Requirements for Future AMBER programs

Thomas Pöschl

thomas.poeschl@cern.ch

02.10.24

Apparatus for Meson and Baryon Experimental Research

AMBER
Apparatus for Meson and Baryon Experimental Research

Post-LS3 Measurements and Plans

Program	Beam type & momentum	target	beam PID	PID	Calorimetry
Drell-Yann measurements	hadron beam ~190 GeV/c	divers solid targets (C, W)	K, π	no	no
hadron radii	hadron beam 80 – 250 GeV/c	light, solid target (Be)	K, π, $\bar{p}$	no	maybe (for rad. cross checks)
primakov and prompt photons	hadron beam 190 GeV/c	solid high Z	K, π	no?	yes (π^0, gamma)
hadron spectroscopy	hadron beam (2 opt: < 100 or ~190 GeV)	liquid Hydrogen	K, π	yes	yes (π^0)
hadron production and correlations	hadron beam ~190 GeV	liquid Hydrogen (ID as addendum)	K, π, p	yes + nuclei PID	(yes) (π^0)
polarized-target physics	?	?	?	?	?

Apparatus for Meson and Baryon Experimental Research

Starting Point: DY setup

- beam PID: at least 2 cedars functioning; potentially additional Cerenkov threshold counters
- beam telescope + Vertex detector (usable afterwards?)
- tracking (SM1 + SM2) + Muon PID
  - currently missing: full configuration of LAS (especially large DCs and upstream SM1)
- *RICH moved out?*

AMBER
Apparatus for Meson and Baryon Experimental Research

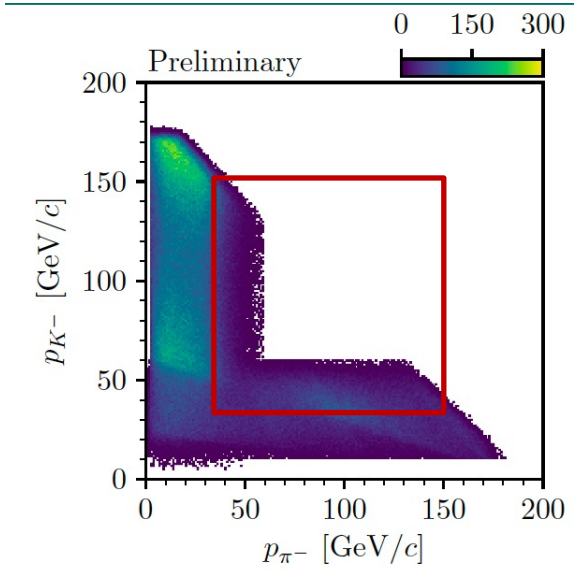
What is missing?

Program	Beam type & momentum	target	beam PID	PID	Calorimetry
Drell-Yann measurements	hadron beam ~190 GeV/c	divers solid targets (C, W)	K, π	no	no
hadron radii	hadron beam 80 – 250 GeV/c	light, solid target (Be)	K, π, $\bar{p}$	no	maybe (for rad. cross checks)
primakov and prompt photons	hadron beam 190 GeV/c	solid high Z	K, π	no?	yes (π^0, gamma) calorimetry
hadron spectroscopy	hadron beam (2 opt: < 100 or ~190 GeV)	liquid Hydrogen	K, π	yes	yes (π^0) calorimetry PID
hadron production and correlations	hadron beam ~190 GeV	liquid Hydrogen (ID as addendum)	K, π, p	yes + nuclei PID	(yes) (π^0) calorimetry PID
polarized-target physics	?	?	?	?	?

Big topics: PID and Calorimeter

PID

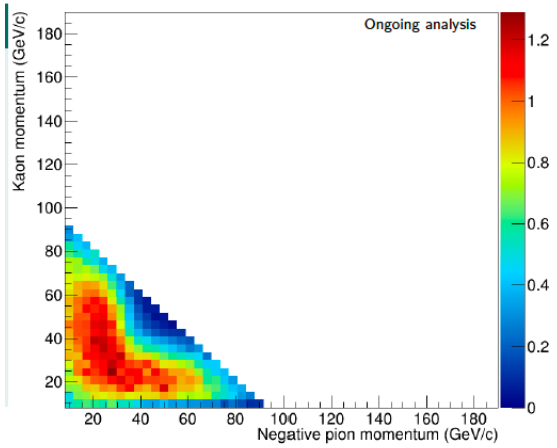
- momentum range to be covered strongly dependent on physics program
  - options:
    - RICH-1 + higher momentum coverage
    - RICH-1 + lower momentum coverage
    - 2 new systems for lower and higher momentum
    - 1 new system, tuned for coverage needed (if possible)



$p_{\text{beam}} = 100\,\text{GeV}/c$

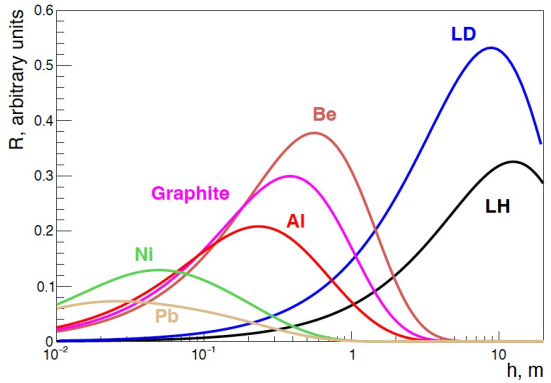
Calorimeter

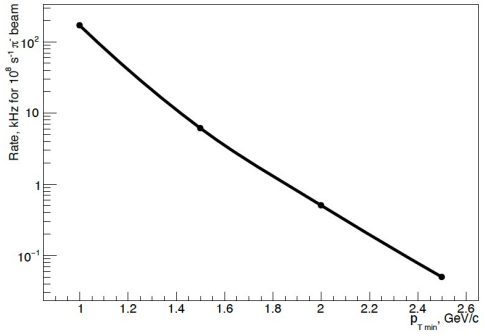
- angular coverage and size dependent on physics program (e.g. high pT photons vs primakov)



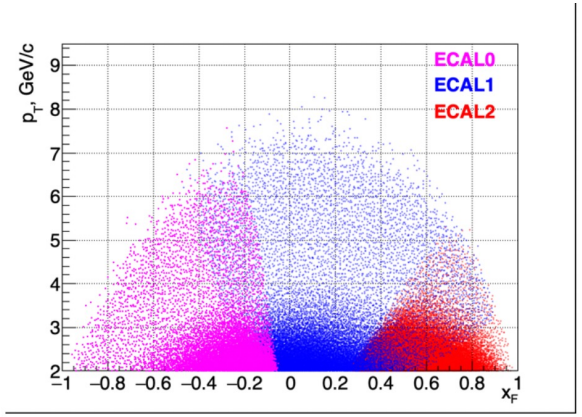
Calorimeter

Photons at AMBER



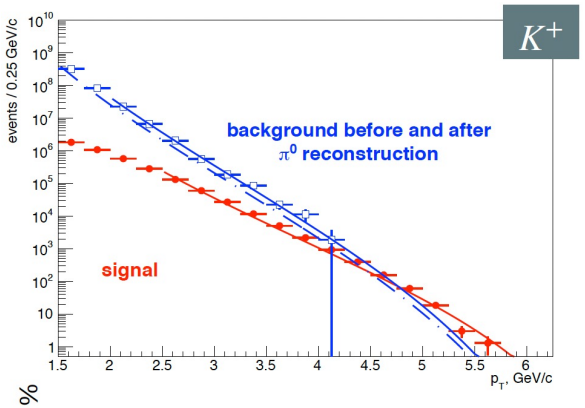


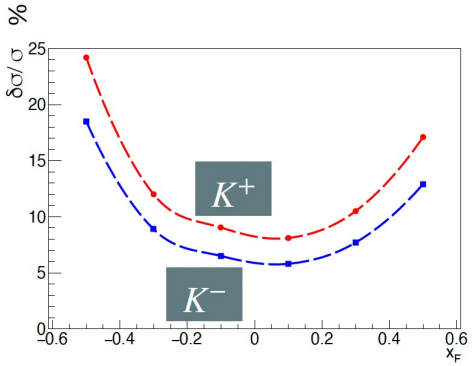
Target: 40 cm of graphite



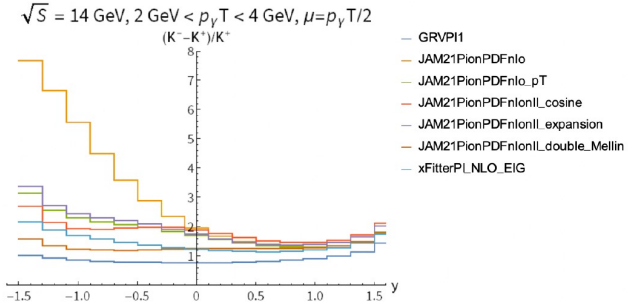
15

Expectations





Assuming the same gluon content for kaon as for pion



courtesy of A. Shipilova (Samara Univ.)

16

Additional tracking needed?

After “reshuffling” for DY, we would need additional tracking layers depending on the requirements

e.g. tracking for PID detectors, in front of ecal (e,gamma sep), etc …

Thank you for your attention and lets hope for a *happy ending*