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Controlled Cold Helium Spill Test in the LHC Tunnel at CERN

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The 27-km circumference LHC underground tunnel is a confined space in which the helium-cooled LHC magnets are installed. The vacuum enclosures of the superconducting magnets are protected by over-pressure safety relief devices that open whenever cold helium escapes either from the magnet cold enclosure or from the helium supply headers, into this vacuum space. Based on scale model studies a 3-m long no stay zone around these devices is defined to protect the personnel against cold burns or asphyxia caused by such an eventual helium release. To validate recent simulations real life mock-up tests have been performed inside the LHC confined space, releasing helium flow rates of 1 kg/s, 0.3 kg/s and 0.1 kg/s. For each test, up to 1000 liters of liquid helium were released under standard operational tunnel conditions. The data recorded include oxygen concentration, temperature and flow speed measurements, and video footage permit to assess qualitatively the visibility. These measurements were made in the up- and downstream directions, with respect to the ventilation flow, of the spill point in the LHC tunnel.

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