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Integration of Sample Temperature Control and X-ray Data Acquisition at the TPS 13A Biological Small- and Wide-Angle X-ray Scattering Beamline

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Integration of sample temperature control with X-ray scattering data acquisition is essential for the biological small- and wide-angle X-ray scattering (BioSWAXS) beamline 13A at the 3 GeV Taiwan Photon Source (TPS), National Synchrotron Radiation Research Center (NSRRC) [1–3]. Based on the Experimental Physics and Industrial Control System (EPICS) framework [4,5], we implemented two independent temperature control systems—chiller and heater—into the X-ray data acquisition workflow through the Control System Studio (CSS) and the beamline data collection graphical user interface (DC-GUI). The chiller system employs a JULABO FCW-2500T unit for a temperature range of -20°C to 80°C , while the heater system (ambient to 300°C) uses heating rods regulated by an SRS PTC10 controller, complemented by a gas-flow cooling module. Through the DC-GUI, the X-ray data acquisition system coordinates seamlessly with the sample environment control, including sample positioning, cooling, and both chiller- and heater-based GUIs. This integration enables programmable X-ray data acquisition under synchronized, programmable temperature control. A temperature-dependent SAXS measurement is demonstrated, showing that the stability and interoperability of the combined systems significantly enhance beamline performance and experimental reliability.

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Footnotes

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