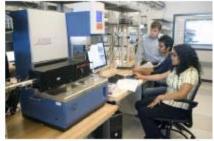
The Advanced Analytical and Diagnostics Laboratory (ADL) at Binghamton University

User Manual







The ADL is component of

The Small Scale Systems Integration and Packaging Center a New York State Center of Excellence

Lawrence Lehman, Laboratory Manager

Introduction

The Advanced Analytical and Diagnostics Laboratories, a major initiative under the Small Scale Systems Integration and Packaging (S³IP) Center, a New York State Center of Excellence, are centralized, interdisciplinary research facilities at Binghamton University that enable research and development activities with the goal of commercialization of microelectronic technologies by providing major instruments and technical support for materials diagnostics, analysis, characterization, and device processing in areas such as electronics systems integration and packaging, materials research, and flexible electronics.

The fully staffed labs, which occupy 8,000 sq. ft on the first floor of the Biotechnology Building at the Innovative Technologies Complex, and 900 sq. ft in Science II will facilitate research and educational experiences for faculty, staff and students, and expose the community to industrial concerns in the commercialization process. The Laboratories are available for use by members of the Binghamton University research community and other academic institutions and nonprofit organizations. Use of the facilities are also permitted to qualified research personnel from profit organizations, providing that comparable services are not available on a commercial basis in the private sector.

This User Manual is limited to usage of the Analytical and Diagnostics Laboratory in the Biotechnology Building at the Innovative Technologies Complex. Currently, the Lab is staffed and operates from 8:30 am to 5:00 pm Mondays-Fridays. The Lab is staffed by Ph.D. level scientists and staff, and include such instrumentation as light microscopy, laser microscopy, transmission and scanning electron microscopy, focused ion beam, x-ray diffraction, small angle x-ray, atomic force microscopy, mesoscale machining, thermal machining, and electronics instrumentation. Equipment charges are established in accordance with Federal OMB Circulars and approved by the Binghamton University Chargeback Committee. Binghamton University provides its shared experimental facilities with consistent operational practices to ensure compliance with all federal, state, local, and University regulations.

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Environmental Health and Safety Off	iice	(607) 777-2211
Emergency/After Hours Police (emergency)		044
From campus phone From a cell phone University Police (non emergency) Laboratory Manager		911 (607) 777-2393 (607) 777-2393 (607) 437-1880

ADL Facilities



The digital imaging services provide both real time programmed control of the fully motorized microscopes and post processing image manipulation and analysis. Some of these services will be available online through the web.

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1308 and 2407 in the Biotechnology Building in Binghamton University's Innovative Technology Complex. Parties contemplating use of the ADL lab can contact the Laboratory Director to discuss their analytical requirements, or visit the ADL web site,

http://s3ip.binghamton.edu/adl/ to read and follow the instructions found there. The ADL offices are located in the Small Scale Systems Integration and Packaging Center, Room 1600 on the first floor in the Biotechnology Building.

The ADL Lab includes the following areas of instrumentation and expertise:

Optical Microscopy Suite

This facility will provide high resolution imaging services in bright field, dark field, polarized light and differential interference contrast imaging modes. Magnifications are available from 0.3x through 1000x, as seen through the eye piece. Images are captured on 5 mega-pixel, Peltier cooled, CCD cameras. Instruments are available for imaging on upright and inverted stage formats, and upright stereo imaging with the ability to acquire stereo image pairs. Imaging includes digital imaging services such as extended depth of field, image stitching

The following instrumentation is available in this Suite:

- -Zeiss Axio Imager M1M Advanced Upright Compound Microscope
- -Zeiss AxioVert 200 Advanced Inverted Compound Microscope
- -Zeiss Discovery V 12 Advanced Stereo Zoom Microscope
- -Zeiss Computer Workstations 25A Imaging Processing Systems (2)
- Quantum Focus Instruments Infrared Microscope

Laser Microscopy Suite

The Suite will be useful for those in life sciences and engineering interested in recording fluid flow in channels, also include scanning confocal microscopy services and particle imaging velocimeter resources.

The following instrumentation is available in this facility:

- -Dantec PIV Particle Imaging Velocimeter
- -VT-Eye Ultra-fast Laser Confocal Imaging System
- Leica SP5 inverted stage Laser Scanning Confocal Microscope

X-Ray Imaging and Analysis Suite

The X-Ray Imaging and Analysis Suite will enable advanced materials science and nanotechnology research, including metrologic characterization in semiconductor process development. Tools in this suite will handle a wide range of applications, ranging from life science and biotechnology (proteins, viruses, DNA complexes, polymers, emulsions, liquid crystals, fibers and catalysts) to engineering materials and microelectronic devices.

The following instrumentation is available in this facility:

- -PANalytical X-Ray Diffraction
- -Phoenix X-Ray Imaging
- -Rigaku Small Angle Scattering and Large Angle Scattering Tool

SEM Suite

The SEM Suite will allow for the delivery of high resolution surface information and informative images, providing leverage against challenging imaging requirements, for applications in materials analysis, life sciences, semiconductor technology and quality assurance. Tooling will offer the ability to investigate non-conducting specimens without intrusive preparation and the possibility to introduce water vapor at sufficient pressures to avoid dehydration damage.

The following instrumentation is available in this facility:

- -Zeiss EVO-50 XVP, LaB6 emitter environmental SEM with Oxford Inca EDS + WDS
- -Zeiss Supra 55 VP, Analytical Ultra High Resolution FESEM + EDAX Pegasus EDS + EBSD

- -FEI NanoLab 600 FIB: Dual Beam-SEM/FIB with Oxford EDS + EBSD
- -JEOL 2100F TEM: 200-kV Field Emission Transmission Electron Microscope with EDS and EELS

Surface Analysis Lab

This facility will enable high resolution 3-D surface characterization of MEMS, semiconductors, and other thin/thick films.

The following instrumentation is available in this facility:

- Atomic Force Microscope, Veeco Instruments Dimension V system
- Spectroscopic Ellipsometer, Horiba
- -Profilometers: stylus and optical
- PHI 5000 VersaProbe X-ray Photoelectron Spectroscopy
- Ultra High Vacuum Scanning Tunneling Microscope

Thermal Analysis Lab

The following instrumentation is available in this facility:

- -TG/MS
- -Flash Thermal Diffusion Tool
- -DSC
- -DMA
- -TMA
- -Rheometer
- -TGA

General Microscopy

The following instrumentation is available in this facility:

- -Laser Doppler Vibrometer
- -CSAM Acoustic Microscope

Metallographic Preparation Laboratory:

This area will contain tooling necessary for surface preparation. The following tools are available in this facility: carbon evaporators, metal sputter coaters, an ion beam tool for SEM, disc punches, ultrasonic cutters, dimple grinders, ion mills, plasma cleaners, and twin jet thinners.

Mesoscale Machining Lab

This area will contain tooling necessary for surface preparation such as machining small channels. The following tools are available in this facility: -Levin Instrument Lathe, Z Corp Rapid Prototyping Tool, Microdrilling Machine, MicroDrill Press, Hardinge Lathe, Production Drill Press, and a CNC Milling Machine.

Types of Users

Binghamton University Users

All faculty, staff and students who charge their research usage to a RF, BUF and/or state account are considered "BU Users". BU Users, with appropriate training, are entitled to ADL Badge Access and to all user privileges.

Exceptions

- 1. When a consulting relationship exists between a faculty or staff member, and an outside commercial organization, and the work to be performed in the facility is connected to the substance of a consulting agreement, or the interests of an outside organization, then the work will be considered commercial work, and external rates assessed, unless the PI can justify otherwise.
- 2. If during the course of a sponsored research program, a company asks to the PI to conduct microscopy, for example, on samples related to its own in-house research, this work, even if billed to a RF account, would be considered commercial work, and would be assessed at the external rates.

Outside Academic Users

An Outside Academic User is anyone who does not have a direct BU affiliation, or who is not paid for by charges to an internal BU account, but who works for a research project of another University or other academic establishment (including hospital-based research and state or federal funded non-profit agencies). Research personnel from outside academic organizations are granted use of the ADL Lab, when it is

determined that the proposed service will not interfere with the progress of Binghamton University research projects. Collaborative programs with Binghamton University faculty and staff are encouraged where such arrangements would enhance the research capability of both parties.

Outside Non-Academic Users

Outside Non-Academic Users include persons who are not affiliated with an academic institution or hospital, and also BU faculty members in connection with a consulting or other formal arrangement the faculty member may have with a commercial entity. As the ADL Laboratory was funded, in part, by New York State with the goal of high technology commercialization, we seek to promote and foster university-industry cooperation and encourage industrial collaborators to use the ADL Laboratory. In accordance with State University of New York policy, Binghamton University implements the following requirements for commercial use of the ADL Laboratory:

Although the primary academic missions and research activities of Binghamton University must take first priority, the University encourages the use of its research equipment by or on behalf of outside parties to achieve mutually beneficial objectives. University policy encourages the use of instrumentation or facilities by or on behalf of outside parties when such use does not constitute provision of services that are readily available to the outside party through commercial enterprises.

Staff will offer such help as they are able to users, in regard to interpretation or other use of data, photographs, or other results obtained from facility information. The user, though, ultimately takes sole responsibility for the interpretation and application of the results to their project.

Commercial Use of Facilities

Binghamton University recognizes and encourages cooperation between the university and industry. This cooperation in advanced study and research will promote a more rapid dissemination of knowledge-enhancing productivity and will contribute to economic development. S³IP encourages its research groups to forge interdisciplinary partnerships between the Center, industry and government.

Facilities must conform to the requirements stated in relevant documents from the Federal Government, and Binghamton University:

- Commercial use of the facility must not interfere with the research mission of the Center.
- Appropriate fees must be charged to recover full costs.
- Fees for services to commercial businesses must not be less than fees charged for equivalent services from viable commercial vendors or facilities.
- Excess capacity must be available to handle the industrial usage.

Certain limited exceptions to this policy may be made, for example, to facilitate key research activities in the Center, or to foster industrial outreach under special circumstances. The Laboratory Manager may recommend, in writing, a limited exception, which must be approved by the S³IP Director in advance of the proposed activity.

It is the responsibility of Laboratory Manager to establish (using reasonable judgment) whether "equivalent" services are available from the private sector. In ambiguous cases, the S³IP Director will assume the responsibility to

establish whether services are equivalent. In determining whether equivalent services are available, the facility manager should identify the specific activities required by the potential commercial user. The ADL Lab Manager should then take into account the capability of the compared instruments, the fragility of the specimens involved, the specialized expertise of the technicians involved, the need for special adjustments or accessories, and the number of samples being tested or the frequency with which the user must repeat processes.

Access to Facilities

The ADL Laboratory is typically open on work days from 8:30 am to 5:00 pm. There may be exceptions to this schedule, which will be posted on the ADL website as far in advance as possible. Night/weekend use privileges may be granted by the Laboratory Manager to experienced BU Users at the graduate level or higher with a significant "track record" of productive and competent use on the equipment.

ADL Lab access is controlled by Badge readers at the doors. Badge access is granted to new users as part of the registration process. ADL instrument access is controlled by the Facilities Online Manager (FOM) software. Secure memory server access is keyed to each user's UserID. Creating these access features requires three business days. New users will receive an email with access instructions and information when the process is complete. Please save that information for later reference.

The following steps are followed, in order, to become a User of the Analytical and Diagnostic Laboratory:

1. New Users should register for access to the lab via the website,

http://s3ip.binghamton.edu/adl.

Binghamton University Users (internal users) will find instructions for an online registration process. Non-Binghamton University Users (external users) registration will include

completion of an ADL External User Application. This document serves to inform the lab staff of the equipment and any materials users will need, and to plan for workloads in the lab. Please print the application form, complete it, gain appropriate signatures and return to the Small Sale Systems Integration and Packaging Center, Room 1600, Biotechnology Building at the ITC, Fax # 607-777-5300.

- 2. External Users will receive an invoice which indicates their specific credits, expenses and balance due each month. Payment terms are Net 30 days from invoice date.
- 3. Authorizations to use the facilities for specific projects are granted for a period of 5 years. Re-application and re-approval are necessary prior to the expiration date of the agreement.
- 4. Internal Users will use their BU ID to access the Lab. External Users will be issued a Binghamton University (BU) Guest ID card to access the ADL Lab. The ID card may be used only by the person it is issued to. Contact the Laboratory Manager concerning lost or forgotten ID cards. ID cards must be returned when laboratory use is terminated.
- 5. Users should make an appointment with the assigned Instrument Trainer for the instrument they wish to use. From the FOM "User Home" page, select the desired instrument on the "Available Instruments" list. FOM will generate a "New User Application Form". Indicate on that form what days or times training may be preferred. This form will then appear as an email request to the instrument trainer, who will then contact the new user. Further information and training schedules for specific equipment is available on the ADL website.
- 6. Until a User has been trained on an instrument, a user cannot schedule or activate it. When a user has been trained, the user should use FOM to check that the tool is working and available before coming to the lab. After using a tool the user must remember to logoff the

instrument again from within FOM so they will not incur additional fees.

- 7. For night and weekend approved usage, there must be a minimum of two people in the ADL Lab at all times.
- 8. All Users will be required to have a Binghamton University parking pass while using the facilities. These are available in the Small Scale Systems Integration and Packaging Center, Room 1600, Biotechnology Building, at the ITC, 85 Murray Hill Road.
- 9. Staff will offer such help as they are able to users, in regard to interpretation or other use of data, photographs, or other results obtained from facility information. The User ultimately takes sole responsibility for the interpretation and application of the results to their project.

Billing

The Center's Administrative Office invoices on a bi-weekly cycle for use of facilities based on the approved rate schedule. This schedule is subject to change. Billing is based on the actual logged usage of the facilities. Most fees for instrument use are billed on an hourly rate for the reserved time or the actual time, whichever is greater. In addition, fees for supplies and materials for certain instruments may be applied. Return invoice to Sponsored Funds with authorization to pay and funding source. Charges are due when billed. Failure to pay in a timely way is grounds for the termination of this agreement.

Checks from external organizations should be made payable to The Research Foundation of SUNY, and forwarded to the following address:

Sponsored Funds Administration Binghamton University PO Box 6000 Binghamton, NY 13902-6000

Questions regarding charges should be addressed to Dr. Lawrence Lehman, (607) 777-6841, lplehman@binghamton.edu.

Confidentiality

The work environment at BU, as with most other Universities, is one of free intellectual exchange and openness. Staff are not required to undertake any obligation of confidentiality with respect to their daily work. It is the ADL policy to decline applications for use of its facilities from third parties if any form of confidentiality agreement would be required.

Use of Facilities for Classified Research

University Policy prohibits Binghamton University personnel from engaging in research on campus that is confidential or classified for National Security reasons. This applies to all University facilities.

Published Reports and Publications

We ask that all users of the ADL Laboratory keep us informed of the nature and progress of their work, if published externally.

Acknowledgment of the use of the ADL Lab is expected in publications or research reports, as is the assistance of a specific ADL Technical Staff member if their work has made a significant contribution to your research. "This work made use of the Advanced Analytical and Diagnostics Laboratory at Binghamton University's Small Scale Systems Integration and Packaging Center." We would appreciate receiving a copy of publications which cite research conducted through the use of the ADL Lab.

Protection of Intellectual Property

Protection of Intellectual Property is important to both our academic and industrial users. Binghamton University employs a flexible policy which protects the intellectual property of our users.

1. The ADL Laboratory User Program

All direct use of the ADL Laboratory by an external organization is through the Lab User Program. Under this program, external users obtain equipment time in the Lab. Neither University nor the Research Foundation of SUNY would make any claim to a company's intellectual property based solely on their use of the facility, provided that the Lab Application is signed by the user's organization prior to such use. As a user facility, the ADL will provide equipment access and staff support on the equipment. It is expected that companies bring their own skilled scientists to work in our laboratory alongside our technical staff. Under this agreement, users keep the details of their specific projects confidential, and do not ask for assistance in developing intellectual property. No help other than assistance by the Lab's technical support staff will be provided to users utilizing this approach.

In addition, external users can create a relationship with a BU faculty member governed by the terms of a nondisclosure agreement (NDA). Through the NDA, the faculty member and his/her staff can carry out confidential work for the external user.

In addition to the ADL Laboratory, Binghamton University has many other items of instrumentation on campus which may be available to external organizations on a fee basis. Further information on these facilities is available by contacting the ADL Laboratory Manager, lplehman@binghamton.edu.

2. Sponsored Research

When companies collaborate with Binghamton University faculty and students on specific projects, with the goal of sharing expertise, a sponsored research agreement is recommended. Any new intellectual property developed under these agreements, using Binghamton University facilities, is owned by the Research Foundation of SUNY and the company sponsor is given an option to negotiate an exclusive license to any developed technology.

Safety Information

Established laboratory policies provide everyone with a safe and successful working environment. Laboratory users are expected to follow the established ADL policies. Use of the shared facilities by a wide range of researchers is a priority and will keep the Center of Excellence at the forefront of microelectronics research.

- 1. All Users of these facilities agree to abide by the rules and policies of Binghamton University. Users are encouraged to ask laboratory staff members any questions.
- 2. Users may only use equipment for which they are authorized. Laboratory staff provide all training on all equipment, Users report all equipment and facility problems to laboratory staff. Repairs and maintenance of equipment and facilities is performed or authorized by laboratory staff only.
- 3. No food or drink is allowed in the laboratory.
- 4. Users must maintain a clean work environment, be considerate of fellow users, and leave their work environment in a neat and clean condition.
- 5. Users must wear safety gear appropriate for the process, if needed. Such gear will be supplied by the lab.
- 6. Lab users must be compliant with the environmental safety and health guideless provided in the User Manual.
- 7. All users are responsible for politely reminding fellow laboratory users of safe laboratory practice, if fellow users are seen engaging in activities that may endanger themselves or others. The observer is responsible for immediately reporting the incident to the laboratory staff.
- 8. ADL Lab has the right to eject and ban any

user for failure to adhere to the Laboratory policies and procedures.

ADL User Rates

Rates are established for the use of all instrumentation in the ADL Lab. These rates are set to maximize usage while recovering a reasonable fraction of expenses, including technical staff support, maintenance, repair, upgrades and replacement of components or equipment. Individual machine rates are reviewed on a yearly basis by the Binghamton University Chargeback Committee.

General principles for establishing user fees for all users are listed below:

- -Facilities may not recover more than cost. (A long-term average with a reasonable variance from break-even is permissible.)
- -Academic users receive the lowest rate available.
- -Facilities should supply services that are not generally available outside the University, or that when combined are considerably more efficient than the alternative.
- -Facilities may not directly compete with services provided by private companies unless a significant efficiency or benefit is achieved through the on-campus location of a service. (The training of students in the use of relevant experimental equipment may be considered a significant benefit.)
- -Facilities may not provide services in commerce for a fee if this will interfere with the specific research of the Center.

In general, there is an hourly rate for self use of an instrument, billable in ½ hour increments. There are also rates for training, and for assisted use, where there is no intent to train the user, but merely to obtain data. In addition, materials consumed by users are billed at cost, plus a minor administrative fee. This service is provided as a convenience to the users.

Rates are subject to change. See Rate Chart on the ADL Website, for up to date rates.

Related Documents

U.S. Federal Government, Office of Management and Budget (OMB)

OMB Circular A-21: Cost Principles for Educational Institutions http://www.whitehouse.gov/OMB/circulars/a021/a021.html

OMB Circular A-110: Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education. http://www.whitehouse.gov/OMB/circulars/a110/a110.html

Binghamton University

Program Income from Sponsored Programs Recharge Operations and Service Facilities Policy on Use of University Facilities Chargeback Policy at Binghamton University

FOM Billing Policy

• Charging rates:

Rates for each facility's instruments are posted on the facility website. Link to the facility from http://www2.binghamton.edu/adl/accessing-labs/ADL User Rates appoved 2010-03-29.pdf

• Reservations:

Most reservations can only be made hour by hour sharp, e.g. 9:00-12:00. Some instruments may have other time units or be charged per use rather than per time unit.

• Daytime and nighttime:

Daytime is from 9AM to 5PM. Rest of the day and weekends are charged as night time for those who have Anytime access approved by the appropriate facility manager. Weekends are considered as night time. FOM does not recognize official holidays. Daytime and night time charges are the same at the ADL.

• Flexible start/end time:

Reservation start time is flexible within a range of plus or minus 30 minutes. So if a user arrives between 8:30 and 9:29 for a 9:00 Start time and logs on to FOM he/she will be able to 'express logon' to the reserved session. Note: if the user is more than 30 minutes late, they will be a No-show for the reserved session. See "Unused Reservation". The user will can still logon to the reserved session late, more than 30 minutes after the reservation start time, but they will be charged from the beginning of the reservation start time.

• Partly used reservations:

If reserved time is not fully used, user will be charged according to reserved time. Do not reserve time more than needed. We charge because if you have a reservation, other users are barred from reserving the instrument during that period.

• Extended usage:

If actual usage exceeds reserved time, user will be charged according to actual usage. On most instruments, if a user is still logged on 3 hours after the reserved time ended, they will experience an auto-logoff event, since FOM assumes they forgot to logoff. A user can extend the reserved time by reserving additional time contiguous with the existing session. (The user does not need to logoff an existing session to reserve more time). FOM will automatically merge the new reservation with the existing session.

• Unused reservation:

If user does not show up within 30 minutes after reserved start time, other users may use the time period. The user who made the reservation will be charged in full according to time reserved.

• Cancelled reservation:

User will not be charged if reservation is cancelled more than 18 hours before start of reserved session. User will be charged the equivalent of one hour usage if reservation is cancelled less than 18 hours ahead, because other users are unable to make reservations when there is a standing one.

• Forgot to logout:

If a user forgets to log out on FOM, i.e. user is still logged on 3 hrs after end of reserved time, User will be automatically logged off and will charged for reserved time plus 3 hours of machine time.

• Report forgotten logouts:

If any user finds that the previous user forgot to logout, he/she should report to facility manager as soon as possible. Facility manager can force logout with administrator's super password. (Please note, user's experiment might be interrupted if the user is forced to log off while the instrument is being used).

• Overridden usage:

If a reserved session is overridden by another user, the user who reserved the session will be charged in full according to reserved time. The user who used the machine will be charged according to actual usage. Anyone who wants to extend his session and there by override a subsequent user's reservation must get permission from the user who reserved the session.

• Technical assistance and training fee:

Technical assistance and training fees are entered manually by facility managers. Charges depend on assistance or training provided and time spent.

• Consumables:

Consumables are charged by the amount user entered when logging off instrument. If the user forgets to enter consumable use, the facility manager may enter manually on the user's behalf.

• Machine downtime:

Users will not be charged if the machine is marked as down, even if he/she has reserved the machine. Users may also request reset of charge if the machine is faulty but not marked as down in FOM.

• Report of equipment problem:

When logging off equipment in FOM, user should check "problem" or "down" if there was problem during the session. Facility managers will receive email notice and fix the problem as soon as possible. Facility managers will also evaluate if the usage charge should be reset due to the problem reported.

• Disputable charge:

Users may contact the appropriate facility manager to discuss any disputed charge. Any adjustments must be completed within 90 days to comply with the university's rule.

• Billing schedule:

ADL sends an invoice for internal users to Accounting every two weeks. External users are billed once a month at the beginning of each month. We use the account numbers that were on your user profile at the time of your log-in.