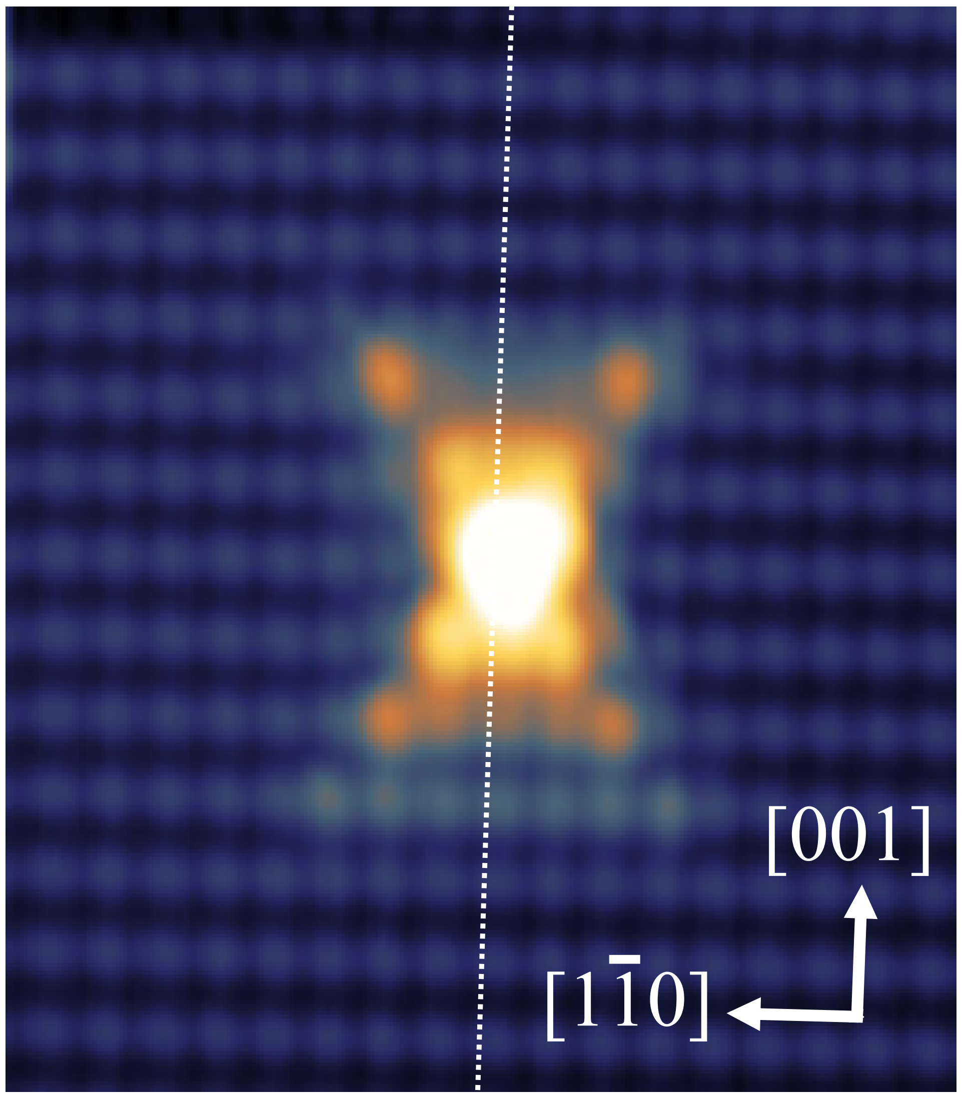
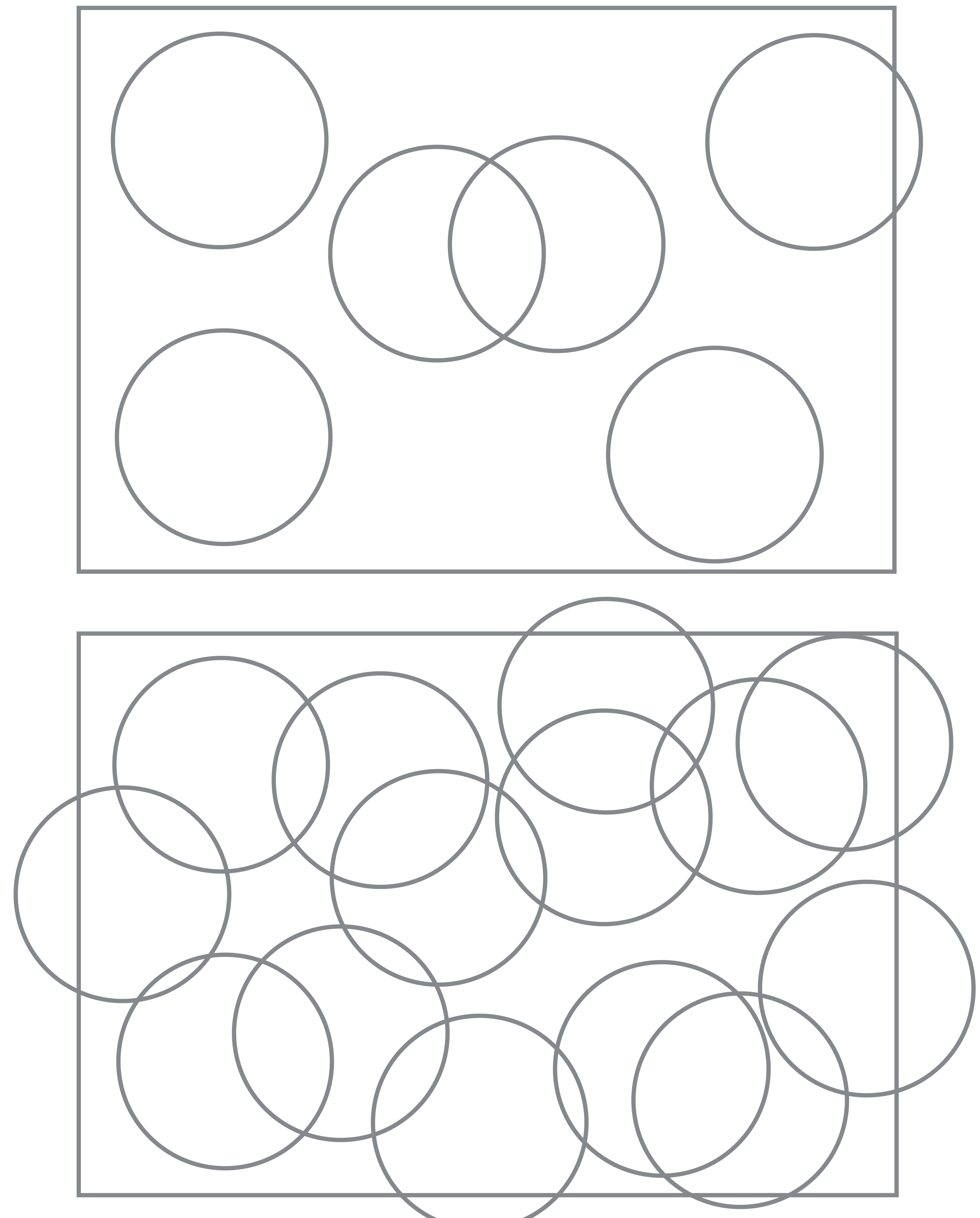
STM image
of an Fe atom in GaAs



Percolation picture
of MIT



Metal-insulator transition (MIT)

Bulk Si doped by P

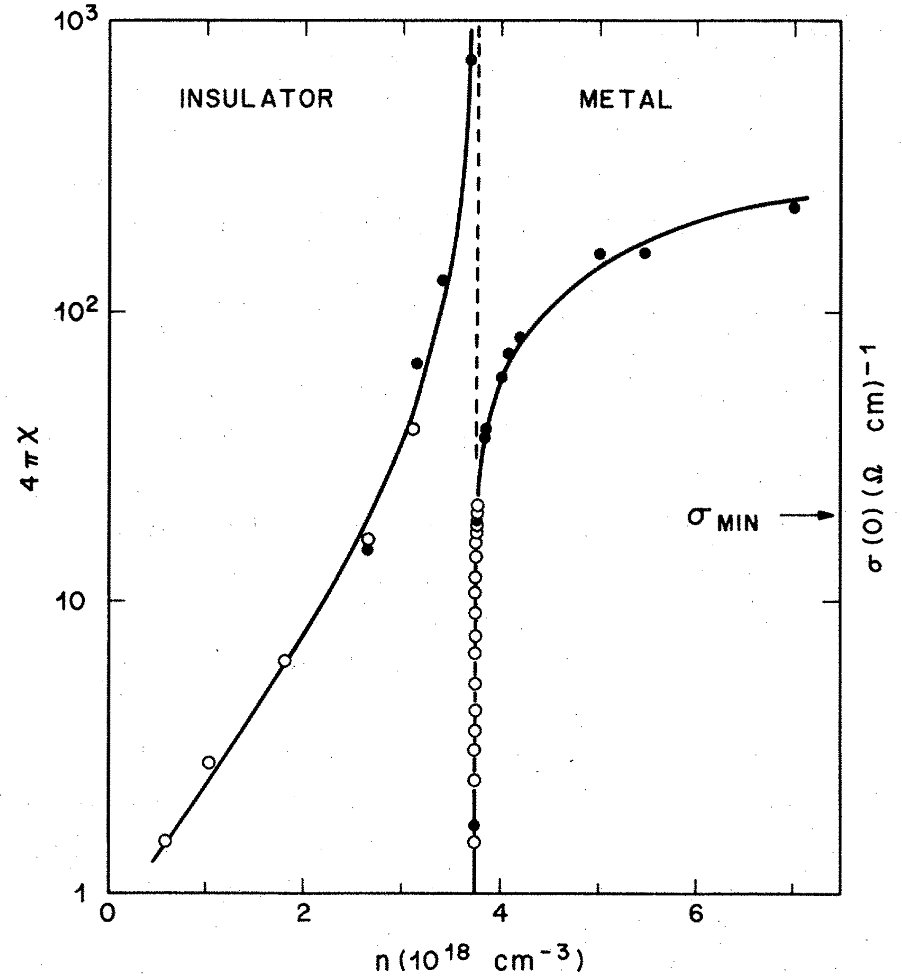


FIG. 2. Divergence of the $T=0$ K donor dielectric susceptibility $4\pi\chi$ in the insulator [solid circles, this work; open circles, Ref. 2; solid line, Eq. (1)] and the $T=0$ K conductivity $\sigma(0)$ in the metal [solid circles, Refs. 5 and 6; open circles, Ref. 7; solid line, Eq. (2)] as a function of phosphorus donor density n. Together these results characterize the metal-insulator transition in a disordered system and indicate a tendency of $4\pi\chi$ to diverge with a critical exponent assumed to be related to the divergence of the localization length.

2DEG with different density

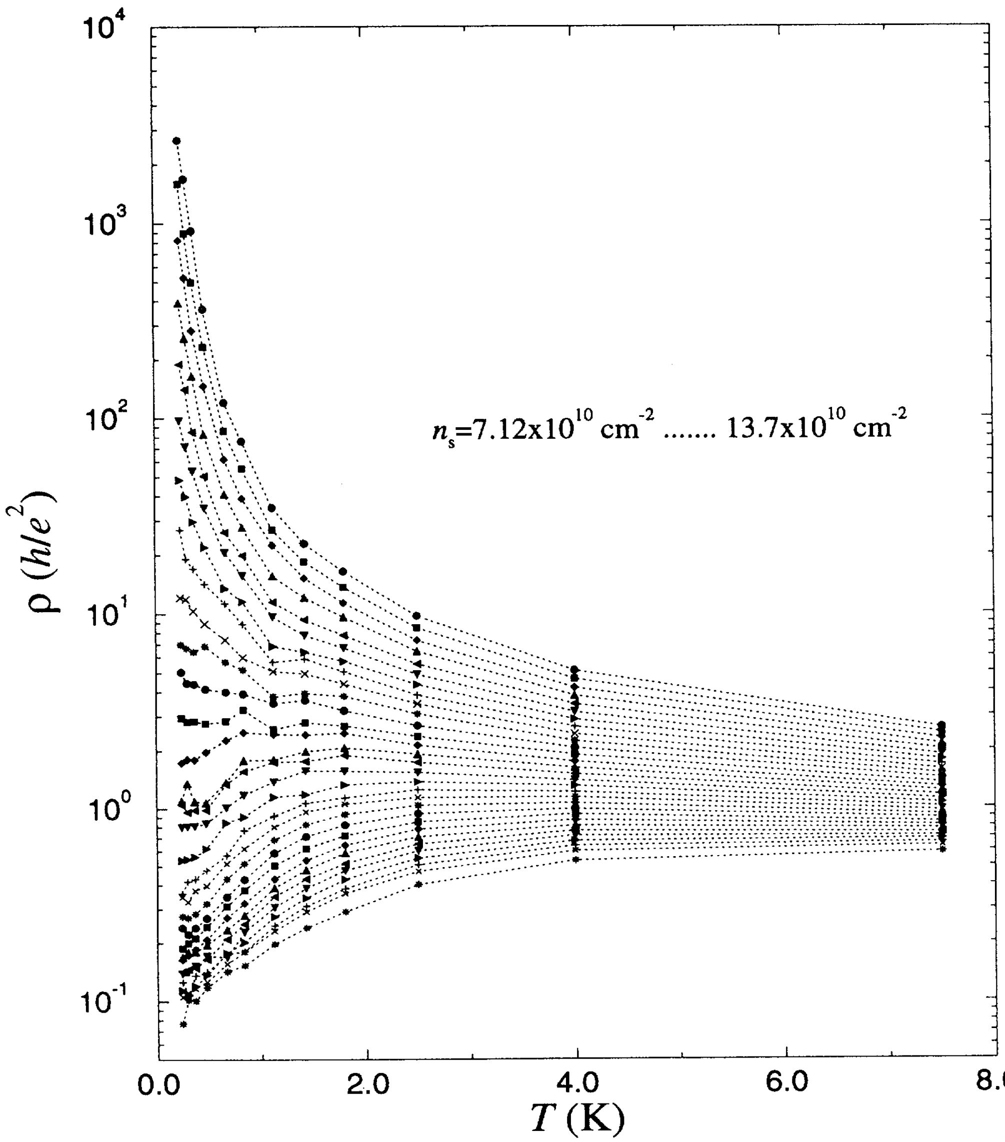
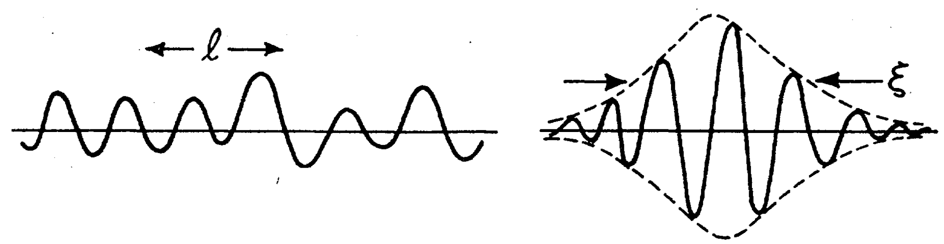


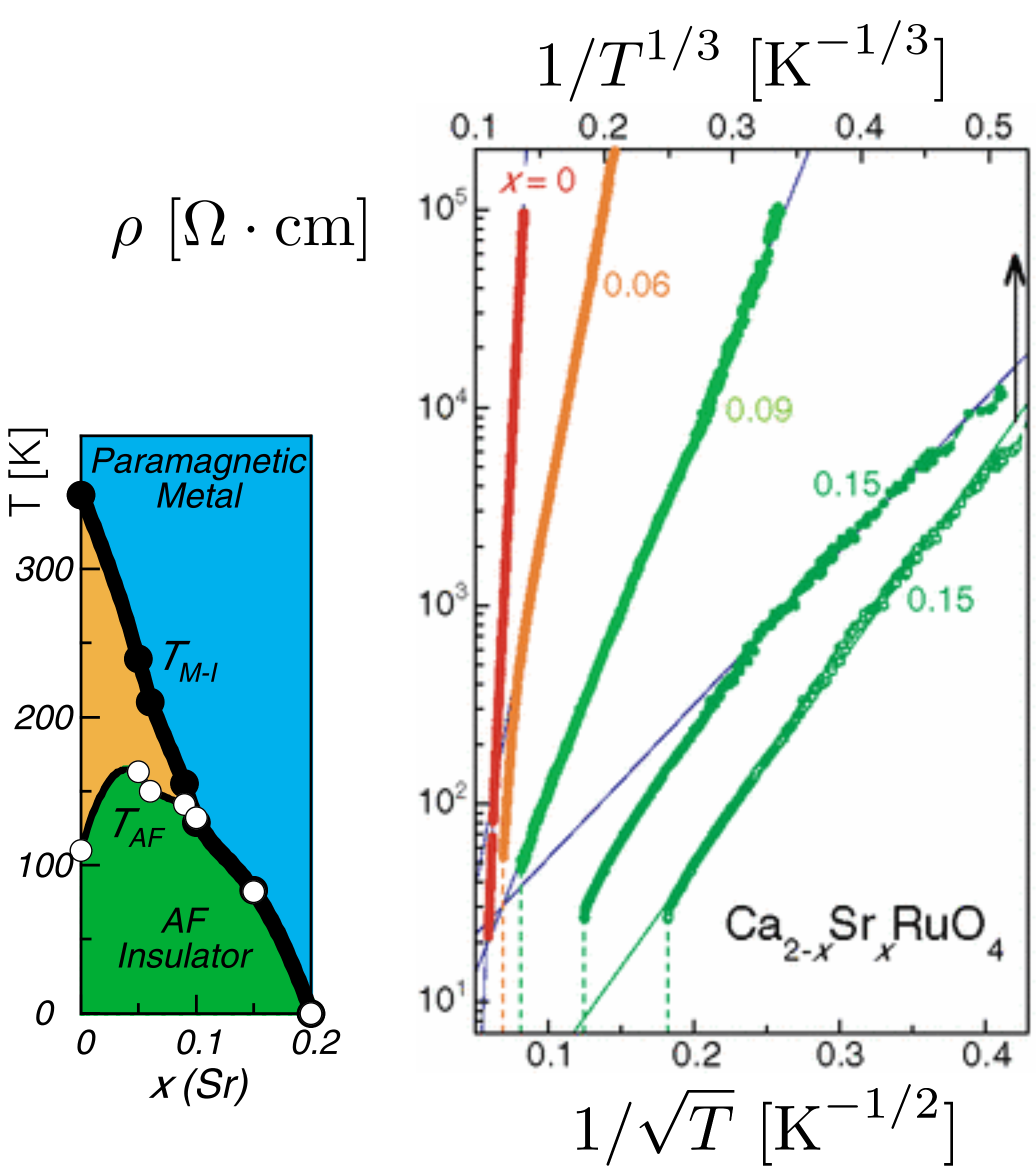
FIG. 3. Temperature dependencies of the resistivity (sample Si-12b) for different electron densities (designated by different symbols) at $B=0$.

Scaling approach to MIT



$|\psi(\mathbf{r})| \sim \exp(|\mathbf{r}-\mathbf{r}_0|/\xi)$

- only in 3D, true metal-insulator transition
- insultator: exponential temperature-dep.
- Anderson & Mott insulators



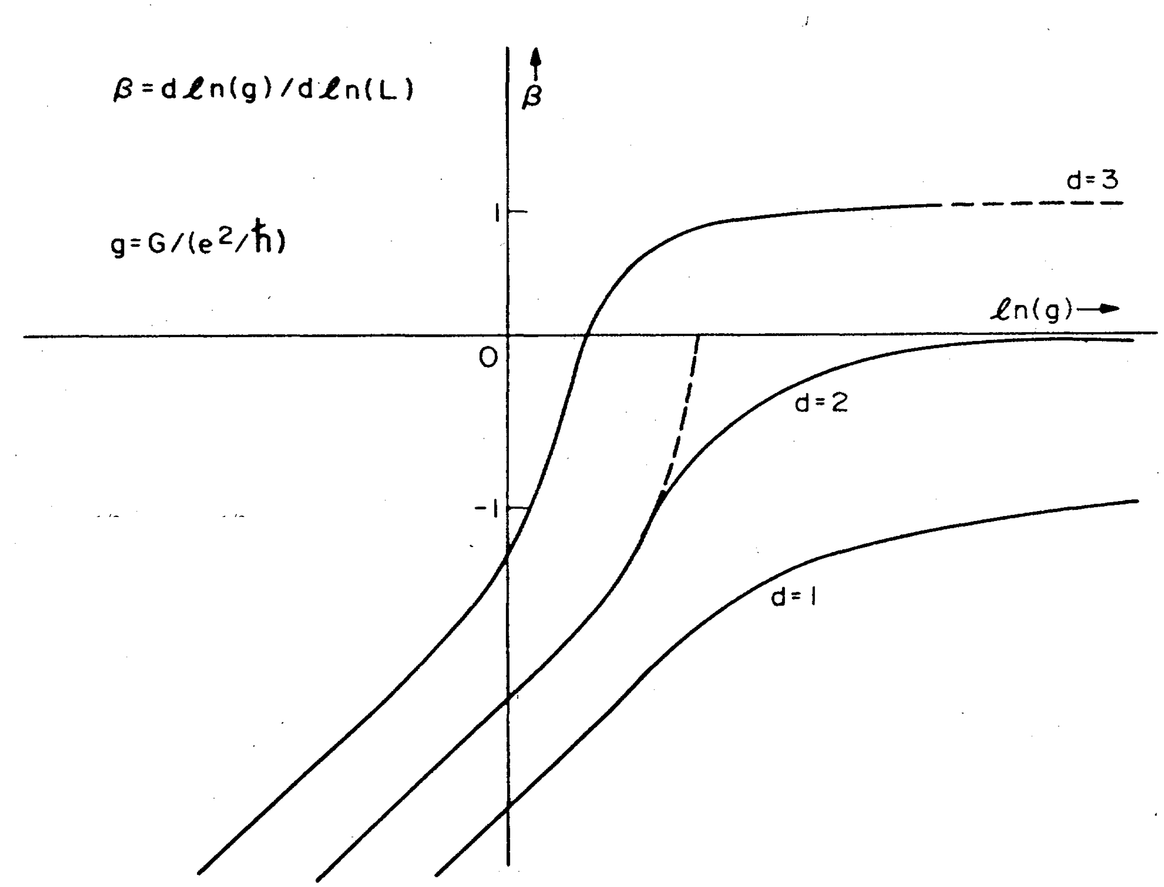


FIG. 3. The scaling function $\beta(g)$ vs the dimensionless conductance g for different dimensions. If σ_{min} exists in 2D, the behavior of β is shown by the dashed lines.

Weak localisation in magnetic field

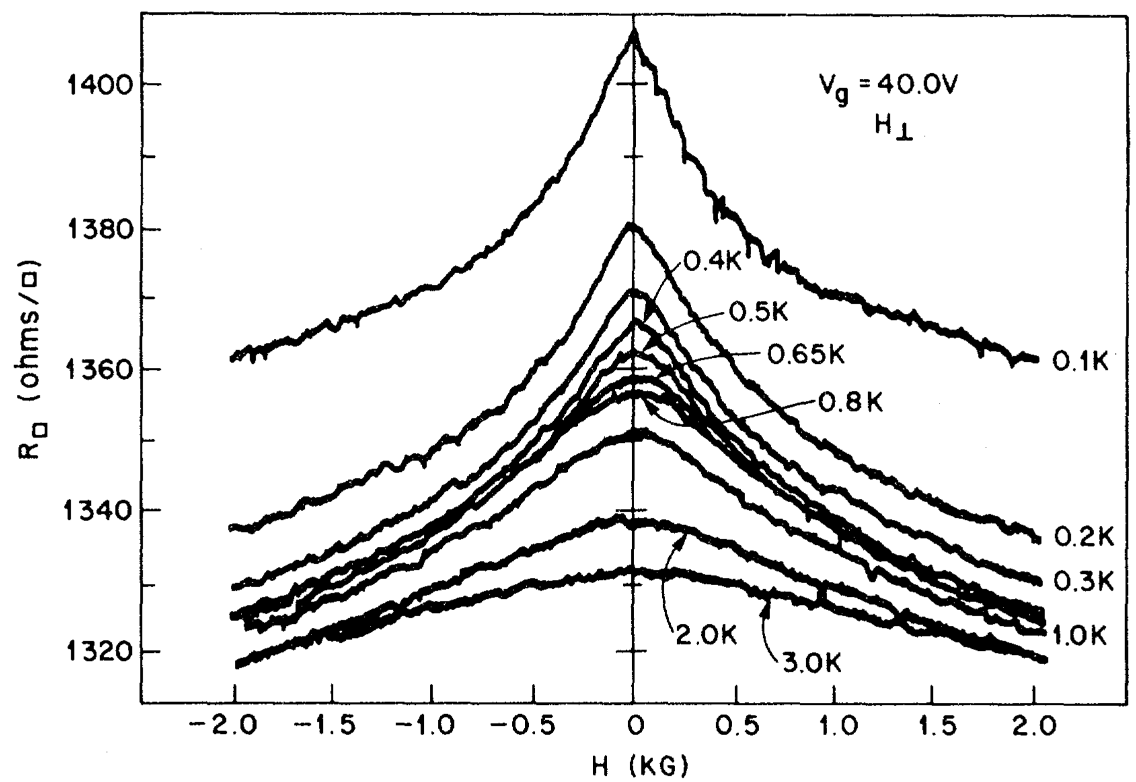
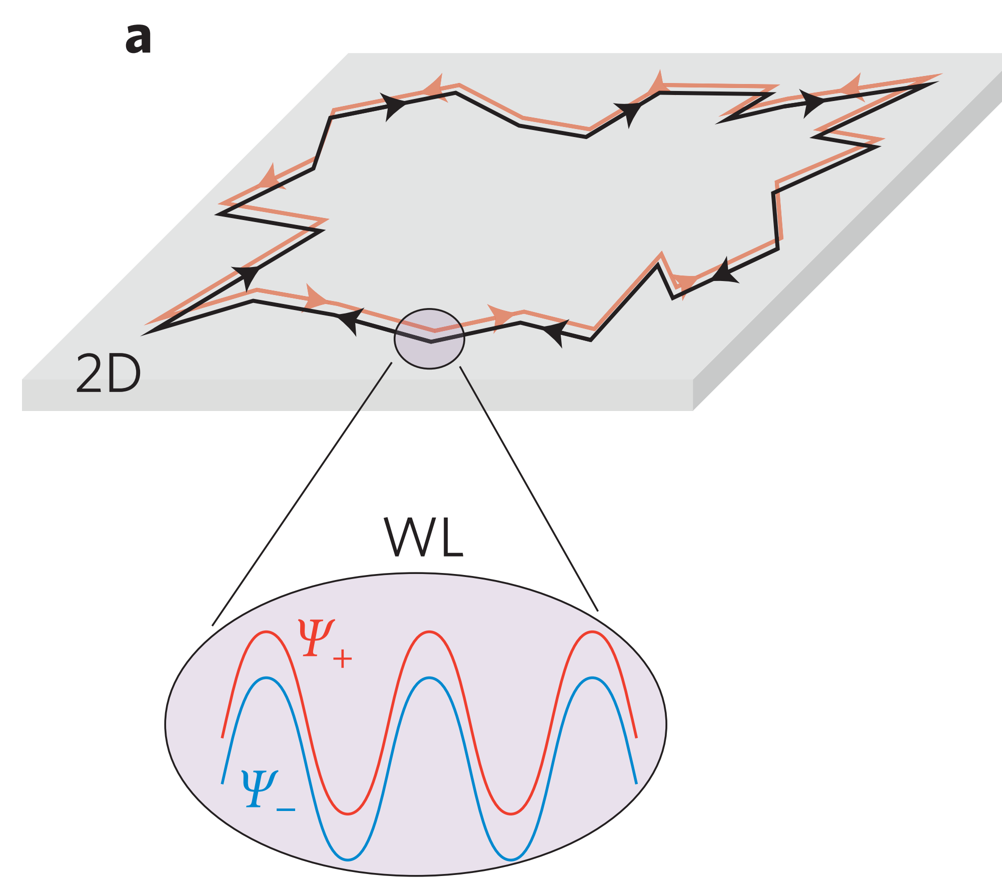


FIG. 2. Low-field magnetoresistance of a Si(111) MOSFET in a perpendicular field for various temperatures. Electron density is 4.52×10^{12} cm^{-2}.



Hikami-Larkin-Nagaoka

$$\Delta G_\square(B) = \alpha \frac{e^2}{2\pi^2\hbar}\left[\ln\left(\frac{\hbar}{4eL^2_{\phi,\mathrm{ss}}B}\right) - \psi\left(\frac{1}{2} + \frac{\hbar}{4eL^2_{\phi,\mathrm{ss}}B}\right)\right]$$

$\alpha = -1$ weak localisation

$\alpha = \frac{1}{2}$ weak antilocalisation

Universal conductance fluctuations

2DEG in MOSFET

at 4.2 K

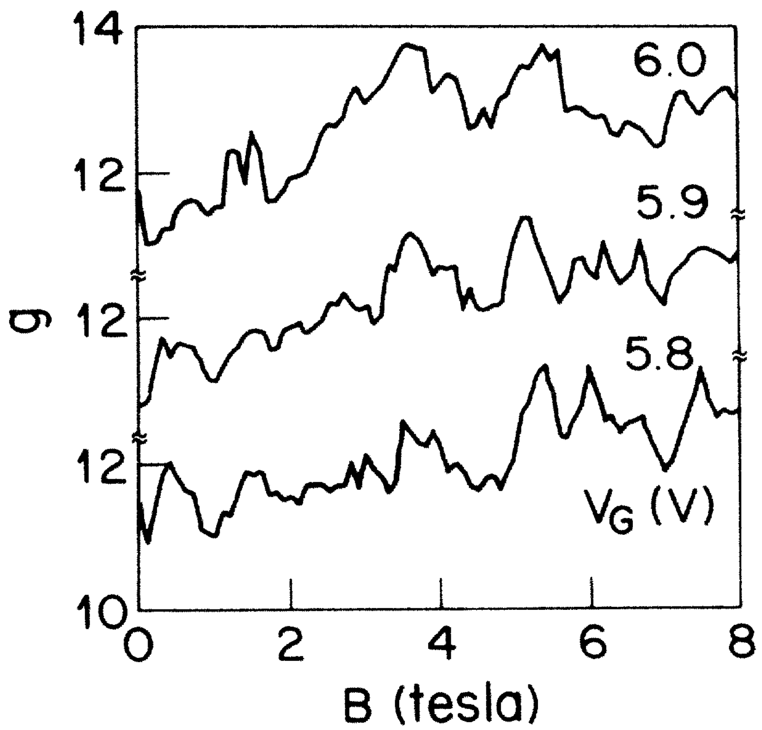
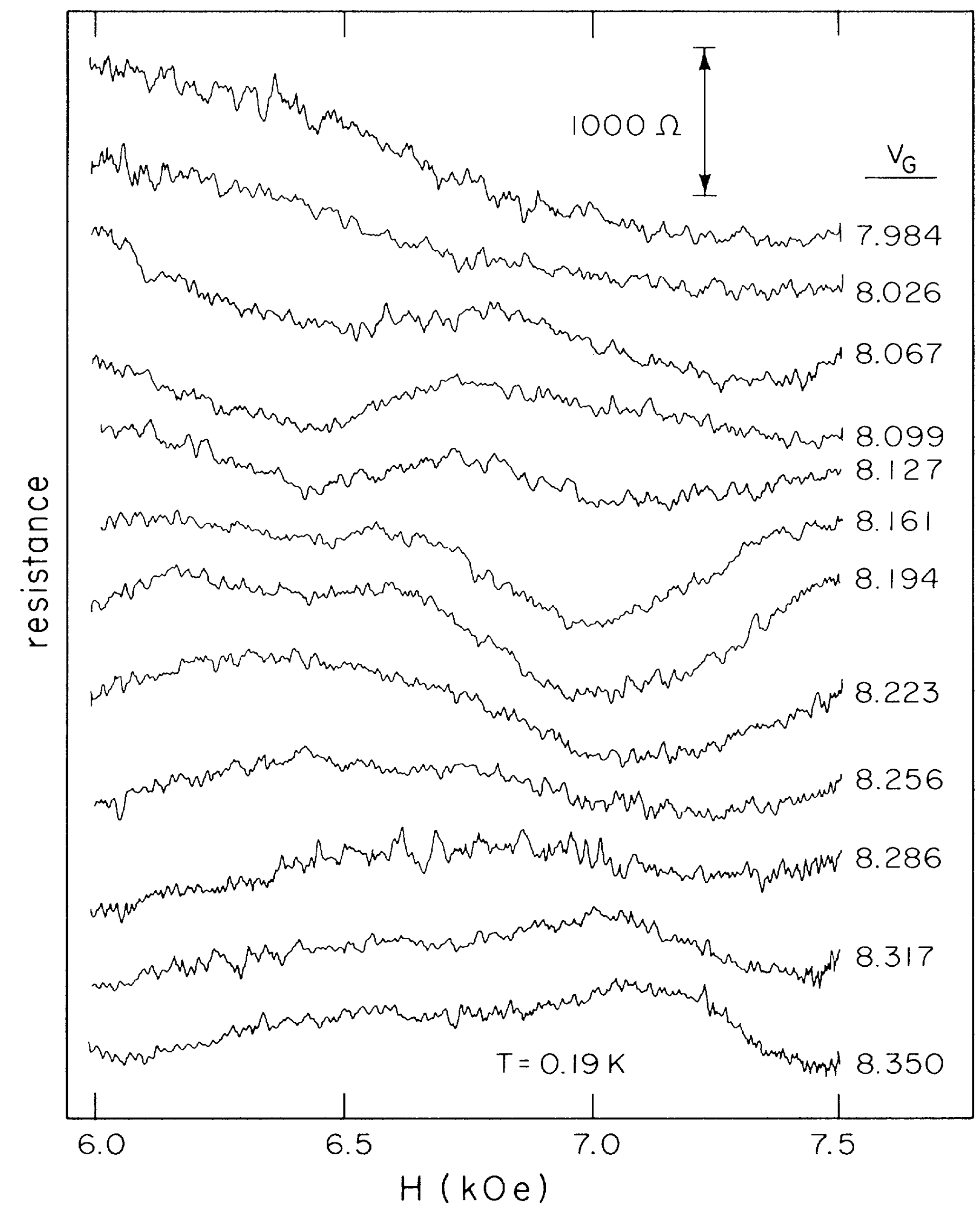
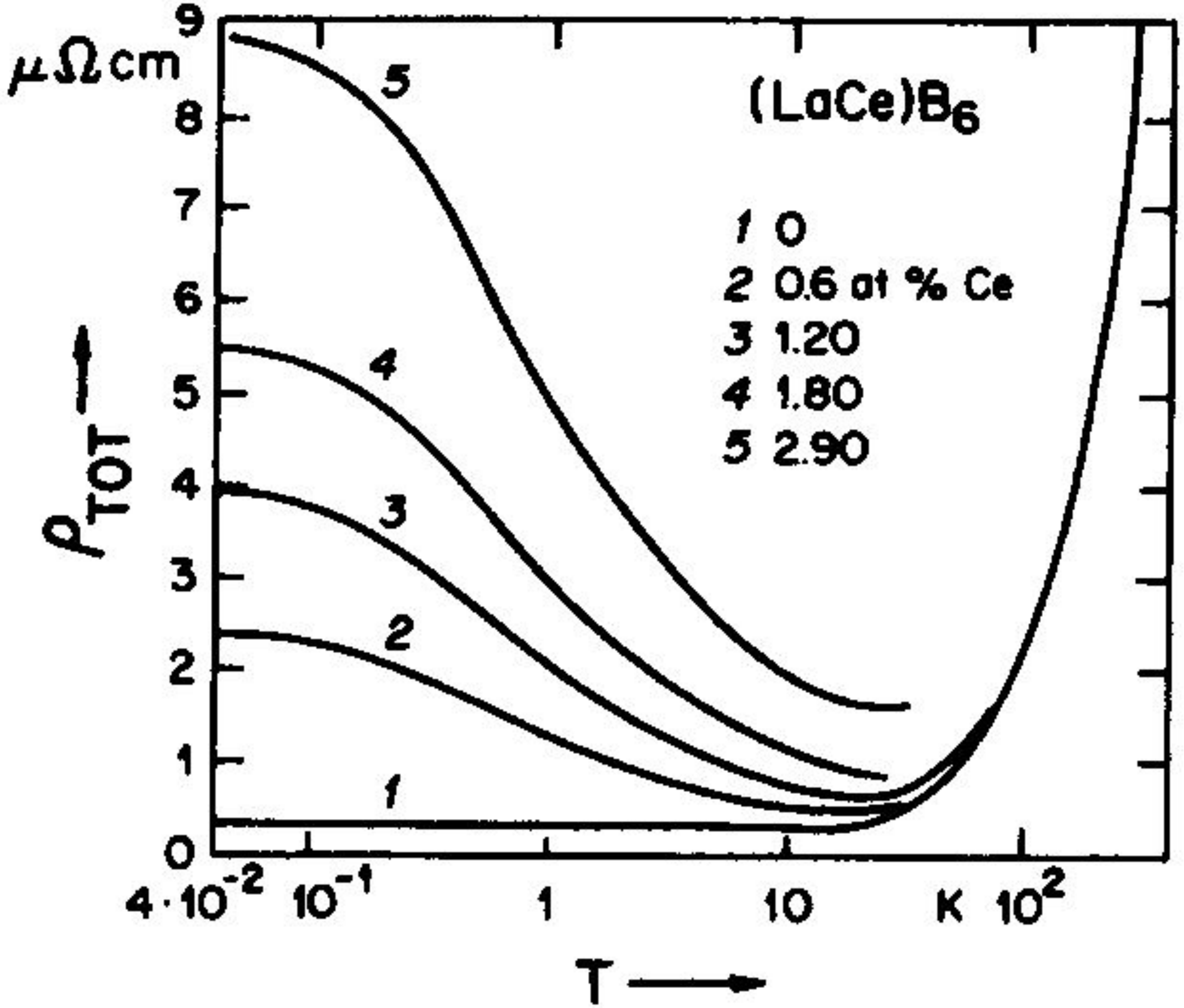


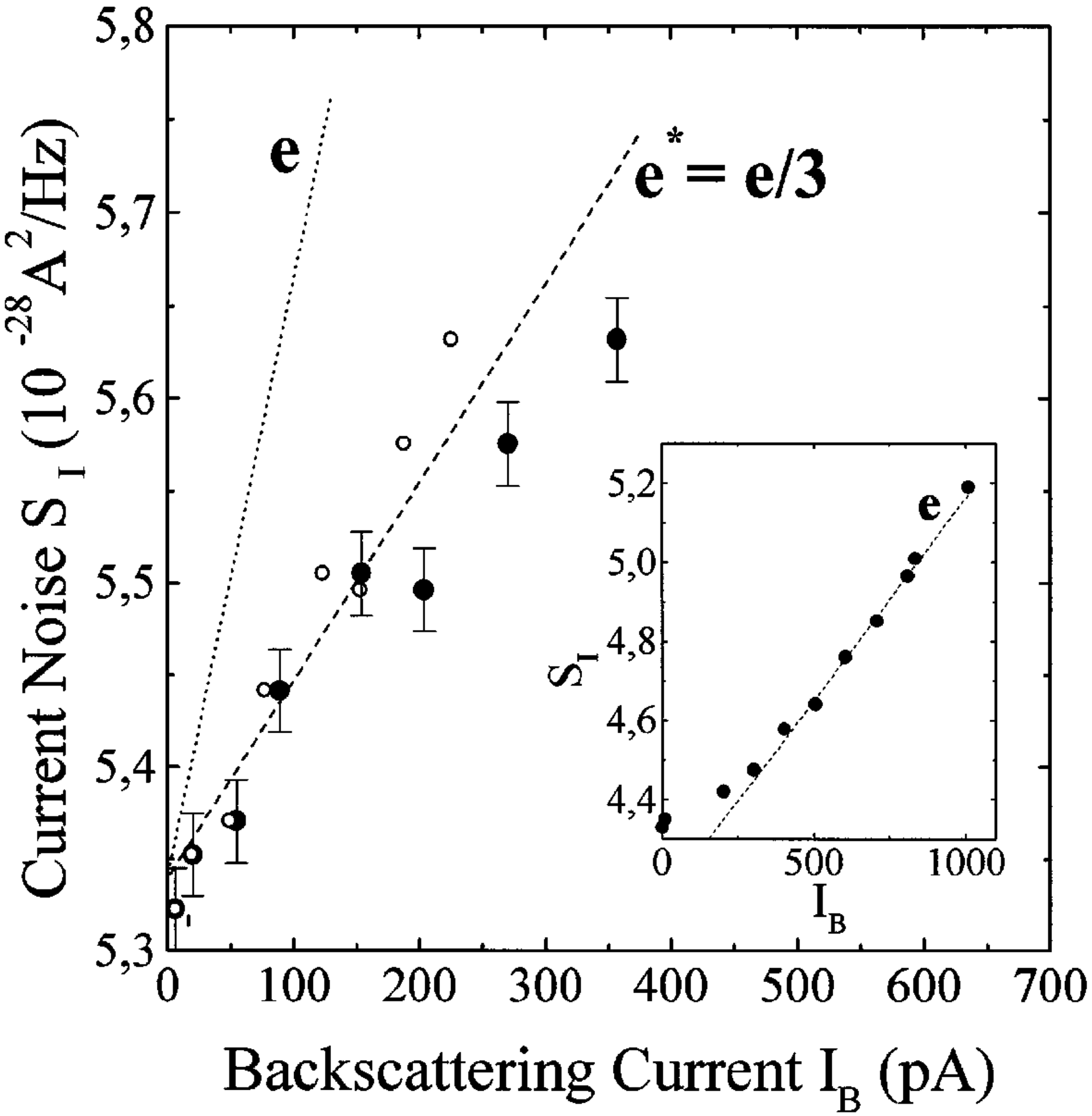
FIG. 2. Dimensionless conductance vs magnetic field at three gate voltages, for the inversion layer segment indicated in Fig. 1, showing aperiodic conductance variations of order e^2/h.



Kondo effect in metals with magnetic impurities



Shot noise (in fractional quantum Hall effect)



$$S_I = e \cdot I$$

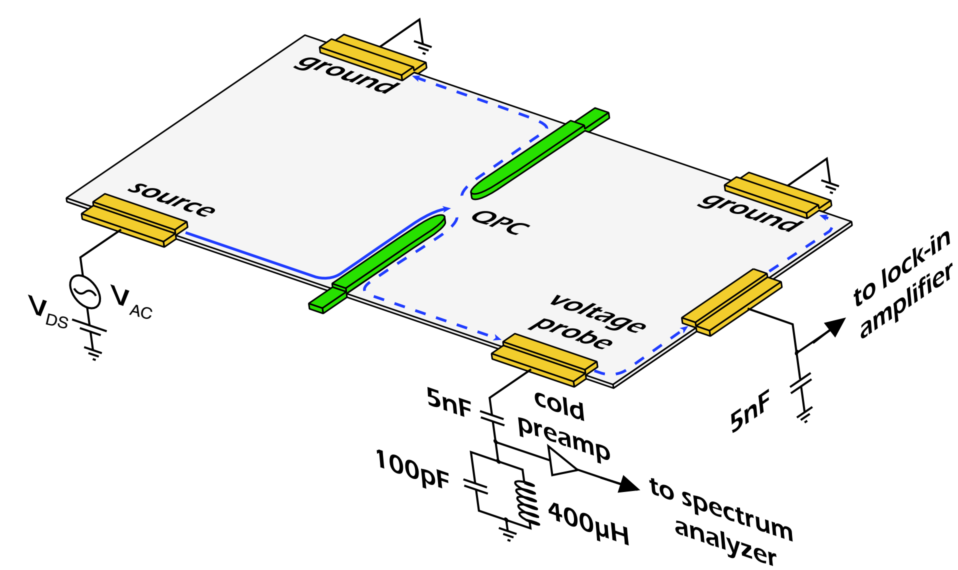


FIG. 1 (color online). Schematic of the noise measurement setup (see text for details).