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Physics in the FY 2015 Budget

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HIGHLIGHTS

– Funding requested for physics-related programs supported by the Department of Energy's Office of Science (DOE-SC) would vary from an increase of 5.5 percent to a decrease of 17.6 percent between FY 2014 and FY 2015. Those programs would decrease a net of $5 million below the current fiscal year.

– The National Science Foundation (NSF) supports physics research mainly through its Division of Physics and its Division of Materials Research. From FY 2014 to FY 2015, funding for the Division of Physics would decrease by 1.0 percent. The Division of Materials Research would increase by 0.3 percent. The combined budgets for these divisions would drop by $2 million over the period. The Major Research Equipment and Facilities Construction account would rise by 0.4 percent, or $1 million.

– The National Institute of Standards and Technology (NIST) conducts physics research in two laboratories, a center and a user facility. Funding for the Materials Measurement Lab would increase by 8.7 percent. Proposed funding for the other physics-supporting components of NIST would remain unchanged from FY 2014 to FY 2015. The net increase across all four components would be 3.1 percent, or $10 million.

INTRODUCTION

Physics aims to discover fundamental principles of nature through experimentation and mathematics. It is a foundational science that underpins fields as diverse as chemistry, geosciences, engineering, and

biology. Physicists uncover properties of energy and matter, opening new ways to solve problems and seize opportunities in national security, energy, and healthcare. Physics research also drives the American economy with applications across sectors as broad as electronics, mining, telecommunications, agriculture, even finance.

Physics research is funded predominantly through DOE-SC, NSF, and NIST. Additional federal support for physics research is included in the budgets for the Department of Defense, National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Institutes of Health, and United States Geological Survey.

The Administration's FY 2015 budget would increase funding for DOE-SC, NSF, and NIST by 1.4 percent between FY 2014 and FY 2015, a rise of $178 million. The proposed physics budgets under these agencies would rise by less than 0.1 percent, an increase of $3 million.

Table 1. Physics in the Federal Budget
(budget authority in millions of dollars)

	FY 2013 Actual	FY 2014 Estimate	**FY 2015 Budget**	Change FY 14-15 Amount	Change FY 14-15 Percent
Department of Energy					
Office of Science	*4,681*	*5,066*	***5,111***	*45*	*0.9%*
Basic Energy Sciences	*1,551*	*1,712*	***1,807***	*95*	*5.5%*
Bio and Environ Research	*561*	*610*	***628***	*18*	*3.0%*
Fusion Energy Sciences	*378*	*505*	***416***	*-89*	*-17.6%*
High Energy Physics	*728*	*797*	***744***	*-53*	*-6.6%*
Nuclear Physics	*507*	*569*	***594***	*24*	*4.3%*
National Science Foundation	6,901	7,172	**7,255**	83	1.2%
Math and Phys Sci Directorate	*1,249*	*1,300*	***1,296***	*-4*	*-0.3%*
Physics Division	*250*	*266*	***264***	*-3*	*-1.0%*
Materials Research Division	*291*	*298*	***299***	*1*	*0.3%*
Major Research Equip & Facilities	*196*	*200*	***201***	*1*	*0.4%*
Natl Institute of Standards and Tech	769	850	**900**	50	5.9%
Physical Measures Laboratory	*125*	*132*	***132***	*0*	*0.0%*
Materials Measurement Lab	*104*	*115*	***125***	*10*	*8.7%*
Center for Neutron Research	*42*	*44*	***44***	*0*	*0.0%*
Center for Nanoscale Sci and Tech	*29*	*34*	***34***	*0*	*0.0%*

Sources: FY 2015 Budget of the United States, agency budget requests, and NIST budget office.
All figures rounded to the nearest million. Changes calculated from unrounded figures.

DEPARTMENT OF ENERGY

The Department of Energy Office of Science supports fundamental energy research and is the leading source of funding for basic research in the physical sciences, including physics, chemistry, and applied mathematics. DOE-SC also pursues advances in cross-cutting energy-related fields including nanotechnology, materials science, and advanced computing. DOE-SC funds 22,000 researchers at 17 national laboratories and more than 300 universities.

DOE-SC user facilities and national laboratories enable government, industry and academic users to pursue large-scale projects. An estimated 28,000 U.S. researchers and international partners are expected to use DOE-SC facilities in FY 2015.

The FY 2015 DOE-SC budget of $5.1 billion would increase funding by 0.9 percent ($45 million) from the FY 2014 appropriation. The Office of Science supports physics research through the following programs:

Basic Energy Sciences (BES): BES supports fundamental research to understand, predict, and control matter and energy. This research lays the groundwork for new and cleaner energy technologies and pursues national security objectives. In FY 2015, BES will continue to support Energy Frontier Research Centers (EFRCs) and two Energy Innovation Hubs (Fuels from Sunlight and Batteries and Energy Storage). BES national user facilities include four light sources, two neutron scattering centers, and five research centers for nanoscale science with electron beam characterization capabilities.

The BES budget proposed new investment in computational materials sciences to develop community codes for new materials design. The request also funds the construction of the Linac Coherent Light Source-II and operations and equipment at the National Synchrotron Light Source-II and the Advanced Photon Source.

The BES budget request of $1.8 billion represents a 5.5 percent ($95 million) increase from the FY 2014 appropriation.

Biological and Environmental Research (BER): BER supports research in genomics, biofuel production, carbon storage, and contaminant bioremediation. BER also supports atmospheric, earth, ocean, and subsurface sciences to improve understanding of climate dynamics, energy, and resource needs. Funding priorities include climate modeling,

software code improvements, and new data analysis and visualization activity.

The BER budget request of $628 million represents a 3.0 percent increase ($18 million) from the FY 2014 appropriation.

Fusion Energy Sciences (FES): FES supports research to understand the behavior of matter at high densities and temperatures to develop fusion energy. FES funds operations at experimental facilities including the Princeton Plasma Physics Laboratory that will resume operations after its upgrade. The request also would supply the U.S. contribution to the International Thermonuclear Experimental Reactor (ITER) project. Other FES priorities include computer simulation, advanced materials development, improved measurement techniques, basic plasma science, and high energy density plasma physics.

The FES budget request of $416 million represents a 17.6 percent decrease ($89 million) from the FY 2014 appropriation.

High Energy Physics (HEP): HEP research strives to understand how the universe works, probing the nature of matter, energy, space and time. HEP resources fund the operations and/or upgrades of the Large Hadron Collider, the Muon to Electron Conversion Experiment project, and the Large Synoptic Survey Camera. HEP-supported research also aims to increase understanding of dark energy, dark matter, neutrinos, and superconducting magnet technology.

The HEP budget request of $744 million represents a 6.6 percent decrease ($53 million) from the FY 2014 appropriation.

Nuclear Physics (NP)*:* NP supports research on forms of nuclear matter. The budget request would support construction of the Facility for Rare Isotope Beams at Michigan State University. The budget request also supports continued operation and research at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory, the Tandem Linac Accelerator System at Argonne National Laboratory, and the Continuous Electron Beam Accelerator Facility at the Jefferson Lab.

The NP budget request of $594 million represents a 4.3 percent increase ($24 million) from the FY 2014 appropriation.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation supports physics primarily through two divisions in its Directorate for Mathematical and Physical Sciences and through the Major Research Equipment and Facilities Construction account. Although the total NSF budget would increase under the request, the two divisions supporting physics would see a small net decline and the construction account would receive a small increase.

The NSF budget request of $7.3 billion represents a 1.2 percent increase ($83 million) from the FY 2014 appropriation.

Division of Physics (PHY): PHY funds physics research across several fields, including atomic, molecular, optical, and particle physics. The division supports gravitational, nuclear, and theoretical physics, as well as the physics of living systems. PHY also funds operations and maintenance at the Laser Interferometer Gravitational Wave Observatory, the Large Hadron Collider, the National Superconducting Cyclotron Facility, and the Ice Cube Neutrino Observatory.

The PHY budget request of $264 million represents a 1.0 percent decrease ($3 million) from the FY 2014 appropriation.

Division of Materials Research (DMR): DMR supports materials science through research in condensed matter physics and solid-state chemistry. Such research advances knowledge of materials that are multifunctional, hybrid, electronic, photonic, metallic, superconducting, ceramic, polymeric, biological, and nanostructured, with significant implications for the commercial, security, environmental, health, and energy sectors.

DMR-supported research also contributes to cross-cutting NSF priorities, including the Science, Engineering and Education for Sustainability program; the Cyber-enabled Materials, Manufacturing, and Smart Systems framework; and the Biological and Mathematical and Physical Sciences program.

The DMR budget request of $299 million represents a 0.3 percent increase ($1 million) from the FY 2014 appropriation.

Major Research Equipment and Facilities Construction (MREFC): MREFC supports acquisition, construction and commissioning of major research facilities and equipment. No new starts are proposed for FY

2015. Three ongoing projects would be funded: the Daniel K. Inouye Solar Telescope ($25 million), the Large Synoptic Survey Telescope ($80 million), and the National Ecological Observatory Network ($96 million).

The MREFC budget request of $201 million represents a 0.4 percent increase ($1 million) from the FY 2014 appropriation.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

The National Institute of Standards and Technology facilitates industry research through user facilities and conducts research in partnership with industry. Such research, combined with NIST standards development, supports U.S. industrial competitiveness.

NIST supports physics research through the Physical Measurement Laboratory (PML), the Material Measurement Laboratory (MML), the NIST Center for Neutron Research (NCNR), and the Center for Nanoscale Science and Technology (CNST). The budget proposes a $10 million increase for MML. Funding for PML, NCNR and CNST would remain unchanged.

The total NIST budget request of $900 million represents a 5.9 percent increase ($50.0 million) from the FY 2014 appropriation.

Physical Measurement Laboratory (PML): PML develops national standards of length, mass, force and shock, acceleration, time and frequency, electricity, temperature, humidity, pressure and vacuum, liquid and gas flow, and electromagnetic, optical, microwave, acoustic, ultrasonic, and ionizing radiation. The lab's activities range from fundamental measurement research to the provision of measurement services, standards, and data.

FY 2015 priorities include areas such as advanced communications, nanomanufacturing, medical imaging, environmental protection, photonics, and standards related to electronics, air conditioning, and atomic clocks.

The PML budget request of $132 million is unchanged from the FY 2014 appropriation.

Materials Measurement Laboratory (MML): MML is a national reference laboratory for measurements in material, biological, and

chemical sciences. It supports fundamental and applied research on the composition, structure, and properties of industrial, biological, and environmental materials and processes. MML also administers programs that support measurement quality.

MML has identified several priorities in subjects such as advanced materials, bioscience, electronics, energy, environment, food safety, manufacturing, infrastructure, and homeland security.

The MML budget request of $125 million represents an 8.7 percent increase ($10 million) from the FY 2014 appropriation.

NIST Center for Neutron Research (NCNR): NCNR operates a national user facility providing neutron-based measurement capabilities to U.S. researchers from industry, academia, and government agencies in support of materials research, neutron imaging, chemical analysis, neutron standards, dosimetry, and radiation metrology.

NCNR priorities for FY 2015 center on energy efficiency, alternative energy, fuel cells, drug development, environment, advanced computing, and data storage. NCNR also will work to understand the performance of materials in public infrastructure, industrial products, and military devices.

The NCNR budget request of $44 million is unchanged from the FY 2014 appropriation.

Center for Nanoscale Science and Technology (CNST): CNST is a national resource for nanoscale science and the only federal nanocenter focused on commerce. The center provides nanoscale measurement and fabrication tools that underlie progress in nanotechnology, serving America's industrial and scientific research communities.

CNST priorities include nanoscale fabrication and characterization, electronics, solar technologies, and training new nanotechnologists.

The CNST budget request of $34 million is unchanged from the FY 2014 appropriation.