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DYNAMICS OF NANO BEAMS WITH ATTACHED MASSES RANDOMLY DISTRIBUTED

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Abstract. In this paper we analyze the dynamic behavior of micro/nano beams with attached masses distributed in a random field. A model of shear deformable micro beam is employed as the basis for deterministic calculations that are carried out in the context of the finite element method. The deterministic model is developed under the frame of non-local elasticity. Attached masses modify the vibratory pattern of unloaded nano-beams, and by the way conveying the possibility to detect alterations (this is the way in which nano-sensors can detect the presence of biomolecules or other nano-particles). The variability of mass and/or the stiffness properties of the nano- beam are assumed as random parameters or random fields taking into account the elastic coupling between bending and shear in the contexts of non-local approaches. The probabilistic model is constructed, under the basis of a first-order-shear-deformation (FOST) beam theory, appealing to the Maximum Entropy Principle in order to derive the probability density functions, according to increasing levels of entropy (i.e. with less number of constraints or less information). The analysis is performed in the frequency domain by comparing the probabilistic models with different levels of information (i.e., given the mean and/or the bounds, etc.) with previously developed probabilistic approaches such as the ones with parametric uncertainty.