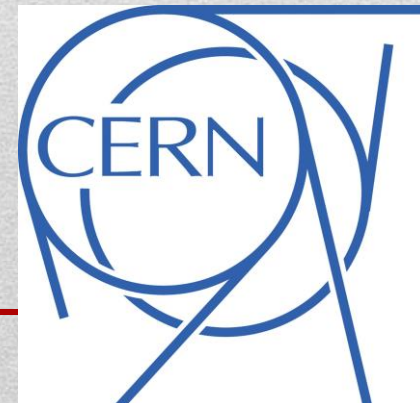


# NA62 + HIDDEN SECTOR PHYSICS

Cari Cesarotti

29/06/16



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

# NA62

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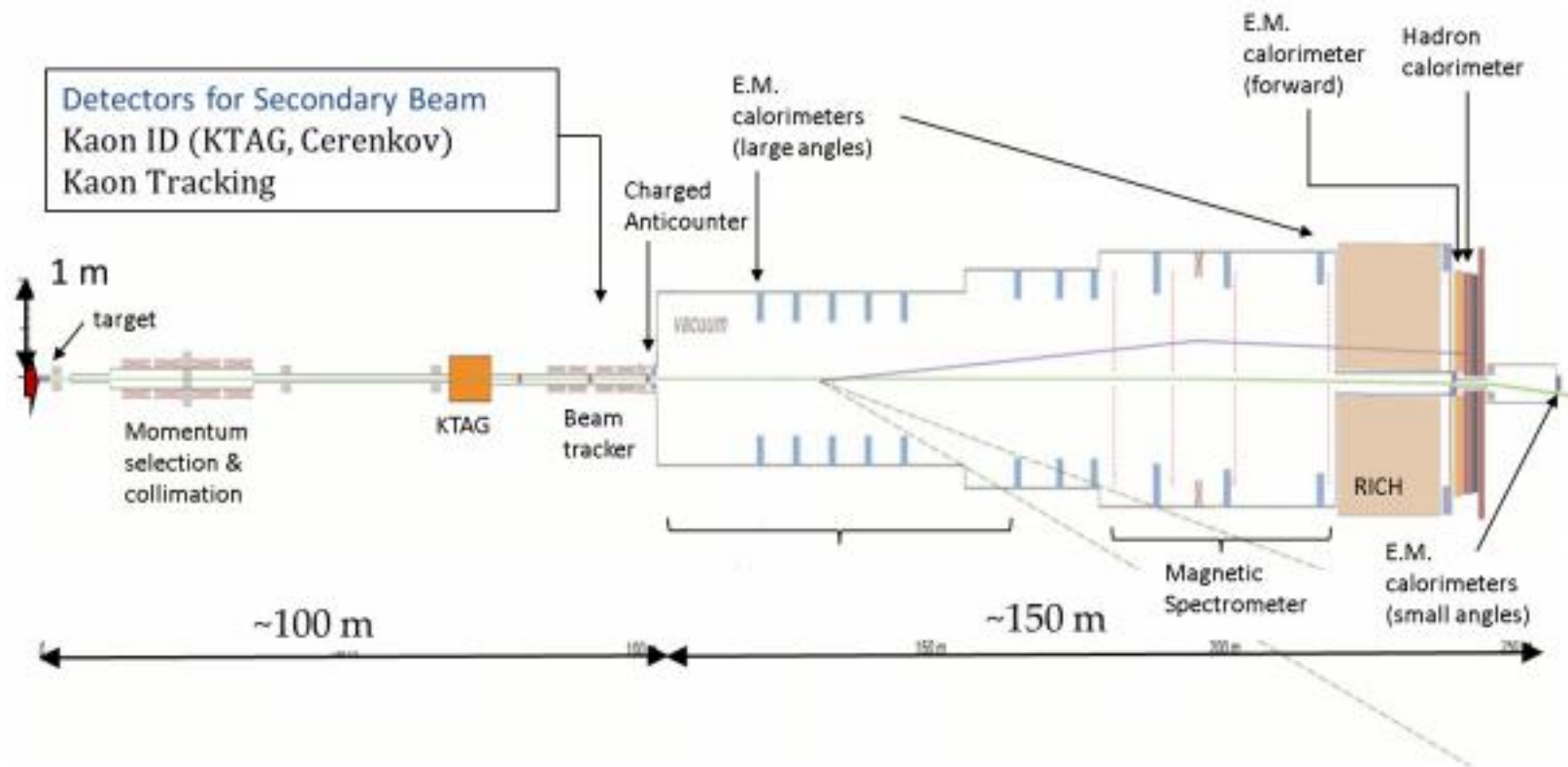


Fig. 2. Layout of the NA62 detector.

# NA62

- Babette Döbrich & Tommaso Sparado
- Search for axion-like particles or the dark photon
- ALP – pseudoscalar coupling to  $2\gamma$
- Dark Photon –  $U(1)_{\text{dark}}$  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

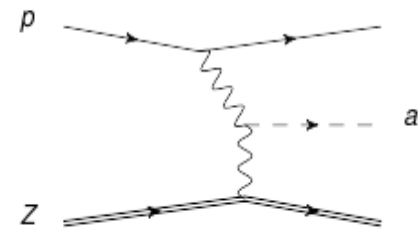
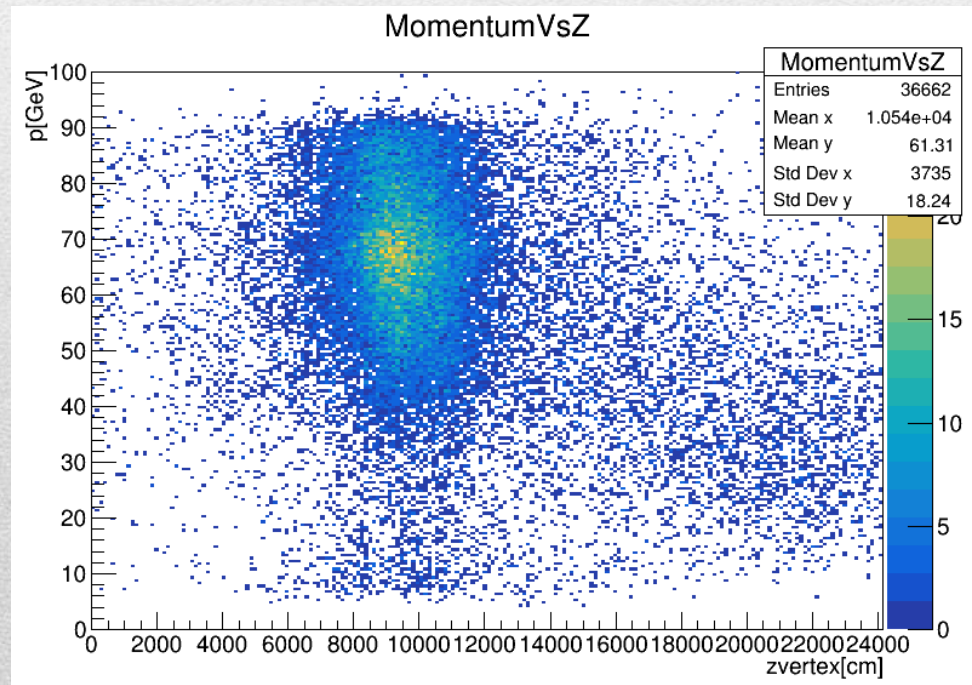
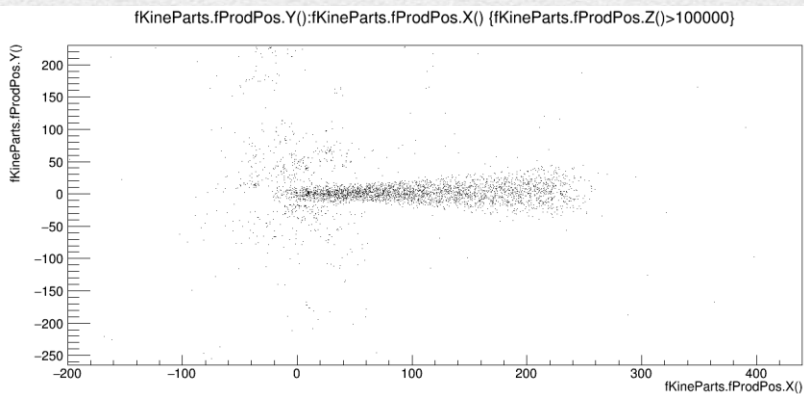


Figure 2. Primakoff production of ALPs in proton-nucleus collisions.

**Hidden Sector**



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



# MC+Data

- 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

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oh i used 'sudo' on lxplus 9:40 PM

by now Tonino knows who you are 😊 if it's reported to him

if it's reported to some other cern guy

we'll see

worst case I claim I don't know you 😊

thank you for being such a supportive advisor 9:41 PM



9:41 PM

if i get put in CERN jail I can't work on Geant!! 9:41 PM

honestly don't worry. but why would you sudo?

9:42 PM

also I think jails in switzerland must have internet

ah sorry

5:17 PM

I had overlok

give me 5min, interesting talk at the moment

feynman multi loop calculation with your eyes closed and machine learning?? 5:18 PM



5:18 PM

# CBB Studies