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Quark matter cores in massive neutron stars

Aleksi Vuorinen, University of Helsinki

https://us02web.zoom.us/j/82028807556

Confirming or ruling out the existence of deconfined quark matter inside at least some neutron stars is a classic open problem in nuclear astrophysics. While the ultimate goal continues to be the observation of a smoking gun signal directly indicating the presence or creation of quark matter, a more indirect approach to the problem has lately become feasible. By combining ab-initio theoretical results for the microscopic properties of dense QCD matter with the latest astrophysical measurements of neutron star properties, it is possible to build stringent model-independent constraints for the material properties of neutron-star matter at different densities. Presenting results from a very recent analysis of this kind, we argue that matter in the cores of the heaviest stable neutron stars has characteristics considerably closer to the predicted properties of deconfined quark matter than those of nuclear matter. The implications of the finding as well as potential ways of improving its accuracy are also discussed.

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https://www.nature.com/articles/s41567-020-0914-9