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Kawarabayashi K & Suzuki M. Partially conserved axial-vector current and the decays of vector mesons. *Phys. Rev. Lett.* **16**:255-7, 1966.
[California Institute of Technology, Pasadena, CA]

A relationship between the ϱ decay constant $g_{\varrho\pi\pi}$ and the pion decay constant F_π is derived, in the limit of soft-pions, under assumption of the current algebra and the partially conserved axial-vector current. The result is in good agreement with the experimental data. [The *SCI*® indicates that this paper has been cited in over 385 publications since 1966.]

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"The work reported in this 1966 paper was done while I was a research associate at the California Institute of Technology. It would be appropriate, therefore, to briefly describe the research activity I witnessed during the years 1965-1966 at Caltech.

"In 1965, Adler[1] and, independently, Weisberger[2,3] published their famous papers on the calculation of weak axial-vector coupling renormalization. Their work immediately attracted much attention since, for the first time in the history of strong interactions, a reliable formula was given in terms of a sum rule under certain assumptions. Two hypotheses were invoked in their papers: one was the SU(3)⊗SU(3) algebra which was strongly advocated by Gell-Mann;[4] the other hypothesis was a notion of partially conserved axial-vector current—PCAC for short.

"The physics behind these two hypotheses, however, was not well understood at that time. It took a few more years for particle physicists to correctly realize that these in fact imply spontaneously broken chiral symmetry in strong interactions.

"In September of the same year, I joined, along with Mahiko Suzuki, the theory group at Caltech. Gell-Mann was then trying, in collaboration with Roger Dashen, to generalize the charge algebra of SU(3)⊗SU(3) to local current algebra. Feynman, on the other hand, was contemplating the physics of current algebra along his own way of thinking, a viewpoint which was later delivered at the 1967 Rochester conference.[5]

"One day in late November, I was discussing with Suzuki further applications of current algebra. We tried, without success, to evaluate the coupling of $\varrho \to 2\pi$. On my way home that day, I kept thinking about how to get a finite result. Suddenly, I realized that we had overlooked the simple fact that ϱ decays into two pions in the P-state. It was then easy for me to evaluate the coupling constant $g_{\varrho\pi\pi}$ in terms of F_π.

"I completed my calculation that evening and was rather disappointed with my result, which was almost in factor two disagreement with the experimental data. Actually, there was a simple mistake of factor two in my computation, which was discovered and corrected the next day in the course of another discussion with Suzuki. We were very happy then to find that the agreement of our formula with experimental data was quite reasonable. On the same day, we had long and intensive discussions with Gell-Mann and Zachariasen and also with Bjorken, who happened to be visiting Caltech. Later we found that the same result was also derived by Riazuddin and Fayyazuddin.[6] Hence, our formula has since then been called the KSRF relation.

"I think that the frequent citation of our 1966 paper owes much to its peculiar nature. Whereas the KSRF relation fit nicely with experimental data, with widespread applications, no firm foundation of its formula has been given. Our original derivation assumed, without justification, a certain 'smoothness' of a vertex function. Personally, I believe that it would come out naturally if we succeeded, based on QCD, in writing down the effective theory of pions and ϱ mesons."

1. **Adler S L.** Calculation of the axial-vector coupling constant renormalization in β decay. *Phys. Rev. Lett.* **14**:1051-5, 1965. (Cited 420 times.)
2. **Weisberger W I.** Renormalization of the weak axial-vector coupling constant. *Phys. Rev. Lett.* **14**:1047-51, 1965.
3. ----------, Citation Classic. Commentary on *Phys. Rev. Lett.* **14**:1047-51, 1965. *Current Contents/Engineering, Technology & Applied Sciences* **15**(15):14, 9 April 1984. See also: *CC/Physical, Chemical & Earth Sciences* **24**(15):14, 9 April 1984.
4. **Gell-Mann M.** The symmetry group of vector and axial vector currents. *Physics* **1**:63-75, 1964. (Cited 775 times.)
5. **Feynman R P.** Field theory as a guide to the strong interactions. (Hagen C R, Guralnik G & Mathur V S, eds.) *Proceedings of the 1967 International Conference on Particles and Fields. 28 August-1 September 1967, Rochester.* New York: Interscience, 1967. p. 111-27. (Cited 10 times.)
6. **Riazuddin & Fayyazuddin.** Algebra of current components and decay widths of ϱ and K^* mesons. *Phys. Rev.* **147**:1071-3, 1966. (Cited 280 times.)