

Using Eiger for high-frequency beam intensity measurement.

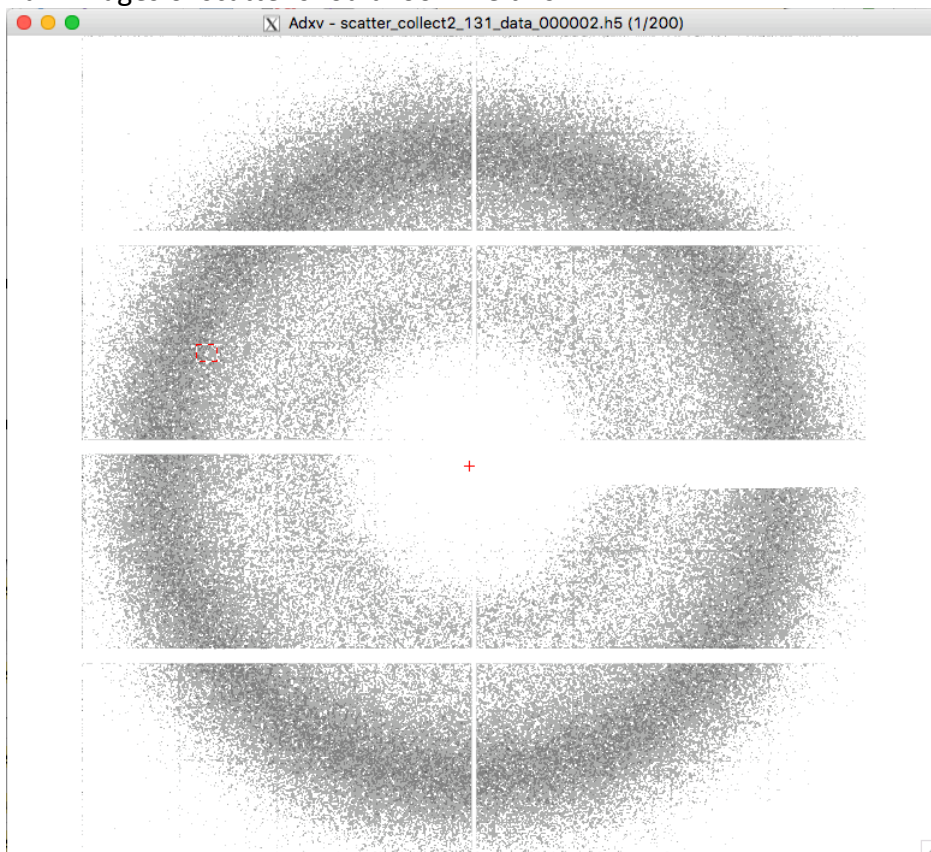
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The MX2 beamline's EigerX16M was used to measure beam intensity fluctuation at 750Hz. The protocol is:

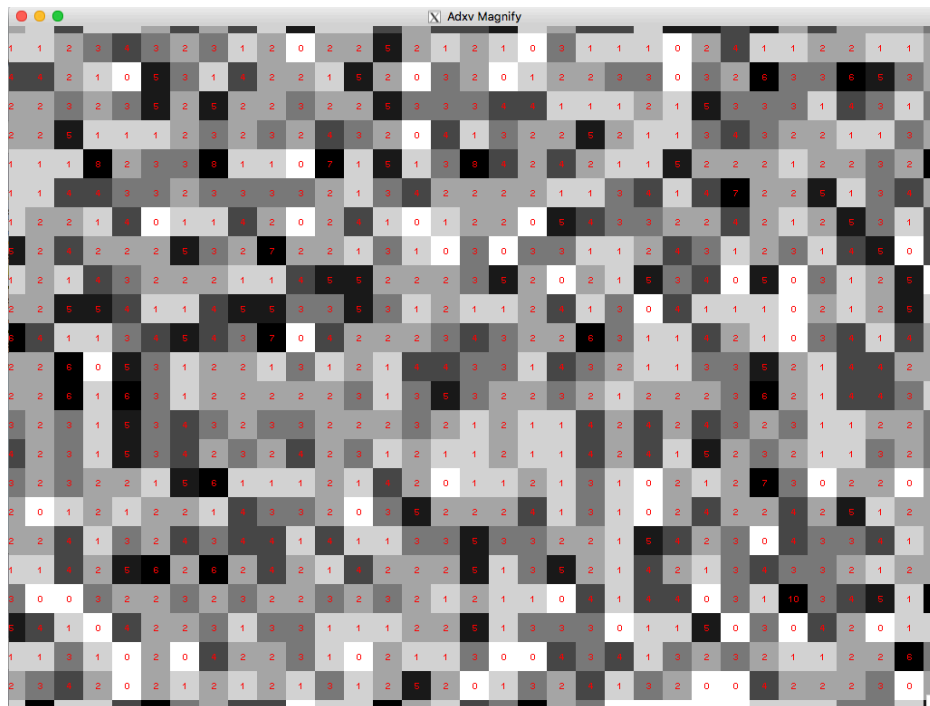
1. A fixed target is used to produce diffuse scatter. We use a plastic target as this allows the same sample to be re-used (such as before and after an optics upgrade). The plastic was cut off the side of an SBS format crystallisation plate and glued to a pin base. You can use a loop of oil as well, anything that produces a diffuse scatter ring without sharp peaks.
2. Set the Eiger to 4M ROI mode. Set frame rate to 750 Hz. We use area detector and set acquire period to 0.00134 s and exposure time to 0.00133 s. Set image mode to continuous. We collected at 13 keV and set sample to detector distance to 300 mm.
3. Raw images of scatter should look like this in ADXV:



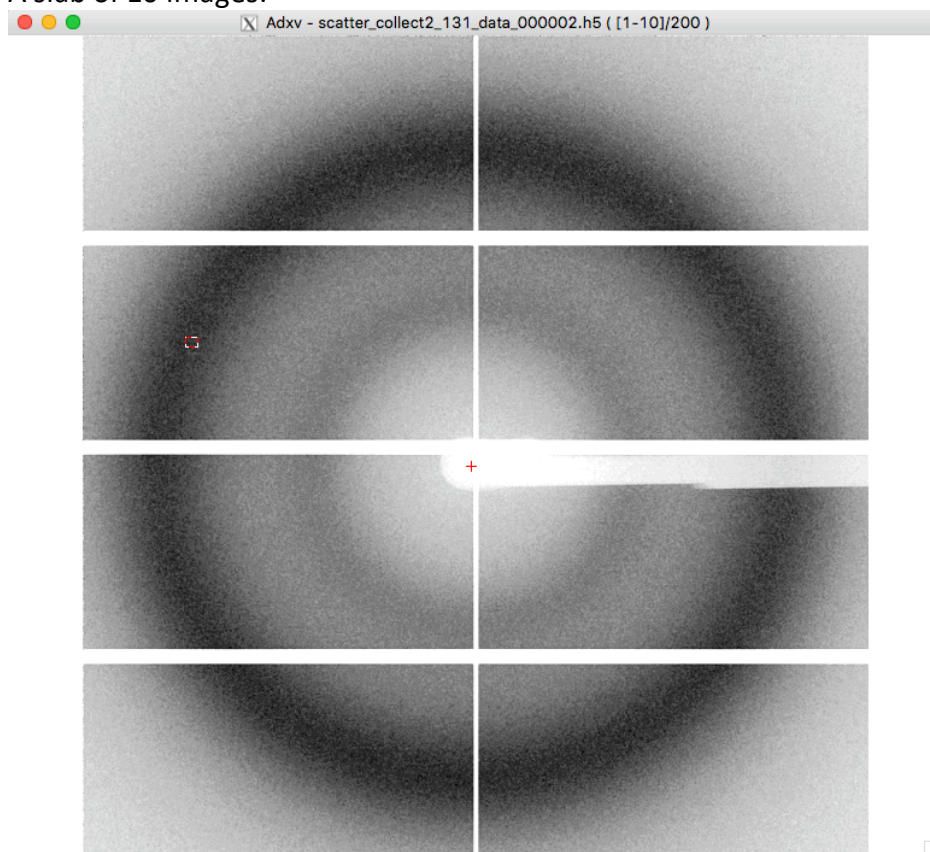
Figure 1. Plastic target glued to pin base



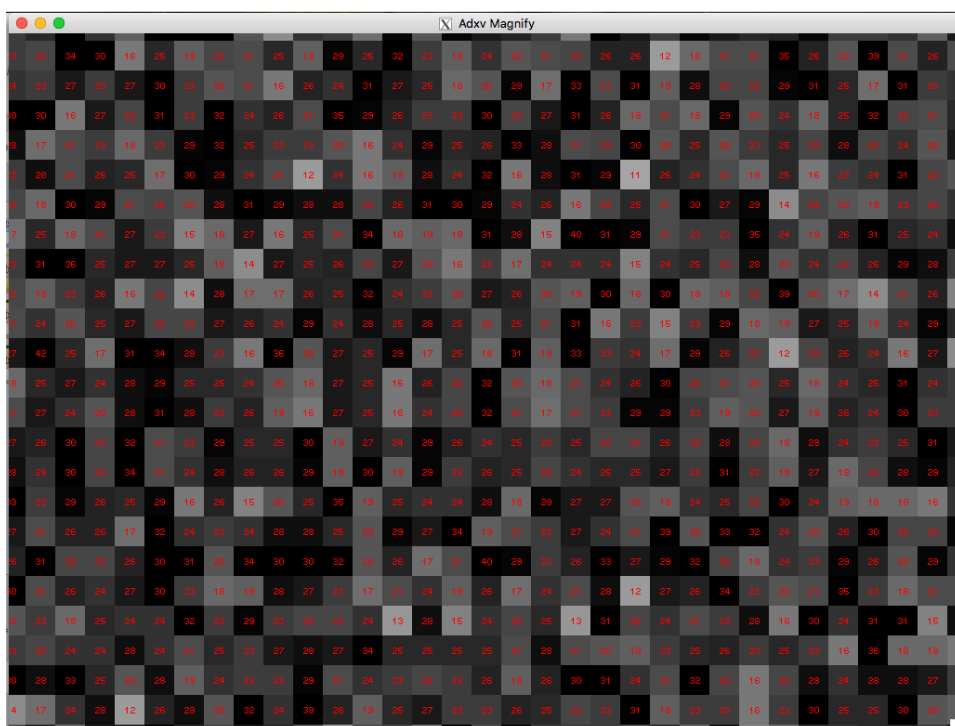
Zoomed in to see raw counts:



A slab of 10 images:

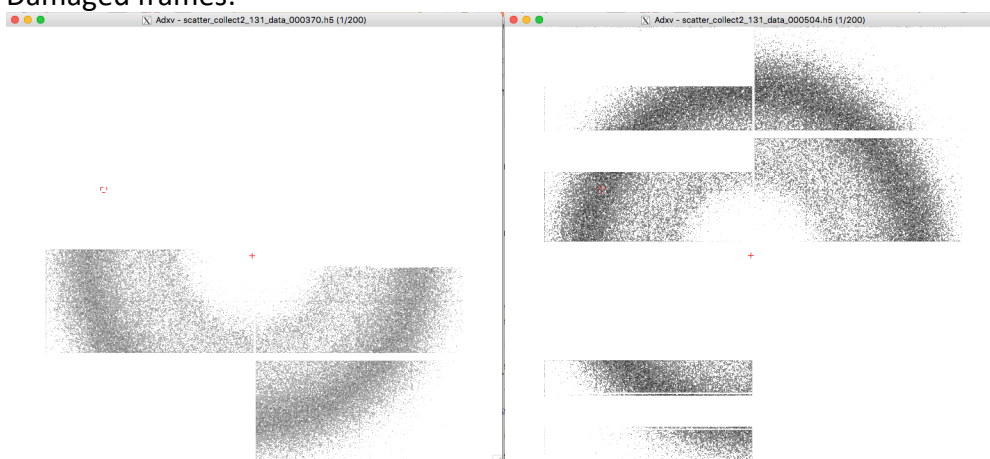


Zoomed:



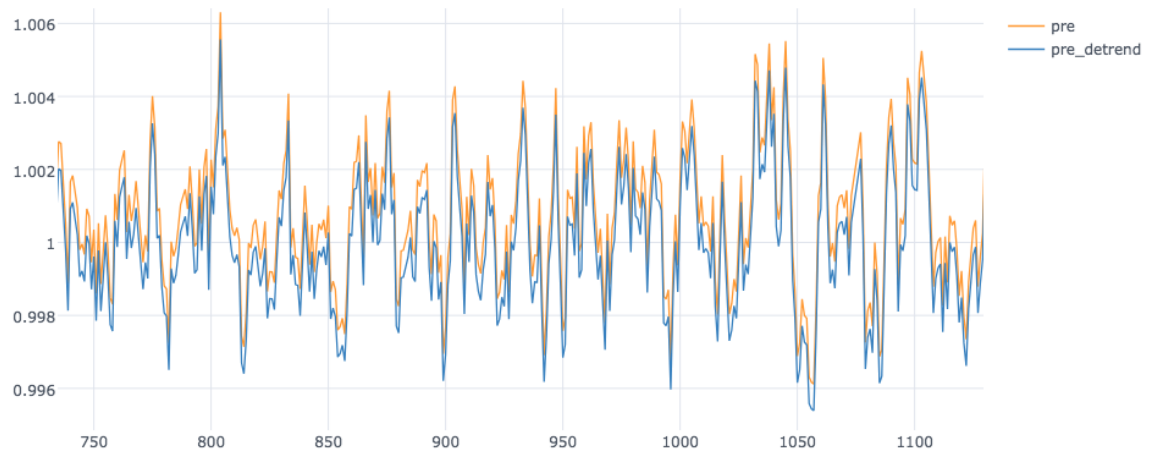
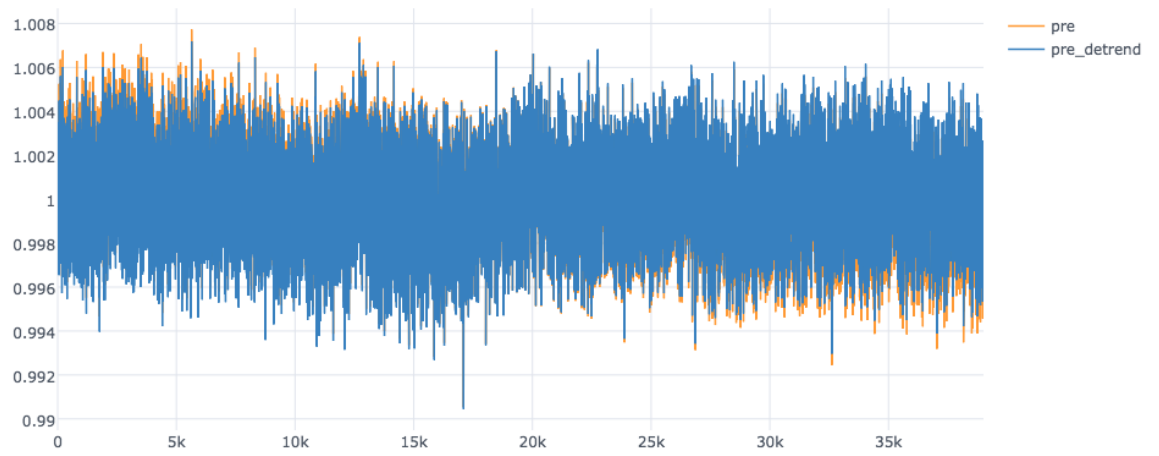
4. Collect the dataset. We collect 60 seconds of data at 750 Hz. Check the frames at the end of the dataset as 750 Hz collection can cause frame artefacts and damaged frames must be omitted (in our tests once damaged frames are seen the rest of the frames in that collection from the first damaged frame must be discarded)

Damaged frames:



5. Data processing:
To process the data sum all pixel values for each frame. The software used to do this at the Australian Synchrotron is on Github here:
<https://github.com/AustralianSynchrotron/Sum-Eiger-Frames>

Example output is shown below:



We report the CV for each run as:

$$CV = df.std() / df.mean() * 100$$

pre	0.191585
pre_detrrend	0.186348
post	0.137921
post_detrrend	0.136994