

Regolith: Protection for humans on Mars

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Shieldings for astronauts could be built on Mars from Martian sand. Credit: G. Otto / GSI Helmholtzzentrum für Schwerionenforschung

For six weeks the rover "Curiosity" is now working on Mars. NASA also plans to send humans to Mars within the next 20 years. On the flight and during the stay on Moon or Mars the astronauts have to be protected against long exposure to cosmic radiation that might cause cancer. On behalf of the European Space Agency ESA the GSI Helmholtzzentrum für Schwerionenforschung GmbH tests whether Moon and Mars regolith can be used to build shieldings for ground stations.

On Earth the atmosphere and the magnetic field weaken cosmic rays. But on Moon and Mars they pelt down unhamperedly. The [cosmic radiation](#) can harm astronauts and could cause cancer in the long run as a result of damage in DNA and cells.

Chiara La Tessa is manager of experiments in GSI biophysics. She explains why Moon or Mars ground stations would not be built from terrestrial high tech material: "In space travels every gram counts. Transporting building material through space would lead to a cost explosion. That is why ground stations would basically be built from Moon and Mars regolith – especially the shielding. We know from the analyses done by rovers what the local sand and stones consist of. With this information one can produce Moon and Mars regolith on Earth and we test it for its properties." As cosmic rays are nothing else but fast ions that were accelerated by star explosions they can be simulated by an accelerator. The GSI facility is one of the few able to reproduce cosmic rays in an original way.



Cosmic radiation is produced with the GSI linear accelerator. Credit: A. Zschau / GSI Helmholtzzentrum für Schwerionenforschung

After the GSI team tested how well the stone slabs can protect against radiation in the American accelerator laboratory in Brookhaven, they

now explore how many neutrons are produced in the materials when radiated.

If [cosmic rays](#) strike the stones with full speed they smash some [atomic nuclei](#) to pieces. The resulting free neutrons have a different effect on the human body than cosmic radiation. Depending on their speed they might even be more harmful.

At GSI the scientists now tested how strong the neutron effect is in Moon and Mars [regolith](#) and how far it passes through the material. "I cannot estimate how the material is going to react to the radiation yet", says La Tessa. "Will many [neutrons](#) be produced? How many fast and how many slow ones? This we will know when we analyzed our experiment data."

Provided by Helmholtz Association of German Research Centres

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