Fourier-Laplace Structure of the Inverse Medium Problem for the Radiative Transfer Equation

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There has been considerable recent interest in the inverse problem of optical tomography. The usual approach to this problem makes use of the diffusion approximation (DA) to the radiative transfer equation (RTE). Within the accuracy of the DA, it is possible to formulate the linearized inverse problem in terms of the inversion of a suitably defined Fourier-Laplace transform which relates spatial fluctuations in the optical absorption of a random medium to the intensity of light transmitted through the medium. In this talk I will discuss analogous results which hold beyond the DA. In particular, it is shown that by making use of the plane-wave expansion for the Green's function of the RTE that a generalized Fourier-Laplace structure arises in the inverse medium problem for the RTE. This is joint work with Arnold Kim and Vadim Markel.