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Angular Correlations of Capture Gamma-rays from p-wave Resonances for the Study of the Boundary Condition at the Entrance Channel

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Extremely large breaking of the symmetry under the spatial inversion (P-violation) is observed in p-wave resonances of medium heavy nuclei[1]. The enhanced P-violating effect is understood as the result of the combination of the interference between neutron scattering amplitudes of P-unfavored neighboring resonances, which is referred to the kinematical enhancement, and the variance of the P-violating nuclear interaction in compound nuclear states, which is referred as the dynamical enhancement. The kinematical enhancement has been studied by determination of partial neutron widths of p-wave amplitudes in energy-dependent angular correlations of individual gamma-ray transitions emitted in the relaxation process of compound nuclear states using pulsed neutron beam at the ANNRI beamline of the J-PARC spallation neutron source[2-6]. In this paper, we overview the experimental results and discuss their consistency with theoretical models and possible extension to their application to search for the breaking of the time reversal invariance in nuclear interaction with the possible sensitivity to new physics beyond the standard model of elementary particles.

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