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Study of damages induced on ATLAS silicon by fast extracted and intense proton beam irradiation

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The ATLAS silicon tracker detectors are designed to sustain high dose integrated over several years of operation. This very substantial radiation hardness should also favour the survival of the detector in case of accidental beam losses.

An experiment performed in 2006 showed that ATLAS Pixel detector modules (silicon planar hybridly coupled with FE-I3 electronics) could survive to beam losses up to $1.5 \cdot 10^{10}$ protons/cm² in a single bunch with minimal or no deterioration of performance.

The upgrade of LHC to even higher luminosity (HL-LHC) calls for a new test of these properties.

Two test beam campaigns have been done in 2017 and 2018 at the High-Radiation to Materials (HiRadMat) Facility of the CERN Super Proton Synchrotron in order to establish for the first time the damage threshold of different types of ATLAS IBL pixel and strip detectors under very intense proton beam irradiation.

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