Properties of Hadrons in strongly interacting matter

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Properties of hadrons in strongly interacting matter provide a link between Quantum Chromodynamics in the strong coupling regime and experimental observables. Heavy-ion collisions and reactions with elementary probes have been used to extract information on in-medium properties of hadrons. In-medium mass distributions of light vector mesons (ρ, ω, ϕ) have been deduced from the 4-momentum vectors of their decay products. Light vector mesons are particularly suited for these studies since their decay lengths are comparable to nuclear dimensions so that a sizable fraction of their decays occur in the nuclear environment after production in some nuclear reaction.

The results obtained in a series of experiments are summarized and compared. The sensitivity of different experimental approaches to in-medium modifications is discussed. Inconsistencies among experimental results are pointed out. For all light vector mesons (ρ, ω, ϕ) an in-medium broadening has been reported by almost all experiments. The majority of measurements does not find evidence for mass changes in the medium. Only for the ϕ meson a broadening and mass shift is reported. The experimental results are compared to theoretical predictions (for details see [1]). Difficulties to link theoretical predictions to the experimental observables are outlined. In view of remaining inconsistencies experiments with much higher statistics and increased acceptance for low momentum vector mesons will be needed. Planned experiments are described.

References

[1] S. Leupold, V. Metag and U. Mosel, arXiv:0907.2388