Uwe Arp Group
NIST
Silver Medal
Scientific/Engineering Achievement

Nominee Information:

Salutation (Ms., Mr., etc.) [Select from Drop Down]	**Nominee Name (or Organization Name)**	**Bureau, First Subdivision** (Ex. – NOAA, National Weather Service)	**Position Title**	**Pay Plan, Series, and Grade**	**Nominee is Eligible Based on Current Rating of Record** (Yes or No; select from Drop Down)	**Past Awards** (Honor or high-level awards received in last 5 years; do not include Special Act or Cash-In-Your-Account Awards)
Dr.	Uwe Arp	NIST, PL	Physicist	ZP-1310-IV/02	Yes	
Mr.	Charles Gibson	NIST, PL	Physicist	ZP-1310-IV/01	Yes	NIST Astin Measurement Award
Dr.	Ping-Shine Shaw	NIST, PL	Physicst	Z-1310-V/02	Yes	
Dr.	Howard Yoon	NIST, PL	Physicst	ZP-1310-V/02	Yes	NIST Astin Measure-ment Award

The Department of Commerce limits group nominations to 10 members and joint organizational nominations to 3 organizational units.

☒ **As the nominator, I certify, through checking the box to the left of this statement, that the nominee(s) listed above have a minimum current rating of record of Level 4 or higher; Commendable or higher; Eligible (Demo); or Meets or Exceeds Expectations (Two-Level).** *If any nominee has a current rating of record of Level 3 or Fully Successful, a separate, one-page justification which details the specific reasons why the award is recommended must be attached to this nomination.*

Nominator's Name and Phone Number: Dr. Katharine B. Gebbie, 301-975-4200

Medal Type (select Gold or Silver from drop-down): Silver

Nomination Type (select one from drop-down): Group

Category (select one from drop-down): Scientific/Engineering Achievement

What is the significance of this accomplishment? *(Maximum of 200 characters)*

This question is designed to give an overview of the importance of the contribution. The response should focus on the value of the accomplishment in concrete, results-oriented terms.

Development of the world's most accurate UV radiation standards positions NIST as the international leader in UV measurements for materials processing, semiconductor lithography and space sciences.

Describe how this accomplishment exceeds the performance expectations of the individual(s) or organization(s). (*Maximum of 300 characters)*

Use this section to provide a compelling statement describing how the nominee exceeded performance expectations as opposed to merely doing his or her job. Please note, while exceeding a performance metric and contributing to the accomplishment of the Department's organizational mission and strategic goals is laudable, it does not necessarily evidence exceptional work above that which would have been expected by the nominee in the normal course of his or her job. The impact of the nominee's accomplishment must be truly exceptional and reflect only the highest level of achievement in the Department.

On their own initiative, scientists from two divisions joined forces to devise an entirely new approach to meeting customer needs. Together they advanced the state-of-the-art not incrementally but by a factor of four, developing and disseminating the world's most accurate UV radiation standards.

I. Certificate Citation: *(Maximum of 150 characters)*

The certificate citation must begin with the word, "*For*" followed by a statement, which summarizes the accomplishment. (Example - For developing a technique to estimate current and historic rates of natural gas flaring through an effective use of satellite imagery data.)

For advancing ultraviolet radiation measurement science for application in materials processing, semiconductor manufacturing and space sciences.

II. Program Booklet Citation: *(Minimum of 450 characters, maximum of 600 characters)*

The program booklet citation must adhere to the following format. Individual nominations (*Mr. Smith is recognized for*…); Group nominations (*The group is recognized for*…); Organizational awards (*The organization is recognized for*…). In lieu of "recognized for", the following may also be used, "*honored for*" or "*cited for*". The program booklet must begin with one of the above introductory phrases, which clearly states what is being recognized followed by details on the nominee's work, and conclude with a sentence on the impact or importance of the accomplishment.

The group is recognized for developing, validating and disseminating the world's most accurate standards for the measurement of ultraviolet radiation important in materials processing, semiconductor manufacturing and space sciences. To achieve this, the group advanced the science of synchrotron radiation measurements to provide an ultraviolet radiation source with a known absolute output based on fundamental laws of physics. The resulting absolute ultraviolet radiation standard proved to be the best in the world in a recent comparison with other national standards laboratories.

III. Justification:

The following questions are designed to succinctly clarify the nominee's accomplishment(s) and the reasons this nomination merits either a Gold or Silver Medal. The justification should be concise and clear, written in "Plain English," and should not rely on acronyms, jargon or extremely technical text. In addition, the justification should be written for the lay reader, not an expert in the field. Complicated technical descriptions often serve to confuse the reader and are seldom necessary to describe the accomplishment. Complete nominations must include responses to Section 1, if applicable, and to both Sections 2 and 3.

Section 1 – Definitions (*Maximum of 500 characters)*

Use this section to define all scientific/technical terms, acronyms, or terms-of-art whose meanings are not readily apparent to a lay reader. This section is only for the definition of terms used in the justification below. Do not define terms in common use within the Department, such as ITA, DOC, OPM, etc.

Synchrotron -- a special-purpose light source designed to produce well-controlled ultraviolet radiation with high efficiency, exploiting Einstein's theory of relativity. A synchrotron is maintained at NIST, and other synchrotrons are used in "atom smashers" around the world.

Ultraviolet (UV) -- harmful radiation with a wavelength shorter than 370 nm, rendering it invisible to the human eye.

SURF: -- The NIST Synchrotron Ultraviolet Radiation Facility now in its third generation.

Section 2 - Award Justification *(Maximum number of characters for all four questions in this section cannot exceed 2000)*

1. **What was the specific goal, challenge or problem related to the Department's mission and/or strategic plan?**

To develop and disseminate high-accuracy ultraviolet (UV) radiation standards using synchrotron radiation to advance US industry sectors and government programs dependent on accurate UV measurements. Practically, the dissemination methods include distribution of calibrated UV deuterium lamps through NIST's Measurement Services.

2. **What was the context in which the nominee addressed the goal, challenge or problem?**

The accuracy of previous NIST ultraviolet standards based on hydrogen plasmas and classical blackbody sources was insufficient to meet our Nation's burgeoning need for accurate UV measurements to be used in materials processing, semiconductor manufacturing, and space sciences. The group realized the unique advantages of NIST's Synchrotron Ultraviolet Radiation Facility (SURF) and its potential as a highly accurate standard for UV measurements.

3. **What specific actions did the nominee take to address the goal, challenge or problem?**

In a collaboration spanning several organizations in the NIST Physics Laboratory, the team advanced the performance of the NIST SURF facility to provide a highly stable source of UV radiation with a magnitude known from fundamental laws of physics. Instrumentation was developed to compare radiation from SURF with the output of deuterium lamp standards for distribution with the lowest possible uncertainties to customers of the NIST Measurement

Services. The team validated their measurements against the NIST primary standard for optical power and against UV standards of other nations in an international measurement comparison.

4. What were the results of the actions in either quantifiable or qualitative terms?

This work has changed ultraviolet measurements dramatically. NIST calibration services were improved, benefiting US industries ranging from aerospace to semiconductor manufacturing. Ultraviolet radiation can now be measured with a standard uncertainty of 0.6 %, a factor of four improvement over previous NIST UV standards, and a degree of accuracy rivaling other national standards laboratories, as shall be apparent from the soon-to-be-released report summarizing an international measurement comparison held under the auspices of the International Bureau of Weights and Measures.

Section 3 - Additional Information *(Maximum number of characters for all six questions in this section cannot exceed 2000)*

1. How long did it take to complete the accomplishment? When was the accomplishment completed/implemented/deployed?

The work was performed between the 1998 SURF upgrade and final validation of the improvements to measurements by an international comparison under the auspices of the International Bureau of Weights and Measures completed in 2008. During this time, the improved measurement capability was also incorporated into NIST Calibration Services.

2. What is the short-term impact (1-2 years) of the accomplishment on the bureau and/or Department's mission?

The work has led to the world's best UV radiation measurement capability in support of industry and government requirements.

3. What is the long-term impact (3-5 years) of the accomplishment on the bureau and/or Department's mission?

The success of this effort will allow the realization of high-accuracy radiation standards at shorter wavelengths in support of other measurement needs, particularly in semiconductor manufacturing and space sciences. The outcome of the recent international comparison should encourage improvements in UV measurements throughout the world and ensure continued international acceptance of our Nation's UV-dependent research and commercial products.

4. Does the accomplishment affect other bureaus/Department or other Federal agencies? If so, how?

Yes, the work benefits other agencies through the dissemination of better-calibrated deuterium lamps. There are also indirect benefits through private companies served by NIST calibration services, who in turn provide services to other government agencies. Numerous government agencies are dependent on UV radiation measurements, such as for the detection

of plume signatures of aircraft and shoulder-launched missiles aircraft (DoD, DHS), satellite remote sensing (NASA, NOAA), and UV astronomy (NASA, NSF).

5. Did the accomplishment result in a major advancement in science, technology, or automation? If so, how?

Yes, the accomplishment resulted in state-of-the-art (i.e., smallest) measurement uncertainties in the ultraviolet region from 200 nm to 400 nm. The methods developed during this work could also be used in whole or in part in other spectral regions, and the lessons learned in radiometry and synchrotron characterization can be leveraged in other applications.

6. Did the accomplishment result in a major advancement in non-scientific areas such as customer service or administrative support? If so, how?

Yes, the improved measurement capabilities are already benefiting many NIST calibration customers in, for example, the lighting, aerospace and materials processing industries.