p-p PHASE SHIFTS AT 970 MeV

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(Presented by Sh. OGAWA)

The program of highenergy nucleon-nucleon phase-shift analysis [1, 2] has been extended to the p-p data at 970 MeV. The available data at this energy are differential cross section including recently measured Coulomb interference data, polarization and pion-production data. The real parts of the phase shifts have been assumed to be of the Stapp No. 1 type. For partial waves with $L > 5$, we have used the one-pion exchange contribution. As for the imaginary part the reflection parameters have been calculated on the assumption that the pion production takes place in a (3.3)-state with the remaining nucleon being in an S-P- or D-state with respect to the center of mass of the system.

Two solutions, A and B, corresponding respectively to peripheral and central absorption types have been obtained.

Some of the prominent features of the solutions obtained are: i) solution A shows a peripheral absorption, quite similar to that found at 660 MeV, whereas solution B exhibits a central absorption. To see this point clearer, the reflection parameters specified with l and averaged over J are calculated (see Table 1).

Table 1

Parameters	$r\,(^1S)$	$r\,(^3P)$	$r\,(^1D)$	$r\,(^3F)$	$r\,(^1G)$
660 MeV	1	0.94	0.64	0.87	1
970 MeV sol. A	0.98	0.76	0.39	0.79	0.88
970 MeV sol. B	0.12	0.49	0.56	0.86	0.91

It is not possible, at the present stage, to decide which of the types of solutions, A or B, is correct. The final choice between the two types of absorption must be decided by the triple scattering experiments. If sol. A is true, it becomes that the waves are absorbed mainly at a distance of $b_D = 0.7 \sim 0.9 \times 10^{-13}$ cm in the energy region of $660 \sim 970$ MeV, b_D being the impact parameter for D-state.

ii) The values of $^1S_0$ real phase shift $\delta_R(^1S_0)$ still decreases at this energy. This fact is consistent with the existence of a hard-core-like repulsion having a radius of about $0.5 \times \times 10^{-13}$ cm.

iii) The ^3p-wave splitting is consistent with the strong LS model, while the ^3F-phase shifts seem to indicate a strong reduction of the LS interaction effects in these states. This reduction may be understood as due to a cancellation, in ^3F-state, of LS interaction effects by the nonstatic effects of higher order in L.

Predictions of some of the triple scattering parameters by sols. A and B are presented in Table 2.

Table 2

Solution	$D\,(\theta \sim 90°)$	$R\,(\theta \sim 110°)$	$C_{kp}\,(\theta \sim 90°)$	$C_{nn}\,(60° \sim 70°)$
A	−	+	+	+
B	+	−	−	−

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