

Calibrationless Parallel Imaging in Multi Echo/Contrast Data

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Calibrationless Parallel Imaging

- Conventional parallel imaging requires auto-calibration signal (ACS) to estimate sensitivities or k-space kernels, which increases scan time
- Inconsistency due to motion or physiological noise in ACS may lead to artifacts [1]
- Dynamic, spectroscopic and non-Cartesian imaging, acquiring ACS can be challenging or not possible at all
- Emerging techniques use low-rank modeling [2-5] or jointly estimate sensitivities and images [6-8] to reduce/eliminate dependence on calibration.

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[7] F Knoll, MRM'12

[2] JD Trzasko, ASILOMAR'11

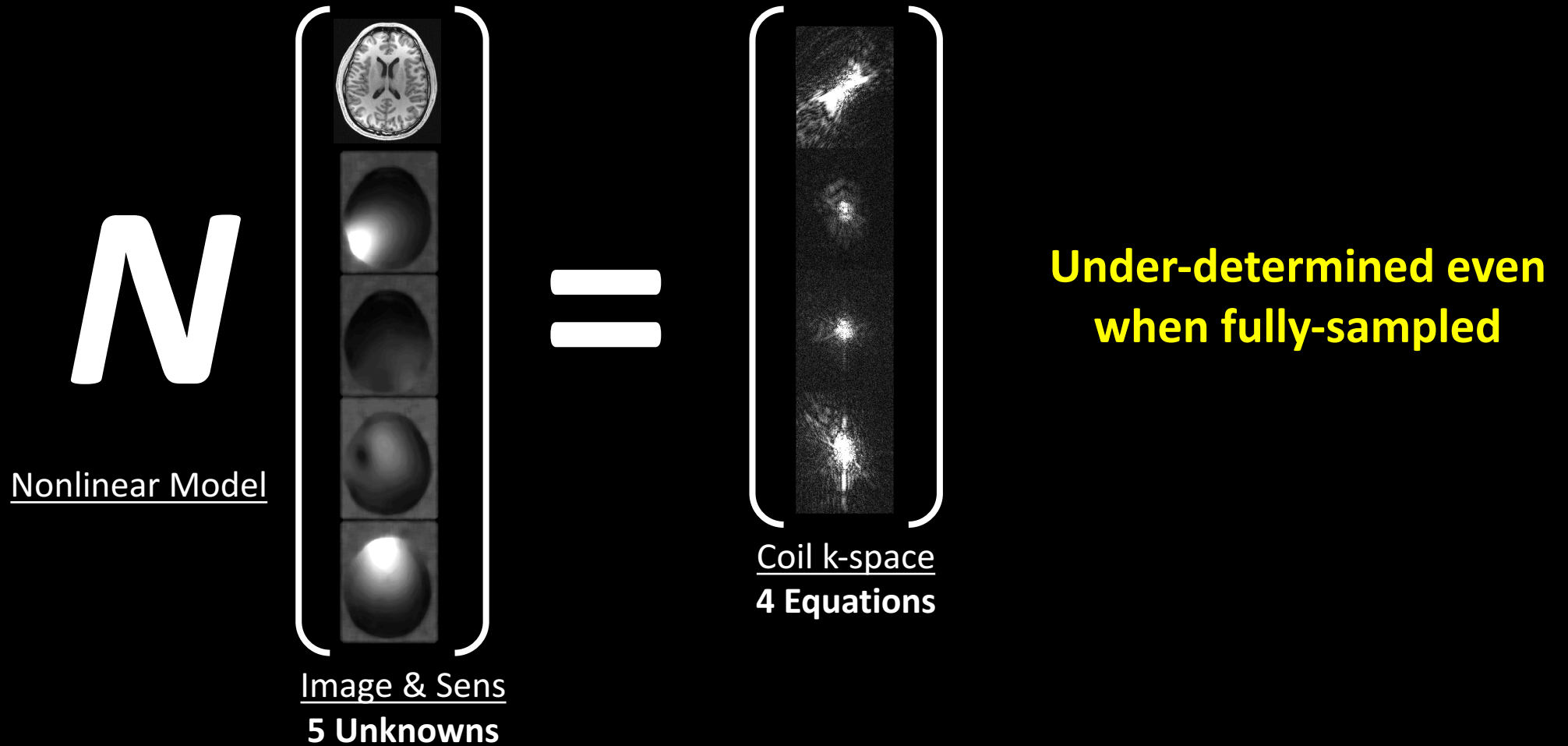
[4] JP Haldar, MRM'16

[6] M Uecker, MRM'08

[8] L Ying, MRM'07

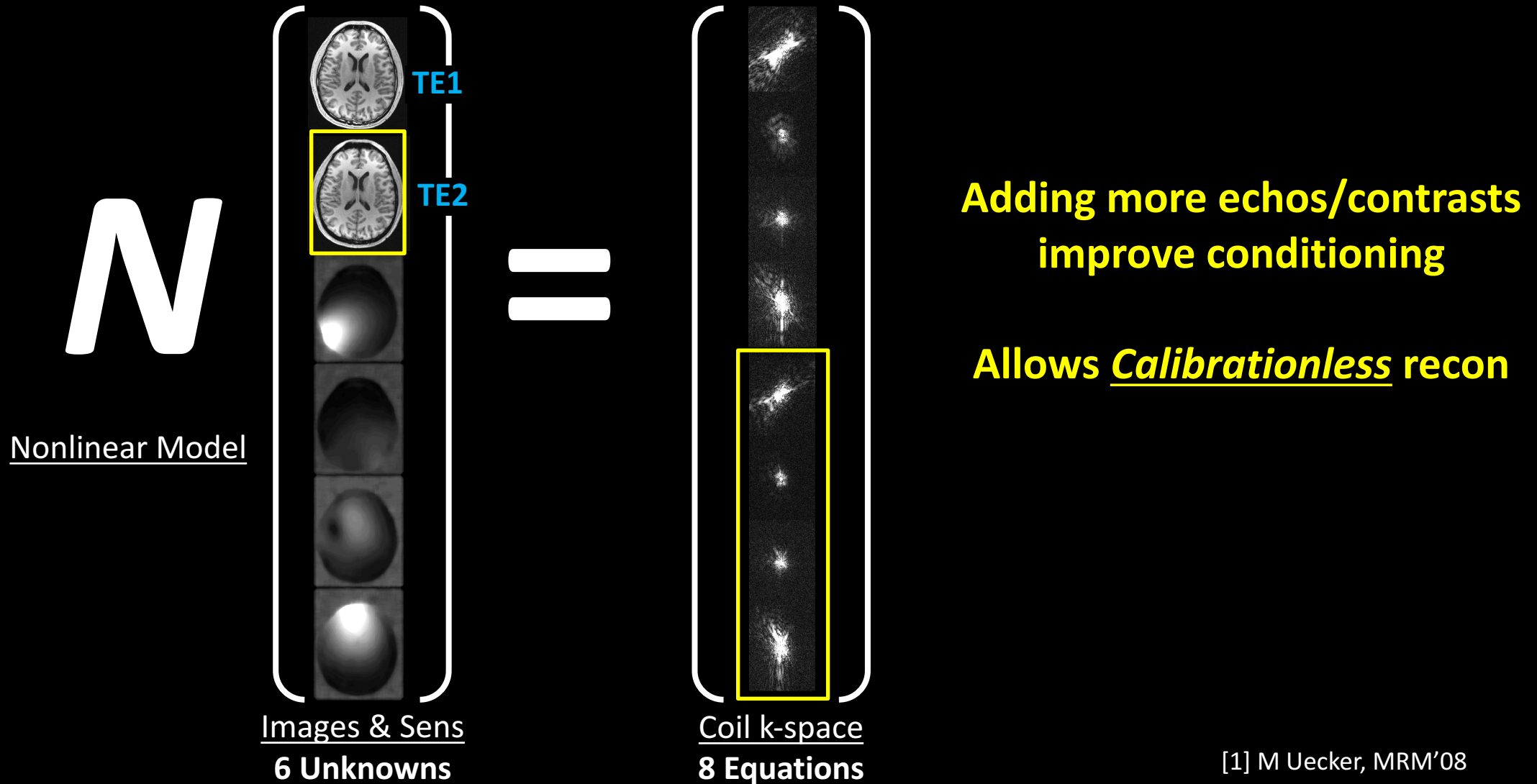
Joint Nonlinear Inversion

- We jointly recon sensitivities & image content by extending Nonlinear INVersion (NLINV) [1,2]



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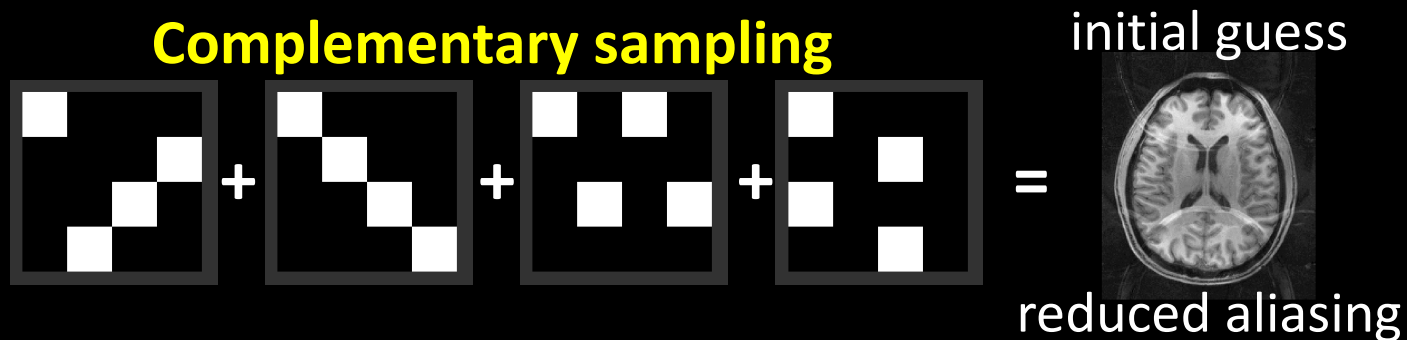
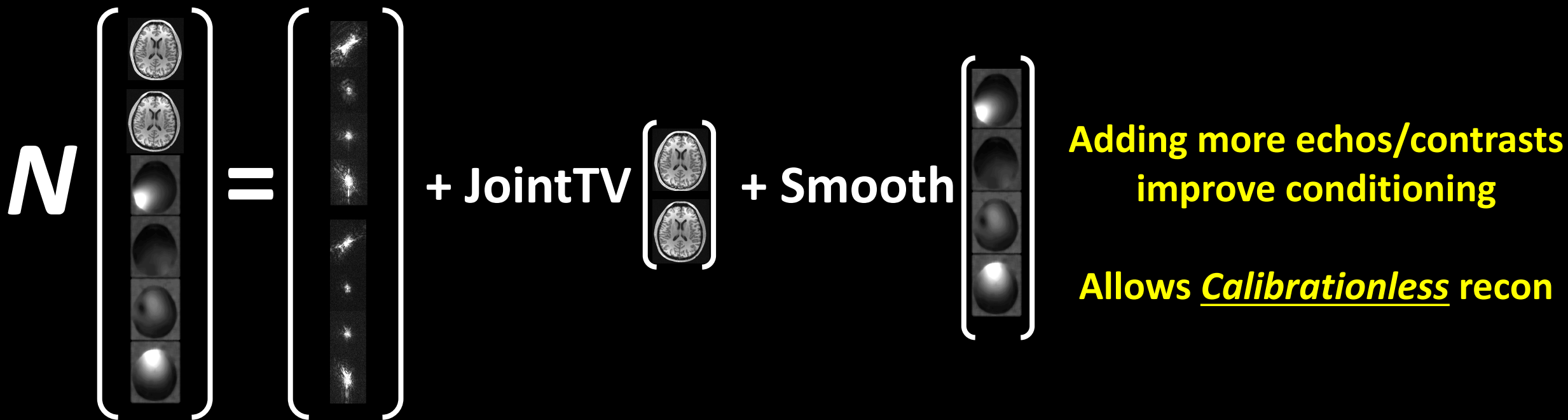


[1] M Uecker, MRM'08

[2] F Knoll, MRM'12

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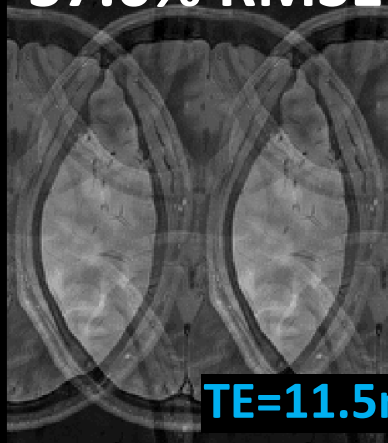


[1] M Uecker, MRM'08

[2] F Knoll, MRM'12

Multi-Echo Spin-Echo, Calibrationless, Acceleration R=2x2

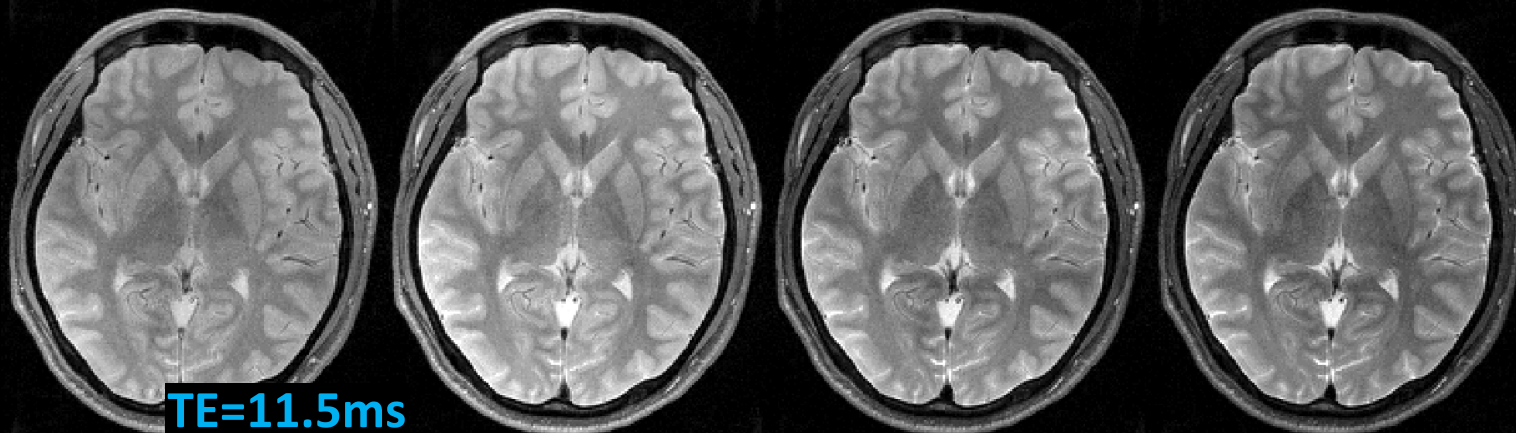
NLINV
37.6% RMSE



TE=11.5ms

Proposed: Joint NLINV

6.0% RMSE

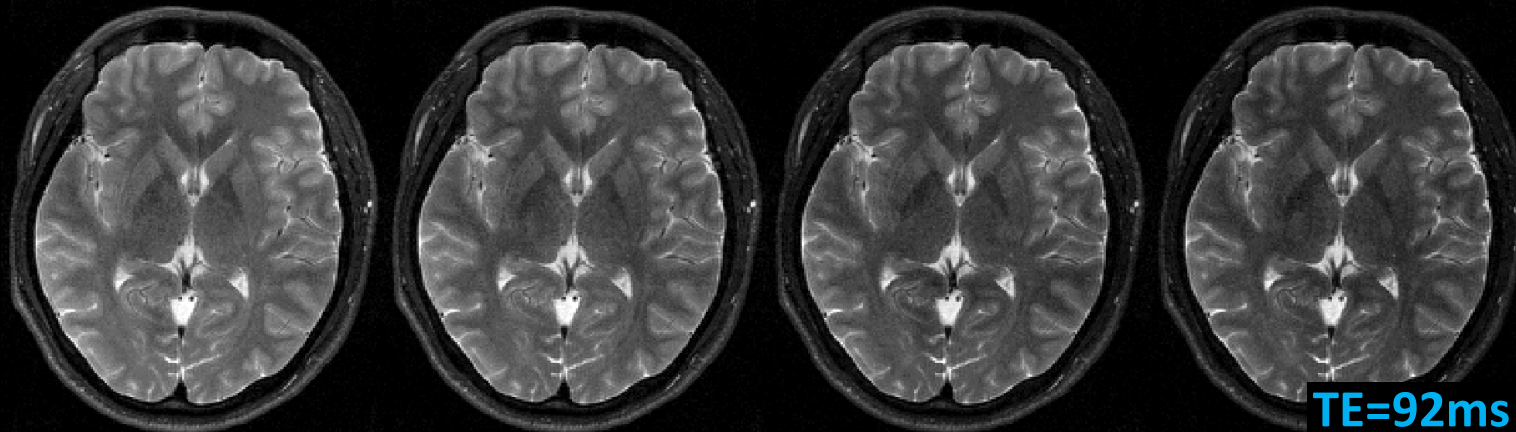
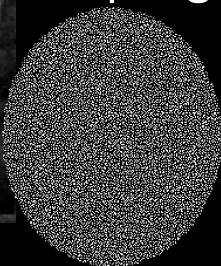


TE=11.5ms

SAKE
28.5% RMSE

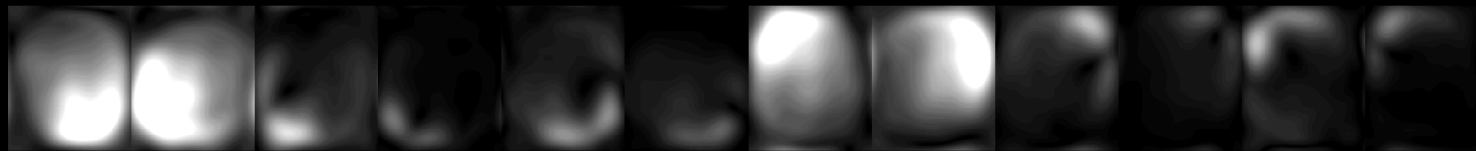


Poisson
sampling



TE=92ms

estimated 12 chan sensitivities

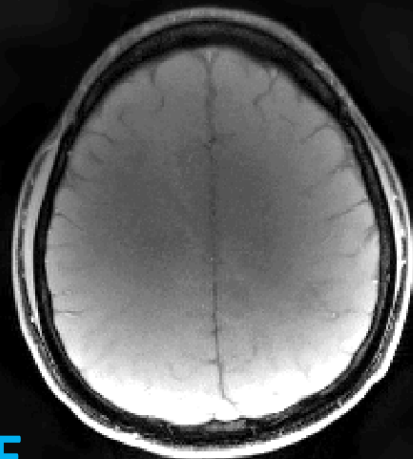


Multi-Contrast, Calibrationless, Acceleration R=2x2

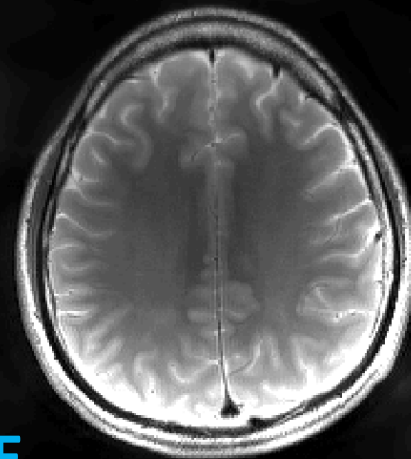
Proposed: Joint NLINV

5.2% RMSE

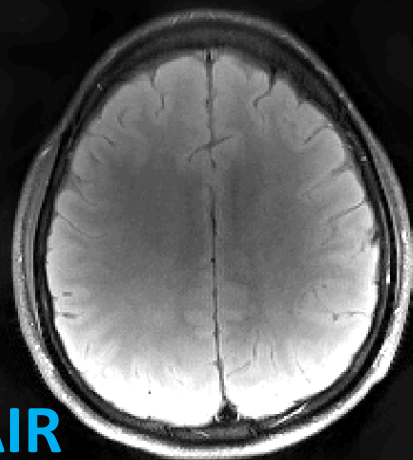
GRE



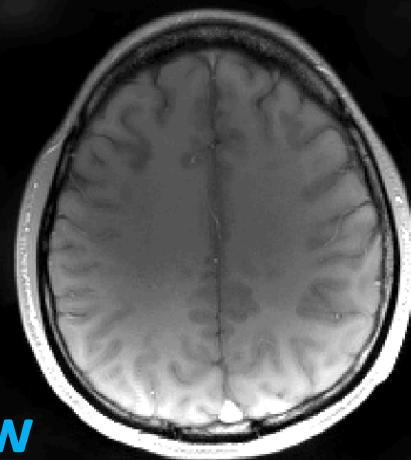
TSE



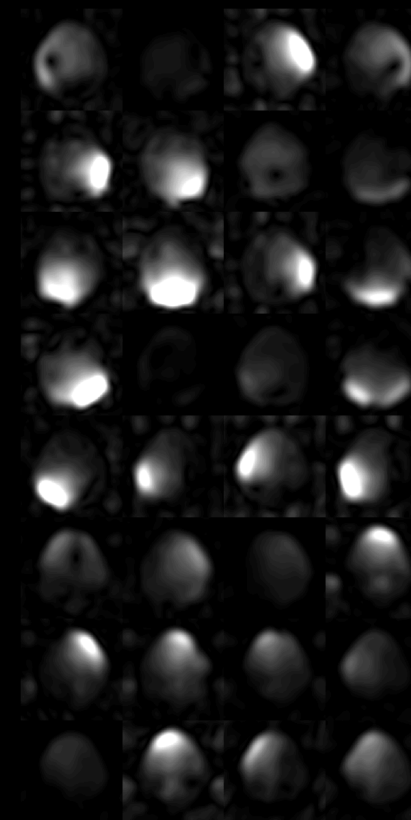
FLAIR



T1w



32 chan sensitivities



Plasma #28

Phase-Cycled bSSFP, Calibrationless, Acceleration $R=2\times 2$

Proposed: Joint NLINV

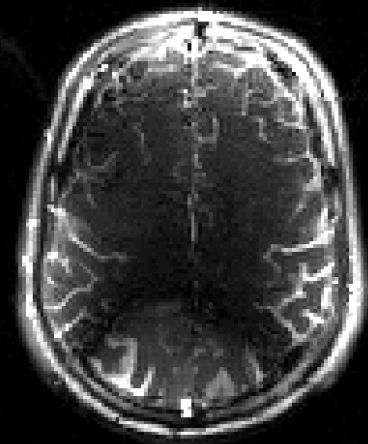
3.3% RMSE



phase-cycle $\phi=0$



$\phi=\pi/2$



$\phi=\pi$



$\phi=3\pi/2$

32 chan sensitivities

