Contribution ID: **60** Type: **not specified**

Feasibility Study of Hidden Photon Dark Matter Searches with an Itinerant Single Microwave Photon Detector

Wednesday 24 September 2025 12:06 (6 minutes)

We present the design and simulation results of a superconducting quantum sensor aimed at the direct detection of axion and hidden photon dark matter in the microwave regime. These dark matter candidates are predicted to convert into microwave photons at very low event rates through their weak coupling to electromagnetic fields, posing a significant experimental challenge.
To overcome this, we aim to employ a QND-type itinerant single microwave photon detector, based on a superconducting qubit, designed for high detection efficiency and low dark count rates in the GHz range. We evaluate this architecture through detailed simulations of the circuit design and its expected performance. Furthermore, we investigate the functionality of key components under realistic cryogenic conditions to ensure efficient photon detection. These results lay the groundwork for our future experimental implementation.

Author: KAWAI, Chikara (The University of Tokyo)

Co-authors: Prof. NOGUCHI, Atsushi (RIKEN Center for Quantum Computing); Prof. FUKUDA, Hajime (The University of Tokyo); NAKAZONO, Kan (The University of Tokyo); WATANABE, Karin (Tokyo University); Prof. TERASHI, Koji (ICEPP, The University of Tokyo); Prof. SAWADA, Ryu (ICEPP, The University of Tokyo); CHEN, Shion (Kyoto University); Dr SHIRAI, Shotaro (RIKEN Center for Quantum Computing); MOROI, Takeo (Tokyo); NITTA, Tatsumi (The University of Tokyo); Mr SICHANUGRIST, Thanaporn (The University of Tokyo); Prof. INADA, Toshiaki (ICEPP, The University of Tokyo); Dr MINO, Yuya (ICEPP, The University of Tokyo)

Presenter: KAWAI, Chikara (The University of Tokyo)

Session Classification: Morning - 6