Electron Beam Radiation Tests - The eRAD Project experience

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The "**eRAD** - Radiation resistance test for aerospace components" PROJECT funded as part of the **LAerospaZIO project**, presented in the call for "Strategic Projects 2019" - POR FESR Lazio 2014-2020, has been started on 11/06/2020.

Partners of the Project are:

- Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali di Frascati (INFN-LNF) - as main responsible
- Italian Space Agency (ASI)
- IMTsrl

The general objective of the eRAD project is to use the electron source, available at the INFN-LNF, to measure the behaviour and resistance of electronic components. intended to be subjected to radiation in the aerospace environment. The values and results acquired with these measurements will be compared with homologous measurements made with photons and other particles in order to define comparative resistance thresholds and related indicators.

These measures have a significant importance for estimating the life cycle of electronic devices that will be applied in long-term missions, where electrons of solar origin (Solar Energetic Particles, SEP) and Jupiter can generate damage with reference to ionization doses (TID, total ionizing dose) and those due to atomic shifts in the crystal lattice (TNID, total non-ionizing dose).

The implementation of the project activities is based on the provision by the INFN-LNF of a LINAC linear accelerator and the Beam Test Facility (BTF) of the Frascati National Laboratories.

The LINAC is the linear accelerator of the DAΦNE complex, consisting of a thermionic gun that emits electrons that are subsequently accelerated in the accelerating sections through the electromagnetic fields produced by 4 radio frequency (RF) power stations of 2856 MHz.

One of the LINAC transfer lines was designed to deliver external electron and positron beams in a dedicated Beam Test Facility (BTF), to test and calibrate the particle detectors.

Currently a first campaign of radiation test has been performed on an Optoelectronic device and a SRAM.

Tests have been done by using electrons beam with energy of 500 MeV at different values of fluence (up to 0.5E+13 p/cm2 to 2.5E+13 p/cm2, depending on the device)

Obtained results are very promising and still to be fully interpretated in terms of performances.