Measuring the transverse magnetization of rotating ferrofluids MANFRED LÜCKE, J. EMBS, S. MAY, C. WAGNER, A. KITYK, A. LESCHHORN, University Saarbrücken — We report on measurements of the transverse magnetization of a ferrofluid rotating as a rigid body in a constant magnetic field, $H_0$, applied perpendicular to the axis of rotation. The rotation of the fluid leads to a non-equilibrium situation, where the ferrofluid magnetization, $M$, and the magnetic field within the sample, $H$, are no longer parallel to each other. The off-axis magnetization perpendicular to $H_0$ is measured as a function of both the applied magnetic field, $H_0$, and the angular frequency $\Omega$. The latter ranges from a few Hz to frequencies well above a characteristic inverse Brownian relaxation time. Our experimental results strongly indicate that the transverse magnetization is caused only by a small fraction of the colloidal ferromagnetic particles. The effect of the polydispersity of the ferrofluid is discussed. Experimental results are compared to predictions based on several theoretical models. A single-time relaxation approach for the so-called effective field and a field dependent Debye relaxation of $M$ yield reasonably good shapes of the curves of transverse magnetization versus $\Omega$. However, like the other models they overestimate their magnitudes.

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