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A production scenario of Galactic strangelets and an estimation of their possible flux in solar neighborhood

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Finite lumps of strange quark matter in the form of strangelets, theorized absolute ground state of QCD containing a bound state of approximately equal numbers of up, down and strange quarks, are supposed to be more stable than ^{56}Fe nuclei. Recent simulation studies suggest that a major source of strangelets in the Galaxy may be the fragmentation of tidally released bulk strange matter during the merger of strange stars in compact binary stellar systems. Here, we determine a plausible baryon number (or mass) distribution of such strangelets by invoking a statistical disassembly model often used in nuclear multifragmentation problems. The produced strangelets are likely to be accelerated by the shock front generated in the stellar merger itself thereby gaining power law energy spectrum with spectral index close to -2. We estimate the fluxes of such accelerated strangelets of different masses in the neighborhood of the Sun considering diffusive propagation of strangelets from the sources in the stochastic magnetic field of the interstellar medium which is found to be consistent with the null results of PAMELA experiment. The reported limit of sensitivity of the AMS-02 experiment suggests that the experiment should be able to detect strangelet events as per the prediction of the proposed model and thereby may finally vindicate the strange matter hypothesis.

Collaboration

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Author: Mr BISWAS, Sayan (Senior Research Fellow, Bose Institute)

Co-authors: Dr BHADRA, Arunava (Senior Research Physicist, HECRRC, University of North Bengal); Dr SYAM, Debapriyo (Visiting Professor, CAPSS, Bose Institute); Dr DE, J.N. (Visiting Scientist, Saha Institute of Nuclear Physics); Dr JOARDER, Partha S. (Associate Professor, Bose Institute); Prof. RAHA, Sibaji (Director & Senior Professor, Bose Institute)

Presenter: Mr BISWAS, Sayan (Senior Research Fellow, Bose Institute)

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