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PASSIV-ITER: AN EXAMPLE OF AN AMIDEX INTERDISCIPLINARY PROJECT

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Expected power and duration of the future fusion device, such as ITER, require the plasma-facing components (PFCs) to withstand considerable plasma fluxes. As a consequence, divertor PFCs are in tungsten (W) due to its refractory properties and low plasma sputtering yield. However, experiments have shown that plasma wall interaction can trigger the formation in the plasma chamber of W particles. Tritium retention in these dust generated during ITER operation is a major concern for the evaluation of the safety of the machine. Indeed, these dust of variable size from nanometers to centimeters will be tritiated and could store a large amount of tritium in the vacuum vessel. This has numerous consequences regarding safety issues including the possible release of tritium with such activated aerosols in case of failure of the first barrier of confinement during a loss of vacuum accident (LOVA). Accidental inhalation of such tritiated particles should thus be harmful for fusion workers. The study of their toxicity is the final objective of the interdisciplinary AMIDEX project PASSIV-ITER
In this seminar, the ITER operation will be recalled with a focus on the plasma wall interaction and their consequences on particles production. The probable properties of the ITER dust will be then presented extrapolating the results obtained in current operating tokamaks. The viability of this extrapolation will be also discussed.
The dust production in current tokamaks is scarce compared to what it is supposed to be produced in ITER. In order to undertaken the toxicity studies of the PASSIV-ITER project, ITER relevant dust have been produced on purpose and characterized. These activities will be described in the second part of this talk with the tritiation of the particles and their behavior in different biologic media.
Then, the first results concerning cyto and geno toxicity will be presented.

As a conclusion, the multidisciplinary methodology that has been especially developed in the interdisciplinary PASSIV-ITER project will be summarized and critically assessed. We will also show how it can be applied to other topics taking as an example the starting H2020 TRANSAT project. This is a good example of how the support of AMIDEX triggers new and innovative research activities within the framework of “interdisciplinarity” and can then give the opportunity to take a leading position at the European level.

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