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Elastic Interaction of Multiple Delaminations in Laminated Structures

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The elastic interaction of multiple delaminations in laminated structures subject to out of plane loading has been investigated by utilizing beam theory approximations of elasticity. Shielding and amplification of the energy release rate of cracks has been quantified for a cantilever beam. These phenomena are controlled by regions of opening and contact that develop along the crack faces. Results show important short and long range interactions between these cracks, depending mostly on their transverse spacing and have some similarity to the results of other investigators for the interaction of cracks in infinite bodies, but with strong modification of certain characteristics by mode ratio and thickness effects. Shielding and amplification strongly influence the propagation of the system of cracks leading to local instabilities, local strain hardening and crack arrest. Maps of these behaviors have been constructed, allowing for easy qualification of shielding and amplification and crack propagation events. The results are being validated using finite elements.

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