

Abstract Submitted  
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**Control Optimization for the Position and Shape of the Ignitor Plasma Column\*** F. VILLONE, CREATE, Napoli, Italy, R. ALBANESE, G. AMBROSINO, A. PIRONTI, G. RUBINACCI, A. COLETTI, ENEA, Frascati, Italy, A. CUCCHIARO, G. MADDALUNO, A. PIZZUTO, G. RAMOGIDA, M. ROCCELLA, M. SANTINELLI, B. COPPI, MIT — The performance of the control system for the position and shape of the elongated, tight aspect ratio plasma column of Ignitor has been analyzed using the CREATE\_L linearized MHD deformable plasma response model<sup>1</sup>. The possible failure of the relevant electromagnetic diagnostics has been taken into account by considering the feasibility of vertical control by other means, employing X-ray emission and thermography to evaluate displacements of the center of the plasma column and deformations of its outer surface interacting with the first wall. A realistic description of the power supplies has been introduced in the simulation scheme, thus allowing the optimization of the PID (Proportional-Integral- Derivative) controller. Both a voltage and a current loop control scheme have been analyzed: the first has been found to be only marginally better than the second one. The problem of controlling the shape of the plasma cross section has been dealt with by considering shape deformations induced by varying one of the plasma macroscopic parameters (eg.,  $I_p$ ,  $\beta_{pol}$ ,  $l_i$ ) by a few percent.

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<sup>1</sup>R. Albanese, F. Villone *Nucl. Fusion* **38** 723 (1998)

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