Update on the EIC-related Generic Detector R&D Program

D. Mack

TJNAF

July 30, 2023

Overview

I’m here to:

- give an update on the generic R&D program*,
- answer any questions regarding the generic R&D program.

*The last update was on May 17, 2023, at the 1st International Conference on a 2nd Detector for the EIC at Temple U.
It can be found at https://indico.bnl.gov/event/18414/contributions/76155/attachments/47562/80635/EICGENRandD_2ndDetectorWorkshop17May2023v1.pdf .

Scope of the Generic Detector R&D Program

This program will support advanced R&D on innovative, cost-effective detector concepts which reduce risk and that either the one detector in the project scope or a second detector could incorporate. (The term "generic" conveys this duality.) The program is supported through R&D funds provided to Jefferson Lab by the DOE Office of Nuclear Physics, and is open to all segments of the EIC community. It is expected to be funded at an annual level of $2M, subject to availability of funds from DOE NP.

In a nut-shell:

- EIC-related R&D
- Aimed at Detector 2, or upgrades of Detector 1
- Proposals accepted from across the world from universities, laboratories, and companies
- Features of a proposal that add value: reduce risk, cost effective, increase physics scope, innovative, etc

(Also: we need to stay orthogonal to other sources of US federal funding such as EIC project R&D, the SBIR program, etc.)

2023 Proposals Received

The deadline for proposals was July 15.

20 proposals were received:

- 7 are continuations of previously funded proposals
- 11 are new
- 2 are updated resubmissions of proposals not funded last year

Last year was our first year. Between receiving 30 proposals and the steep learning curve, the workload for the committee and Jlab Procurement and Contracting personnel was heavy. (The word "crushing" also comes to mind.)

Much of the committee workload scales with the number of proposals. Since there are few proposals this year, and ~half of them are familiar, this is going to be a much easier year for us.

The final report from the 2022 funding cycle is available
https://www.jlab.org/sites/default/files/eic_rd_prgm/files/2022_Proposals/ReviewCommitteeReportFY22_FINAL.pdf .

2023 Submissions

EICGENR&D2023 Proposal Number (1 thru 21)	Title	PI(s)	Institution(s)	Budget Request $US	Status (New or Otherwise)
1	A Fast Timing MAPS Detector for the EIC	X. Li	LANL	211, 586	New
2	Towards a Few-Degree Calorimeter: bridging the Q^2 gap to support the quest for gluon saturation	M. Arratia	UC Riverside	135,000	New
3	Generic glass scintillators for EIC Calorimeters (ScintCalEIC) R&D	T. Horn	CUA	95,333	Continuing
4	Feasibility of Organic Glass Scintillators for EIC ZDC	G. Carini, E. Aschenauer	BNL Instr. Div., BNL Physics Div.	300,000	New
5	Slim Edge for LGADs	G. Giacomini	BNL Instr. Div.	130,000	New
6	Photonics-Based Readout and Power Delivery by Light for Large-Area Monolithic Active Pixel Sensors	S. Mandal, S. Rescia	BNL Instr. Div.	150,000	New
7	R&D for a new concept EIC nucleon polarimeter based on chemical hyperpolarisation	D. P. Watts	U. of York	159,000	New
8	Pressurized RICH	M. Contalbrigo	INFN Ferrara and U. Ferrara	75,000	New
9	Z-Tagging Mini DIRC	C.E. Hyde, Wenliang Li	ODU, SBU and CFNS	117,000	Resubmission
10	Large-Area Monolithic Active Pixel Sensors Combining High Spatial and Temporal Resolution	D. Gorni	BNL Instr. Div.	120,000	New
11	Design, Fabrication and testing of a multi-channel System on a chip for Low-Power High-Density High Timing Precision Readout ASIC for AC-LGADs (HPSoCv3)	L. Macchiarulo, B. Schumm	Nalu Scientific, UC Santa Cruz	221,500	Continuing
12	R&D of 4D Detectors with EICROC and AC-LGAD at EIC consolidating a US-Japan Consortium	P. Tribedy, K. Shigaki	BNL Instr. Div., Hiroshima U.	152,585	New
13	Performance of GridPIX Detector in Magnetic Field with low mass and high efficiency CO2 cooling	T. K. Hemmick, P. Garg	SBU and CFNS, Yale U.	80,193	Continuing
14	Development of High Precision and Eco-friendly MRPC TOF Detector for EIC	Zhenyu Ye, Zhihong Ye	UI at Chicago, Tsinghua U.	120,000	Resubmission
15	Fabrication and characterisation of the Trench Isolated Low Gain Avalanche Detectors for 4D tracking	S. Gardner	U. Glasgow	157,000	New
16	Development of Double-sided Thin-Gap GEM-µRWELL for Tracking at the EIC	K. Gnanvo	Jlab	238,502	Continuing
17	Scintillator Fiber Trackers for the ZDC and off-momentum detectors	C. Ayerbe Gayoso	College of William and Mary	39,500	New
18	Continuation of EIC KLM R&D Proposal	A. Vossen, W. W. Jacobs	Duke U., Indiana U. CEEM	133,000	Continuing
19	Superconducting Nanowire Detectors for the EIC	Sangbaek Lee, W. Armstrong	ANL	60,000	Continuing
20	Development of a Novel Readout Concept for an EIC DIRC	G. Kalicy, J. Schwiening	CUA, GSI	125,000	Continuing

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The view from 30,000 feet:

9 of the 20 proposals are familiar from last year.

Continued/expanded interest in new scintillators, and 4D detectors such as improved LGADs or MAPS.

Subtopics new wrt last year: photonics-based readout and power delivery, scintillating fiber detectors, etc.

New proposals with PI's from England, Scotland, and Japan.

Even greater participation by BNL Instrumentation Division.

Funding requests in proposals are generally better matched to the limited size of this program.

Saying the Quiet Part Out Loud

What does it mean that the number of proposals dropped from 30 to 20?

I estimate that roughly half is what I would call “healthy self pruning”, in that

- proposals better suited for the project (but not funded by the project), have not returned.
- proposals effectively asking for operations grants for poorly focused R&D have not returned.
- proposals that were far too expensive for the generic R&D program have not returned.
- a small backlog of proposals of the “one year and done” type have been fed.

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- proposals that were far too expensive for the generic R&D program have not returned.
- a small backlog of proposals of the “one year and done” type have been fed.

The other half is almost certainly funded proposals with multi-year programs who didn’t resubmit because they recently got their money.

This has to get better. And despite the fact that there are major aspects which Jlab does not control, it will get better.

2023 Submissions: Preliminary Topical Breakdown

Organizing proposals by topic helps make the pile less over-whelming, and helps shepherd us toward a balanced program. Most of the topics below will be perennials, but we may add/drop a few topics from year to year. So far, it looks like I can use the same topics as last year:

Topic	# of proposals submitted	Requested Funds
Calorimetry	4	$663K
PID (non-TOF)	4	$397K
Gaseous Precision Timing and/or Tracking	2	$359K
Front End Electronics	1	$222K
Silicon Detectors	6	$710K
Software Supporting Electronics/Detector Design or Physics Program	0	$0K
“Other New Detectors”	2	$100K
Studies to Support or Expand the Physics Program	1	$159K

Budget request is $2.6M for about $1.3M in disbursable funds, hence we are a factor of 2 over-subscribed.

(Last year we had more proposals, and they were more expensive on average, so the over-subscription was a factor of 3.6 . Tough choices were made. Certainly some good proposals could not be funded.)

The proposals can be found at https://www.jlab.org/research/eic_rd_prgm/receivedproposals .

2023 Submissions: Respecting the $1.3M Sum Rule

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Topic	# of proposals submitted	Requested Funds	Preliminary Weight	Preliminary Funding Allocation
Calorimetry	4	$663K	2	$236K
PID (non-TOF)	4	$397K	2	$236K
Gaseous Precision Timing and/or Tracking	2	$359K	1	$118K
Front End Electronics	1	$222K	1	$118K
Silicon Detectors	6	$710K	3	$355K
Software Supporting Electronics/Detector Design or Physics Program	0	$0K	0	0
“Other New Detectors”	2	$100K	1	$118K
Studies to Support or Expand the Physics Program	1	$159K	1	$118K
				Total = $1.3M

There is no perfect algorithm for achieving a balanced program. I try to:

i. spread funds across all major topics
(while being prepared to zero out a topic if proposal quality there is low)

ii. push more funds into major topics with higher demand
(while not allowing the average grant size to become too low)

FY23 Review Committee

Reviewing proposals is an imperfect but necessary process.

Most of the proposals are sound, and written by experts.

It is a challenge to form a committee which can evaluate the wide range of topics we might receive, and do so at a level which respects the effort and expertise of the PI's.

Nevertheless, this is a very talented committee.

	Name	Institution
1	Nicolo Cartiglia	INFN
2	Gabriel Charles	IJCLab/IN2P3/CNRS, University Paris-Saclay
3	Oleg Eyser	BNL
4	Jin Huang	BNL
5	Samo Korpar	U. of Maribor and Institute Jozef Stefan
6	Ron Lipton	FNAL (retired)
7	Clara Matteuzzi	INFN (retired)
8	Ben Nachman	LBNL
9	Daniel Pitzl	DESY
10	Fabrice Retiere	TRIUMF
11	Petra Riedler	CERN
12	Stefan Ritt	PSI
13	Bjoern Seitz	U. Glasgow
14	Justin Stevens	College of W&M
15	Maxim Titov	CEA
16	Glenn Young	BNL

The Committee Reading Process

- A standard proposal gets 2 readers.
- Complex or cross-disciplinary proposals get 3 readers assigned.
- Each reader will have up to 4 assignments.
- Working groups later split off to discuss groups of proposals on related topics (silicon, gaseous detectors).
- Readers send me their comments. If they recommend that a proposal give a presentation, they also send me questions that need to be addressed in the presentation.

(We can easily fit the 20 proposals from 2023 into a 2-day presentation meeting. But the committee has the option of filtering out some.)

- I send notification that a presentation was requested 1 month in advance of the presentation meeting.
- I send questions to PI’s 2 weeks in advance of the presentation meeting.

2022 Awards

EICGENR&D Proposal Number (1 thru 27)	Title	PI(s)	Institution(s)
	Calorimetry:		
1	CSGlass for hadron calorimetry at the EIC	T. Horn	Catholic University of America
19	EIC KLM R&D Proposal	A. Vossen, M. Arratia, W.W. Jacobs	Duke U., UC Riverside, IU Bloomington
25	Imaging Calorimetry for the Electron-Ion Collider	M. Zurek, Z. Papandreou	ANL, U. Regina
	PID (non-TOF):		
2	A proposal for MPGD-based transition radiation detector/tracker	Y. Furletova, J. Velkovska	Jlab,Vanderbilt U.
12	Development of a Novel Readout Concept for an EIC DIRC	G. Kalicy, J. Schwiening	Catholic University of America
14	Tracking and PID with a GridPIX Detector	T. Hemmick, P. Garg	Stony Brook University
	Gaseous Precision Timing and/or Tracking:		
23	Development of Thin Gap MPGDs for EIC Trackers	K. Gnanvo	Jlab
	Front End Electronics:		
5	Continued Development and Evaluation of a Low-Power High-Density High Timing Precision Readout ASIC for AC-LGADs (HPSoC)	B. Schumm, L. Macchiarulo	UCSC, Nalu Scientific LLC
6	A new radiation tolerant low power Phase-Locked Loop IP block in a 65 nm technology for precision clocking in the EIC frontend electronics	D. Neyret, W. van Noije	IRFU, CEA Saclay, France, and Instituto de Física da U. de São Paulo (USP)
	Silicon Detectors:		
24	Simplified LGAD structure with fine pixelation	G. Giacomini	BNL, Upton, NY, USA
26	Silicon Tracking and Vertexing Consortium, Section 1: Embedded Monolithic Active Pixel Sensor R&D	Nicole Apadula, Giacomo Contin, Nicolas Schmidt	LBNL, Trieste/INFN, ORNL
26	Silicon Tracking and Vertexing Consortium, Section 2: Aluminum Flexible Circuit Manufacturing Capability	Yuan Mei	LBNL
	Software Supporting Electronics/Detector Design or Physics Program:		
7	Refined Methods for Transfer Matrix Reconstruction Using Beamline Silicon Detectors for Exclusive Processes at the EIC	A. Jentsch, M. Murray	BNL, U. of Kansas
	Other New Detectors:		
18	Superconducting Nanowire Detectors for the EIC	W. Armstrong	ANL
	Studies to Support or Expand the Physics Program:		
15	Particle identification and tracking in real time using Machine Learning on FPGA	S. Furletov, D. Romanov	Jlab

Contracting Stuff

After the review committee meeting, this is the part that took the longest in the first year.

2022

- 30 proposals
- 25 invited for presentations (after filtering 5)
- 15 proposals were funded at 60%-100% level

(the committee thought it was important to get more projects started, even if the funding level was only 60%)

- But a typical proposal usually involves multiple institutions, so there had to be 38 separate contracts or other fund transfers.
- PI awardees were in the following countries: Armenia, Brazil, Canada, France, Italy, USA.

Contracting Stuff

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2022	2023
• 30 proposals	20 proposals
• 25 invited for presentations (after filtering 5)	~20 invited for presentations?
• 15 proposals were funded at 60%-100% level (the committee thought it was important to get more projects started, even if the funding level was only 60%)	Fund only 12 proposals at higher % level?
• But a typical proposal usually involves multiple institutions, so there had to be 38 separate contracts or other fund transfers.	… which would imply only ~30 separate contracts or other fund transfers.
• PI awardees were in the following countries: Armenia, Brazil, Canada, France, Italy, USA.	

EIC-related Generic Detector R&D Program Challenges

Get future awardees their funds faster!

- Future contracting (or the national lab equivalent) should generally go faster now that Jlab has established Terms and Conditions with the following 24 institutions:

AANL, ANL, BNL, CUA, Duke U, FNAL, Indiana U, INFN Trieste, IRFU CEA Saclay, LBNL, Nalu Scientific, ORNL, Stony Brook U, Temple U, ODU, UC Riverside, U Hawaii, UNH, U. Regina, U. Sao Paulo, U South Carolina, UVa, Vanderbilt U, Yale U.

(A few contracts took only a few weeks, most take months, and some have dragged on for over half a year.
Foreign institutions are generally a delight to work with.
But the lawyers at some North American universities seem to be funding-adverse.
The Procurement/Legal effort is the same for a $5K or a $150K contract.
I'm not ready to ban small grants to your co-PI's. Let's be optimistic and see how it goes this year.)

- Contracting in 2023 should also go faster if we only fund ~12 proposals
(implying ~30 separate contracts, with ~half the institutions in the above "established contract" list)

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Be prepared for more proposals when project R&D funds disappear in a few years. (Could be very stressful.)

Summary

- Funds from the 2022 call for proposals are now mostly accessible to PIs. A tough year. And there are still tails ….

- Proposals from 2023 have been received. Should be a much easier year.

- The catalog of EIC R&D institutions with which Jlab has agreed upon Terms and Conditions is fairly large now. This should speed up the pace of getting funds to the 2023 round of awardees.

Acknowledgements

The review committee, Jlab support staff, Jlab Procurement and Legal Departments, Thomas Ullrich, Allison Lung, Ivan Graf, ….

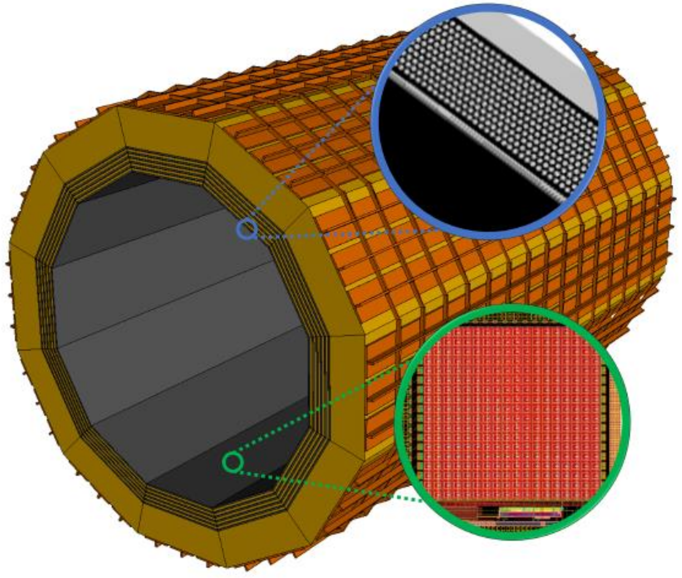
Piotr and the other organizers, for so professionally supporting my remote presentation.

extras

Examples of FY22 Awards

Imaging Calorimetry for the Electron-Ion Collider

Maria Zurek (zurek@anl.gov), Zisis Papandreou (Zisis.Papandreou@uregina.ca)



How could one improve on the lead sci-fi barrel calorimeter concept, as exemplified by BCAL in the GlueX detector?

Much better resolution of shower development :

i. longitudinally, for better discrimination between deeper pi+- showers and shallower e+- showers (generally speaking)

ii. transversely, to better separate the two showers from pi0→gamma + gamma decays (which can otherwise "fuse" in the data analysis and mimic a high energy photon, which is obviously a horrible background in interesting measurements looking for rare events with single, high energy photons)

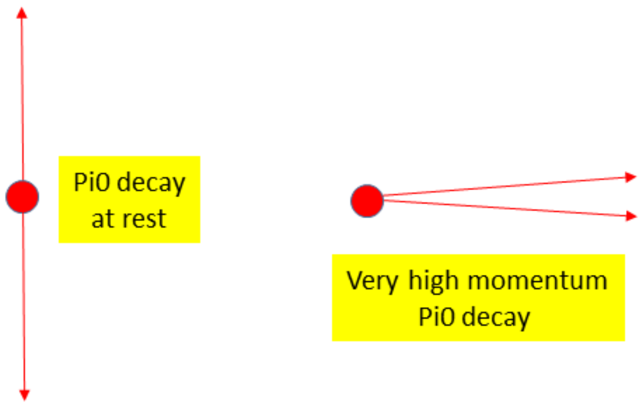
The PIs' collaboration intends to do this via:

i. finer pixelization of the photosensors ($2x2cm^2$), and

ii. sandwiching Astropix silicon tracking between the innermost layers

Simulated pi/e discrimination and pi0 shower separation are excellent.

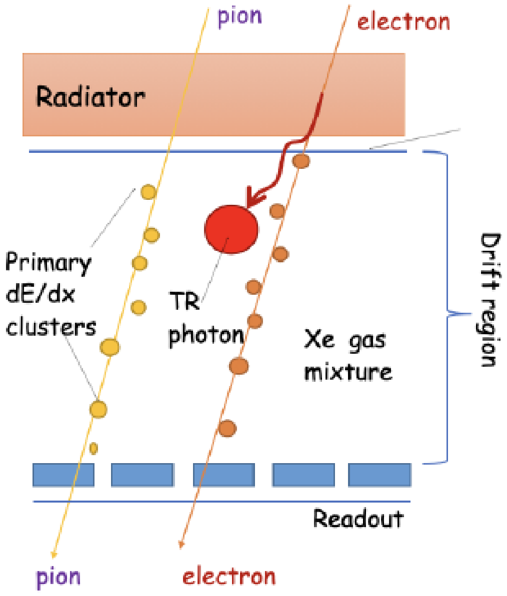
The collaboration has been funded to measure the energy resolution at high beam energy, and compare SiPM and MCP-PMT photosensor readout.



For more information including references, see the 2022 proposal #22 at
https://www.jlab.org/research/eic_rd_prgm/receivedproposals

A proposal for Micro Pattern Gaseous Detector-based transition radiation detector/tracker

Y. Furletova (yulia@jlab.org), and J. Velkovska (julia.velkovska@vanderbilt.edu)

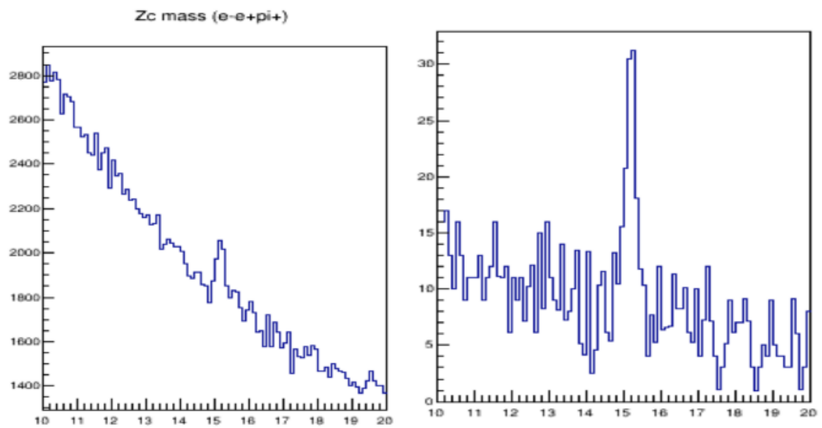


Transition radiation in the x-ray spectrum is emitted when a charged particle sees sudden changes in the index of refraction, such when passing thru a polymer in the form of sheets, foam, or "wool". The intensity is proportional to Energy/mass, so provides some discrimination between a relativistic pi- and an ultra-relativistic e-.

Figure upper right: the x-rays are absorbed in a Xe rich gas mixture, the electrons drift in a an electric field to a structure with gas gain such as a GEM, and the signal is read out.

The PIs' collaboration is testing alternative gas gain structures which are potentially cheaper, simpler to fabricate, and easier to operate than GEMs. They will also continue to optimize the radiator, and try to mitigate cost and supply chain issues with Xe.

Figure lower right: a simulated spectrum for Zc → e+e- at EIC, without and with an additional factor of ~10 rejection of pi+- using a TRD.



For more information including references, see the 2022 proposal #2 at https://www.jlab.org/research/eic_rd_prgm/receivedproposals

Simplified LGAD structure with fine pixelation

G. Giacomini (giacomini@bnl.gov), B. Schumm (baschumm@ucsc.edu)

The existing AC-LGAD detector has several highly desired properties:

- ~100% fill factor,
- superb timing resolution (30 ps),
- superb position resolution (few microns).

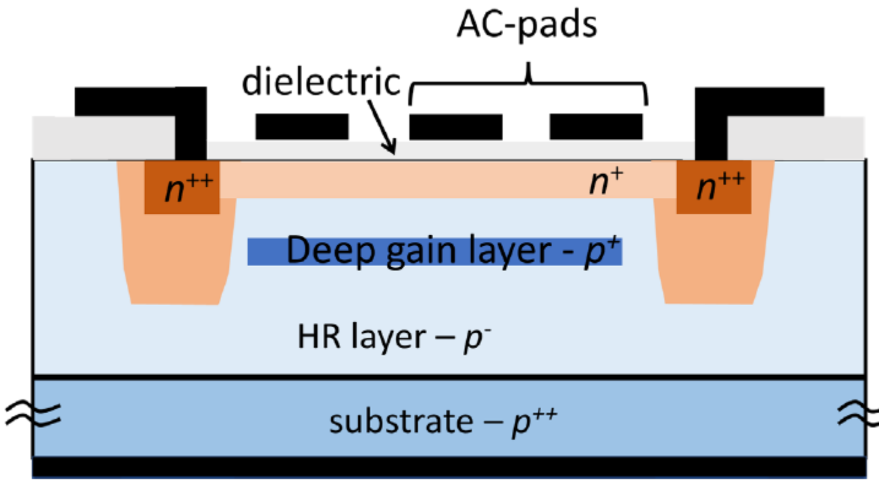
But the AC-LGAD structure and hence fabrication is somewhat complex. (See figure at right.) Also, performance is somewhat compromised by cross-talk (a limitation at high rates) and relatively large capacitance (a limitation when increasing strip sizes to the cm scale).

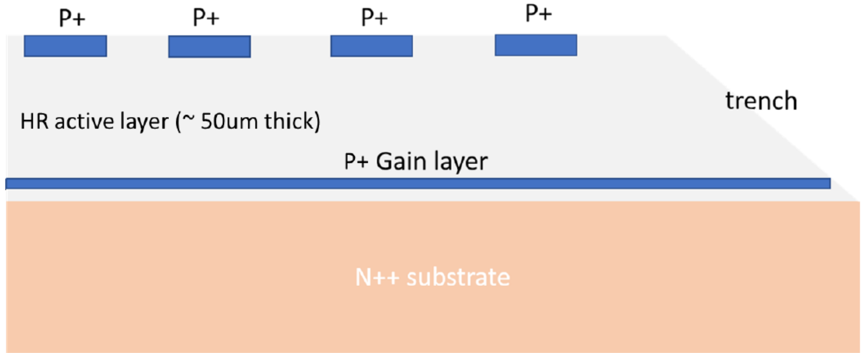
The PI's intend to fabricate a new device they call, "a novel LGAD structure". It would

- retain the good properties of the AC-LGAD,
- reduce cross-talk and capacitance due to its DC-coupled nature,
- be easier to fabricate resulting in higher yields and lower costs.

The perfect 4D detector (ie, precise in both position and time) is arguably the Holy Grail. But even if the "novel LGAD structure" is successful and finds important applications, the search for the Holy Grail will probably continue to reduce multiple scattering, power consumption, etc.

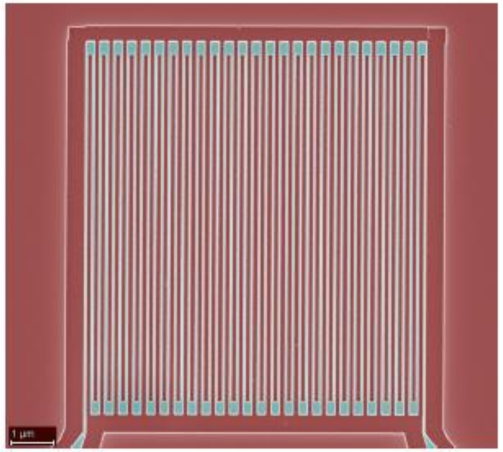
For more information including references, see the 2022 proposal #24 at https://www.jlab.org/research/eic_rd_prgm/receivedproposals





Superconducting Nanowire Detectors for the EIC

Whitney Armstrong (warmstrong@anl.gov)



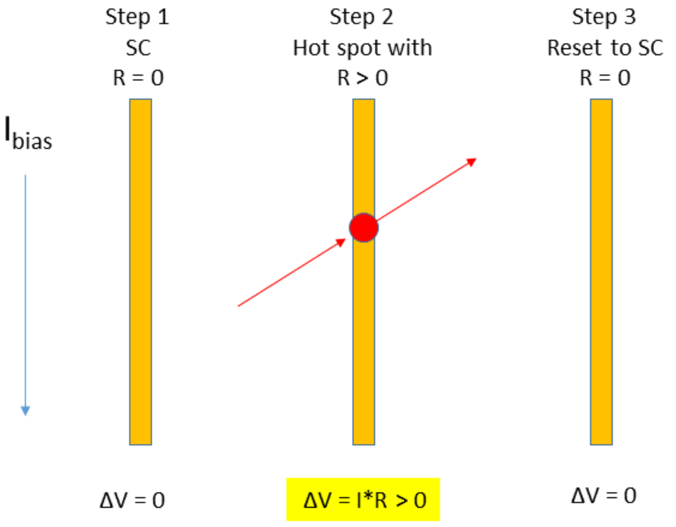
Potential application of a relatively new technology to particle physics:

Superconducting nanowire single photon detectors (SNSPDs) have high quantum efficiency, rapid time response, and ability to operate in multi-Tesla magnetic fields.

Stages in detection (see figure at lower right):

- Wire is superconducting with a bias current flowing thru it. $\Delta V = 0$
- Absorption of particle energy induces a local transition to resistive. $\Delta V > 0$
- The hot spot cools and the wire is ready for another hit. $\Delta V = 0$

The PI's collaboration is testing whether this technology can work for the detection of charged particles in a high radiation environment very close to the EIC hadron beamline. It will also be interesting to see how long the reset times are for charged particles depositing keV-scale energies.



For more information including references, see the 2022 proposal #18 at
https://www.jlab.org/research/eic_rd_prgm/receivedproposals

2022 Submissions: The Whole Elephant

EICGENR&D Proposal Number	Title	PI(s)	Institution(s) (abbreviated and only includes PI's at this time)	# of pages	Budget Request $US
1	CSGlass for hadron calorimetry at the EIC	T. Horn	Catholic University of America, Washington, DC, USA	8	97,240
2	A proposal for MPGD-based transition radiation detector/tracker	Y. Furletova, J. Velkovska	Jlab, and Vanderbilt U., USA	12	174,999
3	Precise Timing with a Micro Pattern Gaseous Detector	K. Dehmelt	Stony Brook U., USA	15	94,694
4	BeAGLE, a tool to refine IR and detector requirements for the EIC	M.D. Baker	MDBPADS LLC, Miller Place, NY	10	105,400
5	Continued Development and Evaluation of a Low-Power High-Density High Timing Precision Readout ASIC for AC-LGADs (HPSoC)	B. Schumm, L. Macchiarulo,	UCSC, and Nalu Scientific LLC	17	150,000
6	A new radiation tolerant low power Phase-Locked Loop IP block in a 65 nm technology for precision clocking in the EIC frontend electronics	D. Neyret, W. van Noije	IRFU, CEA Saclay, France, and Instituto de Física da U. de São Paulo (USP), São Paulo, Brasil	11	54,000
7	Refined Methods for Transfer Matrix Reconstruction Using Beamline Silicon Detectors for Exclusive Processes at the EIC	A. Jentsch, B. M. Murray	BNL, Upton, NY, USA, and U. of Kansas, Lawrence, KS, USA	5	127,000
8	TOMATO (end-TO-end siMulation fAst deTectOrs): An end-to-end simulation framework for fast detectors at the EIC	D. Tapia Takaki	The University of Kansas Center for Research, Inc., Lawrence, KS, USA	9	46,423
9	Z-Tagging Mini DIRC	C. E. Hyde	Old Dominion University, Norfolk, VA, USA	13	114,000
10	Implementation of a gain layer in Monolithic Active Pixel Sensor (MAPS) for high resolution timing application	P. Schwemling	CEA IRFU Saclay, France	7	355,000
11	Development of a Generic, Low-power and Multi-channel Frontend Readout ASIC for Precision Timing Measurements at EIC	Z. Ye, A. Apresyan	U. of Illinois at Chicago, Chicago, IL, USA, and Fermilab	10	210,000
12	Development of a Novel Readout Concept for an EIC DIRC	G. Kalicy (the submitter)	Catholic University of America, Washington, DC, USA	9	95,000
13	Simulations of the physics impact of a solenoid-based compensation scheme for the field of the main detector solenoid in IR8	Pawel Nadel-Turonski, Wenliang Li, and V. Morozov	Department of Physics, Stony Brook U., Stony Brook, NY, USA, and ORNL, Oak Ridge, TN, USA	18	128,000
14	Tracking and PID with a GridPIX Detector	P. Garg	Department of Physics and Astronomy, Stony Brook University, USA	17	74,555
15	Particle identification and tracking in real time using Machine Learning on FPGA	S. Furletov D. Romanov	Jlab, Newport News, VA, USA	7	101,044
16	Development of High Precision and Eco-friendly MRPC TOF Detector for EIC	Zhihong Ye, and Zhenyu Ye	Department of Physics, Tsinghua U., Beijing, China, and Department of Physics, U. of Illinois at Chicago, Chicago, IL, USA	18	118,000
17	Machine Learning for Detection of Low-Energy Photons in the EIC ZDC	L. Wood	PNNL	10	226,000
18	Superconducting Nanowire Detectors for the EIC	W. Armstrong	ANL	26	138,000
19	EIC KLM R&D Proposal	A. Vossen	Duke U., Durham, North Carolina, USA	24	245,100
20	High Quantum Efficiency III-nitrides photocathodes and hybrid photon detectors for EIC	L. Cultrera	BNL, Upton, NY, USA	20	275,000
21	Exclusive and Semi-inclusive reactions in the muonic channel, and development of muon detectors in the far forward region	M. Boer	Virginia Tech, Blacksburg, VA, USA	10	75,000
22	Injection Molding of Large Plastic Scintillator Tiles at Optical Quality	O. Hartbrich	ORNL, Oak Ridge, USA	10	128,000
23	Development of Thin Gap MPGDs for EIC Trackers	K. Gnanvo	Jlab	12	161,354.50
24	Simplified LGAD structure with fine pixelation	G. Giacomini	BNL, Upton, NY, USA	14	215,000
25	Imaging Calorimetry for the Electron-Ion Collider	M. Zurek, and Z. Papandreou	ANL, and U. Regina, Regina, Saskatchewan, Canada	20	97,000
26	Silicon Tracking and Vertexing Consortium	N. Apadula (the submitter)	LBNL, USA	18	574,200
27	Combined design of a projective tracker and PID system for the EIC Detector-1 with the assistance of Artificial Intelligence	C. Fanelli	College of William and Mary, VA, USA	19	110,000
EICGENR&D Proposal Number	Title	PI(s)	Institution(s) (abbreviated and only includes PI's at this time)	# of pages	Budget Request $US

2022 Submissions: Topical Breakdown

We received the equivalent of 30 proposals. (One of the silicon detector submissions unpacked into what I treated as 4 separate proposals.) Twice as many as expected. Twice as much work. (369 pages) But it means twice as much world-wide interest in EIC generic detector R&D.

Organizing proposals by topic helped make the pile less over-whelming, and helped shepherd us toward a balanced program. Most of the topics below will be perennials, but we may add/drop a few topics from year to year. In 2022 the topics were:

Topic	# of proposals submitted
Calorimetry	5
PID (non-TOF)	3
Gaseous Precision Timing and/or Tracking	3
Front End Electronics	3
Silicon Detectors	6
Software Supporting Electronics/Detector Design or Physics Program	4
“Other New Detectors”	3
Studies to Support or Expand the Physics Program	3

Budget request was $4.3M for about $1.3M in disbursable funds, a factor of 3.3 over-subscribed.

The proposals can be found at https://www.jlab.org/research/eic_rd_prgm/receivedproposals .

FY22 Review Committee

Reviewing proposals is an imperfect but necessary process.

Most of the proposals are sound, and written by experts.

It is a challenge to form a committee which can evaluate the wide range of topics we might receive, and do so at a level which respects the effort and expertise of the PI's.

Nevertheless, this is a very talented committee.

	Name	Institution
1	Nicolo Cartiglia	INFN
2	Gabriel Charles	IJCLab/IN2P3/CNRS, University Paris-Saclay
3	Oleg Eyser	BNL
4	Jin Huang	BNL
5	Samo Korpar	U. of Maribor and Institute Jozef Stefan
6	Ron Lipton	FNAL (retired)
7	Clara Matteuzzi	INFN (retired)
8	Ben Nachman	LBNL
9	Daniel Pitzl	DESY
10	Fabrice Retiere	TRIUMF
11	Petra Riedler	CERN
12	Stefan Ritt	PSI
13	Bjoern Seitz	U. Glasgow
14	Justin Stevens	College of W&M
15	Maxim Titov	CEA
16	Glenn Young	BNL

The committee had to be large to keep the workload down, but the size proved to be an advantage. We have:

- deep subject matter experts on most topics, as well as what I call "Swiss-army knife" people,
- experience from many labs across the world, but also people familiar with EIC and BNL
- Retired people who have time to quickly answer my emails, as well as mid-career people whose hair is always on fire
- Heavy sprinklings of enthusiasm thru-out
- keystones of continuity from the previous generic R&D program (Glenn Young, with Thomas Ullrich ex officio)