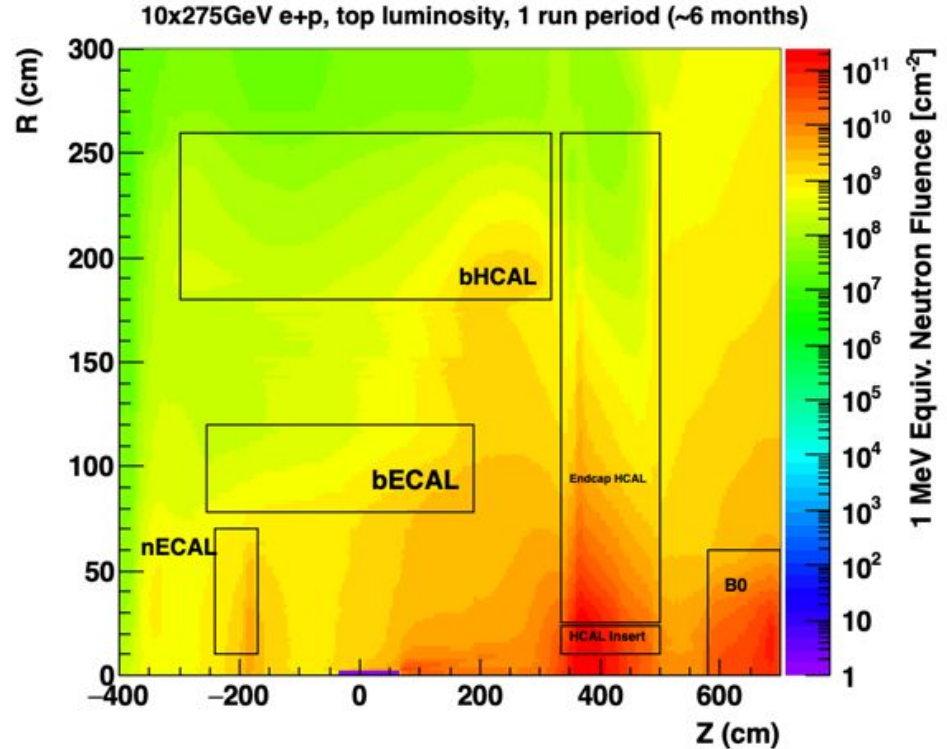


Radiation studies

Highest fluence is $\sim 1E12$ neutron equivalent near beampipe.

We want to test to have hard data for S/N ratio for calorimetry applications, and ultimately include the induced noise in simulations





Rad damage comparison

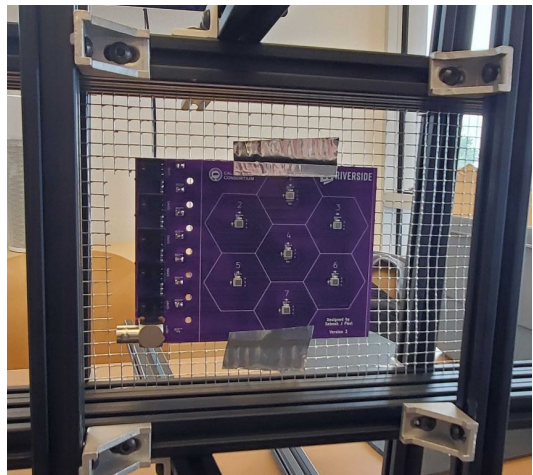


<p>Up to 5×10^{13} 1 MeV neutrons / cm² over lifetime of experiment (TDR)</p>	<p>Up to 1×10^{12} 1 MeV neutrons / cm² Per year at top luminosity.</p>
<p>Operating temperature: -30C (TDR)</p>	<p>Operating temperature: room temperature (Dark current at RT at 2V is ~30 higher than at -30C)</p>

max neutron fluence in 1 year of EIC is similar to the maximum tolerable in CMS HGCA design over lifetime

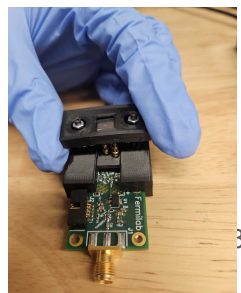
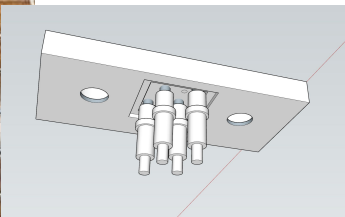
<p>SiPM used: 1.3 mm and 2 mm, 15 microns</p>	<p>SiPM used: 1.3 mm (or 3 mm?), 15 microns</p>
<p>Dedicated irradiation campaign and beamtest 2022-2023</p>	<p>Dedicated irradiation campaign : February 2024 @ UC Davis</p>
<p>Signal-to-noise ratio: S/N > 10 for 1 MIP (as per TDR) S/N ~2.5 for 1 MIP at highest dose (as per latest public result)</p>	<p>Signal-to-noise ratio: S/N > 5 at 1 MIP to be able to keep a 0.5 MIP threshold with 2.5 sigma suppression of noise</p>
<p>Mitigation measures (for higher dose region) - Larger SiPM (2 mm instead of 1.3 mm) - Casted scintillator, not injected molded scintillator - ...</p>	<p>Mitigation measures (for higher dose region): - Large SiPM 3 mm, casted scintillator - Insert: SiPM in high Design to keep SiPM accessible for annealing after each run.</p>

**Old plan: at Berkeley Lab during summer (cancelled due to 88" downtime).
New Plan: UC Davis cyclotron in Feb 2024.**



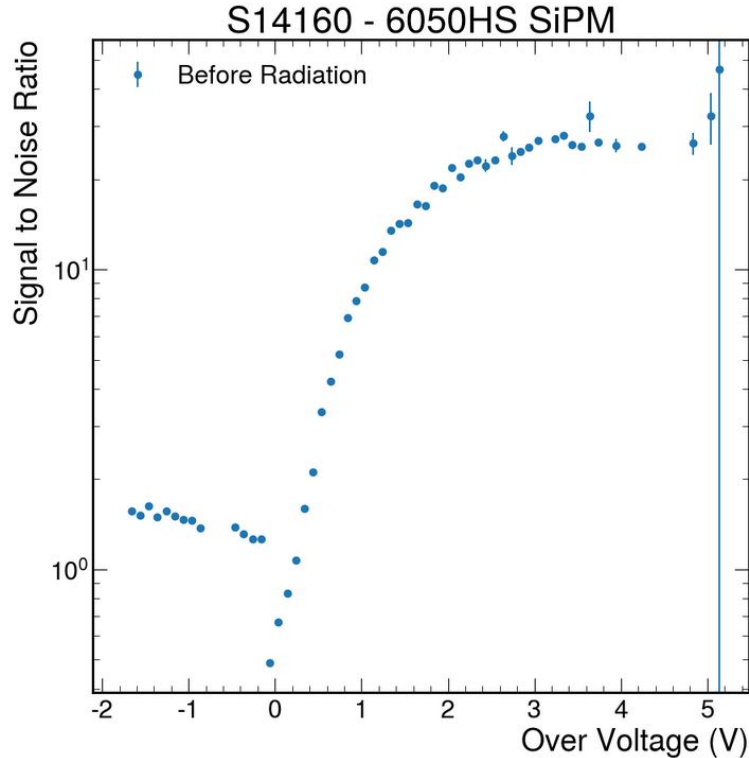
**Our
SiPM
mount**

We will irradiate bare SiPMs and some SiPM in boards (could be tested with HGROC boards)



Planned tests

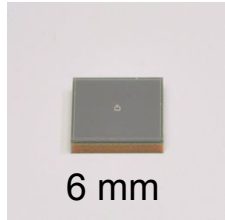
Usual ones (IV, dark rate) but but one is S/R @ MIP vs V before and after annealing



Plans

- February 2024 at [UC Davis cyclotron 60 MeV proton beam](#).
B. Schmookler is organizing test and has established contact with UC Davis, we are in the process of scheduling and finding the money (~6k for a day)
- Plan to measure 6 different fluences from (1E8 to 1E13) in few hours.
- Will characterize SiPM before and after irradiation, and after annealing, with tests mimicking realistic calorimetry applications
- Tests will likely be useful reference for various EIC forward applications

Plan to test:



S14160-3015

S14160-1315

S14160-6050

S14160-6015 (we were sent some of these by project)