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Reanalysis of weak radiative hyperon decays in combined symmetry and vector-dominance approach

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Following recent measurements of the $\Xi^0 \to \Lambda\gamma$ and $\Xi^0 \to \Sigma^0\gamma$ decays we carry out a reanalysis of the combined symmetry and vector-dominance approach to weak radiative hyperon decays. The parity-conserving amplitudes are obtained from those of nonleptonic hyperon decays in two ways: (1) in the pole model and (2) by assuming that the parity-conserving part of the weak Hamiltonian $H_w^{\rm PC}$ transforms as λ_7. Both are considered since, although the two frameworks are theoretically close, their numerical predictions are fairly different. Nonleptonic hyperon decays also fix two of three parameters needed to describe parity-violating amplitudes. The third parameter is then determined from fits to all the branching ratios and asymmetries of weak radiative hyperon decays measured so far. The fits strongly favor a substantial positive asymmetry α for the $\Xi^- \to \Sigma^-\gamma$ decay ($\alpha \sim +0.2$ to $+0.6$). The largest value ($+0.6$) is predicted by the best (and perfect: $\chi^2/N_{\rm DF} = 7.9/7$) fit obtained with $H_w^{\rm PC} \sim \lambda_7$ and photon-baryon coupling determined by experimental values of baryon magnetic moments.

I. INTRODUCTION

Weak radiative hyperon decays have attracted considerable attention from theorists in the past twenty years. Despite all the efforts a successful theoretical description of the slowly growing body of experimental data has been missing so far. On the purely theoretical side the problem was further complicated by the existence of two "symmetry predictions:" one following from the Hara theorem and the other given by the quark model. The origin of the violation of the Hara theorem in the quark model has been clarified in a recent paper [1] where a combined $SU(6)_W$ and vector-dominance approach was employed to give a parameter-free prediction for both branching ratios and asymmetries. (We refer the reader to Ref. [1] for a condensed list of references to various earlier papers on the subject.)

Recently, decay parameters for the $\Xi^0 \to \Lambda\gamma$ and $\Xi^0 \to \Sigma^0\gamma$ processes have been measured [2,3]. Although some of the predictions of Ref. [1] such as the branching ratio for $\Xi^0 \to \Sigma^0\gamma$ or the sign of asymmetry for $\Xi^0 \to \Lambda\gamma$ decays have been confirmed, the overall description of all the available data (in particular the branching ratios for the $\Xi^0 \to \Lambda\gamma$ and $\Lambda \to n\gamma$ decays) is still not satisfactory. The present paper intends to remedy this situation. We find it necessary to depart from the idealized calculation of Ref. [1] in two ways.

The first and major departure consists in not relying upon theoretical calculation of the only symmetry-undetermined parameter of Ref. [1] any longer. This parameter enters the description of parity-violating (PV) amplitudes. In the present paper it is considered free. Apart from this change the present treatment of PV amplitudes follows precisely that of Ref. [1].

The second and less important departure is based on the observation that the additive model of photon-baryon coupling used in Ref. [1] successfully predicts the overall pattern of baryon magnetic moments, but fails when applied to such details as their differences which exhibit peculiar nonadditive SU(3)-breaking properties. Since it is the differences of baryon magnetic moments that enter into the description of parity-conserving (PC) amplitudes in pole models, a fully successful description of weak radiative hyperon decays should take such nonadditivity into account.

In fact, in the baryon pole model (e.g., Ref. [4]) the relevant photon-baryon couplings are expressed in terms of experimental values of baryon magnetic moments (or rather their anomalous parts) so that the nonadditives in question are automatically included. However, the model of Ref. [1] differs from the standard pole model not only with respect to photon-baryon coupling but also in another way: in the former the weak Hamiltonian transforms like λ_7; in the latter this symmetry assumption is not satisfied. As a result, the two models lead to PC vector-meson emission amplitudes that may differ numerically by 30%–50%. Therefore, determination of weak radiative PC amplitudes from those of nonleptonic hyperon decays is not as reliable as one might naively expect. Consequently, in the present paper we consider both the pole model and the λ_7 framework. To study the effect of nonadditivities inherent in baryon magnetic moments we perform fits of the symmetry-undetermined parameter in two versions of the λ_7 approach: with additive (as in [1]) and nonadditive vector-meson couplings to baryons.

All three versions of the fit choose *the same* value of the symmetry-undetermined parameter and predict a *positive* sign of the $\Xi^- \to \Sigma^-\gamma$ asymmetry. Its size depends on which version of the description of PC amplitudes is chosen. The best (and perfect $\chi^2/N_{\rm DF} = 7.9/7$) fit to all branching ratios and asymmetries is obtained in the third version ($H_w^{\rm PC} \sim \lambda_7$ and nonadditive photon couplings) which predicts significant size for the $\Xi^- \to \Sigma^-\gamma$ asymmetry [$\alpha(\Xi^- \to \Sigma^-\gamma) \sim +0.6$].

The paper is organized as follows. In the next section we recall vector-dominance model (VDM) formulas for PV amplitudes and discuss various theoretical estimates of the only symmetry-undetermined parameter. In Sec. III we discuss the three symmetry-based evaluations of the PC amplitudes. Sec. IV presents results of the fits, discussion, and conclusions.

II. PARITY-VIOLATING AMPLITUDES

Parity-violating amplitudes for weak radiative hyperon decays are connected through $SU(6)_W$ symmetry with those of nonleptonic hyperon decays if the vector-dominance assumption is made. Under the standard VDM assumption that the photon couples as the linear combination of vector mesons

$$\gamma=\frac{1}{\sqrt{2}}\rho^0+\frac{1}{3\sqrt{2}}\omega^0-\frac{1}{3}\epsilon\phi \tag{2.1}$$

[where $\epsilon=\frac{2}{3}$ is the additive SU(3)-breaking parameter] the resulting PV weak radiative amplitudes have been calculated in Ref. [1]. They are given up to an overall VDM factor $e/g(e^2/4\pi=1/137, g=5.0)$ by

$$\begin{aligned}
A(\Sigma^+\to p\gamma)&=-\frac{5+\epsilon}{9\sqrt{2}}b+\frac{1}{\sqrt{2}}d\ ,\\
A(\Sigma^0\to n\gamma)&=-\frac{1}{18}(1-\epsilon)b-\frac{1}{2}d\ ,\\
A(\Lambda\to n\gamma)&=\frac{3+\epsilon}{6\sqrt{3}}b-\frac{3\sqrt{3}}{2}d\ ,\\
A(\Xi^0\to\Lambda\gamma)&=-\frac{2+\epsilon}{9\sqrt{3}}b+\frac{\sqrt{3}}{2}d\ ,\\
A(\Xi^0\to\Sigma^0\gamma)&=\frac{1}{3}b-\frac{5}{2}d\ ,\\
A(\Xi^-\to\Sigma^-\gamma)&=\frac{5}{\sqrt{2}}d\ ,
\end{aligned} \tag{2.2}$$

with $d=[(1+\epsilon)c-8a]/27$.

In Eqs. (2.2) a,b,c are three real parameters of which two (b,c) have been determined by symmetry from nonleptonic hyperon decays in [1]:

$$\begin{aligned} b&=-5.0\ ,\\ c&=12.0 \end{aligned} \tag{2.3}$$

(in units of 10^{-7}), which translates into $f/d=-1+2c/3b=-2.6$.

The value of a (which corresponds to factorization contribution [5]) is not accessible in this way. In Ref. [1] we employed a plausible theoretical estimate of McKellar and Pick [6], which, when taken together with the constraints of the colored quark model (see [5]), enabled us to fix

$$a=c/12=1,\quad \text{i.e.,}\quad d=0.44. \tag{2.4a}$$

One may wonder whether this theoretical determination of a is reliable. In this connection let us recall that the simple quark model framework [which is used in the derivation of relation (2.4a)] predicts $c=0$ in total disagreement with the data. The value $c=12$ can only be accommodated when additional effects, such as for instance the sea contribution [7], are taken into account. Thus, the prediction of the simple quark model may be considered unreliable. Other different theoretical assumptions lead to widely scattered values of a. McKellar and Pick [8], under the general assumption of no 27-plet contribution to H_w^{PC}, give several predictions corresponding to various supplementary assumptions. If one takes "strong octet dominance" (i.e., no singlet contribution to H_w^{PC}) as such an additional assumption one obtains

$$a=c=12,\quad \text{i.e.,}\quad d=-2.8\ . \tag{2.4b}$$

If one accepts the Goldberger-Treiman-like result [6] one gets

$$a=-c/4=-3,\quad \text{i.e.,}\quad d=1.6\ . \tag{2.4c}$$

Other assumptions discussed in [8] give yet different values for a (d).

Let us also note that, in a more recent paper of Donoghue, Desplanques, and Holstein [5,9], the value

$$a=-0.8,\quad \text{i.e.,}\quad d=1.0\ , \tag{2.4d}$$

is advocated as the "best" guess.

Since the range of theoretical predictions for a (d) given in (2.4) is very wide we shall simply consider a the free parameter of the model. One should point out here, however, that the measured value of the $\Xi^-\to\Sigma^-\gamma$ branching ratio alone suffices to improve the restriction $|d|<0.5$ to 0.6 [for $d=0.55$ the $\Xi^-\to\Sigma^-\gamma$ branching ratio is 0.56×10^{-3} which is already three standard deviations from the experimental number of $(0.23\pm0.1)\times10^{-3}$]. Out of the various theoretical estimates (2.4) only (2.4a) of Ref. [1] satisfies this restriction.

III. PARITY-CONSERVING AMPLITUDES

The weak PC photon emission amplitudes are often described in the baryon pole model (e.g., [4]). In this model vector dominance gives the formulas (up to e/g VDM factor)

$$\begin{aligned}
B(\Sigma^+\to p\gamma)&=\sqrt{2}\left[\frac{f}{d}-1\right](\mu_{\Sigma^+}-\mu_p)\frac{M}{\Sigma-N}\ ,\\
B(\Sigma^0\to n\gamma)&=-\left[\frac{f}{d}-1\right](\mu_{\Sigma^0}-\mu_n)\frac{M}{\Sigma-N}\\
&\quad+\frac{1}{\sqrt{3}}\left[3\frac{f}{d}+1\right]\mu_{\Sigma\Lambda}\frac{M}{\Lambda-N}\ ,\\
B(\Lambda\to n\gamma)&=\frac{1}{\sqrt{3}}\left[3\frac{f}{d}+1\right](\mu_\Lambda-\mu_n)\frac{M}{\Lambda-N}\\
&\quad-\left[\frac{f}{d}-1\right]\mu_{\Sigma\Lambda}\frac{M}{\Sigma-N}\ ,\\
B(\Xi^0\to\Lambda\gamma)&=-\frac{1}{\sqrt{3}}\left[3\frac{f}{d}-1\right](\mu_{\Xi^0}-\mu_\Lambda)\frac{M}{\Xi-\Lambda}\\
&\quad-\left[\frac{f}{d}+1\right]\mu_{\Sigma\Lambda}\frac{M}{\Xi-\Sigma}\ ,
\end{aligned} \tag{3.1}$$

$$B(\Xi^0\to\Sigma^0\gamma)=\left[\frac{f}{d}+1\right](\mu_{\Xi^0}-\mu_{\Sigma^0})\frac{M}{\Xi-\Sigma}+\frac{1}{\sqrt{3}}\left[3\frac{f}{d}-1\right]\mu_{\Sigma\Lambda}\frac{M}{\Xi-\Lambda}\ ,$$

$$B(\Xi^-\to\Sigma^-\gamma)=-\sqrt{2}\left[\frac{f}{d}+1\right](\mu_{\Xi^-}-\mu_{\Sigma^-})\frac{M}{\Xi-\Sigma}\ .$$

In obtaining Eqs. (3.1) we have replaced the vector-meson couplings from Table III of Ref. [1] by the magnetic moments they ultimately represent according to the relations of the standard model:

$$\begin{aligned}&(\mu_{\Sigma^+}-\mu_p)/\mu=(1-\epsilon)S/3\ ,\\&(\mu_{\Sigma^0}-\mu_n)/\mu=D+(1-\epsilon)S/3\ ,\\&\mu_{\Sigma\Lambda}/\mu=D/\sqrt{3}\ ,\\&(\mu_\Lambda-\mu_n)/\mu=-(4\epsilon-7)D/9+(1-\epsilon)S/3\ ,\\&(\mu_{\Xi^0}-\mu_\Lambda)/\mu=-D/3+(1-\epsilon)(3F-D)/9\ ,\\&(\mu_{\Xi^0}-\mu_{\Sigma^0})/\mu=-D+(1-\epsilon)(F+D)/3\ ,\\&(\mu_{\Xi^-}-\mu_{\Sigma^-})/\mu=(1-\epsilon)(F+D)/3\ ,\end{aligned}\tag{3.2}$$

with $S=F-D$.

In terms of parameters used in [1] we have $M=C(\Xi-N)/(2\mu D)=-2.83\times10^{-4}$ MeV, where $(\Xi-N)/2=190$ MeV is the average spacing in the octet, $\mu=2.7$ ($\approx\mu_p$) is the scale of baryon magnetic moments and we used $C/D=-40.2$ or $C=-33$ (in units of 10^{-7}) which describes nonleptonic hyperon decays slightly better than $C=-30$ of Ref. [1].

Asymmetry parameters ($Y_i\to Y_f\gamma$) are then calculated from [1]

$$\alpha=\frac{2A\bar{B}}{A^2+\bar{B}^2}\ ,\tag{3.3}$$

where

$$\bar{B}=\frac{m_i-m_f}{m_i+m_f}B\ ,$$

with A from (2.2) and B from (3.1).

The branching ratios are given by

$$R(Y_i\to Y_f\gamma)=\left[\frac{e}{g}\right]^2\frac{1}{4\pi m_i}k_\gamma(E_f+m_f)(A^2+\bar{B}^2)\Big/\sum_f\Gamma(Y_i\to Y_f\pi)\ .\tag{3.4}$$

The idealized VDM calculation of Ref. [1] corresponds to making the following two assumptions in (3.1): (1) equal splitting for the octet baryons ($=190$ MeV) and (2) standard relations (3.2) for baryon magnetic moments.

On the other hand, in the baryon pole model [4] both these assumptions do not hold: instead of the "ideal," the experimental values for both baryon mass differences and magnetic moments are used. Because of a difference in normalization, formulas (3.1)–(3.4) reproduce exactly the pole-model contribution to asymmetries and branching ratios of weak radiative hyperon decays (e.g., [4]) if each VDM expression in (3.1) is multiplied by a $(m_i+m_f)/(2m_N)$ factor. The appearance of such SU(3)-symmetry-breaking factors reflects our lack of understanding of how SU(3) breaking in vertices should be introduced. Clearly, for charged hyperon decays ($\Sigma^+\to p\gamma$ and $\Xi^-\to\Sigma^-\gamma$) only the anomalous parts of baryon magnetic moments are to be used in the pole model.

Although constructed by analogy with the pole model for PC amplitudes of nonleptonic hyperon decays, the pole model of [4] violates the SU(2)$_W$ symmetry between PC amplitudes for π and transverse ρ emission amplitudes. This may be seen on the example of the Lee-Sugawara relation

$$\sqrt{3}\Sigma_0^+=\Lambda_-^0+2\Xi_-^-\ .\tag{3.5}$$

Experimental data satisfy this relation fairly well, i.e.,

$$46.2=52.3\ \ (\text{in units of }10^{-7})\tag{3.6a}$$

and so does the pole model for nonleptonic hyperon decays [10]:

$$55.9=59.9\ .\tag{3.6b}$$

However, the corresponding relation for transverse vector mesons,

$$\sqrt{3}\,{}_\rho\Sigma_0^+={}_\rho\Lambda_-^0+2\,{}_\rho\Xi_-^-\tag{3.7}$$

(the subscript "ρ" stands for emission of ρ instead of pion), is badly violated in the baryon pole model if one puts $f/d=-1.18$ and $F/D=0.56$ as determined for nonleptonic hyperon decays [10,11]. Table III of Ref. [1] gives then, for the model of Ref. [4],

$$41.7=69.4\ \ (\text{in units of }10^{-7})\ ,\tag{3.8a}$$

which is even worse when the $(m_i+m_f)/(2m_N)$ factor is included:

$$47.1=86.3\tag{3.8b}$$

to be compared with direct SU(2)$_W$ prediction from (3.6b):

$$65.3=74.0\ .\tag{3.8c}$$

In fact, in the baryon pole model of nonleptonic hyperon decays [10] the Lee-Sugawara relation does not follow from an underlying symmetry of the model. This may be seen by considering the limit of large average octet mass in PC amplitudes of Ref. [10] while, at the same time, keeping SU(3)-symmetry-breaking mass splittings constant. In this limit all $(m_3+m_4)/(m_1+m_2)$ factors become identical and the disagreement (3.8) is reproduced.

The above considerations of $SU(2)_W$ symmetry indicate therefore that the (standard) baryon pole model for PC amplitudes of weak radiative hyperon decays might not be that reliable after all. In particular, the case should be studied in which vector-meson emission amplitudes do satisfy the Lee-Sugawara relation. For PC amplitudes this relation is satisfied if H_w^{PC} transforms like λ_7. This, in turn, corresponds to taking equal mass splitting in Eq. (3.1) as has been done in Ref. [1].

Although considerations of symmetry do support the assumption $H_w^{PC}\sim\lambda_7$ made in [1], they also question another assumption of that paper, namely that the additive quark model provides a satisfactory approximation for the description of baryon magnetic moments. In fact, it is well known that baryon magnetic moments exhibit peculiar nonadditive properties [12,13]. These nonadditives are even more pronounced for differences of magnetic moments and especially for $\mu_{\Sigma^+}-\mu_p$ difference. Since it is the differences of magnetic moments that enter into the description of PC amplitudes (3.1) one may expect strong nonadditive effects in PC amplitudes of weak radiative hyperon decays. In Table I we give present experimental data on relevant differences of baryon magnetic moments and we compare them with the predictions of the standard model. For simplicity we have accepted $\mu_{\Sigma^+}=2.43$, i.e., the average value of two (conflicting) measurements of Σ^+ magnetic moment.

From Table I and Eqs. (3.1) it follows that the $\Sigma^+\to p\gamma$ PC amplitude calculated in [1] might be underestimated by a factor of 3. Also, Ref. [1] might have miscalculated the $\Xi^0\to\Lambda\gamma$ PC amplitude.

Having all the above uncertainties in mind we define three models of PC amplitudes as follows.

Model A. The baryon pole model of Ref. [4] (with $f/d=-1.18$, which uses experimental values of baryon magnetic moments but does not satisfy the π-ρ symmetry expected in $SU(2)_W$.

Model B. The model of Ref. [1] with $H_w^{PC}\sim\lambda_7$ ($f/d=-1.9$, $F/D=0.66$), in which π-ρ symmetry is satisfied but an oversimplified additive model of baryon magnetic moments is used.

Model C. The model of Ref. [1] with $H_w^{PC}\sim\lambda_7$ ($f/d=-1.9$, modified by the replacement of the additive photon-baryon coupling by the experimental magnetic moments, which therefore both respects π-ρ symmetry and takes care of nonadditives in baryon magnetic moments.

Note that in models B,C the deviation of f/d from -1 is much larger than that in model A. As a result, the size of the asymmetry parameter in the $\Xi^-\to\Sigma^-\gamma$ decay (to be obtained from fits in the next section) depends significantly on the model used.

TABLE I. The differences of baryon magnetic moments: comparison of experiment with additive-quark-model predictions.

Magnetic moments	Experiments	Additive quark model
$(\mu_{\Sigma^+}-\mu_p)/\mu$	-0.133 ± 0.02	-0.037
$(\mu_{\Sigma^0}-\mu_n)/\mu$	0.94 ± 0.015	0.96
$\mu_{\Sigma\Lambda}/\mu$	0.60 ± 0.03	0.58
$(\mu_\Lambda-\mu_n)/\mu$	0.48	0.44
$(\mu_{\Xi^0}-\mu_\Lambda)/\mu$	-0.21 ± 0.01	-0.30
$(\mu_{\Xi^0}-\mu_{\Sigma^0})/\mu$	-0.70 ± 0.02	-0.82
$(\mu_{\Xi^-}-\mu_{\Sigma^-})/\mu$	0.17 ± 0.02	0.185

IV. RESULTS OF FITS AND DISCUSSION

The fits were performed with the experimental data on asymmetries and branching ratios as gathered in Table II. In the case of measurements for which both the systematic and statistical errors were given we added them in quadrature. In order not to exaggerate the influence of some data upon the results of fits (we have in mind especially the sensitivity of the PC $\Sigma^+\to p\gamma$ amplitude to the precise value of μ_{Σ^+} used) we decided to keep experimental errors to be at least 15%. In this way the experimental error assigned to $\Sigma^+\to p\gamma$ branching ratio is 0.19 and that for $\Xi^0\to\Sigma^0\gamma$ is 0.52 as indicated in parentheses in Table II. In addition to the fitted values of asymmetries and branching ratios we give in Table II their individual contributions to χ^2 (in parentheses). Dependence of χ^2 upon the value of d is shown in Fig. 1.

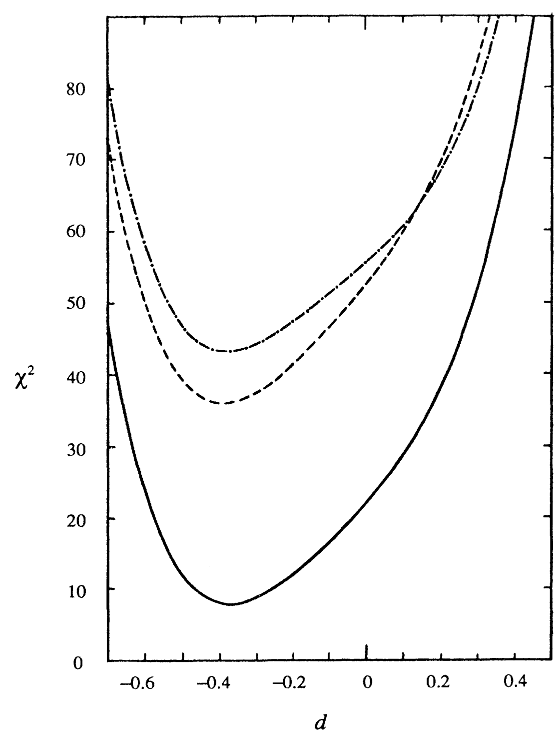

FIG. 1. Dependence of χ^2 on d: dashed line, model A; dot-dashed line, model B; solid line, model C.

TABLE II. Decay parameters of weak radiative hyperon decays.

Process	Model A (pole model)	Model B (λ_7, Ref. [1])	Model C (λ_7, expt. magn. mom.)	Experiment	Two-parameter fit ($\mu_{\Sigma^+}=2.48$, $C_{\rm fit}=-36$)
	Branching ratios in units of 10^{-3} (contribution to χ^2)				
$\Sigma^+\to p\gamma$	0.54 (13)	0.53 (14)	1.33 (0.2)	1.24 ± 0.08 (±0.19)[a]	1.26
$\Lambda\to n\gamma$	0.40 (3.5)	0.74 (0.7)	0.86 (0.2)	1.02 ± 0.33	1.00
$\Xi^0\to\Lambda\gamma$	1.63 (13)	1.47 (6.5)	0.86 (1.6)	1.06 ± 0.16	1.03
$\Xi^0\to\Sigma^0\gamma$	3.22 (0.4)	1.77 (12)	3.17 (0.6)	3.56 ± 0.43 (±0.52)[a]	3.83 (0.2)
$\Xi^-\to\Sigma^-\gamma$	0.26	0.27 (0.2)	0.27 (0.2)	0.23 ± 0.1	0.29 (0.3)
	Asymmetries				
$\Sigma^+\to p\gamma$	-0.63 (2.5)	-0.55 (4.5)	-0.96 (1)	-0.83 ± 0.13	-0.97 (1)
$\Sigma^0\to n\gamma$	-0.17	-0.12	-0.11		-0.09
$\Lambda\to n\gamma$	1.00	0.87	0.83		0.76
$\Xi^0\to\Lambda\gamma$	0.53 (0.1)	0.57 (0.1)	0.71 (0.4)	0.43 ± 0.44	0.65 (0.3)
$\Xi^0\to\Sigma^0\gamma$	-0.40 (3.6)	-0.54 (5)	-0.41 (3.6)	0.20 ± 0.32	-0.36 (3.1)
$\Sigma^-\to\Sigma^-\gamma$	0.19	0.52	0.59		0.63
$\chi^2/N_{\rm DF}$	36/7	43/7	7.9/7		5.3/6
$d_{\rm fit}$	-0.39	-0.38	-0.37		-0.39

[a] Error used in fits.

From Fig. 1 and Table II it is seen that models A and B describe the data more or less equally well, while model C is very successful. In all three fits the minimum value of χ^2 is achieved for $d=-0.38$ ($a=3.8$). The increase in χ^2 for d growing from its fitted value comes first from the discrepancy in the $\Xi^0\to\Sigma^0\gamma$ asymmetry. For $d>0.2$ it is the discrepancy in $\Lambda\to n\gamma$ branching ratio that becomes dominant.

We have carried out also a two-parameter fit within the framework of model C. In this fit the normalization of the PC vector emission amplitude was let free and the value $\mu_{\Sigma^+}=2.48$ was used. This fit gives $C=-36$ instead of $C=-33$ and achieves an even better $\chi^2/N_{\rm DF}$. Clearly, model C seems to have just the right ingredients needed to describe weak radiative hyperon decays properly. In model C the biggest contribution to χ^2 (at its minimum) comes from the asymmetry of the $\Xi^0\to\Sigma^0\gamma$ decay. Not only models considered in this paper, but virtually all models, predict a negative sign for this asymmetry [14]. Our theoretical value is two standard deviations from the recently measured experimental number [2]. The quality of our description of the remaining experimental numbers is so good that we think the measurement of $\Xi^0\to\Sigma^0\gamma$ decay parameters should be redone.

Our best fit predicts significant positive asymmetry for the $\Xi^-\to\Sigma^-\gamma$ decay, which should be in the region of $+0.5$ to $+0.7$. Should this prediction be borne out by the data we will be able to conclude that weak radiative hyperon decays do not present insurmountable difficulties and can be well explained in a combined symmetry and vector-dominance approach. A confirmation of our prediction for the $\Xi^-\to\Sigma^-\gamma$ asymmetry would explicitly demonstrate the power of symmetry-based considerations.

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[14] The positive sign of $\Xi^0 \rightarrow \Sigma^0 \gamma$ asymmetry reported in Table IV of R. C. Verma and A. Sharma, Phys. Rev. D **38**, 1443 (1988), is in disagreement with the negative sign that can be deduced from theoretical formulas of Table I of the same paper.