

# Stability Diagrams of Single-Electron Transistors

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Stability diagrams are a powerful tool for both analysis and design of single electron devices. These diagrams generally show stable regions and also state-transition lines. This tool has become useful for the investigation on the tunneling process within the devices. In this work, the procedure to build a stability diagram of the single electron transistor has therefore presented. The fundamental concept of the electrostatic potential was employed in the mathematical modelling of the electron-tunneling process between the electrode and the quantum dot (island). With a single isolated metal island in the architecture, four linear equations were modeled based on the possible tunneling events in the single-electron transistor. By changing the number of the excess electrons in the island, the stability diagram of the single-electron transistor was plotted to display the transition borders between regions. This technique can be extensively applied to the study of other single-electron devices, such as single-electron pumps.

**Author:** Mr PHOOPATHONG, Titipong (Theoretical Condensed Matter Physics Research Unit, Department of Physics, Faculty of Science, Mahasarakham University, THAILAND 44150)

**Co-authors:** Mr RUNGSRI, Pramote (Theoretical Condensed Matter Physics Research Unit, Department of Physics, Faculty of Science, Mahasarakham University, THAILAND 44150); Dr SRIVILAI, Prathan (Theoretical Condensed Matter Physics Research Unit, Department of Physics, Faculty of Science, Mahasarakham University, THAILAND 44150); Dr RITJAREONWATTU, Supachai (Theoretical Condensed Matter Physics Research Unit, Department of Physics, Faculty of Science, Mahasarakham University, THAILAND 44150)

**Presenter:** Mr PHOOPATHONG, Titipong (Theoretical Condensed Matter Physics Research Unit, Department of Physics, Faculty of Science, Mahasarakham University, THAILAND 44150)

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