Willkommen to the Simulation/Theory session

Jean-Luc Vay (convener) – *Berkeley Lab, USA*
Head of the Accelerator Modeling Program
PI of multi-institutional US DOE Exascale Computing Project WarpX

Maxence Thévenet – *DESY, Germany*
Head of the theory and simulation team in the plasma acceleration group

Marija Vranić – *IST, Portugal*
Researcher in the Extreme Plasma Physics team in GoLP

Simulation/Theory session discussion

Gaps in theory and simulation tools? How far are we from “digital twins”?

How to handle increasing complexity?

- more physics, advanced algorithms, evolving hardware (GPUs, FPGAs, exascale, quantum computers, …), widening gaps between compute & storage, etc.

Benefits from standardization of data (e.g., openPMD) or inputs (e.g., PICMI)?

Needs for benchmarking against experiments? Dedicated time/experiment?

How can theory/simulation leverage/contribute to AI/ML for the field?

Maxence Thévenet

"Theoretical Basis & Exascale Simulations"

2016: Ph.D. LOA, Ecole Polytechnique, France

2016-2019: Postdoc, Berkeley Lab, USA

2019-2020: Physicist, Berkeley Lab, USA

2020-: Head theory & simulation team, plasma acceleration group, DESY, Germany

Plasmas at the extreme

Marija Vranič

Instituto Superior Técnico, Lisbon, Portugal

"Laser-Electron Collisions and Laser-Plasma Interaction in QED Regime (Theory and Simulations)"

2015: Ph.D. IST, Portugal

2016-2017: Postdoc, ELI, Czech Republic
2017-2020: Postdoc, IST, Portugal

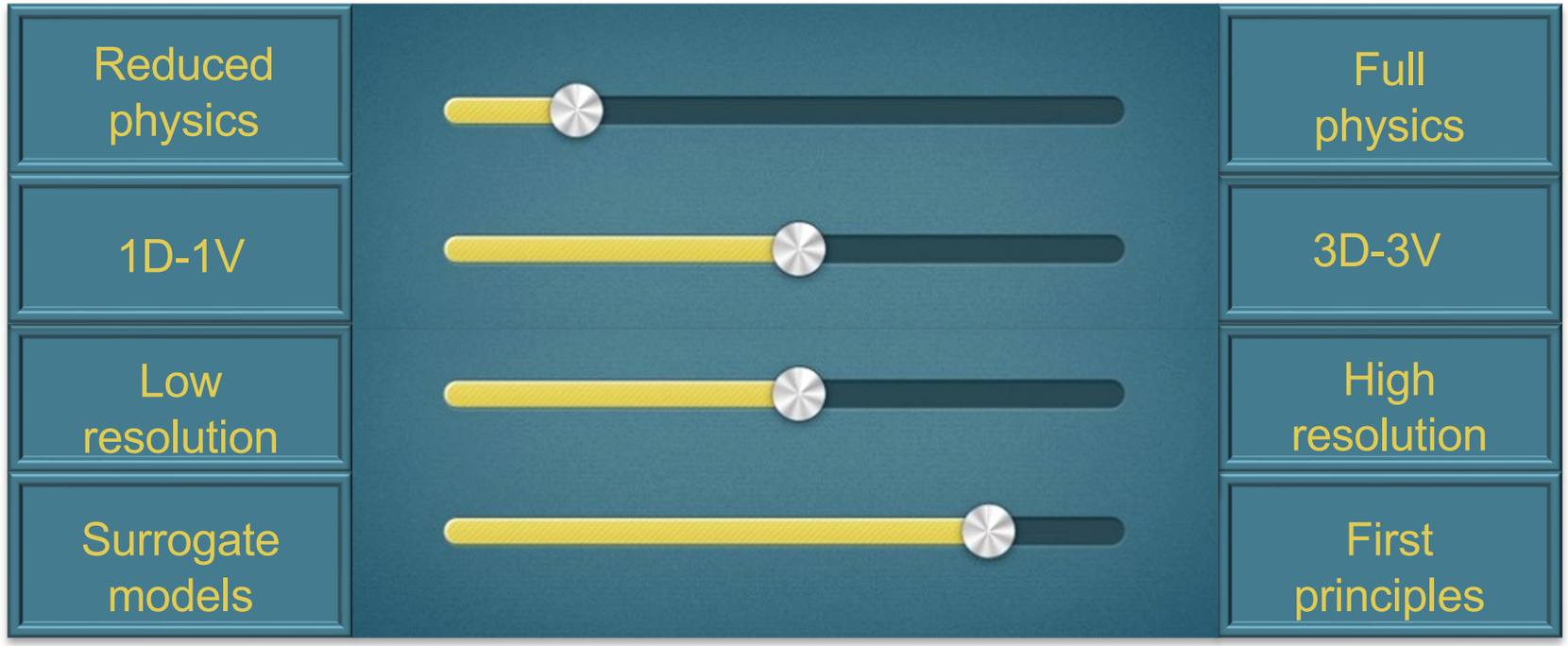
2020-: Researcher, IST, Portugal

Recipient of the 2017 John Dawson PhD thesis prize, 2019 IBM Scientific Prize and 2022 Ada Lovelace PRACE award

Extras

Ultimate goal would be an integrated ecosystem that offers on-the-fly tunability of physics & numerics complexity to users

Great for ensemble runs for design studies



Great for detailed runs for physics studies

Consortium for Advanced Modeling of Particle Accelerators CAMPA

BERKELEY LAB SLAC NATIONAL ACCELERATOR LABORATORY Fermilab UCLA

DOE HEP GARD

Lawrence Livermore National Laboratory radiasoft TECH-X

Particle-In-Cell Modeling Interface

picmi Standard

Code A

Code B

...

open Particle Mesh Data standard

openPMD

HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF BERKELEY LAB TECHNISCHE UNIVERSITÄT DRESDEN EUCALL Lawrence Livermore National Laboratory SLAC NATIONAL ACCELERATOR LABORATORY DESY UH European XFEL UCLA ioq JENA CBG Fermilab OAK RIDGE plasmapy

U.S. DEPARTMENT OF ENERGY | Office of Science