

**Experiment title:**

Triple-k Ordering in Magnetic Field

Experiment**number:**

HE-2168

Beamline:

ID20

Date of experiment:

from: 6/4/2006 to: 11/4/2006

Date of report:

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Shifts:

18

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Multi- k magnetic structures in $\text{USb}_{0.9}\text{Te}_{0.1}$ and $\text{UAs}_{0.8}\text{Se}_{0.2}$ observed via resonant x-ray scattering at the $\text{U } M_4$ edgeB. Detlefs,^{1,2,*} S. B. Wilkins,^{1,2,†} P. Javorský,³ E. Blackburn,^{1,‡} and G. H. Lander¹¹*European Commission, JRC, Institute for Transuranium Elements, Postfach 2340, Karlsruhe D-76125, Germany*²*European Synchrotron Radiation Facility, BP 220, F-38043 Grenoble, Cedex, France*³*Department of Condensed Matter Physics, Faculty of Mathematics and Physics, Charles University in Prague, Ke Karlovu 5, 121 16 Prague 2, Czech Republic*

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Experiments with resonant photons at the $\text{U } M_4$ edge have been performed on a sample of $\text{USb}_{0.9}\text{Te}_{0.1}$, which has an incommensurate magnetic structure with $k=k=0.596(2)$ reciprocal lattice units. The reflections of the form $\langle kkk \rangle$, as observed previously in a commensurate $k=1/2$ system [N. Bernhoeft *et al.*, Phys. Rev. B **69**, 174415 (2004)], are observed, removing any doubt that these occur because of multiple scattering or high-order contamination of the incident photon beam. They are clearly connected with the presence of a $3k$ configuration. Measurements of the $\langle kkk \rangle$ reflections from the sample $\text{UAs}_{0.8}\text{Se}_{0.2}$ in a magnetic field show that the transition at $T^* \sim 50$ K is between a low-temperature $2k$ and high-temperature $3k$ state and that this transition is sensitive to an applied magnetic field. These experiments stress the need for quantitative theory to explain the intensities of these $\langle kkk \rangle$ reflections.

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