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USE OF THREE BODY FADDEEV SOLUTION FOR 3-q NUCLEON STRUCTURE IN S-WAVE N-N SCATTERING PHASE SHIFTS.

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[1]On leave of absence from Bhabha Atomic Research Centre, Bombay, India

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USE OF THREE BODY FADDEEV SOLUTION FOR 3-q NUCLEON STRUCTURE IN S-WAVE N-N SCATTERING PHASE SHIFTS

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The short range part of the nucleon-nucleon (NN) interaction and hence the NN scattering phase shifts (δ) have been found to depend on the internal structure of the nucleon in terms of its valence quark (q) constituents [1,2,3]. It has also been shown [3] that the effective hard core radius derived from the calculated scattering phase shifts is strongly correlated with the single oscillator parameter (which in turn is related to the nucleon size and mass). With this prescription one does not obtain agreement between calculations and measurements for the S-wave NN scattering phase shifts (δ_o) and the nucleon mass consistently [3]. We therefore use the more consistent 3-q nucleon wave functions calculated in the Faddeev formalism for the calculation of S-wave NN scattering. In this approach the completely antisymmetrized internal wavefunction of the nucleon and the NN relative motion wavefunctions of the resonating-group method (RGM) are generated by the same quark-quark force. For use in the RGM equations the completely antisymmetrized 3-q nucleon wave function is expanded in terms of harmonic oscillator functions. For the preliminary calculations , the q-q tensor force is assumed to be zero. Contrary to the conventional calculations,we find a significant space antisymmetric component in the nucleon wave function. The oscillator parameter corresponding to the maximum overlap with the completely symmetric space part of the nucleon wavefunction is thus fixed uniquely. The q-q interaction parameters are fixed by the value of the nucleon mass and the N-Δ splitting.

The q-q interaction thus fixed is used to obtain the NN-scattering phase shifts for L = 0 channels. For the preliminary calculations the $\Delta\Delta$ and the hidden colour, CC channels which have been found to affect the L = 0 phase shifts somewhat marginally by earlier workers, have been omitted.

[1] C.S. Warke and R. Shanker, Phys. Rev. C21 (1980) 2643

[2] M. Oka and K. Yazaki, Phys. Lett. 90B (1980) 41

[3] A. Faessler et al., Phys. Lett. 112B (1982) 201.

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