# On the effect of boundary conditions for electromagnetism in Induction Heat Treatment simulations

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**ABSTRACT**

The commercial software FORGE® deals with electromagnetic problems for induction heating applications by using a global 3-D finite element approach – including the air surrounding the workpiece and the inductors (see Fig. 1). In this work we present in first place an analysis of the influence of the two typical boundary conditions (null Dirichlet and Neumann conditions) to approach far field conditions on the outer boundary of the air box. It has been observed that these conditions have an impact on the results due to the truncation of the infinite domain required for the full decay of the electromagnetic waves. In a second step we introduce the use of perfectly matched layers as a generic approach to almost overcome the influence of the surroundings outer box (or truncated domain) showing that a much more trust-worthy result can be obtained with small model sizes (see Fig. 2).

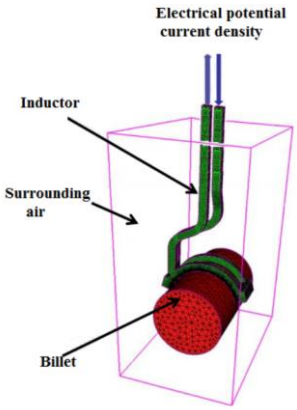


Figure 1Sketch of a typical induction heating simulation set-up.

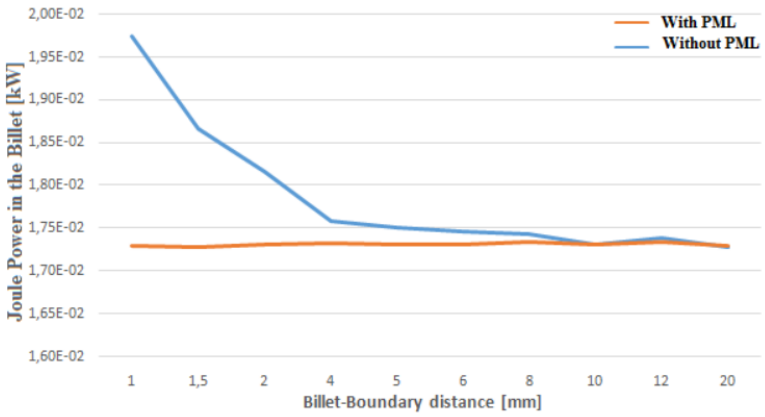


Figure 2 Typical trend of the heat source power on the billet with respect to the billet-bounding box distance.