

COMPUTER CONTROL SYSTEM FOR MR RF

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The low-level system of KEK Main Ring RF is controlled by a mini-computer (YHP 21MX). Hardware and software of this system are described below. The computer controlled RF system provides the ability to use the "self learning" concept. This approach to controls is capable of simplifying the open loop control by the operator at start-up of the machine and operating MR as stable as possible. The system also allows effective change of the operating parameters to give more accurate control.

General description

Main functions of this computer control system are as follows:

- 1) Generation of the program voltages for RF equipments
- 2) Data sampling and monitoring
- 3) Automatic correction of the program voltages
- 4) Timing control.

These are efficiently operated using CRTs, GDP, auxiliary memory (called FFCS), DA-converters (DAC), transient recorder and HPIB. They are connected to the computer via interfaces. To reduce the load of CPU and use CPU effectively in operation, the auxiliary memory is installed as a device and operable without control of CPU. We explain in detail FFCS using the Figure which is shown in the next page. Each memory unit of FFCS is ordinarily loaded initial data at cold start-up, receiving the status signals of magnet, $P_1 \sim P_4$. The contents of memory are put out and fed into the DAC synchronizing the B-clock. The output signals of DAC get into the each device. The acceleration voltage, which is shown by V_p , is controlled using an internal clock which is synchronized by P_1 signal. Even in operation of FFCS, one can load the program data by means of time steal from CPU. The five latch memories of FFCS supply each data to DACs to control the gain of program voltages. The Fb-latch gives effective data to the synthesizer which is used to get good frequency stability at injection porch. The other five latch memories are equipped on the HPIB-line to control the synthesizer which is used to debunched the beam and digital delay which is used for the remote control of timing. CRTs are installed to the central control room and the MR auxiliary room (A44), and an operator can control the computer system on the alternative place.

Software which supports hardware, to manage the above functions smoothly, is loaded with various application programs on real time OS (RTE-II) and it is steadily running under OS-management. The application programs are written in separate functions such as a data loading, a sampling, a monitoring, an automatic correction and a system initialization. The main routine controls each application program. Software is divided into as many subroutines as possible and they can be called from any routine.

Reference

- 1) T. Kasuga: B-Clock System for the KEK Main Ring, IEEE Trans. on Nuclear Science, p.1742, Vol. NS-24, No.3, June 1977.

FFCS Block Diagram

