Supplementary Information

Accelerated Diffusion Weighted Magnetic Resonance Imaging at 7 T: Joint Reconstruction for Shift-Encoded Navigator-based Interleaved Echo Planar Imaging (JETS-NAViEPI)

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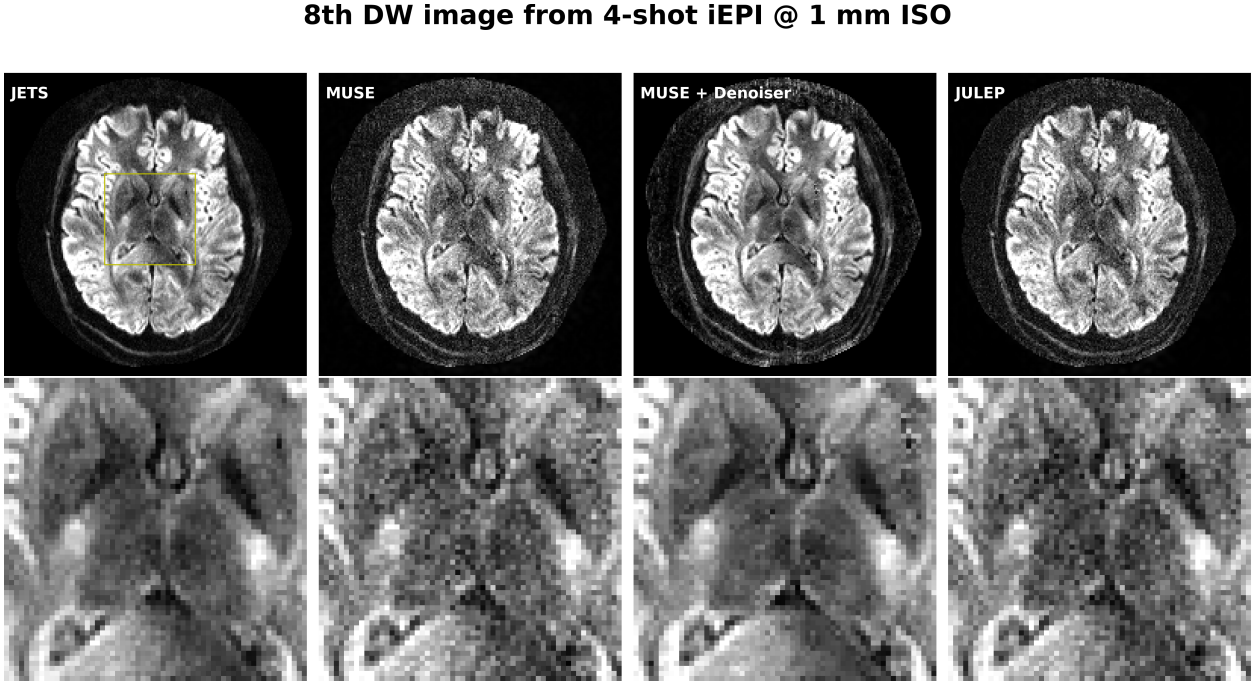
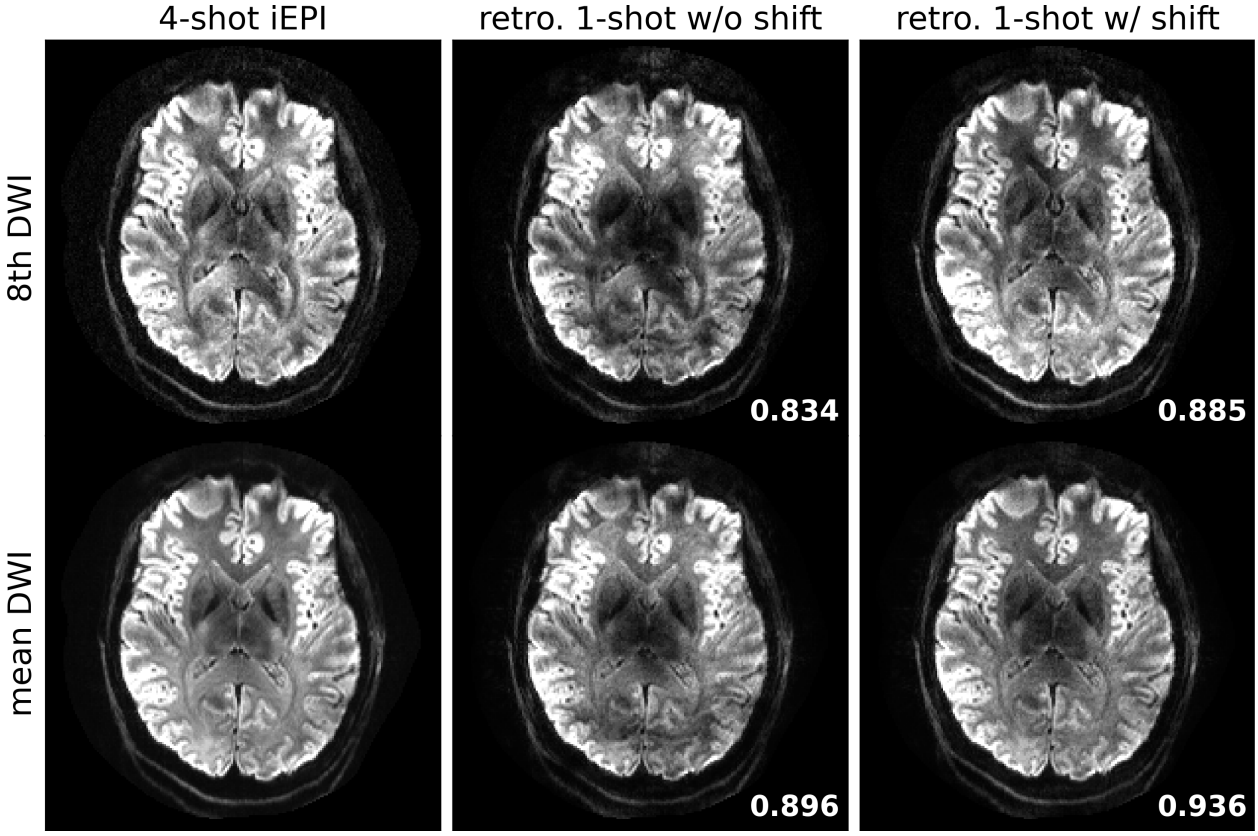
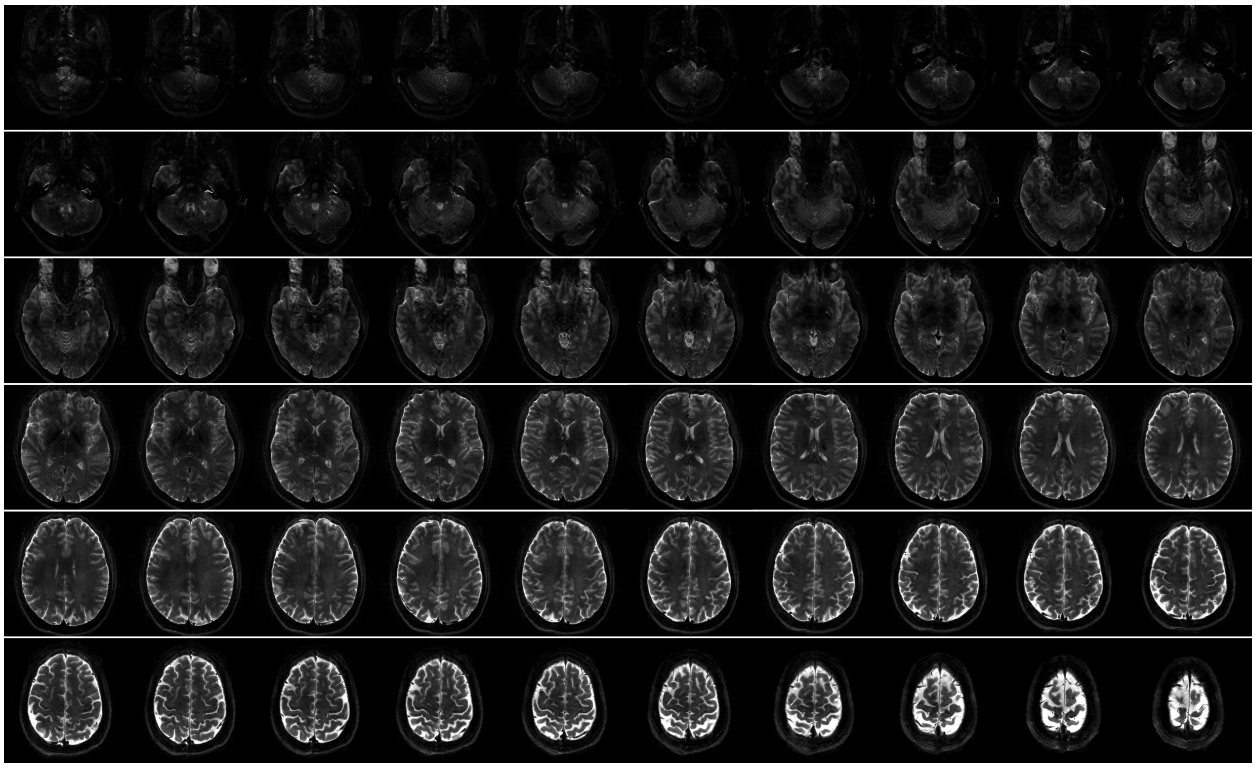
Here we aim to reproduce the results. Another subject with informed consent was recruited and measured by all protocols listed in Table 1 in the main manuscript.



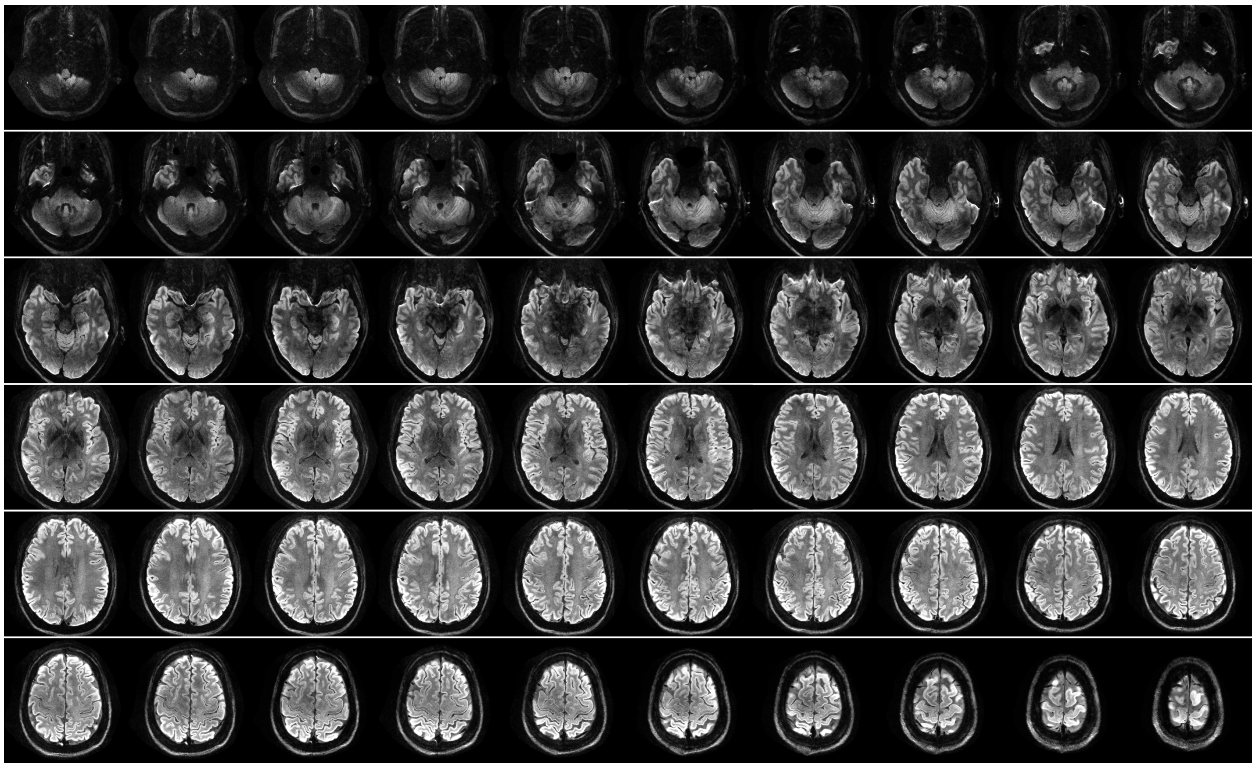
SI Figure S1: Reproducing Protocol #1. Reconstructed DW images (the 8th diffusion encoding) based on 4-shot iEPI acquisition with 1 mm isotropic resolution. Four reconstruction methods are compared (from left to right): JETS, MUSE, MUSE with denoiser, and JULEP. The 2nd row displays the magnified views of the yellow square.



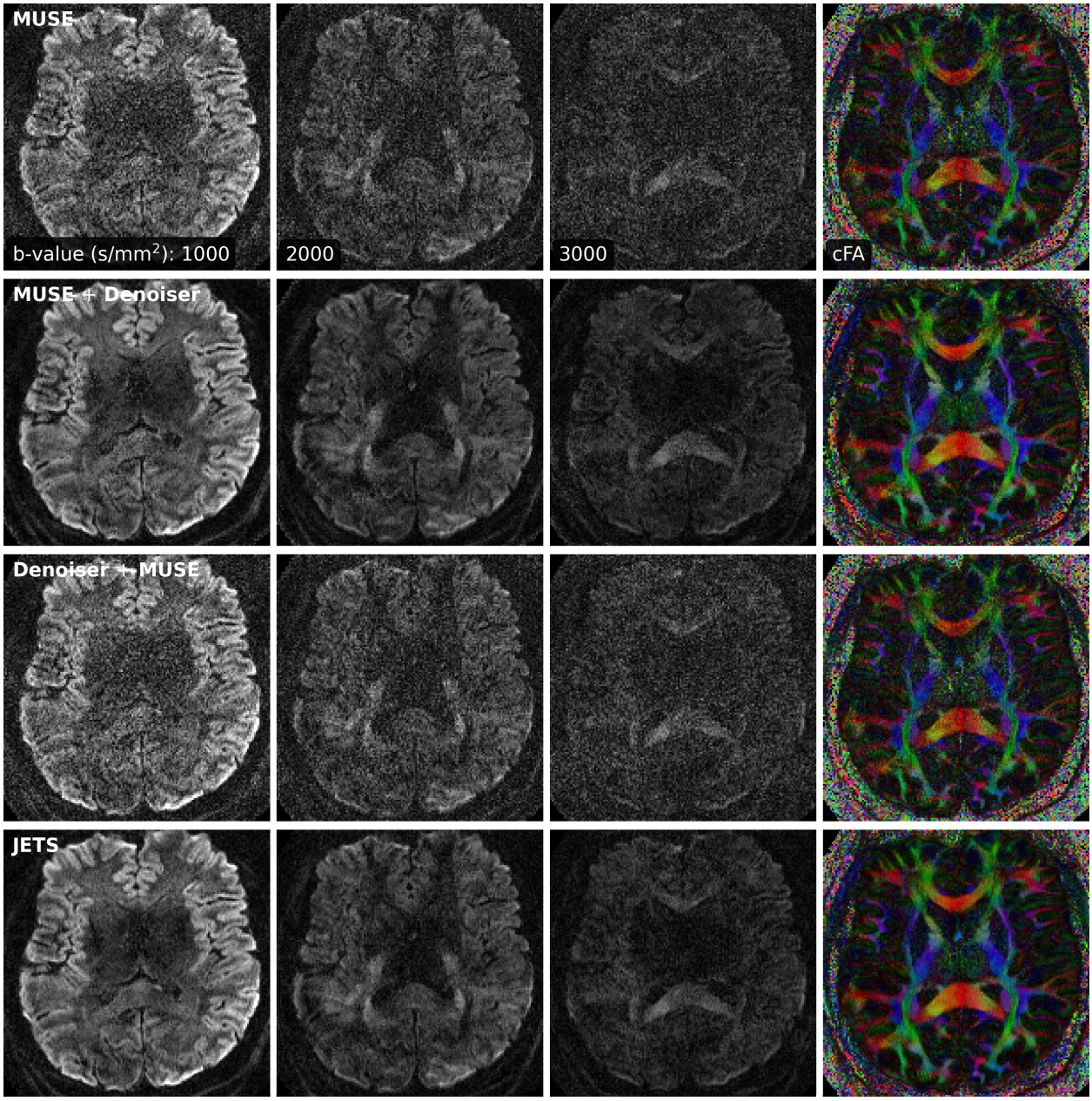
SI Figure S2: Reproducing Protocol #1. Quantitative validation of the proposed k_y-shift enoding sampling pattern based on 4-shot iEPI acquisition with 1 mm isotropic resolution. (Top) the 8th diffusion encoding and (bottom) mean DWI over 20 diffusion encodings. (1st column) JETS reconstruction of 4-shot iEPI acquisition is used as the ground truth. The 2nd and the 3rd column displays JETS reconstruction of retrospectively undersampled 1-shot acquisition without and with k_y shifting, respectively.



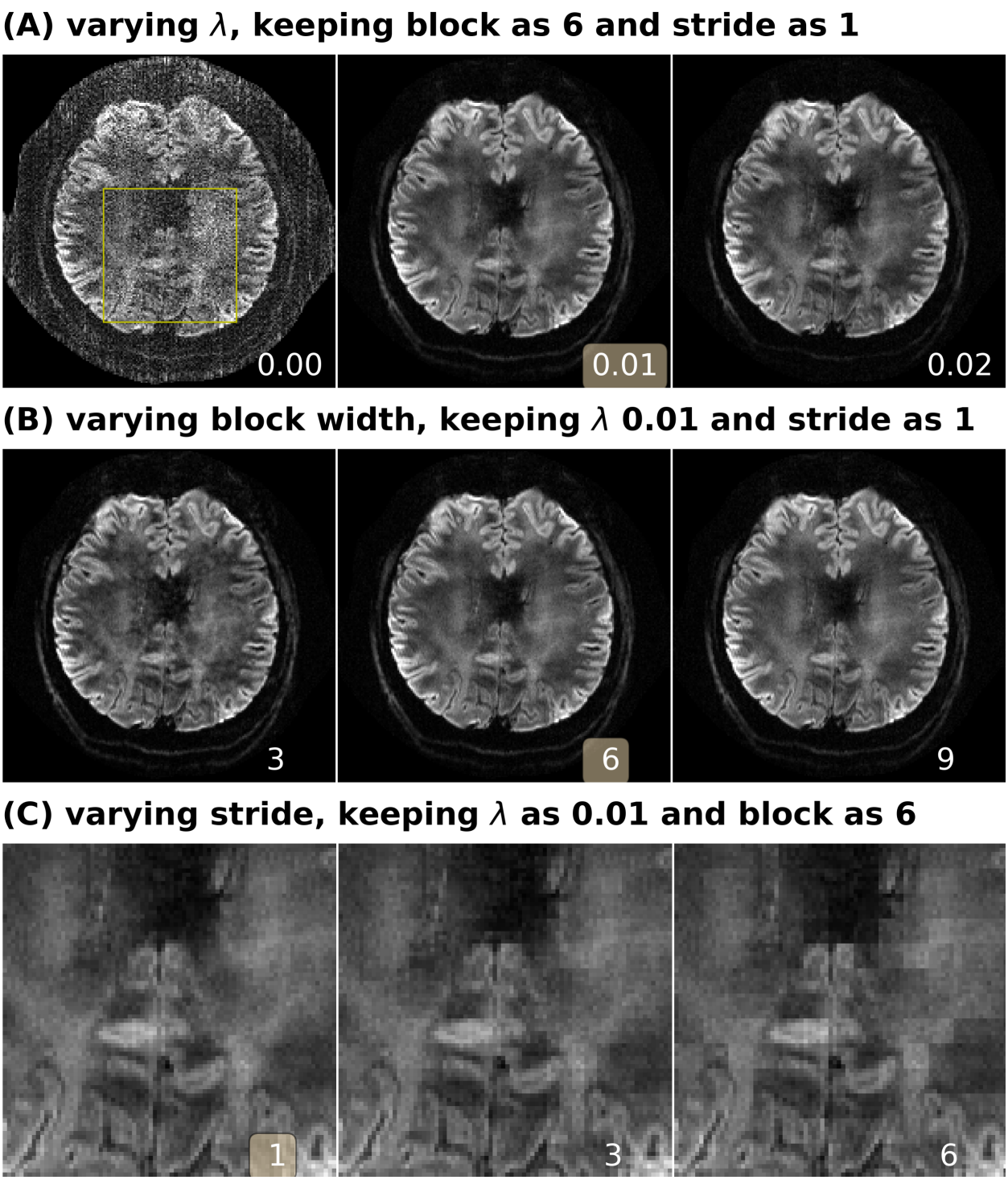
SI Figure S3: Reproducing Protocol #3. Reconstructed b_0 images from the 3-scan trace acquisition with the voxel size $0.5 \times 0.5 \times 2.0$ mm^3.



SI Figure S4: Reproducing Protocol #3. Reconstructed TRACE images from the 3-scan trace acquisition with the voxel size $0.5 \times 0.5 \times 2.0$ mm^3.



SI Figure S5: Reproducing Protocol #2. The FOV and bandwidth were adapted as $200\,\mathrm{mm}$ and 1086 Hz/pixel, respectively. Comparison of three-shell DWIs and cFA maps reconstructed by (top to bottom) MUSE, MUSE with the local-PCA denoiser, MUSE with the local-PCA denoiser applied before the multi-shot combination, and the proposed JETS method, respectively. The local-PCA denoiser, when applied to shot images (3rd row), is less effective compared to its application to shot-combined images (2nd row). The reason is that shot images are reconstructed from the central k-space data, and thus have coarse resolution.



SI Figure S6: Analysis of reconstruction parameters based on the 3-shell acquisition with 1 mm^3 isotropic resolution (Protocol #2 in Table 1). Displayed are JETS reconstructed single-direction DW images. **(A)** Varying the regularization strength λ from 0 to 0.01 and 0.02. **(B)** Varying the block width from 3 to 6 and 9. The red arrow indicates increased noise with the large block width. **(C)** Varying the stride size from 1 to 3 (partially overlapping) and 6 (non-overlapping). The red arrows indicate blocky artifacts.