

# Simultaneous Observation of Electrical Charge Image and its Quantity by TN Liquid Crystal Cell

Tatsuo Takada and Toshiyuki Kawasaki

Department of Electrical and Electronic Engineering,  
Musashi Institute of Technology,  
Tamuzutsumi, Setagaya, Tokyo, Japan

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The amount of charge and image produced by a surface electrical discharge were studied by a special twisted nematic liquid crystal cell. The adjacent glass crystal cell has only one transparent electrode which is located at the bottom of the cell. Charges were placed on the upper surface of the crystal cell by a high voltage discharge between the bottom electrode and a point electrode. The applied voltage on a 0.37 mm-thick crystal cell was approximately 3 kV. An 8-mm diameter discharge figure was obtained using a video camera recording system which was placed below the bottom electrode. The maximum charge density on the cell calculated from the image processing was  $180 \mu\text{C}/\text{m}^2$ . These results are closely related to charge densities obtained by other methods.

## 1. Introduction

In order to visualize electrostatic charge patterns, charged particles, such as toners, are sprayed on insulating materials. This application technique is used in many copying machines.<sup>(1)</sup> It is also used in dust-figure techniques for the study of electrical discharge mechanisms.<sup>(2)</sup> In practical application, the dust-figure technique is used in the study of the charge distribution in insulating materials in power cables.<sup>(3)</sup> These spraying techniques are generally useful in obtaining electrostatic charge patterns; however, in these experiments, quantification was not feasible because electrostatic charges on sheets or plates were neutralized by spraying oppositely charged particles.

Previously, we quantified electrostatic charge patterns by scanning with a small-