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Aula Magna del Dipartimento  
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# Study of quantum electrodynamics and chromodynamics in atomic bound systems

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**Abstract:** An overview of investigations on unusual atomic systems, such highly charged ions and pionic atoms, is presented. In highly charged ions, where the associated Coulomb field is several order of magnitude higher than that of the most powerful available laser, Quantum Electrodynamics (QED) corrections have to be considered to all order of  $Z\alpha$  expansion. In pionic hydrogen and deuterium, high-accuracy X-ray spectroscopy provides important information on the strong interaction (more precisely on effective field theories derived from quantum chromodynamics) between the pion and the nucleons. In the case of atomic transitions where the influence of the strong interaction is negligible, accurate X-ray spectroscopy can be also used to determine the mass of the negatively charged pion with high accuracy.