The Triniti Collaboration on the Ignitor Project*

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A Memorandum of Understanding was signed in April 2010 between the Governments of Italy and of the Russian Federation for a fast paced research program for fusion centered on the construction in Italy and operation of the Ignitor machine at the Triniti site (Troitsk, near Moscow). The design of the machine core has been completed, together with the construction of full size prototypes of all main machine components; major infrastructures that include buildings and power supplies are already available at the site, which is already licensed for the use of tritium, together with a well established tradition of research in plasma physics.

The high field approach represented by Ignitor [1] ($R_0 \cong 1.32$ m, $a \times b \cong 0.47 \times 0.86$ m^2, $B_T \leq 13$ T, $I_p \leq 11$ MA) is the only one that can be pursued in the near term to attain ignition conditions. The Ignitor strategy to reach the point where the ratio of the α-heating power to the power lost by the plasma that is $K_f \cong 1$, relies on the optimal exploitation of Ohmic heating during the plasma current ramp phase, with the possible assistance of modest amounts of RF auxiliary power. The main goal of the experiment is to study the physics of a self-sustained burning plasma and to develop the appropriate strategies to control the instabilities that can develop, in regimes sufficiently far from well known operational limits (density and β limits, for example) and, at the same time, dominated by α-heating. The experimental achievement of these conditions over significant times (in Ignitor $t_{\mathrm{pulse}} \gg \tau_{\mathrm{E}} \gg \tau_{\mathrm{sd}}$) will provide the much needed proof-of-principle that fusion reactors capable of producing net power can be designed. The Ignitor collaboration extends internationally to scientific groups within University and Research institutions involved in plasma physics both in the laboratory and in space.

In parallel to the effort on the Ignitor machine, there will be a line of R&D carried out on high magnetic field technologies, the possible use of compact, high density fusion machines as high flux neutron sources, and the development of hybrid, superconducting magnets using the new superconducting material MgB_2 adopted for a major component of the designed machine.

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[1] B. Coppi, A. Airoldi, F. Bombarda, et al., *Nucl. Fusion* **41(9)**, 1253 (2001).