The $S_{11}-\ \Lambda(1405)$ and $-\Lambda(1670)$ Resonances in Meson-Baryon Unitarized Coupled Channel Chiral Perturbation Theory

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The $s-$wave meson-baryon scattering is analyzed for the strangeness $S=-1$ and isospin $I=0$ sector in a Bethe-Salpeter coupled channel formalism incorporating Chiral Symmetry following the formalism of ref. [1]. Four channels have been considered: $\pi\Sigma$, $\bar{K}N$, $\eta\Lambda$ and $K\Xi$. The needed two particle irreducible matrix amplitude is taken from lowest order Chiral Perturbation Theory in a relativistic formalism and low energy constants are fitted to the $\pi\Sigma \to \pi\Sigma$ mass-spectrum, to the the elastic $\bar{K}N$ and $\bar{K}^-p \to \pi^-\Sigma$ t–matrices and to the $\bar{K}^-p \to \eta\Lambda$ cross section data. The position of the complex poles in the second Riemann sheet of the scattering amplitude determine masses and widths of the $S_{01}-\ \Lambda(1405)$ and $-\Lambda(1670)$ resonances, in reasonable agreement with experiment. A good overall description of data, from $\pi\Sigma$ threshold up to 2 GeV, is achieved keeping in mind that the two pion production channel has not been included.

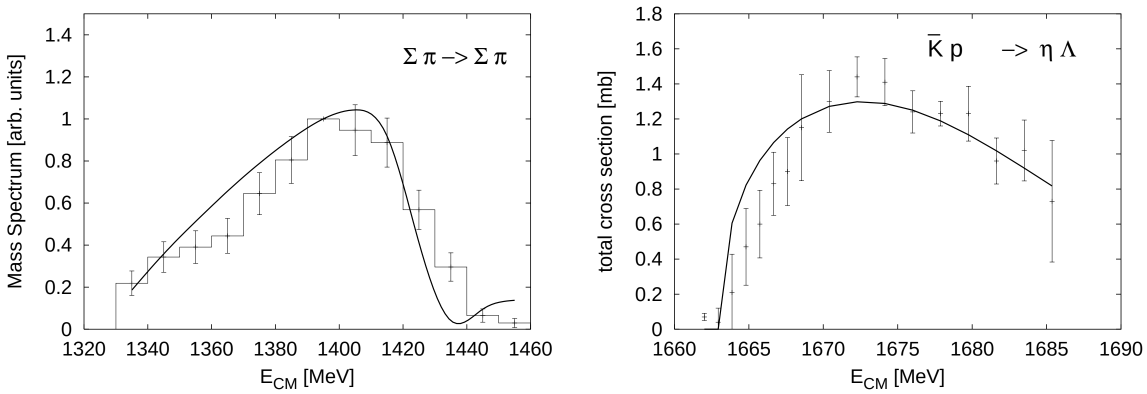

Figure 1: Solid lines: results of our calculations. Experimental data for $\pi\Sigma \to \pi\Sigma$ and $K^-p \to \eta\Lambda$ are from refs. [2] and [3], respectively

References

[1] J. Nieves and E. Ruiz-Arriola, “ The $S_{11}-$ N(1535) and –N(1650) Resonances in Meson-Baryon Unitarized Coupled Channel Chiral Perturbation Theory”, Phys.Rev.D **64**, 116008 (2001)

[2] R.J. Hemingway, “Production of $\Lambda(1405)$ in K^-p reactions at 4.2 GeV/c”, Nucl. Phys. B**523** 742 (1985).

[3] A. Starostin *et al*, ”Measurement of $K^-p \to \eta\Lambda$ near threshold”, Phys.Rev.C **64**, 055205 (2001)