Advanced Terahertz Data Processing for NDE Applications

C.-P. Thomas Chiou[1], John R. Nagel[1], Jared L. Taylor[1], Donald Palmer Jr[2], and Nathan R. Smith[2]; [1]Center for Nondestructive Evaluation, Iowa State University, 1915 Scholl Road, Ames, IA 50011; [2]Boeing Research & Technology, Hazelwood, MO 63042

Recently terahertz technology (THz) has emerged as a very powerful NDE tool for inspecting and characterizing dielectric materials.   Due to its exceptional longitudinal and lateral resolutions, time-domain pulsed THz scan is particularly effective for inspecting thin layered dielectric media. This pulsed scanning produces multi-dimensional data for which advanced processing techniques are needed to extract and analyze the ample information within. In this presentation we conduct a comparable study of several renowned data processing techniques to determine their applicability and performance in processing THz data. These data processing techniques include an outlier detection algorithm based on minimum covariance determinant estimator, the popular partial least squares method in the field of chemometrics and a Bayesian classifier also known as probabilistic neural network in the fields of pattern recognition/machine learning. We will present the results on common simulated data as well as interface data obtained from fiber glass composites.