

# Analysis of ESD Radiation fields from VCP

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**Abstract**—The early-time (E1) HEMP is characterized by a large peak electric field, a fast rise time, a short duration and a wave impedance of  $377 \Omega$ . E1 HEMP radiated immunity test for equipment uses TEM waveguide or HEMP simulator to generate the required field. ESD immunity test is often compared to EMP immunity test for equipment, due to the transient characteristics with fast rise time and high voltages. IEC 61000-4-2 for ESD immunity test has transient radiated field test methods using HCP (Horizontal Coupon Plane) and VCP (Vertical Coupling Plane) as indirect application. This paper shows the measurement results and analysis of the ESD transient field from the VCP.

Keywords-E1 HEMP, ESD, transient radiated field, VCP

## I. INTRODUCTION

ESD immunity test IAW IEC 61000-4-2 is one of general EMC tests for electrical and electronic equipment. IEC 61000-4-2 specifies transient radiated field test methods using HCP (Horizontal Coupon Plane) and VCP (Vertical Coupling Plane) as indirect application as well as direct discharges of contact and air modes. In this paper, the ESD transient fields from the VCP with various bleeder resistors were simulated in CST MW studio and measured using NSG-438A, ESD simulator. Then, the results were analyzed in frequency domain.

## II. ESD RADIATED FIELDS FROM VCP

Measurement were performed for 8 kV ESD using a grounded d-dot sensor on the surface of a metallic rack.

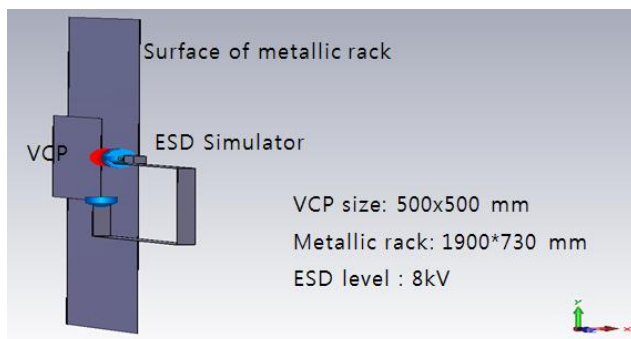


Figure 1. Simulation of ESD radiation field from VCP

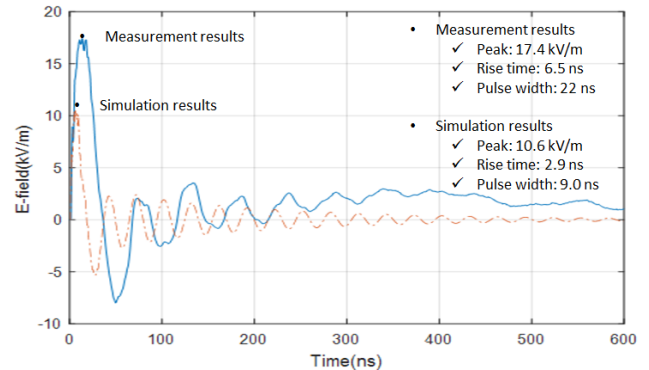


Figure 2. ESD radiation field from VCP with  $2 \Omega$  bleed resistors

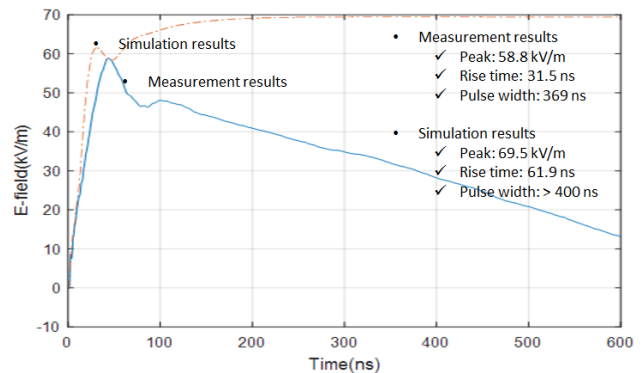


Figure 3. ESD radiation field from VCP with  $940k \Omega$  resistors

## III. CONCLUSION

The ESD radiated field from VCP seems to be comparable to E1 radiated HEMP with the condition of modified bleeder resistors

## REFERENCES

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