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Laurent + Pietarinen partial wave analysis (L+P PWA)

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A new approach has been developed to energy-dependent, single-channel partial wave analysis which does not require constructing and solving elaborate theoretical model of analyzed two body reaction, but uses general principles of analyticity instead. Standard approach of obtaining energy dependent two body partial waves (multipoles) was to create a theoretical model, solve it, fit the free parameters to the data, and make partial wave reconstruction of obtained reaction amplitudes. Instead of constructing the theoretical model it is proposed to decompose the partial waves (multipoles) of a particular two body process in Laurent form where regular part is expanded in fast converging series in particular conformal variable called Pietarinen expansion. Free parameters (pole parameters and Pietarinen coefficients) are then fitted to world collection of observables of a particular reaction. The expansion is fairly well defined as for a particular reaction one has the fairly confident knowledge of all needed partial wave singularities (poles and branch-points), so the complexity of constructing and solving in principle elaborated theoretical model is avoided. The model is presented for a $K\Lambda$ photo-production where there exists a good and confident data base. However, complicated formalism and a lot of fitting parameters create the problem which is hard to be handled by standardly available computers, so certain simplifications of analytic structure of Laurent+Pietarinen expansion are introduced. The deviation between the simplified and the true solution are investigated by using the advantages of newly developed amplitude + partial wave analysis (AA/PWA) method, and successfully implemented for $K\Lambda$ photoproduction.

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