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**Synthetic diagnostics for ITER First Plasma Operation** JOYEETA SINHA, PETER DE VRIES, LUCA ZABEO, JOSEPH SNIPES, SIMON PINCHES, YURI GRIBOV, ITER Organization, Route de Vinon-sur-Verdon, CS 90 046, 13067 St. Paul Lez Durance Cedex, France — ITER First Plasma (FP) operation aims to produce a plasma with current higher than 100kA for a duration longer than 100ms, which corresponds to the plasma initiation phase of ITER operation. However, the low values of plasma density and temperature associated with the initiation phase make it difficult to diagnose the plasma accurately. Therefore, it is essential to develop models for the available diagnostics for ITER FP operation to determine the necessary measurement ranges for plasma initiation and use them as inputs for controller development and assessment within the Plasma Control System. The use of accurate diagnostic models helps to optimally prepare for and analyze ITER FP operation. A model developed for the H-alpha spectrometer for FP shows that it is possible to measure H-alpha emission soon after breakdown for plasma temperatures higher than 3eV and densities higher than 5e17m$^{-3}$. The diagnostic model for the interferometer shows that for the proposed ITER FP scenarios, accurate measurements are possible for plasma densities higher than 5e17m$^{-3}$. Improved diagnosis of the plasma state is possible by combining the measurements from the different diagnostics for ITER FP operation.

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