

Supplemental Material
Multi-Vendor Implementation and Comparison of Volumetric Whole-Brain Echo-Planar MR Spectroscopic Imaging

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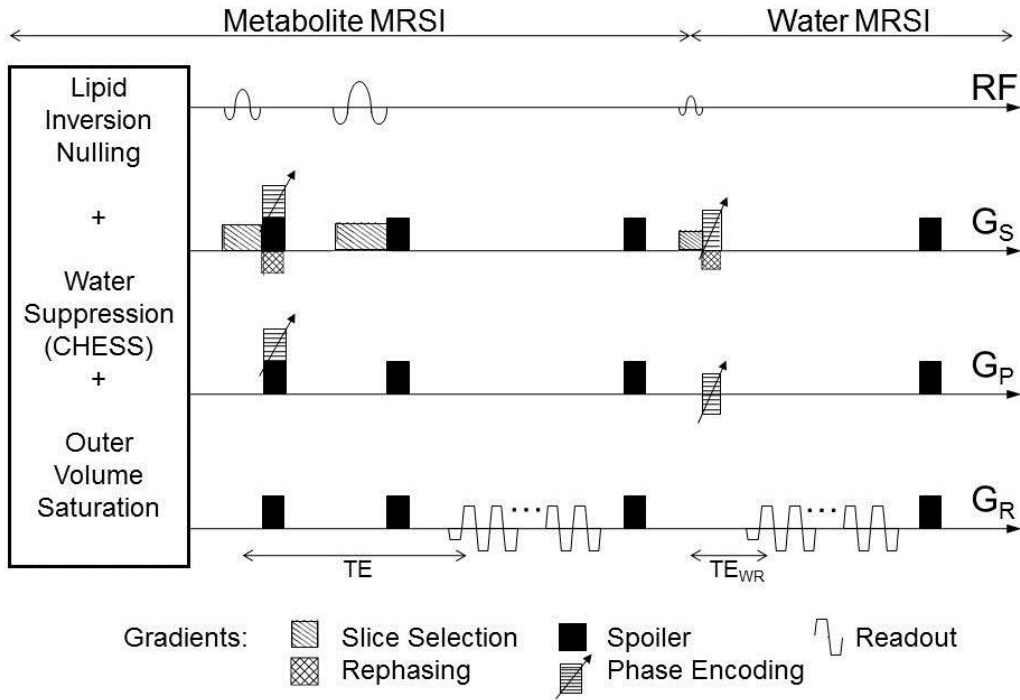


Figure S1

Schematic of the volumetric echo planar spectroscopic imaging (EPSI) pulse sequence with interleaved water reference acquisition and preparatory pulses implemented on three different MR instruments. GS, GP, and GR refer to the gradients applied in the selection, phase-encoding, and readout directions.

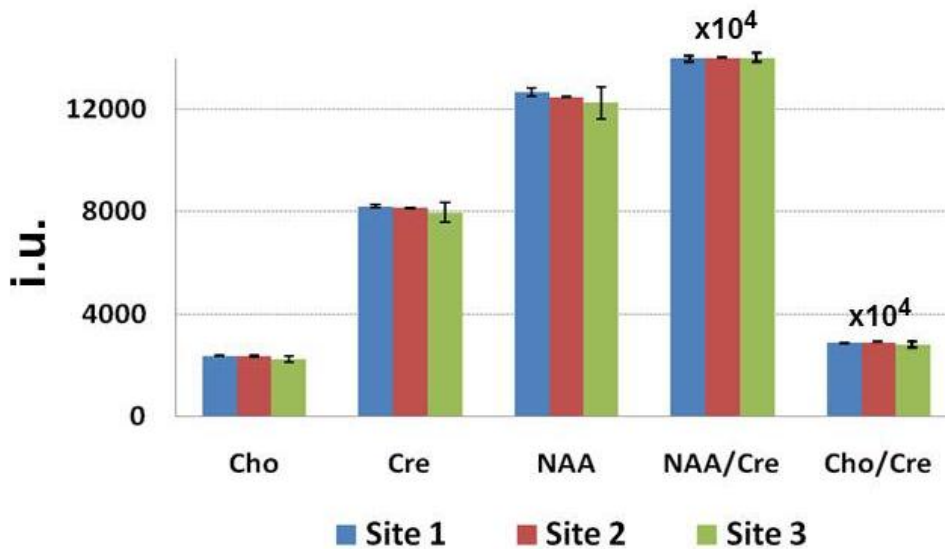


Figure S2

Mean individual metabolite concentration values and their ratios obtained for a spectroscopic phantom scanned five times on each MR instrument. Values for the ratio measurements have been scaled by 10^4 .

Table S1

Spectral quality in terms of fitted volume percentage, volumetric and center-slice uniformities (NAAD) of individual metabolites, and signal-to-noise ratio (SNR) obtained at each Site from a spectroscopic phantom. Values are shown as Mean±standard deviation.

Site	Fitted Volume (%)	Volumetric Uniformity				Center-Slice Uniformity				SNR
		NAA	Cre	Cho	SI_Ref	NAA	Cre	Cho	SI_Ref	
Site 1	76.5±2.8	82.1±2.4	79.3±2.8	79.4±2.5	97.8±1.9	87.3±2.0	88.7±1.8	87.7±2.3	98.7±1.4	22.5±2.8
Site 2	81.7±1.5	87.5±1.7	86.2±1.9	88.6±2.1	98.2±1.2	90.0±1.9	90.1±1.7	93.4±1.4	98.9±1.2	28.0±2.2
Site 3	84.3±2.3	85.6±2.5	84.2±2.0	83.0±2.6	97.6±1.3	92.2±2.1	91.1±2.4	91.1±1.8	98.8±1.5	26.7±1.5

Table S2.

Mean metabolite concentrations corresponding to pure GM and pure WM of each brain region with associated standard deviation (SD) for 10 normal subjects at each site, and ICC calculated for each metabolite at each site. Results are in institutional units and have been scaled by 10^{-3} relative to the values shown in Figure 6. The groups marked with an asterisk are statistically different ($p < 0.05$; one-way ANOVA), and the underlined numbers indicate statistically significant difference between right and left lobes for that brain region.

Brain regions	RFL		LFL		RTL		LTL		RPL		LPL		ROL		LOL		Cbl		ICC
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Pure GM																			
NAA																			
	*		*		*														
Site 1	16.07	0.86	<u>14.94</u>	0.95	13.06	2.04	13.3	2.21	17.70	0.93	<u>16.24</u>	1.28	13.33	2.32	13.49	2.63	13.09	1.74	0.70
Site 2	14.40	0.88	14.53	0.98	16.07	0.98	15.73	1.00	15.76	0.59	15.38	0.99	15.85	1.11	15.52	0.73	14.46	0.56	0.87
Site 3	17.39	1.40	17.90	1.32	12.34	1.40	13.46	1.29	18.83	1.49	18.70	1.68	15.18	1.79	14.26	2.16	11.47	1.39	0.72
Cho																			
					*		*		*									*	
Site 1	2.44	0.30	2.21	0.27	2.06	0.45	2.05	0.46	2.04	0.29	1.86	0.31	1.40	0.53	1.60	0.35	3.18	0.69	0.73
Site 2	2.05	0.23	2.03	0.27	1.99	0.25	2.09	0.27	1.59	0.22	1.66	0.23	1.31	0.16	<u>1.50</u>	0.16	2.51	0.36	0.85
Site 3	2.30	0.36	2.25	0.38	1.35	0.30	1.39	0.37	2.11	0.34	2.03	0.30	1.35	0.39	1.41	0.43	1.41	0.83	0.69
Cre																			
					*		*											*	
Site 1	11.78	1.07	10.79	0.67	11.36	1.77	12.21	1.87	13.17	1.07	12.24	1.10	11.04	2.21	11.58	1.60	17.07	2.63	0.74
Site 2	10.23	0.54	10.38	1.00	11.23	0.64	11.42	0.72	11.17	0.86	10.83	0.78	10.75	1.22	10.86	1.47	14.91	1.19	0.84
Site 3	11.44	1.18	11.63	1.27	7.81	1.22	8.32	1.36	12.93	1.21	12.91	1.39	10.13	1.77	9.93	1.70	8.68	4.01	0.69
Pure WM																			
NAA																			
					*													*	
Site 1	12.42	1.45	12.12	1.79	12.34	1.54	13.47	1.66	11.30	1.32	12.70	1.67	13.68	1.55	14.21	1.67	11.74	1.20	0.67
Site 2	13.37	0.74	12.98	0.73	12.80	0.81	13.08	0.83	13.31	0.72	12.84	0.64	14.10	0.98	13.59	0.74	13.90	1.17	0.90
Site 3	12.50	1.19	12.38	1.20	9.92	1.08	11.43	1.76	12.26	1.14	13.46	1.23	13.39	1.42	13.90	2.24	9.84	2.29	0.73
Cho																			
					*		*											*	
Site 1	2.40	0.36	2.31	0.37	2.01	0.38	2.59	0.63	2.13	0.35	2.35	0.45	1.79	0.41	1.90	0.80	2.96	0.36	0.70
Site 2	2.36	0.23	2.27	0.23	2.45	0.17	2.31	0.15	2.28	0.21	2.13	0.20	1.94	0.23	1.77	0.23	3.24	0.25	0.91
Site 3	2.06	0.38	1.98	0.40	1.50	0.42	1.70	0.44	2.04	0.33	2.17	0.38	1.73	0.36	1.71	0.35	0.61	0.21	0.69
Cre																			
																		*	
Site 1	7.94	0.76	8.01	1.07	6.36	0.94	7.01	1.55	7.06	0.62	7.96	1.20	9.16	1.32	10.50	1.71	9.81	1.72	0.72
Site 2	7.87	0.61	7.51	0.46	7.84	0.60	7.77	0.68	7.72	0.54	7.36	0.48	8.56	0.82	8.06	0.60	11.42	1.71	0.89
Site 3	7.32	0.83	7.13	0.98	5.23	0.91	6.45	1.57	7.10	0.74	7.78	1.01	7.85	1.31	8.75	1.40	2.48	1.28	0.68

Table S3

Ratios of individual metabolite concentrations of each brain region with associated standard deviation (SD) averaged over the 10 normal subjects. The groups marked with an asterisk are statistically different ($p < 0.05$), and the underlined numbers indicate statistically significant difference between right and left lobes for that brain region.

Brain regions	RFL		LFL		RTL		LTL		RPL		LPL		ROL		LOL		Cbl	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
NAA/Cre					*		*											*
Site 1	1.474	0.074	1.463	0.079	1.154	0.098	<u>1.278</u>	0.083	1.474	0.071	1.464	0.062	1.395	0.144	1.364	0.083	0.989	0.103
Site 2	1.589	0.099	1.600	0.093	1.533	0.073	1.551	0.098	1.599	0.106	1.605	0.099	1.578	0.089	1.566	0.090	1.101	0.083
Site 3	1.638	0.077	1.674	0.122	1.781	0.249	1.786	0.208	1.607	0.079	1.616	0.074	1.624	0.124	1.567	0.111	2.518	0.792
Cho/Cre																		*
Site 1	0.254	0.026	0.248	0.022	0.219	0.023	0.228	0.029	0.225	0.026	0.223	0.022	0.165	0.018	0.173	0.025	0.245	0.031
Site 2	0.260	0.031	0.259	0.031	0.242	0.027	0.244	0.030	0.229	0.028	0.229	0.024	0.177	0.021	0.179	0.023	0.217	0.023
Site 3	0.242	0.015	0.235	0.015	0.214	0.026	0.208	0.020	0.223	0.021	0.219	0.016	0.166	0.018	0.158	0.013	0.173	0.017
NAA/Cho					*		*								*		*	
Site 1	6.122	0.692	6.127	0.576	5.008	0.706	5.734	0.835	6.97	0.882	6.837	0.767	9.137	1.638	8.226	1.363	4.182	0.412
Site 2	6.262	0.512	6.388	0.509	6.558	0.545	6.657	0.614	7.277	0.652	7.382	0.584	9.209	0.877	9.075	0.896	5.228	0.633
Site 3	7.016	0.526	7.535	0.944	8.483	1.899	9.131	1.623	7.523	0.535	7.761	0.467	10.313	1.485	10.588	1.030	13.521	3.766

Table S4

Ratios of metabolite ratios in pure GM and pure WM of each brain region with associated standard deviation (SD) averaged over the 10 normal subjects. The groups marked with an asterisk are statistically different ($p < 0.05$), and the underlined numbers indicate statistically significant difference between right and left lobes for that brain region.

Brain regions	RFL		LFL		RTL		LTL		RPL		LPL		ROL		LOL		Cbl	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pure GM																		
NAA/Cre	*		*		*		*						*					*
Site 1	1.364	0.093	1.366	0.092	1.003	0.178	0.892	0.138	1.294	0.092	1.236	0.073	1.120	0.260	1.033	0.154	0.645	0.106
Site 2	1.383	0.074	1.392	0.104	1.371	0.065	1.351	0.116	1.386	0.082	1.421	0.100	1.463	0.109	1.440	0.157	0.951	0.068
Site 3	1.493	0.107	1.519	0.109	1.547	0.343	1.652	0.256	1.421	0.098	1.440	0.091	1.455	0.192	1.421	0.119	1.417	1.026
Cho/Cre					*		*		*									
Site 1	0.202	0.027	0.198	0.025	0.137	0.022	0.128	0.028	0.126	0.016	0.121	0.023	0.120	0.039	0.119	0.024	0.156	0.043
Site 2	0.192	0.023	0.191	0.030	0.158	0.019	0.173	0.027	0.123	0.024	0.143	0.026	0.123	0.021	0.134	0.021	0.155	0.028
Site 3	0.193	0.023	0.187	0.020	0.153	0.021	0.160	0.026	0.143	0.020	0.146	0.016	0.122	0.018	0.140	0.025	0.142	0.029
NAA/Cho					*		*								*		*	
Site 1	6.892	0.765	6.984	0.804	6.263	0.625	5.916	0.838	8.885	1.176	8.478	1.264	10.122	2.616	<u>7.937</u>	1.554	4.195	1.006
Site 2	6.985	0.579	7.257	0.722	7.786	0.744	7.696	1.133	9.326	0.936	9.209	0.766	11.333	1.368	10.441	0.719	5.915	0.925
Site 3	7.469	0.693	8.066	0.983	8.785	1.818	9.728	2.209	8.835	0.717	9.174	0.712	10.951	2.473	10.037	1.827	10.195	5.948
Pure WM																		
NAA/Cre					*													*
Site 1	1.579	0.137	1.553	0.111	1.507	0.192	1.546	0.111	1.603	0.103	1.627	0.098	1.626	0.421	1.663	0.186	1.251	0.182
Site 2	1.713	0.147	1.728	0.114	1.668	0.102	1.692	0.113	1.728	0.143	1.731	0.114	1.661	0.105	1.673	0.108	1.247	0.168
Site 3	1.680	0.090	1.715	0.150	1.898	0.198	1.766	0.182	1.704	0.106	1.680	0.072	1.694	0.131	1.638	0.137	3.399	0.830
Cho/Cre																		*
Site 1	0.301	0.034	0.293	0.027	0.317	0.037	0.296	0.036	0.297	0.035	0.297	0.030	0.196	0.031	0.223	0.044	0.313	0.056
Site 2	0.302	0.044	0.301	0.038	0.314	0.041	0.297	0.040	0.295	0.038	0.287	0.029	0.226	0.031	0.217	0.037	0.280	0.035
Site 3	0.280	0.026	0.275	0.020	0.279	0.042	0.262	0.026	0.289	0.033	0.276	0.026	0.215	0.029	<u>0.182</u>	0.025	0.199	0.016
NAA/Cho					*		*											*
Site 1	5.457	0.812	5.520	0.531	4.990	0.838	5.631	0.944	5.614	0.779	5.676	0.560	8.611	2.497	8.416	2.376	4.168	0.465
Site 2	5.817	0.593	5.846	0.507	5.513	0.555	5.844	0.556	6.035	0.598	6.161	0.642	7.610	1.096	7.935	1.403	4.515	0.593
Site 3	6.167	0.649	6.473	1.039	7.366	2.268	7.194	1.222	6.048	0.650	6.170	0.600	8.369	1.204	<u>9.711</u>	1.533	15.703	3.188