Possibilities for Long Pulse Ignited Tokamak Experiments Using Resistive Magnets

E. A. Chaniotakis
L. Bromberg
D. R. Cohn

MIT Plasma Fusion Center

ABSTRACT

Tokamak designs based on copper and copper alloy magnets could be used for the investigation of the physics issues associated with long pulse (> 40 sec.) ignited operation during the next phase of fusion research. The engineering characteristics of designs with magnets that use copper or beryllium copper alloys are presented. Active cooling of the magnets with either liquid nitrogen or water is considered. Inertial cooling is also discussed. The physics performance of the designs is calculated and compared to the performance of the “Physics Phase” ITER design, and the BPX tokamak.

1 Introduction

The objectives of the fusion program prior to the development of an electricity producing pilot plant or demonstration reactor are to first investigate the fundamental physics issues of long pulse, ignited operation and second to demonstrate and integrate the required technologies. Several tokamak designs have been proposed for achieving these goals. The International Thermonuclear Experimental Reactor (ITER), a superconducting device, is being designed to achieve both of the above mentioned goals in a single machine at an estimated cost of 8 billion US dollars.[1] In addition, the United States burning plasma experiment (BPX) as well as the IGNITOR