DEVELOPMENT OF POST-MORTEM VIEWER FOR THE TAIWAN PHOTON SOURCE

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ABSTRACT

The Taiwan Photon Source (TPS) is a 3-GeV third-generation synchrotron light source located in Hsinchu, Taiwan. The post-mortem (PM) system is act as an important tool to diagnostic the cause of trip events caused by beam loss. A MATLAB-based and web-based viewer were developed to plot and view the each event to understand the cause and effect of the event. The post-mortem viewer architecture and implementation were presented in this report.

SYSTEM DESCRIPTION

- The architecture of the TPS PM system is shown in Fig. 1.
- The system includes the beam trip detector, EPICS embedded standalone data recorders, data storage server and viewer.
- The main system features are the following: generate a trigger signal to data recorders when the stored beam current is lost abnormally; record relevant signals to server when a beam trip occurs; view the report from the GUI tool or web browser to analyze each event for cause and effect.
- The flow char of the save program is shown in Fig. 2.

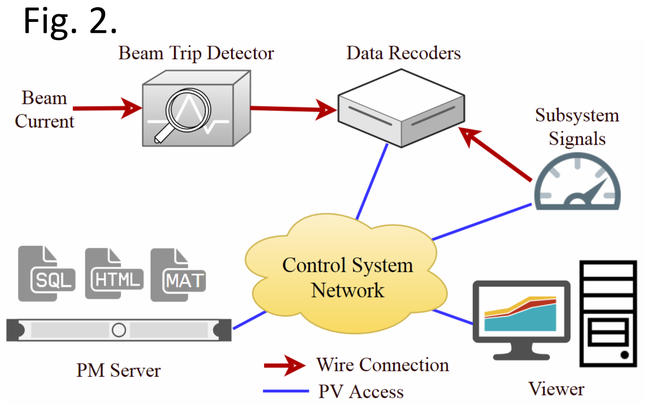

Fig. 1: Schematic layout of the TPS PM system.

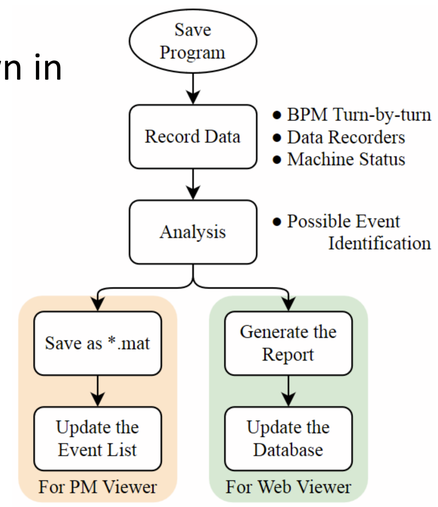

Fig. 2: Flow char of the save program.

POST-MORTEM VIEWER GUI

PM Viewer

- The PM Viewer GUI is designed to list and plot beam trip events and the graphic user interface is developed with the Matlab's GUI-building tool as shown in Fig. 3.
- It can list the beam trip event with a simple note and provide a signal list check box to select for display the desired data, which can be downloaded from the server using the FTP protocol.
- The flow char of the plot function is shown in Fig. 4.
- Figure 5 shows that the vacuum interlock is active during 400 mA operation. The RF system is shut down within a few milliseconds. Finally, the BPM position interlock is active.
- Some kickers were unexpectedly fired without system trigger signal, causing an instant loss of the electron beam, as shown in Fig. 6.
- A customized toolbar can provide simple data adjustment functions as shown in Fig. 7.

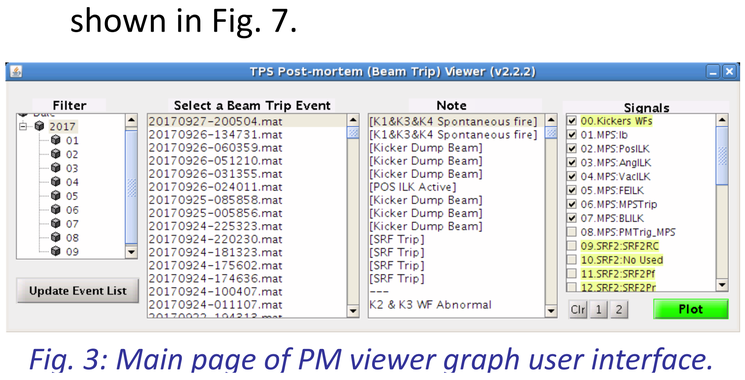

Fig. 3: Main page of PM viewer graph user interface.

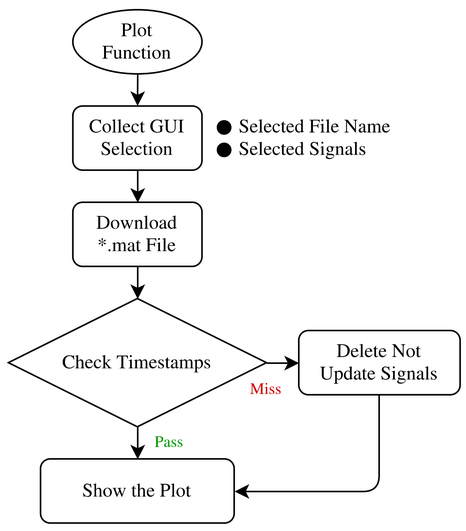

Fig. 4: Flow char of the plot function.

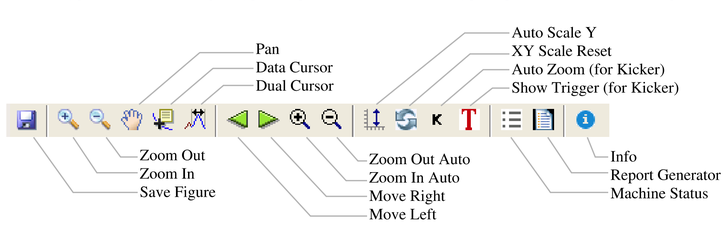

Fig. 7: Text description of the illustration toolbar.

DATA STORAGE SERVER AND VIEWER

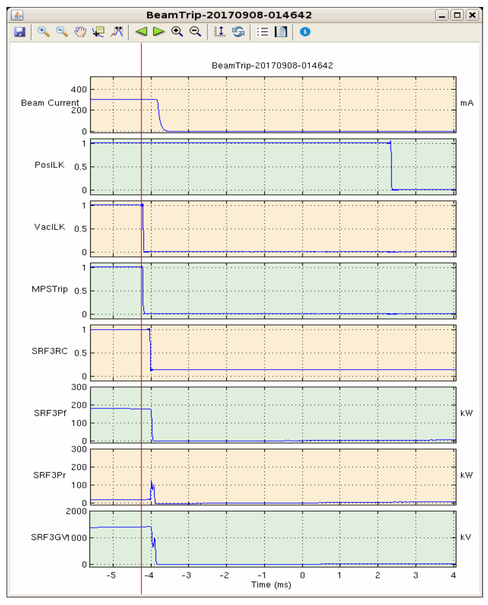

Fig. 5: Plot page of vacuum interlock event.

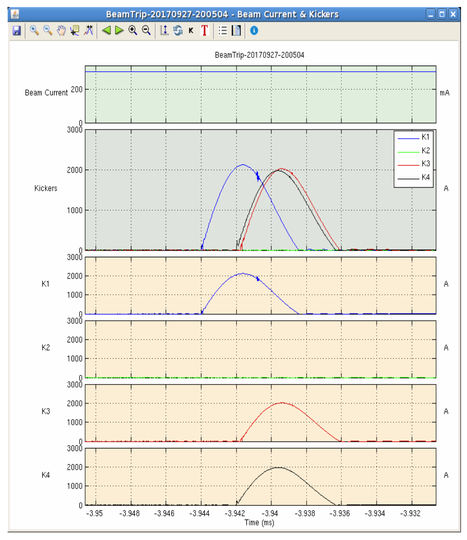

Fig. 6: Kicker waveforms during spontaneous fired kickers K1, K3, and K4 while the K2 is misfired causing a beam trip.

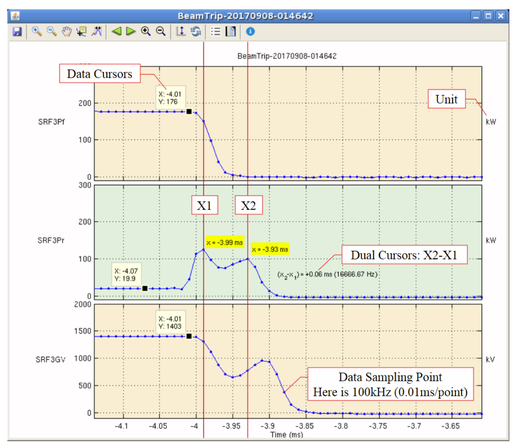

Fig. 8: Demonstrations of the data cursor and dual cursors functions. The data sampling point will be displayed, when the x-axis is zoom in into a certain level.

Web-based Viewer

- The web-based viewer of the beam trip report is designed to list and view beam trip events. The main page is developed by the Python/Django tool with SQLite database as shown in Fig. 9.
- As shown in Fig. 10, the report is generated from the report generator immediately or from the PM Viewer GUI later (regenerate).
- The report contains the information including the timestamp of the trip event, note, beam current, kicker waveforms, subsystem interlock waveforms, history of the beam current, and machine parameters. This web-based interface is useful to quickly review a trip event by any device through the web browser.

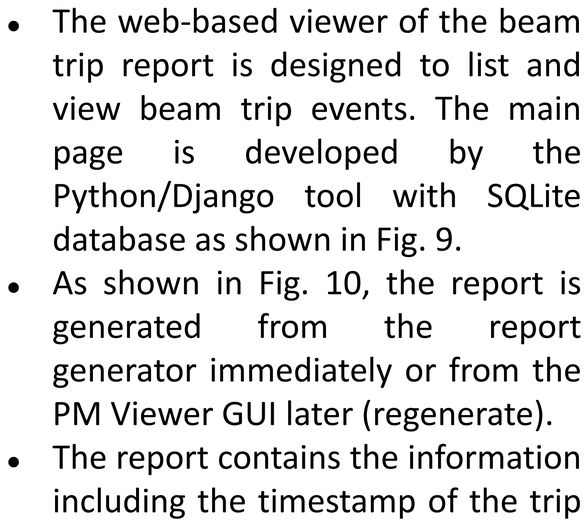

Fig. 9: Web interface of TPS beam trip report list.

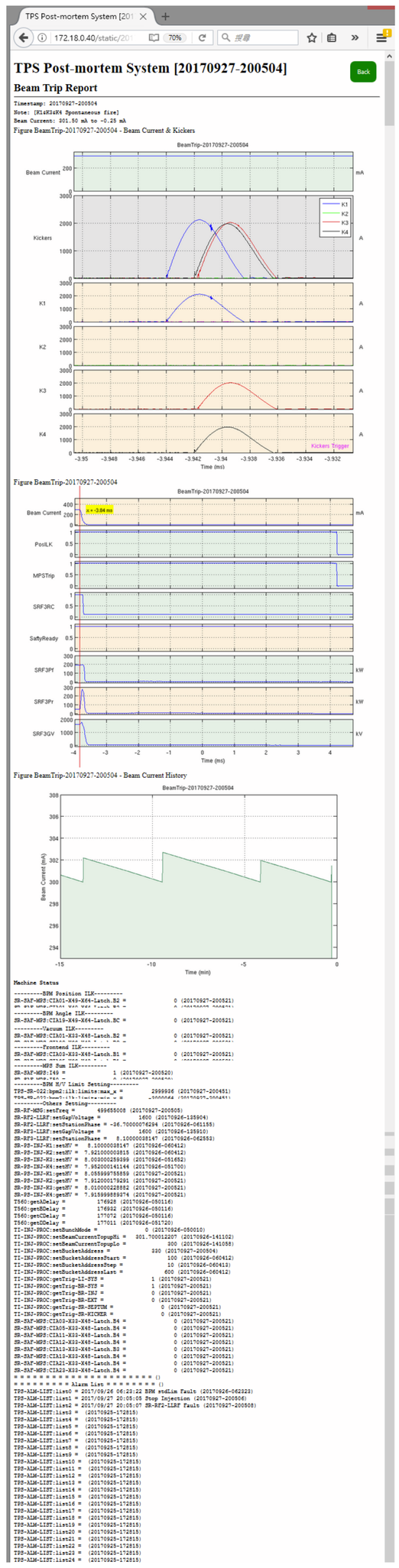

Fig. 10: Web page of beam trip report.

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