J9 The Evaluation of Instrument Sensitivity and Stability for the Magnetic Flux Measurement Relative to Toner Area as a Screening Tool for Casework Application

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After attending this presentation, attendees will better understand the potential for the use of the Regula® Magmouse 4197 to differentiate between black-and-white toner-printed documents from different sources. Attendees will also understand the magnetic class characteristic groups exhibited by toner-printed documents and how to employ magnetic flux measurement techniques for exclusionary purposes as a precursor to confirmatory techniques.

This presentation will impact the forensic science community by providing a method for quickly screening black-and-white toner-printed documents, thus reducing the need for more time-consuming methodology.

This study was created to address questions raised by previous research into magnetic properties of toners. Specifically, the questions of whether magnetic flux could be positively correlated with toner area, whether the flux value remained constant or showed variation with toner age and degradation, and whether there is a way to standardize the measurement of magnetic flux to account for variations across fonts and characters.

With this goal, a preliminary trial was conducted on 5 samples from the collections of the Université de Lausanne. Measurements were taken from 150 samples in a series of ten trials conducted across a span of one week, from each of 3 different font sizes per sample. The results were compared to the results obtained one year prior for consistency and to check for any possible sample degradation, but were found to be within the expected error intervals indicating no change in magnetic flux behavior. The area of each measurement was determined individually, and the flux per area measurement was checked for correlation. Though there is some difference in the level of intra source variation exhibited by the samples, a positive correlation between area and magnetic flux was observed.

For the second phase of trials, magnetic flux measurements of 150 samples representative of an actual population were collected and considered as a function of their toner area measured individually. Three replicate measurements were collected over the course of one week. The data were analyzed with a two-way ANOVA to determine the thresholds for the class groupings.

For the final phase of verification, the thresholds determined in the previous trials for the number magnetic flux measurements necessary, the class intervals, and exclusion thresholds were tested using a blind trial methodology. Seven samples which had been randomized from the pool of 150 phase two samples were presented for analysis and class identification. The magnetic flux of each unknown was measured three times with varying areas, and the average flux per area was used to determine the class of the sample.

The magnetic flux per area was found to be stable over time, and to exhibit levels of intra and inter source variation which allow for the discernment of class-level characteristics. Exclusions can be made with a high degree of confidence; however failure to exclude or the appearance of consistency necessitates further confirmatory testing. Magnetic flux measurements could be useful as a quick, screening tool to eliminate the need for further testing which may be destructive.

Questioned Documents, Toner, Magnetic Flux