CONTROL SYSTEM FOR JAERI TANDEM ACCELERATOR

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Abstract

In this article, fully digitalized control system for JAERI
tandem accelerator is discussed.

Introduction

JAERI tandem accelerator is controlled through a digital
control system. All components (with a few exceptions) of the
accelerator system, including ion sources and beam-optical
elements are controlled digitally. Standard CAMAC system and
mini-computers are applied for communication and control.

Signal transmission

CAMAC serial highway system(ref.1) and a mini-computer
(Perkin Elmer 7/32C) make data transmission between an operator
console and each device in the accelerator system. There are
four loops of serial highways and 16 CAMAC serial crates in the
system. Two of these crates and one of the loops are dedicated
for communication between the operator console and the computer.
Other 14 crates and three loops of highways are distributed in
the accelerator system.
   Four of the above crates are set on the high potential
regions. These are crates for an injector of negative ions, two
dead sections and the high potential terminal of the accelerator
(-300kV, 7MV, 13MV and 20MV against the ground potential
respectively). Signal transmission between these crates and
ground potential points is made by infra-red light links with
baud rate of 2 M baud.

Assignable control

The system has about a thousand of data items for the
accelerator. But, on the console, we have only 6 control dials(
called Shaft-Encoder Control Units : S.E.C.U.'s), one push
button(called Do-it button), 9 monitoring meters and an color
CRT charactor display for general purposes. The CRT display has
65 pages and each page has parameter display for up to 18
devices in the accelerator system. The items in each page are
selected to utilize some operating session for the accelerator.
S.E.C.U.'s and monitoring meters are dynamically assigned to
specified devices by the operator. A cursor on the CRT is used
to select a device to be assigned and can be moved with a
truck-ball on the console. The cursor and Do-it button are also
used to switch status of devices(power ON/OFF etc.).
   This assignable system reduces size of the operator console
and makes large accelerator easy to handle. In conjunction with
the computer, S.E.C.U.'s provide additional feature of storing
current control value and recalling the stored value. It is
helpfull for the accelerator tunning.

Backup system

There is another computer to backup main control system. The backup system is used to develop softwares and is prepaired to reduce down time of the accelerator control system. When the accelerator-control by the backup computer is required, less than ten minutes are needed to exchange two computers. The backup computer is the same type as the main-computer, but has larger memory and more peripherals than the main for software development.

System running and expansions

The system has been in opration since Dec. 1979. Through the installation of the tandem accelerator and through the succeeding beam service running, it has worked well.

In the present state, it provides only communication and no high level control(an auto optimization of accelerator parameters etc.) is made. And program of the control system is a stand-alone program and is written with an assembly language and FORTRAN. To introduce high level controls, more easy to read, flexible and reliable programing style is desired. Works to develop new controle system is in progress, which is oriented to high level control, runs under an multi-tasking operating system and is written in Pascal language(ref.2). Required hardware expansion is also in progress.

References

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