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Electromagnetic Strangeness Production at Jefferson Lab Energies

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An overview of a decade of elementary strangeness production results from CLAS at Jefferson Lab will be presented. Photoproduction off the proton of the ground state Λ and Σ^0 states and kaons has been instrumental in identifying the N^* resonance structure of the nucleon around 2 GeV. Spin observables, aiming at "complete" determination of the photoproduction amplitudes, promise to further constrain the excitation spectrum of nucleons. Electroproduction measurements have extended to non-zero 4-momentum transfer Q^2 the structure function information about strangeness production. Photoproduction of the excited hyperons, the $\Sigma^0(1385)$, $\Lambda(1405)$, and $\Lambda(1520)$ in the reactions $\gamma + p \rightarrow K^+ + Y^* \rightarrow K^+ + \Sigma + \pi$, can be compared to the hyperon ground state reactions for the first time. The cross sections have been compared to current theoretical models based on the effective Lagrangian approach, with varying success. The cross sections for the $\Lambda(1405)$ region are strikingly different for the $\Sigma^+\pi^-$, $\Sigma^0\pi^0$, and $\Sigma^-\pi^+$ decay channels, indicating the effect of isospin interference, especially at W values close to the threshold. We show how this behavior is reflected in the differing mass distributions for the $\Lambda(1405)$ in the different decay channels. Chiral unitary models of the $\Lambda(1405)$ and related non-strange baryonic states suggest how the $\Lambda(1405)$ is a structure of several interfering poles. We highlight also the first measurement of the spin and parity of the $\Lambda(1405)$. Finally, we outline the next experimental steps to be taken in strangeness electromagnetic production in the Jefferson Lab 12 GeV era.

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