



Contribution ID: 439

Type: Poster

Constraining Neutron-Star Matter with Microscopic and Macroscopic Collisions

Friday 8 April 2022 14:24 (4 minutes)

Interpreting high-energy, astrophysical phenomena, such as supernova explosions or neutron-star collisions, requires a robust understanding of matter at supranuclear densities. However, our knowledge about dense matter explored in the cores of neutron stars remains limited. Fortunately, dense matter is not only probed in astrophysical observations, but also in terrestrial heavy-ion collision experiments. In this work, we use Bayesian inference to combine data from astrophysical multimessenger observations of neutron stars and from heavy-ion collisions of gold nuclei at relativistic energies with microscopic nuclear theory calculations to improve our understanding of dense matter. We find that the inclusion of heavy-ion collision data indicates an increase in the pressure in dense matter relative to previous analyses, shifting neutron-star radii towards larger values, consistent with recent NICER observations. Our findings show that constraints from heavy-ion collision experiments show a remarkable consistency with multi-messenger observations and provide complementary information on nuclear matter at intermediate densities. This work combines nuclear theory, nuclear experiment, and astrophysical observations, and shows how joint analyses can shed light on the properties of neutron-rich supranuclear matter over the density range probed in neutron stars.

Author: LE FÈVRE, Arnaud**Co-authors:** Ms HUTH, Sabrina (Technische Universität Darmstadt, Germany); Mr PANG, Peter T. H. (Nikhef, The Netherlands); Dr TEWS, Ingo (Theoretical Division, Los Alamos National Laboratory, USA); Prof. DIETRICH, Tim (Institut für Physik und Astronomie, Universität Potsdam, Germany); Prof. SCHWENK, Achim (Extreme Matter Institute, GSI Helmholtzzentrum, Darmstadt, Germany); Dr TRAUTMANN, Wolfgang (GSI Helmholtzzentrum Darmstadt, Germany); Mr AGARWAL, Kshitij (Physikalisches Institut, Eberhard Karls Universität Tübingen, Germany); Dr BULLA, Mattia (Stockholm University, Sweden); Prof. COUGHLIN, Michael (University of Minnesota, Minneapolis, USA); Prof. VAN DEN BROECK, Chris (Utrecht University, The Netherlands)**Presenter:** Mr AGARWAL, Kshitij (Physikalisches Institut, Eberhard Karls Universität Tübingen, Germany)**Session Classification:** Poster Session 3 T10**Track Classification:** Baryon rich matter, neutron stars, and gravitational waves