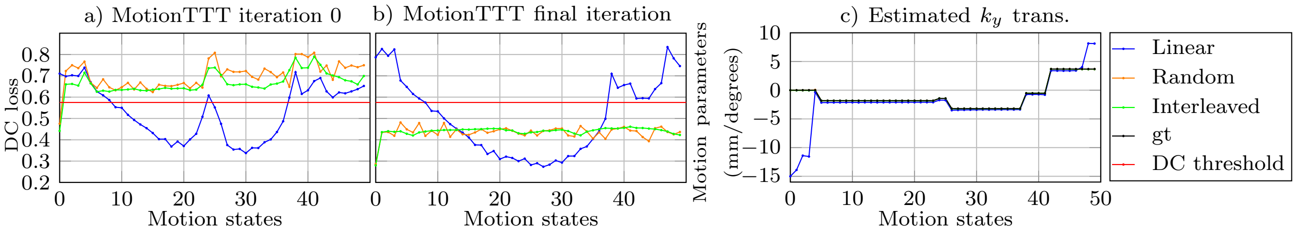


Figure 1: **Ablation study sampling order - Part 2.** First and second panel show the data consistency losses (DC) per motion state of MotionTTT at its 0th and final iteration for one test example and a linear, random and interleaved sampling order. For the random and interleaved order motion states are estimated accurately resulting in a final DC loss well below the DC loss threshold. For the linear order first and last motion states, pertaining to shots that contain only high-frequency components, maintain a high final DC loss and estimated motion parameters are off. For illustration the third panel shows the estimated translation parameter in k_y direction, where curves for the random and interleaved order overlap with the ground truth motion.

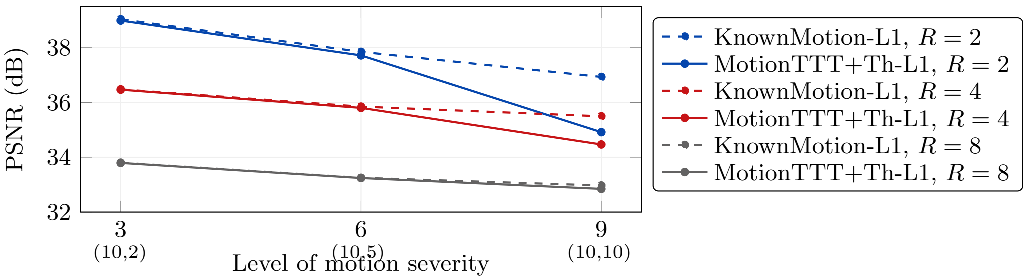
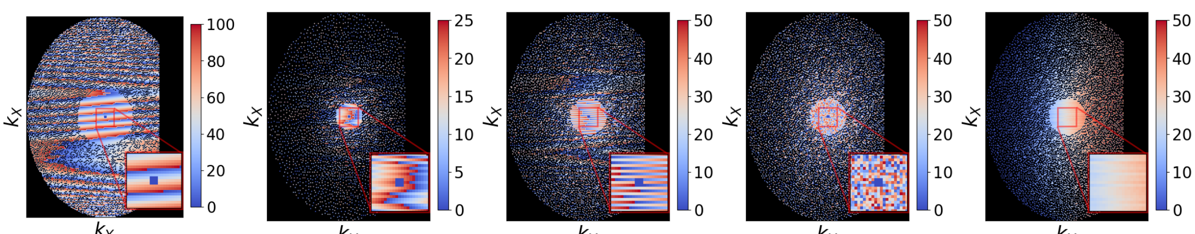


Figure 2: **Ablation study acceleration factor.** Performance of L1-minimization with known motion versus with motion estimated by MotionTTT over three different levels of motion severity (defined in main paper Fig. 3) for acceleration factors $R = 2/4/8$. For mild and moderate motion, MotionTTT achieves highly accurate motion estimation for all acceleration factors indicated by the vanishing performance gap to KnwonMotion-L1. For strong motion (level 9), the best performance is still achieved for the lowest acceleration factor, but an increasing performance gap exists for decreasing acceleration factors due to incorrectly estimated motion states that are then discarded from the final reconstruction via DC loss thresholding. Results are averaged over 4 validation examples with 2 motion trajectories each.



a) Interleaved, $R = 2$ b) Interleaved, $R = 8$ c) Interleaved, $R = 4$ d) Random, $R = 4$ e) Linear, $R = 4$

Figure 3: **Masks and sampling trajectories.** Undersampling masks for different acceleration factors $R \in \{2, 4, 8\}$ with corresponding number of shots $\{25, 50, 100\}$ such that a constant number of k-space lines is acquired per shot. The color coding illustrates the sampling trajectory (interleaved, random or linear) indicating which k-space lines are sampled within the same shots.

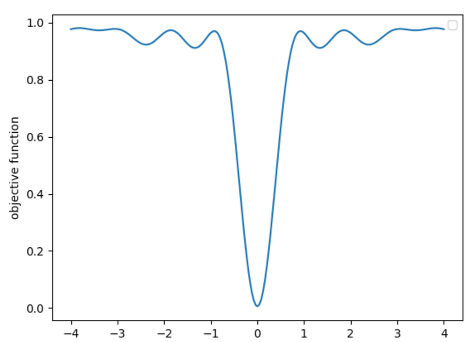


Figure 4: **Simulated toy example.** Simulated objective function from the setup outlined in our response to reviewer fV1o as a function of a single motion parameter t, where the true parameter is $t^* = 0$.