A New Remote Control Room for Tokamak Operations

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This paper presents a summary of a new remote tokamak control room that has been constructed near the offices of DIII-D's scientific staff. It is an integrated system that combines hardware, software, data, and room control into a unified package that has been designed and constructed in a generic fashion so that it can be used with any tokamak operating worldwide. The room is just over 300 ft^2 and can accommodate up to 12 seated participants. Mounted on the wall facing each scientist are five 52 in. LCD televisions and mounted to the wall on their right are six 24 in. LCD monitors. Each seat has associated with it a 24 in. monitor, network connection, and power and the scientist is either provided with a computer or they can use their own.

To be able to efficiently use this remote control room it was important to create a seamless integration of room control along with its associated hardware and software. The five large TVs are used to project information of general usage to the entire room. Customized web browser displays of both graphics and text are used to maximize screen real estate (e.g. no navigation bar) and for ease of viewing (larger fonts) by a larger audience. One of these displays is dedicated to real-time display of the plasma shape. The six displays on the right side wall are typically configured to display time history of plasma control data. Room control is accomplished via a web application which communicates with hardware via RS-232 commands over Ethernet. Via the web page controls, each scientist has the ability to project what is on their personal monitor to one of the five main TVs allowing the ability for the entire room to see their analysis for collaborative discussion.

The room has been used for operation of DIII-D, EAST, and KSTAR. Due to the long distances, data from EAST and KSTAR was brought back to local DIII-D computers in one large parallel network transfer and then was subsequently served to scientists in the remote control room as well as other US collaborators. Without this once per pulse parallel data transfer, the time for all data to be available to US participants was longer than the time between pulses making remote experimental participation much less efficient. Details of the room implementation will be discussed along with lessons learned from its usage with these three machines.

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