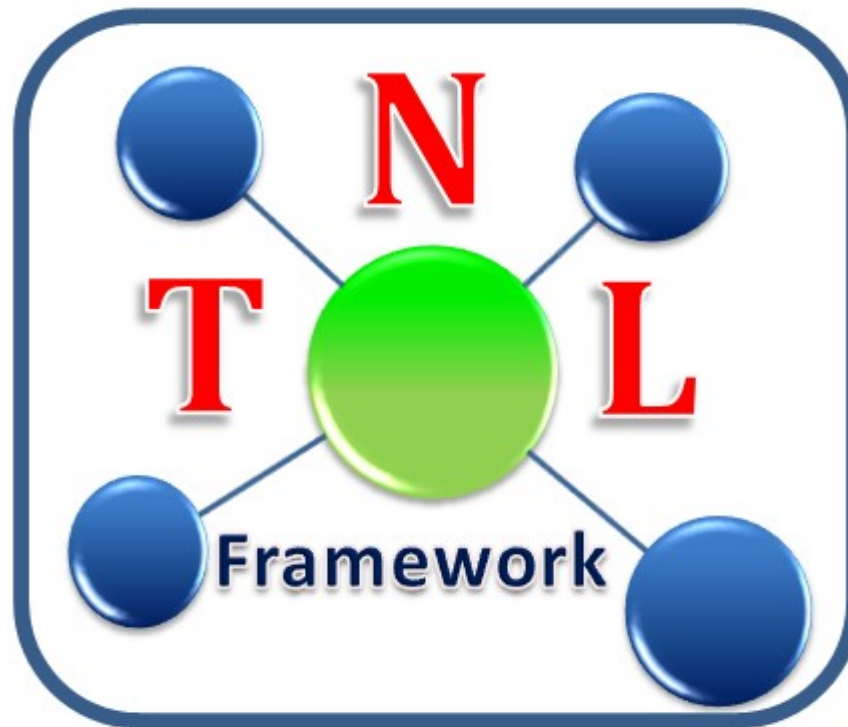




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# Welcome to TNL Era

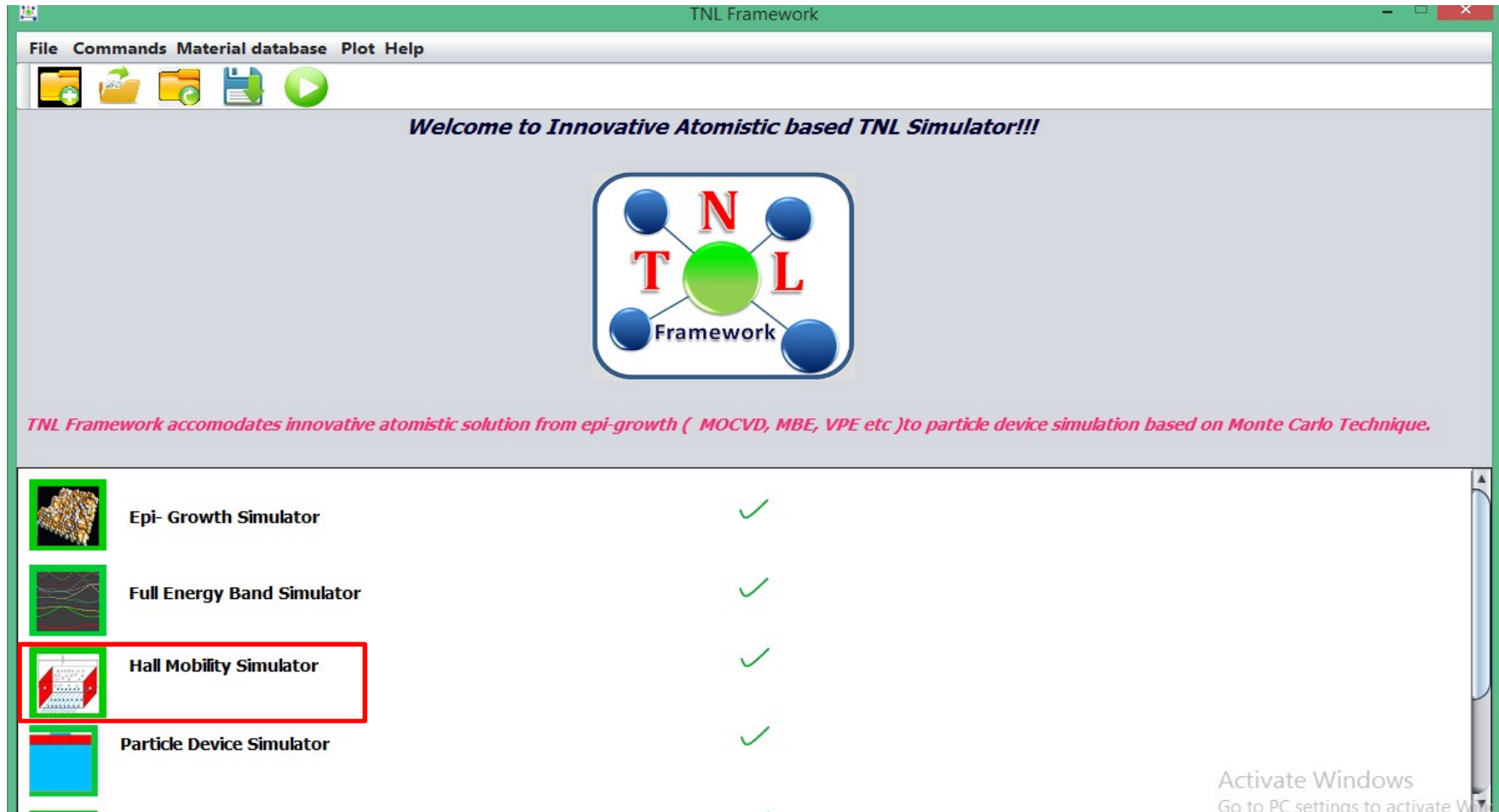


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# TNL Framework



# HALL MOBILITY Simulator

- Hall mobility Simulator consist two tabs.
- First is for Material Parameters.
- Second is for Scattering Mechanism.
- Second Tab also consist run output window. Here user can see his output .

HALL MOBILITY SIMULATOR

Material Parameter Scattering Mechanism

Choose Material Temp Magnetic Field

Electric Field-X Density

Electric Field-Y Var 0.0 0.0 Sound Velocity

Electric Field-Z Non Parabolicity

G-valley effective mass

L-valley effective mass

X-valley effective mass

Relative permittivity (static)

Relative permittivity High Freq

Polar Acoustic InterValley Deformation InterValley Scattering Parameters VallySaperation Equivalent Valley

G-Polar optical phonon energy (eV)

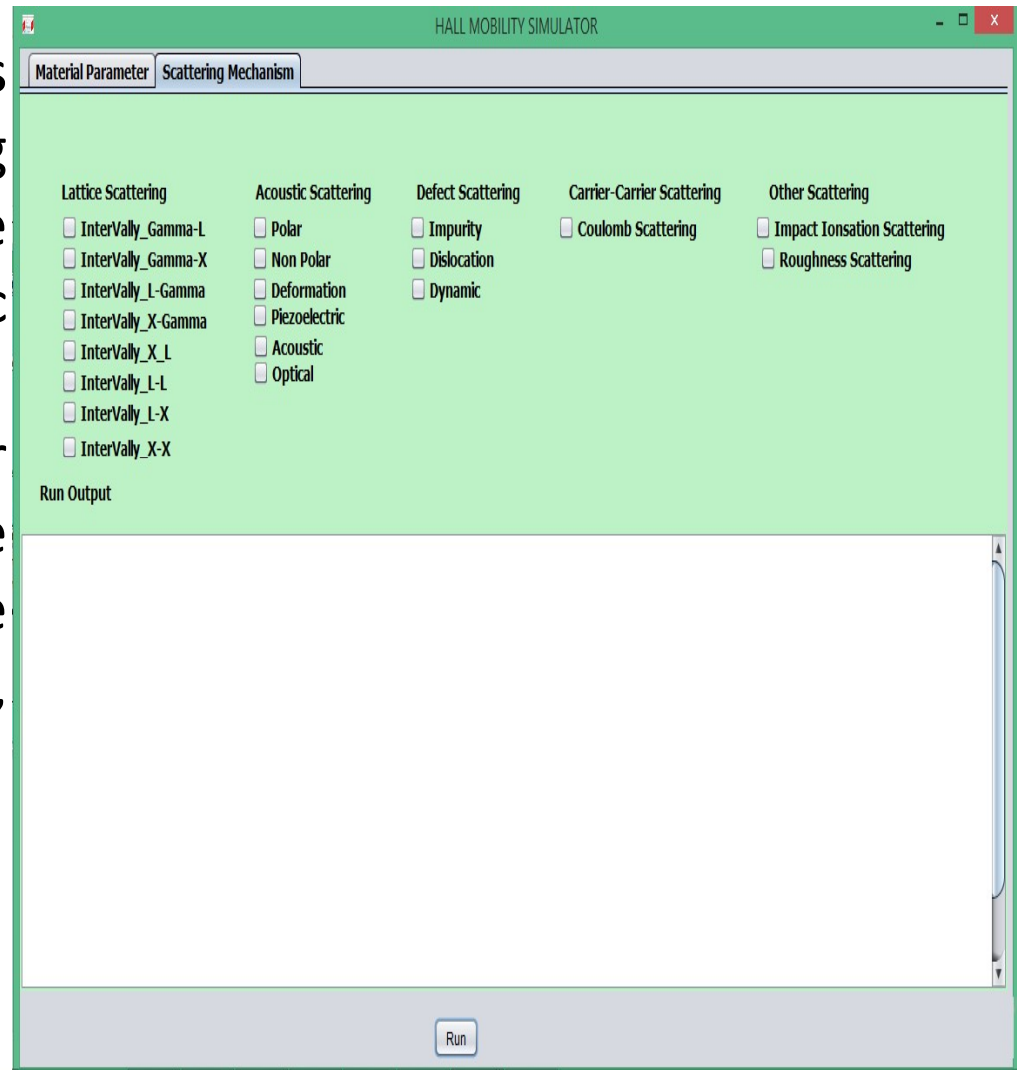
X-Polar optical phonon energy (eV)

L-Polar optical phonon energy (eV)

Reset

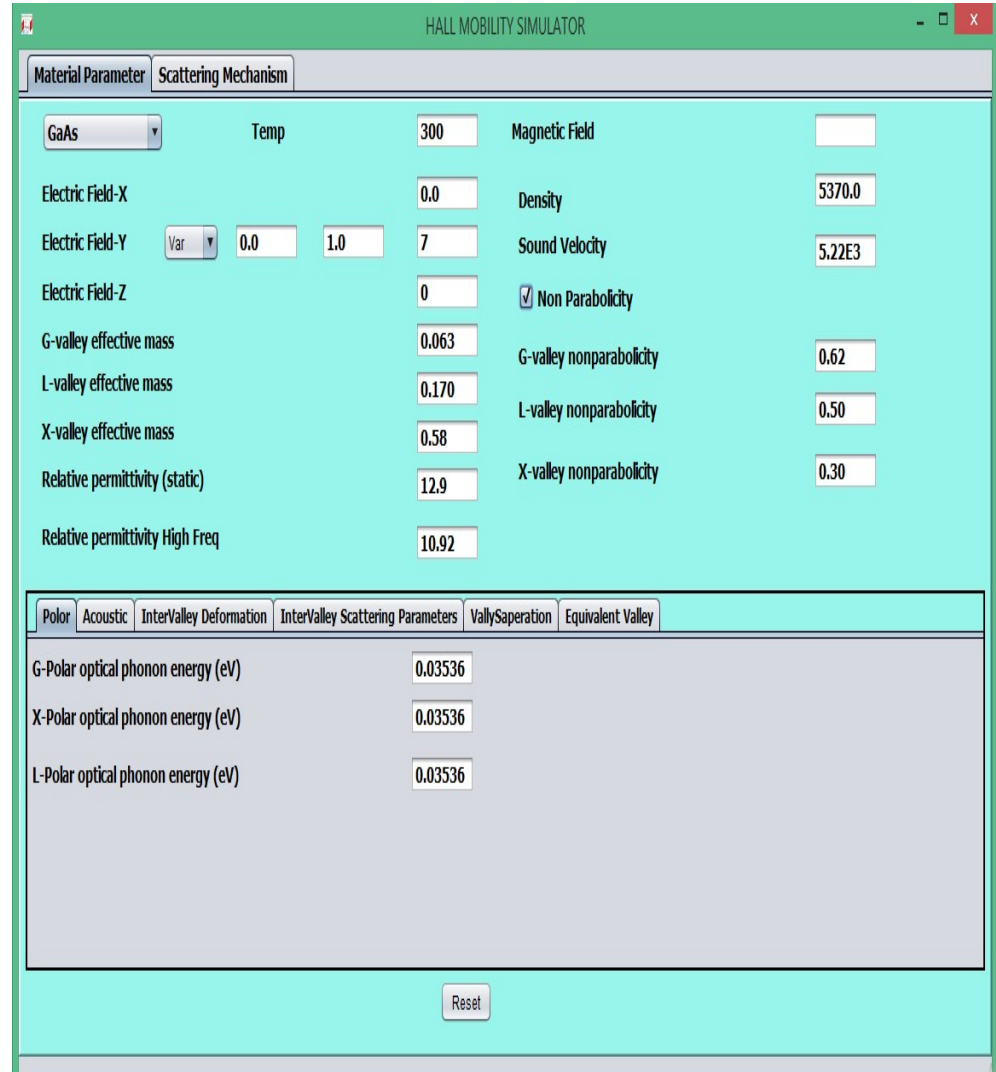
# HALL MOBILITY Simulator

- Hall mobility contains almost all scattering mechanism like Lattice Scattering, Acoustic Scattering, Defect Scattering, Carrier-Carrier Scattering and some other Scattering like Impact Ionisation, Roughness Scattering.



# HALL MOBILITY Simulator

- For this tutorial choose material “GaAs”.
- Simulator automatically fill all fields with default data.
- Here we are varying Electric Filed in Y direction. And take Temperature 300°K.

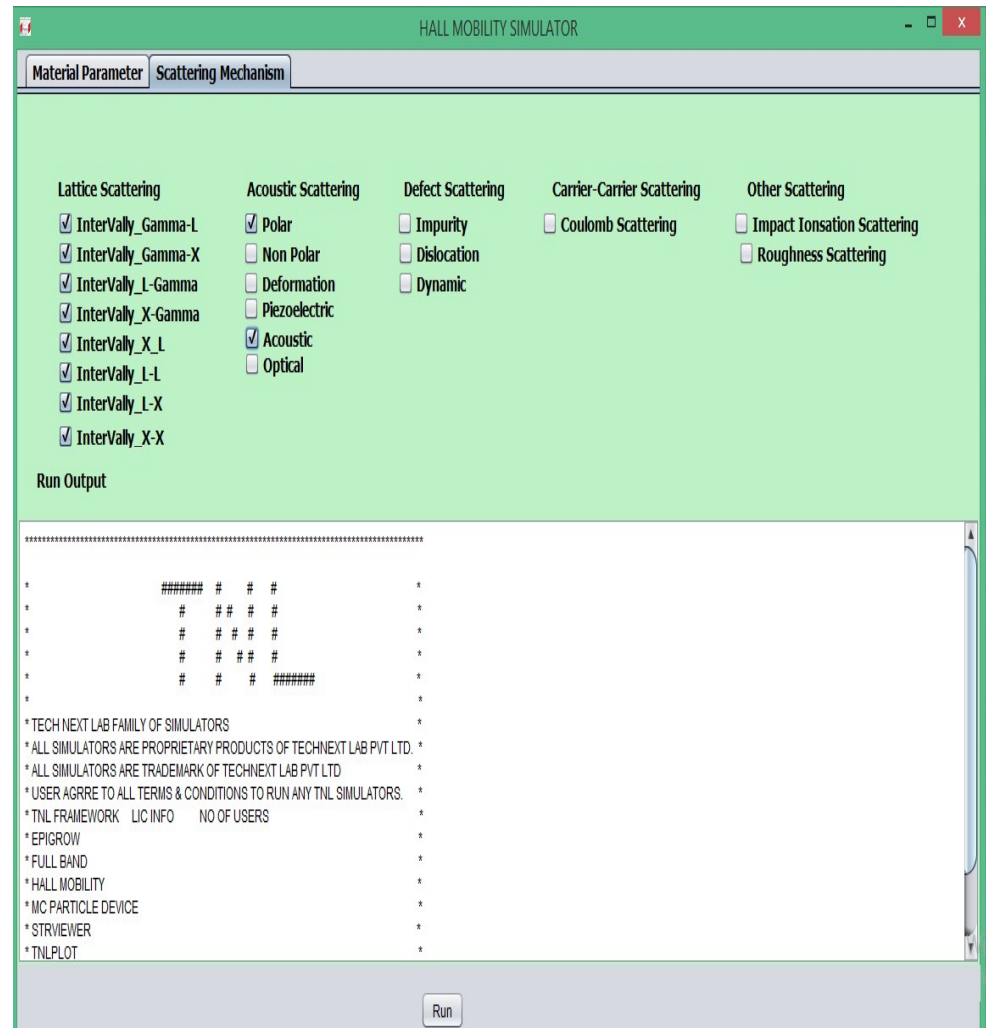


The screenshot shows the 'HALL MOBILITY SIMULATOR' window with the 'Material Parameter' tab selected. The material is set to 'GaAs'. The temperature is 300 K. The electric field in the Y-direction is set to 7 V/cm, with a range from 0.0 to 1.0 V/cm. The magnetic field is 0. The density is 5370.0, and the sound velocity is 5.22E3. The 'Non Parabolicity' checkbox is checked. The effective masses for G, L, and X valleys are 0.063, 0.170, and 0.58, respectively. The relative permittivity (static) is 12.9, and the relative permittivity at high frequency is 10.92. The nonparabolicity parameters for G, L, and X valleys are 0.62, 0.50, and 0.30, respectively. The optical phonon energies for G, X, and L polar modes are all 0.03536 eV. A 'Reset' button is located at the bottom of the window.

Material Parameter	Scattering Mechanism
GaAs	Temp
Temp	300
Magnetic Field	
Electric Field-X	0.0
Electric Field-Y	7
Electric Field-Z	0
G-valley effective mass	0.063
L-valley effective mass	0.170
X-valley effective mass	0.58
Relative permittivity (static)	12.9
Relative permittivity High Freq	10.92
Density	5370.0
Sound Velocity	5.22E3
Non Parabolicity	<input checked="" type="checkbox"/>
G-valley nonparabolicity	0.62
L-valley nonparabolicity	0.50
X-valley nonparabolicity	0.30
G-Polar optical phonon energy (eV)	0.03536
X-Polar optical phonon energy (eV)	0.03536
L-Polar optical phonon energy (eV)	0.03536

# HALL MOBILITY Simulator

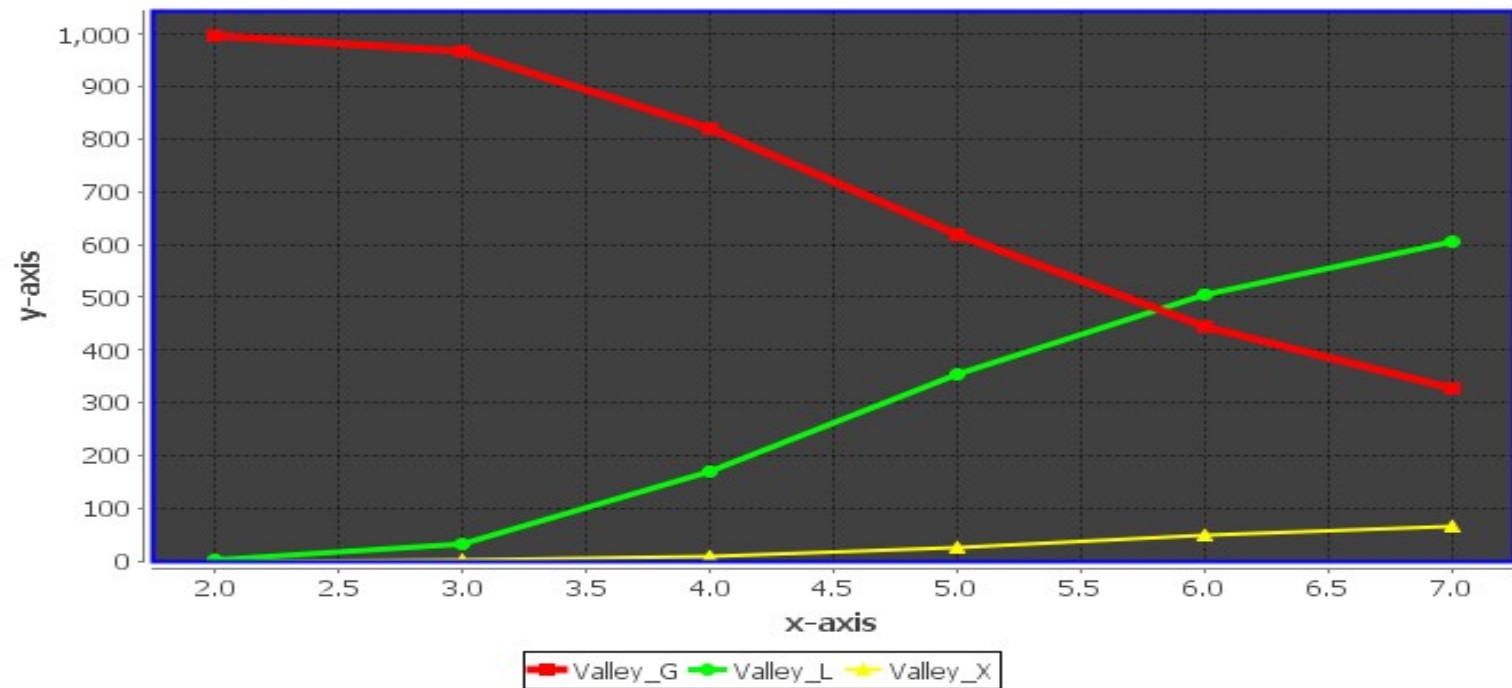
- Select all Lattice Scattering.
  - Intervally Gama-L
  - Intervally Gama-X
  - Intervally L-Gama
  - Intervally X-Gama
  - Intervally X-L
  - Intervally L-L
  - Intervally L-X
  - Intervally X-X
- Also select Polar and Acoustic Scattering .
- Click on “Run” Button.
- Run Output window will show the results.



# Results

- Output data will be saved in the directory given by users at the time of initializing simulator.
- User may directly plot any of the data as given below.

**Valley Occupation  
XY Chart**

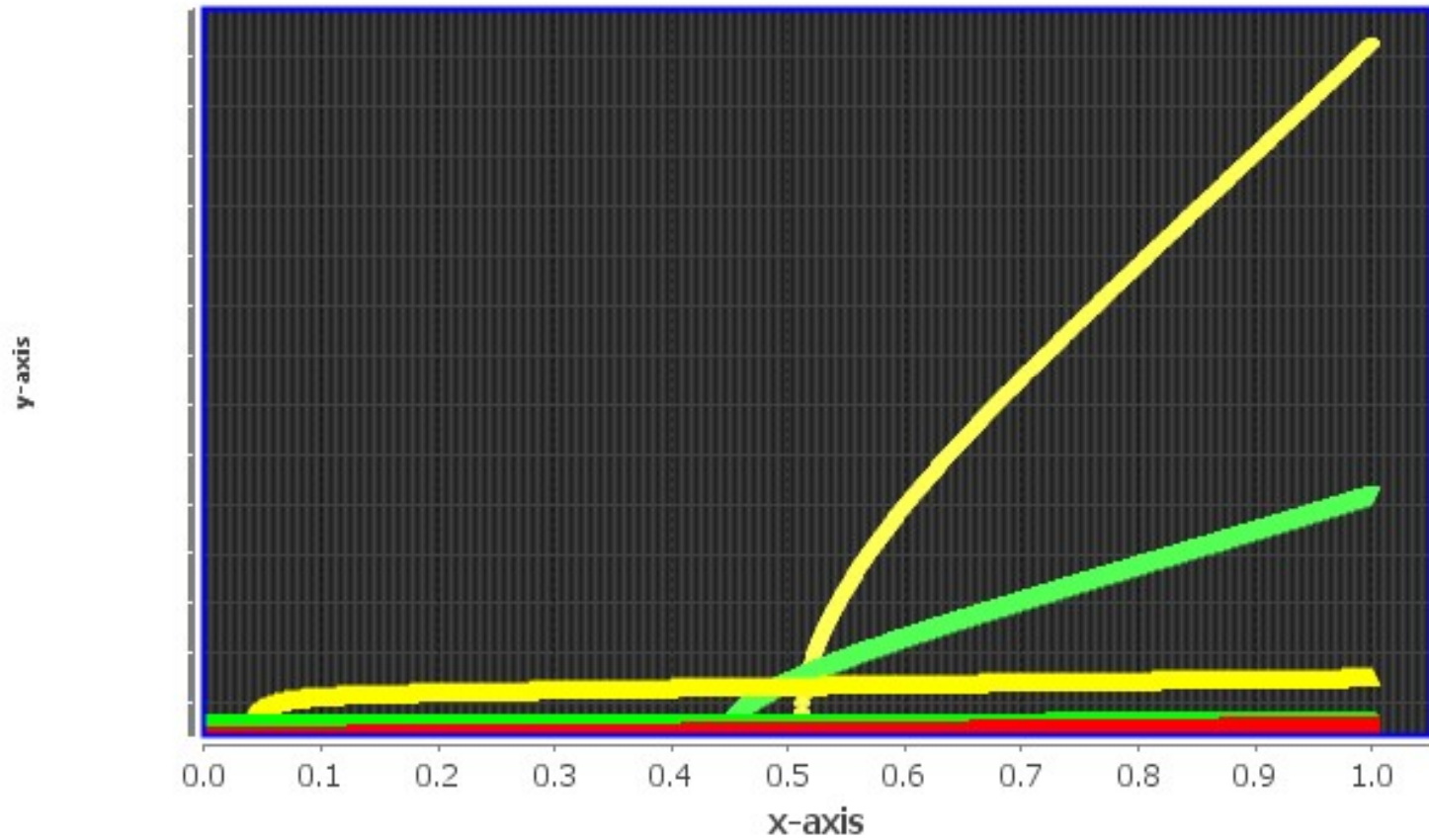




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# Scatterings $\Gamma$ valley

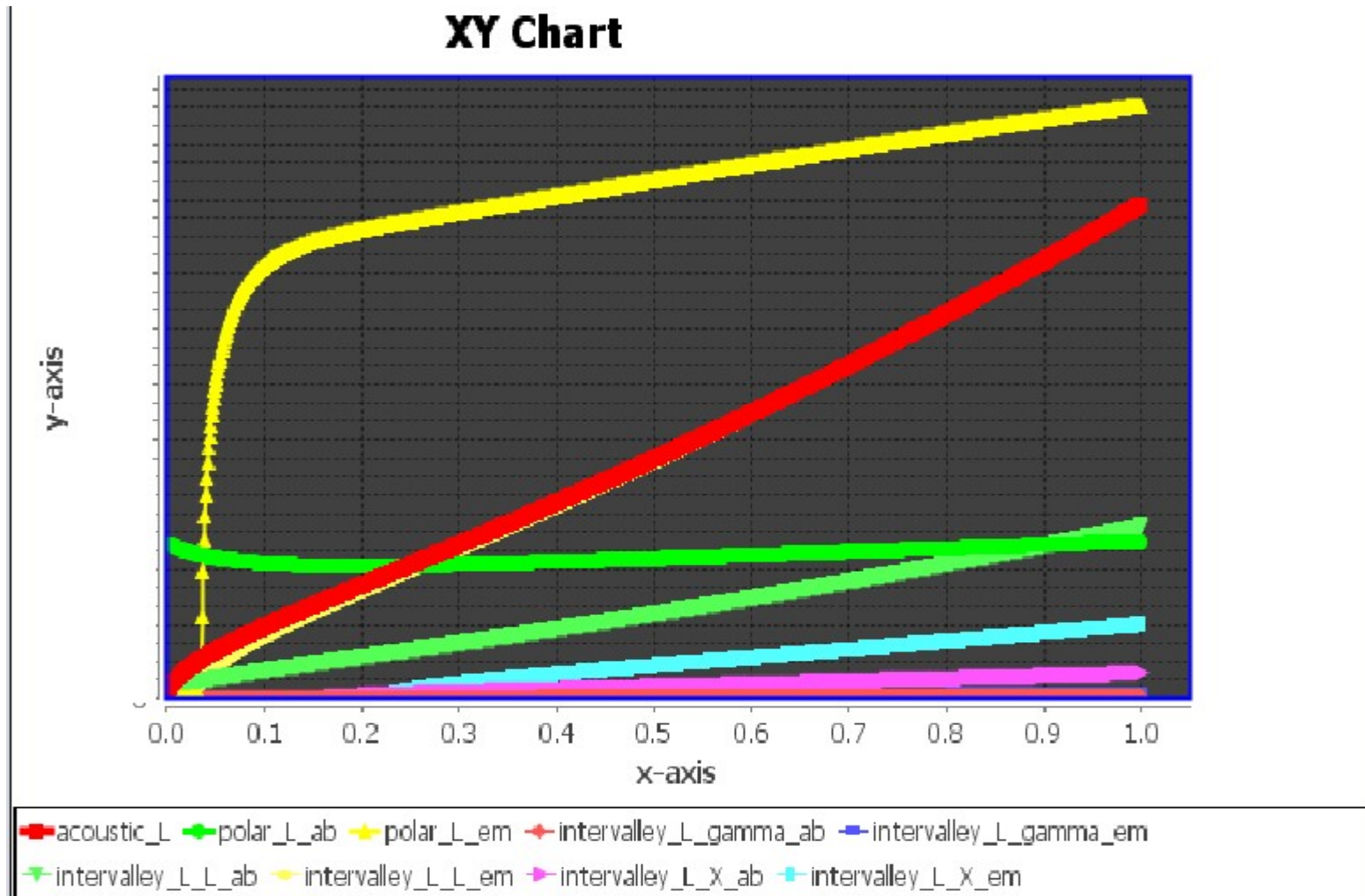
XY Chart



acoustic\_gamma polar\_gamma\_ab polar\_gamma\_em intervalley\_gamma\_L\_ab intervalley\_gamma\_L\_em  
intervalley\_gamma\_X\_ab intervalley\_gamma\_X\_em

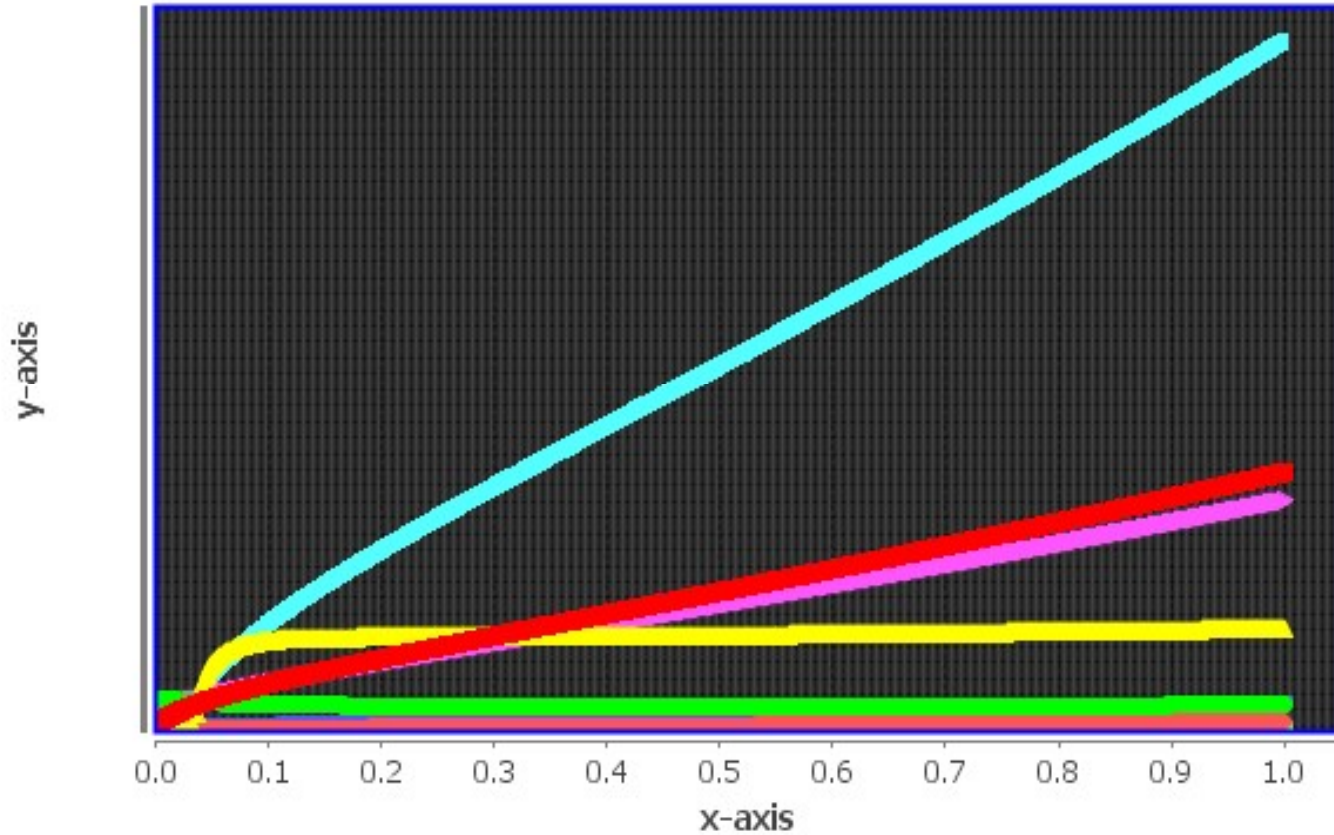


# Scatterings L valley



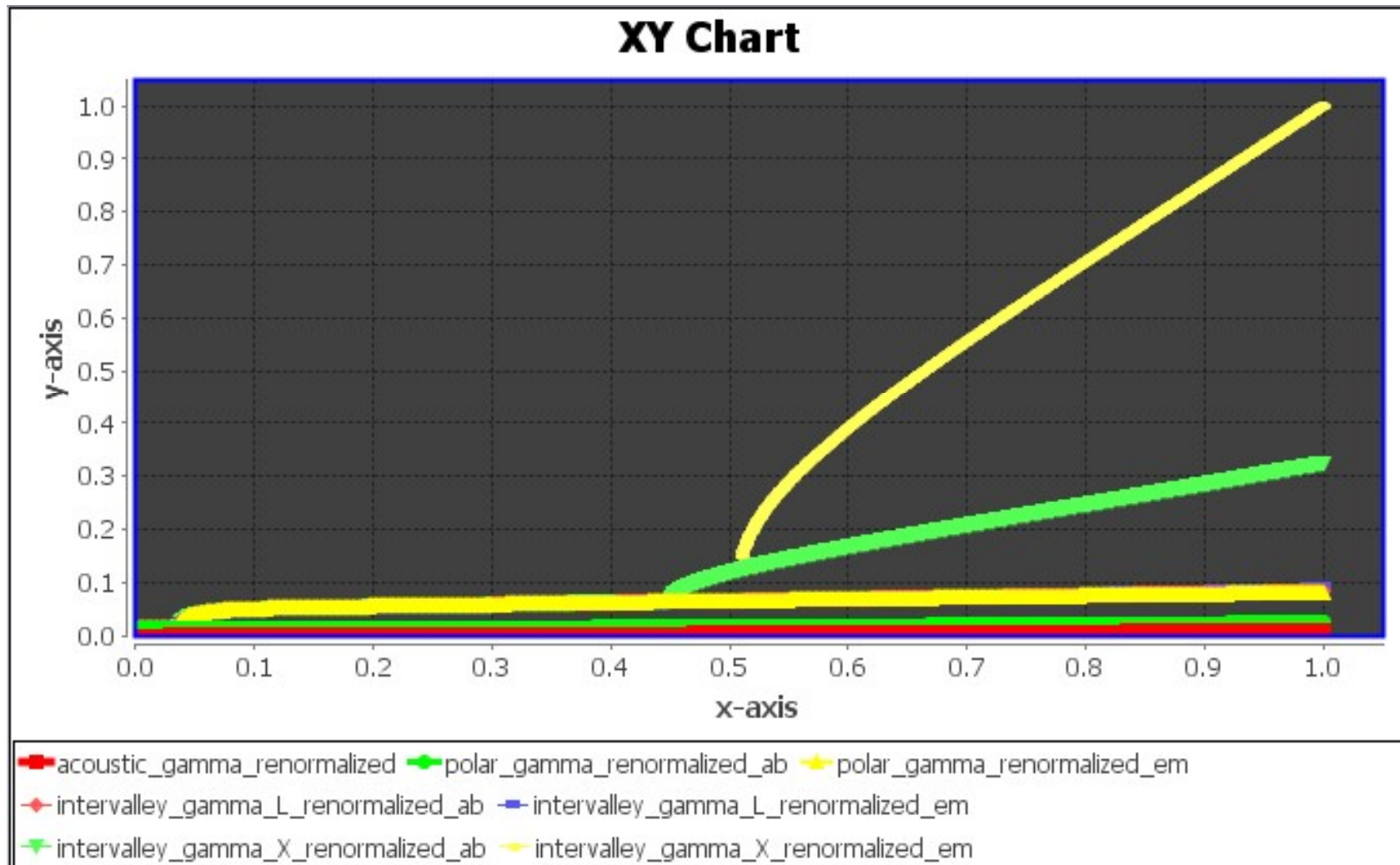
# Scatterings X valley

**XY Chart**

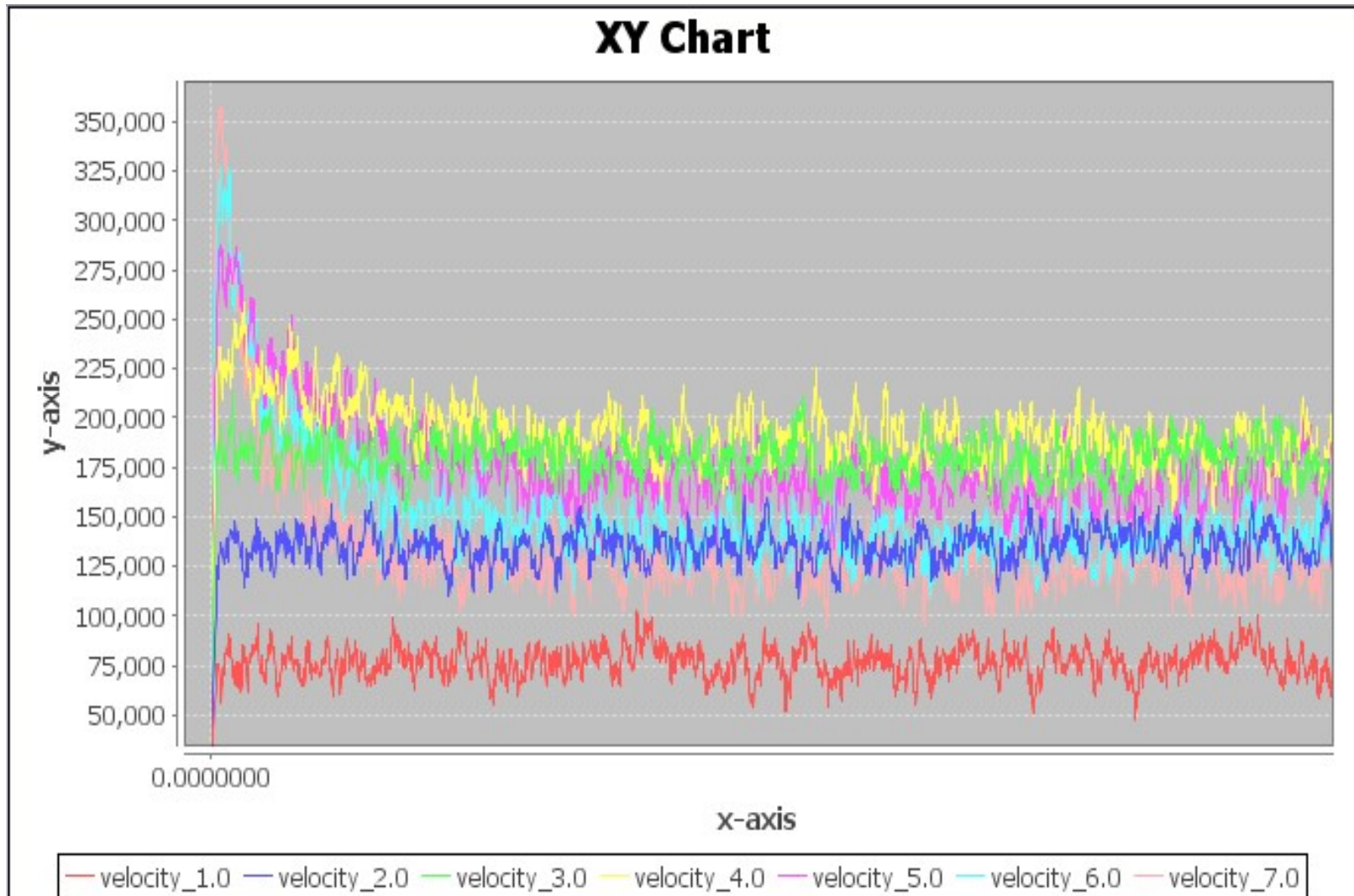


■ acoustic\_X   
 ■ polar\_X\_ab   
 ■ polar\_X\_em   
 ◆ intervalley\_X\_gamma\_ab   
 ■ intervalley\_X\_gamma\_em  
■ intervalley\_X\_L\_ab   
 ■ intervalley\_X\_L\_em   
 ■ intervalley\_X\_X\_ab   
 ■ intervalley\_X\_X\_em

# Renormalized Scatterings



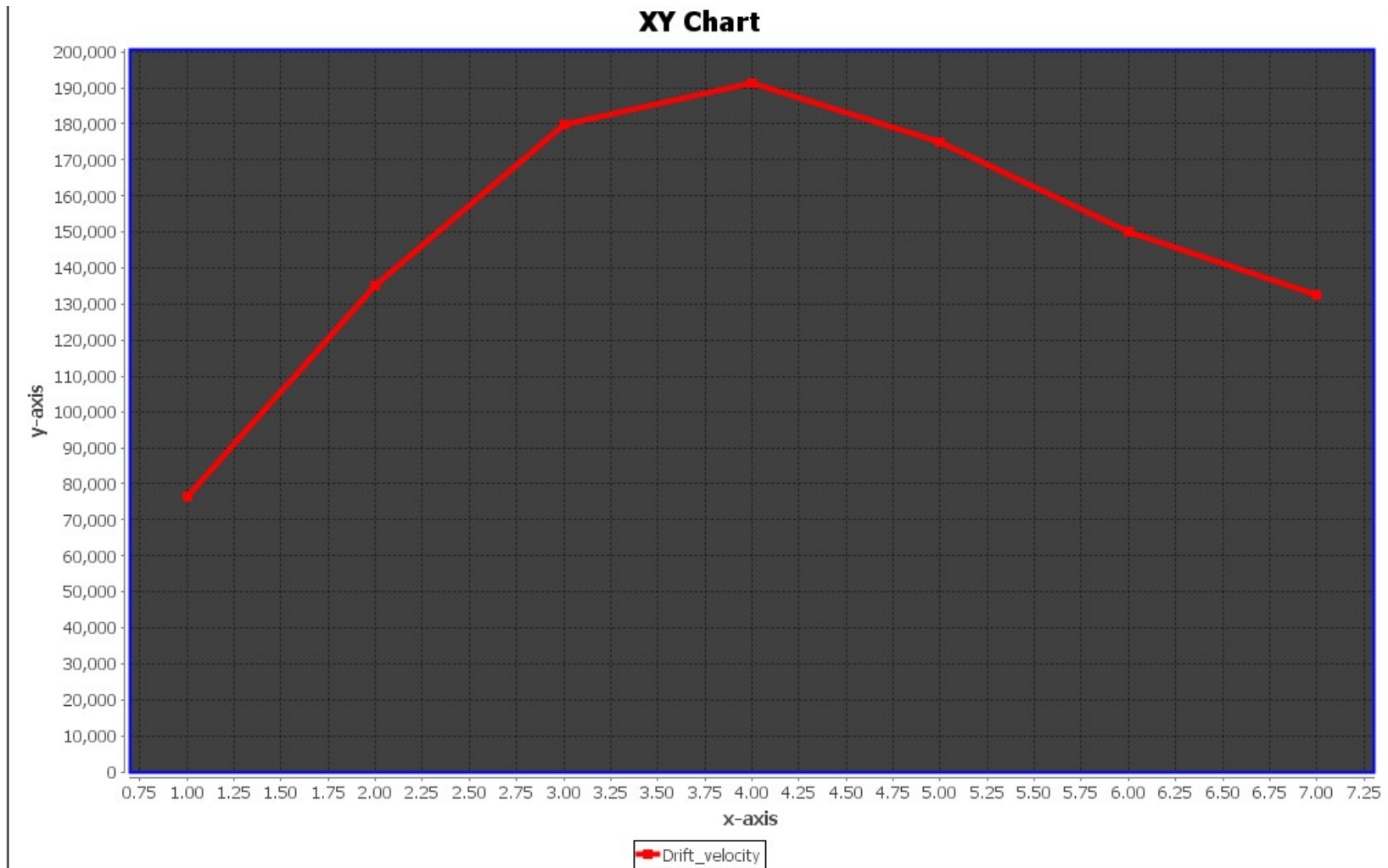
# Carrier Velocity Vs. different V





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# Mobility



Thank You  
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