Phase 2 Planning

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Preliminaries

- Independent test beam relevant for μBooNE and whatever else gets built:
  - LBNE, LAr1, GLADE, GLACIER, etc.
- FNAL provides beam and cryostat + cryo infrastructure
- External groups, (e.g., universities), provide detectors → TPC, electronics, etc.
- Extremely close coordination required
- Phase 1 = modified Argoneut → calibration, recombination, e/γ ID
- Phase 2 = larger detector → energy reconstruction
- Possible funding sources:
  - DOE FOA-0000733 "Particle Detector R&D in HEP" → DUE SEPT. 10th !!!
  - NSF MRI → January 2013

Upcoming DOE FOA

- Program Manger: Glen Crawford
- Plan to submit a collaborative proposal
- Very little time → need to work together
  - Coordinators: B. Rebel, M. Kordosky, K. Lang
- Today:
  - outline the plan
  - gauge interest
  - try to assign pieces → writing requirement

Phase 2 components

TPC & other stuff
Inside the cryostat

External
Detectors

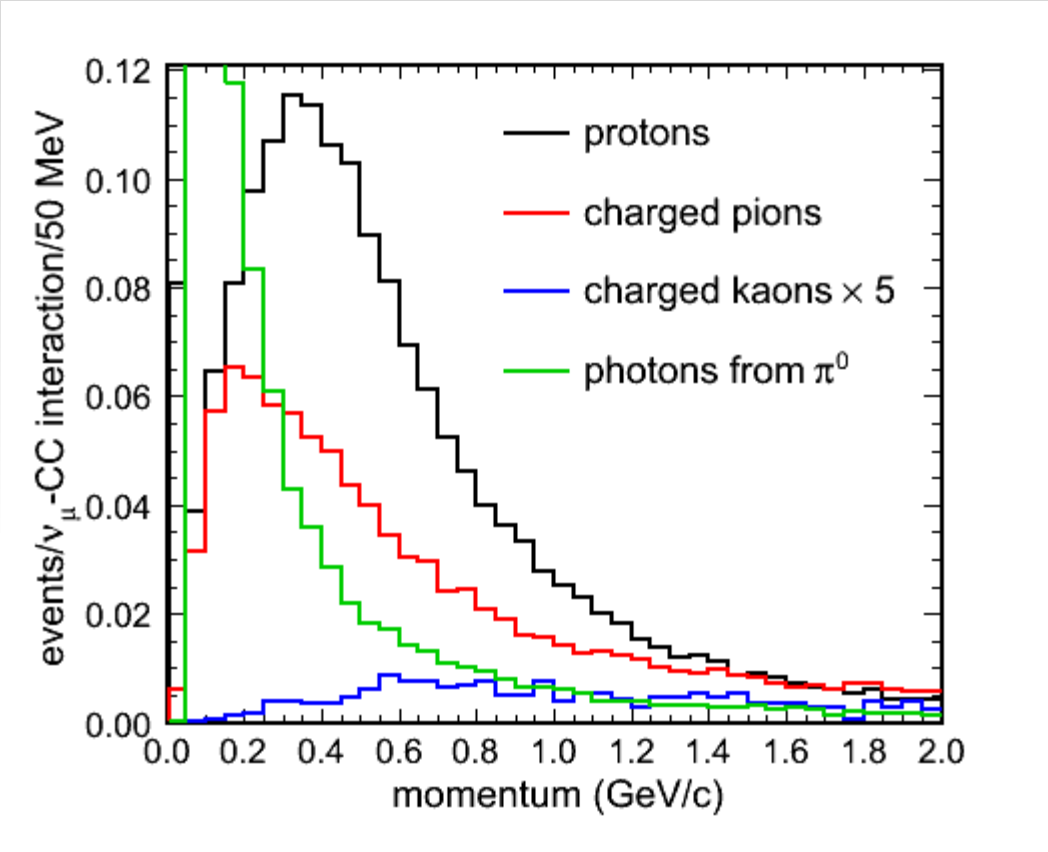
Readout
Electronics

DAQ System
& Triggering

In what follows I will put some names with different components:
* sometimes due to already expressed interest
* sometimes I'm just guessing / projecting
* I don't know everyone who is interested!

Nothing about this is final.

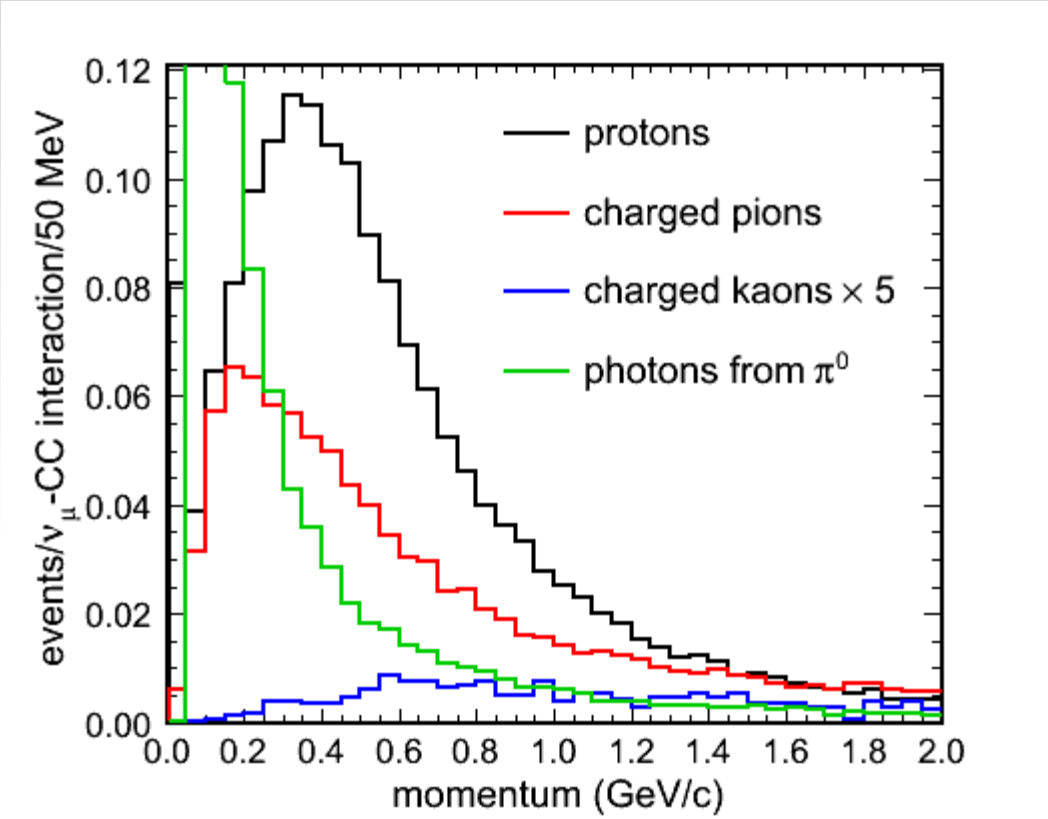
TPC: How large?



Particles produced by neutrinos from NuMI LE on-axis

- LAr: X_0 = 14 cm, λ_{int}=80cm
- MC studies underway → 1-2m wide, 3-4 m long?
- This is a **large detector** → how small can we make it?

TPC: How large?



Particles produced by neutrinos from NuMI LE on-axis

- A few questions:
  - Is traditional calorimetry the right metric for this device?
  - What happens to containment if we assume we can ID the first interaction point?

TPC components

- Field cage (Texas?)
  - + mounting structure in cryostat
- Sense wire planes (Yale/Syracuse?)
  - What pitch? 3mm vs 2mm (2000 vs 3000 channels for a 3m long device)
  - Practical limits on wire span?
- Light collection system (Indiana? INFN?)
  - PMTs or paddles+SiPMs.
  - Internal reflector/WLS foil?

Readout Electronics

- Cold electronics residing in the TPC
  - Amplifier + driver + mux
  - Can we reuse ADF-2 modules?
- Copy MicroBooNE?
- MSU system a la Long-Bo?
- CAEN system → probably expensive
- 1-2, even 3 institutions.
  - MSU, UCL, Manchester?
- Close coordination with DAQ

External Detectors

- Time of flight (Chicago?)
  - Collimated beam → small area counters
  - PMTs? SiPMs? LAPPD?
  - What timing resolution is needed?
  - How to read out?
  - B-Field tolerance required?
- Cherenkov (1 institution)
  - FNAL stock? University group stocks?
  - Always in the beam or just a check?

External Detectors

- Veto wall & cosmic ray counters
  - No amount of shielding will block all the muons and other garbage → must tag
  - Wall upstream of detector with hole/gap
  - Cosmic covering sides, top
  - Use FNAL scintillator stocks (mu2e synergy?)
  - One or two layers?
  - Bottom coverage (cosmic muon trigger)?
  - Level of segmentation? Photosensor?
- W&M (J. Nelson)? Cincinnati? (room for 2)

DAQ & Trigger

- Central DAQ system architecture/control
  - VME based? PCI? PXI?
  - Copy microBooNE? NOvA?
- External detector readout
  - Multichannel digitizer w/ FPGA?
  - LAPPDs → how to?
- Triggering & Vetoing
- Slow controls
- Run control & online monitoring
- W&M (M.K.) + 2-3 others (UCL? Manchester?)
- FNAL/BNL collaboration here?

Next Steps

- Interested?
  - Email: makordosky@wm.edu , brebel@fnal.gov, lang@physics.utexas.edu
  - How do you envision your role? What resources do you have?
- Then:
  - few page description of the system
  - a preliminary budget and workplan
- We'll also need to start collecting supporting information: bios, C&P, facilities, etc.

Joining up

- Institutions wishing to join the Liquid Argon Detector Beam Test collaboration are invited to petition for membership by making a presentation to the collaboration. The presentation should include planned contributions to the experiment.
- The collaboration then discusses the application and each institution has a vote. A successful application is one in which no institution objects to the proposed membership.
- Email: kordosky@fnal.gov, brebel@fnal.gov, jlraaf@fnal.gov, flavio.cavanna@aquila.infn.it