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Environmental Impact of a Tritium Extraction System Small Pipe Break by the Atmospheric Modelling of Elemental Tritium Gas transport with Flexpart

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In the case of a little Tritium-Extraction-System (TES) pipe break (with critical failure of a fuelling line), the tritium source term has not yet been determined in the frame of European Test Blanket Systems, as Design Basis Accident (DBA) but it is expected to be in the order of a few grams. In this critical scenario acute modeling of environmental tritium transport forms (HT and HTO) for the assessment of fusion facilities dosimetric impact appears as of major interest. This paper considers different term releases of tritium-forms to the atmosphere from ITER which has experienced a frequent failure of a fueling line, due the little TES pipe break affecting a Helium-Cooled-Lithium-Lead Test-Blanket-Module. In case of 24.3 g of tritium were released from the broken fuelling-line directly into the gallery found only 0.5 g was released to the environment, assuming a little rupture in the TES piping located in the Port Cell. In this paper we assume a hypothetical daily release of one gram of tritium in HT and HTO forms. The daily failure is taken just in order to evaluate different meteorological scenarios or weather conditions.

The FLEXPART working model simulates the tritium forms dispersion and environmental impact out of the complex ITER-tokamak (and its safeguards) of selected environmental patterns both inland and in-sea using ECMWF/FLEXPART model. We explore specific values of this ratio at different levels. We examine the influence of meteorological conditions of the tritium behavior during 48 hours after the release. For this purpose we have FLEXPART version 9.2 numerical weather model which is useful to follow real-time releases of tritium at low levels of the boundary layer to provide an approximation of tritium cloud behavior ranging from 3 to 48 hours.