

Supplementary Table 1. Comparison of neural interface for stimulation and acquisition

Parameter	Nature 2019 ¹³	ISSCC 2020 ¹⁴	JSSC 2021 ¹⁵	Nature 2021 ¹⁶	TBCAS 2022 ¹⁷	Nature 2022 ¹⁸	Nature 2023 ¹⁹	SFT-ANP (This work)
System								
Process (nm)	180	180	130	65	180	180	–	180
Area (mm ²)	23.04	5.83	0.01	0.9	11	8.75	800	14.82
Stimulation								
Operating Voltage (V)	12	12	1	–	12	≤3.63	± 20	± 12
Channel	128	8	1	1	16	1	8	16
Max Stim. Current (mA)	5	12	0.2	0.025	16	<3	4.7	16.32
Recording								
Noise (μV) (1–250 Hz)	1.6*	1.2	24.7/3*	2.2 (1–500Hz)	10.2 (0.1–1.5kHz)	–	–	0.9
Gain (dB)	–	14–44	–	–	50–73	–	–	46–64
THD (dB)	-43	-80.5	–	–	–	–	–	-72
	@100mV Vpp	@40mV Vpp						@30mV Vpp

SFT-ANP: Self-fine-tuning artificial neural pathway

Stim.: Stimulus

THD: Total harmonic distortion

Vpp: Peak-to-peak voltage

*Band not reported

Supplementary Table 2. Acquisition parameters for MR pulse sequences

Technical parameter	T1-weighted TSE	T2-weighted TSE	T2-weighted SPACE
Plane	Sagittal	Sagittal, Axial	Coronal
Bandwidth (Hz/Px)	269	252	620
Echo spacing (ms)	9.5	9.56	3.9
Field of view read (mm)	300	300	380
Field of view phase (%)	100	100	87.5
Slice thickness (mm)	4.0	4.0	1.20
Base resolution	320	320	384
Phase resolution (%)	75	75	90
Repetition time (ms)	400.0	3000.0	3000.0
Echo time (ms)	9.5	96.0	197.0
Flip angel (degrees)	140	150	–
Concentrations	2	1	1
Acquisition time (min: sec)	1: 19	1: 21	9: 57
Voxel size (mm)	$0.9 \times 0.9 \times 4.0$	$0.9 \times 0.9 \times 4.0$	$1.0 \times 1.0 \times 1.2$
Slices	11	11	72
Averages	2	2	1.4
Phase oversampling (%)	100	100	80
Slice oversampling (%)	–	–	33.3
TI 1 (ms)	–	–	24
Slice resolution (%)	–	–	90
Phase partial Fourier	Off	Off	Allowed
Slice partial Fourier	–	–	6/8

MR: Magnetic resonance

TSE: Turbo spin-echo

SPACE: Sampling perfection with application optimized contrast using different flip angle evolution