

Exotic searches at NA62

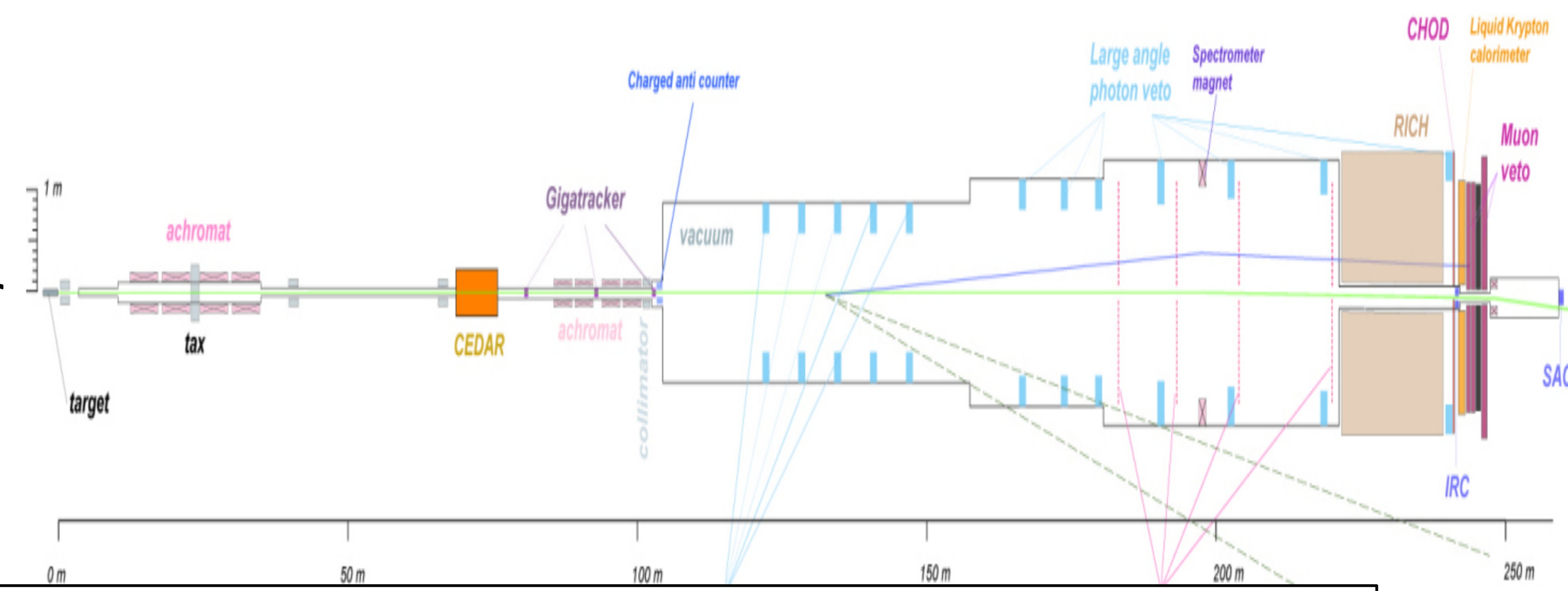
Motivation

If DM is a thermal relic from hot early universe, can hunt for it in particle-physics: **search for non-gravitational interactions DM-SM. Mediators of a hidden sector might exist, inducing DM-SM field (feeble) interactions** many possible dynamics: vector (A' , aka dark photon), neutrino (HNL), axial (ALP, a), Higgs..

NA62 well suited to search for long-lived states

High-intensity 400-GeV proton beam \rightarrow boost charm/beauty, other meson

Production 10^{18} POT / nominal year: Produce 10^{15} $D_{(s)}$, 10^{14} K , 10^{18} $\pi^0/\eta/\eta'/\Phi/\rho/\omega$ with ratios



Can act as a compact beam dump if $\sim 11 \lambda_1$ Cu-based beam-defining collimator (TAX) closed

Dark photon A' : Search for invisible

From K^+ beam: $K^+ \rightarrow \pi^+ A'$,

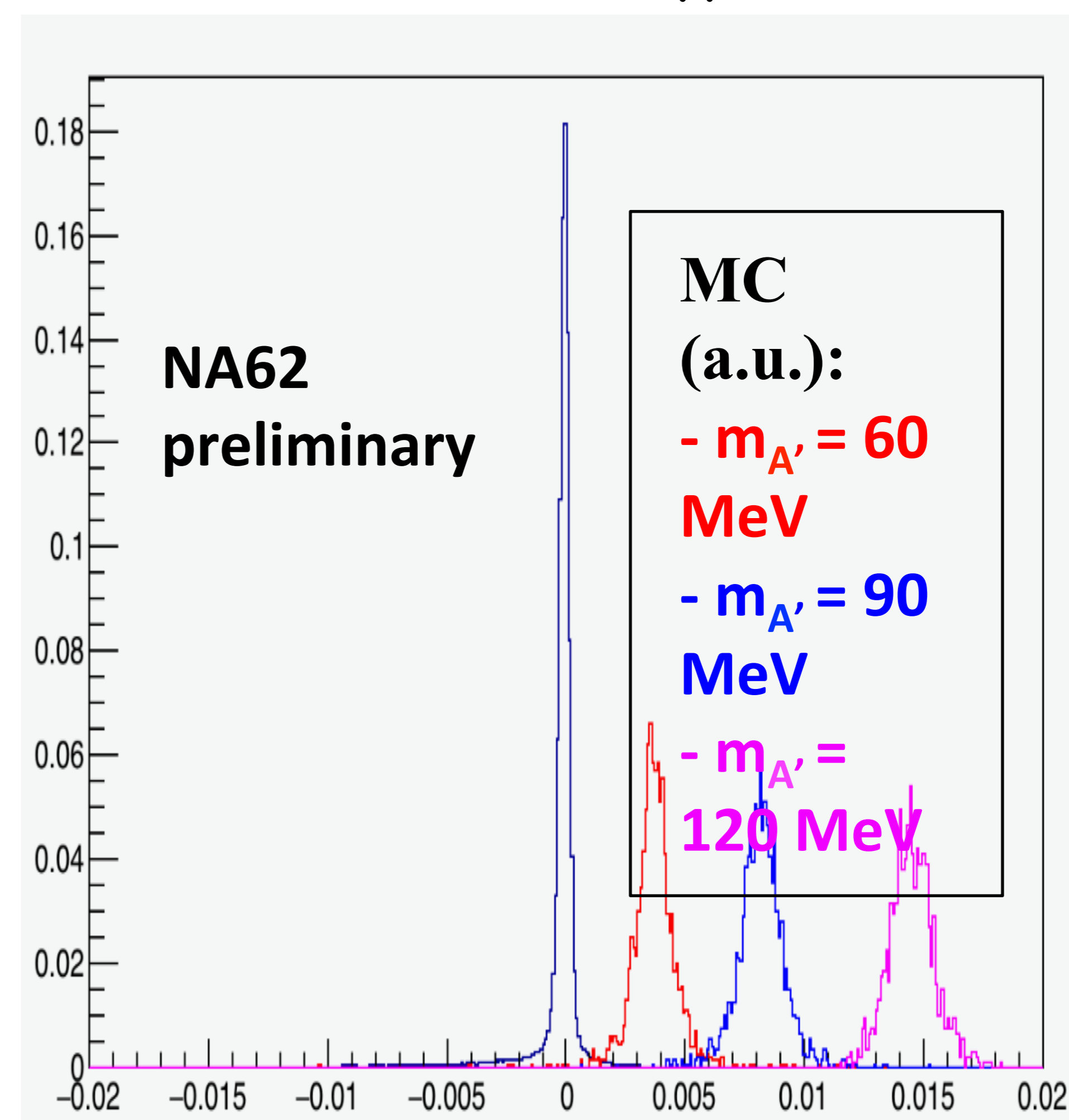
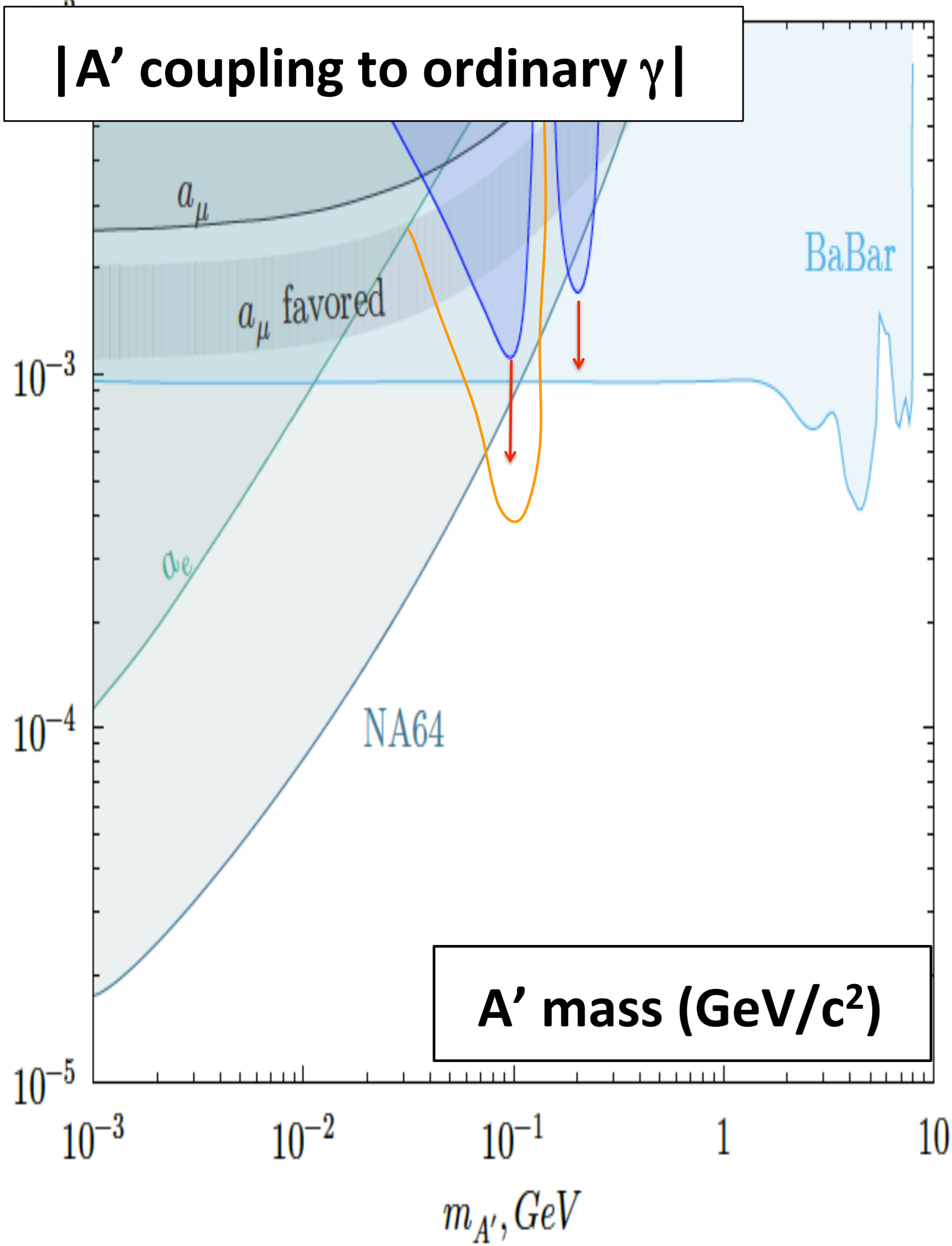
From K^+ decay daughters: $K^+ \rightarrow \pi^+ \pi^0, \pi^0 \rightarrow \gamma A'$

Sensitivity for masses below the π^0 mass:

Signal signature: 1 track, 1 photon + missing energy,

Search for an invariant mass peak around A' mass

dominant background from $\pi^0 \rightarrow \gamma\gamma$, 1 photon missing

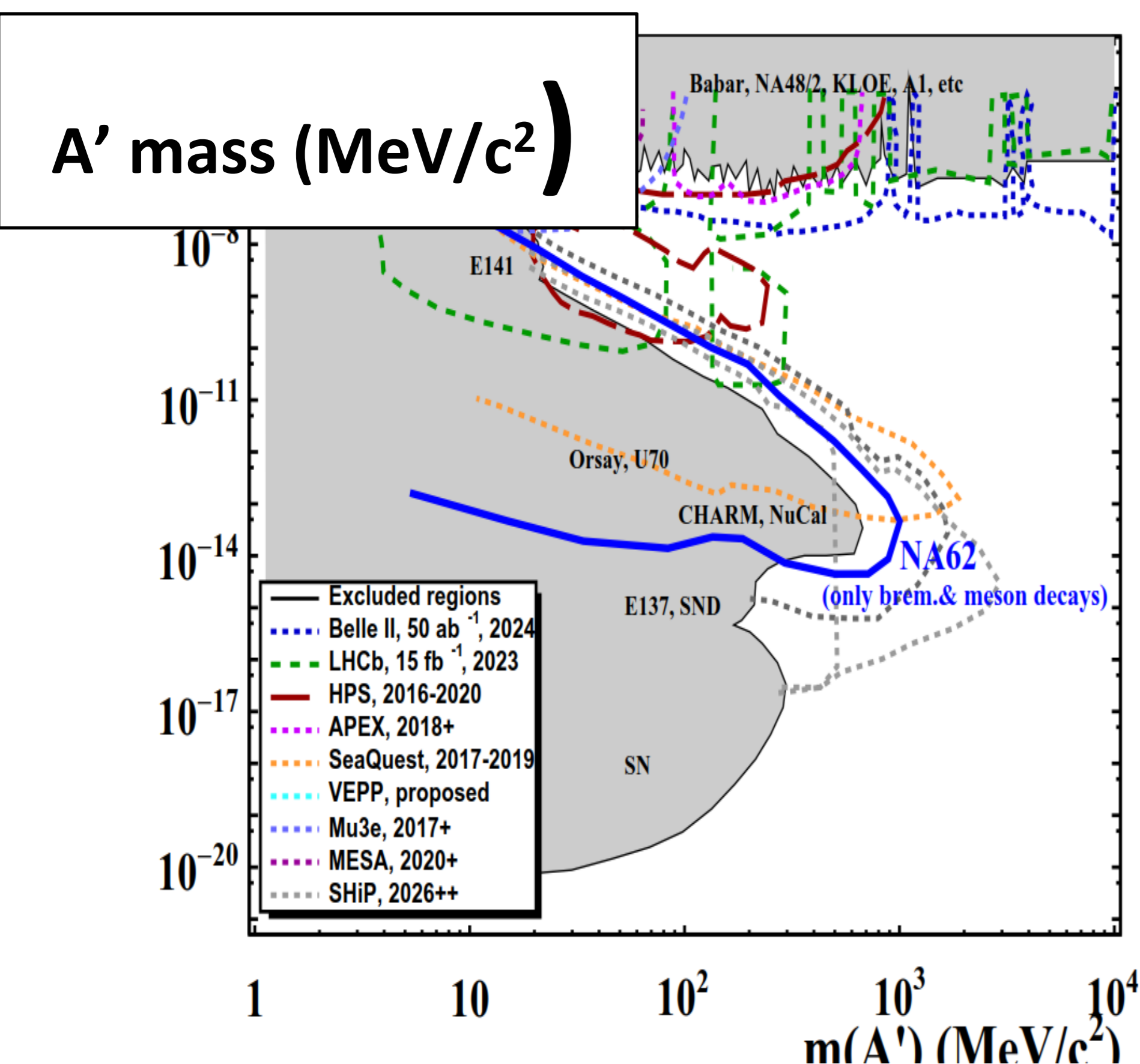


Missing mass²: $(p_K - p_\pi - p_\gamma)^2$ (GeV^2/c^4)

NA62 potential for A' visible decays

search for DP-decay to $ee, \mu\mu$

assume zero-background, evaluate expected 90%-CL exclusion plot



NA62 potential for ALP visible decays

Assume 10^{18} 400-GeV POT: search for ALP-decay to $\gamma\gamma$

assume zero-background, evaluate expected 90%-CL exclusion plot

