

# Mu2e-II Tracker R&D Topics: Personal Picks and Wild Ideas

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# Tracker Requirements for Mu2e-II

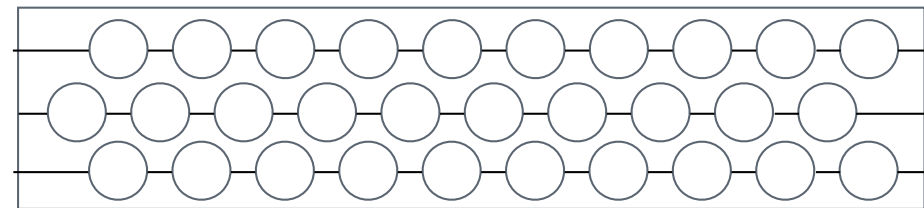
- Must improve the momentum resolution
- Must be physically buildable
  - Optimize design for constructibility
- Acceptable radiation damage to wires
  - Increase C/cm tolerance
  - Reduce charge load
- Acceptable radiation damage to electronics
  - Increase rad hardness
  - Reduce (photon) fluence
- Acceptable pileup
  - Increase pileup tolerance
  - Reduce pileup rate
  - Improve pattern recognition algorithms

# Momentum Resolution Improvement

- Improved drift information
  - lower threshold
  - single-cluster readout
- 3-layer panels
  - ‘Guarantees’ hit ‘doublets’ in each panel
- Reduced straw mass
  - Thinner mylar
  - Reduced metalization
- Improved reconstruction algorithms
  - Will be (mostly) done for Mu2e

# Constructibility Optimization

- Simplify and improve robustness of straw/wire termination
  - Self-centering helical inserts (ATLAS TRT)
  - Crimp termination
- Simplify panel construction
  - Increase inter-straw spacing
    - Add a 3rd layer to recover coverage
  - Allow gaps for mechanical pressure constraint (every ~16 straws)
  - 1-piece IPR (full arc)
  - 'Layered' IPR?
- Improve PIR-straw gas seal
  - Flange on straw insert to create another sealing surface



# Increase wire C/cm tolerance

- Alternate gas mixture (?)
- Wire cleaning (alcohol)
- Wire material and surface improvements

# Reduce wire charge

- Reduce wire cell size
  - Limited by electrostatic instability
- Reduce gas gain
  - Limited by electronics gain/noise
- Reduce pileup fluence
  - Reduce Compton electron fluence
    - lower mass straw walls
  - Reduce photon production
    - Reduce beam flash electrons
    - Optimize target mass, geometry, and material to minimize bremsstrahlung
  - Reduce proton fluence
    - Increased IPA mass or improved geometry

# Increase Electronics Radiation Tolerance

- Small feature ASICs for digitization
- Improved FPGA rad hardness (?)
- Other components (optical link)?

# Reduce Photon Fluence on Electronics

- Increase electronics shielding
  - Takes away active volume
- Reduce bremsstrahlung
  - Reduce beam flash electrons
  - Optimize target mass, geometry, and material to minimize bremsstrahlung
- NB: photons from muon capture are irreducible (tied to # of muon stops)



# Increase Pileup Tolerance

- Reduced cell (straw) size
- Digitization ASIC
- Hardware (FPGA) background hit filtering