Upgrading the BACoN liquid argon cryogenic system to study light

by

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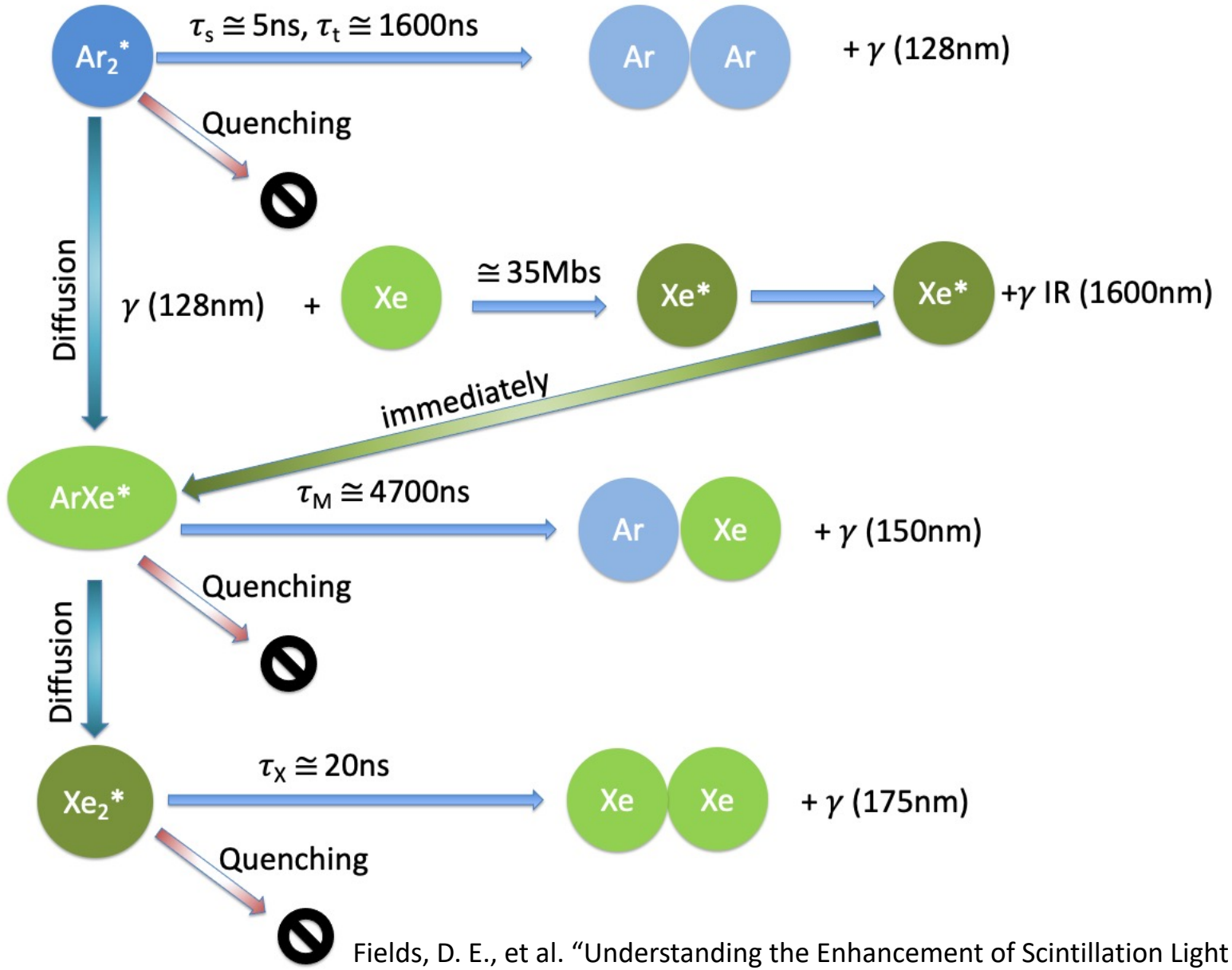
LAr scintillation and Xenon Doping Mechanism

Ionizing particle passes through LAr volume, it creates Ar^+ ion or excites Ar^* atoms and form argon excimers.

S,T, M, and X states have collision quenching process which contributes to the light loss. 1/(7.7μs)

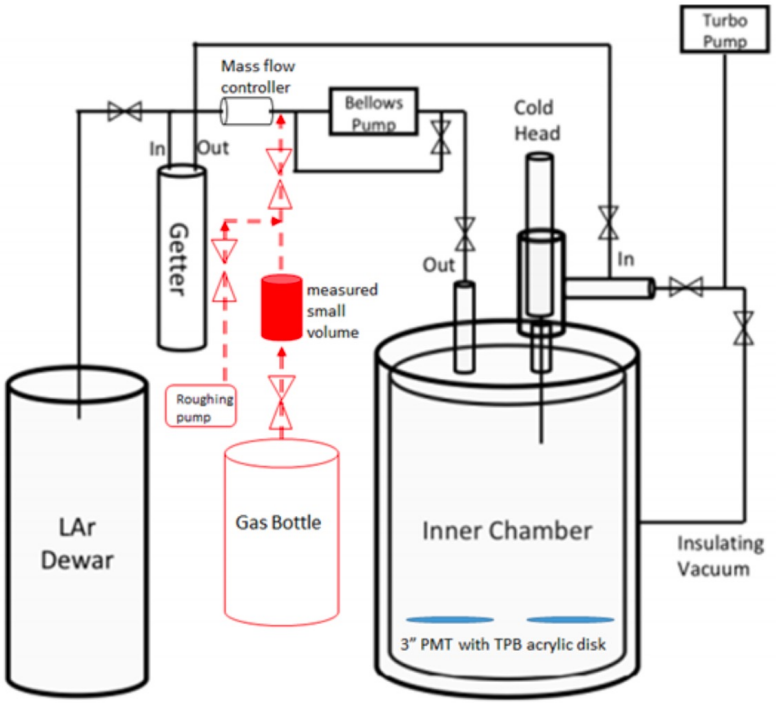
τ_M, τ_x are inversely proportional to xenon concentration

K_q = collision de-excitation factors due to quenching
k_x = a xenon dopant diffusion reaction rate.

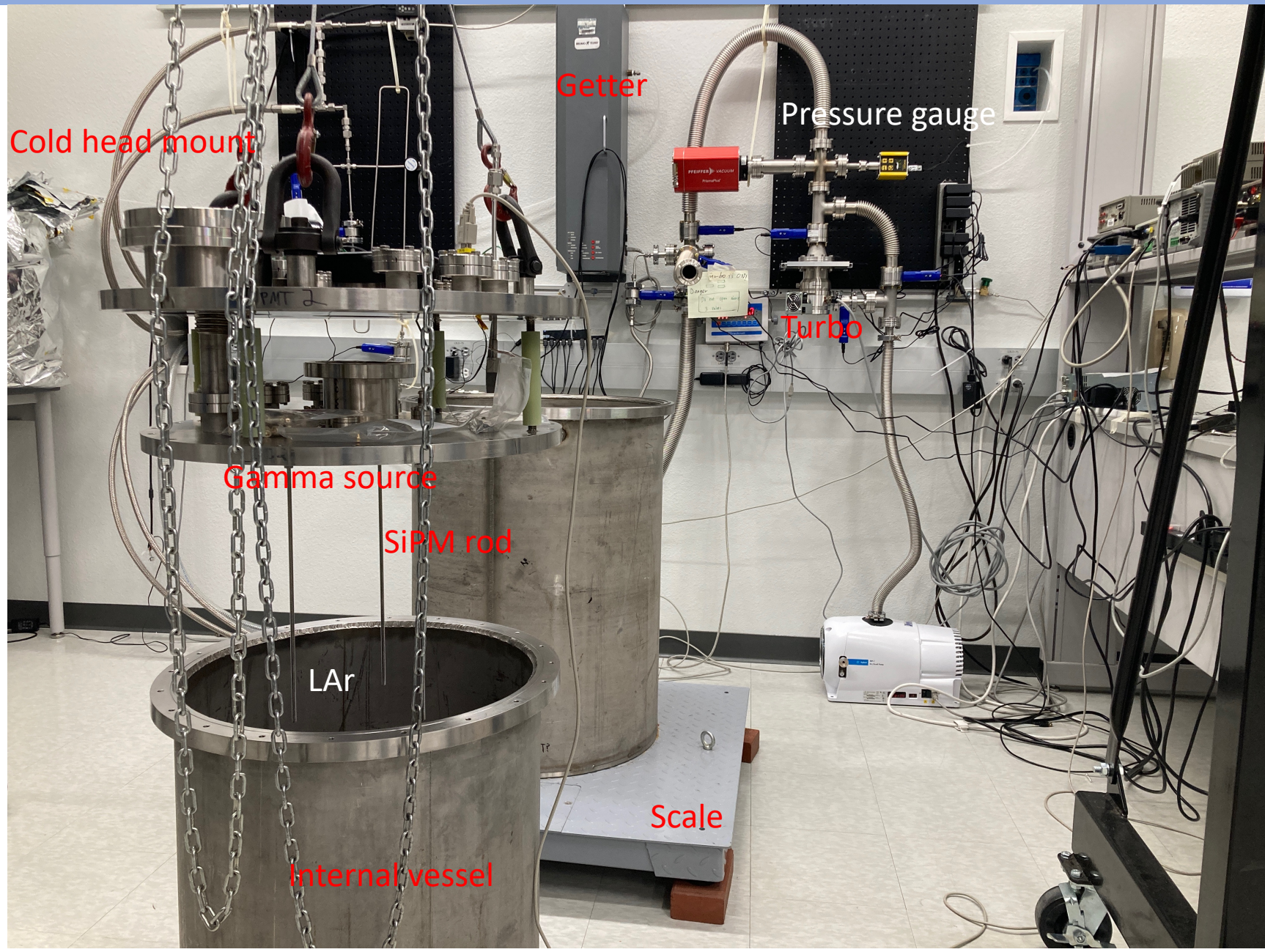


Fields, D. E., et al. "Understanding the Enhancement of Scintillation Light in Xenon-Doped Liquid Argon." http://arxiv.org/abs/2009.10755.

LAr test-stand, BACoN, at UNM

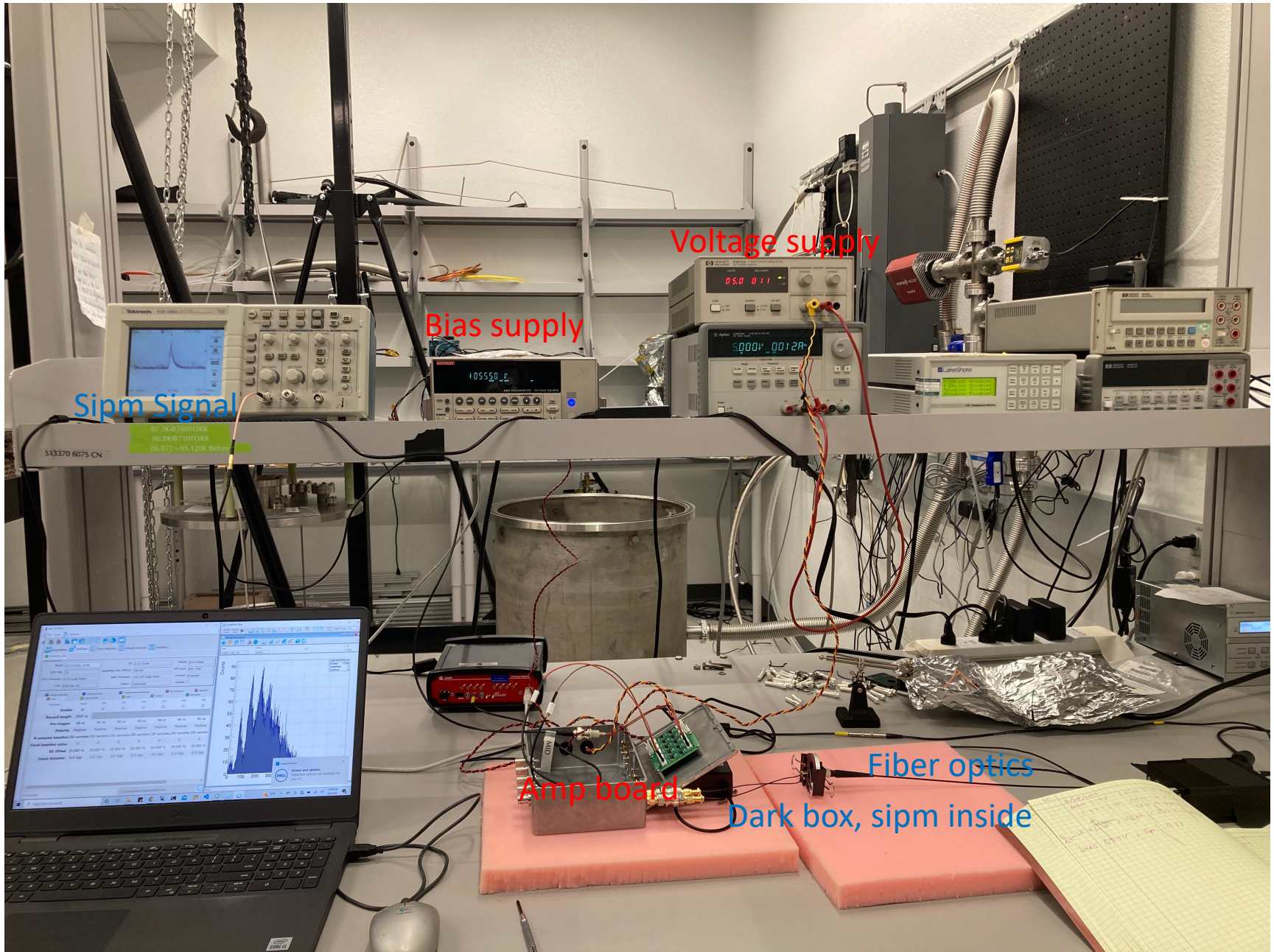


Approximate sketch of Bacon setup

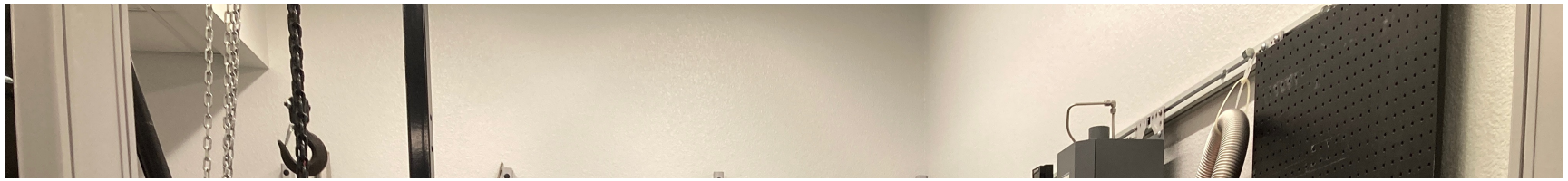


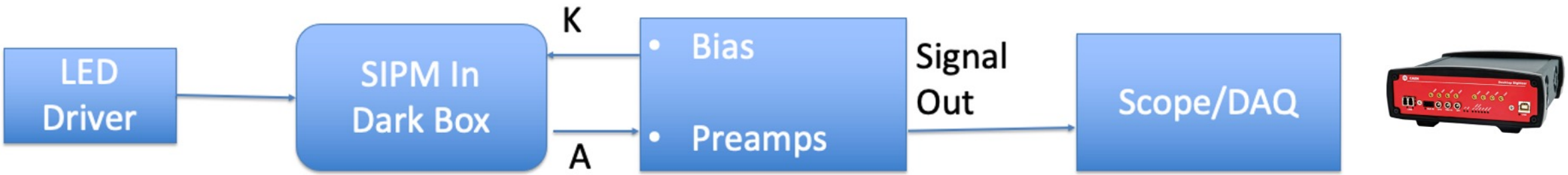
Source: Neil's Thesis

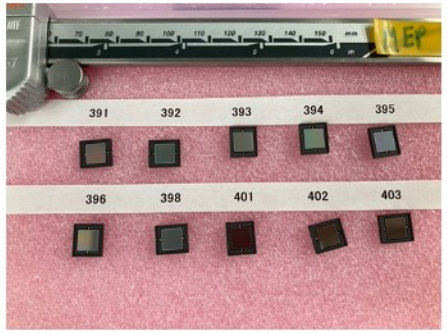
Data Acquisition and SiPM characterization setup

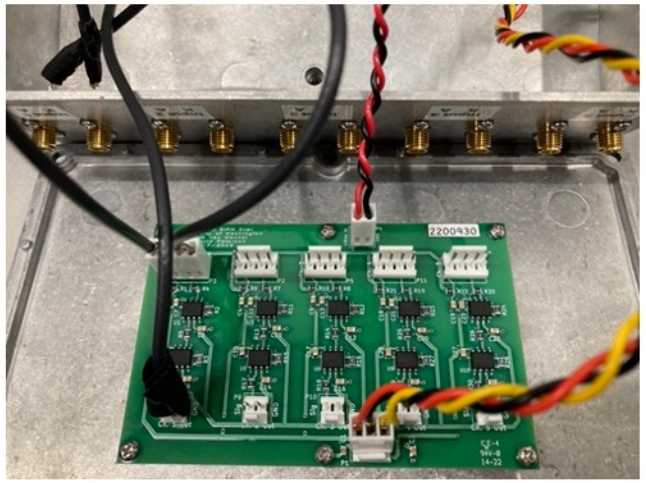


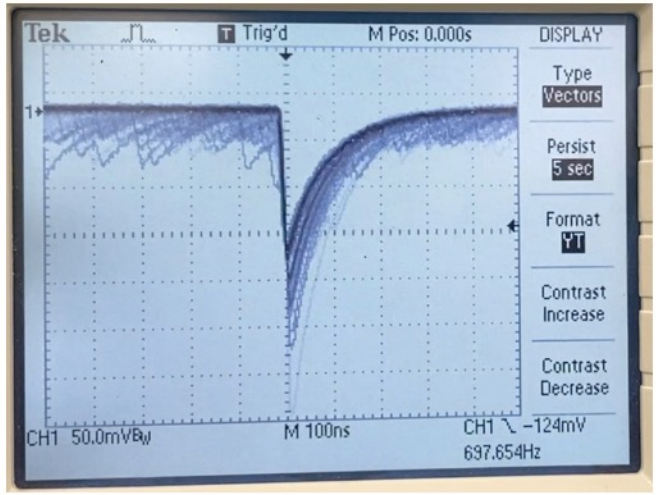
Data Acquisition and SiPM characterization setup



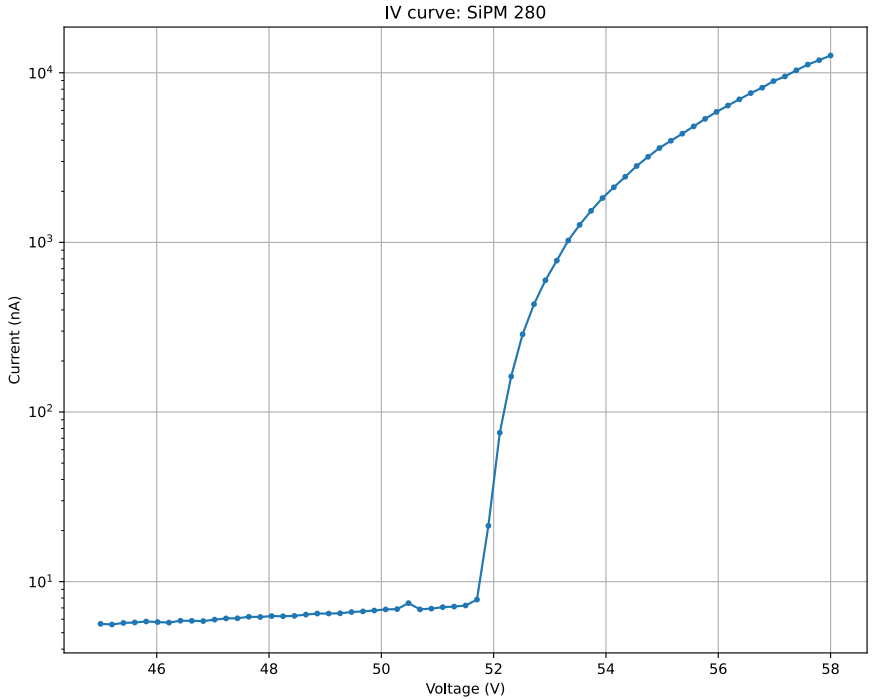








IV-characteristic and Photo-electron Spectrum



IV plot showing the breakdown voltage and its behavior in Over Voltage region

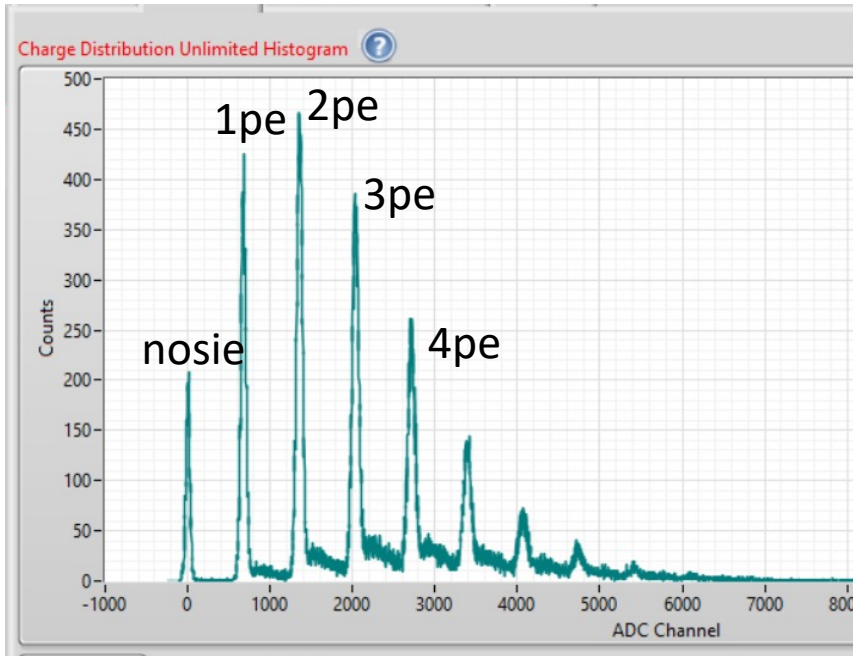


Photo-Electron spectrum and SPE resolution plot

Conclusion and Outlook

1. Upgrade of LAr test stand setup is about to be complete by few months.
2. Cryostat uses PMT, SiPM, led light and Americium gamma source for triggering and calibration.
3. Develop a time development of light yield with for amount of Xe doping.
4. Plan, finer doping below 1ppm to extract the quenching rate and absolute light yield per deposition.