



Standard Guide for Background Subtraction Techniques in Auger Electron Spectroscopy and X-Ray Photoelectron Spectroscopy¹

This standard is issued under the fixed designation E995; 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 The purpose of this guide is to familiarize the analyst with the principal background subtraction techniques presently in use together with the nature of their application to data acquisition and manipulation.

1.2 This guide is intended to apply to background subtraction in electron, X-ray, and ion-excited Auger electron spectroscopy (AES), and X-ray photoelectron spectroscopy (XPS).

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

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E673 Terminology Relating to Surface Analysis (Withdrawn 2012)³

2.2 *ISO Standard:*⁴

ISO 18115-1 Surface chemical analysis—Vocabulary—Part 1: General terms and terms used in spectroscopy

¹ This guide is under the jurisdiction of ASTM Committee E42 on Surface Analysis and is the direct responsibility of Subcommittee E42.03 on Auger Electron Spectroscopy and X-Ray Photoelectron Spectroscopy.

Current edition approved Nov. 1, 2016. Published December 2016. Originally approved in 1984. Last previous edition approved in 2011 as E995-11. DOI: 10.1520/E0995-16.

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.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

3. Terminology

3.1 *Definitions*—Since Terminology E673 was withdrawn in 2012, for definitions of terms used in this guide, refer to ISO 18115-1.⁵

4. Summary of Guide

4.1 *Relevance to AES and XPS:*

4.1.1 *AES*—The production of Auger electrons by bombardment of surfaces with electron beams is also accompanied by emission of secondary and backscattered electrons. These secondary and backscattered electrons create a background signal. This background signal covers the complete energy spectrum and has a maximum (near 10 eV for true secondaries), and a second maximum for elastically backscattered electrons at the energy of the incident electron beam. An additional source of background is associated with Auger electrons, which are inelastically scattered while traveling through the specimen. Auger electron excitation may also occur by X-ray and ion bombardment of surfaces.

4.1.2 *XPS*—The production of electrons from X-ray excitation of surfaces may be grouped into two categories—photoemission of electrons and the production of Auger electrons from the decay of the resultant core hole states. The source of the background signal observed in the XPS spectrum includes a contribution from inelastic scattering processes, and for non-monochromatic X-ray sources, electrons produced by Bremsstrahlung radiation.

4.2 Various background subtraction techniques have been employed to diminish or remove the influence of these background electrons from the shape and intensity of Auger electron and photoelectron features. Relevance to a particular analytical technique (AES or XPS) will be indicated in the title of the procedure.

4.3 Implementation of any of the various background subtraction techniques that are described in this guide may depend on available instrumentation and software as well as the

⁵ <https://www.iso.org/obp/ui/#iso:std:iso:18115:-1:ed-2:v1:en>.