



Abstract

The Hefei light source was overhauled beginning from 2010 and completed in the end of 2014. The new light source is renamed as HLS-II. A set of high level application tools were developed for the light source commissioning and operation. These tools have been playing important roles in the commissioning and operation of the light source. This paper reports some critical applications.

Physical quantity based control system

The physical quantity based control system developed for the HLS-II directly controls the physical quantities of the accelerator elements, including the magnetic field of various magnets, beam energy, etc.. This feature of the control system enables it to directly control the parameters of the accelerators and the electron beam. The physical quantities and related engineer quantities are automatically converted inside of the control system, and can be shared by different high level applications. This significantly improves the feasibility and effectiveness of the system. This system have been well serving the commissioning, machine study and operation of the HLS-II light source.

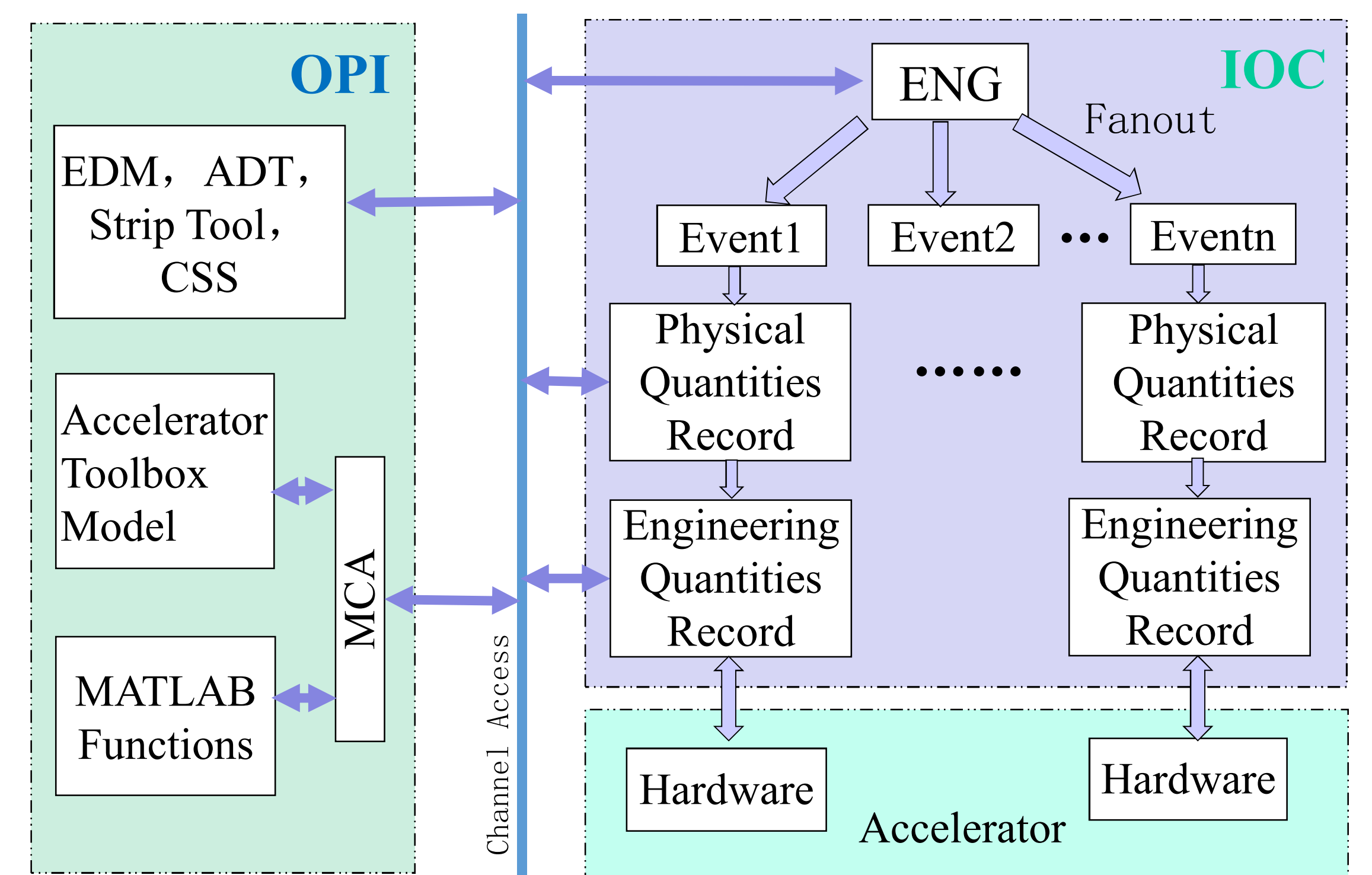
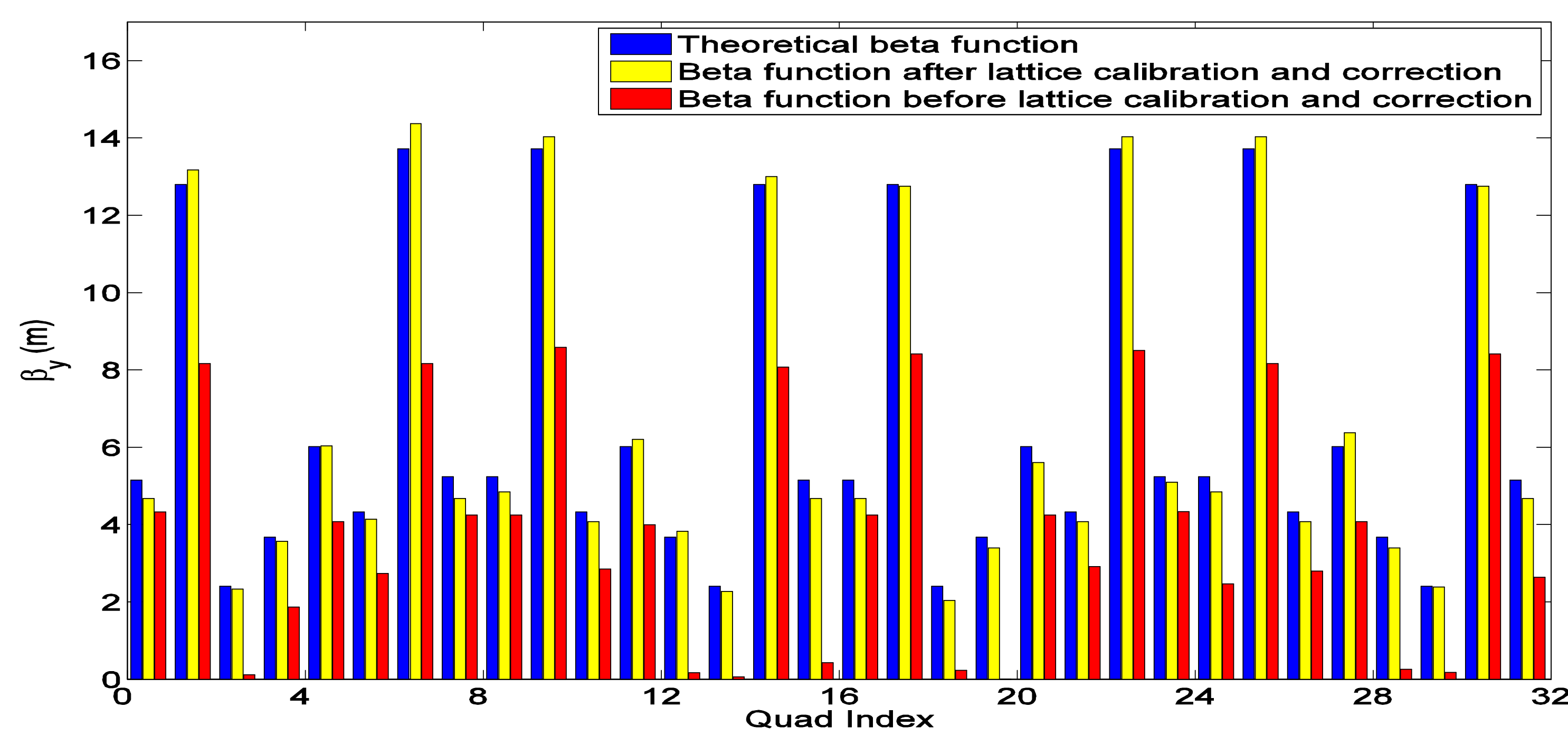


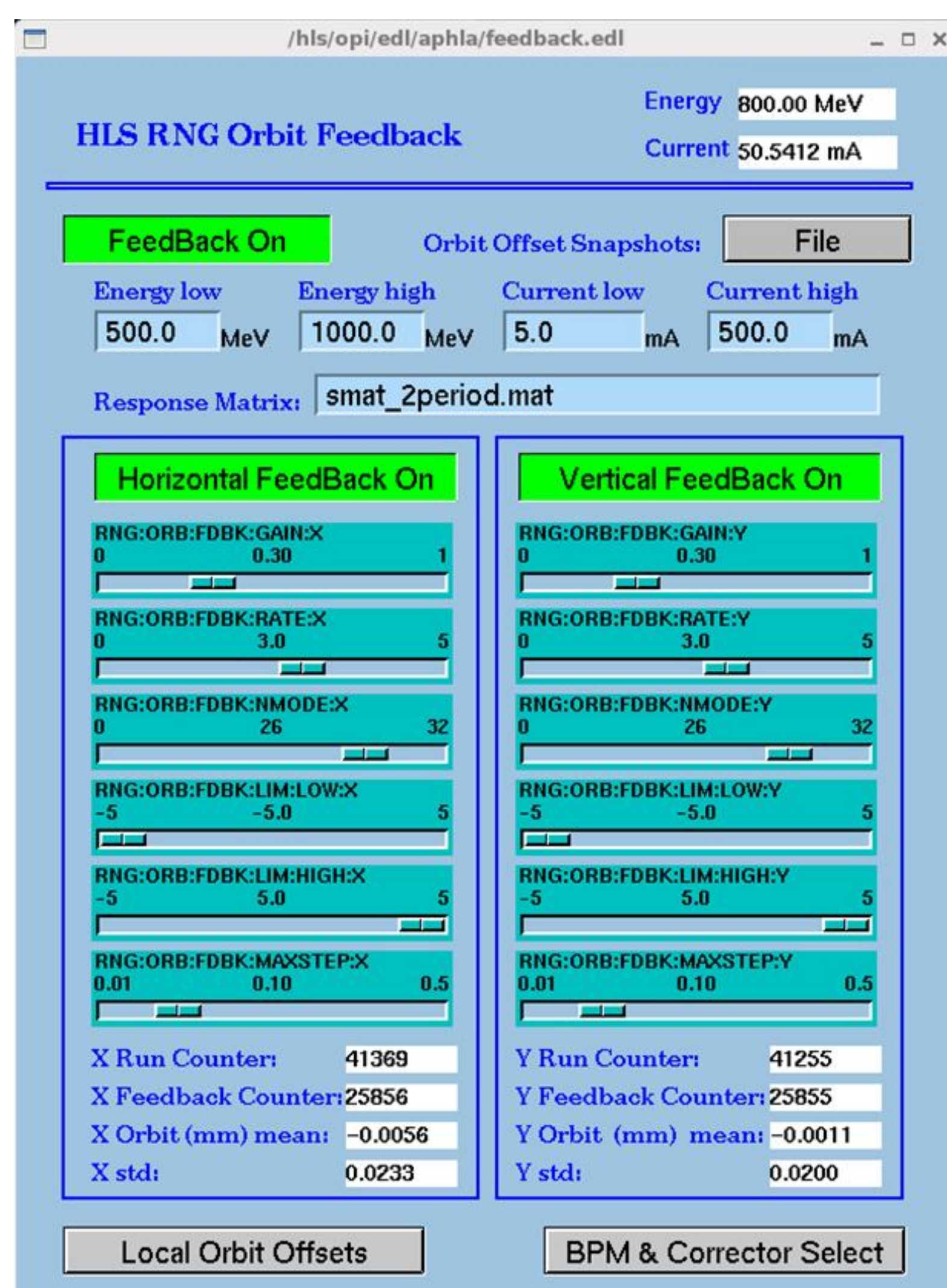
Diagram of the Physical quantity based control system of the HLS-II



Vertical beta function before and after lattice correction.

lattice calibration

The response matrix measured using BPMs and orbit correctors is used for the lattice calibration, optical parameter correction and lattice compensation for various IDs of the HLS-II storage ring. Some modifications are performed from the traditional fitting methods to meet the standard of the HLS-II control system. LOCO is used for the lattice correction and ID compensation.

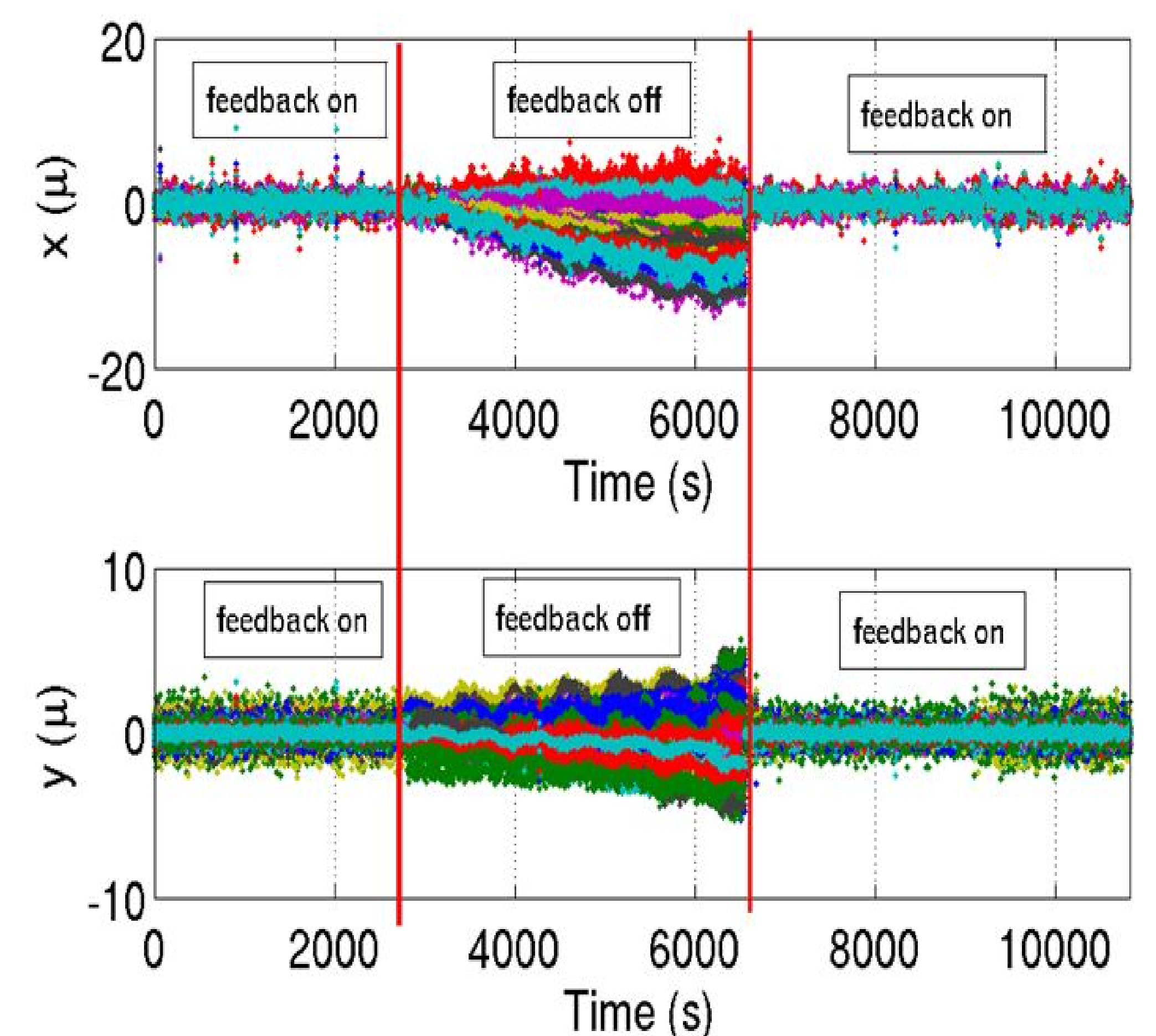


The control panel of the HLS-II storage ring beam closed orbit feedback.

Orbit feedback

High orbit stability is required by synchrotron radiation users. Developing an orbit feedback software for achieving high orbit stability is one of our tasks.

- The BPM system employs button type electrodes. Electronics processing modules manufactured by Libera are used for the signal processing.
- The BPM system and corrector power supplies are capable of performing up to 10Hz feedback correction.
- The gold orbit is defined using the quadrupole centers measured using beam based alignment method.
- The Orbit feedback system can be used for global orbit correction and local bump adjustment.
- The long-term RMS orbit fluctuation is less than 10% of the beam size in both horizontal and vertical directions.



The HLS-II storage ring beam orbit stability with and without feedback, respectively. The values of each BPM are plotted using a designated color.

Summary

The physical quantity based control system of the HLS-II can be used to direct control the physical parameters of accelerators. The high level applications developed based upon this system play important roles in the light source commissioning, and are providing strong supports for stable and high performance operation of the light source.