Remote Collaboration on NSTX

The National Spherical Torus Experiment (NSTX) is a collaborative experimental facility located at the Princeton Plasma Physics Laboratory (PPPL). The national research team consists of physicists, engineers, and students from fourteen institutions. Researchers from Japan, Europe, and Russia are also involved in NSTX.

The distributed nature of the research team, and the fact that many of the off-site participants conduct their research and development at their home institutions, have made it imperative for the NSTX project to develop and implement means of communication among all members during and after an experimental run.

NSTX Control Room

The NSTX control room is equipped with several features that enable remote collaboration. Control room audio and video are broadcast using RealPlayer™ technology. The broadcast includes several color video views of the control room as well as plasma TV pictures from the Los Alamos Fast Camera system. The audio picks up public address announcements in the control room and is used to broadcast meeting discussions. The RealPlayer™ clients are available on a variety of platforms (PC, Mac, and Unix).

The control room is equipped with a Polycom™ video-conferencing system. The system

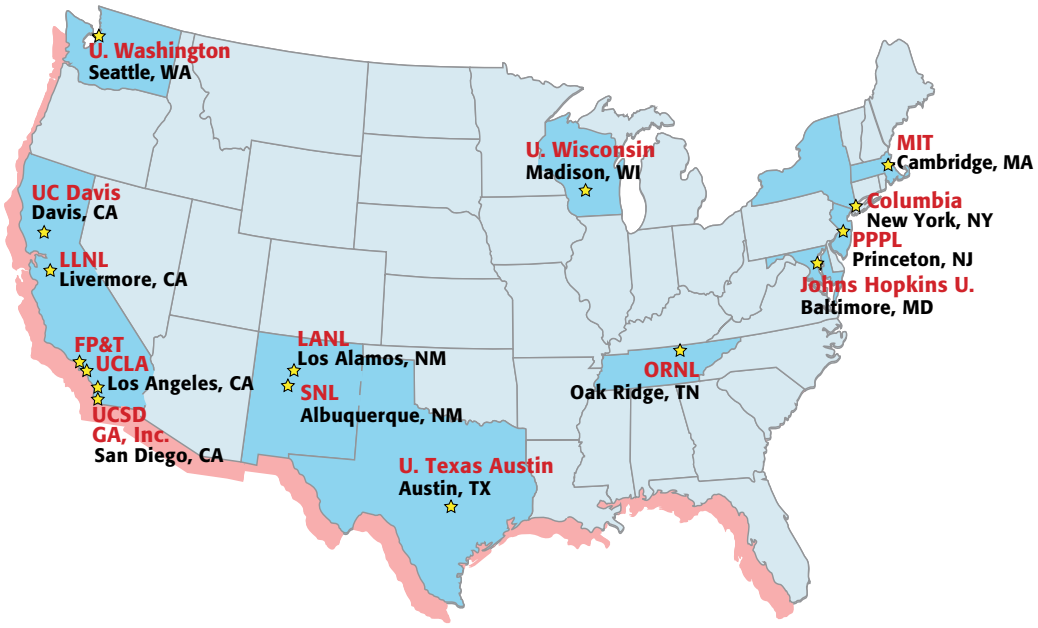

Figure 1. The NSTX National Research Team

About NSTX

NSTX is a new national magnetic fusion experimental facility, located at the U.S. Department of Energy's Princeton Plasma Physics Laboratory, to test the physics principles of the innovative Spherical Torus (ST) confinement concept. The ST concept promises new opportunities for exciting scientific discoveries toward an optimized confinement system and an affordable energy development path. The NSTX National Research and Facility Operations Teams have produced exceptional results since the start of experimentation in 1999 and continue striving to improve in expertise and capability to produce high-quality scientific results and excellent plasma performance. For additional information, please contact: Information Services, Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08543 (609-243-2750); e-mail: pppl_info@pppl.gov or visit our web site at: http://www.pppl.gov

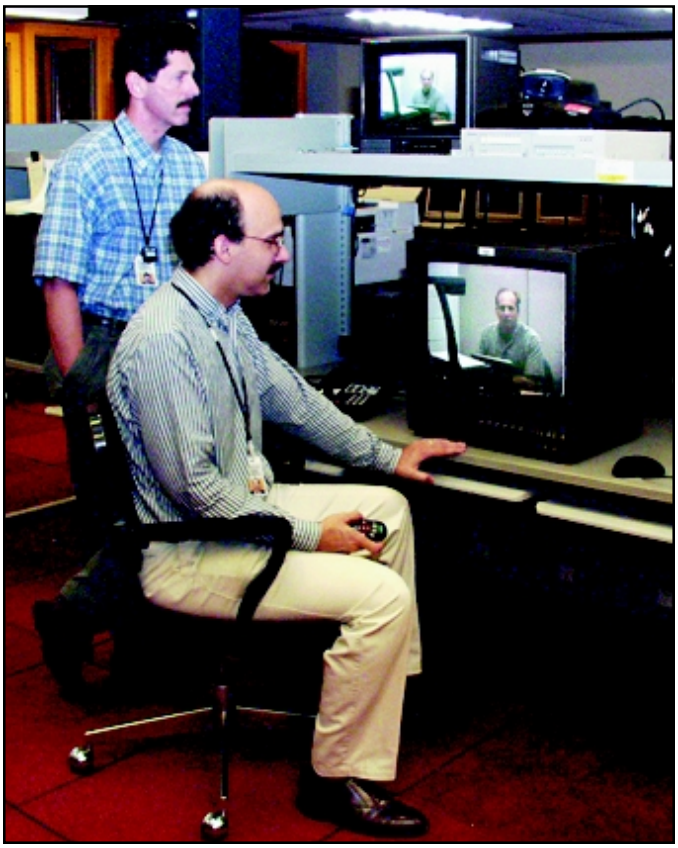

Figure 2. Physicists Steve Sabbagh and Stan Kaye take part in a remote conference using the Polycom™ video-conferencing system.

is setup to allow collaborators to "walk into" the control room and start up a conversation. The system supports both standard ISDN connections (H.320) and Internet based communications (H.323). The system is also capable of multi-point support which allows up to four individual parties to connect at one time.

A Polycom Showstation™ provides remote collaborators with the ability to view the current status of the run or view slides through a web browser.

Meeting Facilities

The NSTX main meeting facility (Room B318) has been outfitted with a number of features. An audio system, which uses advanced echo canceling hardware, has been installed. This system picks up discussions in the room using ceiling, table, and lapel microphones. Ceiling speakers provide return audio from remote sites. The system has been integrated with a telephone, effectively creating a room-sized speakerphone. A separate telephone bridge system has also been installed which allows telephone conferences of up to 18 parties. Audio and video from the room can be broadcast on request using the RealPlayer™ technology. A Polycom Showstation™ provides the ability for remote attendees to both view and present slides which are projected with a built-in overhead projector. Finally, a Polycom Viewstation™ has recently been procured for the room and will be used to provide single and multi-point videoconferences using both H.320 and H.323 standards.

Standardized Software

Resources among various facilities have been pooled and exchanged to create a standard set of software for the storage and retrieval of experimental data that is easily transferable and widely used. The MDS+ system, originally developed at MIT, was the choice for storage of experimental and analyzed data. MDS+, along with its various display tools (e.g., SCOPE, TRAVERSER), and its links to IDL, the Interactive Data manipulation Language, is being used by researchers at the major U.S. magnetic confinement experiments. With the adoption of the SQL Server relational database by the major facilities, applications such as the electronic LOGBOOK, a utility that enables a researcher to record and read comments about each plasma discharge, are being supported widely.

There has also been a mutually beneficial sharing of analysis programs, such as EFIT (GA) for magnetic equilibrium reconstruction, TRANSP (PPPL) for energy and particle transport analysis, and PEST (PPPL), DCON (LANL), and GATO (GA) for plasma stability analysis. At present, software engineers from the major facilities are working together to enhance the pre and post-processors to these codes, and to modularize portions of the codes for easier sharing. This represents the first effort to develop a truly standard set of software to be used widely within the fusion community. It will facilitate off-site collaboration on any of the operating devices.

Figure 3. Physicist Mike Bell presents NSTX data over the web using the Polycom Showstation™.