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Three-Nucleon Scattering with a Possible Long-Range Force SHINSHO ORYU, YASUHISA HIRATSUKA, Tokyo University of Science, SHUICHI GOJUKI, SGI-Japan, TETSUO SAWADA, Nihon University, TAKASHI WATANABE, Tokyo University of Science — Three-nucleon scattering problems have been intensely investigated during almost a half century in an effort to constrain models of the nuclear force. However, we still see discrepancies between theoretical predictions based on certain nuclear forces and the experimental data. Two decades ago, one of the authers (T.S.), in search of a possible long range force between hadrons, analysed S-wave phase shift data for proton-proton scattering. He found that it is consistent with a potential corresponding to a strong Van der Waals force. Here, we try to reproduce modern nuclear phase shifts by replaceing the σ-meson term of the Paris potential with a Van der Waals potential $C'/r(r+a)^5$ having two parameters, the range a and the depth C'. We obtained a reasonable fit to the phase shifts ${}^1S_0$, ${}^3S_1$-${}^3D_1$, ${}^1P_1$, ${}^1D_2$,${}^1F_3$,${}^1G_4$,${}^3P_1$,${}^3D_2$,${}^3F_3$,${}^3G_4$ and ${}^3D_3 - {}^3G_3$ by using the GSE method. Preliminary calculations for three-body *pd* elastic scattering were performed to obtain sample physical observables using the new potentials plus other states from the original Paris (PEST) potentials. We found differences in the three-body observables compared with the original nuclear force results.

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