Magnetic Susceptibility Measurements of $Yb_2Ti_2O_7$ along the [100] direction.

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Introduction

Specific heat measurements carried out elsewhere [1] have shown that the ferromagnetic pyrochlore $Yb_2Ti_2O_7$ undergoes a first-order transition at 150 – 270 mK. Recent neutron measurements [2] reported the possible existence of long-range ordering below this first order transition, while other neutron measurements [3] found that the spins were still non-localized. In order to gain additional insight into the nature of the low temperature we have carried out magnetic susceptibility measurements.

Experimental

The magnetic susceptibility measurements were performed in the High B/T Facility of NHMFL. Single crystal samples were studied with the magnetic field oriented along the [100] direction, coinciding with the direction of the net magnetization of $Yb_2Ti_2O_7$. Measurements were made for temperatures 25<T<250 mK.

Results and Discussion

A very pronounced peak in the magnetic susceptibility was observed at 165 mK, as shown in Fig 1. The transition temperature was independent of the small ac excitation field. The spin relaxation below the transition was more than 5000s below the transition peak.

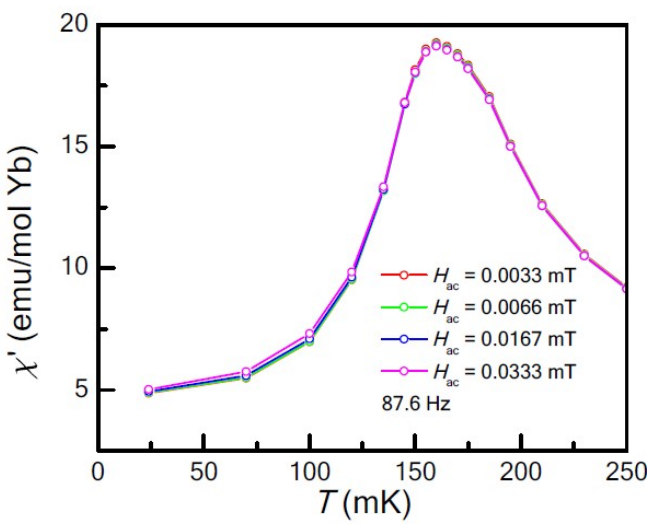

Fig.1 The real part of the magnetic susceptibility as a function of temperature in zero applied magnetic field. The ac excitation frequency was 87.6Hz. The amplitude of ac excitation was 0.0033, 0.0066, 0.0167, and 0.0333 mT.

Conclusions

We have measured the magnetic susceptibility of $Yb_2Ti_2O_7$ along the [111] direction and at temperatures as low as 25 mK. The mechanism for the low-temperature behavior is under discussion.

Acknowledgements

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References

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[2] Chang, L-J., *et al*., Nature Communication, **3**, 992 (2012).
[3] Gardner, J. S., *et al.,* Phys. Rev. B, **70**, 180404(R) (2004).