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#4-195 Multi-Particle irradiation of CubeSat components using the ENEA Distributed Facility: Experimental Setup and Radiation Response Analysis

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The ENEA distributed irradiation facility offers a versatile environment for irradiating samples and conducting experiments with various particles, including neutrons, protons, and electrons. This facility comprises several advanced sub-facilities: the TAPIRO fast nuclear research reactor as a fission neutrons source, the TOP-IMPLART linear accelerator capable of producing proton beams up to 71 MeV, the neutron generator (FNG), which generates neutrons of 2.5 MeV and of 14 MeV, and the REX linear accelerator for electron beams up to 5 MeV. Together, these facilities support a broad range of irradiation experiments and are especially valuable for studies requiring exposure to multiple particle types on the same sample.

In a previous work we evaluated with the SPENVIS code the energetic spectra at 6000 km of altitude from the Earth's surface, obtaining such a quantity for trapped particles (TP) and Galactic Cosmic Rays (GCR). The primary purpose was to compare the mean energy of TP and GCR with our facilities' energy. We found that our distributed facility could be representative of the trapped electron (TP-e) and proton (TP-H), which are the dominant radiation terms, up to the inner Van Allen Belt. In the same work, taking as reference the irradiation condition of the ABCS mission and with the aid of some FLUKA simulations, we presented the design of a set of experiments to be carried out on our distributed facility.

The current work deals with the presentation and discussion of the first results of such irradiation experiments carried out with electrons (REX), neutrons (TAPIRO and FNG) and protons (TOP-IMPLART) using as target a dummy 1 unit CubeSat mounting a RadFET chip like the one used in the ABCS mission to compare the dose measured under irradiation in the distributed facility with the outcomes of our simulations tools.

From such experimental outcomes, supported by further simulations in which more refined modeling and numerical techniques will be implemented, we will be confident in enhancing our design tools to support the radiometric characterization of components and systems used, at least in near-Earth spatial missions.

Primary author: CROIA, Michele (ENEA - Casaccia research center)

Co-authors: AMPOLLINI, Alessandro (ENEA - Frascati research center); SANTAGATA, Alfonso (ENEA - Casaccia research center); COLANGELI, Andrea (ENEA - Frascati research center); VEZYRI, Androniki (Physics Department, University of Ioannina, 45110 Ioannina, Greece); BIANCHI, Barbara (ENEA - Casaccia research center); RONSIVALLE, Concetta (ENEA - Frascati research center); TRINCA, Emiliano (ENEA - Frascati research center); BAZZANO, Giulia (ENEA - Frascati research center); PAGANO, Guglielmo (ENEA - Frascati research center); FALCONI, Luca (ENEA - Casaccia research center); SCARAMUZZO, Luigi (ENEA - Casaccia research center); ASTORINO, Maria Denise (ENEA - Frascati research center); CESARONI, Matteo (ENEA - Casaccia research center); FONNESU, Nicola (ENEA - Frascati research center); BURGIO, Nunzio (ENEA - Casaccia research center); NENZI, Paolo (ENEA - Frascati research center); RICCI, Pierpaolo (ENEA - Casaccia research center); LORETI, Stefano (ENEA - Frascati research center)

Presenter: CROIA, Michele (ENEA - Casaccia research center)

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