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News Briefs

Developments

EXPORTERS URGED TO FOLLOW PROPOSED EC STANDARDS

The Commission of the European Communities (EC) is acting swiftly to turn the 12 member countries into a single integrated market of 320 million people by the end of 1992. EC legislation dealing with standardization is likely to have a profound effect on U.S. exports, predicts an NIST report. The report recommends U.S. business interests should establish communications with European subsidiaries, distributors, or their American industry associations to obtain up-to-date information on the development of European directives and standards. U.S. companies also are urged to seek and take opportunities to comment on, and attempt to influence, proposed European directives and standards. The NIST report contains a list of EC and U.S. government contacts for information on various aspects of EC activities related to standardization.

To obtain a copy of A Summary of the New European Community Approach to Standards Development (NBSIR 88-3793-1), send a self-addressed mailing label to: Patrick W. Cooke, Office of Standards Code and Information, A629 Administration Building, National Institute of Standards and Technology, Gaithersburg, MD 20899.

USING ELEVATORS FOR THE HANDICAPPED DURING A FIRE

Evacuating the handicapped during a fire has long been a concern to the fire protection community. Elevators would be an ideal solution, except for a number of fire-related problems including the "piston effect," which potentially can pull smoke and toxic gases into an elevator lobby as the elevator car moves upward. In a joint project, researchers at NIST and the National Research Council of Canada (NRCC) are developing smoke control technology for elevators and, most recently, analyzed the problem of piston effect. Several concepts for smoke control currently are being tested at NRCC's full-scale research tower. As part of the project, NIST and NRCC jointly will develop practical engineering design information for elevator smoke control.

NEW DIAGRAM FOR PREDICTING WELD PHASES

NIST researchers have produced a new, more accurate diagram for predicting the ferrite content of stainless steel welds. Knowledge of the ferrite content is important because, when held to within a certain small range, it helps to control the properties of the weld. Too low a ferrite content can cause cracking and too high a content can increase the rate of corrosion. The new diagram, developed in cooperation with the Colorado School of Mines and the Welding Research Council, was produced from a database containing more than 950 alloy composites from worldwide sources. It is more accurate than the two most commonly used diagrams, termed DeLong and Schaeffer.

For more information, contact Thomas A. Siewert, Fracture and Deformation Division, National Institute of Standards and Technology, Boulder, CO 80303.

HIGH ACCURACY SATELLITE TIME TRANSFER

Satellites have been used for over 25 years for dissemination of highly accurate time information. The coverage, however, has been restricted to certain areas of the Earth's surface. Now, NIST scientists can utilize several commercial communication satellites to disseminate a time signal whose eventual coverage will be worldwide. It will be an

extremely accurate signal—to within 1 nanosecond (1 billionth of a second). The experimental service was initiated recently using domestic U.S. satellites and will be extended to an Intelsat satellite; users require both a receiver and a transmitter. For more information, contact Dave Howe, Time and Frequency Division, National Institute of Standards and Technology, Boulder, CO 80303.

GOSIP APPROVED AS FEDERAL STANDARD

The Government Open Systems Interconnection Profile known as GOSIP was approved recently by the Secretary of Commerce as a Federal Information Processing Standard. (FIPS are developed by NIST for use by the federal government.) GOSIP defines a common set of data communication protocols which enable computer systems developed by different vendors to communicate and enable the users of different applications on these systems to exchange information. GOSIP is based on agreements reached by vendors and users of computer networks in workshops organized by the NIST National Computer and Telecommunications Laboratory.

Order FIPS PUB 146, Government Open Systems Interconnection Profile (GOSIP) from the National Technical Information Service, Springfield, VA 22161.

EXPANDED COAXIAL NOISE CALIBRATION AVAILABLE

NIST now can calibrate noise sources in the 8 to 12 GHz range for government and industry. The calibration is achieved using an automated radiometer and a cryogenic coaxial noise standard. With the addition, the system now routinely calibrates noise sources from 2 to 12 GHz at all frequencies and at all noise power spectral densities below 18,000 K. Measurement uncertainties range typically from 1 to 3 percent. In principle, there is no limitation on the type of coaxial connector. Current connectors are precision N, APC7, and GR900 as well as various rectangular waveguide flange connectors. The service is valuable to users since noise is the ultimate limiting factor in electromagnetic system performance. Manufacturers and users of high-precision electronic and communications equipment desire low-noise products so the products themselves don't distort the signal being generated, amplified, and received.

For more information contact George J. Counas, Division 723.02, National Institute of Standards and Technology, Boulder, CO 80303, 303/497-3664.

U.S., CANADA LABORATORY ACCREDITATION TO FACILITATE INTERNATIONAL TRADE

The U.S. National Institute of Standards and Technology (NIST) and the Standards Council of Canada (SCC) signed an agreement that will help reduce trade barriers between the world's two largest trading partners.

The agreement—signed by Ernest Ambler, NIST director, and John R. Woods, SCC executive director—provides mutual recognition of testing laboratories which are accredited by the NIST National Voluntary Laboratory Accreditation Program (NVLAP) and SCC National Accreditation Program for Testing Organizations (NAPTO).

The agreement is in accord with provisions of the assigned U.S.-Canada free trade agreement that is to go into effect January 1, 1989 pending approval by legislators in both countries. Under the free trade agreement, each party shall provide recognition of the accreditation systems for testing facilities, inspection agencies, and certification bodies of the other party.

The laboratory accreditation systems administered by NIST and SCC are voluntary; participation is not mandated by law in either country. NIST and SCC base their decision to accredit a testing laboratory on similar but not identical criteria. Officials responsible for administering each system have participated in assessment visits to testing laboratories accredited under the other national program.

The NVLAP program, established in 1976 and managed by the NIST Office of the Associate Director for Industry and Standards, is a voluntary "umbrella" system designed to assess the competence of laboratories to perform specific tests. "Competence" is determined by evaluating applicant laboratories to assure that they have the equipment, staff, and procedures necessary to perform prescribed tests in accordance with nationally or internationally accepted standards or test methods.

Currently, approximately 200 laboratories are accredited in programs administered by NIST for thermal insulation, carpet, solid-fuel room heaters, acoustical testing services, personnel radiation dosimeters, commercial products (paint, papers, and plastics), building seals and sealants, construction materials testing services, electromagnetic compatibility and telecommunications equipment, computer network protocols, and asbestos.

The Canadian NAPTO program was established in 1980. Formal recognition of competence in managing and performing specific tests has been granted to 49 private sector and government

laboratories in scientific, engineering and technological fields including: biological, chemical, electrical, mechanical, nondestructive, and physical and calibration testing. Testing organizations accredited under the SCC program form part of the National Standards System of Canada.

The agreement with the Standards Council of Canada is the fourth pact between NIST and a foreign laboratory accreditation system. NIST also has agreements with Australia's National Association of Testing Authorities, the National Testing Laboratory Scheme of the United Kingdom's National Physical Laboratory, and Testing Laboratory Registration Council of New Zealand.

For further information on NAPTO, or the NIST NVLAP program, contact: Manager, Laboratory Accreditation, A527 Administration Building, National Institute of Standards and Technology, Gaithersburg, MD 20899, 301/975-4016.

FIVE NIST PROJECTS WIN 1988 R&D 100 AWARDS

Five research projects in instrumentation and measurement technology from the Commerce Department's National Institute of Standards and Technology (NIST) received R&D 100 Awards.

R&D 100 Awards are bestowed annually by *Research & Development* magazine to highlight 100 significant technical products of the preceding year. NIST has now received 62 R&D 100 Awards since first entering the competition in 1973.

The 1988 award-winning projects include:

Optical Waveguide Dosimeter

William L. McLaughlin of the NIST Center for Radiation Research and Branislav Radak, a guest scientist from the Boris Kidric Institute in Yugoslavia, developed an extraordinarily versatile ionizing radiation dosimeter around the concept of radiation-sensitive dyes.

Colorless compounds that take on color when irradiated, "radiochromic dyes" have been in use for some years as one-shot, disposable dosimeters for industrial radiation processing, an application that McLaughlin pioneered.

In the new invention, the dyes are used in the core of a long fiber-optic tube that can be coiled into a small space, about 2 centimeters square. A light source at one end and a detector at the other read changes in the dye.

Because the light path can be quite long even in a small detector, the instrument can be made extremely sensitive. The optical waveguide dosimeters can function over a range from about 0.005 to 10,000 gray.

They will register either pulsed or steady radiation fields, and can measure accurately both dose and dose rates of x and gamma rays, neutrons, and charged-particle beams.

By selecting from a variety of available radiochromic dyes and plastics, researchers can tailor the dosimeters to have special properties, such as matching the radiation interaction characteristics of tissue for medical applications and radiation protection.

Cone Calorimeter

Vytenis Babrauskas and William Twilley of the NIST Center for Fire Research developed an apparatus which provides the data critical to predicting the fire hazard of a product from a small sample of material.

The instrument, known as the NIST Cone Calorimeter, measures the heat released and the rate at which it is released, the time it takes for a material to ignite, the amount of smoke produced, and the amount of several known toxic gases. Equipment previously available could not measure as many fire properties.

Both the ASTM and the International Organization for Standardization are proposing voluntary fire hazard test methods based on the NIST Cone Calorimeter. Commercial units now are sold by two U.S. manufacturers and a rapidly growing number are in use worldwide.

System for Absolute Determination of Aqueous Electrolyte Conductivity

Three NIST researchers constructed a device that determines the "absolute" electrical conductivity of aqueous (water-based) solutions and can be used as a primary standard against which other instruments may be compared.

The unique feature of the device is its measurement cell. Other available systems rely on cells of fixed geometry and work by comparing a solution of unknown conductivity to a standard calibration solution of known conductivity. These instruments typically are accurate to 0.1 percent.

The NIST system uses a variable cell size and does not have to be calibrated. Because its results are traceable to the physical standards of mass, length, and electrical resistance, the new device provides an "absolute" conductivity determination with an accuracy of 0.02 percent.

It also features extremely accurate temperature control, which is important because conductivity measurements are dependent on temperature.

The device has many potential applications. Standards laboratories desiring an absolute measuring system could adapt it. Other laboratories could use the device to calibrate existing conductivity measuring instruments. Oceanographers could employ it in measuring seawater salinity, and environmental scientists could determine dissolved solids.

With minor modifications, the device also could be used as a reliable indicator of water purity. Because contaminants change the electrical conductance of water, a measurement of a sample's conductance is a test of its purity. Such an instrument would be valuable in the pharmaceutical, electrical power, and electronics industries, which rely on pure water for their products.

The NIST system for absolute determination of aqueous electrolyte conductivity was developed by Drs. Yung Chi Wu, Kenneth W. Pratt, and William F. Koch, all of the NIST Center for Analytical Chemistry.

Trace Measurement System

Computers known as multiprocessors use more than one computing element, or "processor," to simultaneously solve many pieces of a problem. While multiprocessors can speed the processing of data, they also have unique problems including unbalanced processing loads, uneven flow of information, and an increased likelihood of communications bottlenecks.

Three researchers in the NIST National Computer and Telecommunications Laboratory developed tools to help measure the performance of multiprocessors. The ability to measure performance helps users evaluate and compare machines and manufacturers improve future designs.

Through a single circuit board added to the computer system, the Trace Measurement System (TRAMS), can measure key characteristics of a program such as the time it takes to execute a piece of code and how frequently a piece of code is executed.

Unlike other measurement systems now on the market, TRAMS is significantly simpler and, more importantly, does not disturb the operation being measured. Disturbances, or "perturbations," can alter the performance of a multiprocessor, making the results of the measurement meaningless.

NIST researchers Robert J. Carpenter, John W. Roberts, and Alan Mink developed the measurement system with partial sponsorship from the Defense Advanced Research Projects Agency.

Image-Preserving Optical Delay

Edward F. Kelley of the NIST Center for Electronics and Electrical Engineering generated a pioneering photographic "time machine" which, when used with a high-speed camera, permits photographing events which occurred before the camera's shutter is opened.

The system, called an image-preserving optical delay, differs from conventional photography which records an event only when the shutter is open.

This new device, an arrangement of optical components including mirrors and a crystal shutter, allows researchers to take detailed, high-speed photographs of random—that is, non triggered—events.

It is now used for processes which last from 100 nanoseconds, or billionths of a second, to 10 microseconds, or millionths of a second, to study materials utilized by the electric power industry.

This system stores optical images of a random event long enough so the shutter of a high-speed camera can be opened and photographs taken of the processes leading to the random event. Kelley has filed a patent application on the system.

Functionally, the optical delay is equivalent to forcing the image to travel an additional 120 meters before it gets to the camera. Using a series of concave and planar mirrors, this path length is folded into about 4 meters.

The system is rugged enough to be used in a variety of settings. Situated on a table-top, the device contains optical components which require alignment. However, normal vibration, air currents, and airborne dust have minimal effect on the system's operation. Also, the system does not require a clean room, an optical bench, or any other special features.

U.S.-JAPAN TEST STANDARDS

NIST, in cooperation with Japanese organizations and the American Society for Testing and Materials (ASTM), is developing standard test methods for measuring the tensile and fracture toughness properties of steels at liquid helium temperature (4 K). Special considerations apply to mechanical tests near absolute zero because of severe adiabatic heating during plastic deformation. The U.S. Department of Energy and the Japanese Atomic Energy Research Institute are supporting this work to develop design standards for fusion energy applications. The tensile and fracture standards are now in their sixth drafts and have been submitted to ASTM for formal approval.

SILICON PHOTODETECTOR SELF-CALIBRATION ACCURACY VERIFIED IN INTERNATIONAL COMPARISON

Silicon self-calibration, an accurate and convenient approach to photodetector spectral responsivity calibration founded on the fundamentals of solid state physics, has been successfully implemented at NIST and six other national laboratories as their absolute radiometric base. This technique was developed in 1980 by the Radiometric Physics Division.

The first intercomparison of spectral responsivity scales (or equivalently, monochromatic radiant power scales) that has occurred since a number of national laboratories adopted the new technique has been published recently in the report of the 11th session of the CIPM Consultative Committee for Photometry and Radiometry (CCPR). The comparison, which was run by NIST for the CCPR, included 11 national laboratories. Six used the silicon self-calibration method, four used electrical substitution radiometers, and one used both approaches to realize their scales of absolute spectral responsivity. The results showed that eight of the laboratories agree to within ± 0.15 percent in measuring the responsivity of two different silicon photodiodes at the 633 nm HeNe laser wavelength. This level of agreement is a factor of four better than the ± 0.6 percent achieved by six of the eight national laboratories in an earlier (1967) comparison.

WIGGLER FOR THE NIST FREE-ELECTRON LASER

The Radiation Source and Instrumentation Division recently signed a contract for installation of a wiggler. The wiggler is under construction and scheduled to be installed at NIST in October 1989. It is one of the key parts of the free-electron laser (FEL) facility being constructed as a joint project with the Naval Research Laboratory. The wiggler is a precise array of magnets with alternating fields that cause an electron beam to follow a sine trajectory and to emit intense, coherent radiation. This wiggler will be 3.64 m long and will have 130 magnetic periods. The electron beam will be provided by the racetrack microtron (RTM), which is nearing completion.

The NIST FEL facility will be the most versatile in the country, providing a very large range of wavelengths (200 nm to 10 μm) over which it will be continuously tunable. The FEL output will consist of a continuous train of 3-ps wide pulses at 74.375 MHz with an average power of 10 to 100 W. The facility will be operated for research in physics, chemistry, biophysics, and biomedicine.

Standard Reference Material

STANDARD REFERENCE MATERIAL (SRM) 1879—RESPIRABLE CRISTOBALITE

The various crystalline phases of silicon dioxide cause different physiological effects in the respiratory system and it is necessary to identify the crystalline phases in the industrial atmosphere to assess and monitor health risks. Standards of pure crystalline phases are needed to determine their presence by x-ray diffraction techniques.

The Office of Standard Reference Materials announces the availability of a respirable cristobalite powder certified for use as a quantitative x-ray powder diffraction standard. The powder is 98 percent crystalline cristobalite with no other detectable crystalline phases. The mass median equivalent spherical diameter of the powder is 3.3 microns, with 80 percent of the mass of the particles in the range of 2 to 5 microns.

This SRM and SRM 1878, Respirable Alpha Quartz, provide two respirable powders of different crystalline phases of silicon oxide. The program for the certification of these SRMs was begun in cooperation with the National Institute of Occupational Safety and Health.

Certification of this SRM was performed in the Ceramics Division of the Institute for Materials Science and Engineering.