Missions to Mars: GSI will investigate radiation risks for astronauts

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View inside the 120 meters long accelerator UNILAC at GSI used to generate the ion beams. Credit: G. Otto

The European Space Agency (ESA) has chosen the GSI accelerator facility to assess radiation risks that astronauts will be exposed to on a Mars mission. GSI was selected because its accelerator is the only one in Europe able to create ion beams similar to those found in space. To determine possible health risks of manned space flights, scientists from all over Europe have been asked to investigate the effects of ion beams in human cells and organs. The first experiments will be launched this year and subsequently continued at GSI's planned FAIR accelerator system.

Astronauts flying to the moon or Mars would be constantly bombarded

by cosmic rays, whose health risks are not known in detail. Unlike the situation in space, the earth's surface is largely shielded from cosmic rays by the planet's atmosphere and magnetic field. In general, radiation can damage human cells and their genetic material. In addition to causing cancer, it can directly kill cells, which can later result in extensive damage in tissues including the brain.

The aim of the planned research activities is to quantitatively examine the biological effects of ion beams on the human genome and to determine how these effects would manifest themselves over time. For these tests, scientists will irradiate molecules and cell and tissue samples. The results of the research could then be used to develop optimized radiation shields for space exploration, which are a prerequisite for conducting safe missions to Mars.

The ion beams found in space have a wide variety of sources and can be derived from all types of elements, ranging from the lightest, hydrogen, to the heaviest, uranium. GSI's accelerator facility can generate all types of ion beams, making it particularly well-suited for the planned research project. The research possibilities will be greatly expanded in the future by the FAIR accelerator facility, which will be able to produce even more energetic and intense ion beams.

Source: Helmholtz Association of German Research Centres