CALIBRATION OF A FAST FIELD CYCLING RELAXOMETER FOR ULTRA-LOW FIELD MEASUREMENTS OF T_1-DISPERSION

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In Fast-Field Cycling (FFC) MRI the field switches to different levels, allowing for the measurement of NMR parameters such as T_1 over a range of fields [1].
For the successful implementation of the ultra-low field FFC techniques on a commercial bench-top FFC relaxometer (Stelar S.r.l., Italy) the stray magnetic fields need to be compensated. These are determined with the application of FFC measurements in a range of fields close to zero. During this process correction fields of varying magnitude and orientation are applied by the relaxometer while the magnetisation precesses around a stray component of unknown direction with the frequency of precession determined by the magnitude of the transverse and longitudinal fields. The successful compensation of the stray fields is shown as a minimum in the frequency of precession (Figure 1a) [2].
After the successful calibration of the relaxometer FC methods at ultra-low fields can be applied, including extension of the T_1-dispersion curve acquired to the region of μT (Figure 1b).

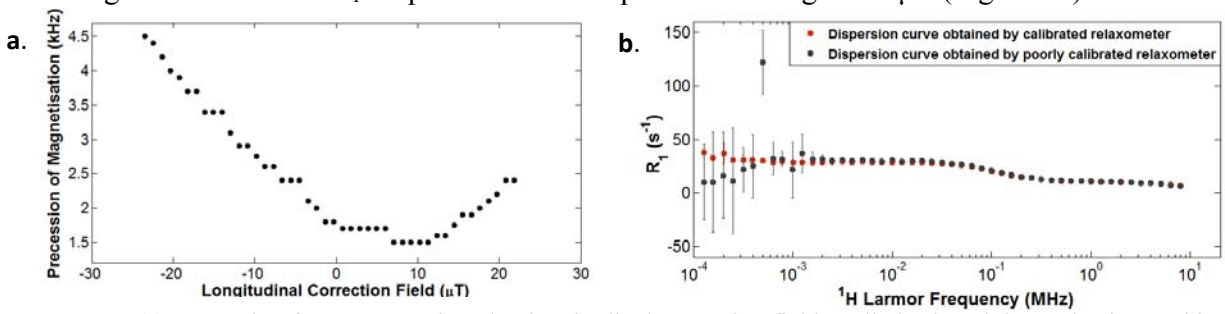

FIGURE 1. (a) Precession frequency against the longitudinal correction field applied. The minimum is observed in the range of 6 to 12 μT. For values larger than 22 μT magnetisation decays exponentially as in conventional FFC experiments thus no precession is observed (b) R_1-dispersion curve (where $R_1=1/T_1$) of a sample of $MnCl_2$ acquired before and after the calibration, with the range of minimum ^{1}H Larmor frequencies extending to 100 Hz (corresponding to a field of 2.3 μT).

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References

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[2] Anoardo E, Ferrante GM, Appl. Magn. Reson., **24**, 85-96 (2003).