

OLTARIS – Enhancements Supporting the Europa Mission

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The **On-Line Tool for the Assessment of Radiation in Space** (OLTARIS, <https://oltaris.nasa.gov>) is a web-based set of tools and models that allow engineers and scientists to assess the effects of space radiation on spacecraft, habitats, rovers, and spacesuits. The site is intended to be a design tool for those studying the effects of space radiation for current and future missions as well as a research tool for those developing advanced material and shielding concepts. The tools and models are built around the HZETRN [1-3] radiation transport code and are currently focused on human-related responses. This code and the team behind its continuing development have been identified by NASA to support verification of human radiation design requirements. The current capabilities include:

User Selected Environment(s)

- Free Space Galactic Cosmic Ray (GCR) at 1 AU
- Free Space Solar Particle Event (SPE) at 1 AU
- Earth orbit (Circular)
- Europa design environments (electrons and protons - 105 days at Europa, Jovian Tour, Peak flux at 5R_J and 9R_J)

User Defined Thickness Distributions (complex vehicle geometries)

- Upload thickness distribution(s)
- Supported materials : aluminum, polyethylene (CH₂), and tissue

User Defined Materials for Multi-Material Slab Calculations

- Materials can be defined by chemical formula, elemental mass percentage, or molecular mass percentage
- Arbitrary slabs can be created using the user-defined materials

User Selected Response Function(s)

- Differential flux/fluence
- Dose in tissue or silicon
- Dose equivalent based on ICRP60 standard
- Whole-body effective dose equivalent using the Computerized Anatomical Man (CAM), Computerized Anatomical Female (CAF), Male Adult voXel (MAX), and Female Adult voXel (FAX) body models
- TLD-100 (Thermo-Luminescent Dosimeter)
- TEPC (Tissue Equivalent Proportional Counter)
- LET (Linear Energy Transfer) in tissue or silicon

The focus of this poster is to highlight new capabilities that have been added to support outer planet missions. Specifically, the electron, proton, and heavy ion design environments for the Europa mission have been incorporated along with an efficient coupled electron-photon transport capability to enable the

analysis of complicated geometries and slabs exposed to these environments. The poster will describe how OLTARIS can be used by instrument vendors and mission designers to analyze their specific requirements.

References

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[2] Slaba, T.C., Blattnig, S.R., Aghara, S.K., Townsend, L.W., Handler, T., Gabriel, T.A., Pinsky, L.S., Reddell, B., “Coupled Neutron Transport for HZETRN,” Radiation Measurements, Volume 45 pp. 173-182 (2010).

[3] Slaba, T.C., Blattnig, S.R., Badavi, F.F., “Faster and More Accurate Transport Procedures for HZETRN,” NASA Technical Paper 2010 – 216213 (2010).