

# Capture of Electroweak Multiplet Dark Matter in Neutron Stars

**Date** 16:30 - 18:00, December 2 (Friday), 2022

**Place** 1130, Building 9 (Zoom ID: 881 5903 1592)

## Speaker

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## Abstract

If Dark Matter (DM) has a sizable scattering cross section with nucleons, it can efficiently be captured by a neutron star. Its energy is then transferred to the neutron star as heat through the scattering and annihilation inside the star. This heating effect may be detectable via dedicated temperature observations of nearby old pulsars, providing an alternative method for DM searches. We show that, for electroweak multiplet DM, this search strategy can probe the parameter region that is out of reach of future DM direct detection experiments.

To see this systematically, we classify such DM candidates in terms of their electroweak charges and investigate the effect of ultraviolet physics using higher-dimensional effective operators. We then show that if the effect of ultraviolet physics is sizable, the DM-nucleon elastic scattering cross section becomes sufficiently large, whilst if it is suppressed, then the mass splittings among the components of the DM multiplet get small enough so that the inelastic scattering processes are operative. In any case, the electroweak multiplet DM particles are efficiently captured in neutron stars, making the search strategy with the temperature observation of old neutron stars promising.

**Reference:** <https://arxiv.org/abs/2204.02238>

## Biography

Dr. Motoko Fujiwara received her Ph.D. of Science from Nagoya University in 2022 completing the work on electroweakly interacting dark matter. She worked as a postdoc researcher at the University of Tokyo in 4/2022-9/2022. She started to work as a postdoc at the Technical University of Munich on 10/2022. Her main research interest is the phenomenology of dark matter. Besides scientific research, she is also engaging in science communication, which was awarded as Nagoya University President's Award in 3/2022.