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Search for Dark Matter Axion with Rydberg Atoms KENICHI IMAI, T. ARAI, A. FUKUDA, Kyoto Univ., H. FUNAHASHI, Osaka Electric Communication Univ., S. IKEDA, Kyoto Univ., Y. KIDO, Ritsumeikan Univ., A. MATSUBARA, Kyoto Univ., S. MATSUKI, Ritsumeikan Univ., T. MIZUSAKI, R. NAKANISHI, M. SAEED, A. SAWADA, K. YAMAMOTO, Kyoto Univ. — Axion is a strong candidate of the dark matter in the universe. From various astrophysical arguments, the mass of the dark matter axion is expected to be in the region from 5 micro-eV to 0.1meV. At Kyoto, a novel single microwave photon detector (CARRACK) had been developed for the search of the dark matter axion. The axion is converted to a microwave photon in the strong magnetic field (7T) by Primakoff process in a cavity which is cooled to 10mK to avoid black-body radiation. The photon is then detected by a Rydberg atom, which is excited by absorbing the photon and then selectively ionized. After the extensive pioneering studies of the CARRACK detector, it was recently moved to a new laboratory and New-CARRACK collaboration was formed. In the previous work by using Rb Rydberg atoms, a stray electric field of an order of mV/cm limited the overall sensitivity of the detector because of its large Stark effect. The New CARRACK utilizes Potassium as Rydberg atom which is estimated to be much less sensitive to a stray electric field. We describe the New CARRAC detector and its sensitivity for the dark matter axion based on our spectroscopic measurements of Potassium Rydberg atoms.

Kenichi Imai
Kyoto University

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