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## Tritium Safety Assessment for Fusion Reactor Based on Fuel Cycle and Environmental Dispersion Modelling

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The environment assessment of large inventory tritium in fusion reactor is an important issue before fusion energy can be considered for commercial use. In this paper, a new approach for assessing the radioactive consequences of tritium release under accident events has been developed.

Firstly, the tritium fuel cycle in fusion reactor was simulated based on system dynamics method, and the tritium inventories in each subsystems were evaluated. And combined with FMEA (Failure Mode and Effects Analysis) of tritium plant, the potential tritium release source and its relevant probability were discussed in detail. Then, the processes of tritium atmosphere dispersion, dry & wet deposition, HT oxidation in air & soil, HTO reemission, HT/HTO/OBT transfer among the soil, plants, animals and human beings had been taken into detailed consideration. Gaussian puff model and related corrections were introduced to calculate the accident emission and reemission, and a virtual point source method was utilized for HTO reemission modeling. Finally, an integral average of tritium concentration in atmosphere was used for dose assessment of the public.

Using those models, a tritium safety assessment module of Tritium Analysis program for fusion System (TAS) was developed. A final discussion showed the improved accuracy and many advantages of this “fuel cycle - environment dispersion” coupling method for tritium safety assessment under accident events.

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