Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

New Superconductors for Near Term Fusion Devices* S. BERTA, Columbus, Italy, B. COPPI, MIT, G. GRASSO, R. PENCO, Columbus, Italy — The high density plasma regimes that have been observed and investigated by the Alcator and Frascati Torus programs, and more recently by the LHD helical device, lend themselves to be exploited in the near term for demonstrating D-T ignition using compact, high field experiments like Ignitor. The same plasma regimes can be relied upon in the attempt to devise useful neutron sources for a variety of applications. The relevant machine does not need to be optimized for ignition but to produce the highest usable neutron fluence. Thus, in order to improve the machine duty cycle the adoption of the recently discovered superconducting material MgB_2 to supplement the copper material in the high field magnet systems (hybrid solution) has been considered. The MgB_2 solution has the advantage of employing gas-He as coolant, like the copper material needed for the highest field regions, although at lower temperature ($\lesssim$ 10 K), and it is not subject to large temperature excursions during the current pulse. A significant fraction of the volume taken up by copper is replaced by structural material (e.g. steel) that can carry the relevant stresses to less critical regions of the magnets. The largest poloidal (vertical) field coils of Ignitor (5 m diameter) are being re-designed to be made exclusively of MgB_2 superconducting cables, a first for a fusion device. *Sponsored in part by ENEA of Italy and by the D.O.E.

B. Coppi
MIT

Date submitted: 16 Jul 2010 Electronic form version 1.4