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Standard Practice for Characterization and Verification of Phased Array Probes[1]

This standard is issued under the fixed designation E2904; 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 standard practice covers measurement procedures for evaluating certain characteristics of phased-array ultrasonic probes that are used with phased-array ultrasonic examination instrumentation.

1.2 This standard practice describes means for obtaining performance data that may be used to define the acoustic and electric responses of phased-array ultrasonic probes including contact (with or without a wedge) and immersion linear phased-array probes used for ultrasonic nondestructive testing with central frequencies ranging from 0.5 MHz to 10 MHz. Frequencies outside of this range may use the same methods but the testing equipment may vary.

1.3 When ultrasonic values dependent on material are specified in this document, they are based on carbon steel with an ultrasonic wave propagation speed of 5920 m/s (±50 m/s) for longitudinal wave modes and 3255 m/s (±30 m/s) for transverse or shear wave modes.

1.4 This document describes the characterization and verification procedures that are to be carried out at the end stage of the manufacturing process of phased array probes. This document does not describe the methods or acceptance criteria used to verify the performance of the entire phased array ultrasonic instrument and probe.

1.5 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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:*[2]

E1065 Practice for Evaluating Characteristics of Ultrasonic Search Units

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, see Terminology E1316.

3.1.2 *Technical Specification of the Phased Array Probes:*

3.1.2.1 *datasheet*—defined as specification. This is the document that defines the general geometry and expected performance of a specific model or part number.

3.1.2.2 *certification*—defined as measured performance of an individual probe. This is the document that reports the measured performance of a specific probe (specific to a serial number).

3.1.2.3 *probe type*—contact or immersion.

3.1.2.4 *probe shape and size*—probe form and dimensions.

3.1.3 *Terminology for Array Probes:*

3.1.3.1 *active aperture*—pitch times the number of elements.

3.1.3.2 *cross-coupling*—also called "cross-talk." An undesirable condition where array elements are activated, electrically or acoustically, by adjacent elements.

3.1.3.3 *element width—in a rectangular element*, the acoustic element's short dimension.

3.1.3.4 *element length—in a rectangular element*, the acoustic element's long dimension. See *passive aperture* (also called element elevation) and Fig. 2.

3.1.3.5 *element pitch (or pitch)*—the distance between the centers of two adjacent array elements.

[1] This practice/guide is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Method.

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[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.

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