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News Briefs and Reports

Developments

NBS AWARDS TWO 1988 PRECISION MEASUREMENT GRANTS

NBS has awarded two new Precision Measurement Grants for studies of atomic energy levels in multi-electron atoms, and the quantized Hall effect.

The awards, for $30,000 each for fiscal year 1988, went to Professor John D. Morgan, III of the University of Delaware, for theoretical work on the calculation of helium atom energy levels, and to Professor Wiley P. Kirk of Texas A&M University, for work on the sources of error in measuring the quantized Hall resistance.

Morgan's project deals with theoretical calculations of helium atom energy levels. The helium atom is something of a guinea pig for atomic physics: complex enough to be interesting, simple enough to be manageable. Since the 1920s theoreticians and experimentalists have studied the helium atom to see how accurately energy values calculated from quantum electrodynamics (QED) theory correspond with measured values. This serves as a test for fundamental principles of quantum theory.

In recent years, experimental physicists armed with sophisticated techniques in laser spectroscopy have outstripped their theoretician colleagues, making energy-level measurements at accuracies better than 10^{-4} cm^{-1}. This is approximately 10 times better than the best theoretical calculations, which are hampered by the fiendish complexity of interactions in quantum theory.

Morgan's proposal is to push theoretical calculations of ground and excited states of the helium atom at least far enough to match the accuracy of current experimental work. This requires making allowance for several effects that were insignificant at lesser accuracies. The combination of Morgan's results with experimental results (supported by previous Precision Measurement Grants) will provide a stringent test of some fundamental aspects of QED theory.

Kirk's work relates directly to design of fundamental standards of electrical resistance. The quantized Hall effect, the discovery of which won German physicist Klaus von Klitzing the 1985 Nobel prize in physics, says that the electrical resistance across the width of a semiconductor strip under special conditions, including low temperature and high magnetic field, goes up in steps or "plateaus" which are simply integer multiples of a combination of basic constants of nature. Standards laboratories around the world leaped on this discovery as the potential basis for new electrical resistance standards based directly on natural constants.

Kirk proposes a series of experiments on three known problems that contribute to error in measuring the quantized Hall resistance to determine in what measure they affect the accuracy of resistance standards and closely related efforts to measure the value of the physical quantity known as the fine-structure constant. One of the fundamental parameters of quantum electrodynamics, the fine-structure constant relates to electrical and magnetic interactions of subatomic particles.

Kirk's work should also provide valuable insight into the structure of the Hall plateaus.

The Precision Measurement Grants Program is administered by Barry N. Taylor, B258 Metrology Building, National Bureau of Standards, Gaithersburg, MD 20899.

NBS SEEKS PROJECT PROPOSALS FOR 1989 PRECISION MEASUREMENT GRANTS

NBS is seeking project proposals for two research grants for fiscal year 1989 in the field of precision measurement and fundamental constants.

The Precision Measurement Grants are for $30,000 for one year, and may be renewed by NBS for up to two additional years. Prospective candidates must submit summaries of their proposed projects and biographical information to NBS by February 1, 1988, to be considered for the current grants, which will run from October 1988 through September 1989.

NBS Precision Measurement Grants are awarded each year to scientists in academic institutions for work in testing basic theories; determining values for fundamental constants; investigating related physical phenomena; or developing new, fundamental measurement methods.

The grants were instituted in 1970 to augment NBS research programs in physical constants and fundamental measurements, and to encourage research in these fields at U.S. colleges and universities. To date, 42 grants have been awarded in such areas as precision spectroscopy, the determination of mass ratios between atomic particles, a test of local Lorentz invariance, the precise timing of millisecond pulsars, and the redetermination of various constants, such as the gas constant and Rydberg constant.

Proposals are evaluated according to the importance of the proposed research; the relation of the project to the improvement of basic measurement units, physical standards, or measurement methodologies; the feasibility of the research; and past accomplishments of the applicant.

By February 1, applicants should submit a preproposal summary of not more than five double-spaced pages outlining the objective, motivation, and technical approach of the research, and the amount and source of current funding for the research, together with a concise biographical sketch of the applicant and a list of the applicant's most important publications. At least three copies of this material should be sent to Barry N. Taylor, chairman of the NBS Precision Measurement Grants Committee, B258 Metrology Building, National Bureau of Standards, Gaithersburg, MD 20899.

Four to eight candidates will be chosen by March 15 on the basis of this material and will be asked to submit more complete proposals. The final selection will be made by August 15, 1988.

For further information, contact Barry N. Taylor at the above address or call 301/975-4220.

SIX NBS PROJECTS WIN 1987 I-R 100 AWARDS

Innovations in semiconductors, sensors and measurement techniques for quality control, and chemistry were among the six projects from NBS to be given I-R 100 awards this year.

I-R 100 awards are given annually by *Research & Development* magazine to honor the "100 most significant" new technical products of the preceding year. Presentations were made in September in Chicago, bringing to 57 the number of I-R 100 awards NBS has received since first entering the competition in 1973.

Descriptions of the award-winning projects follow.

Crystal Axis Detection

Sidney Weiser of NBS (now retired) earned an I-R 100 award for the invention of an automated laser scanner that determines the orientation of the crystal axis in single-crystal semiconductor materials.

The proper alignment of crystal axes is an important element in the manufacture of semiconductor devices, which are fabricated on thin "wafers" sliced from a single crystal of silicon or other material. Weiser's crystal axis laser scanner was developed for a particularly difficult case: the crystals of cadmium telluride which are the heart of mercad telluride infrared detectors.

Previous methods of determining the major axis of cadmium telluride crystals required the use of x-ray diffraction techniques, which work only on wafers and require from 5 to 20 minutes per observation. A more recent technique depends on the reflection of laser light from the crystal surface which has been selectively etched to highlight the crystal planes. Very low signal-to-noise ratios make this technique difficult to use.

Weiser's instrument uses a significant modification of the laser scattering approach and a computerized pattern recognition algorithm to make the same measurement in less than a second—so fast that the machine can easily prepare maps of multicrystalline areas. The instrument works with both single wafers and the original crystal boule from which the wafers are cut.

Weiser's device will be manufactured commercially.

Surface Roughness Measurement

Four NBS researchers shared an I-R 100 award for their development of an automated technique using thermography to measure the roughness of surfaces and find defects. The procedure is faster and more versatile than current methods.

Being able to measure surface profiles and detect defects is important for quality control in industries such as electronics, automotive, ceramics, and construction. The NBS technique should be adaptable to in-line inspection since the measurements are made quickly, without touching the surface, and the instrumentation requires little calibration.

In the NBS method, the material to be inspected is heated slightly and the resulting emissions are detected by an infrared thermographic camera. Using a microcomputer-based image processor, the thermographic image can be converted to an equivalent topographic map of the surface. Accompanying software mathematically describes surface roughness and isolates defects.

The technique was developed initially to measure very rough surfaces, such as steel which has been blasted with an abrasive like sand. But the NBS researchers are confident it also can measure the roughness of much finer surfaces. In addition, they have used it to find defects, such as rust spots under paint on metal surfaces.

Mary E. McKnight, Jonathan W. Martin, and Edward J. Embree of NBS and Dale P. Bentz, formerly of NBS and now with the W. R. Grace Corporation, developed the technique.

In-Situ Ceramic Quality Sensor

Martin P. Jones, formerly of NBS, and Gerald W. Blessing of NBS have won an I-R 100 award for the development of a new ultrasonic method for monitoring the quality of ceramic powders during compaction. The sensor is the first nondestructive evaluation technique that permits ceramic producers to fully automate the inspection of compacted powders while the material is in the mold. The sensor system uses piezoelectric transducers to generate ultrasonic wave pulses that travel through a mold and into a sample. The resulting ultrasonic echoes are recorded as they reflect back and forth through the material until the pulses die out. The sensor, which is sensitive to porosity, moisture, and chemical content, offers producers a way to control the quality of ceramic powders at almost any stage of compaction without having to handle the very fragile materials in their green or unfired state.

The in-situ ceramic quality sensor was developed at NBS as part of the Bureau's effort to apply nondestructive evaluation techniques to measure the properties and characteristics of materials for in-line monitoring and process control during manufacture. Jones, who now works for Alcoa Laboratories, Alcoa Center, PA, developed the sensor with Blessing while he was a Johns Hopkins University graduate student at NBS.

Ultrasound Pipe Porosity Sensor

An industry/government team was given an I-R 100 award for the development of another ultrasonic sensor technique that will enable steel producers to quickly detect flaws in hot metal and more accurately crop unsound material before it is run through the complete production cycle.

The sensor, which has the potential for saving the U.S. steel industry $50 million annually, was developed under a cooperative agreement between NBS and the American Iron and Steel Institute (AISI) and evaluated and tested at Argonne National Laboratory. It is based on an ultrasonic system developed for AISI by the Magnaflux Corporation of Chicago.

The Magnaflux system uses contact rollers that require heavy pressures (10,000–20,000 pounds per square inch) to transmit high-frequency sound waves into hot steel.

Melvin Linzer of NBS modified this system by placing a powder flux—which melts at high temperatures—in front of the rollers. This eliminates the need for heavy wheel pressures to couple ultrasound pulses into and out of hot steel blooms, billets, and slabs. The award-winning technique uses a piezoelectric transducer that is isolated from the hot steel surface by a buffer rod. The powder flux is used as a liquid couplant to provide excellent acoustic contact between the rod and the hot steel surface.

The other members of the research team include Haydn N. G. Wadley, NBS; Lev Spevak, Magnaflux Corporation; David S. Kupperman, Argonne National Laboratory; and C. David Rogers, United States Steel, USX Corporation, and AISI program manager at NBS.

Digital Compositional Mapping

A team of eight researchers from NBS and the National Institutes of Health (NIH) has been honored for the introduction of a system that uses digital computer technology coupled with electron beam instruments to "map" the distribution of chemical elements on the surfaces of a variety of samples.

The key advantage to the system is that it can create compositional images which display both the type and number of atoms at sample sites 1 micrometer or finer in dimension. That is, besides giving qualitative information on which elements are distributed in the sample, the system also provides a complete quantitative analysis at every one-micrometer-wide point. The researchers can view these dual functions through a color-enhanced video image of the sample. Other devices on the market are limited in their ability to provide a complete quantitative analysis.

The system has many applications, including characterization of microstructures in various materials and the linking of disease to chemical imbalances in the body.

The digital compositional mapping system was developed by Ryna B. Marinenko, Dale E. Newbury, Robert C. Myklebust, and David S. Bright, of NBS, and Charles E. Fiori, Richard D. Leapman, Carol R. Swyt, and Keith E. Gorlen of NIH.

Microwave Dissolution System

H. M. Kingston of NBS and Lois B. Jassie, Michael J. Collins, and Ronald J. Goetchius of CEM Corporation, a North Carolina manufacturer of research microwave equipment, are sharing an I-R 100 award for their design of a system that uses microwaves to rapidly dissolve chemical samples in closed vessels. Sample dissolution is the first step in most instrumental elemental analysis.

The new system is an improvement over traditional dissolution techniques. It is rapid, safe, and contaminant-free, factors essential to reliable chemical analyses. By combining the microwave technique's ability to directly couple energy and heat materials quickly with the superior dissolving properties of closed containers under pressure, the NBS/CEM team has designed a method for decomposing samples that takes less than 15 minutes. Older hot plate methods using open-vented beakers typically require dissolving times of anywhere from 4 hours to 4 days, depending on the complexity of the sample.

Kingston and Jassie are editing a book for the American Chemical Society that will allow industrial chemists to predict conditions and safely tailor their own microwave devices for desired results. Also, they have given microwave dissolution information and advice to more than 400 researchers from companies, universities, and research laboratories.

NEW SUPERCONDUCTOR APPLICATIONS CLOSER WITH ELECTRICAL CONTACTS DISCOVERY

NBS, in collaboration with the Westinghouse Research and Development Center, has devised a new method for making improved, lower-resistance electrical contacts on the new high-critical-temperature ceramic superconductors.

High contact resistance has been a major obstacle to commercial applications of the new superconductors. The new method reduces the contact resistivity several thousand times below that previously achieved with conventional contacts.

Resistance at electrical contacts causes heating in any device, but it is particularly fatal in superconductors. Even modest heating can raise the temperature of the superconductor enough to weaken or destroy the property of superconductivity. In addition, for computer applications, heat generation is one of the primary factors limiting the number of circuit elements in a given volume and consequently, the ultimate speed of a computer. In magnet applications, there is the additional problem of needing large contact areas in order to handle very high currents. The new contact method is not restricted to small contact areas. The contacts made thus far have been about 10 square millimeters in size, but there is no inherent limitation preventing much larger contacts.

The new contact method developed by Jack W. Ekin of NBS and Armand J. Panson of Westinghouse, has achieved contact surface resistivities of less than 10 micro-ohm-cm^2, using bulk samples of the new yttrium-barium-copper-oxide ceramic superconductor ($YBa_2Cu_3O_7$), a typical high-temperature superconductor. This level of performance for the "super contacts" was achieved while operating the superconductor at the relatively high temperature of liquid nitrogen—77 K. Even lower contact resistances are expected when the technique is refined and with superconducting films, which are less granular.

The method for producing the contacts is carried out at room temperature. It should be directly applicable to making connections to thin films for computer applications as well as bulk samples for fabricating magnets such as those used in motors and generators.

A number of contacts have been made using the new method, and they have been found to be consistently reproducible. Stability of the contacts over time and with use appears to be excellent. Systematic tests conducted on contacts exposed to dry air over a 3-month period showed consistently low resistivity and little degradation with repeated cooling to 77 K and warming to room temperature.

For further information, contact Jack Ekin at the National Bureau of Standards, Boulder, CO 80303.

NBS CONTRIBUTES TO THIN-FILM SUPERCONDUCTOR RESEARCH

In a joint effort with The Johns Hopkins University Applied Physics Laboratory (APL), NBS prepared and characterized bulk target materials for a new laser-ablation technique, developed at APL, to deposit superconducting oxide thin films on substrates. The superconducting transition temperatures for ablated thin films of barium, yttrium, copper, and oxygen—the BYCO-1,2,3, compound—at 94.5 K, and for films of lanthanum, strontium, copper, and oxygen at 41.5 K are the same as those measured for the bulk material used for ablation. The thin-film deposits were produced on unheated substrates, and no further processing was required. While the test samples were made on fused silica substrates, the new low-temperature method permits the preparation of high-critical-temperature superconducting materials on other substrates such as gallium arsenide that cannot withstand elevated temperatures during processing. The hybrid superconducting/semiconducting systems offer potential for smaller and faster integrated circuits.

For information on the superconducting thin-film program, contact Kishin Moorjani, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD 20707, or call 301/953-6232. For information on the ceramic oxide materials, contact Lawrence H. Bennett, B150 Materials Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-5966.

NBS SETTING UP "NEXT GENERATION" ISDN LABORATORY

The Integrated Services Digital Network (ISDN) is a new telecommunications technology that makes it possible to send and receive voice, data, and image signals simultaneously over existing telephone lines. To help the Federal Government make a smooth transition to ISDN, which is sometimes called the "next generation" of telecommunications technology, NBS is establishing an ISDN laboratory. It will be used primarily to demonstrate ISDN technology and develop standards and test methods. NBS is working with private industry, research laboratories, and other agencies of the Federal government to set up the ISDN laboratory using donated equipment and services.

For further information, contact Michael Wong, A216 Technology Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-2942.

PROTOTYPE IRDS SOFTWARE BEING EVALUATED

More than 40 users from private industry and government, both in the United States and abroad, have agreed to use and evaluate prototype software developed by NBS. The software implements a draft industry standard for the Information Resource Dictionary System (IRDS).

The IRDS is a key computer software tool which can be used to record, store, and process information about an organization's data and data processing resources. NBS and the American National Standards Institute have been working together for several years on the standard's technical specifications. But until now, software has not been available. IRDS standards for both industry and the Federal government are expected to be issued next year.

For more information on the IRDS software evaluation program, contact Alan Goldfine, A265 Technology Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-3252.

BUREAU RESEARCHER DESIGNS NOVEL HUMIDITY SENSING DEVICE

An NBS scientist has received a patent for the design of a device that uses organic polymers to sense and measure humidity. Peter H. Huang has been granted patent number 4,681,855 for the invention, which is an improvement over existing devices because of its expected long life, lasting accuracy, and ability to be used at high temperatures and humidities. Huang envisions many potential applications, especially in controlling the drying processes that support industries such as textiles, paper, chemicals, and food. Meteorological and electronics applications also are feasible. Huang's system uses a halogen-based organic polymer such as Teflon onto which he deposits a mixture of a strong and a weak acid. By using this combination, he is able to "tune" the system to measure humidity over a wide range by varying the ratio of these acids. Because the water content of the polymer is directly related to relative humidity, the polymer can be measured electrically or weighed to determine its water content and, thus, the humidity. This approach significantly reduces hysteresis and increases sensitivity.

For further information, contact Peter Huang, B312 Physics Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-2621.

"EXPERT SYSTEM" MAY BOOST SEMICONDUCTOR PRODUCTIVITY

An improved diagnostic tool that would help manufacturers pinpoint problems that could cause failures at various stages in the semiconductor wafer fabrication process is being developed jointly by NBS and the Westinghouse Research and Development Center. This still-experimental "expert system" offers diagnoses by imitating, through a computer, the collective intelligence and experience of fabrication experts.

The key advantage of the new system is that semiconductor process personnel who have computer-stored data from test probes of wafers can use this data to diagnose fabrication problems on a personal computer screen in a readily understood, English-language format. Specialists with considerable expertise typically are needed in the semiconductor production process to interpret diagnostic test data, but such experts often are not available. The NBS/Westinghouse system is designed to substitute for specialists by supplying a human-like appraisal of critical test data.

Though the system is still in its formative stages, companies interested in working collaboratively with NBS may contact Loren W. Linholm, B360 Technology Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-2052.

NBS/ALUMINUM INDUSTRY DEVELOP TEMPERATURE SENSOR

A process control sensor that rapidly measures the internal temperatures of extruded aluminum as it comes out of a die has been developed by NBS and the Extruded Products Division of the Aluminum Association. The new sensor can measure the body temperatures of extruded aluminum at 500 °C to a depth of one-half the thickness of the material, and with an accuracy of 5 °C.

Based on an electromagnetic concept, the sensor generates eddy currents in hot aluminum as it is extruded from a die. By measuring the properties of eddy currents in metal, it is possible to determine temperature. Electromagnetic signals from the extruded material are recorded by a computer and rapidly processed to show temperature for on-line process control.

The automated system also is designed to measure the dimensions of extruded materials as they come out of the press. This capability could be used to provide information on die wear and for other dimensional sensor needs such as in hot isostatic pressing. The sensor was designed by Michael L. Mester, an Aluminum Association-sponsored researcher at NBS, and by NBS scientists Arnold H. Kahn and Haydn N. G. Wadley.

For information on the process sensor to measure internal temperatures in extruded aluminum, contact Haydn N. G. Wadley, A167 Materials Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-6139.

INDUSTRY AND NBS JOIN IN ADVANCED CERAMICS EFFORT

NBS has agreed to cooperate with the Ceramics Advanced Manufacturing Development and Engineering Center, Inc. (CAMDEC) to develop measurement technology, systems, and procedures for the processing of advanced ceramics. The establishment of CAMDEC, a not-for-profit Tennessee corporation, is the outgrowth of recommendations made by advanced ceramic leaders, including industry, at a workshop held at NBS, July 10-11, 1985, on the "Future of the U.S. Advanced Ceramics Industry." CAMDEC has as its mission the creation of a national center for developing the processing and manufacturing technology required to commercialize advanced structural ceramics. Under the agreement, NBS will provide technical advice to CAMDEC, participate in non-proprietary research and development projects, and conduct cooperative tests at NBS and CAMDEC facilities.

For information on the cooperative program, contact Stephen Hsu, A257 Materials Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-6119.

NEW FEDERAL STANDARD FOR BASIC IS APPROVED

The Department of Commerce has approved a new Federal Information Processing Standard (FIPS) for the computer language BASIC. (FIPS are developed by NBS for use by the Federal Government.) The main purpose for the standard is to make it easier and less expensive to maintain BASIC programs and to tranfer them among different computer systems.

The new standard, which becomes effective March 1, 1988, adopts the American National Standard for BASIC (ANSI X3.113-1987) and supersedes an earlier Federal standard (FIPS 68-1). It reflects major changes, improvements, and additions to the BASIC specifications.

For information on ordering BASIC (FIPS PUB 68-2), contact the National Technical Information Service, Springfield, VA 22161.

Standard Reference Data

NBS/EPA/MSDC MASS SPECTRAL DATABASE AVAILABLE FOR PC USERS

The NBS/EPA/MSDC Mass Spectral Database—a major international source of more than 44,000 analytical mass spectra—is now available from NBS for use on personal computers.

The PC version of the database was prepared from the NBS/EPA/MSDC Mass Spectral Database that is in use worldwide in a computer-magnetic tape format and as a six-volume, 7,000-page reference. The collection of evaluated electron ionization mass spectra of organic and inorganic substances was originally put together by scientists at the Environmental Protection Agency (EPA) and the National Institutes of Health (NIH). It is now maintained jointly by NBS, EPA, and the Mass Spectrometry Data Centre (MSDC) in Nottingham, England.

The PC version of the standard reference database was prepared by Stephen E. Stein of NBS. Stein compressed the 44,000 spectra in the magnetic-tape version and new search programs into 13 high-density floppy disks. The database is designed to be stored on a hard disk of any AT-class or XT-class PC, where it occupies between 8 and 15 megabytes, depending on how many search options are needed by the user.

Stein designed programs which rapidly search the database either for spectra of specific chemicals according to chemical name, chemical formula, molecular weight, or Chemical Abstracts Registry Number, or for spectra which have pre-selected characteristics such as peaks at certain masses.

The PC version of the NBS/EPA/MSDC Mass Spectral Database is available for $750 from NBS. For information on the database, or to obtain a license agreement, contact the Office of Standard Reference Data, A320 Physics Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-2208.

Standard Reference Materials

AST ENZYME LEVELS CAN BE CHECKED WITH NEW MATERIALS

A reference material (RM) aimed at improving the precision of tests for elevated levels of the enzyme aspartate aminotransferase (AST) is now available from NBS. Levels of the enzyme in blood are important because, if elevated, they can indicate a variety of clinical disorders. Among these are heart attacks, congestive heart failure, hepatitis, and liver disease.

The enzyme value found in the new RM's, while not certified, was derived from an interlaboratory study in which 10 analytical laboratories participated. The new material also was produced from human blood sources. (An NBS standard reference material currently for sale, Human Serum, contains a noncertified value for AST, but the enzyme in this case is from non-human sources.) Packaged in vials, the new reference material, Aspartate Aminotransferase (AST) (E.C.2.6.1.1)-Human Erythrocyte Source (RM 8430), is freezedried and intended for reconstitution with 2 milliliters of water. It contains 96.1 international enzyme units per liter, plus or minus 2.6 units. The new Reference Material is available for $120 per set of three vials from the Office of Standard Reference Materials, B311 Chemistry Building, National Bureau of Standards, Gaithersburg, MD 20899, or call 301/975-6776.

NBS Services

NBS ELECTROMAGNETICS LABORATORY ACCREDITATION PROGRAM EXPANDED TO MEET INDUSTRIAL AND DEFENSE NEEDS

The electromagnetics laboratory accreditation program, managed by NBS under the National Voluntary Accreditation Program (NVLAP), has been expanded by the Bureau to meet requests from participating accredited laboratories, the producers of electronic equipment, and the U.S. Naval Air Systems Command.

Test methods have been added to the program to help laboratories improve the quality of their testing services on products that must meet Federal Communications Commission (FCC) approval, and to assure the quality and performance of electronic devices used in military weapons systems.

The expanded program will help the manufacturers of computers, transmitters, receivers, and industrial, scientific, and medical equipment that must be tested and approved by the FCC before it can be sold in the United States. Also, the accreditation of laboratories for military test standards is important to the national defense because it helps to assure the performance of electronic devices used in military aircraft, missiles, and ground support equipment.

NBS initially limited the electromagnetics program, established in 1986, to two test methods to gain experience with the accreditation of laboratories that perform specific tests for radio frequency emissions from computing devices (FCC Part 15J) and for telephone equipment compatibility (FCC Part 68) in accordance with FCC standards.

This program, with 16 accredited laboratories nationwide, and which now includes the first phase of a proficiency testing effort, serves as the basis for the expanded electromagnetics program.

The expanded program includes test methods for radio frequency devices, including receivers (FCC Part 15), industrial, scientific, and medical devices (FCC Part 18), and radio transmitters (FCC Part 90). At the request of the Naval Air Systems Command, NBS added a military standard (MIL STD-462) for the measurement of electromagnetic interference characteristics.

For private sector laboratories, NVLAP accreditation automatically gives them international recognition for their testing services through NBS' agreements with the United Kingdom's National Measurement Accreditation Service, Australia's National Association of Testing Authorities, and New Zealand's Testing Laboratory Registration Council. International recognition of U.S. laboratories and acceptance of test data has been a high priority of industry groups and manufacturers to aid them in exporting their products to foreign countries.

Established in 1976, NVLAP is a voluntary system whereby organizations and individuals request NBS to establish a laboratory accreditation program. On an individual basis, laboratories seek accreditation for having the competence to use specific test methods.

Currently, approximately 200 laboratories are accredited in programs administered by NBS for thermal insulation, carpet, solid-fuel room heaters, acoustical testing services, personnel radiation dosimeters, commercial products (paint and paper), building seals and sealants, construction materials testing services, and electromagnetic compatibility and telecommunications equipment testing. Other programs have been proposed for asbestos hazard abatement testing, electrical and safety testing, plumbing fixture fittings testing, and computer network interface protocol testing.

Laboratories interested in accreditation for any of the test methods offered under the expanded electromagnetics program, or for information on NVLAP, should contact: Harvey W. Berger, Manager, National Voluntary Laboratory Accreditation Program, A531 Administration Building, National Bureau of Standards, Gaithersburg, MD 20899, telephone: 301/975-4016.