eIC Silicon R&D at LBNL

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eIC Silicon Consortium Meeting

January 31, 2022

eRD111: Milestones

All dates based on start date of 12/15/21

Milestone Description	**Date**
Report on baseline stave designs	04/27/2022
Report on baseline disc designs	06/08/2022
Report on simple disc & stave models	12/21/2022
Up-to-date silicon tracking CAD models	06/15/2022
Report on mechanics conceptual design	07/27/2022
FY22 R&D report	09/21/2022

- LBNL is planning to work on stave/disc construction & additional infrastructure (mechanics & cooling) from the eRD111 plan
  - Previous experience with STAR HFT, ALICE ITS2, ATLAS iTK (engineers)

eRD111: Time

- To meet these milestones, LBNL has requested money to cover engineer & technician time, as well as for materials

	Engineer	**Technician**	**Staff**	**Postdoc**	**Student**
Hours	480	220	800	780	200

- Time split between ~2 staff, ~2 postdocs

eRD111: Stave Designs

Milestone Description	Date
Report on baseline stave designs • Stiffness & vibrational requirements for staves & discs • Examine stave options (ITS like, I-beam, etc.) • Develop options based on potential reticle sizes	04/27/2022

- Stiffness & vibrational requirements
  - What has been studied by ITS3 already? What do we know from our own simulations ?
- Stave options
  - ITS-like (truss), I-beam (ATLAS), something else?
    - Benefits & drawbacks (material budget, stiffness, etc.). Information gathering
- Stave configurations based on likely reticle size
  - Layout options to meet the lengths (~34 & 47 cm)

eRD111: Disc Designs

Milestone Description	**Date**
Report on baseline stave designs	04/27/2022
Report on baseline disc designs • Stiffness & vibrational requirements for staves & discs • Examine disc options (stave based, plate based, etc.) • Develop options based on potential reticle sizes	06/08/2022

- Disc options
  - Stave based, plate based, etc.
    - What studies already exist?
    - Benefits & drawbacks (material budget, stiffness, etc.)
    - Cooling?

eRD111: Mechanical/Cooling

Milestone Description	Date
Report on baseline stave designs	04/27/2022
Report on baseline disc designs	06/08/2022
Report on simple disc & stave models • FEA analysis of stave & disc designs • Fabricate & test simple disc & stave mechanical models (mechanical properties, cooling)	12/21/2022
Up-to-date silicon tracking CAD models	06/15/2022
Report on mechanics conceptual design • Review carbon foam studies for cooling options • Integrate cooling options into stave/disc prototype designs • Develop conceptual designs other mechanical structure/support pieces • FEA analysis of shells & cones	07/27/2022

Involvement with ITS3

- Chip testing
  - Requested ITS3 test system
  - 88” cyclotron for radiation effects?
- Test Beam analysis
  - Previous & upcoming

- 3 UC Berkeley members at CERN
  - 1 postdoc, 2 graduate students
  - Will take on both hardware & software tasks
    - Plan to be trained & get experience before passing that knowledge on to rest of LBNL/UC Berkeley group

Summary

- eRD111
  - Stave/Disc concepts, mechanics/cooling
  - Initial conversation with engineers → positive response
  - Staff/postdocs/students beginning work
    - Information gathering, simulation studies
    - Plan to be ready when money arrives
- ITS3
  - Chip testing & test beam analysis
  - Members at CERN provide good opportunity for LBNL involvement