Angle-Dependent Measurements on Ultra-Quantum Limit Bismuth

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Introduction

The bismuth as one of the simplest metal, its Fermi surface is well studied. But beyond the quantum limit along trigonal, unexpected anomalies were observed[1]. Later we carried out angle-dependent Nernst effect which is very sensitive to Landau level crossing Fermi level up to 28T in a static field[2]. The twin scenario well explains the observations. The question still remains to answer whether the twin scenario could explain ultra-quantum limit of bismuth beyond 28T. Whether will more unexpected anomalies present in a higher field.

Experimental

We carried out detailed angle-dependent magnetoresistance measurements in 65T along binary-trigonal plan in a pulsed magnet at 1.4 K. A complete Landau spectrum is established. We also compared our results to that of the calculated.

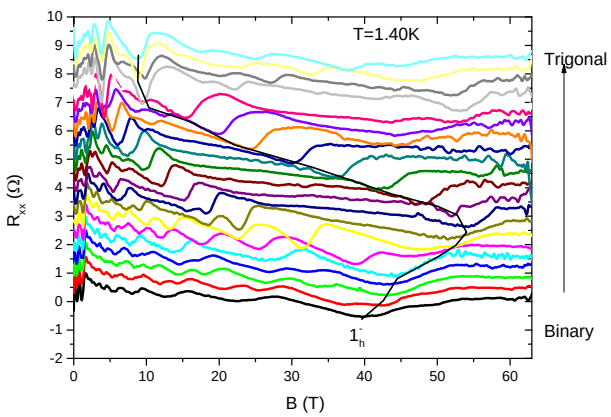

Fig.1 Angle-dependent Rxx as field is tilted from Binary to Trigonal in the pulsed field to 65T at T =1.4 K .

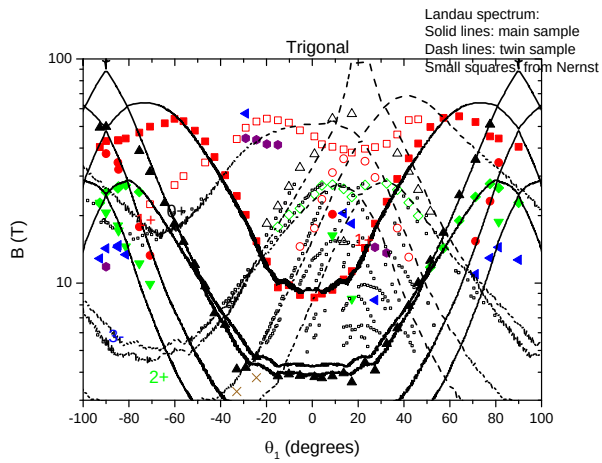

Fig.1 The peaks positions from derivation of magetoresistance shows a few discrepancies with twin scenario.

Results and Discussion

After comparing with the theory, the twin scenario is valid up to 65T. But a few discrepancies remains.

Conclusions

We carried out angle-dependent Rxx measurement along trigonal-binary plane, with field up to 65T. A theoretical calculation is used. Although a few discrepancies, the twin scenario could hold up to 65T.

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References

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[2] Z. Zhu, B. Fauqué, L. Malone, A. B. Antunes, Y. Fuseya, and K. Behnia, Proceedings of the National Academy of Sciences (2012).