High Voltage in ArgoNeuT

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on behalf of the ArgoNeuT Collaboration

High Voltage in Noble Liquids Workshop

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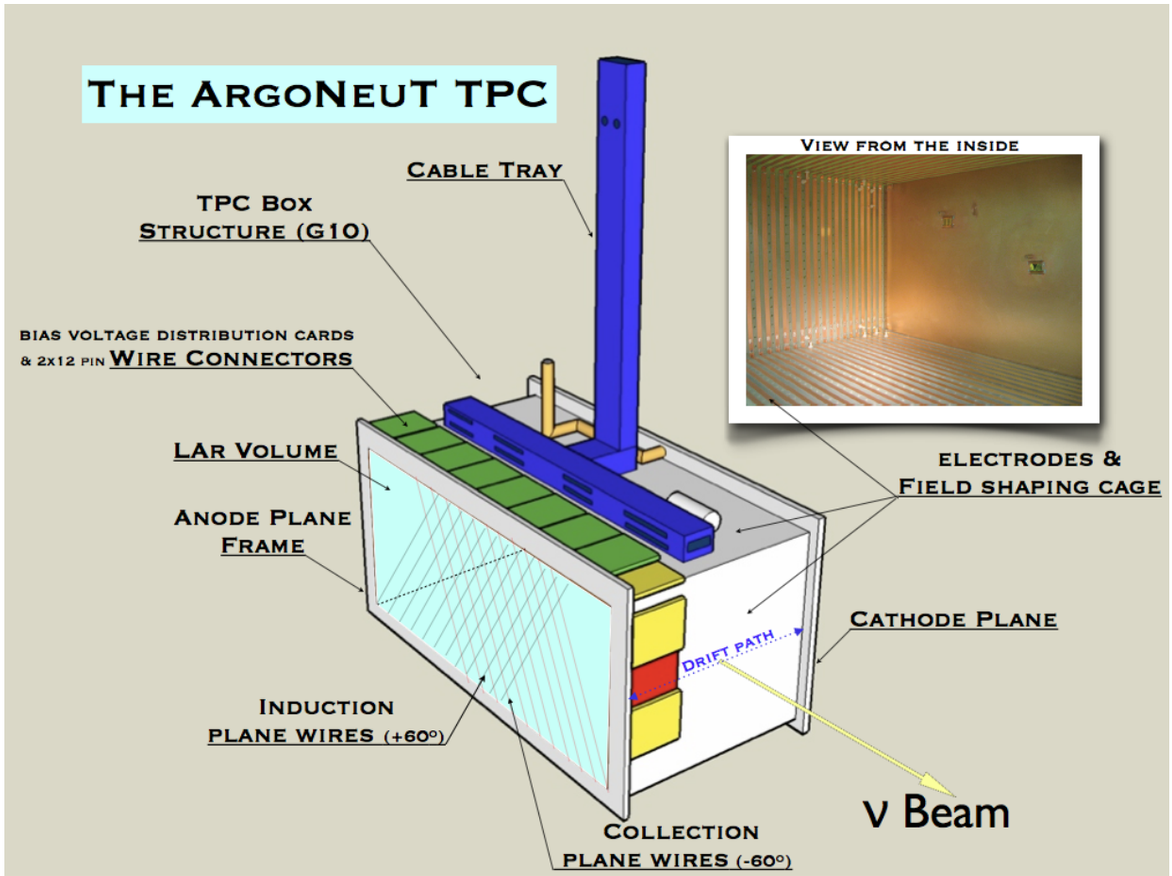
Introduction

- I'll give a very short description of HV system used by ArgoNeuT LArTPC.
- I'll briefly explain design, construction, and operation of the system.

ArgoNeuT Details



Cryostat Volume	500 Liters
TPC Volume	175 Liters (90cm x 40cm x 47.5cm)
# Electronic Channels	480
Electronics Style (Temp.)	JFET (293 K)
Wire Pitch (Plane Separation)	4 mm (4 mm)
Electric Field	500 V / cm
Max. Drift Length (Time)	0.5 m (330 μs)
Wire Properties	0.15mm diameter BeCu

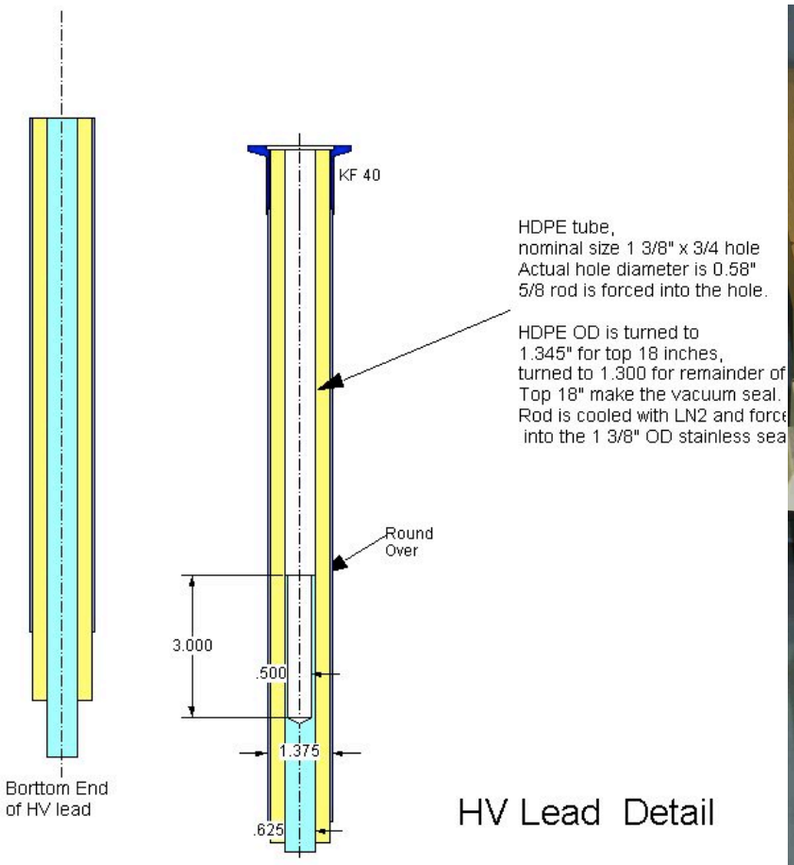
ArgoNeuT in the NuMI Tunnel

Refs:

1.) ***The ArgoNeuT detector in the NuMI low-energy beam line at Fermilab*****, C. Anderson et al., 2012 JINST Vol. 7 P10019, arXiv:1205.6747**

HV Feedthrough Design

- Feedthrough designed by Hans Jostlein.
- Assembled via LN immersion trick.



HV Lead Detail

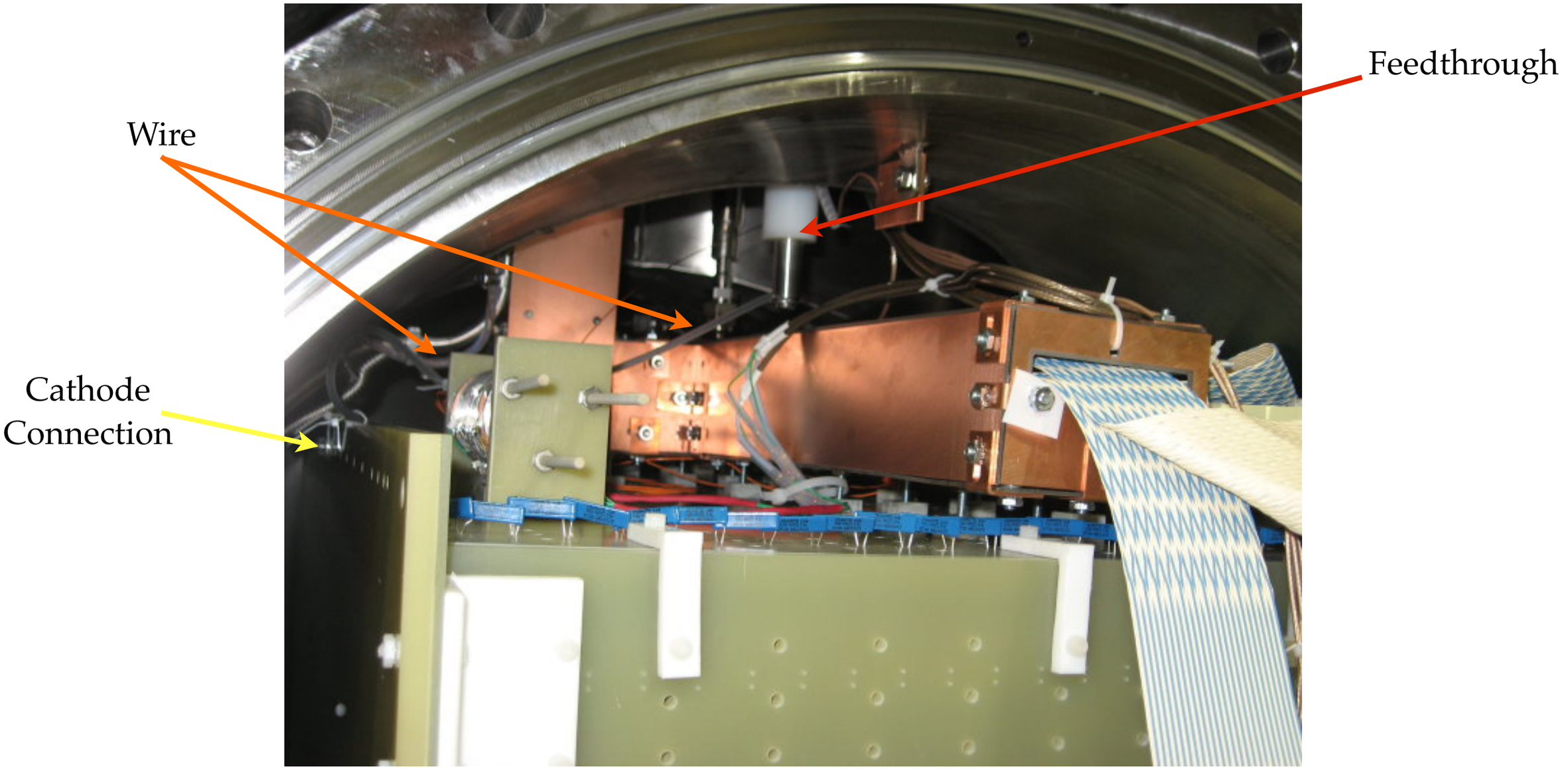
Testing

- Feedthrough tested in dewar filled with non-clean LAr.
- Operated up to 50.0 kV (x2 desired value).
  - From our e-log: ”Two initial attempts got up to ~35kV, with no current observed on the meter, before a very audible ‘pop’ was heard from inside the dewar. A final test was performed, **with a much slower ramp-up**, which got us to 50kV with no current observed.”
- Feedthrough was also leak-checked for vacuum seal. Leak rate less than 10^-10 torr/liter/sec.

Glassman 125kV supply

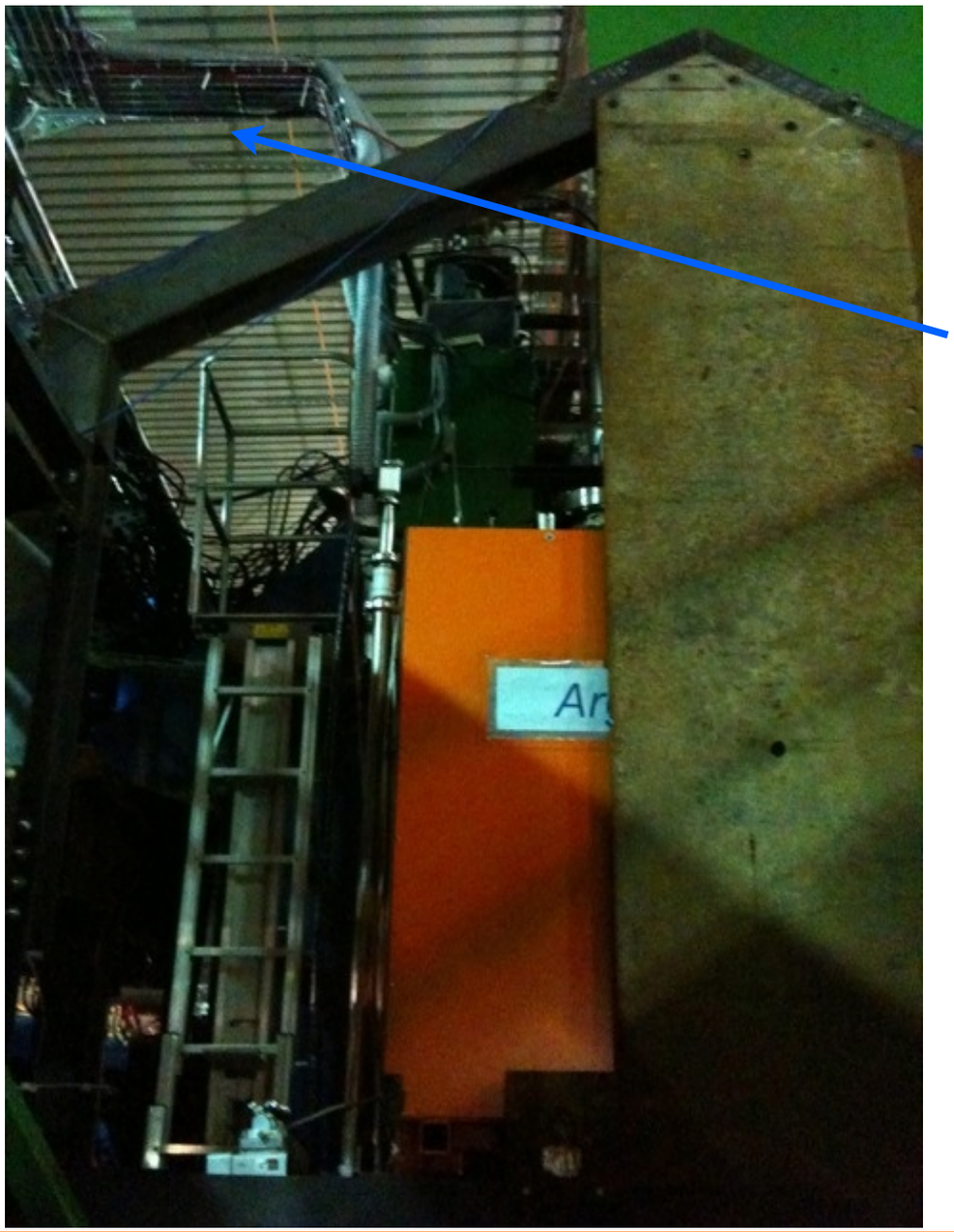
Installation on TPC

- Feedthrough extends down into desired liquid-level by several inches.
- Simple wire connection between feedthrough tip and cathode plane of TPC (one benefit to only needing -25kV).
- HV comes within ~2 cm of nearby cable shield which is at ground.



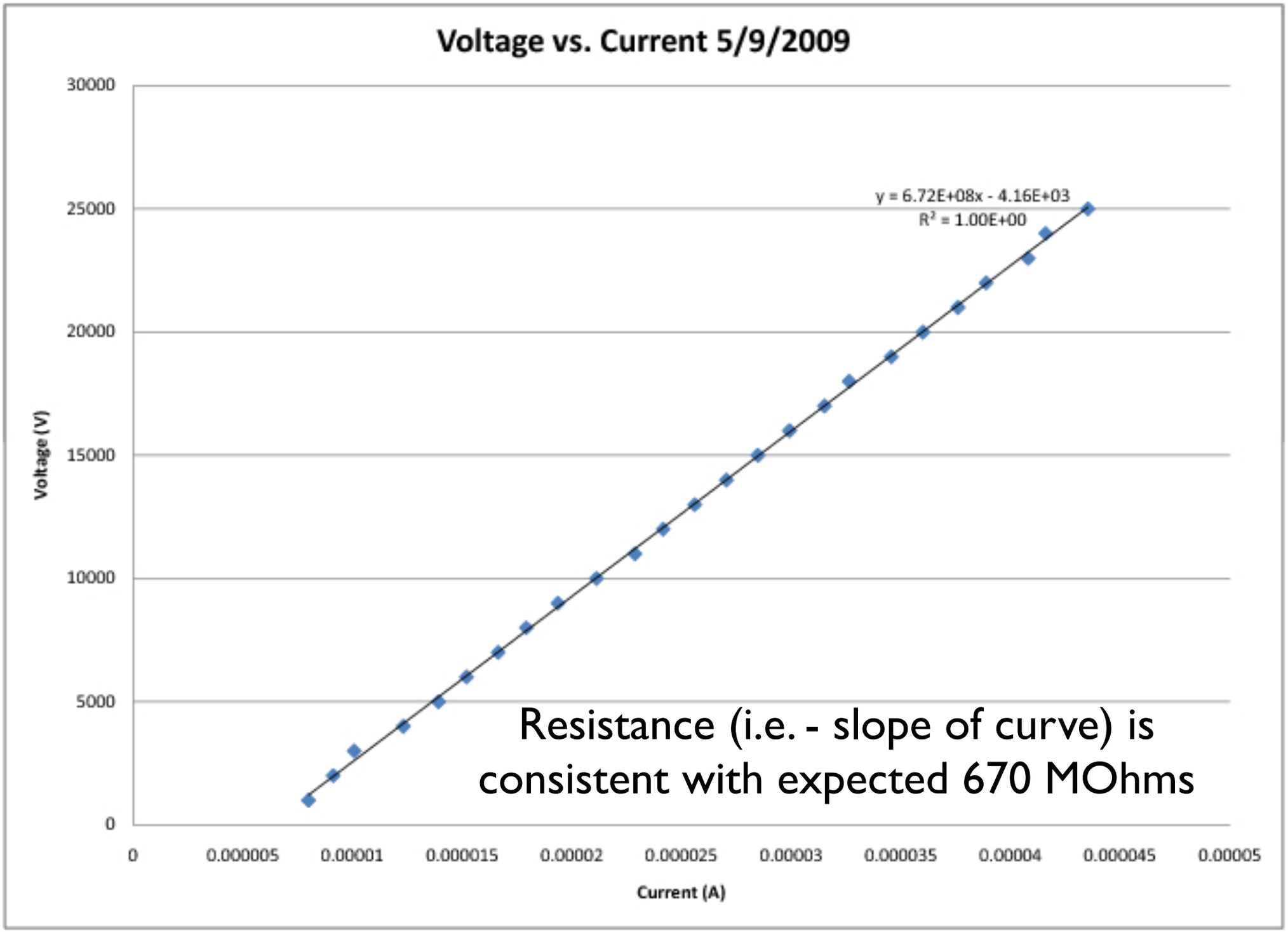
Operation in NuMI Tunnel

- HV supply located about ~20 feet from cryostat.
- Cable routed in tray carrying TPC signal cables.
- Had Ar purge line at feedthrough inlet...never used.



Commissioning

After LAr is filled, slowly ramp up voltage and measure current through TPC.



Conclusions

- HV feedthrough operated at -25kV for ~9 months of operation in NuMI. Cycled on/off ~10 min. each day for short purity tests.
- Never had any problems in NuMI.
- Never fully integrated Glassman supply into monitoring, which would have been tremendously useful.

ArgoNeuT

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