Contribution ID: **37** Type: **not specified**

Pro and Con the Phase Transition to Quark Matter in Neutron Stars

Tuesday 12 September 2023 10:30 (45 minutes)

Recently, on the basis of a Bayesian analysis with new observational data for masses, radii, and tidal deformability of neutron stars, the authors of Ref. [1] came to the conclusion that there is evidence against a strong first-order phase transition to quark matter in neutron star cores.
On the other hand, numerous models for hybrid neutron star equations of state with a strong first-order phase transition have been published that correspond to mass-radius curves and tidal deformabilities perfectly fulfilling the observational constraints, see [2-8] for recent examples.
I will discuss the question of physics-informed versus agnostic Bayesian analyses and observable signals for quark deconfinement in supernovae, neutron star
mergers [9,10] and neutron stars in binaries [11,12].

References:
[1] L. Brandes, W. Weise and N. Kaiser, Evidence against a strong first-order phase transition in neutron star cores: impact of new data, arXiv:2306.06218
[2] J. J. Li, A. Sedrakian and M. Alford, Astrophys. J. 944, 206 (2023)
[3] D. Blaschke, U. Shukla, O. Ivanytskyi and S. Liebing, Phys. Rev. D 107, 063034 (2023)
[4] M. Shahrbaf, S. Antic, A. Ayriyan, D. Blaschke and A. G. Grunfeld, Phys. Rev. D 107, 054011 (2023)
[5] G. A. Contrera, D. Blaschke, J. P. Carlomagno, A. G. Grunfeld and S. Liebing, Phys. Rev. C 105, 045808 (2022)
[6] O. Ivanytskyi and D. Blaschke, Phys. Rev. D 105, 114042 (2022)
[7] M. Shahrbaf, D. Blaschke, S. Typel, G. R. Farrar and D. E. Alvarez-Castillo, Phys. Rev. D 105, 103005 (2022)
[8] M. Cierniak and D. Blaschke, Astron. Nachr. 342, 819 (2021)
[9] O. Ivanytskyi, D. Blaschke, T. Fischer and A. Bauswein, Acta Phys. Pol. Supp. 16, 104 (2023)
[10] A. Bauswein, D. Blaschke and T. Fischer, Effects of a strong phase transition on supernova explosions, compact stars, and their mergers, in: “Astrophysics in the XXI Century with Compact Stars”, edited by C. A. Zen Vasconcellos and F. Weber, World Scientific (2023), pp. 283 - 320. [11] D. E. Alvarez-Castillo, J. Antoniadis, A. Ayriyan, D. Blaschke, V. Danchev, H. Grigorian, N. Khosravi-Largani and F. Weber, Astron. Nachr. 340, 878 (2019)
[12] S. Chanlaridis, D. Ohse, N. Aspradakis, J. Antoniadis, D. Blaschke, D. E. Alvarez-Castillo, V. Danchev, and N. Langer, Astrophysical Consequences of Dense Matter Phase Transitions, in preparation (2023)

Presenter: BLASCHKE, David