Polynomial stability of a transmission problem involving Timoshenko systems with fractional Kelvin-Voigt damping

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In this work, we study the stability of a one-dimensional Timoshenko system with localized internal fractional Kelvin-Voigt damping in a bounded domain. First, we reformulate the system into an augmented model and using a general criteria of Arendt-Batty we prove the strong stability. Next, we investigate three cases: the first one when the damping is localized in the bending moment, the second case when the damping is localized in the shear stress, we prove that the energy of the system decays polynomially with rate t^{-1} in both cases. In the third case, the fractional Kelvin-Voigt is acting on the shear stress and the bending moment simultaneously. We show that the system is polynomially stable with energy decay rate of type $t^{\frac{-4}{2-\alpha}}$, provided that the two dampings are acting in the same sub-interval. The method is based on the frequency domain approach combined with multiplier technique.