Comments for Reviewer C:

Dear Reviewer

We think that we did not explain well that what changes had been done in the revised manuscript with ID AoM-3423 and entitled "Static, Free and Forced Vibration Analysis of a Delaminated Microbeam-based MEMS Subjected to the Electrostatic Force" related to your comments. Please accept our apologies. We have revised the manuscript based on your new comments.

Please notice to our brief explanation to your comments below.

…………………………………………………………………………………………………….

Comment 1:

1. The authors use the "modified couple stress theory" which for a beam system at hand reduces to adding an additional bending stiffness according to eq. (2-3) with an additional parameter l, which is extremely simple, in fact, automatic. Of course, the results will show dependence on this parameter (or on the sample size if l is constant), but the dependence is purely phenomenological and not supported by aby other evidence.

Reply:

The paper investigates the bending and vibration characteristics of a delaminated microbeam under nonlinear electrostatic force which is the main contribution of the present work. To the best of authors' knowledge, there are no publications on the static and forced vibration analysis of the delaminated beam or microbeam under the action of electrostatic force. By letting $l = 0$, the microstructural effect will be ignored and the non-classical model will be reduced to the classical Euler–Bernoulli beam model. It is worth mentioning that there is no solution in the literatures about this problem based on classical Euler–Bernoulli beam model. It is well-known that the usual classical theories are incapable to capture the size dependency of the structures and then we have used the non-classical theory. In other words, the classical theories cannot present the accurate mathematical framework to study the real physics of the microstructures.

……………………………………………………………………………………………………

Comment 2:

2. Anyway, the only comment concerning this theory, added in response to my remark, is the following: "It is worth mentioning that the bending rigidity D_i is calculated based on the modified couple stress theory [26]." This is not sufficient. At least, some comments concerning the theory would be needed (what are the basic assumptions, how is it related to other theories, what are the benefits and drawbacks of the theory...).

Reply:

As you know several higher order theories such as strain gradient, modified couple stress, and Eringen's nonlocal elasticity theories have been proposed for isotropic elastic materials in which the role(s) of material length-scale parameter(s) is (are) involved in the constitutive equations. In this regard, the couple stress elasticity theory was presented in 1960s for the first time where this model introduced two higher-order material length scale parameters, in addition to the two

classical Lame' constants, in the governing equations of motion (Mindlin et al. and Toupin). In 2002, this model was modified by Yang et al. (2002) to develop the modified couple stress theory in which the constitutive equations contain only one additional material length scale, creating symmetric couple stress tensor. Two properties of the modified couple stress theory (i.e., the inclusion of a symmetric couple stress tensor and the involvement of only one length scale parameter) are two advantages of this model over the classical couple stress theory. As you know these parameters will be defined using experimental investigations and it is obvious that finding one parameter is easier than finding two parameters in experiment. A variational formulation of this modified couple stress theory has subsequently been provided by Park and Gao (2006). They developed a new non-local model for Euler – Bernoulli beams using the minimum total potential energy principle and the concepts of the modified couple stress theory proposed by Yang et al (2002). They showed that the bending deformation of the beam has two contributions: one associated with the normal stress component (the conventional term); and the other associated with the couple stress component (the additional term). They indicated that the bending rigidity of the beam, ($D=EI + \mu A l^2$), explicitly depends on l. This new proposed beam model based on the modified couple stress theory contains only one additional material constant, i.e., internal material length scale parameter l, unlike the other non-classical beam models.
Also, Miandoab et al. (2014) showed that the modified couple stress theory coincides experimental results better than Eringen's nonlocal elasticity and classical theories.
Therefore, we have used the model proposed by Park and Gao (2006) and in the past decade many researchers (for instance Jafari-Talookolaei et al. 2018) have studied the behavior of microbeams based on this convenient theory.

…………………………………………………………………………………………………….

Comment 3:
My second major comment concerned nonlinearity. In the manuscript, the authors have changed the description from "linear equations" to "nonlinear equations", but the results are the same. The respective comment does not clarify whether the model has been corrected to account for the nonlinearity, or just the description has been modified. Note that the results reported are identical to the previous ones.

Reply:
We did not correct the model in the revised paper. We only corrected our mistake in writing the "linear equations". Due to this reason, the results in the revised paper are the same as they had been in the initial paper. In other words, we solved the model with electrostatic nonlinear force in the first draft of the paper.
……………………………………………………………………………………………………..

Comment 4:
The constrained mode model is now commented in one sentence. However, examination of the actual equations leads to the conclusion that this formulation is not correct. It does not account for the axial displacements and the corresponding axial forces in the two beams replacing the delaminated segment.

Reply:
We considered the axial force using the conditions presented in Eqs. (2-9) and (2-10). More calculation details exist in Jafari-Talookolaei et al. (2012). Besides, the constrained mode model

proposed by Mujumdar et al. (1998) for the first time in which Eqs. (12-20) of this reference show the consideration of axial force in the formulations.

Best Regards,

……………………………………………………………………………………………….

References:

1-Mindlin, R. and Tiersten, H. \Effects of couple-stresses in linear elasticity", Arch. Ration. Mech. An., 11, pp. 415-448 (1962).

2-Toupin, R.A. \Elastic materials with couple-stresses", Arch. Ration. Mech. An., 11, pp. 385-414 (1962).

3-Yang, F., Chong, A., Lam, D., and Tong, P. \Couple stress based strain gradient theory for elasticity", Int. J. Solids Struct., 39, pp. 2731-2743 (2002).

4-Park, S. K., and X. L. Gao. "Bernoulli–Euler beam model based on a modified couple stress theory." Journal of Micromechanics and Microengineering 16.11 (2006): 2355.

5-R.-A. Jafari-Talookolaei, N. Ebrahimzade, S. Rashidi-Juybari et al., "Bending and vibration analysis of delaminated Bernoulli–Euler micro-beams using the modified couple stress theory," Scientia Iranica, vol. 25, no. 2, pp. 675-688, 2018.

6-E. M. Miandoab, H. N. Pishkenari, A. Yousefi-Koma et al., "Polysilicon nano-beam model based on modified couple stress and Eringen's nonlocal elasticity theories," Physica E: Low-dimensional Systems and Nanostructures, vol. 63, pp. 223-228, 2014.

7- R.-A. Jafari-Talookolaei, M. H. Kargarnovin, and M. T. Ahmadian, "On the dynamic response of a delaminated composite beam under the motion of an oscillating mass," Journal of composite materials, vol. 46, no. 22, pp. 2863-2877, 2012.

8-P. M. Mujumdar, and S. Suryanarayan, "Flexural vibrations of beams with delaminations," Journal of sound and vibration, vol. 125, no. 3, pp. 441-461, 1988.