Mu2e Grounding & Shielding Review
Stopping Target Monitor subsystem

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Mu2e Stopping Target Monitor

General philosophy:

• Determine the rate of muon stops in the Stopping Target to provide normalization for Mu2e.
  ▪ Measure X-rays and gamma-rays from muon stops/captures in the Stopping Target
  ▪ Use high-purity germanium detector located at far end of hall
  ▪ Germanium detector will require power and ground isolated from motors / vacuum pumps at the far end of the hall
  ▪ A calibration source may require a mechanical arm to position it on and off the beam axis. Just mechanical, no signals here, so no shielding/grounding concerns.
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Location:

Calibration source

Ge detector
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- Stopping Target
- MBS
- IFB
- ECS
- CRV-D
- Permanent Sweeper Magnet
- Field-of-view Collimator
- Spot-size Collimator
- HPGe Detector(s)

~34 m
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Located at far end of hall:
- Unlikely to act as a source of noise for other subsystems.
- Unlikely to act as antenna picking up noise from other subsystems.
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Type of detector:
- High-purity coaxial n-type germanium detector

Location of FEE:
- Electronics rack located right next to the HPGe detector, far from PS, TS, and DS
- Estimate 3kW power consumption
- HV supply ~3kV in electronics rack
- Interface to TDAQ is optical fiber
- No direct interface to other subsystems
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- **Power**
  - HV: 3 kV
  - LV
  - Clock divider
  - Veto / Gate
  - LaBr detector
  - HPGe detector

- **Ground**

- **Electronics Rack**
  - Timing: 500 MHz WFD
  - Energy: 20 MHz 16 bit WFD
  - Timing Filter Amplifier

- **Optical Isolation**
  - TDAQ: POT pulse
  - TDAQ: Control Room
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Signals from AlCap 2015:

347 keV, sigma 0.884 keV

1809 keV, sigma 1.88 keV
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Implementation plan:

- Isolated power will be provided at the end of the hall
- STM electronics will connect to Detector Ground Branch
- Ge detector will be vibrationally isolated from the stand (e.g. rubber boots)
- Signal cables from Ge detector to electronics rack will have standard shielding, where they will be digitized, then sent via optical fiber to TDAQ
- Ge will need to be cooled with LN, no shielding/grounding concerns
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Location of Isolated Ground Connection
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1. Does STM address potential noise problems? Will STM achieve desired performance?
   – Electronics are optically isolated from other subsystems.

2. Is the design technically sound? Any outstanding issues? Concerns?
   – Optical isolation and commercial electronics are well understood. No known outstanding issues.

3. Significant risks? Mitigation plans?
   – No known risks.

4. Safety concerns?
   – ~3 kV HV: Standard High-Voltage safety protocols will be followed