Effects of dust on plasma discharges during tokamaks start-up phase
E. Lazzaro1, M. De Angeli1

1 Istituto di Fisica del Plasma, CNR, Milan, Italy

Dust in tokamaks is unlike to be mobilized prior to the beginning of plasma discharges, then dust presence in the vessel during the start-up phase of discharges is not considered an issue. Problems could arise due to the presence of magnetic dust [1, 2, 3] that are more likely to fly in the vessel volume during stat-up phase [4] and could interfere with the plasma discharge [5]. In fact the presence of dust in the early phase of discharges can induce a shift of the optimal loop-voltage vs. gas pressure curve during breakdown phase (i.e. shift in the Paschen’s curve), or perturb the plasma resistivity, through the perturbation of $Z_{\text{eff}}$, leading to a change of the current rise time and a limitation in the plasma current plateau during start-up. In the perspective of the use of stainless steel for the ITER diagnostic first wall [6] and RAFM steel in future fusion plants [7], the presence of magnetic dust could not be negligible.

In this work we propose a model to describe the start-up phase of plasma discharges in presence of solid metallic particles (dust). Examples on how the presence of dust can interfere with the current ramp-up phase for relevant dust densities and dust nature scenarios, being dust generally composed by different materials, is presented.