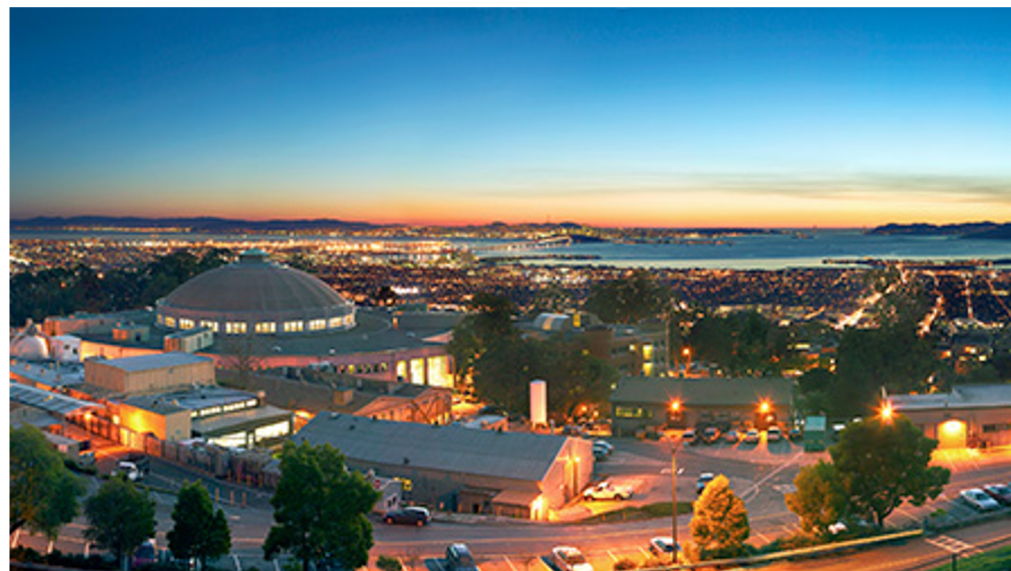


Berkeley Status & Plans



Barbara Jacak
February 29, 2024



UC Berkeley & LBNL Groups



UCB PD: Preeti Dhankher, Minjung Kim

LBNL PD: Wenqing Fan, Yuanjing Ji, Tyler Hague, Peng Miao

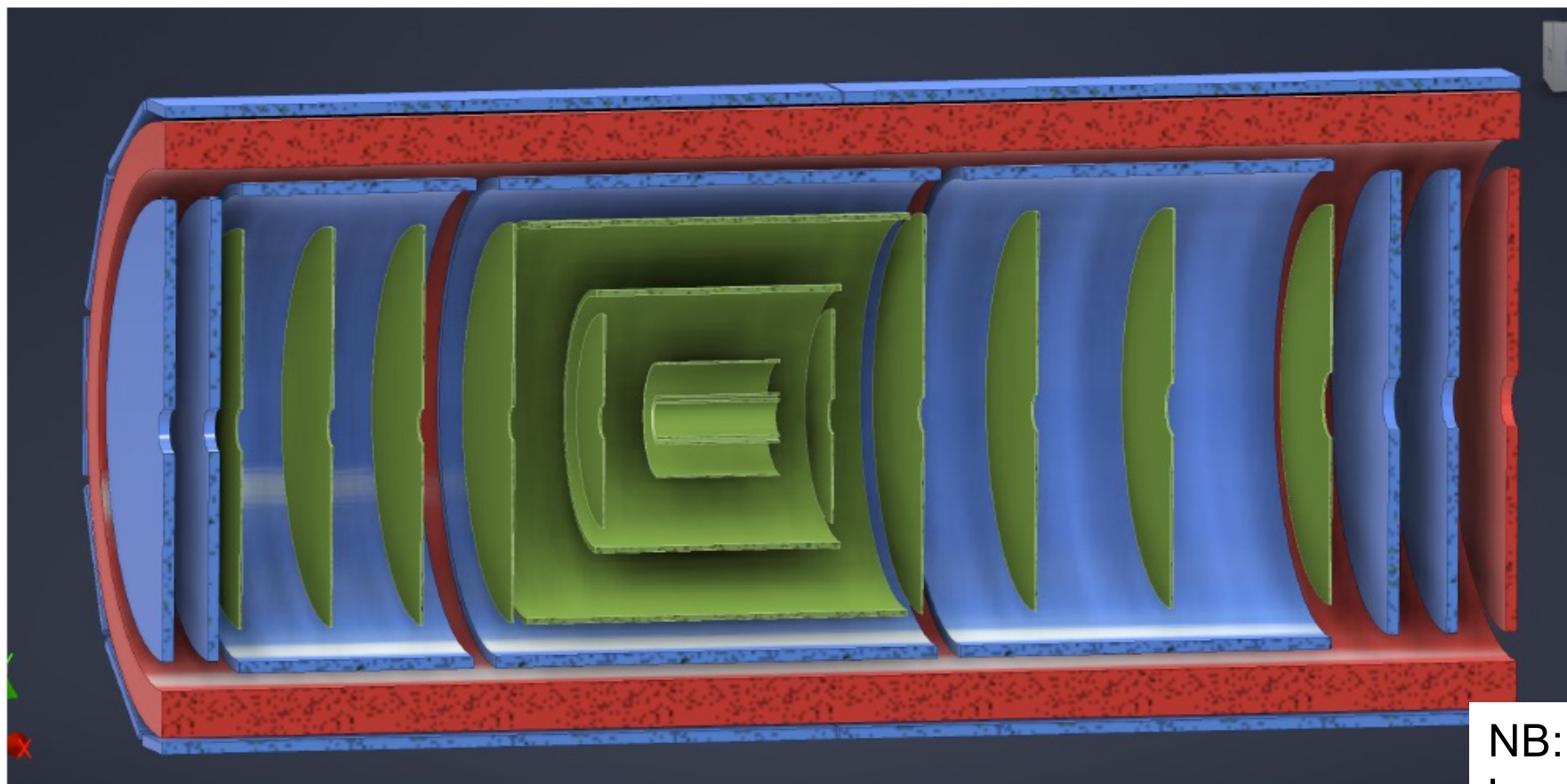
UCB Grad students: Kyle Devereaux, Beatrice Liang Gilman, Tucker Hwang, Anjali Nambrath, Kirill Naumov, Emma Yeats

UCB Undergrad students: Malika Golshan, Benjamin Sterwerf, Jonathon Tordilla

LBNL staff: Ernst Sichtermann, Spencer Klein, John Arrington, Nikki Apadula, Shujie Li, Xin Dong, Barbara Jacak, Jonathan Witte

- EIC, ALICE, STAR, sPHENIX, Jlab experiments
- HI Physics goals
 - Transport properties of dense QCD matter (hot and cold)
 - Jet evolution and modification in dense matter
 - Hadronization process
- Hadron Physics Goals
 - Where is the proton's spin & what is the structure of the pion?
 - Short range correlations in nuclei & quark-level understanding
 - Source of EMC effect & parity violating probes of it
- Our approach is to study with **available machines now** and design, build, and analyze EIC experiment to study with **e+p, A**

We work on tracking



SVT

MPGDs

ToF (fiducial volume)

NB: first Si layer of EMCAL also gives a spacepoint



ePIC SVT concept in a nutshell

- ITS3-like Inner Barrel layers
 - Use the **ITS3 wafer-scale sensor**
 - Adapt **ITS3 detector concept** to the (larger) EIC radii
 - Mechanics, services and cooling of ePIC SVT inner barrel layers need specific development
- Outer Barrel layers and disks
 - **EIC Large Area Sensor (LAS)**, i.e. ITS3 sensor size optimised for high yield, low cost, large area coverage
 - Conventional design of carbon fibre support structures (i.e. staves, disks), with integrated cooling and electrical interfaces

Key Berkeley accomplishments

- Silicon vertex detector design
 - Significant technical progress, including sensor tiling
- Silicon vertex detector R&D
 - Mechanics/cooling studies & prototyping
 - Direct contributions to ITS3 sensor design (Engineering)
 - DPTS (ALICE 3 next gen MAPS R&D) characterization studies
- Track reconstruction
 - SVT geometry definition
 - Simulation and reconstruction software development
 - Pattern recognition (track seeding & finding, hit association)
 - Track quality & duplicate studies
 - Efficiency, purity, resolution & background effects studies
 - Vertexing

EIC physics studies

- Energy-energy correlators at the EIC
- Heavy flavor measurements
- Jet probes of cold nuclear matter
- Photoproduction (coherent and incoherent)
- Tagged structure functions
- Parity violation/electroweak studies

Leadership roles in ePIC/EIC

- Sichtermann – Collaboration Council chair & EB
- Arrington – Nominating Committee chair
- Jacak – EIC Project Advisory Committee member, ePIC EB & conference committee
- Sichtermann – Silicon Vertex Detector Subsystem Leader & Tracking WG co-convener
- Apadula & Ye – Silicon R&D work package leads
- Li – Reconstruction co-convener
- Dong – vertexing leadership

Silicon Plans for 2024

- **Sensor development**
 - Develop large area sensor for EIC, for review in 2024
 - Baby MOSS Bench and beam test & feedback to designers
 - Test set-up development for ER-1
 - Ancillary chip development for power, bias, slow controls
- **Finalize layout**
 - Optimize resolution & efficiency, including backgrounds
- **Mechanical design & simulation of mechanics**
 - Overall support & cooling design
 - Selection of materials
 - Develop aluminum conductor flex cables
- **Prepare for EIC CD-2 in 2024**

Software plans

- Continue performance evaluation & optimization
- Complete hit selection & track quality studies
- Implement hit clustering in MC and reconstruction
- Improve geometry description
- Tracking beam test to inform clustering, etc.
- Prepare for EIC CD-2 in 2024