



Experiment title:
Direct determination of topological winding number
in k -space using RIXS

**Experiment
number:**
HC-3590

Beamline:
ID32

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Shifts:
3

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Report:

During our one-day test beamtime at ID32 on 4th Feb 2018, we attempted to investigate the well-known Weyl semimetal TaAs with resonant inelastic x-ray scattering (RIXS). We used high-quality TaAs single crystals (space group $I4_1md$, $a = 3.437 \text{ \AA}$, $c = 11.656 \text{ \AA}$), which were previously successfully used in angle-resolved photoemission spectroscopy (ARPES) experiments to determine $E(\vec{k})$. The pseudospin is purely from the Ta $5d$ orbitals. Our goal was to use a recently established experimental method, demonstrated for resonant elastic x-ray scattering (REXS), to measure the topological winding number N .

Experimental

Unfortunately for us, but not too surprising either, the Ta edge was not visible in our experiments. Owing to the high quality of the samples, and the previous success of the ARPES experiments conducted on them, we feel comfortable to state that the intended measurement is not feasible.

Conclusion

We are very grateful for having had the opportunity to carry out this proof-of-principle experiment on TaAs. Although this particular material was unsuitable for the intended demonstration of the topological determination principle using RIXS, we are confident that other materials with more favorable absorption edge will show topological extinction phenomena in k -space.