# §18. Charge Exchange Spectroscopy System for CHS in Toki-site

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After the moving of CHS to Toki-site, the charge exchange spectroscopy(CXS) system is being installed with some improvement including increasing observation ports and a newly developed data acquisition system, and the measurements of ion temperature, flow velocities and density profile of fully ionized impurity ion using this system was started. The important features of the CXS system in Higashiyama (Nagoya) site were the bidirectional viewing detecting the absolute value of Doppler shift, which is afterward adopted also in LHD, and the observation cords distributed to cover both of inboard and outboard regions of the plasma[1-2]. In the new system in Toki site, two neutral beams (NB) can be used for the measurement, thus simultaneous measurements of the density profiles and the poloidal flow velocities of two ion species are possible. The dependence of impurity transport process on $Z$ value and magnetic field structure[3-4] is a theme which should be studied with this system. The toroidal flow velocity induced by two co-injected NBs and its effect on the radial electric field will be also studied. Fig.1 shows the system configuration. The bidirectional viewing poloidal fiber arrays are installed at port 8D and 8U viewing the NB No.2(30keV) and at port 3D and 3U viewing the background radiation[5]. These fibers are connected to one spectrometer with CCD detector. Another poloidal fiber array installed at port 6D viewing the NB No.1(40keV), and toroidal fiber arrays for the toroidal flow velocity measurement are connected to another spectrometer. The video signals (NTSC) from these CCD detectors are digitized by 12bit×512kword ADCs, and these ADCs and the clock generators[5] are controlled by a Windows 2000 personal computer via the optical SCSI[6]. The digitized data of 12bit×512kword×2ch/shot can be transferred within a few seconds after the plasma discharge. Fig.2 shows the example of sampled diffraction image of the CVI line ($\triangle$n=8-7, $\lambda$ =5292Å). Here, the fibers from the ports 6D(NB No.1),8D(NB No.2), and 3U/3D(background) are connected to one spectrometer for the comparison of these three toroidal sections. Because of the dependence of the charge exchange excitation rate on the beam energy, NB No.1 gives a more intense excitation. However, NB No.2 also gives an excitation useful for CXS measurements for the outboard region.

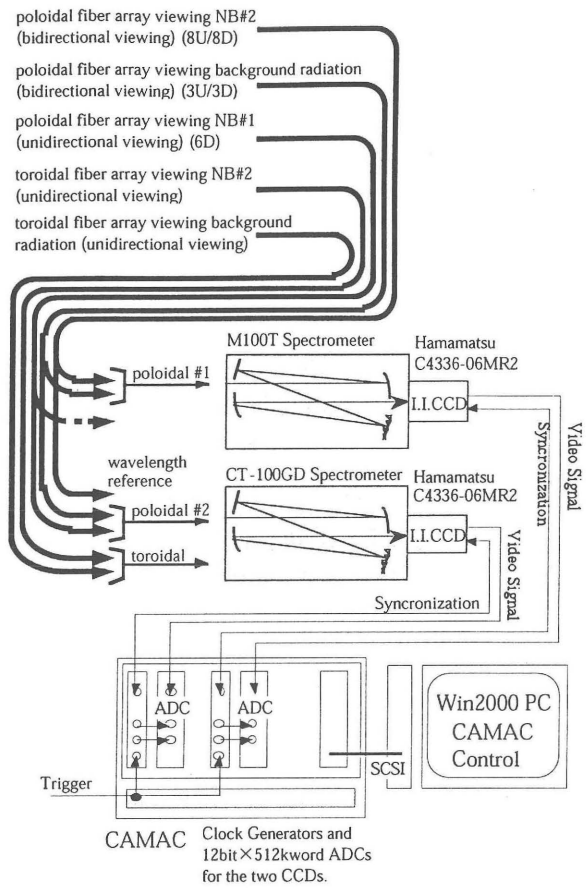


Fig.1 CXS system configuration

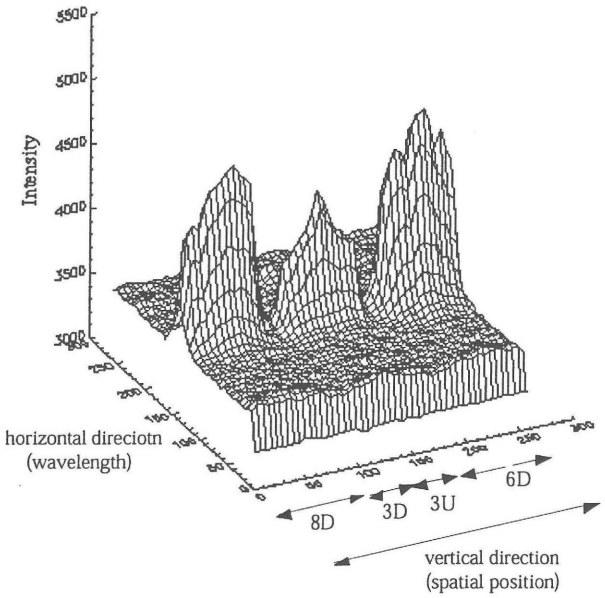


Fig.2 Diffraction image of the CVI line

Reference

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