

# Project R&D Reports and Proposal(s)

Thanks to everyone who contributed.

eRD104 and eRD111 reports and eRD113 proposal are available via the [R&D wiki](#)

DAC meeting, where these were presented, took place past August 28 and 29, 2024 with a close-out on September 3; <https://indico.bnl.gov/event/24086/>

Overall, positive – pertinent close-out slides reproduced next; eRD113 (sensor R&D) award letter likely very soon.

Part of SVT R&D has come to a close and effort is transitioning to PED; thanks to those headed the calls over Summer and worked with the WP conveners and/or Laura, Ernst to get to a coherent set of FY25 requests.

# eRD104 - Silicon Services reduction

- Working on serial powering (SP) with Shunt LDOs to reduce the power infrastructure.
- Reduction of the signal readout cabling.
- UK groups – serial powering/prototype design, overall powering scheme for whole detector.
- ORNL – technologies for readout chain from detector to FELIX
- ORNL + MIT – aggregating fiber board to reduce number of readout fibers.
  
- Milestones – Production of SP flex circuit prototype
  - Simulation/verification of Shunt LDO scheme
  - Finalize Shunt LDO design will allow production and performance testing
  - Production/testing of serialized board – later in 2024
  
- Steady progress since August 2023 review, but much fabrication/testing remains to be done
- Radiation hardness – concern in August 2023 review – lpGBT and VTRx+ now used for which radiation hardness is known.
  
- Actual component fabrication and testing should proceed with high priority in order to understand if further R&D is required for both SP, serialization board and readout aggregation.

# eRD111 - Si-Vertex – Modules, Mechanics, Cooling, Integration

- INFN institutes have pursued design of L0, L1 of inner barrel following ITS3 experience.
  - First local support structure prototype made – 3D printed in Bari.
  - Thermo-mechanical prototype using blank silicon planned for EOY24
  - Climate chamber being set up by Pavia to investigate temp/humidity effects
  - First design of SVT IB global support developed by Padova - first mockup scheduled
  - LBNL studied disc layout using LAS and cooling based on use of carbon foam
  - Oxford is waiting eRD111 funding but has been developing design of OB staves
  - OB stave design is ready for prototyping
  - Purdue also did not yet receive funds but has studied possibility of integration of SVT local structure with larger global support structures.
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- R&D is progressing according to plan – we congratulate groups on past year advances.
  - Cooling tests show manageable airflows on the corrugated disk test piece.
  - Optimization using carbon foam is ongoing.
  - With approx 4000 EIC-LAS sensors in the SVT the groups are aware that power consumption estimates might change.
  - Baseline is cooling with air internal to the mechanical structure, liquid cooling in strategic places is a wise approach.
  - General concern that delays in establishing funding can lead to accumulating delays.
  - Potential impact of delays to contributions to ePIC TDR at end of 2024.

# eRD111 - Si-Vertex – Modules, Mechanics, Cooling, Integration (2)

- In the 2023 review, it was recommended to (1) proceed as fast as possible to prototype bent structures using active ALPIDE parts or, even better, parts from ER1 and (2) build strong communication with the eRD104 group for FPC and readout concept and design. The current report shows progress on both points, in particular, having integrated the readout and FPC components into the CAD design, which is crucial for estimating the heat load and space constraints.
- Continue performing thermal prototypes for IB design.
- Clarify need for liquid cooling in "strategic places" – impact on material profile?
- Continue close collaboration with the eRD104 group for FPC and readout concept and design.
- Keep simulation on track with developments in local/global support structures.
- Streamline the distribution of funds to collaborating institutions in a timely manner.

# eRD113 - Si-Sensor Development and Characterization

- Connections with the ALICE ITS3 community have been strengthened by embedding two designers from EIC institutes into the MOSAIX design team at CERN.
- Other institutes have contributed to the digital library for MOSAIX.
- Development of the specifications of an ancillary chip for the SVT has started and a target technology chosen.
- EIC institutes have carried out a wide range of tests on prototype chip structures recently fabricated by TPSCo for ITS3, and there has been a large effort on preparing test infrastructure for chips from the upcoming MOSAIX submission.
  
- Committee is pleased to note the more direct collaboration with personnel embedded in the ALICE team.
- We commend the team on the advances in specifying the serial powering requirements.
- Concerned that a collaboration agreement with ALICE is not yet in place and that access to the design technology is not yet possible.
- Choice of XFAB-XT011 for the ancillary chip requires early validation of the process - assume a steep learning-curve - significant effort on both technology qualification and design-work.
- Setting up of a common design repository is a vital step for the ancillary chip design and future work on the LAS. All effort must be made to finalize the agreement between institutes on its use.

# eRD113 - Si-Sensor Development and Characterization (2)

- The proposed R&D activities are high priority - we strongly recommend the approval of funding.
- The qualification of the XFAB technology must be concluded quickly. This is a big effort, so we strongly recommend that this is carefully planned (including submission schedules and access to facilities for irradiation) and that the required resources (especially human) are properly understood and consolidated.
- We recommend that the design effort for the ancillary chip be carefully assessed and organized, especially as this is a new technology. This could become a critical issue when the ePIC community is granted access to the TPSCo design kit, and the SVT team has to support the design of both the LAS and ancillary chips.
- We strongly recommend that the collaboration agreement with ALICE be concluded as quickly as possible.

# ePIC Collaboration Meeting

Summer 2024 EICUG / ePIC Collaboration Meeting past July 22–27 at Lehigh University, c.f. <https://indico.bnl.gov/event/20727/>, has a wealth of information on L0+L1, and on the readout chain.

# Initial draft – v0 – of Preliminary Design Report (pre-TDR)

Thanks to everyone who contributed to the zero-th version!

Announced by Silvia Dalla Torre to the collaboration mailing list past October 7, 2024, and made available/distributed via Zenodo: <https://zenodo.org/records/13912060> (the .pdf is also linked directly from the agenda, but consider getting a Zenodo account if you do not already have one; ePIC has adopted it as one of its collaboration tools),

Request for feedback with a deadline of October 20, 2024 via google forms:

<https://forms.gle/nh9Hi4BwCXC2e2Yr9> – QCD-science sections

<https://forms.gle/wHEyuHgzuBE9fMh48> – Detector sections

Note, the ~15 page limit and sectioning of the SVT section followed a template for the overall document. The “additional material” section is not part of the document; instead, we should use it as an “SVT Preliminary Design Document” (a longer SVT-focused document that can become an appendix).

Requests:

- Provide your feedback by October 20, 2024 via the google form or directly to Laura / Ernst
- v1 is due December 1, 2024 (including additional material) – consider contributing