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APPLICATION NOTE

MiniPulse ESD

Antenna Characteristics

For ESD event monitoring, antenna factors are very important in setting up a successful application. The goal of successful monitoring is to be able to distinguish ESD event signals of interest from spurious tool or other process electromagnetic noise. This application note is meant to assist in choosing an appropriate antenna to match the application requirements. This application note is appropriate for both the standalone Novx MiniPulse version and the Novx Series 7000 with MiniPulse.

ESD Antenna Basics

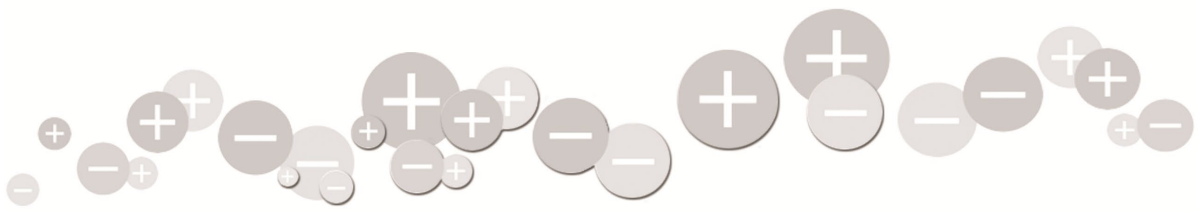
ESD antennas are transducers which take the radiated electromagnetic field produced by an electrostatic discharge event (ESD) and turn it into an electrical signal which can be captured by an ESD detector or oscilloscope. Antennas typically have the following features:

- ***Antenna Gain***. This refers to an antennas ability to convert the radiated ESD pulse signal into an electrical signal. As a rule, the larger the antenna surface, the more sensitivity to ESD events. This means that smaller ESD events can be detected and ESD events can be detected from a greater distance from the source.
- ***Directivity***. This refers to the antenna ability to receive ESD event signals from a desired source, while rejecting unwanted signals from other sources. Some applications will benefit from low directivity, detecting ESD events in a wide surrounding area. Other applications will require a much more restricted solution focusing on a very specific location.

ESD Antenna Detection Accuracy

Due to the properties of electromagnetic waves, in this case produced by an ESD event, great accuracy can be obtained with proper antenna calibration by distance from source. In combination with detection threshold settings and signal filtering, ESD detection can be tuned for specific applications. Below is a table showing which antennas are recommended for generic types of monitoring application.

Monitor Unit	MicroESD Antenna	Application
Novx MiniPulse	Monopole	General area 360º ESD monitoring
Novx MiniPulse	MPA-01	Close directional ESD source monitoring
Novx 7000 with MiniPulse	Monopole	General area 360º ESD monitoring
Novx 7000 with MiniPulse	MPA-02	Close directional ESD source monitoring

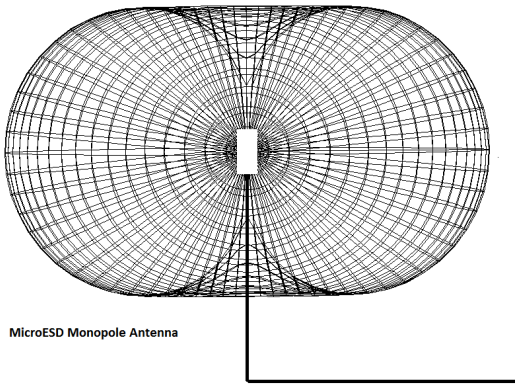


ESD Antenna Types

Monopole Micro ESD Antenna

This general use antenna was developed to provide non-directional ESD detection capabilities. This antenna version is most often used when multiple ESD sources in a small area need to be monitored.

This antenna is sensitive to 1V ESD events at 3 mm distance from any side of the antenna.

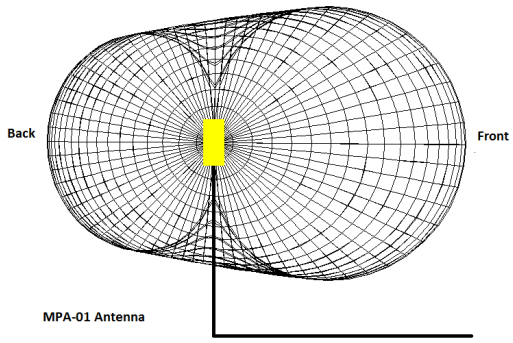


Monopole MicroESD Gain Pattern

MPA-01/MPA-02 Directional Antennas

These antennas were developed for single ESD source monitoring, typically inside enclosed environ-ments. The directionality factor helps to eliminate environmental electromagnetic pulse noise which is not of interest. The antenna focal plane (labeled front side) of the antenna receives the ESD pulse signal, and the backplane of the antenna rejects signals originating from other surrounding sources.

This antenna is also sensitive to 1V ESD events at 3 mm distance on the front side of the antenna.



MPA-01 and MPA-02 MicroESD Gain Pattern

Application Rules

Implementing ESD event monitoring in tools and processes which have some level of background noise requires some careful planning and qualification. Modern tools are getting quieter by, for instance, adopting brushless DC motors to run actuators and tool operations. However, depending upon the tool type and surrounding environment, electromagnetic noise with narrow pulse widths can mimic ESD event pulse events. Below is a brief summary of elements to take into consideration.

- ESD detector calibration should be performed with an accurate and repeatable CDM event source. The Simco-Ion CDMES (Charged Device Model Event Simulator) system is highly recommended. Some organizations require a statistical validation test to be performed to demonstrate monitoring effectiveness. This necessitates having a repeatable CDM event calibration source.
- Careful attention should be placed on identifying the probable device ESD location (e.g., test socket, device/board placement, etc.). ESD antenna type and placement needs to be determined based upon application requirements. For instance, if noise rejection is necessary, then the MPA-01 or MPA-02 antenna should be chosen to minimize unwanted signal acquisition. The antenna should be placed as close to the ESD event source location as possible. The farther the antenna is placed from this location, the more problematic it will be to separate real ESD signals from ambient noise events.

- Once an antenna position has been chosen, a rejection test should be performed with the CDMES to determine the ESD event detection sensitivity and rejection characteristics. If the event detector is picking up conducted events from other locations, it may be necessary to place the antenna in a different position. If the monitoring unit is the Novx 7000 with MiniPulse, there is an additional digital filter feature which can be used to suppress background noise sources. This rejection test should answer questions like, "The MiniPulse at this threshold setting is able to reject a 500V ESD event at 1 meter."

Additional feature information can be found in the product user manuals.

SIMCO ION™
An ITW Company

Technology Group
1141 Harbor Bay Pkwy, Ste 201
Alameda, CA 94502
Tel: +1 (800) 367-2452 (in USA)
Tel: +1 (510) 217-0460
ioninfo@simco-ion.com
www.simco-ion.com

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