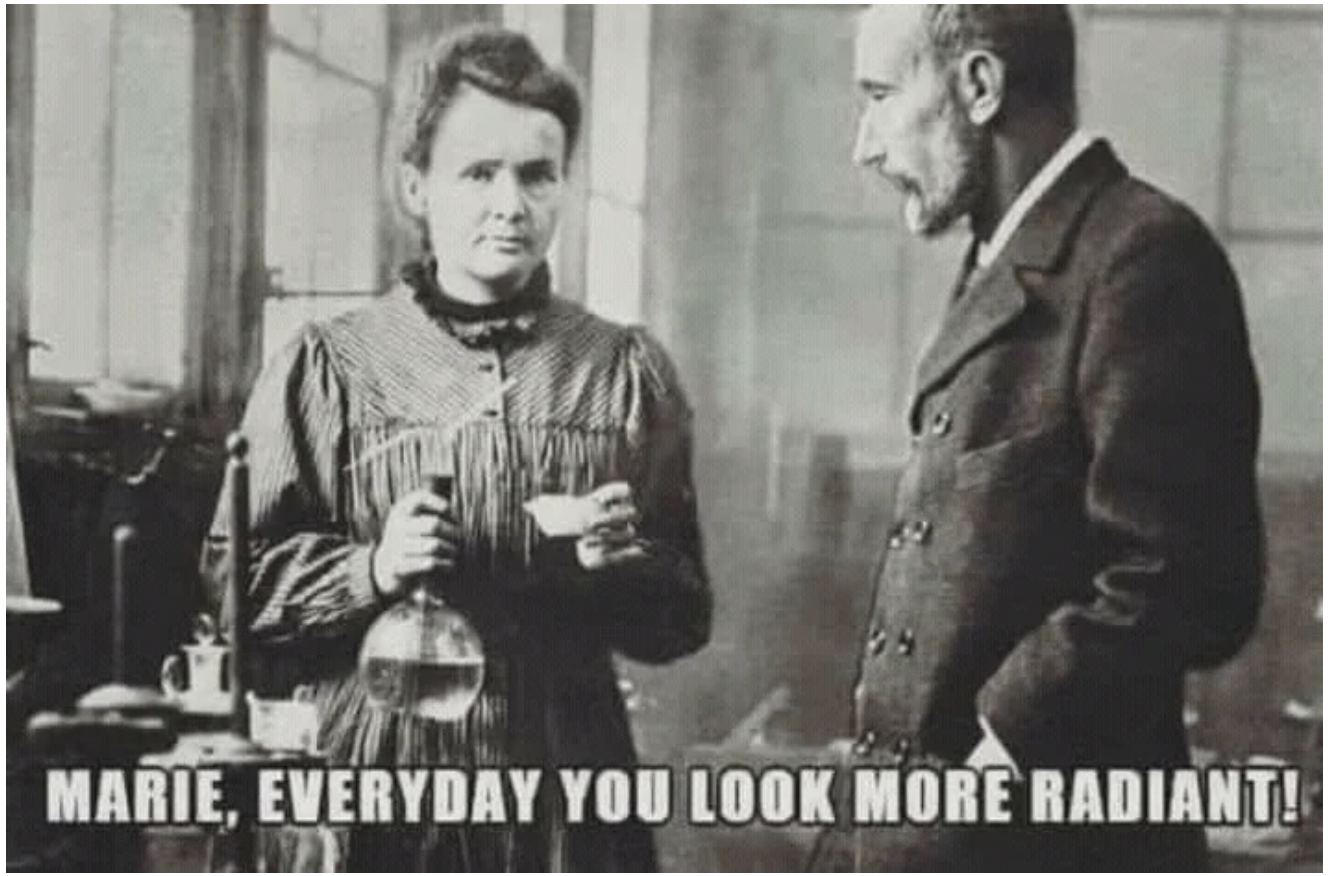
Radiation Hardness Tests

Greg Kalicy

CUA

June 4th, 2026

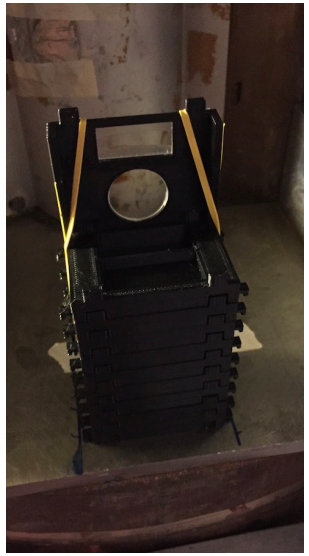


Previous Gamma Irradiation

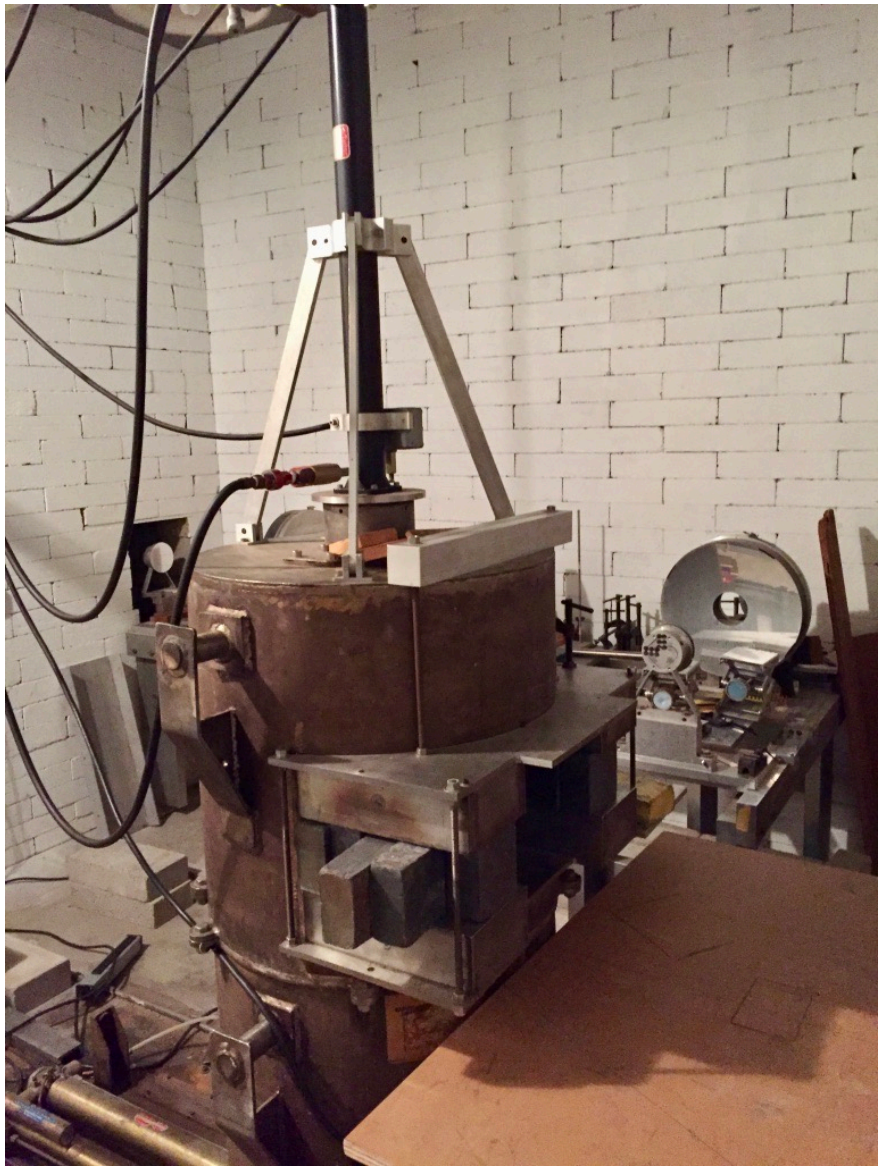
^{60}Co irradiation setup at BNL

- Radiation damage quantified by measuring the transmission in the 190-800 nm range in a Spectrohometer.
- Five materials studied.
- Sapphire and PbF_2 confirmed to be radiation hard.

Tested samples



Co^{60} Chamber



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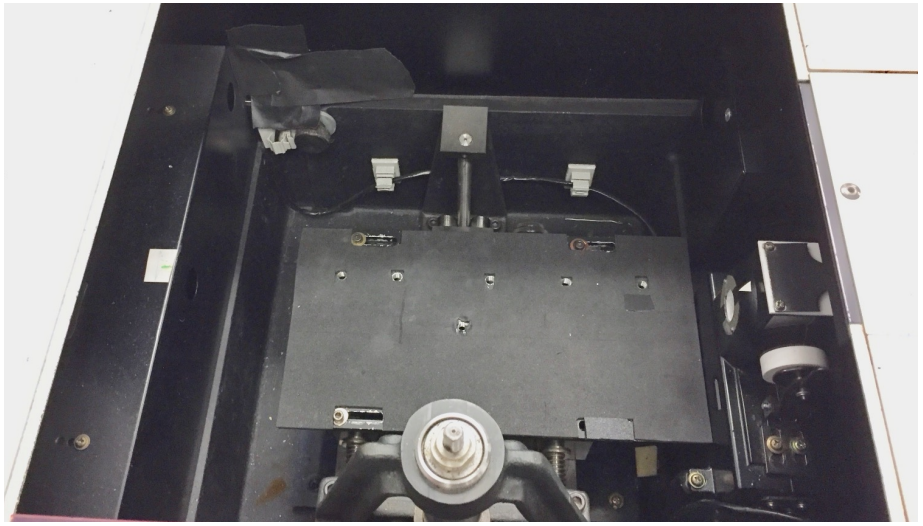

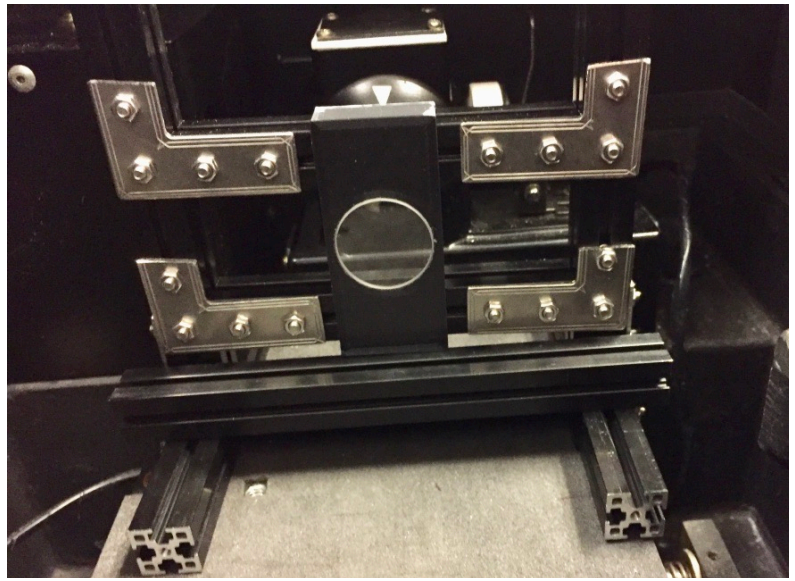

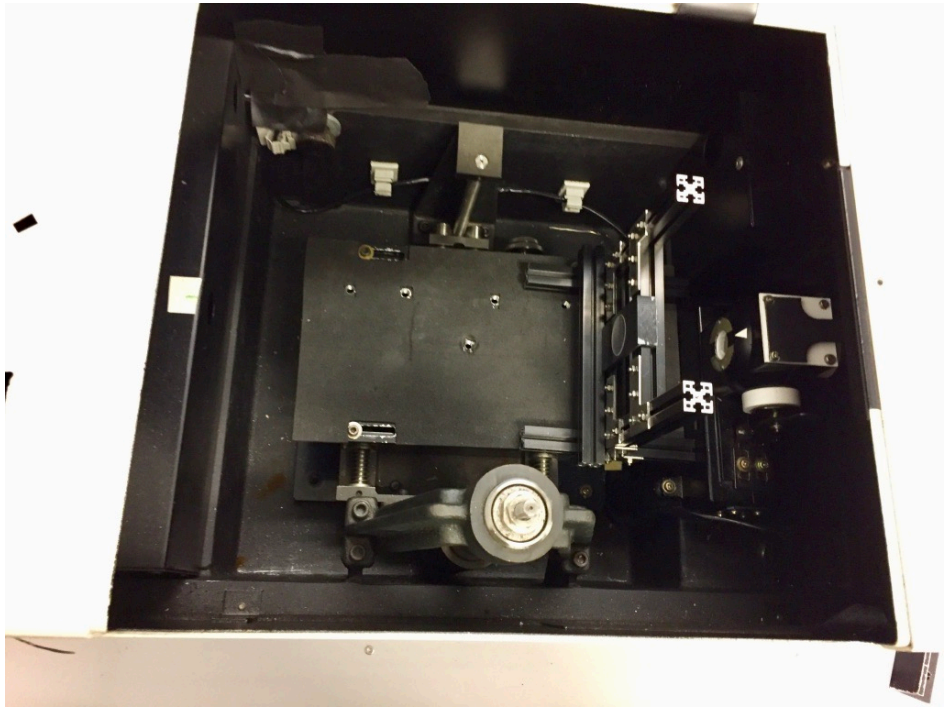

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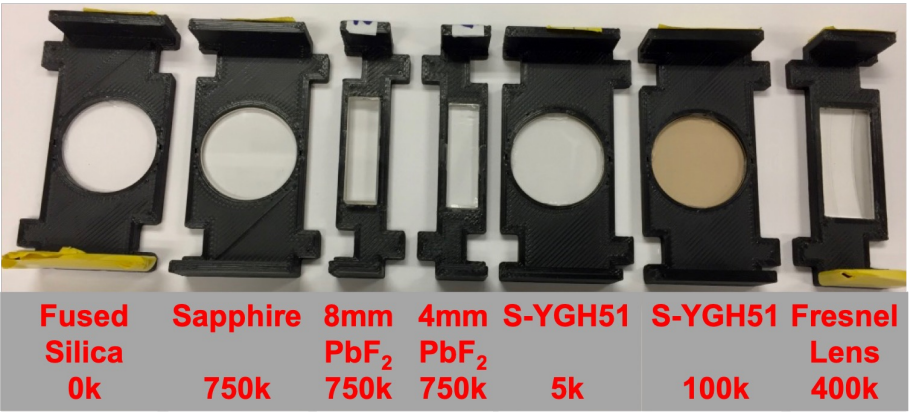
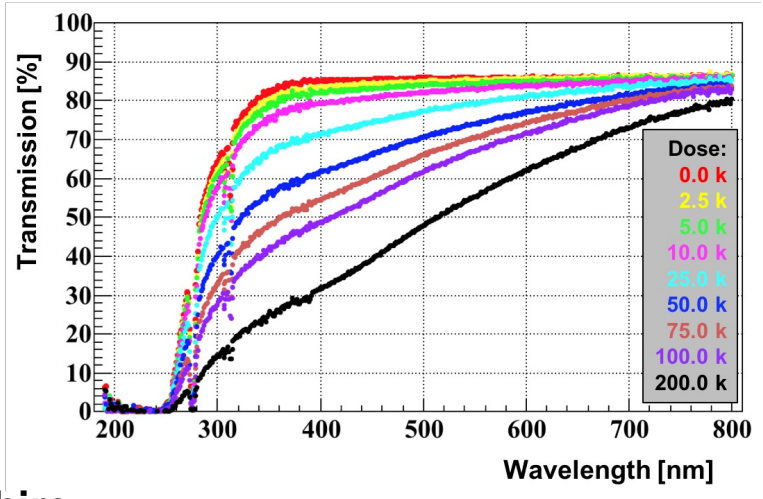
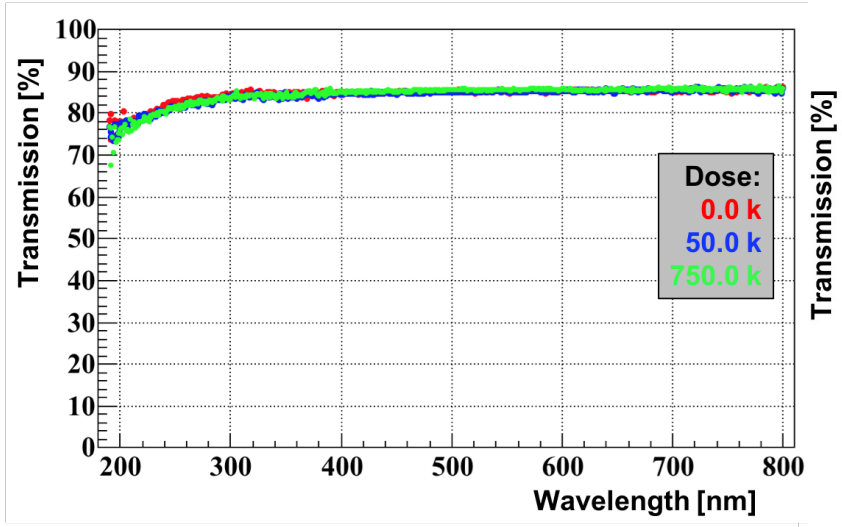


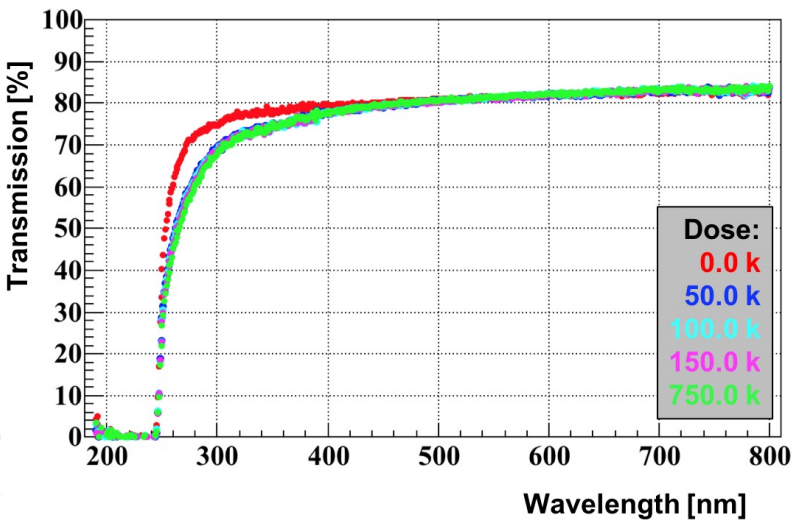
S-YGH51 (NLaK33 equivalent)



Sapphire



PbF_2



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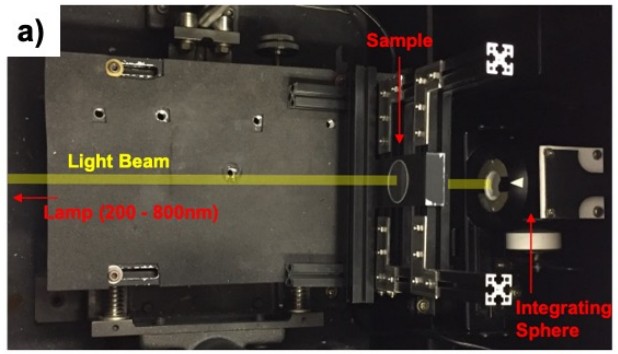

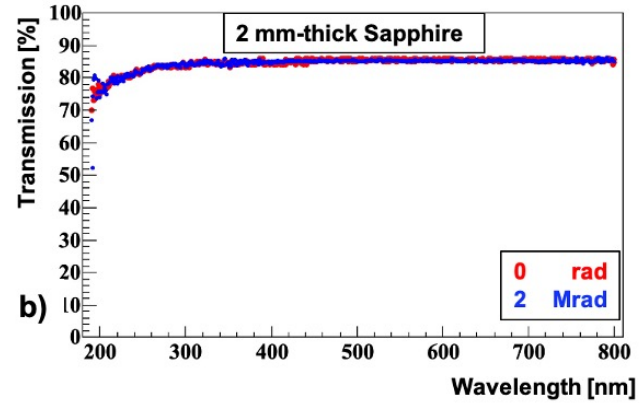

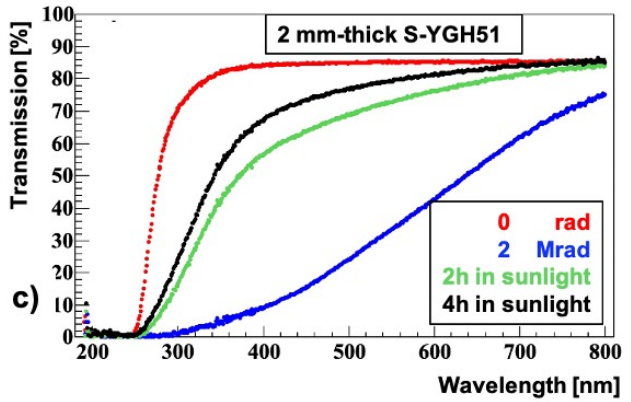

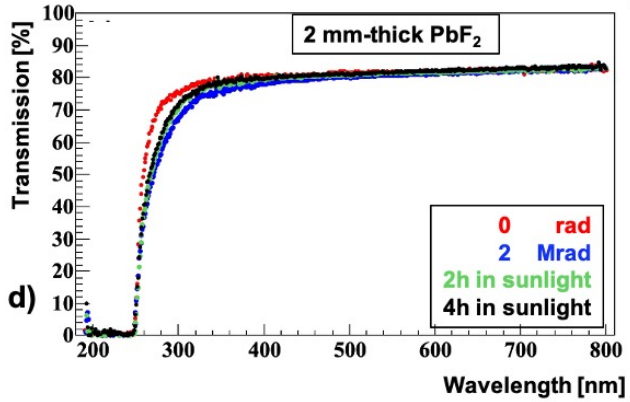

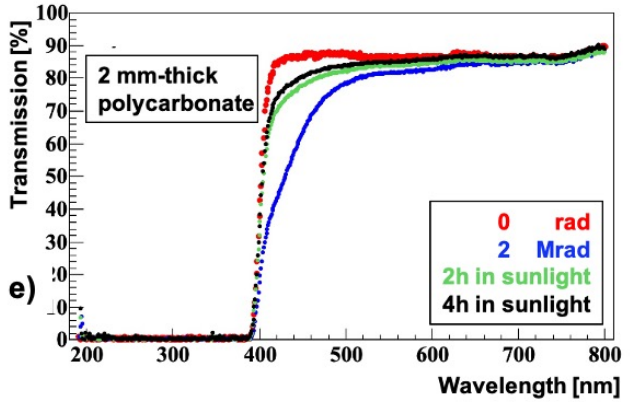

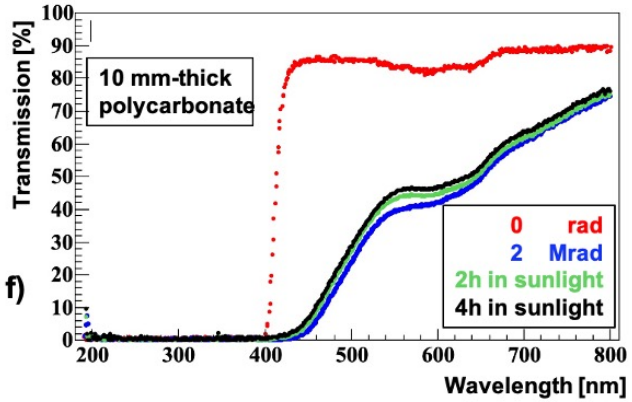

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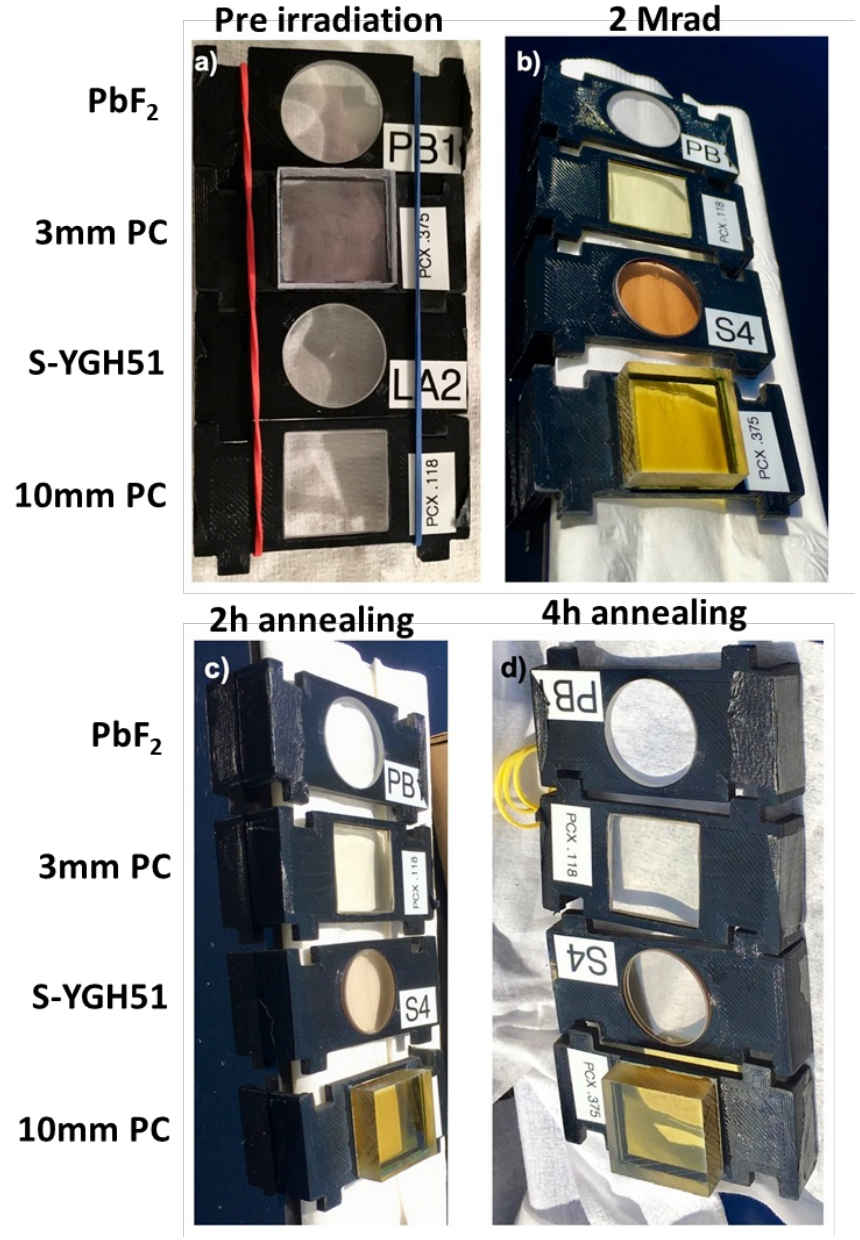
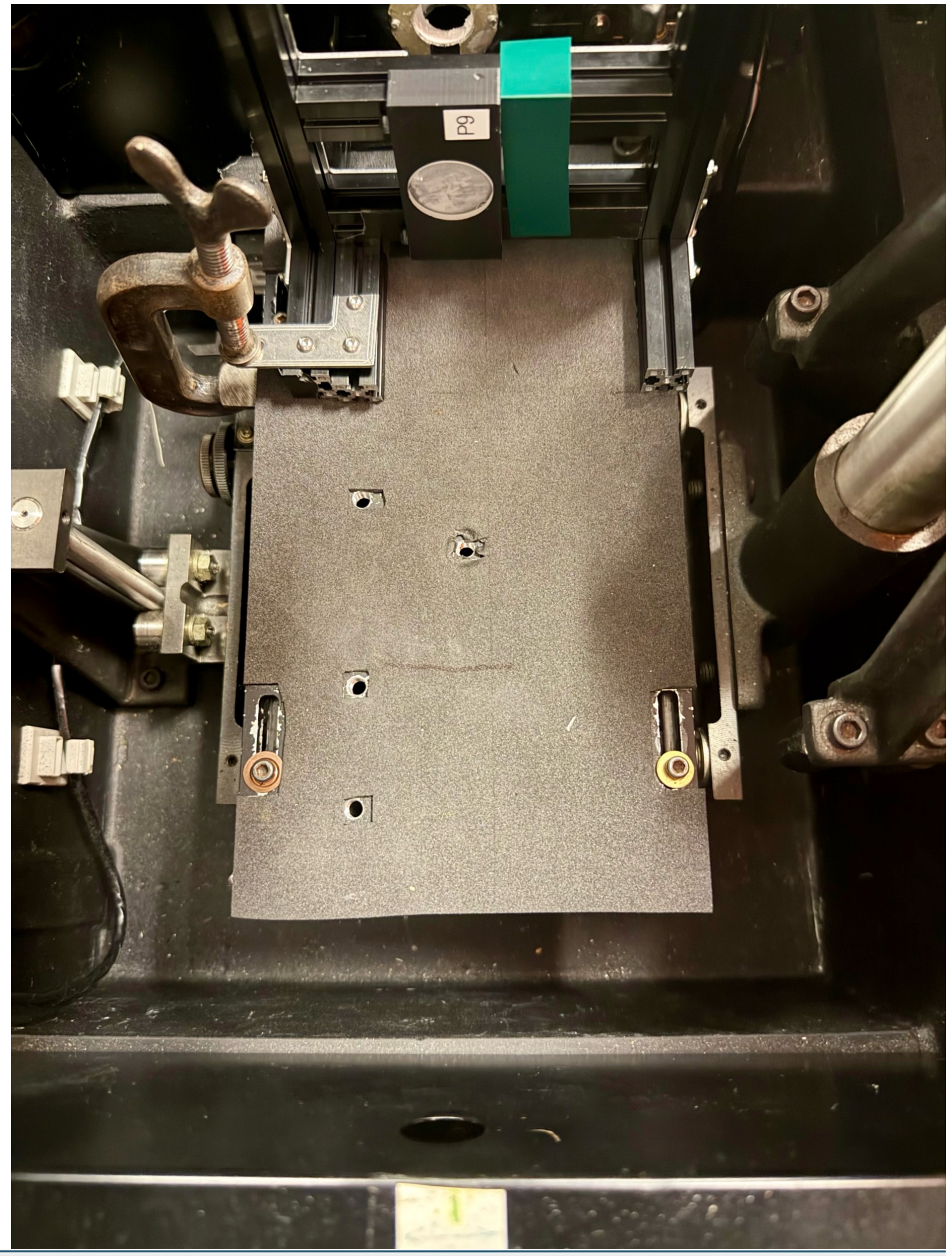


2026 Neutron Irradiation

- 12 Samples characterized in Spectrohometer
  - 3 x Synthetic Fused Silica (F)
  - 3 x Sapphire (S)
  - 3 x Lead Fluoride (P)
  - 3 x Crown Glass (N)
- 8 Samples exposed in the neutron source to 1×10^{9} n/cm^2.
- Four samples are removed, and the remaining four are further exposed to reach 1×10^{10} n/cm^2.
- Completed on May 6 2026: No visual impact on samples
- In late June/early July all eight irradiated samples, along with four control samples, will be exposed to gamma irradiation in several steps up to ~2 Mrad.



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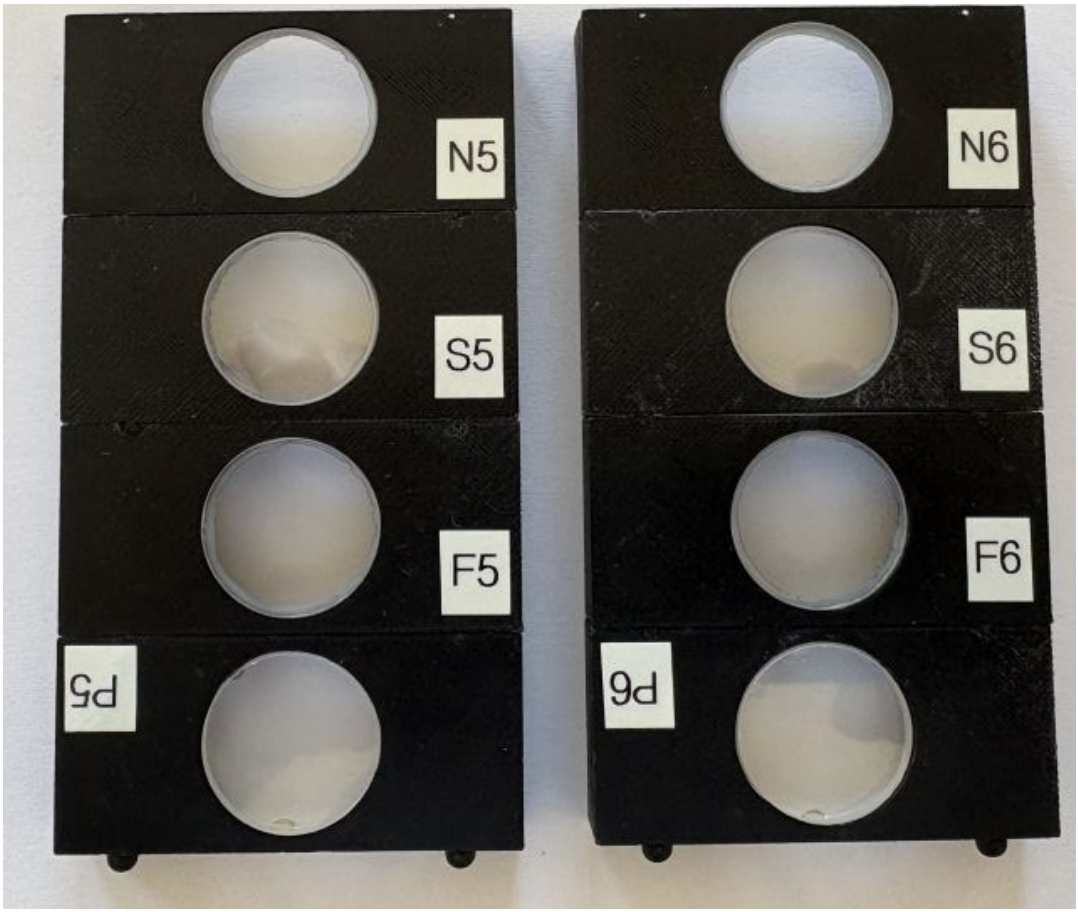

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Samples after neutron irradiation:

3.8h -> 1×10^{9} n/cm² *38h-> 1×10^{10} n/cm²*