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SCATTERING OF 240-Mev AND 270-Mev NEGATIVE PIONS ON HYDROGEN

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THE elastic and exchange scattering of π^- mesons on hydrogen at 240 and 270 Mev energy was studied, using the π^- meson beam of the Joint Institute for

Nuclear Research synchrocyclotron. The measurements were carried out by means of scintillation counters. Liquid hydrogen was used as the target.

The measured values of the differential cross sections are given in Tables I and II (in units of 10^{-27} cm²/sterad).

If we assume that only the S and P waves take part in the scattering, then the angular distributions can be written in the form

$$d\sigma/d\omega = AP_0 + BP_1 + CP_2,$$

where P_0 , P_1 , and P_2 are the Legendre polynomials. The coefficients of the expression, found by means of the least-mean-square method, are given

TABLE I

(240±7) MeV			
ϕ , c.m.s.	$(\frac{d\sigma}{d\omega})_{\pi^- \rightarrow \pi^-}$	ϕ , c.m.s.	$(\frac{d\sigma}{d\omega})_{\pi^- \rightarrow \gamma}$
39.9	1.60±0.16	19.7	9.91±1.21
58.7	1.40±0.12	38.8	7.96±0.93
76.3	1.01±0.09	57.2	6.63±0.77
97.8	0.82±0.09	74.5	4.53±0.53
117.1	0.89±0.08	95.7	4.05±0.49
138.6	1.48±0.12	114.9	3.47±0.43
158.1	1.97±0.19	136.8	3.58±0.51
		157.0	4.56±0.60

TABLE II

(270±7) Mev			
ϕ , c.m.s.	$(\frac{d\sigma}{d\omega})_{\pi^- \rightarrow \pi^-}$	ϕ , c.m.s.	$(\frac{d\sigma}{d\omega})_{\pi^- \rightarrow \gamma}$
40.6	1.40±0.13	20.0	7.78±0.94
59.6	1.17±0.11	39.6	6.19±0.73
77.3	0.83±0.08	58.1	4.90±0.59
98.8	0.60±0.06	75.5	3.42±0.41
117.9	0.77±0.08	96.8	2.52±0.32
139.3	1.09±0.10	115.9	2.31±0.30
158.4	1.56±0.16	137.6	2.65±0.36
		157.4	3.10±0.42

TABLE III

	240 Mev			270 Mev		
	$\pi^- \rightarrow \pi^-$	$\pi^- \rightarrow \gamma$	$\pi^- \rightarrow \pi^0$	$\pi^- \rightarrow \pi^-$	$\pi^- \rightarrow \gamma$	$\pi^- \rightarrow \pi^0$
A	1.28±0.046	5.12±0.22	2.56±0.11	1.04±0.039	3.73±0.18	1.86±0.09
B	0.23±0.089	2.72±0.41	1.82±0.27	0.27±0.077	2.35±0.31	1.53±0.20
C	0.93±0.12	2.30±0.50	2.18±0.47	0.79±0.094	2.01±0.36	1.81±0.32

in Table III (in units of 10^{-27} cm²/sterad).

The total cross sections for the interaction of π^- mesons with hydrogen at 240 and 270 Mev energy equal $(48.3 \pm 3.3) \times 10^{-27}$ cm², and $(36.5 \pm$

$2.4) \times 10^{-27}$ cm² respectively.

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