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ABSTRACT

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Abstract

Interpretation of High Energy p-p Scattering. DON R. SWANSON, Radiation Laboratory, Physics Department, University of California, Berkeley, California.

High energy p-p scattering has been interpreted by several authors in terms of highly singular noncentral interactions[1,2]. The triplet state calculations were carried out in the Born approximation and, together with the singlet, yielded an almost isotropic (c.m. system) differential cross section. Agreement with experiment[3] was good at large angles but the theoretical peak in the forward direction, due mostly to singlet D scattering, was too large. It is not clear however that the Born approximation should be valid for singular potentials.

In the present analysis, the wave equation has been integrated numerically to obtain an exact solution at 350 Mev using the tensor interaction of Christian and Noyes[1]. A "square well" cutoff at the nucleon Compton wavelength was used. In the case of the "repulsive" interaction, the triplet cross section agrees closely with the Born approximation for scattering angles greater than 25° but is larger at small angles. This remarkable agreement is apparently accidental since the $^3P_0$ and $^3P_1$ phase shifts are incorrect by orders of 50% in the Born approximation. The "attractive" triplet cross section is about 30% larger at 30° than at 90°, and is therefore inconsistent with the experimental data even at large angles. The influence of the cutoff is under further study. The exact phase shifts here obtained will be used to calculate polarization effects in a double p-p scattering.

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1 R. S. Christian and H. P. Noyes, Phys. Rev. 79, 85 (1950).
2 K. M. Case and A. Pais, Phys. Rev. 80, 203 (1950).
3 Chamberlain, Segre, and Wiegand, Phys. Rev. 83, 923 (1950).