Supplementary Materials for parallel shimming

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1 Development of 28Ch shim drivers

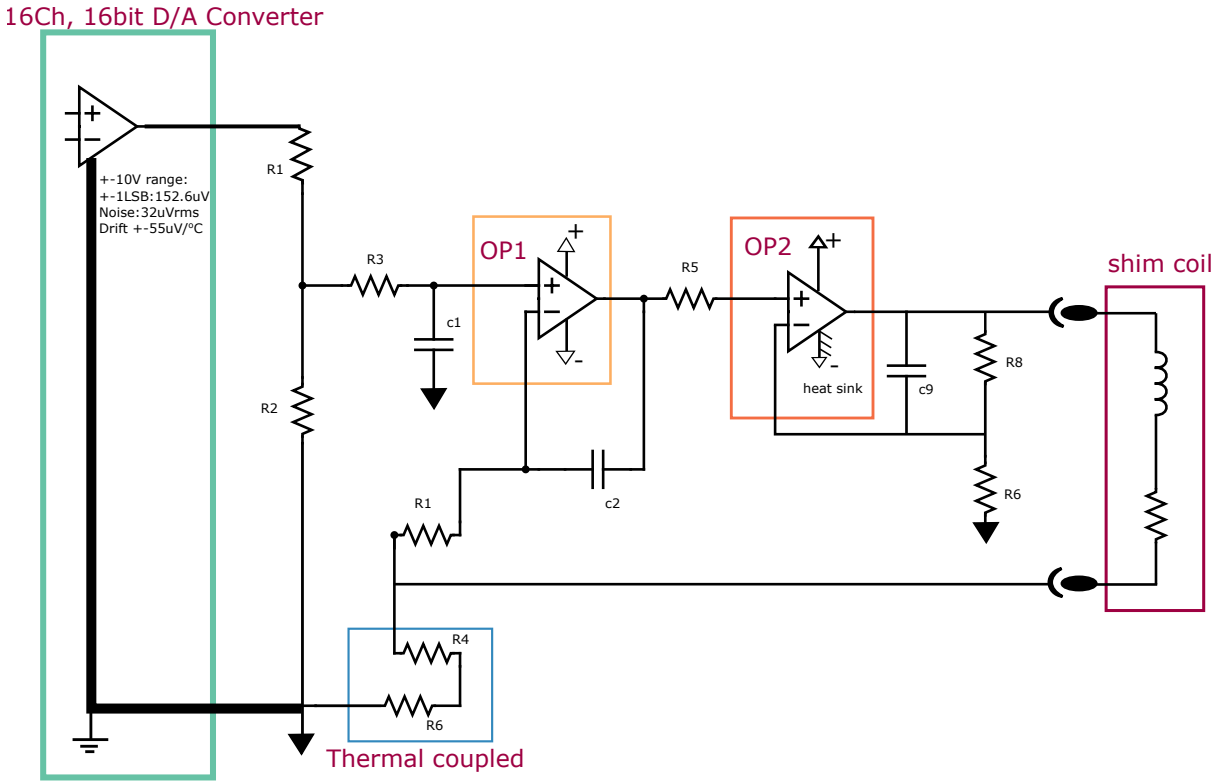

Figure S1: Single-channel DC current generation based on cascaded operational amplifiers.

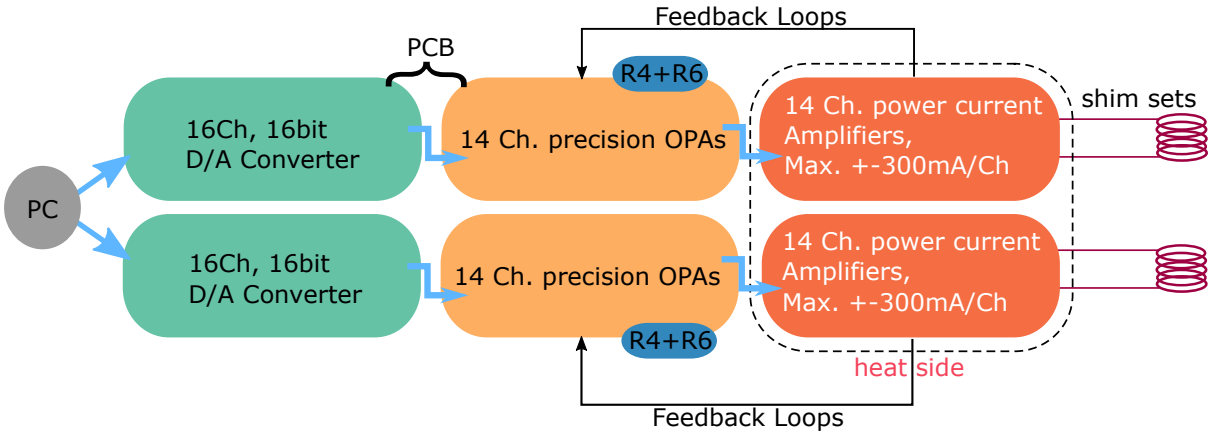

Figure S2: Schematic of the 28 channel shim current source.

2 Pobehead and RF simulation for stripline coil

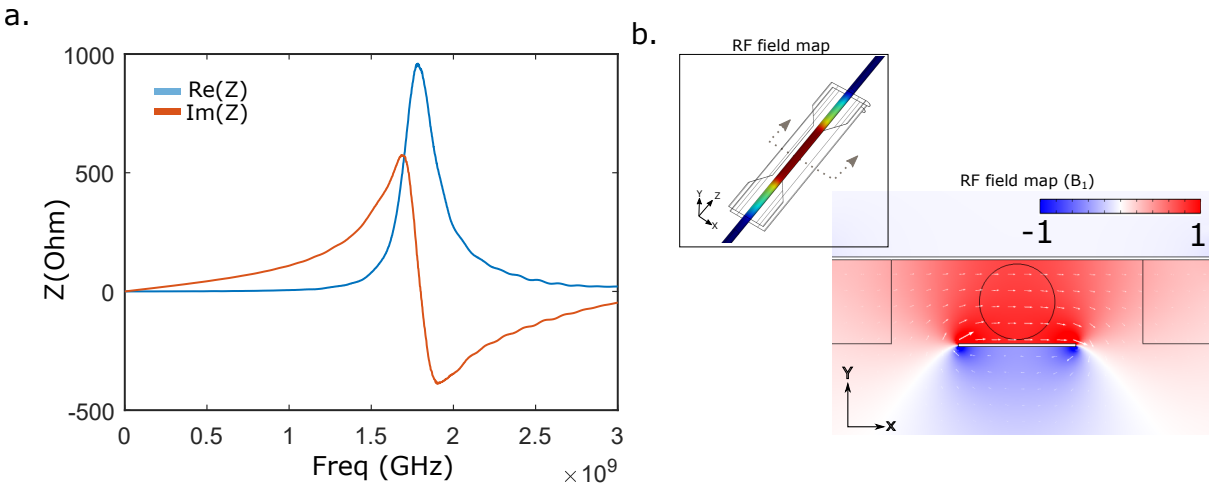

Figure S3: (a) Measured impedance by network analyzer for the fold-up stripline coil, displaying the self-resonance frequency at 1.75 GHz, with a Q factor of 42 at 650 MHz. (b) Comsol simulation result of the stripline's radiofrequency field map at 650 MHz over the central cross-section. The sample capillary is indicated as a black circle, placed where the radiofrequency field is most uniform,

3 Deep learning details

3.1 Dataset parameters

Dataset parameters	NC channels	2
	Local shim coils	6
	Reference values `Ref`	$[0, 90, 140, 14, 0, 60, 8, 80, 20, 22, 0, 0]$
	Shim range R	$\pm 2 \times$ `Ref`
	Sample 1 and 2	50 vol% H_2O in D_2O
	Number of spectra per subset	$\{524, 1536, 2738, 4001\} \times 2$
Acquisition parameters	Nucleus	^1H
	Excitation bandwidth	5 kHz
	Recorded FID points	19736
	Repetition time	1500 ms
	Postprocessing	Bruker default

Table S1: Parameters of the parallel randomized shimming dataset (PaRandShimDB).