

Supplementary material

Supplementary Table S1: X, Y, and Z-coordinates of 51 channel UNIC head coil loop position across the brain surface

Coil number	X (m)	Y (m)	Z (m)
Coil 1	0.04	0	0.1
Coil 2	-0.04	0	0.1
Coil 3	-0.098	-0.005	0.05
Coil 4	-0.068	0.051	0.07
Coil 5	0.068	0.051	0.07
Coil 6	0.098	-0.005	0.05
Coil 7	-0.089	0.063	0.016
Coil 8	-0.034	0.098	0.036
Coil 9	0.034	0.098	0.036
Coil 10	0.089	0.063	0.016
Coil 11	0	-0.07	-0.11
Coil 12	0	-0.021	-0.118
Coil 13	0	0.044	-0.112
Coil 14	0	0.096	-0.072
Coil 15	0	0.12	-0.01
Coil 16	-0.062	0.098	-0.03
Coil 17	-0.057	0.06	-0.087
Coil 18	-0.061	0.01	-0.103
Coil 19	-0.056	-0.05	-0.106
Coil 20	0.062	0.098	-0.03
Coil 21	0.057	0.06	-0.087
Coil 22	0.061	0.01	-0.103
Coil 23	0.056	-0.05	-0.106
Coil 24	-0.089	-0.024	-0.071
Coil 25	-0.08	0.045	-0.049
Coil 26	0.089	-0.024	-0.071
Coil 27	0.08	0.045	-0.049
Coil 28	0.02	0.047	0.109
Coil 29	-0.02	0.047	0.109
Coil 30	0.02	0.075	0.092
Coil 31	-0.02	0.075	0.092
Coil 32	0.02	0.097	0.068
Coil 33	-0.02	0.097	0.068

Coil 34	0.02	0.112	0.039
Coil 35	-0.02	0.112	0.039
Coil 36	-0.109	-0.04	0.015
Coil 37	-0.109	-0.01	0.015
Coil 38	-0.109	0.02	0.015
Coil 39	-0.102	0.048	0.014
Coil 40	-0.109	-0.04	-0.015
Coil 41	-0.109	-0.01	-0.015
Coil 42	-0.109	0.02	-0.015
Coil 43	-0.102	0.048	-0.014
Coil 44	0.109	-0.04	0.015
Coil 45	0.109	-0.01	0.015
Coil 46	0.109	0.02	0.015
Coil 47	0.102	0.048	0.014
Coil 48	0.109	-0.04	-0.015
Coil 49	0.109	-0.01	-0.015
Coil 50	0.109	0.02	-0.015
Coil 51	0.102	0.048	-0.014

Supplementary Table S2: Absolute mean and maximum current used in UNIC 51 channel head coils across twenty-four subjects.

Absolute mean (Amperes)	Max (Amperes)
0.41	2.31

Supplementary Table S3: Coil currents in each 51 channel UNIC head coils in three representative subjects

Coil current	Subject 1	Subject 2	Subject 3
Coil 1	-0.7394	-0.5662	-1.0458
Coil 2	-0.7494	-0.607	-0.8513
Coil 3	0.34509	-0.147	0.71077
Coil 4	-0.2209	-0.3687	0.0002
Coil 5	-0.2502	-0.2137	-0.07
Coil 6	0.2104	0.14722	0.83482
Coil 7	0.59142	0.4133	0.57737
Coil 8	0.06936	-0.0552	-0.0059
Coil 9	0.05847	-0.0472	0.03864
Coil 10	0.56465	0.40626	0.67413
Coil 11	0.01738	0.18101	0.02572

Coil 12	0.02616	0.14609	-0.0115
Coil 13	-0.0393	0.07656	-0.0347
Coil 14	0.05044	0.10302	0.04424
Coil 15	0.08522	0.04603	0.08379
Coil 16	0.15555	0.13871	0.07474
Coil 17	0.00329	0.04299	-0.0594
Coil 18	-0.0334	0.05341	-0.0955
Coil 19	-0.037	0.00416	0.03387
Coil 20	0.14319	0.10475	0.05357
Coil 21	0.02507	0.06174	0.00392
Coil 22	-0.0171	0.08419	-0.0087
Coil 23	-0.0296	0.04916	0.09768
Coil 24	-0.0335	0.02244	-0.1069
Coil 25	0.00067	0.01359	0.00507
Coil 26	-0.0192	-0.0265	-0.0432
Coil 27	0.00044	0.00829	0.00283
Coil 28	-0.1803	-0.2495	-0.4591
Coil 29	-0.3829	-0.177	-0.5517
Coil 30	-0.2902	-0.1341	-0.3369
Coil 31	-0.1865	-0.1635	-0.2894
Coil 32	-0.0093	-0.0588	-0.103
Coil 33	-0.1005	-0.0526	-0.1423
Coil 34	-0.0947	-0.0111	-0.0565
Coil 35	-0.0707	-0.029	0.0117
Coil 36	0.21596	-0.9395	-0.447
Coil 37	1.21245	1.32372	0.94338
Coil 38	0.67865	0.66394	0.26424
Coil 39	0.62409	0.31509	0.32838
Coil 40	1.20568	2.1337	1.68959
Coil 41	-0.1351	-0.2604	-0.2207
Coil 42	0.1308	0.21302	0.50056
Coil 43	-0.0387	0.14187	-0.0199
Coil 44	0.45667	-1.4838	-0.4372
Coil 45	1.09762	1.05078	1.21283
Coil 46	0.89135	0.60793	0.43705
Coil 47	0.65593	0.18239	0.39752
Coil 48	1.13982	2.68984	1.77637
Coil 49	-0.1187	-0.4153	-0.6145
Coil 50	0.06073	0.3007	0.45866
Coil 51	-0.0333	0.09149	-0.2373

Supplementary Table S4: P-values for figure 2 showing the comparison of standard deviation of the frequency for 24 subjects in global shimming of the whole brain.

B0 field shimming	2nd order SH	iPRES 32-ch	3rd order SH	4th order SH	5th order SH
iPRES 32-ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	P=0.02	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	p<0.001	-
UNIC 51-ch	p<0.001	p<0.001	p<0.001	p<0.001	1

Supplementary Table S5: P-values for figure 3 showing the comparison of brain coverage for MRSI at spatial resolutions (a) 1.44 cc and (b) 0.09 cc.

B0 field shimming	2nd order SH	iPRES 32-ch	3rd order SH	4th order SH	5th order SH
(a) 1.44 cc					
iPRES 32-ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	p<0.001	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	p<0.001	-
UNIC 51-ch	p<0.001	p<0.001	p<0.001	0.448	0.679
(b) 0.09 cc					
iPRES 32-ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	p<0.001	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	p<0.001	-
UNIC 51-ch	p<0.001	p<0.001	p<0.001	0.004	0.02

Supplementary Table S6: P-values for figure 4 (a,d) showing the comparison of brain coverage in prefrontal cortex (PFC) for MRSI at spatial resolutions (a) 1.44 cc and (b) 0.09 cc.

B0 field shimming	2nd order SH	iPRES 32-ch	3rd order SH	4th order SH	5th order SH
(a) 1.44 cc					
iPRES 32-ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	p<0.001	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	0.111	-
UNIC 51-ch	p<0.001	p<0.001	0.036	1	p<0.001
(b) 0.09cc					
iPRES 32-ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	p<0.001	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	0.039	-
UNIC 51-ch	p<0.001	p<0.001	p<0.001	1	0.199

Supplementary Table S7: P-values for figure 4 (b,e) showing the comparison of brain coverage in medial temporal lobe (MTL) + temporal pole for MRSI at spatial resolutions (a) 1.44 cc and (b) 0.09 cc.

B0 field shimming	2nd order SH	iPRES 32-ch	3rd order SH	4th order SH	5th order SH
(a) 1.44 cc					
iPRES 32- ch	0.001	-	-	-	-
3rd order SH	0.593	1	-	-	-
4th order SH	p<0.001	0.002	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	p<0.001	-
UNIC 51- ch	p<0.001	p<0.001	p<0.001	p<0.001	0.035
(b) 0.09cc					
iPRES 32- ch	p<0.001	-	-	-	-
3rd order SH	p<0.001	1	-	-	-
4th order SH	p<0.001	p<0.001	p<0.001	-	-
5th order SH	p<0.001	p<0.001	p<0.001	p<0.001	-
UNIC 51- ch	p<0.001	p<0.001	p<0.001	p<0.001	1