Diamond Light Source’s I10 beamline is designed to perform advanced dichroism experiments. Samples are probed by circularly or linearly polarised x-rays which originate from either of two APPLE II insertion devices. In order to reduce noise on measurements it is beneficial to quickly switch between the two different beam polarisations. At Diamond Light Source this is achieved using five horizontal dipole ‘chicane’ magnets that sweep the beam on or off axis between each ID at 10 Hz.

Correction Algorithm

Measuring a complex response matrix that maps changes in chicane amplitudes to BPM magnitude and phase at 10 Hz allows construction of a feedback routine to correct the residual beam noise. Inverting the response matrix and then forward multiplying by the measured 10Hz BPM vector gives a complex delta error vector. Mapping the current amplitude and phase of the chicane magnets into complex space, subtracting the error delta, then taking the magnitude and angle of the result gives new values for chicane amplitude and phase. Applying these new values removes the noise at 10 Hz.