

# LArFCS PrM Test at UC Irvine

Yichen, Sergey

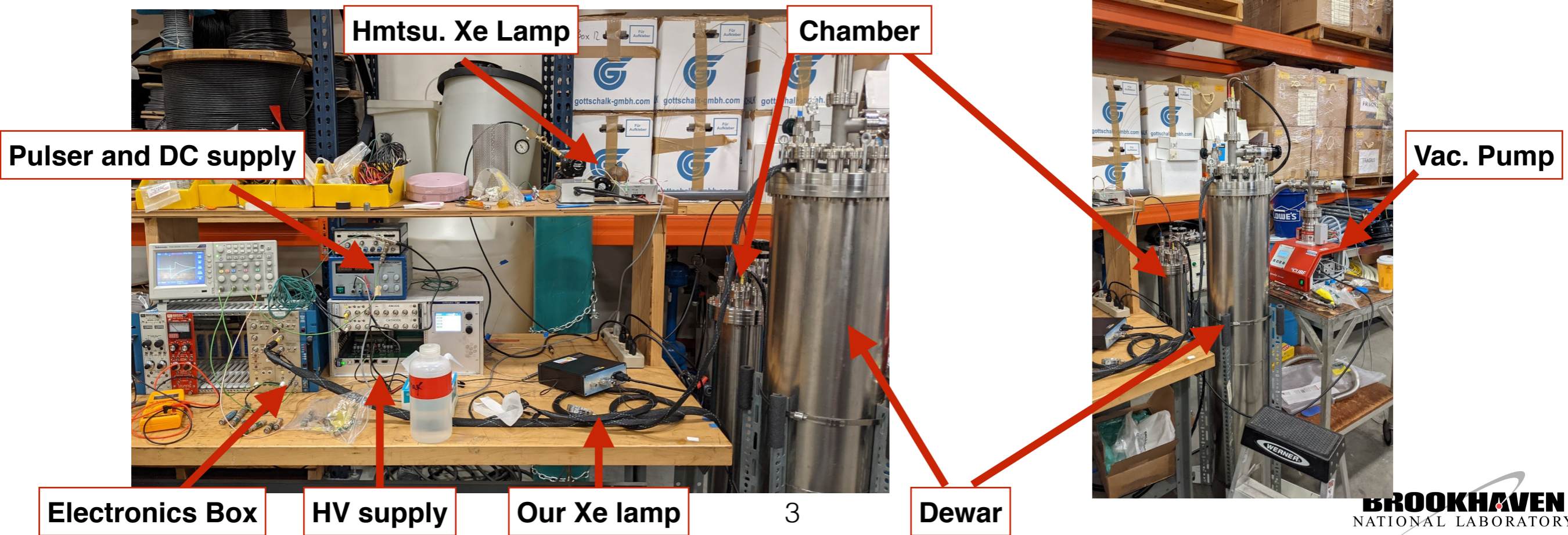
12/7/21



# PrM test at UCI

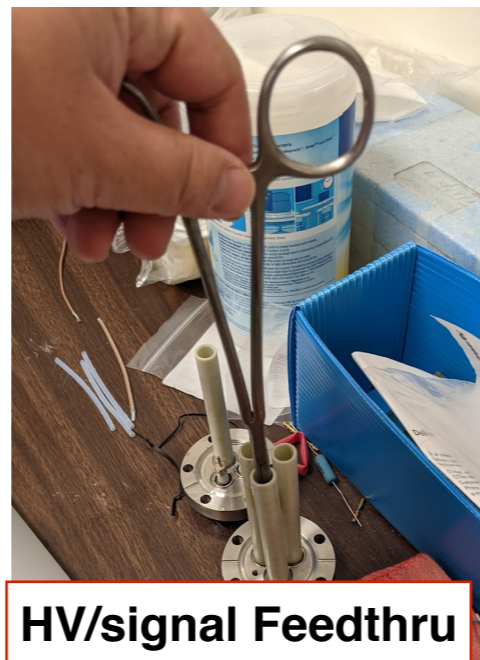
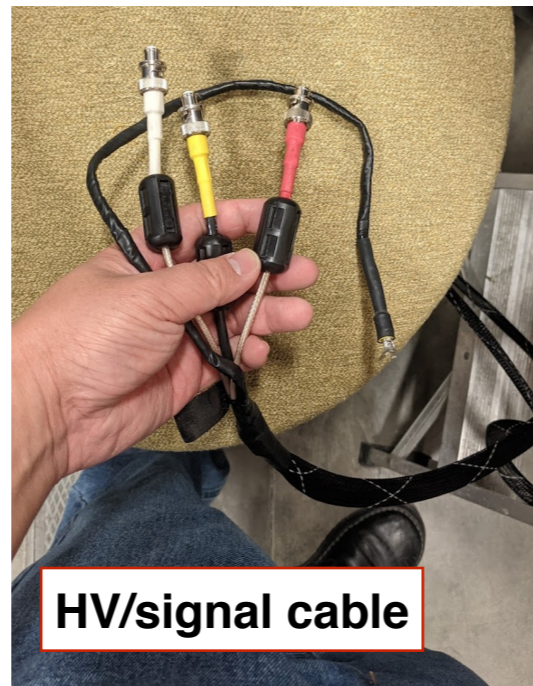
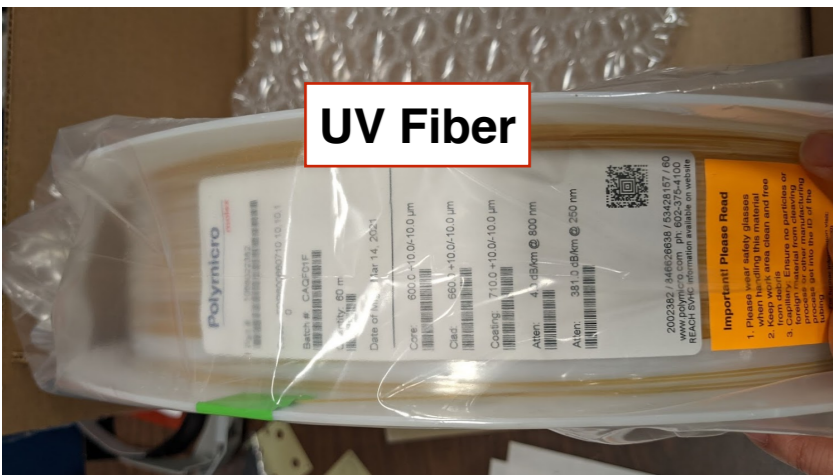
- ▶ **The test was conducted 11/30-12/03**
  - Learned the operation of the full PrM system
  - Went through the assembly and bench test procedures the PrM stack
  - Learned many useful trips on the installation
  - Conducted several rounds of measurements in Vac. and GAr with both light sources
  - Established the baseline measurement of our PrM and electronics box in Vac. and GAr
  - Help UCI constructed the activation system of the purification system
  - The testing plan was mostly complete
  - Documenting the procedures as a SOP to add into our ESR

# UCI Lab overview



# PrM test at UCI

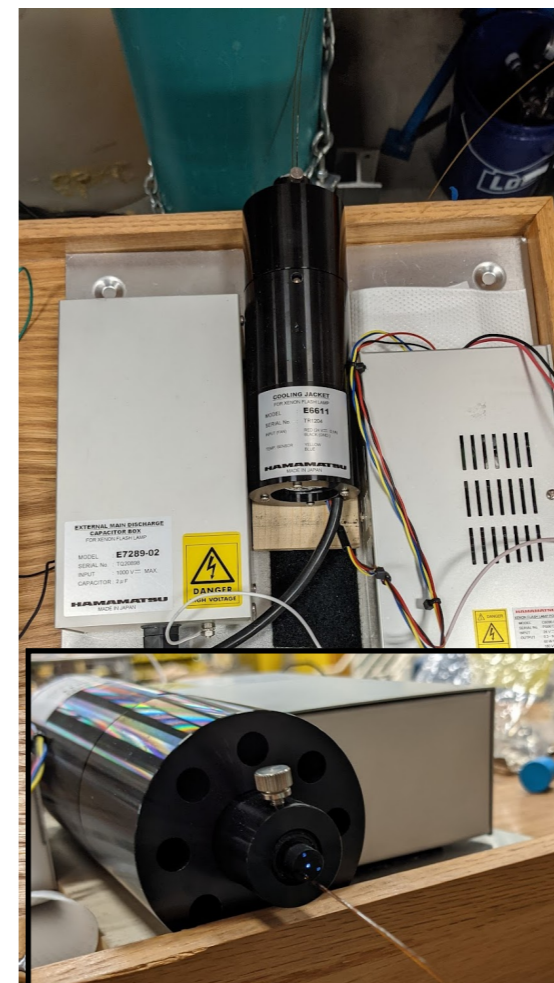
## ► Parts of PrM



# PrM test at UCI

## ► Light Sources

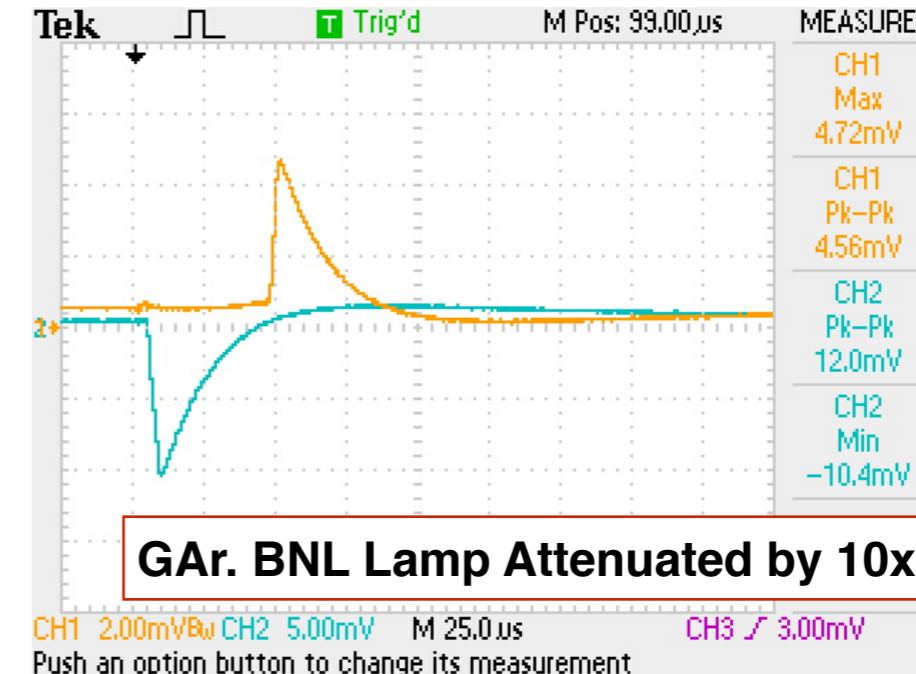
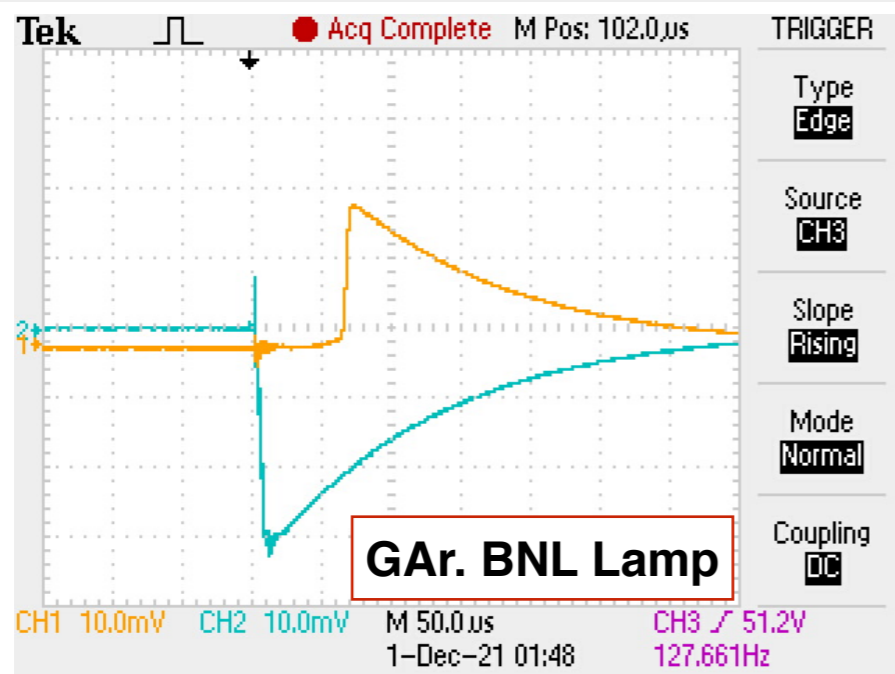
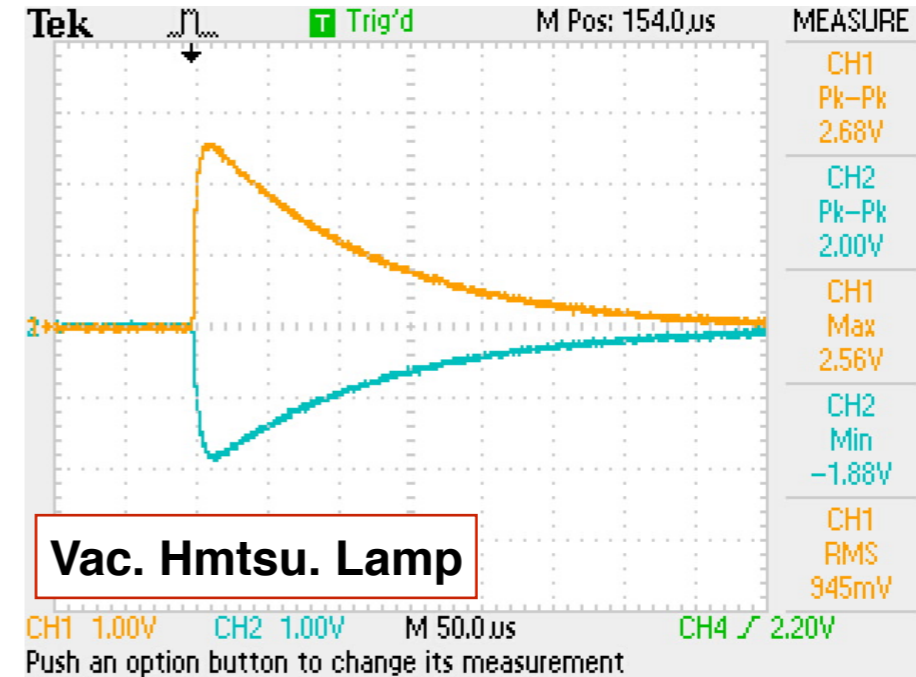
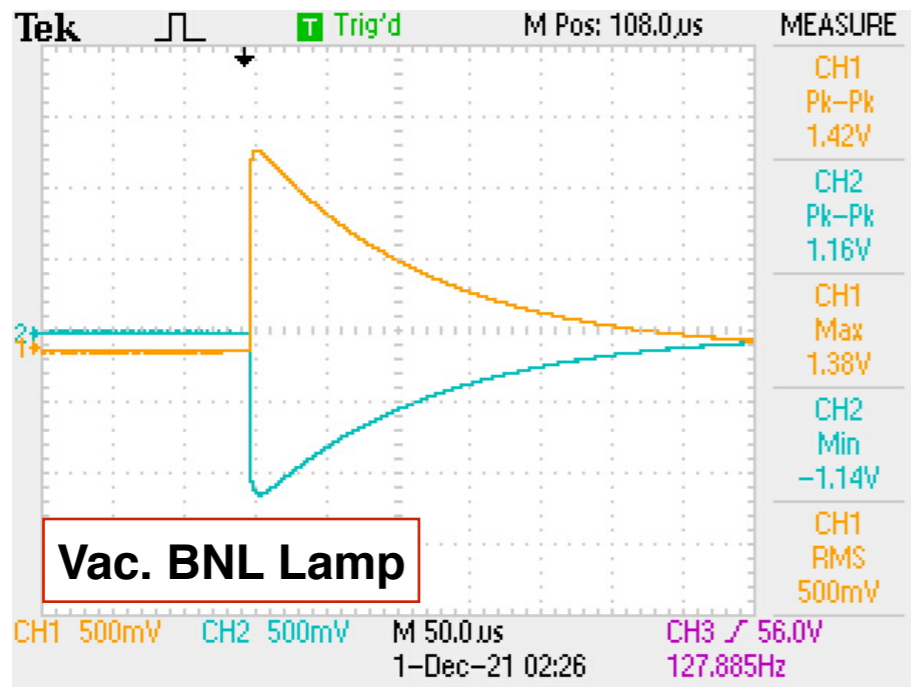
- Hamamatsu Xe Lamp and our Xe Lamp used in the test
- Hamamatsu lamp light intensity is extremely high that the fiber needs to be pulled out a bit to avoid saturation
- A rubber plug is used to adjust fiber positioning to achieve the maximum intensity
  - With adjustment, the signal amplitude can be comparable to Hamamatsu Xe Lamp



# PrM test at UCI

## ► Practice test at the beginning

- Starting with PrM in Vac and charged with GAr to 1 bar
- GAr signal still visible with 10x attenuation
- There is noise issue with our electronics that UCI box with lowest noise was used



# PrM test at UCI

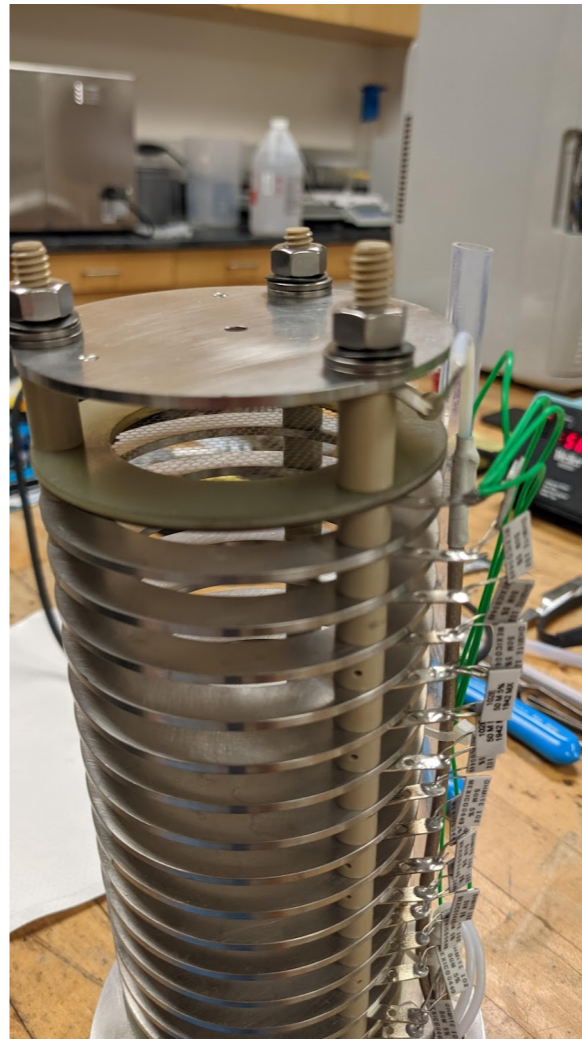
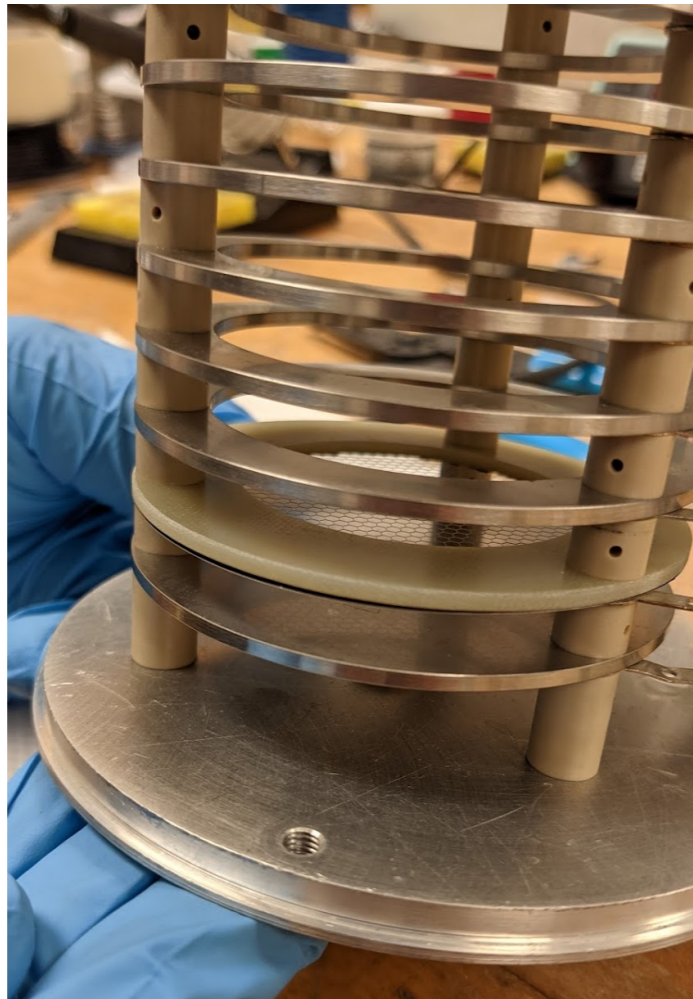
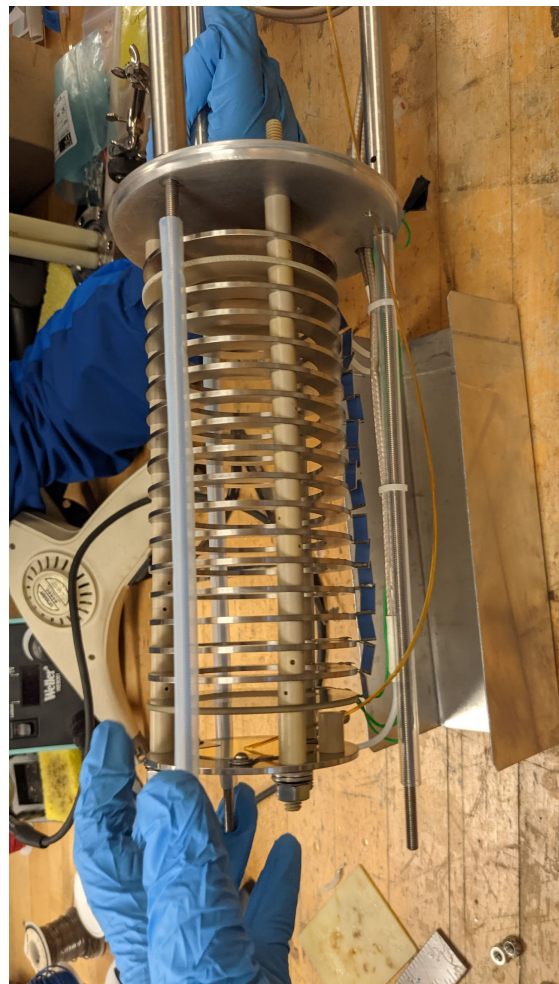
- ▶ **System opening for re-assembly**
  - The system was opened after initial test for re-assembly
  - The test chamber was found to be pretty dirty with oil on the surface that we thoroughly cleaned it up



# PrM test at UCI

## ► PrM Anode Grid Replacement

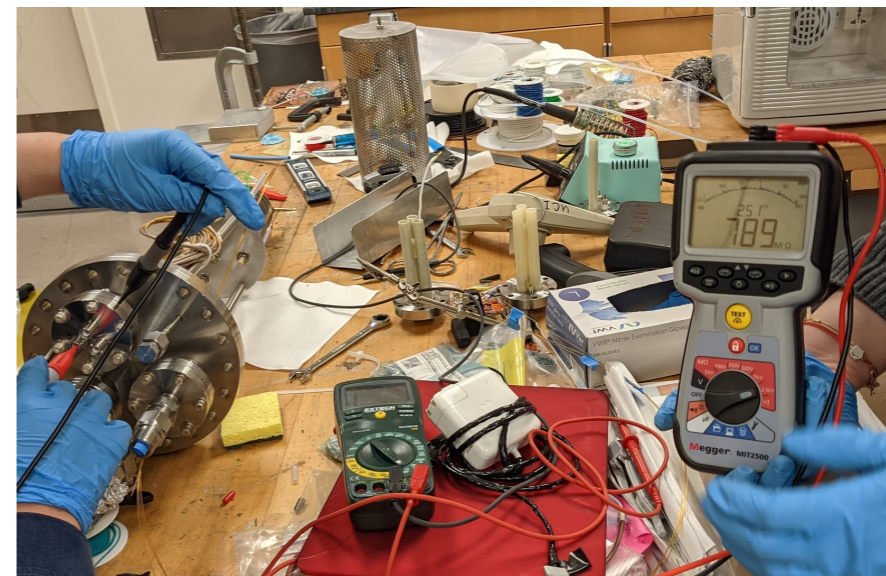
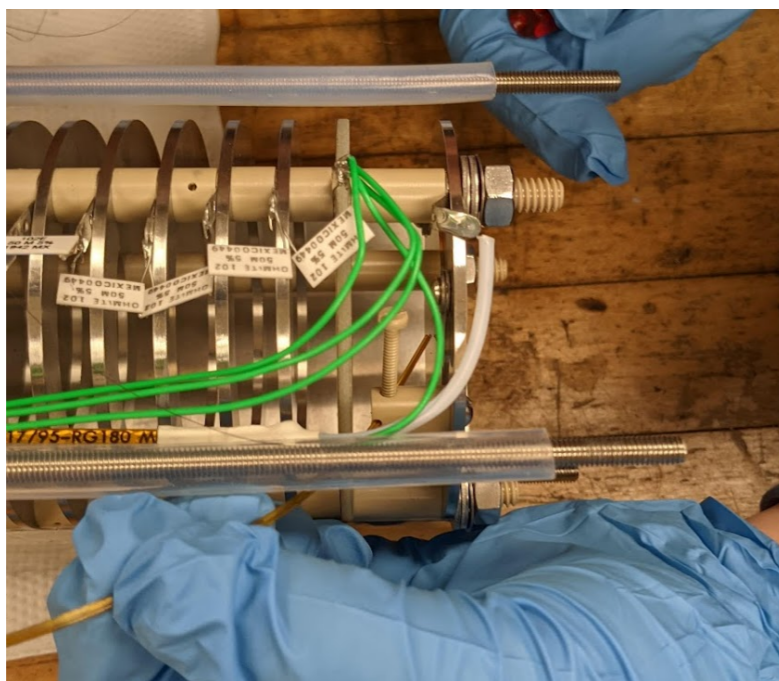
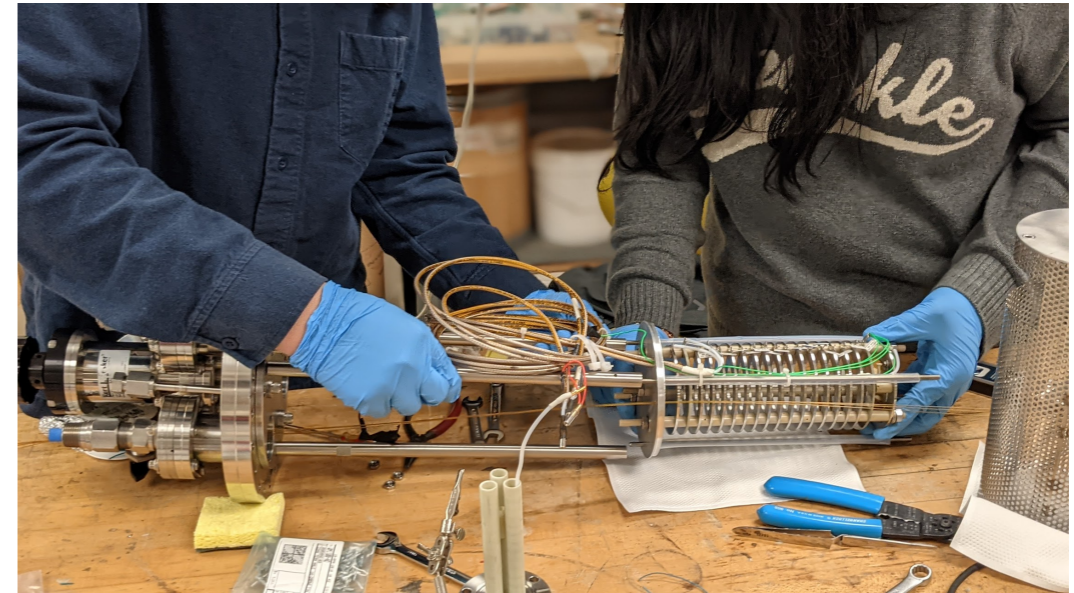
- The cathode grid was previously replaced due to broken wire
- The anode grid was replaced to the honeycomb grid this time
- All the cable and fiber connections need to be disconnected during the process



# PrM test at UCI

## ► PrM assembly

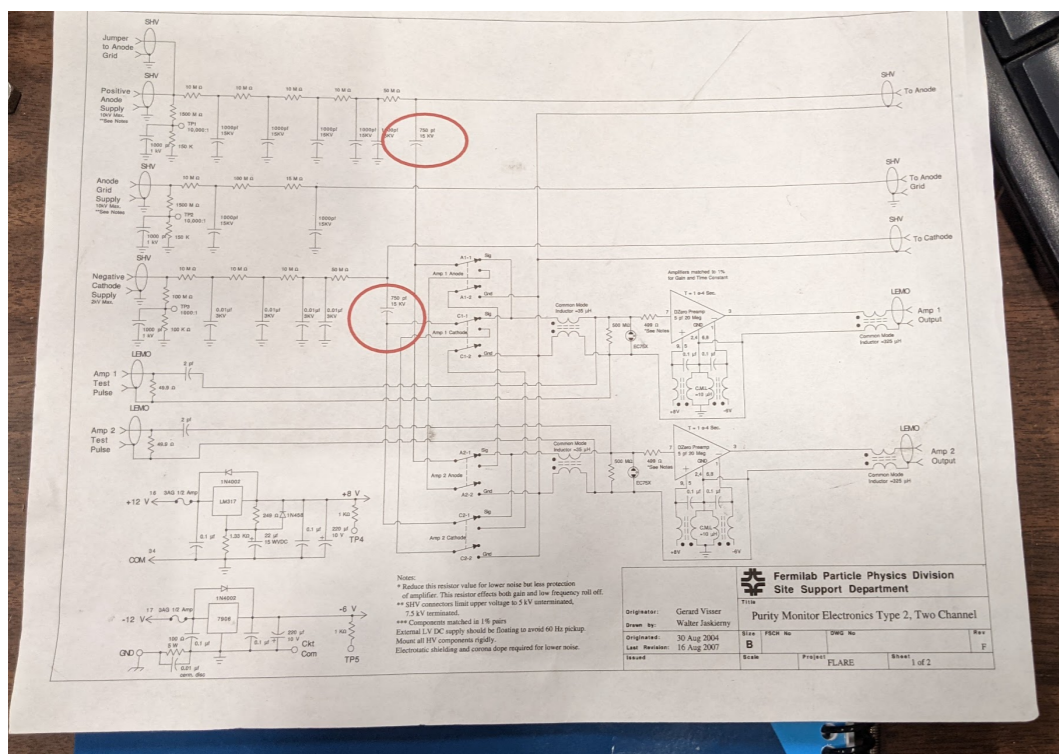
- The PrM stack was cleaned and assembled
- Went through the testing procedures to ensure the continuity of the connection
- Fiber positioning needs fine adjustment



# Electronics Box for PrM

## ► PrM Electronics Box

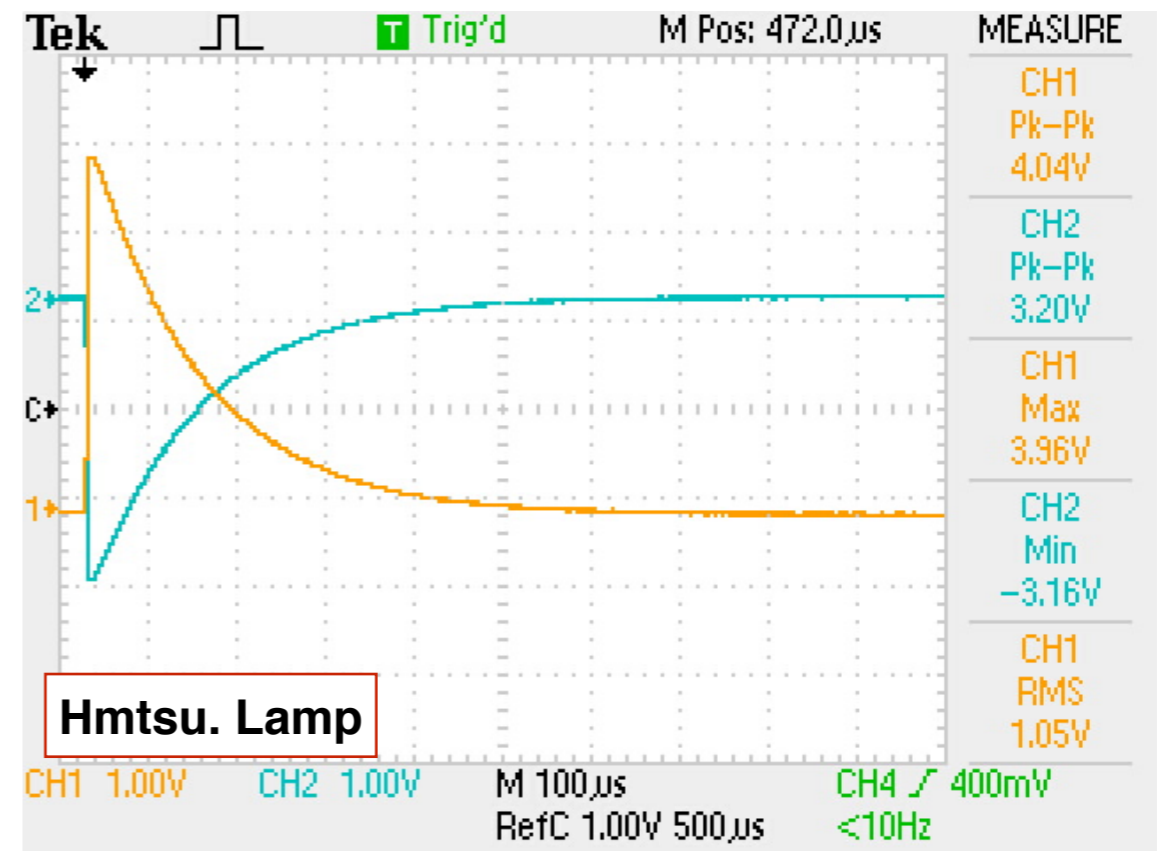
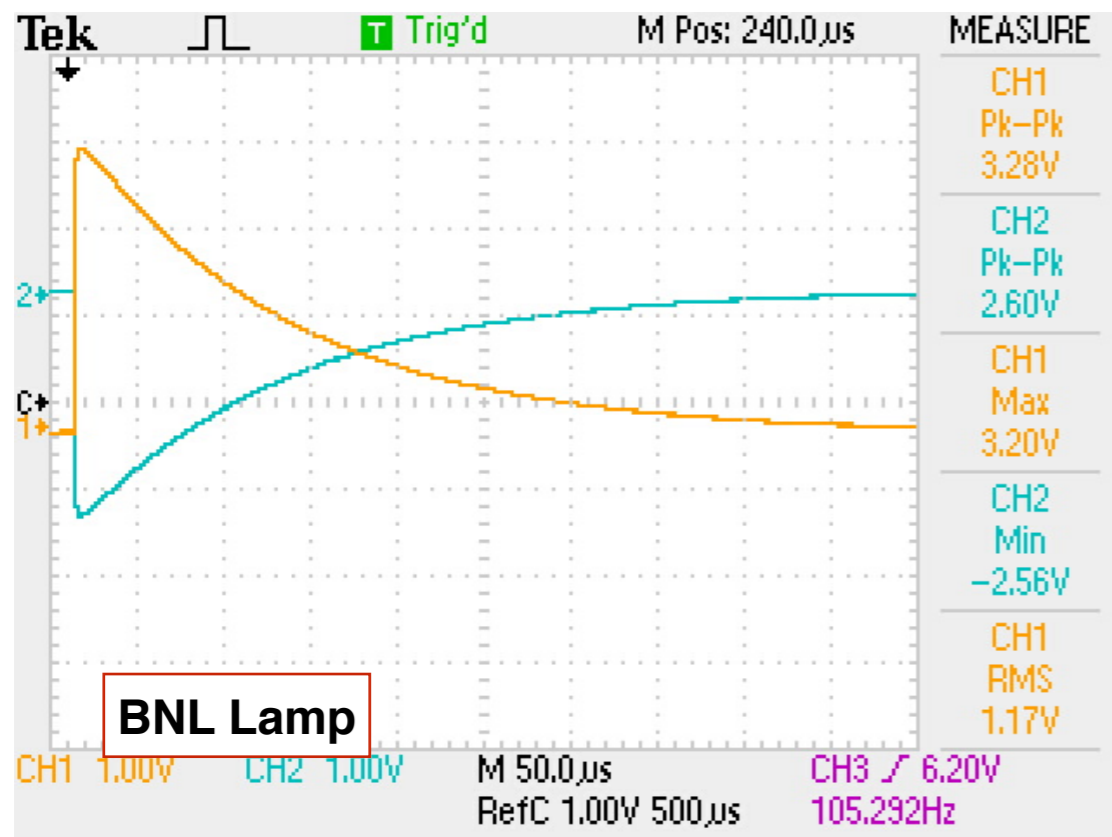
- There are multiple electronics in the lab following the Fermilab design
- Performance differs slightly in terms of noise and baseline stability
- We used one of the UCI's with the best performance
- The assembly work was assigned to single person
- Our box was built by one of Jianming's student
- There were noise and baseline jumping issues and finally fixed by tied down signal cables to the base copper plate
- Our box is similar to UCI's best electronics box now



# PrM test at UCI

## ► Baseline measurement Our PrM

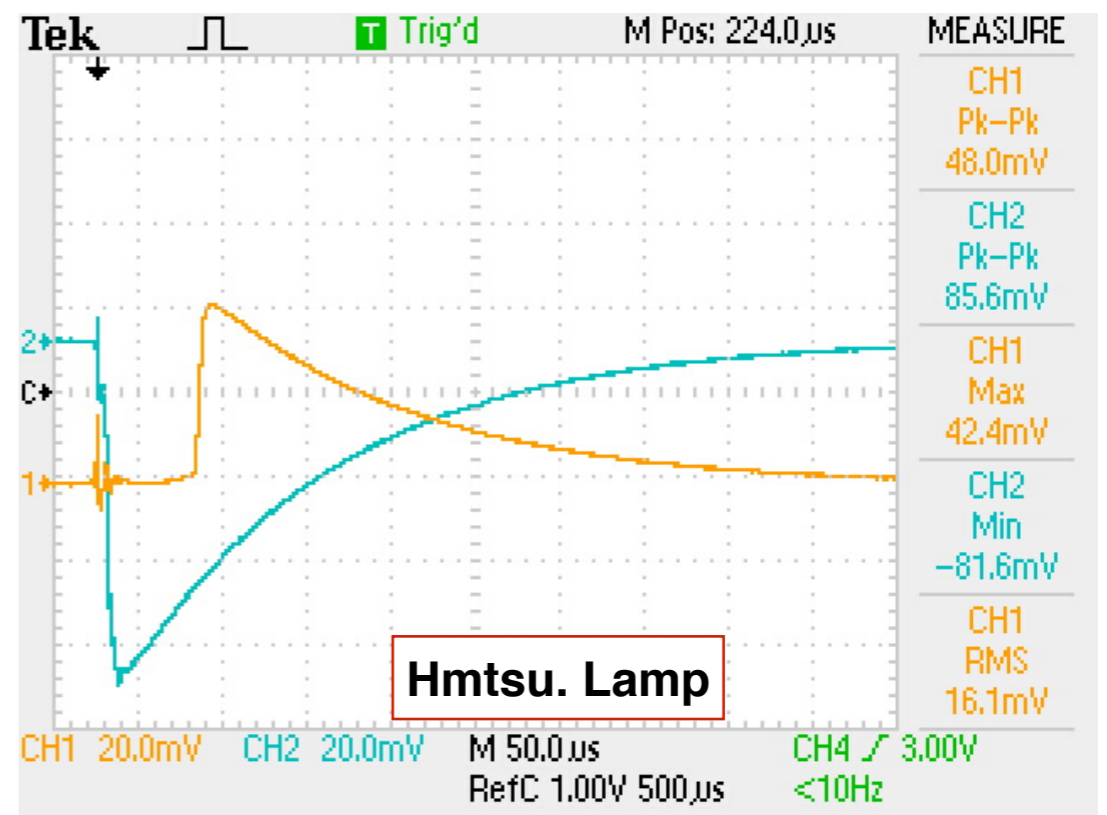
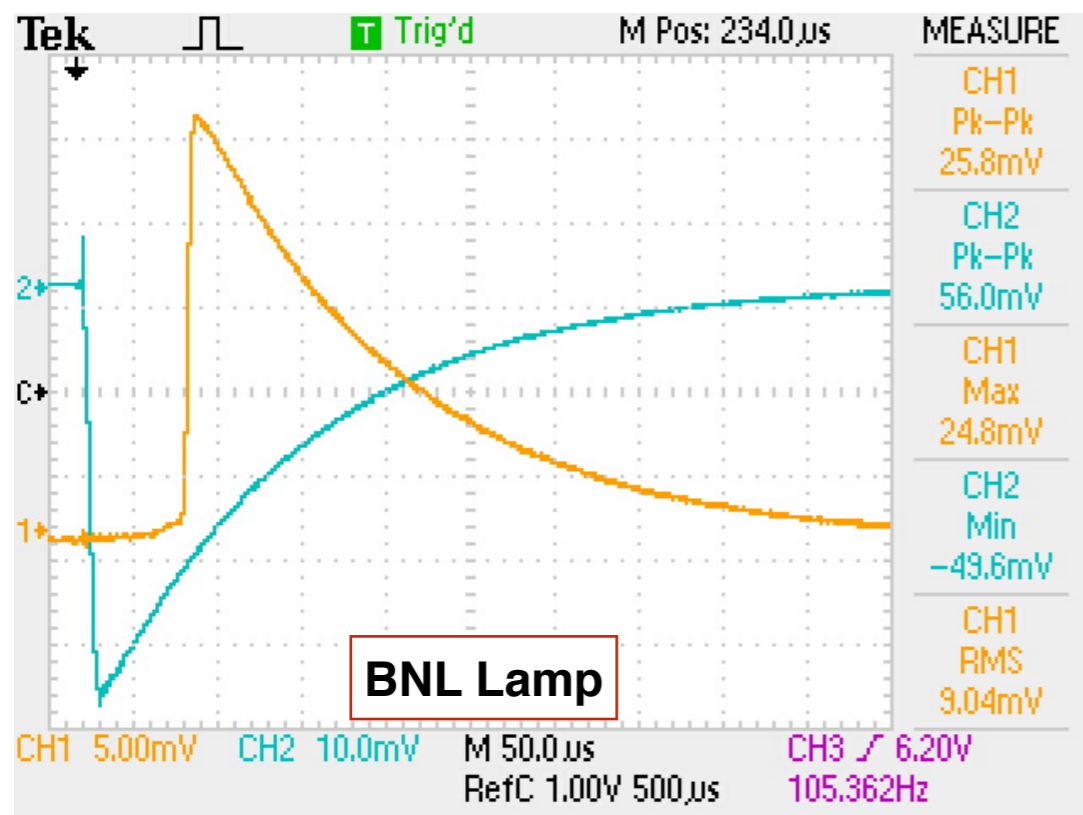
- Vac. with BNL box with different light sources
- Hmstsu. lamp adjusted to the same amplitude
- Our light source could be used in LAr measurement



# PrM test at UCI

## ► Baseline measurement Our PrM

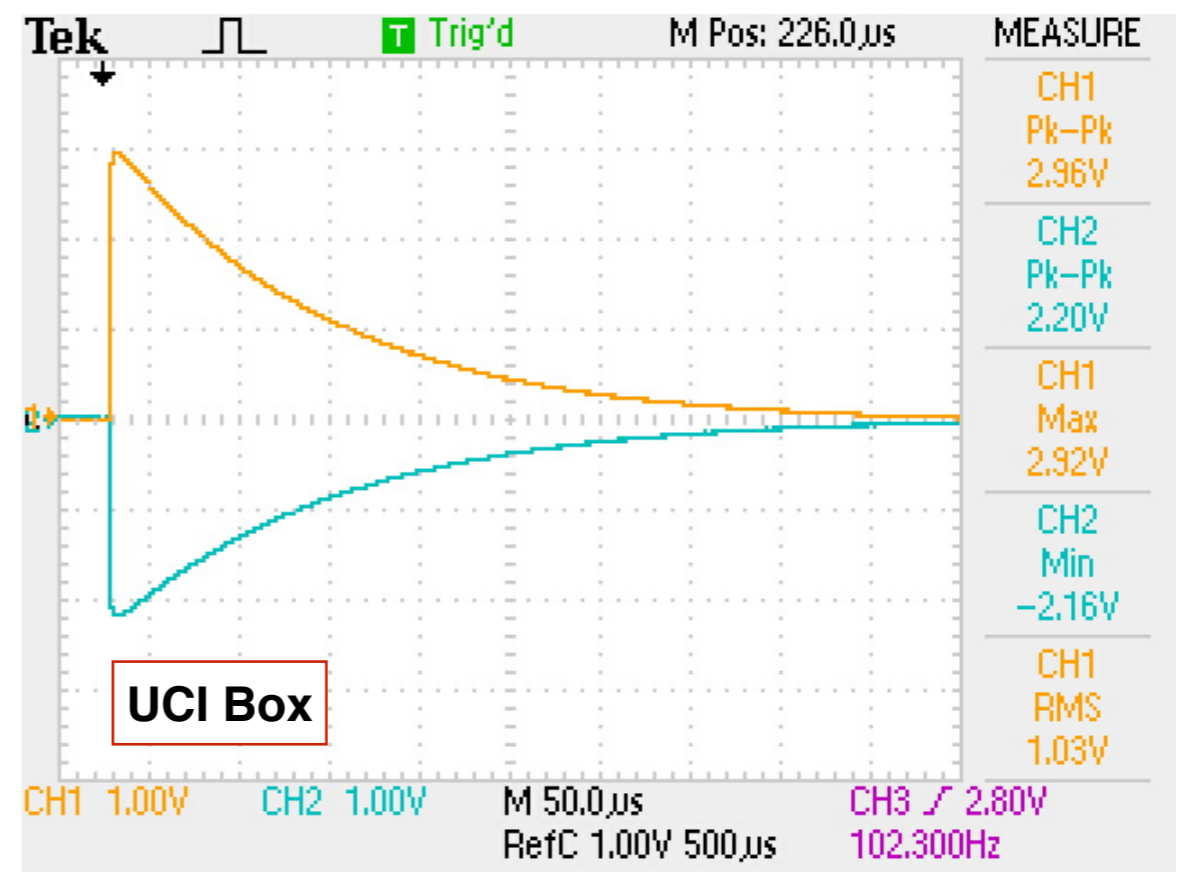
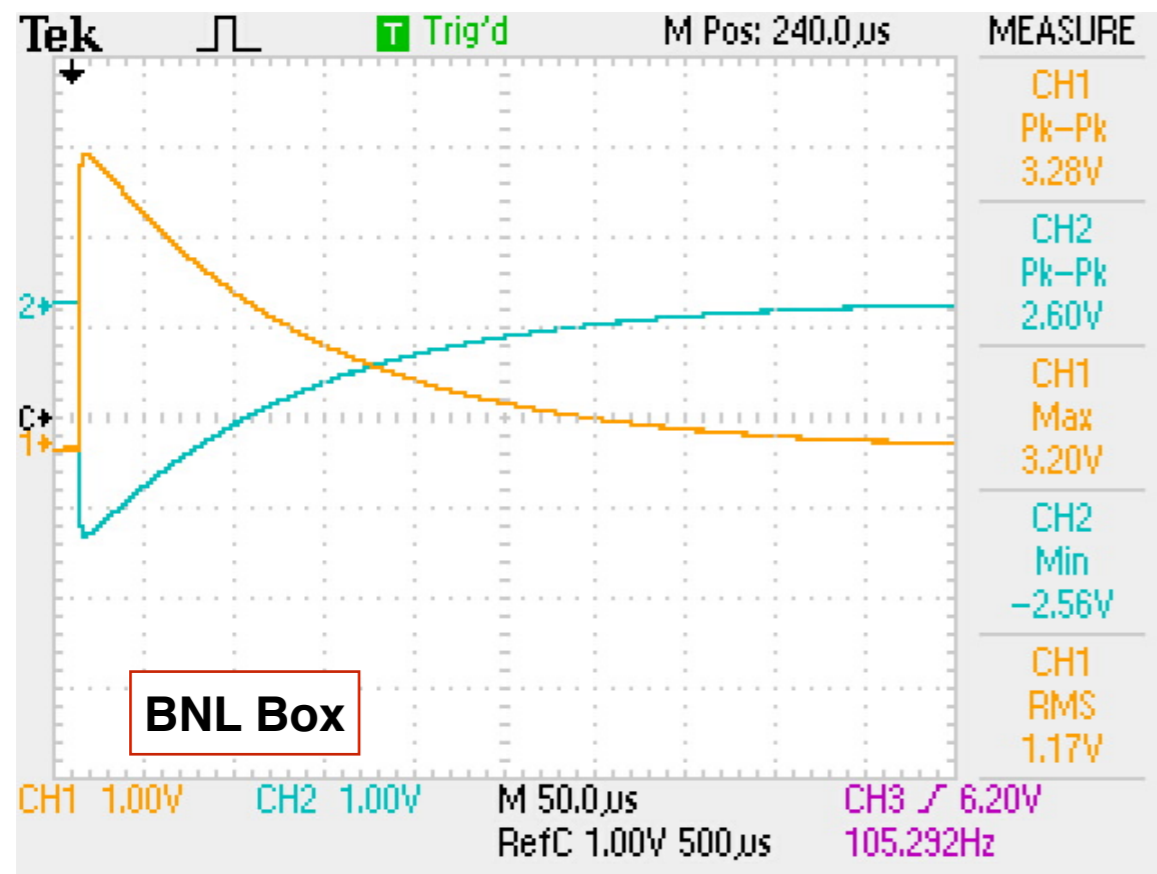
- GAr@1bar with BNL box with different light sources



# PrM test at UCI

## ► Baseline measurement Our PrM

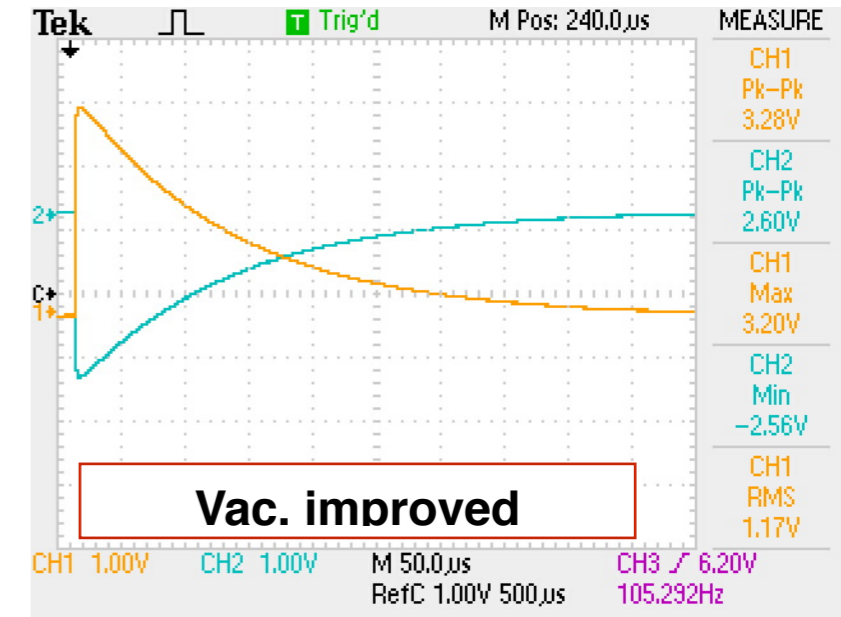
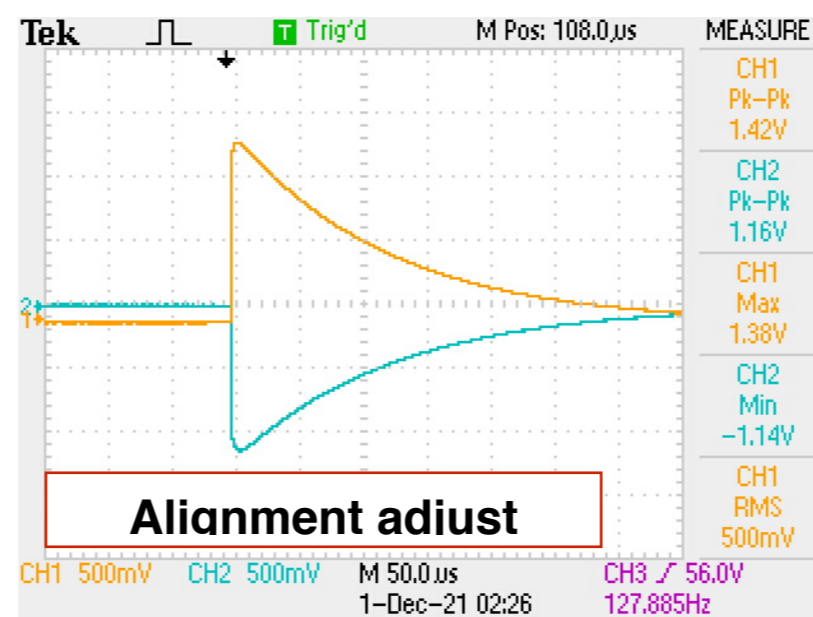
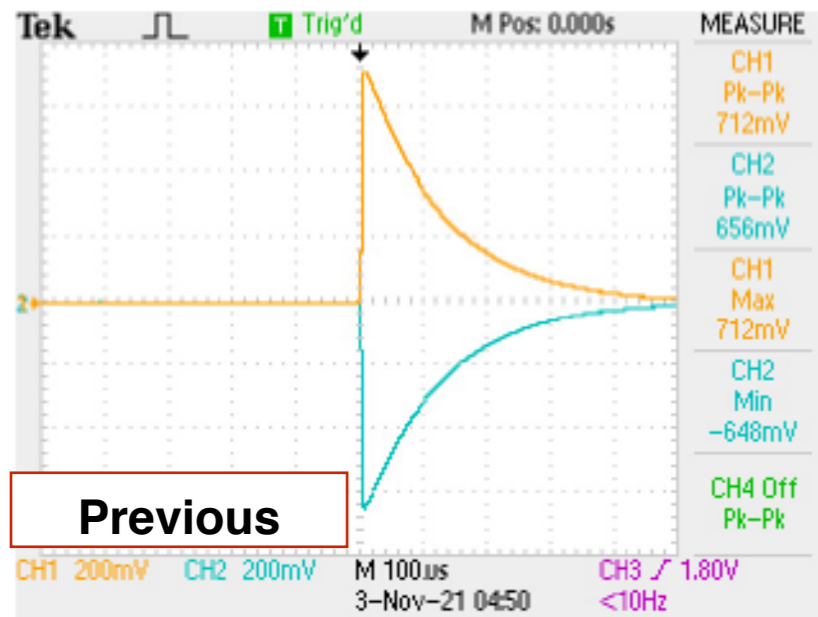
- BNL electronics box Vs. UCI electronics



# Light source comparison

## ► Signal improvement with BNL lamp

- The signal starting at  $\sim 180\text{mV}$  in Vac with old cathode
- After replacement of the cathode With improvement on the alignment and Vac. quality, signal amplitude increased by 1 order of magnitude in vacuum
- Our light source could be used in LAr



# UCI purification system

- ▶ **Construction of the controlling activation system**
  - It is for PrM test in LAr
  - The adapted the in design of our inline filter
  - I helped with installation and plumbing
  - Scrubber materials has not been filled yet

