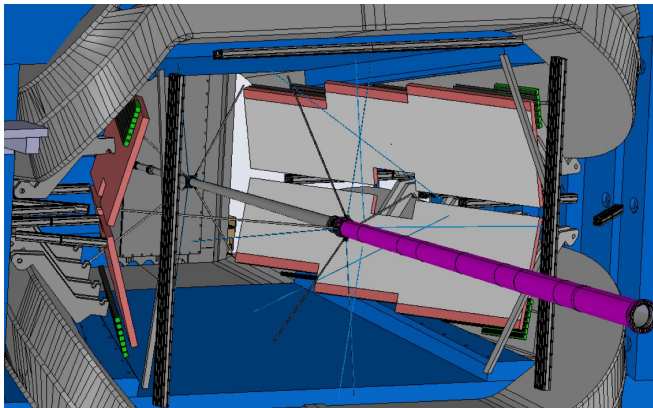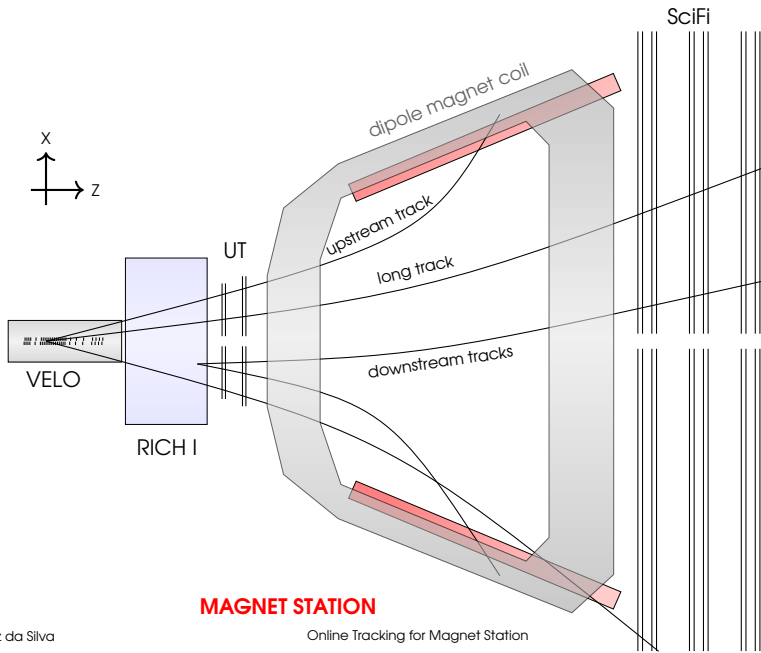# Online Tracking for Magnet Station
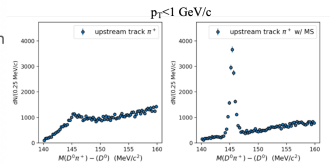
Cesar L. da Silva
Los Alamos National Lab
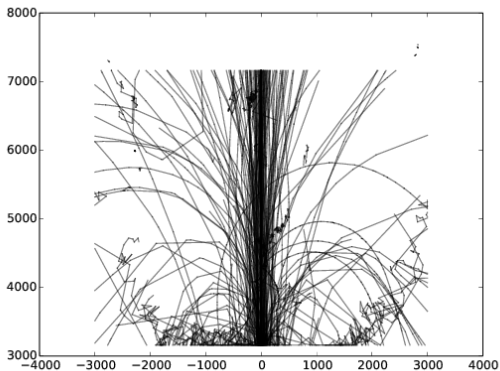
SciFi

X

Z

dipole magnet coil

upstream track

long track

downstream tracks

UT

VELO

RICH I
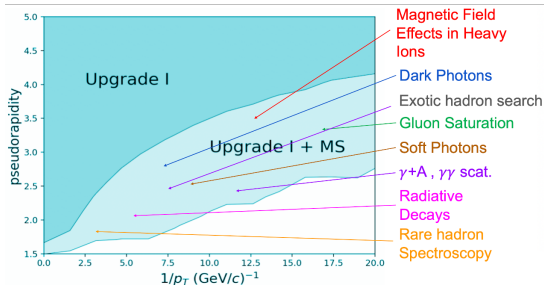
MAGNET STATION

- improvement on the upstream track momentum resolution from $/p$=12% to $/p <$1%
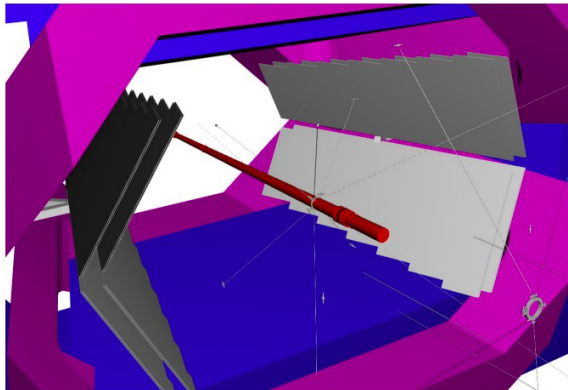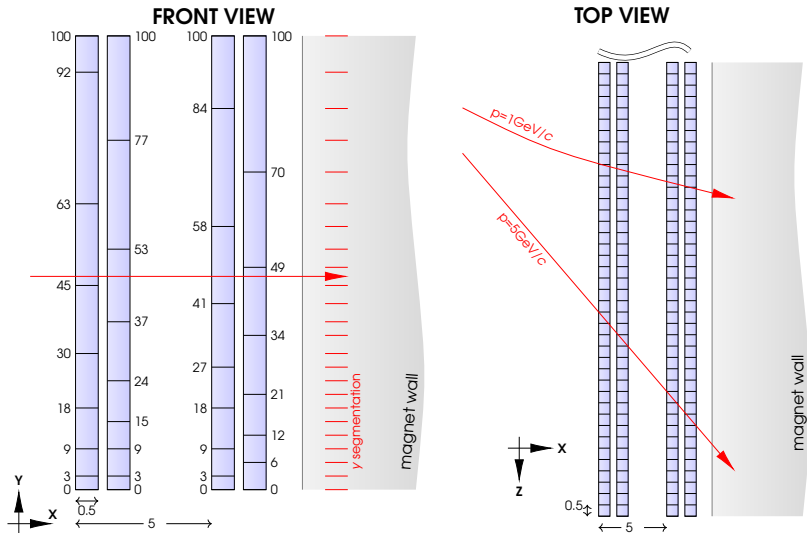
- 4 panels with 4 layers each
- simulated according to expected run 4 luminosity : μ=46

Los Alamos
NATIONAL LABORATORY
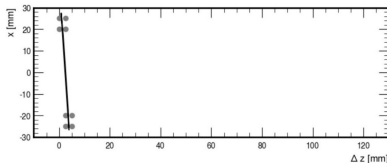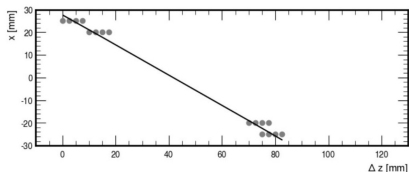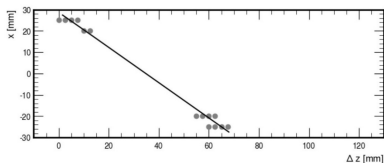EST. 1943

- Magnet Station will have several hits from very soft particles spiraling around the magnet
- it can be a slow offline process if it done on traditional ways
- streaming lines will require some pre-processed information from MS

- particles don't bend in Y-direction
- a combination of 4 Z-position hits in the same Y direction determine a track
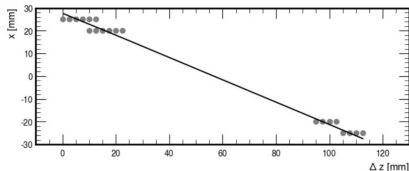
- simulation done with all particles depositing at least one hit in UT
- including off-vertex particles (like kaon decays)
- clustering performed at the front-end electronics
- large clusters from $p >$5 GeV/c particles are rejected
- FEE sends cluster centroids information to the PCIe400s

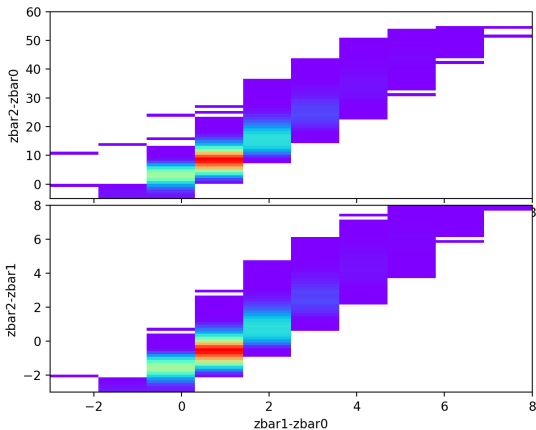Los Alamos
NATIONAL LABORATORY
EST. 1943

Histogram of hit times for all particles
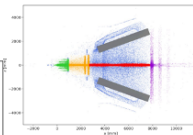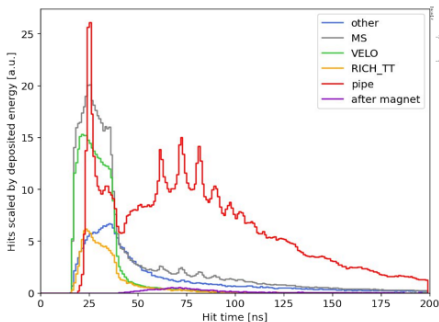
- a TDC threshold implemented in PACIFIC++ will be able to remove the overwhelming number of hits from particles coming from the beam pipe
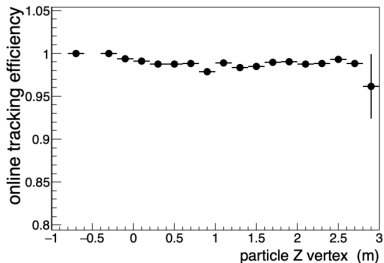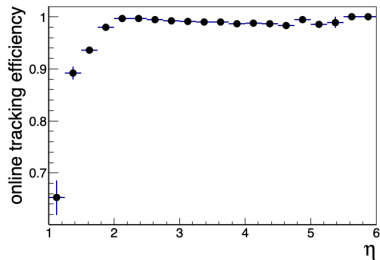- PACIFIC++ available only for UII
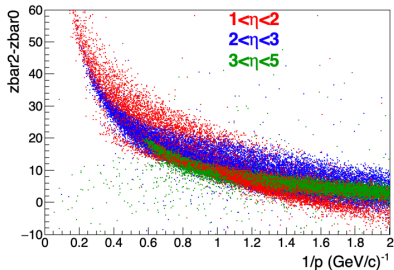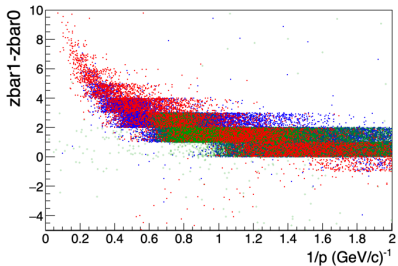
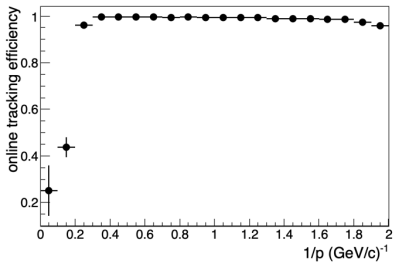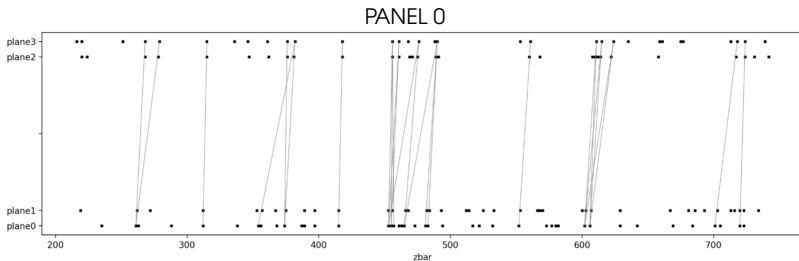- panel is divided in 700 zbar segments
- clear phase-space of zbar combinations

- 200 combinations per zbar found from simulations
- tracks can contain ybar-1, ybar, ybar+1 combinations
- combinations included in a FPGA at the PCIe400
- total of 350 zbars $\times$ 8 ybars $\times$ 200 = 560K combinations per panel

Los Alamos
NATIONAL LABORATORY
EST. 1943

- maximized efficiency for $0.5 < p(GeV/c) < 5$

Los Alamos
NATIONAL LABORATORY
— EST. 1943 —

PANEL 0

- no cluster in or TDC cut implemented in this plot
- number of ghost tracks should reduce once clustering and TDC cut are applied
- VELO+UT track projection needs to match one of the online tracks in the offline software
- cluster centroids are incorporated in the offline tracking
- see Pierre's presentation on track projection
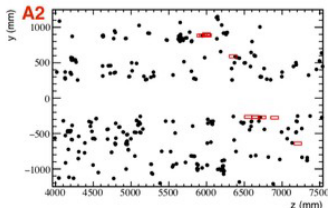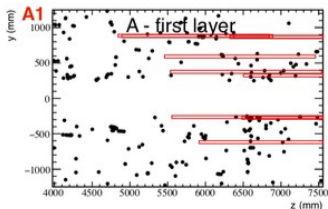
- large uncertainty upstream track projection because of the unknown particle momentum
- a projection matches many MS hits
- but 95% of the VELO+UT tracks match unique online tracks according to previous simulations
- newest MC setup is needed to better quantify UP+VELO and MS unambiguous matches or verify what would be the effect on the upstream track momentum resolution measurent in the presence of ghost MS tracks. More on simulation tomorrow.
- more on the track projection in the next talk

BACKUP SLIDES