

## ***High order homogenization for acoustic and elastic wave problems and optimization of the dispersive coefficients***

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### ***Abstract***

Wave dispersion is a phenomenon appearing in heterogeneous media, by which waves of different wavelengths propagate at different velocities [1]. In the acoustic wave equation for periodic media, the dispersive effect is modeled as an additional forth-order term in the homogenized wave equation [2,3,4]. This effect must be taken into account in industrial applications because the size of periodic microstructures is finite in manufactured products. In this study, the dispersive effect is discussed in the acoustic and elastic wave problem for periodic media. Additionally, the formulated the dispersive coefficient is optimized by using the structural optimization method. This is a joint work with Professor Grégoire Allaire (Ecole Polytechnique, France).

### ***References***

- [1]F. Santosa, W. W. Symes: A Dispersive Effective Medium for Wave Propagation in Periodic Composites, *SIAM Journal on Applied Mathematics*, Vol. 51, pp.984–1005, (1991).
- [2]C. Conca, R. Orive, M. Vanninathan, On Burnett Coefficients in Periodic Media, *Journal of Mathematics Physics*, Vol.47, No.032902, (2006).
- [3]A. Lamacz, “Dispersive Effective Models for Waves in Heterogeneous Media”, *Math. Models Methods Appl. Sci.*, Vol.21 No.9, pp.1871-1899, (2011).
- [4]G. Allaire, T. Yamada, “Optimization of Dispersive Coefficients in the Homogenization of the Wave Equation in Periodic Structures”, hal-01341082, (2016).