Work in Progress

[1] https://wiki.bnl.gov/EPIC/index.php?title=TOFPID
[2] https://wiki.bnl.gov/conferences/index.php/ProjectRandDFY23
[3] https://www.overleaf.com/read/vftxyvjtjrvp

eRD112 [2]

- Sensor
  - BNL, HPK/FBK productions
  - Lab/beam test, Irradiation
- Sensor/ASIC integration
  - Interposer
- Mechanical structure
  - Low-density mechanical structure

eRD109 [2]

- ASIC
  - EICROC1, FCFD1, SCIPP
- Frontend electronics
  - Timing chips and streaming readout
  - Barrel/Endcap TOF Hybrids

Simulation [1]

- DD4HEP geometry, digitization, reconstruction
- Spatial resolution requirement
- Timing resolution requirement
- Material budget requirement

Project Engineering and Design (PED) [3]

- Mechanical engineering
  - Barrel TOF
  - Endcap TOF
  - Cooling system
- Electric engineering – postponed/DAQ PED
  - Precision clock distribution (<5 ps)
  - Prototype readout board, cables

eRD112 (eRD109) FY23 Proposal

Project Office:

We had a very close look at the eRD112 proposal and request a revision of the funding requests keeping the following in mind:

*Reduce the number of produced sensors to the bare minimum
*Reconsider the need for 3 different sensor fabrication companies/institutes
*Streamline the various tasks and do not spread them too broad among the various institutions. *Try to consolidate FTEs on the level of < 5%

As guideline consider the funding estimated in the R&D plan and your own estimate of the FY23 funding needs in the FY22 proposal: $250k. Please keep in mind that you received 200k in FY22 that is not spend. Be also prudent in separating R&D and Project Engineering and Design (PED).

In eRD112 FY22 proposal, we projected in total $450k excluding ASIC/electronics for FY23, and 780k$ including ASIC/electronics. In the submitted eRD112 FY23 proposal (excluding ASIC/electronics), we asked for $255k M&S and $207k labor support, very close to our FY22 projection, and $267k for ASIC/electronics, again close to our FY22 projection.

eRD112 (eRD109) FY23 Updated Proposal

1. M&S Total 180k (original request 254.7k, now remove interposer/test board and reduce sensor and travel costs)

   Sensor BNL 75k
   Sensor HPK 80k
   Mechanical Structure 15k
   Test Beam Setup 5k
   Test Beam Travel 5k

2. Labor Total 70k (original request 207.3k, now remove interposer and all scientific labor costs)

   BNL Board Assembly 20k
   UIC Board Assembly 15k
   SCIPP Prototype Assembly 10k
   SCIPP TCAD Sim and sensor design 5k
   NCKU+Purdue Mechanical structure: 20k

eRD112 (eRD109) FY23 Updated Proposal

1 EICROC ASIC 75k
2 FCFD ASIC 40k
3 Barrel Low-Mass Service Hybrid 44k
4 Third party ASIC Evaluation 33k
5 Readout Board and Precision Clock -> PED
6.Endcap Service Hybrid (Readout and Power Board based on CMS ETL design) -> PED

eRD112 M&S

Vendor/ Institute	M&S Item	Cost per Item (k$)	N. Items	Tot. Cost (k$)
Sensor Production				~~175~~ 155
BNL IO	Sensor fabrication (incl. labor)	50 (10 wafers)	1.5	75
HPK~~/FBK~~	Sensor fabrication	75+3-5/wafer	1	~~100~~ 80
Sensor Characterization				~~13.7~~ 5
UIC	M&S for test beam setup	-	-	5
~~LANL~~	~~M&S for irradiation test~~	~~-~~	~~-~~	~~5~~
~~SCIPP~~	~~Fermilab 16-channel boards~~	~~-~~	~~-~~	~~3.7~~
~~**Sensor/ASIC Integration**~~				~~30~~
~~UIC~~	~~Interposer fabrication and bump bonding~~	~~30~~	~~1~~	~~30~~
Mechanical Structure				15
NCKU	Material for light-weight support structure	-	-	10
Purdue	Material for light-weight support structure	-	-	5
Travel				~~21~~ 5
~~BNL~~	~~Trips to Fermilab testbeam~~	~~2~~	~~2~~	~~4~~
UIC	Trips to Fermilab testbeam	1	5	5
~~ORNL~~	~~Trips to Fermilab testbeam~~	~~3~~	~~2~~	~~6~~
~~Rice~~	~~Trips to Fermilab testbeam~~	~~3~~	~~2~~	~~6~~
TOT.				~~254.7~~ 180

Table 8: eRD112 resource request for M&S costs in FY23, excluding frontend ASIC and electronics.

eRD112 Labor

Inst.	Task	Labor Type	FTE (%)	Tot. Cost (k$)	
Sensor R&D				~~172.3~~	50
BNL	Sensor+ASIC and test board assembly	El. Tech.	10	20	
UIC	Sensor+ASIC and test board assembly	El. Tech.	10	15	
	~~lab/beam test for sensors and ASICs~~	~~Research Sp.~~	~~50~~	~~45~~	
~~LANL~~	~~Sensor irradiation test~~	~~Scientist~~	~~2.5~~	~~10~~	
	~~Sensor irradiation test~~	~~Student~~	~~5~~	~~5~~	
~~Rice~~	~~pixel sensor test~~	~~Postdoc~~	~~40~~	~~40~~	
SCIPP	~~Oversight and coordination~~	~~Project Scientist~~	~~5~~	~~9~~	
	TCAD sim. and sensor design	El. Design Specialist	10	~~16.5~~	5
	Prototype Assembly	EM Engineer	5	~~11.8~~	10
~~**Sensor/ASIC Integration**~~				~~15~~	
~~UIC~~	~~interposer design and testing~~	~~El. Engineer~~	~~10~~	~~15~~	
Mechanical Structure				**20**	
NCKU	light-weight support structure R&D	Mech. Engineer	10	5	
Purdue	light-weight support structure R&D	Mech. Engineer	10	15	
TOT.				~~207.3~~	70

Table 9: eRD112 budget request for labor costs in FY23, excluding frontend ASIC and electronics.

eRD112 (eRD109) ASIC/Frontend Electronics

Vendor/ Institute	M&S Item	Cost per Item (k$)	N. Items	Tot. Cost (k$)
Frontend ASIC				**118.3**
IJCLAB	EICROC1 submission	65	1	65
	EICROC test boards	-	-	10
FNAL	FCFDv1 submission	25	1	25
	FCFD test boards	-	-	15
SCIPP	ASIC service boards	-	-	3.3
Frontend Readout Electronics				**31**
BNL	Xilinx Dev Kit	4	1	4
	Timing cihps and boards	15	-	15
ORNL	Xilinx Dev Kit	4	1	4
	M&S	8	-	8
TOT.	-	-	-	**149.3**

Table 10: eRD109 budget request for M&S costs in FY23 on frontend ASIC and electronics.

Inst.	Task	Labor Type	FTE (%)	Tot. Cost (k$)
Frontend ASIC				**29.7**
SCIPP	Service board design layout	Electronic Design Specialist	7.5	12.4
	Board Assembly	Electro-Mechanical Engineer	5	11.8
	Board loading and lab msmt	Assistant specialist	5	5.5
Frontend Readout Electronics				**88**
BNL	Readout and Timing Distribution	Research Associate	20	38
ORNL	Barrel TOF Low-Mass Service Hybrid	Electric Engineer	10	32
Rice	Endcap TOF Service Hybrid	Electric Engineer	15	18
TOT.	-	-	-	**117.7**

Table 11: eRD109 budget request for labor costs in FY23 on frontend ASIC and electronics.

Next EPIC Collaboraiton Meeting

From the SC:

The ePIC Collaboration Meeting at JLab (January 9-11, 2023) will consist of plenary sessions only. A large fraction of the time will be dedicated to WGs. Each WG will have a one-h time slot to report (including some discussion time). We ask you to start shaping the time slot dedicated to your WG. We are suggesting a short overview report from the coordinators, and a couple of reports from WG members. This structure could offer active colleagues in the WGs an opportunity to report to the whole Collaboration.

We would like that you start structuring your time slot, also because colleagues coming from far need to start planning their trips already in these weeks.