

Standard Test Method for Moduli of Elasticity and Fundamental Frequencies of Carbon and Graphite Materials by Sonic Resonance¹

This standard is issued under the fixed designation C 747; 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 test method covers the measurement of the fundamental transverse, longitudinal, and torsional frequencies of isotropic and anisotropic carbon and graphite materials. These measured resonant frequencies are used to calculate dynamic elastic moduli for any grain orientations.

1.2 *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:

- C 215 Test Method for Fundamental Transverse, Longitudinal, and Torsional Frequencies of Concrete Specimens²
- C 559 Test Method for Bulk Density by Physical Measurement of Manufactured Carbon and Graphite Articles³
- C 885 Test Method for Young's Modulus of Refractory Shapes by Sonic Resonance³
- E 111 Test Method for Young's Modulus, Tangent Modulus, and Chord Modulus⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *elastic modulus*—the initial tangent modulus as defined in Test Method E 111.

3.1.2 *slender rod or bar*—a specimen whose ratio of length to minimum cross-sectional dimension is at least 5 but not more than 20.

3.1.3 *longitudinal vibrations*—when the oscillations in a slender rod or bar are in a plane parallel to the length dimension, the vibrations are said to be in the longitudinal mode (Fig. 1(a)).

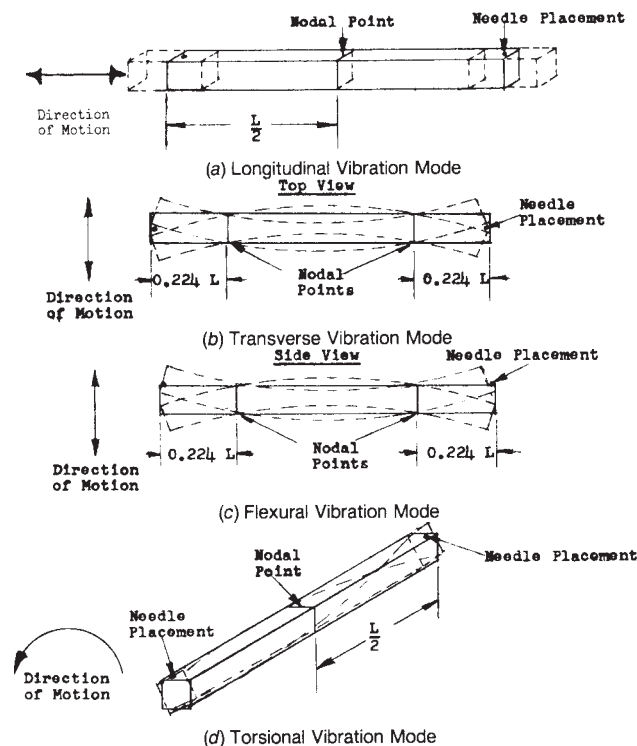


FIG. 1 Resonance Modes

3.1.4 *transverse vibrations*—when the oscillations in a slender rod or bar are in a horizontal plane normal to the length dimension, the vibrations are said to be in the transverse mode (Fig. 1(b)). This mode is also commonly referred to as the flexural mode when the oscillations are in a vertical plane (Fig. 1(c)). Either the transverse or flexural mode of specimen vibration will yield the correct fundamental frequency, subject to the geometric considerations given in 9.1.

3.1.5 *torsional vibrations*—when the oscillations in each cross-sectional plane of a slender rod or bar are such that the plane twists around the length dimension axis, the vibrations are said to be in the torsional mode (Fig. 1(d)).

3.1.6 *resonance*—a slender rod or bar driven into one of the above modes of vibration is said to be in resonance when the imposed frequency is such that resultant displacements for a

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² Annual Book of ASTM Standards, Vol 04.02.

³ Annual Book of ASTM Standards, Vol 05.05.

⁴ Annual Book of ASTM Standards, Vol 03.01.