Ideas for Next Dark Sector Search at Accelerators

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SLAC
Mu2e Experiment at Fermilab

- Objective: to look for neutrino-less muon to electron conversion
- $3.2\times10^{20}$ POT to be delivered
Mu2e Experiment at Fermilab

- 8 GeV protons from a Booster (via special Delivery Ring)
Mu2e Experiment at Fermilab

- Clean well separated proton spills by resonant extraction and extinction
- Possibility to control the spill separation (to some extent)
Mu2e Experiment at Fermilab

- Clean well separated proton spills by resonant extraction and extinction

Absorber:
Steel 1.5mX1.5mX2m and concrete
Ideal for a beam dump experiment

- Detector for time-of-flight type searches using next generation of fast photodetectors
Next Generation of Photodetectors at Argonne

- LAPPD - Large Area Pico second Photodetector
MCP-PMT Characteristics

- Pico-second timing resolution achieved

\[ \sigma \text{ VS } \langle N_{pe} \rangle < 0.2 \]

\[ \sigma \text{ VS } \langle N_{pe} \rangle \]

HV = 2560V
MCP-PMT Characteristics

- Sub mm position resolution
Towards commercialization

- Successfully demonstrated at Argonne
- Transferred to a commercial manufacturer
MiniBooNE at right place again?

Almost!
Summary

- Mu2e experiment provides another possible location for a sub-Gev dark matter search experiment at Fermilab