SUPPLEMENTARY MATERIAL

Robust cardiac $T_{1\rho}$ mapping at 3T using adiabatic spin-lock preparations

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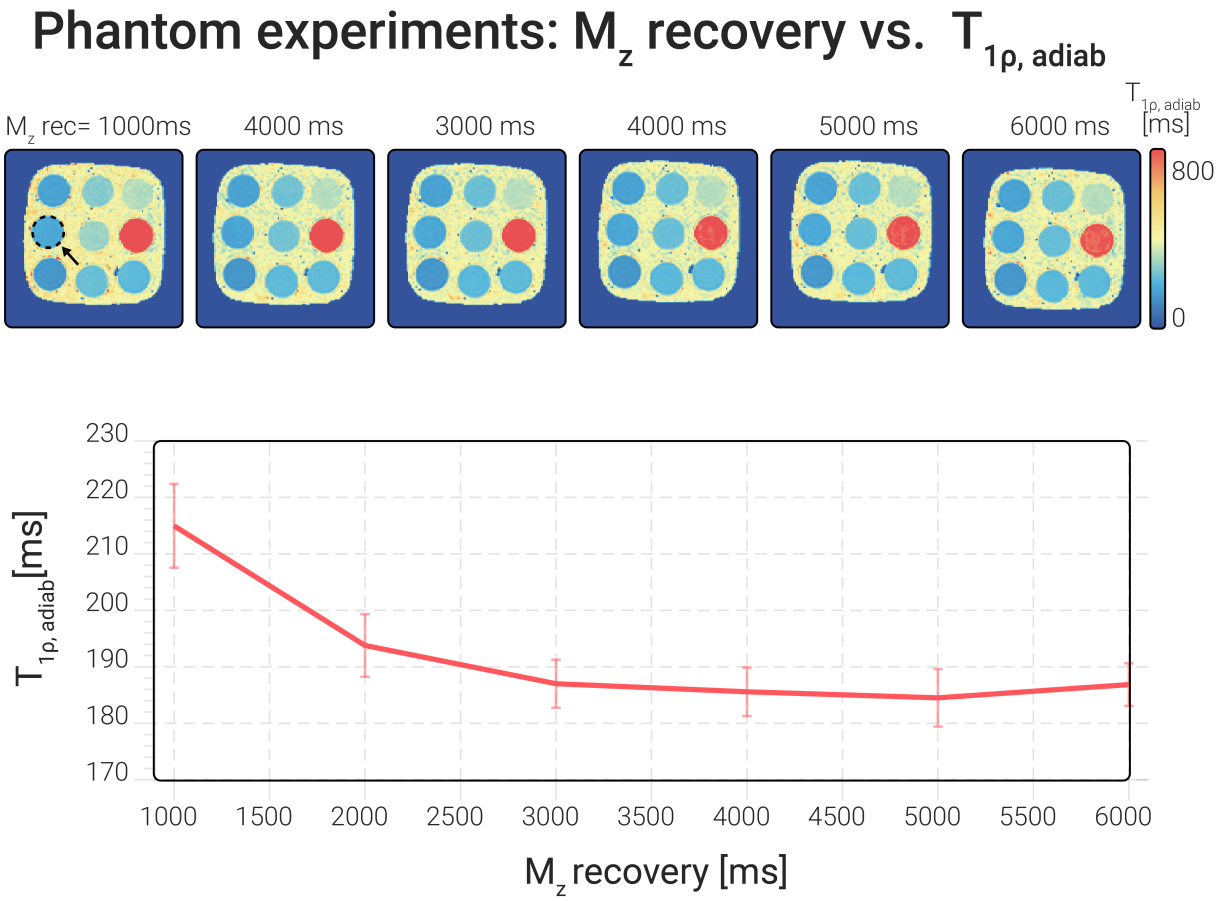

FIGURE S1: Phantom $T_{1\rho,\,\mathrm{adiab}}$ maps acquired with different rest periods for longitudinal magnetization recovery delays. $T_{1\rho,\,\mathrm{adiab}}$ values ($\pm$ standard deviation) reported in the plot are measured from the normal myocardium-mimicking vial (left column, middle row). For longitudinal magnetization recovery delays $\geq$ 3000ms, the measured $T_{1\rho,\,\mathrm{adiab}}$ values deviate less than 5% from the asymptotic value.

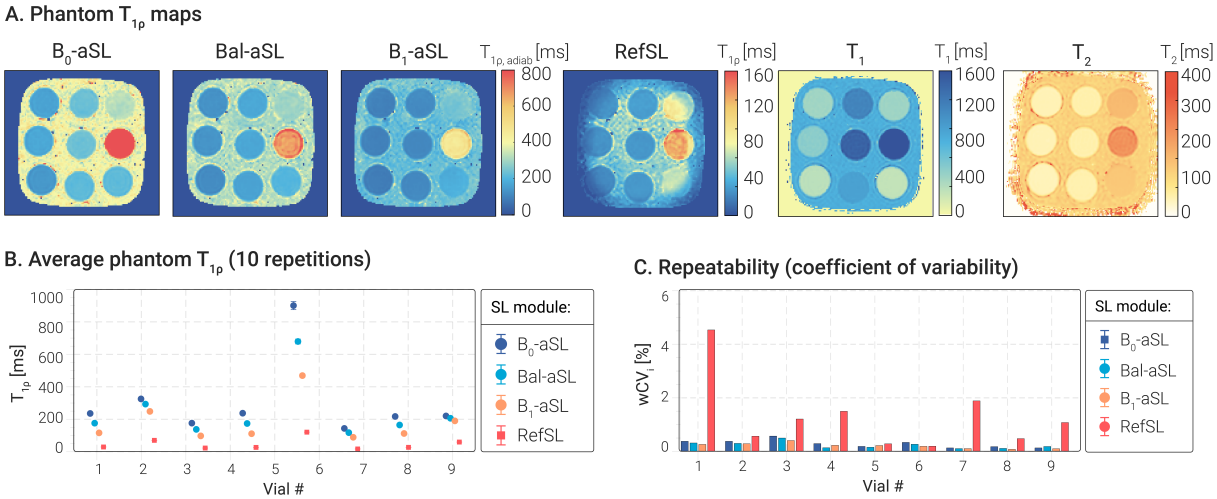

FIGURE S2: (A) Example of $T_{1\rho,\,\mathrm{adiab}}$ and $T_{1\rho}$ maps of the tissue-mimicking T1MES phantom. Good map quality was achieved with aSL preparations, whereas visible artifacts are apparent in most vials in the maps obtained with RefSL preparation. Approximate T_1 and T_2 maps are displayed for reference. (B) $T_{1\rho,\,\mathrm{adiab}}$ and $T_{1\rho}$ values with standard deviation bars for each vial, averaged over 10 repetitions. $T_{1\rho,\,\mathrm{adiab}}$ values are consistently higher than $T_{1\rho}$ values measured with RefSL preparations. $T_{1\rho,\,\mathrm{adiab}}$ dispersion is observed across B_0, Bal and B_1 optimized pulses, due to a progressively lower β value. (C) Repeatability measured as the coefficient of variability ($\overline{wCV_i}$) for each vial. Averaging across all the vials, aSL preparations yielded significantly improved repeatability ($\overline{wCV_i} = 0.29 \pm 0.15$ for B_0-aSL, $p < 0.01$; $\overline{wCV_i} = 0.23 \pm 0.13$ for Bal-aSL, $p < 0.01$; $\overline{wCV_i} = 0.21 \pm 0.11$ for B_1-aSL, $p < 0.001$ vs. $\overline{wCV_i} = 1.30 \pm 1.34$ for RefSL).

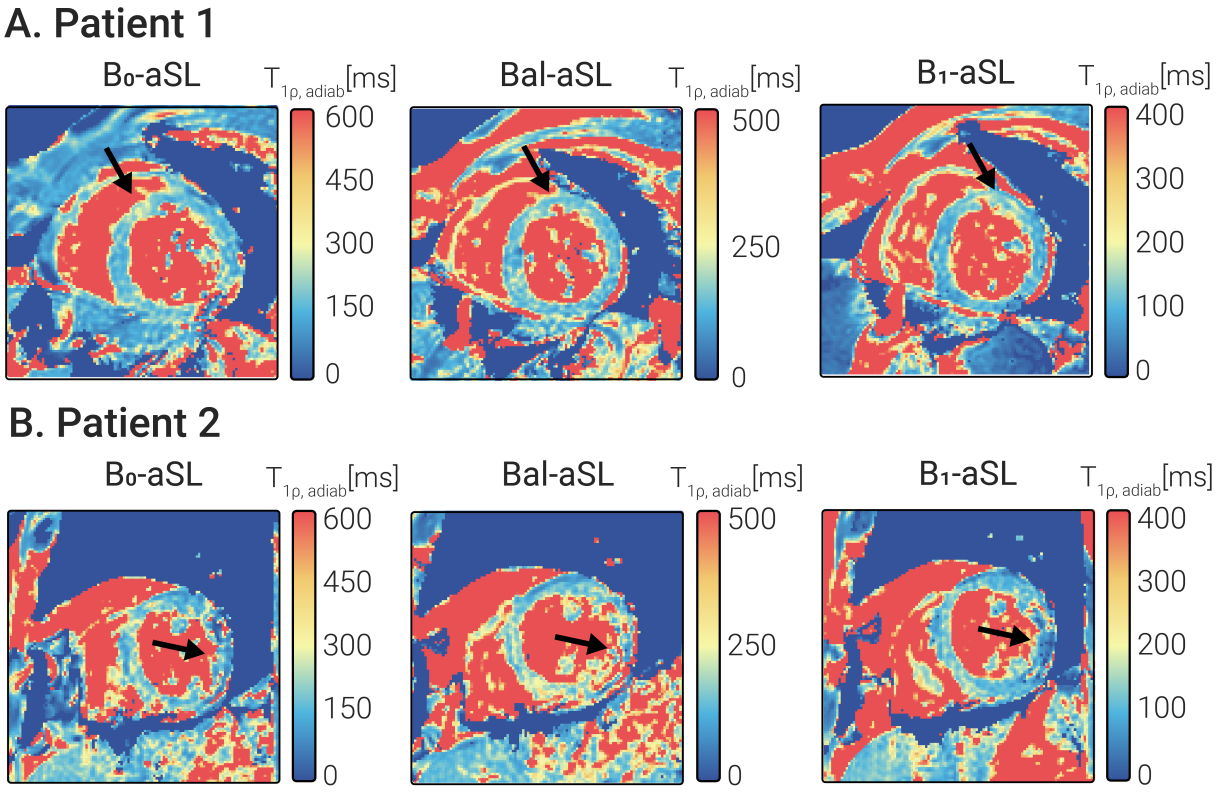

FIGURE S3: $T_{1\rho,\,\mathrm{adiab}}$ maps obtained with B_0-aSL, Bal-aSL and B_1-aSL preparations. Image quality is compromised due to artifacts visible in the maps for B_0-aSL in (A) and for Bal-aSL in (B). Furthermore Bal-aSL prepared baseline images were subject to substantial residual motion in both patients, lowering the image quality.

TABLE S1: In-vivo myocardial $T_{1\rho,\,\mathrm{adiab}}$ values [ms], averaged over all repetitions and segments for 6 healthy volunteers of cohort 1.

Subject #	**B_0-aSL**	**Bal-aSL**	**B_1-aSL**
1	196.41 ± 25.04	160.93 ± 15.50	93.76 ± 7.99
2	201.99 ± 25.30	162.66 ± 18.56	92.82 ± 11.00
3	197.61 ± 23.06	158.34 ± 17.04	92.70 ± 10.78
4	181.04 ± 24.73	139.07 ± 19.58	73.51 ± 14.42
5	190.37 ± 22.93	161.74 ± 15.86	92.83 ± 9.25
6	197.89 ± 26.17	150.82 ± 21.99	79.25 ± 15.89

TABLE S2: In-vivo myocardial $T_{1\rho,\,\mathrm{adiab}}$ precision, reproducibility and inter-subject variability (ISV), averaged over segments and repetitions for 6 healthy volunteers of cohort 1.

	B_0-aSL		**Bal-aSL**		**B_1-aSL**	
S. #	Prec. [%]	Reprod [%]	Prec.[%]	Reprod [%]	Prec. [%]	Reprod [%]
1	12.84±4.55	2.79±2.37	9.72±2.43	1.95±1.40	8.70±3.91	2.52±1.77
2	12.86±5.72	1.74±1.80	11.94±7.27	2.70±2.35	12.60±10.26	4.17±4.69
3	11.83±3.64	2.67±2.32	11.16±5.92	2.80±3.18	12.26±9.92	2.77±2.83
4	13.87±3.18	2.54±1.57	14.32±3.24	5.21±3.33	22.53±17.02	9.94±14.85
5	12.19±3.91	8.09±7.17	9.94±3.34	2.35±2.46	10.51±7.22	5.28±4.03
6	13.55±5.48	4.60±2.88	15.27±7.53	7.52±3.66	22.29±13.69	7.04±5.20
ISV[%]	5.32±3.01		6.40±2.66		9.25±6.10	

TABLE S3: In-vivo myocardial $T_{1\rho,\,\mathrm{adiab}}$ and $T_{1\rho}$ values [ms], averaged over all repetitions and segments for 7 healthy volunteers of cohort 2.

Subject #	**B_0-aSL**	**RefSL**
1	196.41 ± 25.04	23.27 ± 25.05
2	201.99 ± 25.30	43.88 ± 46.04
3	197.61 ± 23.06	26.45 ± 13.50
4	181.04 ± 24.73	21.22 ± 29.12
5	190.37 ± 22.93	33.84 ± 23.42
6	197.89 ± 26.17	58.91 ± 32.78
7	181.25 ± 21.18	39.65 ± 29.42

TABLE S4: In-vivo myocardial $T_{1\rho,\,\mathrm{adiab}}$ and $T_{1\rho}$ precision, reproducibility and inter-subject variability (ISV), averaged over segments and repetitions for 7 healthy volunteers of cohort 2.

	B_0-aSL		**RefSL**	
S. #	Prec. [%]	Reprod [%]	Prec.[%]	Reprod [%]
1	12.84±4.55	2.79±2.37	38.72±25.56	29.15±23.26
2	18.86±5.72	1.74±1.80	69.46±38.78	59.35±24.41
3	11.83±3.64	2.67±2.32	54.81±28.70	28.31±24.14
4	15.87±3.18	2.54±1.57	26.13±39.69	57.65±25.94
5	12.19±3.91	8.09±7.17	34.92±20.38	27.85±16.20
6	13.55±5.48	4.60±2.88	28.40±26.49	40.20±23.70
7	11.19±3.28	2.96±3.05	43.81±19.70	24.76±24.14
ISV[%]	5.32±3.01		51.92±6.10	