

The Electron Gas in High-Field Nanoscopic Transport: Metallic Carbon Nanotubes

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The dynamics of the electron gas is crucial in the drive towards electronic integration on the smallest possible scales. The extreme operating conditions at nanoscales raises additional challenges for established electron-gas theory.

We use a straightforward microscopically conserving quantum kinetic approach to the one-dimensional behaviour of metallic electrons in single-wall carbon nanotubes.

These systems are distinguished by very large applied driving fields, by high degeneracy and by carrier interactions with non-equilibrium phonons. The strong metallicity of confined nanotube channels leads to unusually high sensitivities to gate-bias potentials.

We show as a result of this, that metallic carbon nanotubes could lead to a new class of high-gain amplifiers with surface dimensions much smaller than existing "state-of-the-art" *III-V* heterojunction transistors.