Overview and Select Operator Tools at the Australian Synchrotron

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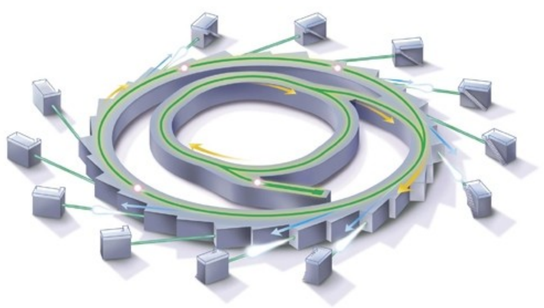
Abstract

With the Australian Synchrotron now in full-time user operation mode the minimisation of unexpected beam down time is of high importance. Having easily accessible tools at the fingertips of the Operator to detect, diagnose and remedy the fault is vital. By using existing EPICS frameworks, such as the epics display manager and the alarm handler, it has been possible to create custom, intuitive and easy to use control and fault indicators. These frameworks were flexible enough to produce the desired tools, which now form part of a backbone for systems monitoring and injection system tuning.



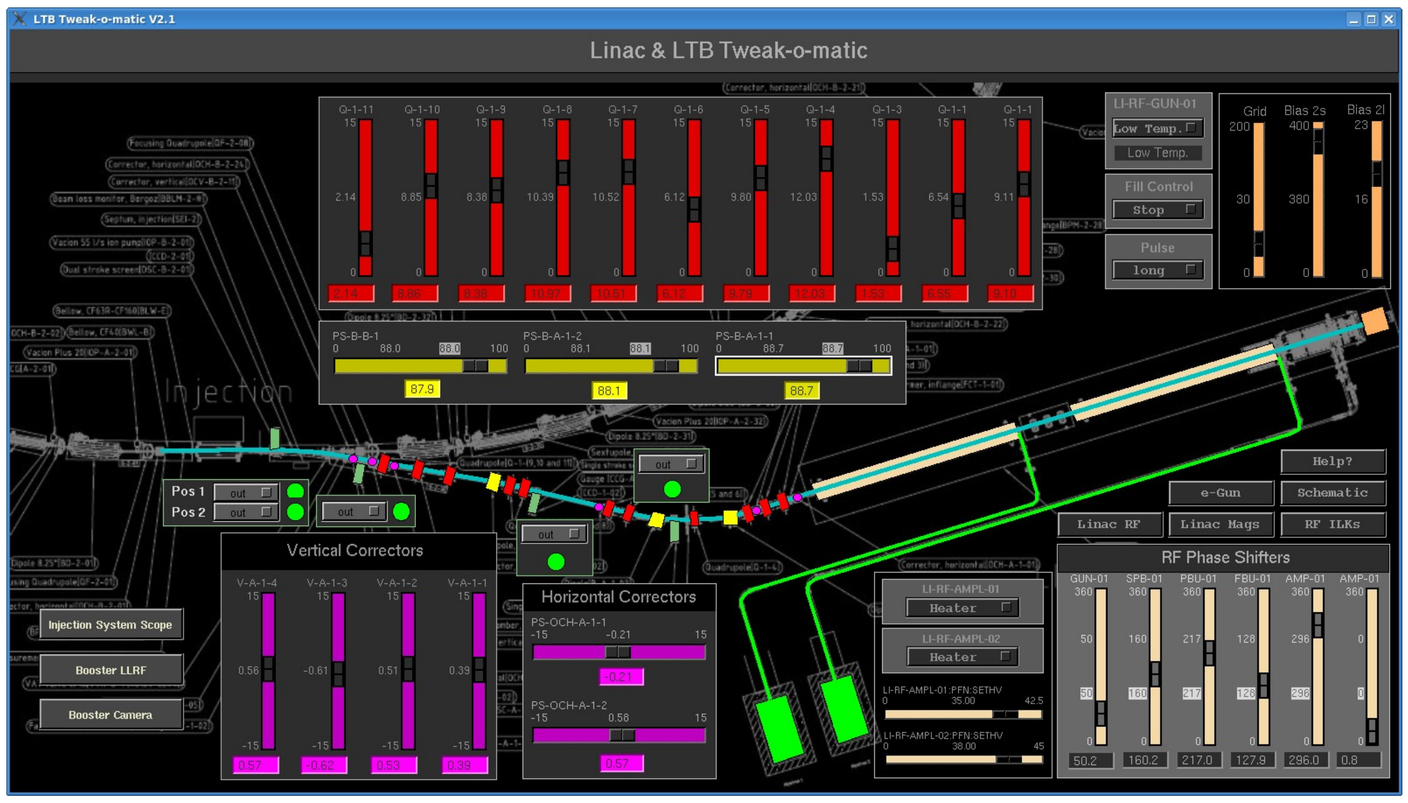


Figure 2: The Linac and LTB tweak-o-matic, showing magnet set-point sliders, screen insertion buttons and program launch buttons.

MACHINE OVERVIEW

Located near Melbourne, Australia, the Australian Synchrotron is a 3rd generation light source. The facility has been open to users since April 2007. The storage ring is currently running with 200mA. A typical stored beam lifetime is in the order of 36 hours, with all insertion devices operating, this requires that we re-inject every 12 hours.

There is a suite of 9 beamlines, currently Infra-Red Spectroscopy, Protein Crystalography 1, Powder Diffraction, X-Ray Absorption Spectroscopy and Soft X-Ray Spectroscopy are fully operational, Protein Crystalography 2, Microspectroscopy and Small/Wide Angle Scattering are under active commissioning and Medical Imaging is currently under construction.

The control system used for all accelerator systems is the Experimental, Physics, Industrial Control System (EPICS). Much of the injection system control interface is managed through the EPICS display manager EDM. All of the storage ring control interface has been developed in-house by the Controls Group (figure 1). Matlab is also extensively used.

All Operator Interfaces (OPI's) are software identical. This means that any of the systems can be controlled from any of the OPI's. However, out of habit, certain interfaces are only used on certain OPI's.

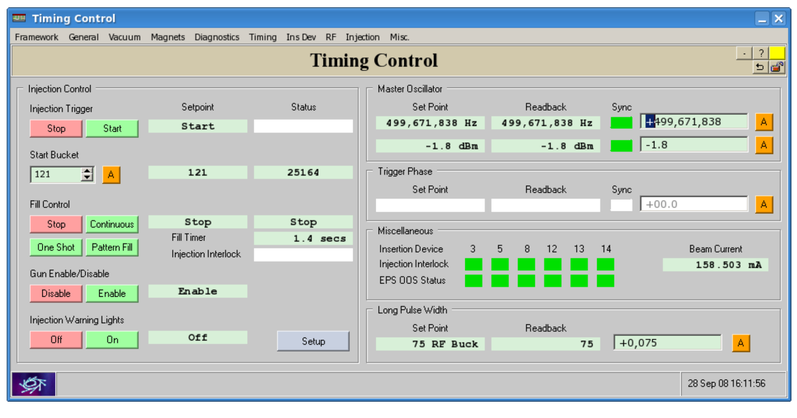


Figure 1: the timing control component of the Controls Group "Navigation GUI".

TWEAK-O-MATIC

Before the birth of the Tweak-o-matic tuning GUI the interface consisted of large slabs of sliders, which for the purpose of commissioning worked well. A more visual display of the components and their relationships between each other was required to more intuitively and effectively tune the injection system.

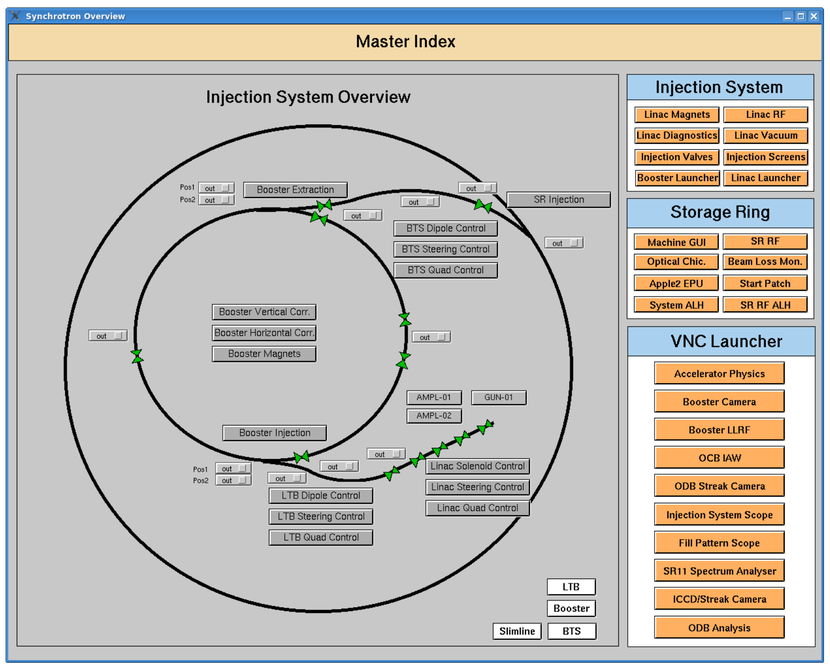


Figure 3: Injection system overview and launch interface. Provides a central location for many of the existing EDM GUI's.

There are 3 GUI's in tweak-o-matic range. The series starts with the overview of the injection system (figure 3), this is the launching pad for other programs and control GUI's. It also provides control and visual recognition of the state of the vacuum gate valves and the beam spot screens.

The Linac and LTB Tweak-o-matic was based around the construction layout schematic (figure 2). All of the systems needed to run and adjust the Linac and LTB have been provided, or are linked to. One useful feature is that when the mouse is hovered over a visual magnet square a pop-up with an adjustable slider is seen.

The BTS Tweak-o-matic is based on the same principles as the Linac and LTB GUI. In addition this GUI also provides a graph of the storage ring current, injection efficiency and dose rate at the point of injection. The graph provides important feedback on the success or otherwise of magnet "tweaks".

ALARM HANDLER

The EPICS Alarm Handler (ALH) is a critical systems monitoring software which provides a central point for the audio and visual display of all current alarms (figure 4) , based on the EPICS process variable (PV) database file information.

The ALH is configured and the alarm tree built up using common text files. The simple syntax allows for the inclusion of a click-able guidance feature, which can be used to provide debugging information. The syntax also allows operators the ability to launch GUI applications to quickly reset any faults.

Another extensively used feature of the ALH is the ability to log all faults detected. This information is placed in a daily log-file and is used to determine a sequence of events and to assist with the writing of fault logs.

In the control room there are many different programs that produce an audible beep; Matlab, system shells and ALH. An addition is currently under development to enable different sounds to be emitted according to the different levels of the alarm state.

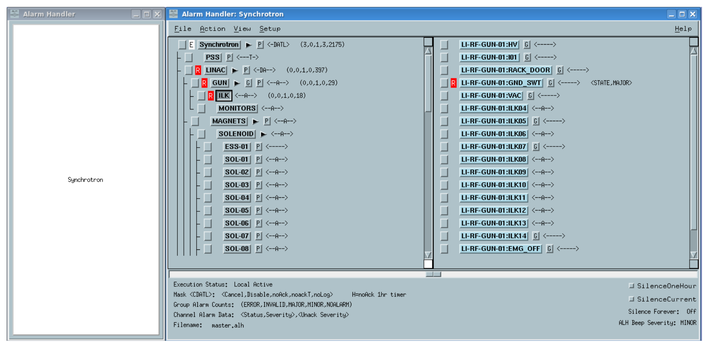


Figure 4: The facility alarm handler showing the electron gun interlock group, with an acknowledged but active ground switch interlock.

CONCLUSION

The simplicity and ease of configuration of the ALH and the EDM has allowed for the custom set-up of alarm files and intuitive, easy to use GUI's for successful fault diagnosis and injection system tuning.

The tools available and the operators' expert use of them has enabled the Australian Synchrotron minimise the impact of un-expected down-time.