Supplementary Table S1: details of standard protocols parameters and sequences

Sequences	**Duration sec [sec]**	**TE [ms]**	**TR [ms]**	**SAR [ms]**	**Thickness [mm]**	**FOV [mm]**	**AI reduction**	**Gradient [dB/dt]**
NEUROVASCULAR								
DWI	136	76	6180	1.3	2	230	NA	104.3
3D T1 TFE	152	3.7	8.1	0.2	1	240	NA	59.5
3D TOF	260	3.5	20	2.8	1.3	200	NA	106.1
SWI	58	7	30	0.3	2	235	NA	61.3
T2 TSE CORO	134	80	6092	3.2	2.5	210	NA	82.4
3D T2 FLAIR	216	330	8000	0.3	1.2	240	NA	114.5
SUPRA TRUNKS								
3D SAT	89	1.97	5.3	1.8	1.1	320	NA	99.4
bolus trak	164	1.26	4.3	1.6	30	450	NA	NA
3D SAT	89	1.97	5.3	1.8	1.1	320	NA	99.4
MULTIPLE SCLEROSIS								
DWI	136	76	6180	1.3	2	230	NA	104.3
3D T1 TFE	188	3.7	8.2	0.2	1	250	NA	59.5
3D SWI ISO	274	9	30	0.3	0.8	230	NA	109.6
T2 DUAL	160	16	3192	3.2	3.5	225	NA	40.9
3D T2 FLAIR	288	318	8000	0.3	1	240	NA	113.8
BRAIN TUMOR								
DWI	136	76	6180	1.3	2	230	NA	104.3
3D T1 TSE FS	220	25	450	0.9	1	240	NA	106.1
3D SWI ISO	135	7	31	0.3	2	250	NA	65.7
T2 TSE CORO	125	105	7794	3.2	3	230	NA	78.5
PERF	208	35	2000	1	4.5	256	NA	99
3D T2 FLAIR	256	342	8000	0.3	1	240	NA	113.6
3D T1 TSE FS GADO	220	25	450	0.9	1	240	NA	106.1
NEURODEGENERATIVE								
DWI	136	76	6180	1.3	2	230	NA	104.3
T2 TSE AX	139	90	5809	3.2	3	230	NA	72.5

3D T2 FLAIR	272	342	8000	0.3	1	240	NA	114.4
3D T1 TFE	173	3.7	8.1	0.2	1	240	NA	60.1
SWI	187	9	33	0.2	0.5	235	NA	62.8
3D TOF	165	3.5	18	3.2	1.3	200	NA	105.6
3D T2 TSE	272	325	2775	0.3	0.7	240	NA	66
T2 TSE CORO HIPPO	223	115	5712	2.4	2	200	NA	63
EPILEPSY								
DWI	136	76	6180	1.3	2	230	NA	104.3
3D T2 FLAIR	272	342	8000	0.3	1	240	NA	114.4
3D T1 TFE	236	3.7	8.1	0.2	1	240	NA	60.1
SWI	210	7	31	0.3	2	250	NA	59.3
T2 TSE CORONAL	267	126	11135	3.2	2	230	NA	80.2
3D DUAL IR	237	288	5500	0.5	1.2	250	NA	92
3D T1 TSE FS	238	28	600	0.4	1	256	NA	55.9
PITUITARY GLAND								
3D T1 TSE FS	213	15	450	1.1	0.7	100	NA	102.1
3D T2	282	335	3000	0.4	0.65	150	NA	68.7
3D T1 TSE FS GADO	213	15	450	1.1	0.7	100	NA	102.1
KNEES								
3D DP FS	255	118	9000	0.5	0.7	200	NA	109.3
DP DIXON SAG	165	30	2500	2.4	3	170	NA	48.8
LUMBAR SPINE								
T2 DIXON SAG	185	80	2500	2.6	4	160	NA	45.5
3D T2 TSE SAG	253	162	1200	1.2	0.9	180	NA	120.3
T2 STIR	192	80	3771	2.7	4	450	NA	40.8
SPINAL CORD								
STIR TSE SAG UPPER	193	70	3108	2.7	3	270	NA	43.6
STIR TSE SAG BOTTOM	193	70	3108	2.7	3	270	NA	46.6
T1 TSE DIXON SAG UPPER	233	10	533	3.2	3	160	NA	42.5
T1 TSE DIXON SAG BOTTOM	233	10	533	3.2	3	160	NA	42.5
AX T2 TSE	177	100	5199	2.7	4	200	NA	42.5

AX: Axial orientation, CORO: Coronal orientation, DWI: Diffusion-Weighted magnetic resonance imaging, FLAIR: Fluid Attenuated Inversion Recovery, FS: Fat suppression, HIPPO: Hippocampus, IR: Inversion recovery, ISO: Isotropic, MB: Multi-Band, PERF: Perfusion, SAG: Sagittal orientation, SAT: Supra-aortic trunks,

STIR: Short-TI Inversion Recovery, SWI: Susceptibility Weighted Imaging, TFE: Turbo Field Echo, TOF: Time Of Flight magnetic resonance angiography, TSE: Turbo Spin Echo

Supplementary Table S2: details of optimized protocols parameters and sequences

Sequences	**Duration [sec]**	**TE [ms]**	**TR [ms]**	**SAR [ms]**	**Thickness [mm]**	**FOV [mm]**	**AI reduction**	**Gradient [dB/dt]**
NEUROVASCULAR								
DWI MB	64	72	5430	2.1	2	230	NA	67.7
3D T1 TFE	116	3.7	8.1	0.2	1	240	5.5	59.5
3D TOF	126	3.5	20	2.8	1.3	200	4.5	105.7
SWI	49	7	30	0.3	2	235	9.5	61.3
T2 TSE CORO	98	80	6092	3.2	2.5	210	3.5	83.7
3D T2 FLAIR	168	330	8000	0.3	1.2	240	8	114.5
MULTIPLE SCLEROSIS								
DWI MB	64	72	5430	2.1	2	230	NA	67.7
3D T1 TFE	134	3.7	8,2	0.2	1	250	4.3	59.5
3D SWI ISO	238	9	30	0.3	0.8	230	7.5	109.6
T2 DUAL	109	16	3192	3.2	3.5	225	3	40.7
3D T2 FLAIR	224	318	8000	0.3	1	240	8	113.8
BRAIN TUMOR								
DWI MB	64	72	5430	2.1	2	230	NA	67.7
3D T1 TSE FS	169	25	450	0.9	1	240	6.5	106.1
3D SWI ISO	117	7	31	0.3	2	250	7.5	65.7
T2 TSE CORO	94	105	7794	3.2	3	230	3.5	78.7
PERF	208	35	2000	1	4.5	256	NA	99
3D T2 FLAIR	200	342	8000	0.3	1	240	8	113,6
3D T1 TSE FS GADO	169	25	450	0.9	1	240	6.5	106,1
NEURODEGENERATIVE								
DWI MB	64	72	5430	2.1	2	230	NA	67,7
T2 TSE AX	93	90	5809	3.2	3	230	3.5	90,3
3D T2 FLAIR	208	342	8000	0.3	1	240	8	114,4
3D T1 TFE	131	3.7	8,1	0.2	1	240	5.5	60,1
SWI	158	9	33	0,2	0.5	235	9.5	62,8
3D TOF	111	3.5	18	3.2	1.3	200	4.5	105,6
3D T2 TSE	214	325	2775	0.3	0.7	240	7	66
T2 TSE CORO hippo	171	115	5712	2.4	2	200	2	60,1

EPILEPSY								
DWI MB	64	72	5430	2.1	2	230	NA	67,7
3D T2 FLAIR	208	342	8000	0.3	1	240	8	114,4
3D T1 TFE	179	3.7	8,1	0.2	1	240	4	60,1
SWI	176	7	31	0.3	2	250	6	59,3
T2 TSE CORONAL	178	126	11135	3.2	2	230	2.8	93,4
3D DUAL IR	204	288	5500	0.5	1.2	250	8	92
3D T1 TSE FS	191	28	600	0.4	1	256	7.5	55,9
PITUITARY GLAND								
3D T1 TSE FS	160	15	450	1.1	0.7	100	4	102,1
3D T2	228	335	3000	0.4	0.65	150	3.5	68,7
3D T1 TSE FS GADO	160	15	450	1.1	0.7	100	4	102,1
KNEES								
3D DP FS	179	118	9000	0.5	0.7	200	10	109.3
DP DIXON SAG	125	30	2500	2.4	3	170	3	45.7
LUMBAR SPINE								
T2 DIXON SAG	85	80	2500	2.6	4	160	3	43,6
3D T2 TSE SAG	204	162	1200	1.2	0.9	180	9	122.6
T2 STIR	147	80	3771	2.7	4	450	3.5	40.9
SPINAL CORD								
STIR TSE SAG UPPER	106	70	3108	2.7	3	270	1.8	43.6
STIR TSE SAG BOTTOM	106	70	3108	2.7	3	270	1.8	46.6
T1 TSE DIXON SAG UPPER	132	10	533	3.2	3	160	1.8	42.5
T1 TSE DIXON SAG BOTTOM	132	10	533	3.2	3	160	1.8	42.5
AX T2 TSE	104	100	5199	2.7	4	200	2.8	42.5

AX: Axial orientation, CORO: Coronal orientation, DWI: Diffusion-Weighted magnetic resonance imaging, FLAIR: Fluid Attenuated Inversion Recovery, FS: Fat suppression, HIPPO: Hippocampus, IR: Inversion recovery, ISO: Isotropic, MB: Multi-Band, PERF: Perfusion, SAG: Sagittal orientation, SAT: Supra-aortic trunks, STIR: Short-TI Inversion Recovery, SWI: Susceptibility Weighted Imaging, TFE: Turbo Field Echo, TOF: Time Of Flight magnetic resonance angiography, TSE: Turbo Spin Echo

Supplementary Table S3: details of energy consumption parameters for standard protocols

Sequences	**Active power [kW]**	**Standard deviation [%]**	**Median power [kW]**	**Min [kW]**	**Max [kW]**	**Time adjusted Consumption [kW/protocol]**
NEUROVASCULAR						
DWI	88.01	0.88	88.04	86.906	88.821	3.32
3D T1 TFE	25.07	12.50	26.50	21.482	27.244	1.06
3D TOF	34.34	1.00	34.23	34.068	34.824	2.48
SWI	33.92	0	33.92	33.92	33.92	0.55
T2 TSE	28.96	0.06	28.96	28.95	28.976	1.08
3D T2 FLAIR	21.59	1.74	21.41	21.389	22.151	1.30
SUPRA TRUNKS						
3D SAT	22.99	20.00	21.37	21.278	34.375	2.18
MULTIPLE SCLEROSIS						
DWI	88.01	0.88	88.04	86.906	88.821	3.32
3D T1 TFE	25.44	14.02	27.36	21.321	27.624	1.33
3D SWI ISO	34.32	2.01	34.45	33.494	35.301	2.61
T2 DUAL	29.04	0.36	29.09	28.915	29.103	1.29
3D T2 FLAIR	26.14	25.24	21.34	21.325	33.957	2.09
BRAIN TUMOR						
DWI	88.01	0.88	88.04	86.906	88.821	3.32
3D T1 TSE FS	25.63	2.12	25.76	24.86	26.129	1.57
3D SWI ISO	35.23	0.23	35.23	35.173	35.288	1.32
T2 TSE CORO	28.76	22.84	32.30	21.184	32.804	1.00
PERF	53.17	0.10	53.18	53.108	53.21	3.07
3D T2 FLAIR	26.47	38.91	21.33	21.3	41.918	1.88
3D T1 TSE FS GADO	26.34	2.71	26.23	25.707	27.193	1.61
NEURODEGENERATIVE						
DWI	88.01	0.88	88.04	86.906	88.821	3.32
T2 TSE AX	27.68	19.71	30.45	21.399	31.205	1.07
3D T2 FLAIR	21.57	1.98	21.40	21.341	22.338	1.63
3D T1 TFE	22.95	12.14	21.36	21.328	26.169	1.10
SWI	37.75	2.18	38.20	36.794	38.245	1.96
3D TOF	38.08	1.75	38.02	37.455	38.779	1.75
3D T2 TSE	31.34	43.46	21.44	21.399	47.609	2.37
T2 TSE CORO HIPPO	29.50	1.53	29.47	29.103	29.954	1.83
EPILEPSY						
DWI	88.01	0.88	88.04	86.906	88.821	3.32
3D T2 FLAIR	21.40	0.34	21.36	21.333	21.51	1.62
3D T1 TFE	24.14	8.35	23.97	22.233	26.389	1.58
SWI	38.62	1.96	38.95	37.752	39.148	2.25
T2 TSE CORO	38.01	1.61	37.88	37.408	38.853	2.82

3D DUAL IR	23.23	13.39	21.83	21.393	27.857	1.53
3D T1 TSE FS	23.36	4.51	23.50	21.654	24.515	1.54
PITUITARY GLAND						
3D T1 TSE FS	25.91	11.98	26.70	21.485	28.751	1.53
3DT2	32.01	42.98	23.13	21.36	47.406	2.51
3D T1 TSE FS GADO	25.51	10.36	26.73	21.552	27.028	1.51
KNEES						
3D DP FS	26.16	3.88	26.53	24.922	27.181	1.85
DP DIXON SAG	34.21	0.28	34.24	34.101	34.283	1.57
LUMBAR SPINE						
T2 DIXON SAG	29.93	1.61	29.84	29.411	30.735	1.54
3D T2 TSE SAG	25.95	3.43	25.93	24.559	27.336	1.82
T2 STIR	28.83	0.67	28.80	28.632	29.072	1.54
SPINAL CORD						
STIR TSE SAG UPPER	27.32	14.74	28.84	21.455	30.136	1.46
STIR TSE SAG BOTTOM	27.19	14.55	28.69	21.447	29.915	1.46
T1 TSE DIXON UPPER	30.52	0.52	30.53	30.368	30.669	1.98
T1 TSE DIXON BOTTOM	30.50	0.50	30.51	30.312	30.661	1.97
AX T2 TSE	27.77	0.13	27.79	27.731	27.8	1.37

AX: Axial orientation, CORO: Coronal orientation, DWI: Diffusion-Weighted magnetic resonance imaging, FLAIR: Fluid Attenuated Inversion Recovery, FS: Fat suppression, HIPPO: Hippocampus, IR: Inversion recovery, ISO: Isotropic, MB: Multi-Band, PERF: Perfusion, SAG: Sagittal orientation, SAT: Supra-aortic trunks, STIR: Short-TI Inversion Recovery, SWI: Susceptibility Weighted Imaging, TFE: Turbo Field Echo, TOF: Time Of Flight magnetic resonance angiography, TSE: Turbo Spin Echo

Supplementary Table S4: details of energy consumption parameters for optimized protocols

Sequences	**Active power [kW]**	**Standard deviation [%]**	**Median power [kW]**	**Min [kW]**	**Max [kW]**	**Time adjusted Consumption [kW/protocol]**
NEUROVASCULAR						
DWI MB	88.96	1.52	88.94	86.961	90.697	1.58
3D T1 TFE	25.02	5.69	25.02	24.012	26.027	0.81
3D TOF	37.37	0.89	37.31	37.079	37.733	1.31
SWI	27.97	0	27.97	27.971	27.971	0.38
T2 TSE CORO	25.27	19.95	25.27	21.705	28.835	0.69
3D T2 FLAIR	21.86	2.06	22.08	21.338	22.151	1.02
MULTIPLE SCLEROSIS						
DWI MB	88.96	1.52	88.94	86.961	90.697	1.58
3D T1 TFE	27.49	3.67	27.49	26.779	28.207	1.02
3D SWI ISO	34.33	2.19	34.22	33.527	35.345	2.27
T2 DUAL	28.56	0.36	28.56	28.489	28.636	0.86

3D T2 FLAIR	26.40	28.05	23.66	21.272	37.011	1.64
BRAIN TUMOR						
DWI MB	88.96	1.52	88.94	86.961	90.697	1.58
3D T1 TSE FS	25.92	1.70	25.72	25.611	26.425	1.22
3D SWI ISO	35.62	2.40	35.62	35.013	36.222	1.16
T2 TSE CORO	26.89	28.87	26.89	21.4	32.379	0.70
3D T2 FLAIR	21.98	2.57	22.28	21.327	22.334	1.22
3D T1 TSE FS GADO	25.91	1.65	25.70	25.63	26.401	1.22
NEURODEGENERATIVE						
DWI MB	88.96	1.52	88.94	86.961	90.697	1.58
T2 TSE AX	26.07	24.95	26.07	21.472	30.673	0.67
3D T2 FLAIR	28.20	28.23	27.65	21.336	36.169	1.63
3D T1 TFE	26.81	4.28	26.81	26.001	27.624	0.98
SWI	37.91	2.32	38.23	36.915	38.581	1.66
3D TOF	32.59	29.36	37.69	21.549	38.53	1.00
3D T2 TSE	28.82	24.63	28.60	21.771	36.289	1.71
T2 TSE CORO HIPPO	28.75	1.56	28.84	28.267	29.148	1.37
EPILEPSY						
DWI MB	88.96	1.52	88.94	86.961	90.697	1.58
3D T2 FLAIR	21.85	3.12	21.85	21.372	22.336	1.26
3D T1 TFE	26.83	3.58	26.81	25.88	27.803	1.33
SWI	38.95	2.19	39.25	37.984	39.609	1.90
T2 TSE CORO	37.09	0.69	37.16	36.801	37.297	1.83
3D DUAL IR	24.06	21.37	21.57	21.338	31.768	1.36
3D T1 TSE FS	23.91	2.49	23.88	23.386	24.492	1.27
PITUITARY GLAND						
3D T1 TSE FS	27.55	3.58	27.45	26.623	28.586	1.22
3D T2	33.91	43.01	33.14	21.263	48.082	2.15
3D T1 TSE GADO	24.21	12.47	24.26	21.482	26.826	1.08
KNEES						
3D DP FS	25.01	10.93	25.15	21.519	28.196	1.24
DP DIXON SAG	30.16	24.93	34.10	21.488	34.88	1.05
LUMBAR SPINE						
T2 DIXON SAG	26.09	13.83	24.84	21.355	29.772	0.62
3D T2 TSE SAG	25.15	7.76	24.99	21.707	27.819	1.43
T2 STIR	27.55	12.19	28.97	21.547	29.307	1.12
SPINAL CORD						
STIR TSE SAG UPPER	28.71	5.23	28.71	27.65	29.772	0.85
STIR TSE SAG BOTTOM	28.68	2.44	28.68	28.183	29.173	0.84
T1 TSE DIXON SAG UPPER	30.36	0.46	30.36	30.261	30.459	1.11
T1 TSE DIXON SAG BOTTOM	30.47	0.71	30.47	30.311	30.619	1.12
AX T2 TSE	27.49	0.66	27.49	27.356	27.614	0.79

AX: Axial orientation, CORO: Coronal orientation, DWI: Diffusion-Weighted magnetic resonance imaging, FLAIR: Fluid Attenuated Inversion Recovery, FS: Fat suppression, HIPPO: Hippocampus, IR: Inversion recovery, ISO: Isotropic, MB: Multi-Band, PERF: Perfusion, SAG: Sagittal orientation, SAT: Supra-aortic trunks, STIR: Short-TI Inversion Recovery, SWI: Susceptibility Weighted

Imaging, TFE: Turbo Field Echo, TOF: Time Of Flight magnetic resonance angiography, TSE: Turbo Spin Echo