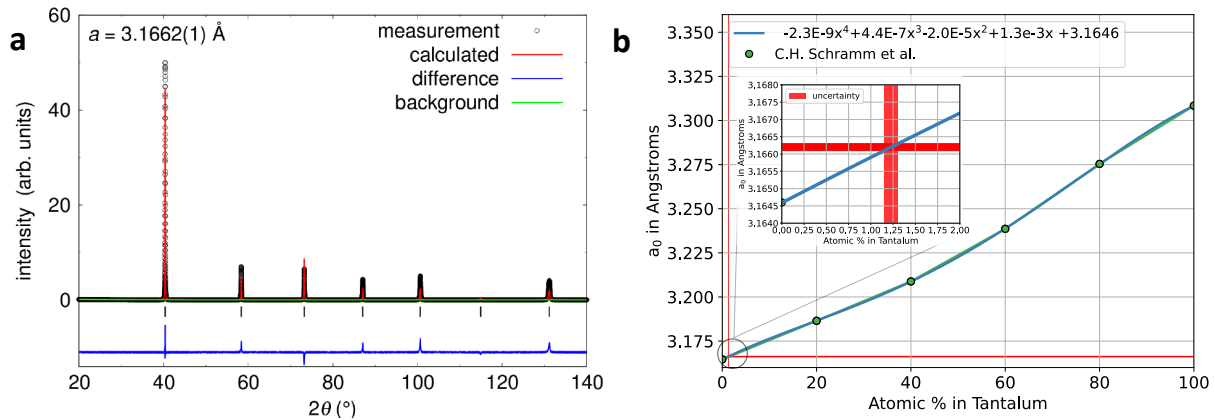


## SUPPLEMENTARY MATERIAL

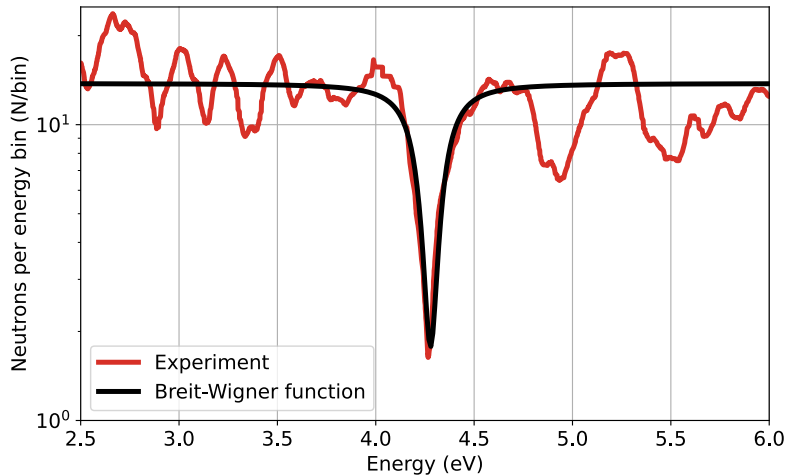
### NRS evaluation



**Supplementary Fig. 1. Determination of the tantalum content.** **a:** The lattice parameter  $a_0$  of the tungsten sample was investigated with X-ray diffraction.  $a_0$  was determined to  $3.1662 \pm 0.0001$  angstrom. **b:** Schramm et al. [2] has found that  $a_0$  changes with the percentage of tantalum present in tungsten (green dots). A 4th order polynomial fit was used to interpolate between the data points. Based on these findings the tantalum impurity has been determined to be at  $1.23 \pm 0.07\%$ . The red area identifies the range of uncertainty for the measurement.

The energy resolution of the setup is influenced by the intrinsic energy uncertainty caused by the moderation process. For the  $^{182}\text{W}$  resonance, this leads to an energy uncertainty  $\Delta E_M = 0.12 \text{ eV}$ . The Doppler broadening for this energy is  $\Delta E_D = 0.05 \text{ eV}$ . Additional contributions to the uncertainty are caused by the distance ( $\pm 1 \text{ cm} \hat{=} 0.05 \text{ eV}$ ) as well as the data processing ( $0.07 \text{ eV}$ ). This leads to a total energy uncertainty of  $0.16 \text{ eV}$  for this resonance. The presence of the tantalum impurity was investigated with energy dispersive spectroscopy on a scanning electron microscope and with X-ray diffraction. The measurement of the lattice parameter was  $a_0 = 3.1662(1) \text{ \AA}$  which corresponds to an atomic percentage of  $1.23 \pm 0.07\%$  tantalum [2] which is close to the detection limit. By applying equation 5 to the  $^{181}\text{Ta}$  resonance at  $10 \text{ eV}$ , it is possible to estimate that the minimal atomic presence of tantalum in the sample has to be higher

that 0.6% to be still detectable. These ranges are deemed to be realistic for the industrial grade tungsten sample. The results of a laser-driven neutron activation analysis is attached separately and further confirms the presence of tantalum.



**Supplementary Fig. 2. Determination of the resonance position.** A small bin size with additional smoothing is used to reduce fluctuations caused by the binning position and enables a more precise determination of the resonance position. The center of the resonance is determined with a Breit-Wigner fit to 4.28 eV. It is worth noting that the resonance width  $\Gamma=0.18$  eV is smaller than the simulated value  $\Gamma=0.55$  eV.

In Fig. 2.c of the publication, the resonance shape was evaluated with a large bin with to reduce the statistical fluctuations per bin. This resulted in an energy uncertainty of 0.4 eV due to the large binning. This resolution can be increased in the evaluation algorithm by using a smaller binning and apply a smoothing function. This distorts the shape of the resonance but enables a more accurate determination of the resonance position. In Supplementary Fig. 2, the binning is set to a average width of  $E_n/85$  which enables a determination of the resonance position of 4.28 eV by a fit to the Breit-Wigner function. This is within the calculated energy uncertainty to the literature value of 4.15 eV [3]. It has to be noted that the width of the resonance is reduced

by this process to  $\Gamma=0.18$  eV. A pure tungsten sample with a natural  $^{182}\text{W}$  content of 26.5 % [4] would result in a FWHM of 0.55 eV according to Monte Carlo simulations. The measured resonance width that is smaller than the literature value is probably due to a lack of statistics and can be considered an artefact.

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### SUPPLEMENTARY REFERENCES

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