

Brookhaven Forum 2025: Launching the Second Century of Quantum Physics



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Origin of Ultrahigh Energy Cosmic Rays in Binary Neutron Star Mergers, and the Fascinating Physics it Entails (remote)

Thursday 23 October 2025 10:50 (40 minutes)

I will briefly review the observations of UHECRs, emphasizing what is robust and what remains uncertain and explain why a key piece of data strongly suggests that UHECRs are produced in BNS mergers. Then, I will discuss the likely acceleration mechanism and locus and explain how the spectral cutoff is determined; the no-free-parameter prediction of the cutoff energy for different nuclei agrees well with observations. Unique predictions which can be confirmed within a decade or so, are that neutrinos above a PeV are preceded by a co-directional gravitational wave arriving about a day earlier, and that the highest energy cosmic rays originated from r-process nuclei and are heavier than iron.

Link

Presenter: FARRAR, Glennys

Session Classification: Plenary