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Van der Waals forces in pNRQED and pNRQCD

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The properties of quarkonia in a nuclear medium are still poorly known, yet they are very important for the description of photo- and hadro-production of quarkonium on nuclear targets (e.g. in experiments at the FAIR facility at GSI) as well as for the diagnostic of hadronic final states in heavy ion collisions at the LHC at CERN.

Interactions of heavy quarkonia with hadrons or nucleons are expected to have significant contributions from the multiple gluon exchange processes. This type of interactions, known as the gluonic van der Waals force, can also be responsible for bound states between quarkonia and nucleons.

Our approach is to study the gluonic van der Waals forces in the effective field theory (EFT) framework using potential non-relativistic QCD, an EFT of QCD that describes bound states of heavy quarkonia.

In this talk we will present an application of this approach to the electromagnetic van der Waals forces between two hydrogen atoms using potential non-relativistic QED (pNRQED) and compare the results we obtained in this framework to the literature. Furthermore, we will discuss perspectives for QCD, in particular concerning interactions between two heavy quarkonia or a heavy quarkonium and a nucleon.

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