

## COW Experiments Using Multilayer-type Neutron Interferometer

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The COW experiment conducted in 1974 was the first to observe the gravitational interaction of neutrons as quantum particles. In this experiment, the phase shift was measured between neutron waves traveling along two paths at different heights in an interferometer, reflecting the difference in gravitational potential. Precise measurements of gravitational effects on neutrons can test the equivalence principle and explore possible modifications to gravity, opening new opportunities to search for physics beyond the standard model. To investigate these phenomena, we are performing follow-up experiments to the original COW experiment using a multilayer-type neutron interferometer developed in 2024. Unlike previous studies employing silicon single crystals, our interferometer uses multilayer neutron mirrors to control the neutron waves, enabling longer wavelengths and larger path separations, which improve measurement precision. In February 2025, we successfully observed gravitationally induced phase shifts for the first time using this multilayer cold neutron interferometer at the pulsed neutron source at J-PARC. At this conference, we will present our experimental results and discuss future prospects for precision studies of gravity with the neutron interferometer.

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