



AMS Roma Group-Research Activities 2017-2019

Space Radiobiology Investigations using AMS-02 experiment on the ISS

«Space RadioBiology investigations using AMS-02 experiment on the ISS»

June 2017 – A proposal for a research collaboration with IRE-IFO institute to use of AMS Data for Space Radiobiology research activities.

Proposers

- Dr. A. Bartoloni (INFN ROMA)
- Drs. L. Strigari (IRE-IFO)
- Prof. B. Borgia (INFN Roma and Sapienza)
- Dr. G. Bossi (IRE-IFO)

Target

“Production of new models of the expected damage of ionizing radiation exposure in space to be used for Space dose characterization and new dosimetry instrumentation design”

September 2017 – Project Approved by INFN Roma and INFN National Scientific committee II.

October 2017 – Grant of about 20K euro from Italian Space Agency for support to the SPRB project

07.10.2017 **Research Project Proposal**
Space Radiobiology investigations using AMS-02 experiment on the International Space Station (ISS)

Project Name
Space Radiobiology studies using AMS-02 experiment on the International Space Station (ISS)

Research Institutions
INFN - IFO

Research Leaders
Ing. Alessandro Bartoloni
Dr. Lida Strigari

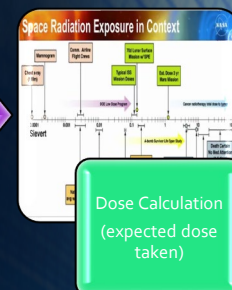
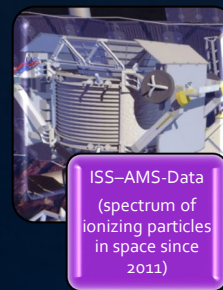
Research Collaborators
Prof. Bruno Borgia
Dr. Gianluca Bossi

Prepared By
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Scope Summary
On May 2011, the Alpha Magnetic Spectrometer (AMS-02), has been installed on the International Space Station, to measure with high accuracy the Cosmic Rays (CR) properties.
AMS-02 is the result of nearly two decades of effort of an international collaboration, to design and build a state of the art detector capable to perform high precision Cosmic Rays measurement.
By the day, more than 100 billion CR events have been collected and the duration of the AMS mission on the ISS has been approved until the end of 2024.
The scope of this research is use the capability of charged particle measurement of AMS to investigate and modelling the ionizing radiation damage on living things in the space environment (ISS, manned solar system exploration, ...).
Living things in the solar system are continuously exposed to Galactic Cosmic Ray (GCR) particles and rarely to more energetic particle emitted by the Sun named Solar Energetic Particles (SEP).
The research will produce new models of the expected damage of ionizing radiation exposures in space using the information on doses and spectra calculated using the AMS data by comparison with the data collected in the “ground environment”.
The produced models will be useful for characterization of expected doses and used to design R&D activities for new dosimetry instrumentation for space.
The research will be conducted in collaboration with the IRE-IFO research institute (www.ifo.it) using the following knowledge and skill:
• AMS detectors, Solar Physics Data Analysis (INFN)
• Radiobiology, Modelling of Ionizing Radiation Damage (IRE-IFO)

INFN-ROMA AMS2 Group
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WHY THIS COLLABORATION BETWEEN INFN & IFO ON SPACE RADIOBIOLOGY

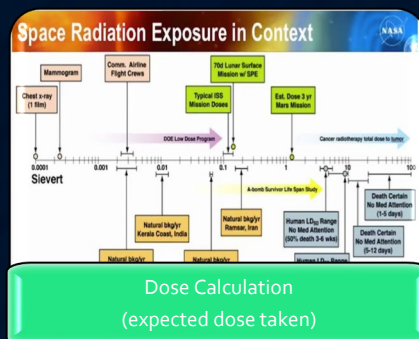
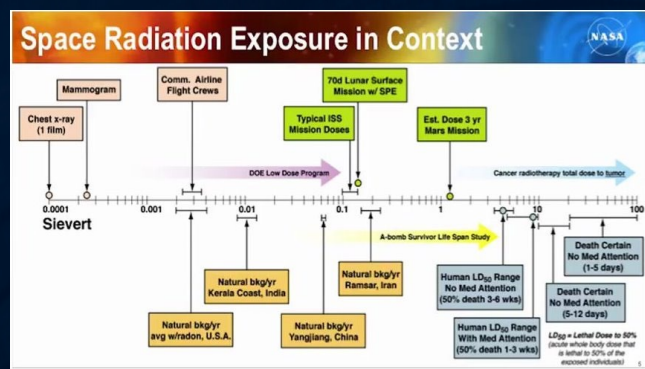


Clinical Exposure	(mSv)
CT Scan (Full-Body)	2-15
PET	5-20
One session of RT	1500-3000
Space Exposure	
6 Months mission on ISS	100-150
Interplanetary natural background per year	400-600
Solar Flare on moon no shielding	500-2000
3 years Mars missions with shielding	1500

Nasa Human Research Program point of view

WHAT IS ONE OF THE GREATEST CHALLENGES FOR AN ASTRONAUT ON THE JOURNEY TO MARS?

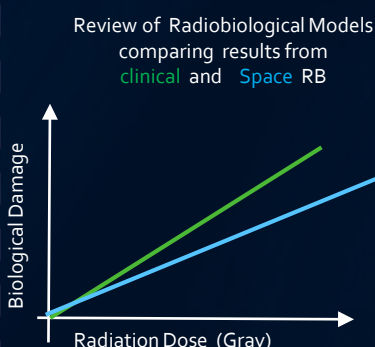
- Radiation exposure, both in-flight and long-term consequences



Experimental setup and measurements to assess the Biological Damage (effects on living things)

Development/validation of RB models Using Proton/Nuclei Accelerator Test Facilities/ experiment from space (i.e. ISS,...)

(Spectrum of ionizing particles in space since 2011)
-> Dose (Gray)



SPRB Research Target

2019 – ACTIVITIES AND FUTURE PERSPECTIVES

- study and compare the recently proposed dose-effect models for cosmic rays and clinical RT
- conduct the AMS data analysis focused to space dose calculation (i.e. to determine the Low energy (50-500 MeV) proton spectrum from the analysis of data using measures collected during 10 or more orbits)
- propose and setup model validation using test beam at ESA accelerator facilities (ESA-CORE-IBER initiative)

AMS SPRB Group 2019

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