Supplementary Material

Materials and Methods

The molecular beam epitaxy (MBE) system employed in the framework of this work is a Riber Compact 21 equipped with a low-temperature Knudsen cell for Yb (Ames Laboratory, 99.9%) and two Telemark electron-beam evaporation sources for Rh (American Elements, 99.95%) and Si (Dr. Eberl MBE-Komponenten GmbH, resistivity > 1000 Ω cm).
We chose an Yb beam equivalent pressure of $1.62 \cdot 10^{-8}$ Torr, measured by the beam flux ion gauge, and growth rates of 0.086 and 0.060 Å/s for Si and Rh, respectively, measured by Inficon quartz thickness monitors, to ensure a stoichiometry of 1:2:2. EDX analysis confirms that the compositions of Yb, Rh, and Si elements are 19, 40 and 41 atomic percent.

Figures

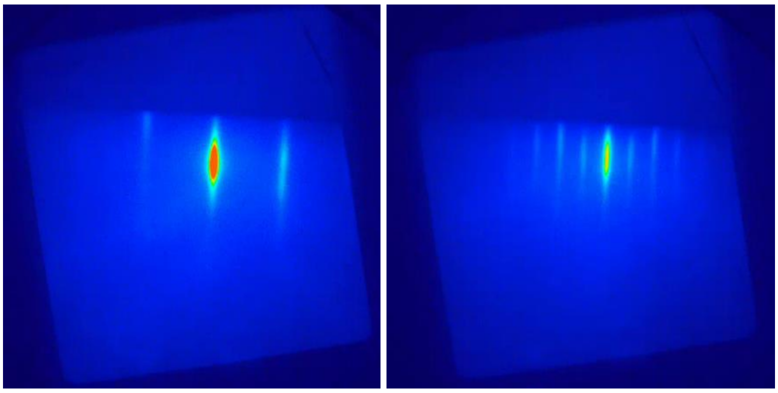

Fig. S1: RHEED patterns along the $[\bar{\mathbf{1}}\mathbf{10}]$ *and* $[\mathbf{100}]$ *directions of* $YbRh_2Si_2$*.*

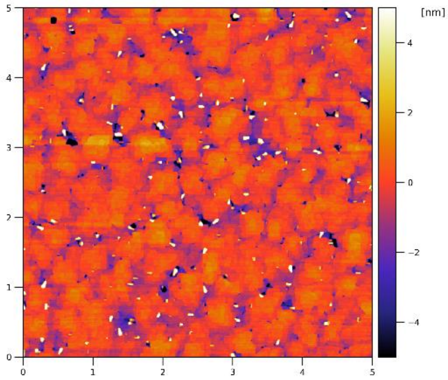

Fig. S2: AFM topography image of $YbRh_2Si_2$ *on Ge(001). The root mean square (RMS) roughness is 1.13 nm.*

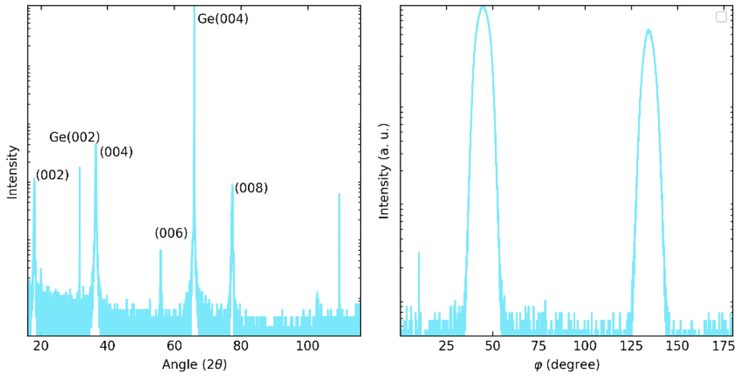

Fig. S3: XRD 2θ and ϕ scans of $YbRh_2Si_2$ on Ge(001)

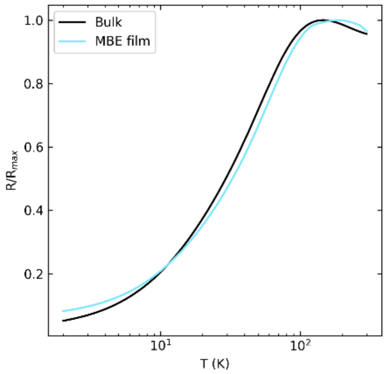

Fig. S4: Normalized resistance of an MBE-grown $YbRh_2Si_2$ film and a bulk single crystal with current j within the tetragonal aa plane [3] for comparison. The film was measured by using the Van der Pauw technique.