

## 106. The $\Sigma(1670)$ Region

### 106.1. Production experiments

The measured  $\Sigma\pi/\Sigma\pi\pi$  branching ratio for the  $\Sigma(1670)$  produced in the reaction  $K^-p \rightarrow \pi^-\Sigma(1670)^+$  is strongly dependent on momentum transfer. This was first discovered by EBERHARD 69 [1], who suggested that there exist two  $\Sigma$  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  $\Sigma$  in this region, the  $\Sigma(1690)$  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].

### 106.2. 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  $\Sigma(1670)$  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  $\Sigma(1670)$  states is obscure.

#### References:

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