



Standard Test Method for Determining the Performance of Passive Radio Frequency Identification (RFID) Transponders on Loaded Containers¹

This standard is issued under the fixed designation D7435; 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 determines the readability of radio frequency identification (RFID) transponders placed on loaded containers that are manually handled or mechanically handled by material handling equipment such as fork trucks, pallet jacks, and automated guided vehicle systems. The results of these tests are intended to be used for qualitative purposes.

1.2 Test results solely reflect the performance of the specified RFID system and the specified loaded container. Results are not intended for performance analysis of the RFID system, in part or in whole.

1.3 This test method is intended for use in laboratory settings that simulate, as closely as is practicable, the distribution environment of the product being tested.

1.4 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.

1.5 *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

D996 Terminology of Packaging and Distribution Environments

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

E337 Test Method for Measuring Humidity with a Psy-

chrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

3. Terminology

3.1 *Definitions*—Terms and definitions used in these test methods may be found in Terminology D996.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *critical transponder distance*—the distance between the transponder and the interrogator antenna at which a transponder becomes undetectable by an RFID system, when moving the RFID transponder out of the read field.

3.2.2 *direct line of sight*—an unobstructed visible path from one object to another.

3.2.3 *empty container*—the shipping case of the loaded container, excluding the product as well as the primary, secondary, and/or tertiary packaging shall be considered the empty container.

3.2.4 *firmware*—a series of programmable instructions, stored in read only memory (ROM), which controls the capabilities of an interrogator.

3.2.5 *loaded container*—the loaded container shall consist of a production run or individually prepared packaging system, to include the product as well as the primary, secondary, and/or tertiary packaging up through the shipping case level.

3.2.6 *radio frequency identification (RFID)*—a wireless data communication technology that uses radio waves to transfer data from one source to another.

3.2.7 *read field*—the area in which an RFID transponder is capable of responding to the interrogator. The outermost boundary of the read field correlates to the critical transponder distance. The distance between the critical transponder distance and the transponder acquisition distance represents an area of RF energy that may or may not be sufficient to activate a passive transponder.

3.2.8 *RF*—the energy used by RFID systems to activate transponders and wirelessly transfer information.

3.2.9 *RF enhancing*—a substance or material that, when in the presence of radio waves, creates constructive interference, causing the amplitude of the radio waves to increase. Ultimately, the resulting wave experiences an increase in

¹ These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.17 on Auto-ID Applications.

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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.