Appendix 1

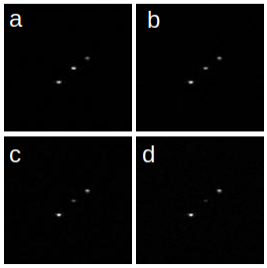
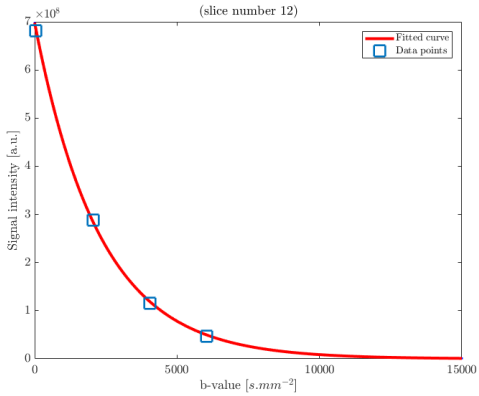
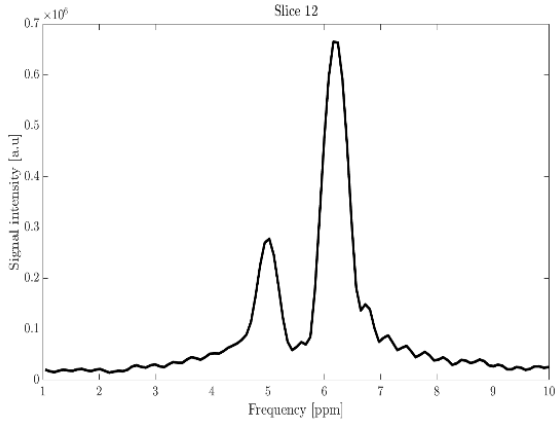
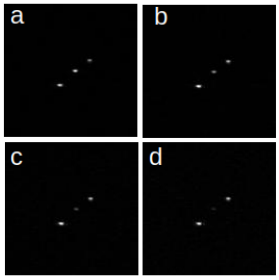
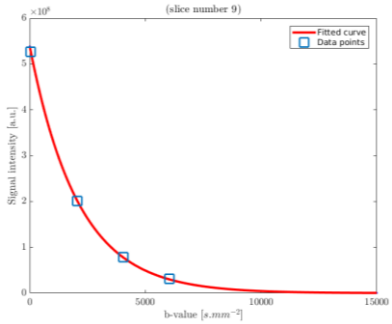
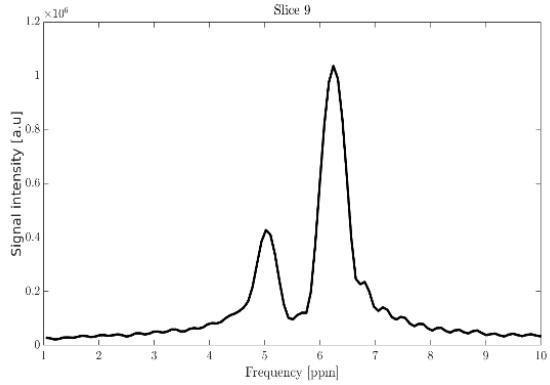
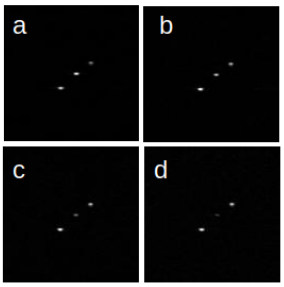
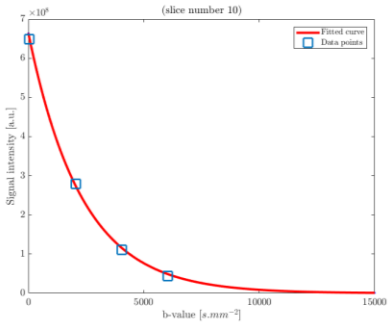
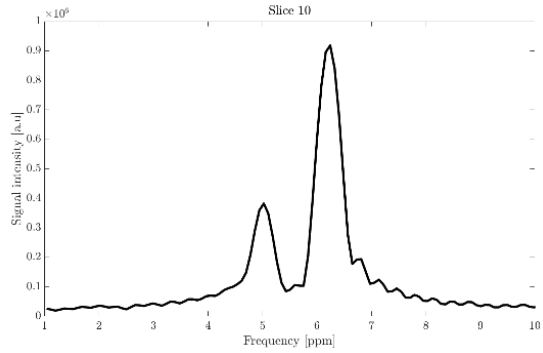
A comparison of temperature measurements by DW-MRI and MRSI

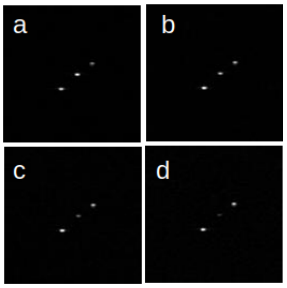
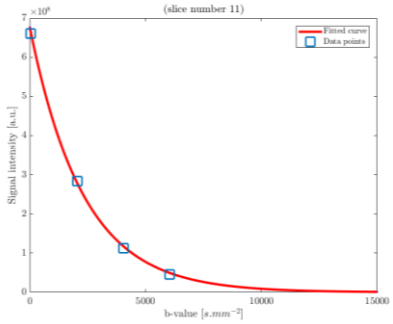
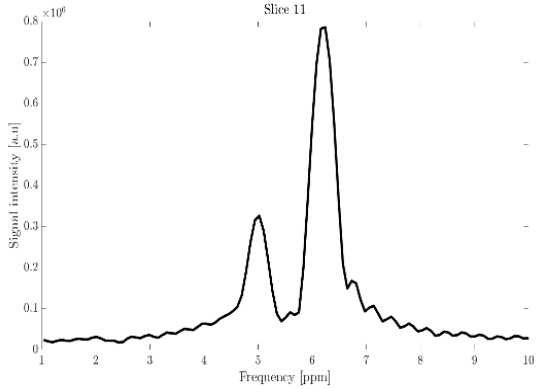
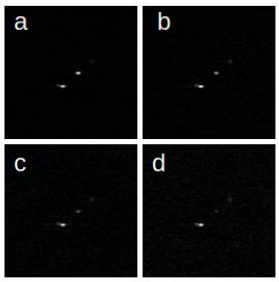
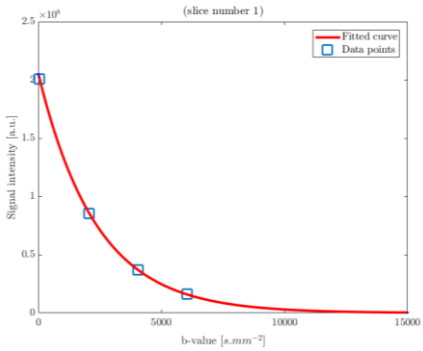
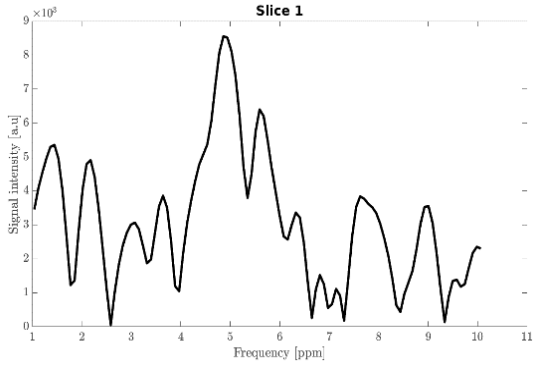
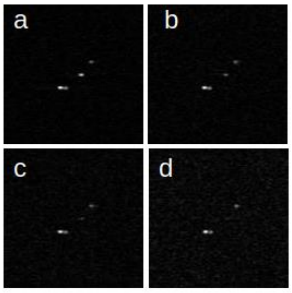
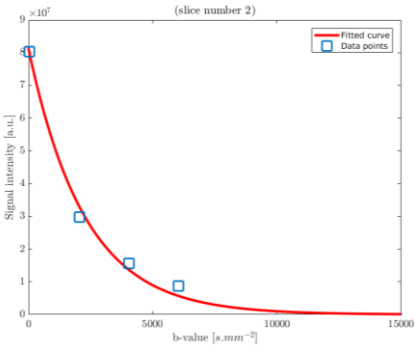
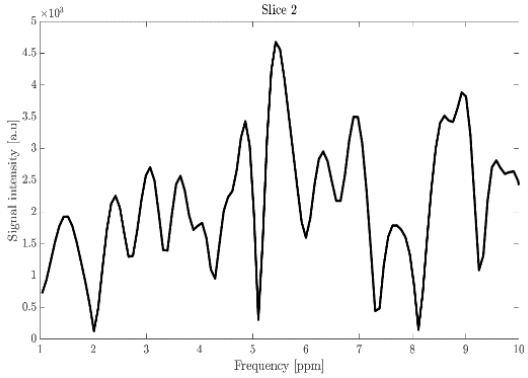
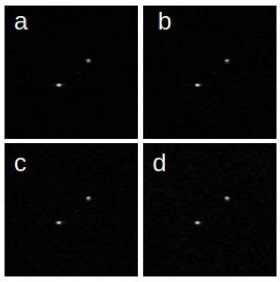
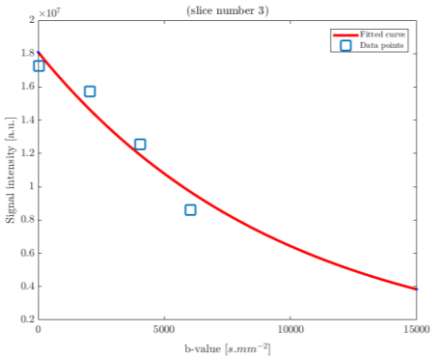
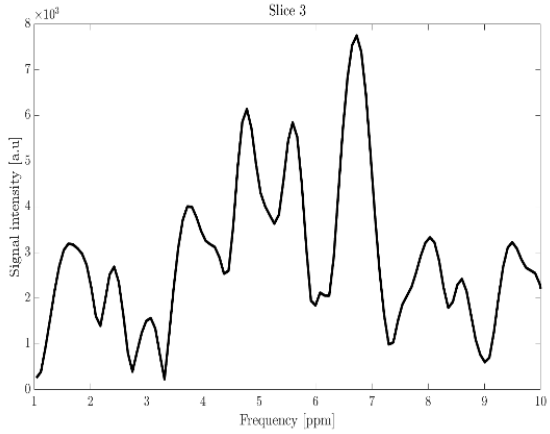
A comparison between temperature measurements by DW-MRI and MRSI is illustrated in the table below. The table includes corresponding slices measured with both methods at the same temperature (~74 °C). The DW-MRI images display the three NMR thermometers inserted in a monolithic structure (honeycomb) as described in the manuscript. The DW-MRI images are generated using four equidistant diffusion weighting steps (Δb=2000 s · mm^{-1}) starting with 50 s · mm^{-1}. Beside the DW-MRI images, the signal intensity of the ethylene glycol capillary are plotted versus Δb. In addition, a simple exponential function is fitted to the data to report diffusion coefficients, where R^2 describes the fit quality. Spectra of the ethylene glycol capillary measured by MRSI method at the same slice position are plotted in the right column to compare both methods.

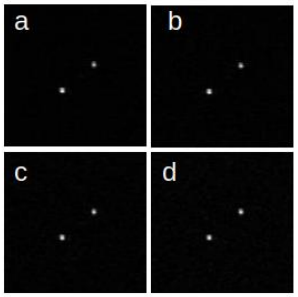
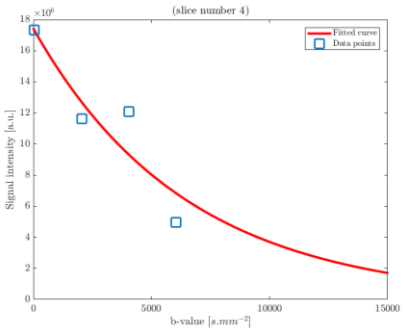
The table represents three different situations that may be encountered in the measurement of NMR thermometers using DW-MRI and MRSI. In the slices *a* to *d* both methods show good performance where the capillary is perfectly filled with ethylene glycol. The MRSI spectrum shows sharp peaks from (-OH) and (-CH_3) groups. Similarly, DW-MRI images measured and the fitted curves show high value of signal intensity ~ 6-7×10^8 at low diffusion weighting (b-value). The fitted curve to DW-MRI data shows a high coefficient of determination (R^2>0.99) for all four slices as well. The determined diffusion coefficients are reliable and in very good agreement with diffusion coefficient (D = 4.37 ×10^{-4} mm² · s^{-1}) obtained at the same temperature from the diffusion-temperature curves in the manuscript (cf. Fig. 6).

In the slices *e* and *f* where the NMR thermometer is only partially filled, the obtained signal intensities at low b-value are three or four times lower. However, the reduced signal intensity does not affect the quality of the analysis performed by DW-MRI, where diffusion coefficients D = 4.41 ×10^{-4} mm² · s^{-1} and D = 4.23 ×10^{-4} mm² · s^{-1} are obtained for slices *e* and *f*, respectively. The measured diffusion coefficients show the reliability of the method in these cases demonstrating that DW-MRI is less susceptible to magnetic field inhomogeneities compared to MRSI. While correct diffusion coefficients are determined by DW-MRI, MRSI fails to give ethylene glycol spectra in both slices (*e* and *f*). The spectra are rather unreadable as a result of the higher dependency of MRSI on the spatial inhomogeneities of the magnetic field. Finally, for nearly empty parts of the ethylene glycol capillary (slices *g* and *h*), the fit quality (R^2) is drastically reduced for the DW-MRI data and consequently unreliable diffusion coefficients are detected. In parallel, MRSI fails to determine spectra of ethylene glycol. Thus, the quality of the fitted curve in DW-MRI plays a decisive role for the reliability of the

obtained diffusion coefficients. In upcoming studies, this fact should be considered in more detail to avoid systematic errors and ensure reliable temperature measurements by DW-MRI.

Slice No.	DW-MRI images	DW-MRI data (signal versus b-value)and fitted curve	Corresponding MRSI spectrum for the same slice position
a		 R^2= 1.000 D= 4.37 ×10^{-4} mm² · s^{-1}	
b		 R^2= 1.000 D= 4.50 ×10^{-4} mm² · s^{-1}	
c		 R^2= 0.999 D= 4.33 ×10^{-4} mm² · s^{-1}	

d		 R^2= 0.999 D= 4.33 ×10^{-4} mm² · s^{-1}	
e		 R^2= 1.000 D= 4.23 ×10^{-4} mm² · s^{-1}	
f		 R^2= 0.993 D= 4.41 ×10^{-4} mm² · s^{-1}	
g		 R^2= 0.926 D= 1.02 ×10^{-4} mm² · s^{-1}	

h		 R^2= 0.840 D= 1.49 $\times 10^{-4}$ mm² · s^{-1}