ITER Plasma Start-up Simulation,¹ J. LEUER, General Atomics, A. PORTONE, ITER Co-Center, Naka, Japan — Characteristics of ITER plasma startup are presented. The initial magnetization, breakdown and initial plasma current ramp-up phases of ITER operation are optimized based on coil voltage and current limitations. Induced axisymmetric eddy currents in the first wall-blanket, vacuum vessel and cryostat are included in the analysis using an eigen-mode technique. A constrained, least squares optimization technique is used to minimize an object functional containing prescribed fields, field time derivatives and voltages needed for plasma breakdown and stable current ramp-up. Within the prescribed coil voltage and current limitations, plasma current ramp rates of 0.5 MA/s are achievable. Approximately 5% of the total flux swing capability is lost prior to achieving breakdown as a consequence of eddy currents driven in the structure prior to build up of adequate voltage in the breakdown region. Resistivity of the passive structure is shown to strongly influence the overall system performance. Startup scenarios which enhance the breakdown performance are discussed.

¹Work supported by U.S. DOE Contract No. DE-AC03-94SF20282.