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DOE Support to EIC Accelerator R&D and FOA Landscape

Manouchehr Farkhondeh
DOE Office of Nuclear Physics

EIC Accelerator Collaboration Meeting 2018
Thomas Jefferson Accelerator Facility

October 29, 2018

DOE Office of Science Accelerator R&D Categories

- **Short Term Accelerator R&D-** Accelerator R&D with the potential for improved performance and/or new capabilities to existing NP scientific user facilities that will lead to new capabilities or improved operations. This is supported by NP and other program offices.

- **Mid-Term Accelerator R&D**: Accelerator R&D with the potential for the development of the future generation of NP accelerators not under construction. This is supported by NP and other program offices.

- **Long-Term or generic Accelerator R&D**: This is directly supported by the Office of High Energy Physics (HEP) although NP work often relevant.

➢ Total annual direct NP investment in EIC-related accelerator R&D through competitive funding opportunity announcement (FOA) and National Laboratory Accelerator R&D is on the order of $13.5 M per year and increasing.

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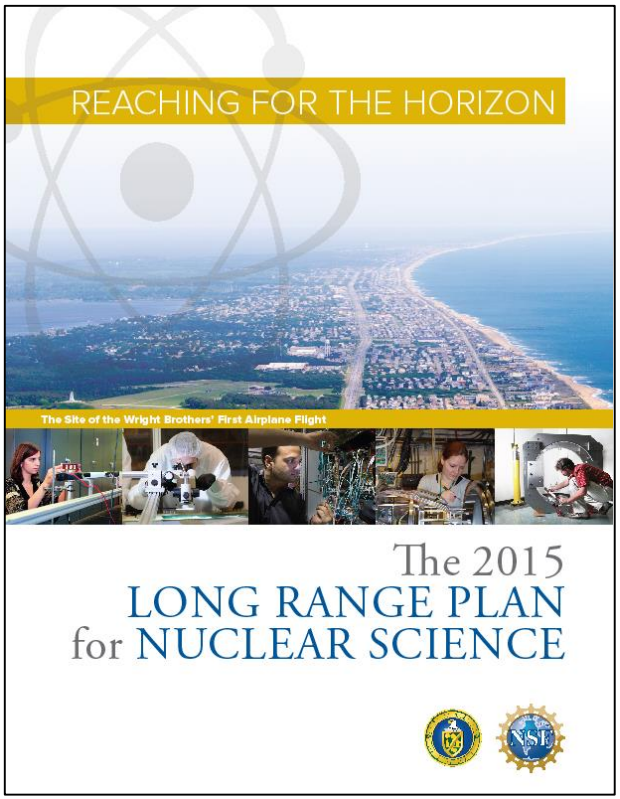
2015 NSAC LRP Report



RECOMMENDATION III (Page 4)

Gluons, the carriers of the strong force, bind ……

We recommend a high-energy high-luminosity polarized EIC as the highest priority for new facility construction following the completion of FRIB.

INITIATIVES : (Page 5)

B: *Initiative for Detector and Accelerator Research and Development*

……

We recommend vigorous detector and accelerator R&D in support of the neutrinoless double beta decay program ***and the EIC.***

The **key EIC machine parameters** identified in the LRP were:

- Polarized (~70%) electrons, protons, and light nuclei,
- Ion beams from deuterons to the heaviest stable nuclei,
- Variable center of mass energies ~20-100 GeV, upgradable to ~140 GeV,
- High collision luminosity ~10^{33}-10^{34} $cm^{-2}sec^{-1}$, and
- Possibly have more than one interaction region.

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Planning Towards an EIC

- **National Academy of Sciences (NAS) Study:** Initiated an 18 month NAS study entitled: *"US-BASED ELECTRON ION COLLIDER SCIENCE ASSESSMENT"* Started in July 2016. **(Report completed)**

- **FY16 FOA:** Published competitive FOA ("Accelerator R&D for Next Generation NP Facilities") focused on EIC-related R&D. NP has been funding competitive accelerator R&D since 2010 at ~$2M/year.

- **NP Community Panel Review:** Conducted NP community EIC R&D panel review charged with identifying high priority R&D aimed at technical risk reduction. Dr. Kevin Jones of SNS chaired this international panel. First face-to-face meeting was held November 29-December 2, 2016. Panel Report published in February 2017 (https://science.energy.gov/np/community-resources/reports/)

- **FY17:** EIC-related Accelerator R&D plans received from Labs and universities and high priority R&D in the context of Jones report is supported.

- **Bi-Annual FOA starting FY18:** Published bi-annual FOA for competitive accelerator R&D based on R&D priorities established in the EIC panel report. **(Awards selected for FY 18)**
  - **Funding level**: ~$8.8 M per year for FY18 and FY19.
  - **Funding sources:** Combination of NP competitive accelerator R&D funds augmented with RHIC and CEBAF Accelerator Operations budget funding.

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EIC Concepts

Current EIC concepts have emerged from national labs.

Strong collaborations at the labs and with universities to advance different concepts and common R&D relevant to all concepts:

- **BNL:** eRHIC based on a Ring-Ring concept
- **TNJAF:** JLEIC based on a high repetition rate figure-8 Ring-Ring concept

Note: At the time of the Jones panel review, BNL developing two different eRHIC concepts R-R and L-R. In April 2017, after the Jones report was published, BNL announced the R-R as the primary concept for eRHIC.

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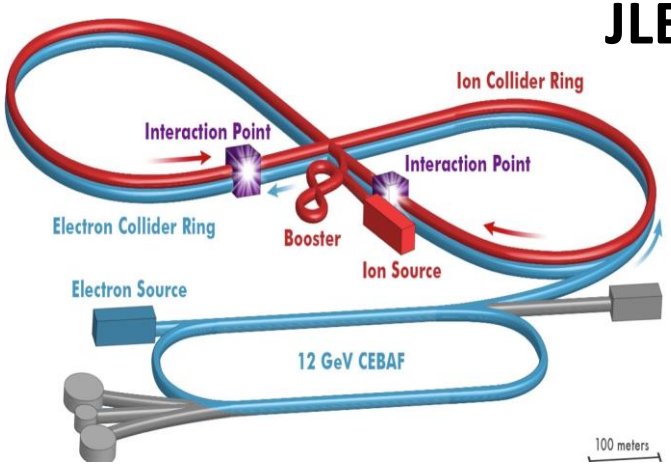
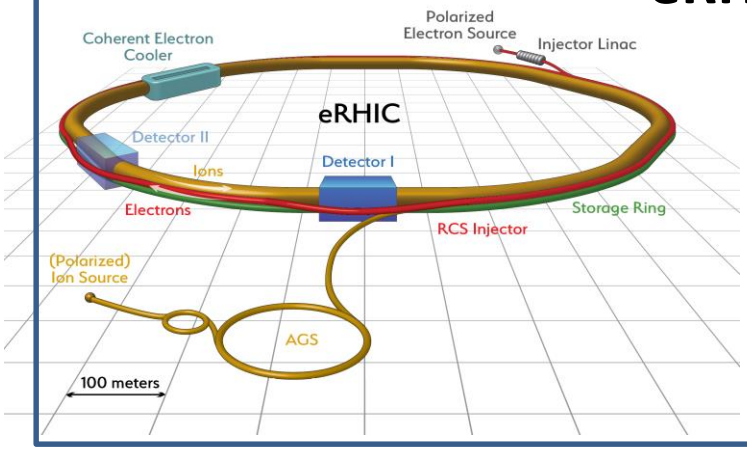
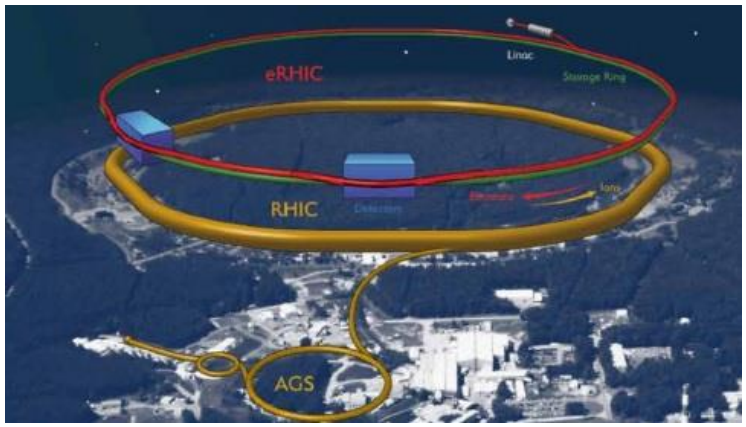
EIC Ring-Ring Design Concepts

JLEIC



eRHIC





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Jones Panel Priority Table:

Report of the Community Review of EIC Accelerator R&D for the Office of Nuclear Physics

February 13, 2017

2017

The **key EIC machine parameters** identified in the LRP were:

- Polarized (~70%) electrons, protons, and light nuclei,
- Ion beams from deuterons to the heaviest stable nuclei,
- Variable center of mass energies ~20-100 GeV, upgradable to ~140 GeV,
- High collision luminosity ~10^{33}-10^{34} $cm^{-2}sec^{-1}$, and
- Possibly have more than one interaction region.

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Jones Report R&D Priorities

Priority: "High", "Medium", or "Low", Sub-Priority: "A", "B", "C" or "None"
Proponent: "PANEL", "BNL" or "JLAB"
Design Concept: "RR", "LR" or "JLEIC"

- Sub-Priority-A: The R&D elements that the panel judged to be applicable to **all** concepts presented are identified by "ALL" in the concept/proponent identifier column and are assigned sub-priority A. **These are considered the most important to be addressed to reduce overall design risk.**
- Sub-Priority-B: The R&D elements that the panel judged to be applicable to individual concepts presented are identified by the appropriate concept identifier in the concept/proponent identifier column (e.g., LR, RR or JLEIC) and are assigned sub-priority B. **These are considered to be second in importance to reduce overall design risk, but important to reduce the risk associated with a specific concept.**
- Sub-Priority-C: The R&D elements self-identified by the proponents are tabulated in lines 23-75 with the priority as deemed by the panel. Specific self-identified high priority R&D elements that have substantial correlation with the high priority global and concept-specific sub-priority A and B elements identified by the panel are denoted as sub-priority C to permit ready cross-reference when evaluating future R&D proposals.

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Technical Challenges for EIC

EIC will be one of the most complex collider accelerators ever to be built. It will push the envelope in many fronts including high degrees of beam polarizations, high luminosity, beam cooling, beam dynamics, crab cavities for both beams, and an interaction region with complex magnets.

Required Accelerator R&D Advances for EIC (list from the Jones panel report)

- Hadron cooling techniques
- Polarized electron sources
- Ring magnet demonstrations
- Interaction region magnet design and prototyping
- Machine-detector interfaces
- Superconducting RF technology
- Large scale cryogenics technology
- High current ERL Linacs
- Crab cavity design, fabrication and testing (with beam)
- Beam and spin dynamics and benchmarking of simulation tools
- Electron cloud mitigation techniques

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State of the Art Accelerator Technology for EIC

- **Beam Cooling:** Beam cooling is one of the highest priority R&D for EIC. The challenge is to achieve the high collision luminosity of order ~10^{33}-10^{34} $cm^{-2}sec^{-1}$.
  - High current multi-pass energy Recovery Linac (ERL)
  - High current unpolarized electron injectors for ERL
- **Interaction Region**
  - **Magnets:** Challenging magnet designs to meet required high fields and field free regions for passage of primary beams.
  - **Crab cavities:** Achieve maximized collision rates between bunches. No operational experience yet exists for crab cavities in hadron beams.
- **Storage ring Magnets**: Challenging high field storage ring magnets are needed.
- **Polarized electron Sources**: High bunch charges for the ring-ring concept
- **Simulation Codes:** Benchmarking of realist EIC simulation tools against available data needs to be aggressively pursued.

Core competencies in these areas exist at NP and SC Labs and universities. Collaborations have formed to address these technical challenges.

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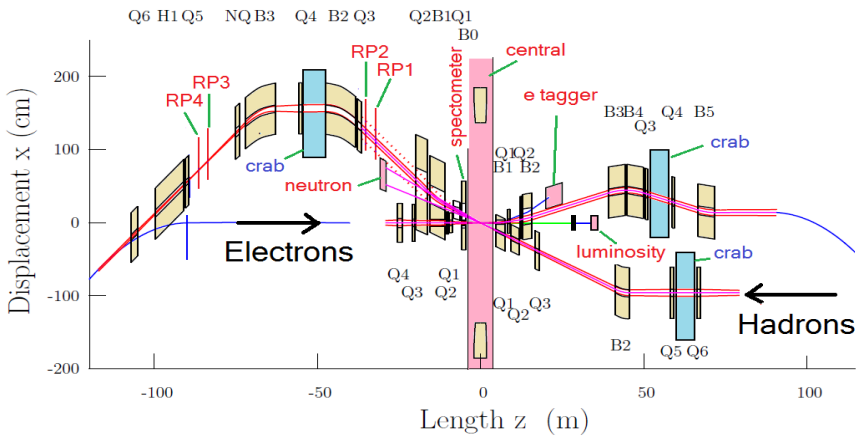
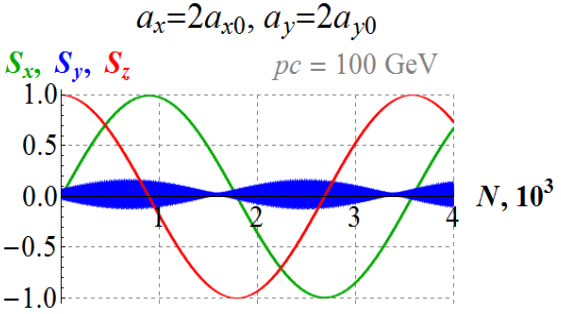
State of the Art Accelerator Technology for EIC

Schematic layout of IR



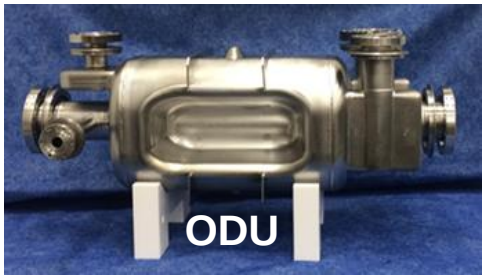
V. Ptitsyn *et al.*

Spin: Nonlinearity of orbital motion-



V. Morozov *et al.*

Crab Cavity

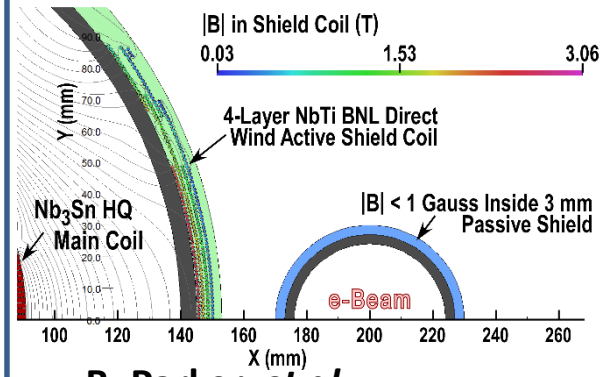


S. De Silva *et. Al*

952.6 MHz cooler ERL (SCRF)

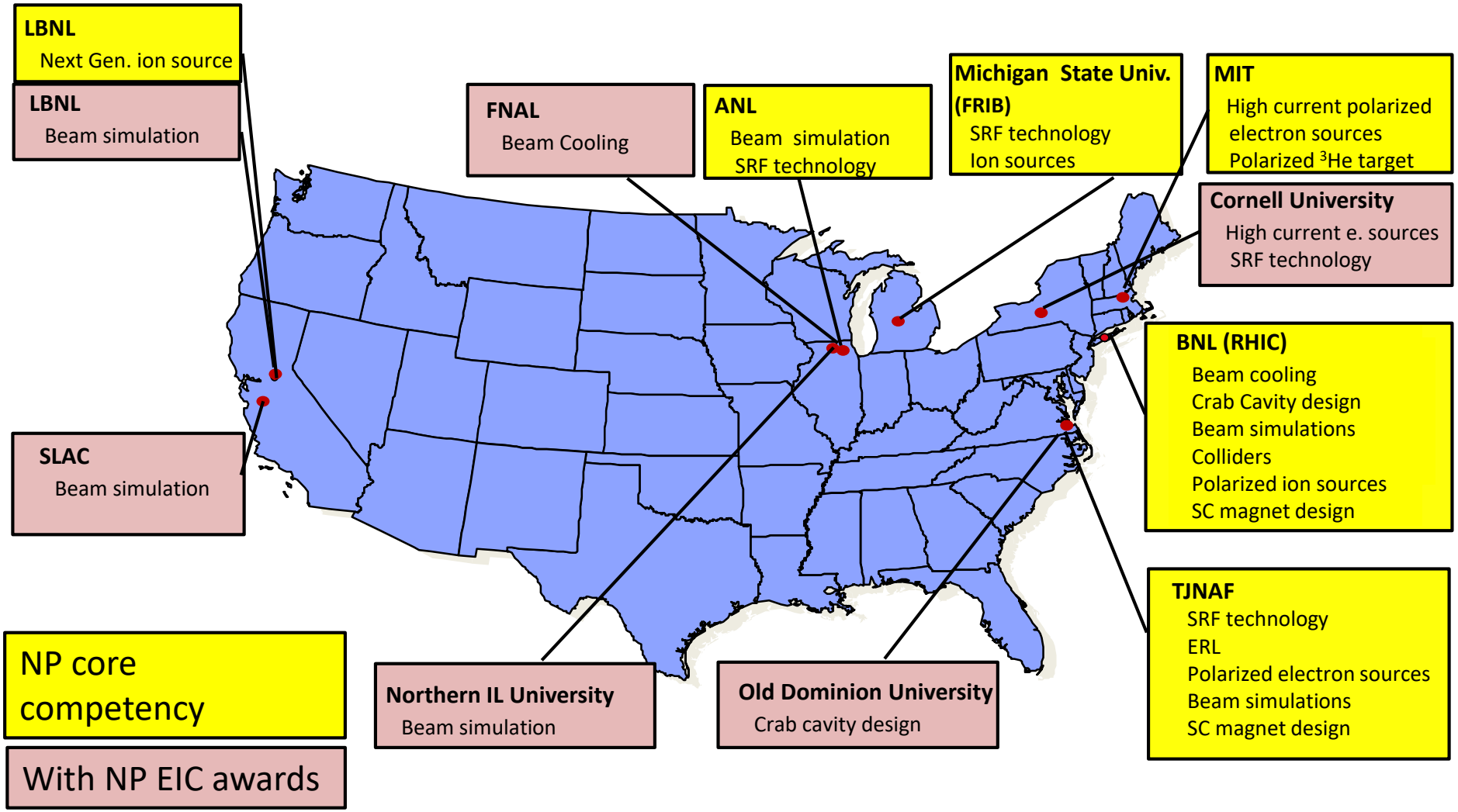
B. Rimmer, *et al.*

IR quadrupole magnet



B. Parker, *et al.*

Core Competencies for EIC at NP Labs and Universities



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FY017 : Accelerator R&D Plans

- Due to delays in planned FOA we have asked TJNAF and BNL for their FY2017 R&D Plans (Base R&D and Additional-NP funds R&D if funding were available.)
- Also requested R&D Plan from Labs and universities that had received funding from NP in FY2016. Collaborations with lead labs were encouraged.
- Plans were received by June1, 2017. Evaluation of plans were completed by end of June and funding recommendations proceeded.
- "Base fund (Taxed)": BNL: $3.5M, TJNAF: $1.5M Total: $5.0M
- "NP Accelerator R&D Funds": $1.879M

FY2017 Accelerator R&D Funding distributions

-	BNL	Base and NP funds
-	TJNAF	Base and NP funds
-	ANL, FNAL	NP funds
-	MIT, Cornell	NP funds
-	TAMU, NIU	NP funds

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FY2017 R&D Plan Awards

Page 1			FY 2017 EIC R&D Plan Awards	
Proposal ID	**Institution**	**R&D Area**	**Proposal Title**	**Principal Investigator**
232006	Cornell	Polarized e Source	Next generation robust pol. photocathodes for EIC	Ivan Bazarov
FY17 Add Collab. BNL	MIT/subc		High Current, High Charge Polarized Electron Sources	Bob Redwine /Evgeni Sentalovich
FY17 Additional	BNL		complete procurement of components for inverted gun	John Skaritka
FY17 Base	BNL		Gatling gun, laser system and design of new inverted gun	John Skaritka
FY17 Additional BNL	BNL	Polarized 3He Source	Development of a Polarized 3He Ion Source for RHIC	Anatoly Zelenski
FY17 Add Collab. BNL	MIT/subc		Development of a Polarized 3He Ion Source for RHIC	Richard Milner
FY17 Base	TJNAF	Beam Cooling	Magnetized Electron Source	Riad Suleiman
FY17 R&D	TJNAF		Electron Cooling Simulation Development	Yves Roblin
FY17 Base	BNL		Coherent Electron Cooling PoP experiment	Vladimir Litvinenko
FY17 Base	TJNAF		Electron Cooler Design	Steve Benson
FY17 Base	TJNAF		Bunched Beam Electron Cooling Experiment	Yuhong Zhang
232015	NIU		Studies of Conventional and ERL-Based Re-circulator Electron Cooling for an Electron Ion Collider	Bela Erdelyi
FY17 Add Collab. BNL	FNAL	Spin Dynamics	Study of Electron Spin Polarization in the EIC	Eliana Gianfelice-Wendt
FY17 Additional BNL	BNL		Study of Electron Spin Polarization in the EIC	Mike Blaskiewicz
FY17 Base	TJNAF		Spin Tracking in Ion and Electron Rings	Vasiliy Morozov
FY17 R&D	TJNAF	Magnet R&D	IR FFQ Prototype Definition	Tim Michalski
FY17 Additional BNL	BNL		Design and Prototyping of SC EIC – IR Magnets	Peter Wanderer
FY17 Base	TJNAF		Interaction Region (IR) Magnet Design Verification	Tim Michalski
FY17 R&D	TAMU/Subc		Complete and Test a Full Scale Suitable Superferric Magnet	Peter McIntyre/Tim Michalski

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FY2017 R&D Plan Awards

Page 2			FY 2017 EIC R&D Plan Awards	
Proposal ID	**Institution**	**R&D Area**	**Proposal Title**	**Prinicipal Investigator**
113	ANL	Beam Dynamics	Beam Simulation and Benchmarking	Brahim Mustapha
FY17 Base	BNL		Beam-Beam Effects, Collective Effects Study, Dynamic Aperture	Mike Blaskiewicz
FY17 Base	BNL		eRHIC Electron Storage Ring Concept Development	Christoph Montag
FY17 Base	TJNAF		Beam-Beam Dynamics with Gear Changing	Yves Roblin
FY17 R&D	TJNAF	SRF R&D	Fast Feedback System and Kicker Design	Bob Rimmer
FY17 R&D	TJNAF		Test of CEBAF Electron Injection Mode	Jiquan Guo
111	ANL		ANL Plan for EIC R&D: HOM damping	Michael Kelly
FY17 Base	BNL		Design of state of the art RF systems for eRHIC	Kevin Smith
FY17 Base	TJNAF		Development of SRF Systems for an EIC	Bob Rimmer

- Areas of R&D: Mostly included highest rated R&D priority areas identified in the Jones panel report. Also included few areas TJNAF and BNL were doing R&D prior to the Community report.
- A two day Principal Investigator meeting is organized for November 13-14, 2018 for all PIs listed above to present their work to NP and other PIs to promote communication and collaboration amongst national labs and universities.

Communications between NP and PI for accelerator R&D work

Two modes of communications between PIs and NP office: Quarterly reports and an annual face to face meeting with all PI in one place.

- Quarterly Reports
  - PIs are asked to submit quarterly reports to NP in a "Small Project" format. The first one for FY 2017 funds was requested for a 6 months period. The 3rd quarter request was sent by Cassie on June 22, 2018. The 4th quarter request was sent on September 28, 2018.

- PI Exchange Meeting
  - For accelerator R&D efforts NP conducts annual "PI Exchange" meetings with presentations on current status of work by all Principal Investigators who received awards under previous fiscal year funds. The 2018 PI meeting will take place in November for all FY 2017 awards.

PI Exchange Meeting, November 13-14, 2018

- Presentations on current status of work by all Principal Investigators (PIs) who received awards under FY2017 Lab R&D Plans**.** Cover the continued work under the FY 2016 funding opportunity announcements DE-FOA-0001556 and LAB 16-1556.

- This is not a review and no review panel is involved. Presentations will be made to NP Office Program Managers and Division Directors, and possibly a few PMs from HEP and BES Program Offices.

- To facilitate exchange of information between PIs and the NP Office and among PIs and institutions on all current and past EIC-related Accelerator R&D funded efforts.

- A continuation of yearly meetings on NP supported Accelerator R&D for next generation NP facilities.

- For the next year's meeting (2019) will invite all PIs who received funding for NP in response to the FY18 FOA DE-FOA-0001848.

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PI Meeting Presentation Guidelines:

- **Presentation guideline was sent to all PIs by email on October 25, 2018.**
- Each presentation should include the following information:
  - Description of the project and the current status;
  - The main goal of the project for which you received the FY 2017 Accelerator R&D Plan award. Specify if the award is part of the Lab Base R&D at BNL or TJNAF.
  - Is the funding for this work continued by the FY 2018 NP Accelerator R&D FOA?
  - A table showing annual budget and the total received to date (see below);
  - A table showing major deliverables and schedule; and
  - **For each R&D task identify the priority and sub-priority designation(s) listed in the priority table of the 2017 Jones EIC R&D report.** Also list the row number in the Jones report Priority table that corresponds to each of your task (Rows 1-75).

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PI Meeting Presentation Guidelines (P. 2):

- submit your presentation file to Ms. Brenda May (Brenda.May@science.doe.gov) before noon on Friday, November 9th.
- It is essential that she has a copy of your final presentation by 8:00 am for the morning sessions and by 12:00 pm for the afternoon sessions on the day of your presentation.
- There will be no written report or follow up actions required for this meeting.
- Summary of expenditures by fiscal year (FY):

	FY10+ FY11	FY12+FY13	FY14+ FY15	FY16 +FY17	Totals
a) Funds allocated					
b) Actual costs to date					

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FY2017 Award PI Meeting Agenda

Meeting Agenda - Day 1, Tuesday, November 13, 2018

FY 2017 EIC R&D Plan

No.	Time	Dur. (min)	Proposal ID	Institution	R&D Area	Presentation Title	Speaker
0	8:30 AM	30	-	DOE NP	-	NP supported Accelerator R&D and EIC	Manouchehr Farkhondeh
1	9:00 AM	25	232006	Cornell	Polarized e Source	Next generation robust pol. photocathodes for EIC	Ivan Bazarov
2	9:25 AM	25	FY17 Add Collab. BNL	MIT/subc	Polarized e Source	High Current, High Charge Polarized Electron Sources	Bob Redwine /Evgeni Sentalovich
3	9:50 AM	25	FY17 Additional	BNL	Polarized e Source	complete procurement of components for	John Skaritka
4	10:15 AM	25	FY17 Base	BNL	Polarized e Source	Gatling gun, laser system and design of new	John Skaritka
	10:40 AM	25	Break				
5	11:05 AM	30	FY17 Additional BN	BNL	Polarized 3He Source	Development of a Polarized 3He Ion Source for	Anatoly Zelenski
6	11:35 AM	0	FY17 Add Collab. BNL	MIT/subc	Polarized 3He Source	Development of a Polarized 3He Ion Source for RHIC	Richard Milner
7	11:35 AM	25	*FY17 Base*	TJNAF	Beam Cooling	Magnetized Electron Source	Riad Suleiman
8	12:00 PM	25	FY17 R&D	TJNAF	Beam Cooling	Electron Cooling Simulation Development	Yves Roblin
	12:25 PM	60	Lunch Break				
9	1:25 PM	35	FY17 Base	BNL	Beam Cooling	Coherent Electron Cooling PoP experiment	Vladimir Litvinenko
10	2:00 PM	30	FY17 Base	TJNAF	Beam Cooling	Electron Cooler Design	Steve Benson
11	2:30 PM	25	FY17 Base	TJNAF	Beam Cooling	Bunched Beam Electron Cooling Experiment	Yuhong Zhang
12	2:55 PM	25	232015	NIU	Beam Cooling	Studies of Conventional and ERL-Based Re-circulator Electron Cooling for an Electron Ion	Bela Erdelyi/Herman Schaumburg
	3:20 PM	25	Break				
13	3:45 PM	25	FY17 Add Collab. B	FNAL	Spin Dynamics	Study of Electron Spin Polarization in the EIC	Eliana Gianfelice-Wendt
14	4:10 PM	25	FY17 Additional BN	BNL	Spin Dynamics	Study of Electron Spin Polarization in the EIC	Mike Blaskiewicz
15	4:35 PM	25	FY17 Base	TJNAF	Spin Dynamics	Spin Tracking in Ion and Electron Rings	Vasiliy Morozov
	5:00 PM		Adjourn				

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FY2017 Award PI Meeting Agenda

	Meeting Agenda - Day 2, Wednesday, November 14, 2018						
						FY 2017 EIC R&D Plan	
16	8:30 AM	25	FY17 R&D	TJNAF	Magnet R&D	IR FFQ Prototype Definition	Tim Michalski
17	8:55 AM	25	FY17 Additional BN	BNL	Magnet R&D	Design and Prototyping of SC EIC – IR Magnets	Peter Wanderer
18	9:20 AM	25	FY17 Base	TJNAF	Magnet R&D	Interaction Region (IR) Magnet Design Verification	Tim Michalski
19	9:45 AM	25	FY17 R&D	TAMU/Subc	Magnet R&D	Complete and Test a Full Scale Suitable Superferric Magnet	Peter McIntyre/Tim Michalski
20	10:10 AM	25	FY17 R&D	TJNAF	Beam Dynamics	Crab Crossing Design and Simulations	Vasiliy Morozov
21	10:35 AM	25	113	ANL	Beam Dynamics	Beam Simulation and Benchmarking	Brahim Mustapha
	11:00 AM	20	Break				
22	11:20 AM	25	FY17 Base	BNL	Beam Dynamics	Beam-Beam Effects, Collective Effects Study, Dynamic Aperture	Mike Blaskiewicz
23	11:45 AM	25	FY17 Base	BNL	Beam Dynamics	eRHIC Electron Storage Ring Concept Development	Christoph Montag
24	12:10 PM	25	FY17 Base	TJNAF	Beam Dynamics	Beam-Beam Dynamics with Gear Changing	Yves Roblin
25	12:10 PM	25	FY17 R&D	TJNAF	SRF R&D	Fast Feedback System and Kicker Design	Bob Rimmer
	12:35 PM	60	Lunch Break				
26	1:35 PM	20	FY17 R&D	TJNAF	SRF R&D	Test of CEBAF Electron Injection Mode	Jiquan Guo
27	1:55 PM	25	111	ANL	SRF R&D	ANL Plan for EIC R&D: HOM damping	Michael Kelly
28	2:20 PM	25	FY17 Base	BNL	SRF R&D	Design of state of the art RF systems for eRHIC	Kevin Smith
29	2:45 PM	25	FY17 Base	TJNAF	SRF R&D	Development of SRF Systems for an Electron-Ion Collider	Bob Rimmer
30	3:10 PM	25	FY17 Add Collab. BNL	MIT/subc	Polarized 3He Source	Development of a Polarized 3He Ion Source for RHIC	Richard Milner
	3:10 PM		Adjourn				

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FY018 : Accelerator R&D Funding

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA)

Research and Development for Next Generation Nuclear Physics Accelerator Facilities

Funding Opportunity Number : DE-DE-FOA-0001848

Announcement Type: Initial

CFDA Number: 81.049

ISSUE DATE: 12/01/2018

Application Due Date: 1/19/2018

• A panel of experts helped NP select for funding the most suitable proposal(s) submitted to this FOA based on the SC merit review criteria and NP Program Criteria (Jones panel priority list and 2015 NSAC LRP) for the appropriated FY18 funds and a similar amount is planned for FY2019.

•This was a two-year funding. The next NP Accelerator R&D FOA is expected to be published for FY20-21 funding.

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Review Criteria for FY2018 FOA

This FOA Supports:

This FOA is in support of pre-conceptual accelerator R&D aimed at technological challenges for the next generation NP facilities. Accelerator R&D intended for this announcement should fall in the following general categories:

- Accelerator R&D with the potential for the development of future generation of NP accelerators not under construction or design.
- Accelerator R&D with the potential for improved performance and/or upgrades to existing NP national user facilities that will lead to new capabilities

Merit Review Criteria

Reviewers are requested to evaluate proposals and comment on: **(Criteria)**

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
4. Reasonableness and Appropriateness of the Proposed Budget

NP Program Criteria

In addition, each application should also address these **program criteria**:

5. Relevance to compelling scientific opportunities identified in the 2015 NSAC Long Range Plan.(LRP)
6. If appropriate, relevance of proposed electron-ion collider efforts to the R&D priorities identified in the Jones Report.
7. The opportunity for training junior accelerator physicists in accelerator science and Technology.

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Proposals submitted to FY 2018 FOA

Institutions	Number of Proposals	Budget Request Y-1 ($k)	Budget Request y1+y2 ($k)
National Labs	43	17,526	34,481
Universities	12	3,966	7,931
Industry	1	107	213
Totals	**56**	**21,599**	**42,625**

Collaboration Proposals

Type of Proposals	No. of Proposals	Total Individual proposals
Collaborative	16	43
Non-collaborative	13	13
Totals	**29**	**56**

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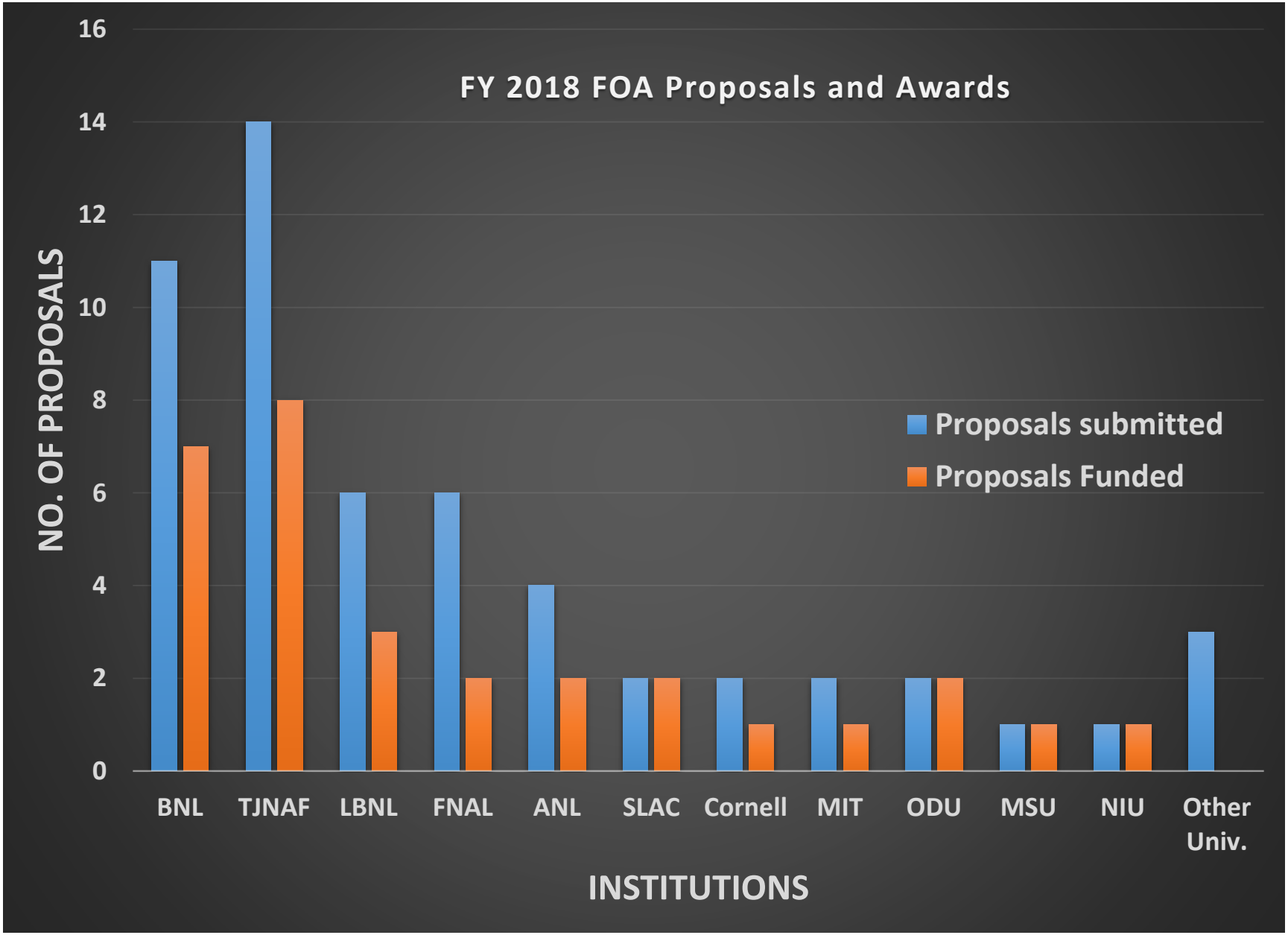

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List of FY2018 FOA Awards

Proposal ID	Institution	Collab. num.	Proposal Title	PI
235278	FNAL		Ring-based high-energy electron cooler	Nagaitsev, Sergei
235263	BNL	Lead	Development and test of simulation tools for EIC beam	Luo, Yun
235254	LBNL		Collaboration	Qiang, Ji
235377	MSU		Collaboration	Hao, Yue
235315	TJNAF		Collaboration	Roblin, Yves
235309	TJNAF	Lead	Theoretical and experimental study of spin transparenc	Morozov, Vasiliy
235264	BNL		Figure-8 Ring (Collaboration)	Huang, Haixin
235325	TJNAF	Lead	Validation of EIC IR Magnet Parameters and Requirements Using Existing Magnet Results	Michalski, Timothy
235265	LBNL		Collaboration	Sabbi, GianLuca
235344	SLAC		Collaboration	Sullivan, Michael
235374	ODU	Lead	Crab Cavity Operation in a Hadron Ring	Delayen, Jean
235261	BNL		Collaboration	Wu, Qiong
235311	TJNAF		Collaboration	Krafft, Geoffrey
235335	BNL	Lead	Strong hadron cooling with micro-bunched electron bea	Willeke, Ferdi
235339	ANL		Collaboration	Zholents, Alexander
235343	SLAC		Collaboration	Stupakov, Gennady
235352	TJNAF		Collaboration	Zhang, Yuhong

Most awards going to collaborative proposals

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List of FY2018 FOA Awards

Proposal ID	Institution	Collab. num.	Proposal Title	PI
235372	Cornell		High current electron sources for strong hadron cooling and polarized sources for EIC	Bazarov, Ivan
235236	BNL	Lead	High Gradient Actively Shielded Quadrupole	Wanderer, Peter
235273	LBNL		Collaboration	Sabbi, GianLuca
235324	TJNAF		Collaboration	Michalski, Timothy
235258	BNL	Lead	Development of an absolute polarimeter and spin-rotat	Raparia, Deepak
235336	MIT		Collaboration	Milner, Richard
235251	ANL	Lead	High Bandwidth Beam Feedback Systems for a High L	Conway, Zachary
235345	TJNAF		Collaboration	Rimmer, Bob
235303	TJNAF	Lead	Development of innovative high-energy magnetized electron cooling for an EIC	Benson, Stephen
235373	ODU		Collaboration	Krafft, Geoff
235277	FNAL		Collaboration	Piot, Philippe
235259	BNL		Collaboration	Blaskiewicz, Michae
235371	NIU		Studies of Conventional and ERL-Based Re-circulator Electron Cooling for an Electron Ion Collider	Erdelyi, Bela
	628	**Total**	**8802**	

- **Funding level**: FY 18 Enacted: $8.8M

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FY019 : Accelerator R&D Funding

FY18 FOA was for 2 year funding

FUNDING OPPORTUNITY ANNOUNCEMENT (FOA)
Research and Development for Next Generation Nuclear Physics Accelerator Facilities
Funding Opportunity Number : DE-DE-FOA-0001848
Announcement Type: Initial
CFDA Number: 81.049
ISSUE DATE: 12/01/2018
Application Due Date: 1/19/2018

- FY 19 appropriated fund should enable us to fund all FY18 awards for year 2. Will Contact PIs as what is needed to proceed to Year 2 funding

- This was a two-year funding. The next NP Accelerator R&D FOA is expected to be published for FY20-21 funding.

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Summary Remarks

- With the 2015 NSAC LRP recommendation for an EIC, NP has developed a near-term plan for moving forward with an EIC:
  - A NAS study of merits of US-based EIC
  - An NP community panel review for setting priorities for EIC accelerator R&D
  - Increased accelerator R&D funding

- The realization of an EIC will require development of many cutting-edge accelerator technologies, securing U.S. leadership in accelerator R&D in the long-term.

- NP will continue to support and nurture the core competencies needed to implement an EIC and will continue EIC R&D.

- All NP funded accelerator R&D are tracked through quarterly reports by PIs and annual PI meetings. The next PI meeting is scheduled for November 13-14, 2018 and will cover all FY 2017 awards to Labs and universities.

Backup

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Jones Panel Priority Table: THIS IS TOO MUCH DETAIL- I would remove

Rows 1-22: "PANEL", "A" or "B"

Sub-Priority-A Rows 1-6

Sub-Priority-B Rows 7-22

Row No.	Proponent	Concept / Proponent Identifier	Title of R&D Element	Panel Priority	Panel Sub-Priority
1	PANEL	ALL	Crab cavity operation in a hadron ring	High	A
2	PANEL	ALL	High current single-pass ERL for hadron cooling	High	A
3	PANEL	ALL	Strong hadron cooling	High	A
4	PANEL	ALL	Benchmarking of realist EIC simulation tools against available data	High	A
5	PANEL	ALL	Validation of magnet designs associated with high-acceptance interaction points by prototyping	High	A
6	PANEL	ALL	Polarized ^{3}He Source	High	A
7	PANEL	LR	High current polarized and unpolarized electron sources	High	B
8	PANEL	LR	Completion of the ongoing CeC demonstration (proof of principle) experiment	High	B
9	PANEL	LR	High-current multi-pass ERL	High	B
10	PANEL	LR	Concept for 3D hadron CeC beyond proof of principle	High	B
11	PANEL	LR	SRF high power HOM damping	High	B
12	PANEL	RR	Complete design of an electron lattice with a good dynamic aperture and a synchronization scheme and complete a comprehensive instability threshold study for this design	High	B
13	PANEL	RR	High peak current multi-turn electron linac	High	B