



# Standard Guide for Acousto-Ultrasonic Assessment of Composites, Laminates, and Bonded Joints<sup>1</sup>

This standard is issued under the fixed designation E1495/E1495M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This guide explains the rationale and basic technology for the acousto-ultrasonic (AU) method. Guidelines are given for nondestructive evaluation (NDE) of flaws and physical characteristics that influence the mechanical properties and relative strength of composite structures (for example, filament-wound pressure vessels), adhesive bonds (for example, joints between metal plates), and interlaminar and fiber/matrix bonds in man-made composites and natural composites (for example, wood products).

1.2 This guide covers technical details and rules that must be observed to ensure reliable and reproducible quantitative AU assessments of laminates, composites, and bonded structures. The underlying principles, prototype apparatus, instrumentation, standardization, examination methods, and data analysis for such assessments are covered. Limitations of the AU method and guidelines for taking advantage of its capabilities are cited.

1.3 The objective of AU is to assess subtle flaws and associated strength variations in composite structures and bonded joints. Discontinuities such as large voids, disbonds, or extended lack of contact at interfaces can be assessed by other NDE methods such as conventional ultrasonics.

1.4 Additional information may be found in the publications cited in the list of references at the end of this guide. The referenced works provide background on research, applications, and various aspects of signal acquisition, processing, and interpretation.

1.5 *Units*—The values stated in either SI units or inch-pound units are to be regarded as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standards.

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.04 on Acoustic Emission Method.

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1.6 *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:<sup>2</sup>

E543 Specification for Agencies Performing Nondestructive Testing

E1316 Terminology for Nondestructive Examinations

### 2.2 ASNT Standard:<sup>3</sup>

ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel

SNT-TC-1A Recommended Practice for Personnel Qualifications and Certification in Nondestructive Testing

### 2.3 AIA Document:<sup>4</sup>

NAS-410 Certification and Qualification of Nondestructive Testing Personnel

## 3. Terminology

### 3.1 Definitions:

3.1.1 *acousto-ultrasonics (AU)*—a nondestructive examination method that uses induced stress waves to detect and assess the diffuse defect states, damage conditions, and variations of mechanical properties of an examination structure. The AU method combines aspects of acoustic emission (AE) signal analysis with ultrasonic materials characterization methods (Terminology E1316).

3.1.2 Additional related definitions may be found in Terminology E1316.

### 3.2 Definitions of Terms Specific to This Standard:

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

<sup>4</sup> Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.