

Meson resonance spectroscopy, semi-local duality and Weinberg spectral sum rules

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In this work, we complete the one-loop calculation of the meson-meson scattering amplitudes, the scalar and pseudoscalar form factors in the framework of $U(3)$ chiral perturbation theory with the explicit tree level exchanges of resonances. The spectral functions of the nonet scalar-scalar (SS) and pseudoscalar-pseudoscalar (PP) correlators are constructed by using the corresponding form factors. After fitting the unknown parameters to the scattering data, we discuss the resonance content of the resulting scattering amplitudes, such as $f_0(600)$ (traditionally called σ), $f_0(980)$, $f_0(1370)$, $K_0^*(800)$ (traditionally called κ), $K_0^*(1430)$, $a_0(980)$, $a_0(1450)$, $\rho(770)$, $K^*(892)$ and $\phi(1020)$. We also study the Weinberg-like spectral function sum rules in the $SS - SS$, $PP - PP$ and $SS - PP$ sectors as well as semi-local duality from scattering. The former relate the scalar and pseudoscalar spectra between themselves while the latter mainly connects the scalar spectrum with the vector one. Finally we investigate these items as a function of N_C for $N_C > 3$. All these results pose strong constraints on the scalar dynamics and spectroscopy which are discussed. They are successfully fulfilled by our meson-meson scattering amplitudes and spectral functions.

[1] Zhi-Hui Guo and J.A. Oller, Phys. Rev. D **84** (2011) 034005.

[2] Zhi-Hui Guo, J.A. Oller and J. Ruiz de Elvira, to appear soon.

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