

THE IBR-2 SPECTROMETERS COMPLEX AND COMPUTATION INFRASTRUCTURE

In the development of the IBR-2 spectrometers complex the main effort concentrated on the creation and introduction of new-generation electronics and software for VME-systems of data acquisition and control of experiment.

On HRFD, test experiments of a VME-system completed and it was commissioned. The system consists of several subsystems and provides:

- accumulation of low-resolution spectra,
- control of the spectrometer devices (goniometer, scanner, refrigerator, etc.),
- registration, computation, and accumulation of high-resolution spectra (RTOF-analyzers),
- control of the Fourier-chopper,
- network support (accumulation of data in central file-servers, remote control from an X-terminal).

The YUMO spectrometer was modernized. In place of old drivers, step-motors were installed to drive the sample displacement table (in two directions) and platforms for moving of scattering detectors inside the neutron guide. Also, new electronic blocks were developed to automate the moving mechanisms, which makes it possible to change the configuration of the setup in the manual and computer versions. The second collimator was replaced by a collimator with a sliding tube. This removed an air gap of 1 m on the way of neutrons. A second scatterer (polyethelene) in front of the scattering detector platform and an additional monitoring counter were installed. The system for regulating of the sample temperature was essentially improved.

On the YUMO spectrometer, VME-subsystems to automate control of the spectrometer devices and the first stage of electronics and software for the VME-subsystem of data acquisition were put into operation in October 1999. The software enables multiwindow control of data acquisition, temperature, motors, monitoring of parameters, and control of the experiment, including remote control from any point of the local network. For several months, test experiments of a ring position-sensitive detector in aggregate with a unified VME-electronic system of data acquisition were carried out with a neutron source. At present, the detector, electronics and the software are ready for the installation in the beam.

In the VME-system of data acquisition of the x-ray spectrometers DRON and SAX, electronics controlling the executive mechanisms is renewed and a new software analogous to the YUMO software in functional possibilities is developed.

On the DN-2 spectrometer, preparatory work to change the measuring systems and sample environment to VME-standard completed. The electronics of the goniometer (GKS-100, PS111, HUBER) and of moving the rotation table with a PSD using a position sensor were reconstructed and modernized. The electronics of a linear PSD was manufactured.

The two-axis position-sensitive detector is filled with a new gas mixture. Test measurements and tuning of the working modes of the detectors were conducted. The electronics of the detectors was modernized and work to optimize time and position resolutions was carried out. A new two-channel time-digital converter for data reading from PSD was developed.

Today, a complete set of VME-devices for the spectrometer is installed, the software is ready, and debugging is being done.

Under the auspices of the modernization project of the polarized neutron spectrometer SPN, the working drawings of the head part of the spectrometer were made and manufacturing started in Experimental Workshops. The electronics of the monitoring detector and 16 preamplifiers for the main detector were manufactured and debugged. Manufacturing of a unified VME system for data acquisition started.

A large volume of work was conducted to manufacture and assembly the elements of the FSD spectrometer in channel 11 of the IBR-2 reactor. Namely,

- a Fourier chopper was manufactured, assembled and tested in cooperation with PINP,
- a prototype of one element of the 90°-detector was manufactured and tested,
- a mirror oven (to 10000°C) was manufactured and tested in cooperation with LfZP (Rossendorf),
- test measurements of a tensor neutron scanner were conducted,
- VME equipment for the registration of low-resolution spectra and the system to control the executive mechanisms were manufactured and tested. Also, tuning of the RTOF analyzer for the detector MultiCon 5.2 began.
- the beam profile at the neutron guide entrance and transmission functions of the Fourier chopper were measured.

For the spectrometer DN-12, a complete set of detecting electronics and a VME-system for data acquisition were manufactured and debugged. Work to select He-counters and develop software is being completed.

In cooperation with HMI (Berlin) there was developed a data acquisition system for a PSD prototype based on microstrip-chambers with a Gd neutron converter. The central elements of the system are a TMS320C67XX digital signal processor with a performance of 1 Gflops, two 8-channel time-digital converters, F1, with a picosecond resolution, a histogram memory with a capacity of 256 Mb, two FIFO-buffers, and a PCI interface.

Also, in cooperation with HMI new programs were developed and they essentially extended the possibilities of the PV-Wave packet for visual express analysis of data from neutron scattering experiments.

Together with the Laboratory of Nuclear Problems a system of filmless registration and accumulation of data from a streamer chamber was created (DUBTO project). The basic elements of the system are two digital TV-cameras (a stereo-pair) on scientific-grade CCD matrices with the resolution 1300x1000. The data are accumulated in a PC with high-capacity removable hard disks. In 1999 the system was commissioned and the first physical results were obtained.

In 1999 a number of new unified blocks of analog electronics, including preamplifiers, amplifier-formers and discriminators for point detectors, power units and power amplifiers for executive mechanisms, etc., were created to replace outdated blocks in the equipment of the spectrometers.

During the reported year a lot of effort concentrated on repairing, modernization and maintenance of the measuring and control systems of the spectrometers and computers.

In 1999 the members of the Division published 5 papers and a Candidate of Science thesis was defended by E.I.Litvinenko.