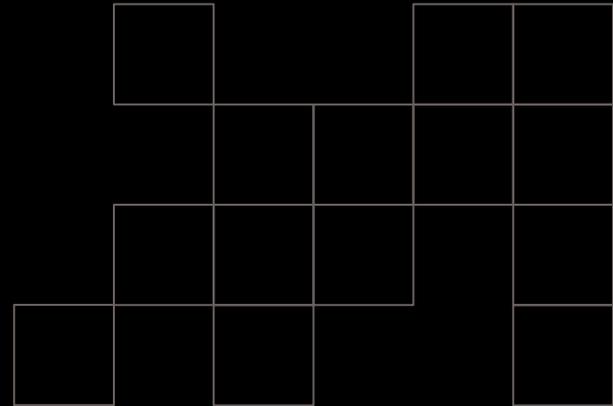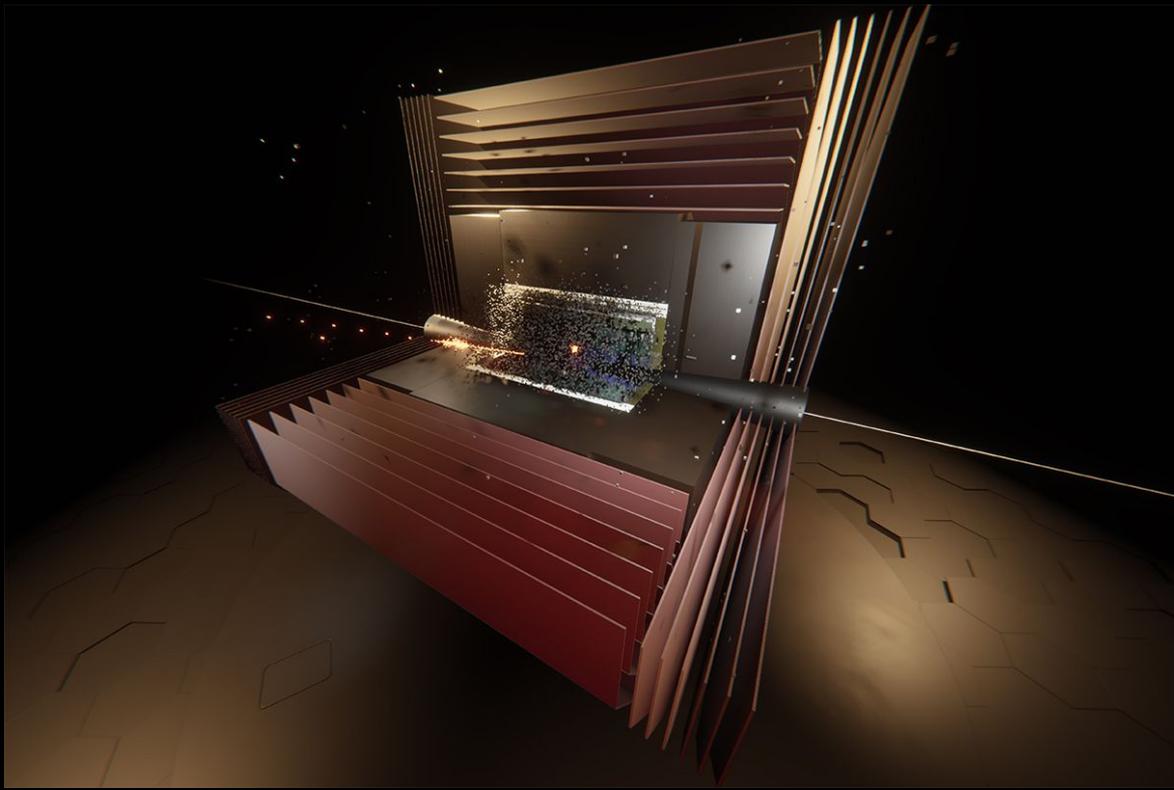Karri Folan DiPetrillo
University of Chicago
11 Feb 2026

Experiment Deliverables

Topics from our initial grant proposal + discussion
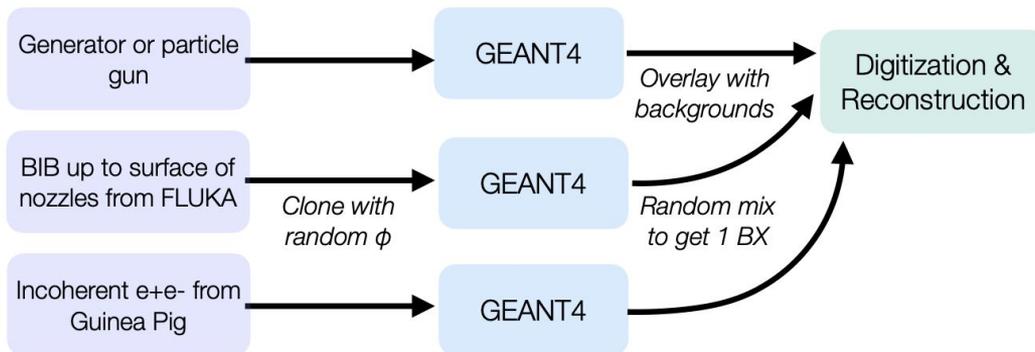
Muon Collider Experiment Reminder

Focus 1: Simulation

We want to enable

- Flexible & efficient studies of Machine Detector Interface

- High statistics & accurate simulation of Beam Induced Background

Generator or particle gun → GEANT4

BIB up to surface of nozzles from FLUKA → GEANT4

Clone with random φ

Incoherent e+e- from Guinea Pig → GEANT4

Overlay with backgrounds

Random mix to get 1 BX

→ Digitization & Reconstruction

Machine Detector Interface

- Can we make our lives easier by simulating with GEANT instead of FLUKA?

- Can we speed up with GPUs? (Ceritas)

Beam Induced Background

- Can we improve our modelling of BIB with smarter slicing/mixing?

- Can we use Generative AI to speed up BIB simulation?

Expertise/Interests

- We're all familiar with https://github.com/Muon ColliderSoft

- JP familiar with FLUKA
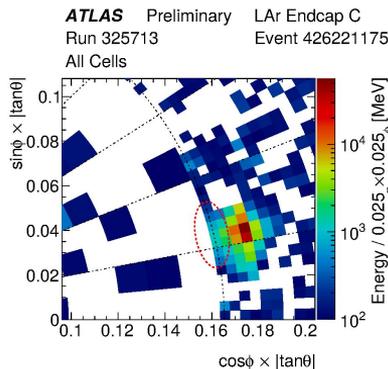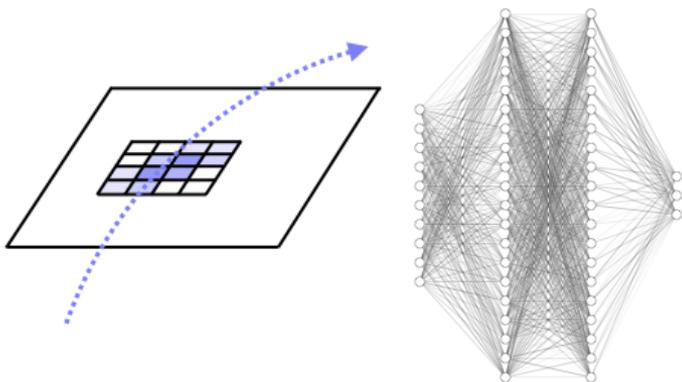
- Lots of interest in AI

Focus 2: BIB Mitigation with AI

Pixel Detector

- **Goal**: enable read out with on detector data reduction

- Baseline exists: cut-based selections with pixel cluster size

- Many related efforts ongoing

Calorimeter

- **Goal**: improve energy resolution for precision physics

- Need to define baseline

- Need to investigate possible approaches

Expertise

- Smart Pixels (Chicago)

- BDTs with Realistic Pixel Simulation (UTK)

- Logic Gate Networks (Princeton)

- Calorimeter BIB subtraction (UTK+Princeton)

Interests

- Co-design of sensor/electronics/AI

- Effects due to radiation

- Alternative algorithms and hardware implementations

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