NMR study of ⁸⁹Y and ¹³⁹La in perovskite Ti oxides

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- Perovskite structure
- GdFeO₃ distortion \rightarrow Ti-O-Ti bond angle
- Spin, lattice and orbital degrees of freedom
 → "Orbital physics"



FM to AFM transition defined by the size of the R-ion \rightarrow solid solution samples, e.g. $Y_XLa_{x-1}TiO_3$

- Microscopic nature of the AFM-FM transition
- Coupling of magnetic and orbital order
- QCP at the transition
- Static orbital order and orbital fluctuations
- Lattice and magnetic frustration

NMR $- B_0 = 11.85$ T, single crystal samples ⁸⁹Y S=1/2 139La 139 La S=7/2 **YTiO₃** ($T_c = 35 K$) $Y_{0.7}La_{0.3}TiO_3$ (T_c=8K) 24.8 24.6 250 K (**ZHV**) 24.4 24.2 24.0 220 K 600 1] J J & & & = 180 K 300K 140 K 250K Supplementary 23.8 23.6 23.4 . (0) 400 200K 180K 150K 50 100 150 200 50 K Temperature (k 120K 200 40 K 80K 23.76 MHz 23.2 40K 23.96 MHz 10K E 100 23.0 - 68.04 MHz - 67.70 MHz 22.8 150 200 250 300 350 50 100 0 23.0 23.5 22.5 24.0 24.5 22.0 Frequency (MHz) Temperature (K) ⁶⁸ Frequency (MHz) 69 70 66 67 0.10 0.6 0.9 0.08 2.0 0.5 0.8 Exponential Gaussian 0.7 (10⁻³ (msK)⁻¹) 0.4 0.06 0.6 $1/T_{2}$ (ms)⁻¹ Exponential (ms)⁻ 1.4 0.5 Gaussian 0.04 0.4

