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Supplementary material

Enhancement of critical current density in a superconducting $NbSe_2$ step junction

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The critical magnetic field of the step junction is also studied. A magnetic field was applied perpendicularly to the sample plane, and the resistance was measured while sweeping the magnetic field. The critical magnetic field here is defined as the field at which the resistance is half of its normal state value. Fig. S1a-c show the resistance versus the magnetic field at various temperatures for S_{Thick}, $S_{Thin,}$ and $S_{Junction}$, respectively, in which the state at 4 T was taken as the normal state. At 1.8 K, when the magnetic field is swept from zero to higher field, the resistances of both S_{Thick} and $S_{Junction}$ have a transition from zero to nonzero values and then reach a nearly constant value at about 4 T, as is shown in Fig. S1a and c. The resistance of S_{Thin} in Fig. S1b evolves towards a nonzero value when the magnetic field is applied, which indicates that the thinner sample is more sensitive to the magnetic field. When the temperature increases from 1.8 K to 7 K gradually, the critical magnetic field moves toward zero, representing the progressively suppressed superconductivity.

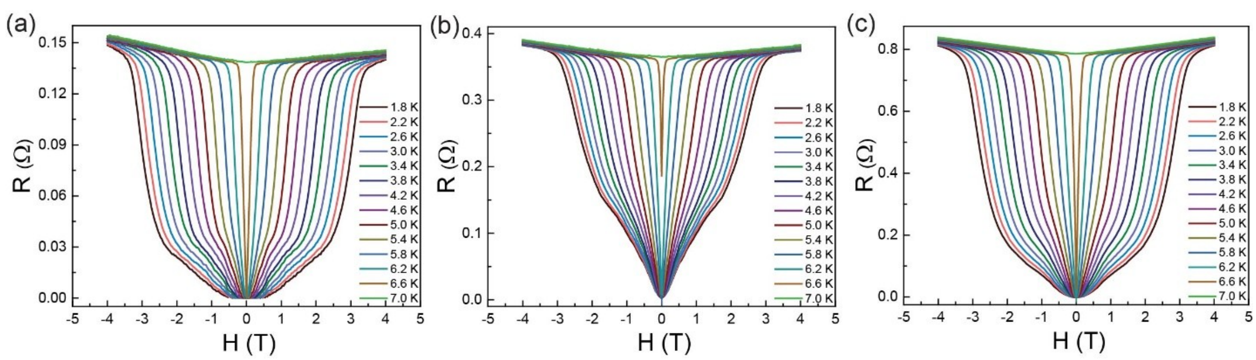

Fig. S1. Four-point resistance as a function of the magnetic field for (a) S_{Thick}, (b) S_{Thin} and (c) $S_{Junction}$ at various temperatures.