further increases the density of vortices. For larger fields $B \geq 800\,\mathrm{mT}$ a noticeable drift at the lower parts of the scan area occurs (fig. 8 D), which possibly is due to heating of the setup by eddy currents while changing the field. However major shifts due to heating of the sample and/or the tip during field change can be excluded. As seen from the pictures (A-D) of figure 8, the overall drift of the scanning area between different scans can be neglected, since characteristic surface defects remain at almost the same positions in every scan (white circles).

In order to demonstrate the performance of the STM in magnetic fields the lattice constant a of the Abrikosov lattice has been extracted from the data. In figure 9 the lattice constant a is shown together with the expected field dependence [16] $a = (4/3)^{1/4} \cdot (\Phi_0/B)^{1/2}$ where $\Phi_0 = h/2e$, without any adjustable parameters. Therefore, imaging the vortex lattice allows a calibration of our scan head at low temperatures for large scanning areas, in addition to the calibration for small scanning ranges achieved by atomic resolution. The scaling factor with respect to the room-temperature motion of the scan head is ≈ 0.2 in both cases.

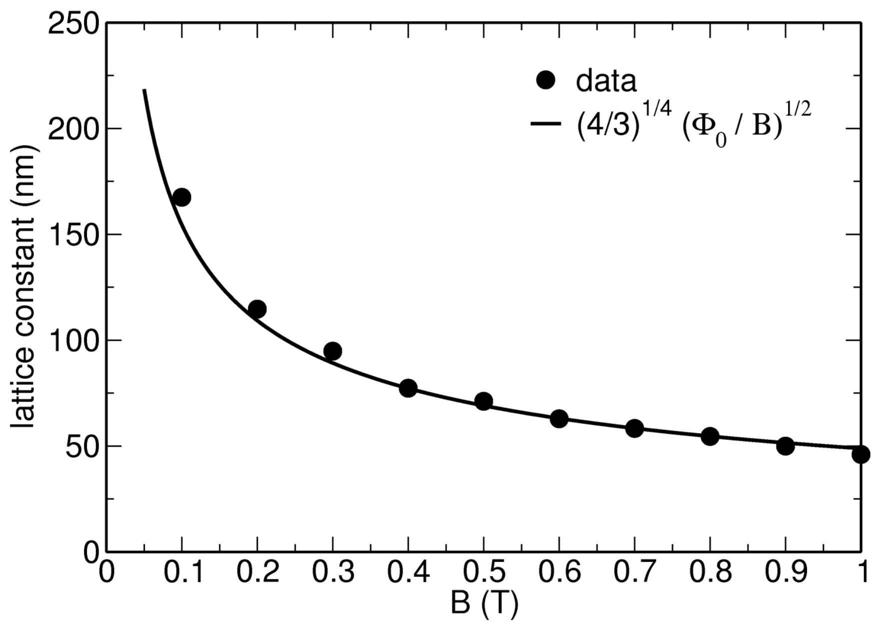

FIG. 9: Field dependence of the flux line lattice constant. The curve is calculated without any free parameter. The expected $a \propto (1/B)^{1/2}$ dependence is clearly seen in the measurements.