U.S. DEPARTMENT OF ENERGY | Office of Science

High Energy Physics Program Status

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Take Away Messages

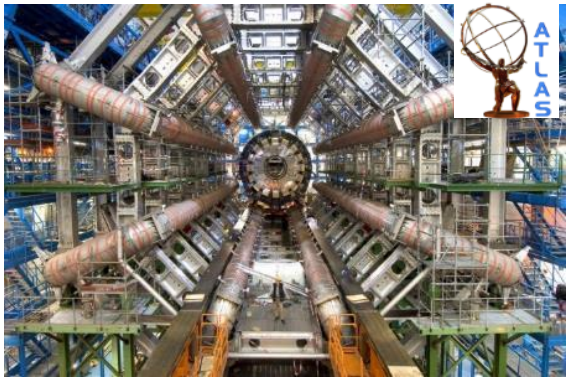
- **Maintain the Core of the DOE Science Mission (courtesy T. Hallman):**
  - Delivering exciting discoveries, important scientific knowledge and technological advances is what we do.
  - We need to stay focused and continue to deliver these outcomes for the nation
- **HEP is executing the P5 plan and delivering those discoveries:**
  - A few recent examples in this talk
  - FY 2017 Funding Opportunities and funding actions are moving forward
- **There are significant impacts of the FY 2018 Request in HEP Research, Operations and (to a lesser extent) Projects**
  - Some details (to the extent known) in this talk. Many more details yet to be worked out.
  - Choices had to be made. These decisions are owned by HEP management and issues should be directed to them.

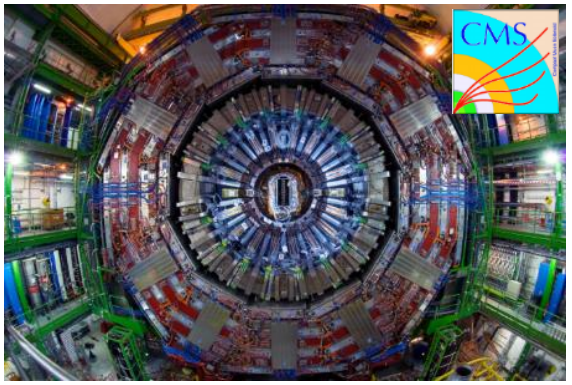

HEP PROGRAM STATUS

Energy Frontier Program

The Large Hadron Collider (LHC) is currently the centerpiece of Energy Frontier research

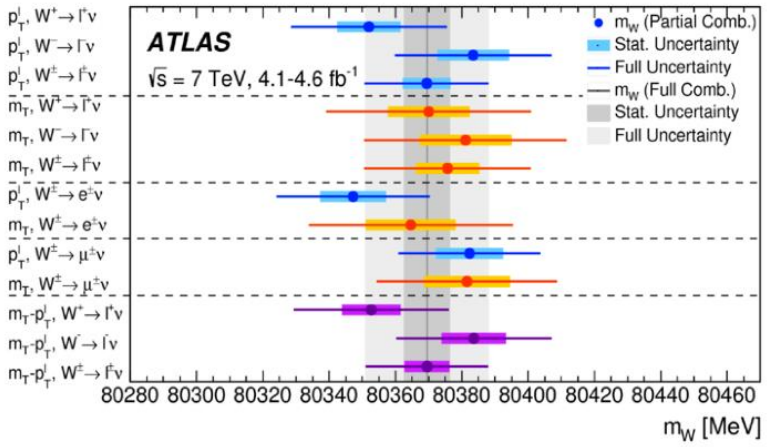
- Only means to produce and study the Higgs boson
- Searches for direct production of dark matter particles
- Explores for signs of new physics through direct production of new particles and precision measurements of known particles
- **P5 recognized that a compelling and comprehensive LHC program is a core part of U.S. particle physics**
  - DOE intends to support key leadership roles in the ATLAS and CMS experiments
  - U.S. participation is enabled by leveraging U.S. expertise in accelerator science & technology to exploit future opportunities
- **ATLAS and CMS detector [Phase-I] upgrades for 2019-2020 progressing**
  - CMS Forward Pixels installed during year-end technical stop
  - Fully exploit opportunities at the LHC to make precision measurements and explore for new physics



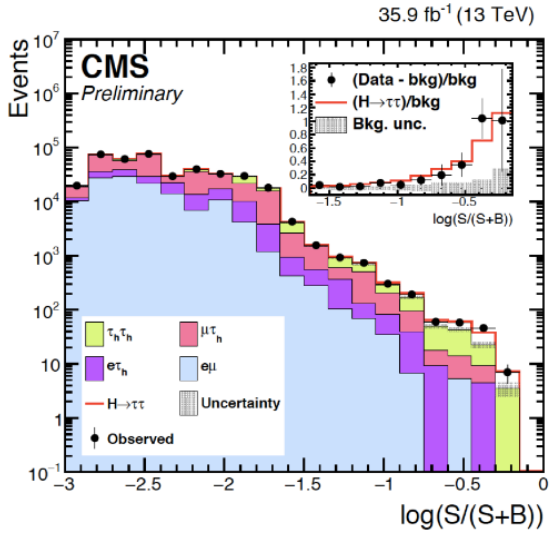


Highlights from the LHC

- **Over 635 LHC Run 1+2 papers submitted by each of the CMS and ATLAS Collaborations**
  - Excellent performance of the LHC in 2016
  - 2017 LHC Physics Run has begun, and we continue to look forward to new results
- **Recent highlights include:**
  - ATLAS measurement of the *W* boson mass to 19 MeV precision
  - CMS result for $H \rightarrow \tau\tau$: observed (expected) significance of 4.9σ (4.7σ) for m_H = 125 GeV



m_W = 80.370 ± 0.007 (stat.) ± 0.011 (exp.syst.) ± 0.014 (mod.syst.) GeV
= 80.370 ± 0.019 GeV

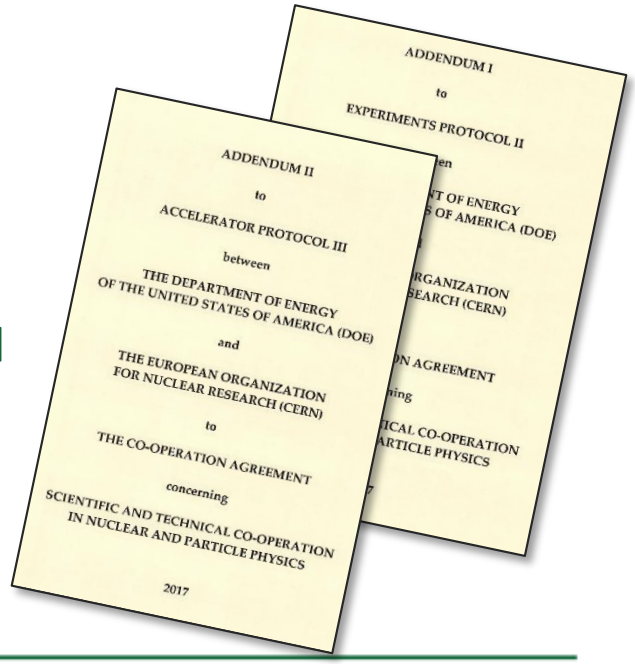


Future of the Energy Frontier

Future program building on historic bilateral U.S.-CERN Agreement and protocols, signed in 2015

- DOE-CERN addenda to the protocols for HL-LHC accelerator, experiments, and neutrinos signed May 2017

- **P5 report identified High-Luminosity LHC (HL-LHC) upgrades as highest priority near-term large project**
  - HL-LHC extends discovery potential by increasing LHC collision rate, enabling detectors to collecting a factor of ten more data over another decade
- **U.S. leadership in superconducting magnet technology, and with Nb_3Sn in particular, is essential to the success of the HL-LHC project**
  - HL-LHC Accelerator Upgrade Project uses this expertise to serve HEP community needs
- **U.S. laboratories and institutions will develop and build major subsystems for the HL-LHC ATLAS and CMS detector upgrades**
  - Detector expertise and support provides foundation for continued U.S. leadership in HL-LHC scientific research program



Energy Frontier: Status & Outlook

Project	TPC ($M)	CD Status	CD Date
LHC ATLAS Detector Upgrade	33	CD-3	November 12, 2014
LHC CMS Detector Upgrade	33	CD-3	November 12, 2014
High-Luminosity LHC (HL-LHC) Accelerator Upgrade	180-250	CD-0	April 13, 2016
High-Luminosity LHC (HL-LHC) ATLAS Detector Upgrade	125-155	CD-0	April 13, 2016
High-Luminosity LHC (HL-LHC) CMS Detector Upgrade	125-155	CD-0	April 13, 2016

- **The U.S. will continue to play a leadership role in LHC discoveries by remaining actively engaged in analysis of LHC collider data at 13 TeV**
- **LHC continues Run II operations at 13 TeV**
  - 2017 physics running began in May, scheduled to continue through December
- **ATLAS and CMS [Phase-I] detector upgrade projects receive final funding in FY17**
- **With the approval of CD-0 for the HL-LHC Accelerator Upgrade Project and HL-LHC ATLAS and CMS Detector Upgrades, project funding starts in FY17**
- **FY18 supports HL-LHC Accelerator Upgrade Project (MIE start) and design and R&D efforts for HL-LHC ATLAS and CMS detector upgrades**
  - HL-LHC Accelerator Upgrade Project *(MIE start in FY18)* **on schedule**
  - HL-LHC ATLAS and CMS detector upgrades **slightly delayed**
  - Project profiles have been adjusted to reflect project maturity and schedule constraints

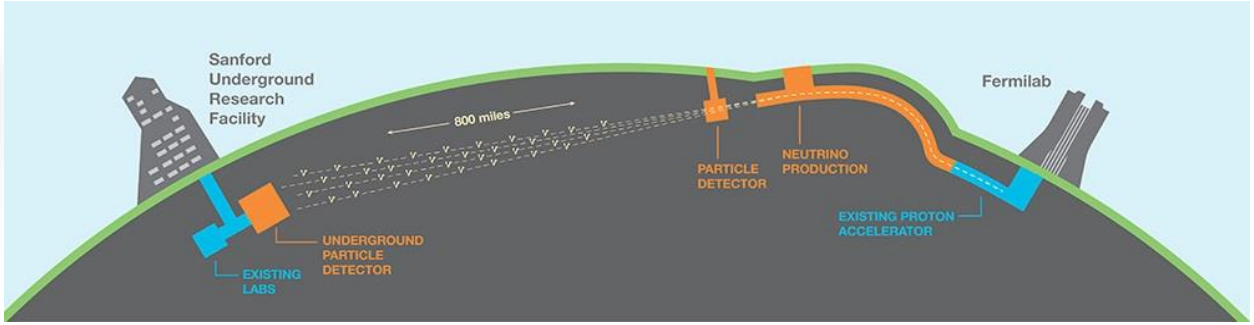
Intensity Frontier Program

Intensity Frontier experiments address the P5 Science Drivers through intense beams and sensitive detectors

- **Exploring the unknown through precision measurements:** *Muon g-2, Mu2e, Belle II, K0TO*
- **Identify the new physics of dark matter:** *Heavy Photon Search*
- **Pursuing the physics associated with neutrino mass:** *NOvA*, *Daya Bay*, *MINERvA*, *Super-K*, *T2K* ongoing; ramping up Fermilab Short-Baseline Neutrino Program (*MicroBooNE*, *SBND*, *ICARUS*)

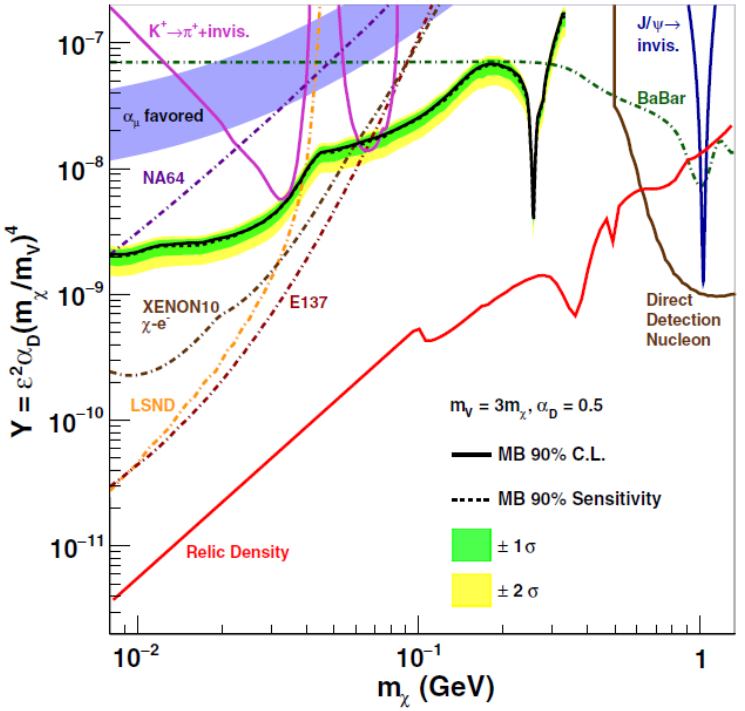
P5 recommended *Long Baseline Neutrino Facility (LBNF)* as the centerpiece of a U.S.-hosted world-leading neutrino program, recognizing it as the highest-priority large project in its timeframe

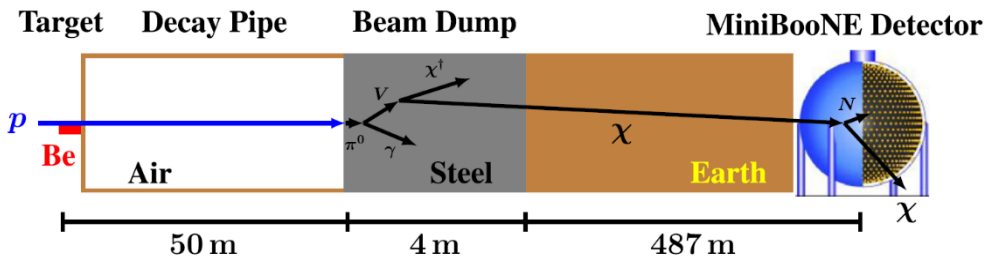
- **Given the compelling discovery potential, Fermilab is working closely with CERN and other global partners to establish a truly international "mega-science" facility with first physics in the mid-2020s**
  - Currently, over 950 collaborators from 161 institutions in 30 countries
- ***LBNF* will produce the world's most intense neutrino beam and send it 800 miles through the earth**
- **The *Deep Underground Neutrino Experiment (DUNE)* will be a large (40 kiloton) liquid argon neutrino detector located nearly 1 mile underground at the Sanford Underground Research Facility**
- ***LBNF/DUNE* project received CD-3A (initial far-site construction) approval in September 2016**



MiniBooNE-DM Sets New Limits on Dark Matter

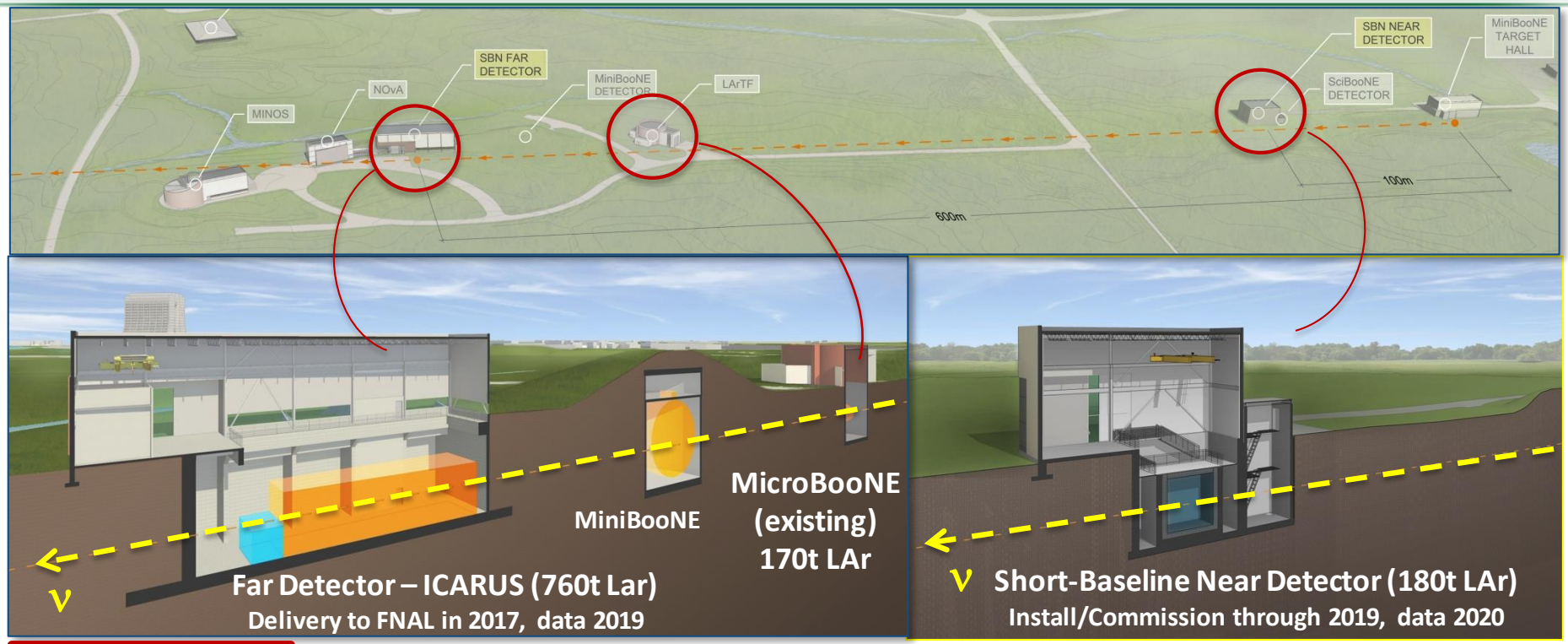
- **The MiniBooNE-DM Collaboration searched for vector-boson mediated production of dark matter**
  - Used Fermilab Booster proton beam in a dedicated run with a steel beam dump
- **MiniBooNE detector sensitive to dark matter via elastic scattering with nucleons in the detector mineral oil**
- **Best limit from a dedicated proton beam dump search in this mass and coupling range**
  - Demonstrates a novel and powerful approach to dark matter searches with beam dump experiments

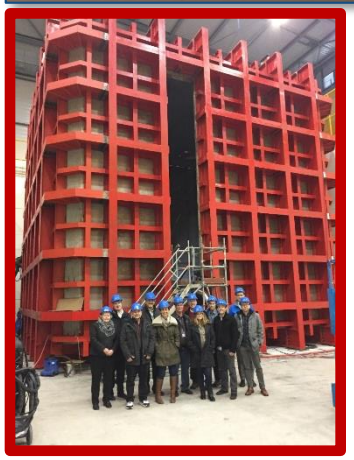




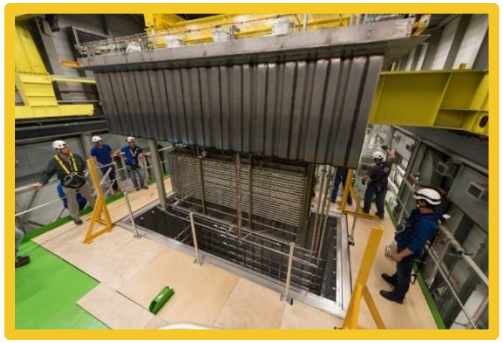
Science and Technology Advance Towards LBNF/DUNE:

Fermilab Short-Baseline Neutrino Program and ProtoDUNEs





CERN: Single-phase ProtoDUNE



CERN: Dual-phase ProtoDUNE Test Cryostat Insertion

- Fermilab Short-Baseline Neutrino Program will search for additional, "sterile" neutrinos while advancing detector technology for DUNE
- CERN Neutrino Platform will include 2 test beams and 2 cryostats for testing of full-scale DUNE prototypes (ProtoDUNEs)

Intensity Frontier: Status & Outlook

Project	TPC ($M)	CD Status	CD Date
Long Baseline Neutrino Facility / Deep Underground Neutrino Experiment (LBNF/DUNE)	1,300 – 1,900	CD-3A	September 1, 2016
Proton Improvement Project (PIP-II)	465-650	CD-0	November 12, 2015
Muon g-2	46.4	CD-3	August 20, 2015
Muon-to-Electron Conversion Experiment (Mu2e)	273.677	CD-3	July 14, 2016

- **Neutrino program will continue to advance and produce science results in FY18**
  - NOvA will be in its fourth year of data taking
  - Fermilab SBN: physics results from MicroBooNE, ICARUS begins data taking, SBND commissioning
  - ProtoDUNE will take data in the CERN beam in FY 2018
- **Precision measurement program will continue to advance and produce science results in FY18**
  - Results from Fermilab Muon g-2 experiment anticipates results from first physics data (just saw first beam!)
  - Belle II will take first data at the SuperKEKB accelerator in Japan
  - R&D, physics studies, and detector simulations will continue for Mu2e
- **Mu2e follows planned fabrication funding profile in FY18 Request**
- **In FY17, Congress provided LBNF/DUNE with an increase of $4.9M over the Request**
- **FY18 Request slows LBNF/DUNE investment growth vs. CD-3A**
  - FY 2018 investments enable international contributions on schedule, but delays project completion
- **FY18 Request delays PIP-II vs. CD-1 schedule**
- **FY18 Request provides reduced funding for the Fermilab Accelerator Complex**
  - Proposal to run 1,800 hours of Fermilab Accelerator Complex operations (37.5% of optimal 4,800) will require further discussion with Fermilab regarding program impacts

Cosmic Frontier Program

Study dark energy through staged program of complementary surveys (in partnership with NSF-AST)

- **Wide-area surveys map cosmic structure over vast volumes of space:** *Dark Energy Survey (DES)* operating, *Large Synoptic Survey Telescope (LSST)* camera in fabrication
- **Focused surveys build deep, 3D maps of cosmic structure and growth:** *eBOSS* operating, *Dark Energy Spectroscopic Instrument (DESI)* in fabrication

Search for dark matter through direct detection experiments over a wide mass range (in partnership with NSF-PHY)

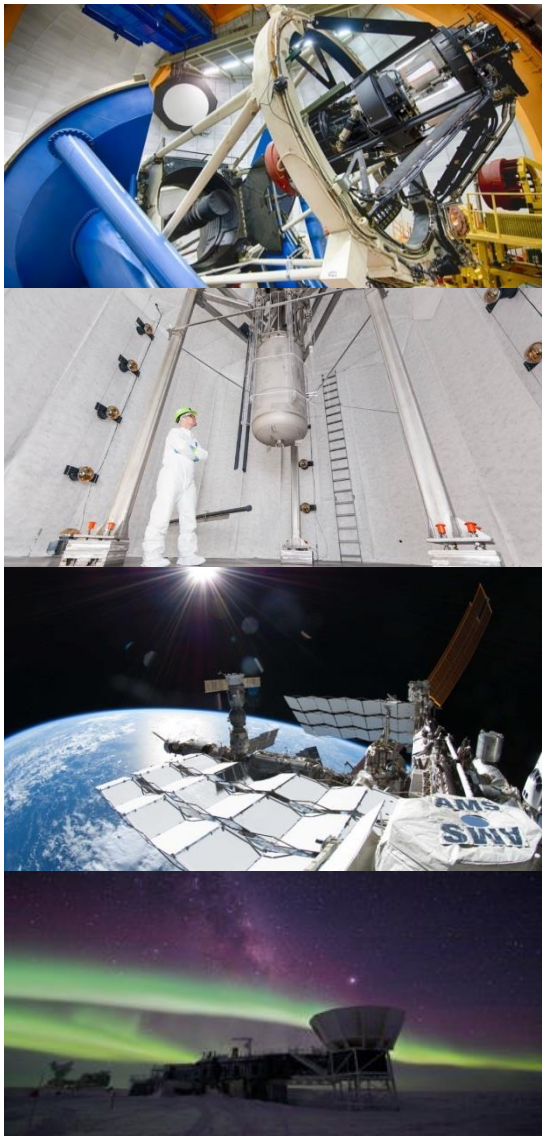
- **High- and low-mass WIMP sensitivity:** *LZ* and *SuperCDMS-SNOLAB*, in fab.
- **Axion (ultralow mass) experiment:** *ADMX-G2* in operation

Search for high energy particles, e.g. from dark matter annihilations in cores of galaxies (in partnership with NSF, NASA)

- **Cosmic- and gamma-ray detectors on Earth and in space:** *HAWC*, *Fermi/GLAST*, *AMS* in operation

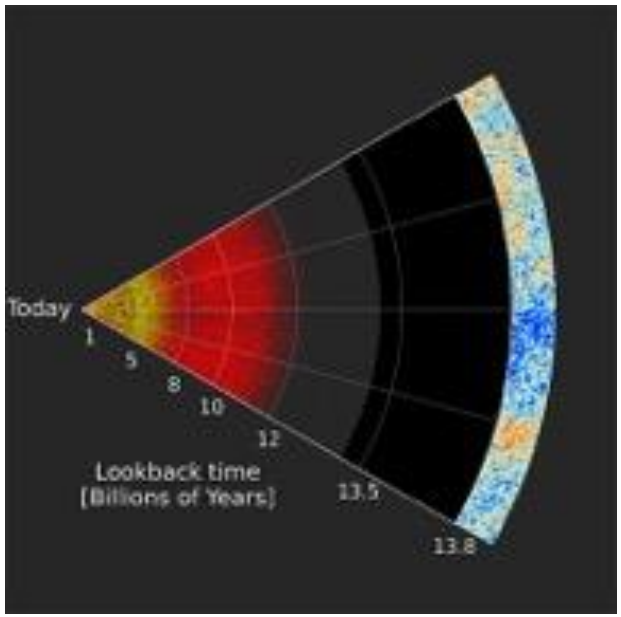
Study cosmic acceleration (inflation) at energies near the Planck scale and neutrino properties through the cosmic microwave background (CMB) (in partnership with NSF)

- **New generation South Pole experiment:** *SPT-3G* in operation
- **Next generation array 10x more sensitive:** *CMB-S4* in planning

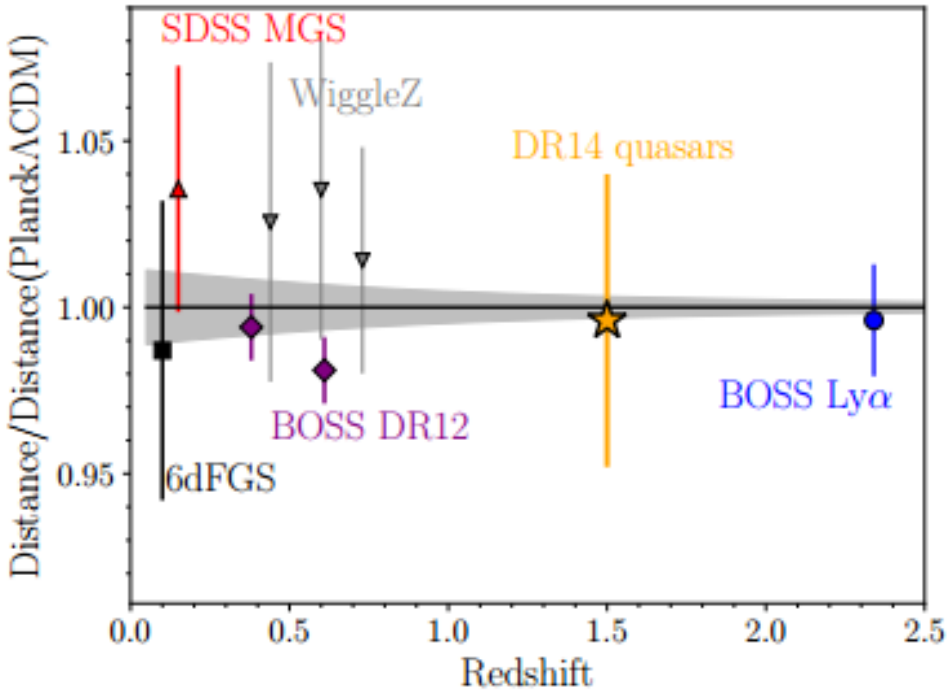


New Firsts in BAO Measurements by eBOSS

- **Extended Baryon Oscillation Spectroscopic Survey (eBOSS) dark energy experiment provides new baryon acoustic oscillation (BAO) measurements**
  - **First ever** measurement of BAO in redshift interval 1<z<2
  - **First ever** measurement of BAO with quasars (147,000 of them)
  - Measured BAO distance to **4.4% at z=1.52** (cosmic age of 4 billion years old)
  - Constrains $\Omega_\Lambda > 0$ **at 6.5σ** significance when testing ΛCDM model with free curvature



Red dots are eBOSS/SDSS quasars
Yellow dots are BOSS/SDSS galaxies



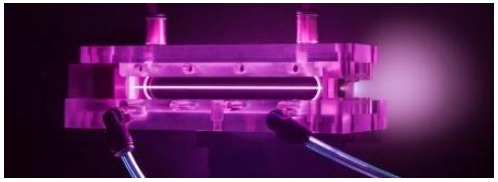
Cosmic Frontier: Status & Outlook

Project	TPC ($M)	CD Status	CD Date
LUX-ZEPLIN (LZ)	55.5	CD-3	February 9, 2017
Super Cryogenic Dark Matter Search - SNOLAB (SuperCDMS-SNOLAB)	16-21	CD-1	December 21, 2015
Dark Energy Spectroscopic Instrument (DESI)	56.328	CD-3	June 22, 2016
Large Synoptic Survey Telescope Camera (LSSTcam)	168	CD-3	August 27, 2015

- **Ongoing experiments continue:** AMS-2, HAWC, FGST, DES, eBOSS, SPT
- **FY17 progress of the SuperCMDS project was slower than expected, so funding was reduced to meet the planned activities**
- **FY17 Congressional appropriation directed HEP to spend:**
  - $12.5M for LZ, an increase of $2M over the FY17 Request
  - $12M for TEC for DESI, an increase of $3M over the FY17 Request
- **FY18 Request prioritizes efforts on LSSTcam and LZ, slows DESI and SuperCDMS-SNOLAB**
  - **LSSTcam and LZ projects follow their planned fabrication funding profiles**
    - LSSTcam receives final funding in FY 2018; LZ in FY 2019
  - **DESI to be rebaselined**
    - Coordinating with NSF-AST to support continuity of Mayall Telescope operations plan
  - **SuperCDMS-SNOLAB will be delayed as project transitions to fabrication**
    - Will coordinate with NSF-PHY and SNOLab management

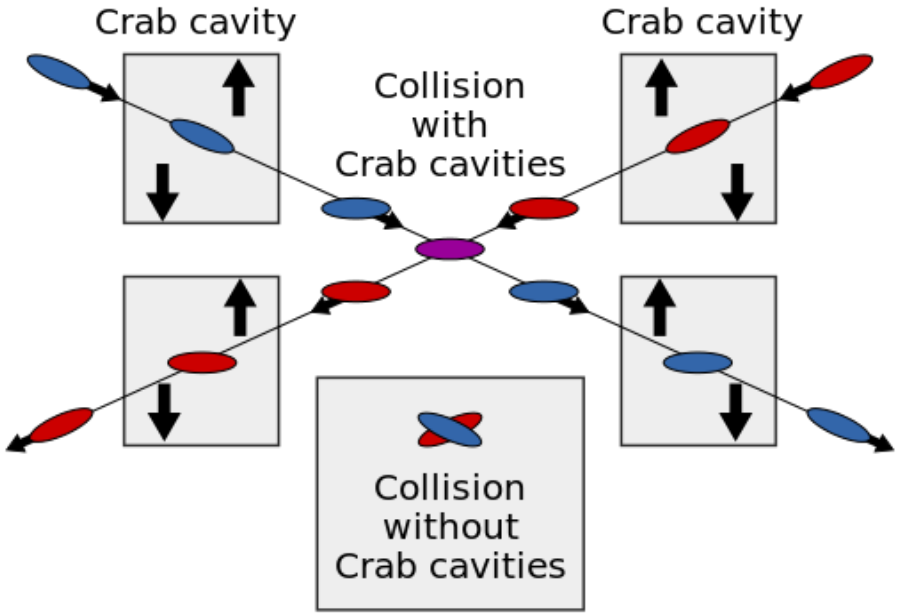
Enabling Discovery though Advanced Technology R&D

- **Advanced Technology R&D supports and advances research at all three experimental Frontiers**
  - Fosters cutting-edge research in the physics of particle beams, accelerator R&D, and particle detection
- **Three broad categories:**
  - **Near- to mid-term directed R&D** for specific facilities or technologies in support of current DOE projects
  - **Mid-term, facility-inspired R&D** focused on specific concepts or technologies to demonstrate feasibility
  - **Long-term, proposal-driven research** on the fundamental science to enable breakthroughs in size, cost, beam intensity, beam energy, and control
- **Recent results:**
  - Low-Loss Superconducting Radio-Frequency (SRF) Cavities using new processes developed by Fermilab
    - Linac Coherent Light Source II (LCLS-II) will be first beneficiary
  - Advances in laser-driven and beam-driven plasma wakefield accelerators
    - Could produce high-gradient accelerators for future machines
  - Record current in high-temperature superconductors
    - Could enable magnetic field levels that double existing particle collision energies
  - First commercial production of Large-Area Picosecond Photodetectors (LAPPDs)



Status of LARP Crab Cavities Effort for HL-LHC

- **R&D is moving forward on the Crab Cavities that are part of the current plan for the High Luminosity LHC (HL-LHC) accelerator upgrade**
  - Require compact SRF cavities
  - Twist proton bunches at interaction point to collide head-on
  - Level the luminosity and tune the collision pile-up density distribution
- **LHC Accelerator Research Program (LARP) spearheaded the design and initial development of the concept for the HL-LHC**
- **February 2017 three (naked) Crab Cavities were tested: all went well beyond the operating voltage of 3.4 MV**
  - One US-LARP DQW went up to 5.4 MV
  - One US-LARP RFD reached 4.03 MV
  - One CERN DQW went up to 5.04 MV
- **Good results for the Crab Cavity testing in the CERN SPS in 2018**



Double Quarter Wave (DQW) ready for final assembly at JLAB

RF Dipole (RFD) chemical processing

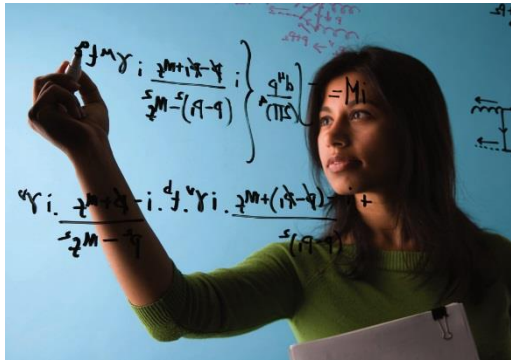
Advanced Tech. R&D: Status & Outlook

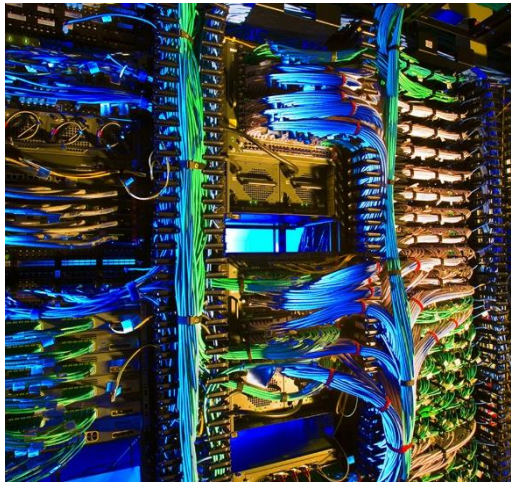
Project	TPC ($M)	CD Status	CD Date
Facility for Advanced Accelerator Experimental Tests II (FACET-II)	46-60	CD-1	December 21, 2015

- **HEP redirected $2 million of planned FY17 MAP funding to LARP program**
  - The U.K. funding agency, STFC, informed DOE that they would only support the MICE experiment, the primary deliverable of the MAP program, through mid-2017
- **FACET-II was a new start in the FY17 Request and could not begin under a Continuing Resolution**
  - HEP and SLAC developed the independent Section 10 Injector Infrastructure AIP to provide a stand-alone improvement independent of the FACET-II MIE that reduces the FACET-II MIE scope
- **FACET-II accelerator project will be delayed vs. CD-1 at the FY18 Budget Request**
  - Coordination with the BES LCLS-II project necessary to plan a new schedule for installation
- **FY18 Advanced Technology R&D Research priorities:**
  - **General Accelerator R&D:** Execute roadmaps developed with community, focus on AAC and SC magnets
  - **Directed Accelerator R&D:** LARP completes R&D for HL-LHC prototypes as funding transitions to HL-LHC projects. MAP receives final funding in FY17.
  - **Detector R&D:** Emphasis on long-term, high-risk, high potential impact efforts. Focus on advanced sensor development, possible synergy with QIS.

Theoretical and Computational Physics

- **Provides the mathematical, phenomenological, and computational framework to understand and extend our knowledge of the dynamics of particles and forces, and the nature of space and time**
  - **Theoretical research** essential for proper interpretation and understanding of the experimental research activities in other HEP subprograms
  - **Advanced computing** tools necessary for designing, operating, and interpreting experiments and scientific simulations that enable experimental discovery research
- **Implementing the P5 strategy requires advancing computing infrastructure to handle the exponentially increasing data and computing needs**
  - Partnerships with Advanced Scientific Computing Research (ASCR) are an important part of addressing HEP computing needs
  - HEP aims to optimally leverage DOE resources in developing future computing solutions to meet our mission needs
  - Cross-cutting efforts aim to prepare for future of computing, especially Exascale facilities





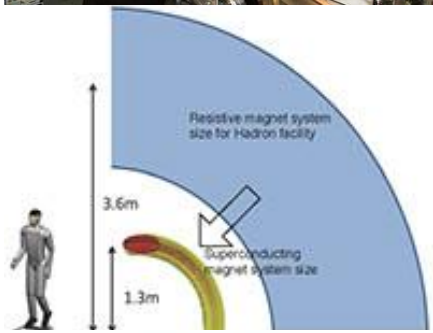
Theoretical and Comp. Physics: Status and Outlook

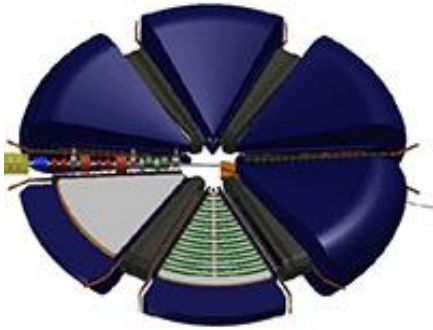
- **SciDAC re-competed in FY 2017 in partnership with ASCR**
  - New partnership with ASCR results in a lower level of funding necessary for SciDAC
  - Proposals under review, selections to be announced soon
- **Lattice Quantum Chromodynamics (LQCD) IT project receives final funding in FY 2017**
- **Increased funding in FY18 Request for Computational Physics will support new Quantum Information Science (QIS) and advanced computing initiatives**
  - QIS is Administration and SC priority which provided additional funds to HEP ($15M) in late stages of FY18 budget development
  - HEP to work with ASCR and other SC offices to develop R&D plan that takes advantage of particular HEP capabilities (e.g., theory, SRF cavities, sensor development)

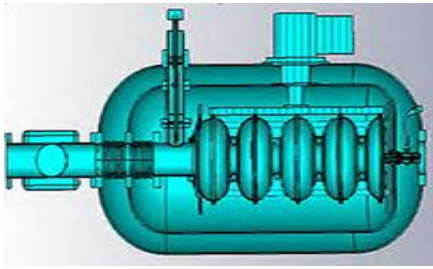
The Accelerator Stewardship Program

Support fundamental accelerator science and technology development of relevance to many fields and to disseminate accelerator knowledge and training to the broad community of accelerator users and providers.

- **Improve access to national laboratory accelerator facilities**
  - Make resources and facilities, such as Brookhaven National Laboratory's Accelerator Test Facility, available for industrial and for other U.S. government agency users and developers of accelerators and related technology
- **Develop innovative solutions to critical problems outside of the DOE Office of Science**
  - More performant, lower cost accelerators for medicine
  - 1000x speedup of laser-based science tools
  - Accelerator tech. for Energy & Environmental applications
- **Broaden and strengthen the community**
  - Bringing accelerator scientists, application scientists, and industrialists together to address high-impact challenges







Status & Outlook

- **FY18 Request will support research activities at laboratories, universities, and in industry for technology R&D areas such as laser, ion-beam therapy, and accelerator technology**
  - R&D on high power electron beam technologies for science and other applications will move from design studies to R&D
  - Test Facility Program will make SC accelerator infrastructure more readily available to non-DOE users
- **FY17 Stewardship FOA out now (see following slides)**

FY 2018 Budget Request: Research Subprograms

- **FY 2018 Request will reduce Research activities at the National Laboratories and Universities, with higher priority given to:**
  - Laboratory research programs that are critical to executing the P5 recommendations
  - R&D that requires long-term investments (i.e., "seeding the future") including Accelerator Stewardship, Detector R&D, and Quantum Information Science (QIS)
    - New funding for QIS initiative appears in Computational Physics Research
    - Advanced Technology R&D reductions are driven by MAP, LARP ramp downs

Research Subprogram ($ in thousands)	FY 2016 Enacted	FY 2017 Enacted	FY 2018 Request	FY18 vs. FY16	FY18 vs. FY16 (as % change)
HEP Experimental Frontier Research	175,514	178,906	134,040	-41,474	-23.6%
Advanced Technology R&D	82,215	83,839	54,151	-28,064	-34.1%
Theoretical Physics Research	48,615	48,429	33,850	-14,765	-30.4%
Computational Physics Research	8,829	7,696	23,213	+14,384	+162.9%
Accelerator Stewardship Research	5,643	6,703	8,953	+3,310	+58.7%
Total Research (no SBIR/STTR)	**320,816**	**325,573**	**254,207**	**-66,609**	**-20.8%**

FY17 FUNDING OPPORTUNITIES

FY 2017 Comparative Review Process

- **5 out of the 151 proposals were subsequently withdrawn by the respective sponsoring institutions**
  - 3 were **duplicate** submissions and 2 were **withdrawn** at request of the PIs
  - Led to **146 proposals** into the pre-screening stage for proposal's responsiveness to the subprogram descriptions and for compliance with the FOA requirements
- **After pre-screening, 10 'complete' proposals were declined before the competition:**
  - 4 proposals declined without review for reasons of **exceeding page limits** *(requirements given in FOA)*
  - 4 proposals were submitted with **non-compliant Data Management Plans** on the management of digital data for applications requesting support for research
    - **SC-wide requirement** for research-based solicitations issued on or after October 1, 2014
  - 1 was **outside the scope** of DOE/HEP supported research
  - 1 proposal was from a 'for-profit' organization, and thus **did not meet FOA eligibility** requirement
- **Proposals that were declined for "technical" reasons could re-submit to general DOE/SC solicitation**
- **For the FY17 HEP comparative review process, 136 proposals were reviewed, evaluated and discussed by several panels of experts who met in the:**

HEP Research Subprogram	Panel Deliberations	# of Total Proposals Reviewed [includes proposals containing multiple subprograms]
HEP Theory	November 7-9, 2016	30
Detector R&D	November 8-9, 2016	21
Intensity Frontier	November 9-10, 2016	33
Cosmic Frontier	December 5-7, 2016	26
Accelerator Science and Technology R&D	December 6-7, 2016	23
Energy Frontier	December 7-9, 2016	30

FY12–17 Review Data: Proposals & PIs

	HEP Total – Review by Proposals [across all 6 subprogram]					
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Received	136	185	129	146	156	146
Declined w/o Review	14	23	5	7	22	10
Reviewed	122	162 (58)	124 (71)	139 (79)	134 (69)	136 (69)
Funded	85	101 (20)	62 (17)	63 (16)	77 (20)	78 (20)
"Success Rate" (%)	70	62	50	45	57	57

	HEP Total – Review by Senior Investigators [across all 6 subprograms]					
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Received	253	504	285	326	363	403
Declined w/o Review	21	42	8	13	54	17
Reviewed	232	462 (113)	277 (97)	313 (128)	309 (111)	386 (112)
Funded	162	338 (40)	178 (31)	174 (24)	199 (31)	267 (39)
"Success Rate" (%)	70	73	64	56	64	69

- ( ) indicates number of proposals or PIs that <u>did not</u> receive DOE HEP funding in the prior fiscal year.
- "Success Rate" is = # Funded/ # Reviewed.
- FY 2017 proposal and PI success rates at 57% and 69%, respectively; comparable to the FY 2016 review.

FY 2017 Review Summary and PI Meeting

- **With respect to the FY 2016 Comparative Review**
  - FY 2017 had similar number of proposals reviewed but with larger research groups
    - 136 proposals (FY 2017) vs. 134 proposals (FY 2016)
    - 386 senior investigators (FY 2017) vs. 309 senior investigators (FY 2016)
  - Overall proposal average success rate similar at 57%
- **FY 2017 New and Renewal awards are now being processed**
- **FY 2018 Comparative Review FOA in development phase now, anticipated to be issued in June-July 2017 with final application due date in early-Fall 2017**
  - Comparative review subprogram panels scheduled for November 2017
- **To help inform PIs and research groups for the FY 2018 review, DOE/HEP organizing PI meeting sessions at APS/DPF Meeting on July 31 – August 4, 2017 at Fermilab**

Early Career Research Program

- There will be HEP Early Career awards in FY2017.
- Formal announcement of awards planned for the end of June.
- FY 2018 SC Early Career FOA in development.

U.S.-Japan FOA

- **First DOE/HEP joint funding opportunity with Japan (MEXT/KEK)**
- **Evolves "traditional" (since 1979) US-Japan program**
  - Required collaborative proposals with coordinated US and Japanese scope on joint research/R&D efforts.
  - Parallel proposals, separately reviewed/funded by each side
  - Separate program for ILC cost reduction R&D per DOE/MEXT mgmt.
- **DOE call posted November 2016 via FOA and lab call**
  - Proposals due Jan 2017. 41 applications received on US-side.
  - Mail/panel reviews in March
  - US/Japan sides exchanged info and met in early April to reconcile recommendations. Tentative selections endorsed by US-Japan Cooperation Committee in mid-April.
    - US priority on technology R&D.
  - PIs have been notified, selections being finalized now

FY 2017 Accelerator Stewardship FOA

- **DE-FOA-0001779 and LAB 17-1779, posted June 1, 2017**
  - Up to $3M in FY2017 funding for new awards
  - Note the highly accelerated deadlines
- **Track 1: Use-Inspired Basic R&D**
  - Eligibility: All domestic institutions
  - Topic Areas:
    - Particle Therapy Beam Delivery Improvements
    - Ultrafast Laser Technology Program
    - Energy & Environmental Applications of Accelerators
- **Track 2: Basic R&D**
  - Eligibility: All domestic accredited academic institutions or non-profits
  - R&D leading to significant increases in accelerator performance and/or decreases in cost
    - Must address a Stewardship Customer's identified R&D need.
- New! **Track 3: Accelerator Stewardship Test Facility Program**
  - Eligibility: All domestic institutions, except DOE labs
  - ≤12 month non-renewable award to use accelerator R&D infrastructure at SC Labs

DE-FOA-0001779 & LAB 17-1779

Pre-Applications DUE
June 15, 2017 (10 days!)

Encourage/Discourage Response:
June 23, 2017

Applications DUE:
July 17, 2017 (24 days!)

Award Notifications:
By Sept 30, 2017

- **Please read the FOA/LAB and the accompanying FAQs carefully**
  - It is incumbent on the PI to identify the Stewardship Customer and provide evidence of the Customer's support for their work
    - "Customer" and "evidence" are both defined in the FOA
  - Topic descriptions are specific for a reason
    - Please contact Eric Colby and discuss if clarification is needed
  - A Pre-application (2 pages) is required
  - Teaming and cost-sharing are strongly encouraged

FOA, LAB, and FAQs are posted at:
https://science.energy.gov/hep/funding-opportunities/


FUTURE LONG-TERM PLANNING

The Future of U.S. Particle Physics

- **DOE HEP continues the implementation of the 2014 P5 global vision for particle physics**
  - Strong community support has been crucial to the successful implementation of the P5 strategy so far
  - Continued community support is necessary to maintain our momentum with the U.S. Administration and Congress
- **At an appropriate point, the strategy for U.S. particle physics will need to be reevaluated and updated**
  - Discoveries and results from upcoming experiments will impact strategy for future investments
  - Further advance current R&D and planning activities conducted towards future projects
  - Updated strategy should be available in time to guide next round of major investments
- **As discussed at March 2017 HEPAP, from a DOE perspective, the appropriate timeline is:**
  - 2018: Anticipated Japanese decision on ILC
  - 2018-20: New NAS Astronomy and Astrophysics Decadal Survey
  - 2019: Start of European Strategy for Particle Physics process
  - 2020: Release of updated European Strategy for Particle Physics
  - **2020: Begin process to update the 2013 "Snowmass" report**
  - **2022: Release new P5 strategy report in time to inform FY 2024 budget**

NAS Role in Strategy for High Energy Physics

- **The community-driven "Snowmass" process, organized by the APS DPF, that lead up to the P5 report helped generate the high level of community support for the P5 strategy**
  - Important to retain this well-regarded part of the process
- **A National Academy of Sciences (NAS) decadal survey for high energy physics may be able to complement and strengthen the successful process the led up to the 2015 P5 report**
  - New Snowmass process could explore science opportunities in detail
  - NAS decadal survey could review detailed Snowmass output identify best science opportunities
  - Next P5 report would provide strategy for addressing science opportunities
- **Would like to explore this possibility further with NAS and APS DPF**

Take Away Messages

- **Maintain the Core of the DOE Science Mission (courtesy T. Hallman):**
  - Delivering exciting discoveries, important scientific knowledge and technological advances is what we do.
  - We need to stay focused and continue to deliver these outcomes for the nation
- **HEP is executing the P5 plan and delivering those discoveries:**
  - A few recent examples in this talk
  - FY 2017 Funding Opportunities and funding actions are moving forward
- **There are significant impacts of the FY 2018 Request in HEP Research, Operations and (to a lesser extent) Projects**
  - Some details (to the extent known) in this talk. Many more details yet to be worked out.
  - Choices had to be made. These decisions are owned by HEP management and issues should be directed to them.

U.S. DEPARTMENT OF
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HEP MIE Project Status

Subprogram	TPC ($M)	CD Status	CD Date
INTENSITY FRONTIER			
Long Baseline Neutrino Facility / Deep Underground Neutrino Experiment (LBNF/DUNE)	1,300 – 1,900	CD-3A	September 1, 2016
Proton Improvement Project (PIP-II)	465-650	CD-0	November 12, 2015
Muon g-2	46.4	CD-3	August 20, 2015
Muon-to-Electron Conversion Experiment (Mu2e)	273.677	CD-3	July 14, 2016
ENERGY FRONTIER			
LHC ATLAS Detector Upgrade	33	CD-3	November 12, 2014
LHC CMS Detector Upgrade	33	CD-3	November 12, 2014
High-Luminosity LHC (HL-LHC) Accelerator Upgrade	180-250	CD-0	April 13, 2016
High-Luminosity LHC (HL-LHC) ATLAS Detector Upgrade	125-155	CD-0	April 13, 2016
High-Luminosity LHC (HL-LHC) CMS Detector Upgrade	125-155	CD-0	April 13, 2016
COSMIC FRONTIER			
LUX-ZEPLIN (LZ)	55.5	CD-3	February 9, 2017
Super Cryogenic Dark Matter Search - SNOLAB (SuperCDMS-SNOLAB)	16-21	CD-1	December 21, 2015
Dark Energy Spectroscopic Instrument (DESI)	56.328	CD-3	June 22, 2016
Large Synoptic Survey Telescope Camera (LSSTcam)	168	CD-3	August 27, 2015
ADVANCED TECHNOLOGY R&D			
Facility for Advanced Accelerator Experimental Tests II (FACET-II)	46-60	CD-1	December 21, 2015

FY17 Comp. Review Data — by Proposal

	HEP Subprogram						HEP Total
	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	
Reviewed	30 (7)	33 (15)	26 (8)	50 (10)	21 (17)	21 (11)	136 (69)
Funded	24 (3)	16 (2)	18 (2)	38 (6)	8 (6)	11 (2)	78 (20)
Declined	6 (4)	17 (13)	8 (6)	12 (4)	13 (11)	10 (9)	58 (49)
"Success Rate" (%) (Previous/New)	80 (91/43)	48 (78/13)	69 (89/25)	76 (80/60)	38 (50/35)	52 (90/18)	57 (88/29)

NOTES:
- Single proposals with multiple research thrusts are counted multiple times [1/thrust]
- ( ) indicates number of proposals from research PI/groups that did not receive DOE HEP funding previously.
- "Success Rate" is = # Funded/ # Reviewed.

FY17 Comp. Review Data — by Senior PI

	HEP Subprogram						HEP Total
	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	
Reviewed	89 (9)	67 (18)	43 (15)	133 (26)	26 (21)	38 (23)	386 (112)
Funded	75 (5)	44 (2)	26 (2)	101 (16)	10 (8)	20 (6)	267 (39)
Declined	8 (4)	23 (16)	17 (13)	23 (10)	16 (13)	18 (17)	119 (73)
"Success Rate" (%) (Previous/New)	84 (88/55)	66 (86/11)	60 (93/13)	76 (81/62)	38 (40/38)	53 (93/26)	69 (83/35)

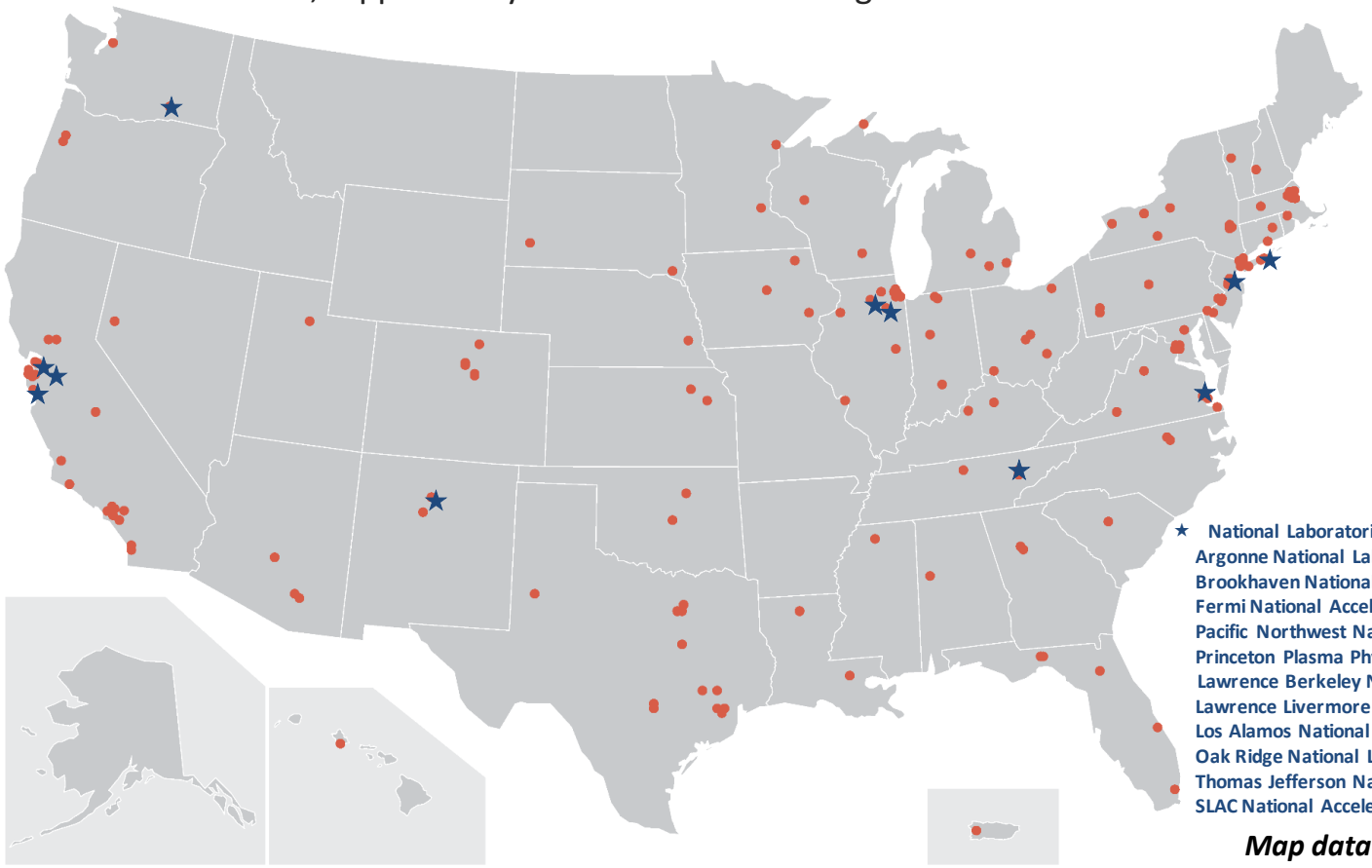
NOTES:
- ( ) indicates number of senior investigators that did not receive DOE HEP funding previously.
- "Success Rate" is = # Funded/ # Reviewed.
- Overall success rate in FY16 for previously (newly) funded DOE HEP PIs was 85% (28%).

Program Advice and Coordination

- **Formal advice (Federal Advisory Committee Act)**
  - High Energy Physics Advisory Panel (HEPAP)
    - Jointly serves DOE and National Science Foundation (NSF)
    - 2014: P5 long-term strategy report
    - 2015: Accelerator R&D Subpanel report
  - Astronomy and Astrophysics Advisory Committee (AAAC)
    - Advises DOE, NSF, and NASA on selected issues of mutual interest within the fields of astronomy and astrophysics
- **Community input**
  - National Academies of Science: Astronomy and Astrophysics Decadal Survey
    - 2010: New Worlds New Horizons in Astronomy and Astrophysics
  - Workshop reports
    - Quantum Sensors, Accelerator R&D Roadmaps, Technology Connections, etc.
- **International coordination**
  - CERN Council (LHC)
    - Governs CERN by defining its strategic programs, setting and following up its annual goals, and approving its budget
  - International Neutrino Council (LBNF/DUNE)
    - International consulting body DOE and Fermilab that facilitates high-level global coordination across the LBNF/DUNE enterprise

U.S. Particle Physics

- **In 2013, DOE HEP supported workforce consisted of 4,300 Full-Time Equivalent (FTE) workers**
  - 2,350 FTEs in Research and 1,950 FTEs providing operations & support
  - 2,600 FTEs at National Laboratories
  - 1,700 FTEs at Universities, supported by more than 250 active grants to >100 institutions



Map data from 2015

Particle Physics is both Global and Local. Scientists, engineers, and technicians at universities, institutes, and laboratories throughout the U.S. are working in partnership with their international colleagues to build high-tech tools and components, conduct scientific research, and train and educate the next generation of innovators. Particle physics activities in the U.S. attract some of the best scientists from around the world.