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# Effective Field Theory Investigations of the ”XYZ” Puzzle

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Quantum Chromodynamics (QCD), the theory of strong interactions, predicts several types of bound states. Among them are mesons (quark-antiquark) and baryons (quark-quark-quark), which have been the only states observed in experiments for years. However, in the last decade many states that do not fit this picture have been identified. There is growing evidence that at least some of the new charmonium- and bottomonium-like states, the so-called “XYZ” mesons, are new forms of matter such as quark-gluon hybrids, mesonic molecules, and tetraquarks. Many questions related with this topic should be solved in the next decade and Europe is situated in a privileged position with two major experiments scheduled: run II LHCb@CERN and PANDA@GSI.

In support of the experimental effort, Europe should also play a leading role in its theoretical counterpart. The state-of-the-art theoretical tools for analysing heavy quarkonium systems are lattice regularized QCD and Effective Field Theories (EFTs). Concerning lattice QCD studies, the path to be followed seems to be still long: calculations of excited states have been only recently pioneered and the full treatment of bottomonium on the lattice seems to be tricky. In this contribution, we intend to present our recently Humboldt awarded research project which aims to develop novel EFTs that, characterizing the conventional quarkonia, also facilitate the the systematic and model-independent description of the “XYZ” states taking into account their possible exotic structure.

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