

The ILC and Accelerator R&D at Berkeley Lab

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Accelerator R&D at Berkeley Lab can support the ILC

- We had contributed some years ago and we currently have several active areas of accelerator R&D at Berkeley Lab with which we could support the ILC
 - Beam physics and simulations
 - High brightness e- injectors
 - Low level RF controls
 - Precision beam control and cooling
 - Damping wigglers, undulators for e+
 - Emerging laser-plasma based methods
 - ...

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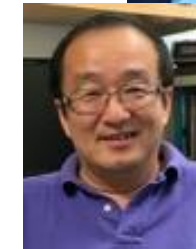
ACCELERATOR TECHNOLOGY &
APPLIED PHYSICS DIVISION



Accelerator Modeling
Program



Berkeley Lab Laser
Accelerator (BELLA) Center



Berkeley Accelerator Controls
& Instrumentation Program



U.S. Magnet
Development Program

Berkeley Center for Magnet
Technology

Berkeley Lab Accelerator Modeling offers Expertise Applicable to ILC

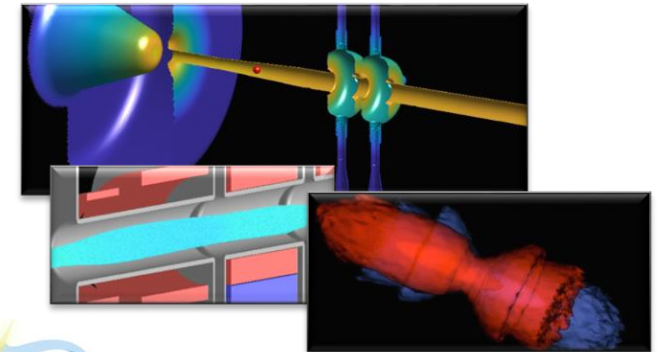
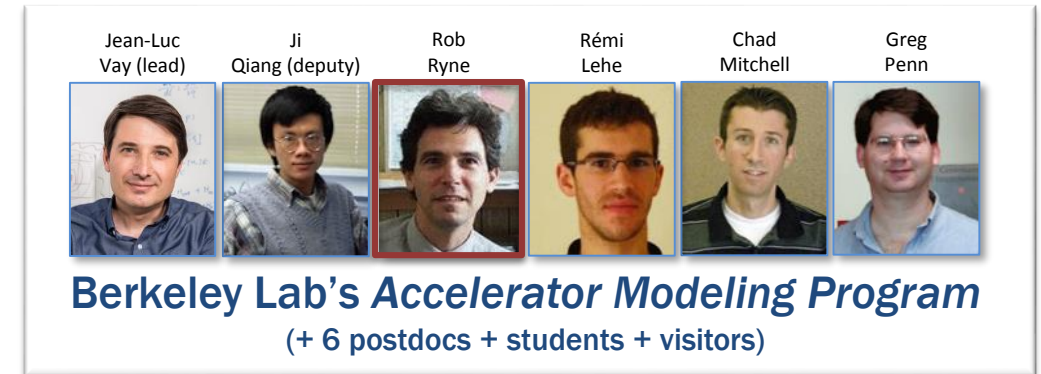
- **Linac design & simulation**

- Design optimization – conventional and AI/ML
- Space-charge effects
- High-order optics effects
- Realistic beamline elements (fringe fields, overlapping fields,...)
- Multi-physics modeling (e.g. WARP+ICOOOL)

- **High performance computing**

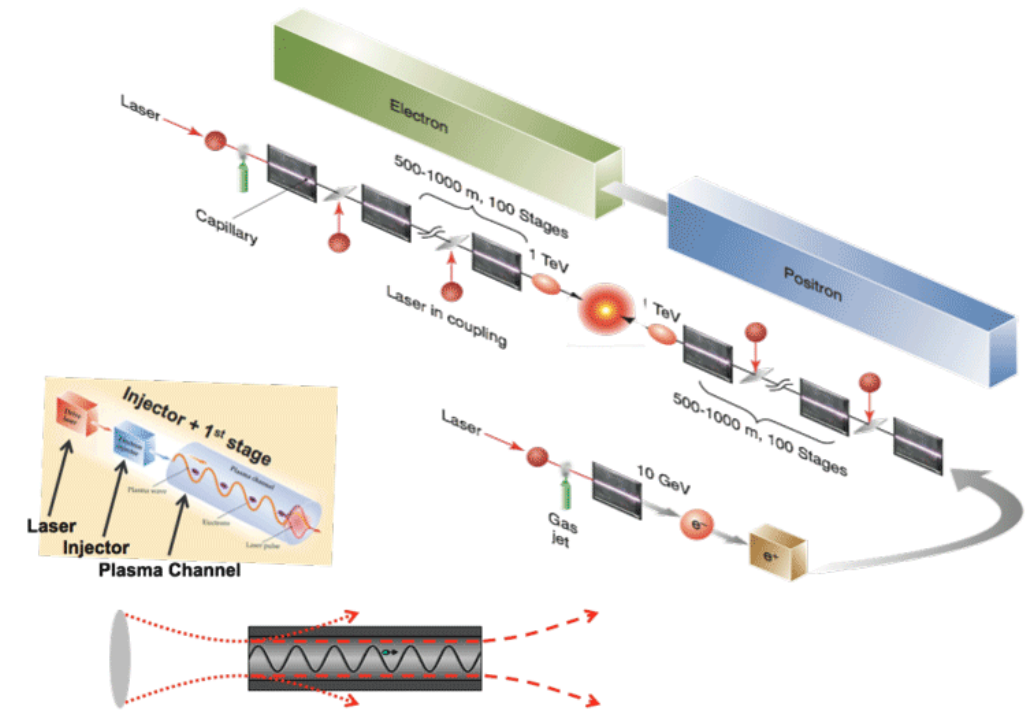
- Start-to-end modeling (code integration, standards for I/O,...)
- Developers of widely used community codes within the *Berkeley Lab Accelerator Simulation Toolkit (BLAST)*
 - Including: **IMPACT suite, Warp, BeamBeam3D.**

- **Contact:** Jean-Luc Vay, jlway@lbl.gov



Berkeley Lab's Expertise in Laser-Plasma Acceleration could support R&D towards future ILC energy upgrades

- **Laser-plasma accelerators can enable future energy frontier colliders**
 - Acceleration at ultra-high gradient
 - Novel cooling mechanisms enabled by ultrahigh fields
 - R&D needed
- Contact: Eric Esarey, ehesarey@lbl.gov



Some examples of references and links to our capabilities in Accelerator R&D at Berkeley Lab with potential connection to the ILC

- high brightness e- injectors, <https://aip.scitation.org/doi/10.1063/1.5088521>
- undulators, <https://newscenter.lbl.gov/2020/07/17/slacs-upgraded-x-ray-laser-facility-produces-first-light/>
- start-to-end linac simulations, <https://journals.aps.org/prab/abstract/10.1103/PhysRevAccelBeams.20.054402>
- low level RF controls, <http://accelconf.web.cern.ch/napac2016/papers/tupoa40.pdf>
- laser-plasma acceleration for future colliders, <https://bella.lbl.gov/research/bella-center-research-high-energy-physics/>
- Examples of earlier ILC R&D at Berkeley Lab
 - damping ring design study, <https://newscenter.lbl.gov/2005/03/31/the-international-linear-collider-2/>
 - e- cloud effects, <https://ieeexplore.ieee.org/document/4441017>
- More info under <https://atap.lbl.gov/>
- Contact: T_Schenkel@LBL.gov