

Supplementary Movie 1. Movements of the F^{seam} subunit pore-1 loop. A morph between atomic models of the recognition complex (PDB code 6WRF) and the fully engaged branched-degron DHFR•MTX complex (PDB code 8V9R). In the morph, the pore-1 loop of the F^{seam} subunit in the substrate engaged structure has moved higher, positioning it closest to the pore-1 loop of subunit A¹ compared to its position in the recognition complex, where it is closest to the pore-1 loop of subunit E⁵.

Supplementary Movie 2. Analysis of structural heterogeneity in the branched-degron DHFR•MTX complex. A sampling of 100 volumes sampled from the *k*-means cluster centroid locations of latent embeddings displayed over a fixed atomic model (PDB code 8V9R). Note that we did not observe structures with the F^{seam} subunit in the ‘down’ conformation or those with the subunit-E IGF loop in a different ClpP cleft.

Supplementary Movie 3. Movements of the F^{seam} subunit. A morph between the fully engaged (PDB code 8V9R) and ssrA tag recognition (PDB code 6WRF) conformations highlighting the motion in the F^{seam} subunit as it transitions from the ‘up’ to ‘down’ conformations. According to the ‘large-step’ model, such a motion could be used to pull substrate down through the axial pore.