

Terahertz Transistor Design Based on Ballistic Transport

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This paper presents a unique type of transistor that is intended to operate at THz frequencies and beyond, at room temperature, with low noise and with very low power requirements. This transistor is unique in that no doping junction or barrier structure is employed. Rather, the transistor utilizes a two-dimensional electron gas (2DEG) to achieve ballistic electron transport in a gated microstructure, combined with asymmetric geometrical deflection. We call it the "Ballistic Deflection Transistor"(BDT). The BDT is a planar structure, so all of its capacitances including the gate capacitance are extremely small, measured in attofarads, and this allows a sub-picosecond response time and THz operation. The major materials requirement is that the active region of the BDT must be smaller than or comparable to the electron mean free path at room temperature, to achieve ballistic transport.

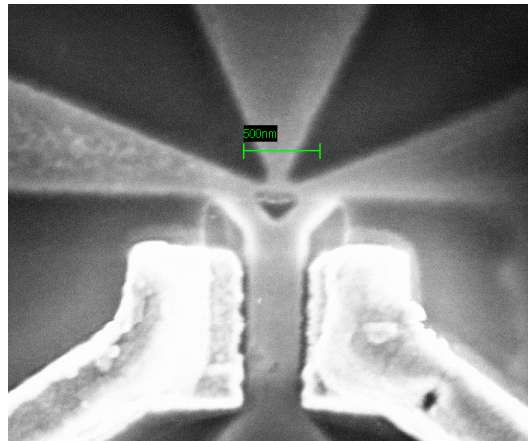


Figure 1. SEM image of measured non-linear ballistic device.