**Localization of Impact Damage in Composite Material Subjected to Mechanical Loading using Electrical Impedance Tomography**

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Electrical impedance tomography (EIT) is a nondestructive imaging modality that is used to determine the conductivity within a domain based on voltage measurements taken on the boundary. When paired with materials that demonstrate stimulant-responsive conductivity, EIT can be used to map damage in terms of conductivity change. An often touted advantage of EIT is that it can be used in-situ; that is, because the method only requires the application of unobtrusive electrodes, it can conceivably be used while the component or structure is in operation. However, operational loads induce strains that often change the conductivity of the material. Establishing that EIT can detect damage-induced conductivity changes through the presence of unrelated strain-induced conductivity changes is therefore important. In this work, we will demonstrate the ability of EIT to detect surrogate impact damage within a polymer-matrix composite (PMC) panel in the presence of mechanical loading. To achieve this, we consider EIT measurements from an eight-ply panel loaded in four point bend after indentation to induce delamination. We perform difference imaging using EIT measurements of the panel loaded before indentation as a baseline. The bending load changes the contact impedance of the electrodes, which results in poor EIT images when solving the EIT inverse problem with the -norm on the error term. We will show that the image quality can be significantly improved by using the -norm on the error term. We solve the -norm optimization problem using the primal-dual interior point method (PDIPM).

For the initial demonstration, measurements of the panel loaded before indentation are used as a baseline. However, we also consider measurements of the non-indented panel before loading as a baseline. We will show we are able to localize the impact damage in this more challenging case using a mixed prior that combines a Gaussian smoothness prior with a conditionally Gaussian prior that favors sparse solutions.