My view on the vapour shielding issues

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There are different models of the vapour shielding. In a ballpark they could be divided on two major categories: i) inertial models, and ii) dissipative models. These models are very different and involve different atomic physics effects.

The first one is relying on inertial heating of the vapour cloud (ablated material) by incoming heat flux, which is carried by plasma particles. The amount of energy reaching the surface is determined by the stopping power of the vapour. No dissipation of energy from the vapour is accounted for. As an example of such model one could refer to the shielding of pellets (both H and impurity) (e.g. see Ref. 1-3).

The second one, in addition to the heating of the vapour cloud, involves also dissipation of incoming heat flux by the radiation loss. For example: shielding of dust particles in tokamak edge plasma, and impact of large ELMs and disruption on divertor targets, and, finally, effective "impurity and hydrogen shield" of divertor targets in detached regimes (e.g. see Ref. 4-6). We notice that in the latter case the radiation trapping effects (e.g. Hydrogen Lyman lines) play an important role (e.g. [7, 8])

We show that atomic physics data used in different approaches to vapour shielding problem is intrinsically linked to particular plasma model implemented. We discuss major atomic physics processes relevant to different shielding mechanisms and demonstrate that comparison of simulation results with experimental data requires careful choice of comparing parameters [9].

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