

Matter sampling, Tritium removal, inventory and management with a versatile embedded system called LASK

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Erosion of the Plasma Facing Components (PFC) of the Tokamak leads to the formation of dusts and deposited layers which can trap part of tritium present in the Tokamak. Therefore, for safety reasons, it is mandatory to control the tritium trapped and to remove it if the limit is exceeded. Several techniques are under study to solve this safety issue but the most versatile technique to remove the tritium without damaging the PFC is the laser technique. Depending of the processing conditions, different treatments can be performed : thermal treatments leading to tritium desorption, dust/layer removal, sampling, measurement of tritium inventory by on-line spectral analysis of the optical signal created during laser ablation (Laser Induced Breakdown Spectroscopy: LIBS) or by analysing solid/gaseous substance produced during the laser treatment.

In order to check the feasibility of an integrated tool able to operate under ITER condition, two embedded versatile systems have been conceived. These tools called LASK V1 and V2 (for Laser Ablation System Kit) are foreseen to perform as well matter sampling, tritium inventory, as tritium removal by using laser treatments.

In this paper, the two systems will be presented.

The first system (LASK V1) is designed to operate at very low pressure (between two plasma sessions). This innovative system loads an aerogel piece to perform matter sampling and permits chemical and physical characterisation. Its ability to perform laser ablation permits to obtain tritium removal by removing deposited layer and to evaluate tritium quantity by LIBS.

The second system (LASK V2) is designed to operate during maintenance phases (Atmospheric pressure). This efficient system permits by using laser treatments, to perform tritium desorption or dust/layer removal. In addition, its efficient vacuum cleaning system permits to collect polluted mobile dusts, ejected matter and outgazed tritium. Associated to a station analysis, in-line tritium inventory can be done.

In this paper, the advantages and limitations of the two systems will be presented in function of ITER environment and process requirements (sampling, tritium inventory and tritium removal). The evaluation of the efficiency for each process will be also presented for the two systems.