



Standard Practice for Selecting, Preparing, Exposing, and Analyzing Witness Surfaces for Measuring Particle Deposition in Cleanrooms and Associated Controlled Environments¹

This standard is issued under the fixed designation E 2088; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice is intended to assist in the selection, preparation, exposure, and analysis of witness surfaces for the purpose of characterizing particle deposition rates in cleanrooms and associated controlled environments, particularly for aerospace applications.

1.2 Requirements may be defined in terms of particle size distribution and count, percent area coverage, or product performance criteria such as optical transmission or scatter. Several choices for witness surfaces are provided.

1.3 *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.*

1.4 The values stated in SI units are to be regarded as the standard.

2. Referenced Documents (Note 1)

2.1 ASTM Standards:

E 1216 Practice for Sampling for Surface Particulate Contamination by Tape Lift²

F 24 Method for Measuring and Counting Particulate Contamination on Surfaces³

F 50 Practice for Continuous Sizing and Counting of Airborne Particles in Dust-Controlled Areas and Clean Rooms Using Instruments Capable of Detecting Single Sub-Micrometer and Larger Particles²

F 312 Test Methods for Microscopical Sizing and Counting Particles from Aerospace Fluids on Membrane Filters⁴

2.2 ISO Standard:

ISO 14644-1 Cleanrooms and Associated Controlled Environments—Part 1: Classification of Air Cleanliness⁵

2.3 Government Standards:

Fed-Std-209 Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones⁶

MIL-STD-1246 Product Cleanliness Levels and Contamination Control Program⁶

NOTE 1—The Institute of Environmental Sciences and Technology has several Recommended Practices which may also be useful.

3. Terminology

3.1 Definitions:

3.1.1 *bidirectional reflectance distribution function (BRDF)*—the scattering properties of light reflected off surfaces, expressed as the ratio of differential outputs of radiance divided by differential inputs of radiance. Surface contaminants scatter the incident radiation in all directions and with variable intensities. The BRDF is a method to quantify the spatial distribution of the scattered energy.

3.1.2 *cleanliness level*—an established maximum allowable amount of contamination in a given area or volume, or on a component.

3.1.3 *cleanroom*—an environmentally conditioned area in which temperature, humidity, and airborne contaminants are controlled by design and operation. High-efficiency particulate air (HEPA) filters or better are usually required to achieve the air cleanliness level. Air particulate cleanliness is classified in accordance with FED-STD-209 or ISO 14644-1.

3.1.4 *contaminant*—unwanted molecular and particulate matter that could affect or degrade the performance of the components upon which they reside.

3.1.5 *contamination*—a process of contaminating.

3.1.6 *contamination control*—organized action to control the level of contamination.

3.1.7 *controlled area*—an environmentally controlled area, operated as a cleanroom, but without the final stage of HEPA (or better) filters used in cleanrooms.

3.1.8 *critical surface*—any surface of an item or product which is required to meet established cleanliness level requirements.

3.1.9 *demonstrated equivalence*—the condition in which a

¹ This practice is under the jurisdiction of ASTM Committee E-21 on Space Simulation and Applications of Space Technology and is direct responsibility of Subcommittee E21.05 on Contamination.

Current edition approved May 10, 2000. Published July 2000.

² *Annual Book of ASTM Standards*, Vol 15.03.

³ Discontinued; see 1993 *Annual Book of ASTM Standards*, Vol 15.03.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

⁶ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.