Supporting Material for: LORAKS Makes Better SENSE: Phase-Constrained Partial Fourier SENSE Reconstruction without Phase Calibration

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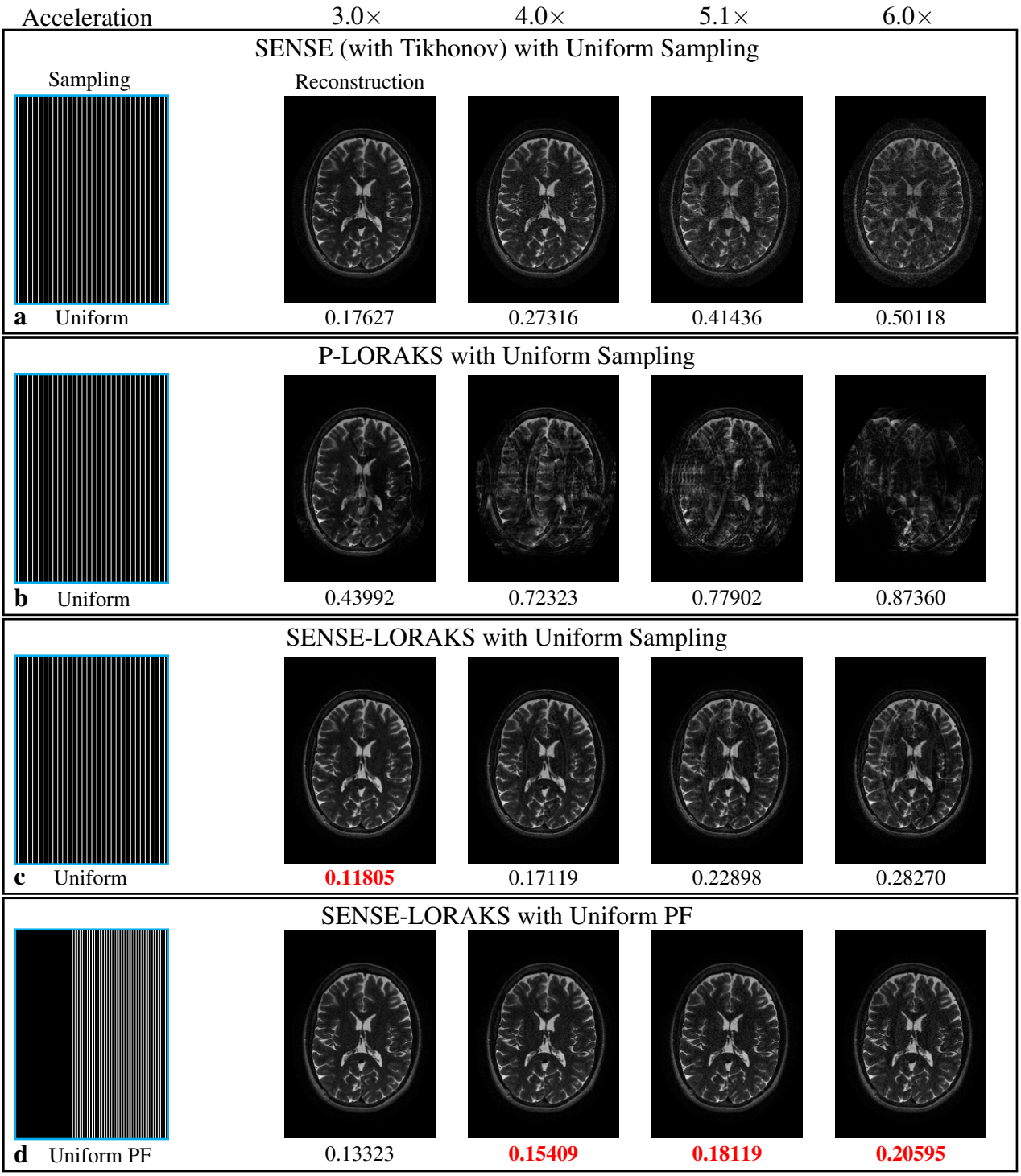

Figure S1: Reconstructed TSE images for a range of acceleration factors, presenting a detailed view of the results summarized in Figs. 2 and 4(a). Comparison between (a) SENSE with conventional Uniform sampling, (b) P-LORAKS with conventional Uniform sampling, (c) SENSE-LORAKS with conventional Uniform sampling, and (d) SENSE-LORAKS with Uniform PF sampling. Reconstructed images are shown using a linear grayscale (normalized so that image intensities are in the range from 0 to 1). NRMSE values are shown underneath each reconstruction, with the best NRMSE values highlighted with red. Corresponding error images are shown in Supporting Fig. S2.

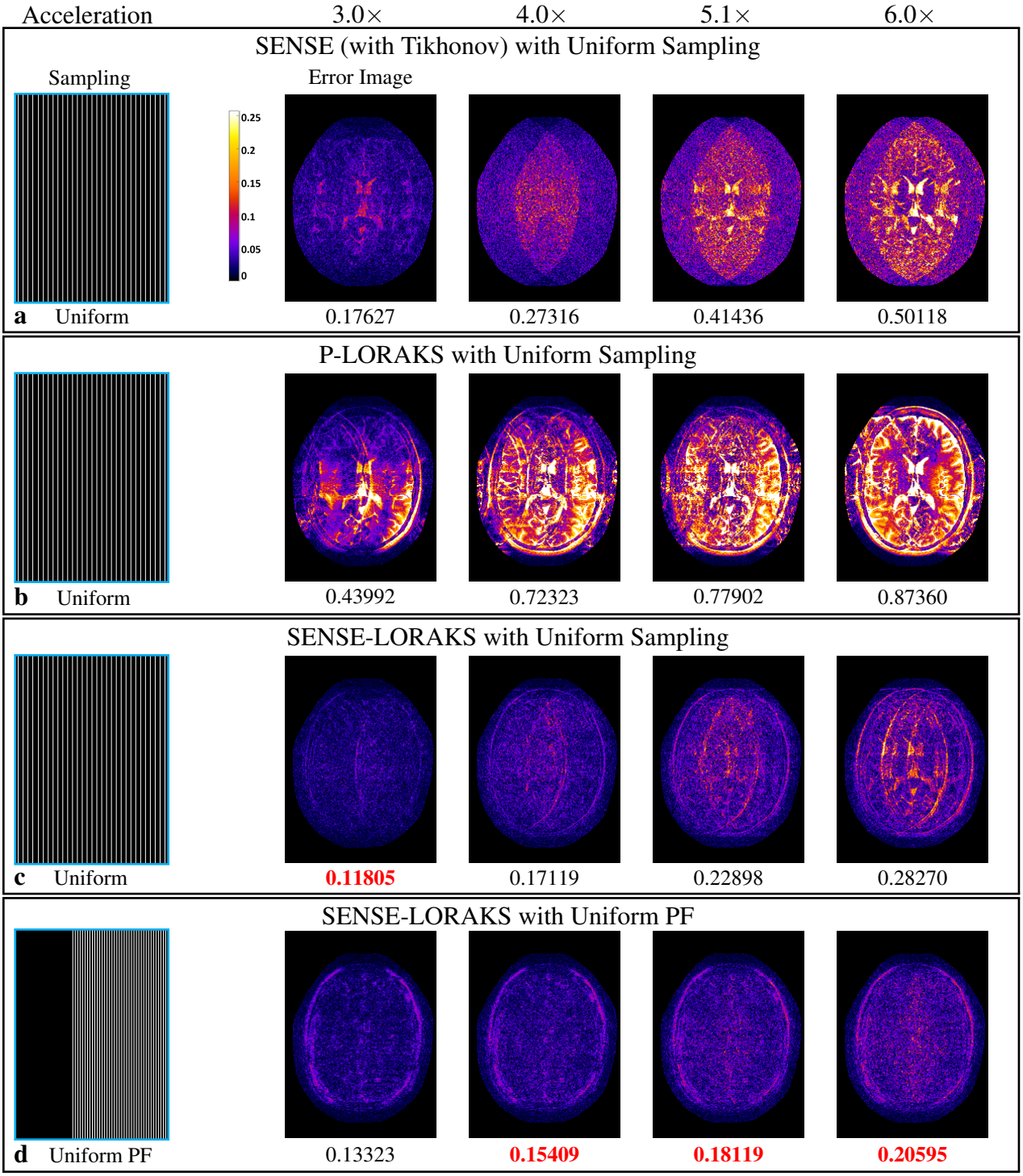

Figure S2: Error images corresponding to Supporting Fig. S1. Error images are shown using the indicated colorscale (which ranges from 0 to 0.25 to highlight small errors). NRMSE values are shown underneath each image where the smallest NRMSE values for a given acceleration rate are indicated in red.

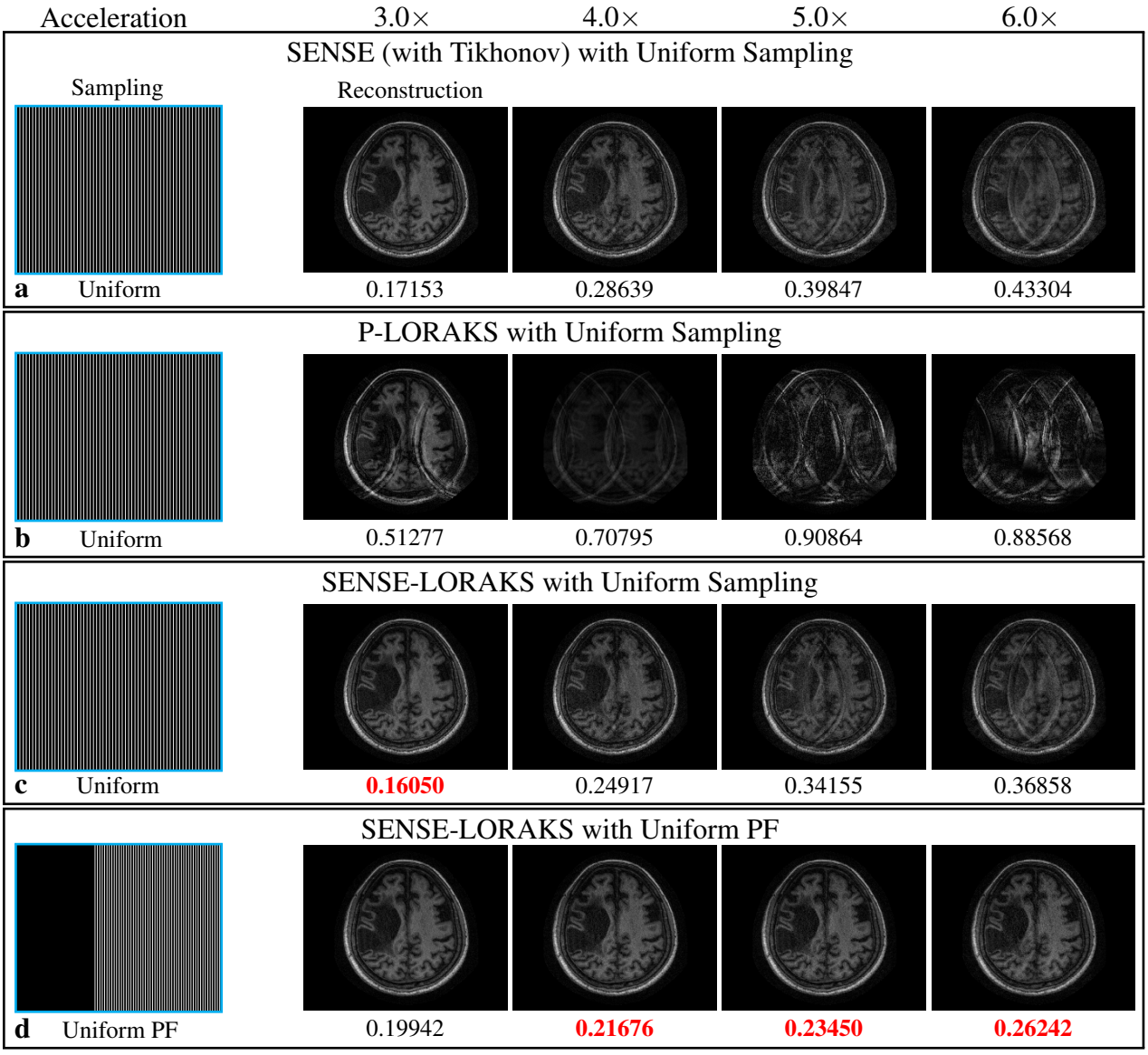

Figure S3: Reconstructed MPRAGE images for a range of acceleration factors, presenting a detailed view of the results summarized in Figs. 3 and 4(b). Comparison between (a) SENSE with conventional Uniform sampling, (b) P-LORAKS with conventional Uniform sampling, (c) SENSE-LORAKS with conventional Uniform sampling, and (d) SENSE-LORAKS with Uniform PF sampling. Reconstructed images are shown using a linear grayscale (normalized so that image intensities are in the range from 0 to 1). NRMSE values are shown underneath each reconstruction, with the best NRMSE values highlighted with red. Corresponding error images are shown in Supporting Fig. S4.

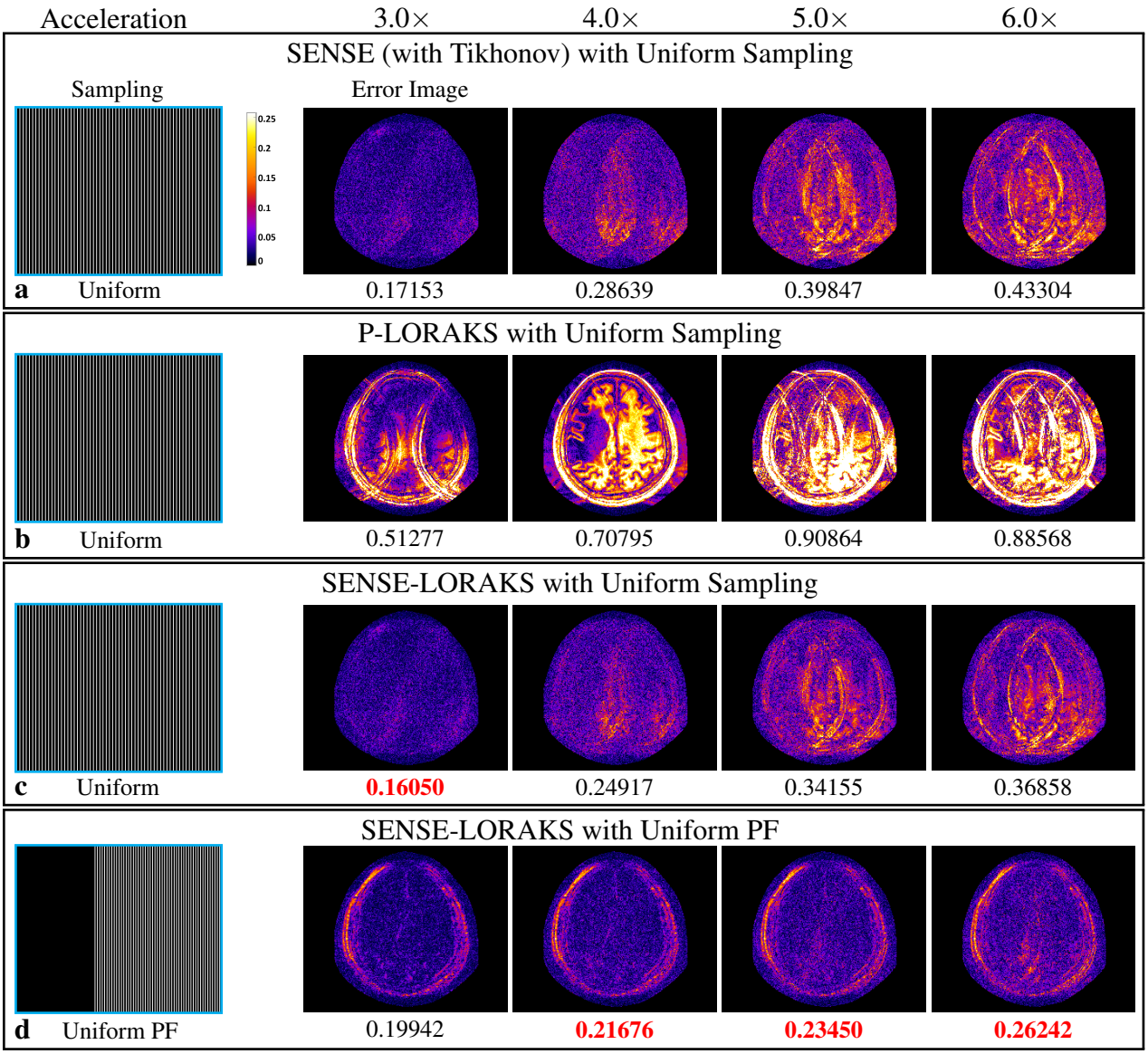

Figure S4: Error images corresponding to Supporting Fig. S3. Error images are shown using the indicated colorscale (which ranges from 0 to 0.25 to highlight small errors). NRMSE values are shown underneath each image where the smallest NRMSE values for a given acceleration rate are indicated in red.

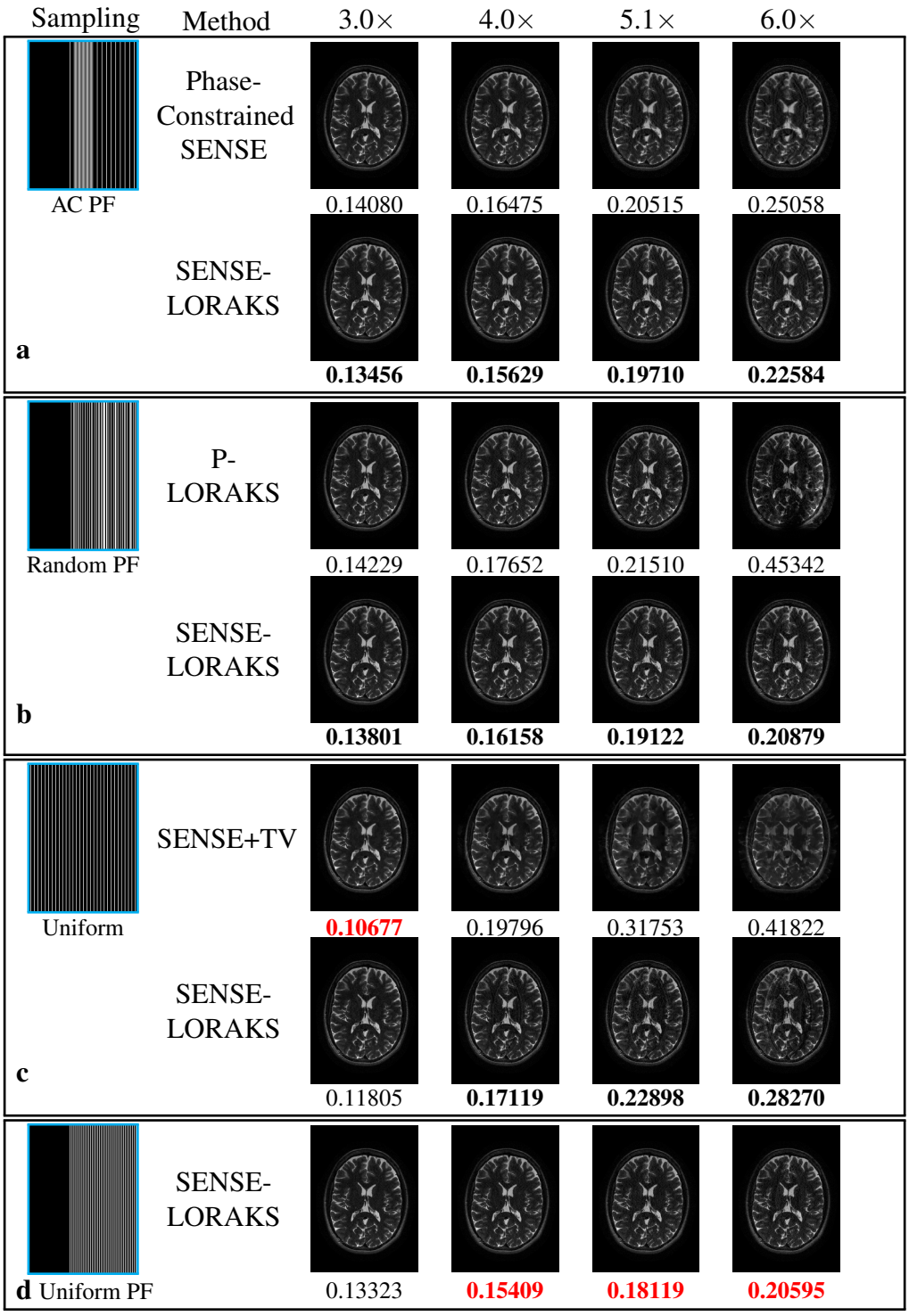

Figure S5: Reconstructed TSE images for a range of acceleration factors, presenting a detailed view of the results summarized in Figs. 5 and 7(a). Comparison of images reconstructed using SENSE-LORAKS against (a) phase-constrained SENSE with AC PF sampling, (b) P-LORAKS with Random PF sampling, (c) SENSE+TV with conventional Uniform sampling. Reconstructions obtained using SENSE-LORAKS with Uniform PF sampling are shown in (d). Reconstructed images are shown using a linear grayscale (normalized so that image intensities are in the range from 0 to 1). NRMSE values are shown underneath each reconstruction, with the best NRMSE values highlighted with red. Corresponding error images are shown in Supporting Fig. S6.

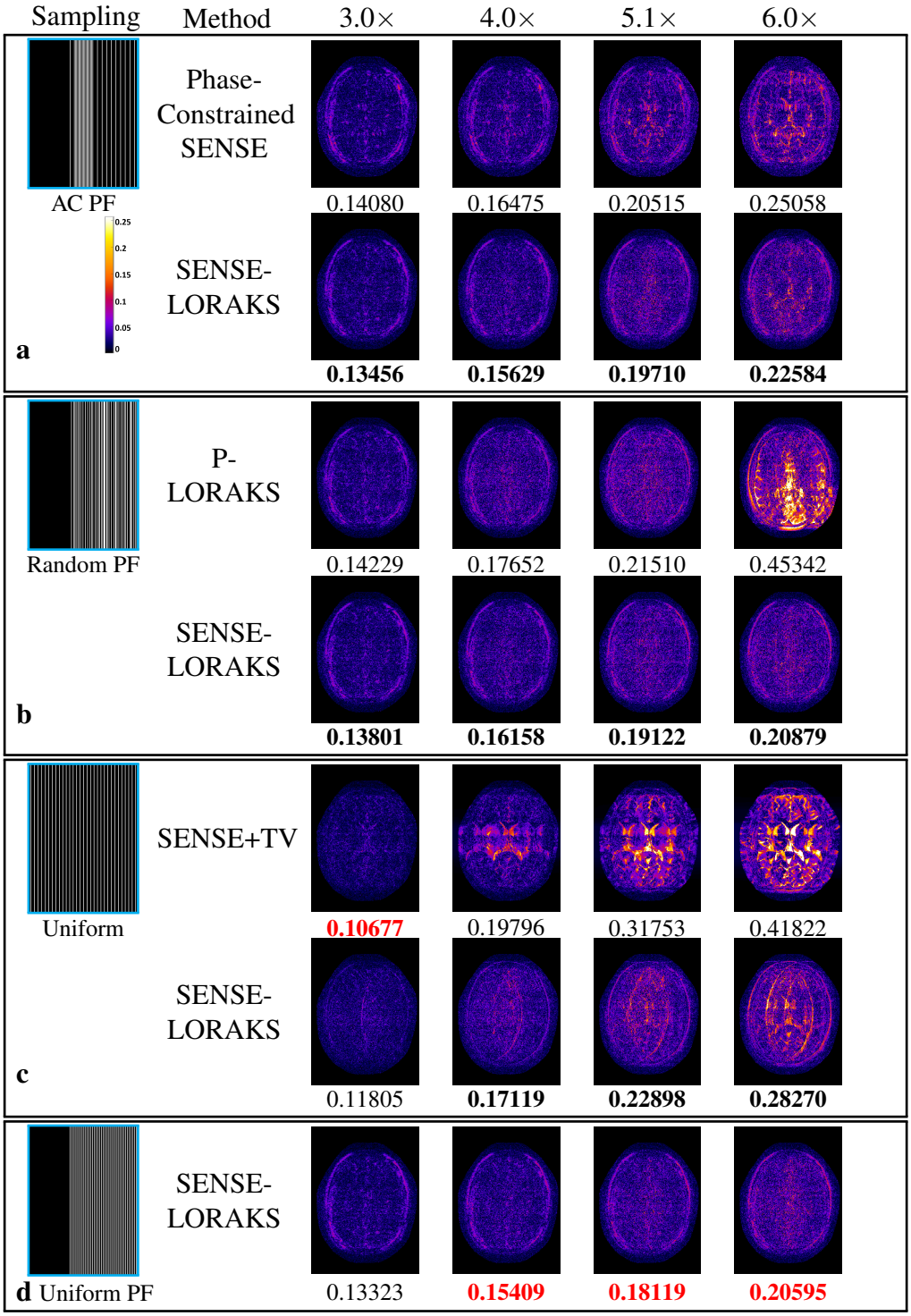

Figure S6: Error images corresponding to Supporting Fig. S6. Error images are shown using the indicated colorscale (which ranges from 0 to 0.25 to highlight small errors). NRMSE values are shown underneath each image where the smallest NRMSE values for a given acceleration rate are indicated in red.

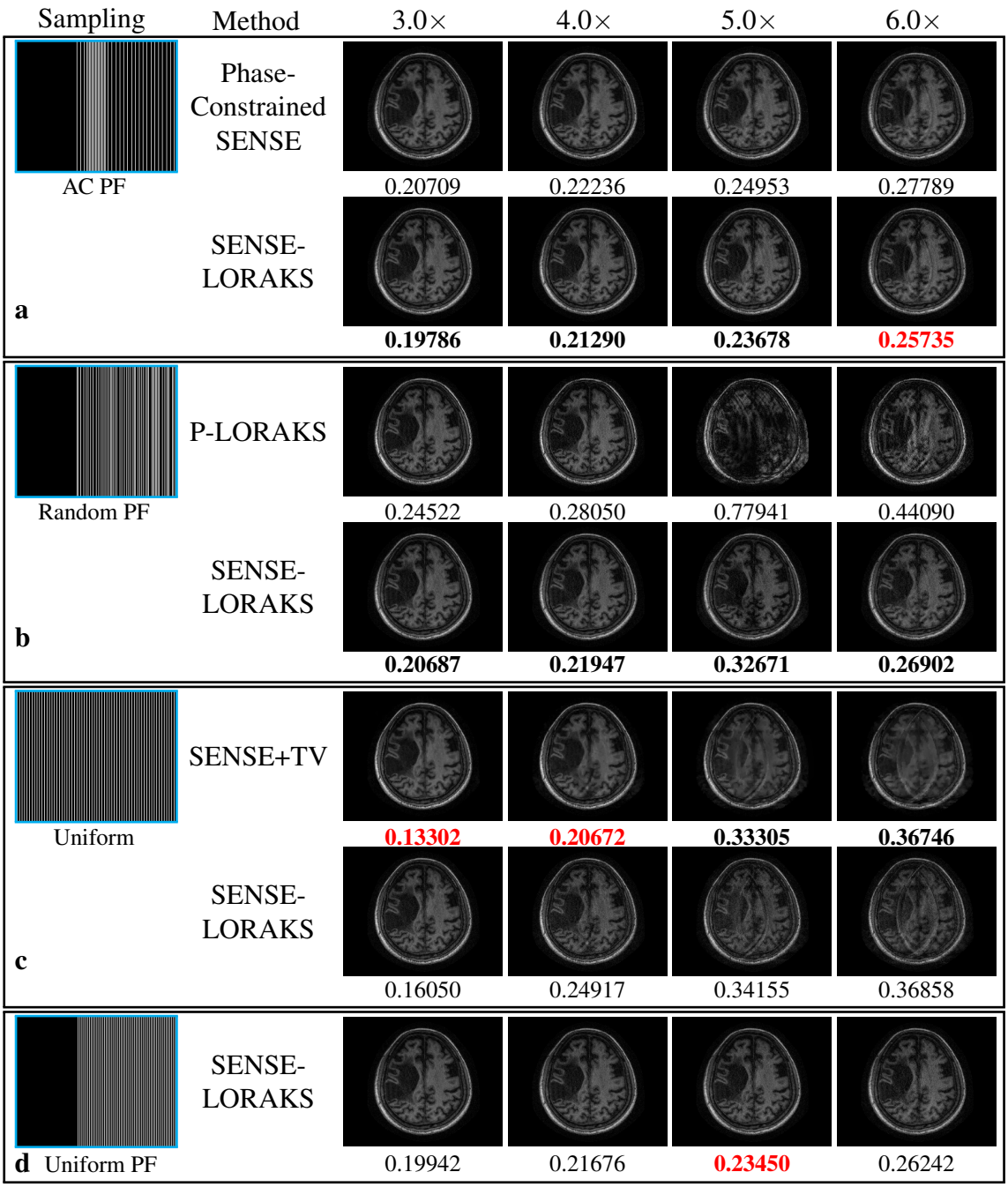

Figure S7: Reconstructed MPRAGE images for a range of acceleration factors, presenting a detailed view of the results summarized in Figs. 6 and 7(b). Comparison of images reconstructed using SENSE-LORAKS against (a) phase-constrained SENSE with AC PF sampling, (b) P-LORAKS with Random PF sampling, (c) SENSE+TV with conventional Uniform sampling. Reconstructions obtained using SENSE-LORAKS with Uniform PF sampling are shown in (d). Reconstructed images are shown using a linear grayscale (normalized so that image intensities are in the range from 0 to 1). NRMSE values are shown underneath each reconstruction, with the best NRMSE values highlighted with red. Corresponding error images are shown in Supporting Fig. S8.

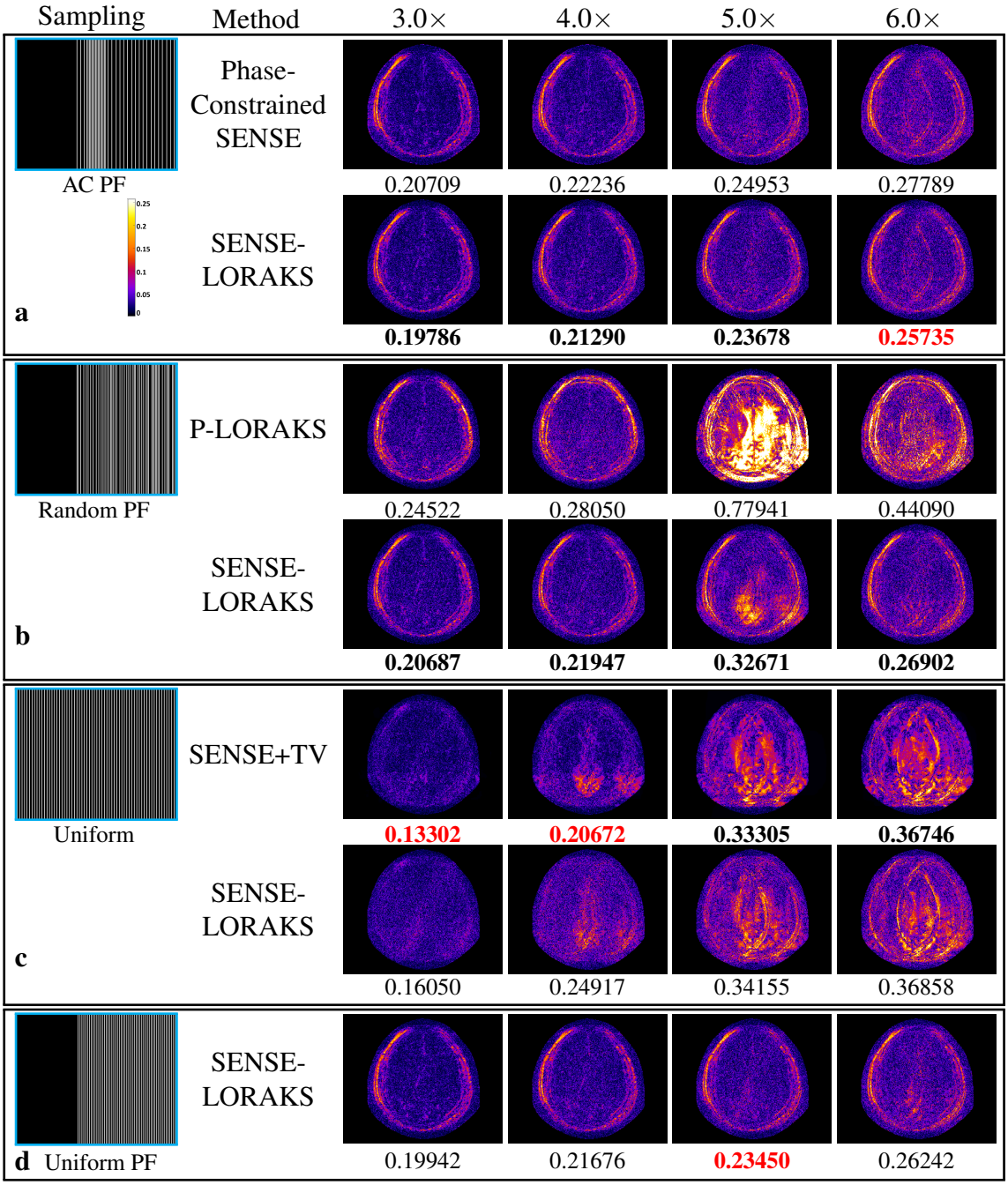

Figure S8: Error images corresponding to Supporting Fig. S7. Error images are shown using the indicated colorscale (which ranges from 0 to 0.25 to highlight small errors). NRMSE values are shown underneath each image where the smallest NRMSE values for a given acceleration rate are indicated in red.

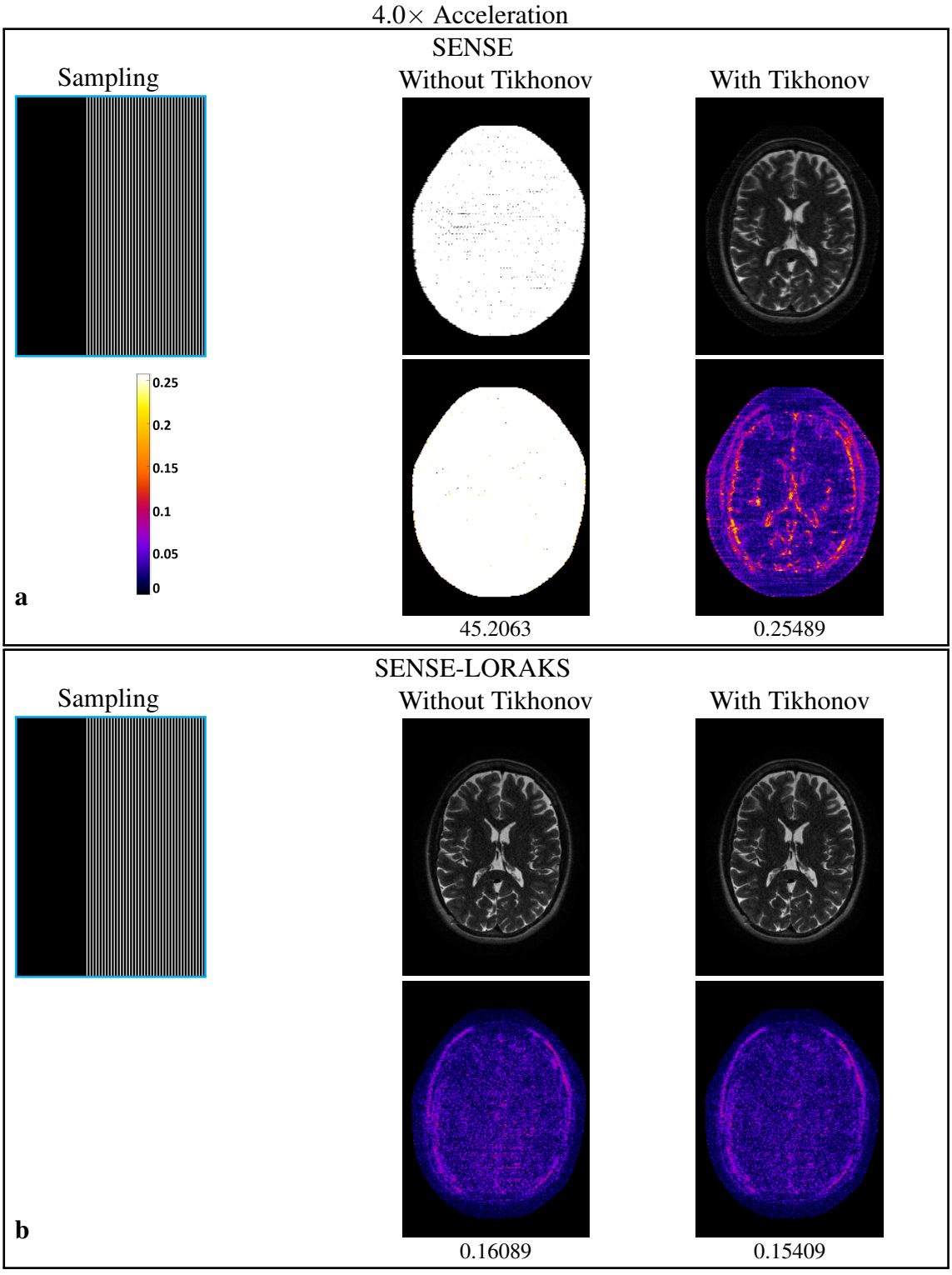

Figure S9: Illustration of the effects of Tikhonov regularization on (a) SENSE and (b) SENSE-LORAKS.

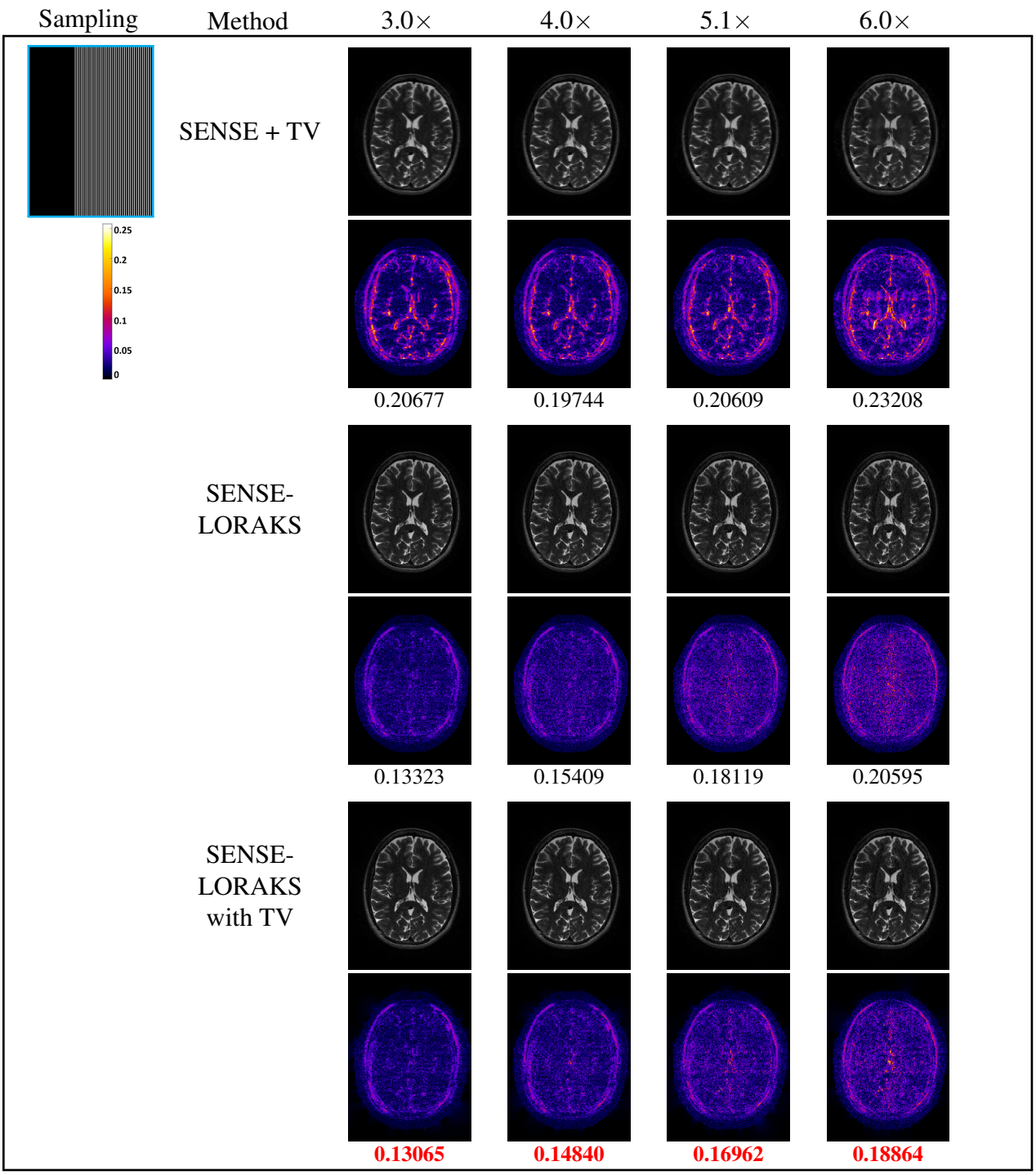

Figure S10: Comparison between SENSE+TV, SENSE-LORAKS, and SENSE-LORAKS with TV for TSE data with Uniform PF sampling. A subset of these results was shown in Fig. 10. The top rows show reconstructed images using a linear grayscale (normalized so that image intensities are in the range from 0 to 1), while the bottom rows show error images using the indicated colorscale (which ranges from 0 to 0.25 to highlight small errors). NRMSE values are shown underneath each reconstruction, with the best NRMSE values highlighted in red.