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UNPHYSICAL ENERGY SHEETS AND RESONANCES IN THE FRIEDRICHS-FADDEEV MODEL

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Assume that $\mathfrak{h}$ is a Hilbert space and $\Delta = (\alpha, \beta)$, $-\infty \leq \alpha < \beta \leq \infty$, is an interval on the real axis. Let H_0 be the operator of multiplication by the independent variable in the Hilbert space $\mathfrak{H} = L_2(\Delta, \mathfrak{h})$ of square-integrable $\mathfrak{h}$-valued functions on Δ. Then the Hamiltonian of the Friedrichs-Faddeev model is defined as $H = H_0 + V$ where V is an integral operator in $\mathfrak{H}$ whose kernel $V(x,y)$ is a compact operator in $\mathfrak{h}$ for every $x, y \in \Delta$ and, in addition, $V(y,x) = V(x,y)^*$.

Many concrete Hamiltonians may be reduced to the Friedrichs-Faddeev model by an appropriate change of variables. The model itself was considered by its creators as the simplest model for the study of additive perturbations of continuous spectrum.

Assuming that the kernel $V(x,y)$ is a holomorphic function of the variables x and y in a certain domain of $\mathbb{C}$, in the present work we study the structure of the corresponding T- and S-matrices on unphysical sheet(s) of the complex energy plane. Furthermore, we allow the Hamiltonian H undergo a complex deformation (or even a complex scaling/rotation if, say, β is infinite). Isolated non-real eigenvalues of the deformed Hamiltonian are called the complex rotation resonances. For a class of analytic kernels $V(x,y)$, we prove that the complex rotation resonances do correspond to the scattering matrix resonances, that is, to the poles of the scattering matrix analytically continued to the respective unphysical sheet.