

# Real-time Video Streaming System for LHD Experiment Using IP Multicast

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In order to accomplish smooth cooperation research, remote participation plays an important role. For this purpose, the authors have been developing various applications for remote participation for the LHD (Large Helical Device) experiments, such as Web interface for visualization of acquired data [1]. The video streaming system is one of them [2]. It is useful to grasp the status of the experiment currently going remotely, and we provide the video images displayed in the control room to the remote users. However, usual streaming servers cannot send video images without delay. The delay changes depending on how to send the images, but even a little delay might become critical if the researchers use the images to adjust the diagnostic devices. One of the main causes of delay is the procedure of compressing and decompressing the images. Furthermore, commonly used video compression method is lossy; it removes less important information to reduce the size. However, lossy images cannot be used for physical analysis because the original information is lost. Therefore, video images for remote participation should be sent without compression in order to minimize the delay and to supply high quality images durable for physical analysis. However, sending uncompressed video images requires large network bandwidth. For example, sending 5 frames of 16bit color SXGA images a second requires 100Mbps. Furthermore, the video images must be sent to several remote sites simultaneously. It is hard for a server PC to handle such a large data. To cope with this problem, the authors adopted IP Multicast to send video images to several remote sites at once. Because IP multicast packets are sent only to the network on which the clients want the data; the load of the server does not depend on the number of clients and the network load is reduced. In this paper, the authors discuss the feasibility of high bandwidth video streaming system using IP multicast.

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[2] M.Emoto, K.Watanabe, S.Masuzaki, N.Ohno, and H.Okada, *Rev. Sci. Inst.* **74** (2003) 1766.