FEATURES AND INITIAL RESULTS OF THE DIII–D ADVANCED TOKAMAK RADIATIVE DIVERTOR*

R.C. O'Neill,[1] A.S. Bozek,[1] M.E. Friend,[1] C.B. Baxi,[1] E.E. Reis,[1] M.A. Mahdavi,[1]
D.G. Nilson,[2] S.L. Allen,[2] and W.P. West[1]

[1]*General Atomics, P.O. Box 85608, San Diego, California 92186-5608*
[2]*Lawrence Livermore National Laboratory, Livermore, California*

The Radiative Divertor Program of DIII–D is in its final phase with the installation of the cryopump and baffle structure in the upper inner radius of the DIII–D vacuum vessel being completed by the end of this calendar year. This divertor, in conjunction with the lower divertor (located in the lower and upper outer radius of the DIII–D vacuum vessel, respectively) provide pumping for density control of advanced tokamak plasma shapes while minimizing the affects on the core confinement. Each divertor consists of a cryo/helium cooling ring and a shielded protective structure. The cryo/helium cooled pump of all three divertors exhaust helium from the plasma. The protective shielded structure or a baffle structure in the case of the divertors located at the top of the vacuum vessel, provides baffling of neutral charged particles and minimizes the flow of impurities back into the core of the plasma. The baffles, which consist of water-cooled panels that allow for the attachment of various size and shaped tiles, house gas puff systems. The intent of the puffing systems is to inject gas in and around the divertor to minimize the heat flux on specific areas of the divertor and its components. The reduction of the heat flux on the divertor minimizes the impurities that are generated from excess heat on divertor components, specifically tiles. Experiments involving the gas puff systems and the divertor structures have shown that the heat flux can be spread over a large area of the divertor, thereby reducing the peak heat flux in specific areas.

The three divertors also incorporate a variety of diagnostic tools such as halo current monitors, magnetic probes and thermaocouples to monitor certain plasma characteristics as well as determining the effectiveness of the cryopumps and baffle configurations. The divertors were designed to optimize pumping performance and to withstand the electromagnetic loads from both halo currents and torodial induced currents. Incorporated also into the designs of the structures is the capability to withstand the thermal gradient across the structures and the DIII–D vacuum vessel during operations and bakeout in which temperatures reach as high as 350°C. The performance of the diagnostics and divertor systems are reported in this paper, along with the baseline of the designs of the three divertor systems.

*Work supported by U.S. Department of Energy Contract DE-AC03-99ER54463.

R.C. O'Neill
General Atomics
P.O. Box 85608
San Diego, CA 92186-5608
(619) 455-2659
FAX (619) 455-2838
e-mail: oneill@gav.gat.com

Prefer:
Oral
✔ Poster

Session: Divertors and Plasma Facing Component Engineering