

Bright spots on neutron stars - exploring the densest matter in the Universe

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Densities in neutron star cores can reach up to ten times the density of a normal atomic nucleus, and the stabilising effect of gravitational confinement permits long-timescale weak interactions. This generates matter that is neutron-rich, and opens up the possibility of stable states of strange matter. Our uncertainty about the nature of matter under these conditions is encoded in the Equation of State, which can be linked to macroscopic observables like mass, radius, tidal deformation or moment of inertia. One very promising technique for measuring the EOS exploits hotspots that form on the neutron star surface due to the pulsar mechanism, accretion streams, or during thermonuclear explosions in the neutron star ocean. I will explain how the hotspot technique is being used by NICER, an X-ray instrument installed only a few months ago on the International Space Station - and why it is a mission driver for future large area X-ray telescope concepts such as eXTP and STROBE-X.