

Fig. S1: Effect of decreasing electrode size and inter-electrode distance on the variation of the magnitude of the current density ( $A/m^2$ ) with depth along a straight radial line (S), whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes ( $cm^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

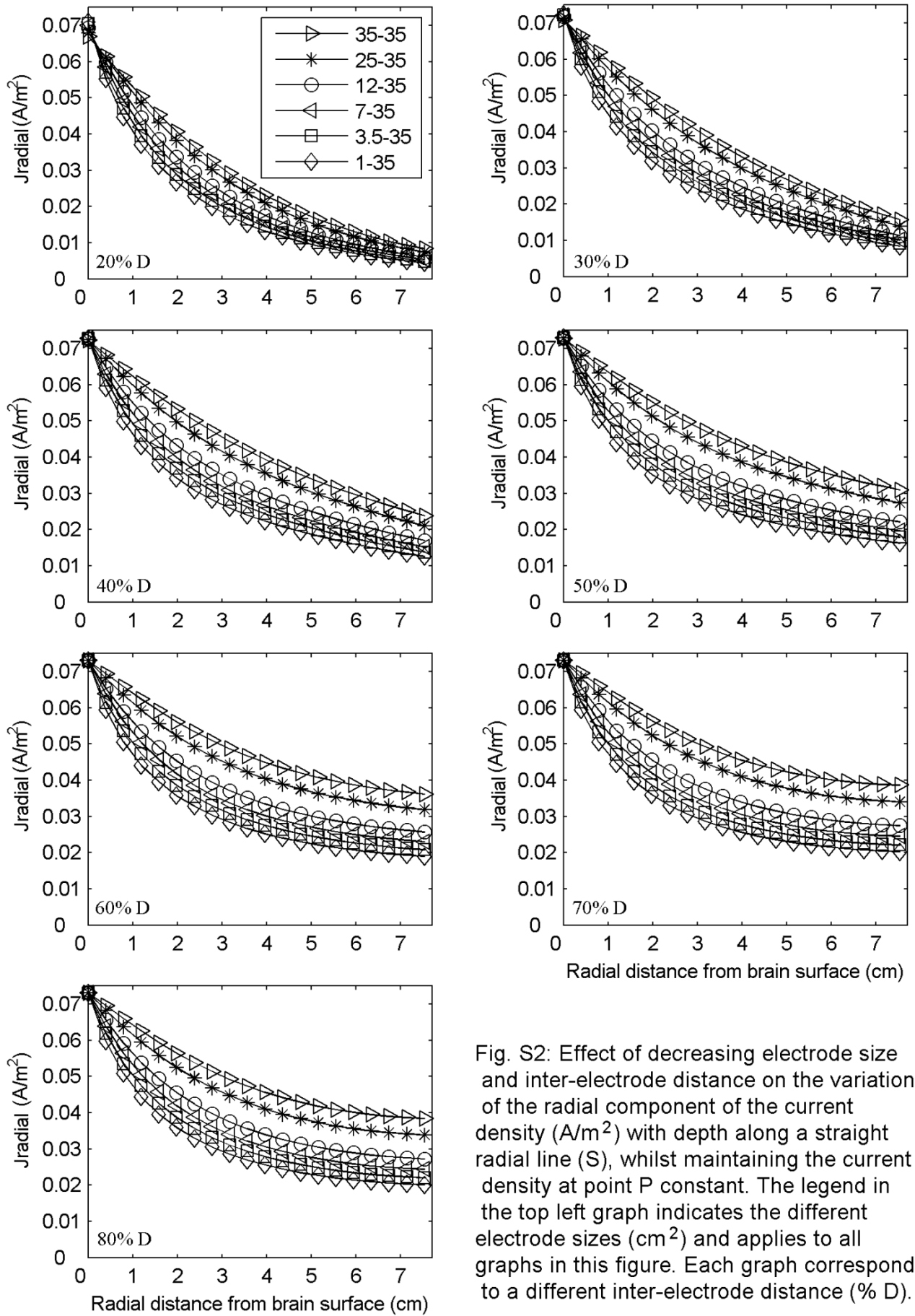


Fig. S2: Effect of decreasing electrode size and inter-electrode distance on the variation of the radial component of the current density ( $\text{A/m}^2$ ) with depth along a straight radial line (S), whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes ( $\text{cm}^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

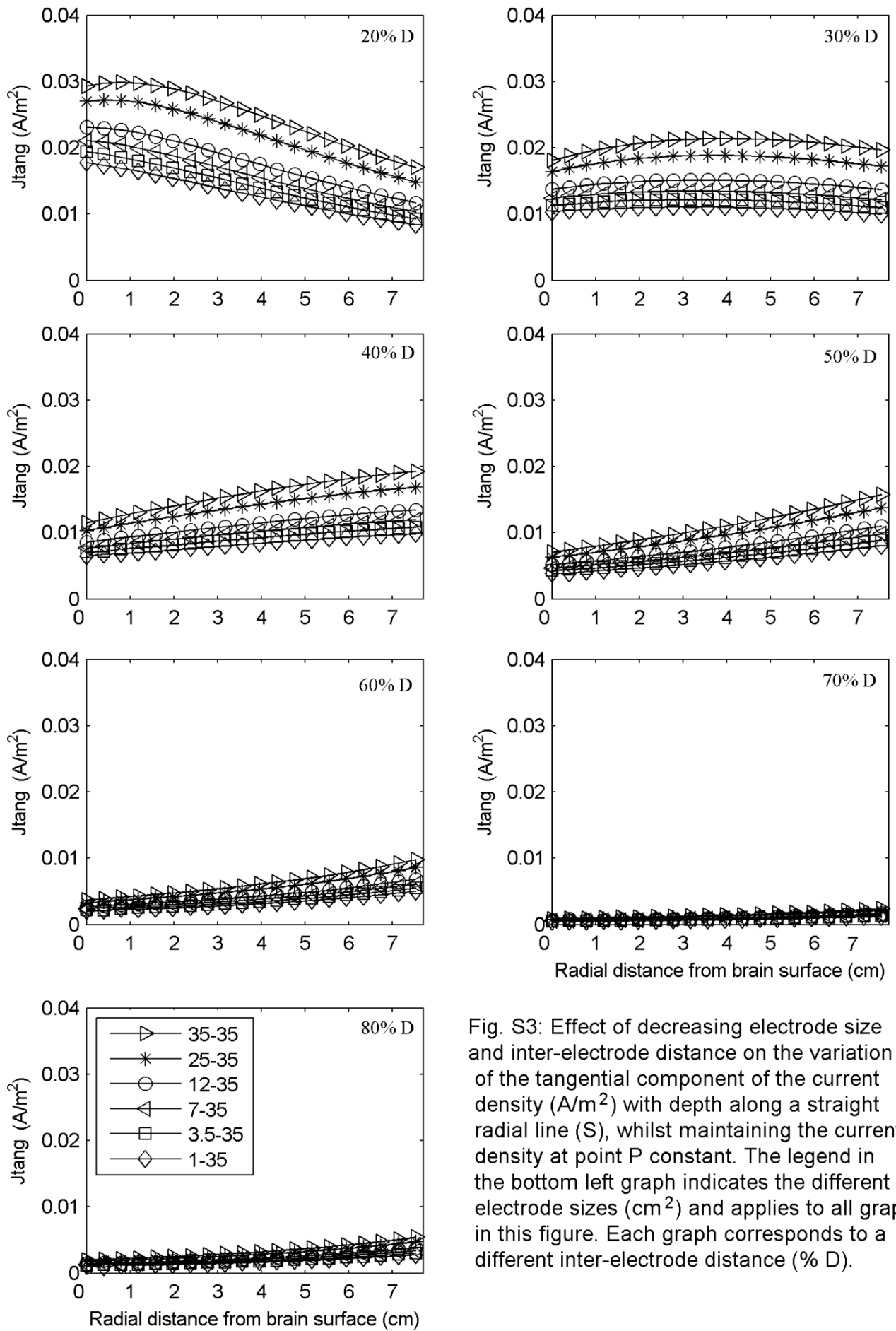


Fig. S3: Effect of decreasing electrode size and inter-electrode distance on the variation of the tangential component of the current density ( $A/m^2$ ) with depth along a straight radial line (S), whilst maintaining the current density at point P constant. The legend in the bottom left graph indicates the different electrode sizes ( $cm^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

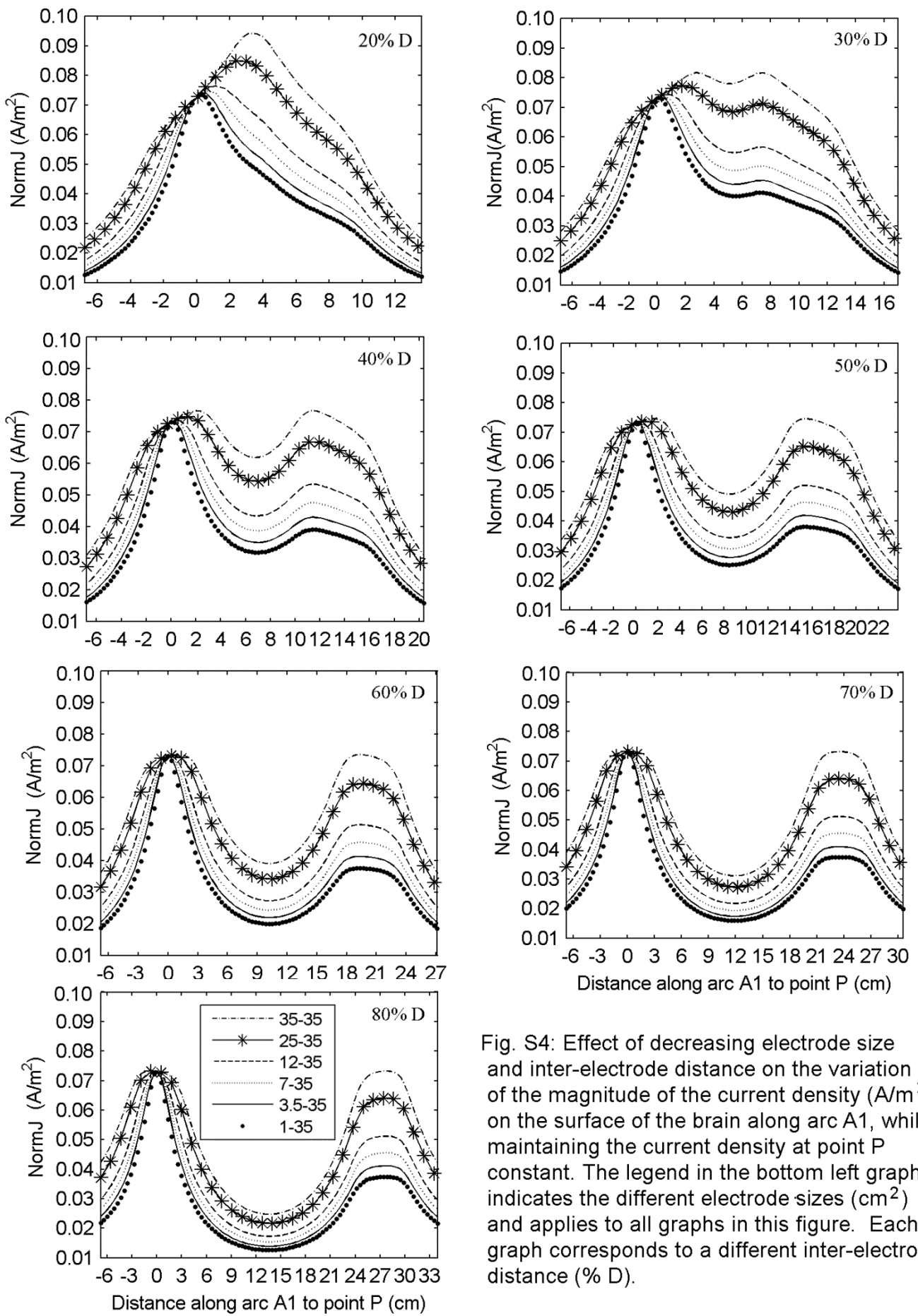


Fig. S4: Effect of decreasing electrode size and inter-electrode distance on the variation of the magnitude of the current density (A/m<sup>2</sup>) on the surface of the brain along arc A1, whilst maintaining the current density at point P constant. The legend in the bottom left graph indicates the different electrode sizes (cm<sup>2</sup>) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

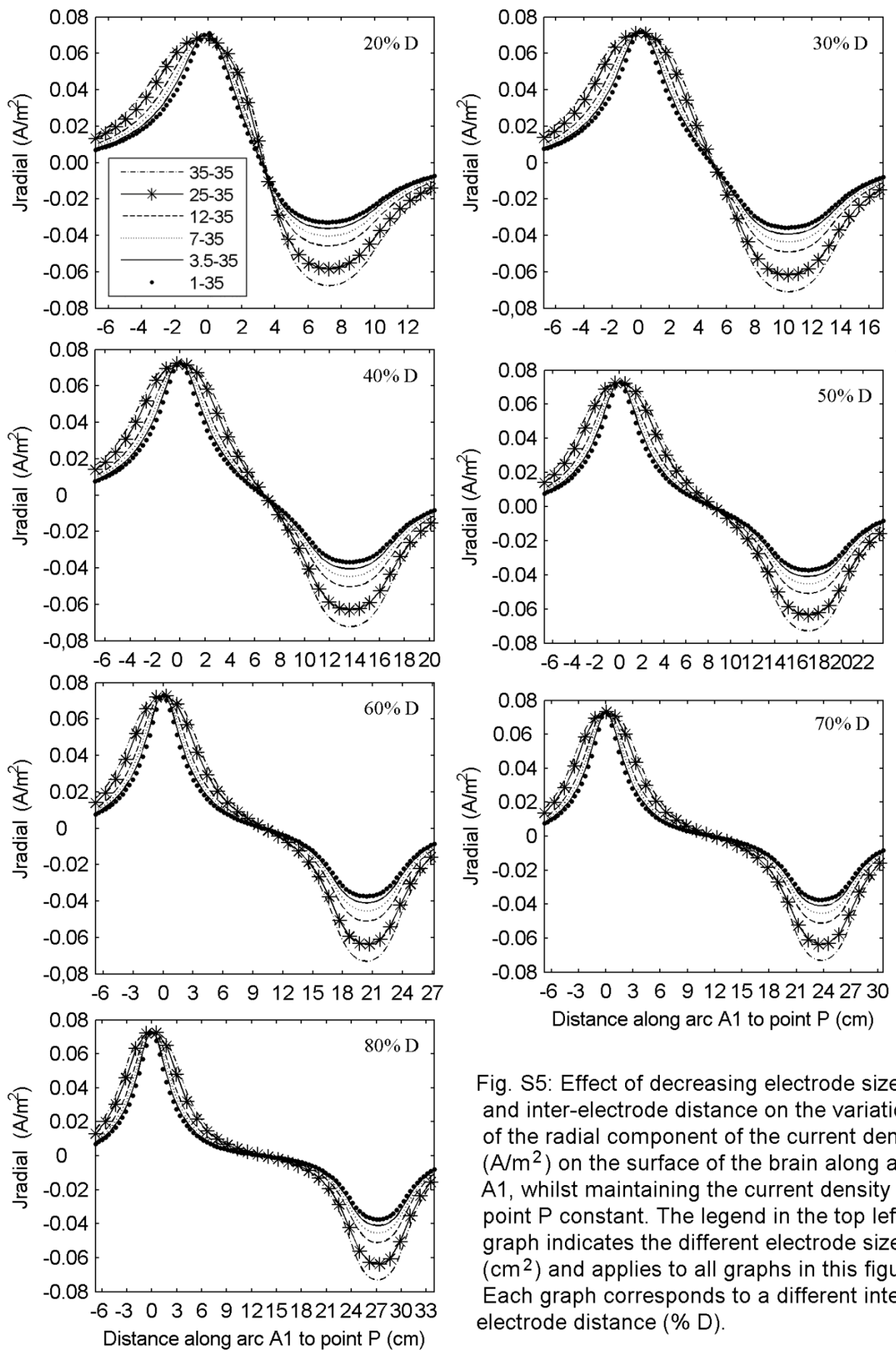


Fig. S5: Effect of decreasing electrode size and inter-electrode distance on the variation of the radial component of the current density ( $A/m^2$ ) on the surface of the brain along arc A1, whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes ( $cm^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

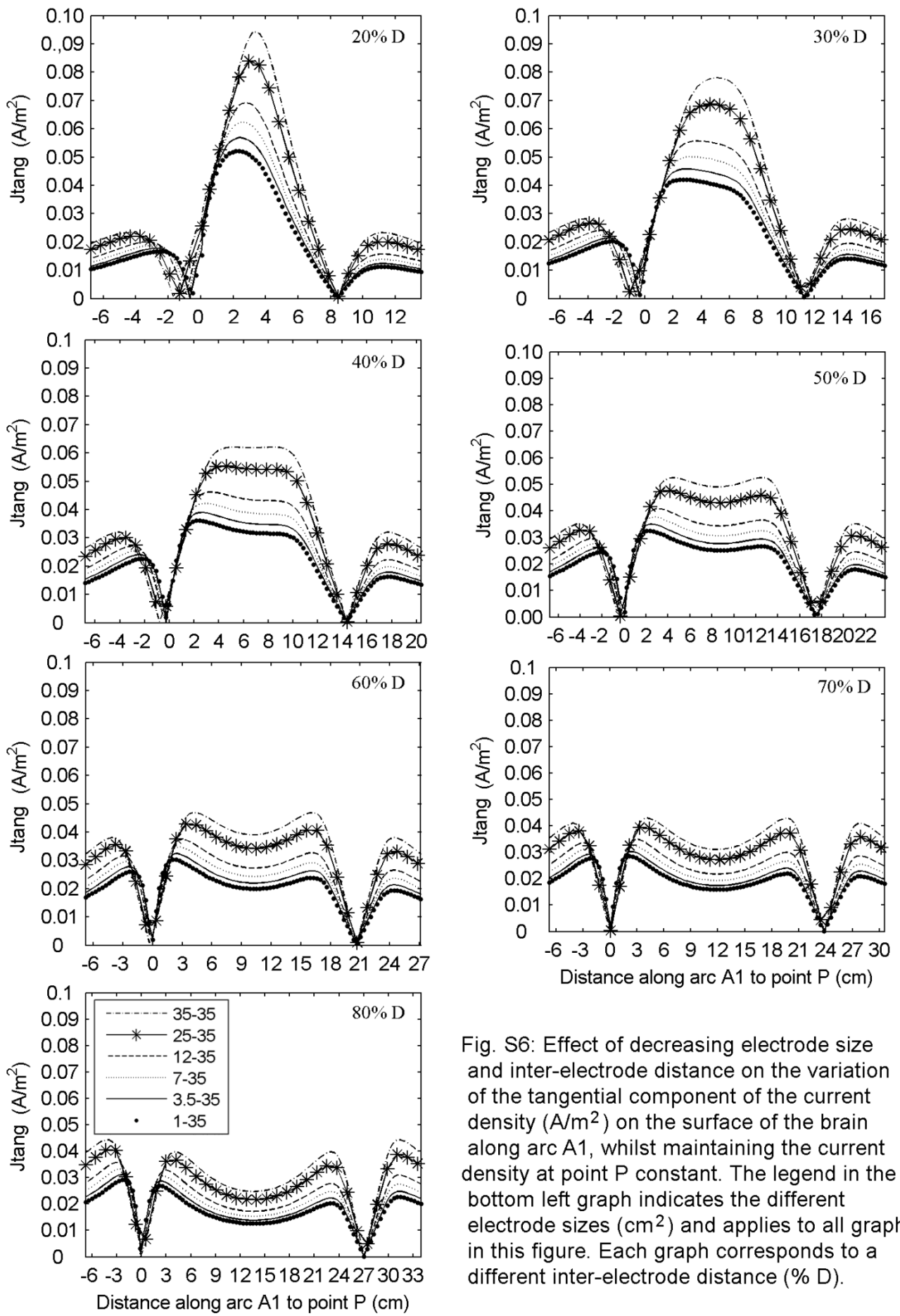


Fig. S6: Effect of decreasing electrode size and inter-electrode distance on the variation of the tangential component of the current density ( $A/m^2$ ) on the surface of the brain along arc A1, whilst maintaining the current density at point P constant. The legend in the bottom left graph indicates the different electrode sizes ( $cm^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

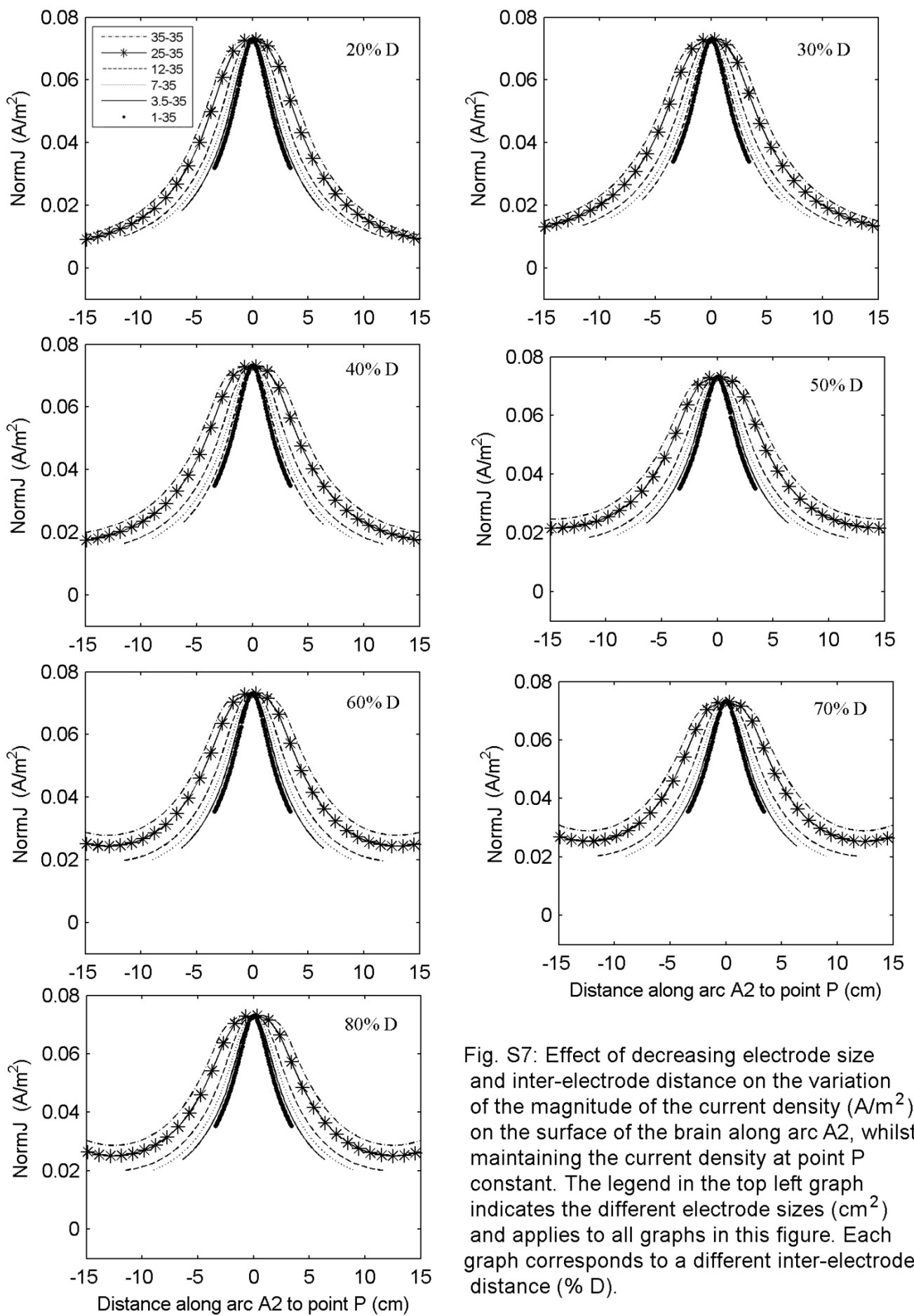


Fig. S7: Effect of decreasing electrode size and inter-electrode distance on the variation of the magnitude of the current density ( $A/m^2$ ) on the surface of the brain along arc A2, whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes ( $cm^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

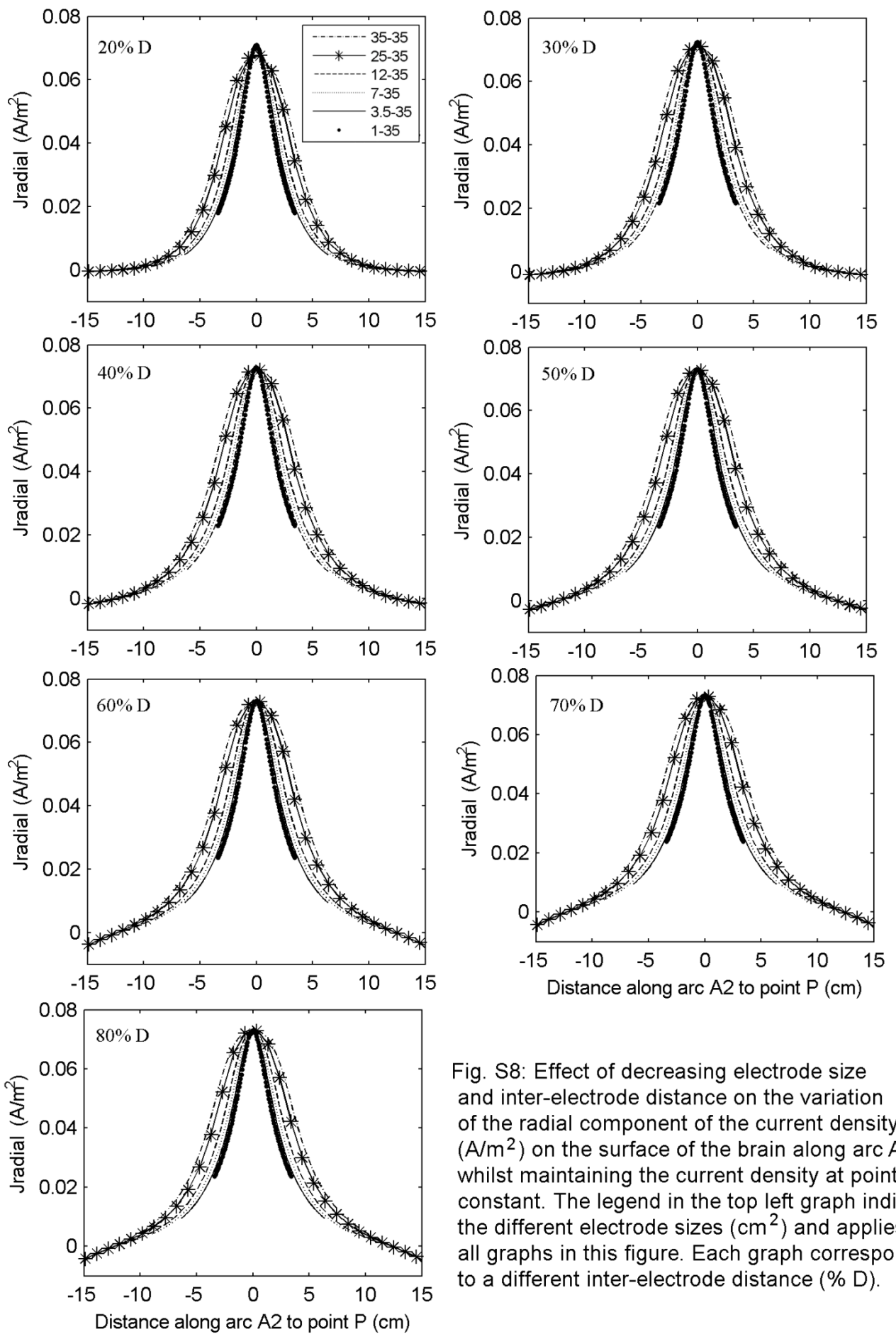


Fig. S8: Effect of decreasing electrode size and inter-electrode distance on the variation of the radial component of the current density ( $\text{A}/\text{m}^2$ ) on the surface of the brain along arc A2, whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes ( $\text{cm}^2$ ) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).



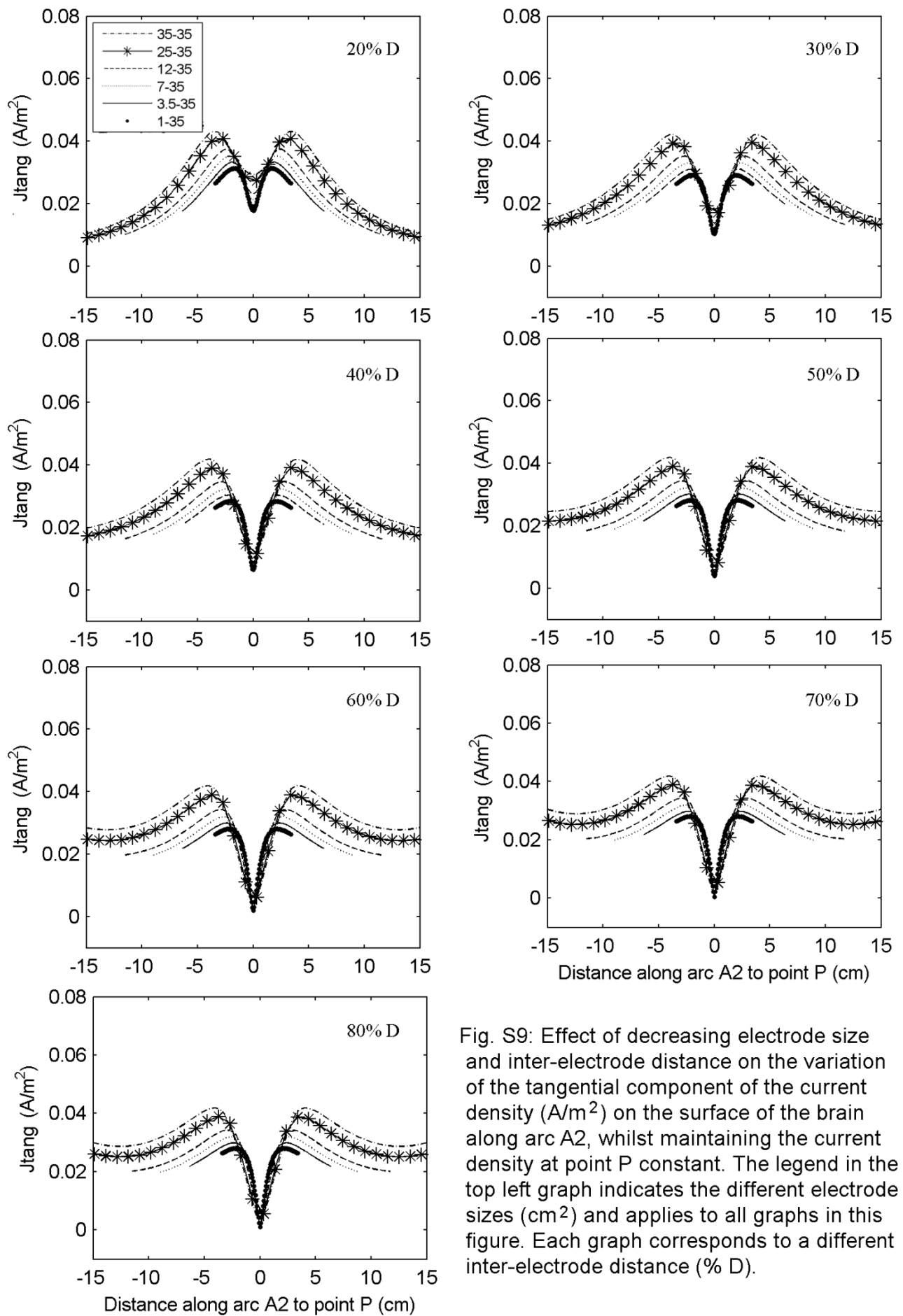


Fig. S9: Effect of decreasing electrode size and inter-electrode distance on the variation of the tangential component of the current density ( $A/m^2$ ) on the surface of the brain along arc A2, whilst maintaining the current density at point P constant. The legend in the top left graph indicates the different electrode sizes (cm<sup>2</sup>) and applies to all graphs in this figure. Each graph corresponds to a different inter-electrode distance (% D).

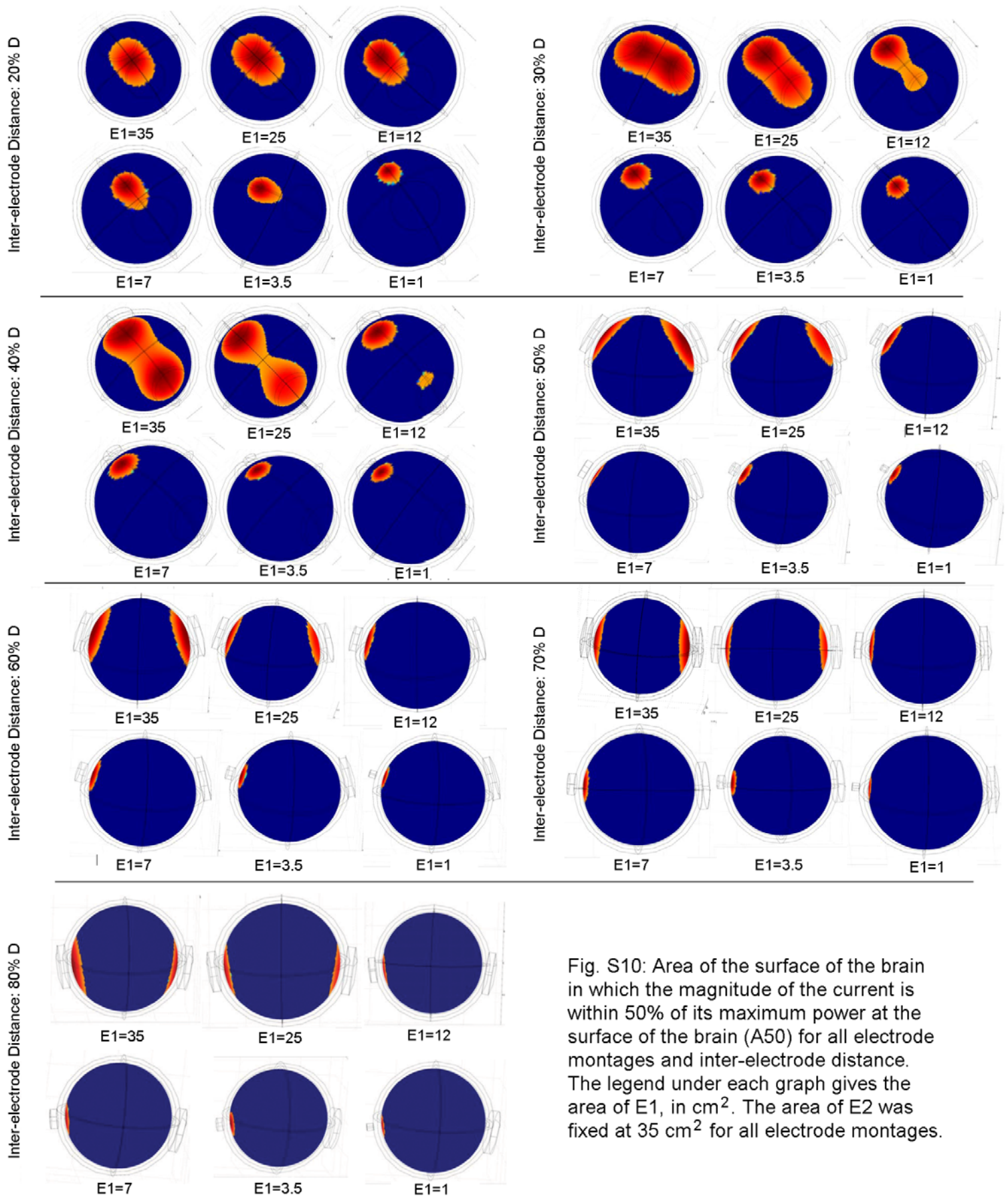


Fig. S10: Area of the surface of the brain in which the magnitude of the current is within 50% of its maximum power at the surface of the brain ( $A_{50}$ ) for all electrode montages and inter-electrode distance. The legend under each graph gives the area of E1, in  $\text{cm}^2$ . The area of E2 was fixed at  $35 \text{ cm}^2$  for all electrode montages.

E1-E2 Area		35-35	25-35	12-35	7-35	3.5-35	1-35
D=20%	Max E1/E2 (A/m <sup>2</sup> )	0.094	0.085	0.077	0.075	0.074	0.074
	Dist from E1 (cm)	3.2	2.8	1.2	0.5	0.5	0.1
	Dist from E2 (cm)	-3.7	-4.1	-5.7	-6.3	-6.3	-6.7
D=30%	Max E1 (A/ m <sup>2</sup> )	0.082	0.077	0.074	0.074	0.073	0.073
	Dist from E1 (cm)	2.7	1.8	0.8	0.3	0.1	0.1
	Max E2 (A/ m <sup>2</sup> )	0.082	0.071	0.057	0.0502	0.045	0.041
	Dist from E2 (cm)	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8
D=40%	Max E1 (A/ m <sup>2</sup> )	0.077	0.075	0.074	0.074	0.073	0.073
	Dist from E1 (cm)	1.9	1.4	0.3	0.3	0.3	0.0
	Max E2 (A/ m <sup>2</sup> )	0.077	0.067	0.053	0.048	0.043	0.039
	Dist from E2 (cm)	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2
D=50%	Max E1 (A/ m <sup>2</sup> )	0.075	0.074	0.073	0.074	0.073	0.073
	Dist from E1 (cm)	1.8	0.8	0.2	0.2	0.2	0.1
	Max E2 (A/ m <sup>2</sup> )	0.075	0.065	0.052	0.046	0.042	0.038
	Dist from E2 (cm)	-2.1	-2.1	-2.1	-2.1	-2.1	-2.1
D=60%	Max E1 (A/ m <sup>2</sup> )	0.074	0.073	0.073	0.073	0.073	0.073
	Dist from E1 (cm)	1.0	0.3	0.1	0.1	0.1	0.1
	Max E2 (A/ m <sup>2</sup> )	0.074	0.064	0.051	0.046	0.041	0.038
	Dist from E2 (cm)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
D=70%	Max E1 (A/ m <sup>2</sup> )	0.073	0.073	0.073	0.073	0.073	0.073
	Dist from E1 (cm)	0.3	0.1	0.1	0.1	0.1	0.1
	Max E2 (A/ m <sup>2</sup> )	0.073	0.064	0.051	0.046	0.041	0.038
	Dist from E2 (cm)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
D=80%	Max E1 (A/ m <sup>2</sup> )	0.073	0.073	0.073	0.073	0.073	0.073
	Dist from E1 (cm)	-0.1	-0.1	-0.1	-0.1	-0.3	-0.7
	Max E2 (A/ m <sup>2</sup> )	0.073	0.064	0.051	0.046	0.041	0.038
	Dist from E2 (cm)	0.8	0.8	0.8	0.8	0.8	0.8

**Table S1:** Values at the maxima of the magnitude of the current density (A/m<sup>2</sup>) for each electrode montage and the displacements of the maxima along A1 from E1 and E2 center positions.

D	20%	30%	40%	50%	60%	70%	80%
E1=1 cm <sup>2</sup>	6.3	5.8	5.7	5.7	5.7	5.7	5.7
E2	0.6	0.6	0.5	0.5	0.5	0.5	0.5
E1=3.5 cm <sup>2</sup>	3.0	2.7	2.7	2.6	2.6	2.6	2.6
E2	0.7	0.6	0.6	0.6	0.6	0.6	0.6
E1=7 cm <sup>2</sup>	2.1	1.9	1.9	1.9	1.9	1.9	1.9
E2	0.8	0.7	0.7	0.6	0.6	0.6	0.6
E1=12 cm <sup>2</sup>	1.8	1.6	1.5	1.5	1.5	1.5	1.5
E2	0.9	0.8	0.7	0.7	0.7	0.7	0.7
E1=25 cm <sup>2</sup>	1.5	1.2	1.2	1.2	1.2	1.2	1.2
E2	1.2	1.0	0.9	0.9	0.9	0.9	0.9
E1=35 cm <sup>2</sup>	1.4	1.1	1.1	1.0	1.0	1.0	1.0
E2	1.4	1.1	1.1	1.0	1.0	1.0	1.0

**Table S2:** Magnitude of the current density (A/m<sup>2</sup>) on the edges of the electrodes in contact with the scalp when the electrodes were 20% to 80% of D apart and the area of E1 ranged from 1 cm<sup>2</sup> to 35 cm<sup>2</sup>. The area of the electrode E2 was fixed at 35 cm<sup>2</sup>.

	20% D		30% D		40% D		50% D		60% D		70% D		80% D	
Inj Current (mA)	0.56		0.53		0.51		0.51		0.51		0.51		0.51	
E1=1 cm <sup>2</sup>	0.29	52%	0.35	66%	0.38	74%	0.40	79%	0.41	81%	0.42	82%	0.42	82%
	0.29	51%	0.35	66%	0.38	74%	0.40	79%	0.41	81%	0.42	82%	0.42	82%
	0.22	39%	0.27	51%	0.30	58%	0.32	63%	0.33	65%	0.34	66%	0.34	66%
Inj Current (mA)	0.62		0.58		0.57		0.56		0.56		0.56		0.56	
E1=3.5 cm <sup>2</sup>	0.32	52%	0.38	66%	0.42	74%	0.44	79%	0.45	81%	0.46	82%	0.46	82%
	0.32	51%	0.38	66%	0.42	74%	0.44	79%	0.45	81%	0.46	82%	0.46	82%
	0.24	38%	0.29	51%	0.33	58%	0.35	63%	0.37	65%	0.37	67%	0.37	66%
Inj Current (mA)	0.70		0.64		0.67		0.62		0.62		0.62		0.62	
E1=7 cm <sup>2</sup>	0.36	51%	0.42	66%	0.46	74%	0.49	79%	0.50	81%	0.51	82%	0.51	82%
	0.34	49%	0.42	66%	0.46	74%	0.49	79%	0.50	81%	0.51	82%	0.51	82%
	0.27	38%	0.33	51%	0.37	58%	0.39	63%	0.40	65%	0.41	66%	0.41	66%
Inj Current (mA)	0.80		0.72		0.70		0.70		0.69		0.69		0.69	
E1=12 cm <sup>2</sup>	0.41	51%	0.48	66%	0.52	74%	0.55	79%	0.56	81%	0.57	82%	0.57	82%
	0.40	50%	0.47	65%	0.52	74%	0.55	78%	0.56	81%	0.57	82%	0.57	82%
	0.30	38%	0.37	51%	0.41	58%	0.44	63%	0.45	65%	0.46	66%	0.46	66%
Inj Current (mA)	1.05		0.91		0.88		0.87		0.87		0.87		0.87	
E1= 25 cm <sup>2</sup>	0.51	49%	0.60	65%	0.65	74%	0.69	79%	0.70	71%	0.71	82%	0.71	82%
	0.50	48%	0.59	65%	0.65	73%	0.68	78%	0.70	81%	0.71	82%	0.71	82%
	0.38	36%	0.46	50%	0.51	58%	0.55	63%	0.57	65%	0.57	66%	0.57	66%
Inj Current (mA)	1.24		1.05		1.01		1.00		0.99		0.99		0.99	
E1= 35 cm <sup>2</sup>	0.58	47%	0.68	64%	0.74	73%	0.78	78%	0.80	81%	0.81	82%	0.81	82%
	0.58	46%	0.67	64%	0.74	73%	0.78	78%	0.80	81%	0.81	82%	0.81	82%
	0.43	35%	0.52	49%	0.58	58%	0.62	62%	0.65	65%	0.66	66%	0.65	66%

**Table S3:** Injected current as a function of inter-electrode distance (main columns) and E1 area (main rows). For a given inter-electrode distance and E1 area the left and the right columns give the current and the percentage of the injected current that entered the skull (first line), CSF (second line) and the brain (third line). The area of the electrode E2 was fixed at 35 cm<sup>2</sup>.