

American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments

Sponsor

National Committee on Radiation Instrumentation, N42

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Secretariat

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Abstract: Specific requirements are established for portable radiation protection instruments used for detection and measurement of levels of ionizing radiation fields or levels of radioactive surface contamination.

Keywords: portable survey instruments, radiation measurements, radiation protection instruments, radiation survey

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Introduction

(This introduction is not part of ANSI N323A-1997, American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments.)

This standard is the responsibility of the Accredited Standards Committee on Radiation Instrumentation, N42. Committee N42 delegated the development of this standard to its subcommittee N42.RPI. Drafts were reviewed by Committee N42, Subcommittee N42.RPI, and other interested parties, and the comments received were utilized in producing the standard as finally approved. The standard was approved by N42 letter ballot on 21 May 1996.

At the time it approved this standard, the Accredited Standards Committee on Radiation Instrumentation, N42, had the following members:

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American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments

1. Scope

This standard establishes specific requirements for portable radiation protection instruments used for detection and measurement of levels of ionizing radiation fields or levels of radioactive surface contamination.

For purposes of this standard, portable radiation protection instruments are those battery-powered instruments that are carried to a specific facility or location for use.

NOTE—These instruments are normally held during operation.

Count rate meters and scalers, when used with an appropriate probe for quantifying activity, can be considered portable radiation protection instruments and treated as a single unit for the purposes of this standard. Specific requirements for calibration of low-range [i.e., near background to $< 10 \mu\text{Sv/h}$ (1 mrem/h)]¹ portable survey instruments will be detailed in ANSI N323B (currently under development). Specific requirements for all air monitoring instruments will be detailed in ANSI N323C (currently under development). Specific requirements for installed instruments that measure dose or dose equivalent, or dose rate or dose equivalent rate, and AC powered instruments used only to detect the presence of radioactive material contamination will be detailed in ANSI N323D (currently under development).

Radiation protection instrumentation provides direct readout of, or readout proportional to, dose or dose equivalent, dose rate or dose equivalent rate, or activity per unit area (i.e., effective probe area). Included are portable rate and integrating devices for beta, photon, and neutron radiations; and monitors for surface contamination (alpha, beta, and photon). Portable radiation protection instruments intended for use in underwater survey and monitoring are included in this standard. Personnel dosimeters (including electronic pocket dosimeters and hybrid pocket dosimeters/dose equivalent rate meters) and environmental monitoring instruments, other than portable instruments used to measure rad/h or rem/h levels, are outside the scope of this standard. Radon monitoring instruments are not within the scope of this standard. Since special-purpose

¹SI units are used throughout this standard with conventional units shown in parenthesis.

instrumentation, such as emergency post-accident radiological monitors, may also fall under the scope of one or more related ANSI standards, this standard is intended to supplement rather than replace these standards. For example, ANSI N42.17A-1989 [B3] sets forth requirements for instrument performance. In general, radiation protection instrumentation is considered to cover the dose and dose equivalent rate ranges for survey meters of 10 $\mu\text{Gy/h}$ to 10 Gy/h (1 mrad/h to 1000 rad/h) and 10 $\mu\text{Sv/h}$ to 10 Sv/h (1 mrem/h to 1000 rem/h), and activity-per-unit-area ranges for surface contamination monitors of 2 Bq/100 cm^2 to 20 000 Bq/100 cm^2 (120 dpm/100 cm^2 to $1.2 \times 10^6 \text{ dpm/100 cm}^2$).

Throughout this standard, three verbs have been used to indicate the degree of rigor intended for each specific criterion. The word *shall* is used to denote a requirement. The word *should* is used to denote a recommendation. The word *may* is used to denote a permissible practice.

2. Definitions

Technical terminology used in this standard is generally consistent with the definitions in ANSI N1.1-1976 [B1], and ICRU 33 [B6]. The following terms are defined specifically for use within this standard:

2.1 absorbed dose: Energy deposited per unit mass of the specified absorbing medium.

2.2 acceptance testing: Evaluation or measurement of performance characteristics to verify that certain stated specifications and contractual requirements are met.

2.3 accredited calibration laboratory: A calibration laboratory that has been accredited by an authoritative body (e.g., Health Physics Society, American Association of Physicists in Medicine, National Institute of Standards and Technology) with respect to its qualifications to perform calibrations on the type of instruments covered by this standard.

2.4 accuracy: The degree of agreement between the observed value and the conventionally true value of the quantity being measured.

2.5 adjust: To alter the response by means of a variable built-in control, such as a potentiometer or software.

2.6 calibrate: (A) To adjust or determine the response or reading of an instrument relative to a series of conventionally true values for radiation sources. (B) To determine the activity of a radiation source relative to a standard or conventionally true value.

2.7 check source: A radioactive source, not necessarily calibrated, that is used to confirm the continuing satisfactory operation of an instrument.

2.8 coefficient of variation: The standard deviation expressed as a percentage of the mean [i.e., (standard deviation/ $\bar{x}$) $\cdot$ (100)].

2.9 contamination monitor: An assembly including one or several radiation detectors and associated assemblies designed to measure activity (alpha, beta, photon, or alpha-beta) per unit surface area or activity of a localized source associated with the contamination of the examined object.

2.10 conventionally true value (CTV) of a quantity: The commonly accepted best estimate of the value of a quantity. This and the associated uncertainty will preferably be determined by a national or transfer standard, by a reference instrument that has been calibrated against a national or transfer standard, or by measurement quality assurance (MQA) with the National Institute of Standards and Technology (NIST), formerly the U.S. National Bureau of Standards, or a qualified secondary laboratory.