

安徽省基础学科(理论物理) 研究中心系列讲座

Confining density functional approach to the QCD phase diagram at low temperatures and thermal twin stars

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摘要: We present a density functional-based equation of state for warm, dense nuclear and deconfined quark matter, relevant for supernova explosions, neutron star mergers, and Q-ball cosmology. Nuclear matter uses a relativistic density functional model, while quark matter employs a confining approach, with the phase transition determined via Maxwell construction. Analyzing TOV equations for isentropic hybrid stars, we find that at finite temperatures above a critical entropy, disconnected third family branches (“thermal twin stars”) can appear in the DDf-SFM model, though they are absent with color superconductivity. This critical entropy aligns well with the Seidov criterion for gravitational instability. We suggest thermal twin stars can indicate supernova explodability for massive blue supergiants, effectively constraining hybrid equation of state models and favoring the exclusion of strong color superconductivity. For symmetric matter, the deconfinement onset density shows high sensitivity to color superconductivity relative to flow constraints.



报告人简介:

Prof. Dr. hab. Dr. h.c. David Blaschke is a distinguished theoretical physicist specializing in strongly interacting matter at high densities and temperatures, quantum field theory, and compact star astrophysics. He earned his PhD in 1987 and habilitated in 1995 from the University of Rostock, where he later served as a Professor in Particle and Astrophysics. Having held leadership roles such as Vice Director of the Bogoliubov Laboratory for Theoretical Physics at JINR Dubna, he has been a Full Professor at the University of Wroclaw since 2006 and a bridge professor at CASUS Goerlitz since 2023. A recognized global expert, Blaschke has directed numerous graduate students, coordinated major international research networks and Helmholtz International Summer Schools, and authored over 250 papers (with an h-index of 45) alongside editing more than 20 books. He serves as Editor-in-Chief of the European Journal of Physics A, is a member of the Academia Europaea, and has received honorary doctorates from Dubna State University and the Russian-Armenian University, as well as the prize of the Polish Minister for Education and Science.