

Abstract Submitted
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Quantum Emitter Ballistic Electron Transistor for Nanotechnology Applications SHEKHAR PRADHAN, Vaughn College of Aeronautics and Technology — The invention is a new type of high speed three terminal, functional devices fabricated using silicon technology which performs a function such as logic normally performed by a circuit consisting of several conventional transistors. Such a device reduces circuit complexity and results in increased circuit speed. The device consists of a metal film deposited on a layer of silicon microcrystallites embedded in a SiO₂ matrix constituting a quantized electron emitter, and a substrate containing n- n+ p- junctions. Electrons are injected into the substrate by resonant tunneling through the emitter. The injected electrons ballistically traverse the n- n+ region in the substrate, and surmount a barrier to enter the p- region. The height of this barrier is varied with the applied bias allowing passage to ballistic electrons at resonant tunneling, but suppressing them as bias is increased further. This effect produces a negative resistance which is repeated for every emitter energy level. Thus, the forward transfer characteristic consists of a sequence of zero, one zero etc. forming the basis for functional device operation. The author wishes to acknowledge the guidance and support of late Professor Edward Nicholian for his mentoring during the research.

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