Pressure Evolution of the Fermi Surface of Chromium at High Magnetic Fields

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Introduction

In order to gain a better understanding of the impact of charge density wave formation on the Fermi surface of depleted uranium we are looking at chromium, which has a spin and charge density wave.

Experimental

In our experiment we used the 35 Tesla top loading ^{3}He system to study the effects of pressure on the Fermi surface of chromium. These measurements were performed using a tunnel diode oscillator circuit with the resonant inductor coil inside the piston cylinder pressure cell.

Results and Discussion

Figure 1 shows Shubnikov-de Haas quantum oscillations of the reconstructed Fermi surface of chromium (repeatable with pressure cycles) above the 9.2 kbar transition. Experiments in the 35T top loading 3He system helped us verify this frequency spectrum, in particular the low frequencies. Figure 1 includes the temperature dependence of the quantum oscillations at 14.7 kbar. Even up to 70K the oscillations have not been suppressed at low frequencies, though they do require fields greater than 16T to resolve the low frequency oscillations at high temperatures.

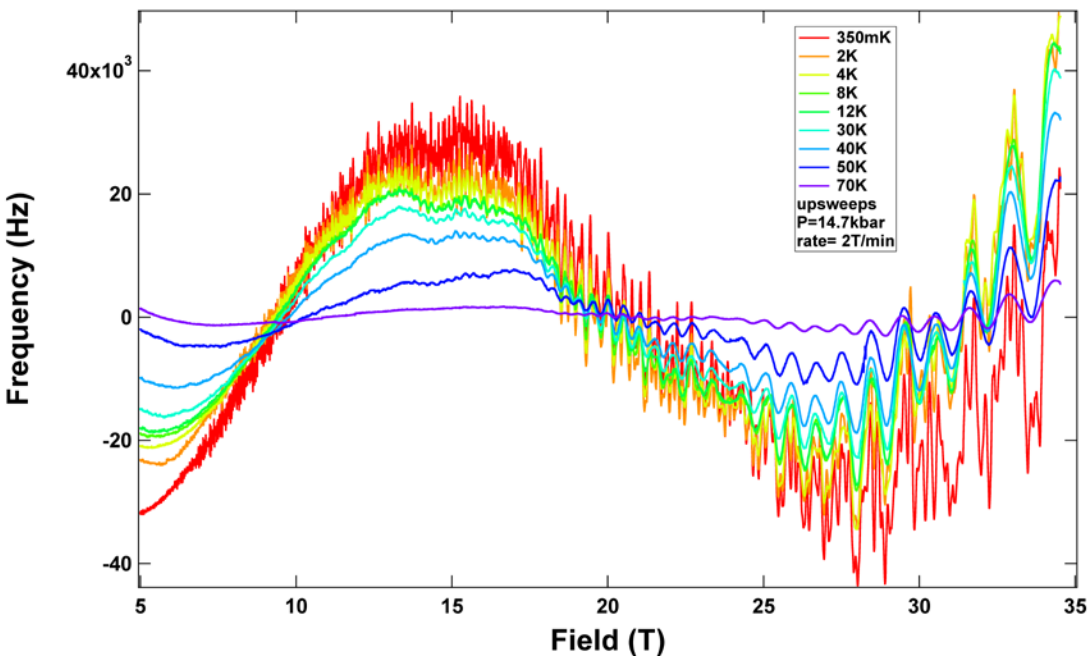

Figure 1. Temperature dependence of quantum oscillations in chromium at 14.7 kbar.

Conclusions

This data shows that there is a radical Fermi surface reconstruction above 9.2kbar and that this new Fermi surface includes at least one orbit with a very low effective mass which we are able to follow up to at least 70K.

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