

Capture, Storage, and Analysis of Video Images on the Alcator C-Mod Tokamak

by

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Abstract

Currently, Alcator C-Mod utilizes up to five arrays of filtered, visible light detectors [1] to tomographically reconstruct the D_α emission from D_α brightness data [2]. These consist of ~ 250 chords and require determination of the view of each detector, as well as an absolute intensity calibration of the view of each array. With the introduction of filtered TV cameras with CCD detectors on Alcator C-Mod, however, a view with over 300,000 different chords is available from a single camera. Since there is only one detector array, only one calibration must be made. Using a wide angle lens, large emission regions can be observed, and if toroidal symmetry is assumed, these multichord images may be inverted to yield 2D poloidal cross sections of emission power density. The use of CCD images required solution of new problems. The large amount of data available, put great demands on the current data handling, storage, and manipulation technology. This thesis describes the video system which has been implemented on Alcator C-Mod to digitize, store, and retrieve camera data. It also describes the development of a reliable, efficient, and quick procedure for inverting video images to get 2D poloidal emission power density information.

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