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Modelling and experimental verification of the pressure wave following a gaseous helium storage tank rupture

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Helium inventory in high energy accelerators, tokamaks and free electron lasers may exceed tens of tons. The gaseous helium is stored in steel tanks under the pressure of 20 bar and at environment temperature. Accidental rupture of any of the tanks filled with the gaseous helium will create a rapid energy release in form of physical blast. An estimation of pressure wave distribution following the tank rupture and potential consequences especially to ITER tokamak adjacent infrastructure and buildings is a very important task critical in the safety aspect of the whole cryogenic system. A special test stand was designed and built in order to verify experimentally the blast effects in controlled conditions. In order to obtain such a shock wave a pressurized plastic tank was used. The tank was ruptured and the resulting pressure wave was recorded using an spatially-distributed array of pressure sensors connected to a high-speed data acquisition device. The results of the experiments and the comparison with theoretical values were presented. A good agreement between the simulated and measured data was obtained.

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