

**APPLICATIONS OF THE NONPARAMETRIC PERMUTATION TEST FOR THE ANALYSIS OF LIBS SPECTRA OF FORENSIC SAMPLES.** Caitlin N. Rinke<sup>1</sup>, Michael E. Sigman<sup>1</sup>, Liqiang Ni<sup>2</sup>, (1) Department of Chemistry and National Center for Forensic Science and (2) Department of Statistics and Actuarial Sciences, University of Central Florida, P.O. Box 162367, Orlando, FL 32816-2367

The application of a nonparametric multivariate statistical method is used to enhance the interpretation of results from analytical techniques in the field of forensic science. Nonparametric permutation-based hypothesis testing was applied to laser induced breakdown spectroscopy (LIBS) analyses of float glass samples. Twelve average LIBS spectra were collected in random order from 10 automotive windows with three areas of each window being sampled. Two averaging techniques were tested, drill down versus multiple points, to determine the ideal sampling method. Pairwise comparison of multiple LIBS spectra from the windows demonstrated excellent discriminating power of the test. Same source same area discriminations (i.e. Type I error) were below the  $\alpha=0.05$  level; however, discriminations were seen for same source different area. Samples from different sources were discriminated with a Type II error of only 7%. The forensic relevance of these results will be discussed.