

**ANSI/ESD SP14.5-2021**

# **ESD Association Standard Practice**

**ANSI/ESD SP14.5-2021**

Revision of ANSI/ESD SP14.5-2015



*For Electrostatic Discharge  
Sensitivity Testing*

*Near-Field Immunity Scanning  
Component/Module/PCB Level*

*Electrostatic Discharge Association  
7900 Turin Road, Bldg. 3  
Rome, NY 13440*

*An American National Standard  
Approved June 17, 2021*



*ESD Association Standard Practice  
for Electrostatic Discharge  
Sensitivity Testing*

*Near-Field Immunity Scanning  
Component/Module/PCB Level*

Approved January 26, 2021  
EOS/ESD Association, Inc.



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(This foreword is not part of ESD Association Standard Practice ANSI/ESD SP14.5-2021)

## FOREWORD

One of the biggest problems when electrostatic discharge (ESD) testing a functional system or subsystem is the analysis of unacceptable soft-errors, upsets, bit errors, and similar faults that occur during ESD testing. These failures are also referred to as “soft” failures, which are non-destructive, and the unit being tested works fine when reset or rebooted. Following a “soft” failure, no physical evidence exists to allow troubleshooting using traditional methods. This standard practice<sup>1</sup> describes a scanning technique for identifying areas, traces, and individual devices that are sensitive to field-coupled transient disturbances. These are likely to be sensitive to the transient electromagnetic disturbances during ESD events or human-metal model ESD testing, as defined by the IEC 61000-4-2 system level ESD test standard. Identifying such areas or devices provides engineers with key information to deduce the causes of “soft” failures, such as upsets and bit errors.

The scanning technique may be performed either under manual control and observation of the device under test (DUT) reactions being monitored by the operator or with a robotic system with automatic failure detection capabilities.

The motivation for using near-field immunity scanning to determine the robustness of components such as integrated circuits (ICs), modules, or printed circuit boards (PCBs) is discussed in the following five points.

**Localizing sensitive areas.** While the system level standard allows one to determine if a system is passing or failing, it does not identify the root cause of an ESD sensitivity. Root-cause analysis of soft failures is best done with near-field immunity scanning.

**Repeatability.** The problems of repeatability of system level testing are well-publicized, and near-field scanning has been shown to offer much better reproducibility in determining ESD sensitivities.

**Relative characterization at the module level.** System level testing requires a complete, operational system, but using near-field scanning allows one to determine individual modules' sensitivity against ESD-like pulses.

**Relative characterization at the IC level.** Many ESD problems, especially in hand-held products, are not caused by coupling into the PCB but rather by direct coupling into the ICs. Using a near-field scanning system, one can determine an IC's sensitivity to electric or magnetic field coupling.

**Fulfillment of system level requirements.** Using near-field scanning techniques, one can compare the sensitivities of previous and new models, and in many cases, obtain good indications of robustness without retesting the complete system. This test method is not a substitute for system-level testing but complements it by providing a tool for identifying problem areas.

This document was originally designated ANSI/ESD SP14.5-2015 and approved on August 21, 2015. ANSI/ESD SP14.5-2021 is a revision of ANSI/ESD SP14.5-2015 and approved on January 26, 2021.

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<sup>1</sup> **ESD Association Standard Practice (SP):** A procedure for performing one or more operations or functions that may or may not yield a test result. Note, if a test result is obtained it is not reproducible.

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**TABLE OF CONTENTS**

<b>1.0 PURPOSE AND SCOPE</b> .....	<b>1</b>
1.1 PURPOSE .....	1
1.2 SCOPE .....	1
<b>2.0 REFERENCED PUBLICATIONS</b> .....	<b>1</b>
<b>3.0 DEFINITIONS</b> .....	<b>1</b>
<b>4.0 PERSONNEL SAFETY</b> .....	<b>2</b>
<b>5.0 EQUIPMENT</b> .....	<b>2</b>
5.1 SCANNING METHODS .....	2
5.2 PULSE SOURCE/TRANSMISSION LINE PULSE (TLP) .....	4
5.3 PROBES .....	5
<b>6.0 WAVEFORM AND PULSE GENERATION REQUIREMENTS</b> .....	<b>5</b>
<b>7.0 TEST SETUP</b> .....	<b>7</b>
7.1 MANUAL TEST SETUP.....	7
7.2 ROBOTIC TEST SETUP OVERVIEW.....	7
7.3 TEST PARAMETERS.....	8
7.3.1 <i>Scan Area</i> .....	8
7.3.2 <i>Point Density</i> .....	8
7.3.3 <i>Field Probe Type</i> .....	8
7.3.4 <i>Field Probe Orientation</i> .....	9
7.3.5 <i>Pulse Polarity</i> .....	9
7.3.6 <i>Pulse Rate and Number of Pulses per Test Point</i> .....	9
7.4 DUT COMMUNICATION.....	9
7.5 TEST SYSTEM VERIFICATION .....	9
7.6 TEST STRATEGIES .....	9
7.7 DATA STORAGE FORMAT.....	12
<b>8.0 RECOMMENDED TEST LEVELS</b> .....	<b>12</b>
<b>9.0 DISTURBANCE CRITERIA</b> .....	<b>12</b>
<b>10.0 DOCUMENTATION</b> .....	<b>13</b>

**ANNEXES**

Annex A (Informative): Waveform Verification .....	14
Annex B (Informative): Field Coupling.....	22
Annex C (Informative): Data Visualization.....	25
Annex D (Informative): Bibliography.....	28
Annex E (Informative): Revision History of ANSI/ESD SP14.5.....	29

**TABLES**

Table 1: General Waveform Parameters.....	7
Table 2: Recommended Test Levels.....	12
Table 3: Geometry Parameters for the Microstrip Trace .....	15
Table 4: Voltage Induced at Each End of a 20-mm Trace .....	23

**FIGURES**

Figure 1A: Block Diagram of a Typical Automated Immunity Scanning System.....	4
Figure 1B: Main Components of a Typical Automated Immunity Scanning System.....	4
Figure 2: Principle Representation of the Voltage Induced by the Suggested Transmission Line Pulse Source in the Case of Electric Field Coupling.....	6
Figure 3: Generic Flow Diagram for Scan Test .....	11
Figure 4: Microstrip Trace for Capturing the Induced Voltages.....	15
Figure 5: Rising Edge of the TLP Waveform.....	16
Figure 6: Schematic of the Test Set-up to Capture the Coupled Waveforms at the Trace Ports	16
Figure 7: 5-mm Hx Probe Mounted over the Center of the Trace.....	17
Figure 8: Induced Voltage from the Ez Probe 1 mm above Trace, 1 Kilovolt TLP Charge Voltage .....	17
Figure 9: Sum and Differential Voltages Caused by the Ez Probe 1 mm above the Trace, 1 Kilovolt TLP Charge Voltage .....	18
Figure 10: Induced Voltage from the Hx Probe 1 mm above Trace, 1 Kilovolt TLP Charge Voltage.....	19
Figure 11: Induced Voltage from an Hz Probe, $Z_{\text{offset}} = 1 \text{ mm}$ , $X_{\text{offset}} = 4.21 \text{ mm}$ , 1 Kilovolt TLP Charge Voltage.....	19
Figure 12: Induced Voltage from the Ez Probe 5 mm above Trace, 1 Kilovolt TLP Charge Voltage.....	20
Figure 13: Sum and Differential Voltage Induced by the Hz Probe, $Z_{\text{offset}} = 5 \text{ mm}$ , $X_{\text{offset}} = 4.21 \text{ mm}$ , 1 Kilovolt TLP Charge Voltage .....	20
Figure 14: Illustration of the Electric Field Coupling and its Return Current Flow.....	22
Figure 15: Illustration of the Magnetic Field Caused by a Horizontal Loop Close to a Ground Plane.....	23
Figure 16: Voltage Induced in the Trace when H-probe is offset by 3.5 mm; Monitored at Both Trace Terminations.....	24
Figure 17: Comparison of Two Functionally Identical ICs from Different Vendors .....	26
Figure 18: Identification of Sensitive Traces Close to a Microprocessor using Immunity Scanning.....	26
Figure 19: Electric Field and Magnetic Field Sensitivity of an LCD.....	27

**ESD Association Standard Practice for Electrostatic Discharge Sensitivity Testing – Near Field Immunity Scanning - Component/Module/PCB Level****1.0 PURPOSE AND SCOPE****1.1 Purpose**

This document establishes a test method for immunity scanning of ICs, modules, and PCBAs. Results from near-field immunity scanning relate to the system level behavior but cannot predict system level performance using the IEC 61000-4-2 test method. The reason is that variations exist in coupling paths between injection points and local current densities and associated fields coupled into traces or ICs.

This test method focuses on soft failures, such as bit errors and upsets, keeping in mind that fast pulses can also cause latch-up. The document will guide the user in identifying the root causes of ESD induced soft failures in components, such as ICs, modules, and PCBAs, for debugging and quality control purposes.

**1.2 Scope**

This document applies to the testing of powered modules, components such as ICs, circuit boards, subsystems, and systems in which system upset can be detected either by an operator performing the test or automatically.

**2.0 REFERENCED PUBLICATIONS**

Unless otherwise specified, the following documents of the latest issue, revision, or amendment form a part of this standard practice to the extent specified herein:

ANSI/ESD STM5.5.1, ESD Association Standard Test Method for Electrostatic Discharge (ESD) Sensitivity Testing – Transmission Line Pulse (TLP) – Component Level<sup>2</sup>

IEC 61000-4-4, Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test<sup>3</sup>

IEC/TR 61967-1-1, Integrated circuits - Measurement of electromagnetic emissions - Part 1-1: General conditions and definitions - Near-field scan data exchange format<sup>3</sup>

**3.0 DEFINITIONS**

The terms used in the body of this document are in accordance with the definitions found in ESD ADV1.0, ESD Association's Glossary of Terms available for complimentary download at [www.esda.org](http://www.esda.org).

**electrical fast transient (EFT).** For this document, an electrical fast transient, as outlined in IEC 61000-4-4 test method, is a burst of electrical events that are coupled onto a system or component.

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