

Overview of the DIII-D Program and Construction Plans*

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The DIII-D tokamak is a mid size tokamak operating at reactor relevant parameters. Because of its size it is relatively easy to modify the machine as required to test new ideas or theories. During the last few years several new hardware items have been added to the DIII-D tokamak and improvements have been made to others. The main additions in the last two years were the installation of the I-coil system and upgrades to the electron cyclotron heating (ECH) system. In addition the fast wave system is being brought back into operation after having been idle for three years. The I-coil system, which consists of 12 coils installed inside the DIII-D vessel, is used to stabilize the resistive wall modes and to produce a stochastic edge, which has suppressed edge localized modes (ELMs). ELMs can be detrimental to ITER, since they can erode the plasma facing surfaces. The I-coils are powered by three switching power amplifying units, which together with a flexible patch panel allow the I-coils to be operated in many different configurations. The ECH system has been upgraded to six gyrotrons, which have been used to heat the plasma, modify the current profile and stabilize the neoclassical tearing 3/2 and 2/1 modes. Three ECH launchers built by Princeton Plasma Physics Laboratory are installed on the DIII-D tokamak and have the capability of changing the beam direction in both toroidal and poloidal directions.

Three additional gyrotrons have been ordered for the DIII-D program. They are required for current profile control and stabilization of the NTMs. The gyrotrons are scheduled to be installed during a 10–12 month facility enhancement period, which spans 2005–2006. At the same time a modification is scheduled to be made to the lower divertor to make it pump double-null high triangularity plasmas, which are important for studying advanced tokamak plasmas. One of the four neutral beam lines will be rotated for counter injection, which will allow study of the quiescent double barrier mode with central co-rotation of the plasma and of the resistive wall mode with low rotation.

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