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## **S-matrix approach to the hadron gas**

*Monday, 21 May 2018 11:00 (30 minutes)*

In this talk I shall discuss the S-matrix formulation of statistical mechanics, which connects the scattering matrix elements to the thermodynamic observables.

The approach allows a consistent treatment of broad resonances and purely repulsive channels, while correctly implementing the constraints from the chiral perturbation theory.

This provides a useful framework for identifying the limitations of the Hadron Resonance Gas model and for incorporating additional effects from hadron physics to reliably describing the thermal medium.

We shall apply the method to study (1) the  $\rho$ -meson and (2) the pion-nucleon system. In the first case the importance of the non-resonant contribution will be demonstrated in correctly describing the soft part of the decay pion momentum spectra. For the latter we will describe how the natural implementation of the repulsive forces can help to better understand the lattice QCD result on the baryon electric charge correlation.

Lastly, I discuss some recent progress to include inelastic effects and  $N > 2$ -body scatterings.

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