

# SUFACE ELECTRIC DISCHARGE AS A MICROSTRIP STRUCTURE

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## Abstract

In this paper, we summarize the results of the systematic studies performed on the morphology of the high voltage gliding electric discharge patterns on dielectric surfaces, observed on photographic films. In spite of the quite complex patterns observed, a statistical study reveals that the electric discharge has a geometry that can be described best using fractal shapes. The morphology of the pattern could be used to infer some physical properties of the discharge. The discharge being on the surface, behaves like a conducting path on a dielectric substrate. So, the pattern can thus be examined from the point of view of conventional micro strip structure.

Hard modeling of some features reveals different characteristics that can be used for making models of the discharge.

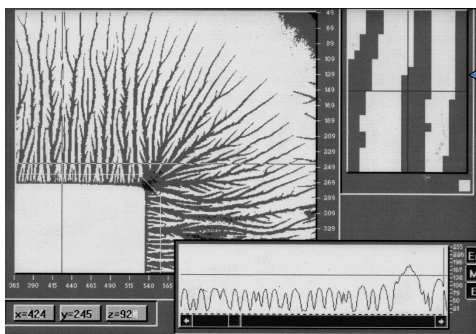
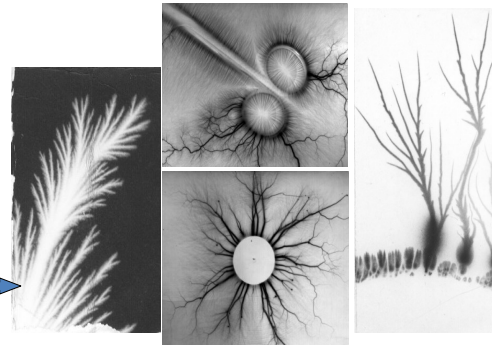
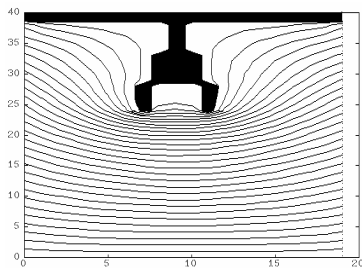


Image analysis, "micro strips"

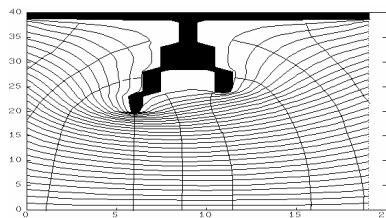
Images high voltage and high frequency surface discharges



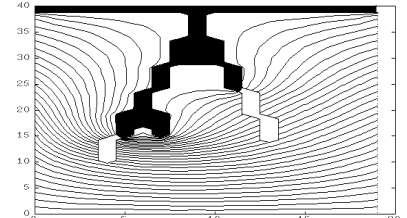
Two dimensional modeling of the discharge path 1. Equipotential lines.



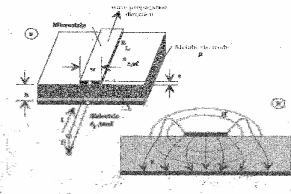
Two dimensional modeling of the discharge path 2



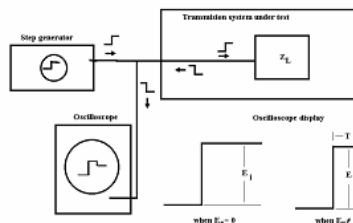
Two dimensional modeling of the discharge path 3



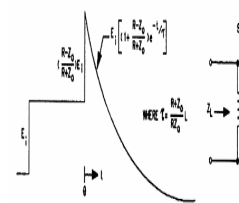
A typical microstrip geometry



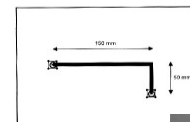
TLD measurement schematics



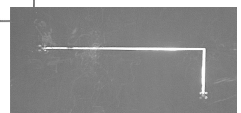
Typical response for TDR used to obtain the microstrip characteristics



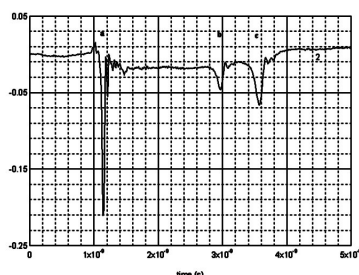
Experimental strip



The geometry and the PCB bent line



Measured TLD response for a sudden change of strip path



## RESULTS

The gliding discharge has a longer path on dielectric compared with the free space discharge, at the same voltage

The discharge channel act as a non-TEM wave guide having also a d.c. component and an a.c. wave component

As a results a standing wave tip-propagation is established on the discharge channel

The standing waves produces local charge accumulations increasing the electric field in this points

These regions could trigger branches of discharge because of increased electric field

The discharge path shows expected fractal structure due to the nonlinear nature of the charge accumulation

