



LABWEB

LNLS Beamlines Remote Operation System

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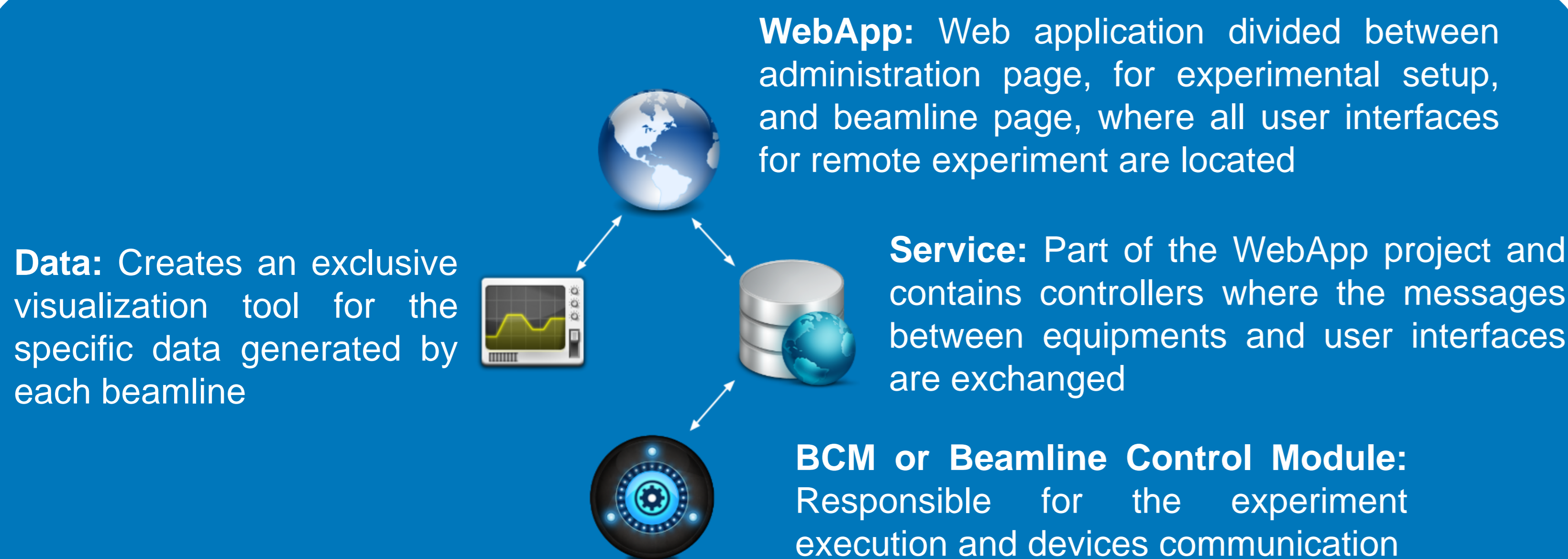
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About LabWeb Project

- Aimed to allow remote operation of LNLS beamlines by the user community.
- Beta version in 2010 as proof of concept.
- New version in 2012 using open source platform Science Studio developed at CLS.
- So far provided remote operation of three LNLS beamlines: SAXS1, XAFS1 and XRD1.
- Expectation to provide this remote way of performing experiments to all other beamlines.

Project Structure



Science Studio at LNLS

- **SAXS1** (Small Angle X-Ray Scattering): first beamline ported to Science Studio. Experiment Consists in sample change, scattering image acquisition and data pre-processing (background subtraction and azimuthal integrations).
- **XAFS1** (X-Ray Absorption and Fluorescence Spectroscopy): second beamline ported to Science Studio which experiment is an x-ray absorption spectroscopy where users can specify a maximum of five energy ranges to launch scans, users can also define optimization strategies for ion chambers and specify wetter wave-vector or energy steps are required.
- **XRD1** (X-Ray Diffraction) : powder samples in capillary can be changed by remote control of a robotic arm and diffractograms can be acquired remotely with a DECTRIS Mythen 24k.
- **All beamline portal homepages have six main tabs:**
 - Beamline** – Storage Ring and Session Informations
 - Samples** – Sample registering and parameters
 - Experimental Setup** – Data Acquisition parameters, progress and sample selection
 - Data** – Live Data and Data Comparison
 - Cameras** – Live View of PZT cameras
 - Help** - Help of all functionalities of the remote operation

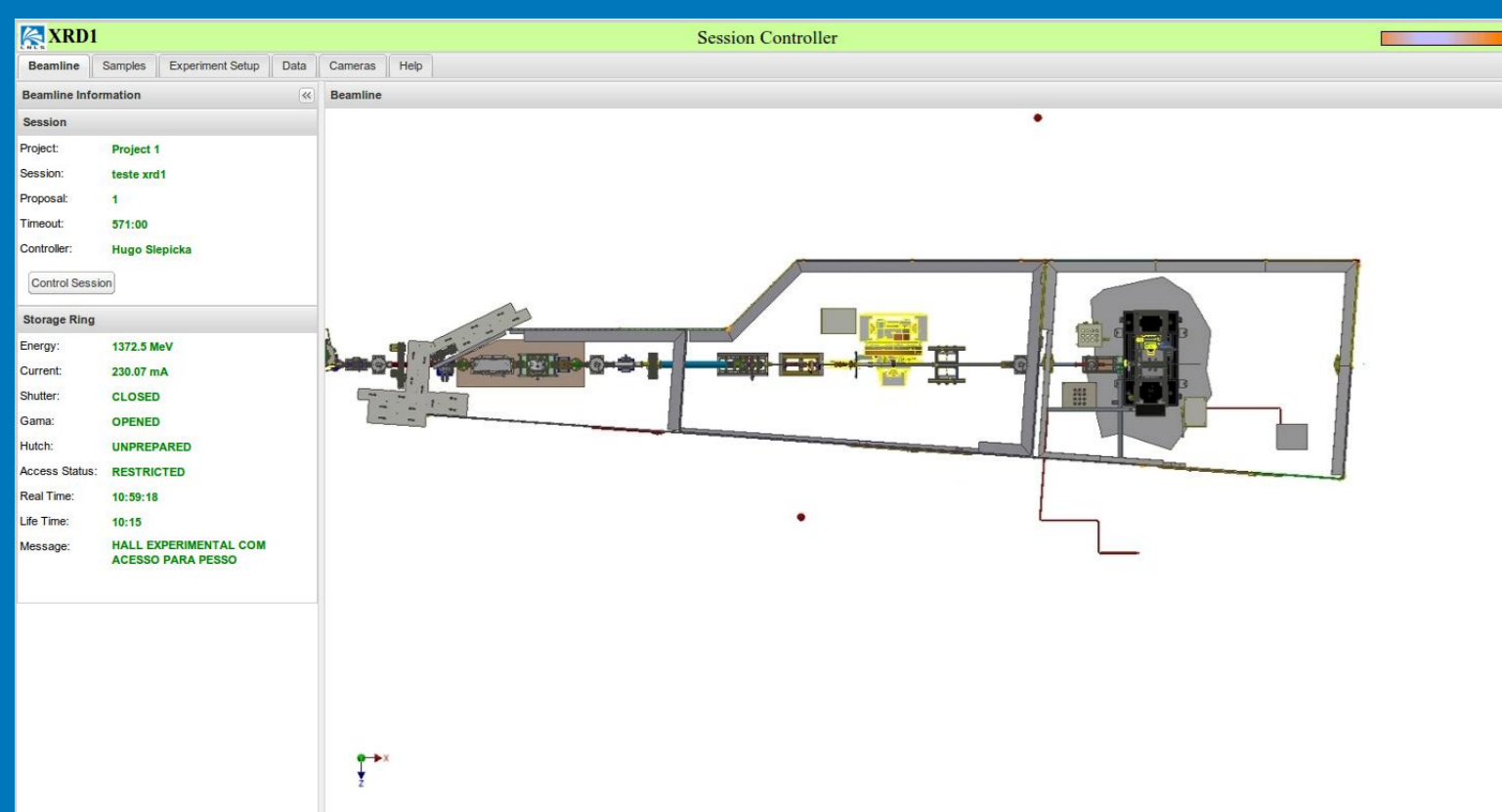


Figure 1: Example of Beamline Tab

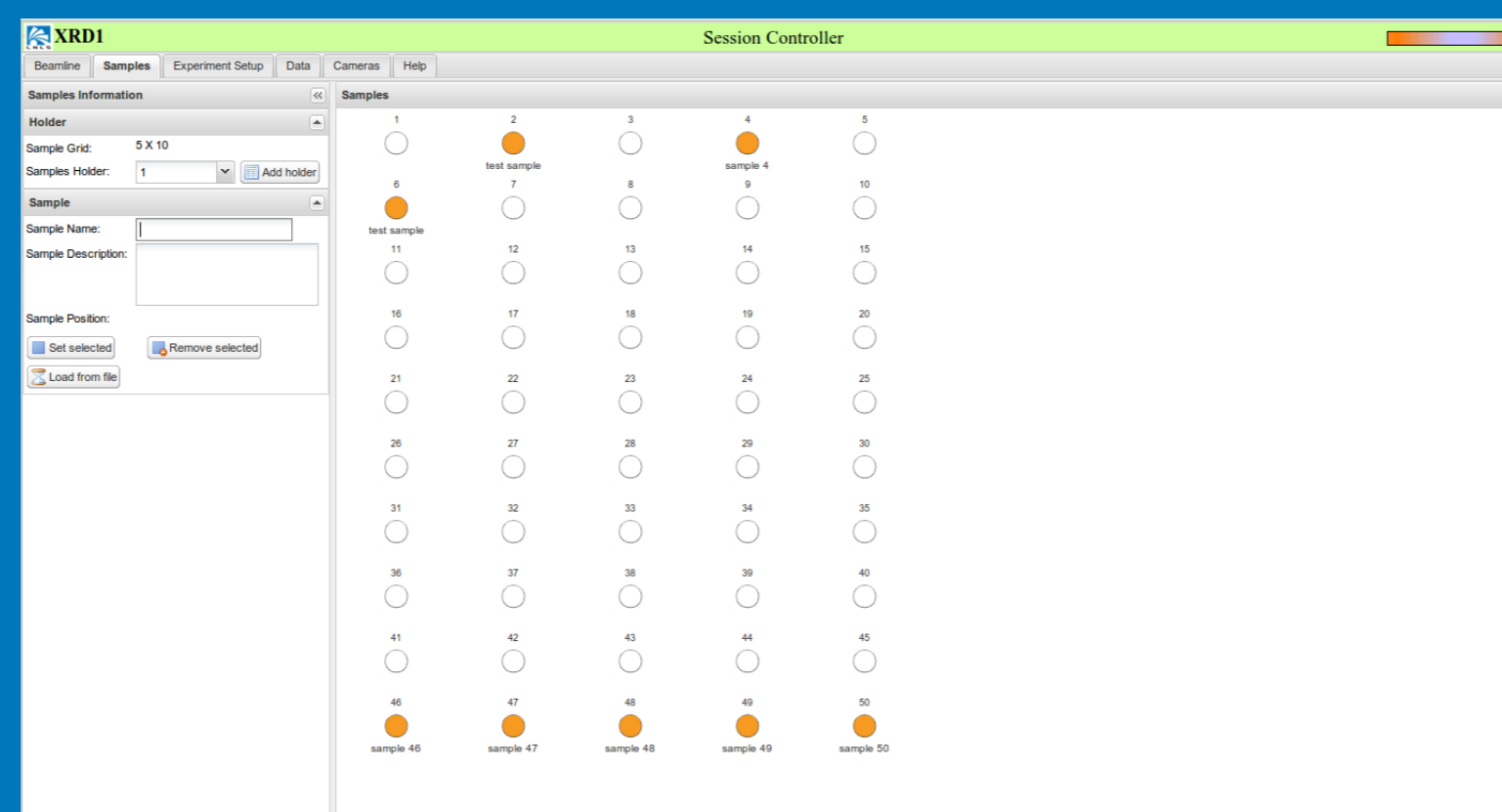


Figure 2: Example of Samples Tab

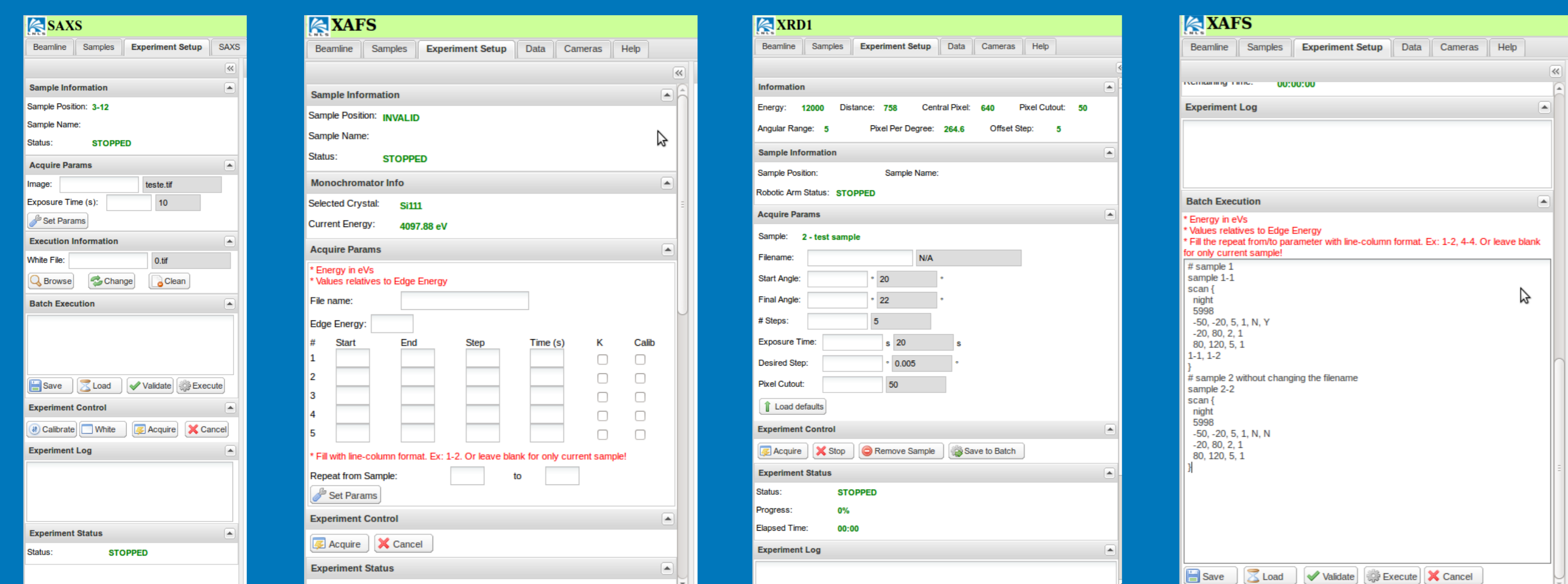


Figure 3: SAXS1, XAFS1 and XRD1 Experimental Setup Tab Acquisition Parameters and XAFS 1 Batch Execution

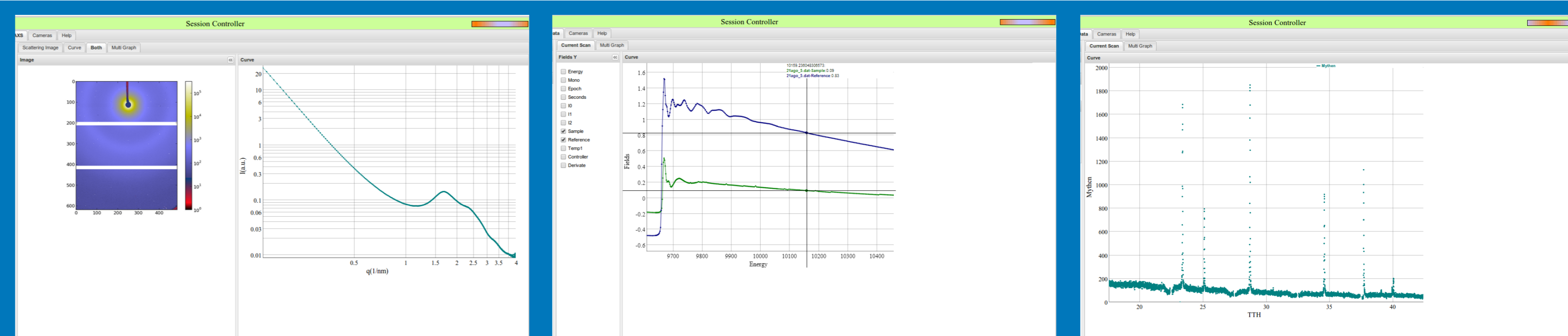


Figure 4: SAXS1, XAFS1 and XRD1 Data View Tab



Figure 5: SAXS1, XAFS1 and XRD1 Data Comparison Tab

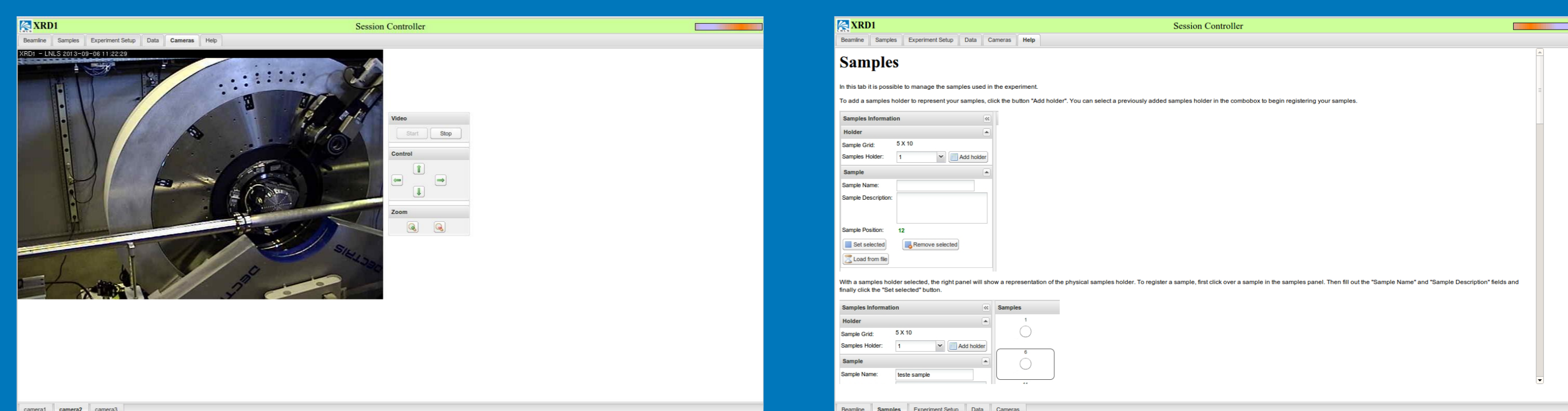


Figure 6: Example of Camera and Help Tabs

Experimental Data

- A major concern in this new version of LabWeb was the file format used to store data.
- Based on technical requirements we decided to use NeXus Scientific Data Format (NeXus).
- A web application for opening NeXus/HDF files was created to avoid third party software.
- HDF Viewer is capable of browse NeXus/HDF files, plot graphs and display images.
- New types of data (3D Plots, Images, and more) can be inserted creating Plugins.

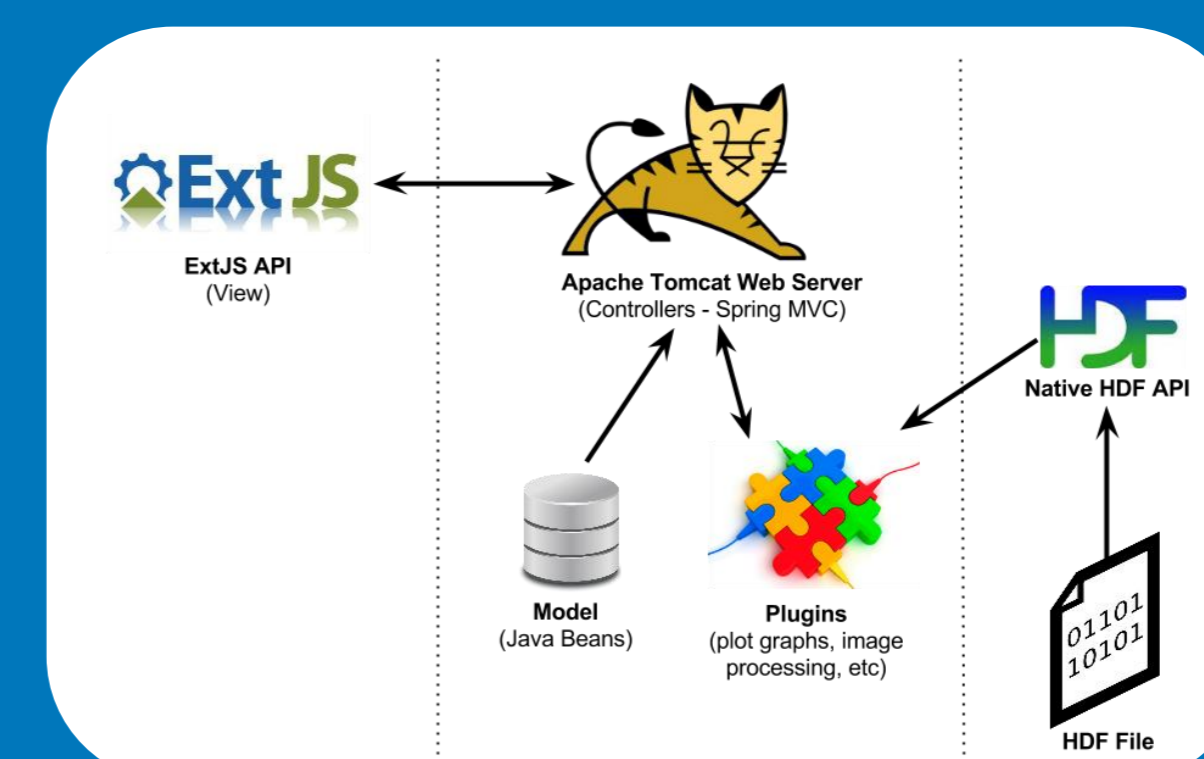


Figure 7: HDF Viewer Workflow

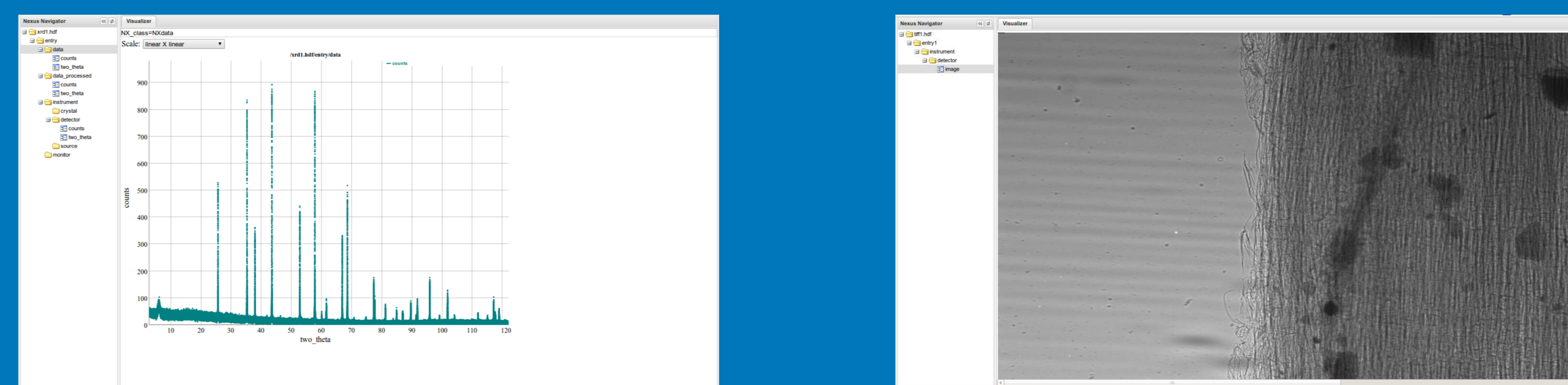


Figure 8: Example of Graph Data and Image of a HDF File generated at LNLS

Conclusion

- Almost 15% of SAXS1 beamline users are already using LabWeb to run experiments.
- XAFS1 and XRD1 beamlines will start remote operations with users in the next months.
- Next beamlines on sight for remote operations are IMX(X-Ray Tomography) and XRF (X-Ray Fluorescence).
- All measurements were carried out successfully and the quality of acquired data were as good as those obtained by local beamline operation.
- In the future we intend to implement upgrades to perform more complex experiments with temperature control and gas devices to increase the range of remote users.

Acknowledgment

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