GRINCH Status Report
SBS Collaboration Meeting

- BigBite pion/electron separation
- High rate/background environment

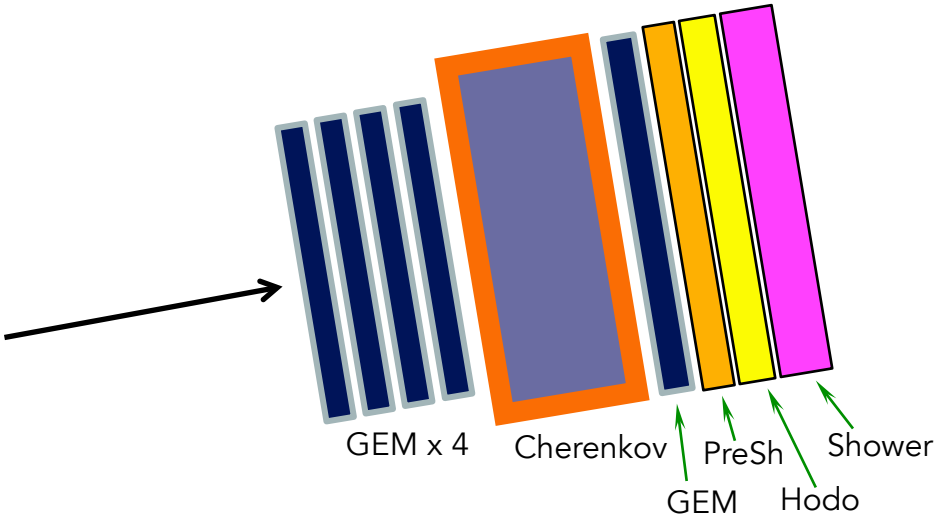
Responsible Groups

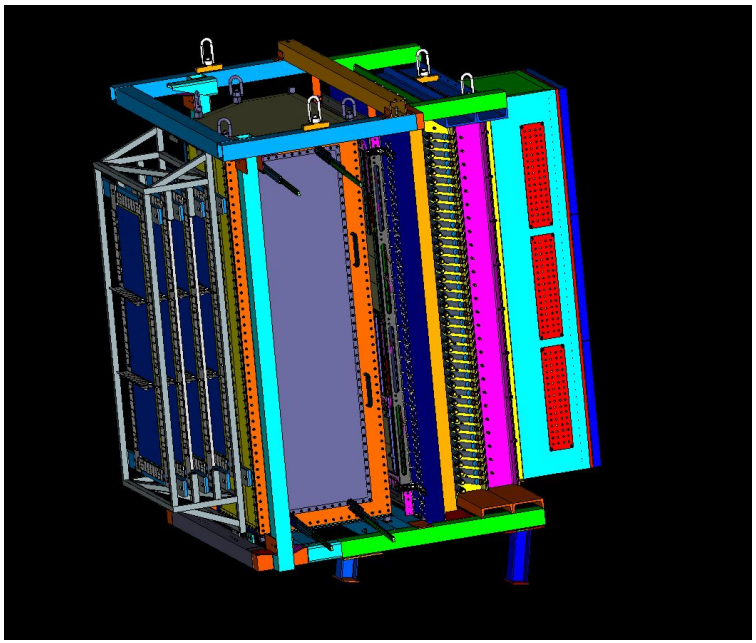
College of William and Mary-Overall project, mirrors, PMT, DAQ, gas
James Madison University-PMT testing
NC A&T-PMT shielding array
Glasgow-NINO cards, cables
Jefferson Lab-Overall project, funding

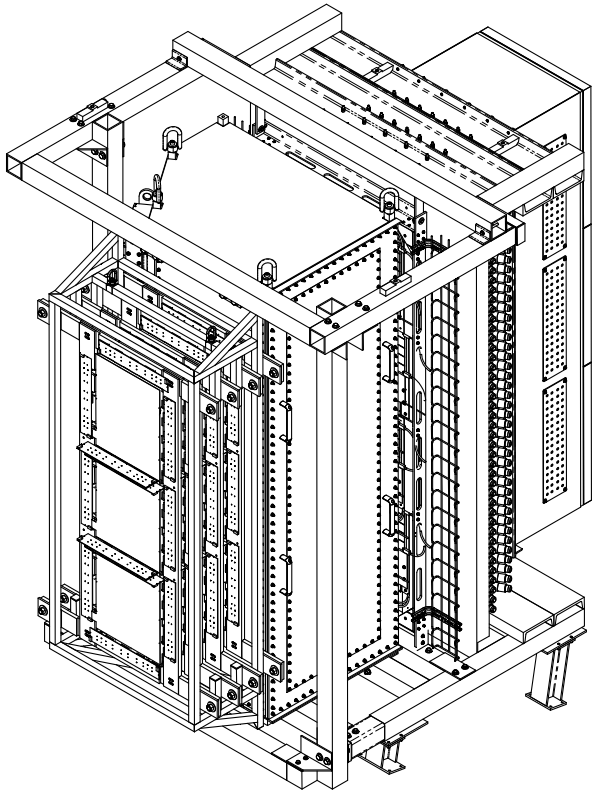
14-Jul-2017

T. Averett

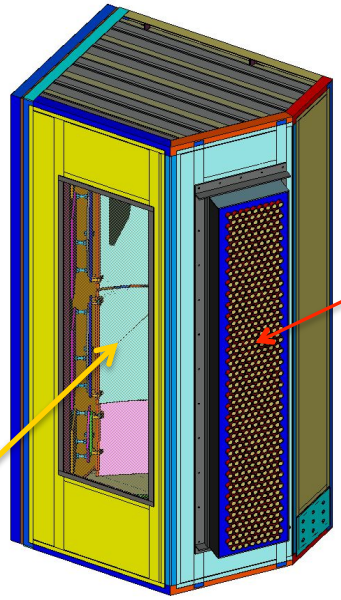
BigBite Detector Stack – 12 GeV





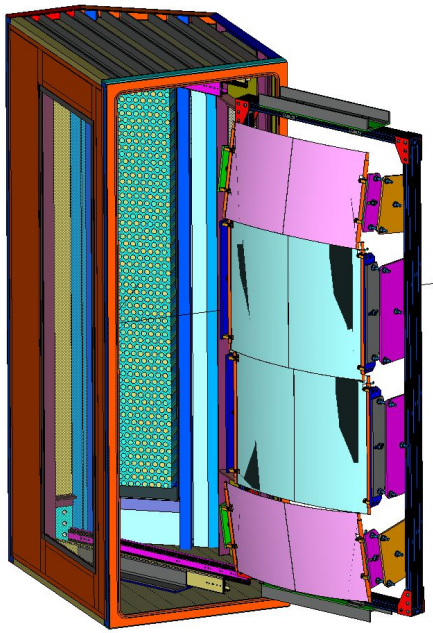


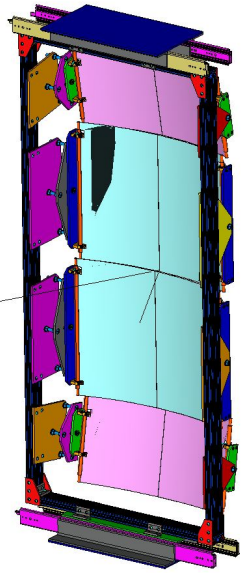
Gas Ring Imaging Cherenkov-GRINCH



PMT array

e^-,π^-





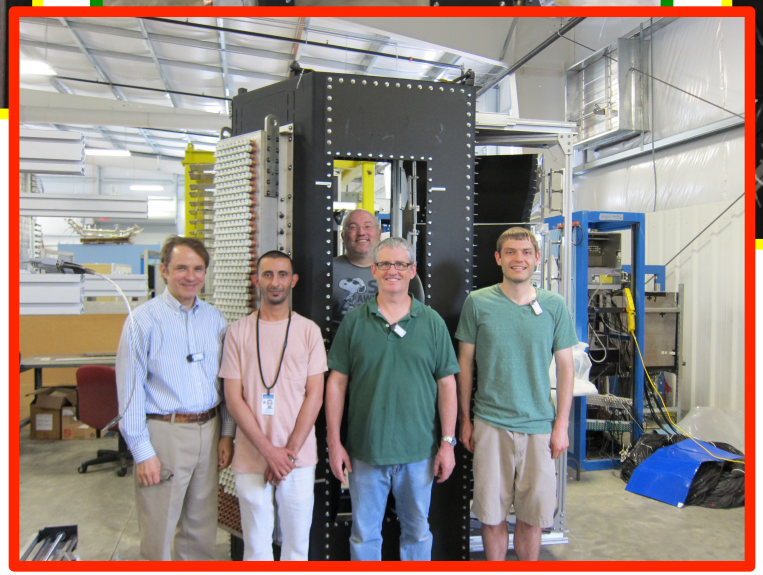
- Array of 510 x 1" PMTs
- C_4F_{10} Gas
- Four cylindrical mirrors on sliding rail system
- NINO front end cards
- Find timing clusters for e^- PID
- VETROC/FPGA DAQ
  - Timing
  - Online cluster finding for trigger

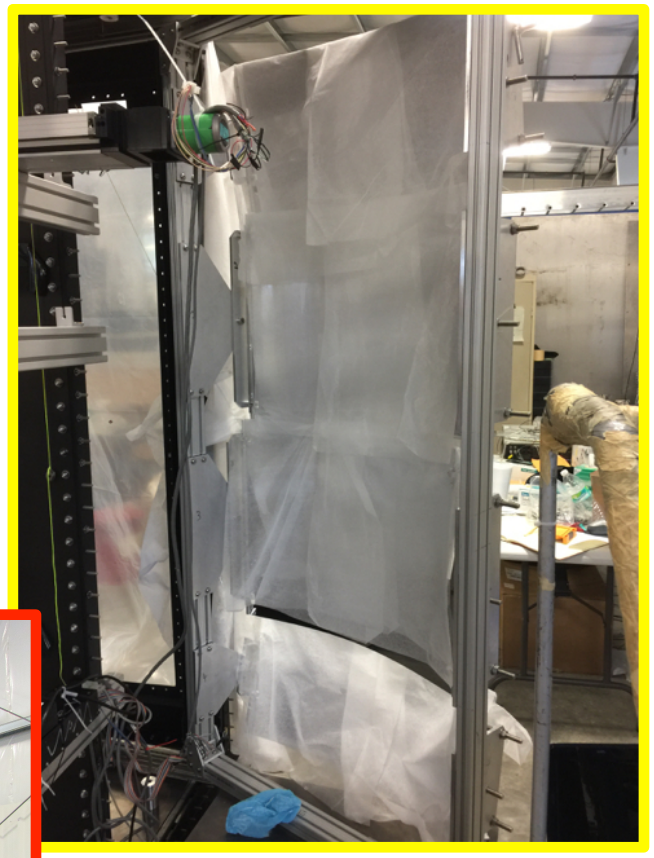
GRINCH Status

- Detector Mechanical Assembly 90% Complete
  - Vessel assembled; Windows installed
  - 460/510 PMTs installed in shielding box; installed on vessel
  - Gas panel built
    - Working with Design Authority Robin Wines for safety certification
  - LEDs not installed
- DAQ Status
  - NINO cards installed
  - Signal and HV cables complete except final HV patch
  - VETROC DAQ assembled and tested for 81-PMT prototype
    - All modules for full DAQ ready for assembly; summer 2017
- Install GRINCH in BigBite in summer 2018
- Manpower for GMn Installation/Testing (focusing on GRINCH) 10-14 man months

GRINCH in ESB

PMT array with light catchers





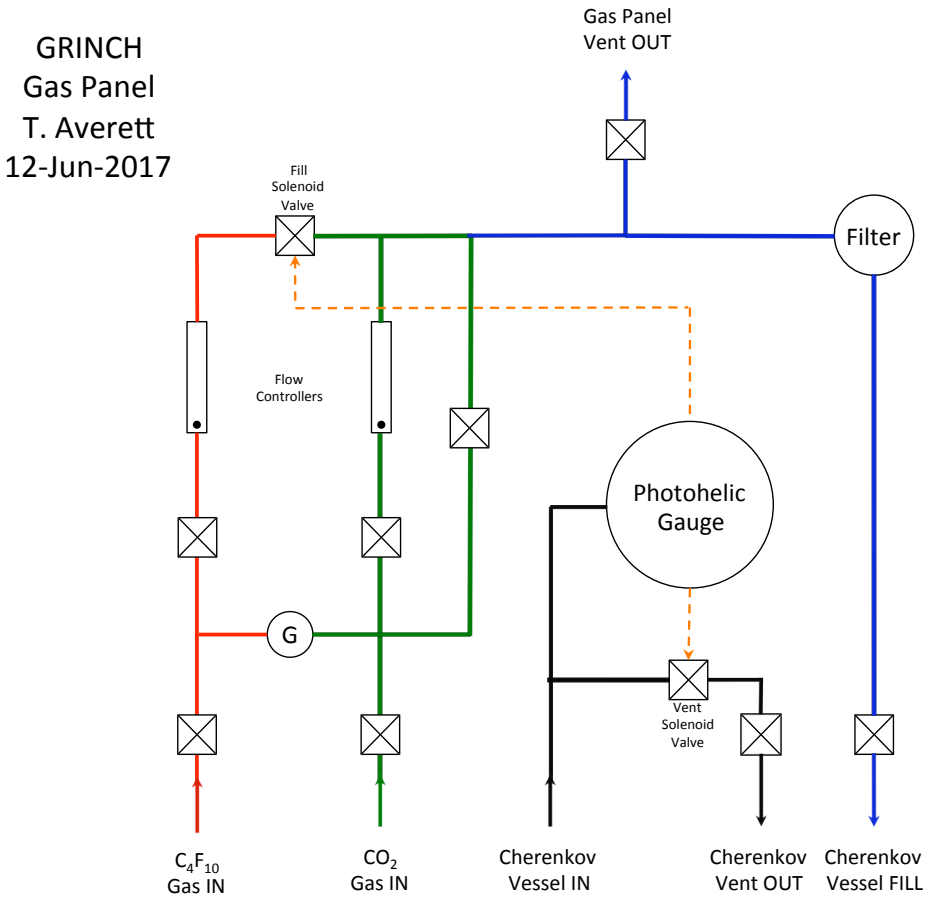
Mirrors (covered) in sliding frame

Current DAQ Tests w/ Prototype Detector

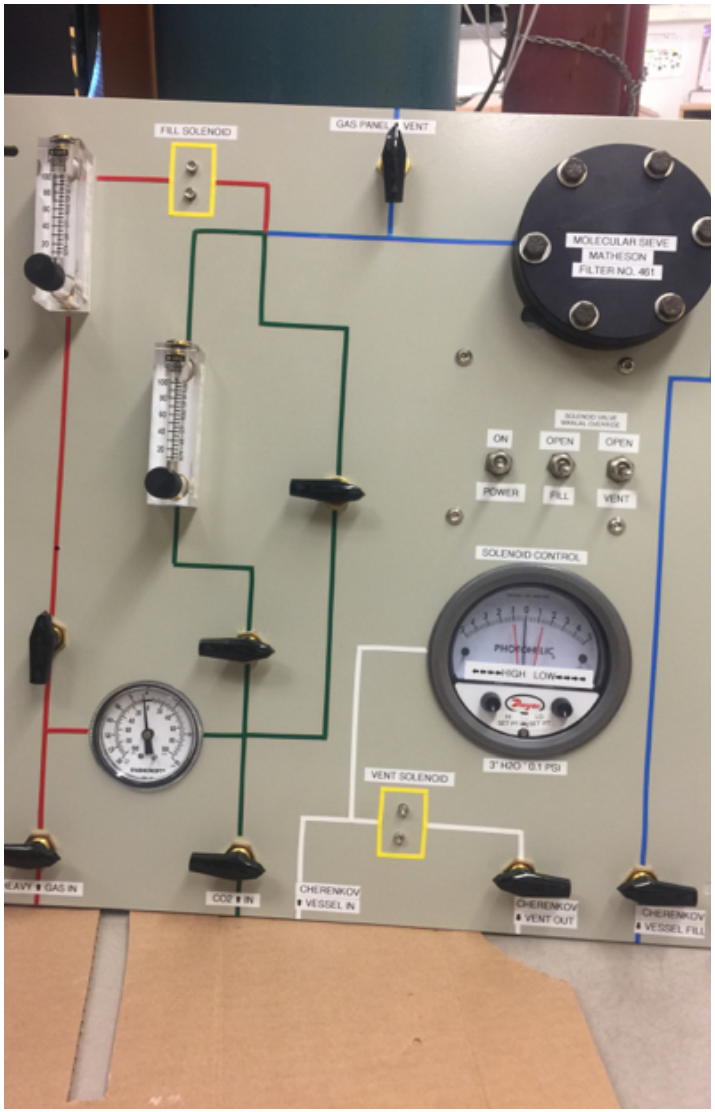
- 81 PMT prototype detector with NINO, VETROC
- Was used to benchmark VETROC
- Now setting up for cosmic tests.
  - Scintillator trigger paddles above and below
  - Piece of scintillator sitting on PMTs
  - Look at timing, cluster finding

Gas System and Recovery

- Gas panel complete, leak tight.
- GRINCH is at 1 atm absolute pressure.
- Gas system will use
  - C_4F_{10} at max pressure ~25 psia
  - CO_2 at bottle pressure, 2500 psia
- GRINCH system is a pressure vessel
- Designing flow restrictor system for inlet gas followed by large flow capacity relief "valve"



Gas Panel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GAS PANEL VENT
MOLECULAR SIEVE
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PHOTOHELIC
HIGH LOW
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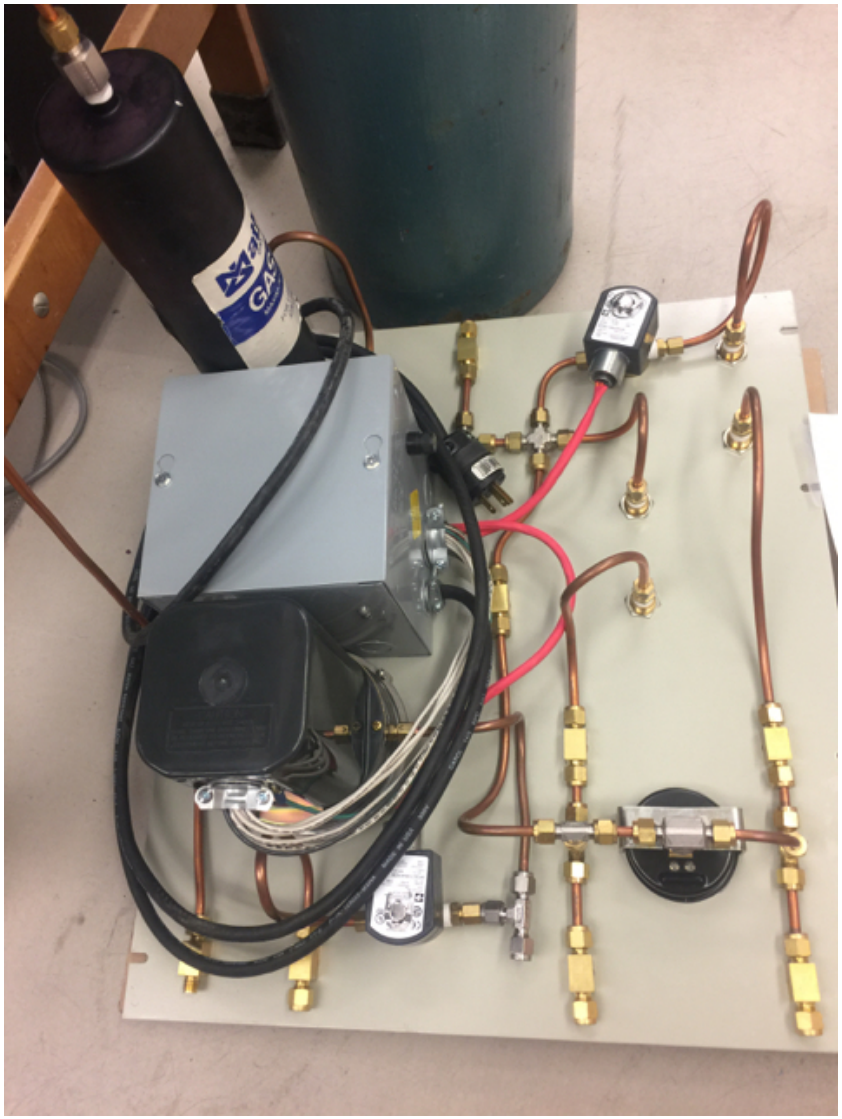

Gas Recovery

- GMn ERR requests C_4F_{10} recovery system
- $5-10k per bottle
- 2-3 bottles needed for flush
- 1 bottle every X months for maintaining pressure in GRINCH
- Vapor pressure at 25 C is P ~ 48 psia
- Boiling point T ~ 271 K

- Recovery Ideas:
  - Only possible during fill/flush
  - Pre-fill with e.g. N_2
  - Compress gas to P > 25 psig to condense to liquid; pump off remaining N_2 gas
  - Or, cool gas to T < 271 K to produce liquid and pump off remaining N_2 gas

Leak Checking

- Prior to filling with C_4F_{10}
  - Fill with 95% Ar + 5% H_2
  - Not considered flammable gas
  - Sniff with flammable gas detector
  - According to Jack Segal and Bogdan, this is an allowed procedure.
  - Requires approval of gas system first.