



Status on Yale R&D

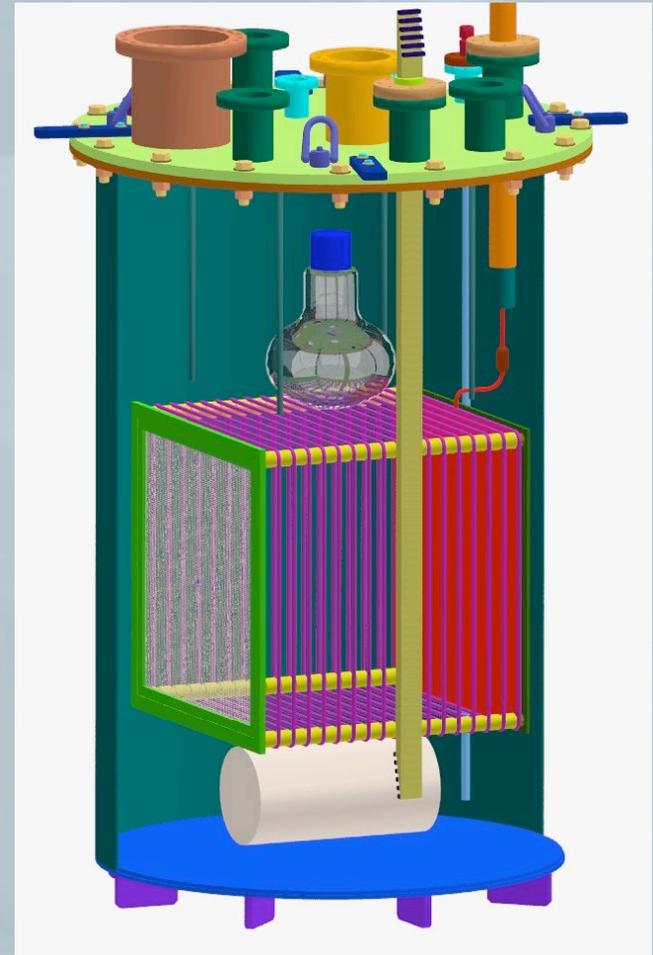
Matthew Harrison

Goals of the Yale Program

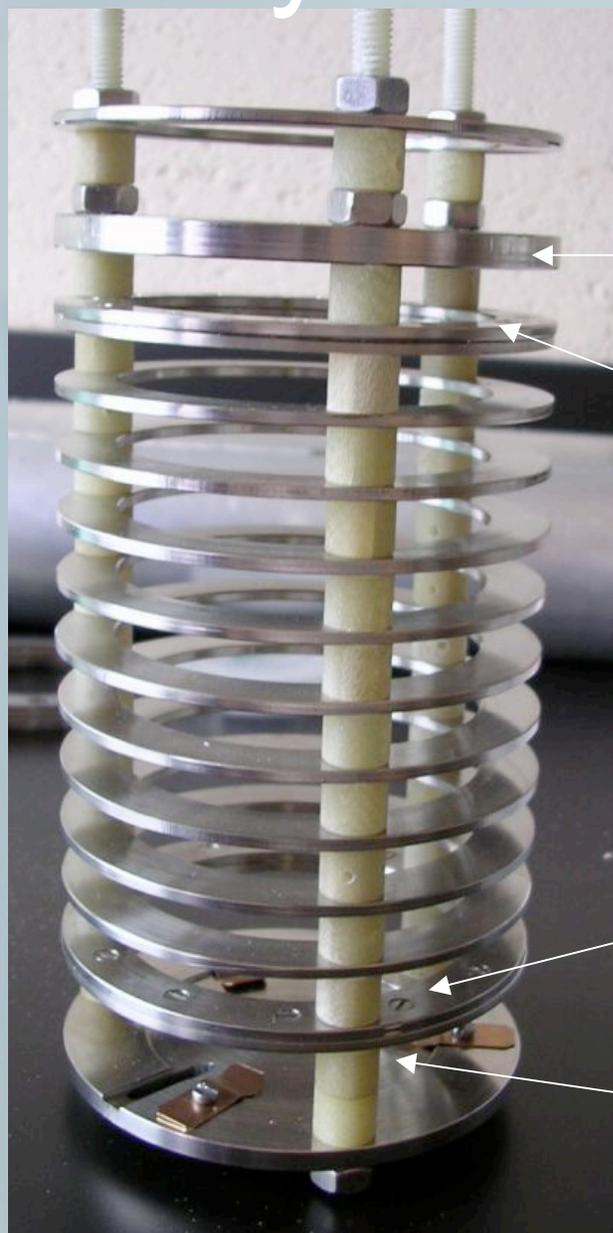
1. Achieve Liquid Argon (LAr) purity good enough (few ppb oxygen equivalent) to ...
2. See tracks in a LAr Time Projection Chamber (TPC)
3. Study light collection (PMT) in conjunction with charge collection

Current R&D Activities

- Purity
 - Small Purity Monitor set-up (ICARUS style PrM and electronics)
- 500 l Vessel
 - 40 cm TPC
 - New Gas Handling System (GHS) with RGA to measure gas composition
 - New PrM and electronics (thanks to FNAL)



Purity Monitor (ICARUS style)



Anode

Anode grid

Cathode grid

Cathode, with
slot for photocathode

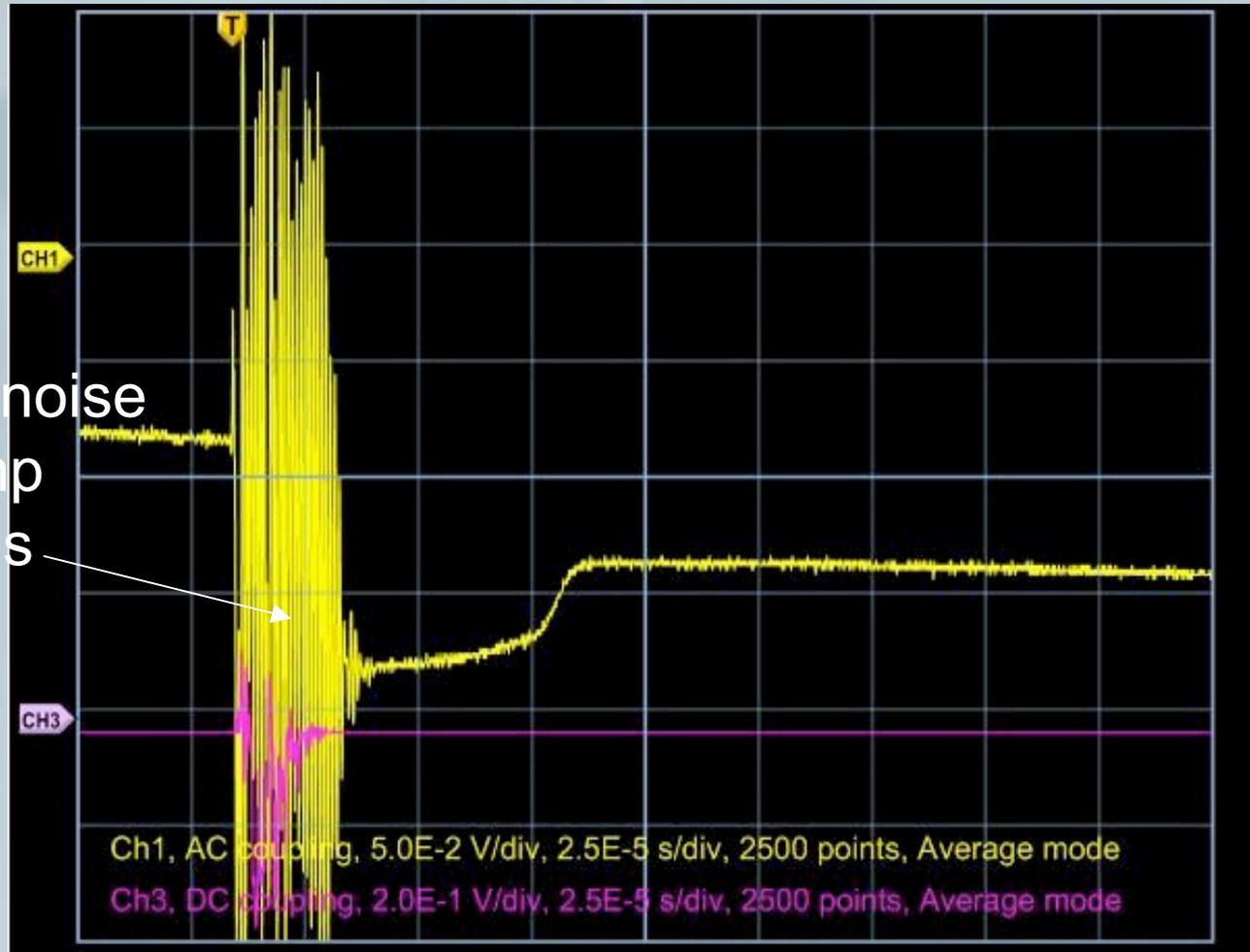


Xe Lamp

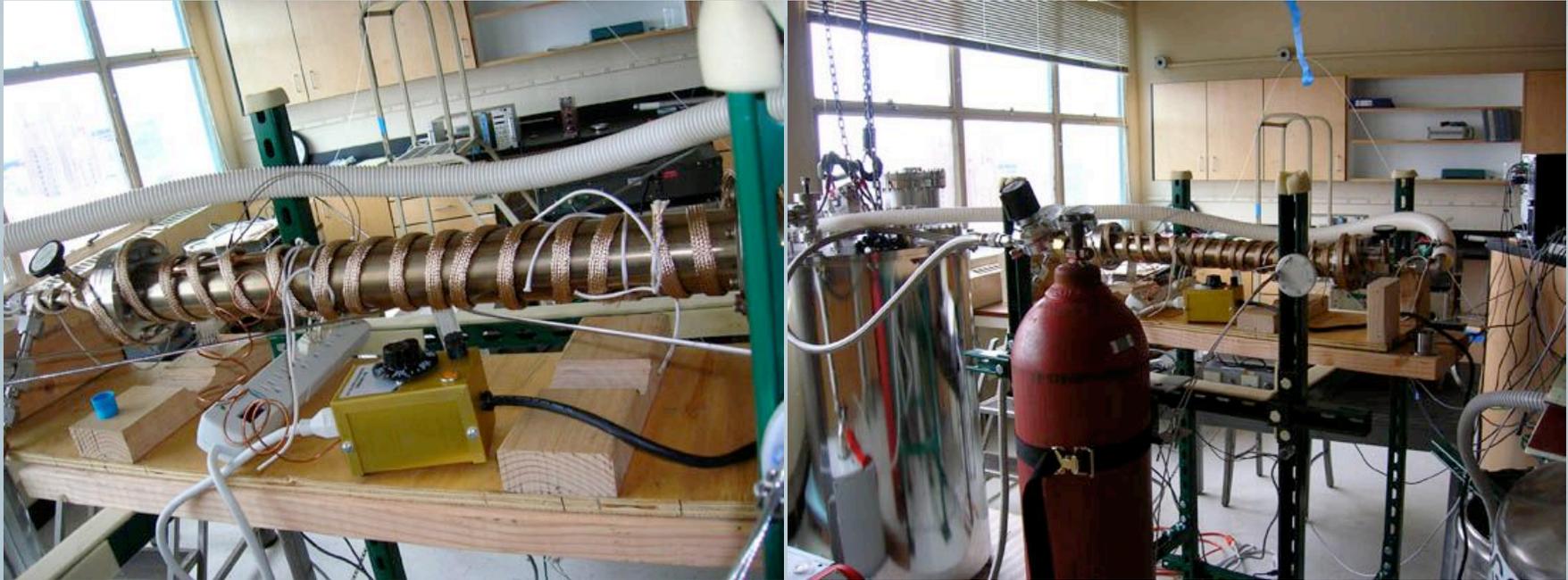


Signals in Gas ...

Lots of noise
(Xe lamp
trigger is
noisy)

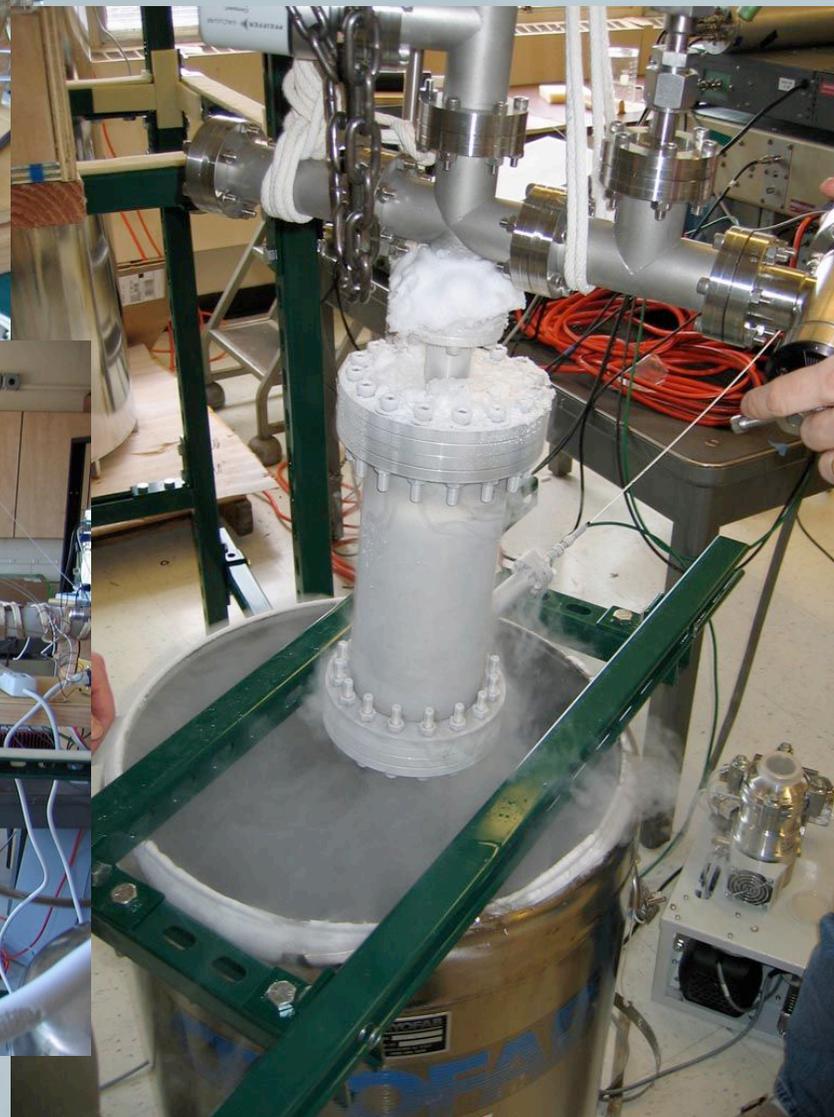
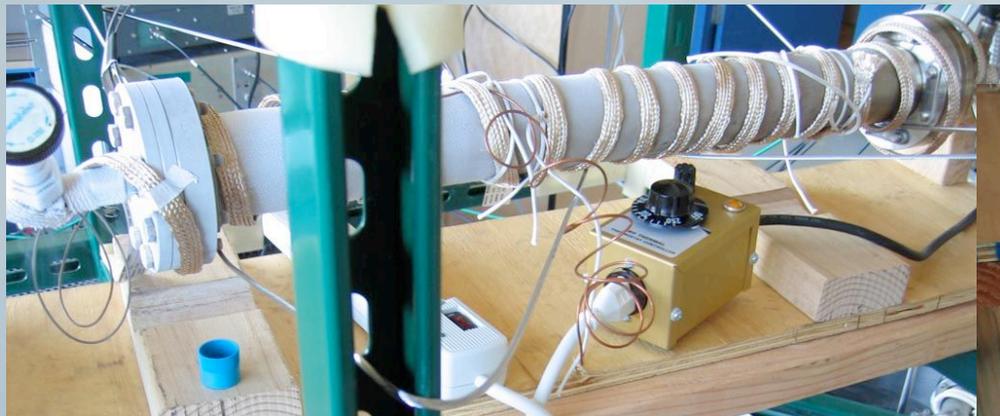


Current filtration set-up

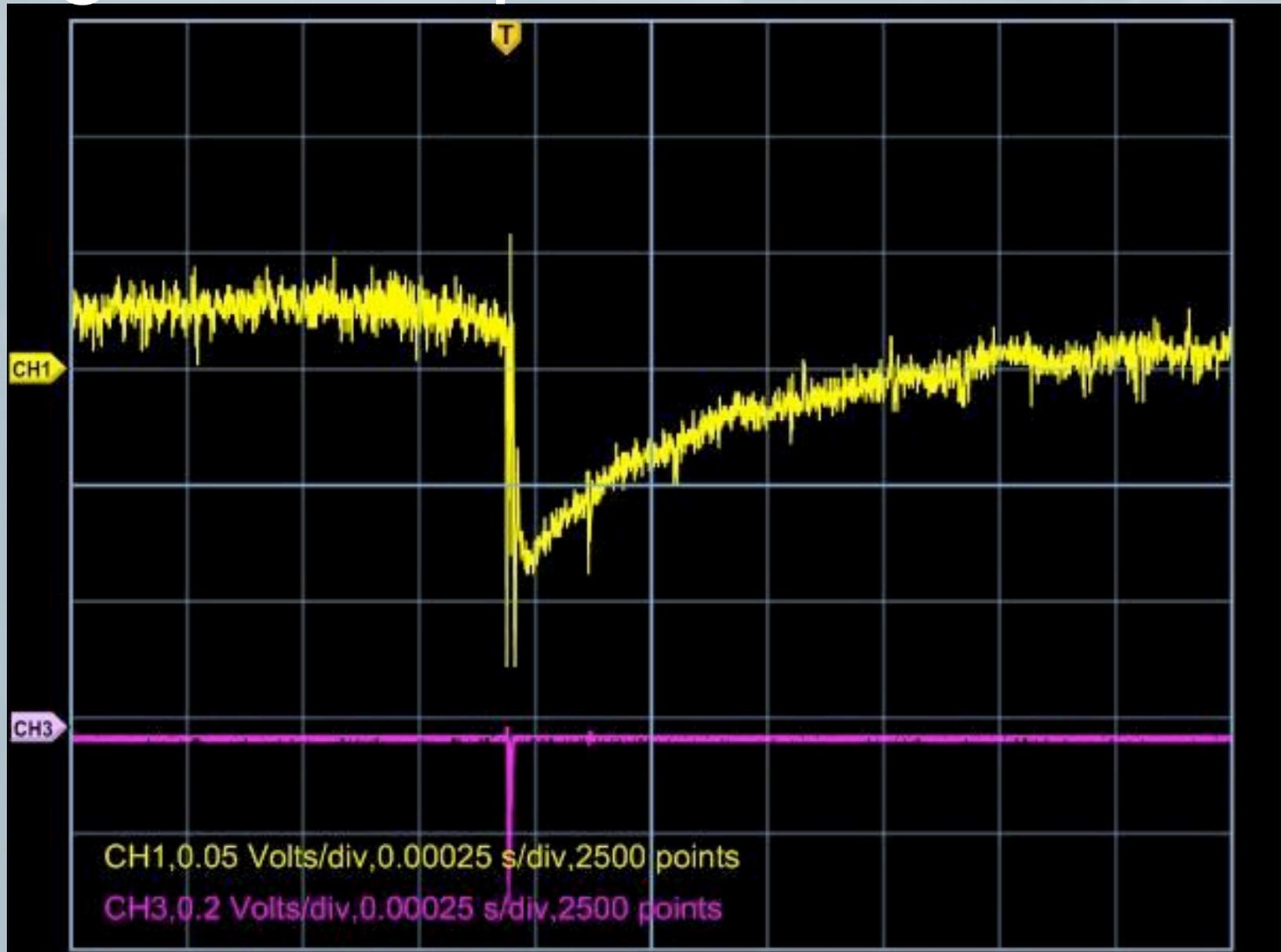


- Only trigon filter
 - Fill directly into PrM vessel by over-pressure (do not dump initial LAr)
 - Have regenerated Trigon
 - No molecular sieve (new set-up discussed later)

Filling...



Signal in Liquid



Ongoing tasks for PrM

- New Gas Handling System (GHS) being put together
 - Molecular Sieve 5A
 - Trigon or Oxisorb
 - Use of capillaries to look at gas
- Will use new GHS to see “good” purity (where good means 4 ms drifts for 50V/cm, more on this later)
- Continue to use PrM as diagnostic tool and study filters

What we're looking for ...



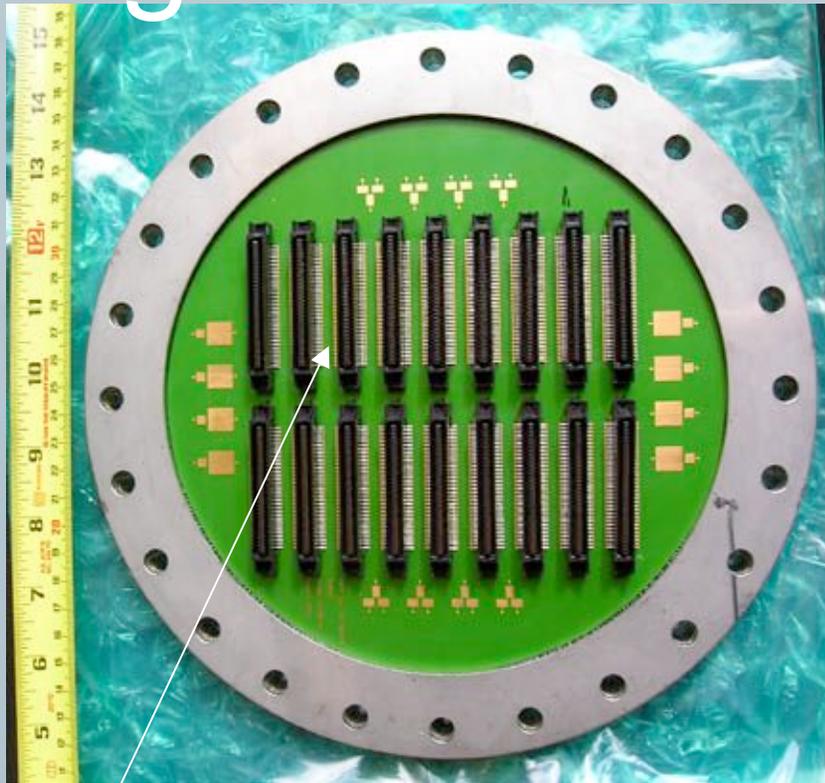
Cosmic Ray tracks in TPC!

500l Vessel for TPC



- Cold Tested
- Building GHS
- Building feedthroughs
- PrM suspended inside (next week) with tests in Gas (and if goes well) liquid
- TPC currently being assembled

Signal Feedthrough (ICARUS)



Signal feedthrough (ICARUS)
-Mounted and vacuum tested



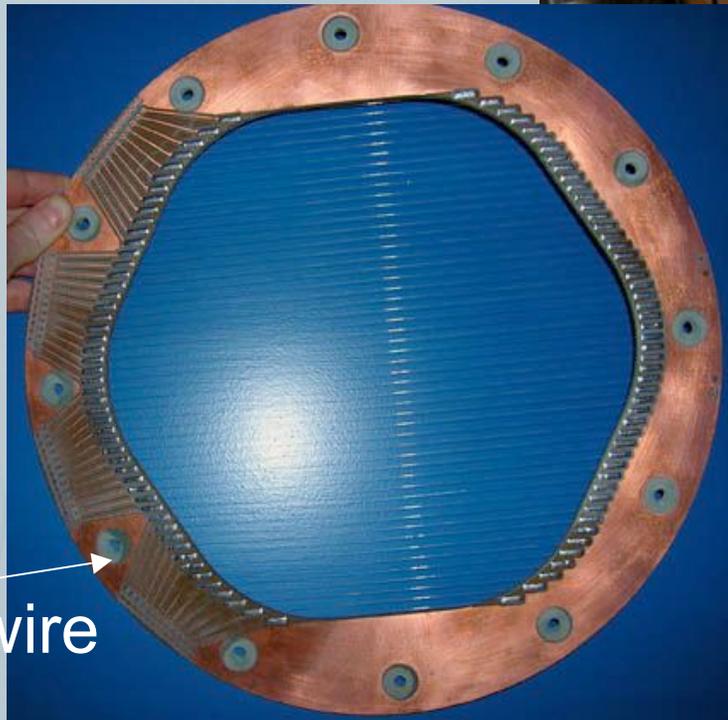
HV, wire plane, TPC (FNAL)

–G10 for TPC has been cut to length (added room for PMT in vessel)

–Sip pins added to rings (so resistors can be soldered)

–Holder and rods built for wire plane readout

Read-out wire plane



HV feedthrough

TPC



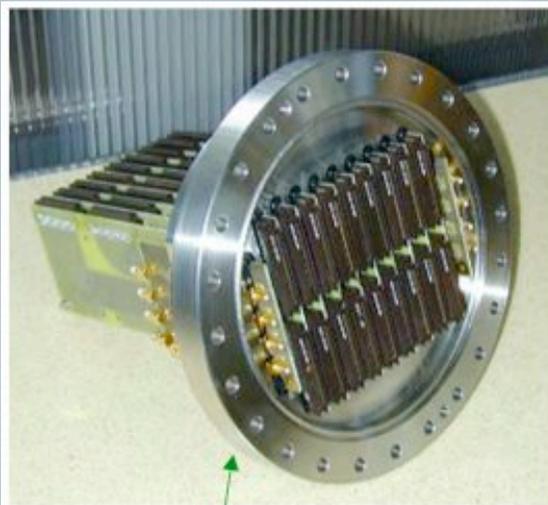
Alternate TPC (in design)

- Copper etched G10 square (similar to NOMAD design)
- Copper strips used as field shaping rings
- Square read-out plans at 90°



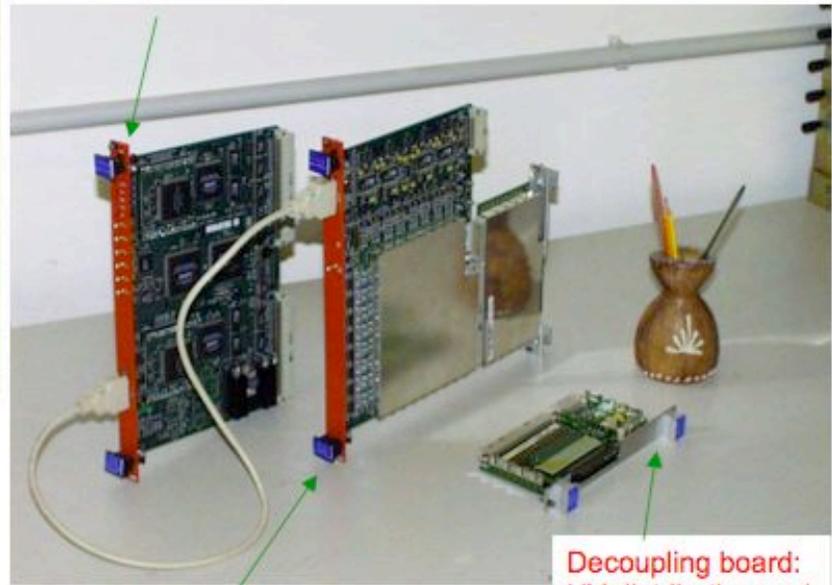
TPC Electronics

- Electronics will be available from ICARUS by mid-June
 - ICARUS will be sending Baghdad to get us up to speed on their electronics
- We are set-up to read out both ICARUS and MSU



Signal UHV feed-through:
576 channels (18 connectors x 32)
+ HV wire biasing

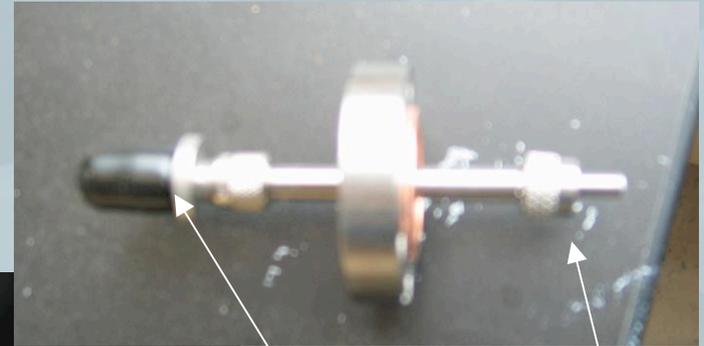
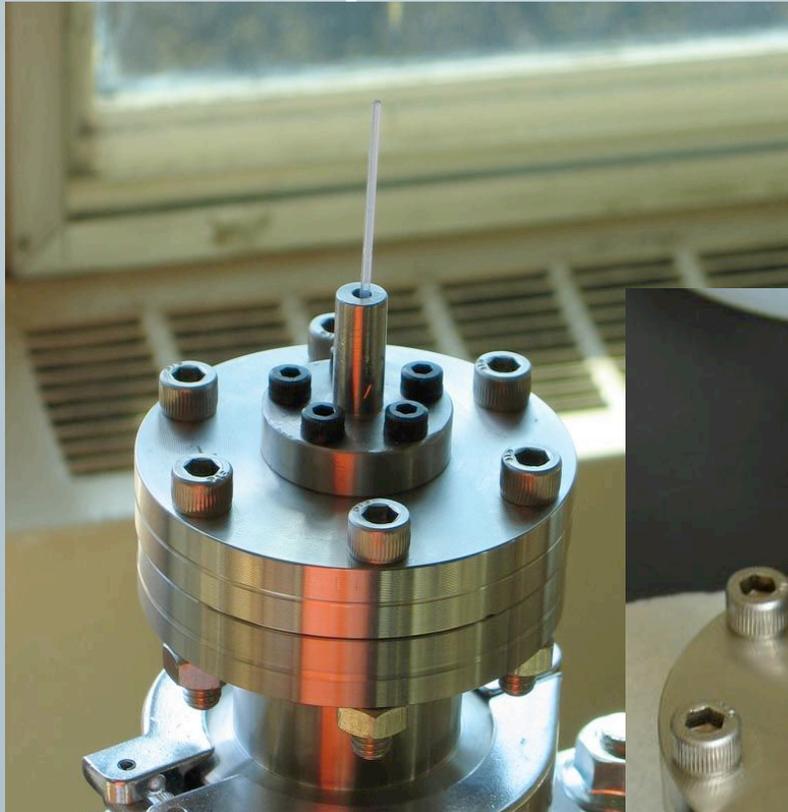
CAEN-V789 board: 2 Daedalus VLSI * 16 input channels
(local self-trigger & zero suppression) + memory buffers +
data out on VME bus



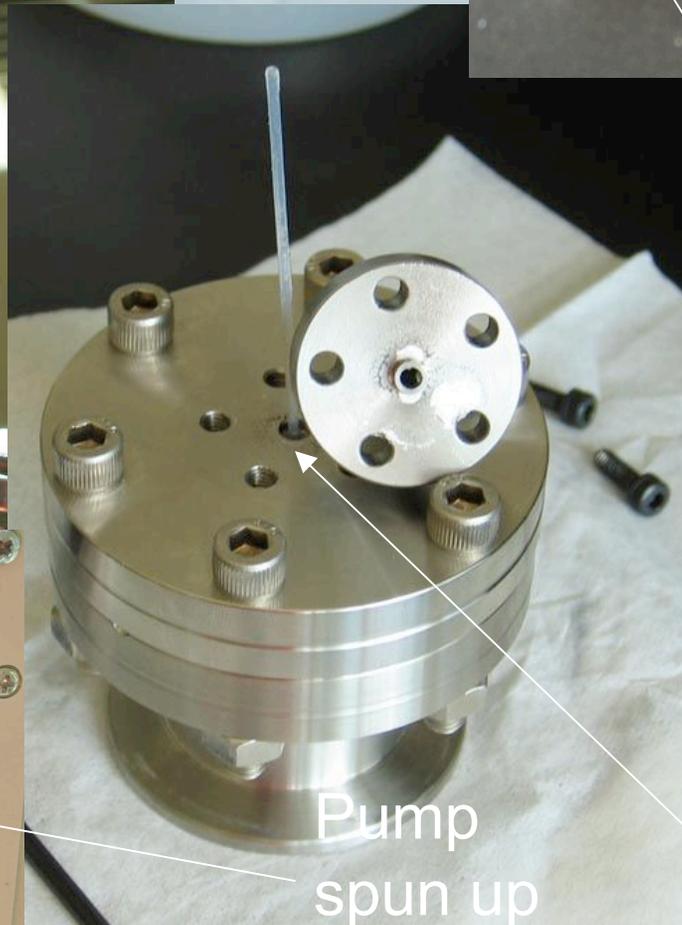
CAEN-V791 board: 32 pre-amplifiers +
4 multiplexers (8:1) + 4 FADC's (10 bits - 20 MHz)

Decoupling board:
HV distribution and
signal input

Fibre (two designs)



2 SMA ends
with fiber
(epoxy)
inside
on CF16

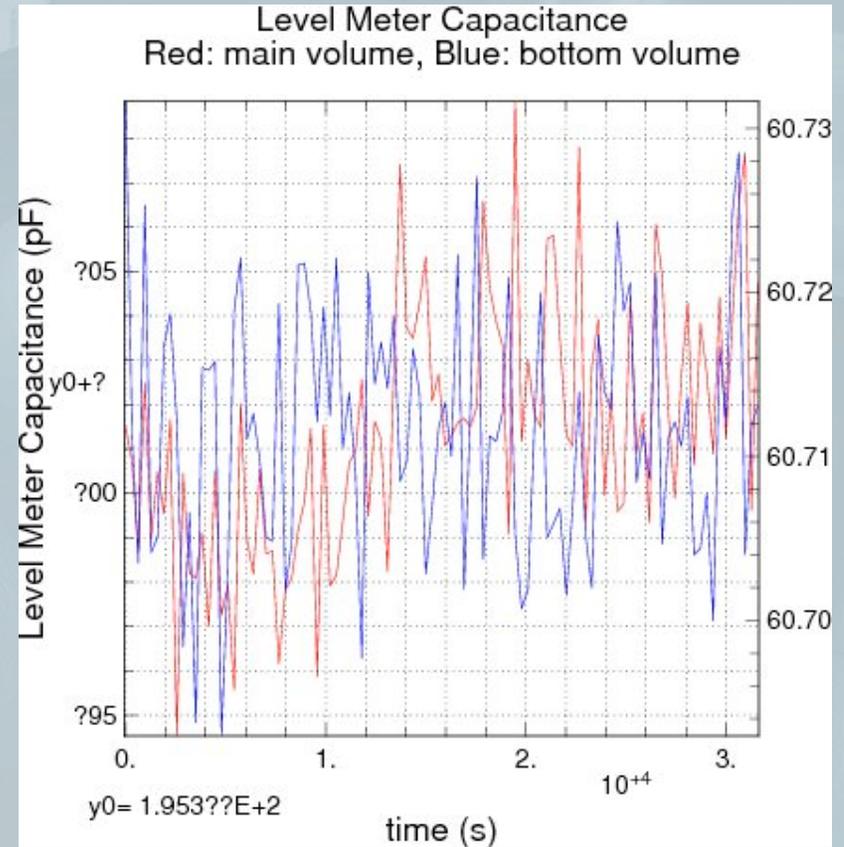


Pump
spun up

Indium Seal

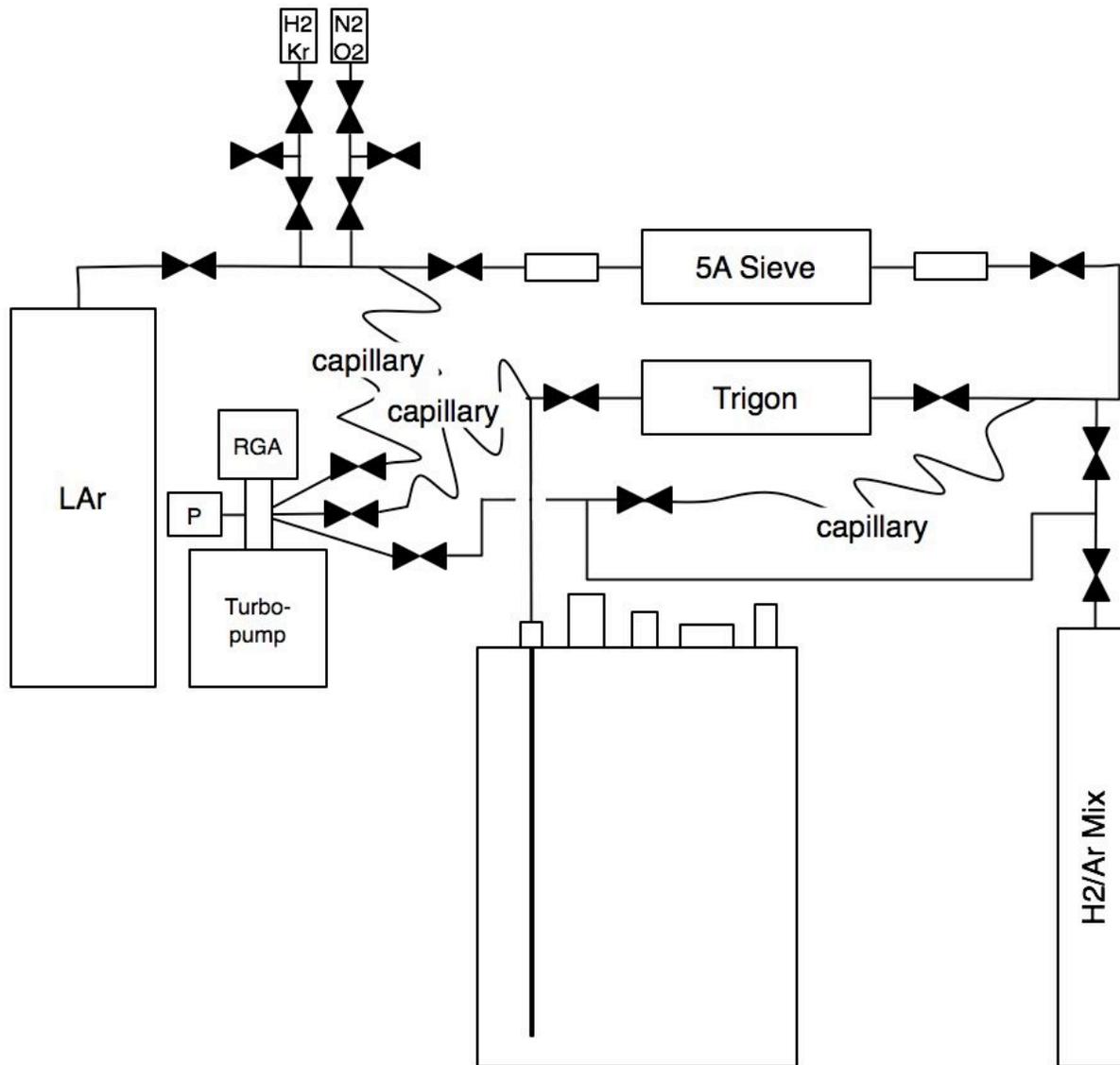
Level Meter

- Cylindrical capacitor
- Very low noise chip
- Can resolve mm liquid level
- Cheap (~\$150)



Smartec
UTI

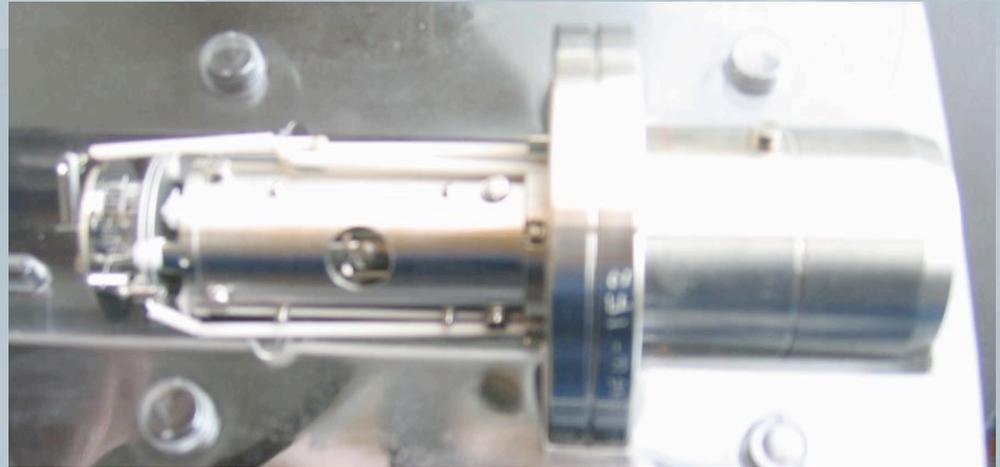
Gas Handling System (GHS)



- Three capillary look at gas
- Bake both sieve and trigon inline

GHS (part 2)

- RGA can measure to partial pressures of 10^{-11} mbar
- Can measure adsorption constants at LAr temp and room temp



Future PMT work



- Can use PMT to look at LAr scintillation light and TPC events in coincidence
 - Use to study physics issues for trigger and PID
- Have nanosecond LED pulser to study PMT in LAr (gain, QE, angular efficiency)

Summary

- Small PrM functioning and works well as small test bed
- 500 l vessel has been designed, built and cold tested
 - Feedthroughs are assembled and tested (HV, PrM HV, level meter, fill lines, signal, fibre)
 - Currently being fitted with PrM from FNAL (hope test next week, gas first, then liquid)
 - TPC on track to be in tank after successful tests of PrM in 500 l vessel