

Advancing Readiness for Deep Space Exploration: Status and Developments by the Alpha Magnetic Spectrometer Group

Alessandro Bartoloni

on behalf of the AMS SPRB collaboration

INFN Roma, CERN

alessandro.bartoloni@cern.ch

Abstract

This presentation will provide an update on the cutting-edge research conducted by the Alpha Magnetic Spectrometer (AMS) group at INFN Roma Sapienza, focusing on three crucial directions essential for advancing readiness for deep space exploration and ensuring the safety of future space explorers.

The AMS group is pioneering high-precision ionizing radiation (IR) dose-effect models to accurately predict the biological effects of IR on human health during space missions. These models are essential for understanding the risks associated with radiation exposure and for developing protective measures for astronauts. In addition to dose-effect modeling, the AMS group is actively evaluating existing Monte Carlo-based codes such as FLUKA and GEANT4. The aim is to compare these codes' behaviors when applied to typical radiobiological simulations of space radiation. This evaluation is crucial for identifying the strengths and limitations of these tools and ensuring their accuracy and reliability in predicting the effects of space radiation on human health.

The research also addresses the significant impact of solar flares and solar radiation on human health, which presents key challenges for deep space missions. Understanding these effects is critical for ensuring the safety of astronauts and developing effective mitigation strategies. Furthermore, the presentation will discuss the ongoing development of an ontology for space radiobiology, which enhances the management and comparison of experimental datasets. This effort aligns with the RBO ontology developed by a NASA Ames-led collaboration and aims to facilitate better data integration across studies.