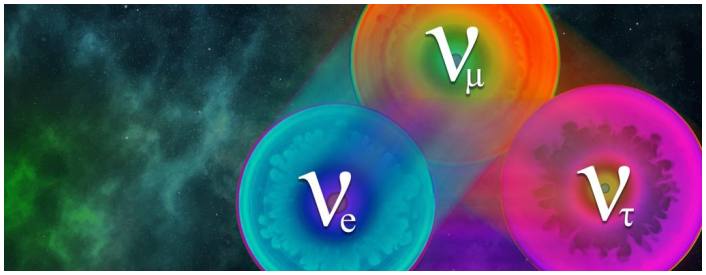

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Dyonic-Taub-NUT-AdS: Thermodynamics and Phase-Transitions

Tuesday, 20 January 2026 14:55 (35 minutes)

Taub-NUT spaces are one of the less understood spaces in General Relativity. Here we introduce consistent thermodynamics for these spaces, i.e., thermal quantities satisfy the first law, Gibbs-Duhem and Smarr's relations. Furthermore, we uncover the rich phase structures of these spacetimes for different horizon geometries, which could be spherical, flat, or hyperbolic. We work in extended thermodynamics to study the phase structure of the three horizon cases, in the mixed ensemble. These investigations revealed a different phase structure for the flat and hyperbolic cases in comparison with dyonic solutions with vanishing NUT charge and spherical horizon! In the latter case, a continuous phase transition occurs at high temperatures and pressures, i.e., above the critical point, but in the former cases, it occurs at low temperatures and pressures, i.e., below the critical point! Generically, the spherical case, with nonvanishing NUT charge, is characterized by two critical points with continuous phase transition between them.

Authors: AWAD, Adel (Ain Shams U & BUE); Mr ALBARQAWY, Amr; ELKHATEEB, Esraa (Ain Shams Univ., Faculty of Science, physics departrment); Mr THARWAT, Mohamed; Mrs EISSA, Somya

Presenter: AWAD, Adel (Ain Shams U & BUE)