NIST Boulder is located in a rich research environment near the University of Colorado (CU) Boulder, and collaborates with industrial, academic, and government laboratories throughout the nation and the world. NIST and CU-Boulder jointly operate JILA, a world leader in atomic, molecular, and optical physics and precision measurement.

NIST Boulder has more than 350 scientific, technical, and support staff, and more than 300 visiting researchers, students, and contractors. NIST Boulder and NIST/JILA scientists have been awarded three Nobel Prizes in physics, a National Medal of Science, and two MacArthur Fellowship “genius grants.”

With an annual research and measurement budget of about $100 million, NIST Boulder is part of the U.S. Department of Commerce's National Institute of Standards and Technology, headquartered in Gaithersburg, Md.

CONTACT:
Dr. Kent B. Rochford, Director
NIST Boulder Laboratories
Communications Technology Laboratory
(303) 497-5285  kent.rochford@nist.gov

www.nist.gov  cover photo: Christina Kiffney Photography

A world leader in the physical sciences and precision measurement for more than 60 years, NIST Boulder Laboratories provide research, measurements, technology, tools, data, and services that enable innovation and improve the quality of our lives.

Support for Manufacturing and Innovation: NIST Boulder develops and supplies measurement tools, test methods, and scientific data that businesses need to invent, innovate, and produce high-quality products for electronics, communications, optics, nanotechnology, public safety, biosciences, forensics, defense, and environmental applications.

Technologies for Everyday Life: NIST Boulder makes possible many commonplace technologies—such as accurate wristwatches and GPS navigation systems, advanced communications networks, DVD players, safe laser surgery, and reliable gas pipelines.

RESEARCH AND SERVICES HIGHLIGHTS

Timekeeping: Computer clocks and other timekeeping devices are linked to the U.S. civilian standard atomic clocks, NIST-F1 and NIST-F2, located at NIST Boulder. NIST official time is disseminated to devices via the Internet about 7 billion times a day (as of late 2014). NIST time also regularly updates about 50 million devices by radio and is used to time-stamp hundreds of billions of dollars in financial transactions every business day. NIST precision time standards underpin telecommunications systems, GPS positioning and navigation, electric power distribution, and TV and radio broadcasts. NIST also develops world-leading next-generation atomic clocks.

Advanced Communications: NIST has pioneered communications technologies for many decades, beginning in the early days of radio. The current focus is on the latest wireless advances, including cellular and data communications and public safety networks. NIST Boulder conducts advanced research related to materials, waveform measurements, antennas, and networks and develops instruments and methods for testing next-generation “5G” cellular devices and systems. NIST Boulder also supports a collaborative test bed to improve public safety communica-
ions, and a national network of federal, academic, and commercial test facilities to help develop and deploy technologies for sharing wireless channels, or spectrum.

Laser Measurements and Applications: NIST Boulder provides tools and services for measuring laser power, energy, and safety. This helps to ensure quality control in manufacturing and improve products and processes for telecommunications, health care, cutting and welding of materials, and defense applications. NIST Boulder offers calibrations for a greater range of laser wavelengths and power levels than any other national metrology institute in the world. NIST Boulder also houses the nation’s leading laboratory for measuring industrially important properties of fluids. The work has diverse impacts, from contributing to novel techniques for arson investigation to improving the reliability of chemical data.

ADVANCED FACILITIES AVAILABLE FOR COLLABORATIONS

700 MHz Public Safety Broadband Demonstration Network
NIST is a partner in the Public Safety Communications Research program, which operates a multi-vendor demonstration site enabling manufacturers, carriers, and public safety agencies to test and evaluate advanced broadband communications equipment and software for emergency first responders.

Boulder Microfabrication Facility
NIST designs and produces custom microfabricated devices for its research and measurements to support electrical standards, homeland security, quantum sensors, and quantum computing experiments. NIST Boulder also fabricates unique devices used by external partners for applications such as precision astronomical research and laser radiometry. The facility houses more than 50 deposition and etching systems for microelectronics fabrication.

Precision Imaging Facility
NIST Boulder provides four instruments for precisely measuring the structure and chemical composition of materials at sub-nanometer scales: a helium ion microscope, a focused ion beam/scanning electron microscope, a transmission electron microscope, and a field ion microscope, or atom probe.

A NIST-developed microscopy technique was used to map the elasticity (yellow means stiffer; purple, more flexible) and topography of a plant cell wall. Measuring mechanical stiffness in plants helps researchers understand correlations between nanoscale structure and biofuel yield.

Credit: NIST

Credit: NIST

Credit: Paul Trantow/Altitude Arts

The newest U.S. civilian time standard, NIST-F2 is the world’s most accurate time standard (as of late 2014).
Credit: NIST

NIST staff are conducting research on advanced communications to improve broadband wireless and the quality and interoperability of public safety communications.
Credit: Paul Trantow/Altitude Arts

Inspecting a wafer inside a process chamber in the Boulder MicroFab, a crucial resource for NIST research.
Credit: NIST

A NIST-developed microscopy technique was used to map the elasticity (yellow means stiffer; purple, more flexible) and topography of a plant cell wall. Measuring mechanical stiffness in plants helps researchers understand correlations between nanoscale structure and biofuel yield.

Credit: NIST

A NIST-developed microscopy technique was used to map the elasticity (yellow means stiffer; purple, more flexible) and topography of a plant cell wall. Measuring mechanical stiffness in plants helps researchers understand correlations between nanoscale structure and biofuel yield.

Credit: NIST

A NIST-developed microscopy technique was used to map the elasticity (yellow means stiffer; purple, more flexible) and topography of a plant cell wall. Measuring mechanical stiffness in plants helps researchers understand correlations between nanoscale structure and biofuel yield.

Credit: NIST

Precision Imaging Facility
NIST Boulder provides four instruments for precisely measuring the structure and chemical composition of materials at sub-nanometer scales: a helium ion microscope, a focused ion beam/scanning electron microscope, a transmission electron microscope, and a field ion microscope, or atom probe.