Space Radiation 101: From a Spark in the Eye to Photons, Neutrons and Uranium

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Radiation is inescapable in space. Understanding the space radiation environment is a pre-requisite for any robotic or human space mission. The space radiation environment includes literally all elemental ions found in the Periodic Table as well as neutral particles such as gammas and neutrons. The energies of space radiation range from very low energy (e.g., less than eV) to extremely high energy (e.g., greater TeV). Effects that the space radiation imposes to the design of space missions are also complex phenomena whether it is robotic or human exploration. Electronics, materials, and of course humans are all susceptible to radiation to some extents. Shielding is often applied to mitigate the harmful effects of space radiation.
At the same time, the field of space radiation involves multi-disciplinary sciences – solar physics to study the radiation from the Sun; astrophysics to understand energization and constituents of highly energetic galactic cosmic rays; magnetospheric science for trapped particles in planetary magnetic field; and lastly using natural space radiation to study surface (~1 m deep) elemental compositions of planetary bodies, which is planetary science.
This talk, based on more than 25 years of experience in radiation physics, space radiation and spacecrraft design, will provide a very brief and general overview of the space environment science and engineering.