

Ultra-High-Capacity Optical Communications:

Challenges in Broadband Optical Access, Materials Processing, and Manufacturing

Program Solicitation

NSF 03-537

Replaces Document NSF 01-65



National Science Foundation

Directorate for Engineering

Division of Electrical and Communications Systems

Division of Chemical and Transport Systems

Division of Design, Manufacture, and Industrial Innovation

Directorate for Mathematical and Physical Sciences

Division of Mathematical Sciences

Letter of Intent Due Date(s) *(required)*:

March 31, 2003

Full Proposal Deadline(s) (due by 5 p.m proposer's local time):

May 06, 2003

REVISIONS AND UPDATES

This program announcement/solicitation replaces the document NSF 01-65.

SUMMARY OF PROGRAM REQUIREMENTS

General Information

Program Title:

Synopsis of Program:

The National Science Foundation (NSF), through the Divisions of Electrical and Communications Systems (ECS), Chemical and Transport Systems (CTS), and Design, Manufacture and Industrial Innovation (DMII) of the Directorate for Engineering, and the Division of Mathematical Sciences (DMS) of the Directorate for Mathematical and Physical Sciences, announces a broad interdisciplinary program of research and education on ultra-high capacity optical communications, including novel concepts in photonic devices, advanced fiber communication systems, component technologies for broadband optical access, new approaches to low-cost processing and manufacturing, and new mathematical models to simulate the device and system performance. The objective is to enable the continued growth of broadband optical access and high-capacity optical communications into the next decade. The Division of Advanced Networking Infrastructure and Research (ANIR) of the Directorate for Computer & Information Science & Engineering and DARPA plan to participate in the reviews and identify proposals of mutual interest and may provide co-funding for programs of high quality that meet their programmatic and relevancy requirements. The reviews and panels will be conducted by NSF, utilizing the NSF merit review process. All awards will be made by NSF, and will be subject to NSF terms and conditions.

Cognizant Program Officer(s):

- Filbert J. Bartoli, Program Director, Directorate for Engineering, Division of Electrical & Communications Systems, 675 S, telephone: (703) 292-8339, fax: (703) 292-9147, email: fbartoli@nsf.gov
- Julie Chen, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 510 N, telephone: (703) 292-5365, fax: (703) 292-9056, email: jchen@nsf.gov
- Charalabos Doumanidis, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 531 S, telephone: (703) 292-7088, fax: (703) 292-9056, email: cdoumani@nsf.gov
- David Honey, Office Director, Defense Advanced Research Projects Agency (ATO), 3701 N. Fairfax Drive, Arlington, VA, 22203, telephone: (571) 218-4323, email: dhoney@darpa.mil
- Admela Jukan, Networking Research Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8949, fax: (703) 292-9010, email: ajukan@nsf.gov
- Jagdeep Shah, Program Manager, Defense Advanced Research Projects Agency (MTO), 3701 N. Fairfax Drive, Arlington, VA, 22203, telephone: (703) 696-2253, fax: (703) 696-2206, email: jshah@darpa.mil
- Ken Shaw, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N, telephone: (703) 292-4859, email: kshaw@nsf.gov
- Richard N. Smith, Program Director, Directorate for Engineering, Division of Chemical & Transport Systems, 525 N, telephone: (703) 292-8371, fax: (703) 292-9054, email: rsmith@nsf.gov
- Robert M. Wellek, Deputy Division Director, Directorate for Engineering, Division of Chemical & Transport Systems, 525 N, telephone: (703) 292-8370, fax: (703) 292-9054, email: rwellek@nsf.gov
- Taieb Znati, Senior Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8949, fax: (703) 292-9010, email: tznati@nsf.gov

Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering
- 47.049 --- Mathematical and Physical Sciences

Eligibility Information

- **Organization Limit:** Proposals may be submitted only by U.S academic institutions and U.S nonprofit research institutions in support of single investigators or small interdisciplinary teams of 2 to 3 investigators (from the same or different institutions). The limitation to U.S academic and nonprofit research institutions is intended to apply also to subawards.
- **PI Eligibility Limit:** Only one proposal may be submitted by a principal investigator. A principal investigator for one proposal may be a co-principal investigator or senior staff on one other proposal. No investigator may participate in more than two proposals as PI, coPI or senior staff. Applicants for small team awards should contact one of the Program Directors listed in this document prior to proposal submission to clarify the appropriateness of the contemplated team proposal.
- **Limit on Number of Proposals:** None Specified.

Award Information

- **Anticipated Type of Award:** Standard or Continuing Grant
- **Estimated Number of Awards:** 7 to 10
- **Anticipated Funding Amount:** \$3,000,000 to cover grants of up to three years duration beginning in FY 2003. Grants of up to \$300,000 for single investigators and \$600,000 for small interdisciplinary teams are anticipated. The above funding amount and grant sizes are subject to availability of funds and the quality of proposals received.

Proposal Preparation and Submission Instructions

A. Proposal Preparation Instructions

- **Letters of Intent:** Submission of Letters of Intent is required. Please see the full text of this solicitation for further information.
- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Other budgetary limitations apply. Please see the full text of this solicitation for further information.

C. Due Dates

- **Letters of Intent (required):**
March 31, 2003
- **Full Proposal Deadline Date(s)** (due by 5 p.m proposer's local time):
May 06, 2003

Proposal Review Information

- **Merit Review Criteria:** National Science Board approved criteria apply.

Award Administration Information

- **Award Conditions:** Standard NSF award conditions apply.
- **Reporting Requirements:** Standard NSF reporting requirements apply.

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I. INTRODUCTION

The rapid growth in optical communications has been a major factor underlying our nation's economic growth. Growth in communications has outpaced the performance of digital semiconductor systems, which according to Moore's law has doubled every 18 months. Still, the high inherent bandwidth of optical fibers is just beginning to be exploited, and longer-term high-risk research is necessary to sustain the growth in information transfer capacity and to enable affordable and efficient optical communications in the future.

Increasing the total capacity in optical communications systems will require new materials and devices, and new concepts for the basic transmission media. Growth in transmission data rates will necessitate new modulation techniques. New wide-band modulators, tunable lasers and amplifiers operating between 1200-1700 nm will need to be developed to exploit increased fiber bandwidth. Adaptive devices such as filters, gain and power equalizers, and dispersion compensators will be of increasing importance. Integrated optical circuits and packaging remain a challenge. There will be a need for greater functionality on a chip, possibly requiring large functional chips with on-board hybrid technologies. Optical intra-chip connections may improve on-chip electronic performance. Significant reductions in the costs of components and systems will be critical if widespread, broadband access is to achieve the market penetration necessary to stimulate the upstream demand for the ultra-high capacity systems.

While breakthroughs are anticipated from individual investigators, interdisciplinary groups will become increasingly important in this area. It is expected that the research supported and stimulated under this solicitation will also impact the NSF-wide Priority Areas on Information Technology Research (ITR), Nanoscale Science and Engineering (NSE), Workforce for the 21st Century, and Mathematical

Sciences.

Many of the above issues are discussed in greater detail in the report of a recent NSF workshop on this subject, which can be found at <http://oclab.usc.edu/nsf/oct2002/>.

II. PROGRAM DESCRIPTION

This solicitation will emphasize forward-looking, high-impact research relating to optical communications, with the goal of assuring continued growth in data capacity in optical communications systems throughout the next decade. It is envisioned that research will be carried out by single investigators, or small interdisciplinary groups that generate new concepts and approaches stimulated by the interaction of diverse disciplines. Proposals offering incremental advances of existing technologies are discouraged. Research should focus on critical enabling technologies for long-term growth. Such research might include concepts for all-optical communications, novel technologies for significantly increasing the optical fiber communications bandwidth, schemes to achieve higher spectral efficiency, the optical-wireless interface, components for broadband optical access, new experimental techniques to facilitate low-cost processing and manufacturing, and new mathematical modeling and simulation tools. Proposals should discuss effective ways in which education and outreach to underrepresented groups is integrated within the research program.

TOPICAL AREAS

Some of the materials, device, and systems topical challenges that will be addressed by this solicitation include but are not limited to:

1. High-speed all-optical fiber communications employing advanced switching schemes.
2. Seamless hybridization and integration of microwave wireless signals with the optical backbone.
3. Next-generations of optoelectronic materials and devices that will fuel future capacity and functionality revolutions, such as photonic crystals, nonlinear processors, and advanced integration and packaging.
4. Revolutionary advances in optical communications beyond current technologies for erbium-doped fiber amplifiers (EDFAs) and wavelength-division multiplexing (WDM).
5. Fundamental advances to achieve greater than 300-nm-wide useful spectral bandwidth.
6. Technologies that will help achieve greater than 50-terabit/s in a single optical fiber, with resulting system capacities.
7. Innovative fiber and component technologies for broadband optical access; new approaches for low-cost processing and manufacturing of critical optical components and structures, addressing hybrid processes, thermal management and mechanical failure mechanisms.
8. New robust mathematical models to enable accurate simulation of new device and system performance.
9. Powerful coding, modulation, and mathematical tools and techniques to achieve better spectral efficiency; identification of fundamental limitations.
10. Optical-electronic interface for greater than 40-Gbit/s/channel systems.

III. ELIGIBILITY INFORMATION

Proposals may be submitted only by U.S academic institutions and U.S nonprofit research institutions in support of single investigators or small interdisciplinary teams of 2 to 3 investigators (from the same or different institutions). The limitation to U.S academic and nonprofit research institutions is intended to apply also to subawards.

IV. AWARD INFORMATION

The awards made under this solicitation will be up to \$300,000 for a single investigator and up to \$600,000 for a small interdisciplinary team, for a duration of up to three years. Small interdisciplinary groups may be from the same institution or from different institutions, and should demonstrate substantial program enhancement resulting from the interaction of diverse disciplines. It is anticipated that the total funds available from NSF for this activity will be approximately \$3.0 million. Estimated program budget, number of awards and average award size/duration are subject to the availability of funds and the quality of proposals.

V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Letters of Intent (*required*):

For NSF planning purposes, a non-binding letter of intent to submit a proposal to this solicitation must be sent via e-mail to fbartoli@nsf.gov by the date listed at the beginning of this solicitation. The letter of intent (in clear text, 1-page limit, with no attachments) should list the project title, PI and coPI's, lead institution, and other participating institutions. This will be useful to the working group in scheduling panels with the requisite expertise to evaluate the proposals.

Full Proposal Instructions:

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available electronically on the NSF Website at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

Cover Sheet: See GPG Section II.C

- Program selection. In order to facilitate proper assignment and review of proposals, **all applicants must select "ECS - Integrative Systems" as the division-program of interest.** Failure to do so may cause delays in processing.

Project Description: See GPG Section II.C.

- Note that the project description may not exceed 15 pages for any proposal submitted in response to this solicitation.

Proposers are reminded to identify the program announcement/solicitation number ((03-537)) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

B. Budgetary Information

Cost Sharing:

Cost sharing is not required in proposals submitted under this Program Solicitation.

Other Budgetary Limitations:

Total award amount will be up to \$300,000 for a single investigator and up to \$600,000 for a small interdisciplinary team, for a duration of up to three years.

C. Due Dates

Proposals must be submitted by the following date(s):

Letters of Intent (required):

March 31, 2003

Full Proposal Deadline(s) (due by 5 p.m proposer's local time):

May 06, 2003

D. FastLane Requirements

Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <http://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail fastlane@nsf.gov. The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program announcement/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

Submission of Electronically Signed Cover Sheets. The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the [Grant Proposal Guide](#) for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

VI. PROPOSAL REVIEW INFORMATION

A. NSF Proposal Review Process

Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 ([NSB 97-72](#)). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued [Important Notice 127](#), Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to make judgments.

What is the intellectual merit of the proposed activity?

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

What are the broader impacts of the proposed activity?

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF staff will give careful consideration to the following in making funding decisions:

Integration of Research and Education

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant

opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

Integrating Diversity into NSF Programs, Projects, and Activities

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

B. Review Protocol and Associated Customer Service Standard

All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

In most cases, proposers will be contacted by the Program Officer after his or her recommendation to award or decline funding has been approved by the Division Director. This informal notification is not a guarantee of an eventual award.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

VII. AWARD ADMINISTRATION INFORMATION

A. Notification of the Award

Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

B. Award Conditions

An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); * or Federal Demonstration Partnership (FDP) Terms and Conditions * and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions

(CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

*These documents may be accessed electronically on NSF's Website at http://www.nsf.gov/home/grants/grants_gac.htm. Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from pubs@nsf.gov.

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at <http://www.nsf.gov/cgi-bin/getpub?gpm>. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at <http://www.gpo.gov>.

C. Reporting Requirements

For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

VIII. CONTACTS FOR ADDITIONAL INFORMATION

General inquiries regarding this program should be made to:

- Filbert J. Bartoli, Program Director, Directorate for Engineering, Division of Electrical & Communications Systems, 675 S, telephone: (703) 292-8339, fax: (703) 292-9147, email: fbartoli@nsf.gov
- Julie Chen, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 510 N, telephone: (703) 292-5365, fax: (703) 292-9056, email: jchen@nsf.gov
- Charalabos Doumanidis, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 531 S, telephone: (703) 292-7088, fax: (703) 292-9056, email: cdoumani@nsf.gov
- David Honey, Office Director, Defense Advanced Research Projects Agency (ATO), 3701 N. Fairfax Drive, Arlington, VA, 22203, telephone: (571) 218-4323, email: dhoney@darpa.mil
- Admela Jukan, Networking Research Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8949, fax: (703) 292-9010, email: ajukan@nsf.gov
- Jagdeep Shah, Program Manager, Defense Advanced Research Projects Agency (MTO), 3701 N. Fairfax Drive, Arlington, VA, 22203, telephone: (703) 696-2253, fax: (703) 696-2206, email: jshah@darpa.mil
- Ken Shaw, Program Director, Directorate for Mathematical & Physical Sciences, Division of Mathematical Sciences, 1025 N,

telephone: (703) 292-4859, email: kshaw@nsf.gov

- Richard N. Smith, Program Director, Directorate for Engineering, Division of Chemical & Transport Systems, 525 N, telephone: (703) 292-8371, fax: (703) 292-9054, email: rsmith@nsf.gov
- Robert M. Wellek, Deputy Division Director, Directorate for Engineering, Division of Chemical & Transport Systems, 525 N, telephone: (703) 292-8370, fax: (703) 292-9054, email: rwellek@nsf.gov
- Taieb Znati, Senior Program Director, Directorate for Computer & Information Science & Engineering, Division of Advanced Networking Infrastructure and Research, 1175 N, telephone: (703) 292-8949, fax: (703) 292-9010, email: tznati@nsf.gov

For questions related to the use of FastLane, contact:

- FastLane Help Desk National Science Foundation, telephone: (800) 673-6188, email: fastlane@nsf.gov

IX. OTHER PROGRAMS OF INTEREST

The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF [E-Bulletin](#), which is updated daily on the NSF Website at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's [Custom News Service](http://www.nsf.gov/home/cns/start.htm) (<http://www.nsf.gov/home/cns/start.htm>) to be notified of new funding opportunities that become available.

Related Programs:

[Ultra-High-Capacity Optical Communications and Networking \[nsf0165\]](#)

[The Future Revolution in Optical Communications and Networking](#)

[Ultra-High-Capacity Optical Communications and Networking: Challenges in Broadband Optical Access, Materials Processing, and Manufacturing](#)

ABOUT THE NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230

- **For General Information** (NSF Information Center): (703) 292-5111

- **TDD (for the hearing-impaired):** (703) 292-5090 or (800) 281-8749

- **To Order Publications or Forms:**

Send an e-mail to: pubs@nsf.gov

or telephone: (703) 292-7827

- **To Locate NSF Employees:** (703) 292-5111

PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

The information requested on proposal forms and project reports is solicited under the authority of the National Science Foundation Act of 1950, as amended. The information on proposal forms will be used in connection with the selection of qualified proposals; project reports submitted by awardees will be used for program evaluation and reporting within the Executive Branch and to Congress. The information requested may be disclosed to qualified reviewers and staff assistants as part of the proposal review process; to applicant institutions/grantees to provide or obtain data regarding the proposal review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers and educators as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the government is a party. Information about Principal Investigators may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records," 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records," 63 Federal Register 268 (January 5, 1998). Submission of the information is voluntary. Failure to provide full and complete information, however, may reduce the possibility of receiving an award.

An agency may not conduct or sponsor, and a person is not required to respond to an information collection unless it displays a valid OMB control number. The OMB control number for this collection is 3145-0058. Public reporting burden for this collection of information is estimated to average 120 hours per response, including the time for reviewing instructions. Send comments regarding this burden estimate and any other aspect of this collection of information, including suggestions for reducing this burden, to: Suzanne Plimpton, Reports Clearance Officer, Division of Administrative Services, National Science Foundation, Arlington, VA 22230.

OMB control number: 3145-0058.



The National Science Foundation

4201 Wilson Boulevard, Arlington, Virginia 22230, USA

Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090 or (800) 281-8749

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