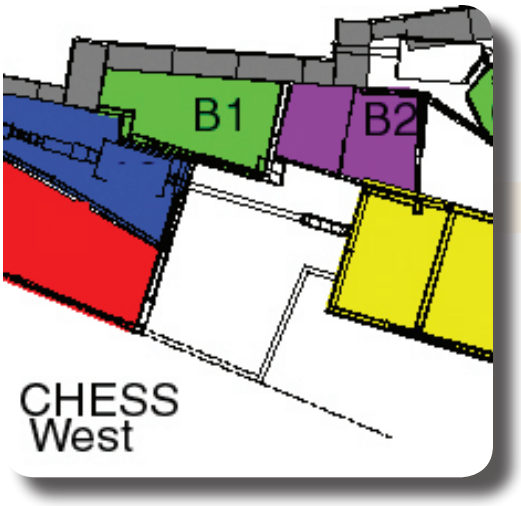
# CHESS High-pressure Stations (B1/B2) Update

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High pressure coupled with synchrotron x-ray diffraction is one powerful technique for discovering novel physics and chemistry with a wide spectrum of applications. CHESS has long been playing a significant role in the development of high pressure synchrotron facilities. To expand our research abilities, particularly in nanoscience and nanotechnology, we have made an effort to improve and update our high pressure facilities, to be capable of a series of new *in-situ* measurements of materials, including wide and small angle x-ray diffraction and Raman measurements at extreme conditions of pressure and temperature. Here, we highlight several modifications and developments at CHESS:

1. Two beam lines for energy-dispersive and angle-dispersive x-ray diffraction are combined and merged into one versatile station. This modification not only keeps all experimental capabilities - energy-dispersive or angle-dispersive x-ray diffraction can be selected by repositioning two monochromator crystals - but also expands the hutch space, enabling introduction of a series of fixed and portable instruments for development of new techniques. The improved capabilities include a three-dimensional rotating stage for side x-ray diffraction, laser-excited Raman spectroscopy, a detector control system, a high temperature tuning system etc.

2. Four-dimensional control for movement of the Mar345 detector is implemented. Slightly tilting and rotating the Mar345 detector enables an accurate calibration of the sample-to-detector distance and associated parameters. Most importantly, a new *in-situ* technique has been developed allowing measurement of both small and wide angle x-ray diffraction at various pressures and temperatures without multiple calibrations. Easy optimization of x-ray energy and sample-to-detector distance makes the two types of measurements possible during one single pressure run.

3. Switching the x-ray source to white beam and using a large area image plate detector enable single crystal Laue diffraction under pressure.

4. A series of side instruments become operational for users. These include two portable spectrometers for Raman, reflectivity and transmission spectra, mechanical and Electrical Discharge Machining (EDM) drillings, a high pressure gas loading system, optical microscopes, etc.