

Irradiations at CERN: a broad spectrum

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Despite their sensitivity to radiations, non-metallic materials such as lubricants and elastomeric seals are used in high radiation areas at CERN. They can experience extreme degradation in the MGy dose range, leading to device failure and possibly compromising the operation of the accelerator complex. CERN therefore carries out irradiation tests of commercial materials, to select the most radiation resistant ones from the market. Experimental studies are underway to improve the understanding of radiation mechanisms and their dependence on several irradiation parameters.

The unique fields of secondary radiation produced by beam intercepting devices represent an opportunity for in-house irradiation of electronics and materials. CHARM and IRRAD facilities are already in use, providing mixed field and proton irradiation respectively, for electronics mostly. New irradiation facilities are being developed for the irradiation of polymeric materials. The ISIS irradiation station at ISOLDE and the NEAR station at n_TOF are being equipped with infrastructures to allow tests in mixed radiation fields.

Parasitic irradiations of selected materials will be possible in parallel to the normal facility operation, allowing unprecedented data to be collected. Materials will be exposed to a unique combination of ageing factors along with radiation doses in the MGy range during exposure times ranging from weeks to several years.

These mixed fields will closely represent the operating conditions at CERN, allowing the identification of usability thresholds for the analysed materials. Until now, gamma radiation has been mostly used to perform radiation tolerance tests under the assumption that equal effects would be induced by equivalent doses of different types of radiation. These new facilities will allow this assumption to be checked.

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