

On perspectives of HED@FAIR experimental study of dual unexplored phenomenon - anomalous thermodynamics regions nearby entropic phase transitions

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There are three basic points for discussions on perspectives of HED@FAIR experimental study of unexplored phenomena: (1) – how to arrange HIB energy deposition; (2) – how to arrange diagnostics; (3) – what fundamental physical phenomenon should be explored to justify our using such huge facilities like FAIR, LHC, NICA *etc* for thermophysical investigations. In my talk I plan to continue my previous discussions on point (3). I.e. – very plausible but still hypothetical objects – *anomalous thermodynamics regions* (ATR) accompanying *entropic phase transitions* (S-PT). Remarkable feature of ATR - negative isochoric pressure/temperature derivative $(\partial P/\partial T)_V$ leads to non-standard sequence of expansion and compression of isochorically heated sample within HIHEX scenario. Another feature of ATR – anomalous negative isentropic pressure/temperature derivative $(\partial T/\partial P)_S$ leads to non-standard behavior of temperature on isentropic compression within LAPLAS scheme, i.e. T -decreasing instead of naively expected T -increasing, and anomalous T -increasing instead of expected T -decreasing along isentropic expansion in second stage of HIHEX. In my discussions I base on example of hot dense nitrogen as the material with (S-PT + ATR) anomalies, which were predicted by dynamic experiments and by the First-Principle numerical simulation.

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