

§ 29. Construction of Video On Demand (VOD) Systems for Real Time Monitoring of a Local Island Divertor (LID) Head

Shoji, M., Komori, A.

Local Island Divertor (LID) experiments have been started from the sixth experimental campaign. The LID system has a limiter head for controlling neutral particles and impurities in the plasma periphery. The limiter head made of carbon plates and molybdenum is inserted into a magnetic island (poloidal mode number $m=1$) formed in the plasma periphery, which causes the concentration of the heat load from the main plasma at the edge of the limiter head. A real time monitoring system for observing the limiter head by using Charge Coupled Device (CCD) cameras, therefore, is needed for optimization of the shape and position of the limiter head in order to effective particle and impurity control without serious mechanical damages.

Video On Demand (VOD) server systems (Dell, PowerEdge2400) have been constructed for observation of the limiter head, plasma dynamic behavior and plasma-wall interactions, etc. It can display the images observed with CCD cameras on a large screen in the LHD control room, and we can easily access image data via the Internet by using Web browser software. Figure 1 indicates a schematic view of the VOD systems. The images taken with the cameras are combined a single image by a video multiplexer (For-A, MV-40E). The video signals are transferred to the control room via electric/optical video signal converters (Melco Technorex, AL-233). The transferred video images are displayed on the large screen and captured in an MPEG encoder board (Canopus, MVR-D2000) installed in a personal computer (Dell Dimension 8300, OS: Windows XP). We customized the data acquisition software to start video capture by a TTL trigger signal using the software developer's kit (SDK) with an I/O board (Interface, PCI-2753). Video capture is automatically stopped by another TTL signal triggered after the termination of visible emission from the main plasma detected by a tangentially viewing CCD camera (Sony, DXC-LS1) installed in 6-T port, which makes a moving picture compression format (MPEG-1) file after every plasma discharge. The captured video data are temporary saved in the personal computers, then, the data are automatically transferred into a Network Attached Storage (NAS) RAID-5 disk (Logitec, LAS-RA500N/H). The video images taken by the other CCD cameras are also stored in the RAID-5 disk. The VOD server system (<http://cdpvods1.lhd.nifs.ac.jp/>) can retrieve a required video data from the RAID disk via the Microsoft Internet Information Service (IIS4.0) with Active Server Pages (ASP) technology.

Figure 2 shows a snap shot of a video taken in the sixth experimental campaign, which includes four images: the LID head observed from inner port (6-I) (upper right); a movable gas puff (7.5-U) (upper left); a back side view of the LID head (lower left); lower divertor plates (3-O) (lower right); a

movable gas puff (7.5-U) (upper left); a back side view of the LID head (lower left); lower divertor plates observed from an outer port (3-O) (lower right). The camera installed in the inner port observed two bright spots at the edge of the limiter head during the plasma discharge when the limiter head was inserted into the plasma periphery. It indicates that the excessive thermal heat load is concentrated at the edge of the limiter head. The divertor plasma image shows no divertor leg structures (which are clearly observed in standard plasma discharges without LID head), showing that the limiter head can almost scrape the peripheral plasma forming the ergodic layer and the divertor leg structures.

Images taken by the CCD cameras and the VOD server systems show the useful information of the effect of the LID head on the plasma periphery. It also indicates the scope of the improvement of the shape and position of the LID head to avoid excessive thermal heat load concentration.

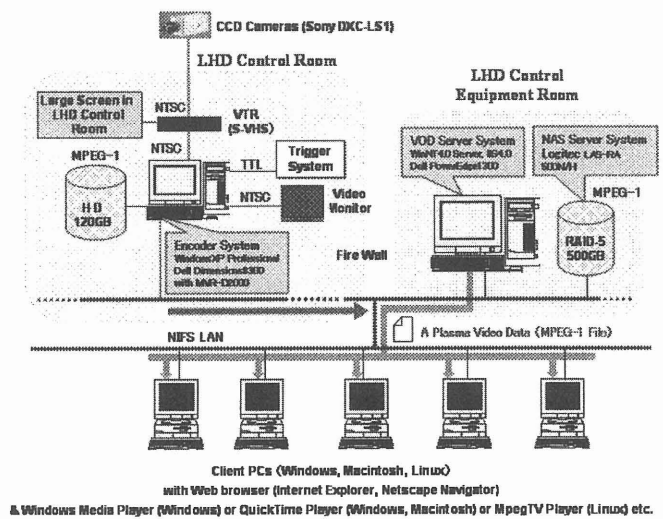


Fig.1. Schematic view of the VOD systems for archiving the video image data observed by CCD cameras for monitoring the LID head.

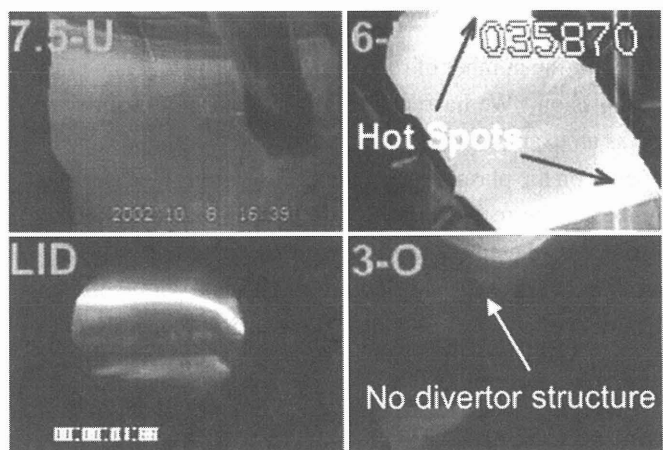


Fig.2. A video image including a LID head viewed from inner port (6-I) (upper right); a movable gas puff (7.5-U) (upper left); a back side view of the LID head (lower left); lower divertor plates (3-O) (lower right).