Supporting Information

Radiation damping at clinical field strength: Characterization and compensation in quantitative measurements

Niklas Wallstein[1] | Roland Müller[1] | André Pampel[1] | Harald E. Möller[1,2]

[1] NMR Methods & Development group, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

[2] Felix Bloch Institute for Solid State Physics, Leipzig University, Leipzig, Germany

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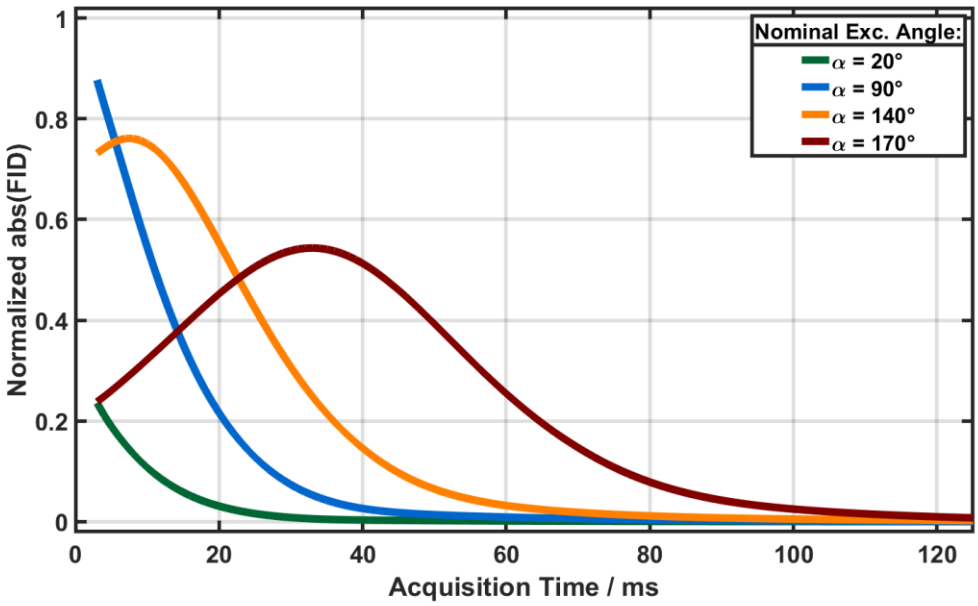
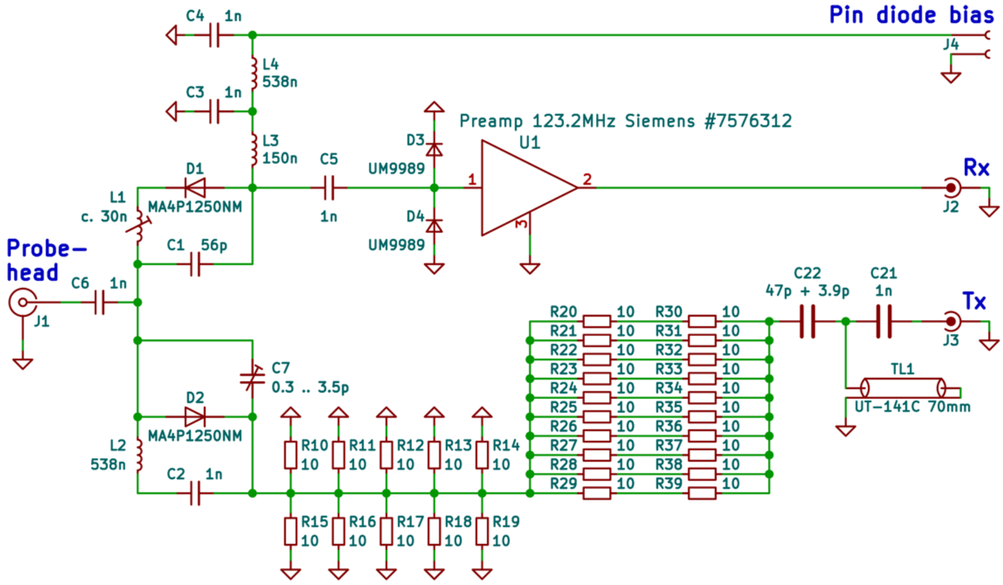
SUPPORTING TABLE S1 | Summary of the results obtained with RADDEX and the 19-mm sample. A difference to the experiments summarized in Table 2 is the use of the alternative Tx/Rx switch configuration with R_1 = 49 Ω and R_2 = 1 Ω.

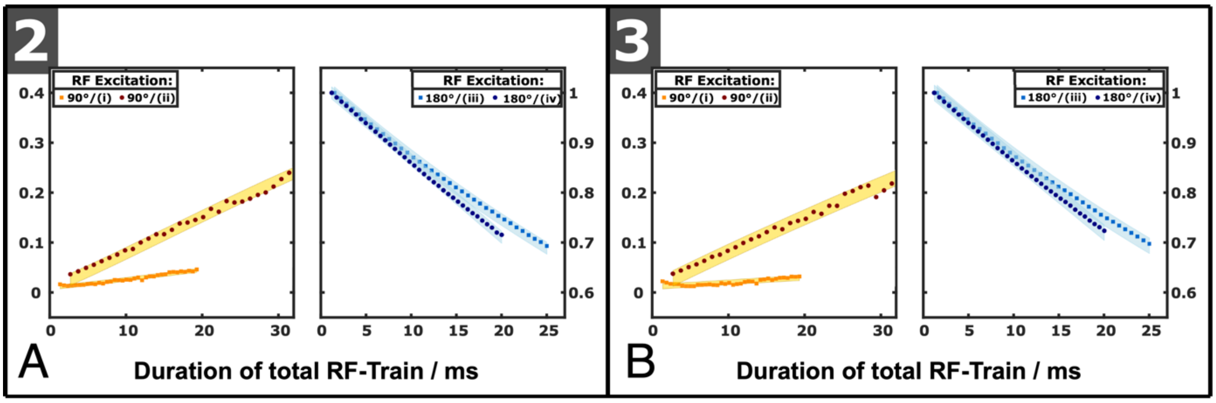
		Coil setup 1	*Coil setup 2*	*Coil setup 3*
Inserted cable		—	$\lambda/6$	$\lambda/4$
Damping effect		Minimal	Moderate	Maximal
RADDEX	$(\zeta_{Rx} M_0)^{-1}$ / ms	—	23.3 ± 0.8	25.3 ± 1.2
	ψ_{Tx} / °	—	–38.6 ± 2.3	–20.2 ± 2.3
	T_2 / ms	—	52.0 ± 0.6	52.2 ± 0.8
	δf / Hz	—	2.18 ± 0.02	1.70 ± 0.02
	c_{B1}	—	0.999	0.997



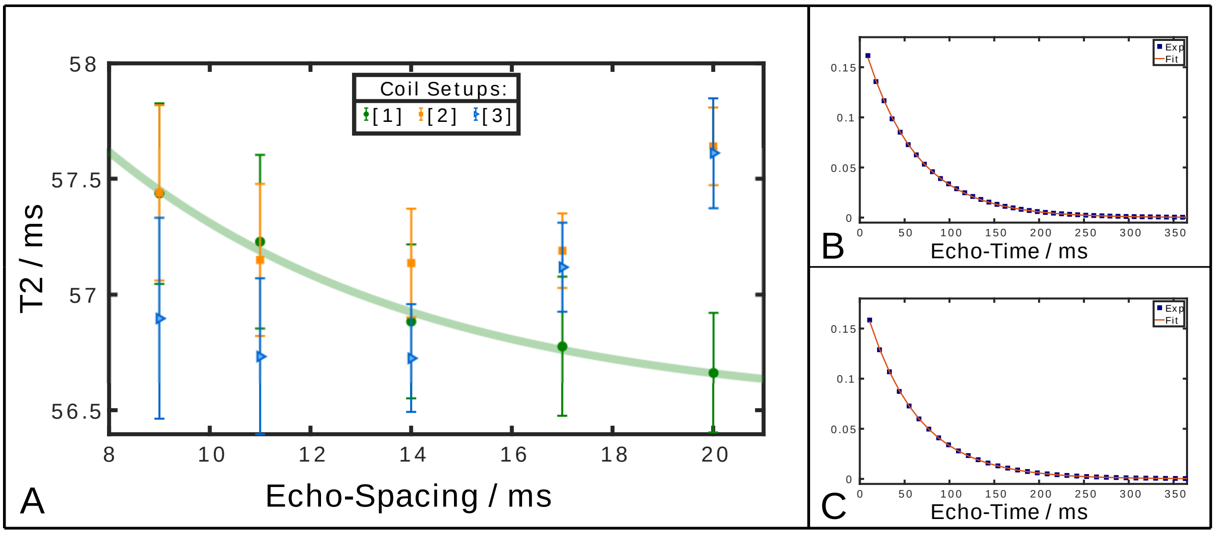
SUPPORTING FIGURE S1 | Free induction decay signal recorded with a simple pulse-and-acquire sequence with different flip angles. An echo-like transient signal increase during the acquisition window due to RD effects acting during free precession is observed for nominal flip angles exceeding 90°.



SUPPORTING FIGURE S2 I Circuit diagram of the Tx/Rx switch. The inductance of the LC transformer (L_p in Figure 1B) was realized as a short-circuited stub of 50-Ω semi-rigid cable (TL1). The reason for this is its much lower stray field compared to a wire-wound inductor, which reduces crosstalk into the receive path. Pulse-resistant thick-film chip resistors (size-code 1206) were used in the voltage divider. It is advantageous to select equal values from a larger quantity with higher tolerance, because laser trimming reduces the pulse capability. Note that the resistor labeled R_2 in the simplified schematic shown as Figure 1B corresponds to resistors R_{10}, …, R_{19} and that R1 corresponds to R_{20}, …, R_{39}. PIN diodes D1 and D2 (MACOM, Lowell, MA, USA) are used in the actual transmit-receive switch. Fine tuning can be done at L_1 by squeezing the wire turns together and in the transmit path at C_7. The preamplifier is an older low-noise amplifier (LNA) used in previous Siemens coils.



SUPPORTING FIGURE S3 I RADDEX experiments with the 19-mm sample and *coil setups 2* (moderately damped; **A**) and *3* (maximally damped; **B**). The signal magnitude (normalized to the signal after preparation with a 180° composite pulse of minimal duration) is plotted as a function of the composite pulse duration. Orange, red, light blue, and dark blue symbols refer to preparations by an 'undamped' 90°, a 'damped' 90°, an 'undamped' 180°, and a 'damped' 180° composite pulse, respectively. Corresponding solid lines indicate simultaneous NNLS fits to the combined data. A difference from the experiments shown in Figure 6 is the use of the alternative Tx/Rx switch configuration with R_1 = 49 Ω and R_2 = 1 Ω, which mitigates the discretization problem. Considerable RD effects, which increase with pulse duration, lead to deviations from a normalized signal of 0 (after 90° preparation) or 1 (after 180° preparation) in all experiments, but are more pronounced for the 'damped' preparations.



SUPPORTING FIGURE S4 I **(A)** Experimental estimations of T_2 in the 24-mm sample as a function of the echo-spacing in a CPMG sequence. Green circles, orange squares and blue triangles show the results obtained with *coil setups 1*, *2* and *3*, respectively. Error bars indicate ±1 SD. The green solid line shows an exponential fit to the undamped data (*coil setup 1*). Deviations from the undamped result become evident at the longest echo spacing for both the moderately and maximally damped case. Exemplary fits to the echo amplitudes recorded with *coil setup 1* (**B**; ΔTE = 9 ms) and *coil setup 2* (**C**; ΔTE = 11 ms) do not indicate relevant deviations from a mono-exponential decay or the occurrence of stimulated echoes.