The Structure and Signals of Neutron Stars, from Birth to Death



Contribution ID: 133

Type: not specified

Superfluidity and superconductivity in neutron stars

Tuesday 25 March 2014 10:20 (40 minutes)

I will review some key aspects of the physics of neutron star superfluidity and superconductivity, which play an important role in the phenomena of pulsar timing noise and rotational glitches. New results will be presented from quantum mechanical Gross-Pitaevskii simulations of vortex avalanches in a pinned, decelerating superfluid, which show the correlated nature of vortex motion during glitches explicitly for the first time and provide a robust

explanation of certain aspects of glitch statistics. Future gravitational wave

experiments probing neutron star superfluidity and superconductivity will be evaluated critically and related to fundamental open questions concerning the physics of bulk nuclear matter.

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Session Classification: Plenary session 3