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HAROLD/PICWave Online Training Course

This will be a 1 day course (split into two half days) designed to teach you how to get the best out of the HaroldGain (1D), HaroldXY and PICWave for simulations of SOA/laser devices, including plenty of time to try out what you have learned in supervised hands-on sessions.

Proposed Agenda

Day 1: Harold tutorial

Session 1:

Introduction, overview of Harold, HaroldGain module tutorial:

- *overview of different modules (gain, XY, VCSEL, QCSE)*
- *epitaxial layers/material database*
- *HaroldGain (1D) module*
  - *physical model*
  - *simulation procedure (layers → device → simulator → 1d test → isothermal → self-heating)*
- *calibration of simulations and additional features/capabilities that aid simulation work*
  - *running convergence tests*
  - *editing material files*
  - *named variables*
  - *scripting/command-line*
  - *Kallistos optimiser for simulation calibration/device optimisation*

Session 2:

HaroldXY module:

- *physical model*
- *cross-section editor*
- *simulation procedure (additional steps as compared with HaroldGain/1D)*

Harold-PICWave link (part 1 – the Harold part):

- *overview, physics exported / approximations made*
- *setting up a Harold "PICWave Model" simulation, and exporting the epi/material model to PICWave*

Day 2: PICWave tutorial

Session 3:

Discussion of theory and physics contained in the model:

- *introduction to the TDTW time domain algorithm*

    - *advantages and limitations*
- *details of active device model:*
    - *carrier rate equations, spontaneous noise*
    - *the wideband gain/spontaneous emission model, gain saturation*
    - *multi-carrier models, capture-escape*
    - *current-spreading/leakage*
    - *thermal model*
- *overview of devices that can be simulated (passive and active including SOAs, FP, DFB and, DBR lasers)*

Using PICWave:

- *circuit components: sections/joins, RWGs, gratings, instruments, signals, monitors*
- *simulation set-up/parameters*
- *simulation results available, including: LI, RIN, eye diagrams; optical, AM, FM, RIN spectra; laser linewidth*

Session 4:

Harold-PICWave link (part 2 – the PICWave part):

- *importing a Harold epi/material model*
- *integrating imported model into a full SOA/laser device time-domain simulation*
- *getting consistency with HaroldGain/XY laser results*

Tips/troubleshooting

Additional features:

- *electrical circuit elements, travelling wave electrodes*
- *modulators/photo-detectors*
- *grating kappa calculator*

Importing passive component models (time permitting):

- *FIR section*
- *integration of PICWave circuit model with Maxwell solvers (FIMMPROP)*