National Voluntary
Laboratory Accreditation
Program

NVLAP

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ELECTROMAGNETICS LAP HANDBOOK

OPERATIONAL AND TECHNICAL REQUIREMENTS OF THE LABORATORY ACCREDITATION PROGRAM FOR ELECTROMAGNETICS COMPATIBILITY AND TELECOMMUNICATIONS

NBSIR 86-3447

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Office of Product Standards Policy
Gaithersburg, Maryland 20899

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U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

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I. THE ELECTROMAGNETICS LAP AT A GLANCE

This document presents the operational and technical requirements of the Laboratory Accreditation Program (LAP) for Electromagnetics Compatibility and Telecommunications, describing all steps leading to accreditation. Technical requirements are explained to indicate how the NVLAP criteria are applied.

This LAP was established in October 1985, in response to a request from five private sector testing laboratories. The purpose of the LAP is to recognize and accredit laboratories that produce reliable test data for the services covered.

Accreditation is available to any organization (including commercial laboratories, manufacturers' laboratories, university laboratories, and Federal, state, or local government laboratories) that tests in accordance with the test methods listed in the Appendix. Accreditation is granted to a laboratory that complies with conditions for accreditation defined in the NVLAP Procedures: Title 15, Part 7 of the Code of Federal Regulations. The names of accredited laboratories are published in the Federal Register, NVLAP Annual Directories, and other media to which NVLAP provides information.

Testing services covered: Electromagnetic compatibility and Telecommunications equipment

Period of accreditation: One year

On-site assessment: Visit by a technical expert to determine compliance with the NVLAP criteria after initial application and every two years thereafter. Monitoring visits as required.

Assessors: Selected from technical experts with experience in the appropriate fields of testing.

Proficiency testing:

Each laboratory is sent test samples or artifacts, data sheets, and an information package containing instructions for preparation, conditioning, configuring, and testing. The completed data sheets are returned to NBS for analysis. The test methods requiring proficiency testing are marked with an asterisk in the list of test methods included in the Appendix.

Proficiency testing is conducted annually for each method. Advance notice is given before testing is required.

Fees: Annual Administrative fee, one-time initial fee, and annual test method fee based on the number of test methods selected.

II. INTRODUCTION

Background

The U.S. Department of Commerce, National Bureau of Standards (NBS) administers the National Voluntary Laboratory Accreditation Program (NVLAP). NVLAP's function is to accredit public and private testing laboratories based on evaluation of their technical qualifications and competence for conducting specific test methods in specified fields of testing. Accreditation is granted on the basis of conformance with criteria published in the Code of Federal Regulations as part of the NVLAP procedures (15 CFR Part 7). (See Appendix.)

This document is intended for use by staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for NVLAP accreditation under this LAP. This document is generally included in the **NVLAP Application Package** along with **General Application Forms, Test Method Selection Lists,** and other materials needed to apply for or renew accreditation. It presents the administrative and operational procedures and technical requirements of the LAP and should be retained and be readily accessible to laboratory personnel.

NVLAP Accreditation

Accreditation is granted only after thorough evaluation of the applicant has demonstrated that all NVLAP criteria have been met. The accreditation is formalized through issuance of a Certificate of Accreditation, Scope of Accreditation and publicized by announcement in various government and private media.

NVLAP accreditation is available to commercial laboratories, manufacturers' in-house laboratories, university laboratories, Federal, State, and local government laboratories. Foreign-based laboratories may be accredited by NBS if they meet the same requirements as domestic laboratories and pay any additional fees required.

Why NVLAP Accreditation ?

A laboratory may wish to be accredited for one or more of the following reasons: legal requirements (such as regulations or codes), contract specifications, or the desire to be recognized as demonstrably competent to meet the needs of its clients.

For accreditation to be meaningful, it must be granted by a clearly credible organization. NVLAP provides an unbiased third party evaluation and recognition of performance as well as expert technical assistance to upgrade laboratory performance when so needed.

Testing Laboratory Defined

NVLAP defines "testing laboratory" as an organization that provides services to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of products or systems.

Accreditation Defined

NVLAP accreditation signifies recognition of a testing laboratory's competence to perform specific test methods in specified fields of testing. It means that the laboratory's quality system, staff, facilities and equipment, calibration procedures, test methods and procedures, records, and test reports have all been evaluated and found to meet NVLAP criteria. NVLAP accreditation does not mean a guarantee (certification) of laboratory performance or of product test data; it is solely a finding of laboratory competence.

For further information about NVLAP, or for assistance in understanding and meeting the NVLAP requirements and criteria, please write or call:

NVLAP
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899
Phone: (301) 921-3431

III. ADMINISTRATIVE AND OPERATIONAL REQUIREMENTS

Note: Administrative and operational requirements presented here are generally applicable to all NVLAP programs. Technical and proficiency requirements are specifically applicable to this LAP.

LABORATORY CODE NUMBER

Each participating laboratory is assigned a four-digit laboratory code number. The code number is used by the NVLAP staff for identification, filing, recordkeeping, and database management. Participants are requested to put their Lab Code number on all correspondence with NVLAP. The Lab Code number is cross-referenced with the laboratory name and location in the NVLAP Directory of Accredited Laboratories.

ACCREDITATION PERIOD

Accreditation is granted for a period specified in the LAP Application Package (usually one year). The accreditation period begins on one of four dates: January 1, April 1, July 1, or October 1. Once a laboratory has been assigned an accreditation date, it retains that date as long as it remains in the program. Accreditation expires and is renewed on that date.

RENEWAL

Each participating laboratory will be sent a renewal Application Package, well in advance of the expiration date of its accreditation, to allow sufficient time to complete the renewal process. The renewal application contains the same forms used for initial application, and the laboratory need only indicate where changes have occurred from the previous period in personnel, equipment, facilities, or the scope of accreditation desired.

With the exception of an initiation fee for new applicants, the technical requirements and fees are the same as for initial accreditation. The application and fees must be received by NBS prior to expiration of the laboratory's current accreditation to avoid a lapse in accreditation.

PUBLICIZING ACCREDITATION STATUS

BY NVLAP

NVLAP publishes an annual Directory of Accredited Laboratories. The Directory contains the name and address, scope of accreditation, contact person, and the accreditation renewal date for each accredited laboratory. Supplements to the Directory are published quarterly to cover interim accreditation actions including initial accreditations, renewals, suspensions, terminations, and revocations. The Directory is distributed nationally and internationally to manufacturers, suppliers, retailers, professional and trade associations, code groups, and government agencies.

BY LABORATORIES

Accredited laboratories are encouraged, within specified limits, to publicize their accredited status. The major restriction is that advertising must not imply product certification by NBS or the U.S. Government. Laboratories and their clients may not reference their accredited status in consumer media, in product advertising, or on product labels, containers or packaging.

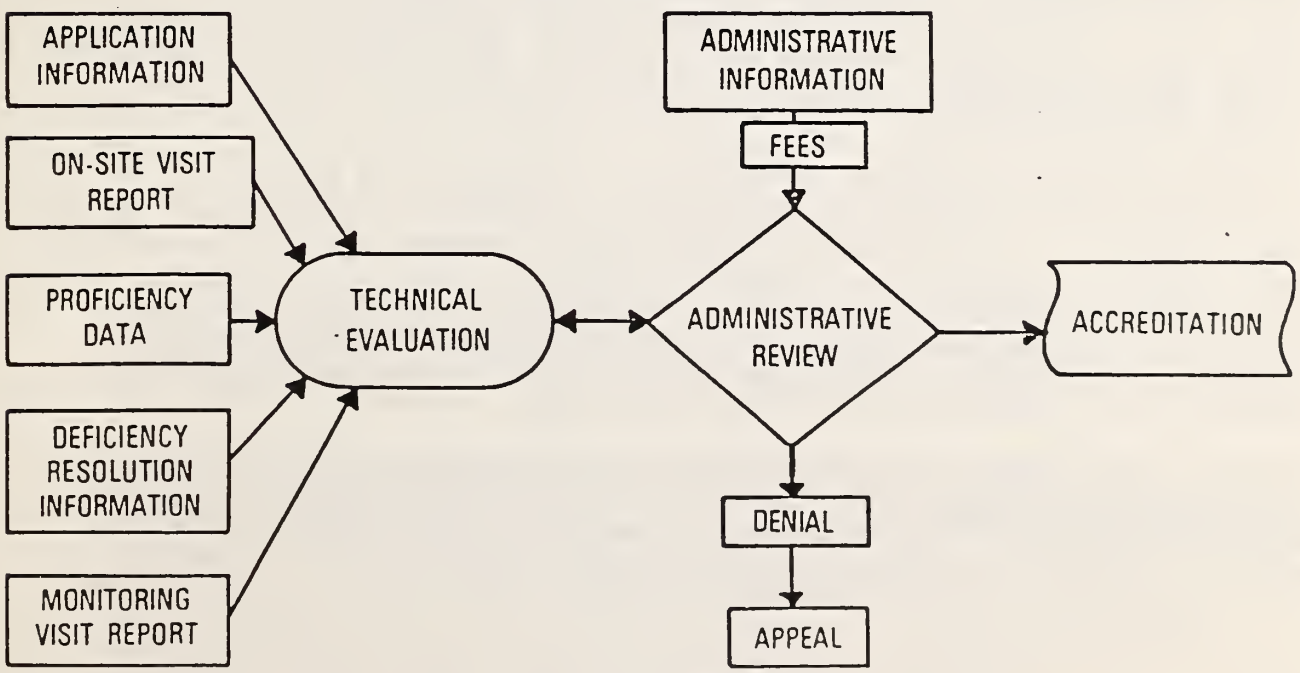
A laboratory may cite its accredited status and use NVLAP logos on reports, stationery, and in business and trade publications provided that it is clearly indicated that it is the laboratory which is accredited. NVLAP Lab Bulletin No. 3A provides more detailed guidance on how a laboratory may publicize its accredited status and the statements which may be made. (See Appendix.)

COMPLIANCE WITH EXISTING LAWS

Accreditation does not relieve the laboratory of the need to observe and comply with existing Federal, State, and local statutes, ordinances, or regulations that may be applicable to its operations, including consumer protection and antitrust laws.

ACCREDITATION PROCESS

Accreditation is granted following successful completion of a process which includes submission of an application and payment of fees by the laboratory, an on-site assessment, resolution of deficiencies identified during the on-site assessment, participation in proficiency testing, technical evaluation, and administrative review. A diagram of the accreditation process is shown in the figure below.



APPLICATION AND FEES

An **Application Package** is sent to a laboratory on request. It includes: **General Application Forms**, a **Fee Calculation Sheet**, and this document. The **General Application Form** must be completed and signed by an authorized representative of the laboratory. The authorized representative is one who can act on behalf of the laboratory and commit it to fulfill the NVLAP requirements. Before completing and signing the application, the authorized representative should review all documents and become totally familiar with NVLAP requirements. Although other laboratory staff may be designated to perform activities, such as handling proficiency testing or receiving an assessor, the authorized representative is the only one who can authorize a change in the scope or nature of the application.

In general, the accreditation fee is composed of several parts, some of which are fixed while others depend on the scope of accreditation desired and the specifics of the LAP. The total accreditation fee must be paid before accreditation can be granted. The individual parts of the accreditation fee include, as appropriate: a one-time LAP initiation fee for new applicants, an administrative fee, test method fees, an assessment fee, and proficiency testing fees. The fees for this LAP are shown in the **Fee Calculation Sheet** included in the **LAP Application Package.**

The laboratory will be scheduled for an on-site assessment after payment of all required fees and will be notified of any additional information which must be supplied and of any applicable proficiency testing requirements which must be completed for the technical evaluation.

APPROVED SIGNATORY

Under NVLAP criteria, an accredited laboratory must have one or more individuals or laboratory positions designated as having responsibility for signing "all test reports endorsed with the NVLAP logo." This is the person(s) to whom NVLAP, laboratory clients, or others would go in case of questions or problems with the report.

There is no formal requirement for nomination or approval of persons or laboratory positions designated as approved signatories. The laboratory should inform NVLAP of its appointments by completing the appropriate sections in the application for accreditation. Approved signatories should be: persons or positions with adequate responsibility or authority within the organization, with adequate and appropriate technical capabilities, and without conflict of interest. The approved signatory may be the authorized representative who is responsible for signing the NVLAP Application Form.

Laboratory test reports carrying the NVLAP logo need not be signed individually by the approved signatory. Test report forms may be preprinted with the required information. Forms that are electronically or computer generated may have the information printed along with the test results.

TECHNICAL EXPERTS

NVLAP uses Technical Experts (TEs) as assessors and evaluators. These are individuals knowledgeable in the testing field being evaluated. They may be engineers or scientists currently active in the field, consultants, college professors or retired persons. They are selected on the basis of their professional and academic achievements, experience in the field of testing, management experience, and tact in dealing with people. Their services are generally contracted as required; they are not NVLAP staff members.

Assessors are TEs selected to conduct an on-site assessment of a particular laboratory on the basis of how well their individual experience matches the type of testing to be assessed, as well as absence of conflicts of interest. The laboratory has the right to appeal the assignment of an assessor and may request an alternate.

Evaluators are TEs selected to review the record of the laboratory as a whole, including the application, assessment report, deficiencies, corrections to deficiencies, and proficiency test results and, based on this record, to recommend whether or not a laboratory should be accredited. The evaluators are matched to the type of testing being evaluated and are selected to avoid conflicts of interest.

ON-SITE ASSESSMENT

Before initial accreditation and periodically thereafter, an on-site assessment of each laboratory is conducted to determine compliance with the NVLAP criteria. The assessment is conducted by one or more NVLAP assessors selected on the basis of their expertise in the field of testing to be reviewed. Assessors use checklists developed by NVLAP so that each laboratory receives an assessment comparable to that received by others. However, assessors have considerable latitude to make judgments about a laboratory's compliance with the NVLAP criteria, depending on the assessor's experience and the unique circumstances of the laboratory.

Each laboratory will be contacted to arrange a mutually agreeable date for an asessment. The time needed to conduct an assessment varies, but two days is the norm. Every effort is made to conduct an assessment with as little disruption as possible to the normal operations of the laboratory. During the assessment the assessor will carry out the following functions:

- meet with management and supervisory personnel responsible for the laboratory's activities (for which accreditation is being sought) to review the assessment process with the individuals involved and to set the assessment agenda.

- examine the quality assurance system employed by the laboratory. The assessor may select and trace the history of one or more samples from receipt to final issuance of test reports. The assessor will conduct a thorough review of the laboratory's quality manual or equivalent, evaluate the training program, examine notebooks or records pertaining to the samples, check sample identification and tracking procedures, determine whether the appropriate environmental conditions are maintained, and examine copies of completed test reports.

- review records of periodic internal audits, use of check samples or participation in round robin testing or other similar programs.

- review personnel records including resumes and job descriptions of key personnel, competency evaluations for all staff members who routinely perform the testing for which accreditation is sought, calibration or verification records for apparatus used, test reports, and sample control records.

- observe demonstrations of testing techniques and discuss them with the technical personnel to assure their understanding of the procedures.

- examine major equipment, apparatus, and facilities.

At the conclusion of the assessment, the assessor will conduct an exit briefing to discuss his or her observations with appropriate laboratory staff and call attention to any deficiencies uncovered. A written summary of any deficiencies discussed will be left at the laboratory. The assessor will forward the assessment forms and a written summary to NBS.

> If deficiencies have been noted, the laboratory must, within 30 days of the date of this notification provide NVLAP with documentation or certification, by the authorized representative, that the specified deficiencies have been corrected or that specific actions are being taken to correct the deficiencies.

A laboratory applying for initial accreditation may request an extension to complete required corrections.

If any deficiencies are noted at laboratories which are currently accredited, such deficiencies must be corrected within 30 days after notification or the laboratory may face possible revocation, suspension, or expiration of its accreditation. Any test equipment that is identified as out-of-calibration, should not be used until corrective action has been completed. All deficiencies noted for corrective action will be subject to thorough review and verification during subsequent assessments and technical evaluations.

MONITORING VISITS

In addition to regularly scheduled assessments, monitoring visits may be conducted by assessors or by NBS staff at any time during the accreditation period. Monitoring visits may occur for cause or on a random selection basis. These visits serve to verify reported changes in the laboratory's personnel, facilities, and operations or to explore possible reasons for poor performance in proficiency testing.

The scope of a monitoring visit may range from checking a few designated items to a complete review. Failure to cooperate with NVLAP assessors will be grounds for initiation of adverse accreditation action. No additional fee is required for the monitoring visit.

PROFICIENCY TESTING

Proficiency testing is an integral part of the NVLAP accreditation process. Demonstration of appropriate facilities, equipment, personnel, etc. is essential, but may not be sufficient for the evaluation of laboratory competence. The actual determination of test data using special proficiency testing samples provides NVLAP with a way to determine the overall effectiveness of the laboratory.

Proficiency testing is a process for checking actual laboratory testing performance, usually by means of interlaboratory comparisons. Each LAP has unique proficiency testing requirements. The data are analyzed by NVLAP and summary reports of the results are sent back to the participants.

For many test methods, results from proficiency testing are very good indicators of a laboratory's testing capability. Information obtained from proficiency testing helps to identify problems in a laboratory. When problems are found, NVLAP staff members work with the laboratory staff to solve them. If problems with the test method are suspected, NVLAP provides information to the appropriate standards-writing bodies.

The specific proficiency testing requirements for this LAP are included in Section V of this document.

TECHNICAL EVALUATION

After a laboratory has completed all the technical requirements of a LAP and is ready for an accreditation action, a final technical evaluation is conducted by experts chosen for their experience and knowledge of the pertinent test methods. They review records on each applicant laboratory and base their evaluation on:

- information provided on the application;
- on-site assessment reports;
- actions taken by the laboratory to correct deficiencies;
- results of proficiency testing; and
- information from any monitoring visits of the laboratory.

If the technical evaluation reveals additional deficiencies, written notification describing them will be made to the laboratory. The laboratory must respond within 30 days of such notification and provide documentation or certification by the authorized representative that the specified deficiencies have been corrected. Clarification of some issues may be requested by telephone. All deficiencies must be corrected before accreditation can be granted or renewed.

ADMINISTRATIVE REVIEW

After the technical evaluation has been completed, the NVLAP staff prepares an administrative recommendation that the laboratory either be granted or denied accreditation. This recommendation is based on a review of the technical evaluation and other records to ensure that all NVLAP technical, financial and administrative obligations have been satisfied.

ACCREDITATION ACTIONS

Acting for the Director of NBS, the Director of the NBS Office of Product Standards Policy makes the following decisions.

Accreditation — If accreditation is recommended, the recommendation forms the basis for granting accreditation. A Certificate of Accreditation will be issued to the laboratory.

Denial — If denial is recommended, the laboratory is notified of a proposal to deny accreditation and the reason(s) therefor.

Suspension — If a laboratory is found to have violated the terms of its accreditation, the accreditation can be suspended. The laboratory will be notified of the reasons for and conditions of the suspension and the action(s) that the laboratory must take to have accreditation reinstated.

Revocation — If a laboratory is found to have violated the terms of its accreditation, the laboratory is notified of a proposal to revoke accreditation and the reasons therefor. The laboratory may be given the option of voluntarily terminating accreditation. If accreditation is revoked, the laboratory must return its Certificate of Accreditation and cease use of the NVLAP logo on any of its reports, other correspondence, or advertising.

If denial or revocation has been proposed, the laboratory may request a hearing, under United States Code 5 U.S.C. 556, within 30 days of the date of receipt of the notification. If a hearing is not requested, the action becomes final upon the expiration of that 30-day period.

After a participant's accreditation has been terminated, whether voluntarily or through adverse action, the accreditation certificate must be returned to NVLAP. If a laboratory elects not to renew or wishes to voluntarily terminate its accreditation at any time, the notification of such intention should be forwarded to NBS in writing.

IV. TECHNICAL REQUIREMENTS

This section presents the technical requirements for accreditation. Criteria for accreditation, Section 7.33, of the NVLAP Procedures (see Appendix) provides the basis for the technical evaluation of a laboratory. Interpretive comments and additional information are given in this section to make the criteria specifically applicable to the Electromagnetics LAP. Application of accreditation conditions and criteria, Section 7.31 and Conditions for accreditation, Section 7.32, are also contained in the Appendix. Questions about the NVLAP Procedures or Criteria should be directed to NVLAP.

The test methods for which a laboratory may seek accreditation are listed in the Appendix. Other test methods may be added to the LAP, upon request, if they are found to be appropriate.

Comments on QUALITY SYSTEM (See Procedures Sec. 7.33a)

The key to a properly functioning organization is that it has and maintains a system of procedures and practices which assure the quality of its services. To qualify for accreditation, an applicant must demonstrate that its quality systems ensure the technical integrity of its work.

A laboratory must have copies of both its Calibration Manual and Quality Assurance Manual available for review during on-site visits. These documents should be written in accordance with recognized industry standards.

Several documents listed below may be of assistance in developing calibration and quality assurance manuals, although some were not specifically written for testing laboratories and therefore may not be directly applicable.

MIL-C-45662A - Calibration System Requirements
MIL-Q-9858 - Quality Program Requirements
MIL-I-45208A - Inspection System
ACIL LA(62)1-76 - Quality Control System, Requirements for a Testing and
EIA Standard QB4 - Calibration System Requirements
EIA Standard IS-7 - Quality System Requirements for IECQ System

The laboratory calibration manual must address such items as:

- frequency of calibration for equipment groups (i.e., signal generators, EMI meters, etc.)
- NBS traceability
- historical data generation
- record keeping for equipment groups and/or individual devices
- calibration tree indicating standards for devices found to be out of calibration
- corrective action procedures

Comments on STAFF (See Procedures Sec. 7.33b)

A laboratory requesting accreditation must maintain a complete listing of its staff. This listing should include a list by job function (i.e., management, engineering, etc.) along with a resume for all supervisory personnel. Laboratories must also maintain their required qualifications for each engineering and testing position (i.e., Sr. EMI Technician, Jr. EMI Test Engineer, etc.)

An accredited laboratory must have one or more individuals or laboratory positions designated as "approved signatory." Those individuals or incumbents of those positions have responsibility for signing "all test reports endorsed with the NVLAP logo." This is the person(s) to whom NVLAP, laboratory clients, or others would go in case of questions or problems with the report. An approved signatory is not required if no reference to NVLAP accreditation is made on test reports. Designated person(s) must be competent to make critical evaluations of test results and occupy positions with authority within the organization, which makes them responsible for the adequacy of test results. A position description for each approved signatory must be submitted to NVLAP.

Laboratory test reports carrying the NVLAP logo need not be signed individually by the approved signatory. Test report forms may be preprinted with the required information. Forms that are electronically or computer generated may have the information printed along with the test results.

Comments on FACILITIES AND EQUIPMENT (See Procedures Sec. 7.33c)

To be accredited, a laboratory must maintain a facility layout plan of the laboratory indicating such items as work stations. Included in this section should be a description of the laboratory's open field test site, if applicable.

The open field test site should be operational and available for inspection during the onsite visit. The laboratory should provide transportation to the site for the assessor and personnel to demonstrate its operation. The site attenuation characterization and the test site report to the FCC will also be reviewed during the visit.

A laboratory must have adequate equipment to perform the type(s) of testing for which capability is claimed. This includes adequate space to perform the testing, environmental controls, adequate testing equipment, adequate safety systems and either properly calibrated laboratory standards or access to the services of a competent calibration laboratory.

A accredited laboratory must also provide and maintain a complete listing of applicable test instrumentation. The list should include model number, serial number, manufacturer, and applicable range (e.g., 14KHz to 1GHz, 0-300VDC, etc.)

Comments on CALIBRATION (See Procedures Sec. 7.33d)

Measurement or quality control equipment that is inherently subject to change due to use or to passage of time must be periodically calibrated. Calibration means comparison with a reference standard so that the performance of a measuring instrument may be determined with sufficient accuracy.

Calibrations of equipment may be performed by the laboratory or by an external calibration service. All calibrations and characterizations must be done with reference standards that are traceable to national standards maintained by NBS or by an equivalent foreign national standards authority. Traceability means demonstration that appropriate, documented actions were taken to compare (either directly or indirectly) a reference standard with a national standard.

The reference standards used, and the environmental conditions at the time of calibration, must be documented for all calibrations. Calibration records and evidence of the traceability of the reference standards used must be made available for inspection during the on-site visit.

Test equipment or verification records should include the following:

- equipment name or description; model, style, or serial number
- manufacturer
- notation of all equipment variables requiring verification
- the range of verification
- the resolution of the instrument and its allowable error
- verification date and schedule
- date and result of last calibration
- identity of the laboratory individual or external service responsible for calibration
- source of reference standard and traceability.

The equipment used for conducting the tests in this LAP must be maintained and calibrated (or verified) in accordance with the manufacturer's recommendation or as specified in the test method, whichever is more stringent.

Comments on TEST METHODS AND PROCEDURES (See Procedures Sec. 7.33e)

Copies of all routine test methods and procedures should be kept in the laboratory QA manual. If unique test plans are used or when test plans are modified to meet special requirements of a client, these test plans should be available to laboratory personnel before testing begins. These special tests should also be reflected in the test report.

In addition to the basic test method (i.e., FCC Parts 15 and 68), copies of documents which describe or extend the meaning of the basic documents (e.g., FCC OST series, the FCC MP series, and IEEE methods) must be available to laboratory personnel when those documents apply to the testing being performed.

Comments on RECORDS (See Procedures Sec. 7.33f)

A laboratory must maintain a functional recordkeeping system. Records must be easily accessible, in logical order, and contain complete information on the subject. Records covering the following items are required and will be reviewed during the on-site visit either in total or by selective sampling:

- staff training dates and results;
- staff competency review dates and results;
- testing equipment calibration and maintenance;
- inspection of incoming materials;
- comprehensive logs of test activities;
- results of internal and external equipment checks, measurement assurance programs, quality audits, etc.;
- test data and reports; and
- tracking and logging of samples tested.

Sample tracking and logging records should trace the movement of each sample through the testing facility from receipt through all the tests performed to the final test report. Dates, times, condition of item and participating personnel should all be included.

Comments on TEST REPORTS (See Procedures Sec. 7.33g)

At least two kinds of test report relate to FCC Part 15J and FCC Part 68: 1) a report to the customer describing test conditions and test results; and 2) filings with the FCC on behalf of the customer.

The report to the customer should provide enough information to permit the same or another laboratory to repeat the test and expect to obtain comparable results. The laboratory should maintain a test file that contains the raw test data, charts, photographs, and all other pertinent material not included in the customer report.

The reports to the FCC should meet the FCC requirements.

NVLAP RECOMMENDATIONS FOR PART 15J

- The site attenuation should be checked at least once per year and complete written records should be maintained. The site attenuation should also be checked if significant changes are made in or near the open field site.

- Broadband anntennas that are used for final radiated emissions testing (not pre-scan) should be calibrated once per year. These calibrations can be made by the laboratory if the proper procedures and equipment are used.

- The line impedance stabilization network (LISN) should be characterized at least once per year.

- Test reports to customers should include enough detail to allow any repeat testing if necessary.

NVLAP RECOMMENDATIONS FOR PART 68

- An up-to-date copy of "Instructions for Completing FCC Form 730" should be available.

- The wave form of the surge generator should be checked with an oscilloscope at least once per year and photographs of the wave form should be kept on file.

- The laboratory should have at least one telephone device reserved for use in periodic checks of the test system.

- The laboratory should have a procedure for daily checkout of the testing system before use. This is especially important for automated systems.

- A laboratory can be accredited for Part 68.312, vibration and temperature, if it has the test equipment. If a device to be tested is too large for the laboratory to accommodate and the testing is contracted out, the test results may not be included in a test report under the NVLAP logo unless an explicit disclaimer is used.

V. PROFICIENCY TESTING

Proficiency testing is an integral requirement of the NVLAP evaluation process. The proficiency testing program may be conducted entirely by NVLAP, by contract for a portion of the program, or by determination that the data from an existing inter-laboratory study can meet the testing requirements for the LAP. The test methods that require proficiency testing are so indicated in the Test Method List in the Appendix.

Each laboratory will be sent test samples or artifacts, data sheets, and an information package containing instructions for preparating, configuring, and testing. The testing should be conducted in accordance with the applicable test method; special NVLAP instructions for parameters and conditions (such as geometry, cables, replicates, frequencies, etc.) should also be followed. The special instructions are designed to ensure uniformity in procedures and test conditions among participants. Completed data sheets must be returned to NBS (for analysis) by the date specified on the sheets.

Some of the test artifacts used in the Electromagnetics LAP will be one-of-a-kind items. After testing they must be returned to NBS for use by other participants. The test artifacts must be protected from harm and damage both in the laboratory and during shipment back to NBS. Examples of artifacts are: a computing device with or without peripherals for Part 15, a commercially procured terminal device for Part 68, and "black boxes" for either Part. "Black boxes" may be used to determine testing performance for specific sub-parts of the test methods.

The results of the proficiency testing program will be reported to the participants and in appropriate documents and reports. The identities and performance of individual laboratories remain confidential. The results of proficiency testing will be made available to on-site assessors for use during laboratory visits. If problems are indicated by proficiency testing, they will be discussed with appropriate laboratory personnel, who will then be responsible for developing and implementing plans for resolving the problems. Although participation in proficiency testing is usually not required for initial accreditation, it is required for continued accreditation.

VI. ON-SITE ASSESSMENT

A NVLAP assessor will make advance arrangements for on-site assessment of a laboratory. The laboratory should be in good order and prepared to demonstrate testing. The demonstrations can be made on laboratory artifacts or the assessor can observe work in progress for a laboratory customer. The assessor will try to minimize disruption to the normal working routine, and all observations are held in strictest confidence.

Each assessor will have NVLAP checklists containing specific questions about all aspects of the visit. The checklists are based on NVLAP criteria for accreditation. They serve to assure a complete assessment and that all assessors cover the same items at each laboratory.

An assessment for either Part 15J or Part 68 will normally take one day. An assessment for both methods will take two days. A typical agenda for each one-day visit is given below; a two-day visit combines elements of both.

ONE-DAY ON-SITE FOR PART 15-J (Example)

1. Assessor conducts an entry briefing with laboratory manager to explain the purpose of the on-site assessment and to discuss the schedule for the day. At the discretion of the laboratory manager, other staff members may attend the briefing.

2. Assessor reviews equipment calibration and maintenance records, record keeping procedures, Quality Assurance system manuals, laboratory test reports, and personnel competency records. Although there should be a staff member available to answer questions, the assessor may wish to review the documents alone. Except in rare circumstances, the assessor does not ask to take any laboratory documents with him.

3. Assessor observes the demonstration of selected procedures and interviews the technician(s). The demonstrations should include the use of receivers and/or spectrum analyzers in the shield room and pre-scan area.

4. Assessor physically examines equipment and facilities. This includes specimen holding areas, shield and screen rooms, pre-scan areas, test benches, electronics, and antennas.

5. Assessor examines the open field test site, observes a demonstration of the facility, and reviews site attenuation data. Laboratory personnel should be available to provide transportation and to accompany the assessor. If the laboratory maintains more than one open field site, only one will be visited. Questions will be asked to determine whether all sites are operated and equipped in the same manner.

6. The assessor needs time during the day to complete NVLAP paperwork.

7. An exit briefing is held with the laboratory manager and staff to discuss the assessor's findings. Deficiencies are discussed and resolutions are mapped out. Items that must be addressed before accreditation can be granted are emphasized. Items that have been corrected during the on-site and any recommendations are specially noted.

8. The assessor completes the Assessment Report, to be signed by the laboratory representative. A copy of this report is left at the laboratory.

ONE-DAY ON-SITE FOR PART 68 (Example)

1. Assessor conducts an entry briefing with laboratory manager to explain the purpose of the on-site assessment and to discuss the schedule for the day. At the discretion of the laboratory manager, other staff members may attend the briefing.

2. Assessor reviews equipment calibration and maintenance records, record keeping procedures, Quality Assurance system manuals, laboratory test reports, and personnel competency records. Although there should be a staff member available to answer questions, the assessor may wish to review the documents alone. Except in rare circumstances, the assessor does not ask to take any laboratory documents with him.

3. Assessor observes the demonstration of selected procedures and interviews the technician(s). An appropriate test artifact is needed to demonstrate the test equipment. Both automatic and manual systems are evaluated. The Hearing Aid Compatibility test set-up must be operable.

4. Assessor physically examines equipment and facilities. This includes specimen holding areas, test benches, electronics, and test jigs.

5. The assessor needs time during the day to complete NVLAP paperwork.

6. An exit briefing is held with the laboratory manager and staff to discuss the assessors findings. Deficiencies are discussed and resolutions are mapped out. Items that must be addressed before accreditation can be granted are emphasized. Items that have been corrected during the on-site and any recommendations are specially noted.

7. The assessor completes the Assessment Report, to be signed by the laboratory representative. A copy of this report is left at the laboratory.

APPENDICES

NVLAP Accreditation Criteria
Subpart D - Conditions and Criteria for Accreditation

NVLAP Lab Bulletin No. 3A
Informing the Public of Your Accreditation Status

Test Method Selection List

SUBPART D - CONDITIONS AND CRITERIA FOR ACCREDITATION

Sec. 7.31 Application of accreditation conditions and criteria.

(a) To become accredited and maintain accreditation, a laboratory must meet the conditions for accreditation set out in Section 7.32 and the criteria set out in Section 7.33 as tailored for specific LAPs.

(b) The conditions leading to accreditation include acceptance of the responsibilities of an accredited laboratory and requirements for information disclosure.

(c) The criteria are tailored and interpreted for the test methods, types of test methods, products, services or standards of the relevant LAP. These tailored criteria are the technical requirements for accreditation developed through the procedures of Section 7.15.

(d) In applying the conditions, criteria, and technical requirements for accreditation, the Director of OPSP shall not:

(1) Prohibit accreditation solely on the basis of a laboratory's affiliation or nonaffiliation with manufacturing, distributing, or vending organizations, or because the laboratory is a foreign firm; or

(2) Develop, modify, or promulgate test methods, standards, or comparable administrative rules.

Sec. 7.32 Conditions for accreditation.

(a) To become accredited and maintain accreditation, a laboratory shall agree in writing to:

(1) Be assessed and evaluated initially and on a periodic basis;

(2) Demonstrate, on request, that it is able to perform the tests representative of those for which it is seeking accreditation;

(3) Pay all relevant fees;

(4) Participate in proficiency testing as required.

(5) Be capable of performing the tests for which it is accredited according to the latest version of the test method within one year after its publication or within another time limit specified by the Director of OPSP;

(6) Limit the representation of the scope of its accreditation to only those tests or services for which accreditation is granted;

(7) Limit all its test work or services for clients to those areas where competence and capacity are available;

(8) Limit advertising of its accredited status to letterheads, brochures, test reports, and professional, technical, trade, or other laboratory services publications, and use the NVLAP logo under guidance provided by the Director of OPSP;

(9) Inform its clients that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NBS;

(10) Maintain records of all actions taken in response to testing complaints for a minimum of one year;

(11) Maintain an independent decisional relationship between itself and its clients, affiliates, or other organizations so that the laboratory's capacity to render test reports objectively and without bias is not adversely affected;
(12) Report to the Director of OPSP within 30 days any major changes involving the location, ownership, management structure, authorized representative, approved signatories, or facilities of the laboratory; and
(13) Return to the Director of OPSP the certificate of accreditation for possible revision or other action should it:
(i) be requested to do so by the Director of OPSP;
(ii) voluntarily terminate its accredited status; or
(iii) become unable to conform to any of these conditions or the applicable criteria of Section 7.33 and related technical requirements.

(b) To become accredited and maintain accreditation, a laboratory shall supply, upon request, the following information:
(1) Legal name and full address;
(2) Ownership of the laboratory;
(3) Organization chart defining relationships that are relevant to performing testing covered in the accreditation request;
(4) General description of the laboratory, including its facilities and scope of operation;
(5) Name and telephone number of the authorized representative of the laboratory;
(6) Names or titles and qualifications of laboratory staff nominated to serve as approved signatories of test reports that reference NVLAP accreditation; and
(7) Other information as may be needed for the specific LAP(s) in which accreditation is sought.

Sec. 7.33 Criteria for accreditation.

(a) Quality System. (1) The laboratory shall operate under an internal quality assurance program appropriate to the type, range, and volume of work performed. The quality assurance program must be designed to ensure the required degree of accuracy and precision of the laboratory's work and should include key elements of document control, sample control, data validation, and corrective action. The quality assurance program must be documented in a quality manual or equivalent (e.g., operations notebook) which is available for use by laboratory staff. A person(s) must be identified as having responsibility for maintaining the quality manual.
(2) The quality manual must include as appropriate:
(i) The laboratory's quality assurance policies including procedures for corrective action for detected test discrepancies;
(ii) Quality assurance responsibilities for each function of the laboratory;
(iii) Specific quality assurance practices and procedures for each test, type of test, or other specifically delineated function performed;
(iv) Specific procedures for retesting, control charts, reference materials, and interlaboratory tests; and
(v) Procedures for dealing with testing complaints.
(3) The laboratory shall periodically review its quality assurance system by or on behalf of management to ensure it's continued effectiveness. These reviews must be recorded with details of any corrective action taken.

(b) Staff. (1) The laboratory shall:
(i) Be staffed by individuals having the necessary education, training, technical knowledge, and experience for their assigned functions; and
(ii) Have a job description for each professional, scientific, supervisory and technical position, including the necessary education, training, technical knowledge, and experience.
(2) The laboratory shall document the test methods each staff member has been assigned to perform.
(3) The laboratory shall have a description of its training program for ensuring that new or untrained staff are able to perform tests properly and uniformly to the requisite degree of precision and accuracy.
(4) The laboratory shall be organized:
(i) So that staff members are not subjected to undue pressure or inducement that might influence their judgment or results of their work; and
(ii) In such a way that staff members are aware of both the extent and the limitation of their area of responsibility.
(5) The laboratory shall have a technical manager (or similar title) who has overall responsibility for the technical operations of the laboratory.
(6) The laboratory shall have one or more signatories approved by the Director of OPSP to sign test reports that reference NVLAP accreditation. Approved signatories shall:
(i) Be competent to make a critical evaluation of test results; and
(ii) Occupy positions within the laboratory's organization which makes them responsible for the adequacy of test results.

(c) Facilities and Equipment. (1) The laboratory shall be furnished with all items of equipment and facilities for the correct performance of the tests and measurements for which accreditation is granted and shall have adequate space, lighting, and environmental control, and monitoring to ensure compliance with prescribed testing conditions.
(2) All equipment must be properly maintained to ensure protection from corrosion and other causes of deterioration. Instructions for a proper maintenance procedure for those items of equipment which require periodic maintenance must be available. Any item of equipment or component thereof which has been subjected to overloading or mishandling, gives suspect results, or has been shown by calibration or otherwise to be defective, must be taken out of service and clearly labelled until it has been repaired. When placed back in service, this equipment must be shown by test or calibration to be performing its function satisfactorily.
(3) Records of each major item of equipment must be maintained. Each record must include:
(i) The name of the item of equipment;
(ii) The manufacturer's name and type, identification and serial number;
(iii) Date received and date placed in service;
(iv) Current location, where appropriate;
(v) Details of maintenance; and
(vi) Date of last calibration, next calibration due date, and calibration report references.

(d) Calibration. The laboratory shall:
(1) Calibrate new testing equipment before putting it into service;
(2) Recalibrate, at regular intervals, in-service testing equipment with the calibration status readily available to the operator;
(3) Perform checks of in-service testing equipment between the regular calibration intervals, where relevant;
(4) Maintain adequate records of all calibrations and recalibrations; and
(5) Provide traceability of all calibrations and reference standards of measurement where these standards exist. Where traceability of measurements to primary (national or international) standards is not applicable, the laboratory shall provide satisfactory evidence of the accuracy or reliability of test results (e.g., by participation in a suitable program of interlaboratory comparison).

(e) Test Methods and Procedures. The laboratory shall:
(1) Conform in all respects with the test methods and procedures required by the specifications against which the test item is to be tested, except that whenever a departure becomes necessary for technical reasons the departure must be acceptable to the client and recorded in the test report;
(2) Have data to prove that any departures from standard methods and/or procedures due to apparatus design or for other reasons do not detract from the expected or required precision of the measurement;
(3) Maintain a test plan for implementing testing standards and procedures including adequate instructions on the use and operation of all relevant equipment, on the handling and preparation of test items (where applicable), and on standard testing techniques where the absence of such instructions could compromise the test. All instructions, testing standards, specifications, manuals, and reference data relevant to the work of the laboratory must be kept up-to-date and made readily available to the staff;
(4) Maintain measures for the detection and resolution of in-process testing discrepancies for manual and automatic test equipment and electronic data processing equipment, where applicable;
(5) Maintain a system for identifying samples or items to be tested, which remains in force from the date of receipt of the item to the date of its disposal, either through documents or through marking to ensure that there is no confusion regarding the identity of the samples or test items and the results of the measurements made; and
(6) Maintain rules for the receipt, retention, and disposal of test items, including procedures for storage and handling precautions to prevent damage to test items which could invalidate the test results. Any relevant instructions provided with the tested item must be observed.

(f) Records. The laboratory shall:
(1) Maintain a record system which contains sufficient information to permit verification of any issued report;
(2) Retain all original observations, calculations and derived data, and calibration records for one year unless a longer period is specified; and
(3) Hold records secure and in confidence, as required.

(g) Test Reports. (1) The laboratory shall issue test reports of its work which accurately, clearly, and unambiguously present the specified test results and all required information. Each test report must include the following information as applicable:

(i) Name and address of the laboratory;
(ii) Identification of the test report by serial number, date, or other appropriate means;
(iii) Name and address of client;
(iv) Description and identification of the test specimen, sample, or lot of material represented;
(v) Identification of the test specification, method, or procedure used;
(vi) Description of sampling procedure, if appropriate;
(vii) Any deviations, additions to, or exclusions from the test specifications;
(viii) Measurements, examinations, and derived results supported by tables, graphs, sketches, and photographs, as appropriate, and any failures identified;
(ix) A statement of measurement uncertainty where relevant;
(x) Identification of the organization and the person accepting technical responsibility for the test report and date of issue;
(xi) A statement that the report must not be reproduced except in full with the approval of the laboratory; and
(xii) A statement to the effect that the test report relates only to the items tested.

(2) The laboratory shall issue corrections or additions to a test report only by a further document suitably marked, e.g. "Supplement to test report serial number .....," which meets the relevant requirements of Section 7.33(g)(1).

(3) The laboratory shall retain a copy of each test report issued for one year unless a longer period is specified by the Director of OPSP.

(4) The laboratory shall ensure that all test reports endorsed with the NVLAP logo are signed by an approved signatory.

National Voluntary
Laboratory Accreditation
Program

NVLAP

U.S. Department of Commerce
in cooperation with the
National Bureau of Standards

Bulletin

Lab Bulletin No. 3A

January 1, 1985

INFORMING THE PUBLIC OF YOUR ACCREDITATION STATUS

Summary

This Bulletin supersedes NVLAP Lab Bulletin No. 3 dated October 1, 1981. It reflects significant changes made to the NVLAP procedures (Title 15, Part 7, of the Code of Federal Regulations) which became effective on December 10, 1984.

The Bulletin is addressed primarily to personnel at accredited laboratories who are responsible for communicating the laboratory's accreditation status to clients and the public, through advertising, issuance of test reports, use of the NVLAP logo, etc.

The Bulletin's purpose is to "provide guidance on referencing the laboratory's accredited status, and use of the NVLAP logo by the laboratory and its clients," in accordance with provisions of the NVLAP Procedures.

Background

NVLAP was established to assist industry and government in identifying competent testing laboratories. NVLAP accreditation means that a laboratory is competent to perform specific test methods in selected fields of testing. The NVLAP Procedures are the bases upon which the entire program operates and accomplishes accreditation of laboratories. Parts A and B of the Procedures provide general information and the method by which a new Laboratory Accreditation Program (LAP), in a new field of testing, may be requested and established. Parts C and D of the Procedures , of more concern to accredited laboratories, describe how a laboratory becomes accredited and the conditions and criteria for initial and continued accreditation. This Bulletin is concerned principally with issues in Part D of the Procedures.

Requirements and Guidance

To become accredited and maintain accreditation a laboratory shall:

> limit the representation of the scope of its accreditation to only those tests or services for which accreditation is granted

A laboratory accredited by NVLAP may use the following statement on its letterheads and in trade or other publications: "Accredited by the National Bureau of Standards, National Voluntary Laboratory Accreditation Program for selected test methods for --(identify product or service area(s))." This statement could, for example, be placed at the bottom of the laboratory letterhead.

A laboratory's letterhead containing a reference to its NVLAP accreditation may be used in any direct solicitation for business from potential customers. It is recommended that a copy of the NVLAP Certificate and Scope of Accreditation be appended to such a solicitation.

To become accredited and maintain accreditation a laboratory shall:

> limit advertising of its accredited status to letterheads, brochures, test reports, and professional, technical, trade, or other laboratory services publications, and use the NVLAP logo under guidance provided by NBS

A statement about NVLAP accreditation and the NVLAP logo may be used on reports and data sheets containing test data obtained by a laboratory provided the tests or services are performed in accordance with the terms of its accreditation. The NVLAP logo may not be used on test reports or data sheets during any period of suspended or expired accreditation or after voluntary or involuntary termination of accreditation.

The nature or type of product advertising prohibited by NVLAP procedures includes any advertising that is intended to encourage a consumer to purchase a product because it was tested by an accredited laboratory, whether that advertising appears in consumer media, the business media, or at a point of sale to consumers.

News stories and advertising by laboratories of their accredited status in the trade press is not only permissible but encouraged. The use of advertisements in the trade press is consistent with NVLAP procedures.

The "consumer media" to be avoided include popular periodicals such as Time, Good Housekeeping, etc., and newspapers such as the Washington Post or the New York Times. The term "consumer media" does not include business publications such as Barron's, or the Wall Street Journal which are oriented to the business community and in which products per se normally are not advertised.

To become accredited and maintain accreditation a laboratory shall:

> inform its clients that the laboratory's accreditation or any of its test reports in no way constitutes or implies product certification, approval, or endorsement by NBS

Laboratory accreditation by NBS confers recognition that a laboratory has been found competent to perform specific test methods or services in a selected field(s) of testing. Laboratories must avoid all inference that accreditation under NVLAP carries with it an endorsement, approval, or recommendation of the products tested by the laboratories.

To become accredited and maintain accreditation a laboratory shall:

> assure that all test reports endorsed with the NVLAP logo are signed by an approved signatory

An approved signatory is an officer or employee of the laboratory, identified by name or position, who has been accepted by NVLAP as being responsible for the issuance of test reports under this condition of NVLAP accreditation. A laboratory seeking initial accreditation or reaccreditation must specify (a) one or more individuals, or (b) position(s) within the organization for which it requests acceptance as an approved signatory.

Computer or machine generated test reports that contain the NVLAP logo need not be signed but must have the printed name of the approved signatory.

Questions About Accreditation

If you have questions about what is an acceptable method of advertising in areas not specifically covered in this Lab Bulletin or about the propriety or acceptability of a particular statement, advertising media, or use of information about your NVLAP accreditation status, please contact NVLAP before your publicity program is implemented.

Call 301-921-3431 or

Send your questions to:

Harvey W. Berger
Associate Manager, Laboratory Accreditation
National Bureau of Standards
ADMIN A531
Gaithersburg, MD 20899

National Voluntary Laboratory Accreditation Program
(NVLAP)

NVLAP-12 ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS
(ELECTROMAGNETICS LAP)

TEST METHODS SELECTION LIST

NVLAP Test Method Code	Test Method Designation
12/C01*	Conducted Emissions, Power Lines, 450 KHz to 30 MHz FCC Method - 47 CFR Part 15 Subpart J
12/R01*	Radiated Emissions, 30 MHz to 1000 MHz FCC Method - 47 CFR Part 15 Subpart J
12/T01*	Terminal Equipment Compatibility FCC Method - 47 CFR Part 68 Subpart D 68.302 Environmental simulation, Para. c, d, e, f 68.304 Leakage current limitations 68.306 Hazardous voltage limitations 68.308 Signal power limitations 68.310 Longitudinal balance limitations 68.312 On-hook impedance limitations 68.314 Billing protection
12/T02*	Terminal Equipment Compatibility FCC Method - 47 CFR Part 68 Subpart D 68.316 Hearing aid compatibility: technical standards
12/T03	Terminal Equipment Compatibility FCC Method - 47 CFR Part 68 Subpart D 68.302 Environmental simulation, Para. a, b

* Proficiency testing required. Charges for proficiency testing are included in the test method charges.

September 1986

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5. AUTHOR(S)

Jeffrey Horlick, Harvey Berger

6. PERFORMING ORGANIZATION (If joint or other than NBS, see instructions)

NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
~~WASHINGTON, D.C. 20234~~
Gaithersburg, MD 20899

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10. SUPPLEMENTARY NOTES

☐ Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This document explains the operational and technical requirements of the Laboratory Accreditation Program (LAP) for Electromagnetics Compatibility and Telecommunications (Electromagnetics LAP). All of the steps leading to accreditation are discussed. Technical requirements are explained indicating how the NVLAP criteria are applied.

It is intended for use by the staff of accredited laboratories, those seeking accreditation, other laboratory accreditation systems, and others needing information on the requirements for NVLAP accreditation under this LAP.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

accreditation; assessment; compatibility; electromagnetics; laboratory; NVLAP; proficiency testing; telecommunications

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