

EVENT REGISTRATION SYSTEM FOR INR LINAC

O.V. Grekhov, A.N. Drugakov, Yu.V. Kiselev

Institute for Nuclear Research of the Russian Academy of Science, Moscow, Russia

E-mail: grekhov@inr.ru

The software of the *Event registration system* for the linear accelerator is described. This system allows receiving of the information on changes of operating mode of the accelerator and supervising of hundreds of key parameters of various systems of the accelerator. The *Event registration system* consists of the source and listeners of events. The *sources of events* are subroutines built in existing ACS Linac. The listeners of events are software *Supervisor* and *Client* ERS. They are used for warning the operator about change controlled by parameter of the accelerator.

PACS: 07.05.Hd, 29.17+w

1. INTRODUCTION

INR Linac is foreseen for H^+ and H^- ion acceleration. The Linac represents a complicated installation with a numerous set of parameters to be supervised. It is difficult for the operator to define operatively the reason of the occurrence of an emergency or an overrun of supervised parameters of the accelerator.

Event Registration System (ERS) was designed in order to raise the effectiveness of Linac control.

2. PURPOSE

Event Registration System is a software package, written on LabView National Instruments, designed for warning the operator about overrun of controlled parameter or equipment faults. Information is sent only about change of controlled values to reduce the loading of computer processor and Ethernet network. This change of state is called an *Event*. Events can be critical (Crash), dealing with equipment faults, and non-critical (Notice), when an overrun of a controlled parameter occurs.

ERS was constructed as an element of the existing Automatic Control System for Linac (ACS).

3. DESCRIPTION OF A STRUCTURE OF ACS FOR LINAC

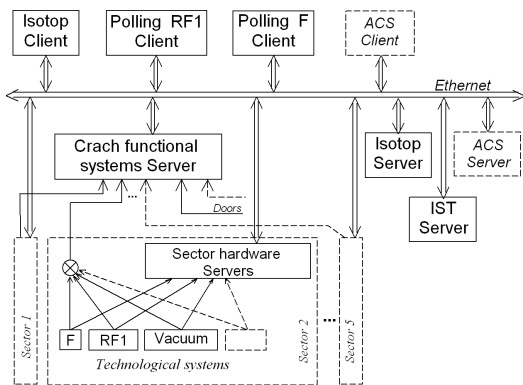


Fig.1. Structure of ACS

ACS is heterogeneous (see Fig.1). It includes Crash Functional Systems (FS) Server, Sector hardware Servers and various systems of the accelerator servers. The major part of ACS is based on *sector hardware servers*. It is used for control of equipment of various systems of this sector. *Crash FS Server* (see Fig.2) handles various alarm situations.

Crash FS Server is based on the hardware scheme of ACS. This scheme allows registering not only the avail-

ability of individual systems, but also the detecting of the first cause of hardware faults, which have caused an accident in any of these systems.

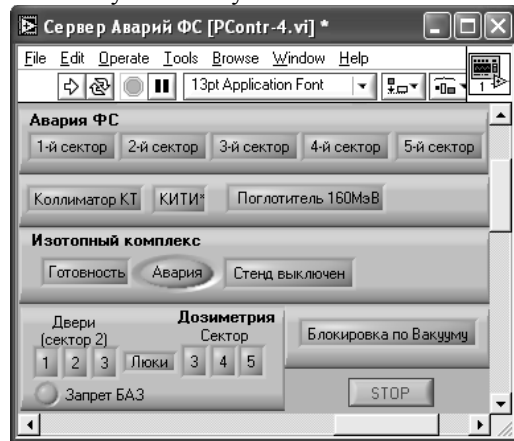


Fig.2. Window of the program Crash FS Server

Clients ACS ensure reception and display of information about parameters of various technological systems. Servers and clients data exchange is provided through Ethernet network.

4. DESCRIPTION OF STRUCTURE OF ERS

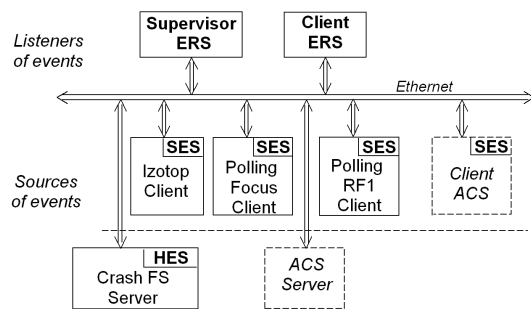


Fig.3. Structure of ERS

ERS consist of *event sources* (ES) and *event listeners* (EL) (Fig.3). Data communication between ES and EL is carried out by means of the Ethernet through broadcast protocol. While the system was being elaborated two points were discount: the speed of communication and the reliability (the receipt of all events arisen).

4.1. SOURCES OF EVENTS

ERS Source is utilized as a subroutine that can be easily combined with the existing software of ACS. The classification of ES includes soft event sources (SES) and hardware event sources (HES). SES communicate the data after their mathematical processing. It includes

ACS clients used for polling of parameters of technological systems. The basic event for them is an overrun of the controlled parameter. HES communicate the data without mathematical processing. HES include Crash FS server that is fast. Application of ERS in Crash FS Server allows registering of short-term events that are very difficult to detect earlier.

4.2. DATA FORMAT

Data format consists of three variables: status, code, and source.

Status determines the event state.

Code fixes the system to which an event can refer and the type of the event.

Event code is a four-digit number. Two high-order digits determine the technological system. Two low-order digits fix the event type of the technological system. A partial list of codes is:

System	Code	Description
Technology	5000...5099	
	5001	USO Error read
	...	
Focusing	5100...5199	
	...	
	5122	2-sector overrun
	5123	3-sector overrun
RF-1	5200...5299	
	5201	Error ARA: overrun
	5202	Error ARF: overrun
	...	
	7001	Beam in IC
Notice	7000...	
	7001	Beam in IC

Source is a source of event that determines the name of the equipment for the system.

Application of this format of ES allows an easy expanding of the system, adding new events and functional systems.

4.3. LISTENERS OF EVENTS

ERS Listeners accept communication from ES. They are of two types: ERS Supervisor and Client. ERS Supervisor (see Fig.4) is intended for operator who controls the state of technological equipment of the accelerator.

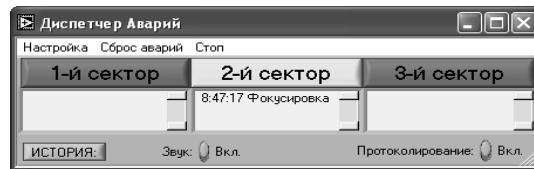


Fig.4. Window ERS Supervisor

ERS Client (Fig.5) is a lite version of the ERS Supervisor software. It is earmark for operator of the separate technological systems.

It includes a choice of custom mode (tracking of an event) for particular technological system.

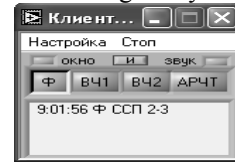


Fig.5. Window ERS Client

Both software programs notify about events in visual mode (pop-up windows, indicator blinking), and by means of various sound signals. History about received events is saved. All events for ERS Supervisor are saved in a file on a hard disk of computer (see Fig.6).

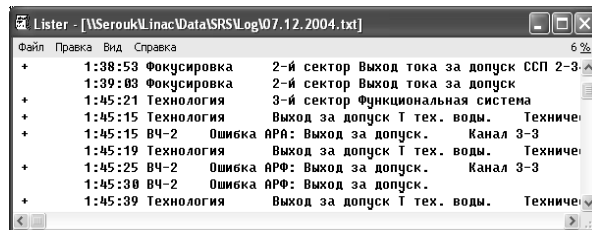


Fig.6. Event history

5. CONCLUSION

Realization of Events Registration System allowed:

- tracing of the changes in the state of Linac functioning operatively;
- taking the necessary measures in order to prevent established situations;
- looking through the chronology of events before an accident;
- keeping the statistics of equipment and accelerator systems faults.

All these features have enabled to raise the effectiveness of functioning of INR Linac foreseen for H⁺ and H⁻ ion acceleration.

СИСТЕМА РЕГИСТРАЦИИ СОБЫТИЙ ЛИНЕЙНОГО УСКОРИТЕЛЯ ИОНОВ ИЯИ РАН

О.В. Грехов, А.Н. Другаков, Ю.В. Киселев

Система регистрации событий это пакет программного обеспечения. Она позволяет оперативно получать информацию об изменениях в режиме работы ускорителя, контролируя более сотни основных параметров различных технологических систем ускорителя. Система регистрации событий состоит из источников и приемников событий. Источниками событий являются подпрограммы, встраиваемые в существующую АСУ ЛУ. Приемниками событий служат программы Диспетчер и Клиент СРС, предназначенные для оповещения оператора об изменении контролируемых параметров.

СИСТЕМА РЕЄСТРАЦІЇ ПОДІЙ ЛІНІЙНОГО ПРИСКОРЮВАЧА ІОНІВ ІЯІ РАН

О.В. Грехов, А.Н. Другаков, Ю.В. Кисельов

Система реєстрації подій це пакет програмного забезпечення. Вона дозволяє оперативно отримувати інформацію про зміни в режимі роботи прискорювача, контролюючи більше сотні основних параметрів різних технологічних систем прискорювача. Система реєстрації подій складається із джерел і приймачів

подій. Джерелами подій є підпрограми, що вбудовуються в існуючу АСУ ЛП. Приймачами подій є програми Диспетчер і Клієнт СРС, що призначені для оповіщення оператора про зміну контрольованих параметрів.