DATA ACQUISITION SYSTEM FOR STUDYING OF BEAM PARAMETERS AND STATUS OF KCSR FACILITY.

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Abstract

Kurchatov Centre of Synchrotron Radiation - the electron accelerators facility, including the linear accelerator, the synchrotron - booster at energy 450 MeV and the main ring at 2.5 GeV, is a dedicated synchrotron radiation source.

The lower level of control system consists of CAMAC hardware for the data acquisition and control. The operators level consists of the PC network.[1]

The system of data acquisition about parameters of a beam and technological systems of KCSR facility is described and examples of network applications are given. Programs of creation of archive of the parameters are described. Examples of using of archives for the analysis of a facility status are given.

1. INTRODUCTION.

The data acquisition system (DAS) solves the following tasks:

- - data capture about parameters of an electron beam during storage and rumping processes in booster and main ring;
- - saving of an operating conditions of technological systems, testing of magnets power supplies and RF-systems;
- - measurement of electron beam current and orbit parameters in storage rings,
- - monitoring of vacuum and temperature;
- - support of facility archive and providing of access on a local PC network;
- - creation of statistical reports and support of resources of processing of the archive data convenient for the external user.

This system is the part of control system of KCSR and includes CAMAC low level hardware, data server and operational PC network which are connected via Ethernet, and the software supporting the protocol of access to archive on a local network.[2]

2. HARDWARE.

The diagram of DAS is given on fig.1. The CAMAC-embedded computers "Odrenok" are used in the KCSR control system. [2]. On six machines (C1 … C6 on fig.1) the control of technological systems of KCSR is distributed, one (CC) is selected as the centre. CAMAC crate is complemented by modules which support the interface with the local terminal, connection of video-check devices, RAM (capacity 128 kwords), driver peripheral crates, connection to the central machine (speed of exchange 1 mb/s).

The central machine (CC) provides access to a hard disk for peripheral machines, initial loading of the operating system is made with PC.

The PC connected to central crate (AS), is used as an application server of DAS, it is connected to a local network, that allows to start the network applications from anyone PC of a local network.

3. SOFTWARE.

From the DAS software point of view are three logically levels (see fig.1): upper level consists of MSWin98 PC's which are connected via Ethernet, intermediate one - processing of inquiries and low level - work with the executive devices.

The network of computers "Odrenok" works under the control of ODOS operating system which provides multitasking, exchange between processes, synchronization of programs written in TRAN language (FORTRANa version).

The process of data capture consists of follows:

- - loading of working programs in RAM of controlling computers from the centre;
- - reading a database of control channels, test of blocks and compilation of the list of channels accessible to handle;
- - start of readers of ADC (general synchronisation frequency is 10 Hz);
- - upgrade of the data buffer (about 2000 words), distributed into the sectors appropriate to programs.

Application server works under the control of MSWindows98 operating system. It provides channel and database access for user applications.

We have developed on VisualC++ application software to fit the KCSR control framework. Using this framework, it is possible to control the following measurement system remotely:

- - status of a complex (current mode and basic parameters of a beam),
- - vacuum monitoring (on a current of pumps),
- - temperature monitoring,
- - betatron frequencies measurement,
- - test of magnet power supplies and RF-system.

Copies of screens of the operator PC below are given. Fig.2 is Monitor screen copy, which displaying the KCSR current mode, electron beam current and energy, in a fig. 3 - vacuum monitoring and betatron frequencies measurement during rumping process.

VBA Microsoft Excel software allows to provide access to the KCSR archive files, that is the convenient tool for creation of the reports and data processing.

One more example: History - program for work with the archive files data. By choosing date of record and list of required parameters, the user can generate the block of the necessary parameters on one or several sheets of the Excel book.

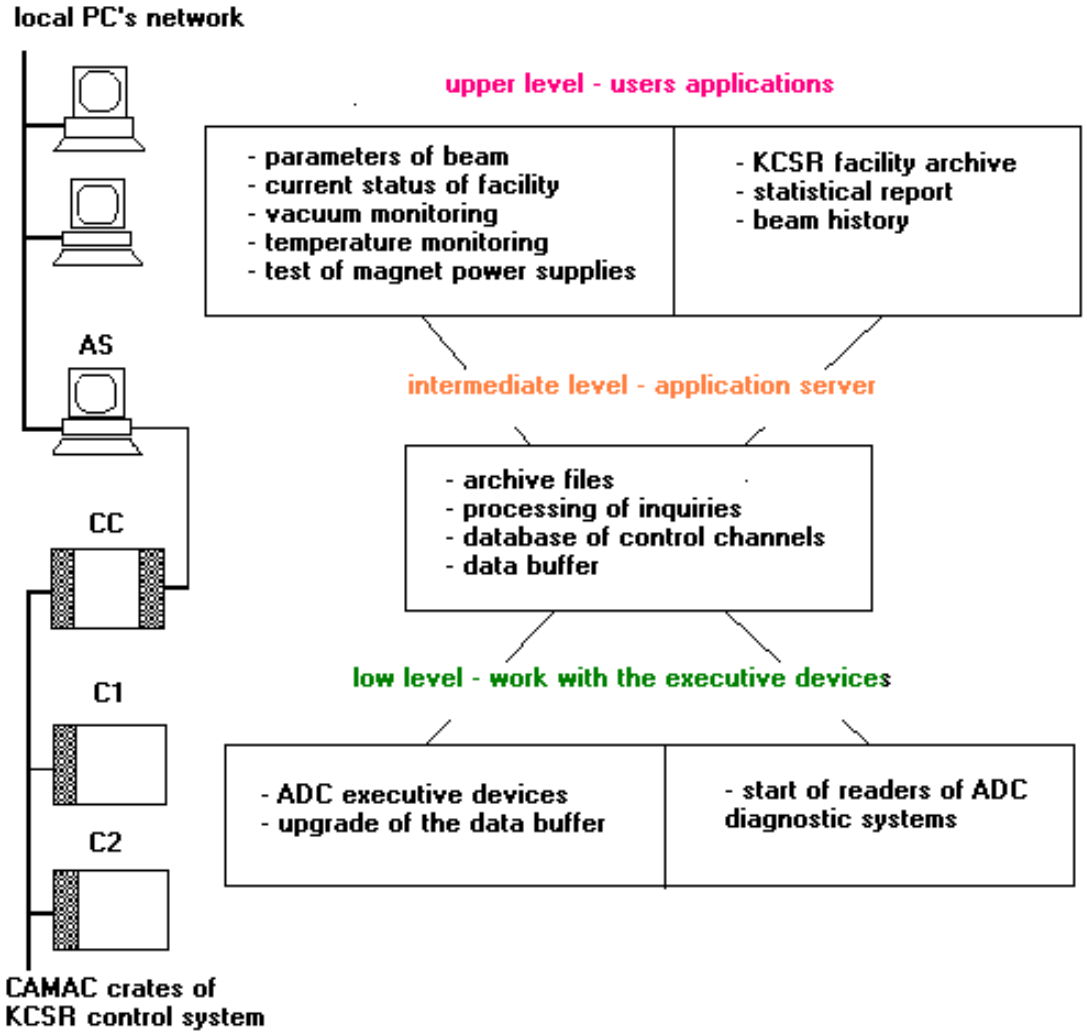

Fig1. Diagram of data acquisition system.
Legend: AS – application server, CC, C1, C2 – central and peripheral machines of control network.

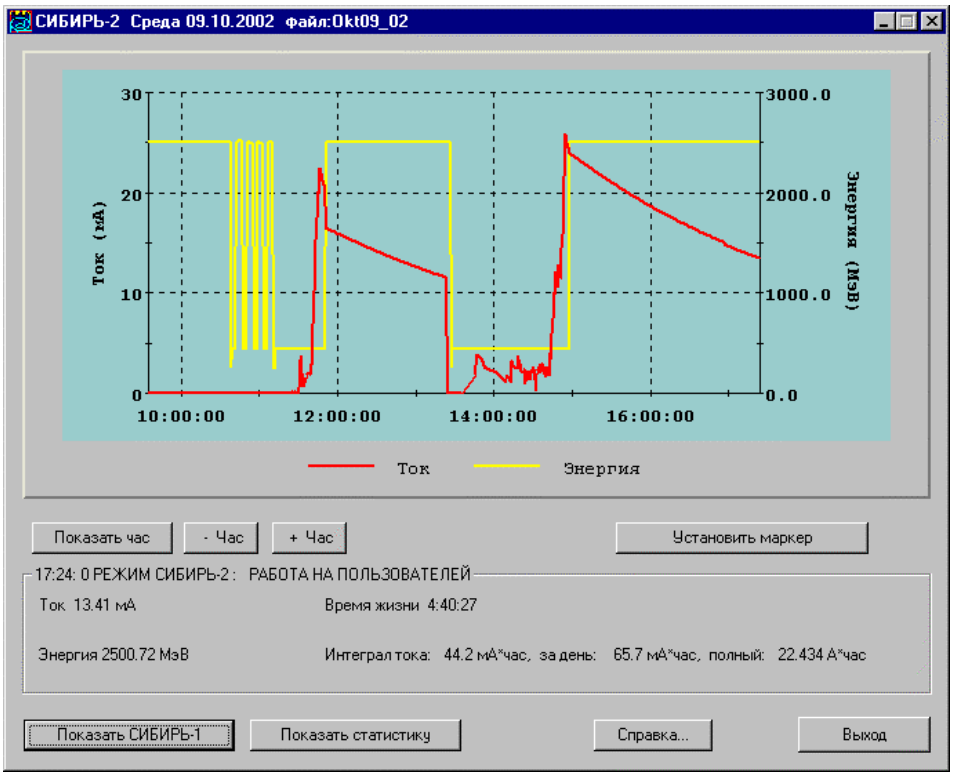

Fig.2. Monitor program screen copy.

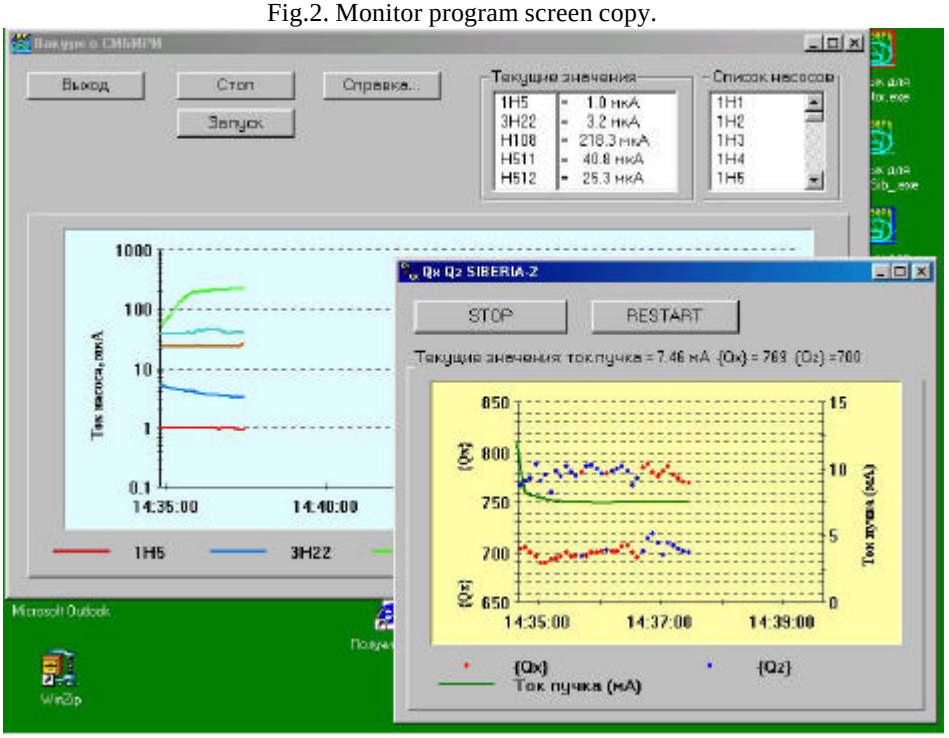

Fig.3. Screen copy of vacuum monitoring and betatron frequencies measurement during rumping process.

4. REFERENCES.

[1] S. Kuznetsov et al., “Control system of synchrotron radiation SIBERIA”, NIM A352 (1994), p.161-165.

[2] I.Krylov et al., «Control system of synchrotron radiation facility SIBERIA in real-time», XVII National paticle acceleration conference, p. 204, Protvino, 2000ã (in Russian)