

TOOLS FOR REMOTE COLLABORATION ON THE DIII-D NATIONAL FUSION FACILITY*

Bill B. McHarg Jr., T.A. Casper,[†] S. Davis,[‡] and D. Greenwood[◇]

General Atomics, P.O. Box 85608, San Diego, California 92186-5608 USA

The DIII-D National Fusion Facility, a tokamak laboratory funded by the U.S. Department of Energy and operated by General Atomics (GA), is an international resource for plasma physics and fusion energy science research. This facility has a long history of collaborations with scientists from a wide variety of laboratories and universities from around the world. These collaborations have mostly been conducted by travel and participation at the DIII-D site. In recent years many changes in the computing and technology fields are now facilitating useful collaboration from remote sites, thus reducing some of the needs to travel to the experiment. Some of these changes include higher speed wide area networks, powerful workstations connected within a distributed computing environment, network based audio/video capabilities, and the use of the world wide web. As the number of collaborators increases, the need for remote tools becomes all the more important in order to more efficiently utilize the DIII-D facility. In the last two years a joint effort among GA, PPPL, LLNL, & ORNL has introduced remote collaboration tools into the DIII-D environment and studied their feasibility. These tools have included the use of audio/video for communication from the DIII-D control room, the broadcast of meetings, use of inter-process communication software to post events to the network during a tokamak shot, the creation of a DCE (Distributed Computing Environment) cell for creating a common collaboratory environment, distributed use of computer cycles, remote data access, and remote display of results. This study also included sociological studies of how scientists in this environment work together as well as apart. As a result of these studies there is now in place an automated distributed processing environment connected to the real-time experimental operations which can be joined by users at remote locations. This environment will allow further exploration of the technology and sociology of remote participation with DIII-D. Having the tools in place has already permitted remote participation in DIII-D experiments that would not have occurred otherwise, and thus the introduction of these tools has shown the initial feasibility of increasing and improving remote collaboration.

*Work supported by U.S. Department of Energy under Contracts DE-AC03-89ER51114, W-7405-ENG-48, DE-AC02-76CH03073, and DE-AC05-OR22464.

[†]Lawrence Livermore National Laboratory.

[‡]Princeton Plasma Physics Laboratory.

[◇]Oak Ridge National Laboratory.