EMR Study of a Possible Topological Kondo Insulator SmB_6

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Introduction

In Kondo insulator samarium hexaboride SmB_6, strong correlation and band hybridization lead to an insulating gap and a diverging resistance at low temperature. However, unlike in other Kondo insulators, the resistance of SmB_6 saturates below about 4 K. Recently it was proposed that SmB_6 may be a three-dimensional topological Kondo insulator where the topologically non-trivial insulating state is produced by the hybridization between conduction band and coherent 4f band [1, 2].

Here, we performed high-field EMR measurements on SmB_6 with the goal to explore the possible topological surface states in this material. Because the gap of SmB_6 is on the order of 10meV, EMR carried out at microwave frequency is a suitable technique for probing the surface states of this material.

Experimental

EMR experiments were performed at NHMFL using a 12.5 T SC magnet, at 240 GHz frequency. Samples were grown at UCI. We investigated undoped SmB_6 samples as well as doped ones.

Results and Discussion

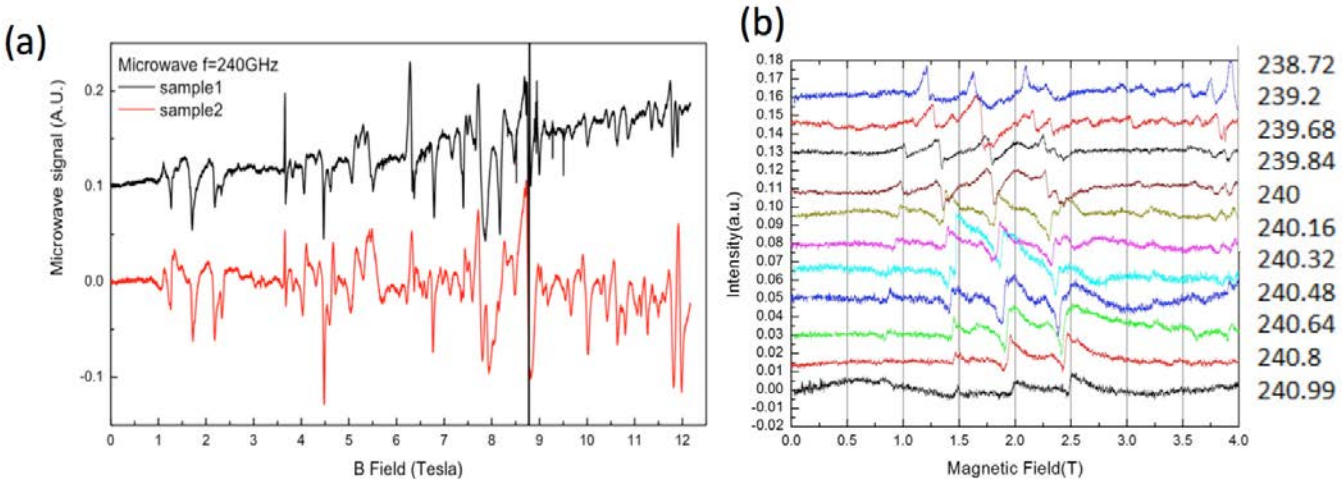

Fig. 1: (a) EMR data for two SmB_6 samples. (b) data for SmB_6 samples at different frequencies shown on the right side in units of GHz.

Fig. 1 shows our EMR data on SmB_6 samples at 240 GHz. The samples show many sharp resonance lines in the EMR spectra, which could be due to impurity states or possibly surface states of SmB_6. As shown in panel (b), the observed sharp features show systematic shifts with varying excitation frequency. We are analyzing the data to explore the physics behind these phenomena.

Conclusions

Our EMR data on SmB6 samples show interesting features, which may provide new insights in the possible surface states of SmB6. This work is in progress.

Acknowledgements

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References

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