SUPPLEMENTAL REPORT

Department of Commerce, Annual Budget Proposal, FY 2006

Annual Report on Technology Transfer: Approach and Plans, FY 2004 Activities and Achievements U.S. Department of Commerce

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In response to the:

Technology Transfer and Commercialization Act of 2000 (P.L. 106-404)

January 2005

Foreword. This is the calendar year 2005 edition of a report series summarizing the technology transfer activities and achievements of the Department of Commerce's federal laboratories. This report responds to the statutory requirement for an annual "agency report on utilization" [15 U.S.C. Section 3710 (f)] under the revised federal-wide reporting process established by the Technology Transfer Commercialization Act of 2000 (P.L. 106-404). All federal agencies that direct one or more federal laboratories or conduct other activities under Section 207 and 209 of Title 35, United States Code are subject to the requirements of this statute.

At the Department of Commerce, technology transfer is a part of the mission and program activities of principally the National Institute of Standards and Technology (Technology Administration), the National Oceanic and Atmospheric Administration, and the Institute for Telecommunication Sciences (National Telecommunications and Information Administration). Accordingly, this report focuses on the activities of these three departmental agencies.

Each of the major sections of this report is organized to summarize the agency's technology transfer approaches and plans and to provide specific information about the activities and accomplishments for FY
2004 and several earlier comparative years. The report begins with a summary of this information for the Department of Commerce as a whole.

This report has been organized and prepared by the Office of Technology Policy (Technology Administration), along with the joint participation of technology transfer personnel at the National Institute of Standards and Technology (Technology Administration), the National Oceanic and Atmospheric Administration, and the Institute for Telecommunication Sciences (National Telecommunications and Information Administration).

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I. DEPARTMENT OF COMMERCE OVERVIEW

Technology Transfer by the Department's Federal Laboratories – Summary of Approaches and FY 2004 Activities/Achievements

The Department of Commerce works in partnership with businesses, universities, communities, and workers to promote U.S. competitiveness. The department pursues this objective through a host of policy and program activities directed at strengthening the nation's economic infrastructure, facilitating the development of cutting-edge science and technology, providing an information base, and managing national resources.

At the Department, research and development (R&D) in numerous areas of contemporary science and technology is conducted at the federal laboratories of the Technology Administration (the National Institute of Standards and Technology -- NIST), National Oceanic and Atmospheric Administration (various lab facilities across NOAA's bureaus), and the National Telecommunications and Information Administration (Institute for Telecommunication Research – ITS). Technology transfer is part of the program activities at each of these agencies' federal lab systems.[1]

■ Agency Missions and Channels for Technology Transfer

Mission	Tech Transfer
Technology Administration – National Institute of Standards and Technology NIST's mission is to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life. NIST laboratories develop and disseminate measurement techniques, reference data, test methods, standards, and other infrastructural technologies and services that support U.S. industry, scientific research, and the activities of many federal agencies. In carrying out its mission, NIST works directly with industry partners (and consortia), universities, associations, and other government agencies.	▪ The focus of NIST's technology transfer activities in general is the broad dissemination of research results to industry, rather than the creation of patents and associated licenses. As such, NIST utilizes a diverse group of mechanisms to transfer the knowledge and technologies that result from its laboratory research. ▪ Principal tech transfer mechanisms: CRADAs, Patents and licenses, Technical publications, Standard Reference Materials, Standard Reference Data, Calibration services, Documentary standards Conferences, workshops, and inquiries Guest researchers and facilities users.

1 In reviewing the technology transfer plans and activity statistics provided by this report, it is important to recognize there are significant differences among the three agencies in the level of resources available to support R&D activities. For NIST, budget authority for R&D (including conduct of R&D and R&D facilities) in FY 2004 totaled an estimated $457 million. For NOAA, the corresponding figure for R&D budget authority in FY 2004 is $617 million. For ITS, the corresponding FY 2004 figure is $6 million.

Mission	Tech Transfer
National Oceanic and Atmospheric Administration NOAA's primary mission is to transfer environmental data on a wide range of time and space scales in order to protect life and property, and provide industry and government decision-makers with a reliable base of scientific information. As part of this mission, almost half of the organization works to produce the daily weather forecast, which advises and warns the general public and, at the same time, provides a base of scientific and technical information for engineers and managers in federal and state governments and in the heating, construction, manufacturing, transportation, and health industries.	▪ NOAA's broad approach to tech transfer involves licensing intellectual property, cooperative research relationships with industry, and/or direct transfer. NOAA works with each of its laboratories based on its ability to provide the necessary resources. ▪ Principal tech transfer mechanisms: Dissemination CRADAs, Patents and licenses
National Telecommunications and Information Administration -- Institute for Telecommunication Sciences NTIA's Institute for Telecommunication Sciences (ITS) supports agency telecommunications objectives such as promoting advanced telecommunications and information infrastructure development in the United States, enhancing domestic competitiveness, improving foreign trade opportunities for U.S. telecommunications firms, and facilitating more efficient and effective use of the radio spectrum. ITS also serves as a principal federal resource for solving the telecommunications concerns of other federal agencies, state and local governments, private corporations and associations, and international organizations.	▪ ITS participates in tech transfer and commercialization by fostering cooperative research with industry where benefits can directly facilitate U.S. competitiveness and market opportunities. ▪ Principal tech transfer mechanisms: CRADAs, Patents and licenses, Telecommunications analysis services.

For a more detailed discussion, see the initial section of each of the agency chapters below.

■ Summary of Technology Transfer Activities and Achievements across the Department, FY 2004 and Recent Years

Selected Activity Measures

Collaborative Relationships for Research & Development

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **CRADAs**, total active in the FY [1]						
▪ Traditional CRADAs [2]	Department	200	190	141	92	67
	NIST	208	174	125	76	51
	NOAA	10	8	8	11	9
	ITS	3	6	6	5	7
▪ Non-traditional CRADAs [3]	Department	--	59	1,744	1,811	1,902
	NIST	0	0	1,687	1,577	1,590
	NOAA	0	0	0	0	0
	ITS	--	59	57	234	312
● **Other types of collaborative R&D relationships** [4]						
▪ Facility use agreements	NIST	--	372	391	511	590
▪ Guest scientists and engineers	NIST	--	1,200	1,300	1,300	1,700
▪ Collaborative standards contributions	ITS	--	3	3	2	11

CRADA = Cooperative Research and Development Agreement. -- = Data not requested from agencies in reports of earlier years.

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority(15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes -- such as, material transfer or technical assistance that may result in protected information.

(4) For details on these types of R&D relationships see the respective agency's chapter later in this report.

Invention Disclosure and Patenting

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● New inventions disclosed in the FY [1]	Department	34	26	17	21	25
	NIST	32	24	16	16	23
	NOAA	2	1	1	5	2
	ITS	0	1	0	0	0
● Patent applications filed in the FY [2]	Department	20	12	12	5	8
	NIST	18	9	11	5	8
	NOAA	2	3	0	0	0
	ITS	0	0	0	0	0
● Patents issued in the FY	Department	18	21	20	9	11
	NIST	14	20	15	7	10
	NOAA	2	1	5	1	1
	ITS	2	0	0	0	0

(1) Inventions arising at the federal lab.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and PCT applications.

Licensing -- Profile of Active Licenses

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All licenses**, number total active in FY [1]	Department	43	40	41	101	125
▪ **Invention licenses**, total active in FY	Department	43	40	41	101	125
- Patent licenses [2]	Department	43	40	41	101	30
	NIST	39	36	35	39	22
	NOAA	2	2	3	5	5
	ITS	2	2	3	57	3
- Material transfer licenses (inventions)		0	0	0	0	0
- Other invention licenses	Department	0	0	0	0	95
	NIST	0	0	0	0	0
	NOAA	0	0	0	0	0
	ITS	0	0	0	0	95
▪ **Other IP licenses**, total active in FY	Department	0	0	0	0	0
- Copyright licenses (fee bearing)						
- Material transfer licenses (non-inventions)						
- Other						

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights(hybrid licenses) are reported as patent licenses -- and not included in the count of copyright licenses.

(1) "Active" = legally in force at any time during the FY.

(2) Patent license tally includes patent applications which are licensed.

Note: For simplicity, sub-departmental detail is suppressed in this table, where the appropriate disaggregated figures are straightforwardly evident from data listed in other rows.

Licensing Management

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Elapsed execution time**,(1) licenses granted in the FY						
▪ **Invention licenses**, average, months						
	NIST	--	4.8	5.4	3.4	**
	NOAA	**	6.0	8.0	5.0	**
	ITS	6.0	**	5.0	1.0	2.0
● **Licenses terminated for cause**, number in the FY						
▪ **Invention licenses**						
	NIST	--	7	3	1	0
	NOAA	0	0	0	0	0
	ITS	0	0	0	0	0

-- = Data not requested from agency in previous years' reports.

** New licenses not executed in the FY

For additional statistics on these metrics see the corresponding table the later agency chapters of this report.

(1) Date of license application to the date of license execution.(Date of license application is the date the lab formally acknowledges the written request for a license from a prospective licensee and agrees to enter into negotiations.)

Characteristics of Licenses Bearing Income

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All income bearing licenses**, number	Department	18	22	39	37	23
▪ **Invention licenses**, income bearing	Department	18	22	39	37	23
Patent licenses [1]	Department	18	22	39	37	23
	NIST	16	19	33	29	15
	NOAA	1	2	3	5	5
	ITS	1	1	3	3	3
Exclusive/partially exclusive/	Department	--	13/5/4	19/1/18	20/0/17	11/0/12
	NIST	--	12/5/2	18/2/13	19/0/10	10/0/5
	NOAA	1/0/0	1/0/1	1/0/2	1/0/4	1/0/4
	ITS	0/0/1	0/0/1	0/0/3	0/0/3	0/0/3
▪ **Other IP licenses**, income bearing		0	0	0	0	0
● **All royalty bearing licenses**,[2] number		18	22	36	34	23
▪ **Invention licenses**, royalty bearing		18	22	36	34	23
Patent licenses [1]	Department	18	22	36	34	23
	NIST	16	19	33	29	15
	NOAA	1	2	3	5	5
	ITS	1	1	0	0	3
▪ **Other IP licenses**, royalty bearing		0	0	0	0	0

-- = Data not requested from agency in reports of previous years.

(1) Patent license tally includes patent applications which are licensed.

(2) Note that royalties are one component of total license income.

Note: For simplicity, sub-departmental detail is suppressed in this table, where the appropriate disaggregated figures are straightforwardly evident from data listed in other rows.

Income from Licensing

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Total income**, all licenses active in FY [1]		$186,368	$268,568	$164,622	$127,566	$203,289
▪ **Invention licenses**		$186,368	$268,568	$164,622	$127,566	$203,289
- Patent licenses [2]	Department	$186,368	$268,568	$164,622	$127,566	$203,289
	NIST	$122,575	$261,968	$89,750	$122,850	$144,828
	NOAA	$100	$1,600	$9,402	$4,716	$24,961
	ITS	$63,693	$5,000	$65,470	$0	$33,500
▪ **Other IP licenses**, total active in the FY		$0	$0	$0	$0	$0
● **Total Earned Royalty Income** [3]		$186,368	$263,568	$99,152	$127,566	$203,289
▪ **Invention licenses**		$186,368	$263,568	$99,152	$127,566	$203,289
- Patent licenses [2]	Department	$186,368	$263,568	$99,152	$127,566	$203,289
	NIST	$122,575	$261,968	$89,750	$122,850	$144,828
	NOAA	$100	$1,600	$9,402	$4,716	$24,961
	ITS	$63,693	$0	$0	$0	$33,500
▪ **Other IP licenses**, total active in the FY		$0	$0	$0	$0	$0

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(2) Patent license tally includes patent applications which are licensed.

(3) "Earned royalty" = royalty based upon use of a licensed invention(usually, a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.

Note: For simplicity, sub-departmental detail is suppressed in this table, where the appropriate disaggregated figures are straightforwardly evident from data listed in other rows.

Disposition of License Income

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● Income distributed [1]						
▪ Invention licenses	Department	$186,368	$269,568	$164,622	$127,566	$203,289
	NIST	$122,575	$261,968	$89,750	$122,850	$144,828
	NOAA	$100	$1,600	$9,402	$4,716	$24,961
	ITS	$63,693	$5,000	$65,470	$0	$33,500
- To inventor(s)	Department	$77,931 (42%)	$106,440 (40%)	$67,387 (41%)	$52,903 (41%)	$83,654 (41%)
	NIST	$57,423 (47%)	$102,040 (39%)	$45,650 (51%)	$51,773 (42%)	$54,134 (37%)
	NOAA	$0 (0%)	$1,500 (94%)	$696 (7%)	$1,130 (24%)	$11,070 (44%)
	ITS	$20,508 (32%)	$2,900 (58%)	$21,041 (32%)	$0 (0%)	$18,450 (55%)
- To other [2]	Department	$108,437 (58%)	$162,128 (60%)	$97,235 (59%)	$74,662 (59%)	$119,635 (59%)
	NIST	$65,152 (53%)	$159,928 (61%)	$44,100 (49%)	$71,076 (58%)	$90,694 (63%)
	NOAA	$100 (100%)	$100 (6%)	$8,706 (93%)	$3,586 (76%)	$13,891 (56%)
	ITS	$43,185 (68%)	$2,100 (42%)	$44,429 (68%)	0 (0%)	$15,050 (45%)

Invention licenses are the chief policy interest regarding disposition of income; content of table reflects this focus.

(1) Income includes royalties and other payments received during the FY.

(2) To internal purposes, in the case of each agency.

Other Important Mechanisms for Technology and Knowledge Transfer [1]

		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Standard Reference Materials (SRMs) available	NIST	1,292	1,335	1,353	1,214	1,211
Standard Reference Materials (SRMs) sold	NIST	34,020	31,985	30,996	29,527	30,490
Standard Reference Data (SRD) titles available	NIST	63	65	90	106	95
Number of items calibrated	NIST	2,969	3,192	2,924	3,459	3,373
Technical publications produced	NIST	2,250	2,207	2,236	1,918	2,074
Journal articles published	NOAA	556	544	529	626	419
Technical reports published	NOAA	418	274	363	245	300
Technical publications produced	ITS	20	17	17	20	17

(1) See the NIST, NOAA, and ITS chapters later in this report for definitions and further information on these measures.

Further detail on the measures cited in the tables above, as well as additional activity statistics can be found in the individual agency chapters later in this report.

□ Illustrative Outcomes from Technology Transfer Cited by the Agencies

The following cases were selected and described by the agencies in their 2003 reports as examples of "downstream" outcomes resulting from agency technology transfer efforts:

Agency	Downstream Outcomes Listed
Technology Administration -- National Institute of Standards and Technology	▪ A new food standard. Accurately measuring the content of food we eat, before we eat it, is a surprisingly difficult job. A recently developed NIST Standard Reference Material (SRM) 1946, a set of five bottles of frozen, homogenized trout from Lake Superior, will make the process both easier and more accurate. ▪ Standard for across-the-road radar. NIST researchers have developed a new performance standard for "across-the-road" radar speed-measuring device systems to help law enforcement agencies to purchase and use with confidence this relatively new method for catching speeders. ▪ New standard to help diagnose heart attacks. Diagnosing heart attacks will become a more precise science thanks to the first of a new series of clinical standards just issued by NIST. Standard Reference Material (SRM) 2921 (human cardiac troponin complex) will help manufacturers develop and calibrate assays that measure specific protein concentrations in patient blood samples to determine whether a heart attack has occurred. ▪ Friction in the nano/micro realm. An improved method for correcting nano- and micro-scale friction measurements has been developed by NIST researchers. The new technique should help designers produce more durable micro- and nano-devices with moving parts, such as tiny motors, positioning devices or encoders. ▪ Production of uniform, self assembled nano-cells. NIST researchers have developed a new method for producing uniform, self-assembled nanocells has been developed by researchers at NIST. The method may have applications as an improved method for encapsulating drug therapies. ▪ Tagging faulty genes with fluorescent nano-dots. NIST researchers have developed a nanoscale imaging technique that could improve the reliability of an important diagnostic test for breast cancer and other biomedical tests. ▪ Designing an ultrasensitive "optical nose" for chemicals. NIST physicists have developed a technique that is believed to be more than 1,000 times more sensitive than conventional methods. The technique is a laser-based method for identifying a single atom or molecule hidden among 10 trillion others. ▪ Uncertainty in clinical tests raises health care costs. A new NIST-commissioned study shows that small measurement uncertainties in

Agency	Downstream Outcomes Listed
	clinical laboratory tests can add large amounts to health care costs. ▪ Improving eye patient care with telemedicine standards. Computer scientists at NIST have teamed up with a group of medical professionals to advance the use of telemedicine. The standards and associated guidelines are related to images of the eye that help doctors decide what problems exist and how to treat them. ▪ Improved dental materials. NIST and the American Dental Foundation (ADAF) have been collaborating on improvements in dental materials for over 70 years. Building upon previous ADAF research, NIST and the National Institute of Dental and Cranial Facial Research (NIDCR) of the NIH have developed new polymeric amorphous calcium phosphate technology, which has been patented by NIST. ▪ Digital evidence. A new guide written by computer forensics experts under the direction of NIST's Office of Law Enforcement Standards (OLES) provides step-by-step instructions to assist investigators in locating digital evidence so that it stands up to scrutiny once cases are tried. ▪ Standardized disaster models to help first responders. NIST is working to make modeling and simulation programs readily accessible to emergency response decision-makers. Computer modeling and simulation programs that depict pre-disaster site conditions, changes due to sudden life-threatening events and consequences of emergency responses can be powerful tools for preparing for and coping with everything from terrorist attacks to hurricanes. ▪ Improving emergency communications. NIST researchers are using buildings set for demolition to measure radio signals to develop new tools that may help emergency personnel save more people trapped in collapsed buildings. ▪ New federal standard for improving IT security. NIST computer security specialists have developed a new standard to help federal agencies better protect their computer networks. The standard provides a new way to categorize government information and information systems. ▪ Interoperability testbed. NIST has established a testbed at its Gaithersburg, Md., headquarters to help manufacturers improve the interoperability of their dimensional measurement systems. ▪ New decision support software. NIST has developed and transferred a new decision-support software tool known as BEES (Building for Environmental and Economic Sustainable)to the building products industry, government agencies, and academic institutions.
National Oceanic and Atmospheric Administration	▪ Predicting the consequences of harmful releases. NOAA has developed a web-based system called the Real-time Environmental Applications and Display System (READY) to predict the consequences of atmospheric releases of radioactivity and other

Agency	Downstream Outcomes Listed
	potentially harmful materials. ▪ High resolution radar data. A NOAA multi-office collaboration has made high-resolution radar data available to the private sector in real time. NOAA has created high-resolution, multi-sensor forecast tools for an entire region, encompassing clusters of radars without the limits previously imposed by the traditional single-radar approach. With this, it is possible for the National Weather Service and private sector forecasters to have a seamless depiction of weather phenomena across an entire forecast region on the appropriate space and time scales required by their customers, including emergency managers, reservoir operators, and flood plain managers. ▪ New precipitation analysis tool. NOAA has developed the HydroEstimator, a tool which provides NOAA precipitation analysts with real-time, instantaneous estimates of rainfall using the GOES satellite infrared channel data as input. ▪ New technology to catch swordfish and save marine turtles. NOAA's National Marine Fisheries Service worked with commercial swordfish fishermen from 2001 through 2003 to develop new high seas long-line fishing technology, which greatly reduces interaction with threatened marine turtles. ▪ Scientific Graphics Toolkit and ncBrowse – A NOAA lab has developed Java-based tools to more easily visualize oceanographic (and other) data in both web-based and desktop computer applications. ▪ Web-based access to distributed data sets. NOAA has transferred Live Access Server (LAS) software for web-based browsing (visualization) and downloading (subsetting) of earth science data sets to a broad scientific community. LAS presents geographically distributed data sets as a unified virtual data base. ▪ International standard for gases. NOAA maintains the world standard working gases for carbon dioxide, carbon monoxide, methane and some halocarbons. In FY 2004, NOAA provided 145 cylinders of standard gases to 105 customers around the world. ▪ Carbon dioxide flask analysis system. NOAA has developed the most accurate and reliable carbon dioxide flask analysis system in the world. ▪ Programmable flask package. NOAA has developed a Programmable Flask Package that allows unattended collection of a series of air samples in glass flasks and is especially suited for aircraft operations. The new system allows for standardized, fast, reliable, and relatively cheap global carbon cycle gas sampling. NOAA provided drawings and specifications to two private companies, who are now preparing to offer these samplers commercially. ▪ Robust high precision carbon dioxide analyzer. NOAA is assisting a private company to test its robust high precision CO2 analyzer at the Trinidad Head Baseline Station in Boulder, Colorado. This new instrument has the potential for continuous, real-time analyses of carbon dioxide at unattended locations, with the accuracy and

Agency	Downstream Outcomes Listed
	precision required to study the atmospheric carbon cycle. The new analyzer is expected to lead to a multi-million dollar private business within a few years. ▪ Raster navigational charts. A NOAA CRADS with a private sector partner continues to provide cutting edge, digital charts to mariners, including weekly electronic updates delivered over the Internet. During FY 2004, the charts were enhanced, the delivery of updates evolved to provide incremental digital patches as well as cumulative patches, and encryption of the charts was developed and deployed. ▪ Print-on-demand nautical charts – A NOAA CRADA with a private sector partner continues to provide an electronic commerce, print-on-demand service for users to access NOAA's suite of more than a thousand nautical charts. During FY 2004, 'remote printing' has been perfected and deployed with 9 sites established in chart sales agent's stores around the nation.
National Telecommunications and Information Administration -- Institute for Telecommunication Sciences	▪ Video quality metric – ITS has developed a superior method of measuring video quality objectively by machine, which closely predicts the quality that subjective human vision would perceive. In 2004, this method became an international standard, with approval by the ITU. ▪ Ultrawideband signal interference. ITS is currently engaged in cooperative research with private industry to investigate the interference potential of various ultrawideband waveforms. This knowledge will be important in planning for the interconnection of new ultrawideband systems with older communications technology. ▪ Measuring emissions from radio frequency identification devices (RFID). ITS is currently engaged in cooperative research with private industry examine the interference characteristics of RFIDs, including with land mobile radio transceivers.

See the agency chapters below for further details on these cases.

■ The Department's Performance Metrics for Technology Transfer

This year's annual report again provides a comprehensive set of statistics on the technology transfer activities of each of the department's agencies with federal lab operations. This information covers cooperative research and development relationships, invention disclosure/patenting, licensing, and other technology transfer mechanisms employed by the labs. There is also a new round of agency-selected case illustrations of downstream outcomes (e.g., commercially significant technologies) resulting from these federal lab technology transfer activities.

The content and format of this year's performance report is consistent with guidelines issued for the annual performance reporting by the Office of Management and Budget in its July 2004 edition of Circular A-11. (OMB's guidelines draw closely from the performance reporting approach organized by the Interagency Working Group on Technology Transfer -- which is coordinated by the Office of Technology Policy at the Department of Commerce. This approach has been the basis for the Department of Commerce's and other agencies' reporting over the last several years.)

Again included this year are the agencies' discussions of technology transfer efforts through mechanisms beyond the cooperative R&D, patenting, and licensing mechanisms that comprise the mainstream currently of technology transfer for most agencies. Included here are activities such as transfer through technical publications, development of industrial standards, other forms of public dissemination, and opportunities for guest scientists and engineers to participate in federal lab activities. Each of the agencies now indicate the important roles these "other" mechanism play in their overall approaches to technology transfer. Plans for technology transfer activities by the Department of Commerce's federal labs generally continue to emphasize the development of better metrics for program performance. An appendix section at the end of each of the separate agency chapters below discuss the specific initiatives currently underway.

II. TECHNOLOGY ADMINISTRATION -- NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Technology Transfer at the Agency's Federal Laboratories – Approach and Plans, FY 2004 Activities Achievements

1. Agency Approach and Plans for Technology Transfer

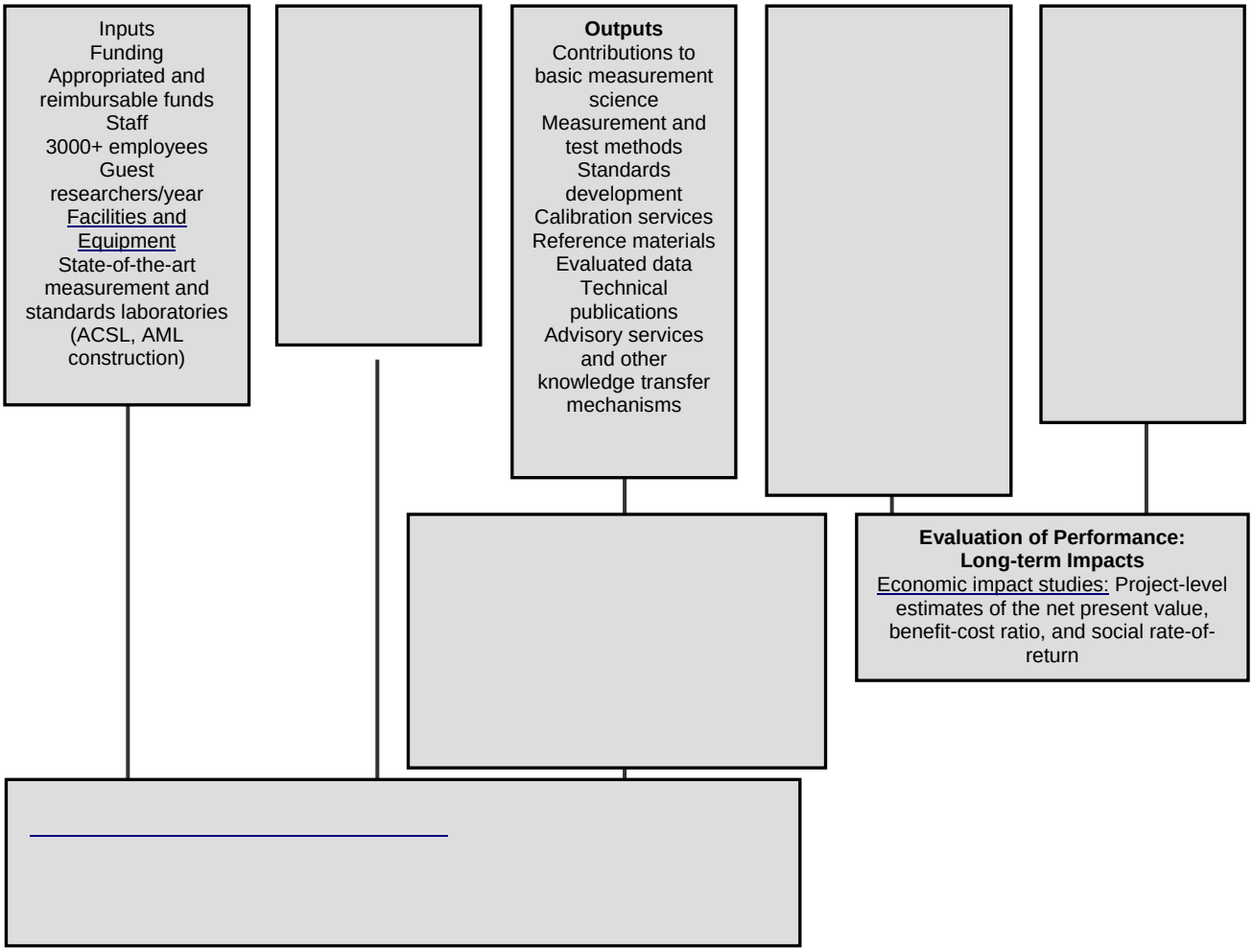
The mission of the National Institute of Standards and Technology (NIST) is to develop and promote measurements, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life. NIST's laboratories develop and disseminate measurement techniques, reference data, test methods, standards, and other infrastructural technologies and services that support U.S. industry, scientific research, and the activities of many federal agencies. In carrying out its mission, NIST works directly with industry partners (and consortia), universities, associations, and other government agencies.

NIST's technology transfer activities are designed to disseminate the Institute's measurements and standards research results broadly to industry and other customers. NIST pursues patents, licensing agreements, and related technology transfer as one of several means for transferring the knowledge and technologies that result from its laboratory research. Generally, NIST has the broadest possible downstream leverage when it uses diverse technology dissemination channels, ranging from reference materials and calibration services to technical publications and guest researchers, as well as patents, licensing agreements, CRADAs, and the like.

Leading-edge scientific and technical work requires multiple disciplines, high levels of collaboration among organizations and people with diverse capabilities, and highly specialized facilities and tools. For more than a century, the NIST laboratories have successfully collaborated with industry and universities to provide the measurement techniques and technical tools needed by America's innovators. NIST uses many mechanisms -- including, but not limited to, CRADAs and patent licensing -- to collaborate with industry and to ensure that the resulting knowledge and infrastructural technologies are broadly disseminated.

While NIST does conduct "traditional" technology transfer activities (participate in CRADAs, hold patents, and engage in licensing), its laboratories create patents and licenses, where appropriate, as tools to accomplish NIST's mission. These and other technology transfer mechanisms such as workshops, conferences, publications, and partnering tools, as well as SRMs, calibrations, and participation in documentary standards committees, enable NIST to disseminate its measurement capabilities to customers. Together, they represent major outputs that NIST's customers use in their R&D activities, production processes, service delivery methods, market transactions, and other economically valuable activities.

This sequence of activities, along with the methods NIST uses to evaluate them, are depicted in the following logic model:



The set of outputs that NIST uses to transfer its measurement capabilities and technologies to customers includes standard reference materials, calibration services, and other products and services that are described below.2

● Standard Reference Materials

Standard Reference Materials (SRMs) are one definitive source of measurement traceability in the United States. All measurements using SRMs can be traced to a common and recognized set of basic standards that provides the basis for compatibility of measurements among different laboratories. As economic exchange has become more global, customers increasingly use SRMs to achieve measurement quality and conformance to process requirements that address both national and international needs for commerce and trade. NIST produces and disseminates (sells) SRMs to a large and diverse group of customers, including private sector laboratories, universities, and other federal agencies. NIST SRMs support industrial materials production and analysis, environmental analysis, health measurements, and basic measurements in science and metrology.

The number of SRMs available for sale -- currently over 1,200 --illustrates the breadth of measurements supported by NIST. Over time, NIST expects slight growth in the number of SRMs available, given its current strategy of focusing on those SRMs that cannot be produced by

[2] NIST's authority to perform its technology/knowledge transfer activities does not rest solely in the Bayh-Dole Act, Stevenson-Wydler Act, Federal Technology Transfer Act (FTTA) and related legislation. It also resides in NIST's Organic Act (15 USC 272) and the Standard Reference Data Act (15 USC 290).

secondary laboratories and which have broad and/or high downstream impact. In establishing its out-year projections, the NIST SRM Program monitors, among other things, trends in emerging technologies, new regulations that will depend on SRMs for enforcement, and the reference material needs of other federal agencies. Several microeconomic studies of NIST SRM programs have shown the technology transfer mechanisms built into these efforts to be effective with resulting high economic benefits delivered to industry.

●Calibration Services

The NIST laboratories provide physical measurement services for their customers, including calibration services, special tests, and measurement assurance programs (MAPs). Calibration services and special tests are characterizations of particular instruments, devices, and sets of standards with respect to international and national standards. MAPs are quality control programs for calibrating entire measurement systems. NIST's calibration services are designed to help the makers and users of precision instruments achieve the highest possible levels of measurement quality and productivity. The services constitute the highest order of calibration services available in the United States. NIST offers more than 500 different types of physical calibrations covering the following measurement areas: dimensional; mechanical, including flow, acoustic, and ultrasonic; thermodynamic; optical radiation; ionizing radiation; electromagnetic; and time and frequency.

Over the past several years, NIST has calibrated approximately 3,000 items annually. Over the next several years, NIST expects to realize a relatively high but slightly declining number of items calibrated. This is in keeping with a long-term trend, over the past several decades, of a decline in the number of items calibrated by NIST. Despite this overall trend, individual years may fluctuate slightly due to multi-year calibration cycles. NIST expects to provide fewer but more highly leveraged calibration services over time. NIST's strategy is driven by the need to effectively manage trends in demand from its major industry and government customers for these services. NIST is pursuing three strategies: (1) performing only those calibrations that require a direct connection to the national standards; (2) improving calibration accuracy in those areas where new industry demands are emerging; and (3) accrediting primary and secondary calibration laboratories to meet on-going industry needs. In FY 2004, NIST accredited 82 calibration laboratories in fields ranging from dimensional metrology to optical and chemical. Through this overall approach, NIST efficiently leverages its primary calibration services to support a broader base of secondary calibrations conducted within the private sector. Several microeconomic studies of NIST calibration programs have shown the technology transfer mechanisms built into these efforts to be effective with resulting high economic benefits delivered to industry.

NIST produces and makes available (i.e., sells or distributes for free) many Standard Reference Data titles (SRDs). SRDs provide numeric data to scientists and engineers for use in technical problem solving, research, and development. These recommended values are based on data extracted from scientific and technical literature or on measurements done at NIST laboratories, which are then assessed for reliability and evaluated to select the preferred values. NIST's SRD databases cover many areas of science, including analytical chemistry, atomic and molecular physics, biotechnology, and materials sciences.

Historically, NIST has produced two new SRD titles per year. At the same time, NIST also provides numerous upgrades to existing databases. Each year, however, some database titles are

eliminated from the NIST catalog. Over time, NIST expects continued modest growth in the total number of SRD titles available. Of those titles currently available, about 50% are available for sale, and 50% are free online systems. Over time, a larger percentage of these titles will be distributed via the Internet. Several microeconomic studies of NIST SRD programs have shown the technology transfer mechanisms built into these efforts to be effective with resulting high economic benefits delivered to industry. (For additional information on NIST's microeconomic impact studies see http://www.nist.gov/director/planning/impact_assessment.htm.)

● Technical Publications

NIST uses publications as a key mechanism to transfer the results of its work to the U.S. private sector and to other government agencies that need cutting-edge measurements and standards. Many of these publications appear in prestigious scientific journals and withstand peer review by the scientific community. Others appear in technological forums where measurement standards and technologies developed by NIST staff (at times in collaboration with private sector partners) are disseminated. Of the technical publications produced annually, approximately 80% are approved for external publication (such as in scientific journals), while the remaining 20% are NIST reports and special publications. Over time, NIST expects a relatively constant level of high quality publications (2,000-2,300 per year) to be produced by its technical staff.

● Guest Researchers and Facilities Users

Each year hundreds of researchers visit NIST to participate in collaborative projects and/or to use NIST's research facilities. NIST makes its facilities available for limited periods of time to domestic and foreign guest researchers to collaborate with NIST staff on research and development projects of mutual interest or to transfer NIST techniques, procedures, and best practices. NIST also sponsors several formal collaboration programs with universities, among them JILA, an interdisciplinary institute for research and graduate education in the physical sciences, located on the main campus of the University of Colorado (CU) in Boulder, and operated jointly by CU and NIST; and the Center for Advanced Research in Biotechnology (CARB). CARB conducts research and provides interdisciplinary training in fundamental problems at the forefront of biotechnology through collaborations with scientists at its parent institutions, the University of Maryland Biotechnology Institute and NIST.

● Advanced Measurement Laboratory

Considered the most technically advanced research facility of its kind in the world, the new Advanced Measurement Laboratory (AML) at the Commerce Department's National Institute of Standards and Technology (NIST) supports some of the world's most delicate experiments in nanotechnology and measurement at the atomic level. The $235 million, 49,843 square meter (536,507 square foot) Advanced Measurement Laboratory features five separate wings—two of them buried 12 meters (39 feet) under ground—with stringent environmental controls on air quality, temperature, vibration, and humidity. The new facility allows NIST to provide the sophisticated measurements and standards needed by U.S. industry and the scientific community for key 21st century technologies such as nanotechnology, semiconductors, biotechnology, advanced materials, quantum computing and advanced manufacturing.

The construction of the AML was itself a research effort even before ground was broken in June 2000. Institute scientists created "testbed" laboratories to try out concepts for some of the

building's most exacting specifications in temperature and vibration control. While the majority of the building's laboratory spaces can be temperature-controlled to within a quarter of a degree Celsius, some highly isolated lab modules can be controlled to within a hundredth of a degree. NIST research efforts planned for the new facility range from improved calibrations and measurement of fundamental quantities such as mass, length and electrical resistance to the development of quantum computing technology, nanoscale measurement tools, integrated micro-chip-level technologies for measuring individual biological molecules, and experiments in nanoscale chemistry.

● Conferences, Workshops, and Inquiries

NIST also transfers technology through the hosting of numerous conferences and workshops, as well as through answering inquiries. In FY 2004, NIST Public and Business Affairs handled more than 9600 inquiries. In addition, during FY 2004, this office managed 156 conferences with about 13,500 attendees at the NIST sites in Gaithersburg and Boulder.

● Participation in Documentary Standards Committees

Still another means by which NIST transfers technology is through staff participation in the activities of documentary standards developing organizations, which develop consensus standards on a host of technologies. NIST participation enables NIST scientists and engineers to bring NIST technology directly into a standard, which could involve test methods and procedures for protecting health, safety, and/or the environment, or specifications for performance or interoperability, to name a few. During CY 04, 365 NIST staff members participated on 892 committees representing 91 standards developing organizations. NIST staff held 1,188 memberships on these committees including 404 in ASTM International, 78 in the American National Standards Institute (ANSI), 43 in the Institute for Electrical and Electronic Engineers (IEEE), and 85 in the International Organization for Standardization (ISO). These activities are also reported by NIST to the Office of Management and Budget and to Congress as required by the National Technology Transfer and Advancement Act of 1995.

2. Performance in FY 2004: Activities and Achievements

The data below describe the many ways through which NIST transfers knowledge and technology to the private sector. In response to the reporting requirements of the Technology Transfer Commercialization Act of 2000 and other relevant legislation, data are provided for collaborative relationships for research and development relationships (CRADAs and other kinds of relationships), invention disclosures and patenting, and licensing. In addition, in keeping with the previous discussion, data are also provided for some of the other technology transfer mechanisms utilized by the NIST laboratories: such as Standard Reference Materials available, technical publications produced, items calibrated, and guest researcher collaborations. A number of examples of downstream outcomes from NIST technology transfer activities are also provided at the end.

■ Collaborative Relationships for Research & Development

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **CRADAs**, total active in the FY (1)	208	174	1,812	1,653	1,641
- New, executed in the FY	40	22	1,712	1,589	15
▪ Traditional CRADAs,(2) total active in the FY	208	174	*125	*76	*51
New, executed in the FY	40	22	25	12	15
▪ Non-traditional CRADAs,(3) total active in the FY	--	0	1,687	1,577	1,590
- New, executed in the FY	--	0	**1,687	**1,577	**1,590
● **Other types of collaborative R&D relationships**					
▪ Facility use agreements, total in effect, end of FY (4)	--	372	391	511	590
-New, executed in the FY	--	172	62	308	239
▪ Guest scientists and engineers during the FY (5)	--	1,200a	1,300a	1,300a	1,700

CRADA = Cooperative Research and Development Agreement. -- = Data not requested from agency in reports of earlier years. a = Figures are approximate.

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority(15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes -- such as, material transfer or technical assistance that may result in protected information.

(4) NIST authorizes individuals to use designated facilities. The numbers reported here represent the Facility Use Agreements in effect for the NIST Center for Neutron Research.

(5) "Guest scientists and engineers" includes foreign and domestic guest researchers, and researchers working at NIST under Intergovernmental Personnel Act(IPA) Agreements and CRADAs.

* Includes CRADAs associated with all NIST programs, including Manufacturing Extension Partnership(MEP), Technology Services(TS), and the Director of Administration/Chief Financial Officer.

** 1,687 "non-traditional" CRADAs were issued in FY 2002 to protect the results(under CRADA authority) of 2,924 calibrated items from disclosure for a period of five years after development. Such "non-traditional" CRADAs are issued (and terminate) on an annual basis. Similarly, 1,577 and 1590 "non-traditional" CRADAs were issued in FY 2003 and 2004, respectively.

■ Invention Disclosure and Patenting

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● New inventions disclosed in the FY (1)	32	24	16	16	23
● Patent applications filed in the FY (2)	18	9	11	5	8
● Patents issued in the FY	14	20	15	7	10
● Active patents, end of the FY	--	--	199	198	143
● Patents purposely dropped (triaged) during the FY	--	--	34	17	31

-- = Data not requested from agency in reports of earlier years.

(1) Inventions arising at the federal lab.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and PCT applications.

■ Licensing
Profile of Active Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All licenses**, number total active in the FY (1)	39	36	35	39	22
▫ New, executed in the FY	3	4	2	3	2
▪ **Invention licenses**, total active in the FY	39	36	35	39	22
▫ New, executed in the FY	3	4	2	3	2
- Patent licenses, (2) total active in FY	39	36	35	39	22
▫ New, executed in the FY	3	4	2	3	2
- Material transfer licenses (inventions), total active	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Other invention licenses, total active in the FY	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Copyright licenses (fee bearing)					
▫ New, executed in the FY					
- Material transfer licenses (non-inventions), total active					
▫ New, executed in the FY					
- Other, total active in the FY					
▫ New, executed in the FY					

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights(hybrid licenses) are reported as patent licenses -- and not included in the count of copyright licenses.

(1) "Active" = legally in force at any time during the FY.

(2) Patent license tally includes patent applications which are licensed.

Licensing Management

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Elapsed execution time**,(1) licenses granted in the FY					
▪ **Invention licenses**					**
▫ Average, months	--	4.8	5.4	3.4	
▫ Minimum	--	2.0	2.5	1.0	
▫ Maximum	--	5.0	5.0	10.0	
- Patent licenses (2)					
▫ Average, months	--	4.8	5.4	3.4	
▫ Minimum	--	2.0	2.5	1.0	
▫ Maximum	--	5.0	5.0	10.0	
● **Licenses terminated for cause**, number in the FY					
▪ **Invention licenses**	--	7	3	1	0
- Patent licenses (2)	--	7	3	1	0

Data included in this table (intentionally) addresses only invention licenses, with patent licenses distinguished as a subclass.

-- = Data not requested from agency in reports of earlier years.

(1) Date of license application to the date of license execution.(Date of license application is the date the lab formally acknowledges the written request for a license from a prospective licensee and agrees to enter into negotiations.)

(2) Patent license tally includes patent applications which are licensed.

** NIST processed no commercialization licenses in FY 2004.

Characteristics of Licenses Bearing Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All income bearing licenses**, total number	16	19	33	29	15
▫ Exclusive	--	12	18	19	10
▫ Partially exclusive	--	5	2	0	0
▫ Non-exclusive	--	2	13	10	5
▪ **Invention licenses**, income bearing	16	19	33	29	15
▫ Exclusive	--	12	18	19	10
▫ Partially exclusive	--	5	2	0	0
▫ Non-exclusive	--	2	13	10	5
- Patent licenses,(1) income bearing	16	19	33	29	15
▫ Exclusive	--	12	18	19	10
▫ Partially exclusive	--	5	2	0	0
▫ Non-exclusive	--	2	13	10	5
▪ **Other IP licenses**, income bearing	0	0	0	0	0
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
- Copyright licenses (fee bearing)					
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
● **All royalty bearing licenses**,(2) total number	16	19	33	29	15
▪ **Invention licenses**, royalty bearing	16	19	33	29	15
- Patent licenses,(1) royalty bearing	16	19	*33	29	15
▪ **Other IP licenses**, royalty bearing	0	0	0	0	0
- Copyright licenses (fee bearing)					

-- = Data not requested from agency reports of earlier years.

In general, license income can result from various sources: license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(1) Patent license tally includes patent applications which are licensed.

(2) Note that royalties are one component of total license income.

* Of the 35 licenses active in FY 2002(see the previous table), 2 were royalty-free research licenses.

Income from Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● Total income, all licenses active in FY [1]	$122,575	$261,968	$89,750	$122,850	$144,828
▪ **Invention licenses**	$122,575	$261,968	$89,750	$122,850	$144,828
- Patent licenses [2]	$122,575	$261,968	$89,750	$122,850	$144,828
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
- Copyright licenses					
● **Total Earned Royalty Income** (ERI) [3]	$122,575	$261,968	$89,750	$122,850	$144,828
▫ Median ERI	--	n/a	$2,300	n/a	n/a
▫ Minimum ERI	--	$1,000	$700	$960	$640
▫ Maximum ERI		$135,927	$20,000	$35,000	$54,072
▫ ERI from top 1% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 5% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 20% of licenses	--	n/a	$50,000	$45,000	dw
▪ **Invention licenses**	$122,575	$261,968	$89,750	$122,850	$144,828
▫ Median ERI	--	n/a	$2,300	n/a	n/a
▫ Minimum ERI	--	$1,000	$700	$960	$640
▫ Maximum ERI		$135,927	$20,000	$35,000	$54,072
▫ ERI from top 1% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 5% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 20% of licenses	--	n/a	$50,000	$45,000	dw
- Patent licenses [2]	$122,575	$261,968	$89,750	$122,850	$144,828
▫ Median ERI	--	n/a	$2,300	n/a	n/a
▫ Minimum ERI	--	$1,000	$700	$960	$640
▫ Maximum ERI		$135,927	$20,000	$35,000	$54,072
▫ ERI from top 1% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 5% of licenses	--	n/a	$20,000	$35,000	dw
▫ ERI from top 20% of licenses	--	n/a	$50,000	$45,000	dw
▪ **Other IP licenses, total active in the FY**	0	0	0	0	0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
▫ ERI from top 20% of licenses					
- Copyright licenses					
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					

n/a = Data not available from agency at time of this report.

-- = Data not requested from agency in reports of earlier years.

dw = Data withheld to protect proprietary information.

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(2) Patent license tally includes patent applications which are licensed.

(3) "Earned royalty" = royalty based upon use of a licensed invention(usually, a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.

Disposition of License Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Income distributed** [1]					
▪ **Invention licenses**, total distributed	$122,575	$261,968	$89,750	$122,850	$144,828
- To inventor(s)	$57,423 (47%)	$102,040 (39%)	$45,650 (51%)	$51,773 (42%)	$54,134 (37%)
- To other [3]	$65,152 (53%)	$159,928 (61%)	$44,100 (49%)	$71,076 (58%)	$90,694 (63%)
- Patent licenses,[2] total distributed	$122,575	$261,968	$89,750	$122,850	$144,828
- To inventor(s)	$57,423 (47%)	$102,040 (39%)	$45,650 (51%)	$51,773 (42%)	$54,134 (37%)
-To other [3]	$65,152 (53%)	$159,928 (61%)	$44,100 (49%)	$71,076 (58%)	$90,694 (63%)

Invention licenses are the chief policy interest regarding disposition of income; content of table reflects this focus.

(1) Income includes royalties and other payments received during the FY.

(2) Patent license tally includes patent applications which are licensed.

(3) NIST

■ Other Performance Measures Deemed Important by the Agency

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Standard Reference Materials (SRMs) available (1)	1,292	1,335	1,353	1,214	1,211
Standard Reference Materials (SRMs) sold (2)	34,020	31,985	30,996	29,527	30,490
Standard Reference Data (SRD) titles available (3)	63	65	90	106	95
Number of items calibrated (4)	2,969	3,192	*2,924	3,459	3,373
Technical publications produced (5)	2,250	2,207	2,236	1,918	2,074

See Section I above for additional information about the measures listed here. See also the Department of Commerce's annual reports under the Government Performance and Results Act(GPRA) for detailed information about each of these measures, analysis of trends, and future-year performance projections http://www.osec.doc.gov/bmi/budget/FY2005APP.htm

(1) Direct and verifiable count of SRMs available to customers at the close of the fiscal year. The number of SRMs available for sale illustrates the breadth of measurements supported by NIST. Over time, NIST expects slight growth in the number of SRMs available.

(2) Direct and verifiable count of NIST SRM units sold during the fiscal year. NIST expects a continued slight decline in the number of SRM units sold, as NIST makes greater use of highly leveraged SRM services over time, including accreditation of Nationally Traceable Reference Material producers.

(3) Direct and verifiable count of SRD products developed and disseminated by NIST. NIST expects continued modest growth in the total number of SRD titles available. Of those titles currently available, about 70% are available for sale, and 30% are free online systems. Over time, a larger percentage of SRDs will be distributed via the Internet.

(4) Direct and verifiable count of items calibrated by the NIST laboratories. Over the next several years, NIST expects to realize a relatively high but slightly declining number of items calibrated. This is in keeping with a long-term trend, over the past several decades, of a decline in the number of items calibrated by NIST. NIST expects to provide fewer but more highly leveraged calibration services over time.

(5) Annual number of technical publications generated by NIST's technical staff. The number is a direct count of the number of technical publications cleared for publication by the NIST Editorial Review Boards at the Gaithersburg and Boulder sites. Over time, NIST expects a relatively constant level of high quality publications(2,000-2,200 per year) produced by its technical staff. Of the publications produced annually, approx. 80% are approved for external publication(such as in scientific journals); the other 20% are NIST reports and special publications.

* These 2,924 calibrated items were covered by 1,687 "non-traditional" CRADAs that protect the results from disclosure.

■ Outcomes from Technology Transfer

NIST develops and disseminates infrastructural technologies and services required by the U.S. private sector and other non-profit and government partners. The outputs of the NIST laboratories provide a foundation for industry in all stages of commerce -- research, development, testing, production, and marketing -- and in turn enable socioeconomic impacts, such as productivity gains, increased market access and efficiency, and improved quality of life. These impacts are long-term, accruing years after the original infrastructural technologies were developed by NIST (often in conjunction with industry partners).

The examples below show how NIST's various technology transfer mechanisms – CRADAs, Standard Reference Materials, joint research facilities, software, technical publications, and documentary standards – have, over the long term, produced outcomes that significantly benefit consumers and improve the quality of life. Most of these examples are linked to the NIST 2010

Strategic Plan, which identifies five strategic focus areas -- measurements and standards essential to established industries; nanoscale measurements and data; biosciences and health care quality assurance; measurements and standards for public safety and security, and information and knowledge management -- that will require measurement capabilities and services provided by NIST.

Measurements and Standards

• **A New Food Standard**. Accurately measuring exactly what's in the food we eat, before we eat it, is a surprisingly difficult job. A recently developed NIST Standard Reference Material (SRM) 1946, a set of five bottles of frozen, homogenized trout from Lake Superior, will make the process both easier and more accurate. With carefully measured values for about 100 chemical constituents, the SRM will help food industry and environmental researchers assure that measurements of both healthful ingredients and contaminants in fish and similar foods are accurate. Laboratories can validate their analytical methods and instrument performance by using them to analyze the SRM and comparing their results to the NIST values. This also is the first NIST food-matrix SRM with values for omega-3 fatty acids, which have been shown to reduce the risk of cardiovascular disease. Other components included on the SRMs certificate include nutritionally significant mono-, poly- and unsaturated fatty acids.

• **NIST Standard Adopted for Across-the-Road Radar**. NIST researchers have developed a new performance standard for "across-the-road" radar speed-measuring device systems to help law enforcement agencies to purchase and use with confidence this relatively new method for catching speeders. Unlike conventional "down-the-road" radar speed-measuring devices, across-the-road radar systems do not require an operator and can be programmed to detect and record vehicles traveling above a predetermined speed. In addition, these devices can be set to look selectively for cars, motorcycles or trucks. The newer systems are also less likely to be detected by speeders because the radar beam used is pointed across, rather than along the road.

• **New Standard to Help Diagnose Heart Attacks**. Diagnosing heart attacks will become a more precise science thanks to the first of a new series of clinical standards just issued by the National Institute of Standards and Technology (NIST). Standard Reference Material (SRM) 2921 (human cardiac troponin complex) will help manufacturers develop and calibrate assays that measure specific protein concentrations in patient blood samples to determine whether a heart attack has occurred. The SRM is a solution containing certified concentrations of three related proteins, including cardiac troponin I, purified from human heart tissue from cadavers. Users can calibrate their assays by analyzing the SRM and comparing the results to the NIST-certified value for troponin I. The standard is expected to help reduce variations in clinical test results from as much as 50-fold on the same sample to just twofold.

Nanotechnology

• **Friction in the Nano/Micro Realm**. An improved method for correcting nano- and micro-scale friction measurements has been developed by researchers NIST. The new technique should help designers produce more durable micro- and nano-devices with moving parts, such as tiny motors, positioning devices or encoders. The NIST team used a specially designed friction tester developed jointly by NIST and Hysitron Inc. of Minneapolis. NIST's research is expected to result in new analytical tools for industry use, including the auto industry, for more reliable prediction of surface roughness and friction.

• **Method Produces Uniform, Self-Assembled Nanocells**. Nanotechnology is about making improved products by building them from components hundreds of times smaller than a human blood cell. But how do you put things together at such a tiny scale? One way is to create the right conditions, so that they assemble themselves. For example, a new method for producing uniform, self-assembled nanocells has been developed by researchers at NIST. Reported in the March 10, 2004 issue of the Journal of the American Chemical Society, the method may have applications as an improved method for encapsulating drug therapies. A patent application has been filed.

• **Tagging Faulty Genes with Fluorescent Nanodots**. A nanoscale imaging technique that could improve the reliability of an important diagnostic test for breast cancer, and other biomedical tests, is described in the Feb. 11, 2004 online issue of Nucleic Acids Research. The method involves attaching fluorescent particles just 15 nanometers (billionths of a meter) in diameter to particular sections of DNA, followed by analysis of the intensity of the fluorescence signal and other properties. These particles, called quantum dots, have unique electronic and optical properties that make them easier to detect than conventional fluorescent tags used in biomedical research. The NIST team demonstrated that quantum dots give off signals that are 200 to 1,100 percent more intense than those from two types of conventional tags, and also are more stable when exposed to light. The new technique is part of on-going NIST efforts to develop standards for a test to identify breast cancer patients who would benefit from a particular drug therapy.

• **Designing an Ultrasensitive 'Optical Nose' for Chemicals**. A laser-based method for identifying a single atom or molecule hidden among 10 trillion others may soon find its way from the laboratory to the real world. Developed by physicists at the National Institute of Standards and Technology (NIST), the technique is believed to be more than 1,000 times more sensitive than conventional methods. Vescent Photonics of Denver, Colo., hopes to commercialize the method as an "optical nose" for atmospheric monitoring. The portable sensors would rapidly identify chemicals in a gas sample based on the frequencies of light they absorb. Other applications eventually may include detection of chemical weapons and land mines, patient breath analysis for medical diagnosis or monitoring, and industrial detection of leaks in subterranean pipes or storage tanks, the company says. Vescent recently signed a Cooperative Research and Development Agreement with NIST. The company will work with NIST to apply the public domain "optical nose" technique to detecting and quantifying trace quantities of atmospheric gases. The technique is a product of years of work and several innovations by NIST scientists. The approach allows analysis of gases that are present in minute concentrations and at very low pressures, which may enable identification of compounds such as explosives that are difficult to detect by other means.

Biosciences and Health

• **Uncertainty in Clinical Tests Raises Health Care Costs**. Small measurement uncertainties in clinical laboratory tests can add large amounts to health care costs, according to a newly NIST commissioned study. Conducted by RTI International (Research Triangle Park, N.C.) and the Mayo Clinic (Rochester, Minn.), the study estimates that calibration errors in measurements of calcium levels in blood may add between $60 million and $199 million to U.S. health care costs annually. High calcium levels can be a symptom of diseases such as cancer and thyroid disorders. NIST is continuing to educate the healthcare community on the importance of accurate calibrations, including the use of standard reference materials in clinical tests.

• **Improving Eye Patient Care with Telemedicine Standards**. Computer scientists at NIST have teamed up with a group of medical professionals to advance the use of telemedicine. Telemedicine helps patients to have access to health care professionals electronically, whatever their location. It can provide fast, affordable service to people who live in isolated areas or are unable to travel. The standards and associated guidelines are related to images of the eye that help doctors decide what problems exist and how to treat them. The standards cover how to "capture" the images, which is similar to taking a photograph. Additionally, the standards provide specific procedures for storing the images electronically, sending them across telecommunications networks and interpreting them. The standards focus on the quality of the images rather than on what kind of cameras or film must be used. This approach gives health care professionals flexibility in choosing equipment.

• **Improvements in Dental Materials**. NIST and the American Dental Foundation (ADAF) have been collaborating on improvements in dental materials for over 70 years. Building upon previous ADAF research, NIST and the National Institute of Dental and Cranial Facial Research (NIDCR) of the NIH, developed new polymeric amorphous calcium phosphate technology, which was patented by NIST. Composite dental materials were developed that stimulate regenerative repair of defective teeth. These composites, made of amorphous calcium phosphate embedded in polymers, can efficiently promote re-growth of tooth structures. In the presence of saliva the composite material releases calcium and phosphate ions, forming a crystalline calcium phosphate similar to the mineral found naturally in teeth and bone. This is the first calcium phosphate remineralizing technology to be marketed for dental prevention and restoration. The transfer and commercialization of this technology was accomplished through a unique collaboration involving NIST, the NIH, the ADAF, and the H.J Bosworth Company.

Public Safety and Security Homeland Security

• **Digital Evidence**. Criminal investigators increasingly find that personal computers, handheld devices and even mobile phones contain pictures, e-mail and other data critical to the prosecution of cases. A new guide written by computer forensics experts under the direction of NIST's Office of Law Enforcement Standards (OLES) provides step-by-step instructions to assist investigators in locating digital evidence so that it stands up to scrutiny once cases are tried.

• **Standardizing Disaster Models to Help First Responders**. Computer modeling and simulation programs that depict predisaster site conditions, changes due to sudden life-threatening events and consequences of emergency responses can be powerful tools for preparing for and coping with everything from terrorist attacks to hurricanes. Yet the multitude of programs, incompatibility of systems as well as technical jargon in the programs themselves hinder widespread acceptance of the potentially life-saving technology. NIST is working to make such modeling and simulation programs readily accessible to emergency response decision-makers.

NIST is identifying the needs of emergency personnel and surveying the available modeling and simulation tools. It also proposes simplifying language in emergency response software to enable emergency personnel, at every level, to use the tools. In addition, NIST advocates industry-government efforts to develop interoperability standards for all modeling, simulation and visualization tools. Finally, NIST supports creation of an electronic "Emergency Response Framework" for such standardized programs. The framework would present state, local and national level decision-makers with a comprehensive menu of easily accessible modeling and

simulation programs for understanding the extent of various threats, for training on mitigating damage to life and property and for coordinating emergency responses to actual events. NIST is currently working with other government researchers, industry software experts and emergency response leaders on a roadmap and development plan for the framework.

• **Improving Emergency Communications**. A team of NIST scientists has begun conducting experiments in "laboratories" that are here one day and gone the next. The researchers are using buildings set for demolition to measure radio signals to develop new tools that may help emergency personnel save more people trapped in collapsed buildings. Recently, the NIST team was in New Orleans as demolition experts were getting ready to raze a high-rise. Prior to demolition, specially modified radio transmitter modules operating in the frequency bands used by emergency personnel and mobile telephones were placed at various points within the soon-to-be-destroyed Fischer Public Housing Project. The researchers collected information on the transmitters' signal strength and other data, and used Global Positioning System (GPS) devices to determine the locations and distances of transmissions from within the building. After demolition, the team found that 10 of the 14 transmitters continued broadcasting. This research may eventually lead to the development of technology that allows emergency personnel to lock on to cell phone or radio signals within collapsed buildings to help in locating and perhaps communicating with survivors.

Information and Knowledge Management

• **Federal Standard for Improving IT Security**. NIST computer security specialists have developed a new standard to help federal agencies better protect their computer networks. The standard provides a new way to categorize government information and information systems. The standard was developed following passage of the Federal Information Security Management Act (FISMA) of 2002. Federal Information Processing Standard (FIPS) 199, Standards for the Security Categorization of Federal Information and Information Systems, introduces significant changes in how the federal government protects information and the computerized networks that store information by giving detailed guidance on how to categorize systems.

• **Interoperability Testbed**. NIST has established a testbed at its Gaithersburg, Md., headquarters to help manufacturers improve the interoperability of their dimensional measurement systems. The testbed uses NIST-developed test methods and tools to verify that specific equipment and software conform to new industry standards designed to allow subsystems to "talk" to one another even if they come from different manufacturers.

• **New Decision Support Software**. NIST has developed and transferred to the building products industry, government agencies and academic institutions a decision-support software tool known as BEES (Building for Environmental and Economic Sustainable). BEES reduces complex, science based content to decision-enabling results and delivers them to architects and building product manufacturers in a visually intuitive graphical format.

Appendix:

Progress in Improving the Agency's Performance Metrics for Tech Transfer

NIST continues to evaluate the effectiveness of the wide variety of mechanisms employed for technology transfer.

In the FY 2002, 2003, and 2004 annual reports, NIST added new categories for non-traditional CRADAs to cover NIST calibration services, provide greater detail on licenses and license income, address workshops, conferences, and publications, and include participation by NIST staff in documentary standards committees.

The NIST Director has asked the National Research Council's Board on Assessment, as part of its annual assessment of the NIST laboratories, to examine the effectiveness of the communication of its intellectual property policy to technical staff at all levels, so that IP protection is sought when it is appropriate to do so.

III. NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Technology Transfer at the Agency's Federal Laboratories – Approach and Plans, FY 2004 Activities/Achievements

1. Agency Approach and Plans for Technology Transfer

NOAA's mission is to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet the Nation's economic, social, and environmental needs. This mission will become ever more critical in the 21st century as national needs intensify concerning climate change, freshwater supply, ecosystem management, and homeland security.NOAA is one of the nation's premier scientific agencies. NOAA science and the technology that results impact the daily lives of the nation's citizens and have significant impacts on the national economy. For example, about one-third of the U.S. economy (approximately $3 trillion) is weather sensitive -- such as agriculture, energy, construction, travel, and transportation. Weather data and forecasts play a critical role -- which are transferred to industry and the public through the media, internet, and NOAA Weather Radio. Governments and the public use weather warnings to save lives and prevent destruction of property. Television weathercasters and many weather related firms use weather data and forecasts in their daily operations. Industry uses NOAA data in home construction and design, crop selection, disease control, and fuel delivery and supply. Additionally, industry has applied weather data for deciding such things as automobile fuel delivery system design, the best time to market umbrellas, and even for when the conditions would be best for the mating of honeybees. Increasingly accurate and longer range weather forecasts depend on an ongoing program of research and development.

Research by NOAA's federal laboratories is aimed at assisting NOAA's in-house organizations. NOAA's research is directed at such topic areas as weather forecasting, solar emission forecasting, estimating fish stocks, predicting water resources, warning of tsunamis, charting ocean bottoms. The results of such research are transferred to NOAA's operational components to improve prediction, management, and other mission activities.

NOAA's web page at www.noaa.gov details the voluminous amount of research and technology data made available to the public in the form of information products and services, such as weather and climate forecast data, El Nino prediction and monitoring, tides and currents, satellite imagery and direct readout, fishery statistics and information on protected species, air quality, state of the coasts, beach temperatures, and nautical charts, as well as extensive data bases on climate, oceans, ice, atmosphere, geophysics, and the sun. According to the Nielsing rating company, NOAA's web page has recently been the second most popular of all government agencies.

NOAA's primary technology transfer mechanism has historically been the open dissemination of scientific and technical information to individuals, industry, government, and universities. This means of transfer is consistent with the agency's mission and scientific tradition and has been

found to be more efficient and economical than transfer through patenting and licensing. Although, NOAA also continues, where advantageous, to transfer intellectual property through licenses and CRADAs -- including to industry to benefit the competitiveness of U.S. companies.

In FY 2004, NOAA carried out an extensive technology transfer program by applying meteorological and oceanographic technologies and information through open dissemination to individuals, industry, government, and universities. NOAA also provided daily weather forecasts and warnings through the media and NOAA Weather Radio. NOAA technology is transferred through presentations at scientific meetings, publication in peer-reviewed scientific journals, and through NOAA scientific and technical publications. For example, the NOAA laboratories in Boulder, Colorado, had published 419 articles in scientific journals and 300 papers in NOAA Tech Reports. NOAA Weather Radio has been integrated into the nation's homeland security efforts and will be used to alert citizens to take precautions due to chemical or nuclear spills and terrorist attacks. The system, called the all-hazards alert system, reaches more than 97 percent of U.S. territory on a 24/7 basis through broadcasts in the 50 states and in U.S. territories.

NOAA collaborates with other federal research agencies on science and technology development matters of joint interest. For example, NOAA and the Environmental Protection Agency (EPA) teamed to provide new experimental air quality forecast guidance that enable state and local agencies to issue more accurate and geographically specific air quality warnings to the public. The annual cost of poor air quality to the U.S. from air pollution-related illnesses has been estimated at $150 billion.

Furthermore, to ensure that the United States benefits from and fully exploits scientific research and technology developed abroad, NOAA collaborates and shares information with organizations in countries throughout the world. Through these international relationships, technology is transferred into NOAA for the eventual benefit of U.S. industry and public users. For instance, the understanding and forecasting of global phenomena that occur in the atmosphere, oceans, and on the sun requires worldwide collaboration and information sharing. This is accomplished through formal agreements with individual countries and participation in international organizations, such as the World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC), and the International Astronomical Union (IAU). NOAA also participates in international scientific programs and shares technology and scientific data, such as in the Global Earth Observation System. This effort involves nearly 50 other countries, the European Commission, and 29 international organizations. NOAA also provides technical assistance and training to individuals from other countries, and participates in a visiting scientist program. In addition, environmental data is shared through NOAA participation in the World Data Center program.

In the future, NOAA will continue to direct its technology transfer and international collaboration activities toward four mission goals: 1. protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management; 2. understand climate variability and change to enhance society's ability to plan and respond; 3. serve society's needs for weather and water information; and 4. support the nation's commerce with information for safe, efficient, and environmentally-sound transportation.

2. Performance in FY 2004: Activities and Achievements

■ Collaborative Relationships for Research & Development

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **CRADAs**, total active in the FY [1]	9	10	10	11	9
- New, executed in the FY	5	3	1	0	0
▪ Traditional CRADAs,[2] total active in the FY	9	10	10	11	9
- New, executed in the FY	5	3	1	0	0
▪ Non-traditional CRADAs,[3] total active in the FY	0	0	0	0	0
- New, executed in the FY	0	0	0	0	0
● **Other types of collaborative R&D relationships**	0	0	0	0	0

CRADA = Cooperative Research and Development Agreement.

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority(15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes -- such as, material transfer or technical assistance that may result in protected information.

■ Invention Disclosure and Patenting

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● New inventions disclosed in the FY [1]	2	1	1	5	2
● Patent applications filed in the FY [2]	2	3	0	0	0
● Patents issued in the FY	2	1	5	1	1

(1) Inventions arising at the federal lab.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and PCT applications.

■ Licensing
Profile of Active Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All licenses**, number total active in the FY [1]	2	2	3	5	5
▫ New, executed in the FY	0	1	1	2	0
▪ **Invention licenses**, total active in the FY	2	2	3	5	5
▫ New, executed in the FY	0	1	1	2	0
- Patent licenses,[2] total active in FY	2	2	3	5	5
▫ New, executed in the FY	0	1	1	2	0
- Material transfer licenses (inventions), total active	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Other invention licenses, total active in the FY	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Copyright licenses (fee bearing)					
▫ New, executed in the FY					
- Material transfer licenses (non-inventions), total active					
▫ New, executed in the FY					
- Other, total active in the FY					
▫ New, executed in the FY					

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights(hybrid licenses) are reported as patent licenses -- and not included in the count of copyright licenses.

(1) "Active" = legally in force at any time during the FY.

(2) Patent license tally includes patent applications which are licensed.

Licensing Management

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● Elapsed execution time,(1) licenses granted in the FY					
▪ Invention licenses					
Average , months	**	*6.0	*8.0	5.0	**
▫ Minimum				6.0	
▫ Maximum				7.0	
- Patent licenses (2)					
Average , months		*6.0	*8.0	5.0	
▫ Minimum				6.0	
▫ Maximum				7.0	
● Licenses terminated for cause, number in the FY					
▪ Invention licenses	0	0	0	0	0
- Patent licenses (2)	0	0	0	0	0

Data included in this table(intentionally) addresses only invention licenses, with patent licenses distinguished as a sub-class.

(1) Date of license application to the date of license execution.(Date of license application is the date the lab formally acknowledges the written request for a license from a prospective licensee and agrees to enter into negotiations.)

(2) Patent license tally includes patent applications which are licensed.

* Only a single new license was executed in FY 2001 and 2002. Thus, there is no range of execution times to report.

** No new licenses were executed in FY 2000 and 2004.

Characteristics of Licenses Bearing Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All income bearing licenses**, total number	1	2	3	5	5
▫ Exclusive	1	1	1	1	1
▫ Partially exclusive	0	0	0	0	0
▫ Non-exclusive	0	1	2	4	4
▪ **Invention licenses**, income bearing	1	2	3	5	5
▫ Exclusive	1	1	1	1	1
▫ Partially exclusive	0	0	0	0	0
▫ Non-exclusive	0	1	2	4	4
- Patent licenses,(1) income bearing	1	2	3	5	5
▫ Exclusive	1	1	1	1	1
▫ Partially exclusive	0	0	0	0	0
▫ Non-exclusive	0	1	2	4	4
▪ **Other IP licenses**, income bearing	0	0	0	0	0
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
- Copyright licenses (fee bearing)					
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
● **All royalty bearing licenses**,(2) total number	1	2	3	5	5
▪ **Invention licenses**, royalty bearing	1	2	3	5	5
- Patent licenses,(1) royalty bearing	1	2	3	5	5
▪ **Other IP licenses**, royalty bearing	0	0	0	0	0
- Copyright licenses (fee bearing)					

In general, license income can result from various sources: license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(1) Patent license tally includes patent applications which are licensed.

(2) Note that royalties are one component of total license income.

Income from Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Total income**, all licenses active in the FY [1]	$100	$1,600	$9,402	$4,716	$24,961
▪ **Invention licenses**	$100	$1,600	$9,402	$4,716	$24,961
- Patent licenses [2]	$100	$1,600	$9,402	$4,716	$24,961
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
- Copyright licenses					
● **Total Earned Royalty Income** (ERI) [3]	*$100	$1,600	$9,402	$4,716	$24,961
▫ Median ERI		$800	$1,333	$696	$1,923
▫ Minimum ERI		$100	$100	$100	$116
▫ Maximum ERI		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 1% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 5% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 20% of licenses		$1,500	$7,969	$1,920	$21,000
▪ **Invention licenses**	$100	$1,600	$9,402	$4,716	$24,961
▫ Median ERI		$800	$1,333	$696	$1,923
▫ Minimum ERI		$100	$100	$100	$116
▫ Maximum ERI		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 1% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 5% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 20% of licenses		$1,500	$7,969	$1,920	$21,000
- Patent licenses [2]	$100	$1,600	$9,402	$4,716	$24,961
▫ Median ERI		$800	$1,333	$696	$1,923
▫ Minimum ERI		$100	$100	$100	$116
▫ Maximum ERI		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 1% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 5% of licenses		$1,500	$7,969	$1,920	$21,000
▫ ERI from top 20% of licenses		$1,500	$7,969	$1,920	$21,000
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					
- Copyright licenses					

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(2) Patent license tally includes patent applications which are licensed.

(3) "Earned royalty" = royalty based upon use of a licensed invention(usually, a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.

* There was only a single license active in FY 2000.

Disposition of License Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Income distributed** (1)					
▪ **Invention licenses**, total distributed	$100	$1,600	$9,402	$4,716	$24,961
- To inventor(s)	0 (0%)	$1,500 (94%)	$696 (7%)	$1,130 (24%)	$11,070 (44%)
- To other	$100 (100%)	$100 (6%)	$8,706 (93%)	$3,586 (76%)	$13,891 (56%)
- Patent licenses, (2) total distributed	$100	$1,600	$9,402	$4,716	$24,961
- To inventor(s)	0 (0%)	$1,500 (94%)	$696 (7%)	$1,130 (24%)	$11,070 (44%)
-To other	$100 (100%)	$100 (6%)	$8,706 (93%)	$3,586 (76%)	$13,891 (56%)

Invention licenses are the chief policy interest regarding disposition of income; content of table reflects this focus.

(1) Income includes royalties and other payments received during the FY.

(2) Patent license tally includes patent applications which are licensed.

■ Other Performance Measures Deemed Important by the Agency

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Journal articles published	556	544	529	626	419
Technical reports published	418	274	363	245	300

Represents publications by NOAA laboratories in Boulder, Colorado.

■ Outcomes from Technology Transfer

For this year's annual report, the cases described below are provided as examples of the downstream outcomes being achieved by NOAA technology transfer efforts:

• **Predicting the Consequences of Harmful Releases**. To predict the consequences of atmospheric releases of radioactivity and other potentially harmful materials, NOAA has developed a web-based system called the Real-time Environmental Applications and Display System (READY) . This system accesses and displays meteorological data and dispersion model products. It brings together dispersion models, graphical display programs, and textual forecast programs into a form that is easy to use. There have been numerous applications of this system. Working with the Department of Energy's (DOE's) Atmospheric Studies in Complex Terrain program NOAA provided guidance for evaluation of terrain effects on dispersion. NOAA's volcanic ash program provided critical information on plume transport and dispersion to the aviation industry. NOAA provided on-site support to the Operations Center of the Nuclear Regulatory Commission during emergency exercises and events occurring at its regulated facilities. In addition, NOAA is a Regional Specialized Meteorological Center (RSMC) for transport and dispersion products through the World Meteorological Organization. NOAA, along with the Canadian Meteorological Centre, the other RSMC for this region, provided meteorological guidance and dispersion predictions in the event of an atmospheric release of radioactive or hazardous materials crossing international boundaries in North and Central America.

• **High-Resolution Radar Data Technology Transferred to Industry**. A NOAA multi-office collaboration has made high-resolution radar data available to the private sector in real time. Some of the largest private sector weather companies have already developed commercial markets for these data. One company, Meteorlogix, recently stated that access to these data would be the basis for Aone of the top three growth areas for private weather companies@.

NOAA has created high-resolution, multi-sensor forecast tools for an entire region, encompassing clusters of radars without the limits previously imposed by the traditional single-radar approach. Consequently, it is now possible for the National Weather Service and private sector forecasters to have a seamless depiction of weather phenomena across an entire forecast region on the appropriate space and time scales required by their customers, including emergency managers, reservoir operators, and flood plain managers.

In the past year, the National Weather Service (NWS) has taken this project nationwide and completed its operational implementation using the Internet2/Abilene high-speed research network. The technology is significant in that it is enabling the development of critical decision-making applications such as those used in forecasting severe weather and flash floods.

The technology has been transferred to several private companies (through Cooperative Research and Development Agreements) and foreign countries, including Taiwan, where a flash flood decision support application employing this technology is currently assisting forecasters to mitigate the effects of tropical cyclones. Private weather companies, such as Baron Services, are now using the real-time radar data to develop high resolution forecast Aproducts@ for their television clients.

•

New Precipitation Analysis Tool Transferred to Mexico. The HydroEstimator, a tool which provides NOAA precipitation analysts with real-time, instantaneous estimates of rainfall using the GOES satellite infrared channel data as input, was transferred to the Mexican Weather Service (Servicio Meteorologico Nacional) to assist them in the detection and monitoring of flooding and flash flooding events. The transfer consisted of software, which was developed in-house by NOAA research hydrometeorologists. The necessary hardware was procured and paid for by Mexico. Benefits of this transfer include: (1) providing support for life and property missions in Mexico, (2) engendering international collaboration and cooperation in such missions, and (3) providing an additional and valuable source of data pertaining to the performance of the HydroEstimator in a different geographical area and climatic regime.

• **New Technology to Catch Swordfish, Save the Turtles**. From 2001 through 2003, the National Marine Fisheries Service (NOAA Fisheries) worked with commercial swordfish fishermen to develop new high seas longline fishing technology which greatly reduces interaction with threatened marine turtles. The cooperative longline gear technology research investigated line configurations, setting and retrieving procedures, hook types, hook sizes, and bait types. Ultimately specific hook designs and bait types were found to be the most effective measures for reducing turtle interactions. In conjunction with tools developed during the research to remove hooks and lines from turtles, the application of specific hook and bait combinations reduced both the number of interactions and potentially the post-hooking mortality associated with the residual interactions. This was accomplished without negatively impacting catch of the swordfish target species for the fishery.

Also, during the period of 2001 through 2003, NOAA Fisheries scientists developed strict protocols for fishing by commercial fishermen contracted to develop new approaches to reducing bycatch of loggerhead and leatherback turtles in the North Atlantic. Innovative ideas and suggestions from both commercial fishermen and scientists led to effective de-hookers and line-cutters as well as the positive results of the fishing research. The 18/0 circle hook, with a 0 degree and 10 degree offset using mackerel bait significantly mitigated loggerhead turtle interaction by 90% and leatherback interaction by 66% over the use of industry standard “J” hook and squid bait used throughout the industry. This was accomplished without a change in the catch rates of targeted swordfish. Statistical tests show that the use of circle hooks reduces swordfish catch and the use of mackerel bait increases swordfish catch, with the net result being no change over the use of the industry standard.

NOAA Fisheries scientists and technicians are transferring the fishing technology developed by the participating vessels to the rest of the U.S. longline fleet. In August and September 2004, NOAA Fisheries held a number of workshops with fishermen to explain and demonstrate the use of circle hooks and safe release practices for caught turtles. Additional workshops are planned with fishermen in other U.S. fishing areas to communicate the results of the experiment to the entire fleet. The turtle release gear and circle hooks with mackerel bait are currently required on all Atlantic pelagic longline vessels. NOAA Fisheries worked with the gear manufacturers and the hook manufacturers around the world to ensure that there would be an adequate supply available for the industry.

The new technology will increase each fisherman’s annual gross revenues by an estimated $47,600 with renewed fishing for swordfish. Also the caught fish will be of higher quality, increased size, and also be in increased numbers.

The U.S. Fleet is a small portion, less than 5% of the total Atlantic fleet. In addition similar problems with turtle interactions are occurring in other oceans. Without decreases in target species catch, effective reduction in turtle take by longline fleets around the world can be achieved by exporting this technology to the rest of the world. Technical experts from NOAA Fisheries Pascagoula Laboratory have conducted workshops in Latin America countries and Europe. They have received a good response and interest from other countries' fleets for a demonstration of the release gear and hooks. Proliferation of this technology around the world can foster a significant reduction, possibly by over 50%, in the interaction and post-release mortality of threatened and endangered sea turtles around the world.

• **Scientific Graphics Toolkit and ncBrowse**. NOAA has developed Java-based tools to more easily visualize oceanographic (and other) data for both web-based and desktop applications. 1. The Scientific Graphics Toolkit (SGT) is designed to aid developers in producing scientific graphics applications. SGT Beans can be used with several Java integrated development environments (NetBeans, JBuilder, etc.) and provides a graphical environment to configure and develop SGT applications. Over 7700 users from 73 countries are using the toolkit, including Australia, France, Germany, Italy, Japan, Poland, Russian Federation, South Africa, Switzerland, and United Kingdom. 2. The ncBrowse is a general purpose Java desktop application designed to enable users to interactively browse and visualize data from netCDF files and OPeNDAP resources. NetCDF is a file format that is commonly used by the oceanographic community to store both observations and model results. The ncBrowse has over 5600 users from 66 countries, including Australia, Canada, France, Germany, Japan, Norway, Poland, Russian federation, Sweden, and United Kingdom.

• **Web-based Access to Distributed Data Sets**. NOAA has transferred Live Access Server (LAS) software for web-based browsing (visualization) and downloading (subsetting) of earth science data sets to a broad scientific community. LAS presents geographically distributed data sets as a unified virtual data base. It is compatible with scientific data networking provided by the Open Source Project for a Network Data Access Protocol (OPeNDAP, formerly known as DODS). There are 50 installations of LAS in research institutions spanning, NASA, the U. S. Navy, Department of Energy, and national and international research institutions. A list of institutions that have installed LAS is available at (http://ferret.pmel.noaa.gov/Ferret/LAS/LASservers.html). Each Institution that installs LAS can configure it with the data that they wish to disseminate.

• **World Standards for Gases**. NOAA maintains the world standards working gases for carbon dioxide, carbon monoxide, methane and some halocarbons. In FY 2004, NOAA provided 145 cylinders of standard gases to 105 customers around the world. The main customers are national and international research facilities, national and foreign universities, and U.S. agencies like NASA and Department of Energy. Use of NOAA standard gases allows for development of intercomparable measurements from around the world.

• **Carbon Dioxide Flask Analysis System**. NOAA has developed the most accurate and reliable carbon dioxide flask analysis system in the world. It has assisted both China and Brazil in helping to design, specify, and procure systems for each country, assembling the systems in the USA, and training Brazilian and Chinese scientists in the operation of the equipment. The data from China and Brazil will advance the understanding of the global carbon cycle.

• **Programmable Flask Package**. NOAA has developed a Programmable Flask Package (PFP) that allows for unattended collection of a series of air samples in glass flasks and is especially suited for aircraft operations. The new system allows for standardized, fast, reliable, and relatively cheap global carbon cycle gas sampling. NOAA provided drawings and specifications to two companies, Atmospheric Observing Systems and High Precision Devices, who are now preparing to offer these samplers commercially. Eventually all developed countries will be monitoring greenhouse gasses to keep track of their emissions.

• **Robust High Precision CO2 Analyzer**. NOAA is assisting the Atmospheric Observing Systems Corporation by testing its robust high precision CO2 analyzer at the Trinidad Head Baseline Station in Boulder, Colorado. The new instrument has the potential of allowing for continuous, real-time analyses of carbon dioxide at unattended locations with the accuracy and precision required to study the atmospheric carbon cycle. The present instrumentation for measuring carbon dioxide concentrations continuously in the atmosphere are bulky, expensive, require large volumes of standard gasses, and are not reliable enough for extended periods of unattended operation. The new analyzer will lead to a multi-million dollar private business within a few years.

• **Raster Navigational Chart CRADA Update**. A Cooperative Research and Development Agreement (CRADA) between NOAA and Maptech, Inc. for Raster Navigational Charts (RNCs), continues to provide these cutting edge, digital charts to mariners, including weekly electronic updates delivered over the Internet. During FY
2004, the charts were enhanced; delivery of updates evolved to provide incremental digital patches as well as cumulative patches, and encryption of the charts was developed and deployed.

• **Print-on-Demand CRADA Update**. A CRADA between NOAA and OceanGrafix, LLC for Print-on-Demand (POD) nautical charts continued to provide these world-leading printed charts. Charts are updated weekly by NOAA, and using POD technology developed collaboratively with the private company, are only manufactured when ordered from those up-to-date files. During FY 2004, 'remote printing' was perfected and deployed with 9 sites established in chart sales agent's stores around the nation.

Appendix:

Progress in Improving the Agency's Performance Metrics for Tech Transfer

In future reports, the agency will list mission-related data that addresses NOAA's primary technology transfer mechanism, which is the open dissemination of its products and services. Numbers of publications in scientific journals, presentations at scientific meetings, NOAA technical publications, collaborative research (other than CRADAs), visiting scientists, data exchange agreements, numbers of data requests received by NOAA's environmental data centers, and external agency studies are being investigated as metrics for reporting this aspect of NOAA's technology transfer activities.

Also, in light of the recent requirements for performance measurements of agency tech transfer activities, there is an enhanced NOAA-wide effort to monitor and update agency files on patent and CRADA activities.

IV. NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION -- INSTITUTE FOR TELECOMMUNICATION SCIENCES

Technology Transfer at the Agency's Federal Laboratories – Approach and Plans, FY 2004 Activities/Achievements

I. Agency Approach and Plans for Technology Transfer

The Institute for Telecommunication Sciences (ITS) is the chief research and engineering arm of the National Telecommunications and Information Administration (NTIA).

ITS supports such NTIA telecommunications objectives as promotion of advanced telecommunications and information infrastructure development in the United States, enhancement of domestic competitiveness, improvement of foreign trade opportunities for U.S. telecommunications firms, and facilitation of more efficient and effective use of the radio spectrum. ITS also serves as a principal federal resource for solving the telecommunications concerns of other federal agencies, state and local governments, private corporations and associations, and international organizations.

ITS uses three principal means for achieving technology transfer: cooperative research and development, technical publications, and leadership and technical contributions in the development of telecommunications standards.

Cooperative research and development. Cooperative research and development agreements (CRADAs), based upon the Federal Technology Transfer Act (FTTA) of 1986, are a principal means through which ITS aids the private sector. The FTTA provides the legal basis for and encourages shared use of government facilities and resources with the private sector in advanced telecommunications technologies.

These partnerships aid in the commercialization of new products and service; they enhance the capabilities of ITS laboratories. They also provide insights into industry's needs for productivity growth and competitiveness that aid ITS to adjust the focus and direction of its programs for effectiveness and value.

In FY 2004, ITS participated in technology transfer and commercialization efforts by fostering cooperative telecommunications research with industry where benefits can directly facilitate U.S. competitiveness and market opportunities. These efforts will continue in future years. ITS also participated – as it has for a number of years – in CRADAs with private sector organizations to design, develop, test, and evaluate advanced telecommunication concepts. The private industry partner benefits through such cooperative relationships, as does the Institute, as it is able to undertake research in commercially important areas that it would not otherwise be able to do.

To date, major contributions to personal communication services (PCS), local multipoint distribution service (LMDS), and ultrawideband (UWB) technologies have been achieved through CRADAs. These have aided U.S. efforts to rapidly introduce new socially-beneficial, communications technologies. More recently, CRADAs in the areas of objective audio and video

quality and advanced antennas for wireless systems have allowed ITS to contribute to the development of new products and services.

In addition, ITS plans to continue using patents to secure intellectual property rights in laboratory innovations with commercial promise. ITS plans to advance its mission and benefit the competitiveness of U.S. industry by pursuing opportunities to commercially license patents to CRADA partners and other interested parties. As an example, ITS is targeting software implementing a video quality metric for commercial development. This software incorporates technology covered by two patents. A beta version of the software has been requested by more than 200 parties for testing purposes and commercial licensing negotiations have begun with one U.S. corporation.

Technical publications. Publication has, historically, been the means through which ITS has transferred research results to other researchers, the commercial sector, and government agencies. Many of these publications – both internal reports and monographs and external, peer reviewed, scientific journal articles – have become standard references in several telecommunications areas.

Technical publication remains at present a principal means for ITS' technology transfer. Most of these technical publications are released only after going through an internal peer review process managed by the ITS Editorial Review Board (ERB). Of the publications released through the ERB process in recent years, approximately one half were approved for external publication in the scientific literature and one third were NTIA reports.

Development of telecommunication standards. This third principal means of ITS technology transfer directly addresses improvement of U.S. competitiveness in telecommunications. For several decades, ITS has provided leadership and technical contributions to organizations, both national and international, responsible for developing telecommunication standards. For example, a plurality of the technical recommendations of the International Telecommunication Union (ITU – a treaty organization) are based on research conducted at ITS. Also, key national quality of service standards developed under the American National Standards Institute (ANSI) T1 committee for video, audio, and digital data incorporate research results obtained at ITS.

ITS continues to chair numerous committees and working groups in the ITU, ANSI T1, and other telecommunication standards organizations, providing technical leadership that is trusted by the commercial sector participants. ITS' technical inputs are relied upon as technically advanced and sound, and unbiased by commercial interests.

In FY 2004, ITS continued its technical leadership and contributions to communications standards for public safety, particularly for first responders. ITS' primary area of contribution has been interoperability standards and testing procedures. ITS' objective video quality measurement method has been made a national standard by ANSI. ITS' method was also the best performing metric in comparison testing by the ITU with other methods from around the world.

II. Performance in FY 2004: Activities and Achievements

■ Collaborative Relationships for Research & Development

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **CRADAs**, total active in the FY [1]	--	65	63	239	319
- New, executed in the FY	--	--	6	178	185
▪ Traditional CRADAs,[2] total active in the FY	3	6	6	5	7
- New, executed in the FY	3	1	0	0	3
▪ Non-traditional CRADAs,(3, 4) total active in FY	--	59	57	234	312
- New, executed in the FY	--	--	6	178	182
● **Other types of collaborative R&D relationships**					
▪ Collaborative standards contributions,[5] total active in FY	--	3	3	2	11
-New, executed in the FY	--	3	0	1	0

CRADA = Cooperative Research and Development Agreement. -- = Data not requested from agency in reports of past years.

(1) "Active" = legally in force at any time during the FY. "Total active" is comprehensive of all agreements executed under CRADA authority(15 USC 3710a).

(2) CRADAs involving collaborative research and development by a federal laboratory and non-federal partners.

(3) CRADAs used for special purposes, such as material transfer or technical assistance that may result in protected information.(For example, CRADAs for Video Quality Software Evaluation.)

(4) ITS' Telecommunications Analysis Services(TA Services) is Internet accessible through Web-based electronic CRADAs. TA Services provides analysis support to private industry and public agencies in the areas of wireless system design and evaluation, and site selection. The service is provided on a cost-reimbursable basis, 24 hours a day/7 days a week throughout the year. TA Services currently reaches numerous government and private sector users across the nation, providing the latest versions of ITS-developed telecommunications models, databases, and tools. Use of the CRADA makes TA Services available to users in a short time and on a cost reimbursable basis. Additionally, CRADA partners provide useful evaluations of the ITS software used. This information aids ITS to improve existing software tools for wireless system design and analysis and to develop new ones – benefiting both ITS' own research capabilities and the resources that outside users can draw upon. The CRADA agreement also allows ITS to gain valuable insights from users' feedback about the rapidly changing needs of industry and government in telecommunications technology.

(5) ITS works with industry, through a number of standards fora, to apply research results to the development of telecommunication performance standards and guidelines. In FY 2004, ITS worked collaboratively with the International Telecommunication Union, the Telecommunications Industry Association, the Alliance for Telecommunications Industry Solutions, and various Federal Public Safety groups to interpret and analyze standards and regulations.

■ Invention Disclosure and Patenting

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● New inventions disclosed in the FY [1]	0	1	0	0	0
● Patent applications filed in the FY [2]	0	0	1	0	0
● Patents issued in the FY	2	0	0	1	0
● Active patents, end of the FY	5	5	6	6	6

(1) Inventions arising at the federal lab.

(2) Tally includes: U.S. patent applications, foreign patent applications filed on cases for which no U.S. application was filed, divisional applications, and continuation-in-part applications. Excludes: provisional, continuation, duplicate foreign, and PCT applications.

■ Licensing

Profile of Active Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All licenses**, number total active in the FY [1]	2	2	3	57	98
▫ New, executed in the FY	1	0	2	54	98
▪ **Invention licenses**, total active in the FY	2	2	3	57	98
▫ New, executed in the FY	1	0	2	54	98
- Patent licenses,[2] total active in FY	2	2	3	54	3
▫ New, executed in the FY	1	0	2	54	3
- Material transfer licenses (inventions), total active	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Other invention licenses, [3] total active in the FY	0	0	0	0	95
▫ New, executed in the FY	0	0	0	0	95
▪ **Other IP licenses**, total active in the FY	0	0	0	0	0
▫ New, executed in the FY	0	0	0	0	0
- Copyright licenses (fee bearing)					
▫ New, executed in the FY					
- Material transfer licenses (non-inventions), total active					
▫ New, executed in the FY					
- Other, total active in the FY					
▫ New, executed in the FY					

Multiple inventions in a single license are counted as one license. Licenses that include both patents and copyrights (hybrid licenses) are reported as patent licenses and not included in the count of copyright licenses.

(1) "Active" = legally in force at any time during the FY.

(2) Patent license tally includes patent applications which are licensed.

(3) International copyright licenses(non fee bearing) for VQM technology

Licensing Management

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Elapsed execution time**,(1) licenses granted in the FY					
▪ **Invention licenses**					
▫ Average (or median), months	6.0*	**	5.0*	1.0	2.0
▫ Minimum				1.0	1.0
▫ Maximum				1.0	3.0
- Patent licenses (2)					
▫ Average (or median), months	6.0*	**	5.0*	1.0	2.0
▫ Minimum				1.0	1.0
▫ Maximum				1.0	3.0
● **Licenses terminated for cause, number in the FY**					
▪ **Invention licenses**	0	0	0	0	0
- Patent licenses (2)	0	0	0	0	0

Data included in this table (intentionally) addresses only invention licenses, with patent licenses distinguished as a sub-class.

(1) Date of license application to the date of license execution.(Date of license application is the date the lab formally acknowledges the written request for a license from a prospective licensee and agrees to enter into negotiations.)

(2) Patent license tally includes patent applications which are licensed.

* Only a single new license was executed in FY 2000 and 2002. Therefore, there are no distributional statistics for elapsed execution time to report.

** No new licenses were executed in FY 2001.

Characteristics of Licenses Bearing Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **All income bearing licenses**, total number	1	1	3	3	3
▫ Exclusive	0	0	0	0	0
▫ Partially exclusive		0	0	0	0
▫ Non-exclusive	1	1	3	3	3
▪ **Invention licenses**, income bearing	1	1	3	3	3
▫ Exclusive	0	0	0	0	0
▫ Partially exclusive	0	0	0	0	0
▫ Non-exclusive	1	1	3	3	3
- Patent licenses,(1) income bearing	1	1	3	3	3
▫ Exclusive	0	0	0	0	0
▫ Partially exclusive	0	0	0	0	0
▫ Non-exclusive	1	1	3	3	3
▪ **Other IP licenses**, income bearing	0	0	0	0	0
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
- Copyright licenses (fee bearing)	0	0	0	0	0
▫ Exclusive					
▫ Partially exclusive					
▫ Non-exclusive					
● **All royalty bearing licenses**, (2) total number	1	1	0	0	3
▪ **Invention licenses**, royalty bearing	1	1	0	0	3
- Patent licenses,(1) royalty bearing	1	1	0	0	3
▪ **Other IP licenses**, royalty bearing	0	0	0	0	0
- Copyright licenses (fee bearing)					

In general, license income can result from various sources: license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(1) Patent license tally includes patent applications which are licensed.

(2) Note that royalties are one component of total license income.

Income from Licenses

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Total income, all licenses active in the FY** [1]	$63,693	$5,000	$65,470	$0	$33,500
▪ **Invention licenses**	$63,693	$5,000	$65,470	$0	$33,500
- Patent licenses [2]	$63,693	$5,000	$65,470	$0	$33,500
▪ **Other IP licenses**, all active licenses in FY	$0	$0	$0	$0	$0
- Copyright licenses					
● **Total Earned Royalty Income** (ERI) [3]	$63,693*	$0	$0	$0	0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					
▪ **Invention licenses**	$63,693	$0	$0	$0	$0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					
- Patent licenses [2]	$63,693	$0	$0	$0	$0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					
▪ **Other IP licenses**, total active in the FY	$0	$0	$0	$0	$0
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
- Copyright licenses					
▫ Median ERI					
▫ Minimum ERI					
▫ Maximum ERI					
▫ ERI from top 1% of licenses					
▫ ERI from top 5% of licenses					
▫ ERI from top 20% of licenses					

(1) Total income includes license issue fees, earned royalties, minimum annual royalties, paid-up license fees, and reimbursement for full-cost recovery of goods and services provided by the lab to the licensee including patent costs.

(2) Patent license tally includes patent applications which are licensed.

(3) "Earned royalty" = royalty based upon use of a licensed invention(usually, a percentage of sales or of units sold). Not a license issue fee or a minimum royalty.

* There was only one active license in FY 2000. Thus, there were no distributional statistics on Earned Royalty Income to report for that year.

Disposition of License Income

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
● **Income distributed** (1)					
▪ **Invention licenses**, total distributed	$63,693	$5,000	$65,470	$0	$33,500
- To inventor(s)	$20,508 (32%)	$2,900 (58%)	$21,041 (32%)	$0	$18,450 (55%)
- To other (3)	$43,185 (68%)	$2,100 (42%)	$44,429 (68%)	$0	15,050 (45%)
- Patent licenses, (2) total distributed	$63,693	$5,000	$65,470	$0	$33,500
- To inventor(s)	$20,508 (32%)	$2,900 (58%)	$21,041 (32%)	$0	$18,450 (55%)
-To other (3)	$43,185 (68%)	$2,100 (42%)	$44,429 (68%)	$0	$15,050 (45%)

Invention licenses are the chief policy interest regarding disposition of income; the content of this table reflects this focus.

(1) Income includes royalties and other payments received during the FY.

(2) Patent license tally includes patent applications which are licensed.

(3) To ITS/NTIA

■ Other Performance Measures Deemed Important by the Agency

	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Technical publications produced	20	17	17	20	17

See "Technical Publications" above in the first section of this report for additional information on this topic.

■ Outcomes from Technology Transfer

For this year's annual report, the cases described below are provided as examples of the downstream outcomes being achieved by ITS technology transfer efforts:

• **Video quality metric**. ITS developed a superior method of measuring video quality objectively by machine that closely predicts the quality that subjective human views would perceive. The technology is covered by three patents owned by ITS/NTIA. In FY 2003, the ITS method was adopted by the ANSI as a U.S. national standard. In addition, the ITU tested a number of proposed video quality metrics from around the world and found the ITS method superior. ITS' method became an international standard in 2004, as approved by the ITU.

ITS targeted this technology for commercial development, with the potential of producing a royalty income for the laboratory within one year. More than 170 copies of software implementing the method have been requested this FY for purposes of evaluation. Three commercial licenses have been negotiated with U.S. corporations. In FY 2004, the Federal Laboratory Consortium presented ITS an award for its efforts to disseminate this technology both nationally and internationally.

• **Ultrawideband Study with Motorola**. ITS has begun a cooperative research program with Motorola/Freescale Inc. to investigate the interference potential of various UWB waveforms. Since the FCC permitted low power UWB emissions between 3.1 and 10.6 GHz in February 2003, a number of companies have developed UWB technologies for application in wireless personal area networking (WPAN) to achieve high data rates at short distances (less than 10 meters). In this Cooperative Research and Development Agreement (CRADA), we will address the fundamental underlying question – how do UWB signals cause interference with existing legacy systems? ITS will generate a range of waveforms representative of existing and proposed UWB systems. Measurement procedures and analyses to characterize the interfering UWB signals will be developed.

• **CRADA with SAVITech to Measure Emissions from RFID Tags**. ITS has entered a CRADA with SAVITech to measure the interference characteristics of 400 MHz RF identification (RFID) devices and determine the extent (if any) to which those emissions interfere with land mobile radio transceivers.

Appendix:

Progress in Improving the Agency's Performance Metrics for Tech Transfer

ITS' annual performance reporting has been revised to conform to the Department of Commerce guidelines. Starting in 2002, ITS added a new metric under the "Other Performance Measures" category: number of publications approved through the Editorial Review Board (ERB) process. While not perfect, this metric provides a useful, working indicator of the number of quality publications released to the public.

In addition, ITS continues to explore other metrics for ITS technology transfer through telecommunication standards development activities. Possible metrics include the number of standards committee leadership positions, the number of documents submitted, and the number of standards adopted that include ITS technology. It is anticipated that a metric (or metrics) will be selected that is (are) both measurable and as well as possible reflects the value of ITS' standards activities. (ITS standards documents do not go through the ERB process.)