where A_μ is a neutral axial-vector current of octet or singlet. Values of $f_{\rm P}$ can be obtained from the two-photon decay $P^0 \to \gamma\gamma$, since in the $m_P = 0$ limit the decay matrix element is determined by the Adler-Bell-Jackiw anomaly [9,10]. However, large uncertainties enter values of f_P through extrapolation to the physical mass and, in the case of η and η', through the mixing angle, too.

The CELLO Collaboration has obtained the values [11]

$$f_{\pi^0} = 119 \pm 4 \text{ MeV}$$

$$f_\eta = 133 \pm 10 \text{ MeV}$$

$$f_{\eta'} = 126 \pm 7 \text{ MeV} ,$$

while the TPC/2γ Collaboration has obtained [12]

$$f_\eta = 129 \pm 8 \text{ MeV}$$

$$f_{\eta'} = 110 \pm 7 \text{ MeV} .$$

(We have multiplied the published values by $\sqrt{2}$ to be in accord with our definition of f_P.)

References

1. S. Berman, Phys. Rev. Lett. **1**, 468 (1958).
2. T. Kinoshita, Phys. Rev. Lett. **2**, 477 (1959).
3. A. Sirlin, Phys. Rev. **D5**, 436 (1972).
4. M.V. Terent'ev, Yad. Fiz. **18**, 870 (1973) [Sov. J. Nucl. Phys. **18**, 449 (1974)].
5. T. Goldman and W.J. Wilson, Phys. Rev. **D15**, 709 (1977).
6. W.J. Marciano and A. Sirlin, Phys. Rev. Lett. **71**, 3629 (1993).
7. S. Aoki *et al.*, Prog. Theor. Phys. **89**, 131 (1993).
8. D. Acosta *et al.*, CLNS 93/1238, CLEO-93-14 (to be published).
9. S.L. Adler, Phys. Rev. **177**, 2426 (1969).
10. J.S. Bell and R. Jackiw, Nuovo Cimento **60A**, 46 (1969).
11. H.-J. Behrend *et al.*, Z. Phys. **C49**, 401 (1991).
12. H. Aihara *et al.*, Phys. Rev. Lett. **64**, 172 (1990).

$\pi^{\pm}$

$I^G(J^P) = 1^-(0^-)$

We have omitted some results that have been superseded by later experiments. The omitted results may be found in our 1988 edition Physics Letters **B204** (1988).

NOTE ON THE CHARGED PION MASS*

The charged pion mass we give in this edition is three (old) standard deviations higher than the one we gave in our 1992 edition. This Note explains why.

Precise determinations of the charged pion mass come from two kinds of experiments: (a) measurement of the momentum of the muon in $\pi^+ \to \mu^+\nu_\mu$ decay at rest, assuming $m_{\nu_\mu} = 0$; and (b) measurement of x-ray wavelengths of transitions in pionic atoms. Technique (b) is free of assumptions about m_{ν_μ}.

For technique (b), the pionic-atom transition is chosen to achieve maximal spectrometer performance and minimal theoretical uncertainty. Experimenters have used the wavelengths of the $4f$-$3d$ transition in magnesium and the $5f$-$4d$ transition in titanium and phosphorous. Screening by K-shell ($1s$) electrons is significant, and the observed line profile is a blend of lines from atoms with 0, 1, and 2 K electrons present during the transition.

The best pionic-atom measurement of the pion mass in our recent editions was that of JECKELMANN 86B. Their observed line profile was measurably broadened by contributions from atoms having different $1s$ populations. Fits to the line profile gave two equally good solutions: One, with probabilities of about 27%, 70%, and 3% for 0, 1, or 2 K-shell electrons; and another, in which the state with two K electrons dominated. Using the ratio of $4f$-$3d$ and $3d$-$2p$ intensities and other experimental information, JECKELMANN 86B rejected the second solution.

Recent measurements now yield a smaller value for the intensity ratio [1], so that in a reanalysis of the data JECKELMANN 94 now consider that the grounds for rejecting the second solution are marginal. The new analysis is improved in other respects as well, including use of an improved wavelength calibration standard. The situation is now considered to be ambiguous, with both of the following solutions given equal footing:

$$\text{Solution A:} \quad m_{\pi^-} = 139.56782 \pm 0.00037 \text{ MeV}$$
$$\text{Solution B:} \quad m_{\pi^-} = 139.56995 \pm 0.00035 \text{ MeV}$$