



Standard Guide for Benchmark Testing of Reactor Dosimetry in Standard and Reference Neutron Fields¹

This standard is issued under the fixed designation E2005; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers facilities and procedures for benchmarking neutron measurements and calculations. Particular sections of the guide discuss: the use of well-characterized benchmark neutron fields to calibrate integral neutron sensors; the use of certified-neutron-fluence standards to calibrate radiometric counting equipment or to determine interlaboratory measurement consistency; development of special benchmark fields to test neutron transport calculations; use of well-known fission spectra to benchmark spectrum-averaged cross sections; and the use of benchmarked data and calculations to determine the uncertainties in derived neutron dosimetry results.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 ASTM Standards:²

- E170 Terminology Relating to Radiation Measurements and Dosimetry
- E261 Practice for Determining Neutron Fluence, Fluence Rate, and Spectra by Radioactivation Techniques
- E263 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Iron
- E264 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Nickel
- E265 Test Method for Measuring Reaction Rates and Fast-Neutron Fluences by Radioactivation of Sulfur-32
- E266 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Aluminum
- E343 Test Method for Measuring Reaction Rates by Analysis of Molybdenum-99 Radioactivity From Fission Do-

simeters (Withdrawn 2002)³

- E393 Test Method for Measuring Reaction Rates by Analysis of Barium-140 From Fission Dosimeters
- E482 Guide for Application of Neutron Transport Methods for Reactor Vessel Surveillance, E706 (IID)
- E523 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Copper
- E526 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Titanium
- E704 Test Method for Measuring Reaction Rates by Radioactivation of Uranium-238
- E705 Test Method for Measuring Reaction Rates by Radioactivation of Neptunium-237
- E854 Test Method for Application and Analysis of Solid State Track Recorder (SSTR) Monitors for Reactor Surveillance, E706(IIIB)
- E910 Test Method for Application and Analysis of Helium Accumulation Fluence Monitors for Reactor Vessel Surveillance, E706 (IIIC)
- E1297 Test Method for Measuring Fast-Neutron Reaction Rates by Radioactivation of Niobium
- E2006 Guide for Benchmark Testing of Light Water Reactor Calculations

3. Significance and Use

3.1 This guide describes approaches for using neutron fields with well known characteristics to perform calibrations of neutron sensors, to intercompare different methods of dosimetry, and to corroborate procedures used to derive neutron field information from measurements of neutron sensor response.

3.2 This guide discusses only selected standard and reference neutron fields which are appropriate for benchmark testing of light-water reactor dosimetry. The Standard Fields considered are neutron source environments that closely approximate the unscattered neutron spectra from ²⁵²Cf spontaneous fission and ²³⁵U thermal neutron induced fission. These standard fields were chosen for their spectral similarity to the

¹ This guide is under the jurisdiction of ASTM Committee E10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.05 on Nuclear Radiation Metrology.

Current edition approved Oct. 1, 2015. Published November 2015. Originally approved in 1999. Last previous edition approved in 2010 as E2005 - 10. DOI: 10.1520/E2005-10R15.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.