J9 Thermal Gradient Mechanism of Line Crossing Anomaly

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After attending this presentation, attendees will gain an enhanced ability to interpret line crossings involving laser printing and moderately embossed handwriting by their microscopic glare-angle behavior.

This presentation will impact the forensic community and/or humanity by demonstrating recognition of a previously unrecognized mechanism underlying the appearance of certain line crossings.

A. In a recent case, intersections of laser printing with a moderately embossed fluid ink signature (e.g., rolling writer genre), I noted what appears to be a dark path or band across the surface of the fused laser toner.

B. This path is anomalous with respect to normal ink-writing-overlaser appearance in that no burnish-sheen or ink-film sheen is present, despite observing the signature to have been written with sufficiently firm writing pressure to emboss the paper.

C. To test the hypothesis that this dead-black surface anomaly is a function of substrate topology rather than brightness differences, test printings were made and studied.

D. In order to separate (1) influences of (underlying) ink on the surface of laser printing from (2) influences associated with the embossment furrow, I laser printed over (a) unembossed ink strokes, and (b) uninked embossments made with various styli including empty ballpoint pens.

E. I observed (1) no apparent dark band or any other visible effect on the fused-toner surface of laser printing applied over unembossed ink writing, but (2) the same anomalous darkened and sheen-free path on the surface of laser printing applied over uninked writing embossments.

F. Due to the method employed by this type of printer to fuse the electrostatically-adhering black powdered toner to the page permanently, i.e., pressure exerted by a hot top roller and a cold bottom roller, I used the terminology “thermal gradient” to describe the loss of effective thermo-mechanical contact between the surface of the powdered toner due to physical sheltering inside the embossment “furrow,” the effect increasing from the edges to the center of embossment.

G. Insofar as using these observations and experiments to aid examinations involving intersections of moderately embossed writing and laser printing, the paper contains a step chart.

H. The demonstrative tests clearly separate the purely topological cause of the observed effect from ink-related influences such as visibility of underlying writing through an integuous toner layer by KubelkaMunk processes, visibility through gaps in the toner layer, leaching of ink components to the surface of the toner layer, or any earlier inkinduced irregularities in the electrostatic transfer stage of laser printing.

Crossing Strokes, Thermal Gradient, Embossment Sheltering

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