Participation to the IRPA16 Conference as Italian Young Awardee

After winning the internal national competition called by the AIRP (Italian Association for Radiation Protection), I was selected to be sent to the IRPA16 conference in Oralndo, Florida (July 2024) by the AIRP as young Italian awardee for the Young Scientist and Professionals Award of IRPA16. The theme of the conference is Radiation Protection. There were researchers from all over the world presenting their research and making us aware of problems being faced in their countries.

I participated in the competition with the work performed during my PhD in Darmstadt, Hessen (Germany), at the GSI. The title of the work is: „Radiation Shielding during Deep-Space Missions: Dose Measurements, Monte Carlo Simulations, and Nuclear Cross-Sections".

Deep-space radiation is in fact, among the biggest hindrances to human space exploration. Therefore, radiation protection in space is a very active field of research. Despite its limitations, passive shielding is currently the most promising radiation protection strategy. It consists of adding shielding material to the walls of the spacecraft and planetary bases. Accelerator-based experimental campaigns were performed with some of the most relevant ion beams for radiation protection in space and several structural, in situ, standard, and innovative shielding materials. Lithium-based hydrides stabilised with paraffin were proven to combine the promising dose attenuation properties of the pure hydrides and the mechanical and chemical stability of the paraffin, resulting in good candidate shielding materials for space missions. The experimental data were compared with the simulation results of the most commonly used Monte Carlo codes in this field of research, namely FLUKA, PHITS, and Geant4. The simulations showed significant and systematic differences among the codes mainly due to the different implemented nuclear cross-section models. Therefore, two nuclear cross-section databases (total reaction and fragment production cross-sections) were generated. The collected nuclear reaction cross-section data were compared to the parametrisations used in the Monte Carlo codes to understand which of them are more suitable in what cases. It was concluded that no parametrisation can reproduce all experimental data for every system and energy region well. Therefore, an optimisation of the Tripathi-Cucinotta-Wilson parametrisation for reaction cross-sections was proposed. An important gap in the experimental data was also pointed out for high energies. The databases are available for open access online, allowing the research community to access and plot them alongside the parametrisations.

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I was awarded the third prize among the Young Professional Awardees and I had the opportunity to learn a lot and share talks about radiation protection in space with other experts in the field.

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