

A Cryogenic Single-Photon Detector for ALPS II

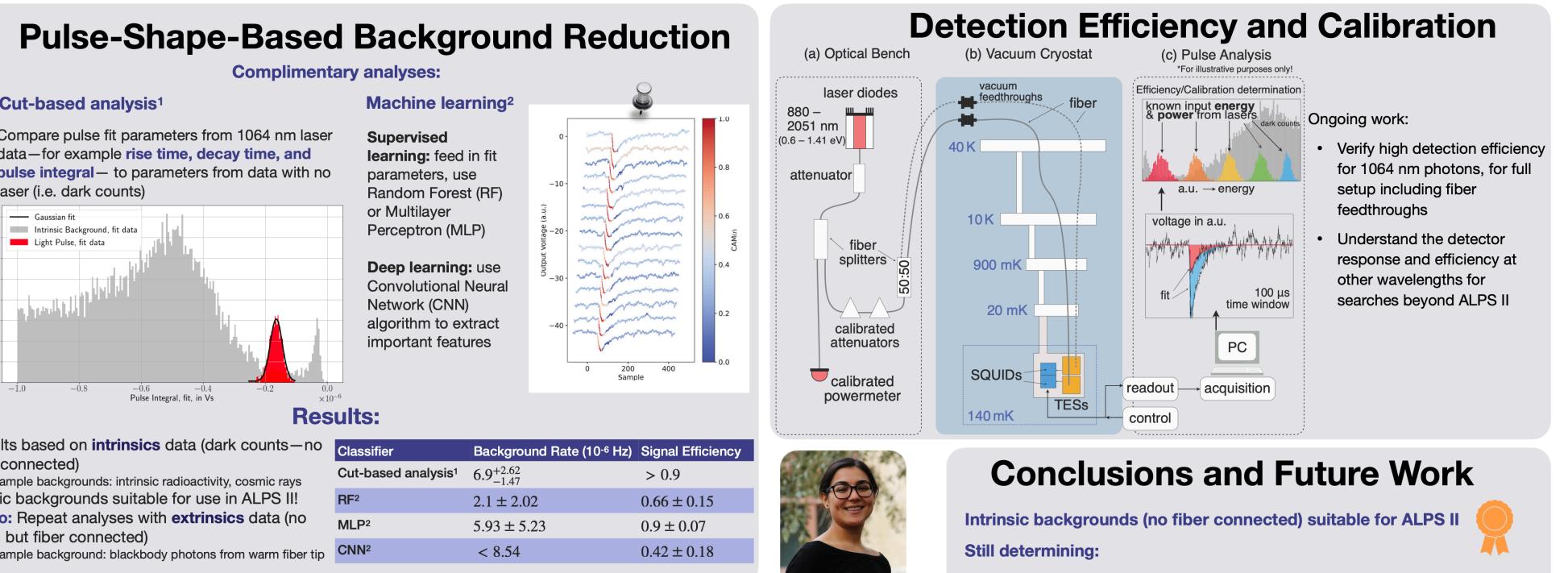
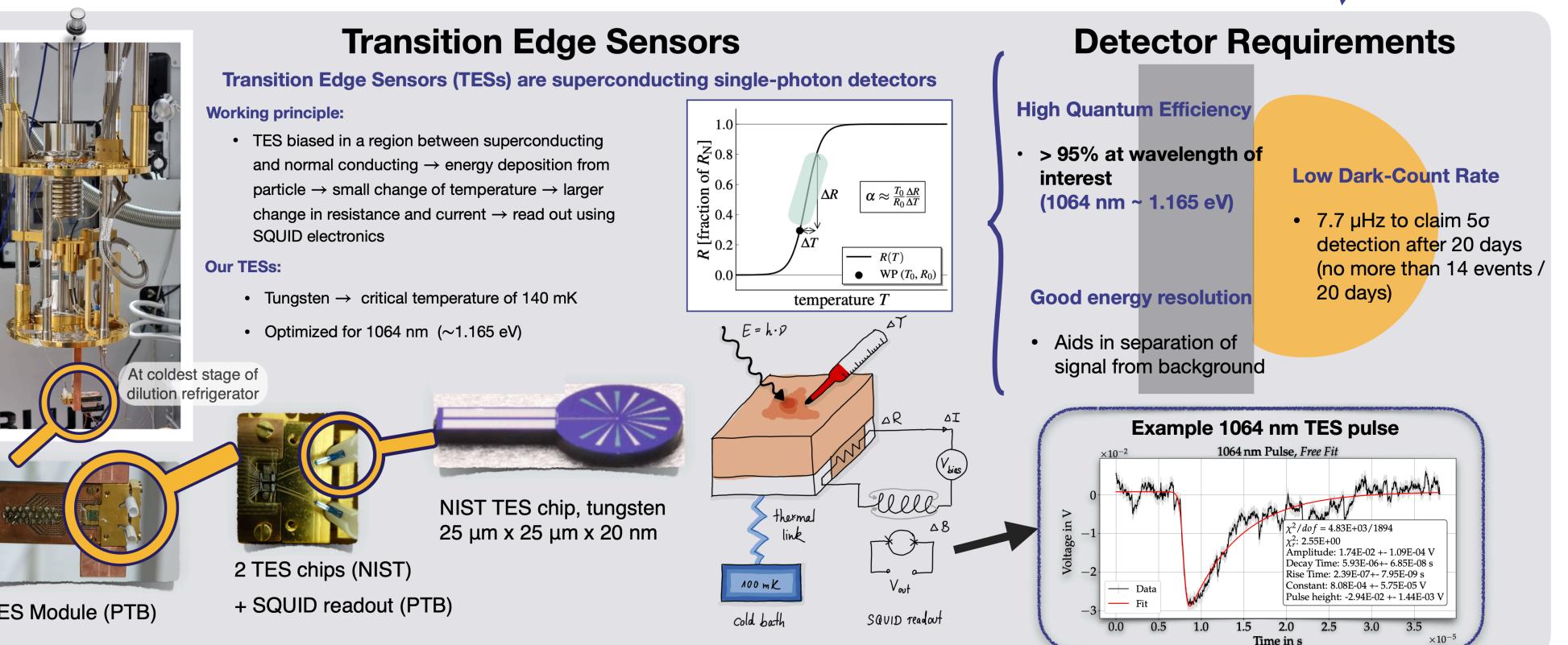
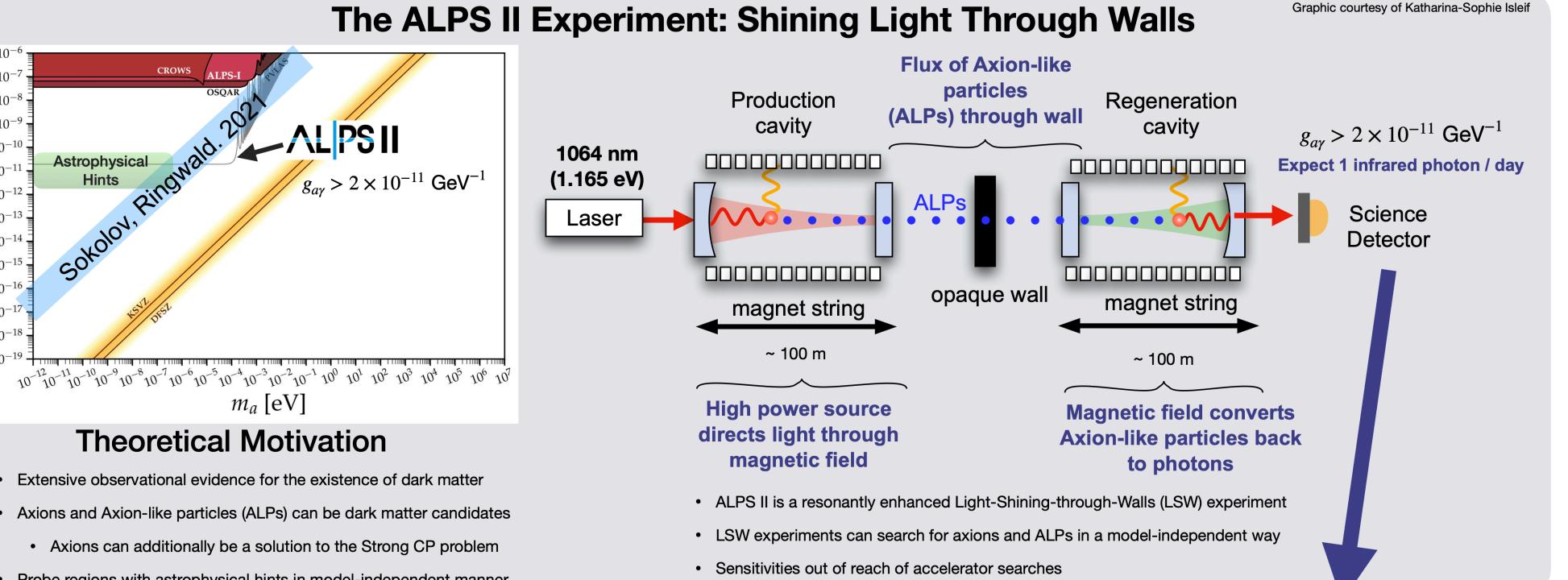
Gulden Othman
University of Hamburg
for the ALPS II collaboration



HELMHOLTZ RESEARCH FOR GRAND CHALLENGES



A Cryogenic Single-Photon Detector for ALPS II



References and Acknowledgements

[1] Shah, R., Isleif, K.S., Januschek, F., et al. Characterizing a Single-Photon Detector for ALPS II. *J. Low Temp. Phys.* **209**, 355–362 (2022). <https://doi.org/10.1007/s10909-022-02700-0>

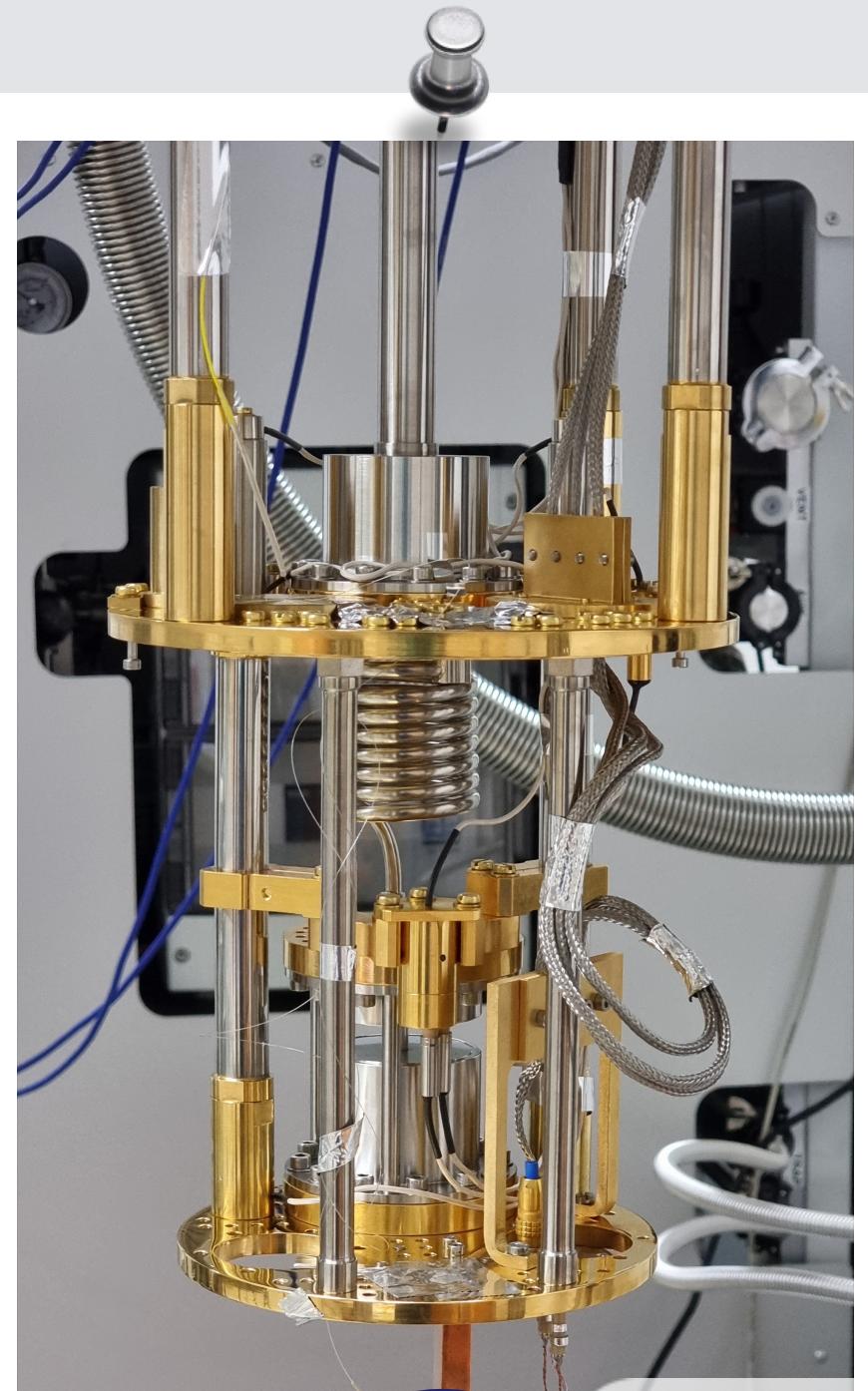
[2] Meyer, M., Isleif, K., Januschek, F., Lindner, A., Othman, C., Rubiera Gimeno, J.A., Schwemmbauer, C., Schott, M., Shah, R., A First Application of Machine and Deep Learning for Background Reduction in the ALPS II TES Detector. *ANNALEN DER PHYSIK* **2023**, 2200545. <https://doi.org/10.1002/andp.202200545>



Want to get in touch?
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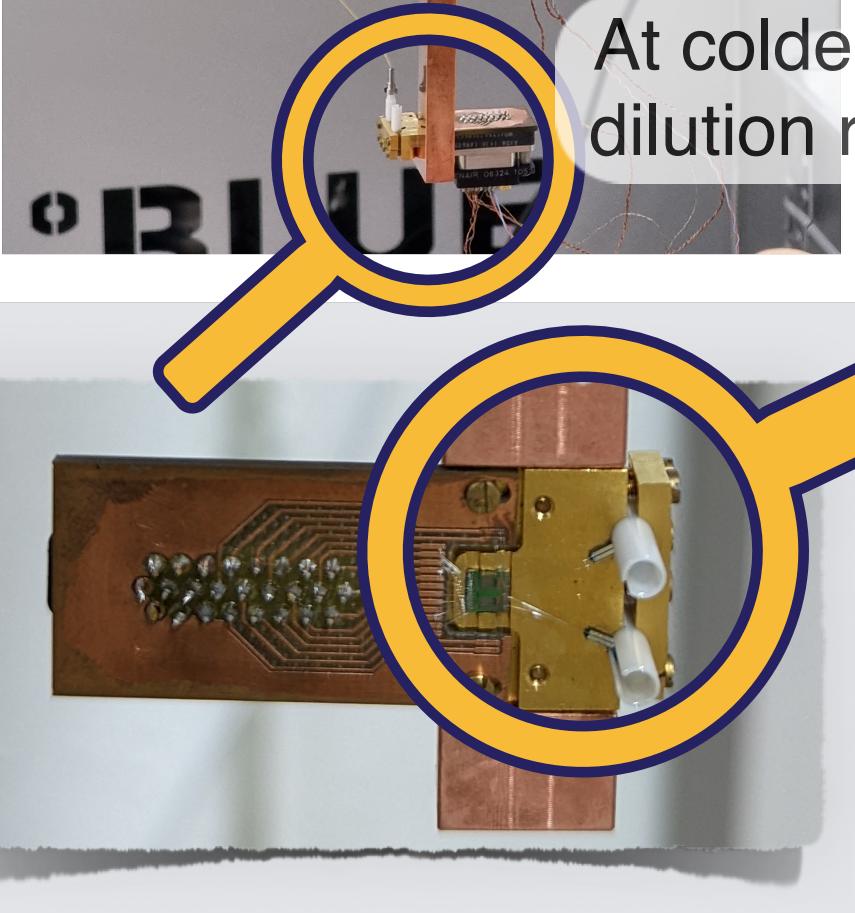
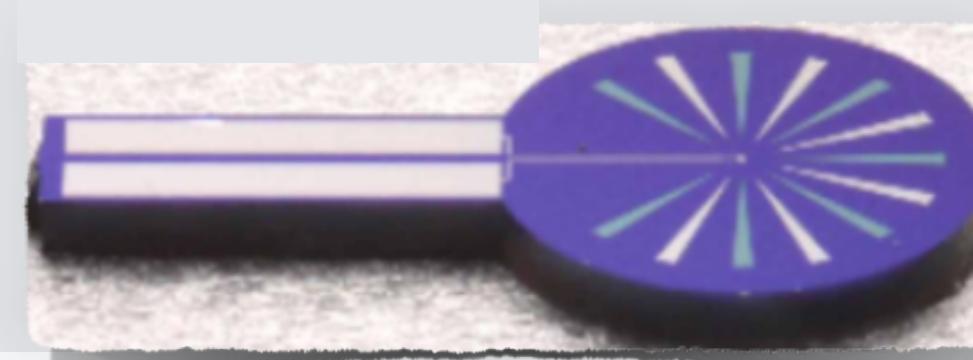
LinkedIn:

Transition Edge Sensor (TES)

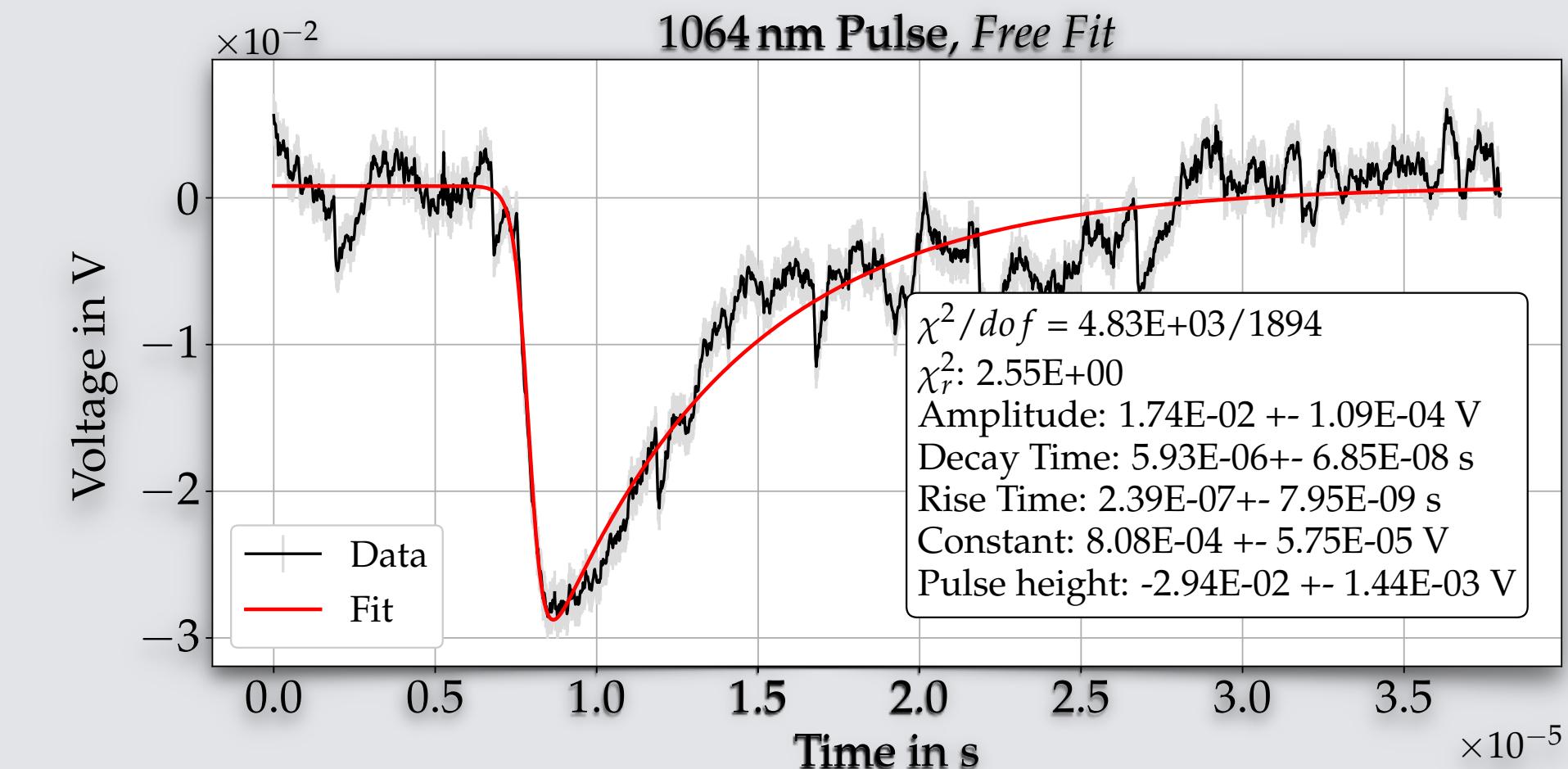
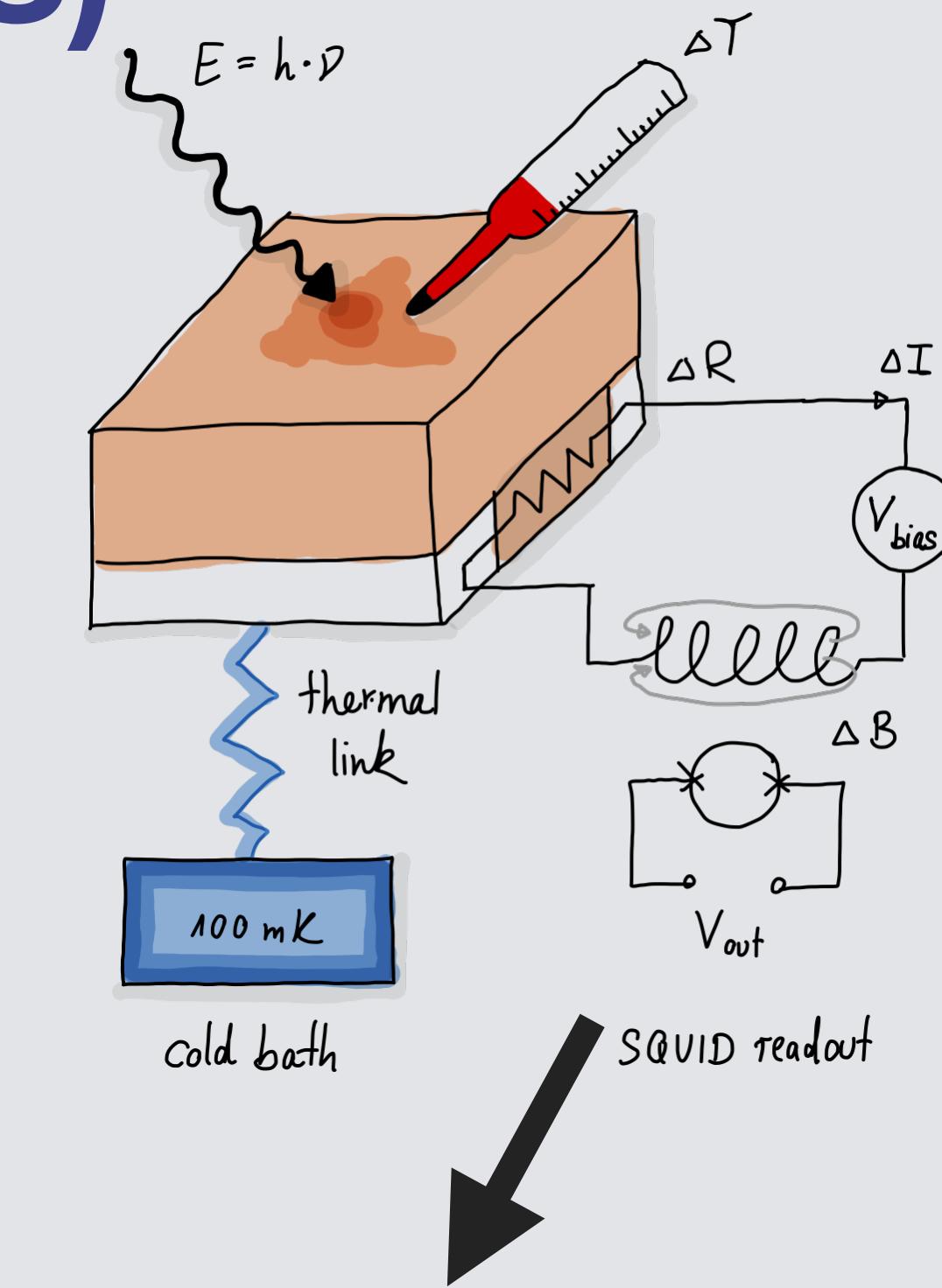
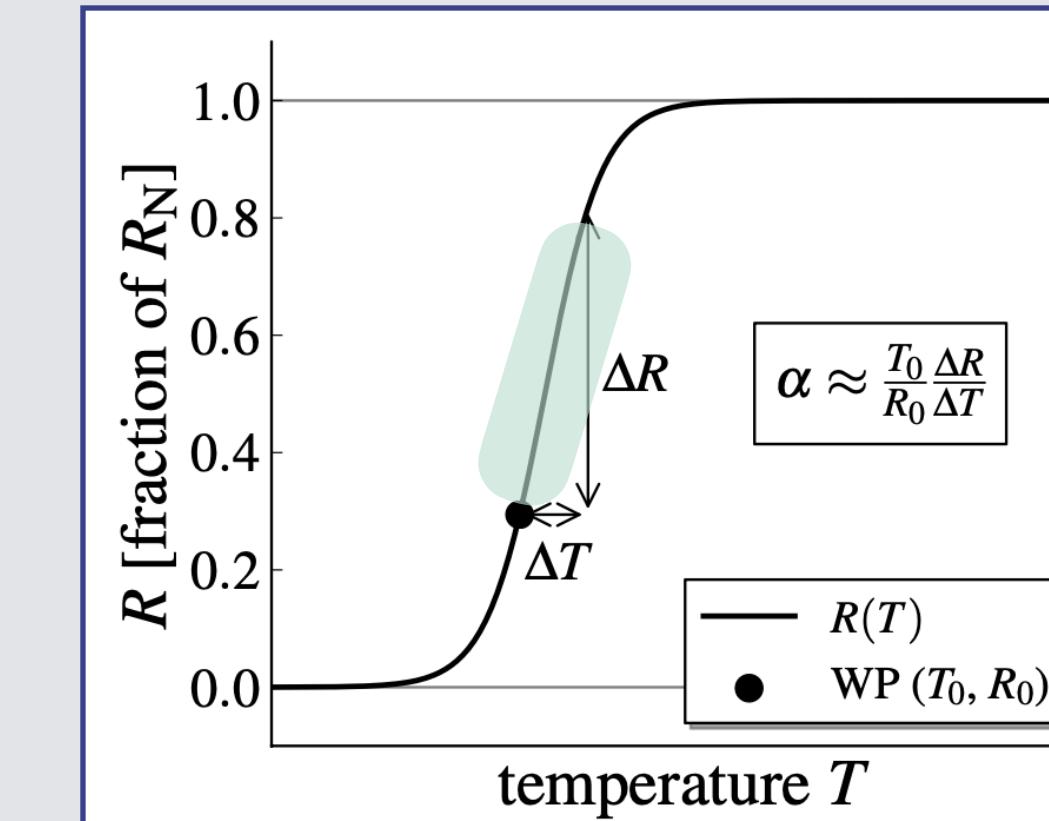


Our TESs:

- Tungsten \rightarrow critical temperature of 140 mK
- Optimized for 1064 nm (~ 1.165 eV)



TES Module (PTB)



Conclusions and Future Work

Intrinsic backgrounds (no fiber connected) suitable for ALPS II



Still determining:

- Extrinsic backgrounds (with fiber connected)
- Full-system detection efficiency and calibration ()

Further science opportunities with the ALPS II TES:

- Direct detection of light dark matter particles, independent of ALPS II
- Explore using TESs in photonics Quantum Computing applications
- Explore using TESs in high-frequency gravitational wave searches
- Developing new TES modules in collaboration with group in Glasgow, UK