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$\eta \rightarrow 3\pi$ decays and coupled channel extension of the Khuri-Treiman formalism

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There have recently been several high-statistics new measurements of the isospin violating decay $\eta \rightarrow 3\pi$. Besides the interest in its analysis, these and other data on three-body decays of mesons have originated a revival on the study and the application of the Khuri-Treiman equations. This is a dispersive formalism which allows to simultaneously incorporate the two-body elastic unitarity constraints in the s-, t-, and u-channels. In our study, we have extended this formalism so as to take into account coupled channels effects, thus extending the range of applicability of the equations. Concerning specifically the decay $\eta \rightarrow 3\pi$, we include the effects of the $K\bar{K}$ channel in $I = 0$, as well as of the $\eta\pi$ and $K\bar{K}$ channels in $I = 1$. In this way the effect of the $f_0(980)$ and $a_0(980)$ resonances can be simultaneously studied. In our approach the needed subtraction constants are fixed by matching our dispersive amplitude with the chiral one at low energies. This allows to compute the amplitude in the physical region without free parameters, except for an overall factor. We find that our predictions tend to improve the agreement between the theoretical approaches and the recent experimental results.

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