

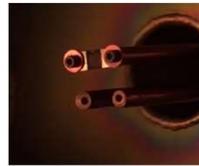
# Rapid Evaporation of Activated Material for Detector Testing

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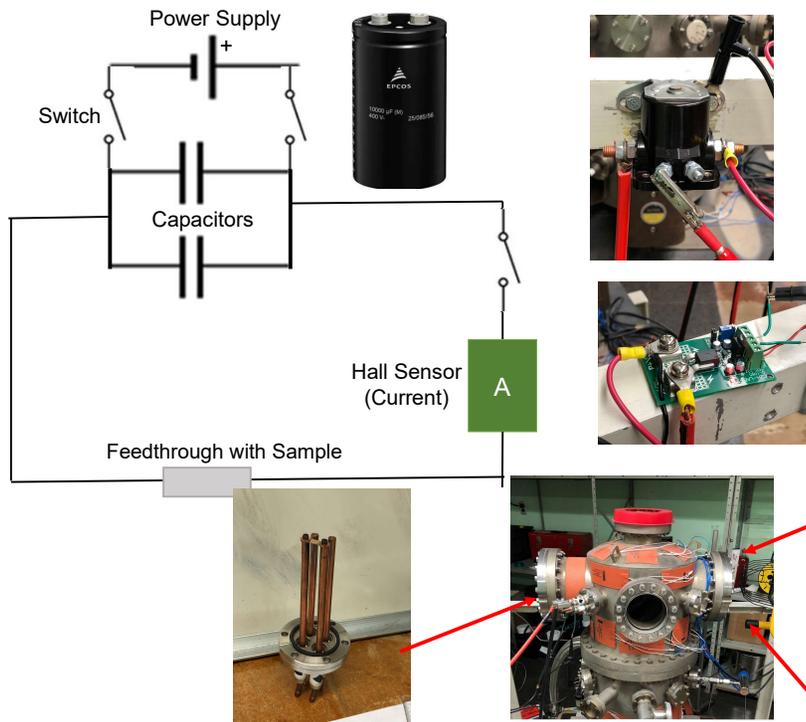
## ABSTRACT

We are designing a system for the testing of a detector of the product of a fusion reaction, where the product has a short half-life (roughly one second). Our system uses a vacuum chamber to isolate the rapid heating of a coated tungsten filament by passing a large current (up to 100 amperes) through the filament. This evaporates the coating into the detector that is being tested. I am working to improve this system, which was previously driven by a car battery. Capacitors have replaced the car battery, to allow for greater control of the energy delivered to the filament. A relay starts the discharge suddenly. By discharging the capacitors with various initial charges (and voltages) through the filament, we measure the temperature of the filament as a function of time with an infrared pyrometer. As another improvement, we will mount the electrical feedthrough on a new rotary flange for the vacuum chamber. During tests, the coating is made radioactive by an accelerator beam. Rotation will allow us to expose more than one filament during one experimental run. This reconfiguration will require the design of extension rods to position the filaments in front of the beam.

## RESULTS OF DATA TRIALS



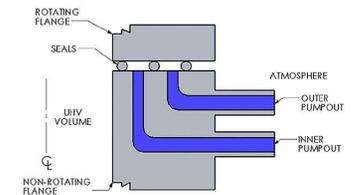
## EQUIPMENT PHOTO AND CIRCUIT SCHEMATIC



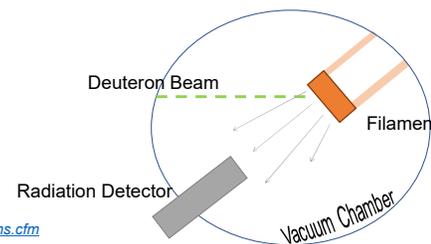
## ENABLING MULTIPLE FILAMENTS



Differentially pumped rotary feedthrough



Differentially pumped rotary feedthrough: Cross-Section



After the beam activates the film on the filament, the film is evaporated at the detector

- [1] high-speed camera used to record evaporation trials
- [2] digital pyrometer used to measure temperature
- [3] capacitors used as controlled high current power source
- [4] relay used to trigger the circuit
- [5] Hall sensor used to measure current
- [6] Geneseo Physics Vacuum Chamber trials were conducted in
- [7] feedthrough used in vacuum

Image sources  
[https://www.lesker.com/newweb/sample\\_manipulation/differentially-pumped-rotary-platforms.cfm](https://www.lesker.com/newweb/sample_manipulation/differentially-pumped-rotary-platforms.cfm)  
<https://www.mouser.com/ProductDetail/EPCOS-TDK/B43706A6109M600?qs=HBWAp0VN4RqV6WK3vuR7Aw%3D%3D>