



Designation: F2137 – 19

Standard Practice for Measuring the Dynamic Characteristics of Amusement Rides and Devices¹

This standard is issued under the fixed designation F2137; 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 practice covers acquisition of data related to the dynamic characteristics of amusement rides and devices.

1.2 This practice also defines the specific requirements of a Standardized Amusement Ride Characterization Test (SARC Test) for use in characterizing the dynamic motion of an amusement ride or device.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3.1 *Exception*—The values are reversed in Section 13 since EN standards primarily use SI units.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

F747 Terminology Relating to Amusement Rides and Devices

2.2 *EN Standard:*³

EN 13814 Fairground and amusement park machinery and structures - Safety

3. Terminology

3.1 Definitions:

¹ This practice is under the jurisdiction of ASTM Committee F24 on Amusement Rides and Devices and is the direct responsibility of Subcommittee F24.10 on Test Methods.

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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.

³ Available from European Committee for Standardization, <http://www.cen.eu/>.

3.1.1 *aliasing*—a phenomenon associated with sampled data systems, wherein a signal containing significant energy at frequencies greater than one half of the system sample frequency manifests itself in the sampled data as a lower frequency (aliased) signal. Aliasing can be avoided only by limiting the frequency content of the signal prior to the sampling process. Once a signal has been aliased, it is not possible to reconstruct the original signal from the sampled data.

3.1.2 *calibration constant*—the arithmetic mean of the sensitivity coefficients, evaluated at frequencies that are evenly spaced on a logarithmic scale between F_L and F_H .

3.1.3 *calibration value*—the ratio of the reference calibration system output, in engineering units relevant to the transducer, to the data channel output, in volts, as measured at constant excitation frequency and amplitude.

3.1.4 *channel frequency class (CFC)*—a frequency response envelope that conforms to Fig. 1 and is referred to by the value F_H in hertz. The CFC frequency response envelope is defined by the boundaries shown in Fig. 1 and the following characteristic frequencies:

F_L —Pass band lower limit (hertz). Always equal to zero (0.0) hertz.

F_H —Pass band upper limit (hertz). The CFC designator.

F_N —The corner or knee of the frequency response envelope. Always equal to or greater than $1.667 \times F_H$.

F_S —The minimum sample frequency for a sampled data system that corresponds to the designated CFC. Always equal to or greater than $12 \times F_H$.

3.1.4.1 *Discussion*— F_L , F_H , F_N , and F_S are always specified in hertz. While the characteristics of the CFC may be applied to individual components of a data channel, the CFC is, by definition, the frequency response envelope of the entire data channel from the mounted transducer to the final representation of the acquired data.

3.1.5 *coordinate system*—three orthogonal axes that intersect at an origin whose positive directions correspond to the right-hand rule.

3.1.5.1 *measurement coordinate system*—a coordinate system that provides the reference axes and sign convention for the test data record(s).