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Specific Heat of Matter Formed in Relativistic Nuclear Collisions

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We report the excitation energy dependence of specific heat (c_v) of hadronic matter at freeze-out in Au+Au and Cu+Cu collisions at the Relativistic Heavy Ion Collider energies by analyzing the published data on event-by-event mean transverse momentum ($\langle p_T \rangle$) distributions. The $\langle p_T \rangle$~distributions in finite p_T~ranges are converted to distributions of effective temperatures, and dynamical fluctuations in temperature are extracted by subtracting widths of the corresponding mixed event distributions. The heat capacity per particle at the kinetic freezeout surface is presented as a function of collision energy, which shows a sharp rise in c_v~below \sNN~=~62.4~GeV. We employ the Hadron Resonance Gas (HRG) model to estimate c_v~at the chemical and kinetic freezeout surfaces. The experimental results are compared to the HRG and other theoretical model calculations. HRG results show good agreement with data. Model predictions for c_v~at the Large Hadron Collider energy are presented.

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