## Atomistic THz Spectroscopy-TNL TSSSimulator

TS simulator is an atomistic simulator to calibrate THz pulse ramping on the sp<sup>3</sup> semiconductors with Zincblende or Wurtzite phases

### **Case Studies**

Using **TNL TSS** simulator, the benchmark of intervalley and intravalley dynamics of hot free electrons intwo prototype semiconductors: Ge, GaAs have been observed and calibrated. The THz peak field strengths used in these experiments reached values of 10, 181 and 441 kV/cm. Electron heating by the THz pulse interactionwith the electrons, enabling a large fraction of the electrons to undergo intra- and intervalley scattering from the initial lowest-energy conduction-band valley into side valleys.

# Germanium (Ge) Case Study T=294K at various Field values: Symbols represent experimental results

Absorption (m<sup>-1</sup>) with respect to THz Freq at 10 kV/cm

Material: Ge"n doped"

Temperature: 294 K

Different THz fields

Absorption coefficient

1400 1200 1200 1000 1000 1000 400 200 1.00E+11 3.00E+11 5.00E+11 9.00E+11 THz Frequency (Hz)

### Absorption (m<sup>-1</sup>) with respect to THz Freq at 181 kV/cm

- Material: Ge"n doped"
- Temperature: 294 K
- Different THz fields
- Absorption coefficient



### Absorption (m<sup>-1</sup>) with respect to THz Freq at 441 kV/cm



#### > Material: Ge"n doped"

- Temperature: 294 K
- Different THz fields
- Absorption coefficient







#### Carrier Transitions due to Scattering mechanism at 441 kV/cm

### <u>Germanium (Ge) Case Study T=97K at various Field values: Symbols</u> <u>represent experimental results</u>



#### **Γ**, L & X Valleys carrier Transitions at 10kV/cm due to Intervalley Scattering at 97K





### **Γ**, L & X Valleys carrier Transitions at 441kV/cm due to Intervalley, Acoustic, Coulomb

**Scattering at 97K** 





### GaAs Case Study T=300K at ramping THz frequencies values



