Supporting Information

Integrating superconducting van der Waals materials on paper substrates

Jon Azpeitia, Riccardo Frisenda, Martin Lee, Damian Bouwmeester, Wenliang Zhang, Federico Mompean, Herre S. J. van der Zant, Mar García-Hernández*, Andres Castellanos-Gomez**

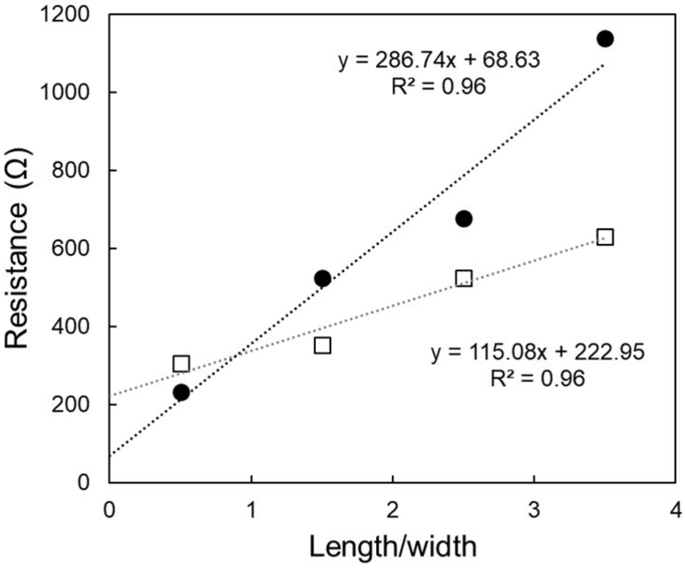

Figure S1. Transfer length characterization of two $NbSe_2$ films on paper to estimate the sheet resistance.

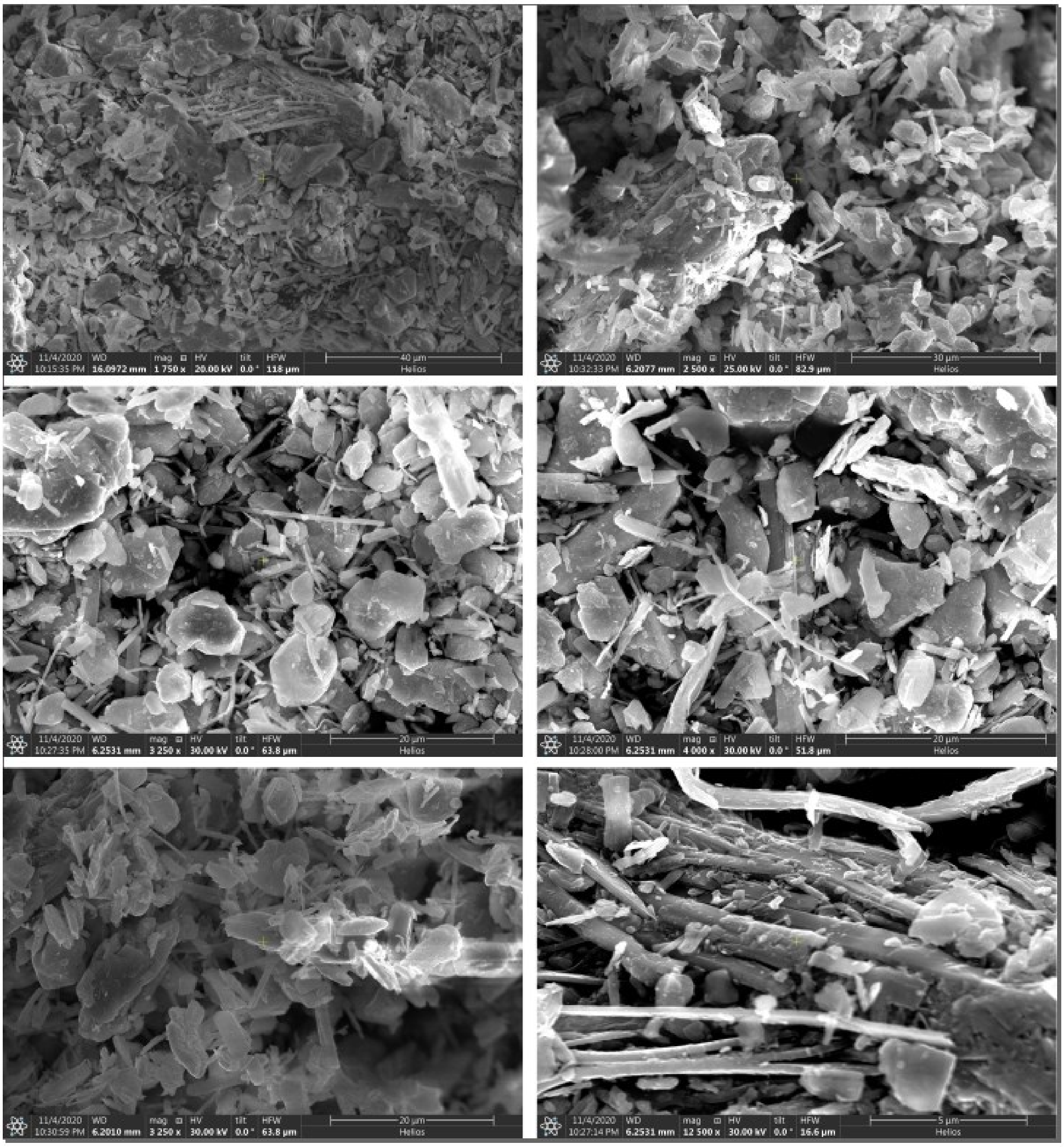

Figure S2: Scanning electron microscopy (SEM) images acquired on the $NbSe_2$ powder source material with different magnifications.

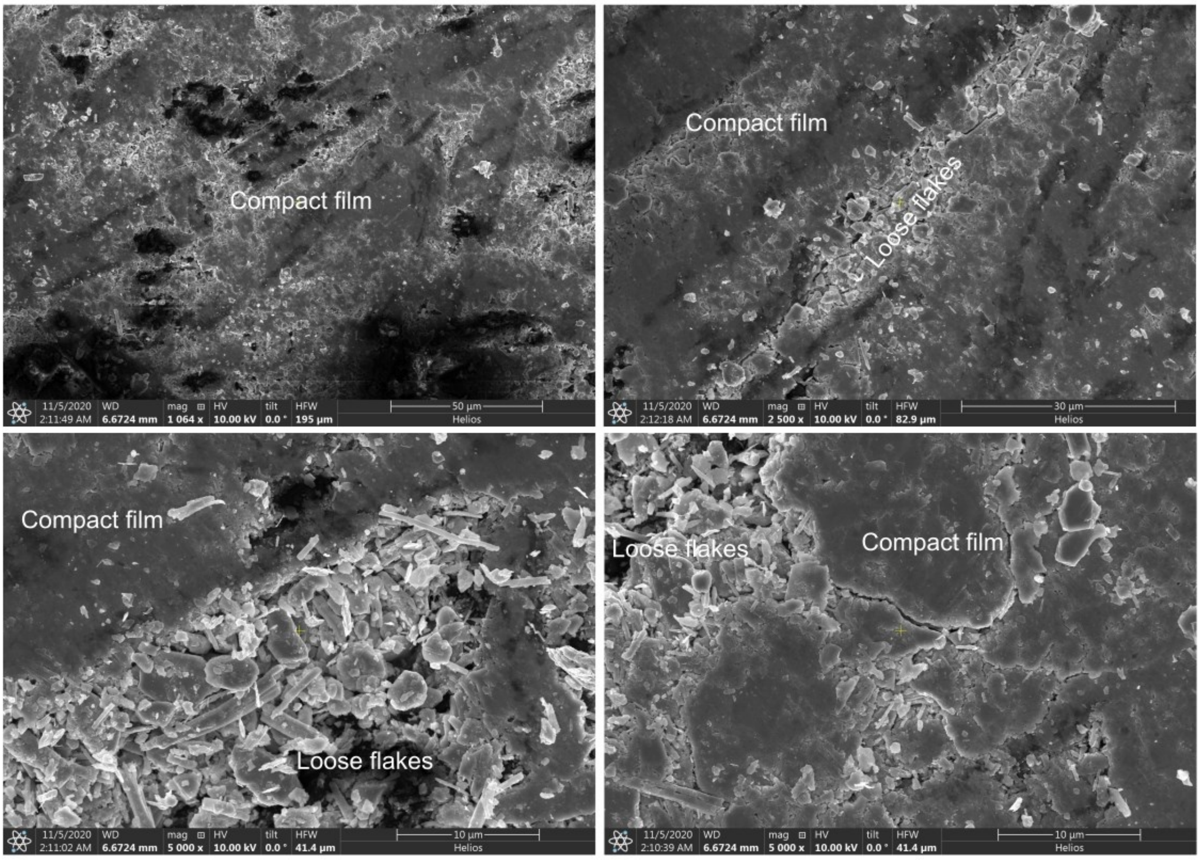

Figure S3: More scanning electron microscopy (SEM) images, at different magnifications, acquired on the $NbSe_2$ film on paper shown in Figure 1 of the main text. The overall film is formed by crushed $NbSe_2$ flakes that form a compact layer but in some of the gaps between paper fibers one can still observe loose $NbSe_2$ flakes.

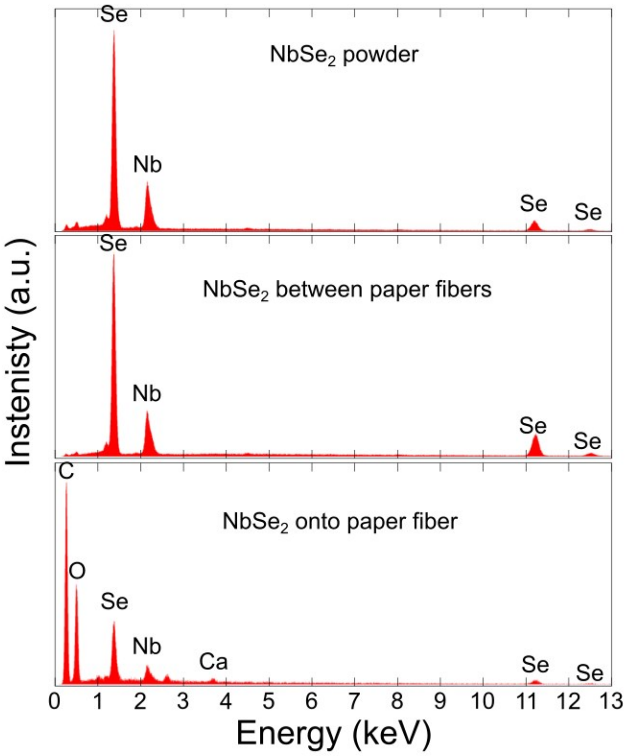

Figure S4: Energy dispersive X-ray spectroscopy (EDX) spectra shown in Figure 1d but in a broader energy range.

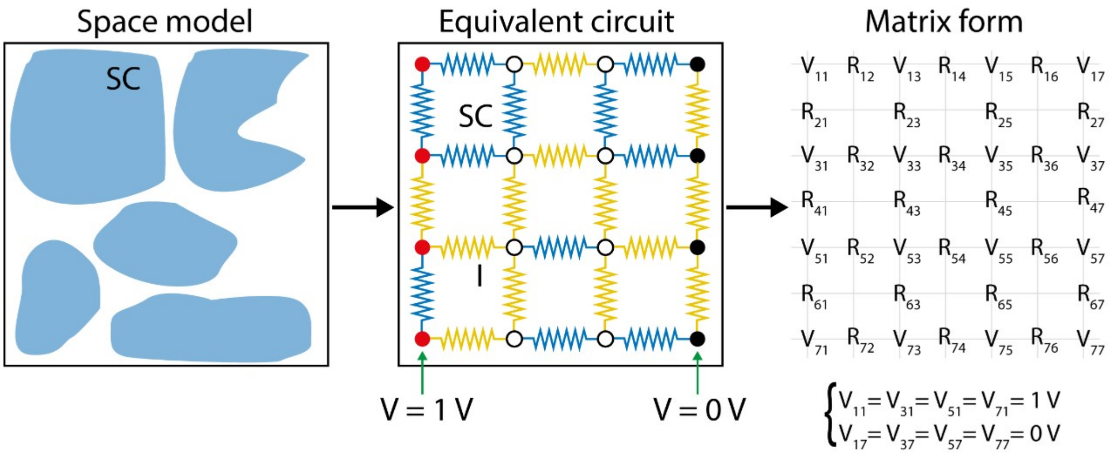

Figure S5: Illustration of the $NbSe_2$ percolative film as a network, (left) random network of superconducting particles, (center) random resistance network derived from the space model, (right) matrix form of the network used to solve the unknown voltages and the currents flowing through each resistor.

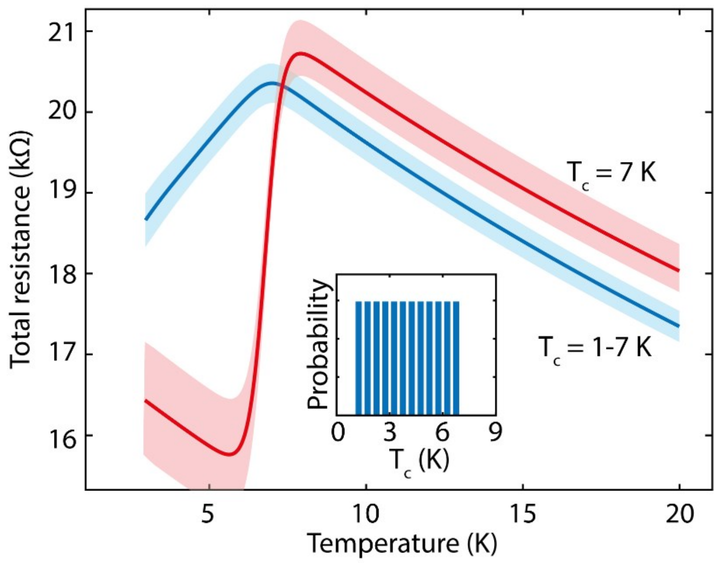

Figure S6: Mean total resistance of random resistors networks (size 120x120) as a function of the temperature with a uniformly distributed critical temperature between 1 K and 7 K (blue curve) and for a fixed critical temperature of 7 K (red). The colored bands correspond to a variation of 1 standard deviation from the mean curves.

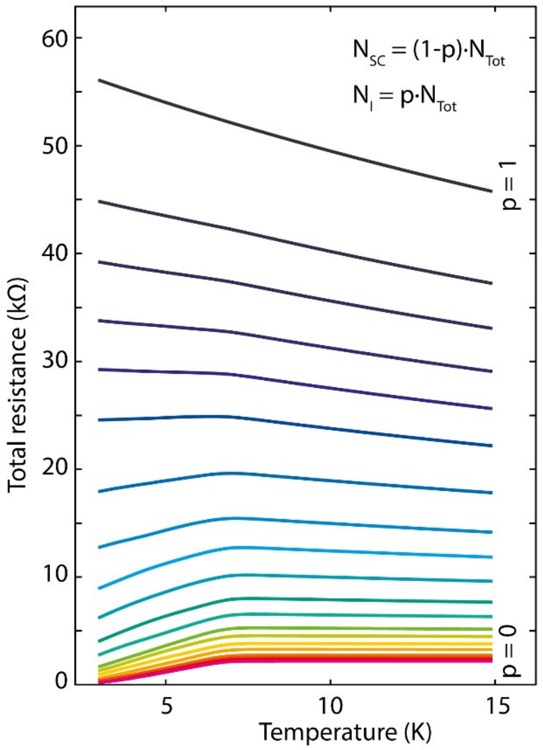

Figure S7: Total resistance of random resistors networks (size 120x120) as a function of the temperature and for different amount of superconducting elements in the film. Going from p=0 corresponding to a network entirely made of superconducting elements, to p=1 where the network is fully insulating. The network used in Figure 4 of the main text has p=0.65.

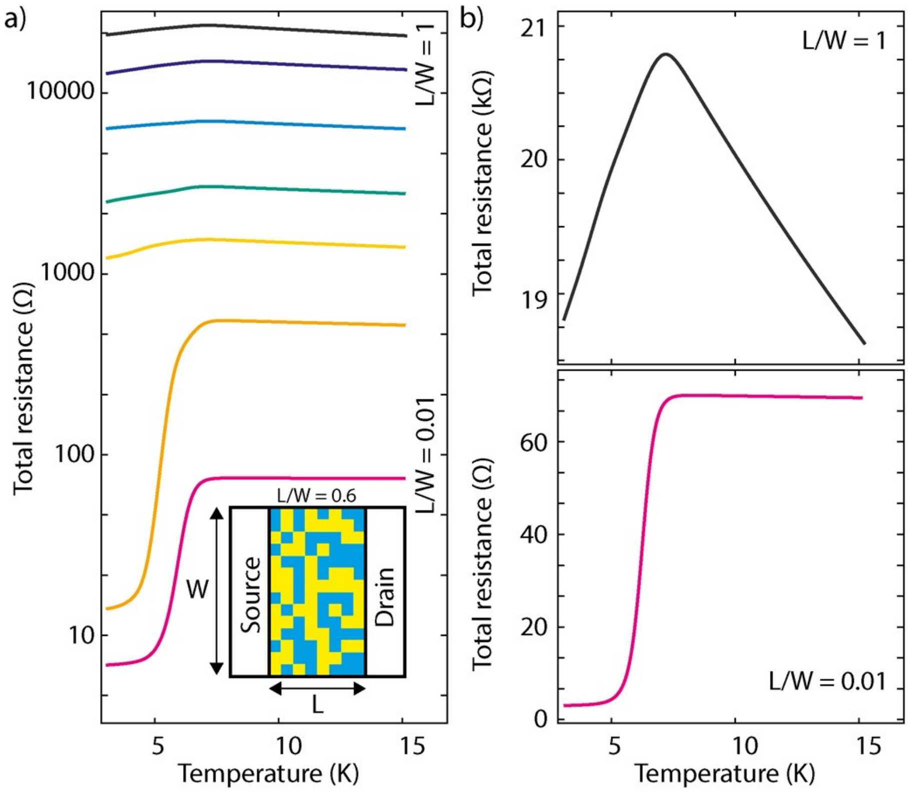

Figure S8: a) Semilogarithmic representation of the total resistance of random resistors networks (size 120x120, p = 0.65) as a function of the temperature calculated for different values of the aspect ratio L/W (where L is the channel length and W the width, see inset for an example with L/W = 0.6). b) Resistance versus temperature curves for a square channel (L/W = 1, top) and for a small aspect ratio channel (L/W = 0.01, bottom).