3D Simulation Of IEC 61000-4-2 Electrostatic Discharge Immunity Test With ESD Gun NSG 435.

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Abstract

Electrostatic discharge (ESD) testing is conducted to assess the vulnerability of ICs and electronic devices to ESD. ESD tests are generally categorized into device- and system-level tests. These tests simply determine whether the equipment under test (EUT) is damaged by ESD.

It is possible to implement the mentioned simulation on any simulated electric design using the Comsol to gain a general view of the ESD test for the designed system. This will help in understanding the B-field and H-field together at the contact point and estimating the designed system's threshold for withstanding.

This simulation will deliver simulated B-field and H-field data during the EMC directive ESD test and also provides a comparison with actual measurement results.

The object will be the exact design of the ESD Gun NSG 435 electrical circuit, including charging and discharging, for a nanosecond simulation based on IEC standards.

The preferred method in ESD testing is contact discharge. If contact discharge cannot be be applied, air discharges should be used instead. The voltages for each test method are listed in provided Table . The differing voltages for each method are due to the differing test methods. It's important to note that the different voltages do not mean that the test severity is equivalent between the test methods.

In this simulation, we will thoroughly examine both contact discharge and air discharge through two simulations, ensuring the specified level of test voltage is achieved. Please consult the table for further details. Furthermore, the air contact will be used in a parametric sweep at varying distances from the EUT, in accordance with regulations.

The internal circuit of the ESD gun will be connected to the PE Equipment Under Test (EUT) and the PE of the ESD gun, based on international standard IEC 61000-4-2.

Additionally, the time curve of an ESD pulse according to IEC 61000-4-2 will be compared with the measured data, and a simulation design.

Reference

International Electrotechnical Commission, IEC 61000-4-2: Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test, 2nd ed., 2008. [Online]. Available: https://www.itu.int/en/ITU-D/Technology/Documents/Events2016/CI_Training_ARB_Tunis_April16/Session8/IEC_61000-4-2_2008.pdf

Schaffner / Teseq. (n.d.). NSG 435 ESD Simulator User Manual. Retrieved from TestWorld
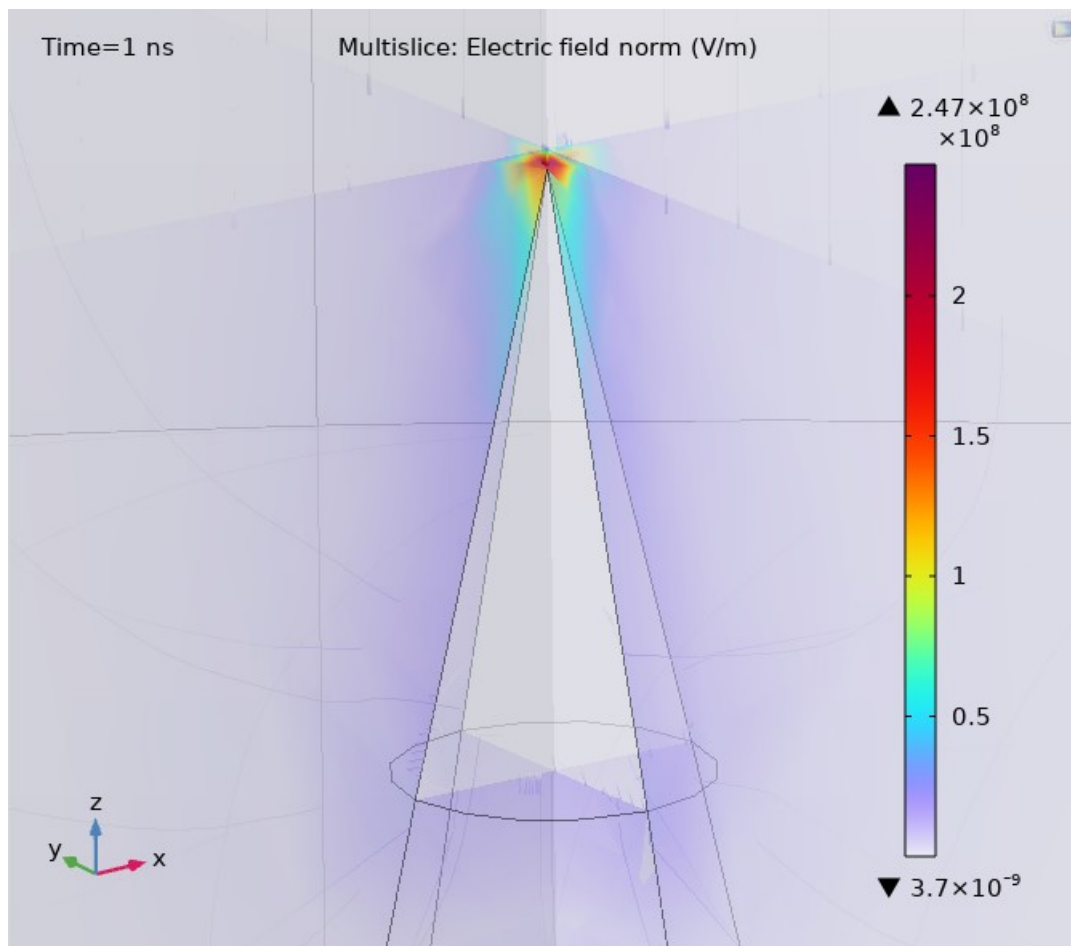
Figures used in the abstract

Figure 1 : NSG 435 ESD Gun with Air and Contact Finger Types
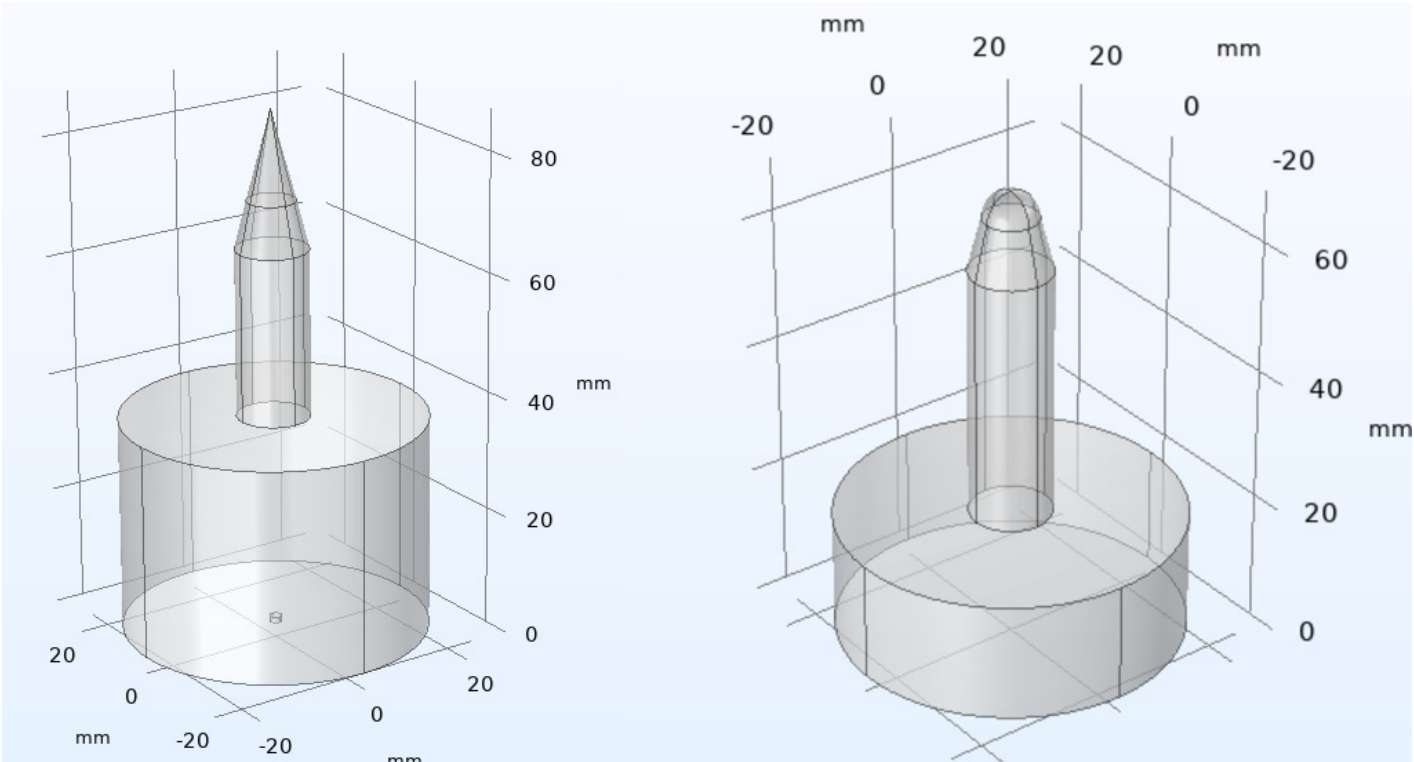
Figure 2 : ESD Gun Fingers Simulation for Contact and Air Discharge Application

Figure 3 : Electric Field Norm Result in 1-ns Discharge

Table 1 – Test levels

	Contact discharge		Air discharge	
Level	Test voltage kV		Level	Test voltage kV
1	2		1	2
2	4		2	4
3	6		3	8
4	8		4	15
x [a]	Special		x [a]	Special

[a] "x" can be any level, above, below or in between the others. The level shall be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.

Figure 4 : IEC/EN 61000-4-2 Test Standard for Electrostatic Discharge (ESD) Immunity