# Space radiation reproduced in the lab for better, safer missions

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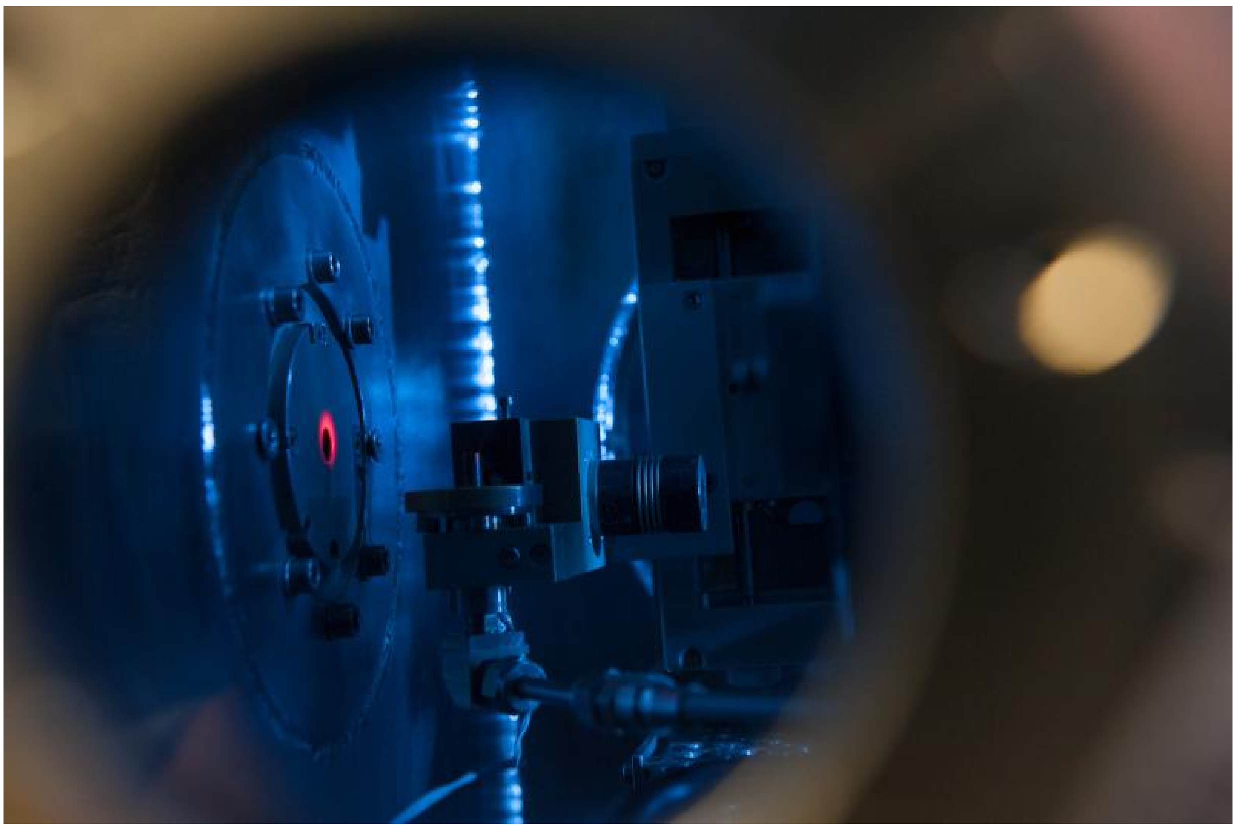

Space radiation. Credit: University of Strathclyde, Glasgow

Man-made space radiation has been produced in research led by the University of Strathclyde, which could help to make space exploration safer, more reliable and more extensive.

Researchers used novel laser-plasma-based accelerators to mimic the radiation, which presents a risk to astronauts and space technology owing to the lack of protection from it in space.

The study, funded by the European Space Agency (ESA), shows for the first time that this type of device can be used for realistic space radiation reproduction and testing on Earth.

The research, published in *Scientific Reports*, also involved researchers and R&D capabilities at ESA, Heinrich-Heine-University Düsseldorf, the Central Laser Facility – where the radiation tests were carried out - the University of Hamburg, Leibniz Supercomputing Centre and the University of California Los Angeles.

Exploratory proof-of-concept experiments have been carried out at Heinrich-Heine-University in Düsseldorf and at the UK's Central Laser Facility. In collaboration with the National Physical Laboratory and the Central Laser Facility, further development of this application is planned at the Strathclyde-based Scottish Centre for the Application of Plasma-Based Accelerators (SCAPA).

Professor Bernhard Hidding, of Strathclyde's Department of Physics, said: "Space radiation is a danger to satellite electronics as well as manned space travel. Earth's magnetic core shields us from dangerous particles but space has no such protection.

"Testing for a solution would ideally be done in space but this is costly; furthermore, space

radiation is difficult to replicate in laboratory conditions with conventional radiation sources, which produce radiation with rather unnatural energy distribution. By using laser-plasma-accelerators, however, we were able to produce particle flux which more closely resembled conditions in space.

"Our research shows laser-plasma-accelerators are viable tools for space radiation testing and are a valuable addition to conventional ground-based testing techniques. Further progress is expected in laser-plasma accelerator technology and this will allow the range of accurately reproducible space radiation to be further extended, to, for example, the radiation belts of other planets with magnetic fields, such as Jupiter or Saturn.

"These planets have much stronger magnetic fields, generating far higher energy electrons than that of Earth, but exploratory missions in these harsh radiation environments have a high scientific priority, such as investigating the possibility of water on the Jupiter moon Io."

**More information:** B. Hidding et al. Laser-plasma-based Space Radiation Reproduction in the Laboratory, *Scientific Reports* (2017). DOI: 10.1038/srep42354

Provided by University of Strathclyde, Glasgow