

Acoustic Emission measurement with fiber bragg gratings for structure health monitoring

Curtis E. Banks¹, James L. Walker², Sam Russell², Don Roth³, Nehemiah Mabry⁴, Melissa Wilson⁵

¹Integrated Structure Health Monitoring and Sensors Branch
EV43 MSFC/NASA, Huntsville, Al 35812

²Nondestructive Evaluation Branch
EM20 MSFC/NASA, Huntsville, Al 35812

³RHI/Optical Instrumentation & NDE Branch
RHI0 GRC/NASA, Cleveland, OH, 44135

⁴MSGR Intern, School of Polymer and Fiber Engineering,
Georgia Institute of Technology, Atlanta, GA

⁵Graduate Student, Structural Engineering,
University of Alabama in Huntsville, Huntsville, AL

Abstract: Structural Health monitoring (SHM) is a way of detecting and assessing damage to large scale structures. Sensors used in SHM for aerospace structures provide real time data on new and propagating damage. One type of sensor that is typically used is an acoustic emission (AE) sensor that detects the acoustic emissions given off from a material cracking or breaking. The use of fiber Bragg grating (FBG) sensors to provide acoustic emission data for damage detection is studied. In this research, FBG sensors are used to detect acoustic emissions of a material during a tensile test. FBG sensors were placed as a strain sensor (oriented parallel to applied force) and as an AE sensor (oriented perpendicular to applied force). A traditional AE transducer was used to collect AE data to compare with the FBG data. Preliminary results show that AE with FBGs can be a viable alternative to traditional AE sensors.