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Software for data acquisition and instrument control Sonix+

Sonix history

The Sonix package is the main instrument control software at the IBR-2 reactor.
Sonix – SOftware for Neutron Instrument on X11 base

Version	Period	Hw platform	Soft platform	GUI
Sonix	1995-2004	VME	OS-9	X window
Sonix+	2004 -	PC	Windows (XP, 7)	MFC, PyQt

Now ~20 installations at FLNP
and at other centers.

Sonix+ concept and main features

Comparison with other systems

❑ ***Similar features***:

- Modular hierarchical structure with a unified inter module communication protocol;
- Database for communication and parameter access;
- Configuring all modules in a common file;
- Scripting programming languages (Python, etc.) to describe a measurement procedure.

❑ ***Essential differences***:

- Mostly local system;
- Windows OS as a platform;
- The universal GUI approach for all instruments.

Sonix+. Varman

- Varman – is «VARiable MANager»
- Original design - OS-9 - IRI Delft, Netherlands (1997).
- Redesign for Windows – FLNP, JINR (2003)

- Main features:
  - Local parameter storage with fast access;
  - Used for inter-module communication;
  - At every moment contains full information about the current state of the measurement (with the exception of spectra) and descriptions how parameters are structured;
  - Snapshot of Varman database is used in Sonix internal data format.

Sonix+ structure

Structure levels

User interface

⇕

Experiment script
Instrument operation library
System scripts
S e r v e r s
D r i v e r s

⇕

H a r d w a r e
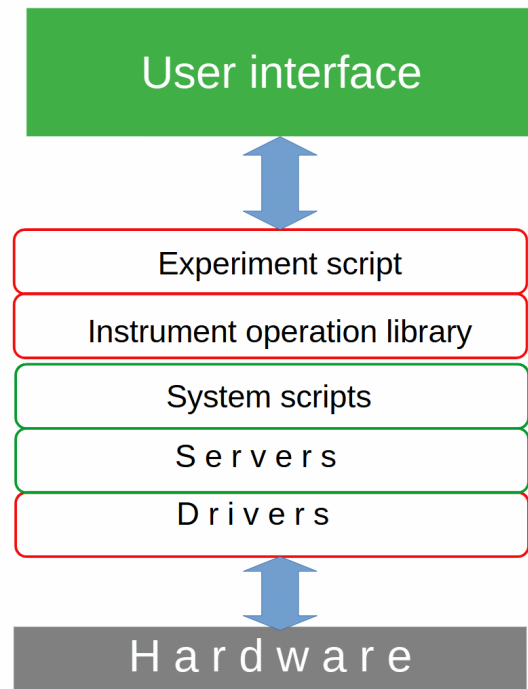
- □ User interface (MFC & PyQt)
- □ Instrument library (Python)
- □ System scripts (Python)
- □ Control modules ("devices")
  - ■ Servers (DAQ, Script interpreter, etc.) (C++)
  - ■ Drivers (C++)

- □ To install the Sonix+ at a new instrument:
  - • Select a set of drivers;
  - • Compose configuration file;
  - • Prepare instrument operation library.

Sonix+ data format

Data reduction & analysis program is responsibility of the User:

- No common data format for IBR-2 instruments
- Histograms output data with few exceptions

Universal approach needs *common* data format

Sonix "internal" format:

- binary histograms
- Varman snapshot
- event data files if any.

User interfaces

- GUI (2 types), Web Sonix, command line
- GUI main features (4 main needs):
  - to watch *current state* of the instrument,
  - to watch the *measurement history* (log file),
  - *spectra visualization,*
  - and to *control the measurement process*.
- Universal GUI – single composed window (GUMTREE idea)
- Addtional widgets for manual control some urgent devices & actions
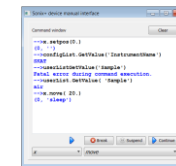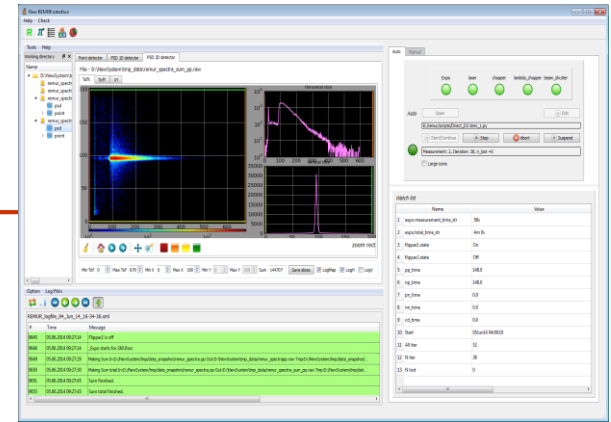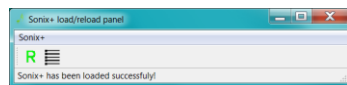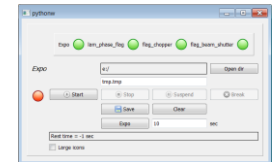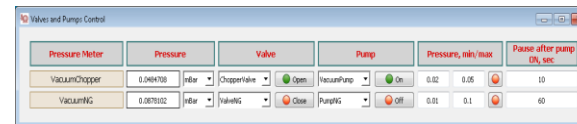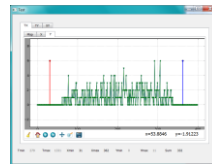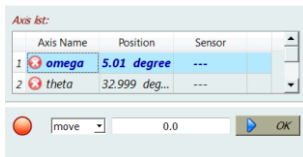
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Universal GUI layout

A – SpectraViewer, B – LogViewer, C – Script interpreter, D – Varman params WatchList
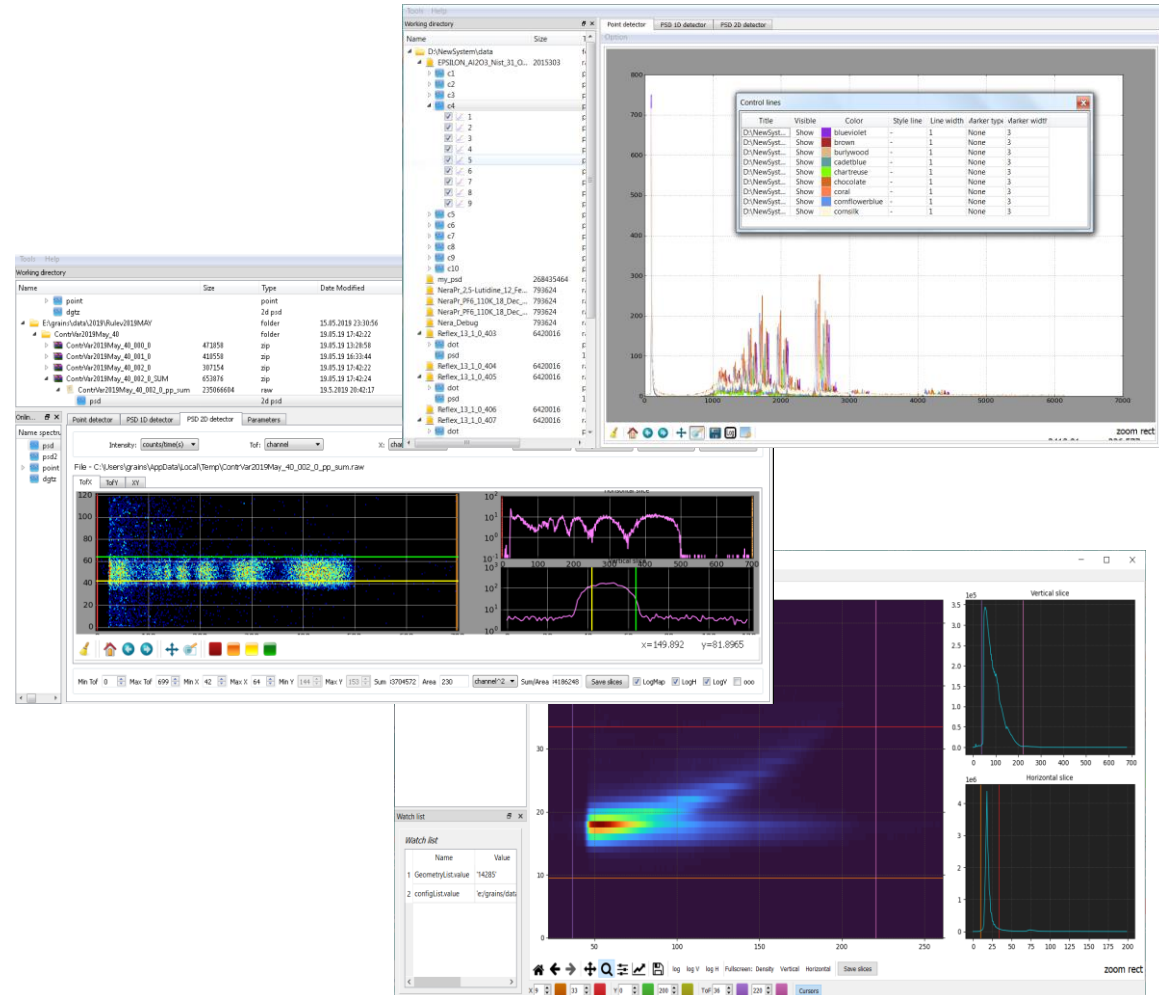
Data visualization – SpectraViewer

The *SpectraViewer* is designed to visualize online & offline data in Sonix+ format:

- mono detectors,
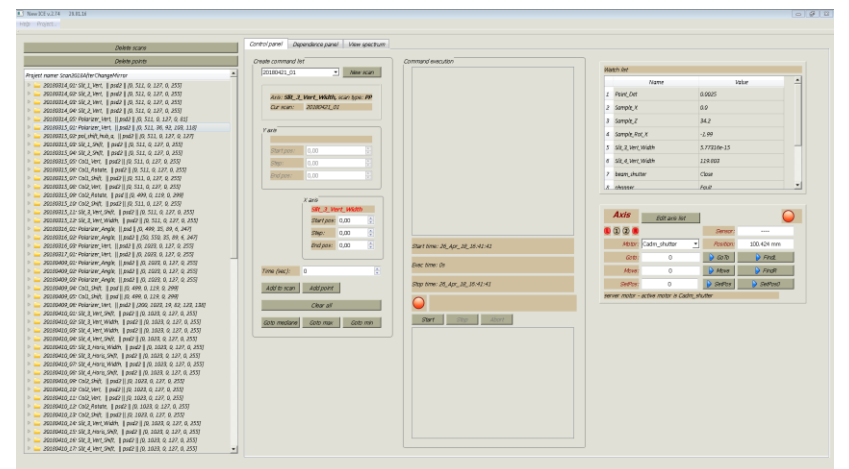- 1D PSD,
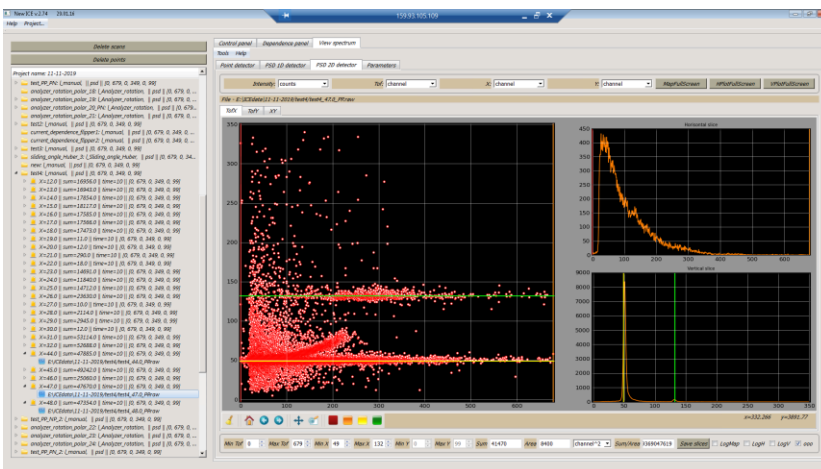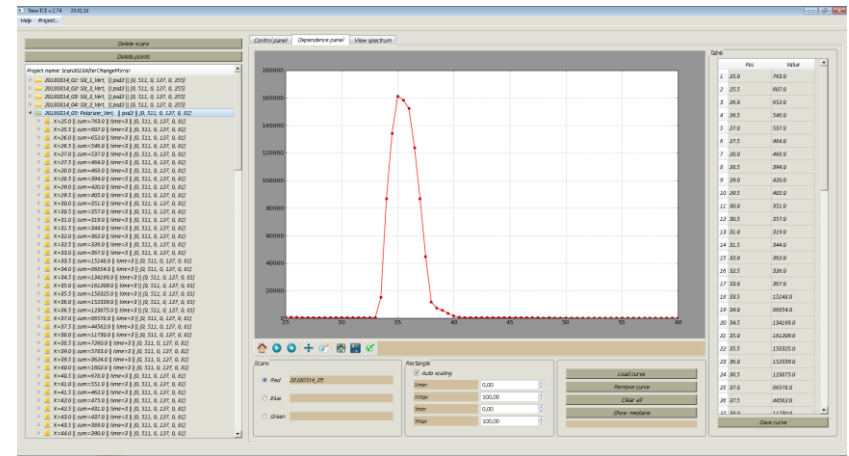- 2D PSD.

Implementation:

- Matplotlib
- PyQt5

Software for data acquisition and instrument control Sonix+
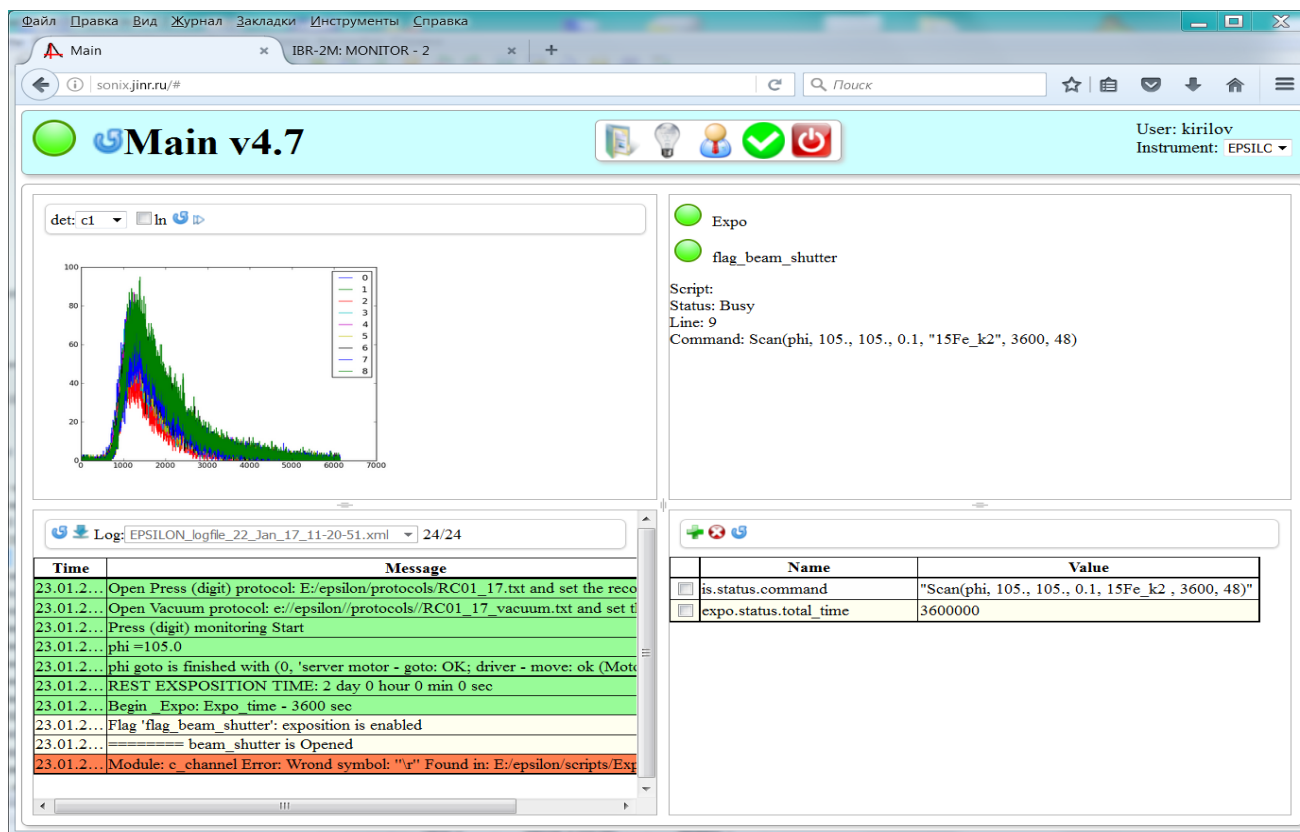
ICE -reflectometers calibration

- Create projects & scans
- Setting scan parameters (type, axis, detector, range)
- Automatic and manual scan control
- Results analyses & visualization
- Spectra visualization

Software for data acquisition and instrument control Sonix+

WebSonix. *Remote measurement supervision*

- Remote measurement monitoring
- Reference manual (wiki)

- Configurable

- Site pages correspond to the main *GUI*

- On-line visualization data from point detectors

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Journal system & Repository

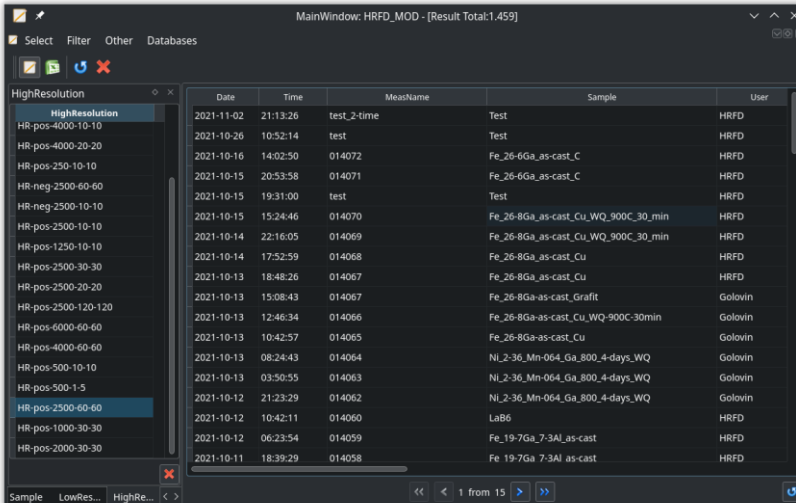*The <u>Journal system</u>* - automatic registration of measurements in a specialized database.
Provides:

- *getting information* about each measurement made at the instrument;
- *search* by measurement *parameters* in the database;
- searching of the *measurement data* in a file storage.

The <u>Central repository</u>

- *55TB in 24 disks (RAID6 array)*
- *6 instruments connected*
- *23TB are filled*
- *Mostly (22TB) are occupied by the HRFD the event-mode data*

The Journal GUI

Conclusion

- At the moment Sonix + is adequate to meet existing requirements.
- Installation of new wide aperture detectors + rejection of histograms in favor of event mode data → new situation.
- Perhaps, it's a right time to have a look at projects of data reduction and analysis frameworks like Mantid, in which many capabilities for data processing and visualization for histograms and event mode data are implemented already.

Reference

[Sonix+] https://sonix-wiki.jinr.ru/doku.php?id=en:index

Thank you for your attention.