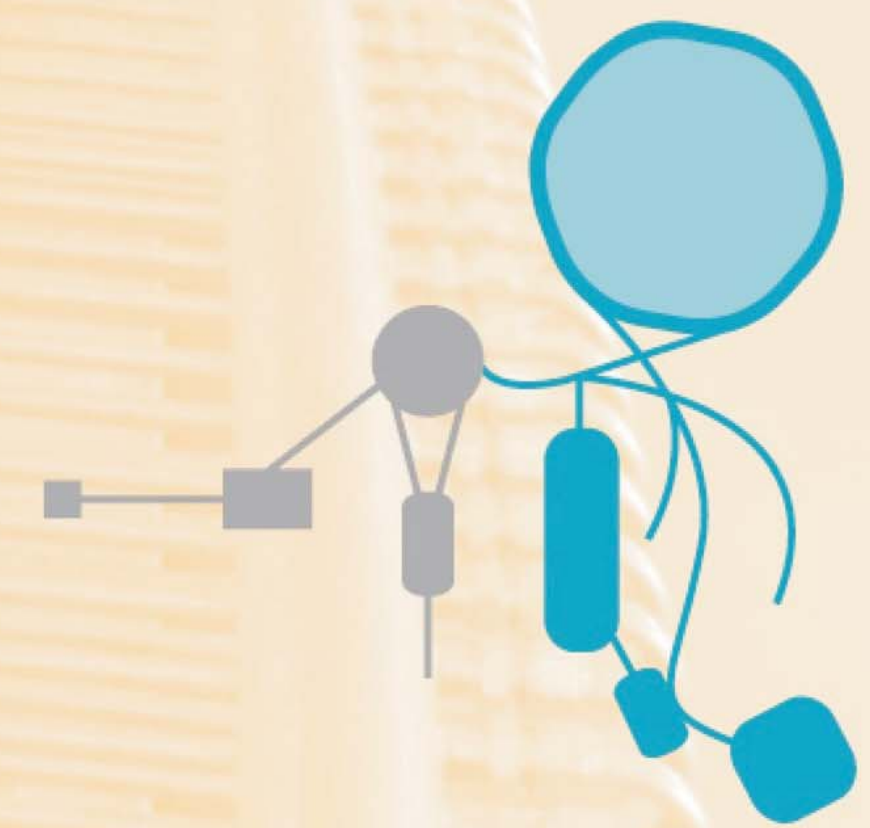
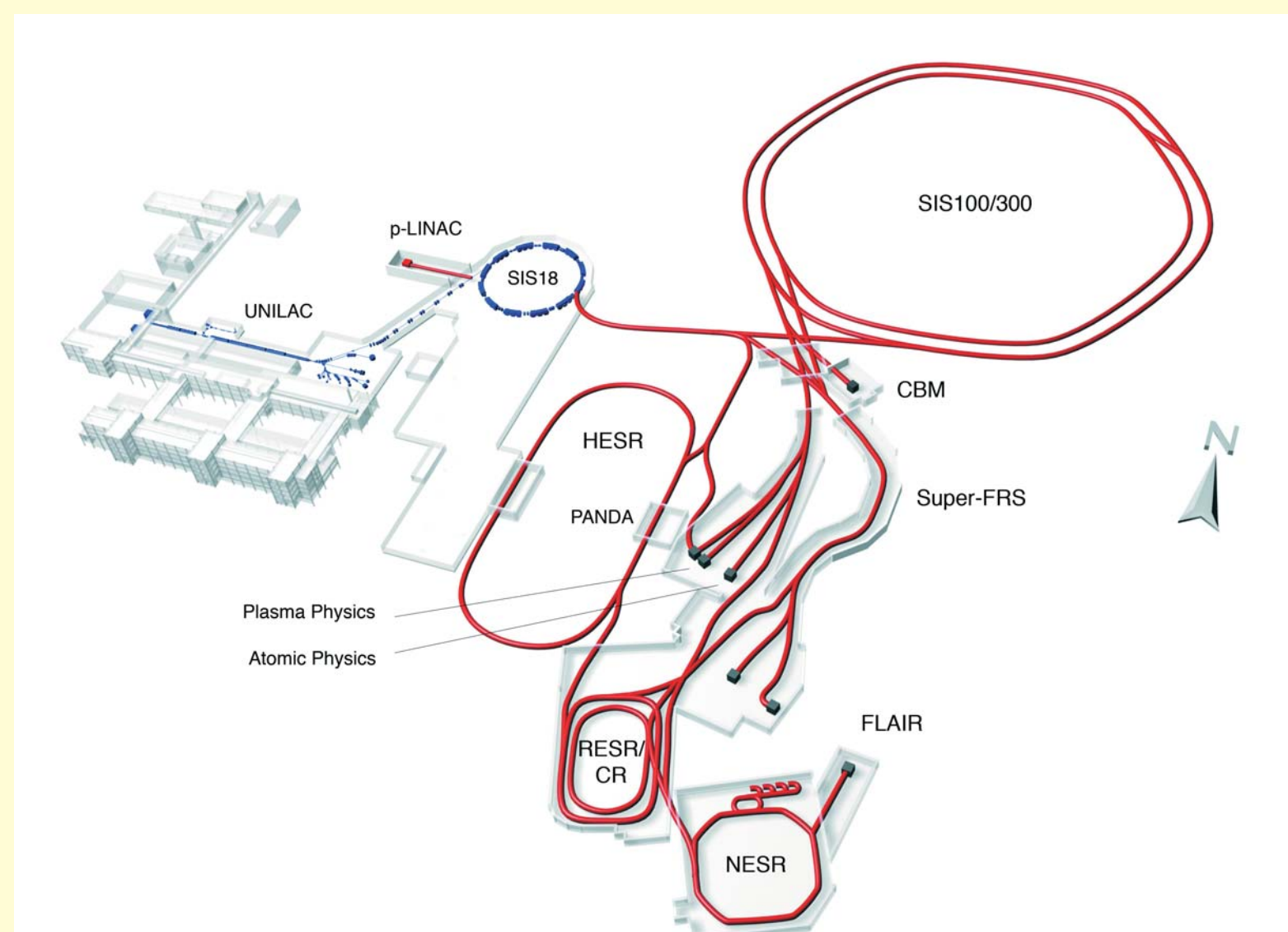




ABSTRACT

In view of the upcoming Facility for Antiproton and Ion Research (FAIR) at GSI with its increased complexity in beam control and diagnostics, the decision was taken to use the well-tested CERN made Front-End Software Architecture (FESA) as the lowest level of the new control system. In the past years, the current stable FESA framework (Version 2.10) has been adapted and installed at GSI, with the major part of the adaptation being the different machine timing models of GSI and CERN. With a stable environment at hand, all current and new beam diagnostic related data acquisition systems will be implemented with FESA. To demonstrate the suitability of FESA for demanding data acquisition problems with high data rates or large amounts of data, two different projects such as the Tune Orbit and POSition measurement (TOPOS) and the Large Analog Signal Scaling Information Environment (LASSIE) will be presented. Experiences with implementing standard interfaces such as CAN, GigE and PLCs in FESA applications as well as a move towards low cost Intel based controllers like the Men A20 VME controller or industry PCs running a real time Linux will be discussed.

FACILITY FOR ANTIPROTON AND ION RESEARCH (FAIR)



Scheme of the planned FAIR installation: Blue: existing accelerators UNILAC and SIS (heavy ion synchrotron) as injectors. Red: all new accelerator installations (p-Linac, SIS100/300, HESR, NESR, CR, RESR, pBar, FLAIR, SuperFRS plus experiments and beam transfer lines)

Primary beams:
 $10^{12}/s$; 1.5-2 GeV/u; $^{238}\text{U}^{28+}$
 Factor 100-1000 over present intensity
 $2(4)\times 10^{13}/s$ 30 GeV protons
 $10^{10}/s$ $^{238}\text{U}^{92+}$ up to 35 GeV/u
 up to 90 GeV protons

Secondary beams:
 Broad range of radioactive beams up to 1.5 - 2 GeV/u; up to factor 10 000 in intensity over present
 Antiprotons 0 - 30 GeV

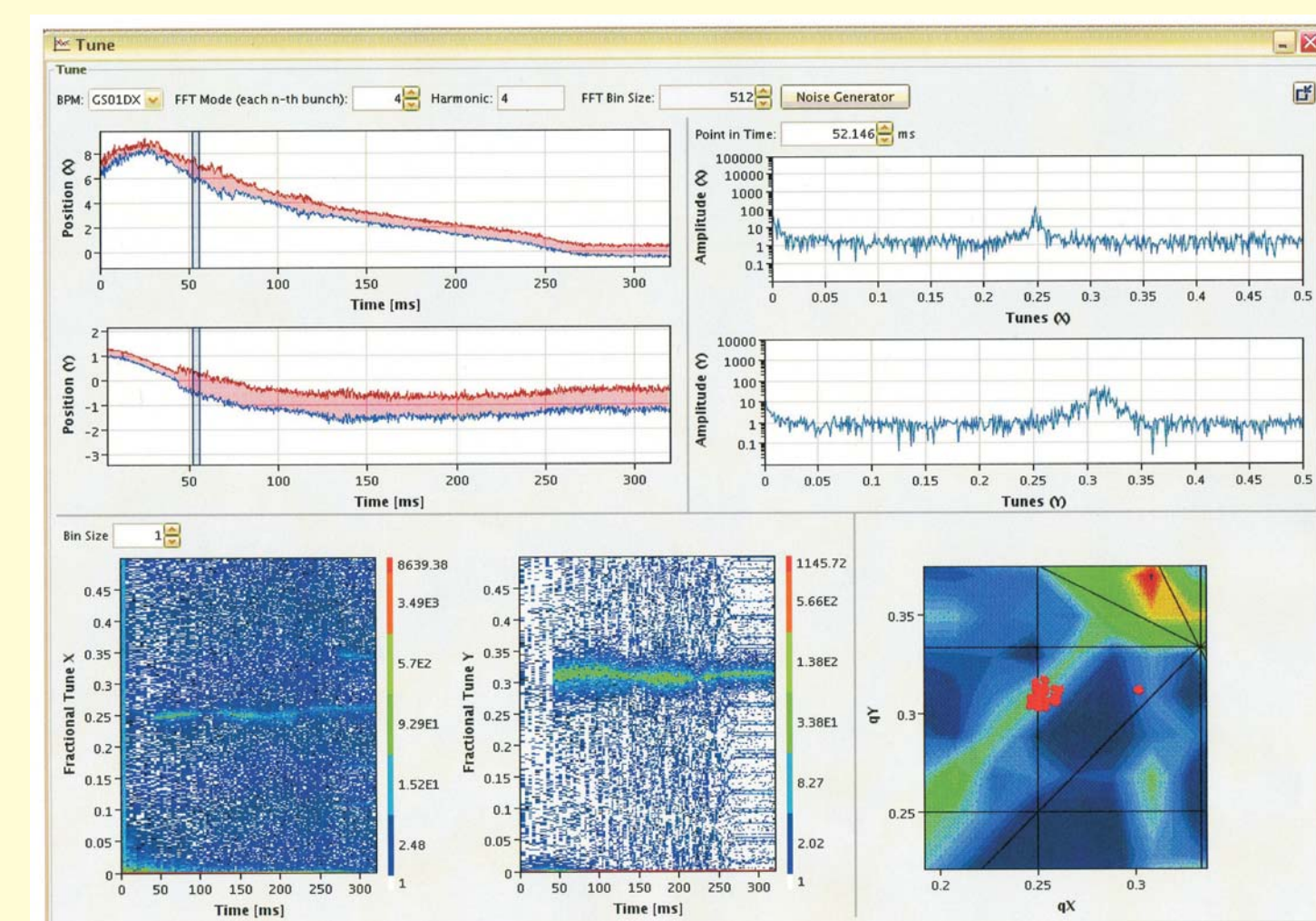
Storage and Cooler rings:
 Radioactive beams
 $e^- - A$ (or Antiproton-A) collider
 10^{11} stored and cooled 0.8 - 14.5 GeV antiprotons

TOPOS

(TUNE ORBIT AND POSITION)

TOPOS is the new beam position monitoring system for bunched beams at the SIS-18 at GSI. The DAQ itself is performed with 12 Liberars and an upper level FESA setup.

- Collaboration with Cosylab, Slovenia
- Prototype project for FESA at GSI
- Performance and concept test for FAIR includes all levels of the CS (FESA, Middleware, GUI)
- Modular concept fits also for SIS-100/300

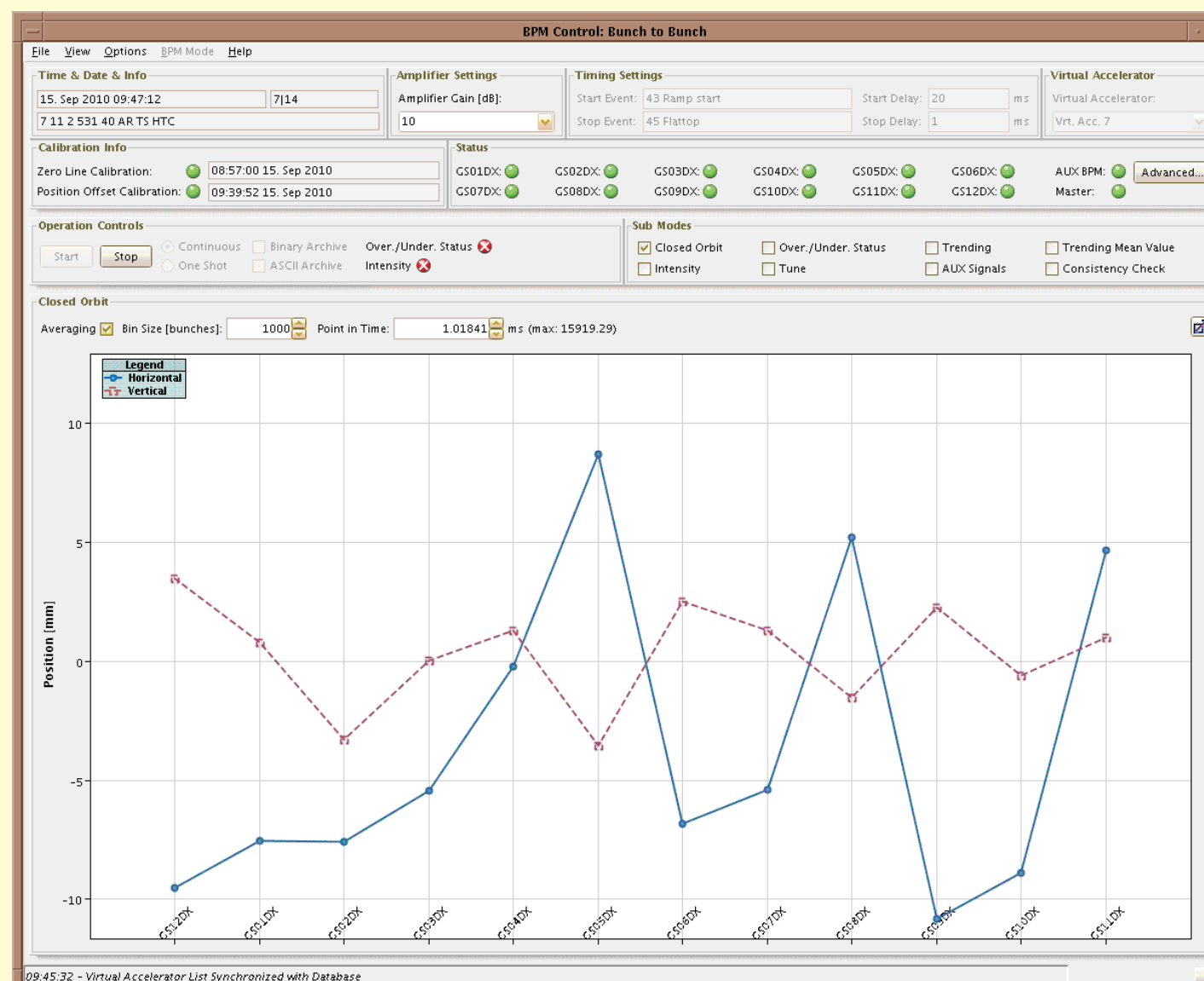


TOPOS provides the first **online** Tune measurement at the SIS-18. On excitation of the circulating beam using a noise generator the Tune can be measured and displayed in the resonance diagram of the synchrotron. The **dataviewer** libraries of CERN used by the JAVA GUIs allow meaningful presentation.

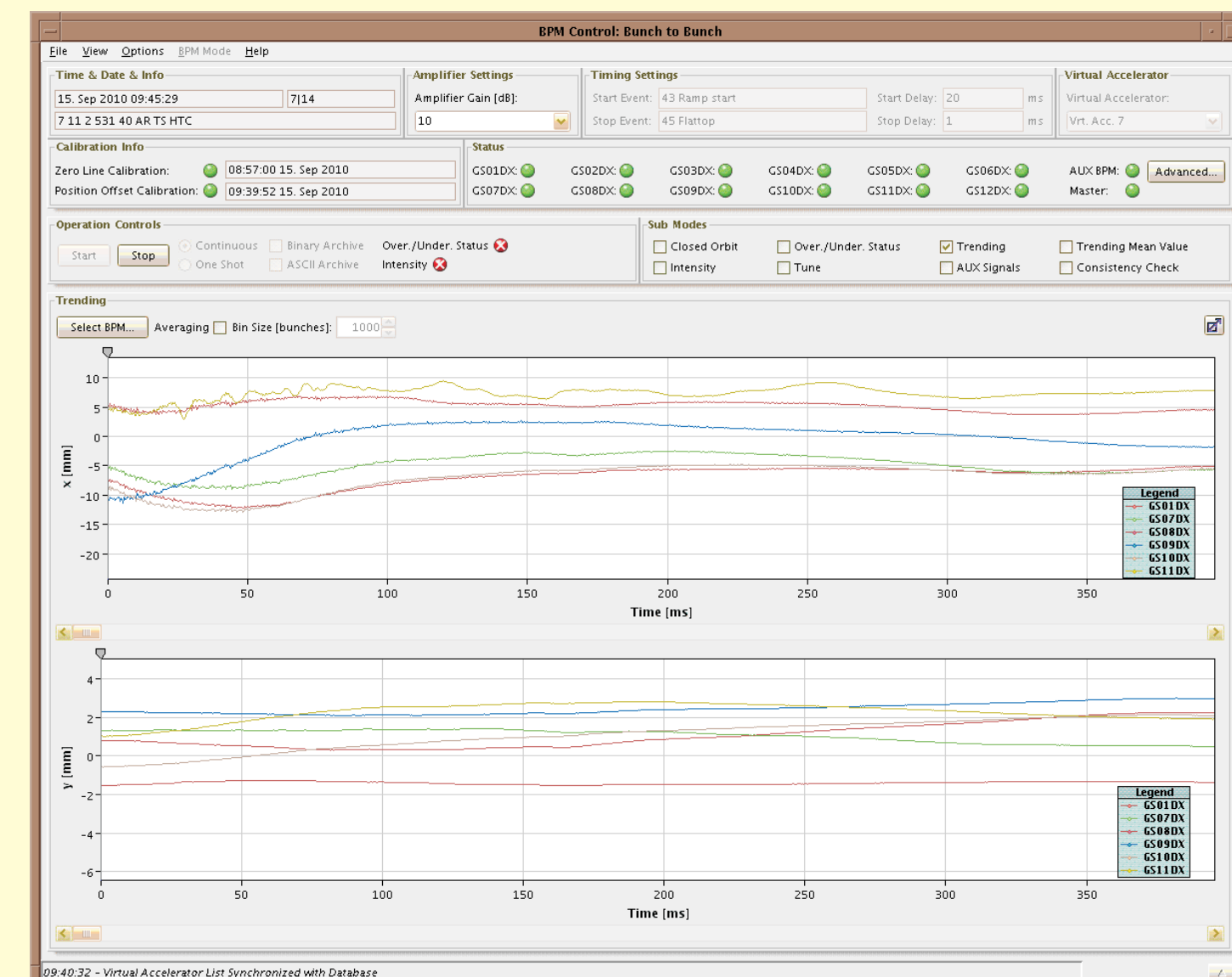
FESA INSTALLATION AT GSI

- Blade Server, Red Hat Enterprise 5.5
- FESA Version 2.10, FESA 3.x under development
- Front-end computer (FEC) OS: Linux-SLC 5 with RT patch / LynxOS
- FECs:

CES	- VME RIO3, LynxOS
MEN	- VME A20, Linux
Kontron	- IPC Kiss PCI-760, Linux
- FPGA GSI-CERN Timing converter (required for multiplexed beams)
- CERN timing receiver boards (CTRV [VME], CTRI [PCI], CTRP [PMC])
- CMW middleware, Oracle database, and NFS infrastructure
- JAPC and JDataViewer GUI development



Online measurement of the **closed orbit** at the SIS-18.

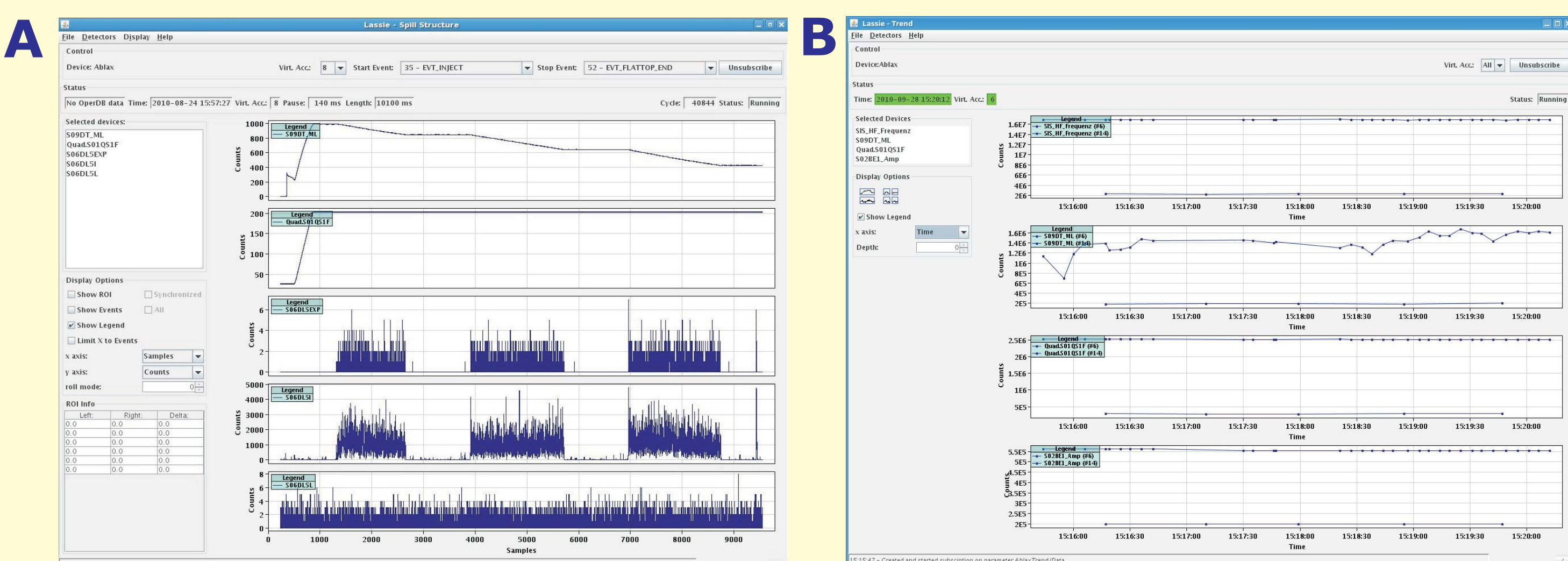


The **trending** tool shows position alteration on the acceleration ramp

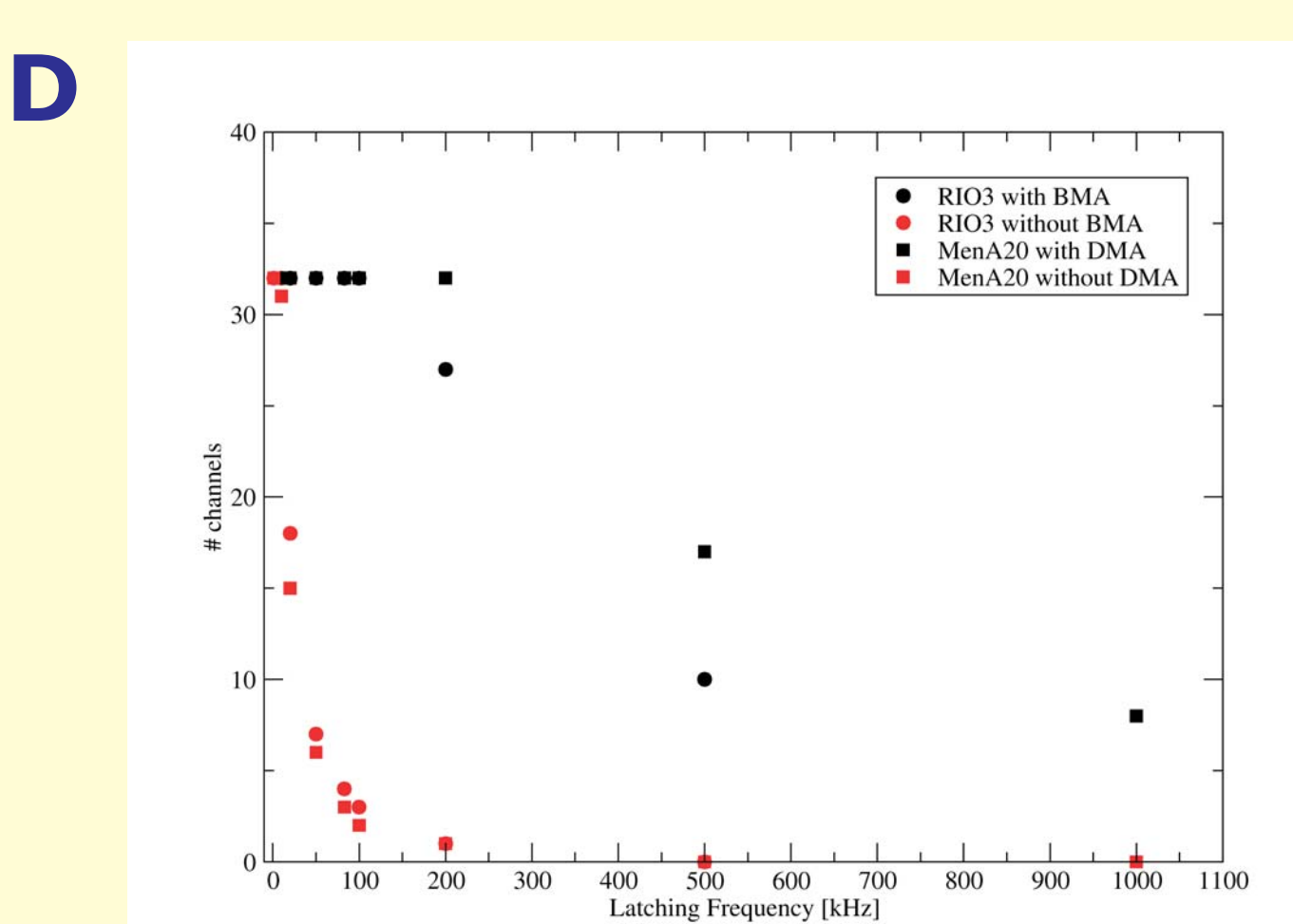
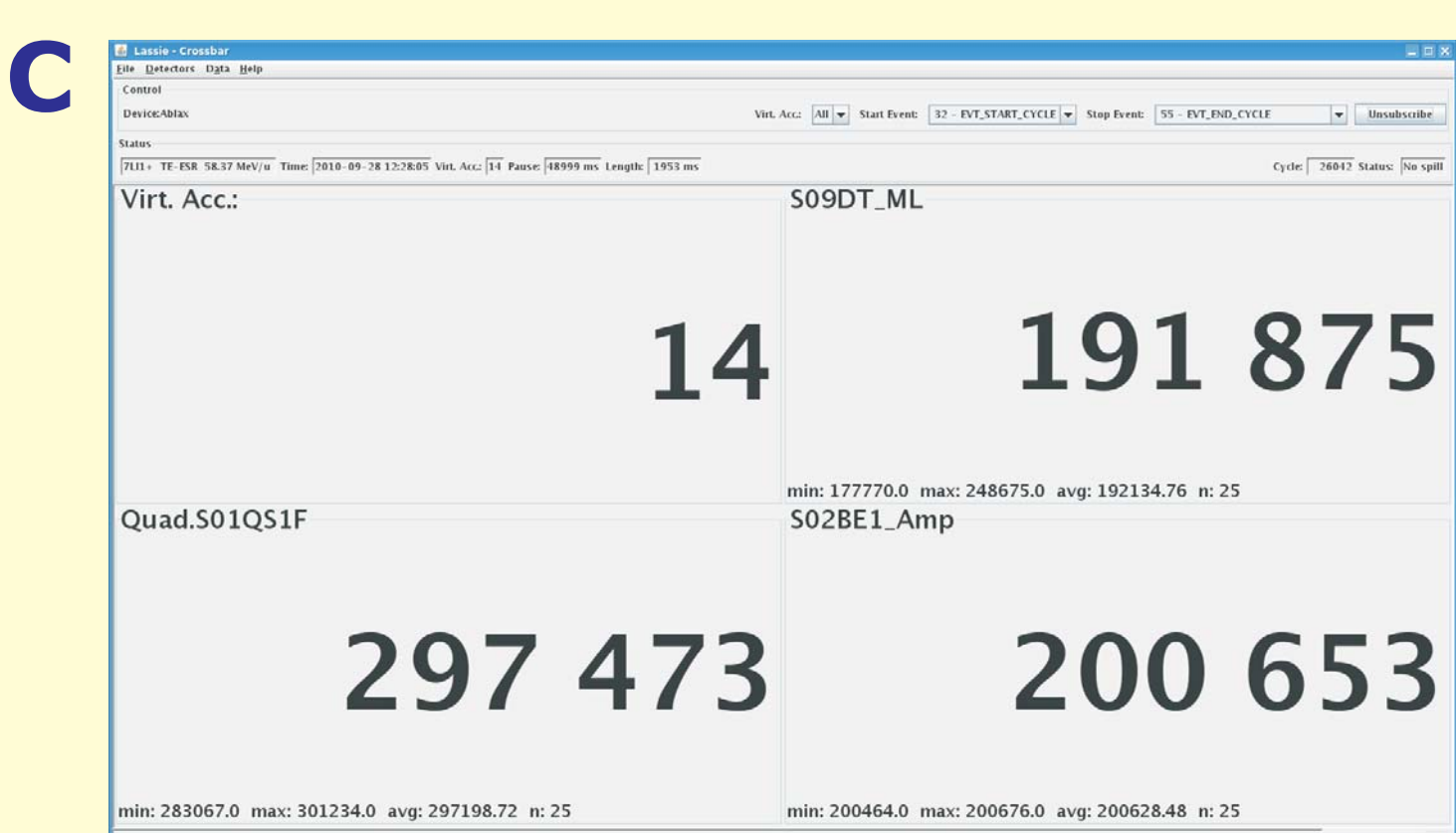
LASSIE

(LARGE ANALOG SIGNAL SCALING INFORMATION ENVIRONMENT)

Lassie is the successor of the ABLASS system at GSI. Main functions are: spill structure analysis (A), Trending (History, B) and cycle count rate (Crossbar, C). Benchmark tests showed good results for MEN A 20 VME controller (D). This project demonstrates the modular, large scale signal acquisition for FAIR for slow extracted beams at the SIS and HEBT.



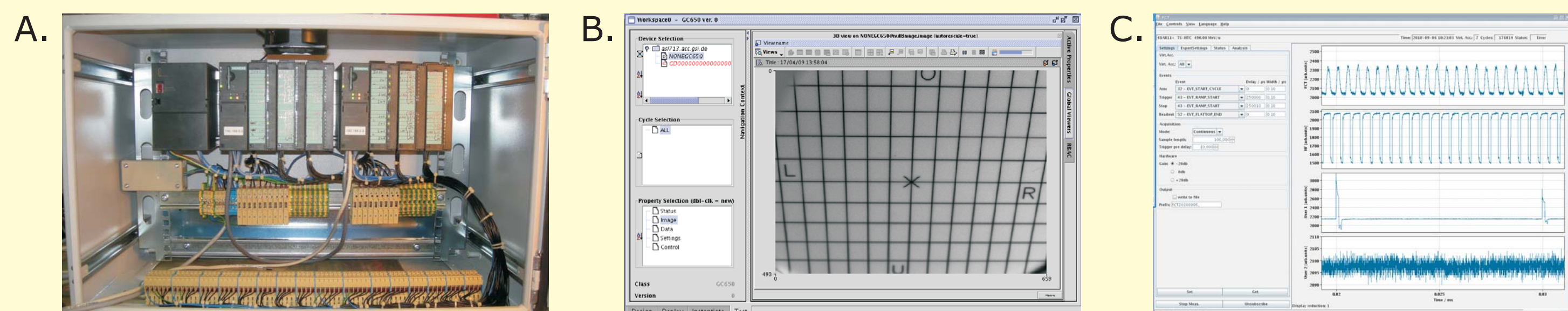
Picture A shows the spill structure of heavy ion beam at the SIS-18 as a function of time. On top the current transformer shows the fractional slow extraction. The magnetic field (2nd line) of the bending magnets is not changed for the whole extraction time. Loss rates can be observed on the beam loss monitors (lines 3-5).



Comparison between the CES RIO3 PowerPC based VME CPU (OS=LynxOS) and the cheaper Intel based MEN A20 VME CPUs (OS=SLC5). The highest latching frequencies on a SIS3320 Multiscaler used for sophisticated spill structure analysis can be reached with the MEN A20 with DMA access.

SCADA AND TEST APPLICATIONS

- Integration of the CAEN SY1527 high voltage power supply, used by particle detectors such as BLM, IC, SEM, profile grids, Faraday cups, etc.
- CAN bus interface for remote control of non-TCP/IP supporting crates
- Siemens Simatic S7-300 Programmable Logic Controller and Profinet as a test fieldbus system for the UNILAC for slow controls. First test application: Beam induced fluorescence monitor (BIF), power and iris control. (A.) S7 - satellites
- GbE Camera readout (B.) Here a picture of a scintillating screen
- Fast Current Transformer at SIS-18 (C.) Here bunches with rf on acceleration ramp



OUTLOOK

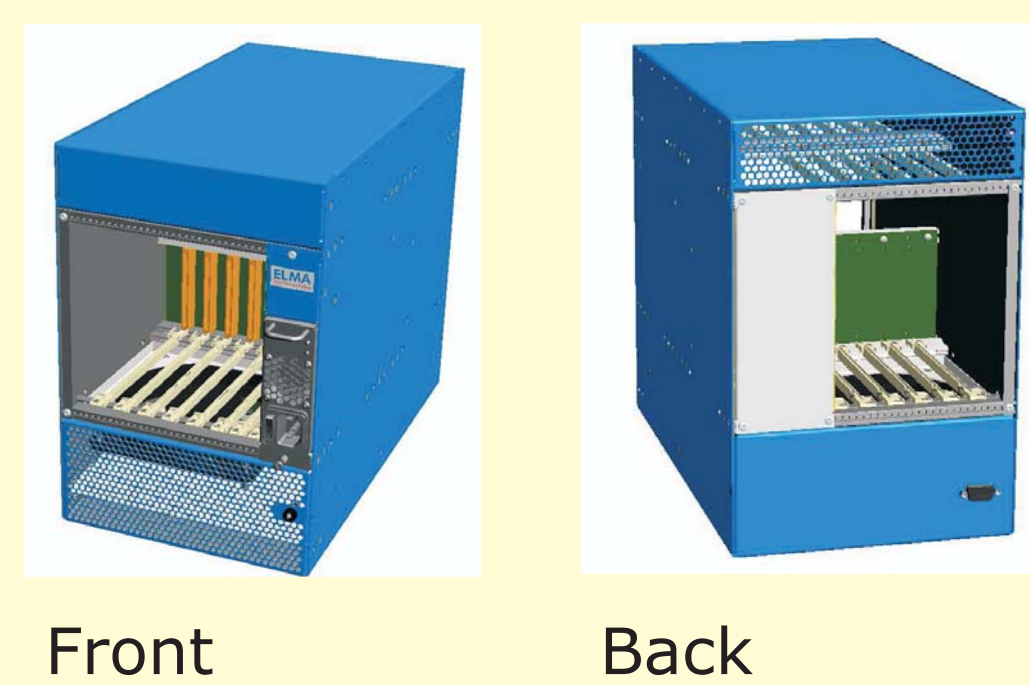
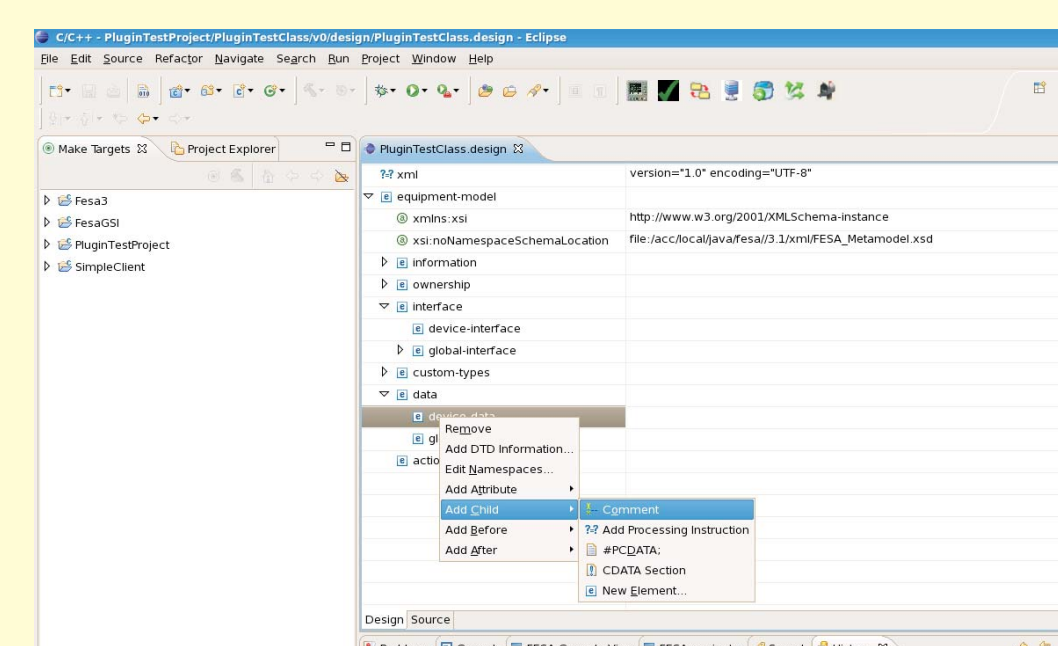
Evaluation of the new **xtCA** form factor **for Physics**, which provides rear transition I/O and new methods for trigger and timing synchronization for shelf and AMCs.

Advantages:

- modern serial bus systems (GbE, XAUI, PCIe, SRIO)
- high bandwidth
- full remote control, shelf management
- redundant and safe mainframe

FESA 3.0

- Development in **collaboration** between CERN and GSI.
- Resolves requirements of specific labs.
- Working shell as **Eclipse** plugin



Front

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