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Experimental studies of gravity with slow neutrons MASAAKI KITAGUCHI, GO ICHIKAWA, KATSUYA HIROTA, HIROHIKO SHIMIZU, Nagoya Univ., NAOYUKI SUMI, SATORU MATSUMOTO, TAMAKI YOSHIOKA, Kyushu Univ., TATSUSHI SHIMA, Osaka Univ., KENJI MISHIMA, TAKASHI INO, KEK, YOSHICHIKA SEKI, RIKEN — Neutron is a chargeless massive particle with the lifetime in the macroscopic range, which is suitable for precision measurement of the small influence of new physics including gravity. We have started the experimental studies of the gravity with slow neutrons in order to search non-Newtonian effect at the short range which is lead by the existence of extra-dimension of the space. Combination of the pulsed neutrons provided by J-PARC and the advanced optical devices enables us to perform new types of high precision measurements. Neutron scattering with noble gas target enables us to measure the interaction at the range of the order of 1 nm. The apparatus was installed into beamline NOP and commissioning has been started. Neutron interferometer has the advantage to measure the gravitational potential precisely. We are developing the large-scale interferometer using long-wavelength neutrons, which is realized by using multilayer mirrors. Ultra-cold neutrons in a small cavity can be bound to the discrete energy eigenstates by Earth's gravitational field. We are discussing the direct measurement of the spatial localization of the neutrons with high resolution detectors, for example, CCD and nuclear emulation.

Masaaki Kitaguchi
Nagoya Univ.

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