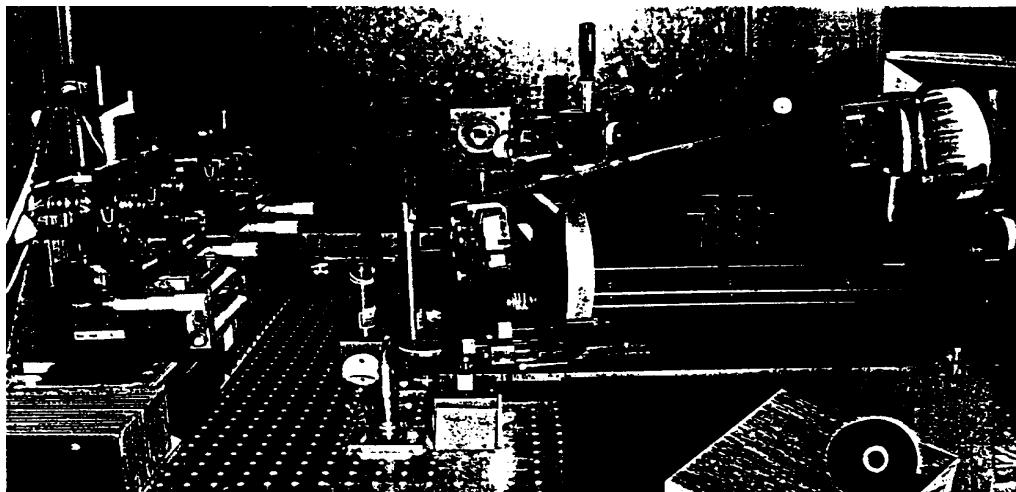
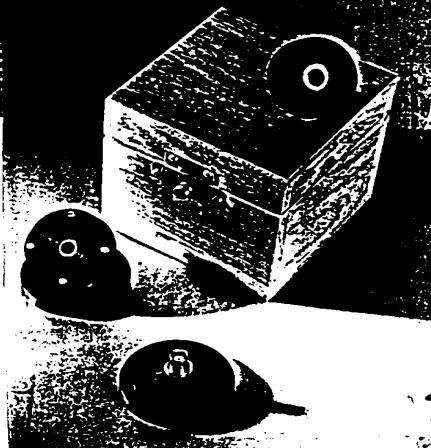


Spectroradiometric Detector Measurements:

Part I—Ultraviolet Detectors and
Part II—Visible to Near-Infrared Detectors



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Thomas C. Larason, Sally S. Bruce, and Albert C. Parr

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NIST MEASUREMENT SERVICES:

Spectroradiometric Detector Measurements:

Part I—Ultraviolet Detectors and Part II—Visible to Near-Infrared Detectors

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Preface

The calibration and related measurement services of the National Institute of Standards and Technology (NIST) are intended to assist the makers and users of precision measuring instruments in achieving the highest possible levels of accuracy, quality, and productivity. NIST offers over 300 different calibrations, special tests, and measurement assurance services. These services allow customers to directly link their measurement systems to measurement systems and standards maintained by NIST. NIST offers these services to the public and private organizations alike. They are described in NIST Special Publication (SP) 250, *NIST Calibration Services Users Guide*.

The Users Guide is supplemented by a number of Special Publications (designated as the “SP250 Series”) that provide detailed descriptions of the important features of specific NIST calibration services. These documents provide a description of the: (1) specifications for the services; (2) design philosophy and theory; (3) NIST measurement system; (4) NIST operational procedures; (5) assessment of the measurement uncertainty including random and systematic errors and an error budget; and (6) internal quality control procedures used by NIST. These documents will present more detail than can be given in NIST calibration reports, or than is generally allowed in articles in scientific journals. In the past, NIST has published such information in a variety of ways. This series will make this type of information more readily available to the user.

This document, SP250-41 (1998), NIST Measurement Services: Spectroradiometric Detector Measurements, is a revision of SP250-17 (1988). It covers the calibration of standards and special tests of photodetector absolute spectral responsivity from 200 nm to 1800 nm (Service ID numbers 39071S - 39081S in SP250, *NIST Calibration Services Users Guide*). Inquiries concerning the technical content of this document or the specifications for these services should be directed to the authors or to one of the technical contacts cited.

NIST welcomes suggestions on how publications such as this might be made more useful. Suggestions are also welcome concerning the need for new calibration services, special tests, and measurement assurance programs.

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Abstract and Key Words

The National Institute of Standards and Technology supplies calibrated photodiode standards and special tests of photodetectors for absolute spectral responsivity from 200 nm to 1800 nm. (This service will soon be expanded to 20 μm in the infrared.) The scale of absolute spectral responsivity is based solely on detector measurements traceable to the High Accuracy Cryogenic Radiometer maintained by the National Institute of Standards and Technology. Silicon photodiode light-trapping detectors are used to transfer the optical power unit from this cryogenic radiometer to monochromator-based facilities where routine measurements are performed. The transfer also involves modeling the quantum efficiency of the silicon photodiode light-trapping detectors. A description of current measurement services is given along with the procedures, equipment, and techniques used to perform these calibrations. Detailed estimates and procedures for determining uncertainties of the reported values are also presented.

Key Words: absolute spectral responsivity; calibration; cryogenic radiometer; light-trapping detectors; optical measurement; optical power; photodetector; photodiode; quantum efficiency; quality system; radiometry; responsivity; scale; standards; silicon photodiode

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