102. Σ(1670) Region

102.1. Production experiments

The measured $\Sigma\pi/\Sigma\pi\pi$ branching ratio for the Σ(1670) produced in the reaction $K^- p \to \pi^- \Sigma(1670)^+$ is strongly dependent on momentum transfer. This was first discovered by EBERHARD 69 [1], who suggested that there exist two Σ resonances with the same mass and quantum numbers: one with a large $\Sigma\pi\pi$ (mainly $\Lambda(1405)\pi$) branching fraction produced peripherally, and the other with a large $\Sigma\pi$ branching fraction produced at larger angles. The experimental results have been confirmed by AGUILAR-BENITEZ 70 [2], APSELL 74 [3], ESTES 74 [4], and TIMMERMANS 76 [5]. If, in fact, there are two resonances, the most likely quantum numbers for both the $\Sigma\pi$ and the $\Lambda(1405)\pi$ states are D_{13}. There is also possibly a third Σ in this region, the Σ(1690) in the Listings, the main evidence for which is a large $\Lambda\pi/\Sigma\pi$ branching ratio. These topics have been reviewed by EBERHARD 73 [6] and by MILLER 70 [7].

102.2. Formation experiments

Two states are also observed near this mass in formation experiments. One of these, the $\Sigma(1670)D_{13}$, has the same quantum numbers as those observed in production and has a large $\Sigma\pi/\Sigma\pi\pi$ branching ratio; it may well be the Σ(1670) produced at larger angles (see TIMMERMANS 76 [5]) . The other state, the $\Sigma(1660)P_{11}$, has different quantum numbers, its $\Sigma\pi/\Sigma\pi\pi$ branching ratio is unknown, and its relation to the produced Σ(1670) states is obscure.

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