

CONTROL SYSTEM FOR RCNP CYCLOTRON

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Abstract

The control system of the AVF-cyclotron is upgraded in the summer, 1995. As the result we can operate the beam from the ion source to the target by using the unified control system. At the same time we upgrade the power supplies of AVF-cyclotron.

1. Introduction

The control system of the AVF-cyclotron has been working for more than twenty years. Recently it becomes difficult to maintain the control system for the operation. The AVF-cyclotron has important role as the injector of the Ring-cyclotron. In order to supply the stable beam and makes the operation of cyclotron more simply, it is necessary to unify the control system of AVF-cyclotron and Ring-cyclotron.[1] We shall replace the control system in the summer, 1995. At the same time, we shall update the power supplies and the RF system of AVF-cyclotron. These projects are expected to get higher quality of the accelerated beam for the high resolution measurements. Furthermore, we have some plans of feedback systems for the beam acceleration. The unification of the control systems is also important to construct feedback systems for the cascade accelerators. The summary of this project is as follows.

2. Computer system

The control system of AVF-cyclotron is connected to the network system of the computer-complex of the Ring-cyclotron facility. (Fig.1) The Universal Device Controller (UDC) controls the devices and collects the status of devices.[2] There will be 60 UDCs for the new control system of the AVF-cyclotron. The UDCs are grouped according to the role so that the variety of UDC becomes minimum. A new Group Control Unit (GCU) is devoted to control the devices of the AVF-cyclotron and the ion-source. The performance of the main computer (SCU) is in a limit only for the operation of Ring-cyclotron. Obviously we expect the present computer is not suitable for the coming operation

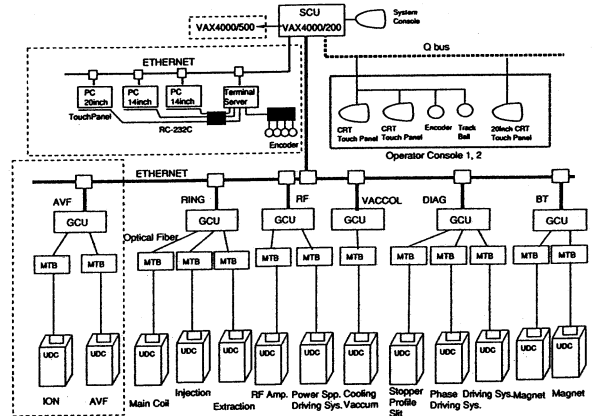


Fig.1: Computer and network system of control system. The SCU, GCU, UDC and operator console will be updated. (surrounded by dashed-lines)

after the replacement of the control system. The main computer will be upgraded from micro VAX 4000/200 to micro VAX 4000/500. We shall make good use of the past main computer of the RCNP VMS cluster computing facility.

3. Power supply

The power supplies of AVF-cyclotron facility have been operated by setting the reference voltage with the pulse motor deriving system. This pulse motor system may be one of reason for difficulty of maintenance and instability of the accelerated beam. We shall reconstruct and update all of power supplies of AVF-cyclotron facility. The reference voltage for the power supply is set by the 16 bit digital-to-analog convertor and the output current is monitored by using the 12 bit analog-to-digital convertor.

4. Beam diagnostic system

The pulse motor deriving systems, such as the beam diagnostic system, are not replaced in this project. The UDC simulates the preset control sequence of the driving circuit. The output from the beam diagnostic system is measured by using updated current

amplifier and transferred to the computer control system. The results of beam diagnosis are shown on the graphical display as used in the Ring-cyclotron facility.

5. Interlock system

The interlock system of AVF-facility has been very complicated and it is very important for the radiation protection. While we shall not update the interlock system in this project avoiding unexpected error in the interlock system, the new control system collects the information of the interlock system and informs the status of the cyclotron for the operators. This is a characteristic advantage of the computer control system.

6. Console

There are twin operator consoles for the Ring-cyclotron facility. When we unify the control system of AVF and Ring facility, the devices in the AVF facility can be controlled from the operator console of the Ring facility. However we must perform extensive operation to tune up the Ring-cyclotron using both of operator consoles. Therefore the twin operator consoles may not be enough for the future operation of cyclotron. We shall construct new console of the control system.(Fig.2) The console of Ring-cyclotron is closely connected to the main computer by using special electric circuits. Already these special electric circuits give rise to difficulties of the maintenance of the control system. By this reason we shall purge these special electric circuits

as much as possible from the new console. We adopt personal computers for the new console which are simply connected with the main computer through Ethernet.

Reference

- [1] K.Tamura et al., RCNP Annual Report 1993, pp.190-192.
- [2] T.Yamazaki et al., Proc. 13th Int. Conf. on Cyclotron and Their Applications, Vancouver, Canada, 1992, pp.672-675.

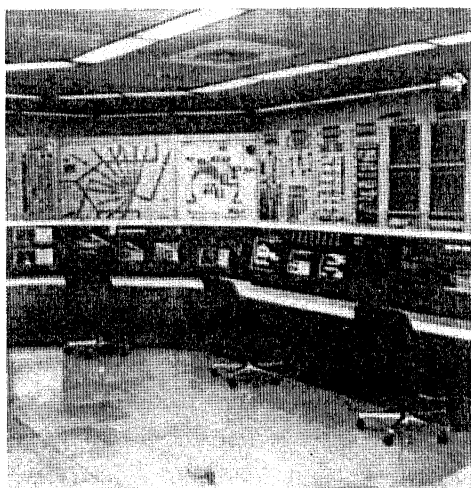


Fig.2: View of new operator consoles.