

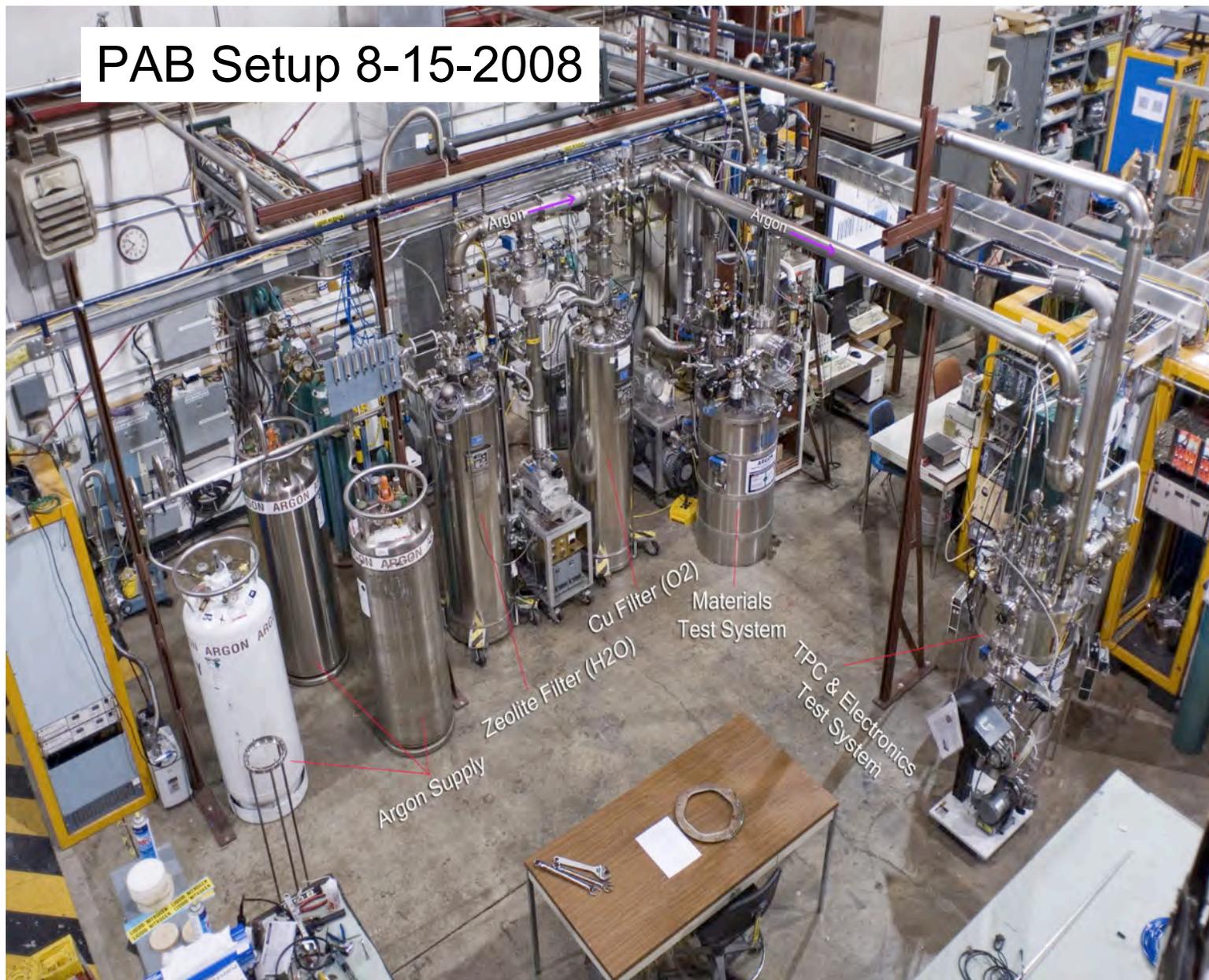
Liquid Argon R & D - non MicroBooNE, non Dark Matter non ArgoNeut

PAB Test Systems:

20 ton Purity Test:

Light detection R & D (with MIT)

PAB Setup 8-15-2008



PAB Systems Ongoing Work/Wishlist:

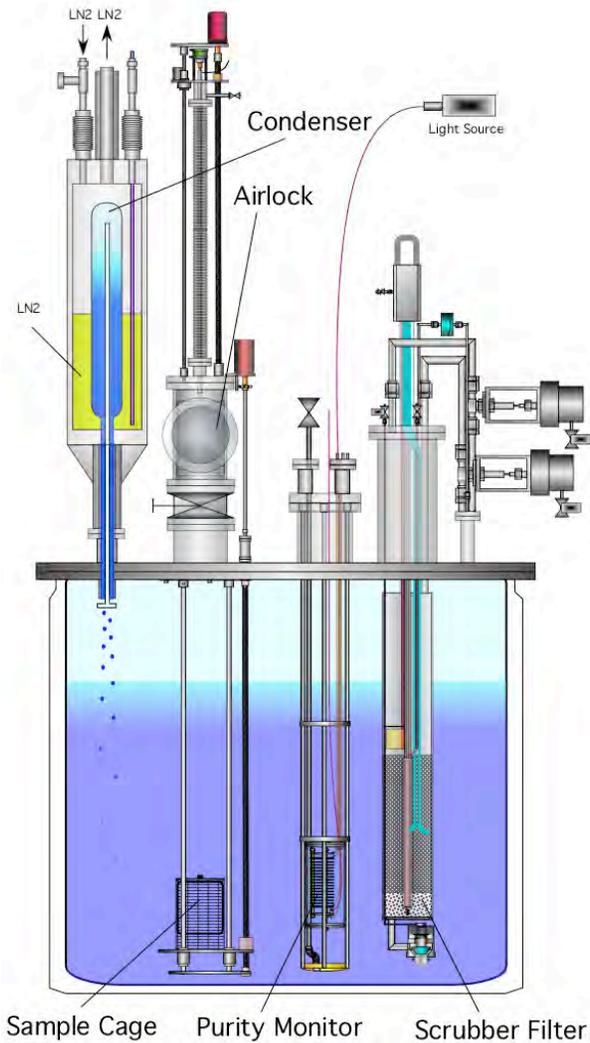
Materials Test System (Luke)

- Understand effect of condensing on life-time;
- Implement gas-recirculation system;
- Test new photo-cathode materials and light sources
(develop simple ion-chamber for bell-jar)
- Operations support;

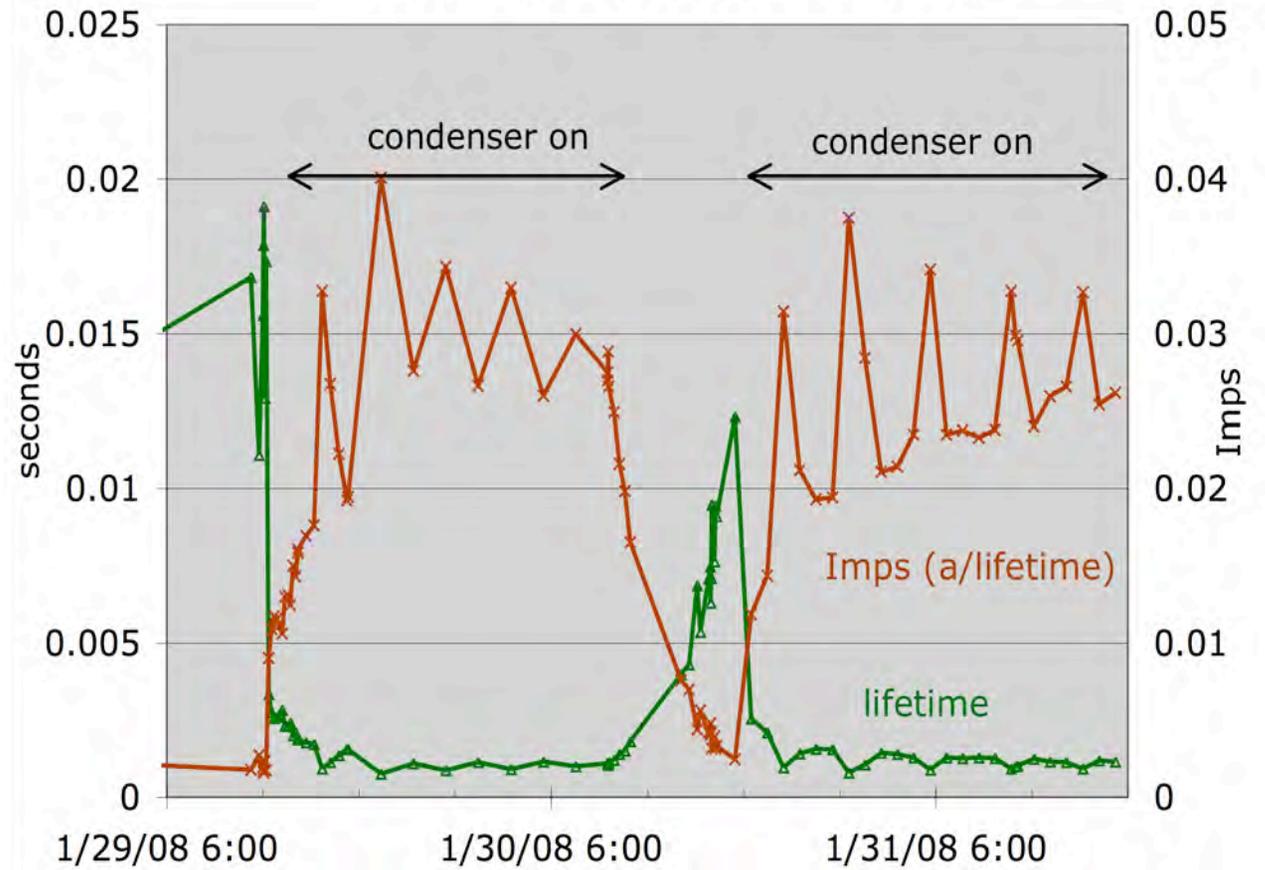
Electronics Test System (Bo)

- Implement condenser (when condensing action understood)
- Associated safety review work
- Implement electronics in cryostat (cold electronics)
(involves new signal planes on existing TPC and new
feed through)

Raining condensers may be a problem



Effect of Condenser Operation on Lifetime



Cure for condenser effect:

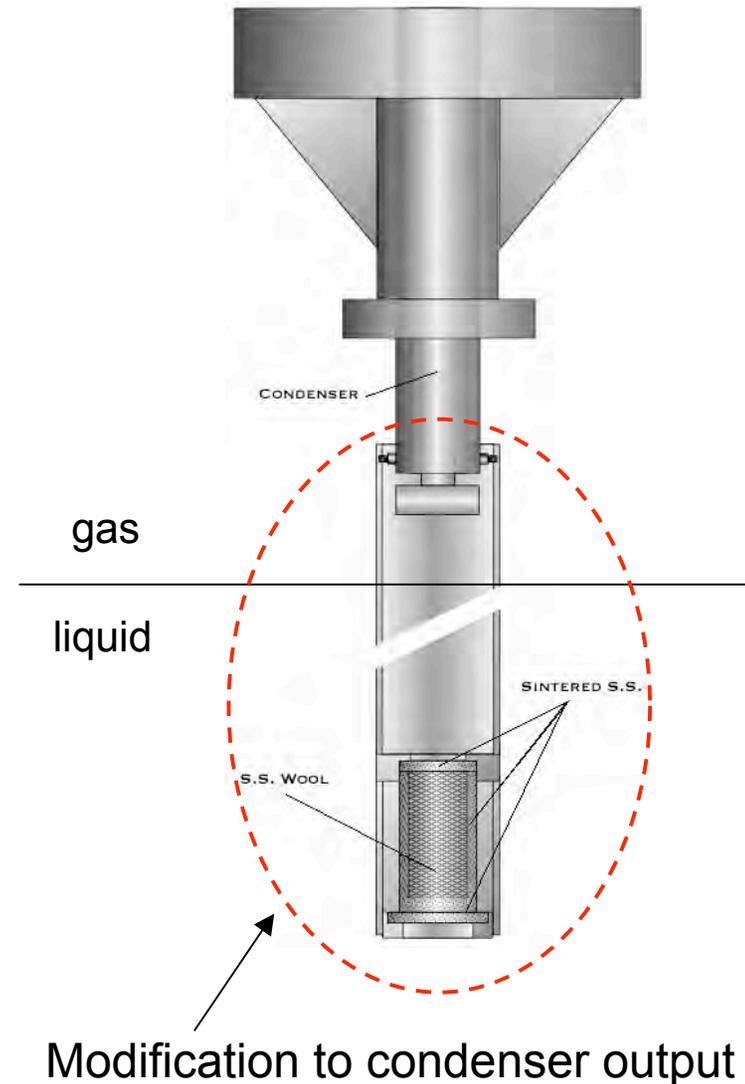
Extended condenser return into liquid by adding pipe with sintered Stainless Steel and Stainless Steel wool.

Effect eliminated - discharging ions?

Removed SS material - effect partially returned;

Rod at some voltage to attract ions directly - no effect.

Significant for design of large tanks where we are considering N2 condenser coils in the ullage



Total PAB effort estimate: (names as indications of type of work)

1/3 fte engineering (MD) (Terry Tope)

1/3 fte engineering associate (MD) (Cary Kendziora)

1/3 fte light/delicate technical effort (TD) (Ewa Skup/Wanda Newby)

1 fte mechanical technician (MD) (Cary's crew)

1/4 fte electrical engineering (SD) (Walt Jaskierny)

1/6 fte electrical drafting (EED) (PC layout group)

20 ton Purity Demonstration:

Goals

- demonstrate we can purify significant volume
- demonstrate we can achieve purity without evacuation (provides infrastructure for larger R&D than PAB systems)
- do this by the end of calendar 2009

- have estimates of cost and effort (R.L.Schmitt)

 - materials cost estimate (\$350k)

 - effort estimate (60 wk engineering, 60 week technician)

(pump ordered, vessel bids by 9/25, purifier vessel drawings ready for requisition to be written)

 - will need assembly of purity monitors and light sources (2 fte months)

| WBS | Item | M&S kS | eng MW | tech MW |
|-----|------------------------------|--------|--------|---------|
| 1.1 | flat bottomed tank | \$45 | 3 | 1 |
| 1.1 | cleaning procedures | \$4 | 1 | 1 |
| 2.1 | argon pump | \$40 | 0.5 | 0.5 |
| 2.1 | electric power | \$5 | 0.2 | |
| 2.2 | blower | \$3 | 0.5 | 0.5 |
| 2.2 | purifier vessels, qty 3 | \$30 | 2 | 3 |
| 2.2 | particulate filter | \$5 | 0.5 | 0.5 |
| 2.3 | Valves | \$10 | 2 | 6 |
| 2.4 | pre-insulated pipe. S50/ft | \$6 | 3 | 4 |
| 2.4 | heat exchanger | \$3 | 0.5 | 0.5 |
| 2.4 | pip ing document | \$2 | 1 | |
| 2.5 | catalyst, carbon, mole sieve | \$3 | 0.5 | 1.2 |
| 2.6 | controller | \$15 | 3 | 4 |
| 2.7 | purging analysis | | 1 | |
| 2.7 | ODH analysis | \$3 | 1 | 2 |
| 2.7 | component lists | | 1 | |
| 2.7 | operating procedures | | 1 | |
| 2.7 | FMEA | | 0.5 | |
| 2.7 | what-if analysis | | 0.5 | |
| 2.7 | hazard analysis | | 0.5 | |
| 2.7 | panel reviews | | 1 | |
| 2.7 | technical report results | | 1 | |
| 3.2 | cheap instruments | \$3 | 2 | 2 |
| 3.2 | expensive instruments | \$10 | 1 | 1 |
| 3.2 | oxygen analyzers | \$0 | 0.5 | 2 |
| 4.3 | tank installation | \$0 | 0.1 | 0.2 |
| 4.7 | tank insulation | \$3 | 2 | 4 |
| 4.7 | tank vapor barrier | \$1 | 0.2 | 2 |
| 4.7 | tank foundation heaters | \$5 | 2 | |
| 5.1 | argon | \$40 | 1 | 2 |
| 5.2 | operations support | | 6 | 6 |
| | totals with contingency | \$354 | 60 | 65 |
| | contingency | 1.5 | | |

Light detection R & D

TPB doped polystyrene (initial tests encouraging)

TPB coated light-fibers (J. Conrad (MIT) idea)

need some weeks of chemistry and coatings.