

## §10. System for Controll of Cooled CCD for Imaging Spectroscopy System

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A Spectroscopic measurement system which has a spacial resolution is important for a plasma without axial symmmetry like the LHD-plasma. For such measurement a cooled CCD is the most important device. Last year, a preliminary check of a cooled CCD was performed.<sup>1)</sup> This year, a computer program for controll of the cooled CCD and image processing was developed.

The system setup is shown in Fig.1. A cooled CCD is used as an image detector of a grazing incidence VUV polychromator.<sup>2)</sup> VUV light is amplified in MCP and converted to visible light by phosfer. The cooled CCD used here is ST-6 manufactured by SBIG (Santa Barbara Instrument Group). The ST-6 system consists of a CCD head, a CPU box, and a power supply. The CCD head is cooled by a thermoelectric(Peltier) system. The controll of the CCD head and the data transfer are made via RS232C. The detecting area of the CCD is 8.6 mm × 6.5 mm, and the pixel number is 375 × 242. The signal is AD converted with a 16 bit ADC.

The computer is FC9801(NEC) and the language is Turbo-C. The commands sent from the personal computer to the ST-6 CPU are structured in packets. The image data are sent in binary form. It should be noted that the binary data "0x1a" cannot be accepted as a value because it means the end of file. Therefore, the system call was used to accept such data.

The size of the program is 120 kB and the size of a file of image data is 181.5 kB. External timing trigger can be given through the mouse connector.

The flow chart of the operation is shown in Fig.2. When the program starts, a menu appears for Take image, Process image, or Quit. To take an image data, first set the temperature of CCD. Wait for a while then set the offset value of the ADC amplifier in ST-6. Then se-

lect the trigger mode, manual trigger or external trigger. After taking the image, the download of the data from ST-6 to the computer takes about four minutes. If the data is good, it is saved to a hard disk. To process the image data, select the file to be processed, then six kinds of process are available as shown in Fig.2. Except the 16 level gray scale image, all the processed figures can be printed out with a printer.

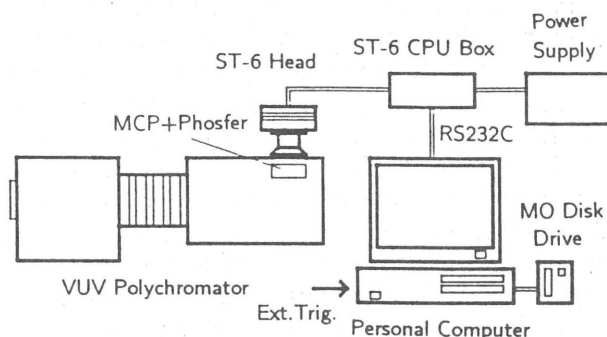


Fig.1 System Setup for Imaging Spectroscopy

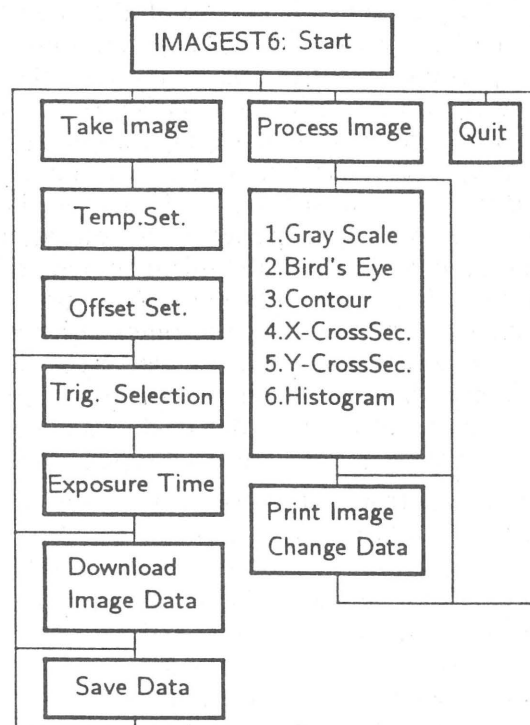


Fig.2 Flow Chart of Operation

### References

- 1) Mimura, M. and Sato, K., Ann.Rep.NIFS (Apr.1993 - Mar.1994) p.90
- 2) Ishiguro, E. et al., Ann.Rep.NIFS (Apr.1993 - Mar.1994) p.89