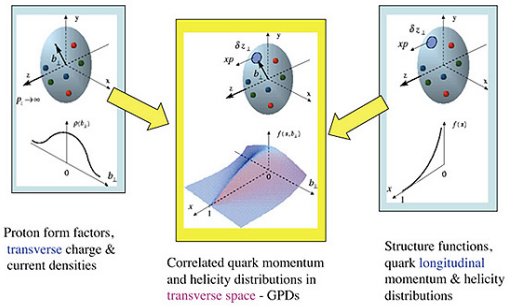
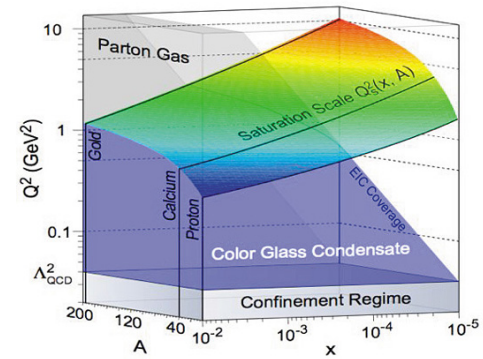
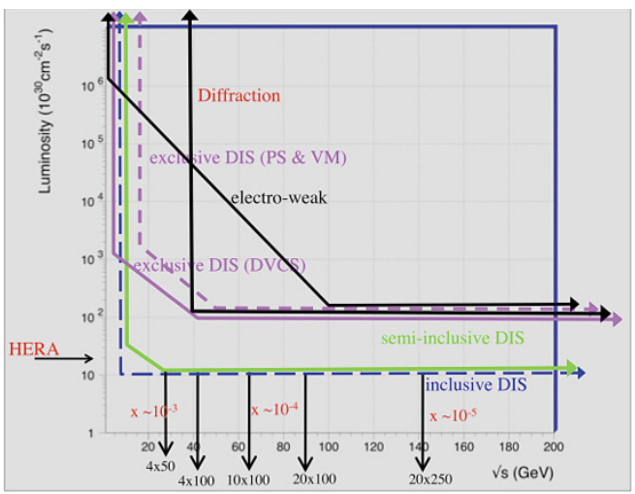
Generic Detector R&D for an Electron Ion Collider Advisory Committee meeting

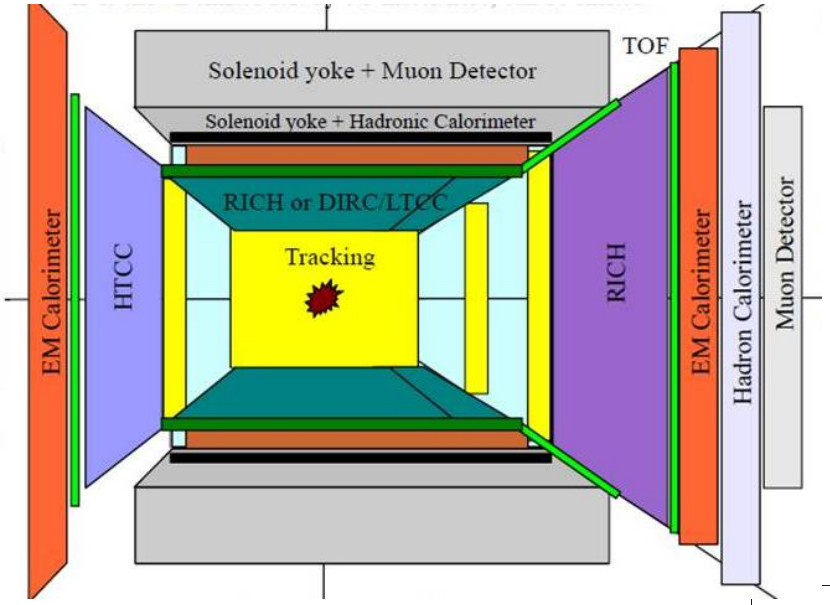
T. Ludlam

May 17-18, 2012









Office of Science
U.S. DEPARTMENT OF ENERGY

BROOKHAVEN NATIONAL LABORATORY

EIC Generic Detector R&D Program

Establish a peer reviewed program of R&D to enable EIC experiments

- Develop detector concepts and technologies that have particular importance for experiments in an EIC environment.
- Help ensure that the techniques and resources for implementing these technologies are well established within the EIC user community.
- Endorsed by DOE, BNL, and JLab; Managed at BNL

Support community-wide development efforts:

New concepts and technologies
Adaptations of existing technology
New design and simulation tools
New computing/analysis techniques

Funding provided by DOE Office of Nuclear Physics through RHIC program operations budget:

$0.5M committed in FY 2011; $1M in FY 2012
Expect ~$1-1.5M per year thereafter for ~5 years.

Proposals are solicited from all segments of the EIC community.

The national discussion for a U.S. Electron Ion Collider

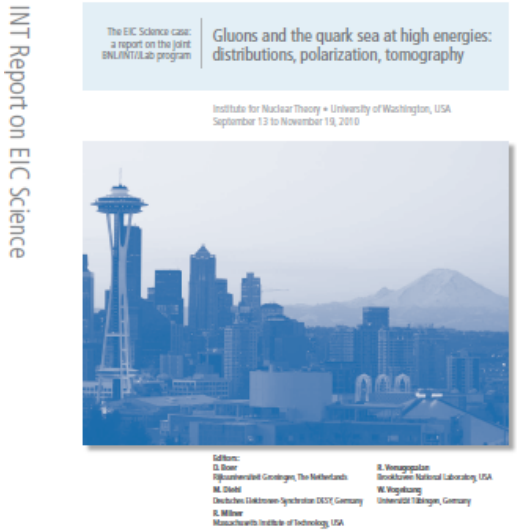
Machine designs being developed independently at BNL (eRHIC) and at JLab (ELIC/MEIC)

Converging on similar performance parameters.

INT workshop on EIC science, September – November 2010

Detailed theoretical study of the science case, with focus on key experiments.

Proceedings (550 pages) : detailed presentation of theory case and "Golden Experiments".



A *white paper* will outline the EIC science case, key experiments, and performance goals.

Distills the highly technical INT proceedings for wide consumption and discussion in the scientific community.

Steering committee appointed by Brookhaven and JLab :

Primary editors: A. Deshpande (Stony Brook), Z. Mezziani (Temple), J. Qiu (BNL)

"Golden Measurements" provide the focus for R&D and detector design.

EIC Detector R&D Advisory Committee

Meet ~twice per year to….

- Hear public presentations of new proposals, and progress on approved projects
- Evaluate the merits of proposals, and the performance of on-going projects
- Make funding recommendations and provide overall guidance for the program

The committee met May 9-10, 2011 to kick off the program and evaluate the first round of proposals.

Second Meeting: Dec. 12-13, 2011… New proposals and progress reports.

Next meeting: May 17-18, 2012

Website: https://wiki.bnl.gov/conferences/index.php/EIC_R%25D

Advisory Committee members: (Glenn Young, Chair)

Marcel Demarteau (Argonne)
Ian Shipsey (Purdue)
Glenn Young (JLab)
Carl Haber (LBNL)
Rick Van Berg (Penn)
Robert Klanner (Hamburg)
Jerry Va'vra (SLAC)

EIC Detector R&D funded projects, thru May 2012

See postings on website

Prop. No.	Title	Contact	Institutions	2011	2012	2013	
RD 2011-1; RD 2012-14	Development of a new detector technology for fiber sampling calorimeters for EIC	H. Huang/ C. Woody	UCLA, TAMU, PSU, BNL, USTC(China)	$110,632	$199,000	$112,500	Compact Calorimetry
RD 2011-3; RD 2012-7	DIRC -based PID for the EIC Central Detector	P. Nadel-Turonski	Catholic Univ. of America, Old Dominion Univ., Univ. of South Carolina, Jlab, GSI Darstadt	$115,000	$140,000		Particle ID; Simulation; Hermiticity
RD 2011-5	Proposal to test improved radiation tolerant silicon photomultipliers	C. Zorn	Jlab	$57,000			Hi density photon detector
RD 2011-6; RD 2012-9; RD2012-16	LOI for Detector R&D Towards an EIC Detector; Proposal: Tracking, PID, Simulation	K. Dehmelt	BNL, BNL/RBRC, Florida Inst. of Technology, Iowa State, LBNL, MIT, Stony Brook Univ., Temple Univ., Univ. Virginia, Yale Univ., RBRC, Jlab	$209,000	$183,000	$356,910	Simulation; Tracking; Particle ID; Hermiticity
RD 2012-3	Design and Assembly of fast and lightweight barrel and forward tracking prototype for an EIC	B. Surrow, F. Sabatie	CEA Saclay, MIT, Temple Univ.		$150,000		Compact tracking; Hermiticity
RD 2012-5	Physics simulations to establish and refine detector requirements and detector design for the EIC	T. Ullrich	BNL		$74,000	$143,000	Simulation tools
RD 2012-8; Joined RD 2012-14	Crystal R&D proposal for a forward calorimeter at EIC	Y. Zhang	USTC, UCLA,		$60,000		Forward calorimetry; e tagging

EIC Detector R&D Funds Distributed

Account Number	Account Title	Project Number	Institution	BNL Req #	FY11	Approved for FY12
18950 (subcontracts)	EIC R&D	RD 2011-1	UCLA	198731	$ 110,632	
		RD 2011-3	Jlab (MPO)	201878	$ 51,910	$ 70,094
			The Catholic University	200821	$ 9,800	$ 8,300
			Old Dominion University	199791	$ 53,290	$ 54,000
			University of South Carolina	216627		$ 7,606
		RD 2011-5	Jlab (MPO)	200930	$ 56,800	
		RD 2011-6	Stony Brook University	200934	$ 50,827	$ 10,000
			Florida Institute of Technology	200940	$ 26,000	
			University of Virginia	200933	$ 50,000	
			Yale Univ	200935	$ 39,907	
		RD 2012-8	USTC	217054		$ 60,000
		RD 2012-3	Temple Univ/CEA-Saclay	in process		$ 150,000
			Subcontract total		$ 449,166	$ 360,000
			BNL Overhead		$ 78,850	$ 63,197
18950 Total					**$ 528,016**	**$ 423,197**
16403	EIC R&D: Physics Simulations	RD 2012-5	BNL-Thomas Ullrich			**$ 74,500**
16412	EIC Detector Simulation	RD 2011-6	BNL-Elke Aschenauer			**$ 173,000**
Total for EIC R&D					**$ 528,016**	**$ 670,697**

Proposals received for May 2012 meeting

See postings on website

Prop. No.	Title	Contact	Institutions	2012	2013	2014
RD 2012-10	R&D of a Silicon-based tracker system for EIC detector	L. Elouadrhiri, A. Yegneswaran	Jlab, Moscow State Univ., Univ. New Hampshire	$ 83,000	$ 82,000	$ 82,000
RD 2012-11	Development of a spin-light polarimeter for the EIC	D. Dutta	Mississippi St. Univ., College of William & Mary, Stony Brook Univ, J. Gutenberg Univ., UVA, ANL, Jlab	$ 113,000	$ 116,000	$ 115,000
RD 2012-12	RICH detector for the EIC forward detector	V. Kubarovsky, P. Rossi	Jlab, INFN Frascati, INFN Ferrara, Ch. Newport Univ., Univ. Tecnica Valparaiso	$ 97,500	$ 122,000	$ 78,500
RD 2012-13	Pre-shower detector for forward EM calorimeters	S. Kuleshov, W. Brooks	Univ. Tecnica Valparaiso	$ 46,000		
RD 2012-14	Joint proposal to develop calorimeters for EIC	H. Huang, C. Woody	BNL, Penn State Univ., UCLA, USTC	$ 199,000	$ 112,500	
RD 2012-15	GEM based TRD for Identiying electrons at EIC	Z. Xu, M. Shao	BNL, Univ. Indiana, USTC, ANL, VECC	$ 75,700	$ 89,000	
RD 2012-16	Proposal for detector R&D towards an EIC detector	T. Hemmick, K. Dehmelt	BNL, Florida Inst. of Technology, Iowa State Univ., LBNL, MIT, RBRC, Stony Brook Univ., Temple Univ., Jlab, Univ. Virginia, Yale Univ.		$ 356,910	$ 437,455

General recommendations from previous meetings: shaping the program

Simulation studies strongly encouraged

- "to maximize acceptance and efficiency for each golden measurement while minimizing machine backgrounds, and backgrounds from other physics processes".

Importance of the formation of consortia of universities and national labs:

- Much work needs to be done on each class of detector technique to identify appropriate technologies through simulation, prototyping, etc.
- Such consortia are the first step toward building scientific collaborations that can successfully mount EIC experiments.

Other important areas in need of R&D, not seen in initial proposals:

- Luminosity and polarization measurements
- tagging detectors and calorimeters downstream in both hadron and electron directions
- Low-mass precision vertex measurement

Explore connections between EIC interests and other R&D programs that are going on in the world (e.g. HEP, ILC, CERN, FAIR, as well as other NP programs)