

NA62

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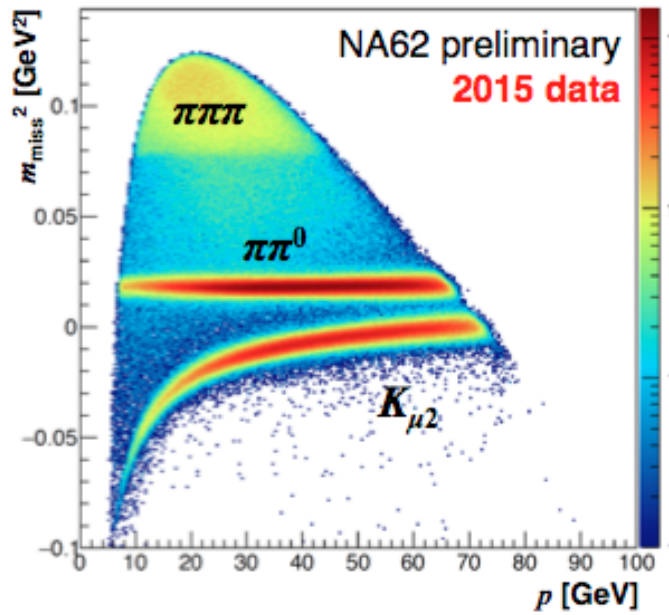
Detector is completed, including the GTK

Taking data currently at 30% intensity - plan to increase further

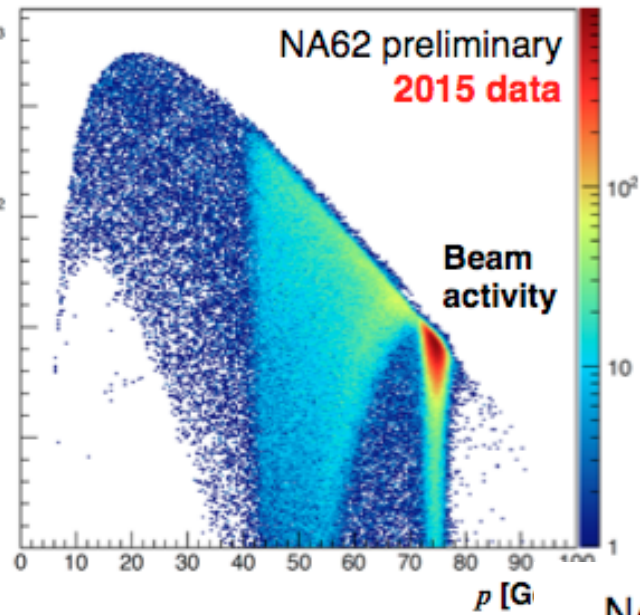
Expect to collect a few SM $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ events by end of 2016

On track to collect $\sim O(100)$ by 2018

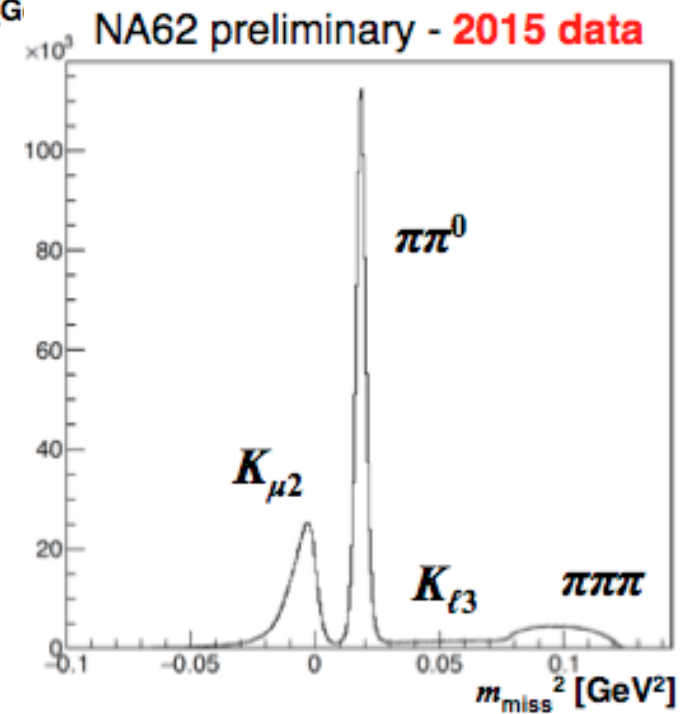
1-track selection
 K^+ ID in KTAG



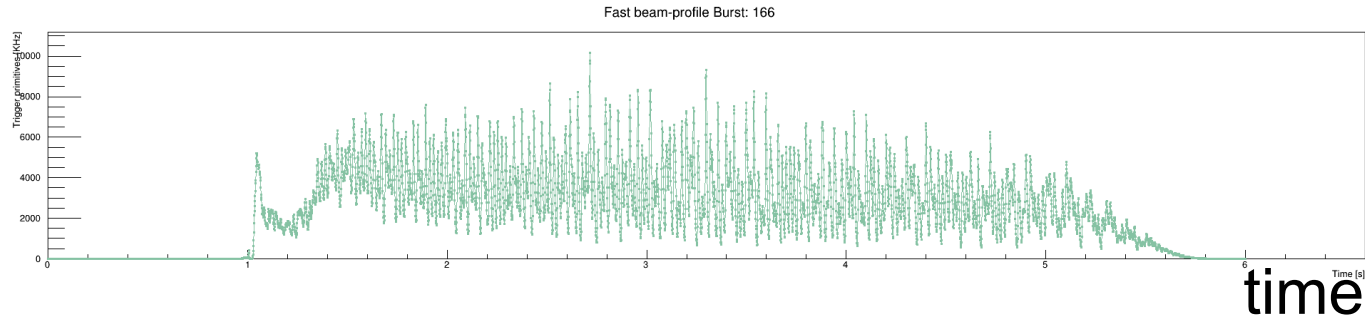
1-track selection
No K^+ ID in KTAG



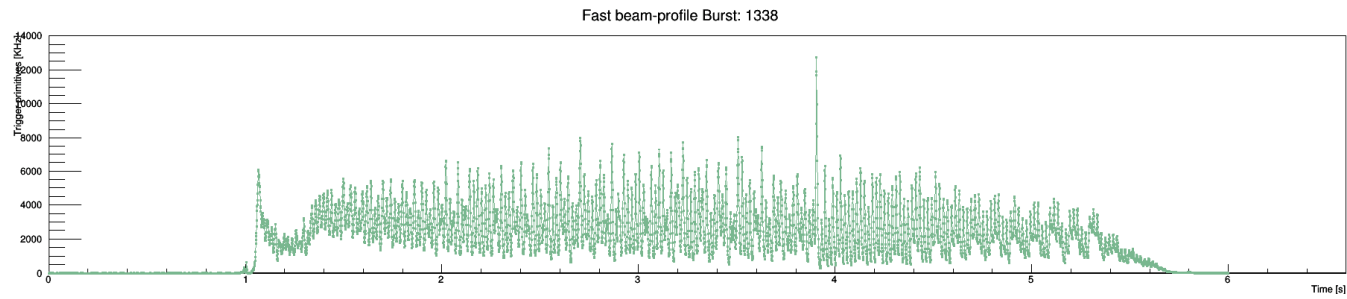
Analysis on-going for 2015
And 2016 data



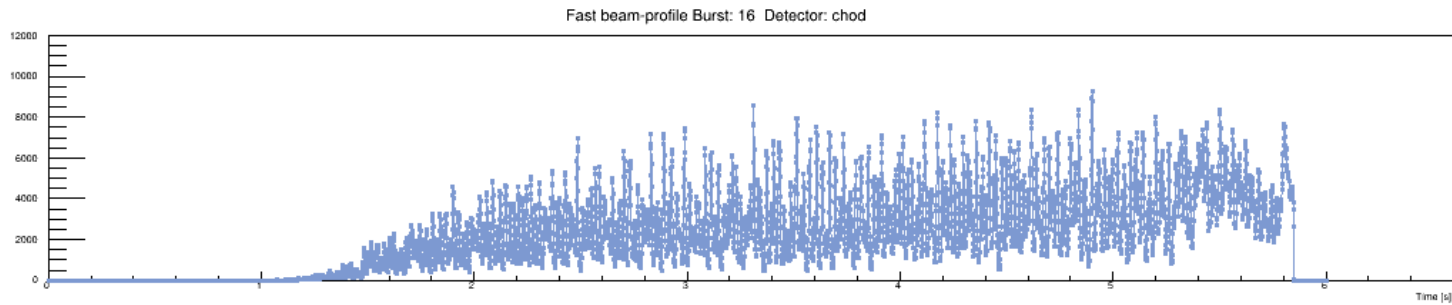
Beam spill shape: current challenge



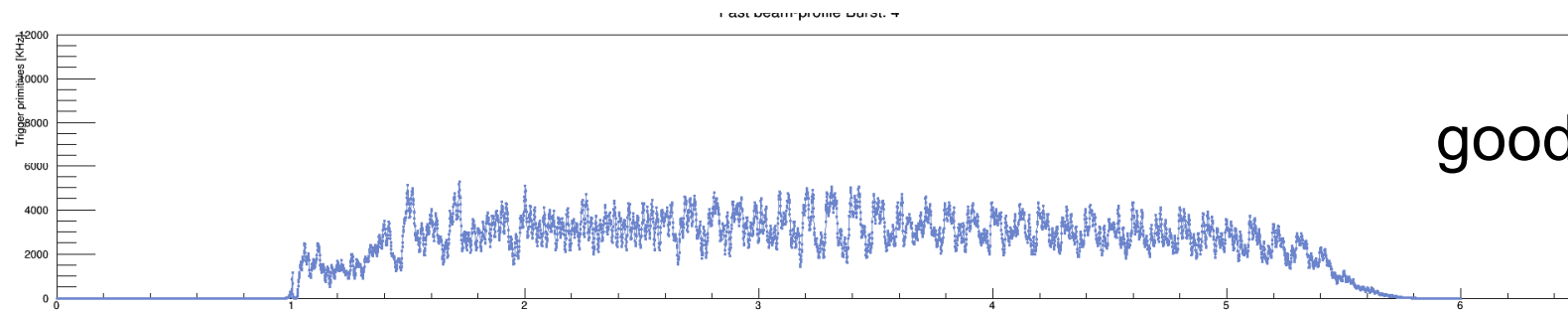
bad



bad



bad



good

Physics Programme beyond $K^+ \rightarrow \pi^+ \nu \nu$ (now-2023)

Standard kaon physics

- Precision measurements of dominant K^+ BRs
- ChPT studies: $K^+ \rightarrow \pi^+ \gamma \gamma$, $K^+ \rightarrow \pi^+ \pi^0 e^+ e^-$, K_{e4}
- Precision test of lepton universality: $R_K = \Gamma(K \rightarrow e \nu(\gamma)) / \Gamma(K \rightarrow \mu \nu(\gamma))$

Searches for lepton-flavor or -number violating decays

- $K^+ \rightarrow \pi^+ \mu e$, $K^+ \rightarrow \pi^- \mu^+ e^+$, $K^+ \rightarrow \pi^- \ell^+ \ell^+$

Searches for heavy neutrinos

- $K^+ \rightarrow \ell^+ \nu_h$ (inclusive)
- ν_h from upstream K , D decays with $\nu_h \rightarrow \pi \ell$

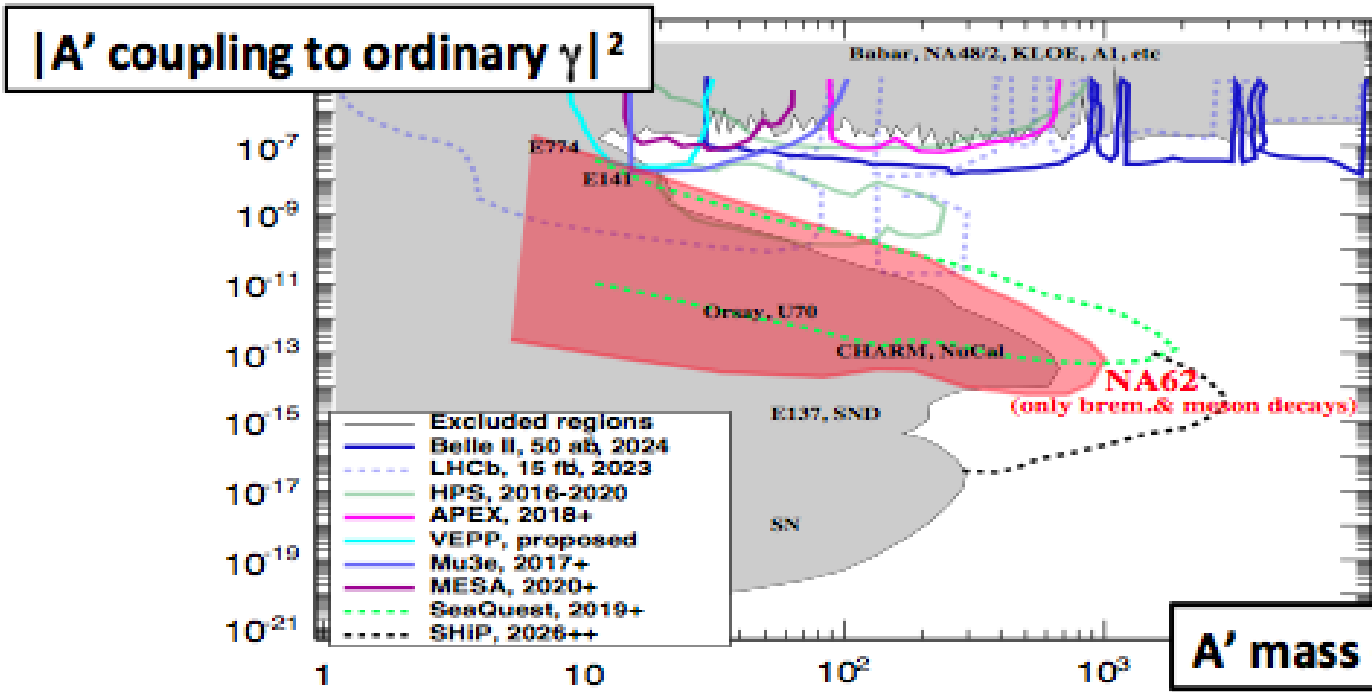
Searches for long-lived dark sector particles

- Dark photon γ' produced in π/ρ decays in target, with $\gamma' \rightarrow \ell^+ \ell^-$
- Axion-like particle A^0 produced in target/beam dump, with $A^0 \rightarrow \gamma \gamma$

π^0 decays

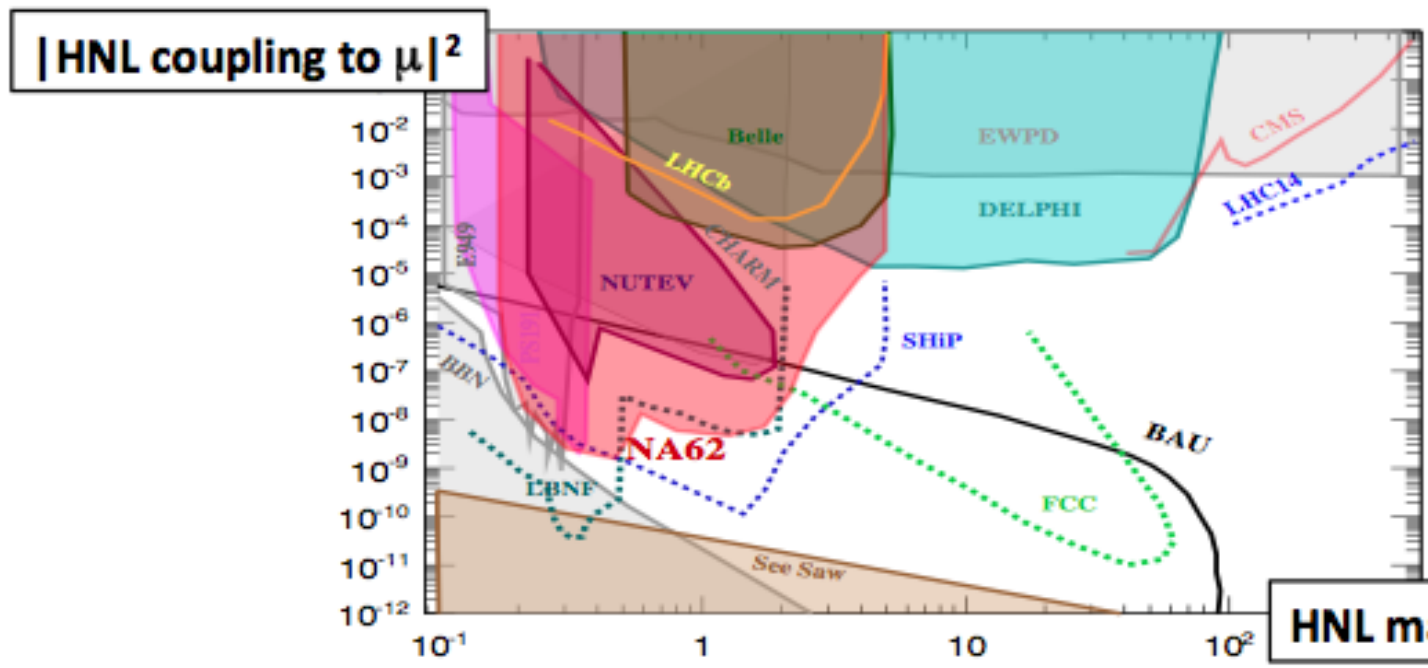
- $\pi^0 \rightarrow$ invisible; $\pi^0 \rightarrow 3\gamma$, 4γ ; $\pi^0 \rightarrow \gamma \gamma'$

After LS2, expand on LFV, LNV, and exotics - including 1 year of beam dump mode for Dark photons, HNL, Axions etc.



Sensitivity expected to be even higher:

1. including direct QCD production of A'
2. Including A' production in the dump (only target considered here)



Sensitivity expected to be even higher after including search for other decay channels (semileptonic, hadronic modes)

Recent work, and in progress:

- Dark photon paper
- NA62 Detector paper
- $K^+ \rightarrow \pi^+ \mu \mu$ - Andy (and Karim)
- $K^+ \rightarrow \pi^+ \gamma \gamma$ - Maria Brigida
- π^0 form factor - Nicolas
- and other analyses - LFV, HNL etc.