Resonant Tunneling Diode Learning Materials

By completing the Resonant Tunneling Diode Simulation with NEGF, users will be able to: a) understand the principle of operation of resonant tunneling diode, b) the meaning of the quasibound states, resonant and non-resonant tunneling and c) the concept of quantum interference which is the basis for the formation of quasi-bound states and the operation of a Resonant Tunneling Diode.

The specific objectives of the Resonant Tunneling Diode Module are:

<table>
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<tr>
<th>Physical Model</th>
<th>Mathematical Model</th>
<th>Computational Model</th>
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<tbody>
<tr>
<td>a) Introduce the concept of:</td>
<td>b) Apply Mathematical techniques for calculating:</td>
<td>c) Validate Resonant Tunneling Diode Lab by running the examples provided</td>
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<tr>
<td>- Quantum interference</td>
<td>- Transmission Coefficient</td>
<td>provided</td>
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<td>- Quasi-bound states</td>
<td>- Current density</td>
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<td>- Resonant Tunneling</td>
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Recommended Reading
Users who are new to the principles of operation of a resonant tunneling diode should consult the following resource:


**Theoretical descriptions**

* Resonant Tunneling Diode operation
* RTD with NEGF Demonstration: Basic RTD Asymmetric
* NEMO 1-D: The First NEGF-based TCAD Tool and Network for Computational Nanotechnology
* Application of the Keldysh Formalism to Quantum Device Modeling and Analysis

**Exercises and Homework Assignments**

1. Exercise: Resonant Tunneling Diode

**Solutions to Exercises**

Solutions are provided only to instructors!

**Evaluation**

This test will assess the users conceptual understanding of the physical, mathematical and computational knowledge related to operation of Resonant Tunneling Diodes.

**Challenge**

Users are challenged to integrate what they have learned about operation of Resonant Tunneling Diodes.

**Resonant Tunneling Diodes: an Exercise**