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Pentaquarks in a Bethe-Salpeter approach

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In the past two decades there has been tremendous progress in the theoretical and experimental investigation of multi-quark states, which has expanded our understanding of what a “hadron” is. Experimental evidence suggests that Nature does not only form “conventional” hadrons such as mesons as quark-antiquark states and baryons as three-quark states, but also more exotic combinations such as tetraquarks and pentaquarks.

From the hadronic point of view, pentaquarks can look like molecules of mesons and baryons, bound states below thresholds, but at the same time they are unstable resonances above other thresholds. How does a molecular picture then arise from the fundamental interactions between five quarks? And how can one distinguish a conventional baryon, which is made of three valence quarks, from a pentaquark with an additional quark-antiquark pair?

The goal of my PhD project is to answer these questions and calculate the properties of pentaquarks in QCD using nonperturbative functional methods, in particular the combination of Dyson-Schwinger equations (DSEs) and Bethe-Salpeter equations (BSEs).

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