Overview of MINERvA DAQ

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ArgonCube 2x2 Electronics
& Readout Integration meeting

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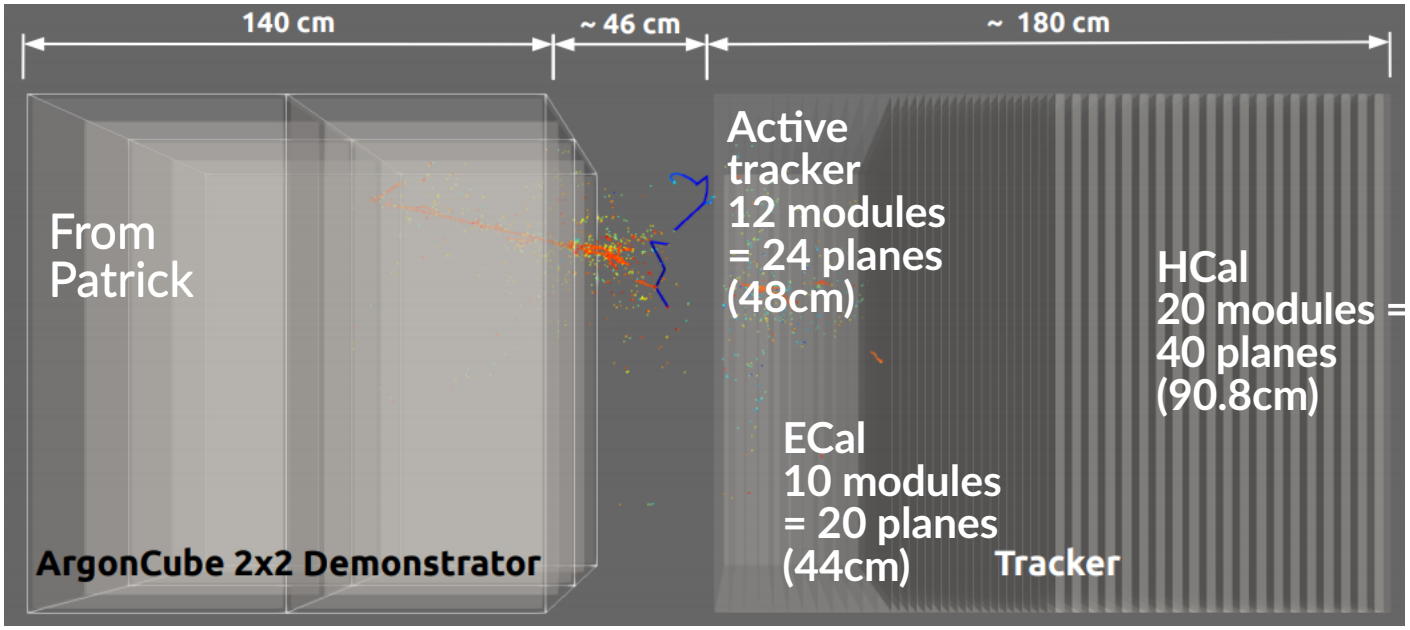
Overview

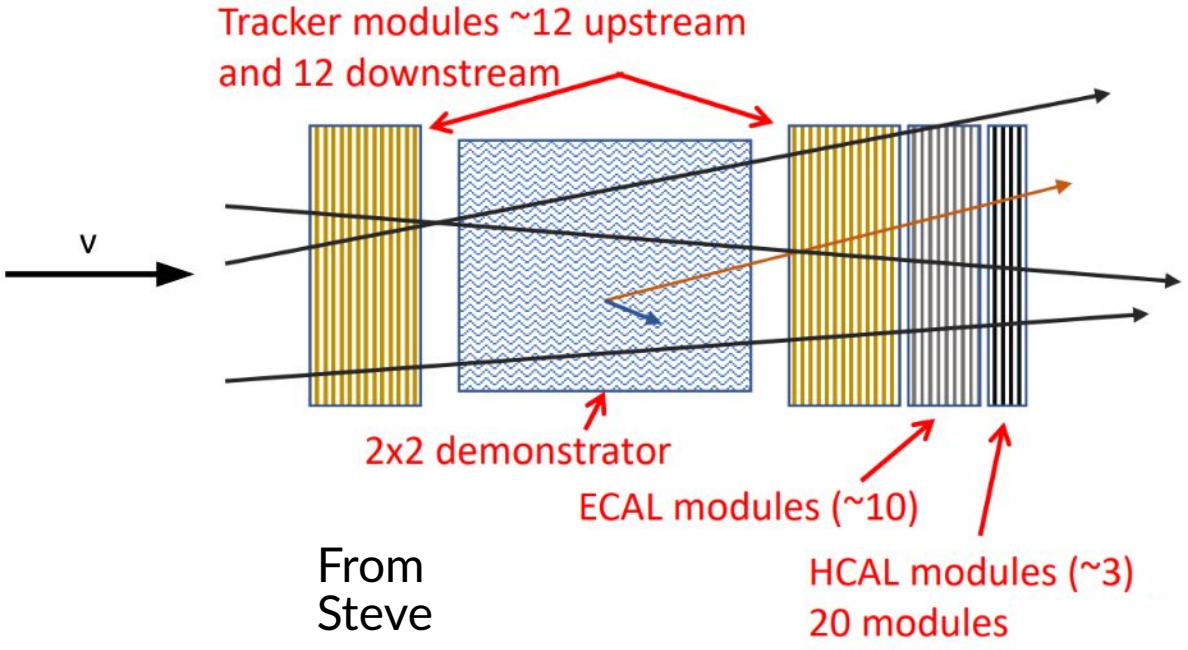
- MINERvA planes are to be used in the ArgonCube 2x2 demonstrator, aka “proto DUNE-ND”
- Upstream rock muon veto
- Downstream tracking, ECal and HCal
  - Not too dissimilar from DUNE ND, where we’ll have ArgonCube → HPTPC/MPD (Ar gas) → 3DST (plastic scintillator)
- Proto DUNE-ND is a good place to study track matching, containment, efficiencies etc
- Patrick Koller’s studies (Bern)
- Steve Manly’s presentation (Rochester)

Proto DUNE-ND design

Geometry used for the downstream tracker studies by Patrick

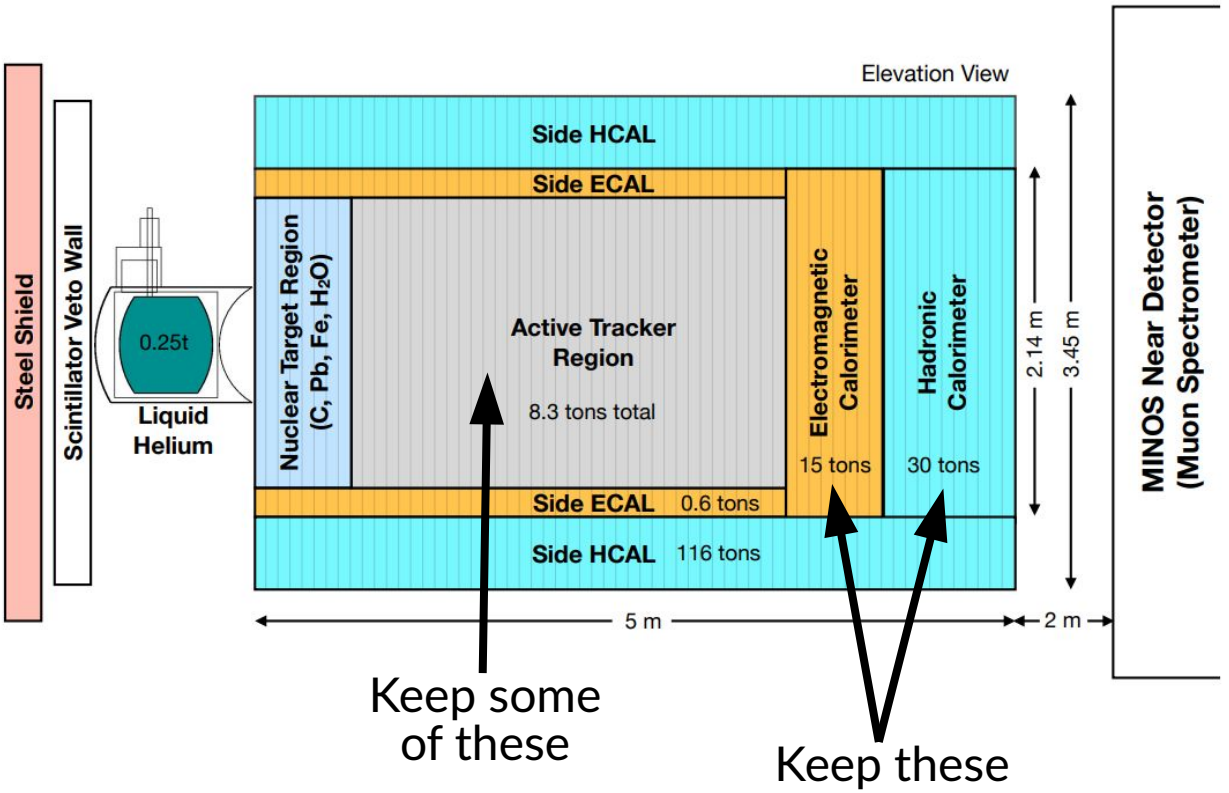


Add in upstream tracker



From Steve

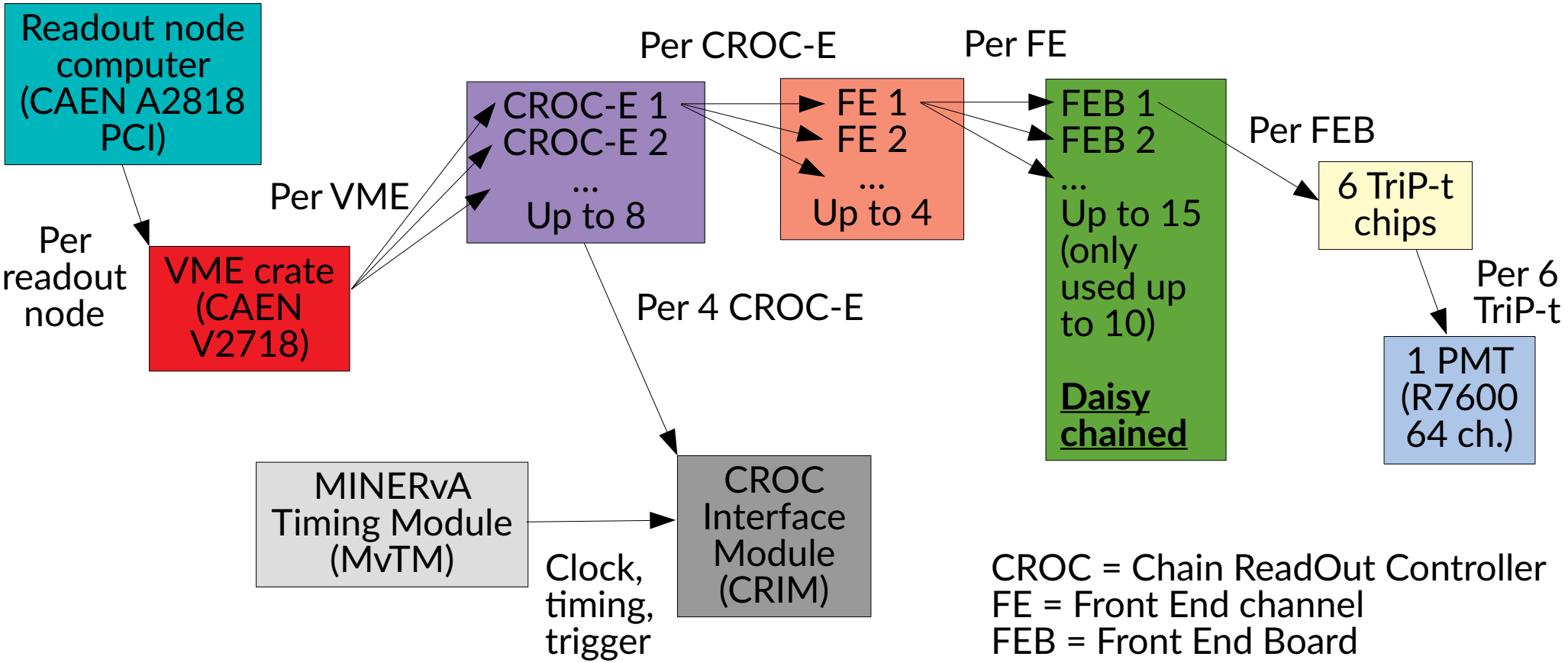
MINERvA detector



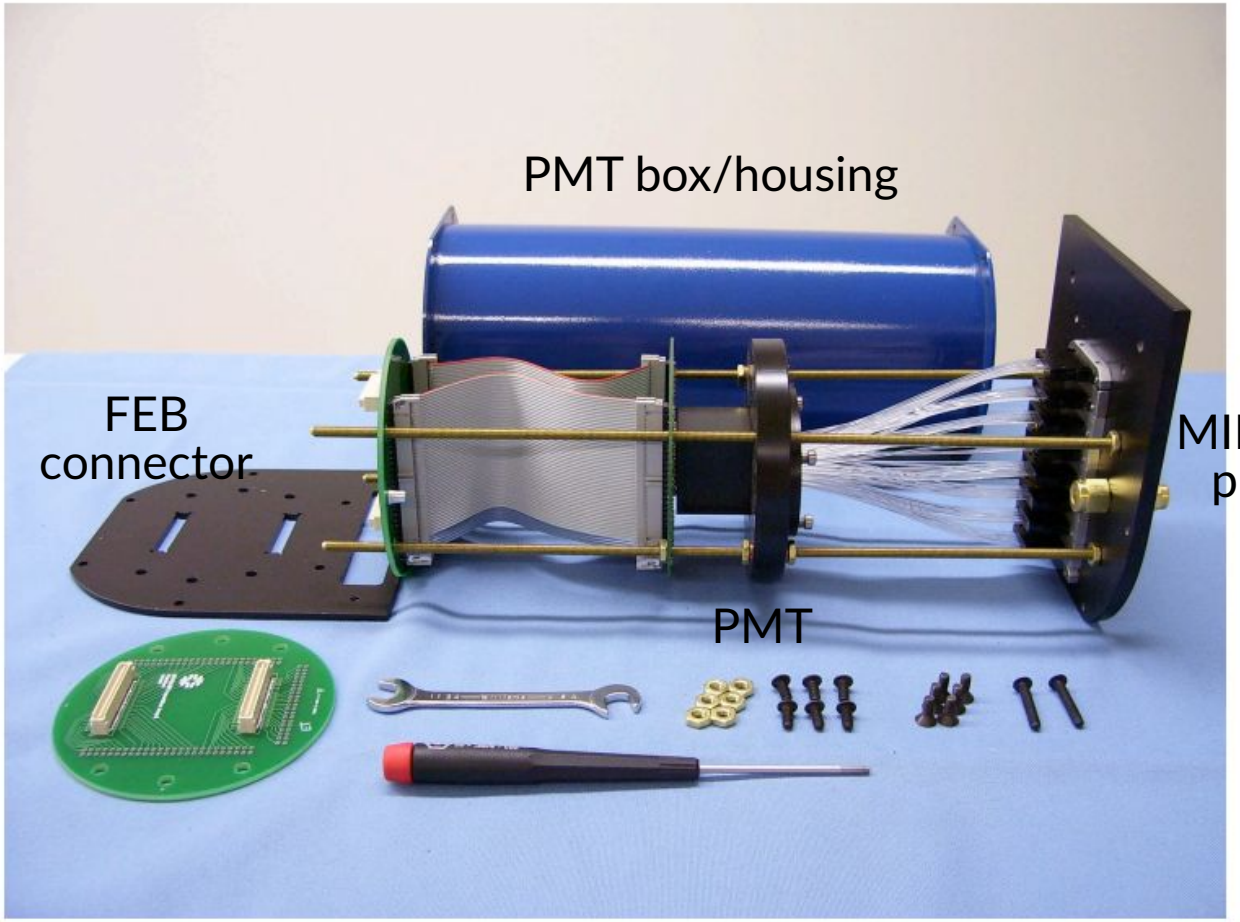
- For our purposes, all the MINERvA DAQ is handled by 2 VME crates, and all the readout is the same
  - Nuclear targets and veto wall has different design, but we're not using those for 2x2
- Detector arxiv link

DAQ overview

- Custom DAQ designed by MINERvA collaborators, many at FNAL: arxiv link
  - Gabe Perdue, Linda Bagby, Chris Gingu, Paul Rubinov, amongst others
  - (I am nowhere near as expert as they are!)

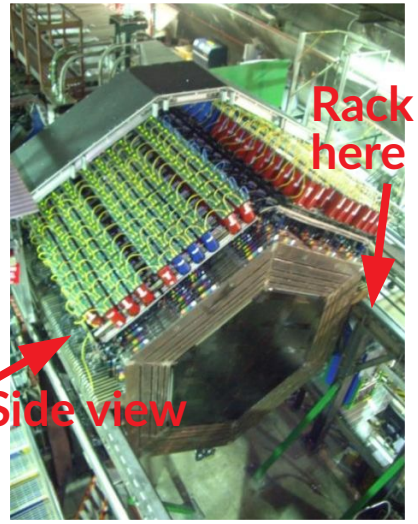


Pictures

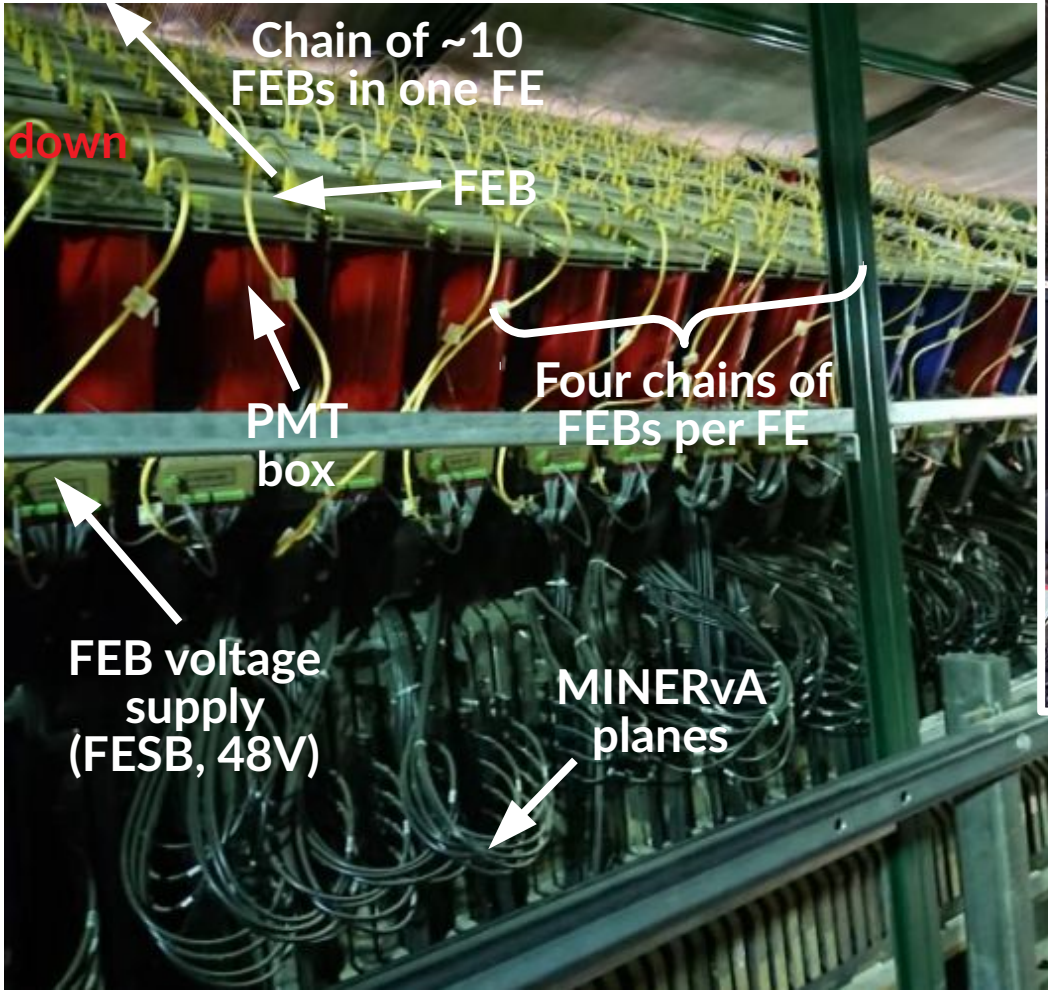


Pictures

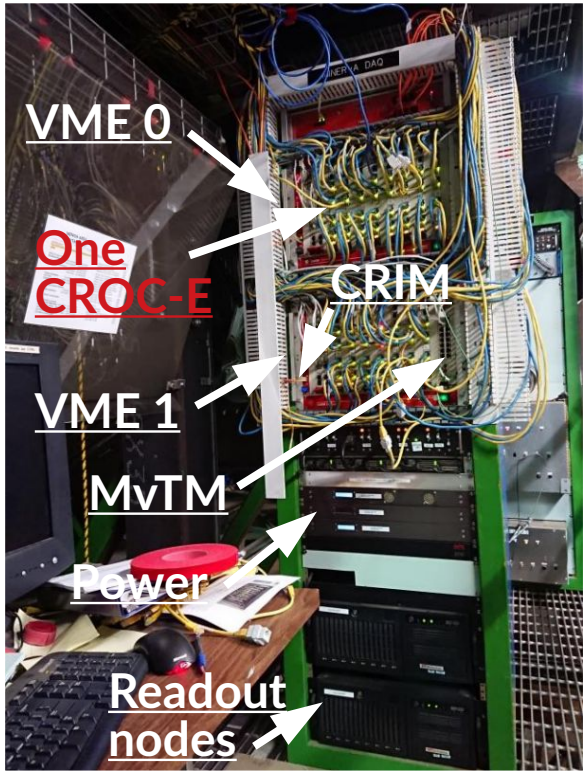
Top view



Side view



Rack view



MINERvA had 15 CROC-Es (8 on VME 0, 7 on VME 1)
(15 CROC-E) *x* (4 chains per CROC-E) *x* (10 FEBs per FE chain) *x* (1 PMT per FEB)
= 600 PMTs supported
507 actually installed and running

For prototype have a total of 10+20+24=54 modules: need at least 7 CROC-E
Plenty of spare CROC-Es, FEBs and PMTs for prototype

Run Control and Slow Control

- Custom in-house
- Run Control: straight-forward python GUI
  - Requires wxPython (GUI) and pySerial (reads RS-232 port)
  - Essentially sshs onto DAQ machine, controls run through tunnel
- Slow control: straight-forward GUI
  - Can find hardware for each VME, control VMEs, CROC-Es, CRIMs, load up new configurations, etc

DAQ work todo

- Can add/remove channels to slow control and DAQ
  - Update the configuration files to have *i* VME crates, *j* CROC-E and *k* FEBs
  - Have done this at MINERvA and Lab F test-bench
  - This is what we would do for 2x2 ArgonCube test
- I see little point in re-engineering the DAQ hardware, firmware, software; objections?
  - Rate should be fine: MINERvA operated in Medium Energy era with modifications to DAQ that we will use
- The challenge is interface the system with ArtDAQ
  - MINERvA DAQ puts data into “frames”: ArtDAQ needs to know the frame structure
  - Replace ET*

*Event Transfer, JLab software. Used to move data from readout node (1 per VME) to master node

Thanks