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SU(3) symmetry and its breaking effects in semileptonic heavy baryon decays

We employ the flavor SU(3) symmetry to analyze semileptonic decays of anti-triplet charmed baryons ($\Lambda_c^+, \Xi_c^{+,0}$) and find that the experimental data on $calB(\Lambda_c \to \Lambda \ell^+ \nu_\ell)$ implies $\mathcal{B}(\Xi_c^0 \to \Xi^- e^+ \nu_e) = (4.10 \pm 0.46)\%$ and $\mathcal{B}(\Xi_c^0 \to \Xi^- \mu^+ \nu_\mu) = (3.98 \pm 0.57)\%$. When this prediction is confronted with recent experimental results from Belle collaboration $\mathcal{B}(\Xi_c^0 \to \Xi^- e^+ \nu_e) = 1.31(04 \pm 07 \pm 38)\%$ and $\mathcal{B}(\Xi_c^0 \to \Xi^- \mu^+ \nu_\mu) = 1.27(06 \pm 10 \pm 37)\%$, it is found that the SU(3) symmetry is severely broken. We then consider the generic SU(3) breaking effects in these decays and find that the data can be accommodated in different scenarios but the breaking effects are inevitably large. In some interesting scenarios, we also explore the testable implications in these scenarios which can be tested with more data become available. Similar analyses are carried out for semileptonic anti-triplet beauty baryons to octet baryons and anti-triplet charmed baryons. The validity of SU(3) for these decays can also be examined when data become available.

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