RESULTS OF DIII–D OPERATION WITH NEW ENGINEERING TECHNOLOGIES*

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The U.S. fusion program has increased emphasis on fusion science and plasma confinement innovation. Recent experiments on DIII–D have been carried out to understand and explore improved tokamak operating modes by exploiting control of the plasma current and pressure profiles using new rf current drive and divertor technology. DIII–D emphasizes plasma shape and divertor experiments with systematic experiments using a digital plasma control system and extensive diagnostics to develop improved understanding and control of transport barriers in high performance plasmas. The experiments are carried out with various plasma current profiles. Studies of transport and stability are then carried out varying plasma shape and plasma radial pressure profiles. The emphasis of our program is to extend the duration of high performance operating modes beyond the plasma current relaxation time by using ICRF and ECRF current drive. Engineering features of the new rf systems being used in these experiments as well as new divertor pumping results will be described. DIII–D employs multi-element ICRF antennas for fast-wave electron heating and on-axis current drive and is beginning 110 GHz ECH experiments with MW gyrotrons for off-axis current drive. DIII–D employs active cryogenic divertor neutral particle pumping for plasma density and plasma pressure profile control. A divertor modification is now being implemented on DIII–D to pump higher triangularity plasmas and to better baffle neutral backflow from the recycling divertor region.

*Work supported by U.S. Department of Energy under Contract No. DE-AC03-89ER51114.