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A systematic study of the strong interaction with PANDA

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The physics of strong interactions is undoubtedly one of the most challenging areas of modern science. Quantum Chromo Dynamics (QCD) is reproducing the physics phenomena only at distances much shorter than the size of the nucleon, where perturbation theory can be used yielding results of high precision and predictive power. At larger distance scales, however, perturbative methods cannot be applied anymore, although spectacular phenomena - such as the generation of hadron masses and confinement - occur. Studies using charmed quarks and gluon-rich matter have the potential to connect the perturbative and the non-perturbative QCD region, thereby providing insight in the mechanisms of mass generation and confinement. Experimental data in this intermediate regime are scarce and so-far studied mostly with electromagnetic probes. A large part of the program will be devoted to charmonium spectroscopy, gluonic and multi-quark excitations, open and hidden charm in nuclei, electromagnetic formfactors, rare decays, and gamma-ray spectroscopy of hypernuclei.

The physics program of the anti-Proton ANnihilation at DArmstadt collaboration, PANDA, will address various questions related to the strong interactions by employing a multi-purpose detector system at the High Energy Storage Ring for anti-protons of the upcoming Facility for Anti-proton and Ion Research, FAIR.

In this presentation, I will give an overview and motivation of the physics program of the PANDA collaboration. A status report of the present research and developments for the PANDA detector design and the feasibility of the physics program will be presented with a perspective towards future activities.

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