PLANS FOR A CONTROL SYSTEM FOR THE LUE200 LINAC IN JINR

A.P. Soumbaev, A.S. Kayukov, V. A. Shvets, O. V. Strekalovsky,
M.M. Korjovkina JINR, Dubna, Russia

Abstract

LUE200 - the 200 MeV electron linac for the pulsed neutron source "IREN" is under development in FrankLab of JINR, Dubna. The main systems of the linac, such as the general timing control, the high-power RF system, the control system of klystrons, the power supply system of magnets, the vacuum subsystem and the cooling system should be integrated into the control system of LUE200. Some subsystems units of the linac are to be made by other manufacturers with different standards used. The technical integration will be based upon the Factory Suite corporation SCADA software. The personal computers will be applied as control devices and PLCs will be used at a lower level.

1 INTRODUCTION

IREN control system consists of linac control system and subcritical multiplying target control system. The lower layer of whole control system is based on PLCs and other intellectual controllers. The subcritical multiplying target control system developing by the Research and Development Institute of Power Engineering is composed on industrial solutions. It involves LINUX control computers and PLCs. The linac control system (Fig. 2) developing by Joint Institute for Nuclear Research uses Windows NT as a main operating system and takes SCADA system by Wonderware as a basis for data storage and representation. Access to the database via internet provided by the Factorysuite SCADA system that contains WWW server. The upper layer of whole control system is the equal for both subsystems, that is the common database, control console, WWW server and other upper level modules will be used simultaneously in spite of the differences in lower layer architectures. Now the two variants of databases are considered: Oracle and MS SQL database. In any case, SCADA gives an ability to work with either of databases. Reliability of data transmission is provided by using fiber-optic lines. The reserve control console also provided for reliability. The block system is realized in hardware layer, so no destructive commands can be executed from control consoles or as the result of software errors.

2 STRUCTURE OF THE CONTROL SYSTEM

Three PCs equipped with big screens and installed on the control console are foreseen for adjustment of the accelerator and the control of operation of its systems. One PC will assume the role of a database server of parameters of the accelerator. Creation of an Internet - server that will provide physicists for the limited access to the information about the state of the accelerator is planned. Local network on the basis of 100MB/s Ethernet will be organized.

The user interface (Fig. 1) of operators workplaces gives an ability to monitoring and control all connected devices in compliance with safety regulations. Operators workplaces may be added or removed without system restart. The mew parameters may be taking into account and showing without restart too.

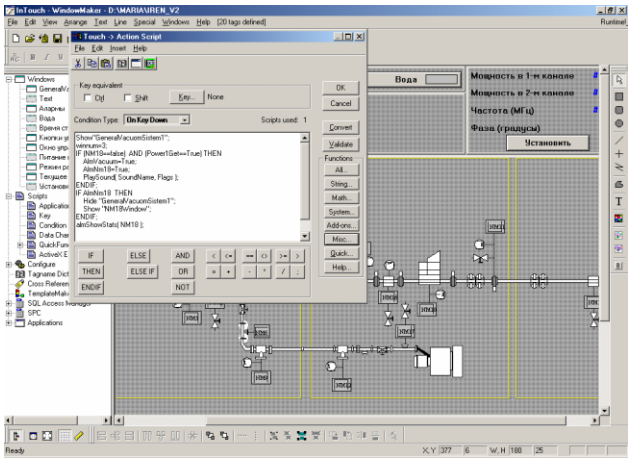

Figure 1: Example of user control interface under construction.

Systems of 4 posts of beam diagnostics assume an application of flash ADCs, processing of video signals and they should be able to completely store the digitized data in the time between accelerator pulses (6 ms).

Modulators for the control of two klystrons SLAC 5045 are foreseen that should be delivered together with control systems according to contract with the German firm "PPT". The programmed controllers of the Siemens S7 family are planned to be applied in the control system.

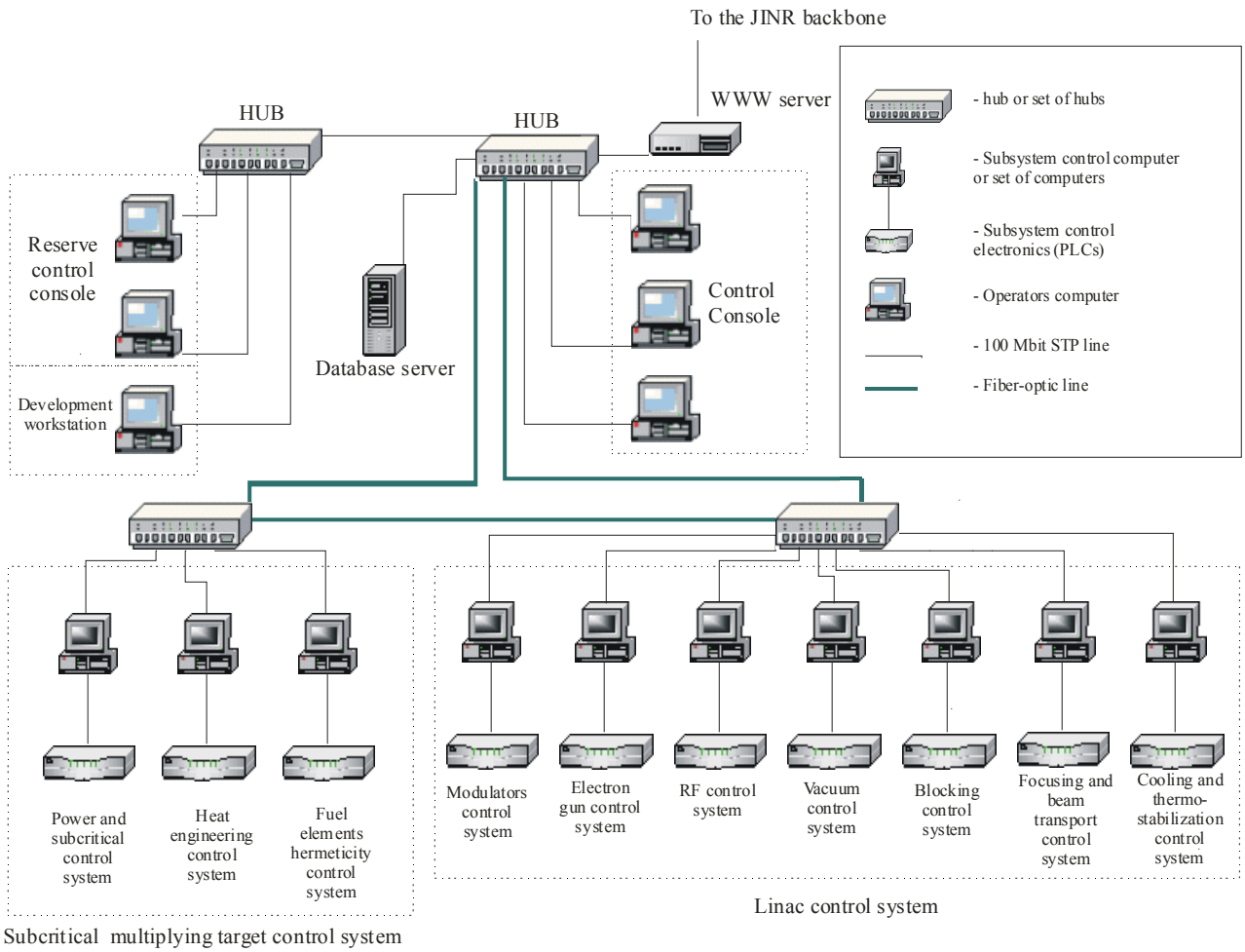

Figure 2: IREN control system structure.

Starts of all subsystems of the accelerator are synchronized with the uniform time sequence (Fig. 3). The start pulses of modulator thyratrons "Start mode" and of electron gun « Gun start » can be shifted from each other with the help of program-controlled delay lines Б3-53. The main two-channel generator RF GEN (2856 MHz) changes, by the command « Phase turn », the output phase by 180 degrees which is required for the system SLED. Repetition rate of start pulses should not exceed 150 Hz.

For maintenance of passage and focusing of an electron beam the system of magnetic elements is stipulated. It should provide focusing of electron beam over the whole energy range.

The channel of quadruple focusing is used for beam transportation from the first accelerating section to the second section and for further beam transportation to the target. The channel will consist of nine quadruple lenses Q1 - Q9. The working current in lenses is up to 160A.

The power supply system of magnets will be manufactured on contract with the BINP (Novosibirsk). For the control of power supply of magnets, the multi-channel modules CAN ADC 40*24 and CAN DAC16*16 will be used. For the data exchange expanded format CAN Specification 2.0 is supported.

For the control of beam parameters, 4 posts of diagnostics are stipulated. Each post will include magnet induction current gauge, the sliding monitor of beam structure , the luminescent TV-monitor for beam structure representation.

For measurement of beam energy, the magnetic spectrometer (50 … 240МэВ) is developed.

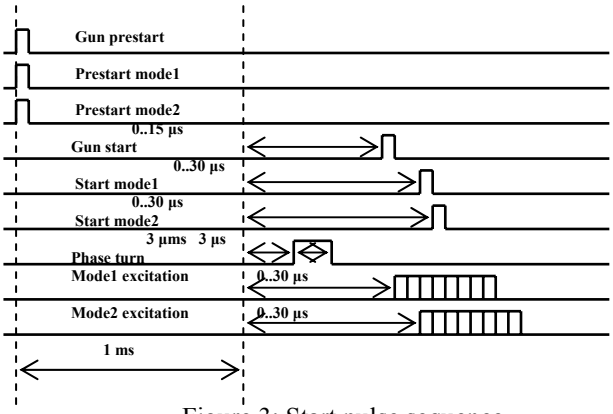

Figure 3: Start pulse sequence

The required pressure of residual gas in the accelerator should be less than 10^{-5} Pa. It is supposed that the required vacuum will be provided with 18 ion-sorption pumps IPT-20, IPT-50, IPT-100 manufactured by VacuumPrague. Power supplies of pumps are connected by the serial RS422 interface. In case of sharp deterioration of vacuum, the power supplies of pumps are switched off automatically. Multichannel vacuummeters TPG300 and TPG256A will be used for vacuum measurement.

Additional monitoring of vacuum is achieved by measurement of current of the ion-sorption pumps.

Accelerating sections and resonators should operate in the working temperature range of 35-45°C with an accuracy of 0,4°C.

Simultaneously, by means of PLC, the control of pressure in the cooling system and of the state of gate-valves is carried out. The thermostabilization system on the basis of controller Eurotherm906 and heating elements controlled by thyristor regulators has been successfully tested at the stand [3].

3 THE CONCLUSION.

Now the works on development of the software for control system LUE200 are started. The logic controllers of the firm Koyo Electronics have been acquired and the development of program for accelerator control system is started. At the same time, we are testing the software products from package of Factory Suite2000 of corporation Wonderware for industrial automation. The components of automation system are tested at the full-scale test stand at the Laboratory of Neutron Physics of the JINR.

4 REFERENCES

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