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Dynamic response of high power target and beam dump materials to short pulse ion beam-induced pressure waves

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Under extreme beam-induced temperature and pressure conditions at the planned FAIR facility, but also at HiLumi LHC and neutrino facilities, new candidate materials and design solutions have to be found to overcome the increased radiation dose and energy density effects in components that see directly the primary beam such as targets, beam windows, beam catchers and beam dumps.

The dynamic response to pressure waves induced by short intense ion beam pulses for different graphite grades, as well as high damping carbon materials and carbon-carbon composites, was studied using 1 GeV U ions at UNILAC accelerator at GSI and 440 GeV protons at the HiRadMat facility at SPS, CERN.

Online techniques such as Laser Doppler Vibrometry (LDV) and strain gauges are used to monitor the samples dynamic deformations and possible failure limits of simple and composite targets and for benchmarking thermo-mechanical calculations of beam-induced stress and strain.

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