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Using Antiprotons for High Precision Studies of Hadrons

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Recently, after decades of slow progress, numerous facilities worldwide have observed a large number of new hadronic states, some of them with very unusual properties. This includes clear evidence for the existence of exotic hadronic states, i.e. states that can not be reduced to either a simple meson or baryon description. Despite this great advance, the nature of many of these states remains debated. One potentially decisive approach to determine the nature of some of these states is to perform high precision measurements of their lineshape. Such lineshape measurements will be performed using the high intensity, phase space cooled antiproton beam of the High Energy Storage Ring at FAIR. By exploiting kinematic constraints that are available in both resonance and threshold scans, well over an order of magnitude higher precision results will be obtained compared to other facilities. These measurements will be performed by the PANDA experiment, which is a multipurpose detector for a wide range of final states from antiproton annihilation reactions in the charm quark mass range. In addition to precision measurements of exotic hadronic states, PANDA has a fascinating program ranging from (but not limited to) time-like studies of nucleon structure, spectroscopy of open charm mesons, as well multi-strange and charm baryons, to the in-medium properties of charm mesons and spectroscopy of (double)-Lambda hypernuclei. This talk will present the physics reach of PANDA and the status for the detector construction.

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