## Obtaining Accurate Lattice Parameters from Debye-Scherrer Image Plate Data

<u>James Hester</u><sup>a</sup>,Brendan Kennedy<sup>b</sup>, <sup>a</sup>Australian National Beamline Facility, Japan. <sup>b</sup>University of Sydney, Australia. E-mail: jrh@anbf2.kek.jp

Image plates (IPs) allow high-resolution, high-dynamic range registration of multiple datasets on a single IP. When refining accurate lattice parameters, independent determination of strongly correlated parameters, usually displacement and zero offset, is essential. We have investigated the use of embedded radioactive fiducial markers to absolutely calibrate the angular scale on each IP and thereby eliminate the need to refine zero offset.

We found that a random rotation of up to  $\pm$ -0.3 degrees is introduced in our BAS2000 scanner during loading of the IP. The consequent systematic variation in refined lattice parameter for multiple datasets on a single image plate seriously complicates diffraction-based thermometry. Typical variation in refined lattice parameter for data collected under identical conditions at each extremity of the IP was found to be 0.02% for uncorrected data, and 0.003% when rotation was taken into account. Thermal expansion is normally of the order of 0.005% per degree C. The effect of IP rotation is reduced when datasets from multiple IPs are refined simultaneously.

The fiducial markers also enabled detection of occasional random "skips" in IP position during scanning.

Keywords: lattice parameter refinement, imaging plates, thermal expansion