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Application of high-Temperature Superconducting (HTS) Magnets in space-based Cosmic Ray Detection and Radiation shielding

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The deployment of high-Temperature Superconducting (HTS) magnets in space has the ability to revolutionize astroparticle physics by enhancing the overall performance of cosmic ray detectors and radiation shielding systems. Traditional superconducting magnets face operational challenges in space because of high temperature variations and power constraints; however improvements in HTS technology offer a promising opportunity. This study explores the application of HTS magnets in monitoring detectors, calorimeters, and radiation shielding for cosmic ray and high-energy particle detection aboard space missions. HTS materials exhibit amazing magnetic field stability at quite higher temperatures, reducing the need for complicated cryogenic structures while preserving high sensitivity for charged particle measurements. The integration of HTS magnets in direct cosmic ray detection instruments can improve trajectory resolution and permit extra efficient particle identification. Additionally, we investigate the capacity of HTS magnetic shielding to deflect low-energy ionizing radiation, mitigating its impact on sensitive space instrumentation.
Simulation results and feasibility assessments suggest that incorporating HTS magnets in future CubeSat's, small satellites, and large-scale space observatories could notably enhance astroparticle measurement skills. This research aligns with the continued efforts to develop novel instrumentation for particle and high-energy radiation measurements in space, contributing to future cosmic ray physics missions, dark matter searches, and space weather studies.

Eligibility for "Best presentation for young researcher" or "Best poster for young researcher" prize

Yes

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