Studies of Vapour Shielding Physics in the OLMAT Facility. Applications to the LMD EuroFusion Project

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The OLMAT-TJII project proposes the use the TJ-II NBI system in order to irradiate Liquid Metal targets with DEMO relevant power densities (neutrals plus occasionally ions), in the range of W< 20MW/m^2.
The targets will be located in a separarted chamber connected to the TJ-II vacuum vessel and facing one of the NBI sources typically used for plasma heating in TJ-II. The nominal power is 1MW at E= 35kV, and the pulse duration is up to 200ms. The repetition frequency for OLMAT experiments can be increased up to 1pulse/2 min. By removing the ion deflectors an extra 30% power can be achieved. In addition, the combined effect of ion irradation and high neutral fluxes can be addressed.
The proposal includes three phases, the first one with some minor modifications to the existing system allowing 200 ms irradiations with 20 MW/m^2, the second one adding a high power laser for transient, ELM-like high power local irradiation and the third one including an upgrade of one of the TJ-II injectors in order to irradiate with long pulses.For the present proposal, phases 1 and 2 apply.
A set of devoted diagnostics is already available, including OES, Langmuir probes, He bem diagnostic, IR cameras, pyrometrs, calorimeter, etc…Some of these diagnostics are already routinely used for beam characterization impigning on a graphite calorimeter. Lithium, and LiSn alloys will be studied, and a lock chamber is attached to the system for easy sample replacement and observation. Actively cooled, refilled samples are being designed for long exposure time experiments.
Vapour shielding effects are expected at these high power densities. They will be characterized by measuring the effective power reaching the sample under different values of the LM temperature. Plasma characterization by the above mentioned diagnostics will allow for the interpretation of the observations and to get insight into the corresponding atomic processes.

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