Calorimeter Report

Ivano Sarra

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Why a Calorimeter?

- Let's summarize the calorimeter scope in Mu2e/Mu2e-II experiment:

1. work as an independent trigger for the experiment:
   - a good energy resolution is needed → lower than 10% from 50 MeV

2. Seed for the tracker reconstruction and provide a good T0
   - good time resolution is needed → lower than 500 ps from 50 MeV

3. PID
   - Good energy and time resolutions (10% and 500 ps)

4. Provide independent (from STM) muon stop normalization
   - With dedicated LYSO or LaBr crystals

Environment and baseline solution

- We need to survey in a high radiation environment:
  1) ~10^{12} - 10^{13} 1 MeV eq./cm^2 neutrons flux on photosensors
  2) ~ 0.1 – 1 Mrad fluence on crystals
  3) High rate and high pile up probability
  4) 1 Tesla magnetic field

- The baseline solution is represented by **BaF2 crystals** (slow scintillation suppression with the Yttrium doping) and **fast UV SiPM** (with bandpass interference filters and delta doping).
  → R&D in progress
  → fast signal (~50 ns signal fullwidth)
  → good amount of light at the beginning

  → resistance of SiPMs?
  → can we have enough slow component's suppression?
  → can we have enough light yield after the losses due the irradiation?

Alternative solution

- 7 cm length LYSO crystals + SiPMs 10 um pixel size (or even less)
  - Same X0 and better RM compared to the BaF2
  - Huge light yield, less problem due to the irradiation

  - Can we operate with a 200 ns signal?

Next Step

- **We will have a calorimenter meeting on January 12 at 8AM PST via zoom.**
- The purpose is assess progress and begin planning for the whitepaper contribution
  - needed efforts on Software → performance with a x10 background with BaF2 and Lyso (respectively 50 ns and 200 ns signals) using digitization.
- Our goal is to held a calorimeter workshop in February at a date still to be determined.

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