

Table S2: Euler angles (α , β , and γ) and axial (A_a) and rhombic (A_r) components of the alignment tensors induced by the presence of Tb^{3+} , Dy^{3+} and Tm^{3+} ions as calculated with the program MODULE (Dosset, P.; Hus, J.; Marion, D.; Blackledge, M. *J. Biomol. NMR*, **2001**, *20*, 223-231) by fitting the measured dipolar couplings to the x-ray structure of ubiquitin (pdb1ubq, Vijay-Kumar, S.; Bugg, C. E.; Cook, W. J. *J. Mol. Biol.*, **1987**, *194*, 531-544).

	α	β	γ	A_a	A_r
Tb^{3+}	-51.9	61.6	-48.9	$-3.3 \cdot 10^{-4}$	$-1.7 \cdot 10^{-4}$
Dy^{3+}	-117.9	69.7	61.2	$3.1 \cdot 10^{-4}$	$1.7 \cdot 10^{-4}$
Tm^{3+}	-39.0	60.3	-63.6	$1.9 \cdot 10^{-4}$	$0.6 \cdot 10^{-4}$