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# Identification method of Non Linear Generalized Maxwell Model for viscoelastic components

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## Abstract :

The dynamic characteristics of viscoelastic components depend on frequency, amplitude, preload, and temperature. A Non Linear Generalized Maxwell Model (NLGMM), with only 4 independent parameters is proposed. The proposed NLGMM is based on the decomposition between the linear viscoelasticity [1-3] and the non linear stiffness. This assumption is validated on a large range of experimental measures. The efficiency of the NLGMM is shown for different kinds of excitations in non linear dynamics : periodic, transient or random excitations. The non linear stiffness is represented by a simple polynomial function. Comparisons between measures and computed values have been carried on several viscoelastic samples. The NLGMM shows a good accordance with experimental results.

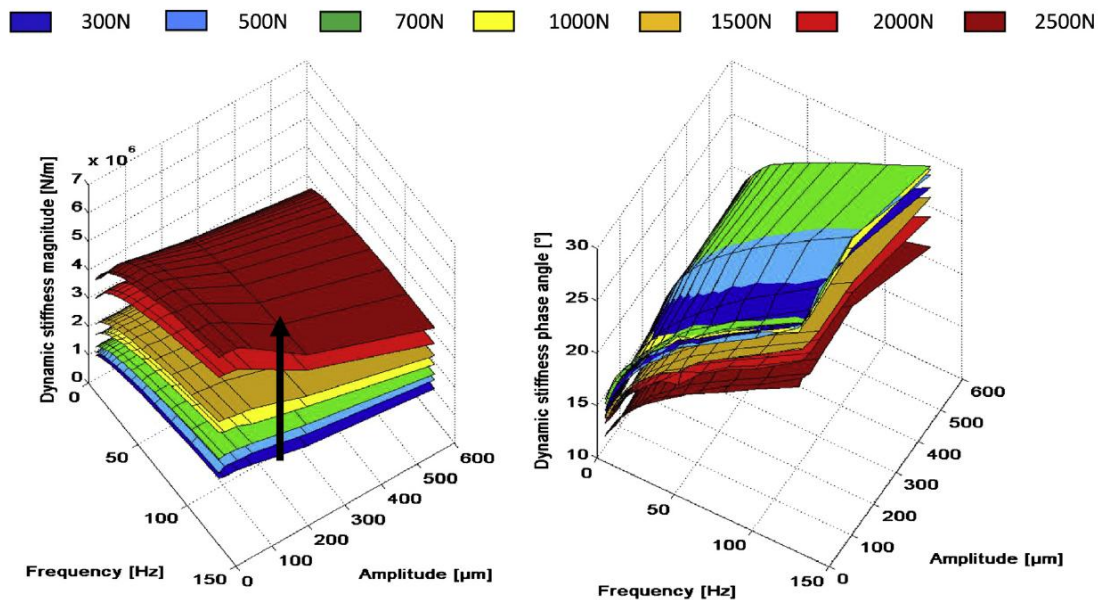


Fig. 1. Dynamic stiffness magnitude and phase angle versus of amplitude and frequency for each preload.

## Mots clefs :

Non linear viscoelasticity ; Generalized Maxwell Model ; DMA tests ; identification technique

## Références

- [1] Dion, J.L., Vialard, S., 1997. Identification of rubber shock absorber mounts. *Mécanique industrielle et matériaux* 50, 232-237.
- [2] Renaud, F., Dion, J.L., Chevallier, G., Tawfiq, I., Lemaire, R., 2011. A new identification method of viscoelastic behavior: application to the generalized Maxwell model, *Mechanical Systems and Signal Processing* 25 (3), 991-1010.
- [3] H. Jrad, J. L. Dion, F. Renaud, I. Tawfiq, and M. Haddar, “Experimental characterization, modeling and parametric identification of the non linear dynamic behavior of viscoelastic components,” *European Journal of Mechanics - A/Solids*, vol. 42, no. 0, pp. 176 – 187, 2013.