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| **Abstract:** |  |
| Abstract— Constant scaling of MOS devices is being done to achieve higher operating speed because carrier transport times are reduced when the channel length is decreased. But this approach has the impact of increased carrier drift, but it is difficult to achieve ballistic transport in a semiconductor with a high electric field and hence saturated carrier velocity and enhanced scattering of electrons. Therefore, a vacuum is better to transport carriers since it allows ballistic transport without scattering. But easy fabrication process, low-cost, low power consumption, lightweight, longer lifetime, etc. have made semiconductor devices preferable. Therefore, the benefits of both semiconductor and vacuum tube transistors are integrated together in a nanoscale regime to get high frequency/power output and robustness in harsh operating conditions even at high temperatures and high radiation. Thus, the new device, Vacuum Field Effect Transistor (VFET) is a combination of semiconductor and vacuum tube transistor. In this nanoscale VFET, the electron transports through a vacuum from the drain to the source when the appropriate gate voltage is applied. The most common design of VFET is a vertical filed emitter consisting of the emitter, gate, and collector. Several research works are going on to model the VFET parameters. To determine current density with applied voltage, we used Child Langmuir’s law, and to determine the tunneling current between anode and cathode with the application of the gate voltage, we used the Fowler-Nordheim tunneling probability equation. We plotted both the graphs of current density and tunneling current of VFET with the applied voltage at the anode terminal of VFET writing MATLAB scripts to study various analytical models of VFET. This type of device needs more analytical models for different types of parameters as well as their characterization. | |