

Advanced Reproduction of Space Radiation Studies by overdense laser plasma interaction

Monday, 3 June 2013 15:30 (15 minutes)

Ionizing radiation in planetary orbits as in Earth's Van Allen belt or the Jovian magnetospheres is a significant hazard for electronically and optical components aboard spacecraft's. Hence a not negligible amount of time and expenses is spent for testing all radiation sensitive components before a mission.

This opens a novel field for LPAs which makes use of the inherent ability of LPAs to generate broadband radiation. The spectral distribution of radiation belt electrons is exponentially-/power law-shaped, in contrast to monoenergetic distributions provided by conventional accelerators. In the completed proof-of-principle experiment with a 30 μm solid Al-target effective electron temperatures < 1 MeV were generated, which is very similar to Earth's radiation belt environment. We investigated the intensity dependence of the electron temperature and the spatial distribution of emission. Due to the high electron flux the daily dose of $3e12$ electron/cm² in a typical navigation satellite orbit can be reached within 140 seconds, instead of several hours needed with today's state-of-the-art testing techniques.

We present an application of enormous industrial relevance including the setup and the results of our experiment, as well as numerical results from PIC simulations.

Primary author: Mr KARGER, Oliver (University of Hamburg, Institute for Experimental Physics)

Co-authors: Mrs COSTANTINO, Alessandra (ESA/ESTEC); Dr NEVSKY, Alexander (Heinrich-Heine-Universität Düsseldorf); Dr KARMAKAR, Anupam (JSC, Forschungszentrum Jülich); Prof. HIDDING, Bernhard (Uni Gamburg/DESY & UCLA); Mr DALY, Eamonn (ESA/ESTEC); Prof. PRETZLER, Georg (Heinrich-Heine-Universität Düsseldorf); Prof. ROSENZWEIG, James (UCLA); Mr MUSCHITIELLO, Michele (ESA/ESTEC); Dr CHEN, Qunfeng (Heinrich-Heine-Universität Düsseldorf); Prof. SCHILLER, Stephan (Heinrich-Heine-Universität Düsseldorf); Mr KÖNIGSTEIN, Thomas (Heinrich-Heine-Universität Düsseldorf); Mrs FERLET-CAVROIS, Veronique (ESA/ESTEC)

Presenter: Mr KARGER, Oliver (University of Hamburg, Institute for Experimental Physics)

Session Classification: WG1 - Electron beams from plasmas

Track Classification: WG1 - Electron beams from plasmas