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DYNAMICS OF THE IRON SPINS IN SUPERCONDUCTING $\text{YBa}_2(\text{Cu}_{1-x}\text{Fe}_x)\text{O}_7$

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ABSTRACT

The dynamics of the iron spins in $\text{YBa}_2(\text{Cu}_{1-x}\text{Fe}_x)_3\text{O}_7$ alloys ($0 \leq x \leq 0.12$) has been studied by the means of inelastic neutron scattering. Measurements were performed using the time of flight technique with an excellent resolution of 50 μeV , in a temperature range of 1.8 K to 300 K. The doped samples show an elastic and a quasielastic intensity strongly varying with temperature.

A spin glass like freezing is revealed at low temperature by a sudden decrease of the quasielastic intensity, an increase of the "elastic" or resolution limited intensity and a minimum in the quasielastic width. The freezing temperature ($T_f \sim 18$ K for $x=0.06$, $T_f \sim 35$ K for $x=0.12$) corresponds to the one already determined by a magnetic splitting in Mössbauer experiments. Above T_f , the occurrence of superconductivity slightly modifies the characteristics of the spin relaxation in the paramagnetic state, as shown by measurements in two $x=0.06$ samples ($T_c \sim 65$ and 78 K). In the whole temperature range of measurement, the dependence of the quasielastic intensity with the scattering vector q , mainly reflects the variation of the Iron form factor, which shows that the spins are almost uncorrelated.