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SOFTWARE OF " DEUTERON-2 " EXPERIMENTAL SET-UP

ЦНИИатоминформ
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МАТЕМАТИЧЕСКОЕ ОБЕСПЕЧЕНИЕ ЭКСПЕРИМЕНТАЛЬНОЙ УСТАНОВКИ "ДЕЙТРОН-2"

Экспериментальная установка "ДЕЙТРОН-2" была сконструирована для исследования электро-ядерных процессов. Установка смонтирована на e_4^-пучке ереванского электронного синхотрона и состоит из магнитного спектрометра использующего многопроволочные пропорциональные камеры и двух каналов пробежного спектрометра на базе сцинтиляционных счетчиков.

Используется быстрая электроника в стандарте КАМАК. Автоматизация осуществляется на базе PC/AT и микро - VAX/2.

В работе описано математическое обеспечение, позволяющее устанавливать рабочие режимы и калибровать различные функциональные части оборудования, а также осуществлять сбор, первичную обработку, передачу и хранение экспериментальных данных.

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1. Introduction

The experimental set-up "DEUTERON-2" was constructed for investigations of electro-nuclear processes. It is mounted on the e_4^- beam of Yerevan electron sinchrotron and consists of magnetic spectrometer with using of multiwire proportional chambers [1] and two differential (DRS) and integral (IRS) range spectrometers on the base of scintillation counters.

The physics program [2], which planed to perform on this experimental set-up is concern to high exclusive measurements, which means the registration of scattered electrons and at least of two nucleons simultaneously. Such conditions need the sufficiently high level of electronics, which provide the reliable recognitions of events of registered. These are achieved by using fast electronics (LeCroy, Phillips Scientific etc) in the CAMAC's standard. Another important part of problem is the development of proper software of experimental arrangements.

This work is devoted to the description of software, which provide the installation of working regimes and calibration of different functional parts of equipment, as well as for acquisition, preliminary processing and storage of experimental data . This software program has been realized on the base of PC/AT and micro-VAX/2 specifies which are described too.

2.Software Overview

The special application package has been worked out in YERPHI for performing to physical experiments and results

processing. This package provides creation of experimental environment by taking into consideration the following scheme.

The correlation between PC/AT and CAMAC is realized by means of special interface board [3] fabricated in YERPHI. The correlation PC/AT — micro-VAX/2 has been realized on the base of networking software DECNET [4].

The application package includes function library CAM, TWINDOW, and special executable programs, which solves specific tasks. The instrumental programming language is " C " or " C++ ".

1.1. The library CAM is intended for CAMAC equipment programming. The CAM includes the host function set, which is characterized by functional completeness and allow to program the CAMAC modules without necessity to know the hardware of IBM-PC and internal structure of interface board in detail.

The CAM allows:

- transferring no-address and addressable instructions;
- high-speed data communication (top speed for present equipment);
- redirection of instruction and data stream on different creates;
- to diagnose the condition of modules in CAMAC standard;
- putting interrupt handler;
- the additional procedures and programs, working with CAMAC;

1.2 The window-oriented technology have used for creating functional environment of experiment. Window-oriented library TWINDOW is human-computer interface, which provides organization of interrelation with user, gives him possibility to transition from one process to another in asynchronous mode quickly and without tiresome going out to MS-DOS. The TWINDOW

library intends for placing, reflection on the screen and saving in the memory screen windows, for data entry by means of establishment of the picture, establishment of the text editor in the window, inference look-up information for experimenter, using functional keys (for example " F1 "), menu organization.
Note that the program usage of TWINDOW can be organized as a resident.

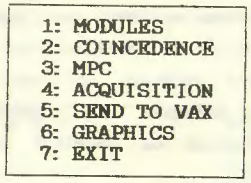
1.3 There are some special program modules such as INSTALl, REMOVE, which permit dynamical work with resident part of the memory. We suggest to use these program modules for realizing correlation between PC/AT and micro-VAX if there is a necessity to send data to the VAX for further processing during the experiment without leaving experimental environment for MS-DOS. These modules allow to load resident parts of DECNET and to pass the control to the networking software. The resident parts of DECNET (drivers) retire from memory after completion of data communication.

Thus, the described software allow to create certain experimental environment and the logic of experimental data processing. It is possible to change this logic, by inserting in software or removing the program modules, which perform definite tasks. Just this application package has been used in the system " DEUTERON ".

3. The " DEUTERON " system

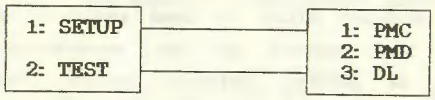
The "DEUTERON" system consists of several executable packages which are incorporated by special program CPV.exe. Since the long write - up available, here we represent the description of general features of this program.

After one call the CPV.exe the user take a opportunity to activate the wanted program via the suggested menu:



Every item in the menu has been supported by help information, which is viewing by pressing " F1 ".

1:"MODULES" allows to access to the executable files through submenu:



These files designed for setup and test parameters of the CAMAC modules: programing modules of coincidence (PMC), program management discriminators (PMD) and delay line (DL) modules. Availability of submenu permits to choose the proper (setup or test) regime of processing.

2: "COINCIDENCE" option is designed to set the delays between two groups of counters via CAMAC modules, such as program management discriminator (PMD) and/or delay line (DL) , e.t.c. These procedures are performed by dividing these modules on right and left part logically. Only one modules (PMD or DL) can be included in the right part while the lift one have a possibility to include up to the ten corresponding modules.

3: "MPC INSTALL" allow to install the Multiwire Proportional Chamber wires grouping in different layers. This option gives the possibility to estimate the efficiency of Proportional Chambers and selects the optimal working regime.

4: "ACQUISITION" lets data acquisition from CAMAC system

on PC/AT. The structure of this program allows to recognize the four different types of registered events: inclusive (only scattered electrons), exclusive with scattered electron and proton/neutron, exclusive with proton and neutron, double exclusive with scattered electron, proton and proton/neutron. The program performs also the on-line analyze of the Multiwire Proportional Chambers and reconstructs the tracks of scattered electrons.

The inserted graphic packages provide the interactive watching of data processing. The choose of the corresponding graphics and inserting the proper thresholds are achieved by using of keyboard interrupt functions of turbo C.

The acquired data have been included into the user defined files for further analysing.

5: "SEND TO VAX" is designed to perform operation between PC/AT and VAX. The program here use the "DECNET" [4] utility, which provide the complete sets of operation between PC/AT and VAX on the base of "ETHERNET".

6: "GRAPHICS" is designed to preanalyze of the acquired data which are written into the user defined files, perform and output the two and/or three dimensional representation of interested quantities.

7: "EXIT" allow to exit from program to MS-DOS or call the any file processing commander (in present the Norton Commander [5]).

It is worth noting, that in case of necessity the "DEUTERON" system is able to change the existence utilities by the another ones.

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