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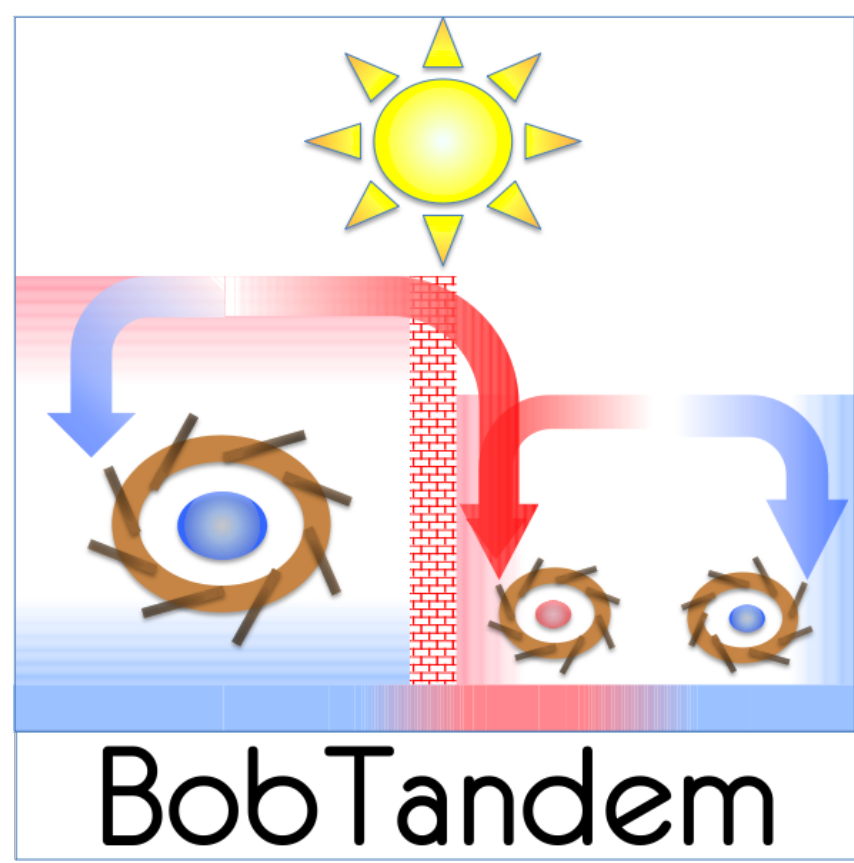
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Multiscale design of perovskite on silicon band offset barrier tandem solar cells

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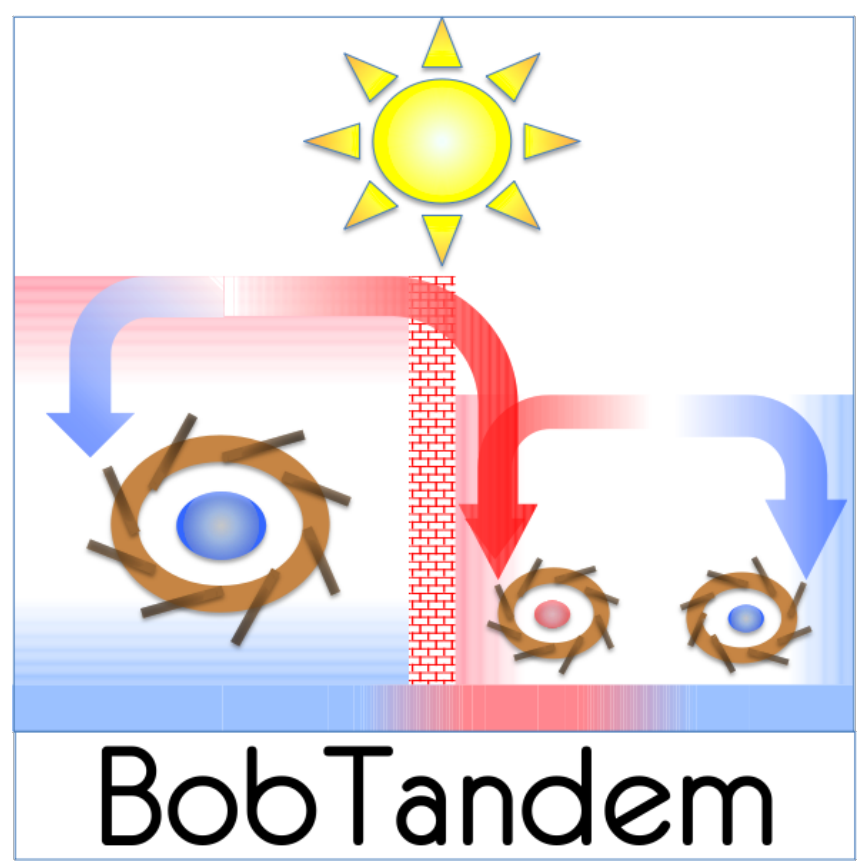
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⁶ IPVF, Institut Photovoltaïque d'Île-de-France, 30 route Départementale 128, 91120 Palaiseau, France

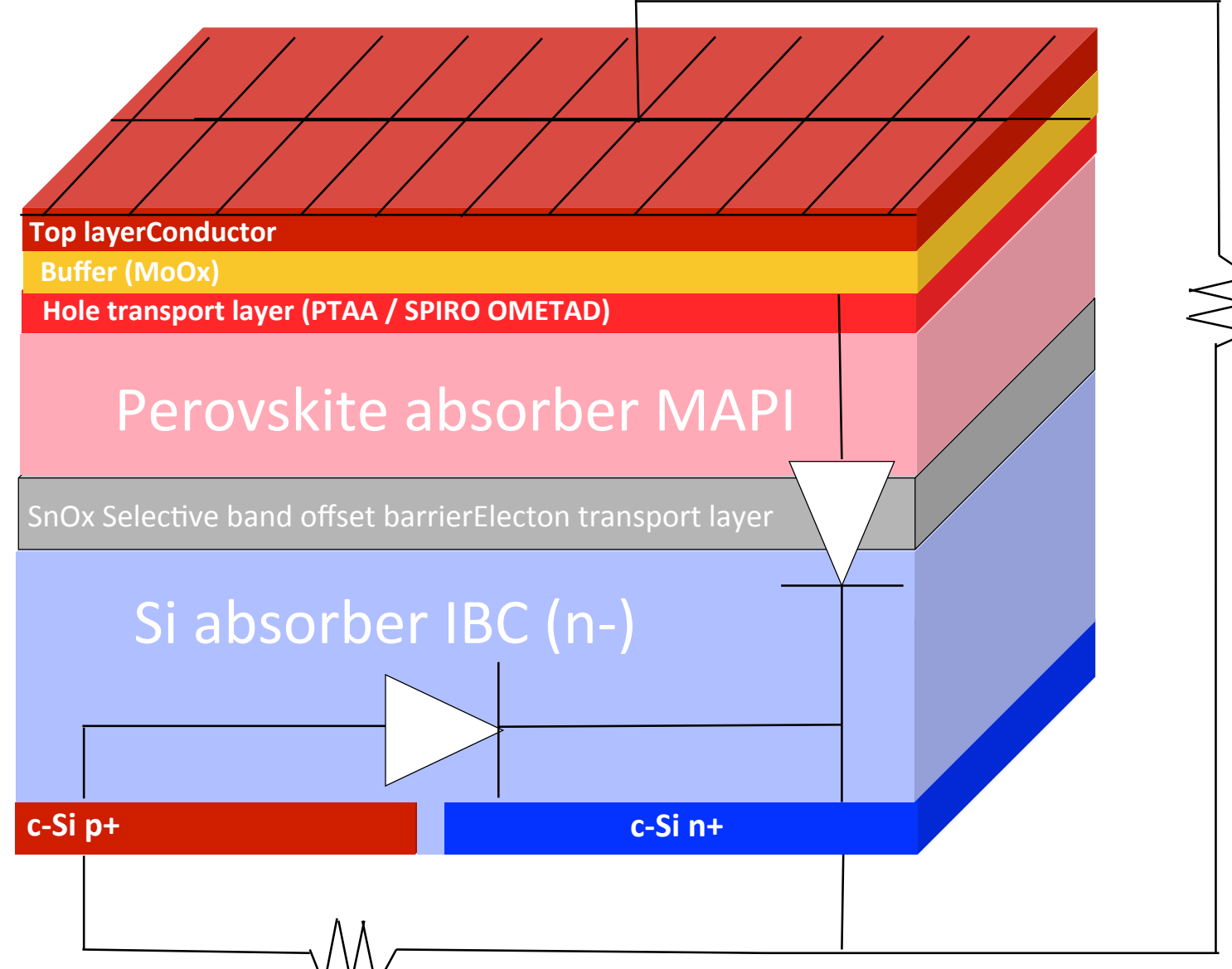
⁷ CNRS, IPVF, UMR 9006, 30 route Départementale 128, 91120 Palaiseau, France,

⁸ Centre for Nanoscience and Nanotechnology (C2N), CNRS, Université Paris-Saclay, 91120 Palaiseau, France

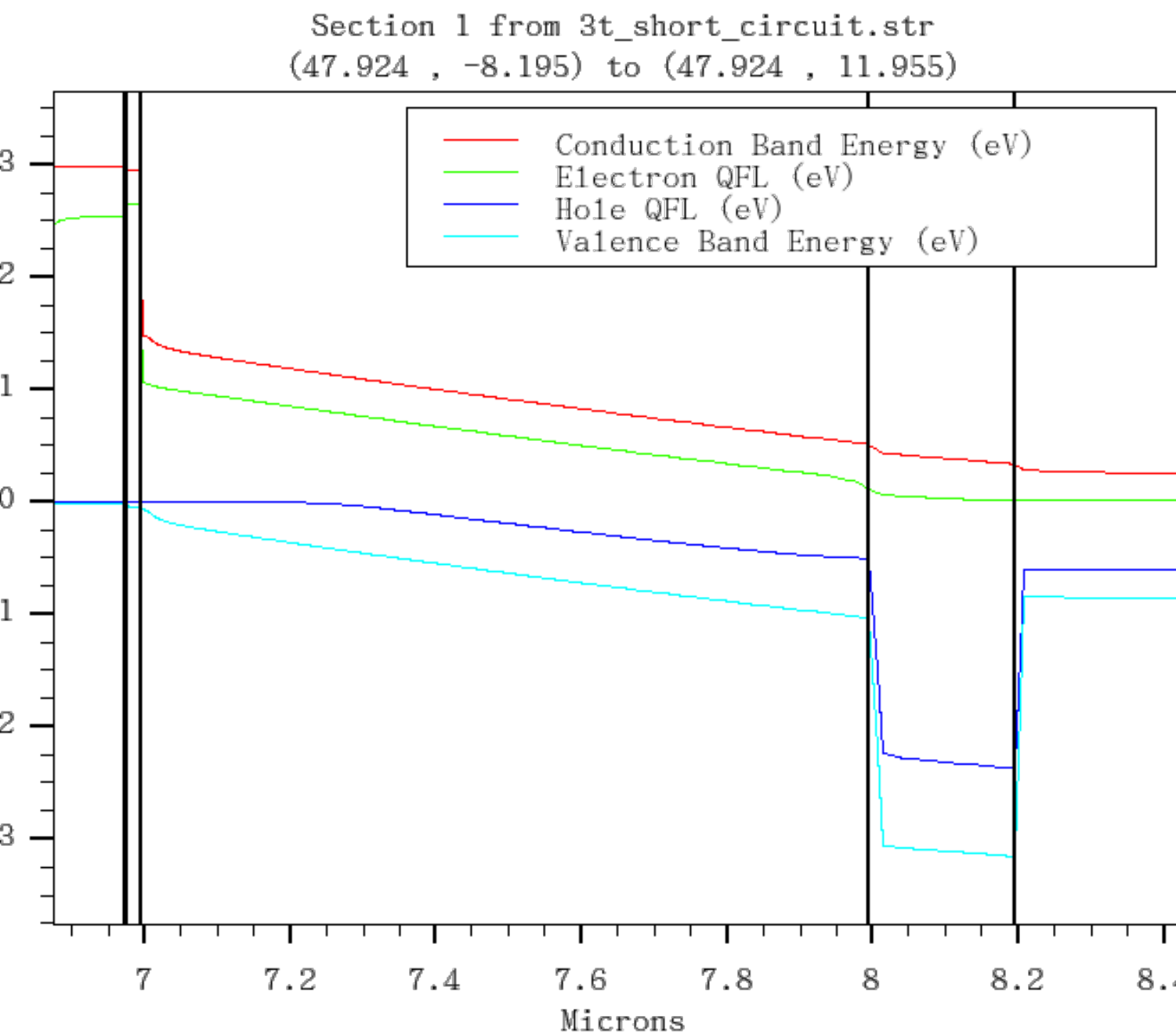
⁹ Delft University of Technology, PVMD Group, Mekelweg 4, 2628 CD Delft, The Netherlands



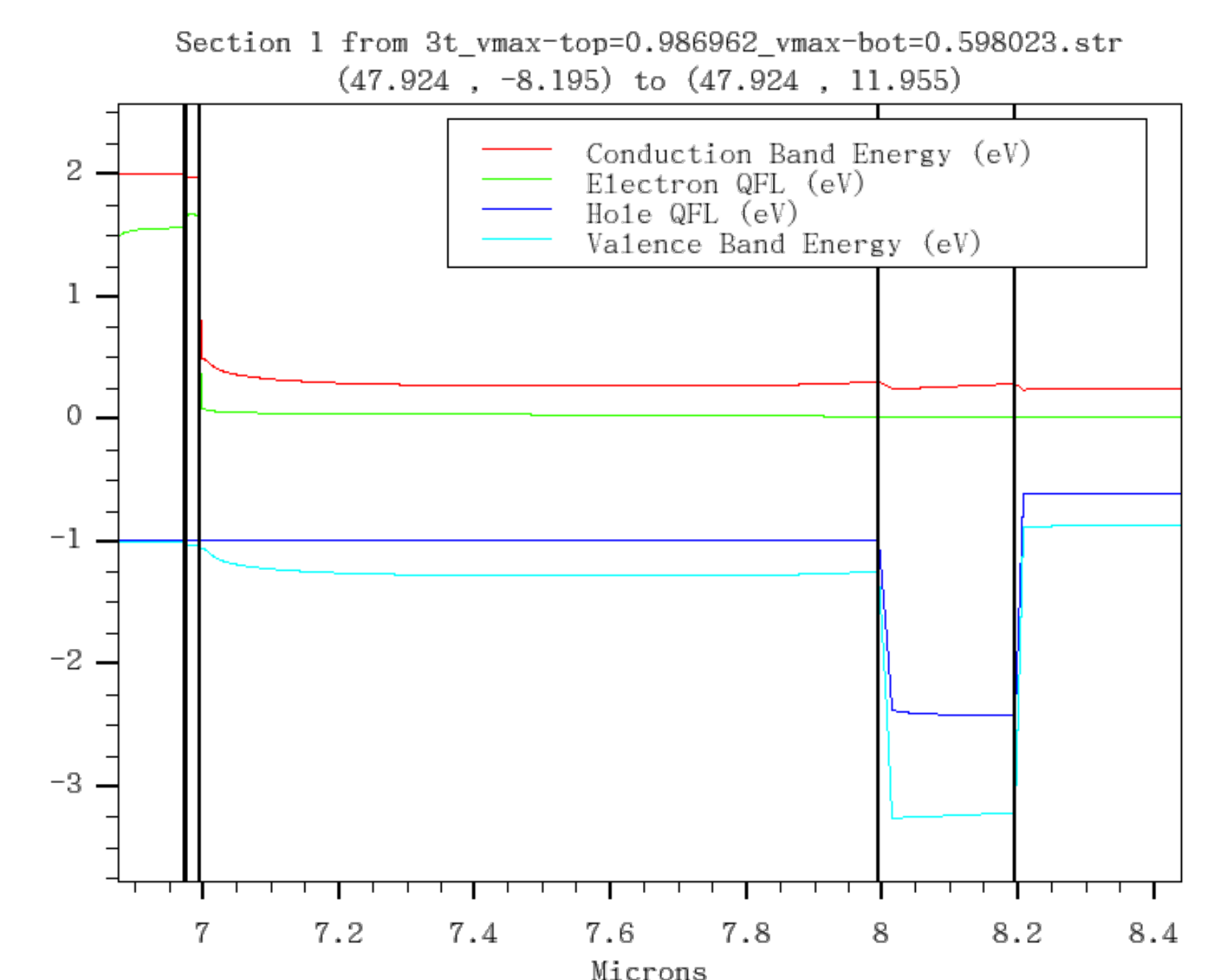
Modelling strategy: 2D device model + DFT materials theory input + experimental input



1) The device : **3T-SBOB** three terminal
3T-Selective Band Offset Barrier tandem



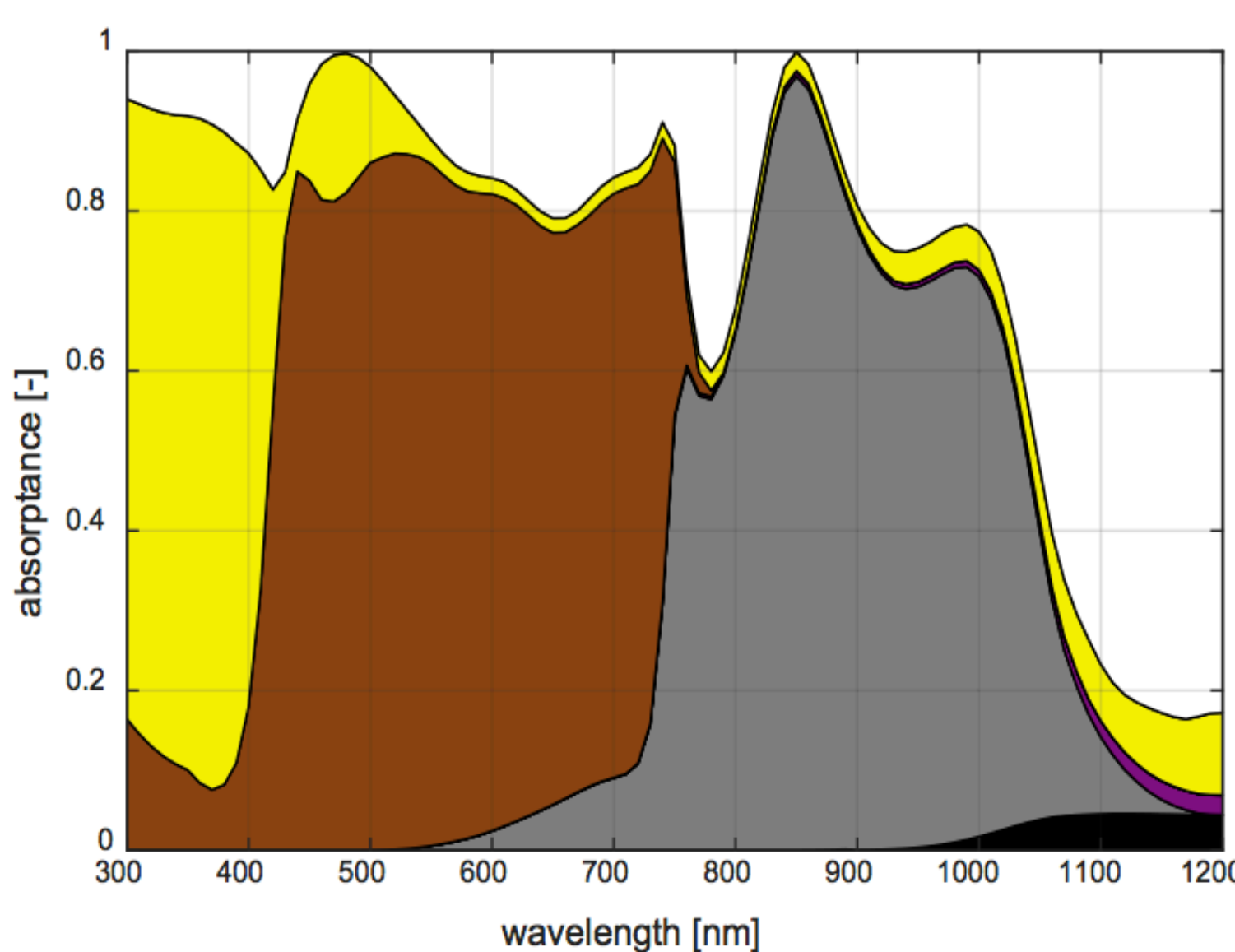
2) Band structure at short circuit



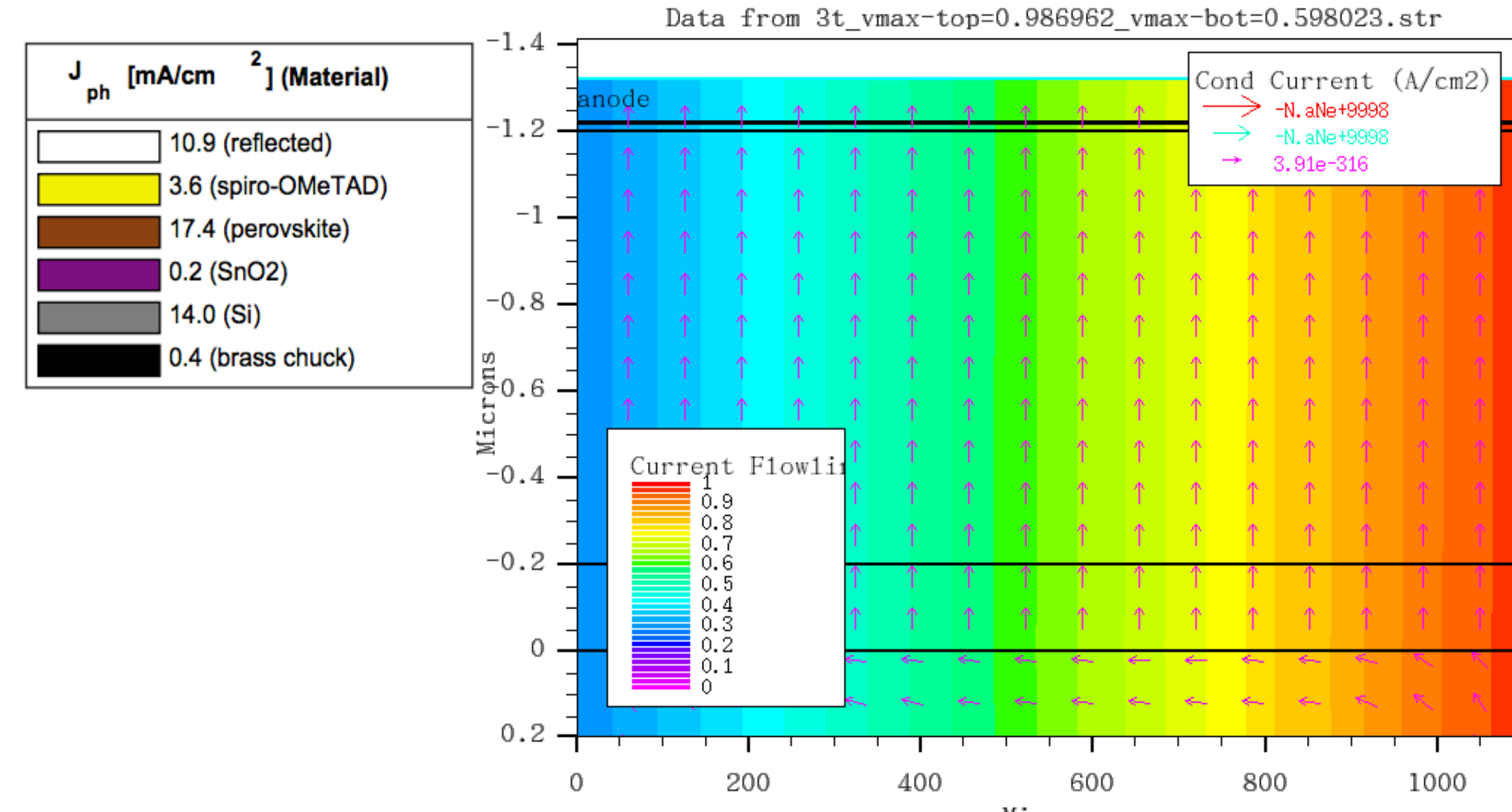
3) Band structure at maximum powers
(top and bottom)

Multiscale validation:

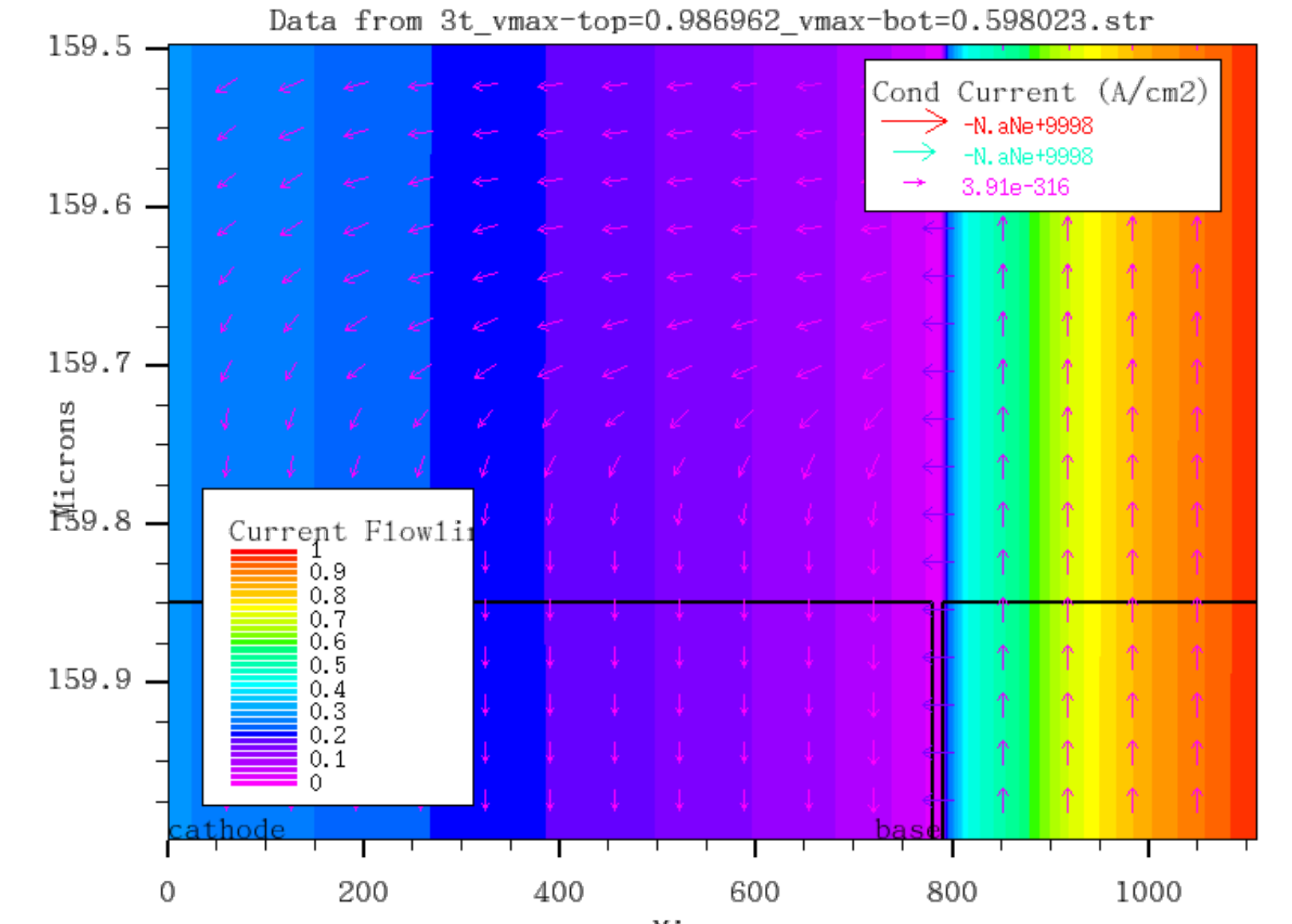
Compare initio materials, optics, and device scales



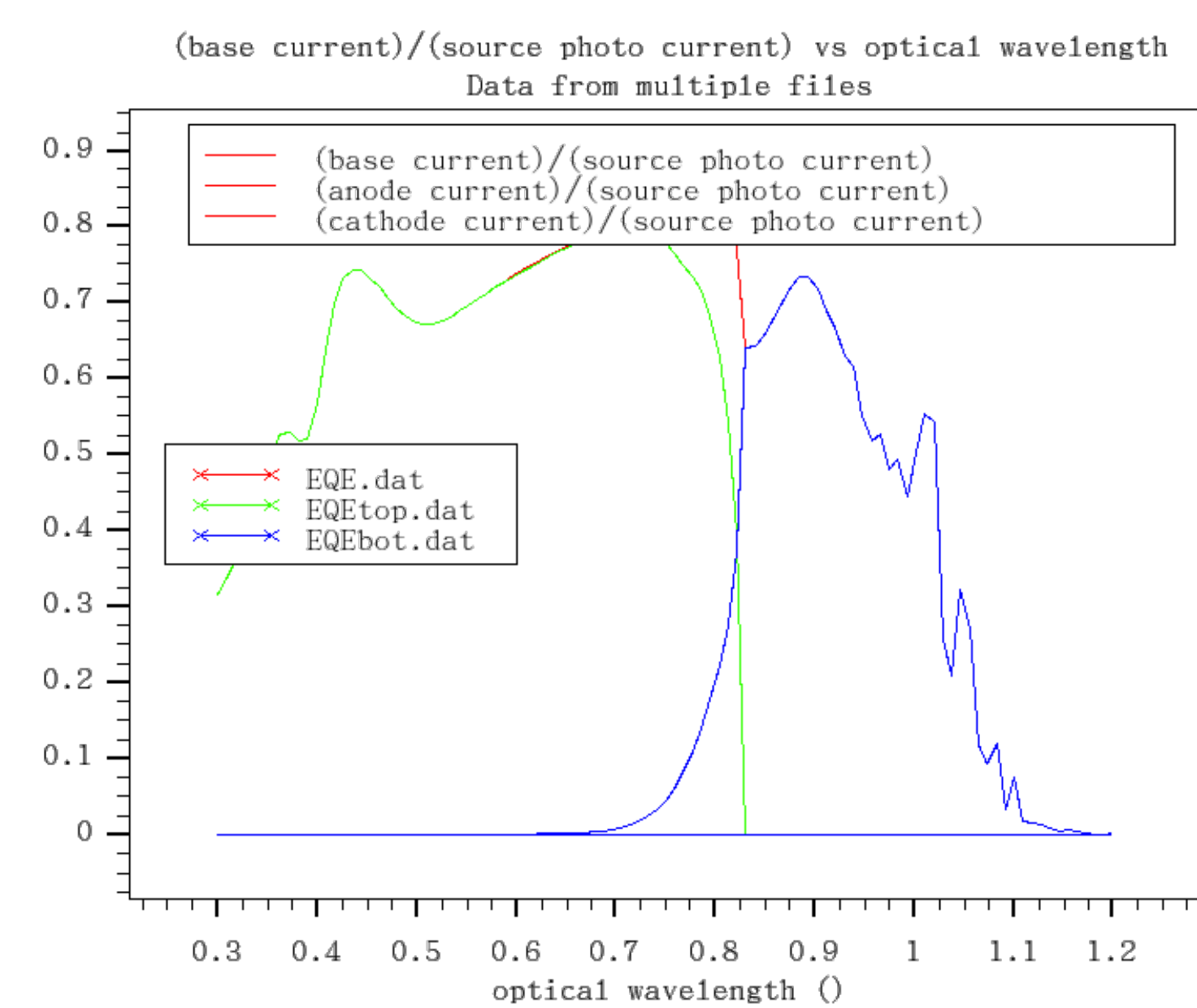
4) External GENPro 4 generation profiles
(In progress – not implemented here)



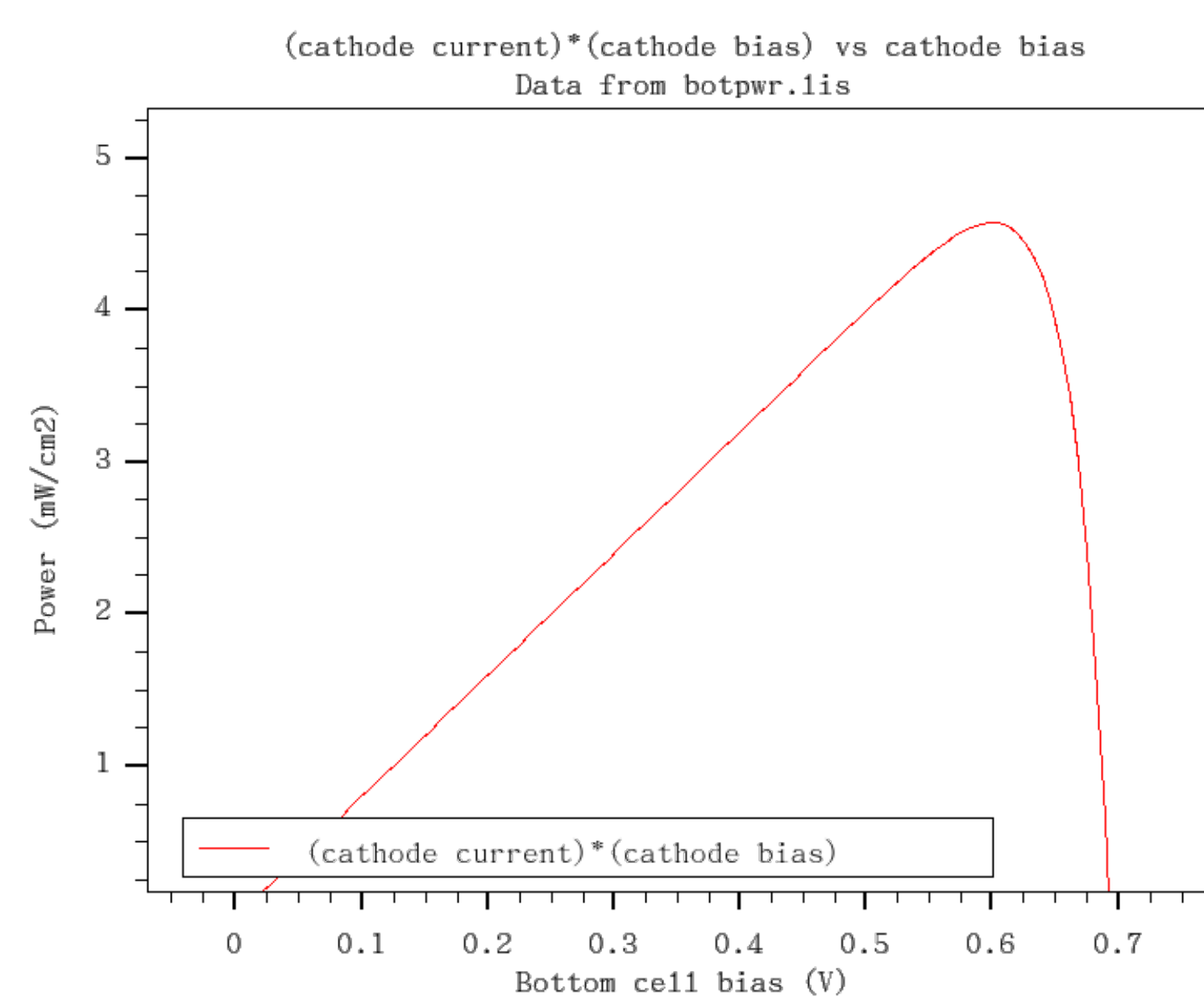
5) Operating point : Top subcell operation
BOB blocking hole thermalisation



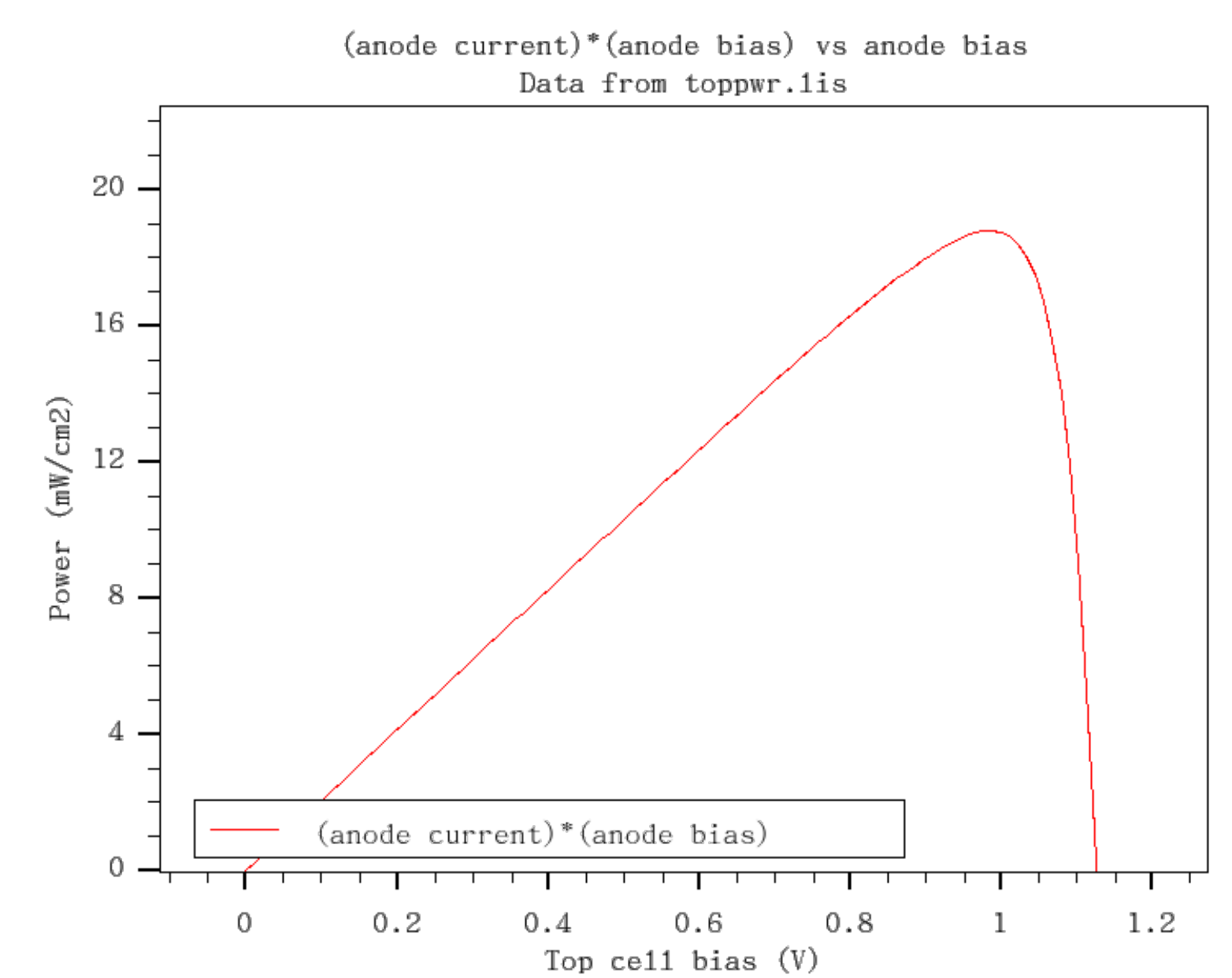
6) Operating point : IBC Rear contacts



7) Performance modelling : Ab initio,
2D model and experimental inputs



8) IBC performance poor (no texture)
≈4.5%



9) PSC performance high : optimistic
treatment of interfaces awaiting
experimental data: ≈ 20%.

Results :

- Multiscale modelling **validated** : Only ≈ 24% - first 3T prototype device.
- The **first 3T-SBOB device** : Just fabricated – characterisation in progress

Next steps :

- Materials and transport property optimisation
- Optical and transport multilayer optimisation
- Aim by end of BOBTandem : ≈35%



Watch this space ! Web : <https://bobtandem.wordpress.com>

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