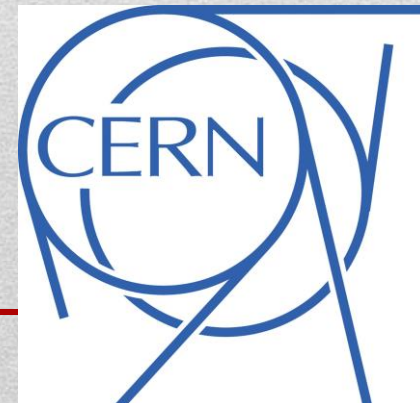# NA62 + HIDDEN SECTOR PHYSICS

Cari Cesarotti

29/06/16

- Measures $BR(K^+ \to \pi^+ \nu\bar{\nu})$
- Uncertainties <10%
- FCNC – not tree level, higher order corrections
- BSM theories come into play
- Measurement of $|V_{CKM}|$ (quark interactions)
- SPS provides 400 GeV/c protons $\to$ beryllium target
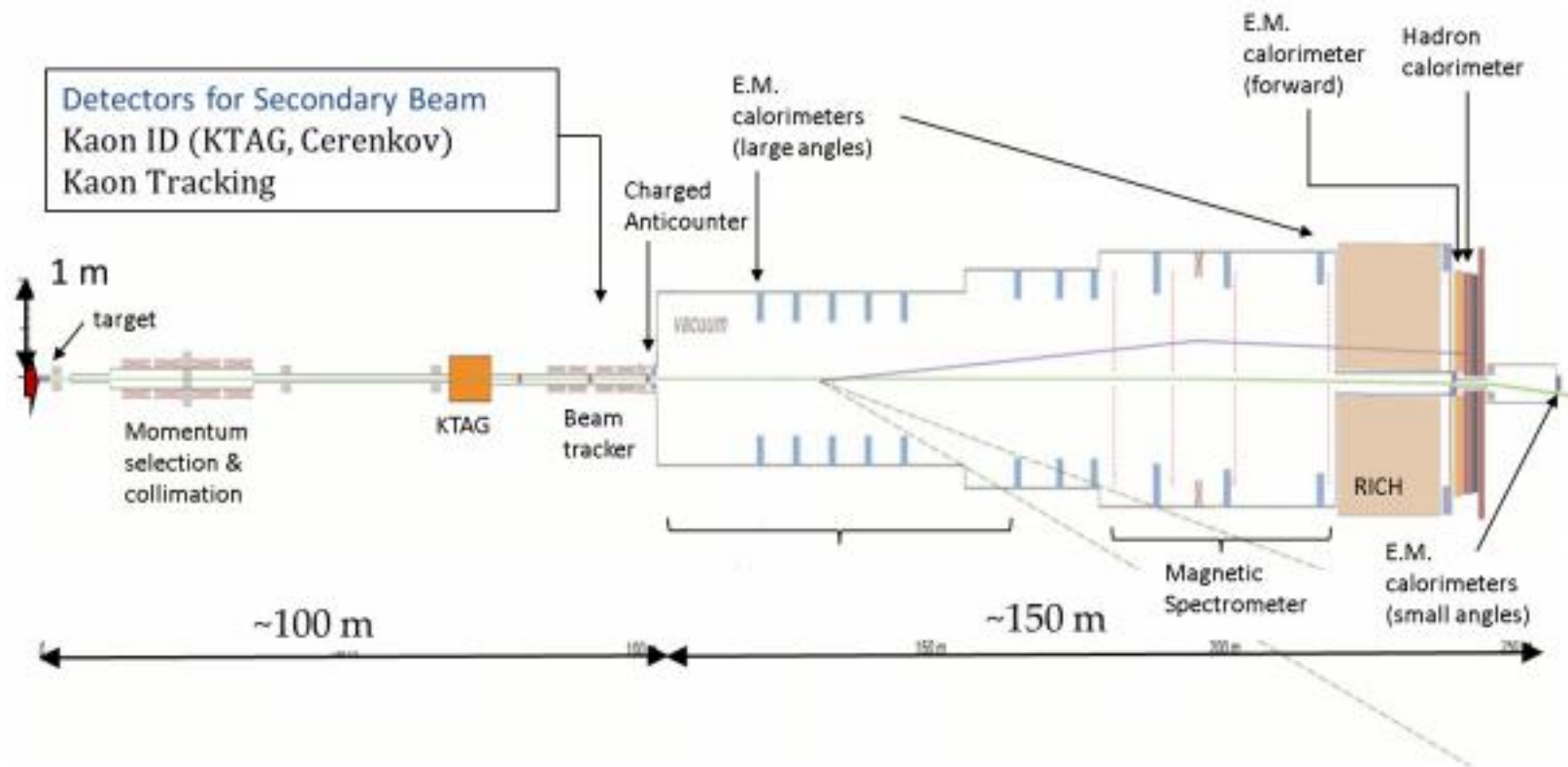- ~75 GeV/c K^+

NA62

Fig. 2. Layout of the NA62 detector.

NA62

- Babette Döbrich & Tommaso Sparado
- Search for axion-like particles or the dark photon
- ALP – pseudoscalar coupling to 2Υ
- Dark Photon – $U(1)_{dark}$ with visible leptonic decay modes
- Predict kinetic mixing with $U(1)_Y$ of SM
- Ideal because of
  - "Dump mode" high Z material
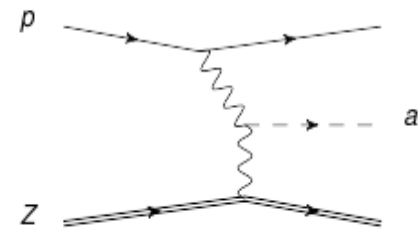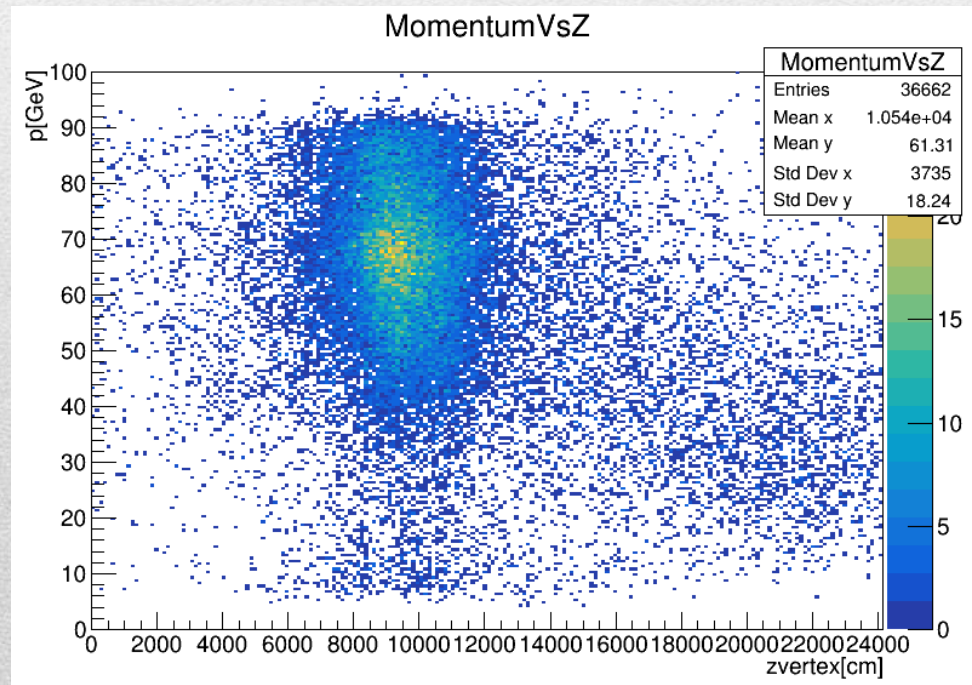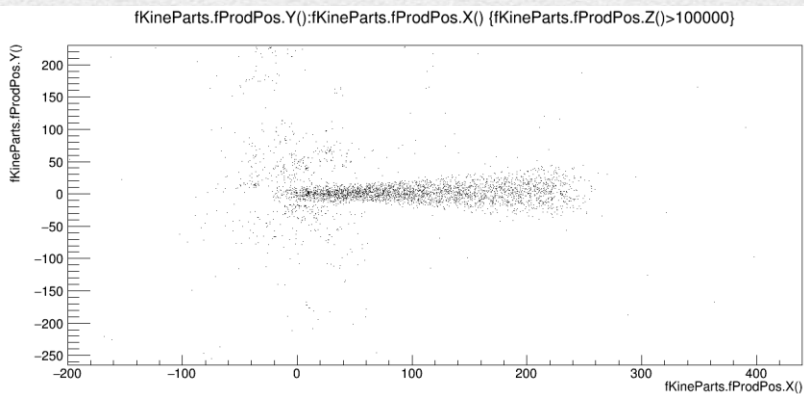 - Cross sections boosted in +z direction
  - Excellent lepton trigger

Figure 2. Primakoff production of ALPs in proton-nucleus collisions.

Hidden Sector

- Analyze data from beam-dump 2015
- Compare (and modify!) MC with existing results
- Vertex reconstruction and particle identification
- Understand background → easy to see signal

fKineParts.fProdPos.Y():fKineParts.fProdPos.X() {fKineParts.fProdPos.Z()>100000}

MC+Data

MomentumVsZ

MomentumVsZ	
Entries	36662
Mean x	1.054e+04
Mean y	61.31
Std Dev x	3735
Std Dev y	18.24

- Too many K^0_S / K^0_L
- Dominant BR's of meson decay include neutrinos…how do we reconstruct?
- Separate $\pi^0 \rightarrow \gamma\gamma$ from ALP signal

Problems

CBB Studies