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[8]H. Alfvén, Cosmical Electrodynamics (Oxford University Press, London, 1950), first edition, p. 33.

[9]R. Post, University of California Radiation Laboratory Report UCRL-5044, June 27, 1958 (unpublished), p. 6.

[10]In Eq. (10) of reference 1, γ should appear as γ^{-1}. Subsequent expressions must then be reduced by a factor $(2.6)^2$.

[11]A detailed discussion of the injection factor will be given elsewhere; it allows one to obtain the latitude and angular distribution of the trapped radiation which does not concern us in this present note.

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PARITY OF THE SECOND PION RESONANCE*

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(Received July 23, 1959)

We would like to point out in this note an ambiguity in the interpretation of the experiment by Stein[1] on the polarization of the recoil proton in photoproduction in the vicinity of the second resonance: He found that at 90° in the center-of-mass system the polarization was quite large—in fact, the polarization seemed to increase to what appears to be a maximum at or near the second resonance. Following the work of Sakurai,[2] it was assumed that the polarization is the result of interference between the first and second resonance, and consequently that the second resonance has parity opposite to that of the first resonance.

However, there exists a third resonance[3,4] in the $\pi^- p$ system and this should be reflected in photoproduction.[5] The large polarization at 90° merely indicates that if the polarization is due to the interference of two levels, then these must have opposite parity (if they were to have the same parity, the polarization would be zero at 90°). But the interference may be between the second and third states with relatively little contribution from the "classical" resonance (or none at all if the first and second resonances have the same spin and parity but differ in isotopic spin). Further, the second and third resonances are slightly closer to one another than the first and second, and the third is broader than the "classical" resonance.

For example, the angular distribution and polarization data can be fitted by the following level scheme:

Photon K. E. Mev	T	J	P
300	3/2	3/2	+
700	1/2	3/2	+
1100	1/2	3/2	-

At the second resonance the angular distribution is essentially $1+(3/2)\sin^2\theta$ and polarization has a maximum at 90° in the center-of-mass system. The maximum value of polarization, as pointed out by Peierls,[6] can be 80%.

The existence of $\cos^3\theta$ and $\cos^4\theta$ terms (which in any case are not large), can be explained by the existence of resonances at energies above 1100 Mev with $J=5/2$. Alternatively assignment of the 1100-Mev resonance to a $D_{5/2}$ level also can explain the observed polarization since the maximum polarization can be 80% at 90°.

A caveat to the above alternative possibilities is that they cannot explain the sign of the $\cos^2\theta$ term in π^+ production in the region ~500 Mev where it has a small positive value.[6] However, this sign persists only in a short energy interval and may be spurious. On the other hand, if this effect is real, it constitutes evidence for the $D_{3/2}$ assignment of the second resonance on the basis of the assumptions previously indicated, i.e., only two states are significant.

In any case, it seems to us premature to make any firm parity assignment to the intermediate resonance without further investigation.

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*Work performed under the auspices of the U. S. Atomic Energy Commission.

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