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Equation of State and the finite temperature transition in hot QCD

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This talk will summarize the results obtained by the HotQCD collaboration on the equation of state and the crossover transition in 2+1 flavor QCD. We will present results on bulk thermodynamic quantities - energy density, pressure, entropy density, and the speed of sound over the temperature range $140 < T < 540$ MeV. These results have been obtained on lattices of temporal size $N_\tau = 6$ and 8 and with two improved staggered fermion actions, asqtad and p4. Our most extensive results are with masses of the two degenerate light quarks set at $m_{ud} = 0.1 m_s$ corresponding to the lightest pion mass m_π between $220 - 260 MeV$. In these simulations, the strange quark mass is tuned to its physical value and defines lines of constant physics. We will also summarize the current state of results on observables sensitive to the chiral and deconfining physics - the light and strange quark number susceptibilities, the chiral condensate and its susceptibility, and the renormalized Polyakov loop. Our results indicate that the deconfinement and chiral symmetry restoration occur in the same narrow temperature interval.