

# Update 2020/11/20

Photon-assisted transport and gain clamping are now supported to simulate lasing above threshold and quantum cascade detectors. This new feature is illustrated in the sample files "MidIR\_QCL\_InGaAs\_InAlAs\_Bai\_APL2011\_GainClamping\_12subbbands.xml" (faster) and "MidIR\_QCL\_InGaAs\_InAlAs\_Bai\_APL2011\_GainClamping\_21subbbands.xml" (more accurate) where LIV curves are calculated. The corresponding documentation can be found here: [Photon-assisted transport and gain clamping](#)

- Open boundary conditions for simulating e.g. Resonant Tunnelling Diodes (RTDs) are supported. See the 2 sample files in the "RTDs" subfolder of the sample files. [Simulation of devices with open boundary conditions](#)

(this page was not maintained before)

## Older updates

**New feature:** a combined temperature-voltage sweep can be done using the keyword Temperature-Voltage in the field <SweepType> of <SweepParameters> (see the example of code below). In this case, the simulation can be parallelized. <Threads> defines the number of parallel threads. Its optimal value should be the number of CPU cores available (if the available memory is sufficient). Within each parallel temperature sweep, a serial voltage sweep is performed.

```
<SweepParameters>
  <SweepType>Temperature-Voltage</SweepType>
  <MinV> 50</MinV>
  <MaxV> 60</MaxV>
  <DeltaV> 2</DeltaV>

  <MinT> 25</MinT>
  <MaxT> 300</MaxT>
  <DeltaT> 25</DeltaT>

  <Threads>12</Threads> <!-- Parallelization for Temperature-Voltage sweep
-->
</SweepParameters>
```

Note that for such voltage-temperature sweep, <Maximum\_Number\_of\_Threads> in <Simulation\_Parameter> should be set to 1. (A combined parallelization will result in lower performances.)

```
<Simulation_Parameter>
  ...
  <Maximum_Number_of_Threads>1</Maximum_Number_of_Threads>
</Simulation_Parameter>
```

At the end of the simulation, current and gain maps can be displayed. `Gain_map.fld` gives the maximum gain at each (voltage,temperature) point. `Max_Gain_frequency.fld` gives the map of the corresponding photon energy for which the gain is maximum.

Folder view:



Gain map (V,T):



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