



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

Εθνικόν και Καποδιστριακόν
Πανεπιστήμιον Αθηνών

— ΙΔΡΥΘΕΝ ΤΟ 1837 —

ΑΝΑΚΟΙΝΩΣΗ

ΠΑΡΟΥΣΙΑΣΗ ΜΕΤΑΠΤΥΧΙΑΚΗΣ ΔΙΠΛΩΜΑΤΙΚΗΣ ΕΡΓΑΣΙΑΣ

Η μεταπτυχιακή φοιτήτρια κα **Παρασκευή Μωραΐτη** θα παρουσιάσει τη μεταπτυχιακή διπλωματική εργασία της διαδικτυακά την **Τετάρτη 11 Φεβρουαρίου 2026, ώρα 17:30**.

«Space Radiation Hazards in the Near-Earth Environment: A Simulation-Based Analysis of Effects on Spacecraft Electronics Using IRENE and the AE9/AP9 Models»

Abstract

This study examines the radiation hazard from charged particles in the space environment and its potential impact on space missions and their electronics. The study begins with a theoretical analysis of the space environment. These two sections discuss the origin and dynamics of charged particles. This includes the Sun's activity through explosive events and the solar wind and continues to the Earth's magnetic field, which traps charged particles, and its magnetosphere. Emphasis is placed on charged particles' motion and the plasma populations they form inside the magnetosphere, such as the Van Allen radiation belts. Mechanisms that contribute to particle convection, acceleration and loss, such as geomagnetic storms and substorms, as well as magnetic reconnection are also discussed. A brief analysis of the classical orbital elements (COEs) is also included. Finally, the correlation between charged particles and induced effects such as surface and internal charging, total ionising dose (TID), and displacement damage (DD) are outlined. In the next sections, following an overview of environmental models and the AE/AP series, IRENE's AE9/AP9 models are implemented to simulate electron and proton fluxes across different energy spectra in five different orbits (LEO, GEO, elliptical, HEO, and MEO), as well as estimate radiation impacts through mapping the dose in relation to shielding depth. Thresholds found in the literature were also utilised to estimate radiation hazard levels for space missions. Every step of the analysis incorporates statistics that ensure that extreme and rare events are taken into consideration. The Monte Carlo mode shows the depths of the highest dose, as well as an indicative worst-case scenario of trapped electron flux, useful for investigating internal charging. The study aims to highlight the importance of modelling the space environment in order to provide a basis for evaluating radiation hazards in various orbital scenarios and assess space missions' and onboard electronic systems' reliability.

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