

Resonances Via Pade Method

Ralf-Arno Tripolt, ECT*, Trento, Italy
arXiv: 1610.03252

Resonance poles and threshold energies for hadron physical problems by a
model-independent universal algorithm

R.-A. Tripolt^a, I. Haritan^b, J. Wambach^a, N. Moiseyev^c

^a*European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*) and Fondazione Bruno Kessler, Villa Tambosi, Strada delle Tabarelle 286, I-38050 Villazzano (TN), Italy.*

^b*Schulich Faculty of Chemistry, Technion - Israel Institute of Technology, Haifa 32000, Israel*

^c*Schulich Faculty of Chemistry, Russel-Berrie Nanotechnology Institute, and Department of Physics, Technion - Israel Institute of Technology, Haifa 32000, Israel*

$$C_M(\eta) = \frac{F(\eta_1)}{1 + \frac{z_1(\eta - \eta_1)}{1 + \frac{z_2(\eta - \eta_2)}{\vdots z_M(\eta - \eta_M)}}$$

Application to analytical model

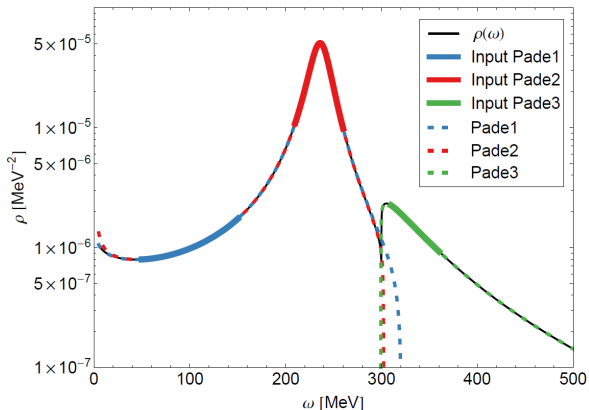


Figure 1: (color online) The spectral function defined in Eq. (4) is shown together with three different input regions for the RVP method and the corresponding extrapolations. It describes a single resonance peak in the vicinity of two decay thresholds at $T_1 = 0$ MeV and $T_2 = 300$ MeV. The input regions 1 and 2 can be used to identify the complex pole associated to the resonance peak as well as the decay thresholds T_1 and T_2 while input region 3 can be used to describe the spectral function for $\omega > T_2$ and to identify T_2 .

Application to form factor

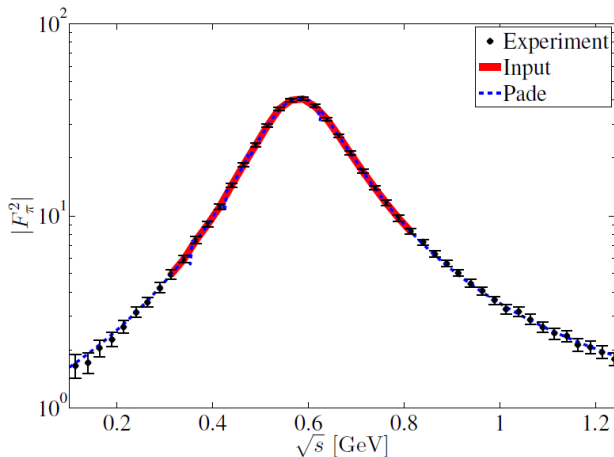


Figure 2: (color online) Experimental data for the squared modulus of the pion form factor $|F_\pi(s)|^2$ from [11] together with the input range chosen for the RVP method (solid red) and the corresponding extrapolation function (dashed blue).

Application to scattering amplitude

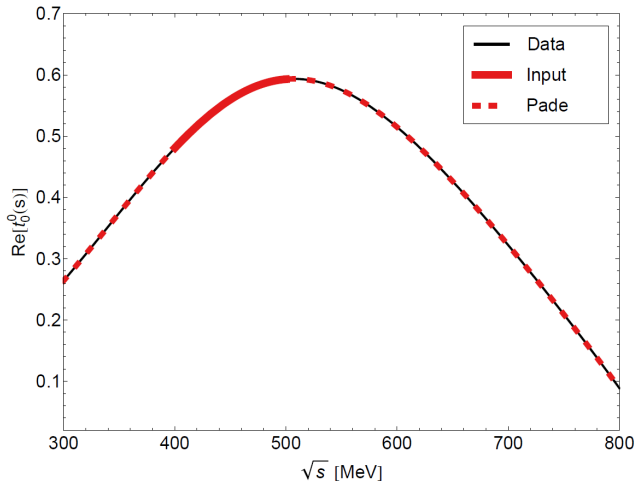


Figure 3: (color online) The real part of the S0 partial wave amplitude, $\text{Re}t_0^0(s)$, as obtained from the Constrained Fit to Data (CFD) parametrization of the $\delta_0^{(0)}(s)$ phase shift provided in [21] is shown together with the chosen input range for the RVP method as well as the obtained extrapolation.