

Probe short-range YN interaction via scattering experiment

Y. Ma¹

¹Nishina Center, RIKEN, Japan

The discovery of two solar mass neutron star has inspired many discussions in hypernuclear physics community. It has been phrased as *hyperon crisis* in some studies to show its impact.[1] Many theoretical efforts have been carried out to reproduce two solar mass neutron star equation of state by modifying YN interaction such as including YNN three-body force.

Instead of looking for more sophisticated possibilities, we would like to point out that the short-range YN interaction may also help to support neutron stars with large mass.[2] From a phenomenological point of view, more repulsive YN short-range interaction implies a more stiff core, which can sustain heavier neutron star without collapse. From uncertainty principle, one can expect that elastic scattering with large momentum transfer (≥ 200 MeV/c) will be sensitive to short-range YN interaction. However, only very limited data from YN scattering experiment is available up to now, which dose not allow a quantitative study for the YN short-range interaction.

In this contribution, we will survey for the possible experimental approaches to study short-range YN interaction by elastic scattering via large momentum transfers. We begin with a summary for current available hyperon production methods and their kinematic characteristics including electromagnetic channel by both real and virtual photons, baryon production channel with primary beam and finally meson production channels. Special emphasis is paid to the meson production channels available at J-PARC. A GEANT4 simulation is carried out to demonstrate the *sensitivity* of such scattering experiment for the short range YN interaction with a pure phenomenological potential to generate YN scattering events.[3]

[1] T. Takatsuka, *et al.* PTEP 073D01 (2013)

[2] J. Haidenbauer, *et al.* Nucl. Phys. A 915 (2013) 24-58

[3] K. Hagino, private communication