

NIST CALIBRATION SERVICES USERS GUIDE



NIST SPECIAL PUBLICATION 250 APPENDIX

FEE SCHEDULE

TO ORDER

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CHAPTER I

POLICIES

A. INTRODUCTION

The physical measurement services of the National Institute of Standards and Technology (NIST) are designed to help the makers and users of precision instruments achieve the highest possible levels of measurement quality and productivity. The hundreds of individual services you will find listed in this Fee Schedule constitute the highest order calibration services available in the United States. They directly link a customer's precision equipment or transfer standards to national measurement standards. These services are offered to public and private organizations and individuals alike.

B. TYPES OF SERVICES

You will find three types of physical measurement services described in this document: Calibration Services, Special Tests, and Measurement Assurance Programs.

Calibrations and Special Tests generally designate those NIST services that check, adjust, or characterize particular instruments, devices, and sets of standards on a one-time-per-request basis. The customer, in most cases, ships an item requiring calibration to the appropriate NIST laboratory in Gaithersburg, MD, or Boulder, CO, as noted in this Fee Schedule. The calibrated item is shipped back to the customer, followed, under separate cover, by a report of test procedures and results.

Measurement Assurance Programs, or MAPs, are quality control programs for calibrating a customer's entire measurement system. In a typical MAP, a stable artifact or set of artifacts--called transfer standards--are first measured by NIST and sent to a customer's laboratory for a series of measurements. The transfer standards are then returned to NIST for remeasurement, along with the participating laboratory's results. NIST reports its comparative findings to the customer and, when necessary, offers guidance on how to achieve and maintain measurement quality.

Successful use of a NIST MAP requires that the customer make periodic measurements of in-house check standards to estimate the random error and to ensure that the measurement process remains in a state of statistical control. Unless a laboratory has a measurement quality control program to monitor continuously its own measurement process parameters, there is little point in participating in a MAP.

PLEASE NOTE: NIST does not audit, regulate, or accredit metrology laboratories as part of the MAP service. Whatever steps a participating laboratory may take to improve its measurement process are undertaken voluntarily.

C. CRITERIA FOR QUALITY ASSURANCE

All the measurement services described in this document meet rigorous criteria for quality assurance. Calibration Services and MAPs satisfy the most demanding and explicit requirements in that these services are carried out regularly under pre-established and well-defined conditions; the measurement processes involved are well-characterized, stable, and statistically controlled; and quality-control procedures are well-defined and strictly followed. Furthermore, each Calibration Service or MAP is planned and documented to permit continuity of service over time.

A Special Test is so designated for one or more of the following reasons: 1) the specific type of calibration is seldom requested, thus precluding the maintenance of a large statistical base for controlling the measurement process, 2) the test requested is unique, or 3) the service is still under development--meaning the measurement or calibration methods are still being perfected or all the quality-control documentation has yet to be completed.

D. FEES

NIST recovers the cost of providing calibration services by charging a fee for each calibration performed. These fees range from a low of less than \$150 for calibration of a laboratory thermometer to \$50,000 or more for special tests of large microwave antenna systems.

The costs of services are listed in this Fee Schedule, which is updated and published, effective January 1, annually to reflect changes in prices and services. Even so, many services are performed at cost and you must provide the technical contact with an exact description of work before receiving a price quote. In this document, fees for such services are denoted to be "at cost". Request a free copy of the current Fee Schedule or the Calibration Services Users Guide by writing or calling the Calibration Program (see section I).

Firm prices or not-to-exceed prices (including "at cost" items) are only guaranteed in writing on the Acceptance copy of the NIST Form 64 sent to the customer or in writing from the Calibration Program. "At Cost" items are those services for which the price varies depending on the particular device submitted and the particular measurements requested. A phone estimate can normally be provided.

NOTE: PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE.

For detailed information on prices please refer to the contacts listed in this Fee Schedule or the Calibration Program.

For non-Federal sponsors, the U.S. Treasury regulations require late charges based on the current value of funds to Treasury be assessed for each 30 day period or portion thereof that the payment is delayed. Therefore, each non-Federal contract or agreement should contain terms for payment as well as a provision for imposition of late charges.

E. REPORTS OF TEST RESULTS

Reports on calibrations or other services are regarded as the property of the customer. Copies are not supplied to other parties except as required by federal law or requested in writing by the customer. The results of calibrations and tests performed by NIST apply only to a particular instrument or standard at the time of test unless otherwise clearly stated.

F. TRACEABILITY

Many Federal regulations and contracts require regulated organizations or contractees to verify that the measurements they make are "traceable" and to support the claim of traceability by auditing records for equipment used in the calibration process. This regulatory requirement implies the ability to relate individual measurement results through an unbroken chain of calibrations to a common source, usually U.S. national standards as maintained by NIST, or intrinsic standards based on fundamental constants of nature with values assigned or accepted by NIST. To adequately establish an audit trail for traceability, a proper calibration result should include: the assigned value, a stated uncertainty, identification of the standard used in the calibration, and the specification of any environmental conditions of the calibration where correction factors should be applied if the standard or equipment were to be used under different environmental conditions.

NIST is supportive of the practice of making the user aware of traceability and providing the user details as to how traceability was established; however, at the same time NIST cannot condone the prominent display of its name on proprietary products or in the advertising of them (see section G).

NIST does not define nor enforce traceability. Moreover, NIST is not legally required to comply with traceability requirements of other federal agencies; nor do we determine what must be done to comply with another party's contract or regulation calling for such traceability. However, NIST can and does provide technical advice on how to make measurements consistent with national standards.

G. REFERENCES TO NIST IN ADVERTISEMENTS

NIST test results or reports shall not be used to indicate or imply that the National Institute of Standards and Technology approves, recommends, or endorses the manufacturer, supplier, or user of any instruments or standards or that NIST in any way guarantees or predicts the future performance of items after calibration or test. No reference shall be made to NIST or to reports or results furnished by NIST in any advertising or sales promotions which would indicate or imply that NIST approves, recommends, or endorses any proprietary product or proprietary material. (For more information please request Letter Circular 1128).

H. DISCLAIMER

Commercial products--materials and instruments--are identified in this document for the sole purpose of adequately describing experimental or test procedures. In no event does such identification imply recommendation or endorsement by the National Institute of Standards and Technology of a particular product; nor does it imply that a named material or instrument is necessarily the best available for the purpose it serves.

I. QUESTIONS AND INQUIRIES

This Fee Schedule is a supplement of NIST Special Publication 250, Calibration Services Users Guide. These documents are designed to make the task of selecting and ordering an appropriate calibration service as quick and easy as possible. Nevertheless, questions will arise. When they do, we urge you to call or write for immediate clarification. Address general questions and lengthy inquiries to:

Calibration Program
National Institute of Standards and Technology
Building 411, Room A104
Gaithersburg, MD 20899-0001
Telephone: (301) 975-2002
Telefax: (301) 926-2884

If you have a technical question concerning a specific service, contact directly one of the NIST staff members responsible for that calibration area. Consult the section of this document that describes the service in question for names, addresses and telephone numbers.

CHAPTER II

ORDERING INSTRUCTIONS - DOMESTIC CUSTOMERS

A. TURNAROUND TIME

Normal turnaround time for NIST calibration services varies greatly, usually from several weeks to six months, depending on the type of service requested and fluctuations in workload. Some services are only provided on a scheduled basis with appointments made many months in advance of the service date. To avoid unnecessary scheduling or administrative delays in the calibration process, always make prearrangements with the technical contact for the service you intend to utilize. See section B for more information on prearrangements.

B. PREARRANGEMENTS AND SCHEDULING

Services are best arranged in advance, beginning with a call or letter from the customer to a NIST staff member directly responsible for the desired service. See the appropriate technical section of this Fee Schedule or the separate Users Guide to determine whom to call or write. This advance communication can clear up any questions you may have, clarify the policies and procedures briefly described here, and permit you to tentatively schedule a calibration date. Following the initial communication, you will immediately need to fill out and send in a purchase order and prepare and ship the item according to the procedures described below. If a calibration must be scheduled far in advance, you may arrange to delay shipment of the item until shortly before the scheduled date; you must however, submit the purchase order--complete with the name and number of the desired service--before a firm calibration date can be assigned. When NIST receives your valid purchase order and assigns a firm service date, you will be notified by mail to confirm the order.

C. PURCHASE ORDER

Send a purchase order to the address listed in the appropriate technical section of this Fee Schedule, or in the separate Users Guide, before you ship an item for calibration. The purchase order must:

- 1) State both the name and number of the NIST service being requested. FAILURE TO INCLUDE THE ORDER NUMBER WILL SERIOUSLY IMPEDE SCHEDULING AND SERVICE.
- 2) Clearly identify the item(s) being sent for calibration, including any serial number(s).
- 3) Give the name, address, and telephone number of the requesting company's procurement officer.
- 4) Give the name, address, and telephone number of the requesting company's technical contact, if different from above.
- 5) List separately the instructions for return shipment, insurance, mailing of the test report, and billing. (Federal or state agency requests for calibration services should be accompanied by a document authorizing that the cost of the service be billed to the agency.)
- 6) Clearly state any special or necessary conditions of test--such as operating frequency or temperature.
- 7) Clearly state the customer identification number; i.e., social security number (EIN) for consumer customers; tax identification number (TIN) for commercial customers; or agency location code (ALC) for government customers.
- 8) Give instructions on the purchase order if the final test report is to be handled in a special manner.

PLEASE NOTE: Receipt of orders by NIST does not imply acceptance of any provisions set forth in the order that are contrary to the policy, practice, or regulations of the National Institute of Standards and Technology or the U.S. government. In general, NIST will not sign any affidavits, acknowledgment forms, or other documents that may be required by company policy governing the procurement of goods and services.

D. SHIPPING, INSURANCE, AND RISK OF LOSS

Ship an instrument or standard to the address to which you mailed your purchase order. Adhere rigorously to the following procedures:

- 1) Ship only items in good repair. Apparatus in disrepair will not be calibrated. If defects are found after calibration has begun, the procedure will be terminated, a report issued, and a charge levied for work completed.
- 2) Use strong, reusable packing materials and containers marked clearly and indelibly on the outside with the requestor's name, address and the following notation: REUSABLE CONTAINER, DO NOT DESTROY.
- 3) Follow any special shipping procedures given in the technical sections of the Calibration Services Users Guide, particularly those sections covering radiation and dosimetry measurements.
- 4) Insure the shipments to and from NIST and clearly state the method of return shipment. NIST will not assume liability for loss or damage unless such loss and damage result solely from the negligence of NIST personnel. If return shipment by parcel post is requested or is suitable, NIST will prepay the return shipment but will not insure it. When no shipping or insurance instructions are furnished, NIST will return the shipment by common carrier, collect and uninsured.

PLEASE NOTE: Fees for NIST services do not include shipping costs.

CHAPTER III

SPECIAL INSTRUCTIONS -- FOREIGN CUSTOMERS

A. CRITERIA FOR PROVIDING SERVICE

The National Institute of Standards and Technology (NIST) is authorized to provide measurement services, including calibrations, for organizations or individuals located outside the United States. NIST policy requires that the Calibration Program review each request to determine if such a service is available in the requestor's country. Foreign customers must provide the following information:

- 1) A justification why NIST should perform this service, if an official standards laboratory in the country of the requestor's provide such service.
- 2) A description of the instrument or standard to be tested, particularly if it is not manufactured in the U.S.
- 3) A detailed description of the measurements that are needed or indicate the test order number as given in the Calibration Services Users Guide (NIST SP-250) or the separate Fee Schedule (NIST SP-250 Appendix).
- 4) A description of any special requirements that might affect the decision to provide the service. For example, will a need exist for adjustments to the instrument or will the time period be restricted in which the device is available for measurement?

B. SPECIAL INSTRUCTIONS

If the request for the measurement service is accepted by NIST, the requesting organization will be notified of the cost of service and will be given the identification of the NIST laboratory that will perform the measurements. The requesting organization must then complete the following steps:

- 1) Contact the NIST technical unit that will provide the service to determine the schedule.
- 2) Send a purchase order to the Calibration Program. Provide complete addresses for returning the instrument and for mailing the calibration or test report.
- 3) Send prepayment by check payable in U.S. dollars to the Calibration Program for the full cost of the service. The check must be drawn on a U.S. bank. NIST cannot begin the service until full payment has been received.
- 4) Ship the instrument or standard to the appropriate NIST technical unit. You must prearrange shipment with a customs broker for entry of the instrument into the U.S. with prepaid transportation from the port of entry. Air freight is most satisfactory. Entry bond is required for instruments not manufactured in the U.S. If arrangements are made with a broker in the country of origin, that broker should, in turn, have a U.S. customs broker in or near the port of entry who must arrange for the entry of the instrument and its transportation to NIST. Direct arrangements can be made with customs brokers located in Washington, DC/Baltimore, MD, metropolitan area or in the Denver, CO, area, as appropriate. These brokers must arrange for transportation to the port of exit after testing is completed.

C. FOREIGN INQUIRIES

Foreign customers requiring additional information or clarifications can get assistance by addressing all calls or correspondence to:

Calibration Program
National Institute of Standards and Technology
Building 411, Room A104
Gaithersburg, MD 20899-0001
United States of America
Telephone: (301) 975-2002
Telefax: (301) 926-2884
Telex: TRT 197674NIST UT

CHAPTER IV
DIMENSIONAL MEASUREMENTS

A. Length Measurements

Technical Contacts:

John R. Stoup (10010C-10050S)
William B. Penzes (10020C)
Ronald G. Hartsock (10030C-10040S)
Theodore D. Doiron (10060S)
Ralph Veale

Telephone:

(301) 975-3471
(301) 975-3477
(301) 975-3465
(301) 975-3468
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
10010C	Gage Blocks	At Cost
10020C	Line Standards	At Cost
10030C	Surveying and Oil Gaging Tapes	At Cost
10040S	Special Tests of Surveying Leveling Rods	At Cost
10050S	Special Tests of Length Standards	At Cost
10060S	Special Tests of Sieves	At Cost

B. Diameter Measurements

Technical Contacts:

John R. Stoup (11010S-11070S)
Dennis Everett (11020C)
Ralph Veale

Telephone:

(301) 975-3471
(301) 975-3471
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
11010S	Special Test for Plug Gages: External Diameter Standards	At Cost
11020C	Measuring Wires for Threads and Gears	At Cost
11030S	Special Test of Spherical Diameter Standards: Balls	At Cost
11040S	Special Tests of Internal Diameter Standards: Ring Gages	At Cost
11050S	Special Tests of Length and Diameter	At Cost
11060S	Special Tests of Step Gages	At Cost
11070S	Special Diameter Measurements, by Prearrangement	At Cost

C. Complex Dimensional Standards

Technical Contacts:

Edgar G. Erber (12010C-12020S)
Theodore D. Doiron (12030S)
Ralph Veale

Telephone:

(301) 975-3468
(301) 975-3468
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
12010C	API Threaded Plug and Ring Gages	At Cost
12020S	Special Tests of Threaded Plug and Ring Gages	At Cost
12030S	Special Tests of Two-Dimensional Gages	At Cost
12040S	Special Complex Dimensional Tests, by Prearrangement	At Cost

D. Optical Reference Planes & Roundness Standards

Technical Contacts:

John R. Stoup (13010S)
Yun H. Queen (13020S-13030S)
Ralph Veale

Telephone:

(301) 975-3471
(301) 975-3468
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
13010S	Optical Reference Planes (Flats)	At Cost
13020S	Special Tests of Roundness	At Cost
13030S	Special Tests of Roundness Calibration Specimens	At Cost

E. Angular Measurements

Technical Contacts:

Yun H. Queen (14010C-14040S)
Ralph Veale

Telephone:

(301) 975-3468
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
14010C	Angle Gage Blocks	At Cost
14020S	Special Tests of Optical Polygons	At Cost
14030S	Special Tests of Rotary and Indexing Tables	At Cost
14040S	Special Tests of Wedges	At Cost
14050S	Special Angular Measurements, by Prearrangement	At Cost

F. Laser Measurements

Technical Contacts:

Jack Stone (14510S)
Ralph Veale

Telephone:

(301) 975-5638
(301) 975-3502

Mailing Address: A107 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
14510S	Laser Frequency/Wavelength	At Cost

G. Surface Texture

Technical Contacts:

Arie Hartman
Cynthia K. Rymes

Telephone:

(301) 975-3475
(301) 975-4081

Mailing Address: A117 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
15010C	Roughness Calibration Specimens	555
15020C	Surface Roughness Comparison Specimens	At Cost
15030C	Step Height Measurements	555

H. Hydrometers

Technical Contacts:

John F. Houser
George E. Mattingly

Telephone:

(301) 975-5956
(301) 975-5939

Mailing Address: 105 Fluid Mechanics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
16010C	Reference Standard Hydrometers	At Cost

I. Volume and Density

Technical Contacts:

John F. Houser
George E. Mattingly

Telephone:

(301) 975-5956
(301) 975-5939

Mailing Address: 105 Fluid Mechanics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
17010C	Volume Standards	At Cost
17020S	Special Tests of Volume Standards	At Cost
17040S	Special Tests of Density: Liquids	At Cost

CHAPTER V
MECHANICAL MEASUREMENTS

A. Flow Rate Measurements

Technical Contacts:

G. Paul Baumgarten
George E. Mattingly

Telephone:

(301) 975-5957
(301) 975-5939

Mailing Address: 105 Fluid Mechanics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
18010C	Single Turbine Meters	At Cost
18020C	Tandem Turbine Meters	At Cost
18030C	Flow Rate Meters (Direct Reading in Flow Rate Units)	At Cost
18040C	Head Class Flow Measurement Devices	At Cost
18050S	Special Tests for Liquid and Gas Flow Rates	At Cost

B. Flow Measurements at Cryogenic Temperatures

Technical Contact:

Jennifer L. Scott

Telephone:

(303) 497-3684

Administrative and Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 832.20
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
18800S	Special Tests of Cryogenic Liquid Flow	At Cost

C. Airspeed Measurements

Technical Contacts:

Norman E. Mease
J. Michael Hall
George E. Mattingly

Telephone:

(301) 975-5959
(301) 975-5947
(301) 975-5939

Mailing Address: 105 Fluid Mechanics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
19010C	Pitot-Static Tubes 1.3 to 67 (3 to 150 mph)	At Cost
19020C	Low Airspeed Instruments .076 to 10.2 m/s (15 to 2,000 fpm)	At Cost
19030S	Meteorological Airspeed Instrumentation 1.3 to 67 m/s (3 to 150 mph)	At Cost
19040S	Special Tests for Airspeed Instruments	At Cost

D. Mass Standards

Technical Contact:

Telephone:

Jerry G. Keller

(301) 975-4218

Mailing Address: A147 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

Shipping Address: National Institute of Standards & Technology
A147 Sound
I-270 at Quince Orchard Road
Gaithersburg, MD 20899
Attn: J. G. Keller

Note: For Weights larger than 50 lb (30 kg), contact Jerry G. Keller prior to shipment.

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
22010C	Weight Set (1 mg to 100 g)	3410
22020C	Weight Set (1 mg to 1 kg)	4120
22030C	Weight Set (2 to 30 kg)	2230
22040C	Single Weights (1 mg to 1 kg)	495
22060C	Single Weights (2 kg to 30 kg)	700
22080C	Single Weights (> 30 kg to 1200 kg, 2 double substitution weighings)	At Cost
22100C	Single Weights (> 1200 kg to 30,000 kg)	At Cost
22110C	Single Weights (> 30 kg to 1200 kg, calibrated in a weighing design)	At Cost
22130C	Single Weights for Dead Weight Pressure Testers (13 lb - 50 lb)	315
22140C	Single Weights for Dead Weight Pressure Testers (> 50 lb)	At Cost
22150C	Single Weights for Dead Weight Pressure Testers (< 13 lb)	190
22170S	Special Mass Measurement Services	At Cost
22180M	Measurement Assurance Program for Mass	At Cost

E. Force Measurements

Technical Contacts:

Simone L. Yaniv
Robert W. Peterson

Telephone:

(301) 975-6655
(301) 975-6649

Mailing Address: 221 Engineering Mechanics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
23010C	Force Transducers (to 25,000 lbf, 1 mode)	1040
23020C	Extra observation	14
23030C	Additional bridges	255
23040C	Force Transducers (to 25,000 lbf, 2 modes)	1850
23050C	Extra observation	19
23060C	Additional bridges	370
23070C	Force Transducers (25,001 to 112,000 lbf, 1 mode)	1285
23080C	Extra observation	21
23090C	Additional bridges	315
23100C	Force Transducers (25,001 to 112,000 lbf, 2 modes)	2510
23110C	Extra observation	37
23120C	Additional bridges	540
23130C	Force Transducers (112,001 to 300,000 lbf, 1 mode)	2420
23140C	Extra observation	43
23150C	Additional bridges	435
23160C	Force Transducers (112,001 to 300,000 lbf, 2 modes)	4310
23170C	Extra observation	63
23180C	Additional bridges	855
23190C	Force Transducers (300,001 to 1,000,000 lbf, 1 mode)	2985
23200C	Extra observation	39
23210C	Additional bridges	570
23220C	Force Transducers (300,000 to 1,000,000 lbf, 2 modes)	5555
23230C	Extra observation	71
23240C	Additional bridges	1025

23250C	Force Transducers (over 1,000,000 lbf)	At Cost
23260S	Special Tests of Force Transducers	At Cost

F. Vibration Measurements

Technical Contact:

Telephone:

Beverly F. Payne

(301) 975-6639

Mailing Address: A149 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Freq. Range</u>	<u>Peak Accel</u>	<u>% Uncer</u>	<u>Fee (\$)</u>
24010C	Pickup Sensitivity	2 to 160 Hz	0.2 to 2g	<u>+1</u> to <u>+2</u>	1215
24020C	Pickup Sensitivity	10 to 3500 Hz	2 to 10g	<u>+1</u> to <u>+2</u>	2110
24030C	Pickup Sensitivity	10 Hz to 10 kHz	2 to 10g	<u>+1</u> to <u>+2</u>	3695
24040S	Shock Measurement	10 Hz to 10 kHz	50 to 5000g	<u>+3</u> to <u>+5</u>	At Cost
24050S	Pickup Sensitivity	3 kHz to 20 kHz	4 to 200g	<u>+1</u> to <u>+3</u>	At Cost
24060S	Special Vibration Tests, by Prearrangement				

G. Acoustic Measurements

Technical Contacts:

Telephone:

Victor Nedzelnitsky
David J. Evans

(301) 975-6638
(301) 975-6637

Mailing Address: A147 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
25010C	Pressure Response: WE Type 640AA microphones or equivalent (e.g., Tokyo Riko Type ECL MR103; Bruel & Kjaer Type 4160, Bruel & Kjaer Types 4144 or 4132 with DB0111 adapter), 50 to 10,000 Hz.	2225
25020C	Pressure Response: WE Type 640AA microphones or equivalent (e.g., Tokyo Riko Type ECL MR103; Bruel & Kjaer Type 4160; Bruel & Kjaer Types 4144 or 4132 with DB0111 adapter), 50 to 20,000 Hz.	2755
25030C	Pressure Response: Tokyo Riko Type ECL MR112; Bruel & Kjaer Type 4134, or equivalent half-inch microphones, 50 to 20,000 Hz.	2545
25040C	Pressure Response: Tokyo Riko Type EC MR112, Bruel & Kjaer Type 4134, or equivalent half-inch microphones, 50 to 20,000 Hz.	3310

25050C	Free-Field Response: Tokyo Riko Type ECL MR112, Bruel & Kjaer Types 4133, 4134, 4165, 4166, or equivalent half-inch microphones, 2,500 to 20,000 Hz.	2650
25060S	Special Tests of Acoustic Devices	At Cost
25070S	Special Tests of Earphones	2410

H. Ultrasonic Reference Block Measurements

Technical Contact:

Telephone:

Gerald V. Blessing

(301) 975-6627

Mailing Address: A147 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
26030S	Special Tests of Area	740
26040S	Special Test of Area Amplitude Titanium or Steel Ultrasonic Reference Blocks - Set of Eight Blocks	At Cost
26050S	Special Tests of Distance Amplitude Aluminum Reference Blocks - Set of Fifteen Blocks	980
26060S	Special Test of Distance Amplitude Titanium or Steel Ultrasonic Reference Blocks - Set of Fifteen Blocks	At Cost
26070S	Special Test of Distance/Area Amplitude (Basic Set) Aluminum, Titanium or Steel Ultrasonic Reference Blocks - Set of Eight Blocks	At Cost
26080S	Special Tests of Velocity Reference Blocks	At Cost

I. Ultrasonic Transducer Measurements

Technical Contact:

Telephone:

Steven E. Fick

(301) 975-6629

Mailing Address: A147 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
26100C	Ultrasonic Transducer Power Output; Radiation Pressure	At Cost
26110C	Ultrasonic System Power Output; Calorimeter	At Cost
26120S	Special Tests of Ultrasonic Transducers	At Cost

J. Acoustic Emission Transducer Measurements

Technical Contact:

Gerald V. Blessing

Telephone:

(301) 975-6627

Mailing Address: A147 Sound
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
26200C	Acoustic Emission Transducer Amplitude and Phase Sensitivity versus Frequency	At Cost
26210S	Special Tests of Acoustic Emission Transducers and Sensors	At Cost

CHAPTER VI

THERMODYNAMIC QUANTITIES

A. Pressure Measurements

Technical Contacts:

Stephen W. Doty (29010C, 29030C)
 R. Gregory Driver (29010C, 29030C, 29040S)
 Walter Markus (29010C, 29030C)
 Donald B. Ward (29020C, 29035C)

Telephone:

(301) 975-4857
 (301) 975-4832
 (301) 975-4827
 (301) 975-6561

Mailing Address: A55 Metrology
 National Institute of Standards & Technology
 Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
29010C	Deadweight Piston Gages	3100
29020C	Controlled Clearance Piston Gages	At Cost
29030C	Pressure Gages and Transducers	At Cost
29035C	Mercurial Barometers and Manometers	At Cost
29040S	Special Tests of Pressure Gages	At Cost

B. Vacuum and Low Pressure Standards Measurements

Technical Contacts:

Richard W. Hyland (30010C-30025C, 30040S, 30050S)
 Albert Filipelli (30029C-30038C, 30050S)
 Stuart A. Tison (30060S-30061C)

Telephone:

(301) 975-4829
 (301) 975-4835
 (301) 975-2857

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 Gaithersburg, MD 20899-0001

Shipping Address: National Institute of Standards & Technology
 I-270 at Quince Orchard Road
 A52 Metrology
 Gaithersburg, MD 20899

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
30010C	Absolute Low Pressure Transducers	3080
30011C	Up to Two Additional Transducer (Cost per Unit)	2340
30020C	Differential Low Pressure Transducers Relative to Vacuum	3080
30021C	Up to Two Additional Transducers (Cost per Unit)	2485
30025C	Ball-Type Deadweight Tester	3810
30029C	Molecular Drag Gages, Without Customer Controller	3560

30030C	Molecular Drag Gages, With Customer Controller	2975
30031C	Molecular Drag Gages, Additional Ball or Gas	2095
30034C	Ionization Gages, 10^{-4} to 10^{-1} Pa, Nitrogen Gas	3560
30035C	Ionization Gages, 10^{-5} to 10^{-1} Pa, Nitrogen Gas	4435
30036C	Ionization Gages, 10^{-7} to 10^{-1} Pa, Nitrogen Gas	5315
30037C	Ionization Gages, Additional Filament or Gas for Above Tests	At Cost
30038C	Ionization Gages, NIST Supplied Gage Tube for above Tests	305
30040S	Special Tests of Low Pressure Gages	At Cost
30050S	Special Tests of Vacuum Gages	At Cost
30060S	Special Tests of Leak Artifacts	At Cost
30061C	Helium Glass or Quartz Permeation Leaks, 2×10^{-14} to 2×10^{-8} mol/s	3515

C. Laboratory Thermometers

Technical Contact:

Telephone:

Jacquelyn A. Wise

(301) 975-4822

Mailing Address: B128 Physics
National Institute of Standards & Technology
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A242 Physics
Gaithersburg, MD 20899
Attn: J. A. Wise

NOTE: The minimum number of test points per thermometer is two. Fahrenheit ranges are not direct conversions of the celsius ranges.

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
31010C	Laboratory Themometers (0 to 150 °C) (32 to 300 °F)	140/pt
31020C	Laboratory Thermometers (151 to 315 °C) (301 to 600 °F)	230/pt
31030C	Laboratory Thermometers (316 to 550 °C) (601 to 1022 °F)	350/pt
31040C	Laboratory Thermometers (-1 to -110 °C) (31 to -166 °F)	170/pt
31050C	Laboratory Thermometers (Liquid N ₂) (-196 °C or -321 °F)	170/pt
31070C	Calorimetric Thermometers	800
31080C	Beckmann Thermometers	845
31100C	Quantity Tests of Liquid-In-Glass Thermometers	At Cost

31110S	Special Tests of Thermometers (0 to 150 °C) (32 to 300 °F)	140/pt
31120S	Special Tests of Thermometers (151 to 315 °C) (301 to 600 °F)	230/pt
31130S	Special Tests of Thermometers (316 to 550 °C) (601 to 1022 °F)	350/pt
31140S	Special Tests of Thermometers (-1 to -110 °C) (31 to -166 °F)	170/pt
31150S	Special Tests of Thermometers (Liquid N ₂) (-196 °C or -321 °F)	170/pt
31200S	Preliminary Exam or Ineligible Thermometer	39
31250S	Additional Copy of Report	24
31260S	Special Thermometry Services, by Prearrangement	At Cost

D. Thermocouples, Thermocouple Materials, and Pyrometer Indicators

Technical Contacts:

George W. Burns
Margaret G. Scroger (32010C-32101C, 32150S)
Jacquelyn A. Wise (32110C-32147C)

Telephone:

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(301) 975-4818
(301) 975-4822

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Attn: G. W. Burns or M. G. Scroger
For: 32110C-32147C
Attn: J. A. Wise

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For: 32110C-32101C, 32150S
Attn: G. W. Burns or M. G. Scroger, B229 Physics
For: 32110C-32147C
Attn: J. A. Wise, A242 Physics

COMPARISON CALIBRATIONS, TEMPERATURE MEASURED WITH THERMOCOUPLE

<u>Test No.</u>	<u>Items</u>						<u>Fee (\$)</u>
	TC Type	Temp. Range °C	Points	Min. Length mm	Est. Temp. °C	Uncert. °C	
32010C	S	0-1450	1°C or 1°F Interv. Table	700	0 to 600 600 to 1100 1450	0.5 0.7 2	705
32020C	R	0-1450	" "	700	0 to 600 600 to 1100 1450	0.5 0.7 2	705

32030C	B	0-1750	" "	1000	0 to 600 600 to 1100 1450 1750	(3 μ V) 0.7 2 3	1110
32031C	B	800-1750	" "	1000	800 to 1100 1450 1750	0.7 2 3	705
32040C	E	0-1000	4 to 15	700		1	705
32041C	J	0-760	4 to 15	700		1	705
32042C	K	0-1100	4 to 15	700		1	705
32043C	N	0-1100	4 to 15	700		1	705
32044C	T	0-400	4 to 15	700		1	705
32050C	Comparison calibration, two point minimum, per point, for all items above						290/pt
32060C	Each additional table of results at 1° C or 1° F intervals, for Type S, R, or B at later date						200
32061C	Each additional table of results at 1° C or 1° F intervals, for Type S, R, or B at time of test						115
32070C	Thermocouple materials tested against Pt Thermoelectric standard, 4 to 15 points, 700 mm minimum lengths						705

CALIBRATION AT METAL FREEZING POINTS, MINIMUM DIAMETER 0.4 mm, FREEZING POINT DETERMINATION AT Au, Ag, Sb, AND Zn

<u>Test No.</u>	<u>Items</u>						<u>Fee (\$)</u>
	TC Type	Temp. Range °C	Points	Min. Length mm	Est. Temp. °C	Uncert. °C	
32090C	S	0-1450	Table, 1° C or 1° F interv. and equations to generate table	1000	at freezing points 0 to 700 700 to 1100	0.2 0.3 0.4 1450 2	1810
32091C	Type S, freezing point determination, per point, two point minimum						580

CALIBRATION OF PYROMETER INDICATORS

32100C	Portable Potentiometer, first dial or range	465
32101C	Portable Potentiometer, each additional dial or range	250
COMPARISON CALIBRATION OF THERMOCOUPLES OR THERMOCOUPLE MATERIALS TESTED AGAINST Pt THERMOELECTRIC STANDARD, TEMPERATURE MEASURED WITH PLATINUM RESISTANCE THERMOMETER, MINIMUM LENGTH 36 INCHES, TWO POINT MINIMUM		
32110C	Range -110 to 315 °C and Liquid N ₂ (-196 °C) or -166 to 600 °F and Liquid N ₂ (-321 °F)	215/pt

32120C

316 to 550 °C or 601 to 1022 °F

345/pt

Table at one degree intervals for Type T thermocouple for any of the following options: (The cost of the table will be in addition to the calibration per point covered under fee schedule terms numbered 32110C-32120C.)

32141C	Option 1: Table from -196 to +300 °C (-321 to +572 °F), calibration points at -196, -110, -50, +100, +200, +300 °C	155
32142C	Option 2: Table from -196 to +100 °C (-321 to +212 °F), calibration points at -196, -110, -50, +50, +100 °C	155
32143C	Option 3: Table from -110 to +300 °C (-166 to +572 °F), calibration points at -110, -50, +100, +200, +300 °C	155
32144C	Option 4: Table from -110 to +100 °C (-166 to +212 °F), calibration points at -110, -50, +50, +100 °C	155
32145C	Option 5: Table 0 to 300 °C (32 to 572 °F), calibration points at +100, +200, +300 °C	155
32146C	Option 6: Table from -110 to 0 °C (-166 to +32 °F), calibration points at -110, -50 °C	155
32147C	Option 7: Table from -196 to 0 °C (-321 to +32 °F), calibration points at -196, -110, -50 °C	155
32150S	Special Tests of Thermocouples and Thermocouple Materials	At Cost

E. Resistance Thermometry

Technical Contacts:

Earl R. Pfeiffer (0.65 K to 84 K)
Gregory F. Strouse (83 K to 962 °C)

Telephone:

(301) 975-4821
(301) 975-4803

Mailing Address:

B128 Physics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

Shipping Address:

National Institute of Standards & Technology
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B04 Physics
Gaithersburg, MD 20899

Test No.	Description of Services	Fee (\$)
33010C	Capsule PRT (13.8 K to 30 °C)	6265
33020C	Capsule PRT (13.8 K to 157 °C)	6265
33030C	Capsule PRT (13.8 K to 232 °C)	7080
33040C	Capsule PRT (54 K to 30 °C)	4680
33050C	Capsule PRT (54 K to 157 °C)	4680
33060S	Capsule PRT (54 K to 232 °C)	5495
33070C	Capsule PRT (84 K to 30 °C) Ar to Ga	3140

33080C	Capsule PRT (84 K to 157 °C) Ar to In	3140
33090C	Capsule PRT (84 K to 232 °C) Ar to Sn	3870
33100C	Capsule PRT (0 °C to 30 °C) TPW to Ga	1655
33110C	Capsule PRT (0 °C to 157 °C) TPW to In	1655
33120C	Capsule PRT (0 °C to 232 °C) TPW to Sn	2390
33130C	Capsule PRT (234 K to 30 °C) Hg to Ga	2405
33140C	Germanium and Rhodium-Iron Resistance Thermometers (0.65 K to 24.6 K)	6590
33150C	Long Stem PRT (83 K to 0 °C) Ar to TPW	2240
33160C	Long Stem PRT (83 K to 30 °C) Ar to Ga	2975
33170C	Long Stem PRT (83 K to 157 °C) Ar to In	2975
33180C	Long Stem PRT (83 K to 232 °C) Ar to Sn	3710
33190C	Long Stem PRT (83 K to 420 °C) Ar to Zn	3710
33200C	Long Stem PRT (83 K to 661 °C) Ar to Al	4930
33210C	Long Stem PRT (234 K to 30 °C) Hg to Ga	2240
33220C	Long Stem PRT (234 K to 157 °C) Hg to In	2975
33230C	Long Stem PRT (234 K to 232 °C) Hg to Sn	3710
33240C	Long Stem PRT (234 K to 420 °C) Hg to Zn	3710
33250C	Long Stem PRT (234 K to 661 °C) Hg to Al	4930
33260C	Long Stem PRT (0 °C to 30 °C) TPW to Ga	1330
33270C	Long Stem PRT (0 °C to 157 °C) TPW to In	1330
33280C	Long Stem PRT (0 °C to 232 °C) TPW to Sn	2225
33290C	Long Stem PRT (0 °C to 420 °C) TPW to Zn	2225
33300C	Long Stem PRT (0 °C to 661 °C) TPW to Al	4185
33310C	Long Stem PRT (0 °C to 962 °C) TPW to Ag	5240
33320C	Additional Copy of Table from Results of 33010C - 3310C at Time of Test	110
33330C	Additional Copy of Table from Results of 33010C - 33310C at a Later Date	260
33340C	Minimum Charge for Unsuitable Thermometer	280
33350S	Special Tests of Resistance Thermometers	At Cost
33360S	Special Tests of Thermometric Fixed-Point devices	At Cost
33370M	Measurement Assurance Program for Temperature (83 K to 420° C) Ar to Zn	10510
33380M	Measurement Assurance Program for Temperature (83 K to 661° C) Ar to Al	11960
33390M	Measurement Assurance Program for Temperature (0° C to 962° C) TPW to Ag	14890

F. Radiation Thermometry

Technical Contacts:

Charles Gibson
Robert D. Saunders
Edward Hunter

Telephone:

(301) 975-2329
(301) 975-2355
(301) 975-2130

Mailing Address: A221 Physics
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
35010C	Optical Pyrometers (1 range between 800 to 2400 °C, 4 to 12 points)	2865
35020C	Optical Pyrometers (per range in addition up to 4200 °C)	1910
35030C	Additional Interpolated Values	120/pt
35040C	Optical Pyrometers (3 or fewer points, 800 to 4200 °C)	1435
35050C	Ribbon Filament Lamp (6 to 16 points, 800 to 2300 °C)	2390
35060C	Ribbon Filament Lamp (5 or fewer points, 800 to 2300 °C)	1910
35070S	Special Tests of Radiation Pyrometers	At Cost

G. Humidity Measurements

Technical Contacts:

Peter H. Huang
James R. Whetstone

Telephone:

(301) 975-2621, 2626
(301) 975-2738

Mailing Address: A303 Physics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

Shipping Address: National Institute of Standards & Technology
I-270 at Quince Orchard Road
B349 Physics
Gaithersburg, MD 20899
Attn: P. Huang

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
36010C	Dew-Point Hygrometers (+25 to -15 °C)	3640
36020C	Dew-Point Hygrometers (-70 to -15 °C)	7285
36030C	Electric Hygrometers	At Cost
36040C	Electrolytic Hygrometers	At Cost
36050C	Aspirated Hygrometers	At Cost
36060C	Pneumatic Bridge Hygrometers	At Cost
36070S	Special Tests of Humidity	At Cost

H. Total Heat Flux Gauges

Technical Contact:

Kenneth D. Steckler

Telephone:

(301) 975-6678

Mailing Address: A345 Polymers
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
36510S	Special Tests of Total Heat Flux Gauges	460

CHAPTER VII

OPTICAL RADIATION MEASUREMENTS

A. Photometric Measurements

Technical Contacts:

Jonathan E. Hardis
George Eppeldauer

Telephone:

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(301) 975-2338

Mailing Address: B306 Metrology
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
37015C	Luminous Intensity Rental Program	4220
37025C	Luminous Intensity-Submitted Lamp	1745
37035C	Color Temperature Determination on Lamp Submitted for 37025C	820
37080S	Special Tests for Luminous Flux of Incandescent Lamps	At Cost
37140C	Airway Beacon Lamps for Color Temperature (500 W, 1 point in range, 2000-3000K)	1975
37150C	Each Additional Color Temperature	1230
37160C	Color Temperature Equation (4 points and interpolation equation)	3590
37170C	Opal Glass Luminous Directional Transmittance Standards	785
37180S	Special Photometric Tests	At Cost

B. Spectrophotometric Measurements

Technical Contacts:

P. Yvonne Barnes (38010C-38060S)
Kenneth L. Eckerle (38070M-38080M)
Lawrence E. Fink (38090S-38100S)

Telephone:

(301) 975-2345
(301) 975-2343
(301) 975-2348

Mailing Address: B306 Metrology
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
38010C	Spectral Transmittance Filters (Cobalt Blue Glass)	1165
38020C	Spectral Transmittance Filters (Copper Green Glass)	1140
38030C	Spectral Transmittance Filters (Carbon Yellow Glass)	1140
38040C	Spectral Transmittance Filters (Selenium Orange Glass)	1140
38050C	Wavelength Standards (Holmium Oxide Glass)	1005
38060S	Special Tests of Spectral Transmittance and Reflectance	At Cost

38070M	Measurement Assurance Program for Retroreflectance - Complete Package	9315
38071M	Retroreflectance MAP - Sheeting Standards or Prismatic Standard with Colored Filters	7180
38072M	Retroreflectance MAP - Sheeting Standards and Prismatic Standard without Colored Filters	7180
38073M	Retroreflectance MAP - Sheeting Standards or Prismatic Standard without Colored Filters	4990
38074M	Retroreflectance MAP - Colored Filters Only	2905
38080M	Measurement Assurance Program for Transmittance	4455
38090S	Special Tests of X-Ray and Photographic Step Tablets	At Cost
38100S	Special Tests of Microcopy Resolution Test Charts	At Cost

C. Radiometric Measurements

Technical Contacts:

John K. Jackson (39010C-39060S)
Chris L. Cromer (39070C-39080S)
Thomas C. Larason (39070C-39080S)
Sally S. Bruce (39070C-39080S)

Telephone:

(301) 975-2330
(301) 975-3216
(301) 975-2334
(301) 975-2323

Mailing Address: A221 Physics
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
39010C	Spectral Radiance Ribbon Filament Lamps (225 to 2400 nm)	7220
39020C	Spectral Radiance Ribbon Filament Lamps (225 to 800 nm)	7010
39030C	Spectral Radiance Ribbon Filament Lamps (650 to 2400 nm)	6705
39040C	Spectral Irradiance Quartz-Halogen Lamps (250 to 1600 nm)	6150
39045C	Spectral Irradiance Quartz-Halogen Lamps (250 to 2400 nm)	7245
39050C	Spectral Irradiance Deuterium Lamps (200-350 nm)	4335
39060S	Special Tests for Radiometric Sources	At Cost
39070C	Photodiode Spectral Response Rental Package	2165
39080S	Special Tests of Radiometric Detectors	At Cost

D. Radiometric Standards in the Ultraviolet

D.1 Standard Sources

Technical Contact:

Mervin Bridges

Telephone:

(301) 975-3228

Mailing Address: A167 Physics
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
40010C	Spectral Irradiance Standard, Argon Mini-Arc (140 to 330 nm)	3475
40020C	Spectral Radiance Standard, Argon Mini-Arc (115 to 330 nm)	3475
40030C	Spectral Irradiance Standard, Deuterium Arc Lamp (165 to 200 nm)	At Cost
40040S	Special Tests of Radiometric Devices in the Near and Vacuum Ultraviolet	At Cost

D.2 Standard Detectors in the Far Ultraviolet

Technical Contact:

Telephone:

L. Randall Canfield

(301) 975-3728

Mailing Address: B119 Radiation Physics
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
40510C	Detector Standard, Windowless Photodiode (5 to 122 nm)	3595
40511C	Recalibration of Detector Standard (5 to 122 nm)	2895
40520C	Detector Standard, Windowless Photodiode (18 to 122 nm)	2610
40521C	Recalibration of Detector Standard (18 to 122 nm)	2155
40530C	Detector Standard, Windowless Photodiode (52 to 122 nm)	1625
40531C	Recalibration of Detector Standard (52 to 122 nm)	1170
40540C	Uncalibrated Windowless Photodiode	705
40560C	Detector Standard, Windowed Photodiode (116 to 254 nm)	6515
40561C	Recalibration of Detector Standard (116 to 254 nm)	1415
40599S	Special Tests on Detectors from the Near Ultraviolet (320 nm) to the Soft X-ray Region (5 nm)	At Cost

E. Laser Power and Energy

Technical Contacts:

Telephone:

Thomas R. Scott
Aaron A. Sanders

(303) 497-3651
(303) 497-5341

Administrative and Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
42110C	Laser Power and Energy Meter Calibrations	1310
42111C	Same as 42110C, Additional Wavelengths or Power Levels	925
42120M	Laser Power and Energy Measurement Assurance Program (MAP)	1895
42130C	Optical Fiber Power Meter Calibrations	980
42131C	Same as 42130C, Additional Wavelengths	665
42140M	Optical Fiber Power Meter Measurement Assurance Program (MAP)	1825
42150M	Low Level Laser Measurement Assurance Program (MAP)	4230
42160C	Pulsed 10.6- μ m Laser Calibrations	4230
42170S	Special Tests for Laser Power and Energy Meters, by Prearrangement	At Cost
42180S	Special Tests for Optical Fiber Power Meters, by Prearrangement	At Cost

CHAPTER VIII

IONIZING RADIATION MEASUREMENTS

A. Radioactivity Sources

Technical Contacts:

Jacqueline M. Calhoun
 Pamela A. Hodge (43030C-43050C)

Telephone:

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 (301) 975-5544

Administrative and Logistics: Cassandra Beck

(301) 975-5531

Mailing Address: C114 Rad. Physics
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 Gaithersburg, MD 20899-0001
 Attn: Cassandra Beck

Shipping Address: Health Physics (Radioactivity Group)
 National Institute of Standards & Technology
 I-270 at Quince Orchard Road
 Gaithersburg, MD 20899
 Attn: Jacqueline M. Calhoun

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
43010C	Gamma-Ray-Emitting Radionuclides in Solution (Half Lives Greater than 15 Days)	1215
43020C	Gamma-Ray-Emitting Radionuclides in Solution (Half Lives Less than 15 Days)	1865
43030C	Alpha-Particle-Emitting-Solid Sources, NIST 2 $\pi\alpha$ proportional counter	915
43040C	Alpha-Particle-Emitting Solid Sources, NIST 0.8 $\pi\alpha$ defined-solid-angle-counter	915
43050C	Alpha-Particle-Emitting Solid Sources, using both counting systems	1255
43060S	Special Test of Beta-Particle-Emitting Solution Sources - Liquid Scintillation Counting	2640
43070S	Special Tests of Beta-Particle-Emitting Solution Sources - Other Techniques	At Cost
43090S	Special Tests of Alpha-Particle-Emitting Solid Sources	At Cost

B. Neutron Sources and Neutron Dosimetry

Technical Contacts:

E. Dale McGarry (44010C, 44020C, 44100S)
 Robert B. Schwartz (44060C, 44100S)
 Edward W. Boswell (44010C-44060C)

Telephone:

(301) 975-6205
 (301) 975-6203
 (301) 975-6207

Mailing Address: A135 Reactor
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 Gaithersburg, MD 20899-0001

Shipping Address: Health Physics (Neutron Field Standards Group)
 National Institute of Standards & Technology
 I-270 at Quince Orchard Road
 Gaithersburg, MD 20899

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
44010C	Radioactive Neutron Sources (10^5 to 10^8 n/s)	2195
44020C	Radioactive Neutron Sources (10^8 to 10^{10} n/s)	2195
44060C	Personnel Protection Instrumentation, Californium Source Bare and Moderated	At Cost
44070C	Activation Detector Dosimetry, Thermal Neutrons	At Cost
44080C	Activation Detector Dosimetry, Californium Fission Neutrons	At Cost
44090C	Activation Detector Dosimetry, ^{235}U Cavity Fission Source	At Cost
44100S	Special Tests of Neutron Sources and Dosimeters	At Cost

C. Dosimetry of X-Rays, Gamma-Rays, and Electrons

Technical Contacts:

Bert M. Coursey (All Tests)
 Paul J. Lamperti (46010C-46050S)
 James T. Weaver, Jr. (47010C, 47011C, 47040S)
 Debra Bensen (47010C)
 Christopher G. Soares (47030C-47036C, 47040S, 48010M-48020S)

Telephone:

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 (301) 975-5589

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 Gaithersburg, MD 20899-0001

Shipment of Instruments: National Institute of Standards & Technology
 I-270 at Quince Orchard Road
 C214 Radiation Physics
 Gaithersburg, MD 20899
 For: 46010C-46050S
 Attn: P. J. Lamperti
 For: 48010M-48020S
 Attn: C. G. Soares

Shipment of Sources: National Institute of Standards & Technology
 I-270 at Quince Orchard Road
 B131 Radiation Physics
 Gaithersburg, MD 20899
 For: 47010C-47040S
 Attn: Health Physics/J. T. Weaver (For Gamma-Ray Sources)
 Attn: Health Physics/C. G. Soares (For Beta-Particle Sources)

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
C.1 X-RAY AND GAMMA-RAY MEASURING INSTRUMENTS		
46010C	Radiation Detectors - Calibration/Correction Factor, One Beam Quality (See Table 13)	1695
46011C	Each Additional Beam Quality or Condition	860
46020C	Passive Dosimeters - Irradiation of Up to Six, One Beam Quality	1220
46021C	Up to Six Additional Dosimeters at Same Set-Up and Beam Quality	480
46030S	Special Tests of High-Gain Electrometers - Charge Sensitivity, One Set of Switch Positions, with 46010C/46011C, by Prearrangement	1075

46040S	Special Tests of X-Ray Penetrameters, Ardran-Crookes Type	At Cost
46050S	Special Tests of X-Ray and Gamma-Ray Measuring Instruments	At Cost

C.2 GAMMA-RAY SOURCES, BETA-PARTICLE SOURCES, AND MEASURING INSTRUMENTS

47010C	Gamma-Ray Sources Similar to NIST Standards -- ^{60}Co or ^{137}Cs Having Air-Kerma Strengths 10 to 1500 $\mu\text{Gy m}^2/\text{h}$, and ^{125}I or ^{192}Ir Sources: Same Type Seeds Used to Calibrate Reentrant Chamber Having Air-Kerma Strengths 0.1 to 30 $\mu\text{Gy m}^2/\text{h}$.	2520
47011C	Each Additional Gamma-Ray Source of Same Radionuclide	2465
47030C	Beta-Particle Sources Calibrated Surface Dose Rate	1345
47035C	Beta-Particle Sources Calibrated for Radiation Protection	1105
47036C	Ionization Chambers Calibrated with Beta Particle Sources for Radiation Protection	1105
47040S	Special Tests of Gamma-Ray and Beta Particle Sources	At Cost

C.3 DOSIMETRY OF HIGH-ENERGY ELECTRON BEAMS

48010M	Dose Interpretation of NIST-Packaged Ferrous-Ferric (Fricke) Dosimeters Irradiated by Customer--Three Dosimeters (Two for Irradiation, One Control)	600
48011M	Each Additional Dosimeter	245
48020S	Special Tests of Electron-Beam Dosimeters	At Cost

D. Dosimetry for High-Dose Applications

Technical Contacts:

Marlon L. Walker
William L. McLaughlin
James M. Puhl

Telephone:

(301) 975-5593
(301) 975-5559
(301) 975-5581

Mailing Address: Attn: J. Puhl
C229 Radiation Physics
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
49010C	Calibration irradiations of Customer Supplied Dosimeters with ^{60}Co Gamma Rays	650
49020C	Dose Interpretation of NIST Transfer Dosimeters Irradiated by Customer	2170
49030C	Dose Interpretation of Each NIST Transfer Dosimeter Package in Addition to Those Supplied under 49020C	715
49040S	Special Tests of Dosimeters by Reading with Spectrophotometer Optical Density at One to Five Wavelengths (Each Dosimeter)	105
49041S	Spectrophotometric Readings of Dosimeters, Ultra-Violet and Visible Spectrum Scan (Each Dosimeter)	300
49050S	Special Measurement Services for Dosimeter Response	At Cost

CHAPTER IX
ELECTROMAGNETIC MEASUREMENTS

A. Resistance Measurements

A.1 DC Resistance Standards and Measurements

Technical Contacts:

Telephone:

Ronald F. Dziuba
Norman B. Belecki

(301) 975-4239
(301) 975-4223

Administrative and Logistics: Denise D. Prather

(301) 975-4221

Mailing Address: B146 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
51100S	Special Resistance Measurement Services by Prearrangement	At Cost
51110M	Measurement Assurance Program Services for Resistance	At Cost
51130C	Standard Resistor, Thomas-Type, 1 Ω	1385
51131C	Standard Resistor, Evanohm Wirewound High Precision, 10 k Ω	1825
51132C	Standard Resistor, Four-Terminal 0.0001 Ω	1240
51133C	Standard Resistor, Four-Terminal 0.001 Ω	895
51134C	Standard Resistor, Four-Terminal 0.01 Ω	895
51135C	Standard Resistor, Four-Terminal 0.1 Ω	895
51136C	Standard Resistor, Four-Terminal 1 Ω	895
51137C	Standard Resistor, Four-Terminal 10 Ω	895
51138C	Standard Resistor, Four-Terminal 100 Ω	795
51139C	Standard Resistor, 1 k Ω	795
51140C	Standard Resistor, 10 k Ω	795
51141C	Standard Resistor, 100 k Ω	795
51142C	Standard Resistor, 1 M Ω	795
51143C	Standard Resistor, 10 M Ω	1280
51144C	Additional Voltage	1280
51145C	Standard Resistor, 100 M Ω	1280
51146C	Additional Voltage	1280
51147C	Standard Resistor, 1 G Ω	1280
51148C	Additional Voltage	1280
51149C	Standard Resistor, 10 G Ω	1280

51150C	Additional Voltage	1280
51151C	Standard Resistor, 100 GΩ	1440
51152C	Additional Voltage	1440
51153C	Standard Resistor, 1 TΩ	1440
51154C	Additional Voltage	1440
51160C	Standard Resistor for Current Measurements (Shunts), One Range, One Current up to 300 A.	1310
51161C	Standard Resistor for Current Measurements (Shunts), One Range, One Current From 300 A to 1000 A.	2425
51162C	Standard Resistor for Current Measurements (Shunts), Additional Range of a Multi-Range Resistor.	480
51163C	Standard Resistor for Current Measurements (Shunts), Additional Determination at Another Current Level.	480

A.2 High-Voltage Standard Resistors

Technical Contacts:

Martin Misakian
William E. Anderson

Telephone:

(301) 975-2426
(301) 975-2423

Mailing Address: B344 Metrology
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Gaithersburg, MD 20899-0001

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Gaithersburg, MD 20899
Attn: M. Misakian, Bldg. 220, Room B351

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
51210C	High-Voltage Standard Resistors	At Cost

A.3 High-Frequency Standard Resistors

Technical Contacts:

George M. Free
P. J. Moore

Telephone:

(303) 497-3609
(303) 497-5284

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
51310S	High-Frequency Standard Resistors; Two-Terminal	At Cost

A.4 AC Resistors

Technical Contacts:

T. Michael Souders
Barry A. Bell

Telephone:

(301) 975-2406
(301) 975-2419

Mailing Address: B162 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
51410S	Special Test of AC Resistors, by Prearrangement	At Cost

B. Impedance Measurements (Except Resistors)

B.1 Low-Frequency Capacitance and Inductance Measurements & Standards

Technical Contacts:

Y. May Chang
Norman B. Belecki

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(301) 975-4223

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(301) 975-4221

Mailing Address: B146 Metrology
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
52110S	Special LF Impedance Measurements, by Prearrangement	At Cost
52130C	Standard Fixed, used-Silica Dielectric Capacitor (10 and 100 pF at 100, 400, or 1000 Hz)	2410
52131C	Additional Frequency Points	2410
52140C	Fixed Three-Terminal, High-Precision Standard Capacitor with Coaxial Connectors (1 frequency, high accuracy under controlled conditions, 100, 400 or 1000 Hz)	750
52141C	Additional Frequency Points	750
52150C	Physical Tests to Qualify Three-Terminal Air Capacitor for Measurement under 52140C	675
52160C	Fixed Three-Terminal Standard Capacitor with Coaxial Connectors (1 frequency, laboratory conditions, 100, 400 or 1000 Hz)	475
52161C	Additional Frequencies	475
52170C	Two or Three-Terminal Solid Dielectric Standard Capacitor (66-2/3, 100, 400, 1000, or 10,000 Hz)	380
52171C	Additional Frequencies and/or steps (for decade capacitors)	380
52180C	Fixed Inductor, Self or Mutual (100, 400, 1000, or 10,000 Hz)	675
52181C	Additional Points	675

B.2 High-Frequency Standard Capacitors and Inductors

Technical Contacts:

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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
52210S	Two-Terminal Low-Loss Standard Capacitors - 10 kHz to 250 MHz; 1 pF to 1000 pF	At Cost
52211C	Two-Terminal Low-Loss Standard Capacitors, (High Accuracy) 1 MHz; 50, 100, 200, 500 and 1000 pF	435
52220S	Three-Terminal Low-Loss Standard Capacitors-100 kHz, 1 MHz; 10^{-2} pF to 10^3 pF	At Cost
52221C	Three-Terminal Low-Loss Standard Capacitors (High Accuracy) 100 kHz, 1 MHz, 10^{-2} , 10^{-1} , 1, 10^2 and 10^3 pF	465
52310S	Two-Terminal, High-Q Standard Inductors (10^{-2} μ H to 1 H)	At Cost

B.3 Power-Frequency Capacitors

Technical Contacts:

James K. Olthoff
William E. Anderson

Telephone:

(301) 975-2431
(301) 975-2423

Mailing Address: B344 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

Shipping Address: National Institute of Standards & Technology
I-270 at Quince Orchard Road
Gaithersburg, MD 20899
Attn: J.K. Olthoff, Bldg. 202, Room 167

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
52400C	Power-Frequency Capacitors	At Cost

B.4 Q-Standards

Technical Contacts:

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P. J. Moore

Telephone:

(303) 497-3609
(303) 497-5284

Administrative & Logistics: Kathy Hillen

(303) 497-3753

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325 Broadway
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
52710C	Inductive Q-Standards; 50 kHz - 45 MHz, 0.25 μ H to 25 mH	285
52711C	Each Additional Frequency for 52710C	87

C. Voltage Measurements

C.1 DC Voltage Measurements and Standards

Technical Contacts:

June E. Sims
Richard L. Steiner
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Telephone:

(301) 975-4238
(301) 975-4226
(301) 975-4223

Administrative and Logistics: Denise Prather

(301) 975-4221

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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
53110S	Special DC Voltage Measurements, by Prearrangement	At Cost
53120M	Measurement Assurance Program for DC Voltage	4675
53130C	First Saturated Standard Cell in a Group	920
53131C	Each Additional Cell	545
53140C	Platinum Resistance Thermometer Temperature Determination for Standard Cell Calibration	290
53150C	Unsaturated Standard Cells	440
53160C	Tests of Solid State Voltage Reference Standard (1 Output, 1-10 V)	1025
53161C	Each Additional Output	335
53180S	Special Handling (Equipment Pickup or Delivery)	92
53190S	Special Handling (Cleaning, Minor Repair, Return Service Charge)	160

C.2 AC Voltage Measurements

Technical Contacts:

Nile M. Oldham
Barry A. Bell
Mark E. Parker

Telephone:

(301) 975-2408
(301) 975-2419
(301) 975-2413

Mailing Address: B162 Metrology
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
53200S	Special Tests of High-Accuracy Digital Multimeters, Multifunction Calibrators, by Prearrangement	At Cost
53201S	Special Tests of Low-Voltage AC-DC Transfer Standards, by Prearrangement	At Cost

C.3 AC-DC Thermal Voltage and Current Converters (To 1 MHz)

Technical Contacts:

Telephone:

Joseph R. Kinard
Norman B. Belecki

(301) 975-4250
(301) 975-4223

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(301) 975-4221

Mailing Address: B146 Metrology
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
53350C	Set up Charge (No Test Points Included) for a Standard or Standards set for AC-DC Difference (Voltage or Current)	375
53351C	First Point on a Voltage or Current Range	600
53352C	Additional Points within a Voltage or Current Range (Additional Frequency/Voltage or Frequency/Current Points)	195

C.4 RF-DC Thermal Voltage and Current Converters (100 Hz - 1 GHz)

Technical Contacts:

Telephone:

Gregorio Rebuldele
Darlene Seibold

(303) 497-3561
(303) 497-5419

Administrative & Logistics: Kathy Hillen

(303) 497-3753

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325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
53405S	Special Tests of AC Thermal Voltage Converters, by Prearrangement	At Cost
53410C	Low Frequency TVC Calibration at One Frequency Selected from Those Given in Table 16 at Rated Voltage in the Range 0.1 - 50 V	430
53411S	Additional Frequency Selected from Table 16 for Same TVC as in 53410C	195
53412S	Same as 53410C, Except Customer Designates a Single Frequency (in Same Frequency Range) Other Than Those Given in Table 16	At Cost
53413C	Low Frequency TVC Calibration at One Frequency Selected from Those Given in Table 16 at Rated Voltage in the Range 50 - 200 V	460

53414C	Additional Frequency Selected from Table 16 for Same TVC as in 53413C	245
53415S	Same as 53413C, Except Customer Designates a Single Frequency (in Same Frequency Range) Other Than Those Given in Table 16	At Cost
53420C	High Frequency TVC Calibration at One Frequency Selected from Those Given in Table 17 at Rates Voltage in the Range 0.1 - 7.5 V	555
53421C	Additional Frequency Selected from Table 17 for Same TVC as in 53420C	285
53430S	Peak-to-Peak Detector Calibration at One Frequency Selected from Those Given in Table 18 at 1.2 V Applied RF Voltage	At Cost
53431S	Additional Frequency for Peak-to-Peak Detector in Test 53430S	At Cost
53440S	Special Tests of RF Micropotentiometers, by Prearrangement	At Cost
53441C	RF Micropotentiometer Calibration at one Frequency Selected from the Frequency Bands Given in Table 19	285
53445S	Special Calibration of RF Micropotentiometer (Output Voltage Range, 200 to 200,000 μ V at Frequency Range, 0.05 to 1000 MHz) with Reduced Limits of Uncertainty	At Cost

C.5 Data Converters

Technical Contacts:

T. Michael Souders
Barry A. Bell

Telephone:

(301) 975-2406
(301) 975-2419

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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
53500S	Special Data Converter Services, by Prearrangement	At Cost
53510C	A/D or D/A Converter, Linearity Errors at 1024 Points, 10 Bit-Correction Coefficients, and Superposition Errors	815
53520C	A/D or D/A Converter, Differential Linearity Errors at 2(N-1) Points (N = No. of Bits)	155
53530C	A/D Converter, Equivalent RMS Input Noise	270
53540S	A/D or D/A Converter - Offset and Gain Errors Relative to U.S. Legal Volt	At Cost

D. Precision Ratio Measurements

D.1 Inductive Dividers

Technical Contact:

Norman B. Belecki

Telephone:

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Administrative and Logistics: Denise D. Prather

(301) 975-4221

Mailing Address: B146 Metrology
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
54110S	Special Ratio Measurements and Tests of Inductive Voltage Dividers, by Prearrangement	At Cost
54120C	Inductive Voltage Dividers - (Single Frequency, Voltage to be Specified, Each Setting of 3 Most Significant Dials)	1905
54121C	Additional Frequency Points	1905
54130C	Inductive Voltage Dividers - (Single Frequency, Voltage to be Specified, Each Setting of Most Significant Dial Only)	1190
54131C	Additional Frequency Points and/or Low Voltage Points	1190

D.2 Resistive Dividers

Technical Contacts:

Martin Misakian (DC Measurements)
Richard J. Van Brunt (60-Hz Measurements)
Gerald J. FitzPatrick (Pulsed Measurements)

Telephone:

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(301) 975-2425
(301) 975-2737

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Gaithersburg, MD 20899
For: 54210C-54211S
Attn: M. Misakian, Bldg. 220, Room B351
For: 54212C-54213S
Attn: R. J. Van Brunt, Bldg. 202, Room 167
For: 54214S
Attn: G. J. FitzPatrick, Bldg. 202, Room 106

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
54210C	Resistor and Resistive Dividers - Total Resistance or Voltage Ratio, Two Direct Voltage Levels Between 10 kV and 150 kV	1360
54211S	Special Tests of Resistor and Resistive Dividers at Direct Voltage Levels, by Prearrangement	At Cost
54212C	Resistor and Resistive Dividers at 60 Hz, Voltage Ratio and Phase Angle, between 10 kV and 100 kV rms	At Cost
54213S	Special Tests of Resistor and Resistive Dividers at 60 Hz, by Prearrangement	At Cost
54214S	Special Tests of Resistor and Resistive Dividers Under Pulsed High Voltage Conditions, by Prearrangement	At Cost

D.3 Capacitive Dividers

Technical Contacts:

Robert E. Hebner, Jr.
Richard J. Van Brunt (60 Hz Measurements)
Gerald J. FitzPatrick (Pulsed Measurements)

Telephone:

(301) 975-2403
(301) 975-2425
(301) 975-2737

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For: 54310S
Attn: R. J. Van Brunt, Bldg. 202, Room 167
For: 54311S
Attn: G. J. FitzPatrick, Bldg. 202, Room 106

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
54310S	Special Tests of Capacitive Dividers at 60-Hz, by Prearrangement	At Cost
54311S	Special Tests of Capacitive Dividers Under Pulsed High-Voltage Conditions, by Prearrangement	At Cost

D.4 Mixed Dividers

Technical Contact:

Gerald J. FitzPatrick

Telephone:

(301) 975-2737

Mailing Address: B344 Metrology
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Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
54410S	Pulse-Voltage-Measuring Systems Including Kerr Cells	At Cost

D.5 Voltage and Current Transformers

Technical Contacts:

James K. Olthoff (Voltage Transformers)
Thomas L. Nelson (Current Transformers)

Telephone:

(301) 975-2431
(301) 975-2416

Mailing Address: B344 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

Shipping Address: National Institute of Standards & Technology
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Gaithersburg, MD 20899
For: 54510C-54513C
Attn: J. K. Olthoff, Bldg. 202, Room 167
For: 54520C-54522C
Attn: T. L. Nelson, Bldg. 220, Room B165

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
54510C	Voltage Transformer, Ratio & Phase Angle, at 60 Hz on 1 Range, 1 Secondary Voltage, 1 Burden Primary $V_{rms} \leq 150$ kV	1360
54511C	Same as 54510C, Additional Similar Transformer at Same Time	985
54512C	Same as 54510C and 54511C, Additional Burden or Range	300
54513C	Same as 54510C - 54512C, at Each Secondary Voltage	89
54520C	Current Transformer, Ratio & Phase Angle, 1 Range at 1 Frequency, 1 Burden, Secondary Currents 0.5, 1, 2, 3, 4, 5 A, Primary Current Not Over 12,000 A	2125
54521C	Current Transformer, Ratio & Phase, 1 Secondary Current, Additional Combination of Range, Frequency, and Burden, Primary Current Not Over 12,000 A	190
54522C	Current Transformer, Ratio & Phase at Each Additional Secondary Current, Same Combination of Range, Frequency, and Burden as 54520C or 54521C	145
54600S	Special Tests of Dividers and Transformers, by Prearrangement	At Cost

E. Phase Measurements and Air Navigation Aids

E.1 Phase Meters and Standards

Technical Contacts:

Raymond S. Turgel
Barry A. Bell
Mark E. Parker

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(301) 975-2420
(301) 975-2419
(301) 975-2413

Mailing Address: B162 Metrology
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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
55110S	Special Tests of Phase Standards and Related Instruments, by Prearrangement	At Cost
55120C	Phasemeters - One Combination of Input Voltages (0.5 V to 100 V rms) at one Frequency (2 Hz to 50 kHz) - the Input Voltage Ratio Shall Not Exceed 10	620
55121C	Phasemeters - Each Additional Combination of Input Voltages (0.5 V to 100 V rms) at the Same or at a Different Frequency (2 Hz to 50 kHz) - the Input Voltage Ratio Shall Not Exceed 10	180
55130C	Phasemeters - One Combination of One Input Voltage (0.5 V to 770 120 V rms) and One Input Current (0.5 to 5 A rms) at One Frequency (2 Hz to 5 kHz)	855
55131C	Phasemeters - Each Additional Combination of One Input Voltage (0.5 V to 120 V rms) and One Input Current (0.5 to 5 A rms)	260
55140C	Phasemeters - One Input Voltage (0.5 V to 120 V rms) and another Input Voltage (0.5 V to 100 V rms) at One Frequency (2 Hz to 5 kHz)	855

E.2 Very-High-Frequency Omnidirectional Range (VOR) Measurements**Technical Contacts:**Neil T. Larsen
David H. Russell**Telephone:**(303) 497-3711
(303) 497-3148**Administrative & Logistics:** Kathy Hillen

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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
55210C	VOR Bearing-Angle Indicators, 12 Bearing Angles Over the Range 0 to 330 Degrees	At Cost
55211C	Calibration of VOR Bearing-Angle Indicator at Each Additional Angle	At Cost
55220C	VOR Generators, 12 Bearing-Angle Equivalent Signals Over the Range 0 to 330 Degrees	At Cost
55221C	Calibration of VOR Generator at Each Additional Angle	At Cost
55230S	Special VOR Tests	At Cost

F. Power and Energy Measurements, Low-Frequency**Technical Contacts:**Andrew J. Secula
Thomas L. Nelson**Telephone:**(301) 975-2416
(301) 975-2427**Mailing Address:** B344 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001**Shipping Address:** National Institute of Standards & Technology
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Attn: A. J. Secula, Bldg. 220, Room B165

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
56110S	Special Tests of AC-DC Wattmeters, by Prearrangement	At Cost
56200C	Watt, Watthour, Var, Varhour Meter, Initial Two Determinations of Same Meter at 60 Hz	1695
56201C	Each Additional Determination Same Meter at 50 Hz	115
56202C	Initial Two Determinations of One or Two Meters Run Simultaneously with the First (56200C)	1505

G. Microwave Measurements

G.1 Bolometer, RF and Microwave

Technical Contacts:

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Manly P. Weidman

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<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
61110S	Effective Efficiency and Reflection Coefficient of Coaxial Thermistor Mounts at Specified Frequency in Range 0.1 to 10 MHz	At Cost
61111S	Each Additional Frequency for 61110S	At Cost
61120S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 10 MHz Intervals within 10-100 MHz	830
61121S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 25 MHz Intervals within 100-500 MHz and 1000 MHz	830
61122S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 10 MHz Intervals within 10-100 MHz and 25 MHz Intervals within 100-500 MHz and 1000 MHz	1330
61123S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 50-MHz Intervals within 1-2 GHz	1170
61124S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 100-MHz Intervals within 2-4 GHz	1170
61125S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 200-MHz Intervals within 4-8 GHz	1170
61126S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 200-MHz Intervals in the Range 8-12.4 GHz	1170
61127S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 250-MHz Intervals in the Range of 12.4-18 GHz	1170
61128S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 1-GHz Intervals in the Range 1-18 GHz	1615

61129S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Coaxial Thermistor Mounts at 1-GHz Intervals in the Range 18-26 GHz	3150
61144S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectangular Waveguide Thermistor Mounts at 200 MHz Intervals within 8.2-12.4 GHz (WR90)	1295
61146S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectangular Waveguide Thermistor Mounts at 250-MHz Intervals within 12.4-18.0 GHz (WR62)	1295
61147S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectangular Waveguide Thermistor Mounts at a Specified Frequency within 18-26.5 GHz (WR42)	At Cost
61148S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectangular Waveguide Thermistor Mounts at a Specified Frequency within 26.5-40 GHz (WR28)	At Cost
61149S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectragular Waveguide Thermistor Mounts at a Specified Frequency within 42-46 GHz (WR22)	At Cost
61155S	Calibration Factor, Effective Efficiency, and Reflection Coefficient of Rectangular Waveguide Thermistor Mounts of Specified Frequency within 94-96 GHz (WR10)	At Cost
61190S	Special Microwave and RF Power Measurement Services, by Prearrangement	At Cost

G.2 Attenuators, RF and Microwave

Technical Contacts:

John R. Juroshek
Ronald A. Ginley
Manly P. Weidman

Telephone:

(303) 497-5362
(303) 497-3634
(303) 497-3516

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Service</u>	<u>Fee(\$)</u>
61210S	Coaxial Fixed Variable Attenuators, Frequency Range 10 MHz to 26 GHz, Attenuation 0 to 50 dB	At Cost
61211C	Coaxial Fixed and Variable Attenuators Measured at 30 MHz, Attenuation 0 - 120dB	At Cost
61215C	Waveguide - Below Cutoff (Piston) Attenuators, Coaxial Connectors, Measured at 30 MHz, Attenuation 0 - 120 dB (Total Insertion Loss)	At Cost
61230S	Rectangular Waveguide Fixed and Variable Attenuators, Specify Frequencies for Waveguide Sizes WR10, WR22 and WR42 0 - 50 dB	At Cost
61240S	Attenuation Measurements of Three-Port and Two-Port Devices at 1.25 MHz, 0 - 6 dB	At Cost

G.3 Coaxial and Waveguide Terminations, Reflection Coefficients**Technical Contacts:**

John R. Juroshek
 Ronald A. Ginley
 Manly P. Weidman

Telephone:

(303) 497-5362
 (303) 497-3634
 (303) 497-3516

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
 National Institute of Standards & Technology
 325 Broadway
 Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
61310S	Complex Reflection Coefficient of Coaxial Terminations, Frequency Range 10 MHz to 26 GHz	At Cost
61320S	Complex Reflection Coefficient of Rectangular Waveguide Terminations with Standard Flange Connectors, Specify Frequency for Waveguide Sizes WR10, WR22, WR28, WR42	At Cost
61340S	Special Reflection Coefficient Measurements, by Prearrangement	At Cost

G.4 Phase Shifters, RF and Microwave**Technical Contacts:**

Ronald A. Ginley
 Gene Marler
 Manly P. Weidman

Telephone:

(303) 497-3634
 (303) 497-5455
 (303) 497-3516

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
 National Institute of Standards & Technology
 325 Broadway
 Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
61410S	Coaxial Fixed and Variable Phase Shifters; Characteristic Phase Shift Difference; Precision Connectors; Measured at 30 MHz, Range 0-360°	At Cost
61411S	Coaxial Fixed and Variable Phase Shifters; Characteristic Phase Shift Difference; Precision Connectors; Frequency Range 1 - 26 GHz, Phase Range 0-360°	At Cost
61420S	Variable Rectangular Waveguide Phase Shifters; Phase Shift Difference; Specify Frequencies for Waveguide Sizes WR10, WR22, WR28, WR42, Range 0-720°	At Cost
61450S	Special Tests of Phase Shifters, by Prearrangement	At Cost

G.5 Dimensional Verification of Coaxial Air Line Standards

Technical Contacts:

John Juroshek
Ronald A. Ginley
Manly P. Weidman

Telephone:

(303) 497-5362
(303) 497-3634
(303) 497-3156

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
61510S	Dimensional Measurement of Air Lines and Verification of Characteristic Impedance from Dimensional Measurements	At Cost

G.6 Dielectric Material Measurements

Technical Contacts:

William A. Kissick
Eric Vanzura

Telephone:

(303) 497-3339
(303) 497-5752

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
61620S	Special Tests for Dielectric Materials 0.05 to 18 GHz	At Cost

H. Noise Temperature Measurements

Technical Contacts:

J. Wayde Allen
Sunchana Perera

Telephone:

(303) 497-5871
(303) 497-3546

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.02
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Freq.</u>	<u>Connector Type</u>	<u>Device Requirements/Services</u>	<u>Fee (\$)</u>
62020S			Special Noise Temperature Measurements (Electromagnetic), by Prearrangement	At Cost
62100S	<u>MHz</u> 30 60	<u>Coaxial</u> N (Prec.) APC 3.5 14 mm	VSWR < 1.2 Temperature 77K - 15,000K ENR < 17 dB	1600
62101S			Additional Devices with the Same Connector Type	1425
62110S	<u>GHz</u> 1 - 12	<u>Coaxial</u> N (Prec.) APC 3.5 14 mm	Reflection Coefficient < 0.2 Temperature 77K - 15,000K ENR < 17 dB	1655
62111S			Additional Device with the Same Connector Type and Calibration Frequency	1410
62112S	<u>GHz</u> 1 - 12	<u>Coaxial</u> APC 3.5 mm	Reflection Coefficient < 0.2 Temperature 77K - 15,000K ENR < 17 dB	2570
62113S			Additional Device Tested at the Same Frequency	2320
62115S	<u>GHz</u> 2.6 3 - 95 3.95 - 5.85 5.85 - 8.2 7.05 - 10	<u>Waveguide</u> WR284 WR187 WR137 WR112	Reflection Coefficient < 0.2 Temperature 77K - 15,000K ENT < 17 dB	2610
62116S			Additional Device with the Same Connector Type and Calibration Frequency	2360

62120S	<u>GHz</u> 8.2, 9.0 9.5, 9.8 10.0, 10.5 11.2, 11.8 12.4 ----- 12.4, 13.5 14.0, 15.0 16.0, 16.5 17.0, 18.0	<u>Waveguide</u> WR90 WR62	Reflection Coefficient < 0.09 Temperature 9,000K - 17,000K ENR < 17.6 dB	1905
62121S			Additional Device at the Same Frequency	1745
62130S	<u>GHz</u> 94.5 - 96.6	<u>Waveguide</u> WR10	Reflection Coefficient < 0.2 Temperature 77K - 15,000K ENR < 17 dB	1400
62131S			Additional Device at the Same Frequency	1190
62132S	55.0 - 64.5	WR15	Reflection Coefficient < 0.09 Temperature 300K - 15,000K ENR < 17 dB	1570
62133S			Additional Device at the Same Frequency	1425

I. Electromagnetic Field Strength and Antenna Measurements

I.1 Microwave Antenna Parameter Measurements

Technical Contacts:

Andrew G. Repjar (63100S-63400S)

Katherine Mac Reynolds (63100S)

Michael H. Francis

Telephone:

(303) 497-5703

(303) 497-3471

(303) 497-5873

Administrative & Logistics: Kathy Hillen

(303) 497-3753

Mailing Address: M.C. 813.10
National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
63100S	Gain and Polarization Calibrations of Standard Antennas Using Extrapolation Range	At Cost
63200S	Measurement of Pattern, Gain and Polarization of Arbitrary Antennas Using Near-Field Scanning Techniques	At Cost
63300S	Special Test Services for Calibration of Probes Used with Near-Field Scanning Facilities	At Cost
63400S	Special Consulting, Advisory, and Other Services	At Cost

I.2 Field Strength Parameter Measurements

Technical Contacts:

Galen H. Koepke
Motohisa Kanda

Telephone:

(303) 497-5766
(303) 497-5320

Administrative & Logistics: Kathy Hillen

(303) 497-3753

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National Institute of Standards & Technology
325 Broadway
Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
64100S	Special-Test Services for Antenna/Field Strength/Measurements, Using the Transverse Electromagnetic (TEM) Cell Method, (10 kHz - 300 MHz)	At Cost
64200S	Special-Test Service for Antennas/Field Strength/Measurements, Utilizing the Open Field Method	At Cost
64300S	Special-Test Service for Antennas/Field Strength/Reflectivity Measurements, Utilizing the Anechoic-Chamber Method	At Cost

J. Pulse Waveform Measurements

Technical Contact:

William L. Gans

Telephone:

(301) 975-2502

Mailing Address: B162 Metrology
National Institute of Standards & Technology
Gaithersburg, MD 20899-0001

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
65100S	Impulse Generator Spectrum Amplitude (50 Ohm)	At Cost
65200S	Fast Repetitive Broadband Pulse Parameters (50 Ohm)	At Cost
65300S	Network Impulse Response (Frequency Domain Parameter S_{21}) of Coaxial Networks, 10 MHz to 10.0 GHz, 0 to ± 40 dB	At Cost
65301S	Additional 65300S Item Tested at Same Time as First	At Cost
65400S	Pulse Time Delay Trough Coaxial Transmission Lines	At Cost

CHAPTER X

TIME AND FREQUENCY MEASUREMENTS

A. Time and Frequency Dissemination

Technical Contacts: Telephone:
 George Kamas (Frequency) (303) 497-3378
 David W. Allan (Time) (303) 497-5637
 Administrative & Logistics: Kathy Hillen (303) 497-3753
 Mailing Address: M.C. 847.50
 National Institute of Standards & Technology
 Boulder, CO 80303-3328
 Shipping Address: M.C. 847.50, Room. 4039
 National Institute of Standards & Technology
 325 Broadway
 Boulder, CO 80303

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
76100S	Special Tests of Time and Frequency; Frequency Measurement Service - (Frequency delivered to user's site)	Initial one-time fee 4,950 monthly charge 500
76110S	Special Tests of Time and Frequency; Global Time Service (Frequency and Time delivered to user's site)	14,100/year

B. Oscillator Characterization

Technical Contact: Telephone:
 James E. Gray (303) 497-3209
 Administrative & Logistics: Kathy Hillen (303) 497-3753
 Mailing Address: M.C. 847.50
 National Institute of Standards & Technology
 325 Broadway
 Boulder, CO 80303-3328
 Shipping Address: M.C. 847.50, Room. 2019
 National Institute of Standards & Technology
 325 Broadway
 Boulder, CO 80303-3328

<u>Test No.</u>	<u>Description of Services</u>	<u>Fee (\$)</u>
77100C	Precision Oscillator Frequency Calibration	270
77110C	Characterization of Atomic Time and Frequency Standards	1995
77120C	Characterization of Precision Oscillators: Time Domain	990
77130C	Characterization of Precision Oscillators: Frequency Domain	990

77131C	Characterization of Precision Oscillators: Frequency Domain, High Accuracy Option	At Cost
77140S	Special Time/Frequency Measurements: Oscillators and Other Components	At Cost

CHAPTER XI

ANNOUNCEMENTS/SEMINARS

The announcements which follow concern notification of changes in services and information about future NIST Measurement Seminars. Specific technical questions regarding the services described in these announcements should be referred to the points of contact indicated. General policy questions regarding NIST measurement services should be referred to the Calibration Program.

It should be recognized that in many cases where NIST calibration services are not advertised, special arrangements can sometimes be made on a case-by-case basis (NIST workload permitting) if it can be shown that there is a critical need for a NIST calibration.

NEW SERVICES

<u>Test No.</u>	<u>Description of Services</u>
30061C	Helium Glass or Quartz Permeation Leaks, 2×10^{-14} to 2×10^{-8} mol/s

REDUCTION IN SERVICES

<u>Test No.</u>	<u>Description of Services</u>
31060C	Laboratory Thermometers (Liquid O ₂) (-183 °C or -297 °F)
31160S	Special Tests of Thermometers (Liquid O ₂) (-183 °C or -297 °F)
32130C	Liquid O ₂ (-183 °C) or (-297 °F)

CHANGE OF ADDRESS

The Physical Measurement Services Program name has been changed to Calibration Program and was relocated to Building 411, Room A104, Gaithersburg, MD 20899-0001.

The Pulse Waveform Measurements, Test numbers 65100S-65400S, have been moved to our Gaithersburg site. Technical Contact: William L. Gans, (301) 975-2502, B162 Metrology, Gaithersburg, MD 20899-0001.

NIST MEASUREMENT SEMINARS

NIST holds seminars and workshops activities that provide advice and assistance on measurements and calibrations so that laboratories outside NIST can make measurements consistent with national standards as maintained by NIST. Participation is open to a limited number of persons from measurement and standards laboratories who meet appropriate prerequisites relating to education, work experience, and current professional activity.

Each seminar lasts from one to five days and its meetings are devoted to lectures, group discussions, and laboratory demonstrations. A course may be canceled if registration is insufficient. However, in the past, requests for enrollment have nearly always exceeded the numbers that could be accommodated. Laboratory directors who wish to have members of their staff attend any of these courses are therefore urged to send, as soon as possible, a letter of application to the individual named in the course descriptions below. Applications should also be accompanied by a check, billing authorization, or purchase order for the stated fee.

Acceptance of qualified applicants, on the basis of first come first served, other things being equal, will be made by letter not later than 4 weeks prior to the scheduled date of the course. Detailed information on schedules and housing will be available at that time. Those accepted will be expected to study the assigned reading material before coming to the course and should be prepared to discuss their own experiences with related problems.

ELECTRICAL MEASUREMENT ASSURANCE PROGRAMS WORKSHOP

Description: This NIST/NCSL EMAP workshop consists of lectures and computer-aided instruction sessions on statistical concepts and electrical metrology, and is intended to provide the necessary background needed to apply statistical process control and other quality assurance concepts to standards and calibration laboratory operations. It is intended for degreed metrology practitioners and senior technicians having a mathematical background at the advanced algebra level or higher.

Technical Contact: Norman Belecki (301) 975-4223

Course Length: 5 days

Dates: Not Scheduled: Call for information.

PRECISION THERMOMETRY WORKSHOP

Description: This workshop gives an integrated instruction in Temperature Scales, Platinum Resistance Thermometry, Thermistor Thermometry, Vapor Pressure and Gas Thermometry, Liquid-in-Glass Thermometry, Thermocouple Thermometry and an overview of Radiation Thermometry. Material to be covered includes the International Temperature Scale of 1990 and its use in the laboratory; thermometers and instrumentation, including automatic data acquisition; the treatment of calibration data; and innovations in thermometry. Time will be split between lecture sessions and hands-on measurements in the laboratory.

The workshop is especially intended for calibration laboratory personnel and others who wish to undertake precision temperature measurements. Applicants should possess undergraduate training in physics or engineering and should have some laboratory experience in metrology.

Arrangements: Attendance will be limited to 16. Fee: To be determined. Dates: March 9-13, 1992 and October 19-23, 1992. Apply to: Lori Phillips (301) 975-3881, NIST, A903 Administration, Gaithersburg, MD 20899.

CALIBRATION AND USE OF PISTON GAGES

Description: These seminars are held to help industrial and other users attain the highest possible accuracy in pressure measurements with piston gages. The seminar is directed at engineers and senior technicians. The two-day seminar presents information on the theory of piston gages, elastic distortion, design and types, calibration of controlled clearance piston gages, calibration by cross-float, error analysis, computer programs, demonstration of cross-float, hydrostatic weighing and transducer calibrations. The seminar closes with a tour of the laboratory, and a discussion of research and development work in the field of pressure measurements.

Arrangements: Attendance will be limited to 12. Fee: \$650. Dates: April 22-24, 1992. Apply to: Tammie Grice (301) 975-2775, NIST, A903 Administration, Gaithersburg, MD 20899.

VACUUM CALIBRATIONS USING THE SPINNING ROTOR GAGE

Description: NIST will be conducting a two and one-half day workshop on the use of the spinning rotor (or molecular drag) gage to calibrate ionization gages in the pressure range 10^{-6} to 10^{-3} Torr (10^{-4} to 10^{-1} Pa). There will be one-half day of lecture followed by demonstrations in the laboratory, one full day of using the gages to perform calibrations, and one-half day of follow-up discussions, questions, and visits to the vacuum facilities.

Arrangements: In order to permit maximum use of the gages, the number of participants is kept to four per system (a maximum of sixteen participants per workshop). Fee: To be determined. Dates: May 18-20, 1992. Apply to: Ana Salazar (301) 975-4840, NIST, A55 Metrology, Gaithersburg, MD 20899.

TIME AND FREQUENCY SEMINAR

Description: This seminar is intended for engineers, scientists and laboratory technicians involved in the application and use of time and frequency services and measurements. Topics include:

SHORT TERM STABILITY
LONG TERM STABILITY
STATISTICS OF OSCILLATORS
PHASE NOISE MEASUREMENTS
CHARACTERISTICS OF COMMERCIAL FREQUENCY STANDARDS
TIME COORDINATION
TIME KEEPING AND TIME SCALES
TIME DISSEMINATION METHODS
PROPAGATION EFFECTS ON RADIO TRANSMISSIONS
NIST SERVICES
MEASUREMENT TECHNIQUES
PERFORMANCE AND SPECIFICATIONS OF QUARTZ OSCILLATORS
RELATING TO MIL-O-55310B

Arrangements: Attendance will be limited to 40. Fee: \$800. Dates: June 23-25, 1992. Apply to: Patsy J. Tomingas (303) 497-3276 or Jerry Hendrix (303) 497-5646, NIST, 325 Broadway, M.C. 847.00, Boulder, CO 80303. Technical contact: David A. Howe (303) 497-3277.

GAGE BLOCK CALIBRATION COURSE

Description: This three day course will emphasize the concepts, techniques, and apparatus used in gage block calibration. The faculty will consist of members of the Dimensional Metrology Group. The course will consist primarily of lectures, although the attendance will be restricted to encourage discussion between the instructors and class. There will also be laboratory visits for informal discussions with the NIST staff. Topics include:

INTRODUCTION
GAGE BLOCKS
STATISTICS
PROCESS CONTROL - AN INTRODUCTION
THE HOW AND WHY OF CALIBRATION DESIGNS
GAGE BLOCK COMPARATORS
CALIBRATION PRELIMINARIES
CORRECTIONS TO MEASUREMENTS
CALIBRATION - NIST PROCEDURES
SURVEY OF COMMON INDUSTRY PRACTICES
INTERFEROMETRY
INTERFEROMETRIC MEASUREMENTS
LENGTH FROM INTERFEROMETRY

Arrangements: Attendance will be limited to 25. Fee: \$750. Dates: November 1992. Apply to: Lori Phillips (301) 975-3881, NIST, A903 Administration, Gaithersburg, MD 20899. Technical contact: John Stoup (301) 975-3471.

SHORT COURSE IN LASER MEASUREMENTS

Description: The three-and-one-half-day course will emphasize the concepts, techniques, and apparatus used in measuring laser parameters and will include a visit to the NIST laser measurement laboratories. The faculty will consist of laser experts from NIST, industry, and other government agencies. A degree in physics or electrical engineering or equivalent experience is assumed, and some experience in the use of lasers is desirable. Topics include:

OPTICS FOR LASER MEASUREMENTS
ATTENUATION TECHNIQUES
LASER OPERATION
BASIC LASER POWER/ENERGY STANDARDS
LASER POWER/ENERGY MEASUREMENT TECHNIQUES

PULSE MEASUREMENTS
TRANSFER STANDARDS
BEAM PROFILE MEASUREMENTS
DIODE LASERS
LASER MEASUREMENTS FOR OPTICAL COMMUNICATIONS
STATISTICS AND ERROR ANALYSIS
LASER SAFETY
DETECTORS

Technical Contact: Thomas Scott (303) 497-3651

Course Length: 3 1/2 days

Dates: Not Scheduled: Call for information.

ALPHABETICAL CROSS-INDEX

Item	Test Number
Absolute pressure transducers	30010C-30011C
Accelerometers	24010C-24060S
Ac-dc thermal converters (to 1MHz)	53350C-53352C
Ac-dc thermal converters (100 Hz to 1 GHz)	53405S-53445S
Ac-dc watt-hour or var-hour meters	56110S-56210M
Ac resistors	51410S
Ac voltage, high accuracy	53200S-53201S
Acoustic devices	25060S
Acoustic emission transducers and sensors	26200C-26210S
Acoustic measurements	25010C-25070S
Activation detector dosimetry	44070C-44090C
A/D or D/A data converters	53500S-53540S
Air navigation aids	55210S-55230S
Air-speed indicators	19010C-19040S
Alpha-particle-emitting solid sources	43030C-43050C
Aluminum ultrasound reference blocks	26030S, 26050S, 26070S
American Petroleum Institute gages	12010C
Analog-to-digital data converters	53500S-53540S
Anemometers	19010C-19040S
Angle gage blocks	14010C
Angular measurements	14010C-14050S
Antenna parameter measurements, microwave	63100S-63400S
Attenuators, rf and microwave	61210S-61250S
Audio-frequency phase meter	55120C-55141C
Balls	11030S
Barometers	29035C, 30010C- 30011C
Bearing-angle indicators	55210C-55221C
Beckman thermometers	31080C
Beta particle applications	47030C-47040S
Beta-particle emitting sources	43060S, 43070S, 47030C-47040S
Bolometer units, rf and microwave	61110S-61129S
Calorimeter thermometers	31070C
Capacitance and inductance measurements, high frequency	52210S-52310S
Capacitance and inductance measurements, low frequency	52110S-52181C
Capacitive voltage dividers	54310S-54311S
Capacitors, dielectric	52130C
Capacitors, high frequency	52210S-52221S
Capacitors, low frequency	52110S-52171C
Capacitors, power frequency	52400C
Coaxial air line standards	61510S
Coaxial attenuators	61210S-61211C
Coaxial terminations and reflection coefficients	61310S-61340S
Coaxial thermistor mounts	61110S-61129S
Color temperature	37140C-37160C
Complex dimensional standards	12010C-12040S
Converters, A/D and D/A	53500S-53540S
Cryogenic flow measurements	18800S
Current and voltage transformers	54510C-54600S
Data converters, A/D and D/A	53500S-53540S
Dc resistance measurements	51100S-51163C
Dc voltage measurements	53110S-53190S
Deadweight piston gages	29010C
Deadweight tester, ball type	30025C
Density measurements, liquids	17040S

Detector standards, windowed photodiode	40560C-40561C
Detector standards, windowless photodiode	40510C-40540C
Detectors, near ultraviolet to soft x-ray region	40599S
Deuterium arc lamps	40030C
Deuterium lamps	39050C
Dew-point hygrometers	36010C-36020C
Diameter measurements	11010S-11070S
Dielectric materials	61620S
Differential pressure transducers	30020C-30021C
Digital multimeters, low frequency	53200S
Digital-to-analog data converters	53500S-53540S
Dimensional metrology	10010C-14050S
Dividers, capacitive	54310S-54311S
Dividers, inductive	54110S-54131C
Dividers, mixed	54410S
Dividers, resistive	54210C-54214S
Dosimeters, electron beam	48010M-48020S
Dosimeters, high dose	49010C-49050S
Dosimeters, neutron	44100S
Dosimeters, radiochromic	49010C-49030C
Dosimeters, spectrophotometric reading	49040S-49041S
Dosimeters, x-ray, gamma-ray, and electron	46010C-48020S
Dosimetry, neutron	44010C-44100S
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Electromagnetic field-strength parameter measurements	64100S 64300S
Electrometers	46030S
Electron beam dosimetry	48010M-48020S
Energy and power measurements, low frequency	56110S-56210M
Ferrous-ferric dosimeters	48010M-48011M
Field strength measurements, electromagnetic	64100S-64300S
Filament lamps, ribbon	35050C,35060C, 39010C-39020C
Filters, spectral transmittance	38010C-38040C
Fixed-point devices, thermometric	33360S
Flats, optical reference	13010S
Flow measurements, cryogenic	18800S
Flowrate meters, liquid and gas	18010C-18050S
Flux standards, luminous	37080S
Force transducers	23010C-23260S
Frequency and time measurement services	76100S-76110S
Frequency domain	77131C
Gage blocks	10010C
Gages, API	12010C
Gages, ionization	30034C-30038C
Gages, low pressure	30040S
Gages, molecular drag	30029C-30031C
Gages, piston	29010C-29020C
Gages, plug	1010S
Gages, plug and ring	12020S
Gages, pressure	29010C-29040S
Gages, ring	11040S
Gages, step	11060S
Gages, two dimensional	12030S
Gages, vacuum	30010C-30050S
Gamma-ray dosimeters	46010C-46021C
Gamma-ray emitting sources	43010C-43020C 47010C-47011C
Gas flowmeters	18050S
Gear measuring wires	11020C
Germanium resistance thermometers	33140C
Global time service	76110S
Heat flux gauges	36510S

Helium permeation leaks	30061C
High dose dosimetry	49010C-49050S
High-frequency standard capacitors and inductors	52210S-52221S
High-frequency standard resistors	51310S
High-vacuum gages	30029C-30038C
High-voltage resistors	51210C
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