Erratum: Branching Ratio and Asymmetry for $\Xi^0 \to \Lambda\gamma$ [Phys. Rev. Lett. 64, 843 (1990)]

C. James, K. Heller, P. Border, J. Dworkin, O. E. Overseth, R. Rameika, G. Valenti, R. Handler, B. Lundberg, L. Pondrom, M. Sheaff, C. Wilkinson, A. Beretvas, P. Cushman, T. Devlin, K. B. Luk, G. B. Thomson, and R. Whitman

(Received 14 August 2002; published 26 September 2002)

DOI: 10.1103/PhysRevLett.89.169901 PACS numbers: 13.40.Hq, 14.20.Jn, 99.10.+g

We erred in sign of the asymmetry parameter for the weak radiative decay $\Xi^0 \to \Lambda\gamma$. We measured this by determining the longitudinal polarization of the daughter Λ in its decay $\Lambda \to p\pi^-$. The correct result for the product of the asymmetry parameters is $\alpha(\Xi^0 \to \Lambda\gamma)\alpha(\Lambda) = -0.27 \pm 0.28$. Division by $\alpha(\Lambda) = 0.642 \pm 0.013$ [1] gives $\alpha(\Xi^0 \to \Lambda\gamma) = -0.43 \pm 0.44$. This also changes one of our conclusions. The predictions of Ref. [2] are in good agreement with both our original branching fraction measurement and corrected asymmetry measurement.

Other results reported in the paper are unaffected by this error.

We have been unable to find in the published literature a clear presentation of the sign conventions affecting this measurement, and we present them here. An early definition of the sign conventions for the asymmetry parameters was published for both hadronic decays and weak radiative decays [3]. The convention was reversed a few years later for hadronic decays but not for weak radiative decays [4], and this is the convention followed since that time. The angular distribution can be written $N(\theta) \sim 1 + \alpha P \cos(\theta)$ for both hadronic ($B \to B'\pi$) and weak radiative ($B \to B'\gamma$) decays of baryons. In both cases, θ is the angle between the polarization, P, of the parent baryon B and the momentum of the daughter baryon B'.

In our measurements, the parent polarization is zero, and we determine α through a measurement of the longitudinal polarization of the daughter baryon.

For ($B \to B'\pi$) the spin transition is $\frac{1}{2} \to \frac{1}{2} + 0$. The longitudinal polarization of the daughter Λ is $\alpha(\Xi^0)$. The angular distribution of the proton in the subsequent nonleptonic decay of the daughter Λ in its rest frame is

$$dN/d[\cos(\theta_\Lambda)] = \tfrac{1}{2}[1 + \alpha(\Lambda)\alpha(\Xi^0)\cos(\theta_\Lambda)]. \quad (1)$$

Equation (1) of our original paper is correct for this process.

For ($B \to B'\gamma$) the spin transition is $\frac{1}{2} \to \frac{1}{2} + 1$. In order to conserve total angular momentum, the spin of B' here must be opposite that of the purely hadronic process; i.e., the longitudinal polarization of the daughter Λ is $-\alpha(\Xi^0 \to \Lambda\gamma)$. The angular distribution of the proton in the subsequent nonleptonic decay of the daughter Λ in its rest frame is

$$dN/D[\cos(\theta_\Lambda)] = \tfrac{1}{2}[1 - \alpha(\Lambda)\alpha(\Xi^0 \to \Lambda\gamma)\cos(\theta_\Lambda)].$$

Equation (1) of our original paper is *not* correct for the weak radiative transition.

This issue was brought to our attention by Erik Ramberg based on studies done by him, Earl Swallow, and Steve Bright of the KTEV Hyperon Group.

[1] The Particle Data Group, K. Hagiwara *et al.*, Phys. Rev. D **66**, 010001 (2002).
[2] A. N. Kamal and Ramesh C. Verma, Phys. Rev. D **26**, 190 (1982) (Ref. [24] in our original paper).
[3] R.E. Behrends, Phys. Rev. **111**, 1691 (1958).
[4] Robert D. Tripp, Mason B. Watson, and Massimiliano Ferro-Luzzi, Phys. Rev. Lett. **9**, 66 (1962); J. Cronin and O. Overseth, Phys. Rev. **129**, 1795 (1963).

 0031-9007/02/89(16)/169901(1)$20.00