EIC Detector Projects in PO
More brainstorming…

TU

July 1, 2022

DAQ/Electronics

- Obvious choice, rather uncontroversial
  - ▶ STAR & (s)PHENIX have plenty of experience and expertise
  - ▶ Jeff, Tonko, Martin, etc …
  - ▶ IO can get involved if needed/desired
  - ▶ affects every subsystem and provides some visibility
  - ▶ local expertise in DAQ is also desirable for operation
  - ▶ BNL Partnership
  - ▶ project R&D: eRD109
  - ▶ generic R&D: new FELIX board tailored for EIC?

IMHO: One of the first topics we probably can agree on

Hadron Polarimetry

- BNL world-expert, almost a must do
  - ▸ Current polarimetry group in CQCD
  - ▸ Project/PO ?
  - ▸ no generic R&D
  - ▸ BNL Leadership

IMHO: Also a clear topic we probably can agree on

Auxiliary Detectors

- CQCD was first to start working on it and is still leading much of it (Alex, Elke, Jada, …)
  - ▶ closeness to machine (IR group) a plus
  - ▶ RP seems most obvious with STAR experience and connection with AC-LGAD interest and efforts at BNL
  - ▶ Other candidates: OMD/Lumi
 - ▶ RP: BNL Leadership
  - ▶ OMD/Lumi: BNL Partnership

IMHO: Obvious that we will have to be involved. Not clear what beyond RP

ToF

- ToF
  - ▸ Pro: STAR has some expertise in ToF (gaseous)
  - ▸ Little expertise in PO/NP in Silicon Sensor Technology
  - ▸ AC-LGAD: interest in HEP, efforts in IO
  - ▸ Main player at BNL so far is Instrumentation not PO
  - ▸ Already strong groups involved Rice, UIC, UCSC, … (relation to CMS/MTD)
- Case A: AC-LGAD remains in Det-1
  - ▸ join AC-LGAD consortium
  - ▸ BNL Partnership
- Case B: ToF with AC-LGAD is not in Det-1:
  - ▸ Get involved in LAPPD R&D (so Alexander) and explore ToF through LAPPDs in RICHs
  - ▸ BNL Leadership
  - ▸ R&D: eRD110
  - ▸ generic R&D: lots of potential

IMHO: Case B is likely, this is a project with lots of potential to get burned. Pixelized LAPPD as ToF has lots of potential

pfRICH

- **mRICH is a dead end**
  - ▶ R&D is behind, lack of manpower, little interest other than GSU
  - ▶ low acceptance, lots of material
- **pfRICH**
  - ▶ ATHENA version by Alexander K.
  - ▶ Established technology (HERMES, BELLE)
  - ▶ Enormous potential to include LAPPD
 - ▶ BNL Leadership

Acceptance (tracks with >3 hits in mRICH)
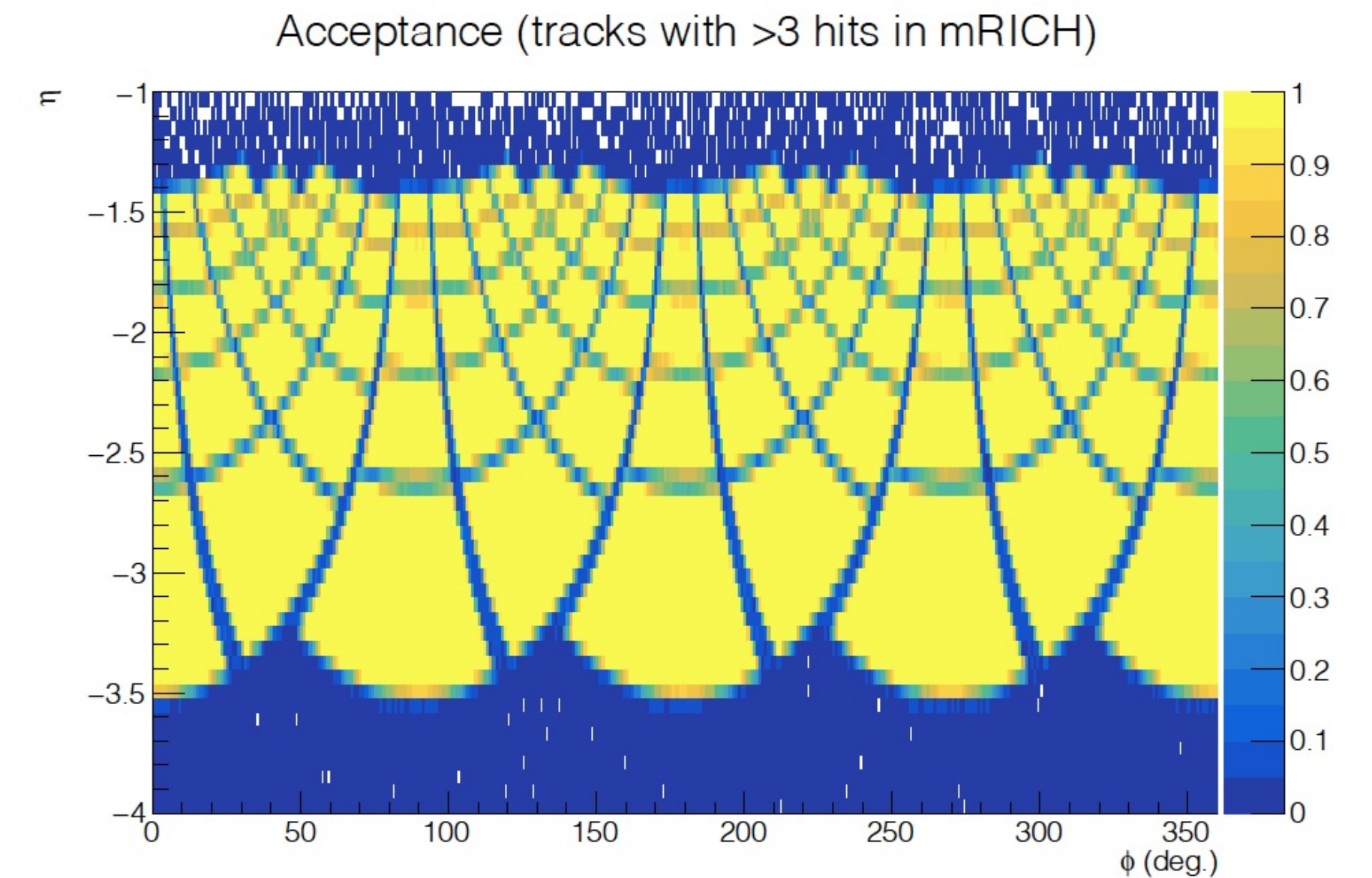
IMHO: A clear winner but right now needs push in Det-1

On pfRICH

- **Key features**
  - ▸ aerogel radiator proximity-focusing RICH with a 40 cm proximity gap
  - ▸ maximizes acceptance while minimizing material in front of the decal
  - ▸ aerogel and photon detector identical to dRICH ⇢ minimizes the number of PID technologies
  - ▸ $-1.5 > \eta > -3.8$
  - ▸ $3 < p < 11$ (K/π)
  - ▸ $0.85 < p < 3$ (e/π)
  - ▸ allows for pressure vessels (1 bar fluorocarbon → ~3 bar Ar)
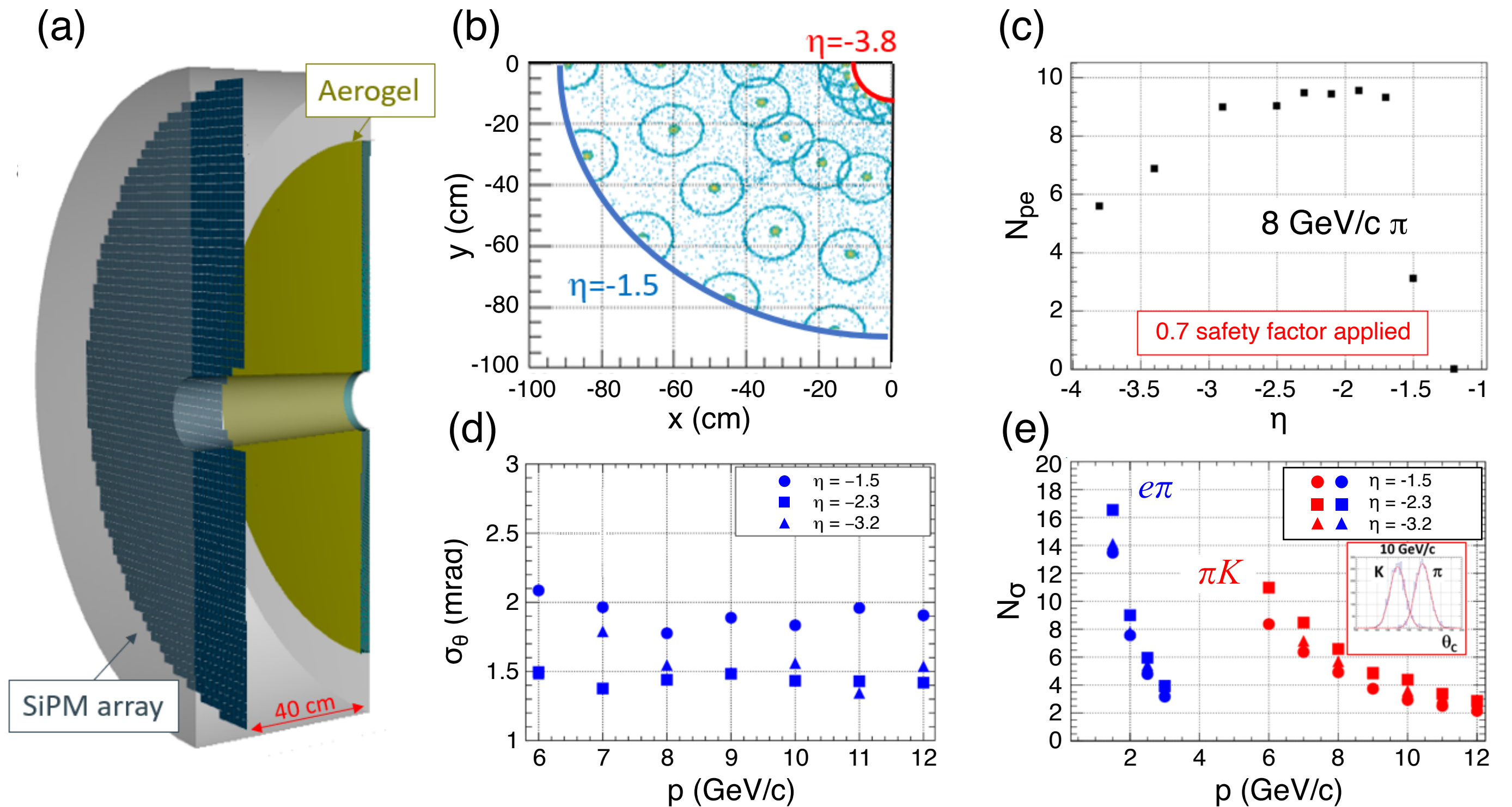
N.B: No strong physics case for PID below aerogel threshold identified. If pixelized LAPPD work out this would provide high resolution ToF (and T0) w/o adding material!

Thoughts on Calorimetry

- Still not convinced that Fwd calorimeter is way to go for BNL
- If Det-1 picks the Imaging Cal over the SciGlass Cal for bECal:
  - ▸ Why not joining efforts with ANL on bECal?
  - ▸ it needs person power more than fwd calorimeter
  - ▸ Lots of new interesting technology (Astropix) but also good old Pb/SciFi

Pb/SciFi

AstroPix
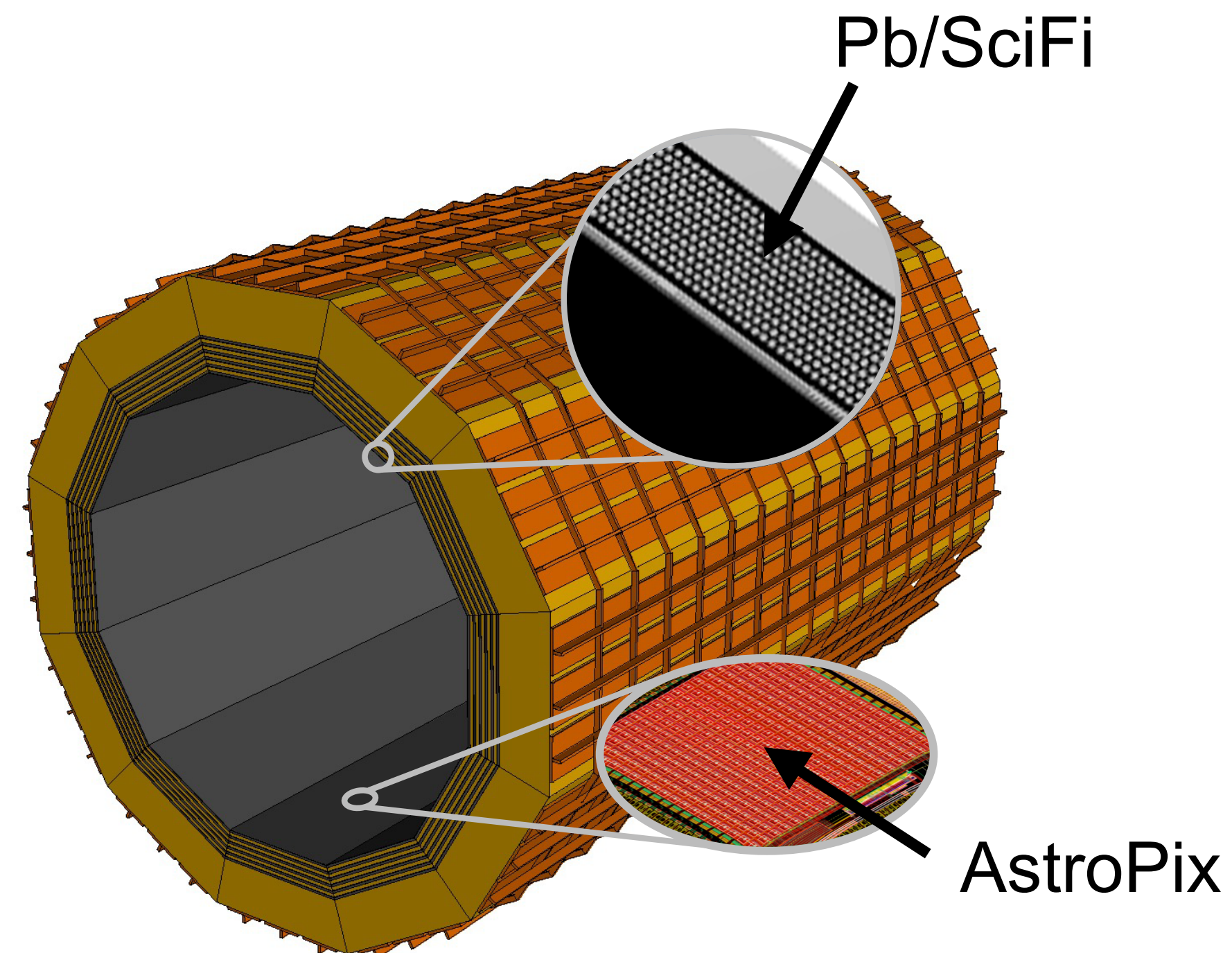
Thoughts on Tracking

- PO has no Si-sensor expertise but IO is knee deep in the Sci-Consortium and the ITS3 effort
- UK groups focus on sensors, LBL lost key expertise (but have composite lab)
- Many opportunities
  - software (slow control, tracking, etc) - also Torre's group
  - mechanics/infrastructure/cooling (eRD111)
  - service reduction effort (eRD104) - close connection to DAQ (see page 1)