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The analytic properties of the Landau gauge quark propagator Dyson-Schwinger equation at rainbow level

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In this talk I review the status of an ongoing study that is aimed at solving the quark propagator Dyson-Schwinger equation (qDSE) in the complex domain. Knowledge of the propagator's analytic properties is required for bound state equations, but can also potentially provide insights into fundamental phenomena such as confinement through its spectral characteristics. Using only the infrared part of the so-called Maris-Tandy interaction model renders the integrand of the quark-self energy loop analytic, and it is then straightforward to solve the equation in the complex domain. This (over)simplified model serves as a starting point in this work. A Graphics Processing Unit (GPU) based code has been developed, that allows for fast, robust and reliable computation of the complex solution for a wide range of bare mass values. The resulting poles and residues are extracted automatically, and can be used to approximate and model the solution of the propagator. The next step in this project is to not only consider the infrared term of the interaction model, but also the (logarithmic) ultraviolet (UV) term, which induces non-analyticities in the self-energy integrand in form of branch cuts. These branch cuts must be taken into account when evaluating the self-energy integral. I will discuss the techniques I employ to address these complications.

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