

Abstract Submitted
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Ignitor and the High Density Approach to Fusion Reactors* F. BOMBARDA, ENEA, Italy, B. COPPI, M.I.T. — The optimal path to ignition that can be followed by experiments based on existing technologies and knowledge of plasma physics relies on the high plasma density regimes that are at the basis of the Ignitor design ($R_0 \cong 1.32$ m, $a \times b \cong 0.47 \times 0.83\text{m}^2$, $B_T \cong 13$ T, $I_p \cong 11$ MA). Their value has been rediscovered recently following experiments by the helical LHD facility that have systematically produced plasmas with $n_0 \leq 10^{21}\text{m}^{-3}$. Consequently, conceptual power producing reactors that would operate with plasma parameters close to those of Ignitor when reaching ignition have been envisioned. The main purpose of the Ignitor experiment is, in fact, that of establishing the reactor physics in regimes close to ignition, where the thermonuclear instability can set in with all its associated non linear effects. “Extended limiter” and double X-point configurations have been analyzed and relevant transport simulations show that similar burning plasma conditions can be attained with both. The machine core design has been essentially completed, but the recent development of a new intermediate temperature superconducting material (MgB_2) has led to its adoption for the largest poloidal field coils, producing a vertical field component of 4 T. The properties of this material make it possible to envision its future use for coils producing higher magnetic fields and open new options in the design of novel experimental devices.

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