

Simulations of Particle Impacts on Beam Intercepting Devices and Methods for an Experimental Characterization

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In recent years, state-of-the-art numerical methods, involving the use of Autodyn and LS-Dyna wave propagation codes, have been developed at CERN and at Politecnico di Torino in order to simulate the impact of a particle beam on solid accelerator devices such as collimators, windows, targets, dumps and absorbers. These methods were adopted by the authors in 2011 to analyze the consequences of an asynchronous beam abort on LHC Tungsten Collimators (TCT). In order to validate the material constitutive models, in 2012 and 2013 a vast characterization campaign has been launched, entailing advanced beam impact tests in the Hi-RadMat facility and high-speed mechanical measurements at Politecnico di Torino with the Hopkinson bar setup. The experiments confirmed the effectiveness of numerical methods to reliably predict beam-induced damages, also allowing to improve the material models. New simulations were then performed, adopting the refined material models and the updated accident scenarios; damage limits were also redefined, to identify the threshold of incipient plastic damage on the tungsten jaw.

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