

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

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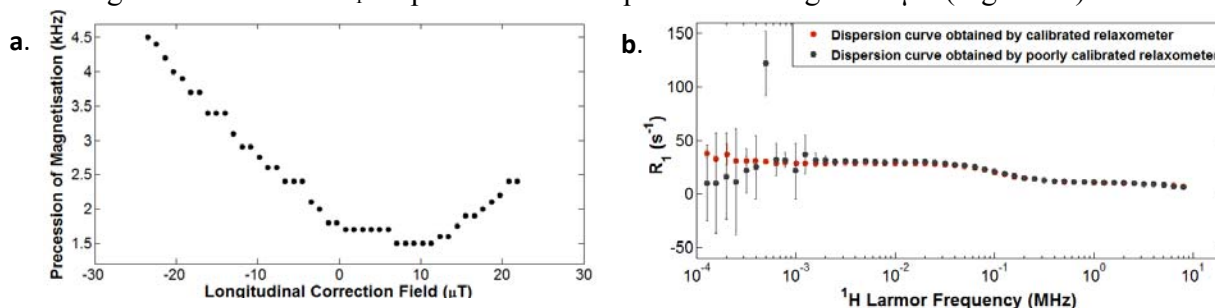
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In Fast-Field Cycling (FFC) MRI the field switches to different levels, allowing for the measurement of NMR parameters such as  $T_1$  over a range of fields [1].

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  $\mu\text{T}$  (Figure 1b).



**FIGURE 1.** (a) Precession frequency against the longitudinal correction field applied. The minimum is observed in the range of 6 to 12  $\mu\text{T}$ . For values larger than 22  $\mu\text{T}$  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  $\text{MnCl}_2$  acquired before and after the calibration, with the range of minimum  $^1\text{H}$  Larmor frequencies extending to 100 Hz (corresponding to a field of 2.3  $\mu\text{T}$ ).

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## References

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