Irradiation Facilities at CERN

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CERN provides unique irradiation facilities for applications in many scientific fields. This paper summarizes the facilities currently operating for proton, gamma, mixed-field and electron irradiations, including their main usage, characteristics and information about their operation. The new CERN Irradiation facilities database is also presented. This includes not only the CERN facilities but also irradiation facilities worldwide.

**CERN Facilities**

- **Applications**
  - Radiation damage studies on materials used around accelerators/experiments, on semiconductor devices, on electronic components (COTS, ASIC, etc.) as well as on specific accelerator elements exposed to high-intensity pulsed beams
  - Test and development of prototypes: final assemblies and/or electronic equipment before installation to study their performance degradation after long exposure (aging, TID, NIEL, etc.) or their functional degradation (SEU, latch-up, etc.)
  - Test and calibration of components: personal dosimeters, radiation monitoring and measurement devices, as well as to provide benchmark data for Monte Carlo particle transport codes

**CERN High energy Accelerator Mixed field facility**

- For testing electronic components/systems for accelerators
- 24 GeV/p beam impinging on movable target (Cu, Al)
- Mixed field (neutron, HHG, gamma...)
- Intensity:
  - Lateral: 10–10^2 HeV/cm^2/s, Long.: 10–10^3 HeV/cm^2/s
  - Beam rate: 0.1–10 Gy/h
- Different irradiation positions
- Also for Low Earth Orbit (LEO) and atmospheric testing environment
- High ion beam to be commissioned by the end of 2017

**HiradMat Irradiation facility**

- For calibrating of the electronic components against CERF experimental area
- CERN Proton Irradiation facility
- For qualification of components of the experimental areas
- 24 GeV/p pulsed p beam with an intensity of 10^12 cm^-2
- Spills of 400 s every 10 s
- Fluence of 5 x 10^12 cm^-2 in 24 day
- Scanning also in dimensions of 10x10 cm^2
- 3 irradiation zones for low-Z, electronics and high-Z samples
- Low temperature irradiation (-25°C) and Crystal with Life 1.38
- Dedicated monitoring and management system

**IRRADIATION FACILITIES DATABASE**

- 200 Irradiation Facilities entries from around the world with 50 different types of sources

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For additional irradiation tests complementary to those of CERN:

- Listed entry point for irradiation facilities at CERN and worldwide
- Search filters by country, source or irradiation field
- Possibility to create and edit new facilities by the facility coordinator
- Auto-maintenance (regular reminders)
- Open access data but secured with the CERN authentication system (SSID)

**Facilities details:**
- Facility coordinator
  - Institute
  - Facility data
  - Irradiation conditions
  - Safety
  - Accessibility
  - Additional comments

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