Report from QCD Town Hall Meeting

Sept. 23 - 25 @ MIT, MA

https://indico.mit.edu/event/538/
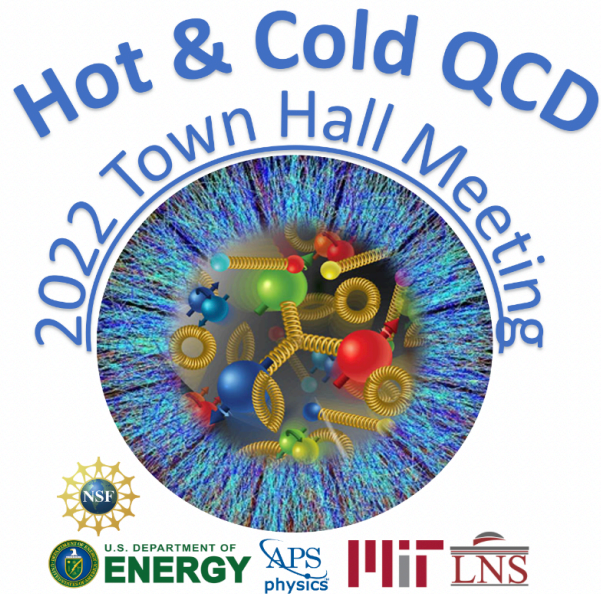
Conveners (alphabetic order):

- Bjoern Schenke (BNL)
- Anne Sickles (Illinois)
- Feng Yuan (LBNL)
- Xiaochao Zheng (UVA)

Organizing Committee (alphabetic order):

- Ian Cloet (ANL)
- Or Hen (MIT)
- David Lawrence (JLab)
- Wei Li (Rice)
- Swagato Mukherjee (BNL)
- Bjoern Schenke (BNL)
- Anne Sickles (Illinois)
- Ramona Vogt (LLNL & UCD)
- Feng Yuan (LBNL)
- Xiaochao Zheng (UVA)

Other Town Hall Meetings for NSAC Long Range Plan
1) Nuclear Structure, Reactions and Astrophysics
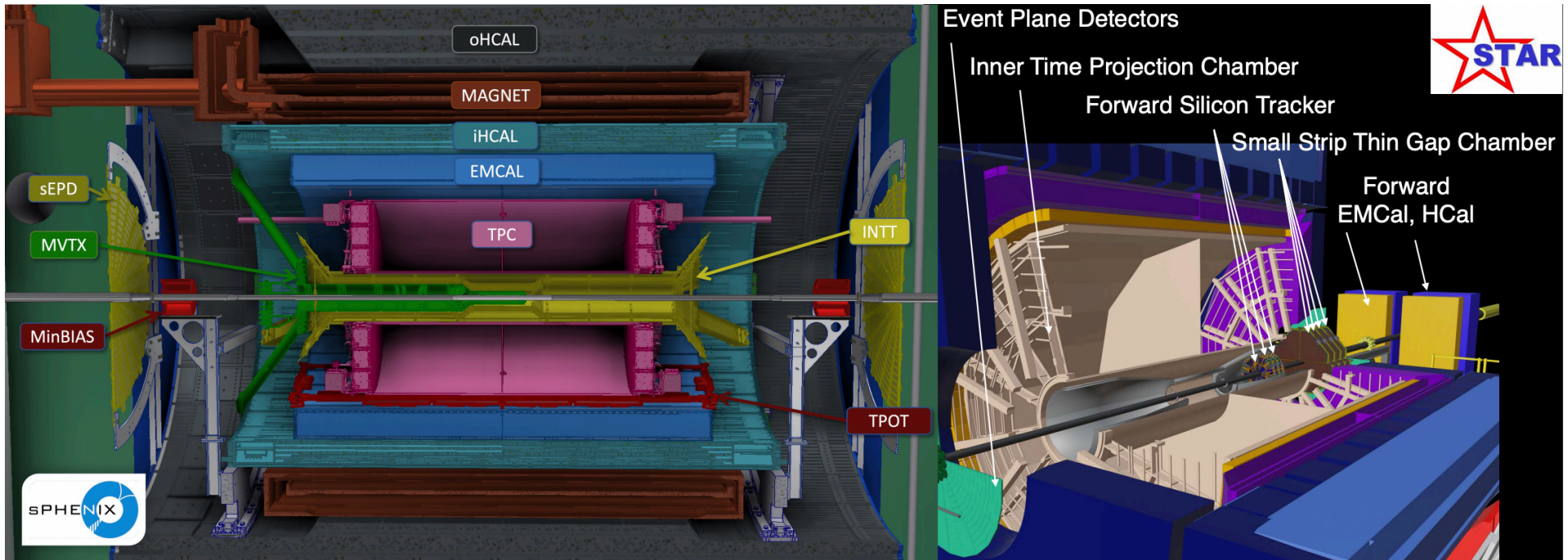   November 14 - 16, Argonne National Lab
1) Fundamental Symmetries, Neutrons and Neutrinos
      December 13 - 15, Univ. of North Carolina - Chapel Hill

422 participants   (182 in-person, 240 remote)
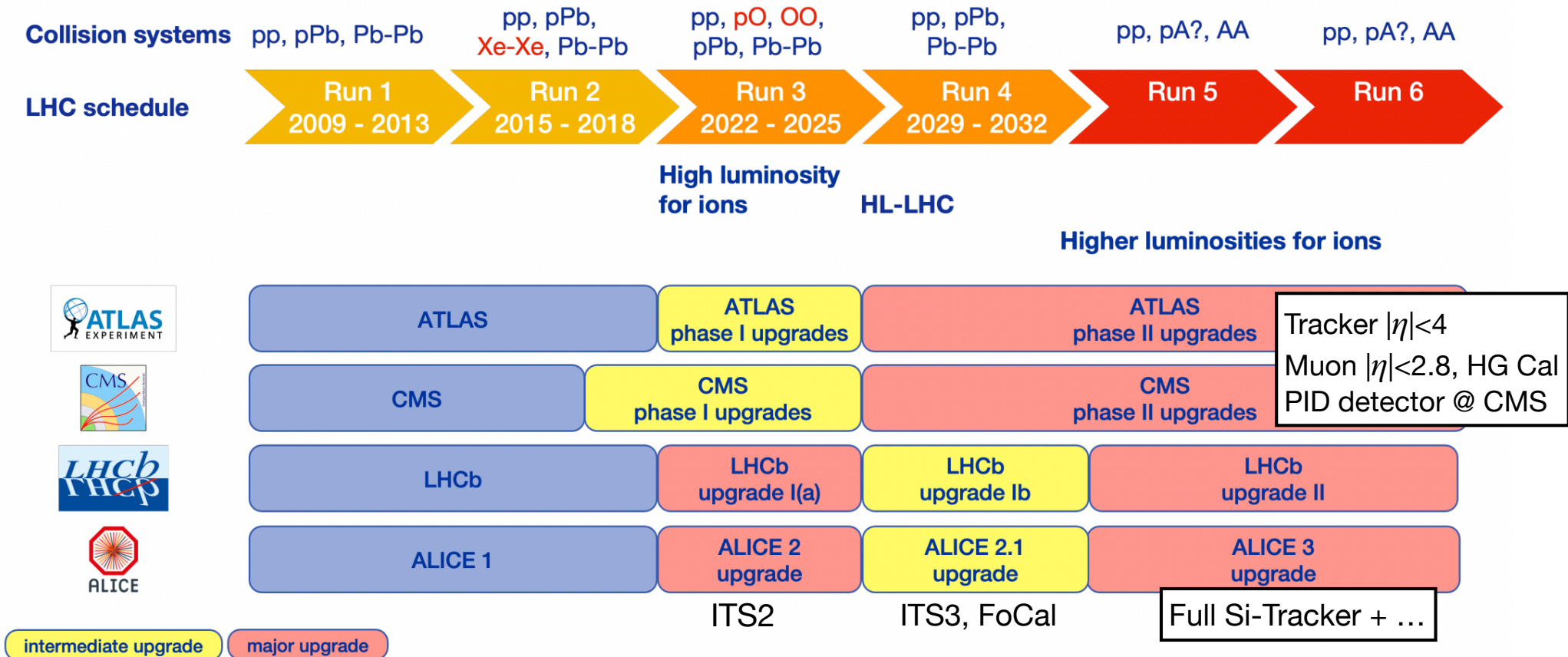
RHIC Runs 2023-2025

sPHENIX BUR

Year	Species	$\sqrt{s_{NN}}$ [GeV]	Cryo Weeks	Physics Weeks	Rec. Lum. $|z| < 10$ cm	Samp. Lum. $|z| < 10$ cm
2023	Au+Au	200	24 (28)	9 (13)	3.7 (5.7) nb^{-1}	4.5 (6.9) nb^{-1}
2024	$p^\uparrow p^\uparrow$	200	24 (28)	12 (16)	0.3 (0.4) pb^{-1} [5 kHz] 4.5 (6.2) pb^{-1} [10%-str]	45 (62) pb^{-1}
2024	$p^\uparrow$+Au	200	–	5	0.003 pb^{-1} [5 kHz] 0.01 pb^{-1} [10%-str]	0.11 pb^{-1}
2025	Au+Au	200	24 (28)	20.5 (24.5)	13 (15) nb^{-1}	21 (25) nb^{-1}

STAR BUR

$\sqrt{s_{NN}}$ (GeV)	Species	Number Events/ Sampled Luminosity	Year	
200	Au+Au	20B / 40 nb^{-1}	2023+2025	
200	p+p	235 pb^{-1}	2024	11 wks
200	p+Au	1.3 pb^{-1}	2024	11 wks

heavy flavors, quarkonia, jets bulk observables

LHC Upgrades and Physics Programs

Collision systems	pp, pPb, Pb-Pb	pp, pPb, Xe-Xe, Pb-Pb	pp, pO, OO, pPb, Pb-Pb	pp, pPb, Pb-Pb	pp, pA?, AA	pp, pA?, AA
LHC schedule	Run 1 2009 - 2013	Run 2 2015 - 2018	Run 3 2022 - 2025	Run 4 2029 - 2032	Run 5	Run 6

High luminosity for ions

HL-LHC

Higher luminosities for ions

ATLAS	ATLAS	ATLAS phase I upgrades	ATLAS phase II upgrades	
CMS	CMS	CMS phase I upgrades	CMS phase II upgrades	
LHCb	LHCb	LHCb upgrade I(a)	LHCb upgrade Ib	LHCb upgrade II
ALICE	ALICE 1	ALICE 2 upgrade	ALICE 2.1 upgrade	ALICE 3 upgrade

Tracker $|\eta|<4$
Muon $|\eta|<2.8$, HG Cal
PID detector @ CMS

ITS2   ITS3, FoCal   Full Si-Tracker + …

intermediate upgrade   major upgrade

heavy flavors, quarkonia, jets, dielectrons
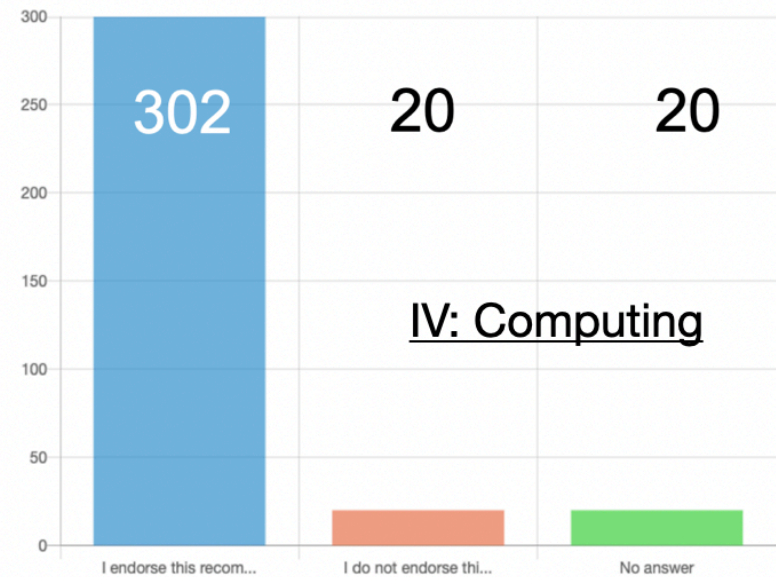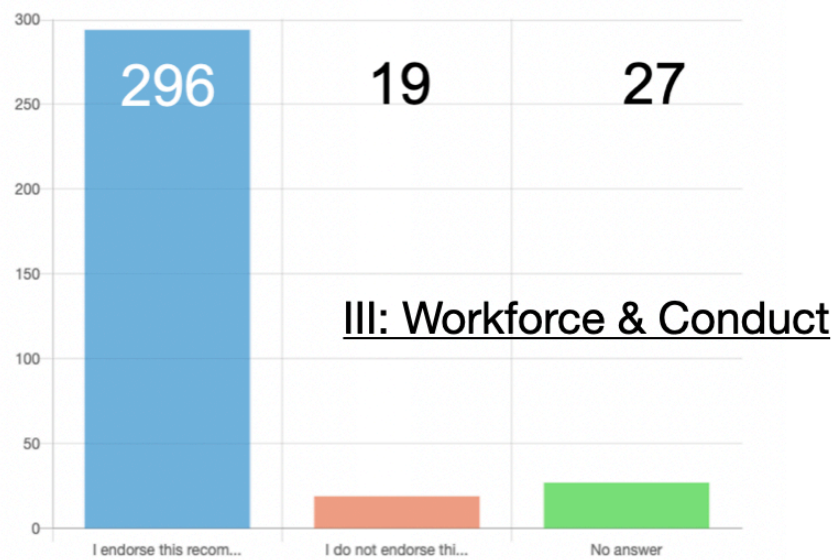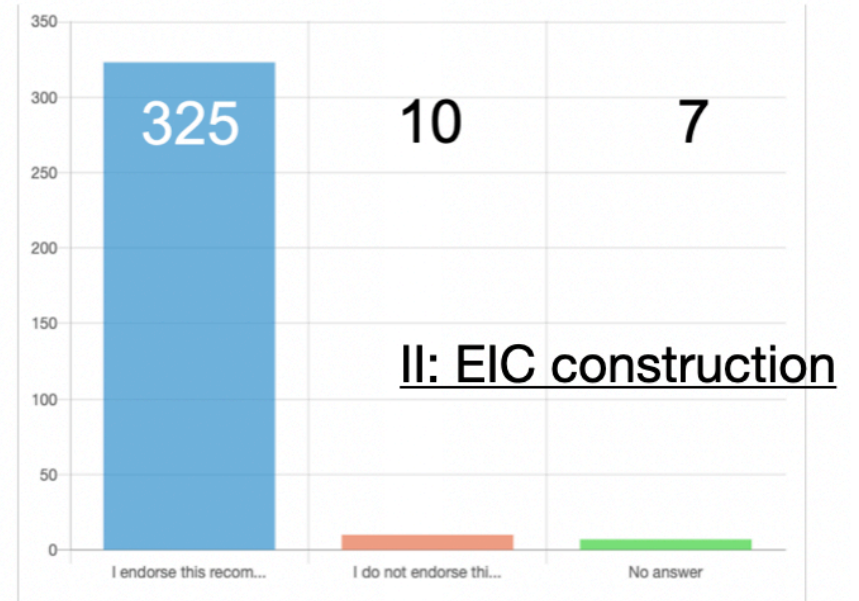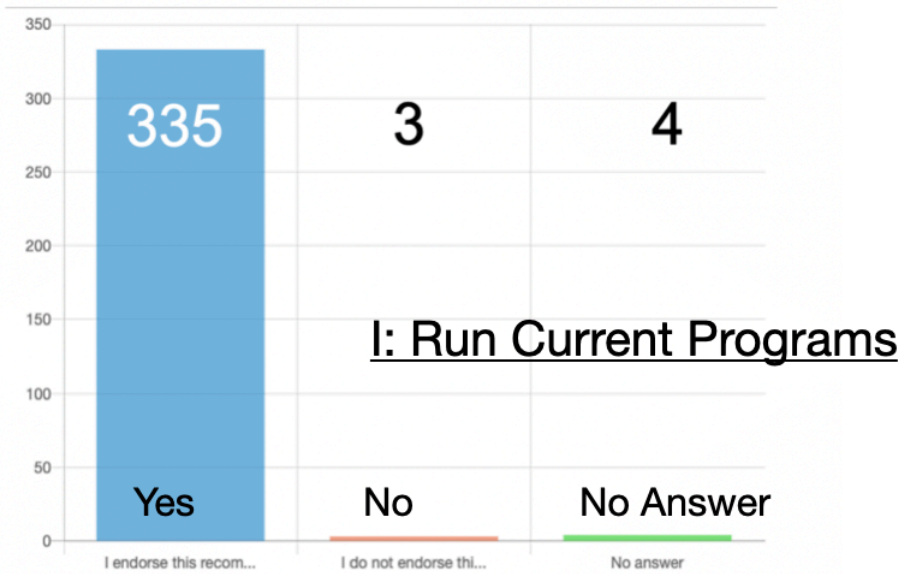
High μ_B Experiments
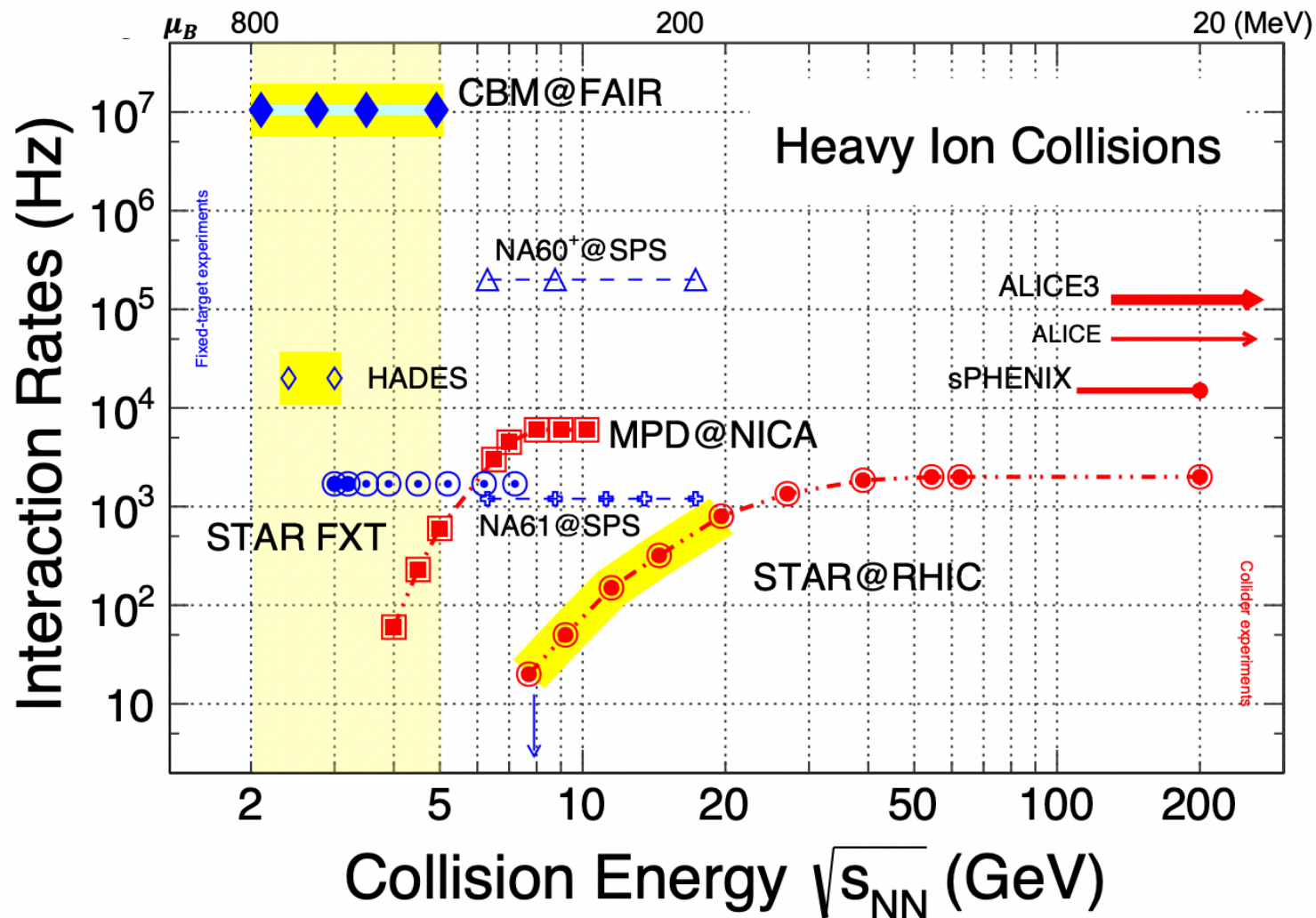
QCD critical point and 1st-order phase transition

Equation-of-state of nuclear matter at high μ_B region
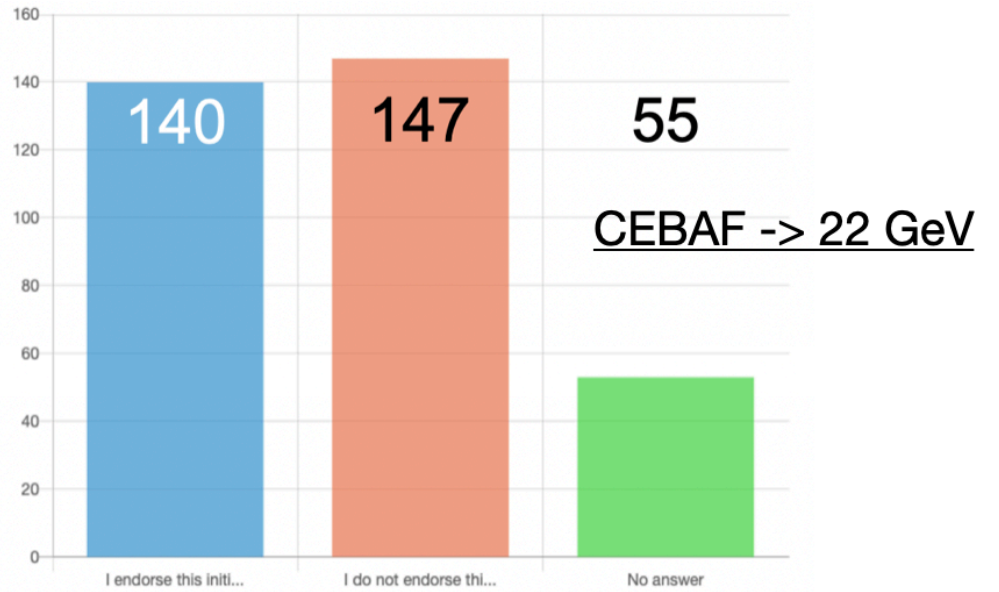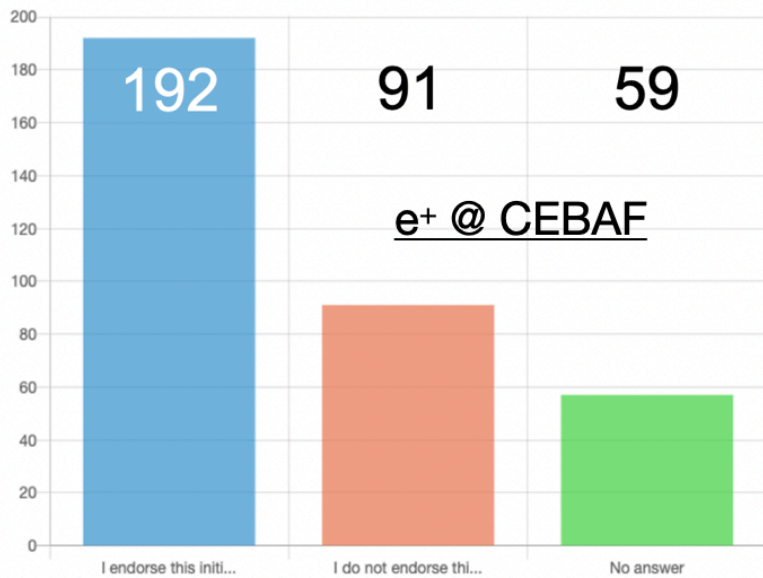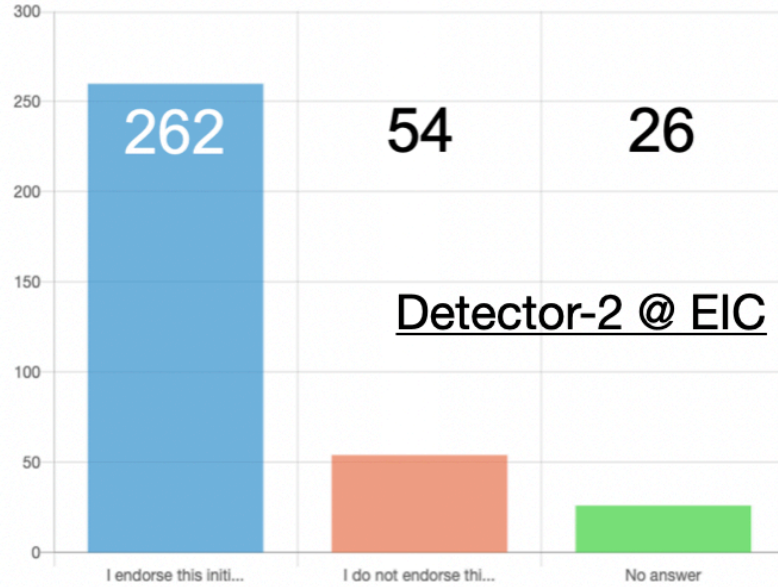- connection to nuclear astrophysics

Plenary sessions: EIC (theory, detector, organization etc.), computing (AI/ML)
JLab (theory, exp, upgrades), hot QCD (exp, theory)
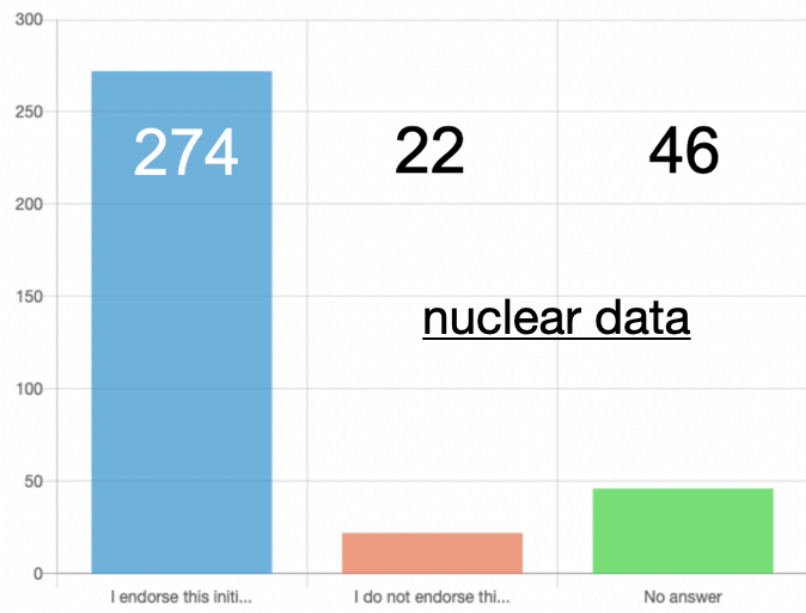workforce, nuclear data

Hot QCD parallel sessions: RHIC/LHC exp. upgrades, future high μ_B exp.
theory developments
other initiatives (small sys scan, UPC, FXT for space etc.)

Open mics + Discussions

Two rounds of survey for recommendations + initiatives
- first round Sat. evening -> Sunday morning
- second round Tuesday -> Thursday

I: Run Current Programs

	Yes	No	No Answer
	335	3	4

II: EIC construction

	325	10	7

III: Workforce & Conduct

	296	19	27

IV: Computing

	302	20	20

Detector-2 @ EIC

262 | 54 | 26

e⁺ @ CEBAF

192 | 91 | 59

CEBAF -> 22 GeV

140 | 147 | 55

LHC upgrades

I endorse this initi...	I do not endorse thi...	No answer
255	49	38

high μ_B experiments

I endorse this initi...	I do not endorse thi...	No answer
157	129	56

nuclear data

I endorse this initi...	I do not endorse thi...	No answer
274	22	46

Follow-ups - NSAC Meeting 9/28

LRP Writing Committee

Christine Aidala
Ani Aprahamian
Sonja Bacca
Paulo Bedaque
Lee Bernstein
Joe Carlson
Mike Carpenter
Kelly Chipps
Vincenzo Cirigliano
Ian Cloet
Andre de Gouvea
Romualdo DeSouza
Gail Dodge
Evie Downie
Renee Fatemi
Alexandre Gade
Haiyan Gao
Susan Gardner
Vicki Greeene

Auston Harton
Tanja Horn
Calvin Howell
Yordanka Illieva
Barbara Jacak
Thia Keppel
Oliver Kester
Josh Klein
Krishna Kumar
Kyle Leach
Dean Lee
Shelly Lesher
Marek Lewitowicz
Chen-Yu Liu
Jorge Lopez
Cecilia Lunardini
Richard Milner
Filomena Nunes
Dan Phillips

Jorge Piekarewicz
Dinko Pocanic
Jianwei Qiu
Sofia Quaglioni
David Radford
Rosi Reed
Lijuan Ruan
Martin Savage
Bjoern Schenke
Derek Teaney
Brent VanDevender
Ramona Vogt
Nathalie Wall
Fred Wietfeldt
John Wilkerson
Richard Wilson
Lindley Winslow
Sherry Yennello
Xiaochao Zheng

slide from Gail Dodge

Timeline

- **DNP organized town halls already underway**
- **Working on forming subcommittees**
- **Closed kickoff meeting Oct. 26 in New Orleans**
  - Agencies will talk to committee
  - Presentation about budgets
  - Subcommittees
  - Writing assignments & proposed outline of LRP
  - Agenda and timing of resolution meeting
- **Writing underway**
- **Whitepapers due end of February 2023**
- **Late spring/summer: 5 - 7 day resolution meeting**
  - 1st part will include presentations by people who are not necessarily on the LRP committee
  - 2nd part will be closed and in-person
- **Editing LRP document**
- **October 2023 – draft report ready**

Subcommittees

- QCD
- Fundamental Symmetries
- Nuclear Structure & Nuclear Astrophysics
- Workforce Development (includes education and DEI)
- Applications
- International Context
- Crosscutting/interdisciplinary scientific opportunities (e Accelerator Science, Computing)
- Impact and synergies with other fields (e.g., High Energy
- Budget

slides from Gail Dodge

Update on QCD Community White Paper Plan

….

we plan to write **a single White Paper for the QCD community** that will cover recent achievements and future plans in both Hot and Cold QCD research.

Our current plan for the White Paper writing timeline is as follows:

- The first draft will be shared with the community by the Winter break (i.e. towards the end of December 2022).

- Community comments on the first draft will be collected until mid January 2023.

- A revised version will be circulated in early February with the option for all community members to opt in to its author list and sign off the document.

- The final version will be submitted to NSAC by their deadline, end of February, 2023.

The writing committee will consist of the Town Hall meeting organizers, who will call on colleagues for help with specific parts of the white paper as needed. Our overarching goal is to produce an inclusive document that well covers the broad range of physics presented and discussed at the town meeting, and all other notable ongoing and/or planned activities in support of QCD research.
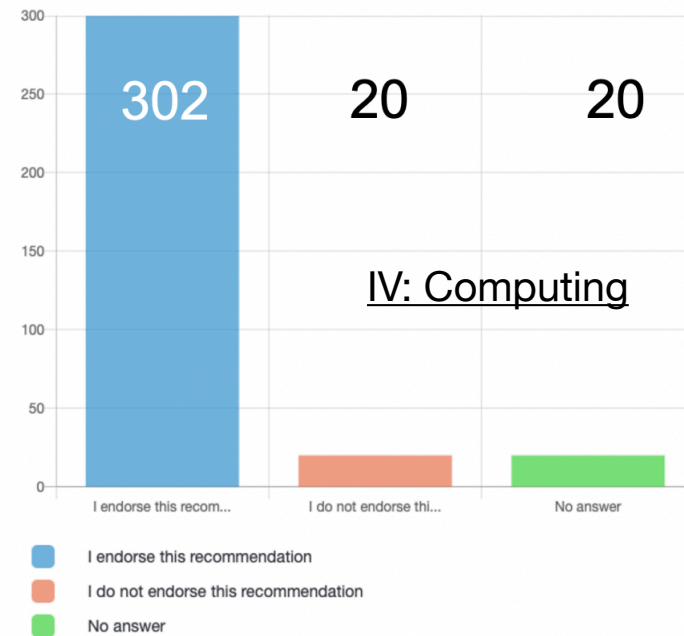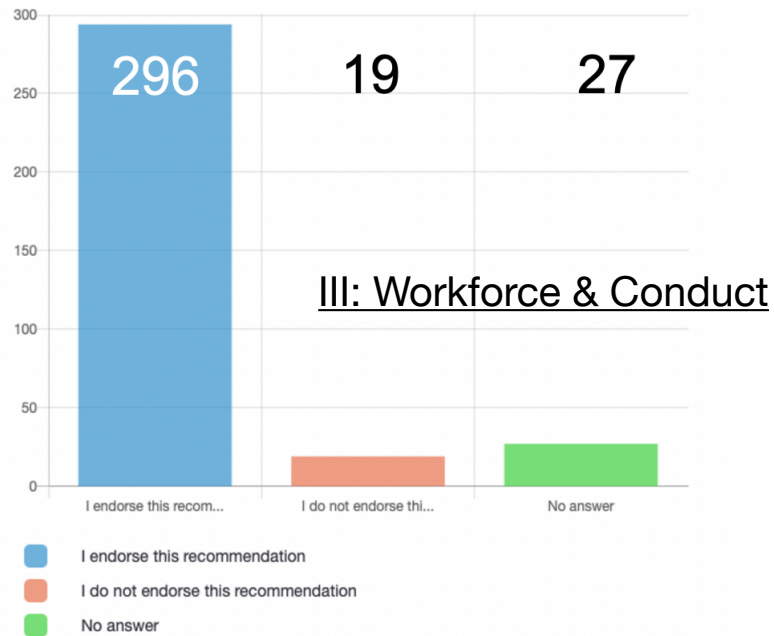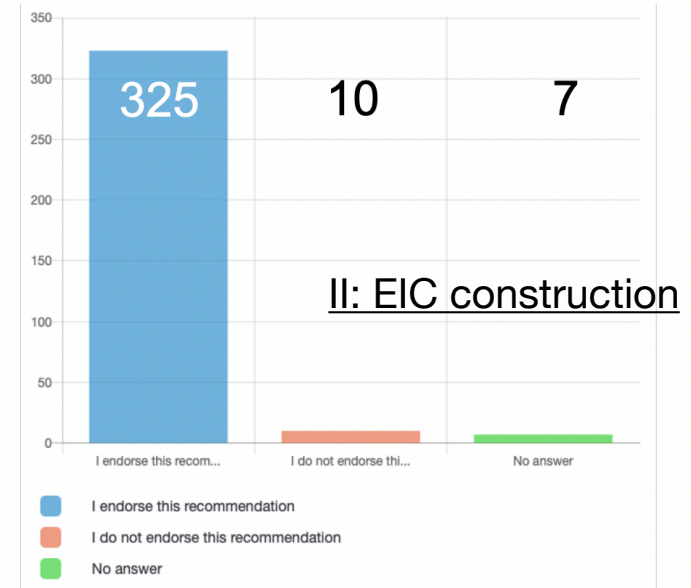
Collaborations and groups working on community white papers, who would like to provide inputs to the town meeting white paper, are encouraged to let us know of their activity at their earliest convenience, and define a point of contact whom the writing committee should interact with. **Please share draft white papers with the writing committee no later than Monday Nov. 7th 2022**.

Best,

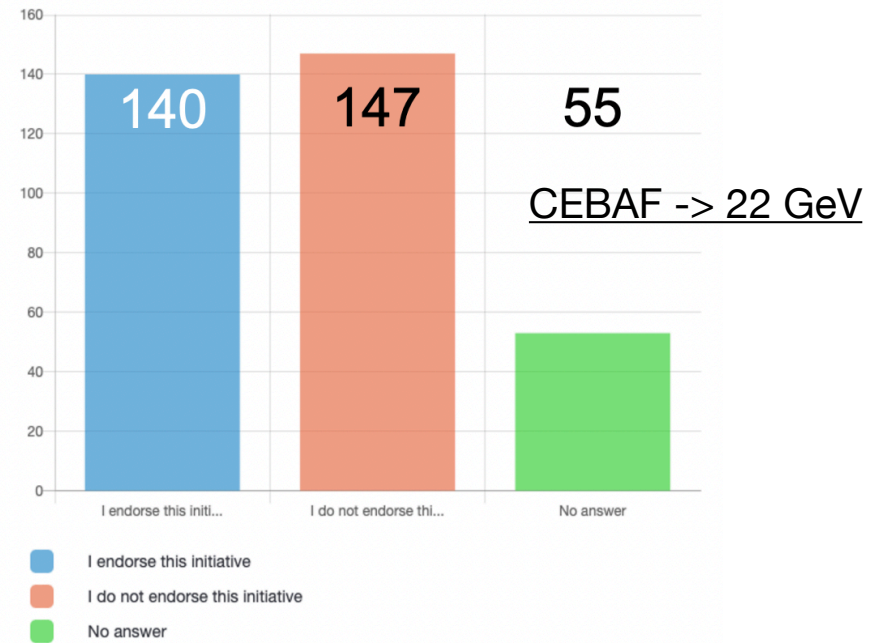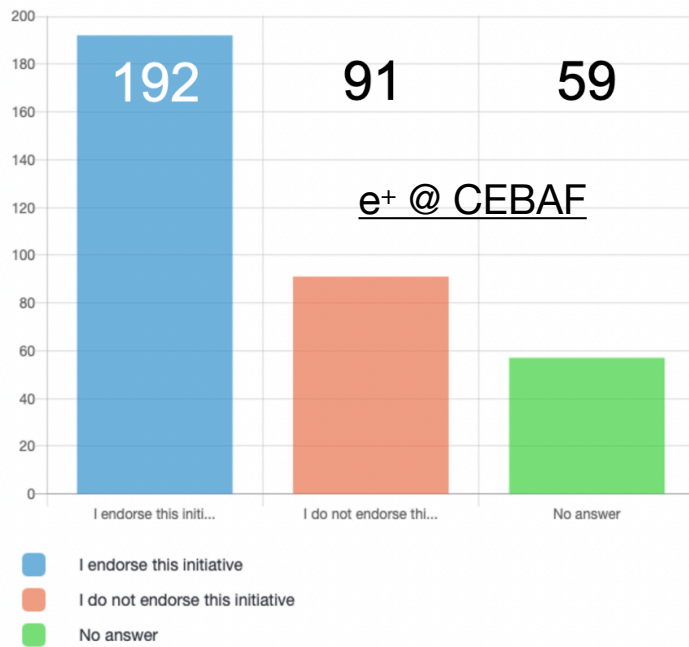Anne, Bjoern, David, Feng, Ian, Or,

Ramona, Swagato, Wei, and Xiaochao

Recommendations

I: Run Current Programs — Yes: 335, No: 3, No Answer: 4

II: EIC construction — 325, 10, 7

III: Workforce & Conduct — 296, 19, 27

IV: Computing — 302, 20, 20

Initiatives

Detector-2 @ EIC

262	54	26

- I endorse this initiative
- I do not endorse this initiative
- No answer

e⁺ @ CEBAF

192	91	59

- I endorse this initiative
- I do not endorse this initiative
- No answer

CEBAF -> 22 GeV

140	147	55

- I endorse this initiative
- I do not endorse this initiative
- No answer

Initiatives

LHC upgrades: 255 (I endorse this initiative), 49 (I do not endorse this initiative), 38 (No answer)

high μ_B experiments: 157 (I endorse this initiative), 129 (I do not endorse this initiative), 56 (No answer)

nuclear data: 274 (I endorse this initiative), 22 (I do not endorse this initiative), 46 (No answer)