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Study of ηN scattering length by means of (p,^{3}He) nuclear reactions leading to the formation of η-mesic nucleus Q. HAIDER, Fordham University, Bronx, N.Y. 10458, L.C. LIU, Los Alamos National Laboratory, N.M. 87545 — Because ηN scattering length is not directly measurable, its value is strongly model dependent[1]. A good knowledge of this scattering length is, however, valuable to the modeling of various hadronic interactions where η is produced. Since low energy ηN interaction is attractive and η-mesic nuclei can exist[2], we suggest to use the $p + A \rightarrow {}^3\mathrm{He} + (A-2)_\eta$ reaction to probe the ηN scattering length. In our model, the η is first produced via $p + d \rightarrow \eta + {}^3\mathrm{He}$ reaction, and then captured by the residual nucleus of nucleon number $A - 2$. As a stronger scattering length allows η to be bound onto lighter nuclei, the smallest value of $(A - 2)$ for which η-nucleus bound states can exist will set an upper limit for the scattering length. Our choice of having ^{3}He in the final state is for the purpose of significantly reducing background events. This suggestion will soon be implemented in an experiment at Juelich, Germany. We will present our predictions for ^{16}O and ^{12}C as target nuclei, leading to $^{14}\mathrm{N}_\eta$ and $^{10}\mathrm{B}_\eta$, respectively. Sensitivity of the η-mesic nucleus formation to the ηN scattering length will also be discussed.

[1] Q. Haider and L.C. Liu, Phys. Rev. **C 66**, 045208 (2002).
[2] Q. Haider and L.C. Liu, Phys. Lett. **B 172**, 257 (1986).

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