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Ignitor and the High Density Approach for Fusion* F. BOMBARDA, ENEA, Italy, B. COPPI, MIT — The high plasma density regimes discovered by high magnetic field toroidal experiments have both outstanding confinement characteristics and degree of purity, and are at the basis of the Ignitor design. 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, by Ohmic heating only or with modest amounts of ICRH auxiliary heating. The driving factor for the machine design ($R_0 \cong 1.32$ m, $a \times b \cong 0.47 \times 0.83$ m^2, $B_T \leq 13$ T, $I_p \leq 11$ MA) is the poloidal field pressure that can contain, under macroscopically stable conditions, the peak plasma pressures corresponding to ignition. Objectives other than ignition can be envisioned for the relatively near term, for example that of high flux neutron sources for material testing involving compact, high density fusion machines. This has been one of the incentives that have led the Ignitor Project to adopt magnesium diboride (MgB_2) superconducting cables in the machine design, a first in fusion research. Accordingly, the largest coils (about 5 m diameter) of the machine will be made entirely of MgB_2 cables. *Sponsored in part by ENEA of Italy and by the U.S. D.O.E.

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