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SPECIFICATION OF THE N-N PHASE SHIFT ANALYSIS AT 23.1 MeV

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Experiments using polarized proton targets at 23 - 25 MeV/1-3/ made it possible to lower the limit of the unambigous determination of the N-N scattering in amplitude to 23 MeV/4-7/. As was expected previously/9/, the accuracy of parameters, which were determined with the largest errors in the first analysis /8/ (the mixing parameter ϵ_1, the phase shifts $^3S_1$ and $^3P_0$) was most sensitive with respect to value of the polarization correlation coefficient C_{nn}^{np} (174^o) in n-p scattering at the energy 23 MeV. Presently, the value of C_{nn}^{np} (140^o) has been determined. The curve C_{nn}^{np} calculated according to the specified phase shift set/4/ still has a very large corridor of errors at $\theta \leq 140^o$. Therefore, it is interesting to check the stability of the last result of the phase shift analysis at 23 MeV with respect to the new experimental value C_{nn}^{np} (140^o). The results of this check are given below.

The data used for the specification of the phase shift analysis are given in Table 1. The phase shift analysis was performed according to the program described in ref./10/ at $\ell_{max} = 2$ and 3. The obtained solutions are shown in Table 2. It follows from the Table 1 that the addition of the new data does not change the solution found previously in ref./4/. The obtained solution is in good agreement with results of the paper/11/ at 25 MeV. The calculated angular dependence of C_{nn}^{np} with its corridor of errors and measured points is given in Fig. 1. It is to be noted that the angular dependence of C_{nn}^{np} is in good agreement with the dependence obtained in ref./11/.

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Table 1

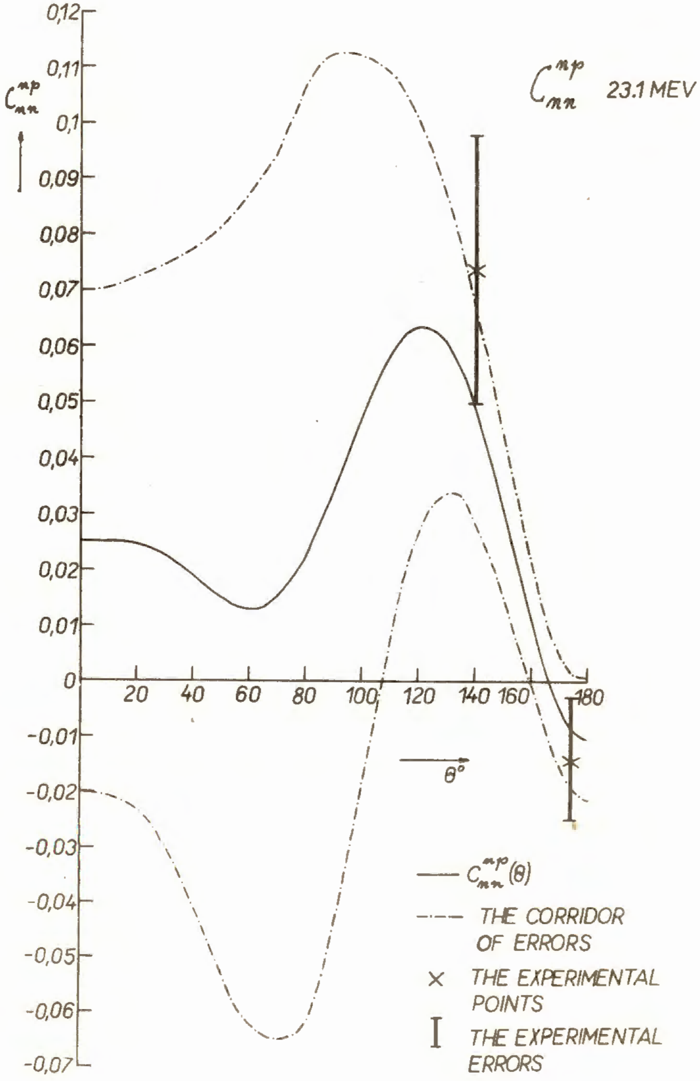
Effective energy in MeV	Experimental quantity	Number of points	Actual experimental energy in MeV	Refs.
23.1	σ^{pp}	23	25.63 renorm.	/12/
	P^{pp}	1	27.4	/13/
	σ^{np}	23	22.5 - 27.5 renorm.	/14,15/
	P^{np}	7	23.1 , 23	/11,16/
	C_{nn}^{pp}	1	20	/3/
	C_{nn}^{pp}	1	25.7	/2/
	R^{pp}	3	25.7	/17/
	D^{np}	3	23	/18/
	A^{pp}	3	25.7	/17/
	A_{ss}^{pp}	1	25.7	/2/
	C_{nn}^{np}	2	23	/1,11/

Designation: renorm. – renormalized according to the ratio of the cross-section at 90° using data at T = 25,63 and 18,2 MeV for σ^{pp} and according to the ratio of the total cross-section for σ^{np} .

Table 2

The phase-shifts in degrees (the Stapp parametrization) for 23,1 MeV nucleon-nucleon scattering.

	$l_{max} = 2$	$l_{max} = 3$	$l_{max} = 3$ the old set /4/
r^2	0.08 fix.	0.08 fix.	0.08 fix.
$^1S_0$	50.00 ± 0.20	50.57 ± 0.27	50.54 ± 0.26
$^3S_1$	95.18 ± 5.28	96.91 ± 5.33	96.41 ± 4.74
$^3P_0$	9.25 ± 0.35	7.93 ± 0.66	7.81 ± 0.71
$^1P_1$	−0.19 ± 1.45	0.39 ± 1.50	−0.19 ± 1.36
$^3P_1$	−5.12 ± 0.17	−4.55 ± 0.50	−4.69 ± 0.43
$^3P_2$	2.76 ± 0.09	2.49 ± 0.34	2.38 ± 0.37
ε_1	−2.97 ± 1.81	−2.91 ± 1.32	−4.38 ± 1.22
$^3D_1$	−1.16 ± 3.08	−2.36 ± 2.81	−3.04 ± 1.93
$^1D_2$	0.81 ± 0.03	1.10 ± 0.08	1.08 ± 0.07
$^3D_2$	3.92 ± 3.20	4.89 ± 3.04	2.56 ± 5.14
$^3D_3$	1.27 ± 1.19	0.75 ± 1.57	−0.47 ± 1.04
ε_2		−1.24 ± 0.32	−1.18 ± 0.25
$^3F_2$		−0.15 ± 0.41	−0.20 ± 0.33
$^1F_3$		−0.47 ± 0.57	0.26 ± 0.65
$^3F_3$		0.23 ± 0.74	0.43 ± 0.63
$^3F_4$		−0.14 ± 0.17	−0.14 ± 0.17
χ^2	70.83	58.06	54.47
χ^2/χ^2	1.24	1.12	1.10



C_{nn}^{np} 23.1 MEV
C_{nn}^{np}
0,12
0,11
0,1
0,09
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0
-0,01
-0,02
-0,03
-0,04
-0,05
-0,06
-0,07
20 40 60 80 100 120 140 160 180
$\theta°$
$C_{nn}^{np}(\theta)$
THE CORRIDOR OF ERRORS
THE EXPERIMENTAL POINTS
THE EXPERIMENTAL ERRORS

Fig. 1.