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Three methods to search for the two $\Xi(1820)$ states

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The chiral unitary approach produces two states from the pseudoscalar-baryon decuplet interaction in the region of the $\Xi(1820)$. A recent BESIII experiment on the $\Psi(3868) \to \bar{\Xi} K^- \Lambda$ showed a clean peak that had an abnormally large width and was interpreted in [1] in terms of the two $\Xi(1820)$. In view of this, we propose to look at the $\Omega_c \to \pi^+ \, (\pi^0, \, \eta) \, \pi \Xi^*$ reaction [2], where the $\pi \Xi^*$ invariant mass shows an interference pattern of the two resonances. A third reaction $\Psi(3686) \to^{+} \bar{K}^{0*-}$ [3] looks at the $\bar{K}^{0*}$ invariant mass distribution, where due to phase space restrictions, the lower mass $\Xi(1820)$ is suppressed and the higher mass around 1875 MeV with a larger width shows up clearly.

[1] R.~Molina, W.~H.~Liang, C.~W.~Xiao, Z.~F.~Sun and E.~Oset,
%"Two states for the $\Xi(1820)$ resonance,"
[arXiv:2309.03618 [hep-ph]].

[2] W.~H.~Liang, R.~Molina and E.~Oset,
%"The $\Omega_c \to \pi^+ \, (\pi^0, \, \eta) \, \pi \Xi^*$ reactions and the two $\Xi(1820)$ states,"
[arXiv:2404.18882 [hep-ph]].

[3] Man-Yu Duan, Jing Song, Wei-Hong Liang and E. Oset

Searching for the two poles of the Ξ(1820) in the $\Psi(3686) \to^{+} \bar{K}^{0*-}$ decay

to be submitted.

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