ForwArd Search ExpeRiment

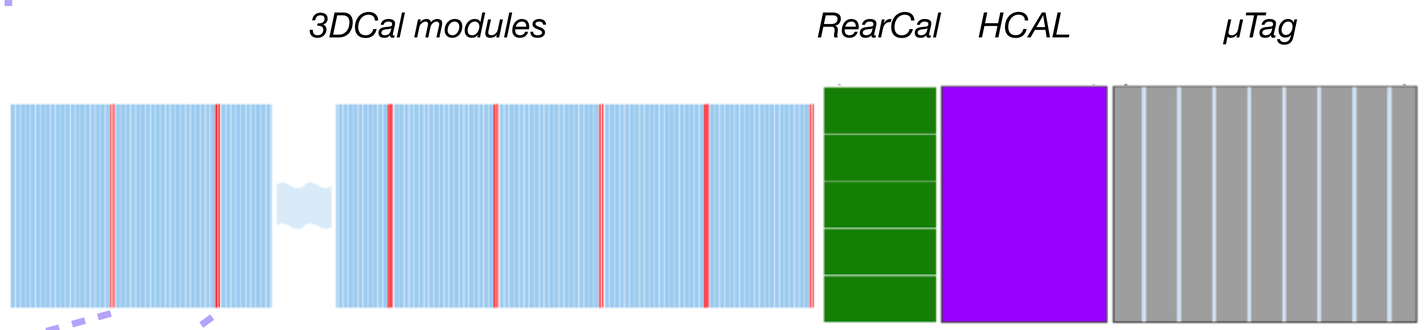
From Run 3 to the High-Luminosity Challenge

- **The FASER detector in Run 3:**
  - Commissioned during 2021 and started physics data taking in 2022.
  - *Core technology:* emulsion detectors → unmatched precision for tracking particle interactions. (x ~300nm, θ ~0.07 mrad).
- **The Coming Data Flood (LHC Run 4):**
  - High-Luminosity LHC, luminosity increase by a factor of 5.
    - *Expected ~30,000 neutrino interactions.*
- **The Technology Limit: Why We Must Upgrade**
  - The emulsion detector saturates (30-50 fb-1) and would need constant replacement: Not feasible.

[Daniel, Davies, Mulvey and Perkins in 1952: Link]

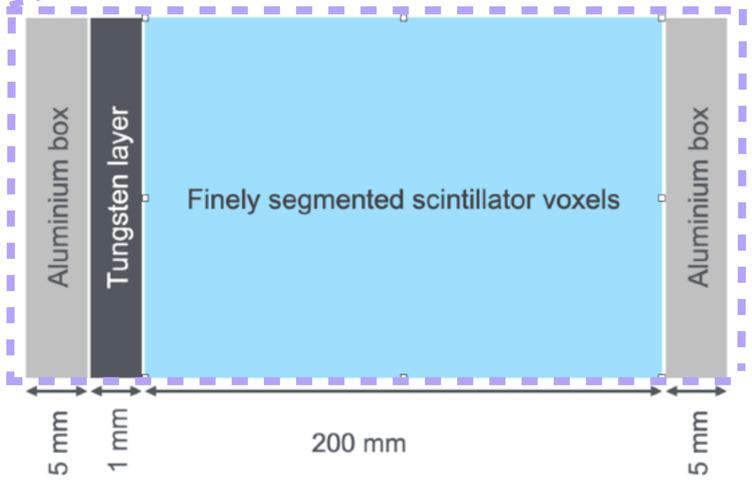
ForwArd Search ExpeRiment

FASERCal Detector Conceptual Design



Proposed Solution: *FASERCal*

- Fully electronic 3D Precision Calorimeter for High Energy Neutrinos, and sub-detectors. (A. Rubbia et al)



- **10 3DCal modules (520 kg):** each with 20 layers of 48x48 3D scintillator voxels → calorimetric information and tracking.
- **RearCal**: sampling calorimeter to enhance EM shower containment + energy measurement.
- **HCAL**: sampling calorimeter for hadronic energy measurements.
- **μTag / spectrometer**: dedicated detector for muon measurement.