

Fig. S2-1: Comparison of the (traditional feedback system) Aligna system off (blue) and Aligna on (orange), from experimental data on HTU (Hundred Terawatt Undulator setup, which similar setup to our PW system), using a double y-axis plot, which shows the Power Spectral Density (PSD) (solid lines, left axis) and the integrated standard deviation (σ) of centroid fluctuations (dashed lines, right axis) as a function of frequency. The standard deviation σ is computed by integrating only the frequency components below the cutoff frequency (f). This combined representation illustrates the spectral suppression achieved by the Aligna system, particularly around 10 - 20 Hz, and complements the time-domain centroid distributions shown in Fig. S2-2.



Fig. S2-2: Centroid distribution from the HTU 1 Hz data, comparing the Aligna system off (blue curve), Aligna on (orange curve), and the simulated ML-based correction (red curve). We artificially introduced vertical offsets to each trace to improve clarity and avoid overlapping curves.



Fig. S3: Raw image of the focal spot