Pulsed Field Study of Interference Commensurate Effect in $(DMET)_2I_3$

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Introduction

A magnetic field rotated within the most conducting plane of Q1D metals such as $(DMET)_2I_3$ results in a kink-like structure in magnetoresistance (MR) when *B* is almost parallel to the 1D axis ("third angular effect", TAE). [1] A small *B*-component now applied perpendicular to the plane results in Lee-Naughton oscillations superimposed on the TAE. Theoretical studies suggest that dimensional crossover is associated with these oscillations.[2] Recent experiments on $(DMET)_2I_3$ up to 33 T (Fig. 1) at NHMFL and 45 T at Boston College [3] showed that unconventional non-saturating MR is observed at angles corresponding to maxima in contrast with saturation at higher field at the minima. This is consistent with the dimensional crossover picture. To confirm and extend these results, the NHMFL Pulsed Field Facility at LANL was employed.

Experimental

The 65T Short Pulse magnet system at NHMFL-LANL, along with a ^{3}He cryostat, was used. A single axis φ-rotator with a special sample holder for orientation along a second, internal degree of freedom θ, based on a similar rotator built at Boston College [4], was put to use, Fig. 2. A DMET crystal of dimensions 750×300×42 $(\mu m)^3$ was mounted on the rotator with gold wires, and then put in the ^{3}He fridge and 65T magnet. Preliminary data were taken at 500 mK, Fig. 3.

Results and Discussion

After a week spent resurrecting the probe and building a sample holder for internal rotation, the magnetoresistance was measured at various angles of external rotation for one internal orientation. Representative data are plotted in Fig. 3.

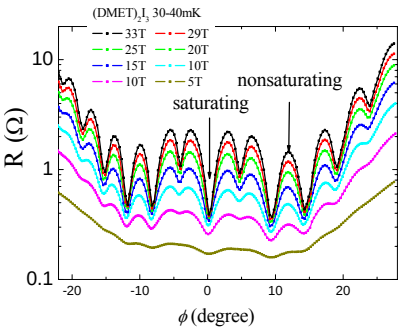

Fig. 1. MR to 33T at NHMFL-FSU.

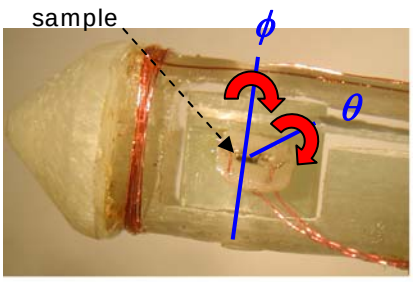

Fig. 2. The rotating probe at LANL.

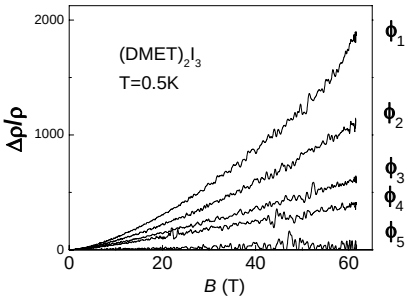

Fig. 3. MR to 65T at NHMFL-LANL.

Conclusions

The φ_5 curve is likely near a local minimum as it shows saturation. However, there is no conclusive evidence as the angles could not be determined accurately during the experiment. This quasi-dual axis rotating probe could possibly be made to yield improved data with the addition of a rotating coil on the sample platform for accurate *in situ* determination of angle.

Acknowledgements

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References

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