must adjust the two parameters β and γ so that

$$[(F-B)/(F+B)]_f=0.40\pm0.09,$$
$$[(F-B)/(F+B)]_b=0.08\pm0.09. \quad (9)$$

This gives

$$\beta=0.22_{-0.14}^{+0.23}, \quad \gamma=0.52_{-0.18}^{+0.19}. \quad (10)$$

These values of β and γ are reasonable in the sense that the second-order terms in β and γ we have neglected in the calculation of the cross section are small and have little effect on the determination of β and γ. In terms of phase shifts, the mean value $\gamma\simeq0.52$ implies that the S-wave phase shifts should be in the neighborhood of $\pm45°$. However, this should not be taken too seriously because the uncertainty of γ is quite large. Furthermore, the background term could have been a superposition of S and D waves, etc., without altering the main features of our results.

We return now to examine the s_2 dependence of the asymmetry parameter integrated over all α. We find

$$[(F-B)/(F+B)]=[2\gamma+(m_\rho^2-s_2)\times(\sin2\delta_0+\tfrac{1}{2}\sin2\delta_2)/\Gamma]/[3(1+2\beta)], \quad (11)$$

If we take the mean values of β and γ given by (10), the asymmetry parameter is 0.24 at the ρ peak, consistent with result (c) of PRS. Furthermore, the asymmetry parameter remains positive throughout the resonance region provided $|\sin2\delta_0+\frac{1}{2}\sin2\delta_2|<1.04$. This seems to be a likely situation but, again, subject to the uncertainty in β and γ.

In conclusion, we have found that a small mixture of a tensor component in the intermediate state of the ρ-production process together with a final-state pion-pion S-wave background is sufficient to account for all the features of the small Δ events of PRS in the neighborhood of the ρ peak. The inclusion of a tensor component is suggested by the Regge pole hypothesis. However, any allowed two-particle intermediate state could have contained a $J=2$ term similar to what we have included and would also be consistent with our results. Another possible explanation of the PRS results has been suggested in connection with the ρ-ω mixing.[1] It seems to us that the ρ-ω mixing may be of secondary importance since it is of electromagnetic origin.

We wish to thank Professor Fronsdal for a very helpful and informative discussion concerning the tensor term.

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Radiative τ^+ Decay*

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A clear example of a radiative τ^+ decay, $K^+\to\pi^++\pi^++\pi^-+\gamma$, has been found in nuclear emulsion. The photon energy is 34±1 MeV.

An unusual K^+ decay event, believed to be $K^+\to\pi^++\pi^++\pi^-+\gamma$, has been found during an examination of K^+ endings for Dalitz pairs. About 30 000 K^+ endings have been scanned to date in G5 nuclear emulsion exposed to a K^+ beam at the Bevatron of the Lawrence Radiation Laboratory of the University of California. Another unusual K^+ decay, interpreted as $K^+\to\pi^++\pi^-+e^++\nu$, was found earlier as a by-product of the same scanning.[1]

The present event appears qualitatively as a "non-momentum-conserving" τ^+ decay at rest (see Fig. 1). The primary, track 4, has 3.7±0.2 times minimum grain density at 10.1-mm residual range, and is identified as a K^+ meson.[2] Tracks 1 and 2 end in π-μ decays and hence are identified as positive pion tracks. Track 3 ends in a zero-prong star, and hence is identified as a

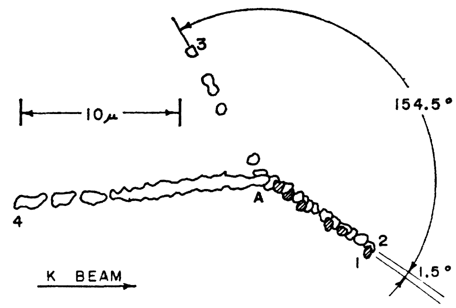

FIG. 1. Camera lucida drawing of the event. Track 4 is the primary, decaying at point A, and tracks 1 to 3 are the secondaries. The indicated angles are the projected angles in the plane of the emulsion.

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[1] E. L. Koller, S. Taylor, T. Huetter, and P. Stamer, Phys. Rev. Letters 9, 328 (1962).

[2] The range-energy and grain count-energy curves of W. H. Barkas and D. M. Young, University of California Radiation Laboratory Report UCRL-2579 (Rev.) (unpublished), have been used throughout.

TABLE I. Data on the secondary tracks. θ is the dip angle measured from the plane of the emulsion, R is the range, P is the particle identification, and T is the kinetic energy.

Track	θ (deg)	R (mm)	P	T (MeV)
1	44.5	4.0±0.3	π	13.8±0.6
2	−80.0	2.0±0.2	π	9.3±0.6
3	3.5	6.5±0.4	π	18.2±0.6
			or μ	16.2±0.6

TABLE II. Total energy E_n and momentum p_n of the neutral secondary of the possible 4-particle decay modes.

Decay mode	E_n (MeV)	p_n (MeV/c)
$K^+\rightarrow\pi^++\pi^++\pi^-+\gamma$	34±1	33±3
$K^+\rightarrow\pi^++\pi^++\mu^-+\nu$	70±1	25±3

negative pion or negative muon track. See Table I for data on tracks 1 to 3.

If the secondaries are all pions, the sum of their kinetic energies is 41.3 MeV. Comparing with the τ^+ Q value of 75.1 MeV,[3] decay in flight of a τ^+ is ruled out. Hence, at least one neutral secondary particle must be present. Assuming a single neutral secondary, the possible decay modes are listed in Table II. Also listed for each mode are the energy and momentum of the neutral particle, calculated respectively from the measured energies and vector momenta of the charged secondaries. These calculations rule out the mode $K^+\rightarrow\pi^++\pi^++\mu^-+\nu$, but the mode $K^+\rightarrow\pi^++\pi^++\pi^-+\gamma$ is a good fit. It is concluded that the event is an example of a radiative τ^+ decay with a photon of energy 34±1 MeV.

One radiative τ^+ decay with a photon energy of 30.2±1.5 MeV has been reported by Daniel and Pal[4] and two possible events have been mentioned by Bhowmik *et al.*[5,6] Dalitz has calculated the probability of radiative τ decay relative to normal τ decay as 1.2×10^{-3} and 1.2×10^{-4} for photon energies greater than 10 and 30 MeV, respectively.[7] Estimating that 2000 or 3000 τ^+ decays have been observed and subjected to varying degrees of analysis, the agreement between the experimental data and the calculations of Dalitz would not seem to be unreasonable.

We wish to thank the staff of the Bevatron for making the exposure possible. We also wish to thank our scanning staff—in particular, L. Frank who found this event.

[3] All particle masses have been taken from W. H. Barkas and A. H. Rosenfeld, University of California Radiation Laboratory Report UCRL-8030 (Rev.) (unpublished).

[4] R. Daniel and Y. Pal, Proc. Indian Acad. Sci. **A40**, 114 (1954) and Y. Pal, in *Proceedings of the Fifth Annual Rochester Conference on High-Energy Nuclear Physics* (Interscience Publishers, Inc., New York, 1955).

[5] B. Bhowmik, D. Evans, I. van Heerden, and D. Prowse, Nuovo cimento **3**, 574 (1956). See also the introductory survey by Leprince-Ringuet, *Proceedings of the Sixth Annual Rochester Conference on High-Energy Nuclear Physics* (Interscience Publishers, Inc., New York, 1956).

[6] *Note added in proof.* Four additional events have recently been reported. T. O'Halloran, G. Goldhaber, and S. Goldhaber [Bull. Am. Phys. Soc. **6**, 509 (1961)] report one event with γ energy of 32.6±1.0 MeV among ~3000 τ^+ decays, and W. Pushel, J. Tietze, D. Monti, G. Giacomelli, and A. Quareni Vignudelli, [Phys. Letters **2**, 96 (1962)] report three events with γ energies of 14.7±0.5, 10.3±0.6, and 10.5±5.2 MeV among 1389 τ^+ decays.

[7] R. H. Dalitz, Phys. Rev. **99**, 915 (1955).