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Electron-phonon interaction in semiconductors: coupling of ab initio data for hot carriers with device-oriented simulation methods

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Electron-phonon interaction $P_{k,k\pm q}^{n,n',\lambda} = \frac{2\pi}{\hbar}|\langle n,k|\Delta W|n',k+q\rangle|^2\delta(E_{nk'} - E_{nk} \pm \hbar\omega_q^\lambda)$

Ab-initio data:

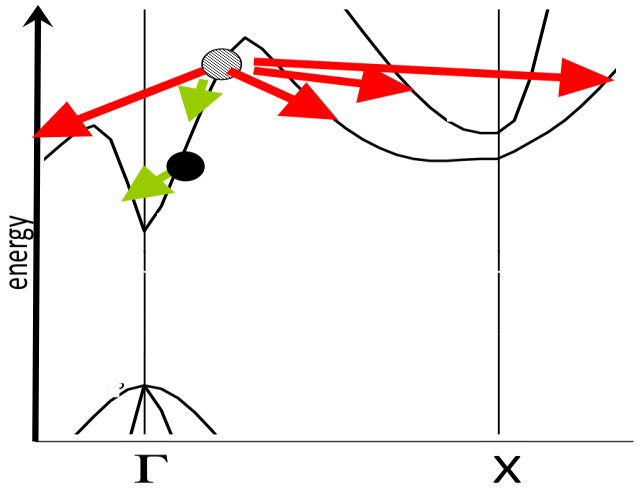
- Scattering rates and times of individual channels
- Dynamics of Scattering

Hot carriers:

- Dynamics of carrier having excess energy
- Important for photovoltaic (PV)

Device oriented simulation methods:

- Stochastic Monte Carlo Simulation
- Calculation of transport properties of hot carriers

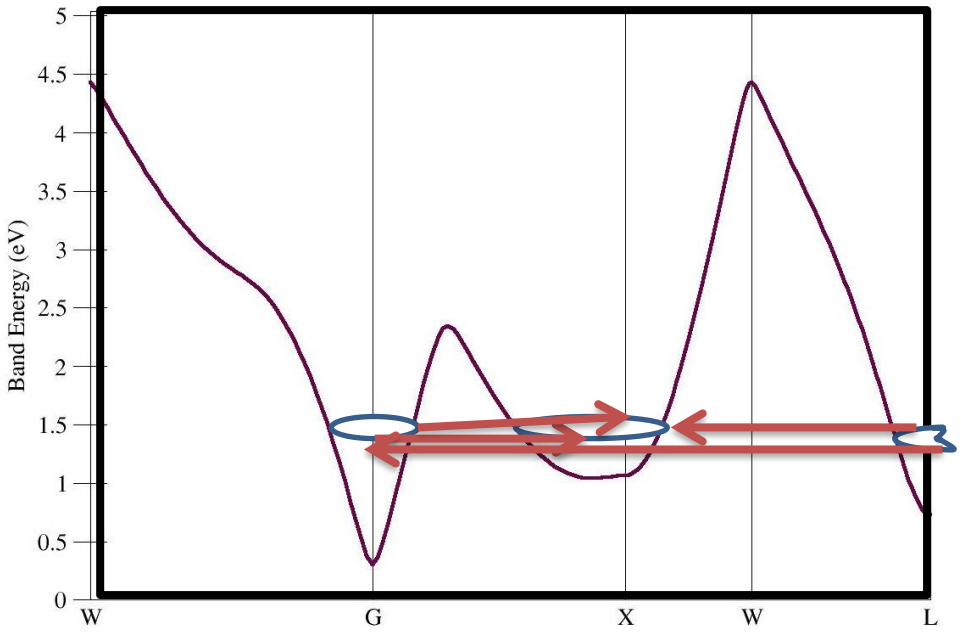


HOW TO COUPLE THE AB-INITIO AND MONTE CARLO?

Coupling of Ab-initio and Monte Carlo

Calculation of Deformation Potentials:

- Simple and efficient method using ab-initio
- Intervalley transitions
- Hot carriers
- Feed into the Monte Carlo Simulation



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