Contribution ID: **263** Type: **Talk**

From Experimental Data to Pole Parameters in a Model Independent Way

Monday 25 September 2017 17:30 (20 minutes)

It is well known that unconstrained single-energy partial wave analysis (USEPWA) gives many equivalent discontinuous solutions, so a constraint to some theoretical model must be used to ensure the uniqueness. It can be shown that it is a direct consequence of not specifying the angle-dependent part of continuum ambiguity phase which mixes multipoles, and by choosing this phase we restore the uniqueness of USEPWA, and obtain the solution in a model independent way [1].

Up to now, there was no reliable way to extract pole parameters from so obtained SE partial waves, but a new and simple single-channel method (Laurent + Pietarinen expansion) applicable for continuous and discrete data has been recently developed [2-5]. It is based on applying the Laurent decomposition of partial wave amplitude, and expanding the non-resonant background into a power series of a conformal-mapping, quickly converging power series obtaining the simplest analytic function with well-defined partial wave analytic properties which fits the input. The method is particularly useful to analyse partial wave data obtained directly from experiment because it works with minimal theoretical bias since it avoids constructing and solving elaborate theoretical models, and fitting the final parameters to the input, what is the standard procedure now. The generalization of this method to multi- channel case is also developed and presented. Tests are performed on Bonn-Gatchina P11 πN partial wave amplitudes taken from BG2011-2 solution [6] by comparing our results with exact results obtained by analytic continuation [7]. As a demonstration this method is applied to GWU-SAID [8] E1+ and M1+ multipoles.

Unifying both methods in succession, one constructs a model independent procedure to extract pole parameters directly from experimental data without referring to any theoretical model.

We give preliminary results for USEPWA of kaon photoproduction on the world collection of real data.

References:

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Author: SVARC, Alfred (Rudjer Boskovic Institute)

Presenter: SVARC, Alfred (Rudjer Boskovic Institute)

Session Classification: Analysis tools

Track Classification: Analysis tools