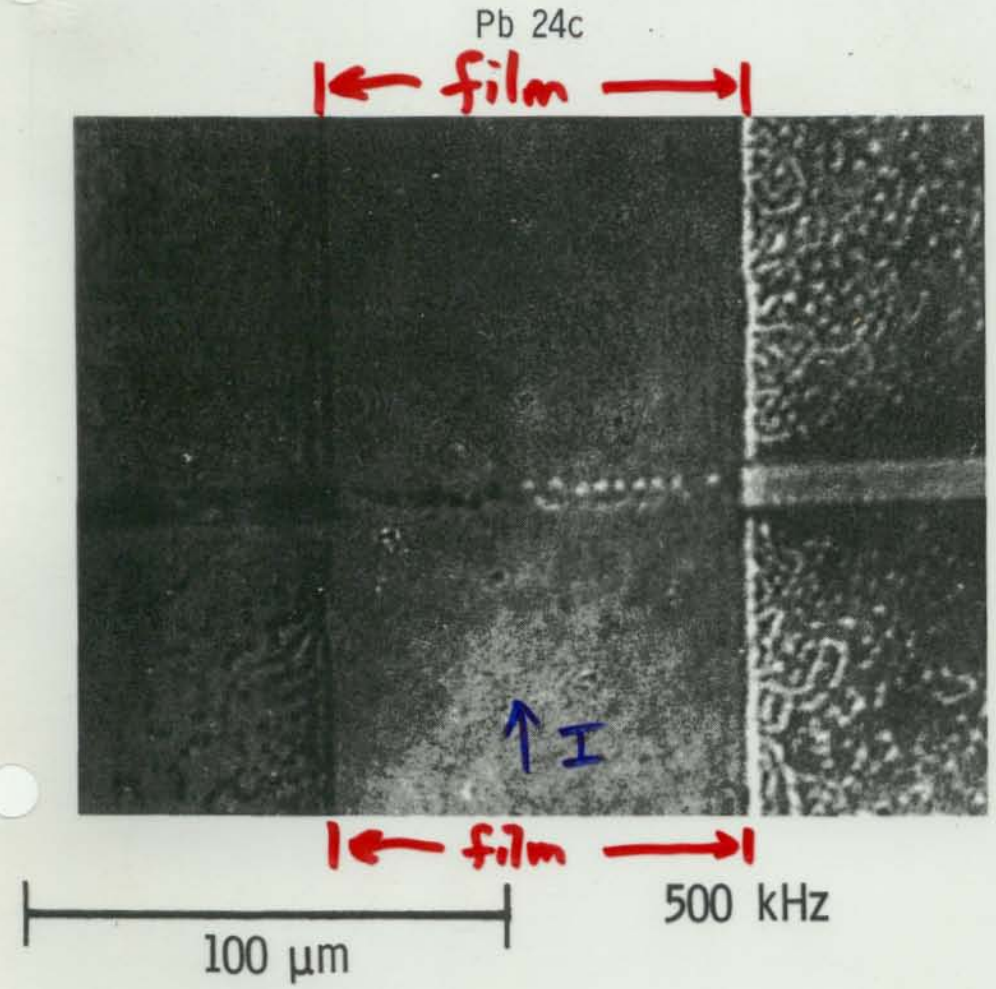

g.14.7. Current-induced resistive state of a constricted Pb film of 6.2 µm ickness at 4.2 K. Current direction is vertical. Magneto-optic flux de- ction with stroboscopic illumination at 500 kHz. The horizontal array of ack and bright flux tubes in the center represents the equivalent of a ngle "channel" such as shown in Fig.14.4 observed under high time resolution ourtesy of D.E. Chimenti)

The constricted geometry has proved to be very useful in combination th the magneto-resistive field probe discussed in Sect.8.6 and shown hematically in Fig.8.6. With such an arrangement the regularity of the ux-tube nucleation process in the current-induced resistive state and its idence upon the geometrical dimensions and the metallurgical microstruc- re of the sample can be studied in a *strictly passive* way. Figure 14.9 ows the spectrum of the flux-tube nucleation frequency in an indium con- riction at 1.88 K as obtained from the signal amplitude of the field probe.

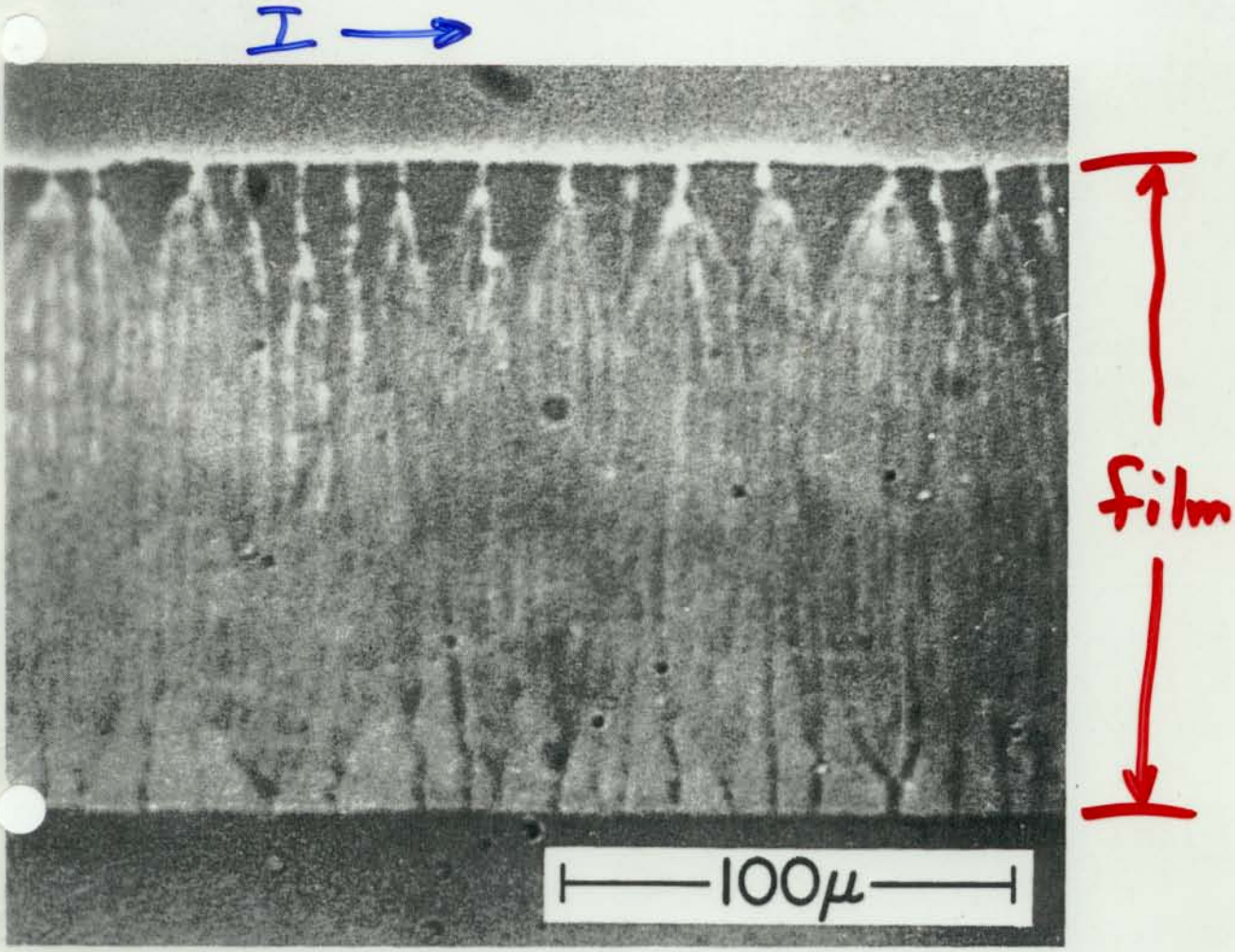

Fig.14.4. Magnetic flux structure in a Pb strip of 4.0 μm thickness and 160 μm width at 4.2 K carrying a transport current of 3.8 A (average current density = 5.9×10^5 A/cm^2). The current flows from left to right. At the top and the bottom the sample edges are clearly visible. The bright and dark "channels" indicate the current-induced flux structure as detected magneto-optically [14.31]

voltage associated with the nucleation of a single "channel" [14.28]. A more direct prove of the dynamic model is provided by photographs of the individual flux tubes in the moving train taken magneto-optically with highly increased time resolution (see Sect.14.2.3).

The abrupt nucleation of the individual flux-tube trains at distinct levels of the transport current leads to structure in the voltage-current characteristic [14.28,32]. Figure 14.6 shows typical voltage steps observed in a Pb strip at the onset of the resistive state. The nucleation of the flux-tube trains and the detail of the voltage-current characteristics are