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ASTROPARTICLE EXPERIMENTS TO IMPROVE THE RADIATION HEALTH RISK ASSESSMENT
FOR HUMANS IN SPACE MISSIONS

Abstract

In the near future, all the space agencies are working to restart the human exploration of space outside the Low Earth Orbit (LEO). Crewed space missions in this and the next decade will see the presence of humans on the Moon and Mars surface. One of the main showstoppers to be investigated for safe exploration and colonization is the biological effects of ionizing radiation that can compromise the health of astronauts/space workers. The Astroparticle experiments presently operating in space (e.g., AMS02, ACE-Explorer, ...) could play a principal role in this vital task. Such experiments are actual cosmic ray observatories and a source of information crucial to investigating the fundamental physics open problems (e.g., Dark Matter, Antimatter) and improving the knowledge of radiobiology effects in space. In this paper, a review of the past, present, and planned Astroparticle experiments operating would be presented and highlighted some of the possible contributions and improvements in the space radiobiology research field. Also, will be presented some examples of progress in understanding the biological effects of radiation in space using the pieces of information acquired for astronomy and Astroparticle science and where such information has been used to enhance the space radiation field characterization and, consequently, improve crucial radiobiological issues in space (e.g., dose-effect models). Finally, the use of the vast amounts of data taken from such experiments will open a new era of studies performed in different exposure scenarios that will allow a safe human space exploration outside of the Low Earth Orbit by addressing important radiation protection open questions, such as the dose relationship for cancer and non-cancer risk, the possible existence of dose threshold(s) for different biological systems and endpoints, and the possible role of radiation quality in triggering the biological response.