

# IN A PILOT STUDY OF 9 HEALTHY VOLUNTEERS, PARALLEL TRANSMIT (PTX) IMPROVES IMAGE QUALITY IN 7 T BRAIN IMAGING

RESULTS

- To date, 9 healthy volunteers have been scanned with the custom-built pTx coil
- Static B1 shimming altered relative amplitude and phase of individual pTx channels to improve the RF field uniformity in 7 T MRI
- In 3 volunteers, B1 shimming pTx resulted in higher power deposition (SAR) than single transmit (sTx), in 1 volunteer SAR was the same, and in the other cases, B1 shimming produced lower SAR

Image Slice	NRMSE	Flip Angle Mean $\pm$ StDev ( $^{\circ}$ )	Calc. Max. Local SAR (W/kg)	Meas. Max. Local SAR (W/kg)
Upper, sTx (A)	0.46	53.0 $\pm$ 19.8	3.5	3.9
Upper, pTx (B)	0.45	50.3 $\pm$ 16.0	3.6	3.9
Lower, sTx (C)	0.42	57.1 $\pm$ 22.1	3.5	3.9
Lower, pTx (D)	0.42	53.1 $\pm$ 18.0	3.6	3.9

Table 1. Comparison of conventional, single transmit and B1 Shimming (static pTx) for the images in Figure 1 (center of poster)

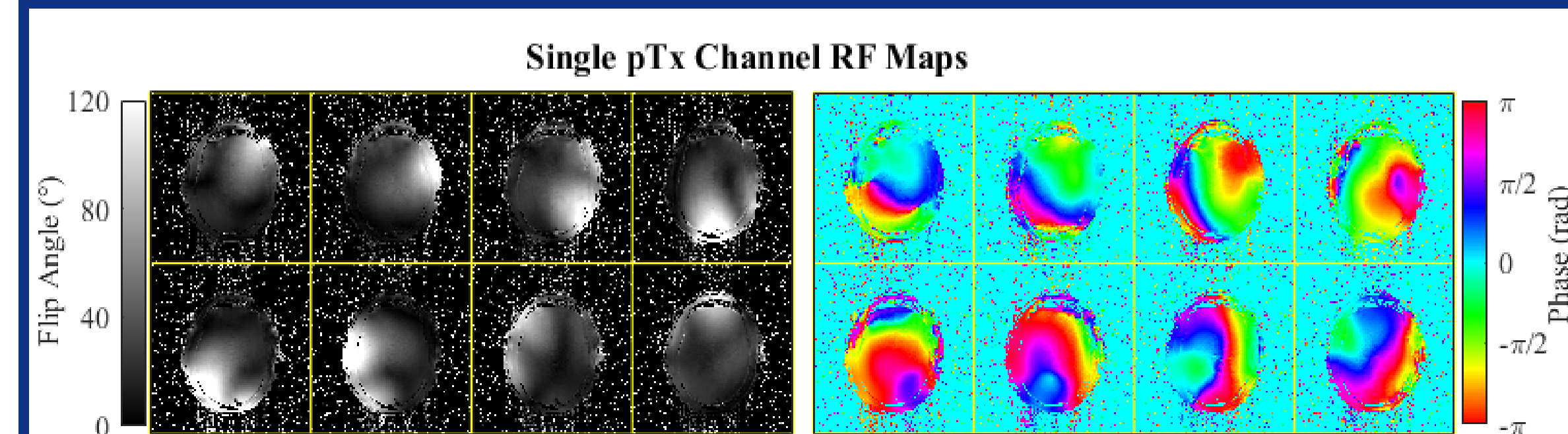
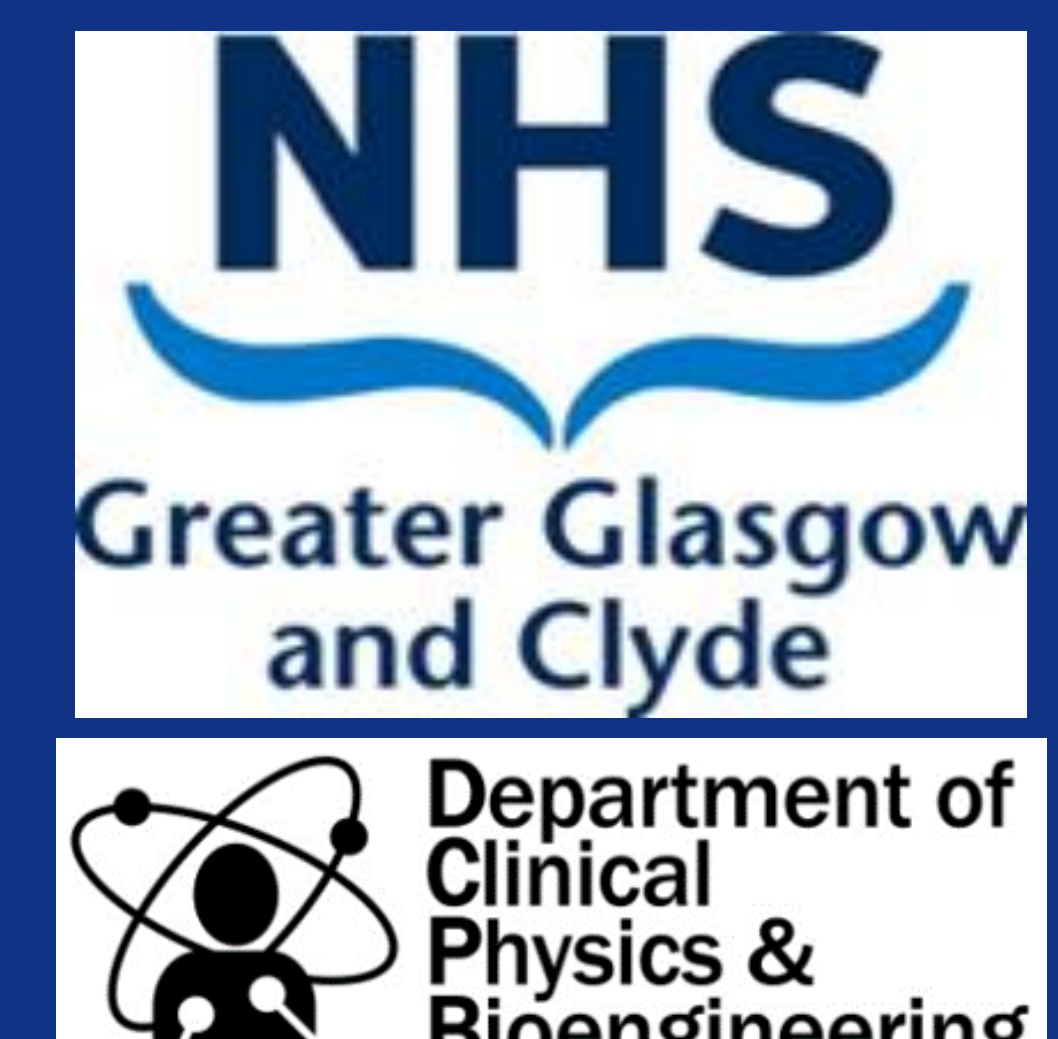


Figure 4. Individual channel RF field maps acquired from a healthy volunteer

CONCLUSIONS

- Preliminary work with B1 shimming has already shown the benefits of pTx
- Meanwhile confidence has been gained in using a technically challenging method and the added safety monitoring requirements it comes with
- Field mapping data from the cohort of healthy volunteers allows for further technical development work on dynamic pTx



## First In Vivo Images from an In-House Parallel Transmit (pTx) Coil for MRI at 7 Tesla

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- MR CoilTech

BACKGROUND:

Clinical 7 T MRI

- Signal  $\uparrow$ , yielding
  - Resolution\*  $\uparrow$
  - Speed\*  $\uparrow$
- Susceptibility  $\uparrow$
- Spectral resolution  $\uparrow$
- Power deposition (SAR)  $\uparrow$
- RF Wavelength  $\downarrow$



\* trade-off between; inherent limits

pTx!

METHODS

- Build custom pTx coil (S. Gunamony) to mitigate RF inhomogeneity at 7 tesla:

S. Allwood-Spiers et al., "Development of a dual-mode head coil for human brain imaging at 7 Tesla", In Preparation  $\rightarrow$  Look out for publication soon!



- Electromagnetic field simulation (P. McElhinney<sup>†</sup>)
- Temperature/safety testing (S. Allwood-Spiers<sup>†</sup>)
- Initial pTx field mapping and static pTx (B1 shimming) in healthy volunteers before full waveform pTx development

<sup>†</sup> other presentations at SINAPSE on these topics

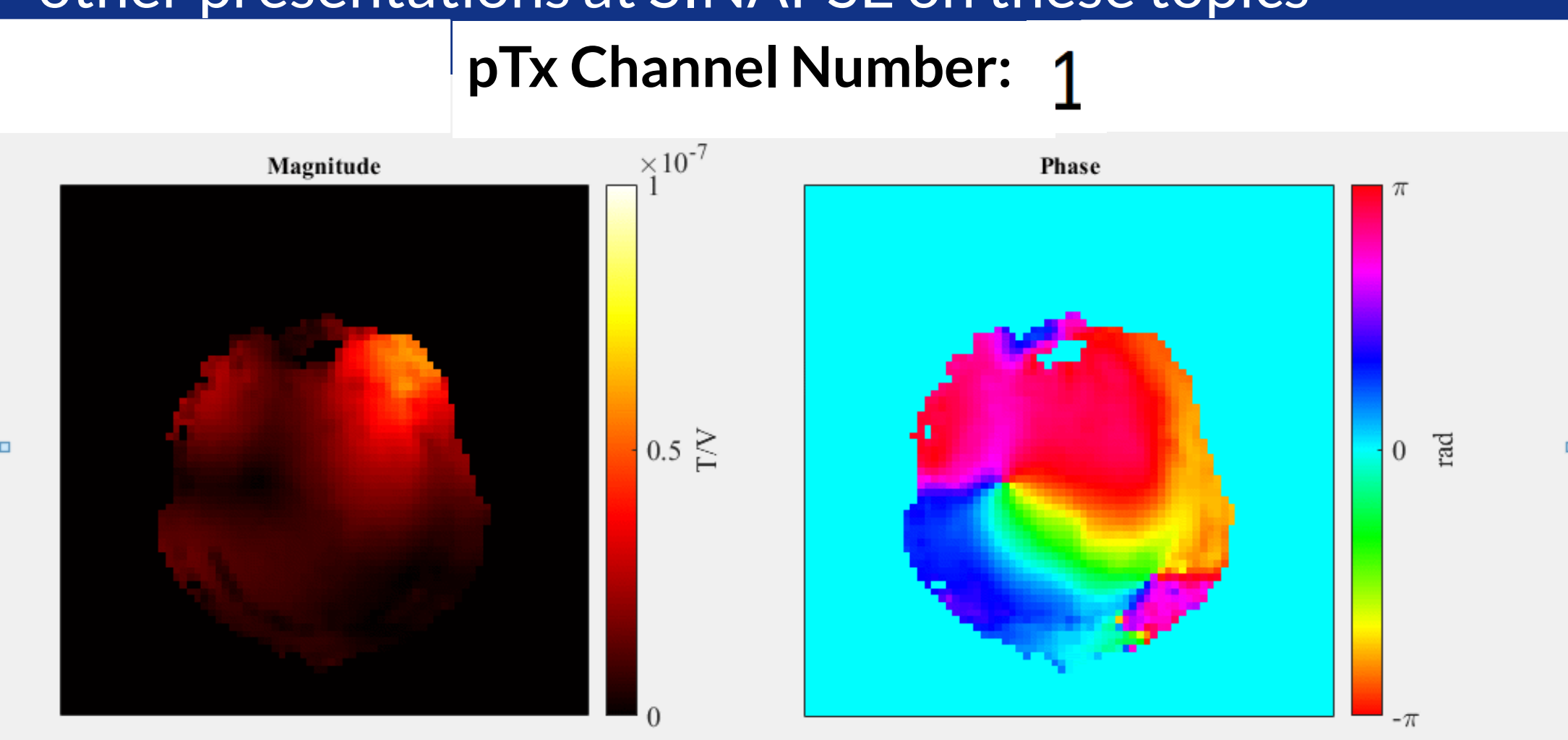


Figure 2. In pTx, individual transmission channels are controlled independently to craft a combined RF field that is more homogenous.

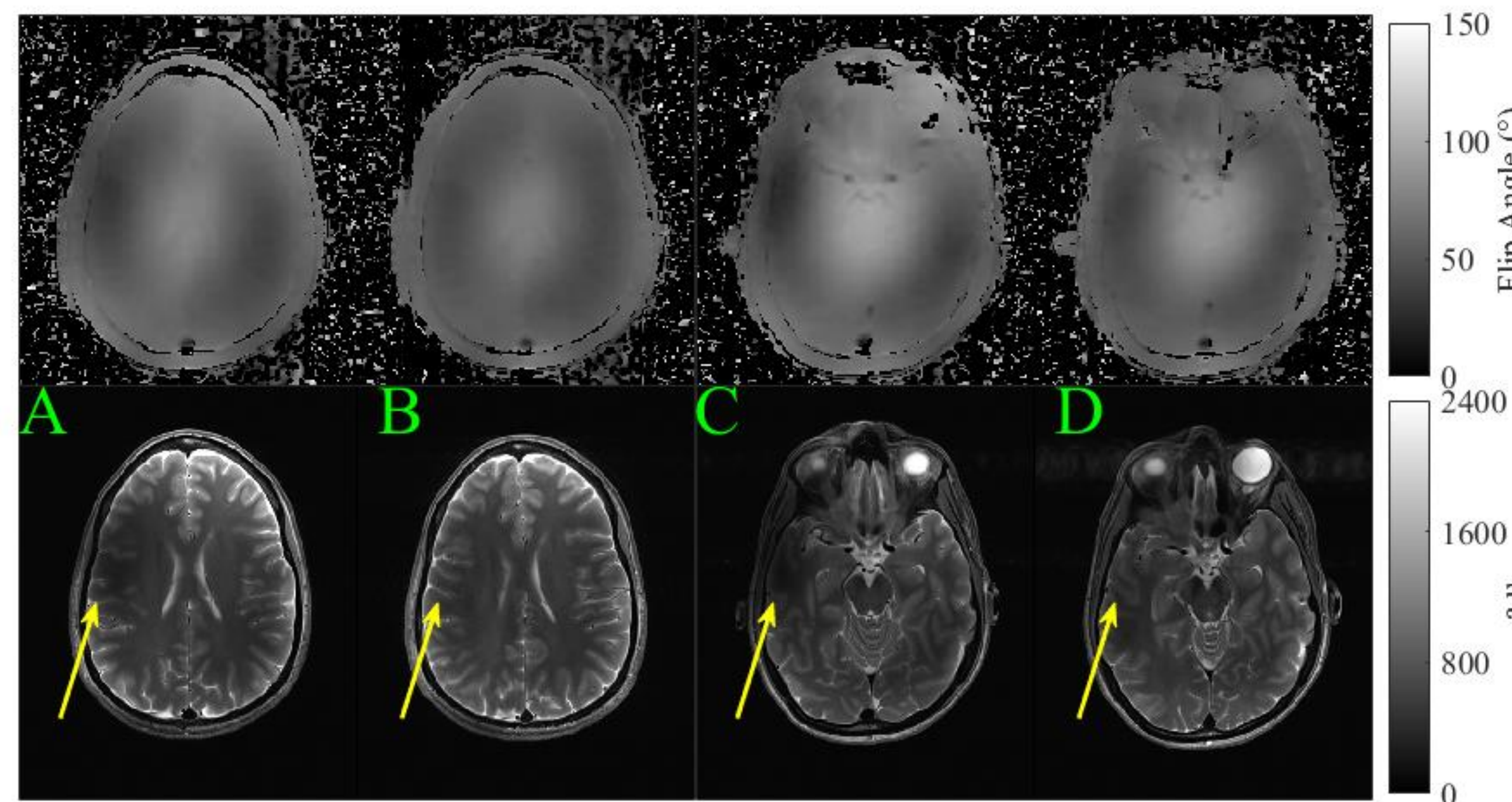
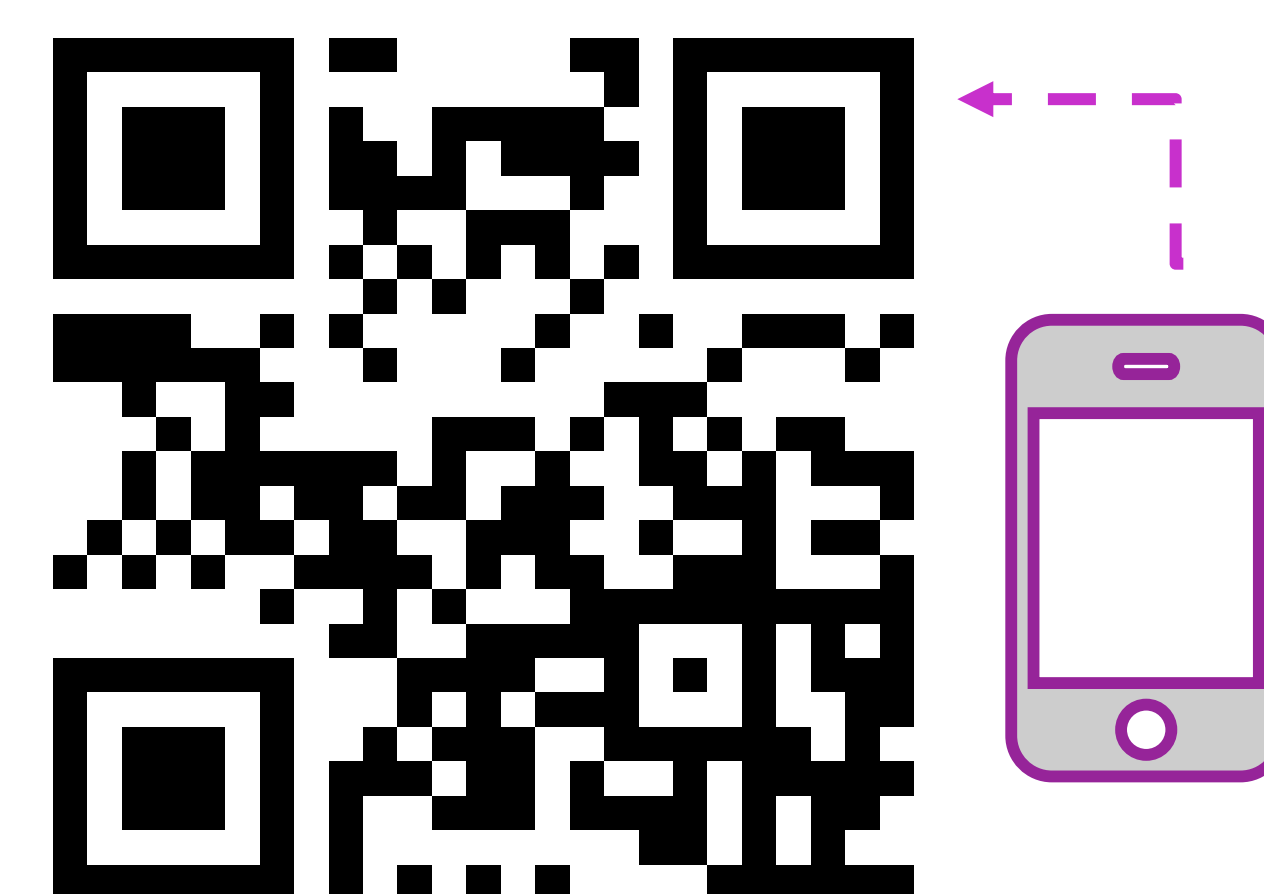


Figure 1. A,C) Single transmit (non-pTx) with signal and contrast loss shown by arrows B,D) B1 shimming, a simple version of pTx, improves signal and contrast loss

FULL ABSTRACT HERE



<https://bit.ly/37EuIMR>



Figure 3. Resultant T2-weighted image in another volunteer using pTx with B1 shimming. We expect further improvements with full waveform pTx.