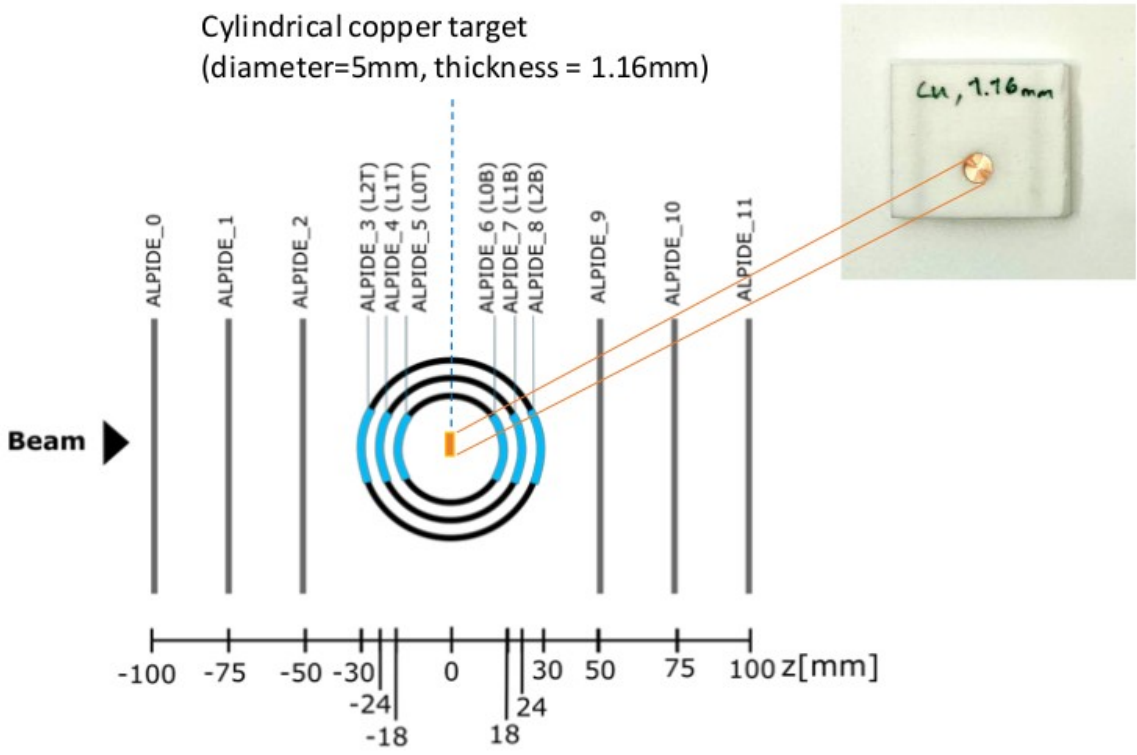
- *Demostrate the μITS can operate as full tracking device*
  - *Pattern recognition, i.e. track finding*
  - *Track fitting: both global fitting and Kalman filter methods*
  - *Impact parameter of tracks from the target wrt primary vertex*





Setup

- **Six flat ALPIDE chips** as reference planes (called REF)
- **6 bent ALPIDE chips (DUT)**
- DUTs radii: 18, 24 and 30 mm;
- Fixed **Cu target**
  - Diameter 5 mm
  - Thickness 1.16 mm
- **Beam: 120 GeV, pions, protons, muons and electrons**
- Data: Test-beam data analysis on micro-ITS3 with target (July 2021)



Telescope: 6REF (flat ALPIDEs) + 6DUT (bent ALPIDEs) + Target

Beam: 120 GeV hadrons (pions(60-70%), protons(25%), muons & electrons(5-15%)).

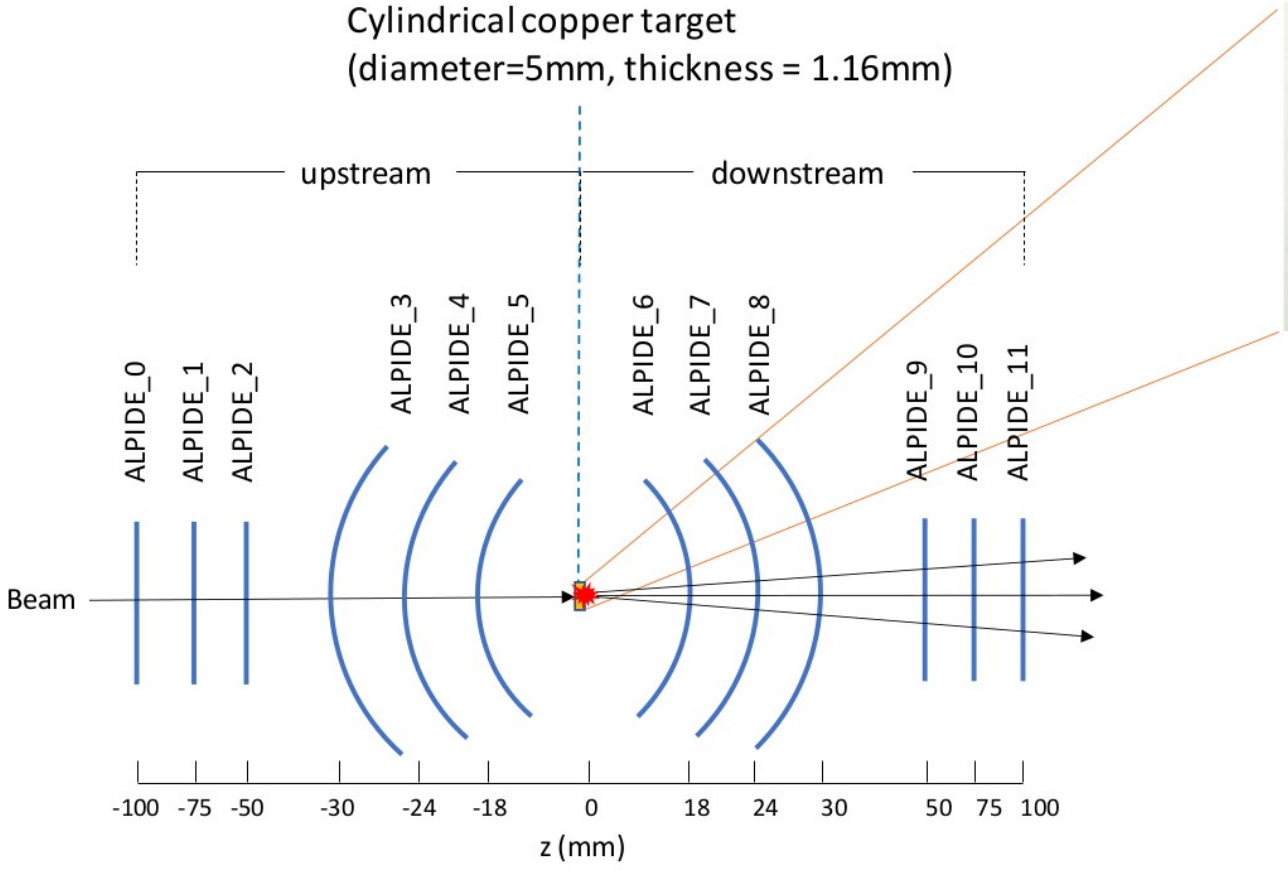
Setup

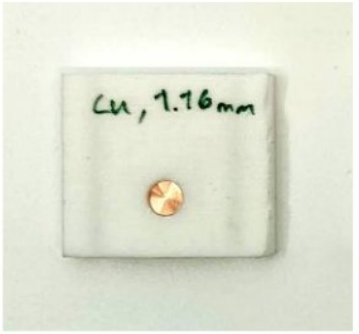
Upstream:

before Cu target

Downstream:

after Cu target





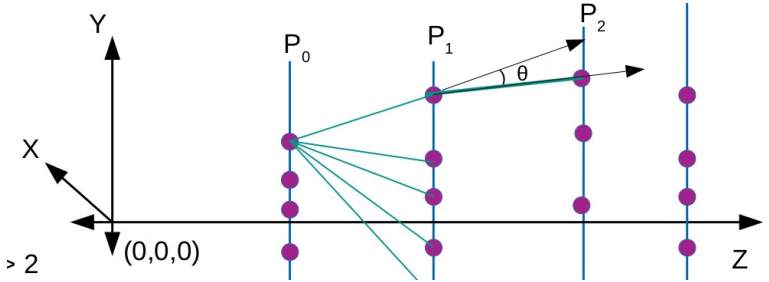
Analysis steps

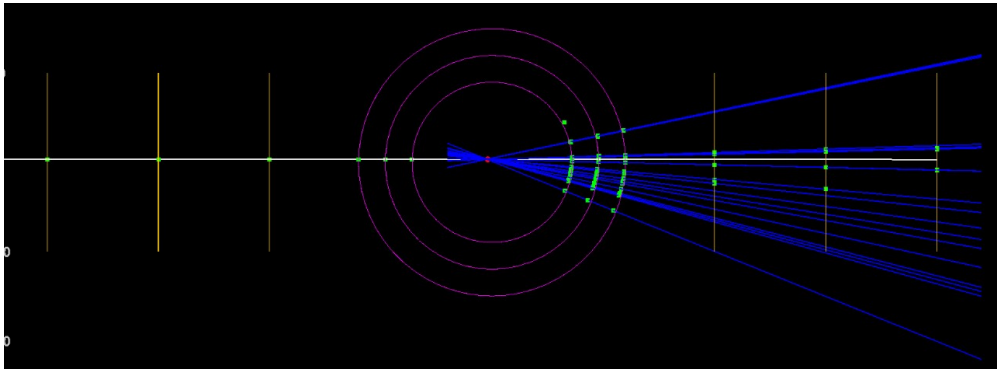
- **Alignment** (Corryvreckan) of the geometry
- **Events selection:** only tracks interacting with the Cu target

Arianna

- **Downstream tracking**: outside Corryvreckan
  - Finding tracks
  - Fitting tracks
    - two appoaches: Global Fitting and Kalman Filter
  - Impact parameter evaluation

Shyam





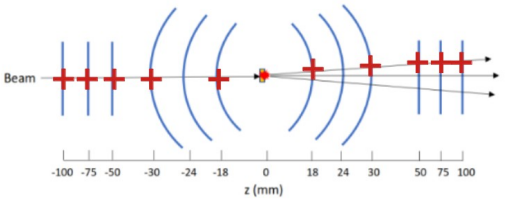
Add Alignment status & procedure

- **Add**

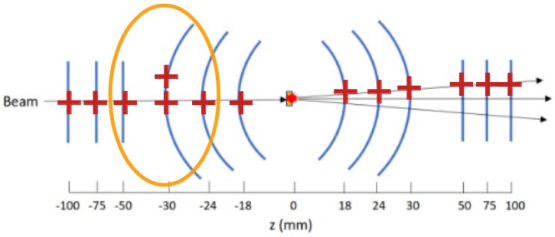
Events selection

Events with interaction in the target are defined applying the following selection criteria:

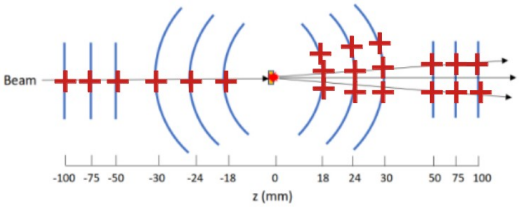
- At least one hit per layer.



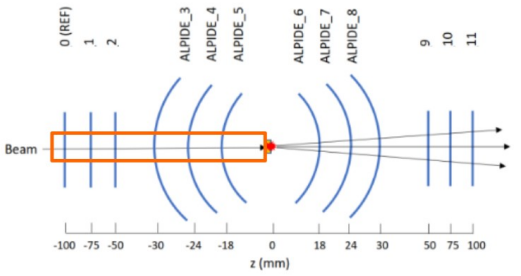
- No more than one hit in the layers before the target (upstream).



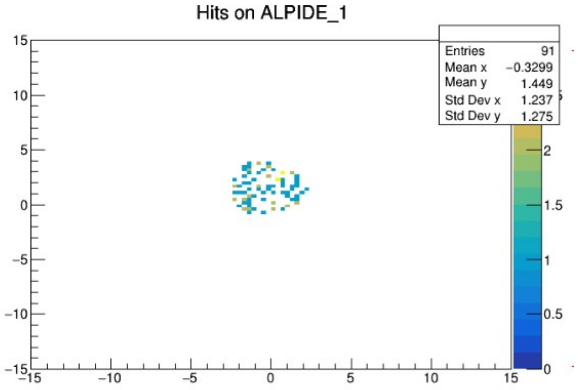
- No less than two hits in the layers after the target (downstream).

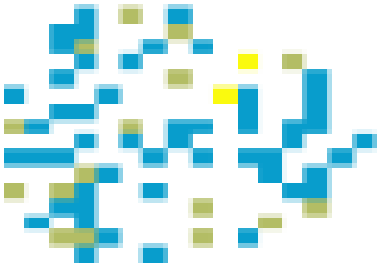


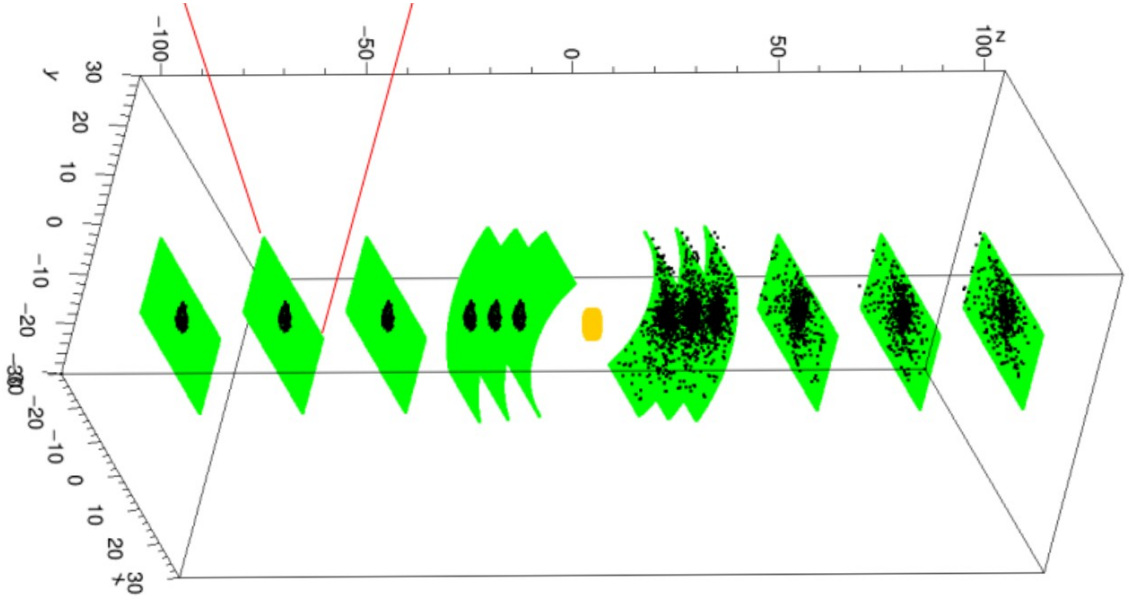
- Geometrical cut in the upstream planes at the estimated target position.



Selection of events with interaction in the target







Downstream fitting / tracking

- **Add**

Conclusions

- **Add**

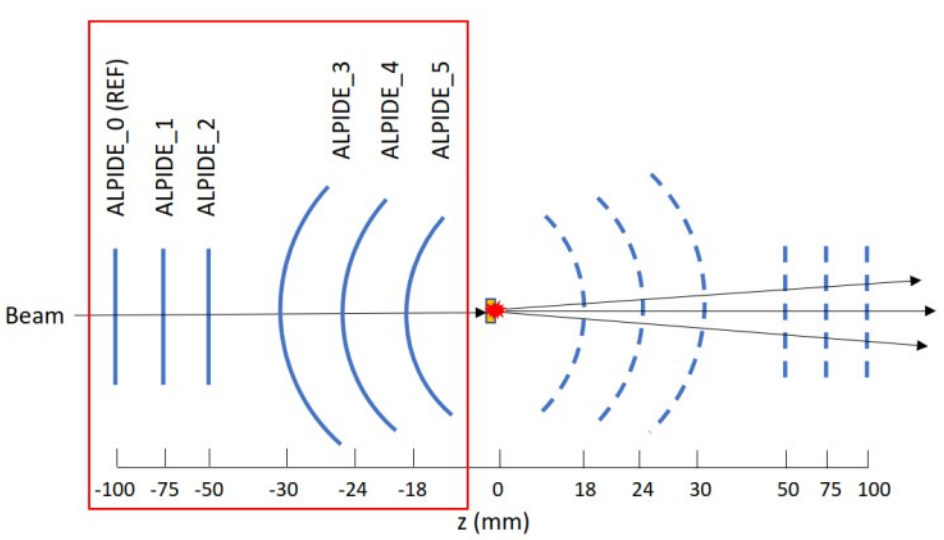
Backup

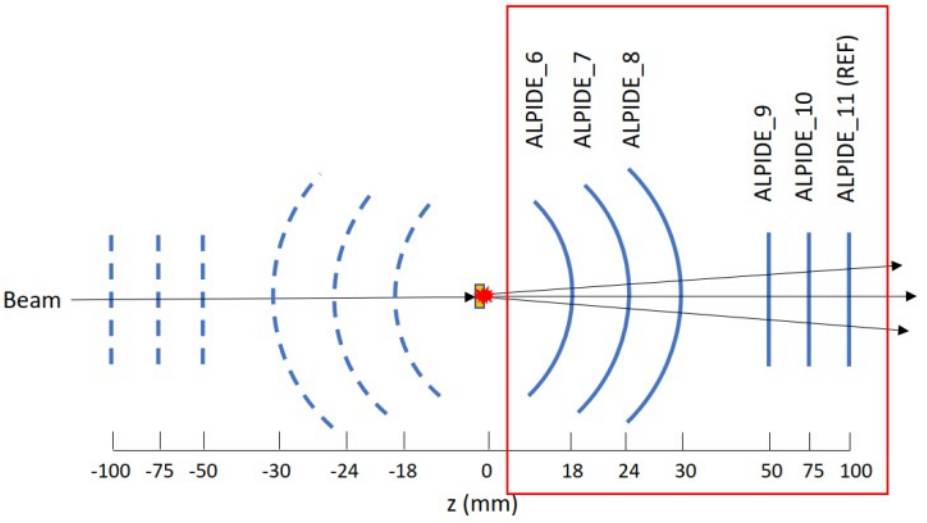
- **Add**

Alignment procedure (I)

The upstream and downstream layers are aligned separately. Each side showed good results, i.e. residual distributions (see next slides)

Next: both alignments need to be linked



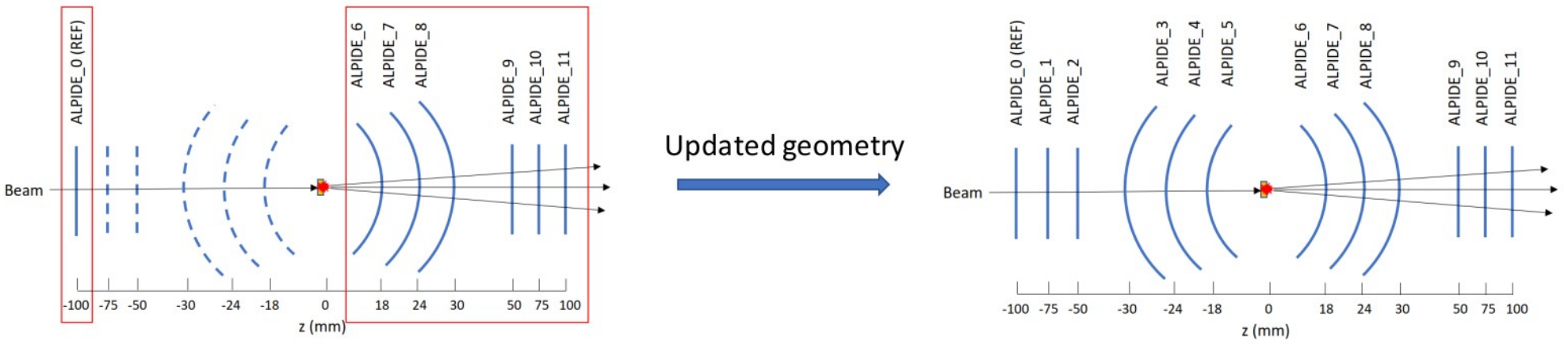


Alignment procedure (II)

Both alignments need to be linked: STEP 1 and STEP 2

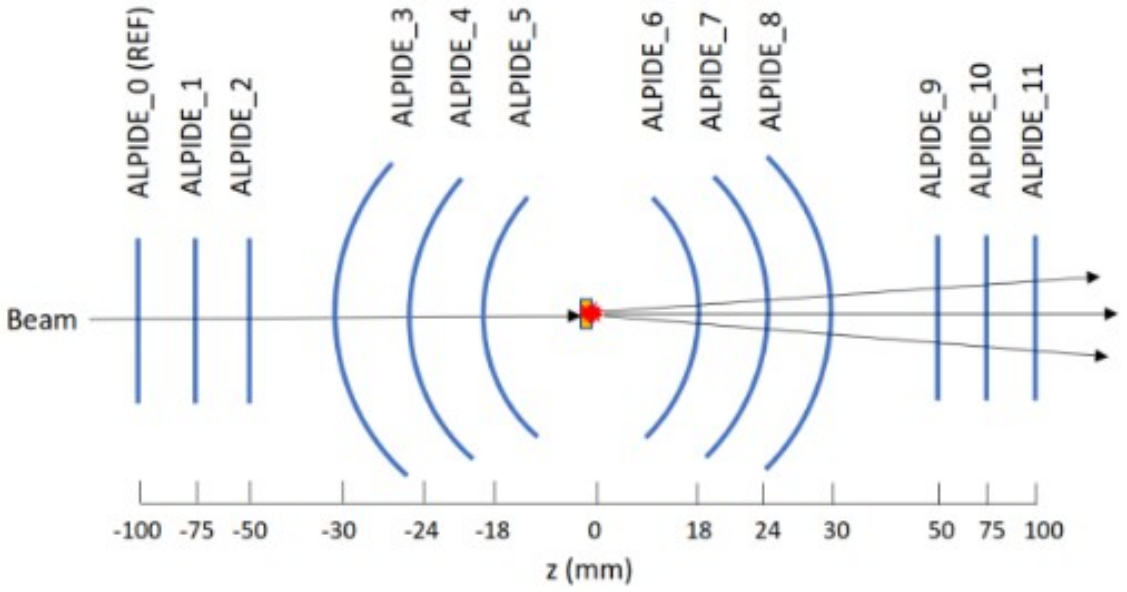
STEP 1:
Alignment ALPIDE_0 (REF) + ALPIDE_6 + ALPIDE_7 + ALPIDE_8 + ALPIDE_9 + ALPIDE_10 + ALPIDE_11

STEP 2:
Alignment STEP 1 + ALPIDE_1 + ALPIDE_2 + ALPIDE_3 + ALPIDE_4 + ALPIDE_5
(All layers)

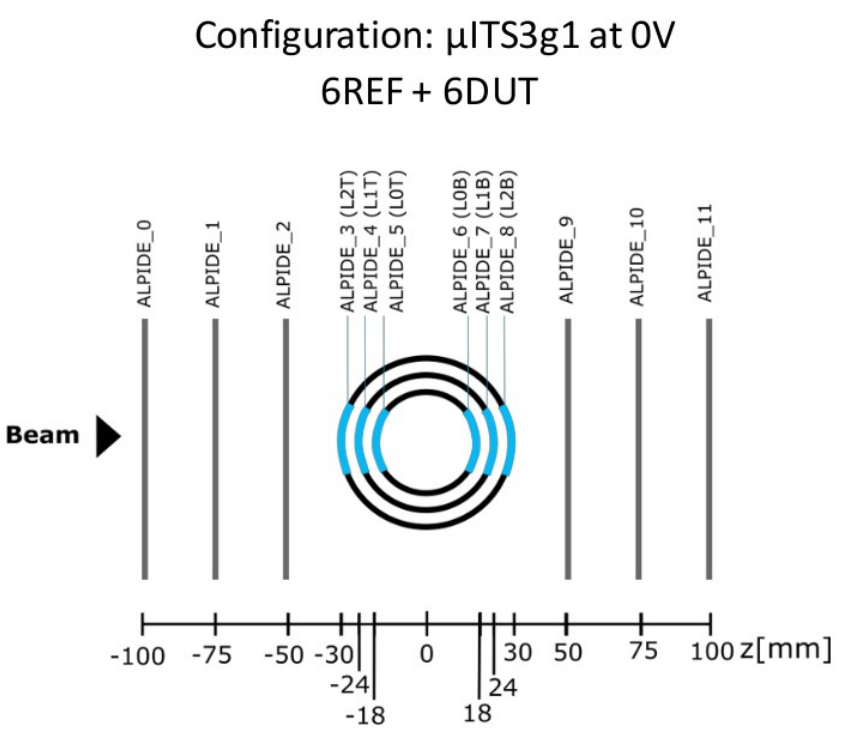


Analysis steps

- At this point, the geometry is aligned
- We can proceed with the analysis ~300k events (full statistics)
  - Selection of events with interaction in the target



Setup for measurement with full µITS3



DUT layer	L2T	L1T	L0T	L0B	L1B	L2B
Radius (mm)	30	24	18	18	24	30