# A Numerical Study on the Influence of silica NanoParticles Matrix Charging on the Toughness Behaviour of Composite Laminates

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**Abstract.**
The use of nanomodified epoxy resins can potentially increase composites application to aeronautical structural components thanks to the potential enhancement, in terms of physical and mechanical properties, when compared to the neat epoxy matrix. In this work, the effects of silica NanoParticles (NPs) on the fracture toughness and, consequently, the crack growth resistance of Fibre-Reinforced Polymers (FRPs) has been investigated. The skin-stringer debonding initiation and growth have been studied by a tailored numerical procedure considering an aeronautical panel reinforced with a single T-shape stringer, made of carbon fibres/epoxy resin material, and subjected to compressive load. An analytical model has been used to evaluate the Mode I fracture toughness value of the nanomodified resin and the Virtual Crack Closure Technique methodology has been employed to assess the delamination growth in the frame of a Finite Elements (FE) analysis performed in the Ansys Finite element environment. Numerical results presenting the comparison between charged and neat configurations have been assessed to provide a first understanding of the influence of nanoparticles on the static delamination growth in geometrically complex composite structures.