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Calculation of the nd Scattering Lengths by a Realistic Nonlocal Gaussian Potential KENJI FUKUKAWA, YOSHIKAZU FUJIWARA, Kyoto University — The calculation of the quartet and doublet nd scattering length, ${}^4a_{nd}$ and ${}^2a_{nd}$, is very difficult because of the deuteron distortion effect, especially for ${}^2a_{nd}$. Even for ${}^4a_{nd}$, it is not easy to keep the numerical accracy since the many channels couple. The well- known corellation between the triton binding energy and ${}^2a_{nd}$ is not completely understood in the calculations including three-body forces. Motivated by the successful application of the our quark-model baryon-baryon interaction fss2 to the triton binding energy without the three-body forces, we reexamine ${}^2a_{nd}$ and ${}^4a_{nd}$ to study the effect of the nonlocality. We use a nonlocal Gaussian potential based on fss2, which is constructed to make few-baryon calculations much easier than the original interaction. We calculate the eigen-phase shift δ and plot $k \cot \delta$ versus k^2. The charge independence breaking is ignored. The energy region examined is from $E_{c.m.}$=50 keV to 1 MeV. For the quartet scattering length, $k \cot \delta$ is almost linear with respect to k^2 above $E_{c.m.}$=100 keV. Below 100 keV, the numerical accuracy seems not to be maintained. We have obtained ${}^4a_{nd}$=6.3 fm, which is close to the experimental value ${}^4a_{nd}^{\rm exp} = 6.34\pm$ 0.03 fm. For the doublet scattering length, ${}^2a_{nd}$ is expected to be about 0.8 fm (vs. ${}^2a_{nd}^{\rm exp} = 0.65 \pm 0.03$ fm), but we need much wider model space than $J_{\rm max} = 2$ and fine mesh points to keep the numerical accuracy of the eigen-phase shifts.

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