Scattering in a forked-shaped waveguide

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joint work with Y. Latushkin

We consider wave scattering in a forked-shaped waveguide which consists of two finite and one half-infinite intervals having one common vertex. We describe the spectrum of the direct scattering problem and introduce an analogue of the Jost function. In case of the potential which is identically equal to zero on the half-infinite interval, the problem is reduced to a problem of the Regge type. For this case, using Hermite-Biehler classes, we give sharp results on the asymptotic behavior of resonances, that is, the corresponding eigenvalues of the Regge-type problem. For the inverse problem, we obtain sufficient conditions for a function to be the S-function of the scattering problem on the forked-shaped graph with zero potential on the half-infinite edge, and present an algorithm that allows to recover potentials on the finite edges from the corresponding Jost function. It is shown that the solution of the inverse problem is not unique. Some related general results in the spectral theory of operator pencils are also given.