Rapid QSM Acquisition with Wave-CAIPI

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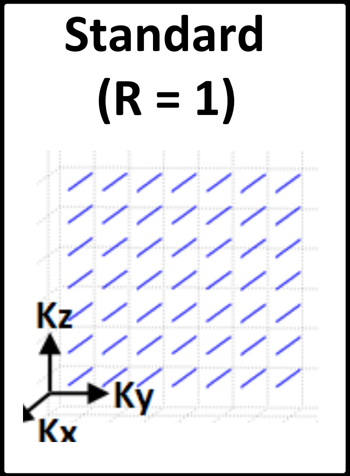
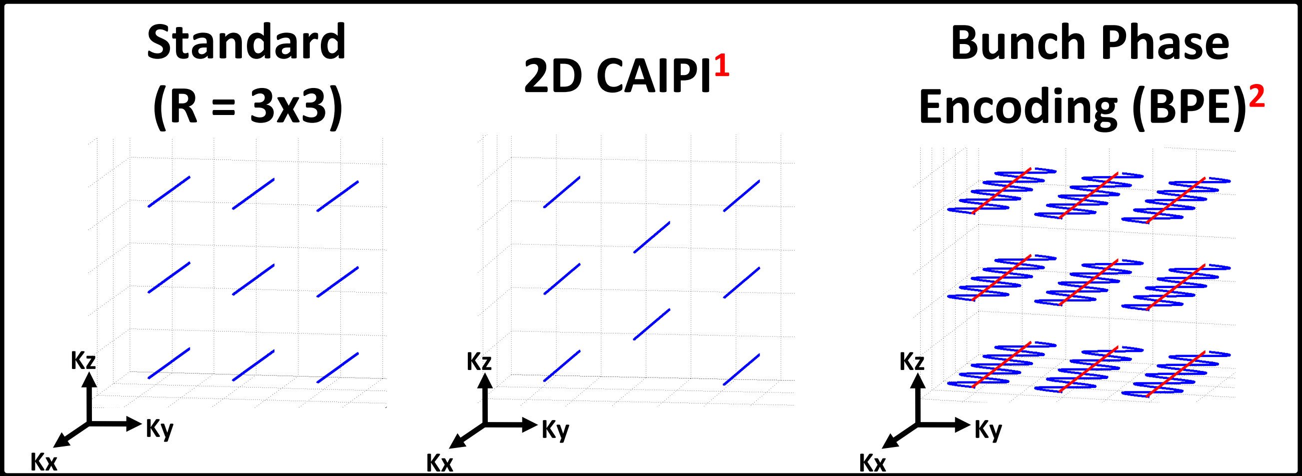
5 Harvard-MIT Division of Health Sciences and Technology, Cambridge, MA

Highly Accelerated 3D Cartesian Imaging

- Recent modifications to rectilinear k-space sampling provided more robust reconstructions of highly under-sampled datasets





1. Breuer F. et al, MRM 2006 2. Moriguchi H. et al, MRM 2006

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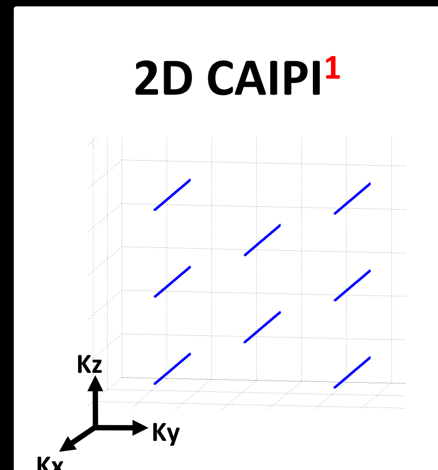

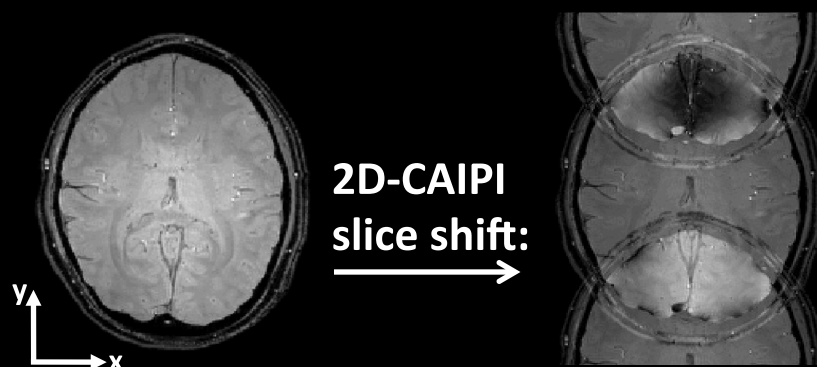

Effect of slice shift in image space

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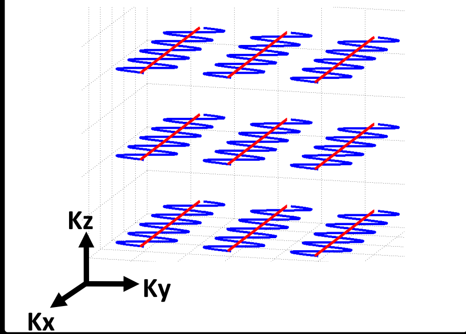
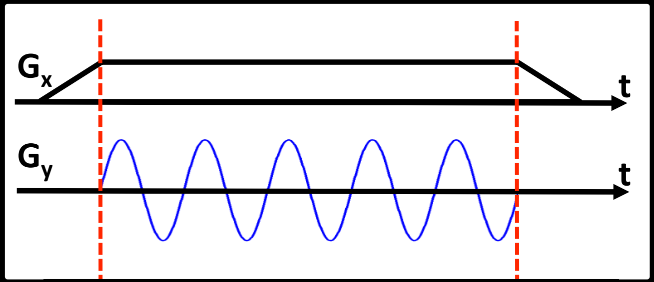
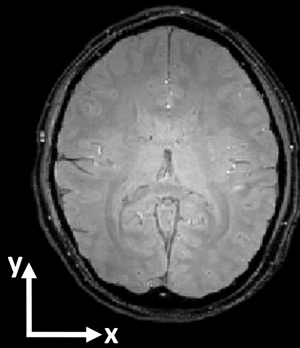
Bunch Phase Encoding (BPE)[2]







Bunch Phase: Zigzag G_y

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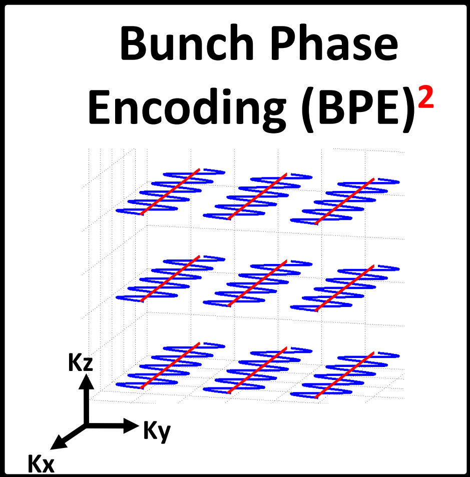
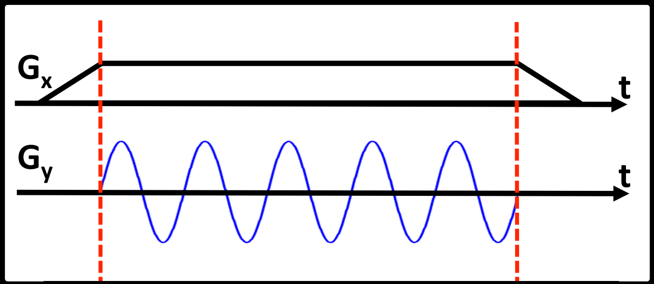


Effect of G_y in image space



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Wave-CAIPI Sampling

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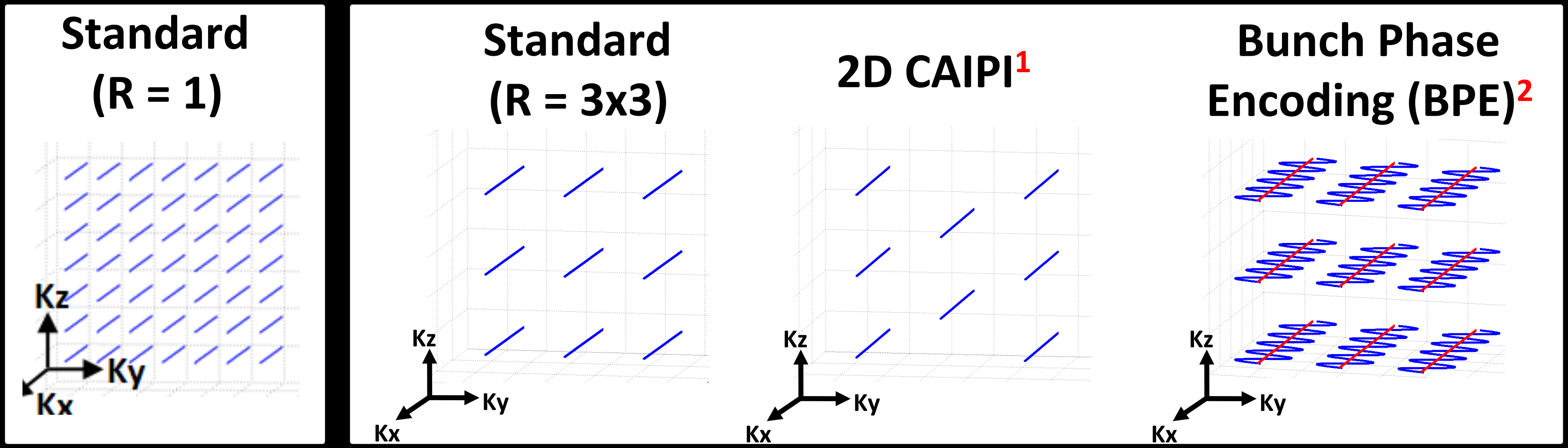
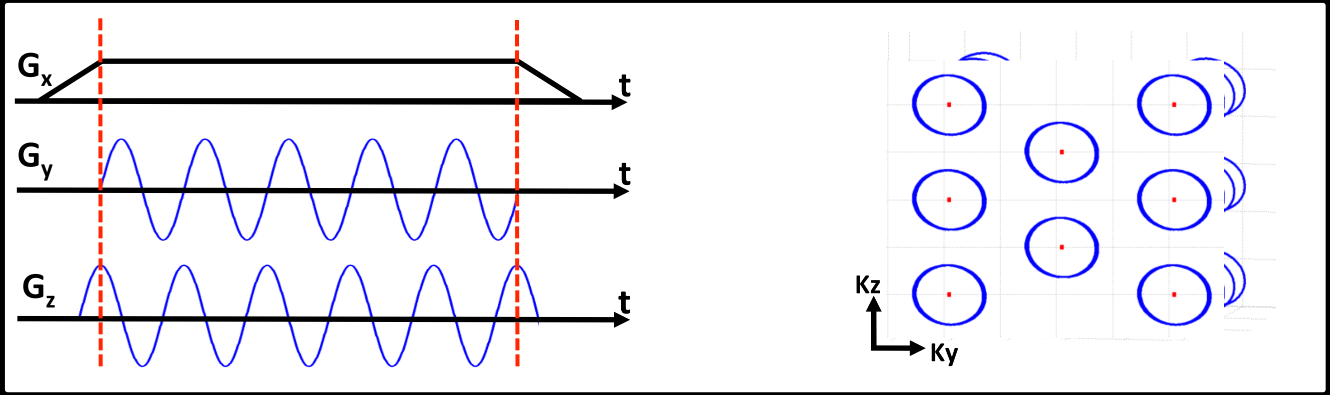


- Wave-CAIPI: 2D CAIPI + BPE in 2 directions
- <u>Spread aliasing in 3D to take full advantage of 3D coil profiles</u>



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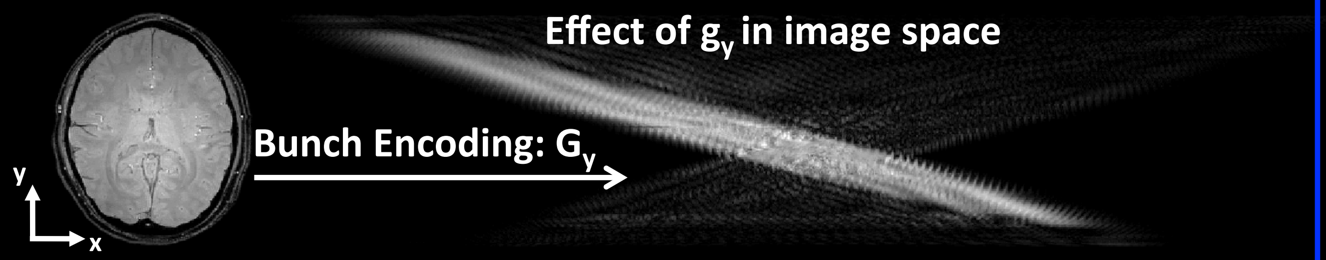
Wave-CAIPI causes voxel spreading in 3 dimensions

- Combination of G_y and G_z gradients with inter-slice shifts yields voxel spreading across three dimensions



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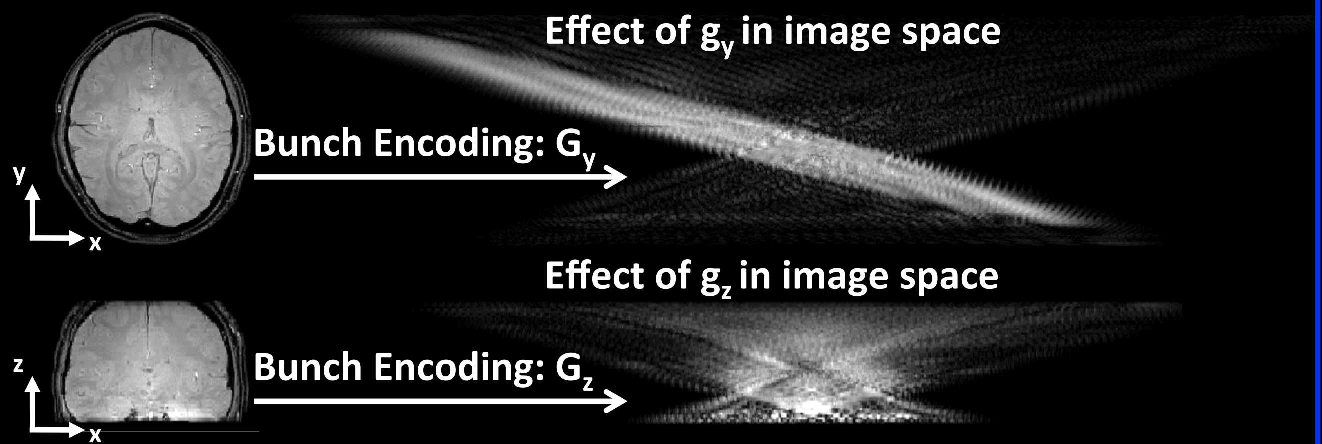

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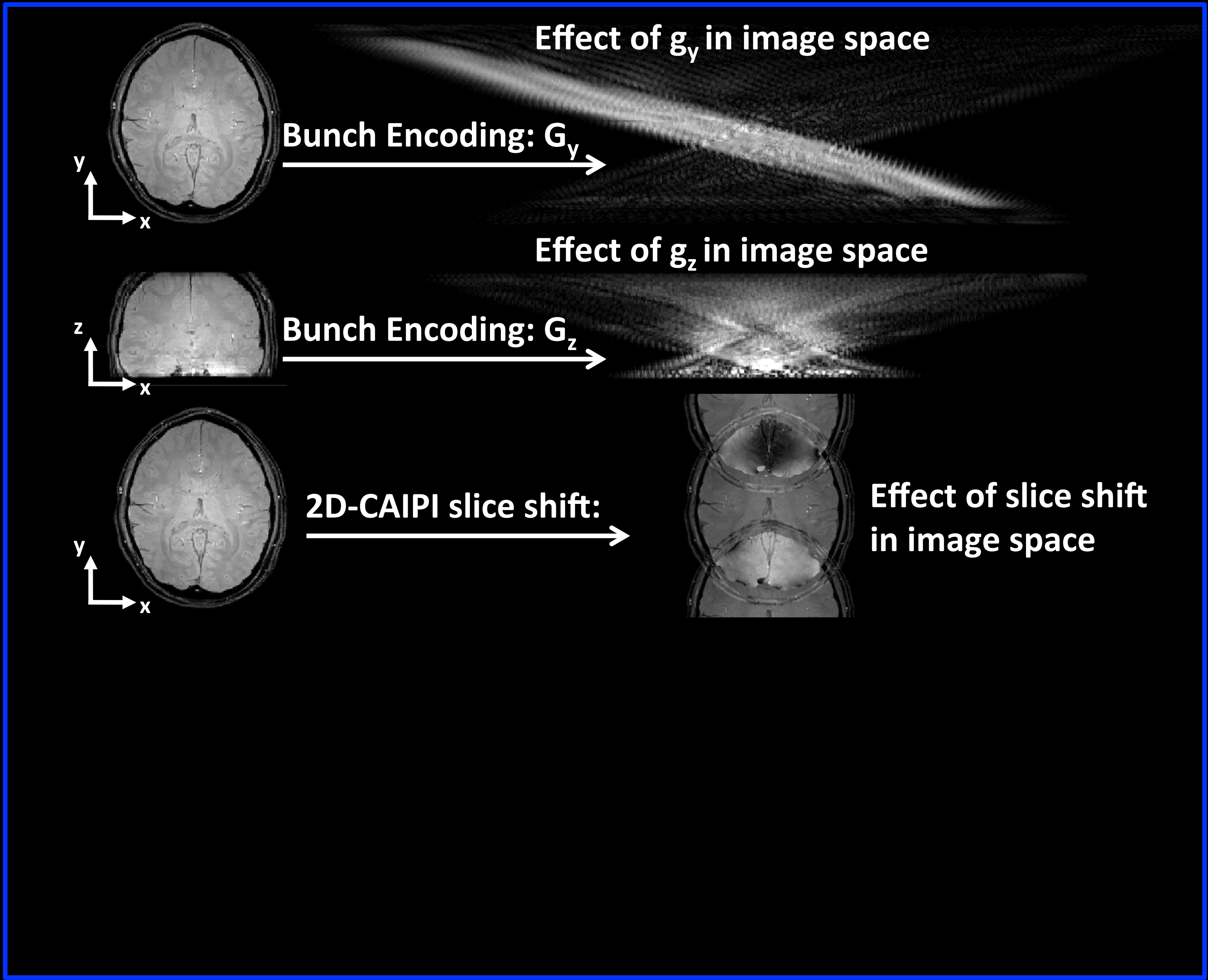

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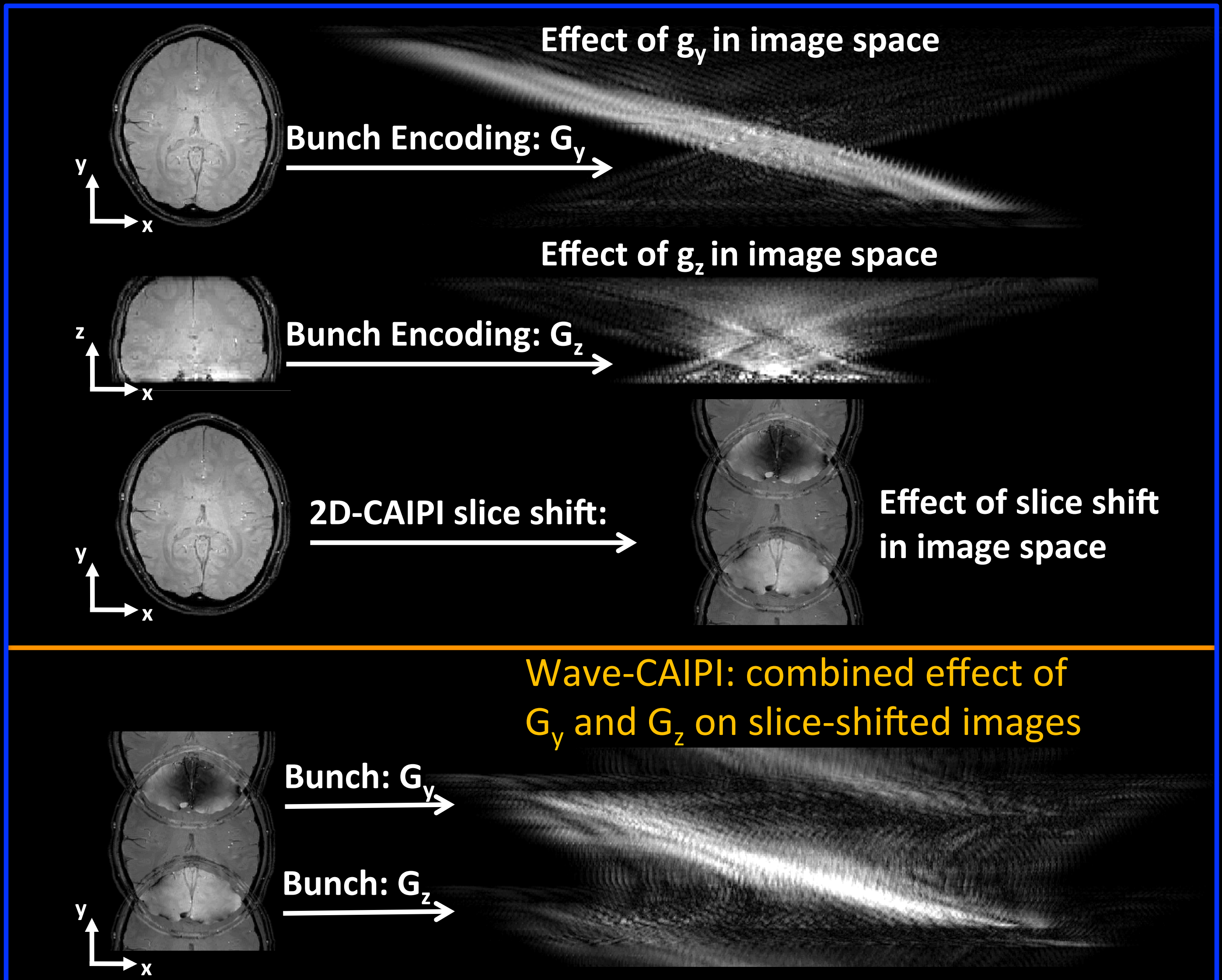
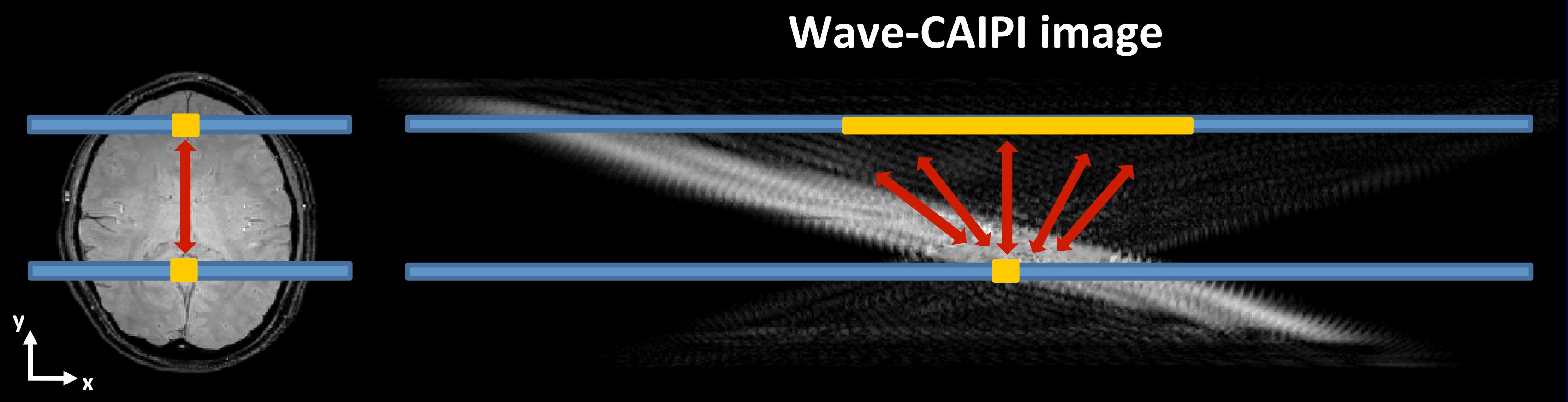


Wave-CAIPI improves parallel imaging

- Voxel spreading increases the distance across aliasing locations
- This increases the variation in coil sensitivity profiles and improves parallel imaging capability

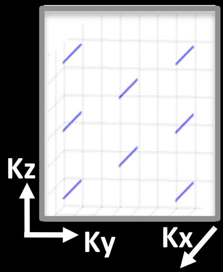


R=2 acceleration in k_y

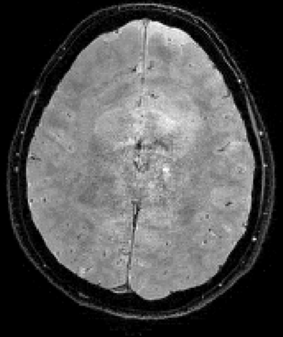
Aliasing voxels are spread out to increase the variation in coil sensitivity profiles

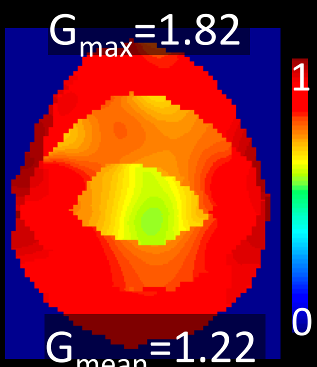
R=3x3 @ 3 Tesla, 1 mm iso, T_{acq}=2.3min

k-space **Recon** **1/G-factor**



2D-CAIPI





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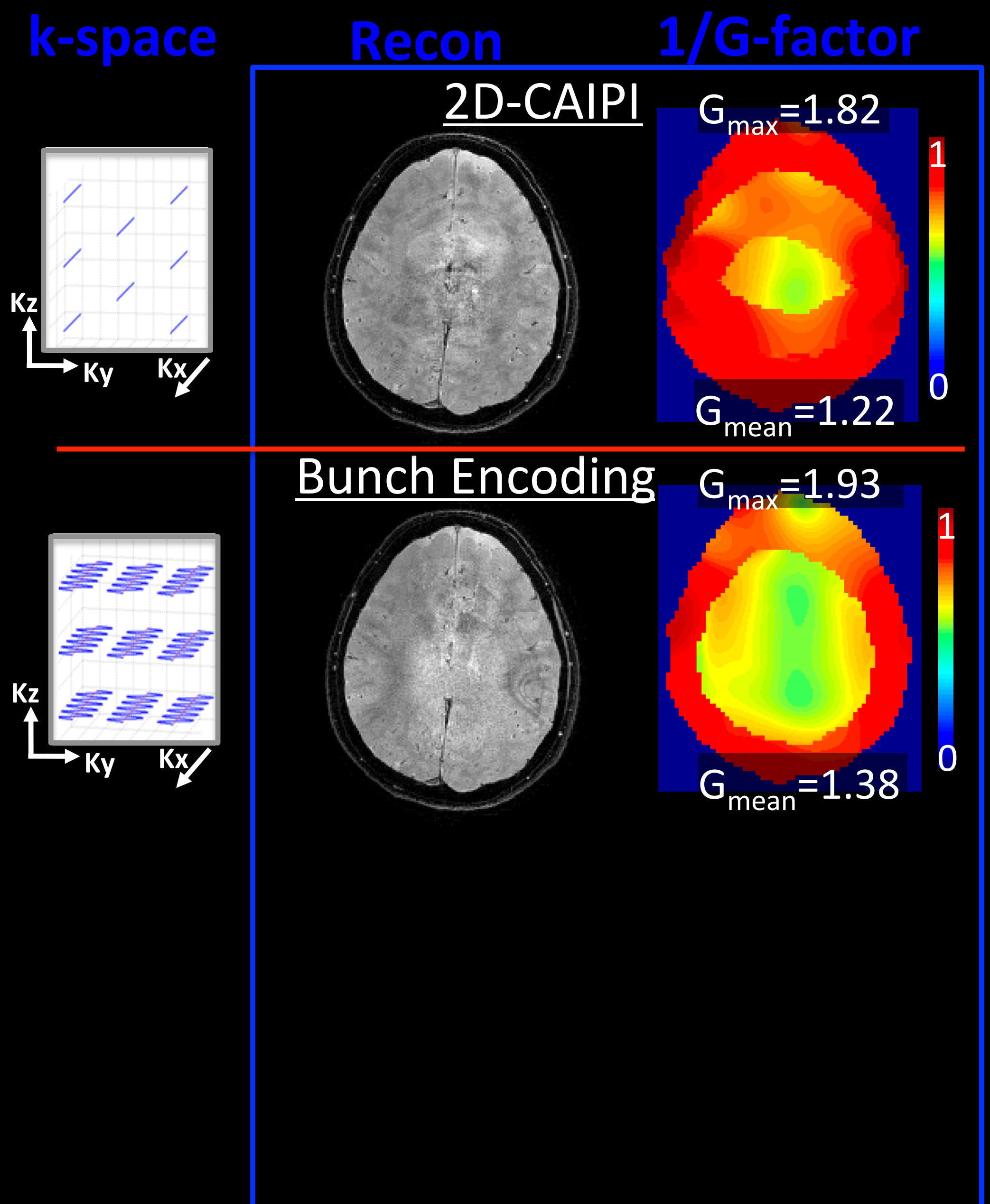

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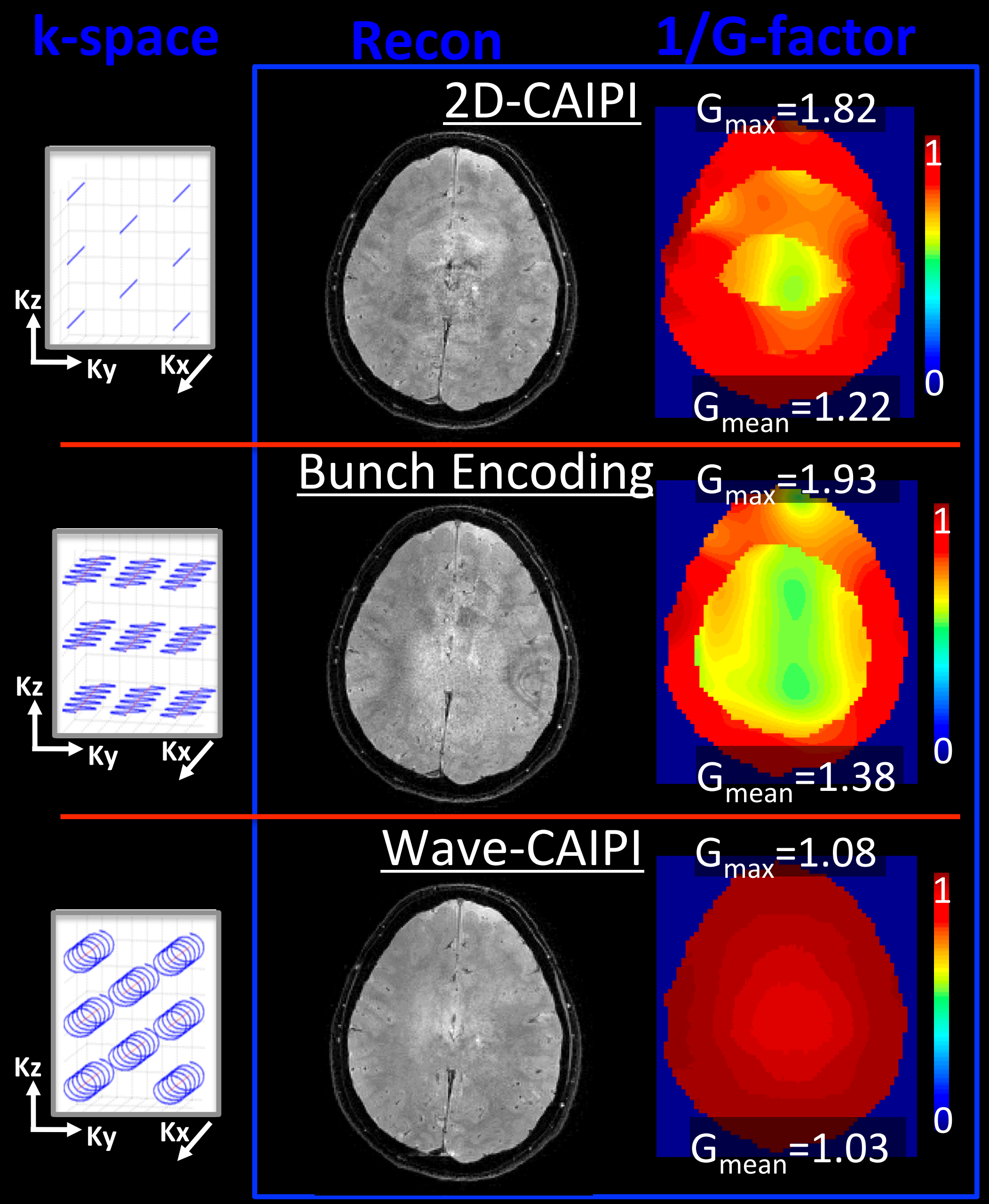
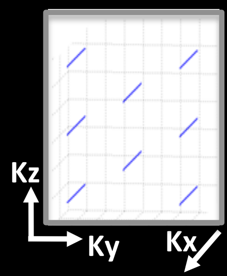


R=3x3 @ 7 Tesla, 1 mm iso, T_{acq}=2.3min

k-space **Recon** **1/G-factor**



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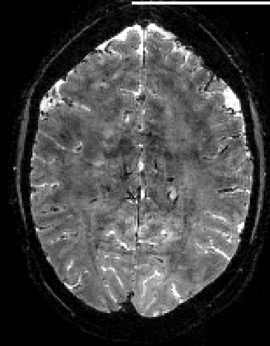

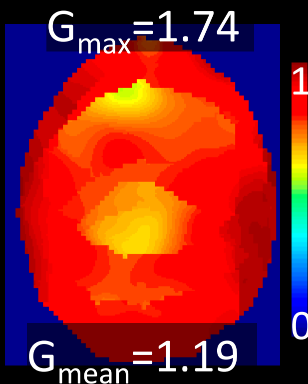

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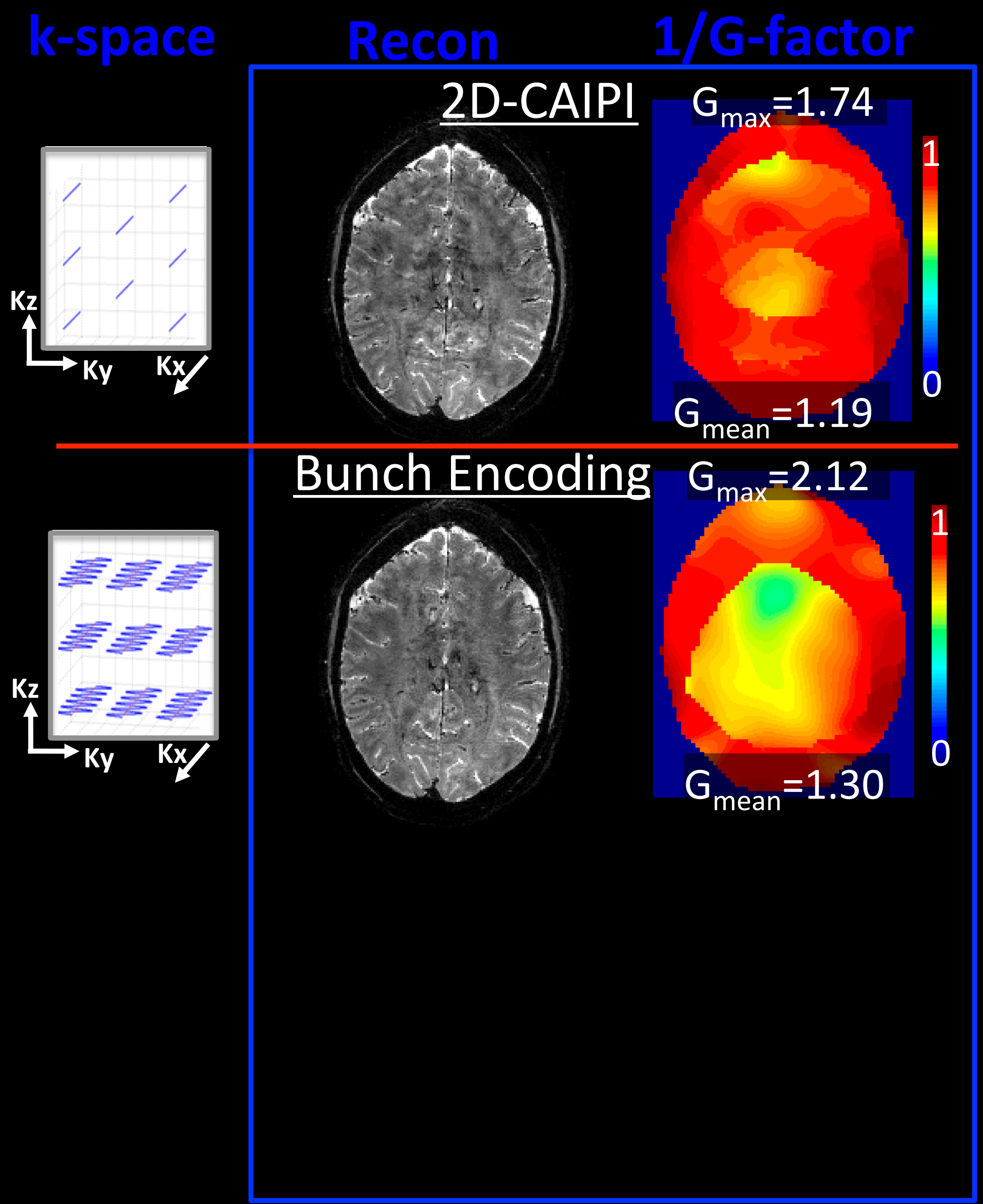

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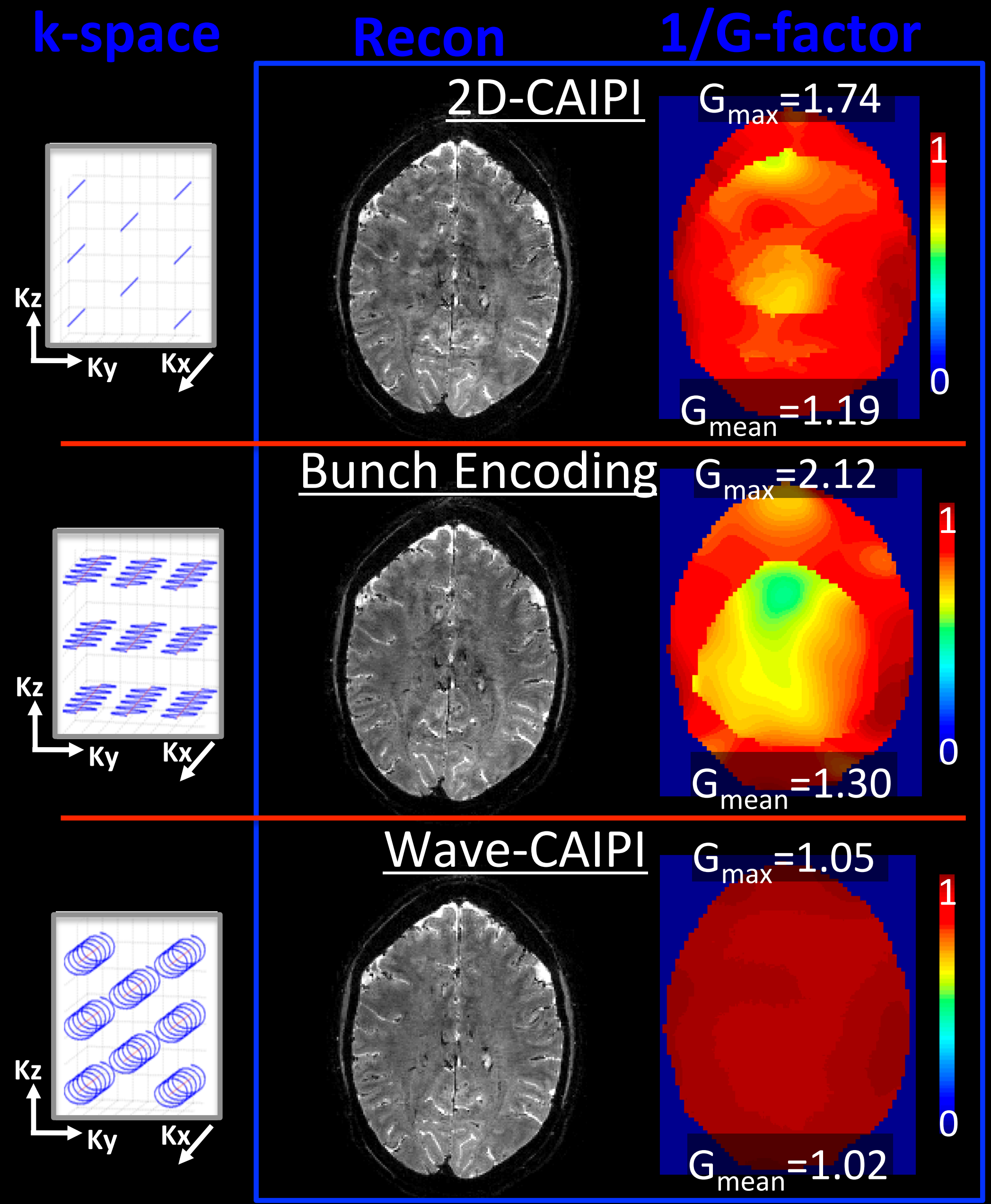

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