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## Hadron Resonance Gas Model, Thermodynamics of QCD and Heavy Quark Physics

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We show how quark and glueball properties can be determined from the Hadron Resonance Gas model below the de-confinement phase transition [1,2,3,4]. This makes use of Quark-Hadron duality necessitating a tower of excited states and poses the interesting problem of identification of degrees of freedom at increasing temperatures [5]. In particular, we compute the equation of state of Gluodynamics and QCD, the Polyakov loop and the Heavy Quark Free Energy [6], and compare with existing lattice computations [7,8,9]. Finally we address on the Casimir scaling of the Polyakov loop at low temperatures, and test it with the most recent lattice results of [10].

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