DESIGN AND ANALYSIS OF A RADIATIVE DIVERTOR FOR USE IN DIII–D*

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The Radiative Divertor is a major upgrade to the divertor of DIII-D and is being designed and fabricated for installation in late 1996. The Radiative Divertor Program (RDP) will enhance the dissipative process in the edge and divertor plasmas to reduce the heat flux and plasma erosion at the divertor target. This approach will have major implications for the heat removal methods used in future devices. The divertor is of slot-type configuration which is designed to minimize the flow of sputtered and injected impurities back to the core plasma. The new divertor will be composed of toroidally continuous, Inconel 625 water-cooled rings of sandwich construction with an internal water channel, incorporating seam welding to provide the water-to-vacuum seal as well as structural integrity. The divertor structure is designed to withstand electro-magnetic loads as a result of halo currents and induced eddy currents. It also accommodates the thermal differential it will experience during the 350°C bake used on DIII–D. The water-cooled rings will remove a 38 MW, 10 second pulse through inertially-cooled, mechanically attached ATJ graphite tiles that will provide a low Z plasma-facing surface. Current schedules call for detailed design in 1995 with installation completed in December 1996. A full size prototype comprising one-quarter of one ring is being built to validate manufacturing techniques such as the machining, roll-forming, and seam welding. The experience and knowledge gained through the fabrication of the prototype is discussed. The design of the electrically isolated (5 kV) vacuum-to-air water feedthroughs needed to supply the water-cooled rings is also discussed.

*Work supported by U.S. DOE Contract DE-AC03-89ER51114.

ABSTRACT SUBMISSION FORM
16th IEEE/NPSS Symposium on Fusion Engineering

September 30 — October 5, 1995
Champaign, Illinois, USA

Paper Title: **DESIGN AND ANALYSIS OF A RADIATIVE DIVERTOR FOR USE IN DIII–D**

Technical Topic Number: **2**

Keywords:
(1)
(2)
(3)

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