Non-Thermal Fusion Processes and Innovations Considered for the Ignitor Program*

P. Ferraris[1], B. Coppi[2,3], G. Faelli[1], E. Boggio-Sella[1], R. Spigler[4] and Ignitor Program Members[5]
[1]Consorzio Ignitor, [2]CNR, [3]MIT, [4]Roma 3 University and [5]Multiple Institutions

The Ignitor Program [1] has produced the first complete design of a machine capable of approaching ignition regimes based on normally known conditions and adopting well tested structural and current conducting materials. The design, referred to as Ignitor EVO, is being updated consistently in order to take the results of new and significant experiments into account and to benefit from developments of technology and materials science that become known. Given the proven ability of high field compact machines to produce well confined plasmas with a wide range of collisionalities, Non-thermal ("Cool") Fusion processes that have been identified theoretically, and would allow approaching ignition under milder conditions than those based on the properties of thermonuclear plasmas, can be investigated with them. Another important issue is that of inducing high currents in low and high density plasmas and investigating the transitions between the two regimes in order to adopt the most appropriate current drive procedures and means. Given the pressing need to investigate meaningful burning plasmas, the choice of superconducting machine components and materials to be employed has been based on assessing the time needed to develop relevant and reliable magnet systems with them. Thus, Ignitor has pioneered the development of large MgB2 superconducting magnets of the kind adopted for the largest poloidal field coils. Collaborations on near term high field superconducting magnets are undertaken with relevant European research and industrial institutions. *Sponsored in part by CNR of Italy.

[1] B. Coppi *et al., Nucl. Fusion* **55**, 053011 (2015).