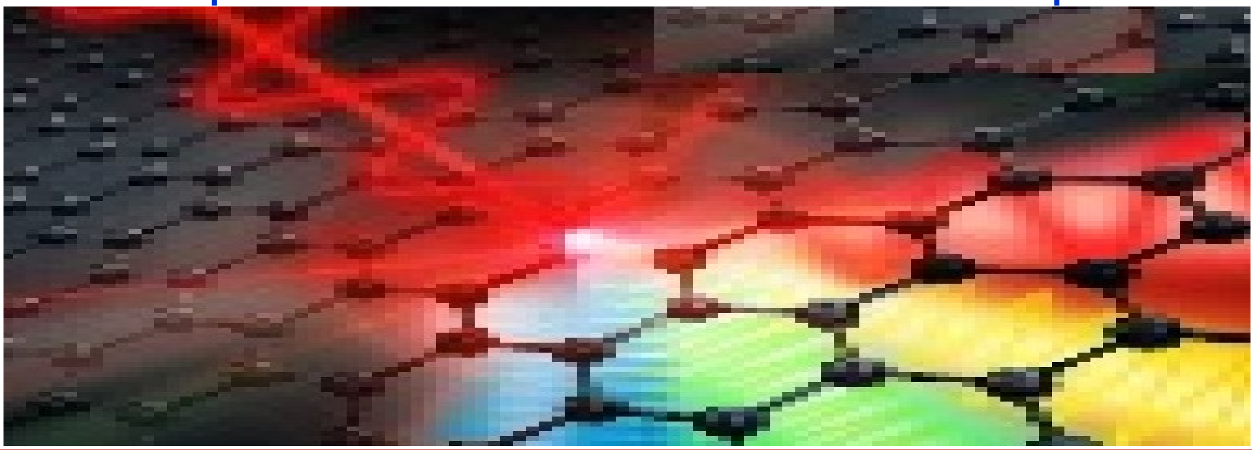
World's First Commercial Innovative
Atomistic THz Spectroscopy – TNL TS Simulator
TS simulator is an atomistic simulator to calibrate THz pulse ramping on the sp^3 semiconductors with Zincblende or Wurtzite phases



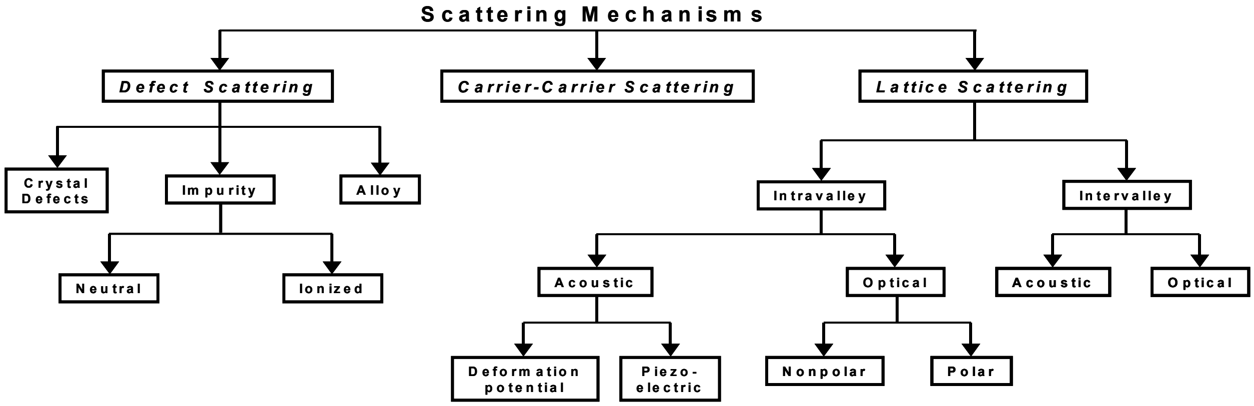
TNL Terahertz Spectroscopy (TNL-TSS) simulator is powerful tool, accommodates a well-established, proven and versatile spectroscopic technique to calibrate the laboratories experiments and demonstrate output results based on purely atomistic physics. **TNL TSS (THz Spectroscopy)** Simulator can help in proper understanding of impact of terahertz frequencies on the electronic motion inside the nano- and bulk materials. The basis of high-quality accurate optical data can be extracted by ramping THz pulses on the semiconductor materials using **TNL TSS** simulator. The correct extraction of the complex-valued dielectric properties (intra- & inter valley carrier transitions, carrier velocities, various scattering mechanism & rates, conductivity, and absorption) from the involved THz signals.

Electron heating by the THz pulses, the interaction with the electrons, enabling a large fraction of the electrons to undergo intra- and intervalley scattering mechanism from the initial lowest-energy conduction-band valley into side valleys and vice -versa.

The strong interaction of free carriers with THz radiation it is possible to use single-cycle THz pulses in **TNL TSS** simulator to monitor changes in carrier mobility and scattering rates due to various scattering mechanisms. Since the values for carrier motion in side valleys are usually very different from the ones in the conduction band minimum, the change in the distribution of electrons between the different valleys can be followed by using a variably delayed THz pulse.

Scattering Mechanisms:

T N L



Users have flexibilities in choosing the appropriate scattering mechanisms as per their requirements to calibrate the experimental THz laboratory results.

An *ensemble* of particles, representative of the physical system of interest, the non-stationary time-dependent evolution of the electron and hole distributions under the influence of a time-dependent driving force due to THz field may be simulated.

Features

- Graphical User Interface (GUI) based simulator i.e. no need for coding & scripting
- User Friendly with Windows based application with full capabilities
- Powerful tool to simulates motion of charged, and interacting particles
- Microscopic simulation of the motion of individual particles under the influence of the THz pulse as well as the internal fields of the crystal lattice and influence of other charges, lattice defects etc
- Include various non-linear scattering mechanisms to calibrate the real time THz experiments
- Fermi Golden Rule for momentum & energy conservation
- Random scattering events, particularly useful in describing inter and intraband transitions of charge carriers in bulk & nanomaterials
- Flexibility for users to initialise the carriers distribution over many valleys or lowest energy lying valley of the material
- Beauty of simulator, it follows Afbau principle i.e. under static field most of high energy valley carriers tranfer to lowest energy lying valley

- THz Pulses applications with frequencies ranging from few hundred gigahertz to several terahertzs
- Users may trace all the carrier electronic dynamics associated with influence of THz pulses on motion for each single electron
- Bunches of examples inbuilt with flexibilities to accomodate USERS defined materials & parameters easily
- TNL-TS simulator offer COST ECONOMICAL SOLUTION for calibration of THz spectroscopy experiments of nano and bulk materials

Benefits can be realized

- User Friendly with Graphical User Interface (GUI) capabilities on windows platform
- Fast and efficient algorithms with variety of material database with flexibilites to ramp USERS define THz frequencies
- Users may track all the run outputs i.e. position, momentum, energy, valley occupation etc parameters during simulation running environment
- Purely atomistic physics based modeling capabilities
- Elemental, binary and ternary compound semiconductors database available
- Ability to controlling & optimizing individual carrier transitions between different intrabands in many body states
- Extraction of the THz conductivities and absorption along with other associated parameters
- Various INBUILT scattering mechanisms used for calibration of experimental findings
- To avoid the transient effects that accompany the turnon of the electric field, all time steps prior to a total elapsed time can be discarded
- State of Art tool for accurately prediction of the conductivity of a weakly confined Drude gas of electrons without any initial assumptions

T N L