

Poster-2-19

**Quantum sensor cryogenic search for dark matter in light mass range
(QROCODILE)**

Laura Baudis,¹ Alexander Bismark,¹ Noah Brugger,¹ Ilya Charaev,¹ Jose Javier Cuenca Garcia,¹ Yonit Hochberg,² Ben Lehmann,³ Severin Naegeli,¹ Titus Neupert,¹ Diego Ramirez Garcia,¹ and Andreas Schilling¹

¹ *University of Zurich*

² *The Hebrew University of Jerusalem*

³ *Massachusetts Institute of Technology*

Dark matter remains one of the big unsolved mysteries of modern physics. After decades of research at the electroweak scale, the research efforts have been shifted towards sub-GeV mass ranges. Among various approaches, superconductors offer unprecedented combination of performance [1]. Superconducting Nanowire Single Photon detectors (SNSPDs) are sensitive to the deposition of energies in the sub-eV range [2]. The SNSPD can be used both as the target and the sensor. By coupling with the advanced fabrication techniques, this device becomes a promising approach for exploration of new territories in the detection of low energy dark matter.

In this work we demonstrate the high quantum efficiency of detectors for energies lower than 0.8 eV. We report on a measurement performed with a SNSPD to set new constraints on dark matter which scatters on an electron as a function of the dark matter mass. Further we provide bounds on DM absorption in SNSPD for a relic dark photon with an exposure of 415 hours for an energy threshold of 112 meV.

[1] Y. Hochberg, Y. Zhao, and K. M. Zurek, Superconducting Detectors for Superlight Dark Matter, *Phys. Rev. Lett.* 116 (2016), no. 1 011301.

[2] Y. Hochberg, I. Charaev, S.-W. Nam, V. Verma, M. Colangelo, K. K. Berggren, *Phys. Rev. Lett.* 123, 151802, 2019.