Analysis of Raw V-I data to extract I_C

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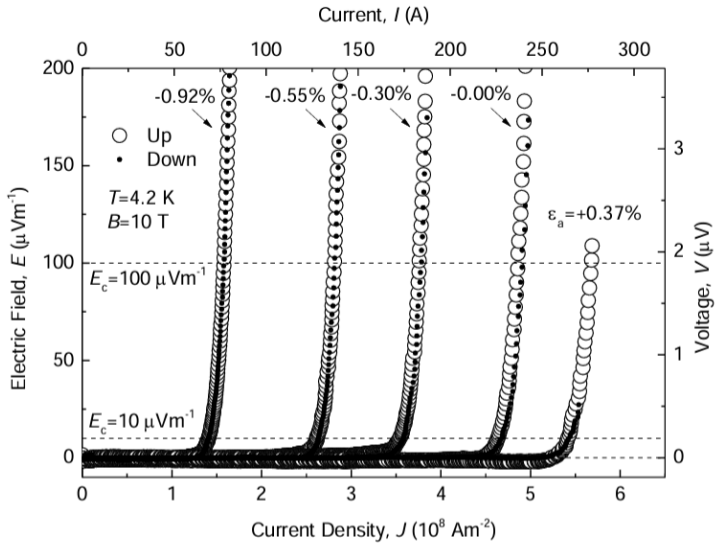
Extracting critical current (I_c) or critical current density (J_c) values.



Typical *E-J* characteristics generated for a Nb_3Sn strand at 4.2 K and 10 T at different values of strain (Tsui and Hampshire, 2012). Each pair of *E-J* characteristics at a given strain were obtained during the strain cycle from +0.4% down to -1.1% and back up to 0.4 % strain. The figure shows that the *E-J* characteristics are a reversible function of strain over the strain range measured.

M J Raine, S A Keys and D. P. Hampshire **Characterisation of the Transport Critical Current Density for Conductor Applications** Handbook of Superconductivity. Publisher: Taylor and Francis (2021)

The raw data is described by:

$$E = \alpha J^n$$

Equally, the raw data is described by:

$$E = E_C \left(\frac{J}{J_c}\right)^n$$

where E_C is the small (and arbitrary) electric field used to define the critical current density (J_c). It is usually taken to be 100 $\mu V.m^{-1}$. The index of transition, *n*, is a fitting parameter that characterises the 'sharpness of the transition' – typically in the range from 10 – 40.